

U S S R –  
Ministry for mechanical engineering  
Irbit Motorcycle Works



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# Manual for a motorcycle with sidecar M - 72

City of

Irbit 1954

Attention, driver! During first driven 2000 km all parts of the engine and of the drive train must wear in thoroughly. In this time an overloading or lugging of the engine and an excess of the speeds indicated in the chapter "test run of a new motorcycle" must not occur.

In order to prevent this, the carburetors are lead-sealed and only after 1000 km are they to be broken.

Over the distance of lead-sealing, times are to be set up in the presence of the responsible motor vehicle officer.

These times are taken to the Kfz. documents, if a complaint should be necessary.

A distance of lead-sealing before the prescribed time is strictly forbidden.

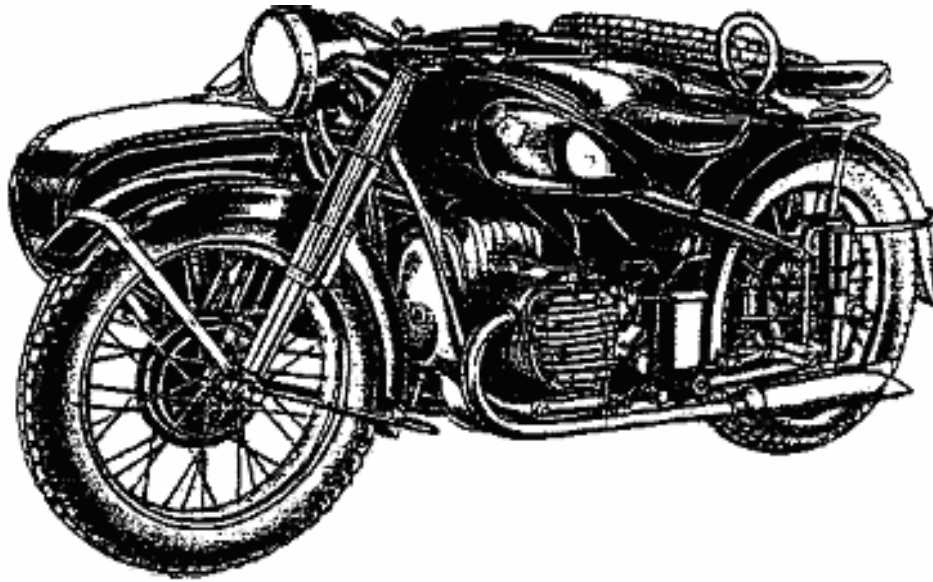


Fig. 1  
the motorcycle M-72  
Introduction

If one does not understand the construction of the motorcycle and does not care about the adjustment schedules, one cannot count on troublefree operation. In this document of maintenance and operation are the procedures for the motorcycle M-72, and there is also a short description of the construction of the mechanisms of the motorcycle.

The care of the motorcycle, adjustment and the lubrication are systematically accomplished, according to the data given in this instruction. If the driver obeys this instruction exactly, it reaches that the motorcycle runs for a long time and troublefree. The motorcycle M - 72 is a complicated machine, which can have a very long life span in the hands of an attentive driver.

In order to learn to control the machine perfectly and use their knowledge completely, one must intimately know its construction, function and adjustment.

At the motorcycle there are no "little things" and unimportant parts. Without an overriding reason one is not to take a motorcycle apart or its assemblies. The correct interaction of the parts can be disturb with an unnecessary dismantling and reassembly of machine parts, causing its premature wear and even breakage.

Technical examinations must be made systematically, foregoing repairs.

## Technical characteristic of the motorcycle

### General data:

Wheel base of the motorcycle. . . . . 1400 mm  
of clearance. . . . . 130 mm  
exterior mass of the motorcycle with sidecar:  
Length. . . . . 2420 mm  
broad. . . . . 1600 mm  
height. . . . . 980 mm  
height of the saddle. . . . . 720 mm  
weight in refuelled condition:  
without sidecar. . . . . 220 225 kg  
with sidecar. . . . . 340 350 kg  
of load-carrying capacity (incl. the whole crew of three persons)  
with sidecar. . . . . 300 kg  
of maximum speed of the motorcycle with sidecar. . . . . 85 km/St.  
Fuel consumption on 100 km with sidecar on even highway route at a speed of  
50 to 60 km/pc.. . . . 7 l  
the fuel of the full tank hands during a travel on a Chaussee  
at least for. . . . . 300 km  
oil consumption on 100 km. . . . . 0.25 l

## The engine

engine type: Four Cycle  
number of cylinders: two  
layer of the cylinders: horizontal in the angle of 180 degrees  
of drilling: 78 mm  
stroke: 78 mm  
capacity: 746 ccm  
compression: 5.5 ±0,2  
maximum output with 4450 4800 U/min at least 22 HP  
of cooling: Air cooling valve situation: down lubrication system: combined: Gear  
wheel pump and spraying system  
contents of the oil tank: 2 l.

### The fuel supply system

contents of the gasoline tank: 22 l  
number of carburetors: two  
type of the carburetors: K - 37  
fuel: Gasoline with the octane number of 66 (A 66 - A 70)  
fuel filters: Mesh filter in the seiher of the gasoline cock  
air cleaner: with two-stage oil cleaning.

### **Electrical equipment**

Ignition system: Battery ignition

ignition coil: UG - 4085 - B

distributor: PM - 05

candles: Well 11/11 A U

zuendverstellung: Setting lever at the steering wheel

battery: SMT 14 - 6 V 14 Ampere

ampere of generator: G - 11 - A 6 V 45 Watts

of relay automatic controllers: RR - 31

signal: S 35 A

headlights: FG - 6

other accessories: Tail light of the Rades, side light of the sidecar, tail light of the sidecar, signal button, dimmer switch.

### **Power transmission**

Clutch: Dry two-disk friction clutch

transmission: Two-speed four-stage transmission

gear shift: Foot and gearshift lever

quantity of oil in the transmission: 0.8 l

gear reductions:

1<sup>st</sup> Gear: 3,6

2<sup>nd</sup> Gear: 2,28

3<sup>rd</sup> Gear: 1,7

4<sup>th</sup> Gear: 1.3

transmission on rear wheel: by cardan shaft

reduction in the rear-wheel drive: 4.62

quantity of oil in the final drive: 0.175 l

entire reduction ratio:

1<sup>st</sup> Gear: 16,65

2<sup>nd</sup> Gear: 10,55

3<sup>rd</sup> Gear: 7,85

4<sup>th</sup> Gear: 6,01.

### **The chassis framework:**

closed, double, undetachable steel  
suspension of the rear wheel: Federaufhaengung  
front suspension: Telescoping forks with hydraulic  
shock absorbers of wheels: interchangeable  
tire size: 3.75 X 19  
tire pressure: Front wheel 1,6 + 0,2 atue  
rear wheel 2,0 + 0,5 atue  
sidecar wheel 1.8 + 0,5 atue  
spare wheel 2,0 + 0,5 atue  
sidecar: for 1 person.

### **The control mechanisms of the motorcycle**

Control mechanisms of the motorcycle (fig. 2) are:  
The ignition key and the central switch

1. They usually lie in the headlight in the following positions:
  1. The ignition key is pulled out, the central switch is in central position, all parts are switched off (conditions of the motorcycle by day).
  2. The key is pulled out, the central switch is turned to the left, it illuminates the small headlight, the tail light of the motorcycle and the lamps of the sidecar (conditions of the motorcycle at night on the road).
  3. The key is inserted, the central switch is completely in the central position - the ignition is switched on, when pressing on the button sounds the signal (during the travel by day). Remark: With engine switched off and completely inserted ignition key the indicator light 2 illuminates. After starting the engine the indicator light is off.
  4. The ignition key is inserted completely, the central switch is turned to the left and the ignition is switched on; the small headlight, the tail light of the motorcycle and the lamps of the side car illuminate. When pressing on the button the signal sounds (during the travel at night on well illuminated roads).
  5. The ignition key is turned to the left completely inserted, the central switch, the ignition is switched on - the tail light of the motorcycle and the sidecar lamps illuminate. When pressing on the button the signal sounds. Large or small light is switched on by the dimmer switch on the steering wheel (during the travel at night on badly lit up roads and outside of the city).

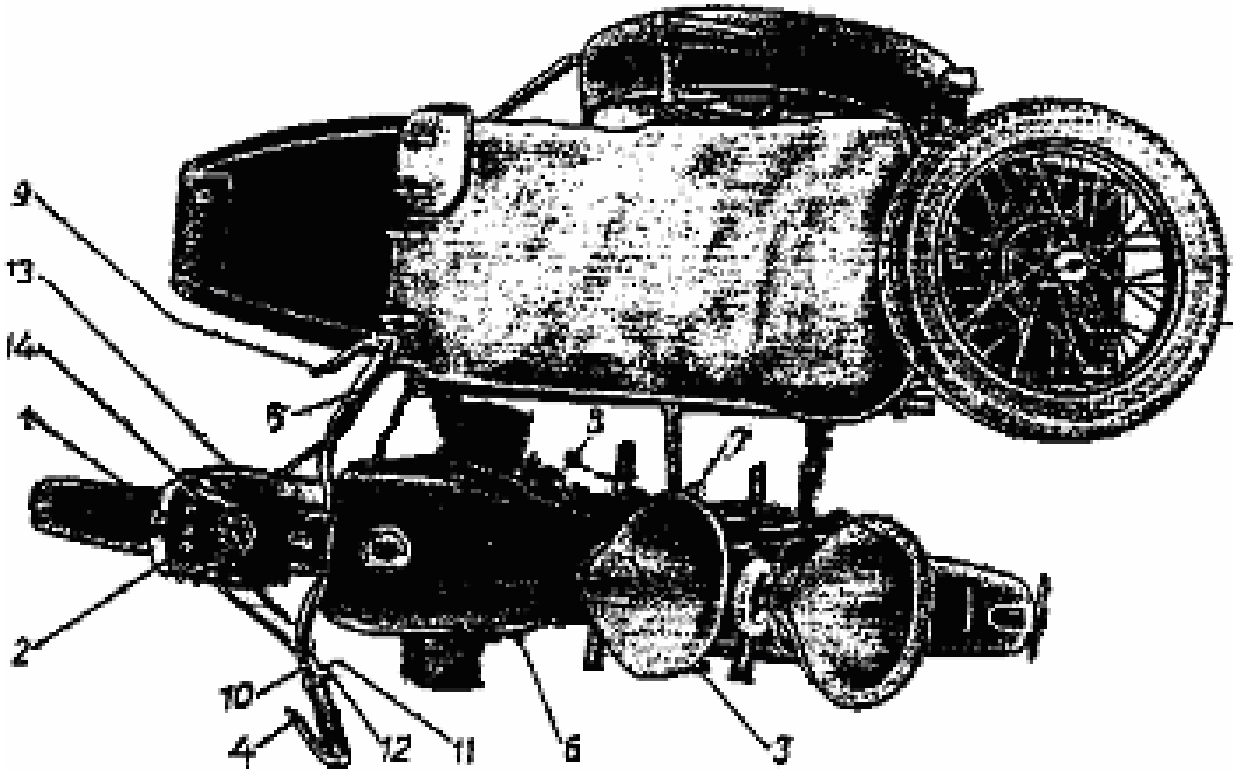


Fig. 2 the control mechanisms

1. Central switch, 2. Indicator light, 3. Starter pedal, 4. Clutch, 5. Throttle, 6. Foot shift lever, 7. Gearshift lever, 8. Foot brake pedal, 9. hand brake handle, 10. Ignition setting lever, 11. Low beam shift lever, 12. Signal button, 13. Steering Damper, 14. Speedometer

The starter pedal lies on the left side of the motorcycle. The starting occurs through pressing down the pedal with your foot. The pedal returns by a feather spring to this starting position.

The coupling lever (clutch) 4 is on the left side of the driver. While drawing the lever the clutch is disengaged and the crankshaft of the engine is separated from the drivetrain. The transmission must be in neutral while starting.

The rotary clutch (friction control) of the throttle sleeve 5 (hand throttle) lies on the right side of the driver. With rotation of the throttle toward you the engine increases RPM. Rotate away and the engine RPM decreases. The way of the throttle cable is limited with a new, not yet well-worn wheel. If you experience an overly difficult throttle, inspect, or it may break the cable.



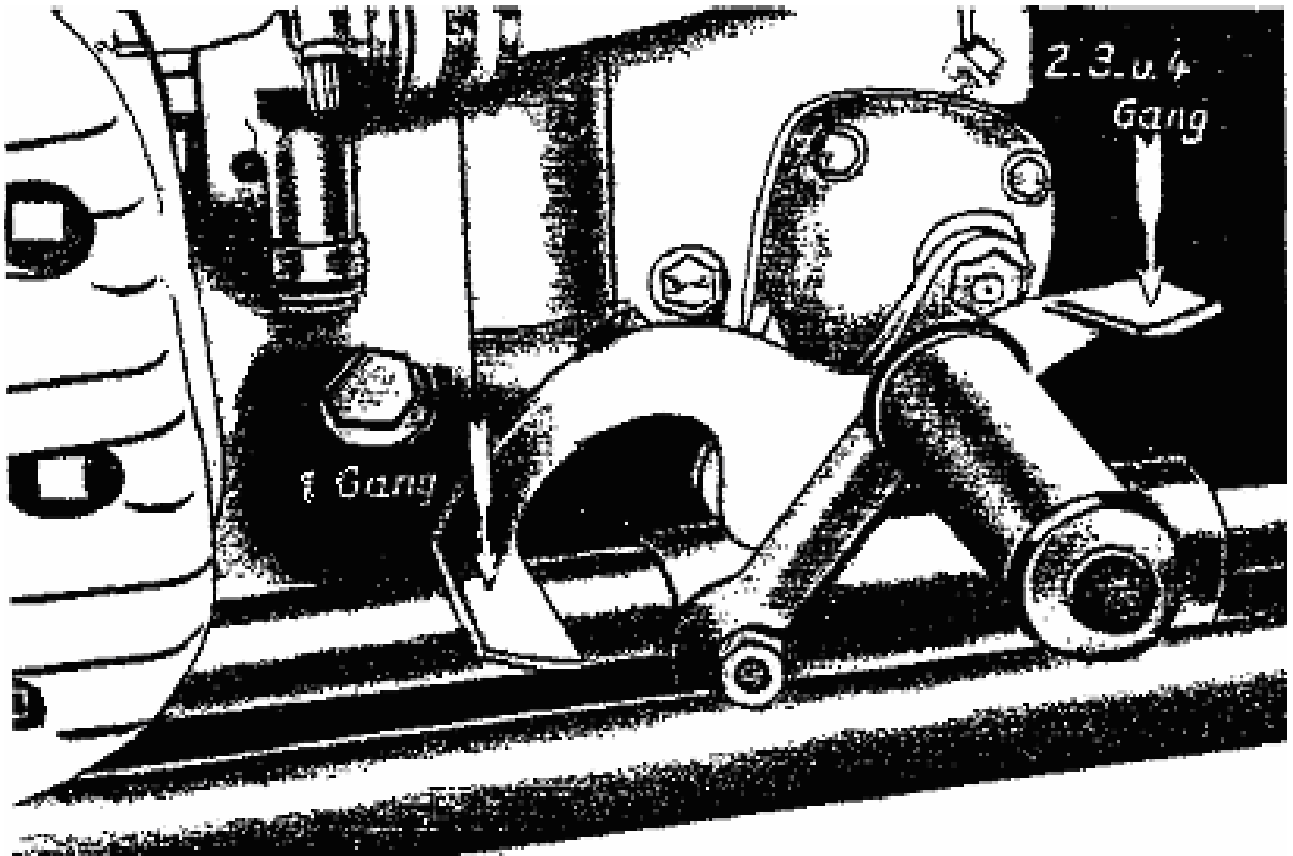


Fig 3  
**Shifting Gears**

The foot shift lever 6 lies under the left foot of the driver and is a double-armed lever with two pedals. The transmission is shifted by pressure on the front or rear pedal of the lever. After every pressure the pedal goes back in the starting position. With the turning on of the first gear one must step on the front pedal of the lever (picture 3).

When switching on on 2<sup>nd</sup>. gear one must step on the rear pedal. When switching to the 3 on. gear one must again step on the rear pedal and when switching on to 4<sup>th</sup>. gear three times on the rear pedal step. The neutral gear is between the 1st. and 2nd. gear. Therefore one must when switching the 1st to neutral the rear pedal around a half gear and when switching 2nd. gear the front pedal likewise around a half gear press down. One finds the idle position however more comfortable, if one uses the hand lever 7 (fig. 2). The gearshift lever 7 is on the right side of the transmission. It serves for the fast finding of neutral gear (the lever is somewhat back-curved for this).

The footbrake 8 lies under the right foot of the driver. The back wheel brake is operated by pressure on the pedal. One can use the foot brake regardless of the hand brake. The hand brake lever 9 is on the right side of the driver. The front wheel brake is operated by drawing the handlebar brake lever. The hand brake should be used together with the foot brake.

The ignition setting lever 10 is on the left side of the steering wheel. In the case of a turn of the lever to the driver the circuit breaker disk moves after the turning side of the cam. This position corresponds to the spark advance. In the case of a turn of the lever away from the driver the circuit breaker disk turns after that the reverse direction of rotation of the cam arranged side. This position corresponds to the spark retarding.

The position of the ignition setting lever is to correspond to the function of the engine. When starting with few revolutions of the engine and likewise with overloading, if the engine begins to knock, the ignition setting lever must be set to spark advance. With an increase of the number of revolutions one must increase the ignition folding or sliding bevel square.

The signal button 12 is on the left side of the steering wheel on the housing of the ignition setting lever.

The steering damper 13 serves the desired driving direction for the weakening of lateral impacts of the motorcycle and for the observance with different road conditions. Depending upon the tightness of the steering damper unwanted turns of the fork are prevented and the steering of the motorcycle is facilitated. During a travel with high speed or on bad roads one must tighten the screw of the steering damper.

The speedometer 14 is built into the headlight and has an odometer and a speedometer. During the engagement of the headlight the dial of the speedometer is lit up.

## **Manual Preparations for driving**

The careful examination of the machine before driving is the absolute condition for the troublefree operation of the motorcycle and for the avoidance of incidents on the road. Before travelling one must make an inspection of the motorcycle, in order to make sure it is in roadworthy condition. Furthermore one must test the presence and the firmness of all pins and connections. With special attention one has on the firm screw connection of the nuts/bolts on the axle of the rear wheel, the engine, the sidecar, to inspect the saddle and the steering wheel. One must examine also the effectiveness of the brakes.

Furthermore one must check whether the tank is full and must in the case of need fuel - refuel. While refuelling embarrassing cleanliness is to be considered, since dirt, threads or fibers, which arrived with the gasoline into the tank the passage openings at the gasoline petcock clog and on the way the cause for an involuntary fuel starvation. In order to avoid this, one must pour the gasoline by a filter in the tank or by a funnel with a filter. In strong rain or snow it is advisable to make the refuelling of the motorcycle at a protected place. While refuelling **PLEASE DO NOT SMOKE**. Gasoline may not also overfilled. Furthermore one must check whether in the crank case sufficient oil is present. It is to reach up to the highest mark of the dipstick, not exceeding these however. Finally also the tire pressure is to be examined and, if it is necessary, the tires inflated.

After completion of the inspection and refuelling one can start the engine.

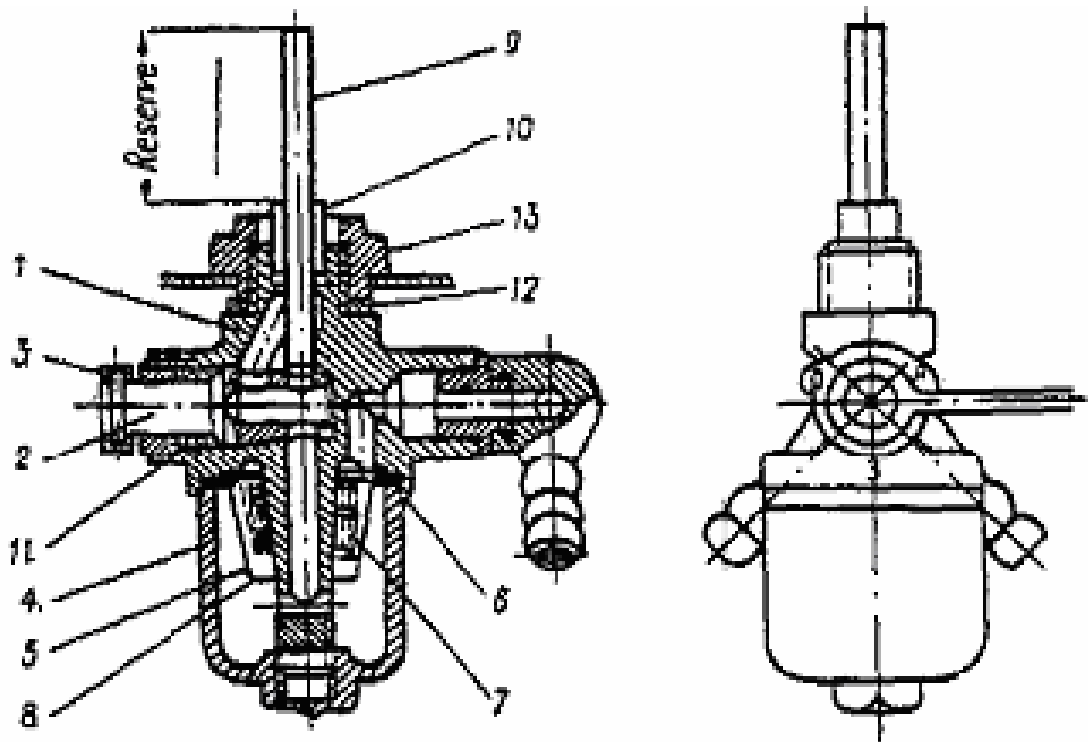
Starting of the engine

To start the engine, the following is necessary:

1. The position of the shift lever for neutral.
2. The gasoline petcock open, which levers turn to the right on the letter O - open - (fig. 4).

The letters in the illustration mean:

S - Cock closed, O - cock openly, R - cock on reserve consumption.



**Fig 4**  
**The Fuel Petcock**

1. Housing, 2. Slidegate valve, 3. Hand lever, 4. Bowl, 5. Filter cup, 6. Bowl Washer, 7. Filter screen, 8. Filter feather/spring, 9. Main gasoline line, 10. Reserve gasoline line, 11. Sealing disk of the slidegate valve, 12. Sealing disk of the gasoline housing, 13. Body

3. With cold engine put the ignition set lever on late ignition (the lever on the handlebar), open the throttle slightly, press the carburetor tickler to overfill the bowl, close the air flap and step several times on the starter to suck in the gas mixture in the cylinders.

4. With warm engine the ignition setting lever and the hand gas are indicated on the same way to adjust as in point 3. The float bowl of the carburetor one does not need to overflow, the choke is not to be closed and to mixture needs not to be sucked in (no pre-kicking necessary). The ignition key is to be inserted completely. If the position is correct, the red indicator light illuminates.

5. Sharply, but not too forcefully, the kick starter is to be pressed. After starting, the engine **must warm up**. This is necessary, because the oil must be warmed to properly lubricate, cold oil lubricates poorly. The engine must warm up with a middle number of revolutions, one may never equal full power give. If the engine is warm, one can open the choke.

### Driving rules

When starting one must disengage the clutch completely and switch to 1<sup>st</sup> gear, by pressing with the foot on the front pedal of the foot shift lever. One turns the hand throttle lever to increase the number of revolutions of the engine and engages 1<sup>st</sup> gear at the same time evenly. The motorcycle moves on that slowly from the starting position. In no case one may engage quickly, since here the power transmission is overloaded and the engine stops. One must also not disengage the clutch at high RPM, however the number of revolutions must be so large that the engine does not stop when engaging the clutch. If the motorcycle in 1<sup>st</sup> gear reaches a speed of 10 to 15 km, one must on the 2<sup>nd</sup> gear. For this one, if one disengaged and took gas away to press fast with the left foot on the rear pedal of the foot shift lever has to in-couple then evenly again and give somewhat more gases.

After one reaches a speed of 20 to 30 km, one switches to the same way the 3<sup>rd</sup>. gear and at a speed of 35 to 40 km the 4<sup>th</sup>. gear. Afterwards the speed is adjusted by the slide of the carburetors, i.e. by a turn of the throttle. Driving into 3<sup>rd</sup> and 4<sup>th</sup> gear with a smaller than the indicated speed is not permitted, because here the engine lugs, with an overloading force, unevenly and jerkily.

This is however very unfavorable for a motorcycle. One should also not drive a longer time in the 1<sup>st</sup> and 2<sup>nd</sup> gears, if the road conditions do not require because the engine here develops high RPMs, is cooled poorly, and it is subjected to a fast wear in addition driving in low gears leads, where this is not necessary, to an increased consumption of fuel.

To start one may only in the 1<sup>st</sup> gear. With small driving speed and during travels in the city one must use 3<sup>rd</sup>. and even the 2<sup>nd</sup> gear. Use gears and hold themselves below to those speeds indicated.

One uses the clutch only when starting and when switching the gears. Coupling is to take place calmly and evenly. Do not disengage the clutch slightly in order to overcome an upward gradient and to increase the number of revolutions of the engine and to let the clutch slip. In urban traffic conditions, where the driving speed is often to be changed, one must switch and with gas, but do not adjust speed by slipping of the clutch. Slipping the clutch entails a fast wear of the clutch disks.

When braking one must disengage and step on the brake simultaneously. One must brake carefully, because the possibility of hurling and tilting the motorcycle is very large with sharp braking. Sharp braking is particularly dangerous in the winter and on a wet road.

During the travel on a motorcycle also the ignition advance must be increased at the same time with the increase of the number of revolutions of the engine, since one cannot achieve otherwise the full power of the engine. One must make note however of the fact that during too much spark advance the power of the engine is reduced. If the spark advance is too advanced, then bright metallic ringing sounds (pinging) with an increase of the load or sudden opening of the throttle valve. In this case one must set the ignition lever to ignition retard.

Too much ignition retard causes an overheating of the engine except a power loss also. In order to stop the ignition correctly, each driver must study and know the motorcycle engine exactly.

During a travel on an upward gradient one must plan ahead and adjust the speed of the machine in such a way that inevitable holding is avoided. If the upward gradient is long, then one must drive the wheel out before that the whole upward gradient or the largest part in 4th. gear is taken.

If during the travel the engine is overloaded, then one must reset and to a smaller gear and adjust the ignition.

During acceleration it is extremely important to pay attention to the condition of the road since large holes can be the cause of accidents. If a motorcycle drives near sufficient speed to a strong upward gradient and is in a high gear, then switch to 2<sup>nd</sup> or 1<sup>st</sup> gear up to the end of the long hill. If the engine on the upward gradient stops, one must hold the wheel with the emergency brake, start the engine, switch to 1<sup>st</sup> gear, releasing the clutch and couples the brake at the same time.

With steep departures in time 2<sup>nd</sup> or 1<sup>st</sup> gear is to be switched on and be braked with the engine.

Short distances of dry, loose sand one is in 2<sup>nd</sup> or 1<sup>st</sup> gear with enough speed to drive through and try to keep the same number of revolutions.

One must be reminded of the fact that a longer travel into the 1<sup>st</sup> and 2<sup>nd</sup> gear can cause an overheating of the engine. Therefore you must occasionally stop, in order to assist the engine cooling.

For the overcoming of distances with thick, tough dirt one must drive likewise as with loose sand. If under the fenders much dirt has accumulated, the rotation of the wheels becomes difficult, then one must continue and remove the dirt with the help of an article (lever, assembly lever, stick).

One must drive over furrows and holes slowly and brake beforehand while driving over them. One crosses deep ditches diagonally, at an angle, at slow speed in 1<sup>st</sup> gear. When driving out of the ditch, give it gas.

Cross railroads and streetcar crossing at a right angle. If one approaches a railway crossing, one must slow down, switching to 1<sup>st</sup> or 2<sup>nd</sup> gear and may not switch when crossing the railway rails.

During a travel with poor visibility (at night or fog) extreme caution is to be practiced and remembered that the braking distance depends on the driving speed and on the condition of the brakes and roads. Consequently one is to limit the speed according to the view.

If one continues on the way, one is to let the motorcycle stand not on the road, but on the side. In order to avoid a running out of the gasoline, the gasoline petcock is to be closed when switching the engine off. In order to prevent a draining of the battery, remove the ignition key.

Each day when shutting down the machine, you must make a daily inspection

It is particularly important to make certain that there are no oil and battery acid leaks.

### **Breaking in a new motorcycle**

Correct breaking in of a new motorcycle increases the life span of the machine. Breaking in is divided into two time periods, driving from 0 to 1000 km and driving from 1000 to 2000 km. When breaking in one may not exceed the following speeds:

<b>Gear</b>	<b>from 0 to 1000 km</b>	<b>from 1000 to 2000 km</b>
1	10 km/hr	15 km/hr
2	20 km/hr	35 km/hr
3	35 km/hr	50 km/hr
4	50 km/hr	70 km/hr

These speeds refer to the travel of a motorcycle with sidecar on even road. At the carburetors automatic controllers are attached, which must be shortened after first 1000 km and be removed completely after 2000 km. One is not to completely rely however on the automatic controllers and to turn the limit the speed. The best breaking in method, which ensures the fastest and most correct flow of the rubbing parts, is an alternating driving acceleration up to the maximally permissible speed on short distances (500 m) and a following decelerating run with throttle back. After first 2000 km one is not to turn into during a longer travel yet on full power. One can increase to the maximum speed gradually, if one approaches 3000 km.



With a run in machine (with sidecar) one may not exceed the following maximum speeds:

<b>Gear</b>	<b>Km/hr</b>
1	20
2	45
3	65
4	95

A new motorcycle requires increased attention during the time of breaking in, if the rubbing parts run in. In this period one may drive the machine to overloads and not on difficult ways.

One may not let the engine run with a high number of revolutions and overheat. It is necessary to occasionally adjust the cylinder head pins tight for better seating of the seals. During breaking in much attention must be paid to lubricating the engine.

After first 500 km the used up oil is emptied, the oil pan is washed and fresh oil up to the necessary height is again filled up.

The sequence with the oil change is:  
Empty the oil only with a warm engine  
Tighten the oil plug and fill up to the appropriate lever

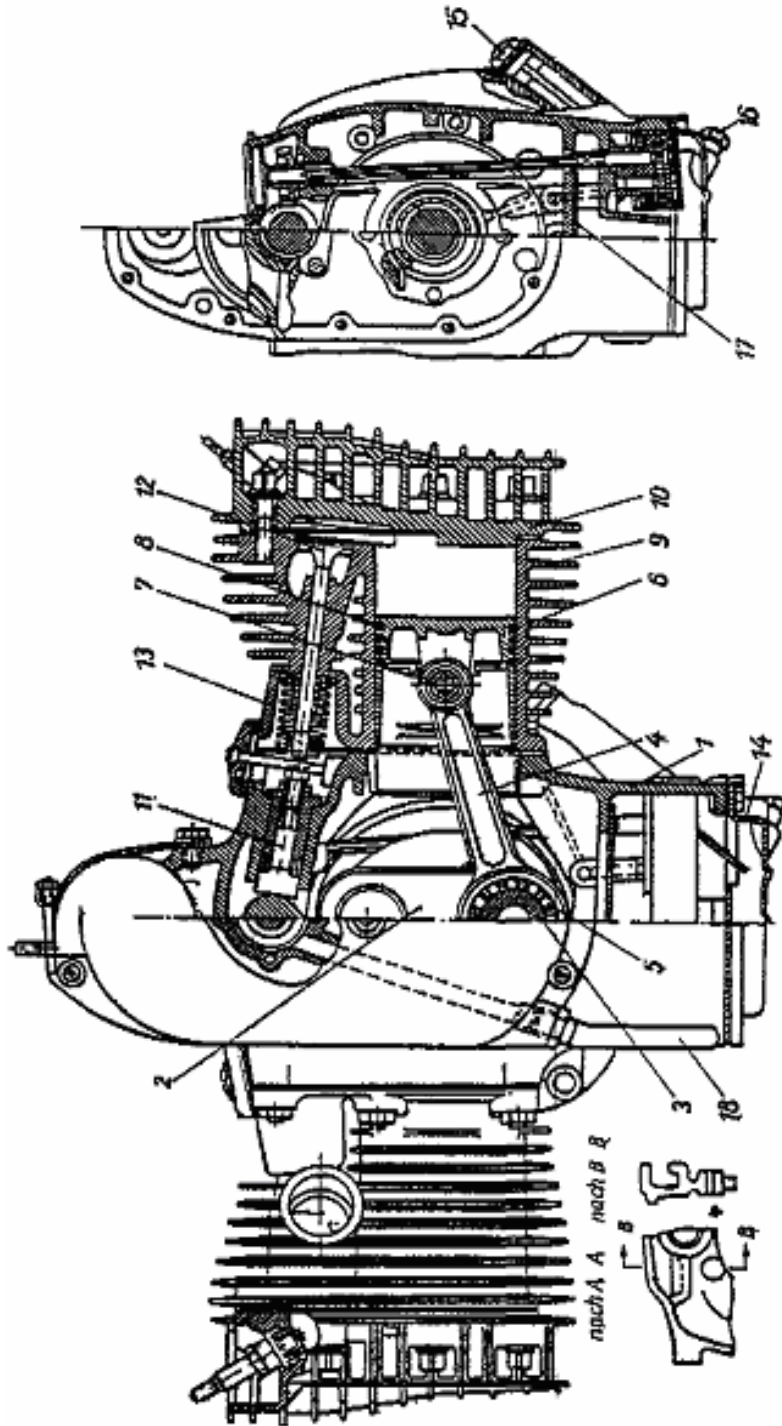
Up to the completion of breaking in one must change the oil also at 1000 km. At the conclusion of breaking in (after 2000 km) the oil in the engine, in the transmission and in the rear transmission must be changed.

The sorts of the oils and quantities which can be used are indicated in the Lubrications Table (page 67).

## **Guidance for care and adjustment**

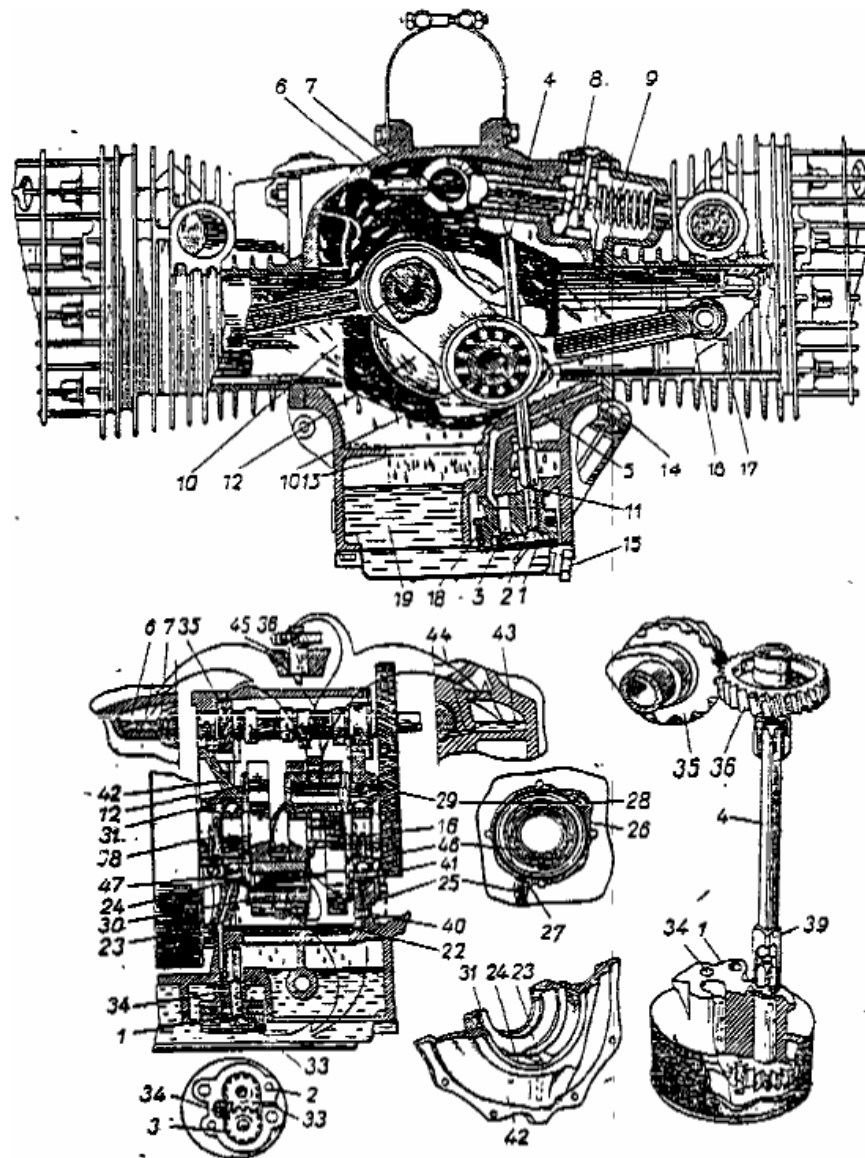
### **The Motor**

The engine belongs to the construction and the technical values after to the motorcycle high speed engines for route machines, since regardless of the existing lateral valves the achievement and number of revolutions for engines of this type are rather high.



**Fig 5**  
**The Motor**

1. Housing, 2. Crank cheek, 3. Crankpin, 4. Piston rod, 5. Bearing of the lower piston rod head, 6. Piston, 7. Gudgeon pin, 8. Piston rings, 9. Cylinder, 10. Cylinder head, 11. Tappet, 12. Valve, 13. Valve spring, 14. Oil pan, 15. Screw connection of the oil filler neck, 16. Drain screw connection. 17. Filter, 18. Ventilation pipe at the oil filler neck



**Fig. 6**  
**Engine Lubrication Schematic**

1. Housing of the oil pump, 2. Drive wheel, 3. propelled wheel, 4. Tie bar, 5. Oil line of the left cylinder, 6. Oiling line, 7. Oil line valve, 8. Hole in the valve housing, 9. Hole in the left cylinder, 10. Crankpin, 11. Seal of the oil pump housing, 12. Oil cup, 13. Filter of the oil discharge, 14. Screw connection of the charging hole, 15. Screw connection of the outflow hole, 16. Opening for the lubricating of the gudgeon pin, 17. Oil wiper ring, 18. Filter of the oil pump, 19. Oil reservoir, 22. Main line, 23. Oil channel to rear bearing, 24. Oil seeping channel, 25. Channel of the front cam, 26. Enular groove, 27. Oelloecher in the bearing house, 28. Recess for the expiration of oil, 29. Oil line pipe, 30. radial openings in the crank ring, 31. Lubrication can of the crank, 33. Inlet port of the oil pump, 34. Discharge opening of the oil pump, 35. Drive wheel, 36. Drive wheel of the oil pump, 38. Oil stripping groove, 39. Coupling sleeve of the drive wheel, 40. Outflow hole, 41. Radius recess in the bearing house, 42. Housing of the rear cam, 43. Oiling ash, 44. Oil line channel, 45. Recess for the lubricating of the drive wheel of the oil pump, 46. front supporting ball bearing, 47th rear supporting ball bearing

The characteristic of this engine is the horizontal situation of the cylinders, which ensure a good cooling and an even working of the engine. The presence of a carburetor per cylinder is to increase the performance of the engine, whereby the intake becomes balanced, which is connected with the necessity for a completely even adjustment of the two carburetors.

The lubrication system of the engine has a combined pressure and spraying lubrication system. A total lubrication pattern of the engine is fig. 6. The oil pan pressed from a steel sheet forms the main oil reservoir. The oil is carried from the oil pan by means of a gear pump by the mesh filter 18.

The oil pump is propelled by the cam shaft by a pair spiral toothed gears. The oil pump has only one compression phase, which consists of a pair in the pump housing of attached gear wheels.

The wheels press the oil into the main line 22. From the main line the oil runs under pressure to four places: to 2 oil cups 12 by the channels 23 and 25 to the left engine cylinder by the channel 5 and to the teeth of the drive wheel of the crankshaft by the connecting piece 29.

The oil, which runs out of the connecting piece, arrives at the gears of the crankshaft and lubricates the gear teeth of the cam shaft and the generator.

The surplus oil runs off and flows back into the oil pan of the housing. Into the oil cups the oil comes from the slots, which are in the seats of the crankshaft ball bearings.

From the oil cups the oil runs into the holes of the crankpins and from there, under the effect of the centrifugal energy, by the openings to the ball bearings of the large piston rod heads.

The surplus oil runs out of the oil cups and connecting rod bearings and hurled around inside the housing.

The intensive pressure of the oil and the high temperature promote the design of a fine oil mist in the housing, whereby the work surfaces of the cylinders, the gudgeon pins, the sockets of the small piston rod heads, the cams, the crankshaft ball bearings, which are lubricated tappet guides and the valves.

In order to ensure a better lubricating of the camshaft, there are special oiling holes 6, in which a part of the around-hurled oil collects itself in the housing.

From oiling holes the oil runs automatically to the bearings.  
In a similar way the bearing of the oil pump drive wheel is lubricated.

The hurled oil arrives only in insufficient measure to the upper wall (in driving direction) link cylinder, since this place is not attainable for oil droplets, which are away-torn by the crankshaft turning in the clockwise direction.

The oil mist does not ensure however the necessary lubrication.

Therefore the channel 5 is led, by that the oil to an enular groove at the cylinder flange runs and from there by three openings to the upper wall of the left cylinder to the left cylinder.

In order to prevent a squeezing out of oil by the lubricators and seals for the moment the mutual approximation of the pistons in both cylinders and also, in order to prevent an unnecessary drop on the air pressure in the housing, a tube end 6 is mounted at the end of the cam shaft (fig. 10).

During the mutual approximation of the pistons the opening in the tube end coincides with the opening of the ventilation pipe 18 (fig. 5), and thereby the housing is connected with outside air.

During the moving away of the pistons the tube end terminates the connection of the housing with outside air, it develops a negative pressure, and the oil mist is sucked off by the distribution gears into the housing. Vibrating the oil prevents and takes the filter attached in the lower part of the housing while driving the foam away.

The oil is cast in into the crankshaft housing through the filling hole locked by the left side by with a screw connection 15 (fig. 5).

As a check of the oil level a dipstick with two marks is attached at the screw connection of the filling hole.

The oil level is to go up to the upper mark, not exceed these and lower itself in no case under the lower mark.

While checking the oil, one is not to screw in the dipstick. Used up oil is removed by the orifice in the oil pan bottom, locked with the screw connection 16 (fig. 5). With this lubrication system one must not in the first few minutes of operation rev the engine. Toward the lubrication one must direct the most serious attention, because short suspending or an insufficient lubrication can lead to heavy accidents. Signs of a insufficient lubrication are those performance and the occurrence of knocking in the engine.



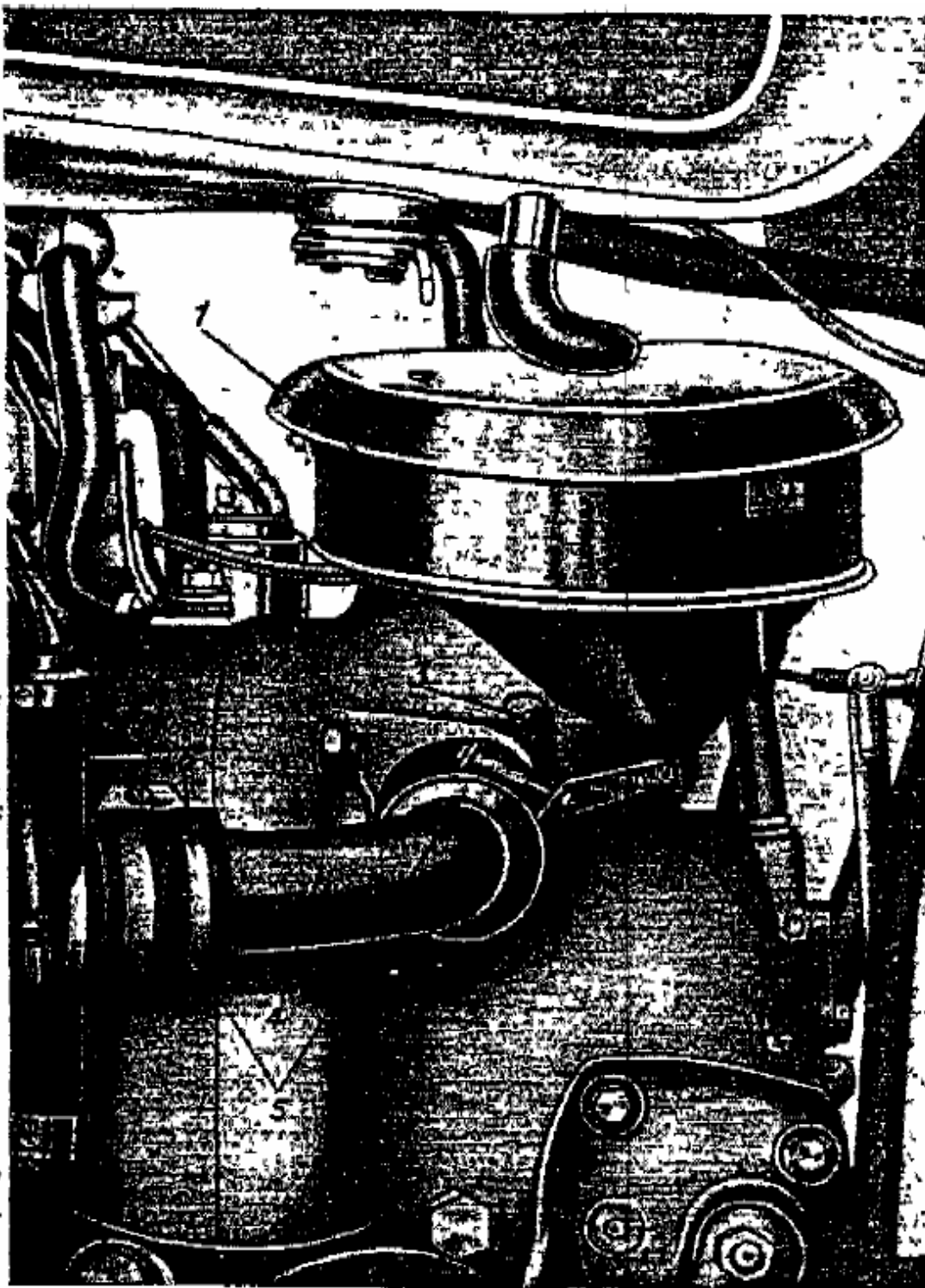


Fig. 7 the air cleaner

1. Air cleaner, 2. Choke, 3. Lock screw of the attachment of the air cleaner, 4. Syphon of the left carburetor, 5. Rubber seal seals, 6. Clamping jaws of the gaskets

The fuel system supplying the engine takes place via two carburetors K - 37, which are directly attached at the cylinders.

The fuel is supplied to the right and the left carburetor from the fuel tank by a petcock and fuel piping.

Both carburetors have a common air cleaner (fig. 7), which is installed at the transmission case, and a coupled throttle slidegate valve.

The air cleaner is provided with a choke, which facilitates a starting and a warming up of the engine in cold weather.

The main cause of the wear of cylinders, pistons piston rings and all other rubbing parts of the engine are dust and sand, which arrive by the carburetors into the engine.

The life span of the engine depends on the perfect condition of the air. The air purification process of the dust takes place in two stages.

Air occurring under the filter cover is thrown under the effect one at the cover of fastened reflector on the mirrors the oil pan.

It steps under sharp change of direction into the neck of the air cleaner, which has a metal wire screen.

Larger dust particles, which penetrate together with air, get into the surface of the oil and into the pan of the air cleaner

Smaller dust particles, which are drug along by the air flow, remain putting in the oiled metal wire filling of the filter neck.

From the filter neck cleaned air arrives by the air lines at the carburetors. In the housing of the air cleaner a disk is attached, which serves as gasket.

Treatment regulation for an air cleaner before start-up of the motorcycle, in enterprise, is to be examined whether the air cleaner is soaked with oil.

For this is necessary:

1. The air cleaner from the neck in the transmission case remove and the lock screws before loosen.
2. The upper cover of the air cleaner must be removed.

If there is no oil present in the air filter one must loosen the lock nut and leave those.

4. The oil of the exterior surface of the oil filter wipe off.
5. Pour oil up to the ring into the oil pan (200 ccm). When pouring in the oil the top margin of the tub of the air cleaner must be horizontal.
6. The upper cover of the air cleaner remount and the filter to its place fasten.

**Note:**

1. The air cleaner will use the same oil as the engine. One can take used engine oil for the air cleaner, only it must be filtered before.
2. If one received the motorcycle from the manufacturing firm, one needs to examine only the presence of oil in the air cleaner.

If the motorcycle is in heavy use, one must control daily the oil level in the oil pan and the degrees of the contamination.

It is advisable to make the following periodic washing of the air cleaner and an oil change:

If the motorcycle on particularly dusty ways is driven, the air cleaner must, without taking apart it, all 150 - 200 km to be washed, and under normal conditions every 500 km.

Washing the air cleaner takes place in a container with petroleum or gasoline via immersing and removing via strong vibrating for careful cleaning of the wire filling from dust.

Complete taking of the air cleaner apart with the washing of the wire filling is necessary every 2000 km.

Taking the air cleaner apart and washing the wire filling happen in the following way:

1. The air cleaner is removed from the transmission case, after one loosened the lock screw before.
2. The upper cover of the air cleaner is removed.
3. The dirty oil is discharged.
4. The oil absorber disk is removed, after the lock washer is taken out before.
5. The protecting filter and then the filling packages are taken out in sequence.



6. The filter housing is cleaned by dirt. The filter and the filling are washed in petroleum or gasoline. Afterwards one must dip and drip off let it into oil. Then the filter is again assembled.
7. Building the air cleaner up takes place in the reverse order like a taking apart.
8. Soaking with oil happens according to the regulation indicated above.
9. After the air cleaner is soaked with oil, one remounts the upper cover, fastens him, puts the air cleaner on the neck at the transmission case and secures him with lock screws.

For easier starting of the engine with a contact oil air cleaner a choke is built into the air lines of the carburetors.

With fully opened flap the lever is in extreme down position, with closed flap in outermost forward position. (the lever is above.) One may use the choke only for starting the cold engine.

The cold engine is started in the following way:

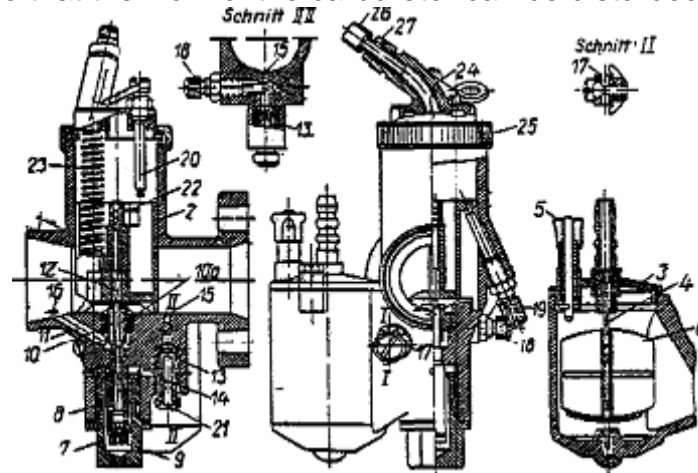
1. The choke is closed.
2. The float bowls must be overfilled.
3. Depress the kick start three or four times to bring in the fuel and air mixture.
4. The ignition switch on and by sharp stepping on the starter pedal the engine start.
5. The engine to warm up let open and gradually the choke.

In order to prevent a contamination of the fuel supply system, a filter is inserted in the filler necks of the gasoline tank, by which the fuel must be filled while refuelling.

In addition the gasoline petcock (fig. 4) has a mesh filter and a sieve 4, at the carburetor connecting pieces is small metal filters for the filtration of the fuel.

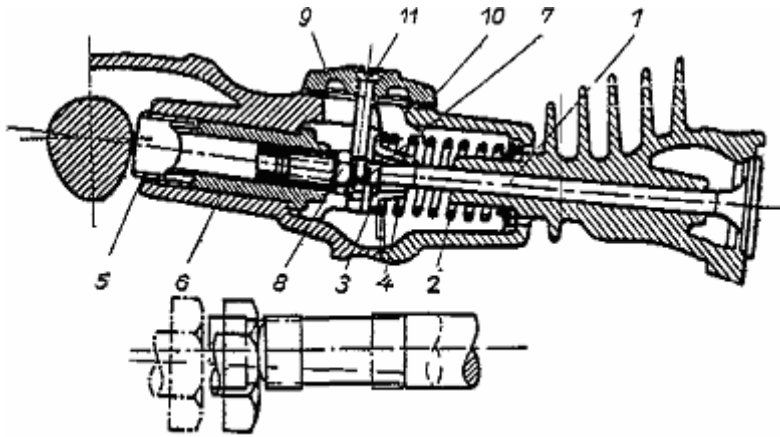
It is recommended to depart at 1000 km the dirt set off in the sieve to wash and clean the fuel filters at the gasoline cock and at the carburetors, the carburetors with gasoline to wash and the nozzles and channels to blow through.

The signs of a contamination of the nozzles or a insufficient fuel supply show up in a sudden and sharp power loss, slamming in the carburetor and in one the position appropriate number of revolutions of the engine. In this case one must check first whether the opening is dirty in the gasoline tank screw connection, which makes the connection with outside air. Then one must close the gasoline cock, which seiher remove and clean as well as wash the filter in it. After the seiher is again attached, one must open the gasoline cock briefly and with a pump blow through. If the carburetor (fig. 8) is dirty, one must take apart, wash and clean it. For this one must unscrew the connecting piece 7, wash the soldered on filter and the main jet with a pump blown through. For the cleaning of the nozzle one may take a steel wire in no case, since thereby the nozzle bore changed and so that the work of the carburetor can be disturbed.



1. Carburetor Housing, 2. Throttle Slide, 3. Float frame cover, 4. Float Needle 5. Tickler, 6. Float, 7. Connecting piece, 8. Filter screen, 9. Main jet, 10. Atomizer, 11. Air duct of the atomizer, 12. Needle of the Slide, 13. Jet, 14. Fuel channel of the Jet, 15. Atomizer opening of the no-load operation nozzle, 16. air duct of the no-load operation nozzle, 17. Filter of the auxiliary air duct of the jet, 18. Idle Mixture Adjustment, 19. Slide stop screw (idle), 20. Run automatic controller of the slide, 21. Lock screw of the no-load operation nozzle, 22. Attachment split pin of the needle of the slides, 23. Feather/spring, 24. Frame cover, 25. Union nut, 26. Conclusion of the cable covering, 27. Conclusion lock nut

For the cleaning of the no-load operation nozzle one, if it is necessary, must loosen the screw 21, take the nozzle out and with a pump blown through. By a turn of the screw 18 one can change the passage of the air duct and adjust the quality of the mixture with low number of revolutions: by pivoting the screw the mixture becomes richer and by unscrewing leaner. With the slide 2 the adjustment of the needle 12 is connected, which goes into the internal channel of the main atomizing nozzle. In this way the fuel arrives at the atomizer by the circular gap between the channel wall of the atomizer and the needle. The needle has a conical form at the lower end, whereby when its rising the circular gap becomes larger, which the atomizer supplied gasoline quantity itself increased and which becomes a richer mixture.



**Fig 9**  
**Valve Adjustment**

1. Valve, 2. Valve spring, 3. Valve disk, 4. Venturilkeil, 5. Tappet, 6. Tappet guide, 7. Adjusting screw, 8. Lock nut, 9. Cover of the valve housing, 10. Seal, 11. Screw

The adjustment needle is connected with the slide by the split pin 22, which goes crosswise through the openings in the throttle slidegate valve housing and in the top of the needle. The needle four and the slidehouse two has such openings, whereby the distance between the latters is one and a half times larger than the distance between the openings in the needle.

If one advances one of the openings in the needle to one of the openings in the slide housing, one can receive eight different positions of the needle. The more deeply the needle stands, the richer will the mixture, the further out, the leaner the mixture. The even work of the two engine cylinders is ensured by the simultaneous function of the carburetors. For this each carburetor is separately tuned in the following order necessary:

1. Clean the carburetor
2. Start, and warm up the engine
3. Set the ignition setting lever to idle retard
4. The lock nut and the fixing bolt 19 (fig. 8) loosen and adjust so far tighten that the slide 2 is easily lifted and the engine makes increase RPM
5. Firmly tighten the screw 18 for the adjustment of the mixture after the engine RPMs decrease, by loosening the screw 19.
6. No-load operation-nozzle-attentively the work of the engine adjust, the screw 18 for the adjustment of the mixture loosen and such a position give, at which the engine with highest number of revolutions works evenly. Then the screw 19 unscrew and the number of revolutions to the extreme reduce. As soon as the adjustment has been completed one must secure the screws 18 and 19 by lock nuts.
7. Raise the slide of the carburetor which can be adjusted by hand in place of the cable, if thereby an increase of the number of revolutions is reached. Thus the attitude is terminated. Adjust the second carburetor in the same manner. In order to receive an even synch of the carburetors, one must jack up the motorcycle, start the engine and switch to 4<sup>th</sup> gear. Then switch a cylinder off (ignition cables decrease) and the number of revolutions of the engine increase, until the pointer of speedometer concerned at 30 km. Some minutes with this function wait, then the working cylinder off switch and the other cylinder on switch. If one opens or closes the butterfly valve somewhat, one achieves the same tachometerstand with the help of the cable delimitation. Since such an adjustment lasts a long time, one must be careful not to overheat the engine.

### Adjusting Valve Clearance

The normal operation of the engine is due to a large extent of a correct valve adjustment. The correct adjustment of the play is an absolute condition for the maximum output of the engine. The adjustment of the play between the valve stems and the tappets takes place after grinding the valves in. The size of the play must after each 500 -- 1000 km to be controlled. The adjustment of the play must be made in the following way:

1. To be removed the screw 11 (fig. 9) is to be solved and the covers as well as the seal. 2. The crankshaft is to be turned, until the intake valve closes. (between the tappet and the shank of the exhaust valve a play must be clearly visible.) In this position the play of the exhaust valve is to be adjusted.

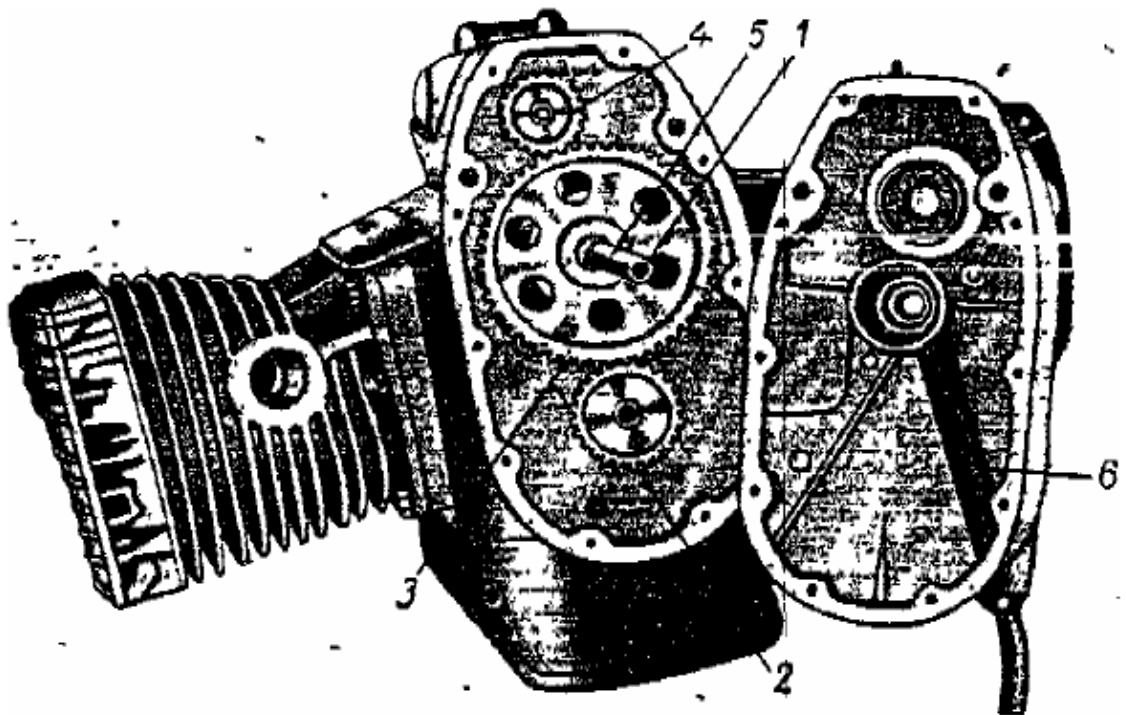


Fig 10  
Camshaft

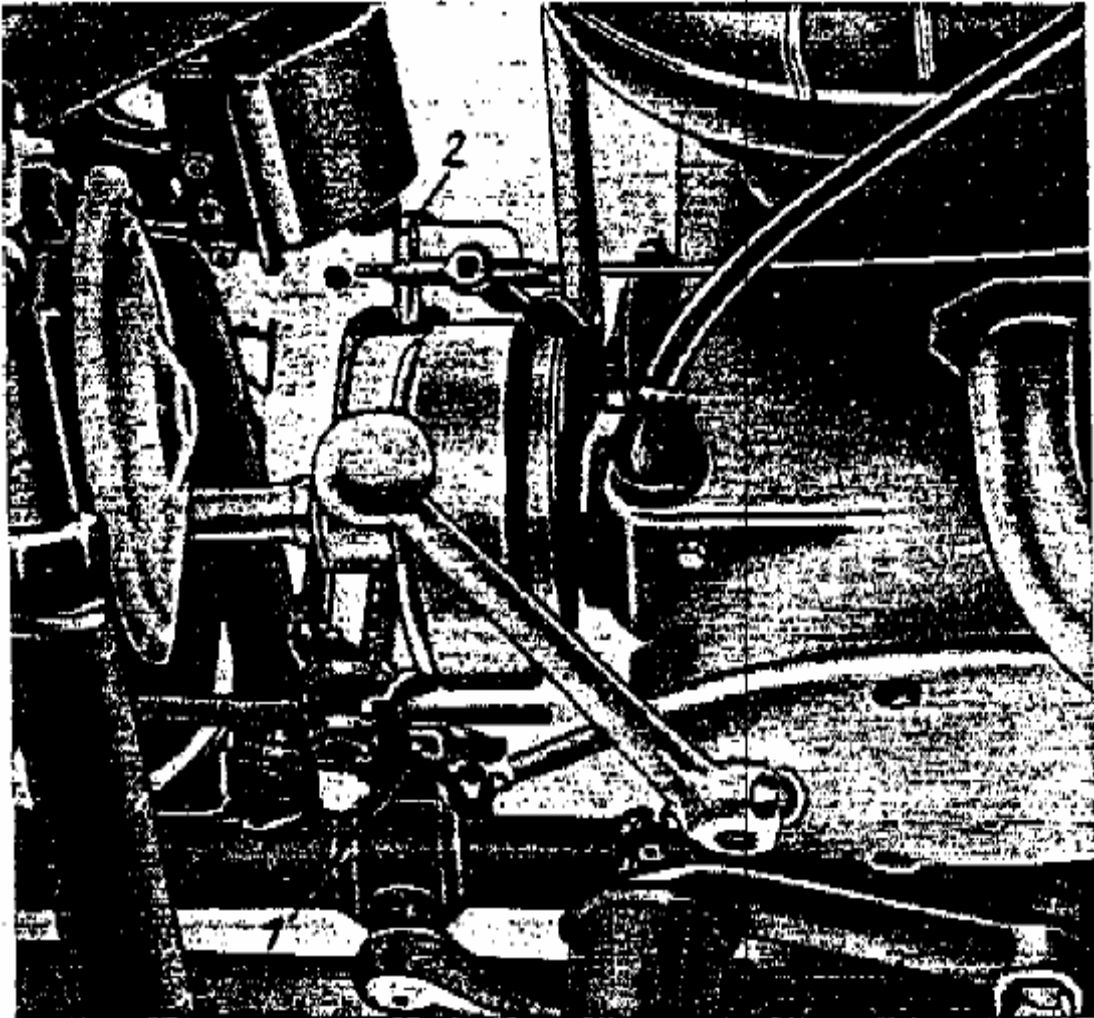
*Cam shaft, 2. Wheel of the crankshaft, 3. Wheel of the cam shaft, 4. Wheel of the generator, 5. Ignition tap, 6. Channel of the filler neck*

Then one continues to turn the crankshaft of the engine up to the moment, if the exhaust valve begins to lift oneself and the play of the intake valve adjusts. For the adjustment of the play one must loosen the lock nut 8 to something and turn the pin 7 of the tappet in or other direction,

after which it is necessary to increase or make the play smaller. The you must secure the adjusting screw. One must make the adjustment of the play with cold engine, the play is here 0.1 mm. If a play is not at all or only very small present, then the valve will rest upon not firmly for the moment reasoning the valve seat. During a necessary dismantling and composition of the engine the correct adjustment is determined by meeting the adjusting markings (fig. 10) at the wheels of the crankshaft and the cam shaft. Every 7500 to 8000 km must the valves be ground in and the cylinders and pistons oil carbon cleaned.

### **The clutch**

The construction of the clutch of the motorcycle M -- 72 is very simple. The correct use of the clutch increases its life span substantially.



**Fig 11**

#### **Attitude of the clutch rope and the rear wheel brake**

*Adjusting screw for the rear wheel brake rope, 2. Adjusting screw for the clutch rope*

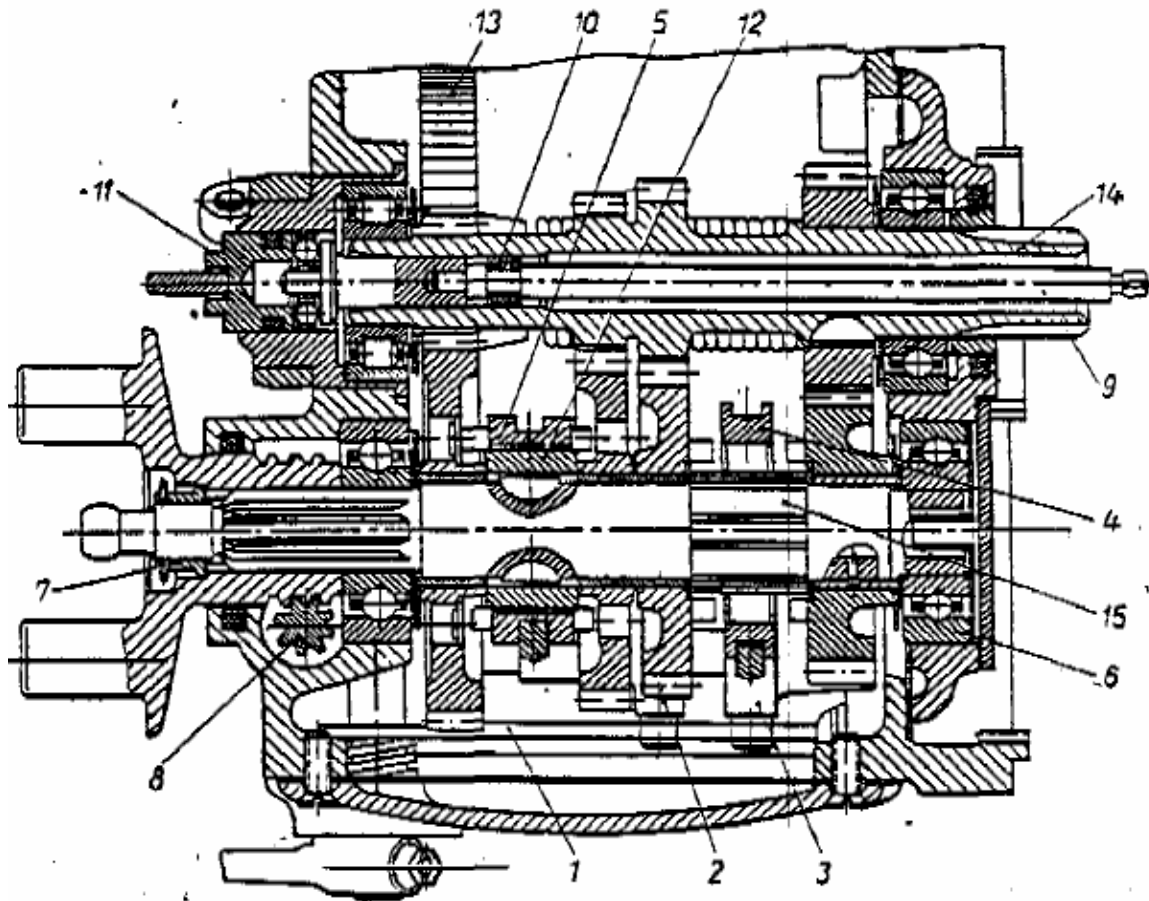


You must not drive with a slipping clutch. When starting and after switching the gears one must couple evenly and softly. Hard coupling with high number of revolutions of the engine leads not only to a fast wear of the linings of the clutch disks, but overloaded also the parts of the power transmission and increases the wear of the tires. With the help of the thumbscrew 2 (fig. 11) the tension of the clutch rope is placed behind occasionally. The cable tension must be adjusted in such a way that the clutch lever (the left lever at the steering wheel) in free 4 -- has 5 mm of air. With this space the clutch will not slip, but will work reliably.

### **The transmission**

The care of the transmission (fig. 12) is limited to the punctual refill and/or changes of the oil (see chapter "lubricating of the motorcycle"). The oil level is to go up to the lower thread of the oil filler screw connection. With dividing the transmission or during the working the necessity can occur to adjust the switch mechanism for the even work of foot and hand clutch. The adjusting screws must stand in such a way that the determination recesses of the segment in all courses fit the ball of the clamp. An uneven work of the foot and hand clutch is determined in the following way:

I. During the transition from a small to a larger gear, D h. during a raising of the front pedal of the foot shift lever upward up to the notice, the quadrant shifts insufficiently and the determination recess of the segment comes not up to the determination ball. One can recognize this easily, if the hand at the gearshift lever is hard. With a pedal of the shifter lifted up to the notice the hand lever moves thereafter the position of the clutch lever is somewhat forward and only held. In the available case one must loosen the lock nut and unscrew the lower adjusting screw of the shift mechanism accordingly.



**Fig 12**  
**The Transmission**

1. transmission segment, 2. Shift fork of the I. and 2. gears, 3. Shift fork 3. and 4. gear, 4. Shift clutch 3. and 4. Course, 5. Shift clutch of the I. and 2. Course, 6. Camp of the countershaft, 7. Nut/bolt of the countershaft, 8. Drive wheel of the speedometer, 9. Shifter rod of the clutch, 10. Lubrication can of the shifter rod of the clutch, 11. Sliding head of the clutch circuit, 12. Slot clutch of the countershaft, 13. Starter wheel, 14. Main shaft, 15. Countershaft

2. During the transition of a small gear to a larger the quadrant is shifted too much and the determination recess passes the determination ball. In this case one must loosen the lock nut and tighten the lower adjusting screw of the gear lever accordingly.

3. During the transition of a large gear to a smaller, D h. when pressing the front pedal of the pedal down up to the notice the quadrant does not shift sufficient and the determination recess of the segment arrived not up to the determination ball. In this case it is necessary to loosen the lock nut and accordingly the upper adjusting screw of the gear lever loosely screws on.



4. During the transition of a large gear to a smaller the quadrant shifts too much and the determination recess of the segment passes the determination ball. In this case one must loosen the lock nut and screw the upper adjusting screw in lever. The attitude of the transmission is shown in the fig. 13.

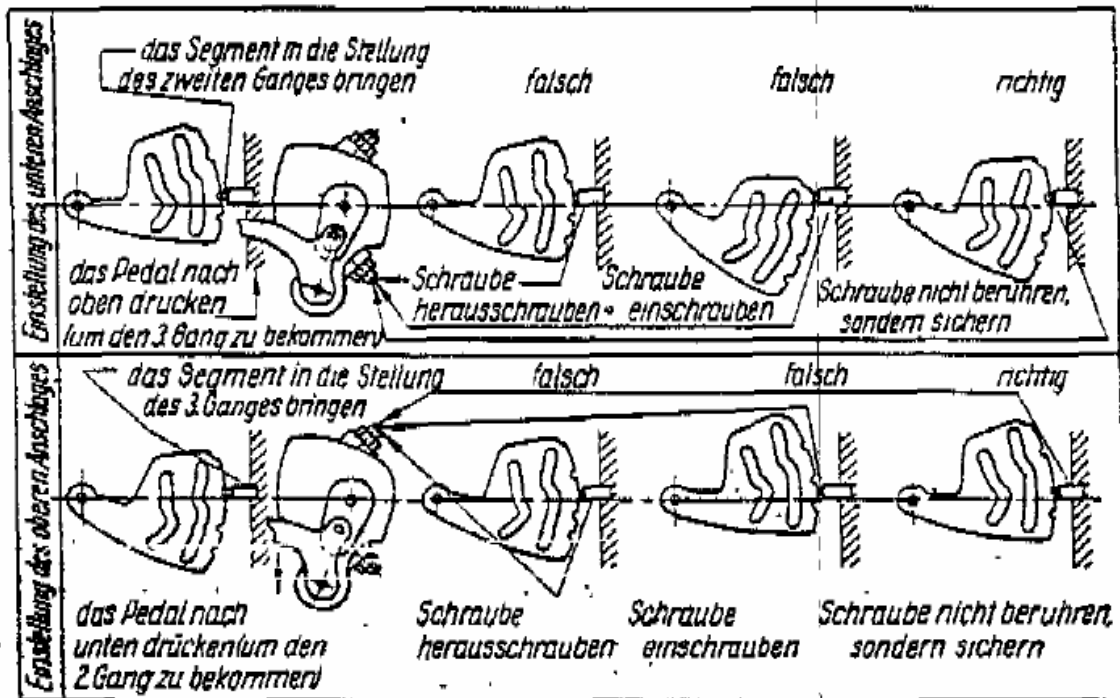


Fig 13  
Attitude of the transmission

### The power transmission

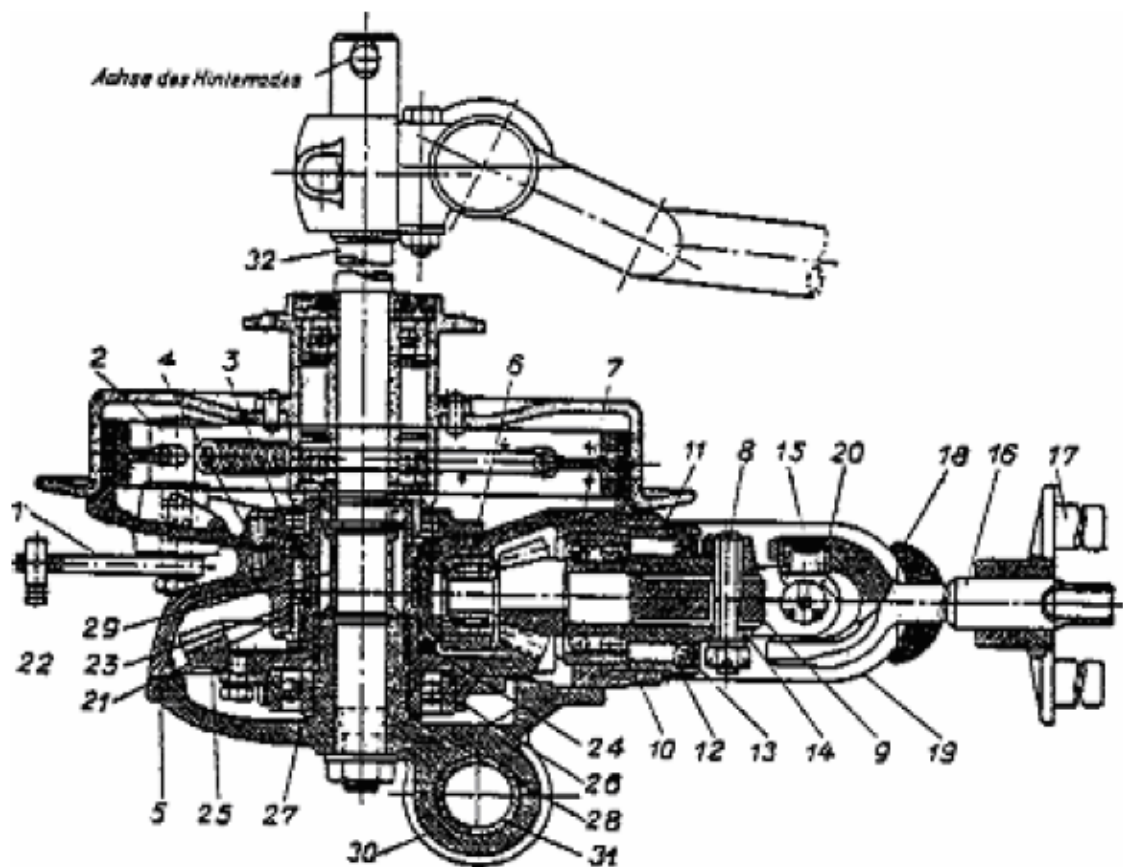
In no case one is to take the power transmission mechanism apart (fig. 14) without compelling necessity if for any reason a dismantling took place, then it is extremely important when building up to use the same adjustment disks which were installed by the factory. By these disks the play between the wheel teeth adjusted after tightening all nuts/bolts to have the wheels easily with the hand to be moveable without wedge and seize. One must be able to feel air between the wheel teeth with the rotation of the drive shaft with locked hub of the propelled gear wheel with the hand. If with the flow of the parts air becomes larger, then one must add an adjustment disk of appropriate strength.

The periodic lubricating of the power transmission is indicated in the chapter "the lubricating of the motorcycle".

The oil level in the housing of the power transmission is to go up to the lower threads of the oil filler screw connection.

In the Kardan crosshead 15 (fig. 14) is a stuffing box.

For the lubricating of the universal joint one must push the rubber seal ring 18 for the center of the cardan shaft and unscrew with a key the Kardan. Here one may not forget that the cap has a left-hand thread and one must turn in the clockwise direction.



**Fig 14**

**Cutaway of the Kardan and Final Drive M – 72**

Brake lever, 2. Brake tap, 3. Cover of the lubricator, 4. Lubricator, 5. Housing, 6. Needle bearing, 7th double-row ball bearing, 8. Keilbolzen, 9. Drive wheel, 10. Adjusting screw, 11. Sealing disk, 12. Bearing nut, 13. Lubricator, 14. Kardangabel, 15. Crosshead, 16. Cardan shaft, 17. Disk of the cardan shaft, 18. Rubber gasket, 19. Kardanmantel, 20. Locking ring, 21. Housing socket, 22. and 23. Bushes of the Nebenlagers, 24. Adjustment disk, 25th propelled wheel, 26. Wheel hub, 27. Ball bearing, 28. Adjustment disk, 29. Clamping chuck, 30. Frame cover, 31. Rear wheel suspension, 32. Axle of the rear wheel.

The front suspension  
the motorcycle M -72 has a telescope front fork with feathers/springs and oleo dampers. The oleo damper serves to accommodate oscillations, which develop in the fork during a travel on an uneven road.

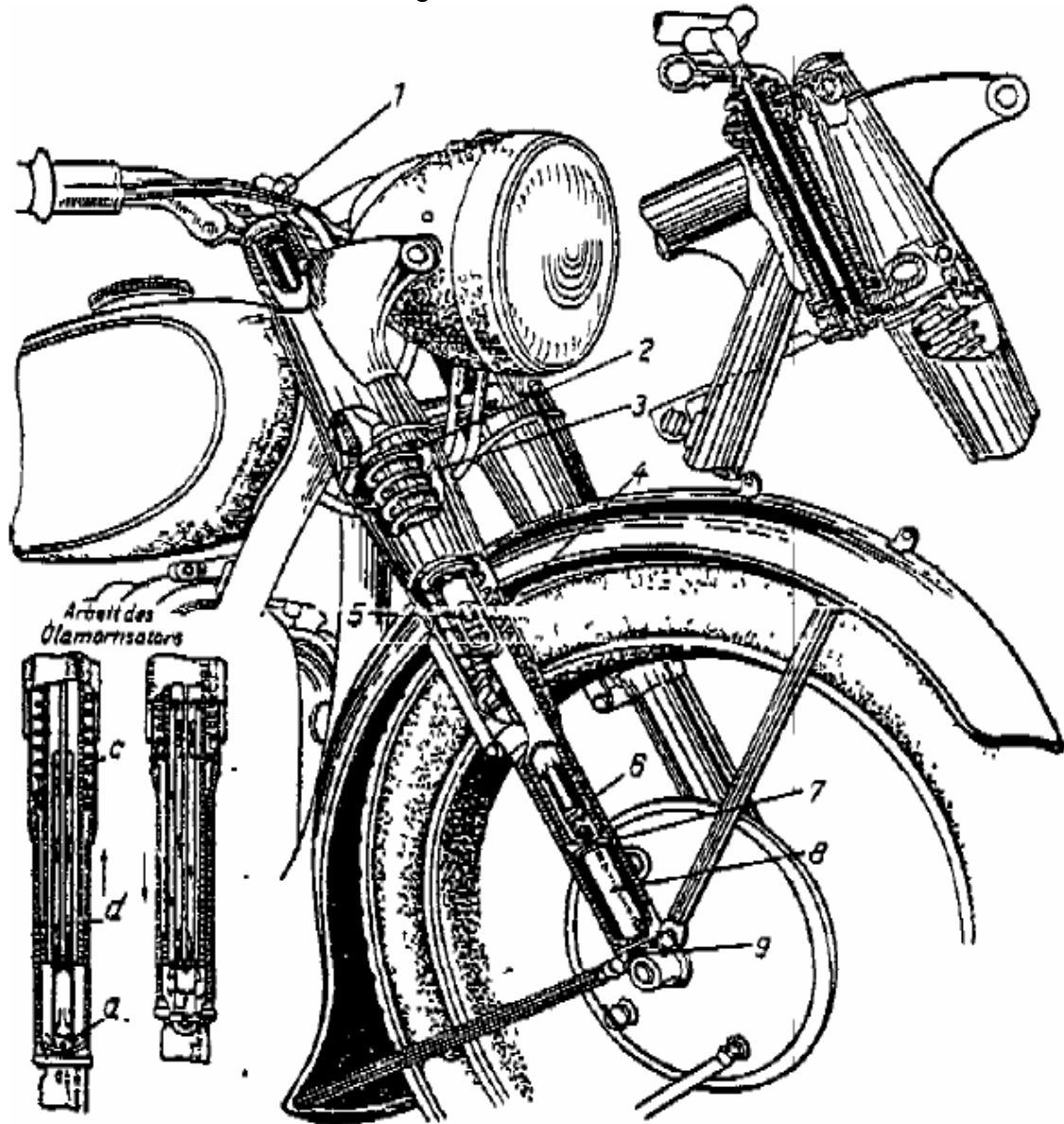


Fig 15

#### The vordergabel

*Tightening nut, 2. Feather/spring, 3. Federrohr of the fork, 4. Guide bush of the shock absorber seaweeds, 5. Shock absorber seals, 6. Shock absorber piston, 7. End piece of the fork feather/spring, 8. Pipe of the shock absorber housing, 9. Discharge screw*

This fork system is characterised by special softness. The general opinion in the work situation is shown in fig. 15, on average in fig. 16. Two immovable steel tubes 3 (fig. 16) are with one another connected in two places firmly: above by the cross beam 12 and down by a bridge of the steering shaft 13.

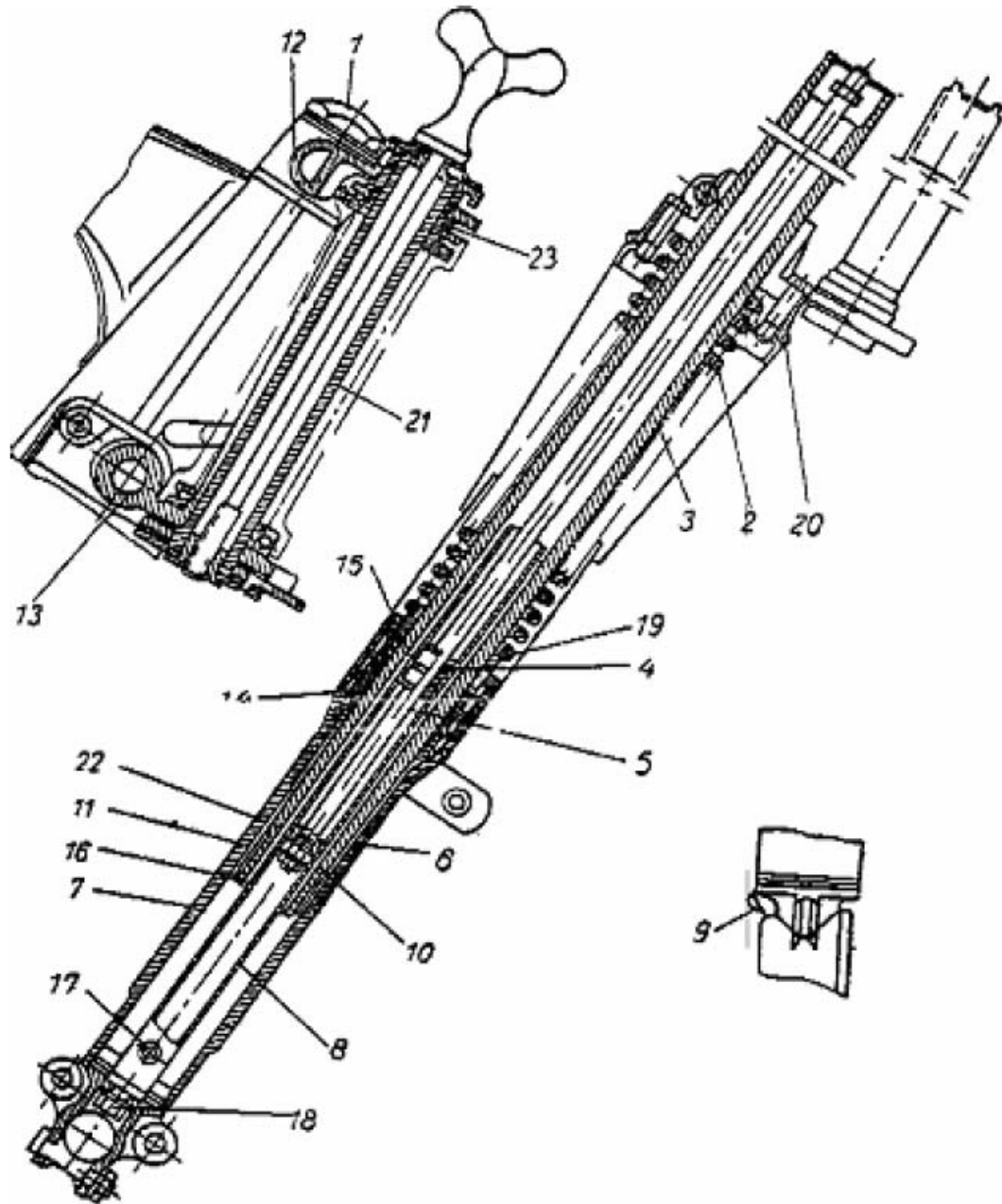
Into the bridge a bar of the steering shaft 21 is pressed in, by which the fork is connected with the framework. Outside, along the pipes, the end pieces of the fork feathers/springs 7 move in the cans 14 and 11. The lower cans 11 are fastened to the rigid pipes, while the upper are pressed into the end pieces of the feathers/springs. At the bridge and at the feather/spring end pieces with the help of the end pieces 19 and 20 fastened spiral springs 2 are the main shock absorbers of the fork.

In the fork pipes is hydraulic (oil more) steering damper inserted, which is intended to the improvement of the absorption with strong impacts and for the admission of the oscillations of the fork. The upper ends shock absorber seals of the 5 are fastened in the tightening nuts 1, while at the lower rod ends guidance 10 with slots are mounted. Between the guidance and the banking pins steel check valves or piston 6 are inserted. The bars are inserted into pipes, which are fastened in the feather/spring end pieces by nuts/bolts 18. In the top of the pipes the sockets 4 are fastened on lock rings, which serve for the adjustment of the bars and for the quantity of the oil, which goes through by the gap between socket and bar. In the lower part of the pipes are openings, by which the oil flows through.

If the wheel rides on an obstacle, the mobile pieces of feather/spring raise themselves, the oil in the pipes press on the pistons 6 and, by raising up to the banking pins 22, runs by the gap between the pistons and the bars and partly flows off by the openings. With very hard impacts the oil does not succeed in running out fast next to the pipes and forms for the movement of the feathers/springs a hydraulic resistance. The pressed together feathers/springs throw the mobile fork feathers/springs downward back and try to press the oil together which is over the pistons; the latters press themselves to the guidance 10. The oil, which is squeezed out by the gap between the bars 5 and the sockets 4 as well as by the gap between the exterior surfaces of the pistons 6 and pipes 8, flows off into the oil reservoir.

In this way the hydraulic shock absorber weakens not only the impacts taken up by the fork, but stops also a loss of control of the motorcycle, if it slips from an unevenness of the way. The shock absorber prevents also a jumping of the motorcycle and the emergence of longitudinal oscillations of the motorcycle.





**Fig 16**  
**The vorderradgabel (profile)**

1. Tightening nut, 2. Feather/spring, 3. Pipe of the fork feather/spring, 4. Guidance can of the shock absorber bar, 5. Shock absorber bar, 6. Shock absorber piston, 7. End piece of the fork feather/spring, 8. Pipe of the shock absorber coat, 9. Discharge screw, 10. Shock absorber guidance, 11 lower socket of the fork feather/spring pipe, 12. Cross beam, 13. Bridge of the steering shaft, 14th upper socket of the fork feather/spring pipe, 15. Lockbolt bush, 16. Lock washer of the fork lock washer, 17. Opening in the pipe of the shock absorber coat, 18. Nut/mother for the attachment of the shock absorber coat, 19th lower end piece of the feather/spring, 20 upper end piece of the feather/spring, 21. Bar of the steering shaft, 22. Banking pin, 23. Bearing nut of the steering shaft

Into each fork feather/spring 80 -- 100 ccm oil is filled. For this the tightening nut I must be unscrewed. The oil is removed from the fork feathers/springs by outflow holes, which sit in the lower part of the end pieces and are locked by the drain screw connections (screws). In order to take the shock absorbers out of the fork, it is sufficient, to remove the nut/bolt 18 and the tightening nut I. In the center of the fork the wing nut of the shock absorber, which must be tightened or loosened, is dependent upon the condition of the road and the driving speed. An additional lubricating of the suspension is not necessary. The dead point in the camps of the steering shaft can eliminate itself by tightening the nut/mother 23 present under the cross beam. Pulling this nut/bolt tight must absolutely take place every 1000 km. The steering wheel of the motorcycle is firmly connected with the fork, and therefore all movements of the steering wheel are transferred by the fork to the front wheel.

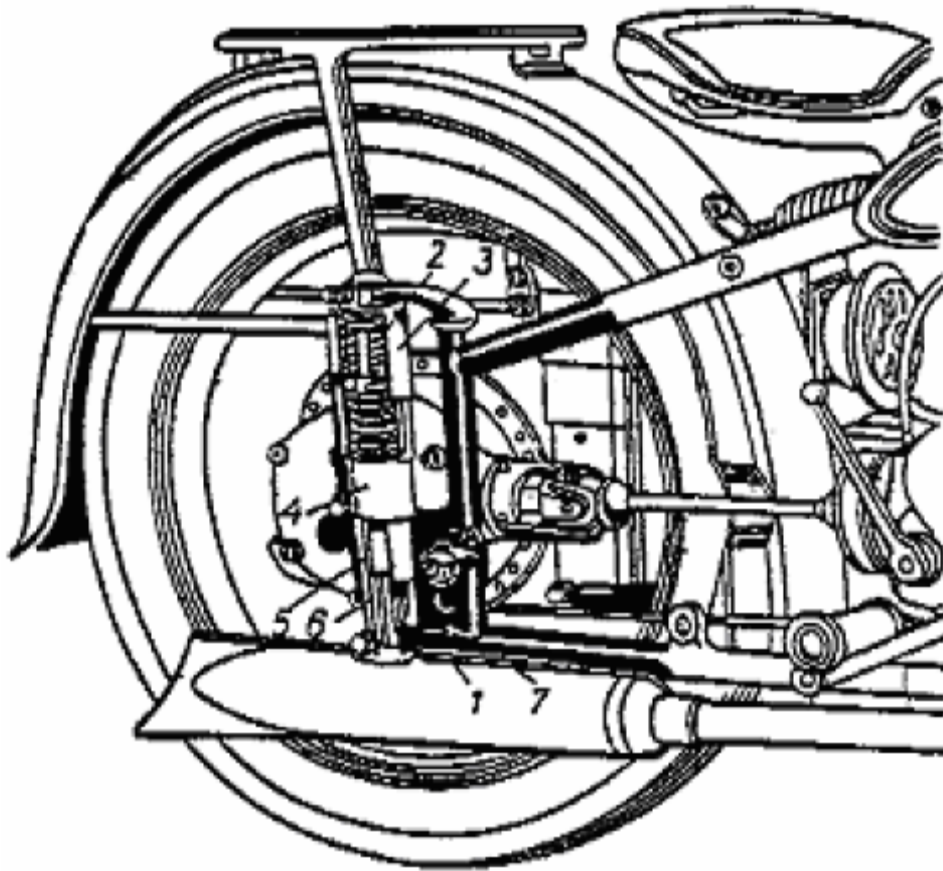


Fig 17

#### The rear wheel suspension

*End pieces of the rear fork, 2. Feather/spring, 3, spring assembly, 4. Support of the right suspension, 5. Guide bush, 6. Bar, 7. Muffler*

### The suspension of the rear wheel

the suspension of the rear wheel (fig. 17) offers a driving comfort in connection with the telescope front fork even on bad roads. Construction principle of the rear wheel suspension is the same as with the front suspension. The whole load, which comes on the rear wheel, is transferred by spiral springs, which weaken the impacts in the case of the rear-end collision of the motorcycle into an obstacle. Strong shocks are caught by the rubber buffers 7.

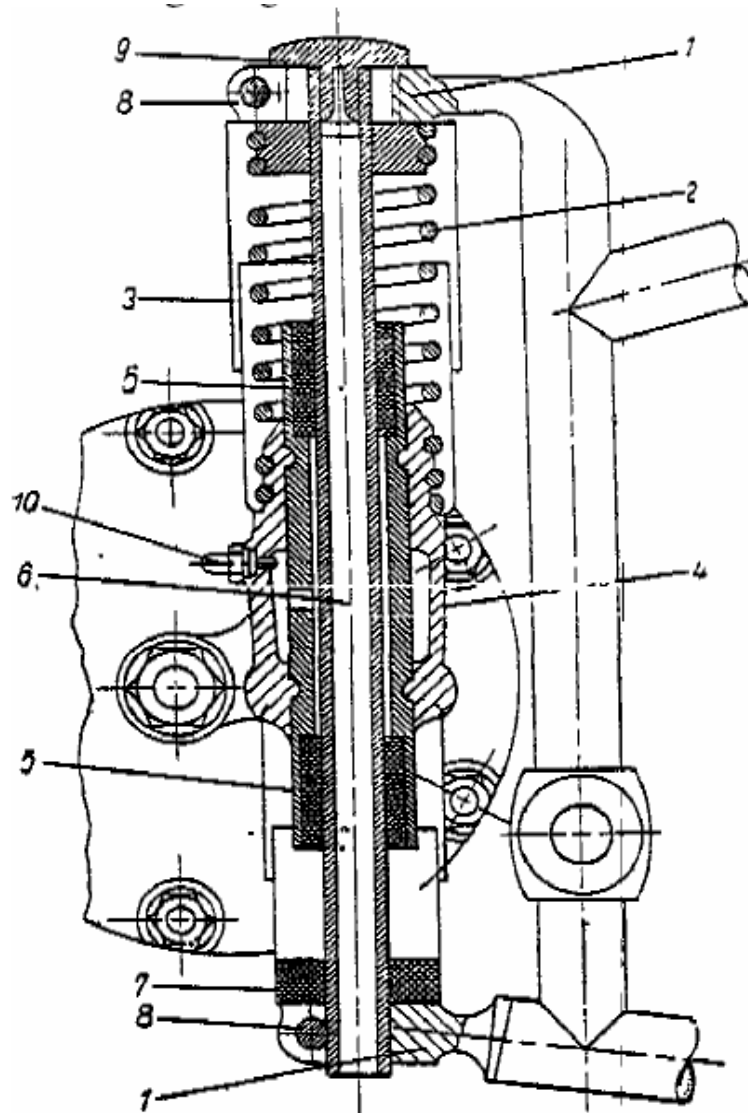


Fig 18

The rear wheel suspension (cutaway)

End pieces of the rear fork, 2. Feather/spring, 3. Spring assembly, 4. Support of the right suspension, 5. Guide bush, 6. Bar, 7. Buffer, 8. Lockbolt of the bar, 9. Absorber, 10. Stuffing box

The support 4 of the right suspension is with the frame cover of the power transmission from a piece. Therefore the power transmission can be removed if necessary only together with the right suspension.

## The brakes

The brakes are very important main parts of the motorcycle. Both brakes, both the hand and the foot brake, are block brakes. There is aluminum cheeks also on them fastened, replaceable friction washers.

The quality of driving depends to a considerable degree on the perfect condition of the brakes, and therefore they must be controlled on that systematically.

The parking brake cable wears in heavy use gradually, and the friction types of both the hand and the foot brake shoes wear themselves out. Therefore the play of the hand brake handle and the foot brake pedal becomes larger, and the work of the brakes worsens gradually.

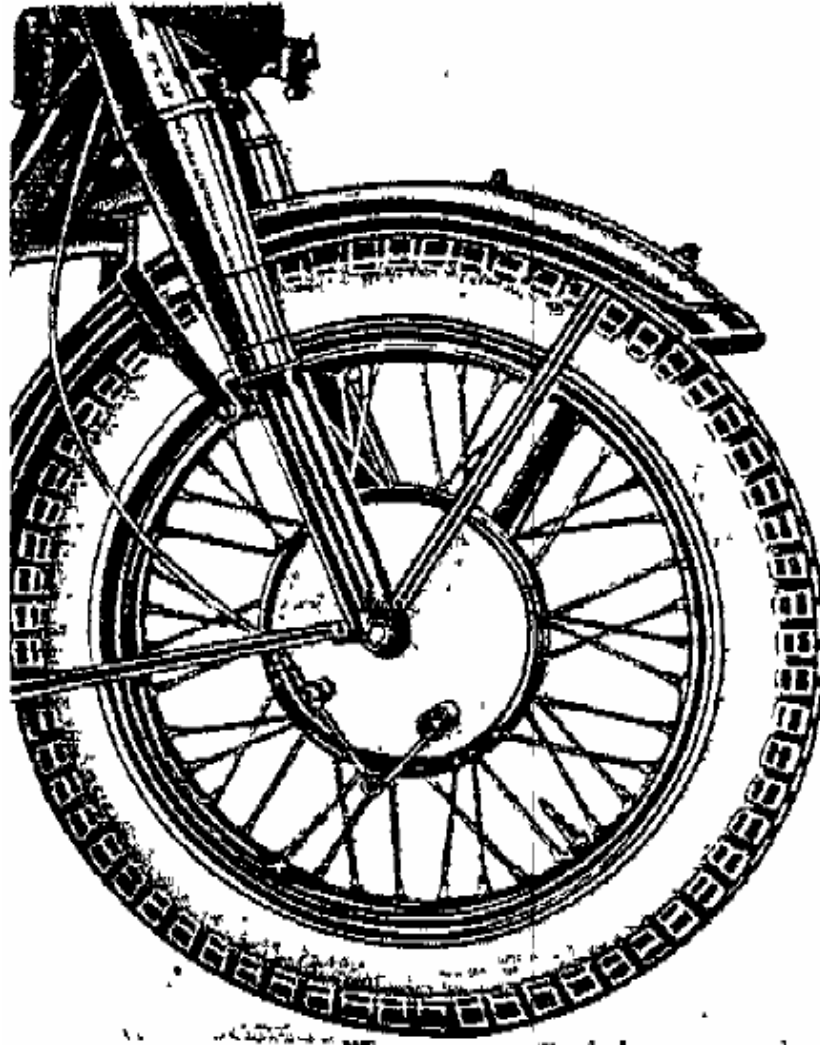
For adjustment the emergency brake is intended at the brake disk a special screw (fig. 19). When unscrewing this screw the dead play of the hand brake handle is reduced. The emergency brake should be so adjusted the fact that braking with a turn of the lever around 5 -- begins 10 mm. The attitude of the foot brake takes place with the help of the wing nut I (fig. 11), which is at the end of the brake play.

The foot brake must be so adjusted the fact that braking when pressing the foot brake pedal down around 10 -- begins 15 mm. A slight play is absolutely necessary with the hand brake handle and with the foot brake pedal, since otherwise the brake drums heat up continuously and excessively wear themselves out as the friction increases at the brake shoes. If these brake linings in the driving gather oil and do not ensure no the necessary braking action, then one must wash and dry them carefully with gasoline. With long departures the wheel must be braked alternating with the hand and with the foot brake, in order to prevent an overheating of the brakes. With steep departures one must brake also with the engine, by switching a low gear.

One must brake softly and increase only gradually the pressure on levers and pedal. One obtains the best braking action, if the wheels still turn. Therefore one may not block the wheels when braking.

This is particularly inadmissible on a wet or smudgy road, if the motorcycle gains speed.





**Fig 19**  
**Attitude of the front wheel brakes**

### **The wheels**

The wheels of the motorcycle M - 72 are easily removable and replaceable. The wheel spokes must be even and firmly tightened. Occasionally one must control the tension of the spokes after feeling. One can make their retightening, without removing the tires. The wheel bearings are lubricated by lubricators, which are screwed in into the wheel hubs. In order to remove the front wheel, the following is necessary: 1. The nuts/bolts remove, that hold the bracing of the wheel at the shield, and the machine jack up. 2. The adjusting screw 4 of the front wheel brake cable completely firmly turn and it in such a way place that the slot of the screw coincides with the slot of the head of the support 5. 3. The lever of the brake cam 6 raise, the end piece out of the rope covering of sinking the adjusting screw take and the cable out 3 by the slot of the screw and the support take.

The end piece of the parking brake cable from the opening of the brake lever pin remove and then take the pin out. 5. The nut/bolt of the tension bolt of the cut through head of the left fork feather/spring loosen.

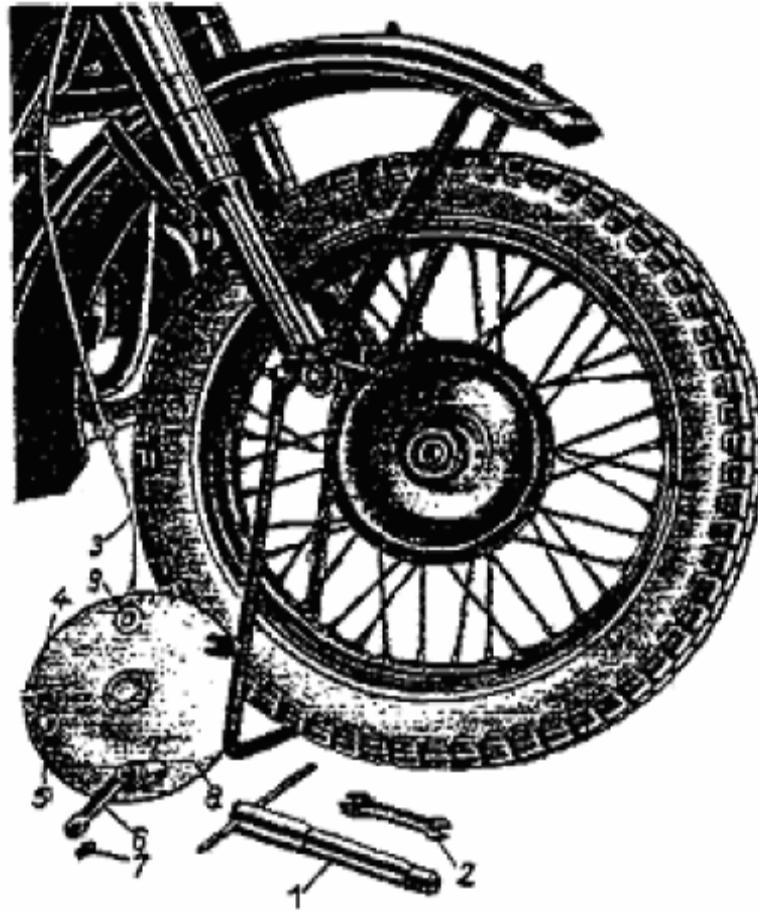
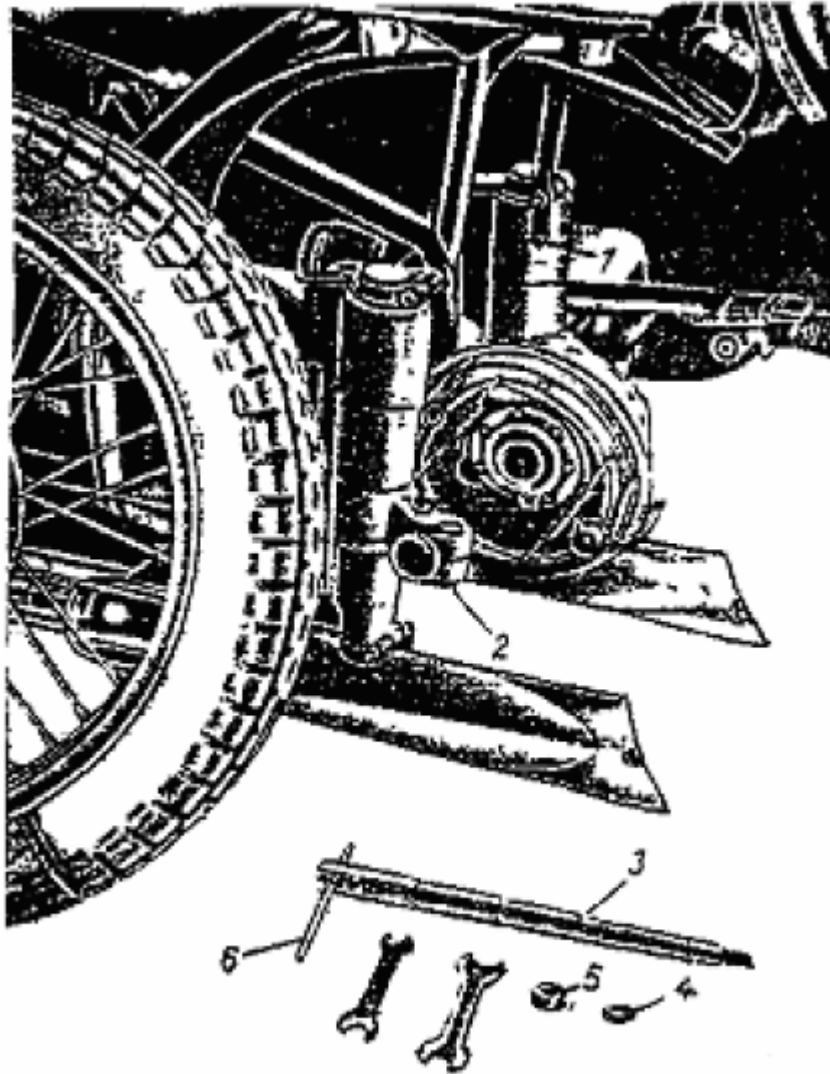


Fig. 20  
removing the front wheel

1. Axle, 2. Key, 3. Cable, 4. Adjusting screw, 5. Hole of the adjusting screw, 6. Lever of the brake cam, 7. Finger of the brake lever, 8. Cover of the brake drum, 9. wear indicator

1 insert into the axle a lever (left-hand thread), and in a clockwise direction unscrew and the wheel as well as remove the brake. Using the front wheel takes place in reverse order, whereby it is to be made sure that the wear indicator 9 at the brake cover goes in into the groove at the right fork feather/spring.

Before final screwing of the tension bolt onto the lower end of the left fork feather/spring one must press strongly on the steering wheel and up-push the front part of the motorcycle several times on the soil. If the wheel without the brake cover is to be removed, the work 2, 3 and 4 needs not to be made.



**Fig 21**

**Decrease the rear wheel**

1. hinged part of the shield, 2. Nut/washer of the tension bolt, 3. Rear wheel axle, 4. Disk, 5. Nut/washer, 6. Lever

For removing a rear wheel (fig. 21) the following is necessary: 1. The wheel jack up. 2. The pins of the supports of the rear shield remove and lift the hinged part up of the shield. 3. The nut/washer 5 of the axle of the rear wheel remove and together with the disk remove. 4. The nut/washer 2 of the tension bolt of the left support of the rear suspension remove and the rear wheel axle out 3 with the help of a lever. 5. The rear wheel of the framework take out. Assembling the wheel is to be made in reverse order, whereby one must turn these continuously when tightening the axle, in order to prevent a seizing. Before one bolts the tension bolt on, one must up-push the rear part of the motorcycle several times on the soil. When taking apart the parts may not become dirty, and before the assembly they must be wiped off and greased carefully.

## **The tires**

The care of the tires is limited to daily control of the air pressure the hoses (see chapter "technical data"). Damaged places of the bearing surface must be repaired by vulcanization after the return to the garage. The rear tire runs under less favourable conditions. In order to ensure an even wear of all tires, one must change all 2000 km the wheels, i.e. the rear wheel against the front wheel, the sidecar wheel against the spare wheel and the spare wheel against the rear wheel.

### **Removing the tires**

In order to remove the tires, the following is necessary:

1. From the valve air is to be released completely.
2. The valve must be unscrewed and pushed inward
3. The wheel is on the earth to put one must with both feet on the tire place themselves and the bulge into the low bed of the rim press.
4. About 1/4 of the rim extent far away from the valve are to be squeezed out with assembly levers bulge over the wheel rim.
5. Under progressive movement of the two assembly levers gradually the whole bulge is to be taken out of the rim. The hose is to be taken out and, if the tire must be removed completely, is it with the second bulge of the tire likewise to be made.

### **Patching the tubes**

The defective place of a tube is to be recognized by the noise of escaping air. If the hole is very small, one must place the tube in water. The ascending bubbles indicate then the defective place. One must wash off and with a file or with sandpaper and roughen these up with pure gasoline. If one does not have special patches, one must cut a piece out rubber, likewise wash off and with a file or with something sandpaper and roughen it up with pure gasoline. Then one must coat the damaged place and the mark in such a way with adhesive that the coated place of the hose is larger in the diameter about 1 cm than the mark. After approximately 10 minutes one coats the hose and the mark for the second time, lets both dry, puts then the mark on the damaged place and presses it in slightly firmly.

If in the repair box of the motorcycle special marks with a laid on glue layer and a gauze protection are present, one must remove the protective layer in this case and the mark on the defective hose place to put to clean before with adhesive to coat and dry is applied. On the special mark no adhesive needs to be laid on. A defective valve insert is to be replaced immediately.

If between the valve and the hose air comes out, one must seat the valve rim nut/washer.

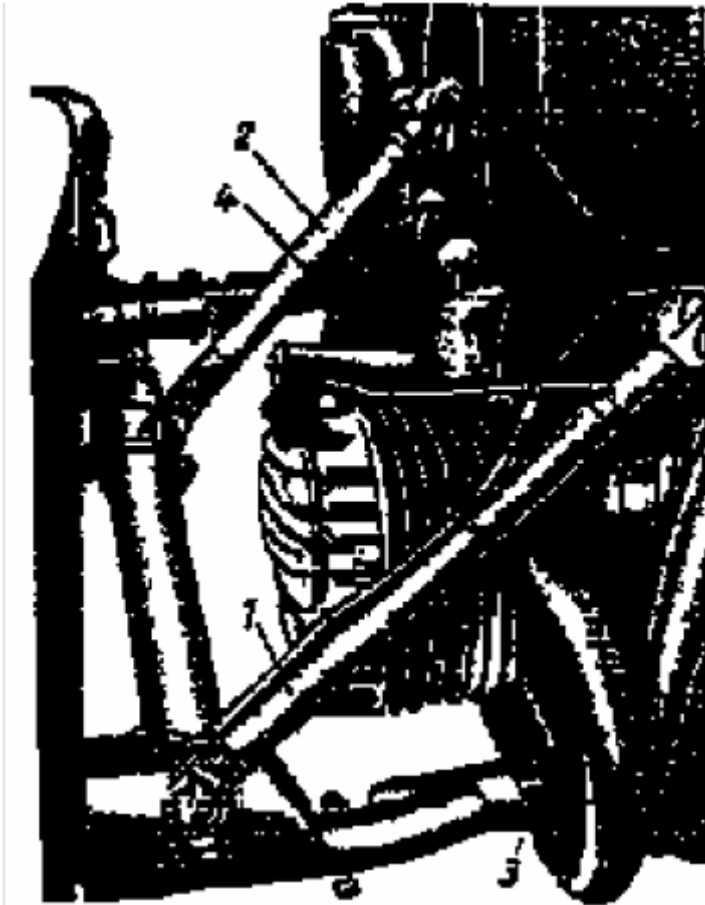
### **Tire assembly**

the assembly of tires must be made in the following order:

1. It is to be checked whether out of the tire all foreign particles are removed, which can have caused or cause a damage of the hose.
2. If during removing the tire also the rim liner was removed, then one must insert it when assembling again. The hole in the liner must fit exactly on the hole in the rim. The rim volume is to cover all heads of the spokes.
3. As soon as one brought a part of the tire bead into the rim, one must draw the whole bulge up with the help of the assembly levers on the rim.
4. The inner surface of the tire is to be covered with talcum powder to insert the valve into the rim hole to screw on and in such a way insert the one little inflated hose into the tire the nut/washer 2 to 3 courses that it does not have anywhere a fold.
5. Before one draws the other bulge up of the cover, is the valve, if those is well into the low bed of the rim brought bulge here to imprint up to the rim nut/washer.
6. To be held the other bulge of the tire is the cover with the feet from the valve facing the side to be drawn up and in this situation.
7. The bulge of the tire is arranged with the hands in the rim, by after-seizing gradually ever further all around.
8. If about 2/3 the bulge are drawn up, on the cover it is pressed in such a way that this part slips into the low bed of the rim and with assembly levers then retrieved the remaining bulge.
9. The valve is now pushed back completely, the hose is inflated and the tire is so for a long time all around knocked off with a hammer, until it sits evenly on the whole rim.
10. The rim nut/washer of the valve is inflated firmly tightened, the hose up to the prescribed tire pressure, the valve insert is screwed in and the valve flap is put on. If the tire sits correctly in the low bed of the rim, one can implement the whole work with two assembly levers. By too much force one can damage the cover and the wire rope in the bulge.



The sidecar the motorcycle M - 72 is a sidecar machine. There are two kinds of sidecar for the M - 72. 1. with a rigid attachment of the wheel on one doubles stored axle and 2. with a torsion suspension of the wheel on a console axle. Since 1954 the Kiewer manufactures motorcycle factory sidecar with a torsion suspension. The sidecar is fastened to the front crossbar with the help of two clips with rubber linings. At the rear part of the framework plates are welded to the lateral pipes, on which the feathers/springs are fastened. At the feathers/springs the sidecar is attached by shoes, which can move along the feathers/springs. The shoes are connected with a cross beam, which is fastened with rubber bushes to the sidecar body by hinges. For the lubricating of the shoes stuffing boxes are attached.



With strong oscillations of the sidecar the impacts are caught by two buffers, which are fastened to the rear crossbar. The spare wheel is installed on the flap of the baggage compartment. The sidecar is fastened to the motorcycle to two points (fig. 22). The lower fastening spots represent two pliers hinges (fig. 23), which cover the ball joints of the framework and fixing bolts of the engine. The rear pliers hinge is mounted at a bent lever, which is screwed by two tension bolts onto the sidecar framework. With loosened tension bolts the bent lever can be turned or pulled out after the side.

Fig 22  
Sidecar Attachment

*1. front tie bar 2. middle tie bar, 3. Front joint, 4. Rear joint*

The upper attachment consists of two tie bars, which are adjusted after the length. The front tie bar has a gelenkverbindung with an eye of the sidecar framework and with the frame support of the motorcycle. The middle tie bar is connected with the crossbar of the sidecar by clips and has the same gelenkverbindung with the motorcycle framework as the front tie bar.

Sidecar with torsion suspension are characterised by a soft ride of the wheel and by larger longevity. Into these side cars into the rear transverse pipe of the framework a torque shaft with a kleinschlitzigen connection is built,

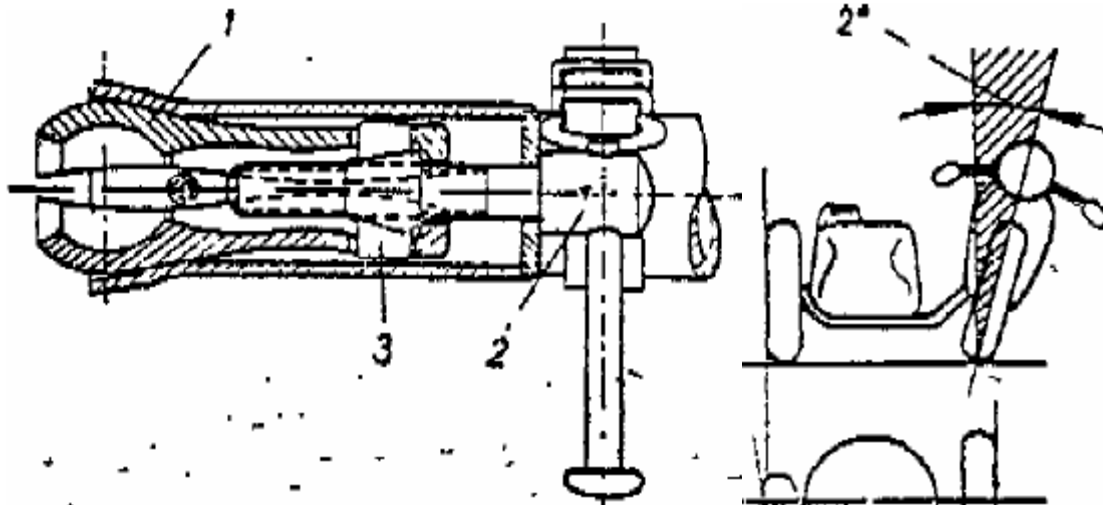


Fig 23

Pliers hinge of the sidecar attachment

1. Pliers, 2nd hinged screw connection, the motorcycle also with
3. Nut/mother dare

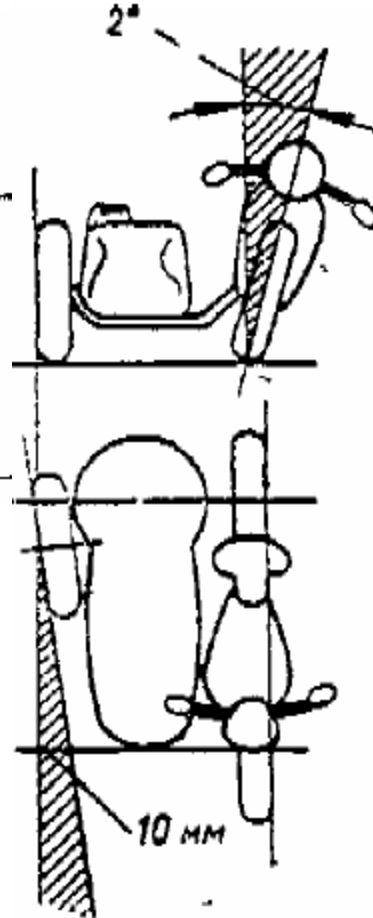


Fig 24

Sketch for adjustment

at the internal end of the crossbar into an immovable slot socket goes and from the outside side by a supporting socket passes through. On the stepping out slots of the wave a support is put on, which is tightened by clamps. At the opposite end of the support the console axle of the wheel is mounted. During this construction the fitted with springs wheel, if it follows the unevenness of the road, in the vertical level will swing. With an increase of the load the torque shaft pulls and the wheel together lifts oneself to the body. In the case of a decrease of the load the wave frees itself due to its elasticity, and the wheel lowers itself.

In this way all on the sidecar and the motorcycle, as with a rigid attachment, but only one part of the wheel oscillations do not become transferred. When the assembling of the sidecar with torsion suspension the tension of the torque shaft takes place via an adjusting screw in the way that the lever of the wheel axle affects the lower notice of the delimitation.

A motorcycle with a correctly installed sidecar travels well on the road. Otherwise the motorcycle is pulled in or other direction. The attachment of the sidecar is regulated according to the load and the road condition. Such an adjustment of the assembly of the sidecar takes place in the form that one proceeds from conditions most frequently which can be found.

The permissible size of the deviation of the wheel levels is 10 mm on the length of the wheel base. With measuring one must set the dipstick as closely as possible on the point of contact of the hub (fig. 24).

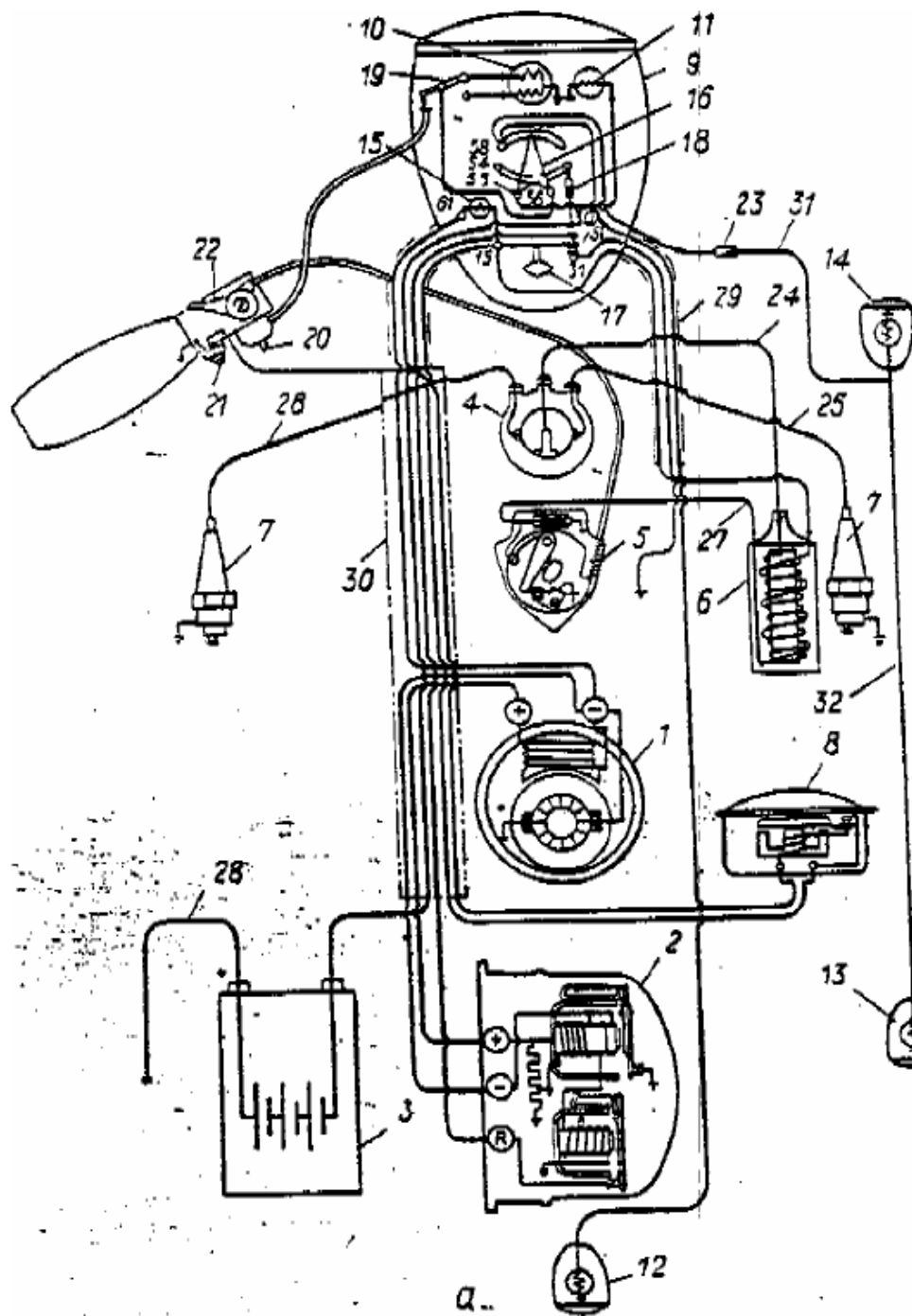
The lateral angle of inclination of the motorcycle axle to the vertical level can amount to to  $2^{\circ}$ . When the assembling of the sidecar all joints must be greased. During the attitude of the deviation of the wheel levels one must loosen the tension bolts, which hold the bent lever, to something. By pushing in and pulling out of the framework cross beam one finds the necessary deviation of the wheel levels and controls her by two straight wood slats (or strings), which 90 -- 100 mm far away from the ground on which the wheels sit. One gets the necessary lateral angle of inclination by an extension or a reduction of the upper tie bars which are adjustable in the length.

One checks the correct assembly of the sidecar by a travel for even road.

### **The electrical equipment**

Up to 1949 the motorcycles M -- 72 with relay automatic controllers of the type RR -- were equipped I. Relay automatic controllers of the type RR become present -- 31 uses. The fig. 25 brings a sketch of the electrical equipment with the relay automatic controller RR -- I and the fig. 26 with the relay automatic controller RR -- to 31.





**Fig 25**

**Sketch of the electrical equipment with the relay automatic controller RR – I**

1. Generator, 2. Relay automatic controller RR – I, 3. Battery, 4. Distributor, 5. Circuit breaker, 6. Ignition coil, 7. Candles, 8. Signal, 9. Headlight, 10. Lamp for large and small light, 11. Parking light bulb, 12. Taillight, 13. Taillight of the sidecar, 14. Front light of the sidecar, 15. Indicator light, 16. Central switch, 17. Ignition key, 18. Safety device, 19. Dimmer switch, 20. Switch for large and small light, 21. Signal button, 22. Ignition setting lever, 23. Lamp safety device of the sidecar, 24., 25., 26. High voltage transmission lines, 27., 28., 29., 30. Low-voltage lines, 31., 32. Lighting leads of the sidecar

These sketches are drawn exact and give a sufficient clear conception of the work principle of the electrical apparatuses and of the assembly of the lines.

### **Generator and relay automatic controller**

The motorcycle M -- a direct current generator of the type G -- 11 has 72 -- A with excitation. The generator with the nominal tension of 6 V and the nominal amperage of 7 ampere is intended for the common work with the relay automatic controller RR -- I or RR -- 31 according to an a cable pattern. At the generator housing are two connecting terminals, + and --. The positive brushes of the generator is connected with mass.

The generator is the source of supply for all power and serves also for the loading of the battery while driving. The generator becomes of the cam shaft with the reduction ratio 1: 3 in turn set. The generator wave turns thus 1 1/2 time faster than the crankshaft.

Without load the generator develops a tension of 6.5 V, which is sufficient over the relay for the connection to the entire net, at a number of revolutions of the anchor of no more than 1350 U/min. During the nominal load of 7 ampere the generator gives a tension of 6.5 V at a number of revolutions of the anchor of 2000 U/min.

From these data it is evident that immediately after starting the engine, if this reaches the work number of revolutions, which produces generator river, which is sufficient for the supply of the power consumers, and that she switches herself on into the net.

The relay automatic controller consists of two electromagnetic apparatuses, the reverse current relay and the voltage regulator. They are in a common housing and serve for the automatic in and disconnection for the net, for the automatic Spannungsreglung of the generator and for their protection from an overloading as well as for the protection of the battery from a too strong charging current. The reverse current relay is a switch, which is necessary for the parallel work of the generator with the battery. The generator switches itself on automatically with the help of the relay into the net, if the tension at the clamps of the generator 6.5 -- 7.2 V reaches, i.e. if the tension of the generator is larger than those the battery.

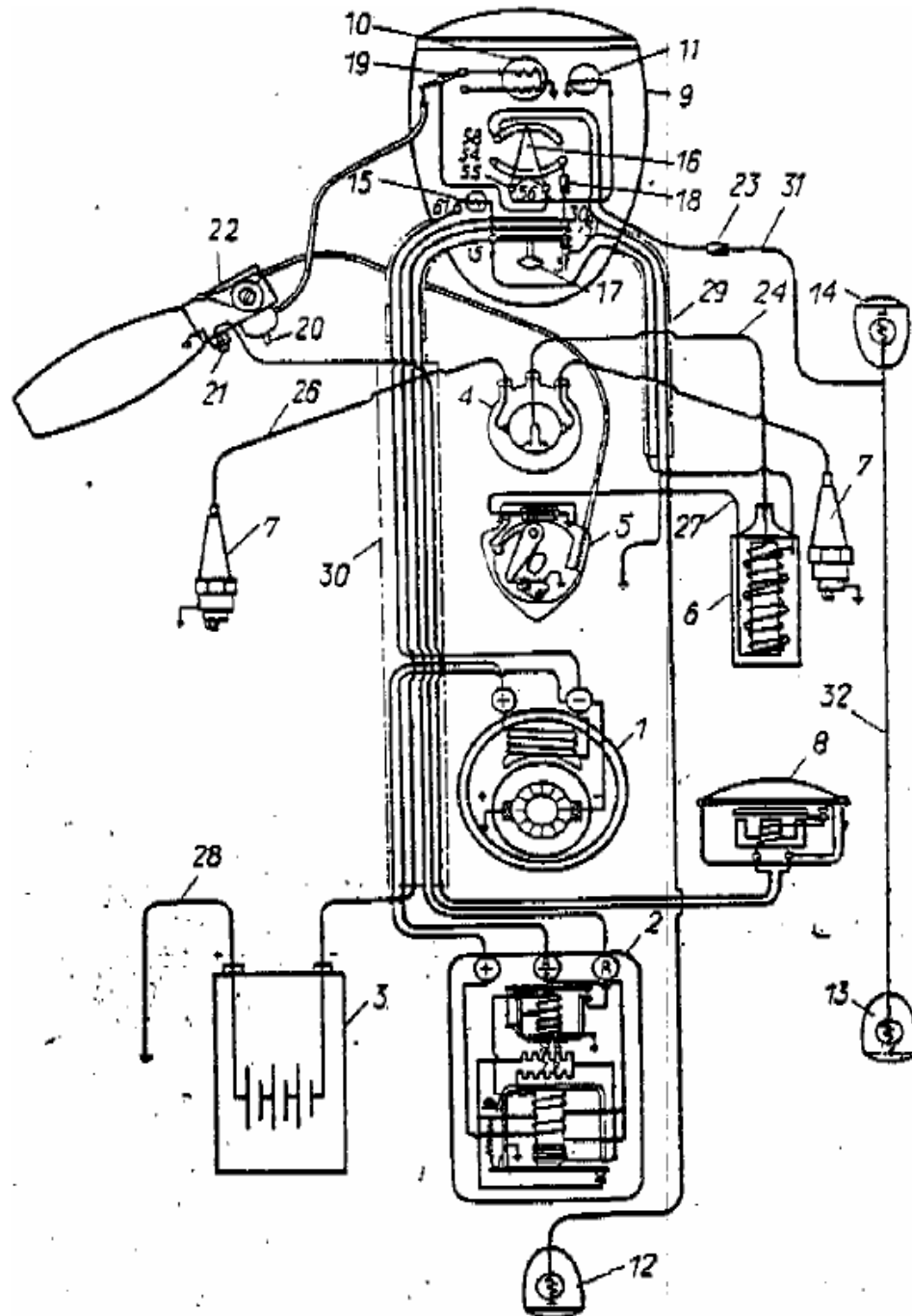


Fig 26

Sketch of the electrical equipment with the relay automatic controller RR -- 31

1. Generator, 2. Relay automatic controller RR -- 31, 3. Battery, 4. Distributor, 5. Circuit breaker, 6. Ignition coil, 7. Candles, 8. Signal, 9. Headlight, 10. Lamp for large and small light, 11. parking light bulb, 12. Taillight, 13. Taillight of the sidecar, 14. front light of the sidecar, 15. Indicator light, 16. Central switch, 17. Ignition key, 18. Safety device, 19. Dimmer switch, 20. Switch for large and small light, 21. Signal button, 22. Ignition setting lever, 23. Lamp safety device of the sidecar, 24., 25., 26. High voltage transmission lines, 27., 28., 29., 30. Low-voltage lines, 31., 32. Lighting leads of the sidecar

The generator switches itself off from the net, if its tension smaller than those the battery will and if over the generator river of the battery begins to flow off. The strength of the current reversal, with which the generator of the net switches itself off, is equivalent 0,5 -- 3.5 ampere.

The voltage regulator is an electromagnetic vibration apparatus. It switches periodically an additional resistance on into the circle of the energizing winding of the generator. Thereby one achieves the automatic tension adjustment of the generator with a change of the number of revolutions of the anchor and the load of the generator. The voltage regulator reacts not only to the height of the tension, but also to the height of the load, without permitting an excessive load. One reaches this by a decrease of the tension which can be regulated with an increase of the load of the generator.

The relay automatic controller is regulated of the manufacturing firm and requires no care. The factory pre-set to hurt or the relay automatic controller open, is strictly forbidden. The housing is lead-sealed, and if the plombe is removed, with a defect no complaints are recognized by the factory.

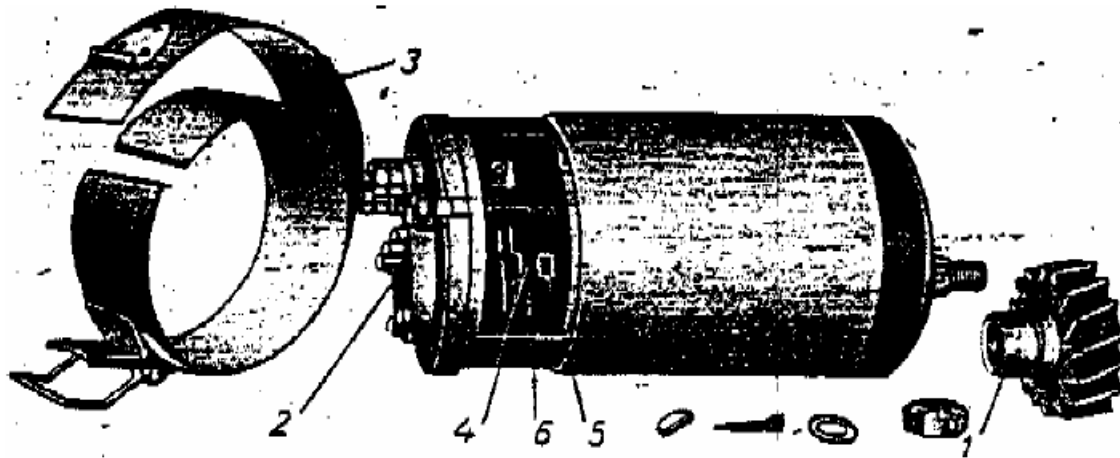
When the assembling of the relay automatic controller at the motorcycle one must make certain that he has a reliable connection with the mass. For this the attaching pin of the relay automatic controller a special metal panel is under one. This panel may not be damaged when the assembling of the relay automatic controller. With the relay automatic controller RR -- 31 is the mass the apparatus housing, which is connected with the mass of the motorcycle by the fixing bolts of the relay automatic controller. In addition a special clamp is as safe contact on the right apparatus side.

The generator G -- 11 -- A is installed at the top of the crankshaft housing in a particularly pre-adjusted place and protected against an oh shift by a special notice. The generator is fastened by a band. Since the armature shaft of the generator is eccentrically mounted to the housing, air between the wheel teeth is adjusted by a turn of the generator. Air should be like that that the wheels do not make noise after starting the engine, on the other hand one is the teeth in addition, not to seize.

In the case of a coincidental stretch of the band a turn of the generator can take place. In order to prevent a food of the teeth, the generator must be so installed on the crankshaft housing that its wheel is right from the housing axle, if one sees from the side oppositely from the drive.

The wheel of the generator is fastened on the armature shaft with the help of a laengskeils and supports themselves with its edge by the internal race of the ball bearing. When the assembling of the Rades one must bring it firmly to to the camp. With a strammen seat of the Rades on the wave one must remove the quill 2 (fig. 27), place the generator wave (from the side of the collector ago) on any support and watch out the wheel with an easy hammer blow.

Periodically, all 500 km, one must control the generator attachment at the crankshaft housing and the attachment of the lines at the clamps. If that band stretched, one must pull it tight. If required one must to be regulated air above indicated in the gear wheels as.



**Fig 27**

**The generator G -- 11 A**

1. Wheel, 2. Quill, 3. Schutzband, 4. Buerstenfeder, 5. Brush, 6. Collector

All 3000 to 5000 km one must examine the condition of the brushes and the collector. For this one must remove the schutzband 3, raise and check the buerstenfeder whether the brushes shift into the holding easily and whether they are not too much worn out.

If the brush sticks, one must abrade it and the owner with a rag soaked with gasoline. If one or both brushes are strongly worn out, they have to be replaced by new, which one ground in before with emery cloths at the collector elbow. In the case of a contamination or an oiling of the collector one must abrade him with a rag dampened with gasoline. Periodically also the anchor camp must ago be lubricated by the side of the collector, to which the quill is to be decreased before.

In order to get when dividing and building the generator and other apparatuses of the electrical equipment up no short-circuit, one must separate above all the battery from the mass. If while driving because of any defects the indicator light goes out only with high routes of the engine or goes out not completely, then it is necessary as a check of the intact condition of the generator and the relay automatic controller to proceed in the following way:

1. The intact connection of the lines is to be examined.
2. To switch on and the engine start the lines of the clamps + and -- from the generator are to be removed, + the clamp is by any leader on mass to be put, between -- clamp and the mass a transportable 6-Volt-Lampe. If the lamp is on, then this means that the generator is correct. One must remember that one may not let the engine run with such a control with high routes, since otherwise, if the generator is correct, the lamp burns through inevitably. After control the lines must be brought back to their place.
3. If the generator is correct, one must remove the line, which proceeds from the clamp R of the relay automatic controller, as a check of the relay automatic controller from the clamp 30/51 of the central switch and switch a lamp on between this line and the mass. If after starting the engine the lamp shows or does not burn a weak glowing at all, then this is called that the relay automatic controller is defective. With this control of the relay automatic controller one can bring the engine on high routes, without having to fear that the lamp burns through.

## The Battery

The motorcycle has a 6-Volt-Saeure-Batterie with plates, type SMT -- 14, with a capacity of 14 Amp./Std..

The positive terminal is attached to ground, the negative pole to the wiring. The battery is the only power source of the motorcycle while stationary and with the work of the engine at low RPM, the generator does not supply power. During a night travel also fully switched on power consumers, with temporary short overloads, when switching on of the signal on and at low speed into 4. Course is insufficient the stromabgabe of the generator and by the battery is supplemented. Therefore it is advisable, in order to avoid an unloading of the battery to drive during nocturnal travels in the city during good road lighting with small light.

While driving one must make certain that the battery will not excessively drain. During strong draining of the battery the plates cover themselves with a layer of sulfur-sour lead, i.e. it takes place a sulfation of the plates. The sulfur-sour lead of the plates is a steady connection. A battery, in the case of which the plates are covered with sulfur-sour lead, charges badly and discharges very fast.

One can judge the degree of the loading of a battery by the tension and the density of the electrolyte. The tension of each element of a fully charged battery is equivalent 2,1 -- 2.2 V. With unloading the tension falls fast on 2 V and lowers themselves then gradually up to 1.7 V. In no case the tension may go under this limit.

The statement of the degree of the charge is safer after the density of the electrolyte, which is measured with an specific gravity gauge. The density of the electrolyte is to amount to in the case of a fully charged battery 32° Baumé, which corresponds to a specific weight of 1,285. In the winter, with strong, frost, one must bring the specific weight of the electrolyte up to 1,3 -- 1.32 (33 -- 35° Baumé). If, while the motorcycle is in service, the specific weight is reduced up to 1,25, then this is called that the battery is empty and must be absolutely filled.

A decrease of the specific weight under 1, 25 is inadmissible. The density of the electrolyte is to be controlled all 1500 km or every two weeks.



The density of the electrolyte one must respect particularly in the winter. One must consider that a fully charged battery freezes only at a temperature of minus 50°, while a drained battery will freeze at minus 6°.

The conditions of the electrolyte in the battery are to exceed the upper disk edges around 10 -- 15 mm. During service the water evaporates. Therefore one, if the conditions of the electrolyte are lower in the battery than the indicated border, must distilled water on the elements refill.

One must make certain that the battery is kept always clean and that the openings in the fillers do not get dirty.

In the case of longer sitting without charging the battery discharges gradually. If the battery is not used, one must load it monthly about 2 hours or so with 1-Ampere-Strom unload, electrolyte to pour off, which rinses elements out several marks with warm water and which keep battery in dry condition. If loaded batteries longer time stand, one must reload, unload and again load them each half-year.

If the battery is in service, the clamps must always with a thin layer of technical vaseline or grease to be provided.

New motorcycles receive the buyers both with loaded and with dry, uncharged batteries. Dry batteries must before start-up with electrolyte (GOST 667 -- 53) with a specific weight of 1,120 and a temperature of 20 -- 25° to be full-filled. In order to manufacture electrolyte, one must pour battery sulfuric acid in distilled or rain water, but in reverse. The first charge begins 2 -- 3 hours after filling up the elements with electrolyte and with an amperage of 2 ampere. If the tension in each element 2.38 -- 2.42 V reached, the amperage on 1 ampere is lowered and loading up to the conclusion is continued. First loading takes approximately 35 -- 45 hours. The signs of the completion of loading are: A) plentiful gas elimination in all elements, b) stability of the tension to the Poland of the elements in the course of 2 hours, C) stability of the density of the electrolyte in the course of 2 hours.

When loading the temperature of the electrolyte is not to exceed 45 °. If the temperature is higher, loading must be cooled down be interrupted, electrolyte at 30 -- 35 ° and be continued loading only then again.



After first loading it is advisable, before the battery is inserted, to unload and then again load it of in until twice again. The loading takes place with the river of a ten-hour regime according to the table for the batteries Smt-14.

Regime	Current Strength Amperes	Capacity in Amp/Hours		Final tension in the element in volts
		Nominal	Guaranteed	
10 hours	1	10		1.7
3 hours	3		3.4	1.65
30 minutes	11		5.5	1.55

The tension at the conclusion of the loading is brought up to 1.7 V of each element. The second and next loading takes place with a river from 2 ampere. As soon as the tension of each element up to 2,38 -- 2.42 V rose, the amperage up to 1 ampere is lowered and the loading with this amperage up to the conclusion is accomplished. With this river up to the conclusion one loads, which is determined by the characteristics stated above.

At the end of the second and following loadings the specific weight of the electrolyte brought on 1,285 by Zugiessen of distilled water or of acid with a specific weight of 1,40, according to whether the density of the electrolyte is to be increased or reduced. At expiration of 15 -- 20 minutes the density of the electrolyte is controlled, and if it 1,285 is not alike, the work is repeated, electrolyte is sucked off and water or acid in addition-poured.

Circuit breakers, distributor, ignition coil,

to produce candles over at the motorcycle M-72 high voltage stream are inserted at present the circuit breaker distributors Pm-05 and the ignition coil Ig-4085-b. The situation of the distributor is shown in fig. 28 and those the ignition coil in fig. 29. The distributor Pm-05 (fig. 30) consists of the cover of the distributor of high voltage stream, the circuit breaker disk and the circuit breaker.

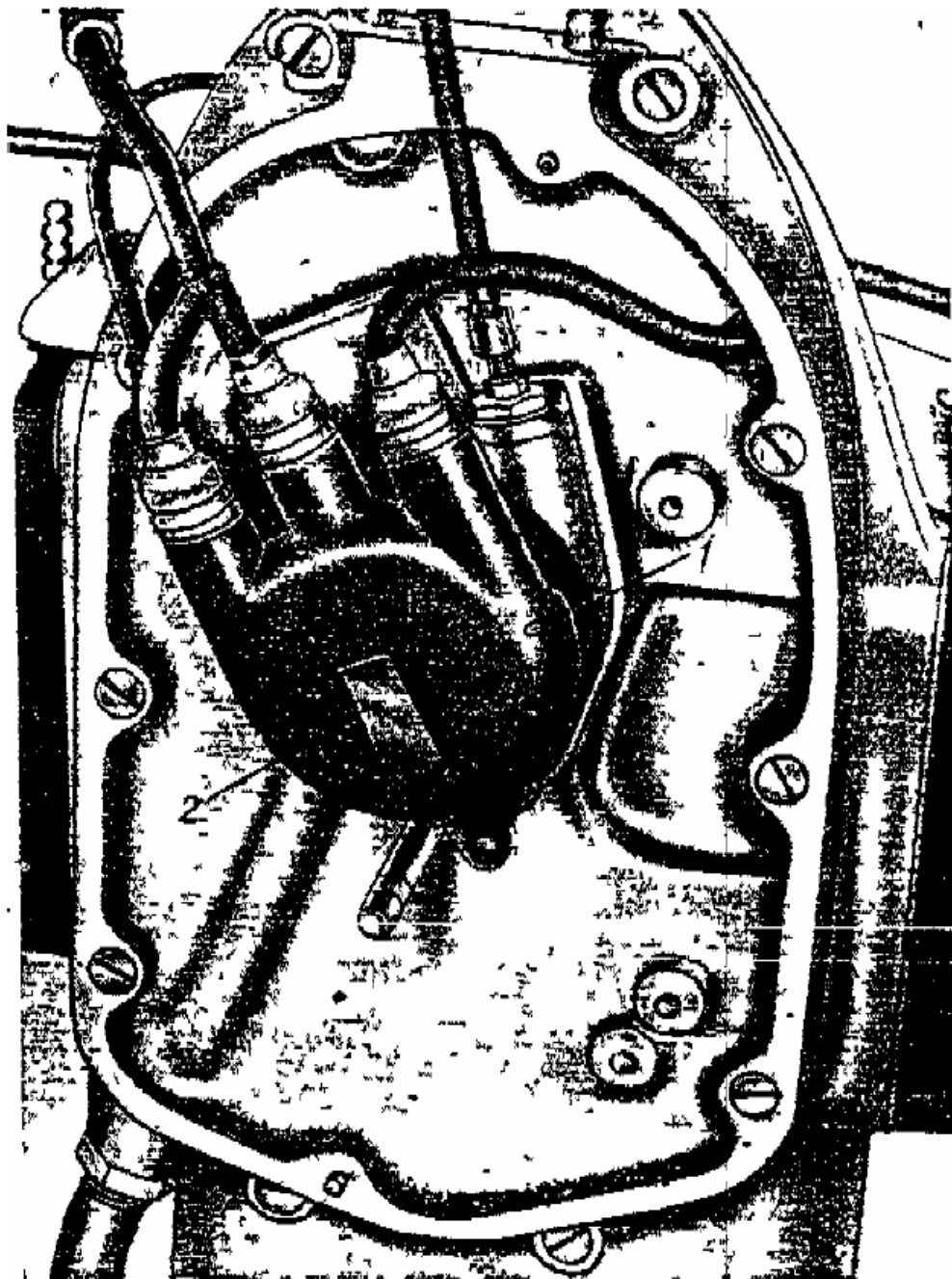


Fig 28

The situation of the distributor PM – 05

1. Circuit breaker -- distributor, 2. Attachment feather/spring

The distributor cover has three connections for high voltage transmission lines: the central, by that the high-tension river from the ignition coil to the distributor one leads and two lateral, by which the high-tension river is led from the distributor to the candles. On the circuit breaker disk the middle contact is in form of a metal cap with a feather/spring as well as a lateral contact plate.

The circuit breaker disk is fastened to the end of the distributor wave by a special wedge with a screw. The high-tension river goes from the middle connection of the cover to the middle contact of the circuit breaker disk and over the lateral contact plate alternating to the carbon contacts of the lateral connections of the cover, of where it arrives over the high voltage transmission lines at the candles.

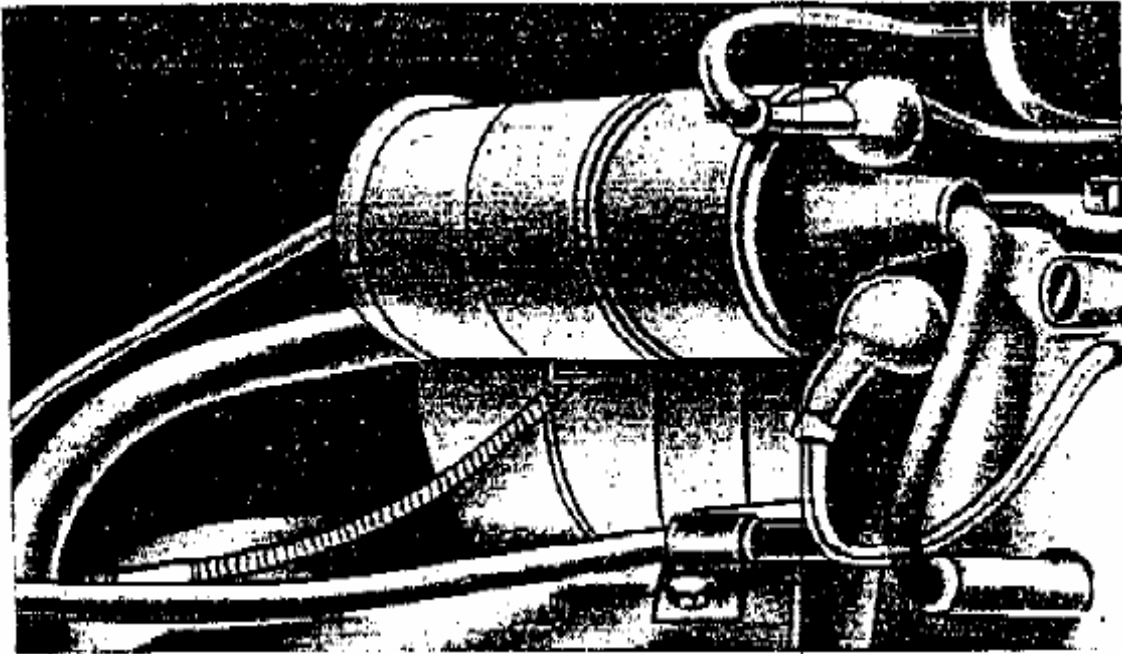


Fig 29

The situation of the ignition coil industrial union -- 4085 – B

The circuit breaker consists of a housing and a disk, on which the hammer and the anvil are fastened. With a movement of the ignition hand lever on the left side of the steering wheel the rope pulls on the disk and turns it, whereby also the early and spaetzuendung are stopped. On the disk the screw 3 is fastened with an eccentric head (adjustment eccentric cam), which goes in into a cutout of the housing. Depending upon the position of the eccentric cam in or other situation changes the maximum angle, in which the circuit breaker disk can turn. With the plate can turn outermost position of the eccentric cam around  $15^\circ$ , with second around  $20^\circ$ , whereby the enlargement of the angle of rotation of the disk of  $15$  on  $20^\circ$  in the direction of an enlargement of the maximum angle of the spark advance develops. The minimum angle of the spaetzuendung remains unchanged. As soon as the adjustment has been completed the eccentric cam into the desired situation one must secure it with a lock nut.

In the top of the circuit breaker housing a condenser is inserted, which serves the sparking of the breaker points for the decrease and for the protection from a burn.

The distance between the breaker points should be during full interruption 0.4 -- 0.5 mm. For adjustment the distance must one the locking screw 12 (fig. 30) loosen, which holds the anvil and after these or shift other direction, by turning the screw with the eccentric cam head 13. After the attachment of the screw 12 the distance between the contacts is to be examined again.

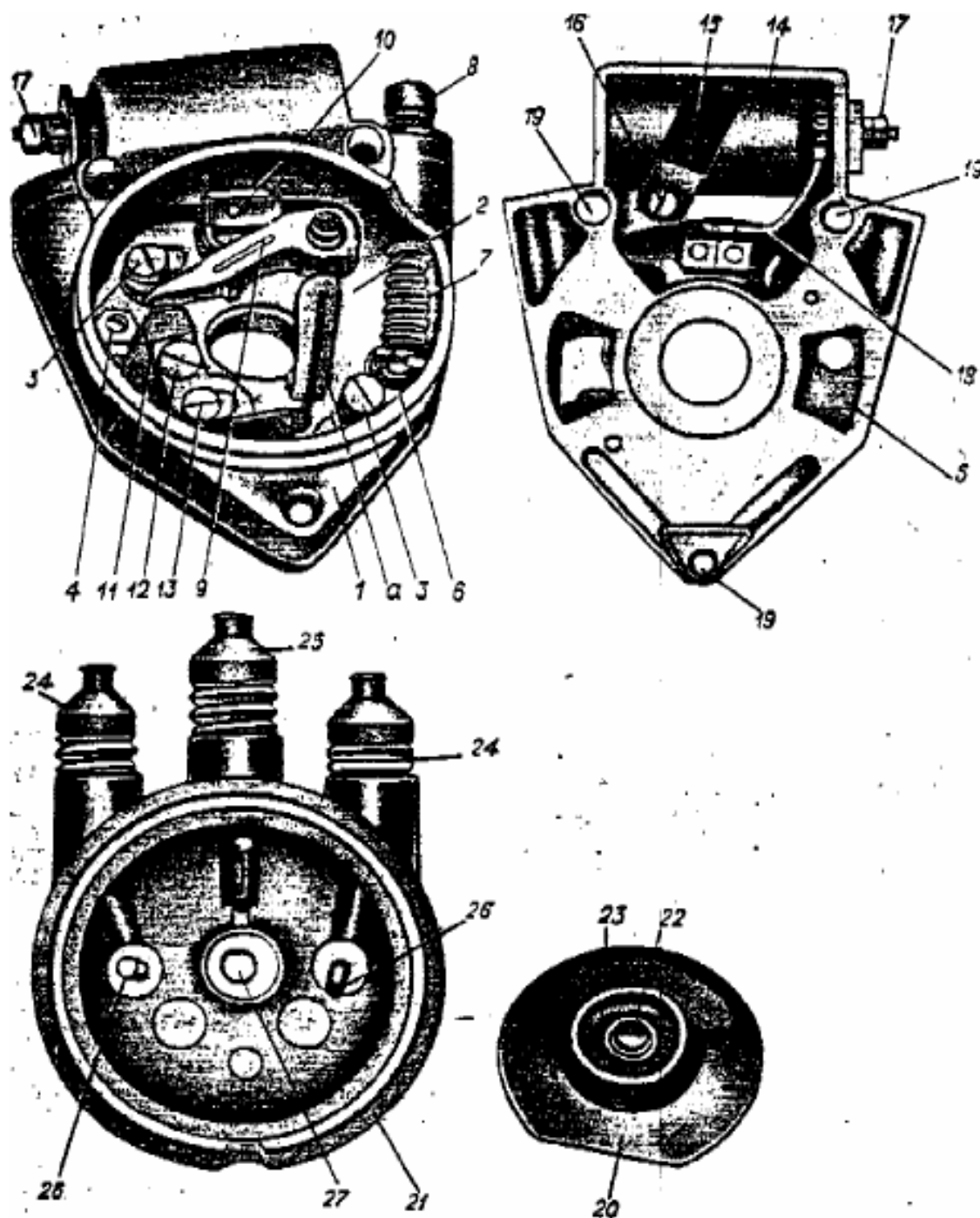
On the circuit breaker disk a support with a feather/spring and felt is appropriate. This felt serves for the lubricating of the circuit breaker finger. One must soak felt with oil, according to the data, which are made in the chapter "lubricating of the motorcycle".

The circuit breaker disk 20 is put on on the wave or down-taken by it in such a position, if the screw is opposite the cutout in the circuit breaker housing. The disk is set as deeply as possible on the end of the wave, but so that it does not wedge the hammer of the circuit breaker.

Before one puts the circuit breaker cover on, one must the presence of the spring clip, for which coals and the seals in the cover control. For the engine of the Rades M-72 one uses candles of the type WELL 11/11 A -- U with the thermal value 145. The distance between the electrodes of the candles should be 0.5 -- 0.6 mm. The attitude of the distance takes place via bending the lateral electrode.

After each 1500 km put back by the motorcycle the following is necessary:

1. The condition of the work surfaces of the contacts of the circuit breaker and the size of the distance between them are to be examined. If the contacts are processed or burned down, then one must remove the hammer and the anvil, which clean and with gasoline wash contacts with a kontaktfeile.
2. One must examine the distance of the electrodes of the candles and clean her if required of oil coal.
3. One must examine all 3000 -- 5000 km the connections of the lines for security. Suspending the engine and the difficulty or even the impossibility of starting the engine, can be based on different reasons by defects of the ignition apparatuses.



**Fig 30**

**Circuit breaker -- distributor PM -- 05**

1. Housing, 2. Turntable, 3. Screw, 4. Screw, 5. Cutout in the housing, 6. Notice, 7. Feather/spring, 8. Adjustment notice, 9. Hammer, 10. Anvil, 11. Circuit breaker hammer, 12. Locking screw, 13. Screw, 14. Condenser, 15. Disk, 16. Screw, 17. isolated clamp, 18. Line, 19. Hole for the screw, 20. Circuit breaker disk, 21. Cover with contacts, 22. Cap with feather/spring, 23. Contact plate, 24., 25. Connections for lines, 26. Carbon contact, 27. Central contact, A) felt brush

The hauptsaechlichsten is the following:

1. Oiling the breaker points; in this case one must abrade and prevent it with a small cloth dipped into gasoline that oil arrives into the circuit breaker.
2. Clamp the circuit breaker hammer.
3. Burn the breaker points.
4. Short-circuit in the condenser (the condenser is pierced).
5. Pollution of the candles.
6. Tears in the isolation of the candles.
7. Pierce the taping of the ignition coil.
8. Unload of the battery.
9. Line damage. An overheating of the engine can occur by spaetzuendung due to wedging the rope of the zuendleitung or by wedging the circuit breaker hammer.

The signal

at the motorcycle is a vibration signal of the type S -- 35 -- A, which is switched on by a button at the steering wheel. The attitude of the signal takes place via the in or unscrewing of a screw, which is at the rear part of the signal.

The headlight

at the motorcycle M-72 is a headlight of the type fG -- 6 attached, into except a two-thread pear for small and large light and a parking light pear still the speedometer, which is inserted to central ignition switches with key and the dimmer switch.

The central ignition switch is in the top of the headlight and is there fastened with 3 screws. In the left part of the central ignition switch the indicator light lies, in the right fusible 15-Ampere safety device.

For the replacement of a burned through safety device one needs to unscrew only the fuse holder, with which together the safety device can be taken out. If the motorcycle stands, one may let the ignition key be in no case completely imprinted in the starter lock, because then the battery can discharge of the ignition coil over the main coil.



Thereby only the battery does not become useless, but it can burn through also the ignition coil. If the indicator light burns, then this means that the supply of all power consumers takes place from the battery. The control lamp expires in the moment, if the relay contacts are closed and the generator switches itself on into the net.

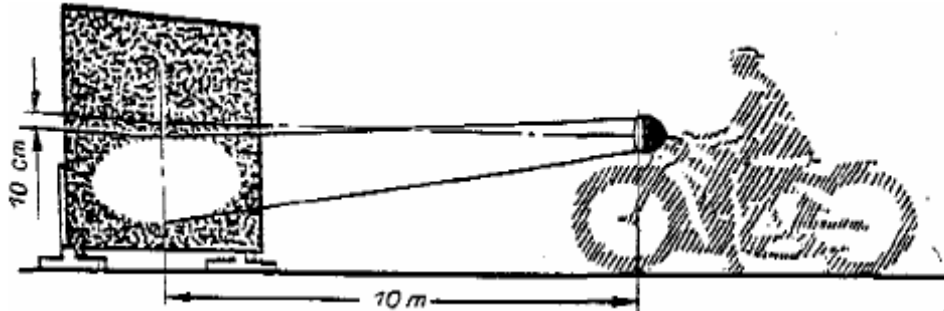


Fig 31  
Sketch for adjustment the headlight

Direction of the light cone to receive, takes place in the following way:

1. The motorcycle with load is set up on an even place before a white wall or a light light at a distance of 10 m up to the headlight glass (fig. 31).
2. The headlight is held in such a position, with which the axle of the light cone of the large light is horizontal, D h. if the center light spots on the light screen and the center of the headlight in the same distance from the ground are.
3. The small light is controlled on that. The top margin of the Lichtflecken on the light screen does not have to be to less than 10 cm when switching on small of the light on under the center of the headlight.

The lines

the connection of the lines in the fig. 25 and 26 one shows. The low-voltage lines are combined in bundles and have into the easier assembly different colors.

All 3000 -- 5000 km must one the condition of the line isolations and the perfect attachment of the cable ends and line ends examine. On the good condition of the electrical equipment the perfect enterprise of the motorcycle depends. Regular controls of the battery, the distributor, the candles, the generator and the lines ensure a troublefree work of the electrical installation.

The lubricating of the motorcycle

the lubricating of the motorcycle is to take place regularly, carefully and in time, since short omitting of the lubrication accidents can pull after itself and make the machine useless.

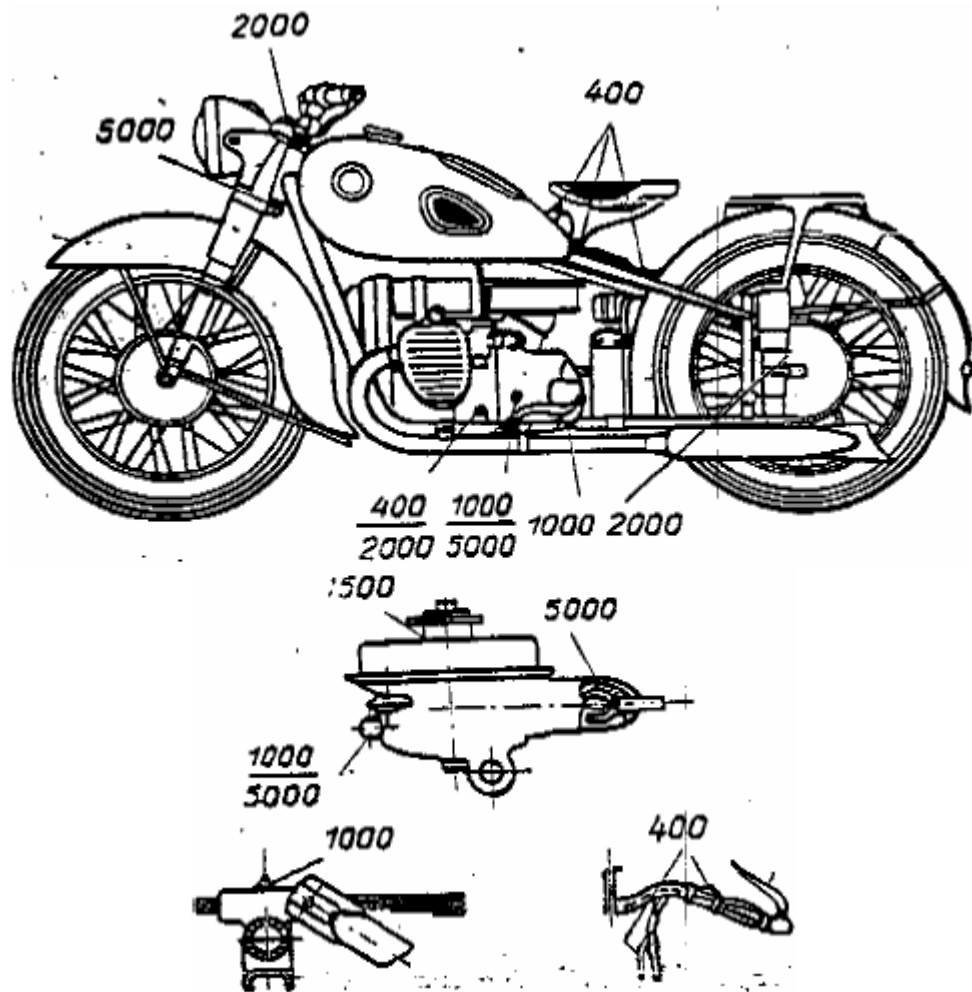


Fig 32  
Operating lubrication pattern



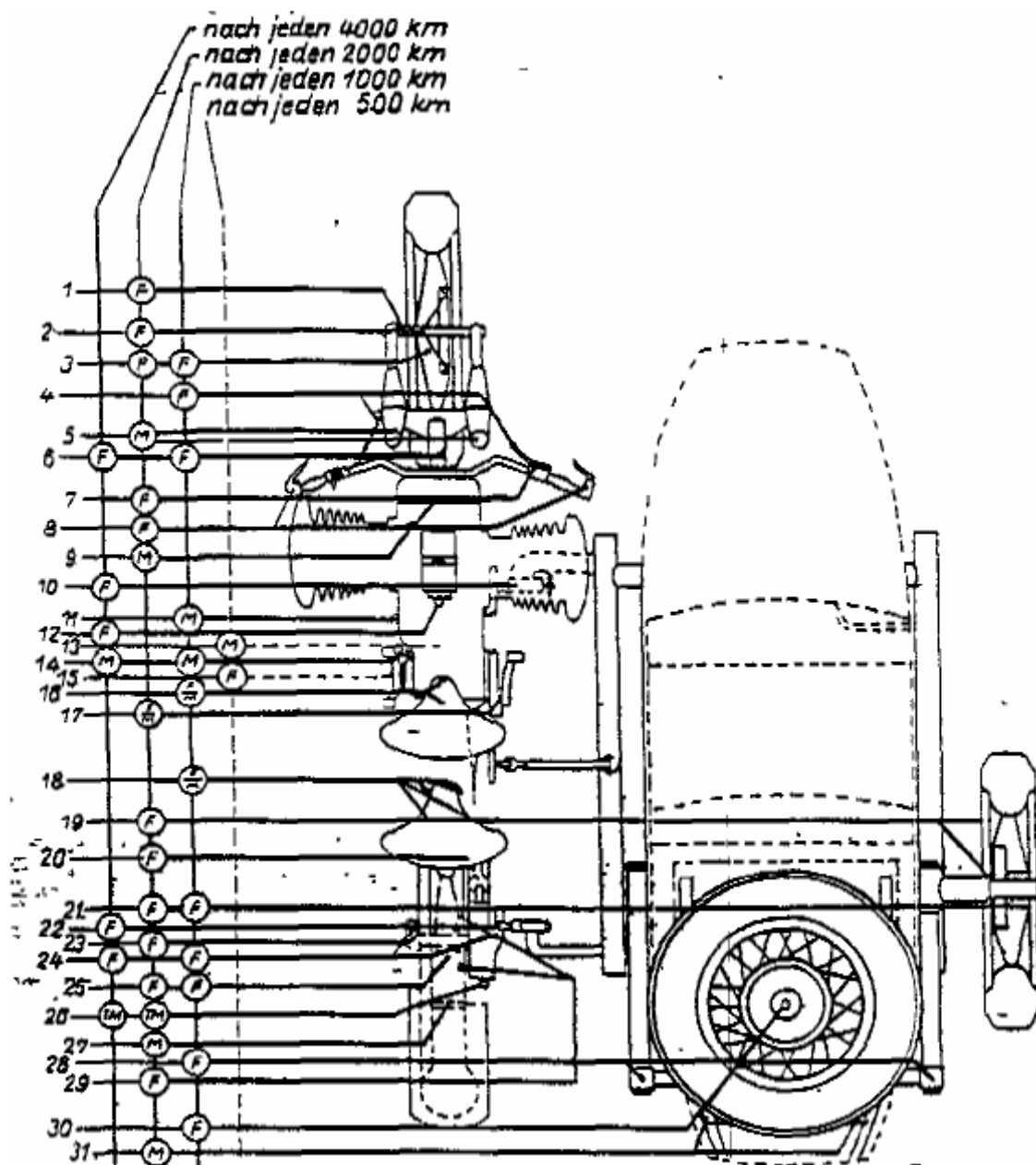


Fig 33  
Lubrication map of the motorcycle M – 72

in the table is indicated the lubrication fittings, the dates of controls and the oil change as well as sort and mark of the oil which can be used according to the season. When lubricating the main parts of the motorcycle, which are to be taken apart for this, the old oil and/or fat must be removed, it must when the assembling thickly with fresh fat be in-lubricated. Fig. 33 shows the sketch of a motorcycle with the indication of all lubrication fittings.

## **The cleaning of the motorcycle**

after completion of the travel and return to the garage must be submitted the motorcycle of a thorough cleaning. One cleans the engine and transmission case best with a haarpinsel dipped into petroleum. Painted and chromium-plated places with a soft rag and a sponge are washed, whereupon with dry cotton rag abraded.

In order to give the painted and chromium-plated parts gloss, it is advisable to polish it after drying with a leather rag. With a hose one may hose down only a cooled down engine.

When washing one must avoid a too strong water pressure, which jet not directly on the generator, which automatic controllers, headlights and carburetors arrange, since the humidity penetrates into individual parts, rusting to cause and defects of the machine which can be eliminated which can be overcome with difficulty involve can.

After drying it is advisable, the hinge of the rear, tiltable part of the shield and the brake courses provided with some drops oil too, in order to prevent a corrosion in these places.

One is to grease chromium-plated parts always slightly. If a motorcycle is for a long time not in enterprise, all parts must be in-lubricated well and plentifully with acidless vaseline.

## Lubrication Points for the M72

Position on the Lubrication Map	Designation of the lubrication fittings	Number of points	Lubrication Times	Lubricant Type	
				Summer +5 and above	Winter +5 and below
1	2	3	4	5	
1,19,23	Wheel Axles	3	All 2000km. While changing a tire wipe off and with fresh fat lubricate.	Grease	Grease
2,29	Axles and cams of the brake shoes	2	All 2000 km divide, wash and with fresh fat lubricate.	Grease	Grease
3, 21, 25, 30	Wheel hubs (reserve if necessarily)	4	All 1000 km fat squirt. After 2000 km wheels decrease, hubs wash and freshly lubricate.	Grease	Grease
4	Clutch and bremsseile	2	All 1000 km grease. During the transition to the winter fat off wash and lubricate with engine oil.	Grease	Motor Oil 10-18
5	Shock absorber of the vordergabel	5	All 2000 km wash and 0,1Ltr. fresh oil on each feather/spring pour.	Motor Oil 10-18	Motor Oil 6
6	Thrust bearing of the steering shaft	2	All 1000 km fat squirt. Take out not less than once in the year or after 8000 km, wash and freshly grease.	Grease	Grease
7	Lever of the throttle guidance	1	All 2000 km with fat squirt. Divide during the transition to the winter operation, wash and freshly grease.	Grease	Motor Oil 6
8	Clutch and brake lever	2	All 2000 km the axles take out and freshly lubricate.	Grease	Grease
9	Circuit breaker	1	All 2000 km wash and 2-3 drops engine oil on the circuit breaker axle and 1-2 drop on the felt brush traefeln.	Motor Oil 10-18	Motor Oil 6
10,22	Hinge of the zangenverbindung	2	After 4000 km take apart, wash and freshly lubricate.	Grease	Grease
11	Crankshaft housing	1	Daily and up to the mark, all 1000 km oil control refill change.	Motor Oil 10-18	Motor Oil 10-18
12	Generator, rear camp	1	Renew fat of the rear rotor camp after 4000 km.		

Position on the Lubrication Map	Designation of the lubrication fittings	Number of points	Lubrication Times	Lubricant Type	
				Summer +5 and above	Winter +5 and below
1	2	3	4	5	
13	Air Filter	1	Wash and after 500 km oil change. On particularly dusty roads all 150 -- 200 km change.	Motor Oil 10-18	Motor Oil 6
14	Transmission Case	1	After 1000 km control and refill	Motor Oil 10-18	Motor Oil 6
15	Foot switching pedal	1	Daily lubricate	Grease	Grease
16	Front saddle joint	1	Lubricate every 1000km	Grease	Grease
	Feather/spring joint	2	Lubricate every 1000km	Motor Oil 10-18	Motor Oil 6
17	Joint of the Emergency Brake	2	All 2000 km divide, wash and lubricate	Motor Oil 10-18	Motor Oil 6
	Joint of the brake pedal	1	All 2000 km divide, wash and lubricate	Grease	Motor Oil 6
18	Rear saddle joint	1	Lubricate every 1000km	Grease	Grease
	Feather/spring hinges	4	Lubricate every 1000km	Motor Oil 10-18	Motor Oil 6
20	Cardan shaft joint	1	All 2000 km lubricate. If dirt under the cap is, wash	Grease	Grease
24	Left and right suspension	2	All 1000 km lubricate. After 4000 km, but not less than once in the year divide, do not wash and freshly lubricate.	Grease	Grease
26	Housing of the power transmission	1	All 2000 km control refill. Discharge after 4000 km, wash and fresh oil fill up.	Transmission sommeroel	Transmission sommeroel
27	Eyes rear shield of the hinge	1	Lubricate every 2000km	Motor Oil 10-18	Motor Oil 6
28	Federschuhe	2	All 1000 km lubricate. With particularly dusty roads daily	Grease	Grease
31	Hinges of the baggage compartment cover	2	Lubricate every 2000km	Grease	Motor Oil 6
32	Speedometer spiral	1	Clean and lubricate every 2000km	Motor Oil 10-18	Motor Oil 6
33	Axle bearing of the lever of the torque shaft	1	Lubricate every 1000km	Grease	Grease

## Possible engine disturbances and means to their removal

Cause of problem and how to remedy	Trouble Signs							
	Engine has bad achievement (pulls badly, works irregularly)	Engine uses too much fuel	Engine does not have compression	Engine overheats	A cylinder does not work	Engine knocks	Engine does not start	Engine Stops Suddenly
1	2	3	4	5	6	7	8	9
Lean mixture - carburetors adjust	X							
Fat mixture - carburetors adjust	X	X	X					
Gasoline is empty - refill							X	X
Fuel Petcock closed - open							X	
Vent of the gasoline tank screw connection is dirty dirty – cleans							X	X
Gasoline line of a carburetor is dirty dirty - blow through					X			
Water is in the gasoline - new gasoline fill in							X	X
The nozzle of a carburetor gets dirty - nozzle clean					X			
Carburetor not correctly adjusted - regulate again	X	X	X	X			X	X
The distance between the breaker points is not correct - distance regulate							X	
Ignition is not correctly adjusted - adjust correctly						X	X	
Condenser is pierced – replacement							X	X
High voltage transmission line has itself solved - again to attach							X	X

Cause of problem and how to remedy	Trouble Signs							
	Engine has bad achievement (pulls badly, works irregularly)	Engine uses too much fuel	Engine does not have compression	Engine overheats	A cylinder does not work	Engine knocks	Engine does not start	Engine Stops Suddenly
1	2	3	4	5	6	7	8	9
Too much spark advance – retard ignition						X		
Ignition is defective - repair							X	
It works only one cylinder	X							
Piston rings broke – replace	X	X						
At the cylinder head gas steps out - cylinder head pins tighten or seal replacement	X	X						
Valves do not close closely - clean of oil carbon and grind in	X	X					X	
Piston rings are angebrannt - replacement or slots and rings of oil coal clean	X	X						
Piston rings or cylinders are badly seated - piston rings replacement	X	X						
Formation of oil carbon on the pistons and in the cylinder heads - clean	X					X		
Float chamber vent is clogged - clean					X			
Valve clearance is incorrect – adjust	X			X			X	
Oil is too thin – change oil			X	X				
Defective oil pump - repair				X				X

Cause of problem and how to remedy	Trouble Signs							
	Engine has bad achievement (pulls badly, works irregularly)	Engine uses too much fuel	Engine does not have compression	Engine overheats	A cylinder does not work	Engine knocks	Engine does not start	Engine Stops Suddenly
1	2	3	4	5	6	7	8	9
No oil is coating the cylinders when starting due to cold engine - by the spark plug opening add clean, fresh, warm oil			<b>X</b>					
The engine is overheated - 10-15 minutes cooling time	<b>X</b>							
The gaps between the cylinder fins and cylinder heads are extremely dirty - must be cleaned				<b>X</b>				
Too much late ignition - ignition correctly stop				<b>X</b>				
Formation of oil carbon at the spark plug - clean and with denatured white spirits wash					<b>X</b>			
Formation of oil carbon at the spark plug electrodes - clean					<b>X</b>		<b>X</b>	
Spark electrodes are isolated - replacement					<b>X</b>		<b>X</b>	
Wear of the gudgeon pins, pistons and piston rod pins – replacement						<b>X</b>		
Valve tappet clearance too loose -- adjust	<b>X</b>	<b>X</b>				<b>X</b>	<b>X</b>	
Wrong gear chosen, switch to smaller gear						<b>X</b>		
Exhaust pipe clogged - clean	<b>X</b>							
No oil – refill				<b>X</b>				



## Technical characteristic

### I. main data

1. Wheel base of the motorcycle (unloaded) 1430 mm of
2. Clearance 130 mm of
3. Length of the motorcycle without sidecar 2230 mm broad of the motorcycle with sidecar 1600 mm height (up to the ignition key) of 1000 mm of
4. Weight of the motorcycle, refuelled 370 kg of
5. Maximum speed 85 km/St.
6. Contents of the gasoline tank 22 l
7. Gasoline consumption on 100 km during the travel with sidecar on even asphalted Chaussee with a speed of 50 -- 60 km/St. 7 l
8. Radius of action 300 km

### II. The engine

9. Engine: Two-cylinder, Viertakter
10. Drilling: 78 mm of
11. Stroke: 78 mm of
12. Capacity: 746 ccm
13. Compression: 5,5
14. Cooling: Air cooling
15. Valve situation: down
16. Maximum output with 4600 U/min: 22 HP of
17. Lubrication system: combines
18. Contents of the oil reservoir: 2 l
19. Carburetor: K-37
20. Number of carburetors: 2

### III. Power transmission

21. Clutch: drying, zweisheibenkupplung
22. Transmission: Two-speed, four-stage transmission
23. Power transmission to the rear wheel: by cardan shaft
24. Speed ratio:

Gear	Transmission	Total
1.	3,6	16,65
2.	2,28	10,55
3.	1,7	7,85
4.	1,3	6,01

25. Quantity of oil in the transmission: 0.8 l
26. Quantity of oil in the power transmission: 0.175 l

#### IV. Chassis

- 27. Framework: undetachable rohrrahmen
- 28. Vordergabel: Teleskopgabel with hydraulic shock absorbers
- 29. Rear wheel suspension: by feathers/springs
- 30. Wheels: replaceable
- 31. Tire size: 3,75X19 32.
- Tire pressure:

- Front wheel 1.5 atue
- rear wheel 2.5 atue
- sidecar wheel 1.5 atue

- 33. Sidecar: Passenger vehicle type for l person

#### V. Electrical equipment

- 34. Ignition system: Battery
- 35. Battery: Smt-14 6 V of 14 Amp./Std.
- 36. Generator: G 11 A 6 V 45 Watts of
- 37. Relay automatic controller: Rr-31
- 38. Distributor: Pm-05
- 39. Headlight: Fg-6
- 40. Signal: S-35
- 41. Taillight
- 42. Front sidecar lamp
- 43. Rear sidecar lamp

To the motorcycle M 72 belong:

A maintaining and an operating instruction

Tools:

- 1. Tool kit. . . . . I piece
- 2. Screwdriver. . . . . 2 pieces
- 3. Flat-nose pliers. . . . . I piece
- 4. Wrench 8 X 10. . . . . I piece
- 5. Wrench 12 X 14. . . . . I piece
- 6. Wrench 14 X 17. . . . . I piece
- 7. Wrench 19 X 22. . . . . 1Stueck
- 8. Wrench 36 X 41. . . . . I piece
- 9. Wrench. . . . . 1 pieces
- 10. Box spanner 10 X 11. . . . . 1 pieces

11. Box spanner 12 X 19. . . . .	1 piece
12. Box spanner 14 mm. . . . .	1 piece
13. Kerzenschlüssel 22 X 22. . . . .	1 piece
14. Match key. . . . .	1 piece
15. Thorn. . . . .	1 piece
16. Box spanner. . . . .	1 piece
17. Air pressure gauge. . . . .	1 piece
18. Assembly lever. . . . .	2 pieces
19. First aid kit. . . . .	1 piece
20. Tire pump. . . . .	1 piece
21. Fettspritze. . . . .	1 piece
22. Key for adjustment the eccentric cam and the nozzle. .. . . .	1 piece
23. Hammer with handle. . . . .	1 piece
24. Kontaktfeile. . . . .	1 piece
25. Feeler gauge 0.1 and 0.5 mm. . . . .	1 piece
26. Key 11 on one side. . . . .	1 piece

#### Spare parts

1. Candles. . . . .	2 pieces
2. Spare wheel complete. . . . .	1 piece
3. short spokes. . . . .	20 pieces
4. Ignition key. . . . .	2 pieces
5. Key to the toolbox. . . . .	1 piece
6. long spokes. . . . .	5 pieces
7. ET box for generator. . . . .	1 pieces
8. Cylinder head gaskets. . . . .	2 pieces
9. Fuse box for headlight. . . . .	1 piece
10. Speedometer spiral. . . . .	1 piece
11. Oil rings. . . . .	2 pieces
12. Compression rings. . . . .	4 pieces
13. Nipple. . . . .	10 pieces
14. Gasoline hose, long. . . . .	1 piece
15. Gasoline hose briefly. . . . .	1 piece
16. Clutch cable. . . . .	1 piece

according to the accessory list.

USSR  
MINISTRY FOR MECHANICAL ENGINEERING HEAD OFFICE ENGINE  
INDUSTRY NATIONAL IRBITER  
union motorcycle factory

The motorcycle M-72 with sidecar is manufactured according to the designs and technical conditions, it is tried out and from the department technical control removed.

The motorcycle can be taken in enterprise.  
Framework NR.  
Engine NR.  
Transmission NR.  
Sidecar NR.

Distribution date 1954

The speedometer of this motorcycle shows \_\_\_\_\_ km.  
Date stamp:

Signatures as required:

Before one uses the motorcycle, one must read the enclosed maintaining and operating instruction attentively.

The exact observance of all regulations, which are specified in the operating instruction, ensures a long and troublefree work of the motorcycle.

If questions emerge, which are not mentioned in the maintaining and operating instruction, one turns with further inquiries to the factory.

Because of all missing explanations and possible suggestions on the improvement of the machine or individual aggregates one turns to the factory:

City Irbit, Swerdlowsker area,  
Irbiter motorcycle factory.

**Approved**

Lead engineer of the Irbiter motorcycle factory

signed.: *I g n . t j e w*

3 October 1953