MOTO GUZZI G. T. V.

REPAIR MANUAL (April 1949)

Translated by PATRICK HAYES
1998

Updates, diagrams and photos added by Shawn Doan 2019

DISCLAIMER

I have a reproduction printing of the full repair manual provided by Jerry Kimberlin of Richmond, CA. I use GLOBALINK - ITALIAN ASSISTANT translation software. I have undertaken the laborious task of re-typing this manual into my computer. I have tried to be careful to avoid misspellings which might create translation errors. I have found obvious misspellings in the original manuals. In some cases, despite my best efforts at magnification and interpretation through context, I have been unable to read some words. These are shown by "xxxxxxxxxxxxx". You may surmise what belongs in these mystery locations by context. Unless we can come up with better original texts there will be no accurate way to correct these missing pieces.

The translation turns out to be more work than the simple re-typing. I have had to "train" the translator to think in technical terms rather than in conversational terms. I have added dozens of technical words and phrases to the dictionary. In some cases, where Italians may use several words to form an idiomatic expression, my computer tries to translate word for word. For example, the phrase 'MESSA IN MOTO' is translated as a catholic religious mass on a motorcycle but in reality means the kick starter. The Italian language commonly coins new words by combining roots of other words. For example, "tendifilo" is not a word per se, but a combination of 'hanging' or 'tensioning' and 'thread' thus meaning the adjustable, hollow, lock bolt at the business end of the clutch cable and the compression release cable.

I make no pretense to fully understand much of this language. I have altered and corrected translations where I believed I understood the context and meaning but the translation was too awkward for casual reading. On the other hand, wherever possible, I have not tampered with the translation and I have left some sentences or phrases intact even if they create awkward English structure as long as the context and understanding appear clear.

These documents may never be perfect. They are a work in progress. They are published now as a best effort. You may criticize and offer corrections at any time. Individual pages or sections can be re-translated and reprinted at any time.

I must forewarn you that errors may and certainly do exist herein and I can't bear responsibility for those. I already misadjusted my clutch because I thought it said to tighten the spring down 27 mm from the relaxed position when in reality it needs to be tightened until the result is a compressed length of 27 mm. A very subtle language translation difference almost destroyed the parts in the process. I take my risks, you take yours. Work slowly and think about what you read and what you see.

BUONA FORTUNA, RAGAZZI!
(GOOD LUCK MY PALS!)

[I am not yet certain of the Italian convention for showing measurements. In many of these metric measurements, you will see the abbreviation "H". I think this refers to alternate axis measurements. So that a 2 by 4 of wood will be shows as 2H4. Any better ideas?]

2019 update by Shawn Doan:

Patrick was kind enough to share his translation with me so that I could add pictures, notes and formatting that will make the manual easier to use. We've done this work to help ourselves and our friends working on old Guzzis - not for profit. This scan is for non-commercial use and is not intended for financial or material gain by anyone. No one should sell what we offer for free, so we reserve all rights.

I've attempted to be clear and accurate, but errors will remain. As Patrick wrote above, those errors could be expensive or worse and we cannot be responsible for your work. Work carefully and thoughtfully.

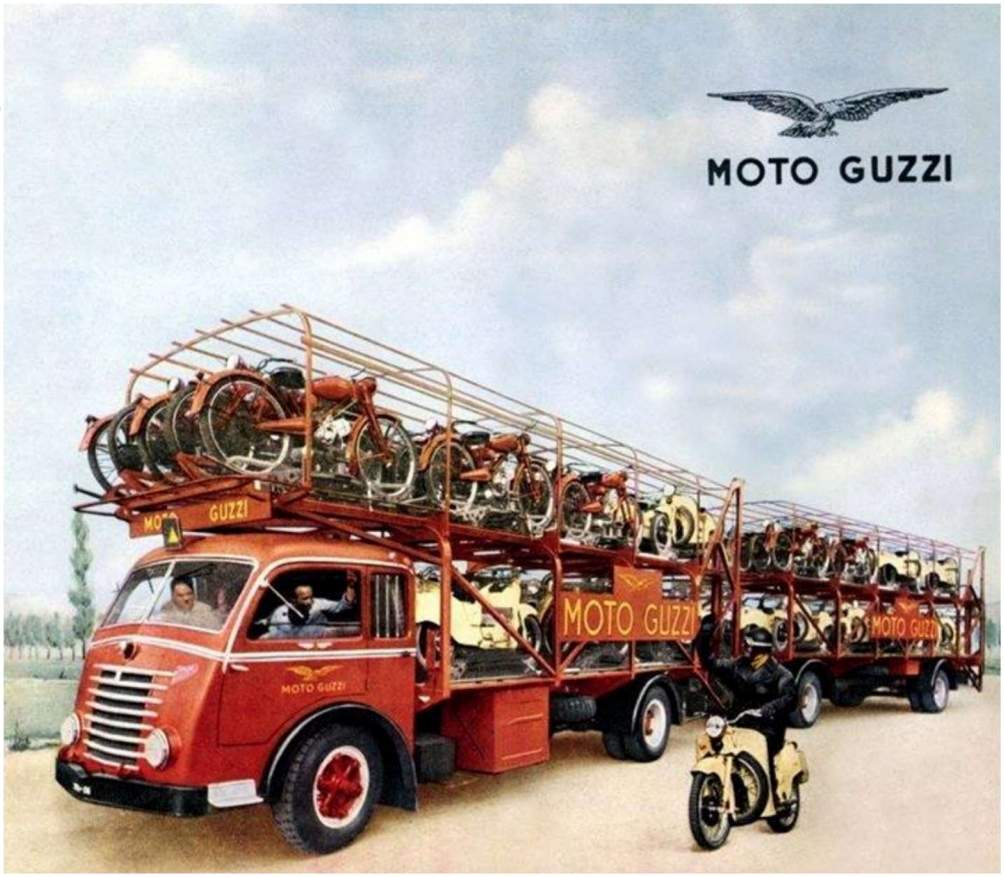
MANUAL FOR OPERATIONS of DISMANTLEMENT, INSPECTION and ASSEMBLAGE

PREFACE

The purpose of the manual, presented and furnished in short, but practical form, is for the required instructions to perform practical revisions and the general repairs of the motorcycle type "G. T. V.". For such purpose, the manual has been equipped with photos, sketches and diagrams, required in order to be able to perform, with safety and rapidity, the operations of dismantlement, inspection and assemblage. The manual must be also a guide for whoever desires to know the particular construction of the type in examination and the knowledge of such details, in the personnel employed for the repairs, is an essential factor for a good execution of the job.

S. p. A. MOTO GUZZI

MANDELLO LARIO, April 1949



GTV, Astore and Falcone recognition:

GTVs, Astores and Falcones share many similarities and many parts are interchangeable.

GT frames were used to build GTS, GTV and GTW models. V and W engines prior to WWII had dual exhaust. Records online suggest that dual exhaust was used up until 1942 and possibly into 1946. Chrome gas and oil tank caps changed to black phenolic in 1945. Girder forks and steel knee-action rear dampers were used until 1947 when they were replaced by telescopic forks and rear hydraulic dampers. A larger front brake was installed with the telescopic fork.

The Astore is essentially a GTV except that the cast iron cylinder and head has been replaced by aluminum versions with the aluminum head having enclosed valves.

The Falcone fuel tank is taller and more rounded, and the rear fender has lost its hinge for removing the rear wheel. The spring boxes under the engine were shortened so they carry two springs each instead of three and the hydraulic rear dampers were replaced by aluminum knee-action dampers. The crashbox of the GTV & Astore was replaced with a constant mesh gearbox which results in a rounded bulge at the back of the crankcase.

Note: In the description, RIGHT or LEFT you must understand the right or to the left of whoever is in saddle.

FIGURES

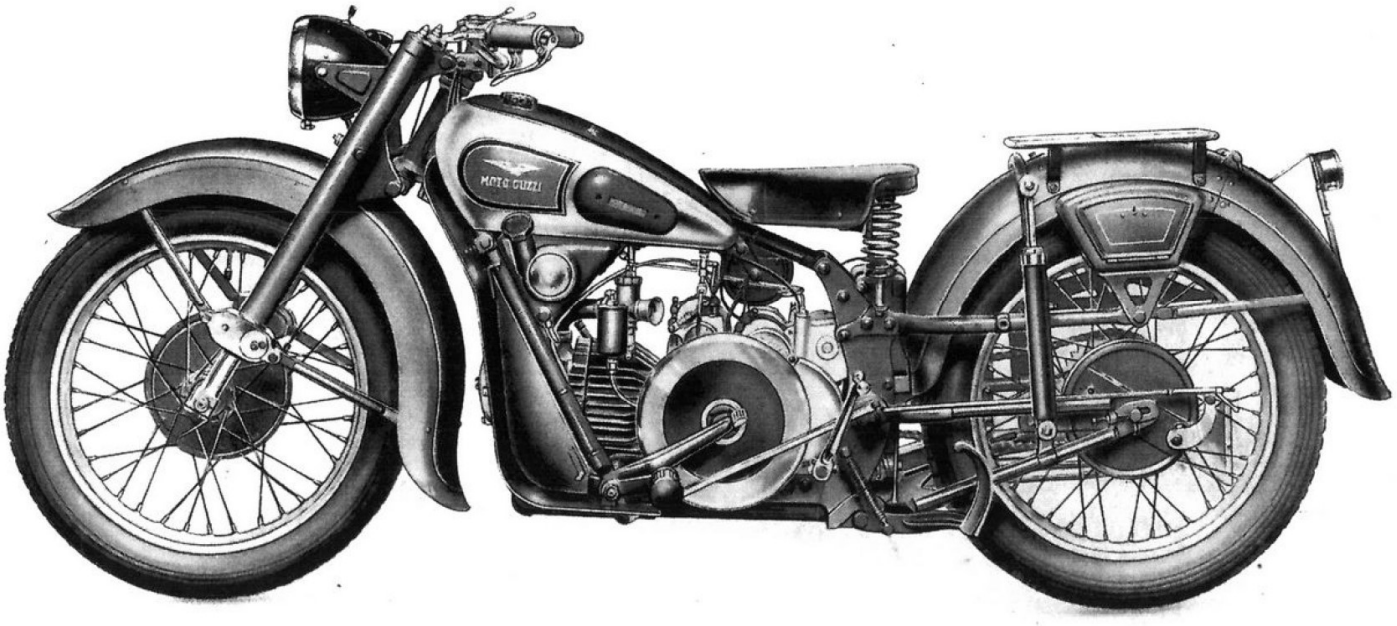


Fig. 1 - Motorcycle GTV – flywheel side

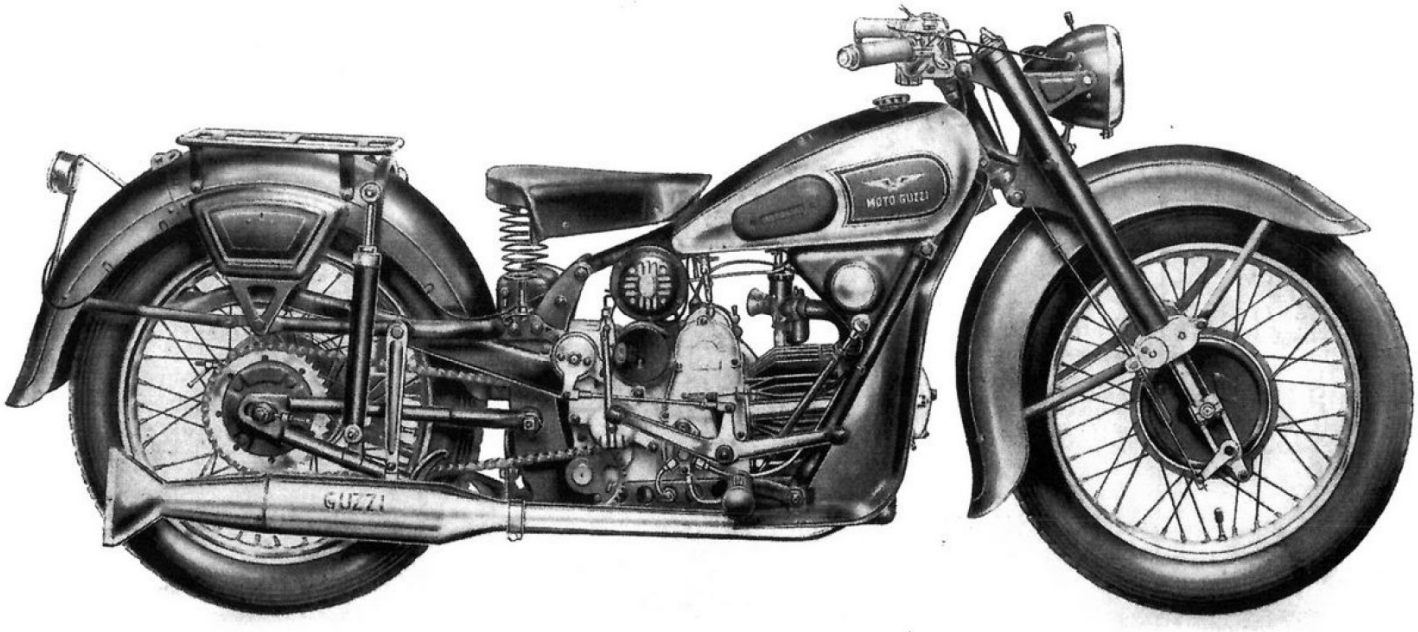


Fig. 2 - Motorcycle GTV – timing side

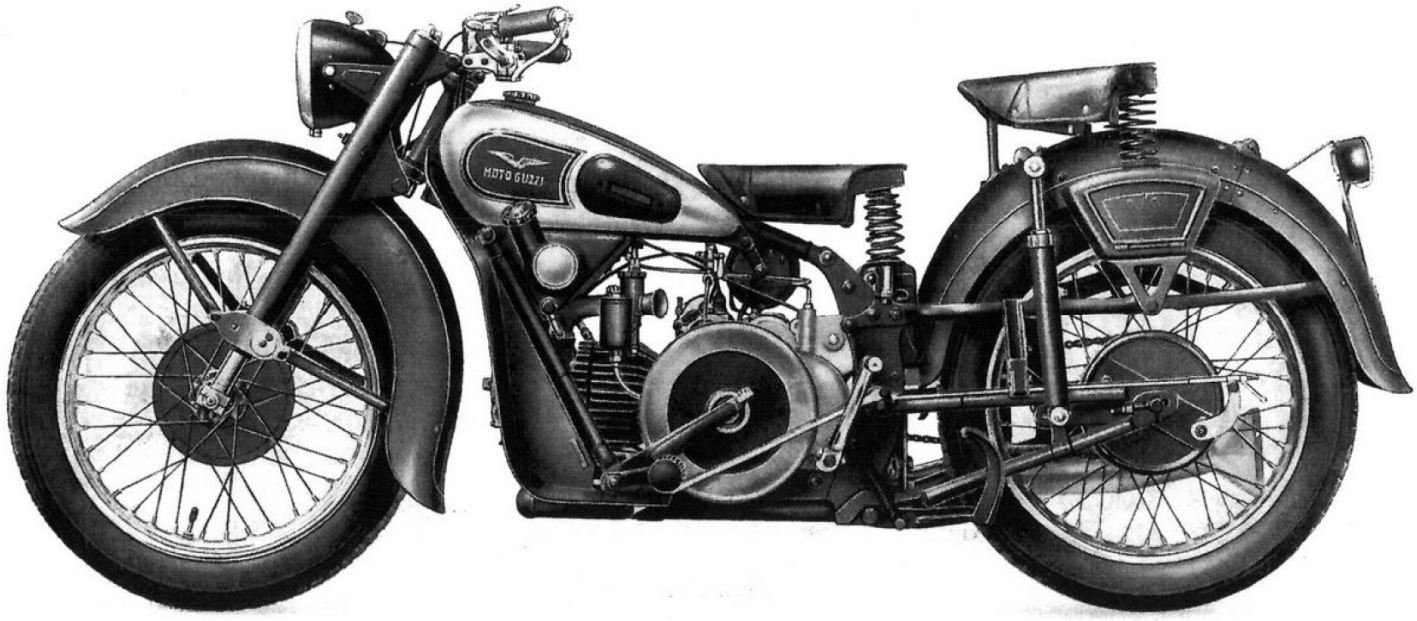


Fig. 3 - Motorcycle GTV two seater – flywheel side

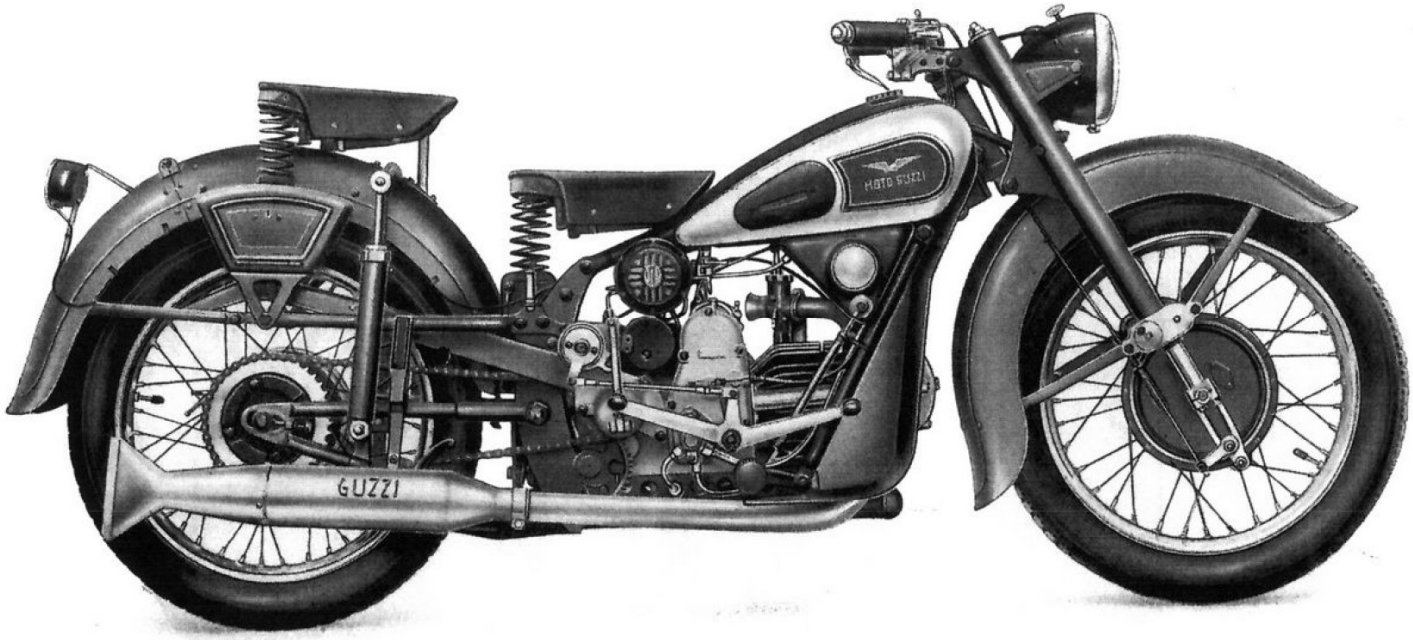


Fig. 4 - Motorcycle GTV two seater – timing side

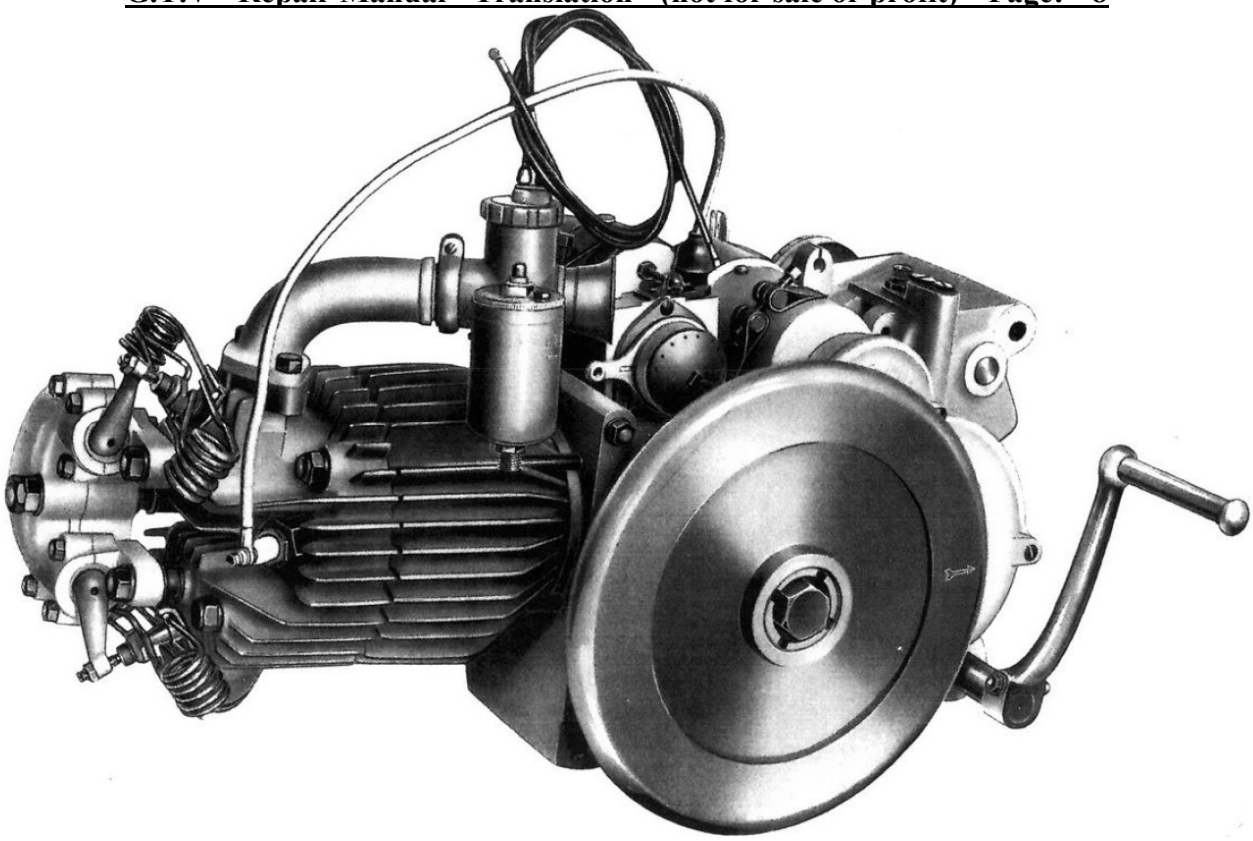


Fig. 5 – Engine unit – flywheel side

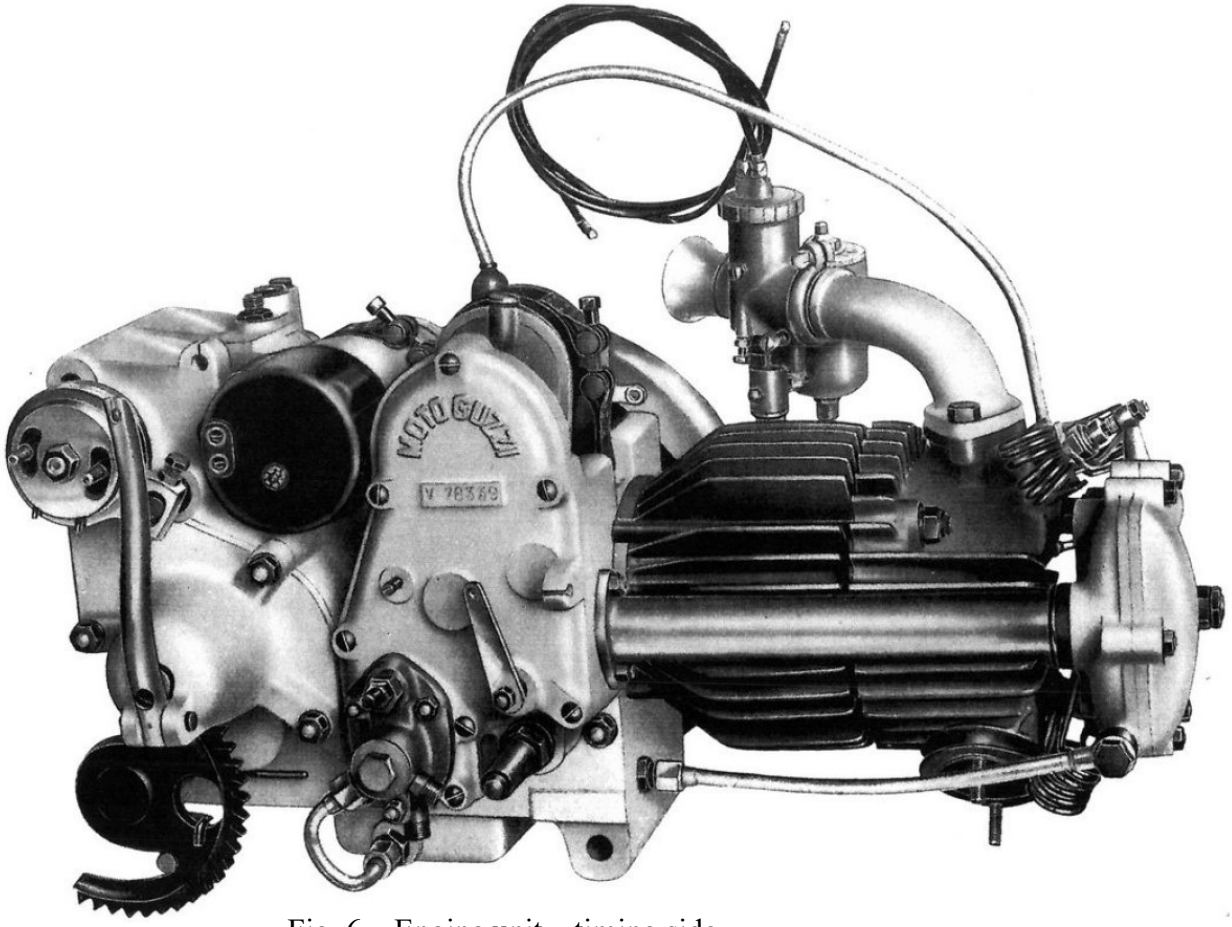


Fig. 6 – Engine unit – timing side

GENERAL CHARACTERISTICS of the ENGINE
TYPE - V.
Number cylinders 1 horizontal.
Bore and stroke 88 mm X 82 mm.
Displacement cc 500.
Power at 4300 rpm - HP 18.9.
Compression ratio - 1: 5.5.
Head nut torque – 34-40 N/m (25-30 ft.lbs.)
Connecting rod bolt torque – 38 N/m (28 ft.lbs.)

VALVE TIMING
Measured with valve clearance set to 0.20 mm (intake and exhaust):
Intake:
It opens 24 before TDC (Top Dead Center).
It closes 70 after BDC (Bottom Dead Center).
Exhaust:
It opens 72 before BDC.
It closes 31 after TDC.
Note: The valve play of mm 0.20 serves only for the synchronization of valve timing.
For the proper adjustment of the valves see the chapter "Regulation of the valve play."
Running valve clearance: Intake – 0.05 mm (0.002”)
Exhaust – 0.3 mm (0.012”)

IGNITION
Magneto to high tension, leftwise (counterclockwise rotation) gear driven.
Type MLA 53 [Marelli].
Adjustable advance with small manual control lever (pulling retards).
Measured on the crankshaft: Maximum 45 degrees.

INTAKE
Gravity feed.
Capacity liters 13,5.
Carburetor with fuel flow regulation.
Handle grip for regulation of throttle air and small lever for regulation of choke.
Dell'Orto Tipo MD 27.
Idle regulation screw.
Normal adjustment of the carburetor:
Diffuser mm 27.
Main jet: Summer 118/ 100. Winter 122/ 100.
Idle jet 50/ 100.
Plunger number 70.
Taps N 5.

LUBRICATION
Forced by gear pump for transmitting, vanes for retrieval.
Range at full speed - around 60 liters per hour.
Capacity of oil reservoir - around 3 liters.

Quantity of oil required for the lubrication of the motor - around 2.5 liters.

COOLING
By air.
Head and cylinder are provided with radially arranged fins as regards the axis of the cylinder.

COUPLING to CLUTCH
Dry.
Metallic multiple disks.
Number of disks 12 (5 in steel, 5 in bronze, 2 in clutch lining).

GEAR CHANGE
Constant mesh, number of the ratios: 4.

Ratio 1 speed- 17-27 x 18-26	1: 2.30.
Ratio 2 speed- 20-24 x 18-26	1: 1,73.
Ratio 3 speed- 23-21 x 18-26	1: 1,32.
Ratio 4 speed- direct drive	1: 1

FINAL DRIVE
Gears with helical teeth between motor and gear change.
Roller chain 5/ 8" X 1/ 4" between pinion sprocket and rear wheel sprocket.
Ratios of transmission:

Between motor and gear change- 1,77: 1	44-78.
Between pinion and rear sprocket- 2,4: 1	16-39.

Total ratios of transmission:

In direct drive (4th)	4,32: 1.
In third speed	5,70: 1.
In second speed	7,47: 1.
In first speed	9,93: 1.

GENERAL CHARACTERISTICS of the FRAME.

Wheelbase	1.475 meters approx.

Overall size of motorcycle:

- length	2.280 meters
- width	0.800 meters
- height	0.970 meters approx.

Minimum ground clearance (empty) 0.160 meters approx.

SUSPENSION:
Front: Telescopic fork with hydraulic damping.
Rear: Swingarm with springs horizontal under motor in a special box and hydraulic dampers.

WHEELS:

Front spoke wheel	diameter	19” x 2.5”
Rear spoke wheel		19” x 2.5”

TIRES

Front	3.50 – 19 [some sources show 3.25 – 19 on front]
Rear	3.50 – 19

TIRE INFLATION PRESSURE

Front	1.5 kg/cm^3 (21.3 psi)
Rear	2.0 kg/cm^3 (28.4 psi)

BRAKES

Expansion type in light alloy.
Two controls: one on the front wheel controlled with a lever on the right side of the handlebar; one on the rear wheel controlled with a left pedal.

ELECTRICAL SYSTEM

Illumination. - Consists of a dynamo, Marelli type MRD 30/6 – 2000 AR 2 with regulator 6 V 30 W.
Righthand rotation. Driven by gears.
Dynamo to engine ratio = 1:1.32

Electric horn Marelli T 21 with button on handlebar type MA 800.

Headlight with three-way switch Marelli FM 150 N. Dimmer control on the handlebar Marelli type MA 800.

Battery – Marelli 3 ME 7/5.

Rear light and reflector Marelli type T 16166.

PERFORMANCE:

Maximum gradients can be overcome with two people using various gear ratios on well-maintained roads.

In 1st gear maximum gradient 22.5% at the speed of 31 km/hr. (19 mph)
In 2nd gear maximum gradient 15.5% at the speed of 41 km/hr. (25 mph)
In 3rd gear maximum gradient 9.4% at the speed of 54 km/hr. (33 mph)
In 4th gear maximum gradient 4.1% at the speed of 71 km/hr. (44 mph)

Range on well-maintained roads in hilly areas. 270 km approx. (168 miles)

Maximum speed in gears corresponding to engine speed of 4300 rpm.

Speed in 1st	53.2 km/hr	(33 mph)
Speed in 2nd	70.7 km/hr	(44 mph)
Speed in 3rd	93 km/hr	(58 mph)
Speed in 4th	120 km/hr approx.	(75 mph)

GENERAL CHARACTERISTICS FOR THE TWO-SEAT GTV MOTORCYCLE VARIANT:

Transmission ratios:		
between engine and gearbox	1.77:1	44-78.
between pinion and rear sprocket	2.60:1	15-39.
Total ratio (motor to wheel):		
in 1st	10.58:1	
in 2nd	7.95:1	
in 3rd	6.08:1	
in 4th	4.60:1	

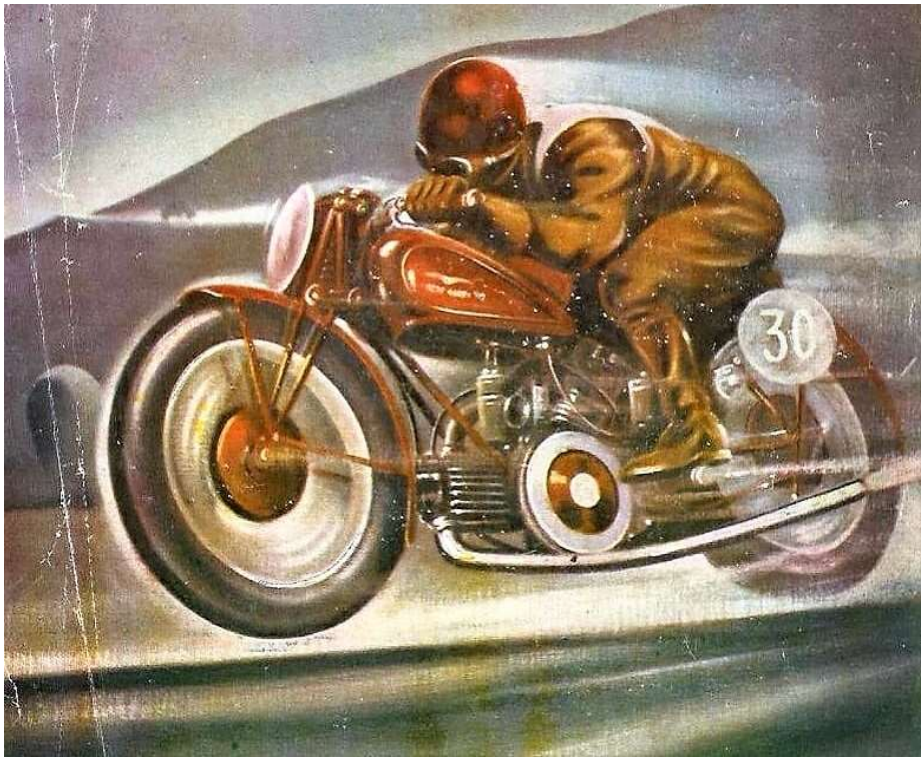
PERFORMANCE:
Maximum gradients can be overcome with two people using various gear ratios on well-maintained roads.

In 1st gear maximum gradient 24% at the speed of 29 km/hr. (18 mph)
In 2nd gear maximum gradient 16.5% at the speed of 38.5 km/hr. (24 mph)
In 3rd gear maximum gradient 10% at the speed of 50.5 km/hr. (31 mph)
In 4th gear maximum gradient 4.3% at the speed of 67 km/hr. (41 mph)

Range on well-maintained roads in hilly areas. 270 km approx. (168 miles)

Maximum speed in gears corresponding to engine speed of 4300 rpm.

Speed in 1st	50 km/hr	(31 mph)
Speed in 2nd	66.5 km/hr	(41 mph)
Speed in 3rd	87 km/hr	(54 mph)
Speed in 4th	110 km/hr approx.	(68 mph)



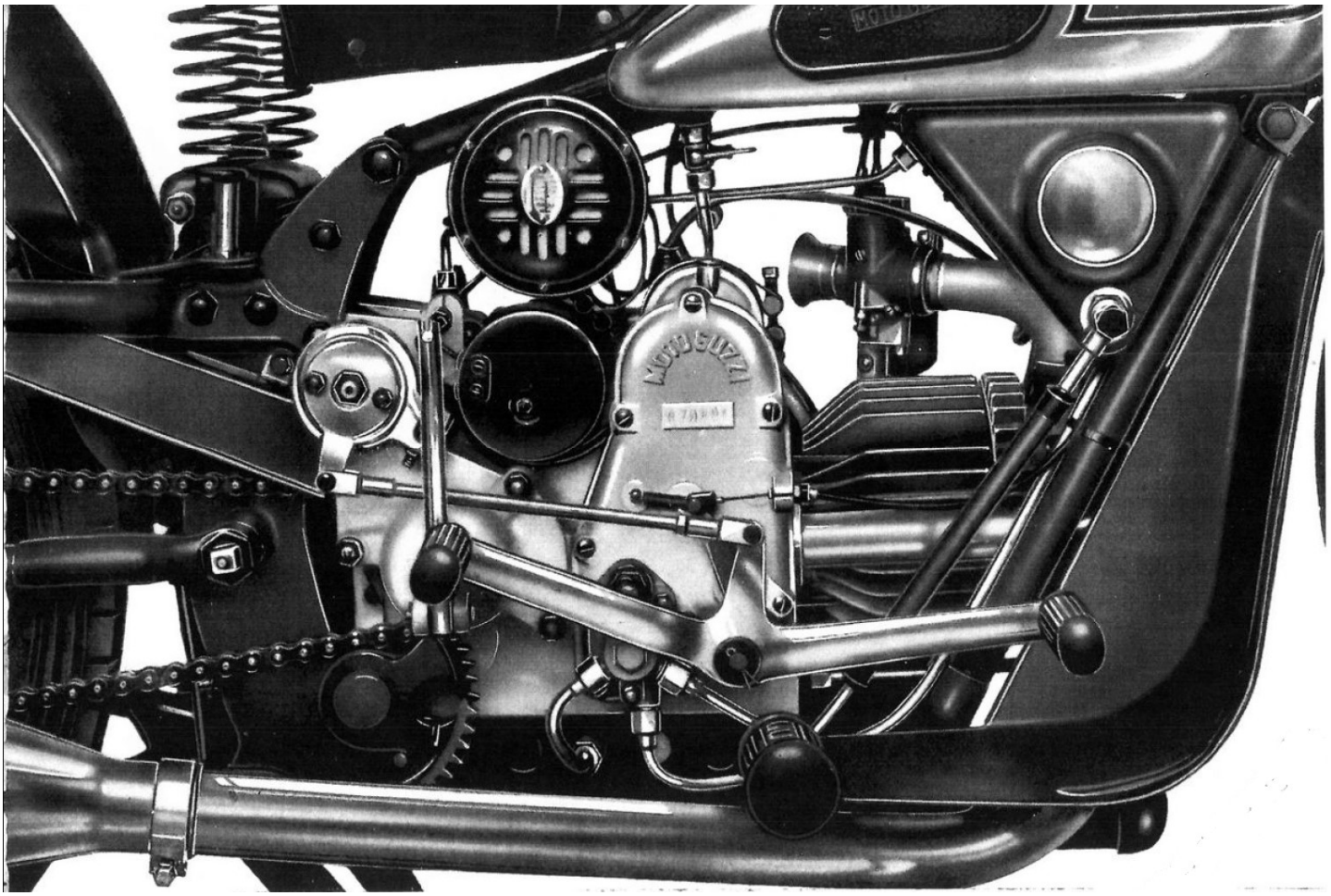


Fig.7 – Engine unit mounted in frame.

MOTOR **1. Removing the motor from the frame**

Caution: Due to the particular conditions in which the motorcycle is sometimes used (rain, mud, dust) before you proceed to dismantle, it is always advisable to provide a good general cleaning of the individual pieces.

[Disconnect battery]

Remove the leg protectors by unscrewing the two nuts for fastening onto the footrests and the bolt fastening the leg protector upper portion to the frame.

Remove the left footrest pedal and the rear brake lever. [Leave the tie rod between the foot rests in place - it supports the front of the frame.]

Remove the gasoline supply pipe from the carburetor and filter body after having previously closed the taps.

Remove the intake manifold combined with the carburetor from the motor. As you pull away the carburetor, detach the notched ring from the body tube of the carburetor so as to completely extract the sliding valves of the fuel and air.

Remove the vent hole pipe which puts the upper portion [airspace] of the oil reservoir into communication with the crankcase.

Remove the right footrest. [Leave the tie rod between the foot rests in place - it supports the front of the frame.]

Before removing the flywheel read the note on page 27. [see next 2 paragraphs]

"Motor crankshaft bearings. There are two: one with rollers at the left (flywheel side) and one with ball bearings to the right (valve timing side). The roller bearing is exclusively for load carrying: that of ball bearings is for load carrying and for end thrust.

It is worthwhile to inspect the status of wear of these two bearings before dismantling the flywheel. Grabbing the flywheel with the hands try to move it in an axial direction (pull it toward and push it back) and in a radial direction. You must not observe any radial play, or at least it must be nearly imperceptible (around 0,01 of mm.). A small amount of axial play is admissible. If you discover radial play you need to replace the roller bearing. If you discover excessive axial play replace the ball bearing. If you discover axial and radial play replace both."

The flywheel is taken off by unscrewing the lock-ring for around 3/4 of turn (this ring is supplied with a counterclockwise [or left-handed] thread). Therefore, in order to unscrew it, you need to rotate in the direction of the hands of the clock). You then unscrew the inside nut (right-handed thread) creating a puller when the lock ring presents opposition or resistance to the unscrewing of the inside nut.

Remove the exhaust pipe from the head and from the mounts on the frame.

Remove the control cable for the manual spark advance magneto. [Some machines are converted to a more modern automatic advance and this control cable is obsolete.] You are obliged to first detach the control cable from the small lever on the handlebar, then take off the cable clamp on the magneto, and then unscrew the cable adjuster tube bolt completely.

Remove the pedal lever of the gear change and the chain guard.

Detach the oil feed supply pipe from the bottom pipe compression fitting on the pump, moving the pipeline aloft in order to avoid draining of the oil from the reservoir (see figure 9).

- the oil recovery pipe from the pump to the reservoir (front pipe compression fitting of the pump).
- the oil recovery pipe from the crankcase to the pump with filter (back pipe compression fitting of the pump).

Detach the control wire of the compression release by unhooking the rebound spring, taking off the cable clamp and unscrewing the adjuster tube bolt.

Remove the electric warning horn, the wires and detach the wires from the generator. In order to be certain to not trigger short circuit contacts, before completing the aforementioned operations it is recommended that you detach the electrical ground cable end fixed under the saddle.

Detach the clutch control cable, compressing the clutch actuating lever in such a way to release the cable from the loophole of the same lever. Then completely loosen the adjuster tube bolt and extract it from the mount of the casting.

Remove the selector complete from the gear changer shifting shaft (see figure 8).

Remove the chain taking off the spring clip which fixes the small plate for the master link of conjunction.

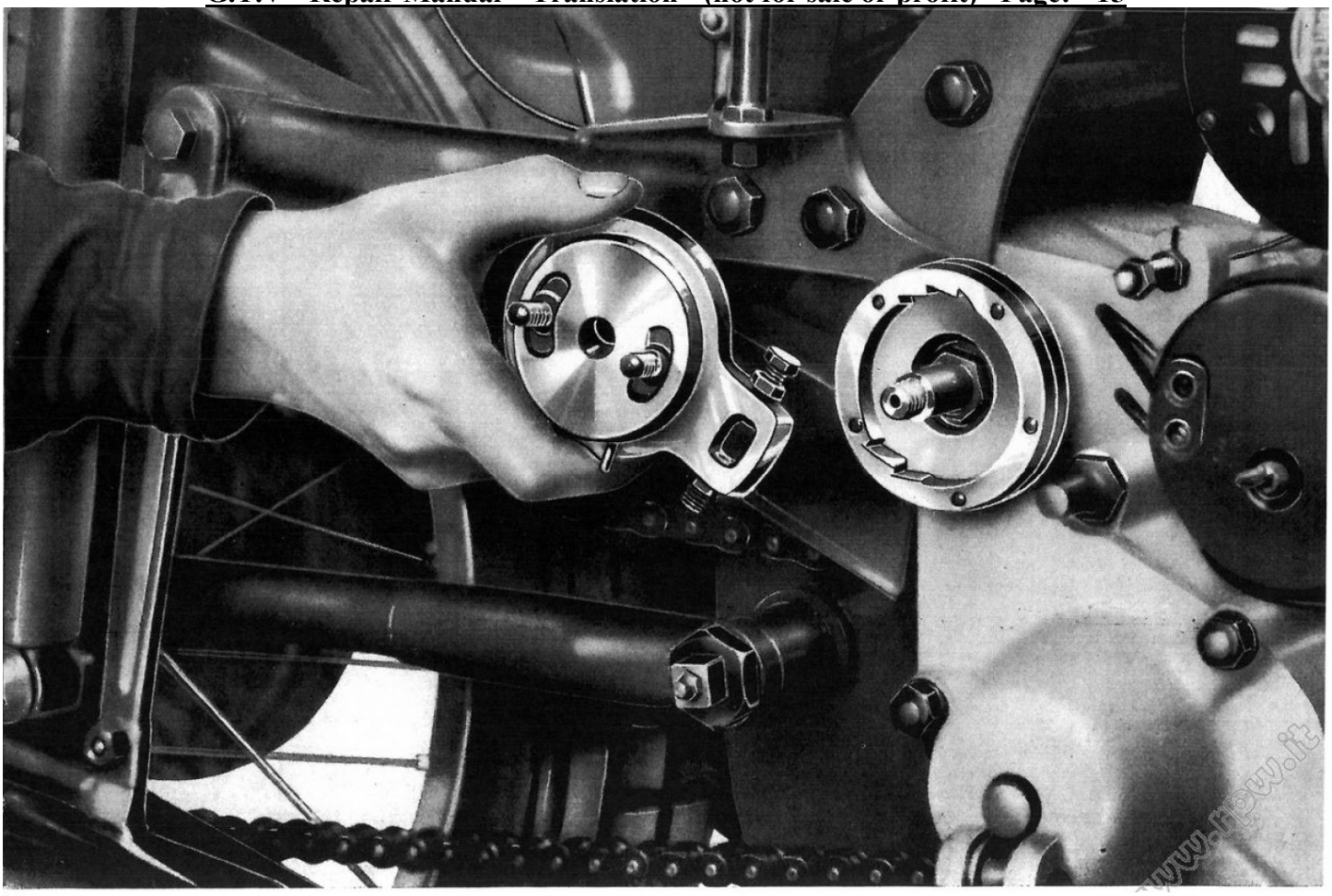


Fig. 8 - Come si smonta il selettore per comando marce 19

Then take off the chain to expose the transmission sprocket.

Remove the kick starter by extracting the slotkey from the crank pedal on the left side and then remove the kick starter shaft from the right side.

Detach the clamp for retaining the spark plug wire to the frame and the gasoline filter.

Remove the pins which fix the motor to the frame plates. There are three. They can get removed either way from the right or from the left of the machine (view figure 9). You will be able, in this way, to \remove the motor. Remove it from the right portion of the machine. After you have pushed the motor forward around 5 cm, it comes out from the rear portion as demonstrated in figure 10. [you may also have to loosen the cross-frame tie bolts at the battery box.]

[Note: I also removed the chain guard, fuel tap, oil tank and rockerbox drain tube (it is very easy to bend when working the engine out of the frame) and the bolts holding the spring tubes to the frame rails. Valve springs are likely to scrape frame tubes which can be avoided if the head is removed first. Removing the head before the engine may make removing the oil tank unnecessary.]

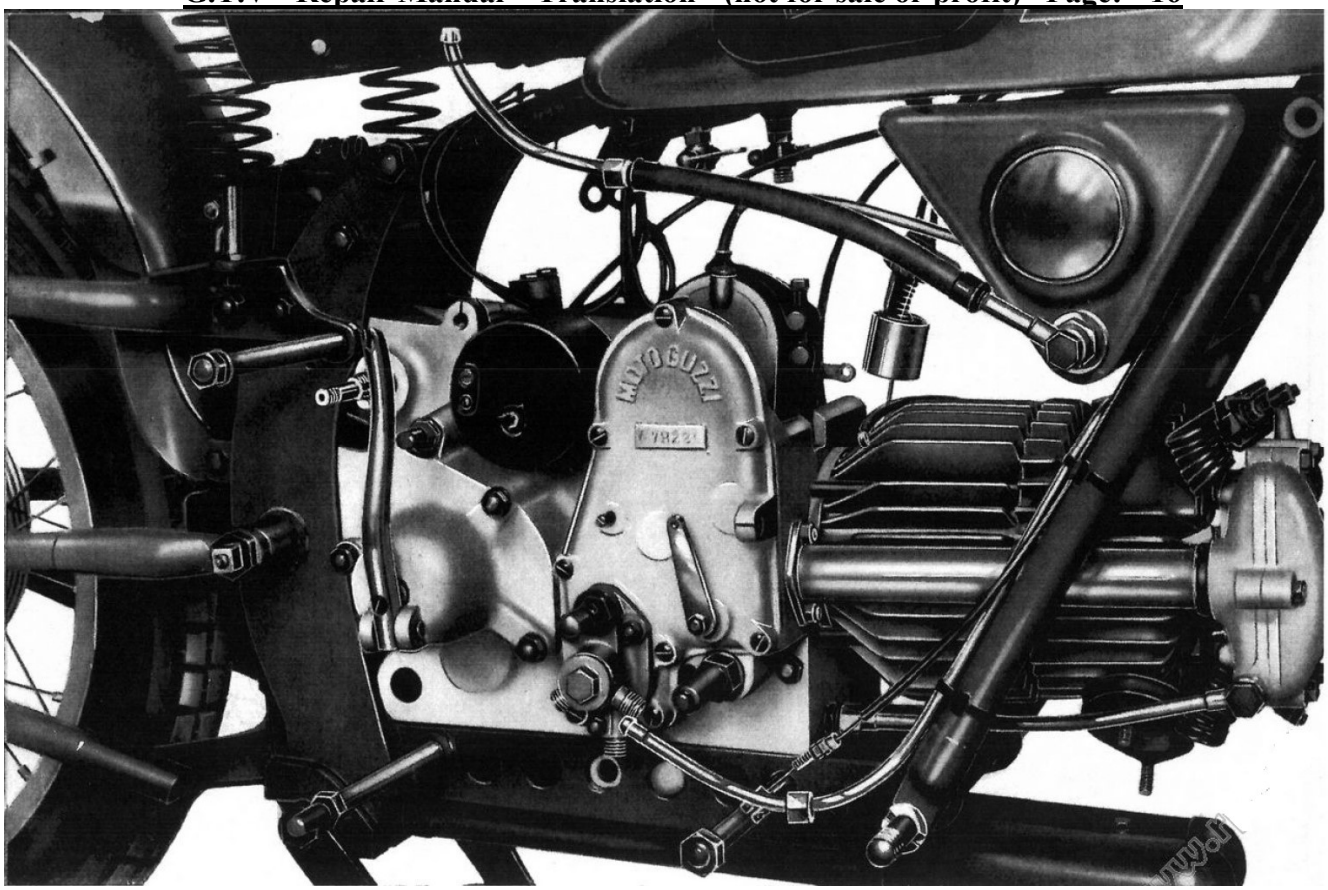


Fig. 9 – Engine ready to remove from frame. Notice 3 engine fixing pins partially pulled out.

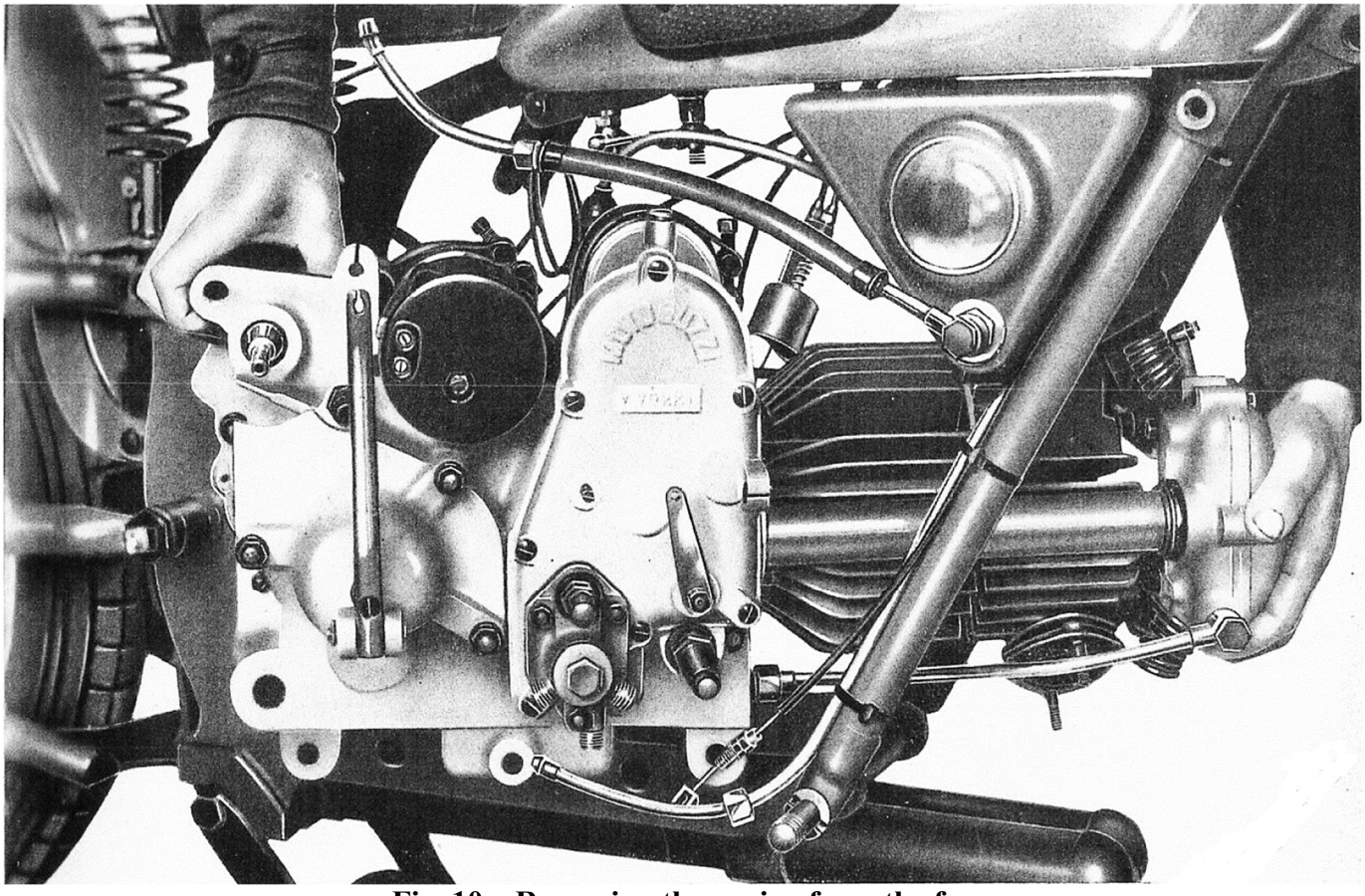


Fig. 10 – Removing the engine from the frame.

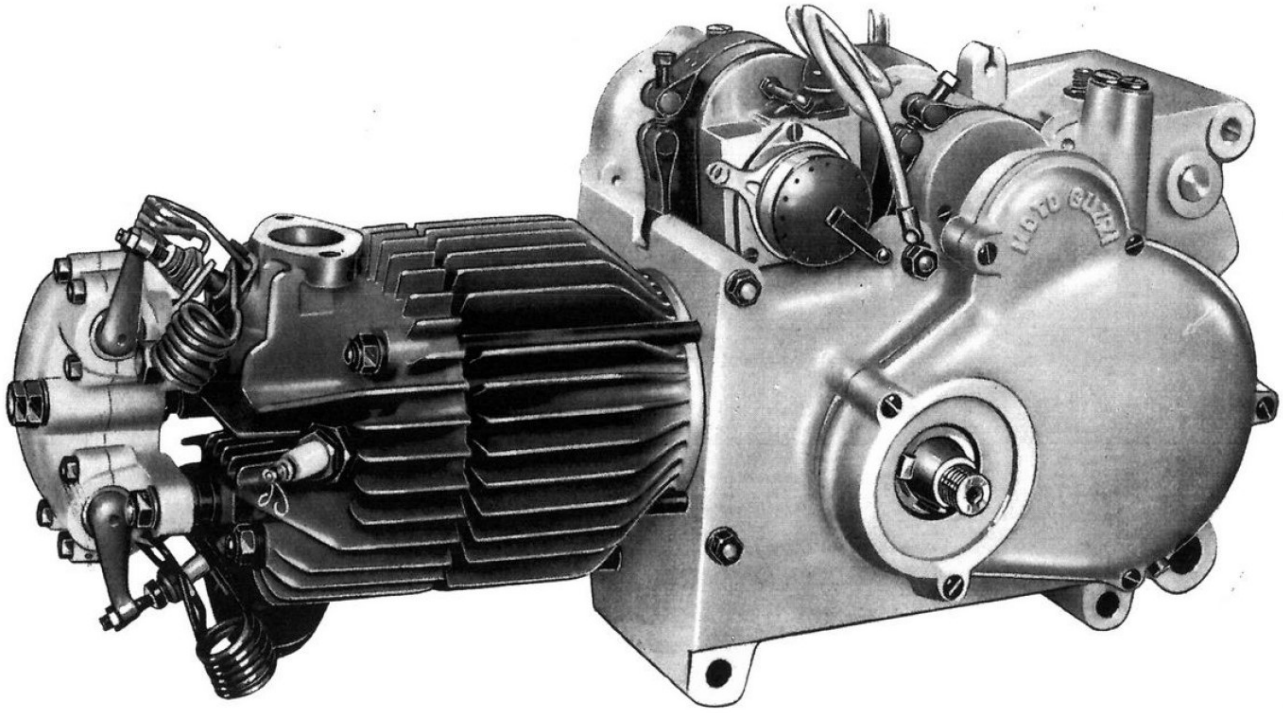


Fig.11 – Engine after being removed from the frame.

MOTOR **2. Dismantling of the motor**

In order to proceed to the complete dismantlement of the motor as soon as it is removed from the frame (view figure 11), you undergo an operation as follows:

Remove:
- the spark plug.
- the rocker arm box.
- the pushrods.
- the pushrod cover tube.

In order to remove the cylinder head, take off the 4 nuts from the fastening studs, thereafter beat it with a wooden mallet around the periphery and thus withdraw the complete cylinder head.
- the cylinder is removed by rocking and pulling forward with the hands.

Remove the piston by removing the small spring ring which fastens the wristpin from the flywheel side and remove the wristpin from the flywheel side.

Notation. - (view page 31) in case the same piston must be reassembled it is necessary to replace it into the same relative position it was in when it was removed. In order to avoid an error, you are only to remove the left side wristpin circlip (flywheel side) and leave the right-side wristpin assembled within the piston. Now, remove the wristpin toward left as mentioned above. In this way, it will be impossible to reassemble the piston rotated 180 [upside down] as regards the axis of the cylinder. In such a case, the remaining wristpin circlip, which was originally on the right side, would now be on the left side and therefore you will not be able to re-insert the wristpin [from the left side as you had removed it.]

Remove the valve timing side cover by removing the eight fastening screws. [Note: Cam timing will be lost if the cam comes out with the cover. To prevent this slide a slim blade between the cover and cam and ensure the cam stays in place.] The complete oil pump and the mechanism for controlling the compression release will stay mounted on the cover.

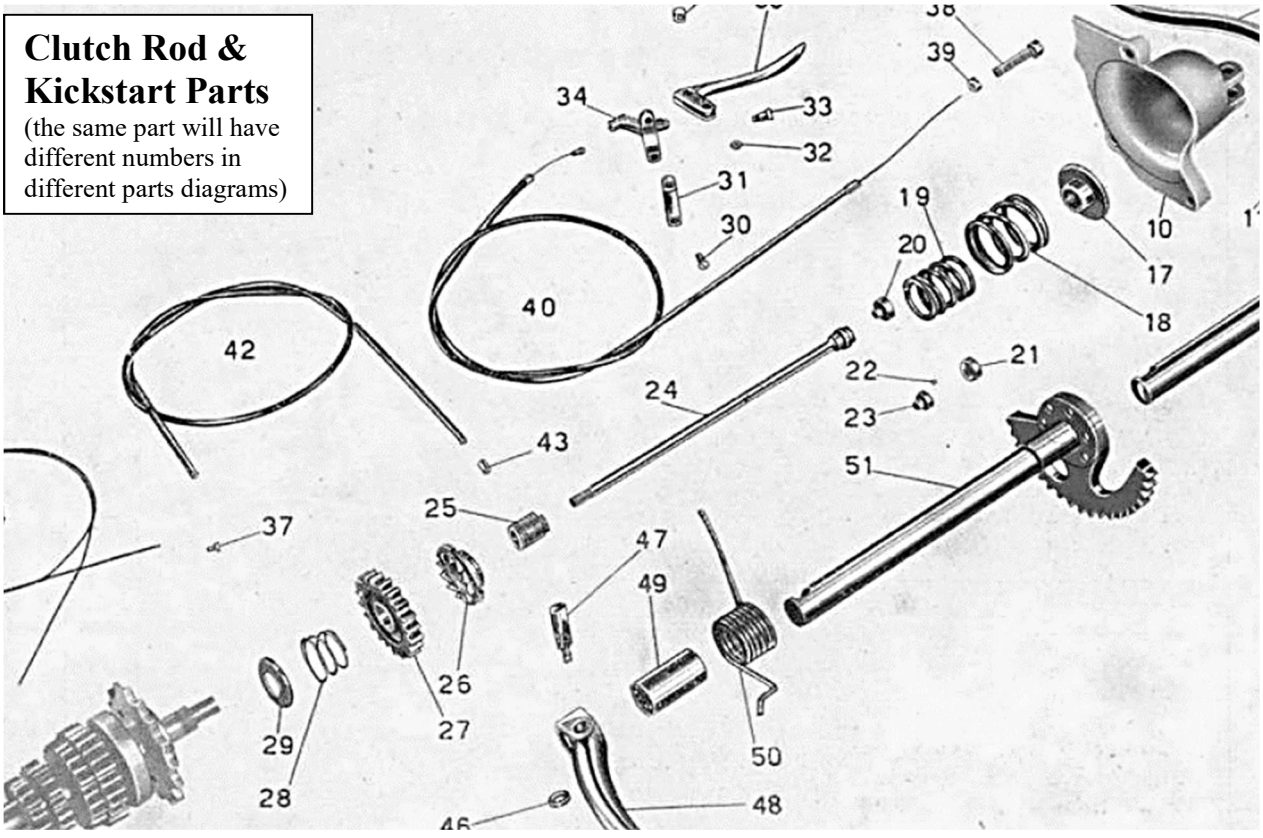
Remove the magneto [Under the timing cover]; loosen the nut which fastens the drive gear onto the shaft for around 3 turns and the clasping bolt of the strap clamp. Beat on the nut with a lead hammer to achieve separation of the gear from the cone of the shaft. Take off the magneto toward left (flywheel side). You will thus free also the felt oil retaining ring which remains mounted on the gear. [Assembly: a shim may be required under magneto to obtain correct gear mesh. Magneto grounds through case.]

You can now remove (valve timing side) the intake and exhaust cam with the drive gear and the camfollowers which drive the pushrods along with the pivot for mounting the camfollowers. The pivot of the intake and exhaust cam is pressed secure and you can remove it after achieving the opening of the two crankcase halves.

Remove the chain drive sprocket cover with the clutch control lever mounted.

Remove the flywheel side cover by removing the 6 fastening screws.
Caution: You need to loosen the 6 screws equally and simultaneously because the crankshaft helical gear will no longer be restrained in its position by the flywheel and its thrust spring will press it against the cover. This caution is useful for dismantlement and is imperative for the assemblage, otherwise the thrust spring pressure might deform the cover.

Remove the generator, performing the same operations by which you removed the magneto. [Assembly: use blue locktite or a locktab on the nut when reassembling the drive gear. This nut often works loose. Rotate generator in cradle to adjust gear mesh – an additional shim may be required. Generator grounds through case.]



[Under clutch cover] Unscrew the knurled disk [#17 in Clutch Rod parts diagram] with a left-handed thread which pre-loads the 2 concentric clutch springs [# 18 & 19]. Remove the two springs and the internal control rod [#24]. Unscrew it completely by means of flat wrench (view figure 12). Because this can rotate, you need to push the threaded sleeve against the toothed sleeve of the kick starter.

Remove the threaded sleeve [#25], which is freed after you remove the clutch control rod [#24].

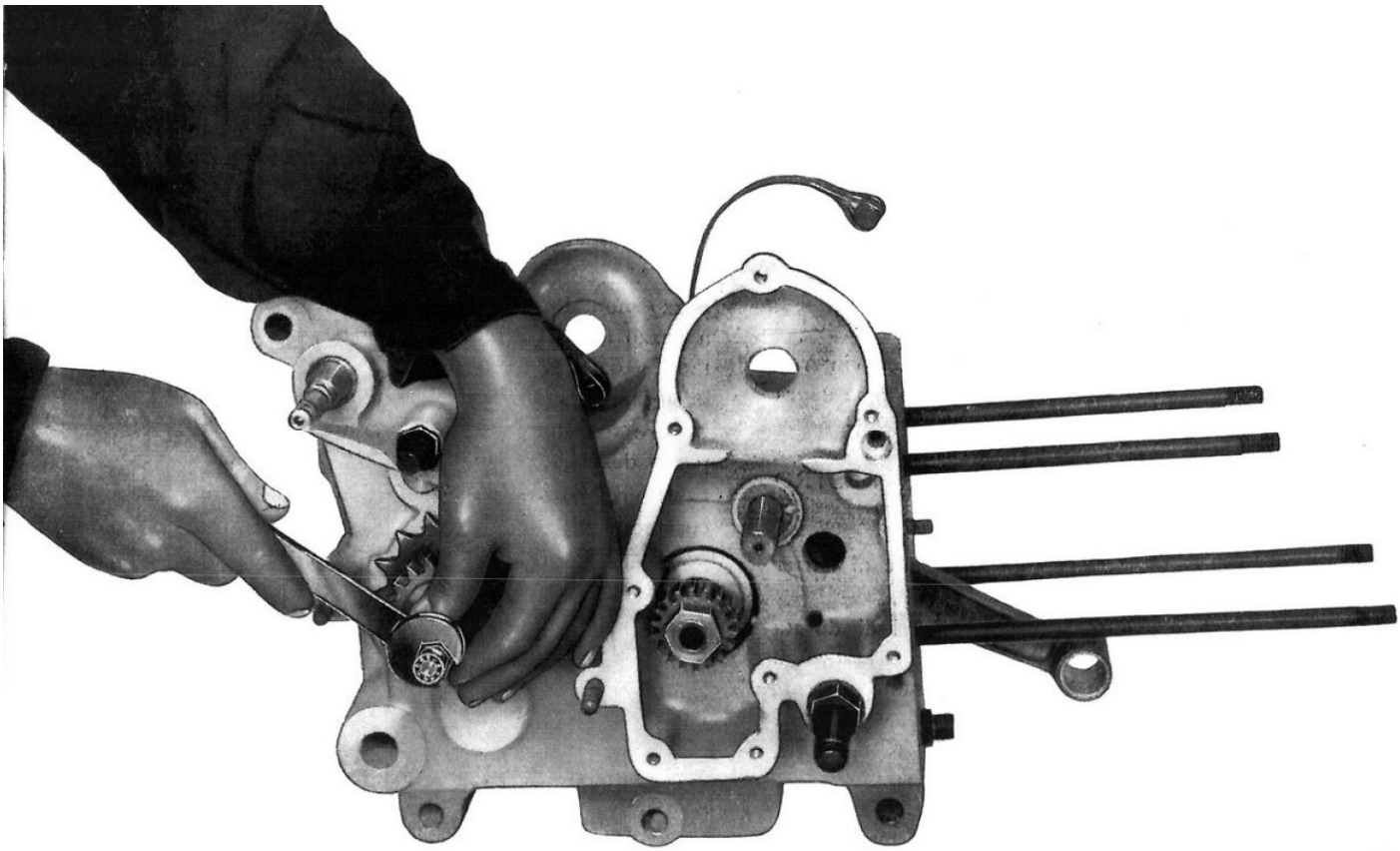


Fig.12 – Disassembling the clutch rod.

Remove the slotkey which restrains the crankshaft helical gear (flywheel side). [There is a spring under the helical gear so you need to push in on the gear in order to release the slotkey.]
After you have removed the slotkey, remove the crankshaft helical gear, the thrust spring, and the thrust spring support ring toward the outside.

Remove the clutch (flywheel side) by taking off the pressure plate disk, the clutch disk stack, and the helical gear. All these parts get removed toward the left.

You will notice, below the clutch, that the clutch fixed body mates to the main shaft of the transmission onto which it is mounted with a conic coupling and a slotkey and locked with a nut. This piece must not become dismantled until after the two halves of the crankcase have been separated.

Remove the toothed sleeve (ratchet) [#26] for the kick starter. Unscrew it completely. Restrain the transmission main shaft with a socket wrench on the fastening nut of the clutch fixed body (see figure 13). You will thus free the idle gear for the kick starter, the thrust spring and the spring support disk [#27, 28 & 29].

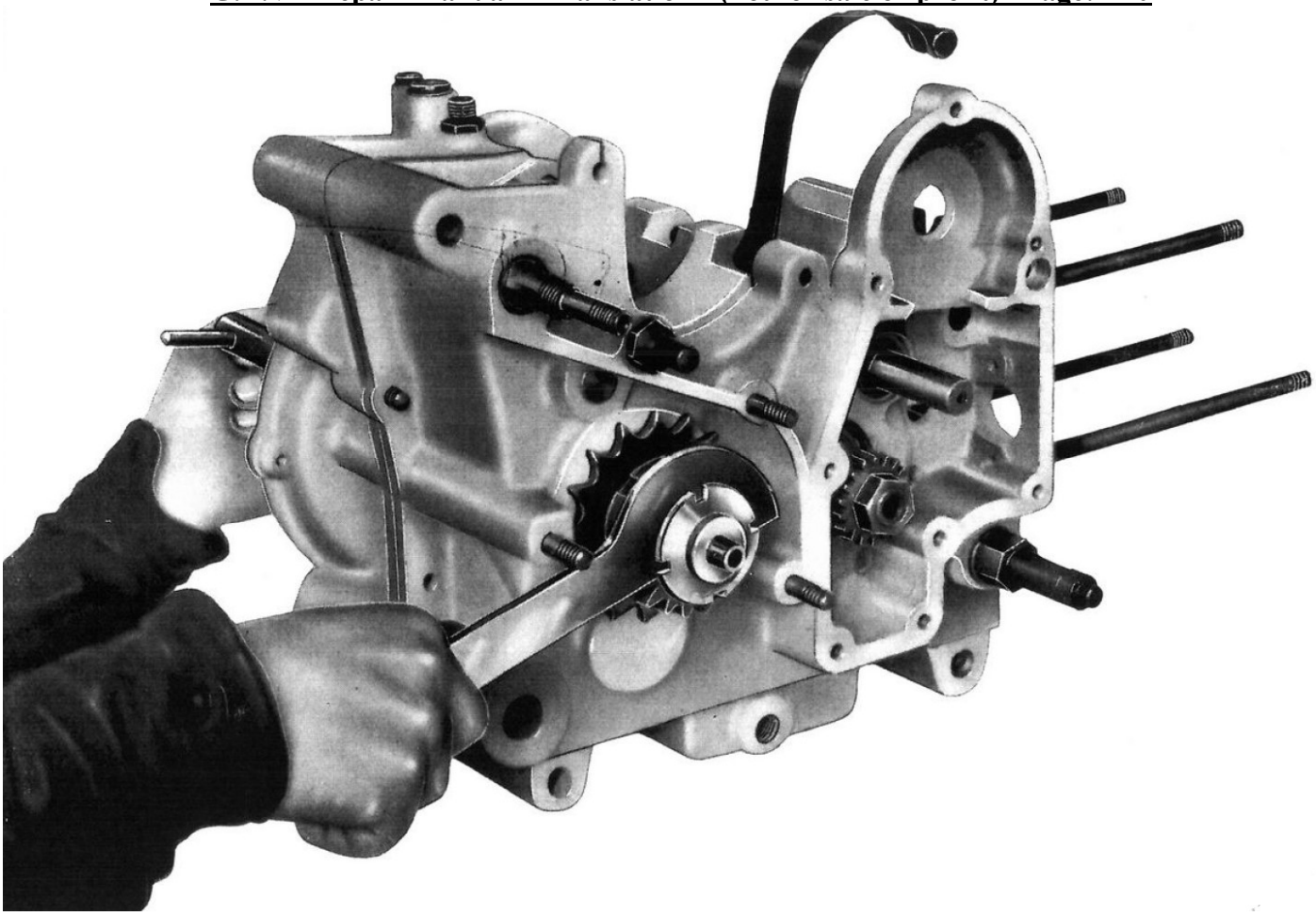


Fig.13 – Removing the toothed sleeve (ratchet) for the kickstarter. [Flywheel lockring tool is the same size.]

Remove:
- the lock screw from the chain drive sprocket.
- the notched nut for fastening the sprocket in the same way as you did for the kick starter toothed sleeve.
- remove the chain drive sprocket from the engaging dogs of the direct drive transmission gear.

Remove from the right side of the crankshaft; the nut, the valve timing and oil pump drive gear, the relative slotkey and the spacer spool.

After you have accomplished all these operations, in order to separate the two crankcase halves, you need to: unscrew the nuts from the 3 captive studs [one below generator], remove 3 small bolts and 2 longer connecting rods from the front portion of the crankcase.

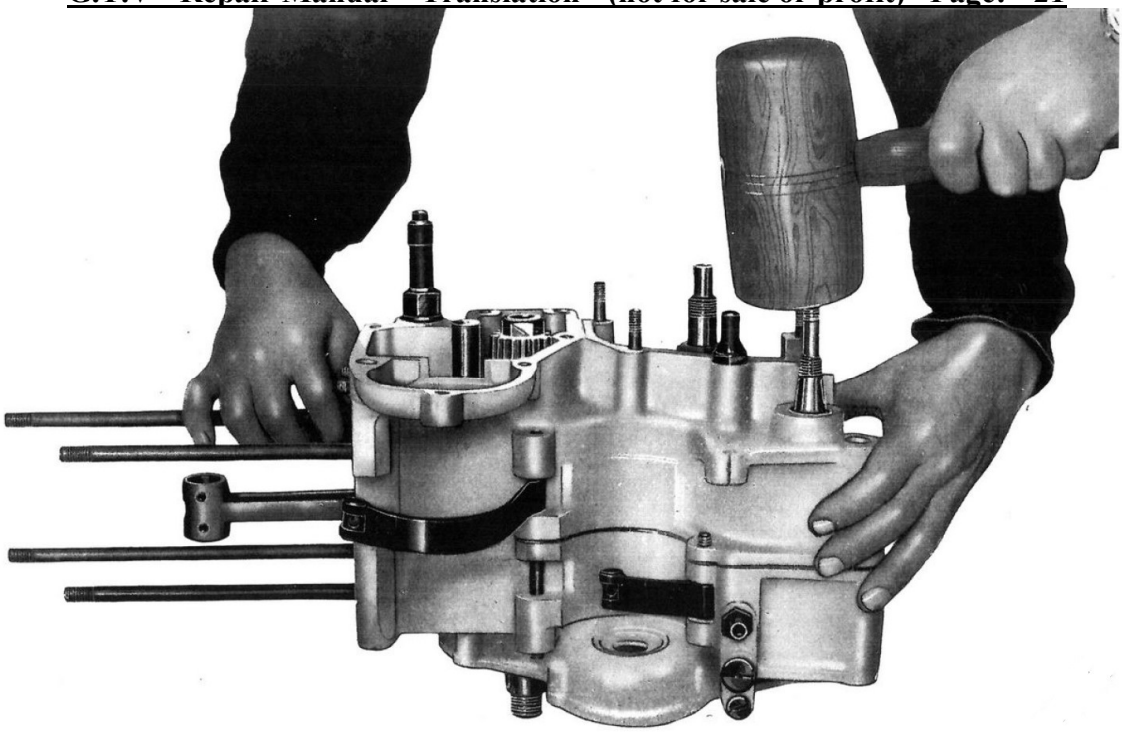


Fig.14 – Opening the crankcase.

Suspend everything by hand (view figures 14-15). Beat with a wooden mallet on both extremities of the transmission shift control shaft and on the transmission main shaft (valve timing side). The opening of the two halves is achieved thus. [Or hammer on a block of wood on studs and projections of the case halves.]

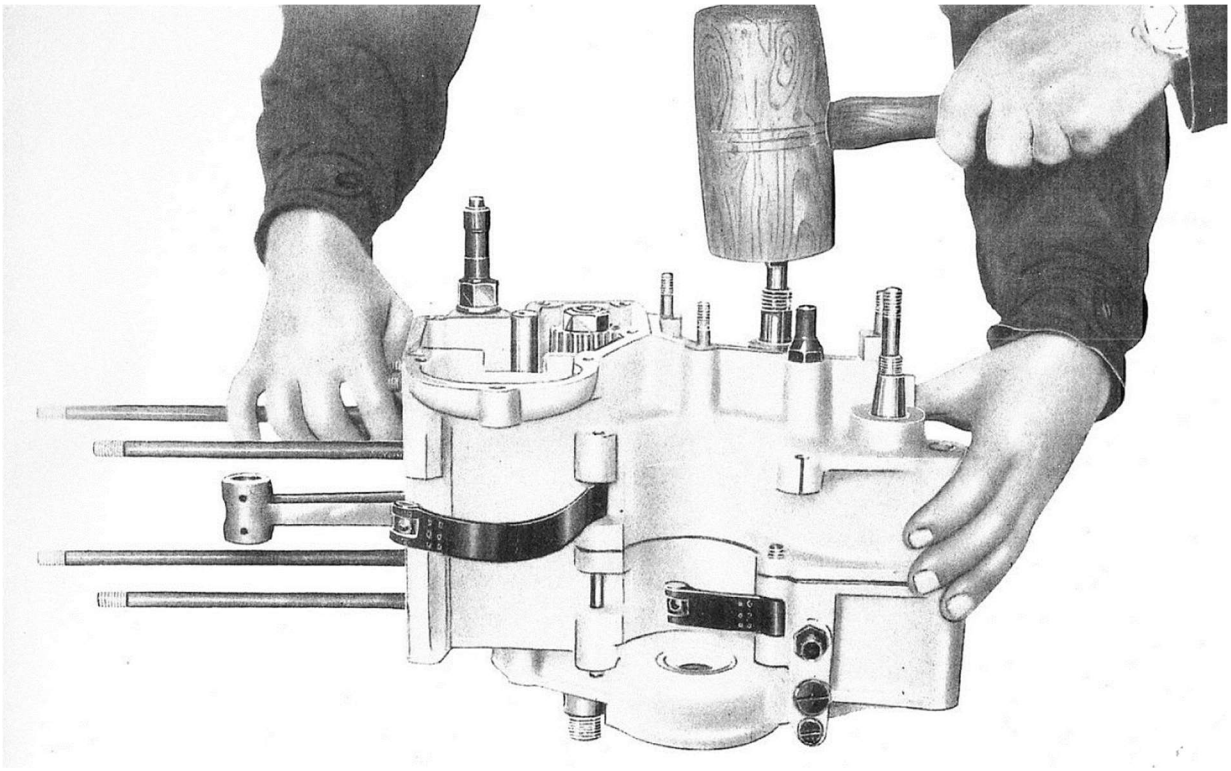
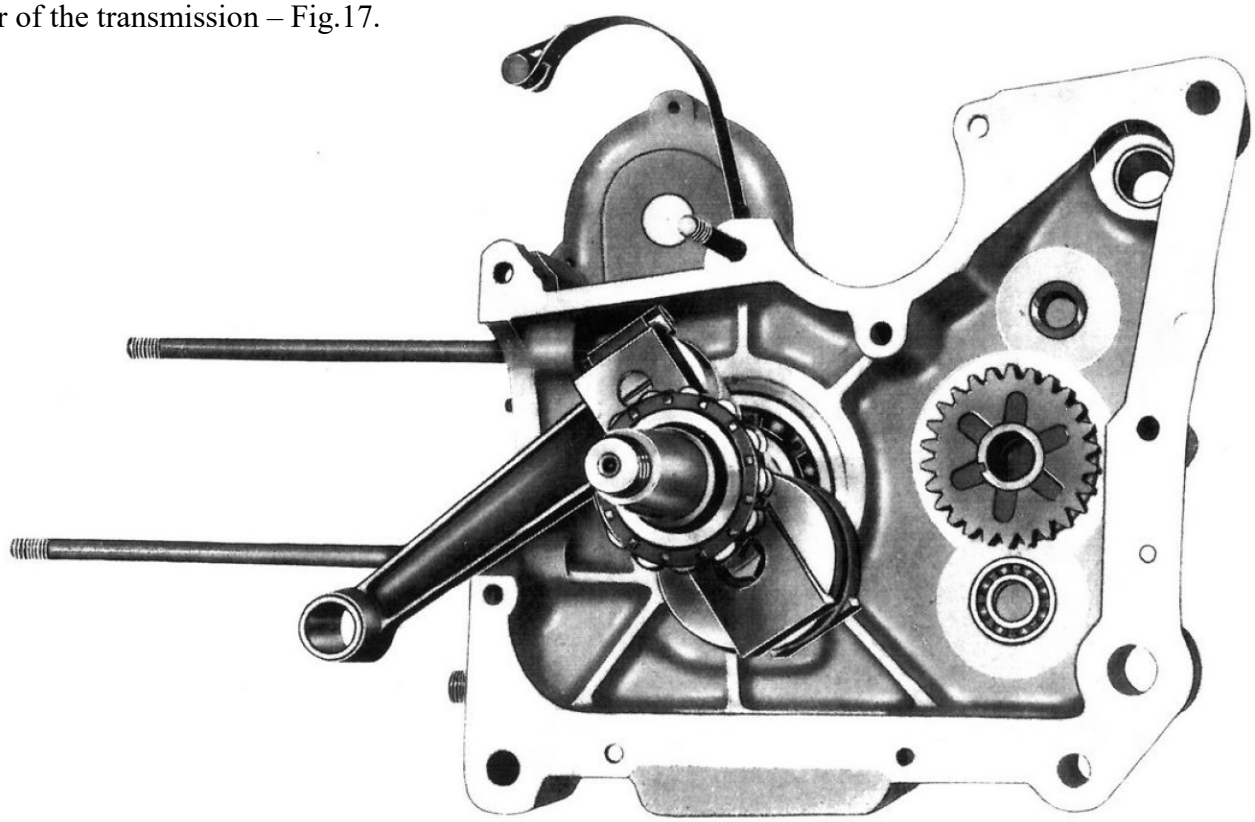
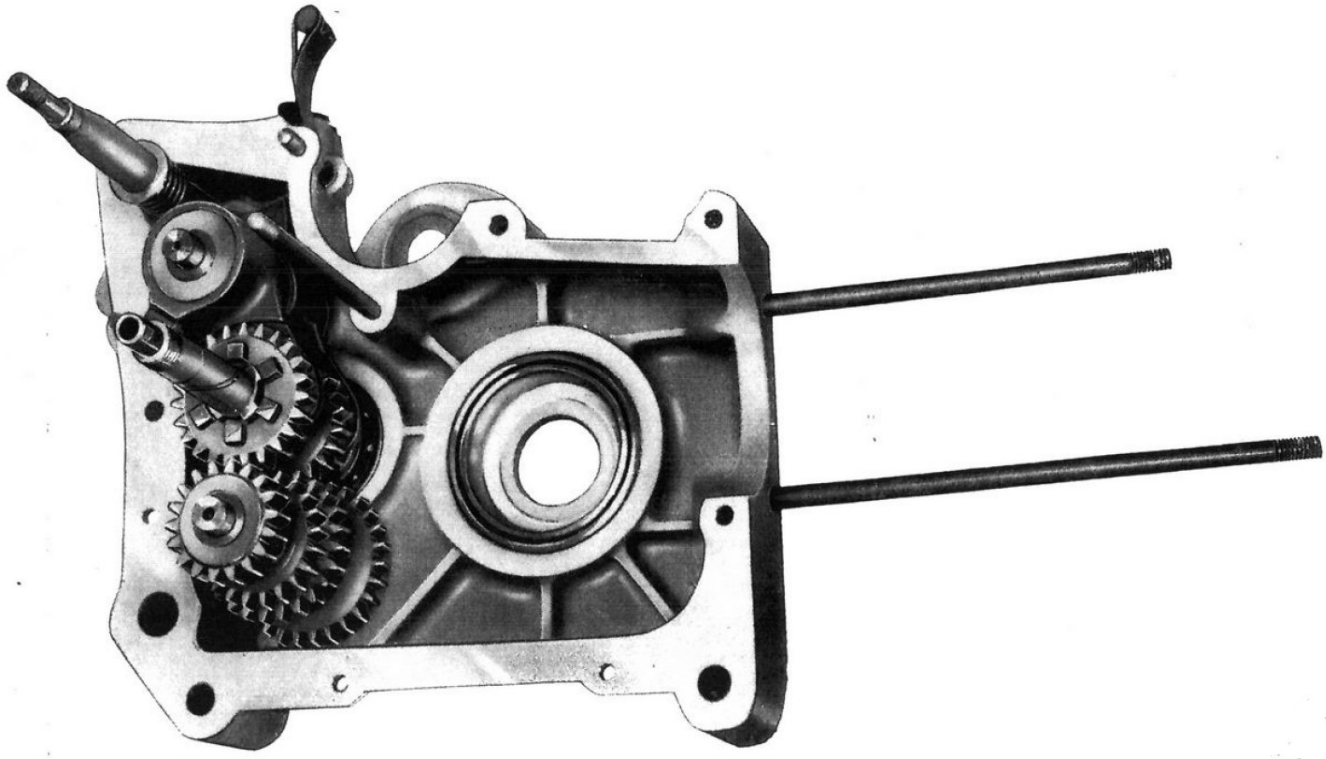


Fig.15 – Opening the crankcase.

On the right crankcase half (valve timing side) will remain mounted the complete crankshaft and the direct drive gear of the transmission – Fig.17.



On the left crankcase half (flywheel side) will remain mounted the shift control shaft with toothed arc, the transmission gear clusters and the shift control cylinder with the relative shift forks – Fig.16.



Remove the crankshaft unit, complete with connecting rod, by suspending the right crankcase half by hand and beating the crankshaft with a wooden mallet from the exterior toward the interior.

Remove the direct drive gear [4th gear] by also completing the same operation.

Remove:
- the transmission shift control cylinder unit with relative shift forks and the sliding gears from the main shaft.
- the secondary shaft of the transmission by extracting it from the end ball bearing. You will thus free two spacer rings and the shift control shaft with toothed arc.

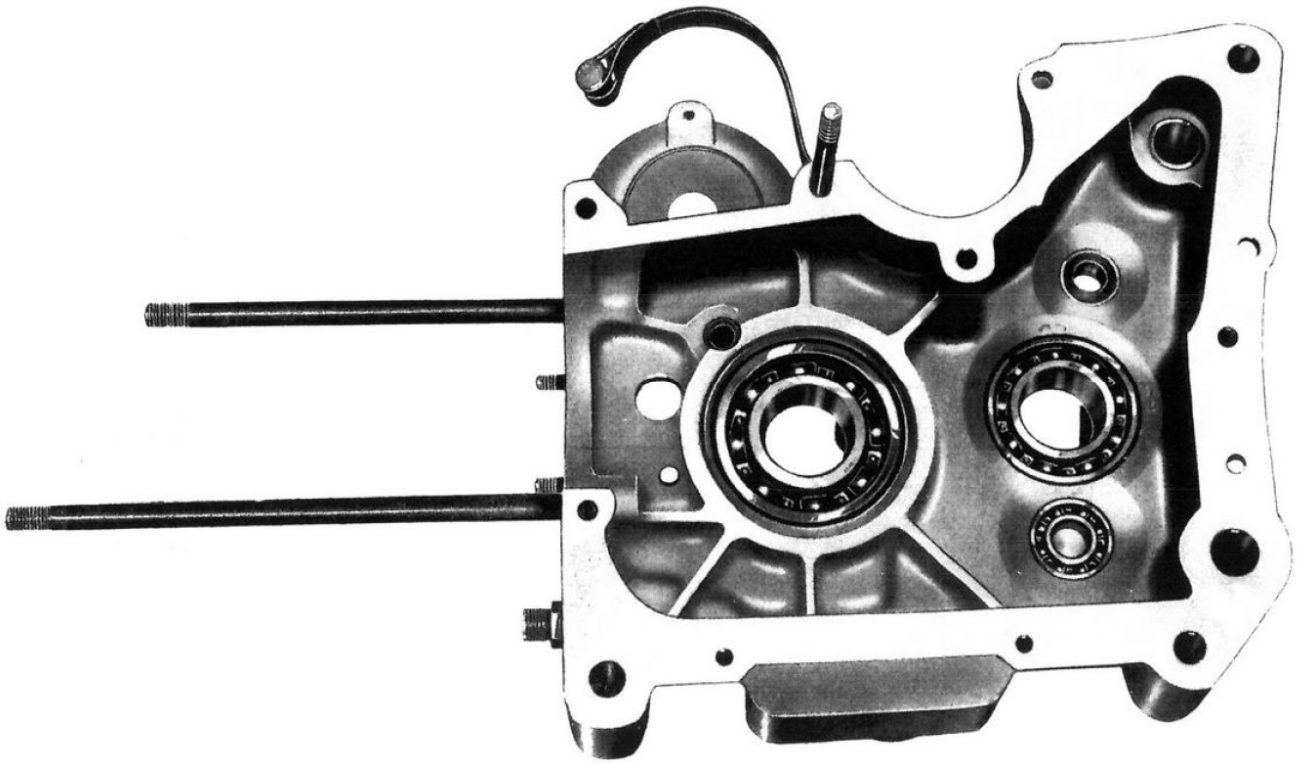
All these pieces get removed toward the interior.

[Remove clutch hub and mainshaft:]
Restrain the left crankcase half (flywheel side) in a vice by clamping the transmission main shaft between soft lead jaws in order to be able to remove the fastening nut from the clutch fixed body. Slip an iron pipe (of around 280 mm long and inside diameter of around 27 mm) onto the main shaft so that one end of such pipe braces against the spacer ring which presses against the internal bearing race of the ball bearing. Support the other end of the pipe on a solid base and beat with a soft aluminum punch and a hammer, from the exterior toward the interior. You will thus achieve removal of the transmission main shaft and will free the bearing pressure support ring. Capsize the crankcase for 180° and beat with a soft aluminum punch (from the interior toward the exterior) on the clutch fixed body. This will achieve the separation of the piece from the ball bearing mount with extraction to the left (flywheel side).

MOTOR **3. Inspection and revision of the motor.**

CRANKCASE AND COVERS UNIT.
Perform the operations of disassembly of the motor. Provide for the accurate cleaning of the individual pieces. Wash them with solvent or kerosene and dry them with clean rags or better with a blast of compressed air.

RIGHT CRANKCASE HALF (valve timing side) Figure 18.



INSPECTION.
After you have it carefully polished up (cleaned):

Observe if the crankcase doesn't show cracks at any point. In case that is discovered, weld or replace the piece. Welding is advisable only if it has small crack. It such case, after the welding, it is always good to check that the crankcase has not suffered heat deformations. Verify with detail the condition of the mating surfaces of the crankcase and of the cover.

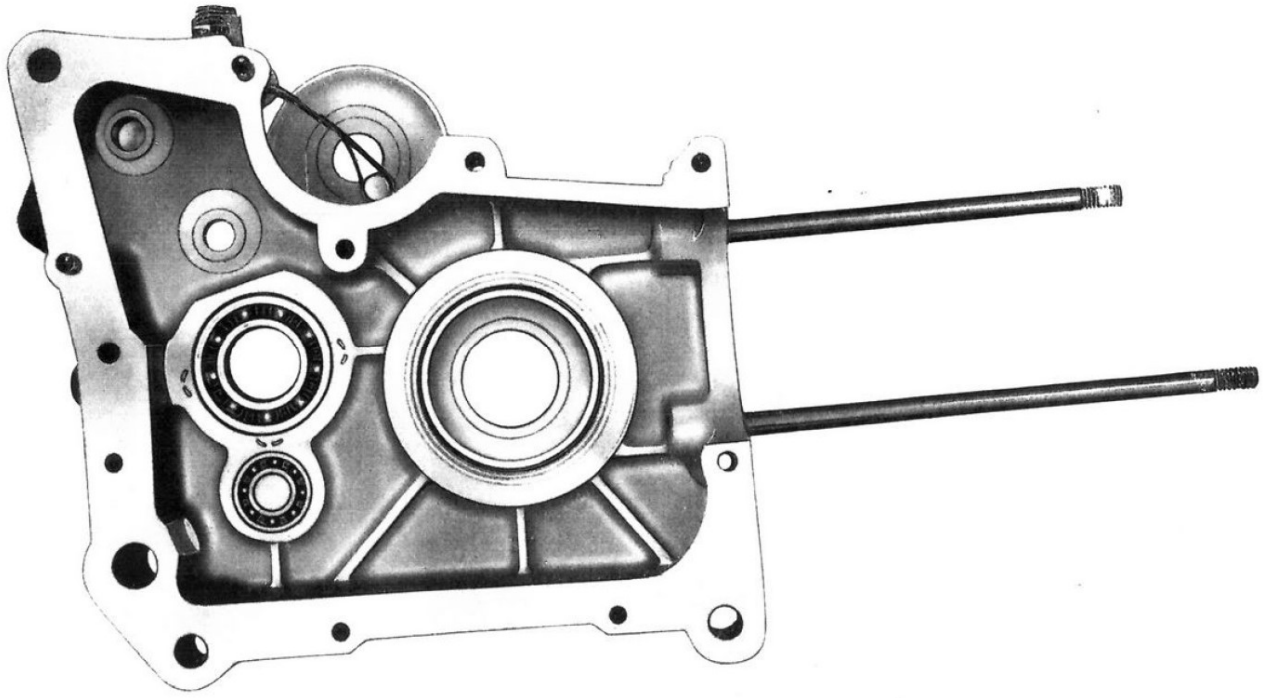
Check the captive studs for fastening the clutch spring and drive sprocket cover lid, for fastening the cylinder head and for uniting the crankcase halves. The must be secure. Otherwise tighten them to the bottom. If it happens that the thread in the hole of the crankcase is ruined, you need to fill with weld repair material, drill and cut threads again.

Verify the condition of the mating surfaces of union to the cover and to the left crankcase half. In order to remove traces of sealant which you will notice, use a good beveled scraper or wash with alcohol and dry with clean rags. Remember that if the mating surfaces are not perfect, the retaining of the oil won't be achieved.

Examining the right crankcase half you will notice:
- the large ball bearing for mounting of the crankshaft.
- the bearing for the direct drive gear.
- the right side bearing for the transmission secondary shaft.

Check that bearings are well fixed in their recesses. For inspection and measurements see BEARINGS section.
- Bushing for mounting the transmission shift control cylinder: Observe the inside surface. It must be smooth. Inspect the pressed bushing in the casting. The internal diameter of the new bushing piece is 14 mm ± 0,02. Wear maximum is + 0,03 mm.
- Bushing for mounting the shaft with toothed arc for controlling the shift cylinder: Examine the internal surface. It must be smooth. Inspect the pressed bushing in the casting. The internal diameter of the new bushing piece is 19 mm ± 0,02. Wear maximum is +0,04 mm.

TIMING COVER (valve timing side). [no gasket is used to seal the timing cover]
Inspect condition of the crankcase mating surface (see details for RIGHT CRANKCASE section above).
- Bushing for the compression release pivot: It is of almost unlimited duration because of the scarce work to which it is subjected. In order to observe the internal condition, remove the control lever to the outside, and take off the pivot with lifting node toward the interior. Reverse the operation for reassembly.
- Oil pump assembly: In order to remove it you need to take off the three fastening nuts for the captive studs on the cover casting and take off the pump toward the exterior. For the inspection, revision, etc., see OIL PUMP section below. In order to reassemble it onto the cover reverse the operations of dismantlement. [a paper gasket is used under the pump]



LEFT CRANKCASE HALF (flywheel side) Figure 19.
Inspect condition of the crankcase mating surface and captive studs (see details for RIGHT CRANKCASE section above).
Examining the piece from the interior. You will notice:
- the bushing for mounting the shift control shaft with toothed arc. The remarks for the analogous pieces mounted on the right crankcase half are valid here as well. The new piece diameter is 5 mm + 0,027. Wear maximum + 0,04 mm.
- the bushing for mounting the transmission shift control cylinder. Measurements and tolerances are identical to those of the right-side piece.
- the bearing for clutch fixed body. Beneath this bearing is an oil seal for retaining oil.
- the left side bearing for transmission secondary shaft.
- the external race of crankshaft roller bearing. For inspection see BEARINGS section.

Above the bushing for mounting the shift control cylinder there is a passage from the interior of the crankcase into the primary gear space under the primary+clutch unit cover. In the upper portion of this duct there is a loose ball bearing which creates a tiny valve which allows the air passage only in the direction described above. [Free passage from the crankcase to the outside chamber but no air passage from the outside chamber back into the crankcase. In essence a one-way checkvalve.] In order to inspect and clean this duct, you must remove the appropriate screw cover situated on the external upper portion of the left crankcase half. To the right of this checkvalve screw cover there is a hole with pipe compression fitting for the vent tube to the oil reservoir. At the left is a small filler plug.

Caution: Take care of the cleaning of these three holes. Many times the leakage of oil from the oil seals of the crankcase is caused by the obstruction of these ducts.

PRIMARY + CLUTCH COVER (flywheel side). [no gasket is used to seal the primary cover]
Verify condition of the crankcase mating surface (see details for RIGHT CRANKCASE HALF above).
Note in the lower portion of this piece a plug for dumping of solvent used for the washing of the clutch system.

BEARINGS UNIT
General caution: All the ball bearings and roller bearings used in the Guzzi motor are overly dimensioned so as to last for a very long time (beyond one thousand hours).
Crank bearings are standard dimensions: 35 x 80 x 21 ball bearing = 6307 roller bearing = N307
Gearbox mainshaft bearings are special sizes: clutch = 30 x 62 x 13 (Riv 889b)
drive = 33 x 66 x 13 (Riv 4490)
Secondary shaft bearings are standard dimensions = 6202: 15 x 35 x 11

INSPECTION - Observe carefully:
- the exterior surface of the inner races, and the internal surface of the outer races (surface of rotation). They must appear perfectly smooth and polished. If you discover cracks, flaws or superficial roughness, you need to replace the complete bearing.
- the ball bearings or the rollers. They must present themselves intact and very smooth for the entire surface.
If you discover defects, exchange the bearing. Remember, don't ever attempt partial repair, it is difficult to obtain good results through repaired bearings. In the assemblage of the bearings, always take care to work [apply pressure] directly onto the race which is being pressed. Remember that the new bearings have a presentment of a small radial play (on the order of a thousandth of a millimeter), before being pressed onto the shaft and into the recess; such play diminishes during pressing, but it must not cancel out completely because otherwise the ball bearings or the rollers would strain, and the bearing would ruin itself in a short time. For the load carrying and end thrust bearings is conceded an appreciable axial play (on the order of several hundredths of a millimeter).

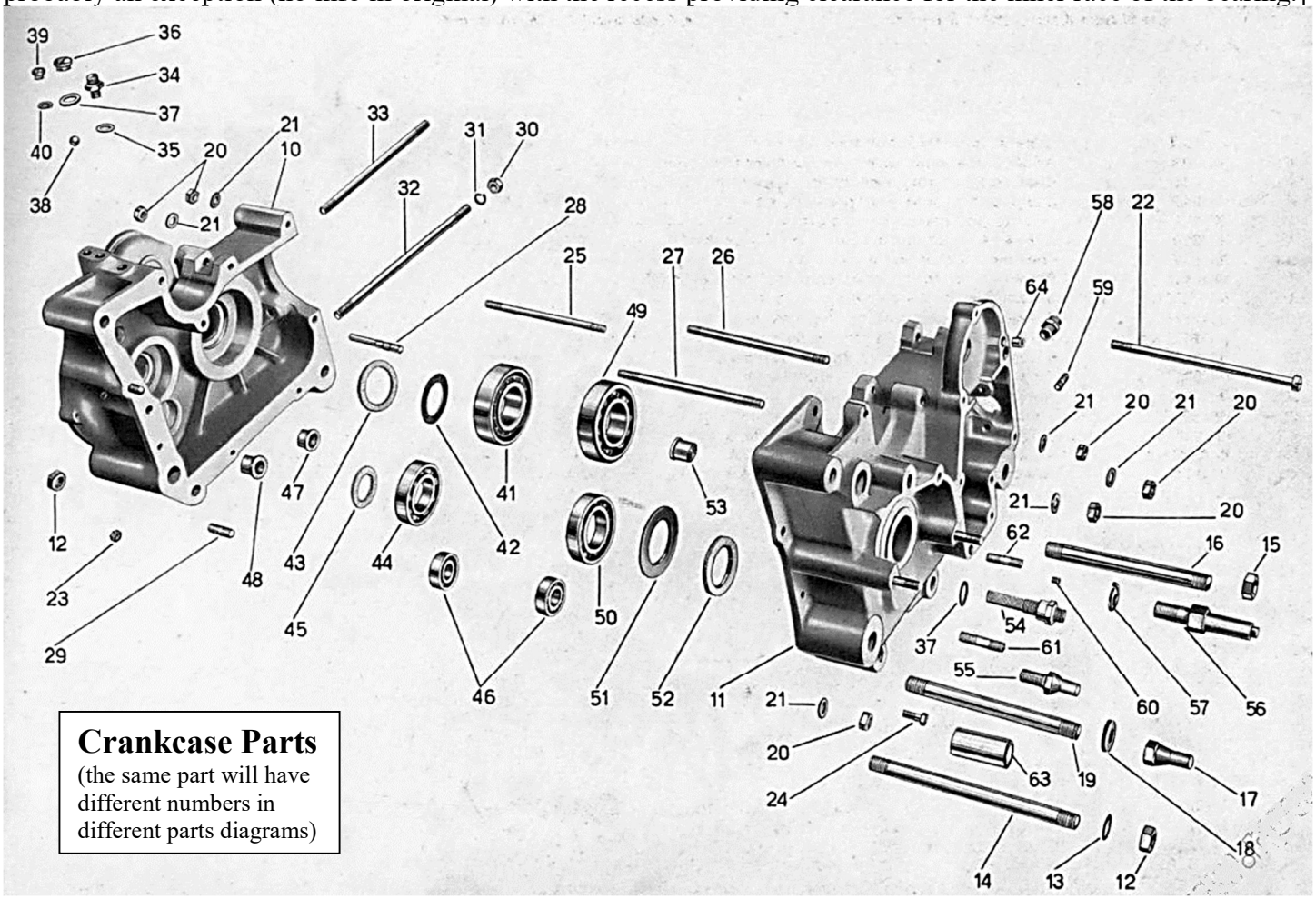
Motor crankshaft bearings. There are two: one with rollers at the left (flywheel side) and one with ball bearings to the right (valve timing side). The roller bearing is exclusively for load carrying: that of ball bearings is for load carrying and for end thrust.

Note: It is worthwhile to inspect the status of wear of these two bearings before removing the flywheel and dismantling the engine. Grabbing the flywheel with the hands try to move it in an axial direction (pull it toward and push it back) and in a radial direction. You must not observe any radial play, or at least it must be nearly imperceptible (around 0,01 of mm.). A small amount of axial play is admissible. If you discover radial play you need to replace the roller bearing. If you discover excessive axial play replace the ball bearing. If you discover axial and radial play replace both.

[**Installing Bearings and Seals:**

Note: there is nothing in the original about heating the crankcase to remove or install bearings – though it seems wise to use heat, too much can burn the felt seals. Bearings must be staked securely in place using a punch on the alloy crankcase. The staking must withstand any side loads to the crank from the helical primary gears on the crank ball bearing and pressure from the clutch springs on the transmission bearings. **Unlike most engines, these sideloads tend to pull bearings OUT of their bores!**

The Crankcase Parts diagram below shows crankshaft bearings #41 & 49, mainshaft bearings #44 & 50 and secondary shaft bearings #46. Numbers 43, 45 & 52 are felt seals. Numbers 42 and 51 are steel spacers. When installing bearings, felt seals 45 & 52 and spacer 51 must be installed before bearings 44 & 50. Spacer 51 has a recess on one side. Normally Guzzi specifies that spacers be installed flat side to bearing, but spacer 51 is probably an exception (no info in original) with the recess providing clearance for the inner race of the bearing.]



OIL SEAL UNIT

There are five oil seals for retaining oil: (seals 1º and 4° have steel spacers between the felt and the bearing)

(1º) #43 in the left crankcase half (flywheel side) mounted under the roller bearing for the crankshaft;
(2º) one of rubber on the top of the left crankcase half, it allows passing of the generator shaft;
(3º) #45 in the left crankcase half mounted under the bearing for the clutch fixed body;
(4°) #52 in the right crankcase half (valve timing side) mounted under the ball bearing for the drive sprocket;
(5°) one fixed by the magneto gear.

[There is also a rubber seal (#44 in the Transmission parts diagram) that seals the shift control shaft (#47 in the Transmission diagram).]

If you notice leakage of oil from these oil seals observe that the oil vapor vent holes are not obstructed, if the

recovery side of the oil pump works well (see Lubrication page 56) and the wear condition of the unit including the cylinder, the piston, and the piston rings (view pages 31 - 33).

[During the down stroke of the piston, crankcase chamber volume diminishes and therefore ambient pressure increases. This increased crankcase pressure is released through a vent pipe and a checkball at the top of the transmission. The vent pipe directly connects the crankcase chamber and the oil reservoir. A small amount of this excess crankcase pressure serves to pressurizes the oil reservoir and helps to force-feed oil to the oil pump. As crankcase pressure increases further, it then raises the checkball to vent the excess off to the atmosphere. After passing the checkball, the pressurized oil mist leads to the clutch housing to mist-lubricate the helical gears and clutch plates. The oil mist settles out and puddles in the clutch housing. A casting duct leads across from the clutch chamber to the right side of the engine to automatically drip-lubricate the chain at the drive sprocket. During the up stroke of the piston, the checkball at the top of the transmission drops and seals, thus generating a slight vacuum inside the crankcase chamber. This vacuum helps to suck and hold oil inside the relatively weak felt seals on the crankshaft and transmission main shaft. Through this process, crankcase pressure can only build to the point when it lifts the weight of the checkball.]

In fact, if the oil vapor vent holes are blocked, if the oil recovery pump is damaged, or if the piston allows passage of a notable quantity of blow-by gas into the crankcase, you will observe leakage of oil from these seals despite their efficiency. If the conditions above are complied with and lubricant leakage persists, then proceed to exchange the oil seals. The second and fifth seals are easily accessible and exchanged. In order to substitute the first, third and fourth oil seals, you need to dismantle the motor and remove the bearings from their relative recesses.

CYLINDER HEAD AND VALVE UNIT

DISMANTLEMENT.
After you have removed the head from the motor, described under Dismantling the Motor, proceed to the complete dismantlement of the head. Remove the valve springs with the appropriate spring compressor, the valve wear caps, the valve stem retainer half collars, the upper spring support plate, the lower spring support plate and the valves. [Valve spring removal: hold the valves in place by stuffing a rag in combustion chamber and clamping head down to a bench. Wear gloves and remove springs with large locking pliers.]

Table 1.

Description	Chart	New piece mm	Construction Tolerance + mm	Construction Tolerance – mm	Max. wear mm	Observation
intake valve seat 120°	B	9.9	0.015	0.015	– 0.05	The thickness at the rim of the valves (intake and exhaust) must not be ground more than 1 mm. At new, the thickness is (view the table) 2 mm for the exhaust valve and 1.7 mm for the intake valve.
exhaust valve seat 120°	D	10.85	0.01	0.02	– 0.05	
intake valve guide	E	10	0.02	0.02	+ 0.10	
exhaust valve guide	F	11	0.02	0.02	+ 0.10	
Valve cap	G	2	_	_	– 0.80	
Valve seat deformation [recession]	A	0	_	_	2	

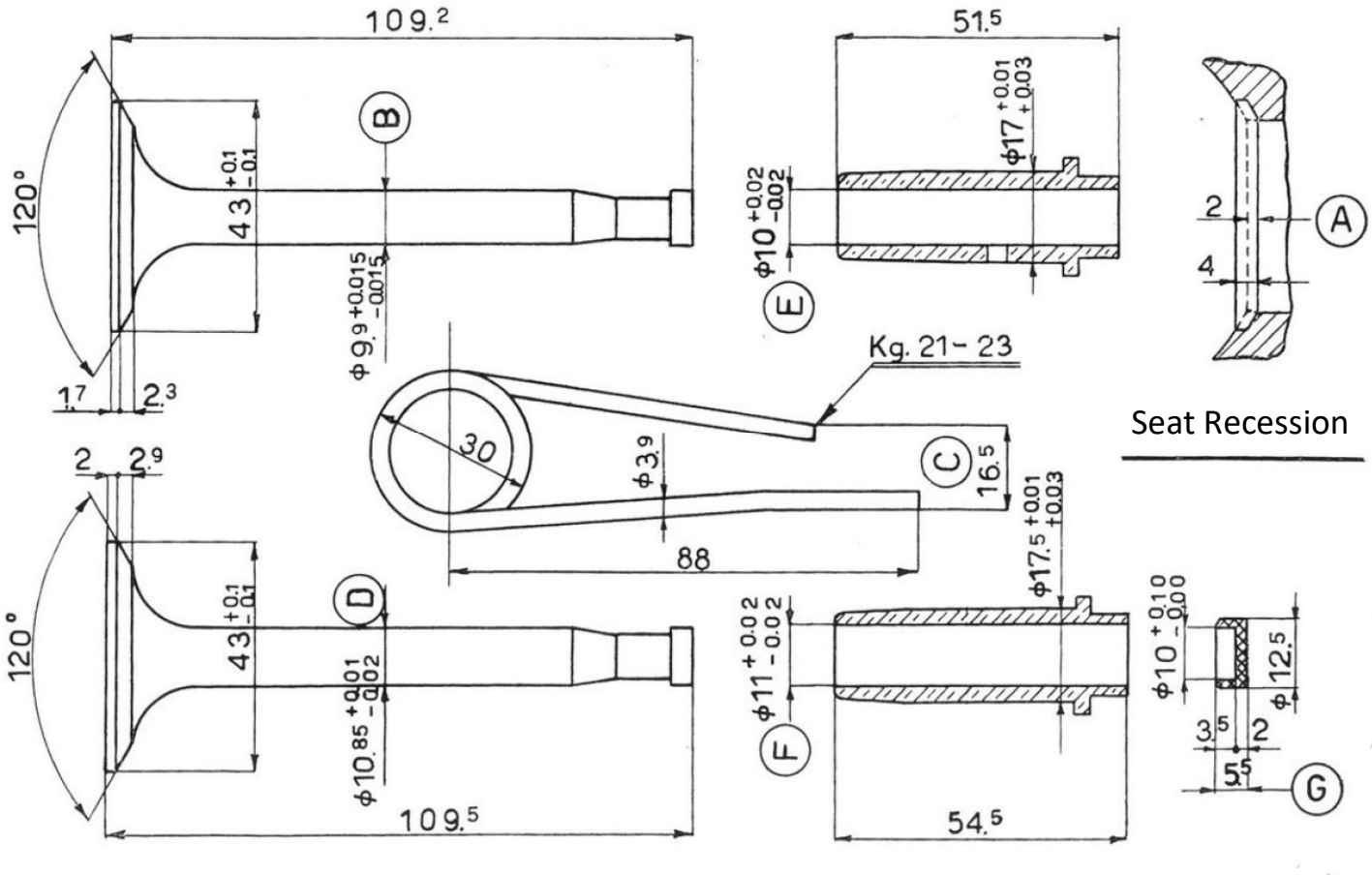


Chart 1.

INSPECTION
Remove the carbon deposit residues carefully (taking care to remove also those in barely accessible locations) make use of scrapers and metallic brushes. Wash afterwards with solvent and dry with a blast of compressed air or rags. Examine the status of the head. Check that the captive studs are tightly fixed and show intact threads (otherwise tighten or replace). Check if there broken or chipped cooling fins (if there are many, replace the head). Examine that there are not any cracks or notching on valve seats or on the valve guides.

Inspect the beating of the valve seats (especially for the exhaust seat, see chart number 1, table 1). Examine the wear of the valve guides. If you must substitute the intake valve guide, beat it from the inside toward the outside. The exhaust valve guide sometimes shows deformations and cracks on the inner portion. If so, it is appropriate to remove it by breaking off the external support lip with a chisel and then beat it with a punch from the outside toward the inside. Remember, after you assemble new valve guides they must be overhauled with a broach or reamer to 10 mm for the intake, to 11 mm for the exhaust.

The Valves.
Examine the stem and the edge of the crown which bears on the valve seat (see chart number 1 table 1). If you discover excessive wear, deformations, cracks, deep pitting, etc., replace the valves and guides.

Notation. - Whenever the substitution of a valve is required, it is always advisable to exchange the relative valve guide as well. It is also clear that, if substitution of a valve guide is required, it is always advisable to exchange the relative valve. This assures a perfect retaining of compression.

Caution: If you assemble new valves and valve guides, or if you reassemble the old ones after grinding the valve seats, it is always advisable to proceed to emery lapping of the valve faces into the respective valve seats.

[Additional Undocumented Caution: The manuals strangely do not describe a very special feature of the intake valve guide. The exhaust valve stem gets lubricated by oil residue in the exhausted combustion gases. The exhaust rocker arm bushings get lubricated by the puddle of oil collecting near their low position within the rocker arm box. However, the intake valve stem has no source of lubrication at all and the intake rocker arm bushings are deprived of oil due to their higher position in the rocker arm box. Carefully observe the cross-section diagram of the intake valve guide. You will notice a small hole (3 mm?) drilled at a right angle through the wall of the valve guide. You should also observe that the upper stud which retains the rocker arm box to the cylinder head is shaped with a narrowed center section. The rocker arm box casting also has a small internal hole leading from the upper stud hole to the interior vicinity of the intake rocker arm bushings. During the intake stroke, vacuum in the intake manifold (especially high during rapid deceleration) sucks air through the small amount of clearance between the intake valve stem and the intake valve guide. This hole in the wall of the intake valve guide described above delivers the vacuum up past the narrowed rocker box stud and into the rocker arm box chamber. The rocker arm box is furnished with an oil mist created the crankshaft spray and crankcase air turbulence and delivered by way of passages in the pushrod cover tube. The oil mist in the rocker arm box is therefore sucked past the bushings, through the box casting, down along the narrowed stud, through the head casting and through the small hole in the wall of the intake valve guide. In this way, a small quantity of oil is directly wasted, but it lubricates the camshaft surface, cam follower rollers, pushrod ends, intake rocker arm bushings, the intake valve stem and probably also the exhaust valve stem on its way out. Unfortunately, there is nothing in the manual to discuss this hole in the wall of the intake valve guide or its effect on lubrication of many pieces. After installing a replacement intake valve guide, it is mandatory to remove the narrower, upper rocker arm box stud and reach through the cylinder head casting to drill the small hole through the wall of intake valve guide.]

Check the efficiency of the intake and exhaust valve springs by measuring the loss of spring resistance. Compressed to 16,5 mm (measure C, table 1) they must withstand a load of 21-23 Kg. If, at this established measurement, they withstand less than 20 Kg, replace them. Check the wire edge on the portion which is held against the upper spring retaining plate. If you discover a heavy wear replace the springs. Check the spring support plates of the intake and exhaust valve springs. Replace the upper spring support plate if you discover an excessive wear where it supports the spring. [Presumably there is a risk of catastrophic failure damage if the upper spring support plate fails, but not a similar risk from failure of the lower spring support plate.]

ASSEMBLAGE

Reverse the operation of dismantlement.

[**Valve spring installation (exposed valves only):**

1. Install valve and hold in place with a rag in the combustion chamber while clamping head down to bench.
2. Install base plate and keepers on valve. Hold keepers on valve by wrapping the stem with tape.
3. Each spring has a narrow and wide spring. Factory pictures show the wider springs on the rockerbox side of the head and the narrow springs on the spark plug side.
4. Install an old, weakened spring first - easier and will hold keepers in place while installing the new spring. Start with intake valve springs – they are easier because there is more clearance.
5. Wear leather gloves. Hook the loop of the spring under the spring keeper on valve. The coil part will point straight up. Clamp locking pliers firmly to one tine and lever the tine up to the base-plate - the spring will twist and the other tine will try to go into the fins, but the twist won't hurt the spring.
6. Repeat with second tine.
7. Remove the old spring and replace with new.]

Caution.
It is proper to install a new gasket between the cylinder head and cylinder. The gasket is composed of copper clad asbestos and it is appropriate to dampen it [we believe water is appropriate to soften the asbestos] before assembly. Remember to tightening to the bottom the four nuts which fasten the cylinder head to the cylinder. [There is no bolt torque specified. We believe that the cylinder studs should be torqued between 25 and 30 foot pounds based on comparing their diameter and material to other similar modern applications.] After the bench test of the motor and when it is still warm, it is necessary re-tighten the four nuts to assure that the head gasket has settled in and compressed completely.

CYLINDER AND PISTON UNIT

DISMANTLEMENT. – Remove piston as describe under Dismantling the Motor.

Notation [from Dismantling the Motor] - in case the same piston must be reassembled it is necessary to replace it into the same relative position it was in when it was removed. In order to avoid an error, you are only to remove the left side wristpin circlip (flywheel side) and leave the right-side wristpin assembled within the piston. Now, remove the wristpin toward left as mentioned above. In this way, it will be impossible to reassemble the piston rotated 180 [upside down] as regards the axis of the cylinder. In such a case, the remaining wristpin circlip, which was originally on the right side, would now be on the left side and therefore you will not be able to re-insert the wristpin [from the left side as you had removed it.]

Remove the three compression rings and the oil scraper ring from the piston.

Notation- If you are intending to reassemble the same piston, attentively observe the relative positions of the compression rings and the oil scraper ring before removing them from the piston. At assemblage, these pieces will be methodically put back into the exact position which they occupied when dismantlement was started; this will avoid a new adaptation [bedding in] between the cylinder and the piston rings.

Table 2.

Description	Chart	New piece mm	Construction Tolerance		Max wear mm	Observation
			+ mm	– mm		
Cylinder	D	88	0.015	0.015	+ 0.08	
Piston	O	87.44	0.05	0.00	–	
	P	87.78	0.01	0.02	–	
	Q	87.81	0.01	0.02	–	
	R	81.2	0.1	0.1	–	Note - The allowable wear for O-P-Q-R-S is nil.
	S	87	–	–	–	
	T	2.52	0.02	–	+ 0.08	
Piston rings	B	2.9	–	–	– 0.20	
	C	2.5	–		– 0.05	
Scale of overbores for exchange piston (mm) = 0.2, 0.4, 0.6, 0.8, 1.00						

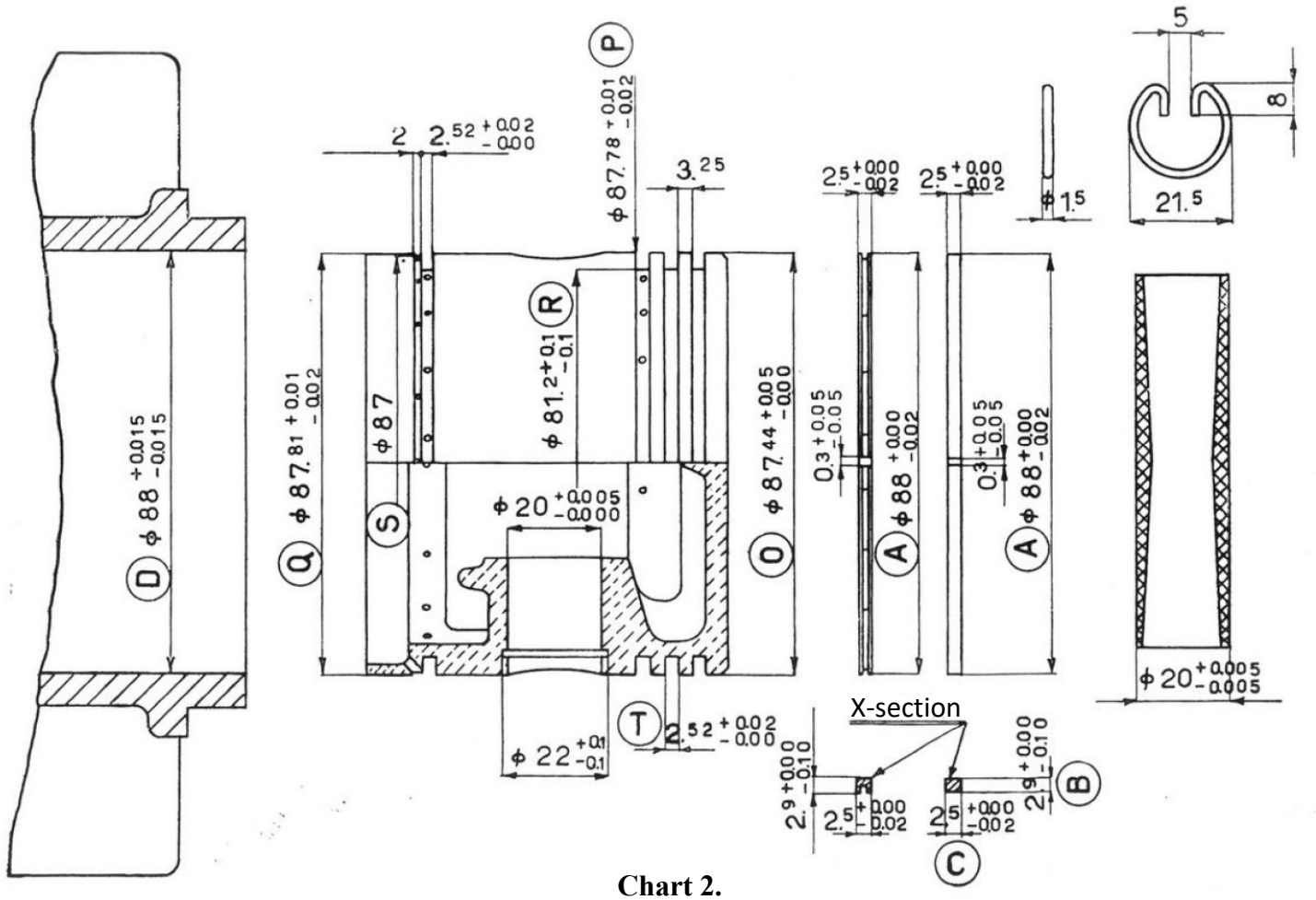


Chart 2.

INSPECTION

Cylinder:
Examine the inside surface of the barrel of the cylinder. It must appear smooth and free of scratches, grooves, etc. In a contrary case, ream the cylinder barrel or, if dealing with very deep scratches, replace the cylinder. [Or have a new sleeve inserted and re-bored to original specifications.]

Inspect the status of the mating surface to the crankcase and to the head on the external surfaces.

Inspect the status of the cooling fins.

Remember to assemble new gaskets: between the cylinder and head is composed of copper and asbestos, between the cylinder and crankcase is composed of paper of 0.25-0.30 mm thick.
- Verify the inside diameter of the cylinder (see chart 2 & table 2).

Piston:
Examine the top and the sides very carefully. Remove any carbonous incrustation, the surfaces must appear smooth. If deep striations or grooves of seizure are observed, it is opportune to replace the piston. For measurements see chart 2 & table 2.

Notation- ask for the appropriate piston rings for oversized pistons indicating overbore.
Assembling oversized pistons, the cylinder is reamed (D measurement) at 2- 4- 6- 8- 10 tenths of a mm according to the oversize of the piston.

Verify the status of the piston ring grooves in the wall of the piston.

Verify that the little holes located in the wall of the piston beneath the oil scraper piston ring are not blocked. If after inspection, you have decided to re-mount the old piston, remember the caution on page 17. Assembling oversized pistons it is necessary to proceed to the boring and honing of the cylinder according to the overbore scale.

Wristpin:
It must fit precisely into the small end bushing of the connecting rod and fit slightly pressed into the mounts in the piston wall. When you change the piston you need to replace the wristpin also. For measurements: see table 2.

Compression Rings:
Verify the status. If abraded or not perfectly adherent to the cylinder for the entire periphery replace it. (See measurement A).
Verify the fit of new compression rings in the appropriate ring grooves of the piston.

The piston ring should turn freely, although with very little play, inside the appropriate ring grooves (see chart 2 table 2). Introduce each piston ring into the barrel of the cylinder. Verify that it lies on a plane perpendicular to the axis of the cylinder (that can be assured by inserting an inverted piston and making the piston support against the edge of the compression ring). Measure the distance between the end gaps of a new piston ring, it must be around 0.3 mm [0.012”]
For oversized pistons, according to the scale of overbore, also ask for the appropriate oversized piston rings.

ASSEMBLAGE.

Assemble the piston rings in the order illustrated by the drawing; two compression rings above, then the oil scraper ring, and in the bottom groove the other compression ring. Before assembling the piston into the cylinder, examine that the end gaps of the three upper rings are approximately at 120° spacing. This facilitates the starting of the motor as soon as it is mounted. However, since there are no locks for the rings, these will move during the period of settlement, achieving an angle divergent from 120°. This is not important because when the piston rings are well fitted, it assures good compression whatever the angle between the piston ring end gaps.

CRANKSHAFT - CONNECTING ROD UNIT

[Notation: Throughout this section, the Italians use a terminology different than Americans. In this section, the HEAD of the connecting rod is the big end attached to the crankshaft journal with roller bearings. The FOOT of the connecting rod is the small end with bronze bushing which attaches to the piston wristpin. I believe this terminology is directly opposite for American usage. Don't get confused.]

DISMANTLEMENT

Loosen the nuts and remove the two bolts which attach the connecting rod end cap. After removing this, take off the small rollers (there are 33) and the connecting rod. Important caution. - don't ever reassemble the old bolts and nuts. Even if you reassemble the same connecting rod which you had taken off, new small bolts must be used.

INSPECTION

Connecting rod:
The internal surface of the head [big end] of connecting rod must present itself very smooth.

The wrist pin bushing in the foot of connecting rod must be well fixed (pressed), it must not show grooves or internal striations. Take care to clean the lubrication holes. Maximum wear: (see chart 3 table III).

If you must replace the bushing, press it into the foot [small end] of connecting rod so that it sticks out for about 0.5 mm on each side and overhaul the hole with a 20 mm reamer.

Small rollers:
Examine them each attentively one by one. They must be intact and very smooth. If not, replace them.

Connecting rod cap:
Verify the internal surface, it must present itself very smooth.

Small bolts for clamping the end cap: [Torque new bolts to 28 ft.lbs. on reassembly]
Important caution. - don't ever reassemble the old bolts and nuts. Even if you reassemble the same connecting rod the rod cap bolts must be replaced with new.

Crankshaft.
Examine the surface of connecting rod main journal. It must present itself very smooth. In a contrary case you need to proceed to grinding or to substitution of the piece.
If you need to grind the connecting rod journal, it is necessary to remove the counterweights. You proceed in this way:

Remove the safety wire from both sides, the two small bolts with the respective washers and the counterweights, take them off toward the interior (bring them toward each other).

If the connecting rod journal is ground, you naturally need to perform the same operation also to the head [big end eye] of connecting rod and replace all the rollers with oversized rollers (see Table 3 for dimensions).

Perform a cleaning of the internal lubrication channel in the crankshaft. In order to achieve this aim, remove the safety wire which fixes the inspection plug in the left side (flywheel side) and unscrew it completely. Wash the channel with solvent injected from the hole of the crankshaft (valve timing side) and dry with a blast of air.

Examine

- The status of the rollers of the load carrying [big end] bearing (see bearing inspection page 26):
- The cone for fastening flywheel:
- The thread for the flywheel fastening nut;
- The surfaces onto which were pressed the inside bearing races of the roller bearing and ball bearing.

Table 3.

Description	Chart	New piece mm	Construction Tolerance + mm	Construction Tolerance – mm	Max wear mm	Observation
Conrod big end bore	A	35.05	0.000	0.015	–	Standard journal requires 33 rollers of 3 mm diameter.
Crank pin dia.	B	29	0.010	0.005	–	
Conrod wrist pin bore	C	20	0.007 0.028	–	–	
1st oversize conrod bore	A	35.30	0.000	0.015	–	1st oversize requires 31 rollers of 3.25 mm diameter.
1st oversize crank pin dia.	B	28.75	0.010	0.005	–	
2nd oversize conrod bore	A	35.55	0.000	0.015	–	2nd oversize requires 28 rollers of 3.5 mm diameter.
2nd oversize crank pin dia.	B	28.5	0.010	0.005	–	

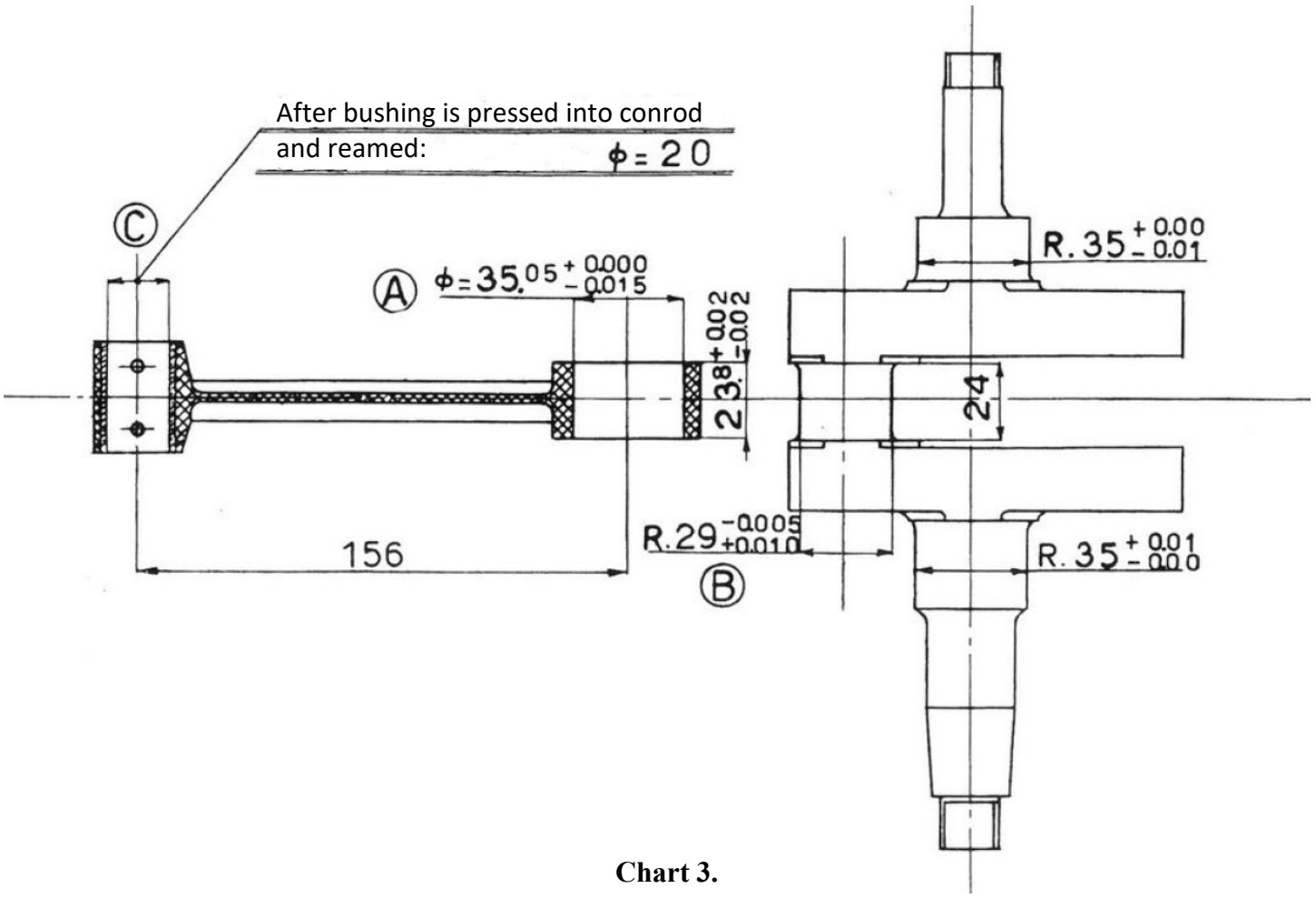


Chart 3.

ASSEMBLAGE

In order to mount the connecting rod roller bearings onto the connecting rod journal, the counterweights and the inspection plug, proceed by reversing the operations of dismantlement.

Before mounting the connecting rod you need to examine its trueness; that is you need to verify that the two holes of the head and the foot of the connecting rod are parallel and collimated. The possible deformations can be corrected by working on the stem by means of forked wrenches and twisting the connecting rod stem in contrary direction to the discovered deformation.

In order to fit the small rollers onto the crankshaft and conrod proceed as follows:
Set the connecting rod into a vice [with the big end facing up], drip some dense oil and apply the small rollers. Lay the crankshaft onto the connecting rod, coat the exposed journal with dense oil and apply the remaining rollers (see figure 20).

Affix the cap and (new) rod bolts. Secure the nuts just enough to make the mating surfaces of the cap adhere lightly to those of the connecting rod. Then tap around the periphery of the head [big end] of connecting rod with a wooden mallet. Move the connecting rod in both directions in such a way to achieve a perfect arrangement of the small rollers. Alternate tightening of both nuts of the clamping bolts to the bottom. [Torque to 28 ft.lbs.] Peen the ends of the bolts to prevent the nuts loosening accidentally.

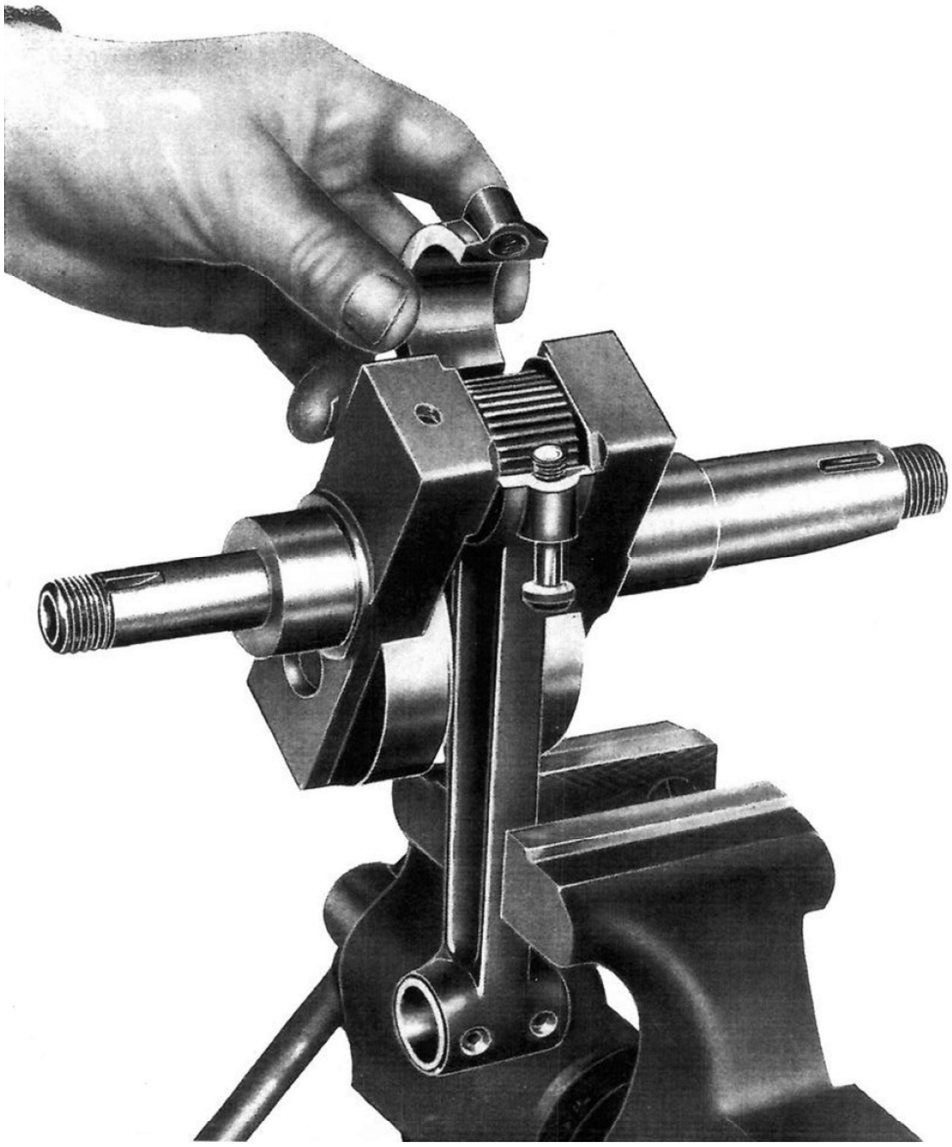


Fig. 20 – How to assemble the connecting rod and the needles on the crankshaft.

Caution. - don't forget to assemble the safety wires for the lubrication channel inspection plug and the small bolts attaching the counterweights. This omission could be a cause for loosening of the pieces cited above with serious consequences for the motor. The spacer spool, the slotkey, the drive gear for the oil pump and the relative attachment nuts are all assembled after the crankshaft is already contained between the two crankcase halves (see Final Assemblage of the Motor).

CAMSHAFT AND VALVE TIMING UNIT

This unit includes:
- The axle for the intake and exhaust cam.
- The intake and exhaust cam with the relative drive gear in a single piece.
- The pivot with camfollowers and rollers for driving the pushrods.
- The pushrods.
- The rocker arms.

Cam Axle:
Inspect the axle for mounting the intake and exhaust cam, it should be lightly pressed into the crankcase casting. Check the external surface of the piece: it must be polished and smooth.
If you discover cracks, grooves, etc., you need to substitute. For the play between axle and bushings (see chart & table 4).

Camshaft:
Examine the work surface of the cam. It must present itself smooth. If there are deep scratches or nicks replace the piece.
- The teeth of the drive gear. If worn out or damaged, substitute.
- The status of maintenance of the internal bushing. For the wear tolerance (see chart 4).
- Take care to clean the small duct for oil.

Axle with camfollowers and rollers for driving the pushrods.
DISMANTLEMENT.

Take off the camfollower axle toward the exterior. You will release in this way (from the internal toward the external) the intake camfollower, the spacer ring, the exhaust camfollower.

INSPECTION.

Inspect the status of the camfollower axle which should be lightly pressed into the crankcase casting; check the external surface of the piece: it must be polished and smooth. If you discover cracks, grooves, etc., you need to substitute. For the play between pin and bushings (see chart 4 table IV).
- The inside surface of the two bearings of the camfollowers must present themselves smooth. In a contrary case replace them. In order to perform this, press the appropriate bushing and overhaul with a 13 mm reamer.
- The medial spacer ring must be smooth on the sides and in the hole. The thickness of a new piece is 2 mm, maximum wear is 0,08 mm, diameter of the hole is 13,2 mm.
- The status of the external surface of the rollers must be smooth and they must turn freely around their own pivots.
- The play of the rollers in the camfollowers: It must not be greater than 0,20 mm. In a contrary case replace the small pivots, bushings and rollers. After you have peened the new roller pivots you need to eliminate the prominences on both sides. [Set the two cam followers and the central spacer ring onto the pivot axle. Make certain that the peened ends of the roller pivots don't hit each other as the camfollowers work back and forth past each other. Grind off any excess on the peened ends of the roller pivots to provide a good clearance between these passing parts.] The play for a new piece must not be less than 0,08 mm. At this play you will avoid that the rollers bind into and damage the profile of the cam.

Table 4.

Description	Chart	New piece mm	Construction Tolerance + mm	Construction Tolerance – mm	Max wear mm	Observation
Valve clearance						0.20 mm for initial assembly. See description
Rocker arms	B	15	–	0.01 0.02	– 0.05	Difference between max. and min. diameter (out of round ovalization)
	C	5	–	–	+ 0.5	
Camfollowers	H	13	0.016 0.034	–	+ 0.15	
	G	5	–	–	+ 0.5	
Bushing for rocker arm	A	15	0.02	0.01	+ 0.15	
Bushing for cam	D	16	0.032 0.050	–	+ 0.15	
Axle pin for cam	F	16	0.012	0.006	– 0.1	
Pivot pin for camfollowers	E	13	0.012	0.006	– 0.05	Difference between max. and min. diameter (out of round ovalization)

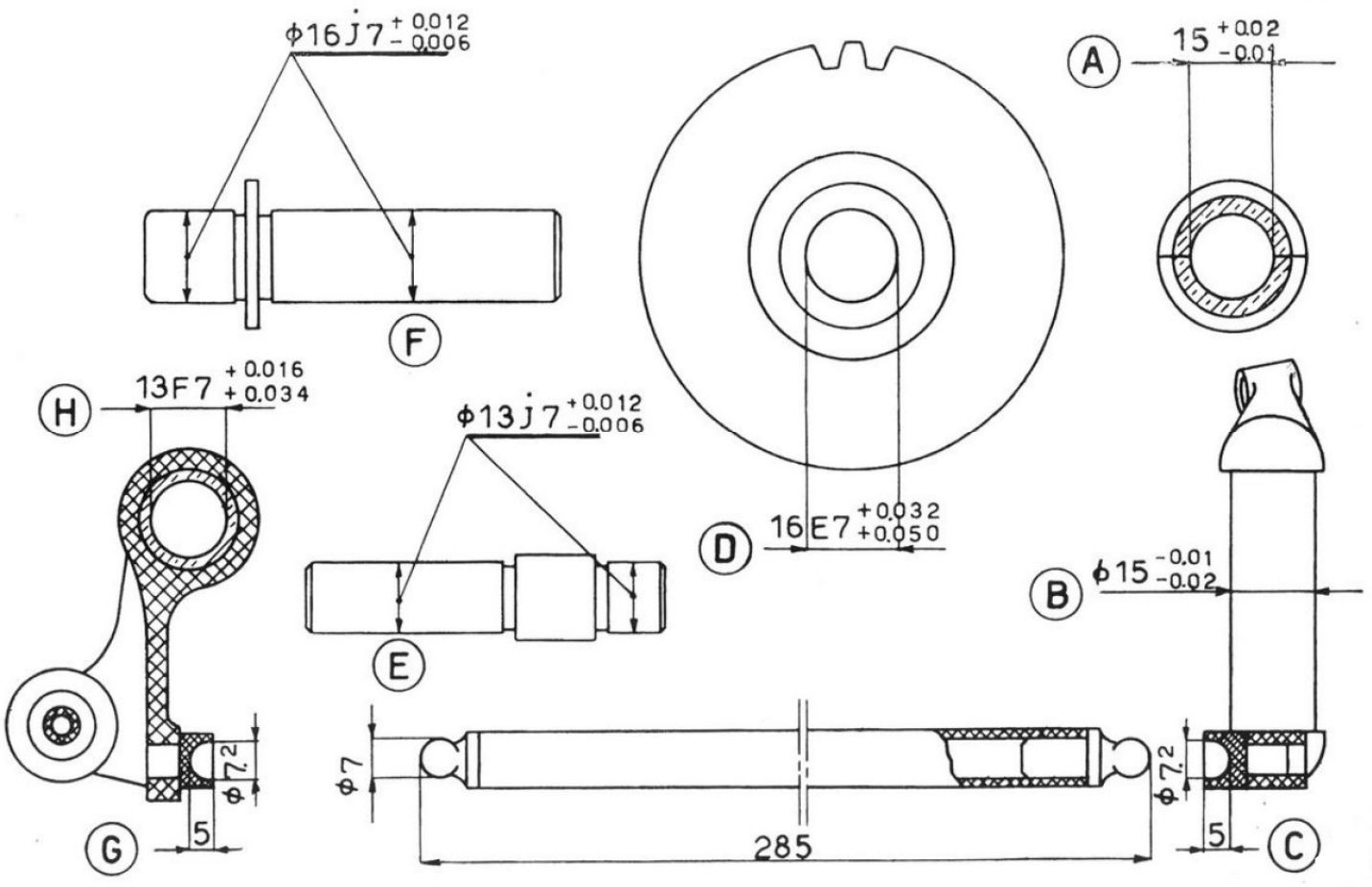


Chart 4.

ASSEMBLAGE.

Reverse the operation of dismantlement.

The pushrods which drive the intake and exhaust rocker arms:

INSPECTION

They are tubular pushrods with hemispherical ends, refer to their shape (see table IV).

Check that the shafts are straight and true and that the wear at both ends is not excessive.

- Do not try to exchange the two ends. They are force fit and by removing them, the seats will widen in such a way as to not render certain the retaining of the two new ends. Therefore it is advisable to exchange the complete pushrod.

ASSEMBLAGE

Put mastic onto the flange of the pushrod cover tube, thereafter mount it onto the crankcase by means of the two appropriate captive studs. Insert the two push rods and install the rocker arm carrier box. Put the motor in the phase of top dead center of compression (TDC) and perform the adjustment of the valves. [the ends of the pushrod tube fit closely around the pushrods to guide them into the cups on the cam followers and rockers during assembly. Wear in cam follower and rocker pivots can lead to wear in the guide holes making it difficult to align pushrods when installing the rocker box.]

For the adjustment of the valve play you use an 11 mm wrench and a screwdriver. The lock nut is loosened, and you tighten or loosen the screw which works on the stem of the valves. By tightening the screw, the play is decreased and vice versa. [Initially valves need to be set at 0.20 mm to confirm valve timing (see **Synchronization of cam and valves** in Final assembly of the Motor).] After timing is confirmed the running clearance can be set - 0.05 mm (0.002”) for the intake and 0.3 mm (0.012”) for the exhaust. Check the aforementioned play with the appropriate size feeler gauge. After adjusting the valves, tighten the adjuster screw locknut securely by hand.

Caution. - Check the valve play again after completing the job. It could happen that as the locknut is tightened, it drags the screw along and in that way the play is decreased.

Rockerbox: Rocker arms for exhaust and intake.

DISMANTLEMENT

Unscrew the 7 nuts and take off the outer portion of the box from the captive studs along with the two half bushings. Remove the rocker arms and observe the measurements. Refer to table 4. Check that the felt seals are in perfect efficiency. In a contrary case replace them. For the assemblage reverse the operation of dismantlement.

Check the status of maintenance of the mating surface of the cover. In order to remove all traces of sealant, use a good, beveled scraper, wash with alcohol and dry with clean rags. Remember that if the mating surfaces are not perfectly clean, the perfect retaining of oil won't be achieved. [The upper half of the bronze bushings carry the most load but there are no pins or locking screws to hold them in place, consequently any play leads to wear into the aluminum cover of the rocker box. Ensure there is no movement of the bushing’s upper half.]

The valve adjusting screws are on the rocker arms.

INSPECTION

Observe that the threads of the adjusting screws and nuts are intact. In a contrary case replace them. Inspect the wear on the convex portion of the screws and if consumed, replace them.

CLUTCH AND KICKSTARTER UNIT.

DISMANTLEMENT.
See chapter "dismantlement of the motor." [The clutch pack is on the left side of the engine under the primary cover, but the clutch springs and clutch adjustments are carried out on the right side of the engine under the clutch arm cover.]

INSPECTION.
This unit includes: (from the outside to inside) [right to left in fig. 21] Pressure plate disk, clutch disks, helical gear with clutch body, clutch hub [“fixed body”] attached to input shaft of transmission.

Pressure plate disk:
Examine, with a straight edge ruler, that the face which bears onto the friction disks is flat. In a contrary case replace the plate.
- If there are light scratches overhaul the piece on a lathe. If the scratches are deep, replace the piece.
- That the threads for the control rod are intact. [bad threads here will quickly result in a clutch that won’t disengage.]

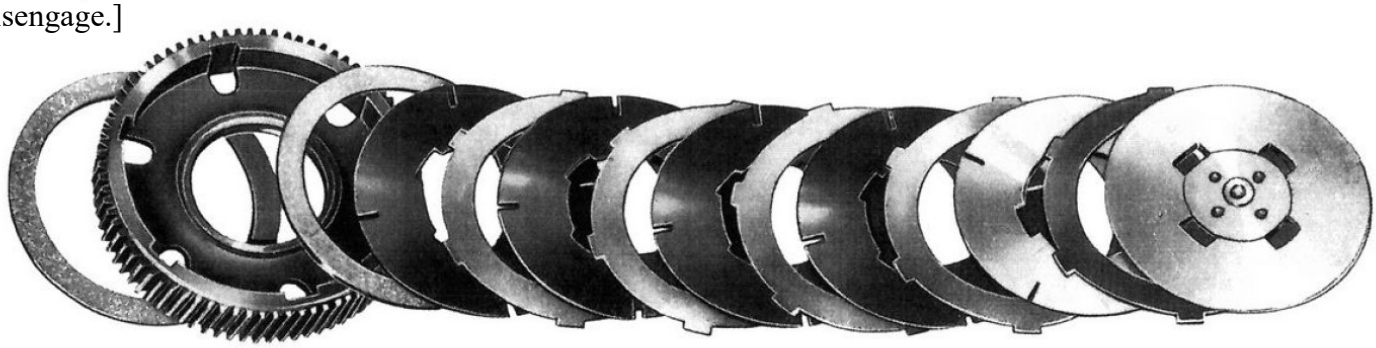


Figure 21- Dismantled clutch (notice the order of assemblage of the varied pieces).

Clutch Disks:
There are two composed of clutch lining material, five of steel and five of phosphorous bronze. They must not be scored, deformed or very much worn. If you discover scratches, deformations or excessive wear replace the pieces. The initial thickness of the disks of phosphorous bronze is 1,0 mm, they can erode until they are at 0,8 mm. The initial thickness of the disks of clutch lining material is 3,0 mm, they can erode until they are at 2,4 mm. However, if cracks are discovered it is opportune to substitute even if they are not yet fully consumed. The initial thickness of the disks in steel is 1,0 mm, they are not subjected to appreciable wear. They are replaced only if deformed.

Helical gear with clutch body:
Inspect the profile and the consumption of the teeth of the gear; observe if there are chipped or broken teeth, observe that the surface of the bushing pressed into the gear has not suffered from cracks or wear greater than 0.3 mm (new bushing diameter is 60 mm +0.06 to +0.10). In such case substitute the entire piece or the bushing.

Clutch Fixed Body: [clutch hub]
It is mated to the main shaft of the transmission to which it is joined through conic coupling, slotkey and locking nut.

See chapter "dismantlement of the motor" to remove clutch hub. [p22 Last paragraph explains how to correctly support the bearing when removing the mainshaft from clutch hub and removing hub from bearing.]

Verify that the friction surface, at the outside (where it works upon the friction disks) is flat and not scratched.
- That the four engaging teeth are straight and smooth on their outer surface.
- That the interior cone is in perfect condition.
- That the recess for the slotkey doesn't show any wear.
If it shows a contrary case, substitute the piece.

Control Rod:
Inspect that the thread which serves to screw the rod into the pressure plate disk is intact. [this can be worn or stripped along part of its length which quickly leads to being unable to disengage the clutch]
- That the rod is straight and true.
- That the ball bearing pressure support (at the right extremity) assembled onto the control rod is efficient. If worn, replace the complete piece.
- That the small tempered cap [or cup] over the ball bearings has not been consumed [or pitted] by pressure from the lever. Maximum wear at the center is 0.8 mm.

Clutch Spring Support Disk and Kickstarter Freewheel Gear:
Examine the condition of each piece. That the disk has not been deformed.
- the kickstarter freewheel gear spring, when new and unloaded, has a length of 20 mm and needs 2 Kg in order to compress it to a length of 6 mm (shortening by 14 mm). If, when compressed to 6 mm it produces less than around 1.5 Kg force, you need. replace it.
- The kickstarter freewheel gear. It must not show broken or damaged teeth. Inspect the frontal teeth as well as the kick lever engaging teeth. It requires that the frontal teeth preserve their original profile which is of the shape of a right-angled triangle. If damage is discovered, replace the piece.

Toothed Fixed Sleeve for Kickstarter:
Verify the status of the thread which serves to unite it to the main shaft of the transmission.
- the frontal teeth (like the kickstarter freewheel gear).

Springs for loading the clutch:
There are two concentric. The external spring, new and unloaded, has a length of 45 mm and requires 86 Kg in order to compress it to a length of 25 mm (shortening by 20 mm). If compressed to 25 mm and it returns less than around 78 Kg force, you need to replace it. The inner spring, new and unloaded, has a length of 43 mm and requires 70 Kg in order to compress it to a length of 25 mm (shortening by 18 mm). If compressed to 25 mm and it returns less than around 63 Kg, you need to replace it.

Threaded sleeve for adjusting the clutch:
Inspect that the thread is intact.

External control lever on the aluminum lid:
Inspect the play between the pivot and the lever. It must not exceed 0,2 mm on the diameter.
- The wear of the screw which bears on the small tempered cover [cup] over the ball bearings of the clutch control rod. For a new piece the tempered hemispherical portion of this screw projects around 3.5 mm from the mating surface of the control lever. If flattening of the tempered contact end is observed it is necessary to replace the screw.

CLUTCH ASSEMBLAGE.
Reverse the order of dismantlement (see chapter "dismantlement of the motor").

The disks are mounted in the order of which they had been removed (see figure 21). They must be clean and lightly joined. The clutch control rod must screw into the pressure plate disk so that it projects out the exposed side for about one thread. It is important to verify that the maximum stroke of the clutch control rod and of the pressure plate disk (when the control is moved to the "fully disengaged" position) are certain to prevent the exit of the pressure plate disk from the four frontal engaging dogs of the fixed body, and of the outermost friction disks from the perimeter notch recesses of the revolving helical gear body. If that is discovered, then you need to screw the control rod further into the pressure plate disk.

The knurled disk which adjusts the compression of the clutch pressure springs must be screwed in so that the length of the clutch pressure springs is reduced to a final length of 27 mm. [The final clutch spring loaded length measurement should be taken with the clutch fully engaged - hand off the lever.]

Verify, during assembly, that the two clutch pressure springs remain concentric as regards the main shaft of the transmission onto which they are mounted, rotate all the assembly together by hand.

Adjustment of the clutch.
In practical usage, three drawbacks could present themselves:
Grabbing: the clutch grabs and jumps, that is, the coupling is abrupt and violent.
Grabbing clutch could be caused by:
- Clutch pressure springs too tight or overloaded. Remedy: loosen the knurled adjusting disk.
- Disks might be consumed or deformed: replace them.
- Impurity between the disks. Perform a solvent washing. Introduce some [half liter?] solvent into the upper hole located in the left half of the crankcase [the plug is adjacent to the breather pipe]. After having made clutch rotation by hand and moving the control repeatedly, discharge the solvent from the lower plug hole.

Slipping: the clutch slips, sliding between the disks even when the control is the "fully engaged" position.
Slipping clutch could be caused by:
- Clutch pressure springs too weak. Remedy: tighten the knurled adjusting disk or replace the springs.
- An absence of play between the external control lever and the internal control rod. Adjust the aforementioned play (around 0.2 mm) working on the appropriate cable adjuster situated on the end of the flexible conduit sheath.
- Excessive seepage of oil into the clutch. Remedy: wash with solvent. Frequent repeating of this drawback requires that you observe the status of the checkball valve above the transmission and clean the duct which discharges oil onto the chain.

Dragging: the clutch doesn't disengage completely. Verify if there is drag between the fixed clutch body and the rotating helical gear when the control is in the "fully disengaged" position. That is a reason for difficult startup and noisy gear changes.
Dragging clutch could be caused by:
- Excessive play between the external control lever and the internal control rod (adjust the play; see above).
- Excessive sagging of the control cable conduit: replace it.
- Soiled disks: perform a washing (see above).

Kickstarter.
Verify the condition of the teeth of the toothed arc.
- the control shaft must be straight and true.
- the rebound spring: if weakened replace it.
[Check also for excessive wear in the crankcase casting where the kickstart shaft passes through the back of it.]

TRANSMISSION UNIT

DISMANTLEMENT. See the chapter on "Dismantlement of the Motor."

INSPECTION

The Mainshaft.

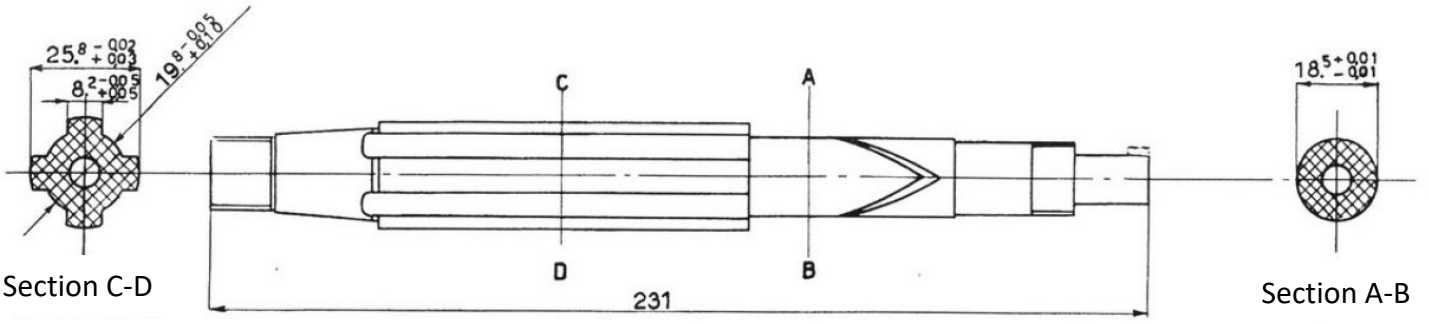
Verify:

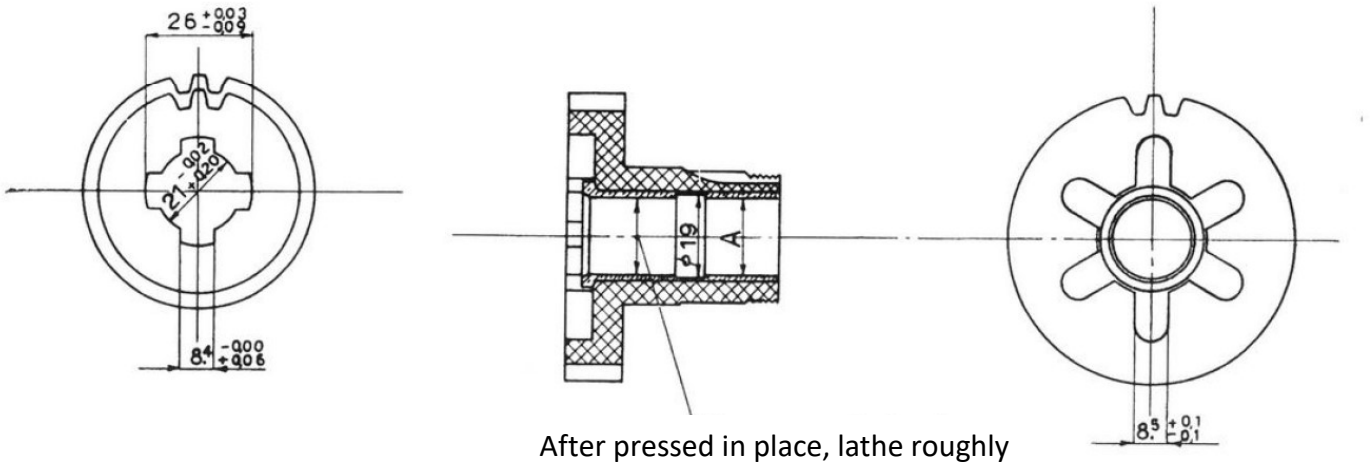
- the completeness of the threads at both ends.
- the surface of the taper for coupling into the clutch fixed body must present itself very smooth.
- the condition of the keyway slot. Examine that the key is not loose in the keyway [no play].
- the condition of the four splines onto which the two mobile gears slide (view Table 5).
- the surface upon which runs the bushing of the direct drive gear; it must be smooth.
- the radial play of the mainshaft. Inspect by setting the mainshaft between two opposing points [in a lathe or on a wheel truer or balancer] and verifying runout with a dial indicator. If you observe a radial runout greater than 0.05 mm you need to straighten the shaft under a press.

The spacer ring [#62] on the mainshaft left side is assembled with the flat portion against the ball bearing. Verify that this ring has not deformed.

Table 5.

Description	Chart	New piece mm	Construction Tolerance		Max wear mm	Observation
			+ mm	– mm		
Bushing for direct drive gear	A	18.58	0.01	0.01	+0.06	





After pressed in place, lathe roughly to 18,5 +/- 0.02 then ream precisely to 18,58 +/- 0.01.

Chart 5.

Sliding gears.
There are two. One single cog gear with frontal engaging dogs and gear cogs for the third and fourth speed. One with double gear cogs for the first and second speed. Verify the play between the shift forks and the recesses: it must not exceed 0,4 mm.

Direct Drive Gear.
Verify:
- the status of the gear teeth and of the frontal engaging dogs.
- the condition of the threads onto which the notched nut for clamping the chain sprocket is tightened.
- the surface of the gear shaft must be very smooth where it rides in the internal ball bearing race.
- the internal bushing must be free of grooves, scratches, etc.
- take care to clean the small oil duct by blowing with a blast of air.

For the nominal play and wear tolerance of the shafts and bearings (see chart 5 and table 5),
The Spacer Ring [#67 in parts diagram below] is assembled with the flat portion toward the bearing.

Secondary shaft of the transmission.
Inspect:
- the condition of the teeth of the individual gears.
- the radial runout play of the secondary shaft (see the inspection of the mainshaft).
- the two ends must be very smooth where they ride in the internal bearing races of the ball bearings.
- the two spacer rings are of different thickness. The thinnest is assembled normally to the right (that is from the side of the direct drive gear). They are assembled with the flat side against the ball bearings. Check that they are not deformed and that they have the desired thickness.

The Grooved Cylinder with shift forks for control of the sliding gears. [gear selector camshaft]
Check:
- the two ends of the cylinder (supports for bushings in the crankcase); they must present themselves smooth.
- the condition of the teeth of the small sprocket.

If it is considered necessary to dismantle the shift control forks from the cylinder it is necessary to:
- remove the iron safety wire.
- the tempered screw which works in the groove of the cylinder.
- the plug, the spring and the ball bearing for catching gears [detent]. You will thus be able to remove the two shift forks.

Inspect:
- the surface of the cylinder: it must be smooth.
- the groove must present smooth sides.
- the tempered screw must not be consumed at the end.
- the shift control fork must not be worn.

Reassembly: **[gear selector camshaft]**

In order to reassemble the gear selector camshaft, reverse the operations of dismantlement.

The Shift Control Shaft with Toothed Arc.

Check:

- the ends (where it will run in the bushings of the crankcase) must be smooth.
- the condition of the thread must be complete.
- the condition of the teeth of the toothed arc must not be worn.

ASSEMBLY OF TRANSMISSION:

Important cautions for the general assemblage of the transmission. All the pieces which make up this unit are assembled in the left crankcase half (view figure 22), except for the direct drive gear which is assembled into the appropriate bearing in the right crankcase half. Using an aluminum punch, press the clutch fixed body into the internal bearing race of the appropriate ball bearing mounted in the left crankcase half. It is necessary, in order to prevent ruining the bearing, to use the support pipe which had been previously used for mainshaft removal (see page 23). Support one end of the pipe on a solid base and the other on the internal bearing race of the bearing.

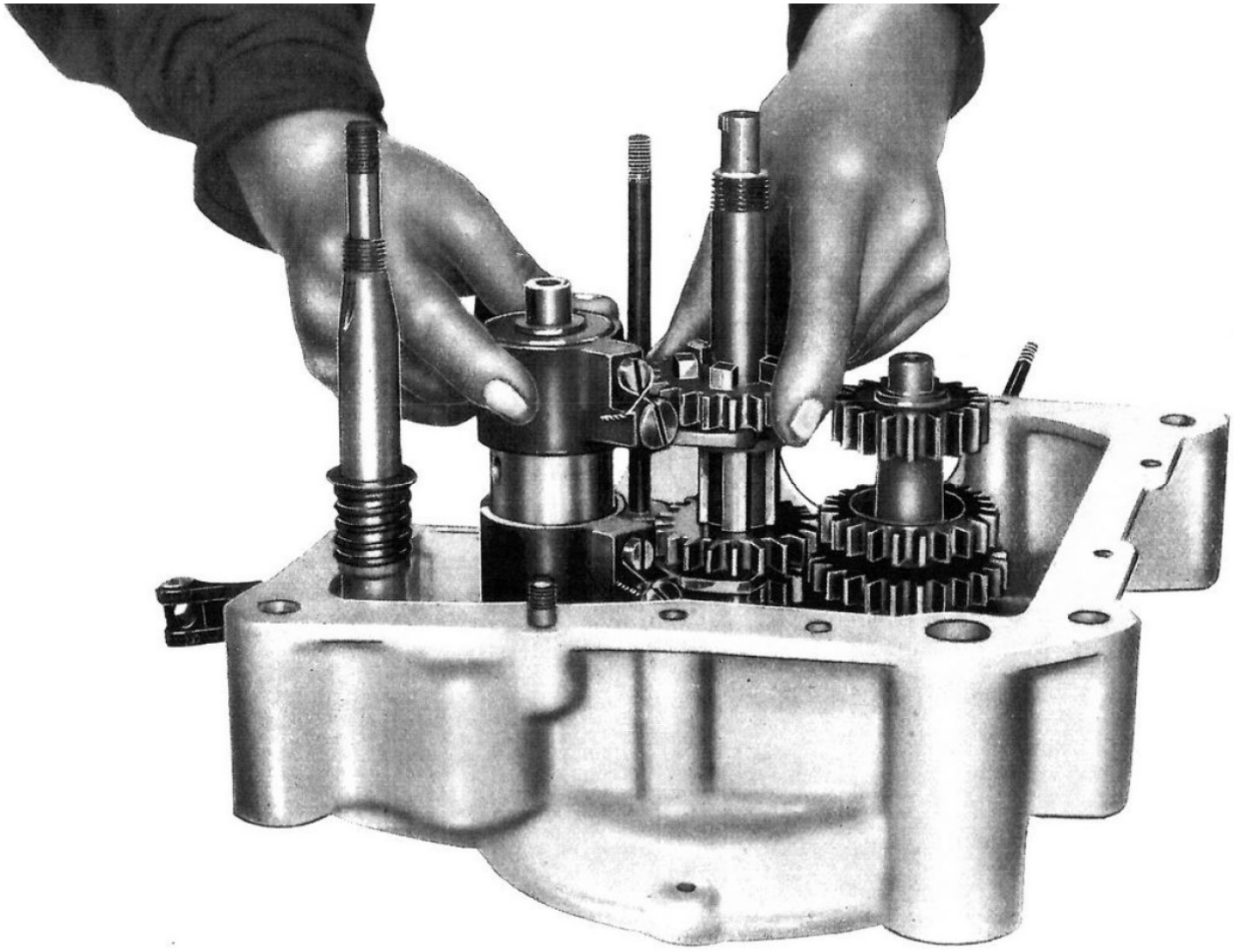
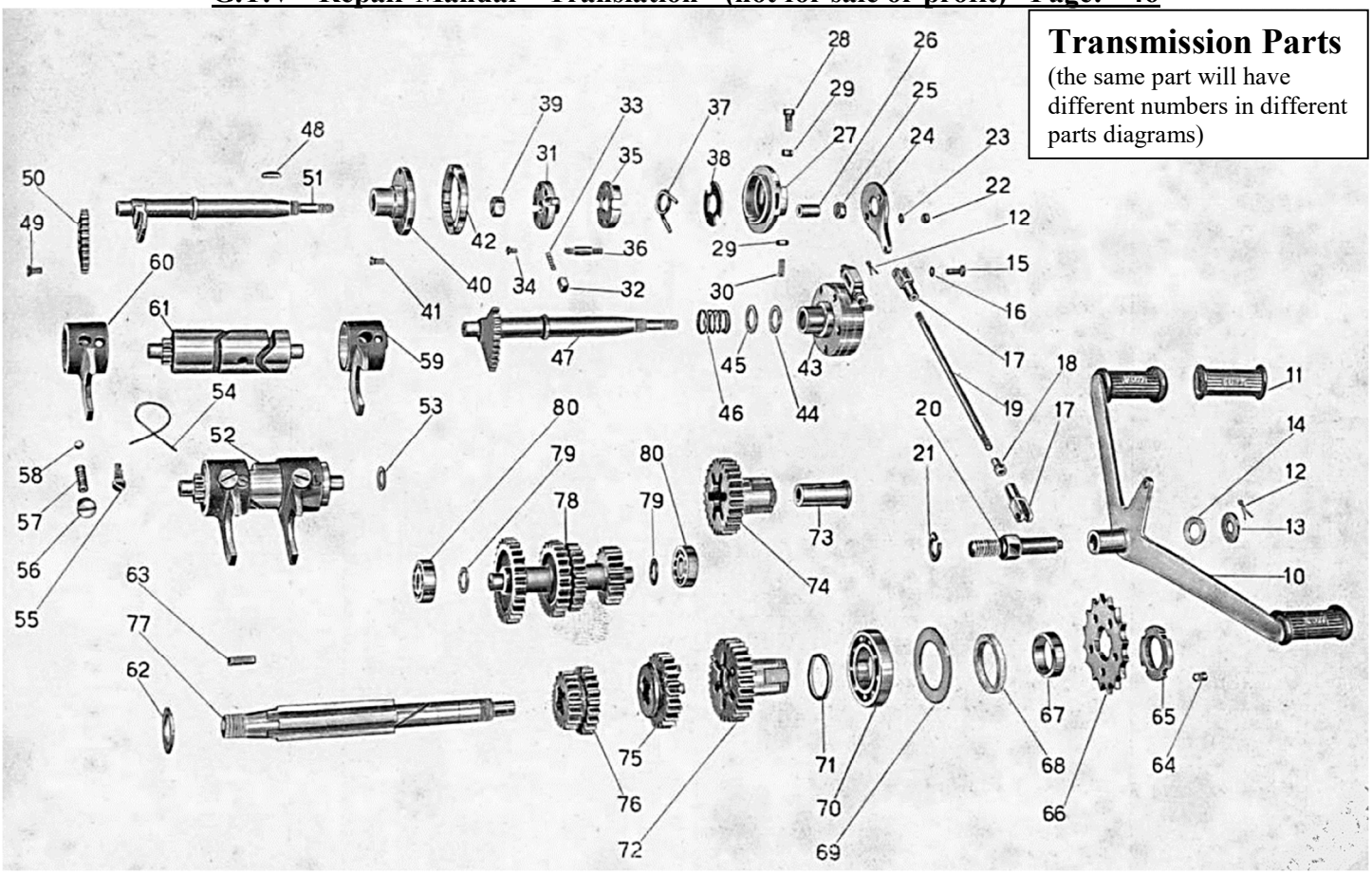
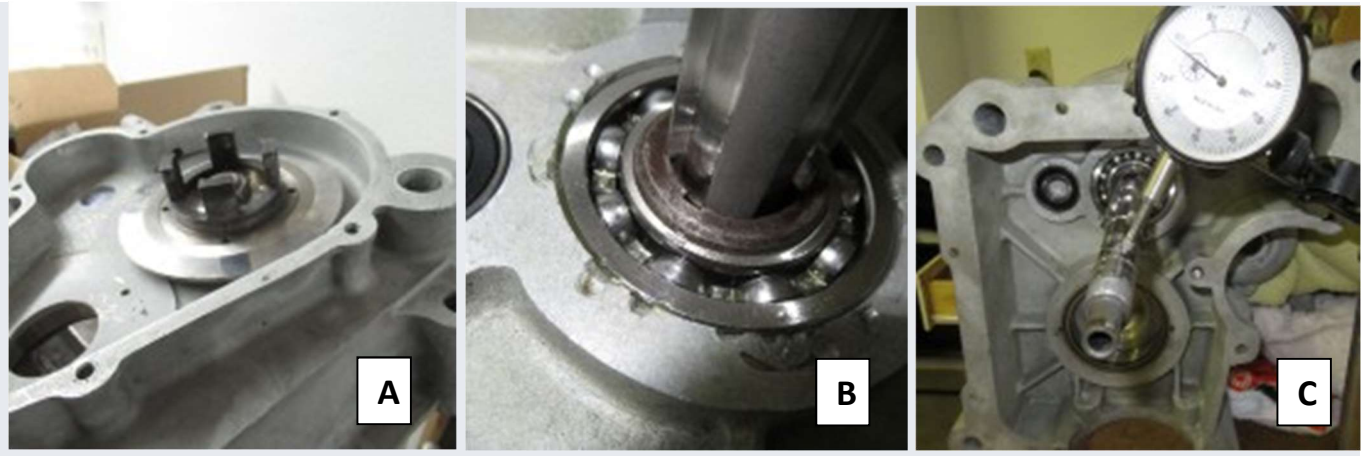


Figure 22- How you must assemble the gear change into the left half of the crankcase.

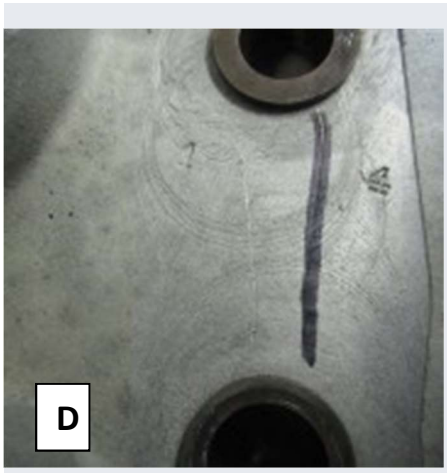


Assemble the mainshaft by aligning the keyway and inserting the tapered end into the taper of the clutch fixed body. Don't forget the spacer ring which is assembled with the flat side toward the bearing [#62 in parts diagram – left side bearing not shown. photo B].



Beat the mainshaft with light blows from a wooden mallet in such a way to make the surface of the clutch fixed body female cone [taper] contact and adhere well to the mainshaft male cone [taper]. Capsize the crankcase and fasten the mainshaft in a vice [remember to protect the shaft from the vice jaws]. Apply the fastening nut and tighten to the bottom. [photo A] Verify if the mainshaft remains centered and true after completing the operation. [photo C] If not, align it with light blows of a wooden mallet and rotate the mainshaft by hand, measuring if there is movement at the free end.

Assemble the shift control shaft [#47 in parts diagram] with its toothed arc in position 4, namely that the 4 punched in the casting coincides with the 4 marked on the same toothed arc. [mine had a line scribed in the case – photos D & E] Insert the secondary gear cluster [#78] with the small gear up. Don't forget the appropriate spacer rings. [Despite both being part #79 the two spacers are of different thickness. The thicker spacer is normally installed on the left (clutch end) of the cluster gear and the thinner on the right (up) end closest to the direct drive gear. The spacers are assembled flat side against the bearings.]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E


F

Take the shift control cylinder and shift fork cluster [camshaft] and prepare it so that the upper shift fork (right) aligns with upper end of the cam cylinder. The lower shift fork (left) must be in line with the first [photo F]. In this way, you will be able to insert the two sliding gears [#75 & 76] into the clevis forks, the single cog gear into the upper shift (right) fork and the double cog gear into the lower (left) shift fork. Thus, the complete cluster can be assembled into the left crankcase half. Remember the spacer ring [#53] on the right end of the shift control cylinder [camshaft].

[Note: it is easy to get the shifting off by one tooth and impossible to correct without splitting the cases. To confirm that cam and control shafts are engaged correctly, temporarily install the right-side crankcase and install the shift control ratchet aligned with its anchor pin – photo H. If the indicator aligns on #4 then the teeth are engaged correctly. If not, the indicator will fall about halfway between 3 & 4. A punch mark at the shifter shaft keyway will allow you to confirm alignment during final assembly – photo I.]


G

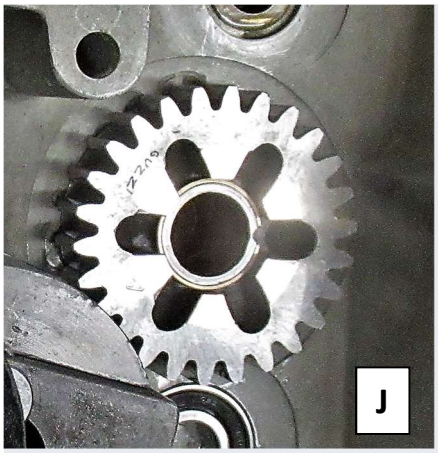

H


I

Direct Drive [4th] Gear.

Before assembling the direct drive gear into the appropriate ball bearing in the right crankcase half (valve timing side) you need to verify the important specified end play between the right end of the splines on the mainshaft and the recessed face of the direct drive gear and bushing [photo J].

Install the direct drive gear onto the mainshaft and bring the direct drive gear up near to the front face of the mainshaft splines. Set and measure the specified gap between the face of the direct drive gear busing and the end face of the mainshaft splines at 0.2 – 0.3 mm. [0.008" – 0.012"] While this play space measurement is maintained [0.008" – 0.012" shim], carefully measure the relationship or distance between the right end of the mainshaft and the external face surface of the direct drive gear. [photo K. Write down that measurement.]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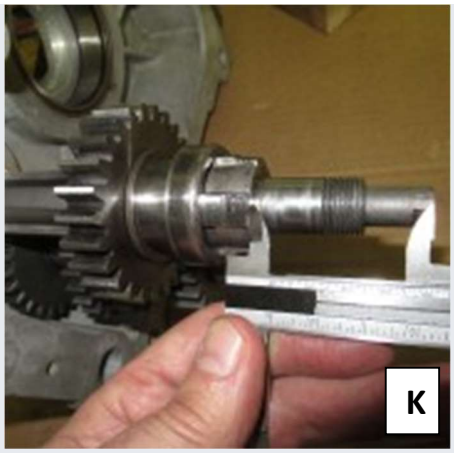
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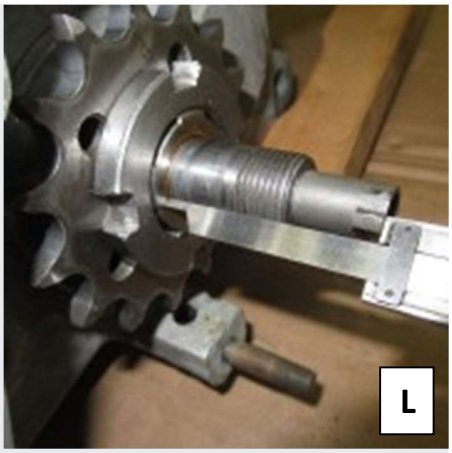

L

Now, remove the direct drive gear from the mainshaft and assemble it into the appropriate ball bearing in the right crankcase half (don't forget the spacer ring [#67 & 71] which is placed with the flat side turned toward the ball bearing). Thereafter, gently and provisionally close the two crankcase halves together. After you have verified that the crankcase mating surfaces are well adhered, again measure the relationship distance noted above between the right end of the mainshaft and the external face surface of the direct drive gear [photo L].

If the external measurement is unchanged, it means that the specified internal play has stayed effectively the same (that is 0.2 – 0.3 mm).

If the external measurement has decreased, the specified internal play has increased (a maximum play of 1 mm could be tolerated and therefore a decrease of about 1 mm in the external measurement). If this limit is exceeded, you will need to replace the spacer ring between the direct drive gear and the ball bearing with another of greater thickness. [if steel spacer in the case under the bearing (#69) is missing, the external measurement will decrease about 2mm.]

If the external measurement has increased, the specified internal play has decreased, you then need to replace the spacer ring between the direct drive gear and the ball bearing with another of lesser thickness.

Notation - This verification is necessary whenever you have replaced the mainshaft, the direct drive gear, the relative bearings, or the spacer rings. If you are reassembling the original parts, this verification can be omitted.

[Be certain you understand this complex measurement. The internal play specification is important to prevent bushing and bearing wear and to prevent any binding of the mainshaft against the direct drive gear. The mainshaft is mounted into the left crankcase half and the direct drive gear is mounted into the right crankcase half. The required play specification cannot be measured after the crankcase halves are closed together. So, this technique allows one to set up the mainshaft and direct drive gear at the specified play amount and take an alternate external relationship measurement. Then, after closing the crankcase halves, you can interpret

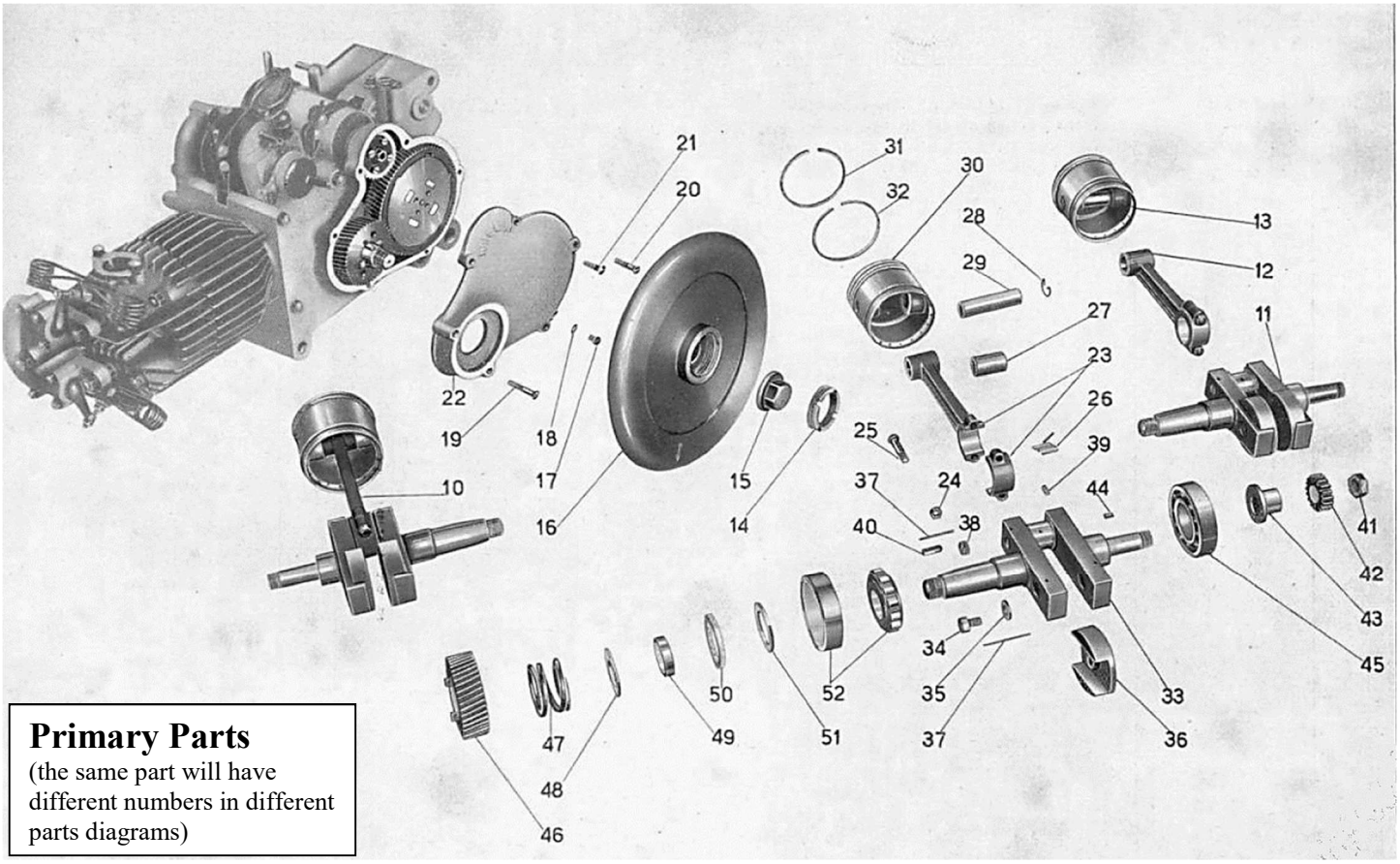
changes in the internal play from any measured changes in the external relationship of the direct drive gear and mainshaft.

I have translated these instructions as originally written. It seemed odd that Guzzi requires you to set and hold the direct drive gear away from the mainshaft spline face at such a minor tolerance amount and then measure the exposed shaft relationship. It would seem easier and more reliable to just put the direct drive gear flush against the mainshaft spline face (zero play) and then take your measurements. However, I then realized that if you close the crankcases and measure the external relationship of the shafts and the measurement stays the same, you would never know if the internal play was actually zero, or if the gear and shaft were now binding and pre-loaded against each other! Using Guzzi's clever technique, you get a true interpretation of the resultant closed case play allowing for both increases or decreases. Stick to the Guzzi technique! When setting up the direct drive gear against the mainshaft spline face, you might insert a precise thickness washer or wire gauge at the 0,2 - 0,3 mm dimension in order to securely hold the gear at the required specified play while you take the original measurement of the relationship of the end of the shaft and the external exposed face of the direct drive gear.]

FINAL DRIVE UNIT (primary gears, chain and sprockets)

This unit includes:

- Primary drive helical gears on the motor and on the transmission;
- Chain drive sprocket;
- Rear wheel sprocket;
- Drive chain;
- Rear wheel drive hub coupling.



Primary Parts
(the same part will have different numbers in different parts diagrams)

INSPECTION

Helical gear for crankshaft. [#46 in Primary Parts diagram]
Inspect the status of the teeth and of the two frontal engaging dogs which join this gear to the flywheel. They must be in perfect condition. The slotkey [#40] must not show any flaws and it must fit into the appropriate recess of the crankshaft without any play (lightly forced).

Spring for crankshaft helical gear. [#47 in Primary Parts diagram]
A new piece, when unloaded is 32 mm long and it needs around 70 Kg in order to compress it to the length of 19.5 mm. If this spring produces less than 55 Kg when compressed to 19.5 mm, replace the piece.

Spring support ring. [#48 in Primary Parts diagram]
Verify that it is flat and not worn (otherwise replace it).

Oil seal ring [#49 in Primary Parts diagram]
It must be smooth and free from scratches. Assemble with the chamfer to the inside.

Helical gear with clutch body for transmission mainshaft.
Inspect the profile and the consumption of the teeth of the gear; observe if there are chipped or broken teeth, observe that the surface of the bushing pressed into the gear has not suffered from cracks or wear greater than 0.3 mm (new bushing diameter is 60 mm +0.06 to +0.10). In such case substitute the entire piece or the bushing.

[Primary Cover Installation: Install the generator with rubber seal between the generator body and left crankcase. Install the generator drive gear. The original gear was phenolic; they are now available in aluminum (Note – the Falcone gear is similar but doesn't fit.). Tighten the nut on the drive gear securely - use blue locktite or a locktab. This nut often works loose. Adjust the play between the drive gear and the helical transmission gear by rotating the generator body in its cradle, then clamp in place with the strap clamps.

Install oil seal ring #49 with chamfer to the inside. Install spring support washer and spring. Install helical crank gear – it can be held in place with key #40 if the spring is compressed and key inserted into keyway.

Install cover with sealant. *Caution:* The 6 cover screws must be tightened and loosened equally and simultaneously because, once the flywheel is removed, the full force of the crank gear's thrust spring is pushing against the cover. This caution is useful for dismantling and imperative for assembly, otherwise the thrust spring pressure might deform or break the cover.**]**

[Rear Drive]
Chain drive sprocket.
Inspect the profile of the teeth. If they are very worn replace the piece.

The notched nut for fastening the chain drive sprocket.
Inspect that the inside thread is complete.

Rear wheel sprocket.
Inspect the profile of the teeth. If they are very worn replace the piece.

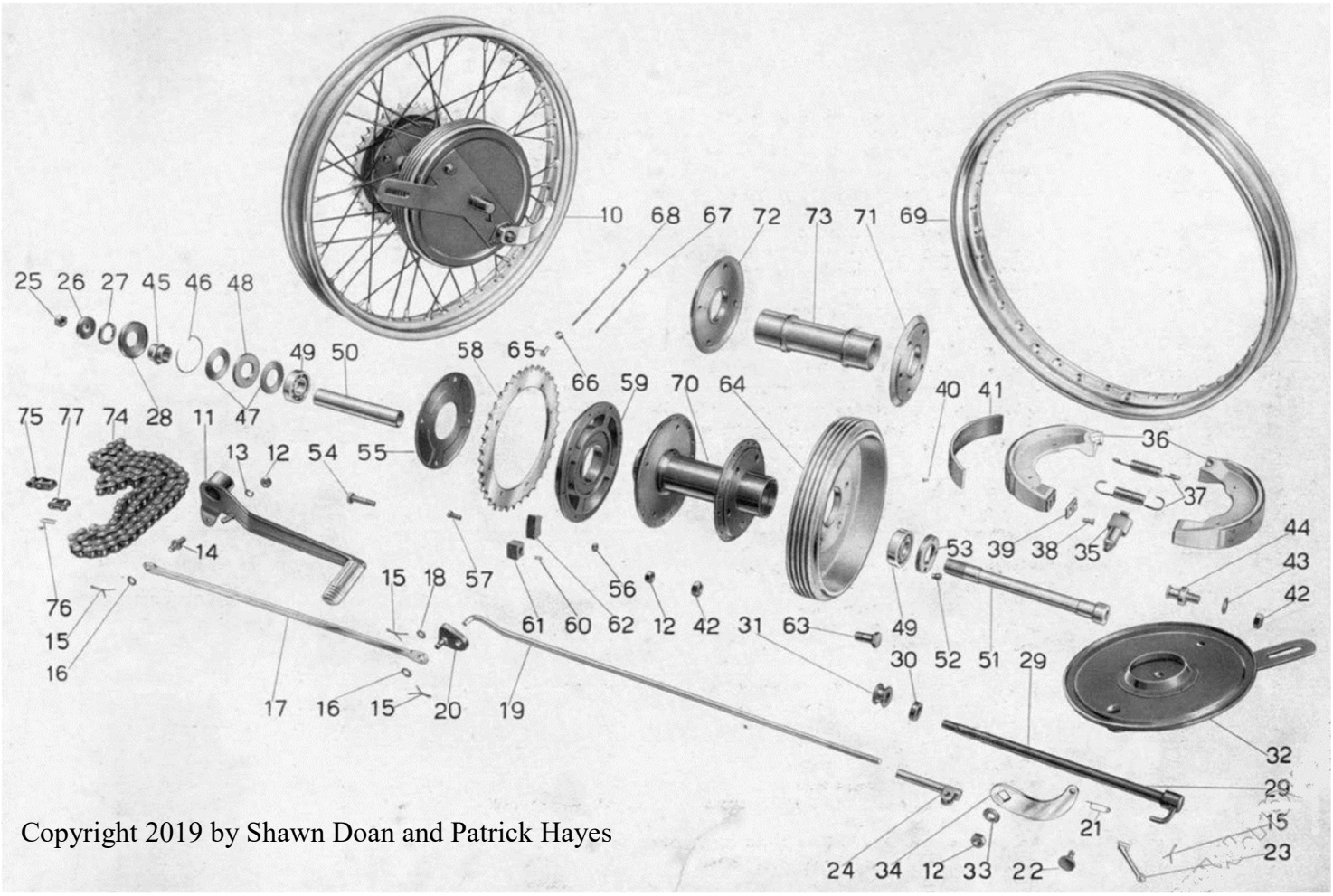
Drive chain.
Examine the status of the rollers and the junction plates and verify if it has stretched. To carry out this complete operation you need to secure an end of the chain in a vice and count the number (N) of pivots. When new, the length of each link will be 15.875 mm. The total length (L) of the chain measured between the centers of the last two fixed end pivots will be: $L = (N-1) \times 15.875$.

For a used chain, conceding a 0,16 mm increase of the length of each link, the total length will be:
L = (N-1) x (15.875 + 0.16) = (N-1) x 16.035.

If you Measure a length greater than this, you need to replace the chain. Whenever this is performed, always observe carefully the status of the drive sprocket and rear wheel sprocket. If these two pieces show worn teeth, it is recommended to replace them. The new chain adapts itself nicely only onto new teeth. If the above-mentioned verification is not performed with diligence, it can thus happen that you will have very bad outcome by exchanging only the chain.

Drive hub coupling.
DISMANTLEMENT. Remove the back wheel from the machine. Then remove by hand the 4 nuts from the interior of the hub flange which unites the drive hub coupling body and carries the chain sprocket. Unscrew the 4 bolts from the exterior and dismantle the drive hub coupling completely. Examine the condition of the 8 rubber blocks. If they are worn or deformed replace the pieces.

Adjustment of the chain tension.
The tension of the chain is adjusted by working on the appropriate adjusting screws of the swingarm when the swingarm is at the mid-point of its limits of stroke. [This is at the mid-point in the arc of motion. At this mid-point in the range of arc, the rear sprocket, the swingarm pivot bolt and the drive sprocket are all lined up. This is the maximum tension point of the chain. We require adjustment at this point so that adding or reducing weight loads does not ever create more chain tension and rapid wear.] Operating in this way you will notice that when the machine is on the center stand the chain will have excess slack. That is necessary because otherwise an excessive tension would be reached when the swingarm is at the mid-point of its range of stroke.



FUEL SYSTEM AND EXHAUST UNIT

Gasoline tank including taps, filter and pipes:

DISMANTLEMENT (see section on Frame disassembly page 66 below.)

INSPECTION.
Inspect that the vent hole in the fuel tank cap is clear. [So a vacuum lock does not develop as fuel is used up.]

If there is leakage from the tank, before proceeding to weld it, you must empty the tank carefully, then allow the interior to dry in such a way to be sure that every trace of gasoline vapor has disappeared.

It is always prudent to leave the tank open while performing welding.

Perform a good interior cleaning with solvent or gasoline. Insert a piece of chain into the filler neck hole, hold [the chain] at its end while you agitate the tank. By completing this operation you will be able to nicely detach the dirt and the rust deposited in the bottom.

Filter, taps and pipelines.
Wash the filter and ascertain that it is intact. If the taps leak, sandpaper the conic surface lightly, if necessary change the small rebound spring. Perform a cleaning of the pipelines by means of a blast of compressed air.

Carburetor.
Dell'Orto brand type MD27.

DISMANTLEMENT. After you have taken it off from the motor as pointed out on page 13, proceed as follows:

Loosen the lock screw for the fuel bowl cover. [This is a small screw located on the top side edge of the bowl cover. Once the cover is removed, note that the threads of the bowl cover have a horizontal slot clear through at one side. The cover lock screw pinches this slot in the threads and locks the bowl cover in place so that it can not vibrate loose. Many covers have been lost because the lock screw was not tightened.]

Remove:
- the fuel bowl cover.
- the float. It gets removed toward the top. [There is a small spring clip on the top surface of the float which engages a slot in the central support shaft. Slide this small spring clip to one side to release the clip from the central shaft of the float.]
- the fuel cutoff shaft [fuel cutoff valve]. It gets removed out from the bottom of the bowl fitting.
- the domed cap nut which is situated at the lower extremity of the main carburetor body.
- the main jet [immediately under the domed cap nut].
- the main jet carrier tube [aka “atomizer” or “needle jet”. Likely it and the main jet will come unscrewed as one long piece. They do separate for cleaning.].
- the horizontally situated screw with holes for regulating air flow of the idle jet.
- the idle jet

Notation. - the valve for regulating fuel and air [mixture] is the throttle slide and the tapered throttle needle. These have already been removed from the carburetor when removing the motor from the frame [page 13].

CATALOGO CARBURATORI DELLORTO SERIE MC F (ø diff. = 26) MCS (ø diff. = 25)
MD F (ø diff. = 27 - 28.5) MD FO (ø diff. = 27)

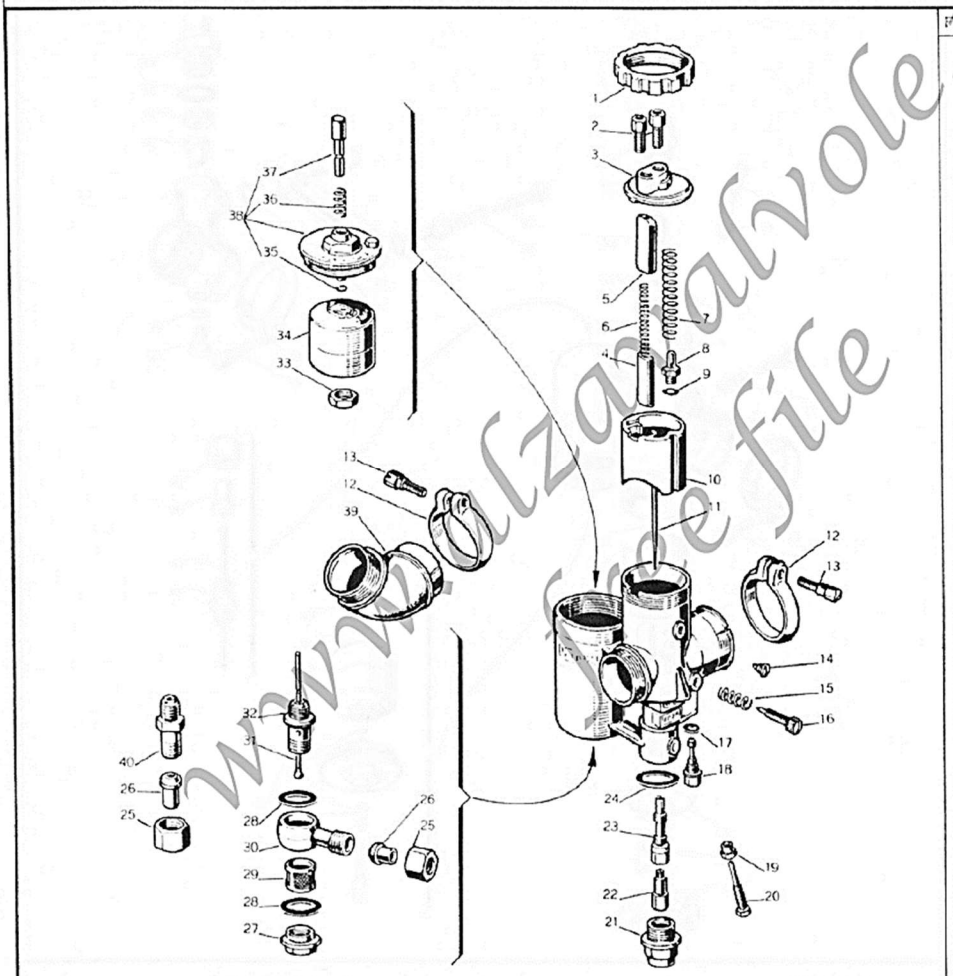


Fig.	Numero	Denominazione
1	1166 - 60	**Ghiera** blocc. coperchio camera miscela
2	1104 - 37	**Vite** tendifilo com. valvola
	1104 - 37	**Vite** tendifilo com. tegolo
3	1169 - 53	**Coperchio** camera miscela
4	1154 - 33	**Astuccio** tegolo aria
5	1093 - 61	**Molla** rich. tegolo
6	1155 - 64	**Tegolo** aria
7	1091 - 61	**Molla** rich. valvola
8	1174 - 40	**Nipplo** anc. cavo valvola
9	1168 - 21	**Anellino** rit. spillo
10	1167 X 64	**Valvola** gas
11	1160 X 08	**Spillo** conico tipo L
12	1722 - 50	**Anello** serr. manicotto
	1723 - 50	**Anello** serr. manicotto
	1723 - 50	**Anello** serr. gomito
13	1111 - 36	**Vite** serr. anello
	1111 - 36	**Vite** serr. anello
14	1110 - 37	**Vite** req. valvola
15	1116 - 61	**Molla** vite req. aria
16	1101 - 37	**Vite** req. aria
17	1158 - 30	**Guarnizione** getto minimo
18	1159 X 02	**Getto** minimo
19	1096 - 27	**Dado** blocc. vite req. valvola
20	6113 - 37	**Vite** req. valvola
21	1107 - 34	**Tappo** pozzetto
22	1102 X 02	**Getto** massimo
23	1105 X 28	**Polverizzatore**
	5377 X 28	**Polverizzatore** tipo 2
24	1382 - 30	**Guarnizione** tappo pozzetto
25	1109 - 27	**Dado** blocc. raccordo tubo benzina
26	1113 - 38	**Raccordo** tubo benzina
27	1494 - 34	**Tappo** fiss. pipetta
28	1416 - 30	**Guarnizione** tappo fiss. pipetta
	1416 - 30	**Guarnizione** pipetta
29	1419 - 29	**Filtro** benzina
30	1991 - 38	**Pipetta** racc. tubo benzina
31	1142 X 05	**Astina** chius. benzina
32	2513 - 33	**Sede** astina a cono
33	1153 - 27	**Dado** blocc. sede astina
34	1156 X 80	**Galleggiante**
35	1117 - 21	**Anellino** rit. agitatore
36	1318 - 61	**Molla** rich. agitatore
37	1098 - 25	**Agitatore** galleggiante
38	1255 - 54	**Coperchio** vaschetta
39	1823 - 82	**Raccordo** a gomito
40	1108 - 33	**Sede** astina a cono

INSPECTION.
Perform a good cleaning in the fuel bowl and ascertain that the channel which carries the gasoline from the fuel bowl to the main jet is clean (blow it with compressed air).
Inspect the seat in the fitting at the bottom of the fuel bowl where the fuel cutoff valve shaft works. It must be smooth.

- replace the float if it has been dented or it isn't perfectly watertight.
- the lower end cone of the fuel float cutoff valve shaft is obliged to adapt well to the seat in the fuel bowl bottom fitting. If it is slightly deformed sandpaper or abrasive lap the seat.
- Make sure that the main jet has the appropriate numeral (see adjustment and regulation) and that the hole has not been tampered with. Proceed by cleaning with a blast of air.

Notation. - For cleaning of all these holes, you are urged to use compressed air and not to use metallic wires, needles, etc. which could alter the diameter of the holes and make carburetor adjustments problematic.

Clean the holes of the fuel bowl cover. [These holes are not obvious. There are two very small diameter bleed holes in the upper rim of the bowl cover. The holes are drilled horizontally into the knurled edge of the cover lip and easily overlooked.]

Inspect the body of the carb. Clean the holes for regulating air on the main jet and the small idle hole, blowing from the hole located in the base (in the lower portion) of the carburetor body. [The horizontal idle mixture adjust screw regulates an air bypass. The tip of the needle protrudes right through the cast body and out the back side of the carburetor wall. Due to vacuum at this location, it is an easy place to develop a dirt clog.] Examine the seat where the throttle body slides and the hole in the carburetor throat through which passes the throttle tapered needle shaft of the main jet. If you discover notable wear replace the piece. The valve for controlling fuel and air mixture is the throttle needle shaft of the main jet (these pieces remained attached to the machine when you dismantled the carburetor, see page 13). These must not show notable wear.

Examine the position of the tapered throttle needle before removing it from the throttle slide. It must be replaced in the same notch. Inspect that the small spring clip which fixes the throttle needle shaft and the spiral spring of the throttle control are efficient.

ASSEMBLAGE
Reverse the operation of dismantlement having care not to forget the fiber gaskets.

ADJUSTMENT
Regulation of the maximum speed and of the cruise speed.

- Perform by working on the diameter of the main jet (replacing the latter with one having larger or smaller number) and on the position of the throttle needle shaft. Increasing the number of the main jet and raising the tapered throttle needle makes the mixture more rich, the contrary happens when decreasing the main jet and lowering the tapered throttle needle.
- Rich mixture: black smoke at the exhaust, uneven travel with loss of power, spark plug insulator tip of a sooty dark color.
- Lean mixture: backfire of flame at the carburetor; spark plug insulator white and porous.
- Remember that for colder weather you need to enrich the mixture; vice versa you will need to lean it out in hot weather. With gasoline, to go richer it is necessary to increase the numeral of the main jet and lift the throttle needle shaft.

Normal Settings:
Main jet: Summer 118, Winter 122.
Idle jet: 50
Air slide cutaway: 70
Tapered needle: L5, clip in 4th notch from top
Atomizer: 270

MD27:
Spigot attachment diameter = 31.7mm
Vertical float bowl
Bottom feed float bowl
Float: 14 grams
Float needle: D

Regulation of idling.
This is performed on a hot motor by working on two screws; one horizontal situated immediately behind the choke which regulates the idle fuel/air mixture. Tightening this screw into its seat, the mixture gets rich and vice versa. [The screw controls air flow not fuel flow so tightening restricts air and increases richness. The regulated idle air flows in through a small hole in the back side of the carburetor body.]

- The other screw is inclined at a steep angle to the axis of the carburetor body and it regulates the idle speed or stop position of the "fully closed" throttle slide.
- First adjust the inclined idle speed screw so that, with the control of the throttle slider valve fully closed, the motor can continue turning at slow rpm. Then, according to the circumstances, tighten or unscrew the horizontal idle mixture screw until you obtain the desired idling performance.

[Note: it is easier to ignite a rich mixture with a weak spark. If the mixture has been set too rich it may be compensating for a weak magneto.]

Caution: Inspect carefully that there are not any vacuum leaks in the intake manifold (between carburetor and manifold, between manifold and head), sometimes for this reason, the adjustment of idling is not absolutely successful. [If you remove the intake manifold from the cylinder head, note carefully that the two attachment bolts are of differing lengths. One of these bolt holes is drilled and threaded directly through one of the main cylinder head stud holes. Therefore, that bolt must be fairly short in order to avoid bottoming out against the stud. Such condition would prevent complete sealing of the intake manifold. Don't switch the two manifold bolts!]

Exhaust pipe.
Eliminate the carbonaceous deposits with metallic brushes and iron wires introduced into the curved part of the pipe.

Silencer.
DISMANTLEMENT: Take away the tail from the body of the silencer by loosening the three retaining screws.
Examine that the perforated sheet metal has not rusted or broken, otherwise replace it.
- carefully clean the little holes for exhaust by means of metallic brushes.
- In the assemblage, take care that the pieces fit perfectly in such a way to avoid leakage of gas.

LUBRICATION UNIT

Use oil of excellent quality: fluid if the environmental temperature is less than 10°, semi-thick above 10º. [The archaic oil grades are 'fluido' and 'semidenso'. Use your judgement on modern oil grade applications.]

INSPECTION.
Oil Tank (to remove see section on Frame disassembly page 66 below.).
Verify that there are no leaks.
Clean the interior of the reservoir with solvent and dry with care.
Dismantle the filters and observe that the metallic wire meshes are intact. Wash it with solvent.

Pipelines.
They are washed with solvent and blown with a blast of compressed air.

Pipe compression fittings.
Verify that the opening has not deformed, otherwise replace the pipe compression fittings. This is very important because, through a defective pipe compression fitting, the pump could aspirate air normally yielding serious drawbacks. [The oil supplied from the remote reservoir to the pump is not merely a gravity feed. Once primed, the pump creates suction and pulls oil from the reservoir at a much faster rate than gravity. Any imperfections in the sealing of the supply line or in the tolerances specified within the pump will seriously reduce the effective oil volume flow.]

Oil pump.
Dismantlement from the crankcase (view figures 23-24).
Remove the three fastening nuts from the captive studs of the valve timing cover. You will remove the pump complete with drive gear toward the outside.
Remove the automatic valve by unscrewing it completely from its seat.

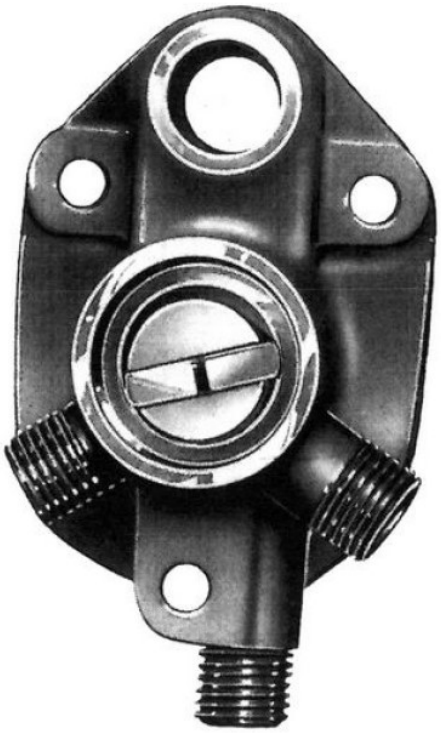


Fig. 23

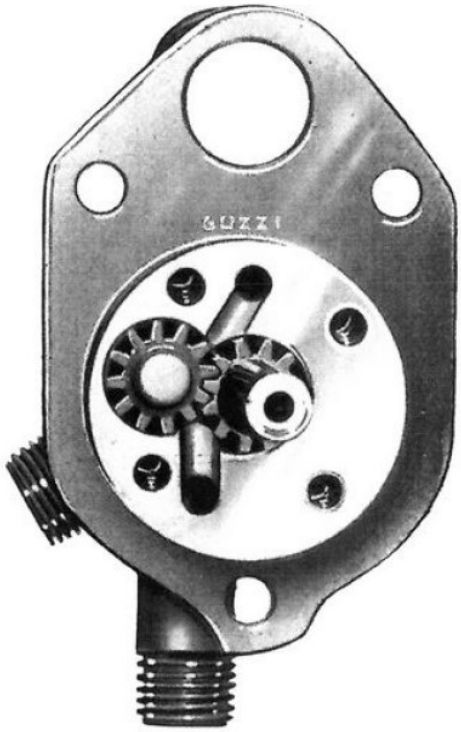


Fig. 24

Figure 23 & 24 - Oil pump body viewed from the external side and the internal side.

Figure 25- Oil pump dismantled: one notices the sequence of dismantlement.

DISMANTLEMENT of the automatic valve (view figure 25).
Remove the cover.

- the oil injection spray tube.
- the cotter pin and remove the tiny oil valve from the inside.

[The automatic valve serves as a drain shut-off mechanism. It does not serve as an injected oil pressure regulating valve. Whenever the engine is running, this valve is immediately forced to the full open position. When the engine stops, the automatic valve closes and seats and prevents reservoir oil from slowly draining overnight through the oil pump tolerances and into the crankcase. Older Guzzi's did not have this valve and required a manual valve for the supply line.]

DISMANTLEMENT of the oil pump.
Remove:

- the nut fastening the pump drive gear and the gear itself. [This gear fastening nut may be staked for safety or it may be secured with LockTite and will require some heat for removal.]
- the outer oil pump body cap.
- the internal cover by removing the four fastening screws.
- the pump idler gear by extracting it from its seat toward the interior.
- the splined pump drive shaft, remove it toward the exterior. You will thus free also the two oil scavenge vanes and the small spring.

Important caution: Don't tamper with tension of the scavenge vane spring which is set at the factory.

INSPECTION.
Pump drive gear.
Inspect the status of the teeth.
Inspect that the pump body exterior cover thread is intact. Replace the leather outer cover gasket if it is not in excellent condition.

Inside cover.
Inspect the mating surface to the pump body. You must not observe any scratches or deformations.
Check the hole that allows the passage of the pump drive shaft. A new piece shows a diameter of 9.5 x 7 mm (tolerance =+0,0 or -0,015). If you discover wear beyond 0,08 mm replace the piece.
The blind hole which affords support of the shaft of the pump idler gear. For a new piece the diameter is 7 mm (tolerance = +0,04 or -0), maximum wear 0,08 mm.

Splined pump drive shaft.
Verify the condition of the thread at the inside end. It must be intact.

- the status of the conic force surface in seat of the gear. It must be smooth and devoid of scratches.
- the status of the teeth of the gear.
- the wider cylindrical area which bears into the bronze body of the oil pump. It must be smooth. This piece, being constructed in steel, wears the least and any play which will be discovered is likely due to the wear of the support area in the body of the pump which is constructed of softer bronze.

Oil pump body.
It is constructed of bronze. After you have cleaned it carefully with solvent and blown with a blast of compressed air, proceed to the following checks:
Examine the inside of the body. You will notice recesses for the two gears. For a new piece the diameter is 14 x 8 mm (tolerance = +0 or -0,027). Maximum wear 0,08 mm.

- the support recess for the pin of the idler gear. For a new piece the diameter is 7 mm (tolerance = +0,04 or -0,00). Maximum wear is 0,08 mm.

Turn over the piece and examine it from the exterior. You will notice:

- the cylindrical opening for the splined drive shaft. For a new piece the diameter is 14 x 8 mm (tolerance = +0 or -0,027). Maximum wear is 0,08 mm.
- the seat for sliding of the two oil scavenge vanes. It is not circular but has the shape and the dimensions shown in figure 26.

Is very important for the good operation of the oil pump to observe the play between the lower portion of vane sliding seat (A-B in the figure) and the wide cylindrical section of the splined drive shaft which drives the two vanes. To ascertain this play it is necessary to assemble the splined drive shaft into the pump body and rotate it by hand. [It is not specified, but we believe this end play or shaft float can only be measured with the external cap in place as well.] The play between the wide cylindrical section of the splined drive shaft which drives the two vanes and the bottom portion of the seat in the pump body (A-B in the figure) must not exceed 0,03 mm.

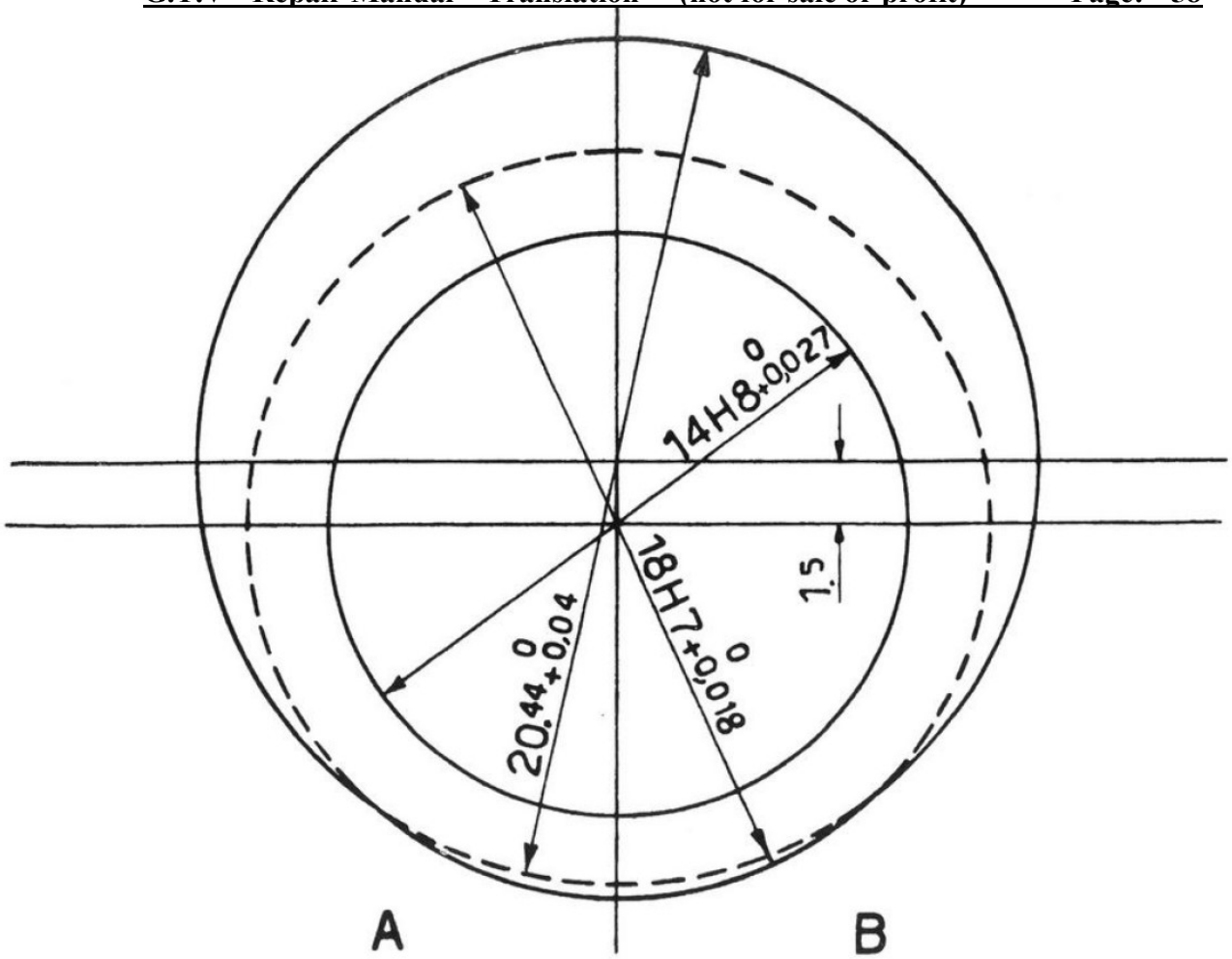


Figure 26- Diagram center of the vanes on the oil pump.

ASSEMBLAGE

Caution. During assembly, don't forget the gaskets. The pump must seal perfectly because, otherwise, it could aspirate air and therefore work poorly for defective circulation to replenish the oil supply. [Also don't forget to provide for secure retention of the drive gear nut. Either stake the nut with a pin punch or coat the thread area with LockTite so the nut can not loosen under vibration.]

As soon as you have completed the assemblage, before you reassemble the pump onto the valve timing cover, it is good to observe the pump operation. Rotate the drive shaft in the opposite direction to the hands of a clock [counterclockwise] while looking at the drive gear. Connect the bottom and the rear facing pipe compression fittings into a bowl full of oil. You should observe the ejection of the lubricant from the front facing pipe compression fitting and from the spray injection tube of the automatic valve.

Oil circulation.
After assembling the pump onto the motor make sure that the oil circulates regularly. Because the pump is empty, it is convenient to remove the supply line pipe compression fitting and fill it with oil. In order to make sure that the oil circulates regularly during travel, it is good to touch the walls of the reservoir which must be lukewarm after a few minutes of travel.

IGNITION UNIT.

The ignition is provided by a high-tension magneto "Marelli" MLA type 53. For dismantlement (see page 18). [Assembly: check gear tooth mesh. A shim may be required under the mag.] [Indications of a weak magneto: starts easier with timing advanced, difficult to start hot. runs better with excessively rich mixture, unstable idle.]

INSPECTION.

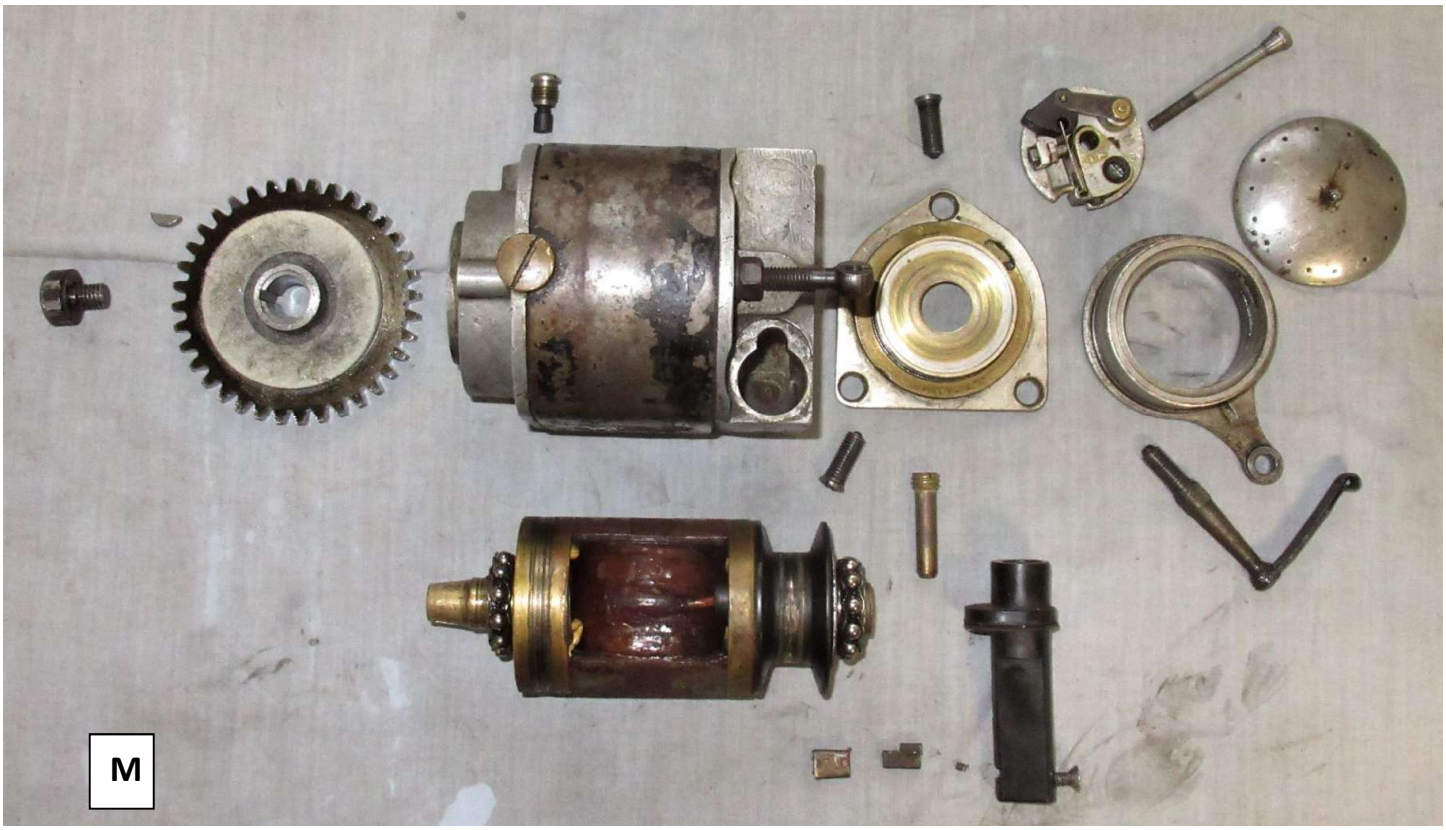
Inspect the contacts of the ignition points polishing them up with a fine grain nailfile. If they are consumed replace them always using new material.

Remove the floating lever and lubricate the pivot with a small amount of mineral grease. Moisten the surface of the cam and the felt pad of the ring in the head with mineral oil. When the contact breaker is assembled make sure that the slotkey goes to position exactly in its seat.

Inspect the opening of the ignition contact: it must be 0.3-0.4 mm. [0.012”-0.016”]

- The ball bearings don't need any particular care. Filled with lubrication grease at assemblage, they are insured for almost an indefinite period.

[Bearing play can be checked by alternately pushing on the drive and points end of the magneto shaft.] Bearings can be inspected by dismantling the high-tension circuit of the magneto [Remove the phenolic spark pickup and its brush, grounding brush, center bolt and contact breaker plate, and end cap. See photo M. Note: the points of Marelli MLA and LAN (rotating coil) magnetos connect to the low-tension coil through the center bolt.]. Grease bearings with special [high temperature] mineral grease. [It is good practice to remagnetize the magneto after removing the armature.]



[Note: it is easier to ignite a rich mixture with a weak spark. If the mixture has been set too rich it may be compensating for a weak magneto.]

[**High-voltage coil check:** An Ohm meter connected between the spark plug lead and magneto ground should show about 5,000 Ohms resistance. 5k Ohms is the approximate resistance of a good high-tension coil. Much greater resistance suggests worn or dirty grounding brush, worn or dirty pickup brush or a broken wire in the high-tension coil. Very low resistance suggests the coil is grounding through the armature. Note: a magneto with a break in the high-voltage coil may still spark by arcing across the break. **Low-voltage coil check:** Connect an Ohm meter between the insulated moving point and magneto ground. A meter showing about 0.3 Ohms (100% continuity) across closed points should show about 0.7-0.8 Ohms with **open** points. If much more than 0.7-0.8 Ohms, there is a poor or dirty contact between the points and coil. If open points show much less resistance, check the condition of the insulators under the points. These tests aren't able to test the capacitor.]

If it is possible, after the inspection, it is convenient to check the operation of the magneto on an appropriate test bench provided with a sparkgap.

Bench test of the magneto: [passing the electrical tests but failure of the slow rpm test suggests a bad capacitor]

Primary test. With a 5mm gap setting on a Standard spindrive sparkgap tester, sparks must be achieved at a speed not greater than 100 rpm when the advance mechanism is situated in "full advance" position; at speed not greater than 200 rpm if the advance mechanism is situated in "full retard" position. [magnetic flux is greater at full advance.]

Secondary test. At the speed of 3000 rpm, sparks are made to dart between the electrodes of a spark plug mounted in an appropriate pressure chamber. The sparks are required to continue regularly while elevating the pressure up to 5 atmospheres and at full spark advance.

Important caution: When assembling the magneto on the engine casting don't forget the appropriate spacers under the base. If these are unusable or mislaid, verify carefully:

1) the parallelism between the axis of the magneto and the axis of the cam.
2) the distance between such axes. This must be certain in order to afford the correct contact between the teeth of the gears.

Wire which connects the magneto to the spark plug:
Inspect the condition of the insulator surface. If areas are discovered with abrasion or cuts where you might observe discharge to electrical ground (causing an absence of thrusts from the motor [misfires]) replace the cable.

Spark plug (Type Marelli M D M 175 T). [NGK AB6 is a modern 18mm sparkplug with 1/2" reach that uses the common 13/16" sparkplug socket. Some (many? all?) Guzzi cylinder heads of the '40s require a plug with 5/8" reach. An AB6 plug can be cut on a lathe so that it has 5/8" reach.]

Inspect the status of the insulator, if you discover cracks or breaking replace the spark plug.

- the distance between the electrodes must be 0.5 mm. [0.018"-0.20"]

Inspect the retention of compression. Drip some oil between the insulator and the external hexagon retention nut. While the motor is operating, observe if little bubbles are seen in the oil, in this case replace the spark plug. [this is for a old style plug that comes apart.]

It is unadvisable to dismantle the spark plug to test it.

- in order to clean the spark plug, use clean gasoline.
- It is not good to change the type of spark plug originally installed. Remember that many drawbacks to the motor can be avoided with the constant use of a proper type of spark plug.

GENERATOR AND BATTERY

For dismantlement of the generator from the motor: see page 18. [Assembly: adjust gear mesh by rotating generator in its cradle – a thin shim may be required under the generator. Generator ground is through case.]

INSPECTION.

Generator (MRD 30/ 6- 2000 AR 2).

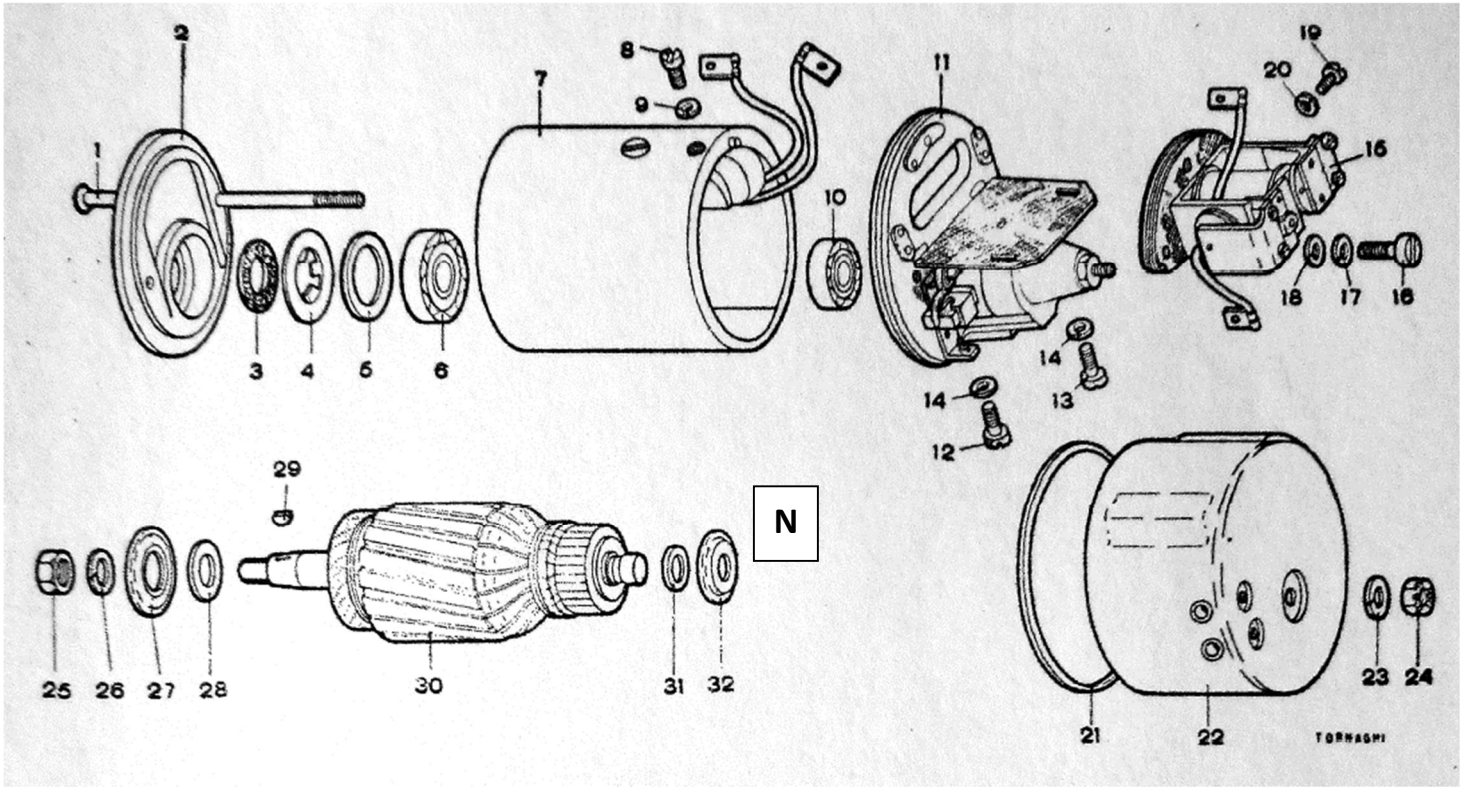
Verify the condition of the brushes. These must slide freely within their guides. If they are dirty you need to clean them and if consumed to replace them.

- the condition of the commutator. If it has become black, clean it with gasoline (don't ever use solvent for this operation). It is unadvisable to use sandpaper even if it is of very fine grain. If deep scratches are discovered on the commutator, consign to a specialist to perform a slight lathe turning.
- the ball bearings are durable and don't need lubrication for long intervals. If you dismantle the rotor, then repack the bearings with special [high temperature] mineral grease.
- the setting of the automatic voltage regulator is performed on a test bench and it is therefore absolutely unadvisable to modify or adjust it. [modern, solid state regulators are available.]

[The nut on the generator drive gear can come loose and drop into the primary gears – use a lock tab or Loctite.]

If you prepare for an appropriate bench test it is advisable to observe the functioning of the generator. We provide here, for this purpose, the data of setting at operating temperature: potential 30 watts, autocontrol of the voltage at the limits from 6.3 to 7.3 volts at various loads and of temperature (up to 50°) as regards the environmental temperature. Charge begins at 1000 rpm. Normal power at 1900 rpm. Maximum revolution of operation at 5500 rpm. Right hand rotation. Ratio of the motor to the generator is 1 : 1.32.

Photo N shows a Marelli dynamo of similar design.



Wires.

Inspect the exterior condition, especially at points where they might slide between metallic pieces and the insulation. If defects are discovered, replace the wires.

Headlamp. (FM 150 N).
It is perfectly watertight; that makes internal inspection practically unnecessary. Remember that the surface aspect of the parabola is not to be polished because it scratches easily, and this would diminish the brightness.

Orientation. In order to have the maximum brightness productivity you need to orient the headlamp beacon so that the geometric axis of the parabola (axis of the high beam) hits a vertical plane at 5 meters of distance, at a point 2 cm below the level of the parabola pivot bolts.

Focal point. It is fixed; the focus is held by the filament of the light bulb.
Light bulbs. Use lamps of equal dimension and type of those originally assembled at 25/25 watt.

Horn button and low beam switch.
Lubricate the high/low position changer on the handlebar and the internal wire which causes the movement within the headlamp. [Early and original machines had a headlamp with a switch inside the housing for high/low beam. This switch was activated by a sliding control cable much like a choke cable. Later versions changed to an electrical high/low switch on the handlebar.]
For best operation it is necessary to see that both extreme positions of the high/low switch cam correspond to the electric contact positions within the interior of the headlamp. Otherwise adjust the control cable conduit by means of the adjuster positioned on outside surface of the headlamp housing. The aforementioned instructions serve for the headlamp Marelli FM 150 N. On the headlamps S.I E M. and E.C., the high/low is an electric switch control and doesn't require adjustment.

Electric warning horn - Adjustment of the sound:
With the operation of the warning horn, it can occur that, either for the position of some parts or for the consumption of others, the sound is not as good as it was when first placed into service. It therefore becomes indispensable to adjust the sound. First confirm that the storage battery is charged. Take a screwdriver to back portion of the warning horn apparatus and proceed to the adjustment of the sound. Adjust the round head screw positioned at the left of the warning horn mount. This screw has a knurled cone beneath the head, in such a way that, rotating to the right or to left, the click of detent teeth will be heard. When you take away the screwdriver, the screw will remain in the position which produced the best sound.

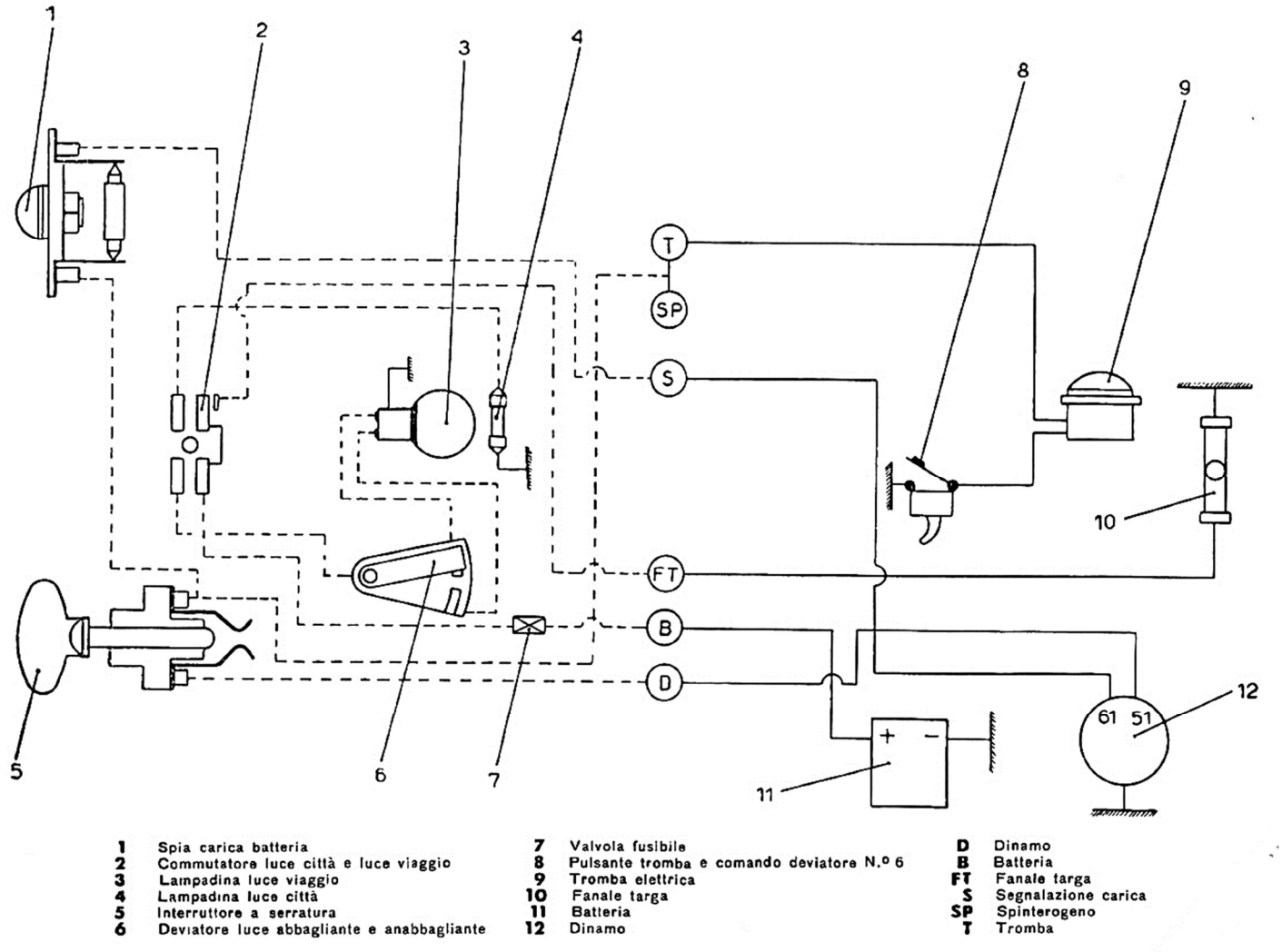
Battery.
Effect an accurate cleaning, especially on the upper portion of the elements, and check that flaws don't exist. Remove the caps and observe the level and the density of the electrolyte (with an appropriate hydrometer). If the battery is efficient the electrolyte must have a density of 28 BE in each element, otherwise recharge it. [We have no reference to convert this electrolyte density specification. Use modern electrolyte specifications.] The electrolyte level must be around one cm above the plates. If it is lacking add distilled water. This last operation is performed with more frequency in the summer months (around every 30 days) while in the winters months it is performed around every 50 days.

It is advisable to clean and dry the ends and the upper portion of the elements of the battery by hand. It is recommended to coat the threaded portion of the terminals with Vaseline.

Notation. - If the battery doesn't maintain a charge you need to consign to a skilled shop equipped with all the required apparatuses for dismantlement.

Plan of the connections of the electric system - figure 27.

The wires marked with dashed lines are contained within the headlamp housing. The wires marked with solid lines are outside the headlamp housing. The six terminals marked with the letters D - B - FT - S - SP - T are within the headlamp housing. They are connected respectively: D to the generator (51), B to the battery, FT to the taillight, S to the generator warning light (61), T to the horn.



1	Spia carica batteria	7	Valvola fusibile	D	Dinamo
2	Commutatore luce città e luce viaggio	8	Pulsante tromba e comando deviatore N.° 6	B	Batteria
3	Lampadina luce viaggio	9	Tromba elettrica	FT	Fanale targa
4	Lampadina luce città	10	Fanale targa	S	Segnalazione carica
5	Interruttore a serratura	11	Batteria	SP	Spinterogeno
6	Deviatore luce abbagliante e anabbagliante	12	Dinamo	T	Tromba

Figure 27- Diagram of the connection of the electric installation.

1 warning light for battery charge.
2 Switch for parking light and highway headlight.
3 Headlight bulb.
4 Parking light bulb.
5 Light switch with key.
6 Switch for high-beam and low-beam headlight.
7 Fuse.
8 Horn button.
9 Horn.
10 Rear running light. [brake light circuit is not shown]
11 Battery.
12 Generator.

D Generator.
B Battery.
FT Rear running light.
S Charge light.
SP Coil ignition [if no magneto?]
T Horn.

FINAL ASSEMBLY OF THE MOTOR

In order to proceed to the assembly of the motor, first assemble the individual units as they were before the general dismantlement (view the chapter for dismantlement of the motor). The operations of dismantlement are reversed except leave off the timing cover so that you can set the cam and magneto timing.

Synchronization of the motor:
This must be performed before assembling of the valve timing cover.

Synchronization of the magneto:
Set the control lever at the full advance position and rotate the crankshaft clockwise when looking at the flywheel. The ignition contact must break open when the arrow traced on the flywheel is separated in advance around 110 millimeters (measured on the periphery of the flywheel) from the arrow traced on the cover. When the two arrows meet the motor it is top dead center.

[Guzzi eventually incorporated an automatic advance magneto of identical size and configuration. Many early machines were quickly converted to the automatic advance version and the hand control will be absent. Static magneto timing on these automatic advance machines can only be set at the fully retarded position. We have an owners manual for the SuperAlce with the automatic advance magneto. This is an identical engine to the GTW although it has lower compression and a less dramatic camshaft lift and duration. The SuperAlce manual specifies 30 mm of flywheel periphery advance for the fully retarded position of the automatic advance magneto or 105 mm of flywheel periphery advance for the fully advance position of the older, manual advance magneto. The higher performance Guzzi singles likely take a slightly earlier ignition advance curve as demonstrated by the 110 mm full advance specification for the GTW. In either case, it is easy to inspect dynamic timing as well. You may use any 12 volt inductive timing light. Attach the power supply cables to any nearby modern motorcycle or car 12 volt battery and attach the inductive pickup around the spark plug wire of your Guzzi single. If your flywheel has been adequately marked, you can observe dynamic timing at the flywheel and observe the full range of advance capability for either the manual or the automatic magneto.]

Synchronization of the valve timing:
Adjust the rocker arms so that the play for both valves is at 0.20 mm. [Operating play is different and will be re-adjusted later.] When the arrow on the flywheel is separated at 60 mm in advance (measured on the periphery of the flywheel) from that traced on the cover, the intake valve must just begin to open. Thus, the intake set at this point, the exhaust will also be synchronized.

If there has not been substitution of any of the valve timing gears, the synchronization is facilitated by the signs marked out upon the teeth of the gears. Start at top dead center of the motor before you assemble the valve timing gears. The tooth marked for the crankshaft gear must enter between the teeth marked for the camshaft gear and the tooth marked on the camshaft gear must enter between the teeth marked upon the magneto drive gear (see figure 28).

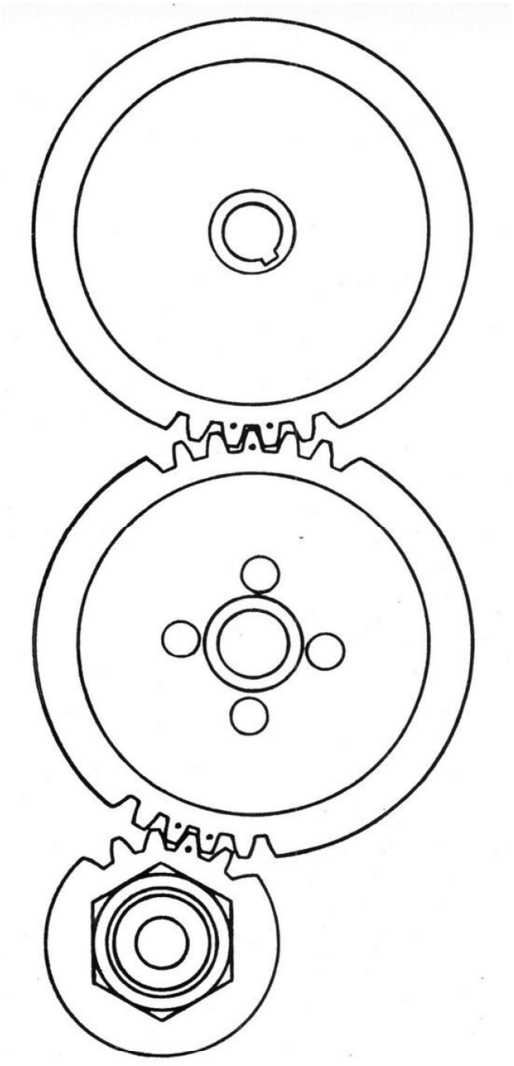
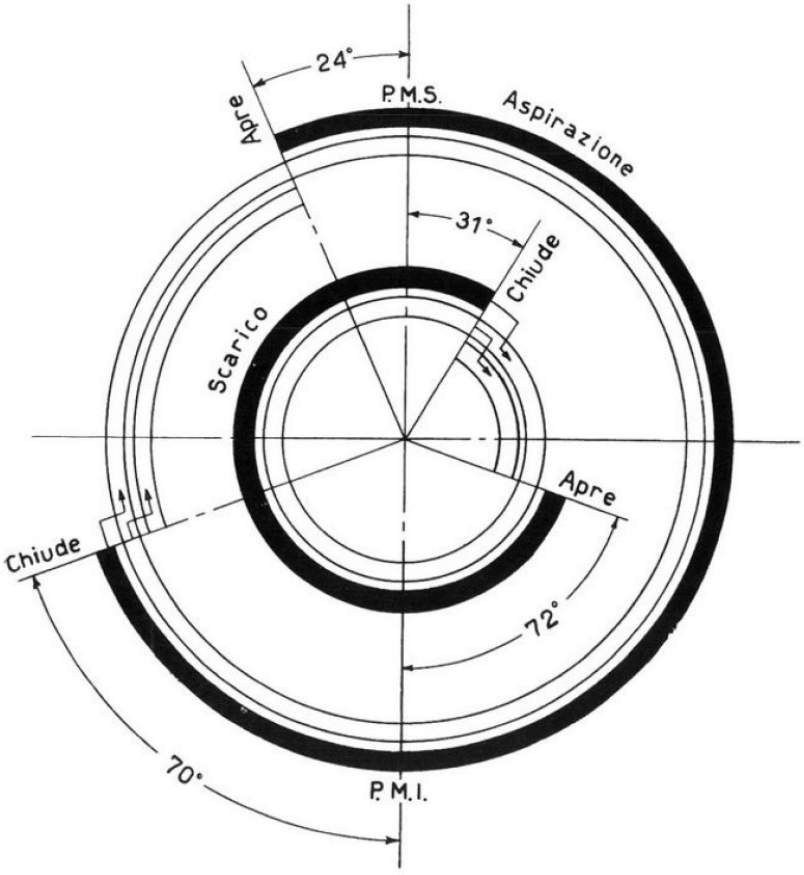


Figure 28 – Timing marks.



Aspirazione { *Apre 24° prima del P. M. S.* / *Chiude 70° dopo il P. M. I.*

Scarico { *Apre 72° prima del P. M. I.* / *Chiude 31° dopo il P. M. S.*

Con gioco alle valvole di mm. 0,20.

Intake:	opens 24° before TDC closes 70° after BDC
Exhaust:	opens 72° before BDC closes 31° after TDC

with valve lash at 0.20 mm (0.008")

Figure 29- Angular diagram of valve timing related the crankshaft.

Timing Cover installation:
Inspect that the mating surface of union of the crankcases, covers, etc., are clean and smooth.
Before you assemble them spray uniformly with sealant. [no gaskets under primary or timing covers.]

Remember afterward:
- to take off the flywheel (and to reassemble it after the motor has been replaced into the frame).
- to adjust the screws which act on the stem of the valves.

Adjustment of the valve play. [Running valve clearance]
It takes place on a cold motor. Makes use of an 11 mm wrench and a screwdriver. The locknut is loosened and you tighten or loosen the screw which works on the stem of the valves. When you tighten, the play is decreased and vice versa. The prescribed play is 0.05 mm [0.002"] for the intake and 0.3 mm [0.012"] for the exhaust. Check the aforementioned play with the appropriate feeler gauge. After hand adjustment, arrest the screw and jam the locknut.

Caution: After completion of the job, check the valve play again. It can happen that when you jam the locknut it drags along the screw and in this way the play reduces.

Test of the motor:

After the general revision has taken place, it is always advisable, if possible, to test the motor at the bench. If substitution of the piston and reaming of the cylinder have taken place, you need to break in the motor, that is to make it work against a slight load of the brake, for around three hours, with the revolutions progressively increasing from 800 to 2000 rpm. You may then try shortly the maximum power. At 4300 rpm must be achieved, with no load, 18 – 18.9 HP.

It is strongly recommended to not strain the revised motor before the vehicle has covered around 1500 Km. In the first 500 Km in particular, you are urged to not exceed, in the separate gears, the revolution of 2500 rpm, and to never open the motor to full throttle when at low revolution. If you don't prepare for a bench test, take care to complete the break-in on the vehicle and comply meticulously to the instructions listed above. You are encouraged to replace the lubricant and to wash the filters well after the first 500 Km.

FRAME

DISMANTLEMENT of the frame

Proceed to the dismantlement of the frame as follows after you have completed the operations to remove the motor (view the chapter "Dismantlement of the Motor from the Frame" and figure 30). Proceed as follows:

Take off the saddle and the battery after you have loosened the respective fastening bolts.

Remove the gasoline tank. Remove the fuel filter and loosen the fastening bolts. The tank gets lifted off from the top.

Remove the oil tank by loosening the two fastening bolts after you have disconnected the sump recovery pipeline.

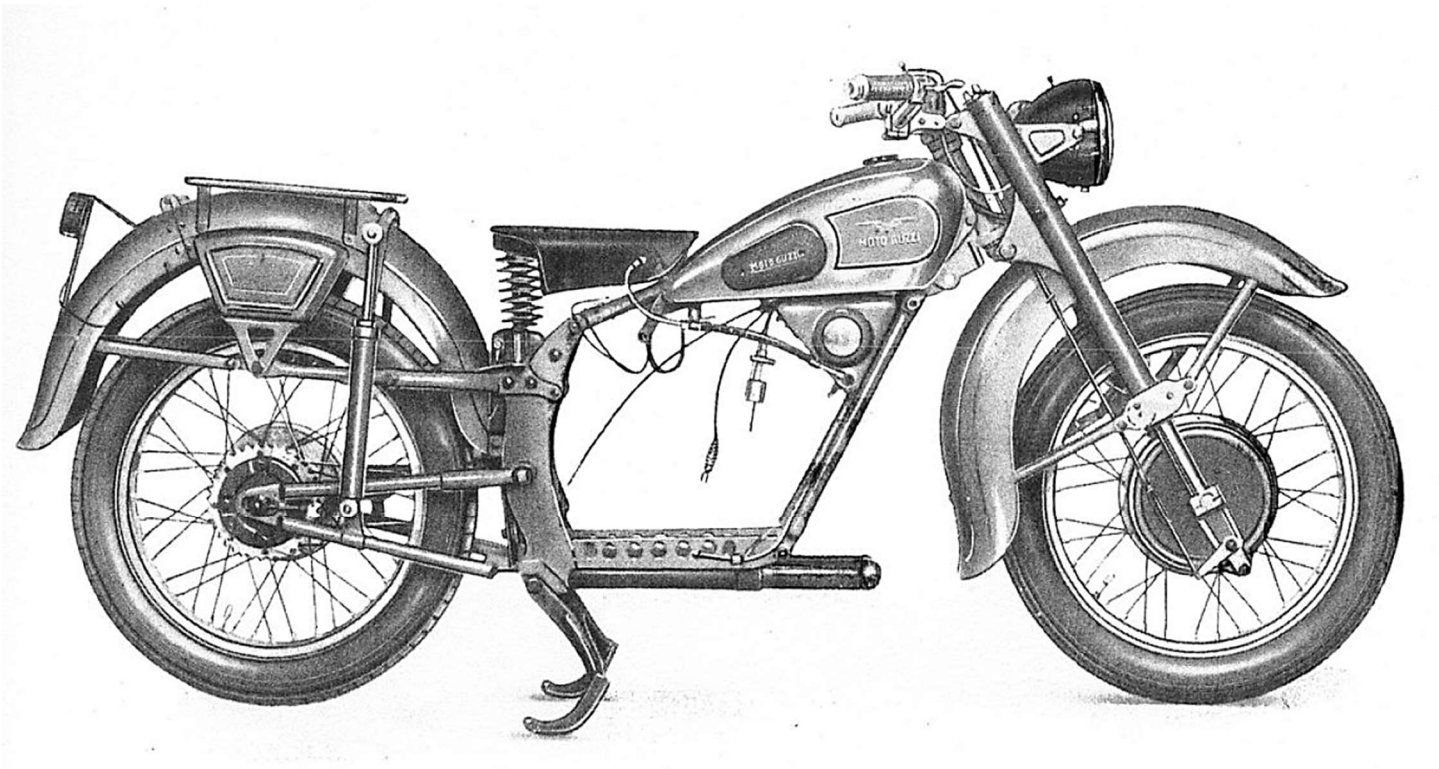


Figure 30- Frame ready for dismantlement.

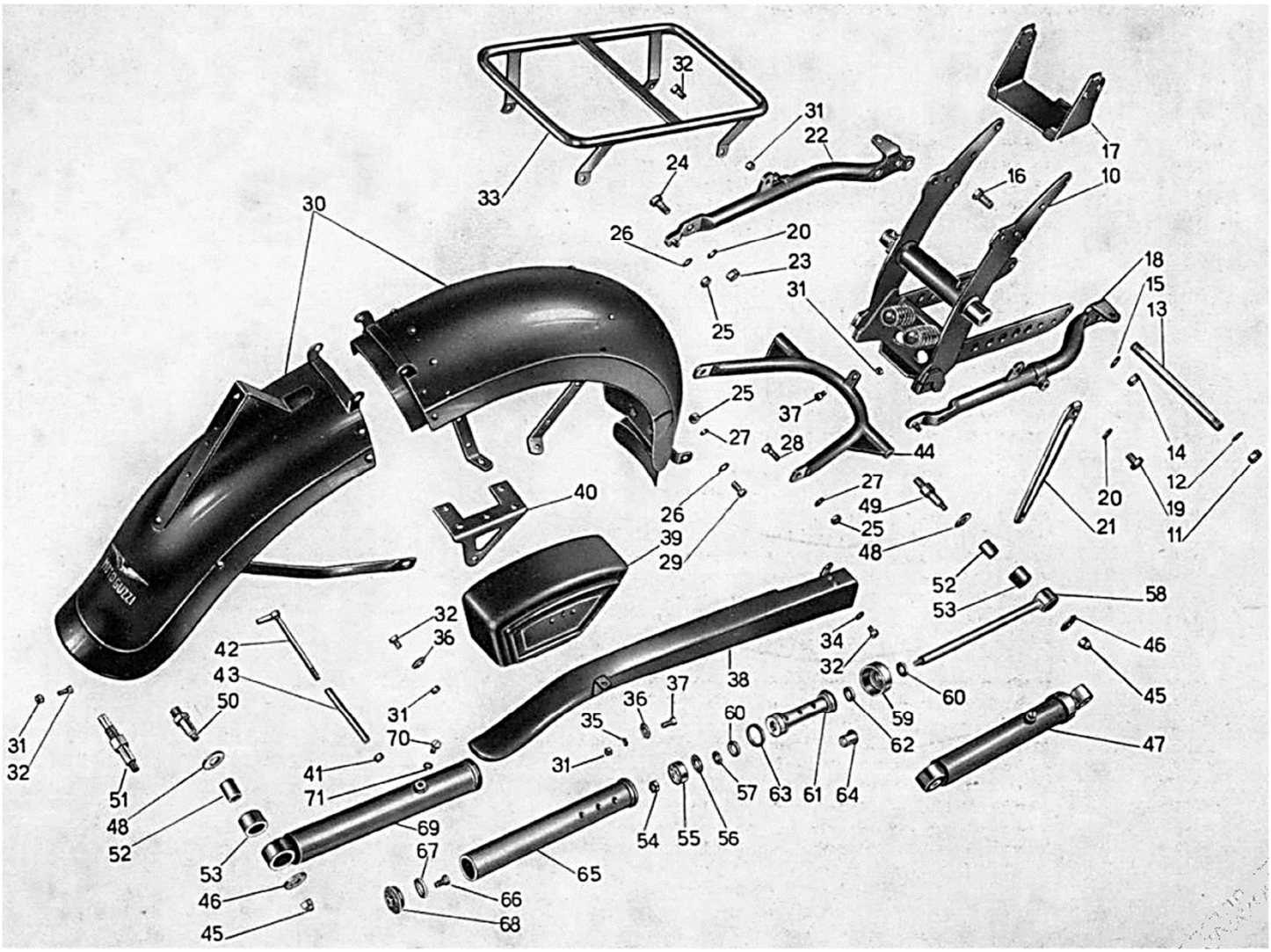
DISMANTLEMENT of the **rear of frame**

Remove the rear brake connecting rod by unscrewing the bolt which attaches the foot brake linkage plate onto the pivot of the oscillating swing arm and the pin which fastens the forward connecting rod onto the rear brake foot lever.

Take off the back wheel, unscrewing the axle nut toward the right and remove the axle pin to the left. (For dismantlement of the wheel see page 71).

Remove the rear suspension hydraulic dampers by unscrewing the 4 acorn nuts, the lower anchoring stud for attaching the dampers and the brake anchor. [In Italian these nuts are referred to as blind nuts. There are 2 on each side. 1 upper and 1 lower. The lower damper mount on the left side serves also as the brake anchor bolt.]

Remove the centerstand, damper attachments, the carrier rack, the tool boxes together with the license plate frame, the taillight, the mudguard and the two rear frame brace arms.



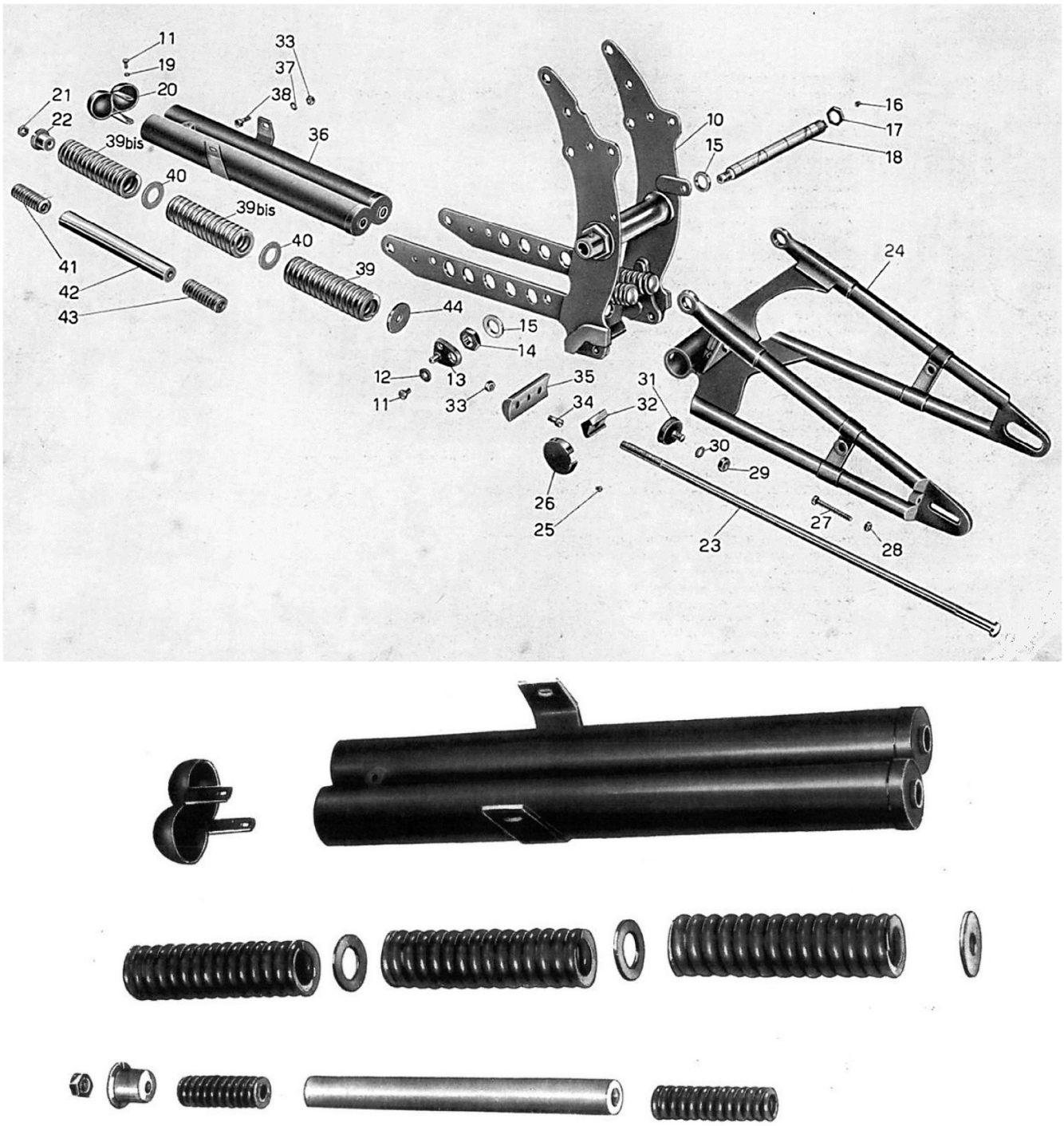


Figure 31- Springs and carrier tubes: notice the group is removed from the suspension.

DISMANTLEMENT of the **rear springs** and **swing arm**
Remove the cover for the spring carrier tubes, unscrew the locknuts and the coupling nuts on the two suspension connecting rods.

Remove the nuts of the main pivot of the swing arm. Unscrewing the same pivot completely (use a suitable wrench on the appropriate square ends). This pivot gets removed toward the right side.

In this way you will be able to remove the complete oscillating swing arm and the associated connecting rods.

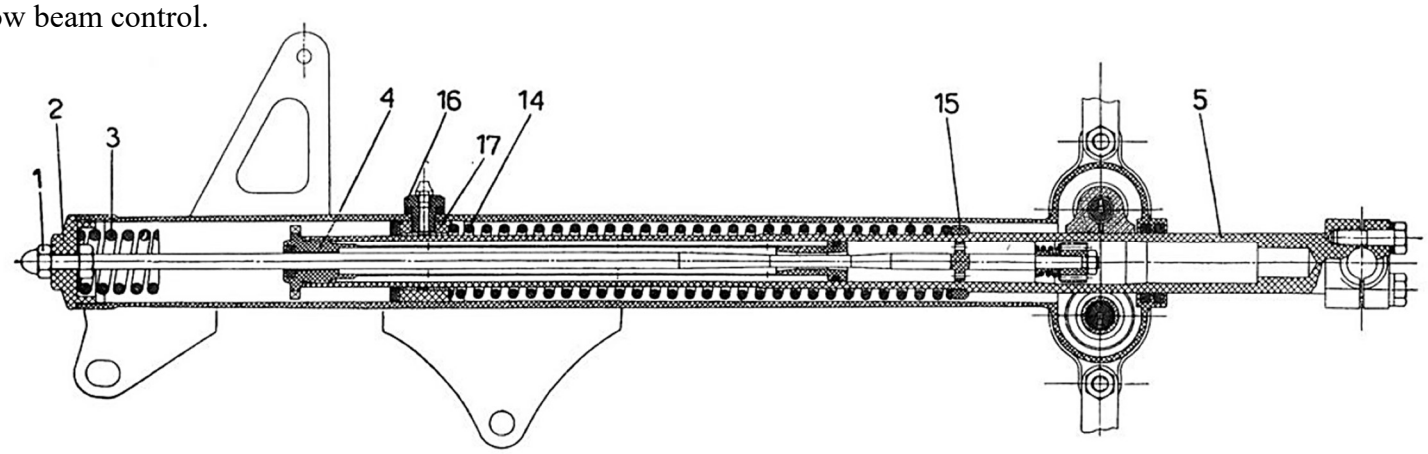
Unthread the two spring connecting rods from the swing arm, dismantle the small cover and the flexible joint of the suspension and extract them sideways.

Loosen the two bolts which attach the spring carrier tubes, remove them, and unthread the spring package from these pipes, (see figure 31).

Notation. Observe the exact sequence in which the individual pieces are removed in order to be able to reassemble them exactly the same. For the restoration and the assemblage see page 78.

DISMANTLEMENT of the **telescopic fork** (see figure 32)
[We have difficulty translating the sections referring to the telescopic front fork. Both of our motorcycles have the built-up girder front suspension. It is difficult to translate with any confidence or precision when you are not specifically familiar with the parts or their motion relationships.]

Remove the headlamp unscrewing the two fastening bolts, it can be removed together with all its wires and the low beam control.



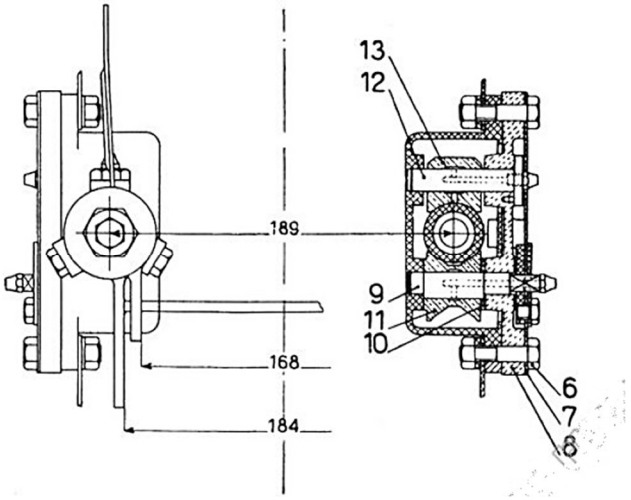


Figure 32- Internals of the telescopic fork.

Remove the internal body of the fork. In order to achieve that: unscrew the nut #1, the cap for upper fork tube #2, remove the spring #3 and (by means of a special socket wrench) unscrew the notched nut #4; thereafter take off the internal lower fork slider body slowly using caution so you don't spill the liquid inside of the lower tube where it is contained before removing the body completely.

Remove the wheel, in order to achieve that: detach the screw from the front brake control lever removing the pin and the cable clamp.

Remove the 4 bolts and the lower portion of the left clamp. (For dismantlement of the wheel see page 71).

Detach the fork from the steering gear cluster by means of the dismantlement of the two fastening bolts. Detach the fork take off the arm #5 pull it by hand and at the same time make it turn slowly. Be attentive so you don't overturn and spill the liquid contained inside the slider.

In order to dismantle the mudguard from the fork and the interior of the cans of the fork you need:

Remove the fastening bolt of the upper portion of the mudguard and the 4 bolts #6 on the slider roller boxes, you will thus be able to remove the mudguard and the two plates #7, unscrew the two screws #8 from the cover of the box, take off the cover along with the pivot #12 remove the eccentric pivot #9, the adjustment ring#10, the roller #11 and the roller guide #13.

In order to remove the spring #14 and the ring #15, you need to unscrew the three bolts #16 which hold the upper guide. Remove these pieces from the upper portion of the fork.

Notation. The dismantlement is equal for both pipes.

DISMANTLEMENT of the **rear dampers** (view figure 33)

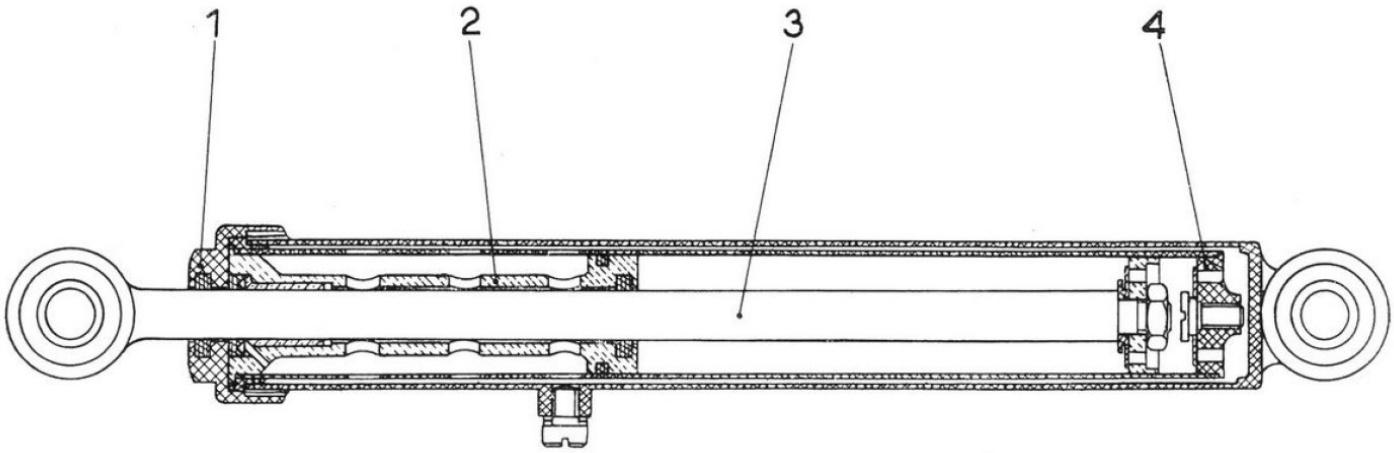


Figure 33- Internals of the rear dampers.

Unscrew the cap #1 and slowly (in order to avoid spilling the liquid) remove the complex shape #2 from the body tube and from the rod #3 with the assembled plunger.

Remove the internal cylinder #4 from the pipe by means of two fingers, before you finish this complete operation it is wise to pour the liquid out of the damper.

DISMANTLEMENT of the **steering head**.

Detach the headlamp low beam control and the horn button from the handlebar.

Remove the handlebar by means of the dismantlement of the two retaining clamps.

Remove the pinwheel of the steering damper. Unscrew it completely and the nut of the steering pivot tube of the steering gear.

Loosen the nut which pinches the head of steering gear. With light blows from a wooden mallet beat on the base of steering gear, both ways to the right and to the left you get unthreaded the steering pivot guide tube from the head of steering gear. After performing that you can easily remove the complete unit from the pipe of steering gear.

Caution: Remove and immediately count the ball bearing spheres from the steering head. These are no longer restrained and they could fall out. There are 18 in the upper portion and 18 in the lower portion.

Remove the center stand by removing the two fastening bolts and unhooking the rebound spring.

DISMANTLEMENT of the complete **front wheel** hub.
On the side opposite to the brake drum, clamp the central axle of the complete wheel in a vice. Unscrew the nut which fastens the brake backing plate disk and remove the disk, the oil seal retaining spring, the rings and the oil seal. Remove the wheel from the vice and clamp it back in the reverse portion. Unscrew the nut for fastening the small dust cover and remove the dust cover. Unscrew the counternut and the bearing adjuster nut, remove the felt retaining spring, the rings and the felt. Remove the wheel from the vice again and with lead hammer beat on the central axle on the side opposite to the brake drum in order to extract the axle from the hub and bearings.

DISMANTLEMENT of the complete **rear wheel** with hub.

Remove the brake backing plate disk. Clamp the hollow pivot from the part of the drum in vice, thereafter unscrew the bearing retaining nut. Remove the wheel from the vice and beat on the threaded portion of the hollow pivot with a lead hammer in order to extract; remove the felt retaining spring, the rings, the felt and then the bearing. Unscrew the drum from the hub, the threaded bearing retaining ring, and extract the bearing. Remove the complete drive hub coupling by means of the dismantlement of the 4 retaining bolts and the brake drum by means of the dismantlement of the 5 retaining bolts.

FRAME REVISION AND ASSEMBLY

Caution: The inspection and revision of the frame is required for both normal wear and accidental damage. The first condition of repair takes place on the occasion of the general revision of the machine, and it concerns the wear between fixed and moving parts (bearings, pivots, etc.); the second condition of repair takes place independently from the first, when, as a result of violent bumping, any part has suffered permanent deformation. We will identify the verification measurements in order to be able to operate, whenever possible, the truing of the deformed parts.

Telescopic Fork:

INSPECTION
After you have dismantled the individual parts (see page 69) proceed as follows:

Fork.
Verify the measurements of the cross-section of the pipes and of the ears of fastening (view figure 32) (no damage).

Gaskets.
Clean and examine all the gaskets, observe if they have lost their elasticity for perfect retaining, if they are worn or broken. In these conditions you need to replace them without hesitation.

Springs.
The fork springs act by compression. A new piece presents an unloaded length of 310 mm and requires 49 Kg in order to reduce the length to 247 mm. Verify the load. If less than 42 Kg, replace the piece.
The supplementary fork springs act by compression. A new piece presents an unloaded length of 74 mm and

requires 74 Kg in order to reduce the length to 65 mm. Verify the load. If less than 63 Kg, replace the piece.

Upper fork tubes.

Inspect the bushing of the upper guides for arms. They must be free from scratches, grooves, etc.
Verify the play between arm and relative bushing. Such play must not exceed 0,3 mm. Otherwise replace the bushing.

Wheel carrier arms [fork sliders].

Check the upper portion of the arm where it slides into the bushing, it must not have play greater than 0,3 mm.
Check the lower portion of the arm where it slides between guide roller and roller. If you discover scratches or light wear you need to grind the shaft and restore it to original specification measurement 30 - 0,160,- 0.193 by means of chrome plating and re-grinding. If the wear and the scratches are deep, the slider is replaced.

Roller guide.
If the surface where the fork slider slides is scored or strongly worn you need to replace the piece.

Rollers
Check that the surface where the fork slider rolls has not worn, that it has not developed a flat area. If you discover that you need to replace the roller. Inspect the play between the eccentric central pivot and the roller. It must not exceed 0.2 mm, otherwise replace the roller.

ASSEMBLY of **Telescopic Fork:**

For the assemblage of the complete group reverse the operations of dismantlement.

Cautions.

Check that all the gaskets have a perfect sealing; view figure 32 how they must be assembled.
Verify that the spring carrier ring (view figure 32, #15) has the flat portion where it supports the spring. At the assemblage of the roller guides and rollers be careful that during the assembly of the roller the space has turned toward the interior of the box and the ring for regulation (view figure 32, #10) it has assembled toward the exterior. After you have assembled the cover of the roller box, with a finger inserted into the inside check that the roller turns with a normal play. If the roller is jammed or has too much play, you need to replace the adjusting ring with one having greater or lesser thickness than the original.
Insert the two fork sliders and provisionally retain them by means of the clamping of the rollers. Assemble the fork, the mudguard and the wheel onto the frame. After you finish these operations you need to place the damper liquid into the fork. In order to insert the liquid into the fork sliders B (view figure 34) it is good use a piece of tubing to insure that the liquid doesn't get poured between the fork slider B and the interior of the upper fork tube A.

Inspect the level of the liquid whose height must be 26/ 28 cm measured from the inside bottom of the fork slider B, you are urged to use special liquid for these dampers. Before you insert the body of the damper C, remember to assemble the ring made of clutch lining material onto the guide.

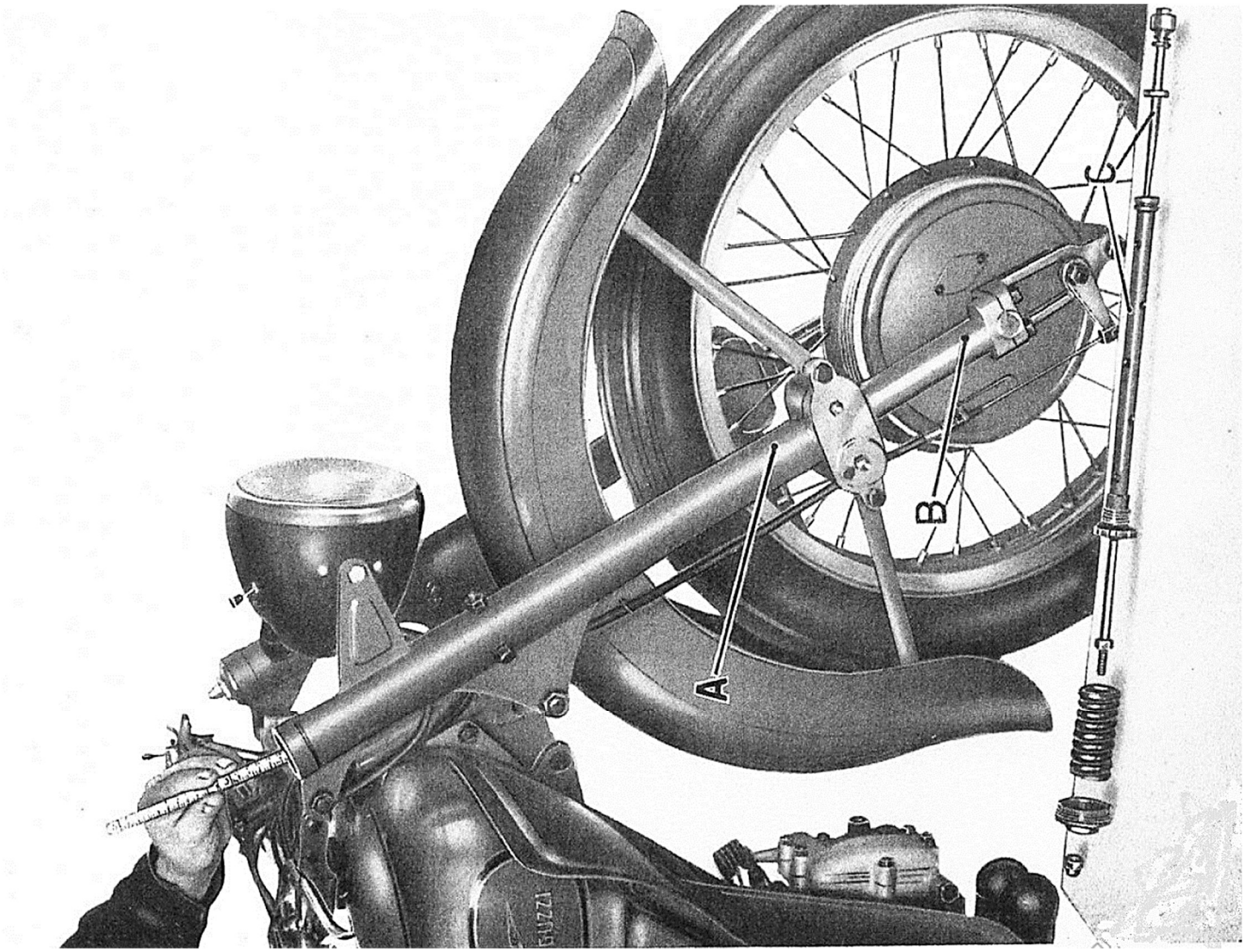


Figure 34- Verification of the liquid in the telescopic fork.

After you have assembled the fork completely you need to go through its adjustment (view figure 35) observing the play between the fork sliders, roller guide and rollers. In order to perform such verification, you need to elevate the front portion of the machine by enough as required to lift the wheel from ground. Thereafter, grab the two fork slider arms with your hands. Set the thumb of each hand on the lower edge of the roller box and against the fork slider arm. In this way you will sense the slightest possible play.

Adjust the fork slider arms in the following way: loosen the bolt C on the disk of the roller guide D, then with the appropriate wrench turn the square end of the pivot clockwise for the right arm and in the opposite direction for the left arm. Turn this pivot enough to bring the roller against the fork slider arm which is being adjusted so as to eliminate the play completely. Under these conditions arm A can not slide between roller and guide. Then, rotate the square end of pin E in the opposite direction to the previous, to move the edge of disk D three or four millimeters. In order to do this accurately it is necessary mark a target between the D disk and the cover of the F box before implementing this shift. After completing the adjustment, jam the bolt C onto the disk D. Recheck as aforementioned above and as shown in figure 35 that the minimum of play exists between the fork slider arms, roller guides and rollers. However, don't adjust so much as to prevent the motion. Is absolutely necessary to keep the fork slider arms well adjusted, because, developing appreciable play, the fork slider arms, roller guides and rollers would be consumed making difficult each subsequent adjustment with consequence of unsatisfactory functioning.

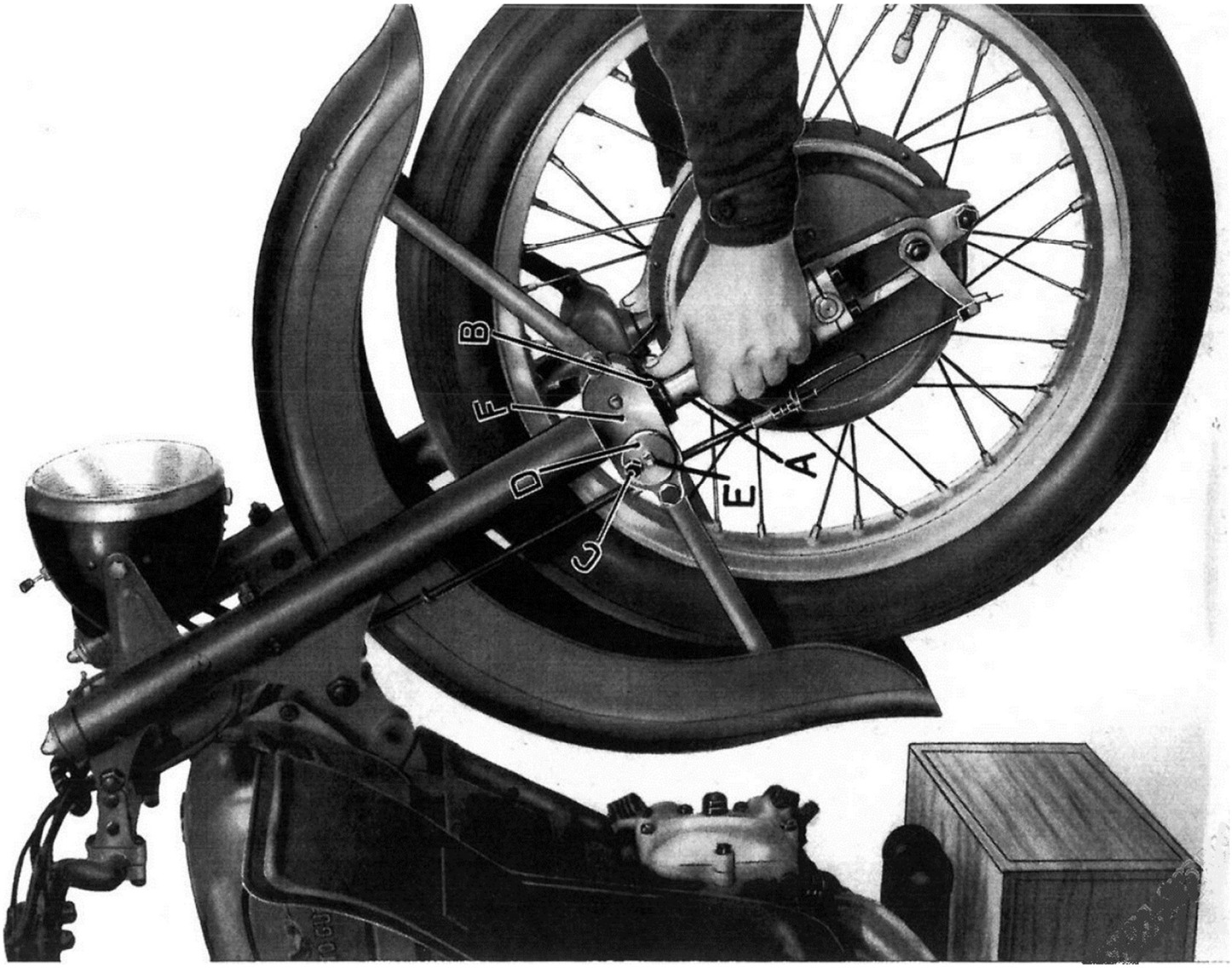


Figure 35- Adjustment of the telescopic fork.

Remember to lubricate the fork by means of the appropriate lubricators with light grease.

Rear Dampers:

INSPECTION
After you have dismantled the individual parts (view the chapter "dismantlement of the dampers") then proceed as follows:

Gaskets.
Clean and check all the gaskets, observe if they have lost their elasticity sealing, if they are worn or broken. In these conditions you need to replace them without hesitation.

Piston.
Check that it is not scratched and that the play between the piston and cylinder is not greater than 0.2 mm, otherwise replace the piston.

Control rod.
Check that the bushing for the push rod is not scratched and that the play between bushing and rod doesn't exceed 0.1 mm, otherwise replace the bushing.

ASSEMBLAGE of **Rear Dampers:**

After you have assembled the internal cylinder (view figure 33, #4) pour the liquid into the damper. In order to observe the level (view figure 36) you need to remove the appropriate inspection hole setscrew on the exterior tube of the damper and pour in the liquid until it leaks out of the same inspection hole. You are urged to use special liquid for dampers. After you have assembled the damper make sure that the plunger B slides to full stroke.

Caution: Check that the sealing of all the gaskets is perfect. View figure 33 how they must be assembled.

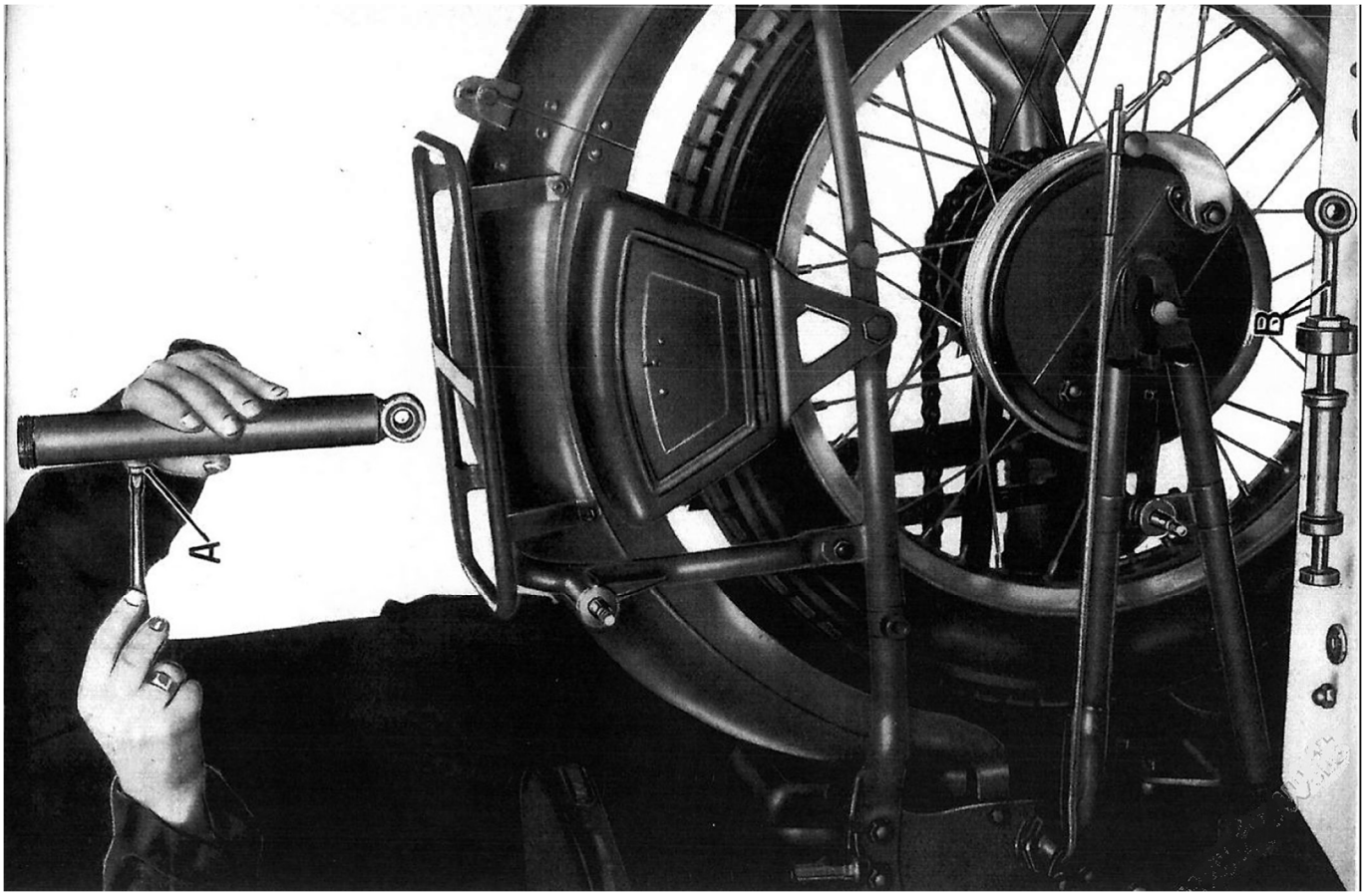


Figure 36- Verification of the liquid in the dampers.

Central Frame: - Steering Head and **Swing Arm**

INSPECTION.
Steering Head
Check the play between steering pivot tube of steering gear and frame pipe of steering head. This play is between the ball bearings and the cap races (two upper and two lower). If you discover play exceeding 1 mm above or below, substitute the pair of cap races concerned and the ball bearing spheres.

Caution: In order to simplify the assemblage of the ball bearing spheres, it is necessary to smear the cap races and spheres (18 lower and 18 upper) with a substantial grease which will hold them in place during assembly.

Steering damper.
The steering damper must be also be adjusted according to the road conditions and the speed of travel.

Oscillating swing arm.
Inspect the play between the pivot of the rear swing arm and its bushings. It must not exceed 0,15 mm.

Central Frame
View figure 37 for the principal measurements of the frame. You must examine the frame after any accident. You need to set up the frame on a flat table and verify all the distance marks. Include the fixed parts and articulated parts as regards the central frame. The parts mated rigid to the central frame include: mudguard, saddle, rear brace arms, etc. All these parts don't demand any particular maintenance care except for paint.

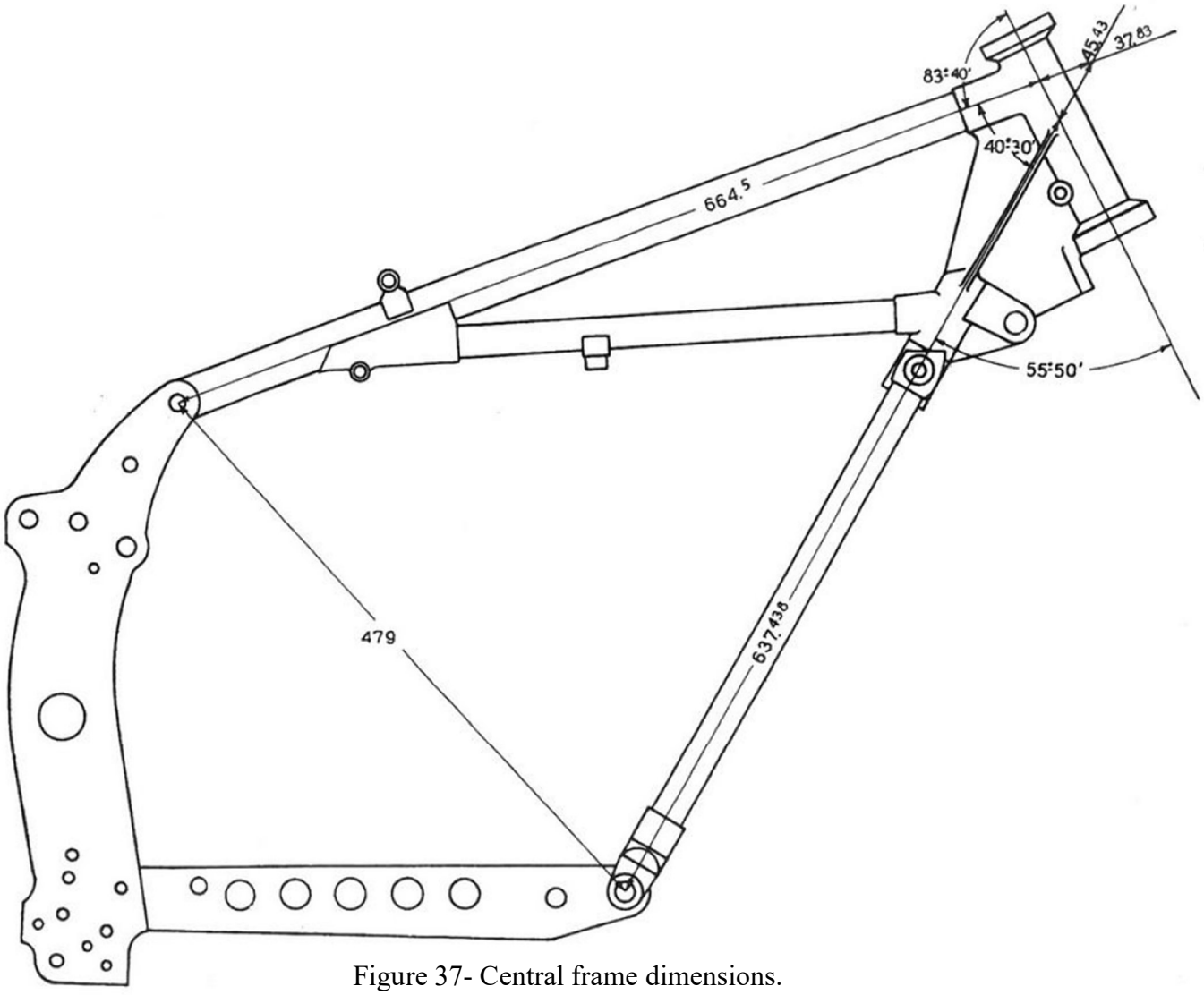


Figure 37- Central frame dimensions.

Articulated rear frame includes: oscillating swing arm with flexible joint [swing arm pivot] and suspension spring connecting rods.

If it is not necessity to replace the suspension spring connecting rods or the entire swing arm, then it is not advisable to dismantle the flexible joint between the two pieces.

For the measurements of inspection of the oscillating swing arm (view figure 38).

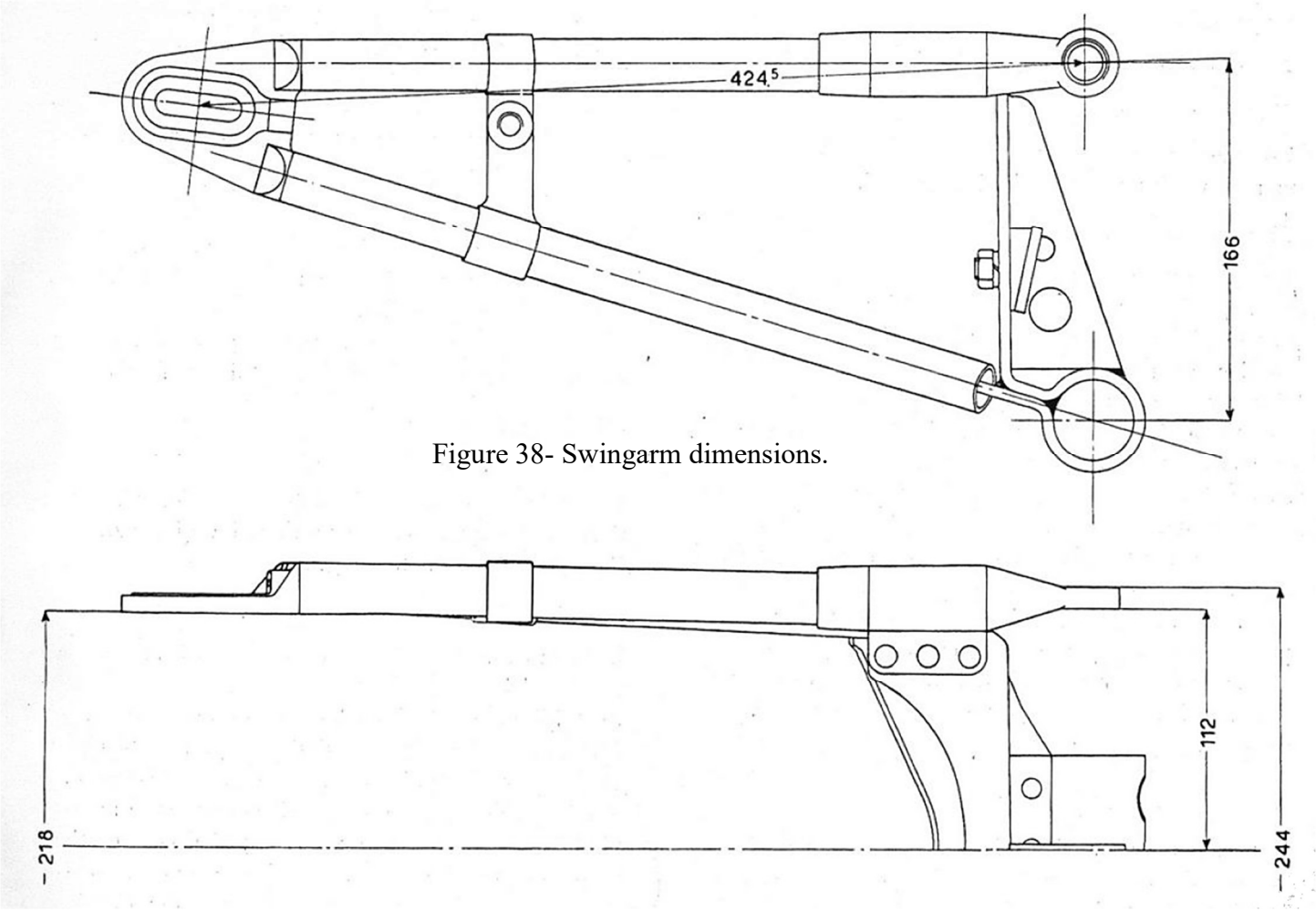


Figure 38- Swingarm dimensions.

Flexible joint. [swing arm pivot]
Fill it with grease after assembly.
Notation. - it is not necessary to dismantle the flexible joint to grease it.

Connecting rods
Inspect the condition of the end threads. Check that they are straight.

Spring package.
There are: two long internal springs (15 coils), four long internal springs (12 coils), two internal mid-length springs and two internal short springs.

Verify that they are not broken. Here are the length and load dimensions:

Long springs (15 coils). Length of a new and unloaded piece is 161 mm ± 1 mm and it requires 216 Kg ± 5 Kg in order to reduce the length to 145 mm.

Long springs (12 coils). Length of a new and unloaded piece is 161 mm ± 1 mm and it requires 130 Kg ± 5 Kg in order to reduce the length to 150 mm.

Mid-length springs. Length of a new and unloaded piece is 87 mm ± 1 mm and it requires 84 Kg in order to reduce the length to 80 mm.

Short springs. Length of a new and unloaded piece is 75 mm ± 1 mm and it requires 108 Kg ± 5 Kg in order to reduce the length to 70 mm.

Tolerances.
For the above lengths you may concede a diminution of the load of around 5% due to tolerance of construction.

ASSEMBLY of **rear springs** and **swing arm**.

For the spring package, for the oscillating swingarm group with suspension spring connecting rods and the flexible joint, reverse the operations of dismantlement.

Caution. In order to obtain a good load handling of the suspension spring package, you need to compress the suspension springs for around 31 mm. Compress both spring groups exactly the same amount by hand tightening against the internal connecting rods. The motorcycle must be supported on the center stand and therefore the rear wheel is unloaded and suspended above the ground.

WHEELS, BRAKES AND HUBS.

After you have proceeded to the dismantlement of the individual parts (view page 71) proceed as follows:

INSPECTION
Inspect that the rim doesn't present deep bruises or flaws. Otherwise replace it.

- if there are broken spokes or spokes with stripped thread. If you assemble any new spokes, you must observe the centering [trueing] of the wheel. In order to perform this operation you continue in the following way:
  - a front fork is clamped into a vice. Mount the wheel and make it turn around. Measure and adjust any peripheral shifting in radial and axial (side) direction.
  - in order to correct radial shifts you need to tighten or loosen the spokes (right and left) which are diametrically opposite to the points of maximum shift.
  - in order to correct the lateral shifts you need to tighten the right spokes and loosen the left (or vice versa).

Brake Drums.
Check that there are not deep scratches. Otherwise replace the piece.
Check that the internal surface (where it works against the material of attrition) is concentric as regards the axis of rotation.

Brake Shoes.
Inspect the status of the segments of the material of attrition.

Front brake:
The thickness for a new piece is 4 mm. If eroded beyond 3 mm replace both the segments.

Back brake:
The thickness for a new piece is 4 mm. If eroded beyond 3 mm replace.
Use appropriate copper rivets in order to secure the segments onto the brake shoe.

- it is expedient to perform the substitution in any case when you discover cracks or breaks on the piece.
- performing the substitution, take care that the external extremity of the copper rivets for fastening the attrition material has been embedded or recessed into the thickness of the attrition material segment in such a way to avoid scratches in the drum.
- inspect the load of the rebound springs between the brake shoes.
- the spring for the brake shoe of the back brake must carry 60 kg when it is elongated to 125 mm.
- the spring for the brake shoe of the front brake must carry 10 ~ 12 kg when it is elongated to 96 mm.

Tolerance of the load variation is 10%.

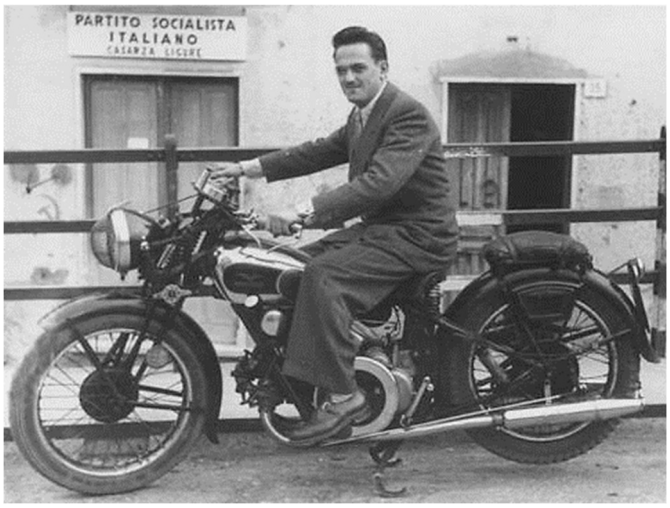
Adjustment of the brakes.
For a good adjustment it requires play (measured at the end of the foot pedal for the back brake or at the end of the hand lever for the front brake) of around 10 - 15 mm before the material of attrition comes into contact with the drum. Adjust this play by working on the adjuster which is situated on the right side of the fork for the front brake, and on the wing nut screwed onto the connecting rod for the back brake.

Hubs.
The hubs of the wheels of the Guzzi motorcycle are watertight and don't need lubrication except at long intervals.
For the bearings view the general rules on bearings page 26. Oil seal: If damaged replace the felt.

ASSEMBLY of Wheels, brakes and hubs.

Reverse the operation of dismantlement. Observe the order with which the various pieces are assembled. Fill the bearings with grease.

Adjustment of the front hub bearings.
The front hub being endowed with conic roller bearings, is adjustable. In order to restore the lateral play you need to loosen the counternut and tighten the adjuster nut as necessary. Thereafter lock the counternut again. It is necessary (after you have jammed the counternut) to have a small side play (0,01 mm); this is so that the roller bearings don't strain causing resistance to the rotation and rapid wear of the pieces.



Parallelogram Fork for 1934-’47 GTV, GTS, 500S, 500V, etc.

Removal of front fork assembly. (translated from Sport 15 shop manual. GTV will be similar.)

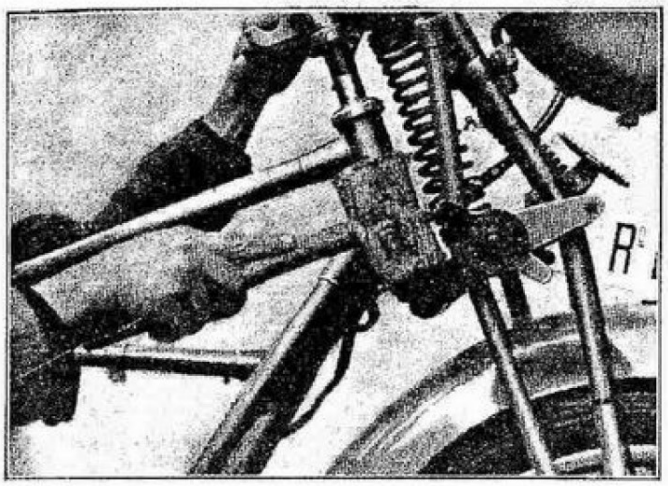


Fig. 29 - Come si sfila il canotto di guida dalla testa di sterzo.

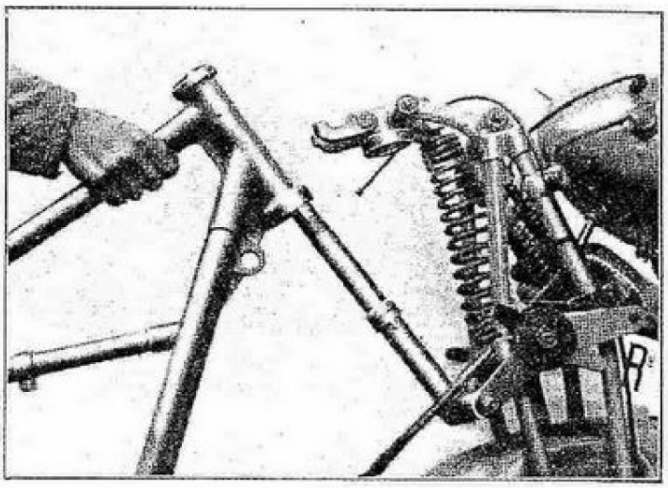
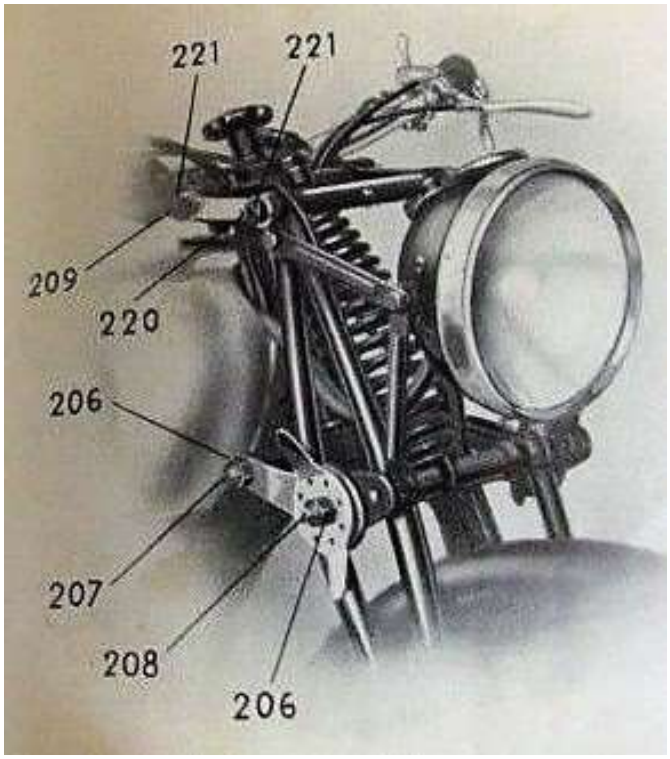


Fig. 30 - Come si sfila il canotto di guida dal canotto del telaio (pipa di sterzo).

Remove the headlight high/low switch from the handlebars.
Remove the front brake control, from the handlebars.
Remove the steering damper knob, unscrewing it completely.
Remove the two screws that fix the guide rings for control cables. (they are located on the frame head tube, one on the right and the other on the left.)
Remove the handlebar. Make sure all controls are free.
Remove the locknut from the steering tube.
Loosen the nut that tightens the steering head.
Lightly knock with a wooden mallet on the steering base (crosswise of the steering tube), alternately on the right and on the left, until the steering tube is removed from the steering head. Once this is done, you can easily remove the steerer tube from the head tube and thus free the entire front fork assembly.

Warning: Wash immediately and count the support balls so that they cannot be dropped and lost (Balls are 1/4”. There are 19 upper and 20 lower balls for Sport 15, GT16, Super Alce. 18 upper and 18 lower balls for hydraulic fork GTV.).

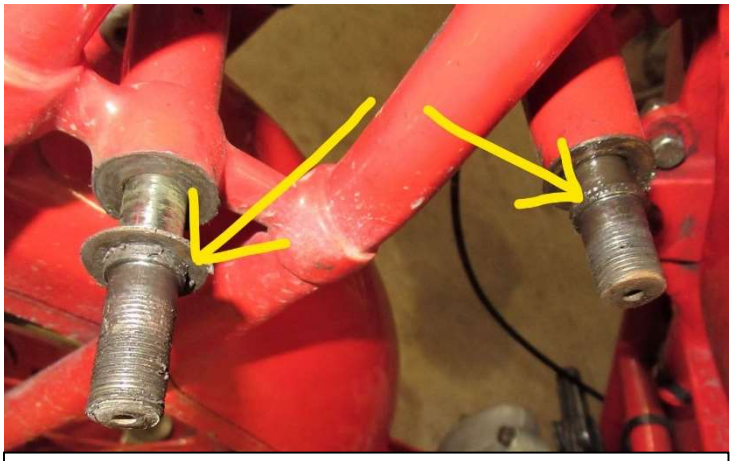


Removal of the Girder leaving the steering head on frame. (translated from GTV manual)

The two lower pivot pins 207 and 208 must be removed first. To do so, hold the pins by their square ends and unscrew lock nuts 206 and the opposing nuts on the left side. The damper wingnuts, side plates and friction material can now be removed. Having done this, use the square ends to screw in the pins enough to loosen the left lower link. The end of a screwdriver to be introduced and used as a lever to complete removal of the left link.

With the left link removed the respective nut is screwed back onto the left end of pin 207, bottoming it, and the two counter-nuts 206 are screwed onto the left end of pin 208, tightening them against each other. This makes it possible, by turning the pins 207 and 208 counterclockwise (from the left side of the machine) to extract the pivot pins completely from the right-hand lower link.

Next, the upper pins 209 and 220 are removed. Hold the pins by their square ends and undo the two lock nuts 221 and the respective nuts on the left side. Remove the left link and bronze washers. Use the same technique as above to unthread the pins from the right link.



Left link removed. Arrows mark shoulders that prevent pivot pins from being pulled through to the right.

Rebuild Notes:

The 2 parallelogram forks I have worked on had been put back in service despite suffering an astonishing amount of damage and wear. Because I don't have a copy of the workshop manual that covers the parallelogram fork, the dimensions given below are a best guess at the original. Please let me know if you have additional information – doansci at gmail.com.

upper pivot pin diameter = 11 mm
upper pivot pin bushing — ID = 11 mm
OD = 14 mm
upper bronze thrust washers (#8050 *ter* x4) — ID = 11.2 mm (left side may be 13.2 mm to clear shoulder on pin)
- specs from Super Alce parts book — OD = 23 mm
thickness = 1 mm

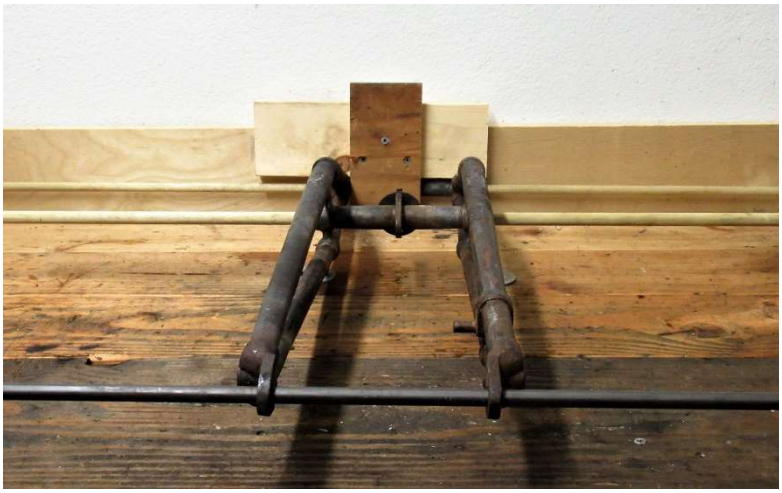
lower pivot pin diameter = 13 mm
lower pivot pin bushing — ID = 13 mm
OD = 16 mm
lower bronze thrust washers (#8054 *bis* x4) — ID = 13.2 mm (left side may be 15.2 mm to clear shoulder on pin)
- dimensions based on #8050 *ter* — OD = 25 mm
thickness = 1 mm

maximum play in pivots due to wear = 0.10 mm (0.004")

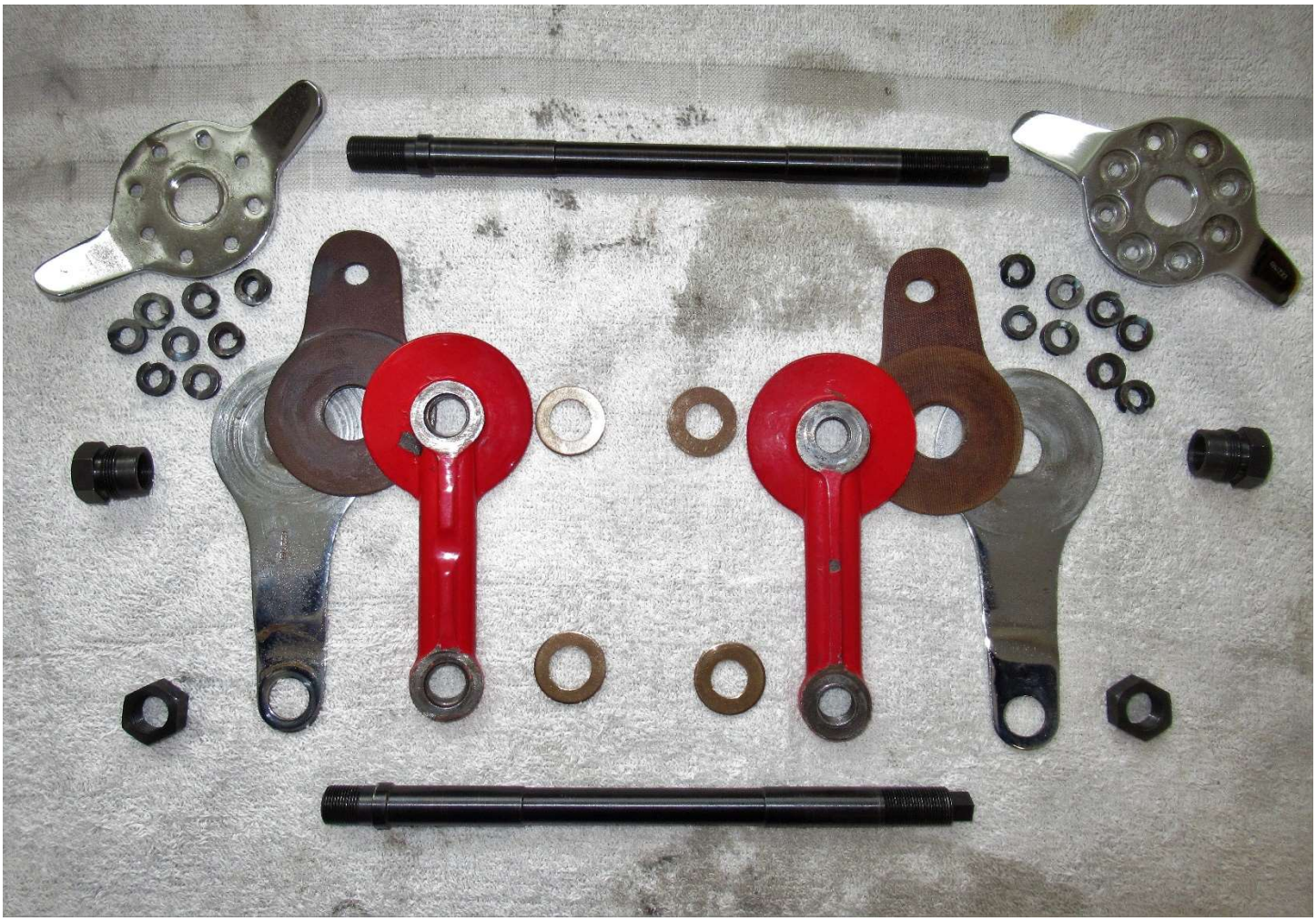
steel side plates for damper = 2 mm thick

phenolic friction material for damper = 4 mm thick

Width of girder and steering head at upper and lower pivots is 167 mm.
Girder alignment can be checked by inserting 3 long, straight rods through the pivot pin passages and the eyes for the axle. Sighting along the ends of the rods will reveal any twist to the girder. A contractor's square can be used to check that the upper frame of the girder is still orthogonal to the pivot pin axes. Place



the long edge of the square against the pivot eyes and compare the alignment to the ends of the straight rods.
Side links are straight with both ends of the link in the same plane (in other words the thickness of the bronze washers should be the same at both ends of the link.). Upper links are 8 mm thick at pivot pin eyes. Lower links are 11 mm thick at pivot pin eyes.
Bronze thrust washers can be thicker and have a larger OD than the specs indicate. I used 1/16" bronze washers of 1" diameter.
Test fit the pivot pins and side links with the bronze thrust washers. Confirm that the pivot pins can thread far enough through the right link to take up any endplay and that the shoulder on the left end of the pin does not bind with the girder or steering head. (Original pivot pins have a shoulder that is 3 mm in width. This shoulder seats in a recess in the left link. The new reproduction pins have shoulders 6 mm wide which means that much more of the shoulder sits proud of the link and binds the girder or steering head when tightened. The solution is to use thicker bronze washers or cut the extra width off the left end of the shoulder.)



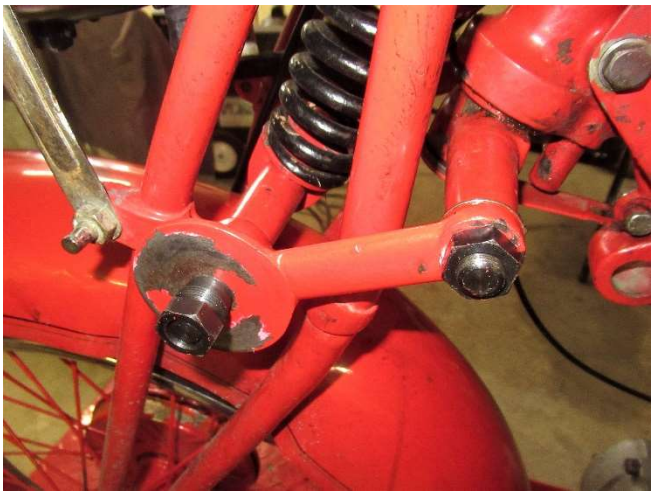
Installing and Adjusting the Fork

Assemble upper links first. The goal is to tighten up the links with just enough clearance that the bronze washers can still rotate.
Insert the pins from the left. Install 4 bronze washers and thread pins into right link evenly. Install left link and all the nuts finger tight. Adjust endplay by rotating pins until pins have very little endplay ("axial play" in the translation below) then tighten nuts securely. Check that at least one bronze washer on each pin can still rotate. If not, loosen both nuts on the pin and turn the pin counter-clockwise (from the left side) a little and repeat until bronze washer can be turned. (ensure that shoulder of pin is not binding against girder or steering head)

Assemble the lower link. Ratchet straps can be used to compress the mainspring when installing links.

Insert the pins from the left. Install 4 bronze washers and thread pins into right link evenly. (Note: The parts book provides a part number (#8054 *bis*) for the lower washers but not the number required. I used 4 washers based on measured width of the lower steering pivot and girder – both 167 mm on my GTV. The Super Alce used only 2 washers on the lower links.) Install left link and all the nuts finger tight – don't install wingnuts, friction material or other damper parts until after link is adjusted and secured. Adjust endplay by rotating pins until pins have very little endplay ("axial play" in the translation below) then tighten nuts securely. Check that at least one bronze washer on each pin can still rotate. If not, loosen both nuts on the pin and turn the pin counter-clockwise (from the left side) a little and repeat until bronze washer can be turned when both nuts on the pin are tight.

Adjusting the upper link.



Nuts tightened on left lower link to check endplay.

Once the lower link is installed and nuts securely tightened, remove the nuts on the left side and install the left damper. The 8 springs under the wingnut can be held by grease. Thread the wingnut onto its pivot nut completely, then thread the pivot nut onto the pin and tighten it securely. Once the left side damper is completely assembled and nuts securely tightened the right side nuts can be removed and the right side damper assembled the same way.

Patrick Hayes' translation of the Super Alce assembly instructions below.

ASSEMBLAGE.
For reassemble the complete unit reverse the operation of dismantlement.

Prudence: In order to make easy the assemblage of the ball bearing is necessary to smear upon the caps substantial grease and dip the ball bearing into the grease (20 lower and 19 upper) which stays thus restrained for support.
Remember mounting the six rings of bronze to the exterior of the transverse carrier plate, of the base of steering gear and of the leading link pivot (anterior pivot).
The pivots (adjustment) they are adjusted so that they don't allow axial play (sides), when the dampers have been loosened to allow the maximum freedom of oscillation.
The dampers are regulated according to the load, the road conditions and the speed of travel.
The steering gear brake must also be regulated according to the last two above mentioned conditions.