ISUZU

Bellett

INSPECTION AND ADJUSTMENT

ENGINE SERIES

PART 2

INTRODUCTION

ISUZU MOTORS LIMITED

TOKYO, JAPAN

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PART 2 INSPECTION AND ADJUSTMENT

CONTENTS

PART 2 INSPECTION AND ADJUSTMENT

2-1 GASOLINE ENGINE

Automobiles of latest model are equipped with improved high-speed, high-performance engines which necessitates the use of electrical equipment and all other associated parts with highest rate of performances.

The engine adjustment should be made periodically to maintain the engine in the optimum operating condition.

Appropriate trouble-shooting measures should be taken to cope with any types of failure of the engine performance. The engine adjustment may be classified into two categories, namely: the visual inspection and adjustment without use of any measuring instruments, and the detection and correction of operating failures with the aid of gages and other instruments. Either work should be carried out in the manner outlined below.

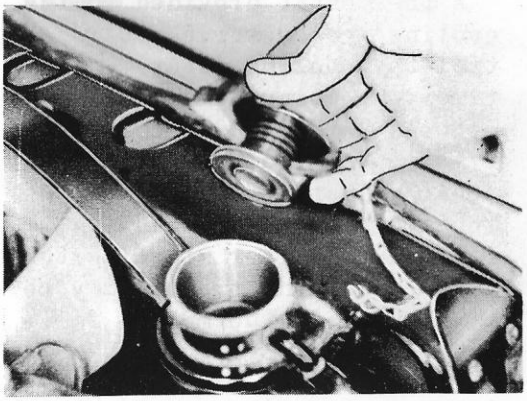

Fig. 2-1

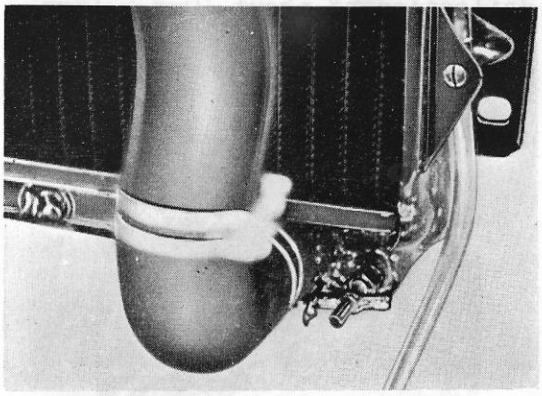

Fig. 2-2

2-1-1 Cooling System

(1) Cooling Water

The water filler cap on the radiator neck should be removed for checking the water level, and clean water (preferably city water) may be added if necessary. For removing the filler cap while the radiator is hot, the cap should be covered with a rag and carefully turned loose to release the internal pressure. The entire cooling water should be replaced at every service intervals of 18,000 km. For replacing the cooling water, the coolant should be well drained by releasing the drain cock on

the lower part of the radiator and that on the lower front part of the engine block. The Isuzu genuine anti-freeze is recommended for use in the cooling system during winter season.

(2) Thermostat

A thermostat provided in the cooling system serves to control the cooling water to optimum operating temperatures between 70°C - 80°C (158°F - 176°F). If the water in the cooling system fails to reach the above-mentioned range a few minutes after starting the automobile, the trouble may be attributed to thermostat failure.

2-1-2 Tension of the Fan Belt

If the fan belt is properly adjusted, it should give a lateral deflection of about 10mm - 15mm at its longest section. For adjusting the fan belt tension, the set bolts on the generator mount bracket should be slackened and then the generator partly pivotted. The fan belt tension should be carefully adjusted as improperly tensioned belt leads to the engine trouble.

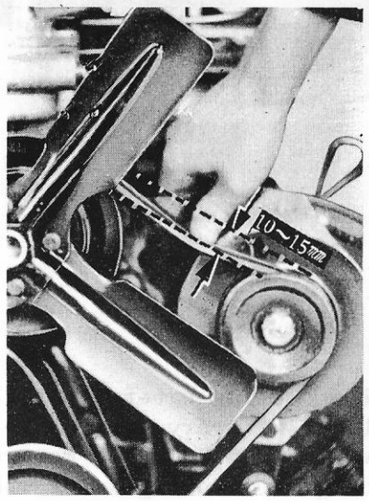

Fig. 2-3

2-1-3 Engine oil

Before starting the engine, the engine oil level should be checked using a dipstick. If the oil level comes between the arrow markings on the dipstick, the oil level may be regarded as normal.

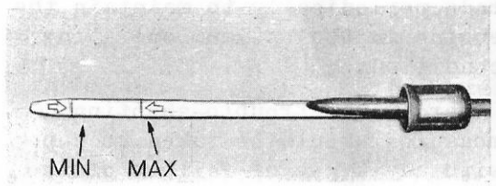

Fig. 2-4

The breather cap on the cylinder head cover should be removed for replenishing the engine with oil. The engine should be drained and

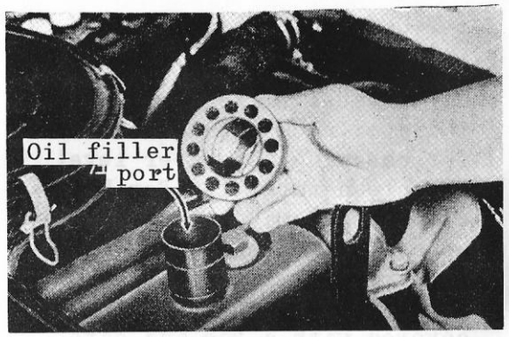

Fig. 2-5

refilled with specified oil after the automobile covered the initial 1,000 km of break-in travel distance and thereafter, the engine oil should be replaced in the same manner after every 3,000 km of travel.

Hi-belper engine oil
a product of Showa Sekiyu

Ambient temperature	Specified oil
Above 10℃	SAE #30
−10℃~+10℃	SAE #20
−20℃~ 0℃	SAE #10
Below −20℃	SAE # 5

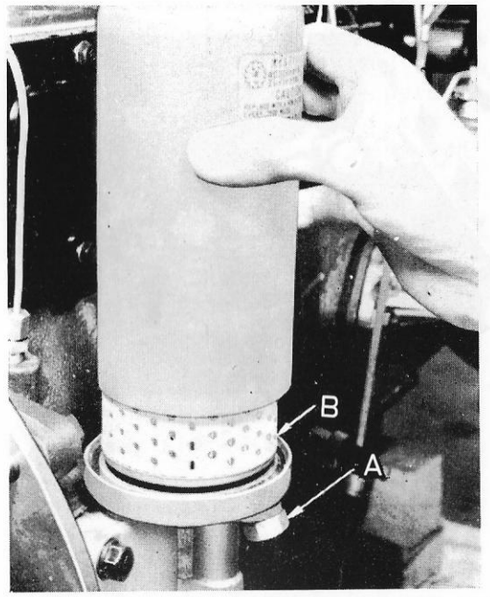

Fig. 2-6

2-1-4 Engine Oil Filter

For replacing the engine oil (after every 3,000 km of travel distance), the drain plug (A) on the oil filter body should also be removed for draining the engine oil therethrough. The oil filter element (B) should be replaced after every 9,000 km of travel distance.

2-1-5 Air Cleaner

The air cleaner element should be removed and cleaned with the aid of compressed air (to blow dust deposit) after every 3,000 km of travel. The dismantling and cleaning intervals may be reduced when the automobile is subjected to road service in

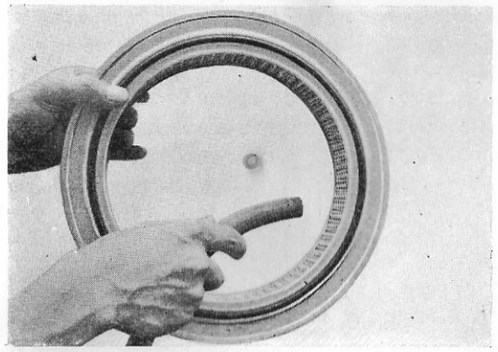

Fig. 2-7

dusty areas. If the filter element is smeary or damaged, it should be immediately replaced. The air filter element should be regarded as due for replacement after every 18,000 km of travel distance.

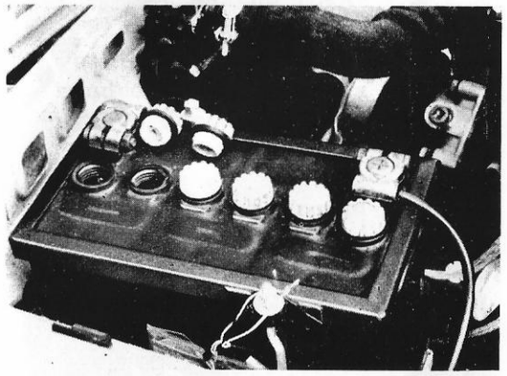

Fig. 2-8

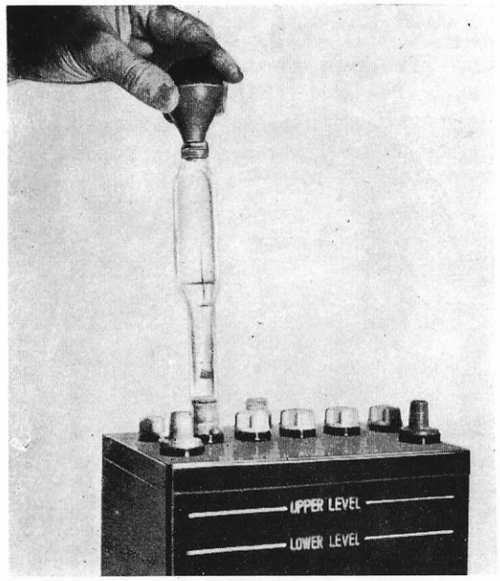

Fig. 2-9

2-1-6 Battery Check-up

(1) The battery electrolyte should be checked to make sure it retains specified level with the battery fully charged.

The battery electrolyte level should be held within 10-15mm above the plates. Distilled water should be used for replenishing the battery as other water is detrimental to normal battery performance.

(2) Measuring the specific gravity of the electrolyte

According to the specifications, the specific gravity of the electrolyte should be measured while it is held at the temperature of 20°C, but for all practical purposes, the value of the specific gravity thus obtained by measuring the electrolyte at any degrees of temperature is represented by the following formula:

$S_{20} = St + 0.007\ (t-20)$

S_{20} ... Specific gravity of the electrolyte measured at 20°C.

t. .... Temperature of the electrolyte when the specific gravity of which is measured.

St. ... Specific gravity of the electrolyte regardless of its temperature.

If the value of the specific gravity obtained from such calculation is less than 1,180, the battery should be regarded due for re-charging.

Specific gravity of the electrolyte	Rate of discharge (%)
1,260	0
1,200	30
1,150	50
1,100	75
Below 1,100	Completely discharged

(3) The battery should be charged with specified power after completing the necessary connections in accordance with the following illustration subsequent to adjustment of the electrolyte level. During the charging operation, the filler caps of the battery should be held removed.

This charging operation may be often accompanied by a sudden increase in the supply voltage due to bubbles and fumes. During the charging period, the voltage at the terminals should be measured every thirty (30) minutes and if the measured value exceed 15V and so continues, the battery may be regarded as fully charged. During the re-charging operation, the temperature of the electrolyte should be measured and if it rises above 45°C (or 113°F), the charging should be temporarily stopped or the charging current should be reduced by 50 percent. The charging may be started again when the temperature of the electrolyte has declined. The current used for re-charging should not exceed one-tenth (1/10) of the battery capacity.

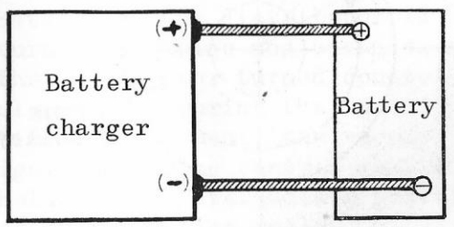

Fig. 2-10

2-1-7 Spark plug

The spark plugs should be cleaned and provided with specified spark gaps after every 3,000 km of travel distance. The spark plug should be provided with a gap of about 0.7 - 0.8mm by adjusting the ground electrode. The spark plugs specified for use with the Bellett engines are: NGK B-6E or HITACHI L45J.

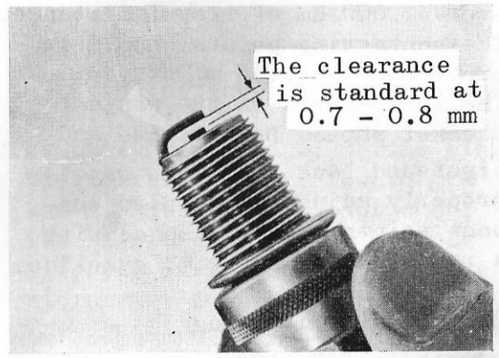

Fig. 2-11

2-1-8 Distributor

A few drops of engine oil should be applied to the rotor shaft of the distributor at the position (B) after every 3,000 km of travel distance. The distributor is also provided with a grease

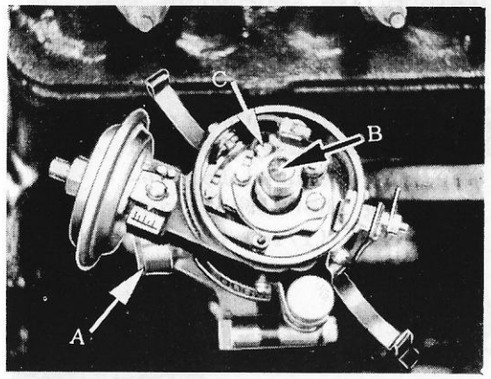

Fig. 2-12

cup (A). The grease cup is adapted to lubricate the distributor shaft as it is turned clockwise. The entire surface of the cam should be provided with a thin coating of grease and the contacting point should be checked for proper gap (C) after every 3,000 km of travel distance. The contacting points should be provided with 0.45 mm of gap. The lock screws on the contact breaker should be loosened and tightened back after the gap is properly adjusted. Fouled contact points may be cleaned with a rag slightly wet with gasoline.

2-1-9 Ignition timing

The engine should be checked for ignition timing and properly adjusted after every 3,000 km of travel distance. The ignition timing is standard at 12-14° (at 600-650 r.p.m.) B.T.D.C. (For models G150 and G130). For model G160, the ignition timing is standard at 12° B.T.D.C. (at 600-650 r.p.m.)

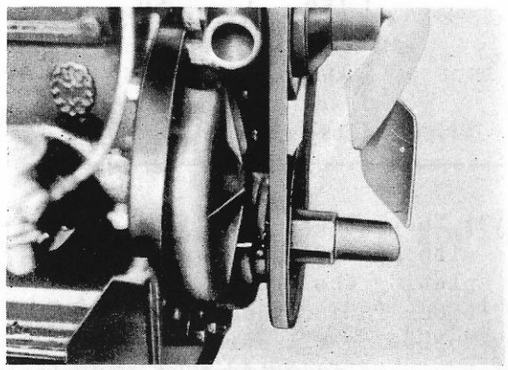

Fig. 2-13

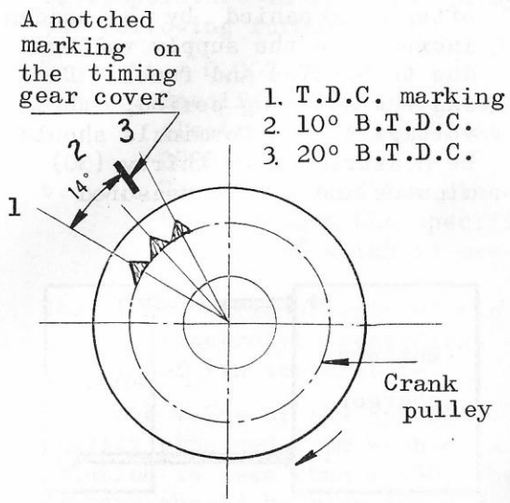

Fig. 2-14

Notched marks on the crank pulley represent T.D.C., 10° B.T.D.C. and 20° B.T.D.C., respectively.

A strobo lamp should be used for inspecting and adjusting the ignition timing. The strobo lamp should be connected in the following manner.

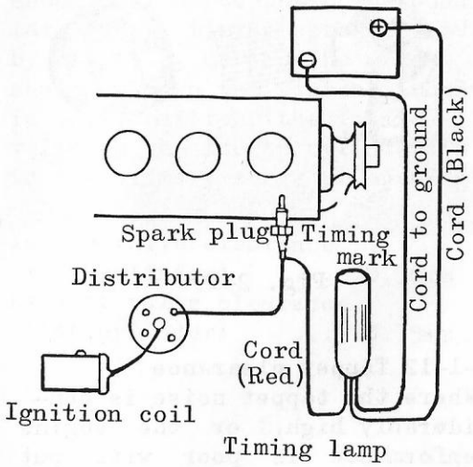

Fig. 2-15

For adjusting the ignition timing, the distributor should be carefully turned after the clamping bolts on the distributor set plate are slackened. The ignition timing retards as the distributor is turned clockwise and advances with the distributor turned counter-clockwise. During the ignition timing adjustment, the vacuum ignition timing control should be held in the intermediate position of the adjusting scale.

To obtain the optimum ignition timing using different octane fuels, the ignition timing may be fractionally adjusted with a micrometer adjuster on the vacuum timing control.

For the most practical purpose to obtain the optimum ignition timing, the ignition timing may be so adjusted that the engine slightly knocks when suddenly accelerated from the travel engine slightly knocks when suddenly accelerated from the travel speed of approximately 25 km/h on the top gear, and the knocking gradually fades away responding to increasing speed.

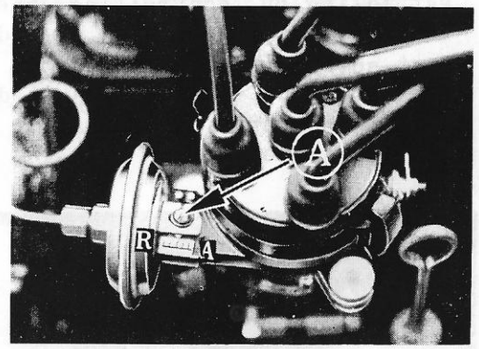

Fig. 2-17

In the instance where the knocking is notable, the timing may be slightly retarded by moving the micrometer adjuster toward "R" and if knocking does not occur the ignition timing may be slightly advanced by moving the micrometer adjuster toward "A". The ignition timing is adjustable in both "R" and "A" directions within 5 degrees using a micrometer adjuster.

2-1-10 Idling

The carburetor should be carefully adjusted as it gives direct influence on the engine performance as well as on fuel consumption.

(1) The adjusting screw (A) on the carburetor should be partially released by turning 1-1/4 - 1-1/2 back after it is screwed all the way in. Then the engine idling speed should be adjusted to approximately 600 - 650 r.p.m. by adjusting the idle speed screw (B).

(2) The engine should be adjusted to provide a smoothest and fastest idling by controlling the carburetor with the aid of adjust screw (A) and then, the engine idling speed is adjusted to 600-650 r.p.m. by adjusting the idle speed screw (B).

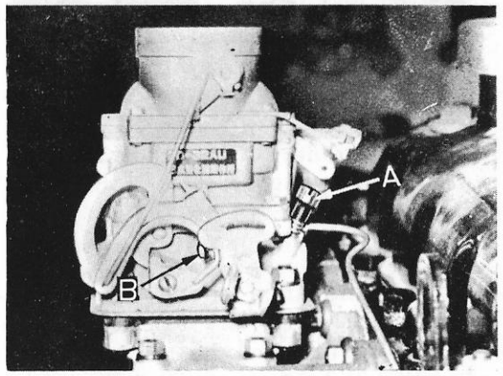

Fig. 2-18

2-1-11 Fuel filter

All internal parts of the fuel filter should be cleaned after every 3,000 km of travel distance. The screw on the clamp should be slackened for removing the glass bowl. The glass bowl should be carefully removed lest it should cause damage to the packing. The filter element should be replaced after the 18,000 km of service.

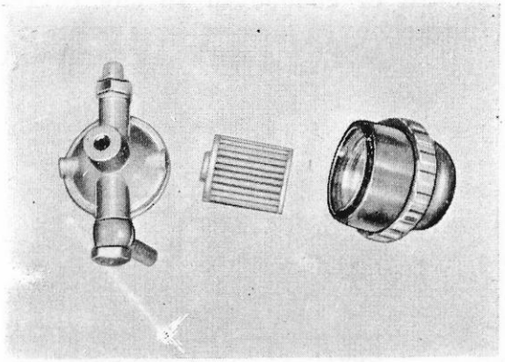

Fig. 2-19

2-1-12 Tappet clearance

Where the tappet noise is considerably high, or the engine performance is poor with out failures in the fuel system or in the electrical system, the trouble may be attributed to maladjusted valve clearance. In such instance, the valve clearance should be adjusted while the engine is cold.

Cautions for valve clearance adjustment:

The set bolts on the following parts should be tightened with application of the specified torque prior to adjustment of the valve clearance.

Cylinder head set bolts ...
6.0 - 7.0 m-kg
Rocker arm shaft bracket set bolts ... 2.3 - 2.6 m-kg

Manifolds set bolts ...
2.3 - 2.6 m-kg

With the cylinder head cover removed, the crankshaft should be carefully rotated with use of a crank handle so as to bring the piston of the first cylinder to the top dead center on the compression stroke. With the piston held in normal position, T.D.C. notch marking on the crank pulley should be set to the corresponding mark on the timing sprocket cover by carefully moving the crankshaft. (When the piston is held in this position, the intake valve on the fourth cylinder is in the primary stage of opening.)

Intake valve clearance
(1st cylinder) ... 0.30mm
Exhaust valve clearance
(1st cylinder) ... 0.35mm

Intake valve clearance
(2nd cylinder) ... 0.30mm

Exhaust valve clearance
(3rd cylinder) ... 0.35mm

Upon completion of the above adjustment, the crankshaft should be turned 360° and again the T.D.C. notch markings on the crank pulley should be set to the corresponding mark on the timing sprocket cover. (When the crankshaft is held in this position, the intake valve on the first cylinder is beginning to open). With the valve components held in the relative positions, the clearance of the remaining valves should be adjusted to the following values.

Intake valve clearance
(4th cylinder) ... 0.30mm
Exhaust valve clearance
(4th cylinder) ... 0.35mm

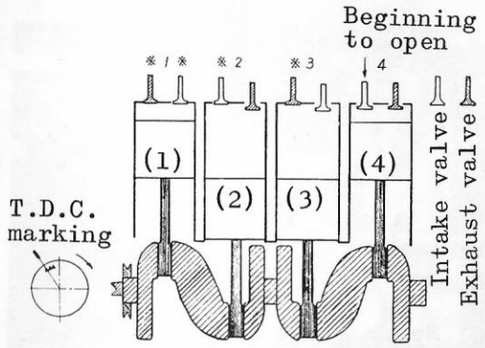

Fig. 2-20

(1) - Compression stroke
(2) - Combustion stroke
(3) - Suction stroke
(4) - Exhaust stroke

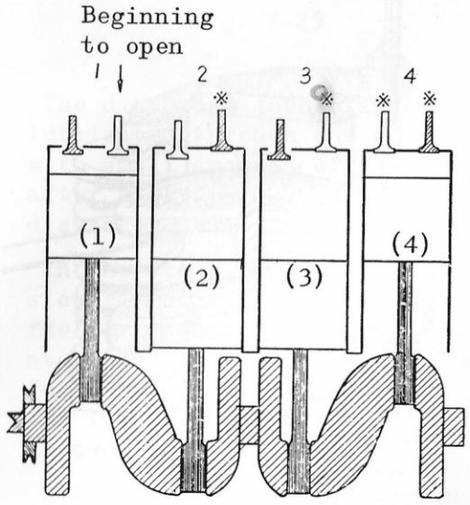

Fig. 2-21

Exhaust valve clearance
(2nd cylinder) ... 0.35mm

Intake valve clearance
(3rd cylinder) ... 0.30mm

When the lock nut is slackened, the screw adjuster should be carefully turned to give a proper clearance. When this adjustment is completed, the lock nuts should be carefully tightened back and the valve clearances re-checked with the aid of a thickness gage.

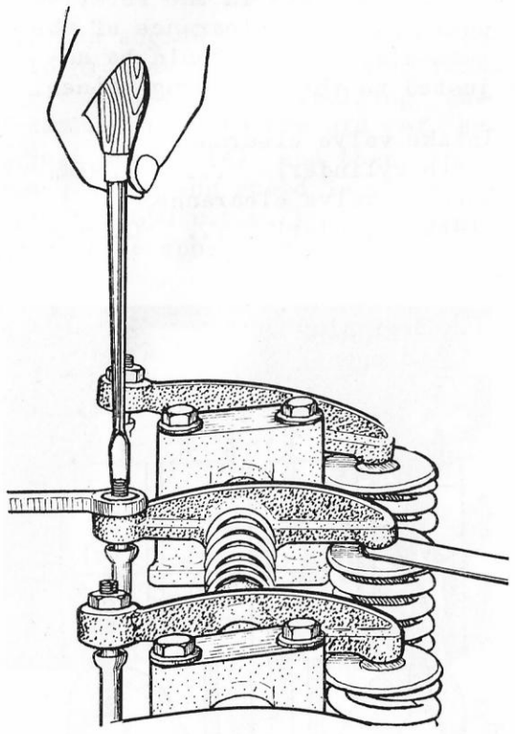

Fig. 2-22

2-1-13 Cylinder compression

Worn or damaged piston rings, tapered piston or worn cylinder wells will lead to the engine failure, power loss, difficulty of starting and so on.

For easier detection of troubles of this sort, a compression measuring may be performed.

(1) All ignition cords should be disconnected.

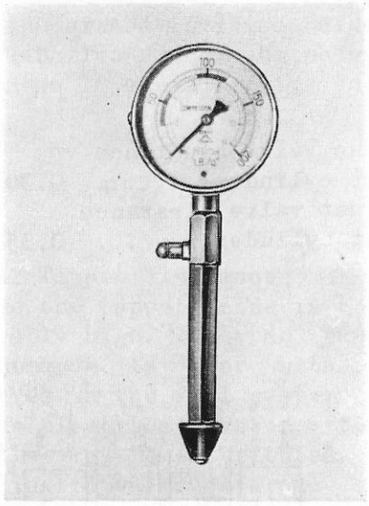

Fig. 2-23

(2) Spark plugs should also be removed.

(3) With the throttle valve fully opened, the engine should be rotated with the aid of the starter (The cranking speeds should be on or above 300 r.p.m.)

(4) The gage pointer at maximum should be read at least twice

when the deflection of the pointer is ceased.

If the reading is insufficient to the specified value, the associated parts should be dismantled for correction.

Compression at standard:
11.0 kg/cm^2
Difference of compression between cylinders:
0.6 kg/cm^2 or below
Service limit:
7.7 kg/cm^2 or below

2-2 DIESEL ENGINE

The parts used in the diesel engine of Isuzu Bellett are in common with those in the gasoline engine and therefore are omitted from further description.

2-2-1 Fuel injection pump

The cam chamber should be checked for proper oil level with use of a dipstick (A) and replenished with recommended oil as necessary.

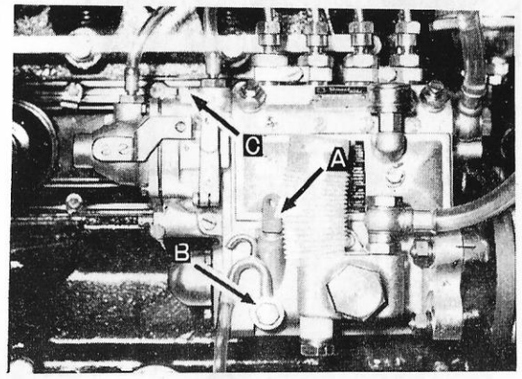

Fig. 2-24

Lubricating oil in the cam chamber should be drained by removing the drain plug (B) and replaced after every 3,000 km of travel distance.

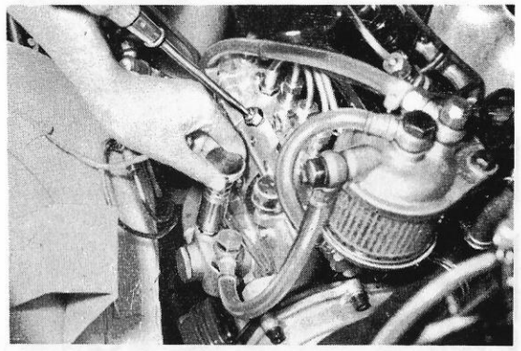

Fig. 2-25

The diaphragm should also be lubricated through the port (C) with small amounts of engine oil after every 9,000 km of travel distance.

In the event when the engine stopped running due to lack of fuel or the engine failed to start on supply of fuel to the fuel tank, the residual air in the injection pump should be bled in the following manner:

With the air bleeder plug on the injection pump slackened, the residual air should be bled by manually operating the feed pump mounted on the injection pump.

When it is certain that the residual air has been fully bled, the air bleeder plug should be tightened back for starting the engine. The cap on the fuel feed pump should be fully tightened.

2-2-2 Engine idling

With the engine held warm, the engine should be adjusted to an idling speed of 600 r.p.m. by controlling the idle adjust screw (A). During this adjustment, the throttle control button on the control panel should be held in depressed position.

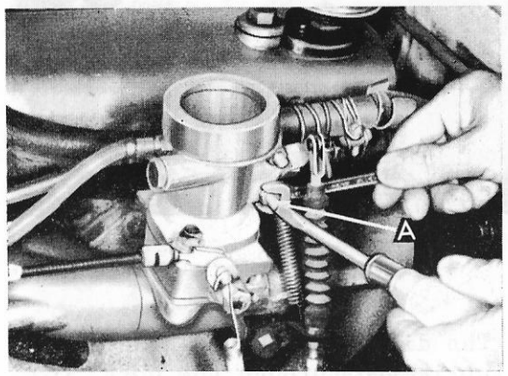

Fig. 2-26

2-2-3 Fuel injection timing

The injection timing is standard at 27° B.T.D.C. and in most cases, readjustment is not required. The injection timing should be adjusted by tilting the injection pump.

The injection timing gains when the pump is inclined toward the engine and loses with the pump inclined against the engine.

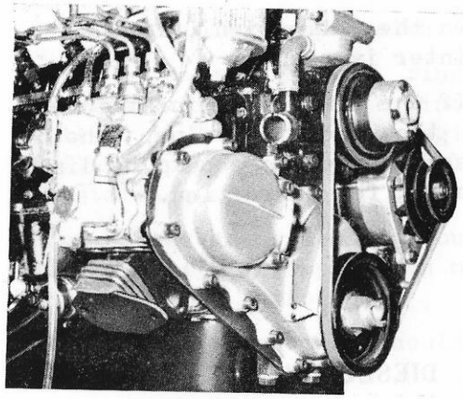

Fig. 2-27

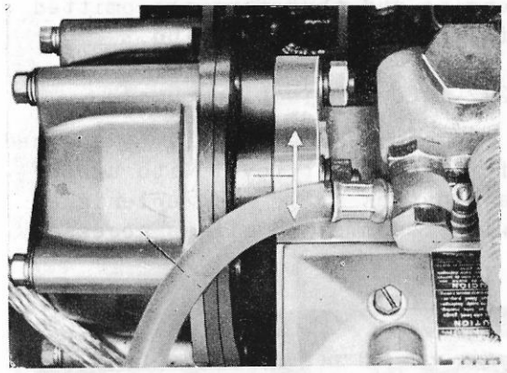

Fig. 2-28

Method of adjustment:

(1) Set the engine so as to bring the piston in the 4th cylinder to T.D.C. in the compression stroke.

(2) Bleed the air from the fuel injection pump.

(3) Remove the 4th delivery valve from the injection pump.

(4) With the fuel feed pump in the injection pump manually operated, rotate the engine

counter-clockwise with the aid of the crank handle until fuel comes out from the 4th plunger on the fuel injection pump.

(5) Rotate the engine again clockwise until the fuel stops flowing from the barrel, the position of the plunger in which the fuel stopped flowing may be regarded as "static injection timing".

2-2-4 Injection nozzle

The injection nozzle should be inspected and adjusted to maintain proper operating conditions after every 9,000 km of travel distance. The nozzle pressure is standard at 120 kg/cm^2.

Decreased nozzle pressure and poorly adjusted nozzle often invite a loss of the engine power and an increase in the engine operating noise.

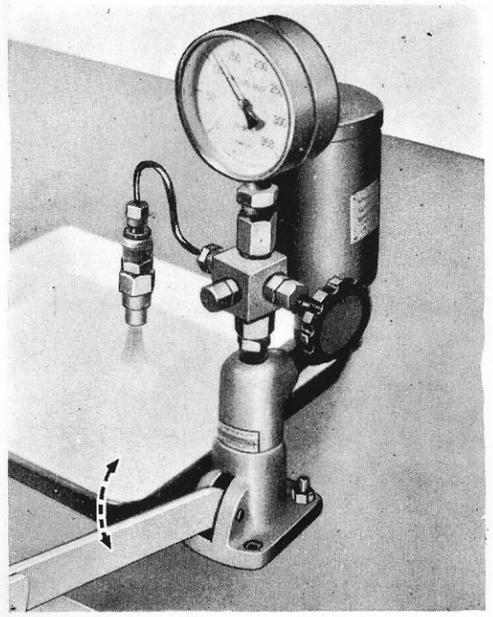

Fig. 2-29

2-2-5 Fuel filter

The fuel filter should be drained for cleaning the interior of dust and other deposit and the filter element should be also cleaned after every 3,000 km of travel distance.

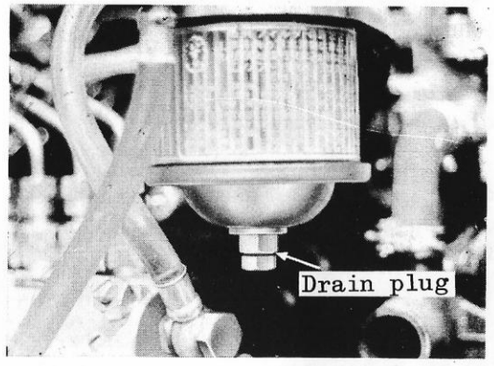

Fig. 2-30

The filter element should be replaced after every 18,000 km of travel. When the fuel filter is drained, the residual air in the filter should be bled by operating the feed pump.

2-2-6 Tappet clearance

For adjusting procedure, the method introduced in 2-1-12 may be used as a reference. The set bolts on the following parts should be tightened with application of the specified torque prior to adjustment of the tappet clearance.

Cylinder head set bolts ...
11 - 12 m-kg
Rocker arm shaft bracket bolts ... 2.3 - 2.6 m-kg
Manifolds set bolts ...
2.3 - 2.6 m-kg

The tappet clearances are standard at 0.4mm with cold engine for both intake and exhaust valves.

2-2-7 Compression

Worn or damaged piston rings, tapered piston or worn cylinder walls will lead to the engine failure, power loss, difficulty of starting and the like.

For easier detection of troubles of this sort, a compression measuring may be performed in the following manner:

(1) All nozzle holders should be disconnected.

(2) With the throttle valve fully opened, the engine should be rotated with the aid of the starter. (The cranking speed should be 240 r.p.m. or above).

The gage pointer at maximum should be read at least twice when the deflection of the pointer is ceased. If this reading is insufficient to the specified value, the associated parts should be dismantled for correction.

Standard cylinder compression ... 28.0 kg/cm^2
Difference of compression in the cylinders ...
1.4 kg/cm^2 or below
Service limit ...
19.6 kg/cm^2 or below