



**GILERA**  
**SATURNO**  
**500 c.c.**

**ENGINE**  
**WORKSHOP**  
**MANUAL**

*Including wiring diagram*

***translation by Christian***

***First try, probably needs improvements. Just tell us.***

# OPENING THE ENGINE

## 1. HEAD AND BARREL

a) Remove the spark plug with the appropriate key; b) remove the upper cover by unscrewing the fixing screws; c) remove the shafts of the rockers by screwing into the tapped hole one of the fixing screws of the lid by actuating like an extractor; d) remove the rockers arms, paying attention to the possible adjusting washers; e) remove the rocker arm shafts; f) loosen uniformly the five screws (fig.9) that hold the head and the cylinder to the crankcase; g) remove the head, the oil delivery pipe and, using a wooden mallet, remove the cylinder from the crankcase.

## 2. PISTON

a) Remove one of the felt-retaining rings with a suitable clamp. b) Remove the gudgeon pin and the piston from the connecting rod.

N.B. - If the same piston and the same piston rings were to be reassembled, remember to observe previously the position found at the time of disassembly; i.e. to avoid a new adaptation with the cylinder.

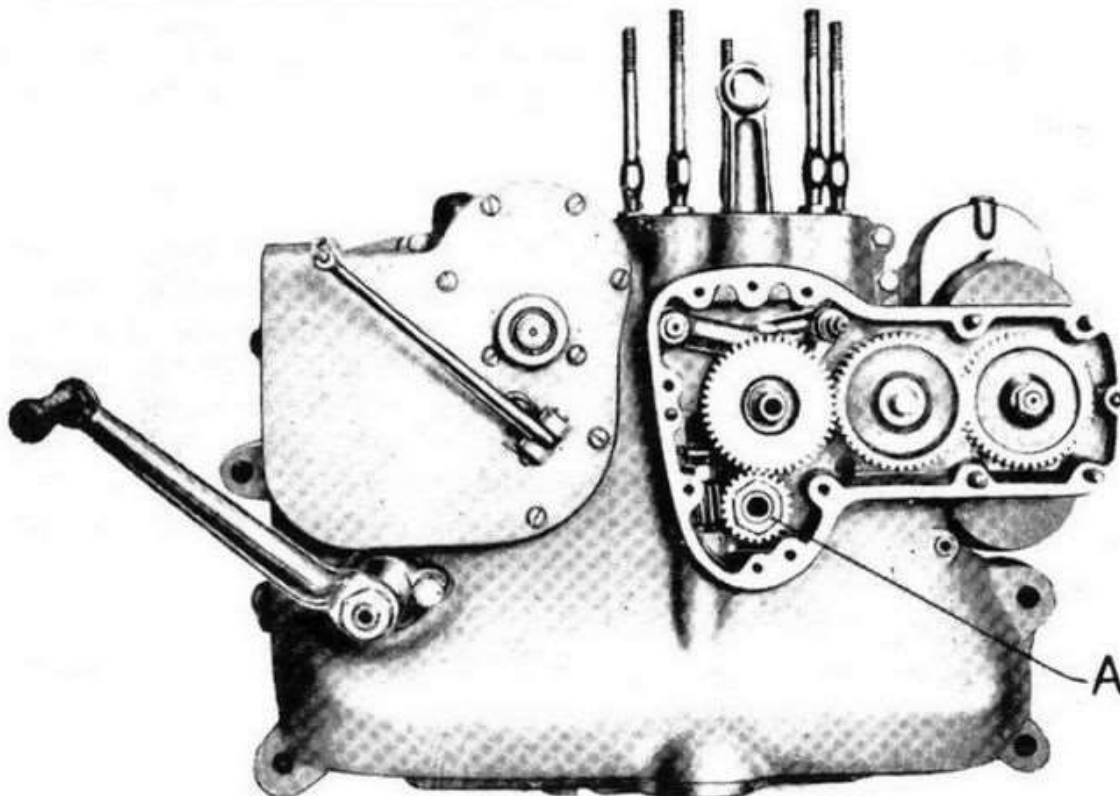


Fig. 9 - Engine block with uncovered distribution

### 3. CAMSHAFT

a) Remove the gear shift lever, the valve lever with the relative spring. b) remove the woodruff key on the shaft of the valve lift lever; c) unscrew the four blind nuts fixing the mag and the ones which hold the cover. d) remove the last one taking support on the place planned for; e) remove the cam gear, the control levers and the relative shafts, as well as the intermediate gear; f) with the appropriate tool n. 6942 unscrew the lock nut of the mag gear assembly and with a wooden mallet on the shaft, take off the gear and the mag-dynamo; g) unscrew the fastening nut A (see Fig. 9/10) of the timing gear with the key and the lock tool No. 4710 and with the extractor No. 5263, take the gear from the crankshaft .

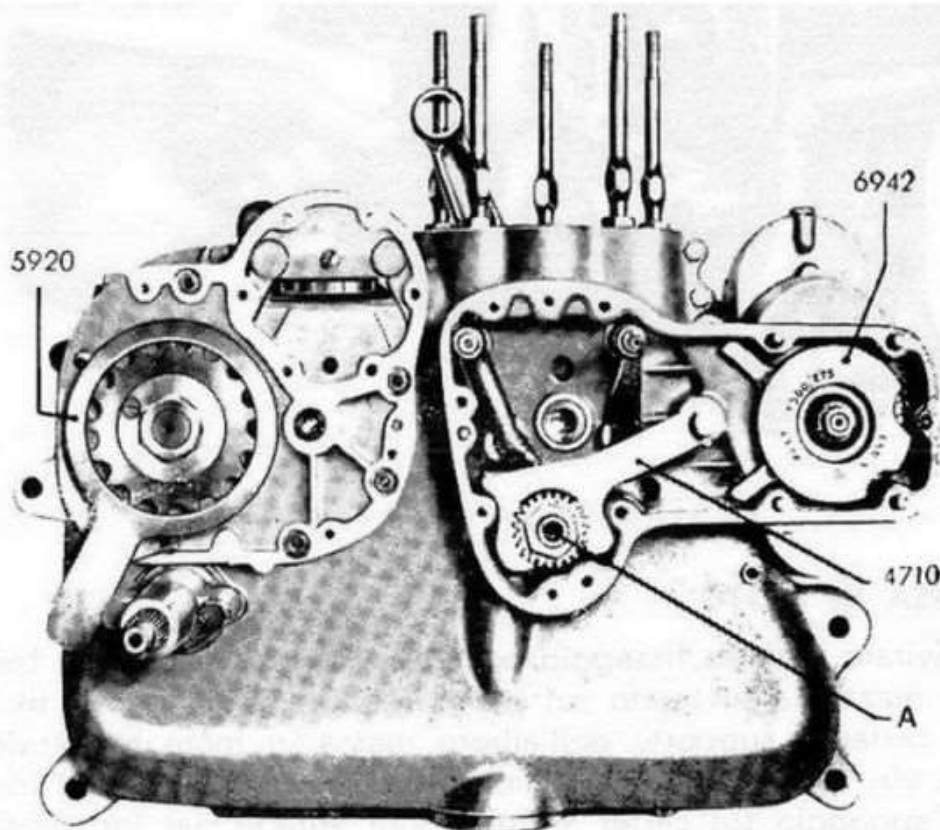
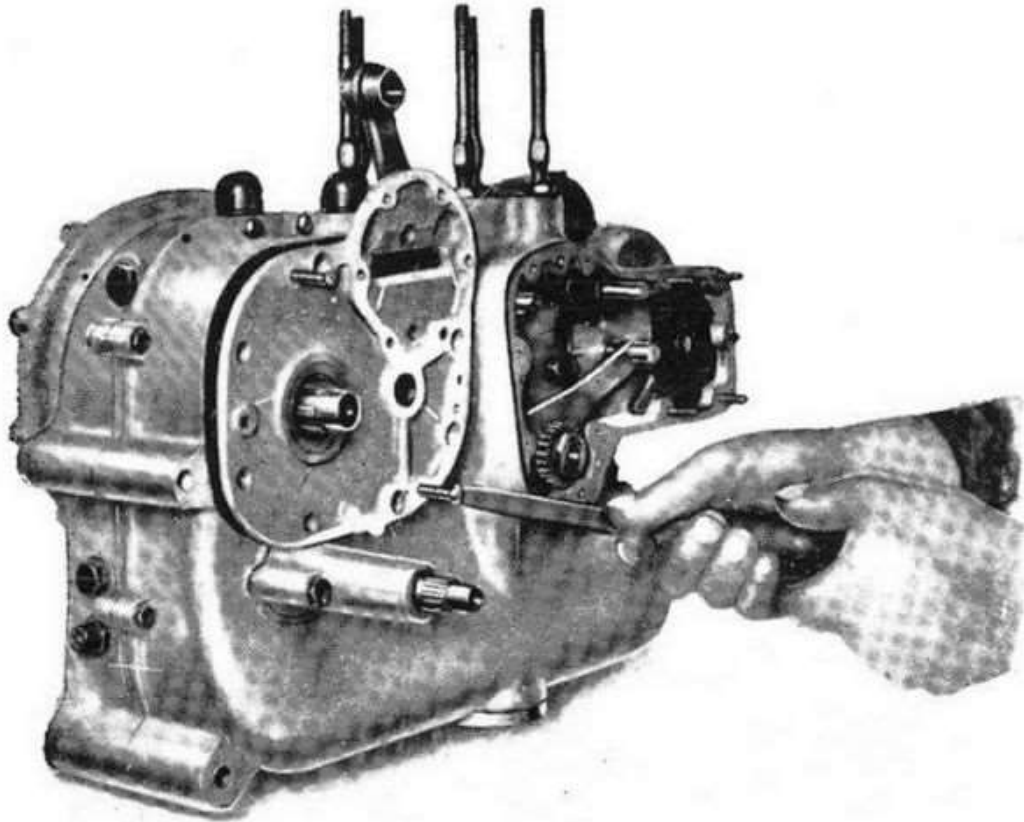


Fig. 10 - Special tools for removing gears

### 4. GEAR CHANGE

a) Remove the selector cover by unscrewing the fixing screws; b) remove the safety washer of the chain sprocket by unscrewing the fixing screw, then the sprocket itself unscrewing the locking nut with the tool N. 5920 (see figures 9/10); c) remove the gearbox cover (right side) by unscrewing screws and fixing nuts. For this operation you can use, as an extractor, two screws of the cover itself screwed into two tapped holes (see Fig. 11); d) remove the gearbox layshaft, and the fork, withdrawing the shaft, and the gearshift gears except the 1st gear and the sliding 2nd.



**Fig. 11 - Disassembling the gearbox cover**

#### **5. KICK – STARTER**

**a)** Unscrew the crank nut and, hitting with a wooden mallet on the shaft, remove the kick starter; **b)** remove the crankshaft support from the crankcase by removing the two fixing screws; **c)** release the shaft of the support on the left casing, then remove it from the hole of the supports housing together with the spring while, with a hand introduced into the opening of the change cover, the gear set in motion is extracted and the sliding clutch comes with its spring.

#### **6. CLUTCH**

**a)** Remove, after unscrewing the screws, the cover of primary transmission using a screwdriver on the specific part; **b)** unscrew the clutch springs retaining nut; **c)** remove the cups and springs; **d)** remove the discs and the pusher rod; **e)** unscrew the safety grub screw and remove the clutch drum fixing nut; **f)** extracting the inner drum and the ring gear with relative rollers (see Fig. 34), and the flange spacer, being careful not to mix parts.

#### **7. TRANSMISSION SHOCK ABSORBER**

**a)** With a pipe wrench and tool No. 4712, unscrew the engine gear nut, then use the extractor No. 4713 to remove the complete gear. **b)** insert the whole assembly on the conical shaft N. 6978 and fasten it in a vice and with a special key loosen the spring retaining ring nut. (The ring nut is screwed

with left thread). **c)** Compressing the spring clutch with the tool N. 6977 completely unscrew the ring nut and, by using the above-mentioned tool, remove all the parts that are part of the damper.

## 8. CRANK

After having unscrewed and extracted the oil filter cap in order to completely empty the oil cup; the screws for joining the crankcase halves are removed, the latter being separated by means of small wooden cradles with special "ears" located below the joining plane. Once the crank has been removed from the crankcase, it is fixed in the vice by taking it on the cylindrical surface of the vowels, then, with a pipe wrench, the nut fixing the transmission coupling axle is removed. At this point, to separate the flywheels, the crank is placed on the bench with a lead mallet on a copper cylinder supported on the edges of the surfaces facing the flywheels, at the closest point to the coupling axis, remove the rollers and, by unscrewing the fixing nut, remove the coupling axle of the flywheel on the distribution side (see Fig. 12)

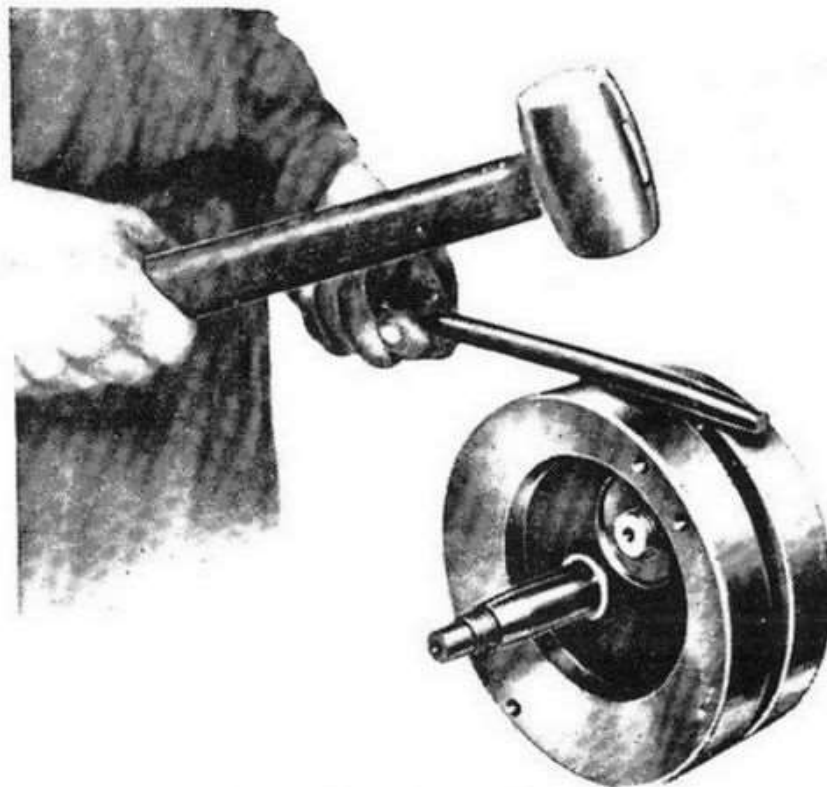


Fig. 12 - Disassembling the crankshaft

## 9. MAGNETO - DYNAMO

**a)** Remove the group cover; **b)** unscrew the fixing nut of the mag gearing interposing a 3 mm diameter **copper wire** between the teeth of the dynamo gear and the intermediate gear; to prevent rotation; **c)** extract the intermediate gear, loosen the **dynamo clamp** and remove **this clamp** with its

gear; **d)** remove the mag fixing screws, remove the drive gear by tapping on its shaft with a wooden mallet; **remove the mag from its holder.**

To remove the control gear from the dynamo shaft, lock it, unscrew the nut, then remove the gear with the extractor.

## 10. VALVES - OIL LINES – CARBURETOR

**a)** Remove the two side covers by unscrewing the fastening screws and, using the tool No. 7380, extract the springs; **b)** remove the valve after having removed the upper cap of the spring and the corresponding cotters (if the cap and the cotters are blocked, they must be unblocked by light strokes using a soft material tool).

The oil pipe to the rocker arms is removed from its respective fittings after having unscrewed the closing blind nuts; **c)** remove the carburetor by unscrewing the fixing studs to the head after unscrewing the relative nuts.

# ENGINE CHECK

In this part, we'll see the possible inconveniences to which the various parts of the motor and the relative remedies may be subject, as well as the general criteria for a periodic and effective check of the various parts of the motor vehicle. You'll also find the limits of use of the various parts and the how to's **for the replacement when said limits are exceeded.**

## 1. CAMSHAFT CRANK

**a)** Wash the crankcase carefully with gas, making sure that the lubrication holes are not blocked, blowing them with compressed air; **b)** Carefully examine the bearings condition. The inner rings must rotate without hard points and have a minimal axial play; **c)** observe the surfaces of the bushings which must be absolutely smooth. Otherwise they will have to be replaced; **d)** check the joining's plan of the carter on a perfectly polished countertop. In case it's needed, proceed to a leveling.

## 2. TRANSMISSION CRANK

The same information applies to the timing case.

## 3. CRANK

### Coupling shaft

**a)** Wash thoroughly with clean gas, and in particular, the oil passage holes, using for the latter, a syringe; **b)** dry with compressed air; **c)** verify the surface on which the rollers work; it must present itself very smooth without traces of seizing; **d)** check with micrometer the degree of wear and

trueness, this must not exceed the value of **0.03 - 0.04** in relation to the dimension indicated in fig. 13.

### Rollers

**a)** Carefully examine them one by one after washing them with clean gas. The rolling surface must be without traces of seizing or overheating; **b)** check the diameter of the rollers with a micrometer; the amount of wear must not exceed the value of mm. 0.03 in relation to the normal diameter indicated in fig. 13.

### Connecting Rod

**a)** Examine the internal surface of the connecting rod end where the rollers work; it must be very smooth without traces of seizing or heating. Same for the inner surface of the foot; **b)** check the use and trueness of the surfaces mentioned above as shown in fig. 13.

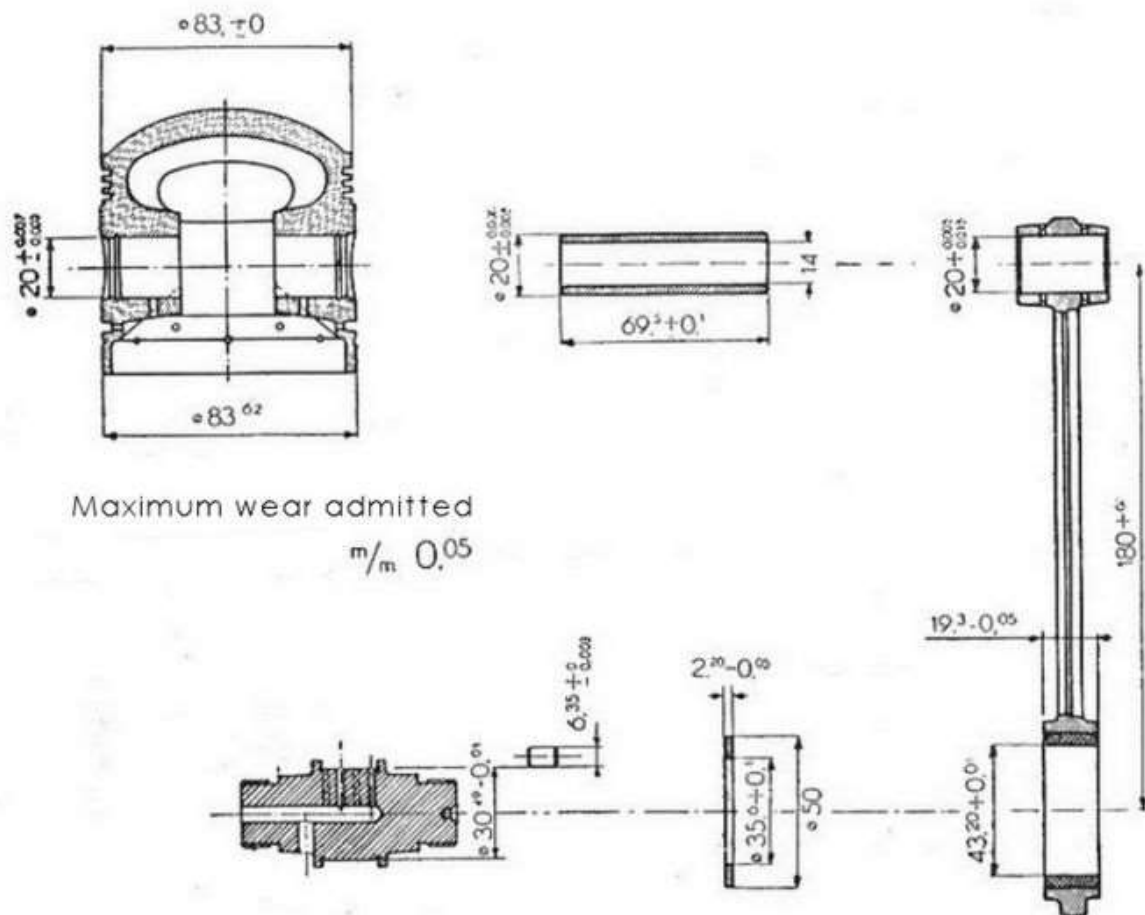


Fig. 13

## 4. COMPLETE TOP END

### Piston

**a)** Clean thoroughly the dome from any incrustations and carbon deposits by using a scraper without affecting the aluminum; **b)** carefully wash the piston with gas paying particular attention to the grooves of the rings and to the oil drain holes. The rings must be able to rotate easily in their

respective places; **c)** check the diameters of the piston with a micrometer; **the wear must not exceed mm. 0.05** (see Fig. 13).

Examine the surface in contact with the cylinder barrel; if it shows signs of meshing, deep scratches or cracks it will be necessary to replace the part. Check the housings for the pin retaining rings that must not be broken. If the surface of them presents scratches or marks, it should be eliminated with fine emery cloth.

**Keep in mind that if the cylinder is bored, the piston must be replaced by one oversize. Obviously, the rings would also need to be change. It should be remembered that excessive play between the piston and the cylinder causes problems such as: loss of power, excessive consumption of oil, noise.**

#### **Gudgeon pin**

Examine the surface, it must be very smooth and not show scratches or out-of-round; otherwise replace the pin. The coupling of the pin with the connecting rod must result with **a maximum play of mm. 0.03** (fig 13.)

#### **Rings**

Examine them closely: if worn so as not to adhere completely to the surface inside the cylinder barrel, replace them.

Assembling new rings is necessary to ensure that they are of an appropriate diameter with respect to the cylinder to which they are intended; the verification of this is carried out by introducing the ring in the barrel of the cylinder so that it is normal to the axis of said barrel, then with a thickness gauge the distance between the two ends of the bands is found: **this distance must be 0,1 - 0,2mm.** As for the piston rings, there is also an increase **scale of mm for the piston rings. 0.2 in mm. 0.2 up to 1mm.**

### **5. Barrel**

Look closely at the surface of the barrel, it must be very smooth and free of scratches. In the event that there are slight scratches, signs of seizing, it is necessary to rectify them finely until they disappear. If, on the other hand, the deep fossil lines have to be bored and grinded, keep in mind that the reaming increases go from **2/10 to 2/10 mm.** up to 1mm. above the normal rate referred to in fig. 14. These augmentations must also be kept in mind if, by checking the bore with a centesimal comparator, it should be noted that out-of-round **exceeding mm. 0.06** will require boring and grinded operations. In addition, for the grinding operation after **the boring**, bear in mind the machining tolerances adopted for the normal diameter (see table Fig. 14)



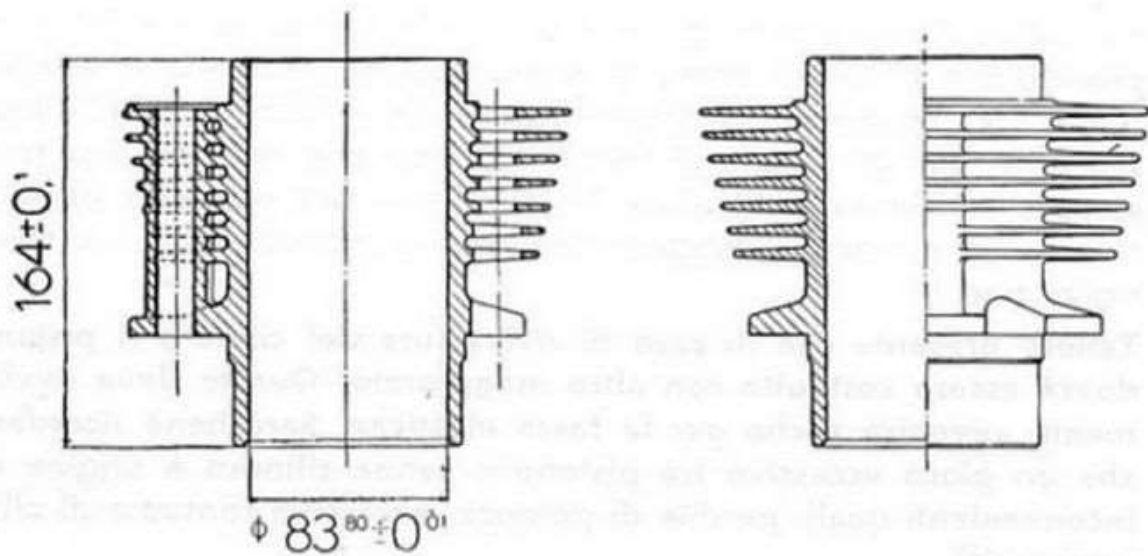


Fig. 14

## 6. Top end

### HEAD

**a)** Carefully remove the carbon deposits without affecting the metal and wash it with gas; **b)** observe that there are no cracks in which case the head must be replaced. (Especially examine the inner surface). The valve seats must not show any nicks or scratches, but must have a uniform surface so a perfect contact with the valve is ensured over the seat; when necessary it is possible to proceed with grinding. This operation must be carried out with great accuracy by using fine emery and oil. By alternately rotating the valves on their respective seats in both directions, after having fixed the head in a vice, and having previously smeared the seats of the valves with emery, look to obtain the simultaneous grinding of the contact surfaces of the valves with the seats. Avoid putting the emery in the valve guides. When the operation is completed, the head and valves are cleaned thoroughly with petrol or gas.

If the valve seats are to be fitted with a log or very recessed, it will be necessary to machine them with the appropriate tool before grinding them.

The valve guides must be very smooth on the internal surface and their wear must be ensured by the values established in the table (see Fig. 15)

### Valves

Remove the encrustations and carbon deposits of the head. As for the seats, also the support of the valves seat area must be uniform: otherwise it is necessary to proceed with sanding, or if finding dents, scratches, out-of-rounds, replace the valve. In doing so, it is also necessary to replace the guide to ensure perfect coupling between the guide and the valve.

### Wear limit

Valve	Intake valve guide	Exhaust valve guide
9,84	10,06	10,09

### Play at the wear limit

Between valve stem and intake guide . . . mm. 0,22

Between valve stem and exhaust guide . . . mm. 0,25

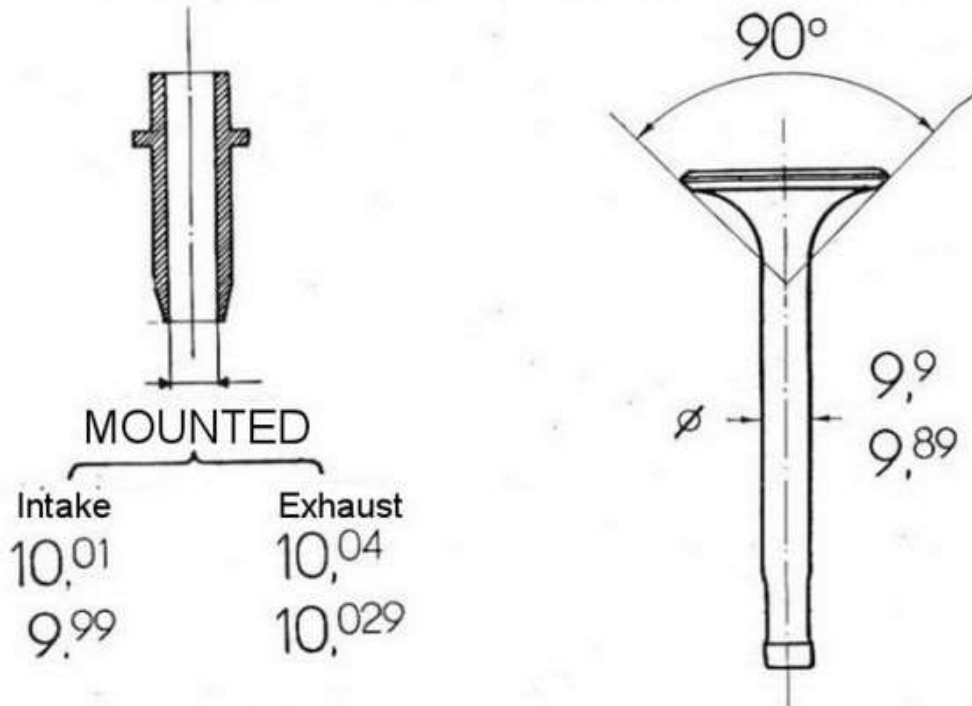
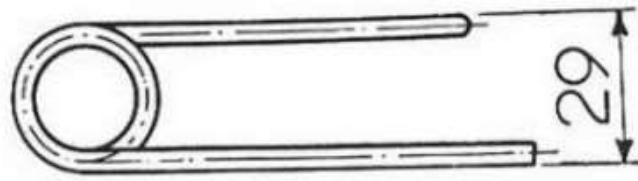


Fig. 15

The stem must be very smooth at the guided section: the maximum wear must be contained within the limits indicated in the table (fig. 15)

### Valve springs

Check the loads as established in fig. 16. If these loads are lower than the established limit, replace the springs to prevent the valves from flickering.



Load Kg. 23

Fig. 16

#### **Rocker arms**

Check the surfaces of the pads: they must be smooth and free of marks and furrows. Check the wear of the hole for the pin whose limits are indicated by the table (fig.17)

#### **Rocker arms shaft**

Make sure that the oil passage holes are free: otherwise, clean them with some gas injected with a syringe. Check the wear on the journals: it must be contained within the limits established in the table (fig.17)

#### **Oil line**

Wash with gas and blow it with compressed air to ensure there are no obstructions.

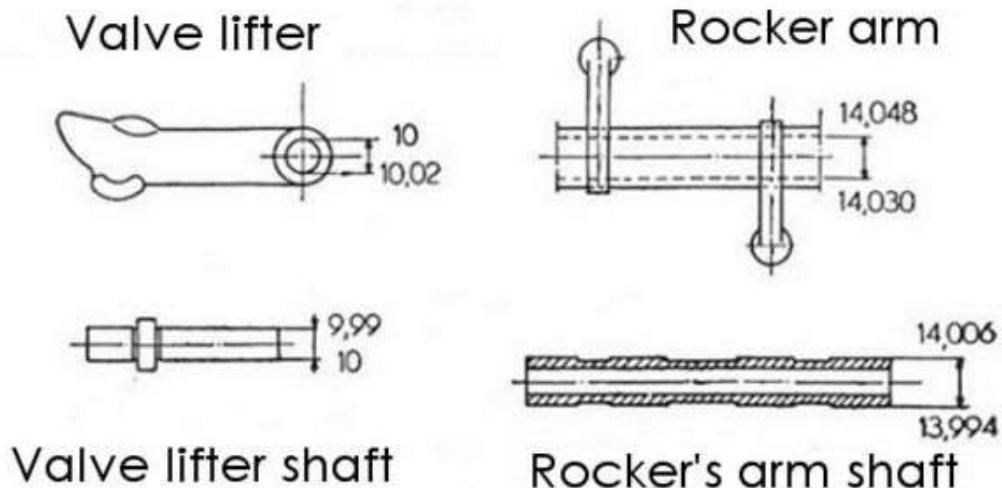
### **7. DISTRIBUTION**

#### **Cams**

Check that the working surface of the cams is smooth without deep lines, marks or signs of seizure. Take care to clean the lubrication oil holes.

#### **Valve levers**

Look the state of the hole and the profile of the bearing face. If the surface of the bearing face appears to be worn significantly or with signs of overheating, proceed with the replacement of the part.



#### Wear limit

Rocker's arm hole	Rocker's arm shaft
14,07	13,97

Maximum play between the shaft and the rocker arm is mm 0,1

Valve lifter hole	Valve lifter shaft
10,07	9,94

Fig. 17

The wear limits of the hole are fixed in the table (fig.17)

#### Shafts

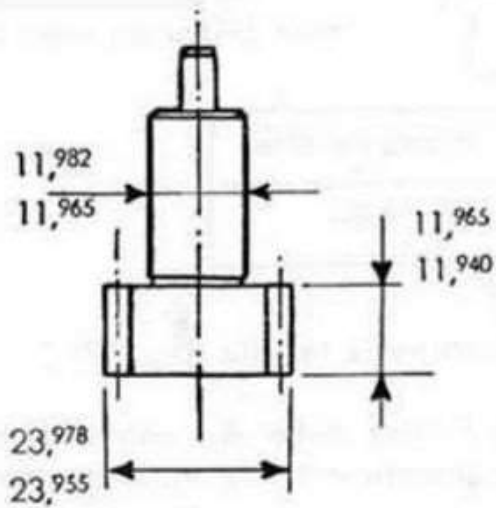
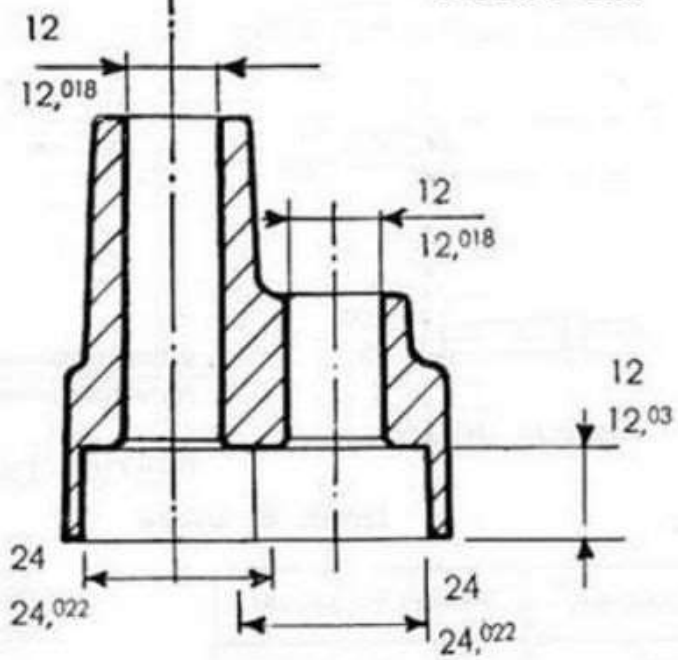
Check that they are straight, that the wear of the two ends is not excessive and that they flow freely within the appropriate guides.

### 8. OIL PUMP AND FILTER

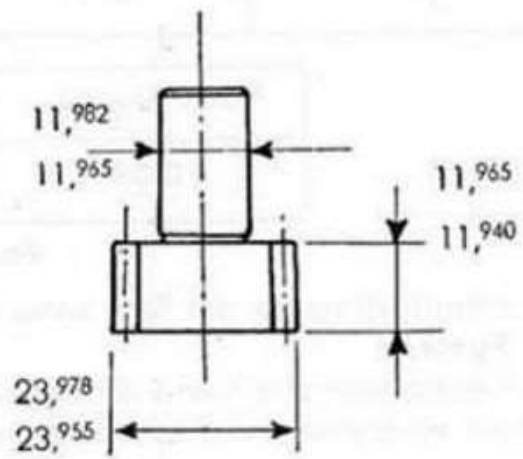
#### Pump

a) Disassemble the pump by unscrewing the four screws that secure the cover to the body and remove the gears; b) carefully wash the parts with gas; c) check the gears which must be without signs of wear. The coupling play between the teeth must not exceed **0.1 mm**. The limits between the pins and the relative holes, between the external gear diameter and the relative housing and between the gear sides and relative shoulder heights, are indicated in the table fig. 18. **Keep in mind that the correct lubrication of the most vital parts of the engine and consequently the life of the essential parts depends on the good functioning of the pump.**

### BODY PUMP



DRIVING GEAR



DRIVEN GEAR

### Wear limit

Gear shaft hole	Gear shaft	Gear housing diameter	Gear outside diameter
12,07	11,9	24,1	23,9

Gear housing height	Gear height
12,1	11,9

Fig. 18

## Filter

Wash well with gas and dry with compressed air. Make sure that there are no breakages which would compromise its efficiency.

## 9. MAGNETO-DYNAMO

The ball bearings of the support do not require any particular maintenance, as they are greased properly when they are assembled. Check the seals, especially the one on the central gear, as any infiltration of oil in the unit could jeopardize the operation of the dynamo which, given its position, would be hit by it.

## 10. CLUTCH

a) With a brush soaked in petrol, carefully clean the various parts and then blow dry with compressed air; b) check the wear of the dowels **A** that garnish the discs **B**. If these pieces are worn to a thickness of less than 5/10 mm from the metal disc, replace them. Therefore the pieces must be calibrated between two planes by means of a hand rocker to bring them to the extent established in fig. 19. The grooves on the external and internal drum must not have any notches to allow the discs to freely slide during the clutch operation. The metal disks must not show any overheating or deformation indexes;

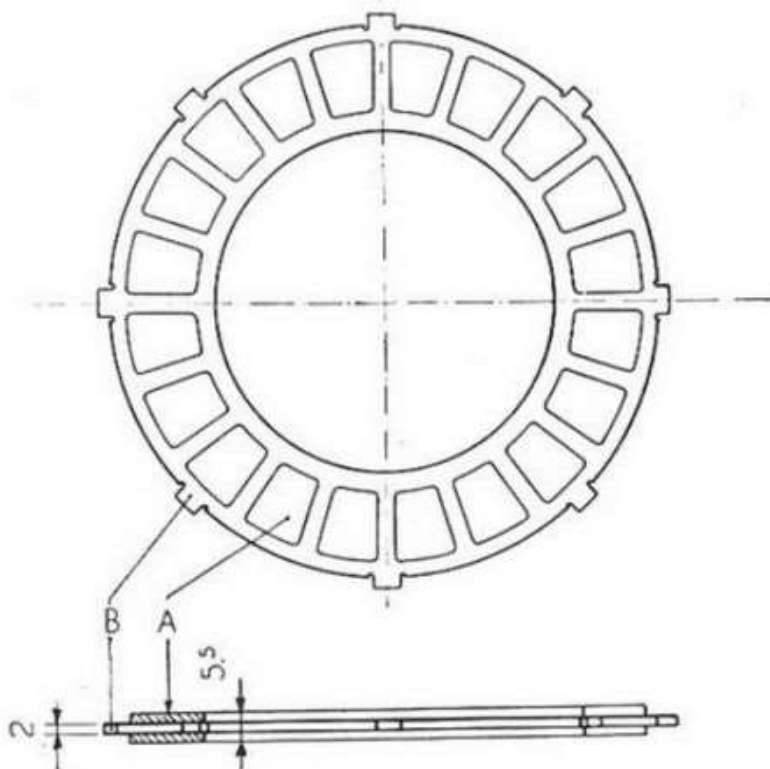
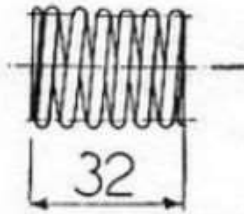


Fig. 19

Minimum load Kg. 14



There is a mistake in the original handbook. Minimum load for the 32mm springs is Kg. 25 and vice versa.

Fig. 20



Minimum load Kg. 25

c) check the load of the pressure springs which must be within the limits established in fig. 20; d) checking the rolling surfaces of the relative track rollers on the above mentioned surfaces are indicated in the table (Fig. 21); e) check that the ends of the control rod, the pusher tips, the balls and the relative bushing, are not worn out.

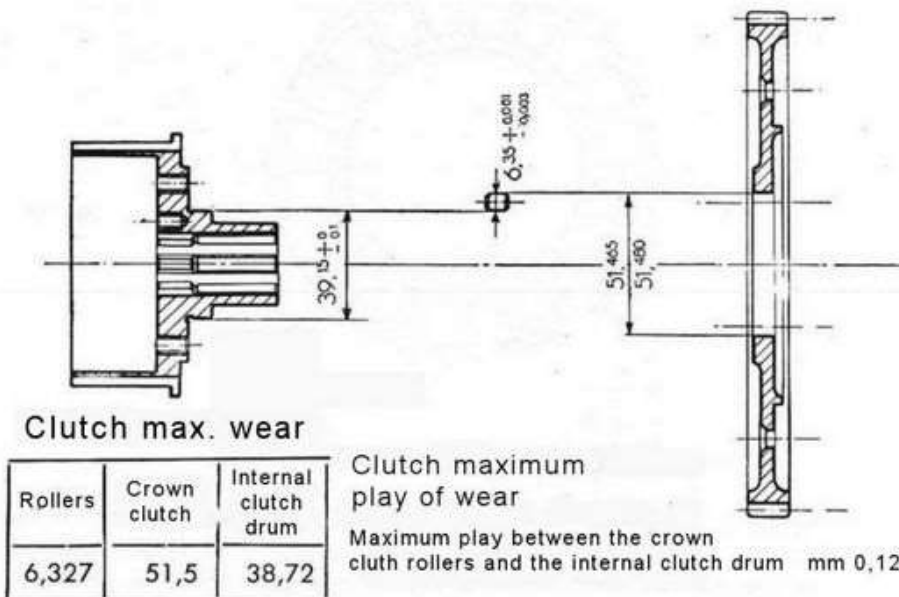


Fig. 21

## 11. GEARBOX AND SELECTOR

a) Wash all the parts thoroughly with gas; b) check the gears; the tothing's must not be chipped nor excessively worn, especially the inlets. The grooved holes must also be intact. Those of the lost gear, as well as being perfectly polished without any scratches, must have the wear limits as in Figures 22 and 23. The same considerations also apply to the bushings; c) the shafts must have grooves without fingerprints or burrs. The surfaces of the journals where the bushings work must be perfectly smoothed while their wear must be contained within the limits established in the table (Fig. 23); d) check the wear of the sliding gear control forks both on the guide hole and on the gear thrust planes;

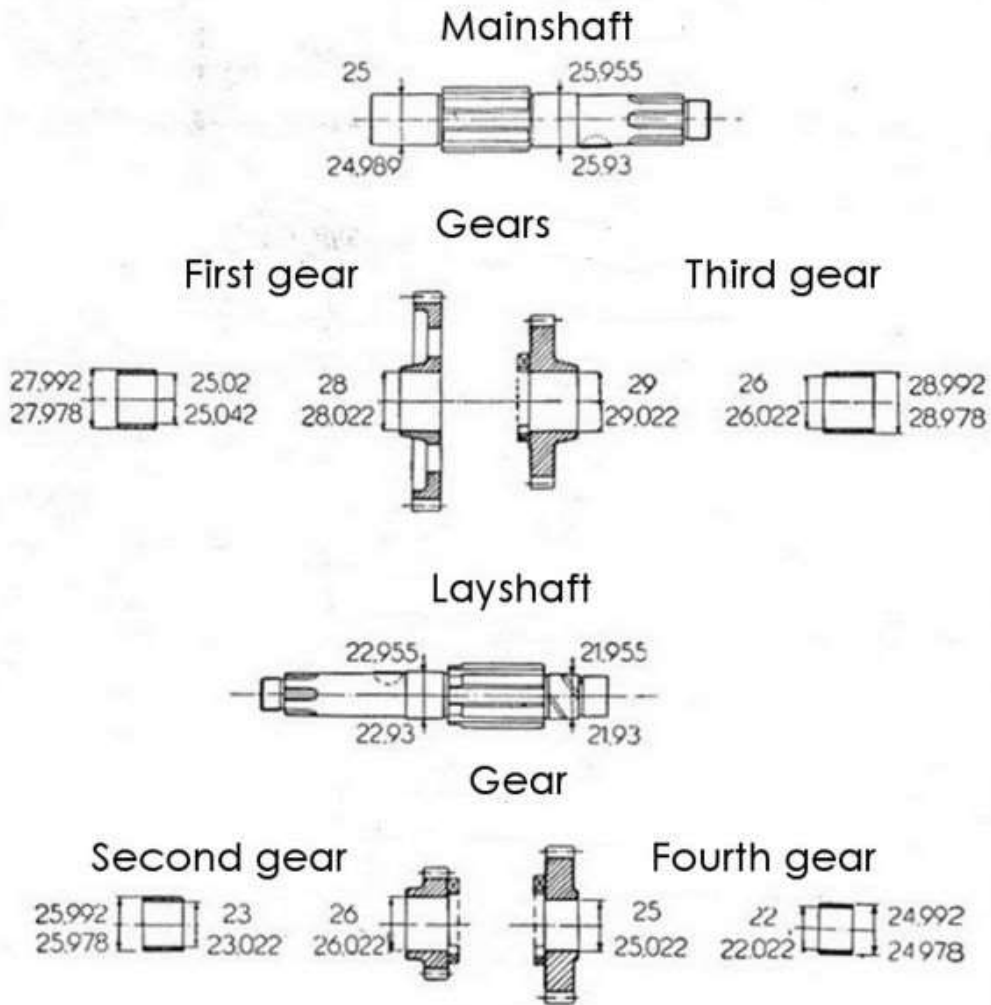


Fig. 22



### Gearbox wear limits

Layshaft		Mainshaft		Gears		
journal 2nd gear	journal 4th gear	journal 1st gear	journal 3rd gear	1st speed	2nd speed	3rd speed
22,9	21,9	24,959	25,9	28,052	26,052	29,052

4th speed	1st speed bush		2nd speed bush		3rd speed bush		4th speed bush	
	∅ out.	∅ ins.	∅ out.	∅ ins.	∅ out.	∅ ins.	∅ out.	∅ ins.
25,052	27,948	25,072	25,948	23,052	28,948	26,052	24,948	22,052

### Gears wear limit

1st gear and its bush	mm. 0,104
1st gear bush and mainshaft	mm. 0,113
2nd gear and its bush	mm. 0,104
2nd gear bush and layshaft	mm. 0,152
3rd gear and its bush	mm. 0,104
3rd gear bush and mainshaft	mm. 0,152
4th gear and its bush	mm. 0,104
4th gear bush and layshaft	mm. 0,152

**Fig. 23**

They must be contained within the limits established in the table (Fig. 24); **e**) check if the pawls on the selector lever slide freely in their relative seats and if the push pegs are not broken or otherwise inefficient.

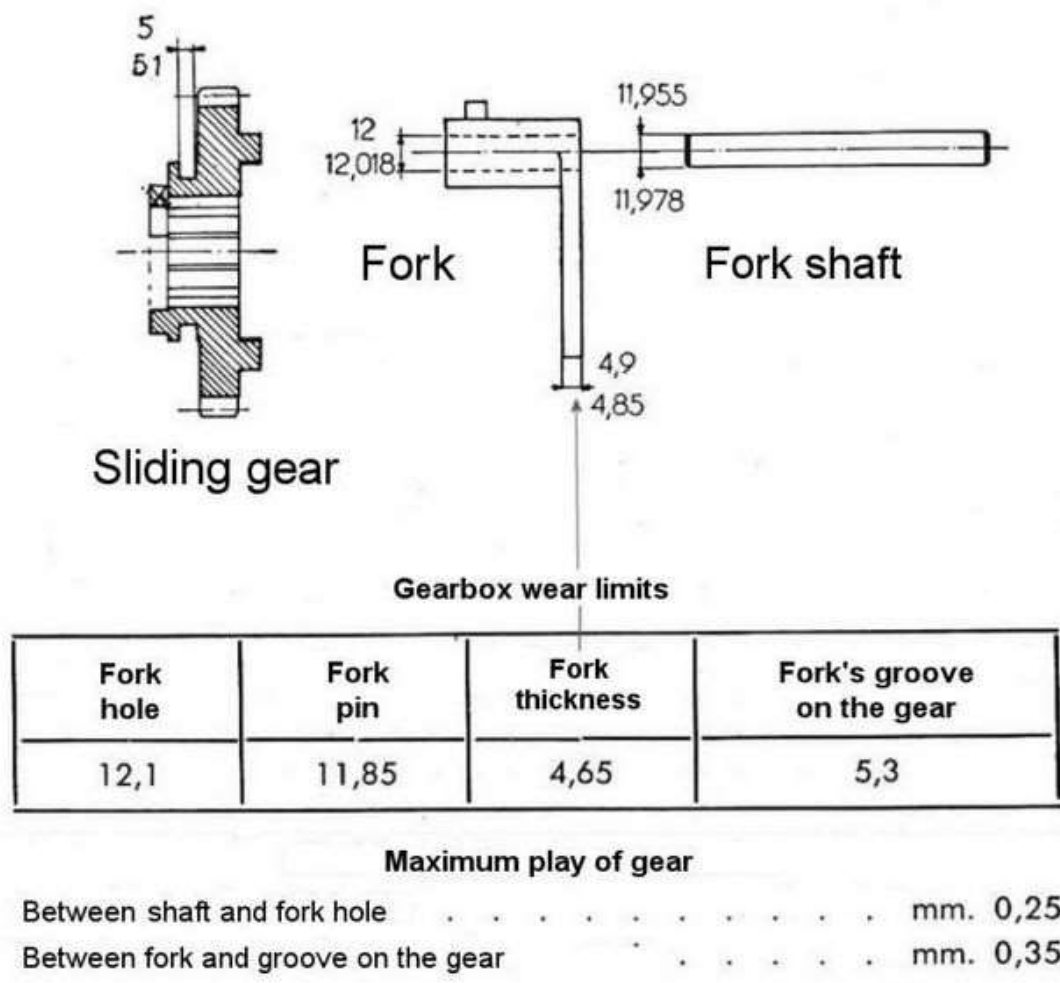


Fig. 24

**12.SPROCKET, CROWN AND CHAIN TRANSMISSION**

- a) Check the wear of the pinion and crown teeth. It is necessary to replace the parts when the wear is excessive;
- b) the transmission chain must be washed and cleaned thoroughly with gas and then dried perfectly;
- c) lubricate it by immersing it in a hot oil bath (50 ° - 60 °) so that it can penetrate well between the rollers and the relative pins; allow it to drain well by removing the excess lubricant;
- d) check the lengthening of the chain: this operation is carried out with the well washed chain resting on a flat surface verifying the length of 20 pins. **If the total elongation exceeds mm. 5 it will be appropriate to replace the chain.**

**13.CARBURETTOR**

For the relative nomenclature, refer to the "Use and maintenance" booklet. a) Separate the carburetor body from the tank, unscrewing the cap that is located below the body; b) loosen the anchor screw of the cover and remove the float by releasing it from the tapered rod. This comes off from the bottom; c) check if the float has dent or holes, in which case it must be replaced; d) the rod with conical seat must have this last part perfectly smoothed, otherwise grind it; e) carefully wash the container with clean gas, then blow it out with compressed air in order to clear away any deposits; f) remove the mainjet, the relative jet holder and the pilot jet from the carburetor body.

Wash them thoroughly with clean gas, with a compressed air jet, clear the holes of any impurities. **It is inadvisable, in the most absolute way, to clean the holes of the jets with metal wires or needles which could alter the diameters compromising the carburetor functioning.** **g)** carefully wash the carburetor body with gas, then with compressed air, release the gas passages from any impurities; **h)** examine the sliding surface of the air and gas valves and the housing of the conical needle: they must not show excessive wear; otherwise, replace the parts. The air filter must be removed and washed with gas to remove the impurities deposited, then dried with a jet of air. This operation will be good to repeat every so often after a certain period of use. **Reassemble the carburetor by performing the disassembly operations in the reverse order.** For the carburetor adjustment, refer to the "Use and maintenance" booklet.

## 14. IGNITION

### Magneto

**a)** Check the points of the circuit breaker by cleaning them with a fine file; if however they were to be considered very worn, replace them with original spare parts; **b)** remove the hammer and lubricate the pin with a little grease. With a little oil, moisten the surface of the cam and the ring guide on the head. Having to reassemble the breaker, make sure that the key is placed exactly in its seat.

The support bearings do not require any particular care since they are filled with grease since their assembly, so that the lubrication is guaranteed for almost infinite time. **When the magnet is mounted, check the opening of the pins:** it must be three or four tenths of a millimeter. Should it be possible, after inspection, it would be advisable to check the function of the magnet with a suitable test bench.

### Magnet - candle cable

Check the condition of the insulator, which must be intact; otherwise it is necessary to replace it.

### Spark plug

**a)** Clean with pure gas; **b)** check the condition of the insulator; finding cracks or breakages, replace the candle without any doubt; **c)** check the distance between the electrodes which must be 0.35-0.40 mm. The compression seal can be checked by pouring a little oil between the insulator and the hexagon of the spark plug on the motor running. If you notice bubbles in the oil, replace the spark plug.

**It is always inadvisable to dismantle the candle in its elements as it is difficult to restore its original condition.** It is recommended to always install the type of spark plug prescribed.

## 15. ELECTRICAL SYSTEM (fig.25-26)

### Dynamo

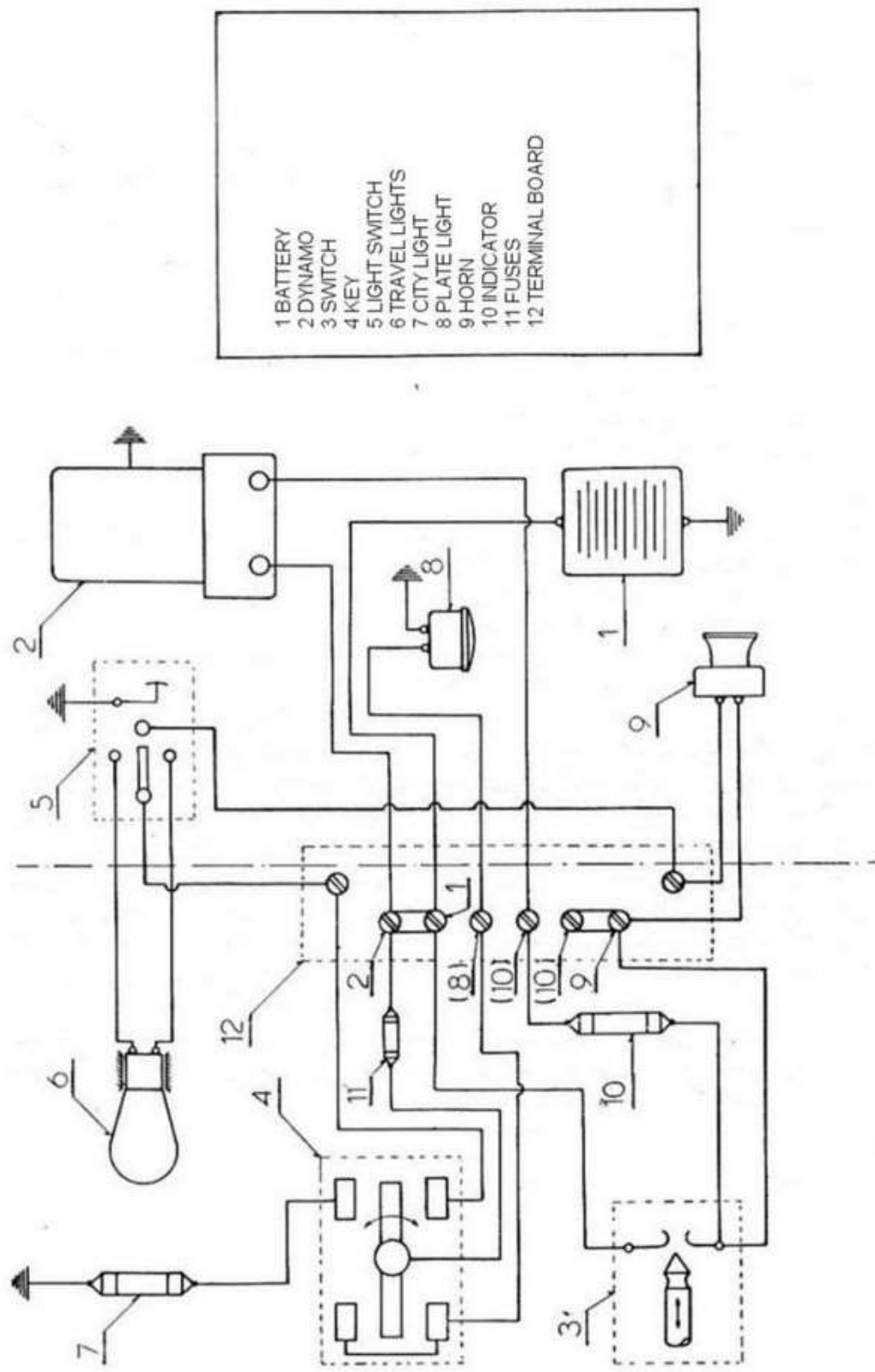
**a)** Remove the protective cap; **b)** clean the various parts with a brush from any coal dust; **c)** make sure that the brushes work freely on their guides: they must not show excessive wear, neither breakage nor chipping; otherwise it is necessary to replace them; **d)** check the elasticity of the control brush springs; **e)** clean the manifold with a damp rag of pure petrol. If the manifold shows

slight scratches, these can be eliminated with fine sandpaper (**never emery paper**) by rotating the dynamo.

The motor support bearings are lubricated indefinitely by the grease applied during assembly. **It is not advisable to change the setting of the voltage regulator, if you do not have a practical person and a specific test bench.**

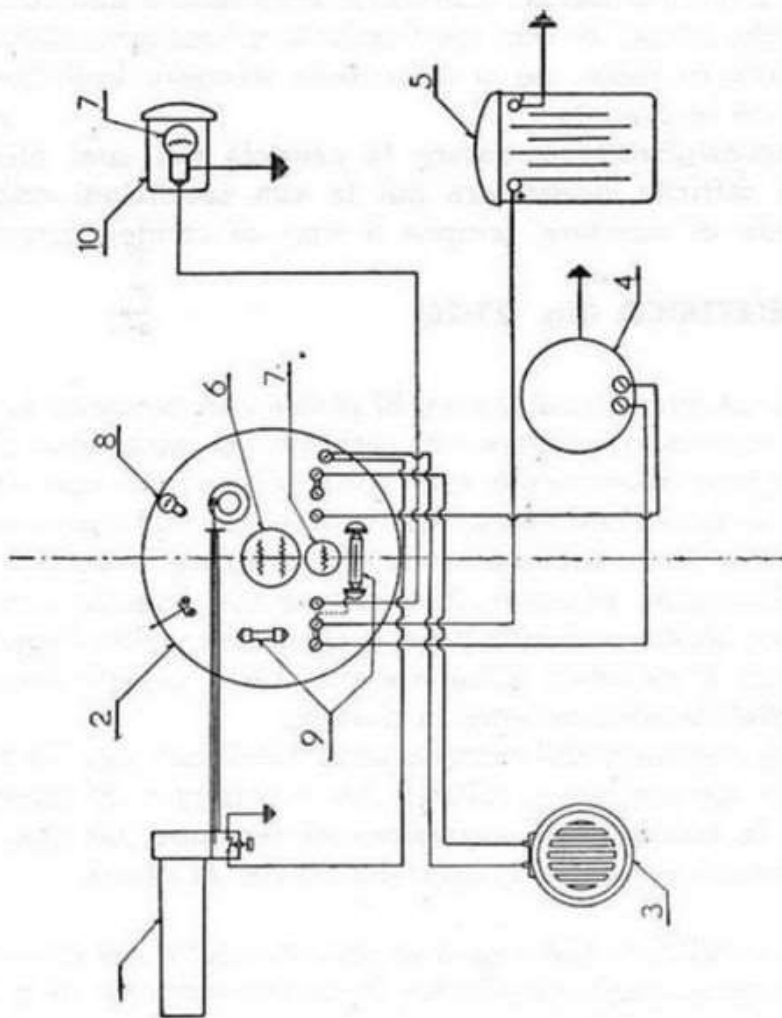
### **Cables**

Check the condition of the insulating sheaths, especially in areas where there is sliding on metal parts. If you find cracks or uncovered points, replace the cables.



- 1 BATTERY
- 2 DYNAMO
- 3 SWITCH
- 4 KEY
- 5 LIGHT SWITCH
- 6 TRAVEL LIGHTS
- 7 CITY LIGHT
- 8 PLATE LIGHT
- 9 HORN
- 10 INDICATOR
- 11 FUSES
- 12 TERMINAL BOARD

Fig. 25



- 1 Throttle control with BUTTON FOR HORN AND LIGHTS INVERTER
- 2 PROJECTOR (Marelli FM 150  $\alpha$  154 °)
- 3 HORN
- 4 DINAMO (Marelli MRD 30/6 -2000 AR1)
- 5 BATTERY 6 v 12 Amp / h
- 6 LAMP. 25-25 w
- 7 LAMP. 5 w
- 8 INDICATOR LAMP. SPY 3 w
- 9 VALVE (?) 6 amp.
- 10 PLATE LAMP

Fig. 26

## Lights

- a) Headlight** - As the inside of the headlamp is perfectly protected from external agents, inspection can be neglected except in cases of lamp replacement, fuses and external connection. **The surface of the dish must never be cleaned as it would be easy to make it so unusable.** To perfectly orient the headlight, it is necessary that the axis of the light beam, projected on a vertical plane placed 5 meters away, is two centimeters lower than the horizontal passing through the focus of the dish (the focus is occupied by the filament of the bulb) .
- b) Rear light** - No maintenance required due to its extreme simplicity.

## Battery

It is the part that requires the most assiduous surveillance together with the most diligent maintenance.

Should the complete liquid substitution be carried out, proceed as follows: **a)** Make sure that the container is not cracked; **b)** remove the caps and empty the acid; **c)** fill with distilled water excluding absolutely natural water even if it is drinkable; **d)** shake and empty again. **This operation must be repeated until the water comes out clean; e)** then fill with 28BE sulfuric acid solution and proceed with the charge; **if the charge is not kept, the battery must be replaced.** With regards to maintenance, **it is necessary to check on 20-30 days in the summer; 40-50 in the winter period of the liquid level;** this must completely cover the plates, otherwise, add distilled water until the aforementioned level is restored. **Should the machine remain inefficient for a certain period of time (1 month or more), the battery must be periodically recharged, which is automatically discharged within three months.**

