

Industrial Engine

Type 122

INSTRUCTION MANUAL

EA-83

January 1962



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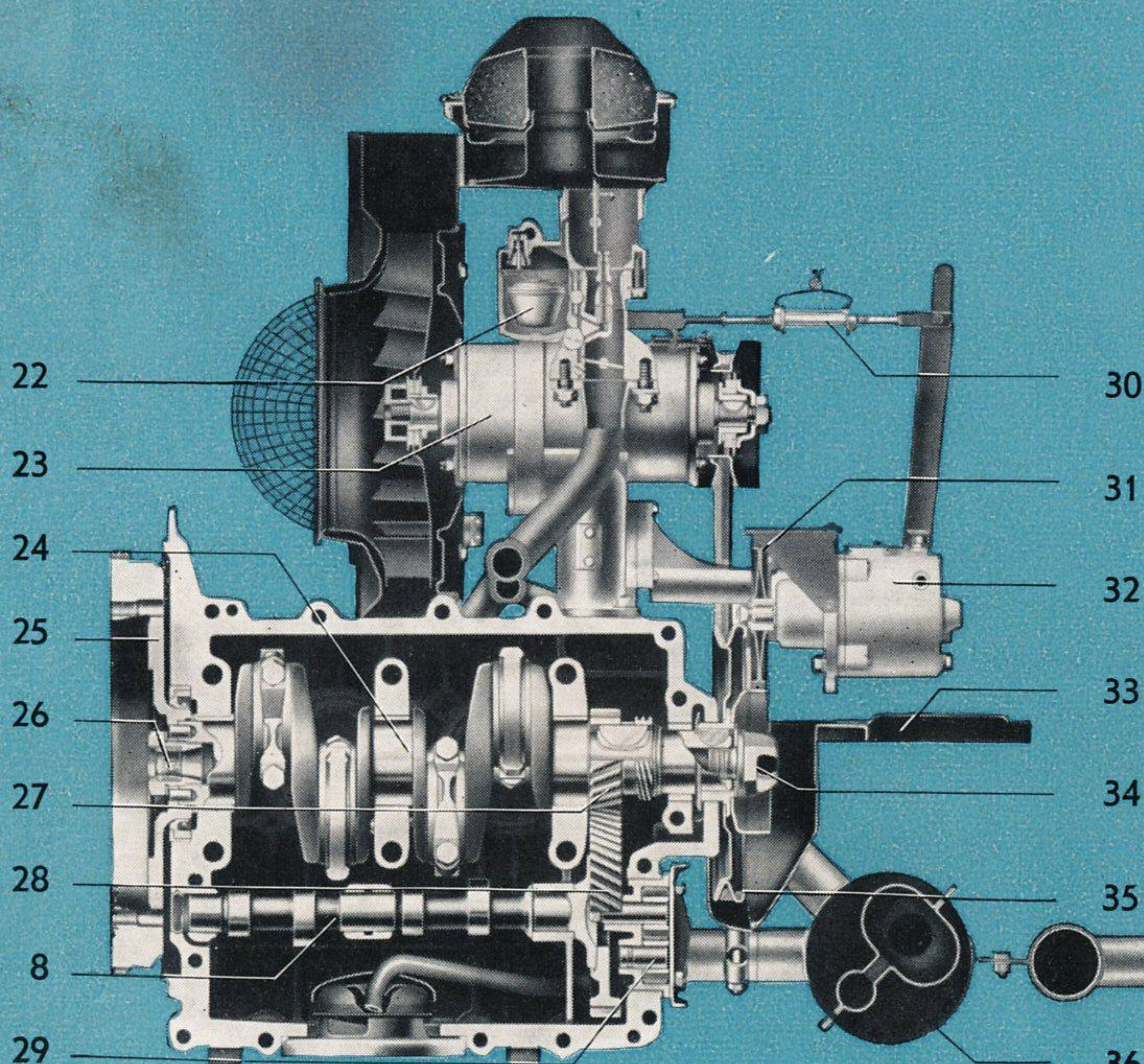
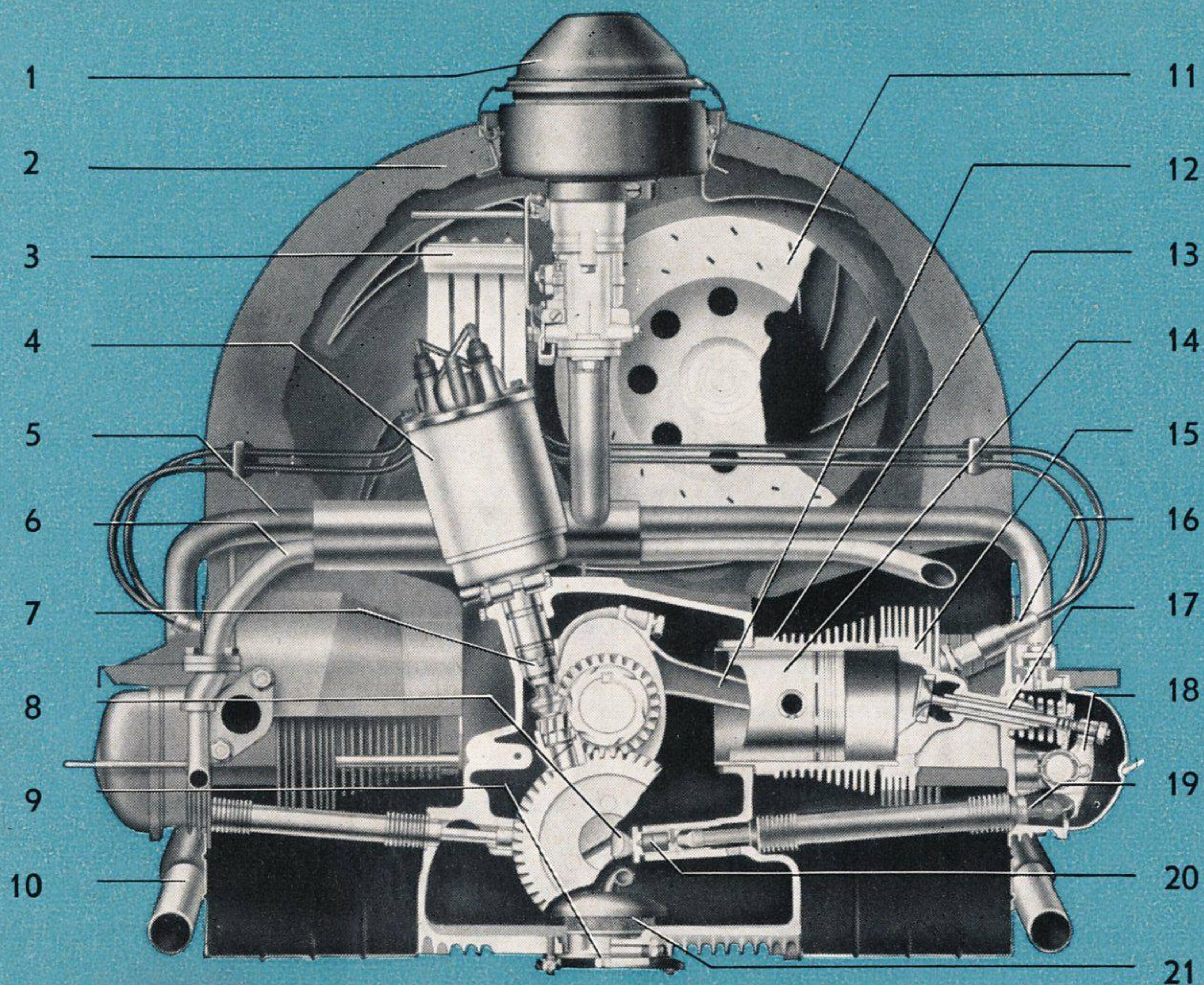
VOLKSWAGENWERK A.G. · WOLFSBURG
(GERMANY)

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 more than four million VW vehicles. The VW Industrial Engine is provided with magneto ignition and governor to meet special operating conditions and is supplied to run at different speeds.

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.

V O L K S W A G E N W E R K A G



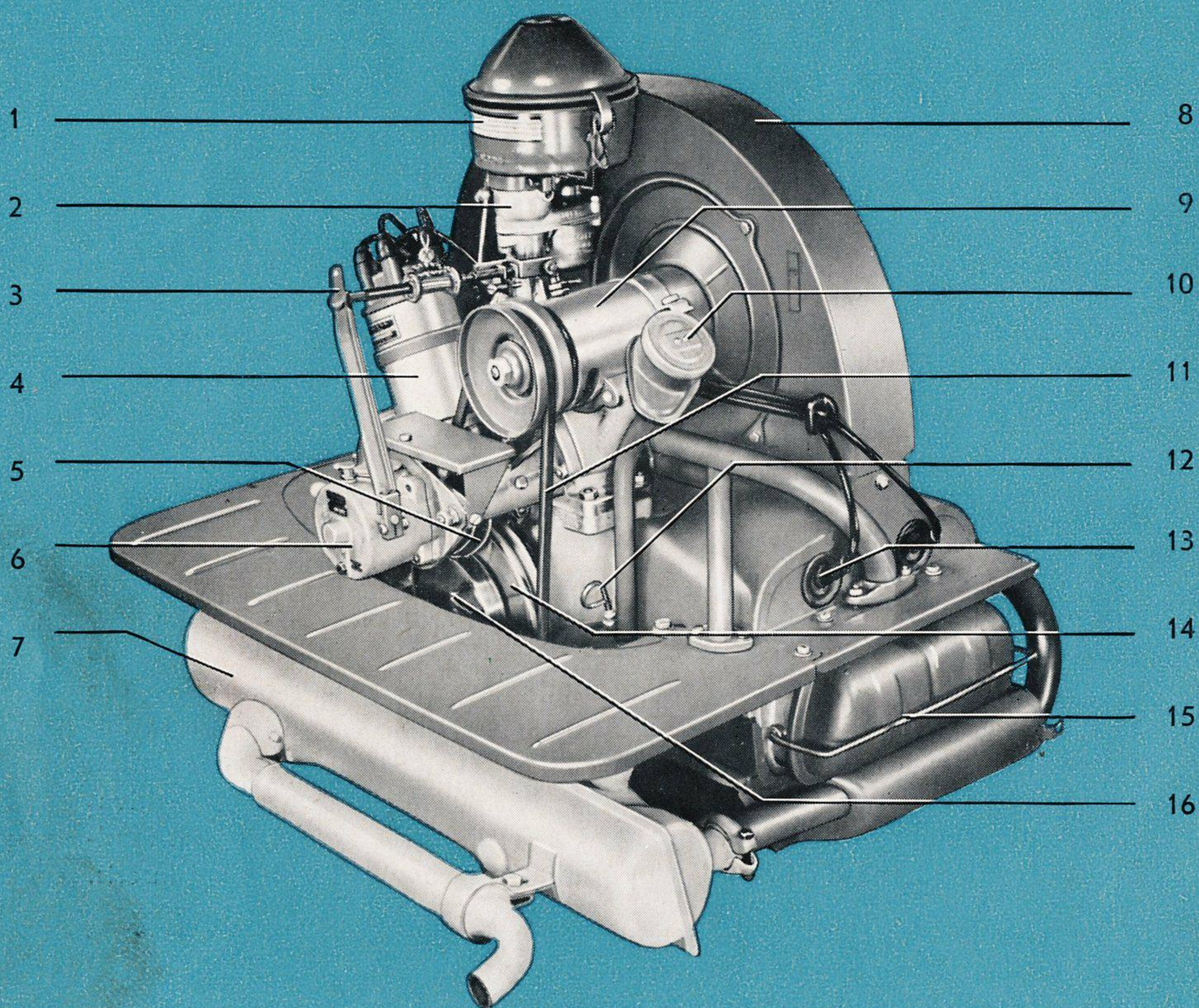
- 1 — Air cleaner
- 2 — Fan housing
- 3 — Oil cooler
- 4 — Magneto
- 5 — Intake manifold
- 6 — Intake manifold preheater
- 7 — Magneto drive shaft
- 8 — Camshaft
- 9 — Oil drain plug
- 10 — Exhaust pipe
- 11 — Fan
- 12 — Connecting rod
- 13 — Cylinder
- 14 — Piston
- 15 — Cylinder head
- 16 — Spark plug cable and connector
- 17 — Valve
- 18 — Rocker arm
- 19 — Valve push rod
- 20 — Cam follower
- 21 — Oil strainer
- 22 — Carburetor
- 23 — Fan bearing
- 24 — Crankshaft
- 25 — Flywheel
- 26 — Gland nut with needle bearing
- 27 — Crankshaft gear
- 28 — Camshaft gear
- 29 — Oil pump
- 30 — Governor push rod
- 31 — Friction wheel
- 32 — Governor
- 33 — Rear cover plate
- 34 — Starter handle dog
- 35 — Fan pulley
- 36 — Muffler

GENERAL DESCRIPTION

The air-cooled VW Industrial Engine is of the 4-cylinder, 4-cycle type. Two pairs of cylinders are horizontally opposed (flat four). Each pair has one mutual cylinder head made of light-metal alloy. The overhead valves are located in the cylinder heads and are operated by the camshaft via cam followers, push rods and rocker arms. The short and counter-balanced crankshaft rests in four bearings and is heat-treated at its four points of support. It drives the camshaft through helical gears. The connecting rods are fitted with lead-bronze 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.

The oil pump of the pressure feed lubrication 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 thicker, an oil pressure relief valve makes it possible for the engine to be lubricated direct, that is, by avoiding the oil cooler. The air cooling of the engine is done by means of a fan, which is connected to the crankshaft by an adjustable V-belt and driven at 1.8 times the engine speed. The fan sucks in air through an opening in the fan housing, and the air cools the engine by passing through the cylinder fins.



1 — Oil Bath Air Cleaner
 2 — Carburetor
 3 — Governor Linkage
 4 — Magneto
 5 — Friction Wheel

6 — Governor
 7 — Muffler
 8 — Fan Housing
 9 — Fan Bearing
 10 — Oil Filler and
 Breather

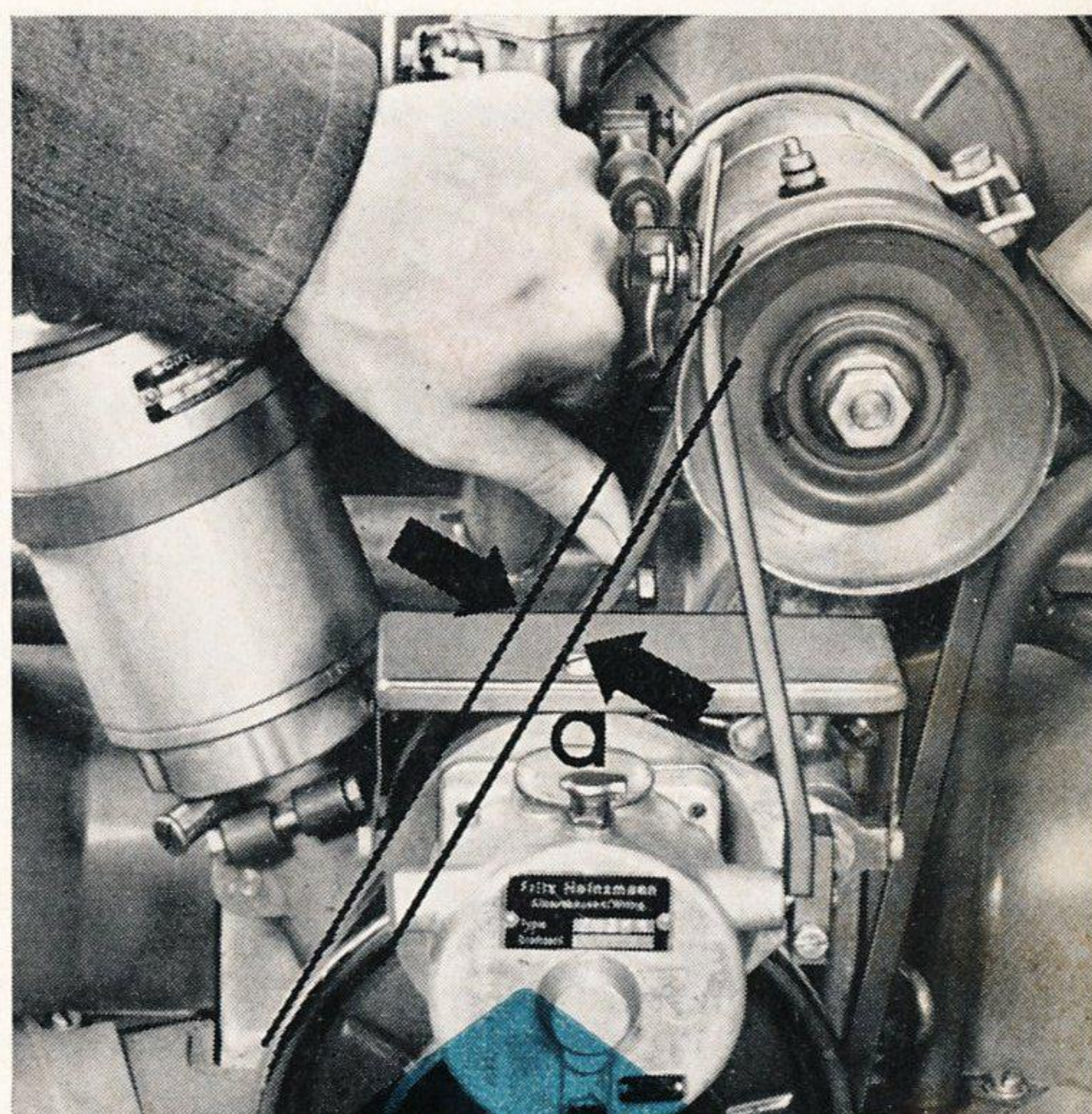
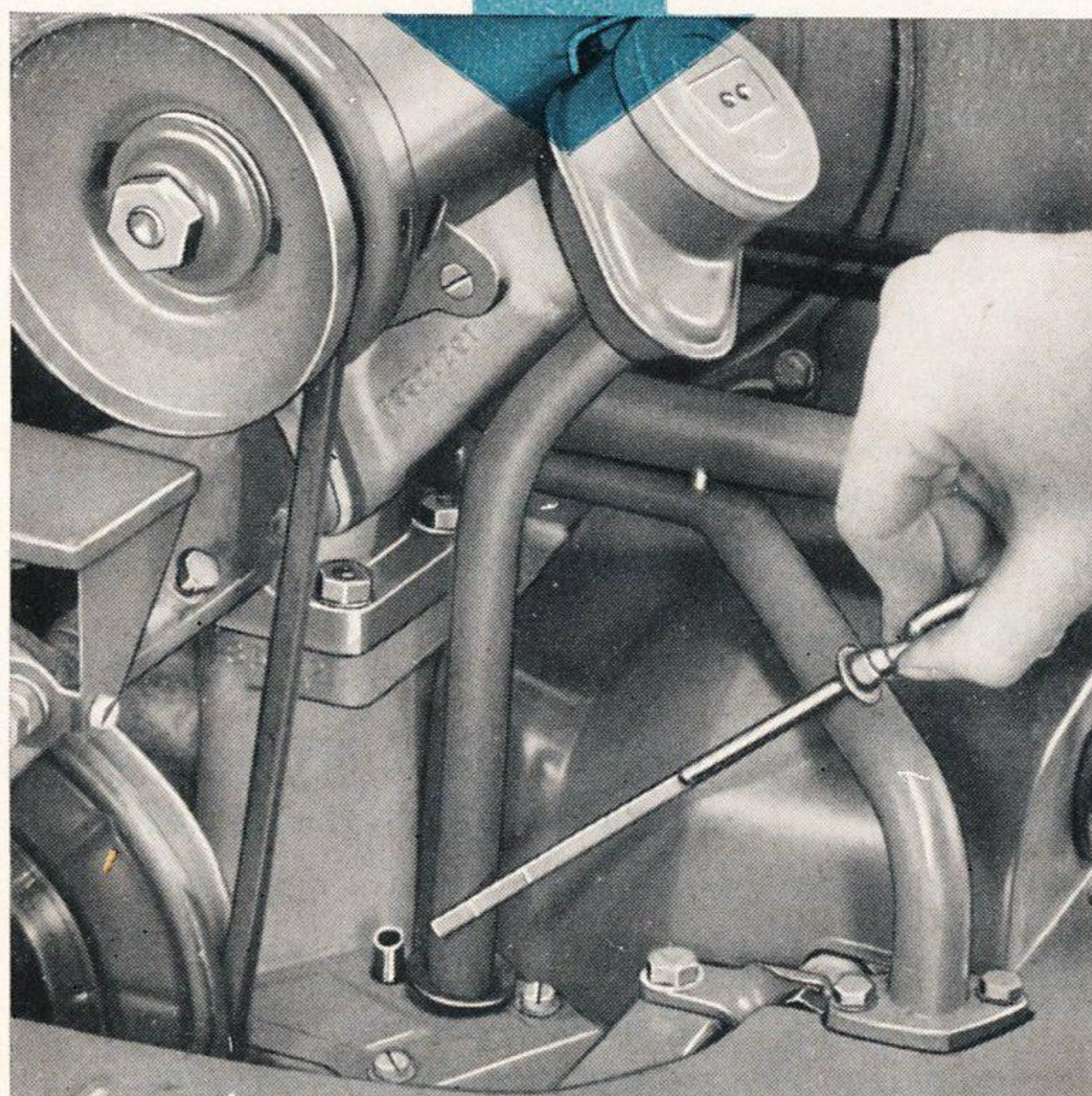
11 — Fan Belt
 12 — Dipstick
 13 — Spark Plug Connector
 14 — Fan Pulley
 15 — Cylinder Head Cover
 16 — Starter Dog

OPERATING INSTRUCTIONS

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

Engine Oil Level

The oil level should be checked with the engine at rest. The oil level is satisfactory when it is between the two marks on the oil dipstick, but it should never be permitted to drop below the lower mark. To make an accurate check, it is best to wipe the dipstick with a clean rag beforehand. With the engine operating continuously, it is advisable to check the oil level every 10 hours. If necessary, replenish with oil of the proper specification. Select an HD Oil of a well-known and dependable brand right at the beginning, and keep to it.



Fan Belt

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 with the thumb, must yield approximately 1.5 cm. (approx. 0.6"). No traces of excess wear, such as frayed edges, should be perceptible.

$a = 1,5 \text{ cm.}$
(approx. 0,6")

The Fuel Quantity

should be checked before putting the engine into operation. This will avoid annoying interruptions. It is recommended that the fuel tank is 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 VW Industrial Engine will run on all normal branded fuels. These fuels, including gasoline-benzol mixtures are characterised by their purity, consistent quality and adequate antiknock properties.

The selection of a grade and brand of fuel is therefore left entirely to your discretion.

Special care should be taken when filling the tank from cans to avoid dirt and foreign matter entering the tank. It is advisable to 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 still at operating temperature.

The choke control

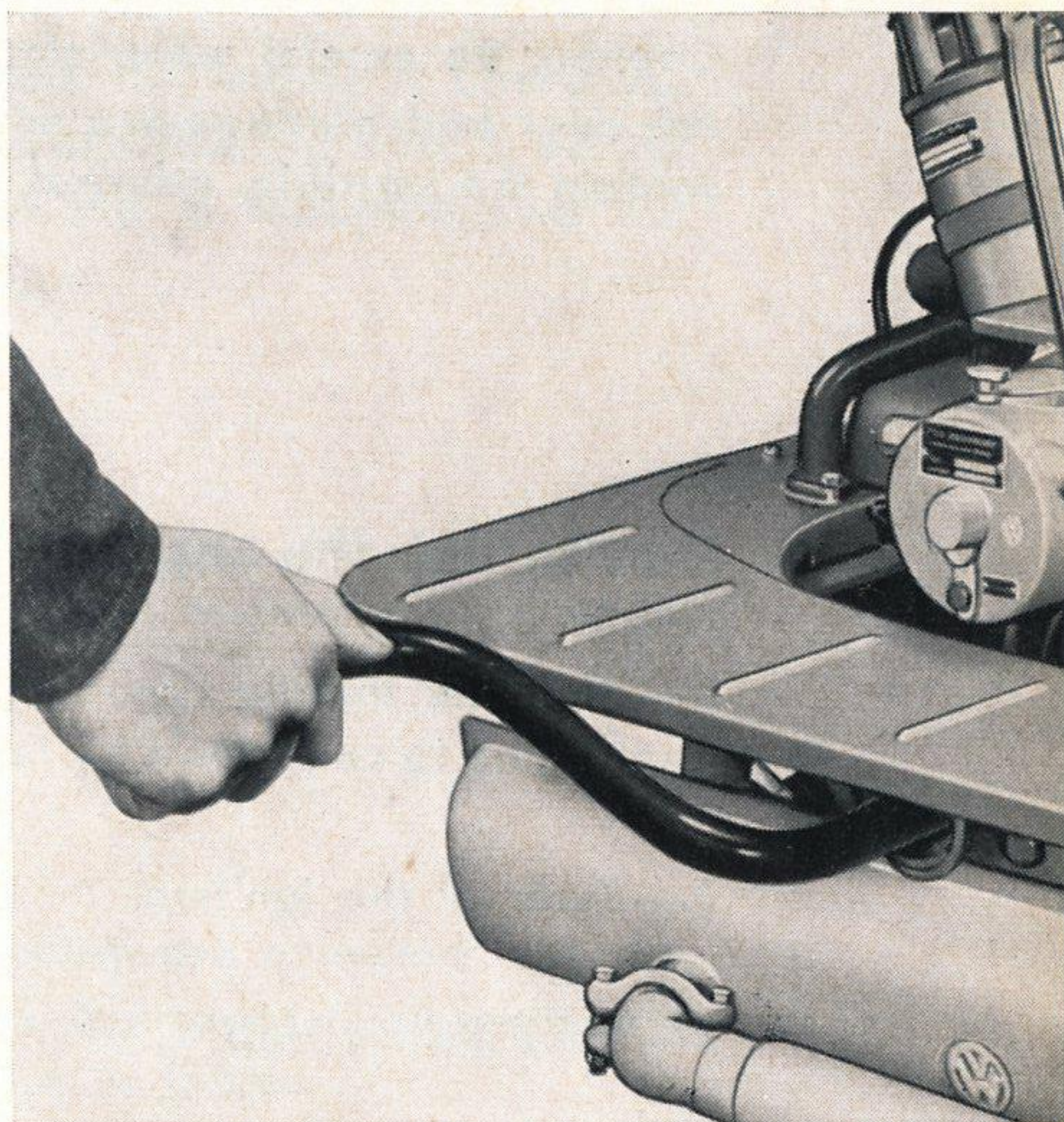
operates the choke, which, when closed, enriches the mixture.

The throttle control

actuates the throttle of the carburetor, allowing alteration of the engine speed independently of the automatic governor in the range from idling speed to the limit fixed by the governor.

To start the engine when cold

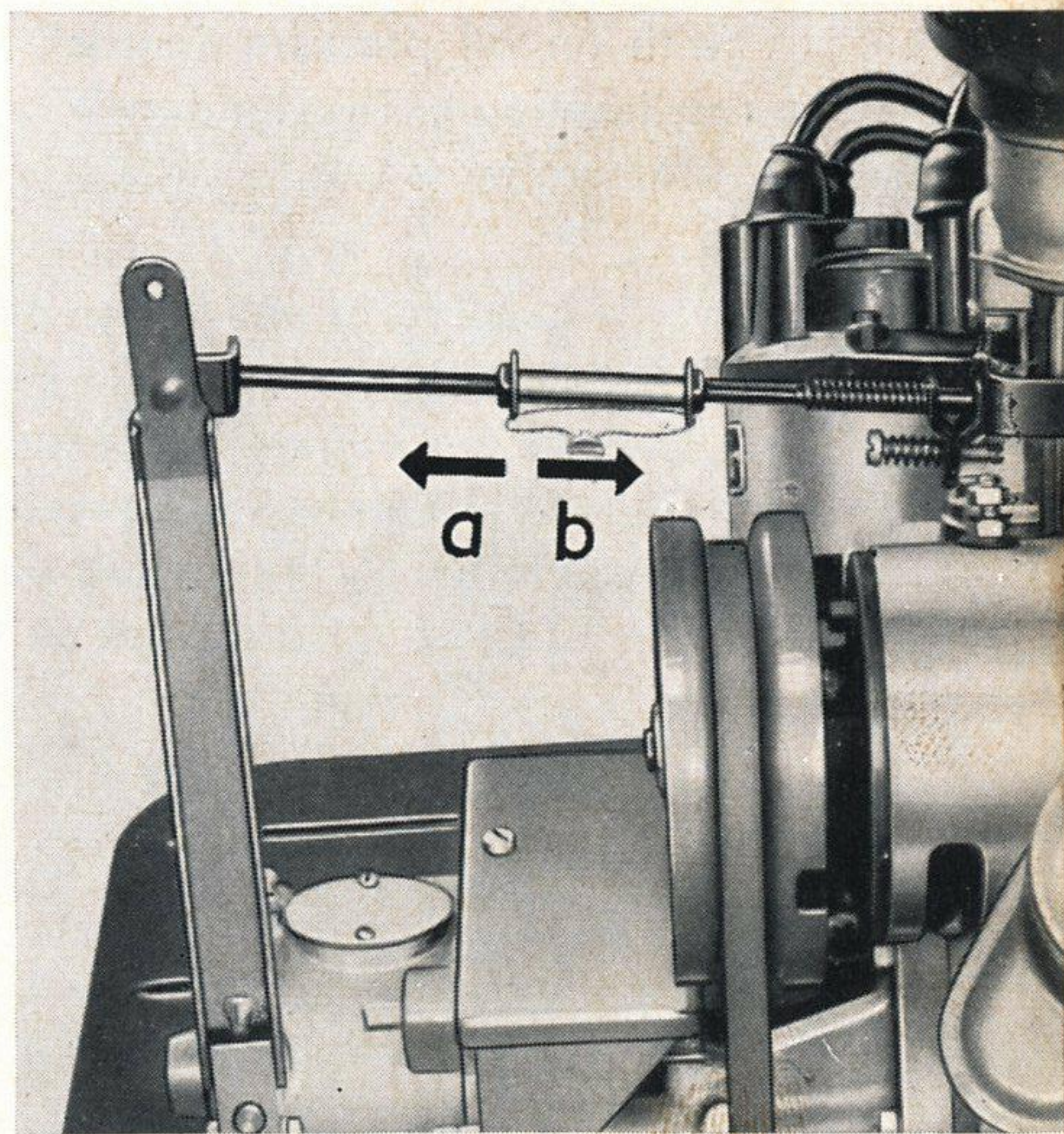
- 1 — Open the fuel tap.
- 2 — Switch on the ignition.
- 3 — Fully close the choke.
- 4 — Shift the throttle control linkage to the idling position.
- 5 — Crank the engine or press the starter button.
- 6 — As soon as the engine fires, slowly open the choke. Let the engine run at a fast idle speed for 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.



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.

To start the engine when hot

- 1 — Switch on the ignition.
- 2 — Shift the throttle control linkage to the idling position (do not close the choke).
- 3 — Crank the engine. If the engine does not fire immediately because it is still too hot, push the throttle control linkage to the operating position and repeat the starting. As soon as the engine fires, push the control linkage back to the idling position and then again slowly to the operating position. Do not repeatedly open and close the throttle if the carburetor is equipped with an accelerator pump.



a = Operating position b = Idling position

Caution. Be careful when starting the engine inside closed rooms. See that the door 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 half a minute.
- 2 — Turn off the ignition.
- 3 — Shut the fuel tap.

Warning Lamps

If the power systems which incorporate generator and battery are equipped with an oil pressure contact, a warning lamp lights up when the ignition is switched on. The light will go out when the engine is started and the oil pressure increases.

Caution. If the lamp lights up during operation, the chances are that the oil circulation has been interrupted, which means that the lubrication of the engine has ceased. Stop the engine at once and check the oil level before you consult a service station. An occasional flashing of the lamp with the engine warm and at low speed does not indicate trouble, if the light goes out as the speed increases.

If an oil pressure gauge is fitted, the lowest pressure indicated on the dial should be 0.5 atm. (7 lbs./sq. in.), at idling speed after the engine has attained operating temperature.

If the engine is equipped with a generator, a warning lamp is provided. The light will go on when the ignition is switched on and when the engine is idling. The light will go out when the speed increases.

Caution. If the warning lamp lights up while the engine is operating, the fan belt may be broken. Stop the engine and find out what is wrong, for when the fan belt is broken, the cooling is disrupted and the generator no longer charges.

Note:

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.

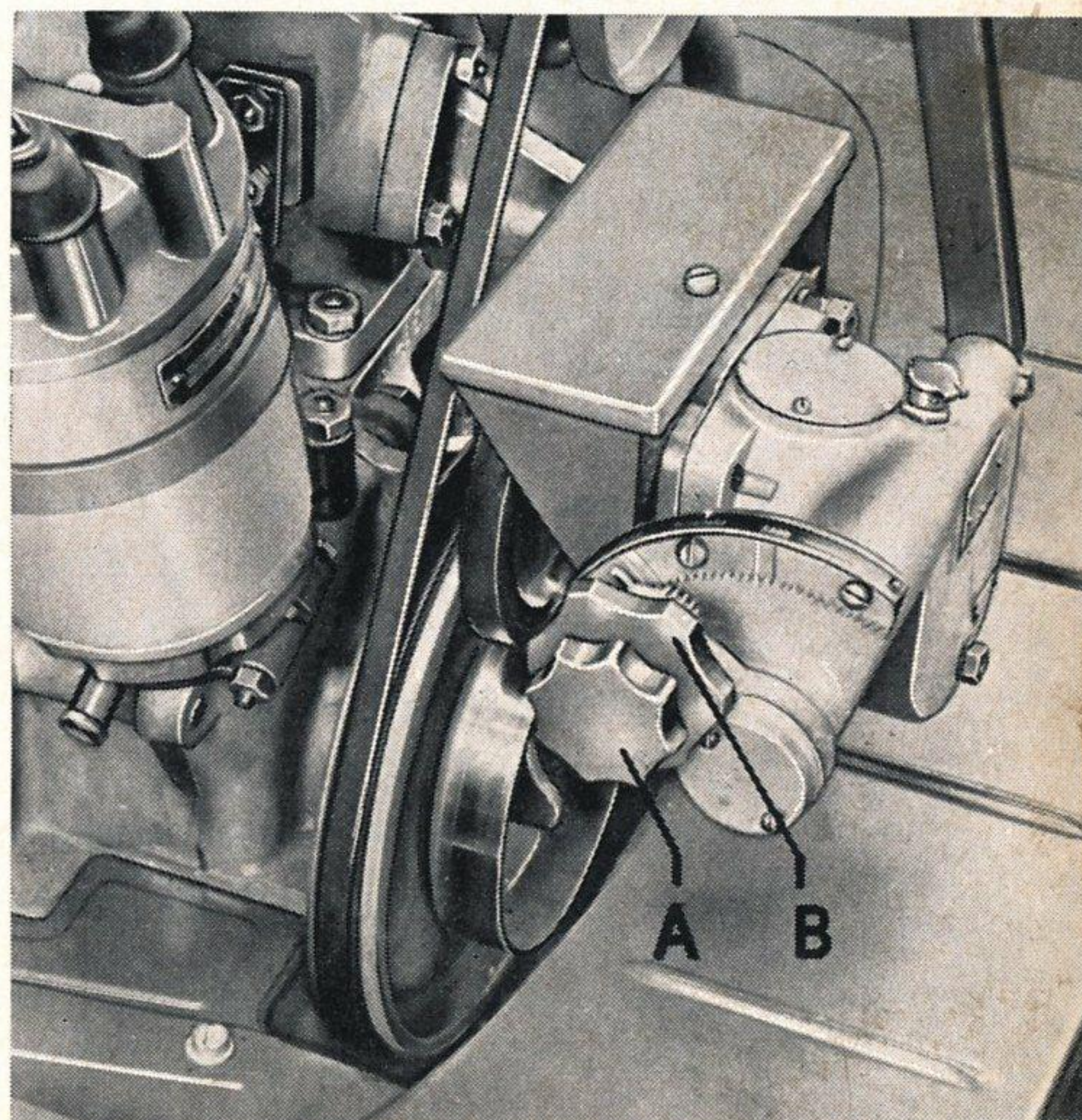
To avoid this, a 9 Ohm resistance must be installed between terminal B + (51) on the generator and ground as a constant current consumer.

Adjustable Governor

If the engine is fitted with a governor, the speed should be regulated as follows:

- 1 — Start the engine.
- 2 — Loosen the lock nut.
- 3 — Regulate speed by turning the knurled disc.
- 4 — Tighten lock nut.

A — Lock nut
B — Knurled disc



LUBRICATION

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 safety, and to ensure the long life and good service which you have the right to expect from this highly economical engine.

To lubricate correctly means to lubricate carefully and at prescribed intervals

so do not neglect to carry out all the tasks contained in the Lubrication Chart on page 33.

Changing Oil

at the prescribed intervals is necessary even if the very best branded oils are used. Dirty oil in your engine simply means increased wear and a shorter period of life for your engine.

The oil is drained by removing the plug in the oil strainer cover. To ensure complete draining, it is important that the operation is performed while the engine is warm. Replace the plug and tighten correctly.

The engine is refilled with 2½ liters of HD oil (5.3 U.S. pints, 4.4 Imp. pints).

The constant use of HD oil renders engine flushing unnecessary.

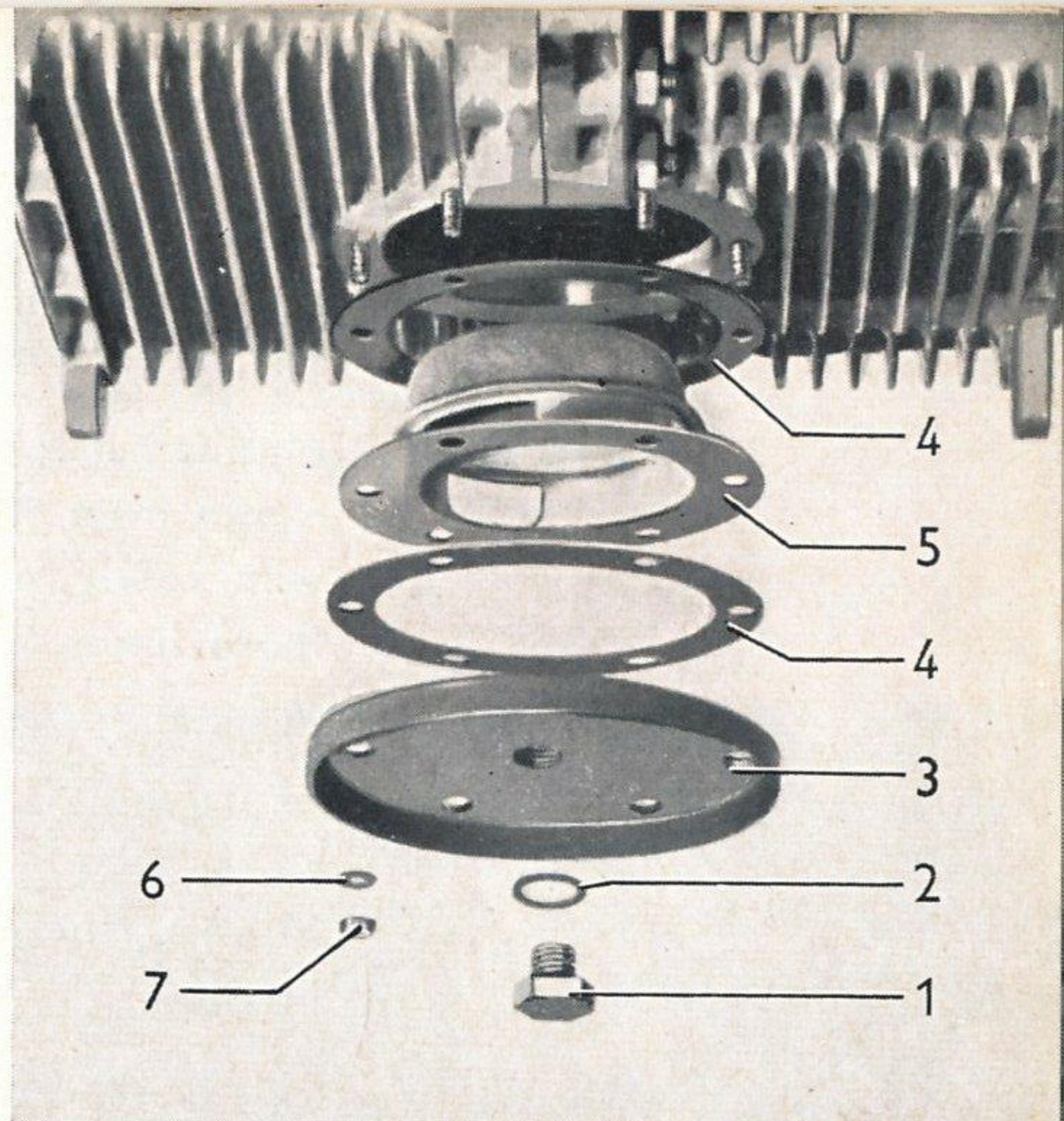
Prior to filling the engine with oil, cover the governor drive wheels to prevent them from being splashed with oil.



The Oil Strainer

retains foreign matter and should be taken out and cleaned at each oil change. The two gaskets should be renewed.

- 1 — Oil drain plug
- 2 — Gasket
- 3 — Oil strainer cover
- 4 — Gasket
- 5 — Oil strainer
- 6 — Lock washer
- 7 — Hexagon nut



Types of Lubricant

The advantages of using a **branded HD engine oil** are quite evident.

HD oil is an oil with proved oxidation stability, bearing corrosion preventive properties and detergent-dispersant characteristics which tend to hold in suspension foreign contaminants which would normally settle on engine parts. These foreign contaminants will drain out with the oil at the periodical oil changes. The detergent properties of HD oil will make the fresh oil darker after a short period of operation. This is quite natural and there is no reason whatsoever to change the oil earlier than called for in the Lubrication Chart.

Additional lubricating agents should not be added to HD oil.

Some More Information on Engine Oils

It is left to your discretion to select an oil from well-known and dependable brands, which has the proper viscosity to suit the requirements. In cases of doubt, refer to your authorized VW Dealer who will be glad to help you with your lubrication problems. It is recommended that you select "your" oil right at the beginning and keep to it at all future service oil changes.

Viscosity of the lubricant is an indication of its resistance to flow at a given temperature. The SAE numbers classify lubricants in terms of viscosity, but with no reference to other characteristics or properties.

- SAE 30 This oil is satisfactory in tropical climates where the temperature range will frequently rise above 30° C (86° F).
- SAE 20 W/20 engine oil is recommended for use within the mild temperature range from 30° C to 0° C (86° F—32° F). It may also be used with safety, should temperatures temporarily rise or fall below these limits.
- SAE 10 W engine oil is recommended when it is anticipated that the temperature will fall below 0° C (32° F). It may also be used with safety should temperatures rise above freezing point. A change of oil is, therefore, not necessary until the next regular mileage interval.
- SAE 5 W This extremely light engine oil is for use in arctic climates only.

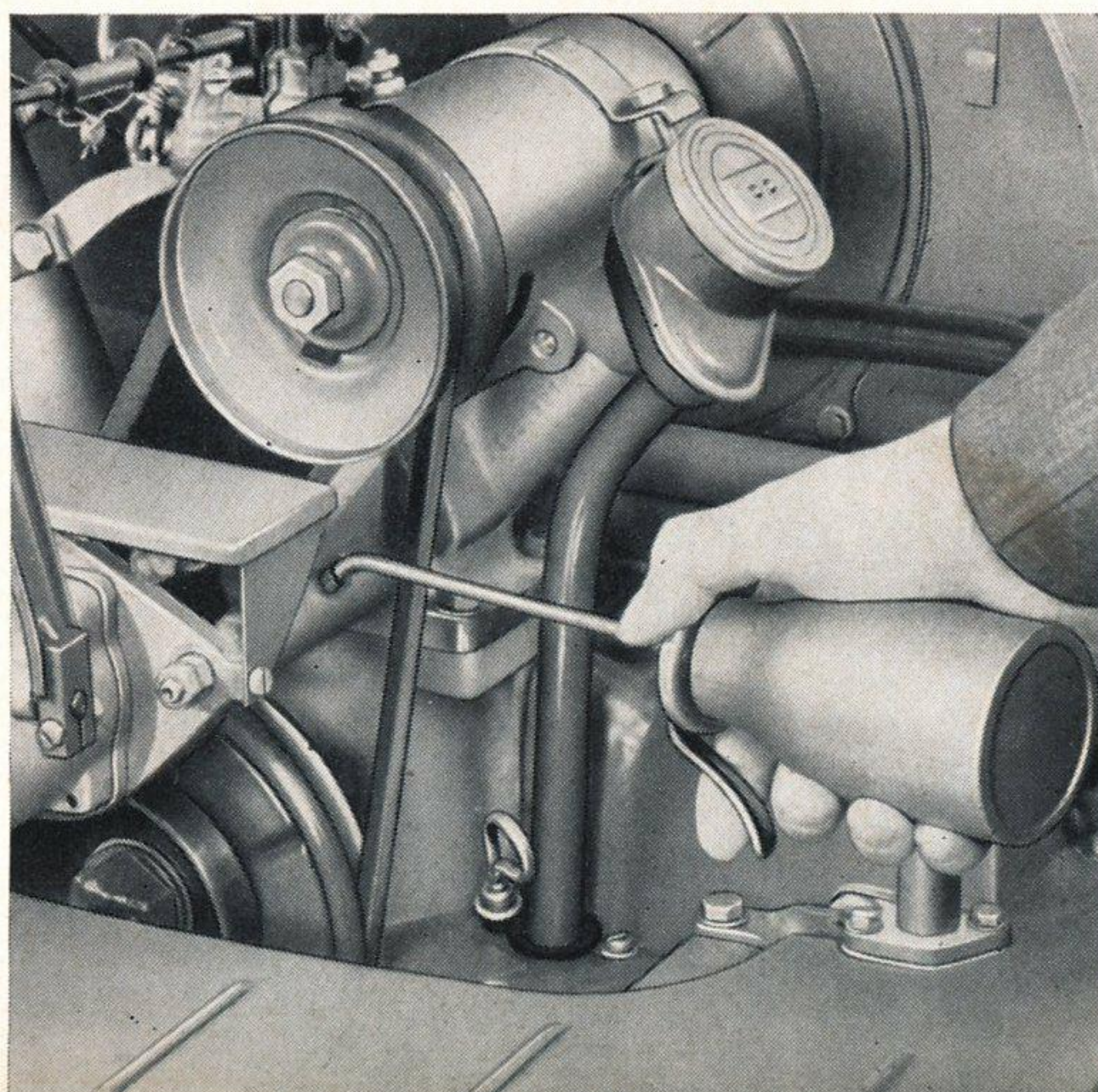
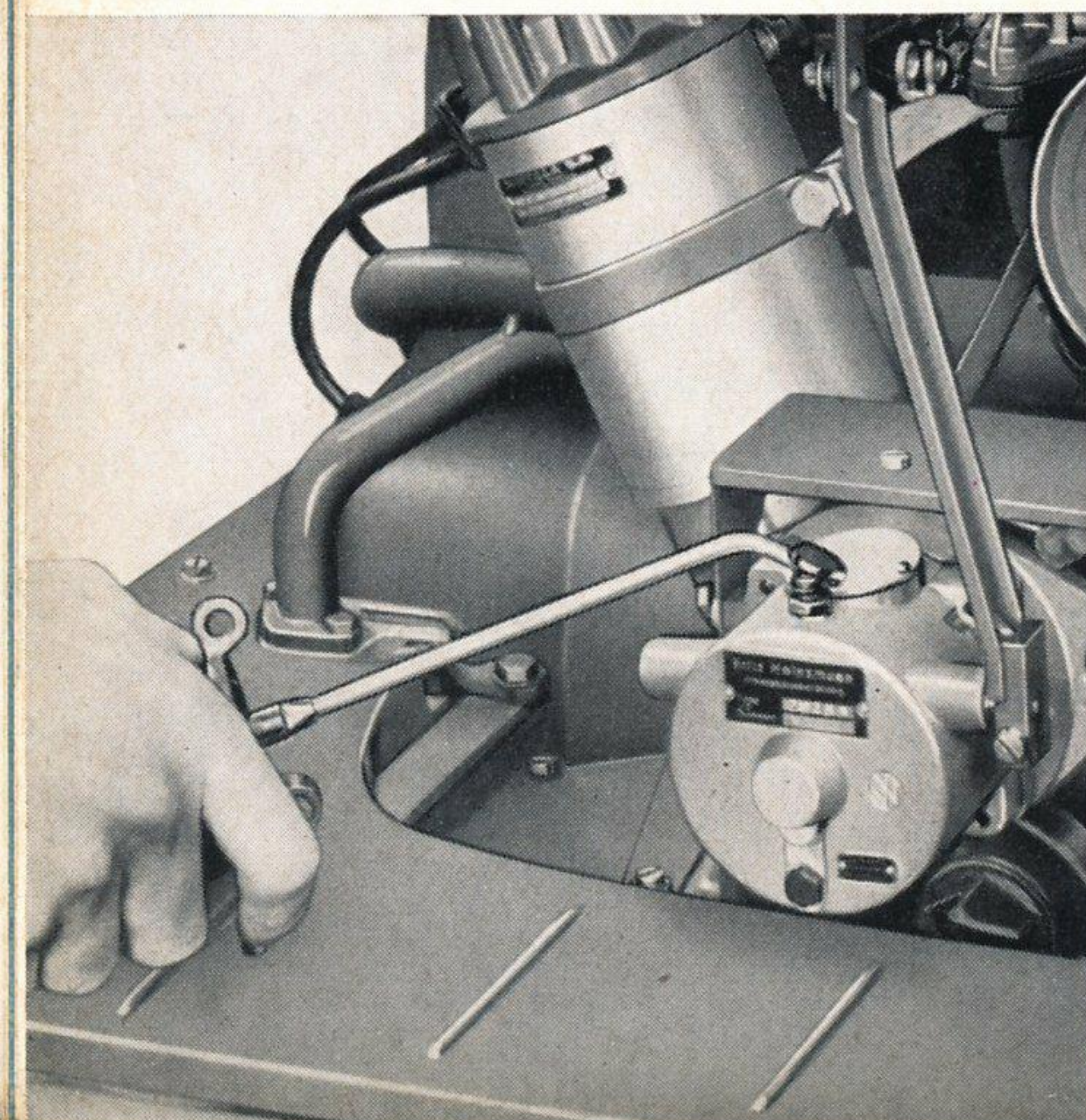
Multigrade Oils

are HD oils which cover several viscosity grades, such as SAE 10 W/30 for example. These oils are also suitable for VW engines.

In some countries the API Classification is applied (API = American Petroleum Institute). According to this classification, the oils suitable for the VW Industrial Engine are referred to as "For Service MS".

The Governor

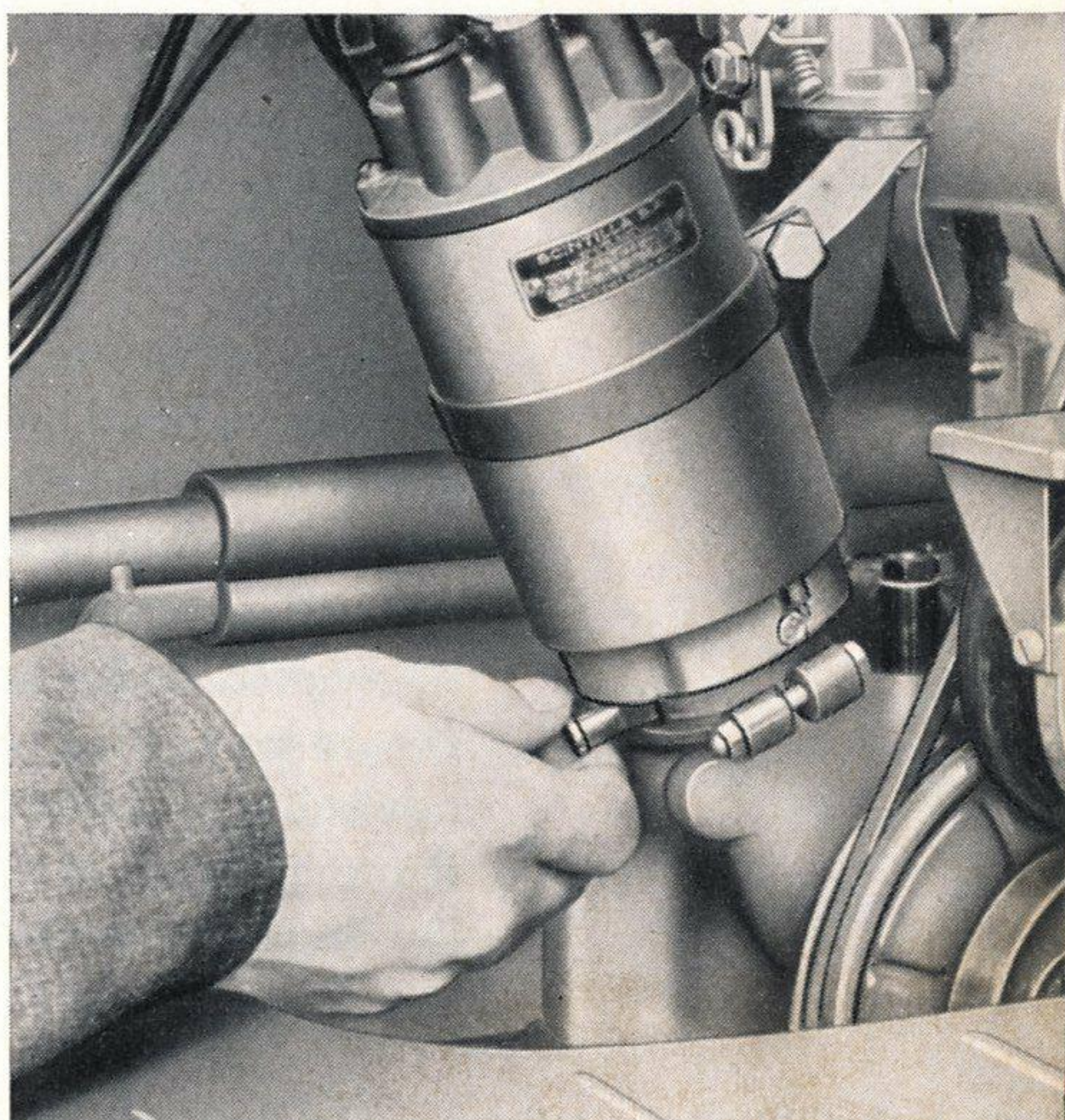
should be oiled at the intervals indicated in the Lubrication Chart. Screw out the oil level control screw and add oil until the level reaches the lower edge of the control screw hole. After completing the lubrication, make sure that the cap of the lubrication fitting is properly closed, as dirt and grit in the governor will cause premature wear.



The spring-loaded mounting bracket should be lubricated daily by applying a few drops of oil. Prior to lubricating, carefully clean the lubrication fittings with a rag to avoid any dirt or foreign matter entering the lubrication points.

The Magneto

is lubricated every 50 running hours by turning the threaded greaser cap at the bottom of the magneto clockwise. With engine running turn cap only twice, as excessive lubrication will have a detrimental effect on the magneto. When the greaser cap is screwed right home, it should be removed and refilled with grease. Lubrication of the contact breaker cams is done by a grease-soaked felt, which is spring-loaded to bear against the cams. The felt is accessible after removing the cover from the magneto. Apply a coat of grease and rub it into the felt. It is advisable to use Scintilla Grease Type G or Special Grease (High melting point grease) for the above purposes.



Ignition Distributor (Battery Ignition)

The breaker arm fiber block should, if necessary, be lubricated with Universal Grease at the prescribed intervals.

In accordance with the Lubrication Chart, apply 1 drop of oil to the felt in the cam bearing after the rotor is removed.

Engine Storage

- 1 — If the engine is used rarely or for short periods only and the running hours stipulated for oil change in the Lubrication Chart are not reached, the engine oil should be changed not later than every six months.
- 2 — The VW Industrial Engines should be protected against corrosion depending on the operating conditions.

A — Machinery not in use for a long period (e. g., combine harvesters)

Proceed as described below: The quantity of anti-corrosion oil to be used is $1\frac{1}{2}$ ltrs. ($1\frac{1}{2}$ quarts). Before putting the engine into use drain off the anti-corrosion oil and fill with $2\frac{1}{2}$ ltrs. ($2\frac{1}{2}$ quarts) of SAE engine oil of the specified grade. The outside of the engines should also be protected with anti-corrosion oil.

B — Machinery which must always be ready for use but is only used at irregular intervals (e. g., emergency pumps).

Engines which are started up and run for at least 20 minutes every two weeks, need not be provided with anti-corrosion oil. They should run under full load. If, however, it is intended to use anti-corrosion oil in these engines fill up with $2\frac{1}{2}$ ltrs. ($2\frac{1}{2}$ quarts). The quality of the anti-corrosion oils recommended is such that the engines may be worked under full load immediately after filling up. Oil changes should be carried out in accordance with the Lubrication Chart. It is advisable to change the oil when the engine is no longer needed as the anti-corrosion properties in the oil lose much of their effect when the engine is in use.

3 — When protecting the engine with anti-corrosion oil proceed as follows

a — Drain the oil

b — Fill up with anti-corrosion oil

$1\frac{1}{2}$ quarts for machinery under 2-A and
 $2\frac{1}{2}$ quarts for machinery under 2-B.

c — Start the engine and allow it to run at fast idling speed for half a minute.

d — Remove the air cleaner and slowly pour 25—30 cc (1.5—1.8 cu. ins.) of anti-corrosion oil into the carburetor air horn while the engine is running.

e — Switch off the ignition

f — Replace the air cleaner and plug up the exhaust pipe to prevent ingress of dust and dirt.

g — Spray the exterior of the engine with anti-corrosion oil.

It is good practice to fill the governor, too, with anti-corrosion oil. This is done as follows:

- a — Remove governor from its bracket.
 - b — Remove oil level control screw and drain oil.
 - c — Attach governor to its bracket and fill up with anti-corrosion oil until the oil level reaches the lower edge of the control screw hole.
 - d — Turn governor friction wheel by hand.
- 4 — It is advisable to use anti-corrosion oils of well-known brands only, which meet with the requirements of the lubrication specifications.

On all matters concerning anti-corrosion oils consult a VW workshop.

MAINTENANCE

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 necessary special tools and appliances to service your engine.

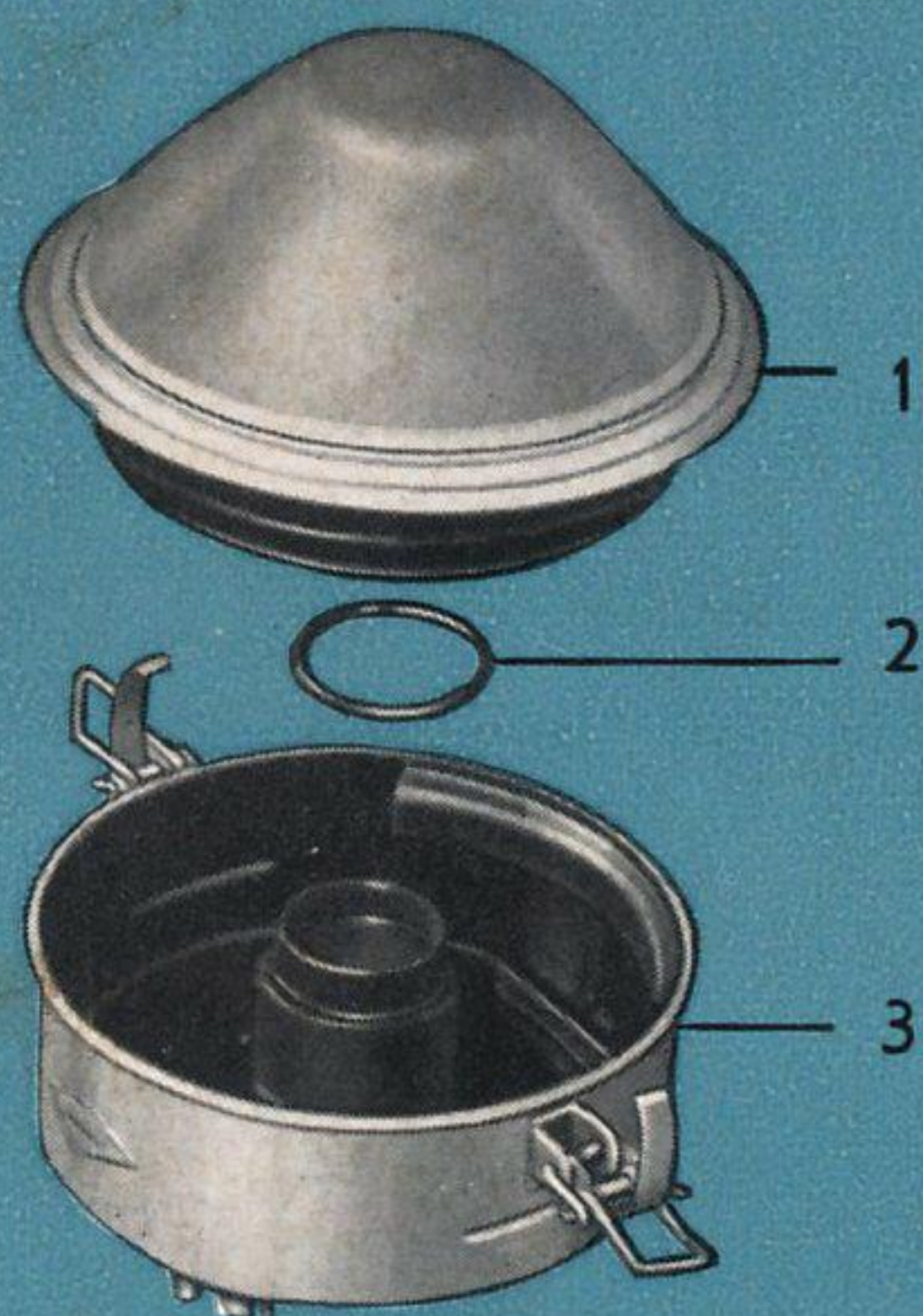
In case you cannot contact an Authorized VW Service Station in time, we are including some information which, if needed, will help you to carry out normal maintenance work.

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.

Servicing Air Cleaner

The air cleaner filters particles of dirt and grit from the air. Regular servicing is especially important in dusty areas. A dirty air cleaner is responsible for frictional wear, decreasing operating efficiency, and increasing fuel consumption. If the engine is mainly operating in very dusty conditions the cleaner must be serviced more often, even daily.

In cases where the machinery is not in use for a prolonged period, the air cleaner may become dirty and the oil dry up. The air cleaner must always be cleaned, if there is no longer thin oil above the sludge at the bottom of the oil reservoir. Detailed instructions as to the intervals of cleaning, depending on the operating conditions, are generally given by the manufacturer of the cleaner. When cleaning, detach cleaner from carburetor and disassemble the cleaner. Remove dirty oil from oil reservoir and refill with fresh engine oil SAE 20 up to the mark. The filter element should be rinsed in fuel, kerosene, or any other degreasing solution and then dried.



1 — Filter element 2 — Gasket 3 — Oil reservoir

In some special cases, the cleaner is used as a wet air cleaner. The filter element should be rinsed in fuel, kerosene, or any other degreasing solution and then dried. The filter element is then saturated with diluted engine oil. It is recommended that a mixture of two parts oil and one part fuel be used. Allow the surplus oil to drain off prior to assembling the cleaner.

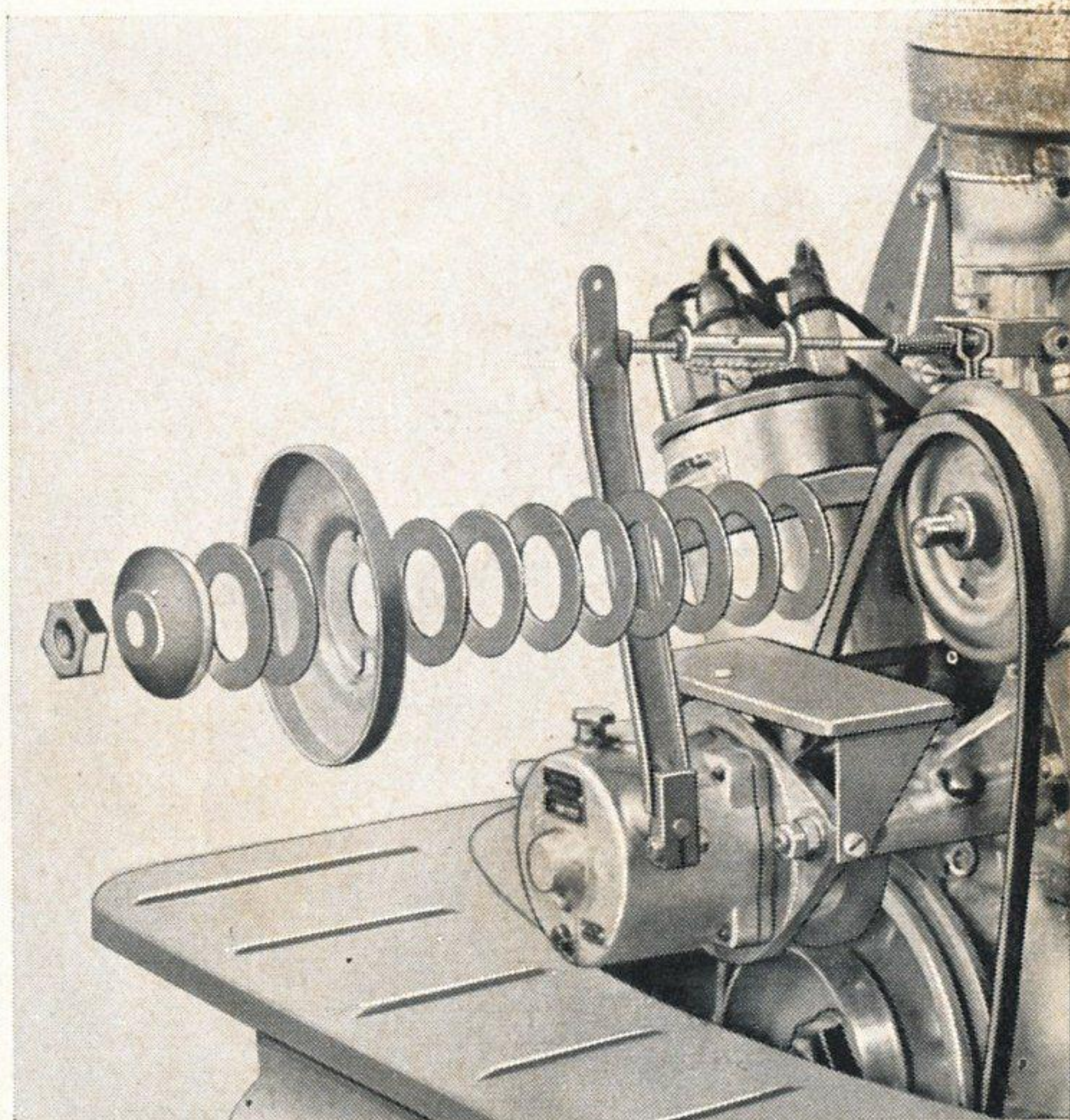
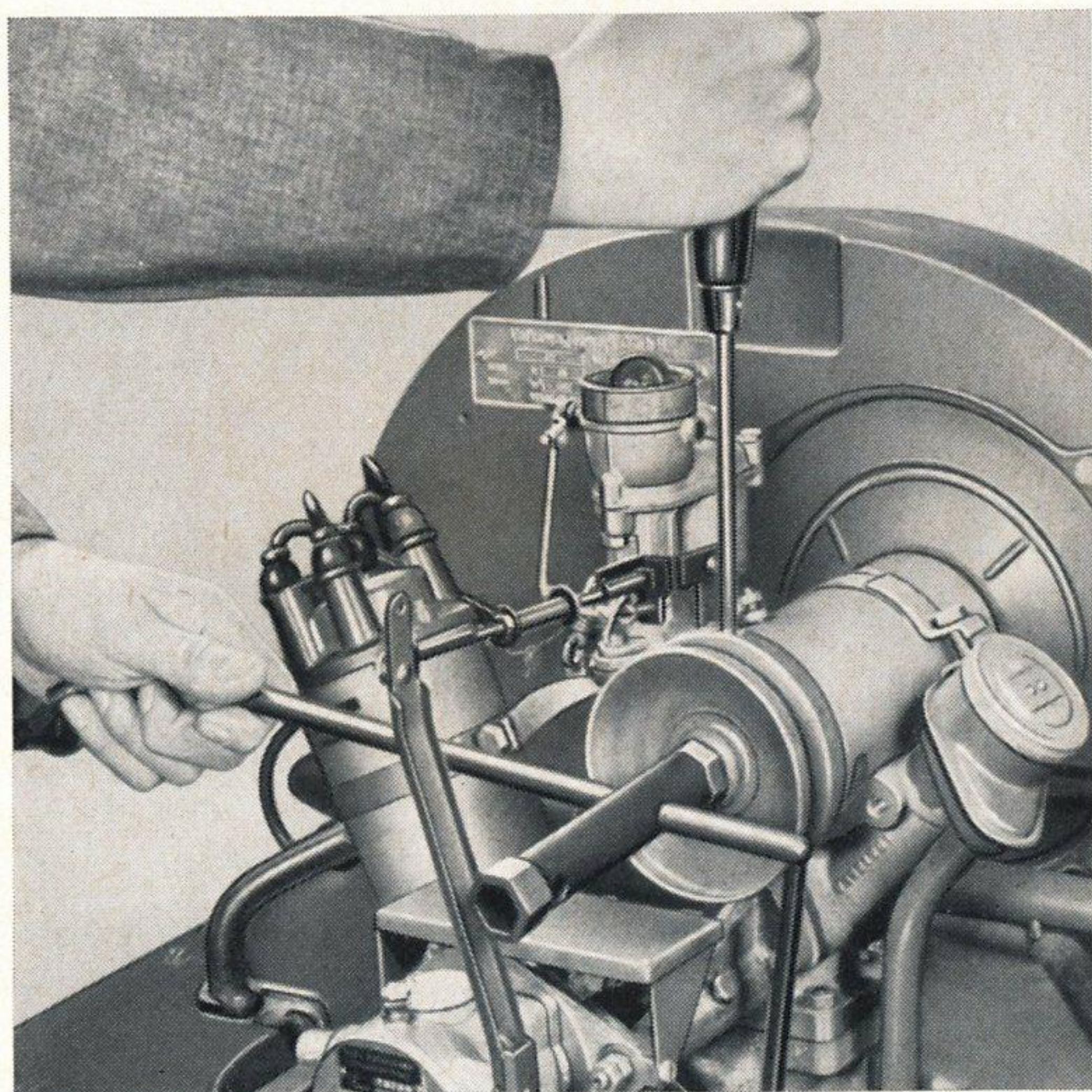
Adjusting the Fan Belt

To adjust 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 adjustment of the fan belt tension is effected 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. The total number of washers must remain the same.

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

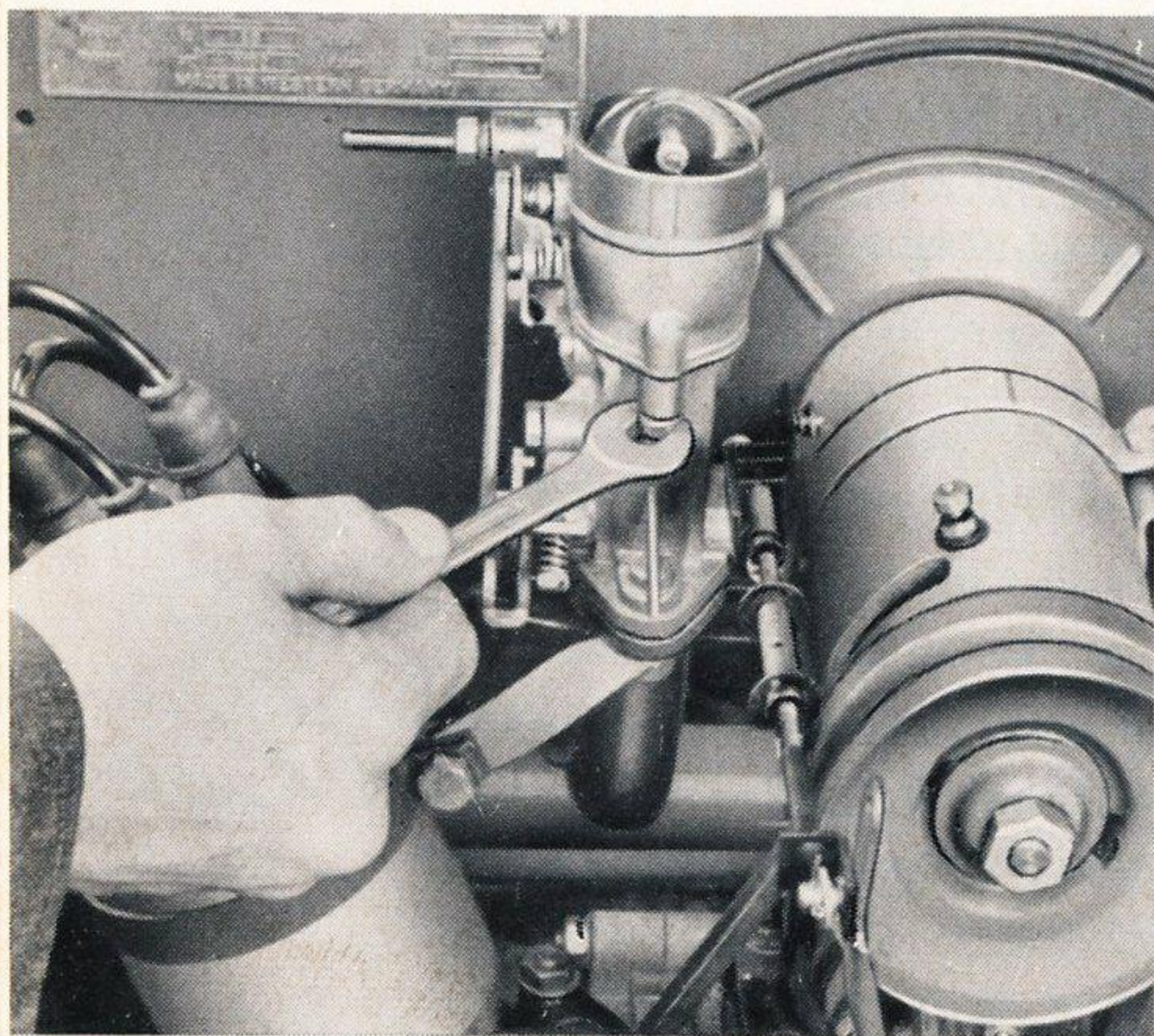
Newly installed belts will stretch to some extent and should, therefore, be checked and, if necessary, adjusted after the first ten hours of operation. After this, the tension will not change and the belts will need no further adjustment.

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



Carburetors 26 VFIS and 28 PCI

The following hints apply to both carburetor types unless otherwise specified.



Removal

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

Cleaning the Carburetor *)

To clean the carburetor, remove the bowl cover.

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.
- 5 — Clean air correction jet and emulsion tube.
- 6 — Clean the float needle valve.

Applicable to Carburetor 28 PCI only:

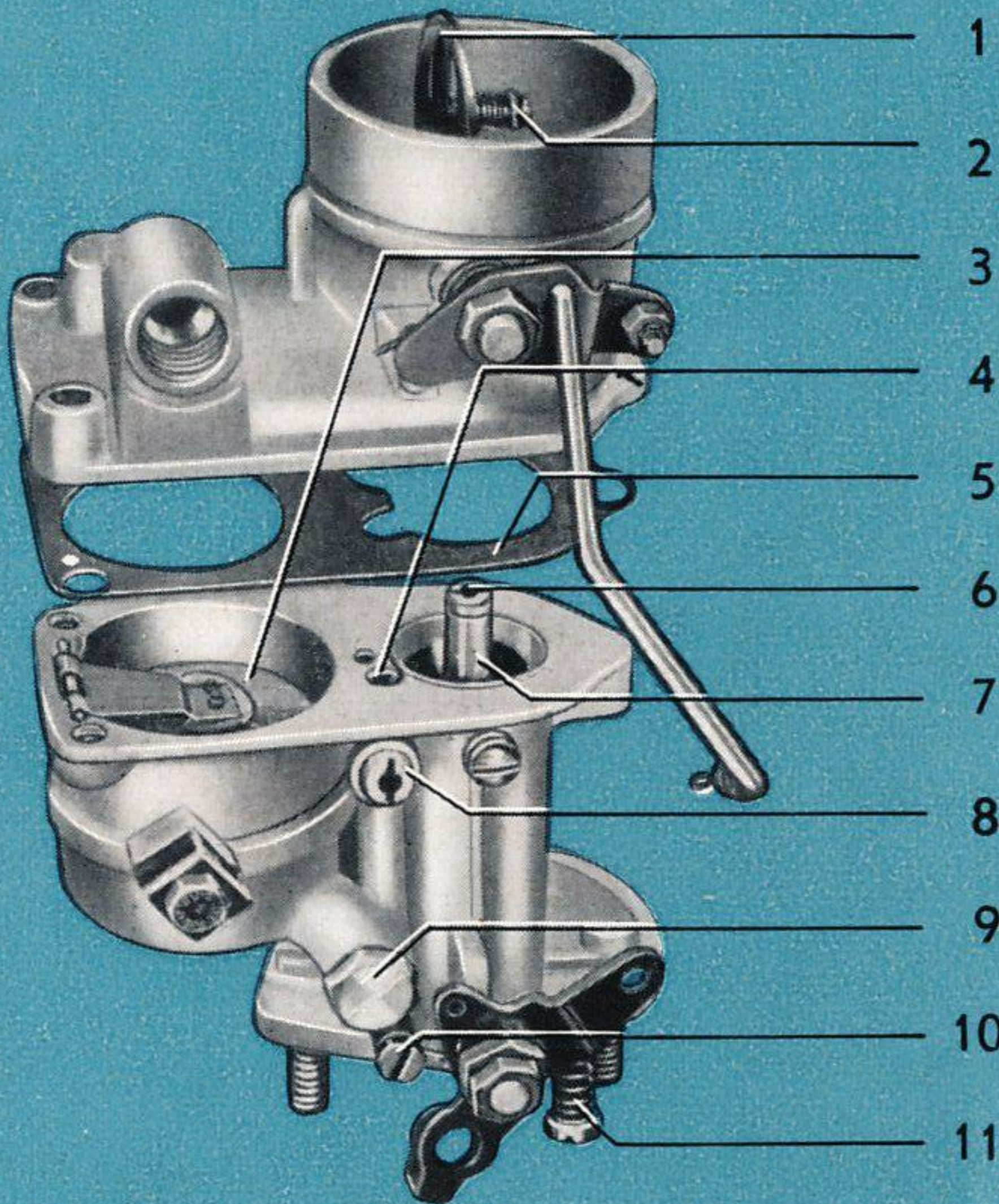
- 7 — Clean accelerator pump discharge passage.
- 8 — Clean passage between float chamber and accelerator pump.

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. With carburetor 28 PCI check that the pump pipe projecting above the jointing face of the lower part fits properly into the upper part.

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

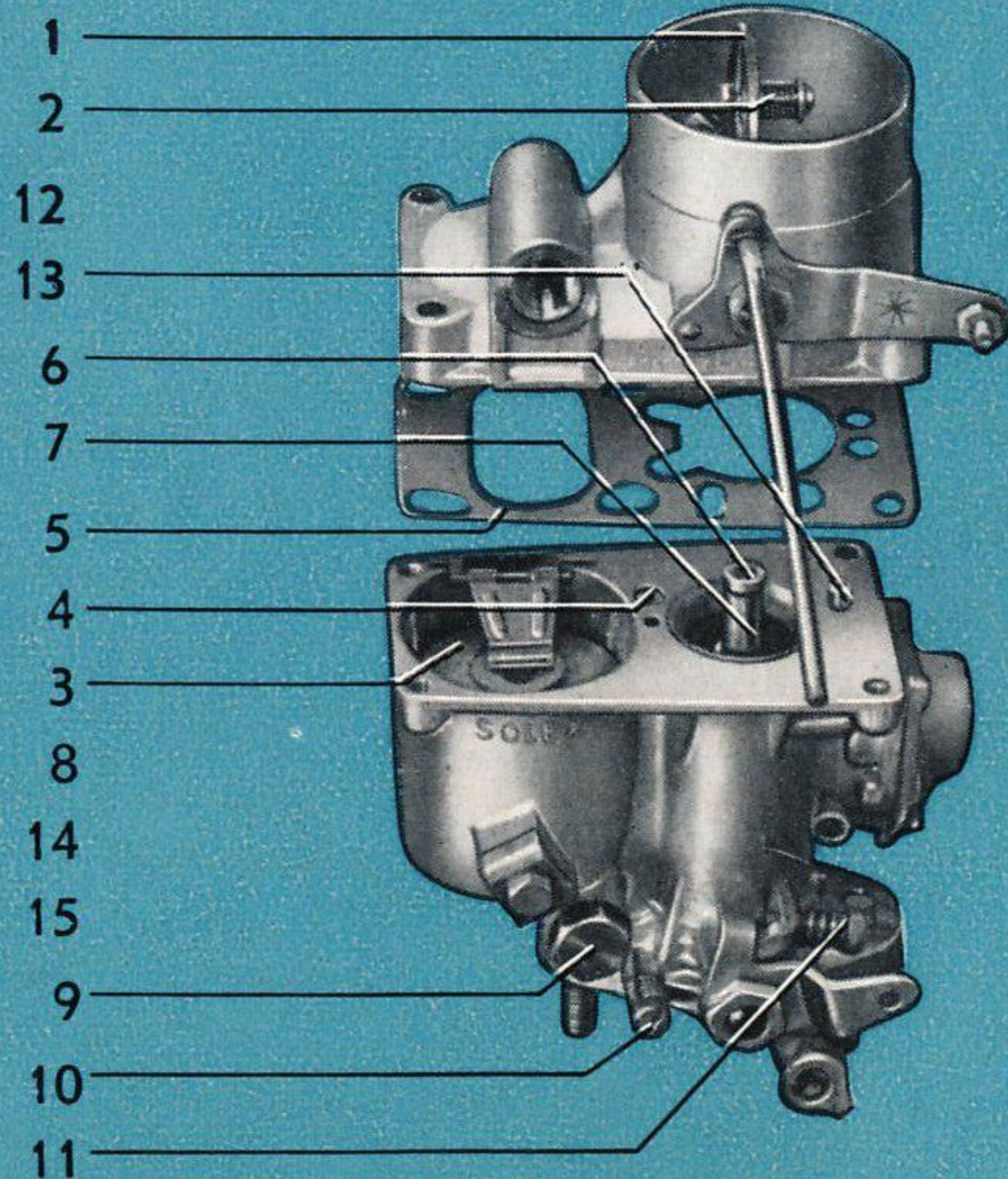
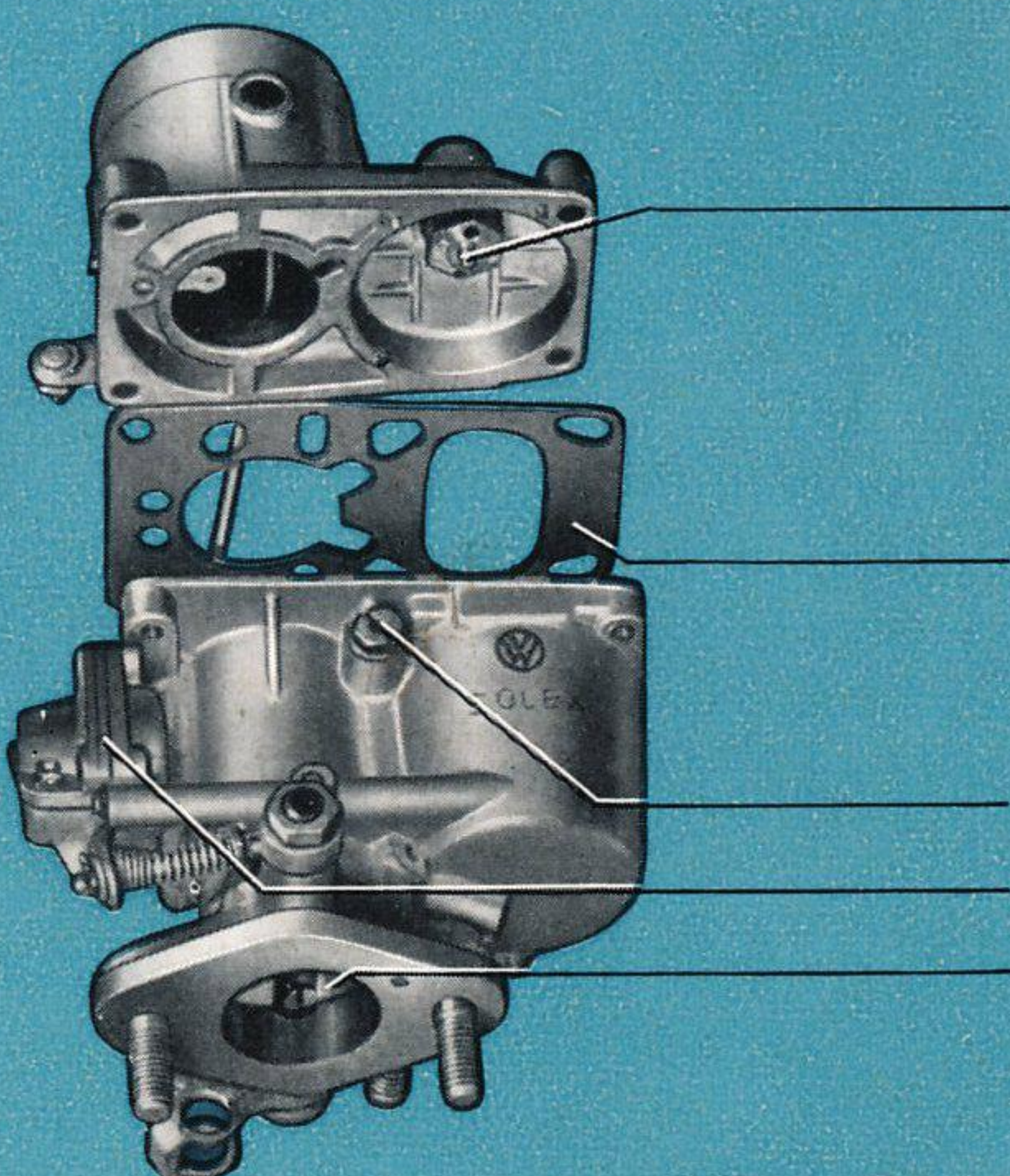
*) does not apply if the engine is fitted with a fuel pump with filter. In this case, the fuel filter should be cleaned at the same intervals.

26 VFIS



- 1 — Choke
- 2 — Poppet valve
- 3 — Float
- 4 — Pilot jet air bleed
- 5 — Gasket
- 6 — Air correction jet
- 7 — Emulsion tube
- 8 — Pilot jet
- 9 — Main jet
- 10 — Volume control screw
- 11 — Idle adjusting screw

28 PCI



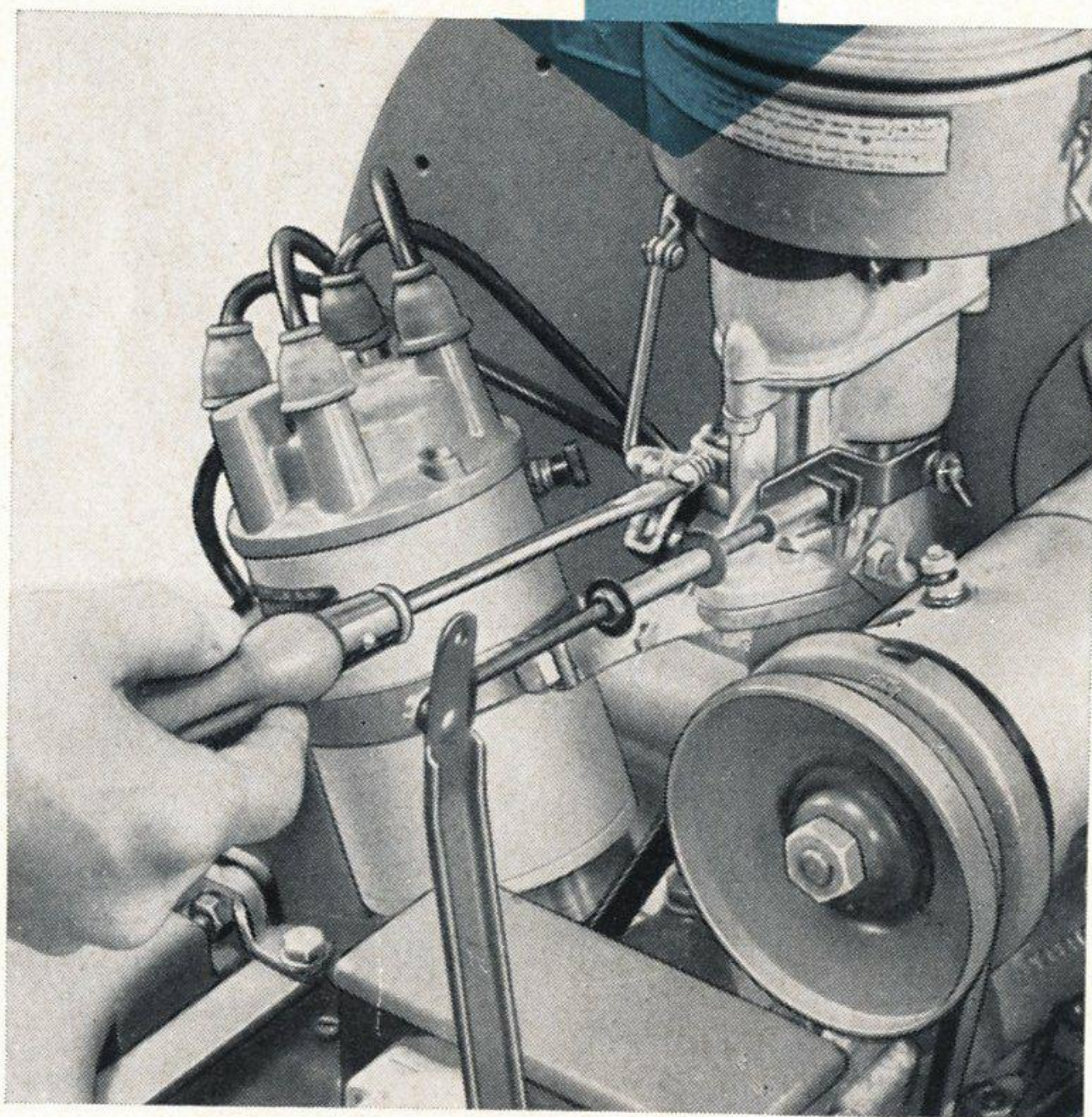
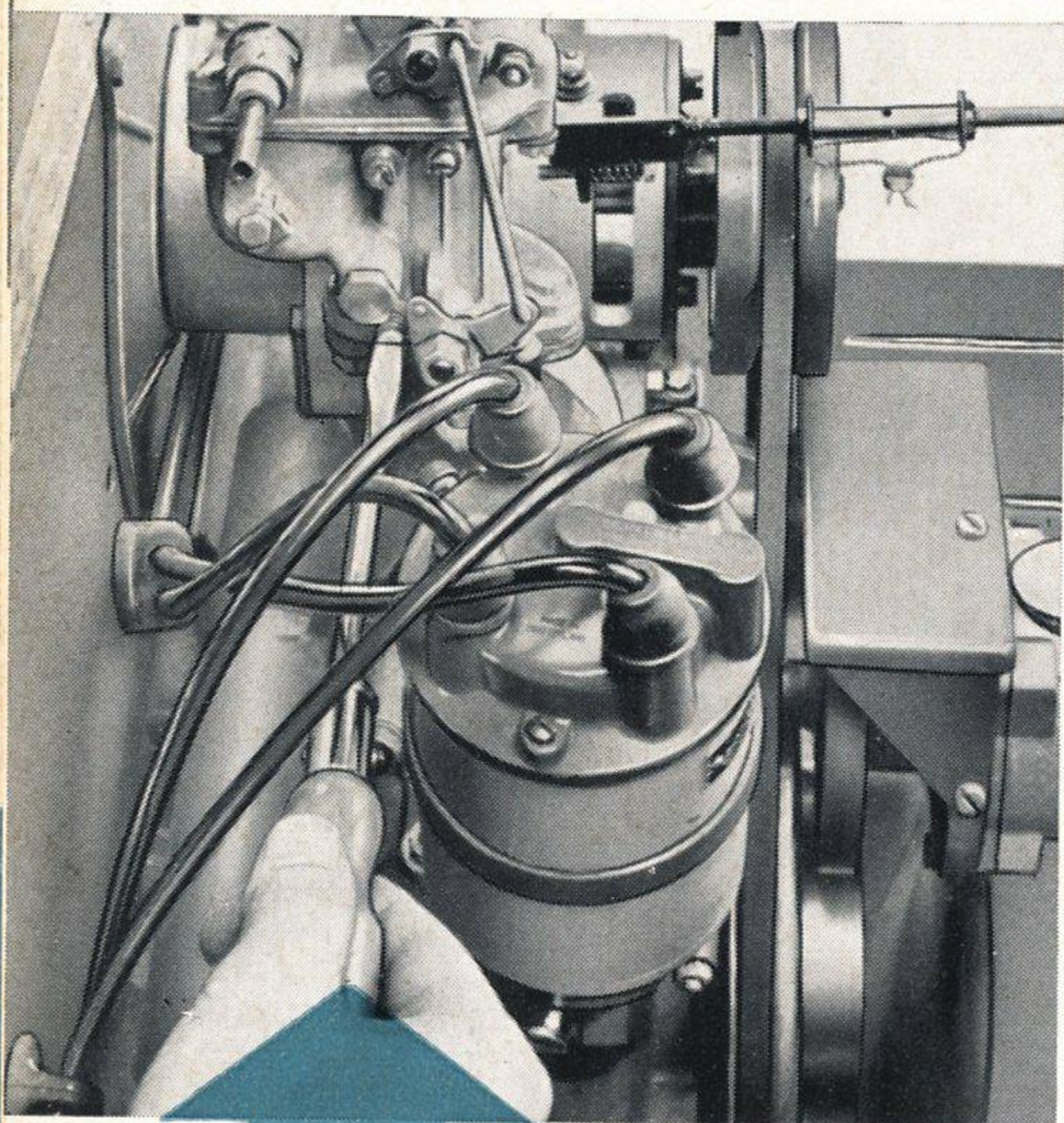
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Adjustment

The carburetor is tested at the factory 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. This would be detrimental under normal operating conditions and may result in hard starting, excessive fuel consumption or unsatisfactory performance.

Only an idling adjustment will be necessary from time to time. Before attempting to adjust the carburetor, make sure the engine is at normal operating temperature.

- 1 — Turn the idling adjusting screw in or out until an idling speed of about 550 rpm has been attained.



- 2 — Turn the volume control screw clockwise until the engine speed begins to drop, then give it approximately $\frac{1}{4}$ to $\frac{1}{3}$ of a turn in an anti-clockwise direction. Then, if necessary, adjust a little in either direction until the engine idles smoothly.
- 3 — Finally re-adjust the idling adjusting screw until the engine runs at normal idling speed.

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

Poor idling may also be the result of damaged gaskets, intake manifold flanges not sufficiently tightened, faulty ignition 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.

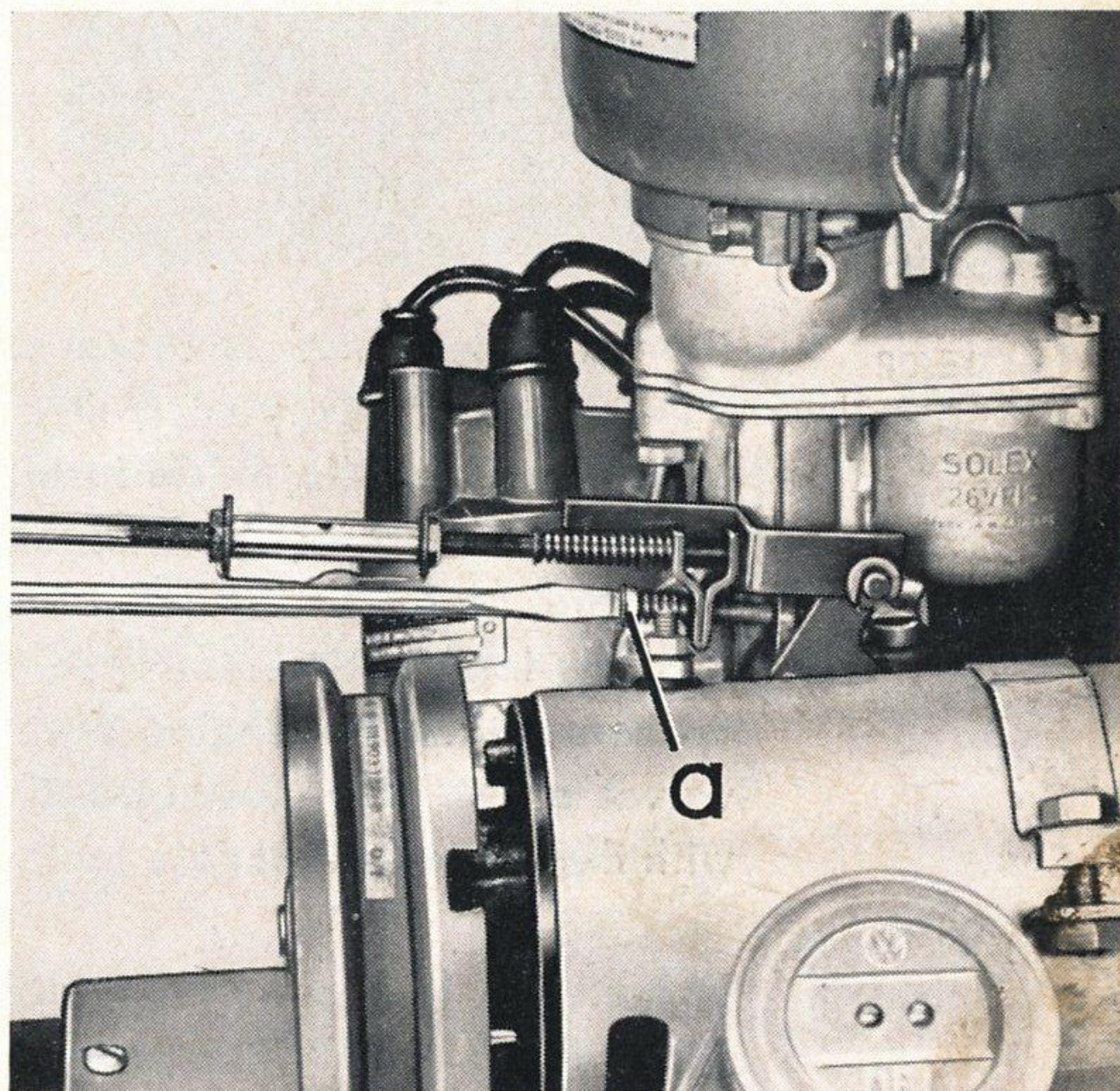
Adjusting Stop Screw of Governor Push Rod

"Surging" (continued rapid rise and fall of engine speed) can be eliminated by means of the spring-loaded stop screw located at the carburetor end of the push rod.

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

- 1 — Allow the engine to run under the lowest possible load.
- 2 — Steady the rhythmically moving governor linkage with your hand.
- 3 — When the engine runs steadily, turn the push rod stop screw (a) until there is a clearance of 0.1 mm. (0.04") between the screw and the carburetor body.

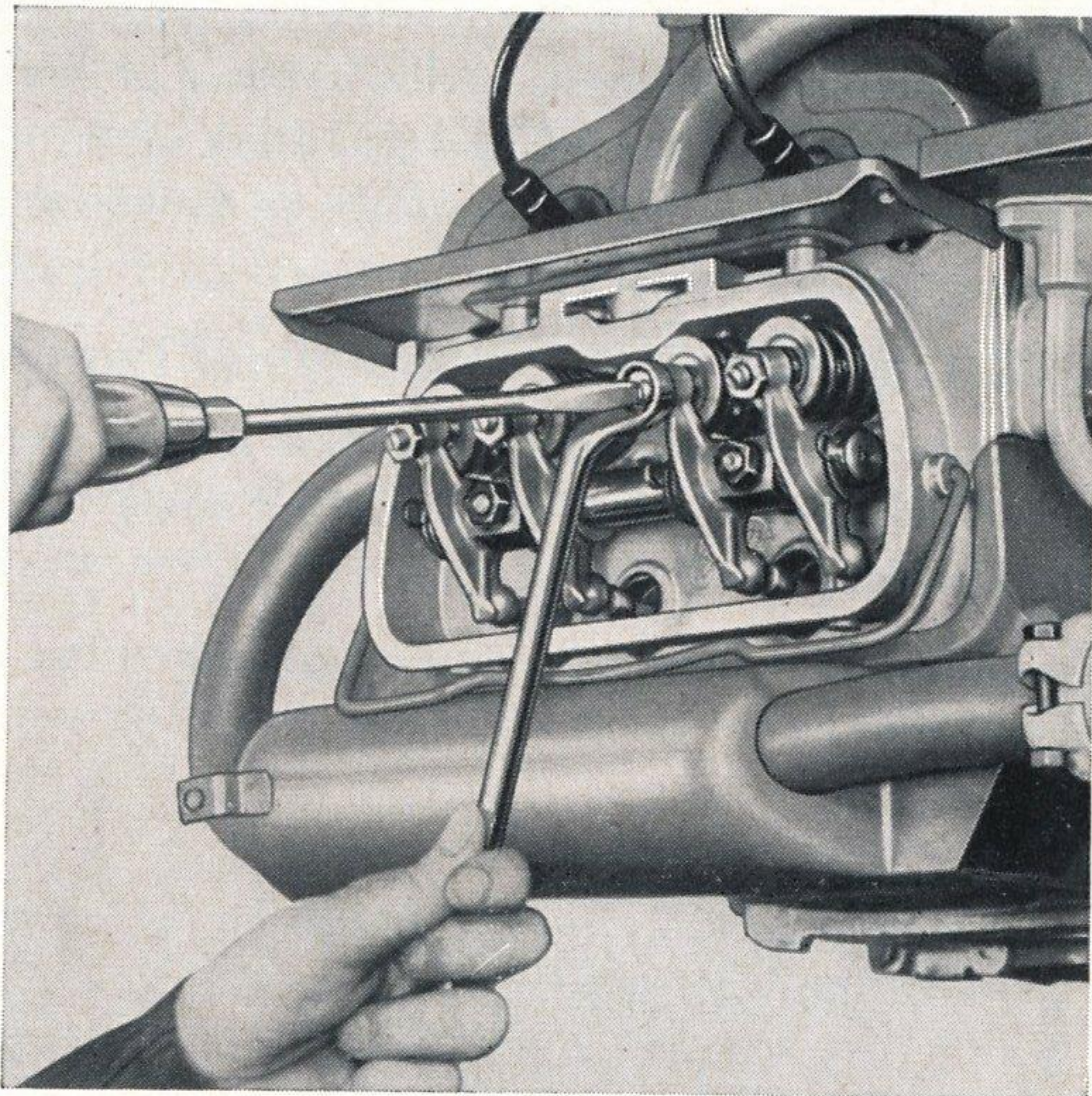
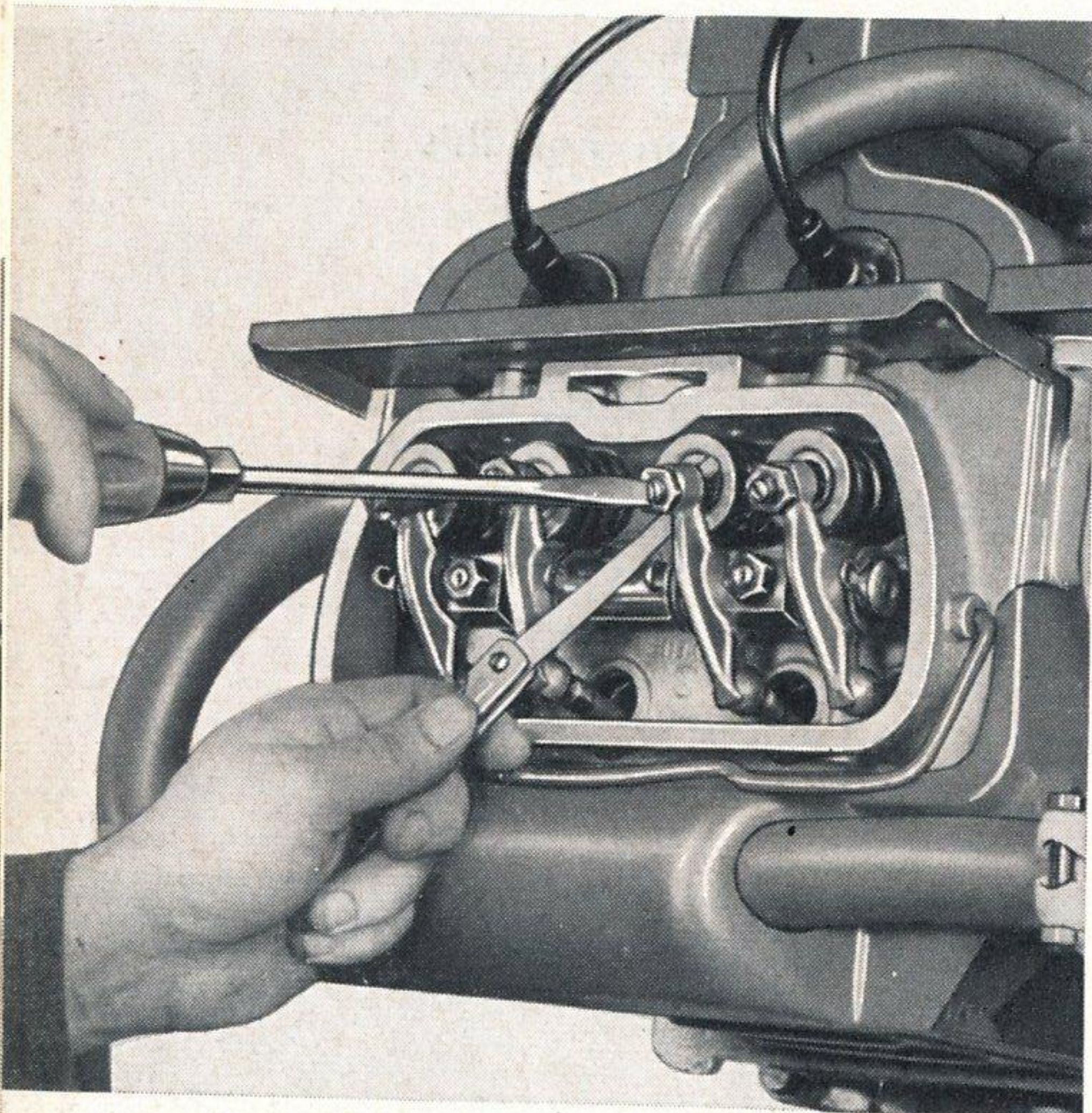
The engine idles when the push rod is pressed against the spring-loaded stop screw.



Valve Adjustment

The following procedure should be carried out only in emergencies when it is impossible for you to reach a VW Service Station.

Valve clearance should be adjusted to 0.20 mm (0.008") for the inlet and exhaust valves with the engine cold or when the oil temperature is not over 50° C (122° F)



The valve clearance decreases when the engine warms up. For this reason adjust valve clearance very carefully. First remove both cylinder head covers. Valve adjustment may be made 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 corresponding cylinder is at the top dead center position of the compression stroke. Starting with No. 1 cylinder, crank the engine over slowly to the left by the fan pulley, until both valves are in fully closed position and the timing mark on the pulley is in line with the vertical crankcase joint.

Loosen the lock nut of the adjusting screw and turn the adjusting screw as required to obtain the proper clearance, using a feeler gauge. Tighten the lock nut 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.

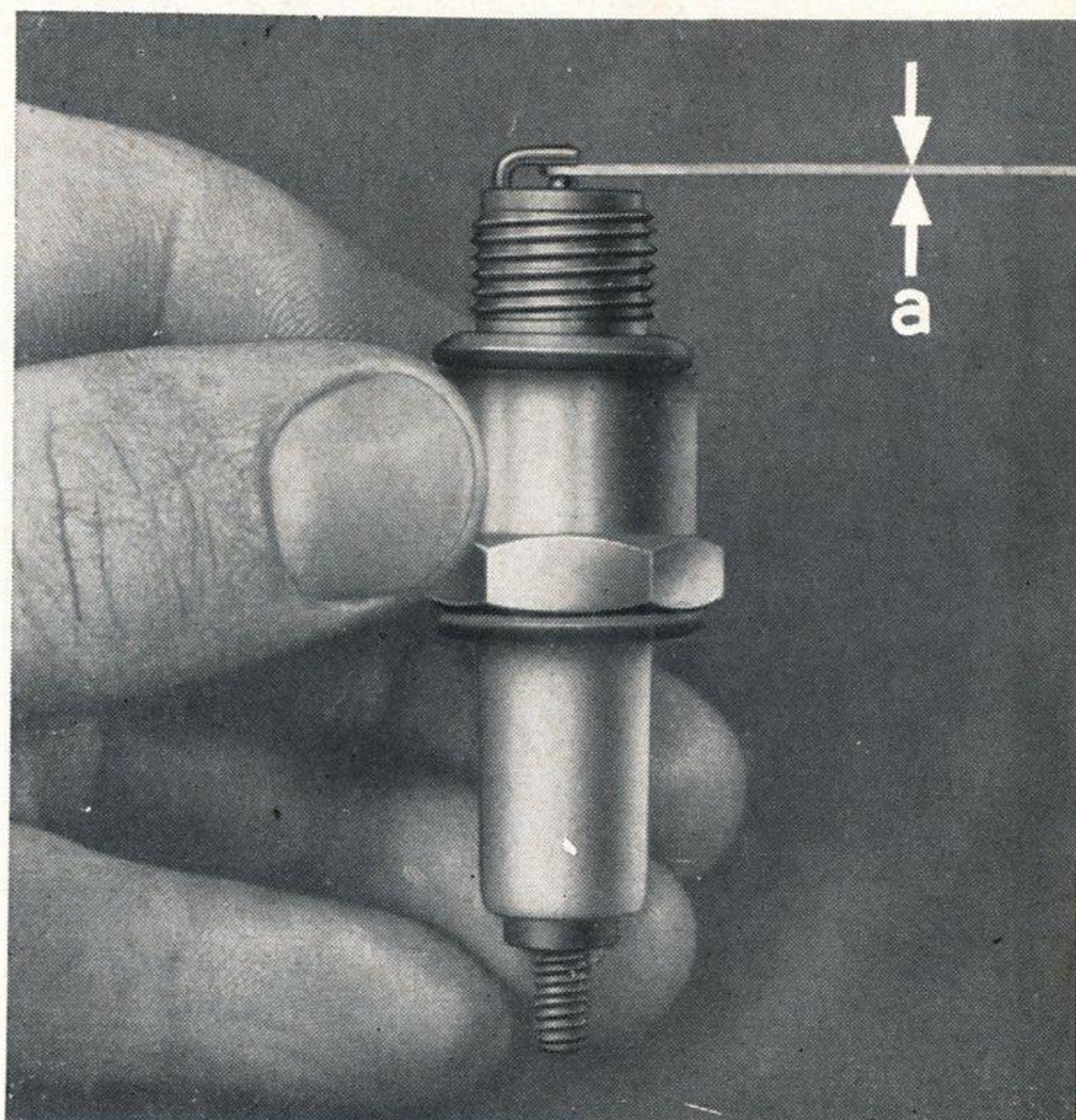
Intermediate-grey — good adjustment of carburetor and correct performance of spark plug,

black — mixture too rich,

light grey — mixture too lean,

oiled up — failure of spark plug or worn-out cylinder.

$a = \begin{matrix} 0.4-0.5 \text{ mm. (.016"-0.020")}, \text{ magneto ignition} \\ 0.6-0.7 \text{ mm. (.024"-0.028")}, \text{ battery ignition} \end{matrix}$



In the case of fuels containing lead-tetra-ethyl (antiknock fuel), the insulator will show a grey color, provided the engine is correctly adjusted. Clean the spark plugs with a brush and a chip of wood and blow them out. The insulator should be clean and dry inside and out to avoid short circuits. Check the electrode gap (magneto ignition: 0.4 to 0.5 mm.; battery ignition: 0.6 to 0.7 mm.) and reset, if necessary, by bending the outer electrode. Do not forget the plug washer. Generally speaking, you may count on a spark plug service life of up to 150 working hours.

Ignition Timing

Particular attention should be attached to the importance of correct ignition timing. The engine operation will be seriously affected if the ignition breaker points are not properly timed and correctly spaced. 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.

Adjustment may 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 the contact plate until the correct gap of 0.3 mm. to 0.4 mm. (.012" to .016") is obtained. (In case of battery ignition, loosen the lock screw on the fixed point and turn the eccentric adjusting screw until the correct gap of 0.4 mm (0.016") is obtained.) Tighten lock screw. If the points are burned they should be replaced.

Grease cam lobes slightly, if found necessary (see Lubrication Chart). The distributor cap should be clean and dry, inside and out, so as to avoid short circuits and high-tension leakage.

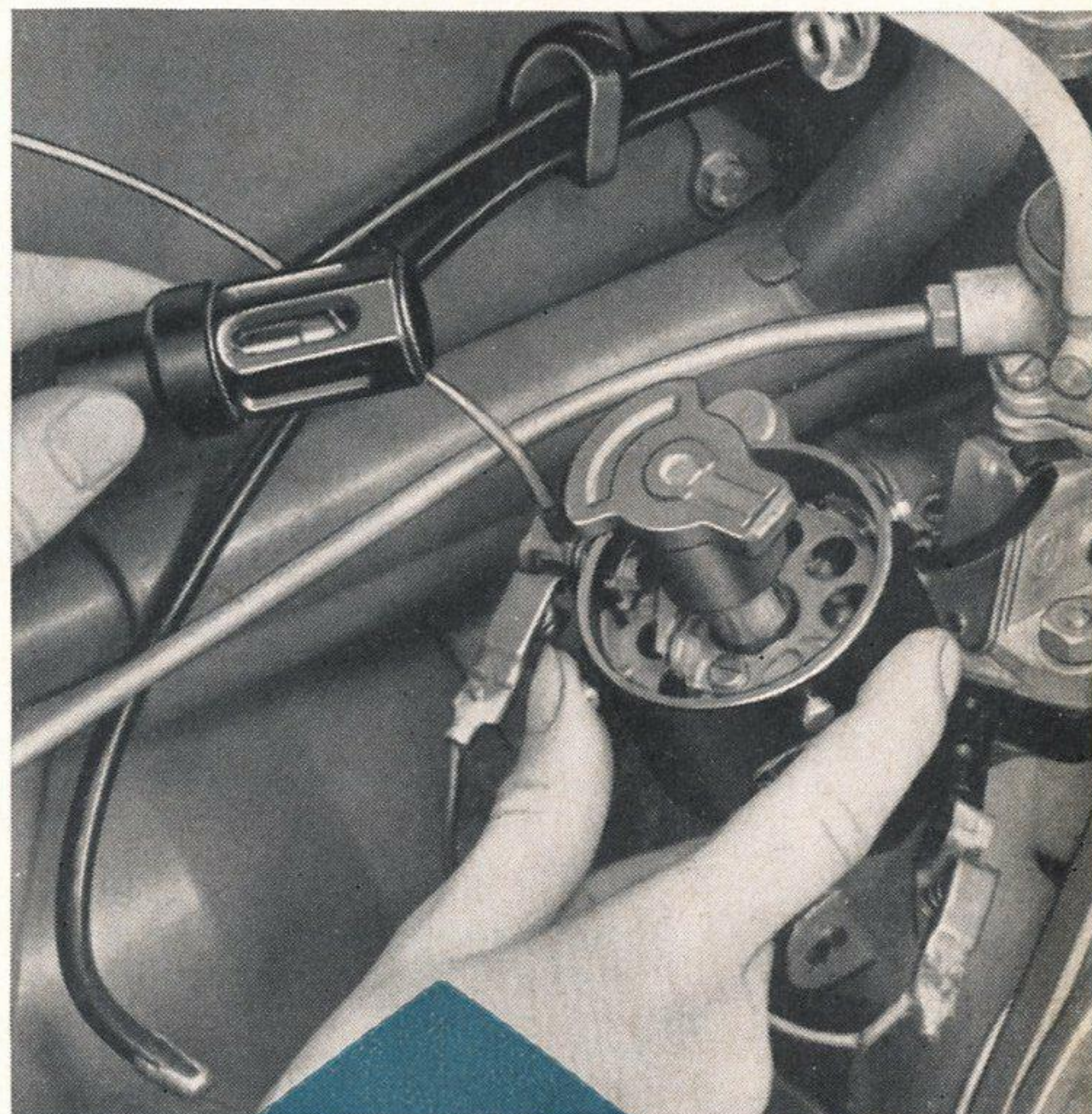
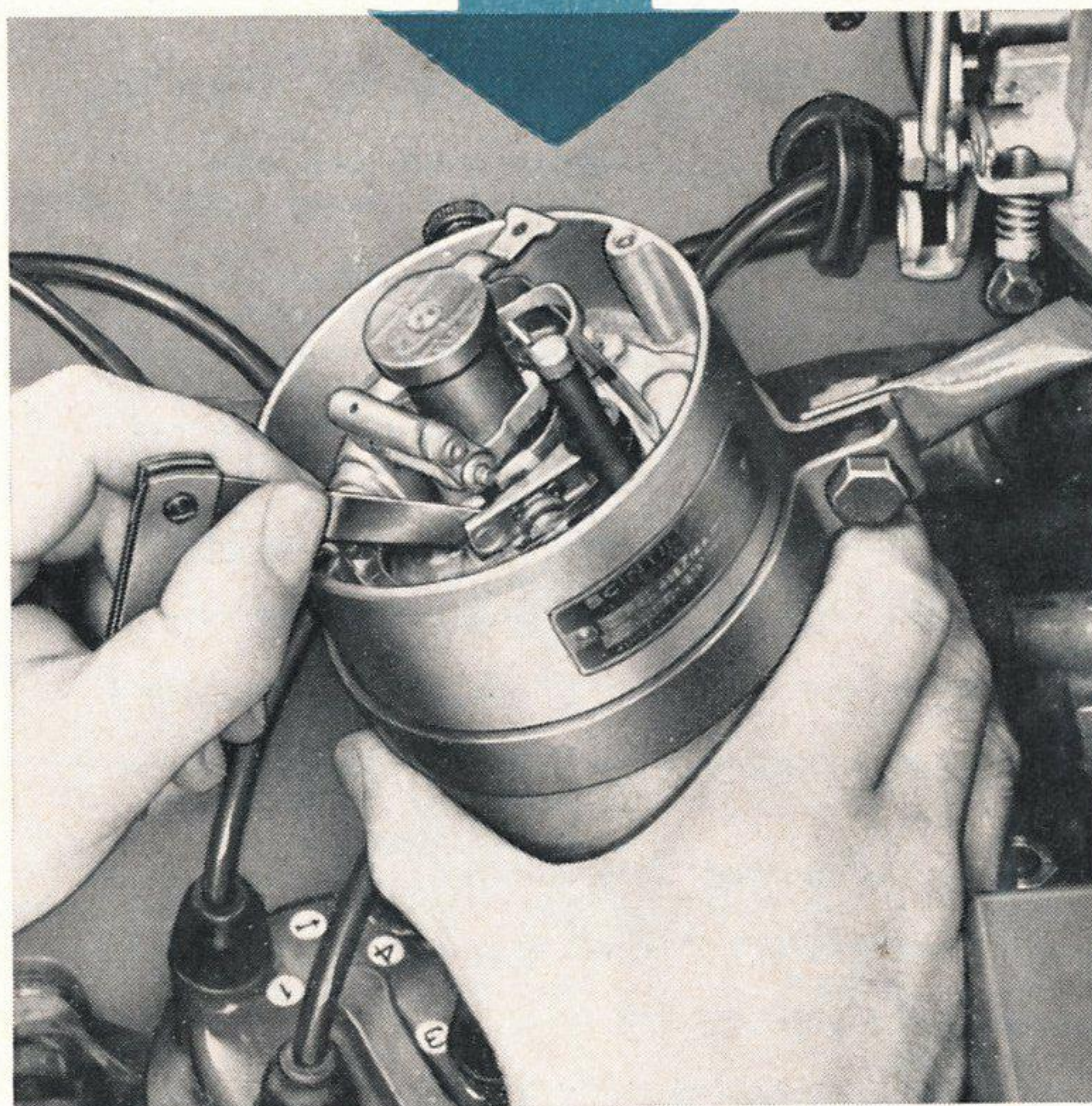
After the breaker points have been adjusted, it is absolutely necessary to check the ignition timing.

Ignition Timing

a — Magneto Ignition

Crank the engine until the mark on the crankshaft pulley lines up with the vertical crankcase joint and the rotor arm points to the electrode for No. 1 cylinder in the cap. Loosen the clamp screw below the magneto base and on the clip and rotate the magneto body clockwise until the points are closed. Then clamp a strip of 0.05 mm. (.002") tinfoil between the breaker points and turn the magneto slowly counter-clockwise until the tinfoil

can be easily withdrawn. This is the position when the breaker points just start to open. Tighten clamp screw and replace distributor cap.



b — Battery Ignition

Crank the engine until the mark on the crankshaft pulley lines up with the vertical crankcase joint and the distributor rotor arm is in line with the No. 1 cylinder mark on edge of distributor body. Loosen the lock screw below the distributor base 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.

This may be seen and heard, for a spark will jump from one point to the other. To obtain a more accurate adjustment for maximum results, it is advisable to use a test lamp or an ignition timing light. The test lamp should be connected to the distributor primary lead terminal and to ground. The lamp will light up as long as the contact points are kept open by one of the four cam lobes of the distributor shaft. After the adjustment is completed, tighten the lock screw, replace the rotor and clamp the cap on the distributor.

ENGINE TROUBLE CHECKING

Symptom	Cause	Remedy
Engine will not start	<ul style="list-style-type: none"> a — Fuel tap closed. Fuel filter clogged b — No fuel in tank c — Float needle valve dirty or sticking d — Carburetor jets clogged e — Choke poppet valve sticking or not closing f — Ignition switched off g — Breaker points dirty h — Accumulation of moisture in magneto cover i — Wrongly connected high tension leads k — Loose cable connections at magneto l — High tension leads damaged or moist m — Moist spark plugs (condensed water) n — Fuel on spark plugs due to excessive use of choke, sticking poppet valve, or carburetor flooding o — In extremely cold weather, spark plug gap too large 	<ul style="list-style-type: none"> a — Open fuel tap. Clean filter b — Replenish fuel supply c — Clean or renew needle valve d — Remove and clean jets e — Check poppet valve and, if necessary, renew choke f — Switch on ignition g — Clean or renew breaker points and adjust ignition timing h — Carefully dry magneto cover and rotor i — Firing order 1—4—3—2 k — Check cable connections l — Carefully dry high-tension leads, or, if necessary, renew them m — Carefully dry spark plugs n — Dry spark plugs and check fuel system for defects o — Adjust spark plug gap
Engine starts but does not idle steadily	<ul style="list-style-type: none"> a — Carburetor idling adjustment incorrect (too rich or too lean a mixture) b — No valve clearance or valves leaking c — Air leaks at intake manifold flanges d — Excessive clearance between pistons and cylinders 	<ul style="list-style-type: none"> a — Adjust idling until engine runs evenly and steadily and exhaust is free from soot b — Adjust or grind-in valves renew, if necessary c — check intake manifold for cracks d — Renew pistons and cylinders
Engine idles erratically after attaining normal operating temperature. Sooty exhaust	<ul style="list-style-type: none"> a — Choke closed b — Carburetor idling adjustment too rich c — Float needle valve dirty, sticking, or worn 	<ul style="list-style-type: none"> a — Fully open choke b — Adjust idling until engine runs evenly and exhaust is free from soot c — Clean or renew needle valve
Engine misfiring	<ul style="list-style-type: none"> a — Loose high-tension lead b — Short circuits in high-tension lead or spark plug connector c — Spark plugs dirty or defective d — Valve leaking or sticking 	<ul style="list-style-type: none"> a — Check connections b — Check high-tension leads and spark plug connectors, renew as necessary c — Clean or renew spark plugs d — Grind-in or clean valve

Symptom	Cause	Remedy
Engine runs erratically or misfires	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 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 governor
	f — Magneto defective	f — Renew magneto
	g — Speed limiter (cut-out) maladjusted	g — Correct the adjustment
Engine develops excessive heat and does not stop when switched off	a — Insufficient fan belt tension, inadequate cooling	a — Adjust fan belt tension. Renew excessively stretched fan belts
	b — Incorrect ignition timing	b — Adjust breaker point gap and ignition timing
	c — Fuel/air mixture too lean	c — Check and adjust carburetor
	d — Advance mechanism does not function properly	d — Clean or recondition centrifugal weights
	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 for better accessibility
Engine pinks under load at normal speed	a — Pre-ignition	a — Properly adjust ignition timing
	b — Insufficient fan belt tension, engine too hot; inadequate cooling	b — Adjust fan belt tension. Renew excessively stretched fan belts
	c — Poor quality fuel of low anti-knock rating	c — Use branded fuel
	d — Advance mechanism does not function properly	d — Recondition advance mechanism
	e — Excessive carbon deposits in combustion chamber	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

TECHNICAL DATA

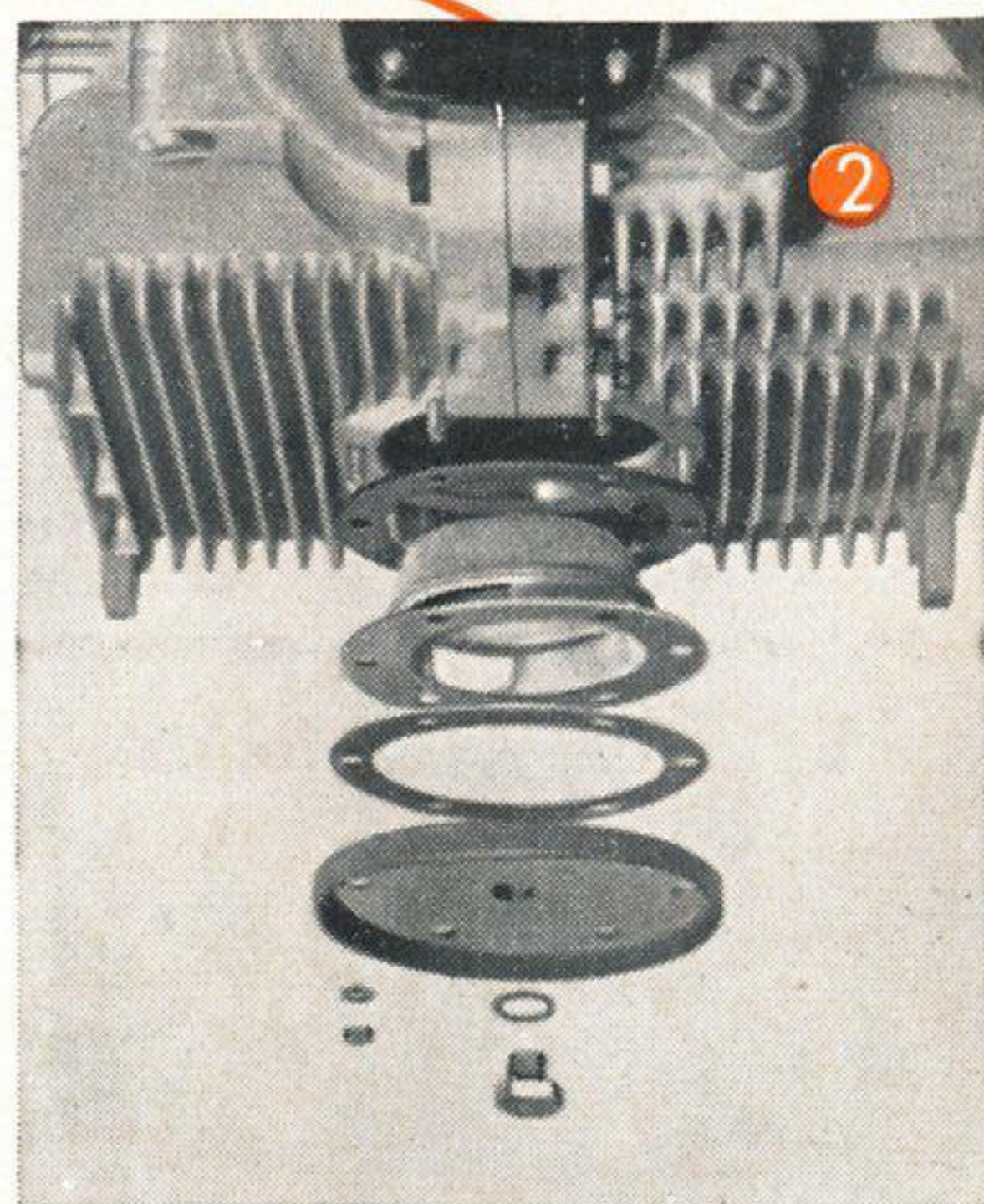
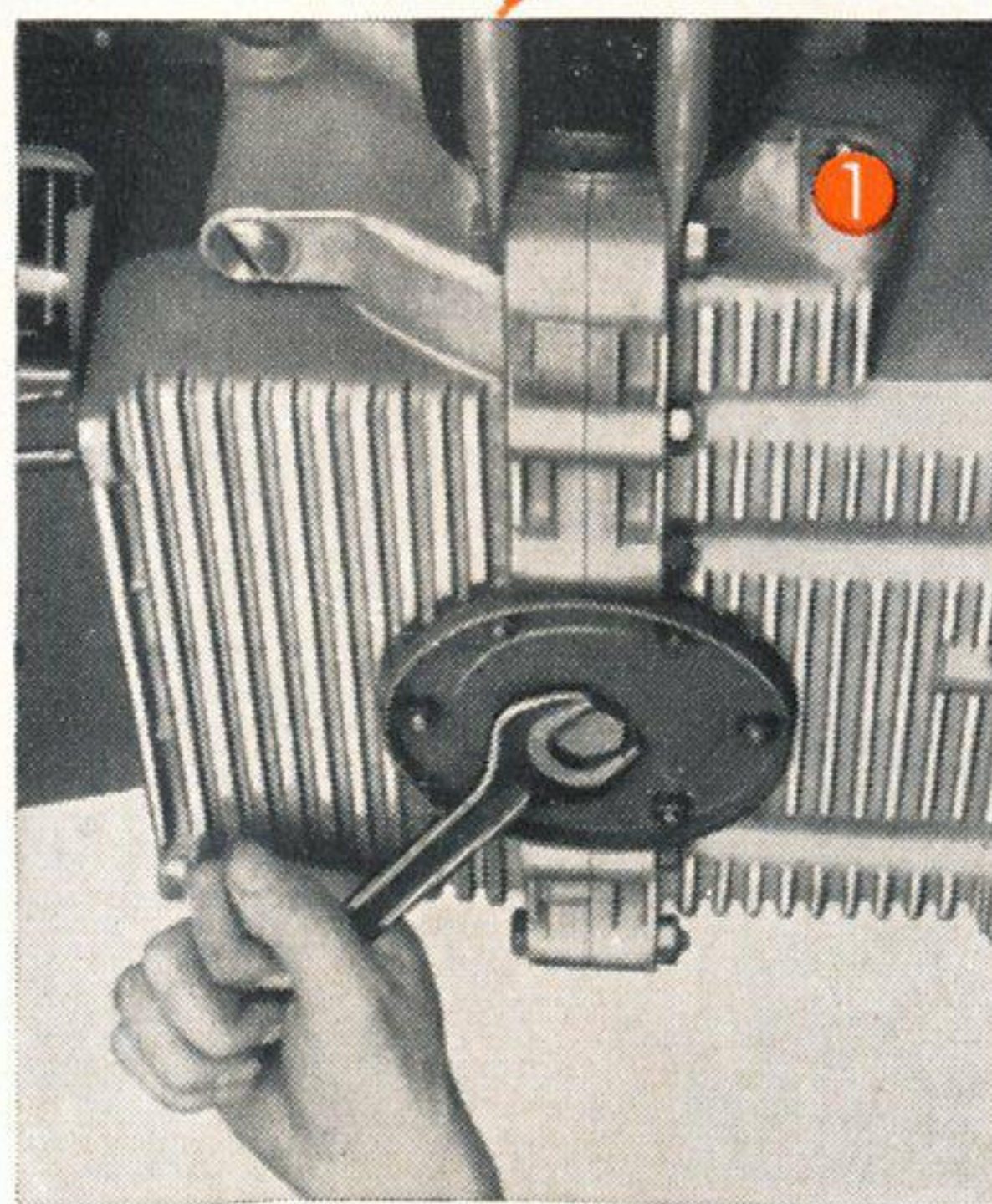
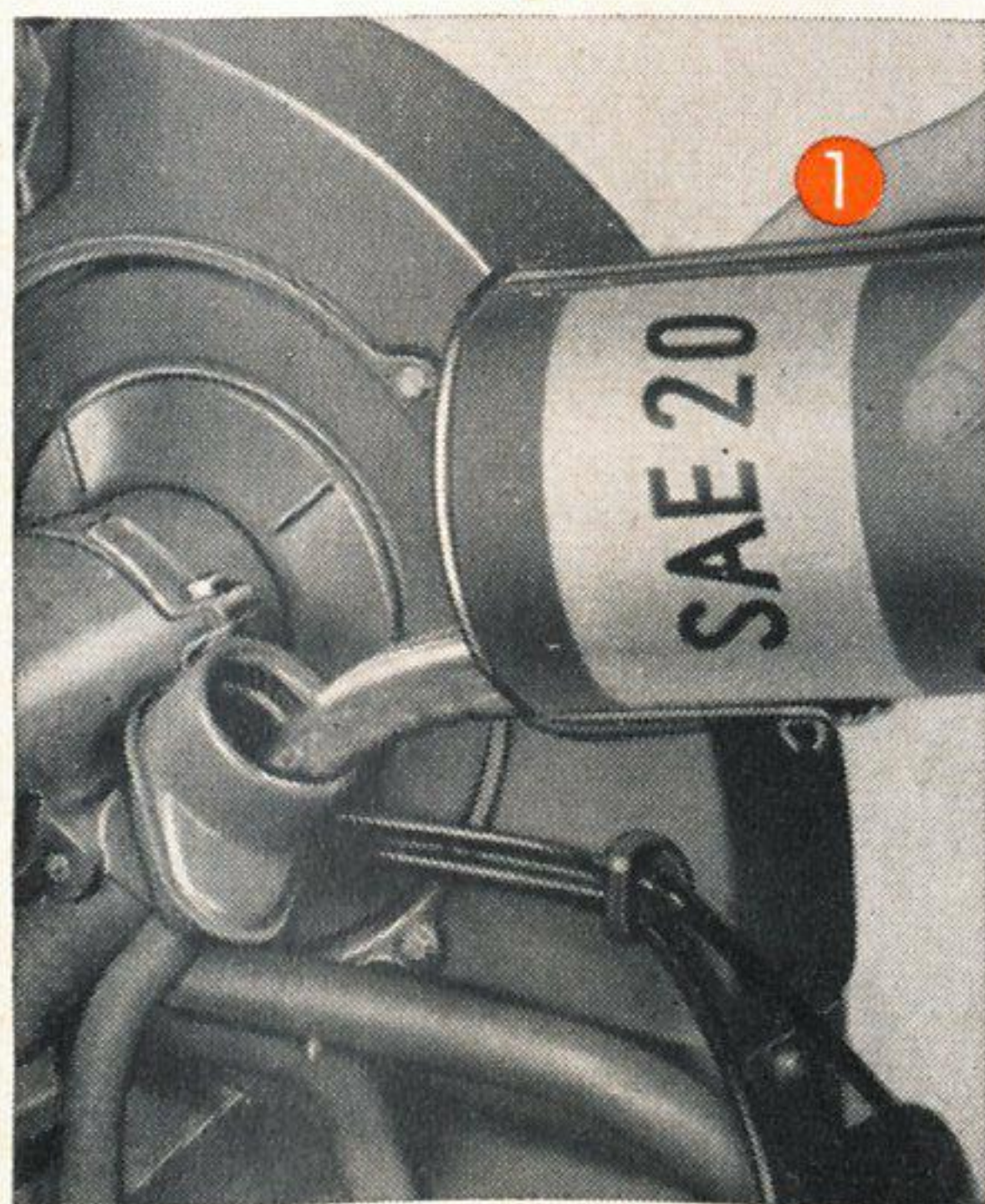
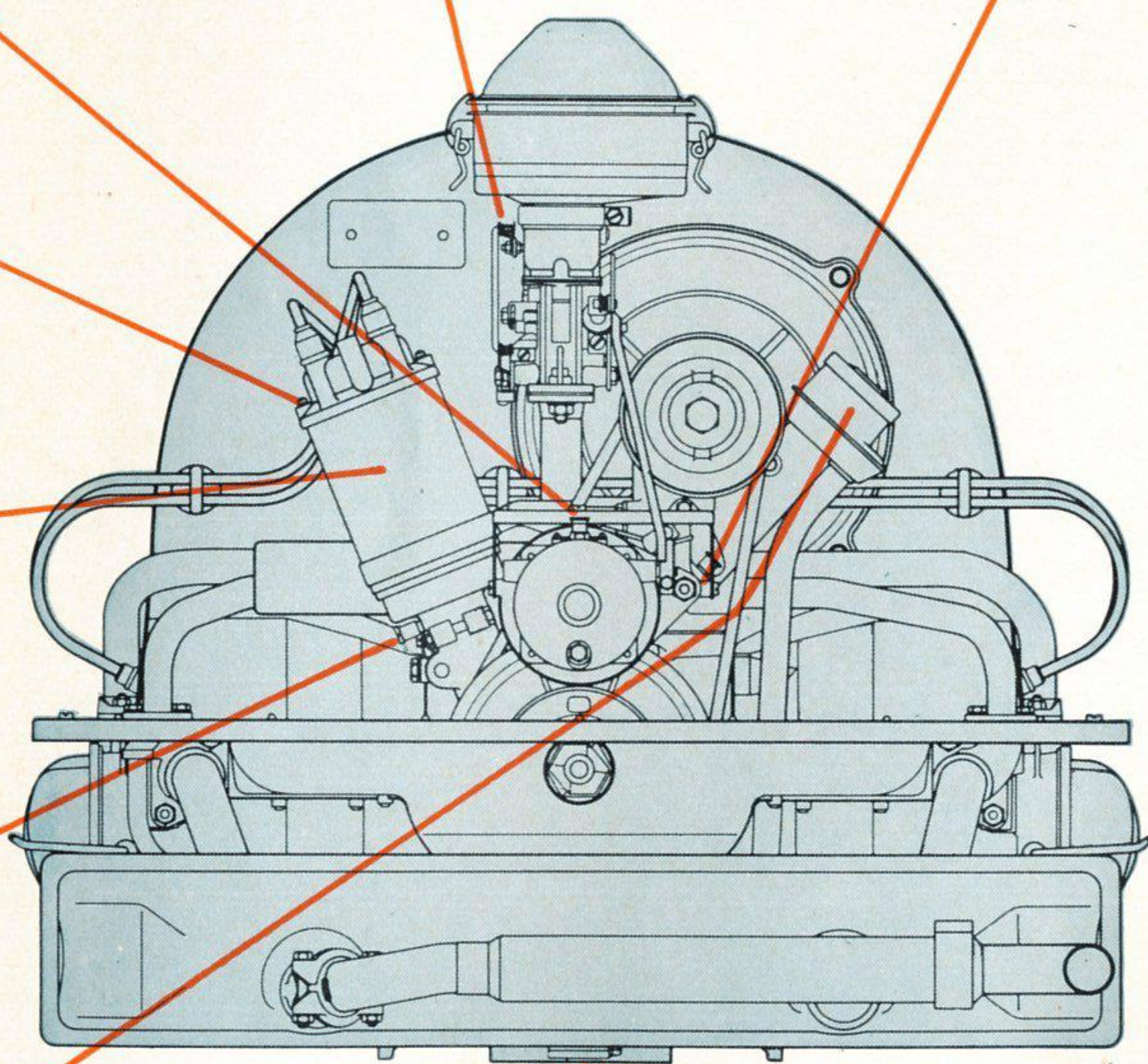
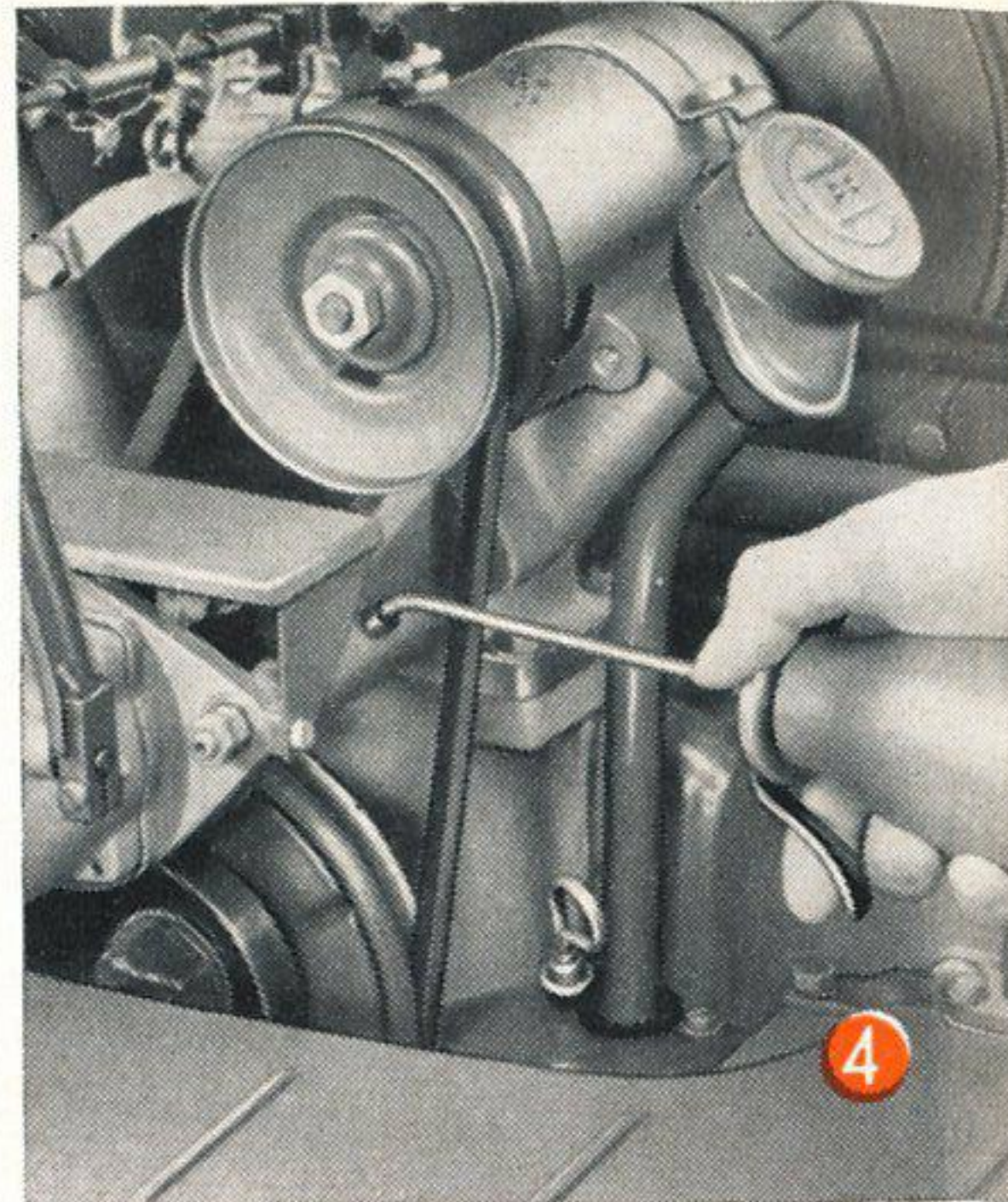
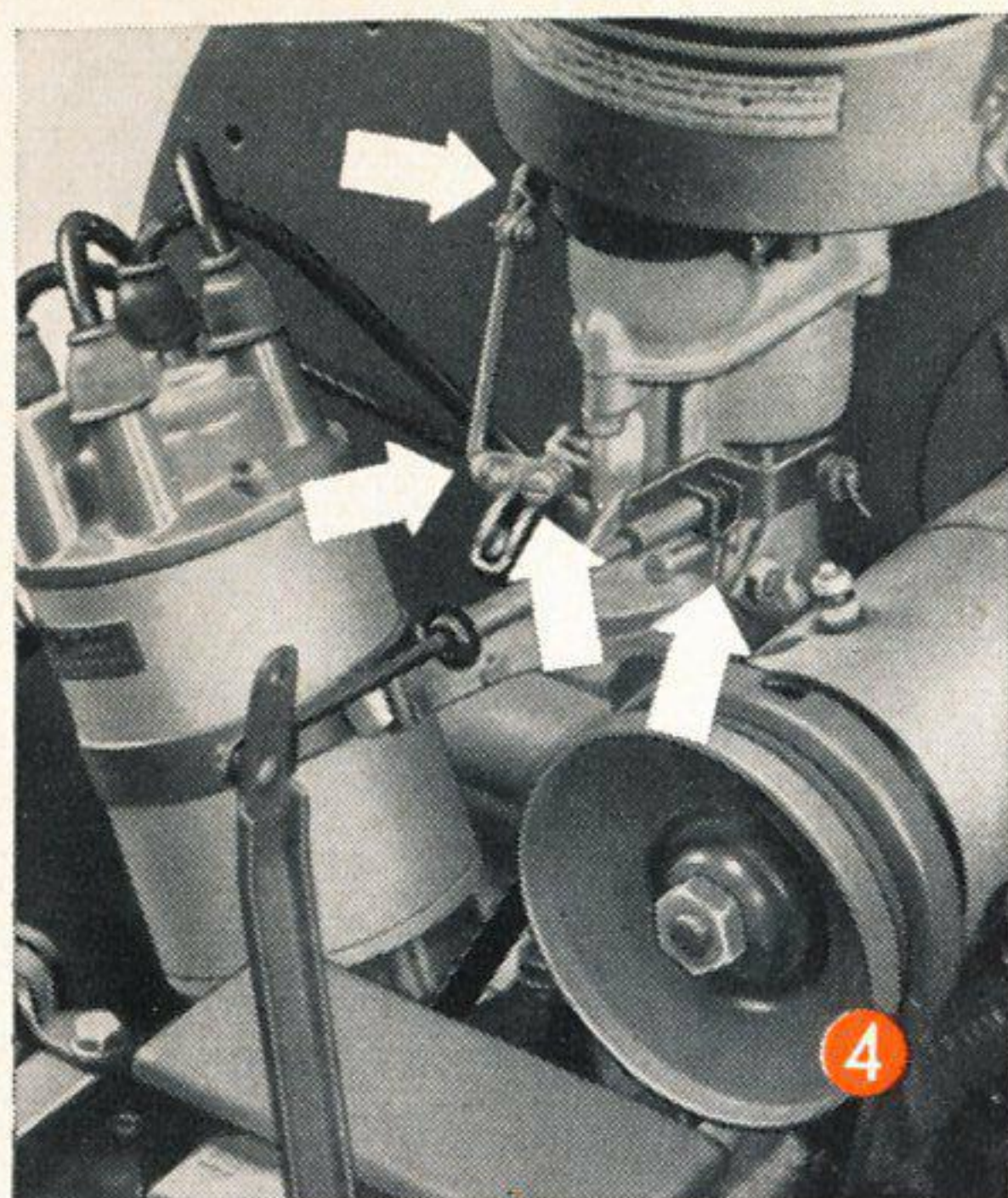
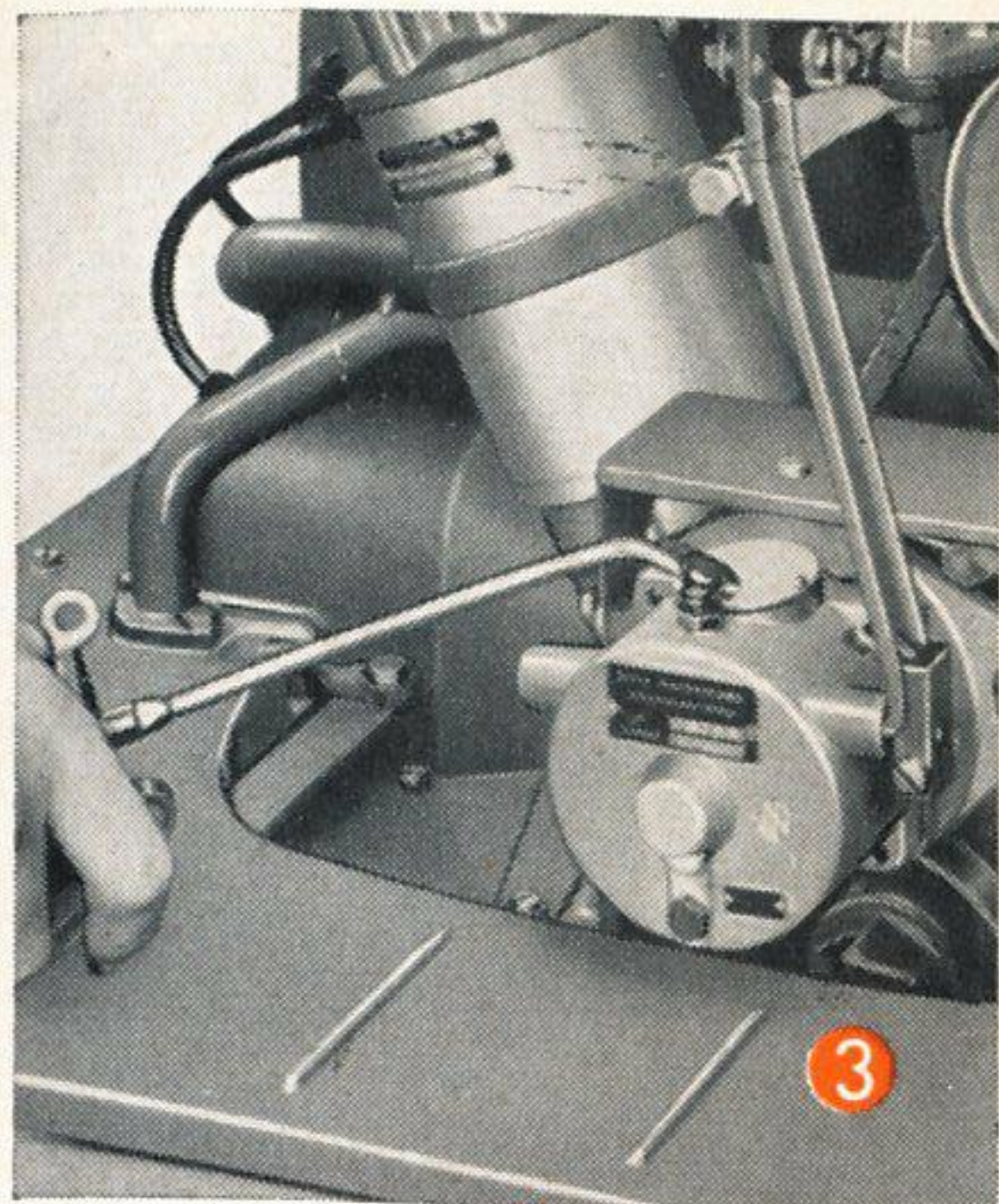
Type	122
Design	4 Cylinder, 4 Cycle, Carburetor Engine
Arrangement of Cylinders	Horizontally opposed (Flat four)
Bore	77 mm. (3.031")
Stroke	64 mm. 2.520")
Capacity	1192 c. c. (72.740 cu. in.)
Compression Ratio	7.0 : 1
Weight of engine, with normal equipment	93.5 kg (206 lbs.)
Turning direction (flywheel)	Anti-clockwise
Crankcase	Magnesium alloy
Crankshaft support	Four plain bearings of aluminium alloy
Valve actuating mechanism	Cam followers, push rods and rocker arms
Valves	Overhead, one intake and one exhaust for each cylinder
Valve clearance	Intake 0.20 mm. (.008") } up to Exhaust 0.20 mm. (.008") } a maximum oil temperature of 50° C (122° F)
Pistons	Light-metal alloy with steel inserts
Piston speed	6.4 m./s. at 3000 rpm (1263 ft. per. min.)
Cylinders	Single cylinders of special grey cast iron
Cylinder heads	Light-metal alloy, one head for two cylinders
Cooling	Radial blower driven by V-belt
Blower speed	Approx. 5400 r p m. at 3000 engine r p m.
Amount of cooling air	Approx. 425 Liters (16 cu. ft.)/sec. at 3000 engine r p m.
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	Gravity feed; pump should be used if drop is less than 200 mm. (7.9")

Fuel	Octane rating 76 (Res. F 1)
Carburetor	Downdraft SOLEX 26 VFIS or 28 PCI
Air cleaner for carburetor	Oil-bath type or wet type
Ignition	High-tension magneto with speed limiter (Scintilla-Vertex) (Battery ignition on request)
Firing Order	1 — 4 — 3 — 2
Spark timing (Magneto)	7.5° before T D C.
Spark plugs	Bosch W 175 T 1 Beru 175/14
Spark plug gap	0.4 to 0.5 mm. (.016" to .020")
Breaker point gap	0.3 to 0.4 mm. (.012" to .016")
Battery ignition system	
Ignition	Ignition distributor Bosch VJ 4 BR 25 or VJR 4 BR 25 Coil Bosch TE 6 B 1
Spark timing	7.5° before T D C.
Spark plugs	Bosch W 175 T 1 Beru K 175/14 AC 43 L Auto-Lite AE 6 or AER 6 Champion L 336×27 KLG F 70 Firestone 147 Lodge H 14
Spark plug gap	0.6 to 0.7 mm. (.024" to .028")
Breaker point gap	0.4 mm. (.016")
Governor	Centrifugal governor, acting on the carburetor throttle
Starting system	Starting handle (Starter motor on request)
Starter	Bosch EED 0.5/6 L 44
Generator	Bosch LJ/REG 180/6/2500 L 2
Clutch	Single disc, dry — Fichtel & Sachs K 10

The data printed in blue refers to the equipment which is not fitted to the standard type engine 122.

MAINTENANCE

Running-in period (Operating hours)			Operation	Every (Operating hours)
10	30	50		
			Clean air cleaner	50
			Check fan belt	
			Clean carburetor, adjust idling	
			Clean breaker points. Check grease on breaker arm fiber block. Check contact breaker points gap and ignition timing	
			Check valve clearance	
			Clean and check spark plugs Check compression	
			Check governor operation	
			Check generator output	
			Check battery voltage and acid level, add distilled water if requi- red. Clean and grease terminals	
			Check air throttle ring contact on fan housing	
			Clean fuel pump filter	
			Check tightness of nuts and bolts on engine, particularly on exhaust and intake manifolds, carburetor and fuel pump (if fitted)	100



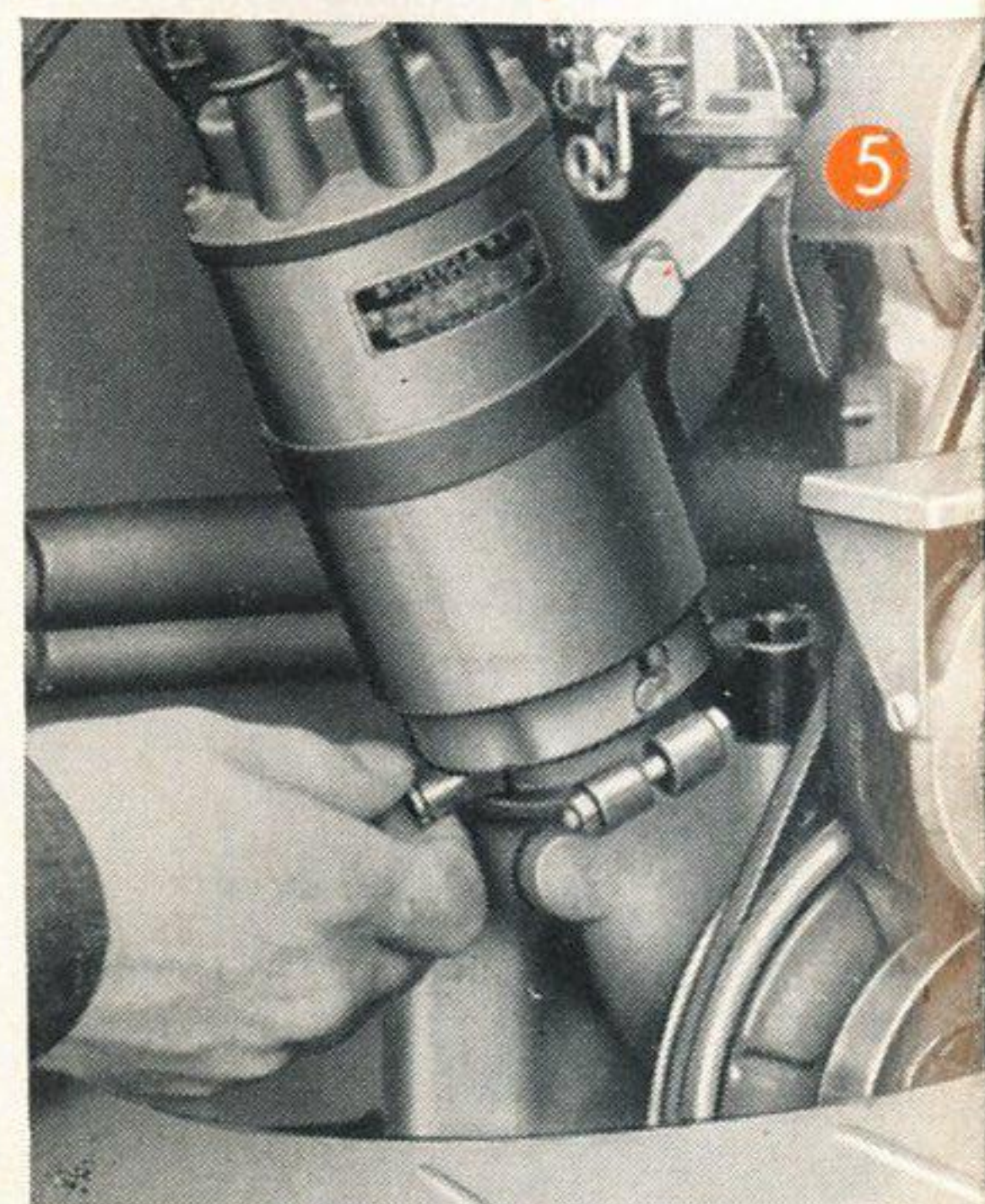
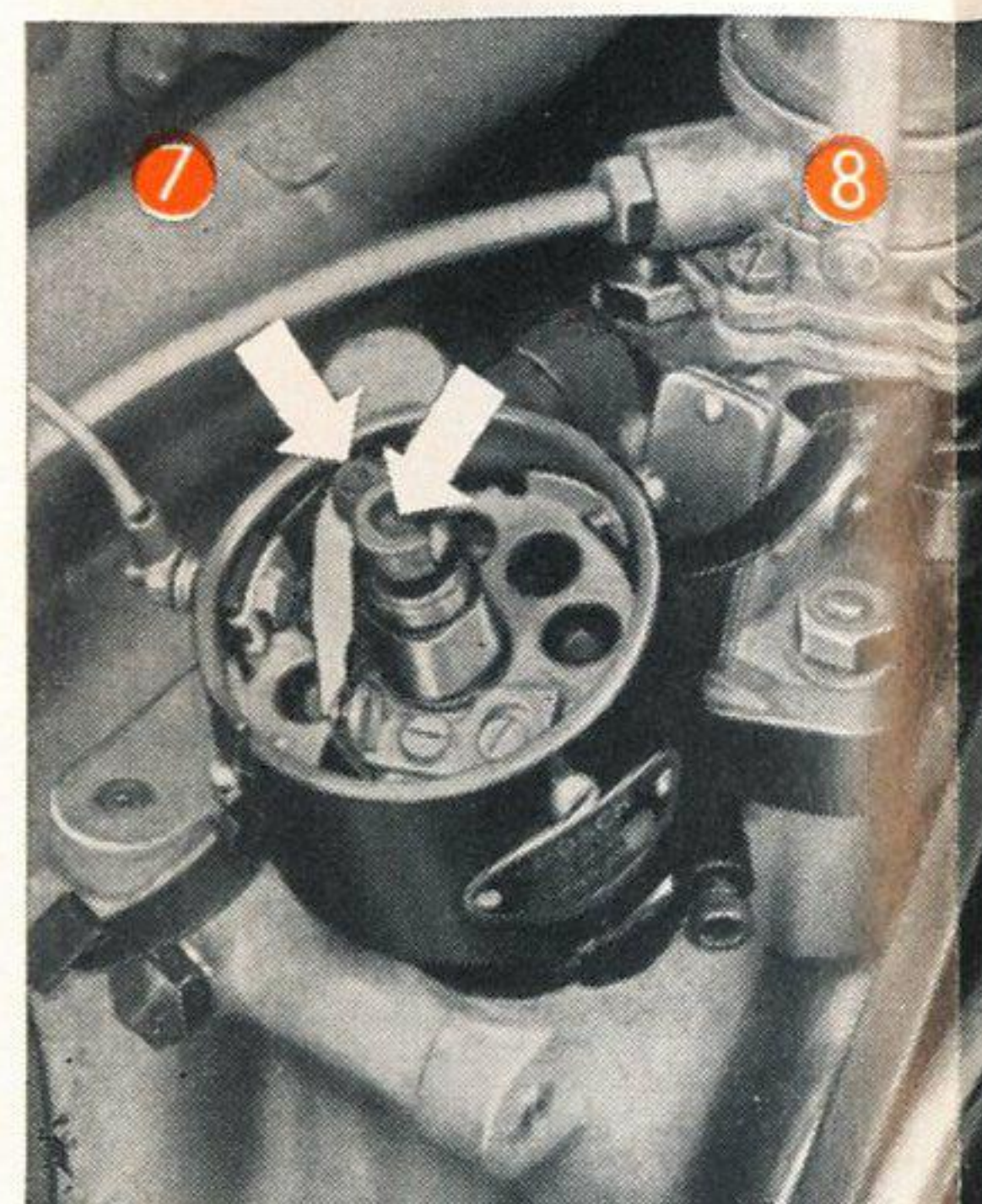
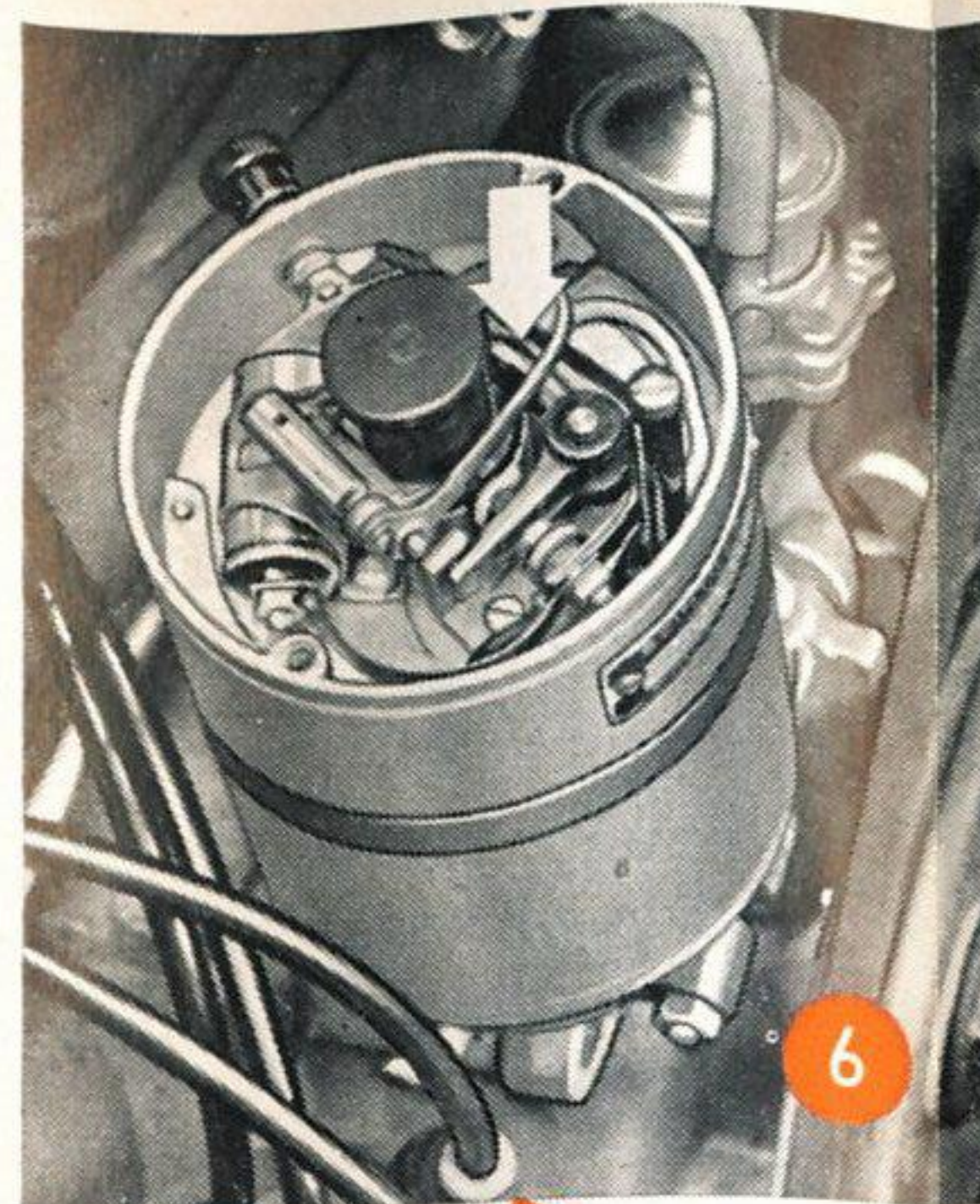
LUBRICATION CHART

Running-in period (Operating hours)			Lubrication Points	Every (Operating hours)
10	30	50		
			① Change oil (Every 6 months at least)	50
			② Clean oil strainer ③ Top up governor oil	
			④ Governor mounting bracket, control linkage*)	
			⑤ Lubricate magneto drive shaft (Two turns of grease cap)	
			⑥ Grease cam felt in magneto	
			⑦ Oil cam bearing in distributor (if fitted)	
			⑧ Check amount of grease at distributor breaker arm fiber block (if fitted), replenish if necessary	

* A few drops daily

LUBRICANTS

Lubricant	Lubrication Points	Specifications			
		Temperature	°C	°F	
Engine oil (Branded HD oil for spark ignition engines)	Engine, oil bath air cleaner, governor, governor linkage, carburetor controls, cam bearing in distributor	above	30	86	SAE 30
		from up to	0 30	32 86	SAE 20 or SAE 20 W
		below below	0 — 25	32 — 13	SAE 10 W SAE 5 W
Special grease	Grease cap and cam in magneto	High melting point grease or Scintilla Grease Type G			
Universal grease	Breaker arm fiber block in distributor	Cold-resistant, water-repellent grease			



Delay and confusion can be avoided, if the correct details are furnished on parts orders and correspondence, i. e. type year of manufacture, engine No, etc.

Protect your Warranty rights by adhering to the conditions given on the Warranty Voucher.

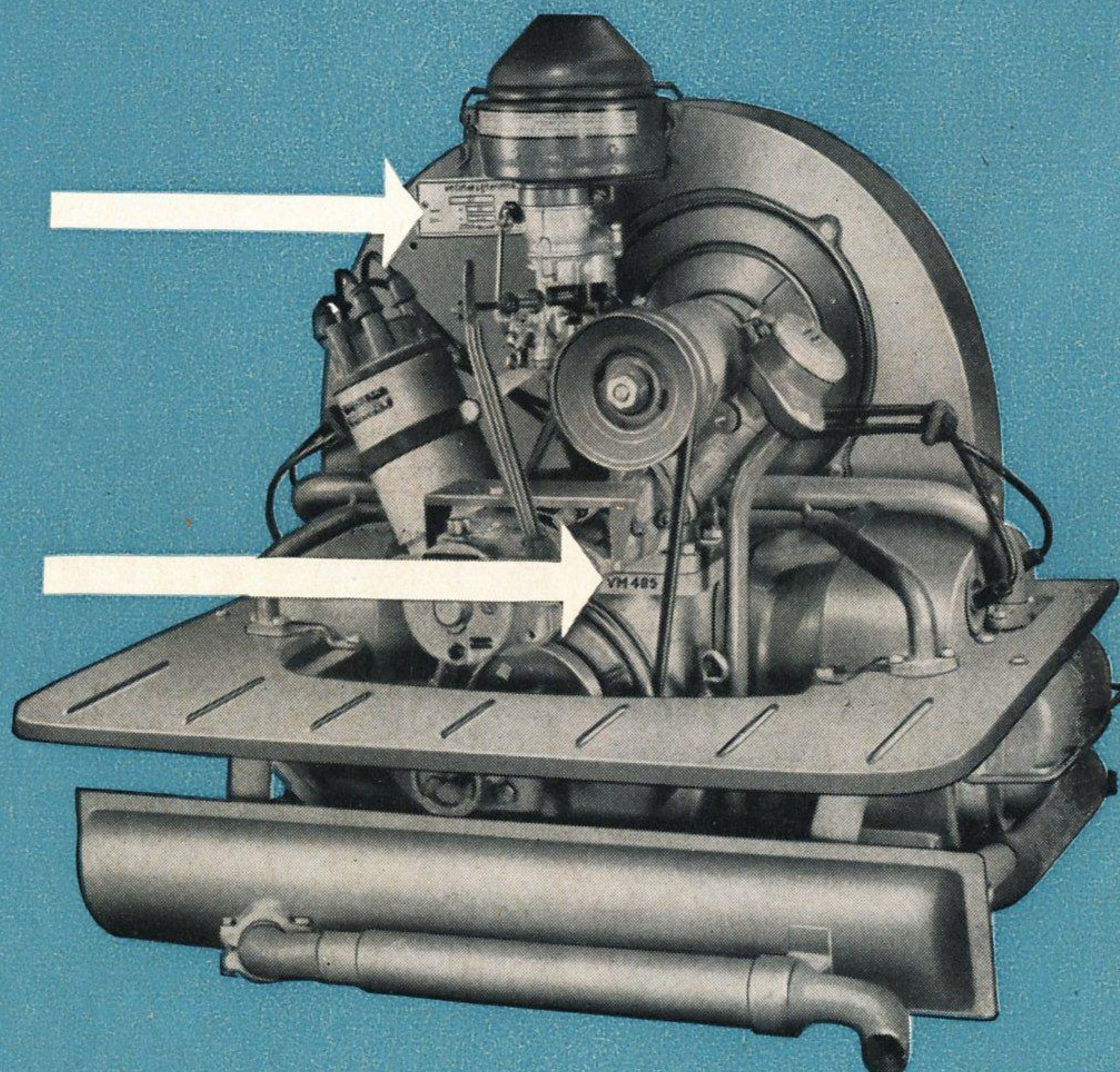
Take care not to lose the Voucher.

The Identification Plate

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

The Engine Number

is stamped on the
crankcase by the
generator support.



Tools and Accessories

- 1 Tool Bag
- 1 Spark Plug Wrench
- 1 Tommy Bar
- 1 Open End Wrench
- 1 Pair of Combination Pliers
- 1 Screwdriver 0.8
- 1 Socket Wrench 14 mm.
- 1 Starting Handle
- 1 Fan Belt
- 1 Warranty Voucher

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