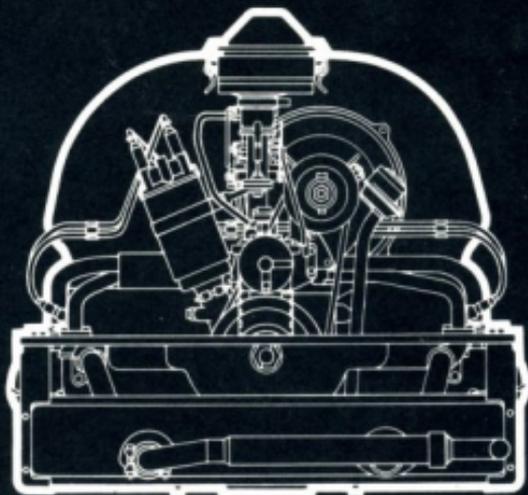


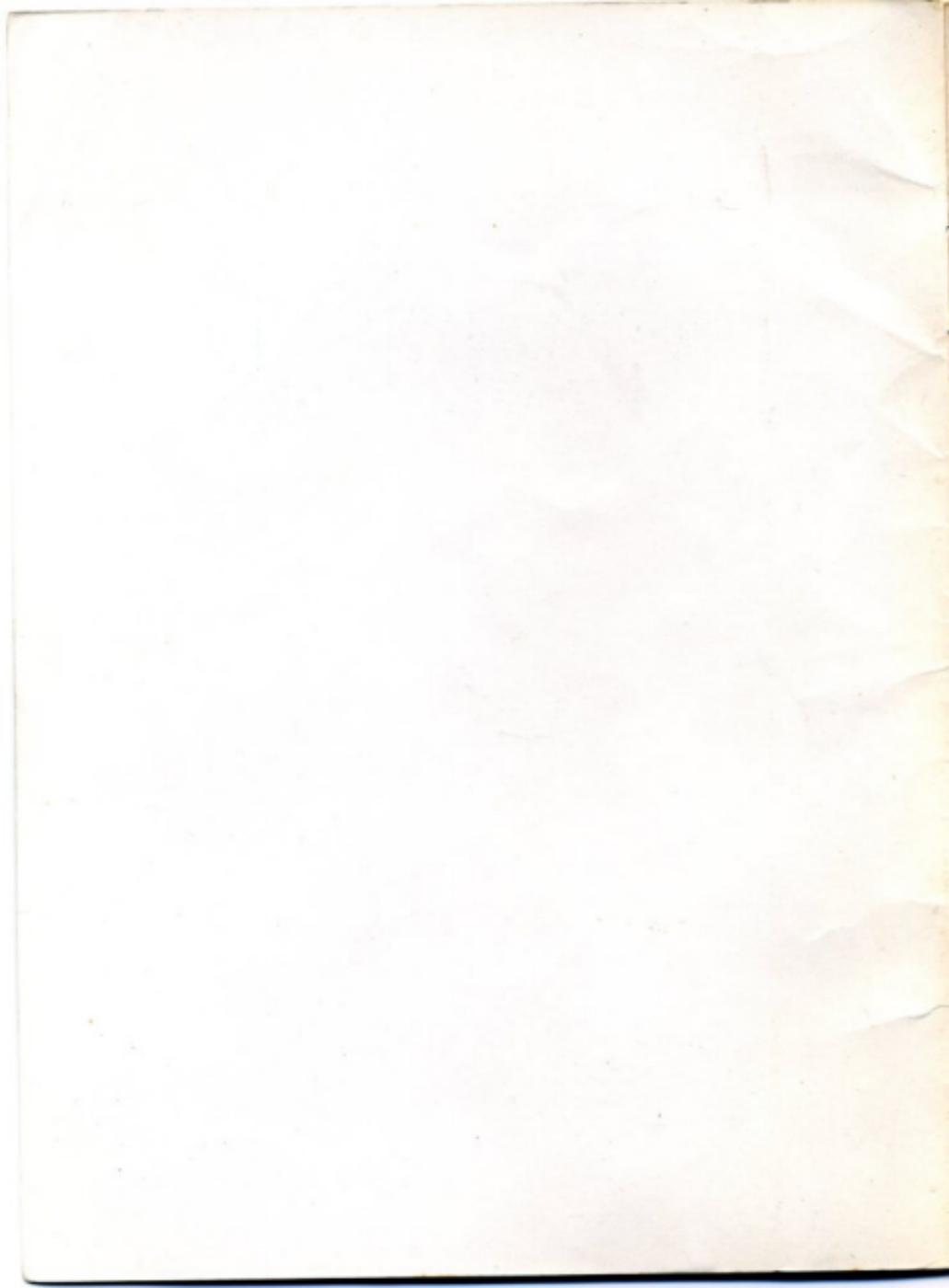


Industrial Engine

Type 122
Type 126 A



Instruction Manual





Industrial Engine

Type 122

Type 126 A

Instruction Manual

March 1969

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PREFACE

The VW Industrial Engine has been designed to meet the increasing demand for a robust and reliable, yet economical power unit in the industrial and agricultural field. The constructional features of the VW Industrial Engine are identical with those of the VOLKSWAGEN Engine which has proved its reliability in millions of VW vehicles.

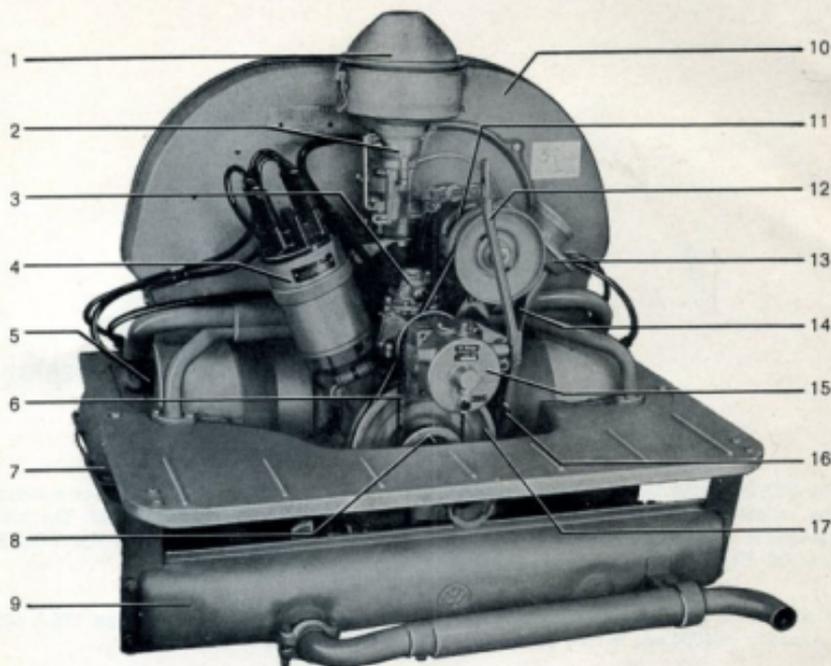
In addition to the well established Type 122 1200 cc Industrial Engine, the Type 126 A with a capacity of 1600 cc., is now available for the same purpose.

This manual is valid for the 122 and 126 A Industrial Engines.

Data which differs on the Type 126 A engine is printed in blue.

These engines are also fitted with magneto or battery ignition as required and are delivered with a governor for various operating speeds or without governor.

We are sure that you will obtain the utmost service and satisfaction from your VW Industrial Engine, if attention is paid to the care and maintenance set forth in the ensuing pages. You will find in this booklet everything pertaining to the operation and maintenance of your engine. In addition to such information, you will find all kinds of interesting facts and a summary of the technical data. Occasions may arise when advice is required which is beyond the scope of this book. Approved service agencies throughout the world, staffed by VW trained technicians, are ready to attend to your needs. The VW Service Stations will be readily recognized by the familiar blue VW SERVICE sign. These service shops are in close contact with the Volkswagenwerk through our field engineers, thus providing quick and expert execution of any job to be done.

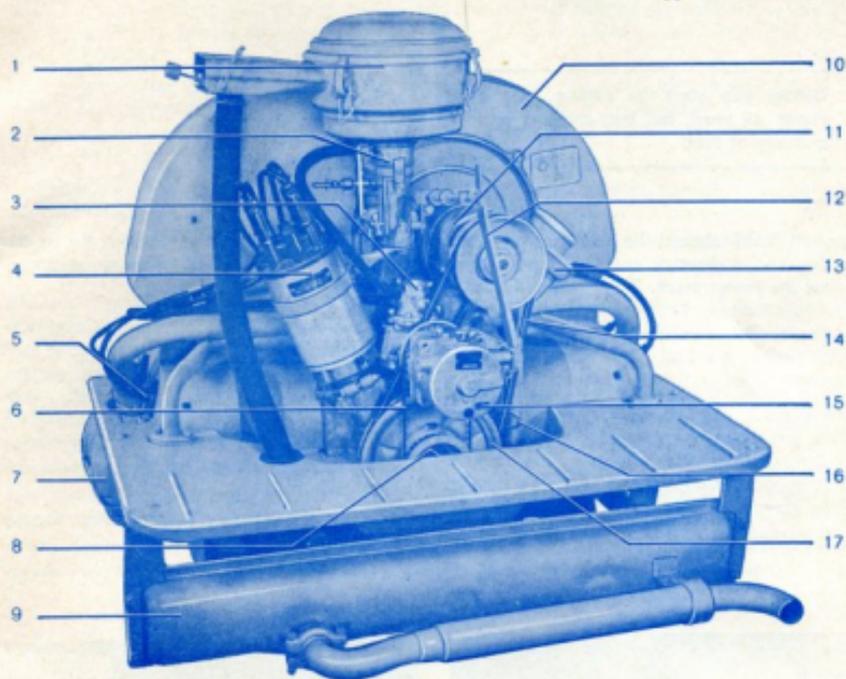


- | | | | |
|---|---------------|--------------------------|-------------------------|
| 1 — Oil Bath Air Cleaner
with Pre-heater | 3 — Fuel Pump | 5 — Spark Plug Connector | 7 — Cylinder Head Cover |
| 2 — Carburetor | 4 — Magneto | 6 — Toothed Belt | 8 — Starter Dog |

GENERAL DESCRIPTION

The air-cooled 122 and 126 A VW Industrial Engines are of the 4-cylinder, 4-cycle type with a crankcase of magnesium alloy. Two pairs of cylinders are horizontally opposed (flat four). Each pair has one mutual cylinder head made of aluminium alloy. The overhead valves are located in the cylinder heads and are operated by one camshaft via cam followers, push rods and rocker arms. The short crankshaft runs in four bearings and has heat-treated journals. It drives the camshaft through helical gears. The connecting rods are fitted with split shell bearings. The light-metal alloy pistons are provided with steel inserts.

A downdraft carburetor supplies the fuel-air mixture to the cylinders. The standard engine is equipped with a magneto ignition system. The engine speed required is controlled by a governor which is driven by a toothed belt.



- | | | | | |
|------------------|-----------------------|----------------------------------|---------------|--|
| 9 — Muffler | 11 — Fan Bearing | 13 — Oil Filler with
Breather | 15 — Governor | 17 — Fan Pulley with
Toothed Belt
Drive Gear |
| 10 — Fan Housing | 12 — Governor Linkage | 14 — Fan Belt | 16 — Dipstick | |

The oil pump of the pressure feed system is driven by the camshaft and sucks the oil from the crankcase sump through a strainer and pumps it to the various lubrication points via an oil cooler. In cold weather, when the oil is thick, an oil pressure relief valve makes it possible for the engine to be lubricated direct, that is, without the oil going through the oil cooler.

The engine is cooled by a radial fan. The fan spindle runs in ball bearings lubricated by grease nipples and is driven from the crankshaft by a belt. The upper pulley is adjustable so that the belt tension can be corrected. The fan sucks in air through an opening in the fan housing and forces it through deflector plates to the heavily ribbed cylinders.

OPERATING INSTRUCTIONS

Before you start the engine, please check oil level, fan belt tension, and quantity of fuel.

The oil level should be between the two marks on the dipstick and must **never drop below the lower mark**. If the engine is to be run continuously for long periods (10—12 hours), the oil level should be at the upper mark before starting. Wipe dipstick before checking level.

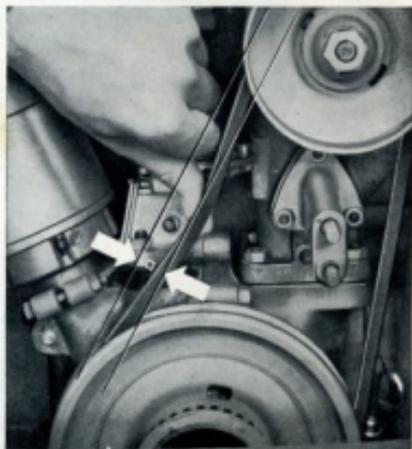
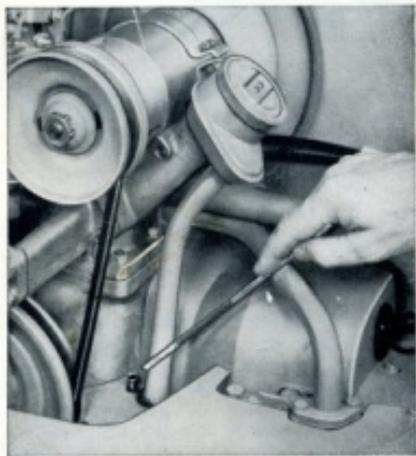
The dipstick reading will only be accurate if the engine is horizontal. Do not check the oil immediately after stopping the engine. Wait about 5 minutes to give the oil time to drain down to the bottom of the crankcase.

Try to always use the same brand of gasoline

engine HD oil. Further details about the viscosity of the oil to be used are given on pages 12/13.

The belt drives the cooling fan. Good condition and correct tension ensure long belt life and adequate cooling of the engine. Checking is very simple: The belt, when pressed firmly with the thumb, must yield approximately 1.5 cm (a). No traces of excess wear, such as frayed edges, should be perceptible.

The governor has been removed here for the sake of clarity.



a = 1.5 cm (.6 in)

The Fuel Quantity should be checked before putting the engine into operation. This will avoid annoying interruptions. It is recommended that the fuel tank be provided with a reserve tap. If the engine begins to "stutter", as a result of fuel starvation, just switch the tap to reserve position.

The choice of fuel brand and type is left to you. The VW industrial engine will run on all normal commercial fuels which fulfil the octane requirement of the engine.

Type 122	86 Octane (Res. F 1)
Type 126 A	90 Octane (Res. F 1)

If regular fuels with adequate anti-knock properties are not available, premium fuels should be used or mixed with the regular fuel.

When filling the tank from cans, please filter the fuel through a clean piece of chamois or a fine strainer.

Starting the Engine is easy if you follow the instructions given here. Please note the different methods to be used if the engine is completely cold or if it has been started before and is fairly warm.

A cut-off valve combined with the pilot jet cuts off the supply of fuel when the engine is switched off at idling speed and prevents the engine from running-on.

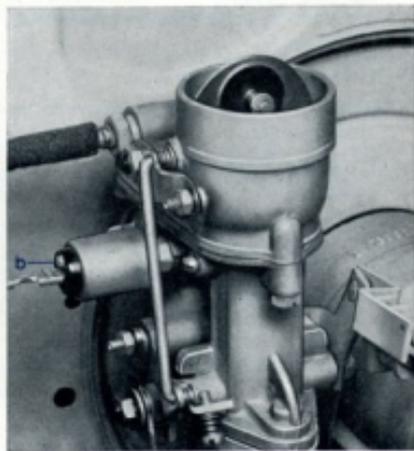
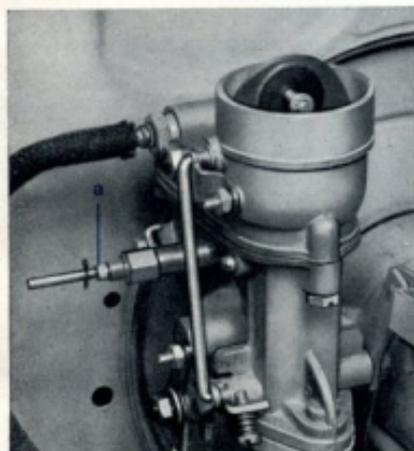
On engines with **magneto ignition (1)**, ensure that the cut-off valve in the pilot jet is in the open position before starting the engine.

The electro-magnetic cut-off valve used on engines with **battery ignition (2)** opens and closes automatically when the ignition is switched on and off.

If the cut-off valve needle cannot be operated electrically or with the cable, it can be withdrawn from the jet by turning the knurled nut (a) or the grub screw (b) to the left.

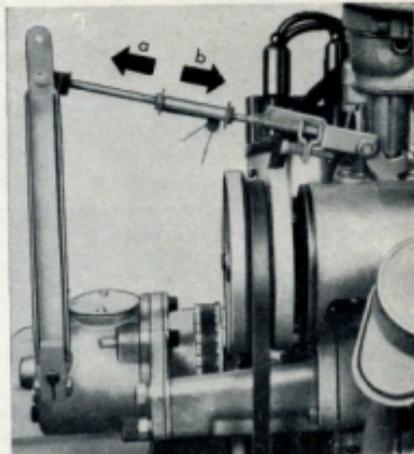
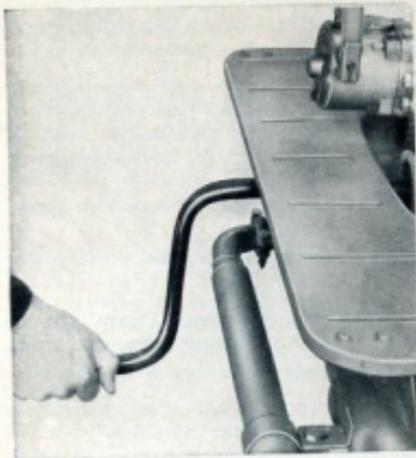
1

2



The **choke control** operates the choke, which, when closed, enriches the mixture.

The **throttle control** opens and closes the throttle and allows alteration of the engine speed independently of the automatic governor in the range from idling speed to the limit fixed by the governor.



a = Operating position

b = Idling position

To start the engine when cold

- 1 — Open the fuel tap.
- 2 — Switch on the ignition (On engines with magneto ignition, the cut-off valve in the pilot jet must also be opened with the cable).
- 3 — Fully close the choke.
- 4 — Shift the throttle control linkage to the idling position.
- 5 — Crank the engine or press the starter button.
- 6 — As soon as the engine fires, slowly open the choke. Let the engine run at a fast idle speed for about one minute to allow the oil to warm up (push the throttle control linkage towards the operating position). It is not advisable to race the engine immediately on starting up from cold.
- 7 — Slowly shift throttle control linkage to full operating position. The governor then begins to work.

To start the engine when hot

- 1 — Switch on the ignition (On engines with magneto ignition, the cut-off valve in the pilot jet must also be opened with the cable).
- 2 — Shift the throttle control linkage to the idling position (do not close the choke).
- 3 — Crank the engine or press starter button. If the engine does not fire immediately because it is still very hot, push the throttle control linkage to the operating position and repeat the procedure. As soon as the engine fires, push the control linkage back to the idling position and then move it slowly to the operating position.

The linkage for operating the throttle and choke is not shown in the illustration. The arrangement of this linkage depends on the particular installation conditions.

Do not repeatedly open and close the throttle if the carburetor is equipped with an accelerator pump (28 PCI and 32 PCI). This increases fuel consumption and may "flood" the engine.

Caution. Be careful when starting the engine inside closed rooms. See that the doors and windows are open so that the exhaust fumes can escape. They contain the invisible, odorless, yet extremely poisonous carbon monoxide gas.

How to stop the engine

- 1 — Shift the throttle operating linkage to the idling position and allow the engine to cool down by letting it run at idling speed for a few minutes.
- 2 — Turn off the Ignition or press the short circuiting button. (On engines with magneto ignition, the pilot jet cut-off valve should be closed with the cable at the same time.)
- 3 — Shut the fuel tap.

Warning lamps. Engines with a generator and battery are fitted with an oil pressure switch and a **warning lamp** which lights up when the ignition is switched on. The lamp goes out when the engine is started and the oil pressure increases.

If the lamp does not go out it can mean that the oil circulation and the lubrication of the engine has been interrupted. Stop the engine at once and check the oil level before you consult a VW service station. If the lamp flickers occasionally when the engine is warm and running slowly it is of no importance as long as it goes out as speed increases.

If an oil pressure gauge is fitted, the pressure should be at least 0.5 kg/cm² (7 psi) at idling speed when the engine is warm.

Another warning lamp is fitted to check that the generator is charging. The lamp lights up when the ignition is switched on and when the engine is running slowly. As the engine speed increases, the lamp goes out and indicates that the battery is being charged.

If the lamp lights up when the engine is running normally, it means that there is a defect in the electrical system or that the belt has broken or is slack. Stop the engine and find out what is wrong as otherwise the battery will soon be discharged and — if the belt is faulty — the cooling of the engine will be affected. The proper way to fit a new belt is described on page 17.

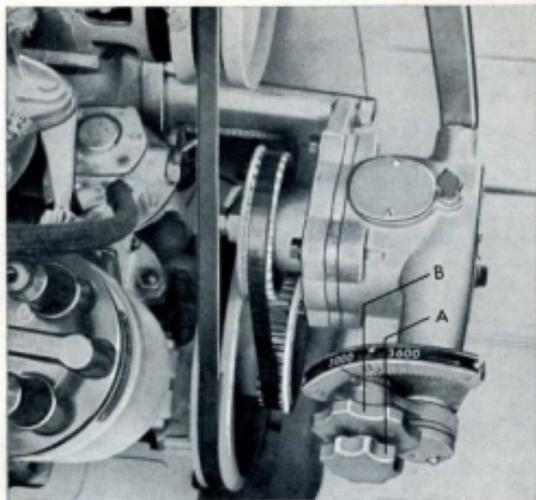
On engines which are equipped with a generator only, the light shows continuously during operation and goes out when the engine is stopped or when the fan belt is broken.

Generator Series Resistance. When engines with a generator but without a battery are operated with the generator loaded intermittently, there is a danger that graphite deposits will form in the generator and eventually lead to generator failure.

To avoid this, a 9 Ohm resistance must be installed between terminal B + (51) on the regulator and terminal D on the generator housing as a constant current consumer.

Adjustable Governor. If the engine is fitted with an adjustable governor, the speed should be regulated as follows:

- 1 — Loosen the locknut.
- 2 — Regulate speed by turning the adjusting disc.
- 3 — Tighten locknut.

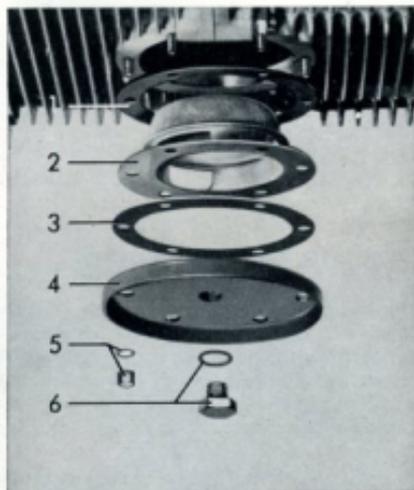
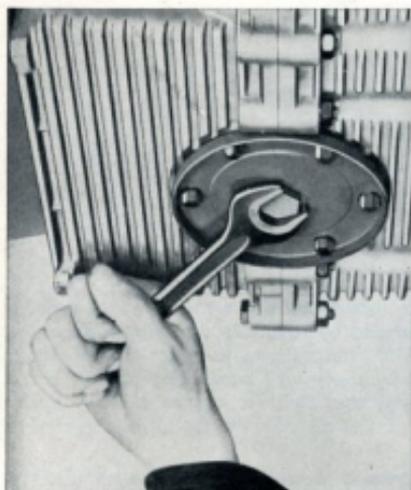


A — Locknut
B — Adjusting disc

Proper Lubrication is of Vital Importance. The extra time spent in following these recommendations will be amply rewarded in the long run by your engine's efficient performance. It is up to you to maintain its standard of reliability and to ensure the long life and good service which you have the right to expect from this highly economical engine.

Correct lubrication means, above all, to lubricate punctually and carefully but not excessively. Do not neglect therefore, to carry out all the tasks connected with the lubrication service as laid down in the lubrication chart on page 36.

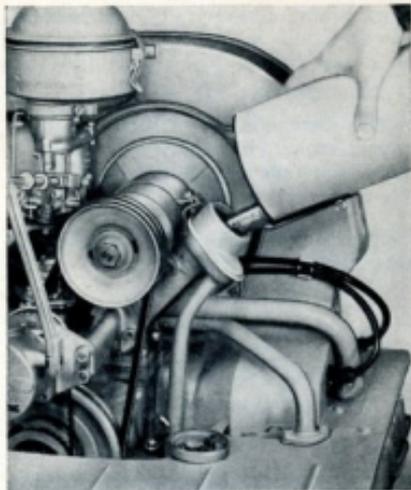
Oil changing. Regular oil changes are necessary even if the very best brands of HD oil are used because dirty oil in the engine simply means increased wear and shortened service life.



- | | |
|--------------|---------------------------|
| 1 — Gasket | 4 — Cover |
| 2 — Strainer | 5 — Cap nut and washer |
| 3 — Washer | 6 — Drain plug and washer |

The old oil is drained by removing the plug in the oil strainer cover when the engine is thoroughly warm. The engine need not be flushed out but it is important that the oil strainer be removed and cleaned at every oil change. The gaskets for the strainer and the sealing washers for the drain plug and

cap nuts should always be renewed when the strainer is installed. The engine is then filled with 2½ liters of HD oil.



Due to the detergent properties of HD oil, the fresh oil will look very dark after the vehicle has been running for only a short time. This need not worry you and under normal operating conditions there is no reason whatever to change the oil at shorter intervals.

Some more information about oil

When changing and topping up the oil, try to always use the same brand of gasoline engine HD oil. The quality of modern oils produced by reputable firms is so good that the choice of brand is left entirely to you. The VW industrial engine makes no demands in respect of oil quality which cannot be fulfilled by every well known and popular brand. It is best to select "your" oil at the first oil change after 10 hours running and stick to this brand on all occasions. Should you have any doubts at all, your VW Dealer will be pleased to advise you.

The classification of oil into various viscosity grades is shown by the designations SAE 30, SAE 20 W/20 and so on. The viscosity of a lubricant indicates its resistance to flow at a given temperature. The VW industrial engine only requires two different viscosity grades which are used, according to season of year, as follows:

SAE 30 In warm seasons and all the year in countries with hot climates.

SAE 20 W/20 In the winter.

or

SAE 10 W In areas where the average temperature is below -15°C (5°F).

SAE 5 W*) In countries with arctic climates and temperatures below -25°C (-13°F).

All SAE grades cover a temperature range of about 35° C and the ranges of two neighbouring grades overlap by at least 20° C. Brief variations in temperature between seasons can therefore be disregarded. For the same reason it is also quite in order to mix oils of different viscosities when oil has to be added between oil changes and the viscosity of the oil in the engine no longer corresponds to the actual temperature. This is subject of course to the stipulation that the same brand of oil must be used.

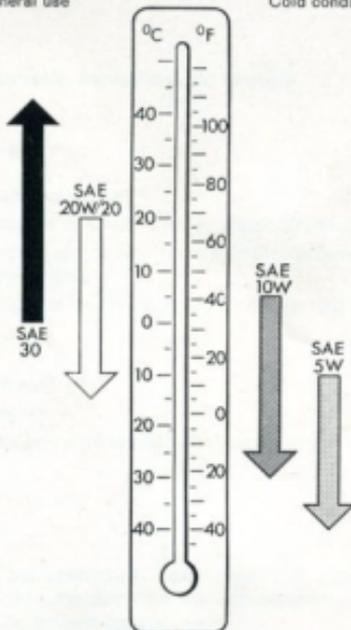
In some countries, oils are classified according to the API system (American Petroleum Institute). Under this system HD oils suitable for the VW industrial engine are designated "For Service MS".

No additives of any kind should mixed with HD oils.

Temperature ranges of SAE grades

General use

Cold conditions only



The Governor should be oiled every 50 running hours. Screw out the oil level control screw and add oil until the level reaches the lower edge of the control screw hole. Then replace the oil level control screw. Make sure that the cap of the lubrication fitting is properly closed, as dirt and grit in the governor will cause premature wear.

Prior to lubricating, carefully clean the lubrication fitting with with a rag to prevent dirt or foreign matter from getting into the governor.



ENGINE PRESERVATION

If the engine is used rarely or for short periods only and the running hours stipulated for oil changes in the Lubrication Chart are not reached, the engine oil should be changed not later than every six months.

The VW Industrial Engines should be protected against corrosion depending on the operating conditions.

Machinery which must always be ready for use but is used at irregular intervals — fire pumps for example. Engines which are run under load for at least 20 minutes every two weeks need not be filled with anti-corrosion oil.

If corrosion protection is desired for these engines, however, they should be filled with 2½ liters of anti-corrosion oil. The characteristics of the anti-corrosion oils recommended are such that the engines can be started immediately and run at full load. The oil is then changed at the normal intervals as given in the lubrication chart.

If the machine is to be taken out of service for a long time, the anti-corrosion treatment should be carried out with new anti-corrosion oil as described on page 15.

Machinery which is not used for long periods — combine harvesters for example.

The anti-corrosion treatment is carried out as follows:

- 1 — Run engine till warm and then drain oil after stopping engine
- 2 — Put 2½ liters of anti-corrosion oil in and run engine at a fast idle for about 30 seconds
- 3 — Remove the air cleaner and slowly pour 25—30 cc of anti-corrosion oil into the carburetor air intake while the engine is running, then stop engine
- 4 — Remove spark plugs and squirt anti-corrosion oil into combustion chambers so that the upper halves of the cylinders are coated.
- 5 — Turn engine a few times with crank or starter
- 6 — Spray spark plugs with anti-corrosion oil and install
- 7 — Lubricate carburetor linkage with anti-corrosion oil
- 8 — Seal all openings — exhaust pipe, breather pipe and air-cleaner — to keep out dirt and damp air
- 9 — Spray exterior of engine with anti-corrosion oil.

Before spraying, thoroughly clean all parts to be preserved. Take care that rubber parts — belts, hoses, cables etc. — do not come into contact with the anti-corrosion oil. If the engine is fitted with a governor, it must also be treated against corrosion.

- 1 — Remove governor from bracket.
- 2 — Remove oil level screw and pour oil out.
- 3 — Fill governor up to the oil level hole with anti-corrosion oil and insert screw.
- 4 — Turn governor quickly by hand a few times.
- 5 — Install governor.

Use only reputable anti-corrosion oils which conform to the lubricant specifications.

Important. When you have carried out the corrosion protection of your VW Industrial Engine you must not run the engine until it is required for use as this would destroy the effect. Otherwise you must repeat the whole procedure.

MAINTENANCE CHART

The Volkswagen Service Organization offers you an extensive network of Authorized VW Service Stations, staffed with well trained and experienced men, and equipped with all the special tools and appliances necessary to service your engine.

In case you cannot contact an Authorized VW Service Station in time, we are including some information which will help you to carry out normal maintenance work. However, repair jobs which are beyond your capacity should be performed by your nearest VW Service Station. This will save you time, inconvenience, and money.

Checking Air Cleaner

The oil bath air cleaner should be checked every 100 operating hours.

If the firm installing the air cleaner recommend any particular intervals for servicing, these should be adhered to.

All the dust present in the air drawn in by the engine is retained by the filter insert in the upper part of the air cleaner and washed out when the engine is running by the oil in the lower part of the cleaner. In time, this causes a layer of sludge to form

at the bottom of the lower part. If the cleaner check reveals that there is only 4—5 mm (.16—.2 in.) of oil above the sludge layer, the lower part should be cleaned carefully and filled with fresh oil. The top part does not normally need cleaning. However, if the filter insert has become so dirty due to overdue cleaning or oil shortage that the air inlet holes on the underside are partly blocked, the encrusted dirt should be removed, preferably with a small chip of wood.

A dirty filter insert not only reduces the engine output, it can also cause premature wear in the engine. If the operating conditions are such that the engine is often run in a very dusty atmosphere, it is advisable to clean the air cleaner more often.

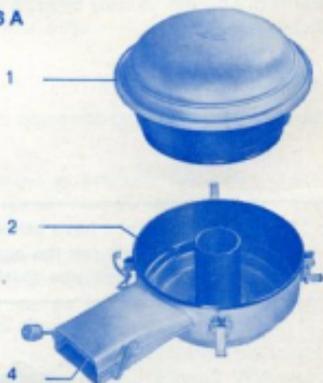
On engines which are not used for prolonged periods, the oil in the lower part tends to dry up; so do not forget to check these air cleaners as well.

The warm air control flap in the intake elbow should be checked each time for freedom of movement. This flap regulates the flow of warm air to the carburetor in conjunction with the speed of the engine.

Type 122



Type 126 A



Servicing Air Cleaner

- 1—Take warm air hose off oil bath air cleaner.
- 2—Unhook the clips on the upper part of the cleaner and lift the upper part out, taking care not to point the filter insert upwards.
- 3—Loosen the hexagon screw of the clip on the filter lower part and take lower part off carburetor.
- 4—Clean lower part carefully and fill to the mark with fresh engine oil.
- 5—Install cleaner in reverse order.

The special air cleaners used in certain cases should be serviced according to the manufacturers instructions.

Adjusting or Replacing the Fan Belt. To adjust or replace the fan belt, remove nut and outer half of the upper pulley. When loosening or tightening the nut, insert a screwdriver in the slot cut into the inner half of the pulley and support it against the upper bolt of the fan bearing (generator housing). The fan belt tension is adjusted

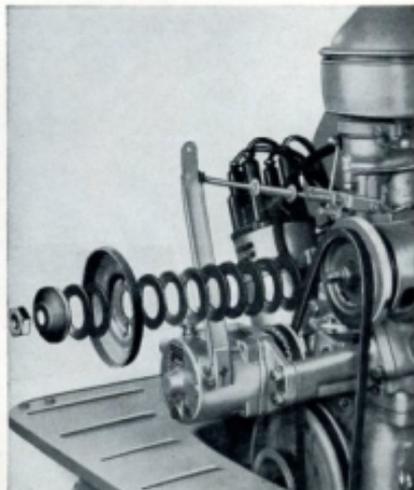
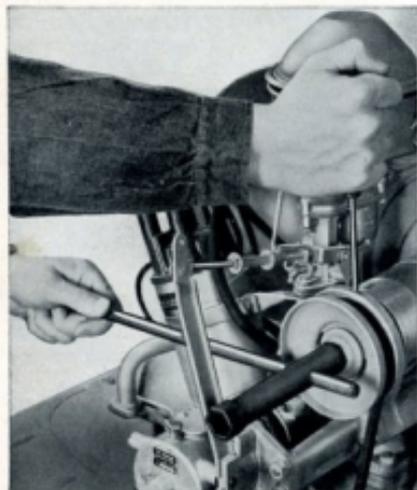
by means of spacer washers situated between the two pulley halves. Belt slackness is taken up by removing washers. If the belt is too tight, washers should be added. All washers taken out must be placed in front of pulley because the total number of washers must remain the same.

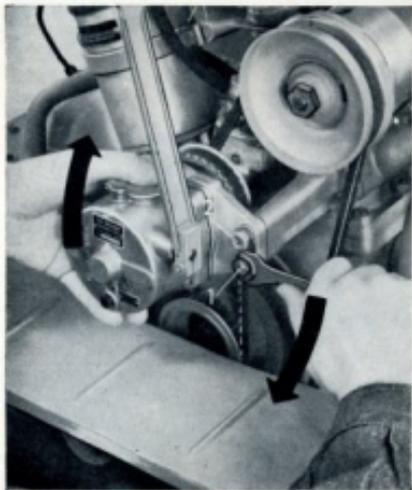
Slackness and excessive tension have a detrimental effect on the service life of the belt.

When replacing the belt, it is advisable to disconnect the governor push rod at the governor lever.

Newly installed belts will stretch to some extent and should, therefore, be checked and, if necessary, adjusted after the first ten hours of operation.

Even though the belt has a long service life if properly adjusted, a spare belt should always be available.





Toothed Belt for Governor Drive

The governor is driven by a Synchroflex toothed belt which gives a silent, non-slip drive. To enable the belt to function satisfactorily, the following points should be noted:

- 1 — Despite the fact that the belt has a long service life, it is advisable to always have a spare handy. It should be stored in a cool dry place and not kinked.
- 2 — Do not expose the toothed belt to hot water or steam.

To tighten or replace belt

- 1 — Loosen the two nuts on the tensioner to the right of the governor.
- 2 — If necessary, take belt off. Rub a molybdenum-disulphide based lubricant into the new belt and place it on the pulleys.
- 3 — Tension belt by lifting governor. Tighten the lower nut (1) first and then the upper nut (2). The belt should only be tensioned just enough to prevent it from hanging down.

Cleaning fuel pump filter. The filter gauze in the fuel pump separates dirt and water from the fuel. It should be removed at the specified intervals and carefully cleaned as follows:

Close fuel tap or take suction pipe off fuel pump and seal it.

Remove filter retaining plug.

Take filter out, wash in gasoline and blow out with compressed air.

Install filter again. Do not forget the plug washer.

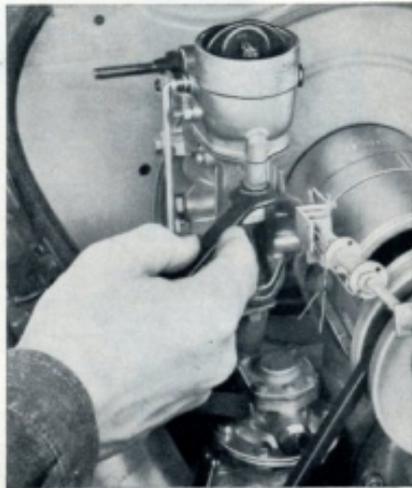
Solex downdraft carburetor

Type 122 : 26 VFIS — 28 PCI

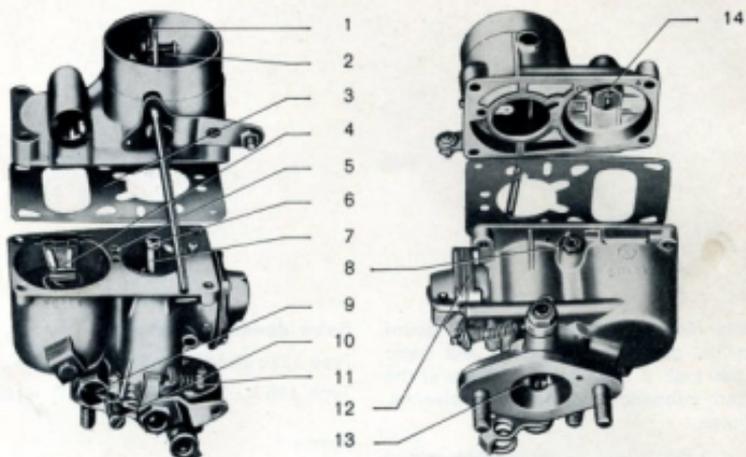
Type 126 A : 26 VFIS — 28 VFIS — 32 PCI

Removal

- 1 — Close the fuel tap.
- 2 — Remove the air cleaner.
- 3 — Disconnect the line at the carburetor.
- 4 — Remove the three screws attaching the cover to the carburetor bowl.
- 5 — Take cover off.



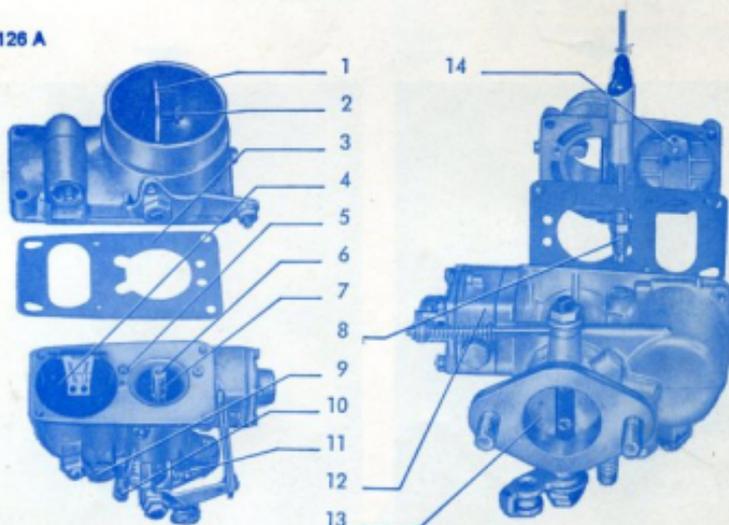
Type 122



28 PCI

- | | | |
|-------------------------|----------------------------------|-----------------------------|
| 1 — Choke | 6 — Air correction jet | 11 — Idling adjusting screw |
| 2 — Poppet valve | 7 — Emulsion tube | 12 — Accelerator pump |
| 3 — Gasket | 8 — Pilot jet with cut off valve | 13 — Throttle |
| 4 — Float | 9 — Main jet | 14 — Float needle valve |
| 5 — Pilot jet air bleed | 10 — Volume control screw | |

Type 126 A



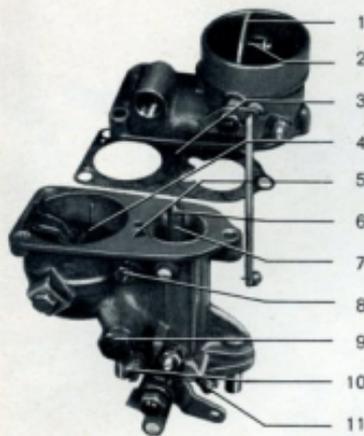
32 PCI

Carburetor cleaning

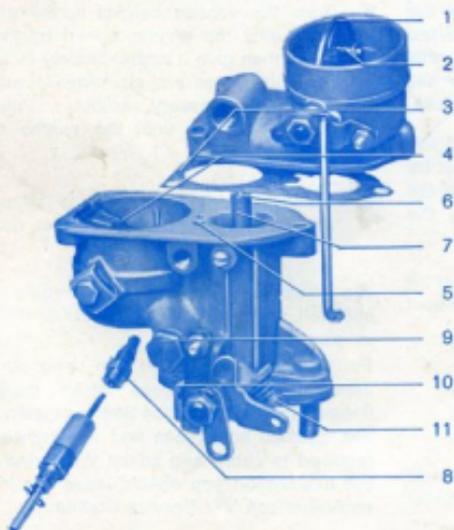
As there is a filter in the fuel pump, the carburetor will normally not require cleaning. Because the industrial engine is often used under various operating conditions, however, it may sometimes be necessary to clean the carburetor. Proceed as follows:

Cleaning

- 1 — Remove float.
- 2 — Remove the main jet plug. Clean float chamber and main jet.
- 3 — Clean pilot jet air bleed.
- 4 — Clean pilot jet. **On the Type 126A the jet can be screwed off the cut-off valve to do this. Use two open-end wrenches to do this. Do not clamp valve in vise.**
- 5 — Clean air correction jet and emulsion tube.
- 6 — Clean the float needle valve.



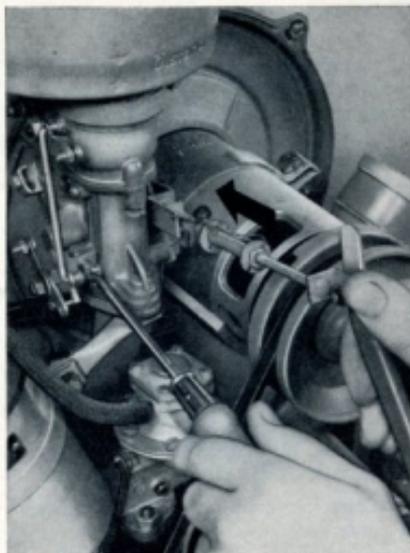
26 VFIS



26 VFIS and 28 VFIS

To re-assemble the unit, proceed in reverse order. Install a new gasket and ensure that it is properly seated between bowl and bowl cover.

Blow out the jets with compressed air. Never use pins or pieces of wire as this will damage the jets.

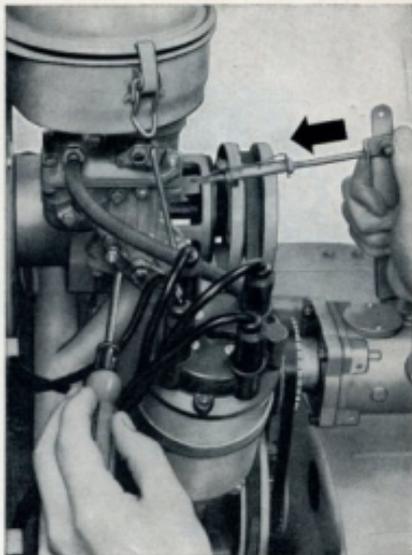


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Adjustment. The carburetor is tested at the factory on the engine and properly adjusted to operate on branded fuels. Do not alter this adjustment by exchanging the jets or the venturi for other than the prescribed sizes.

Only the **idling setting** will require adjustment from time to time. The engine must be warm when making the adjustment and the governor push rod must be held in the idling position.

- 1 — Turn the idling adjusting screw in or out until an idling speed of about 700—800 rpm has been attained. (1)



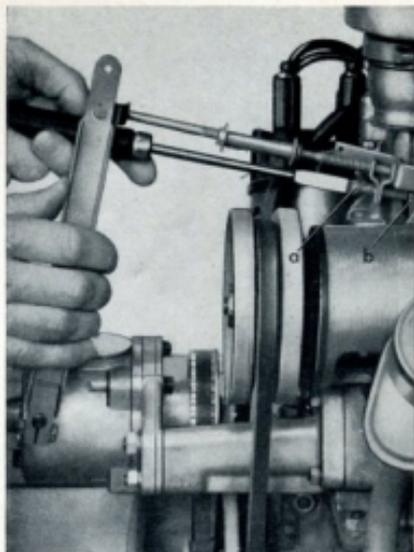
2

- 2 — Turn the volume control screw clockwise until the engine speed begins to drop, then give it approximately $\frac{1}{4}$ to $\frac{1}{2}$ of a turn in an anti-clockwise direction. Then, if necessary, adjust a little in either direction until the engine idles smoothly. (2)

- 3 — Finally re-adjust the idling adjusting screw until the engine runs at normal idling speed. (1)

The adjustment is correct if the engine does not stall when the throttle is either opened or shut suddenly.

Poor idling may also be caused by damaged gaskets, loose intake manifold flanges, incorrect ignition timing or leaky valves. Special knowledge and experience are required to check and adjust the carburetor. For this reason you should leave this job to an Authorized VW Service Station.

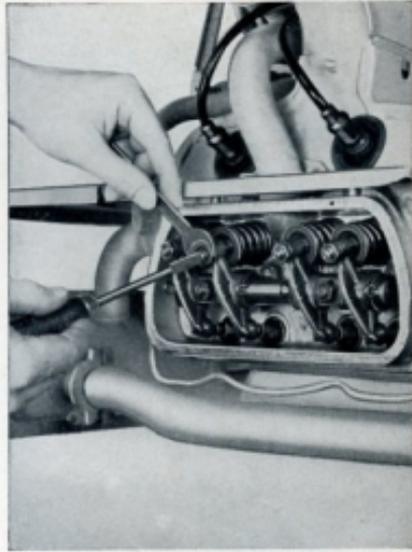
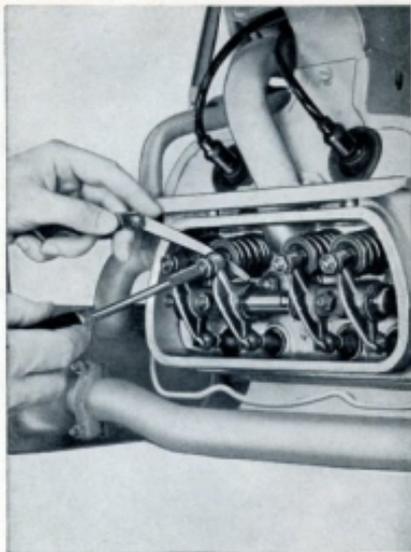


Adjusting Governor Push Rod Stop. "Surging" (continued rapid rise and fall of engine speed) can be eliminated by means of the spring-loaded damping stop on the governor the push rod.

The adjustment should be carried out when the engine has attained operating temperature.

- 1 — Allow the engine to run without load.
- 2 — Steady the rhythmically moving governor by holding the governor push rod.
- 3 — When the engine runs steadily, turn the push rod stop screw until there is a clearance of about 0.5 mm. (0.02 in.) between the screw (a) and the carburetor stop (b).

The engine idles when the push rod is pressed against the spring-loaded stop screw.



Valve Adjustment. This operation should be carried out by a VW Workshop whenever possible. Only in emergencies, when you cannot contact a VW Workshop, should you adjust the valves yourself. The clearance for the inlet and exhaust valves is **0.10 mm (.004 in.)**. The valve clearance increases when the engine warms up. For this reason the adjustment should always be carried out when the engine is cold or only slightly warm (up to a maximum oil temperature of 50° C).

First remove both cylinder head covers. The valves are adjusted in the following sequence: 1st—2nd—3rd—4th cylinder. The arrangement of the cylinders is indicated by the

numbers 1 to 4 on the cover plate. Adjust the valves when the piston of the cylinders concerned is at top dead center on the compression stroke. Starting with No. 1 cylinder, turn the engine over slowly to the left until both valves are fully closed and the timing mark on the lower pulley is in line with the crankcase joint.

Loosen the locknut of the adjusting screw and turn the adjusting screw as required to obtain the proper clearance, using a feeler gauge. Tighten the locknut and re-check the clearance. Check and adjust the other valves to the proper clearance in this manner by turning the crankshaft anti-clockwise another 180° for each cylinder.

Checking the Spark Plugs. Remove the plugs and inspect them. The appearance of the electrodes and insulators gives considerable information regarding adjustment and state of the engine.

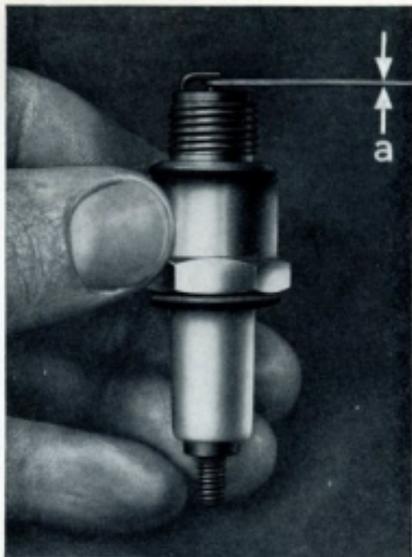
- | | |
|-------------------|--|
| Intermediate-grey | — good adjustment of carburetor and correct performance of spark plug. |
| black | — mixture too rich, |
| light grey | — mixture too lean, |
| oiled up | — failure of spark plug or leaking piston rings. |

The spark plugs have an average service life of approximately 100—200 running hours and should be replaced in good time.

To avoid ignition breakdowns the plugs should be removed and inspected every 100 running hours. Carbon deposits can be removed with a chip of wood. The plugs should be clean and dry to avoid short circuits and tracking. The gap is 0.4—0.5 mm for magneto ignition and 0.6—0.7 mm for battery ignition and is set by bending the outer electrode. Do not forget the plug washers when installing the plugs. Tighten firmly but do not use excessive force.

Ignition Timing. Particular attention should be attached to the importance of correct ignition timing. The engine operation will be seriously affected if the ignition is not correctly timed. In many cases, poor performance, high fuel consumption and engine breakdown are the result of unskilled setting of the ignition. The ignition may not be advanced arbitrarily, even when using premium grade fuels. The alteration of the timing is not only pointless but may cause damage to the engine.

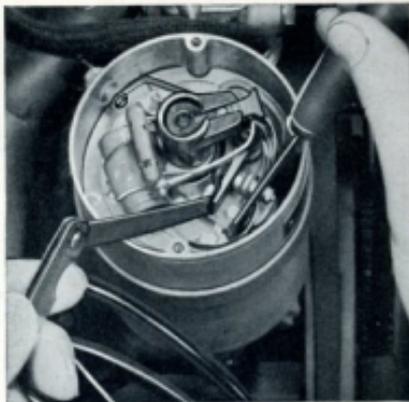
Before setting the ignition, check the contact breaker gap. The timing is set to 7.5° before TDC.



a = 0.4—0.5 mm (.016—.020 in.) magneto ignition
0.6—0.7 mm (.024—.028 in.) battery ignition

Note

Replacement plugs have a gap of 0.6—0.7 mm. When these plugs are fitted in an engine with magneto ignition, ensure that the gaps are set to 0.4—0.5 mm as otherwise the engine may be difficult to start.



Adjustment may only be carried out with the engine cold or up to a maximum oil temperature of 50° C (122° F).

Adjusting Breaker Points. Remove distributor cap. The contact breaker points are adjusted by cranking the engine until the fiber block on the contact arm rests on the highest point of the cam lobe. Then loosen the stationary point locking screw on the contact plate and turn a screwdriver between the adjusting slots until the correct gap of 0.3 mm. to 0.4 mm. (.012 in. to .016 in.) is obtained. (In case of battery ignition, turn the eccentric adjustment screw until the correct gap of 0.4 mm is obtained.) Tighten lock screw.

If the points are burned they should be replaced.

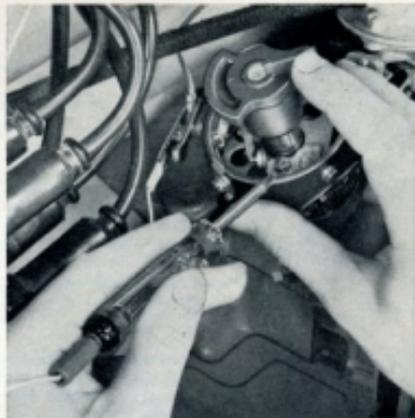
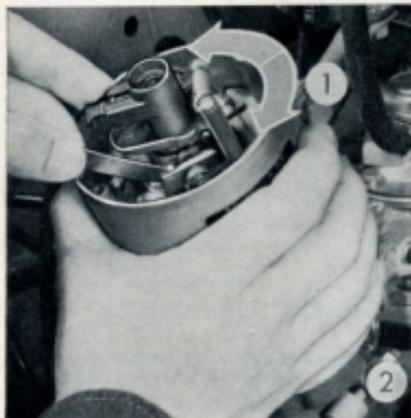


The magneto is lubricated by rubbing a small quantity of Scintilla Type G grease or lithium grease into the felt which is pressed lightly against the breaker cam.



The distributor (with battery ignition) must also be lubricated at regular intervals — see maintenance chart on page 36. In addition to greasing the contact breaker fiber block, a drop of oil is applied to the felt in the cam drilling at the same intervals. The rotor arm must be removed to do this.

After the breaker points have been adjusted, the ignition timing must be reset.



a — Magneto Ignition

Crank the engine clockwise until the mark on the crankshaft pulley lines up with the crankcase joint and the rotor arm points to the No. 1 cylinder cable connector in the magneto cap. The crankshaft should only be turned clockwise.

Loosen the retaining clip (1) and the clamp (2) and rotate the magneto body clockwise until the points are closed. Then place a strip of 0.05 mm. (.002 in.) tinfoil between the breaker points and turn the magneto slowly counter-clockwise until the tinfoil can just be withdrawn. While doing this, press the rotor arm lightly as shown here to cut out the radial play in the magneto drive. This is the position when the breaker points just start to open. Tighten retaining clip and clamp screw and replace magneto cap.

Note

Do not use a test lamp on an engine with magneto ignition as this will destroy the magnetic field of the permanent magnets.

b — Battery Ignition

Crank the engine slowly until the mark on the crankshaft pulley lines up with the crankcase joint and the distributor rotor arm is in line with the No. 1 cylinder mark on edge of distributor body. The crankshaft should only be turned clockwise.

Loosen the clamp and rotate the distributor body clockwise until the contact points are closed. Now switch on the ignition and rotate the distributor slowly counter-clockwise until the contact points just start to open. While doing this, press the rotor arm lightly as shown here to cut out the radial play in the distributor drive.

The spark which jumps across the points makes this check visible and audible. To obtain a more accurate adjustment, it is advisable to use a test lamp or an ignition timing light. The test lamp should be connected between terminal 1 on the distributor and ground. The lamp will light up as long as the contact points are kept open by one of the four cam lobes on the distributor shaft. After the adjustment is completed, tighten the clamp, replace the rotor and install the cap on the distributor.

ENGINE TROUBLE SHOOTING

Symptom	Cause	Remedy	
Engine will not start	a — Fuel tap closed. Fuel filter clogged	a — Open fuel tap. Clean filter	
	b — No fuel in tank	b — Replenish fuel supply	
	c — Float needle valve dirty or sticking	c — Clean or renew needle valve	
	d — Carburetor jets clogged	d — Remove and clean jets	
	e — Choke poppet valve sticking or not closing	e — Check poppet valve and, if necessary, renew choke	
	f — Ignition switched off	f — Switch on ignition	
	g — Breaker points dirty	g — Clean or renew breaker points and adjust ignition timing	
	h — Accumulation of moisture in magneto cover or distributor cap	h — Carefully dry magneto cover or distributor cap and rotor	
	i — Wrongly connected high tension leads	i — Firing order 1—4—3—2	
	k — Ignition cables loose	k — Check cable connections	
	l — Ignition cables damaged or moist	l — Carefully dry high-tension leads, or, if necessary, renew them	
	m — Moist spark plugs (condensed water)	m — Carefully dry spark plugs	
	n — Fuel on spark plugs due to excessive use of choke, sticking poppet valve, or carburetor flooding	n — Dry spark plugs and check fuel system for defects	
	o — In extremely cold weather, spark plug gap too large	o — Adjust spark plug gap 0.3—0.4 mm for magneto ignition 0.4—0.5 mm for battery ignition	
	Engine starts but does not idle steadily and stops again	a — Carburetor idling adjustment incorrect (too rich or too lean a mixture)	a — Adjust idling until engine runs evenly and steadily and exhaust is free from soot
		b — No valve clearance or valves leaking	b — Adjust or grind valves renew if necessary
		c — Air leaks at intake manifold flanges	c — Check intake manifold for cracks
d — Pressure loss between pistons and cylinders		d — Renew pistons and cylinders	
e — Pilot jet cut-off valve defective		e — Withdraw needle from jet by turning the knurled nut or the grub screw	
Engine idles erratically after attaining normal operating temperature. Sooty exhaust	a — Choke closed	a — Fully open choke	
	b — Carburetor idling mixture too rich	b — Adjust idling until engine runs evenly and exhaust is free from soot	
	c — Float needle valve dirty, sticking, or worn	c — Clean or renew needle valve	
Engine misfiring	a — Loose high-tension lead	a — Check connections	
	b — Short circuits in high-tension lead or spark plug connectors	b — Check high-tension leads and spark plug connectors, renew as necessary	
	c — Spark plugs dirty or defective	c — Clean or renew spark plugs	
	d — Valves leaking or sticking	d — Grind or clean valves	

Symptom	Cause	Remedy
Engine runs erratically or cuts out	a — Spark plugs misfiring	a — Check and clean spark plugs. Adjust gap. Renew spark plugs, if necessary
	b — Short circuits at spark plug connectors	b — Renew defective connectors (generally burned)
	c — Short circuits in high-tension leads	c — Dry the moist high-tension leads and renew if damaged
	d — Short circuits in distributor/magneto cap or rotor, or high-tension leakage caused by moisture	d — Inspect parts for burned spots and replace as necessary. Remove any accumulated moisture
	e — Governor defective	e — Renew or repair governor
	f — Magneto defective	f — Renew magneto or have it repaired
	g — Speed limiter maldjusted	g — Correct the adjustment
	h — Engine speed varies	h — Adjust spring-loaded stop for governor push rod
	i — Governor works sluggishly and irregularly. Governor linkage or slip joint for hand throttle sticks	i — Free off by repairing or replacing defective parts
Engine runs hot	a — Fan belt loose, inadequate cooling	a — Adjust fan belt tension.
	b — Incorrect ignition timing	b — Adjust breaker point gap and ignition timing
	c — Fuel/air mixture too lean	c — Check and adjust carburetor
	d — Ignition advance mechanism does not function properly	d — Clean or recondition advance mechanism in magneto or distributor
	e — Insufficient oil cooling caused by dirt accumulated on the cylinder head ribs and the oil cooler	e — Clean by applying compressed air in opposite direction to air stream; if necessary remove fan housing while cleaning
Engine pinks under load at normal speed	a — Pre-ignition	a — Adjust ignition timing properly
	b — Fan belt loose, causing engine to overheat	b — Adjust fan belt tension.
	c — Fuel with low anti-knock rating	c — Use fuel with higher anti-knock rating
	d — Ignition advance mechanism does not function properly	d — Repair ignition advance mechanism
	e — Excessive carbon deposits in combustion chambers	e — Remove cylinder heads and decarbonize
	f — Heat range of spark plugs too low	f — Use specified spark plugs. Note plug gaskets, one gasket for each plug

COLD WEATHER OPERATION

A lubrication and maintenance service should always be carried out on the engine at the beginning of the cold season. The following instructions should also be noted when running the engine at very low temperatures.

1 — Fuel system

When the temperature is between 0° C and +10° C and the air humidity is very high it may be found that the engine stalls frequently when idling and tends to misfire when accelerated. Assuming that the engine is in good condition, the cause of this trouble can be the formation of ice in the carburetor.

Remedy:

The ice formation can be prevented to a large extent by mixing de-icing additives (such as 2% Isopropylalcohol) with the fuel. If an engine still tends to ice-up despite the use of such an additive, it is advisable to install a pre-heating device for the combustion air. This can be done in any VW Workshop with the aid of the detailed fitting instructions in Technical Bulletin K 11.

2 — Electrical system

- a — All connections in the ignition system should be checked and cleaned as necessary because oxidized connections cause voltage drops and this promotes difficult starting.
- b — If the engine is difficult to start at low temperatures, the ignition spark can be boosted on engines with battery ignition by fitting a high performance coil.
- c — The spark plugs can be protected against shorting and tracking due to dirt, dampness and water splashes by fitting protective caps (Part No. 111 905 631).
- d — In winter the battery should be charged every 6—8 weeks. Acid level and specific gravity should be checked and the voltage of the cells checked under load. This work should preferably be carried out in a specialist workshop.

The battery posts and cable terminals should be cleaned with a proper cleaner from time to time and the posts and terminals greased with special grease or petroleum jelly after the terminals have been connected again.

In countries with extremely low temperatures, it is advisable to charge the battery with a trickle charger when engine is not running and protect battery against the cold by using a mains fed battery heater. The maker's instructions should be followed when using these appliances.

e — When temperatures are low, the plug gaps can be reduced to facilitate starting.

Plug gaps		
Spark plugs	normal	at low temperatures
Battery ignition (heat value 145)	0.6—0.7 mm (.024—.028 in.)	0.4—0.5 mm (.016—.020 in.)
Magneto ignition (heat value 175)	0.4—0.5 mm (.016—.020 in.)	0.3—0.4 mm (.012—.016 in.)

3 — Anti-corrosion treatment

When the engine is to be taken out of service for a period, it is advisable to carry out anti-corrosion treatment as described on page 14.

TROPICAL OPERATION

The following measures are necessary to protect the engine against heat and dust.

1 — Oil bath air cleaner

If the engine is to be used in districts where there is a great deal of dust, a larger oil bath air cleaner should be fitted. This can be done in any VW Workshop with the aid of the detailed fitting instructions in Technical Bulletin K 7.

2 — Oil dipstick

The dipstick should be sealed on the guide tube by inserting a felt washer under the cap on the dipstick. If necessary the dipstick can be bent slightly so that it fits tightly in the tube.

3 — Distributor

If the engine has a distributor it should be fitted with a special washer to keep out dust.

4 — Oil filter

In very dusty areas it is advisable to install a by-pass oil filter to give the engine additional protection. The oil change intervals should not be extended when this filter is fitted.

The oil filter can be installed in any VW Workshop with the aid of the fitting instructions supplied with the filter by the manufacturer.

5 — Dust-proofing engine when not running

When engine is not to be run for a prolonged period, the exhaust tail pipes and the crankcase breather pipe should be sealed to stop dust getting into the engine.

The oil bath air cleaner does not need to be covered in any way but it is essential to check the condition of the oil in the cleaner before starting to use the engine again.

6 — Corrosion due to high air humidity

If engine is not to be run for a long time in areas where the air humidity is high, it should be given anti-corrosion treatment as described on page 14.

7 — Maintenance instructions

a — Air cleaner

The level of the oil in the air cleaner should be checked daily but the cleaner does

not normally require servicing unless it has extracted so much dirt that there is only 4—5 mm of oil above the layer of sludge. In very adverse conditions it may be necessary to clean the air cleaner daily.

b — Fan belt

When the outside temperature is high, the fan belt tension should be checked regularly — preferably daily — in order to ensure that the engine is cooled properly. As soon as the belt shows signs of wear it should be replaced without delay.

c — Battery (optional extra)

The level of the acid in the battery should be checked every week. The acid should be 5 mm above the top edges of the plates or as indicated by the marker installed in some batteries. When level has dropped due to evaporation, top up only with distilled water. As high temperatures increase the self-discharging tendency of the battery it is advisable in tropical countries to use an acid mixture with a specific gravity of $27^{\circ} \text{Bé} = 1.230$ when battery is fully charged. To get this specific gravity, take 240 cc of liquid out of the battery and put back the same quantity of distilled water. Afterwards the specific gravity must be checked with a hydrometer and correct as necessary.

d — Fuel filter

The strainer in the fuel pump should be checked every week and cleaned as necessary. The intervals given in the maintenance chart for strainer cleaning should not be exceeded.

TECHNICAL DATA

Type	122	126 A
Design	4 cylinder, 4 cycle, carburetor engine	
Arrangement of cylinders	Horizontally opposed (Flat four)	
Bore	77 mm. (3.031 in.)	85.5 mm. (3.365 in.)
Stroke	64 mm. (2.520 in.)	69 mm. (2.710 in.)
Capacity	1192 cc	1584 cc
Compression ratio	7.0 : 1	7.7 : 1
Weight of engine, with normal equipment	94 kg (207 lbs.)	100 kg (220 lbs.)
Turning direction (flywheel end)	Anti-clockwise	
Crankcase	Magnesium alloy	
Crankshaft bearings	Four plain bearings	
Valve actuating mechanism	Cam followers, push rods and rocker arms	
Valves	Overhead, one intake and one exhaust for each cylinder	
Valve clearance	Intake 0.10 mm. (.004 in.) Exhaust 0.10 mm. (.004 in.)	} up to a max. oil temp. of 50° C (122° F)
Pistons	Aluminium alloy with steel inserts	
Mean piston speed	6.4 m./s. at 3000 rpm (1263 ft. per min.) 6.9 m./s. at 3000 rpm (1374 ft. per min.)	
Cylinders	Single cylinders of special grey cast iron	
Cylinder heads	Aluminium alloy, one head for two cylinders	
Cooling	Radial blower driven by V-belt	
Amount of cooling air	Approx. 485 Liters/sec. at 3000 rpm (17 cu. ft.) Approx. 595 Liters/sec. at 3000 rpm (21 cu. ft.)	
Lubrication	Force feed by gear pump	
Oil capacity	Metric — 2.5 Liters U. S. — 5.3 Pints Imp. — 4.4 Pints	
Oil cooling	Flat tube cooler in air stream	
Fuel supply	by fuel pump	
Fuel	86 Octane (Res. F 1)	90 Octane (Res. F 1)
Carburetor	SOLEX downdraft carburetor	
	26 VFIS	26 VFIS
	28 PCI	28 VFIS
		32 PCI
Air cleaner	Oil-bath type or special types (according to engine location)	

Magneto ignition High-tension Scintilla-Vertex magneto with speed limiter (Suppressed)

Contact breaker gap 0.3—0.4 mm (.012—.016 in.)

Battery ignition (on request) 6 or 12 Volt

Contact breaker gap 0.4 mm (.016 in.)

Spark plugs

Heat range 145

Thread 14 mm

Spark plug gap

 a — with magneto ignition 0.4—0.5 mm (.016—.020 in.)

 b — with battery ignition 0.6—0.7 mm (.024—.028 in.)

Types

Battery ignition	Magneto ignition
Bosch W 145 T	Bosch W 145 T 1
Beru 145/14	Beru 145/14

 or plugs with similar values from other manufacturers

Firing order 1—4—3—2

Firing point 7.5° before TDC

Governor Centrifugal, acting on carburetor throttle

Starting system Starting handle or, on request, 6 or 12 Volt electric starter, mounted horizontally or radially

Clutch Single disc, dry (on request)

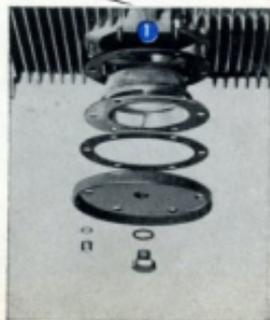
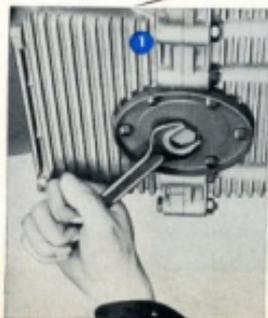
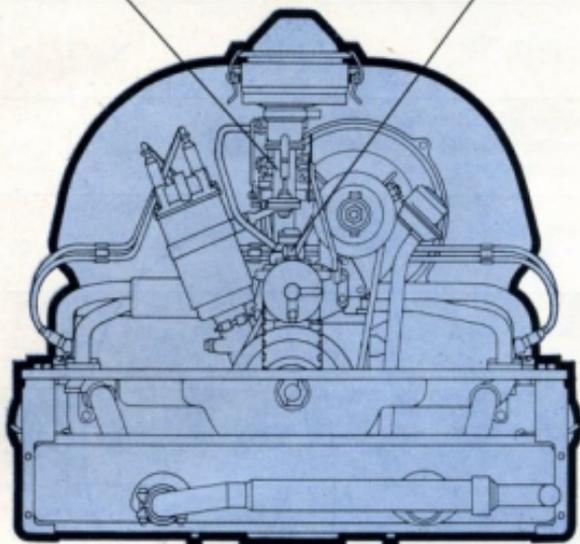
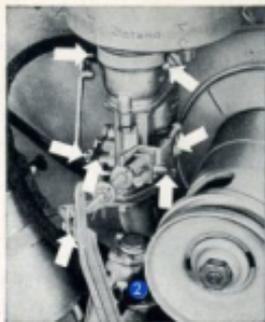
LUBRICATION CHART

No.	Operation	After 10 hours operation	After 50 hours operation and then every 50 hours ¹⁾
1*	Change oil, clean strainer, check for leaks	×	×
2	Lubricate carburetor linkage	×	×
3	Lubricate governor	×	×
	Check battery (if fitted) clean and grease terminals	×	×

* Or at least every 6 months.

LUBRICANTS

Lubricant	Lubrication Points	Specifications
Engine oil (Branded HD oil for spark ignition engines)	Engine, oil bath air cleaner, governor, carburetor controls, cam drilling in distributor	See pages 12/13 for oil viscosities
Lithium grease	Cam felt in magneto, or breaker arm fiber block in distributor	Multi-purpose grease or Scintilla Grease Type G



MAINTENANCE CHART

Operation	After 10 hours operation	After 100 hours operation and then every 100 hours ^f
Check air cleaner, clean lower part if necessary	X	X
Check fan belt	X	X
Clean fuel pump filter	X	X
Check breaker points and replace if necessary, lubricate magneto or distributor, adjust contact breaker gap and ignition timing	X	X
Adjust valve clearance and fit new cylinder head cover gaskets	X	X
Clean or replace spark plugs and check compression		X
Check security of crank handle bracket nuts and bolts (if fitted)	X	X
Adjust idling	X	X
Check governor linkage and toothed belt (if fitted)	X	X

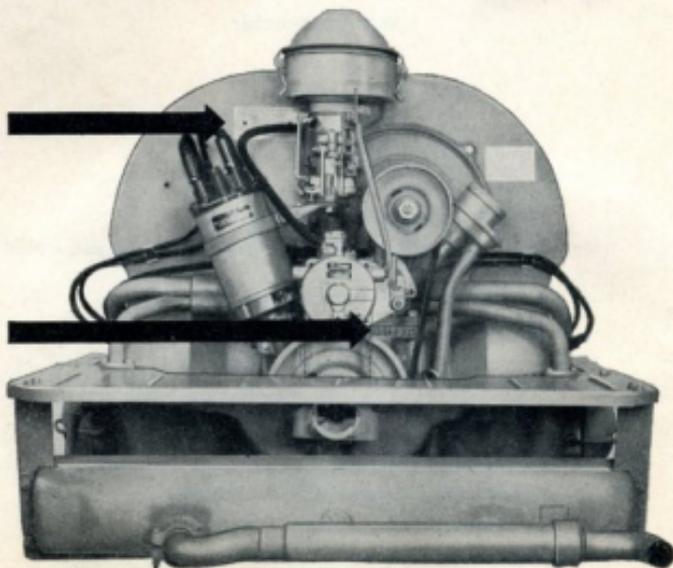
1) Or at least at yearly intervals

Delay and confusion can be avoided if the correct details are furnished on parts orders and correspondence, i.e. type, year of manufacture, engine number, etc.

Protect your Warranty rights by adhering strictly to the conditions given on both sides of the Warranty Voucher. Take care not to lose the Voucher.

The Identification Plate is found on the left-hand side of the fan housing.

The Engine Number is stamped on the crankcase near the generator support.



Tools and Accessories

- 1 Tool Bag
- 1 Spark Plug Wrench
- 1 Tommy Bar
- 1 Open End Wrench 8 x 13
- 1 Pair of Combination Pliers
- 1 Screwdriver 0.8
- 1 Socket Wrench 13 mm.
- 1 Starting Handle
- 1 Fan Belt
- 1 Toothed Belt
- 1 Warranty Voucher

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