PUCH

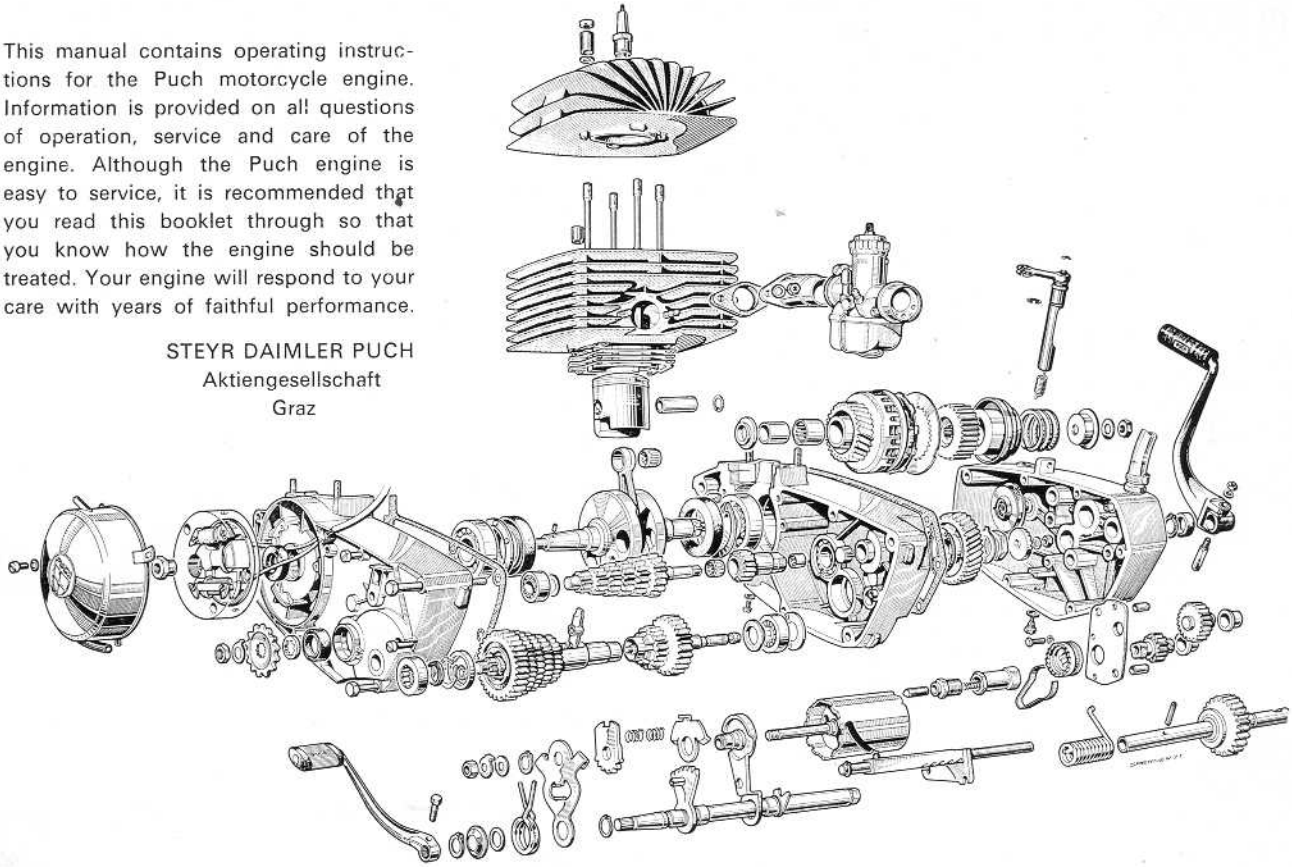
ENGINE
125/175 CC

INSTRUCTIONS

INDEX

This manual contains operating instructions for the Puch motorcycle engine. Information is provided on all questions of operation, service and care of the engine. Although the Puch engine is easy to service, it is recommended that you read this booklet through so that you know how the engine should be treated. Your engine will respond to your care with years of faithful performance.

STEYR DAIMLER PUCH
Aktiengesellschaft
Graz



1 TECHNICAL DATA – 125/175 Cross Country

The statements in brackets refer to Model 175 cc

Engine

Type	1-cylinder-2stroke engine – aircooled
Maximum output	17 hp at 8500 r.p.m. (20 hp at 8000 r.p.m.)
Maximum torque	10,49 fl/lb at 8000 r.p.m.; 1,45 mkp at 8000 r.p.m. (13,02 fl/lb at 8000 r.p.m.; 1,8 mkp at 8000 r.p.m.)
Compression ratio	13:1 (11,5:1)
Bore	2,165 in; 55 mm (2,441 in; 62 mm)
Stroke	2,047 in; 52 mm (2,205 in; 56 mm)
Displacement	4,174 US-oz. fl; 123,5 cc (5,712 US-oz. fl; 169 cc)
Cylinder material	Alu-alloy with cast iron liner
Cylinder head	Alu-alloy
Crankshaft	Steel
Inlet and exhaust	Ports
Port control	Piston
Lubrication	Petroil lubrication 1:25

Carburetor

Type	Bing central-float 1.024 in dia; 26 mm dia (1.063 in dia; 27 mm dia)
Main jet	125
Needle jet	2,76 (2,73)
Idle jet	40
Needle	5 (4)
Needle position	4th notch from top (3rd notch from top)
Idle air screw	appr. $1^1/_2$ rotations open
Throttle	Bing 22.5.70 (Bing 22.5.75)
Air cleaner	Dry filter

Electrical Equipment

Ignition	Bosch transistorized ignition, 6 V 17 W
Lighting coil	17 W
Ignition timing	0.0866 in; 2,2 mm in advance of TDC
Spark plug	Champion N3, Bosch W 260 T2
Spark gap	0.0197 in; 0,5 mm

Transmission

Gearbox	6-speed
Type of gearbox	Draw key shifted
Clutch	Multi-disc, running in oil
Primary transmission	Helical gears
Secondary transmission	Chain $^1/_2 \times {}^5/_{16}$"
Gear control	Foot operated

Gear ratios

Speed	Primary	Reduction		Gears
1st	61:50	36:17	23:23	41:11
	1.220	2.117	1.00	3.727
2nd	61:50	36:17	23:23	32:13
	1.220	2.117	1.00	2.461
3rd	61:50	36:17	23:23	29:16
	1.220	2.117	1.00	1.812
4th	61:50	36:17	23:23	27:19
	1.220	2.117	1.00	1.421
5th	61:50	36:17	23:23	24:21
	1.220	2.117	1.00	1.142
6th	61:50	36:17		
	1.220	2.117		

Capacity and quality of lubricants

Engine	Mixture of high octanity gasoline with Castrol two Cycle Motor Oil-Mixture ratio 1:25 = 4% e. g. Castrol B 767
Gearbox	27,04 US-oz.fl; 800 cc Automatic Transmission Fluid e.g. Castrol TQF, Typ A

2 TECHNICAL DATA – 175 cc Trial

Engine

Type	1-cylinder-2stroke engine – aircooled
Maximum output	16 hp at 7800 r.p.m.
Maximum torque	1,5 mkp at 7000 r.p.m.
Compression ratio	10:1
Bore	2,441 in; 62 mm
Stroke	2,205 in:; 56 mm
Displacement	5,712 US-oz.fl; 169 cc
Cylinder material	Alu-alloy with cast iron liner
Cylinder head	Alu-alloy
Crankshaft	Steel
Inlet and exhaust	Ports
Port control	Piston
Lubrication	Petroil lubrication 1:25

Carburetor

Type	Bing central-float 1,024 in dia; 26 mm dia
Main jet	125
Needle jet	2,73
Idle jet	40
Needle	5
Needle position	2nd notch from top
Idle air screw	appr. $1^1/_2$ rotations open
Throttle	Bing 22.5.75
Air cleaner	Dry filter

Electrical Equipment

Ignition	Bosch transistorized ignition, 6 V 17 W
Lighting coil	17 Watt
Ignition timing	0,0866 in; 2,2 mm in advance of TDC
Spark plug	Champion N3, Bosch W 260 T2
Spark gap	0,0197 in; 0,5 mm

Transmission

Gearbox	6-speed
Type of gearbox	Draw key shifted
Clutch	Multi-disc running in oil
Primary transmission	Helical gears
Secondary transmission	Chain $^1/_2 \times {}^5/_{16}$"
Gear control	Foot operated

Gear ratios

Speed	Primary	Reduction		Gears
1st	61:50	36:17	24:22	40:12
	1.220	2.117	1.090	3.333
2nd	61:50	36:17	24:22	32:13
	1.220	2.117	1.090	2.461
3rd	61:50	36:17	24:22	29:16
	1.220	2.117	1.090	1.812
4th	61:50	36:17	24:22	27:19
	1.220	2.117	1.090	1.421
5th	61:50	36:17	24:22	24:22
	1.220	2.117	1.090	1.090
6th	61:50	36:17		
	1.220	2.117		

Capacity and quality of lubricants

Engine	Mixture of high octanity gasoline with Castrol two Cycle Motor Oil–Mixture ratio 1:25 = 4% e.g. Castrol B 767
Gearbox	27,04 US-oz.fl; 800 cc Automatic Transmission Fluid e.g. Castrol TQF Typ A

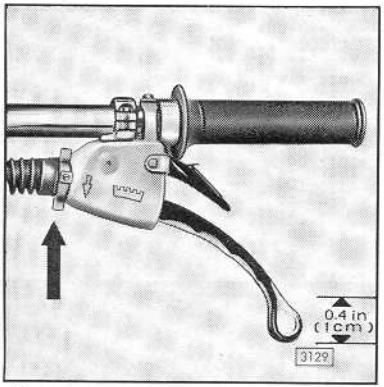


Fig. 1

Clutch lever

The play of the clutch lever, measured at the lever outside (fig. 1) is approx. 0.4 in (1 cm). For this adjustment use the cable adjuster (fig. 1). The play is reduced by turning the adjuster in the direction of the arrow (on the cover) turning against this direction increases the play.

If a readjustment is no longer possible the proper clutch play is obtained by means of the screw (fig. 2). Set cable adjuster at the handle bar approx. to middle range position, so that a later adjustment can be made again with the cable adjuster. If the correct clutch play cannot be adjusted by these two cable adjusters, have the clutch removed and checked over. If necessary replace the clutch cable.

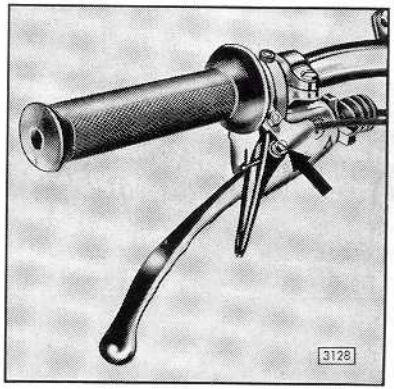
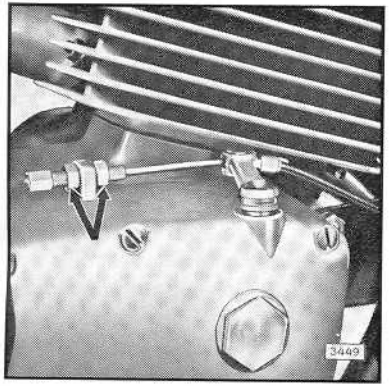


Fig. 3

Compression release – only in 175 cc engines on demand

It is adjusted at the control lever on the handle bar by means of the clamp (fig. 3). The cable socket must have a play of 0.04 in (1 mm) at the lever of the engine (support) (see fig. 4).
If there is no play the compression release valve will become untight. The consequences will be difficulties in starting and a loss of power. In case the compression release has become untight in spite of correct cable adjustment the complete compression release insert may be unscrewed for the purpose of repair (see page 10).

Fig. 2



Foot gearshift pedal

Changing the gears see fig. 5. Any rider will set the gearshift pedal that way to get the best shifting position. To this end loosen the fixing screw, remove pedal and fit it in the position required.

Carburetor

The carburetor is a special carburetor. Double float and float housing are of one piece. The carburetor tickler is on the left, the

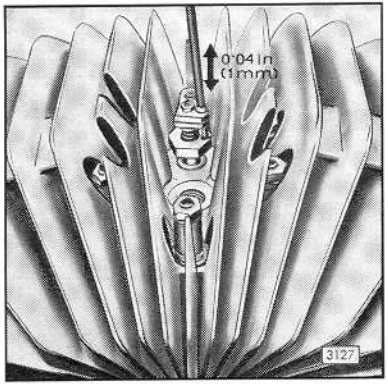


Fig. 4

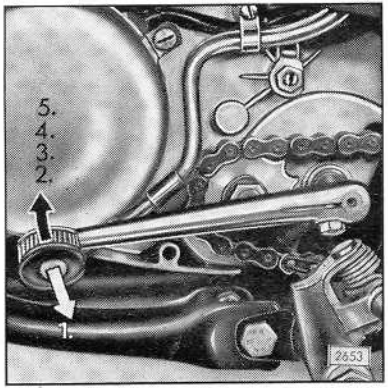


Fig. 5

throttle sliding stop screw and the idling air screw are on the right hand side. The float housing with main jet, the jet holder, neddle jet and mixing tube, idle jet, float and float needle are accessible by turning the wire clip and removing the float cover. The float needle is clamped by means of a spring and a ball absorbing shocks and vibrations when going on uneven tracks. In competition you will have to perform leaps with your machine. While leaping the fuel in the carburetor is pressed upward, and the engine would tend to drown. A washer placed between main jet and jet holder prevents drowning.

Component parts of the carburetor see fig. 8.

Fuel

The fuel consists of a mixture of premium grade gasoline and Two Cycle Motor Oil. Mixing ratio 1:25 e.g. Castrol B 767.

Oil level in the gearbox

The oil level should regularly be checked. One of the screws bolting the crankcase cover to the gearbox (fig. 6/2) is the oil level checking screw at the same time. When removing this screw with the vehicle on a level ground the oil level must reach to the bottom edge of the hole. If the oil level does not reach this mark top up with oil until oil starts escaping from this hole. Retighten the checking screw only in case no more oil escapes.

Changing the gearbox oil

Warm engine up. Remove oil level checking screw (fig. 6/2), and drain screw (fig. 6/3). Incline machine somewhat to the right so that the oil may escape entirely. Through the breather hose (fig. 6/1) fill approx. 27.04 US-oz.fl. (800 cc) of automatic transmission fluid (see technical data). If the oil level is correct refit checking screw and filler plug. At any oil change clean oil drain plug from metal chips.

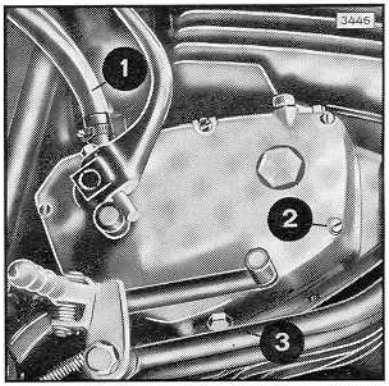


Fig. 6

Ignition

The vehicle is equipped with a Bosch transistorized ignition, i. e. a point less ignition electronically controlled.
With this unit, the control for the delivery of the spark is executed by a control coil on the magneto base plate and a control element fitted in the intake box. The thyristor in the control element functions as breaker contact.

When mounting the above unit for the first time, please make sure that control valve and condenser are earth connected, or the control valve might take damage. Moreover, it is important to fit the control valve contacts down in order to facilitate a dripping off of the condensed water and to prevent a dead short from forming.

The ignition timing has precisely been adjusted and need not be checked or readjusted.

A readjustment is only then necessary if. . .
The items to be considered see page 41.

Break-in Instructions

In order to prolong the life of the machine a certain running-in period is necessary. Since the machine has been designed for off-the-road operation, it will also be run in off the road.
Particularly important is the treatment of the engine. Within the first hours of operation the various parts of the machine are worn to such a degree that they have the ideal clearance.
In order to guarantee a proper running-in do not ride on full throttle right from the beginning, as the engine will be overheated. Increase the stress on the engine only gradually and throttle entirely down for short intervals. Within the first hour of operation ride on half opened throttle, within the 2nd and 3rd hour open throttle fully only for short durations.

Careful handling of the vehicle during the running-in period will prolong the life and increase the power of the machine.

3 MAINTENANCE

Decarbonizing the engine (fig. 7)

The combustion deposits on cylinder head, piston head and exhaust port are in the long run a source of trouble, and must therefore be removed from time to time.

Cylinder head and piston head

Use a blunt edged instrument to remove the carbon deposits so that the surfaces of the parts are not scratched. Every new scratch furthers the deposit of new carbon residues. Remove only the scaly spreading deposits from the piston head, a fine, even layer of oil carbon need not be removed.
Before refitting the cylinder head, remove all carbon deposits from inner side of cylinder thoroughly and rub lightly with motor oil. Then by turning the crankshaft over a few times make sure that the engine runs easily. Wipe sealing surfaces on cylinder and cylinder head clean.

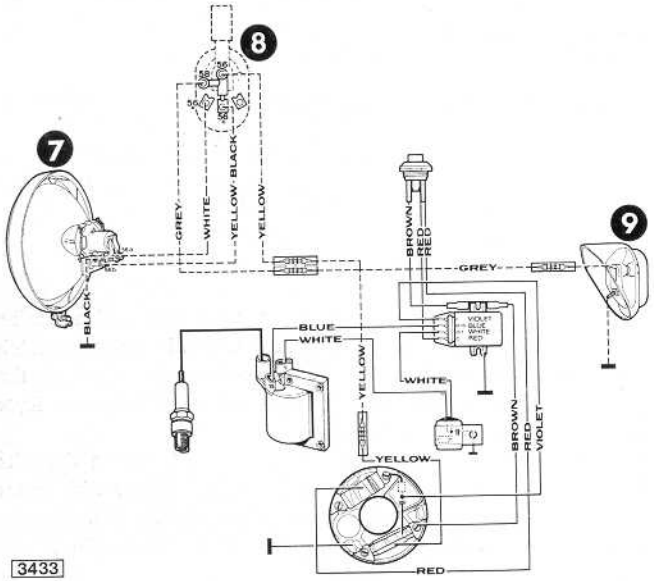
Refit cylinder head on to cylinder without gasket or sealing compound with the arrow pointing forward. Tighten the four cylinder head nuts crosswise.

Exhaust port

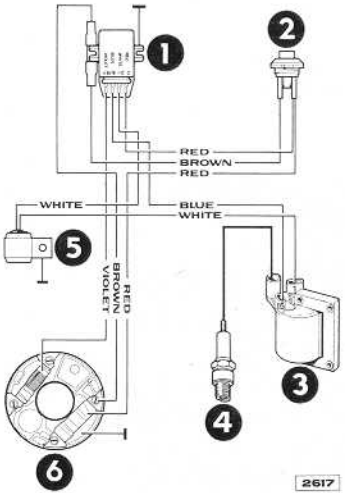
Remove the exhaust. Engage top-speed gear and turn engine over by rotating the rear wheel (spark plug removed) until piston reaches lowest point. Carefully remove oil carbon from the exhaust port taking care not to damage piston or cylinder working surface.

4 WIRING DIAGRAMS

With light



Without light



1. Control valve
2. Short circuit button
3. Ignition coil
4. Spark plug
5. Condenser
6. Flywheel magneto
7. Head light
8. Combination switch
9. Tail light

Compression release valve in a 175 cc engine

In case of 175 cc engines also the compression release valve is to be decarbonized. For this purpose unscrew the compression release insert from the cylinder head and undo it (page 10).
If the valve seats are untight the valves must be ground anew before refitting them (see page 38).

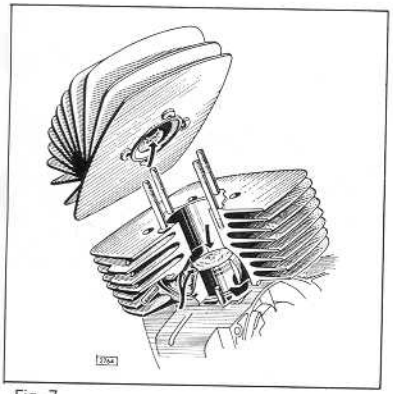


Fig. 7

Checking and cleaning the spark plug

Screw the spark plug out of the cylinder and ground it at its threaded end e. g. the cylinder head (plug still being connected with the ignition cable). If the starting device is operated now, a powerful spark should flash over between the electrodes. Oily plugs or plugs with dirt deposits between the electrodes will not produce any spark and must be cleaned with a wooden splinter or steel brush. The spark gap should be 0.02 in (0,5 mm). If the gap is wider regap by bending the outer electrode. When screwing in the plug take care that it fits into the thread properly and can be turned easily. Never screw in with force: First screw in by hand–2 or 3 turns–then use the spark plug wrench.
When replacing the spark plug use only plugs with long thread and the specified thermal value.

Stripping and cleaning the carburetor

To prevent unpleasant incidents, caused by carburetor troubles, it is expedient to strip and clean the carburetor from time to time.
Removing the carburetor.
Undo screw cover (fig. 8/1). Pull out throttle piston (fig. 8/2) from the carburetor housing. Unscrew air feed adjusting screw (fig. 8/3) and throttle piston stop screw (fig. 8/4). The float chamber cover (fig. 8/5) is removed by turning the retaining

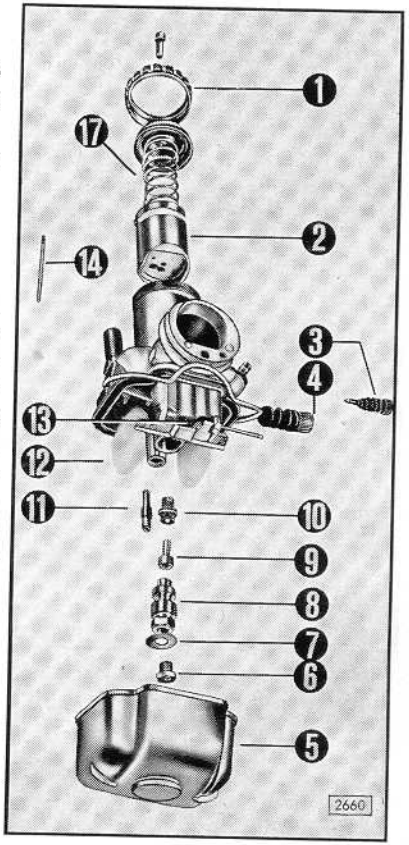


Fig. 8

clip. Undo main jet (fig. 8/6) and washer (fig. 8/7). Also undo jet holder (fig. 8/8). Remove needle jet (fig. 8/9) together with diffuser (fig. 8/10). (Just slightly pushing by a finger through the carb. housing removes it easily.) Unscrew idling jet (fig. 8/11). Check float (fig. 8/12) and float needle (fig. 8/13) for leaks. If it is necessary to remove the float and float needle remove the pin using a pair of pliers.
Wash carburetor housing and the component parts with gas and dry them with compressed air, and reassemble.

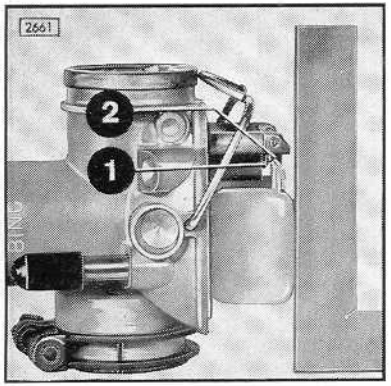


Fig. 9

Checking the level

Check carburetor as shown in figure 9 on a level plain. Adjust float needle to bottom. The level is correct if, with the float in vertical position, the damping ball (fig. 9/1) of the float needle contacts the brass plate (fig. 9/2). The damping ball must not be pressed down. The level is corrected by bending the brass plate.
If the throttle cable is disengaged from the throttle piston and the jet needle (fig. 8/14) removed, consider the needle position when clamping on the clip (see technical data). The jet needle is held in the throttle piston by means of a wire clip. For changing the needle position turn jet needle by $^1/_4$ turn, and in this position it is lifted or lowered, thereafter turn on another $^1/_4$ turn until the needle engages again in the retaining clip.
Insert spring (fig. 8/17), and while forcing down the spring engage throttle cable. Put throttle piston into the carburetor housing (nose of the throttle piston must fit into the guide of the housing). When inserting the jet needle into the needle jet no violence must be used. Place carburetor cover with its nose into the recess of the carburetor housing.
Fit screw cover and tighten.

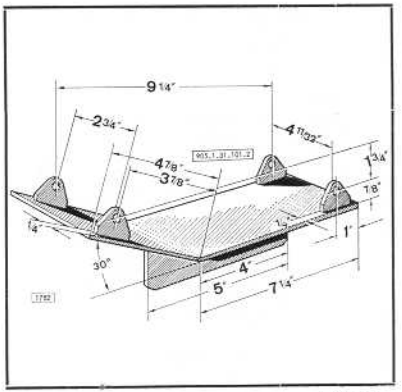


Fig. 10

5 STRIPPING THE ENGINE

Draining the gearbox oil

Undo the drain screw from the crankcase cover, incline the engine somewhat and drain the oil.

Note:

The illustrations show also the special tools used and the part numbers under which they are available.
For stripping the engine we recommend to use an engine repair jig. This tool could either be home-made according to sketch (fig. 10) or be made available per spare part No. 905.1.31.101.2.

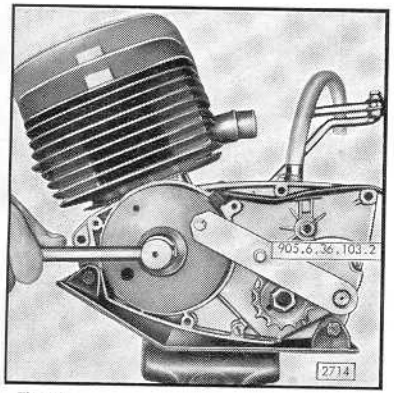


Fig. 11

Gearshift outside

Engage the 6th speed, loosen clamping bolt and pull off the gearshift lever.
Remove the circlip (fig. 12/1), the washer (fig. 12/2) and the rubber seal from gearshift shaft (fig. 12/3).
Bend up the tab washer (fig. 12/4) at the nut of the gearshift drum axle (fig. 12/5). Loosen nut and remove it along with the tab washer (in case the drum axle should turn itself hold against with a screwdriver).

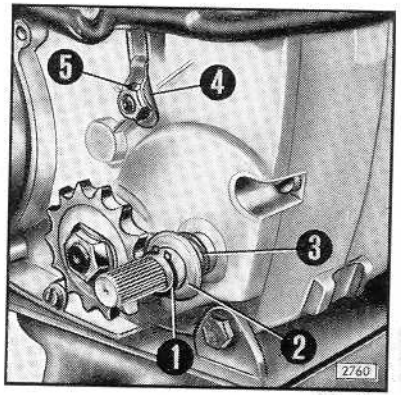
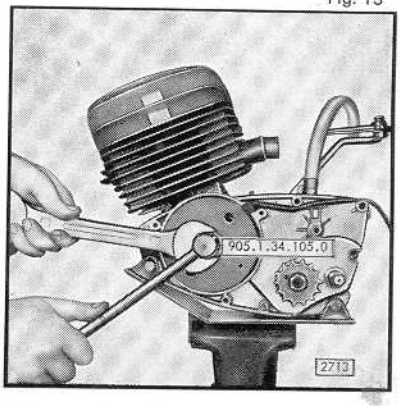


Fig. 12

Removing the flywheel magneto

Lock flywheel using the flywheel holder (fig. 11) and loosen the mounting nut. Pull flywheel off using the magneto puller (fig. 13) and make sure that the guide pin for flywheel does not get lost (fig. 14/1). Before removing the base plate it must be marked together with the crankcase (fig. 14/2). This is done so that the ignition need not be readjusted. Readjustment is only essential if parts of the ignition unit or the crankshaft are replaced. Only then loosen the mounting screws (fig. 14/3) and lift off base plate. The lifted-off base plate should be replaced into the flywheel magneto in order to avoid any damages.

Fig. 13



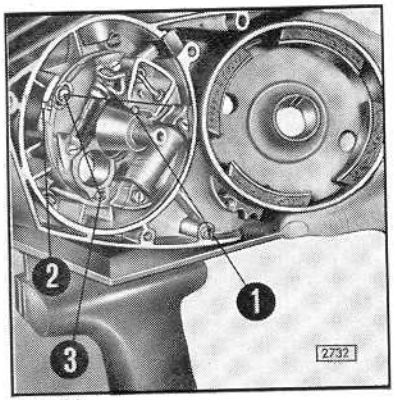


Fig. 14

Removing the gearbox sprocket

Bend up the tab washer of the mounting nut.

Note:

Before undoing prop the sprocket outside at the crankcase (fig. 15) as the mainshaft is damaged when tapping against it. While holding the sprocket (fig. 16) undo fixing nut and remove tab washer, sprocket and thrust washer.

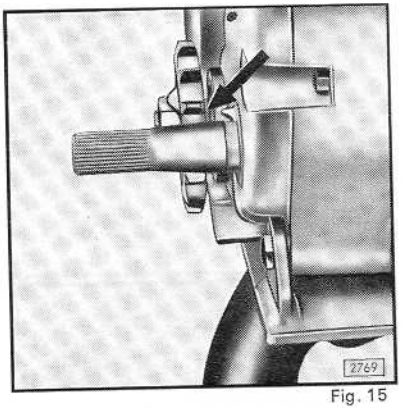


Fig. 15

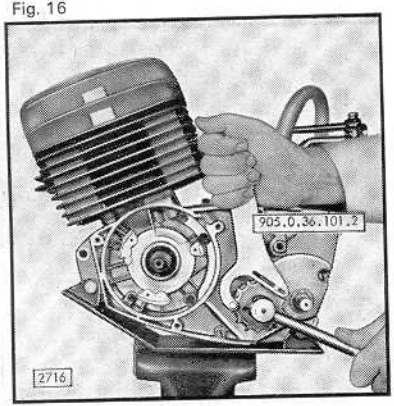
Removing the cylinder head

Undo spark plug, loosen the nuts crosswise, remove cylinder head.

Disassembling the compression release valve - 175 engine

Remove the complete compression release insert with a spark plug key. Fix the loose compression release insert by the lever support into the vice and unscrew the lock nut (M4). Unscrew by means of a screwdriver the compression release valve from the fixed lever (support) and draw the valve out of the guide.

Fig. 16



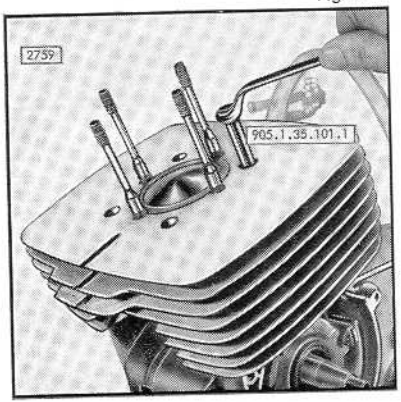
Removing the cylinder

Undo the 4 cylinder flange nuts, having a socket head (fig. 17) and remove the cylinder and the flange gasket.

Note:

If the engine is not further stripped down, cover the crankcase with a clean not ravelling rag.

Fig. 17



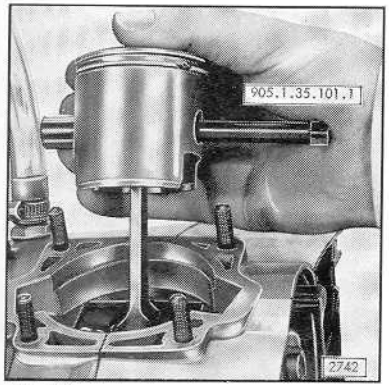


Fig. 18

Removing the piston

Remove both wrist pin circlips and press wrist pin out using the special tool (fig. 18). Remove the piston and from bottom side put it into the cylinder at once, thus preventing the piston and rings from getting damaged. Remove the needle bearing from the small end.

Crankcase cover

Undo the 7 cover fixing bolts, remove the complete cover (fig. 19).

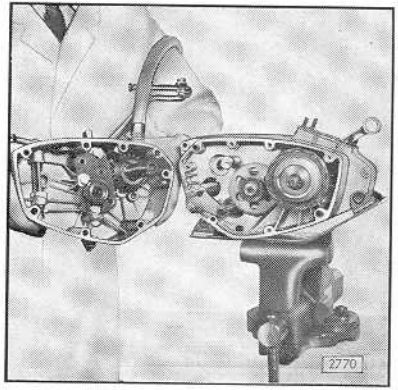
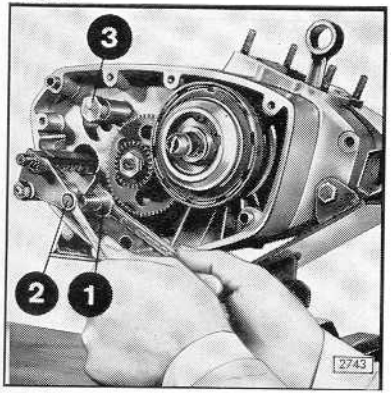


Fig. 19

Gearshift, Engine r.h.s.

Hold gear selector shaft at its flat end using a wrench 0.35 in (9 mm) (fig. 20/1). While unscrewing selector screw (caution: lefthand thread) push selector shaft in.
Remove selector shaft and selector fork with its axle, then push shaft completely in (1st gear).

Fig. 20



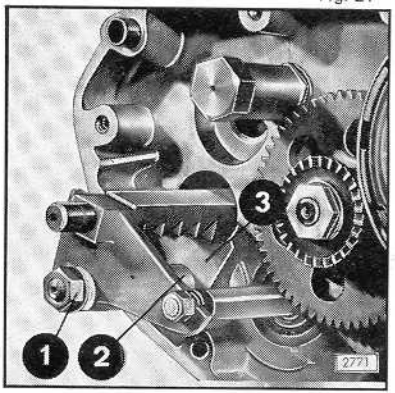
Note:

Consider the shims at the selector screw and at the locking plate.

Loosen nut (fig. 21/1) and remove guide sleeve for selector fork (fig. 21/2) and locking plate (fig. 21/3).

Undo nut from catch guide (fig. 20/3) and remove it together with the spring.

Fig. 21



Clutch and primary drive

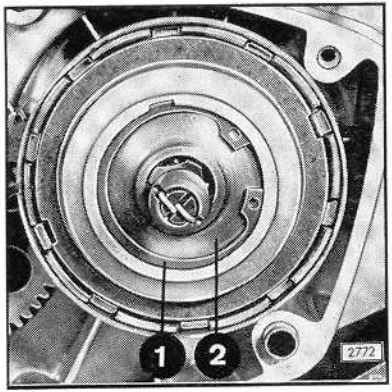


Fig. 22

Remove the circlip (fig. 22/1) from the set bolt and take set bolt out (fig. 22/2).

Put the locking device onto the primary gear (fig. 23/1) and remove nut from the driver for kickstarter (fig. 23/2).
Press the drive (fig. 23/3) off using a screw driver.

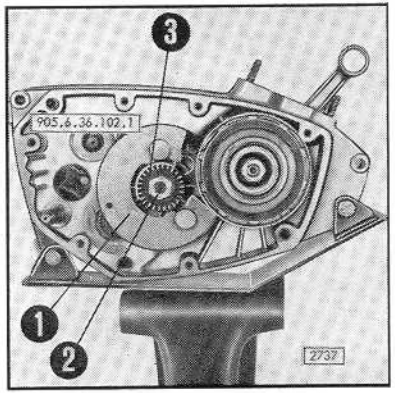
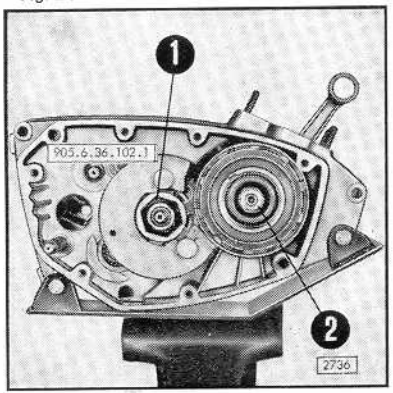


Fig. 23

Fig. 24

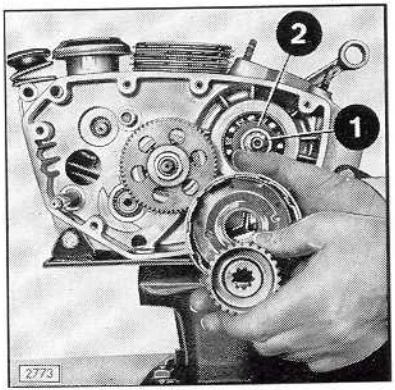


Bend up the tab washer at the mounting nut (fig. 24/1) of the primary gear, loosen nut and remove it. Remove nut from clutch (fig. 24/2).

Take off the locking device and remove the clutch housing with all interior parts. Remove the spacer (fig. 25/1) and the thrust washer from the crankshaft journal (fig. 25/2).

Removing the primary gear (fig. 26).

Fig. 25



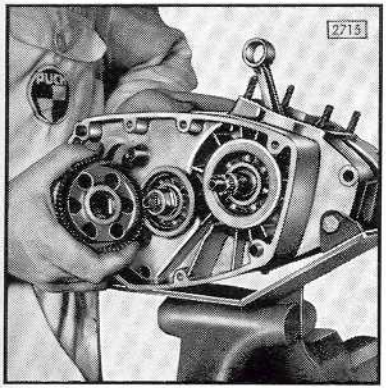


Fig. 26

Taking apart the two crankcase halves

Turn engine repair stand together with the engine over, loosen the 7 crankcase bolts and undo them. Take the engine out from the repair stand and put it on to the home made repair trestle, with the magneto side facing upwards (fig. 27).

Remove l.h.s. crankcase half (fig. 23) and crankcase gasket.

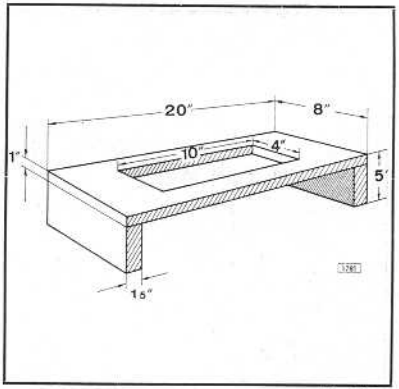
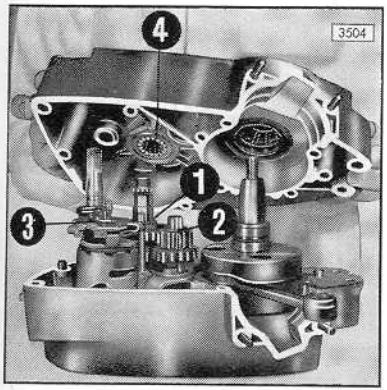


Fig. 27

All parts remain in the crankcase r.h.s. Take care of the shims of the mainshaft (fig. 28/1), layshaft (fig. 28/2) and the 16 bearing rollers to the mainshaft (fig. 28/4).

Fig. 28



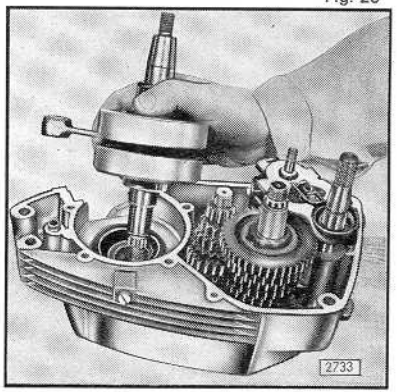
Removing the crankshaft

Pull the crankshaft out from its bearing (fig. 29).

Note:

Cover the crankshaft with a clean rag so that no dust gets to the big-end bearing.

Fig. 29



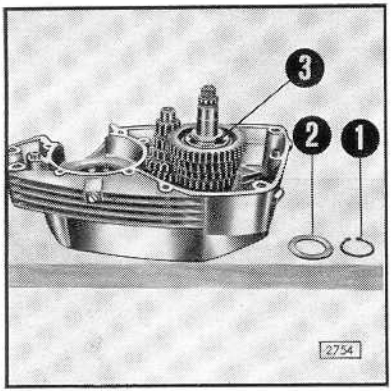


Fig. 30

Removing the gear shaft

Remove the gearselector shaft and the gearshaft drum together. Push the catch downward.

Removing the mainshaft

Take the circlip (fig. 30/1), the thrust washer (fig. 30/2) from the mainshaft. Remove the gears for 1st, 2nd, 3rd, 4th and 5th speed and pull the mainshaft out (fig. 30/3). Now take out the twin gear of 6th speed along with the spacer (fig. 31/1) and thrust washer (fig. 31/2). Remove the 22 bearing rollers (fig. 31/3).

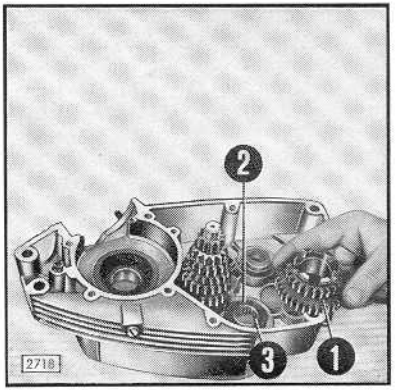
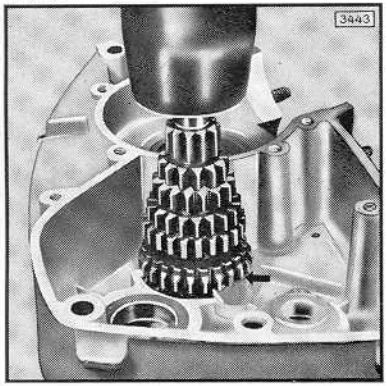


Fig. 31

Fig. 32



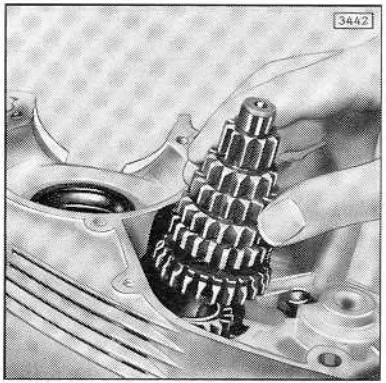
Removing the layshaft

Remove the circlip for ball bearing on the clutch side from its seat. From transmission side press against the layshaft until 6th speed gear touches the housing (fig. 32). Now lift the layshaft slightly and remove it from the layshaft gear (fig. 33).

Hint:

The ridge at the contact surface of the layshaft, caused by tightening of the kickstarter tappet ring, has to be removed by means of emery cloth prior to removing the shaft.

Fig. 33



6 BEARINGS, BALL RACES, SEALS, DRAW KEY

General hints

The bearings, ball races and seals can be removed properly and in an expert manner only by using our special tools. The part numbers under which they are available are quoted on any illustration and in the enclosed special tools list on page 47. For pressing the races or bearings out or in a flat pressing base must be at hand. The fitting sleeves have to be removed from the crankcase halves to be able to put them under a press.

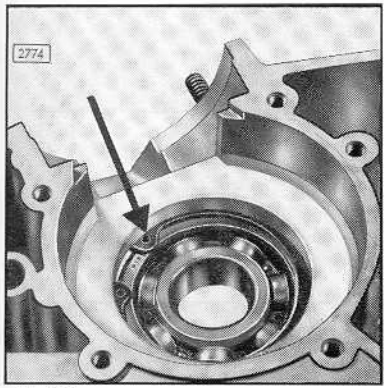


Fig. 34

Note:

A bearing or race should be pressed out only if it is necessary to replace it with a new one. It is suggested to stick to precise cleanliness when fitting new bearings. Unpack a bearing from its protective packing just immediately before pressing it in.
Before the bearing or race is pressed in again it is expedient to warm the crankcase up to appr. 80° C. Only when following this suggestion a proper seat of the bearing is attained and a damage to the crankcase and the bearing seats is avoided.
Whenever a seal is removed it must be replaced with a new one.

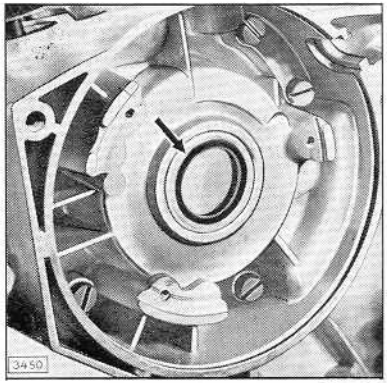


Fig. 35

Crankshaft bearings

In the crankcase half r.h.s. the crankshaft is carried in a ball bearing, and in the crankcase half l.h.s. in a roller bearing. The ball bearing is axially fixed in its seat by means of a circlip (fig. 34). The roller bearing is not secured. These two bearings are lubricated through the gearbox. The small end and big end are lubricated by the oil mixed to the gas. The small seal in the crankcase half seals the magneto side and prevents the oil from escaping and penetrating of dirt (fig. 35).

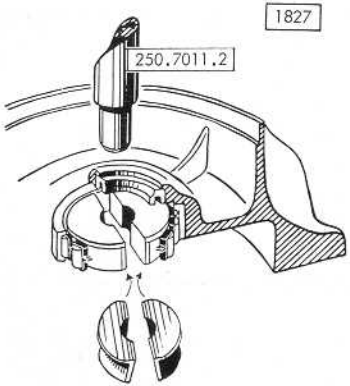


Fig. 35

Pressing out the main bearings and seals

Crankcase half l.h.s.:
The roller bearing, spacer and the large seal can be pressed out jointly (fig. 35). Thereafter press out the small seal using the stamp 1.38 x 0.71 in (35 x 18 mm) dia.

Crankcase half r.h.s.:
To remove the large seal use a screw driver (fig. 36), and remove the circlip holding the ball bearing. Now it is possible to press out the bearing (fig. 37).

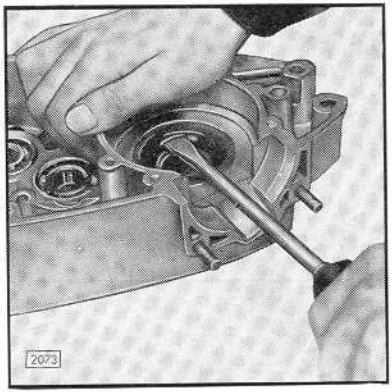


Fig. 36

Pressing in the main bearings and seals

(see page 15)

The bearings should be pressed in so that the inscription on the bearing faces the crank web.
The roller bearing is pressed into the crankcase half l.h.s., the ball bearing into the crankcase half r.h.s. until they suit properly in their seats (fig. 38). After that fix the ball bearing fitting a circlip.

A spacer ring made from plastics is fitted to the crankcase half left-hand side between the roller bearing and the large oil seal. On one side, this spacer ring has small pegs which face the roller bearing. Between the pegs, forming slits, oil is fed to the roller bearing for lubrication.

Pressing in seals

The lips of both large seals must point to the bearings. Press both large seals in to the crankcase until they are on a level with the inner face of the crankcase.

Fig. 37

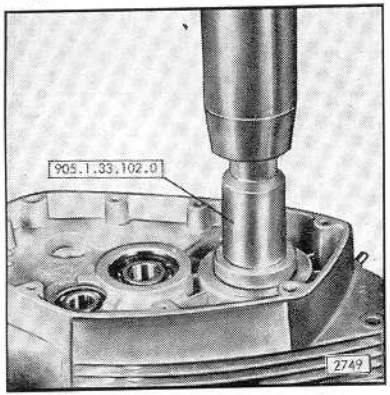
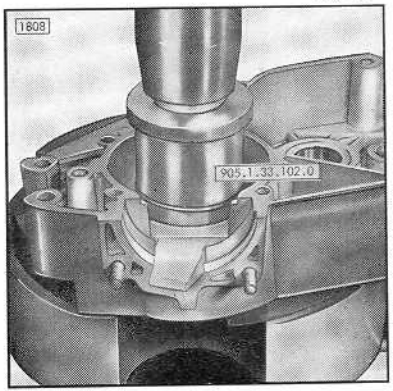


Fig. 38



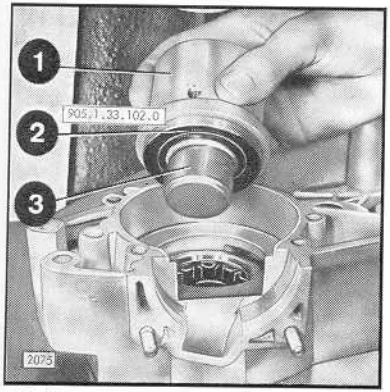


Fig. 39

For this purpose use the special stamp (fig. 39/1) on to which the seal is slipped over (fig. 39/2). The special stamp is guided in the bearing with the drift (fig. 40). The guiding drift is easily interchangeable (fig. 39/3).
With the roller bearing use the drift of 1.38 in (35 mm dia.) as shown in fig. 41/1, with the ball bearing the drift of 0,98 in (25 mm) dia. as shown in fig. 41/2.

Fig. 40

Crankshaft

If the roller bearing is replaced, pull also the inner race from the crankshaft journal l.h.s. off. This pulling can be performed only together with the ring of the seal. Just as well on to the crankshaft journal r.h.s. is pressed on a ring for the large seal. These spacers can be pulled off using a puller (fig. 42).

Fig. 41

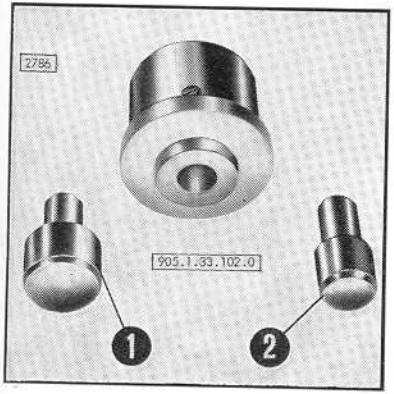
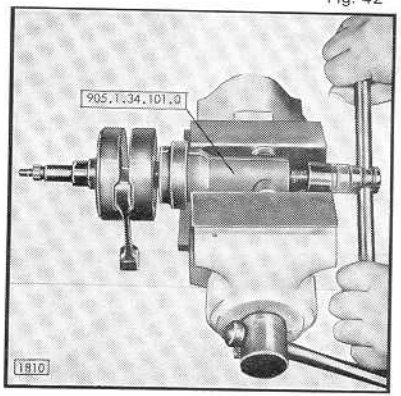


Fig. 42



Hint:

If the working surfaces of the spacers show grooves or other signs of damage, thus no longer guaranteeing proper sealing of the seal, they have to be replaced.

When pressing the races on to the crankshaft journals it is necessary to support the crankshaft and to use the pressing stamp provided for that (fig. 44).

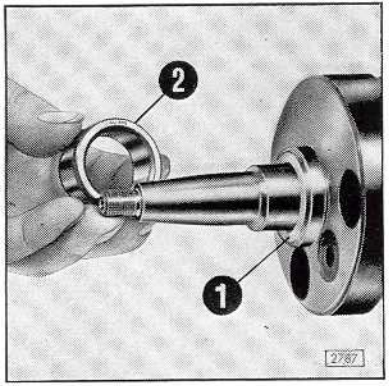


Fig. 43

When pressing both rings for the seals on to the crankshaft journals observe that the right-angled shoulder of the rings points to the crank web (fig. 43/1). Then press the inner race of the roller bearing on to the journal. The inscription on the race faces the crank web (fig. 43/2).

Only for engine 175 cc

In order to prevent the crankshaft from touching the crankcase right-hand side a compensating washer is fitted between the crank web and spacer. The thickness of this washer is determined as follows: Put crankshaft with compensating washer fitted into the crankcase right-hand side, and rotate crankshaft while pressing it slightly, against the bearing.

Use so many washers until crankshaft rotates freely without touching the crankcase.

The compensating washers are available in a thickness of 0.004 in (0,1 mm), 0,2 mm and 0,3 mm and per spare part numbers quoted below:

Part no. 13584 washer 0.004 in (0,1 mm)
Part no. 13584.2 washer 0.008 in (0,2 mm)
Part no. 13584.3 washer 0,012 in (0,3 mm)

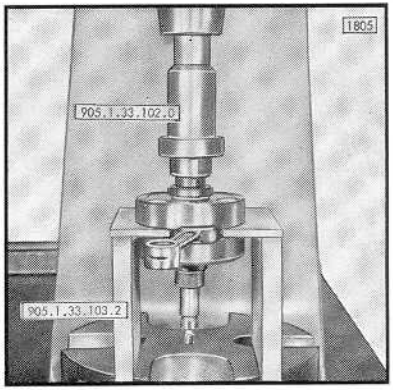


Fig. 44

Fig. 45

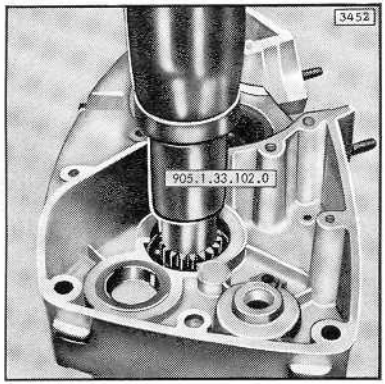
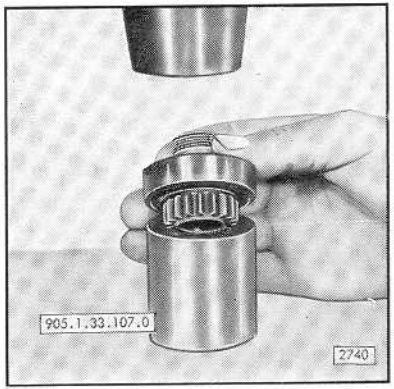


Fig. 46



Removing the gearbox bearings

Layshaft

Press out the big ball bearing part no. 23821 from the crankcase half r.h.s. jointly with the layshaft gear (fig. 45).

Then pres the layshaft gear out from the bearing (fig. 46). (Replacing the bearing of the layshaft gear see page 19.)

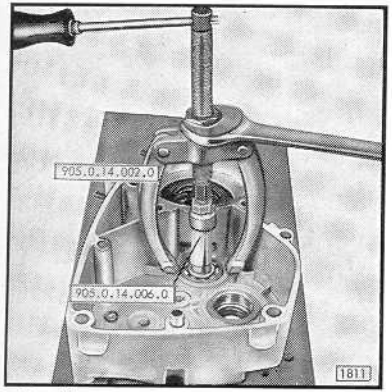


Fig. 47

The small ball bearing, spare part no. 900.4.6202 can be pulled out from the crankcase half l. h. s. only by using the special puller (fig. 47).

Mainshaft

In both crankcase halves, the main shaft is mounted on loose rollers running in center races. Using a pressing out stamp, press the covering washer along with the outer race,part no.411.13.065.1 out from the crankcase half r.h.s. (fig. 48).

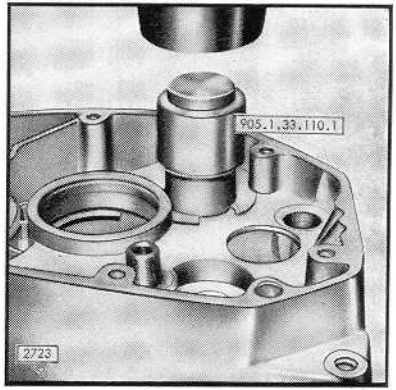
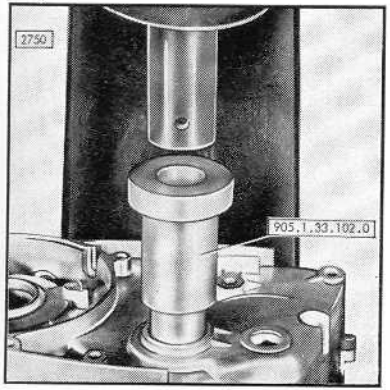


Fig. 48

Fig. 49



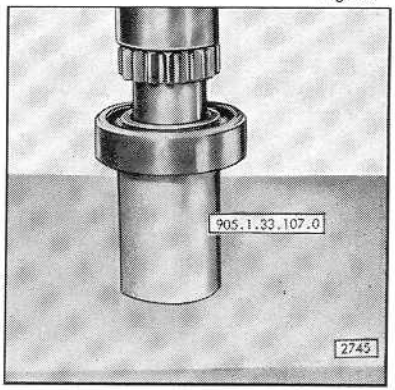
Just as well press out the roller bearing race, part no. 366.1.13.066.1 jointly with the seal (fig. 49) from the crankcase half l.h.s.

Pressing in the bearings and seals

Layshaft

Press the layshaft gear (fig. 50) into the large ball bearing before fitting the layshaft.

Fig. 50



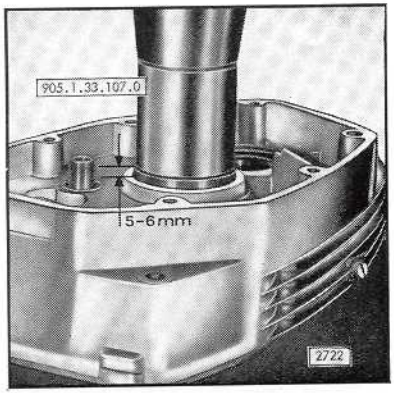


Fig. 51

From outside press both parts together into the crankcase half r.h.s. so that bearing edge protrudes 0.2 to 0.24 in (5 to 6 mm) (fig. 51) out of the bearing seat. Do the bearing not press in deeper as given above as otherwise the layshaft cannot be fitted.

The small ball bearing is pressed into the crankcase l.h.s. using the stamp 1.38×0.71 in (35×18 mm) dia. (fig. 52, page 17/ fig. 41/1).

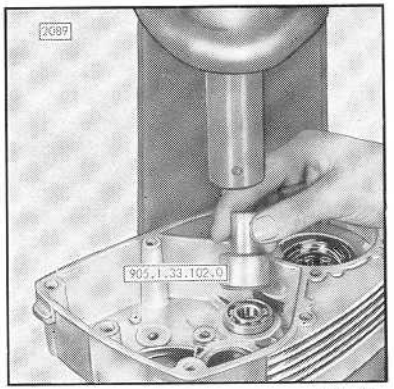
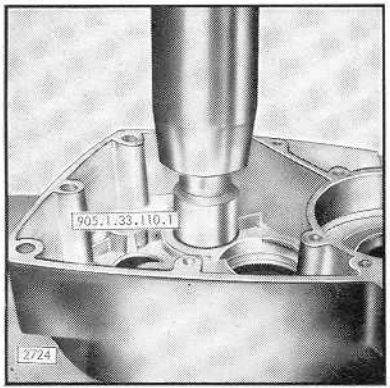


Fig. 52

Fig. 53

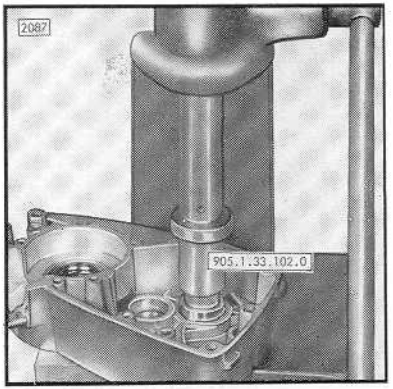


Mainshaft

Befor pressing the race part no. 411.1.13.065,1 into the crankcase half r.h.s. (fig. 53) put the thrust washer for the rollers into the bearing seat.

The roller bearing race 366.1.13.065.1 is pressed into the crankcase l.h.s. using the stamp of 2.126 in (54 mm) dia. and 3.937 in (100 mm) height (fig. 54).

Fig. 54



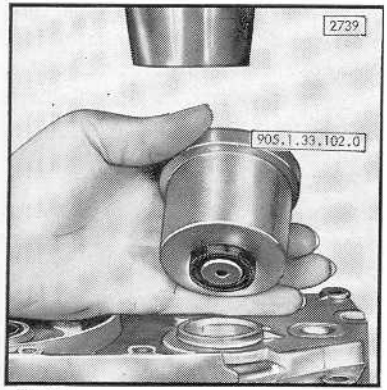


Fig. 55

From outside and by means of the special stamp, press the seal, part no. 900.3803 for the mainshaft into the crankcase l.h.s. The lip of the seal must point inward. (fig. 55).

Clutch housing

The roller bearing part no. 900.6834 fitted to the clutch housing is detachable. Press the bearing out using a stamp as shown in fig. 55/1. As support for this procedure use the pressing-in sleeve (also used to press out the large ball bearing at the layshaft) (fig. 56/2).

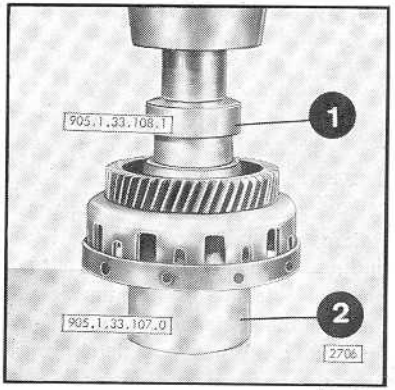
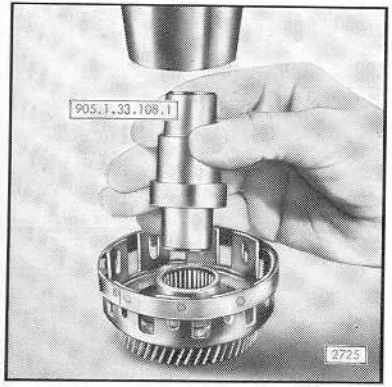


Fig. 56

Fig. 57

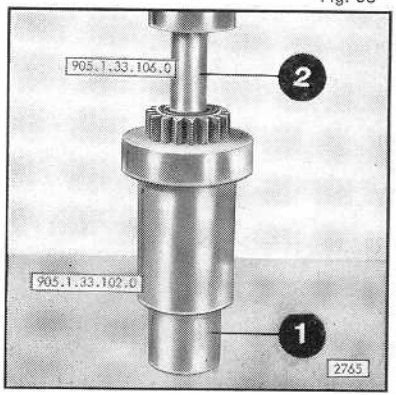


After having thoroughly cleaned its seat press a new roller bearing in. To this end put the clutch housing on to its toothed wheel, turn the pressing-in stamp over (fig. 57), put the bearing on and press in up to the stop of the stamp.

Layshaft gear

In the layshaft gear there is an INA-needle bearing part no. 900.6825 pressed in. Also this bearing can be replaced. If replacing the bearing use stamp (fig. 58). A particular pressing-in stamp is used to press the needle bearing in.

Fig. 58



7 ASSEMBLING THE ENGINE

General

Before reassembling the engine have a visual check of all parts and replace damaged or worn out parts. If there is a gear of the gearbox defective replace the complete layshaft and the faulty gear of the mainshaft. It is self-evident to use new gaskets and circlips. When completely overhauling the engine replace both the bearings and seals. All parts should be cleaned with petroleum or cleaning gas and then dried by compressed air. Before reassembling oil all movable parts.

Gearbox

Short description

This machine has a 6-speed gearbox. The transmission sequence is clutch–primary gear–layshaft gear on the layshaft-twin gear (for layshaft and 6-speed gear on the mainshaft)–layshaft–main-shaft–engine sprocket–chain–to the rear wheel.

The layshaft gear is carried in a ball bearing. The gear shaft has two faces. These faces are the drivers for the primary gear. The primary gear is fixed with a nut and locked with a tab washer. Into the shaft of the layshaft gear is pressed in a needle bearing with an outer race. Inside the gear is the outer race for another needle bearing. These two needle bearings carry the layshaft. The twin gear for layshaft and 6-speed gear is running on the mainshaft. It is the intermediate gear to the layshaft. The 6th speed works directly. All gears are in constant mesh and particular speeds are changed by a draw key.

The draw key is pulled into the gear required by the gearshift rod and gear selector screw of selector fork. The selector fork is actuated by the gearshift drum, the gearshift drum by the automatic gearshift assembly.

The automatic gearshift assembly is actuated by pedalling the gearshift pedal.

A gearshift ratchet prevents the gears from being overshifted. You shift to a lower gear when pressing the gear change pedal down, the upper gears when changing up. Neutral is between the 1st and 2nd speed.

When reassembling the gearbox follow the fitting instructions.

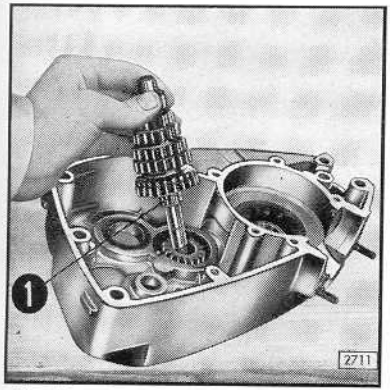


Fig. 59

Fitting the mainshaft and layshaft

Layshaft

Put the right crankcase half on to the mounting board. So that the layshaft (fig. 59/1) with the needle bearing 900.6815 can be put into the layshaft gear, do not press the ball bearing completely in but let it protrude form its seat 0.2 to 0.24 in (5 to 6 mm) (fig. 60). Therefore, press the protruding ball bearing in using the pressing-in sleeve (fig. 60) and secure with the circlip (fig. 61).

Now slip the primary gear on to the layshaft gear. Slightly tighten the gear with a nut until the layshaft gear has no axial play in the bearing.

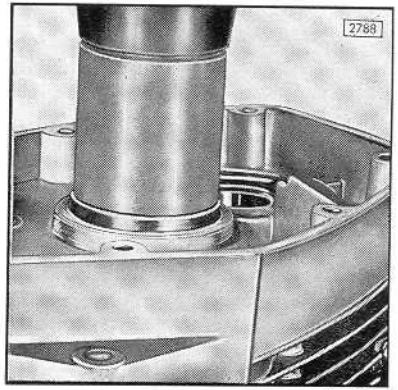
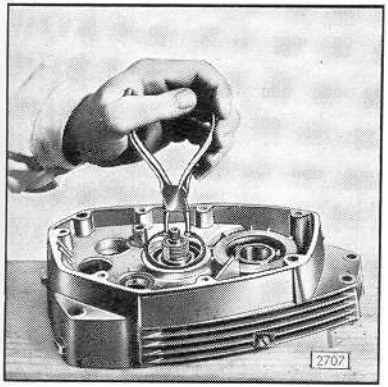


Fig. 60

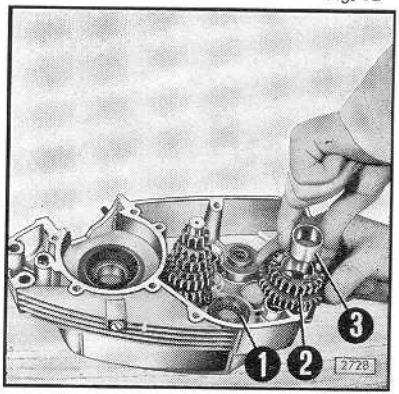
Fig. 61



Mainshaft

Grease the race, put in the 22 rollers (0.138 in dia. x 0.295 [3,5 mm dia. x 7.5] fig. 62/1), the thrust washer, the 6th speed twin gear (fig. 62/2) together with bush (fig. 62/3) and set the washer right if necessary. Fit the mainshaft with the fitted draw key (fig. 63).

Fig. 62



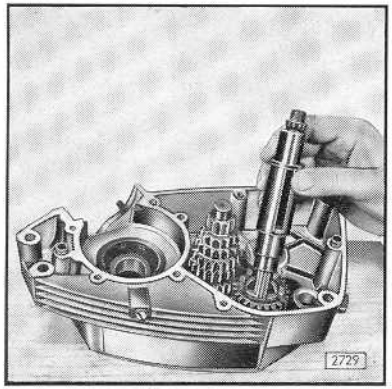


Fig. 63

How to fit the gears

In each of the gears is the working face for the draw key (fig. 64).

The tappets of all gears are axially displaced (fig. 65/1). Fit the gears to the mainshaft so that the tappets face and are proximal to the circlip notch (fig. 65/2).

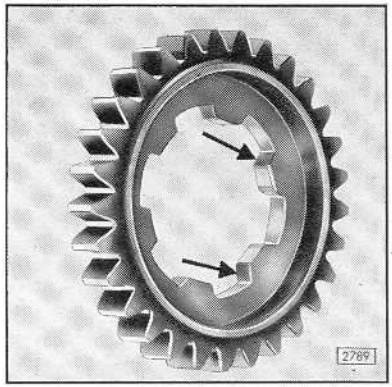


Fig. 64

Assemble the gears in the following sequence:

5th speed gear 24 teeth (fig. 66/1).
4th speed gear 27 teeth (fig. 66/2).
3rd speed gear 29 teeth (fig. 66/3).
2nd speed gear 32 teeth (fig. 66/4).
1st speed gear 41 teeth (fig. 66/5).

Finally fit the thrust washer (fig. 66/6) and fix the gears to the mainshaft with the circlip (fig. 66/7).

Fig. 65

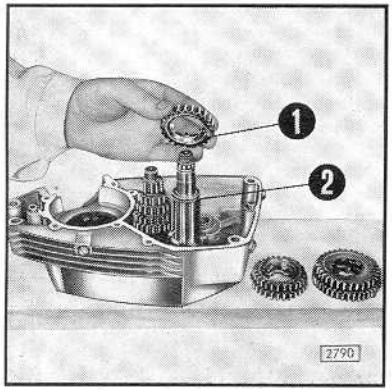
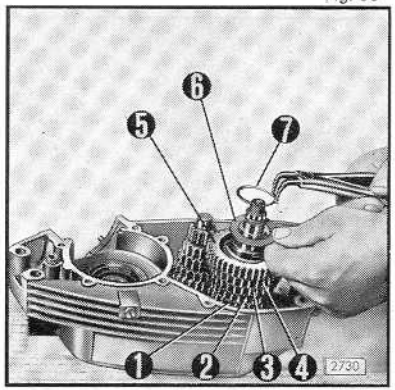


Fig. 66



Note: On the newer models the thrust washer has a recess on one side to secure the circlip.
Installation is as follows: Fit the thrust washer with the recess side up on the mainshaft. Lift the mainshaft slightly until the recess for the circlip is free, then fit the circlip and press the mainshaft back in.

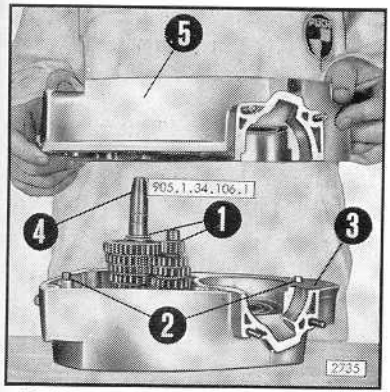


Fig. 67

The axial play of mainshaft and layshaft

General hints:

The permissible axial play of layshaft and mainshaft in assembled state is 0.004 to 0.008 in (0,1 to 0,2 mm).
When replacing a part influencing the axial play of the shafts it is necessary to check the play again and to correct it. To correct use shims; they are available in various thickness.

The following parts influence the axial play:

The crankcase, the layshaft ball bearing, the mainshaft races, the layshaft, the layshaft gear. If no part, influencing the play, is replaced stick to the adjustment prior to stripping the engine, that is, use the same shims again.

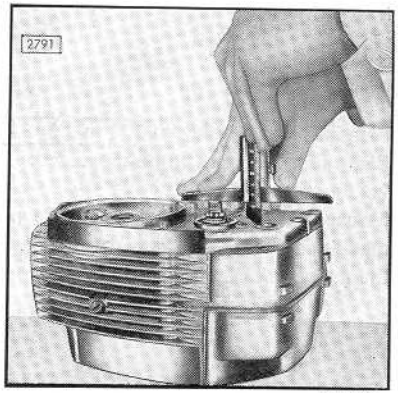
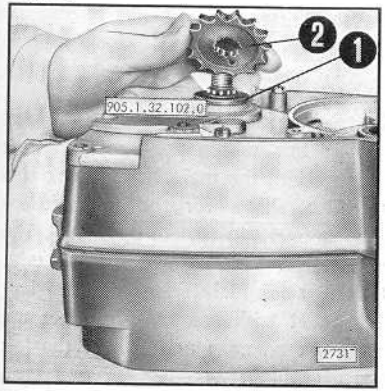


Fig. 68

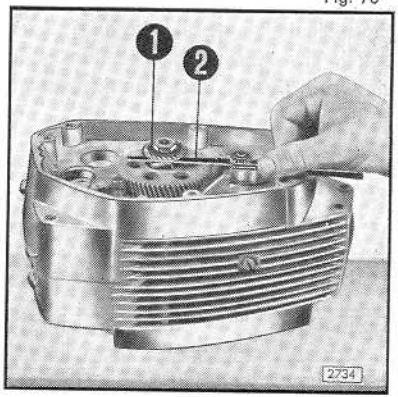
Fig. 69



Checking the axial play

If the mainshaft and layshaft are fitted to the right crankcase half (fig. 67/1), put those shims on to the shafts which were fitted before replacing the part. Then put the fitting sleeves into the drill holes (fig. 67/2), place the gasket on to the sealing face (fig. 67/3) and slip the guiding bush on to the mainshaft (fig. 67/4). Now prepare the left crankcase half. Pack the mainshaft race with grease and put the 16 rollers (of 0.20 in dia. x 0.47 in [5 mm dia. x 12 mm]) in. Put this crankcase half to the crankcase half r.h.s. (fig. 67/5) and bolt them together.

Fig. 70



Mainshaft

Permissible axial play 0,004 to 0,008 in (0,1 to 0,2 mm).
Clean first the faces to be measured.
1st measurement:
Measure from the front face of the protruding mainshaft to the machined face of the crankcase (fig. 68). While measuring press the mainshaft down. Put the measured value down.

2nd measurement:

With its shoulder upward, slip the distance washer and the sprocket (fig. 69) onto the mainshaft. Slightly tighten the sprocket with the mainshaft nut until the axial play of the mainshaft is compensated. The measuring procedure is equal to the previous one as shown in fig. 68. Put also this measured value down.

Evaluation of the measured values:

Deduct the value "1" from "2". The difference between both values is the axial play of the mainshaft.
If the play is beyond 0,004 in (0,1 mm) use a thicker shim, if the play is less than 0,1 mm a thinner one. The shims are available in 10 different sizes, from 0,118 in to 0,163 in (3 mm to 4,15 mm) and in the graduation of 0,0047 in, 0,0501 in and 0,0059 in (0,12 mm, 0,13 mm and 0,15 mm).
Having replaced the shim do not forget to check the actual play again.

Layshaft

Permissible axial play 0,004 to 0,008 in (0,1 to 0,4 mm).
To be able to check the axial play of the layshaft fit the kickstarter driver and tighten the nut (fig. 70/1). Using a feeler gauge, measure the gap between the front face of the layshaft gear and the bottom side of the kickstarter driver (fig. 70/2).
The measurement must be taken twice. First with the layshaft pressed in and then with the shaft lifted.

The difference between the two measurements is the axial play of the layshaft. If the play is not within the specified limit compensate in the same way as with the mainshaft. Check also the play again afterwards. The shims for the layshaft are available in sizes from 0,004 to 0 012 in (0,1 to 0,3 mm). The axial play can also be checked by means of a dial gauge with suitable stand. Remove the driver for kickstarter from the layshaft again and also the sprocket with spacer shim from the mainshaft. Thereafter unbolt the crankcase and lift off the left crankcase half. (Take care of the shims!)

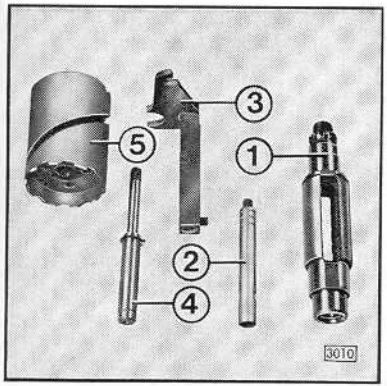


Fig. 71

Gearshift

The gearshift must be readjusted when the following parts are replaced: the mainshaft (fig. 71/3), the selector rod (fig. 71/2), the selector fork (fig. 71/3), the gearshift drum axle (fig. 71/4), the gearshift drum (fig. 71/5) and the crankcase. If the above mentioned does not apply, use the same distance washers and shims that were fitted by the firm.

Checking axial play of the gearshift drum

Whenever you disassemble a gear unit, check the axial play of the gearshift drum on the gearshift drum axle. The specified play is 0,004 in (0,1 mm). If the play is greater, it may be reduced by inserting distance washers of 0,008 to 0,012 in (0,2 to 0,3 mm). (Fig. 72/b).

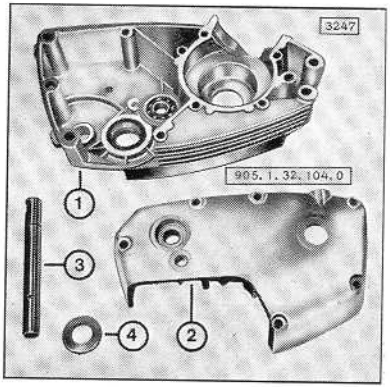
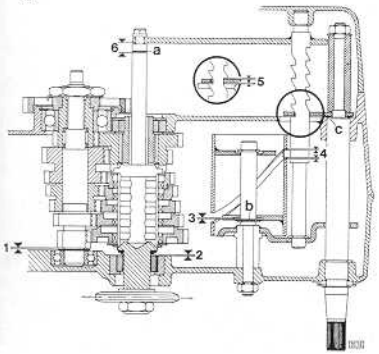


Fig. 73

Fig. 72



If it is necessary to adjust the gears follow the procedure as given below.

8 ADJUSTING THE GEARSHIFT

The gears cannot be adjusted until the clearance of mainshaft and layshaft are measured in axial direction. Permissible play 0,004 to 0,008 in (0,1 to 0,2 mm)

The following tools are required for the adjustment.
1 cut-off crankcase half left-hand side (adjusting housing-fig. 73/1), 1 cut-off crankcase cover (fig. 73/2), and a shaft for centering the control drum (fig. 73/3). The intermediate shim (fig. 73/4) serves to determine the axial play of the mainshaft. Further a depth gauge and a feeler gauge.

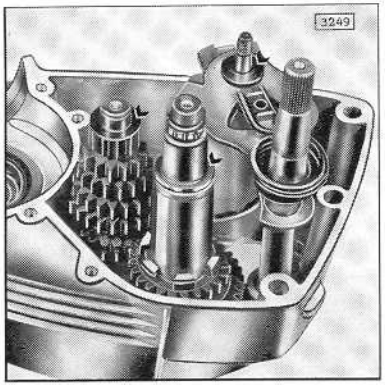


Fig. 74

Crankcase half right-hand side

Remove circlip, thrust washer and gears 1st, 2nd, 3rd, 4th and 5th speed. Fit control drum and control shaft. Slip washer on to control drum, thrust washer on to mainshaft and compensating washer on to layshaft (fig. 74).

Crankcase half left-hand side

Put the bearing rollers of the crankcase half l.h.s. into the adjusting housing, and measure the distance between the sealing surface and the bearing rollers. Now take measurement of the difference between the two crankcases halves from the crankcase sealing surface to the contact surface of control drum (fig. 75). For later adjustment make a note of the difference measured. Fit the two fitting bushes and put on the gasket. Put on the adjusting housing and bolt together. Slip rubber ring and covering washer on to control shaft and fix control shaft axially by circlip. Run nut down finger tight on control drum axle (do not tighten).

Turn engine over and fit indexing plunger. Put a spacer of 0,02 in (0,5 mm) and the control lock on the protruding end of the control shaft. Slip gear selector fork on the selector fork axle (circlip on bottom end). Put both parts through the aperture (fig. 76) and nest guiding peg of selector fork into guiding notch of control drum; at the same time insert gear selector fork axle in its bearing bore. Put the sleeve for lock (with its recess downwards) and spring washer on the selector axle and tighten with the nut. Slip on the adjusting cover (fig. 73/2) along with the 2 fitting bushes.

Fit starter shaft (fig. 73/3)–centre control drum–and fix cover (without gasket) by 3 cover screws. Connect gear selector rod to selector fork and set selector fork to position of 5th gear. Pull out selector fork, engage selector screw into the selector fork, screw selector screw by hand into the selector rod (left-hand thread) and tighten using a spanner.

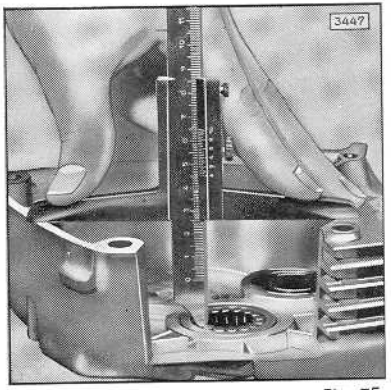


Fig. 75

Fig. 76

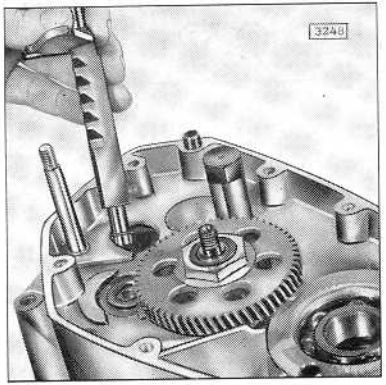
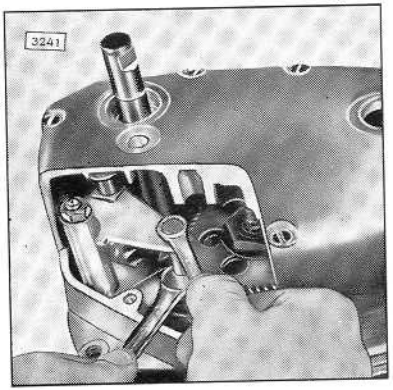


Fig. 77



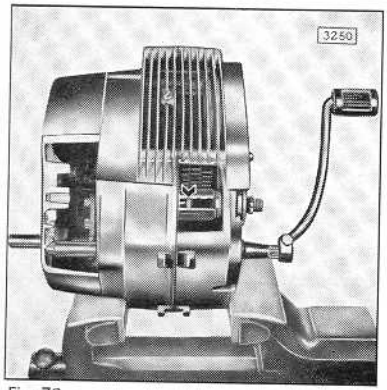
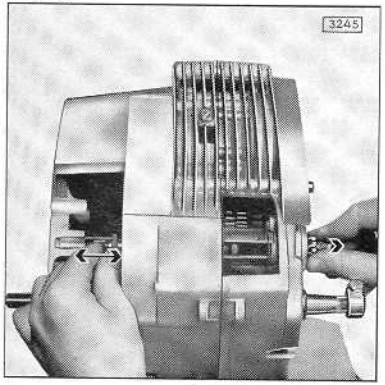


Fig. 78

Fig. 79



While tightening hold the selector rod using a wrench (fig. 77). Clamp engine with its rear top suspension between a vice. To this end use buffers of aluminium or plastics. Tighten the nut of control drum axle at the crankcase half left-hand side.

Adjusting and checking the gearshift

Fit foot control pedal and set draw key to 3rd gear position (fig. 78). Pull the mainshaft by hand in the direction of sprocket up to the stop. Check whether the draw key catches the recess of 3rd gear of the mainshaft. To do so, push selector fork and selector rod slightly to and fro and fix exactly central position (fig. 79). For better visibility use an electric torch. If the draw key does not catch the recess of the mainshaft correct by putting a shim to the selector screw (fig. 80). The thickness of the shims is 0,008 to 0,012 in (0,2 to 0,3 mm). After the adjustment the central position of the draw key must be exactly in the middle of the mainshaft (fig. 81). For further assembly, however, consider a possible difference between adjusting housing and crankcase half l.h.s. (already previously measured) as to the use of spacer shims. E.g. if the crankcase half l.h.s. is lower by 0,008 in (0,2 mm) than the adjusting housing a shim of 0,008 in (0,2 mm) has to be removed after the adjustment; so that the adjustment is correct again if the engine is assembled in the "correct" crankcase.
The reverse procedure follows, i. e. an other shim must be fitted if the adjusting housing is lower.

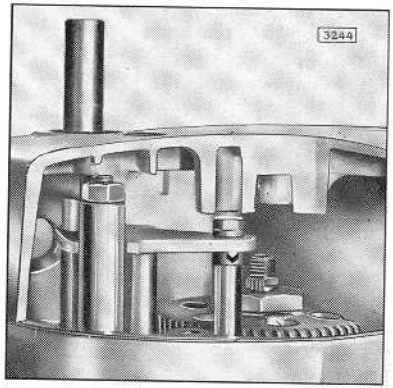


Fig. 80

Adjusting the control lock

Mode of action:
The control lock is put on the control shaft and is thus connected to it.
When changing a gear the control lock swivels between the ratchets of the selector fork thus limiting the travel of selector fork. A play of 0,004 to 0,008 in (0,10 to 0,20 mm), in pivoted state, between the control lock and the ratchets of the selector fork is required in order to obtain proper gearshift (fig. 72/5).

Checking the play and ascertaining the spacer shims

Change down from 6th to 5th speed and hold foot control pedal in this position. The pivoted control lock is now situated below the ratchets of the selector fork. In this position the selector fork must not be tight but have an axial play of 0,004 to 0,008 in (0,10–0,20 mm) (fig. 82). If, with the selector fork in this position, there is no play then the spacer shim below the control lock is too thick necessitating an adjustment until an axial play of 0,004 to 0,008 in (0,10–0,20 mm) is obtained.

The same procedure follows when changing up from 4th to 5th gear. Also in this case, fix foot control pedal in this position. The pivoted control lock is now situated above the ratchets of selector fork. Also in this position, the axial play of the selector fork should be 0,008 in (0,20 mm). If the selector fork jams in this position, fit a thicker spacer shim below the control lock. The spacer shims are available in the thickness of 0,008 to 0,02 in, 0,04 in (0,2 mm to 0,5 mm, 1 mm).

When adjusting, a possible difference of the crankcase (previously measured) is to be considered. E.g. adjusting housing, being lower by 0,008 in (0,2 mm)–necessitating an additional spacer shim of 0,008 in (0,2 mm) when fitted to the "right" crankcase. Crankcase lower by 0.008 in (0,2 mm)–a spacer shim of 0.008 in (0,2 mm) is to be omitted.

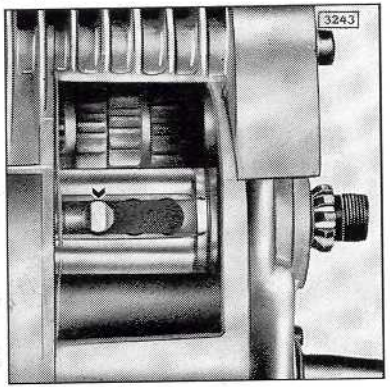


Fig. 81

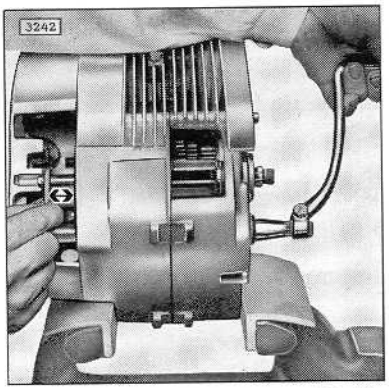


Fig. 82

Removing the adjusting cover and crankcase

Removing the adjusting cover:

1. Undo selector fork screw (take care of the adjusting shims).
2. Undo the 3 cover screws and remove cover.
3. Remove sleeve along with control lock and spacer shims.
4. Remove selector fork and selector axle.
5. (Take care of the spacer shims.) Disassemble catch.

Unclamp engine, and put it with its clutch side on repair stand and carry out the following jobs.

1. Remove foot control pedal circlip, cover shim and rubber ring.

2. Unscrew nut from control drum axle.
3. Undo crankcase bolts, remove adjusting housing and put bearing rollers into the "right" crankcase.
4. Remove control drum along with control shaft.

Proceed reassembling the engine.

Crankcase half right-hand side:

Slip gears on the mainshaft and fasten using thrust washer and circlip, see page 24.

Gearshift drum – Automatic gearshift assembly

Before reassembling put the gearshift drum and the gearshift shaft with the automatic gearshift assembly together. Then fit both parts at the same time (fig. 83). Make sure that the shifting drum axle properly protrudes into the drill hole of the right crankcase half. Slip the thrust washer on to the protruding part of the shifting drum axle.

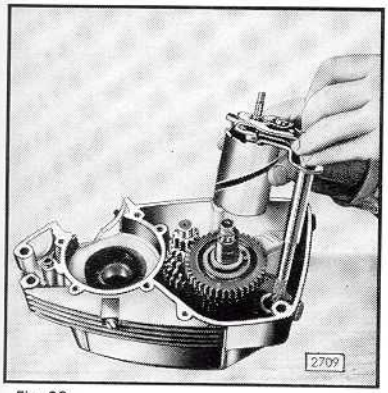


Fig. 83

Fitting the crankshaft

Slightly oil the working face for the seal on the clutch side and press the crankshaft by band into the ball bearing of the right crankcase half.

With engine 175 cc see page 18.

Hint:

The axial play of the crankshaft need not be adjusted. The ball bearing in its seat is axially fixed by means of a circlip. If, in spite of this, the axial play is too excessive the origin might be a worn out ball bearing or bearing seat.

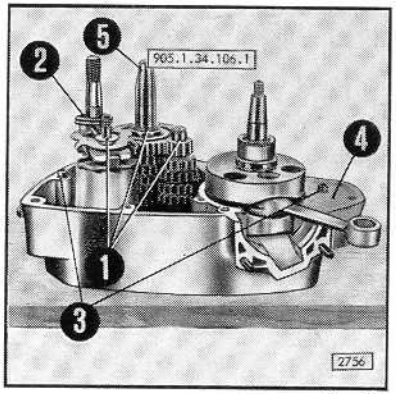


Fig. 84

Fitting the left crankcase half

Before the left crankcase half is completely fitted check the right crankcase half once again, whether the shims and thrust washer are put on to the mainshaft and layshaft (fig. 83/1), that the gear selector spring (fig. 83/2) is in equal distance round the gear selector shaft, that the fitting sleeves stick in their holes (fig. 83/3), that the gasket lies properly on the sealing surface (fig. 83/4).

Provided that everything is found all right slip the guide sleeve

on to the mainshaft (fig. 84/5), and slightly oil the crankshaft journal for the seal.
Check the left crankcase half whether the 16 rollers rest properly in the bearing race.
Without applying violence it is now possible to put the left crankcase half on to the right one. While putting the crankcase together both sealing surfaces must always be parallelly opposite. If, however, resistance is noticed while pressing the halves together do not try to do it violently, but find out the origin of the resistance (e.g. the gearshift drum axle has been displaced).

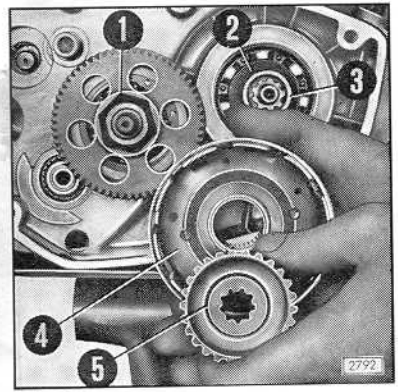


Fig. 85

The position of the axle can be corrected without necessitating to disassemble the crankcase.
If the left crankcase half rests plainly on the right half, bolt them together with the 7 engine mounting bolts. (5 bolts M 6 x 50, 1 bolt M 6 x 83, 1 bolt M 6 x 70.) Take engine from the mounting board and put it into the repair stand to proceed reassembling. Now tighten completely the 7 mounting bolts and remove the guide sleeve from the mainshaft.

Gearshift drum axle and gear selector shaft

With the nut tighten gearshift drum axle and lock with tab washer. Put rubber ring and cover plate on to the gearshift shaft and fix it with a circlip.

Clutch and primary drive

Turn engine along with the repair stand over.
Primary gear
Undo the fixing nut from the primary gear, slip on the tab washer and tighten nut again (fig. 85/1).
Clutch
Slip the thrust washer with its grooved side facing the ball bearing (fig. 85/2) on to the crankshaft journal, then the spacer (fig. 85/3), the clutch housing (fig. 85/4) and the clutch hub (fig. 85/5).
Hint:
The clutch hub must entirely be slipped on to the crankshaft jour-

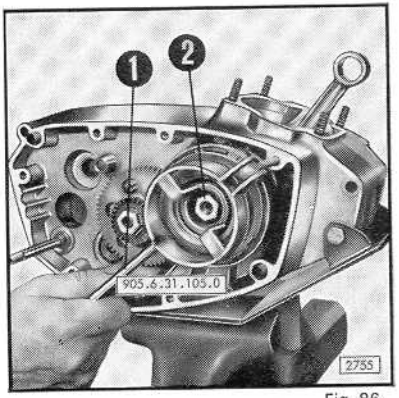


Fig. 86

nal as otherwise it could occur that the fitst steel clutch disc is getting placed between clutch housing and clutch hub and is bent when tightening the clutch.

Fitting the clutch discs into the clutch housing

Note:

There are two different sorts of clutch discs with lining and two different sorts of steel discs (without lining) used:

INDEX	Quantity of discs used
1 = Clutch disc with lining without dogs	1
2 = Clutch disc with lining with dogs	4
3 = Interior steel disc with straight dogs	4
4 = Interior steel disc with straight and with 2 bent dogs	1

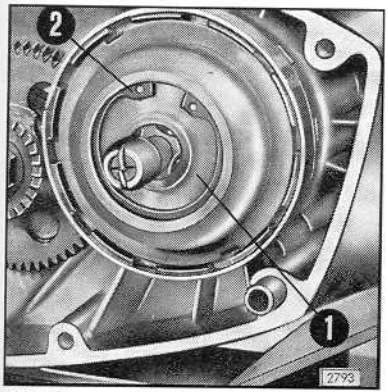


Fig. 87

From inside to outside fit the clutch discs in following sequence: (The numbers quoted refer to the above index.)
"1"–"3"–"2"–"3"–"2"–"3"–"2"–"3"–"2"–"4".
The last disc "4" must be fitted so that the 2 bent dogs are facing inwards.

After the last disc, fit the spring cage with clutch spring (fig. 86/2), spring cup and spring washer. For pressing the clutch spring together use special tool (fig. 86/1) and tighten with nut.

Tightening the primary drive

Now put in locking device and tighten nut to the clutch and primary gear and lock. Put driver for kickstarter on to the layshaft, slip on spring washer and nut and tighten.

Fitting the clutch set bolt

Remove the locking device, put the complete clutch set bolt into the spring cage (fig. 87/1) and lock with circlip (fig. 87/2).

Fitting the catch

Put catch into the catch guide (fig. 88/1), fit nut (fig. 88/3) with catch spring (fig. 88/2) and tighten.

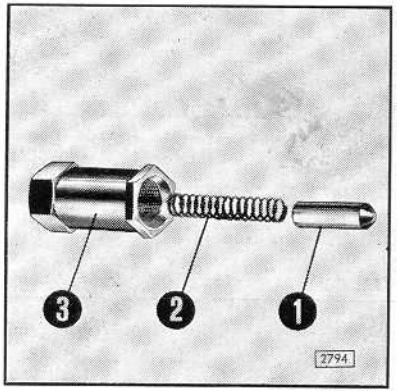


Fig. 88

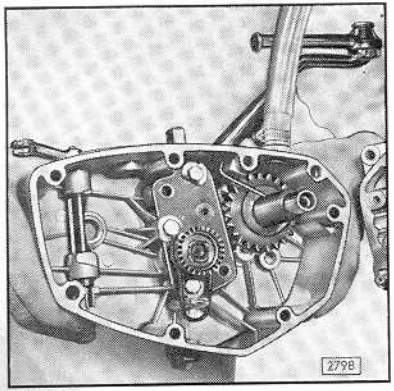


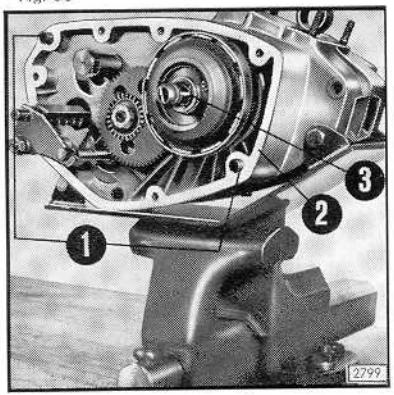
Fig. 89

Fitting the crankcase cover

The crankcase cover is fitted to the crankcase with the pre-mounted kickstarter assembly and declutching shaft. To be able to engage the declutching shaft without difficulty into the clutch set bolt undo the centering screw (fig. 89) from the crankcase cover. Put the two fitting sleeves (fig. 90/1) into their holes, oil the crankcase cover gasket and place it on to the sealing face of the crankcase (fig. 90/2). Turn the set bolt so that its recess points forwards (fig. 90/3). At the crankcase cover turn the declutching shaft so that its recess is in parallel position to that of the set bolt (fig. 89). In this position is the crankcase cover put on. At the same time it is necessary to slip the selector fork axle into its bore of the cover. This is done between the two sealing faces in centering the selector fork axle by hand into its bore while putting on the crankcase cover. Thereafter tighten the crankcase cover with 5 bolts M 6 x 75 and 1 bolt M 6 x 85 (fig. 91/1). The bolt 6 x 85 must be fitted together with a sealing washer as it is the oil level checking screw at the same time. Then engage the declutching shaft to the set bolt by turning the declutching shaft to the left (in the direction of the crankcase). Make sure that the declutching shaft releases properly and run the centering screw down again (fig. 91/2). To prevent the declutching shaft from getting disengaged when cranking the engine, fasten the declutching lever by means of a piece of wire to the support for the clutch control cable (fig. 91/3) and kick then the crank down.

If the kickstarter does not move back to its initial position, loosen the circlip and mounting nut of the gearshift drum axle on the left engine side. Hold the gearshift drum axle in place using a screwdriver and kick down starter crank. By this, the gearshift drum axle and the starter shaft are better centred to each other. Then tighten the gearshift drum axle again and lock.

Fig. 90



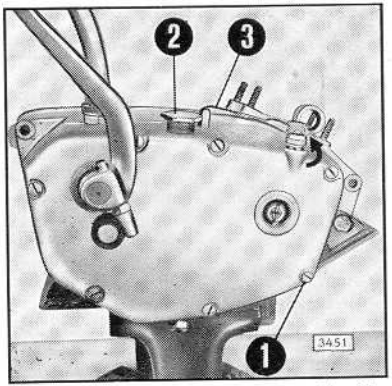


Fig. 91

9 CYLINDER-PISTON-CYLINDER HEAD

General Hints:

1. The cylinder is made from light alloy. Into the cylinder bore is pressed in a cylinder liner of gray cast iron. Between cylinder and crankcase is placed a cylinder flange gasket of 1 mm thickness. The cylinder is tightened with 4 socket head nuts M 7.
The cylinders are sorted and marked in groups according to their bore diameter.
2. The piston is made from a special light alloy. The pistons are sorted according to their outer diameter and are marked according to the wrist pin bore. Just as well are sorted the wrist pins, the connecting rod and the needle bearing.
3. The fitting clearances of a modern high performance engine have to be as close as possible, as only then the full power can be attained. The compression ratio specified by the factory guarantees maximum durability.
The parts listed below are therefore sorted in a tolerance group:
a) cylinder–piston
b) wrist pin bore–wrist pin
c) wrist pin–needle bearing–connecting rod.
d) The specified compression is obtained by fitting paper gaskets between the cylinder and crankcase.

Cylinder-Piston

a) In order to adhere to the necessary clearance the cylinder and piston are matched in pairs.
The diameter of the cylinder is measured at "D" (fig. 92). Within the specified tolerance this diameter is subdivided into two groups. The tolerance group "1" or "2" is marked on the cylinder flange (fig. 92/x). The diameter of piston is measured at "d" (fig. 93). The piston group (fig. 93/x) and the specified diameter of the piston (fig. 93/1) are marked on the piston head.

SORTING TABLE – CYLINDER – PISTON 125 cc

GROUP		STANDARD				PLAY	
		Cylinder ⌀ "D" (fig. 92)		Piston ⌀ "d" (fig. 93)		"D" Cylinder – "d" Piston	
		mm	in	mm	in	mm	in
1	from	55,0000	2,1670	54,943	.164754	0,0470	0,001851
	to	55,0095	2,167374	54,953	2,165148	0,0665	0,002620
2	from	55,0096	2,167378	54,954	2,165187	0,0465	0,001832
	to	55,0190	2,167748	54,963	2,165542	0,0660	0,002600
		REBORE					
1	from	55,5000	2,18670	55,443	2,184454	0,0470	0,001851
	to	55,5095	2,187074	55,453	2,184848	0,0665	0,002620
2	from	55,5096	2,187077	55,454	2,184887	0,0465	0,001832
	to	55,5190	2,187448	55,463	2,185242	0,0660	0,002600

SORTING TABLE – CYLINDER – PISTON 175 cc

GROUP		STANDARD				PLAY	
		Cylinder ⌀ "D" (fig. 92)		Piston ⌀ "d" (fig. 93)		"D" Cylinder – "d" Piston	
		mm	in	mm	in	mm	in
1	from	62,000	2,440940	61,920	2,437790	0,070	0,002756
	to	62.010	2,441333	61,930	2,438184	0,090	0,003543
2	from	62,010	2.441333	61,930	2,438184	0,070	0,002756
	to	62,019	2,441688	61,940	2,438577	0,089	0,003504
		1st REBORE					
1	from	62,500	2,460625	62,420	2,457475	0,070	0,002756
	to	62,510	2,461018	62,430	2,457869	0,090	0,003543
2	from	62,510	2,461018	62,430	2,457869	0,070	0,002756
	to	62,519	2,461373	62,440	2,458262	0,089	0,003504
		2nd REBORE					
1	from	63,000	2,480310	62,920	2,477160	0,070	0,002756
	to	63,010	2,480703	62,930	2,477554	0,090	0,003543
2	from	63,010	2,480703	62,930	2,477554	0,070	0,002756
	to	63,019	2,481058	62,940	2,477947	0,089	0,003504

To define sorting of cylinder and piston gauge only at the points marked "D" and "d" as shown in figures 92 and 93. The measure "D" on cylinder minus "d" on piston results in the piston clearance as shown in the table. This clearance, however, is not the smallest play between piston and cylinder. The piston having a convex and oval shape has its widest dimension below gauging point "d".

Note:

Only cylinders and pistons of identical tolerance groups are allowed to be sorted in pairs.

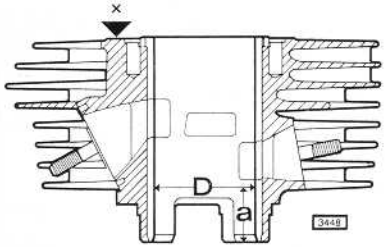


Fig. 92

Measurement a = 125 cc cylinder 29 mm (1,1417 in)
175 cc cylinder 35 mm (1,3779 in)

Wrist pin bore – wrist pin

b) In order to adhere to the specified clearance between wrist pin bore and wrist pin the specified tolerance of the piston diameter is subdivided in 2 groups and that of the wrist pin in 3 groups. The clearance is 0 to 0,00021 in (0 to 0,0055 mm).

Marking of the tolerance groups

The wrist pin bore is marked inside the piston by a spot of blue or yellow paint.

Group:

Yellow	from	0,59078 to 0,59088 in (15,006 to 15,0085 mm)
Blue	from	0,59068 to 0,59078 in (15.0035 to 15,006 mm)

The tolerance group of the wrist pin is marked with 1 to 3 lines on its front face.

Group:

1	from	0,59066 to 0,59078 in (15,003 to 15,006 mm)
2	from	0,59055 to 0,59066 in (15,000 to 15,003 mm)
3	from	0,59043 to 0,59055 in (14,997 to 15,000 mm)

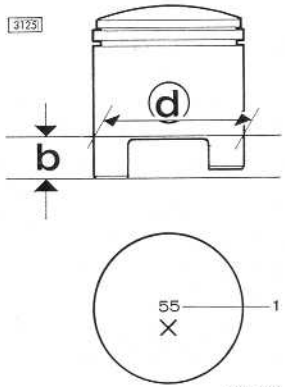


Fig. 93

Measurement b = 125 cc piston 15,8 mm (0,625 in)
175 cc piston 22,3 mm (0,878 in)

Wrist pin – needle bearing – con rod small end

c) As with the cylinder, piston and wrist pin, the wrist pin diameter, wrist pin needle bearing and small end diameter are sorted to each other.
Marking of the groups:
The needle bearings are marked by a spot of color.

Group:

0	= yellow
I	= red
II	= blue
III	= white

The connecting rod is marked with numbers 1 to 5 on the small end outside.

Group:

1	from	0,74771 to 0,74787 in (18,992 to 18,996 mm)
2	from	0,74787 to 0,74803 in (18,996 to 19,000 mm)
3	from	0,74803 to 0,74818 in (19,000 to 19,004 mm)
4	from	0,74818 to 0,74834 in (19,004 to 19,008 mm)
5	from	0,74834 to 0,74850 in (19,008 to 19,012 mm)

Note:

As spare part is supplied the crankshaft of tolerance group 3 only.

Sorting the parts

In order to match the parts properly assemble them as per sorting table (fig. 94).
The hatched sections of the table show what groups of the assortment are available as spare parts.

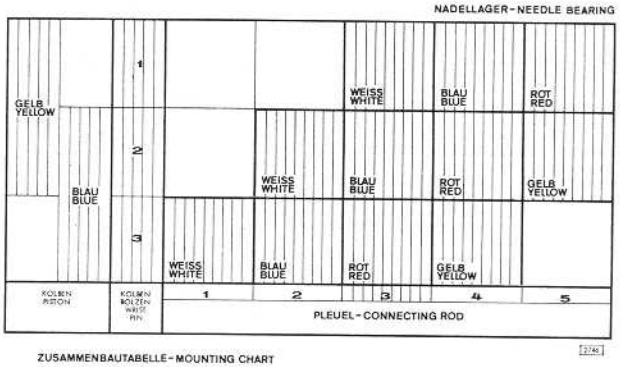


Fig. 94

The following examples show how to find the correct assortment by means of the table.

Example no. 1 (fig. 95)

The cylinder and piston are to be replaced, the new piston being marked blue.
Your engine originally was equipped as follows **(dash-dotted line):**

Piston marked "yellow", wrist pin no. "1", needle bearing marked "red", small end marked "5".

The following parts go now together **(new line):**
wrist pin bore marked "blue", wrist pin "2", needle bearing "yellow", small end "5".

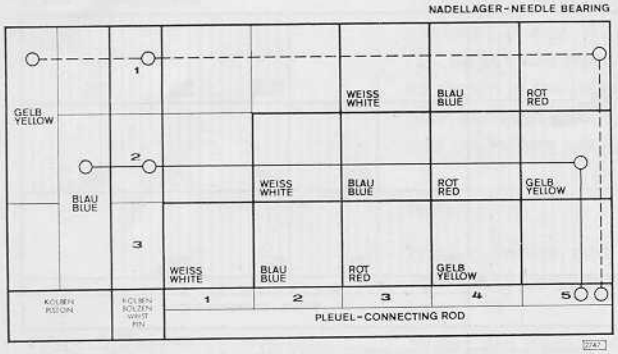


Fig. 95

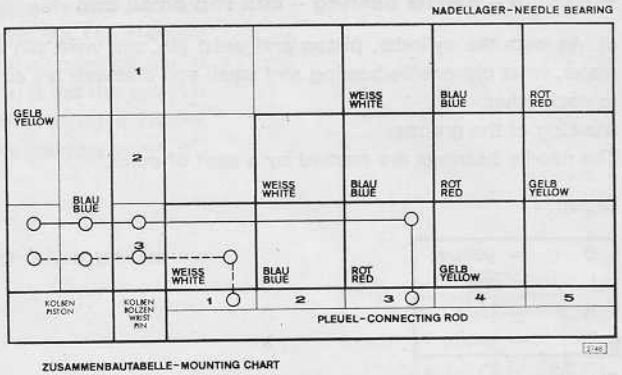


Fig. 96

Example no. 2 (fig. 96)

The crankshaft is to be replaced. Your machine originally has been equipped as follows **(dash-dotted line):**

Small end marked "1", needle bearing "white", wrist pin no. "3", piston marked "blue".

New assortment:

Crankshaft with small end "3", needle bearing "red", wrist pin no. "3", wrist pin bore marked "blue".

Cylinder head and Compression release

Before every reassembling remove any carbon residues from the cylinder head (see page 5). After decarbonizing the cylinder head, check the plug thread. If necessary chase the thread with a screw tap M 14 x 1.25. If the thread is seriously damaged or stripped it may be replaced by the thread insert "Heli-Coil". Moreover don't forget to check the sealing surface of the cylinder head. For this purpose place a perfectly flat metalruler across and in longitudinal direction and check the sealing surface for a light gap. In case the cylinder head is distorted the sealing surface is levelled on a bed plate with emery paste or on a level surface with emery paper. The rise in compression thus produced need not be taken into account.

Compression release

The 175 cc models are equipped with an assistance for starting, i. e. a stop device in form of a decompressor valve, which is operated by a cable. Before mounting the cylinder head check valve seat and the valve itself for wear and residues from combustion. If there are damages the valve plus valve guide or the valve only must be replaced. If only the valve is replaced, it must be lapped into the seat with a fine emery paste. Reassembling is done in reversed order. The gasket and the asbestos ribbon, which serves for sealing the insert, must be renewed after every stripping.

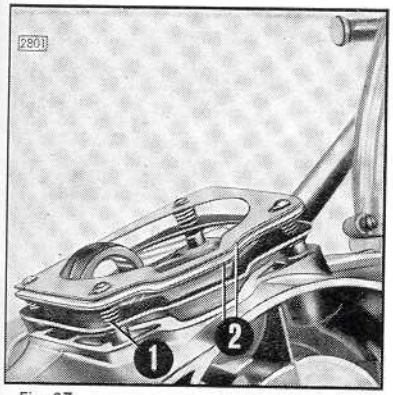
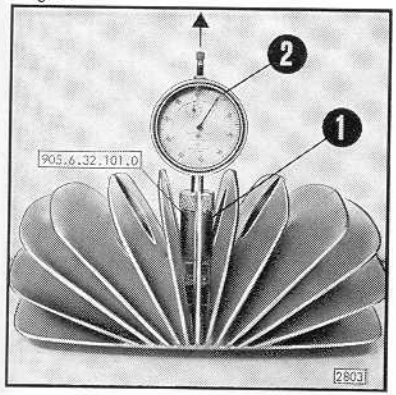


Fig. 97

Fig. 98



Compression ratio – timing

d) When fitting a new cylinder and piston proceed as follows: Put standard cylinder flange gasket in its place on the crankcase (fig. 97/1), fit piston and cylinder and tighten.

Then measure the projection of the piston in the T.D.C. position. The following instruments are required to measure the projection of the piston:

A commercial dial gauge (fig. 99/1) with a long feeler pin (fig. 99/2) a dial gauge holder (fig. 99/3), a plane adjusting bed-plate (glass plate), and the cylinder head of the engine.

The dial gauge holder is screwed into the thread for spaking plug of cylinder head (fig. 98/1). Then put cylinder head on adjusting plate.

Put feeler pin into gauge holder, adjust dial gauge, fix and turn large dial face until the large finger coincides with the zero-mark (fig. 98/2).

Adjust the dial gauge so that its feeler pin is still allowed to move upwards by 6 mm at least (see small finger, fig. 98).

Put cylinder head together with the adjusted dial gauge on to cylinder and tighten. By rotating the crankshaft find T.D.C. and then read the real projection of the piston off the dial gauge.

The projection of the piston with the model 125 is 0,1969 in + 0,0039 in (5,0 mm + 0,1 mm) with model 175 0,2205 in + 0,0039 in (5,6 mm + 0,1 mm) (fig. 77). With the use of the cylinder flange gasket of suitable thickness the above mentioned measure is obtained. Remove cylinder again and use the suitable gasket. For this purpose gaskets with a thickness of 0,2mm, 0,3 mm and 0,5 mm are available.

If with the model 175 the projection is measured through the spark plug thread in the cylinder head, the adjusting value is reduced to 0,0078 in (0,2 mm) 0,2126 in ± 0,0039 in (5,3 mm ± 0,1 mm) as the spark plug thread is off-center.

Now is the cylinder finally fitted.

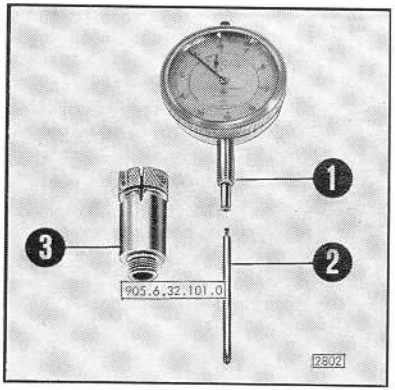


Fig. 99

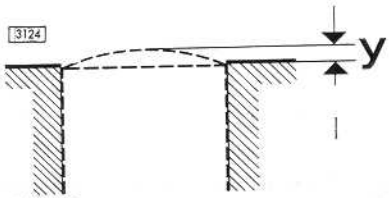


Fig. 100

Measurement y = 5 mm + 0,1 (0,1969 in + 0.0039 in) in 125 engine

5,6 mm + 0,1 (0,2205 in + 0,0039 in) in 175 engine

Note:

Therefore it is expedient to check before every reassembly:

a) Whether the sortings of the particular parts are matching to each other (see page 35–39).

b) Whether the compression ratio or the number of paper gaskets fitted is correct.

Fitting the piston and cylinder

Having made sure that the cylinder and piston (fig. 101) wrist pin bore and wrist pin, needle bearing and connecting rod (fig. 101/1) are properly sorted to fit the piston.

Oil the small end!

Fit the piston so that the shorter side of the shaft points to the rear (intake pipe) (fig. 101). In the 175 trials engine the piston is to be fitted according to the arrow on the piston head, i.e. the arrow points in the driving direction. The wrist pin is locked with 2 circlips.

Place the cylinder flange gasket on to the crankcase sealing face, and oil slightly the cylinder liner and the piston.

While putting carefully on the cylinder, take special care of the piston rings. Then tighten the cylinder with the 4 socket head nuts using a torque wrench (fig. 102).

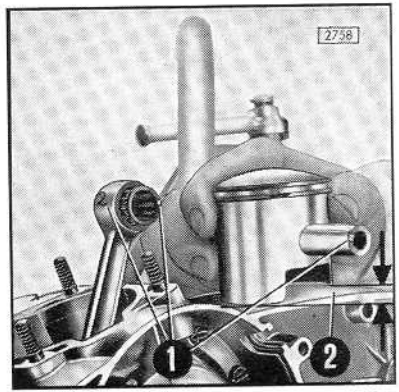
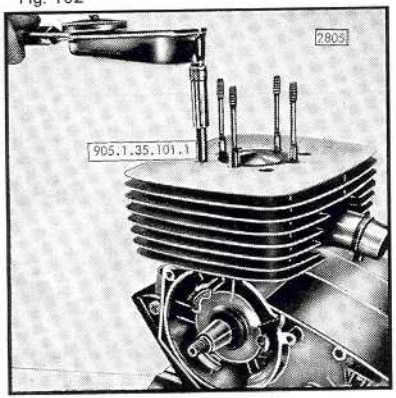


Fig. 101

Fig. 102

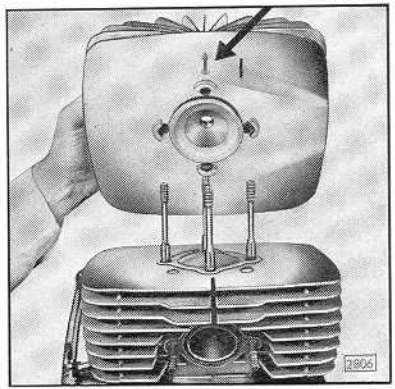


Fitting the cylinder head

After having compensated the projection of the piston at the cylinder put on the cylinder head. The arrow on the head must point into the direction of driving (fig. 103). Slip on the spacers and tighten crosswise with nuts M 8 using a torque wrench.

In the trials motor aluminium gaskets are inserted between the cylinder and cylinder head to decrease the compression ratio. The total thickness of the aluminium gaskets is 0,04 in (1 mm).

Fig. 103



10 FITTING THE MAGNETO

If replacing or removing from the magneto the base plate (fig. 104/1), the charging coil (fig. 104/2), the control coil (fig. 104/3), the flywheel (fig. 104/4), or the control valve (fig. 104/5), or the crankshaft, the ignition must newly be set. Only by use of a stroboscope it is possible to adjust the ignition properly.

Fitting the base plate

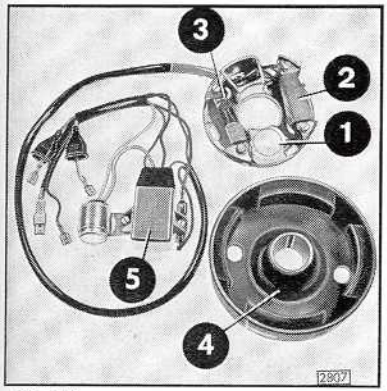


Fig. 104

Put the base plate on and slip the rubber socket into its slot. Fix the base plate with 3 fillister head screws and washers only finger-tight (fig. 105/1).

If the ignition need not be readjusted, the base plate is placed in correspondence with the marks on the crankcase and on the base plate (fig. 105/2). Thus the ignition is properly timed. Then fasten the three mounting screws.

In case of a readjustment new marks must be placed on crankcase and base plate. Already existent marks with the exception of the mark on the flywheel magneto do not apply.

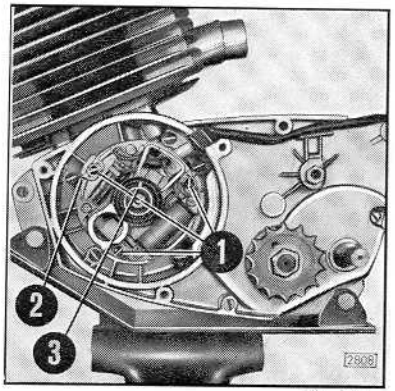


Fig. 105

Mounting the flywheel

Hint:

Before fitting the flywheel it is necessary to degrease the seat on the crankshaft and in the flywheel by means of an effective agent (e.g. carbon tetrachloride, trichlorethylen etc.). Even small traces of grease reduce the torque up to 30% which could cause the flywheel to work loose and thus damaging the crankshaft.
After degreasing fit the guide pin (fig. 105/3) to the crankshaft, slip on the flywheel and run down the mounting nut. While holding the flywheel, using the flywheel holder, tighten the nut.

Fitting the engine sprocket

Slip the toothed lock washer, the sprocket and the tab washer on to the mainshaft. While holding the sprocket tighten with mounting nut and lock. Now tighten the gearshift pedal.

Electrical connections

Connect the 4 cables (white, red, violet, blue) with the control valve (fig. 106/1) and put on the protecting cap (fig. 106/2). The sequence of the colours is specified on the control valve (fig. 106/3).

Place the cable harness with the control valve and the condenser into the intake box.

Fix the control valve (fig. 107/1), the condenser with clip (fig. 107/2), and the twin plug for the two earth cables (brown ones) (fig. 107/3) with two screws to the left wall of the intake box.

Connect the white cable (fig. 107/4) and the blue cable (fig. 107/5) with the ignition coil and the brown cable (fig. 107/6) and red cable (fig. 107/7) with the short circuit switch.

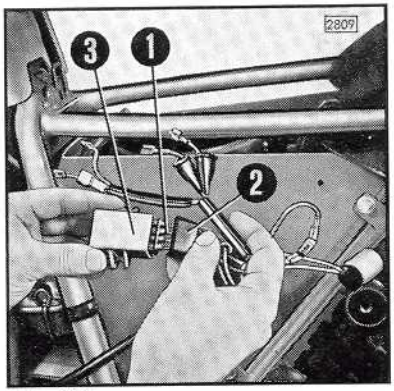


Fig. 106

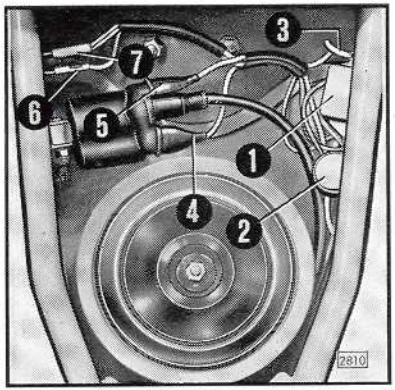


Fig. 107

Covering the intake box

If the magneto cover is fitted, place the vent hose of this cover into the intake box. Slip the fuel hose on to carburetor. Cover intake box on top. Put the other vent hose of the crankcase cover between frame and intake box, and wrap the carburetor and intake box with the outer cover. Finally fix the cable harness to the crankcase with a clip.

In the newer models an ignition system with a 17W lighting coil is installed. The system is designed for the subsequent installation of a 15W headlight and 2 W taillight. The connecting terminal is located on the left side of the frame under the cover. There are two markings on the flywheel. The broken-line marking shows the manufacturer's basic setting and is of no significance for the ignition timing. The second marking (a thin stripe) is applied for the exact ignition timing. It may happen that the markings are applied one on top of the other.

11 CHECKING AND TIMING THE IGNITION

The vehicle is equipped with a non-contacting magneto-high tension condenser ignition. In this case you cannot use the customary method of ignition timing.

For timing the ignition you need a battery charged stroboscope and a rev. meter. The stroboscope must be suitable for 8000 r. p. m., e. g. Bosch EFAW 185.

If using a rev. meter mind that most of these devices can only be used if a diode (e. g. TV diode Philips-By 127) is inserted into the ground cable (mind the flow direction). If this is not taken into account the ignition unit is short circuited and the engine cannot be started.

Time the ignition in the following order:
Marking the crankcase:

In order to be able to check the ignition, the mark on the flywheel magneto must point to the crankcase, the piston must be in advanced-ignition position. Instead of marking the crankcase you may use a home-made tin-indicator, see fig. 108. The indicator will make reading easier.
The procedure is the following:

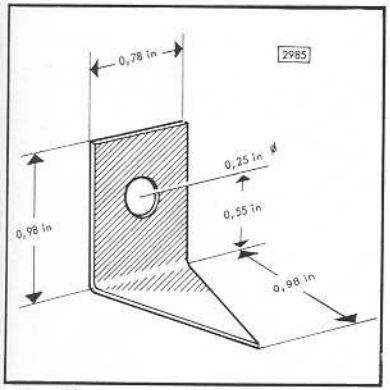


Fig. 108

Screw dial gauge holder, dial gauge and feeler pin into spark plug thread.
Rotate flywheel magneto in direction of engine revolution (indicator on flywheel-magneto) until it points to T. D. C (fig. 109).

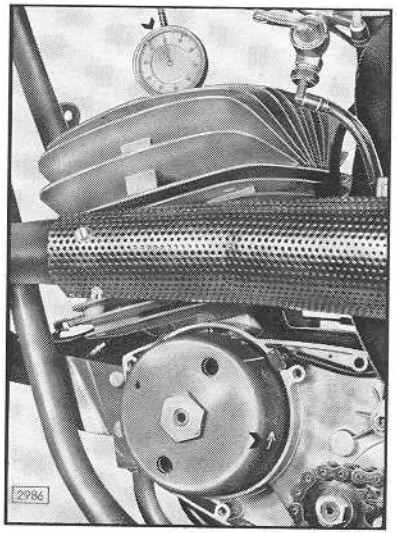


Fig. 109

Turn dial gauge indicator to „0" (Zero)
Rotate the flywheel magneto against direction of engine revolutions until the dial gauge indicates the prescribed advanced-ignition value (piston stroke) before T.D.C.

In this position the mark on the flywheel magneto is transferred to the crankcase, i. e. the indicator is mounted in such a way that its tip coincides with the mark on the flywheel magneto (fig. 110). Unscrew dial gauge holder and dial gauge, mount spark plug and connect ignition cable.

Checking ignition point

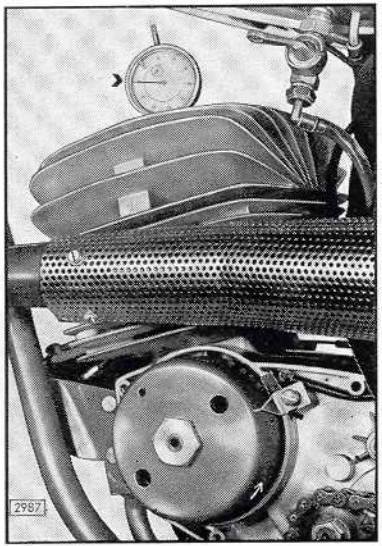


Fig. 110

The ignition point is to be checked when the engine is running, the revolution ratio must be 8000 r. p. m.

The stroboscope must be connected in keeping with the producer's instructions, you need a 6 or 12-Volt battery.

After connecting the stroboscope and the rev.meter the engine is started and brought to the revolution ratio required for the test.

At this revolution ratio the stroboscope is to illuminate the mark on the crankcase and the indicator tip. Thus the mark on the flywheel magneto is made visible at the moment of the ignition point.

The ignition point is correct if the two marks coincide. If this is not the case, stop the engine and disconnect the devices. Then mount the crankcase cover.

The ignition is too much advanced, when the mark on the flywheel magneto – seen in direction of engine revolutions – is before the mark on the crankcase respectively before the indicator tip (fig. 111).

The ignition is too little advanced if the mark on the flywheel magneto – seen in direction of engine revolutions – is behind the indicator tip (fig. 112).

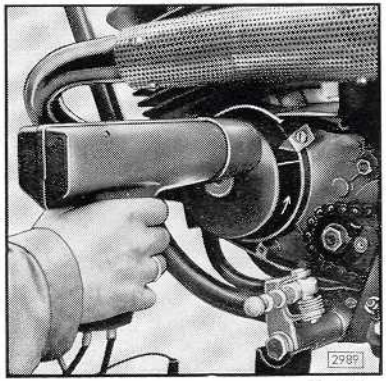


Fig. 111

Correcting the ignition point

If the two marks do not coincide, stop engine and turn the base plate.

For this purpose the mounting screws must be loosened (fig. 105/1). These screws are to be reached through the two bores in the flywheel magneto (fig. 113).

A turning of the base plate against the direction of engine revolutions results in less advanced ignition.

After turning the base plate fasten the mounting screws and check the ignition point again with the stroboscope.
(Proceed as previously described.)

If the ignition point is correct, the vehicle may be reassembled.

Turning the magneto base plate results in an alteration of the advanced ignition of approx. 0,055 in (1,4 mm).

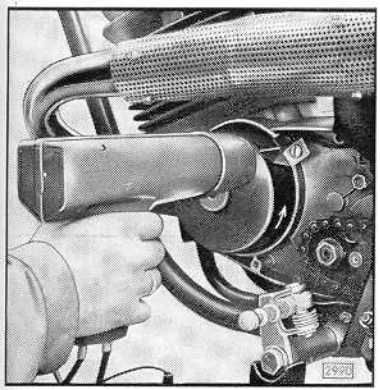


Fig. 112

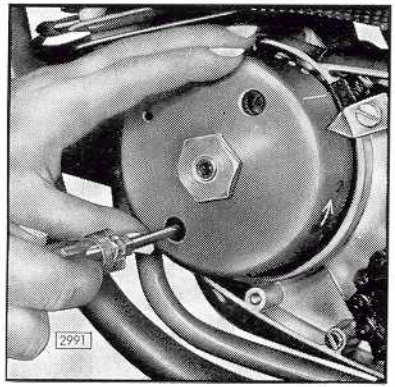


Fig. 113

12 TIGHTNESS OF SCREWS AND NUTS

Screws (Nuts)	mkp	ft/lb
Cylinder	1.5	10.85
Cylinder head	2.5	18.08
Cylinder head (expansion screw)	1.8	13.02
Mounting the engine	3	21.70
Flywheel	4.5–5	32.55–36.16
Clutch	4.5	32.55
Primary wheel	6.5	47.01
Selector screw	1.5	10.85
Selector rod draw key	1.5	10.85
Drive sprocket	6.5	47.01
Case screws	0.8	5.78
Bearing bolt for starter gear in crankcase cover	1.2	8.68
Selector drum axle	1.8	13.02

Description		Part Number
Engine repair stand	×	905.1.31.101.2
Extractor for flywheel magneto generator	×	905.1.34.105.0
Sprocket holder	×	905.0.36.101.2
Detent for flywheel magneto generator	×	905.0.16.101.2
Socket wrench for fastening cylinder	×	905.1.35.101.1
Holder for primary gear	×	905.6.36.102.1
Extractor (for crankshaft spacer)	×	905.1.34.101.0
Dismantling ring (to push out crankshaft bearing)	×	250.7011.2
Supporting table		905.1.33.103.0
Extracting and pressing on tool for crankshaft bearing and seal ring		905.1.33.102.0
Clutch expander		905.6.31.105.0
Extracting and pressing on tool for needle bearing and transmission gear		905.1.33.106.0
Extracting and pressing on tool for layshaft gear ball bearing		905.1.33.107.0
Extracting and pressing on tool for outer ring of mainshaft		905.1.33.110.1
Mounting sleeve for mainshaft	×	905.1.34.106.1
Measuring makeshift for adjusting gearshift	×	905.1.32.104.0
Extracting and pressing on tool for needle bearing in clutch drum		905.1.33.108·1
Gauge for measuring piston projection and ignition timing		905.6.32.101.0
Kukko puller insert for gearbox bearing (the Kukko supporting tool 22-1 belongs to it)	×	905.0.14.006.0
Kukko supporting tool 22-1	×	905.0.14.002.0
Stroboscope fed by a battery and must be appropriate for 8000 revolutions per minute		on the market
Revolution counter (must be appropriate for MHKZ ignition system, see Service Bulletin)		on the market
Dial gauge		on the market
Depth gauge		on the market
Feeler (valve gauge)		on the market
Sliding rule		on the market
Micrometer		on the market
Torque spanner		on the market
Mounting board		selfmade
Pointer for ignition timing		selfmade

× Tools absolutely required

14 CONVERSION TABLE

Millimetres (mm) to Inches (in)	1 cm = 10 mm
1 mm = 0.0394 in	Conversion factor 0.0394
e. g. 15.003 mm x 0.0394 = 0.5911182 in	

Square centimetre (cm^2) to Square inch (sq in)	
1 cm^2 = 0.155 in	Conversion factor 0.155
e. g. 1.5 cm^2 x 0.155 = 0.2325 sq in	

Cubic centimetre (cc) to Cubic inch (cu in)	
1 cc = 0.06102 cu in	Conversion factor 0.06102
e. g. 135 cc x 0.06102 = 8.2377 cu in	

Litres (l) to US-gallons (US-gall)	
1 l = 0.2642 US-gall	Conversion factor 0.2642
e. g. 9.3 l x 0.2642 = 2.45706 US-gall	

Kilograms (kg) to Pounds (lb)	
1 kg = 2.205 lb	Conversion factor 2.205
e. g. 92 kg x 2.205 = 202.86 lb	

Kilopondmetres (mkp) to Foot pounds (ft/lb)	
1 mkp = 7.233 ft/lb	Conversion factor 7.233
e. g. 1.3 mkp x 7.233 = 9.4029 ft/lb	

Kilograms/square centimetre (kg/cm^2 = atü) to Pounds/sqare inch (lb/squin = psi)	
1 atü = 14,22 psi	Conversion factor 14.22
e. g. 1.2 atü x 14.22 = 17.064 psi	

Kilometres (km) to Miles (mil)	
1 km = 0.621 mil	Conversion factor 0.621
e. g. 100 km x 0.621 = 62,1 mil	

Litres/100 Kilometres (l/100 km) to Miles/US-gallon (mil/US-gall)	
$\text{mil/US-gall} = \frac{235}{\text{l/100 km}}$	e. g. $\frac{235}{7\,\text{l}} = 33.57$ mil/US-gall

907.1.71
1. Auflage

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