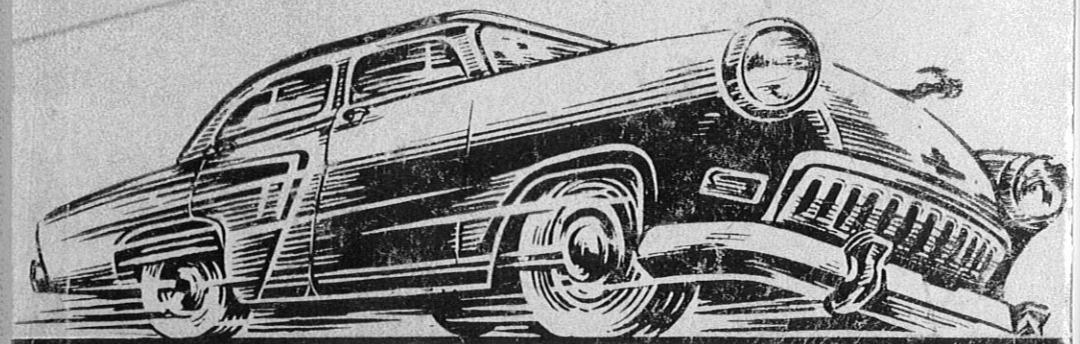
VSESOJUZNOJE OBJEDINENIJE

AVTOEXPORT

"Volga"

AUTOMOBILE MAINTENANCE INSTRUCTIONS

M-21K



VSESOJUZNOJE OBJEDINENIJE

AVTOEXPORT

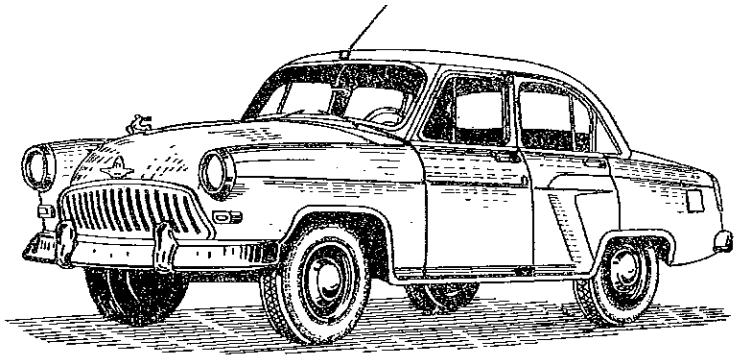
«VOLGA»

AUTOMOBILE

MODEL M-21K

MAINTENANCE INSTRUCTIONS

V/O "AVTOEXPORT"
USSR Moscow



The Main Committee of the Moscow Industrial Exhibition of 1958 awarded a Certificate of Merit of the Second Class to the Gorky Motor Works.

Our new car models including the 1959 "VOLGA" model won the Grand Prix at the 1958 Brussels Technical Progress Exhibition.

We are constantly endeavouring to improve the quality of our automobiles and welcome any suggestions that may help to achieve this purpose.

SUPPLEMENTS AND CHANGES introduced in 1961

Supplement to page 4

Engines of different compression ratios are optional on car model M-21K. Variations of engine power, torque and octane rating of fuel with compression ratio are shown in the table given below.

Compression ratio	Horsepower	Torque kg. m	Octane rating of fuel
6.6	70	17	72
7.15	75	17.5	76
7.5	80	18	80

Page 5, lines 2 and 3 from bottom

Change... positive pole grounded... to read... negative pole grounded.

Page 7, line 7 from top

Change... 0.75... to read... 0.9.

Page 7, line 12 from top

Change... 0.12... to read... kg... 0.15

Pages 8 and 9, Figs, 1 and 2

Windshield washer control button is transferred from the instrument panel to the body floor.

Supplement to page 8

Plug socket is located under the instrument panel on the left side at the hand brake bracket.

Page 13, line 5 from bottom

Change... 35—40 mm... to read... 20 to 25 mm.

Supplement to page 15 between lines 11 and 12 from top

After first 12.000 km lap engine valves.

Pages 16 and 19

In left hand column under «Lubrication Intervals, km» change... 200... to read... 500... and... 2000... to read... 3000.

Page 16, item 6

Change... 20.000 km... to read... 30.000... km.

Supplement to pages 18, 19 and Fig. 5

Propeller shaft centre bearing should be lubricated with special additive high melting point, water — repellent grease every 60.000 km.

Page 25, line 2 from top

Change... 200, 1000, 2000... to read... 500, 1000, 3000...

Page 26, line 17 from bottom

Change... 200 km... to... 500 km.

Page 26, line 2 from bottom

Change... 35 to 40 mm... to read... 20 to 25 mm.

Page 27, line 6 from top

Change... 2000 km... to read... 3000 km.

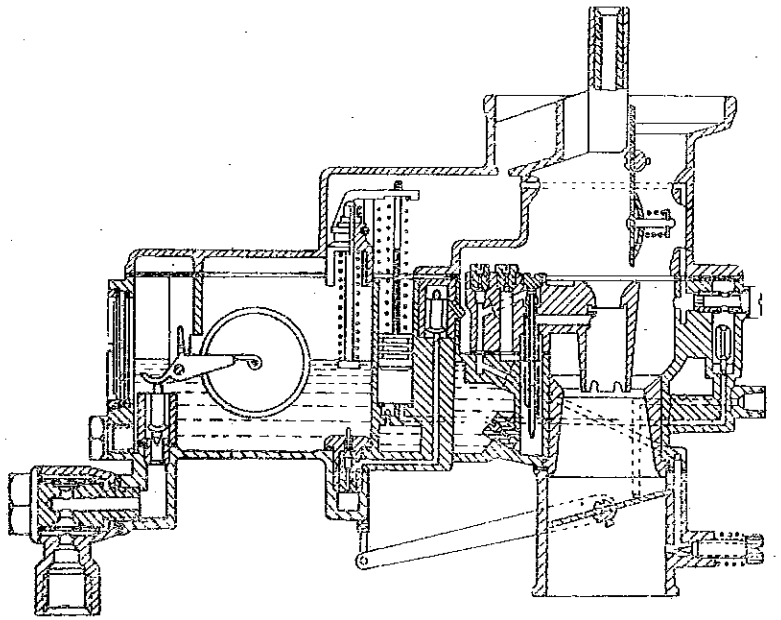


Fig. Carburettor K-105.

Page 30, line 2 from bottom

Change... 120 g... to read... 150 g.

Supplement to page 31 between lines 4 and 5 from top

Every 24.000 km lap engine valves.

Page 32 lines 13 and 14 from top

Change... 12.000 to 16.000 km... to read... 30.000 km

Page 36, Fig. 12

A lubricator fitting is installed instead of the grease cup.

Page 37, Fig. 13

Another design of the tyre K-105 carburettor is also used.

Page 37, line 5 from bottom

Change... 185... to read... 590.

line 4 from bottom

Change... 1.9... to read... 2. 3

line 3 from bottom

Change... 0.5... to read... 0,85.

line 2 from bottom

Change... 1.5... to read... 1.8.

line 1 from bottom

Change... 1.5... to read... 0.6

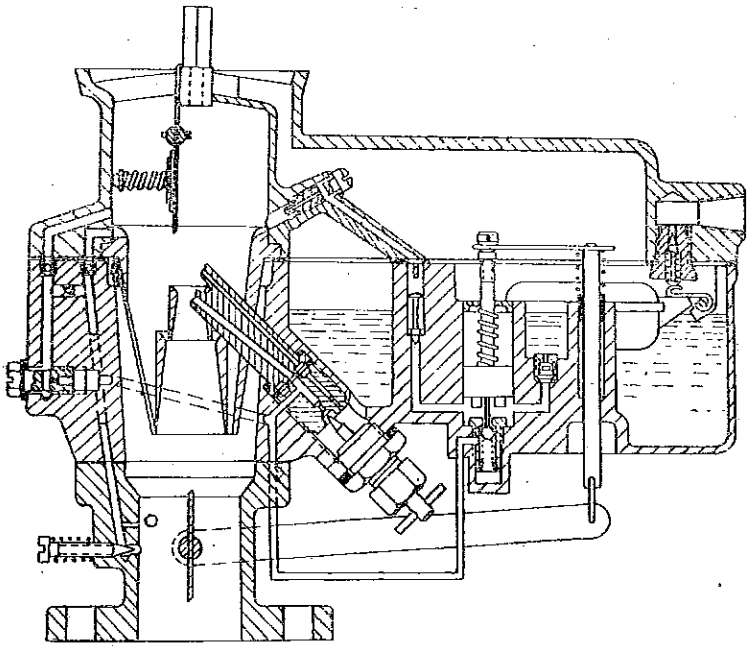


Fig. Carburettor K-22H Sectional View.

Supplement to page 38

On some cars a К-22И carburettor may be installed, the sectional view of which is shown above.

Page 39, Fig. 15

In this figure the storage battery circuit terminal should be marked plus (+) and the ground terminal should be marked minus (—).

Page 48, Fig. 21

Correct position of propeller shaft universal joints is shown below.

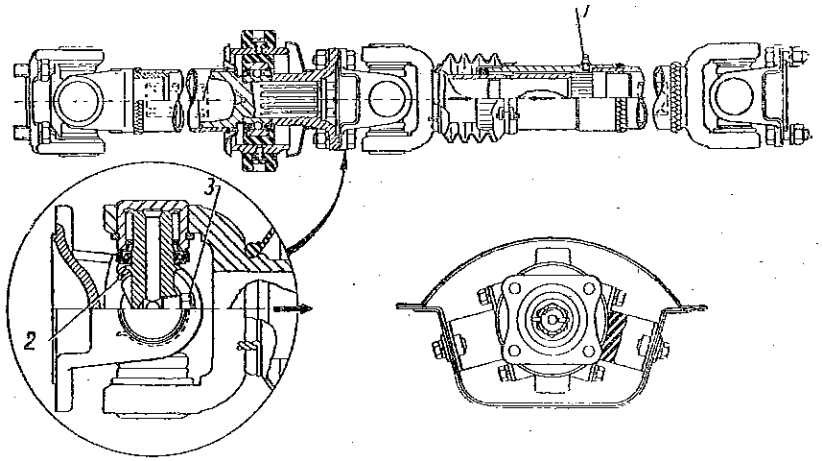


Fig. Correct Position of Propeller Shaft Universal Joints.

Supplement to page 48, line 5 from bottom

Every 60.000 km remove propeller shaft centre bearing, disassemble it and lubricate with special additive water — repellent high melting point grease.

Page 64, Fig. 34 and page 66, Fig. 35

Storage battery circuit terminal should be marked plus (+) and its ground terminal should be marked minus (—).

Supplement to page 70 between lines 17 and 18

When changing the radio receiver, install the receiver A-12 of the same polarity as that of the car electric systmen. Receiver polarity is shown in the instruction book for its use and care.

CAUTION

When operating the "Volga" car, the driver should bear in mind the following recommendations:

1. Check the temperature and the level of the cooling water. Do not allow the radiator upper tank to become empty as this will damage the water temperature sensitive unit installed in the cylinder head. The green pilot lamp located on the instrument panel flashes on when the temperature of water in the radiator exceeds the permissible level.

2. When draining the cooling system, be sure to open two drain cocks and the radiator filler cap. Also open the heater cock located on the cylinder head to avoid freezing of water in the heater radiator.

3. Enrichment of the working mixture during starting of a cold engine by the use of the choke valve should be resorted to with moderation to prevent excess gasoline from getting into the inlet pipe.

4. When the engine is being warmed up after starting, pull the choke knob slightly out. The use of the choke valve while starting a warm engine, is not permissible. A threaded plug in the rear bottom part of the inlet pipe serves for draining excess gasoline.

5. After starting the cold engine do not race it at once. Cold oil reaches the bearings slowly and at high engine speed the bearings may melt out.

Remember that the thermostat valve prevents the circulation of water through the radiator during engine warm-up period so that the radiator may get frozen even though the water in the engine water jacket is hot. Do not open the heater port lid, until the water is warm.

6. Do not switch on the ignition (the key turned to the right), when using the radio set with engine inoperative, as this causes overheating and damage of the ignition coil. As the radio set consumes a 3.5 amp. current do not use it in excess of 3 hours, when the car is parked, to avoid discharging the storage battery.

SPECIFICATIONS

GENERAL

Number of seats (driver incl.)	5
Overall dimensions (nominal):	
length	4 770 *mm*
width	1 800 *mm*
height (in working order, without load)	1 620 *mm*
Wheel base (axle-to-axle distance)	2 700 *mm*
Wheel tread:	
front wheels	1 410 *mm*
rear wheels	1 420 *mm*
Road clearance (fully loaded, with normal tyre pressure):	
front suspension cross member	200 *mm*
muffler pipe	190 *mm*
rear axle housing (at flange)	190 *mm*
Minimum turning radius (outer wheel tread)	6.3 *m*
Angle of approach (fully loaded)	27°
Angle of departure (fully loaded)	19°
Maximum speed with normal load on horizontal level road	135 *km/hr*
Dry weight of car	1 360 *kg*
Fuel	automotive gasoline, 80 octane rating
Engine and chassis numbers	manufacturer's numbers of the engine and chassis are stamped on the plate located under the hood

ENGINE

Type	four-stroke cycle gasoline
Number and arrangement of cylinders	four, vertically in line
Bore	92 *mm*
Stroke	92 *mm*
Displacement	2.445 *l*
Compression ratio	7.5
Horsepower and engine speed	80 *H. P.* at 4,000 *r. p. m.*
Maximum torque	18 *kgm*
Firing order	1—2—4—3

POWER TRANSMISSION

Clutch	dry, single-plate type with hydraulic release mechanism
Transmission	mechanically operated, with three speeds forward and one reverse
Propeller shafts	two exposed shafts with three-needle bearing type universal joints and one centre bearing
Final drive	hypoid type. Ratio 4.555

RUNNING GEAR

Tyres	with tubes or tubeless, low pressure, 6.70 × 15
Front suspension	independent, lever type, on coiled cylindrical springs mounted on detachable cross member
Rear suspension	longitudinal semi-elliptic leaf springs enclosed in boots
Front and rear shock absorbers	double acting, hydraulic, piston-lever type

FRAME

Frame	short frame in the front end of automobile only

STEERING GEAR

Type	hour-glass worm with twin roller
Ratio	18.2 (mean)

BRAKES

Foot brake	four-wheel, shoe-type
Hand brake	transmission, drum-type

ELECTRIC EQUIPMENT AND INSTRUMENTS

Rated voltage	12 *V*
Wiring	single-wire type; positive pole grounded
Generator	shunt-wound, 220 *W*

Current and voltage regulator	incorporates three units: circuit breaker, voltage regulator and current limiting regulator
Storage battery	54 *A-hr*
Ignition coil	with additional resistor
Distributor	with centrifugal and vacuum spark advance control and octane selector
Spark plugs	14 *mm* thread
Starter	remotely controlled
Headlamps	with country and traffic beams. Equipped with semisealed optical units with 50 and 21 *c. p.* bulbs
Side lamps	with double-filament 6 and 21 *c. p.* bulbs for direction indication and parking light
Tail lamps	produce the rear light, stop light, reverse indicator light and indicate direction of turn. Equipped with double-filament 6 and 21 *c. p.* bulbs and single-filament 21 *c. p.* bulbs
Sound horns	combination of two-tone signals
Fuses and thermal circuit breaker	button-type thermal breaker in lighting circuit and three fuses in one block
Instrument cluster	includes: ammeter, gasoline level gauge, oil pressure gauge, water temperature gauge, and speedometer with odometer wound electrically from storage battery, illuminated by two 1 *c. p.* bulbs
Radio set	two-range type, button type tuning

BODY

Body	four-door sedan of all-metal integral construction

CAPACITIES (litres)

Fuel tank	60
Cooling system	11.5
Engine lubricating system	5.6
Air cleaner	0.3
Transmission housing	0.8
Rear axle housing	0.75
Steering gear case	0.25
Front shock absorbers	0.235 (each)
Rear shock absorbers	0.145 (each)
Brake and clutch control system	0.7
Front hubs	0.12 (each)

ADJUSTMENT DATA

Clearance between rocker arm and valve	0.25—0.30 *mm* (engine cold)
Engine oil pressure (not to be adjusted)	2 to 4 *kg/sq.cm* at 50 *km/hr* Not less than 0.5 *kg/sq.cm* at idle speed on warmed-up engine
Fan belt sagging	10—15 *mm*
Spark plug gap	0.8—0.9 *mm*
Breaker point gap	0.35—0.45 *mm*
Normal temperature of cooling water in radiator	75—85° C
Clutch pedal play	32—40 *mm*
Brake pedal play	10—15 *mm*
Tyre pressure	1.7 *kg/sq. cm*

INSTRUMENTS AND CONTROLS

Arrangement of controls is shown in Fig. 1.

Steering wheel *4* is located on the left-hand side. It is fitted with ring-type horn button *3*.

Direction indicator switch lever *2* is located on the left-hand side of the steering column. Right turn is indicated by moving the lever up, and left turn — by moving it down. Simultaneously a pilot lamp flashes on the right-hand side of the instrument panel. Direction indicators are switched off automatically as the turn is completed.

Gear shift lever *6* is located on the right-hand side of the steering column. Lever positions are shown in Fig. 2.

Brake pedal *10*, **clutch pedal** *11*, and **accelerator pedal** *9* are located in accordance with the universally accepted standard.

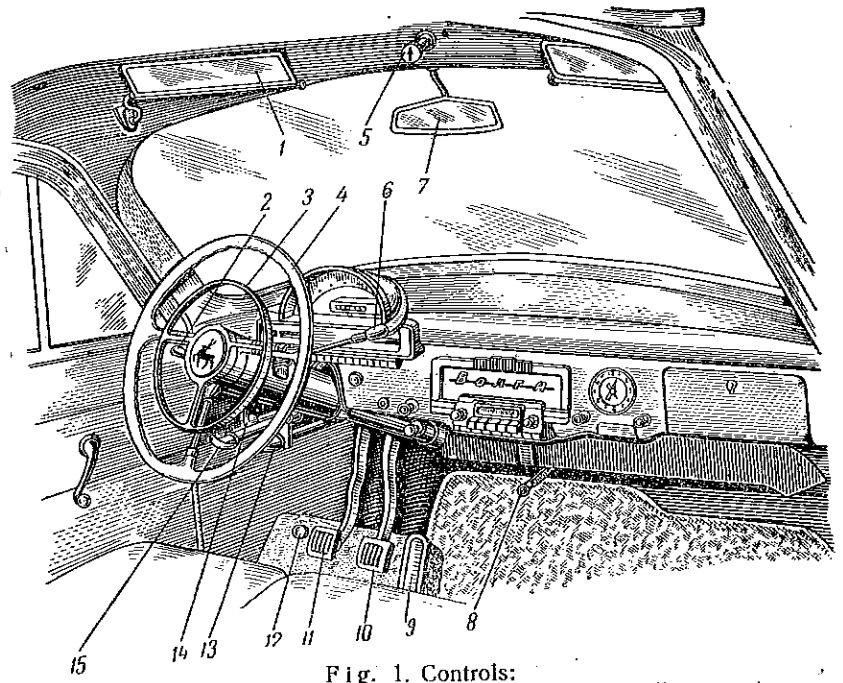


Fig. 1. Controls:

1 — sun visor; *2* — direction indicator switch lever; *3* — horn ring button; *4* — steering wheel; *5* — antenna control knob; 6 — transmission shift lever; *7* — rear view mirror; *8* — ventilation inside port lid handle; *9* — accelerator pedal; *10* — brake pedal; *11* — clutch pedal; *12* — dimmer switch; *13* — hood control handle; *14* — radiator blind control handle; *15* — hand brake lever

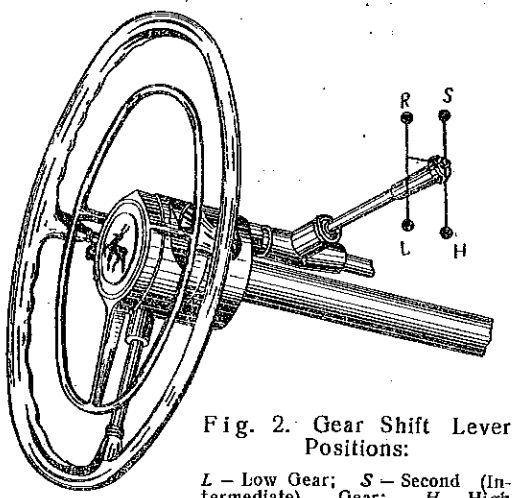


Fig. 2. Gear Shift Lever Positions:

L — Low Gear; *S* — Second (Intermediate) Gear; *H* — High Gear; *R* — Reverse Gear

Hood control handle *13* is located under the instrument panel, on the left side. To open hood, pull the handle out.

Ventilation inside port lid handle *8* is located under the instrument panel at the center. Pushing the handle in opens the lid, pulling it out closes the lid.

Lighting foot switch *12* is located on the left side of the toe-board. Depending on the position of the main lighting switch knob the lighting foot switch allows to change over from traffic light to side lamps, or from country light to traffic light, and vice versa.

Windshield washer pump button *16* (Fig. 3) is located on the left side of instrument panel. *

Hand brake lever *15* (see Fig. 1) is located under the instrument panel to the left of the steering column. To apply the brake, pull the handle all the way out. This is accompanied by flashing on of a red pilot lamp on the instrument panel. To release the brake, turn the lever counterclockwise and push it in.

Radiator blind control handle *14* is located under the instrument panel. To close the blind, pull the handle out. To open the blind, push the handle in.

Illustrated in Fig. 3 is the arrangement of control knobs and instruments.

Air intake port handle *1* and **heater lid handle** *2* are located in the left part of the instrument panel. With the air intake handle in the extreme left position "O" the outer ventilation port is open. With the handle in the extreme right position "3" the outer ventilation port is closed.

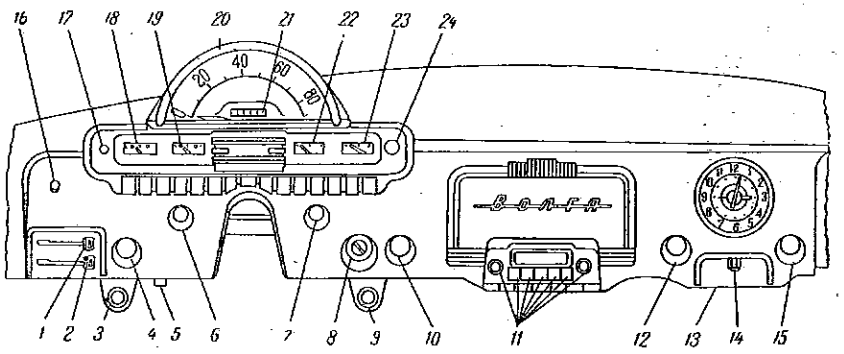


Fig. 3. Instrument Panel;

1 — air intake port handle; *2* — heater lid handle; *3* — heater fan switch; *4* — main lighting switch; *5* — lighting thermal circuit breaker button; *6* — hand brake pilot lamp; *7* — water temperature pilot lamp; *8* — ignition and starter switch; *9* — windshield wiper switch; *10* — carburettor choke valve knob; *11* — radio set knobs; *12* — throttle valve knob; *13* — ash tray; *14* — clock hand setting knob; *15* — cigar lighter; *16* — windshield washer pump button; *17* — headlamp country beam pilot lamp; *18* — ammeter; *19* — gasoline level gauge; *20* — speedometer dial; *21* — odometer; *22* — water temperature gauge; *23* — oil pressure gauge; *24* — direction indicator pilot lamp

Turning heater handle *2* to the right position "O" opens the heater lid and warm air is supplied for heating the body. Turning the handle to the left position "3" closes the lid and warm air is supplied for windshield defrosting only.

* On some cars this button is located on the toe-board

Heater fan switch *3* is located under the instrument panel, at the left. It has three positions: OFF, LOW, and HIGH. When the fan is ON, a pilot lamp flashes on inside the switch knob.

Main lighting switch *4* is located to the left of the steering column. It has three positions: knob pushed all the way in — all lights out; knob pulled half way out — traffic beam; knob pulled all the way out — country beam.

Thermal circuit breaker button *5* is located under the instrument panel to the left of the steering column. The breaker opens the lighting circuit of the car when there is a shorting at some point. Having corrected the trouble, press the button until a click is heard.

Instrument cluster consists of speedometer *20* with odometer *21*, ammeter *18*, gasoline level gauge *19*, water temperature gauge *22*, and oil pressure gauge *23*. To the left of the instruments the country beam pilot lamp *17* is installed and to the right of the instruments — the direction indicator lamp *24*.

Pilot lamps: hand brake red lamp *6* flashes on when the hand brake is applied; water temperature green lamp *7* flashes on when the temperature of water in the radiator upper tank rises to 92—98° C.

Ignition and starter switch *8* is located on the instrument panel, to the right of the steering column. The key may be shifted into any one of the four positions:

mid position — ignition OFF;
first right position — ignition and radio ON;
second right position — radio OFF, ignition and starter ON;
extreme left position — radio ON, only.

Windshield wiper switch *9* located under the instrument panel, to the right of the steering column, has three positions: OFF, LOW and HIGH.

Carburettor choke valve knob *10* is located right of the ignition switch.

Radio set control knobs and buttons *11* are located in the middle of the instrument panel. The left outer knob is the ON—OFF and volume control knob. The left inner knob is tone control. The right outer knob serves for tuning up the set. The buttons marked "Д" are long wave control buttons, those marked "С" — medium waves. The aerial positioning handle is located above the windshield in the middle.

Throttle valve knob *12* is located to the left of the clock. To open the throttle, pull the button out. To close the throttle, push it all the way in.

Clock hand setting knob *14* is located under the instrument panel opposite the clock. To shift the clock hands, press the knob upward and turn it as required.

Ash tray *13* is located under the clock. To use it, pull it out. To remove the ash press the spring located inside the ash tray body.

Cigar lighter *15* is located to the right of the clock. To use the lighter depress it, then release. When the knob jumps out with a click the lighter element is red hot and ready for use.

RUNNING-IN A NEW CAR

Service life of the car depends to a great extent on its operation during the running-in period. Therefore, during this period the car should be given particular attention and care and certain limitations as to its operation should be observed. The running-in programme for the "Volga" car covers 1000 *km* of operation.

RUNNING-IN INSTRUCTIONS

1. Do not drive the car in direct gear over 55 to 60 *km/hr*, in second gear over 35 *km/hr* and in first gear over 25 *km/hr*.
2. Do not start driving with a cold engine and do not race the engine. The engine should be warmed up during 2 or 3 minutes at moderate speed.
3. Do not overload the engine. The number of passengers, including the driver should not exceed four. Avoid driving over difficult roads (deep mud, sand, steep grades, etc.).
4. During running-in use gasoline with an octane rating of 80. The use of gasoline with a lower octane rating is not allowable.
5. During running-in the lightest winter grade of engine lubricating oil should be used. This grade is thinner and contributes to better running-in of parts.
6. Adjust to a somewhat higher idle speed, because a new engine runs with a certain difficulty and cannot run steadily at a low idle speed.
7. Check the brake drums for overheating. If overheated, allow them to cool down and re-adjust the brakes. It should be noted, that the brakes become fully efficient only after the brake shoes have broken-in to the brake drums.
8. Simultaneously check the front wheel hubs for overheating; if they are considerably overheated, loosen the adjusting nut one slot (see under "Adjustment of Front Wheel Hub Bearings").
9. During running-in pay special attention to condition of all the car attachment points. Loose bolts and nuts should immediately be tightened.
10. Check carefully the pipe joints and prevent any possible oil, gasoline, water and brake fluid leaks.
11. Move the coarse filter handle in and out 15 to 20 times every day after driving.

BEFORE FIRST RUN

1. Remove the protective coating from chrome plated parts using a cloth moistened with gasoline. Wipe the parts dry.

2. Check:
a) fuel level in the tank;
b) water or anti-freeze level in the radiator;
c) oil level in the engine;
d) electrolyte level in the battery cells;
e) fluid level in the brake master cylinder;
f) oil level in the air cleaner oil bath;
g) tyre pressure;
h) tightening of wheel nuts.

3. Lubricate all the 1 000 *km* points in accordance with the Lubrication Chart.

4. Start the engine and check for oil, water and gasoline leaks.

5. Inspect the entire car.

AFTER 500 *km* OF OPERATION

1. Change oil in the engine.

2. Lubricate all the 1 000 *km* points in accordance with the Lubrication Chart.

3. Tighten up all the wheel nuts.

4. Tighten the steering arm nut.

5. Tighten the four bolts fixing the inlet and exhaust pipes.

6. Tighten the nuts of eight bolts attaching universal joints to flanges, tighten four hand brake drum bolts and the bolts of the universal joint to the transmission flange.

7. Check the oil level in the transmission case and rear axle housing. If the level is below the edge of the filler hole, add lubricant; if it is higher — allow excess lubricant to drip down.

8. Drain sediment (dirt and water) from the fuel tank through the drain hole.

AFTER FIRST 1000 *km* OF OPERATION

ENGINE AND FUEL SYSTEM

1. Tighten the cylinder head nuts in the sequence shown in Fig. 4; this operation should be performed with a torque indicating wrench or with a special wrench furnished with the car. Do it without jerks and on cold engine only. A torque of 6.7 to 7.2 *kgm* should be exerted. Avoid overtightening these nuts to prevent breaking of the studs.

2. Tighten the nuts attaching the inlet and exhaust pipes to the engine.

3. Tighten the bolts clamping the inlet and exhaust pipes.

4. Tighten the nuts connecting the manifold to the muffler inlet pipe.

5. Check fan belt tension and adjust, if necessary.

6. Check, whether the throttle valve is opened fully when the accelerator pedal is completely depressed. Also check whether the choke valve is fully opened and closed by the control knob. Adjust, if necessary.

7. Check for sediment deposits in the gasoline sediment bowl. Clean the sediment bowl in case of urgent necessity only. Having replaced it check for leaks from under the jar.

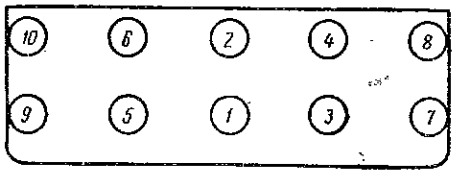


Fig. 4. Cylinder Head Nut Tightening Sequence

8. Listen to engine valve operating noises and adjust clearances, if necessary.

ELECTRIC EQUIPMENT

9. Check the electrolyte level in all the battery cells and add distilled water, if necessary (see "Storage Battery" section). Tighten the storage battery cable to terminals and coat them with petrolatum.

10. Check the tightness and cleanliness of the connections of the generator, current and voltage regulator, starter cables, etc.

11. Blow through the generator with compressed air and wipe the commutator with a clean cloth soaked in clean gasoline.

12. Tighten the generator bracket to engine bolts and those attaching the generator to the bracket.

CHASSIS UNITS

13. Check adjustment of the front wheel bearings and adjust them, if necessary, as outlined in the "Adjustment of Front Wheel Hub Bearings" section.

14. Check free travel of the brake pedal (10—15 *mm*) and of clutch pedal (32—40 *mm*); adjust, if necessary.

15. Check functioning of the foot brake and adjust it if with the fully depressed pedal the clearance between the pedal and the body front panel is less than 35—40 *mm*.

16. Check and adjust, if necessary, the hand brake linkage, as described in the "Hand Brake" section.

17. Check the fluid level in the brake master cylinder and add fluid, if necessary.

18. Make sure there is no play of the steering idler arm pivot (rock the idler arm up and down by hand) and tighten the upper threaded bushing, if necessary (see "Adjustment of Steering Idler Arm" section).

19. Check caster, camber and toe-in; adjust, if necessary (see "Front Suspension" section).

ATTACHMENT OF UNITS AND PARTS

20. Tighten the bolts attaching the steering gear case to the side member. Tighten the steering arm nut.

21. Check the steering rod ball pin nuts and tighten, if necessary.

22. Uncotter and tighten the nuts attaching the steering arm to the steering knuckles and cotter them up again. If during tightening of the nuts the bolts start to turn, remove the brake drums to make the bolt heads accessible.

23. Tighten the bolts of the steering idler arm.

24. Tighten the steering idler arm bolt.

25. Tighten the spring clip nuts after loading the car so as to straighten up the springs.

26. Tighten the nuts of the bolts compressing the spring rubber bushings in spring eyes and rear suspension brackets. Tighten them with a box wrench as far as they will go. Before tightening load the car fully.

27. Tighten the rear shock absorbers-to-car body bolts and the nuts of their link pins. Tighten four outer nuts of the front suspension shock absorbers and four bolts located inside the springs.

28. Tighten the lateral stabilizer bushing bolts.

29. Tighten the bolts attaching the front suspension cross member to the side members and six bolts of the engine rear mounting cross member.

30. Tighten eight bolts of the side members to front panel bracings.

31. Tighten all the other loose joints, paying attention to the attachment of the front and rear bumpers, mud guards, hood and fenders, hood and luggage compartment lid hinges, door hinges, and license plate.

LUBRICATION

32. Drain sediment from the coarse and fine filters.

33. Change engine oil. Viscosity of the fresh oil should conform to the recommendations given in the Lubrication Chart depending on the season.

34. Change oil in the air cleaner.

35. Change lubricant in the rear axle housing and transmission case.

36. Lubricate all the 1 000 *km* chassis lubrication points shown in the Lubrication Chart.

After the first 1 000 *km* of operation and after completion of all the above operations the car is ready for normal service. However, in the course of the next 3 000 *km* of operation do not drive the car continuously at speeds exceeding 90 *km/hr* and do not race the engine while driving over difficult roads in low gear.

The running-in programme is completed after a 5000 to 6000 *km* run after which the car may be driven continuously at 120 *km/hr*; higher speeds may be developed on short sections of highway only.

SERVICING CAR

After the car has been properly run-in its life depends on the care it receives and on the quality of lubricating materials used in its operation.

DRIVER'S KIT

Each car is furnished with a jack, starting crank, tyre pump, inspection lamp and two tool bags.

HOW TO USE JACK

Prior to jacking up the car apply the hand brake, engage the 1st gear and put special wooden chocks under the wheels on the opposite side. The chocks are included in the driver's kit. The jack should be placed under the front bumper bracket or under the rear bumper.

To raise the car, shift the jack latch up and swing the jack handle smoothly up and down. To lower the car, move the latch downward and swing the handle in the same manner.

FILLING COOLING SYSTEM

The cooling system should be filled with water. In winter it is recommended to use special liquids with a low freezing point. The cooling system should be drained through two cocks: one on the radiator tank and the other on the cylinder block. While draining, open the radiator filler cap and the heater cock.

LUBRICATING CAR

LUBRICATING CAR CHASSIS

Lubrication reduces considerably friction in the car mechanisms and wear of its parts. Therefore the car should be lubricated in due time in accordance with Table 1. Lubrication points are shown in Fig. 5.

Nos. on Fig. 5	Name of units	Number of lubrication points	Lubricant symbol	Daily	Lubrication intervals, km			Seasonal (twice a year)	Once a year	Remarks
					200	1000	2000	6000	12000	
1	Water pump	1	G2	—	+	+	—	—	—	—	—	
2	Storage battery	2	P	—	—	—	—	—	—	+	—	
3	King pins	2	G1	—	+	+	—	—	—	—	—	see Fig. 6
	Front suspension and steering rods	15	G1	—	—	+	—	—	—	—	—	see Fig. 6
4	Steering gear	1	T	—	+	—	—	—	—	+	—	
5	Hand brake control linkage	1	CG	—	—	—	—	+	—	—	—	Every
6	Generator	2	G3	—	—	—	—	—	—	—	—	20 000 km
7	Brake and clutch master cylinder	1	B	—	—	+	—	—	—	—	—	
8	Gear shift shaft lower support	1	G1	—	—	+	—	—	—	—	—	
9	Joints and splines of the propeller and intermediate shafts	4	T	—	—	—	—	+	—	—	—	
10	Rear shock absorbers	2	A	—	—	—	—	+	—	—	—	
11	Rear wheel bearings	2	G2	—	—	—	—	+	—	—	+	

Lubrication Chart

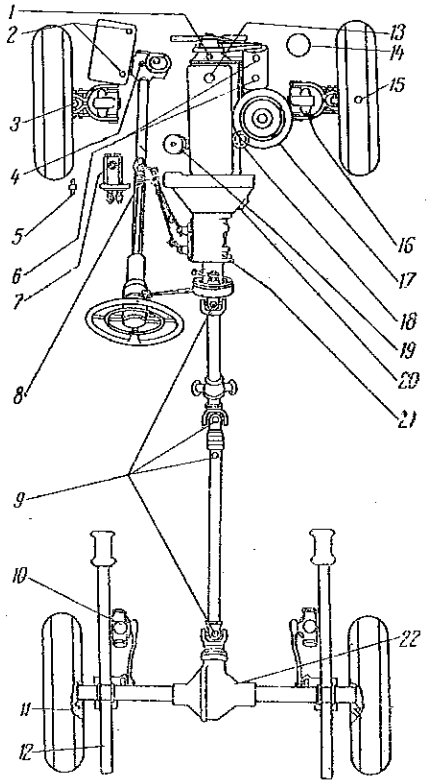


Fig. 5. Chassis Lubrication Points

Continued

Nos. on Fig. 5	Name of units	Number of lubrication points	Lubricant symbol	Daily	Lubrication intervals, *km*					Seasonal (twice a year)	Once a year	Remarks
					200	1000	2000	6000	12000			
12	Springs	2	GG	—	—	—	—	+	—	—	—	
13	Engine crankcase	1	E	+	—	—	+	—	—	+	—	
14	Fine oil filter	1	—	—	—	—	+	—	—	—	—	
15	Front wheel bearings . . .	2	G2	—	—	—	—	—	+	—	—	
16	Front shock absorbers	2	A	—	—	—	—	+	+	—	—	
17	Carburettor air cleaner	1	E	+	—	—	—	+	—	—	+	
18	Coarse oil filter	1	—	+	—	—	+	+	—	—	—	
19	Ignition distributor:											
	cap oiler	1	G2	—	—	—	—	+	—	—	—	
	breaker lever pivot	1	E	—	—	—	—	+	—	—	—	
	cam brush	1	E	—	—	—	—	+	—	—	—	
20	Clutch release bearing . .	1	E	—	—	—	—	+	—	—	—	
21	Transmission	1	T	—	—	—	—	+	+	—	—	
22	Rear axle	1	H	—	—	—	—	+	+	—	—	

Table 2

Recommended Lubricants and Fluids

Symbol in chart	Lubricants used in summer (atmospheric temperature above + 5° C)	Lubricants used in winter (atmospheric temperature below + 5 °C)
E	Summer grade engine oil. Viscosity 7—10° E at 50° C. (SAE 20 – 5 W or 30 — 5 W oil)	Winter grade engine oil. Viscosity 3.5—5° E at 50° C (SAE 20 - 5 W or 30 – 5 W oil)
T	Summer grade transmission oil Viscosity 3.0 - 4.5° E at 100° C. (SAE 90 oil)	Winter grade transmission oil. Viscosity 2.7—3.2° E at 100° C. (SAE 90 oil. In extremely cold weather use SAE 80 oil)
H	Hypoid oil	
G1	Grease, general purpose	
G2	Grease. Melting point 120° C. Penetration 175—210 at 25° C	
G3	Grease. Melting point 170° C. Penetration 270—320 at 25° C	
P	Petrolatum	
B	Brake fluid	
A	Fluid for shock absorbers. (Spindle oil). Viscosity 2—22° E at 50° C. Freezing point — 45° C (SAE 5 W oil)	
GG	Graphite grease. Melting point 75° C	
CG	Lubricant 60% of concentrated colloidal graphite in mineral oil and 40% white spirit	

1. The water pump is provided with two ball bearings lubricated through one grease cup. Force lubricant into the bearings until it appears from the sight hole in the pump body. Then remove excess lubricant, otherwise it will quickly render the fan belt unserviceable.

2. Storage battery terminals should be cleaned of corrosion and lubricated every 6000 *km* but not less than twice a year.

3. Every 500 *km* lubricate the king pins (two lubricator fittings, Fig. 6).

Every 1000 *km* apply grease Gl (see Table 2) with a pressure gun to the following points:

front suspension joints (8 points), steering rod joints (6 points) and idler arm joint (1 point).

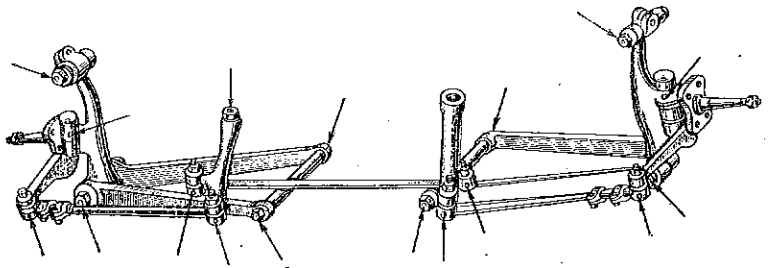


Fig. 6. Lubrication Points of King Pins, Front Suspension and Steering Rod Joints

4. The steering gear is lubricated with the same lubricant as used in the transmission. Check the oil level every 1 000 *km*. The oil level should be 20 *mm* below the edge of the filler hole.

As the frosty weather sets in, do not fail to add light oil into the case to reduce the viscosity of the lubricant. For this purpose remove the lower right bolt of the front cover and drain about 0.1 *l* of lubricant. Then replace the bolt and add light oil through the filler hole in the top to the edge of this hole. Change oil in spring.

5. The hand brake cable should be lubricated through the hole closed with a spring clamp located in the upper part of the cable tube.

6. Generator. Every 20 000 *km* change lubricant in generator bearings.

7. The brake and clutch master cylinder should be replenished with brake fluid every 1 000 *km*, if necessary. The fluid level should not drop below 20 *mm* from the filler hole edge.

8. The lower bearing of the gear shift shaft should be lubricated by turning grease cup two turns every 1 000 *km*.

9. The intermediate and propeller shaft joints and splines are lubricated with thin transmission oil by means of a pressure gun.

Lubrication of these points with grease is not allowed. The universal joints (3 oilers) should be lubricated until the oil appears from the check valves located on the opposite side of the cross. The splines (1 lubricator fitting) should be lubricated moderately without waiting for the lubricant to appear. Excessive quantity of lubricant may press out the shaft plug and get inside the shaft tube thereby impairing its balancing.

10. The rear shock absorbers should be removed every 6000 *km* and replenished to the level of the filler plug, leaving the space above the plug empty. Once a year remove the shock absorbers, flush out with kerosene or gasoline and let them dry.

11. The rear wheel bearings are lubricated by filling the grease cup and pressing it out twice.

12. The springs should be lubricated every 6000 *km* or more frequently if squeaking appears.

13. Check the crankcase oil level every day and top up, if necessary. Change crankcase oil every 2000 *km*. Do not use additive-type oils containing sulphur, because it deteriorates the bearings.

14. The fine oil filter element should be replaced, as a rule, whenever the crankcase oil is changed. The element should be replaced earlier if the oil discolorates which evidences a clogged fine filter.

15. When changing lubricant in the front wheel hubs, flush out the hubs and bearings and pack with fresh grease.

16. The front shock absorbers should be replenished every 6000 *km* without removing them from the car. Once a year remove the shock absorbers and flush out with kerosene or gasoline.

17. Change oil in the carburettor oil cleaner when crankcase oil is changed. If the car is operated on dusty roads, change oil daily.

When the air cleaner element becomes dirty, rinse it in kerosene, allow the kerosene to drip down, then dip in clean oil. It should be borne in mind that the air cleaner does not function properly unless its filter element is covered with an oil film.

18. Clean the coarse oil filter by turning its stem every 1.5 to 2 turns on hot engine for which purpose move the stem handle 15 to 20 times in and out. Drain sediment every 2000 *km* when changing crankcase oil. Every 6000 *km* disassemble the filter and flush it out.

19. In the ignition distributor lubricate the following points:

Shaft bushing by turning the grease cup one turn every 6000 *km*;

Breaker lever pivot by applying 1 or 2 drops of oil every 6000 *km*;

Breaker cam brush by applying 1 or 2 drops of oil every 6000 *km*.

20. The clutch release bearing should be lubricated by turning the grease cup 2 or 3 turns every 1000 *km*. Excessive lubrication of

the bearing results in the slipping of the clutch. If a new hose is installed, fill it with lubricant.

21. Check the transmission oil level every 6000 *km*; change oil every 12 000 *km*.

22. Check the rear axle housing oil level every 6000 *km* and top up, if necessary. Change lubricant every 12 000 *km* of operation, but not less than twice a year: in spring and autumn.

LUBRICATION OF CAR BODY

The car body lubrication points and lubrication intervals are shown in Fig. 7. Description of the lubrication points, their number and lubrication instructions are given in Table 3.

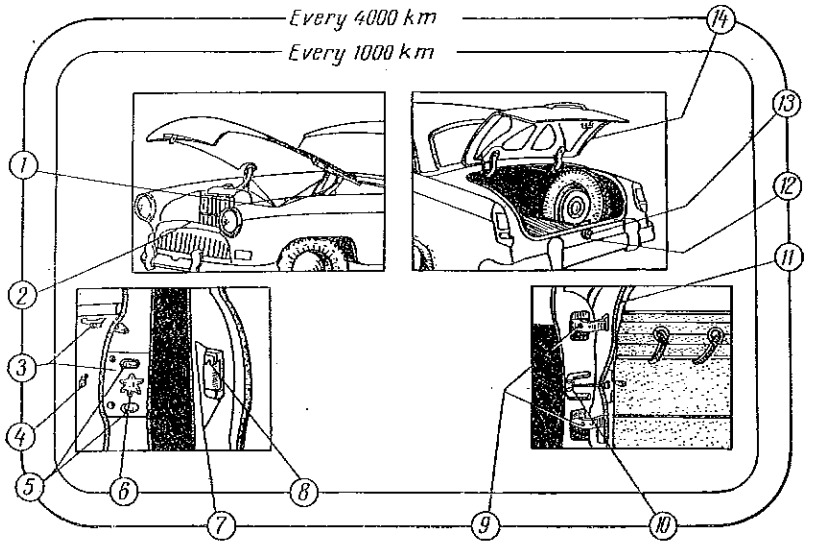


Fig. 7. Body Lubrication Points

Body Lubrication Table

Nos. of lubrication points	Name of lubrication point	Number of lubrication points	Lubricating instructions
1	Hood hinges	4	Apply thin oil every 6000 *km*
2	Hood lock catch	1	Ditto

Continued

Nos. of lubrication points	Name of lubrication	Number of lubrication points	Lubricating instructions
3	Door locks and outer door handle buttons	8	Apply grease twice a year
4	Door lock cylinder	2	Apply graphite powder every 6000 *km*
5	Door dovetails (male)	8	Lubricate with lubricating pencil every 6000 *km*
6	Door lock rotor	4	Lubricate every 1000 *km* with lubricating pencil
7	Door dovetail retainer blocks	4	Lubricate every 6000 *km* with lubricating pencil
8	Retainer teeth	4	Lubricate every 1000 *km* with lubricating pencil
9	Door hinges	8	Apply grease every 6000 *km* (earlier, if necessary)
10	Door check hinge	4	Apply thin oil every 6000 *km*
11	Door rubber sealing strip	4	Rub with graphite powder every 6000 *km*
12	Luggage compartment lock and button	2	Every 6000 *km* lubricate lock rotor with lubricating pencil. Twice a year lubricate lock with grease
13	Luggage compartment lock cylinder	1	Apply graphite powder every 6000 *km*
14	Luggage compartment lid rubber sealing strip	1	Apply graphite powder every 6000 *km*

CARE OF CAR

Upon completion of running-in the service life of the car depends upon the attention given to it and on the quality of the servicing materials used. Failure to observe the recommendations given in the instructions greatly reduces the life of the car.

The maintenance operations should be carried out as required, daily and every 200, 1 000, 2 000, 3 000, 6 000 and 12 000 *km* of operation, also twice a year (seasonal maintenance in spring and autumn) and once a year.

MAINTENANCE AS REQUIRED

Operations carried out as required depend not so much on the mileage, as on the conditions of car operation.

These operations are:

1. Washing the car chassis and body;

2. Removal of carbon deposits formed in the engine. These deposits are formed on the inner surface of the combustion chamber the cylinder head and on piston crowns. The deposits may be removed by driving the car at high speed. If high quality gasoline is used the engine is self-cleaned after a 150 to 200 *km* run. If the engine has not been self-cleaned remove the cylinder head and clean both the cylinder head and piston crowns. If in a short time the engine becomes carbonized again, this indicates that the engine needs repairing. First of all clean or replace the piston rings.

Excessive oil consumption should not be always attributed to worn piston rings or cylinders, it may be caused by gumming up of oil control ring slots. In this case remove carbon deposits from the rings.

3. Checking and adjusting the valve-to-rocker arm clearances and lapping the valves. Check the clearances on cold engine with removed valve cover.

The clearance should be 0.25 to 0.30 *mm*.

When adjusting, do not reduce the clearances, as small clearances will cause poor seating and burning of valves.

4. Elimination of irregular engine performance at low speed during acceleration. This trouble may be caused by gum formation in the carburettor, improper breaker point gap, breaker points, faulty spark plugs (with cracked or burnt insulators), improper spark plug gaps, leakage of H. T. current due to soiled distributor, faulty wires.

Poor engine performance at low speed may also be caused by air leaking through loose manifold connection.

5. Squeaking of the springs is remedied by lubricating them.

6. If braking begins during the second half of the brake pedal travel, and if the pedal, being firmly depressed, comes close to the floor, it means that the brakes want adjustment.

After each adjustment of brakes and front wheel bearings check at halts the brake drums and front hubs for heating.

DAILY MAINTENANCE

Inspect the storage battery and, if necessary, perform the following operations:

1. Wipe the storage battery with a cloth moistened with ammonium hydroxide or a solution of soda ash. Oxidized battery and cable terminals should be cleaned and lubricated with petrolatum.
2. Check the storage battery mounting for tightness. The wing nuts, fixing the battery to frame, should be tightened securely by hand without the use of any tools, because overtightening may result in cracking of the battery case.
3. Check battery wire terminals and lead-out terminals for good contact.
4. Clear the battery cell vent holes.

BEFORE STARTING OUT

5. Check gasoline, water and crankcase oil level.
6. Inspect the car and make sure there are no fuel, water, oil or brake fluid leaks.
7. Check proper functioning of the steering gear, brakes, horn and lighting.
8. Check tyre pressure.
9. Move in and out the coarse oil filter handle 15—20 times (on warm engine).

200 *km* MAINTENANCE

Lubricate the king pins.

1000 *km* MAINTENANCE

1. Check fan belt tension (the belt pressed by finger should sag 10 to 15 *mm*).
2. Check the electrolyte level in the storage battery and add distilled water, if necessary. Check specific gravity of electrolyte.
3. Check tightness and condition of wire connections of storage battery, generator, current and voltage regulator, starter and other electric equipment.
4. Check free travel of brake pedal (10 to 15 *mm*), and clutch pedal travel (32 to 40 *mm*); adjust, if necessary.
5. Check fluid level in the brake master cylinder and add fluid, if necessary.
6. Check the operation of foot brakes, if the clearance between the pedal and the body front panel is less than 35 to 40 *mm* with fully depressed pedal, adjust as described in the "Brakes" section.

7. Check all the car attachments for good condition paying maximum attention to the fixing of the steering gear case and steering arm also to the generator-to-bracket bolts.
8. Carry out all the chassis lubrication operations in conformity with the Lubrication Chart.

2000 *km* MAINTENANCE

Change crankcase oil. Replace the fine oil filter element after draining the sediment from the filter. Drain sludge from the coarse oil filter.

3000 *km* MAINTENANCE

1. Inspect tyres. If the tread is worn unevenly, find out and eliminate the cause of the trouble. Interchange the tyres and wheel assemblies as shown in Fig. 8.

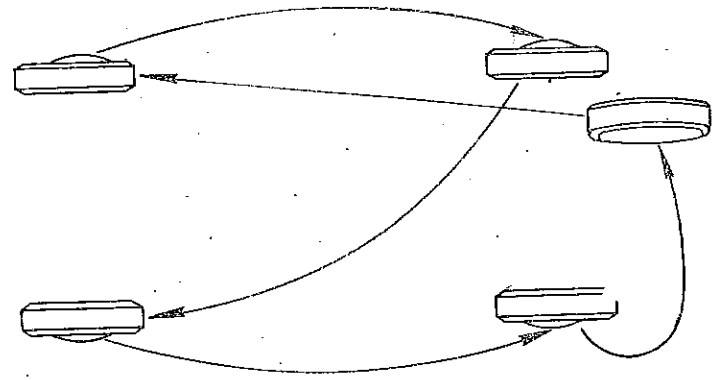


Fig. 8. Tyre Interchanging Order

6000 *km* MAINTENANCE

1. While vehicle is in motion check the following:
   a) deflections of the ammeter pointer;
   b) cooling water temperature;
   c) operation of brakes;
   d) operation of the steering gear and behaviour of the car on road;
   e) engine performance at idle speed and under load;
   f) oil pressure in engine lubricating system as shown by an inspection oil pressure gauge. Do it when engine is hot.

ENGINE

2. Listen to valve operating noises and adjust clearances, if necessary.

3. Tighten the nuts attaching manifold to engine, inlet pipe to exhaust pipe, and manifold to muffler inlet pipe.

4. Tighten the bolts attaching the generator bracket to engine and generator to bracket.

5. Remove carburettor and clean the mixing chamber of gummy deposits. Having replaced the carburettor adjust engine low speed.

6. Inspect the distributor breaker points and clean, if necessary. Adjust the breaker point gap. Check and readjust ignition timing disturbed during the adjustment breaker point gap.

7. Inspect spark plugs, check electrode gaps (0.8 to 0.9 *mm*) and adjust, if necessary.

8. Inspect fuel pump to engine attachment, condition of the flexible fuel hose and check its connections for tightness.

9. Clean the sediment bowl and filter screen of the fuel pump.

10. Check fan belt tension; adjust, if necessary.

11. Inspect water pump and check for leaks.

12. Drain dirt and water from the fuel tank.

13. Check condition of gaskets on the radiator filler cap.

ELECTRIC EQUIPMENT

14. Check the level and specific gravity of electrolyte in the storage battery and add distilled water, if necessary. (Refer to "Storage Battery" section).

15. Wipe and inspect the storage battery case. If cracked and leaky, repair or replace the battery.

16. Clean the contacting surfaces of the storage battery wire terminals. Coat the connections and terminals with petrolatum.

17. Check condition of the generator and starter commutator and brushes. Blow them with compressed air and wipe the commutators with a clean cloth moistened with gasoline.

18. Check functioning of the current and voltage regulator by means of special instruments.

19. Check wire connections of generator, current and voltage regulator, starter and other units for cleanliness and tightness.

20. Check condition of other wires and cables and repair damaged insulation.

21. Check headlamp aiming and the functioning of the entire lighting system.

22. Check attachment of horns and connections of wires leading to the horns and to their relay.

23. Check and clean, if necessary, the contacting surfaces of the cigar-lighter. After cleaning check the time required for heating

the element. If necessary, adjust by bending the bimetal springs. The cigar-lighter should be automatically switched off after 8 to 16 *sec*.

CHASSIS UNITS

24. Check free travel of the brake and clutch pedals.

25. Check condition of the propeller shaft joint locking rings and look for leaks.

26. Inspect condition of the spring rubber bushings.

27. Inspect front and rear shock absorbers. If there are leaks, tighten the glands, check the fluid level and add shock absorber fluid, if necessary; tighten the bolts and rear shock absorber link pin nuts.

28. By rocking the front wheel brake drums check tightening of the front wheel bearings and the clearances of king pins and upper threaded pins of the front suspension. Clearances in the king pins and threaded pins are eliminated by adjustments. In case of excessive clearances replace king pins and bushings.

29. Remove the brake drums and inspect the brakes. Make sure there is no leakage of brake fluid. If the fluid leaks from under the cylinder cap, disassemble the cylinder and wash in alcohol.

Check brake linings for wear. Make sure the rivet heads are still sufficiently sunk into the linings.

30. Check the toe-in, camber and caster of the front wheels; adjust, if necessary.

31. Check operation of the foot brakes and adjust them, if necessary.

32. Check operation of the hand brake and its linkage.

33. Make sure there is no play of the steering idler arm pivot; if necessary, tighten slightly the upper threaded bushing. Tighten the clamp bolt of the idler arm head.

ATTACHMENT OF UNITS AND PARTS

34. Tighten the bolts of the bracings which connect the side members to body front panel.

35. Tighten the bolts holding the front suspension cross member to the side members.

36. Uncotter and tighten the bolts of the front suspension lower arm pivots to the cross member. Reinstall the cotter pins.

37. Tighten the bolts of the lateral stabilizer bushing casings.

38. Tighten the four threaded bushings of the lower arms, four threaded pin nuts, four clamps of the steering knuckle support,

tighten the lower threaded bushing of the steering idler arm and the idler arm bracket bolts.

39. Tighten the bolts attaching the steering gear case to side member.

40. Tighten the steering arm nut.

41. Uncotter and tighten the nuts attaching the steering arms to steering knuckles. After tightening replace cotter pins.

42. Tighten the steering rod ball pin nuts.

43. Check tightening of the spring clip nuts.

44. Check for secure fastening the following body parts: door hinges, door dovetails and retainers, hood hinges, front and rear fenders, mud guards, etc.

LUBRICATION

45. Carry out all the chassis lubrication operations as instructed in the Lubrication Chart.

46. Lubricate the door hinges and body fittings.

12 000 *km* MAINTENANCE

1. Carry out all the services listed under "6000 *km* Maintenance".

2. During a trial run see whether it is necessary to remove carbon deposits from the combustion chambers (see "Maintenance as Required").

3. Remove, disassemble and clean the carburettor. Clean carefully all the orifices and the mixing chamber. Inspect all the gaskets and replace the faulty ones. Check fuel level in the float chamber. After having reinstalled the carburettor adjust the closing of the choke valve and slow idle speed.

4. Examine the engine inlet pipe for gummy deposits. Wash it in benzol or turpentine, if necessary.

5. Remove coarse oil filter from the engine, and clean its sediment bowl and filtering element of sediment.

6. Blow through the fine oil filter connecting pipes.

7. Remove starter, clean it and blow with compressed air. Check the setting of the beginning of engagement.

8. Check operation of the vacuum and centrifugal spark advance automatic control units.

9. Remove front wheel hubs and wash bearings, steering knuckles and inner cavities of the hubs in kerosene. After having checked their condition, assemble and adjust the tightening of bearings. When assembling, pack them with 120 *g* of fresh grease with a high melting point.

10. Remove propeller shafts and the transmission brake drum, tighten the nuts attaching the flanges to the transmission, rear axle and intermediate propeller shaft ends.

11. Change oil in the rear axle and transmission housings.

SEASONAL MAINTENANCE (ONCE OR TWICE A YEAR)

1. In autumn (at an air temperature below +5° C) and in spring (at a temperature above +5° C) change oil in the engine, transmission and rear axle in conformity with the recommendations of the Lubrication Chart.

2. In autumn add light oil into the steering gear case. In spring change the oil.

3. In autumn remove the gasoline tank and wash it carefully in clean gasoline.

4. In autumn flush out the engine cooling and body heating systems.

5. In autumn check carefully the engine ignition system to avoid difficulties in starting a cold engine in winter.

6. In autumn fill the cooling system with anti-freezing solution.

7. In spring and autumn change the specific gravity of electrolyte if required by the operating conditions.

YEARLY MAINTENANCE

1. Remove all the shock absorbers, unscrew the plugs, remove the valves and wash shock absorber body and valves several times with kerosene or gasoline until all dirt is removed.

When washing, clamp the shock absorber arm in a vice and rock its body by hand. Do not clamp the shock absorber body as this will inevitably cause deformation of the inner surface of the cylinder. The bodies of the front and rear shock absorbers should be washed without removing the cylinder end covers. After washing remove the remaining kerosene (or gasoline) by carefully blowing the bodies with compressed air and subsequent rinsing with shock absorber fluid.

To avoid improper functioning of the shock absorber be sure to install the right springs in the right places during assembly and do not make any adjustments. It is advisable to mark the valve plugs before disassembly. Having screwed in the valves fill the shock absorbers with fluid (see Lubrication Chart). After filling allow excess fluid out and replace the plugs.

2. Inspect the brakes and the brake system. Remove the brake drums, wash and wipe the drums and backing plates of all the brakes. Disassemble the master cylinder and the wheel cylinders.

Clean the pistons, working surfaces of the cylinders and other parts with great care. While disassembly and cleaning do not use metal tools and fluids of mineral origin (gasoline, kerosene, etc.). Flush brake cylinders and piping with alcohol or brake fluid bleeding through the master cylinder. Before reassembly lubricate the pistons and cups with castor oil or brake fluid.

3. Remove spring covers. Check condition of interleaf gaskets and replace, if necessary. Lubricate the springs with graphite grease.

4. Check the readings of the water temperature and oil pressure gauges, and condition of the water temperature pilot lamp tender unit.

5. Once a year but not less frequently than every 12 000 to 16000 *km* lubricate the speedometer flexible shaft.

OPERATING INSTRUCTIONS

ENGINE

The "Volga" automobile is powered by a gasoline, four-stroke cycle engine with overhead valves The valves, located in the cylinder head are actuated by the camshaft through the valve tappets, push rods and rocker arms.

ENGINE LUBRICATING SYSTEM

The main and crankpin bearings of the crankshaft, the camshaft bearings, rocker arm bearings and the push rod upper ends are pressure lubricated. Other working surfaces are splash-lubricated.

Engine lubrication diagram is shown in Fig. 9. The oil pressure in the engine lubricating system with the car moving at 50 *km/hr* should be from 2 to 4 *kg/sq. cm.* On a cold engine it may rise to 4.5 *kg/sq. cm* and in a hot summer weather it may drop to 1.5 *kg/sq. cm.*

A pressure drop below 1.0 *kg/sq. cm* at medium engine speed is a symptom of some engine deficiency. In this case the car should be stopped. At low idle speed the oil pressure in a warmed up engine should be not less than 0.5 *kg/sq. cm.*

The engine lubricating system is protected against over-pressure by the relief valve located in the front end of the cylinder block, on the right-hand side, under the generator bracket.

A sudden pressure drop in the lubricating system may be caused by clogging of the relief valve. In that case disassemble the relief valve and rinse its parts carefully in gasoline. Blow with compressed air the valve chamber and reassembly the valve. Do not tamper with the valve setting (do not change the thickness of the gasket neither stretch nor heat the spring).

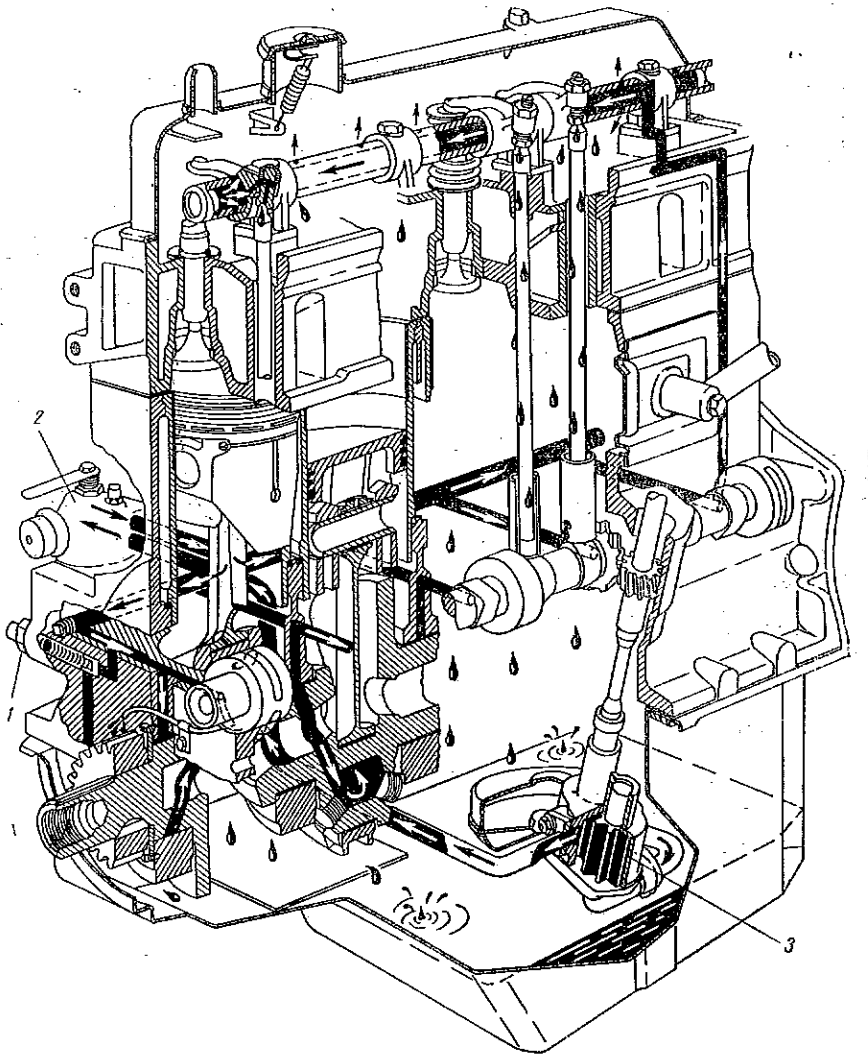


Fig. 9. Engine Lubrication Diagram:
1 — relief valve; *2* — coarse oil filter; *3* — oil pump

The oil level in the engine crankcase should be maintained at all times between the "О" and "П" marks on the dipstick. Instructions for changing the oil are given in the "Lubricating Car" section. If large quantities of sediment accumulate in the engine crankcase the latter should be flushed out. For this purpose use thin oil; do not use kerosene. Drain oil, fill the crankcase with 5 *l* of flushing

oil and run the engine at low speed for 2 or 3 minutes. Then drain the flushing oil and fill with fresh oil as usual.

The coarse oil filter (Fig. 10) is provided with a by-pass valve which opens when the filter becomes badly clogged. The element must be cleaned on hot engine by moving the handle in and out by hand.

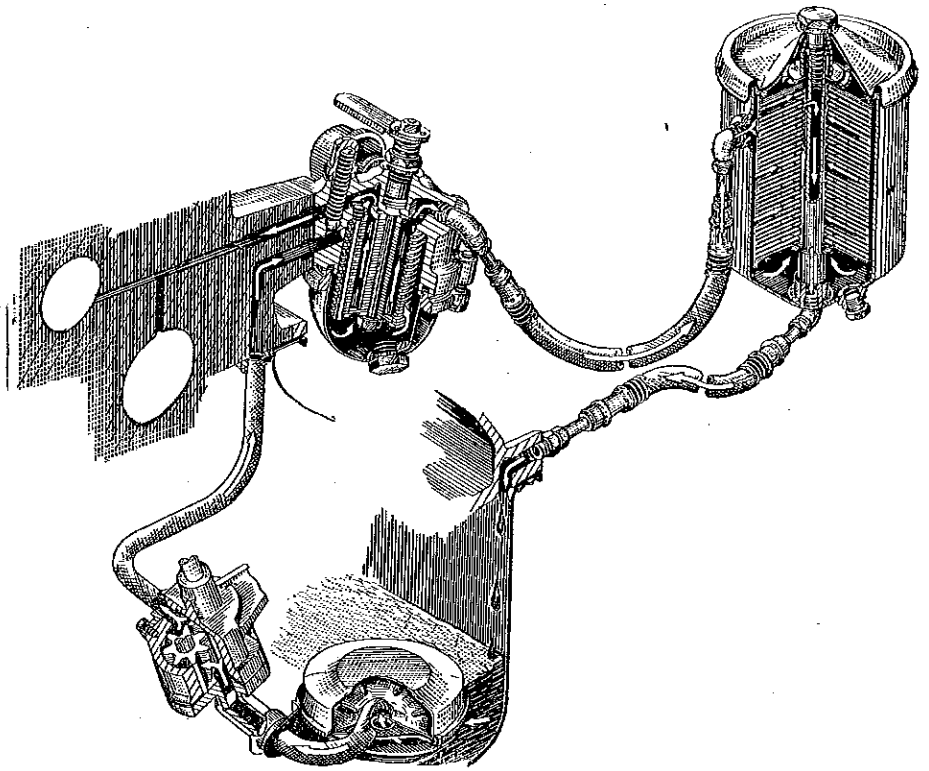
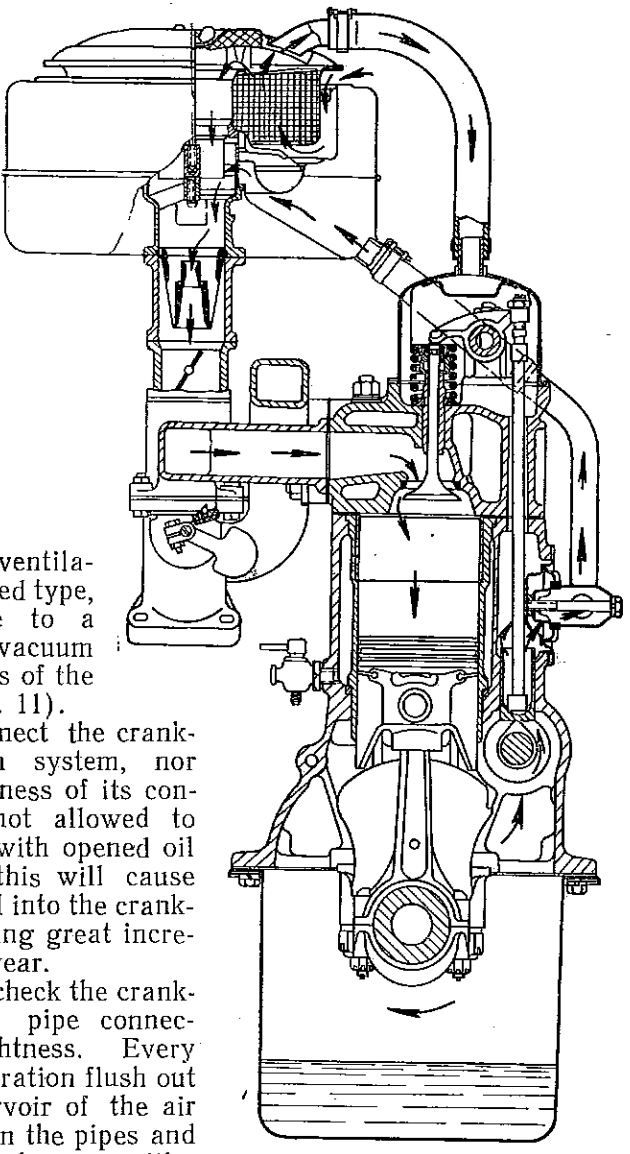


Fig. 10. Engine Oil Filter Installation Diagram

Drain sediment from the filter sediment bowl every 2 000 *km* of operation when changing crankcase oil. Before removing the drain plug pump the handle 15 to 20 times. If the filter becomes clogged, which is indicated by difficult moving of the handle, it should be cleaned.

The fine oil filter is mounted on the right side of radiator shield. It is fitted with a replaceable filter element. Every 2 000 *km* of car operation (when changing crankcase oil) clean the filter of dirt, drain the water accumulated in the sediment bowl and replace the filter element.



Crankcase ventilation is of the forced type, functioning due to a difference of the vacuum in different zones of the air cleaner (Fig. 11).

Never disconnect the crankcase ventilation system, nor impair the tightness of its connections. It is not allowed to run the engine with opened oil filler neck, as this will cause dust to be sucked into the crankcase with resulting great increase in engine wear.

Periodically check the crankcase ventilation pipe connections for tightness. Every 12 000 *km* of operation flush out the lower reservoir of the air cleaner and clean the pipes and hoses of the crankcase ventilation system.

Fig. 11. Engine Crankcase Ventilation Diagram

ENGINE COOLING SYSTEM

The cooling system is of the closed type with forced circulation of coolant. In order to ensure the best engine operating temperature (80—90° C) and to speed up its warming, the cooling system

includes a thermostat valve located in the cylinder head jacket pipe connection, a blind installed in front of the radiator and controlled by the handle from the driver's seat. When starting the engine, close the blind, then gradually open it as the engine warms up. Warming up the engine in winter with opened radiator blind may result in freezing of water in the radiator, because the thermostat prevents the water from circulating through the radiator at the beginning of warming up period.

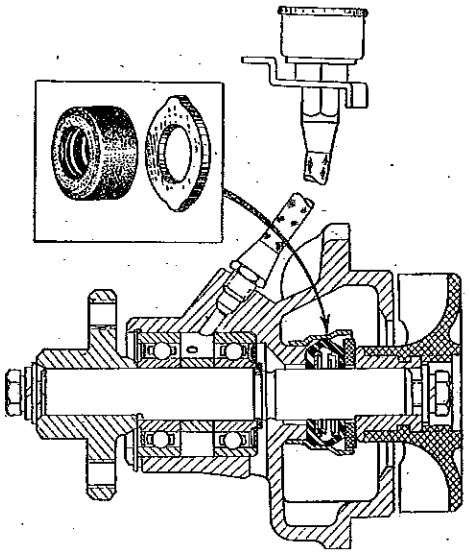


Fig. 12. Water Pump

To maintain the required engine temperature in winter the radiator grille should be covered with a warm hood.

The radiator filler cap closes the radiator hermetically, so that the cooling system communicates with the atmosphere through the cap valves only. The valves prevent water losses even if the water temperature rises a little above 100° C. For proper functioning of the cap valve see that its gaskets are in good order.

The water pump (Fig. 12) is of the centrifugal type. It is fastened to the cylinder block by means of four studs through a hollow cast bracket. The pump shaft is sealed by a self-adjusting gland.

Water leaking through the control hole in the lower part of the pump body is an indication of a faulty gland. Under no circumstances should this hole be plugged, because in this case the water seeping from under the gland will get into the pump ball bearings and damage them.

The water pump bearings are lubricated through a grease cup located on the bracket attached to the outlet pipe stud. Lubricant must be packed in until it appears from the control hole on the pump body.

FUEL SYSTEM

The quantity of the fuel in the tank is checked by means of the electric gasoline level gauge installed in the instrument cluster, and by the dipstick installed in the tank (inside the luggage compartment).

The K-105 carburettor (Fig. 13) is of a vertical down-draft type. The carburettor main metering system controls the flow of fuel by means of an air bleed. The economizer and acceleration pump are mechanically operated. The balanced type float chamber is provided with a double float of plastic material and a sight glass with marks for checking the level of fuel. The fuel enters the float chamber through a strainer.

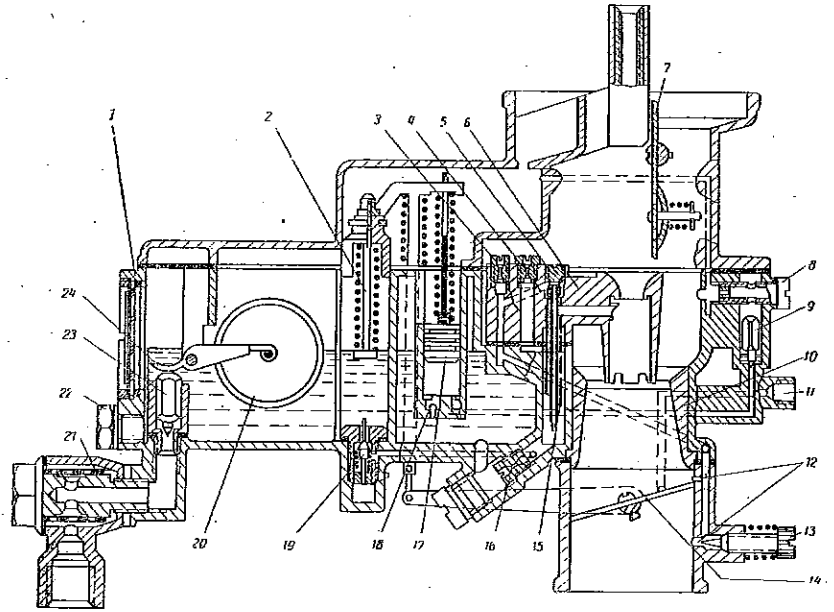


Fig. 13. Carburettor K-105. Sectional View:

1 — sight glass; *2* — economizer; *3* — idle air nozzle; *4* — main air jet; *5* — idle fuel jet; *6* — small venturi; *7* — choke valve; *8* — acceleration pump atomizer; *9* — acceleration pump pressure valve; *10* — large venturi; *11* — hole for connecting octane selector vacuum pipe; *12* — emulsion idle outlet holes; *13* — idle adjustment screw; *14* — throttle valve; *15* — emulsion tube; *16* — main jet; *17* — acceleration pump piston; *18* — return valve; *19* — economizer valve; *20* — float; *21* — strainer; *22* — drain plug; *23* — fuel valve; *24* — float lever lug

The jet capacity at a head of 1 *m* and at 20° C in *cu. cm.* per *min* or jet inside diameters are given below.

Main fuel metering jet	185±2.5 *cu. cm.* per *min*
Main air nozzle dia., *mm*	$1.9^{+0.06}$
Idling fuel jet dia., *mm*	$0.5^{+0.06}$
Idling air nozzle dia., *mm*	$1.5^{+0.06}$
Power jet dia., *mm*	$1.5^{+0.06}$

The carburettor should be serviced as follows:

1. Wash and blow through the float chamber, jets, air holes, venturies and passages in the bodies.
2. Wash the needle valve and check it for tightness.
3. Check float chamber fuel level.
4. Check carburettor joints for tightness, cardboard gaskets, plugs, etc. for proper condition.
5. Adjust slow idle speed.
6. Periodically remove resinous sludge from the mixing chamber. Gumming up results in irregular engine idling.
7. Regularly check the acceleration pump rod for absence of binding.

To start successfully a coid engine see that the throttle valve opens partly when the choke valve is closed by pulling out its knob. This is ensured automatically by the rod connecting the choke valve control with the lever which opens the throttle valve slightly.

Idle speed is adjusted by stop screw *1* (Fig. 14) limiting the closing of the throttle valve and by the idle mixture adjusting screw. Screwing the adjusting screw IN makes the mixture leaner, and screwing it OUT, enriches the mixture.

Begin the adjustment by turning the idle mixture screw all the way IN (though not too tightly); then back it off 2 or $2^1/_2$ turns. This will make the mixture too rich. Start the engine and turn the throttle stop screw in until smooth idling is reached. Then proceed to make the mixture leaner by turning the adjusting screw each time $^1/_4$ of a turn until the engine misses. For a richer mixture back off the adjusting screw $^1/_2$ of a turn.

Having adjusted the mixture composition reduce the idle speed, unscrewing gradually the throttle valve stop screw until steady engine idle speed is reached. Idle speed of the engine should be adjusted only on the fully warmed up engine and with the ignition system in a perfect order. Pay particular attention to the condition of spark plugs and see that the spark plug gap is correct.

The fuel pump is actuated by the eccentric on the camshaft. It is provided with a manual priming lever.

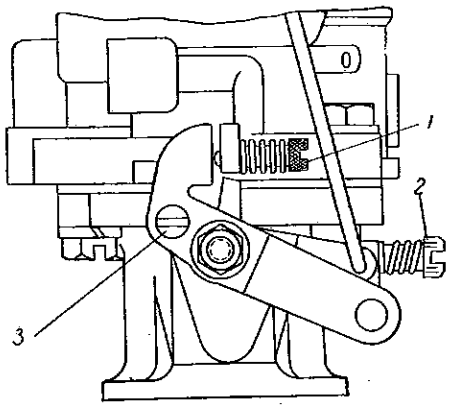


Fig. 14. Carburettor Adjusting Screw:

1 — slow idle screw; *2* — idle mixture adjusting screw; *3* — stop screw limiting the closing of the throttle valve during the running-in period

The ignition system is of the storage battery type (Fig. 15). In order to ensure fail-safe functioning of the ignition system inspect periodically the ignition distributor, spark plugs, ignition coil and H. T. cables.

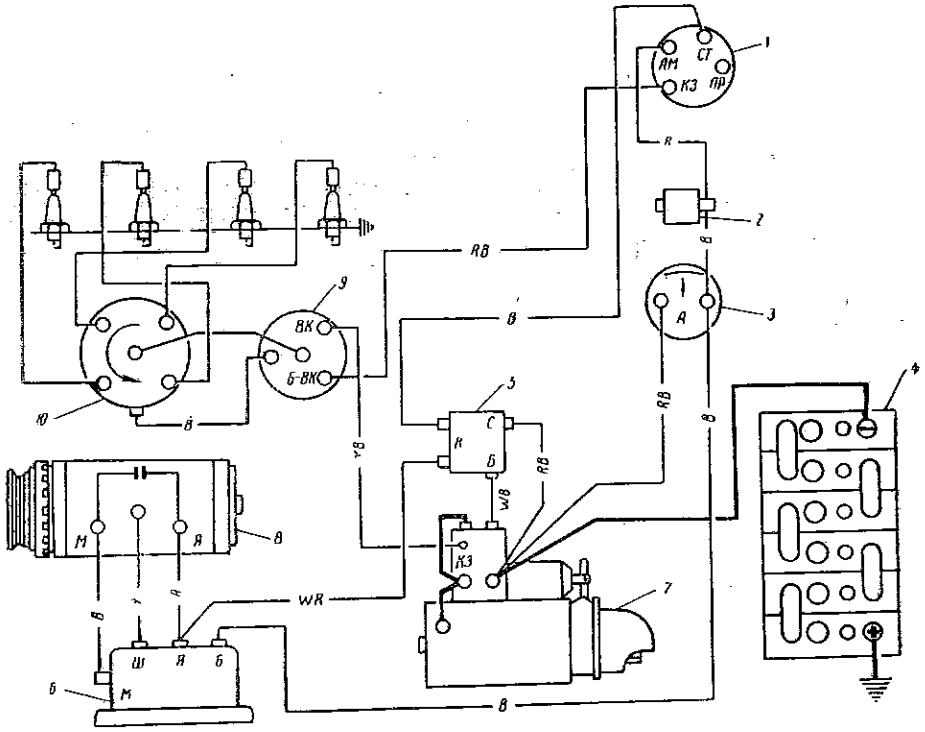


Fig. 15. Ignition System Diagram:

1 — ignition switch; *2* — thermal circuit breaker; *3* — ammeter; *4* — storage battery; *5* — starter relay; *6* — current and voltage regulator; *7* — starter; *8* — generator; *9* — ignition coil; *10* — distributor; *11* — spark plugs

Symbols: *M* — ground; *Ш* — shunt; *Я* — armature; *Б* — battery;

Cable Colour Code: *B* — black; *R* — red; *Y* — yellow; *WB* — white and black; *YB* — yellow and black; *RB* — red and black; *WR* — white and red

The ignition coil is installed on the body front panel. An additional resistance installed between the coil terminals is shorted automatically when the engine is started by the starter.

When adjusting the spark plug gap, bend the side electrode only, because bending of the central electrode results in cracking of the spark plug insulator. Check the gap with the feeler gauge furnished by the Motor Works.

Adjustment of Breaker Point Gap

Prior to adjustment inspect the working surfaces of the breaker points and, if they are oiled, burned or soiled, clean them with a dry clean cloth and a needle file. The use of emery cloth for this purpose is not allowable. After cleaning wipe the points.

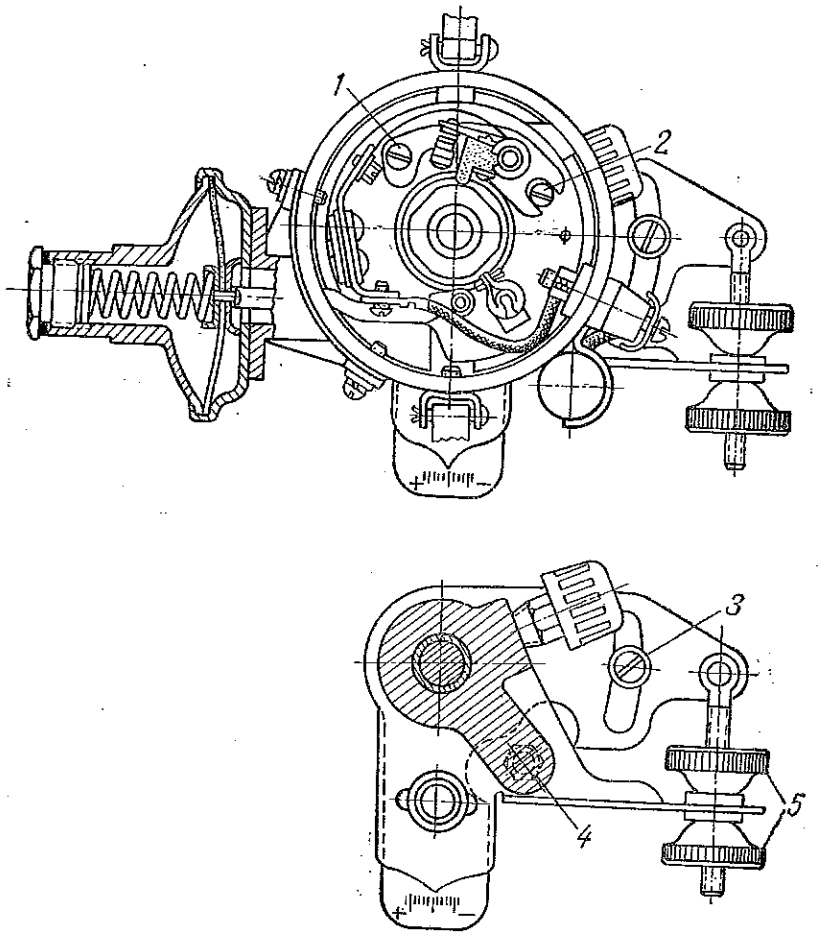


Fig. 16. Ignition Distributor:

1 — stop screw; *2* — adjusting screw; *3* — distributor adjusting screw; *4* — octane selector to distributor body bolt; *5* — octane selector nuts

To adjust the gap, rotate the crankshaft by the starting crank to set the breaker points at their widest.

To change the gap, loosen the stop screw (Fig. 16) holding the fixed breaker point plate and, turning the adjusting screw, located

near the arm pilot pin, set a clearance of 0.35 to 0.45 *mm* measuring it with the feeler gauge. Having set a correct clearance turn in the stop screw.

Ignition Timing

Ignition is timed by means of a mark (drilled hole) on the crankshaft pulley.

The breaker should open the circuit at the moment when the piston in No. 1 cylinder approaches the top dead centre on the compression stroke. At this moment the TDC mark (hole) should exactly line up with the timing pin located in the timing gear cover.

The distributor rotor should be located correspondingly opposite No. 1 cylinder spark plug wire contact in the distributor cap. Ignition should be timed with a high degree of precision as even slight errors will result in an abrupt increase of fuel consumption and loss of power.

Ignition is timed in the following sequence:

1. Remove the distributor cap and rotor and check the breaker point gap. (Adjust the gap, if necessary). Replace the rotor.
2. Remove No. 1 cylinder spark plug.
3. Closing the spark plug hole in the cylinder block with a finger, turn the crankshaft by the starting crank until the air begins to escape from under the finger. This will take place at the beginning of the compression stroke in No. 1 cylinder.
4. Make sure that compression has begun and continue to rotate the crankshaft slowly until the mark (hole) on the crankshaft pulley coincides with the timing pin on the timing gear cover.
5. Make sure that the rotor is located opposite the inner contact of the distributor cap, connected to the wire leading to No. 1 cylinder spark plug.
6. Using the fine adjustment nuts set the octane selector scale at zero.
7. Loosen the distributor (see Fig. 16) to drive bracket screw and turn the distributor body slightly counter-clockwise, to close the breaker points.
8. Pull the hood lamp wire end out of the plug box and connect it through an additional piece of wire to the L. T. terminal on the coil (i. e. to the distributor wire terminal).
9. Turn on the ignition and rotate gently the distributor body clockwise until the lamp flashes on. Stop rotating the distributor exactly at the moment of flashing. If you have failed to stop the distributor, turn its body into the initial position and repeat the operation.
10. Holding the distributor body to prevent rotation, tighten the distributor attachment screw, then replace the cap and central wire. Connect the octane selector pipe.

11. Check connection of spark plug wires beginning with No. 1 cylinder. The wires should be connected in the engine firing order, i. e. 1—2—4—3 in the counter-clockwise direction.

After each ignition timing and breaker point gap adjustment check the accuracy of ignition timing by listening to the engine operating noises on the moving car.

Final adjustment of the ignition timing should be done by means of the octane selector without loosening the distributor attachment screw. For this purpose it is sufficient to rotate the octane selector nuts (turning OUT one of them, and turning IN the other one). Moving the pointer one division on the octane selector scale changes ignition timing by 2° (crankshaft degrees). Turning the distributor body clockwise makes the spark to occur earlier, while turning it counter-clockwise — retards the ignition.

In order to finally time the ignition, check engine performance as follows: warm up the engine to 80—90° C. Driving the car in direct gear over a level road at 30 to 35 *km/hr* accelerate the car by sharply depressing the accelerator pedal as far as it will go. If this is accompanied by a slight and transient detonation (erroneously called "piston pin knocking") the ignition timing may be considered correct.

If detonation noises are too loud, turn the distributor body counter-clockwise one division of the octane selector scale. If no detonation is evidenced, turn the distributor body one division clockwise. If necessary, re-check ignition timing. It is recommended always to set ignition timing so as to obtain a light detonation when the engine is heavily loaded.

An excessively advanced ignition may result in blow-by of gases through the cylinder head gasket and in burning of valves and pistons.

If ignition is too much retarded, excessive fuel consumption, loss of pick up, and overheating of engine will result.

CLUTCH

The car is equipped with a dry, single-plate clutch. The clutch release mechanism is operated hydraulically. It consists of a pedal, master cylinder, pipe-line and working cylinder (Fig. 17).

The clutch release master cylinder is cast integral with the brake master cylinder and has a common reservoir for fluid, with a partition in the lower part, owing to which failure of one of the two systems (brakes or clutch control mechanism) does not affect the operation of the other.

For normal functioning of the clutch and its control mechanism adjust the free travel of the clutch pedal to 32—40 *mm* and the stroke of the working cylinder piston to not less than 19 *mm* with the fully depressed pedal.

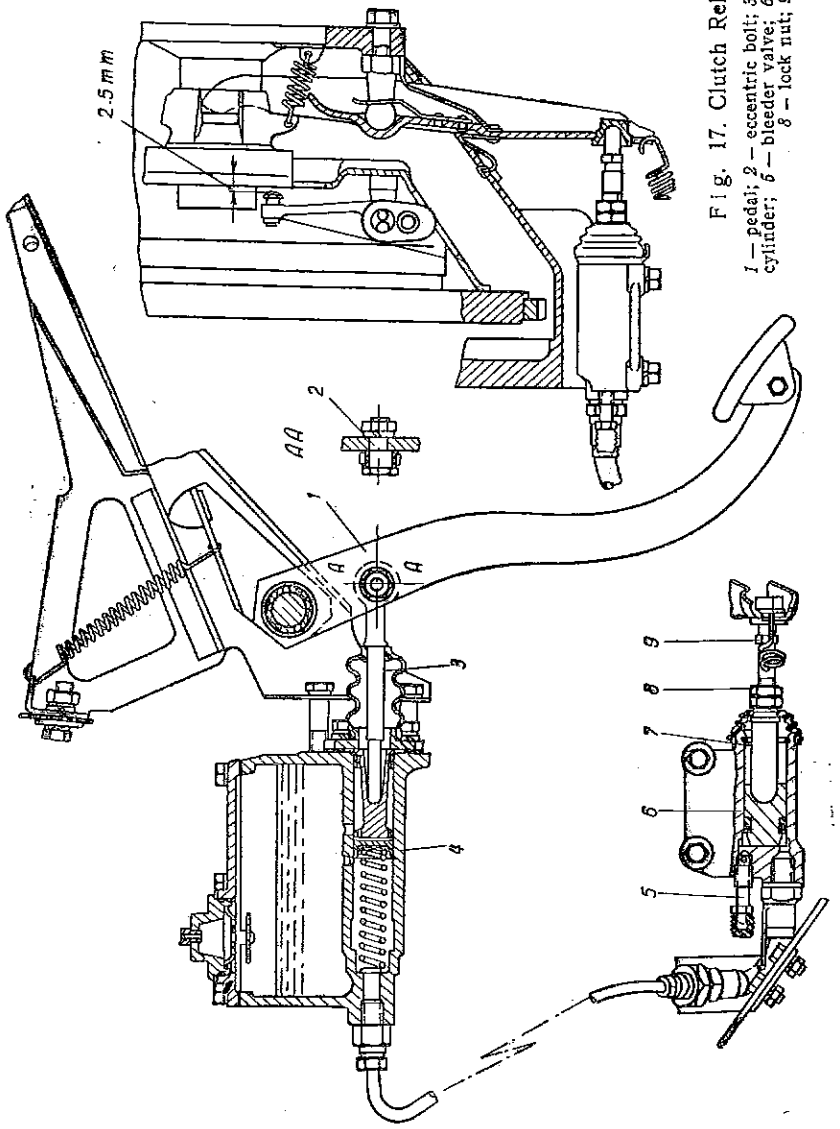


Fig. 17. Clutch Release Linkage:
1 — pedal; *2* — eccentric bolt; *3* — pusher; *4* — master cylinder; *5* — bleeder valve; *6* — piston; *7* — pusher; *8* — lock nut; *9* — rod

The clearance between the pusher and piston of the master cylinder is adjusted by the eccentric bolt which connects the pusher to the clutch pedal. After adjustment tighten the eccentric bolt nut securely.

The clearance between the clutch collar and clutch pressure levers is adjusted by changing the length of the working cylinder pusher.

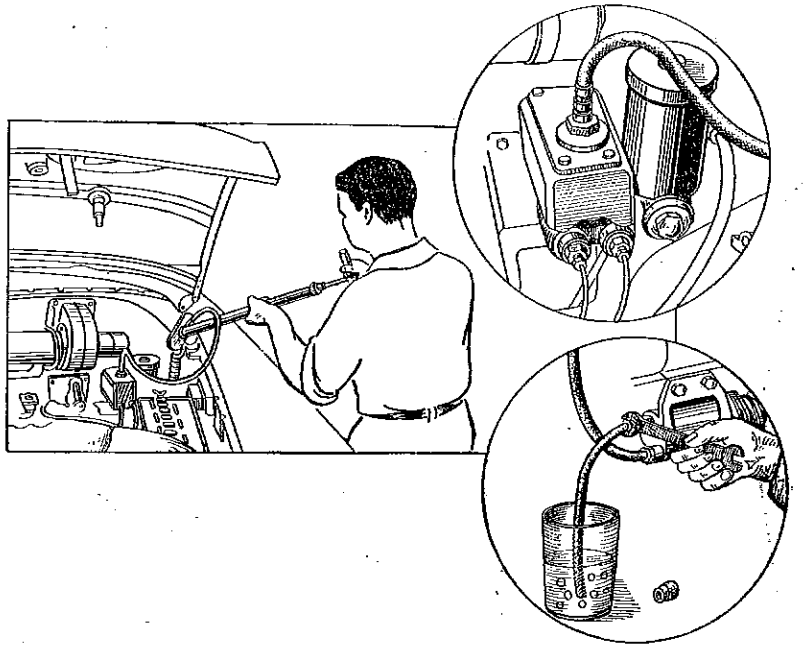


Fig. 18. Bleeding Clutch Control System

The end of the release yoke should have a free travel of 3 to 4 *mm* which corresponds to 20—27 *mm* of the pedal free travel. After adjustment tighten the nut securely.

As has already been mentioned above the travel of the working cylinder pusher with the fully depressed clutch pedal should not be less than 19 *mm*. A shorter travel fails to ensure efficient operation of the clutch. The pusher travel is not subject to adjustment and is ensured by the design of the clutch control mechanism when the system is filled with fluid.

Air locks in the system reduce the pusher travel and cause faulty operation of the clutch control mechanism.

The clutch control mechanism is filled with brake fluid through the master cylinder neck. Having filled the reservoir of the master

cylinder screw in the neck plug and use the tyre pump to produce a small pressure on this fluid. Connect the tyre pump hose to the nipple of the plug (Fig. 18). This pressure forces the fluid contained in the master cylinder reservoir to fill the system. The air is forced out of the system through the bleeder valve and hose. Immerse the hose tip into a glass vessel filled with a small quantity of brake fluid.

As soon as the air ceases to escape from the system, and the fluid begins to flow in a uniform stream without air bubbles, tighten the valve, remove the hose, put the cap in place and add fluid. The fluid level in the master cylinder reservoir should be 15 to 20 *mm* below the upper edge of the filler plug hole.

While bleeding the system see that the fluid in the master cylinder reservoir is not used up entirely, i. e. that the bottom of the reservoir is not exposed. Therefore, if about 150 *cu. cm* of fluid has been discharged from the system, stop bleeding and continue it only after having added some fluid.

Next depress the pedal and measure the pusher travel which should be not less than 19 *mm*. If it is less, continue bleeding as described above until the system is completely free from air and normal pusher travel is obtained.

Every 1 000 *km* of operation do the following:

1. Check the fluid level in the master cylinder; top up, if necessary.

2. Check the free travel of the clutch pedal as described above and adjust, if necessary, by changing the length of the pusher.

TRANSMISSION

The three-speed transmission is of the mechanically operated type (Fig. 19). The 2nd and 3rd speeds are fitted with a synchronizer ensuring noiseless gear shifting. To provide for correct operation of the synchronizer and noiseless gear shifting, move the gear shift lever smoothly without jerks.

If the shifting is performed too rapidly, particularly from 3rd to 2nd speed gear, this may damage the synchronizer.

It should be borne in mind that the 1st speed gear is not fitted with a synchromesh unit, therefore the shifting from 2nd to 1st speed should be done only after slowing down the car to approximately the speed of a pedestrian, to avoid breaking the gears.

Care of the transmission consists in maintaining the lubricant level flush with the filler hole, in periodical changing of the lubricant and washing the transmission case.

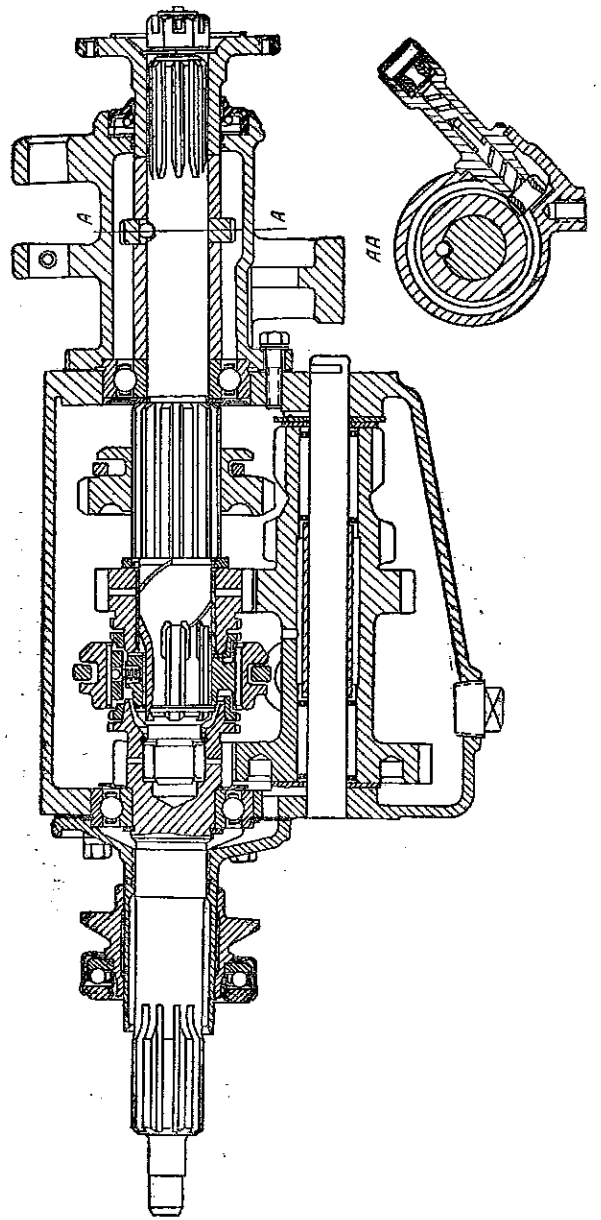


Fig. 19. Transmission

1. Engage the 3rd speed gear and make sure gear shift lever *7* (Fig. 20) is in the horizontal position. If necessary, change the length of rod *14* by rotating its end.

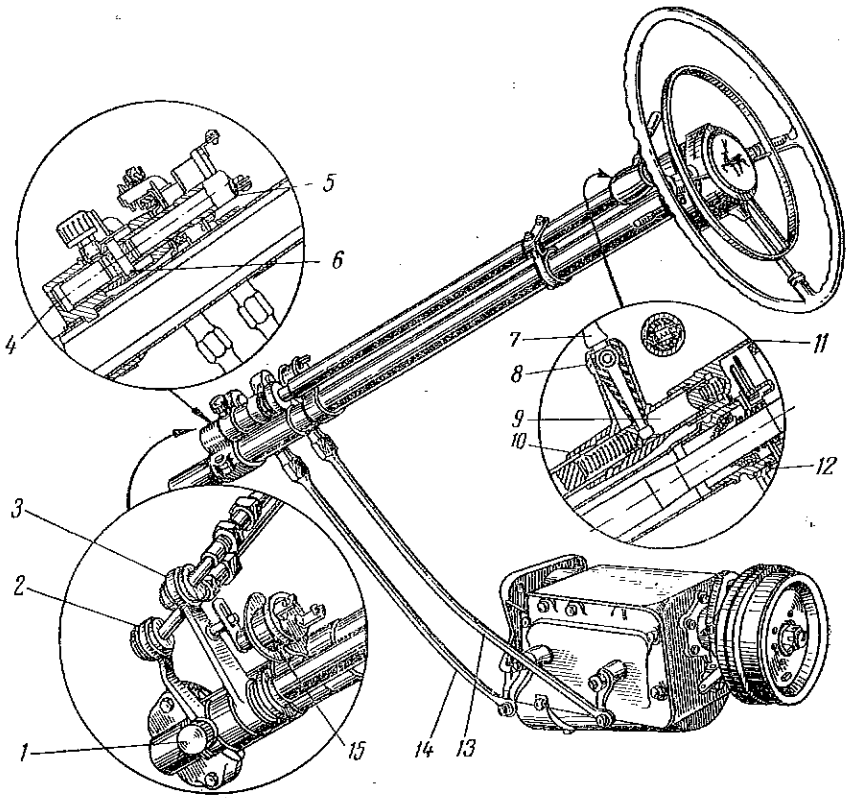


Fig. 20. Gear Shift:

1 — oiler; *2* and *3* — control levers; *4* — lower bracket; *5* — shift shaft; *6* — dowel; *7* — gear shift lever; *8* — rubber seal; *9* — shaft pin; *10* — shift shaft extension; *11* — direction indicator switch body; *12* — locking ring; *13* and *14* — shift rods; *15* — reverse indicator switch

2. Shift lever *7* into neutral and make sure shaft *5* is free to move along the steering column. In this position the marks on gear shift levers and on side cover bosses should line up.

3. Check whether all the gears are fully engaged and disengaged by hand-rocking the ends of the levers on the transmission side cover in all gear positions and in the neutral. The levers should be securely locked. Unreliable locking is caused by incomplete engagement the cause of which should be located and done away

with. Upon completion of adjustment the rod end should be locked.

4. Check functioning of the reverse indicator switch. Engagement of the reverse gear must be accompanied by flashing on of the white light in the tail lamp body. If the rear light is not switched on, unscrew the bolt of the switch and adjust its position. It should be noted that the reverse indicator flashes on only with the ignition switch turned ON.

PROPELLER SHAFTS

There are two shafts: the front-intermediate shaft, and the rear propeller shaft. Arrangement of universal joint yokes is shown in Fig. 21. Improper position of the yokes results in vibration of the centre bearing under heavy loads.

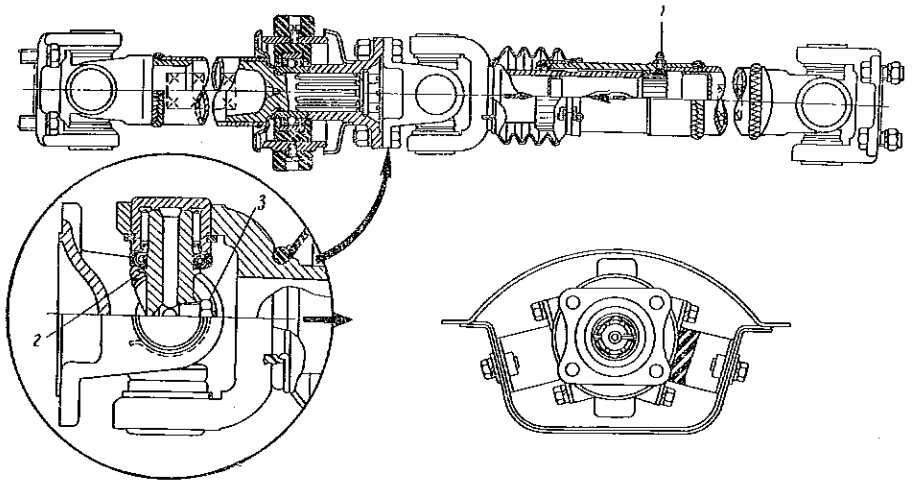


Fig. 21. Propeller Shaft:
1 and *2* — lubricator fittings; *3* — safety valve

Universal joints should be lubricated with fluid lubricant in accordance with the Lubrication Chart; lubricant should be forced in until it appears from the safety valve of the cross. Consistent lubricants are not fit for the joints as they are too thick and fail to reach the needles during operation, therefore the use of such lubricants results in deterioration of the needle bearings.

REAR AXLE

The rear axle of the "Volga" car is equipped with a hypoid final drive (Fig. 22). The axle shafts (Fig. 23) are of the semi-floating type. The axle shaft ball bearings take both radial and axial loads.

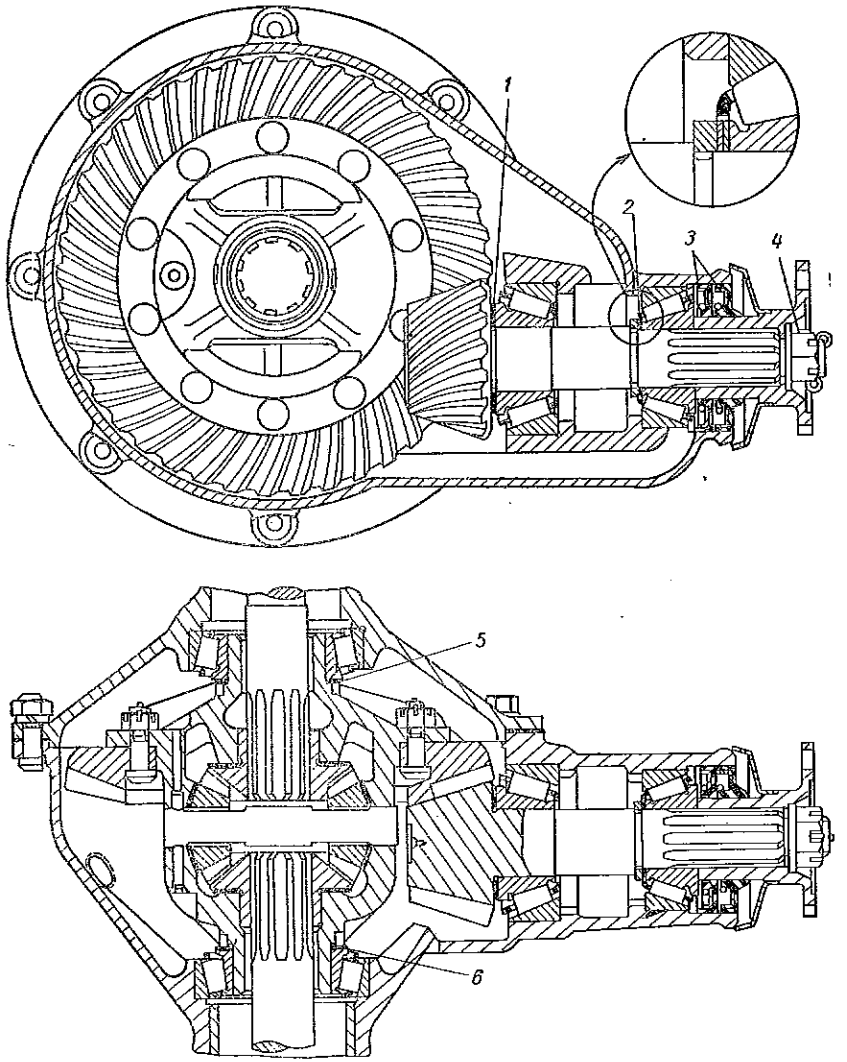


Fig. 22. Rear Axle Differential:
1 — pinion adjusting ring; *2* — pinion shaft bearing adjusting shims; *3* — oil rubber seals; *4* — pinion shaft bearing nut; *5* and *6* — differential bearing adjusting shims

The brake drum and rear wheel are attached directly to the axle shaft flange without separate hub. The bearing is fixed on the axle shaft by means of a locking ring pressed on the axle shaft journal. The bearing outer race is inserted in the recess in the axle shaft housing flange and is fixed by means of a plate and gland body with four bolts. The clearances are taken up by a spring gasket located between the bearing outer race and flange face.

Lubricant is retained in the axle shaft bearing by the rubber and felt oil seals fitted over the bushings. The felt seal is of the split type; it may be replaced without pressing the bearing off the axle shaft. The seal body and axle shaft flange are fitted with oil slingers keeping the oil from penetrating into the brakes in case of a leak through the felt gland. The bearing is lubricated with grease through a grease cup.

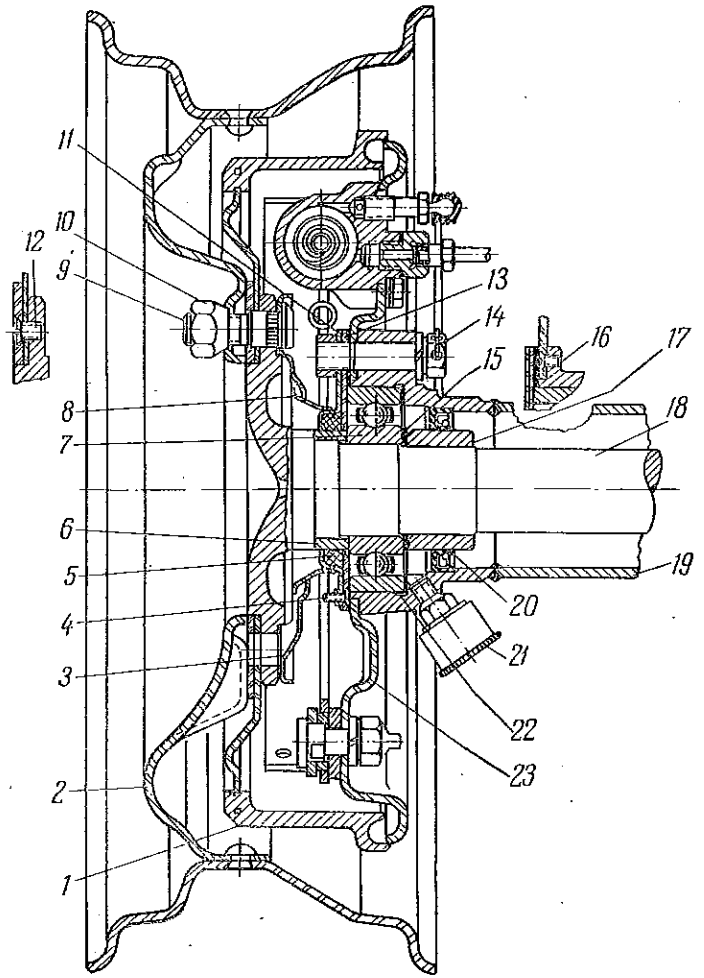


Fig. 23. Axle Shaft and Rear Wheel Mounting:

1 — brake drum; *2* — wheel disc; *3* — outer oil baffle; *4* — gland body screw; *5* — felt gland; *6* — gland bushing; *7* — axle shaft bearing; *8* — inner oil guard; *9* — wheel bolt; *10* — nut; *11* — seal body; *12* — brake shaft bearing bolt; *13* — bearing mounting plate; *14* — axle shaft bearing bolt; *15* — spring ring; *16* — backing plate screw; *17* — bearing locking ring; *18* — axle shaft; *19* — axle shaft housing; *20* — rubber seal; *21* — oiler; *22* — spring gasket; *23* — backing plate

Care of the rear axle consists in maintaining the proper lubricant level (flush with the filler hole), regular changing of lubricant in accordance with the Lubrication Chart, tightening loose joints (driving gear nut, axle shaft bearing bolts and housing bolts), periodical lubrication of the axle shaft bearing by the grease cup and in periodical cleaning of the breather.

STEERING GEAR

The steering gear (Fig. 24) consists of an hour-glass worm pressed on the steering shaft and mounted on two tapered roller bearings and of a twin roller installed in the recess of the steering arm shaft head.

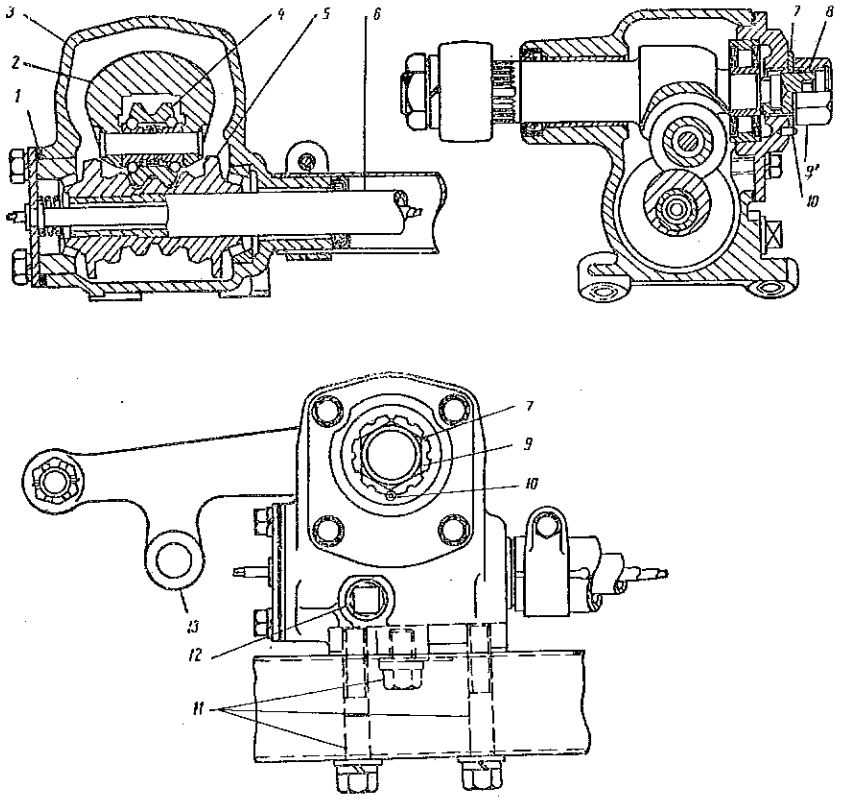


Fig. 24. Steering Gear:

1 — adjusting shims; *2* — steering arm shaft; *3* — case; *4* — roller; *5* — worm; *6* — steering shaft; *7* — lock washer; *8* — adjusting screw; *9* — cap nut; *10* — locking dowel; *11* — case bolts; *12* — filler plug; *13* — steering arm

Care of the steering gear consists in lubricating the steering mechanism and joints, tightening the attachment of the steering gear case, steering arm and idler arm and checking the free movement of the steering wheel.

If a noticeable free travel is discovered during the straight-ahead movement of the car, adjust the worm-roller mesh. In order to adjust the end play in the worm remove the steering gear from the car and adjust the worm bearings by removing the necessary number of shims from under the front cover.

FRONT SUSPENSION

Independent wheel suspension is mounted on the second cross member of the car frame (Fig. 25). The suspension together with the cross member forms a separate unit which is adjusted at the Works on a special stand. Therefore, check front wheel adjustment at the prescribed intervals, but do not re-adjust unless urgently necessary.

Front wheel adjustment consists in setting correct caster, camber and toe-in. Toe-in is adjusted by means of adjusting tubes of the side steering rods. Change of wheel camber affects simultaneously wheel caster and toe-in, therefore the front suspension should be adjusted in the following sequence: camber, caster, toe-in.

Under full static load the setting angles should be as follows:
Caster — $0 \pm 1°$.
Camber — $0 \pm 0°30'$.
Toe-in (measured on tyres at wheel centres) — 1.5—3.0 *mm*.
Prior to adjustment of the front wheels do the following:

1. Adjust front wheel hub bearings as outlined below.
2. Check tyre pressure and bring it to the required value.
3. Load the car to the rated value, corresponding to the weight of two passengers (about 150 *kg*) on the front seat and three passengers (about 225 *kg*) on the rear seat.
4. Place the car on a special stand (or a level floor).
5. Set the wheels in the straight-ahead position.

ADJUSTMENT OF WHEEL CAMBER (RIGHT AND LEFT WHEELS IN TURN)

1. Loosen bolt *10* in the lower head of the steering knuckle support to release the eccentric bushing.
2. Turn eccentric bushing *6* with a wrench to obtain the required camber.
3. Tighten bolt *10*.

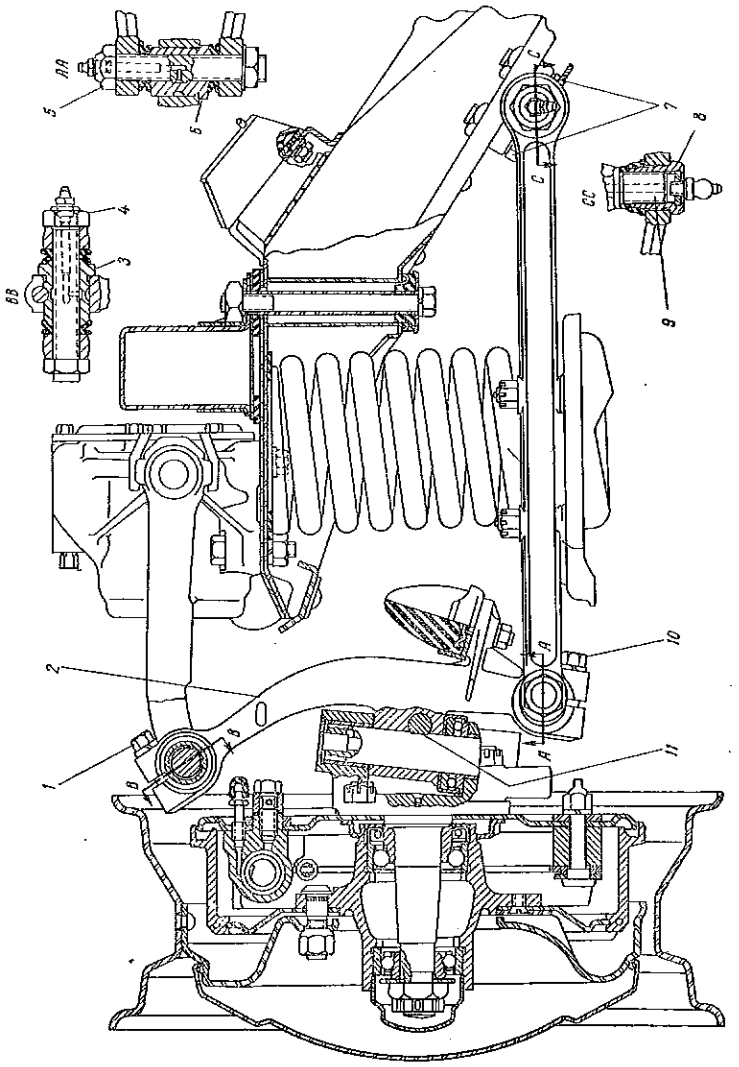


Fig. 25. Front Suspension:
1 — steering knuckle support upper end tie bolt; *2* — steering knuckle support; *3* — threaded bushing; *4* and *5* — pins; *6* — eccentric adjusting bushing; *7* — suspension lever to cross member bolts; *8* — threaded bushing; *9* — lower suspension lever pivot; *10* — steering knuckle support lower end coupling bolt; *11* — king pin stop

ADJUSTMENT OF WHEEL CASTER (RIGHT AND LEFT WHEELS IN TURN)

1. Loosen bolt *1* in the upper head of the steering knuckle support.

2. Turn upper bushing *3* with a wrench to obtain the necessary caster angle. Under no circumstances should the bushing be turned as far as it will go: leave not less than 1/6 of a turn to go. If this distance is not provided for, then during swinging of the shock absorber arm the bushing end face may bear against the upper head of the steering knuckle support, which will cause the bushing to turn and the caster angle will be disturbed.

3. Tighten bolt *1*.

4. Check camber and caster angles of both wheels.

As a rule, wheel caster is not changed during operation. Therefore, do not adjust this angle unless there are some indications calling for it.

If the lower end of the king pin is inclined too much forward (in excess of +1°) this is evidenced by an increased effort on the steering wheel and a sharp return motion upon completion of a turn.

Conversely, if the lower end of the king pin is inclined too much to the rear (in excess of — 1°) the return motion of the wheels is reduced or disappears altogether and the car straight-ahead motion is unstable.

ADJUSTMENT OF WHEEL TOE-IN

Prior to adjusting the toe-in make sure there is no back-lash of the steering idler arm by moving the arm end up and down by hand; adjust, if necessary (see "Adjustment of Steering Idler Arm" section, below). Correct setting of the wheel toe-in with a back-lash in the steering idler arm is impossible.

The toe-in is adjusted by measuring the distance between the outer surfaces of the tyres on a special stand. For this purpose it is necessary to find the position of equal side run-out of the tyres and place them so as to bring these points in a horizontal plane, otherwise the wheel toe-in will not be adjusted properly.

If, prior to adjustment, with the car moving straight-ahead, the steering wheel has occupied a correct position, i. e. its side arms have been in a horizontal position, and the error of the toe-in setting has not exceeded 3 to 4 *mm*, the adjustment may be carried out by changing the length of any one of the side steering rods.

Proceed as follows:

1. Uncotter and loosen two bolts of clamps coupling the ends of adjusting tube (Fig. 26).

2. Insert a pin into the hole in the adjusting tube and rotate it until the required toe-in is obtained.

3. Having completed the adjustments set the rods and their ends so that their head faces are parallel to the faces of the heads

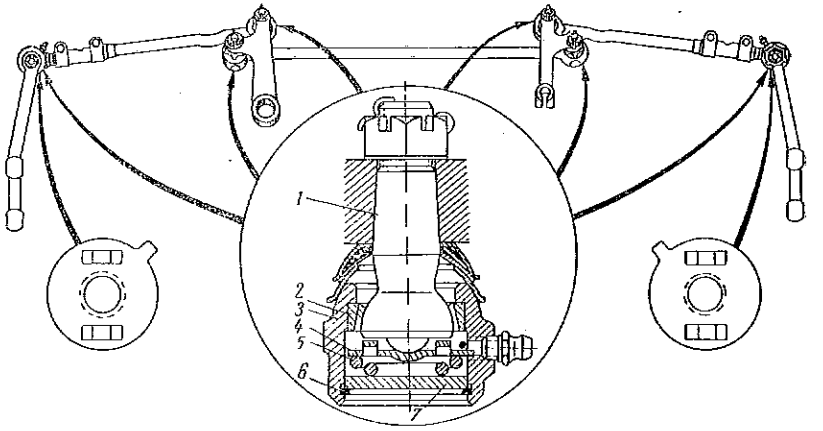


Fig. 26. Steering Rods:

1 — ball pin; *2* — retainer; *3* — rod end; *4* — socket; *5* — spring; *6* — snap ring; *7* — plug

on the steering levers, steering arm and steering idler arm, then turn the clamps to the position shown in Fig. 25, tighten the clamp bolts and insert cotter pins.

If, before adjustment, the steering wheel position was incorrect on straight-running car (also if adjustment operations must be carried out after disassembly of the steering rods, so that their original length is changed), the wheel toe-in should be adjusted as follows:

1. Set the steering wheel in the normal position for straight-ahead movement (side arms in a horizontal plane).

2. Adjust the toe-in by changing the length of the right steering rod.

Caution: Adjustment of wheel camber disturbs the toe-in, therefore after each wheel camber adjustment the toe-in should also be readjusted.

ADJUSTMENT OF STEERING IDLER ARM

Design of the steering idler arm is shown in Fig. 27. Adjustment of this arm consists in eliminating of the play of threaded pin *4* in bushings *1* and *5*. To eliminate the play, tighten upper threaded bushing *1* after loosening bolt *2* of the upper head clamp of bracket. Tighten by turning smoothly the upper threaded bushing clockwise until the play in the steering idler arm is eliminated. Do not overtighten the bushing as this will increase friction in the threaded pin with resultant increase of effort on, and impaired return motion of the steering wheel.

Upon completion of adjustments tighten bolt *2* of the bracket upper head clamp and do not fail to tighten the bolt of the steer-

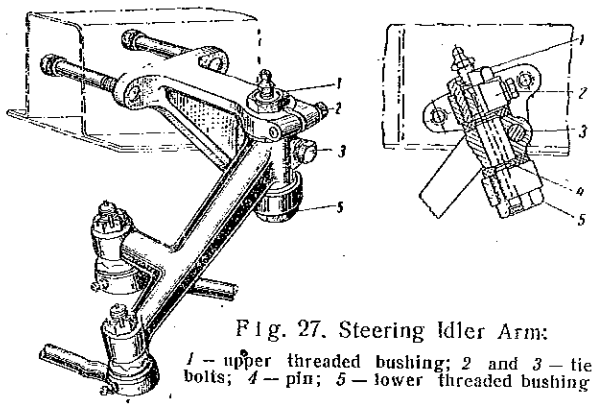


Fig. 27. Steering Idler Arm:
1 — upper threaded bushing; *2* and *3* — tie bolts; *4* — pin; *5* — lower threaded bushing

ing idler arm head clamp and to check tightening of the lower threaded bushing. The latter should be tightened 12—17 *kgm* with a wrench 500—600 *mm* long.

ADJUSTMENT OF FRONT WHEEL HUB BEARINGS

To adjust the bearings proceed as follows:

1. Jack up the front end of the car, remove the wheel cap, and unscrew the hub cap. Extract the cotter pin and back off the adjusting nut on the end of the steering knuckle spindle one slot (1/8 of a turn). Push the wheel by hand to see whether it rotates freely. If the wheel rotates with difficulty, eliminate the cause of drag (one of the causes is brushing of the drum against the brake shoes) and only then proceed with bearing adjustment.

2. Tighten the nut with a wrench 200 *mm* long applying the effort of one hand so that the wheel can be rotated with difficulty by hand. While tightening the nut, press on the wrench smoothly without jerks. While tightening the nut keep turning the wheel to ensure correct position of balls in the bearings.

3. Back off the nut one or two slots depending on the position taken by the nut slot with respect to the cotter pin hole in the steering knuckle spindle after the nut is tightened.

Correct adjustment of the bearings is checked finally on the moving car by hand-feeling the temperature of the wheel hubs. Noticeable overheating after a 5 to 10 *km* run is an indication that the bearings have been overtightened and that the nut should be backed off one slot. Insignificant heating of the hub is allowable only when new bearings have been installed or the hub gland has been replaced.

When checking the bearing adjustment by heating of the hubs, do not apply foot brakes, because this will cause the hubs to heat.

REAR SUSPENSION

The rear suspension consists of two longitudinal semi-elliptic springs operating in conjunction with two double-acting hydraulic shock absorbers. The spring eyes and shackles are connected to the car body by means of pins and rubber bushings.

The rear axle is fastened to the springs by clips which should be securely tightened at all times. The spring clip nuts should be tightened 7—9 *kgm* which corresponds to an effort of 22—28 *kg* on the end of the wrench included in the driver's kit.

Care of the springs consists in periodical cleaning them of dirt, lubrication of leaves and replacement of worn gaskets.

Once a year remove the spring, disassemble and wash carefully in kerosene. While assembling lubricate the spring leaves with graphite grease.

SHOCK ABSORBERS

Design of the shock absorbers is shown in Figs. 28 and 29. Care of the shock absorbers includes periodical adding of fluid in conformity with the recommendations of the Lubrication Chart and

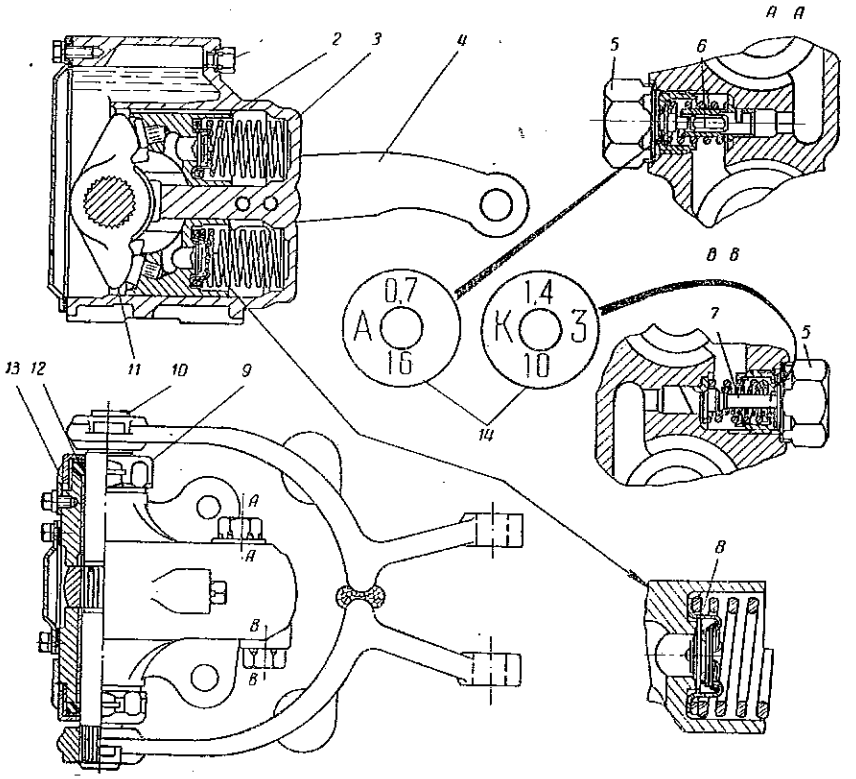


Fig. 28. Front Shock Absorber:
1 — filler plug; *2* — piston; *3* — body; *4* — arm; *5* — valve plugs; *6* — rebound valve; *7* — compression valve; *8* — inlet valve; *9* — oil seal nut; *10* — shaft; *11* — cam; *12* — oil seal; *13* — oil seal locking cap; *14* — valve marking

washing them once a year in gasoline or kerosene with subsequent drying.

In case of fluid leak tighten the shock absorber shaft oil seal. For this purpose remove fixing washers from the seal covers and tighten the covers with a wrench. The seals should be tightened to 4 or 5 *kgm* corresponding to an effort of 12—16 *kg* on a 300 *mm* long wrench.

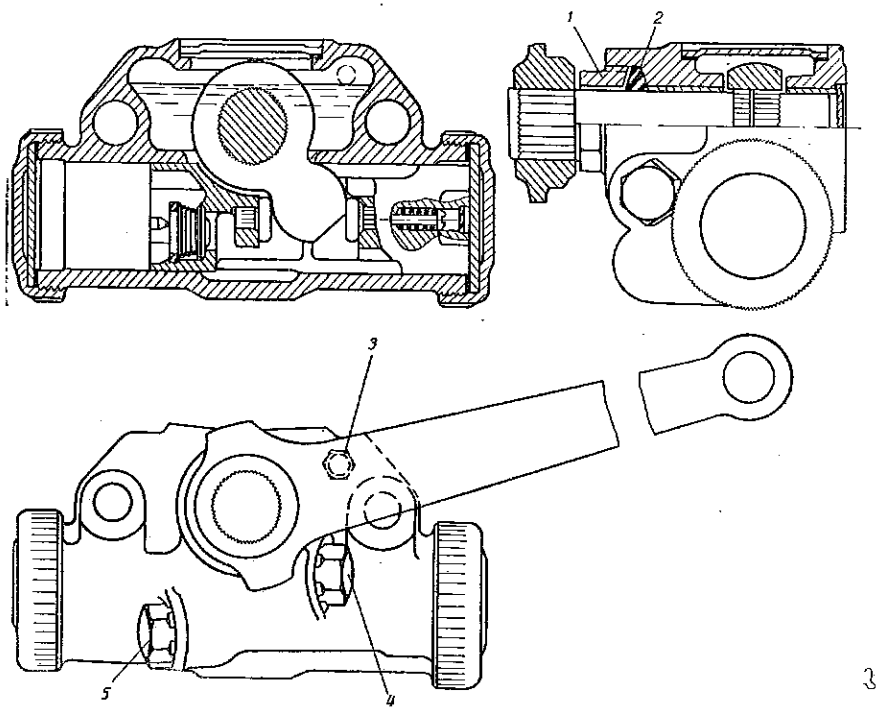


Fig. 29. Rear Shock Absorber:
1 — oil seal nut; *2* — oil seal; *3* — filler plug; *4* — rebound valve plug; *5* — compression valve plug

Replacement of seal packing involves removal of shock absorber arms. The front shock absorber arms must be preliminary cut along the welding seams.

BRAKES

FOOT BRAKES

The "Volga" car is equipped with four-wheel hydraulic brakes. Design of the wheel brakes is illustrated in Figs. 30 and 31.

As the brake linings gradually wear out the clearances between the linings and brake drums are increased and during braking the pedal comes close to the body front panel.

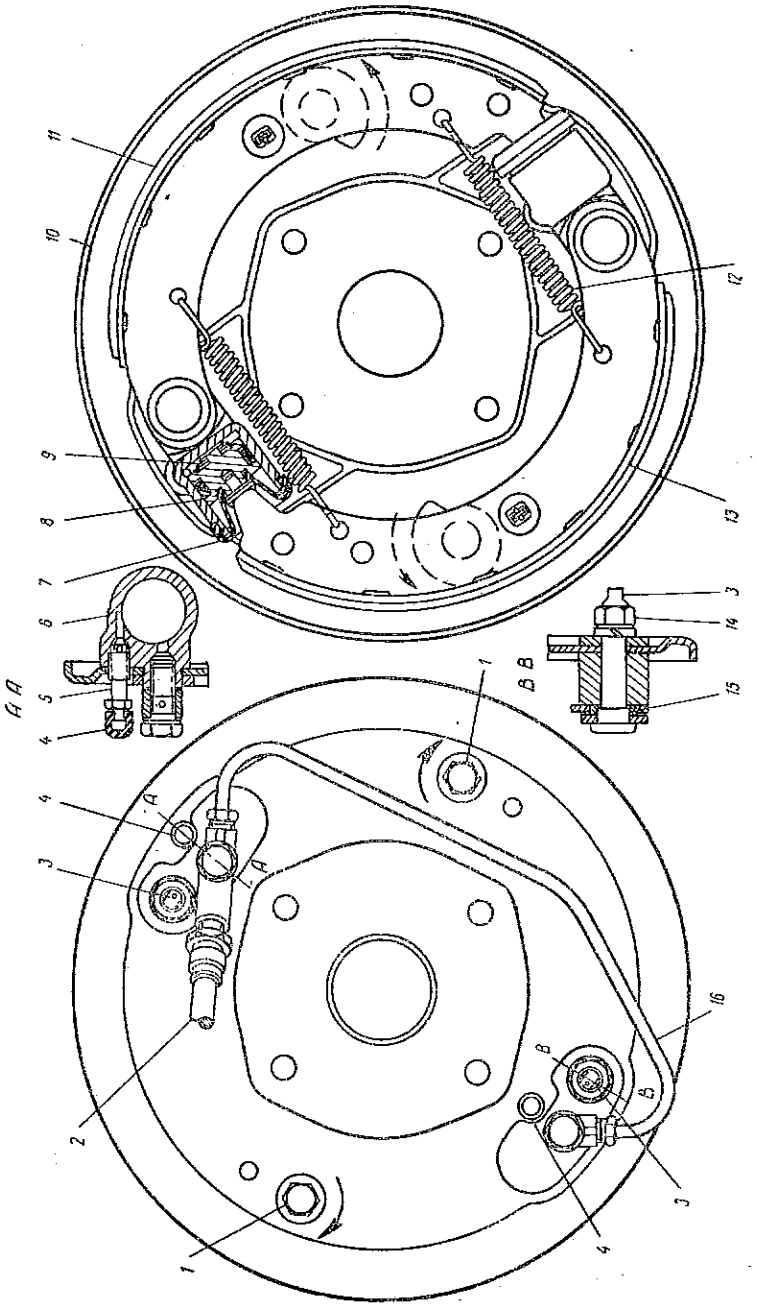


Fig. 30. Front Brake:
1 — adjusting cam head; *2* — brake hose; *3* — anchor pins; *4* — bleeder valve cap; *5* — by-pass valve; *6* — wheel cylinder; *7* — wheel cylinder rubber cap; *8* — piston; *9* — spring; *10* — backing plate; *11* — brake shoe; *12* — return spring; *13* — brake shoe; *14* — anchor pin nut; *15* — anchor pin cam; *16* — pipe

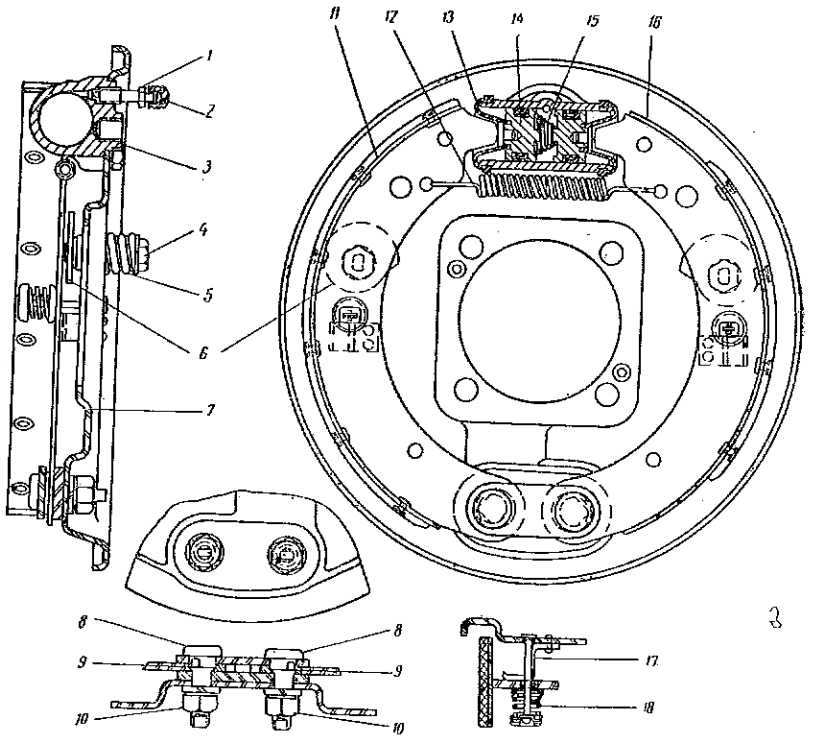


Fig. 31. Rear Brake:

1 — by-pass valve; *2* — cap; *3* — wheel cylinder; *4* — eccentric head; *5* — spring; *6* — cam-return spring; *7* — backing plate; *8* — anchor pins; *9* — anchor pin cam; *10* — nuts; *11* — front shoe; *12* — protecting sleeve; *14* — piston; *15* — spring; *16* — rear shoe; *17* — shoe guide; *18* — spring

In order to restore the original clearance each brake must be adjusted by means of two eccentrics. Hexahedral ends of the cam pivots extend outside through the brake backing plate.

To adjust:

1. Jack up the wheel the brake of which is to be adjusted.

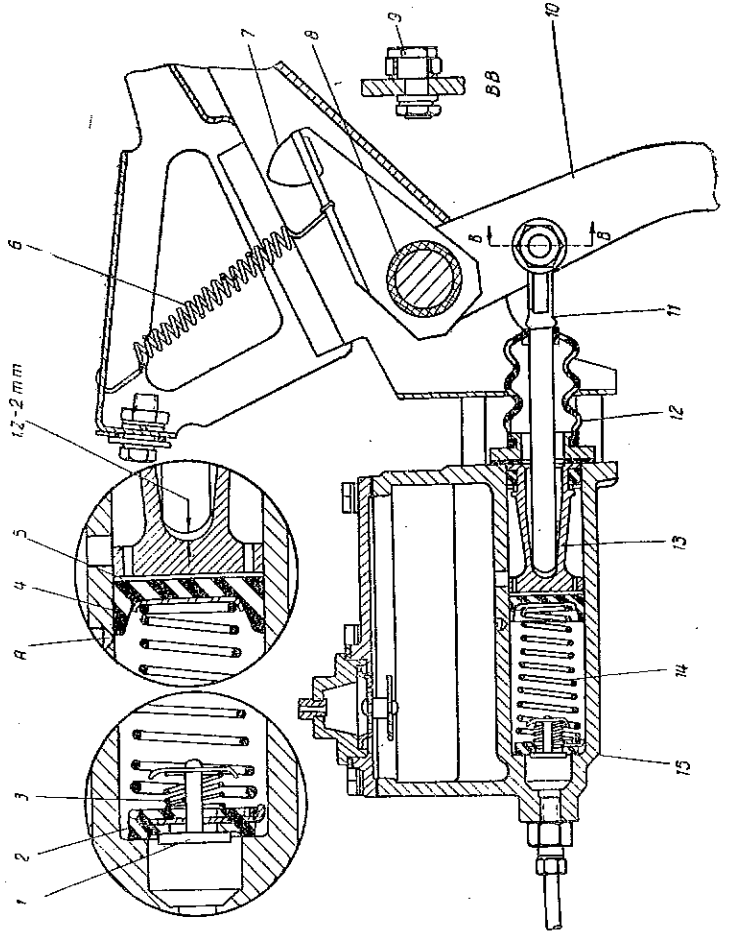
2. Turning the wheel forward rotate gently the adjusting cam of the front shoe until the wheel drags.

3. Loosen the cam gradually (simultaneously turning the wheel by hand) until the wheel rotates freely without the drum brushing against the shoe.

4. Adjust the rear shoe in the same manner. While adjusting the rear shoe of the front brake, rotate the wheel forward; while adjusting the rear shoe of the rear brake, rotate the wheel backward.

Fig. 32. Brake Master Cylinder:

1 — outlet valve; *2* — inlet valve; *3* — spring; *4* — cup; *5* — star-shaped plate; *6* — pedal retracting spring; *7* — pedal bumper; *8* — pedal shaft; *9* — adjusting pin; *10* — pedal; *11* — pusher; *12* — rubber boot; *13* — piston; *14* — spring; *15* — master cylinder body
A — by-pass hole



5. Carry out the above adjustments on all the four brakes.
6. Check the brake drums for heating on the moving car.

Caution: Under no circumstances should the shoe anchor pin nuts be tampered with during brake adjustment, as this disturbs their factory setting. These pins must be adjusted only when either the shoes or the shoe linings are being replaced.

See that there is a clearance between the brake master cylinder piston and pusher (Fig. 32). This clearance is necessary as it allows the master cylinder piston to return to its initial position (until it bears against the washer) with the released brake pedal to avoid the by-pass hole being covered by the rubber cup. A clearance of 1.2—2 *mm* is required which corresponds to a 10—15 *mm* pedal travel. Free travel of the pedal is adjusted by the eccentric pin.

The brake system should be filled with special brake fluid only. The empty brake system is filled as follows:

1. Remove the master cylinder filler plug and fill the cylinder with fluid.
2. Remove the rubber cap from the right rear brake cylinder and fit a rubber hose 350—400 *mm* long over the bleeder valve. Dip the opened end of the hose into a glass container of not less than 1 pint capacity and fill it to half its capacity.
3. Unscrew the bleeder valve $^1/_2$ or $^3/_4$ of a turn and depress the brake pedal several times. Keep pumping the fluid through the master cylinder until air bubbles cease to be discharged from the hose immersed into a container with fluid. While bleeding add fluid into the master cylinder reservoir, making sure that the fluid constantly covers the bottom of the reservoir.
4. Tighten the wheel cylinder bleeder valve securely, remove the rubber hose from it and replace the rubber cap. The valve should be screwed in with the depressed pedal.
5. Bleed the brakes in the following sequence: rear right, front right, front left and rear left. As the front brakes are fitted with two wheel cylinders each, bleed the lower cylinder first then the upper one.
6. After bleeding all the four brakes (six brake cylinders) add fluid into the brake and clutch master cylinder so that the fluid level is 15—20 *mm* below the upper edge of the hole and screw in the filler plug snugly.

HAND BRAKE

The hand brake (Fig. 33) is designed for braking the parked car and for holding it on slopes. The use of this brake for braking the moving car is allowable in case of emergency only when the foot brakes are unserviceable. Frequent application of the hand brake without necessity results in premature wear of the friction

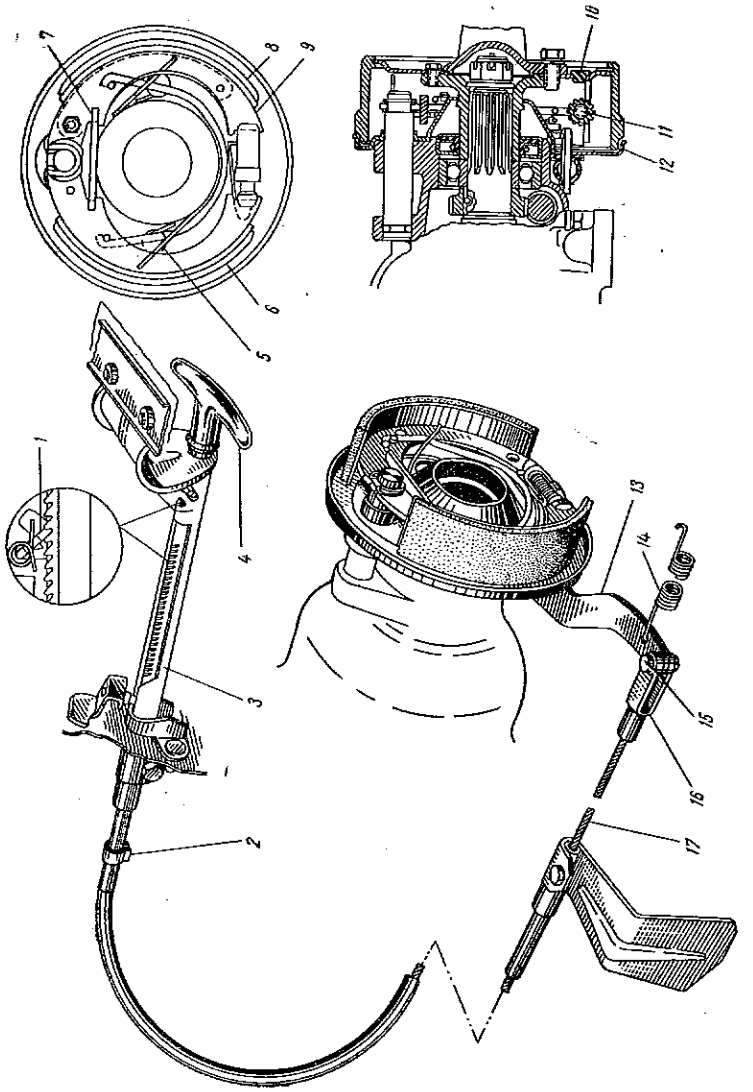


Fig. 33. Hand Brake:
1 — brake latch; *2* — spring clamp for closing cable lubricating hole; *3* — rack; *4* — handle; *5* — shoe return spring; *6* — shoe; *7* — expander link; *8* — shoe; *9* — brake lever; *10* — plug; *11* — adjusting nut; *12* — drum; *13* — operating lever; *14* — retracting spring; *15* — pin; *16* — yoke; *17* — cable

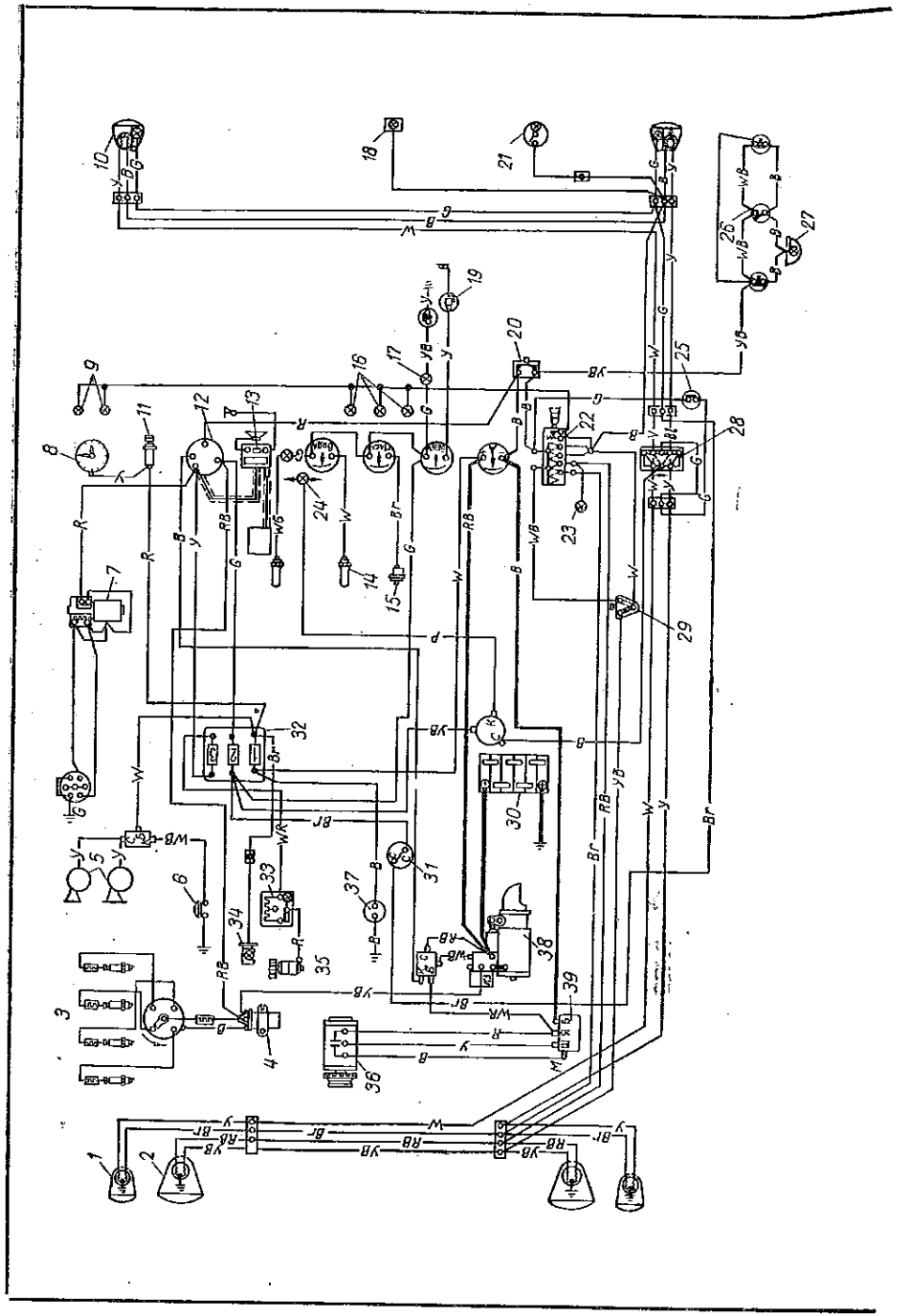


Fig. 34. Wiring Diagram:

1 — side lamp and direction indicator; *2* — headlamp; *3* — ignition coil; *5* — horns; *6* — horn button; *7* — windshield wiper motor; *8* — clock; *9* — clock lights; *10* — rear lamp; *11* — cigar lighter; *12* — ignition switch; *13* — radio set; *14* — water temperature gauge sender; *15* — oil pressure gauge sender; *16* — instrument lights; *17* — hand brake pilot lamp; *18* — license plate lamp; *19* — gasoline level gauge sender; *20* — thermal circuit breaker; *21* — luggage compartment lamp; *22* — main lighting switch; *23* — beam indicator; *24* — direction indicator pilot lamp; *25* — stop light switch; *26* — dome lamp switches; *27* — dome lamp; *28* — direction indicator switch; *29* — lighting foot switch; *30* — storage battery; *31* — reverse indicator switch; *32* — fuse block; *33* — heater motor switch; *34* — hood lamp; *35* — heater motor; *36* — generator; *37* — plug socket; *38* — starter; *39* — generator regulator (*M* — ground; *III* — shunt; *Я* — armature; *5* — battery)

Wire Colour Code:

W — white; *Y* — yellow; *G* — green; *R* — red; *Br* — brown; *B* — black; *WB* — white black; *YB* — yellow black; *RB* — red black; *WG* — white with green strands; *WR* — white with red strands; *V* — violet; *Bl* — blue

linings and imposes undue loads on the power transmission of the car.

The hand brake is installed behind the transmission; it is applied to the propeller shaft of the vehicle. The brake control handle is located under the instrument panel, to the left of the driver.

Poor or no braking effect with the control handle pulled all the way out indicates the necessity of hand brake adjustment. Increased travel of the handle may be caused by worn brake shoe linings or by excessive play in the brake linkage.

Clearance between the shoes and the drum of the hand brake are adjusted in the following order:

1. Jack up one rear wheel.
2. Reach adjusting nut *11* through the slot in the drum and screw in the nut until the drum cannot be turned by hand.
3. Back off the adjusting nut until drum *12* is free to rotate without brushing against the brake shoes. Free rotation of the drum must be checked after pressing lever *13* by hand.
4. After adjustment close the slot in the drum with plug *10*.

If after the above described adjustment the handle travel is still too large, then the brake control mechanism wants adjustment.

This is done as follows:

1. Push hand brake handle *4* to the extreme forward position.
2. Adjust the length of the cable by rotating yoke *16*. Take up the cable slack and turn the yoke until the holes in the yoke and lever *13* are lined up. Lever *13* should be in its rearmost position retracted by spring *14* until it bears against the brake backing plate. Insert pin *15* head up and cotter it. A properly adjusted control handle should be pulled out by hand not more than 5 to 7 teeth of rack *3*.

ELECTRIC EQUIPMENT

The electric system is of the D. C. 12*V* single wire type. The wiring diagram is shown in Fig. 34.

GENERATOR

The generator is of a two-brush shunt-wound type. It is driven by the engine and works in conjunction with the current and voltage regulator. The generator and regulator hook-up is shown in Fig. 35.

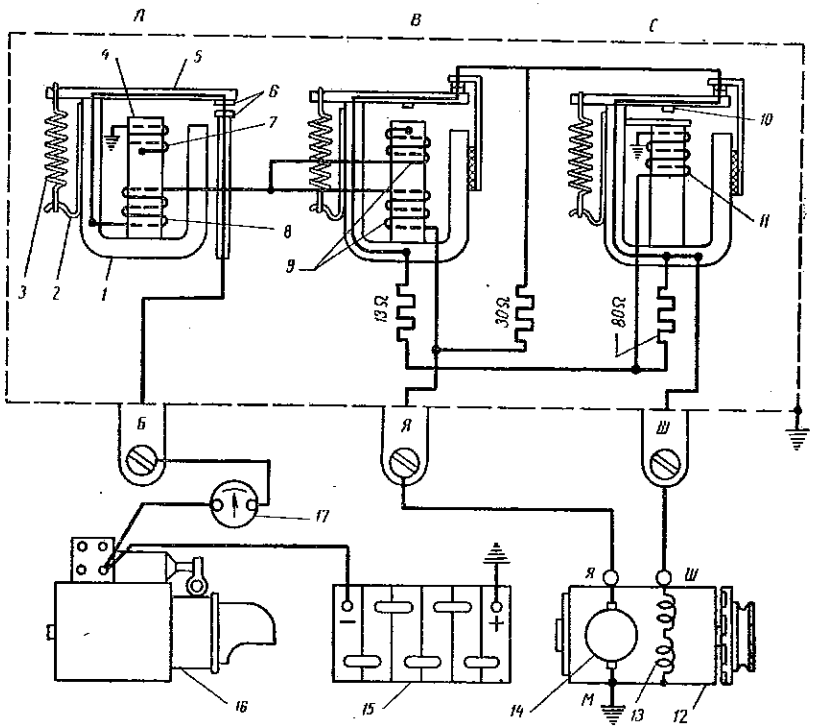


Fig. 35. Current and Voltage Regulator and Generator Hook-Up:

A — circuit breaker; *B* — current regulator; *C* — voltage regulator; *1* — yoke; *2* — adjusting post; *3* — spring; *4* — core; *5* — armature; *6* — contacts; *7* — shunt winding; *8* — series winding; *9* — current limiter winding; *10* — brass dowel; *11* — voltage regulator winding; *12* — generator; *13* — generator field winding; *14* — generator armature; *15* — storage battery; *16* — starter; *17* — ammeter

Symbols: *Я* — armature; *Б* — storage battery; *Ш* — shunt; *М* — ground

The electrical circuit of the generator and regulator is such that absence of the charging current shown by the ammeter does not mean that the electric system is faulty. If after starting the engine the charging current decreases gradually and becomes almost unnoticeable, this indicates that the storage battery is fully charged and the system is in order.

CURRENT AND VOLTAGE REGULATOR UNIT

The purpose of the current and voltage regulator unit installed on the car is to cut the generator in and out protecting it against overload, and for regulating the voltage and amperage of the charging current.

STARTER

The starter used on the car is equipped with an electro-magnetic switch.

This switch forces the starter pinion into mesh with the flywheel ring gear and closes the contacts of the starter circuit. Disengagement of the pinion is ensured by the pull-back spring as soon as the electro-magnetic switch ceases to function.

FUSES

The electric system of the car includes the following circuit breakers and fuses.

1. A thermal circuit breaker 20*A* of the button type which protects all the lighting circuits except hood and inspection lamps, direction indicators and reverse indicator.

If overload or shorting occurs in the circuits the bimetal plate bends due to heating and opens the contacts thereby breaking the circuit.

After elimination of shorting the breaker is again cut in by pressing upon its button protruding through the lower flange of the instrument panel. Press on the button for a short time only. Holding the button depressed for a long time may cause burning of the car wiring and damage the breaker if the cause of shorted electric circuit has not been eliminated in due time.

2. Three numbered fuses combined in one block. These fuses protect the following circuits:

No. 1—20*A* fuse — horn, cigar lighter, and clock;

No. 2—10*A* fuse — instruments, direction indicators and reverse indicator;

No. 3—20*A* fuse — fan motor.

3. Thermal circuit breaker for the clock. This breaker is mounted on the rear cover of the clock. It disconnects the power supply in case of shorts and voltage drops below the permissible value. The thermal circuit breaker is switched on again by pressing the button.

4. Thermal circuit breaker of the vibrating type, mounted on the windshield wiper body is connected to the windshield wiper circuit. In case of some failure this breaker opens the contacts periodically which is accompanied by characteristic clicks.

5. 5*A* fuse mounted on the radio set wire.

The "Volga" car is equipped with a storage battery consisting of six cells connected in series having a rated voltage of 12 *V* and a capacity of 54 *A-hr* at 10 *hr* discharge rate.

Care of the storage battery consists in periodical inspection and keeping it clean and charged in accordance with the "Storage Battery Servicing Instructions." To ensure correct functioning and long life of the battery it is of paramount importance to maintain the correct level of electrolyte. It should be borne in mind that only water evaporates from electrolyte, therefore the storage battery should be topped up with distilled water only. If the electrolyte level drops to such an extent that the battery plates are no longer covered with electrolyte, this causes sulphation of the uncovered portions. The use of town water is strictly forbidden as it contains noxious admixtures (iron, chlorine) which cause deterioration of the battery.

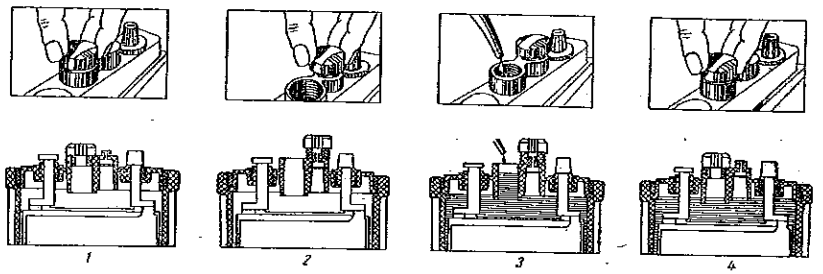


Fig. 36. Storage Battery Topping Up Sequence

Add distilled water (or electrolyte) as follows (Fig. 36): remove the filler plug, and place it tightly over the tapered nozzle of the vent hole located next to the filler hole. Add the required amount of liquid. Then remove the plug from the tapered nozzle. The electrolyte level will drop to normal and no further adding is required. Replace the filler plug.

Storage Battery Trouble Shooting

Battery discharges. This is caused by the following:

1. Continuous driving at a low speed with the head lamps turned on.
2. Faulty generator or current and voltage regulator.
3. All or some of the battery cells are faulty, which is accompanied by a rapid discharging of the battery.

This defect may be attributed to:

a) shorted plates due to damaged separators, or pieces of paste getting between the plates, or high level of sediment has accumulated on the bottom of the cell;

b) noxious admixtures getting into the electrolyte or dirty battery surface; this causes intensive self-discharged and reduces the capacity of battery cells;

c) sulphation of battery plates which is due to the battery having been out of service for long, or operated for a long time with a low electrolyte level or due to systematic undercharging.

4. Water evaporates too rapidly from the battery cells. This is accompanied by intensive gassing during charging ("boiling" of electrolyte) and calls for checking the voltage regulator.

5. During charging a stream of electrolyte flows from the vent holes of one or more cells. This may be caused by:

a) electrolyte level too high;

b) the rate of charging current too high.

HEADLAMPS

The headlamps (Fig. 37) are equipped with a semi-sealed unit consisting of a reflector, lens, two-filament bulb with a flanged

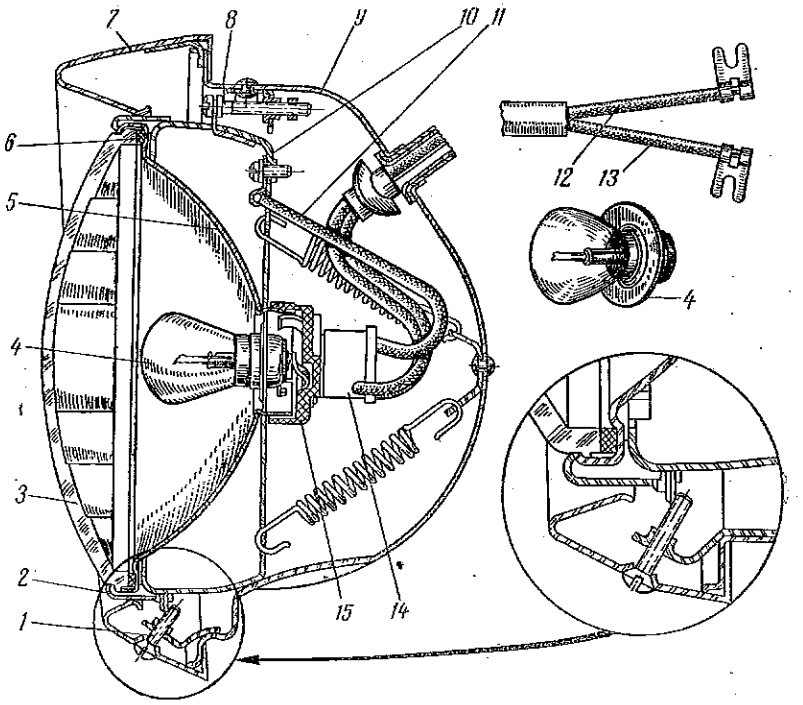


Fig. 37. Headlamp:

1 — rim attachment screw; *2* — optical unit rim; *3* — lens; *4* — bulb; *5* — reflector; *6* — gasket; *7* — facing rim; *8* — adjusting screw; *9* — headlamp body; *10* — mounting ring; *11* — ground cable; *12* and *13* — country and traffic beam cables; *14* — panel; *15* — cover.

base and a cover with block. The lower 50 *c.p.* filament, located in the reflector focus produces the country beam. The upper 21 *c.p.* filament produces the traffic beam.

Headlamp Aiming

Correct aiming of the headlamps is of vital importance for the proper distribution of light over the surface of the road. To aim the headlamps:

1. Place the unloaded car on a level floor squarely facing an adjusting screen 7,5 *m* from the headlamps and remove the rims of both headlamps.
2. Turn on the light and operate the dimmer switch to make sure the connections are correct and the country and traffic beams are turned on and off simultaneously in both headlamps.
3. Switch on the country beam, cover one of the headlamps and aim the other one with the adjusting screws located on top and on the side of the headlamp body under the rim. Aim the beam so that the hot spot is centered at a height of 765 *mm* on the screen above the floor at a distance of 700 *mm* from the longitudinal axis of the car.
4. Proceed in the same manner with the second headlamp, locating both spots at the same level.
5. Replace the headlamp rims.

RADIO SET

The radio set is installed in the middle of the instrument panel (Fig. 38). For the description of the radio set and its operating instructions refer to the special booklet issued by the "Radio Manufacturing Works".

When using the radio on a parked car with a stopped engine, turn the ignition key to the extreme left position (counter-clockwise). The use of the radio set on a parked car with engine stopped and ignition switch turned ON is not allowable as it causes failure of the ignition coil due to overheating.

Prior to removing the radio set, loud-speaker and power supply unit, disconnect the "ground" cable from the battery.

Operating of the radio set in the car is accompanied, besides atmospheric and industrial disturbances, by noises produced by the operating electric equipment of the car. Normal radio reception is ensured by the following interference suppressing devices:

1. Suppressor resistors of 8 000 to 13 000 *ohm* in the H. T. circuit, i. e. in the cables leading from the ignition distributor to the spark plugs and from the ignition coil to the distributor.
2. Blocking condenser of 0.1 *mfd* capacity installed between the *M* (ground) and *Я* (armature) terminals of the generator.

3. Shielded braid of the aerial cable, connected to the car body.
4. Flexible wire connecting the engine to the body of the car.
5. To ensure reliable grounding of the electric gauges they are fastened by bolts with star-shaped washers.
6. A 0.25 *mfd* condenser is connected to the "ПР" radio set terminal of the ignition switch.

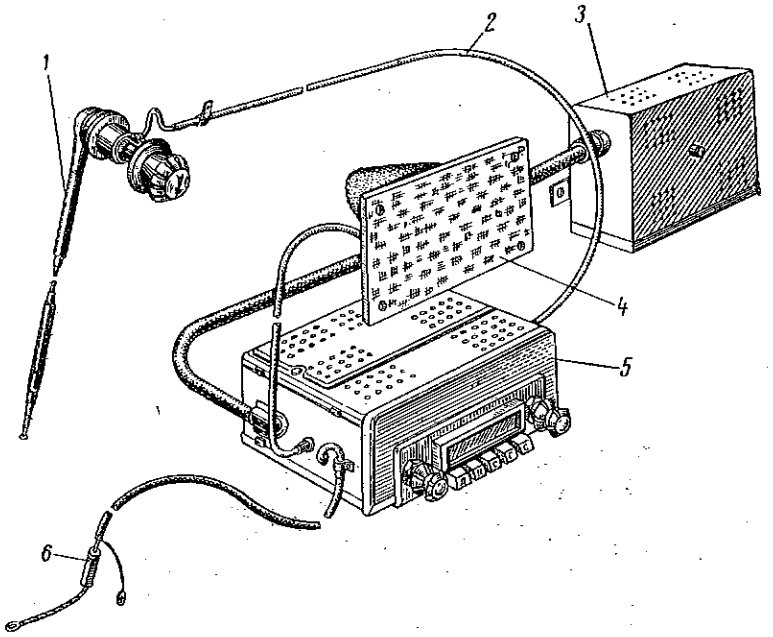


Fig. 38. Radio Set and Wiring:
1 — antenna; *2* — antenna cable; *3* — power supply unit; *4* — loud-speaker; *5* — radio set; *6* — fuse

When operating the car, maintain all the interference suppressors and the entire electric system in perfect order: this will ensure normal functioning of the radio set.

BODY

The "Volga" car has an all-metal, four-door body of integral construction with two rows of seats, a luggage compartment in the rear end, and a short frame in the front end, for mounting the engine and attaching the front suspension.

The front seat with a collapsible back is adjustable. To shift the seat back and forth pull the seat guide handle up. To convert the seats into sleeping berths, shift them to the foremost position and lower the back flush with the rear seat cushion.

The doors are of the two-panel type without inner facing frames. Door hinges are attached to the body pillars with bolts and screws without adjustment. The doors are adjusted at the Works. Therefore, if it becomes necessary to remove the doors, take them off together with the hinges to avoid tempering with their adjustment. Door hinges are lubricated through special grease fittings.

In the closed position the door is held by two hinges on one side and by dovetails on the other. The dovetails rest on the retainer screwed to the body lock pillar. Position of the retainer may be adjusted after loosening the screws.

Door opening stops keep the doors from knocking against the outer body panel surface. If necessary, the door opening may be adjusted by changing the length of the check rod.

HEATING AND VENTILATION

The body of the car is heated by hot water admitted into the heater radiator from the engine cooling system (Fig. 39). A cock is mounted on the engine cylinder head to pass hot water to the heater during winter months.

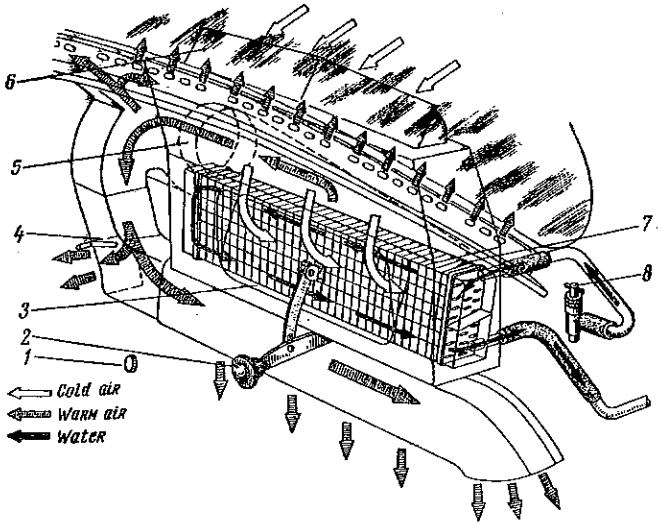


Fig. 39. Body Heating and Ventilation and Windshield Defrosting:

1 — fan motor control knob; *2* — inside port handle; *3* — inside port; *4* — body heater lid; *5* — fan with motor; *6* — air intake port lid; *7* — heater radiator; *8* — cylinder head cock

When starting a cold engine in winter it is recommended, prior to filling the radiator with water, to close the cock on the cylinder head to avoid freezing of cold water in the heater radiator. Open the cock only after having warmed up the engine. While draining the cooling system keep the heater cock open, otherwise the water will not be drained from the heated radiator.

Fresh air for body ventilation comes in through the air intake port closed with a lid. Part of the heated air is directed for windshield defrosting. The amount of air admitted into the body may be controlled by adjusting the fan speed.

TYRE OPERATING AND STORAGE INSTRUCTIONS

Daily, before driving out check tyre pressure (1.7 *kg/sq. cm*) while the tyres are cold. Check the presence and condition of the spare wheel and its tyre. Inspect tube valves and make certain that their caps are not missing.

En route do the following:

1. Be sure that the car does not pull to one side. If this is evidenced stop the car immediately and inspect tyres.
2. Check the tyre pressure at regular intervals and avoid driving on underinflated tyres even for a short distance. Driving with deflated tyres is strictly forbidden.
3. Do not reduce the pressure in the hot tyres by letting the air out. An increase of tyre pressure during driving is unavoidable due to heating of the air inside the tyres.
4. Do not apply the brakes sharply and do not allow the tyre sides to brush against curbs.

Every 3 000 *km* interchange the tyres in the order shown in Fig. 8.

Efficient suspension of the car and a low centre of gravity permit making sharp turns at high speed. However, this should be avoided as causing side slipping of the wheels and premature wear of the tyres.

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Vneshtorgizdat. Order No. 03891. Resp.: Semenov M. I., Matvejeva A. M.,
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