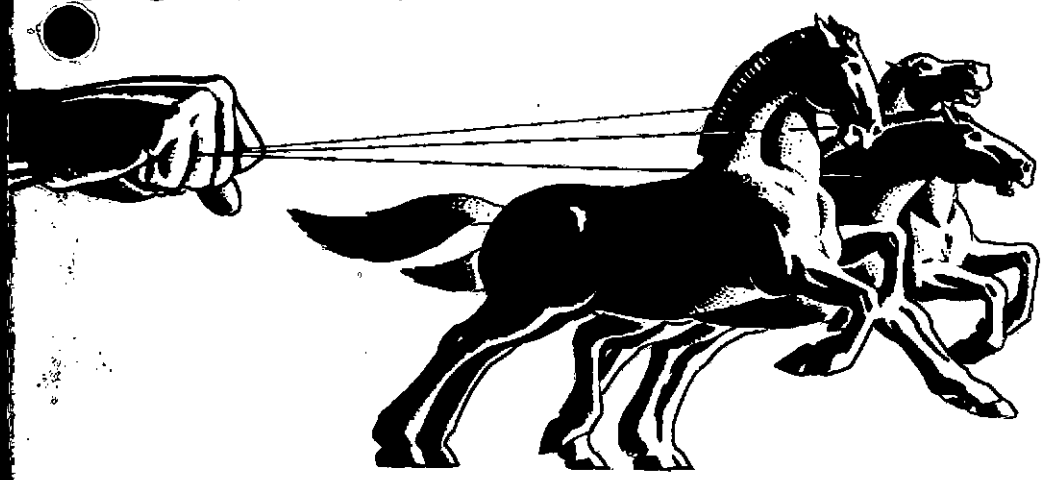
Chrysler

V-8 INDUSTRIAL ENGINES



HORSEPOWER WITH A PEDIGREE!

Models IND. 52, 53, 54, 56 and 56A

OPERATING MANUAL

D-16719

CONTENTS

SPECIFICATIONS

Make	CHRYSLER V-8 INDUSTRIAL ENGINES				
Model	52	53	54	56	56A
Type	*V-8 O.H.V.*	*V-8 O.H.V.*	*V-8 O.H.V.*	*V-8 O.H.V.*	*V-8 O.H.V.*
No. of Cylinders	8	8	8	8	8
Bore	3.63 in.	3.63 in.	3.63 in.	3.81 in.	3.94 in.
Stroke	3.256 in.	3.80 in.	3.80 in.	3.62 in.	3.62 in.
Piston Displacement	270 cu. in.	315 cu. in.	315 cu. in.	331 cu. in.	354 cu. in.
Horsepower Rating	151@4000 rpm	160@4000 rpm	173@4000 rpm	183@4000 rpm	188@4000 rpm
Compression Ratio	7.6 to 1	7.0 to 1	7.5 to 1 8.5 to 1 LPG	7.5 to 1	7.6 to 1 Gasoline 8.5 to 1 LPG
Compression Pressure at 150 rpm	120 to 140 psi	120 to 140 psi	120 to 140 psi	120 to 140 psi	120 to 140 psi
Minimum allowable	90 lbs.	90 lbs.	90 lbs.	90 lbs.	90 lbs.
Maximum variations between cylinders	15 lbs.	15 lbs.	15 lbs.	15 lbs.	15 lbs.
Cylinder numbering as viewed from fan end of engine					
(Right Bank)			1-3-5-7		
(Left Bank)			2-4-6-8		
(Firing Order)			1-8-4-3-6-5-7-2		
Oil Pressure			45 to 55 lbs. @ 2000 rpm		
Cooling System Capacity			Approximately 8½ gallons (With Chrysler Radiator)		
Crankcase Capacity			*5 quarts		

*Add one additional quart of engine oil when filter element is changed.

Foreword

This operators book is published as a guide and reference to assist in obtaining from the CHRYSLER V-8 INDUSTRIAL ENGINE the many hours of low-cost, trouble-free service built into it.

In order to obtain the advantages of these qualities over a long period of time, it is necessary only that the engine be treated with reasonable care.

If followed, these instructions will ensure dependable operation, long service and satisfaction. For extensive repairs or overhaul, it is suggested that an authorized Dealer be consulted, as he has special equipment and tools needed for overhaul and repair, and will provide the particular attention of an organization devoted to the interest of service.

Modifications

Slight modifications in design as dictated by field experience or desire to improve the unit, or changes of material due to inability to procure those originally specified may become necessary. Such changes in design will be obvious and, wherever possible, parts or assemblies will be interchangeable with the original design.

Illustrations

The illustrations are intended to show typical construction of the various parts. In some instances the shapes or details of the parts illustrated may not exactly represent their actual appearance; however, they will serve to show the servicing methods explained or help to identify parts performing the same function.

Ordering of Parts

The exploded views shown are intended to enable the operator to better understand the general construction of CHRYSLER V-8 INDUSTRIAL ENGINES, and to asist in ordering parts.

The views are helpful in determining the sequence of assembly and function of the various parts; therefore, they will be of considerable assistance when making adjustments or repairs.

Important

Orders for parts should be placed with the nearest Authorized Dealer. Authorized Dealers are in possession of complete parts information and can, in most instances, promptly supply your parts requirements from their inventory. If you do not know the location of your nearest Chrysler Industrial Engine Dealer, a card addressed to the Chrysler Industrial Engine Division, 7700 Russell, Detroit 11, Michigan, will bring you his name and address promptly.

Most important in ordering parts is the proper identification of the engine. *Always* mention the Model, Type and Serial Number. (Sample: Model Ind. 56, type 373, Serial Number 1273.) This information is stamped on the identification plate (Fig. 1) and should be mentioned in all parts order or communications. The number stamped on the front end of the cylinder block just back of the water pump is a manufacturing code and should *not* be used for the purpose of identification.

Identification

A brass name plate is attached to the rear of the cylinder block immediately above the housing attaching face, showing the model symbol, type and serial number of the engine. See Figure 1.

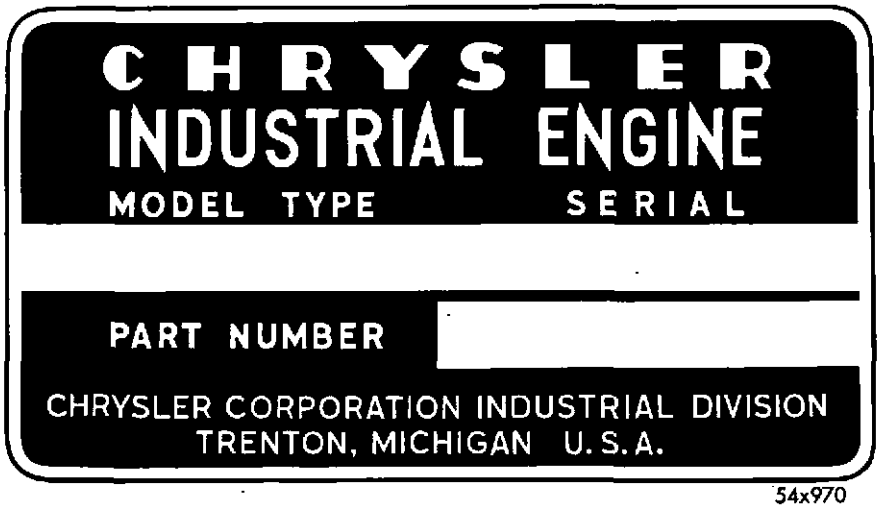


Fig. 1—Engine Identification Name Plate

Important

For your convenience, fill in the information requested below on your own engine. It will then be readily available when needed for identification purposes, should the replacement of parts ever become necessary.

Model .....

Type .....

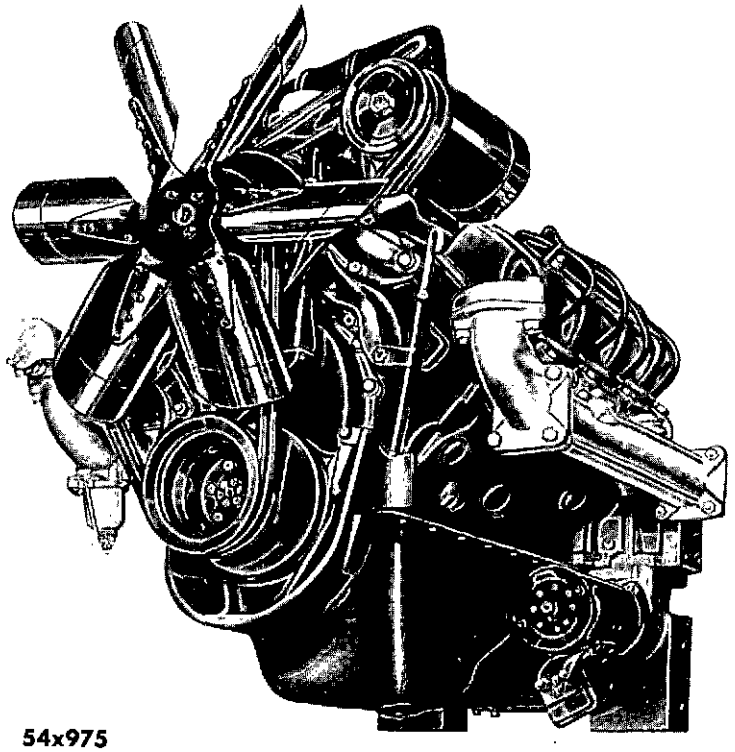
Serial No. .....

Description

THE CHRYSLER V-8 INDUSTRIAL ENGINE MODELS IND. 52, 53, 54, 56, 56A as shown in Figures 2 and 3 are custom made with various types of engine accessories.

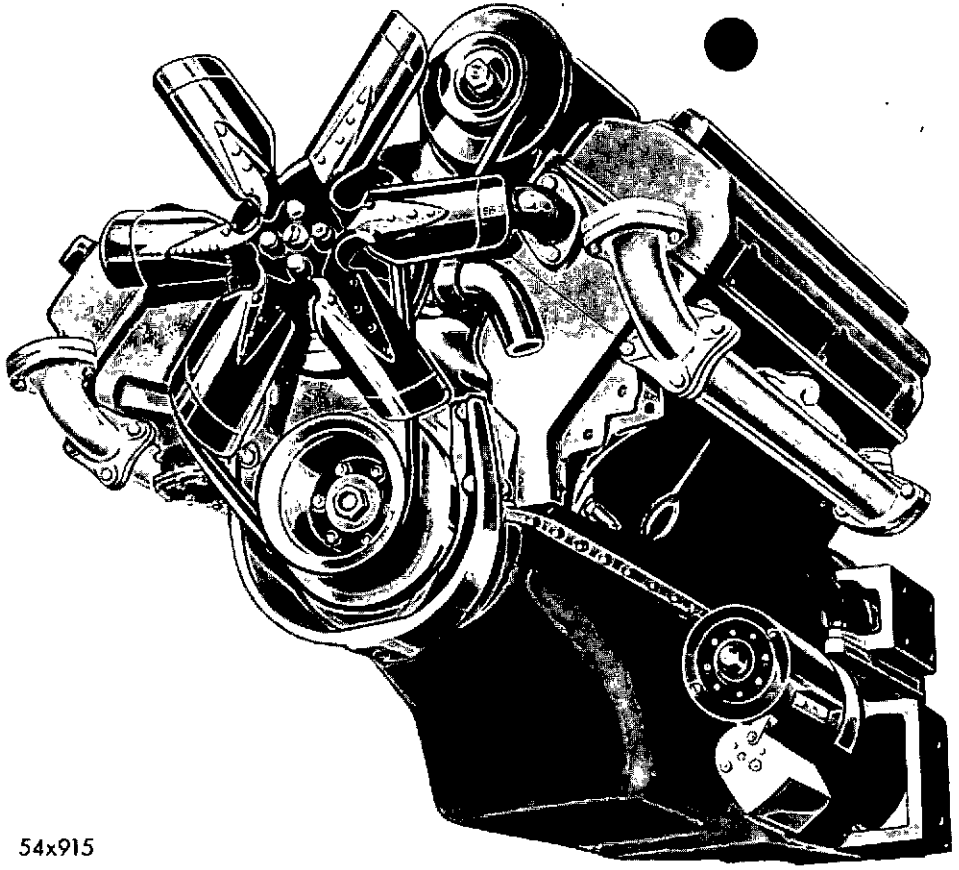
The V-8 Industrial Engines are used as power units for Mechanical Shovels, Power Winches, Road Building Equipment, Welding Generators, Farm Tractors, Irrigation Deep Well Pumps, Truck Tractors, Air Conditioning Mobile Units and many other heavy duty industrial applications.

The accessories supplied with the basic engine depends on the type of installation for which the unit is to be used. Some units will include the Power Take-Off and Heavy Duty Clutch, while other units may include a truck type flywheel with the 5-speed transmission. Torque Converters are also available as optional equipment.



54x975

Fig. 2—Chrysler V-8 Industrial Engine (Model Ind. 52)



54x915

Fig. 3—Chrysler V-8 Industrial Engine (Model Ind. 56, 56A)

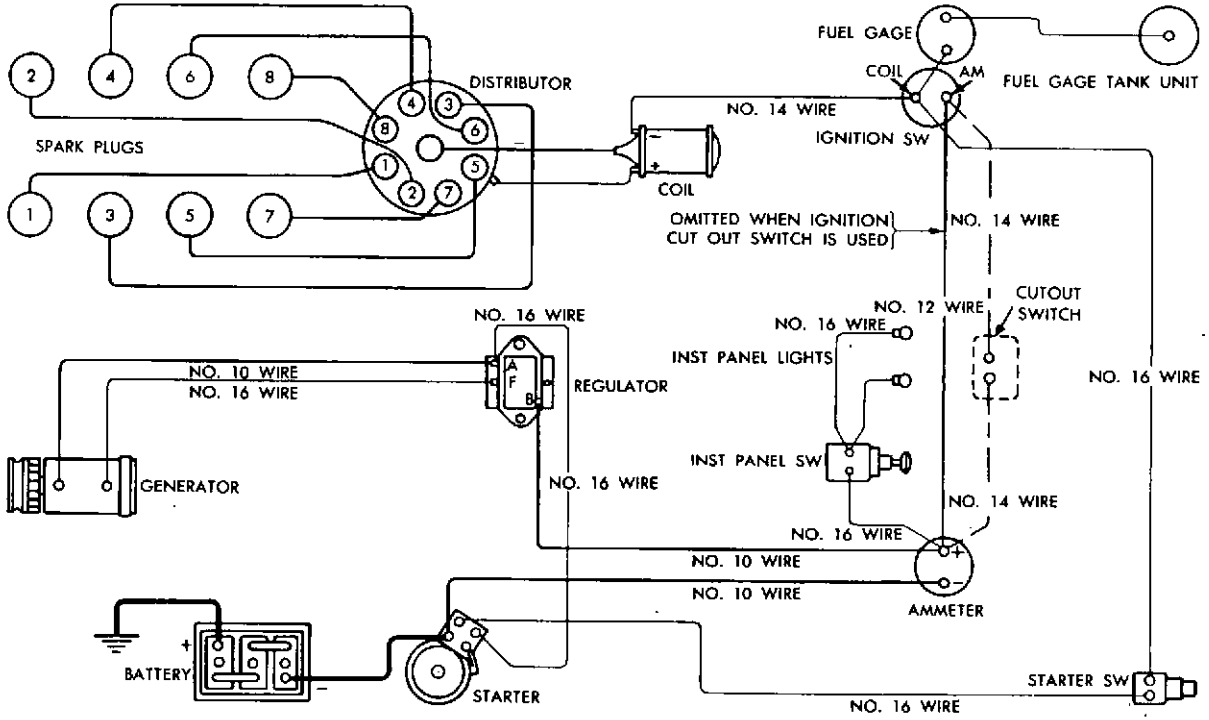


Fig. 4—Positive Wiring Diagram (6-Volt System)

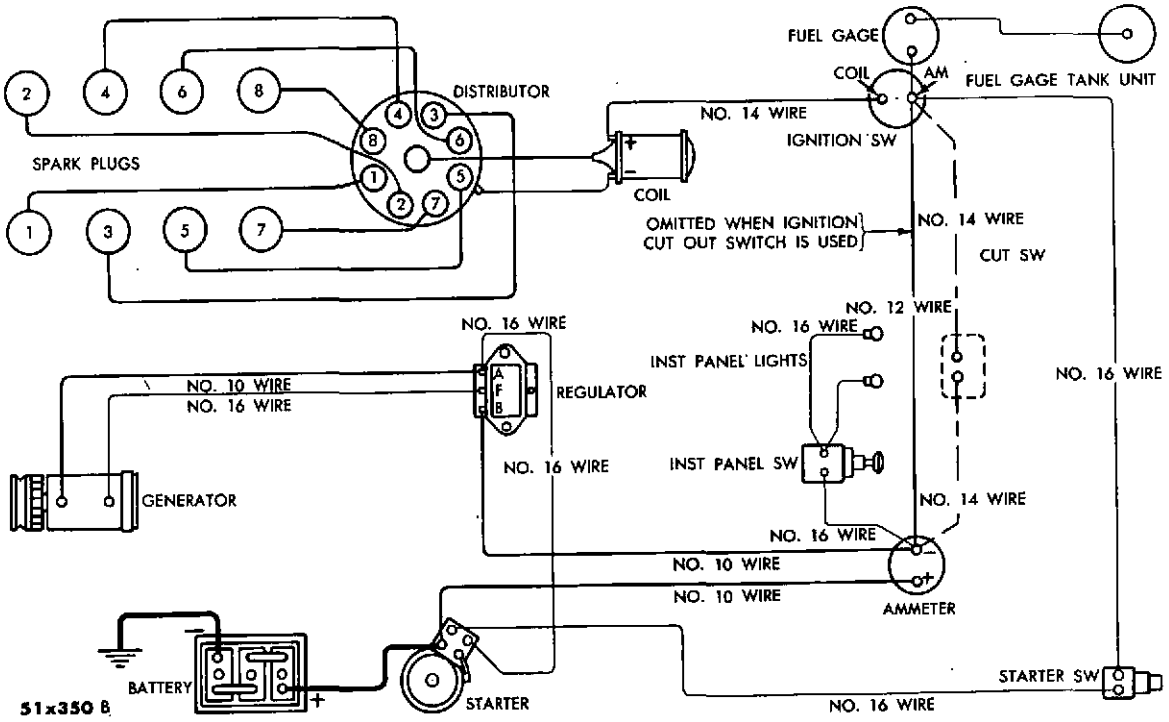


Fig. 4A—Negative Wiring Diagram (6-Volt System)

ENGINE

The basic engine is a V-type eight cylinder, four cycle, gasoline burning unit, with liquid cooling and full pressure lubrication. The valves are of the overhead type. Hydraulically operated valve tappets provide quiet and efficient operation and require no special attention.

CYLINDER HEADS

One of the most outstanding features of the Chrysler V-8 Industrial Engine is the Polyspherical combustion chamber together with a single rocker shaft valve mechanism on Models Ind. 52, 53 located in the cylinder heads. On Models Ind. 54, 56, 56A the engine uses the double rocker valve shaft design with multiple head valve locks on the valve stem. Valve locks of this design wedges only against the valve spring retainer leaving the valve stem free to rotate. This type of combustion chamber plus the lateral valve arrangement provides the maximum amount of space for extra large valves and permits direct and unrestricted exhaust and intake valve porting.

LUBRICATION

The engine lubricating system supplies a constant flow of filtered oil to all internal engine parts. The oil pump in the oil pan is driven by the distributor and oil pump drive shaft. It draws oil through a floating strainer and forces it through the oil filter to the crankshaft, camshaft, timing gears and valve tappets. Pistons and cylinders are lubricated by splash feed. Crankcase ventilation is provided through a ventilator pipe with an air cleaner, removing fumes and moisture from the crankcase. An air filter on the oil filler pipe cleans air before it enters the crankcase.

In order for an engine to give long trouble free service, the working parts should be kept clean, the pressure sealed into the combustion chamber, excess heat eliminated, and the working surfaces lubricated to reduce wear. The oil, to perform these functions properly, should be kept as clean as possible, and should be renewed when excessively contaminated. To help the owner obtain the proper lubrication for good engine service, Chrysler Corporation recommends that the owner select an oil of good quality and the proper SAE number of oil according to the anticipated temperature range.

ELECTRICAL SYSTEM

The six-volt electrical wiring diagram includes the storage battery, generator, generator regulator, starting motor, ignition coil, distributor and spark plugs, together with the necessary cables, connecting wires and switches. (See Figs. 4 and 4A.)

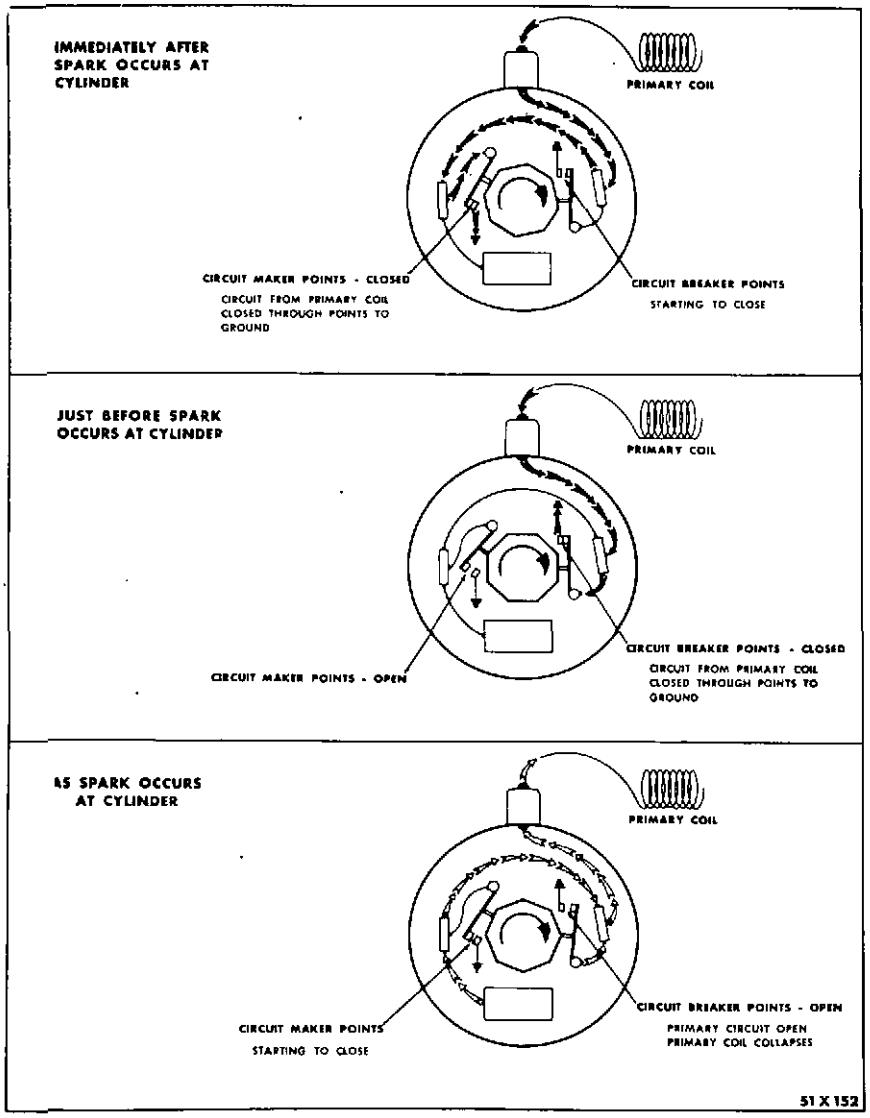


Fig. 5—Distributor (Operational Schematic) (Models Ind. 56 and 56A only)

DISTRIBUTOR

The distributor used in the ignition system is driven by the oil pump drive shaft which engages the camshaft. This device times and distributes the ignition current to each spark plug at the exact instant necessary to fire the mixture in that combustion chamber. On any distributor when the points open, the primary current through the coil is interrupted causing the magnetic field to collapse suddenly, thus inducing a high voltage in the secondary winding. This high voltage fires the spark plug. The value of this voltage depends on the strength of the primary current at the instant the points open. Primary current starts to build up the instant the points close. The longer the points remain closed, the greater will be the primary current build-up (to the point of saturation), and the higher the voltage induced when the points again open to fire the next spark plug. Figure 5 shows the positions of the points at various stages of the operation for Models Ind. 56 and 56A only. Automatic spark advance is accomplished through the centrifugal governor in the distributor. Models Ind. 52, 53, and 54 have single point distributors.

FUEL SYSTEM

The fuel system includes the fuel lines, fuel pump and filter, carburetor, intake manifold and throttle control. Fuel from the tank passes through the filter into the fuel pump, which is driven by an eccentric on the front end of the camshaft. The fuel pump forces fuel into the carburetor where it is atomized and mixed with air and drawn through the manifold and valves into the combustion chamber.

CARBURETORS

The Stromberg Carburetors, as shown in Figure 6 are double-barrel, downdraft types with each barrel having its own idle system (with adjustable needle), main metering system and throttle valve, as shown in Figure 7. The idle system and main metering systems are supplemented by the float system, the accelerating system and the power system. The function of each system is described as follows:

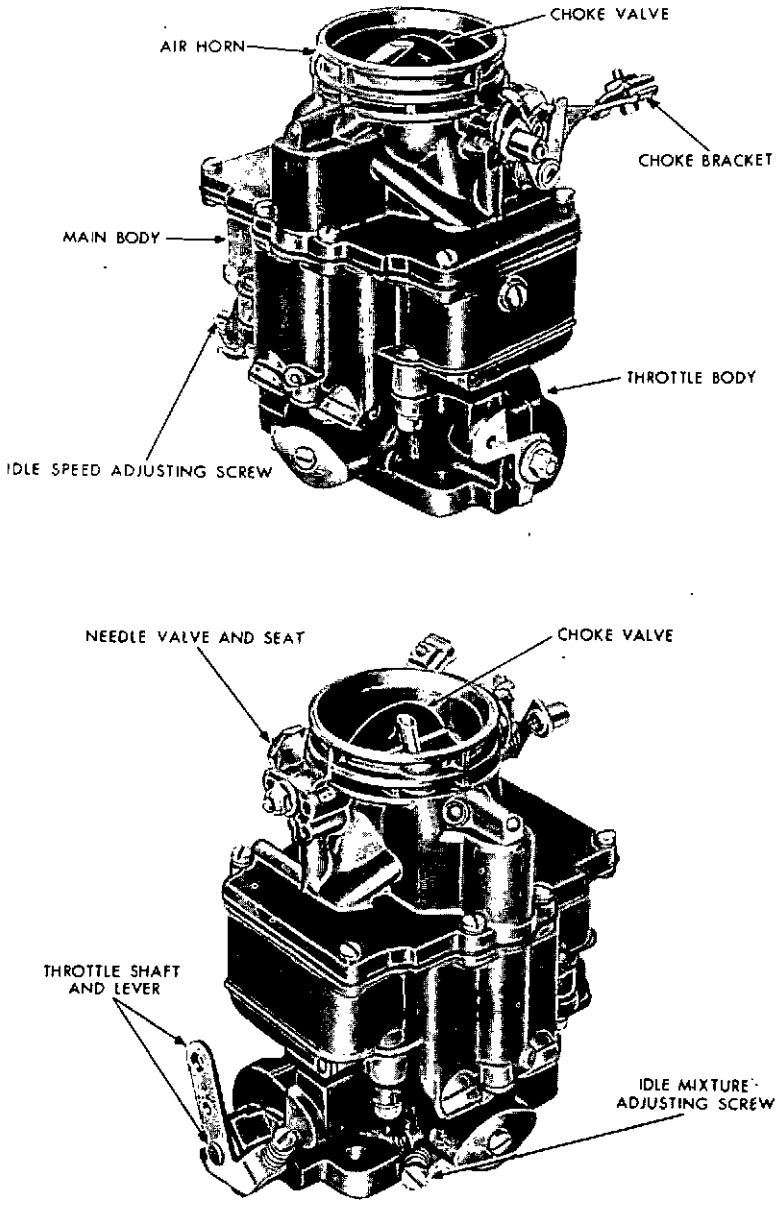


Fig. 6—Stromberg Carburetor (Assembled View)

THE FLOAT SYSTEM (Refer To Fig. 8)

The function of the float system is to maintain a constant level of fuel in the float chambers at all times and under all conditions of operation. Fuel enters the carburetor at the fuel inlet, flows through the float needle valve and seat and into the float chambers.

When the fuel reaches a given level, the floats shut-off the fuel supply at the needle valve. The float chambers are vented internally by a vent tube which connects the float chambers with the air horn.

THE IDLE SYSTEM

With the throttle valves closed, as shown in Figure 9, and the engine running at slow idle speed, fuel from the float chambers is metered into the idle tubes through an orifice at the base of each idle tube. The air taken in through the idle air bleed holes mixes with the fuel at the top of the idle tubes.

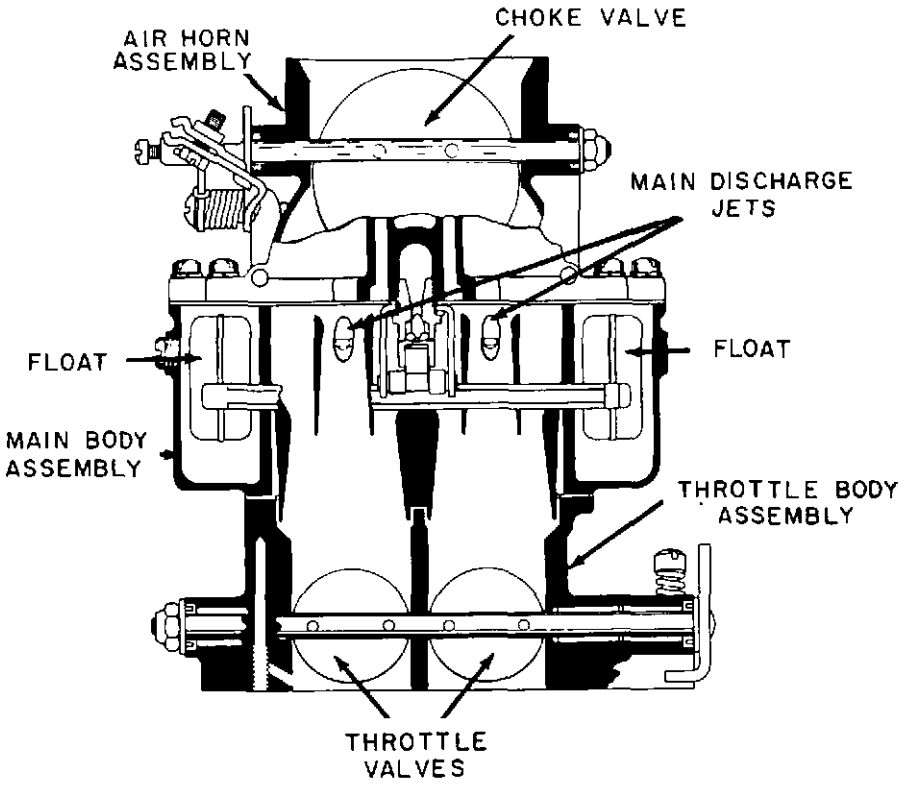
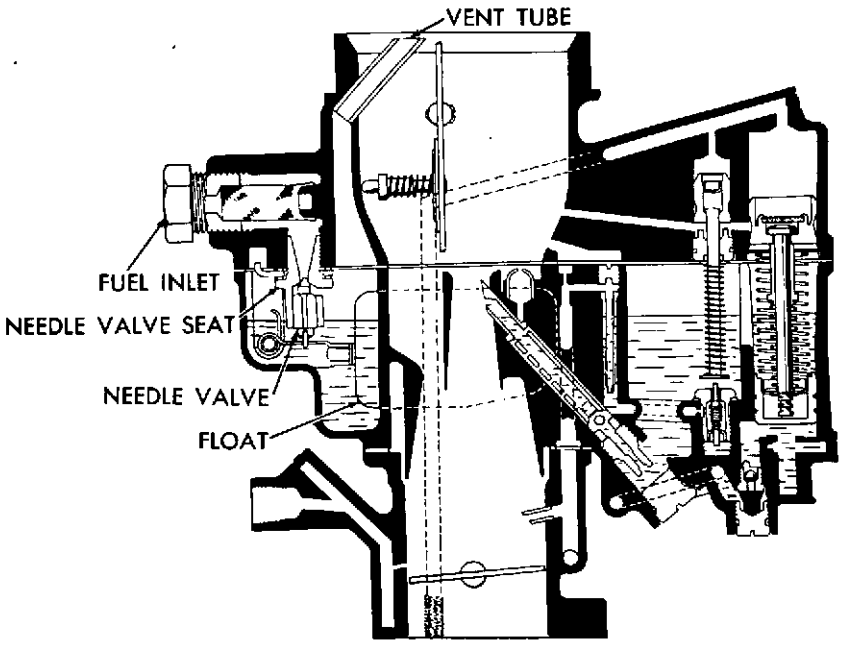


Fig. 7—Stromberg Carburetor (Sectional View)



54x88

Fig. 8—Float System

The mixture of air and fuel flows down the channels where it is mixed with additional air entering through the secondary idle air bleeds. The mixture is discharged at the lower idle discharge holes. The quantity of fuel discharged is controlled by adjustable idle needle valves. As the throttle valves are opened slightly, the air-fuel mixture is also discharged from the upper idle discharge holes to supply the additional fuel required for increased engine speed.

MAIN METERING SYSTEM

The main metering system controls the flow of fuel during the intermediate or part throttle range of operation. With the throttle valves in a partially open position, as shown in Figure 10, fuel flows from the float chambers through the main metering jets and enters the main discharge jets where it is mixed with air taken in through the high speed air bleeders.

This mixture of air and fuel is then discharged into the air stream through the auxiliary venturi tubes. The main body and main discharge

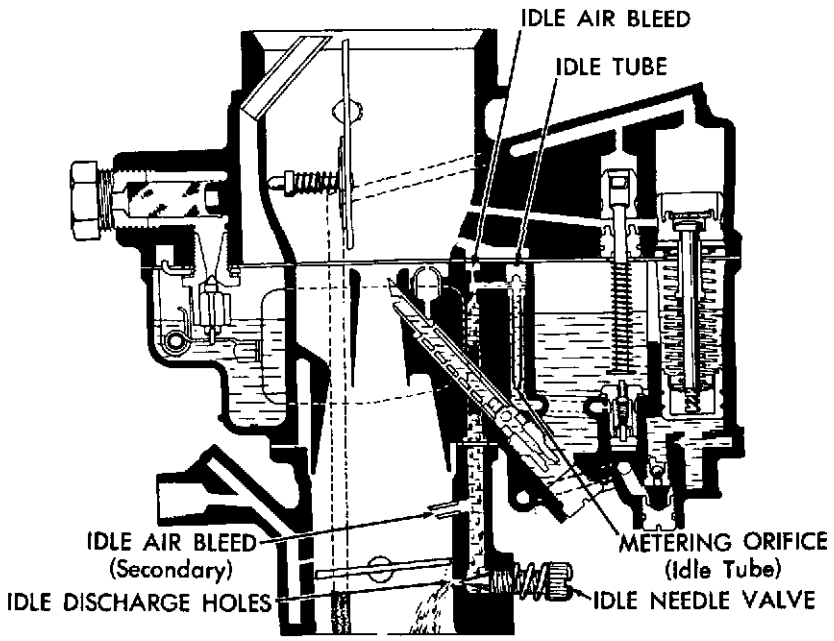


Fig. 9—Idle System

jets are so designed that should vapor bubbles form in the fuel in the main discharge system, due to high temperatures, the vapor bubbles will collect in the outside channels surrounding the main discharge jets, rise and vaporize in the domes of the high speed bleeders, thus preventing "percolation."

POWER SYSTEM

The power system is incorporated into the carburetor to provide a richer mixture for maximum power and high speed operation. The extra fuel for power is supplied by a vacuum controlled power piston which automatically operates the power by-pass jet in accordance with throttle opening.

Intake manifold vacuum is maintained above the vacuum piston through a vacuum channel which leads to the manifold flange of the carburetor, as shown in Figure 11. During partial throttle operation, the

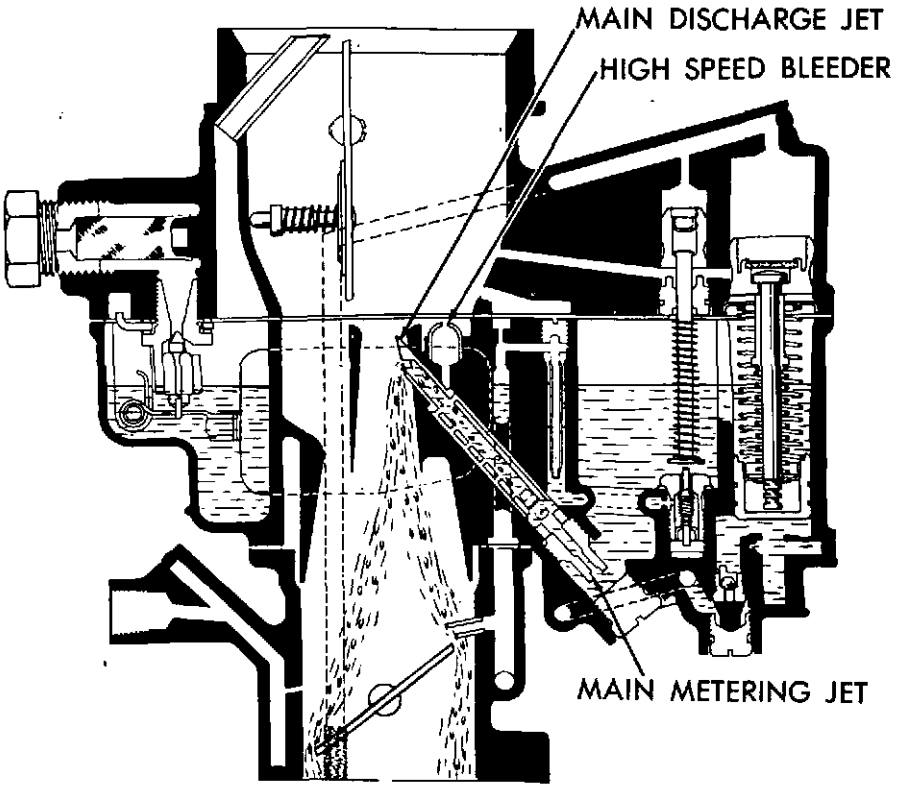


Fig. 10—Main Metering System

vacuum above the vacuum piston is sufficient to overrule the compression spring and hold the piston in the "UP" position.

When the throttle valves are opened to the point where the manifold vacuum drops to approximately four to five inches of mercury, the compression spring then moves the piston "DOWN" to open the power by-pass jet and meter additional fuel into the main metering system.

ACCELERATING SYSTEM

To insure a smooth uninterrupted flow of power for acceleration, additional fuel must be metered into the engine. This is accomplished through the use of an accelerating pump which is operated by vacuum.

As the throttle valves are opened, the accelerating pump piston is moved "DOWN" either by a pump lever or by a drop in vacuum above the piston to close the inlet ball check valve and force a metered quantity

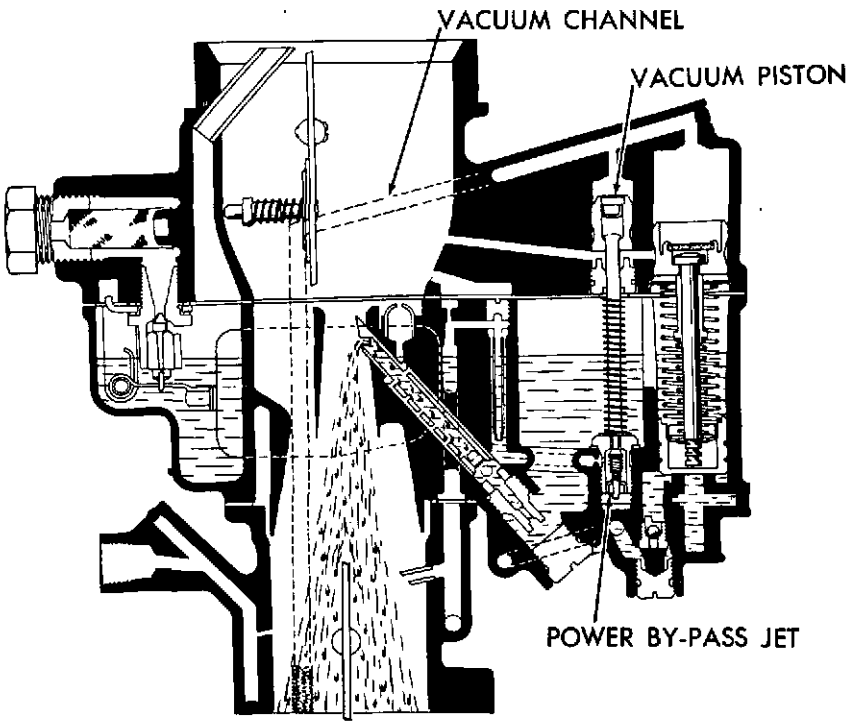


Fig. 11—Power System

of extra fuel through the outlet ball check valve and pump discharge nozzle into the air stream, as shown in Figure 12.

With the return of the accelerating pump lever to the released position or the return to normal engine vacuum, the outlet ball check valve "CLOSES" while the inlet ball check valve "REOPENS," thus permitting fuel from the float chamber to enter and refill the accelerating pump cylinder, as shown in Figure 13.

NOTE

The carburetor is supplied by the Manufacturer with a hollow screw in the mouth of the vacuum channel. When the carburetor is used with a governor this screw must be in the passage to block off the connection between the throat and the vacuum passage. When not used with a governor this screw must be removed.

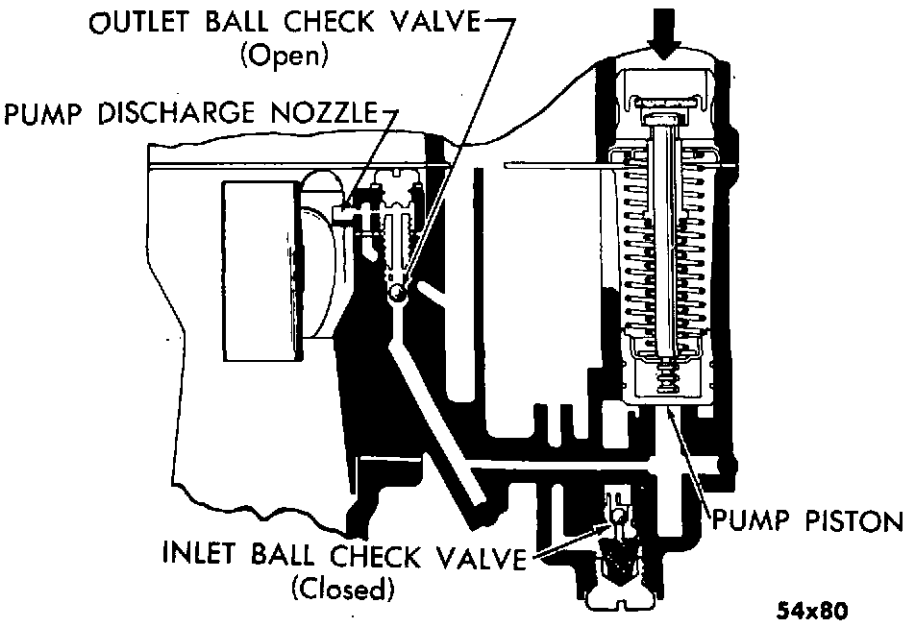


Fig. 12—Accelerating System (Pump Piston "Down")

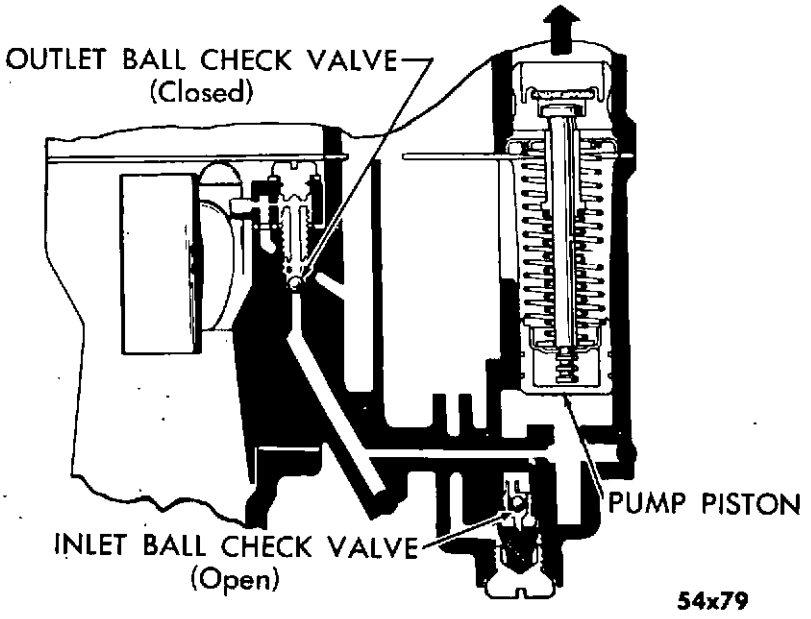


Fig. 13—Accelerating System (Pump Piston "Up")

GOVERNORS

There are three types of governors used on the V-8 Industrial Engines and they are as follows:

Hoof Governor, Mechanical Type.

Pierce Governor, Mechanical Type.

King Seeley Governor, Velocity Type.

DESCRIPTION

Some engines are equipped with the mechanical type Hoof Governor, the mechanical type Pierce Governor, or the velocity type King Seeley Governor.

The mechanical governor unit is mounted on the fuel pump side of the engine, just above the fuel pump, and is driven by a belt from the double pulley at the fan. Governor weights revolving with the governor main shaft inside the housing actuate the operating lever, which is connected to the carburetor throttle lever. A calibrated spring controls movement of the operating lever to oppose the force exerted by the governor weights. Balance between these two forces governs the engine speed.

HOOF GOVERNOR (Mechanical Type)

In the Hoof Governor, speed and sensitivity are set at the factory to provide accurate control. However provision is made for some adjustment to vary sharpness of control, and to correct surge.

PIERCE GOVERNOR (Mechanical Type)

The Pierce Governor may be adjusted for governed engine speed, as well as for control and to eliminate surge.

KING SEELEY GOVERNOR (Velocity Type)

The velocity type King Seeley governor, used on some engines, is an integral part of the carburetor. Engine speed is governed by the throttle valve which is closed by the velocity of the air-fuel mixture as it passes through the governor. An accurately calibrated spring system attached to the throttle shaft opposes the velocity and controls the position of the throttle valve and the maximum speed of the engine. When in proper operating condition, the governor does not affect engine performance below the speed at which it begins to control, and does not affect fuel consumption.

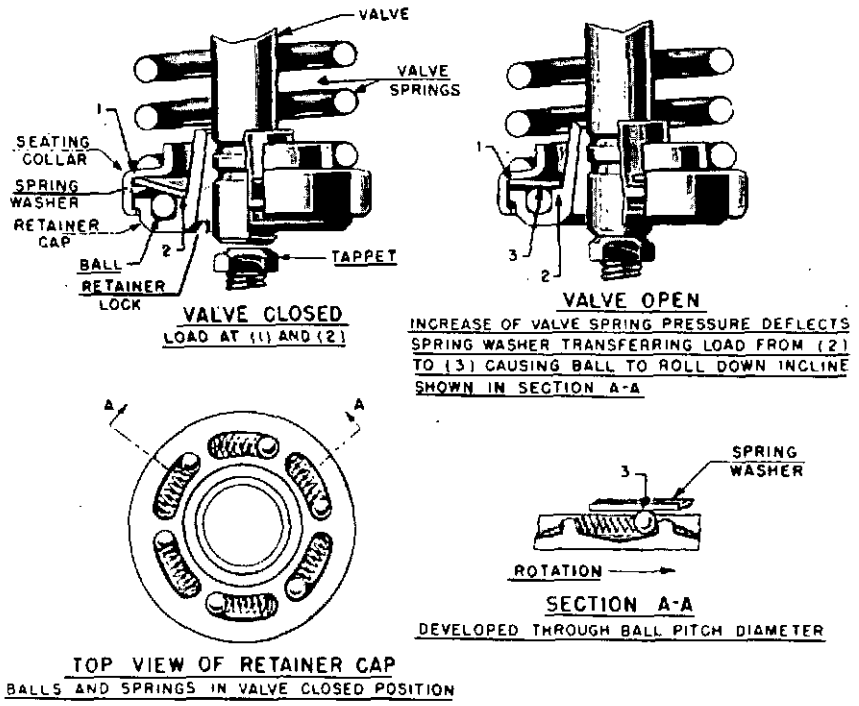
VALVE TAPPETS

The hydraulic tappets which operate the push rods are designed for quiet and efficient operation. Service adjustments are eliminated. These units automatically compensate for variations in the valve train resulting from temperature changes. They use oil as the compensating factor.

EXHAUST VALVE SPRING RETAINERS (Fig. 14)

All Models have as standard equipment exhaust valve spring retainers. The retainers (or rotocaps) provide positive rotation of the exhaust valve each time the valve moves. This rotation with each stroke prolongs the life of the exhaust valves.

With the retainers (or rotocaps) that are used on the exhaust valves, special valve springs are used, which are not interchangeable with the intake valve springs.



50x209

Fig. 14—Exhaust Valve Spring Retainer Assembly (Rotocaps) (Cutaway Sectional View)

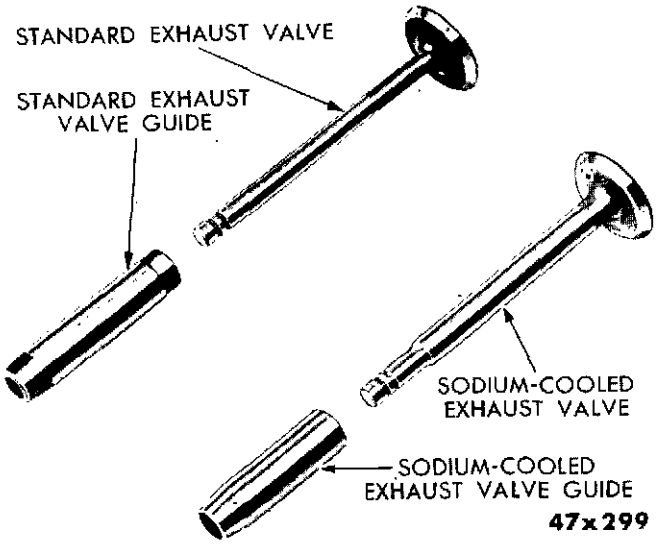


Fig. 15—Valves and Guides

SODIUM-FILLED EXHAUST VALVES (Extra Equipment)

The sodium-cooled valve stem (Fig. 15) is made hollow and then partially filled with pure metallic sodium, which liquefies at 207 degrees F. In liquid form, the sodium moves up and down with the motion of the valve in operation and facilitates the transfer of heat from the valve head to the engine cooling system. Engines equipped with sodium-cooled valves can be identified by a plate attached to the right side of the engine just back of the engine serial number plate.

CARBURETOR AIR CLEANER

A heavy duty oil bath type air cleaner protects the carburetor against dirt and other foreign matter which might otherwise enter the engine through the carburetor. (See Fig. 22.)

EXHAUST SYSTEM

Exhaust from the combustion chambers passes through the exhaust valve ports into the exhaust manifold and out through the exhaust pipe. Some of the V-8 Industrial Engines were equipped with a manifold heat control valve, which permits faster warm-up of the engine by diverting the exhaust from the right engine bank through a by-pass port and hot spot chamber in the intake manifold and out through the left exhaust manifold.

NOTE:

None of the Industrial Engines presently being shipped are equipped with the manifold heat control valve.

The manifold heat control valve is located between the right exhaust manifold and the exhaust pipe. It consists essentially of a butterfly type valve operating on a shaft in a housing. Movement of the valve is controlled by a flat coil spring and a counterweight. The inner end of the spring fits in a slot in the valve shaft; the outer end contacts one of two stop pins; which also serve to limit travel of the valve. The counterweight fits over the outer end of the valve shaft, and is held with a key and clamp bolt. Bumpers and an anti-rattle spring keep the mechanism quiet.

When the engine is cold, the tension of the coil spring holds the valve in the closed position, restricting the exhaust passage. As the engine warms up, the spring loses enough tension to permit the counterweight to rotate the shaft and open the valve. The outer end of the spring must contact the correct stop pin to provide proper spring tension. Otherwise, the counterweight cannot overcome the spring tension to open the valve.

The heat tube from the carburetor automatic choke is located in the hot spot chamber of the intake manifold. Therefore, efficient operation of the automatic choke depends upon proper functioning of the manifold heat control valve.

COOLING SYSTEM

The belt driven, centrifugal type water pump circulates water from the heat exchanger, or radiator, to the cylinder heads, completely around each cylinder bore, through the cylinder block, around the exhaust valve ports, into special passages in the intake manifold, and to the thermostat housing, for recirculation or return to the radiator, or heat exchanger.

THERMOSTAT

The thermostat as shown in Figure 16 restricts flow of water to the radiator until the water has reached a predetermined temperature, thereby permitting faster warm-up of the engine.

A by-pass passage and tubes from the intake manifold provide circulation through the carburetor throttle body. On units equipped with torque converter unit, an oil cooler is also connected to the cooling system.

Three drain cocks are provided for draining the cooling system, one in the radiator and one at each side of the cylinder block near the exhaust manifold outlet. All three must be open to drain the system completely.

CLUTCH

The type of clutch used is determined by the type of drive adaptation. On Models equipped with a Torque Converter, the turbine shaft is attached to a flywheel which has the clutch assembly mounted on it. When the clutch is engaged, the clutch disc, which is splined to the trans-

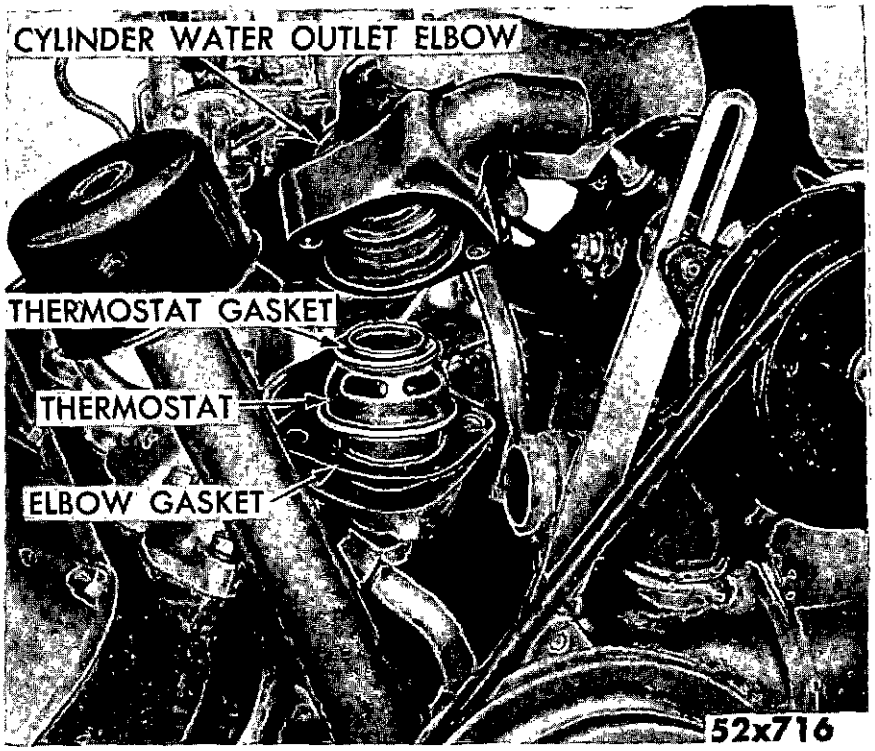


Fig. 16—Typical By-Pass Type Thermostat

mission drive pinion, is clamped between the flywheel and the clutch pressure plate to transmit power to the transmission. The unit is controlled by the clutch release through the clutch release fork and linkage to the clutch pedal or lever.

TORQUE CONVERTER (Fig. 17) (Optional Equipment)

The Chrysler Industrial Torque Converter (Fig. 17) consists of The Torque Converter Unit or "Donut", oil cooling and lubrication system, and governor, which is optional equipment.

When the torque converter assembly is installed on an Industrial engine it multiplies the torque output to a value of 2.6 times the torque of the engine. The multiplication decreases to a 1:1 ratio as the speed of the turbine increases to the speed of the impeller. When this occurs, the stator begins to rotate freely on the overrunning clutch. An oil cooler which is connected to the cooling system prevents overheating and thinning of the oil.

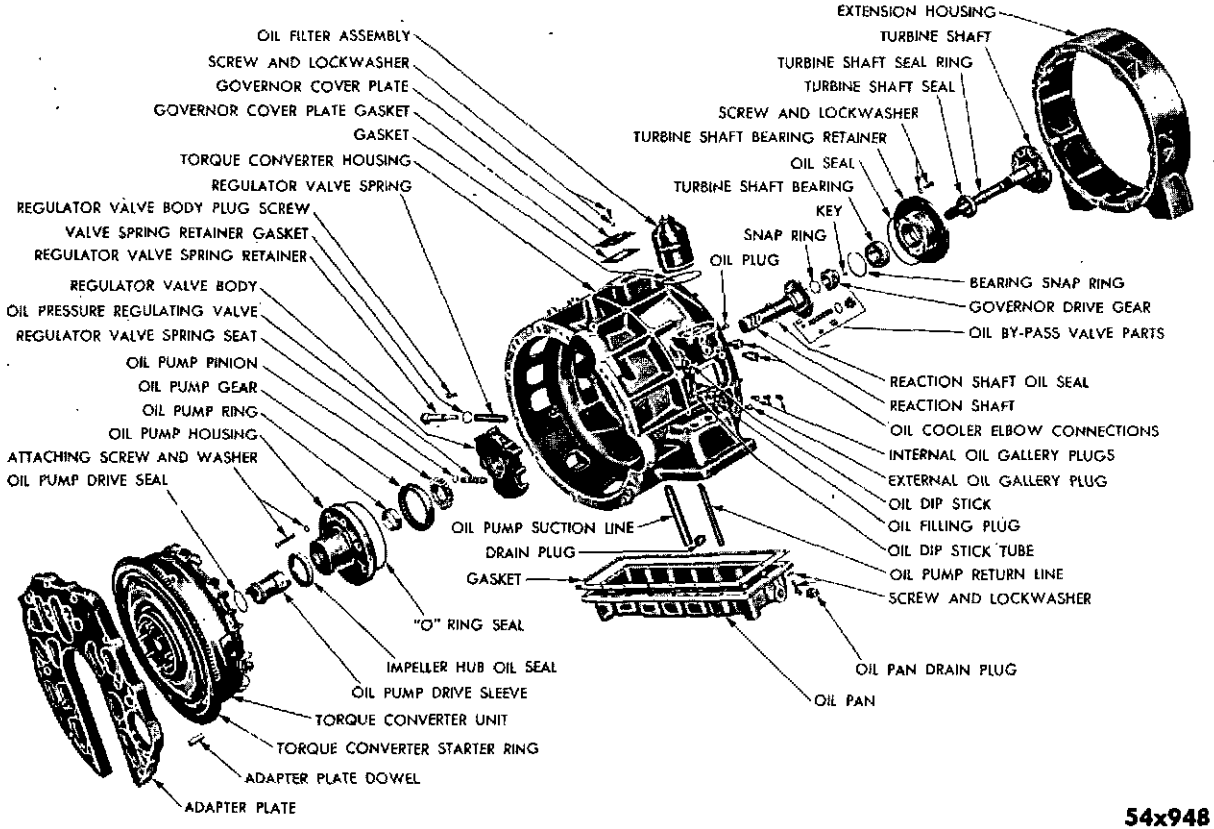


Fig. 17—Torque Converter Housing Assembly (Disassembled View)

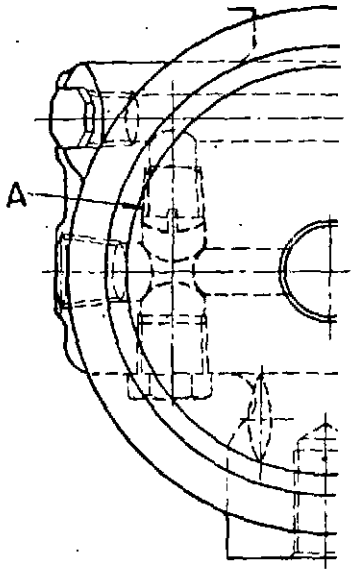


Fig. 18—Inner By-Pass Hole

NOTE:

When external oil cooler is used, the inner by-pass hole plug "A" must be added, as shown in Figure 18. The cooler capacity is owner responsibility. The cooler must be capable of maintaining oil temperatures under 250° F for continuous operation.

5-SPEED TRANSMISSION (Optional Equipment)

One of two 5-speed transmissions may be used in the unit. These transmissions are similar in design and operation, but the heavy duty transmission is more widely used. In either unit, there are five forward speeds and one reverse. Direct drive is in fifth speed.

POWER TAKE-OFF (Optional Equipment)

The power take-off and clutch assembly (Fig. 19) used with some industrial engines is a heavy duty unit consisting of a three section dry disc clutch and a drive shaft enclosed in a special housing which is bolted to the engine. The clutch drive ring is attached to the engine flywheel and drives the pressure plate by means of internal gear teeth. When the clutch is engaged, the pressure plate is clamped between the discs, engaging the clutch body which is keyed to the drive shaft. The drive shaft is supported by a double row ball bearing at the front and by two tapered roller bearings at the rear of the housing. The clutch release lever controls the clutch release bearing through a clutch yoke which engages the clutch release bearing trunnion. Positive disengagement of the clutch mechanism is accomplished through a toggle arrangement acting in conjunction with the return springs. A threaded adjusting nut in the clutch provides a means of compensating for wear.

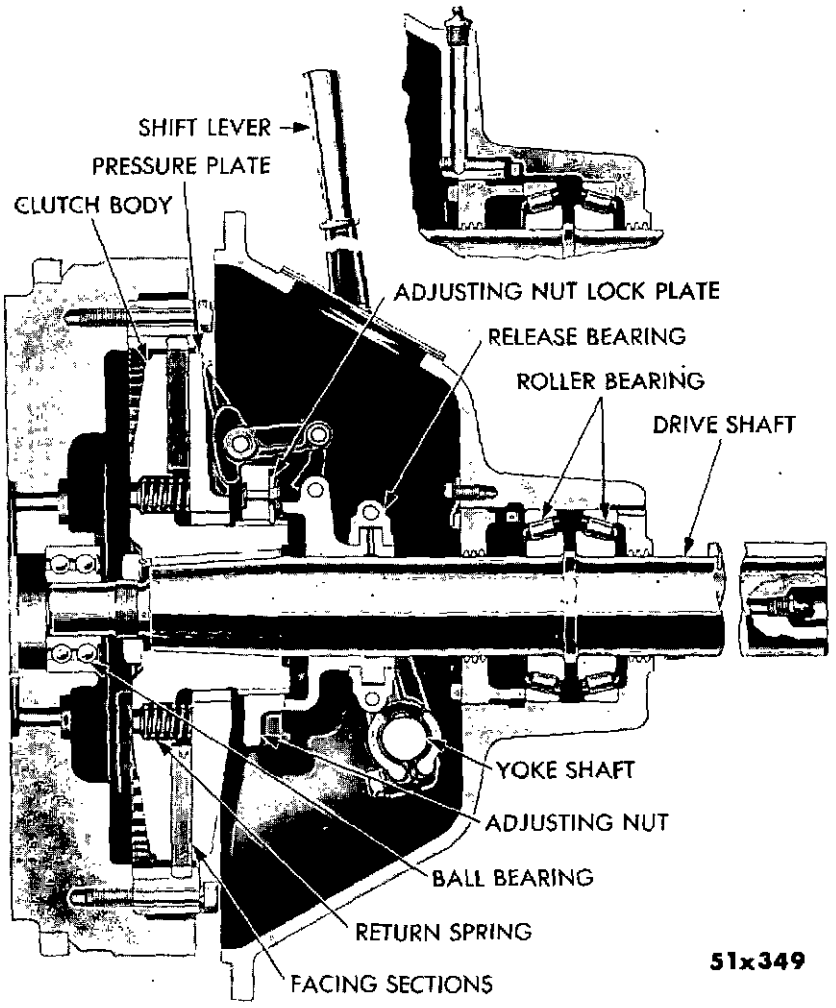


Fig. 19—Power Take-Off, With Heavy Duty Clutch (Sectional View)

Operating Instructions

PREPARATION OF A NEW ENGINE

Before placing a new or rebuilt engine in service, make a thorough visual inspection for evidence of damage or loose parts.

ENGINE OIL. See that the crankcase contains the correct amount of clean new SAE 10W Engine Oil.

COOLING SYSTEM. Fill the cooling system with water, using anti-freeze solution, if temperature requires it. In warm weather, the use of MOPAR Rust Resistor is recommended.

CAUTION

Before any type of permanent anti-freeze is added to the engine coolant, the cylinder head bolts must be tightened to 85 foot-pounds torque. Failure to do so may result in extensive damage to the engine.

ENGINE ACCESSORIES. See that all points requiring lubrication are properly supplied. Check storage battery terminals to see that they are tight and clean. Check the electrolyte in the battery.

ELECTRICAL CONNECTIONS. See that all electrical connections are tight and clean. Check each spark plug for tightness.

ATTACHING PARTS. See that all nuts, bolts and screws that attach parts are secure.

PRESTARTING INSTRUCTIONS

When the engine is in daily use, inspect it daily, always before starting.

ENGINE OIL LEVEL. Inspect the oil level and add oil of proper viscosity if required.

FUEL. Check the fuel supply.

COOLING SYSTEM. Inspect the cooling system and add water or anti-freeze, as required.

TIPS ON ENGINE CARE

NEW OR REBUILT ENGINES. It is good practice not to operate a new or rebuilt engine at more than ¾ throttle for the first 8 to 10 hours. This low speed will permit the bearings to seat properly, and will allow the operator to familiarize himself with the controls and performance of the engine.

No. 10W Engine Oil should be used in the engine during the break-in period because the clearance between moving parts is very small and the light oil provides assured lubrication. Keep the oil at the proper level. After 25 hours of operation, the crankcase should be drained and refilled with oil as recommended in the Lubrication Section.

COLD ENGINES. When starting a cold engine (whether new or not), avoid unnecessary acceleration during the warm-up period. Keep the throttle at little more than idling speed until normal operating temperature is indicated on the temperature gauge. This simple precaution will assure long life of the engine and maximum efficiency of operation.

STARTING AND STOPPING THE ENGINE

STARTING. Open the throttle to ⅓ opening. See that the clutch, gear shift lever or power take-off lever is in neutral position. Turn on the ignition switch and press the starting motor switch until the engine starts. Do not hold the starting motor switch in for periods longer than 15 seconds if the engine does not start promptly. After the engine starts, watch the oil pressure gauge. If oil pressure does not register after about 10 seconds, stop the engine and investigate.

STOPPING. To stop the engine, close the throttle and disengage the clutch. Allow the engine to run at idle speed for a few minutes. Close the throttle and turn off the ignition.

PRECAUTIONS

WARM-UP PERIOD. After starting a cold engine, operate it at a speed only slightly faster than idle (approximately 700 rpm) for a few minutes to allow the engine to reach normal operating temperature before placing it under full load. This warm-up period will permit oil to reach all bearing surfaces, thus reducing the possibility of scoring and premature wear of internal engine parts.

OIL PRESSURE. With engine turning at approximately 2000 rpm and the water temperature at 160 degrees F., the oil pressure should be from 45 to 55 pounds. As bearings wear and the increased clearances permit more than the normal escape of oil, there will be a drop in pressure shown on the gauge, particularly at idling speed. A drop in oil pressure may also be the result of a plugged oil filter element.

WATER TEMPERATURE. A thermostat (Fig. 16) in the cylinder block restricts the circulation of liquid in the cooling system until the liquid has reached a pre-determined temperature, thereby permitting faster warm-up of the engine. Do not operate the engine with the thermostat removed as this unit is essential to proper circulation and efficient engine performance. Without the thermostat, sludge will form in the crankcase, because the low temperature of the engine permits condensation of fumes in the crankcase. When operating in hot climates, the maximum reading of the temperature gauge should not exceed 100 degrees F. above the prevailing atmospheric temperature.

AIR CLEANERS. Remove and service the carburetor and oil filler cap and crankcase ventilator outlet air cleaners every 50 hours or less, depending on the severity of working conditions. Operating in dusty areas will require daily service of air cleaners.

IGNITION SYSTEM. Keep the units of the ignition system clean and properly adjusted.

FUEL SYSTEM. Keep the fuel tank, lines and filters clean. Always use a good grade of fuel.

COOLING SYSTEM. Do not fill the cooling system when the engine is overheated. Allow the engine to cool before adding liquid, in order to prevent cracking the cylinder blocks. Use a good grade of MOPAR anti-freeze during cold weather, and MOPAR Rust Resistor during warm weather.

POWER TAKE-OFF AND CLUTCH ASSEMBLY. On units equipped with the Power Take-Off and Clutch Assembly, avoid unnecessary use of the shifting lever. Frequent engagement and disengagement of the clutch causes rapid wear of clutch facings, necessitating frequent adjustment and replacement of parts. Do not attempt to engage or disengage the clutch while the engine is accelerated. Do not operate the unit when the clutch is slipping. See Adjustment Section.

Trouble Shooting

A good rule to follow when trouble shooting is to make only one adjustment at a time. Locate the cause of failure or irregular operation by the process of elimination.

STARTER WILL NOT TURN ENGINE

Loose or corroded battery terminals. Remove cable connections at battery and ground, clean and tighten securely.

BATTERY NOT FULLY CHARGED

Test the electrolyte in the battery. The specific gravity of a fully charged battery is 1.275. If the hydrometer reading is below 1.225, replace the battery with one fully charged.

INOPERATIVE STARTER

If the starter fails to run when the starter switch is closed, inspect all wiring connections to see that they are clean and tight. If there are no loose or corroded connections, inspect the starting motor for loose, worn, or corroded brushes or corrosion on the commutator. To test the starting motor, disconnect the cable from the battery terminal of the solenoid and touch it firmly to the solenoid starter terminal. If the starting motor operates, the trouble is not in the starting motor. If the motor fails to operate and a heavy arc occurs when the cable touches the solenoid starter terminal, a mechanical lock-up of the motor or pinion, or a grounded condition in the motor may be the cause. Failure of the motor to operate and no arc in the preceding test indicates poor brush contact or an open circuit in the motor windings. Remove the starting motor and test off the engine to determine if the trouble is electrical or mechanical. Repair or replace the starting motor as required.

SOLENOID OR STARTER SWITCH

To test the switches, remove the relay cover from the solenoid and observe whether the relay points close when the starter switch is closed. If the points close and the starting motor fails to operate, clean the relay points with 00 sandpaper and retest. If the points do not close, connect a jumper across the terminals of the starter switch. If the points do close, a faulty starter switch is indicated. Replace the starter switch. If the points do not close, replace the relay or the complete solenoid, as required.

STARTER PINION JAMS OR BINDS

Check to see that the nuts that hold the starter on the housing studs are tight. Loose attaching parts will cause misalignment of the starter pinion with the flywheel. Another cause may be incorrect pinion clearance. Too little clearance will permit the pinion to travel too far into the flywheel teeth, causing binding. Too much clearance will prevent full engagement of the pinion, causing the pinion to jam and chip the flywheel teeth.

ENGINE WILL NOT START

WEAK BATTERY

Battery run down because of low charging rate, resulting from a loose generator belt or a faulty generator or generator regulator.

LOOSE, DAMP, OR CORRODED CONNECTIONS

Corrosion at battery terminals or loose or damp connection at distributor, coil or spark plugs.

FOULED OR DAMP SPARK PLUGS OR INCORRECT GAP

Fouling of spark plugs caused by incorrect carburetor adjustment. Clean and dry plugs and set gap at .035 inch. Adjust carburetor.

DIRTY, WORN, OR INCORRECTLY ADJUSTED DISTRIBUTOR CONTACT POINTS

Clean both sets of points and examine for pitted and worn surfaces. The gap should be .015 to .018 inch. Replace worn points. When replacing the points, apply a small amount of MOPAR Cam Lubricant (Part No. 1473595) to the rubbing blocks.

COIL OR CONDENSER

Check spark at spark plugs to see if sufficient secondary voltage is reaching spark plugs.

DIRT OR MOISTURE IN FUEL SYSTEM

Check fuel lines to see that fuel reaches carburetor. Remove fuel level sight plug from carburetor to inspect fuel level. Level should be at the lower edge of the sight plug opening.

POOR PERFORMANCE

Poor performance, such as lack of power, stalling, and missing at various speeds may be caused by an inferior grade of fuel; overheating, resulting from low oil level, insufficient liquid in cooling system, a loose fan belt

or inoperative manifold heat control valve; ignition system difficulties; fuel system difficulties; worn or broken piston rings or lack of compression resulting from burned or pitted valves or valve seats.

FUEL SYSTEM DIFFICULTIES

FUEL DOES NOT REACH CARBURETOR

Clogged vent in fuel tank, dirty strainer element in fuel pump restrictions in fuel line, or worn fuel pump valve or ruptured diaphragm. Frozen water in gas line or fuel pump.

FUEL REACHES CARBURETOR, BUT DOES NOT REACH CYLINDERS

Dirt in carburetor channels, float needle valve sticking in valve seat, incorrect float level, or lack of sufficient vacuum in intake manifold.

CARBURETOR FLOODED

Inoperative automatic choke or carburetor float system.

FUEL PUMP NOT OPERATING

Loose fuel line fittings between filter and pump, leaking fuel pump valves or diaphragm assembly, or a weak or broken rocker arm spring. Fuel leaks at the fuel pump are an indication of loose fittings, worn or ruptured diaphragm or loose diaphragm mounting screws.

IGNITION DIFFICULTIES

PRIMARY CIRCUIT

Primary circuit difficulties usually are caused by loose, broken, dirty or corroded connections, a grounded condenser, burned distributor contact points, incorrectly set points or sticking of the contact breaker arm.

SECONDARY CIRCUIT

Secondary circuit difficulties are usually caused by fouled or broken spark plugs, incorrect spark plug gap, wrong type of spark plug, a cracked or wet distributor cap, a faulty coil or a broken distributor rotor contact spring. Repair or replace parts as required.

BURNED OR PITTED DISTRIBUTOR CONTACT POINTS

Dirt or oil on points, incorrect setting of points, a faulty coil or condenser, or high voltage in the system. Replace contact points and condenser.

COIL FAILURE

Excessively high voltage, moisture formation, engine overheating, or an open circuit at soldered connection on primary studs. Replace coil.

CONDENSER FAILURE

Normal fatigue, excessive heat or moisture formation. Replace condenser.

FOULED OR BURNED SPARK PLUGS

Incorrect type of spark plug, spark plug not sufficiently tight, too much oil in carburetor air cleaner, incorrect carburetor adjustment, or inoperative automatic choke, incorrect ignition timing, water in combustion chamber, or oil leaking past piston rings. Clean spark plugs if dirty, replace if damaged. Adjust gap to .035 inch.

ENGINE NOISES

PISTON NOISES

Broken piston ring or ring land, too tight or too loose piston pins, excessive clearance between pistons and bore, broken pistons or carbon deposits in cylinder head.

VALVE NOISES

The hydraulic valve tappets are designed for quiet and efficient operation over an indefinite period of time and usually require no special attention. Oil pressure and oil level affect the operation of the tappets, since oil in the valve oil galleries acts as a compensating factor to maintain a zero clearance throughout the valve train. Low oil pressure or low oil level restricts flow of oil into the valve galleries, causing tappet noise. If the oil level in the crankcase is too high, the oil has a tendency to foam, thereby permitting air to enter the galleries and cause noise. Actual valve noises may be caused by wear of the rocker arms, worn valve guides, stems or broken valve springs.

CONNECTING ROD NOISES

Connecting rod noises are caused from low oil pressure, low oil level, thin or diluted oil, excessive bearing clearance, incorrectly fitted bearings or bearing caps. Inspect and correct oil level and pressure.

MAIN BEARING NOISES

Low oil pressure, low oil level, thin or diluted oil, excessive bearing clearance or end play, eccentric or out-of-round journals or a sprung crankshaft. A loose flywheel or fluid drive may be mistaken for main bearing difficulty.

Lubrication

CHANGING OIL

Frequency of oil change is determined by the type of operation and by operating conditions. Under normal operating conditions, oil should be changed after each 50 hours of operation. High speed, heavy load and extremely dusty conditions necessitate more frequent changes. A comparison of the oil on the indicator with fresh oil will usually serve as a guide. Lack of body, the presence of dirt or grit and excessive darkening of the oil indicate that fresh oil is needed. The oil capacity is 5 quarts. Add one additional quart when the filter element is replaced. Drain the oil while the engine is hot, as the oil will flow freely and carry more dirt and other foreign matter with it.

ENGINE OIL RECOMMENDATIONS

For temperature not lower than 32° F.	Use SAE 30
For temperature as low as 10° F.	Use SAE 20W
For temperature as low as —10° F.	Use SAE 10W
For temperature below —10° F.	Use SAE 5W

DILUTION OF ENGINE OIL

If SAE 5W Engine Oil is not available, dilute SAE 10W engine oil with kerosene. Fill the crankcase with SAE 10W engine oil so that the oil level indicator shows "FULL." Add one pint of kerosene and run the engine for a few minutes to mix the kerosene and oil thoroughly. Stop the engine and check the oil level indicator reading. During operation, check the oil level frequently as oil consumption may increase due to the use of light engine oil. Replenish the crankcase with SAE 10W Engine Oil when necessary.

ADDING OIL

Between oil changes, check the oil level daily. The oil level indicator (Fig. 20) is of the bayonet type, with two markings, "FULL" and "ADD OIL." After the engine has been standing, the oil level should be at the "FULL" mark. After the engine has started, this level will drop somewhat, due to the filling of oil passages and the oil filter. A quart of oil should be added when the level is at or slightly below the "ADD OIL" mark. Do not run the engine with the oil level below the "ADD OIL" mark.

51x351

Fig. 20—Oil Level Indicator

COLD WEATHER OPERATION

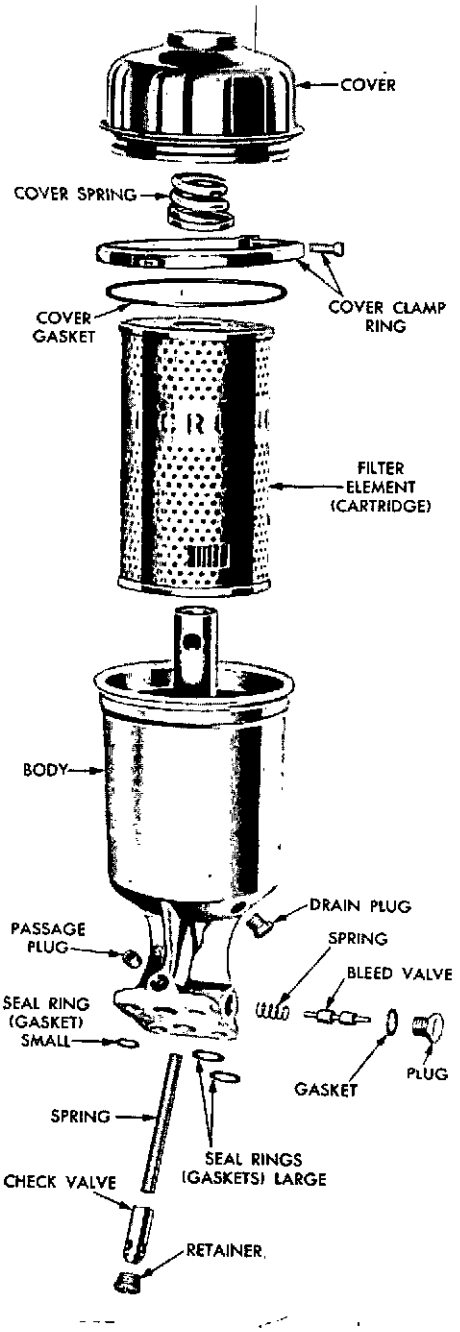
During cold weather, examine the oil daily for evidence of sludge or water resulting from condensation of moisture in the crankcase. Under extreme conditions, the engine may not reach normal operating temperature during a short run, with the result that fumes are not dissipated in the crankcase and sludge forms. This sludge may freeze or clog the oil inlet strainer, retarding lubrication of internal parts. If there is evidence of sludge, change the oil. If excessive sludge accumulation is evident, remove the oil pan and clean all accessible parts, including the oil inlet strainer, as thoroughly as possible. Use a new oil pan gasket when installing the oil pan.

OIL FILTER

The "Full Flow" oil filter as shown in Figure 21 means that all the oil delivered under full pressure to the working parts of the engine goes through the filter before entering the oil passages.

This type of filter assures a constant flow of clean oil to the engine and is so constructed and installed that it is impossible for the supply of oil to be cut off even though the filter becomes clogged.

The filter element is of the economical replaceable type and should be replaced every 100 hours or prior to this time, or in extremely dusty conditions and if the oil appears to be excessively dirty.



51x990

Fig. 21—"Full Flow" Oil Filter (Exploded View) (Typical)

REMOVING AND INSTALLING "FULL-FLOW" FILTER ELEMENT

While the engine is warm, remove the filter drain plug and drain the oil. Remove the clamp screw from the clamp ring, open the ring and remove the filter cover, the cover gasket and the filter element. Wipe the housing clean and install the new filter element. Install a new cover gasket and the cover. Close the clamp ring and install the retaining screw. Be sure the drain plug is in place before starting the engine.

CARBURETOR AIR CLEANER

The carburetor air cleaner (Fig. 22) should be inspected after each 50 hours of operation or oftener, depending on operating conditions. Dirt level above the lower off-set in the reservoir calls for cleaning of the unit.

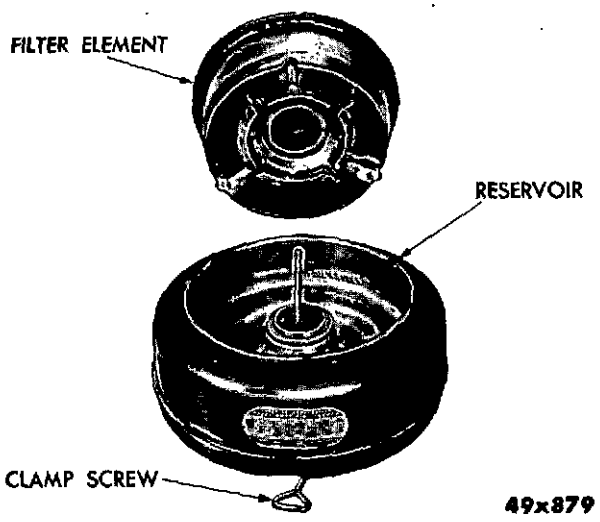


Fig. 22—Typical Carburetor Air Cleaner (Exploded View)

REMOVAL AND INSTALLATION OF THE CARBURETOR AIR FILTER

Remove the cover filter element and clean in kerosene. Allow to drain. Unscrew the clamp screw and remove the reservoir and the gasket between the reservoir and the carburetor. Clean the reservoir thoroughly and install the reservoir with the gasket on the carburetor. Be sure the gasket is in good condition. Use a new gasket, if possible, and be sure the reservoir fits securely on the carburetor. Tighten the clamp screw. Refill

the reservoir to the indicated level with one pint of SAE 50 Engine Oil for temperatures above 32 degrees F., or SAE 20W for temperatures consistently below 32 degrees F. Do not overfill reservoir, as excess oil in the air cleaner may be sucked into the engine through the carburetor. Install the filter element and cover.

CRANKCASE VENTILATING AIR CLEANERS

After each 50 hours of operation, or with each oil change, remove the air cleaner from the oil filler pipe and one from the ventilator outlet pipe, wash in kerosene, dry and reoil with SAE 50 Engine Oil.

WATER PUMP

The water pump has one fitting. Lubricate with water pump grease after each 25 hours of operation.

GENERATOR

The generator has two oil cups, one at either end. Lubricate with five to ten drops of SAE 10 engine oil after each 50 hours of operation.

DISTRIBUTOR

The distributor has an oil cup at the side. Lubricate with five or ten drops of SAE 10 engine oil after each 50 hours of operation. After 250 hours of operation, remove the distributor cap and rotor and apply two or three drops of SAE 10 Engine Oil to the cam wick.

CAUTION

Keep oil away from the contact points.

GOVERNOR

Lubrication is the same for both the Pierce and the Hoof Governor. Check the oil level in the governor housing daily by removing the inspection hole plug at the rear of the housing. The level should be even with the lower edge of the inspection hole. To replenish the oil, remove the filler hole plug at the top of the housing and fill with engine oil until oil reaches the correct level. Use oil of the same viscosity as that in the engine crankcase.

TORQUE CONVERTER

Remove the oil dip stick at the side of the torque converter housing and inspect the level of the oil in the converter after each engine start,

or after 8 hours if the converter is in continuous operation. If necessary, replenish with Automatic Transmission Fluid Type "A".

After 500 hours of operation drain and refill the assembly.

To drain the oil pan reservoir, remove the drain plug at the bottom of the oil pan.

To drain the torque converter unit, remove the drain plug from the converter unit and allow the oil to drain. Rotate the unit one-half revolution and remove the opposite drain plug. Allow the remainder of the oil to drain.

To refill the converter unit, re-install the two drain plugs and the oil pan plug. Fill the oil reservoir with Automatic Transmission Fluid Type "A". Start the engine, and run at 500 rpm's with transmission in neutral. This will allow the fluid to fill the torque converter. With the engine running, continue adding fluid to the reservoir until the fluid level remains constant at the full mark on the dip stick.

INSPECTION 4, 5-SPEED REGULAR AND 5-SPEED HEAVY DUTY TRANSMISSION

Remove the filler plug and inspect the level of the lubricant after each 50 hours of operation. Level should be at bottom of the filler plug opening. Replenish, if necessary, with Multi-purpose gear lubricant of the proper grade. For temperatures above — 10 degrees F., use SAE 90 and for temperatures below —10 degrees F., use SAE 80. If SAE 80 is not available, use a blend of four parts SAE 90 to one part SAE 10W Engine Oil. Do not use a lubricant heavier than SAE 90. Drain and refill the transmission prior to anticipated temperature change or after each 500 hours of operation. The capacity of the regular 4-speed transmission is 5½ pints, the 5-speed regular transmission is 9½ pints and the 5-speed heavy duty transmission is 15 pints. If the engine is equipped with a power take-off add 1½ pints.

POWER TAKE-OFF

Two lubrication fittings are provided for this assembly, one on the side of the housing and one at the end of the shaft. On some units, the fitting for the clutch release bearing is inside the housing. It is made accessible by removing a small plate at the left side of the housing. (See Fig. 19.) For some types of installation, the drive shaft must be lubricated from the side, rather than the end. In such case, remove the small plug from the shaft and install a fitting in its place. Remove the fitting from the end of the shaft and replace with the plug. Lubricate the clutch release daily with general purpose grease, and lubricate the drive shaft after each 50 hours of operation.

Maintenance

DAILY MAINTENANCE SCHEDULES

1. Check level of oil in crankcase and add oil if necessary to bring level to "FULL" mark on indicator. See Lubrication Section for oil recommendations.

2. Check cooling system and add clean water or anti-freeze as required.

3. If the engine is operated under extremely dusty conditions, check the carburetor air cleaner and the two crankcase ventilation air cleaners for accumulation of oil and dirt. See Lubrication Section.

4. If the unit is equipped with a power take-off, lubricate the clutch release bearing.

5. Check the oil level in the Hoof or Pierce Governor housing, and replenish, if necessary.

EVERY 25 HOURS OF OPERATION

Lubricate and service as specified for "Daily" and perform the following additional operations:

1. Lubricate the water pump.

2. Check the level of the fluid in the torque converter unit, if so equipped.

3. Adjust fan and generator belts.

EVERY 50 HOURS OF OPERATION

In addition to the operations listed under "Daily" and "Every 25 Hours of Operation," perform the following operations:

1. Drain the engine crankcase and refill with recommended grade of oil. See Lubrication Section.

2. Clean and service the carburetor air cleaner and the crankcase ventilation air cleaners as described in the Lubrication Section.

3. Lubricate the generator. See Lubrication Section.

4. Lubricate the distributor (oil cup).

5. Check the lubricant in the transmission.

6. Lubricate the power take-off drive shaft bearings.

7. Check the electrolyte in battery.

EVERY 100 HOURS OF OPERATION

1. Replace filter element in oil filter.

EVERY 250 HOURS OF OPERATION

1. Clean and adjust contact points in distributor (0.15 to .018 inch).

2. Lubricate distributor cam wick.

3. Check spark plugs for fouling and for proper gap (.035 inch).

4. Check ignition timing. See Adjustment Section.

5. Check carburetor adjustment. See Adjustment Section.

6. Inspect all wiring for loose connections and worn or broken insulation. Clean the battery terminals and coat with vaseline.

7. Clean the engine thoroughly.

8. Inspect fluid level in Torque Converter.

EVERY 500 HOURS OF OPERATION

1. Drain and refill transmission (4 and 5 speed).

2. Drain and refill Torque Converter Unit.

Adjustments

ELECTRICAL SYSTEM

DISTRIBUTOR CONTACT POINTS (FIG. 23). In order to maintain efficient operation, the contact points in the distributor must be adjusted properly. There are two sets of points, the maker points and the breaker points, on Models Ind. 56 and 56A only. Models Ind. 52, 53, and 54 have one set of points. (Fig. 23A.)

To adjust either set of points, remove the distributor cap, rotate the distributor shaft until a high spot of the cam contacts the rubbing block for the points. Loosen the lock screw just enough to permit the stationary plate to be moved. Insert a screwdriver blade in the triangular space and rotate the blade against the stationary plate to open or close the point gap. Clearance between the points should be from .015 to .018 inch, as measured with a clean feeler gauge for all V-8 Models. Tighten the lock screw.

Rotate the distributor shaft until the high spot of the cam contacts the rubbing block of the opposite points and adjust in the same manner.

If the cam appears dry, apply a small amount of MOPAR Cam Lubricant (Part No. 1473595) to the rubbing blocks.

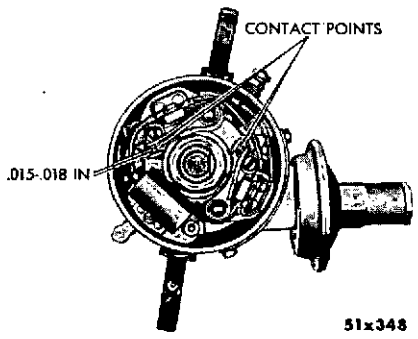


Fig. 23—Distributor Contact Point Adjustment (Models Ind. 56 and 56A only)

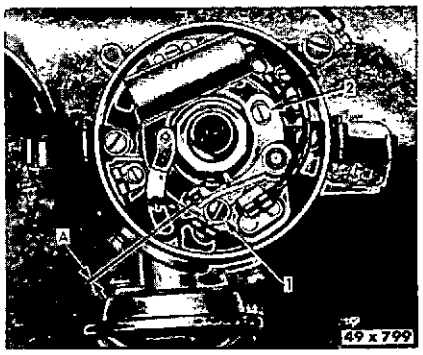


Fig. 23A—Distributor Breaker Points

1 — Adjustable breaker point lock screw
2 — Adjustable breaker point adjusting screw
A — Breaker point gap

DISTRIBUTOR TIMING (Fig. 24)

Before adjusting the ignition timing, make certain that the distributor is properly installed and that the points have been set to open at .015 *to .018 inch.*

To determine the timing position for normal operation, the ignition should occur at 4 degrees before top dead center for Ind. 52 engine, 6 degrees before top dead center for Ind. 53 engine, 5 degrees before top dead center for Ind. 54 engine, 6 degrees before top dead center for Ind. 56 and 8 degrees before top dead center for Ind. 56A engine.

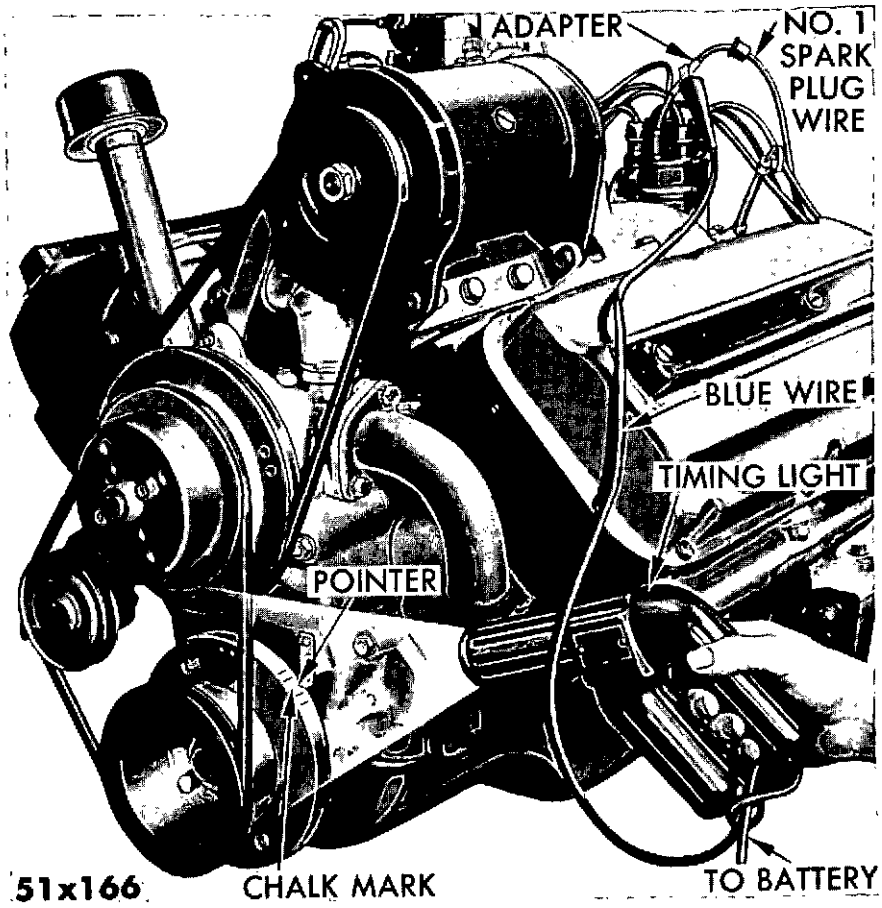


Fig. 24—Timing Distributor With Timing Light

ADJUSTING IGNITION TIMING (WITH TIMING LIGHT TOOL C-693)

Place a chalk mark as shown in Figure 24 on the vibration damper at the register mark indicating the desired timing point (TDC, or the correct number of degrees BTDC). Remove the No. 1 spark plug wire from the distributor and insert it in the female end of the adaptor Tool C-3066. Insert the male end of the adaptor in the No. 1 distributor tower. Connect the blue wire of the timing lamp to the female end of the adaptor Tool, the wire with the black insulator to the negative battery terminal and the wire with the red insulator to the positive battery terminal. Start the engine and run at idle speed until normal operating temperature is reached. Observe the flash of the timing light. It should occur when the chalk mark on the vibration damper is exactly opposite the pointer on the engine block. If it does not, loosen the distributor clamp bolt and rotate the distributor clockwise or counter-clockwise until the specified timing is obtained; then tighten the clamp bolt. Accelerate the engine and observe the timing light. As engine speed increases, the timing light should indicate a gradual spark advance.

ADJUSTING IGNITION TIMING (WITH TEST LAMP)

Rotate the engine in operation direction until the correct register mark on the vibration damper is opposite the pointer on the engine block. Connect a test lamp (6-volt) in series between the distributor primary lead and the negative terminal of the battery. Turn on the ignition. Loosen the distributor clamp bolt and turn the distributor clockwise until the test lamp lights. Turn it counter-clockwise until the instant the light goes out. Tighten the distributor clamp bolt.

SPARK PLUGS

Spark plugs used in the industrial engine are the Resistor type, size 14 mm. The gap should be .035 inch, ±.001 inch. Be sure to use the correct type of spark plug, as the V-8 Industrial Engine is a high compression engine.

CARBURETOR ADJUSTMENT

Before attempting any adjustment of the carburetor, check the following items:

(1) Spark plugs. See that plugs are correct type, clean, and have correct gap (.035 inch).

(2) Distributor Points. See that both sets of points are clean, in good condition and properly set (.015 to .018 inch).

(3) All high tension terminals. See that terminals are making good contact at plugs and at distributor cap.

(4) Compression should be approximately even in all cylinders.

(5) Carburetor should be clean and in good condition and firmly attached to the manifold with no air leaks.

(6) The manifold heat control valve should be free and functioning correctly.

Make initial adjustment of the idle needle valve on the Stromberg Carburetor by turning clockwise carefully until seated. Do not force the valve against the seat. Back the valve out ONE full turn. Start the engine and run until normal operating temperature is reached. The choke valve should now be fully in the open position. Turn the needle valve ⅛ turn clockwise (leaner).

Observe the performance of the engine for slightly increased speed, smoother running and absence of fluffs at the exhaust.

If these improvements are noticed, try turning the valve another ⅛ turn clockwise and observe as before. If further improvement is noted, the adjustment is correct, but if the engine stalls or misses, turn the valve counter-clockwise until the engine runs smoothly and at the best idling speed.

Try to adjust the needle valve within ⅛ turn. The best performance is usually obtained with the valve between ¾ and 1¼ turns open.

Other carburetor adjustments are made during assembly of the carburetor and require the use of special tools. They should be made only by an experienced carburetor mechanic.

GOVERNOR ADJUSTMENT (PIERCE, HOOF AND KING SEELEY) (Figure 25)

DRIVE BELT (Pierce or Hoof). To tighten the governor drive belt, loosen the governor mounting bolts and move the governor away from the engine enough to establish tension on the belt. Tighten the mounting bolts.

THROTTLE TO GOVERNOR ROD (Pierce). Install the lower ball joint of the rod in the upper hole of the governor operating lever. Turn the low speed stop screw in to hold the governor lever in the open position, and hold the carburetor throttle lever open against the stop. Adjust the

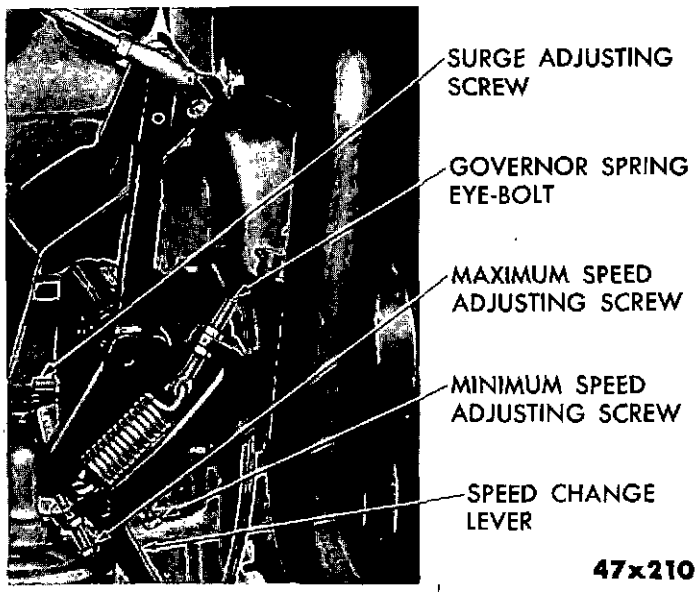


Fig. 25—Governor Adjustments—Pierce Type

length of the rod so that the upper ball joint fits into the tapped hole in the throttle lever. Test the operation of the rod for friction or excessive free play, and adjust, if necessary, at the ball joint.

THROTTLE TO GOVERNOR ROD (Hoof). Adjust the length of the rod so that the throttle lever on the carburetor contacts the stop just as the governor lever is at the wide open position. Test the operation of the rod for friction or excessive free play and adjust, if necessary, at the ball joint.

ADJUST TO ELIMINATE SURGE (Pierce). Select an engine speed at the low point of the range at which the governor is to operate and set the speed change lever to obtain this speed. If a no-load surge is encountered at this point, turn the surge adjusting screw in slowly until the surge disappears. Under no circumstances should the surge screw be turned in far enough to increase the no-load speed of the engine more than 25 rpm.

To correct surge under load, loosen the spring eye-bolt lock nut and turn the eye-bolt to decrease spring tension. Tighten the lock nut.

ADJUST TO ELIMINATE SURGE (Hoof). To correct no-load surge, loosen the adjusting screw lock nut and turn the adjusting screw in until the surge disappears, but not far enough to increase no-load engine speed more that a few rpm's.

To correct surge under engine load, loosen the spring lever clamp screw and move the spring lever forward until the eye of the lever is clear of the front of the governor lever. Tighten the spring lever clamp screw.

ADJUST GOVERNED SPEED OF ENGINE (Pierce). Move the speed change lever in clockwise direction until an engine speed midway in the desired range is obtained. Load and unload the engine and observe the variation in rpm's between no-load and full-load speeds. If variation is excessive, adjust the spring eye-bolt to increase spring tension and move the speed change lever counter-clockwise until the previously selected speed is obtained. Check the results again and repeat the process until the desired regulation is obtained. Move the speed change lever clockwise until the top load is reached and set the maximum speed adjusting screw to limit lever travel at this point. Move the speed change lever counter-clockwise until the lowest speed in the range is reached and set the minimum speed adjusting screw to limit lever travel at this point. Tighten all lock nuts after making the adjustments.

***ADJUST VARIABLE SPEED LEVER TRAVEL* (Some Hoof Models).** Test the engine rpm's at high and low speeds in the desired range and set the adjusting screws to limit travel of the variable speed lever in that range. The maximum speed adjusting screw is located at the right of the lever and the minimum speed adjusting screw is at the left. Both screws are provided with lock nuts to hold the adjustment.

ADJUST CONTROL (Hoof). Sharpness of governor control may be increased by varying the tension of the governor spring. In general, increasing the spring tension sharpens the control. However, for very low speeds, it may be advisable to reduce spring tension. To increase spring tension, loosen the spring lever clamp nut and move the spring lever counter-clockwise. To decrease tension, move the lever clockwise. The position of the lever will be determined by the speed range at which greatest accuracy is desired. For middle speed ranges, the spring lever should be approximately vertical when the throttle valve is wide open. Tighten the spring lever clamp screw after adjusting the lever. Check the spring deflection; normal deflection for wide range of speed is ⅜ inch

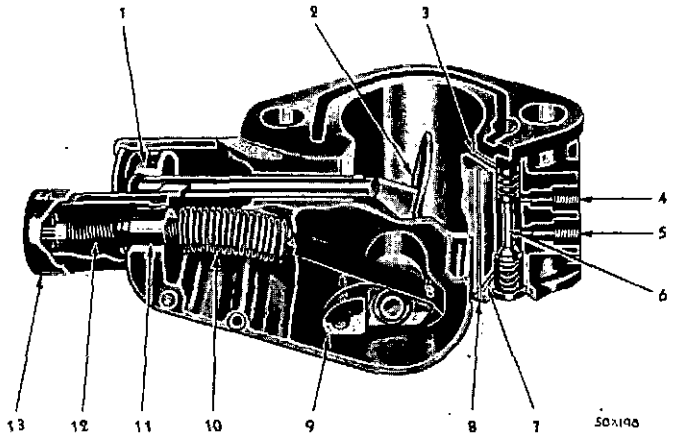


Fig. 26—King Seeley (Handy) Governor (Sectional View)

1 — Non-cheating stabilizer piston
2 — Throttle valve
3 — Passage to transfer valve chamber
4 — Carburetor vacuum connection (not used)
5 — Ignition distributor vacuum connection (not used)
6 — Vacuum transfer valve plunger
7 — Vacuum passage
8 — Vacuum by-pass passage
9 — Cam and valve shaft assembly
10 — Control spring and ribbon assembly
11 — Calibrating nut
12 — Adjusting screw
13 — Adjusting screw cap assembly

with the throttle wide open and the eye of the spring lever in alignment with the front edge of the operating lever. If spring deflection exceeds ¾ inch when the spring lever is vertical, or nearly so, hook the spring in the end hole in the spring clip, or move the spring clip to the next anchor pin hole on the right. (The spring clip is secured to the anchor pin with a cotter pin.)

ADJUSTING THE KING SEELEY (HANDY) GOVERNOR

It may be apparent after a long period of operation that the governor has become sluggish and is not as responsive as when it was originally installed. Such sluggishness is most generally caused by deposits of carbon and gum on the valve shaft and bearings, stabilizer piston rod or cylinder. The remedy for this condition, is to remove the governor and soak it in a cleaning solvent that will remove the carbon and gum deposits.

It is always recommended that a governor that is not functioning properly be soaked in cleaning solvent before any adjustments or repairs are attempted, because in many cases, satisfactory performance can be restored in this manner.

Before attempting any adjustment or recalibration of the governor, run the engine until normal operating temperature is reached. Manifold vacuum at sea level, should be at least 16 inches with engine running at full throttle (governor operating), and at least 17 inches at idling speed, with an allowable reduction for altitude.

To adjust governor, refer to Figure 26. For a **HIGHER** speed, turn adjusting cap (13) counter-clockwise or to the left; for **LOWER** speeds, turn adjusting cap clockwise or to the right. One turn of the adjusting screw will change the engine speed approximately 300 rpm.

When a more sensitive regulation is desired, or if the governor is too sensitive and inclined to surge at full throttle, correct as follows by means of the calibrating nut (11).

SENSITIVITY ADJUSTMENT

(1) If the governor is too sensitive or has a tendency to surge, place the hollow wrench (1) in position on the calibrating nut (11) and

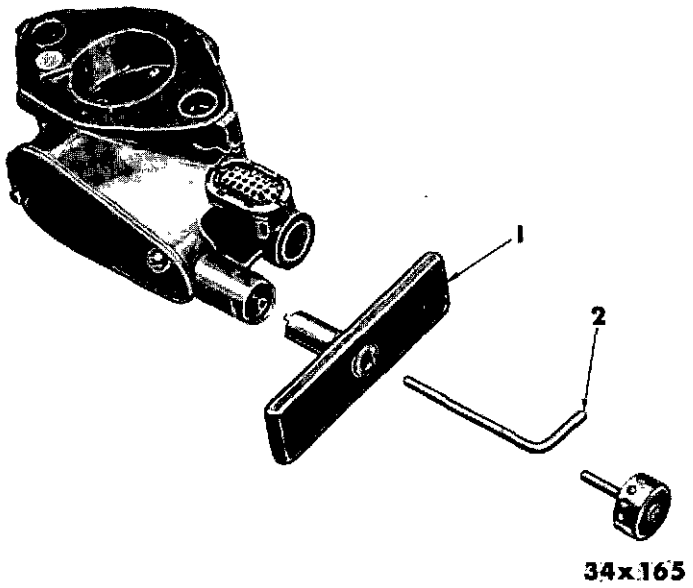


Fig. 27—Governor Adjusting Wrenches

1 — Hollow wrench — A-24283 2 — Hex wrench — A-25264

insert the special adjusting wrench (2) through the hollow wrench into the adjusting screw and turn the screw clockwise one turn (Figure 27).

(2) With the hollow wrench in the slot of the calibrating nut, turn the nut clockwise about ¼ of a turn. When this adjustment is made the adjusting screw must be held from turning.

Continue this adjustment until the surge is eliminated. However, engines operate most efficiently when the governor is adjusted to the point which just barely eliminates the surge at full throttle.

REACTION ADJUSTMENT

(1) If the governor is slow acting and does not open promptly when a load is applied at the governed speed or cut off promptly at maximum speed, turn the adjusting screw counter-clockwise one turn and while holding the screw in the new position, turn the calibrating nut counter-clockwise ¼ of a turn. Repeat this procedure until the desired regulation is obtained. When making this adjustment, however it is best to continue until an actual surge is produced, and then, just eliminate the surge.

(2) When the adjustment is completed, tap lightly on the end of the hollow wrench so that the calibrating nut will be properly seated and re-check speed.

These wrenches can be obtained from the King-Seeley Corporation, Ann Arbor, Michigan.

The stock numbers of the special wrenches (Figure 27) are as follows:

A-24283 (Item 1 Fig. 27).
A-25264 (Item 2 Fig. 27).

CALIBRATION

If the control spring should for any reason be disengaged from the adjusting screw, or the relationship of the adjusting screw and calibrating

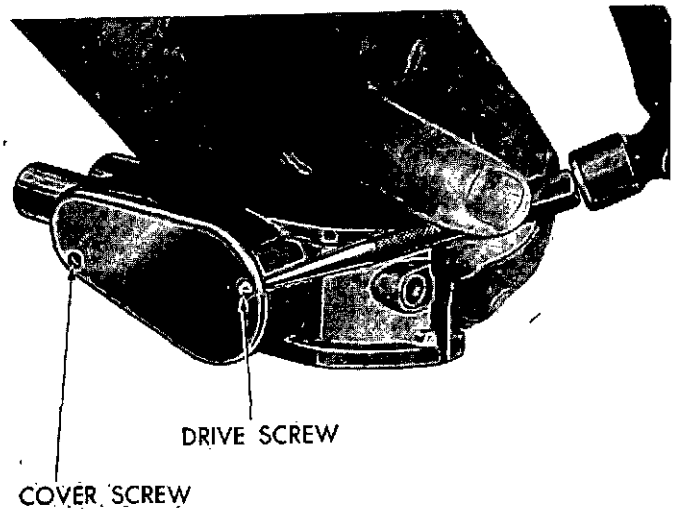


Fig. 28—Removing Governor Housing Cover

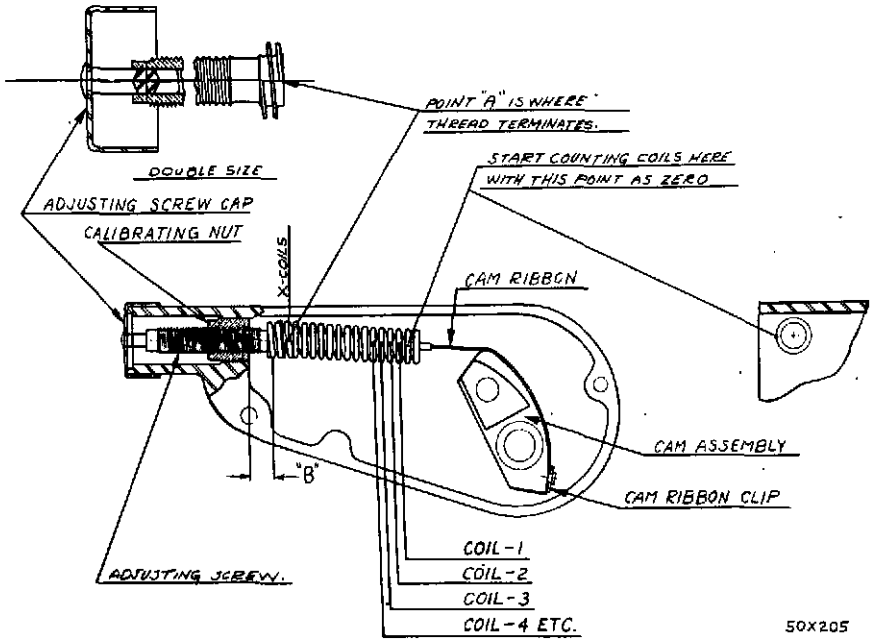


Fig. 29—Control Spring Calibration

nut changed by someone not familiar with the governor, it will be necessary to go over the complete calibration for the particular governor to insure efficient control.

Remove seal and adjusting screw cap (13). Remove cover screw and force out the drive screw as indicated on Figure 28. Do not use a screw driver or similar tool, as it will result in damage to the housing or cover. When the drive screw is out far enough so that side cutting pliers can be applied under the screw head, turn the screw out counter-clockwise.

(1) Position the adjusting screw in the spring until the open coils correspond to the number indicated on the "Calibration Specification" (Fig. 29) sheets for the particular governor, and it may in some cases be necessary to move the calibrating nut several turns to provide sufficient space between the end of the spring and governor housing to obtain the correct number of open coils.

(2) Referring to Figure 29, the active coils of the control spring end where the spring contacts the thread of the adjusting screw at point "A." Each turn of the adjusting screw adds or subtracts one coil. As an example: To obtain 10¼ coils turn the adjusting screw until there are 10 active coils between zero point and point "A," and then add ¼ coil by turning adjusting screw counter-clockwise ¼ turn.

When the adjusting screw is positioned to provide the correct number of active coils, hold the adjusting screw and turn the calibrating nut in the direction required with the A-24283 wrench until dimension "B" (Figure 29) indicated on the "Calibration Specification" sheets for the particular governor is provided. This measurement is from the center of the last spring coil to the inside of the governor housing, as indicated on Figure 29.

This will usually provide a setting within a few hundred revolutions of the maximum governed engine speed recommended for a particular model. However, further adjustment may be required after the governor is installed on the engine to obtain correct control and governed maximum speed. Perform any changes necessary, according to the instructions outlined under the subject of "Adjustments."

(3) Lead type seals are recommended for the governor adjustment, inasmuch as it is possible to lock the lead type seals with a particular symbol which prevents tampering, as any change in the seal would be readily noticeable. While the patented type seals are easier to use, they offer but little protection, inasmuch as they can be easily purchased, enabling the operator or mechanic to change the adjustment and reseal the governor to avoid detection.

Generally, it is not economical to attempt major governor repairs in the average shop, as mechanics are seldom familiar with this type of work. Moreover, it will usually prove less expensive to replace the governor if necessary, or have it reconditioned in an Authorized Handy Governor Service Station.

STARTER PINION ADJUSTMENT

When the starter solenoid is energized to engage the starter pinion, there should be .015 to .030 inch clearance between the pinion and the pinion thrust washer, in order to prevent binding or jamming of the pinion. An accurate measurement of clearance can be made only when the solenoid is holding the pinion in the engaged position. For this reason, do not rely on a measurement made when holding the solenoid plunger in by hand.

ADJUSTING PINION CLEARANCE

Remove the starter from the engine. Detach the strap connecting the solenoid to the starting motor terminal. Connect a 6-volt battery to the frame of the starting motor (ground) and to the starter solenoid battery terminal. Connect a jumper wire from the solenoid relay ground terminal to the starter frame. Connect another jumper wire from the starter switch terminal of the relay to the solenoid battery terminal. (This wire energizes the solenoid.) Push the solenoid plunger into the engaged position; the energized solenoid will hold the plunger in position. Measure the clearance between the pinion and the pinion thrust washer. If the clearance is not within the specified limits (.015 to .030 inch), remove the cotter pin and link pin that attaches the pinion yoke to the solenoid plunger and turn the plunger stud in or out the required distance to provide proper clearance.

FAN BELT ADJUSTMENT

Fan belt adjustment is made by moving the idler pulley to loosen or tighten the belt. To make the adjustment, loosen the idler pulley bracket bolt and position the idler pulley so that there is ½ inch of slack when pressure is applied between the pulleys. Tighten the idler pulley bracket bolt after making the adjustment.

GENERATOR BELT ADJUSTMENT

Generator belt adjustment is made by means of the generator adjusting strap. To make the adjustment, loosen the generator mounting bolts and the adjusting strap screw. Position the generator so there is ¾ inch slack when pressure is applied to the belt. Tighten the adjusting strap screw and the generator mounting bolts after making the adjustment.

POWER TAKE-OFF

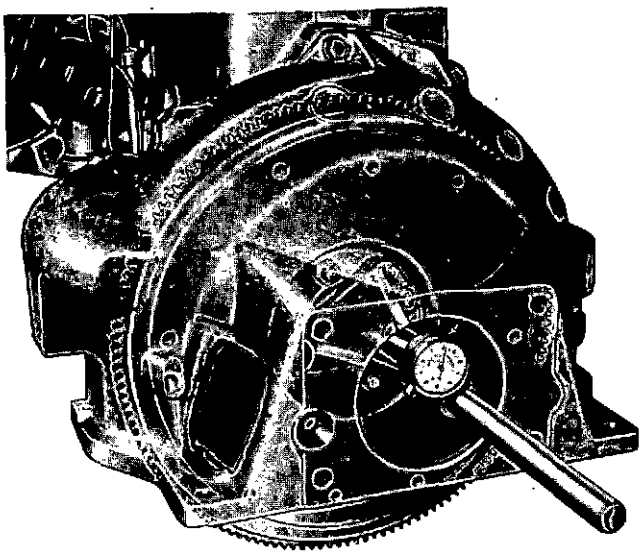
The clutch must be properly adjusted to prevent slippage. Slipping causes rapid wear of the clutch facings and distortion of the plates. Frequency of adjustment is determined by the amount and nature of the load. Heavy or shock loads necessitate frequent clutch adjustment to compensate for wear.

ADJUSTING THE CLUTCH RELEASE LEVER

Place the shifting lever in released position and remove the adjustment cover from the housing. See Fig. 19. Release the adjustment nut lock and with a long screwdriver or rod inserted in a notch in the nut, turn the nut in a clockwise direction until firm pressure is required to engage the clutch. To keep the clutch from turning with the adjusting nut, apply pressure on the shifting lever while turning the nut. Make sure the lock engages to hold the adjustment.

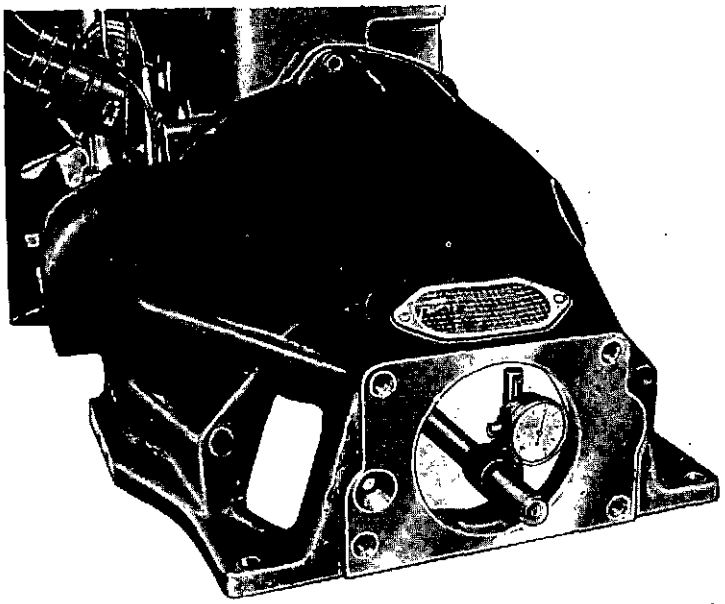
ALIGNMENT OF CLUTCH HOUSING (IF SO EQUIPPED). Replacement of clutch housing or reinstalling the original clutch housing (if removed for any reason), must be correctly aligned when installed. Out-of-round of the bore must not exceed .005 inch total indicator reading. To correctly align clutch housing with or without fluid drive, proceed as follows:

1. Inspect the housing face where it contacts the rear of the engine block for particles of dirt and burrs; remove burrs with a file, then clean both surfaces.



49x609

Figure 30—Method of Attaching Fixture C-870 (Flywheel Type Housing Illustrated)



49x633

Figure 31—Checking Clutch Housing Bore (Fluid Coupling Type Housing Illustrated)

2. Start the two dowel pins in the block from the front end so they protrude beyond the machined face of the engine block and install the clutch housing. Install clutch housing to block cap screws, making them just snug enough so the housing can be shifted if necessary by tapping with a mallet.

3. Install the fixture C-870 to the flywheel attaching bolts (Figure 30) or, if fluid drive unit is to be installed, attach the fixture to the crankshaft flange bolts and install the indicator (C-435 or C-430), as shown in Figure 31. Rotate the crankshaft and check the inside diameter of the housing bore; it should not vary more than .005 inch to one complete revolution of the crankshaft. If alignment is necessary, remove the dowel pins and tap the housing until it comes within the specified tolerance. After obtaining correct alignment, tighten the housing cap screws to 30 to 35 foot-pounds torque.

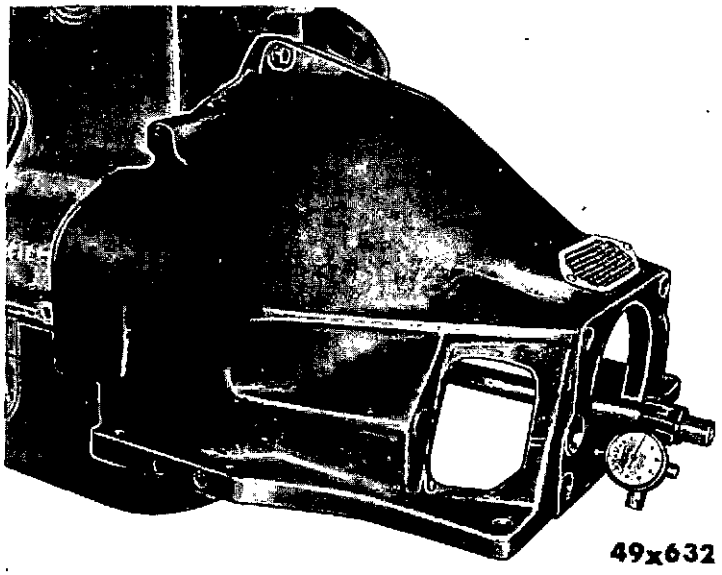


Figure 32—Checking Rear Face of Housing

4. Change the position of the dial indicator and check the rear face of the housing as shown in Figure 32. This tolerance must be within .002 inch. Assuming that all burrs and dirt has been removed as described in step 1, this tolerance will no doubt be within the specified limits.

If alignment of the housing was necessary as described in step 3, the dowel pin holes will have to be reamed. Ream with Tool C-860 as shown in Figure 33 and install .512 inch oversize dowel pins. Continue to assemble the clutch assembly. **Failure to align clutch housing may result in hard shifting of transmission and the possibility of gear disengagement.**

ROCKFORD. A hand-hole of ample size is provided to permit convenient adjustment of the clutch. Instructions for adjustments and lubrication are shown on the hand-hole cover plate.

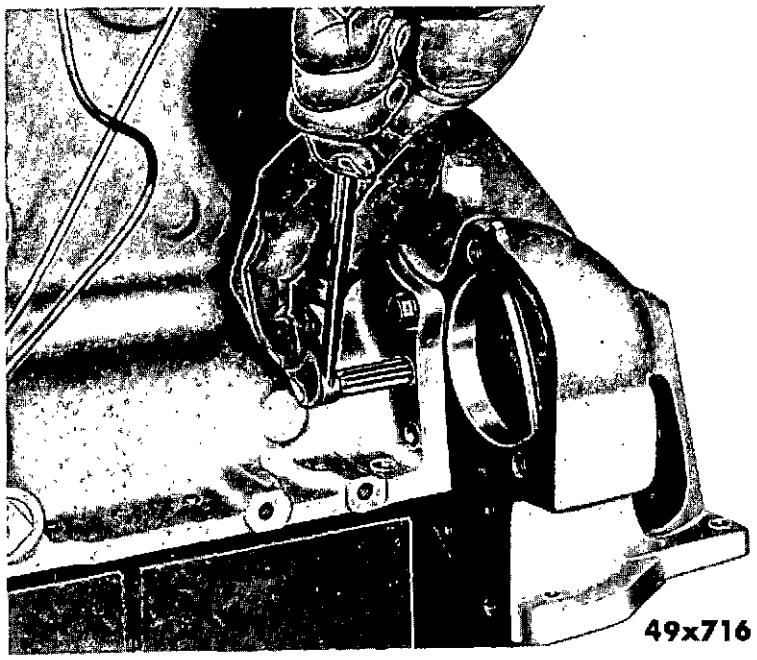


Figure 33—Reaming Dowel Pin Holes

Liquid Propane Gas

LIQUID PROPANE GAS OPERATION

Liquid Propane Gas is a high quality petroleum product which can be stored in liquid form under pressure, but will boil or become vapor at normal atmospheric temperatures. Although Liquid Propane gas is a liquid in the tank it can readily be converted to a vapor when entering the carburetor. The Liquid Propane gas system (Figure 34), is composed of three main units, carburetor, converter and filter.

a. **The carburetor** is of the venturi principle and so designed to mix Liquid Propane gas vapor fuel and air in the correct proportions for best engine operating efficiency at all engine speeds.

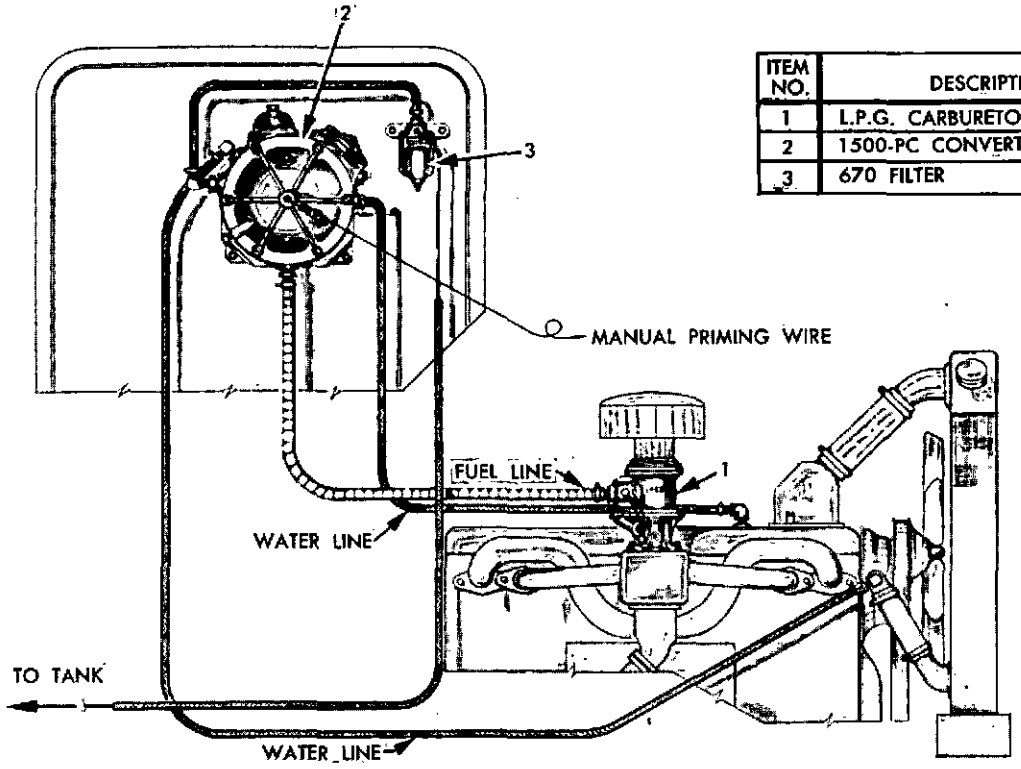
b. **The converter** is a combination heat exchanger and pressure reducing unit. The converter receives the liquid fuel under tank pressure, converts it to vapor form, reduces pressure to slightly below atmospheric, and regulates the flow of vapor in volume to meet the engine's demand.

c. **The filter's** function is to catch foreign particles of dirt that may be in the tank and fuel line.

d. **To start engine,** open throttle **all the way.** Depress plunger on the propane vaporizer for a short period of time and close the throttle to one-fourth open position. Depress magnetic safety switch and start the engine. Continue to depress safety switch button until oil pressure reaches 40 pounds. When weather is extremely cold, it may be necessary to "choke" the engine occasionally by depressing button on the vaporizer. Warm up the engine at approximately 1400 rpm before putting on the load.

OPERATING AND SERVICE INSTRUCTIONS

When removing or servicing converter or filter, be sure to shut off fuel at the tank and run engine until all fuel is out of the lines.



ITEM NO.	DESCRIPTION
1	L.P.G. CARBURETOR "ALGAS"
2	1500-PC CONVERTER
3	670 FILTER

Figure 34—The Liquid Propane Gas System

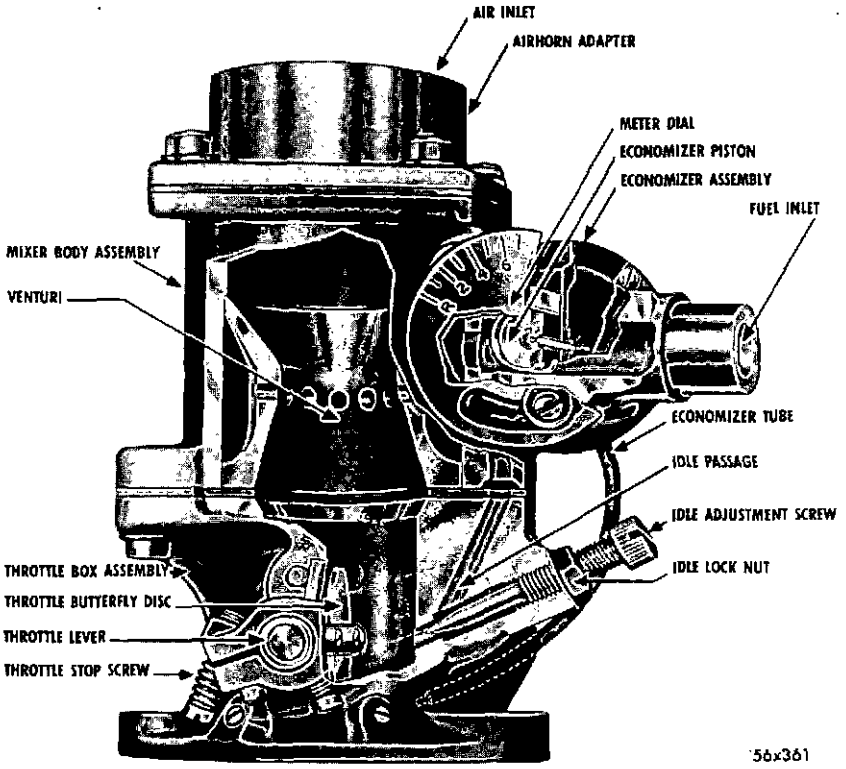


Figure 35—The Liquid Propane Gas Carburetor

CARBURETOR (Figure 35)

The Liquid Propane gas carburetor (Figure 35) replaces and serves the same function as the gasoline carburetor in that it mixes the fuel and air in proper ratio for economical operation under all load conditions. The idle, or no load, adjustment consists of a needle valve at the base of the throttle box, the setting being held by a locknut, as shown in Figure 35. The power adjustment is made by rotating the meter tube dial and is firmly set by a lockscrew. This provides the fuel setting for maximum power and rpm. The economizer varies the fuel input in proportion to engine requirements during part throttle or irregular operation at the engine, such as during cruising or deceleration periods. Adjustment is made by the economizer screw on the opposite side of the meter tube dial.

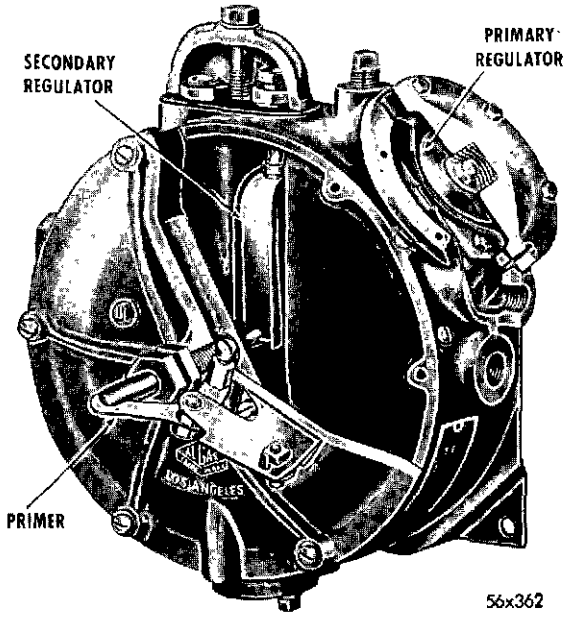


Figure 36—The Liquid Propane Gas Converter

CONVERTER (Figure 36)

The converter is composed of three parts, as follows:

a. The heat exchanger portion is connected to the cooling system of the engine. The converter furnishes the heat for vaporizing the fuel in the transformation from liquid to vapor.

b. The primary regulator reduces the liquid fuel from existing tank pressure to a lower controllable pressure approximately 5½ to 7 pounds.

c. The secondary regulator is a lockoff device as well as a fuel regulation unit and controls the flow of fuel to the carburetor. It operates by engine suction when the engine is running, and locks off the fuel flow when the engine is stopped. The converter is equipped with a priming device for starting. The primer when depressed causes the secondary regulator to leak thus filling the carburetor lines and manifold with fuel sufficient to start the engine, and suction takes over and operates the secondary regulator to continue the flow of fuel. Both primary and secondary regulators are controlled by spring pressure and do not require adjustment.

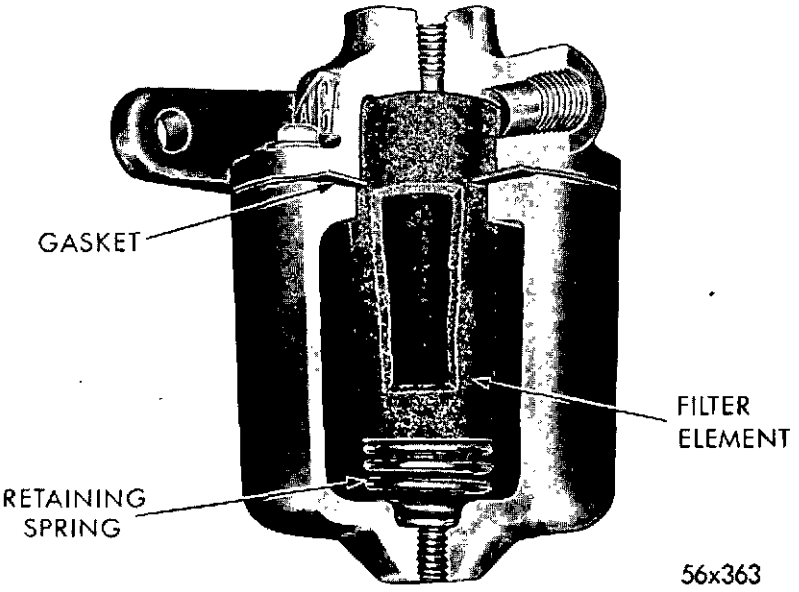


Figure 37—The Liquid Propane Gas Filter

FILTER (Figure 37)

Remove the drain plug from bottom of the Filter and drain any particles trapped in filter bowl. By removing the six screws in the cover, the bowl and filtering element may be removed for cleaning or replacing.

ADJUSTING PROCEDURES

The following adjustments are essential to obtain the best performance of the engine operating system. Run engine to reach operating temperature before adjusting. In making adjustments, it is best to use a Tachometer and Fuel Analyzer.

APPROXIMATE IDLE

Screw idler adjustment (Figure 35) in (for lean) or out (for rich) until a good smooth idle is obtained. This may be checked by means of manifold vacuum; the best idle is at the highest vacuum.

POWER ADJUSTMENT

Screw economizer adjustment all the way in. Set engine at 1400 rpm with throttle stop screw. After engine has stabilized at this speed, set power adjustment to read 12.5 on fuel analyzer. Tighten screw on meter tube after adjustment. If a fuel analyzer is not available proceed as follows: Set engine at 1400 rpm with throttle stop screw.

After engine has stabilized at this speed, rotate meter tube dial to the lean side until engine rpm starts to fall off, mark this point. Rotate the dial to the rich side until engine rpm again falls off and mark this point. Go halfway between marks and set 2 to 3 serations to the rich side.

ECONOMIZER ADJUSTMENT

With engine running at 1400 rpm after making power adjustment, turn out economizer screw gradually until engine has reached peak rpm at this throttle setting and begins to lose speed. Turn screw back in until peak rpm is reached, and tighten locknut. Fuel analyzer will read between 13.8 and 14.4 with this adjustment.

FINAL IDLE ADJUSTMENT

With main jet and economizer set as above, adjust idle screw for smoothest idle. The throttle stop screw is set for desired idle rpm. Making this final adjustment will not affect the correct power or economizer settings.

PRIMER ADJUSTMENT

Run engine at 700 rpm. Loosen locknut and turn primer out (counter-clockwise) a couple of turns. Press primer button and turn primer in (clockwise) until mixture richens to drop engine 350 to 400 rpms.

CAUTION

Under no circumstances should power settings be made too lean as this will result in poor economy and possible engine damage.

Most analyzers may reverse their reading if they have been subjected to an overly lean or rich condition. If satisfactory reading cannot be attained, check analyzer.

Preparation for Storage

When the engine is to be stored or removed from operation for an extended period of time, precautions should be taken to prevent rust accumulation, corrosion of bearing and mating surfaces within the engine, and gum formation in the fuel system. Prepare the engine for storage as follows:

1. Drain the lubricating oil from the engine and add 2½ quarts of Rust Preventive Oil which may be obtained from a reliable oil company.

2. Drain the cooling system, add **MOPAR** Rust Resistor and fill with clean water.

3. Run the engine at idle speed for three or four minutes (avoid overheating) to:

(a) Circulate the Rust Resistor to form a protective film in the water jackets and in the radiator or heat exchanger.

(b) Distribute the Rust Preventive Oil throughout the internal parts of the engine.

4. Remove the top of the carburetor air cleaner and with the engine running at approximately 1000 rpm, pour ½ pint of Rust Preventive Oil through the carburetor air intake. Turn off the ignition as soon as the ½ pint of oil has been drawn into the combustion chamber.

NOTE

If the engine will not run under its own power, turn it over several times with the starting motor to distribute the oil.

5. Drain the Rust Preventive Oil from the crankcase.

6. Remove the spark plugs and pour one ounce of Rust Preventive Oil into each spark plug opening. Turn the engine over four or five revolutions with the starting motor and install the plugs.

7. Drain the cooling system (one drain cock in radiator, one at each side of engine block).

8. Drain the fuel system tank, fuel pump and filter and carburetor. Operate the carburetor throttle lever several times to empty the accelerator pump system.

9. Remove the carburetor air cleaner, the oil filler cap air cleaner and the outlet ventilator pipe air cleaner. Seal the openings with masking or adhesive tape. Also, seal the exhaust outlet opening in the exhaust manifold or exhaust pipe.

10. Replace the element in the oil filter after cleaning the filter housing.

11. Remove the storage battery and store in a cool, dry place. Replenish the water in the battery cells to cover the plates 3/8 inch. See that the battery is fully charged and keep it fully charged during the idle period.

12. Protect the engine with a waterproof cover if it is exposed to the weather.

13. Make periodic inspections to see that the engine is properly stored and that all seals are intact.

CHRYSLER

INDUSTRIAL ENGINES

CHRYSLER CORPORATION
INDUSTRIAL ENGINE DIVISION
7700 RUSSELL DETROIT 11, MICHIGAN