111 DESCRIPTION

A. Overview

The motor is a four-stroke, single-cylinder block engine with the gearbox mated to the clutch housing and held in place by six studs and nuts. It is fastened to the lower part of the pressed steel frame by means of a bolt that goes through the motor housing, and also by means of two studs on the cross strut of the front vertical frame. The engine block is offset to one side of the wheel center line, so that the cylinder is not in the slipstream of the front wheel and its mudguard and good cooling is guaranteed. This shift in the centre of gravity is compensated for by the arrangement of all auxiliary equipment such as alternator, battery, horn, tool box and exhaust system on the other side. The motor is protected from being damaged from below by means of a sumpguard made of strong sheet steel and fastened to the frame on both sides.

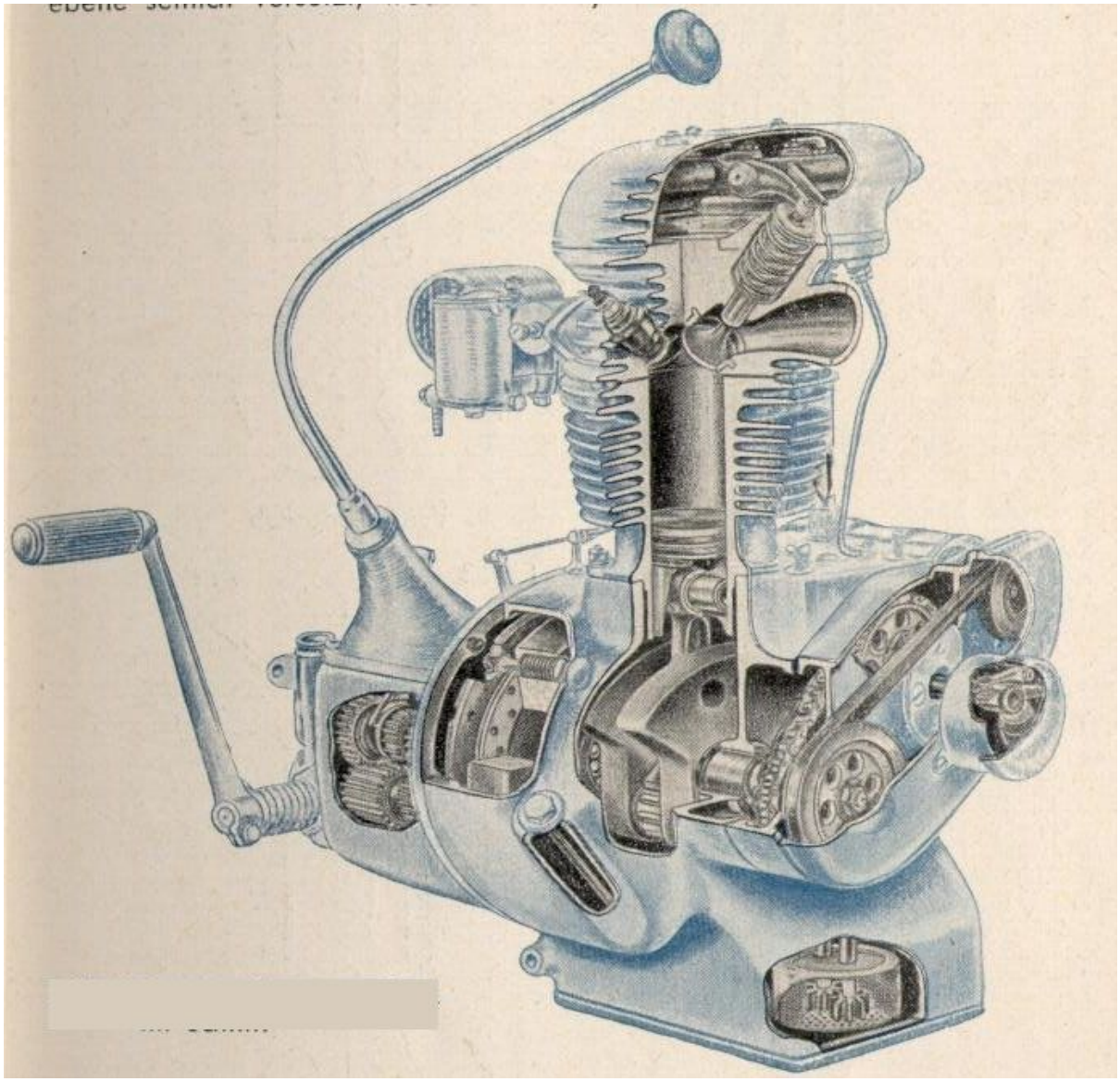

Fig. 15

B. Motor and transmission block

2. Housing and cylinder:

The motor housing is cast from a resistant aluminum alloy, which has been used for this purpose for years and consists of a single cast piece without a partial joint, which guarantees absolute oil-tightness. The cylinder is made of special cast iron and protrudes well into the crankcase. The cylinder head, which is cast from light metal, is connected to the cylinder by four bolts. A protective cover made of light metal encloses the cylinder head, which has the rockers mounted on it in bushes, so that it is dust- and oil-tight. An abundance of large cooling ribs on the cylinder and cylinder head ensure good cooling even during the most strenuous operation. This cooling is also effective for the spark plug, which is exposed to the airstream due to its lateral position.

3 Crankshaft, connecting rod and piston:

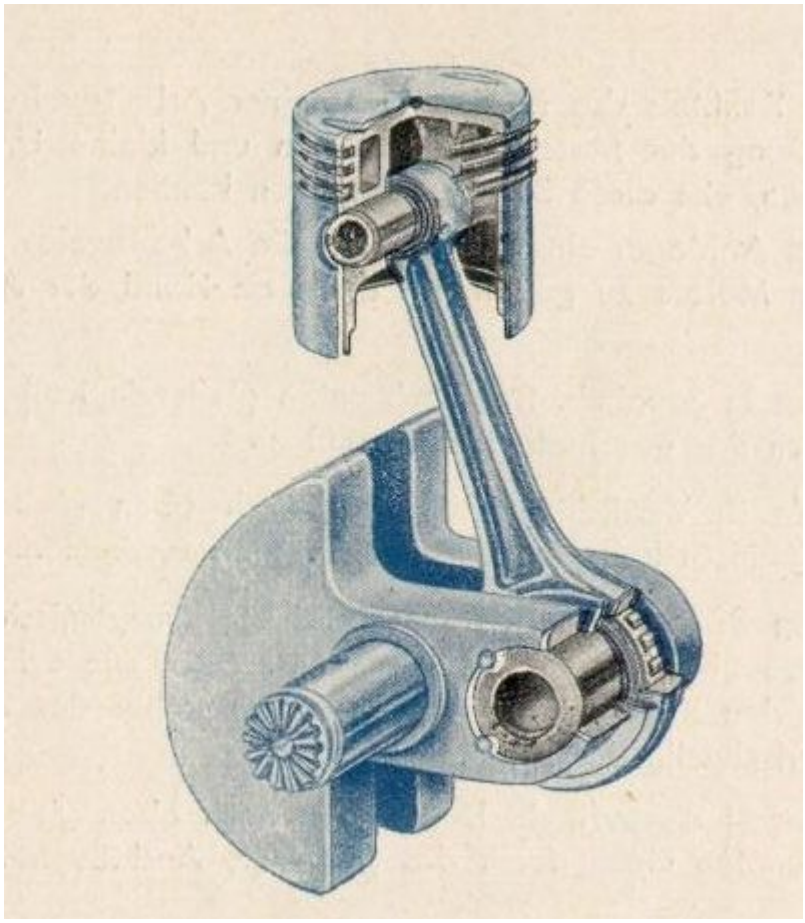

Fig. 17

(Note this is a pre-war style crankshaft, with a ridged end to the shaft.)

The crankshaft is made of special steel and the flywheels are pressed onto the cylindrical crank pin. The crankshaft runs in a bush at the front and in a strong ball bearing at the back. Hollow-drilled journals in connection with the corresponding oil galleries are used for the ample lubrication of all bearing points with pressured oil. The big end bearing is a roller bearing, whereby the friction between the connecting rod and the crank pin is reduced to a minimum.

The drop-forged connecting rod has an H -shaped cross-section. Well-known quality pistons are used, which are provided with three piston rings, one of which is designed as an oil scraper ring. The hardened and ground gudgeon pin is mounted in the small end bush and secured with snap rings. In addition, the entire engine is carefully balanced, which ensures that the engine runs as free from vibrations as possible.

4. Camshaft and valves:

The camshaft is driven by a chain from the crankshaft, while the alternator is driven by an endless rubber V-belt. The alternator drive is installed in a closed housing and is driven from the crankshaft; the complete noiselessness of the drive and the extremely low maintenance that it requires should be emphasized.

To re-tension the v-belt, loosen the securing strap and turn the alternator slightly outwards. It is important to ensure that the tension does not become too great. Tensioning the belt too much increases wear and tear and can damage the alternator bearings.

The nut of the securing strap must be tightened again.

The valves made of first-class special steel are arranged above the piston and are of large diameter. They are opened by the rocker arms equipped with screw adjusters; the rockers, in turn, are actuated by enclosed pushrods, which are held at the bottom in hollow followers that run on the cam lobes.

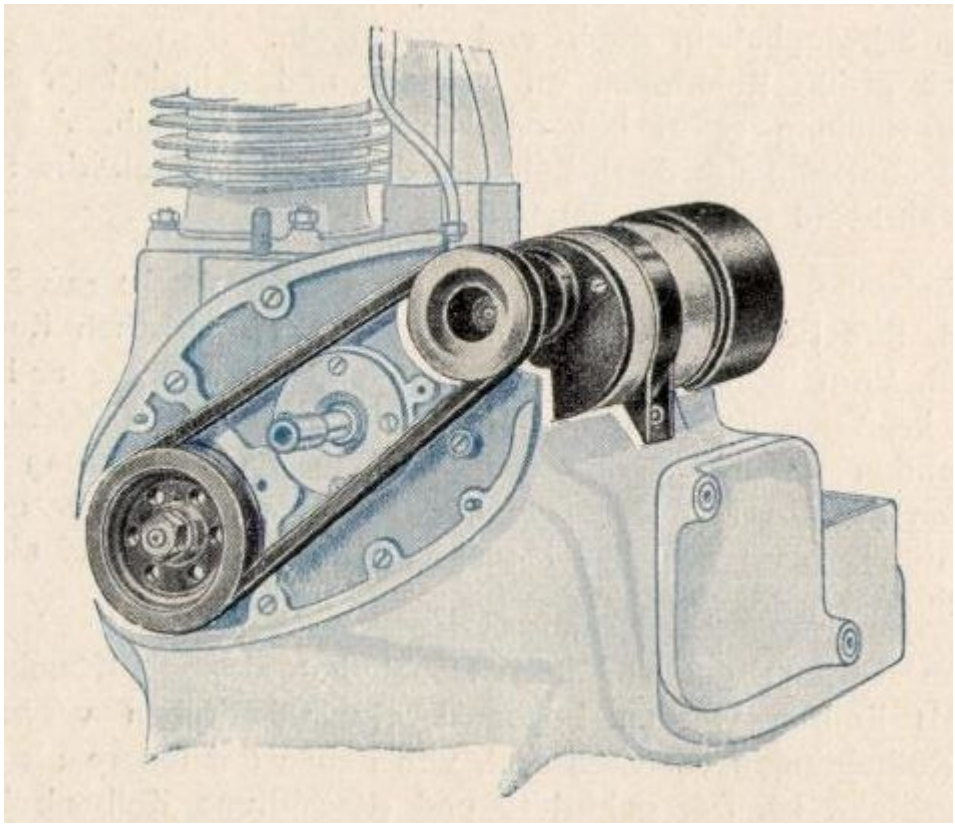

Fig. 18

5. Crankcase breathing:

The air compressed in the crankcase and the oil vapor it may contain is guided through a duct into the rear pushrod tube and rises up into the rocker cover. The oil vapour settles there and the oil-free air is led through a pipe arranged between the pushrod tubes down through a channel cast in the housing into the open air.

6. Lubrication and oil level check:

The motor is lubricated completely automatically under high pressure by a gear pump that is attached to the crankcase. This pump is driven by a worm on the control shaft via a worm wheel, the shaft of which engages with a square end in the hollow axis of the drive wheel of the gear pump.

This forces the oil, which has been cleaned by a filter, through a hole in the pump cover and a riser gallery into the crankshaft plain bearing. From here it is guided through the appropriate galleries and through the hollow crankshaft journal to the connecting rod position, where it emerges as centrifugal oil and lubricates the cylinder wall and with it the piston, gudgeon pin and the upper connecting rod bush. Another line leads from the front crankshaft bearing to the camshaft bearing and into the hollow camshaft, from which the cams, the worm for the oil pump drive and the rear camshaft bearing are generously lubricated through appropriate openings.

The rocker arms of the valve control are lubricated by means of pressured oil through their own oil riser pipe (Fig.15), whereby the oil supply is regulated through a hole in the control shaft. The oil carried up by this oil pipe reaches the rocker arm plain bearings through galleries in the cylinder head. The oil that collects in the rocker arm housing drains through the front pushrod tube into the hollow cam follower and from there back through narrow galleries in the crank housing and into the oil sump.

To check the oil level in the crankcase, the lower part of which also forms the oil container, there is a dipstick with a hexagonal head on the right side of the housing.

7. Carburettor:

A SUM carburettor with three fuel jets is used, which is operated by means of a bowden cable from the right twist grip. The three fuel jets are coordinated in such a way that no jet has to be changed even when changing the fuel type. (Fig. 11 and 19.)

The carburettor housing 1 sits on a cast flange of the float housing 2 and is connected to it by studs 3 and nuts 4. Three jets are screwed into an extension of the float housing, two of which (5 and 6) protrude into the middle of the intake pipe of the carburettor housing and are separated from each other by a vertical sheet 7, while the third, the idle jet 8, enters a side channel of the carburettor housing. The throttle slide 9 is arranged perpendicular to the intake pipe in the carburetor housing, which is connected to the right twist grip by a bowden cable. A compression spring 10 always keeps the slide in the closed position and blocks the suction channel. The closed position of the slide for idling can be regulated by means of an adjusting screw 11. To regulate the mixture composition for idling, an adjusting screw 12, which regulates the air flow that sweeps over the idling nozzle, is arranged above the latter and coaxially with it. By screwing in this adjusting screw, the air flow is

reduced, which makes the mixture more fuel-rich, and by screwing it out, the opposite is achieved.

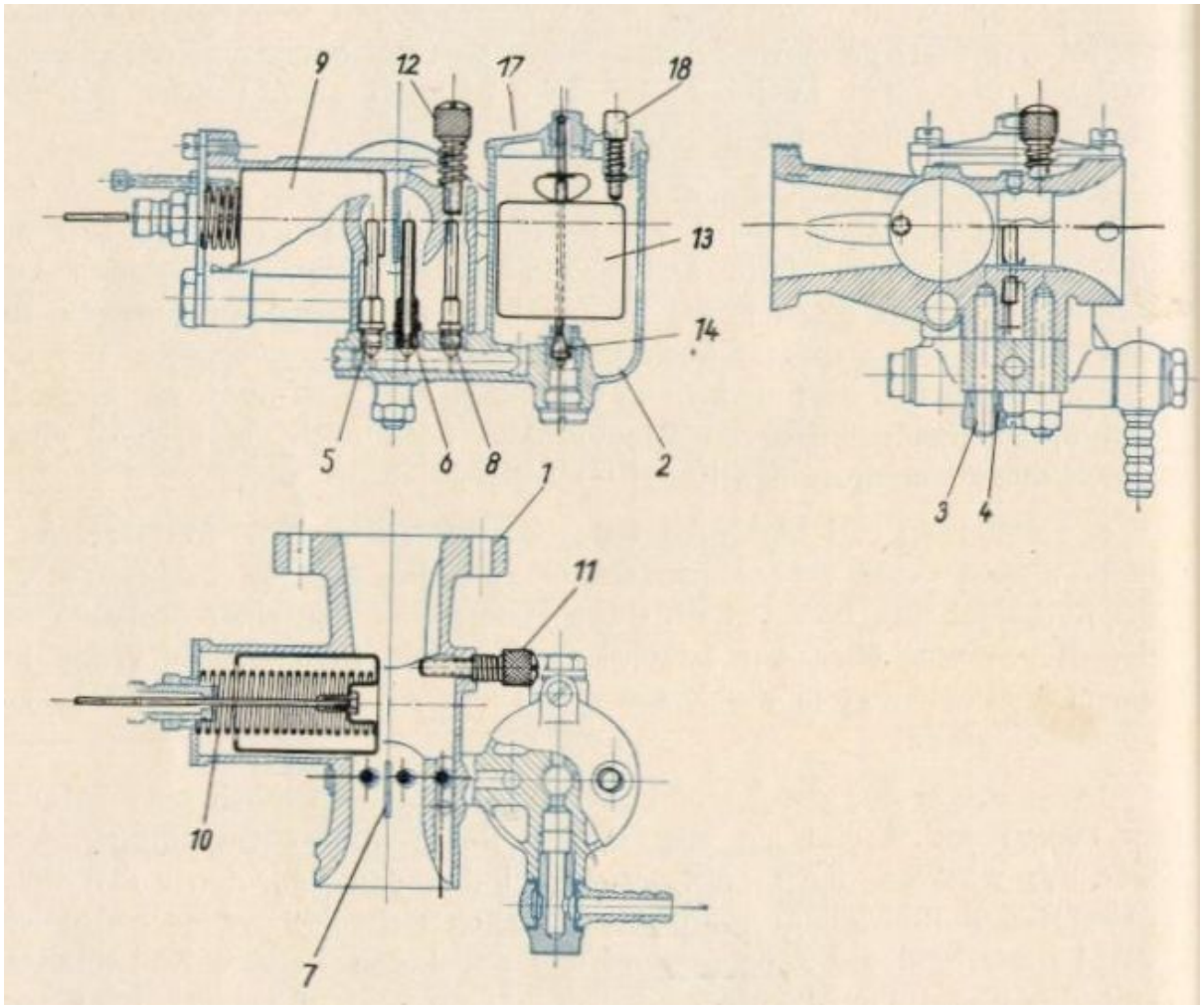

Fig. 19

The float 13 with needle 14 is housed in the float housing 2 and controls the fuel level by acting on the needle valve 14. the fuel enters the three nozzles 5, 6 and 8 through a hole in the cast flange of the float housing. These are finely drilled below the fuel level, approximately at the level of their square flange.

In order to give the rider the opportunity to achieve a quick start of the engine at any time, a tickler 18 is attached in the cover 17 of the float housing 2, through which the float 13 can be pressed down and the needle valve 14 can be opened. The result is an increase in the fuel level and a fuel-rich mixture when the engine is started, which makes starting the engine much easier.

8. Ignition :

The starting current is supplied by a 6-volt battery, which is fed by a 45-watt generator.

The alternator is fastened to the engine housing with a strap above the cast tool container. The battery is housed in a casting on the crankcase. The alternator is driven from the crankshaft by means of a rubber V-belt that runs in a closed housing.

The alternator is a shunt machine with automatic voltage regulation. As long as the engine is running at sufficient speed, it supplies the ignition current, the current for the headlight, the tail lamp and the horn. It also charges the battery, which feeds the ignition when the engine is at a standstill. The terminal voltage of the alternator is kept at an almost constant level by an electrical high-speed regulator, regardless of the speed at which the alternator rotates and how much demand is made. As a result, the incandescent lamps always burn evenly and have a long service life. The battery is fully automatically charged with a high initial charging current. The charging current decreases with increasing charge, so overcharging of the battery with its harmful consequences cannot occur. The battery is used to store electrical energy for drawing electricity when the vehicle is at a standstill.

The regulation of the terminal voltage offers the great advantage that the motor and the lighting system can be operated even when the battery is switched off or the battery is defective, without fluctuations in the light intensity or the light bulbs burning out. However, it is necessary to push hard, if possible downhill!

An automatic switch is built into the alternator, which switches the alternator in parallel with the battery as soon as it has reached the voltage required to charge the battery. The switch disconnects when the alternator voltage drops below the battery voltage at low engine speeds, thus preventing the battery from being discharged via the alternator.

The contact breaker is located on the front of the housing. After removing the protective cover, the contacts and the breaker cam, which is made in one piece with the camshaft, are exposed. The ignition coil is protected at the top of the left vertical frame strut. The low-voltage current supplied by the battery is converted into a high-voltage current by the interaction of the ignition coil and contact breaker and fed to the spark plug, where it jumps as a spark between the two electrodes.

The ignition timing is adjusted using the ignition lever on the left side of the handlebar. (Fig. 5)

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9. Clutch :

The clutch is a single-disc friction clutch as shown in section in fig. 20.

It is driven by the flywheel 1, which is seated on the conical journal of the crankshaft and fastened with a woodruff key and nut. Six guide pins 5 and three drive pins 9 in the flywheel carry a pressure plate 2 with them, which rests against a thrust bearing 10. The bearing body of the thrust bearing 10 is screwed to the pressure plate 2. The thrust bearing 10 is seated on a guide bush 3 which is mounted on the neck of the ball bearing bush 11 so as to be displaceable in the longitudinal direction. The hub of the clutch plate 20 is connected to the drive shaft 12 of the transmission by means of splines so that it can be longitudinally displaced and is torsionally rigid. The clutch plate 20 is pressed against the flywheel 1 by the pressure plate 2 under the pressure of the springs 19 seated

on the guide bolts 5, whereby the rotary motion from the crankshaft is transmitted via the clutch to the gearbox.

By means of the lever provided on the left handlebar grip, the Bowden cable actuates the clutch lever 13, the fork of which moves the guide bush 3 with the thrust bearing 10 backwards, thus lifting the pressure plate 2 off the clutch plate 20 and interrupting the transmission of power from the motor to the gearbox.

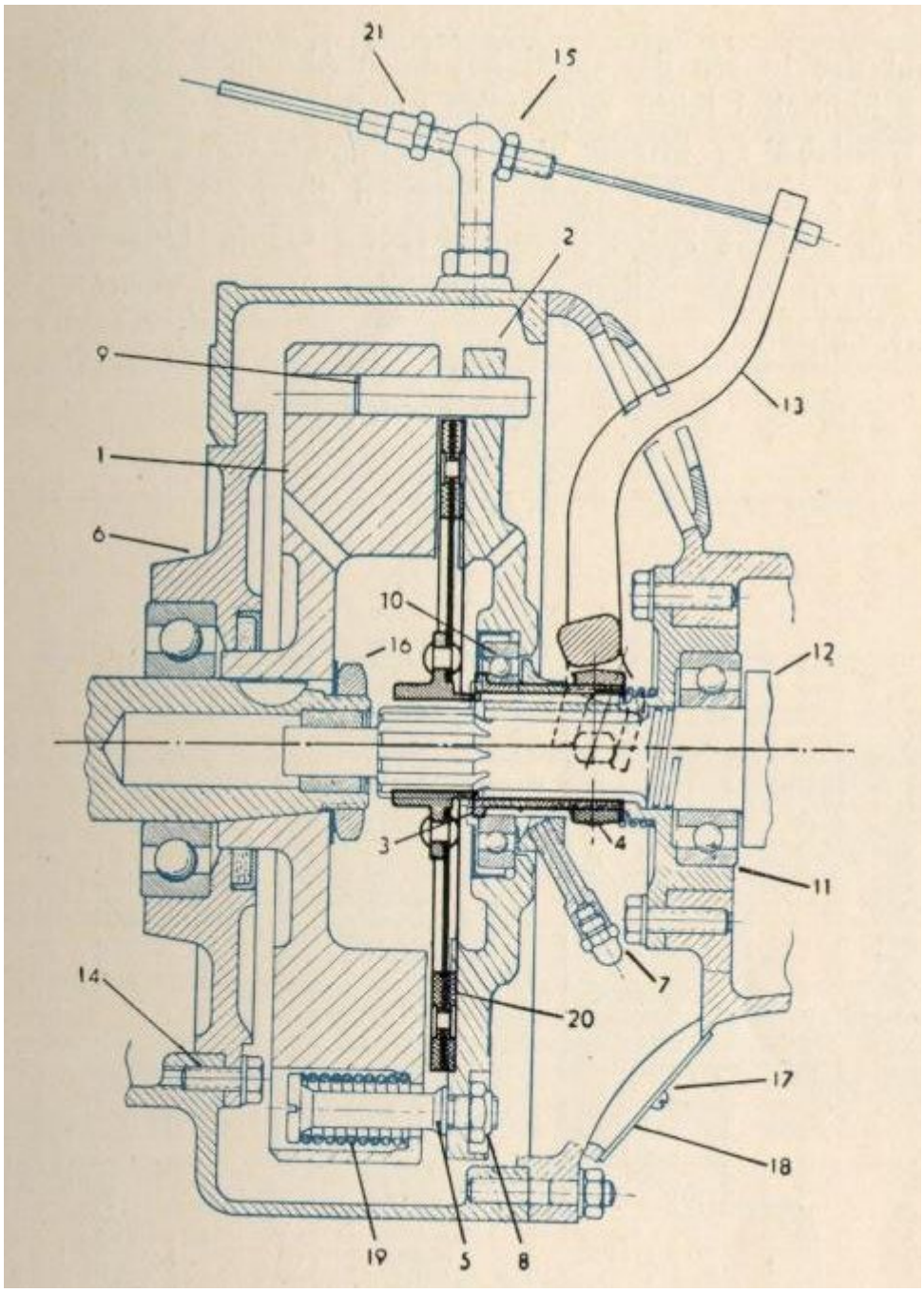

Fig. 20

10. Transmission :

The gear housing is cast in the same aluminum alloy as the motor housing. Strength and oil tightness are particular advantages of the same. The gearbox is attached to the clutch housing and secured to it by means of studs and nuts. This arrangement has the advantage that the transmission can be easily removed without removing the motor from the frame.

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Although the inside of the gearbox is easily accessible after removing the gearshift lever housing cover, we strongly advise against opening and dismantling the gearbox if it is not absolutely necessary. When reassembling, the teeth will mesh in a different position and the result will be noisy gears. Any work on the gearbox that becomes necessary should only be carried out by one of our representative workshops.

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The machine is equipped with a four-stage gearbox. All gears are constantly engaged and all gears are selected by means of forks, which means that stress on the transmission is significantly reduced.

Figure 21. For engaging 1 and 2 gears, the change lever engages the selector fork 1, which in turn moves the claw piece 2 down (1 gear) or up (2 gear); to engage the 3rd and 4th gear, the change lever swings over the neutral position into the shift fork 3, by which the claw 4 for the 3rd gear is pushed down and the 4th gear is pushed up onto the gearwheel 5, which causes the mainshaft 6 to be directly connected in a non-positive manner to the shaft 7 which drives the rear-wheel. In fig. 21 the position of the forks shown is the neutral position.

The gear lever positions in the individual gears are determined by a gate, which is attached to the frame and is at the same time designed as a knee cushion and on which the gear numbers are stamped.

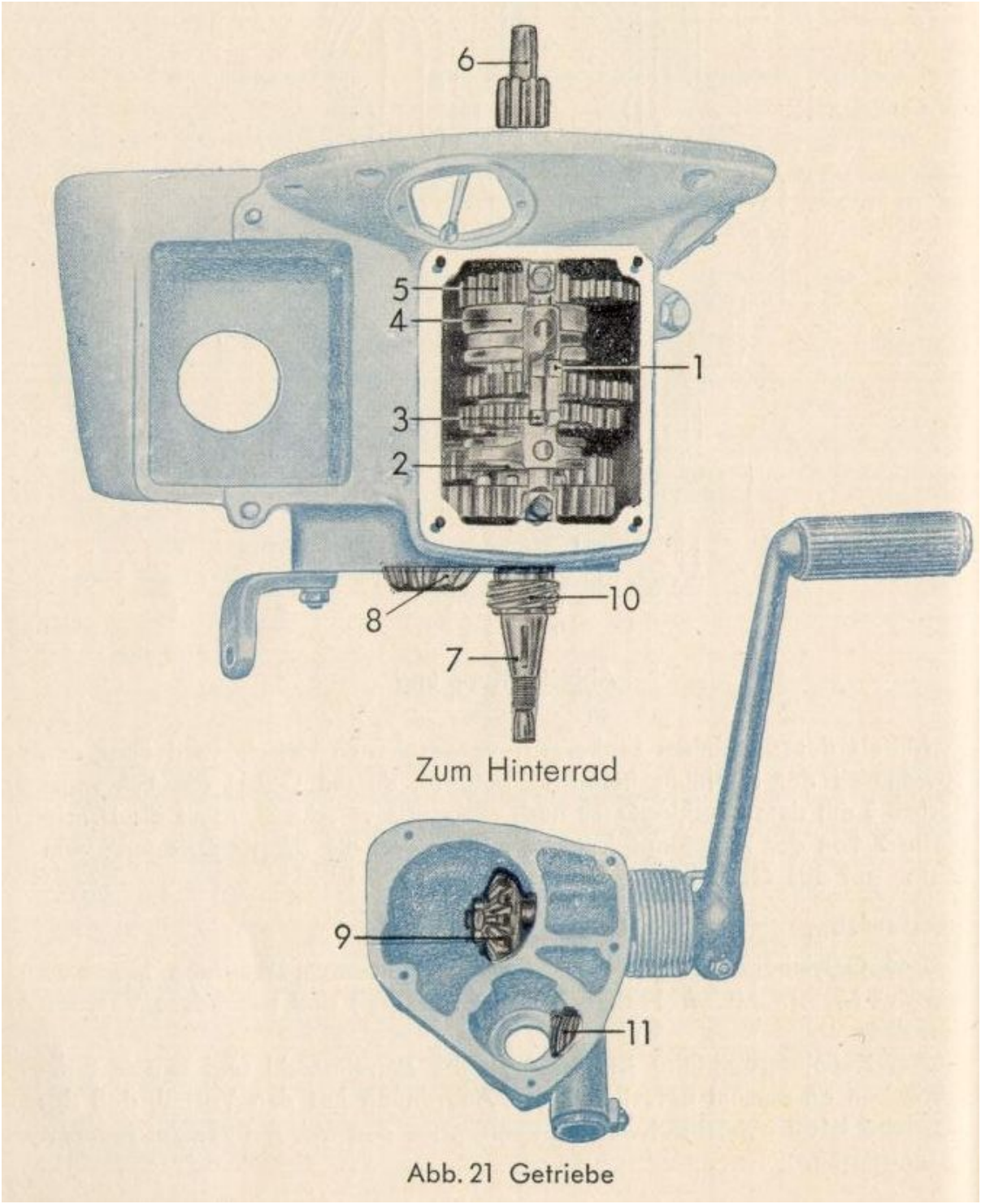

Abb. 21 Getriebe

Fig. 21.

11. Power transmission

The rotary movement generated by the engine is transmitted from the gearbox to the drive shaft 1 (fig. 22) with the interposition of a rubber shock absorber, which in turn controls the torque via a toothed coupling 2 and 3, which absorbs any longitudinal displacements that may occur. The movement is carried forward to the drive pinion 4 of the bevel gear pair. The pinion 4 is mounted in a double helical roller and a ball bearing and transmits the rotary movement to the large ring gear 5, which is screwed to the drive flange 6. The spur teeth 11 of the hub body 12, to which the brake drum 13 is riveted, thus transmits the force from the ring gear 5 to the rear wheel. The drive flange 6 is mounted in two strong ball bearings 7 and 8 in the final drive housing 9 and in the housing cover 10.

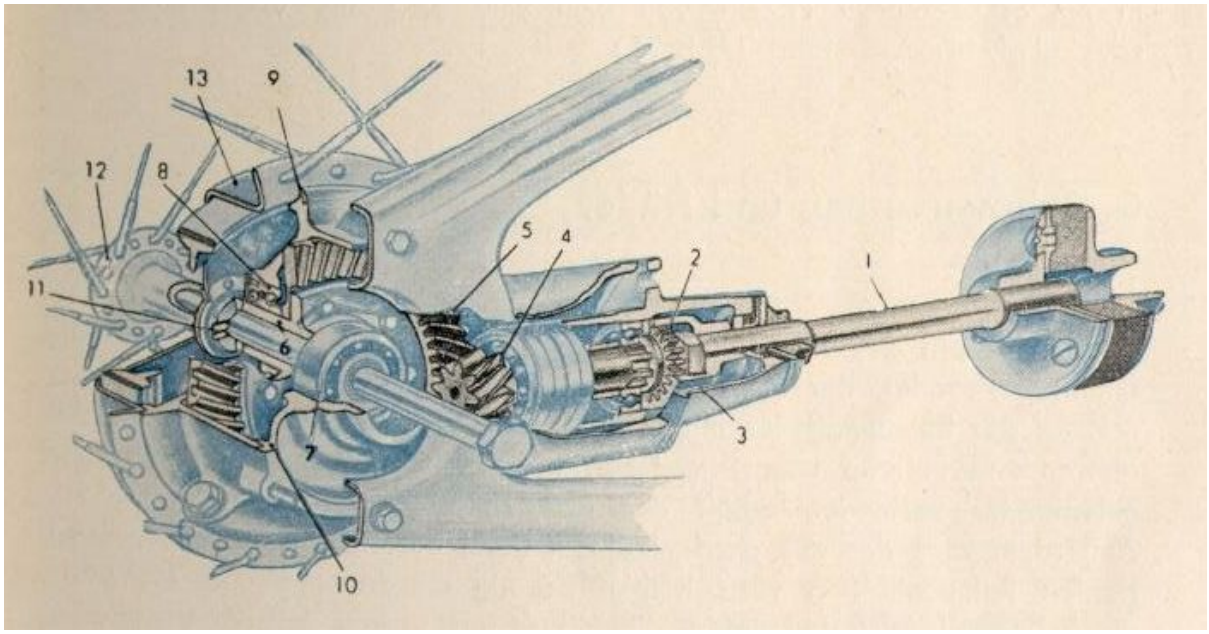

Fig. 22

The sealing of the drive shaft when it enters the final drive housing, as well as the sealing of the brake drum against the final drive housing, is so perfect that an escape of oil is effectively prevented.

A foot-operated lever is used to start the engine. The shaft on which it is clamped is in a non-positive connection by a pair of bevel gears 8 and 9 (Fig. 21) with a short auxiliary shaft mounted lengthways in the gearbox housing, which in turn is connected to the saw-tooth-like internal toothing of a bell-shaped intermediate wheel by means of a pawl device, which is mounted on the same auxiliary shaft. This intermediate gear engages in the rear spur gear of the gearbox auxiliary shaft and in this way transmits its rotary movement via the gearbox countershaft to the crankshaft when you step down the foot-operated lever, thus starting the engine.

The speedometer is driven by a worm 10 wedged on the main shaft of the gearbox. This meshes with a worm wheel 11, from which a flexible shaft leads to the speedometer. (Fig. 21)

Page 42 **IV. Repair**

The following explanations are intended to be a guide for those who own the bike and who want to carry out maintenance work themselves. In the case of more important work, which usually cannot be carried out without outside help, it is advisable to commission one of our representative workshops to carry it out.

1. Removing and grinding in the valves:

The valves are to be checked for a good fit after 10,000 to 15,000 km or if faults are noticeable, and, if necessary, to be ground in. The contact surfaces of the valves must be completely smooth and close tightly. Any stuck carbon and the like can usually be removed by turning the valve with the valve spindle a few times on its seat. If this is not sufficient, the valve must be readjusted and removed for this purpose, as described below. First the fuel tank is removed after loosening the three bolts and then the carburettor, exhaust pipe and spark plug. Now unscrew the lower nuts for the pushrod tube and carefully pull the entire cylinder head off after removing its four fastening nuts from the cylinder. Now the head can be further dismantled by first removing the rocker cover. The cork seal between the cylinder head and cover is glued to the latter to prevent it from tearing.

In order to be able to remove the valves, the rocker arm must first be removed by loosening the nuts on the valve side from the rocker arm shafts and pulling off the rocker arm. Since the latter are secured against rotation on their axis by a fine longitudinal toothing, it is necessary to mark the face of the lever and axis so that the angle is not changed when reassembling. The cylinder head is now placed on a solid base; a hardwood block that is shaped to suit the combustion chamber is best suited. It is advantageous to clamp the cylinder head with the base in a vice so that you have both hands free to work. Now the valve collar is pressed down against the valve spring pressure by means of a suitable tool until the collets are free and can be removed with a wire hook. This also releases the springs which have to be removed from the outside while the valves are removed through the combustion chamber. If the collar is very difficult to detach from the collets, you can help a little by tapping it lightly with a hammer.

Now you brush a small amount of very fine emery powder mixed with oil on the valve seat, insert the valve loosely again and turn the valve back and forth on its seat with strong counterpressure and release until the valve and valve seat are ground in so far that they are fit exactly together again. You then grind with pure oil and then put the valve back in, **after carefully removing every trace of grinding material from the valve and the inlet and exhaust ducts.** The tightness of the valves can be checked by pressing the previously installed valves against the valve seat with your finger and pouring petrol into the ducts. If the valves close properly, no petrol may enter the combustion chamber.

After the valves with springs and collets have been reinserted in the reverse order as previously described and the rocker arms have also been correctly installed, the cylinder head can be carefully placed on the cylinder and screwed tight without the rocker cover. The valve clearance must now be readjusted. (See page 25.) When assembling the engine, particular care must be taken to ensure that the seals between the cylinder and cylinder head and the carburettor and the exhaust pipe are completely sealed.

2. Valve and ignition settings:

If the crankshaft has been removed for any reason, the settings must be readjusted after it has been reinstalled.

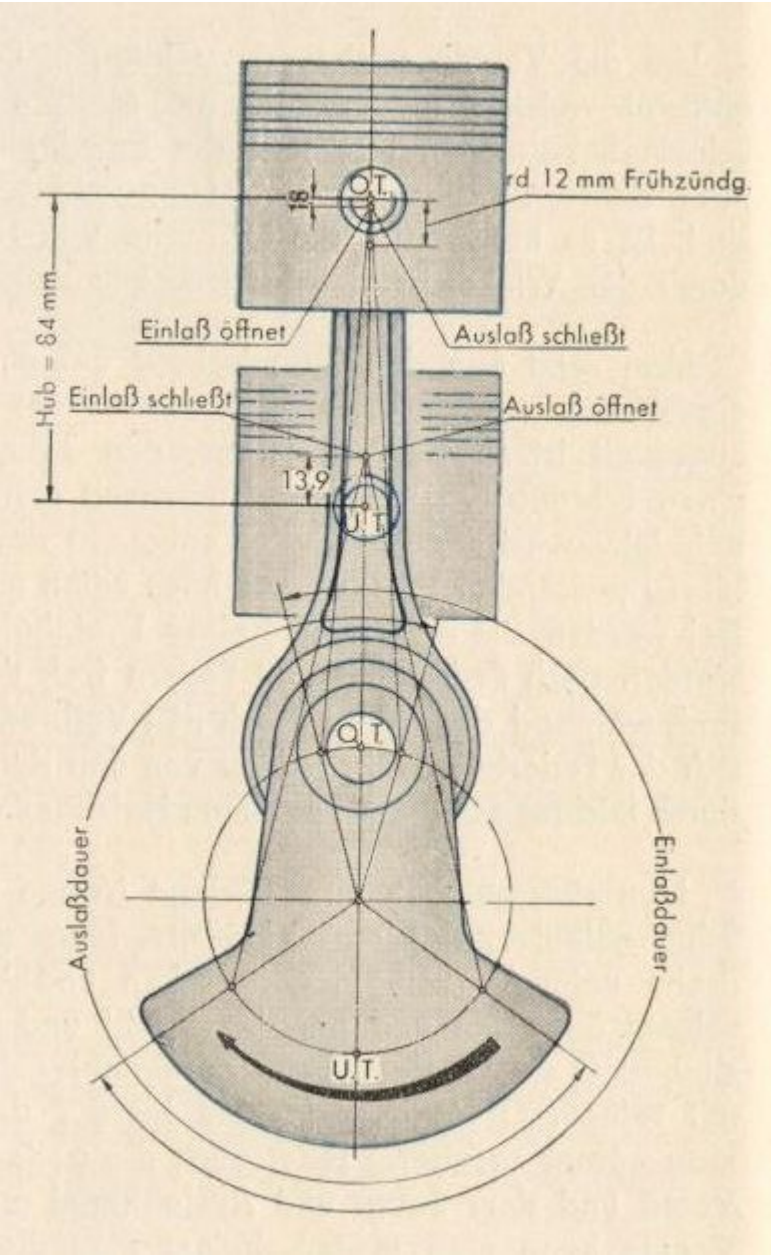

Fig. 26

N.B! The setting diagram is seen opposite to the direction of travel. The direction of rotation indicated is only correct when looking towards the front wheel.

Before inserting the crankshaft, the oil galleries in the journal must be thoroughly cleaned of any dirt that has accumulated. The setting of the valves is done as follows: first the crankshaft is turned so that the piston is exactly at top dead center. Then turn the timing gear with the timing chain in place so that the valves exactly overlap, i.e. the inlet valve is opening and the exhaust valve is in the process of closing. Then the sprocket on the crankshaft is pushed into the spur teeth of the

crankshaft journal and screwed tight with the threaded bolt on which the pulley for the alternator drive is keyed and secured with the small stud screw. (Note, this is the pre-war style crank.)

If the camshaft is correctly installed, **the ignition setting** is correct by itself, as the cam for actuating the contact breaker is ground on the front end of the control shaft.

3. Removal and cleaning of the oil pump:

To clean or check the oil pump, before removing it, first drain the oil from the motor housing by loosening the screw plugs located at the bottom of the motor housing on the left-hand side and removing the underbody protection of the motor after removing the fastening screws on the frame. Now loosen the twelve fastening screws of the oil pan and take it off. this makes the oil pump accessible and after removing the safety wire from the two screws, the **oil pump filter** can be removed. **This must be cleaned thoroughly before reinstallation.**

To remove the oil pump itself, the safety wire must be removed from the two fastening screws that are now accessible above. After loosening these screws, the oil pump can be pulled out.

Before reassembling, the motor housing should be thoroughly flushed and especially the oil pan should be cleaned of any accumulated sludge.

After reassembling and inserting the oil pump into the motor housing, check with a little oil to make sure that the pump has been installed correctly, i.e. that plenty of oil is being delivered when the drive wheel is turned. It is also important not to overlook the fact that the worm wheel is secured on the drive shaft with the cylindrical pin. When inserting new gaskets, it is important to ensure that the hole to the riser pipe between the oil pump cover and the housing flange is not covered, otherwise the lubrication will be interrupted and the bearings will be seriously damaged.