TROUBLES & REMEDIES

Excessive Oil Consumption

Burning oil

(1) Rings not correctly seated to cylinder wall
Give sufficient time for rings to seat
Replace if necessary

(2) Piston rings worn excessively or stuck in ring grooves
Replace ring

(3) Excessive clearance between piston and cylinder wall due to wear or improper fitting
Fit new pistons

(4) Cylinder walls, scored, tapered or out of round
Recondition cylinders and fit new pistons

(5) Piston ring oil return holes clogged with carbon
Replace rings

(6) Piston rings broken
Replace rings

(7) Valve stem oil seals missing or leaking
Replace seals, check for sealing

Leaking oil

(1) Rocker arm cover gasket or tightening tappet cover damaged or loose
Tighten covers or replace gasket

(2) Oil pan drain plug loose
Tighten drain plug

(3) Oil pan retainer bolts loose
Tighten oil pan bolts

(4) Oil pan gasket damaged
Replace gasket

(5) Timing gear cover loose or gasket damaged
Tighten cover bolts or replace gasket

(6) Fuel pump loose or gasket damaged
Tighten fuel pump bolts or replace gasket

(7) Rear main bearing leaking oil into clutch housing or flywheel housing
Adjust or replace main bearing or main bearing oil seal

Lack of Engine Power

Ignition system improperly adjusted

(1) Spark plug faulty
Replace or clean, adjust and seat spark plugs

(2) Distributor points not set correctly
Set distributor points and timing engine

(3) Ignition not properly timed
Set ignition by the instruction under correct specification of engine

Lack of fuel

(1) Gas line partly plugged
Clean gas lines

(2) Dirt or water in carburetor
Clean carburetor and fuel pump

(3) Dirt in gasoline tank
Clean the tank

(4) Air leaks in gasoline line
Check gasoline lines and tighten

(5) Fuel pump not functioning properly
Replace or repair fuel pump

Carburetor air inlet restricted

(1) Air cleaner dirty
Clean air cleaner

(2) Carburetor choke partly closed
Adjust or replace choke mechanism

Over heat

(1) Lack of water
Refill or replace

(2) Fan belt loose
Adjust or replace

(3) Fan belt worn or oil soaked
Replace belt

(4) Water pump inoperative
Replace water pump

(5) Thermostat sticking closed
Replace thermostat

(6) Cooling system clogged
Clean and reverse flush

(7) Incorrect ignition or valve timing
Retime engine

(8) Improper grade and viscosity oil being used
Change to correct oil

(9) Fuel mixture too lean
Overhaul or adjust carburetor

(10) Valve improperly adjusted
Adjust valves

(11) Exhaust system partly restricted
Clean or replace

Over cooling

Thermostat holding open
Replace thermostat

Hard Staring

Slow cranking

(1) Heavy engine oil
Change to lighter oil

(2) Partially discharged battery
Change battery

(3) Faulty or under capacity battery
Replace battery

(4) Poor battery connections
Clean and tighten or replace connections

(5) Faulty starter switch
Replace switch

(6) Faulty starting motor or starting switch
Repair or Replace

Ignition troubles

(1) Distributor points burned or corroded
Clean or replace points

(2) Points improperly adjusted
Readjust points correctly

(3) Spark plugs improperly gapped
Set plug gap correctly
0.7 ~ 0.8 mm (0.0275 ~ 0.0315 in.)

(4) Spark plug codes loose and correded in distributor cap
Clean code and cap terminals

(5) Loose connections in primary circuit
Tighten all connections in primary circuit

(6) Series resistance in condenser circuit
Clean all connections in condenser circuit

(7) Low capacity condenser
Install proper condenser

Engine condition

(1) Valves burned
Grind valves or change

(2) Valves holding open
Adjust valves

(3) Leaking manifold gasket
Tighten manifold bolts or replace gasket

(4) Loose carburetor mounting
Tighten carburetor mounting bolts

(4) Faulty pistons, rings or cylinder
See "Lack of power"

Carburetion

(1) Choke not working properly
Adjust or repair choke mechanism

(2) Throttle not set properly
Set throttle

(3) Carburetor dirty and passages restricted
Overhaul carburetor

Spitting and Detonation

Ignition troubles

(1) Loose wiring connections
Tighten all code connections

(2) Faulty wiring
Replace faulty wiring

(3) Faulty spark plugs
Clean or replace and adjust plug gap

REMOVING & REFITTING

Experience has shown that it is much easier to remove the engine and transmission as a single unit than to detach the engine by itself.

To remove the engine and transmission upwards, proceed as follows;

Completely drain the cooling system and the transmission, disconnect and remove the battery and its supporting tray.

Remove the upper and lower radiator hoses by undoing the retaining clips.

Disconnect the capacitor lead at the distributor, also the high tension and switch wires at the coil.

Take off the dynamo lead and disconnect the starter motor cable at the motor end.

Remove the oil gauge and water, temperature gauge leads from their terminals on the engine.

The throttle and choke controls must be disconnected from the carburetor. Disconnect the fuel pipe from the fuel pump.

Next, remove the exhaust pipe from the manifold.

From below the vehicle, remove the gear change selector rod from the lever on the transmission casing.

Disconnect the earth strap from the starter motor. Remove the hand brake control rod supporting from transmission.

Disconnect the speed-meter cable from the transmission. Uncouple the propeller shaft pinion franges at rear axle and draw the shaft out of the transmission.

To allow the engine and transmission to be drawn forward, the radiator must be removed by undoing the four securing bolts.

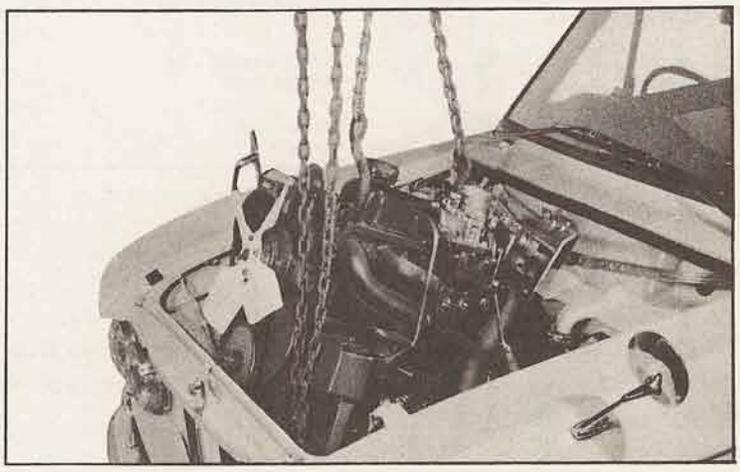

Fig. 1

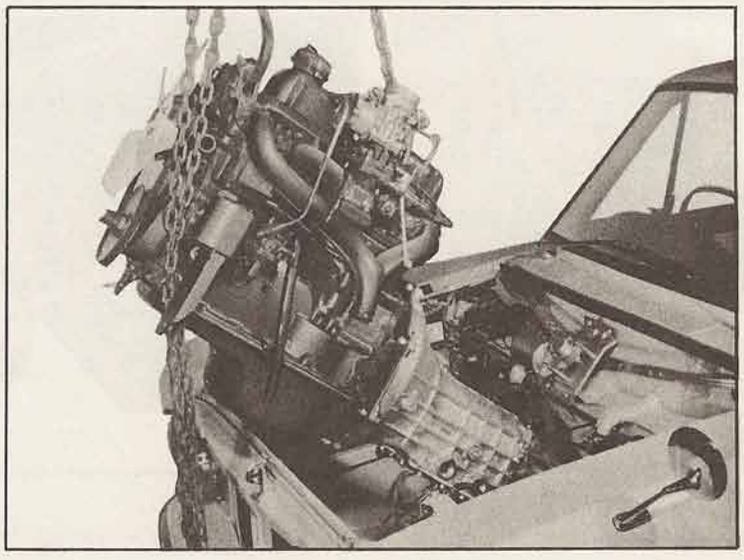

Fig. 2

OPERATION WITH THE ENGINE REMOVED

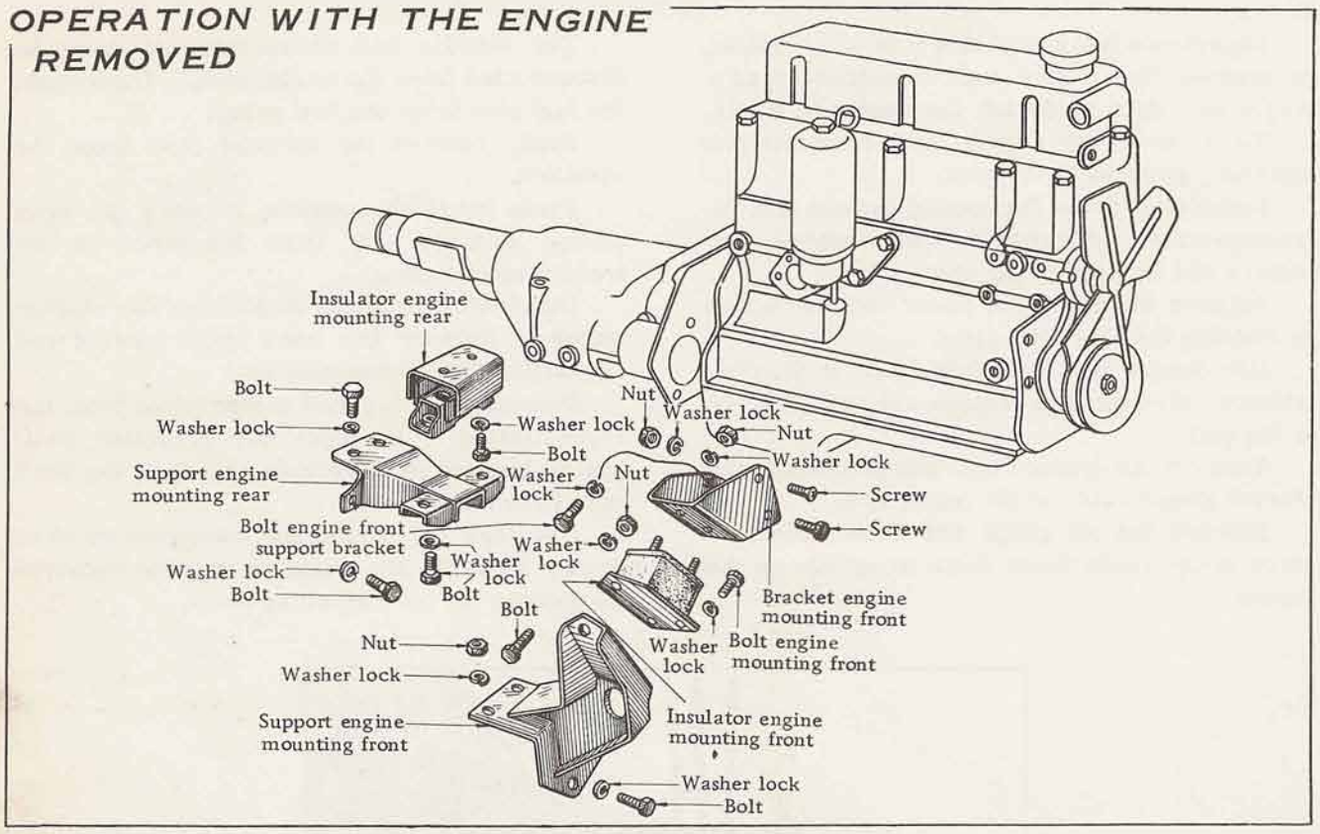

Fig. 3 Engine Mounting

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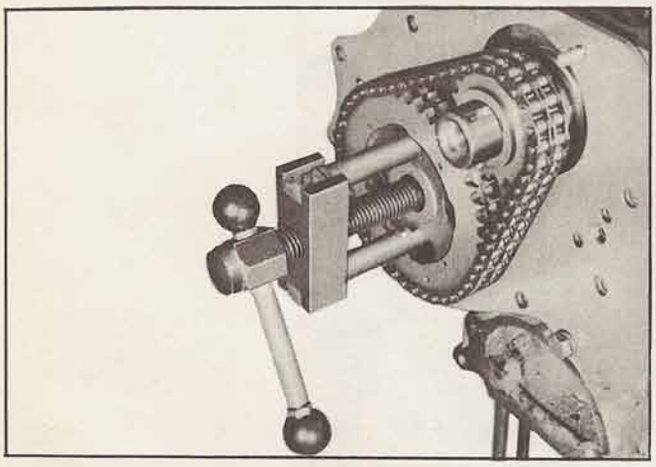

Fig. 4 Removing Crank Gear, Cam Gear and Chain

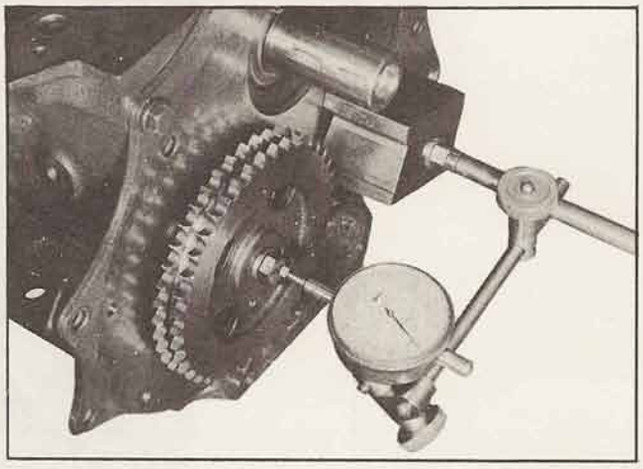

Fig. 5 Checking Thrust Clearance

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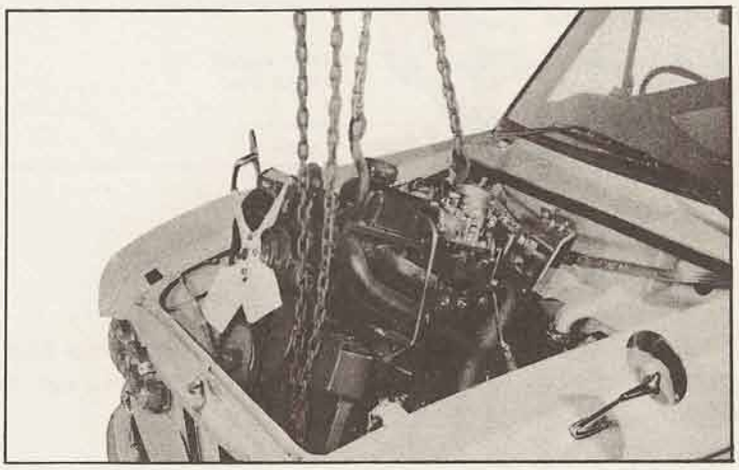
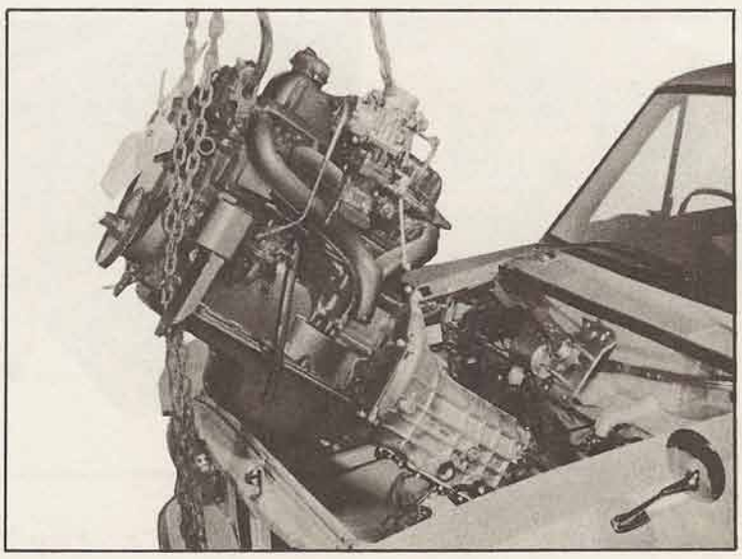


Fig. 1



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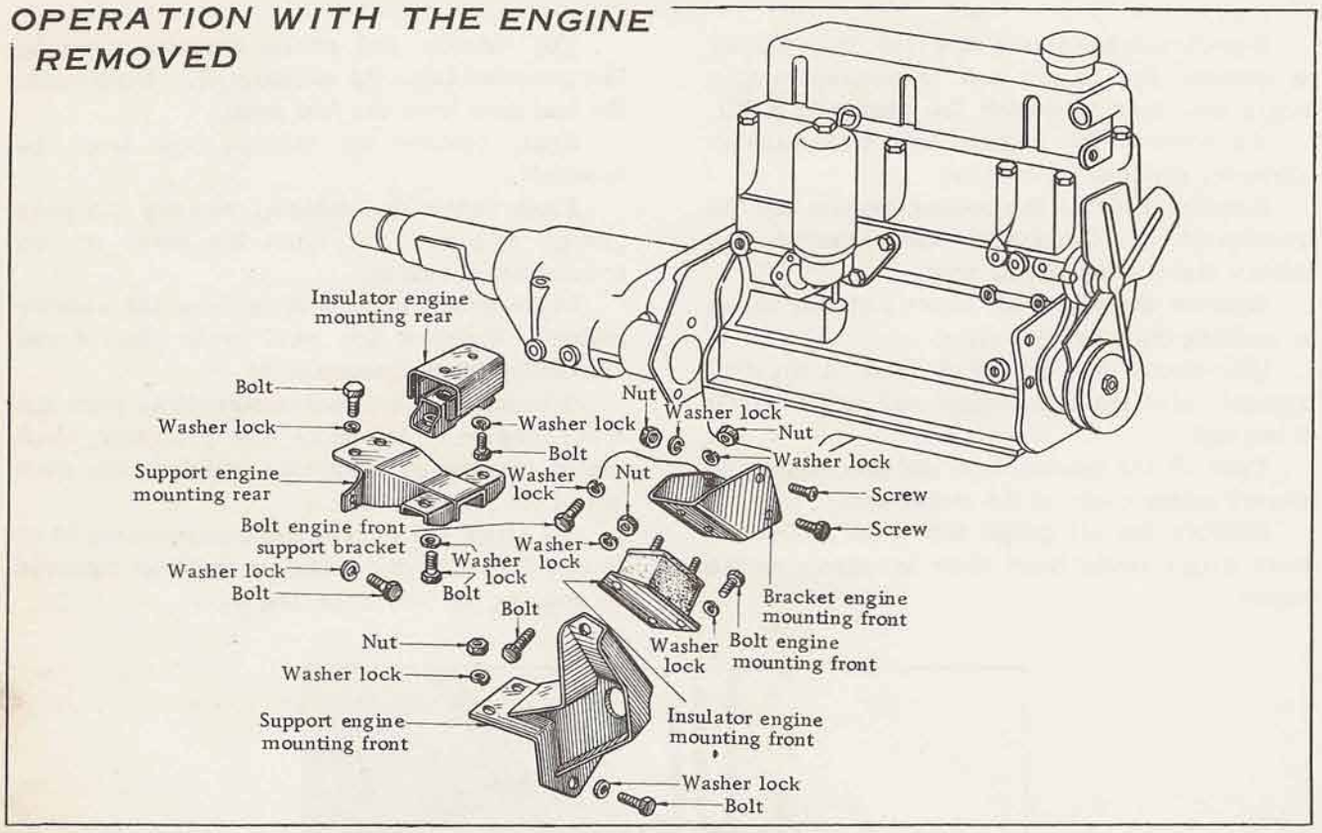

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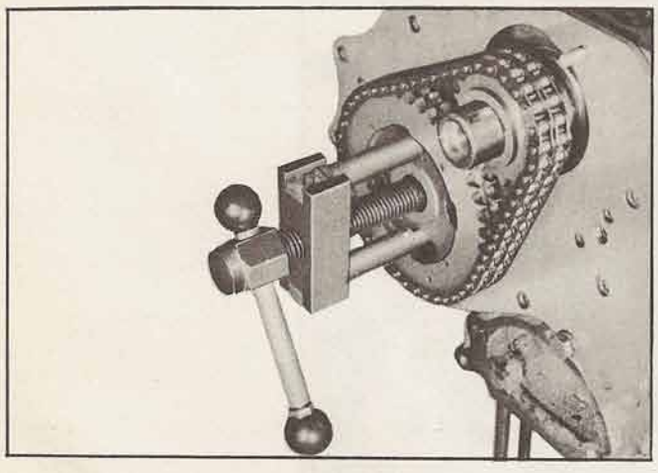


Fig. 4 Removing Crank Gear, Cam Gear and Chain

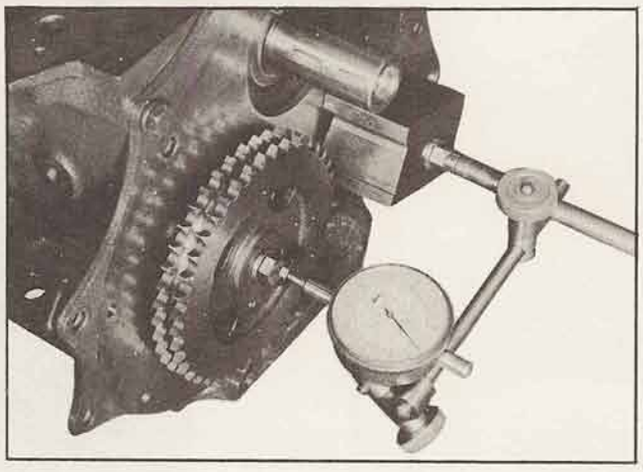


Fig. 5 Checking Thrust Clearance

Withdrawing Camshaft

The camshaft is positioned by a locating plate held by three screws and shakeproof washers. Note the position of the small lubricating oil hole in the locating plate when replacing should be to the right of the engine.

End play of 0.003-0.007 in. (0.076-0.178 mm)is controlled by the thickness of the locating plate, and can be checked with a dial indicator set against the camshaft gear.

Before withdrawing the camshaft the distributor and its driving spindle push rods, and tappet, will have to be removed. Remove the oil pump and its drive shaft, and take off the timing cover and gears. The engine front mounting plate is now accessible and may be removed by withdrawing the setscrew and locking plates. The dynamo swinging link must be removed.

Take out the setscrews securing the camshaft locating plate, when the camshaft can be withdrawn from the cylinder block.

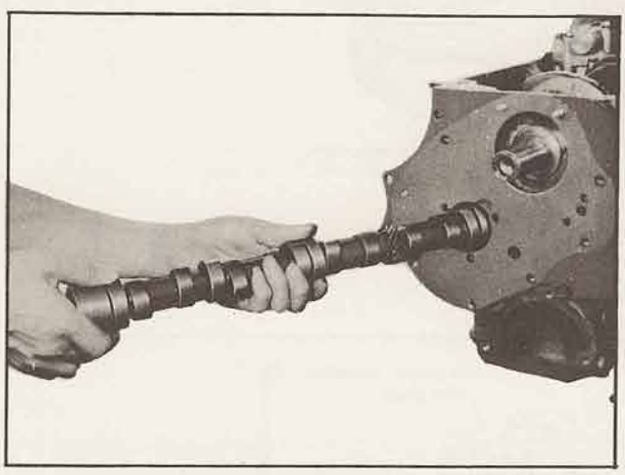


Fig. 6 Pulling out Camshaft

Camshaft Bearings

White metal bearings, with steel lining are used for the camshaft. They can be taken out renewed when necessary, it being usual to do this when the cylinder block is being reconditioned.

The bearings can be removed by drifting them out of their housings.

When fitting new bearings care must be taken to line up the oil holes with the corresponding holes in the cylinder block.

Tap the new bearings into position and ream them to give a running clearance of 0.001-0.002 in. (0.025-0.015 mm).

Refitting the Camshaft

This is a reversal of the introductions for removal. Care should be taken however, to align and engage the drive pin in the rear end of the camshaft with the slot in the oil pump drive shaft.

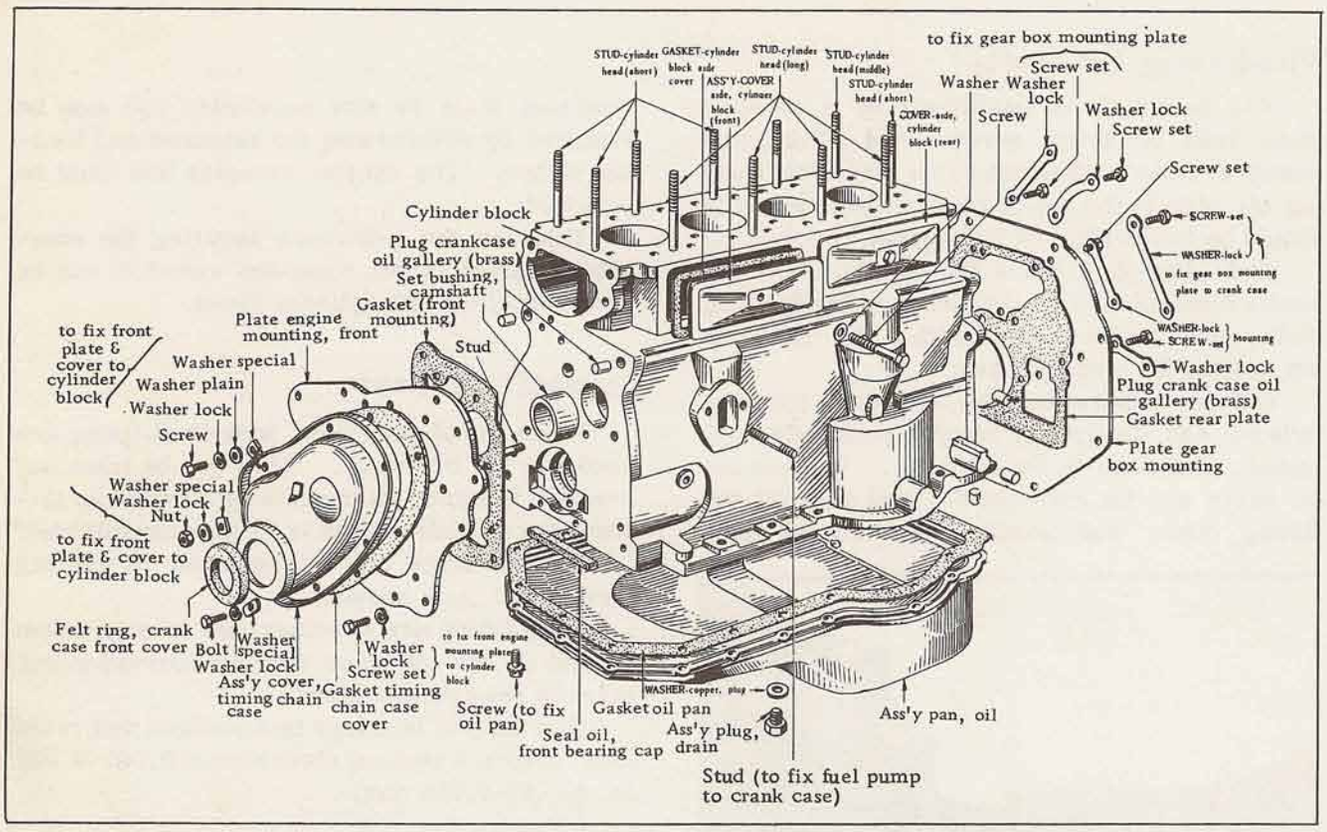


Fig. 7 Cylinder Block (A)

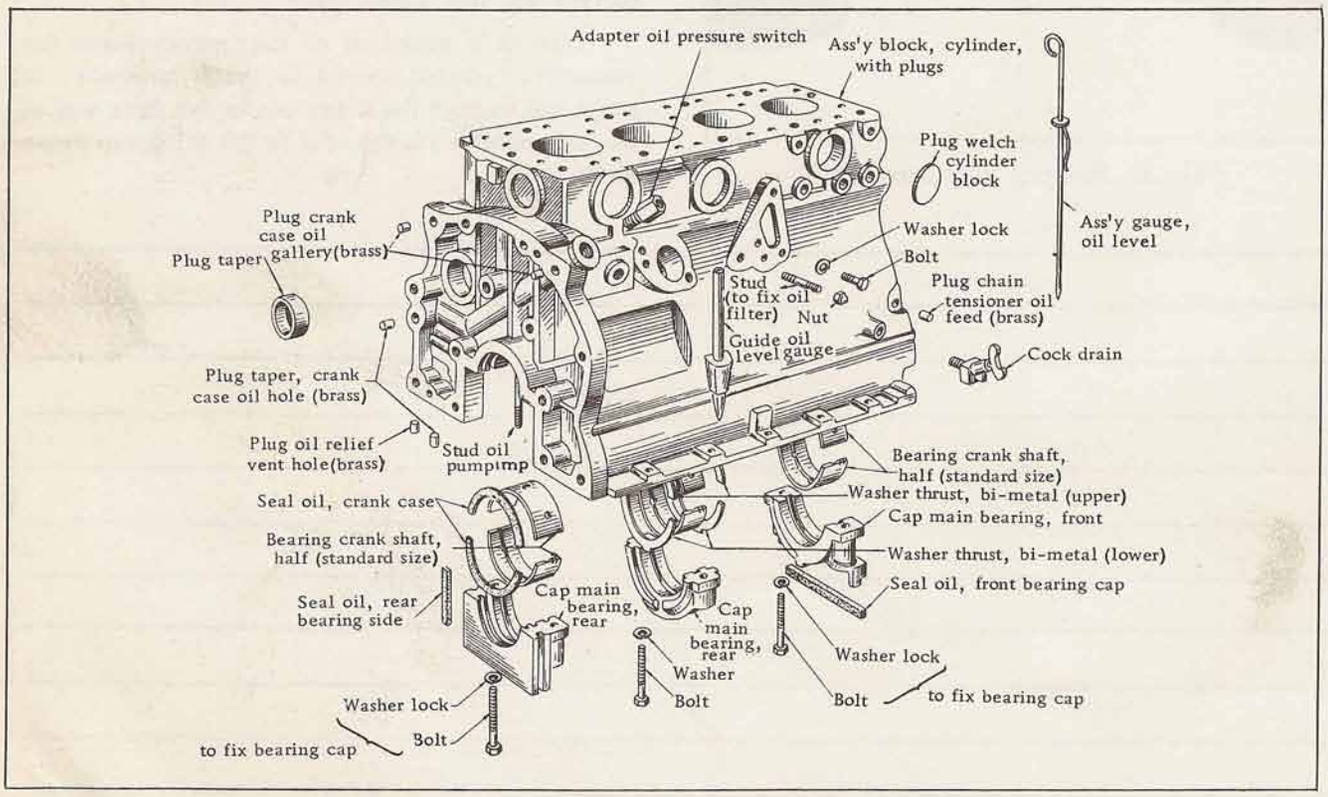


Fig. 8 Cylinder Block (B)

Main Bearing Caps

Remove the flywheel and clutch.

Take off the timing chain, the sump and strainer, and the engine rear mounting plate. Unlock and remove the bolts securing the main bearing caps to the cylinder block, also the two bolts securing the front cap to the engine front bearer plate.

Note that a thrust washer is fitted on each side of the centre main bearing to take the crankshaft end thrust. These thrust washers each consist of two semicircular valves, one half having a lug, which is located in a recess in the detachable half of the bearing, the other being plain.

When fitting new bearings no scraping is required as they are machined to give the correct running clearance of 0.0005-0.002 in. (0.0127-0.0508 mm).

Ensure that the locating tangs are properly engaged in their recesses.

Handle the new bearings carefully so as not to damage the fine surface finish.

Remove all traces of dirt and oil from the housings and throughly dry them with a non-fluffy rag. Make sure that the oilways are clear. When fitting the bearing caps ensure that they are replaced the right-way round. Each cap is punch marked, and the marks should race the camshaft side of the engine.

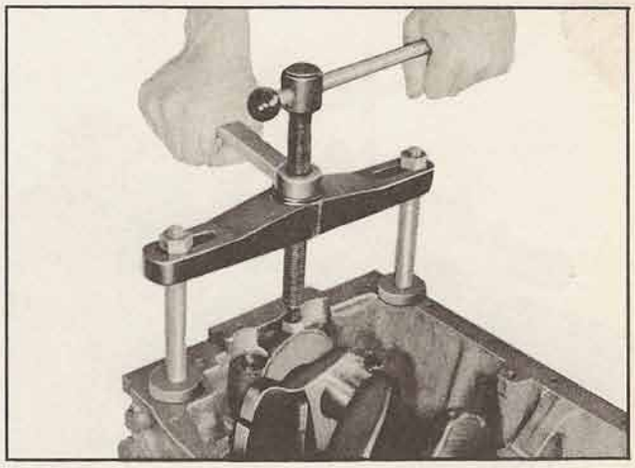


Fig. 10 Removing Main Bearing Cap

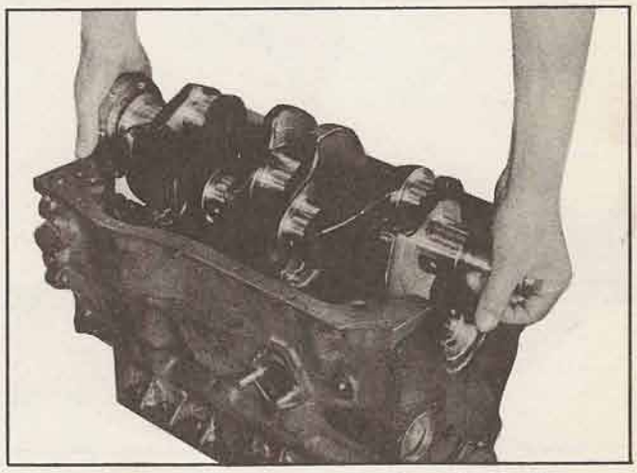


Fig. 11 Removing Crankshaft

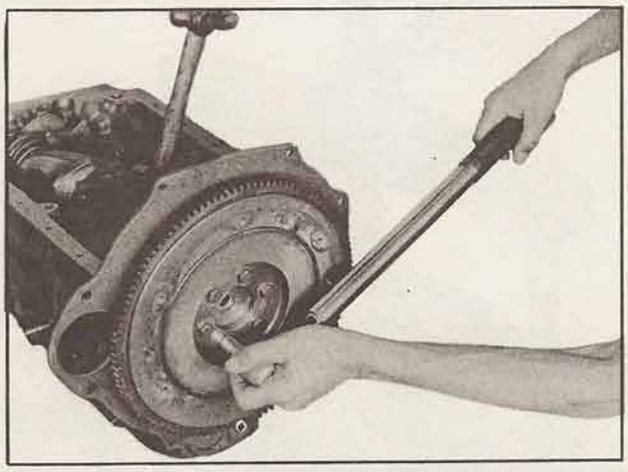


Fig. 9 Removing Fly Wheel

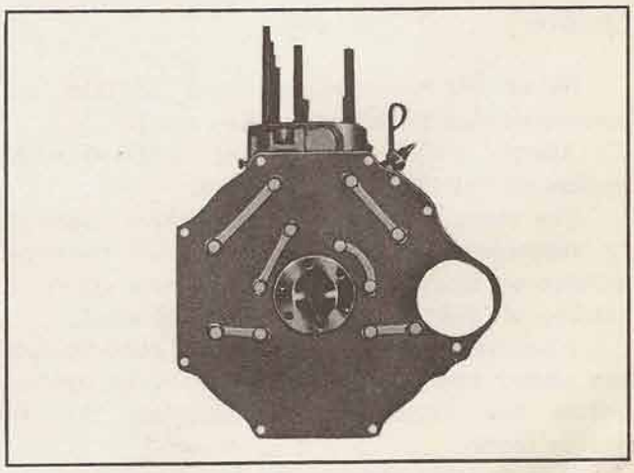


Fig. 12 Engine (Rear Side)

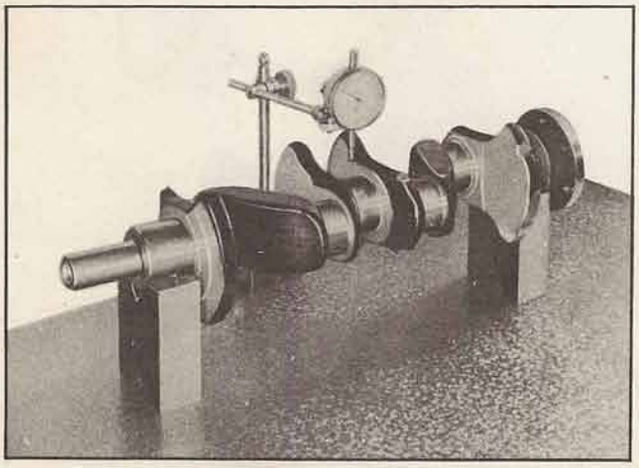


Fig. 13 Measuring Bend of Crankshaft

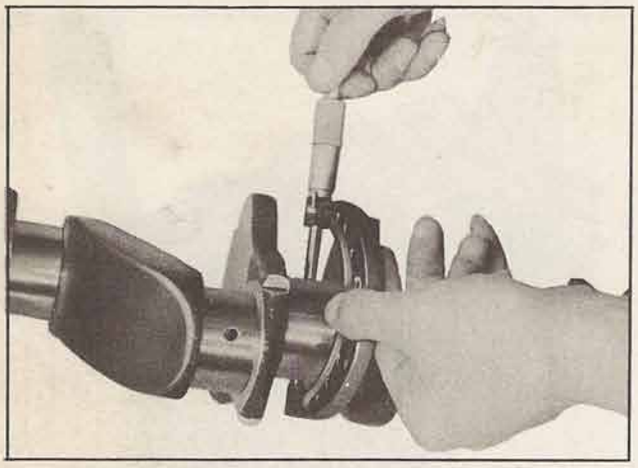


Fig. 14 Measuring Crankshaft Pin and Journal

Caution

Never file the bearing caps to take up excessive play as this will cause ovality.

Always cover the bearing surfaces with engine oil when they are replaced.

The main bearing caps are held in position by setscrews and lock washers. Pull the setscrews up tight with a torque wrench set to a loading of 75-80 lb./ft. (10.36-11.05 kgm).

When refitting the main bearing caps tighten the center one first, after each cap is tighten rotate the crankshaft to ascertain that it volves freely.

If it is tight remove the last cap tightened, and examine the bearing and its seating for foreign matter.

Check the crankshaft end play by means of a dial gauge. This should be 0.002 in. (0.051 mm).

If a bearing has "run", it is essential to clean out all oilways in the crankshaft and block. Wash out the engine sump and the strainer.

The oil pump should be dismantled and cleaned. Ensure that no particles of bearing, metal are left within the engine lubrication system.

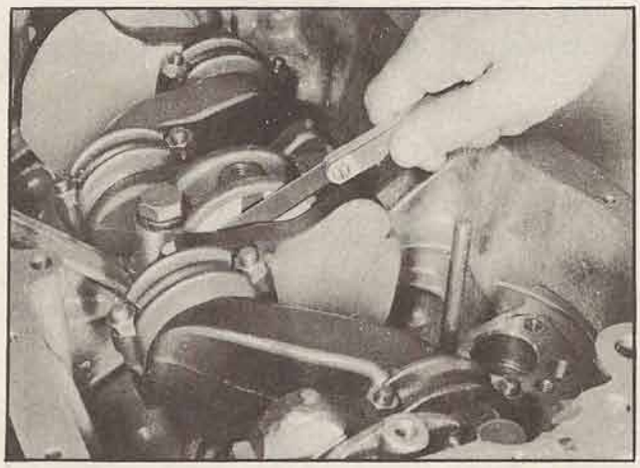


Fig. 15 Measuring End Play of Crankshaft

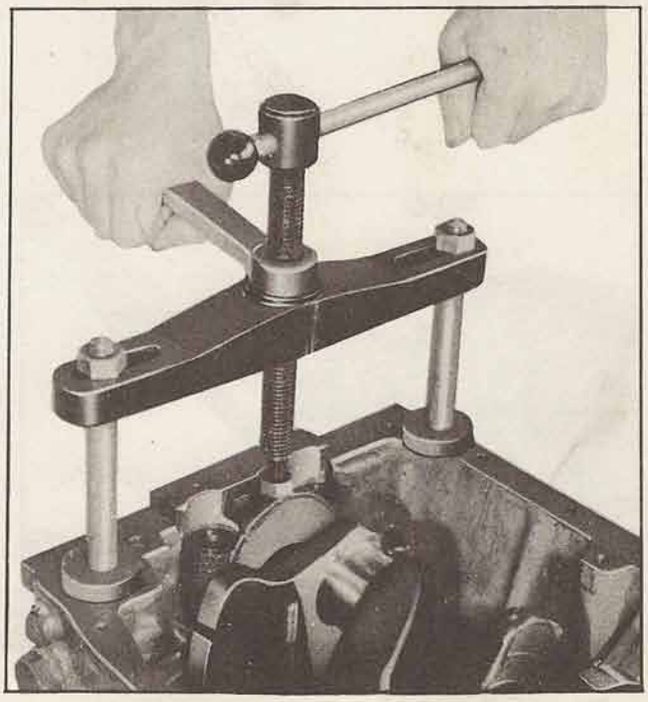


Fig. 16 Removing Crankshaft

IGNITION TIMING

DISTRIBUTOR

Type	Hitachi D411-53
Ignition timing standard	8° before top dead center at 600 r.p.m.
Apparatus of automatic advance	Governor type
Advance starting vacuum pressure	100 ~ 120 mm-Hg
Advance angle by vacuum pressure of 340 mm-Hg	12° ~ 18° (Crankshaft) 6° ~ 9° (Distributor)
Number of revolution at the start of advance angle	450 r.p.m.
Max. advance angle at crankshaft	11° ~ 15° at 2400 r.p.m.
Rotating direction of cam	Counterclockwise
Firing order	1-3-4-2
Point gap	0.45-0.55 mm (0.018-0.022 in.)
Dowel angle	50°-55°
Contact arm spring pressure	0.5-0.65 kg
Condenser capacity	0.20-0.24 mfd.

Inside the distributor is a braker point as shown in Fig. 1. This braker makes and brakes contact several thousand times in one minute. Each time this braker brakes contact, a spark is generated in one of the spark plugs. Therefore, the maintenance of this braker must not be treated lightly. Also, because the time during which the ignition coil current flows varies with the gap between these braker points, see that this gap is maintained at the standard value, which is 0.45 mm. (0.018 to 0.022 in.)

The braker points must be kept free of grease and oil. If the points should become burnt or blackened, they are cleaned with a fine honing stone or croucus cloth after which they should be wiped clean with a piece of cloth which has been dampened with gasoline.

If the points are badly burnt, they must be replaced. Braker points must always be replaced as sets.

Adjusting the Breaker Points

To adjust the breaker points, turn the engine crankshaft with the crank handle until the breaker is fully open. Then loosen the breaker point fixing screw. Next, by turning the adjusting screw, move the plate until a feeler gauge of 0.45 to 0.55 mm (0.018 to 0.22 ins.) thickness slides easily between the breaker points. Then tighten the fixing screw securely.

Finally, check the gap once more; then reinstall the rotor. The interior and exterior of the cap is wiped clean with a soft, dry piece of cloth, extra attention being paid to the areas between the terminals. Clean the center electrode on the inside of the cap also.

Whether or not the vacuum type timing advancer is functioning properly, can be determined by the inspection pointer located at the diaphragm if, as the engine is being run, this pointer moves when the engine speed is suddenly changed, the advancer is satisfactory.

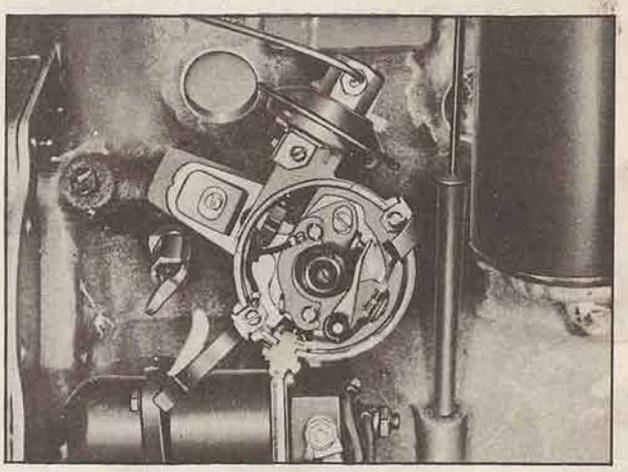


Fig. 1 Adjusting the Point Gap

ADJUSTING THE IGNITION TIMING

The ignition timing is adjusted to 10 degrees before top dead center with the engine stopped as shown in Fig. 2. With this adjustment, the automatic timing advancer of the distributor advances the ignition timing even further at the time the engine starts to rotate, and the timing is maintained constantly at valves suitable for the rotational speed.

With the engine stopped, adjust so that the distributor breaker point just breaks when the piston of the No. 1 cylinder is in its 10 degrees before top dead center position for compression. If a timing lamp is used, the standard ignition timing is 15 degress before top dead center at idling (600 rpm.) speed.

In the case of marks which are not evenly spaced, pointers indicate 10 deg., 15 deg. and 20 deg., positions before top dead center. Adjustment is made by the following procedure.

1. First adjust the distributor to the correct gap as described previously.

2. Turn the crankshaft gradually until the top dead center mark (Fig. 2) on the pulley perifery coincides with the mark for 10 deg. before top dead center on the timing gear cover as the crankshaft approaches its positions somewhat before that corresponding to the end of the compression stroke of the No. 1 piston. Stop the crankshaft in this position. The compression stroke of the No. 1 piston can be determined if the spark plug of the No. 1 cylinder is removed, the hole plugged with a finger, and the crankshaft turned. With the crankshaft in the previously-mentioned position, the No. 1 piston is in its position of 10 deg. before top dead center of compression.

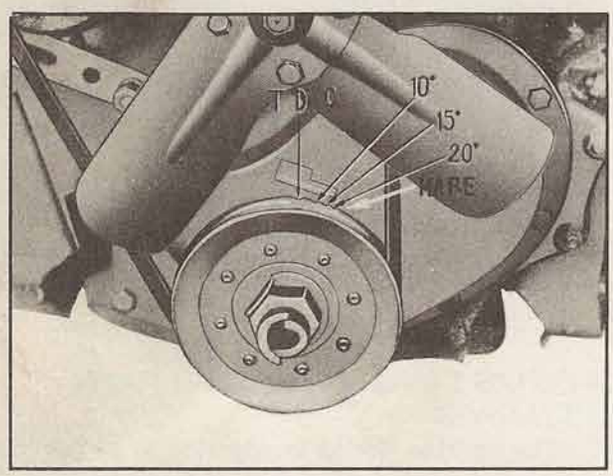


Fig. 2 Checking the Ignition Timing

3. Next, inserting the driving shaft of the distributor at an angle to the engine, engage the gear on its lower and with the gear on the camshaft. During this assembly place the slot of the distributor drive of the upper end of the shaft somewhat to the left as shown in Fig. 4. At this time, the smaller of the semicircle is placed toward the front.

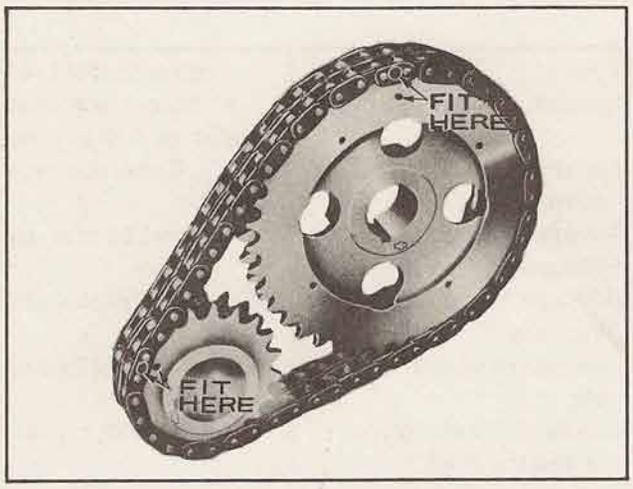


Fig. 3 Setting of Timing Gear Mark

4. Adjusting the direction of the rotor so that it engages the drive shaft slot, mount the distributor to the engine. During this assembly the directions of the distributor and rotor must be as shown in Fig. 4. At the same time, the breaker must be in its position when it is just begining to open. If these conditions do not coincide, they are made to do so by slightly turning the distributor body only.
   To determine the position when the breaker point is just begining to open, turn on the ignition key; hold the end of the No. 1 spark cord about 1/4 inch away from the cylinder head; and turn the body until spark jumps across the gap.

The off-set slot position of the drive shaft when the No. 1 piston is in its compression top dead center position is shown here.

5. Next put the distributor cap on and clamp it securely with the clip.

6. To the No. 1 spark plug connect the cord from the terminal to which the arm of the rotor is pointing. Thereafter connect the terminal cords to their spark plugs in the counter-clockwise order so as to obtain 1-3-4-2 firing order.

7. Upon completion of the wiring, cover the distributor with a rubber cap. The engine should now start properly.

Ordinarily, the pointer of the octane selector is set at its zero reading during the ignition timing adjustment. If the octane number of the fuel being used is low and the engine knocks, the pointer is adjusted to the right (R) to the optimum advance angle.
Conversely, if the octane number is high the pointer is adjusted to the left (A). One unit of calibration of the selector corresponds to 2 deg. of the distributor angle and to 4 deg. of the crankshaft angle.

When a timing lamp is used, the standard setting is 15 dge. before top dead center with the engine idling (600-620). In any case, the optimum adjustment is that in which a slight knocking is heard when, with the car running at low speed in "HIGH" (TOP) gear, acceleration is applied suddenly.

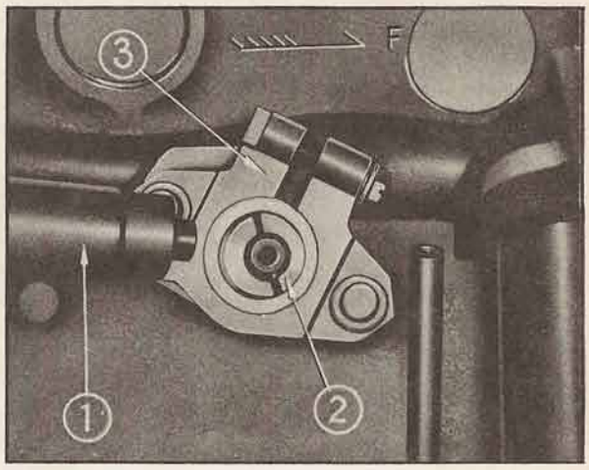
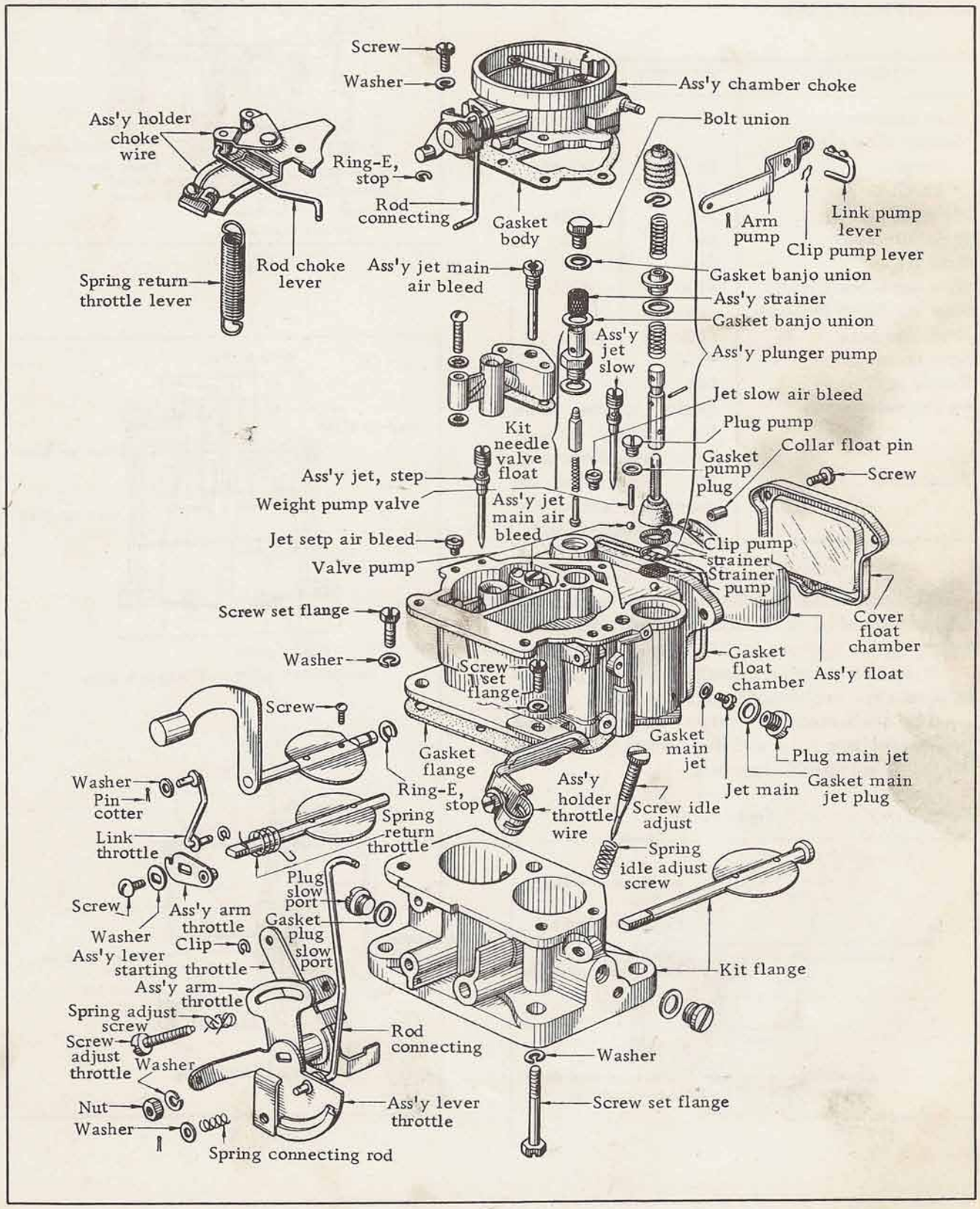


Fig. 4 Assembly Angle of Drive Shaft

① Distributor shaft
② Distributor drive shaft
③ Distributor fixing plate

FUEL SYSTEM

CARBURETOR



SPECIFICATIONS

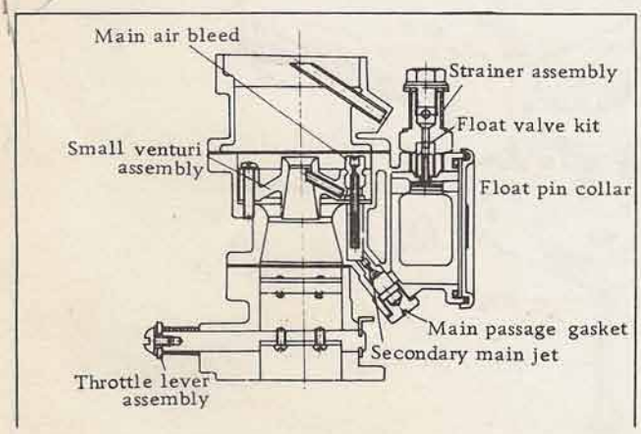
D2630A-5A	Primary	Secondary
Bore diameter	26 mm	30 mm
Venturi diameter:		
large	20 mm	27 mm
small	8	8
Main jet	#92	#140
Main air bleed	#60	#60
Slow jet	#48	#48
Slow air bleed (first)	#100	#120
Slow air bleed (second)	#240	
Emulsion hole	#60 x 12	#60 x 20
Slow economizer	#145	
Power jet	#40	
Power valve	Begins to open when the primary throttle valve is at 48° opening.	
Float level	21.5 mm below the upper surface of the float chamber body.	

The carburetor has the function of automizing the fuel, mixing it in suitable ratio to air and supplying the mixture to the engine.

It is therefore an important part which can influence the performance of the engine.

The carburetor is a highly efficient one of two barrel two step and down draft type having the following special features.

Construction and Operation



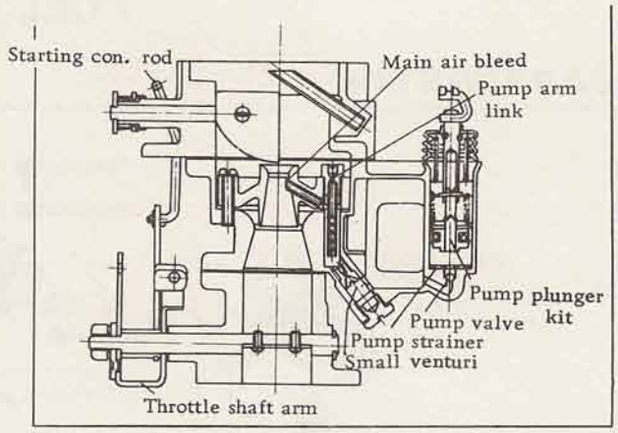


Fig. 1

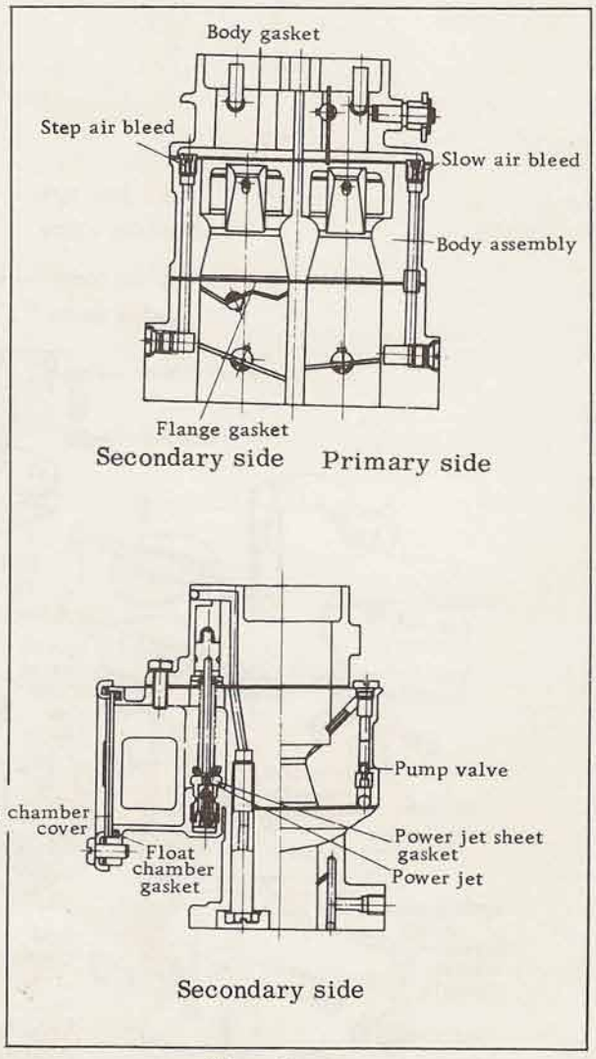


Fig. 2

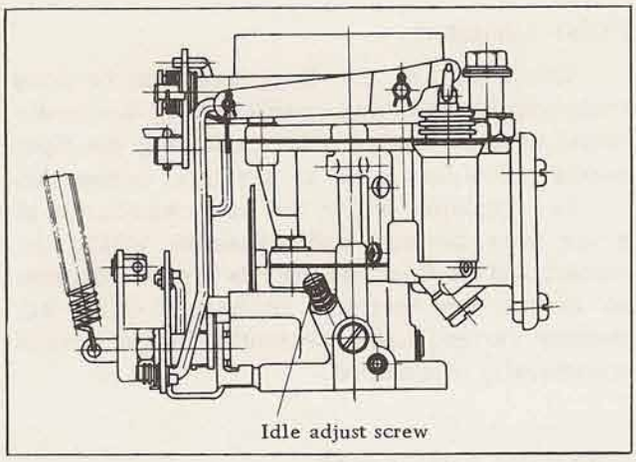


Fig. 3

Main Carburetting System

The fuel flowing out of the passage at the bottom of the float chamber passes through the primary main jet and then mixed with the air coming from the main air bleed to be minute drops and inject into the venturi through the main nozzle.

When the throttle valve is widely open and the engine requires dense mixture gas, the acceleting pump opens its power valve, from where the fuel also flows into the main system.

The power valve beings to operate when the throttle valve opens 48° from full closed position.

Slow Speed System

Passing through the main jet, the fuel passage separate from main line and flows through the slow jet, slow air bleed first, slow economizer, slow air bleed second and inject from the by-pass holes and idle holes.

Accelerating System

Mechanical accelerating pump synchronized with the throttle valve is adapted. When throttle valve is open, the piston rod is pushed up with the linkage, which pushed up the piston through the dumper spring. When the piston is coming down, the inlet check valve closes the out-let check valve opens and the fuel within the pump is blown out from the pump jet by the compressed dumper spring and hits against the side wall of the small venturi to be minute drops, compensating trancient sparseness of the fuel. A jetting amount of the fuel can be varied with the two holes provided on the pump arm, that is, the inserting positions of the Connecting rod.

Starting System

The choke valve is provided with the spring and installed eccentrically on the normal carburetting device and synchronized with the throttle valve. When the choke is fully closed, the throttle valve opens about 14° from a full close. This is the best condition to start operation. The synchronization of the choke valve and the throttle valve can be exactly maintained often the engine has started firing.

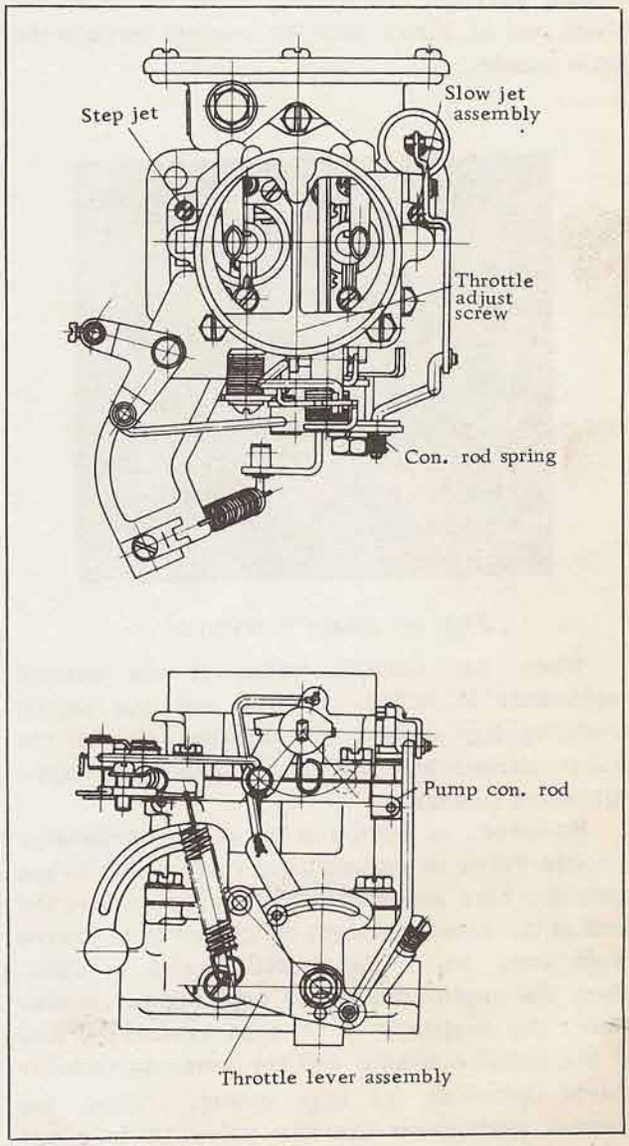


Fig. 4

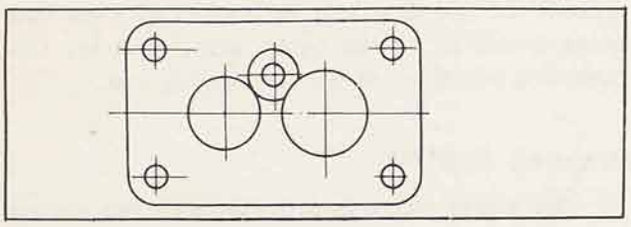


Fig. 5

Main Carburetting System

Same as the normal carburetting function the fuel flowing out of the passage at the bottom of the float chamber passes through the secondary main jet and become minute drops mixing with the air coming from the main air bleed and is blown into the venturi through the main nozzle.

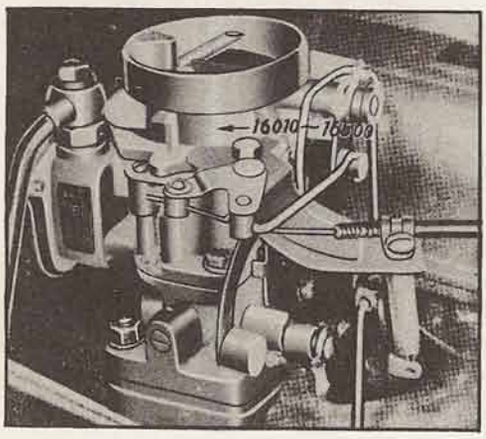


Fig. 6 Nikki Carburetor

When the throttle valve of the normal carburetor is widely opened and the engine produces high power, the throttle valve of the power carburetor begins to open by the synchronized linkage.

However, at the top of the power carburetor throttle valve is an auxiliary valve which is not open at a slow speed with a heavy load due to the load of the counter weight connected to the valve shaft even when the throttle valve is open. When the engine change to still higher revolutions, the auxiliary valve open against the loat of the counter weight and the power carburetor starts operation for high power. When the normal carburetor throttle valve is in a full open, the power carburetor throttle valve is also to be in a full open.

Float Chamber

Adjustment of the float level can be done from outside by adding or subtracting the needle valve carrier gasket after removing the float needle valve installed at the inlet connector.

As ventilation within the float chamber is of a air vent method and pressure within the venturi and the float chamber is always constant no matter how suctional registance of the air cleaner varies, fuel consumption can be always econmically maintained.

Adjusting Fuel Level

1. Take off the cover of float chamber.
2. Raise the float slowly until its hanger lip contact with the valve retainer.
3. At this stage, the float upper surface must be level and parallel with the chamber top.
4. Adjusting the float level is done by adding or subtracting the gasket of float valve seat (needle valve carrier).
5. Addition or subtraction of 2 numbers gasket make the float level up or down about 1 mm. (one gasket is thickness (0.5 mm))

Adjustment of Fuel Level

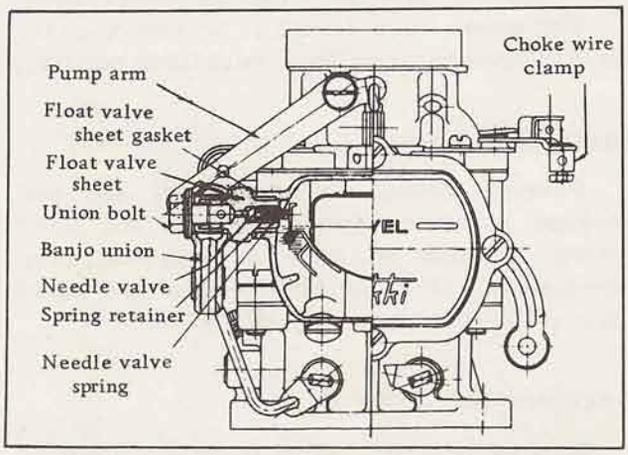
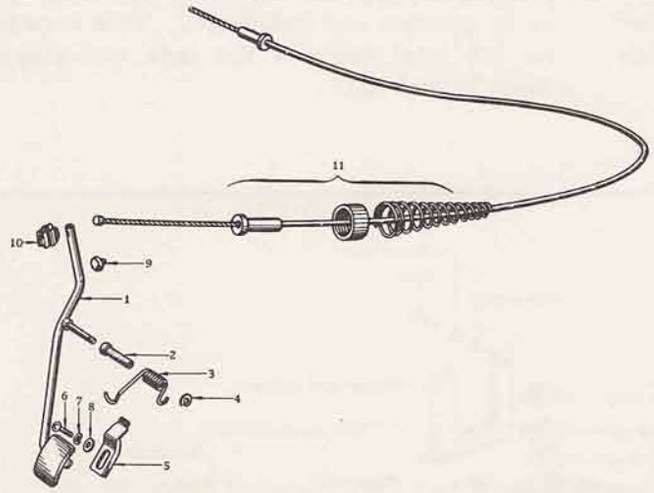


Fig. 7 Float Chamber

The float chamber is provided, cover of which is made of glass of facilitate for inspecting inside condition through the marked "LEVEL" line of cover of it.

Float level is shown on the float chamber cover with the line 21.5 mm below the body top to which fuel is to be adjusted.

Adjustment of the float level can be done from outside by adding or subtracting the needle



1.	Ass'y-pedal, accelerator
2.	Bearing-accelerator pedal
3.	Spring-return, accelerator
4.	Ring-snap, "E" type
5.	Plate-stopper, accelerator pedal
6.	Screw-machine
7.	Washer-lock
8.	Washer-lock
9.	Bumper-accelerator, pedal arm
10.	Spring-clamp, accelerator wire
11.	Ass'y-wire, accelerator

Fig. 9

valve carrier gasket after removing the float needle valve installed at the inlet connector end.

Increase or decrease of shim makes the fuel level up or down about 0.039 in. (1 mm).

When fuel level is wrong density of the mixture gas will become improper and the engine will get in disorder.

Adjustment of Accelerator

The accelerator must be so adjusted by the adjusting plate at the carburetor side that the throttle valve may be full open with full pedal on and of slight gap with pedal off. After adjusting this, tighten up surely the nuts of the adjusting plate.

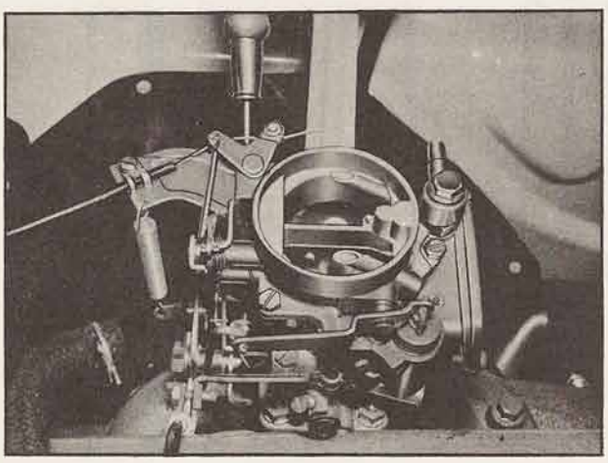


Fig. 8

Dimensions of (D) is adjusted to 86.5 mm by rod and adjusting plate.

The nut must tighten surly after fixing the dimension of (D).

THE GASOLINE TANK

The fuel tank has a capacity of 41.0 litres and is situated at the rear of the luggage compartment.

The fuel pump, operated off the camshaft draws fuel from the tank and forces it into the carburetor float chamber. A large and efficient air cleaner fillers the air supply to the carburetor.

Draining the Fuel

The fuel tank is drained by turning the wrench operated drain cock.

Fuel Tank Gauge Unit

Situated on the top face of the tank is the gauge unit. To remove, withdraw the set screws which secure the unit to the tank not forgetting to disconnect the electrical lead beforehand.

Care must be taken not to strain or bend the float lever as this may seriously effect subsequent gauge readings. Remember this also applies when refitting the unit.

Examine the joint washer to ensure that it is in position and undamage. This is essential as the joint between the tank and gauge unit must be fuel tight.

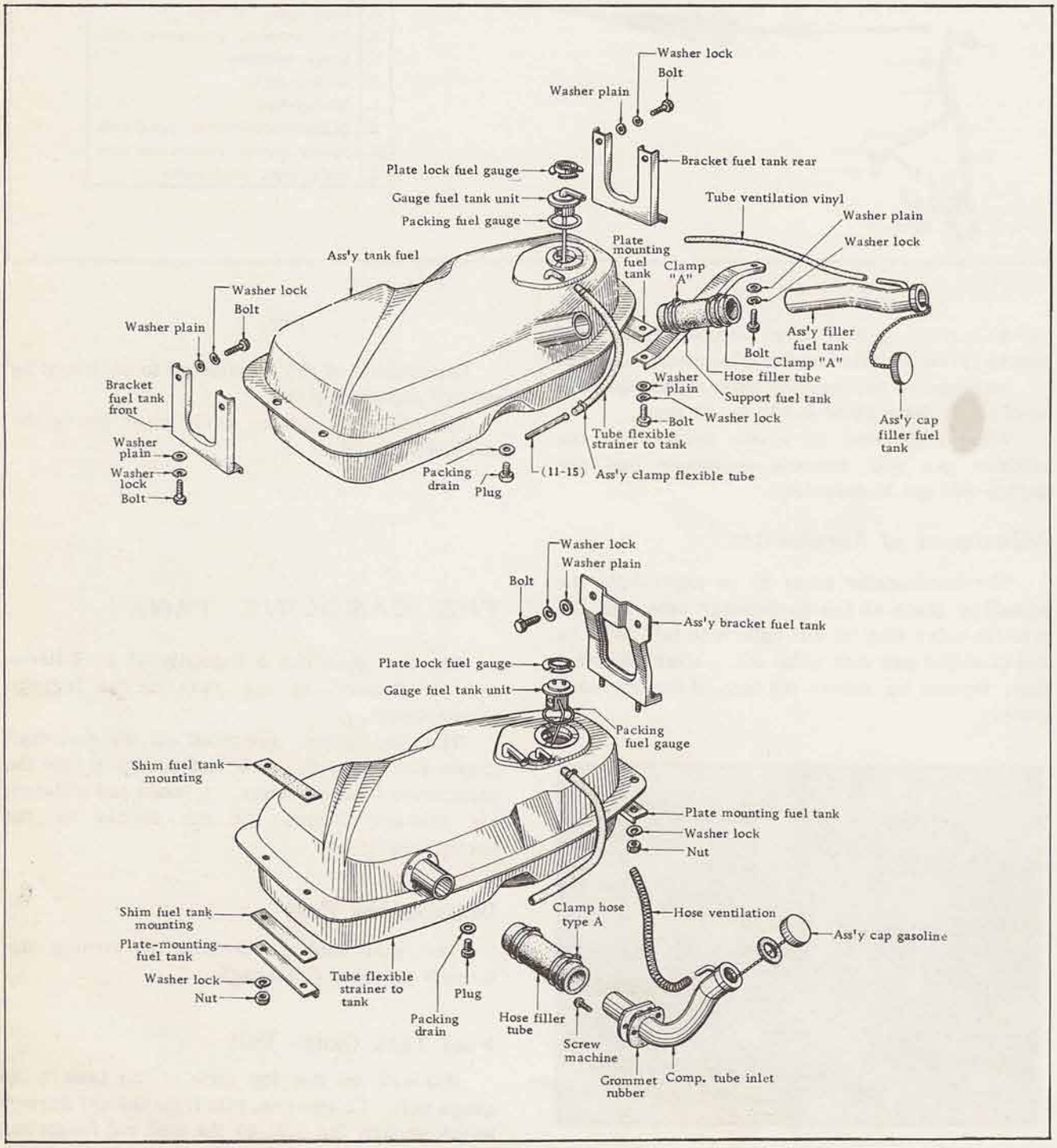


Fig. 1 Fuel Tank Mounting

Troubles and Repairs of Gasoline Tank

(A) When Fuel Leaks from Gasoline Tank

When a crack, distortion or damage is found in the tank, repair or replace it.

To make repairs, put marks with chalk at the leaking points and, even after the fuel in the tank has been drained out, blow with compressed air through the tank to force out stagnant gasoline vapor completely. Repairs should be done only when the tank is completely dry.

Leakage is ordinarily mended by soldering. When welding is necessary, the above precaution must be strictly observed. Otherwise, there will be danger of exposion.

(B) When Gasoline Fails to Reach Gasoline Strainer

If the fuel fails to reach the gasoline strainer when there is some fuel left in the gasoline tank and the operation of fuel pump is known to be satisfactory, check the following points.

(When it is difficult to confirm the delivery of fuel at the strainer, loosen the connector at the fuel intake of the carburetor.)

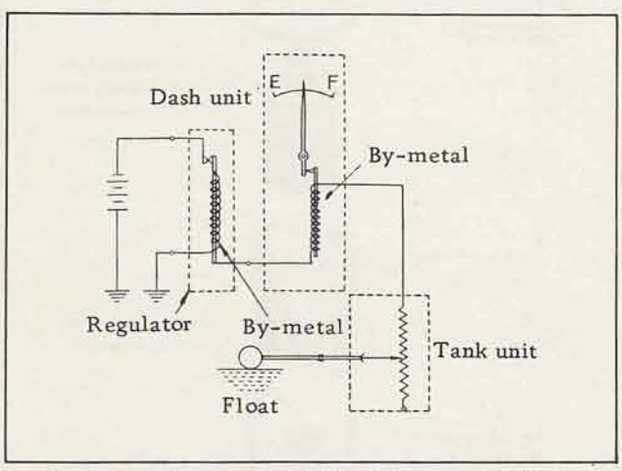


Fig. 2 Diagram of Fuel Gauge Unit

(1) Check to see if gasoline pipe is clogged with dust and dirt. This can be easily checked by disconnecting the connector of the pipe and blowing with compressed air toward the direction of the tank. Then from the tank end blow the pipe again and clean the pipe. In many cases the tip of gasoline intake pipe of tank unit is clogged with dust and water. Therefore, together with cleaning of the pipe, the interior of the tank should be cleaned by removing the drain plug at the bottom of the tank.

Check to see if the gasoline pipe of the tank unit is so bent as to fail to reach the fuel surface.

The standard position of the bottom end of pipe is about 3/4 in. apart from the bottom in order to prevent its sucking up sediments on the tank bottom.

If not normal, remove tank unit and adjust the bend of the pipe.

Check to see if the vent hole of the filler cap is clogged with dust and dirt, not supplying air to the tank.

According to the degree of vacuum within the tank, fuel cannot be drawn up even by the operation of fuel pump.

So be sure to clean the air vent of the cap.

If you should lose the cap and substitute a wooden plug for it, a measure which in sometimes witnessed, the condition inside of the tank becomes the same as though it were sealed up. Always use only the standard cap.

Operation and Repairs of Fuel Gauge

As shown in Fig. 3, the fuel gauge consists of the dash unit and tank unit.

The dash unit, which is installed on the instrument panel, has two coils that cross each other at right angles, whose magnetic forces control the movement of a keeper (iron piece) with a hand (indicator).

On the tank unit, a contact arm slides over a resistance in response to the float level.

As shown in Fig. 3 if the ignition switch is turned on when the tank is empty, electric current will flow from the battery through the by-metal unit.

As the float is raised and the contact arm moves, tank unit increases resistance in the circuit and thus the current which traveled through coil by-metal then flows, this time, both contact arm and by-metal, and finally to the ground.

That is, this is a gauge of electric resistance control type; E signifies Empty level and F, Full level.

Troubles with Fuel Gauge and their Remedies

When something is wrong with the readings of the fuel gauge, first disconnect the wiring at the unit and, turning on the ignition switch, ground and unground the terminal end of the said wiring to the body of the car.

If the indicator of the dash unit swings actively between E and F, the wiring between the dash unit and the said terminal end is in good condition, with the defect existing either in tank unit itslef or in poor ground of this unit.

In the test mentioned in the preceeding section, if the indicator does not swing but it moves (moves to E) when the dash unit end of the wiring from the tank unit is grounded, the wiring between the dash unit and tank unit is defective.

Therefore rewiring or repairing is required.

If, when indicator fials to swing but sparking is observed when the wiring connecting the battery with the terminal on the dash unit is disconnected at the dash unit end and grounded, it proves the wiring is satisfactory, and the trouble is in the dash unit itself.

If sparking does not occur, the wiring, which is thus indicated to be out of order, should be repaired or replaced.

In correct readings of the indicator probably menas that the height of the float of the tank unit is in error.

In this case, adjust the height of the float by bending the rod.

Troubles with the unit are difficult to repair so it should be replaced by a new unit.

In checking the tank unit, be sure to insert a fuel gauge in the circuit between the battery and the unit.

FUEL STRAINER

Instruction for Disassembly

To remove the bowl from the body, loosen the strainer nut and remove the wire to a side. Take off the bolt, nut and washer from the wire and remove bowl, gasket and screen.

The strainer body in made of aluminum alloy. Take good care not to break threads of each connection.

Pay attention not to tighten the strainer nut so excessively that the gasket and bowl are broken.

When installing the strainer assembly, the strainer bracket should be cleaned sufficiently. Dust and dirt on the bracket surface prevent plug from keeping air-tight.

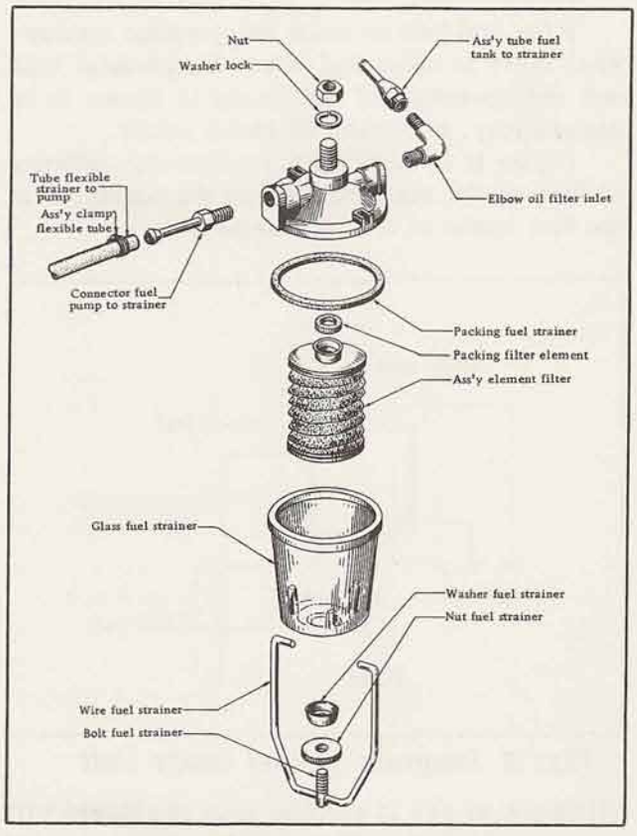


Fig. 3 Fuel Strainer Assembly

FUEL PUMP

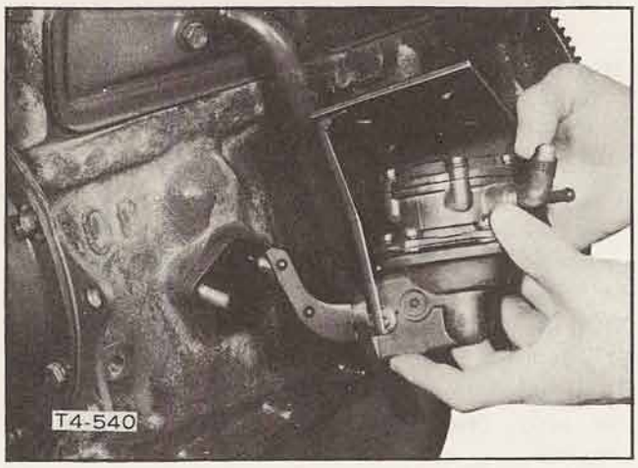


Fig. 4

FUEL PUMP

Type	Diaphragm pump
Method driven	Driven by camshaft
Diaphragm spring	
Free length	36.5~0.1 mm
Length in use and tension	18 mm-1.6~0.1 kg
Rocker arm spring	
Free length	30 mm
Valve spring	
Free length	9.5 mm
Thickness of valve	1.6 mm
Performance	
Max. quantity discharged	1300 cu.cm per minute at 1000 r.p.m. of cam, 500 mm in suction height
Max. pressure discharged	110-130 mm in mercury column
Max. degree of suction vacuum	More than 400 mm in mercury column
Hand primer quantity discharged	80 cu.cm (at 20 strokes)

The fuel pump, which is of the diaphragm type, is mechanically driven by the eccentric part of the camshaft of the engine.

It draws gasoline from the tank and delivers it under pressure to the carburetor.

Even when the engine is not running, fuel can be delivered under pressure by moving the hand primer up and down.

By the rotation of camshaft, rocker arm is pushed and pull rod of diaphragm is pulled down.

At the same time, diaphragm goes down against diaphragm spring and then is pushed up again by its spring.

By the movements of the diaphragm and functioning of the valves at the inlet and outlet of the pump chamber, gasoline is drawn up from the tank to the carburetor.

If the float chamber of the carburetor contains enough gasoline and the needle valve is closed, gasoline is not allowed into the carburetor.

Thus gasoline is stored in the pump chamber and due to its pressure, the diaphragm is kept down and cannot return.

Under this condition, the rocker arm works in vain, as the rod remains low.

The rocker arm spring serves to prevent noise, keeping the rocker arm pushed against the eccentric of the camshaft.

Disassembling & Inspection

Checking with fuel pump installed on engine:

Switch off and stop the engine. Disconnect the fuel pipe at the inlet union of the carburetor, and then turn the engine with the crank handle.

Now the gasoline should be ejected vigorously from the tip of the pipe once very two rotations of the crankshaft.

To test the function of the pump alone, operation of the hand primer and checking the fuel ejection is enough.

Removal from engine:

Fuel pump can be easily removed by disconnecting the inlet and outlet unions and loosening the 2 attachment nuts.

Inspection prior to disassembling:

Prior to disassembling of the removed pump, measure the distance between the rocker arm and flange of the lower body by means of a scale and see if the rocker arm, rocker link and pins are worn.

Method of disassembling:

First wipe dirt off the outer surface of the pump and put marks on both the upper and lower bodies, to make their reassembling easy.

It is easily separated into two when the five screws around the upper body are loosened.

Take great care not to damage the diaphragm during this disassembly.

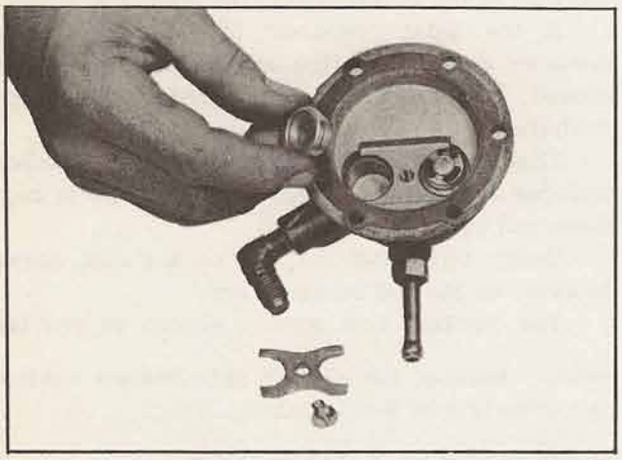


Fig. 5

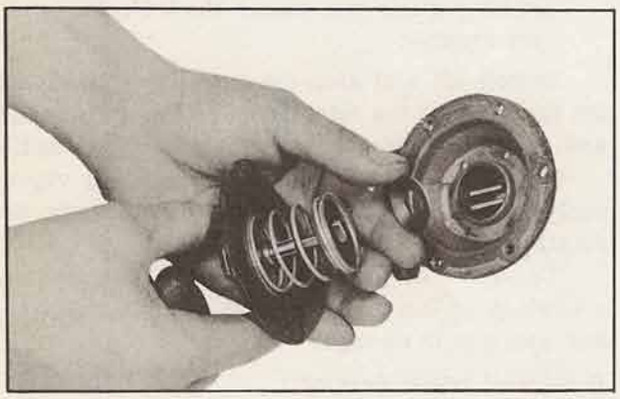


Fig. 6

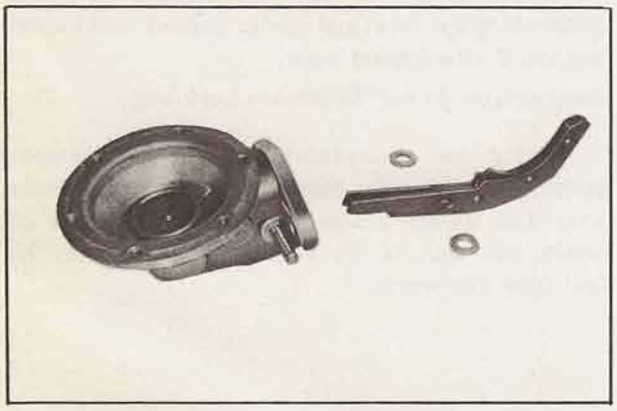


Fig. 7

Checking & Repaires of Parts

Wash the disassembled parts well in gasoline then inspect them.

Replace the diaphragm if any damage, impregnation by gasoline.

Replace a valve assembly if any wear or faulty operation is detected.

Even if repairs are unavoidably required, the limit for repairs of warp or wear of the valve is 0.001 in.

When the surface of the valve seat or valve is found irregular, remove the valve seat of the outlet and dress the surface with a fine oilstone.

In case of irregularity of the seat surface of the inlet valve, which cannot be taken off from the body, recondition it with a cutter and grinding tool.

When the surface of the valve is faulty, place some very fine grinding compound on the surface of a flat piece of glass plate and grind it lightly with the tip of a finger. The standard thickness of the valve is 1.6 mm.

The hole of the joint parts of diaphragm shaft and link may be worn to some extent. This is not serious, but when serious eccentric wear, crack, or breakage is found, the part must be replaced.

As a remedial measure, such wear can be compensated for at the time of dismantling and reassembling of the body, by inserting a packing made of thick paper between the lower body and diaphragm to raise the relative position of diaphragm shaft with respect to the lower body.

The rocker arm should be replace when its contact face with the cam and that with the link and its pin hole are seriously worn.

When its re-employment by reconditioning is unavidable, add material to the rocker arm and link by welding and finish them with a file, but this cannot last long and is no more than a temporary measure.

Renew the arm pin when it is found worn excessively.

The diaphragm spring, arm spring seldom become faulty, but when weakened, replace them always with standard ones.

If the diaphragm spring is to strong, it results in overflow of the float chamber of the carburetor.

The tension of the spring must not be strengthened or weakened arbitrarily by hand.

Check to see if there is any warp on the joint surfaces of the cap and body, and, after disassembling is over, renew the gasket to keep its air-tighteness.

Reassembling & Installing

Employ standard springs for the various uses as stated before.

Install valves precisely for close contact with their respective seats.

In screwing in of upper and lower bodies and diaphragm, fit them together according to the marks which were put before the disassembling and align one screwing hole to its mate, and then screw in at the position where the diaphragm is fully pulled down with the rocker arm pushed towards the side of the body by and pressure.

Do not screw in tight one by one since it causes warping. Instead, clamp all the screws round loosely and uniformly.

Then tighten them diagonally and lastly re-tighten all of them in order to make sure.

As a general rule, gaskets should be replaced by new ones.

Installation on the engine is done in the reverse order to that for disassembly.

Be sure to set the rocker arm so that it is contacting the eccentric of camshaft properly, not the rear side or to one side. Replace the gasket between the cylinder block and pump with a new, standard one.

Checking Function

When repairs of the pump is over, or before it is installed on the engine, make a check to see:

When a vacuum gauge is connected to the pump inlet port and the pump is mounted on a tester, the rocker arm is activated by the eccentric of the camshaft revolving at 1000 rpm. Then the gauge pressure should rise to higher than 400 mm of mercury column, and, even if operation is discontinued, this condition should remain for more than 3 seconds.

When a gauge or tester is not available, test in the following way:

Close the inlet port and outlet port with finger tips. Then, after operating the rocker arm several times, suddenly release the fingers. The pump is in good conditions if, 3 to 5 seconds thence, there can be heard strong inlet and outlet noise respectively.

The pump is mechanically fit for use when, by connecting a hose to the inlet port, it is able to draw up gasoline from a height of more than 0.5 m. After installing the pump, test its functions during operation.

(A) Connect the gasoline pipe on the inlet post side only. Leave that on the outlet port side as it is, and turn the engine 6 to 7 rotations by means of the crank handle and make sure that there is sure outflow of gasoline from the outlet port.

(B) Connect the gasoline pipe to the outlet port side and tighten all the piping joints. Then turn the engine again several times to see if there is any leakage of air or gasoline from each connection.

ADJUSTMENT AND INSPECTION OF ENGINE

The engine must always be operated in the best possible condition, and for this purpose, periodic inspection and adjustment must be maintained in a certain order while in use as well as after overhaul.

Order of Inspection and Adjustment of Engine

(1) Check the cooling water: water level and extent of fillthiness.

(2) Inspect the battery: all connections, level of electrolyte, specific gravity of electrolyte and voltage.

(3) Inspect the oil: amount, filthiness, classification and viscosity.

(4) Cleaning of spark plugs and adjustment of their gaps.

(5) Measurement of compression pressure of cylinder. The standard compression pressure of the engine is approx. 163 lbs. per.sq.in. at 350 r.p.m. Measurement of pressure is made in the following manner: (see Fig. 1) First, warm up the engine (temperature of cooling water, 70-80°C) then remove all spark plugs and pull out the throttle knob all the way (that is in the carburetor, the throttle valve and choke valve are fully opened); press a compression gauge against each spark plug hole, and, running

the starter motor with a fully charged battery, read the maximum pressure obtained within 5-8 rotations of the motor. This measurement must be made as quickly as possible. It the compression pressure of any one cylinder differs by 10 lb./sq.in. or more form that of another, the cause must be

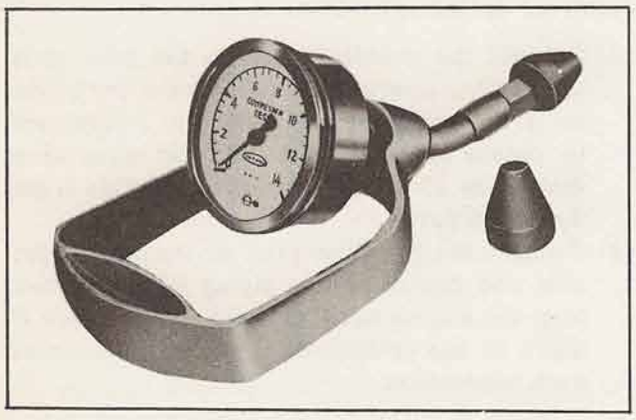


Fig. 1 Compression Gauge

(6) Check and adjust the distributor:
If the breaker contact points have defective contact surfaces, dress them and adjust the gap to 0.45-0.55 mm.
Also turn the cam of the distributor clockwise and check to see if the governor can carry out advancing function.

(7) Adjust ignition timing correctly.
By utilizing a power timing light, the function of the governor can be checked together with the ignition timing (illumination of crank pulley will enable to inspect the conditions of running and advancing of the timing.) (B.T.D.C. 20°)

(8) Inspection of fuel pump and gasoline strainer.

(9) Adjust the slow setting of carburetor.

(10) Checking operation of generator.
Check the generating condition and functioning of the cut-out relay by means of indications of the ammeter.

(11) Adjustment of slack in fan belt.

(12) Adjustment of valve tappet clearance.

(13) Road test.
While driving in 3rd. speed at about 25 km/hr., suddenly step on the accelerator. If only a slight knocking results, the ignition timing is correct. Slow speed adjustment is made so that the speed is about 15 km/hr., when driving in 3rd speed.

Diagnosing of Engine by means of Vacuum Gauge and Combustion Tester

In diagnosing the engine, the condition of each cylinder can be assumed by measuring its compression.

For employment of a vacuum gauge, connect it to the engine intake manifold and refer to Fig. 2.

The use of a master motor tester as shown in Fig. 2 is convenient.

When a combustion tester is used, install a special intake (pick-up) in the exhaust tube, and after the engine has been started, analyze by means of a special gauge, the combustion gas which flows through the connecting hose into the tester, and judge the combustion condition according to the mixture ratio of fuel and air, When measurement is to be made in rainy or cold weather, use an auxiliary condenser between the pick up and the meter, otherwise, the excessive moisture in the exhaust gas will damage the functioning of the meter if permitted to enter it.

Fig. 2 Motor Master Tester Available for 4, 6 and 8 Cylinder Engine

When a tester is to be used, make adjustments according to the following table.

Conditions (Without load)	Suitable Weight Ratio of Mixture
Low Speed Running (600 r.p.m.)	70 ±2%
High Speed Running (2,000 r.p.m.)	$85 \pm \frac{5}{2}$%

Engine Trouble Shooting

Fig. 3 is intended to be of assistance in the systematic analysis and isolation of symptoms of engine troubles so that the defective points may be accurately traced and economically repaired.

(1) Normal Condition
Settles between 18 ~ 20 in.

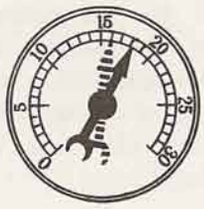
(2) Normal condition
When indicator fluctuates between a range of 0~25 in. as engine is raced, rings and valves are in good conditions.

(3) Even if indicator settles, if reading is low rings or oil are in faulty condition.

(4) When above (3) condition exists, indicator will swing to 0 in. if engine is raced.

(5) When indicator sometimes drops by 4 in., or so, valve sticking exists.

(6) When indicator drops by several inches at certain time, valve are burnt.

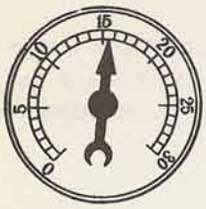


(7) When indicator drops by about 2 in., valve leak. (Faulty seating of valves.)

(8) When indicator oscillates actively between 14 and 18 in., valve stem guide is worn out.

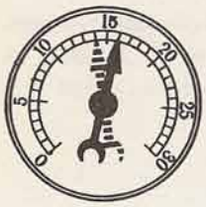
(9) When, with a slight speeding up, indicator moves between 10~22 in., and with increase of speed, the range becomes larger, valve springs are weak.

(10) When indicator remains still between 8 ~ 15 in., it is because either valve timing is retarded or valve clearances are not correct.



(11) When indicator settles between 14 ~ 17 in., ignition timing is retarded.

(14) When indicator oscillates regularly between 5 ~ 19 in., there is leakage at cylinder head gasket. (Faulty clamping of gasket.)



(12) When indicator moves slowly between 14~16 in., it is because either electrode gaps of plugs are too narrow, or breaker point is defective.

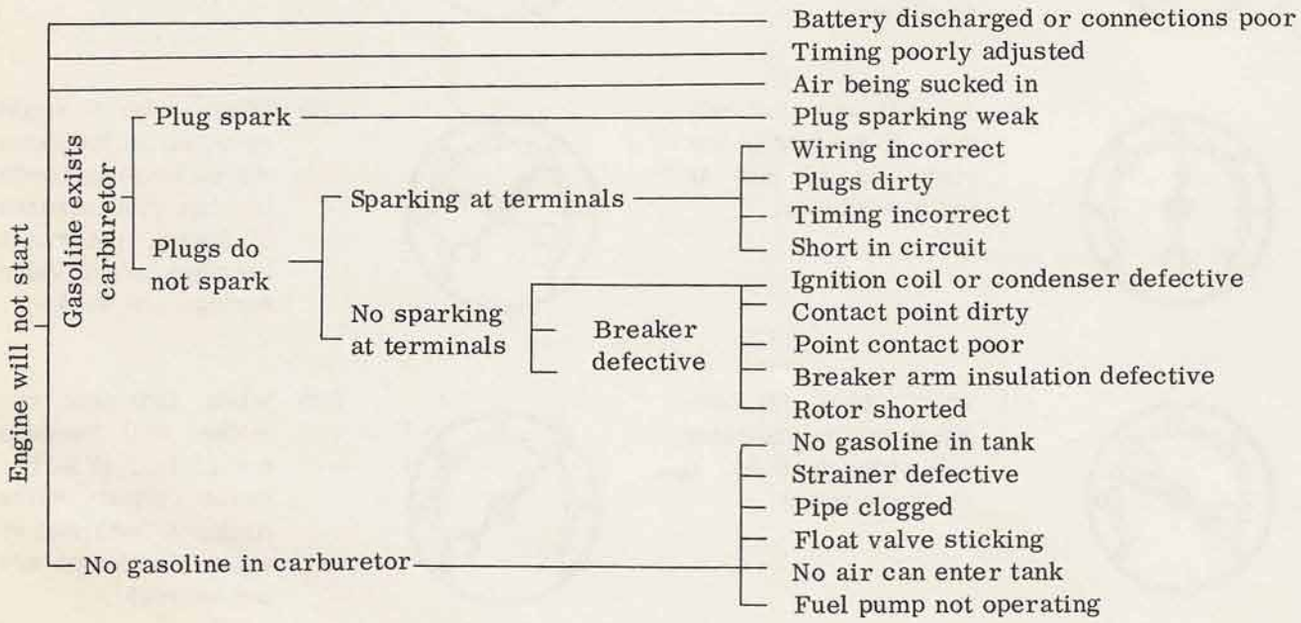
(15) When indicator first rises high, drops down to zero, and then returns to 16 in., muffler is clogged.

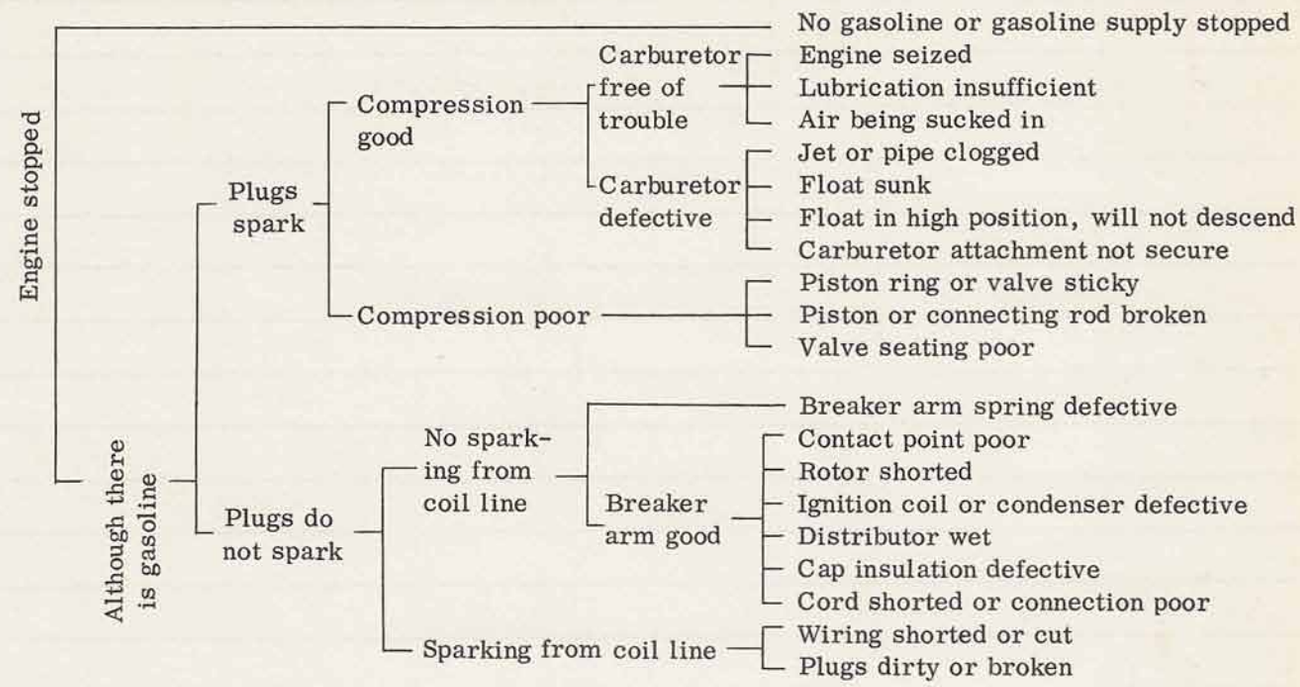
(13) When indicator points to 5 in. or below, there is leakage at intake-manifold or gasket of carburetor. (Faulty clamping of gasket.)

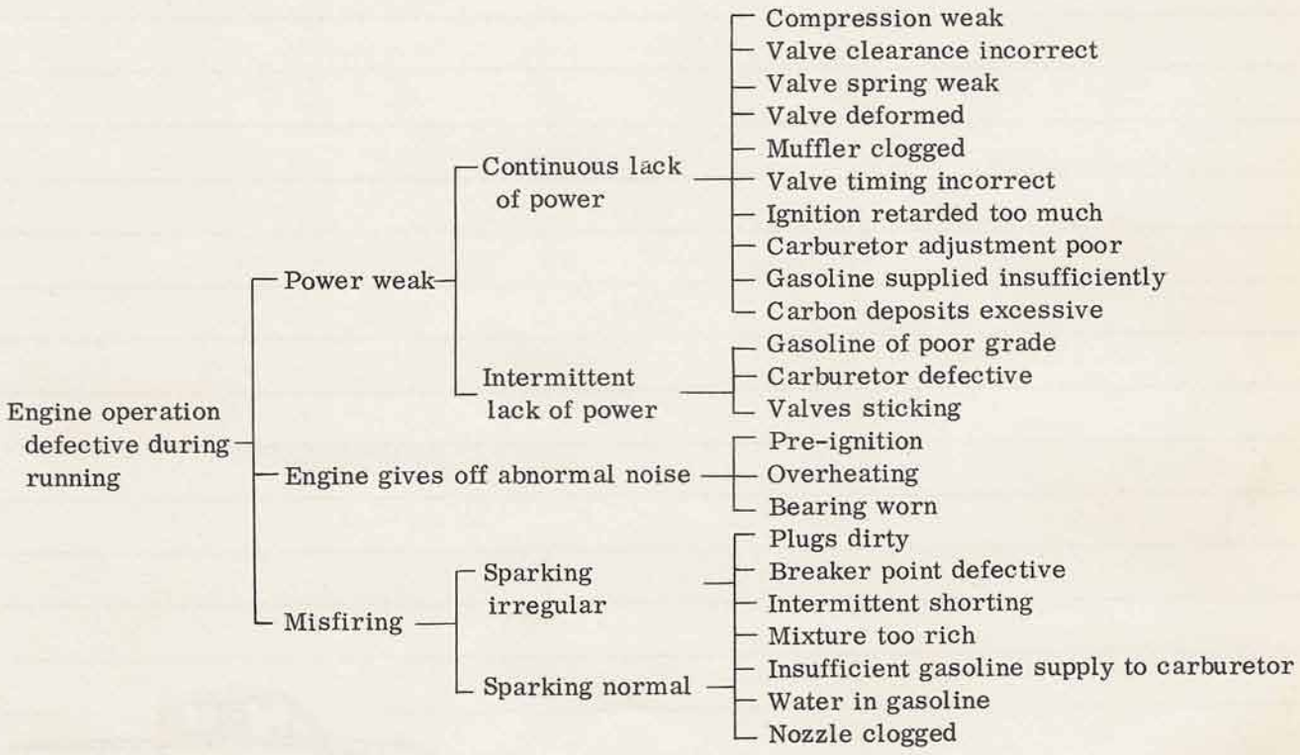
(16) When indicator moves slowly between 13 ~ 17 in., carburetor is poorly adjusted.

Fig. 3 Diagnosing Engine by Means of a Vacuum Gauge

Trouble Shooting Chart




Engine stopped
No gasoline or gasoline supply stopped
Although there is gasoline
Plugs spark
Compression good
Carburetor free of trouble
Engine seized
Lubrication insufficient
Air being sucked in
Carburetor defective
Jet or pipe clogged
Float sunk
Float in high position, will not descend
Carburetor attachment not secure
Compression poor
Piston ring or valve sticky
Piston or connecting rod broken
Valve seating poor
Plugs do not spark
No sparking from coil line
Breaker arm good
Breaker arm spring defective
Contact point poor
Rotor shorted
Ignition coil or condenser defective
Distributor wet
Cap insulation defective
Cord shorted or connection poor
Sparking from coil line
Wiring shorted or cut
Plugs dirty or broken


Engine operation defective during running
Power weak
Continuous lack of power
Compression weak
Valve clearance incorrect
Valve spring weak
Valve deformed
Muffler clogged
Valve timing incorrect
Ignition retarded too much
Carburetor adjustment poor
Gasoline supplied insufficiently
Carbon deposits excessive
Intermittent lack of power
Gasoline of poor grade
Carburetor defective
Valves sticking
Engine gives off abnormal noise
Pre-ignition
Overheating
Bearing worn
Misfiring
Sparking irregular
Plugs dirty
Breaker point defective
Intermittent shorting
Mixture too rich
Sparking normal
Insufficient gasoline supply to carburetor
Water in gasoline
Nozzle clogged