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FIAT

500 - 500 B - 500 C

SHOP MANUAL

FIAT - SERVICE DEPARTMENT - TURIN

This book is exclusively reserved
for the FIAT Service Staff

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FOREWORD

This Shop Manual of FIAT 500 - 500 B - 500 C Cars has been produced with the object of rendering it easy to carry out with efficiency and precision all repairs that may be needed by this car in a FIAT Service Station.

An endeavour has been made not to repeat the description of some repairing operations which are by now generally known, so to find space to devote to the new features, yet achieving a brevity that will permit a speedy consultation of this manual.

The necessary tools are referred to with their respective order number in the « Tool Catalogue », 1950 Edition.

FIAT
SERVICE DEPARTMENT

Turin, September 1957.

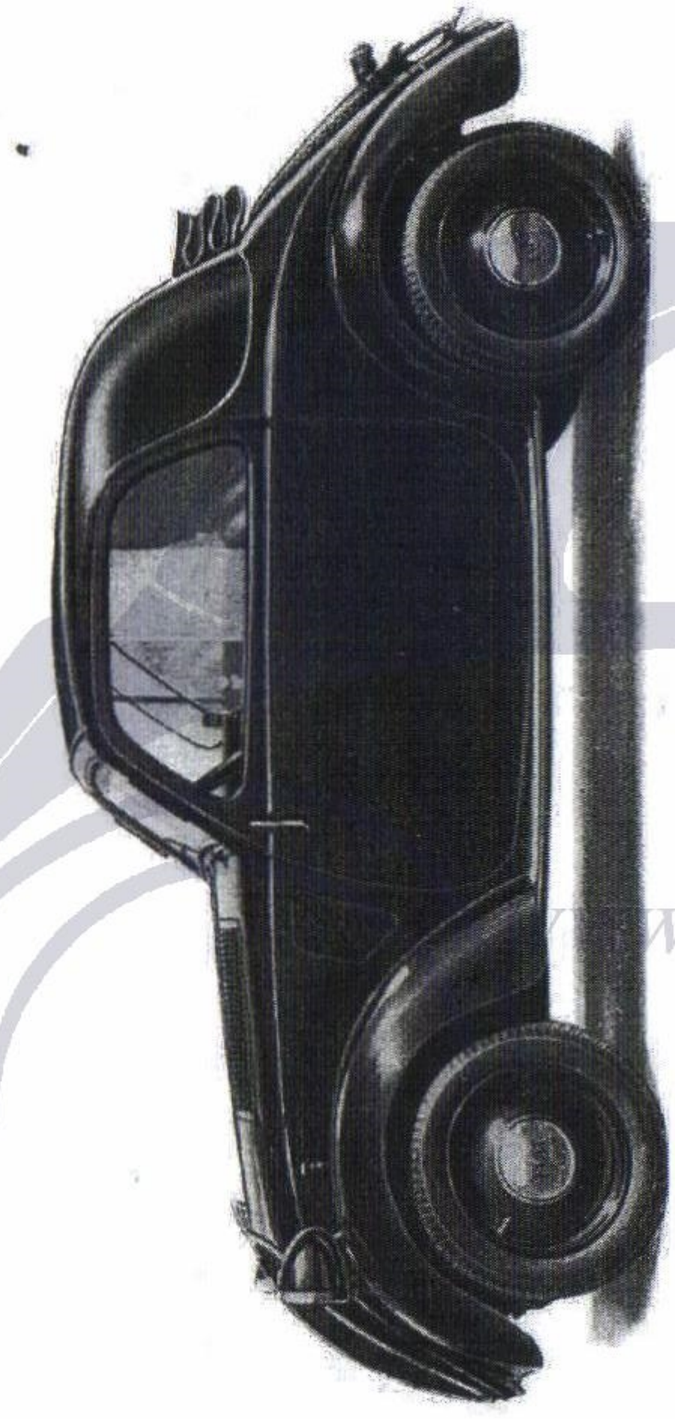

Fig. 1. - Fiat Mod. 500 car.

LEADING FEATURES OF MODEL 500 CAR

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ENGINE

Type	500
Cycle	Otto - Four strokes
Number of cylinders	4
Fuel	Petrol
Bore and stroke	mm 52×67
Cubic capacity	cc 570 (34,7 cu. ins)
Brake horse power at a speed of 4000 r. p. m.	13
Compression ratio	6,7

Cylinder block, of phosphor-manganese cast iron.
Detachable aluminium head.
Large diameter steel crankshaft, supported on two bearings. - Special steel connecting rods. - Aluminium alloy pistons. - Pressed steel plate sump.

Valve gear.

Side valves actuated by means of pushrods from the camshaft located to the right in the crankcase. The camshaft is driven, through a silent chain, by the crankshaft.
Valve timing - with theoretical adjustment of 0,25 mm (.01") clearance between valve stem and tappet:

Inlet	Beginning before t. d. c.	8°
	End: after b. d. c.	50°
Exhaust	Beginning before b. d. c.	50°
	End: after t. d. c.	8°
Actual clearance between valve and tappets	inlet	0,10 mm (.004")
	exhaust	0,20 mm (.008")

Battery ignition.

Firing order	1-3-4-2
Initial advance	5°
Automatic advance	17°
Total maximum advance	22°

Fig. 2. - Fiat Mod. 500 car chassis.

Gravity fuel system.

Tank located under the bonnet on the front side of the dash.
Either the Solex 22 HD carburetter or the Weber 22 OTS carburetter is fitted. The latter, on latest production cars, is not equipped with an economizer, and the petrol inlet connection instead of being fitted sideways is fitted to the top of the bowl cover:

	Solex 22 HD	Weber 22 OTS
Choke tube diameter	mm 14	mm 15
Main jet	mm 0,80	mm 0,95
Auxiliary jet	mm 0,35	mm 0,45
Pilot jet	mm 1,20	mm 1,20

Inlet manifold centrally warmed by exhaust gases.

Forced lubrication

by means of a vane pump—up to engine No. 019250—or of a gear pump —starting from engine No. 019251—both fitted with a suction filter submerged in the sump.

Standard oil pressure	Kg/cm² 2,5 (35 lbs. per sq. inch)
Oil capacity	(kg. 2) lbs. 4

Cooling by thermo-syphon principle.

The radiator is mounted behind the engine, and is cooled by air blown by a fan mounted on the dynamo spindle.

Water capacity	(lt 4,5) gallons 1

TRANSMISSION

Clutch.

Single dry plate with flexible hub, adjustable by a sleeve fitted on the connecting rod of the control pedal.

Gearbox.

4 speeds and reverse, with silent third and synchromesh gears for the quick engagement of the 3.rd and 4.th speeds.

First speed ratio	4,48 to 1
Second speed ratio	2,732 to 1
Third speed ratio	1,766 to 1
Top speed ratio (direct drive)	1 to 1
Reverse speed ratio	5,68 to 1
Gearbox oil capacity	(kg 0,750) 1 1/2 lbs.

Propeller shaft.

Tubular, of drawn and welded steel fitted with flexible joints at both ends and a front sliding sleeve.

Rear axle.

Rear axle casing of pressed steel plate.
Final drive through spiral helical gears. Differential mounted on adjustable ball bearings. Driving pinion adjustable for backlash from outside.

Standard ratio	8/39
Special ratio (on request) for mountainous country	8/41
Oil capacity of the rear axle casing	(kg 0,600) 1 1/4 lbs.

CHASSIS

Wheelbase	m 2,000 (6' 6 3/4")
Front track	» 1,110 (3' 7 9/22")
Rear track	» 1,080 (3' 6 1/2")
Ground clearance	» 0,145 (5 3/4")

Rigid frame of pressed steel plate, with brackets projecting from the side members for supporting the body.

Suspension.

Front: by wheels independently sprung, transverse spring, swinging radii and hydraulic shock absorbers.

Rear: by semi-elliptic springs, integrated by hydraulic shock absorbers.

Disc wheels.

Well base rims	15" x 2,5" C
Low pressure tyres	4,00—15
Tyres pressure	(kg/cm² 1,5) 21 lbs. per sq. in.

Hydraulic brakes on the four wheels.

Pedal control.

Brake fluid capacity	(kg 0,550) 1 1/4 lbs.

Brake on the transmission.

Mechanical: operated by a hand lever.

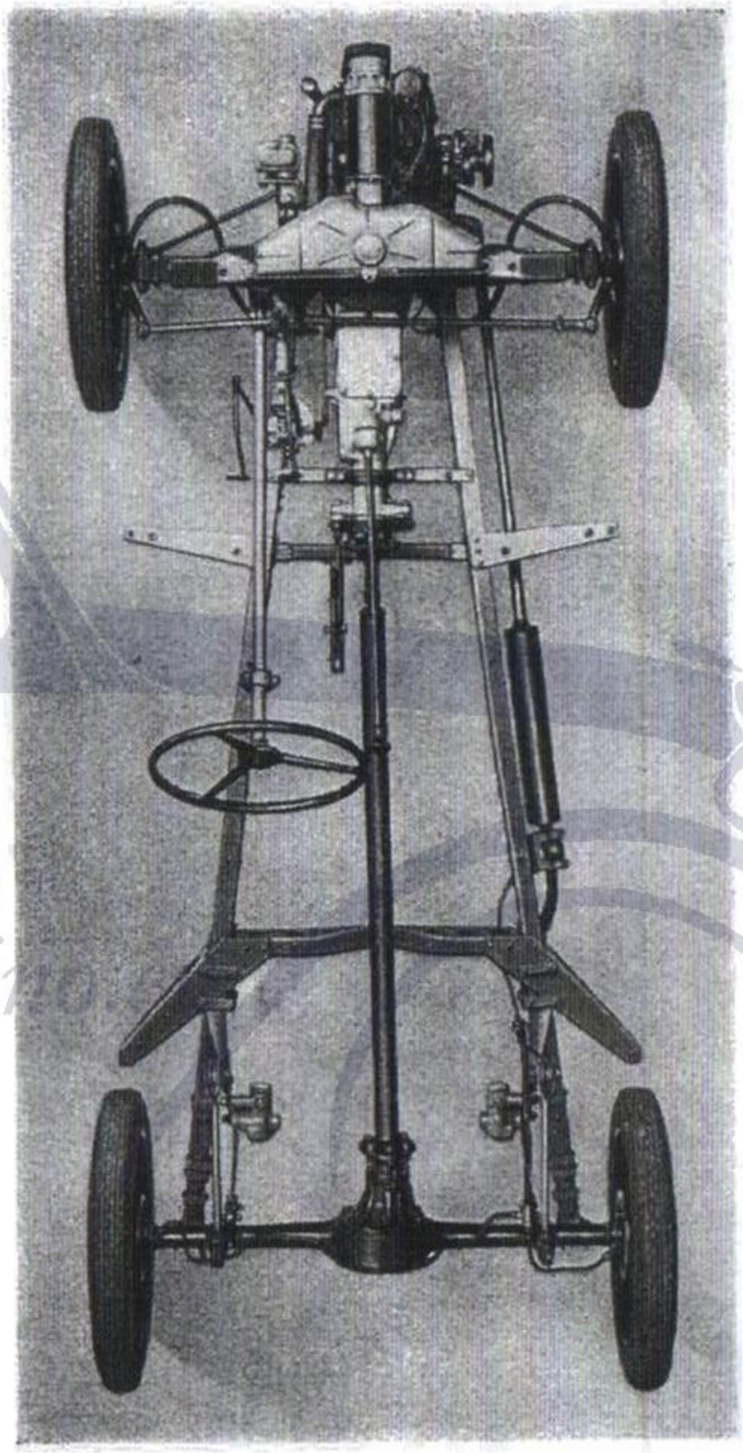


Fig. 3. - Chassis of the 500 Model, up to No. 046000, viewed from above.

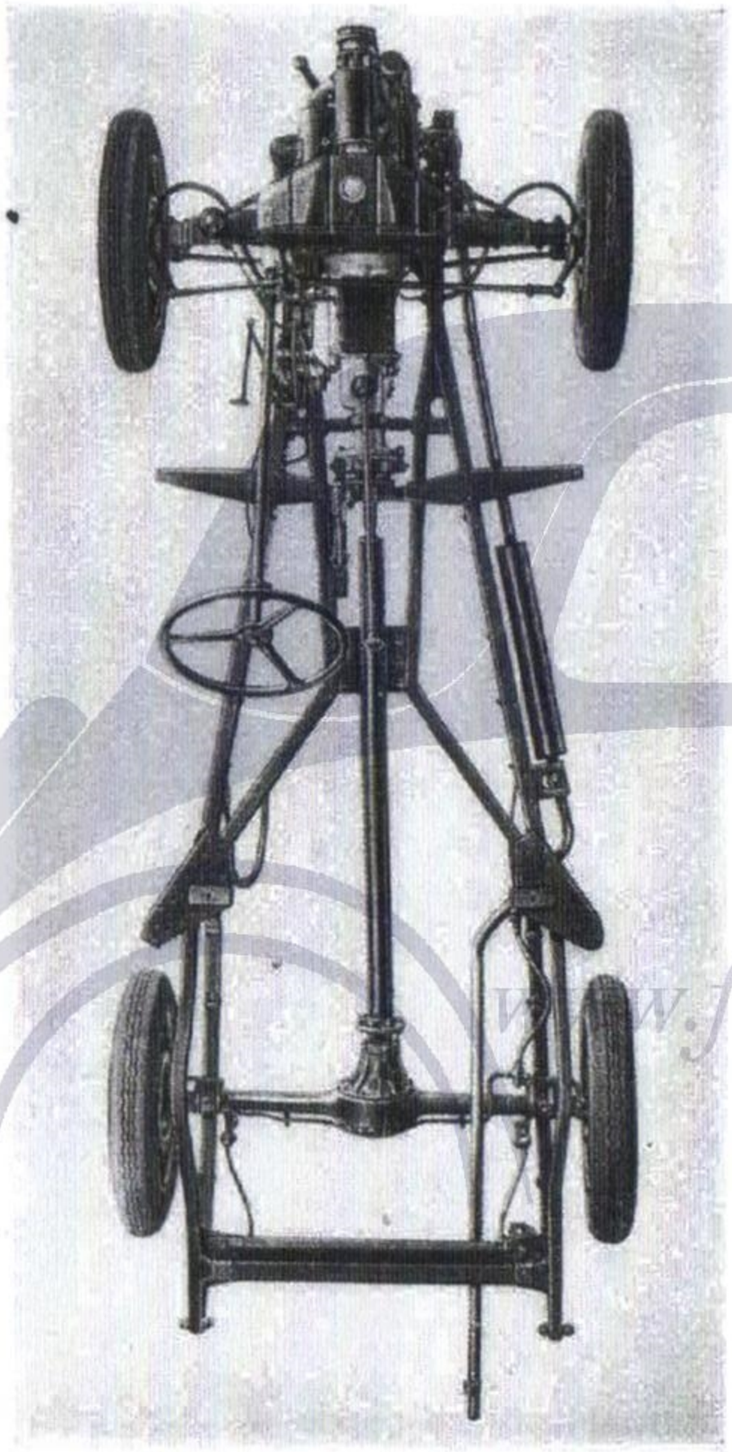


Fig. 4. - Chassis of the 500 Model, starting from No. 046001, vieved from above.

Front wheel intrack (with static load) . . . mm 2÷4 (.08" to .16")
Front wheel camber (with static load) . . . . . about 1°
Front pitch of the car . . . . . about 9°

Steering:

By worm and worm sector easily adjustable by means of a central screw.
Ratio 2/26

Steering rods:

Independent for each wheel.
Steering radius . . . . . m 4,35 (14' 3")

ELECTRICAL EQUIPMENT

Voltage . . . . . 12 volts

Battery Marelli 6 VX 7:

Capacity (10 hours discharge) . . . . . amp. hours 38
Size . . . . . mm 250×175×195
Weight with electrolyte . . . . kg 19,7 (approx. 43 1/2 lbs.)
Weight without electrolyte . . . kg 17,2 (approx. 38 lbs.)

Battery 6 BA 7 Marelli of 30 Amp./hours had been formerly fitted.

Self starting motor.

	Up to engine No. 33508	Starting from engine No. 33509
Type	500	500
Number of poles	4	4
Maximum power	0,70 HP	0,90 HP
Outer diameter	mm 70	mm 90
Rotation (facing the pinion end)	clockwise	clockwise
Driving motor: $\frac{\text{engine}}{\text{starting motor}}$ ratio	$\frac{1}{8,4}$	$\frac{1}{10}$

The engagement of the motor pinion is controlled at the same time as the starting switch by a pull knob on the dash.

Ignition distributor.

Type Magneti Marelli	S 25 F 14
Gap between breaker points	mm 0,47 to 0,53 (.018" to .021")

Spark plugs.

Type Marelli		MW	125 T 3 P
Diameter and pitch	up to engine No. 060057	mm	12×1,25
	starting from engine No. 060058	»	14×1,25

Ignition coil.

Type Magneti Marelli	12 Volts 662-04/20

Dynamo.

Type		Fiat 75/12
Number of poles		2
Standard power		Watts 75
Beginning of charge: engine about 1050 r. p. m.: car in top gear		(km 23) 15 miles p. h.
Maximum charging capacity	lights out	Amp. 6,5
	lights on	» 7,5
Rotation (driving pinion end)		clockwise
Driving belt $\frac{\text{engine}}{\text{starting motor}}$ ratio		$\frac{1}{1,22}$

Cut-out 508 III.

Voltage automatically regulated on the 3.rd brush system. A resistance is cut out for increasing the output when the headlamps are switched on.

Lamps:

Double filament lamps:

for headlights	Watts	35
for anti-dazzling lights	»	20
Lamps for twon driving	»	3
Tail lamp	»	3

Dash lamp with lever switch on dash board.

Plug-in socket for an inspection lamp under the facia board, to the left.

A warning light, located in the centre of the lighting switch, shows when the dynamo is not charging the battery.

Accessories:

Lock-and-key switch for ignition and external lights.
Speedometer.
Electric horn with push button on the steering wheel.
Screen wiper, with lever switch on the dash.
Oil pressure gauge.
Direction indicators.
Driving mirror and two sun visors.
Push button for flashing the headlights (extra).

WEIGHTS

Chassis with tyres	kg	300	(Cwts. 6 approx.)
Two-seater Saloon with spare wheel and tool kit but without fuel, water and oil	»	540	(Cwts. 11 approx.)
Chassis with bodywork, full load and a 50 kg (1/2 Cwt.) luggage	»	750	(Cwts. 15 approx.)
A spare wheel and tyre	»	10	(22 lbs. approx.)
Tool kit	»	3,5	(8 lbs. approx.)

PERFORMANCE

Maximum permissible speeds after a running-in period of 1500 km (1000 miles) for cars with a rear axle ratio of 8/9:

in bottom gear	about	20 km/h	(12 m. p. h.)
in 2.nd gear	»	32 »	(20 m. p. h.)
in 3.rd gear	»	50 »	(30 m. p. h.)
in top gear	»	85 »	(55 m. p. h.)

Climbable gradients for a fully laden car:

in bottom gear	22 % (1 in 4 1/2)
in 2.nd gear	12,5% (1 in 8)
in 3.rd gear	7 % (1 in 14)
in top gear	3 % (1 in 33)

Fuel consumption less than 6 lts per 100 km (10 miles to the U. S. A. Gall.).

Cruising range about km 350 (220 miles)

REFILLING

Part to be refilled	Quantity		Material
Petrol tank . . . . . including a reserve of 0,8 gall. (lt 3,4)	4,6 galls.	lt 21	Petrol
Radiator and water jacket	1 gall.	» 4,5	Water *
Engine sump	4 1/2 lbs.	kg 2 —	Fiat Oil **
Gearbox	1 1/8 lbs.	» 0,75	Fiat CP oil
Rear axle casing	1 1/8 lbs.	» 0,60	
Steering box	1 3/4 oz.	» 0,08	Fiat CP oil ***
Hydraulic brake system	1 1/4 lbs.	» 0,55	Lockheed Fluid for hydraulic brakes
Hydraulic shock absorbers front	5 oz.	» 0,15	Fiat S. A. I. oil
Hydraulic shock absorbers rear	5 oz.	» 0,15	Fiat S. A. I. oil
Pressure grease cups	—	—	Fiat E oil

(*) When the temperature drops below 40° F (5° C) it is advisable to use an antifreeze mixture.

(**) When the temperature is above 50° F (10° C) use oil Fiat V Estivo (SAE 50); for temperatures below 50° F (10° C) oil Fiat V Invernale (SAE 20).

(***) Fiat CP oil (SAE 90) should be used to refill the steering box after reassembling. It would be difficult, however, to add occasionally such a thick oil by means of an oilgun. For occasional addition of lubricant it is therefore recommended Fiat E Oil.

TYRE PRESSURES

Front tyres	21 lbs. per sq. in. (kg/cm² 1,50)
Rear tyres	21 lbs. per sq. in. (kg/cm² 1,50)

MODEL 500 DELIVERY VAN

The differences between the chassis of the Delivery Van Mod. 500, and the chassis of a Mod. 500 standard car, are detailed here. These differences however do not affect the controls and the maintenance, so that the same instructions on this subject may be carried out for the Delivery Van as for the standard car.

CHASSIS FRAME: is the same as that of the standard car, starting from No. 046001, but up to Delivery Van No. 046000 the frame is the same as that of the previous-type cars, although reinforced and provided with rear prolongations suited for fitting the bodywork.

REAR SPRINGING: by semi-elliptic springs, reinforced.

REAR AXLE ratio . . . . . 8 : 41

TYRES: low pressure . . . . . 4,00—15 T

Tyre pressure . . . . front 1,75 kg/sq. cm (lbs. 25 per sq. in.)
rear 2,25 kg/sq. cm (lbs. 32 per sq. in.)

BODY: streamlined, in steel plate with wooden frame.

Cab, with two lateral doors fitted with safety glasses.
Single seat for the driver, in black, washable leather.
Double door at the rear.
Driving mirrors mounted on the two lateral doors.
Spare wheel arranged in the cab at the driver's side.

CAPABILITIES

Useful load (driver excluded)	kg 300 (6 cwt.)
Max. speed in 4.th gear, about	km/h 82 (50 m/h)
Max. climbable gradient in 1.st gear . . .	1 in 5 1/2 (18%)

Petrol consumption: about 7 lt per 100 kms (about 33 miles to the U. S. A. gallon).

Fig. 5. - Delivery van, mod. 500.

CHARACTERISTICS OF FIAT LUBRICANTS

LUBRICANT	DATA	
Fiat V Estivo (summer oil) for engine (above 50° F) SAE 50	Flash point (in open cup)	≥ 210° C
	Channelling point	≤ –16° C
	Viscosity, at 50° C - Engler degrees	14,5 to 17,1
	Viscosity, at 100° C - Engler degrees	2,4 to 2,6
Fiat V Invernale (winter oil) for engine (below 50° F) SAE 20	Flash point (in open cup)	≥ 200° C
	Channelling point	≤ –20° C
	Viscosity, at 50° C - Engler degrees	4,8 to 5,8
	Viscosity, at 100° C - Engler degrees	1,64 to 1,74
Fiat CP Oil for gear box and rear axle SAE 90	Flash point (in open cup)	≥ 210° C
	Channelling point	- 0° C
	Viscosity, at 50° C - Engler degrees	19,7 to 23,7
	Viscosity, at 100° C - Engler degrees	2,64 to 2,87
Fiat F Oil SAE 10	Flash point (in open cup)	≥ 180° C
	Channelling point	–15° C
	Viscosity, at 20° C - Engler degrees	16 to 20
	Viscosity, at 50° C - Engler degrees	3,1 to 3,8
Fiat E Oil	Flash point (in open cup)	≥ 240° C
	Pour point (Ubbelhode)	40° to 50° C
	Viscosity, at 75° C - Engler degrees	4,3 to 5,8
Fiat A 11 Grease	Appearance	fibrous
	Pour point (Ubbelhode)	140° to 150° C
	Consistence	≥ 250
Fiat G 2 Grease	Pour point (Ubbelhode)	130° to 140° C
	Consistence	≥ 300
Fiat A 1 Grease	Pour point (Ubbelhode)	70° to 75° C
	Consistence	250 to 280

OVERHAULING
THE MECHANICAL UNITS

ENGINE, CLUTCH AND GEARBOX UNIT

Removing the unit from the car.

The engine, clutch and gearbox assemblies cannot be removed separately. Consequently the whole of these three assemblies must be removed whenever there is need to carry out a repairing operation involving the dismantling of any one of them.

Disconnect the battery cable.

Take off the front of bonnet and grill of dummy radiator shell.

Open the tap located in front of the cylinder block to drain the water from the radiator and the cylinder jackets.

Disconnect the water hoses from the top and bottom of the radiator.

Remove the bolt fixing the dashboard tie rod to the radiator core and to the petrol tank; also the two bolts fixing the radiator core to the chassis cross member. In this way the radiator core becomes free.

If the car has not been placed over a pit and if a pit is not available the car must be jacked up at the front and at the rear.

Remove the bolts fixing the gearbox to the rear support.

Disconnect the driving end of the speedometer cable;
the dynamo earthing cable from a bolt in the gearbox;
the clutch control rod;
the propeller shaft joint on the gearbox;
the transmission brake connecting rod.

Remove the cap and the rubber block for the rear suspension of the unit.

Disconnect the two side undertrays of the engine;
the petrol pipe from the carburetter;
the carburetter silencer;
the accelerator tie rod and the starter control wire;
the oil pipe from the engine base chamber;
the exhaust pipe from the manifold;
the ignition distributor lead from the ignition coil;
the dynamo and starting motor leads;
the electric horn cables;
the electric horn from the cross member that supports the radiator.

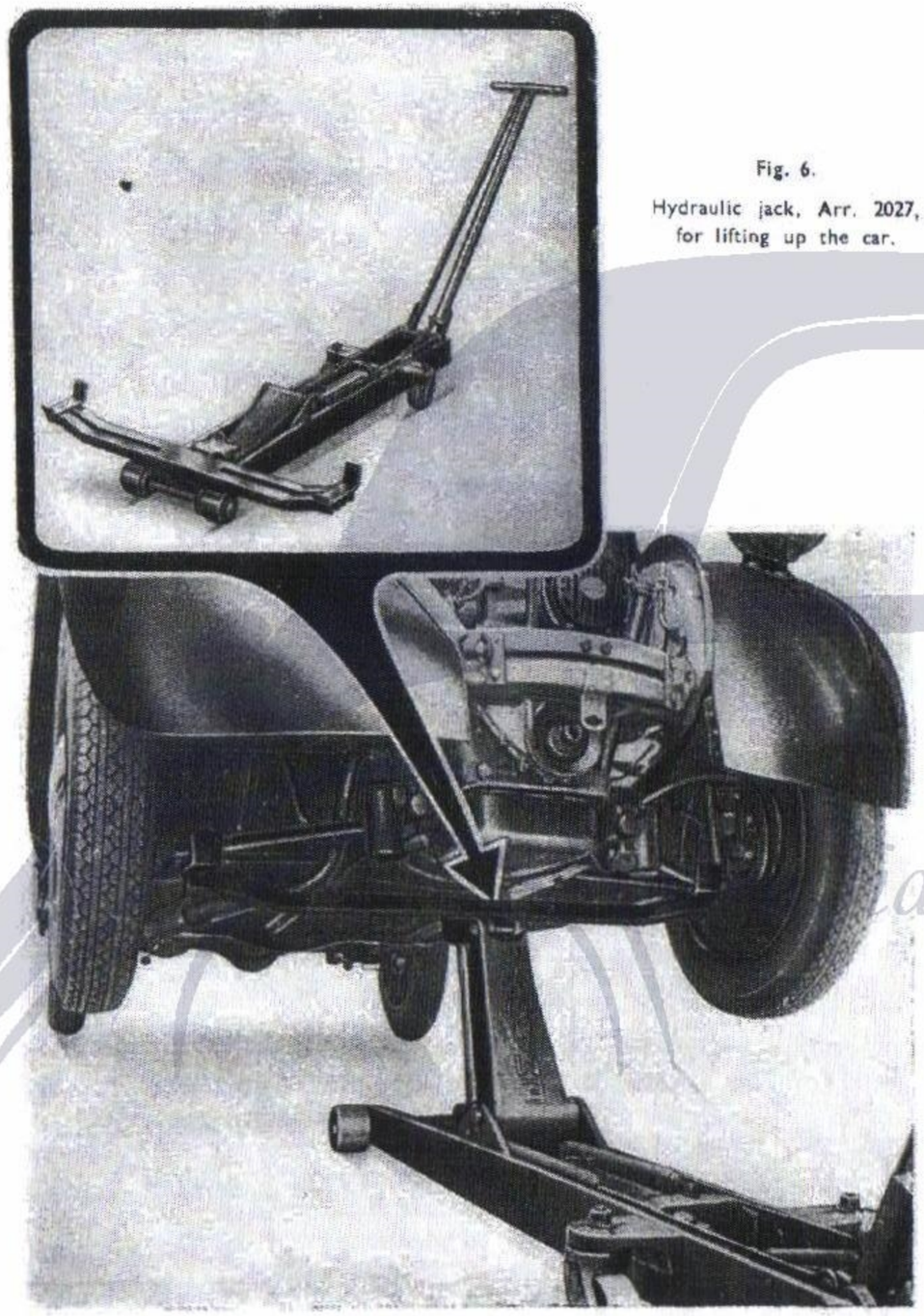


Fig. 6.

Hydraulic jack, Arr. 2027, for lifting up the car.

Remove the cross member connecting the front ends of the wings;

the two caps and rubber blocks for the front suspension of the engine-and-gearbox unit.

Unscrew the gear hand lever from the interior of the car, by means of a punch placed in the hole provided for this purpose.

The engine, clutch and gearbox unit, so disconnected can be removed from the car, bringing the unit forward and then lifting it.

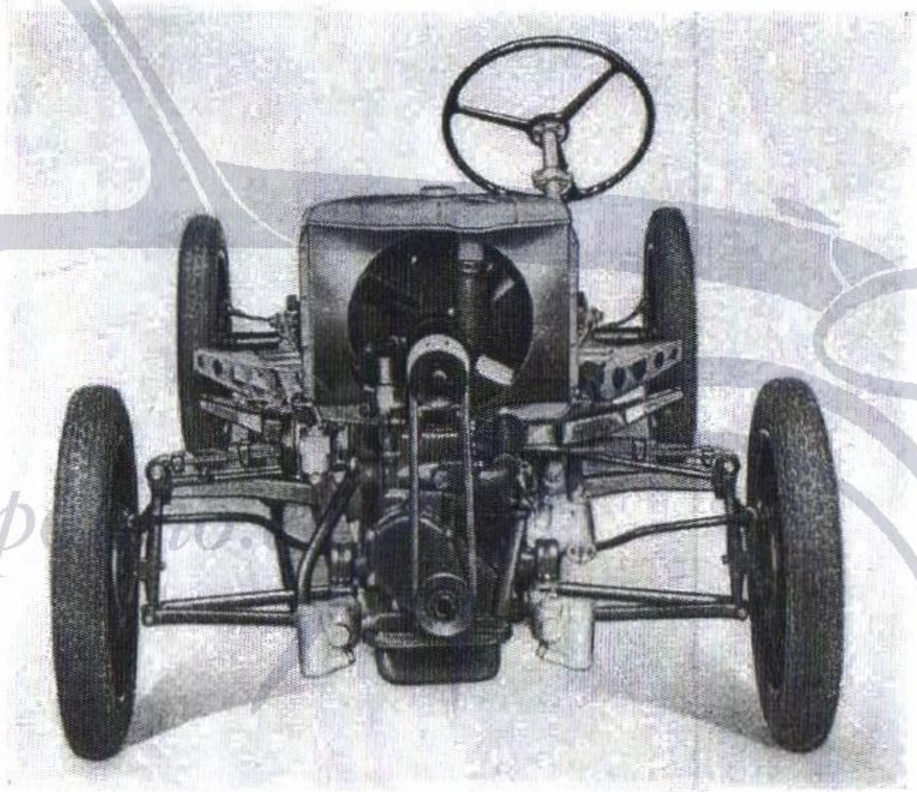


Fig. 7. - Mod. 500 chassis viewed from ahead.

Fitting the unit to the car.

If a pit is not available the car must be jacked up at the front and at the rear.

Bring the unit to the car, having previously unscrewed the gear lever.

Fit the two caps and rubber blocks for the front suspension of the engine; also the cap and rubber block for rear suspension.

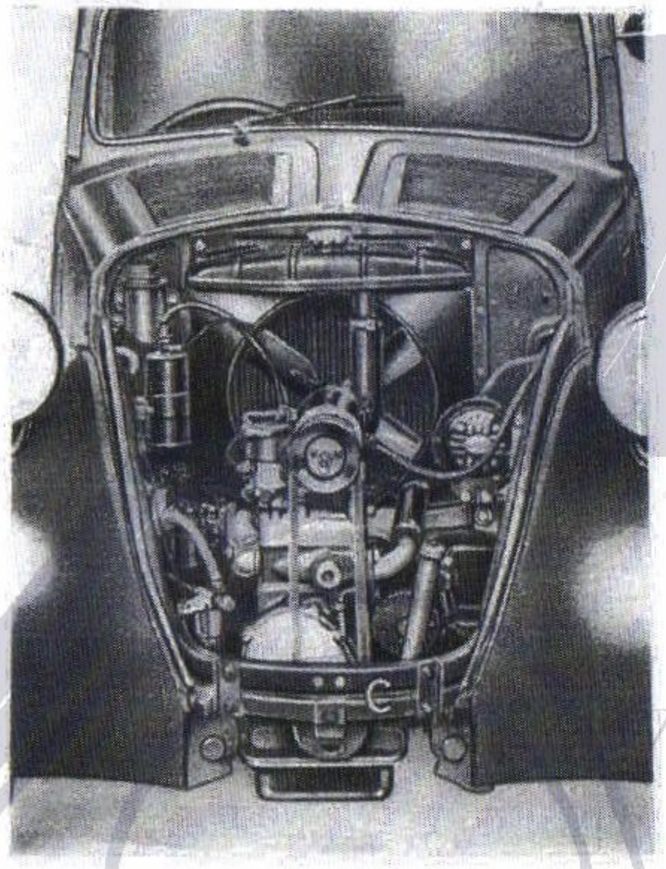


Fig. 8.

C = Cross member connecting the wings, which should be removed in order to remove the engine unit.

Connect the propeller shaft to the transmission brake drum;
the transmission brake control rod;
the clutch control rod;
the dynamo earthing cable to the gearbox;
the speedometer flexible transmission;
the exhaust pipe to the manifold;
the oil pressure gauge pipe to the connection on the engine base chamber;
the engine side undertrays.

Fit the radiator core and connect the rubber hoses to their respective water pipes on the cylinder head and the cylinder block;

the carburetter silencer.

Fix the accelerator control rod and connect the starter motor control cable.

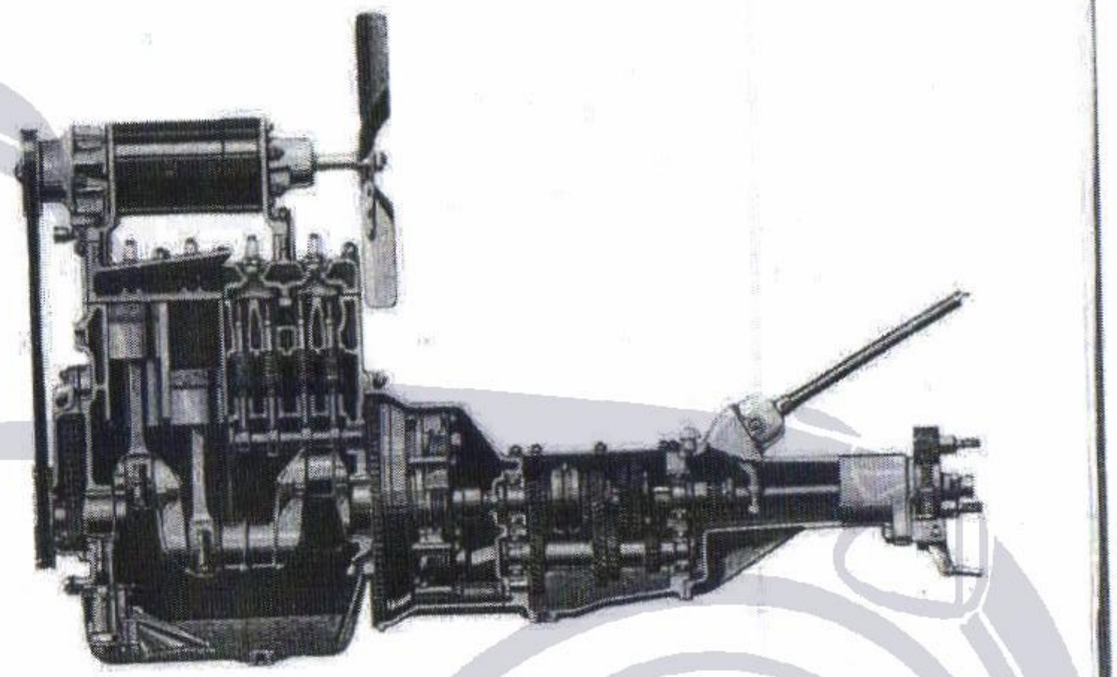


Fig. 9. - Longitudinal section of the mechanical units: engine - clutch - gearbox.

Connect the petrol pipe to the carburetter;
the ignition coil cable to the ignition distributor;
the dynamo and starter motor cable.

Fit the front cross member connecting the mudguards;
the electric horn; connecting the pertaining cables.

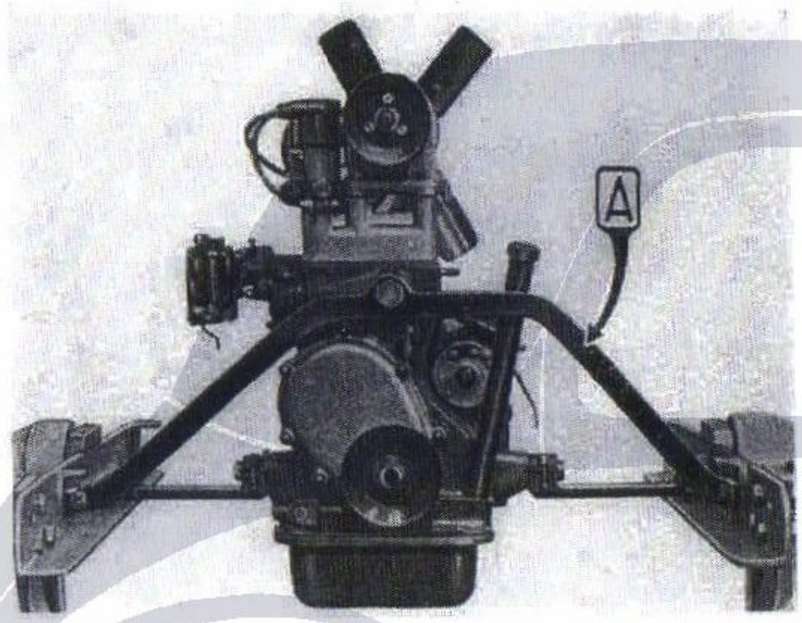
Screw on the gear lever.

Connect the cable to the battery.

Take care that everything is in working order. Then refill the radiator and fit the front portion of bonnet with dummy radiator grill.

Dismantling the assembly.

Fit the stirrups (A, Fig. 9 & 10) Arr. 2205/X and fix the engine to a revolving stand (Arr. 2204) for the inspection.



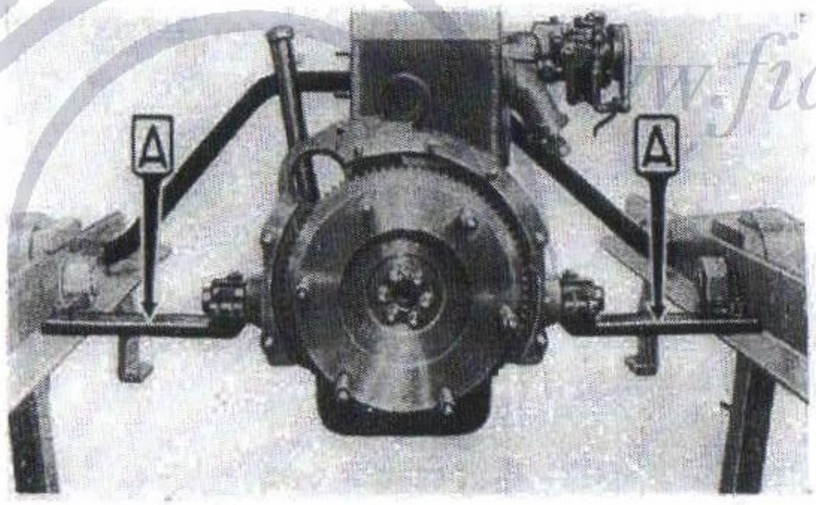


Fig. 10 & 11. - Stirrups Arr. 2205/X, for fixing the engine to the revolving stand Arr. 2204.

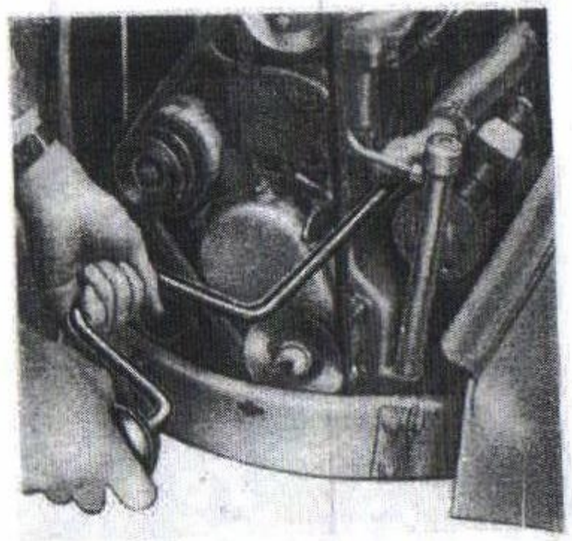


Fig. 12.

Dismantling starter motor with wrench A. 8507.

Remove the plug of the oil sump and drain the sump.

Disconnect the gearbox from the engine; also—should it be necessary—the clutch unit.

Loosen the small bolt fixing the ignition distributor so that the latter may be pulled out from its position. Then disconnect the sparking plug cables;
the nuts fixing the outside flange of the dynamo driving pulley until the belt becomes slack enough and can be removed.

Remove the dynamo.

Disconnect the water inlet pipe.

Fig. 13.

A = Spanner A. 8063 bis for removal of sparking plugs.

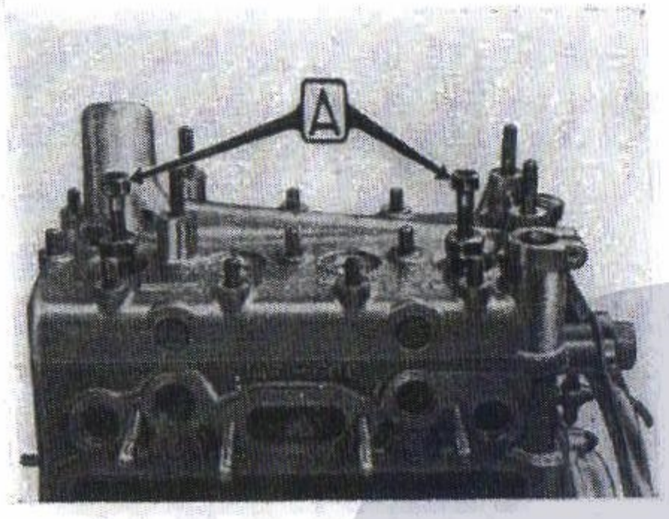


Fig. 14.

A = Draw bolts A. 6506 for the cylinder head.

Remove the starter motor, using the spanner A. 8507 (Fig. 12);
the sparking plugs, using the spanner A. 8063 for engines up to No. 060057, and spanner A. 8063 bis for successive engines (Fig. 13).

Disconnect the cylinder head, having previously loosened all the nuts by means of the draw bolts A. 6506 (Fig. 14). In conjunction with the cylinder head the distributor driving spingle must also be lifted.

Unscrew the cap fixing the dynamo driving pulley, using the spanner A. 8064 (Fig. 15). Then remove the pulley.

Remove the cover of valve gear.

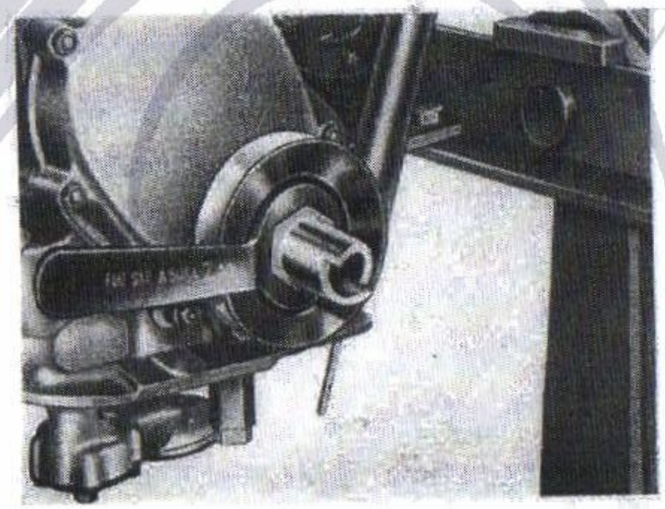


Fig. 15.

Spanner A. 8064 for the cap fixing the dynamo driving pulley.

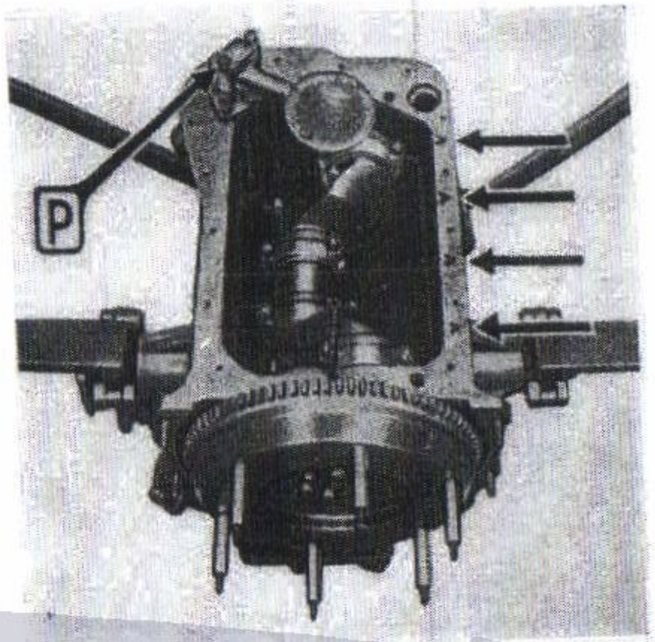


Fig. 16.
P = Oil pump.

The arrows on the right indicate the stamped reference to the exact diameter.

A = mm 52,00 to 52,01
B = mm 52,01 to 52,02
C = mm 52,02 to 52,03

Dismantle the gears on the camshaft, and thus this way remove the driving chain.

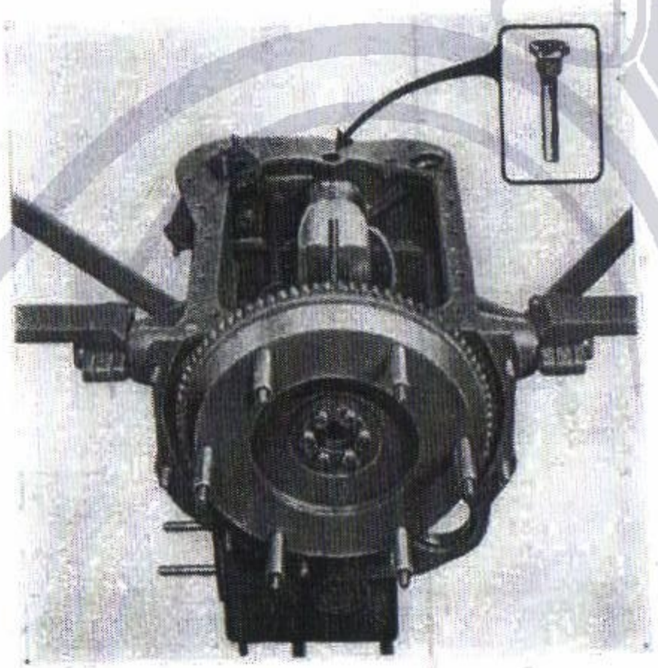


Fig. 17
(Up to engine No. 019250).

In the inset the centring bolt of the crankshaft front bearing is represented. This bolt is hollow to allow a vent to excessive oil pressure.

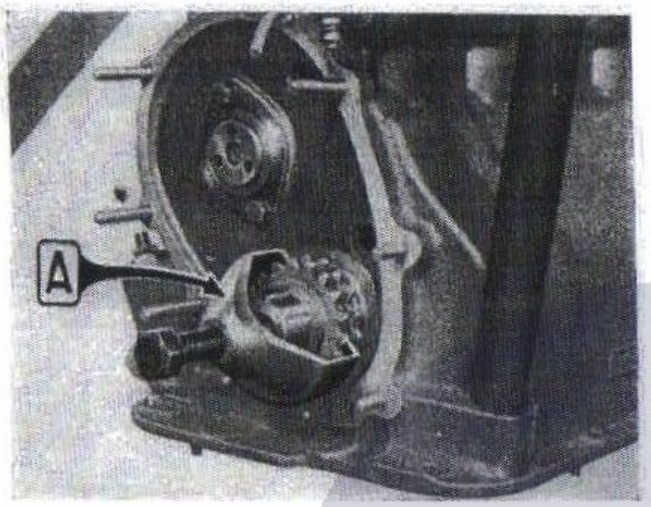


Fig. 18.

A = Drawer, A. 6507, for removing the valve gear driving pinion.

Remove from the crankshaft the driving pinion of the valve gear, using the drawer A. 6507 (Fig. 18).

Disconnect the inlet and exhaust manifold;
the union of the oil pipe from the oil pressure gauge behind facia board.

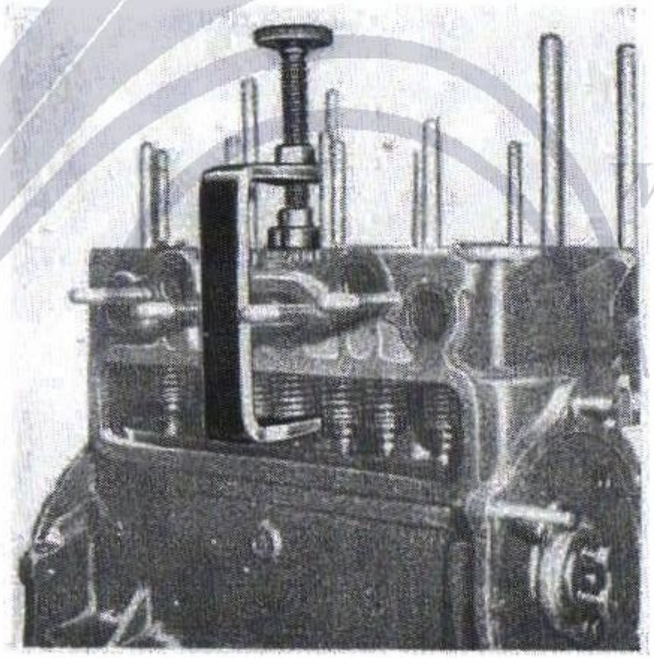


Fig. 19.

Tool A. 10107, for dismantling and fitting the valves.

Turn the cylinder block upside down.

Remove the sump, the oil pump (P, Fig. 16) and the pump driving shaft.

Disconnect the flywheel from the crankshaft.

Remove the big end caps of the connecting rods;
the crankshaft rear bearing;
the crankshaft front bearing, loosening the centring bolt, which is hollow to allow a vent to excessive oil pressure (see inset Fig. 17) on engines up to No. 019250, or the pressure limiting valve on engines starting from No. 019251.

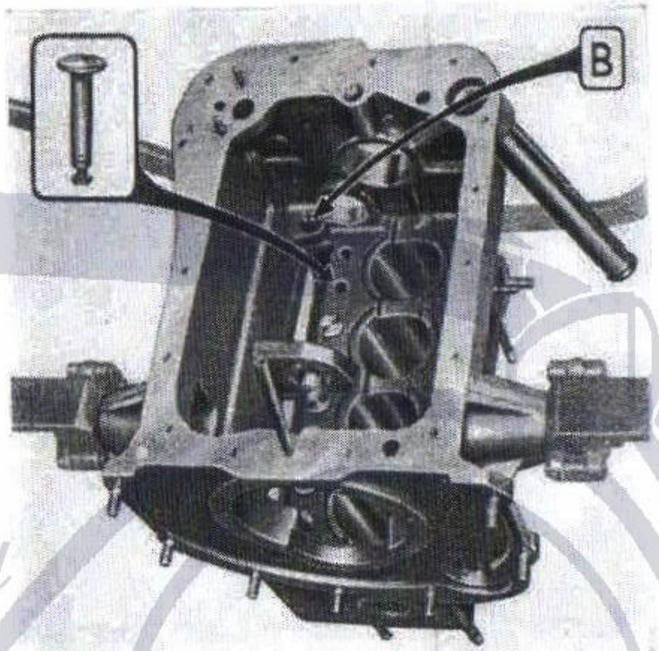


Fig. 20.

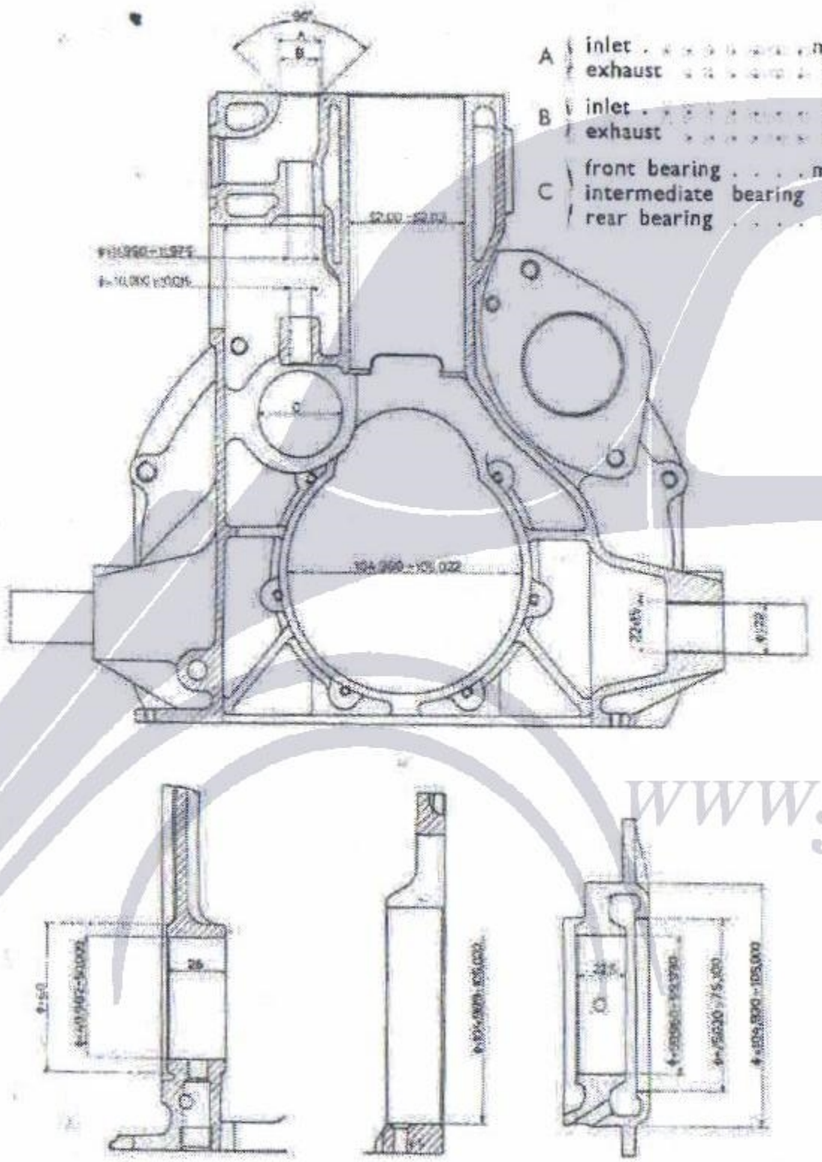
The inset illustrates a tappet out. The letter B indicates the bronze bush which acts as a bearing for the distributor driving shaft.

Remove the crankshaft through the opening of the rear bearing. It is necessary to arrange the connecting rods in such a way that they will not foul the crank webs;
the connecting rods with pistons, taking them off from the lower part of cylinder block.

Dismantle the valves by means of the tool A. 10107 (Fig. 19).

Remove the valve camshaft, pulling it out from its front end;
the tappets from their guides in the cylinder block (see Fig. 20).

CYLINDER BLOCK



A	inlet	mm	21,5
	exhaust	»	20 –
B	inlet	»	19 –
	exhaust	»	17,5
C	front bearing	mm	40,000 ÷ 40,025
	intermediate bearing	»	36,930 ÷ 36,965
	rear bearing	»	24,940 ÷ 24,970

Fig. 21. - Principal data concerning the cylinder block.

The cylinder bores should be checked by use of the dial gauge C. 687 (Fig. 22), which should be also checked over with the ring gauge C. 643 (Fig. 23).

The reboring of the cylinders should be carried out by using the grinder A. 11210 which has a working efficiency from 50 mm to 55 mm diameter. This

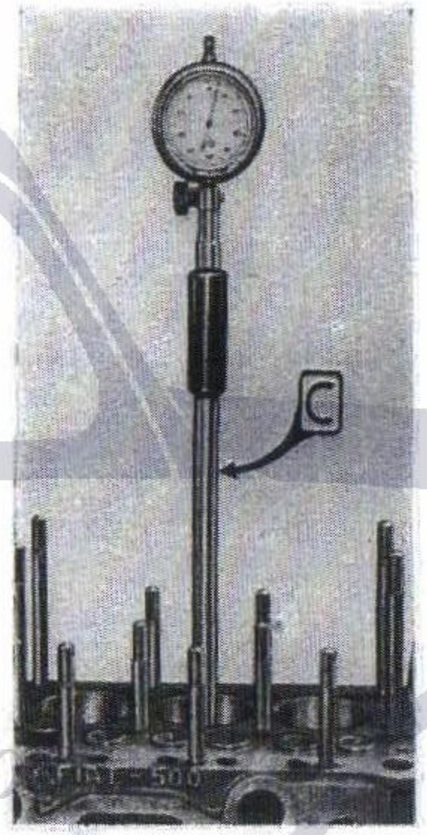


Fig. 22.

C = Dial gauge C. 687 for checking the cylinder bore.

Fig. 23.

C = Gauge C. 643 for checking dial gauge C. 687.

grinder can be fitted to a suitable re-grinding machine as well as a hand-operated tool.

The re-boring of the cylinders should be carried out with fixed machines, which effect the job quickly, or else with portable boring machines.

The valve seats should be hand ground with the cutter A. 11453 fitted to the socket spanner A. 11420; or with the "Vibrocentric" apparatus A. 11640

Fig. 24.

On the apparatus A. 11480 the tapering grinding stone A. 11478, is being dressed, fitted to the valve re-facing chuck A. 11475, for use in the « Vibrocentric » apparatus A. 11460.

which implies the use of the conical grinding stone A. 11476, fitted to the valve re-facing chuck A. 11475. To dress the grinding stone there should be used the apparatus A. 11480 (Fig. 24).

The cutter A. 11454 should be used for refacing the valve seats.

For re-facing the valve seats, using either a cutter or a " Vibrocentric " apparatus, it is necessary to use the expanding pilot A. 11439, which is inserted in the valve guides.

To test for valve leak when all re-facing operations are completed, use the testing apparatus A. 11443, which is designed to fit over the valve head.

The valves guides are cleaned of incrustations by means of the wire brush A. 11444; while a final adjustment can be carried out with the burnishing tool U. 0315.

The **hydraulic test of the cylinder block** is usually carried out with fitted cylinder head, so that both parts result tested at the same time. All holes are stopped and water is admitted through the opening for the cylinder jackets. A pressure of 22 lbs. p. sq. in. (1,5 kg/cm.) should be attained, which is sufficient to render leakages evident if there are any.

CYLINDER HEAD

The cylinder head should never be removed when hot. Always wait until it has cooled down, to avoid possible distortion.

The operations for carrying out this removal have been described on page 26 and the Fig. 14 shows the use of the necessary pullers A. 6506.

The revision of the cylinder head implies a checking over of the rest surface on the cylinder block. If this surface is not plane it should be rendered so by filing and checking over on a surface plate.

It is also indispensable to remove the incrustations of the combustion chambers by means of a wire brush carried by a portable electric drill.

The water jackets too should be cleaned by means of a hooked scraper and then by washing forcibly with a solution of water and soda.

If the engine has been noticed to knock in a manner that cannot be accounted with the ignition advance, the capacity should be checkec of the combustion chambers to ascertain whether it is the same for every chamber.

For checking the capacity of the combustion chambers, the cylinder head must be fitted, the piston brought to t. d. c., and the valves closed. Then pour through the spark plug hole, a mixture of castor oil containing benzol to the ratio of 20% and use a graduated vessel so to effect a most accurate measure. The liquid should reach the same level in each cylinder.

CRANKSHAFT AND CRANKSHAFT BEARINGS

The crankshaft is supported only at its ends by means of two circular sleeve bearings. In order to ensure perfect working efficiency of the engine, it is most important that the crankshaft pins are exactly aligned. Should they not be so they must be straightened under a press and then re-faced. By using the special tool for re-facing the crankshaft pins any poss ble ovalization will also be corrected. The crankshaft journal re-grinding may be carried out with a circular grinding machine, bearing in mind that for the connecting rod pins the hand-operated tool A. 11503, fitted with an A. 11518 blade of 28 mm in width is quite suitable.

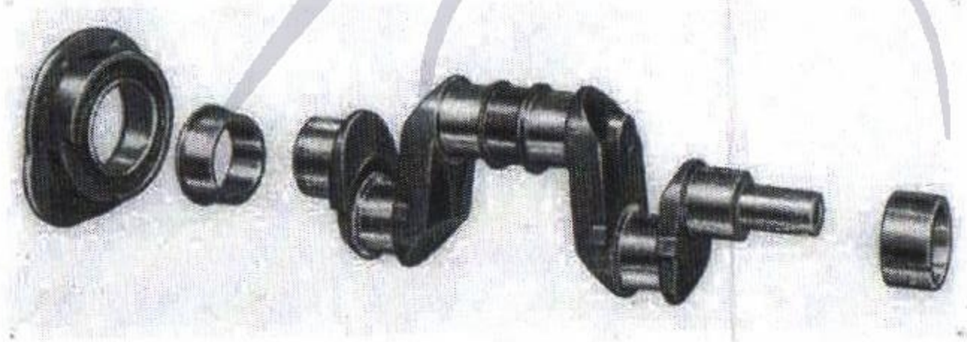


Fig. 25. - Crankshaft and crankshaft bearings.

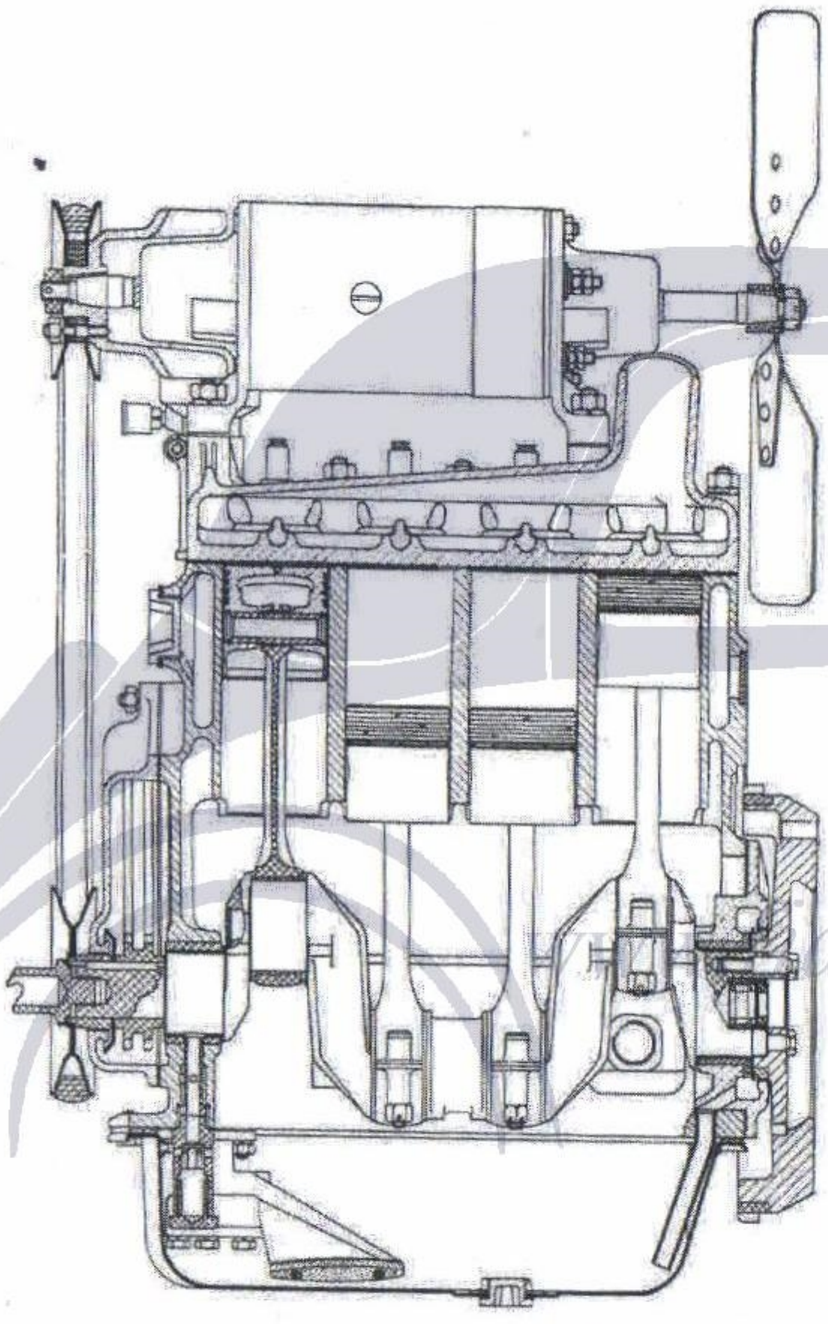


Fig. 26. - Engine section through the crankshaft (starting from engine No. 019251).

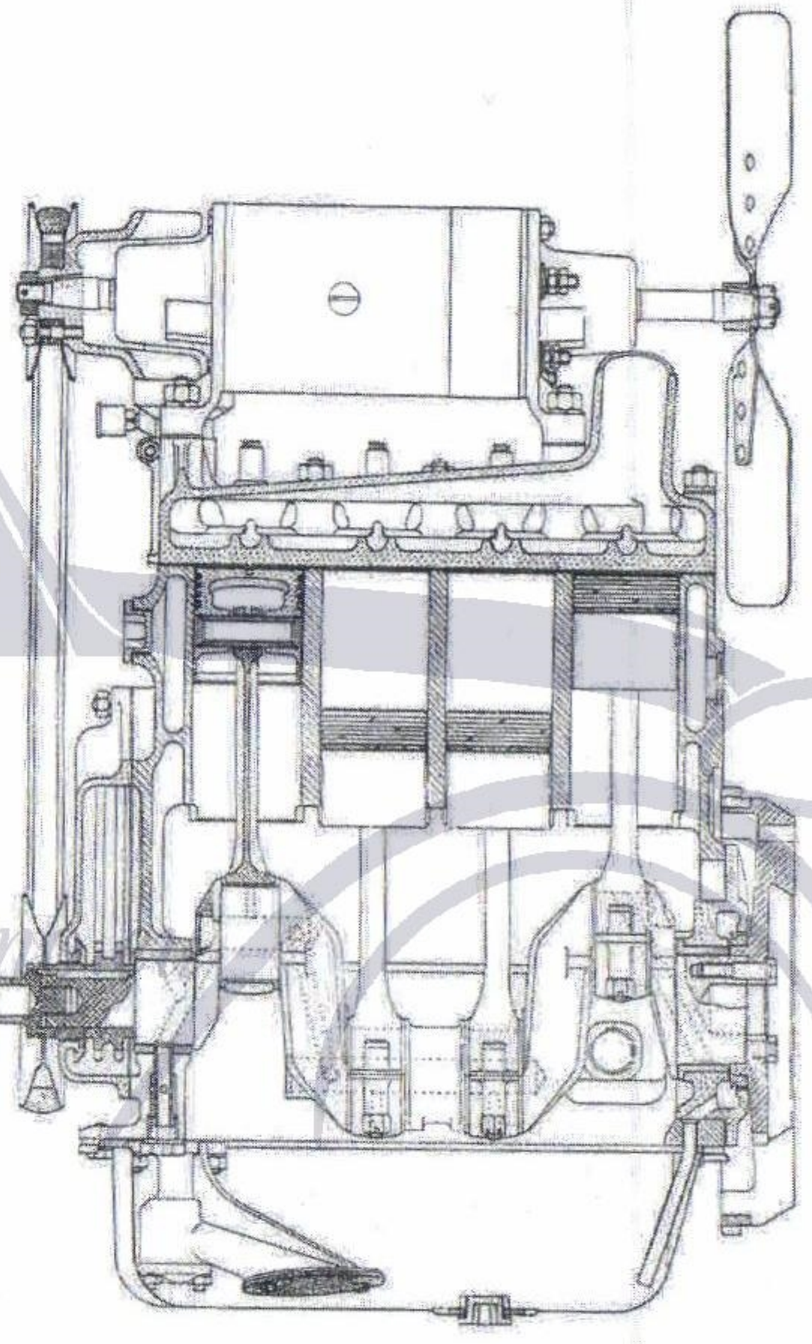


Fig. 27. - Engine section through the crankshaft (up to engine No. 006618).

The clearance between the main bearings and the main journals of the crankshaft should be as small as possible. If it is found that this clearance exceeds 0,10 mm (.004"), it is advisable to replace the bearings altogether, re-facing the pins if they are out of round. The bearings must be perfectly aligned. To achieve this result it is advisable to re-face them to the exact diameter, using the tool carrier A. 11606 (Fig. 29).

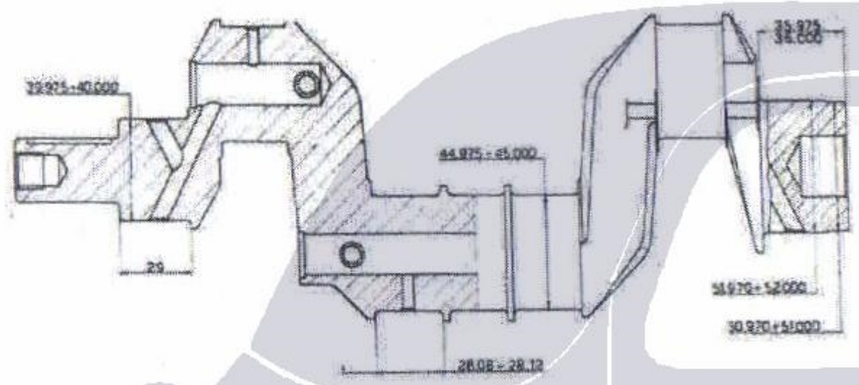


Fig. 28. - Crankshaft and main bearings, starting from engine No. 006619.

Progression of oversize dimensions for main bearings:

front: mm 0,2 - 0,4 - 0,6 - 0,8 - 1 - 1,5 - 2.

rear: mm 0,2 - 0,4 - 0,6 - 0,8 - 1.

The oil passages should be most carefully cleaned. If necessary dismantle the lubrication pipes conveying the oil to the connecting rod pins. When re-assembling them, carefully connect the terminal unions to the crankshaft bearings, in order to prevent them becoming loose when the engine is running, thus causing overheating and running of the metal.

In Fig. 28 we give the principal structural data for the crankshaft and main bearings. On the basis of the standard constructional tolerances it will be easy to adapt oversize replacement parts in order to obtain a fitting in accordance with the original standard clearances.

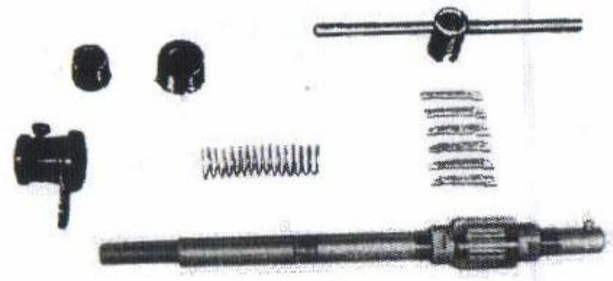


Fig. 29.

A. 11606 - Chuck for refacing the crankshaft bearing on a « 500 Model » engine.

Mind that up to engine No. 006618 the crankshaft diameter was not smaller at the rear bearing end, and that the bearing shoulder, up to engine No. 011435,

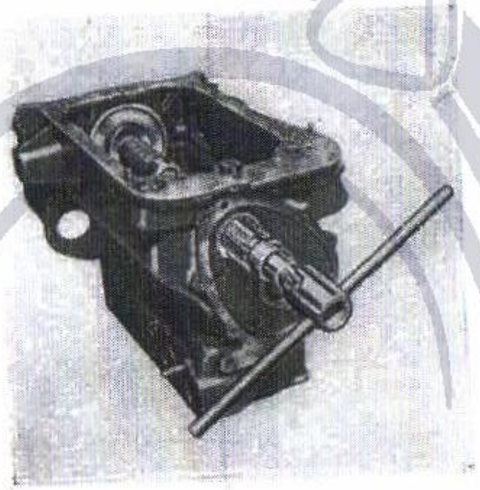


Fig. 30.

A. 11606 - Chuck for refacing the crankshaft bearings.

was facing the opposite side of flywheel. Furthermore this bearing had the oil discharge sloping on the shoulder side.

That arrangement is illustraded on the engine section of the unaltered engine (Fig. 27).

CONNECTING RODS AND PISTONS

To revise the connecting rods, their squareness should be checked with the apparatus C. 627 (Fig. 33). The big and the small end axes must be absolutely parallel; if not so any deformation should be eliminated with a forked key.

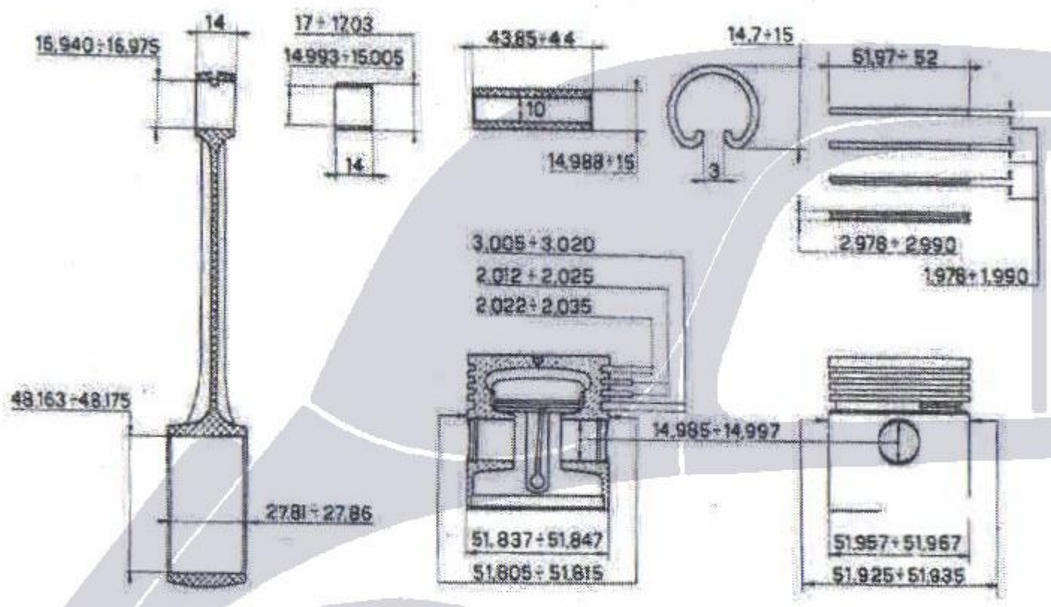


Fig. 31.

Connecting rod, piston pin, piston and piston rings shown according to their assembling order.

NOTE - The data for piston clearance are the nominal ones for pistons marked with the letter A; whereas those stamped with B and C correspond to 0,01 (.0004") and 0,02 mm (.0008") oversize dimensions. Up to the engine No. 001204 the diameter of the piston was greater by mm 0,01 (.0004") than now.

Range of oversize spare parts:

Connecting rod = mm 0,20 - 0,40 - 0,60 - 0,80 - 1 - 1,5 - 2.

Piston pin = mm 0,20 - 0,50.

Piston = mm 0,10 - 0,20 - 0,40 - 0,60 - 0,80 - 1.

Piston ring = mm 0,10 - 0,20 - 0,40 - 0,60 - 0,80 - 1.

See assembling data on page 157.

If the connecting rod bearings appear heavily scored or they are worn out, they must be replaced, fitting the new bearings to the crankshaft pin, which should be opportunely re-faced.

To fit the new bearings they should be re-bored with tool A. 11806, leaving them 0,01 mm (.0004") oversize so that a perfect finish may be achieved with a scraper. When the correct fit has been reached, the bearings should be smoothed out with a burnishing tool.

When replacing the connecting rod small end bush, remember that is must be driven into its seat and opportunely fitted to the piston pin by meant of an expanding reamer U. 0326 (Fig. 34) which has a working diameter of 15 mm ($2\ \frac{1''}{2}$).

Connecting rod small end and piston pin clearance should be inferior to .0004" (0,01 mm).

Prior to their fitting, the connecting rods must be weighed. Their weight should be identical or, at most, with a 3 gr. ($\frac{1}{10}$ oz) of tolerance more or less.

Starting from engine No. 118351 new connecting rods with bearings inserts have been installed; crankpins are therefore machined with a thinner tolerance: 44,988 to 45,000 mm.

Connecting rods cannot be singularly replaced with new ones; this replacement is permissible only for the whole set of four rods, which should be provided with undersize bearings suited to the diameter of crankpins being accordingly refaced down to the size rate of relevant undersize bearings.

NOTE. - Thin-wall bearings are a precision-insert type; neither reface nor adjust them! Connecting rod caps should be righetened with a torque wrench gauged at a tension of 2000 kg/mm.

To this purpose see the pamphlet "Thin-wall bearings" SAT publication No. 1056, April 1948.

The piston revision asks for a scraping of the upper portion of the piston, also of the ring grooves; and this operation can be carried out with a wire brush fitted to an electric drill, or with a scraper.

Then check the parts for wear.

If the piston walls are found excessively out of round they must be replaced with oversize others to be fitted by opportunely re-boring the cylinder walls.

Replace too with oversize ones those scraper rings that show excessive play in their slits.

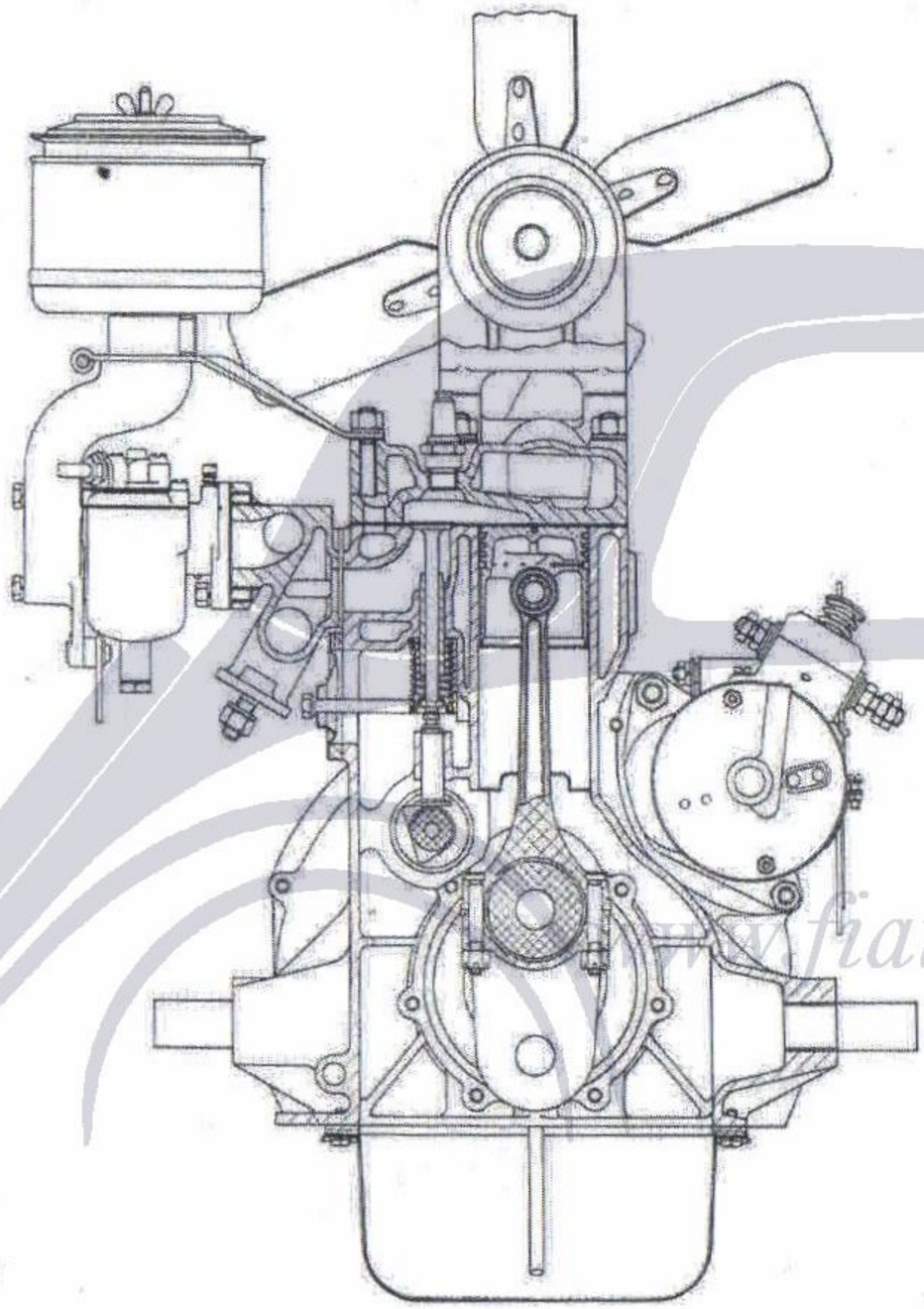


Fig. 32.

Cross section of the engine, through the connecting rod, piston and valve.

If the piston pins are scored or out of round, and if their seat in the gudgeon too is out of round, new oversize pins should be fitted, conveniently reboring their seat and the nush of the connecting rod small end with the expanding reamer U. 0326.

The fitting of the pistons to the engine can be made easier by employing the band A. 10108. The tool A. 10114 for fitting the piston rings prevents breakages.

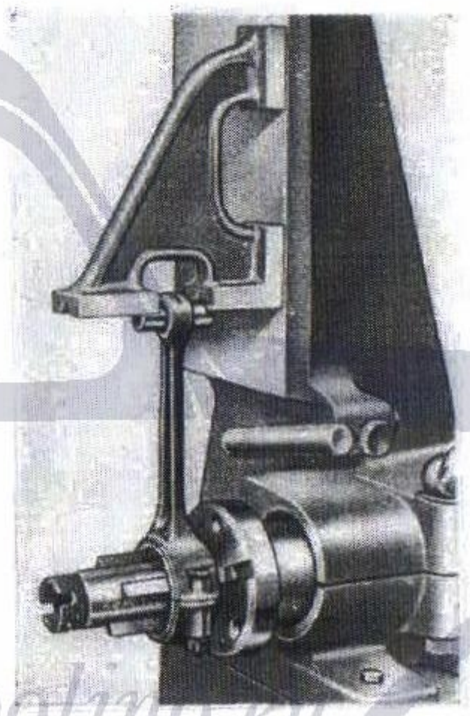


Fig. 33.

Checking the connecting rod alignment with tool C. 627.

Fig. 34.

Refacing the bush of the connecting rod small end by means of expanding reamer U. 0326.

To avoid breaking the piston rings while fitting or removing them use the clips A. 10114.

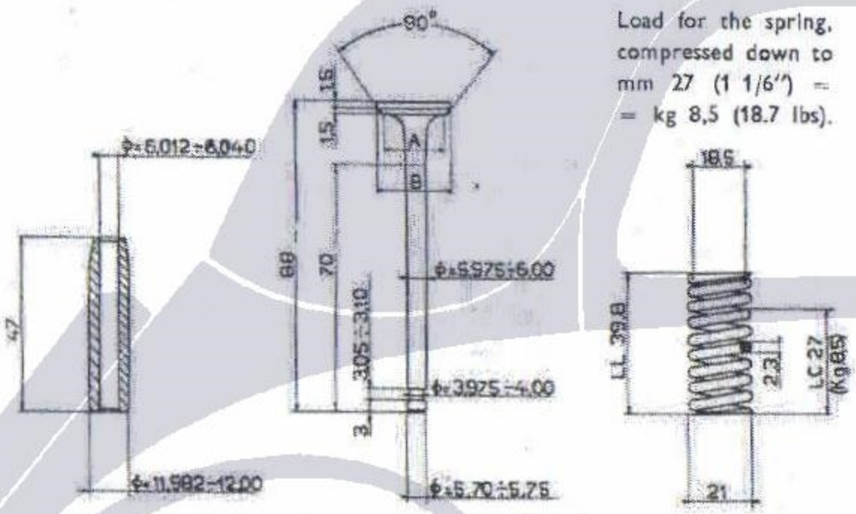
To re-cut the piston pin hole in the piston, use the expanding reamer U. 0326 (15 mm diameter).

Pistons must be fitted with the vertical slit facing the direction of rotation of the engine.

VALVES, VALVE GUIDES AND VALVE SPRINGS

Carbon deposits on the valves are removed with a revolving wire brush, while for cleaning the valve guides the suitable A. 11444 wire brush should be used.

Then measure the valve stem diameter and if it is 0,10 mm (.004") less than the correct one replace the valve. Check also the valve stem clearance in its



Load for the spring, compressed down to mm 27 (1 1/6") = = kg 8,5 (18.7 lbs).

Fig. 35. - Main data concerning the valves, valve guides and valve springs.

guide, which must be driven in its seat. If the clearance overpasses 0,15 mm (.006") replace the part which results more worn out, or both.

To fit new valve guides use the reamer U. 0315. To take off and re-insert the valve guides use the tommy bar A. 10109, for which a suitable washer is provided, as shown on Fig. 36.

When inspecting the valves, the valve seat, both on the valve itself and on the cylinder block should be re-faced as described on page 32.

The seating portion of the valve should be re-faced on the grinding machine A. 11401, whereupon the valve tightness should be tested with the apparatus A. 11443.

The valve springs must be carefully inspected so to discard those that have deteriorated through cracks or loss of elasticity. Suitable apparatuses for measuring their flexibility are available, but in any case this measure can be carried out by loading the springs with weights and checking the ensuing compression, which must be maintained within established limits, as shown on Fig. 35.

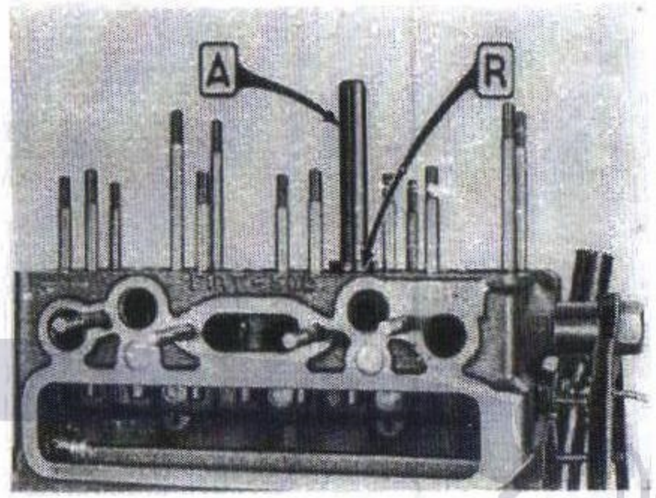


Fig 36

A = Tommy bar A 10109, for dismantling and assembling the valve guide

The distance washer R will act as a gauge for the depth of the valve guides

Before grinding valves it is necessary to make sure that the stem is perfectly straight and correctly fitted in the self centering chuck of the grinding machine.

VALVE TAPPETS

The tappets are slid directly into their guides in the cylinder block (Fig. 20) The allowable clearance between the tappet and the guide is about 0,15 mm (.006").

Oversize range of tappets: 0,05 mm; 0,10 mm.

If the end of the tappet which rests on the cams of the camshaft appears slightly scored it should be smoothed with a small block of the finest carborundum.

CAMSHAFT AND BEARINGS

The camshaft should be perfectly aligned. If, on checking it with a dial indicator, it is found out of alignment for more than 0,05 mm (.002") it must be straightened with a press.

The bearing journals and the cams must be smooth. If not so they should be smoothed with carborundum.

The clearance between the bearing journals and their bearings must not overpass 0,15 mm (.006"). This clearance can be measured with a micrometer.

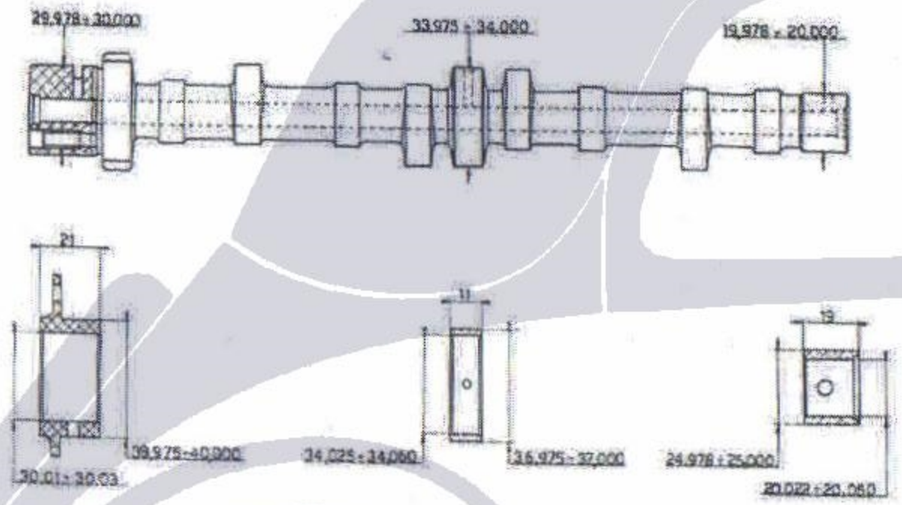


Fig. 37. - Main data concerning the camshaft and its bearings.

The bearings must be slightly tight in their seats on the cylinder block. If a clearance is detected they must be replaced to prevent their turning together with the camshaft.

Closely inspect the camshaft gears and chain; if the gears appear worn or the chain slack, the part concerned must be replaced.

DRIVING SHAFT FOR OIL PUMP AND IGNITION DISTRIBUTOR

The driving shaft for the oil pump and the ignition distributor is carried in the bronze bush B (Fig. 20) and is driven off the camshaft through a suitable gear.

To avoid undue noise and wear make sure that the play between this bush and the shaft does not exceed mm 0,15 (.006").

Also do not fail to ascertain that the driving shaft and the vertical one operating the ignition distributor are aligned, and that the joints too are in perfect condition.

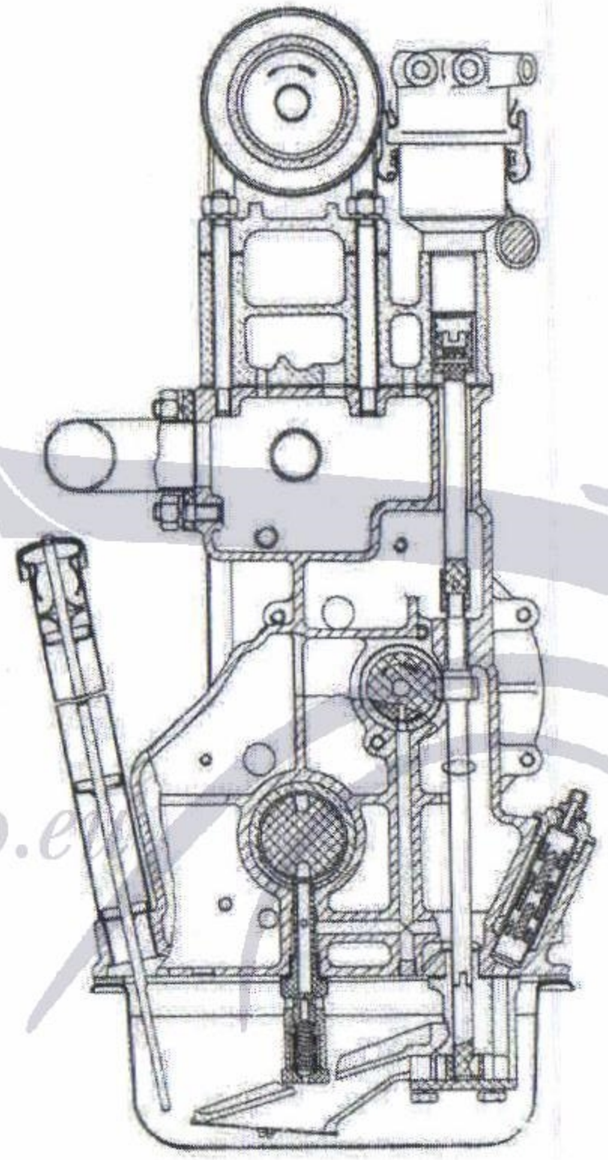


Fig. 38.

Cross section of the engine through the driving shaft for the oil pump and the ignition distributor. (Starting from engine No. 019251).

ENGINE LUBRICATION

Oil pump.

The engine lubrication is forced by means of a gear pump, driven, as it has been said, off the camshaft.

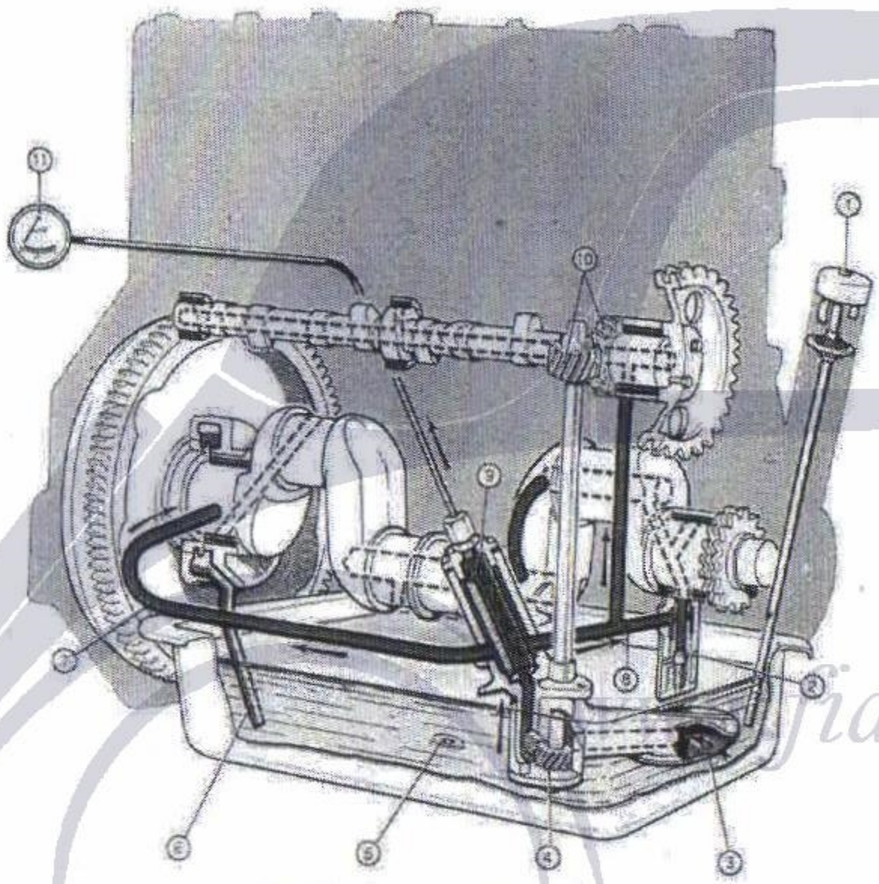


Fig. 39. - Engine lubrication diagram.

1. Oil level dip stick. - 2. Pressure relief valve. - 3. Suction filter. - 4. Gear pump. - 5. Sump drain plug. - 6. Return pipe from rear bearing housing. - 7. Oil delivery pipe to back main bearing. - 8. Oil delivery pipe to front main bearing and camshaft. - 9. Delivery filter. - 10. Pump driving gears. - 11. Pressure gauge.

This pump is submerged in the oil sump and is fitted with intake and delivery filters. On the latter filter is connected a pipe for the pressure gauge which should show—when the engine is normally operating—a pressure of 2,5 kg. p. sq. cm. (35 lbs.).

On the crankshaft front main bearing is screwed a pressure relief valve (Fig. 41). If uncorrect pressures are noticed, the valve must be adjusted by conveniently actuating the retain plug for the valve spring.

Figure 39 shows the engine lubrication system.

On occasion of a revision check the play between the gears and the pump body; this play must not overpass 0,15 mm (.006"). Check also the clearance

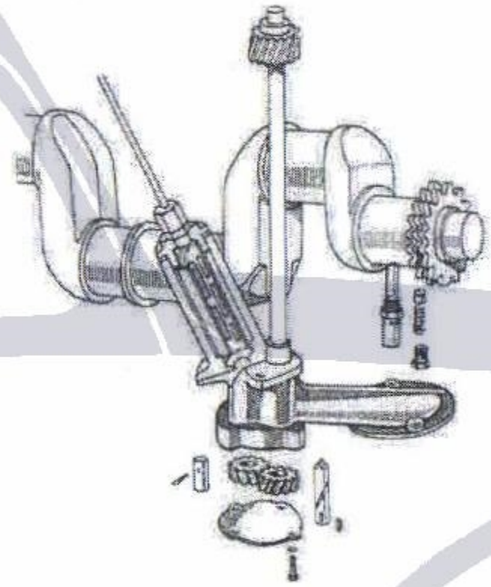


Fig. 40.

Oil gear-wheel pump (fitted from engine No. 019251).

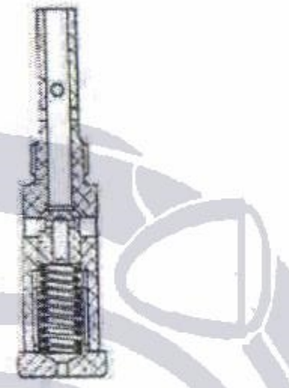


Fig. 41.

Cross section of oil pressure relief valve (fitted starting from engine No. 019251).

between the pump driving shaft and its guide; the maximum allowable clearance being 0,15 mm (.006").

Inspect that the gears are not worn; and, if necessary, replace them. Thoroughly clean the suction strainer.

Formerly, up to engine No. 019250, a vane-type pump was fitted, and with this was not present a pressure relief valve. The oil surplus was discharged in the sump through a pierced bolt which acted as a retaining dowel for the crankshaft front main bearing (Fig. 17).

CARBURETTER

As it has already been said in the " Leading Features " chapter the types of carburetters that have been fitted are: Solex 22 HD and Weber 22 OTS; but while the Solex carburetter has always been integrated with an economizer,

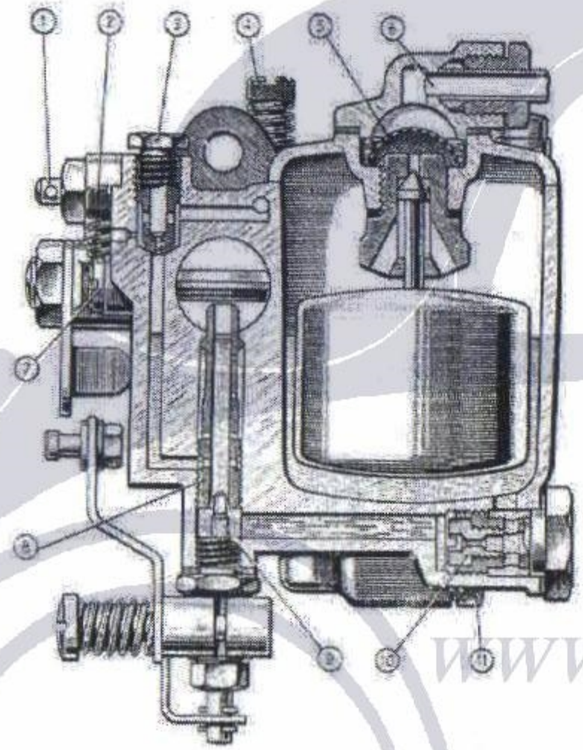


Fig. 42 - Section of the 22 HD Solex carburetter (with economiser).

1. Control needle valve for the starting device. - 2. Idling speed adjusting screw. - 3. Auxiliary jet. - 4. Idling speed air inlet regulating screw. - 5. Filter gauze. - 6. Petrol inlet union. - 7. Emulsion air inlet. - 8. Emulsion tube. - 9. Petrol economiser. - 10. Main jet. - 11. Pilot jet.

the latter, starting with engine No. 100517, is devoid of that device, because of the very low fuel consumption peculiar to the " 500 Model ".

For the data regarding these carburetters see page 7 of the " Instruction Book ".

The carburetters can be easily removed or adjusted. They must however be removed only on occasion of their cleaning, but the greatest care must be had not to alter the jet calibration so to prevent afterwards abnormal operation of the engine.

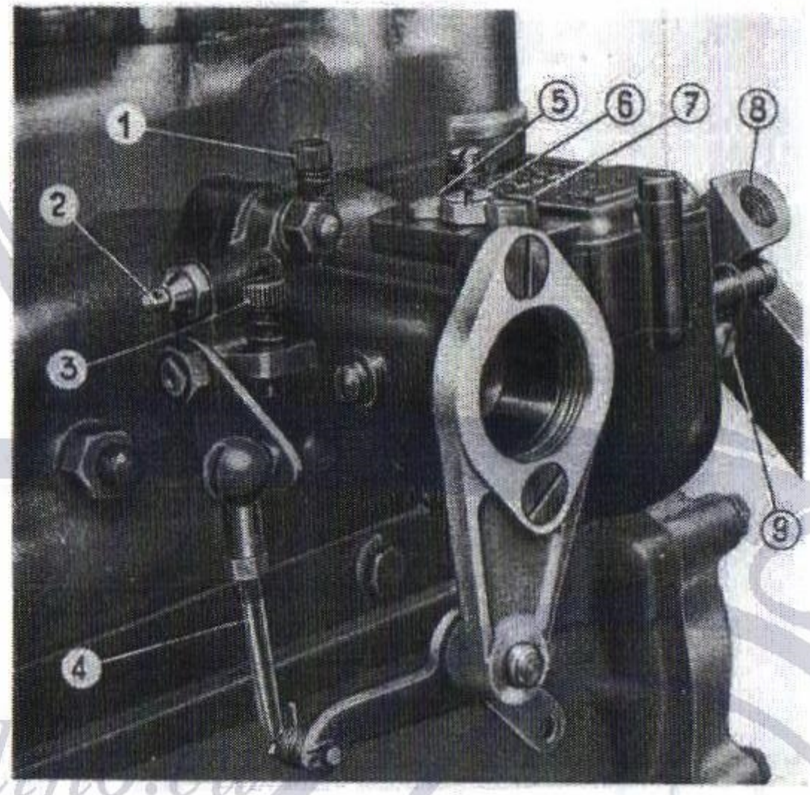


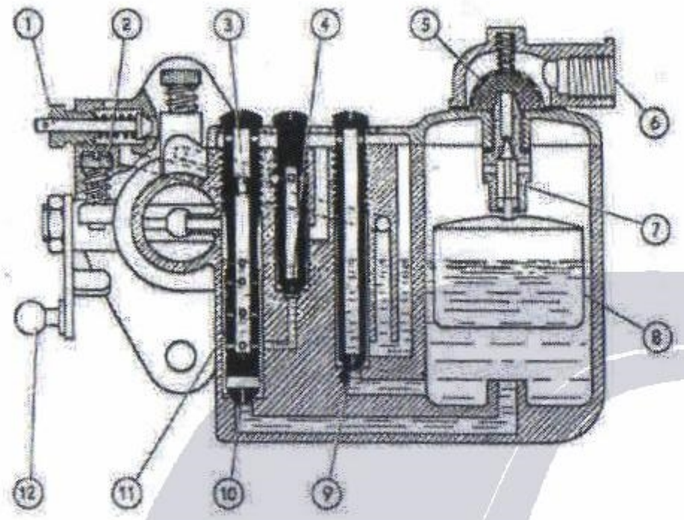
Fig. 43. - Weber 22 OTS carburetter (without economizer).

1. Adjusting screw for idling mixture. - 2. Primer valve. - 3. Adjusting screw for idling speed. - 4. Throttle control tie rod. - 5. Primer jet holder. - 6. Main jet holder. - 7. Idling jet holder. - 8. Petrol inlet connection. - 9. Fulcrum screw for float.

The best procedure for cleaning the jets is that of blowing forcibly air through them and washing them afterwards with clean petrol.

This way the cleaning will be perfect and the jet diameter will remain unaltered.

The figure stamped on every jet corresponds to the diameter expressed in hundredths of millimeter.



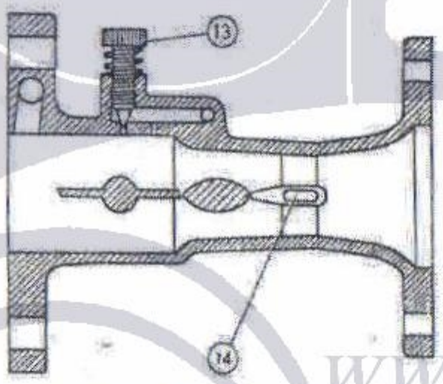


Fig. 44. - Section of carburetter Weber OTS.

1. Primer valve. - 2. Adjusting screw for acceleration throttle. - 3. Compensating air intake. - 4. Idling jet. - 5. Filter gauze. - 6. Fuel inlet. - 7. Valve of bowl. - 8. Float. - 9. Pilot jet. - 10. Main jet. - 11. Emulsion tube. - 12. Control lever for acceleration throttle. - 13. Adjusting screw for idling mixture. - 14. Fuel outlet into diffusion tube.

RE-ASSEMBLING THE ENGINE

When the revision operations for the engine have been effected, the engine can be assembled by reversing the dismantling procedure that has been described on page 24.

Whereupon the valve gear and the ignition can be timed and the engine brake horsepower can be determined, operating as indicated in the chapters that follow.

VALVE TIMING

Marking numbers on the cylinder head 1-2-3-4
Firing order 1-3-4-2

1) The engine has been removed from the car:

a) Fit to the engine back the graduated sector C. 642 (Fig. 45).
b) By means of gauge C. 110 and of wrenches A. 8061 (two) and A. 8062

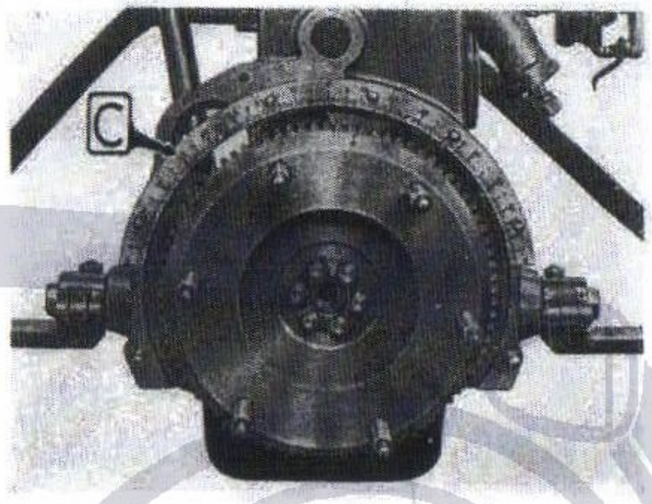


Fig. 45.

C. = Graduated quadrant C. 642 for timing the engine.

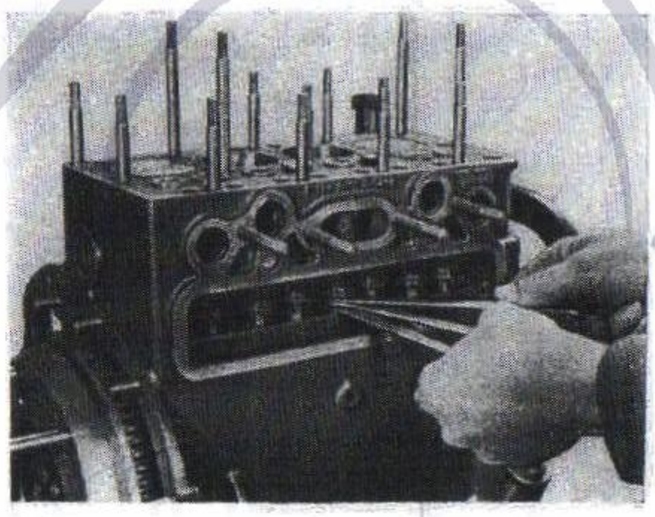


Fig. 46.

Spanners (two) for adjusting the tappets: A. 8061 and A. 8062.

(Fig. 46), temporarily adjust to 0.25 mm (.01") the clearance between the tappets and the intake and exhaust valve stems of No. 1 cylinder.

c) Turn the crankshaft by hand until the arrow stamped on the flywheel, corresponding to the t. d. c. of pistons No. 1 and No. 4, points on the graduated sector to 8° advance in the direction of the engine rotation.

d) Turn the camshaft until the cylinder No. 1 intake valve just starts opening.

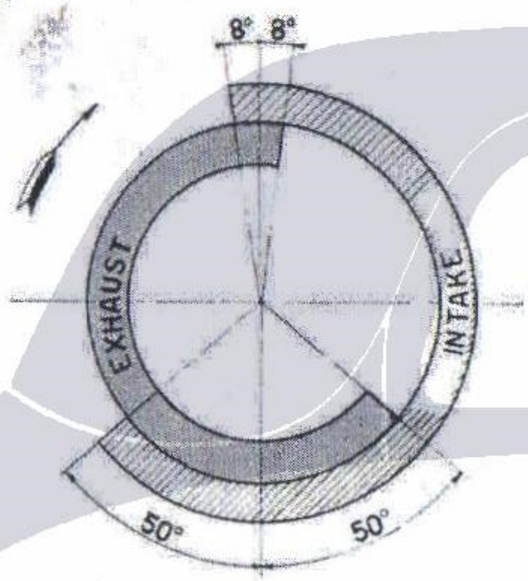


Fig. 47.

Valve timing diagram for a 0,25 mm (.010") clearance between valve and tappet.

e) Make sure that the marks " O " stamped on the distribution gear wheel and on the crankshaft pinion correspond. Then fit the chain (Fig. 48).

f) Finally adjust all tappets of the intake and exhaust valves respectively to 0,10 mm and 0,20 mm.

2) The engine is fitted to the car:

To check the valve timing, the operations that follow must be carried out:

a) Adjust to 0,25 mm (.01") the clearance between the tappet and exhaust valve of cylinder No. 4.

b) Turn the crankshaft until the exhaust valve of the same cylinder No. 4 just starts opening.

c) Remove the plug on the cylinder head, in coincidence with cylinder No. 4 and fit instead gauge C. 900 for checking the dead center (Fig. 49). Push the rod up to the top of the piston and note the position of the reference nick, then turn the crankshaft so as to reach the piston bottom dead center and make

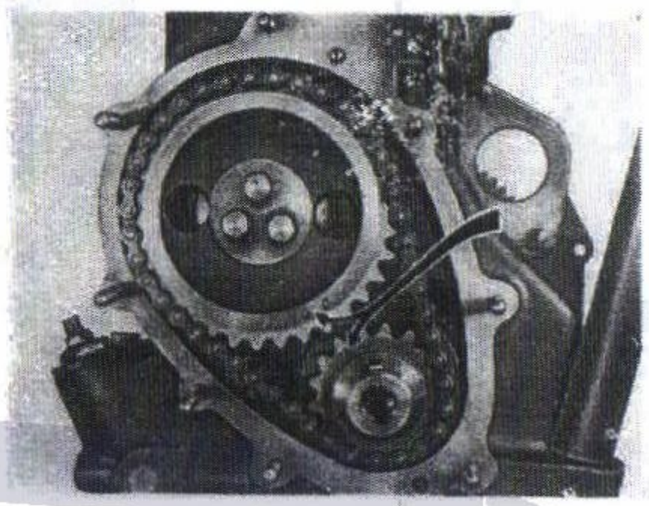


Fig. 48.

The arrow shows the marks O, which must correspond when the timing operation has been accomplished.

sure that the rod has descended 12 mm, with a tolerance of 0,5 mm more or less.

d) When the check operations have been accomplished adjust the valve tappet clearance according to normal value.

It is indispensable to effect the valve timing any time the valve gear control chain has been removed, whatever the reason.

TIMING THE IGNITION DISTRIBUTOR

Marking numbers on the cylinder head	1-2-3-4
Firing order stamped on the ignition distributor	1-3-4-2

The ignition distributor must be set with 5° ignition advance. The advance is automatically controlled through a device within the distributor any time the engine attains a given speed. The automatic advance is 17°. The whole advance is therefore 22°.

On the following page the procedure is described for timing the ignition.

1) The engine is removed from the car:

a) Fit to the engine back the graduated sector C. 642 (Fig. 45).

b) Turn the flywheel so to make the arrow for the t. d. c. of cylinders No. 1 and No. 4 point 5º advance.

c) See which of either cylinder is in the compression stroke and set the distributor rotating brush in correspondence with the contact block for the current to the pertaining cylinder.

d) Fit the distributor, together with its driving spindle, making sure that the contact platinum points are just parting. To achieve the utmost precision, the distributor brush should be contrasted, that is slightly pushed in the opposite direction to rotation, so to neutralize any play existing in the automatic advance device.

2) The engine is fitted to the car:

a) Unscrew, on the No. 4 cylinder head the plug for checking the dead center, and screw up instead the apparatus C. 900 (Fig. 49).

b) Turn the crankshaft and, with the aforesaid apparatus, make sure that the piston of No. 4 cylinder reaches about 0,15 mm (.006") before t. d. c. in the exhaust stroke. This position corresponds to the firing instant in No. 1 cylinder with an advance of 5º with respect to the t. d. c.

c) Set the distributor revolving brush in correspondence with the current contact for No. 1 cylinder, and fit the distributor, together with its driving spindle, making meanwhile sure that the ruptor platinum points just start parting.

Adjust the gap of the platinum points between mm 0,47 and mm 0,53.

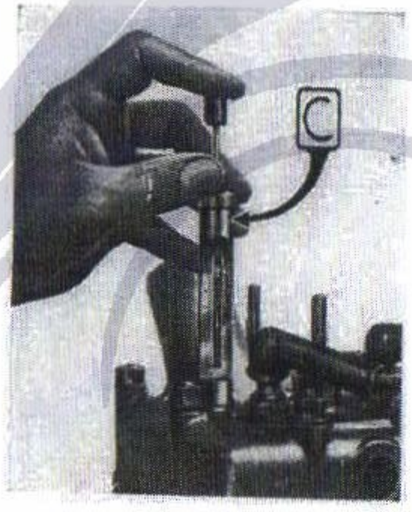


Fig. 49

C – Gauge C. 900 for checking the engine dead center.

Even a small misadjustment in the ignition timing may bring about a diminution of the engine efficiency.

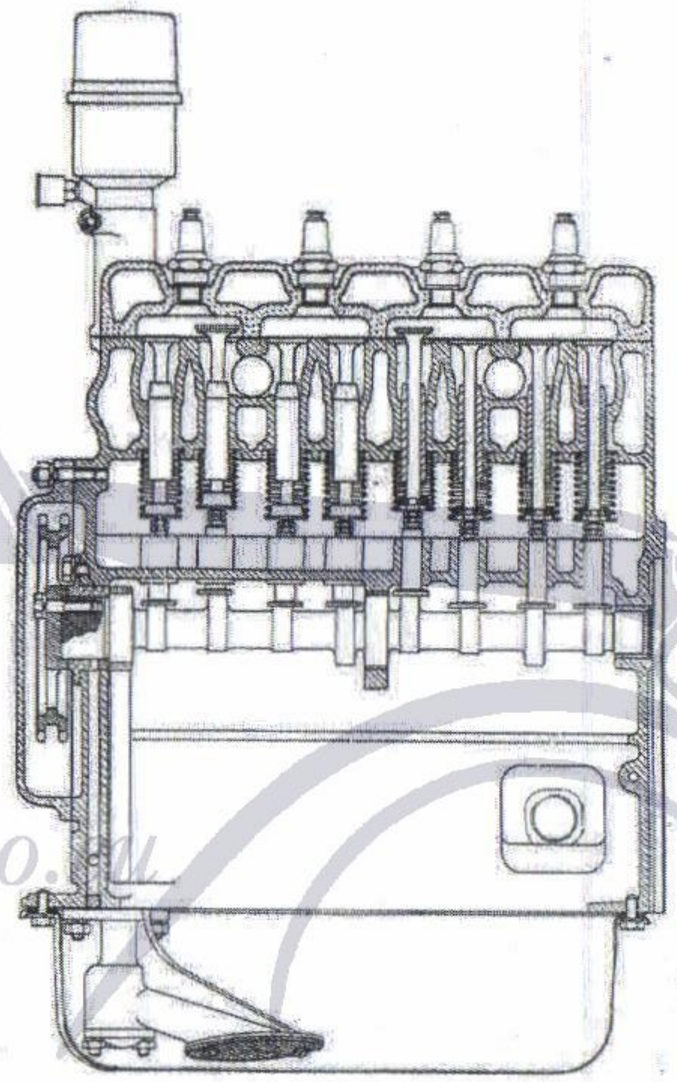


Fig. 50.

Longitudinal section of the engine through the valve gear.

ENGINE BRAKE TESTS

After a general overhaul of the engine it is advisable, in carrying out the brake tests, to abide by the data of the following table:

Time in hours	R. p. m.	Weight in kg at the end of an arm 0,716 m in length	H. P.
0,20	400 ÷ 800	—	—
0,20	800 ÷ 1200	1,25	1 ÷ 1,5
0,20	1200 ÷ 2000	2,25	2,7 ÷ 4,5
0,20	2000 ÷ 2500	3,00	6 ÷ 7,5
0,20	2500 ÷ 3000	3,5	9 ÷ 11
0,20	3400	3,7	11,9

On completing these tests on the bench the engine should be fitted into the car and then run in for about 100 km (60 miles) at moderate speed before driving a the maximum revolutions. If it is desired to carry out the running in period on the test bench, the tests should be prolonged for about 3 hours at a speed of 3000-3400 r. p. m. and with a load of kg 3,5 ÷ 3,7.

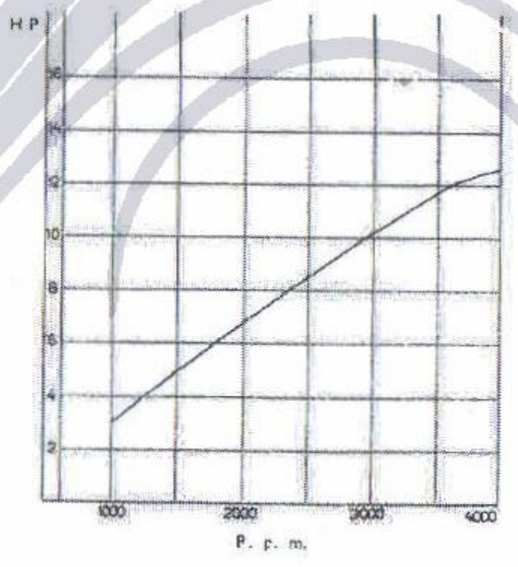


Fig. 51.

Horse-power curve for the 500 car engine.

CLUTCH

The clutch pedal should be adjusted in such a way as to leave 14 to 18 mm (1/2"-3/4") free travel before operating the clutch. When the clutch linings have become worn to such an extent that the free travel is reduced or eliminated

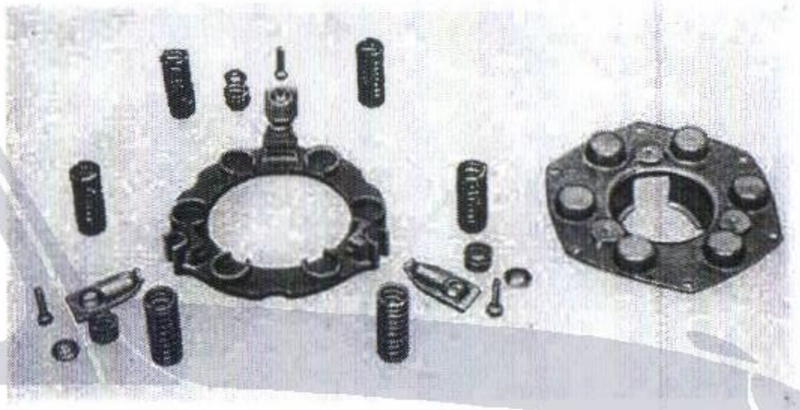


Fig. 52. - The clutch dismantled.

—in which case the clutch will tend to slip—the pull rod controlling the horizontal clutch lever must be slackened off and locked in the new position by means of the lock nuts provided.

If, by slackening the pull rod, the necessary adjustment is not obtained, this shows that the clutch facings are worn out and must be renewed.

In such a case it is necessary to again balance the driven plate.

The plate may be balanced by reducing weight on the heavier side by grinding and scraping the outer edge.

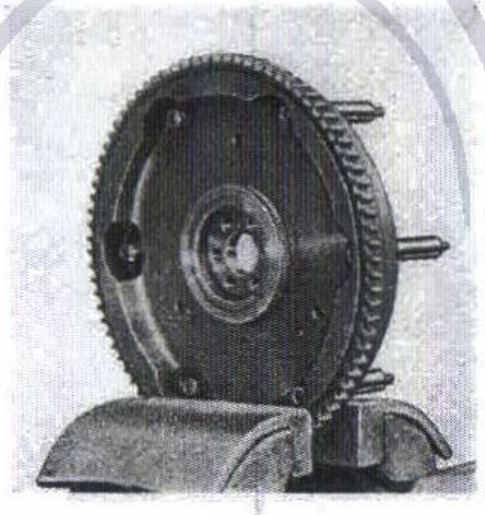


Fig. 53.

Fixing the clutch bolts on the engine flywheel.

Inspect the clearance between the splines on the driven plate hub and those on the direct drive shaft. This clearance should not exceed 0,20 mm (.008"), so as to prevent the clutch driven plate from any tendecy to rattling.

See that the driven plate runs perfectly true.

Make sure that the bolts fixing the clutch plate to the engine flywheel are in a satisfactory condition. If they are fouhd to be worn they should be replaced.

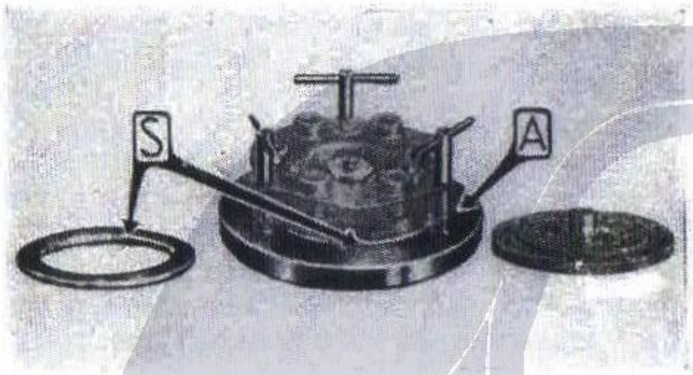


Fig. 54. - Tool A. 10112 for dismantling assembling and adjusting the clutch
S = Distance rings.

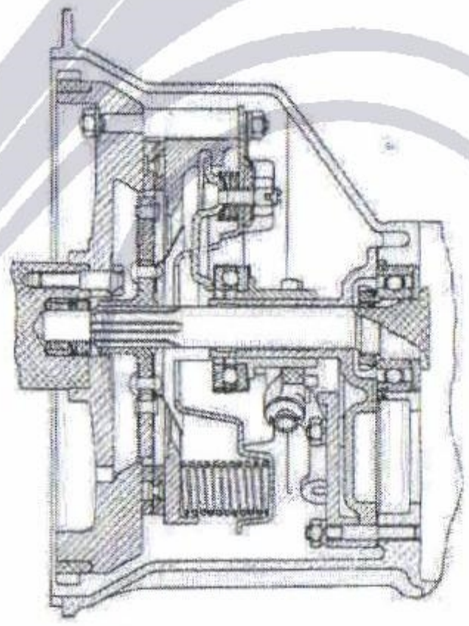


Fig. 55. - Section of the clutch.

In order to replace these bolts the engine flywheel must be removed from the crankshaft, because the fixing nuts of the bolts must be unscrewed from the inside (Fig. 53).

The assembling and adjustment of the clutch may be rendered much easier if the purposely designed tool A. 10112 is used as shown in the Fig. 54. This tool is provided with two distance rings (S) corresponding to the respective positions of the levers when the driven plate has either new or worn linings.

GEARBOX

Dismantling the assembly.

Remove the engine from the car together with the clutch and gearbox (see page 19);

the gearbox from the engine.

Fix the gearbox on the overhauling support A. 2221, fitted to the revolving stand Arr. 2204 (Fig. 56).

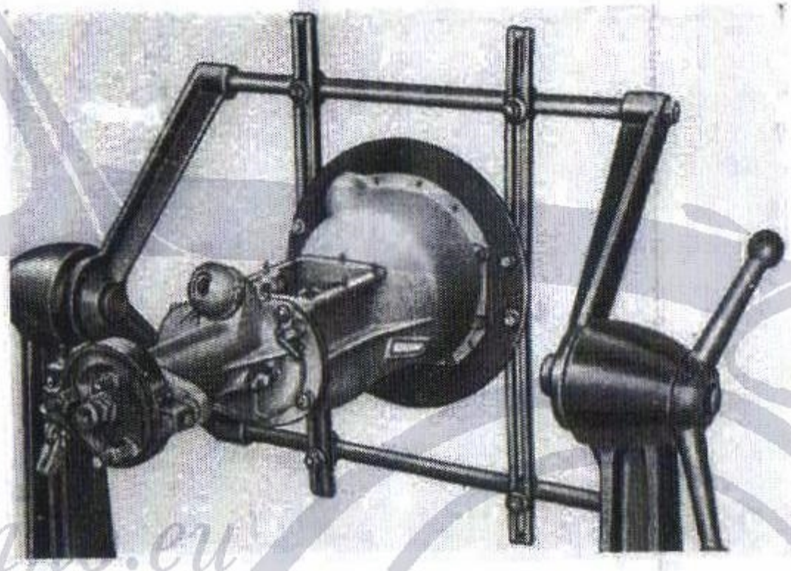


Fig. 56.
Gearbox fixed to support Arr. 2221 of the revolving stand Arr. 2204.

Remove the gearbox cover;

the side cover (C, Fig. 57) and the bush for the reverse gear safety pawl;

the sleeve (M, Fig. 57) for the speedometer cable;

the two side screws (V, Fig. 57), of the ball housing for the gear lever articulation;

the spherical nut fixing the brake drum to the transmission shaft. The remove the drum.

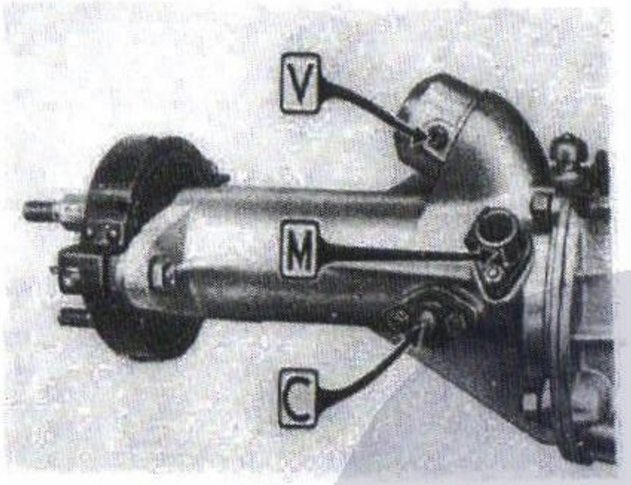


Fig. 57.

V = Guiding screws for the gear lever.

M = Sleeve for speedometer cable.

C = Retaining cover for the reverse gear safety pawl.

Tighten the gear lever temporarily, pushing it in the neutral position. The engaging slots of the striker rods should be in the position shown by the arrow on Fig. 58.

Take off the nuts fixing the gear box rear cover.

Lift the gear lever upwards and to the left until it is possible to disengage it from the striker rods so to remove the rear cover together with the transmission shaft brake band.

Remove the three side plugs with sphere locks;
the striker rods, after having straightened the locking plates and having removed, by use of the spanner A. 8069, the bolts which fix the fork to the rods.

Pull out the primary shaft rear ball bearing (1, Fig. 64); the washer (2) and the spring ring (3).

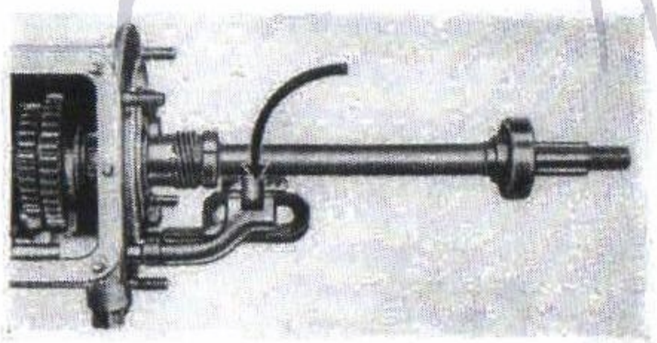


Fig. 58.

The arrow points to the striker rod ends and their slots. They must be in this position before the rear cover can be removed.

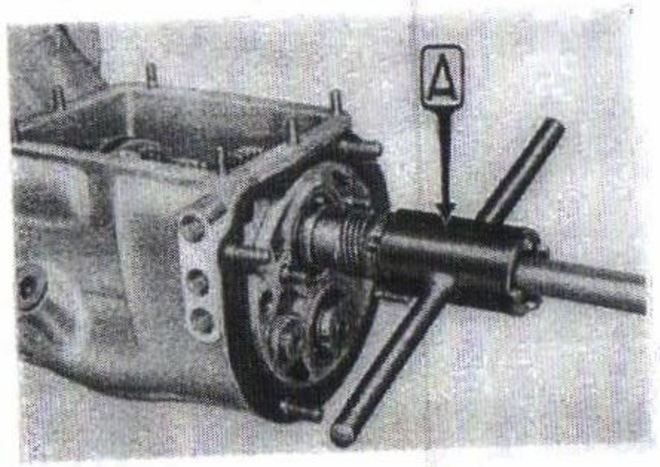


Fig. 59.

A = Wrench A. 8066, for the lock plates of the primary and direct drive shaft.

Unscrew by means of the wrench A. 8066 (Fig. 59) the lock ring (4), on the primary shaft after having straightened out the lock plate (5). Then pull out the speedometer driving pinion (6), taking care of the tiny lock key. Pull out also the lock ring (7).

Remove the plate (P, Fig. 60) retaining both the primary shaft bearing and the reverse gear pin.

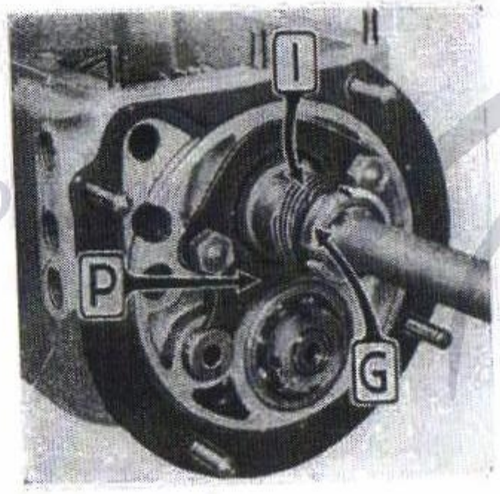


Fig. 60.

G = Lock ring on the primary shaft.
I = Speedometer gear.
P = Retaining plate for the primary shaft bearing and the reverse gear pin.

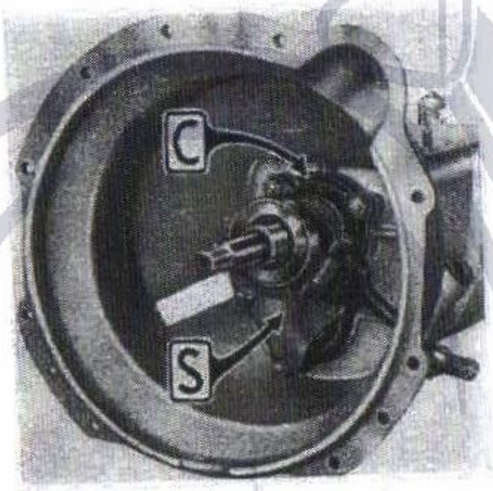


Fig. 61.

C = Retaining cover for the gearbox front bearings.

S = Support of the clutch release control fork.

Dismantle the support (S, Fig. 61) of the clutch release control fork.

Remove the front cover (C, Fig. 61).

Unscrew by means of the wrench A. 8067 (Fig. 66) the lock rings (8 & 9, Fig. 64) of the secondary shaft, straightening out the lock plates 10 & 11, Fig. 64).

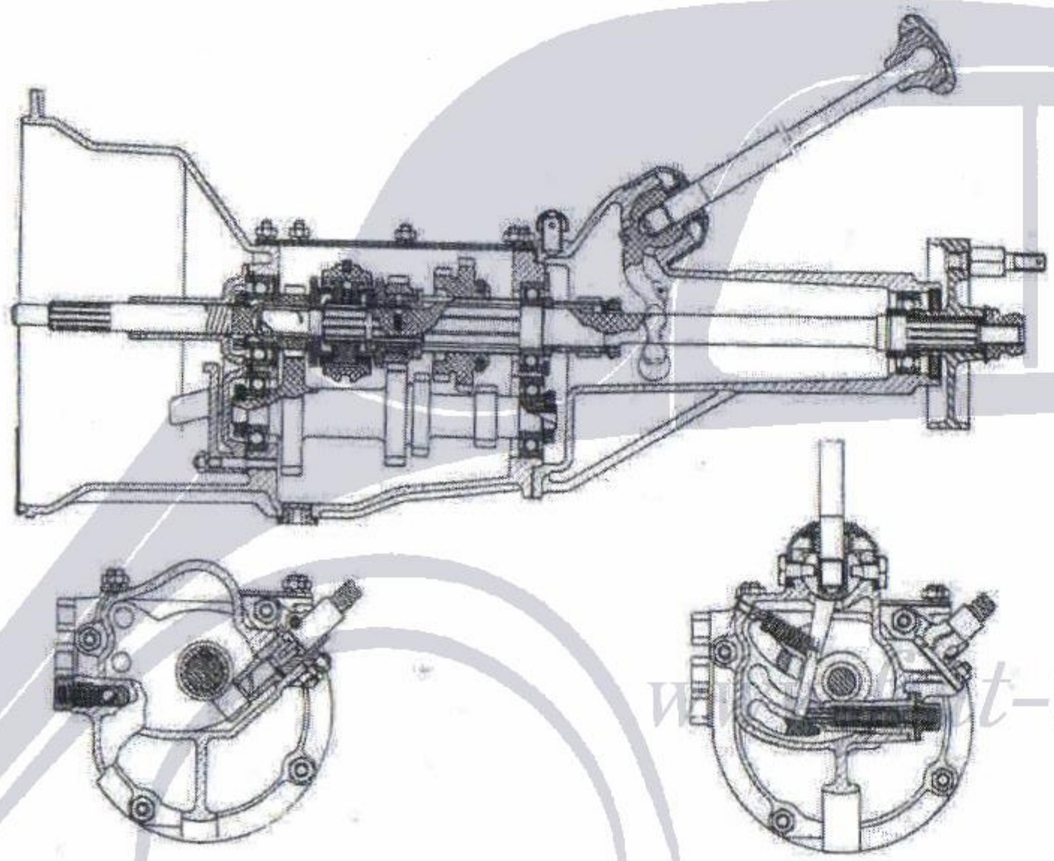


Fig. 62. - Sections of the gearbox.

Push out the direct drive gears (12), striking with a lead hammer on the connection with the primary shaft. The secondary shaft gear (14) will also be pushed a little forward. The spring ring (15) can then be removed from its seat in the outer ring of the direct drive shaft ball bearing.

Push back the direct drive and primary shaft gears, then the secondary shaft gears, using a lead hammer against the direct drive and secondary shaft, until the primary and secondary shaft rear ball bearings have come out from their housings.

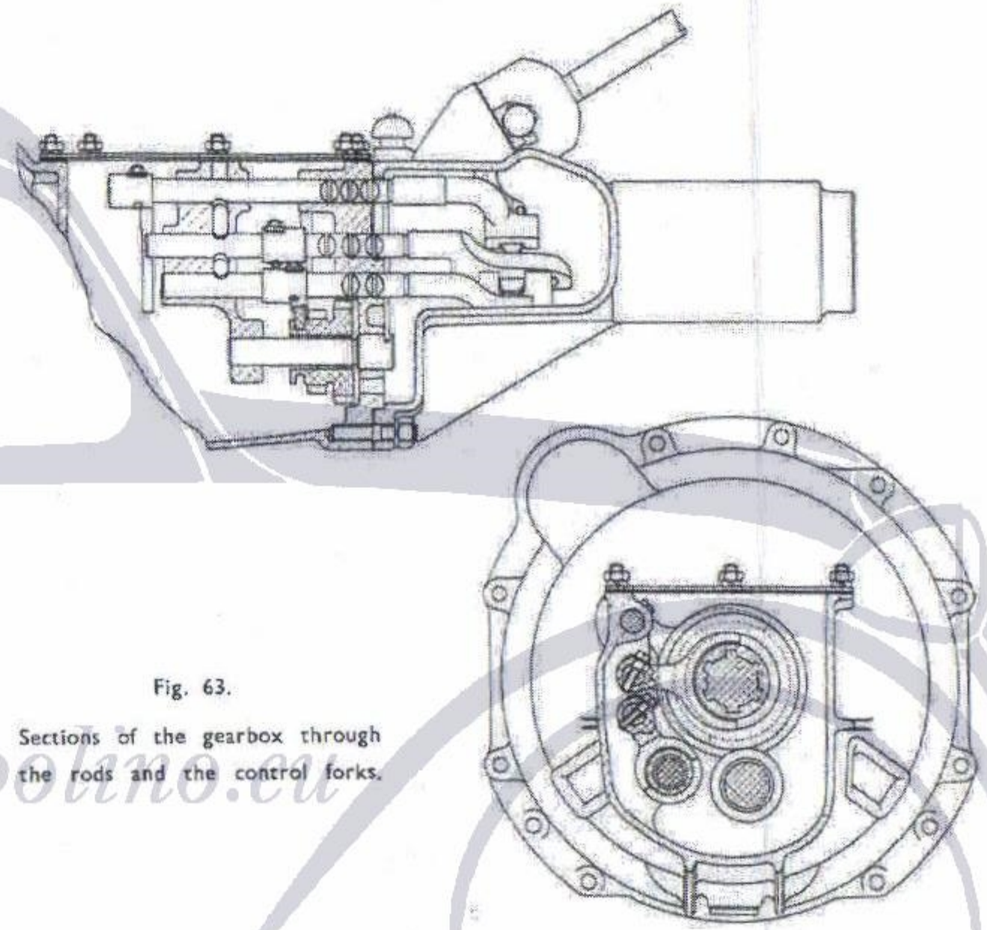


Fig. 63.

Sections of the gearbox through the rods and the control forks.

Pull out the rear ball bearings (16 & 17, Fig. 64) of the primary and secondary shaft.

Remove the secondary shaft front ball bearing (18) dropping the corresponding gears in the bottom of the gearbox.

Take off the gears of the direct drive.

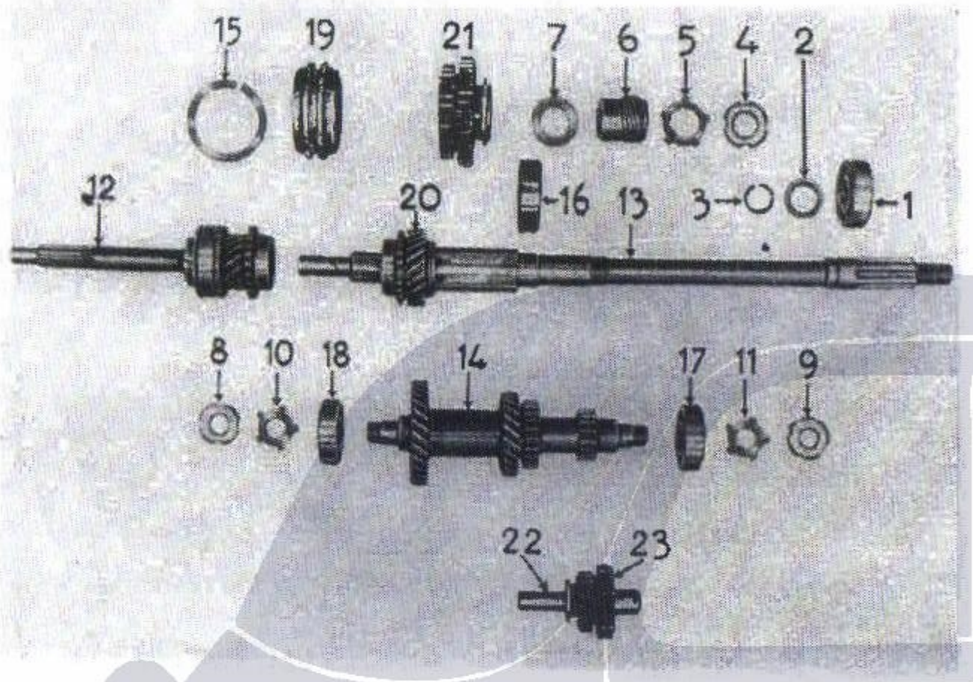


Fig. 64. - Shafts and gears in the gearbox.

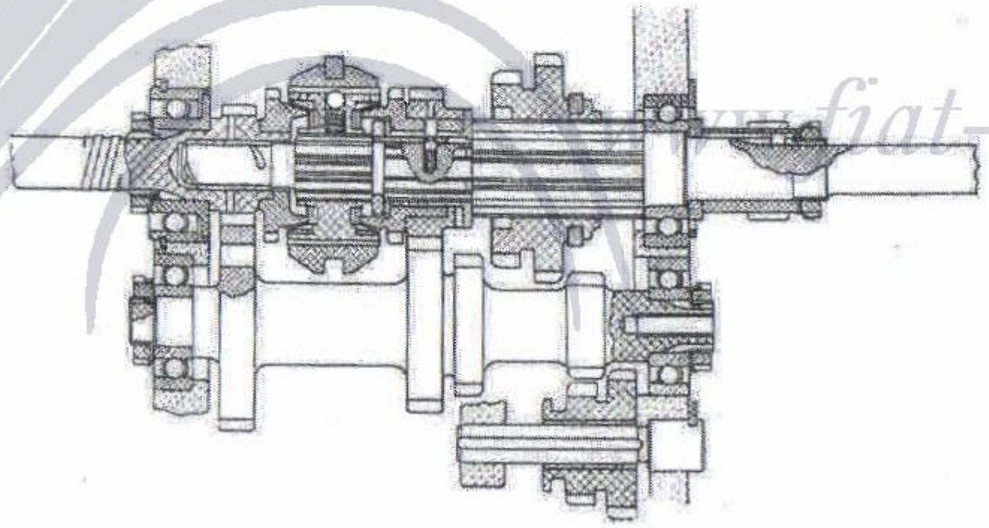


Fig. 65. - Section of the gearbox through the three shafts.

Remove the 3.rd and top gear engaging sleeve (19) pulling out the primary shaft and its gears (20 & 21) from the bottom towards the upper side of the gearbox.

Remove the secondary shaft assembly in the same manner.

Pull out the reverse gear pin, removing the gear from the interior of the gearbox.

Dismantle the direct drive assembly, loosening the lock ring by means of the wrench A. 8066;

the synchronising device and the 3.rd speed gears from the primary shaft.

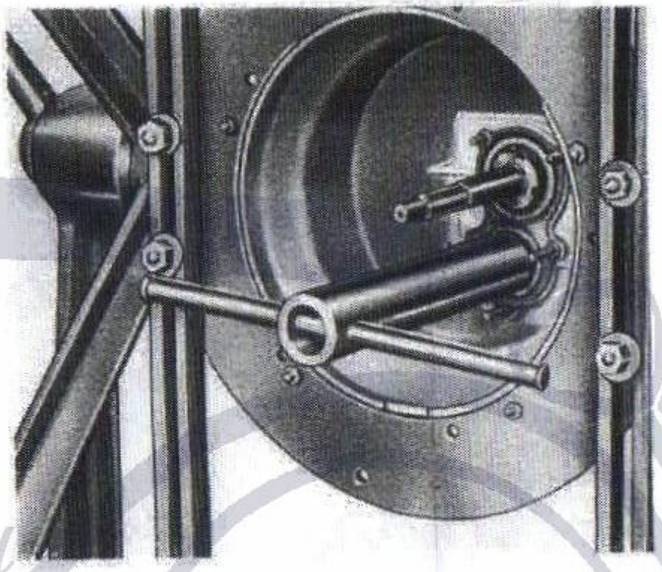


Fig. 66.

Wrench A. 8067 for the lock rings on the secondary shaft.

Overhauling.

The inspection and testing operations to be effected on the gearbox are the same as those carried out on the previous models of FIAT cars. Make particularly sure that the gears ar not damaged or worn out; that the primary, secondary and direct drive shafts are not indented. Specially the surface on which the gears slide, and the ball bearings should be absolutely smooth and noiseless.

In the 500 car gearbox the only modifications concern the shifting gear control, as shown on the figures 62 and 63.

Owing to the relatively small dimensions of the various parts the wear limits shoulds be reduced if working efficiency must be ensured.

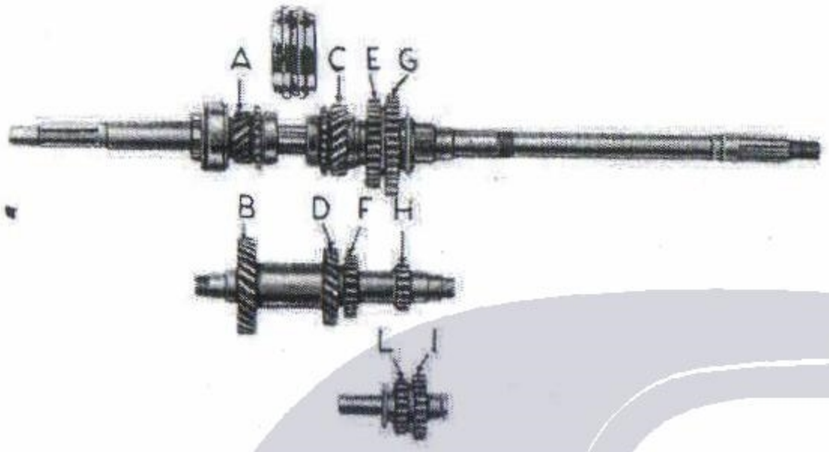


Fig. 67. - Gear and shaft arrangement.

A = teeth	15	F = teeth	22
B = »	29	G = »	37
C = »	21	H = »	16
D = »	23	I = »	24
E = »	31	L = »	19

GEARBOX RATIO					
Constant mesh gears	1.st speed	2.nd speed	3.rd speed	Direct Drive 4.th speed	Reverse gear
SINGLE RATIOS					
$\frac{15}{29} = 0,517$	$\frac{16}{37} = 0,432$	$\frac{22}{31} = 0,709$	$\frac{23}{21} = 1,095$	1	$\frac{16}{24} \times \frac{10}{37} = 0,341$
TOTAL RATIOS					
	$0,517 \times 0,432 = 0,223$ $\frac{1}{0,223} = 4,48$	$0,517 \times 0,709 = 0,366$ $\frac{1}{0,366} = 2,732$	$0,517 \times 1,095 = 0,566$ $\frac{1}{0,566} = 1,766$	1	$0,517 \times 0,341 = 0,176$ $\frac{1}{0,176} = 5,68$

Assembling.

Repeat in reverse order the operations as described for dismantling.

TRANSMISSION SHAFT

The transmission shaft is tubular with joints of the flexible coupling type.

The centring of the joints is achieved by means of the ball ends of the gearbox primary shaft and the rear axle bevel pinion.

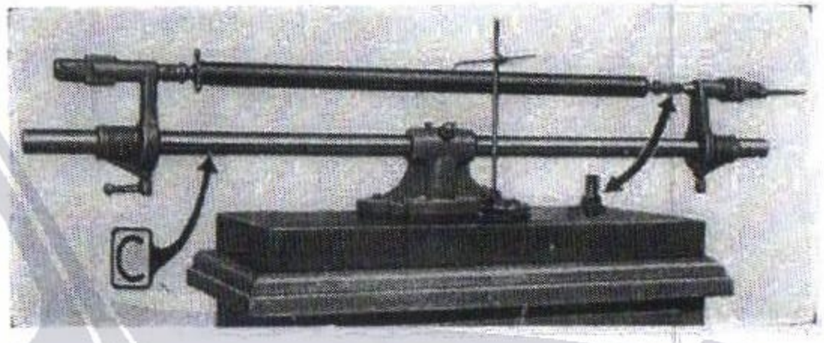


Fig. 68.

Checking the transmission shaft for whip, using the apparatus C. 603.

To check the transmission shaft for whip, the front joint, indicated by an arrow on Fig. 68 should be dismantled.

After checking the transmission shaft for whip, check also its balance.

Above inspections should be made with apparatus C. 603 for whip and parallel blocks C. 732 for balance.

Whip is rectified under the press, and correct balance is got by soldering some tin on the lighter side of the shaft.

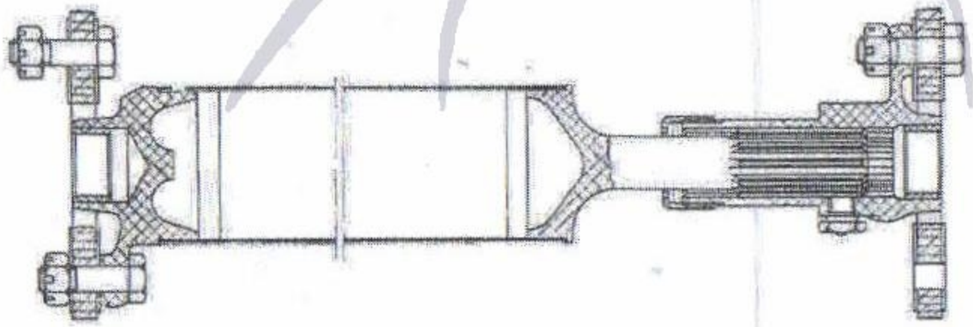


Fig. 69. - Longitudinal section of the transmission shaft.

REAR AXLE

Procedure starting from chassis No. 046001.

Removing the rear axle from the car.

Jack up the rear end of the car using the hydraulic jack Arr. 2027, and place supporting stands under the chassis side members.

Remove the wheels.

Disconnect the transmission shaft from the bevel pinion sleeve.

Unscrew the bolts that fix the ends of the rebound hemp straps.

Remove the clips and pertaining fixing plates for the road springs; the union of the rear hydraulic brake hose.

Whereupon the rear axle can be removed.

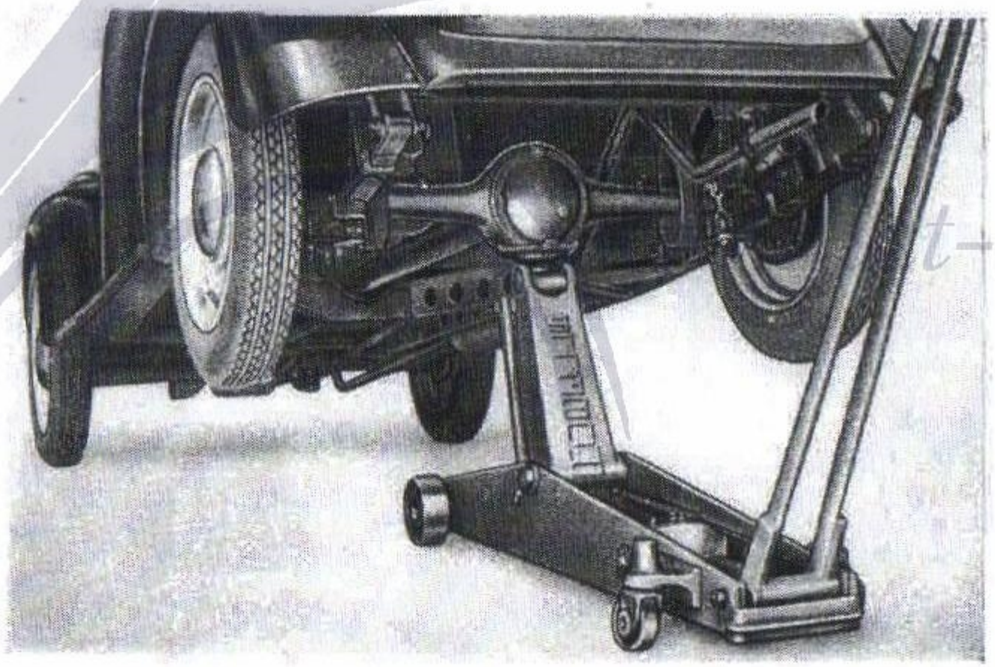


Fig. 70. - Jacking up the car with the hydraulic jack Arr. 2027.

Removing the rear shock absorbers and road springs.

After jacking up the car and placing support stands under the rear cross beam, proceed as follows:

Remove the clips and pertaining fixing plates for the road springs, also for the lower fastening of the shock absorbers.

Unscrew the front fastening screw.

Remove the rear fastening shackle.

To remove the shock absorber, uncrew the two screws for the fixing to the rear cross beam.

N. B. - The procedure for removing the rear axle and the cantilever road springs on chassis up to No. 046000 are:

removal of the two torque arms: disconnection of the fork lever pins for the shock absorbers, also disconnection of the bolt that fix the cantilever springs to the rear axle casing. This for removing the rear axle.

For removing the road springs loosen the bolts that fix the spring to the chassis frame, also the side bolt that fix still the spring, and then withdraw the lower grooved plate and slid off the spring.

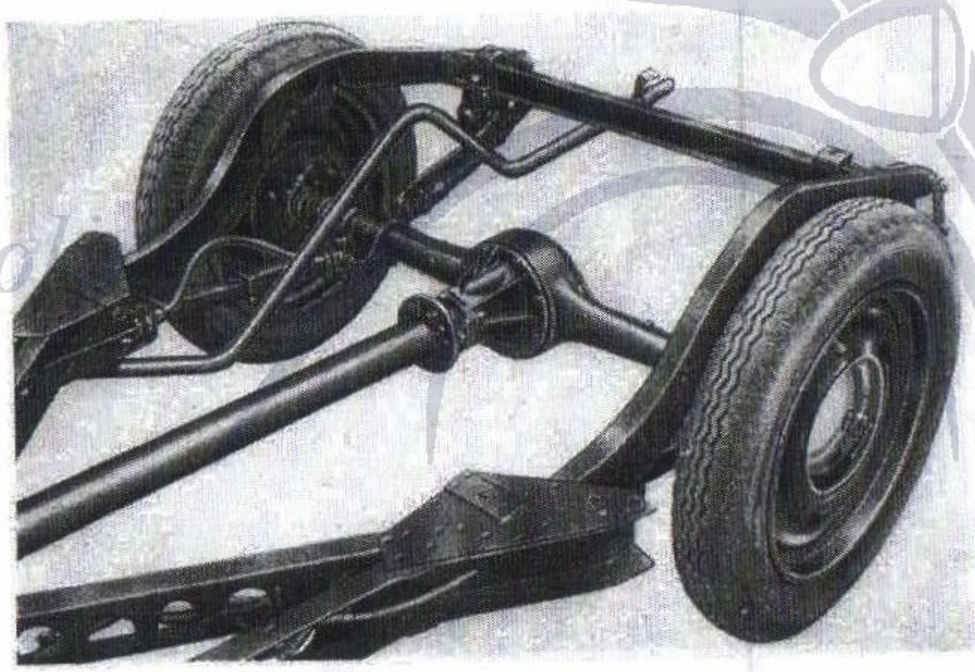


Fig. 71. - Details of the rear portion of the chassis (starting from chassis No. 046001).

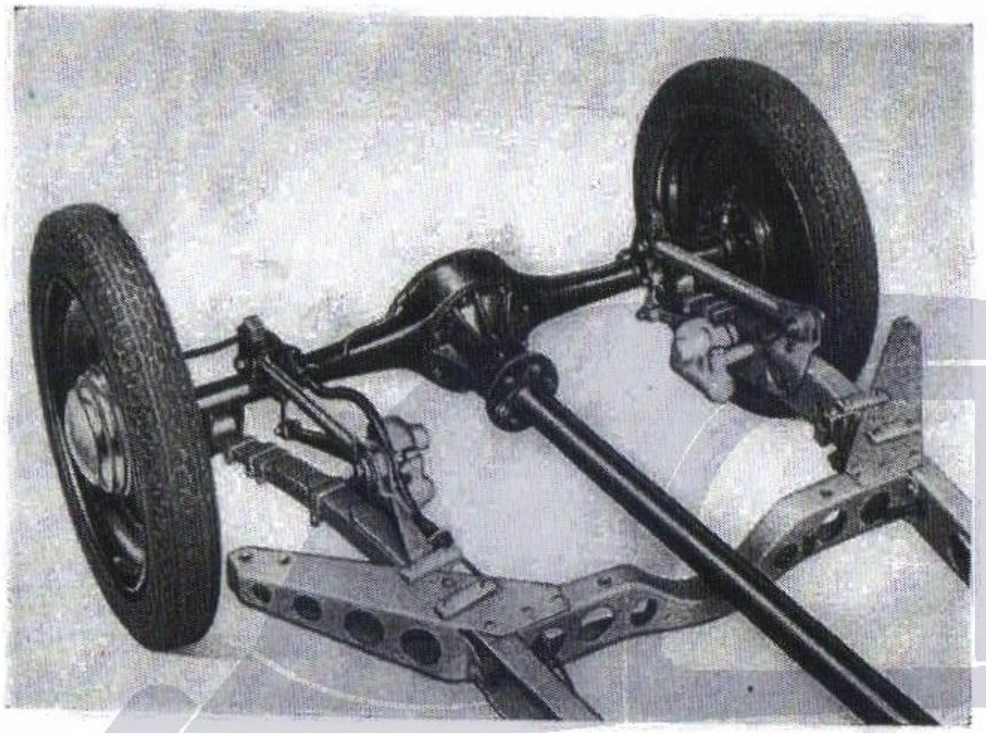


Fig. 72. - Details of the rear portion of the chassis (up to chassis No. 046000).

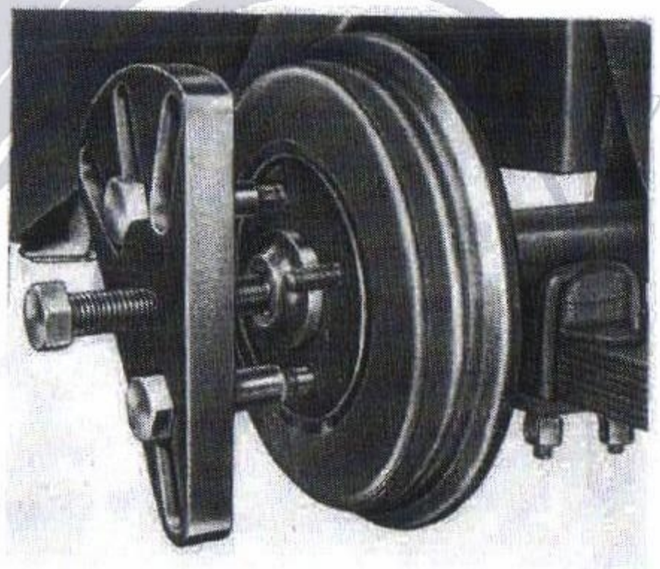


Fig. 73.

A = Drawer A. 6469 for the wheel hubs.

Dismantling the rear axle unit.

Pull off the hubs with brake drums from the driving shafts, having first removed the split pins and the nuts, and using the drawer A. 6469 (Fig. 73).

Remove the brake housing flanges, complete.

Pull out the driving shafts using the drawer A. 6466 (Fig. 74).

Unscrew the bolts fixing the differential carrier to the rear axle casing, and remove the differential unit.

Should it be necessary to remove with a press the driving shafts bearings, use the drawer A. 10113 (Fig. 75).

Wash the differential assembly thoroughly and fix it on the support Arr. 2221 of the overhauling stand A. 2204.

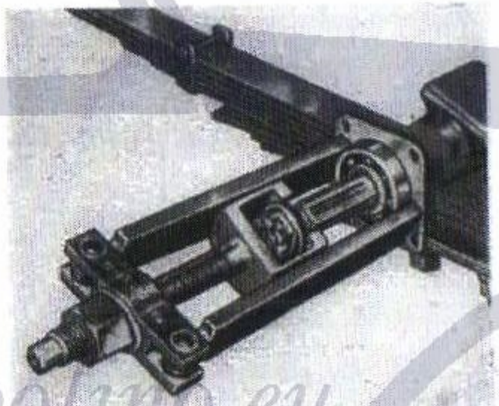


Fig. 74.

Drawer A. 6466 for removing axle shafts.

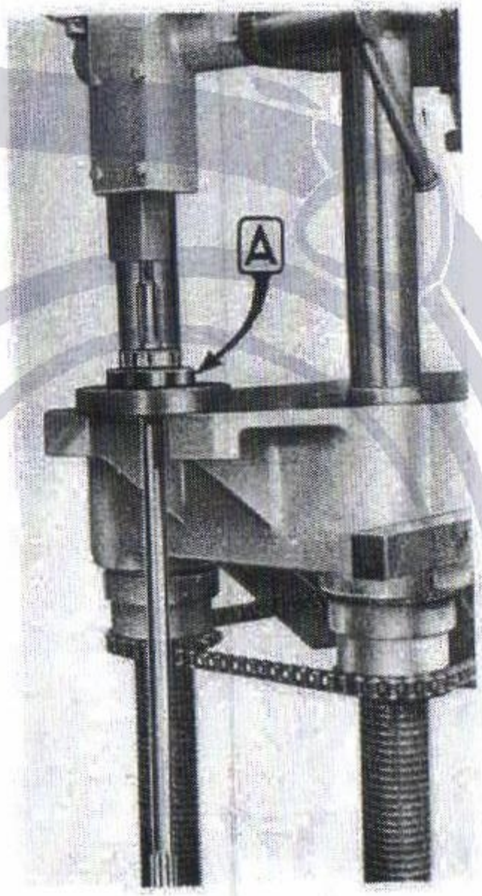


Fig. 75.

A = Ring A. 10113 for withdrawing the driving shaft ball bearings.

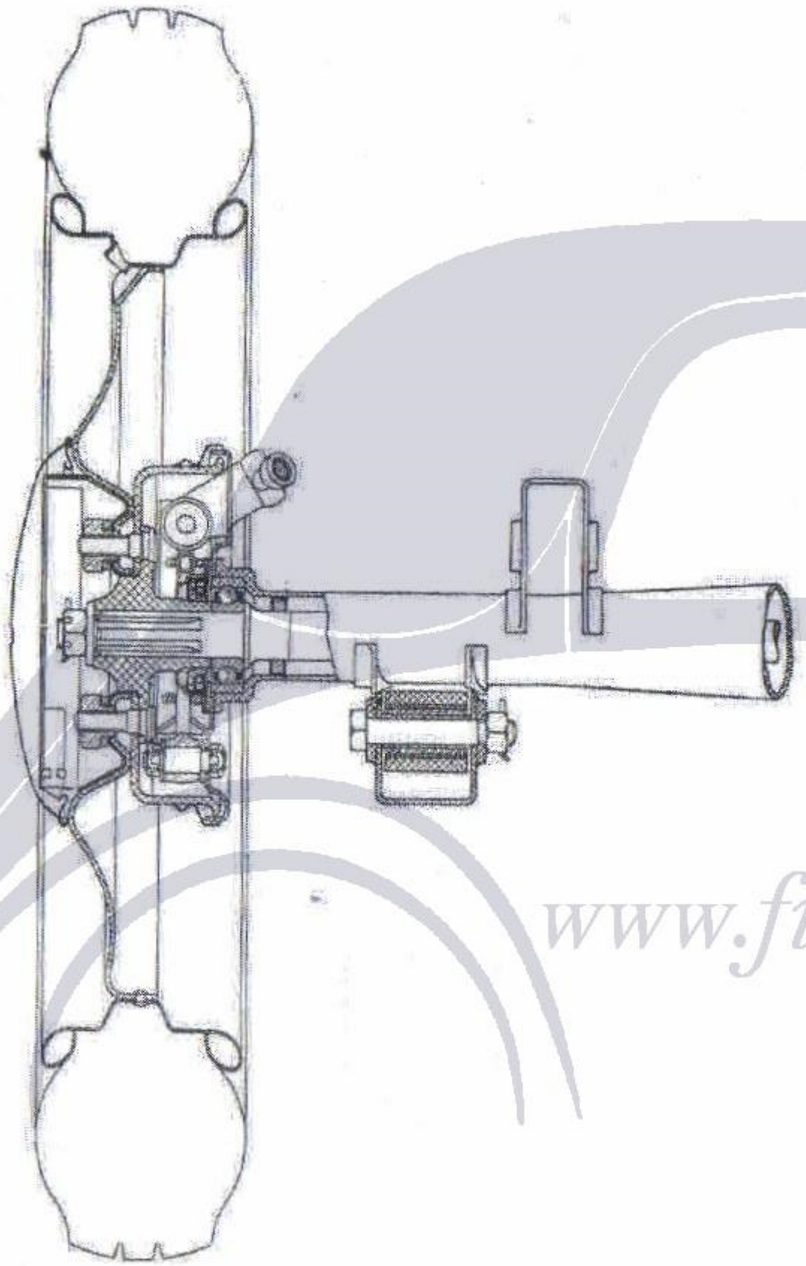


Fig. 76.
Rear axle section through the wheel and the suspension spring shackle pin.

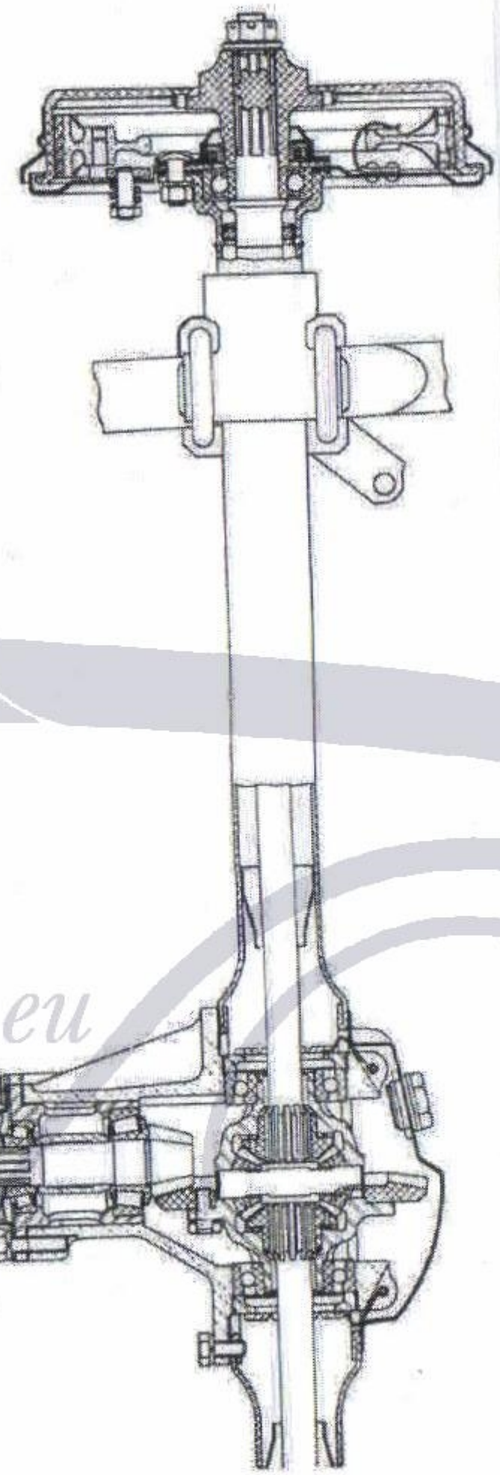


Fig. 77.
Rear axle section through the differential unit and the wheel hub.

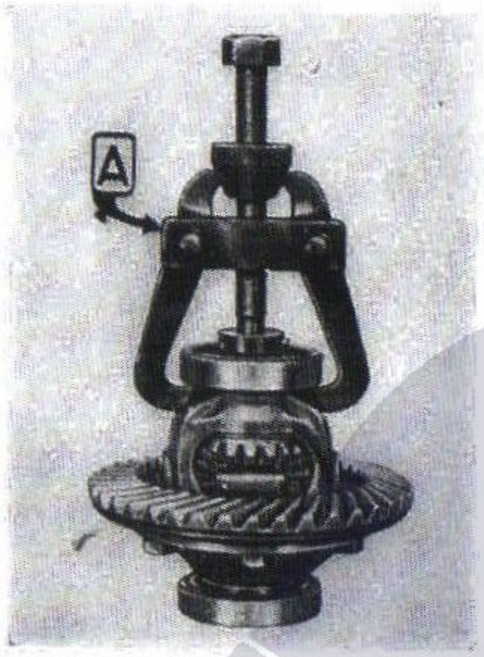


Fig. 78.

A — Drawer A. 6509 for the differential casing bearings.

If the support and the overhauling stand are not available, fix the unit on the plate A. 10549 (Fig. 81) which should be carried by the overhauling stand A. 10536 bis (Fig. 81).

Remove the split spins and the clips of the differential assembly;

the bearing caps, the lock plates plates and the inner box;

the bevel pinion sleeve;

the bevel pinion group.

Dismantle the bevel pinion group; if required, the crown wheel, and then the planetary and satellite pinions.

Should it be necessary to remove the bearings from the journals of the differential box, use the drawer A. 6509 (Fig. 78).

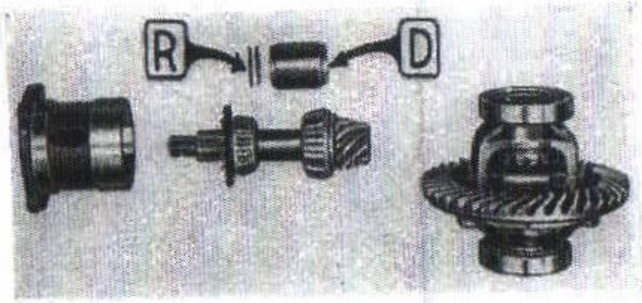
To dismantle the bevel pinion rear roller bearing, use the tool A. 6512 (Fig. 79).

Fig. 79.

A — Tool A. 6512 for dismantling the bevel pinion roller bearings.

Fig. 80.

R — Packing washers to use in conjunction with the distance piece D for adjusting the clearance of the roller bearings.



Adjustment of the bevel pinion bearings and of the bevel pinion.

To adjust the bevel pinion roller bearings add or remove the packing washers R which are used in conjunction with the distance piece (D, Fig. 80).

To move the bevel pinion backwards or forwards add or remove the packing plates (S, Fig. 81).

The side movement of the differential inner box and the bearings play adjustment is effected by actuating the lock rings (G, Fig. 82) after having lifted the retaining clips (L).

The bevel group has a toothed crown wheel with a **clockwise spiral** and a toothed pinion with an **anti-clockwise spiral.**

Re-assembling.

Repeat the same operations in a reverse order as for dismantling. No difficulty should be encountered.

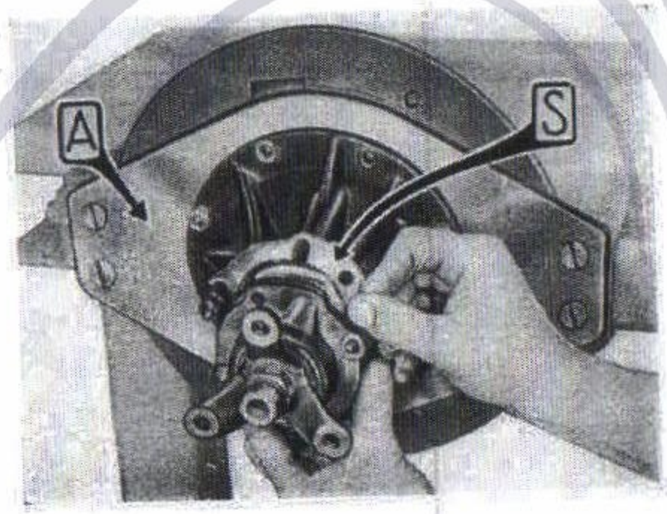


Fig. 81.

A — Plate A. 10549 fixing the differential unit on the overhauling stand A. 10536 bis.

S — Packing plates for adjusting the mesh between pinion and crown wheel.

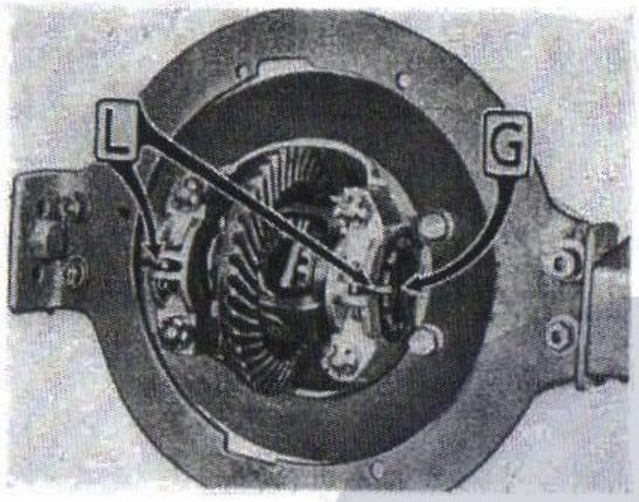


Fig. 82.

L = Retaining clips of lock rings G for adjusting the transmission bevel pinion group.

The pins of the torque arms as well as the pins of the arms of the shock absorbers (on cars with cantilever rear springs) must be set while car is under static load.

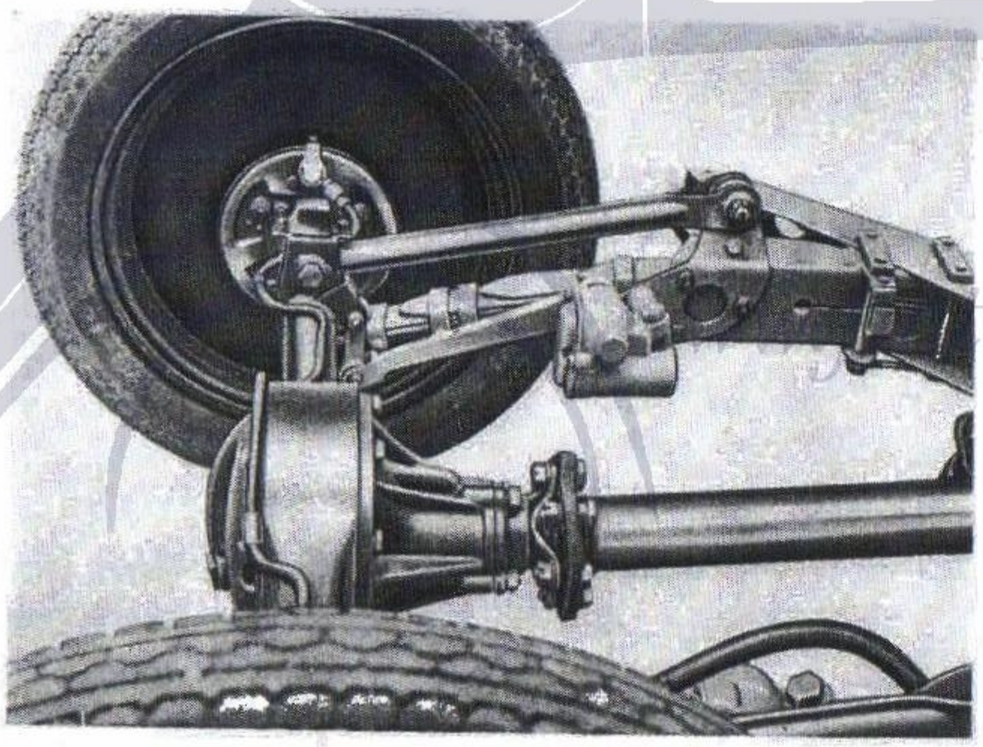


Fig. 83. - A close-up of the rear springing (up to chassis No. 046000).

FRONT SUSPENSION

Removing the unit from the car.

Jack up the front portion of the car, placing the stands under the side members of the frame.

Remove the radiator;
the wheels;
the pins of the semi-elliptic spring;
the four bolts fixing the spring central clamps
the four bolts fixing the wings to either side of the buffered cross member;
the two bolts, with spacer, fixing the cross member to the side members of the frame;
the cross member with the spring.

Disconnect the steering rods from the steering knuckles;
the unions of the control pipes of the front hycraulic brakes;
the swinging arms unit, the wheel hubs, the hydraulic shock absorbers.

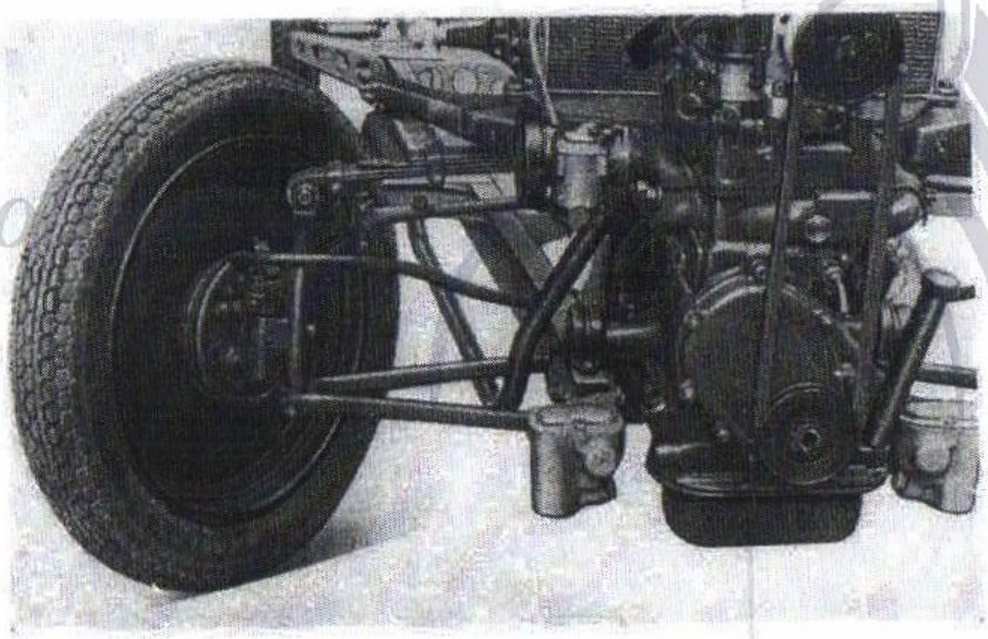


Fig. 84. - A close-up of the front suspension.

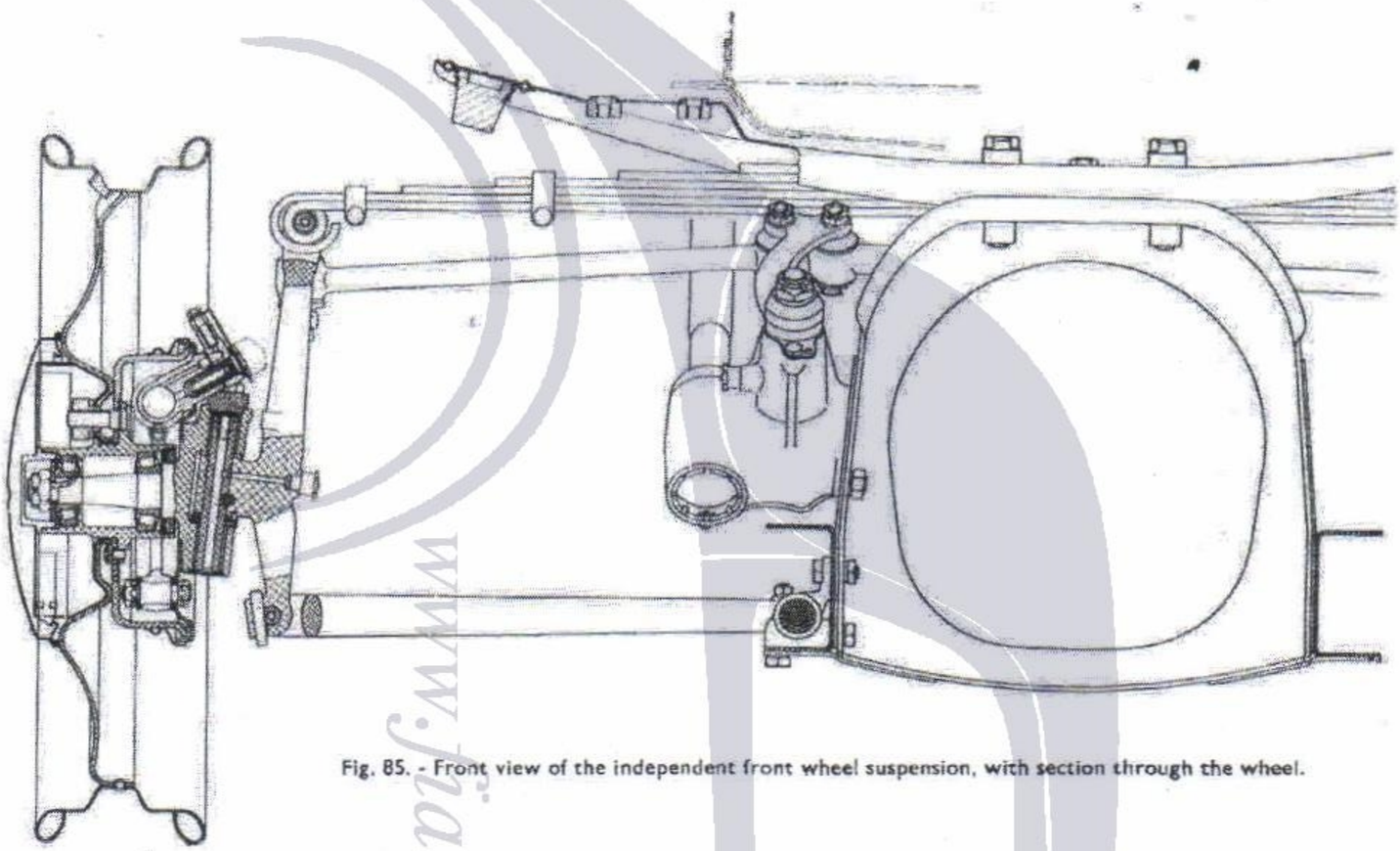


Fig. 85. - Front view of the independent front wheel suspension, with section through the wheel.

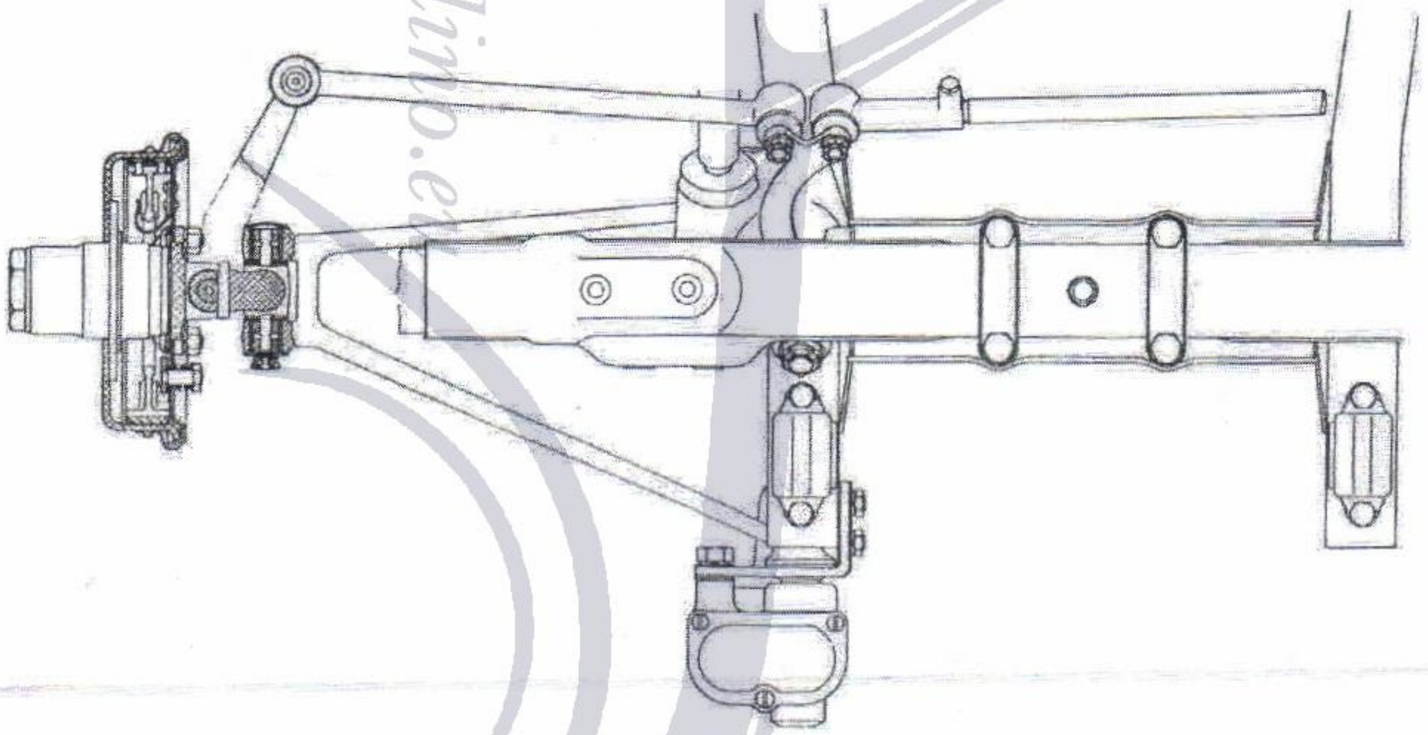


Fig. 86. - Front suspension viewed from above, with section through the brake and the pin of the suspension pillar.

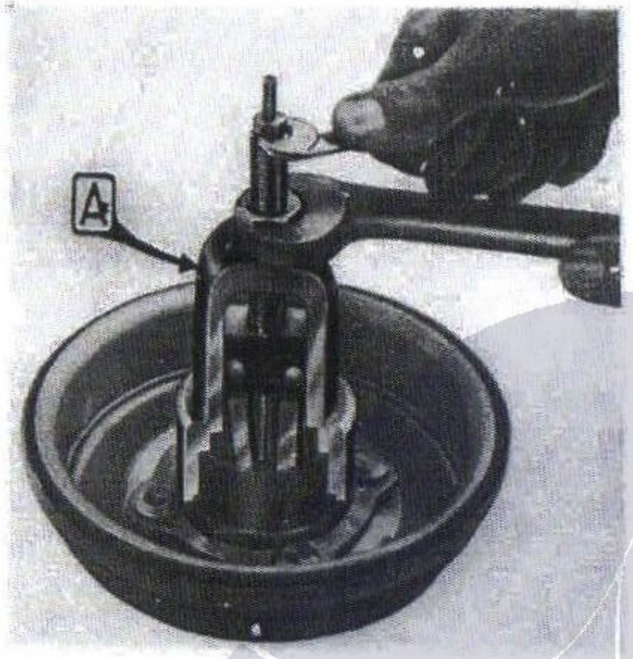


Fig. 87.

A = Drawer A. 6511 for the front wheel outer roller bearing.

Dismantling the front suspension assembly.

Remove the wheel hubs with brake drums, using the drawer A. 6469 (Fig. 73). Later, if it is necessary to dismantle the roller bearings outer rings, use the drawer A. 6511 (Fig. 87).

Dismantle the brake housing flanges, complete, unscrewing the bolts by which they are fixed to the steering knuckles.

Remove the steering rods, and disconnect them from the steering knuckles.

Withdraw the steering knuckle pins, after having removed the split pins from the pillar:

the pins connecting the pillars of the swinging arms unit to the swinging arms;

the pins of the swinging arms supports on the side members of the chassis frame.

Reassembling.

Repeat the operations in reverse order as described for dismantling.

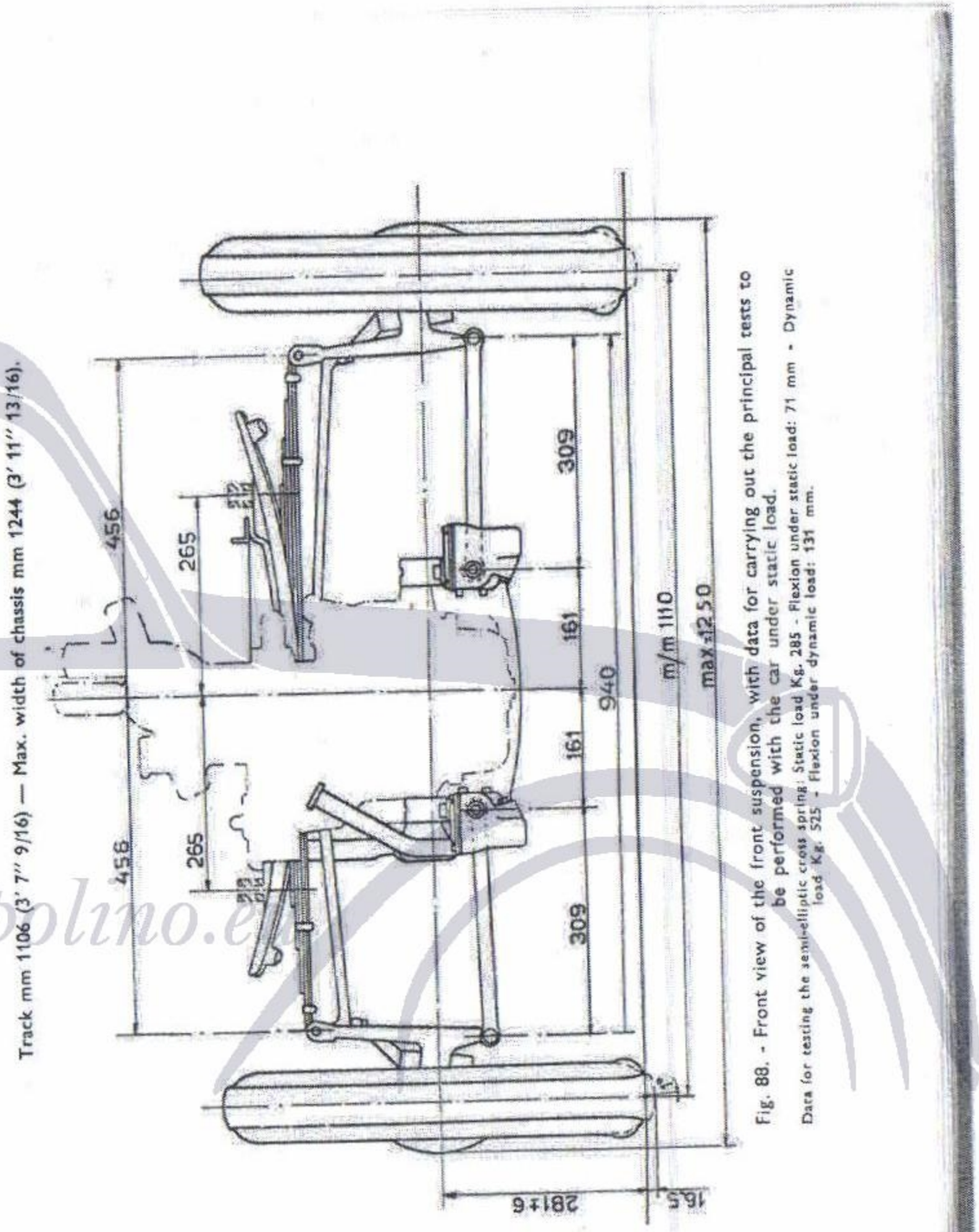


Fig. 88. - Front view of the front suspension, with data for carrying out the principal tests to be performed with the car under static load.

Data for testing the semi-elliptic cross spring: Static load Kg. 285 - Flexion under static load: 71 mm - Dynamic load Kg. 525 - Flexion under dynamic load: 131 mm.

SWINGING ARMS

See that the pins are exactly parallel and lay in the same plane. The maximum clearance allowable between the bushes and the pins is mm 0,15 (.006").

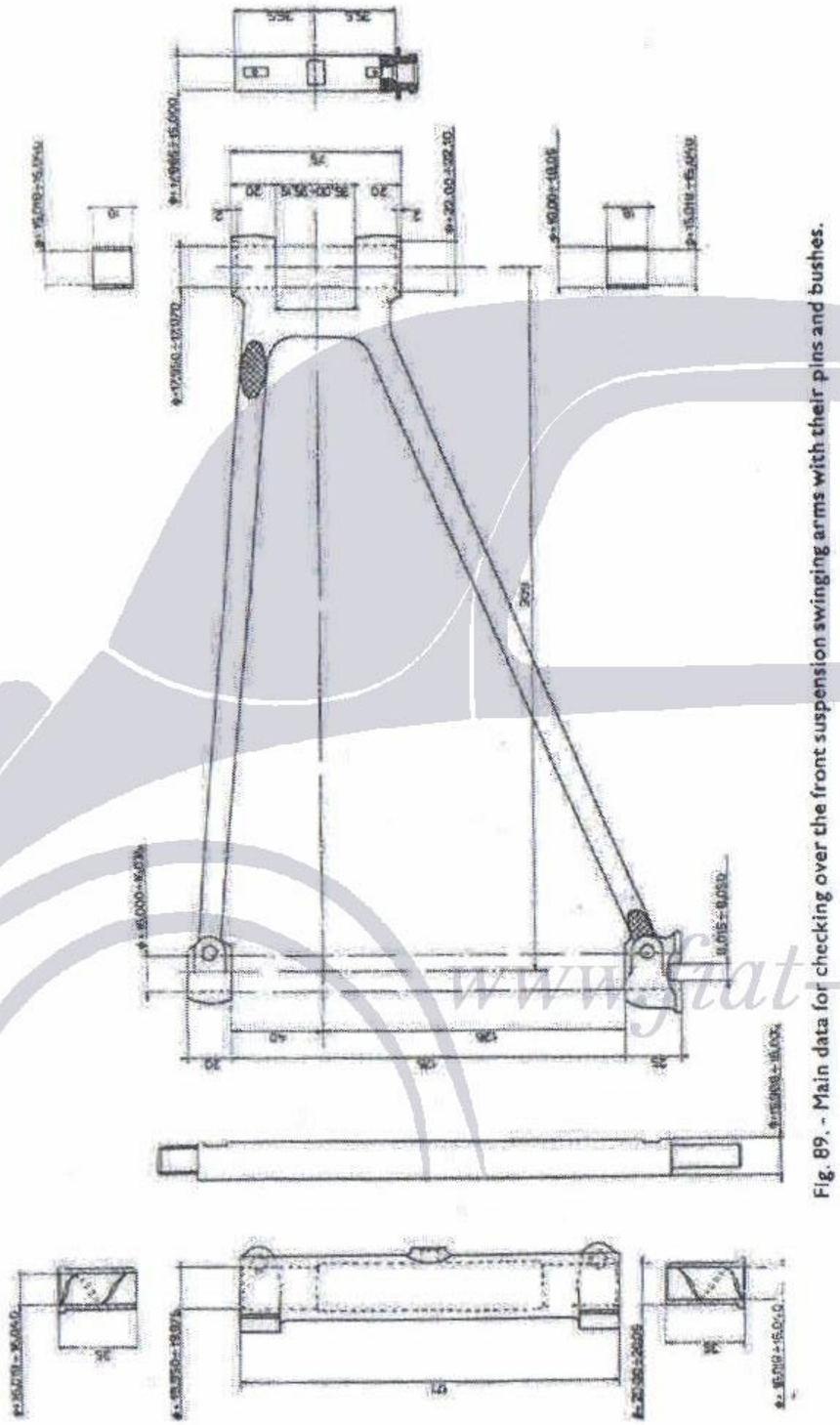


Fig. 89. - Main data for checking over the front suspension swinging arms with their pins and bushes.

STEERING KNUCKLE AND FRONT SUSPENSION PILLAR

Make sure that the clearance between the bush located in the knuckle, and the pin does not exceed mm 0,10 (.004").

Between the knuckle and the pillar, with their distance and thrust rings, the play should not exceed mm 0,15 (.006').

The checking over of the suspension pillar is particularly important. It can be easily effected using the gauge A. 10104.

Even small pillar deformations may noticeably influence the inclination of the wheels.

The figures 89 and 90 refer to the front springing fitted up to chassis No. 100164.

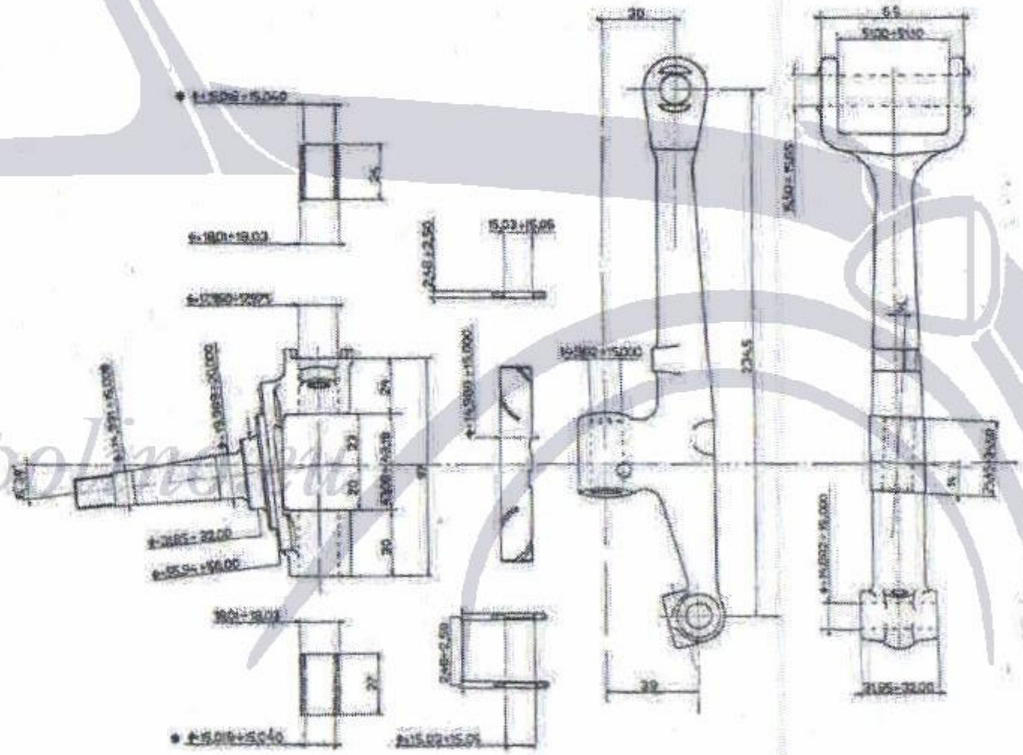


Fig. 50.

Main data for checking over both the steering knuckle with its pivot pin and the front suspension pillar (up to chassis No. 100164).

King pin seat, that figure shows 3° tilted on supporting pillar, has been varied by suppressing inclination.

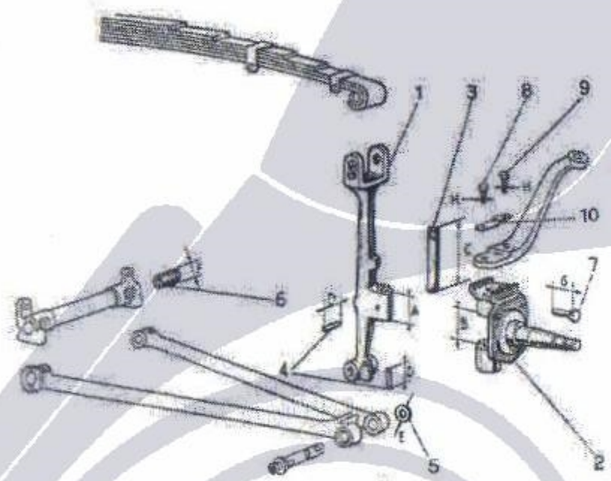
Starting from chassis No. 100165, the following alterations have been effected to the front springing:

— the swinging radii resting plane, on the support and on the pillar, has been enlarged;

— the height has been increased of the pillar fastening to the steering knuckle;

— the pitch has been altered of the screws that fix the steering arm to the steering knuckle, also have been replaced the lock plates.

The fig. 91 is accompanied by a table where the previous and present dimensions are given for the concerned parts.



	DIMENSIONS	
	Now	Earlier
1	A mm 16,5	A mm 34,5
2	B mm 55	B mm 43
3	C mm 105	C mm 93
4	D mm 35	D mm 32
5	E mm 26	E mm 23
6	F mm 26	F mm 24
7	G mm 25	G mm 22
8	H mm 10×1	H mm 10×1,5
9	H mm 10×1	H mm 10×1,5

Fig. 91.

Components of the front suspension, starting from chassis No. 100165. The measures regard the parts that have been altered.

Checking " toe-in " of front wheels.

Measure the distance between the insides of the front wheels from tyre edge to tyre edge both in front and behind their centres. The distance behind should be the greater by a margin of between .08 inches and .16 inches (2 to 4 mm).

This test should be carried out with the car under static load.

To adjust the wheel convergence, disconnect the longer steering rod, and vary its length according to requirements, by adjusting the sleeves at the ends (Fig. 93).

Checking camber.

The front wheels have an outward inclination of about 1 degree from the vertical which is equal to approximately 1/4" (7 mm) incles at the tyre edge. Checking must be carried out with a laden car.

Should an undue inclination be observed, check over the whole of the front suspension, about which are supplied data with the figures 88, 89, 90 and 91.

Checking caster.

The angle of caster should be 9 degress. Should there be any doubts of this, check over the individual items of the component parts of the suspension.

A correct adjustment of the front wheel camber and « toe-in », together with a proper caster, greatly improve the steering and increase the stability of the car.

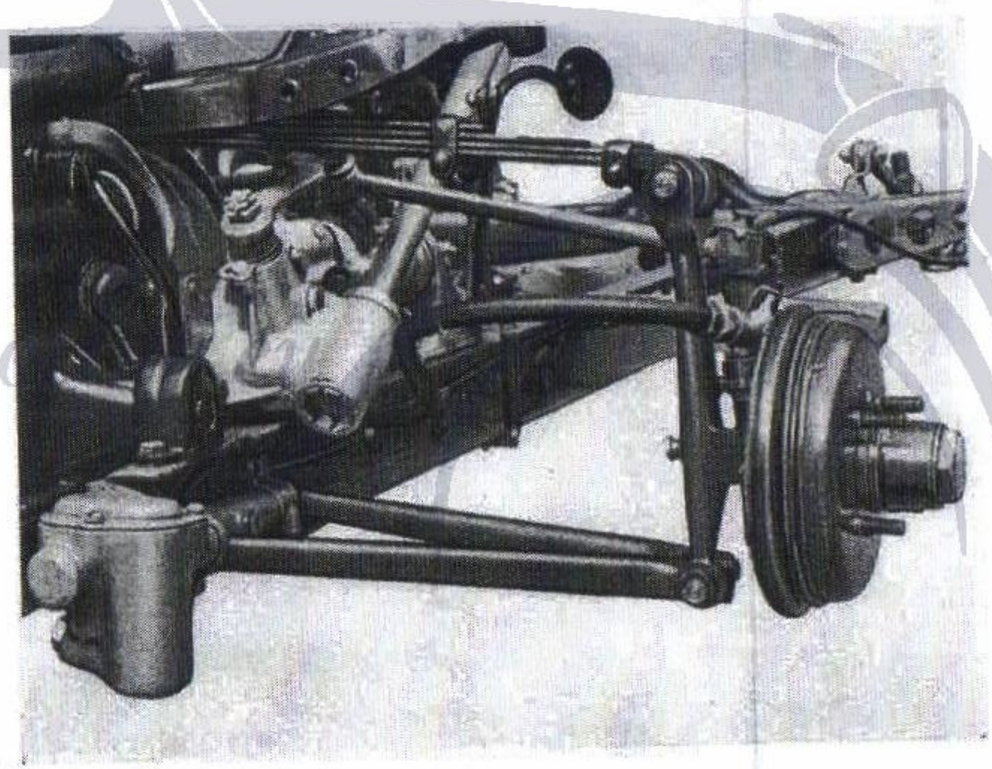


Fig. 92. - Details of the steering box and front suspension.

STEERING RODS

One of the two steering rods, viz. the longer one, has adjustable terminal sleeves, which can be unscrewed or screwed up to adjust the front wheel convergence.

Fig. 93 shows both steering rods.

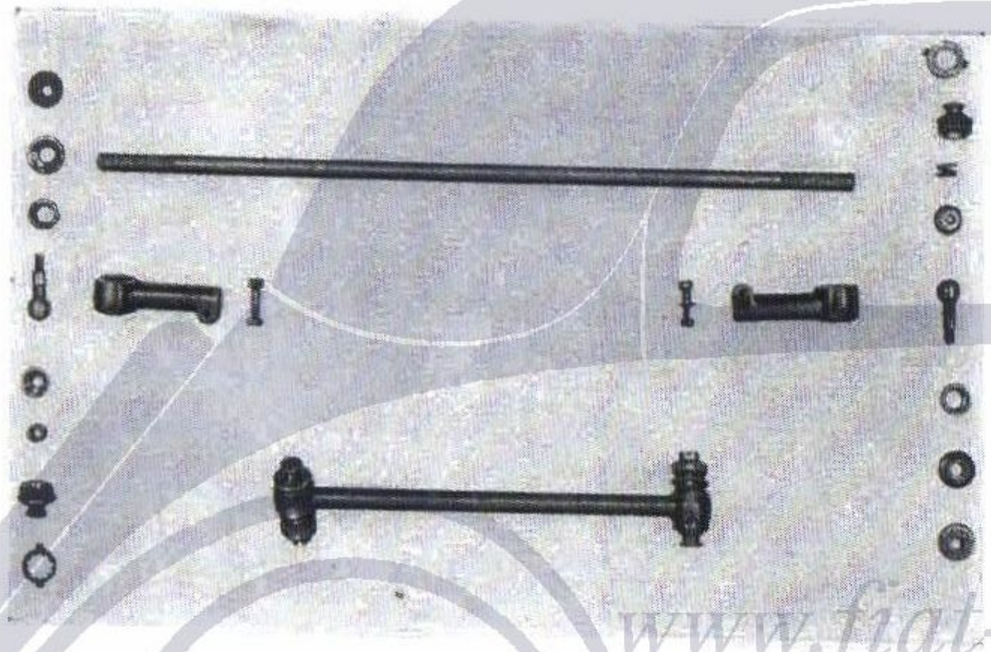


Fig. 93. - Steering rods.

Inspect the condition of the ball joints and the concave bearings.

The working surface should be quite smooth, without pits or roughness.

Should they not be so they should be replaced by new ones.

The ball pin should also be replaced if the head tends to become oval owing to wear, or if the pin threaded portion appears worn.

Also make sure that the springs still retain their tension, otherwise they should be replaced with new ones.

STEERING SYSTEM

Removing the steering system from the car.

Jack up the front end of the car.

Remove the left side front wheel (for cars with left-hand drive);
the engine left side undertray;
the split pin and the nut fixing the steering arm.

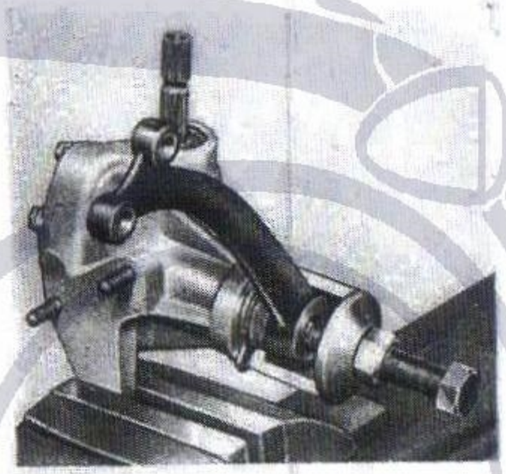
Pull off the steering rods.

Dismantle the steering column together with the steering wheel, disconnecting the electric horn cable and removing the worm sector fixing bolt together with the cap of the support securing the steering column to the facia board.

Remove the steering unit from the car.

Fig. 94.

A = Puller A. 6513 for removing the steering arm.



The operations for dismantling the unit are quite simple, and the work may be rendered easier by using the following tools:

A. 6513 (Fig. 94) Puller for the steering arm.

A. 8065 (Fig. 95) Spanner for the front bearing lock ring of the steering worm.

A. 10111 (Fig. 96) Tool for removing the outer ring from the rear roller bearing of the steering box.

A. 6514 (Fig. 97) Puller for the inner rings of the worm roller bearing.

A. 10110 (Fig. 98) Tool for dismantling the steering box oil seal.

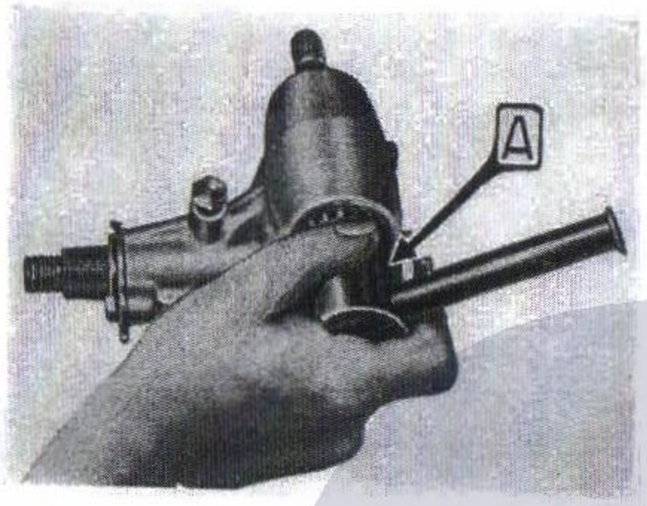


Fig. 95.
A = Spanner A. 8065 for the steering worm front bearing lock ring.

Always employ rationally the tools for dismantling the steering so to prevent damages to the assembly.

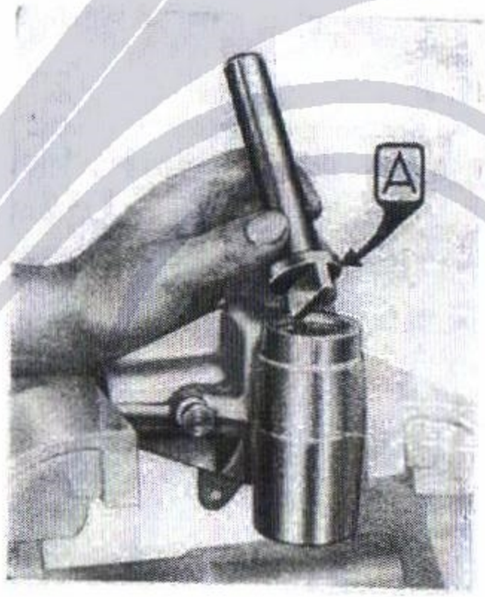


Fig. 96.
A = Tool A. 10111 for removing the outer ring of the steering box rear roller bearing.

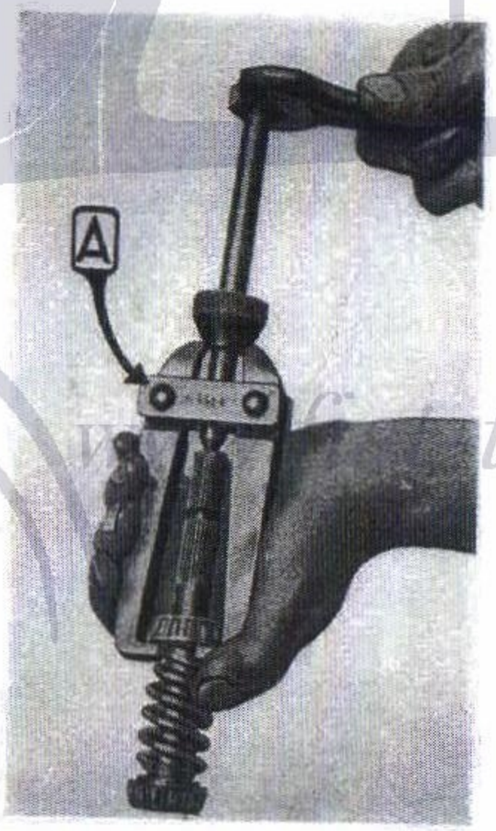


Fig. 97.
A = Puller A. 6514 for the worm roller bearing inner rings.

Inspections and adjustments.

Closely inspect the working surface of steering worm and worm sector, which should be perfectly smooth, having no pits nor roughness.

It is also necessary to make sure, from an examination of the worm and teeth contact surfaces, that the steering worm and worm sector engage in a proper and central position in order to be able to effect the required adjustments when reassembling.

Check over the play between the eccentric bush and the worm sector spindle. It is allowed a maximum play of mm 0,10 (.004").

Make sure that the steering worm is running true; the maximum allowable tolerance is 0,05 mm (.002").

Excessive play between the steering worm and worm sector is corrected by turning the eccentric bush carrying the sector spindle, proceeding as follows:

Take down the steering arm and its packing.

Remove the screw holding the adjusting plate, turn the eccentric bush by means of the adjusting plate so as to bring the sector nearer to the worm, and at such an angle as to make it possible to fix the adjusting plate again through the second hole.

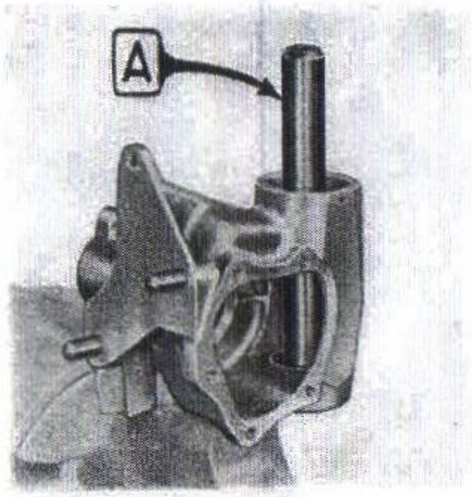


Fig. 98.
A = Tool A. 10110 for dismantling the steering box oil seal.

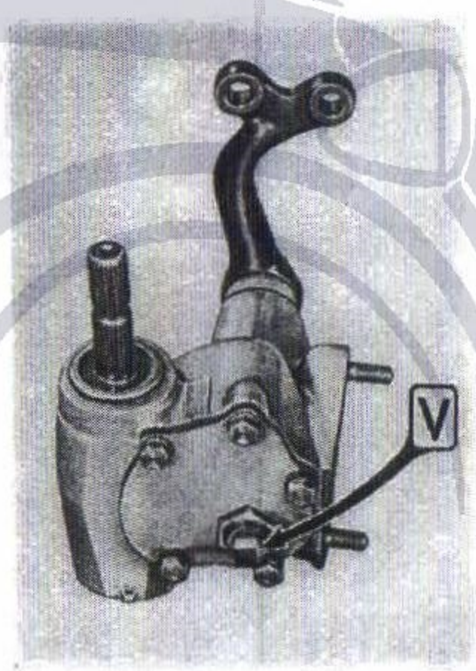


Fig. 99.
V = Screw for adjusting the steering worm side play.

Should the adjusting plate be already fixed at the second hole and consequently, by turning it, it is no longer possible to fix it in position again, it must be taken off the bush and replaced one notch further round.

Play in the roller bearings of the worm is taken up by means of the screwed ring situated on the end of the steering box (Fig. 95).

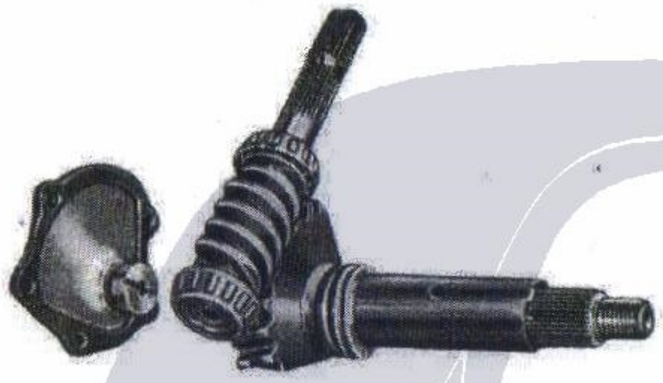


Fig. 100.

Steering details; cover with lateral thrust cap, steering worm, worm sector, eccentric bush with spacing rings for adjusting the worm and sector contact in a central position.

Should the steering worm and worm sector not engage centrally it is possible to move the worm sector spindle sideways by adding or taking off distance rings on the eccentric bush union, after which the lateral play can be adjusted by means of the screw V (Fig. 99).

The foregoing adjustments must be made in such a manner as to eliminate all play in the steering column, without however making the steering too stiff.

PEDALS

Removing the pedals from the car.

Jack up the front end of the car.

Disconnect the left front wheel (on cars with left-hand drive); also the pipes of the brake control pump, collecting the brake fluid in a suitable container.

Remove the brake and clutch pedal control levers.

Disconnect the return springs and the clutch actuating rod

Remove the pedal unit from the chassis.

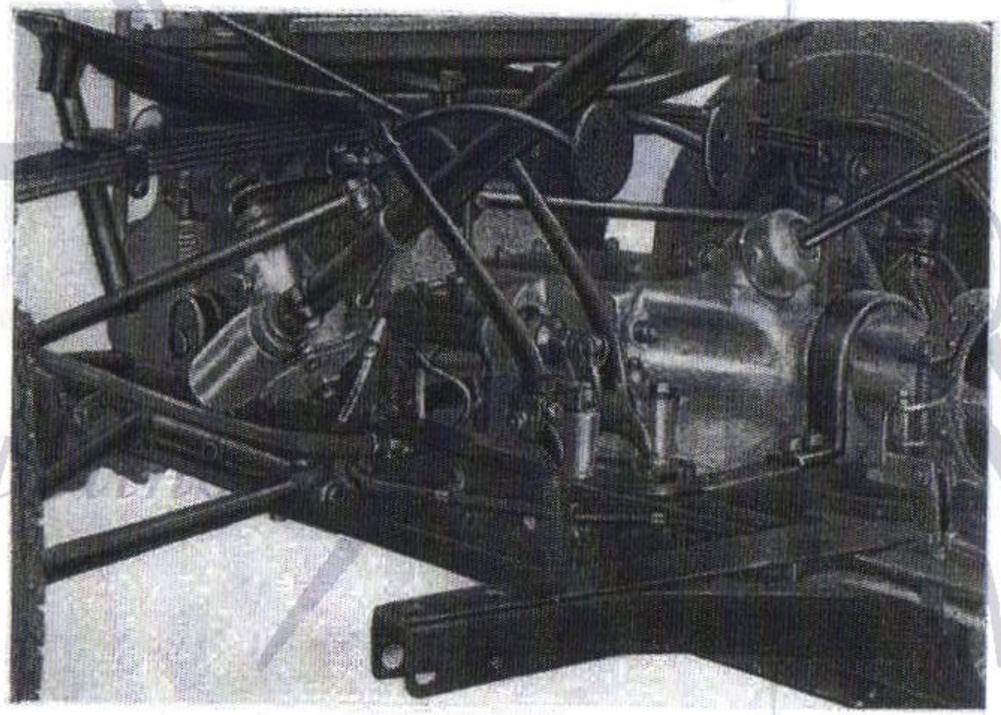


Fig. 101. - Pedal detail.

Reassembling

Carry out in reverse order the same operations as for dismantling, refilling, the brake unit with brake fluid, and bleeding the lines.

RADIATOR

Removing the radiator from the car.

Take off the shell with the front grill.

Open the tap located on the cylinder block front, to drain the water from the radiator and the cylinder block jackets.

Disconnect the rubber hose for the radiator water inlet and outlet.

Remove the bolt fixing the tie rod on the upper part of the radiator and the two bolts fixing the lower part to the chassis cross member.

The radiator is then free and can be removed.

Repairing the radiator core.

It is easy to detect and repair leakages in the outer range tubes, but it is not so easy to find the exact spot where the leakage originates with inner range tubes, so that it is sometimes advisable to substitute a new radiator core.

To eliminate small leakages, heat the part concerned with a blow lamp, taking precaution to keep the flame moving to avoid burning the pipes. It is thus possible to create an opening among the blades, bending down the lower ones and lifting the upper ones around the leakage which is then exposed to view, and the faulty tube can be repaired.

For radiator outer repairs any soldering iron can be useful, but for repairs to inside tubes a small soldering iron, flat enough to pass between the tubes should be used. The surface around the leakage can then be tinned, and the leak repaired. The spot to be soldered should be previously cleaned with acid. The soldering apparatus of the iron should be used moderately hot, and should be withdrawn early enough to prevent its adhesion to the tubes.

For these repairs 50-50 solder preparations should be used. (Tin and lead to be united into alloy should be first fusion metals, without any traces of antimony or other impurities).

When the soldering has been effected, the blades should be straightened.

BRAKES

Pedal controlled hydraulic brakes are fitted to the four wheels. A mechanical brake, hand controlled, is fitted to the transmission shaft.

The wheel brake system is of Lockheed type, hydraulically operated by the pedal through the master cylinder that sends the fluid to the four wheel-cylinders which actuate the brake shoes.

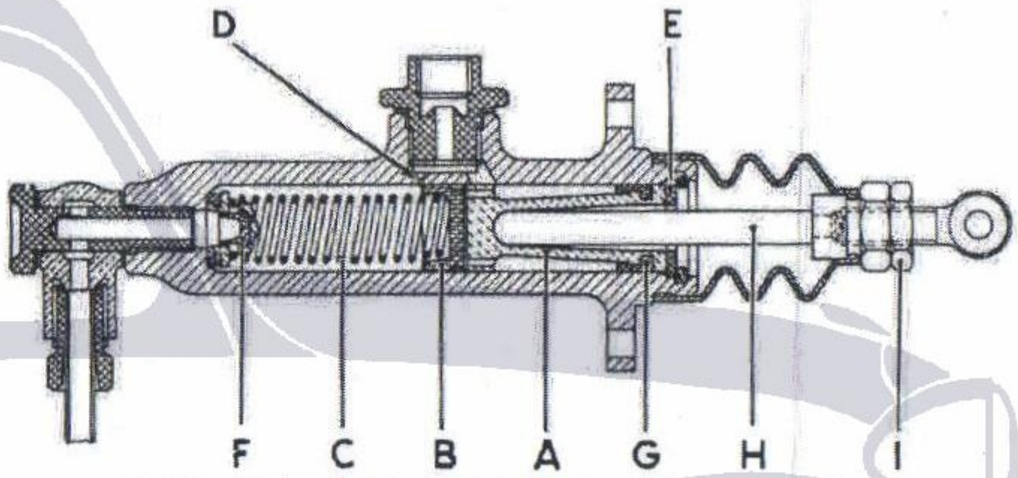


Fig. 102. - Section of the hydraulic brakes control pump; Lockheed type.

A. Piston. - B. Primary cup. - C. Return spring. - D. Fluid compensation hole. - E. Stop washer for rest position. - F. Valve. - G. Secondary cup. - H. Piston push rod. - I. Stroke adjusting nuts.

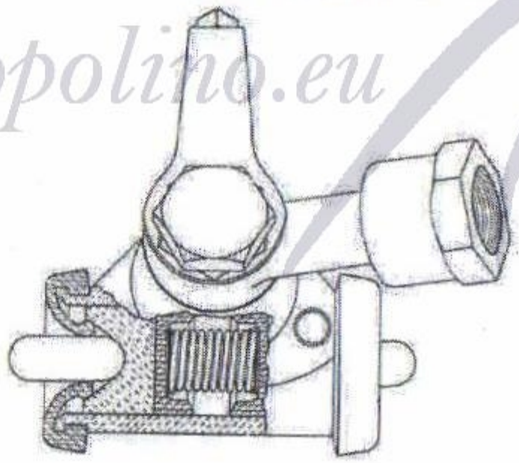


Fig. 103.

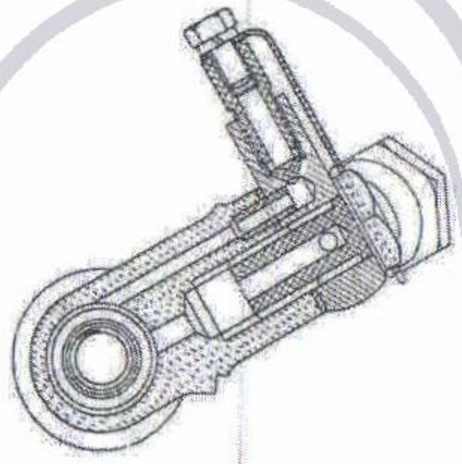


Fig. 104.

Sections through the brake shoe controlling cylinder; Lockheed type.

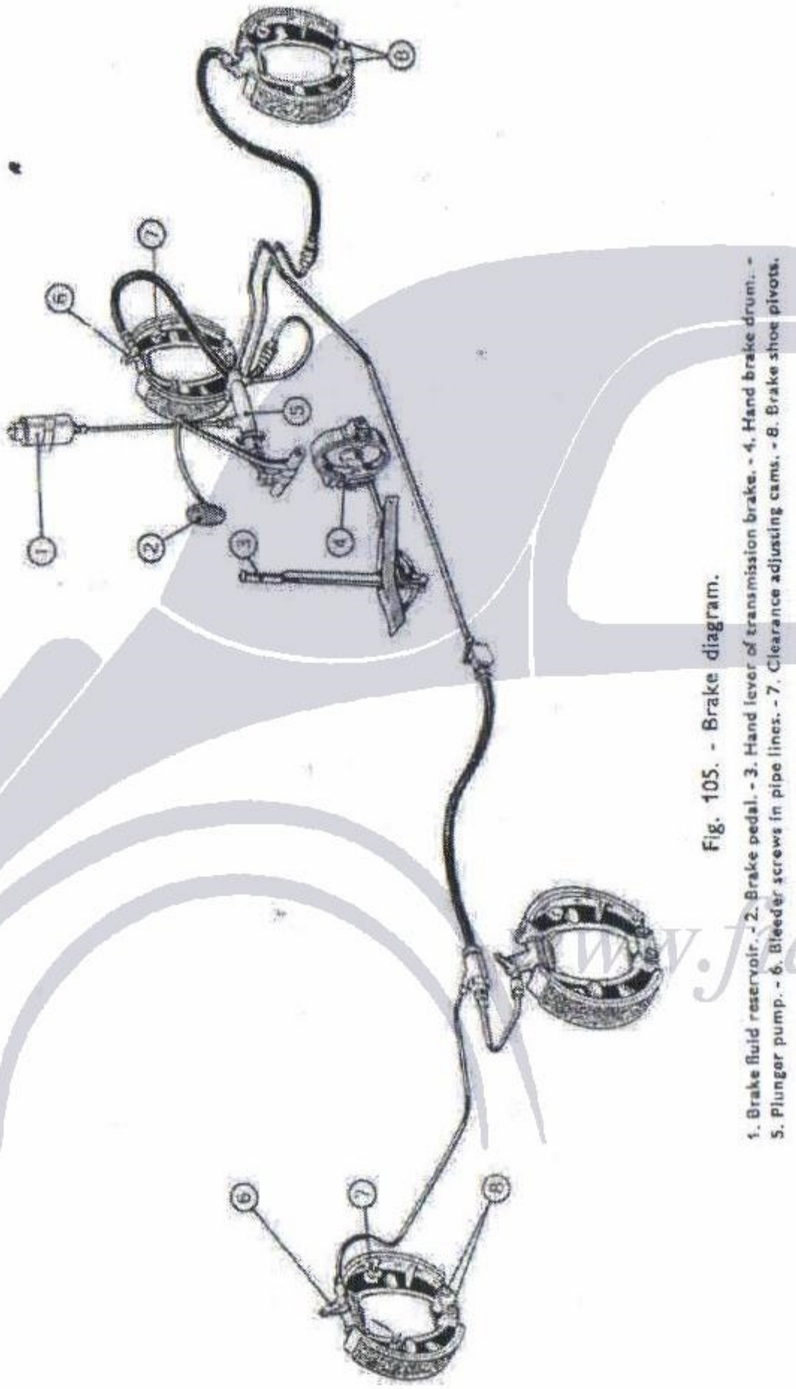


Fig. 105. - Brake diagram.

1. Brake fluid reservoir. - 2. Brake pedal. - 3. Hand lever of transmission brake. - 4. Hand brake drum. - 5. Plunger pump. - 6. Bleeder screws in pipe lines. - 7. Clearance adjusting cams. - 8. Brake shoe pivots.

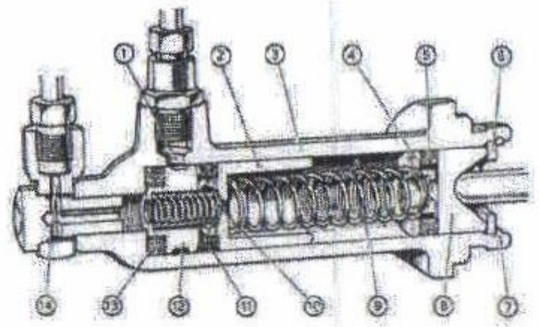
The fluid reservoir is fixed to the forward side of the dash.

Starting from chassis No. 115706 and on some previous vehicles the Patent F. B. hydraulic brake system has been fitted, which has, with respect to the Lockheed type, some constructional alterations both in the master and in the

Fig. 106.

Hydraulic brake master-cylinder (FB Patent).

1. Admission port. - 2. Spring guide cup. - 3. Cylinder body. - 4. Cup of return spring. - 5. Sealing elastic ring. - 6. Piston stop washer. - 7. Lock ring for washer. - 8. Piston. - 9. Piston return spring. - 10. Contrasting spring. - 11. Rubber ring valve. - 12. Spacer ring for valve. - 13. Sealing elastic ring. - 14. Outlet.



wheel cylinders, also in the fitting of the pipes, though remaining unchanged the operation principles.

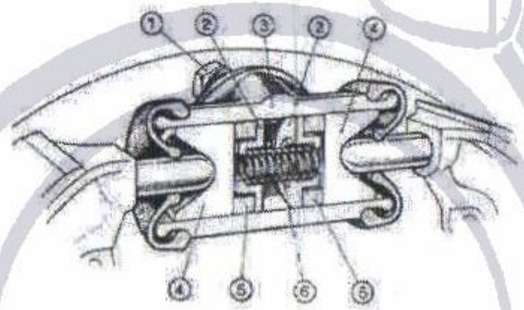
The illustrations of both systems show the details that ciffer.

The inspection and adjustment operations are the same in either system.

Fig. 107.

Hydraulic brake wheel-cylinder (FB Patent).

1. Connection and plug to be replaced by a suitable connection, supplied with the tool kit for effecting the purge of the system.
2. Cup for contrasting spring.
3. Wheel cylinder body.
4. Piston.
5. Sealing elastic rings.
6. Contrasting spring.



Inspections and adjustments.

If, on whatever account, the pedal free stroke is less than 6 to 7 mm (1/4"), adjust the master cylinder stem stroke by means of the suitable nuts; or else, on those types of master-cylinder where are not these nuts, by means of the brake shoe cams.

With regard to the wheel brakes make sure that the drums are well centred; the maximum tolerance allowed being 0,10 mm (.004"). For checking them

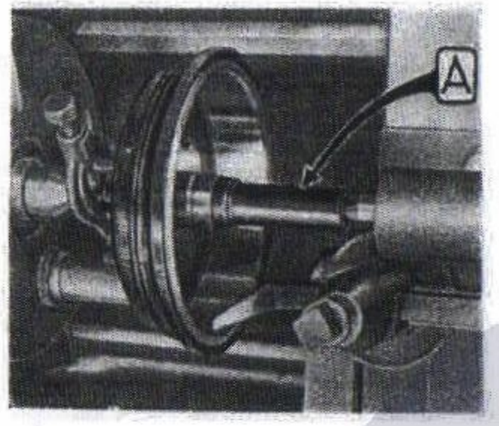


Fig. 108.

A = Mandrel for turning the brake drums on the lathe:
A. 10105 for the front wheel drums;
A. 10106 for the rear wheel drums.

over or testing them on the lathe use the mandrel A. 10105 for the front wheel brakes; and the mandrel A. 10106 for the rear wheel brakes (Fig. 108).

The brake shoe pivots, up to chassis No. 033458, are not eccentric, so that any necessary adjustment to the shoes should be effected through the upper eccentrics, and the clearance between the drum and the linings brought to about 0,25 mm (.01").

To check over this clearance, up to chassis No. 033458, use the gauge C. 641 (Fig. 109).

Starting from chassis No. 033459, the clearance between the drum and the linings is adjusted by means of the shoe pivots that now are eccentric. About them there should be 0,10 mm (.004") clearance; and 0,30 mm (.012") in coincidence with the master-cylinder.

To check this clearance use the gauge C. 646 (Fig. 110).

An important operation to be carried out on the brake system is the bleeding of the lines.

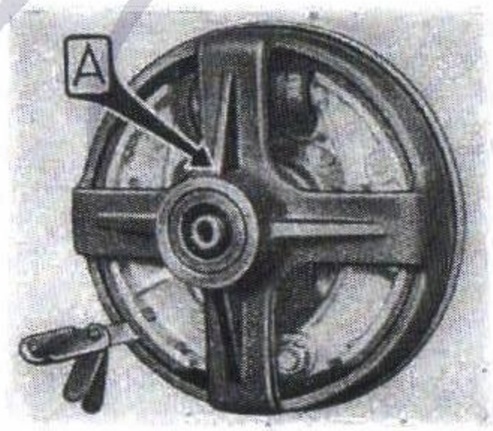


Fig. 109.

A = Drum gauge C. 641 for checking over the brake shoe clearance, up to chassis No. 033458.

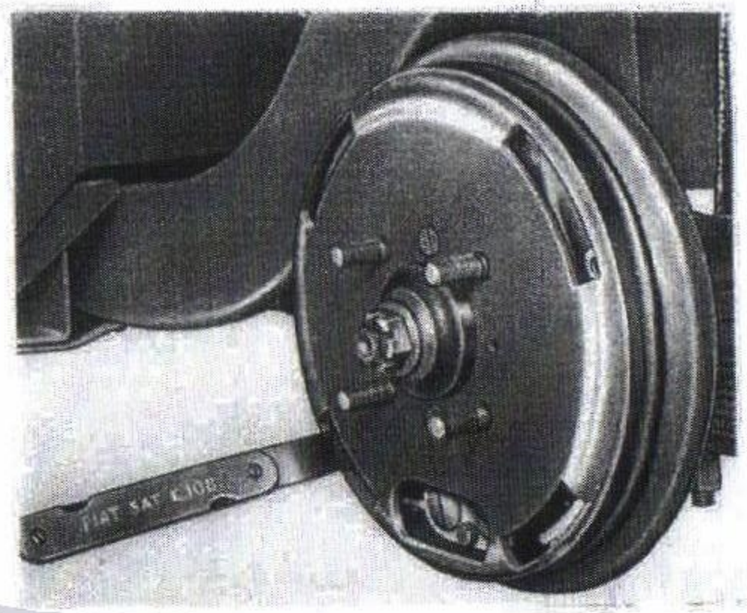


Fig. 110.

Gauge C. 646 for checking the brake drum for center, starting from chassis No.033459; and feeler gauge C. 111 for checking and adjusting the clearance.

Unscrew the plug of the suitable screw on the wheel cylinder, screwing up instead the connection A. 10102 fitted with the pertaining rubber pipe for chassis up to No. 033458 and A. 10103 for further chassis.

Submerge the other end of this pipe in a vessel containing brake fluid, loosen of half a turn the screw (V, Fig. 111) and press repeatedly the brake pedal until no more bubbles will be noticed in the fluid.

Hold full depressed the pedal; tighten the screw; remove the connection with the rubber pipe, and fit in place again the plug.

This operation should be effected on each wheel.

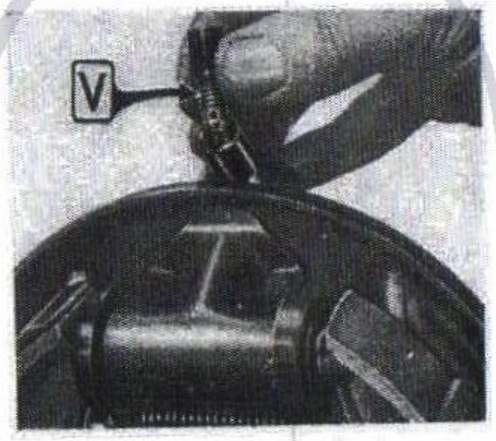


Fig. 111.

V = Plug for bleeding the brake system: to be loosened of half a turn to allow the fluid a passage through the holes shown on the figure.

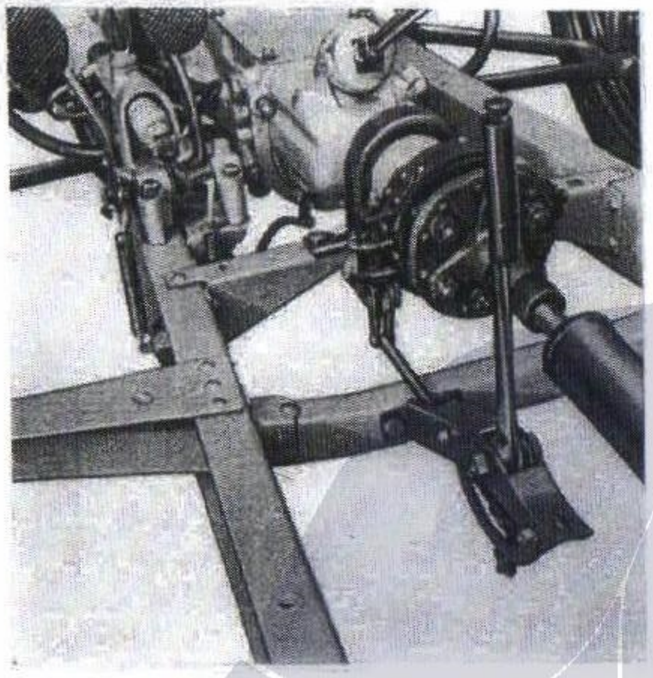


Fig. 112.

Details of the brake control pump and of the transmission brake.

The brake drum on the transmission should be perfectly true and balanced. A uniform clearance is necessary all round, of about 0,50 mm (.02"). To adjust the clearance between drum and brake band actuate first the screw to the right of Fig. 113 and then the tie rods to the left, situated on the ends of the brake band.

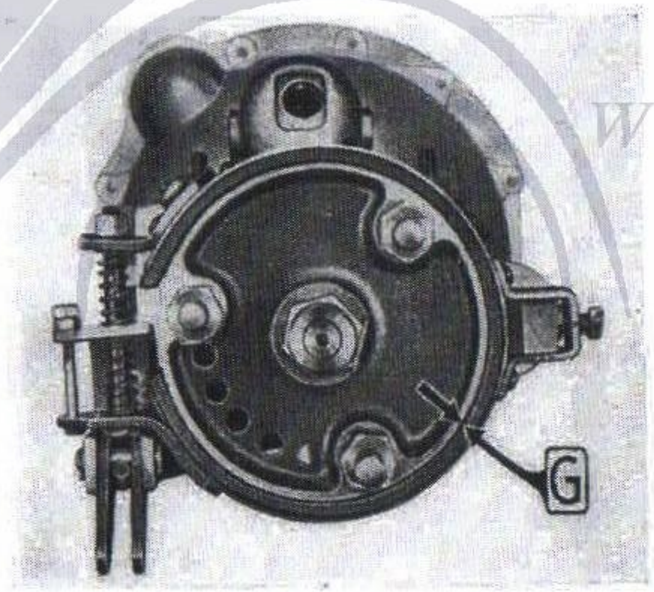


Fig. 113.

G = 0,50 mm (.02") clearance between transmission brake drum and brake band, evenly adjusted all round.

WHEEL BALANCE

To balance the wheel employ the tool A. 10260 with the flange specifically suitable for a 500 model car.

The wheel is fitted to the tool, and the sector is individuated which shows an excess of weight, then apply to the rim, in a position diametrically opposed, a small lump of putty, sufficient to balance the wheel.

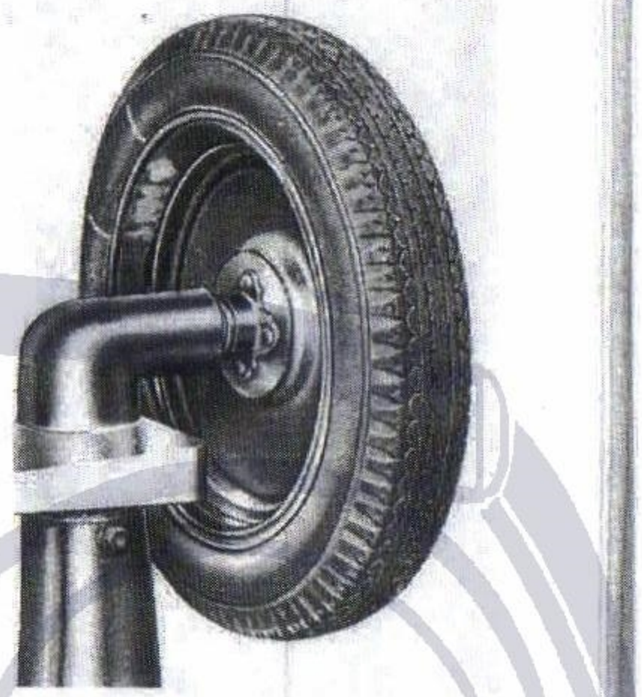


Fig. 114.

Balancing a wheel by means of the tool A. 10260 and the suitable flange for the 500 model car.

Mark on the tyre the position of the putty (Fig. 114) detach it and have it weighed. Then prepare some tin having the same weight, and solder it to the rim in the same spot where the putty was applied.

When re-mounting tires it is a good practice, to keep balance, to fit their lightest spot (i. e. where the identification number is stamped) in line with pneumatic valve.

Pirelli tires bear a red mark in coincidence with their lightest spot.

A correct wheel balance is necessary if favourable road holding qualities are desired at top speed, and if damage to the mechanical units and greater tyre wear are to be prevented as ensuing from unbalanced conditions.

FRAME

To check over or straighten the frame, as well as to make sure as to the alignment of the several units joints, look at the figures 115 & 116 wich show principal data of the chassis.

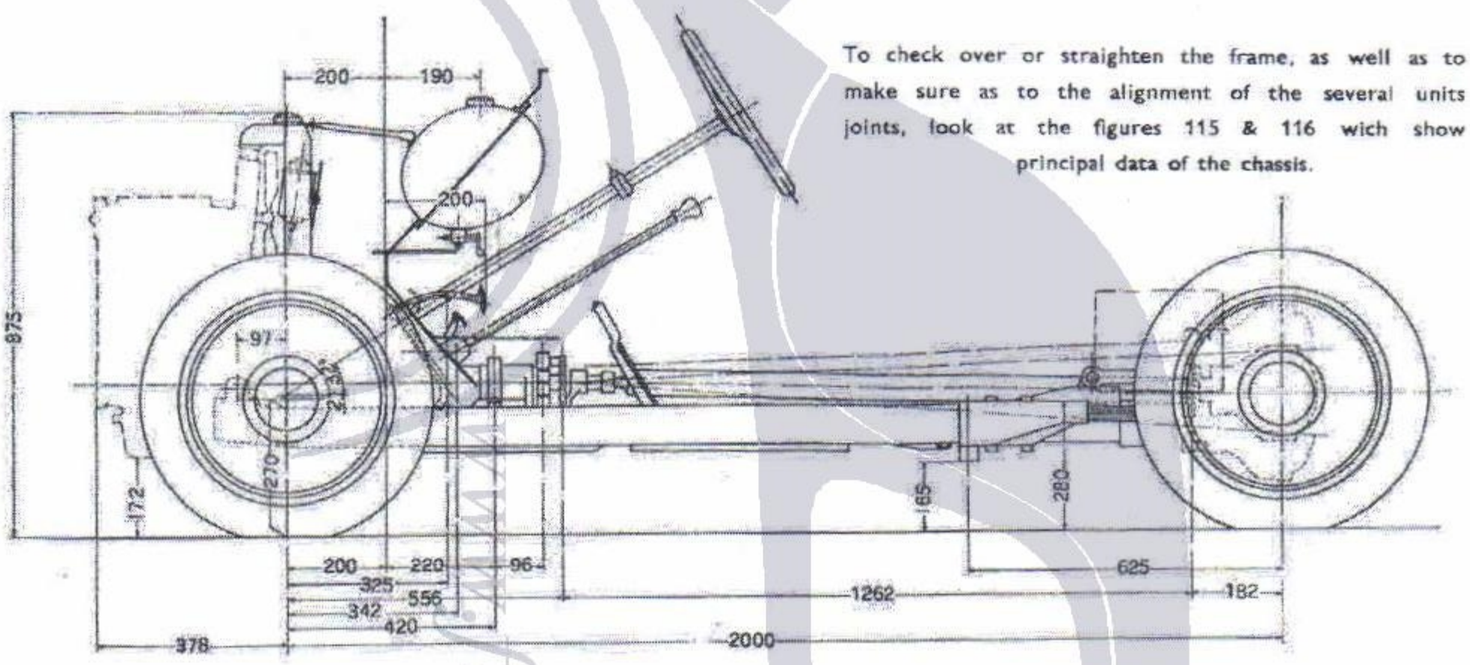


Fig. 115. - Chassis viewed from one side, with outstanding data (up to chassis No. 046000).

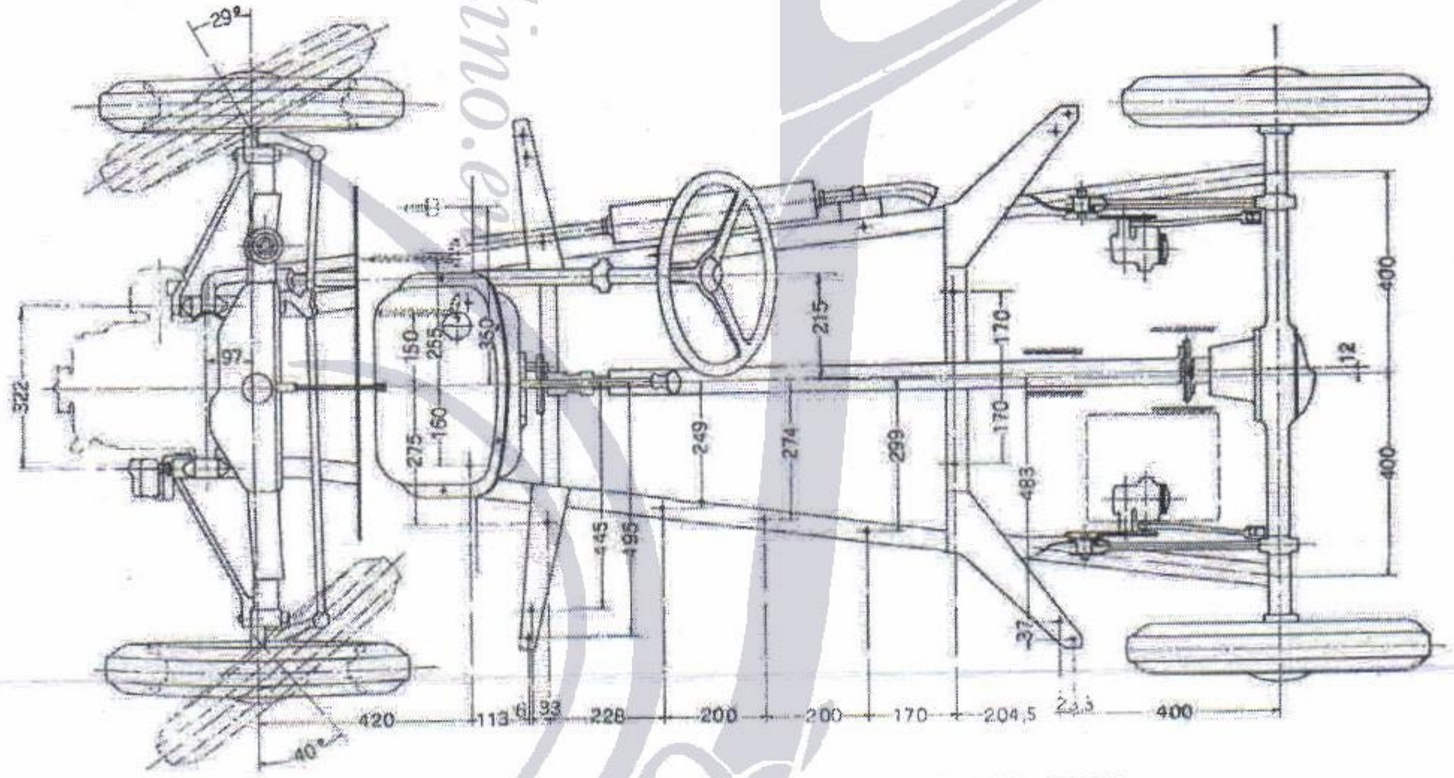


Fig. 116. - Chassis viewed from above, with outstanding data (up to chassis No. 046000).

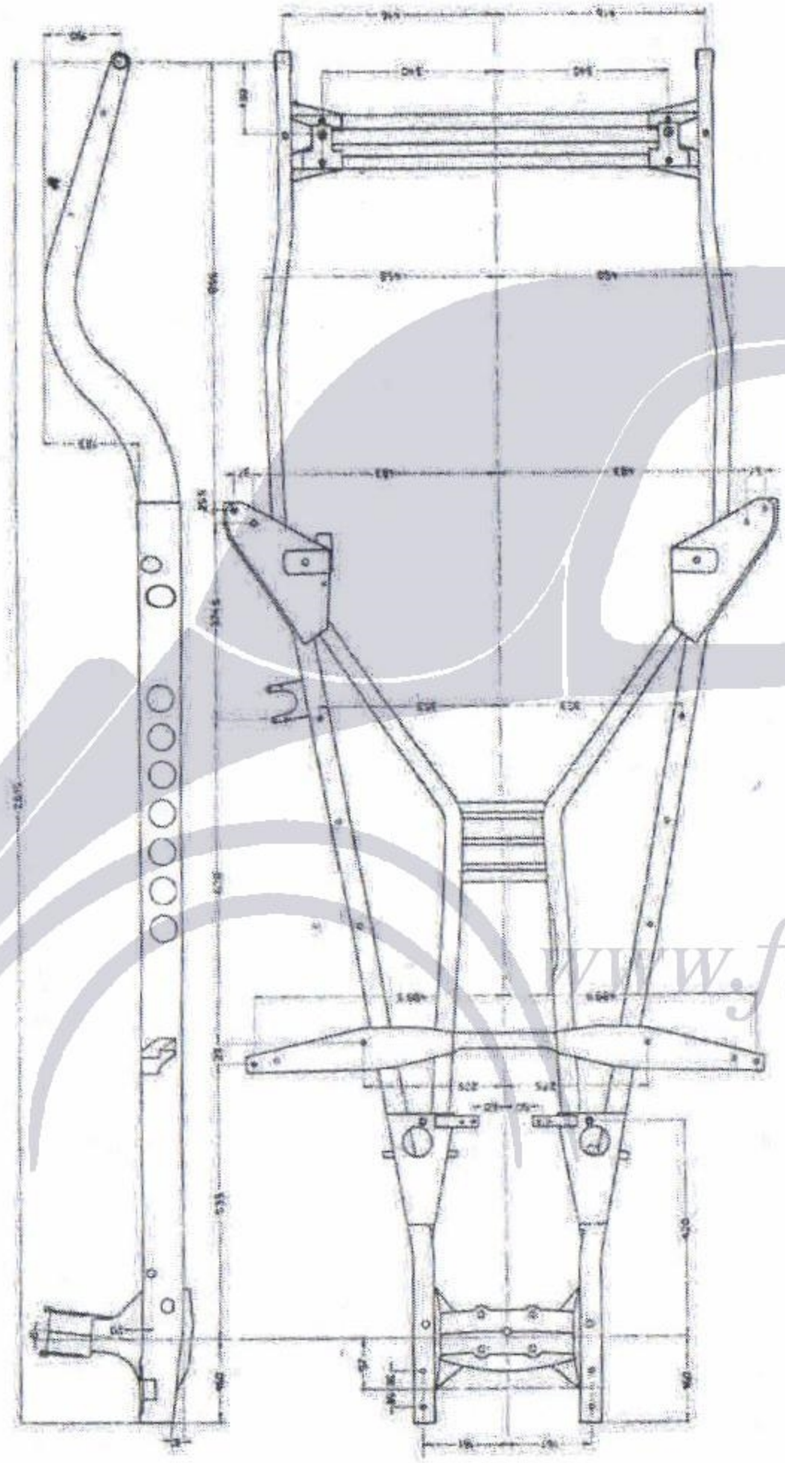


Fig. 117. - Chassis main data, beginning from No. 046001.

OVERHAULING
THE ELECTRICAL SYSTEM

Combinations that can be obtained with the external lighting switch.

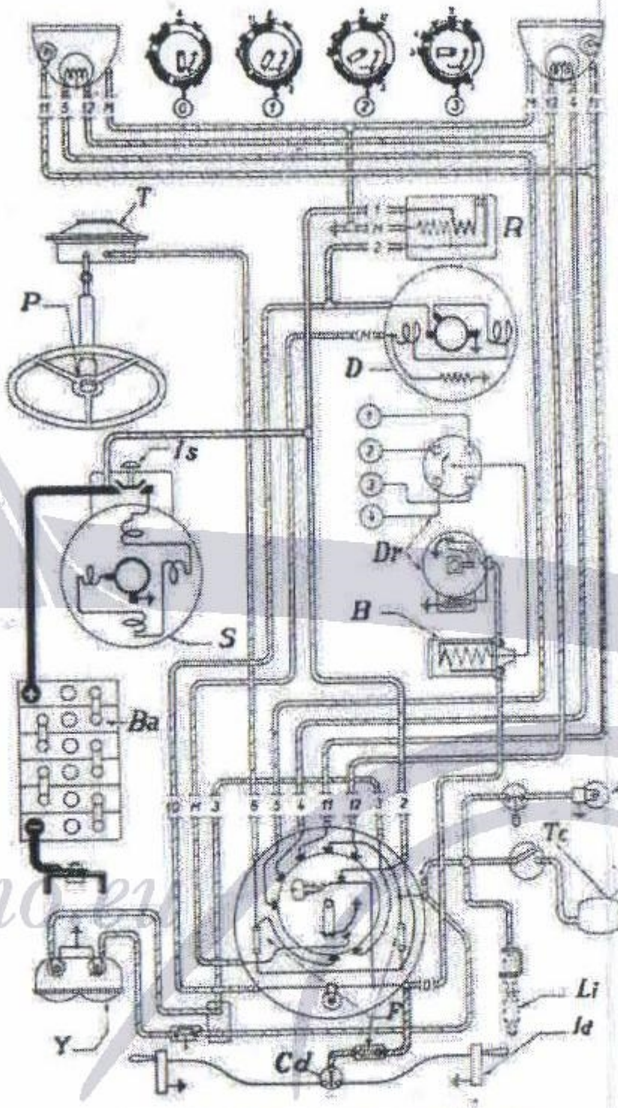


Fig. 118. - Electrical equipment diagram.

B. Ignition coil. - Ba. Batteries. - Cd. Trafficators control switch. - D. Dynamo. - Dr. Ignition distributor. - F. 8-Amp. fuses. - Id. Direction indicators. - Is. Starter switch. - Li. Inspection lamp. - Lq. Dash lamp. - P. Electric horn switch. - R. Automatic cut-out. - S. Starter motor. - T. Electric horn. - Tc. Screen wiper. - Y. Tail and « stop » lights.

Combinations that can be obtained with the external lighting switch.

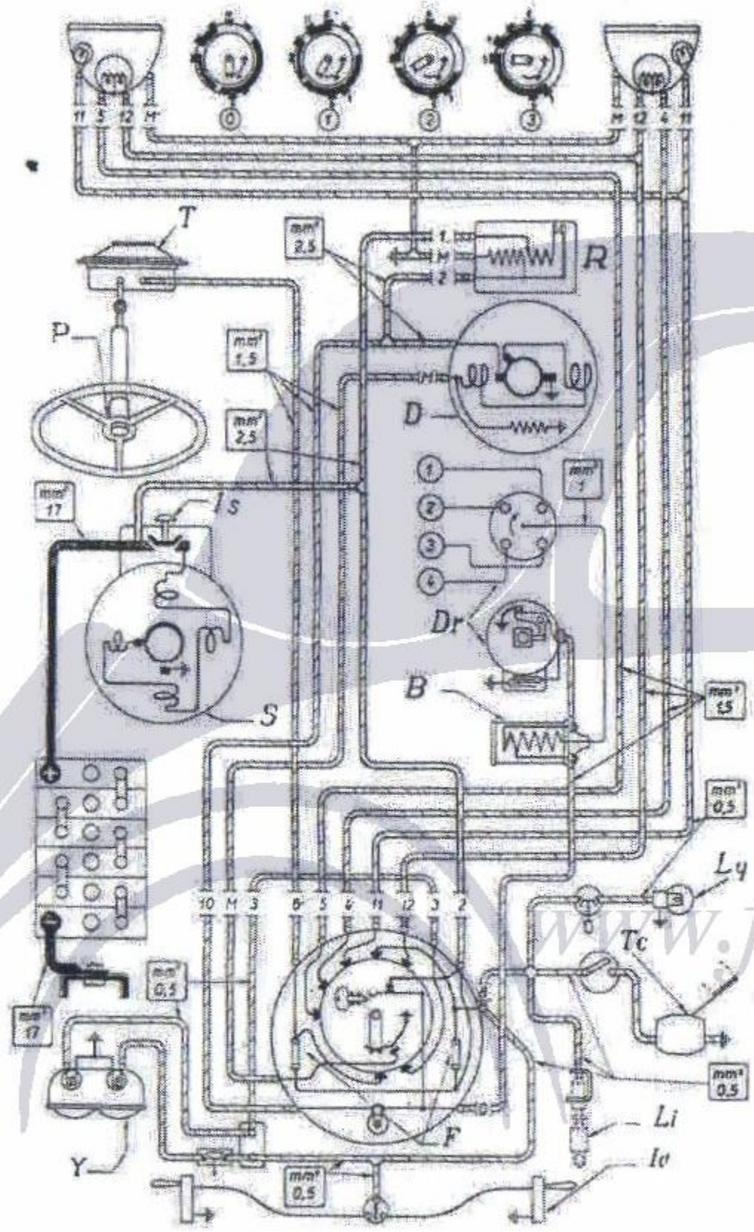


Fig. 119. - Electrical equipment diagram (on some cars prior to No. 047800) with key switch for outer lighting and ignition.

B. Ignition coil. - D. Dynamo. - Dr. Ignition distributor. - F. 8-Amp. fusibles. - Id. Direction indicator. - Is. Starter switch. - Li. Inspection lamp. - Lq. Dash lamp. - P. Electric horn switch. - R. Automatic cut-out. - S. Starter motor. - T. Electric horn. - Tc. Screen wiper.

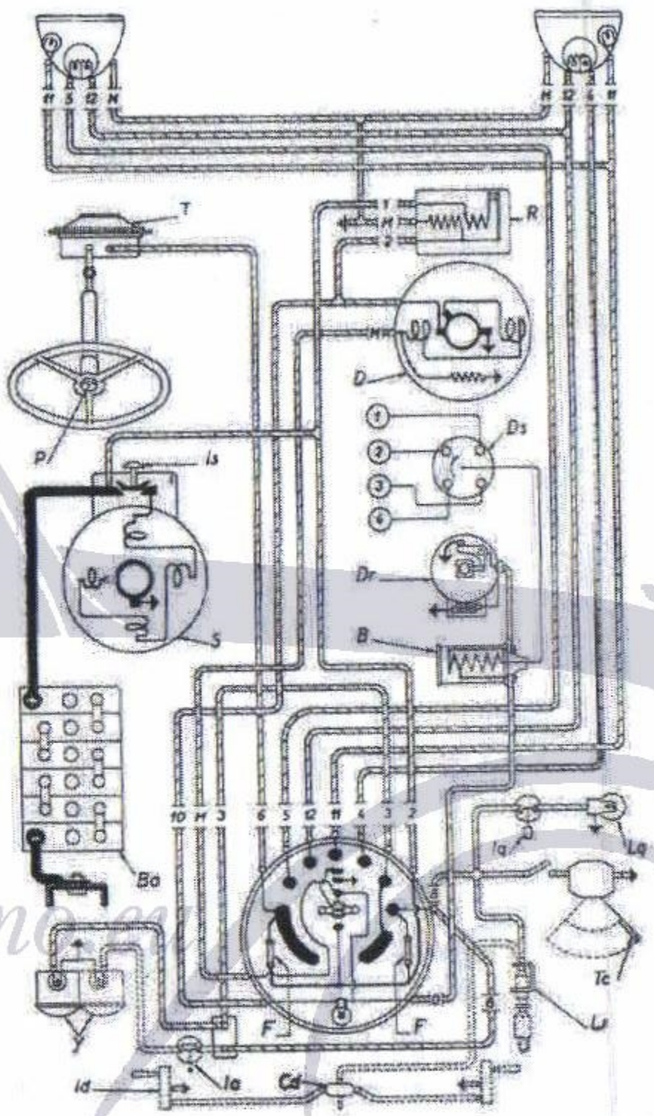


Fig. 120. - Electrical equipment diagram (1.st type) with handle switch for outer lighting and key switch for ignition control.

B. Ignition coil. - Ba. Battery. - Cd. Direction indicator switch. - D. Dynamo. - Dr. Ignition contact breaker. - Ds. Ignition switch. - F. 20 amp. fuses. - Ia. « Stop » lamp switch. - Id. Direction indicator (optional). - Iq. Dash lamp switch. - Is. Starter motor switch (operated from dash). - Li. Connection for eventual inspection lamp. - Lq. Dash lamp. - P. Electric horn button. - R. Automatic cut-out. - S. Self starting motor. - T. Electric horn. - Tc. Screen wiper. - Y. Tail lamp and « Stop » signal (optional).

BATTERY

Magneti Marelli, type 6 BA 7.

Dimensions: length (mm 250) 9 7/8"; width (mm 175) 6 3/4"; height (mm 195) 7 5/8".

Voltage: 12 Volts.

Capacity: 30 Amp/hours - during a standard 10-hour discharge.
Final discharge voltage should never be less than 10,5 Volts.

In regard to maintenance and repairs the instructions may still be followed as set out in previous Repairshop Manuals.

IGNITION DISTRIBUTOR

Magneti Marelli S 25 F 14 type.

The ignition distributor is similar to those fitted on all other FIAT models. Its structural features are shown in the figures 121, 122 and 123.

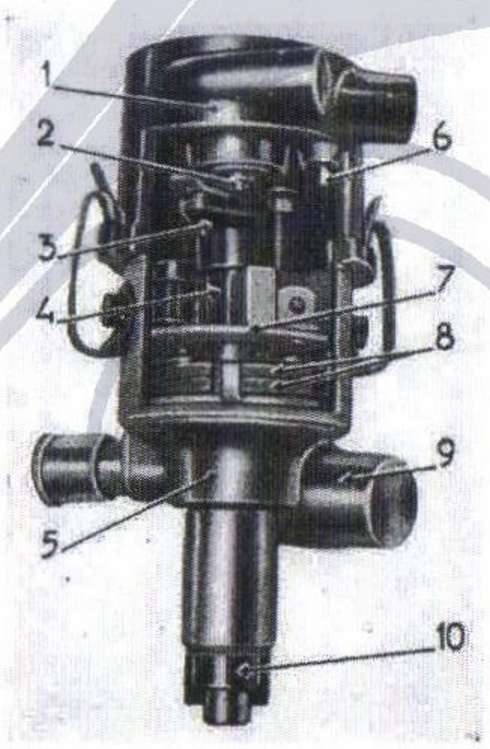


Fig. 121.

Ignition distributor of the « Marelli » type.

1. Distributor head. - 2. High tension carbon. - 3. Revolving brush. - 4. Cam. - 5. Distributor body. - 6. Sparking plug terminals. - 7. Breaker plate. - 8. Governor weights. - 9. Condenser. - 10. Drive coupling.

Clearance between the breaker points:

mm 0,47÷0,53 (.018" to .021").

Contact pressure:

gr. 650÷700.

Advance, in regard to the engine:

fixed 5°
automatic 17°
22° degrees.

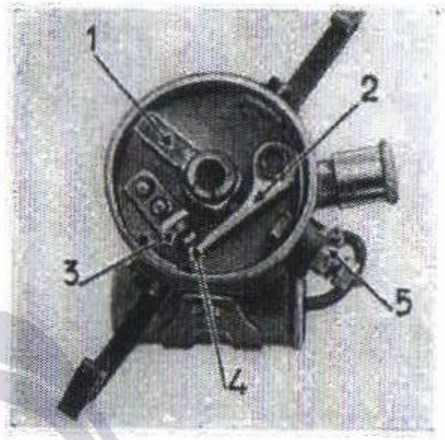


Fig. 122.

1. Cam lubricator wick. - 2. Contact breaker arm. - 3. Fixed earthed contact. - 4. Moving insulated contact. - 5. Terminal for primary current.

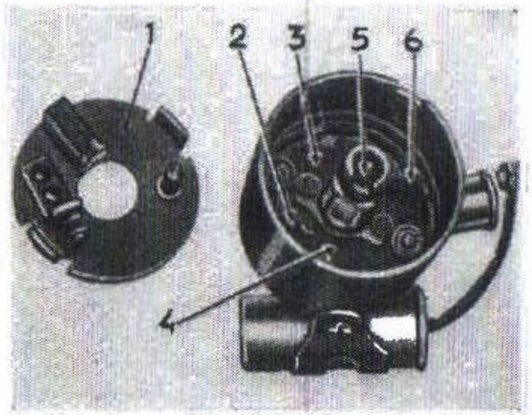


Fig. 123.

1. Breaker plate, removed. - 2-6. Governor weights return springs. - 3-4. Governor weights. - 5. Seat for the revolving brush on the distributor spindle.

The automatic advance device begins to operate when the engine has attained a speed of 200 r. p. m.; and the maximum advance is reached at 2800 r. p. m.

Timing the ignition distributor.

The ignition distributor should be coupled to the engine with 5 degrees advance in respect of the t. d. c. As the distributor has an automatic advance of 17 degrees, the total advance amounts to 22 degrees.

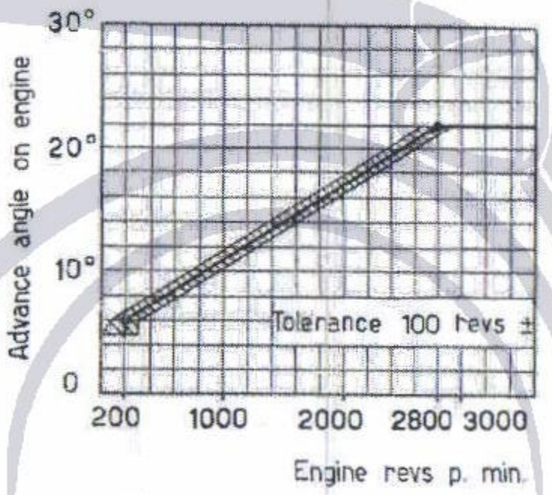


Fig. 124.

Distributor timing curves

IGNITION COIL

Magneti Marelli: 12-Volt type " 662-04/20 ".

Testing on the bench: Follow the instructions in regard to the ignition coil test as set out in previous Repairshop Manuals.

Ad various engine speeds sparks 8 mm in length should occur.

If not so replace the ignition coil.

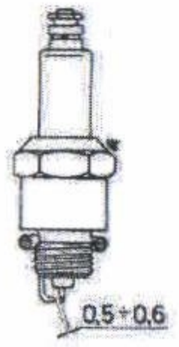


Fig. 125.

Gap between the spark plug electrodes.

SPARK PLUGS

Magneti Marelli: "MW 125 T 3 P" type.

Gap between the electrodes: 0,5 mm to 0,6 mm (.019" to .024")

Diameter { up to engine No. 060057 mm 12×1,25;
and pitch { starting from engine No. 060058 mm 14×1,25.

As the diameter of the threaded portion has been altered, the hexagonal portion has been altered too.

There are therefore two different wrenches for screwing up or removing the spark plug:

the wrench A. 8063 for 12×1,25 mm spark plugs;
the wrench A. 8063 bis for 14×1,25 mm spark plugs.

AUTOMATIC CUT-OUT

The automatic cut-out is the same as that fitted to "1100" Fiat cars.

Data for adjustment.

Closed contacts voltage: 12,5 ± 0,5 Volts.
Voltage for parting the contacts: 10,5 ± 1 Volts.
Return current: 7 ± 1 Amperes.

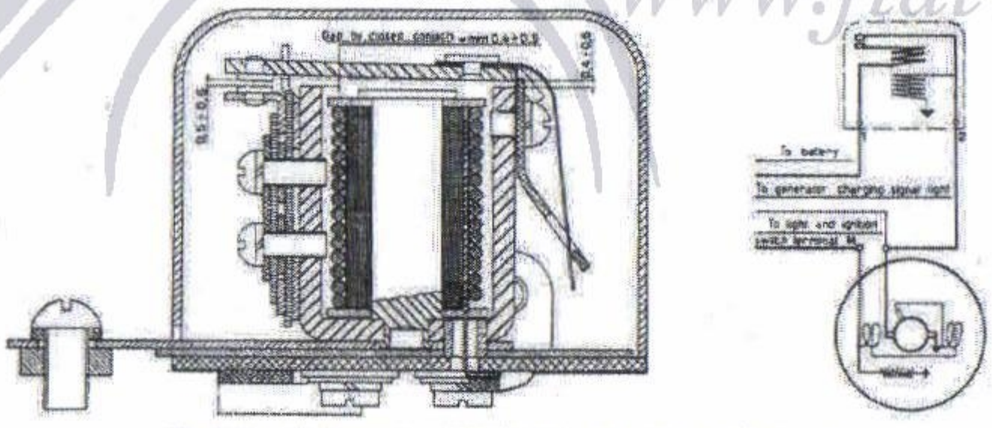
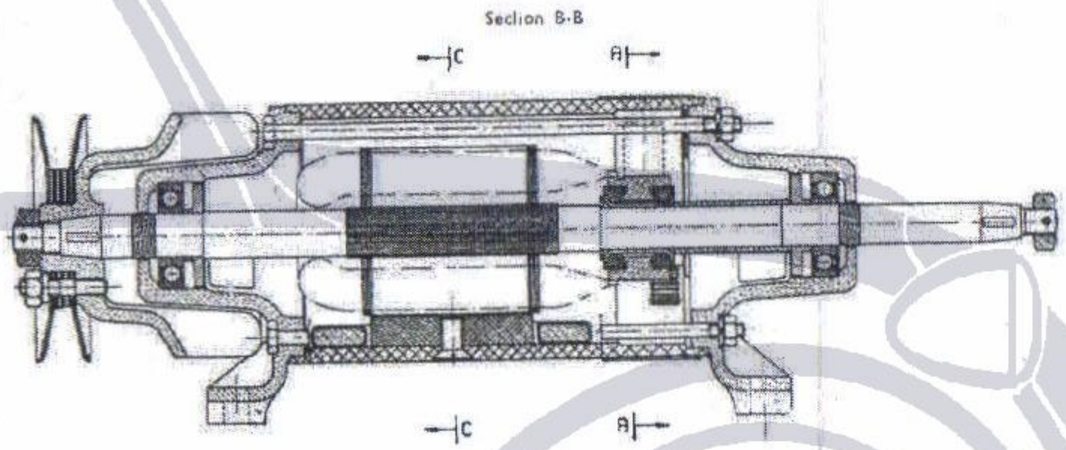


Fig. 126. - Section and operation diagram of automatic cut-out.

DYNAMO

Fiat 75/12 type.

Voltage: 12 Volts. — Standard power: 75 Watts.
Two poles. — 3.rd-brush-and-resistance regulation.
Beginning to charge (on top gear) at km/hour 23 (15 m. p. h.).
Dynamo, number of revolutions: 1300.
Eingine (with new belt) number of revolutions, about 1050.
Engine (with average worn belt) number of revolutions, about 1140,
Maximum output { with headlamps off = Amp. 6,5.
with headlamps on = Amp. 7,5.
Rotation (coupling end) clockwise. — Belt driven.



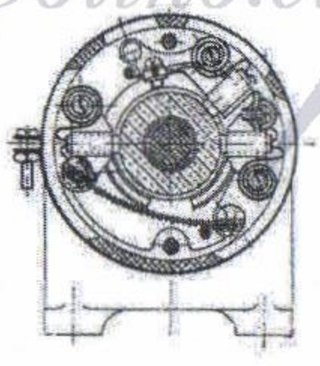
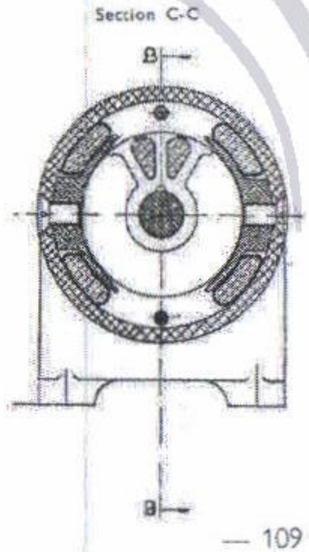
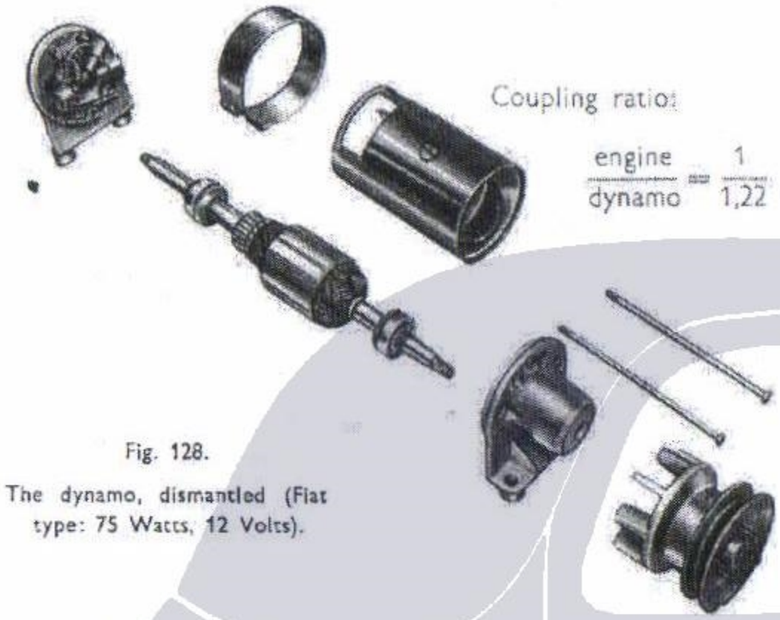


Fig. 127.

Dynamo cross sections.





Coupling ratio:

$$\frac{\text{engine}}{\text{dynamo}} = \frac{1}{1{,}22}$$

Fig. 128.

The dynamo, dismantled (Fiat type: 75 Watts, 12 Volts).

Upkeep and overhauling.

For upkeep and overhauling of the 75/12 dynamo the instructions concerning the dynamos fitted on the last FIAT car models are still valid.

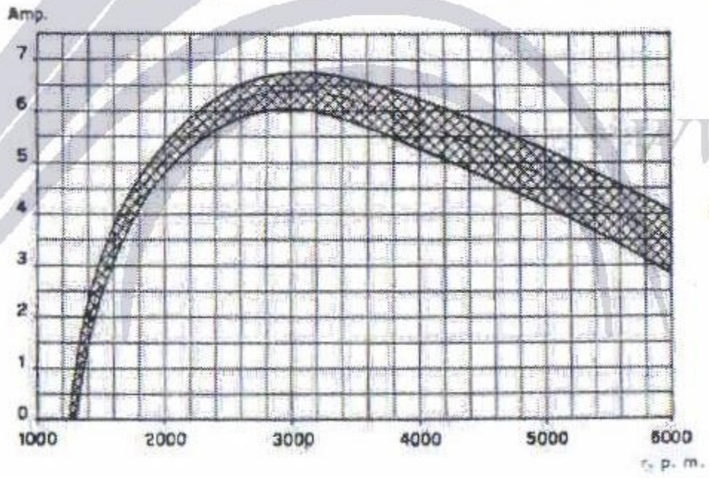


Fig. 129.

FIAT 75/12 generator out-put curve.

steady tension 14,5 V.

Adjusting the tension of the dynamo driving belt.

The pulley on the dynamo spindle consists of two outer discs with several intermediate spacing rings that form the pulley groove.

When the belt becomes slack it should be drawn off, then the pulley should be dismantled and one or two of the spacing rings moved to the outside of the outer discs. Thus the pulley groove becomes narrower and the belt will be tightened.

The wear of both pulley: the one on the dynamo and the driving one on the engine will alter the transmission ratio between engine and dynamo. Have therefore care that this ratio never gets lower than $\frac{11}{1{,}06}$

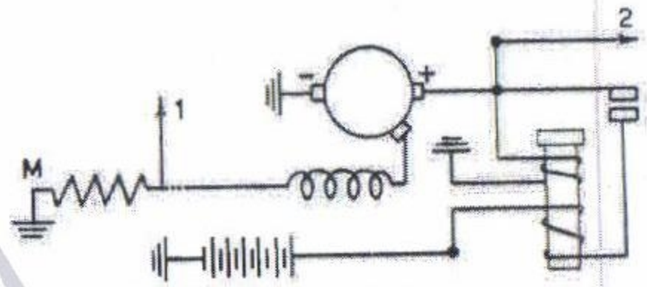


Fig. 130. - Dynamo circuit diagram.

The dynamo is viewed from the commutator end (M = Earthing connection).

Coil windings.

INDUCTION COIL - Symmetrical winding.

12 slots. - 24 comm. bars. - Winding pitch—3 ± 5. - Pitch to the commutator ±1. - 52 wires per slot. - 4 coils per slot. - 13 turns per coil. - In the whole 624 turns.

Diameter of bare wire: mm 0,75 (.03"). - Diameter of insulated wire (enamel and double cotton) maximum: mm 1,02 (3/64").

FIELD. - 2 poles. - 212 turns per pole. - Diameter of copper wire: mm 0,70.

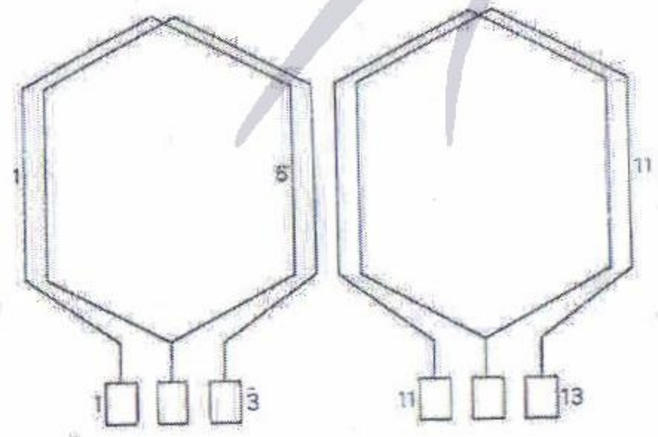


Fig. 131.

Induction coil winding diagram.

STARTER MOTOR

Fiat 500 type.

Maximum power: h. p. 0,90.
Rotation (commutator end): clockwise.
Control: thrown into mesh by hand, through a knob on the dashboard.

FIELD COIL DATA:

4 poles - 7 turns per pole - section of copper wire: 7,3 sq. mm.

Coupling ratio:

$$\frac{\text{engine}}{\text{motor}} = \frac{10}{1}$$

Fig. 132.
Starter motor dismantled.

INDUCTION COIL DATA:

Diameter: from 59,7 mm to 59,8 mm (about $2\frac{23''}{64}$). - Length of laminated pole piece: 59 mm ($2\frac{21''}{64}$). - Number of wires: 92. - Number of slots: 23 - Number of commutator bars: 23 - Copper section: sq. mm 3,14 - Radial air gap: from 0,40 mm to 0,45 mm - Number of brushes: 2 - Brush contact surface: sq. mm 133 (sq. in. 0,2061).

This starter motor has been fitted on the 500 model car starting from engine No. 033509.

Above starter motor has undergone the following further variations:

— brushes screwed to swinging holders replaced by guided brushes with cushioning coil springs;

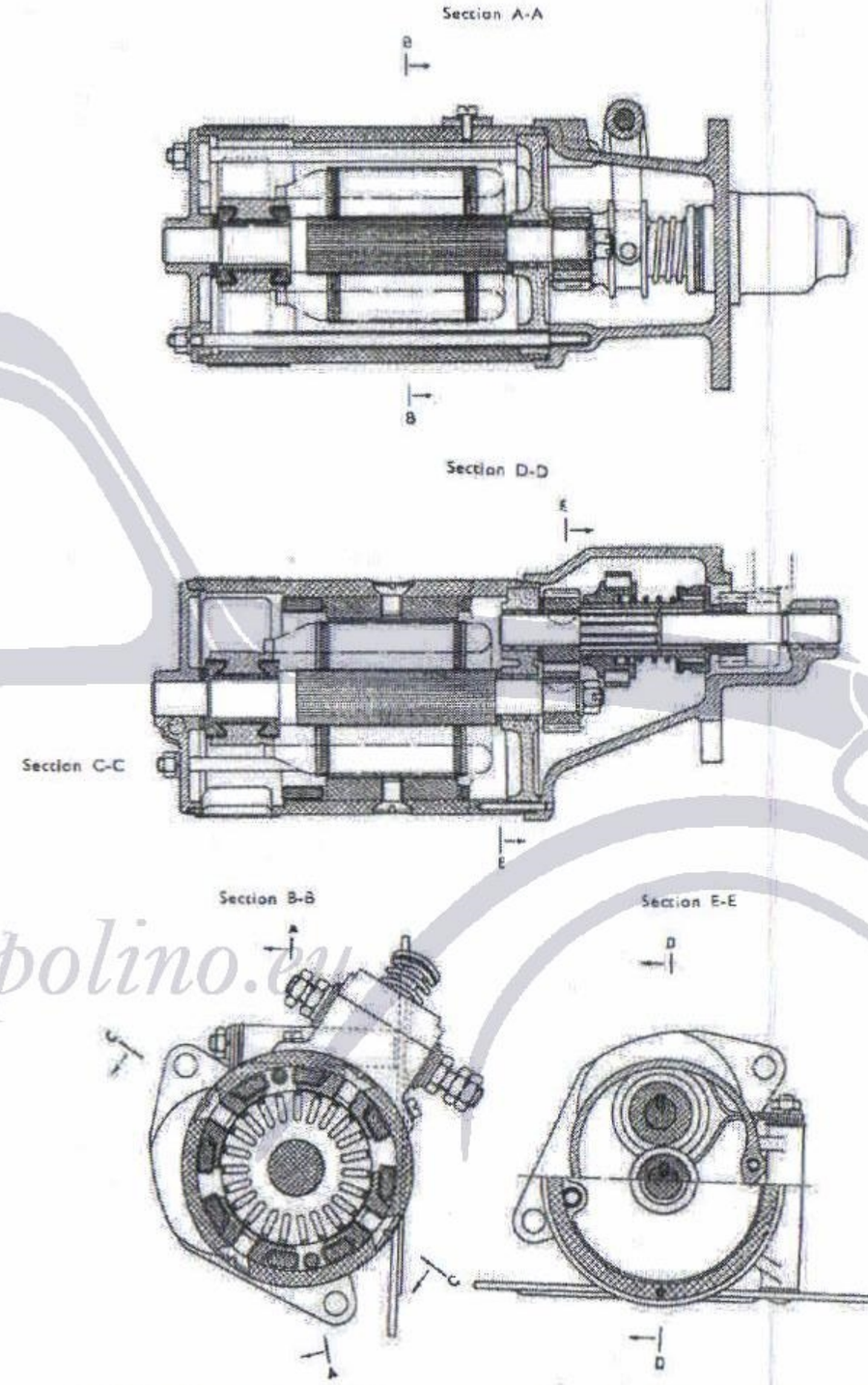


Fig. 133. - Cross sections of the starter motor (type fitted from engine No. 033509).

— oiler replaced by a self-lubricating bronze bushing on commutator side support.

Should the old commutator side support be replaced with the new one, the following must be done:

1) replace induction coil ends by accurately soldering, instead of present lead, another being the same section and 50 mm in lenght;

2) widen housing openings at brush location.

To this regard see the Technical Information Bulletin "October-November 1947".

Fiat 500 type (up to engine No. 033508).

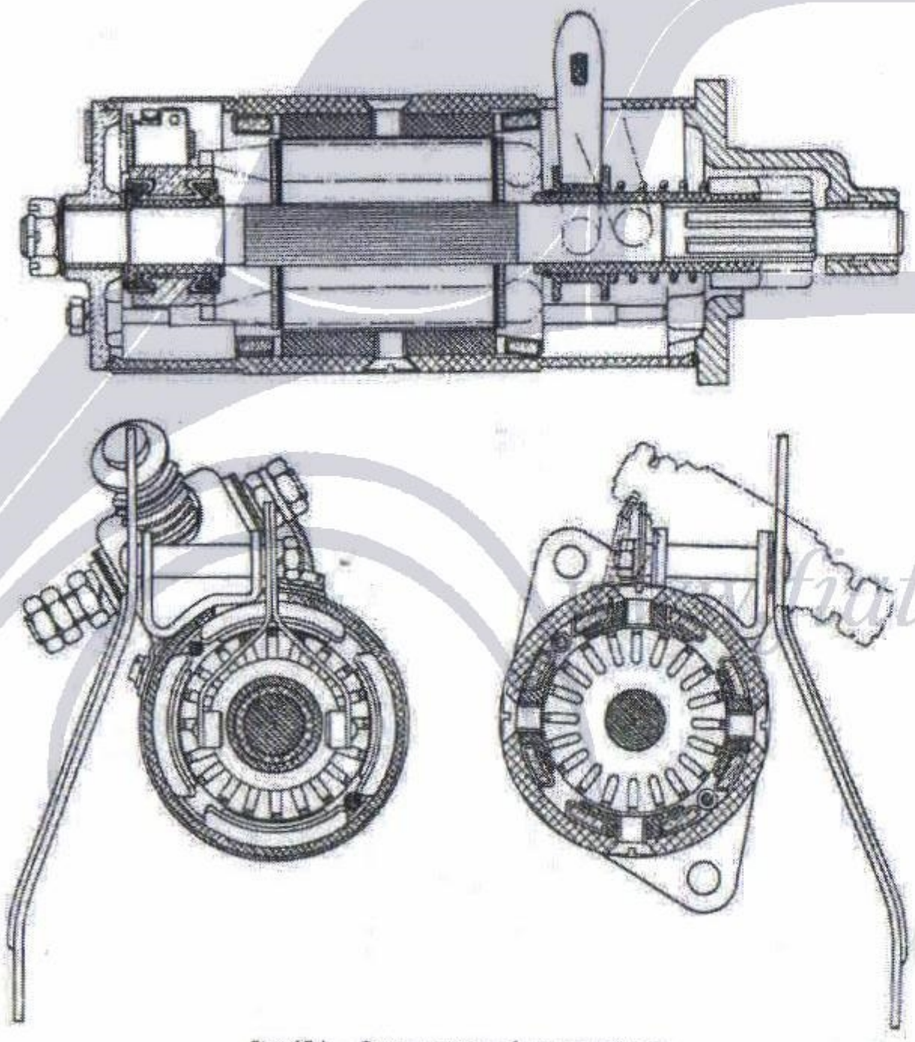


Fig. 134. - Cross section of starter motor.

Maximum power: h. p. 0,70.

Coupling ratio $\frac{\text{engine}}{\text{motor}} = \frac{1}{8,4}$.

Winding.

INDUCTION COIL. — Series winding. - Winding pitch: 5. - Pitch to the commutator: 9.

19 slots. - 4 wires per slot. - 38 coils. - 2 turns per coil. - 76 turns in all. - 19 commutator bars.

Diameter insulated wire: 2,10÷2,30 mm.

FIELD: 4 poles. - 5 turns per pole. - Copper section 4,8 square mm.

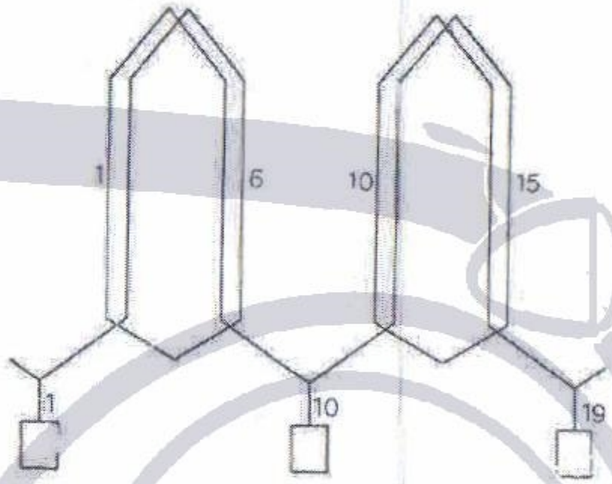


Fig. 135.

Starter motor induction coil diagram.

For the upkeep and overhauling of the starter motor the instructions concerning those fitted to the last FIAT models are still valid.

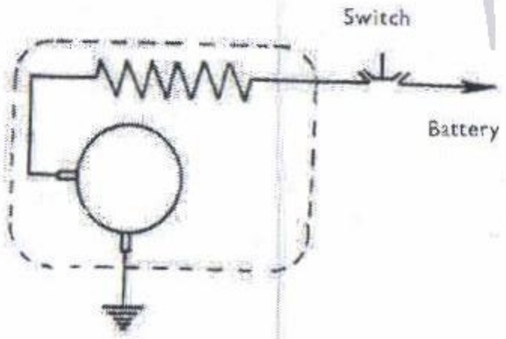


Fig. 136.

Starter motor circuit diagram.

LOCK-AND-KEY SWITCH FOR LIGHTING AND IGNITION

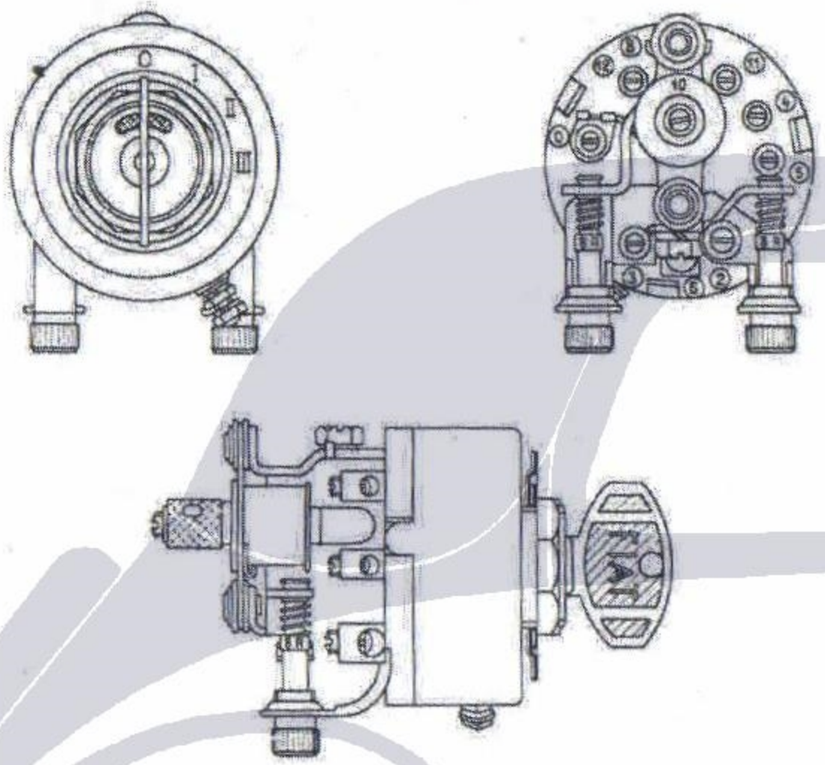


Fig. 137. - Three views of the lock-and-key switch fitted up to car No. 019840.

Lock-and-key switch (starting from chassis No. 019840).

The key may be pushed down either up to the first stop, for the only control of the outer lights, or right home, for controlling both the outer lights and the ignition.

The positions in which the key can be set are:

O - All lights off.
I - Parking lights and tail light on.
II - Anti-dazzle lights and tail light on.
III - Headlamps and tail light on.

The left-hand fusible protects the terminals 5-6-3 (nearside headlamp, electric horn, tail lamp).

The right-hand fusible protects the terminals 8-4-11-12 (offside headlamps anti-dazzle lights, parking lights, instrument board light, " stop " lamp, screen wiper, direction indicators). No protection is provided for the terminal 0 and 10.

The terminal 2 is the one which adduces the current.

This lock-and-key switch has been fitted starting from car No. 019840.

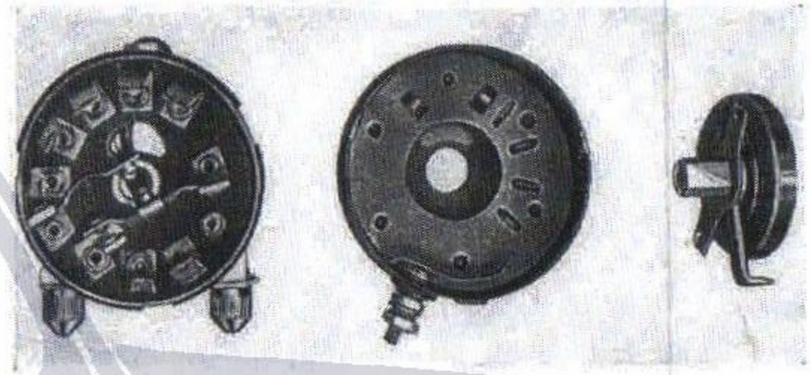


Fig. 138. - Lock-and-key switch, partially dismantled.

Lock-and-key switch (up to chassis No. 019839).

The switch for outer lighting is controlled by a handle which is provided, on the pivoted end, with an ignition switch. The latter is controlled by a suitable key.

The handle may be set in the following positions:

O - All lights off.
I - Parking lights and tail lamp on.
II - Anti-dazzle lights and tail lamp on.
III - Headlamps and tail lamp on.

The key for the ignition switch can be set in the following positions:

Horizontal = Ignition off (circuit open).
Upright = Ignition on (circuit closed).

To withdraw the key it is necessary that it be set in the horizontal position.

— The right-hand fusible protects the right-hand headlamp, the instrument board lamp, the tail lamp and the screen wiper.

— The left-hand fusible protects the left-hand headlamp, the antidazzle light, the parking lights, the electric horn and the direction indicators.

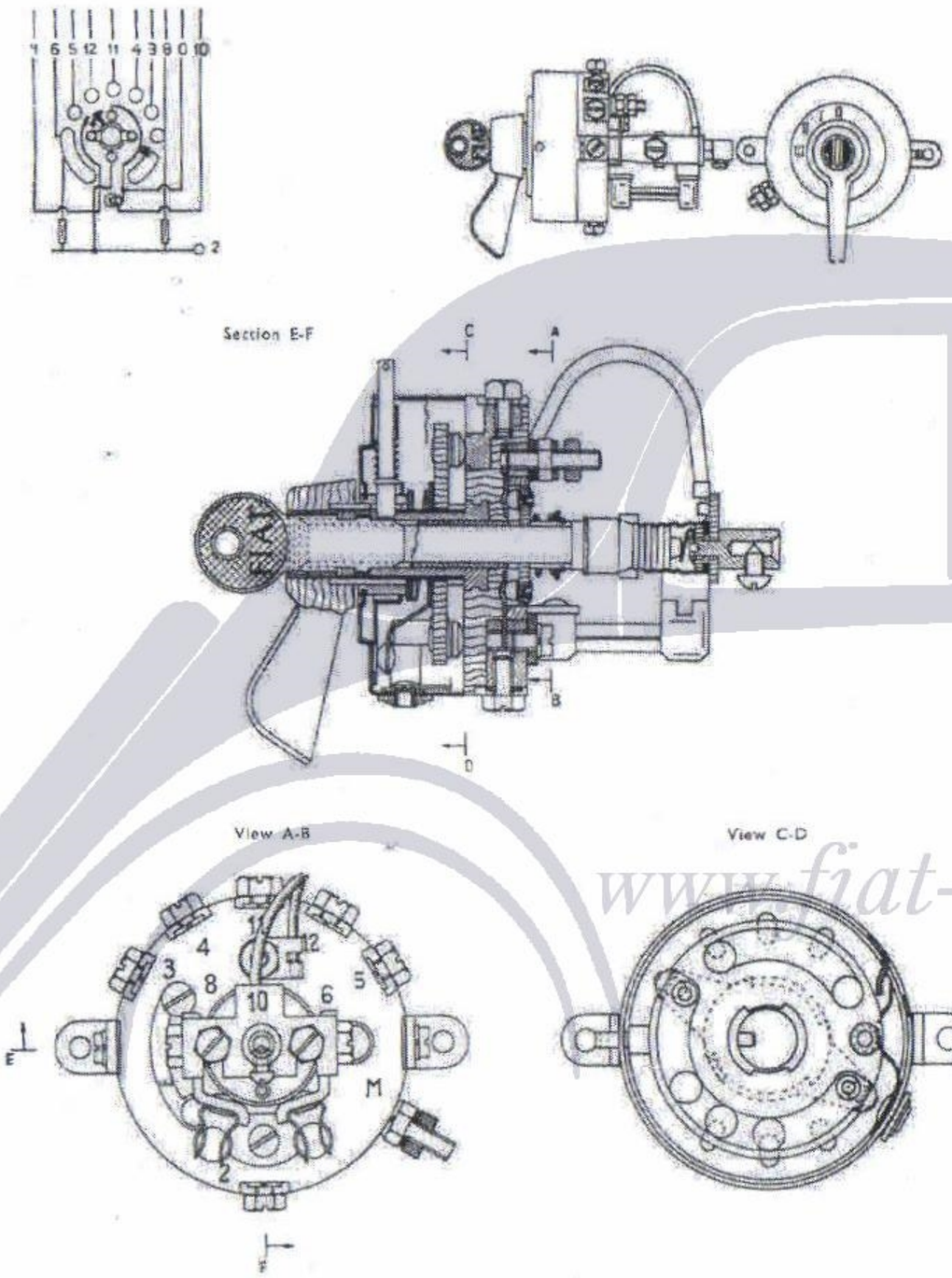


Fig. 139. - Diagram, cross section and views of the lock-and-key switch (up to chassis No. 019839).

Caution for both lock-and-key switches.

Never hold the key in the position of ignition circuit closed when the engine has been stopped. This to prevent discharging the battery and damaging the ignition coil through overheating. It is not possible to start the engine when the ignition coil is hot.

HEADLAMPS

To open the headlamps, unscrew the lower lock screw and draw the rim of the headlamp forwards at the bottom, until the upper tongue is disengaged from the slot in the carcase. The parking light tubular bulb can then be easily and quickly replaced as it is held only by the pressure of the spring supports.

To replace the driving light bulb the spring catch holding the lamp-socket to the reflector must be disengaged, and the bulb holder then withdrawn by forcing it gently at its upper part so as to free the lower tongue.

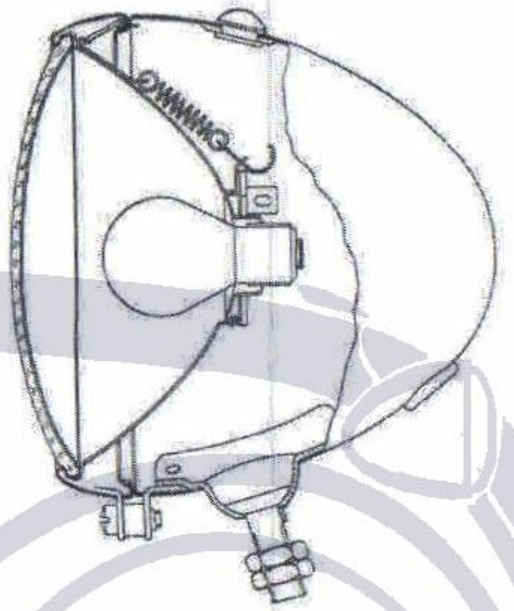


Fig. 140. - Partly sectioned view of the headlamp.

Aiming headlights.

Place the car on level ground, at a distance of 5 metres (nearly 17 feet) from a white screen situated in shadow, which may be the white wall of a house, and take care that the longitudinal axis of the car is perpendicular to the screen.

Draw on the screen a vertical line, corresponding to the vertical axis of the car, and then trace on either side of this normal a cross: each at a height of 71,5 cm. ($26\ \frac{3}{16}''$) from the floor and at a distance of 97 cm. ($38\ \frac{3}{16}''$) from each other (Fig. 141).

Now, with car unladen, cast the headlamps light straight on to the screen, so as to make coincide the center of each pool of light with the cross on the same side.

The correct position of the headlamps is found turning each of them as required after slackening a little the lower nut which fixes each to the respective support.

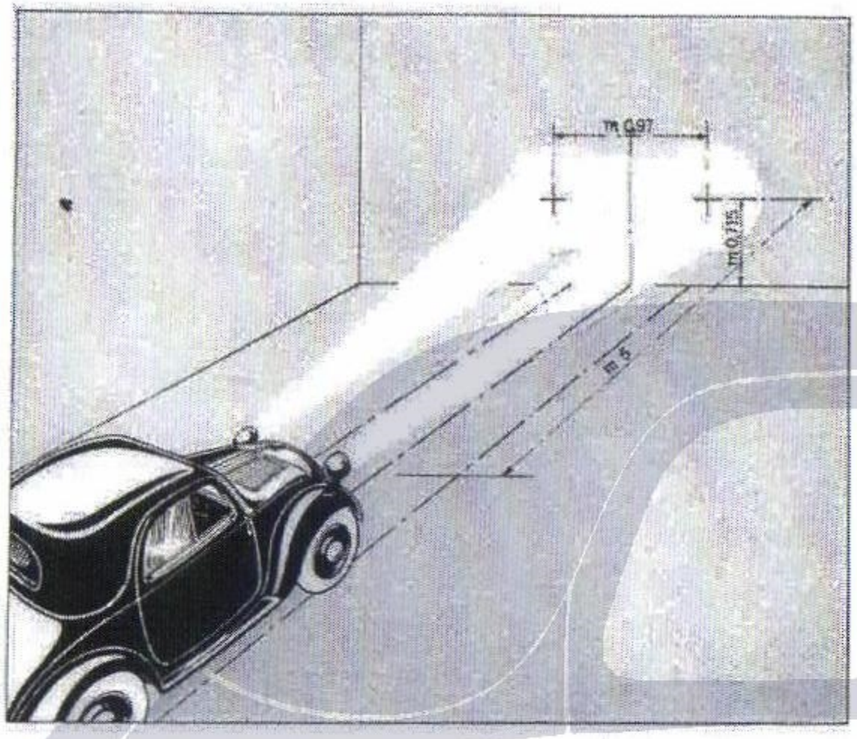


Fig. 141. - Aiming headlights.

DIRECTION INDICATORS

To replace the tubolar bulb inside the trafficator, press on the clip at the outer end, so that the chromium plated side is disengaged and the trafficator can be opened.

Open it as required to withdraw the bulb from between the two celluloid faces, and have care that the spring plate which holds the bulb in position is providing an efficient contact. To ensure a good contact the spring plate, if necessary, may be bent a little more.

Then, after replacing the bulb, make sure that the trafficator has been closed tightly.

Starting from car No. 047800, the wire adducing current for the direction indicators working is connected to the O terminal of the lock-and-key switch instead of the plug "8" for the inspection lamp, as previously. To ensure protection of the trafficator circuit, an 8-ampere fuse has been added on the wire that adduces the current.

BODY OVERHAULING

BODY OVERHAULING

Removing from the chassis.

Remove the front of bonnet with grill of dummy radiator shell.

Drain the radiator and cylinder jacket water.

Dismantle the carburetter, disconnecting the starting device control wire, the petrol pipe, the accelerator control rod and loosening the nuts which fix the carburetter to the manifold.

Disconnect the oil gauge pipe from its union on the crankcase.

Remove the radiator.

Disconnect the starter motor switch wire.

Jack up the front end of the car.

Remove the left front wheel.

Disconnect the hydraulic brakes master cylinder pipe, taking care to collect the brake fluid in a vessel;
the engine side undertrays;
the speedometer cable from the gearbox.

Remove the clutch and brake pedal stems;
the transmission brake control hand lever.

Disconnect the clutch control rod.

Unscrew the gear lever.

Remove the steering column and wheel.

Disconnect the battery;
the headlamp, tail and signal lamp cables;
the dynamo and starter motor cables.

Fit the left front wheel, and lower the front end of the car.

Disconnect the rebound straps so that the rear axle becomes free.

Remove the rebound straps so that the rear axle becomes free.

Remove the seats.

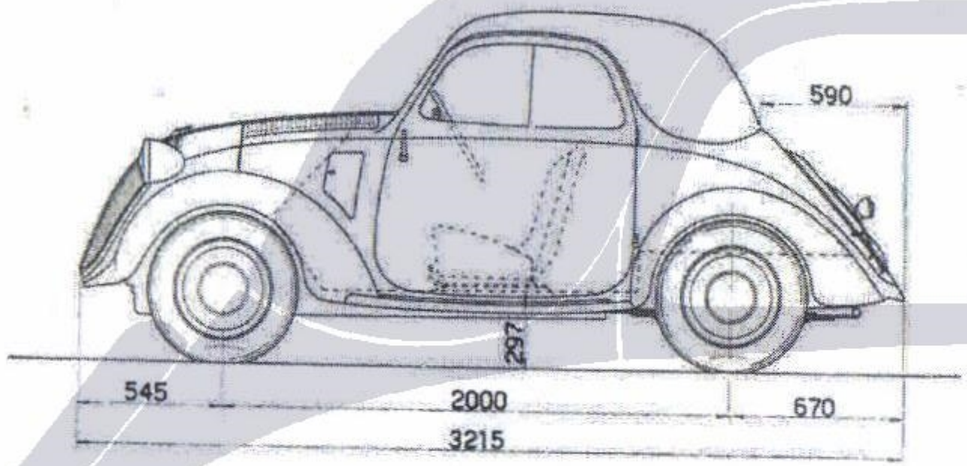
Pull out the carpets.

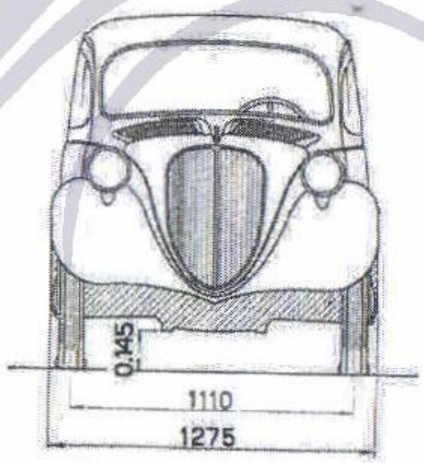
Remove the bodywork inner side coverings under the dash board.

Loosen all the bolts fixing the bottom floor framework to the chassis and those fixing the bodywork to the side brackets.

Lift up the body slowly, taking care that no fixing bolt has been overlooked. It is possible to lift up the body by hand. Four men are enough.

BODYWORK DIAGRAM





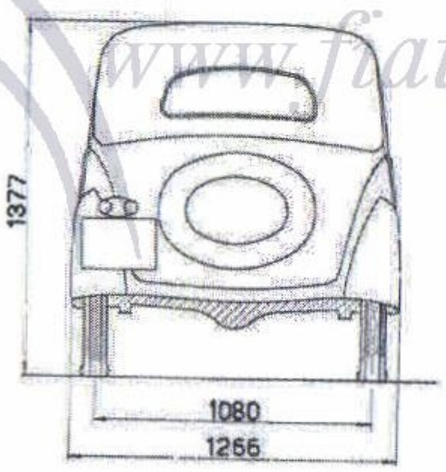


Fig. 142. - Bodywork diagram.

Reassembling the body on the chassis.

Place the body on the chassis taking care that the bolt holes register correctly and that the tarred hemp pads are in their proper places. Then insert all the bolts without tightening them thoroughly.

Insert the four bolts fixing the body on the cross member and those two for which a distance piece is supplied with each.

Jack up the front end of the car to fix the body on the front brackets after fitting the distance pieces. Then jack up the rear end of the car to fix the body on to the rear brackets.

Connect the rebound straps.

Lower the car.

Tighten all the fixing bolts.

Fix the carpets, the inner side coverings of the body and the seats; the front curved member connecting the front wings.

Disconnect the left front wheel.

Connect the brake pipes to the master cylinder.

Fit the brake and clutch pedal stems;
the steering column and steering wheel;
the gear lever and the transmission brake.

Refit the left front wheel and then lower the car.

Fit the radiator;
the carburetter together with the control rod and the petrol pipe.

Reconnect the oil gauge pipe;
the starter motor control cable;
the speedometer cable to the gearbox.

Fit the battery, connecting again the dynamo, starter motor, headlamps, tail lamp and the ignition distributor leads.

Make sure that everything is in order, then refill the radiator and the brake fluid reservoir.

Bleed the hydraulic brake system (see page 95).

Fit the front of bonnet.

Maintenance - General rules.

1) Maintenance of the bodywork should never be neglected. The same care which is expanded on the chassis should be extended to the bodywork if it is desired to preserve it in good condition.

2) By periodically adjusting and lubricating its component parts there will not only be less wear but a constant and satisfactory efficiency.

3) Periodically ascertain that the body is securely fixed to the chassis. **A great many body troubles originate through insecure fastenings.**

   Between the chassis and the body packing pads of tarred hemp are placed, to coincide with the fixing bolts. Before tightening the bolts make certain that these pads are not worn out or out of place.

4) Inspect the alignment of the doors at regular intervals and pay particular attention to the hinges, blocks and fixing devices.

5) To avoid rattles, periodically make sure that the headlamps, wings, valances, spare wheel carrier and the rear number plate braket are securely fastened. Examine the inside of the car also, as gauges and other instruments, cushions, seats, battery and accessories are all liable to cause rattles.

6) When noises, rattles or squeaks develop, attend to them immediately whether it requires extensive work or even if the trouble seems to be quite negligible.

By delaying the repairs these troubles will grow more pronounced, will reduce riding comfort and may be the origin of irreparable damage to the bodywork.

POSSIBLE TROUBLES WITH A PASSENGER CAR BODYWORK DIAGNOSIS AND REPAIR

Troubles and their causes	Repair methods
Water leakages. Water leakages in a car may originate from: a) Cement drying too quickly or from an imperfect adhesion of the framework to the channels, particularly at the lower corners of the front or rear glass frameworks. Water leakages may occur too between the door panels and the channels of the fixed or movable glasses.	Find out the exact leakage spot, bearing in mind that the leakage may originate in quite other places than those apparently concerned. Then apply some cement—as indicated by the arrow on Fig. 143 and 144—and make sure of the perfect adhesion of the framework.

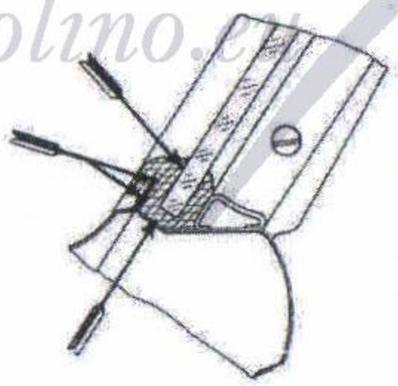


Fig. 143.

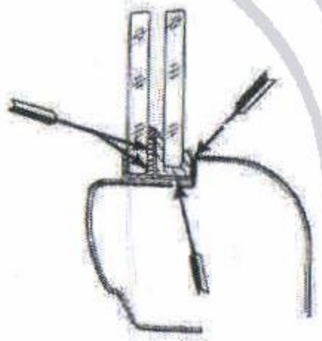


Fig. 144.

The arrows point to the spots to which the cement should be applied in order to eliminate water leakages.

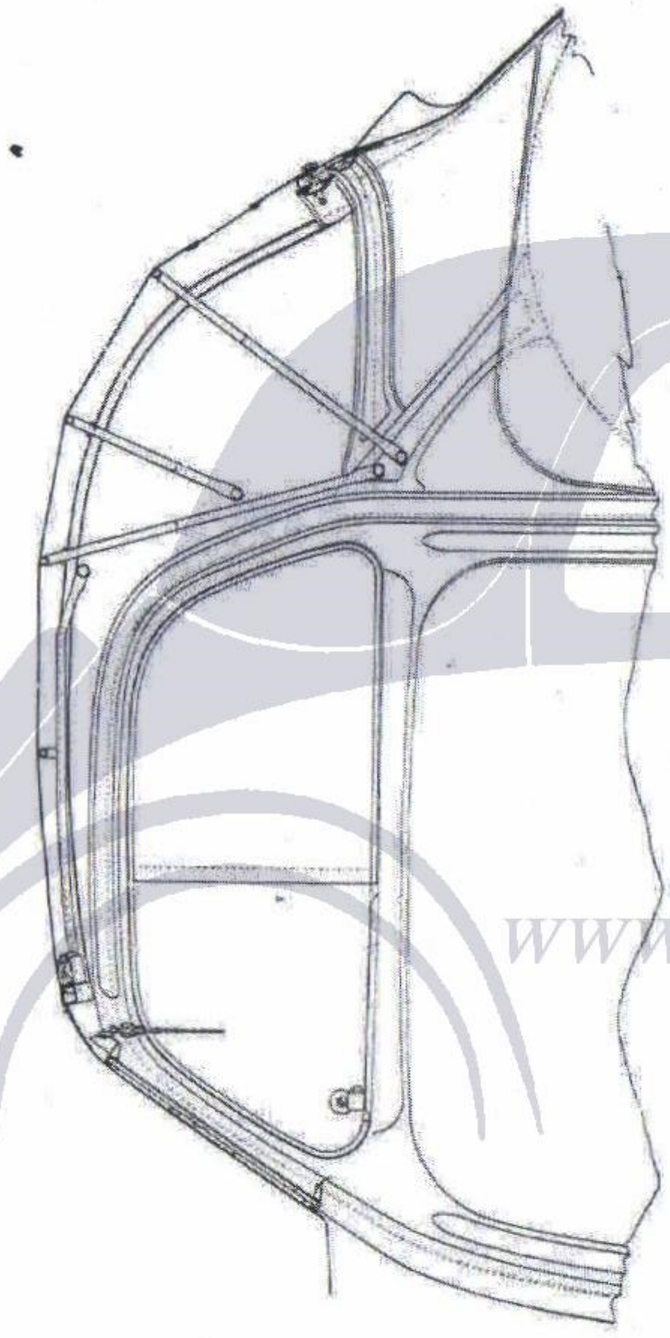


Fig. 145. - Detail of the « 500 » Mod. bodywork, with collapsible roof.

Troubles and their causes	Repair methods
b) A deterioration of the rubber packing of the windows, probably brought about by the petrol used in cleaning the glasses.	Replace the rubber packing.
c) Water leakages may also occur between the dash board and the front side panels of the bodywork, as the water may come in unimpeded throught the ventilation slots in the upper flaps of bonnet.	In the outer and lower corners of the dash board, at the connection with the panels, there are points where filling plaster is used instead of rubber packing. Make sure that the plaster is still in place and not cracked or chipped. If found to be faulty apply a new filling plaster.
The doors are noisy.	
Door rattles may be traced back to:	
a) Registers being loosened, not aligned and not fitting in their housings.	Tighten the screws fixing the door registers or replace them with oversize ones if their seat thread has become worn. Under the steel housing of the rubber blocks in the striker plate add—as required—taper or flat pads to re-establish the alignment.
b) Unequal clearance between door and door frame.	Make sure that there is a 3 mm (1/8") minimum clearance all round between the door and the door frame, both internally and externally.
c) Excessive play in the latch.	Particularly correct the play between the latch tongue and the lock wall punching the latter as necessary.
d) Excessive play between the latch tongue and the rear wall of its catch plate.	Replace the catch plate with another 1 or 2 mm (.04" to .08") longer-according to need.

Troubles and their causes	Repair methods
e) Rubber buffer at bottom of rear pillar insufficiently compressed when the door is closed.	Add a rubber or metallic washer under the buffer, or substitute a harder or slightly higher buffer for the old one.
Noisy windows.	
The door windows may become noisy for the following reasons:	
a) Excessive play between the glass and its felt channels, owing to the felt getting worn.	Replace felt channel altogether.
b) Excessive play between the glass and the felt channel owing to the metal framework of the channel being too wide.	Press the edge of the metal channel slightly downwards, from inside the car, taking care that the surrounding framework is still adhering to it.
c) Excessive play between the glass and the upper and lower channels.	Add cardboard or fibre packing between the channel and the door rail.
d) The sliding glass knob becoming slack.	Add leather or imitation leather washers, so glued that they register it properly on the guide. Then tighten the screw securely.
e) The glasses rattle against the heads of the channel fixing screws.	Try counter sinking the screw heads, so that these remain completely sunk in the felt. But if the felt gets irreparably damaged replace the channel completely.

Troubles and their causes	Repair methods
Squeaking.	
Squeaks may emanate from:	
a) The flaps of the bonnet against the edges of the cowl.	Reduce the height of the flap flanges to correspond with the cowl closure edges and fit below some rubber buffers or one or two 1-mm washers.
b) The dummy radiator shell.	Find the spot where the edges of the dummy radiator shell overpass the rubber packing touching the bodywork, and remove some of the material.
Dust penetration.	
The penetration of dust may be caused by:	
a) The rubber draft excluder which runs round the door frame having got out of shape or loose.	Replace the rubber draft excluder with a new one having a wider projecting rim.
b) The rubber draft excluder may have too much of its rim cut off along the bottom, for draining the water.	Remove the lower part of the rubber draft excluder and replace it with another on which less of the rim has been removed.
c) The sound-absorbing plaster has come off along the lower union flange of the bodywork.	Remove the carpets so that it is possible to find out exactly where the dust gets in. Then fill up with filling material or glued strips of imitation leather.
The doors open while the car is running.	
a) Latch alignment defective.	Loosen the screws, align the latch and then tighten the screws.
b) Excessive clearance between the latch and the catch plate.	Add a packing plate 1 mm thick under the catch plate.

MAINTENANCE

SUMMARISED MAINTENANCE TABLE

CAUTION. — Before applying the grease gun, carefully clean each nipple, otherwise the dust or mud of the road will mix with the lubricant and cause undue wear of moving parts.

After greasing wipe off all trace of oil from the nipples, in order to prevent dust accumulating on them.

Every 200 miles (300 km).

LUBRICATION

1. — Engine: Fill up with oil to the " Max " level (Fig. 18). For the quality of oil recommended according to the season, see page 14.

INSPECTIONS AND FILLING UP

2. — Radiator: Check the level and, if necessary, add clean water.

3. — Tyres: Check the air pressure by means of an accurate tyre gauge. It is also advisable to check the tyre of the spare wheel.

4. — Battery (in Summer): Check the level of the acid in the cells, and, if necessary, add distilled water.

Every 600 miles (1000 km).

LUBRICATION

5. — Ignition distributor: Give the grease cup two or three turns.

6. — Steering knuckles: Squirt some Fiat E oil into the two lubricators situated on the vertical articulation arms of the steering knuckles.

7. — Front springs: Squirt some Fiat E Oil into the two grease cups of the shackle pins of the transverse spring and into the four grease cups on the pivot pins of the reaction arms.

8. — Road springs: Wash with paraffin and inject graphited oil between the leaves. To take the load off the springs, lift the frame with a jack until the wheels are off the ground, then take off the stirrups binding the leaves together.

9 — Pedal shaft: Squirt some Fiat E Oil into the grease cup at the end of the shaft.

10. — Propeller shaft: Squirt some Fiat E Oil into the lubricator on the front sliding sleeve.

INSPECTIONS AND FILLING UP

11. — Battery: Check the acid level and, if necessary, add distilled water Further, after the first 600 miles (1000 km) check the tightness:

a) of the cylinder head bolts, when the engine is cold;

b) of the bolts that fix to the frame the rubber blocks for the suspension of the engine and the gearbox;

c) of the wheel nuts.

Every 1800 miles (3000 km)

LUBRICATION

12. — Engine: Change the oil in the sump (normal period). On this occasion, if it is found that the oil has grown thick and dirty with filth, it is as well to take down the sump and carefully clean the inside of it and the oil suction filter.

13. — Ignition distributor: Fill the screw lubricator with Fiat A 11 Grease and smear slightly with Fiat F Oil the cam of the contact breaker.

14. — Steering box: Squirt some Fiat E Oil into the lubricator on the steering box. Use instead Fiat CP Oil if the steering box is being dismantled.

15. — Steering rods: Squirt some Fiat E Oil into the four oil cups of the ball joints of the two steering rods.

16. — Front wheel hubs: Fill the caps with Fiat A 11 Grease and screw home on hubs.

17. — Gearbox: Check the level through the filler hole on the left side of the box and if necessary fill up to correct level with Fiat CP Oil.

18. — Rear axle: Check the oil level by means of the plug on the rear cover of the casing and if necessary fill up with Fiat CP Oil.

— Starter motor. - Pour a little Fiat F Oil in the ball greaser on the front bearing of the armature.

Lastly, oil all joints and bearing of the accelerator controls, hand brake, etc. with Fiat V Invernale Oil (winter oil) and do the same also to the door hinges and locks.

INSPECTIONS AND FILLING UP

19. — Hydraulic brake reservoir: Check the level of the liquid and if necessary add special Fiat G Fluid to correct level.

20. — Shock absorbers: Check the level of the liquid and, if necessary, add Fiat S. A. I. Fluid.

CLEANING (besides general cleaning).

21. — Radiator: Carefully wash out.

22. — Petrol filter: Close the tap under the tank and take down the filter chamber, which must be well washed in petrol together with the filter.
If the state of the filter is indicative of considerable sediment, also the filter situated in the petrol inlet union on the carburetter should be cleaned.

23. — Oil delivery filter: Unscrew the filter casing situated on the front of the base chamber, first disconnecting the pressure gauge connection, and wash the filter gauze in petrol or paraffin.

24. — Spark plugs: Clean them with a wire brush dipped in petrol and check the gaps (0,5 to 0,6 mm; that is .02" to .024").

25. — Ignition distributor breaker points: Clean the points with a clean rag dipped in petrol and check the gap (0,47 to 0,53 mm; that is .018" to .021").

26. — Dynamo and starter motor commutators: Clean them with a clean rag and, if necessary with very fine glass paper (000) pressed against the bars. See that the brushes make good contact. If broken or worn, change them.

27. — Battery: Clean the terminals and grease with yellow vaseline.

ADJUSTMENTS

28. — Valve tappet clearance: see page 5.

29. — Dynamo belt tension: see page 111.

30. — Clutch pedal travel: see page 57.

31. — Hydraulic brakes shoe clearance: see page 95.

32. — Transmission brake clearance: see page 98.

33. — Play between worm and sector of steering gear: see page 89.

34. — Steering rod joints: see page 86.

Every 6000 miles (10.000 km)

(Operations to be carried out by a Service Station).

LUBRICATION

35. — Gearbox: Empty, wash out with paraffin and refill.

36. — Rear axle: Empty, wash out with paraffin and refill.

37. — Rear wheel bearings: Fill the bearings with Fiat A 11 Grease.

38. — Dynamo and starter motor bearings: Thoroughly clean all parts and lubricate the dynamo ball bearings with Fiat G 2 Grease. For the starter motor bearings use Graphited Grease Fiat A 3.

CLEANING AND ADJUSTMENTS

39. — Combustion chambers: Take off the cylinder head and scrape the combustion chambers and piston crowns. Take care not to scratch the jointing surfaces of the cylinder head and block.

40. — Valve seats: Grind in the valves if it is found that any of the cylinders lacks compression.

41. — Carburetter: Clean out the float chamber with a chamois leather and adjust, if necessary, the idling device. On the Weber carburetter the three jets can be easily demounted from the outside and slid out from above for cleaning.

42. — Front wheel bearings: Check the play in the bearings and, if necessary, adjust them.

43. — Brakes: Take off the wheels, check the wear of the brake linings and change them if worn down to half thickness.

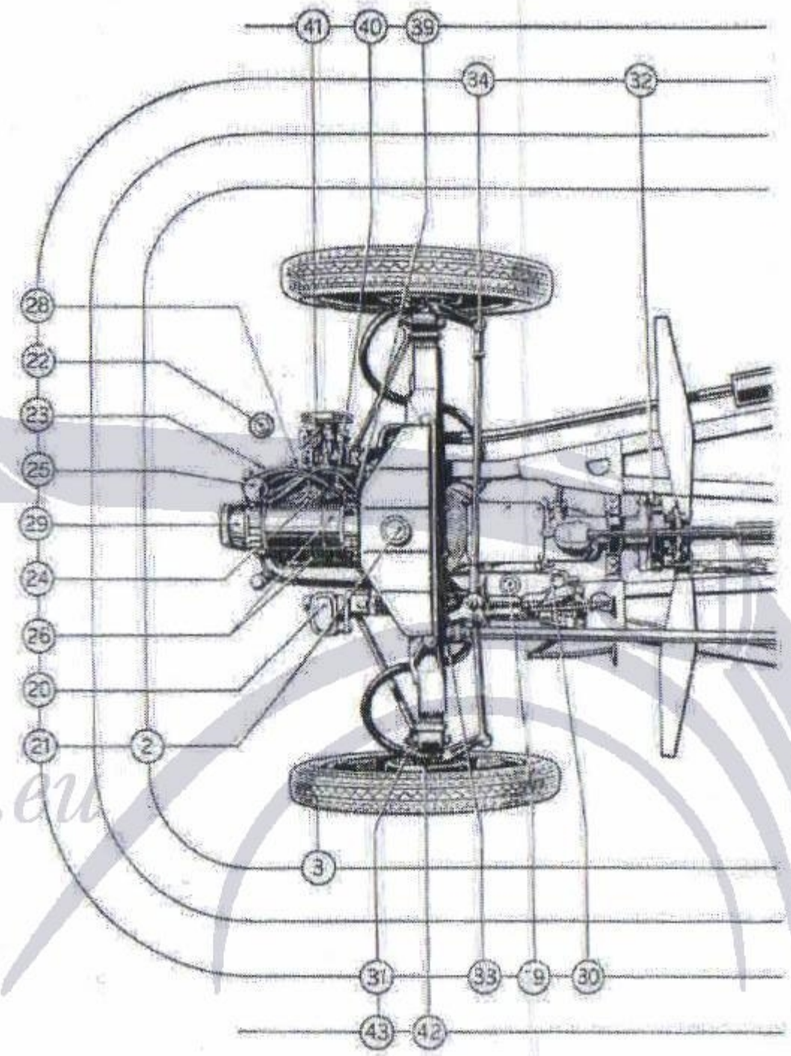


Fig. 147. - Cleaning, i

(The numbers refer to the operations

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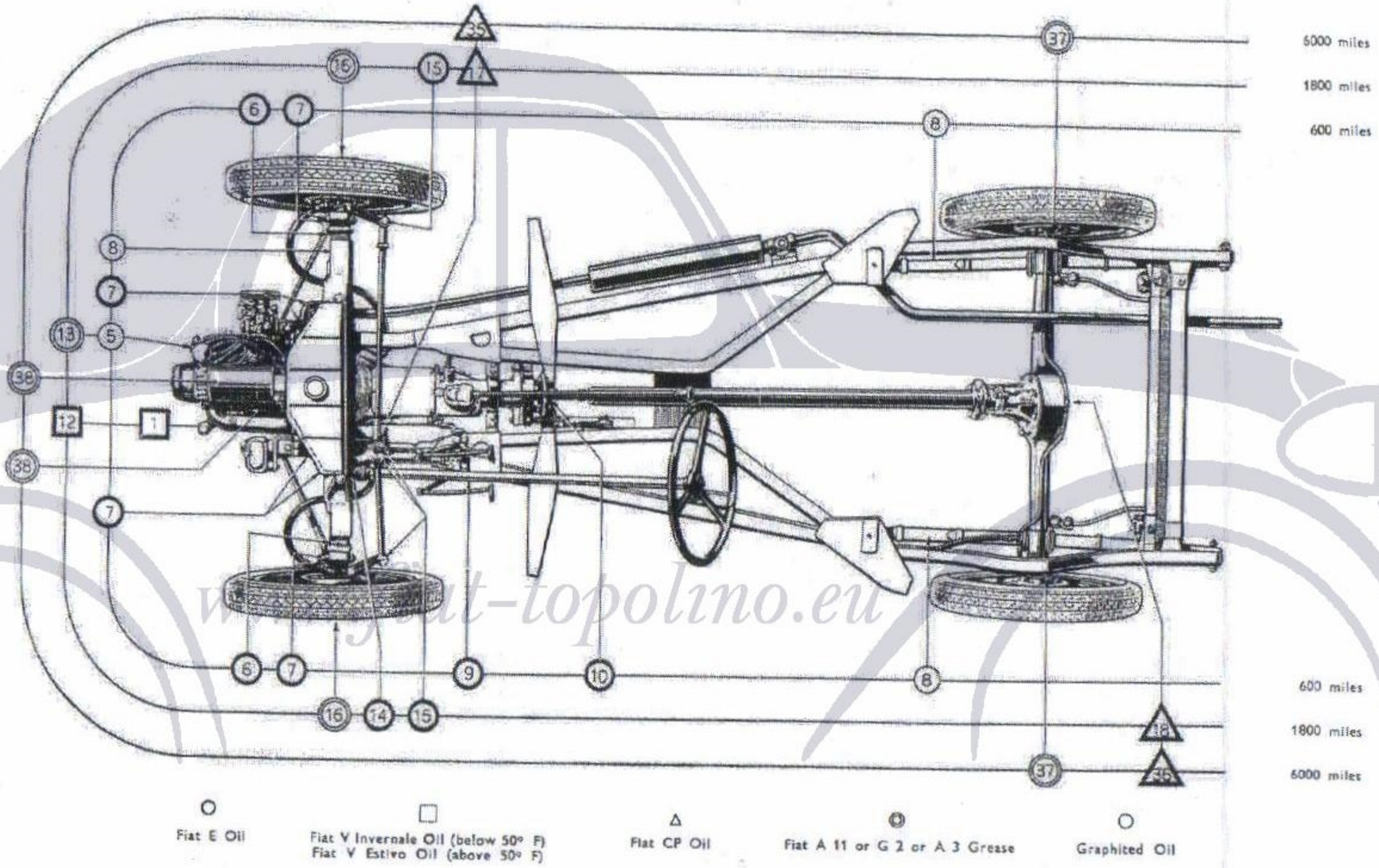

Fig. 146. - General lubrication diagram.

(The numbers refer to the operations indicated on the « Summarized maintenance table »).

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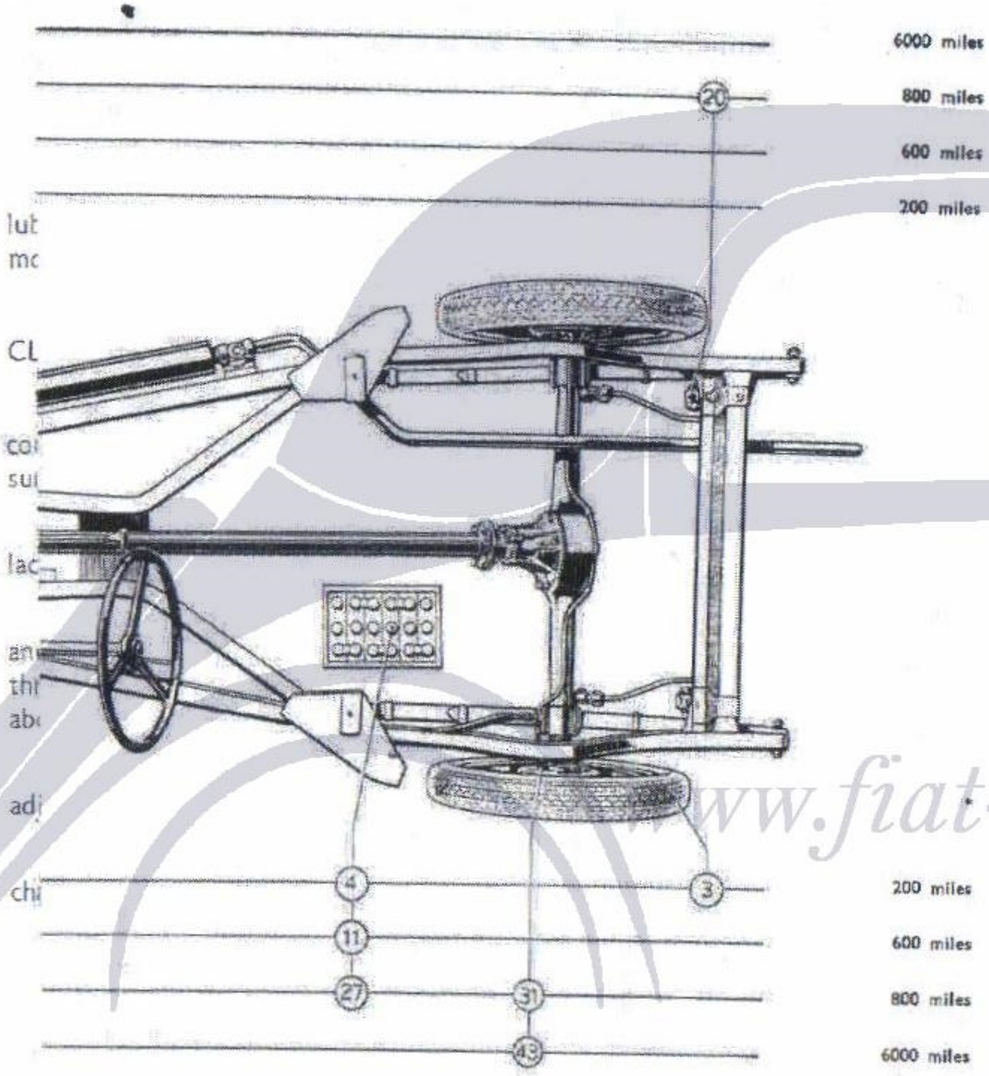


nspection and adjustment diagram.
indicated on the « Summarized maintenance table »).

MODEL 500 B

DIFFERENCES FROM MODEL "500"

MODEL "500 B„

DIFFERENCES FROM MOD. "500„

ENGINE

Engine Mod. 500 B is derived from engine Mod. 500, bore and stroke being unchanged. It affords, however, an increased horsepower and, consequently, a better general performance.

The main changes, which have been introduced, are listed hereunder:

1. — Overhead valves, operated by push rods and rockers—the design of crankcase and cylinder head has been changed accordingly.

2. — Thin-wall connecting rod bearings, as already installed on latest Mod. 500 cars.

3. — New downdraft carburetter.

4. — Metal wool air cleaner with intake silencer.

5. — New intake and exhaust manifold.

6. — Generator installed on side of crankcase, instead of on cylinder head.

7. — Fuel pump with drive on distributor spindle.

8. — New distributor with vertical cable sockets.

9. — Improved oil filter with oil pressure release valve embodied in filter plug-the latter being accessible from outside.

10. — Crankcase ventilation obtained connecting through pipes the breather and cylinder head cover with intake duct between air cleaner and carburetter.

11. — Oil retaining rubber packing on crankshaft end.

12. — Oil filler on cylinder head cover.

Interchangeability with engine Mod. 500.

1. — The new crankshaft differs from the previous one in working tolerances only and can be also fitted as replacement on engine Mod. 500.

2. — Connecting rods being new in design on account of the adoption of thin-wall bearings, cannot be used for single replacements on engine Mod. 500. If, however, the whole set of connecting rods has to be replaced, it is advisable to install the new type. The crankshaft, of course, must be ground to the dimensions and tolerances prescribed for thin-wall bearings.

3. — Oil seal on crankshaft rear end. This improvement can be introduced on previous engines, but to do so the flywheel and engine rear support must be replaced.

CHASSIS

Although the main structural features of the chassis are essentially unchanged, both frame and suspension assemblies have been considerably improved.

The main changes are:

Front suspension.

1. — The flexibility of the suspension and the dynamic load have been increased with the adoption of a variable flexibility spring.

2. — Double-acting telescoping shock absorbers.

3. — Additional reinforcements between the spring supporting cross member and the frame.

4. — Rubber buffers improved in shape and dimensions.

Rear suspension.

1. — The flexibility of the suspension and the dynamic load have been increased with the adoption of variable flexibility springs.

2. — Double-acting telescoping shock absorbers.

3. — Stabilizer bar.

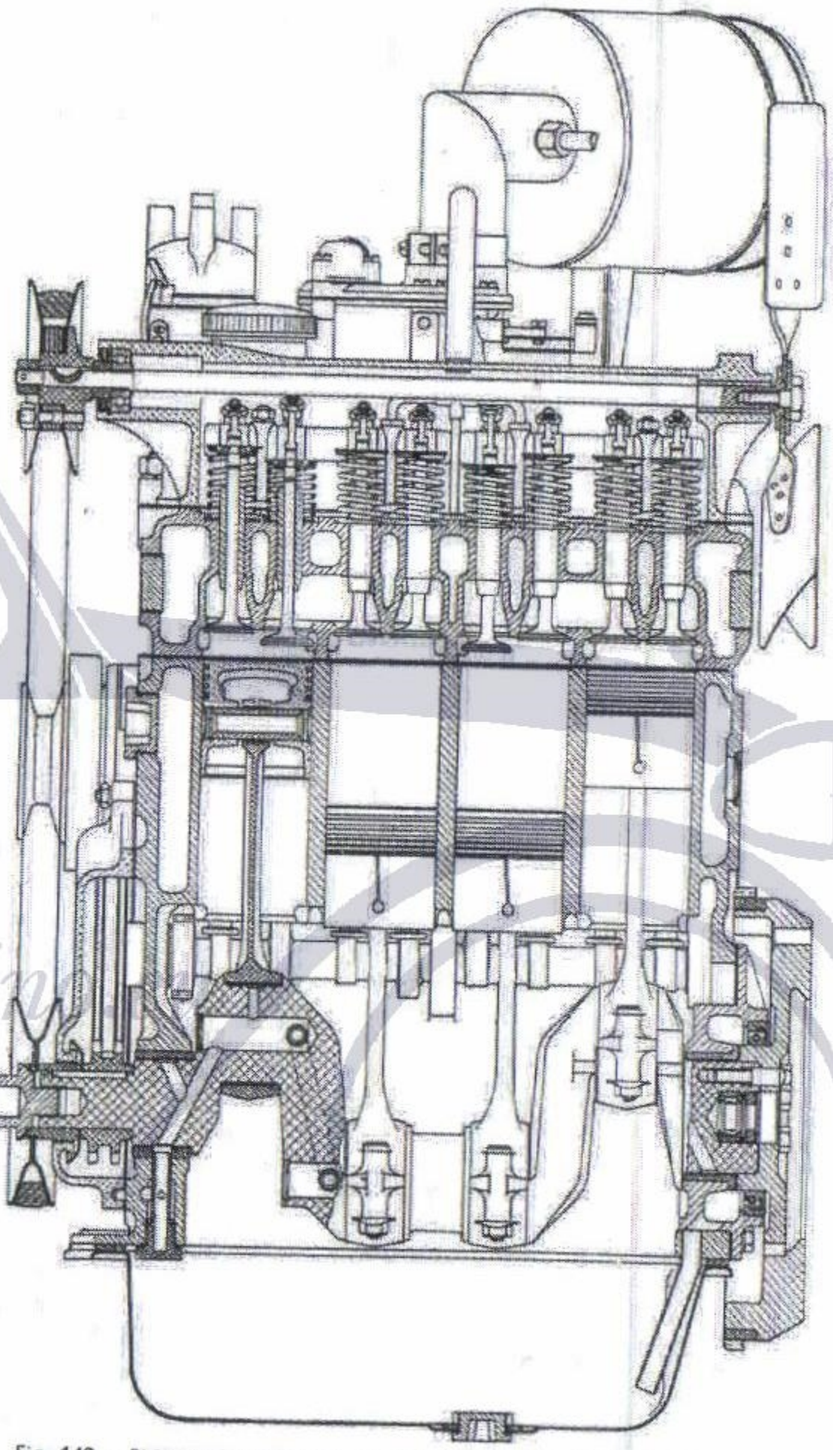


Fig. 148. - Side cross section on crankshaft of engine Mod. « 500 B ».

Wheels.

— Larger section size tires: 4,25-15.

Frame.

1. — Reinforcements have been fitted to side member front ends and to the steel plates joining the front cross member to the side members for the steering box attachment.

2. — Outriggers have been added to side member front ends for bolting down the body.

3. — A brace and reinforcements have been added to the rear cross member for the attachment of the telescope shock absorbers and stabilizer bar.

Steering.

1. — Two-spoke steering wheel.
2. — Sliding contact for horn wiring.
3. — Improved steering column support on dashboard.

Clutch.

— Clutch release thrust bearing with improved oil seal.

Fuel tank.

1. — Fuel supply outlet on top of tank. Fuel tap in interior of car has been suppressed.

2. — Gasoline gauge on instrument panel.

Electrical equipment.

1. — Rubber cap for protection of stop light switch.
2. — Battery capacity increased to 38 Ah., as recently adopted on Mod. 500.
3. — Interior light on rear view mirror.
4. — New, better looking and better lighted instruments on dashboard. Larger speedometer with square tip transmission.
5. — Switch for maximum generator output.
6. — Dual windshield wiper.
7. — Control knobs on instrument panel with new shape and color matched to steering wheel.

Accessories.

— Improved tool kit.

Hot air heater.

— A car heater with hot air intake from the radiator and outlet at bottom edge of windshield, can be installed on request.

The temperature control is obtained by means of a knob fitted on the instrument panel.

Interchangeability with chassis Mod. 500.

The new variable flexibility springs can be installed on chassis Mod. 500.

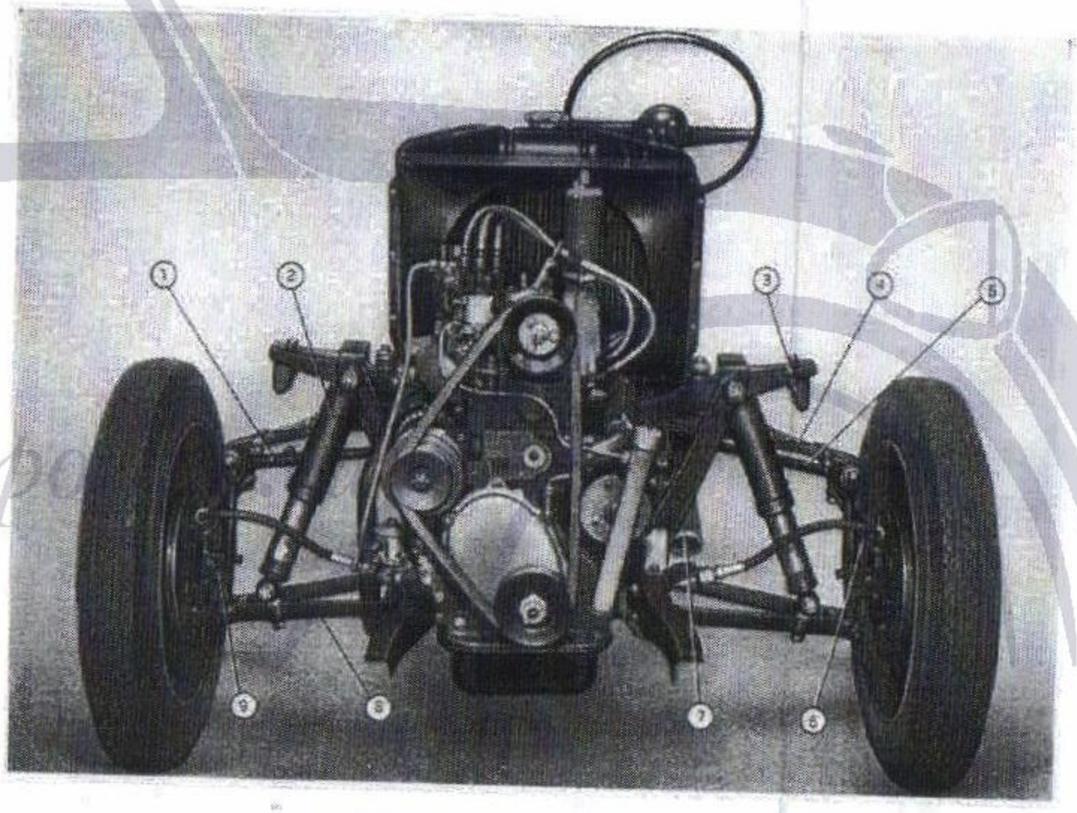


Fig. 149. - Front suspension and steering.

1. Sleeve on track rod for adjusting toe-in. - 2. Double acting hydraulic shock absorber. - 3. Rubber buffer. - 4. Transverse spring. - 5. Left hand track rod. - 6. Steering lever. - 7. Steering box. - 8. Swinging arm. - 9. Steering knuckle arm.

FEATURES OF MODEL 500 B CAR

ENGINE

Type	500 B
Cycle	Otto - 4 strokes
Fuel	Gasoline
Number of cylinders	4
Bore and stroke	mm 52×67
Total piston displacement	cc 570
Brake H. P.	15
Rated H. P.	8
Compression ratio	6,45

Phosphor-manganese cast iron cylinder block. - Head: Phosphor-manganese cast iron detachable cylinder head. - Sturdy steel crankshaft with 2 supports only. - Special steel connecting rods. - Aluminium alloy pistons. - Pressed steel sump.

Valve gear.

Overhead valves actuated by means of pushrod rockers from the shaft in the crankcase. The camshaft is driven, by a silent chain, from the crankshaft.

Valve timing—with timing clearance of mm 0,17 at the valve tappets (with cold engine):

Inlet	Opens:	15° before t. d. c.
	Closes:	55° after b. d. c.
Exhaust	Opens:	55° before b. d. c.
	Closes:	15° after t. d. c.

Operating clearance between valve and rocker after timing with cold engine:

Inlet	mm 0,10
Exhaust	» 0,10

Ignition: by battery.

Firing order	1-3-4-2
Initial advance (*)	10°
Maximum automatic advance	30° ± 2°
Maximum total advance	40° ± 2°

(*) Initial advance may be reduced down to 5° according to fuel quality.

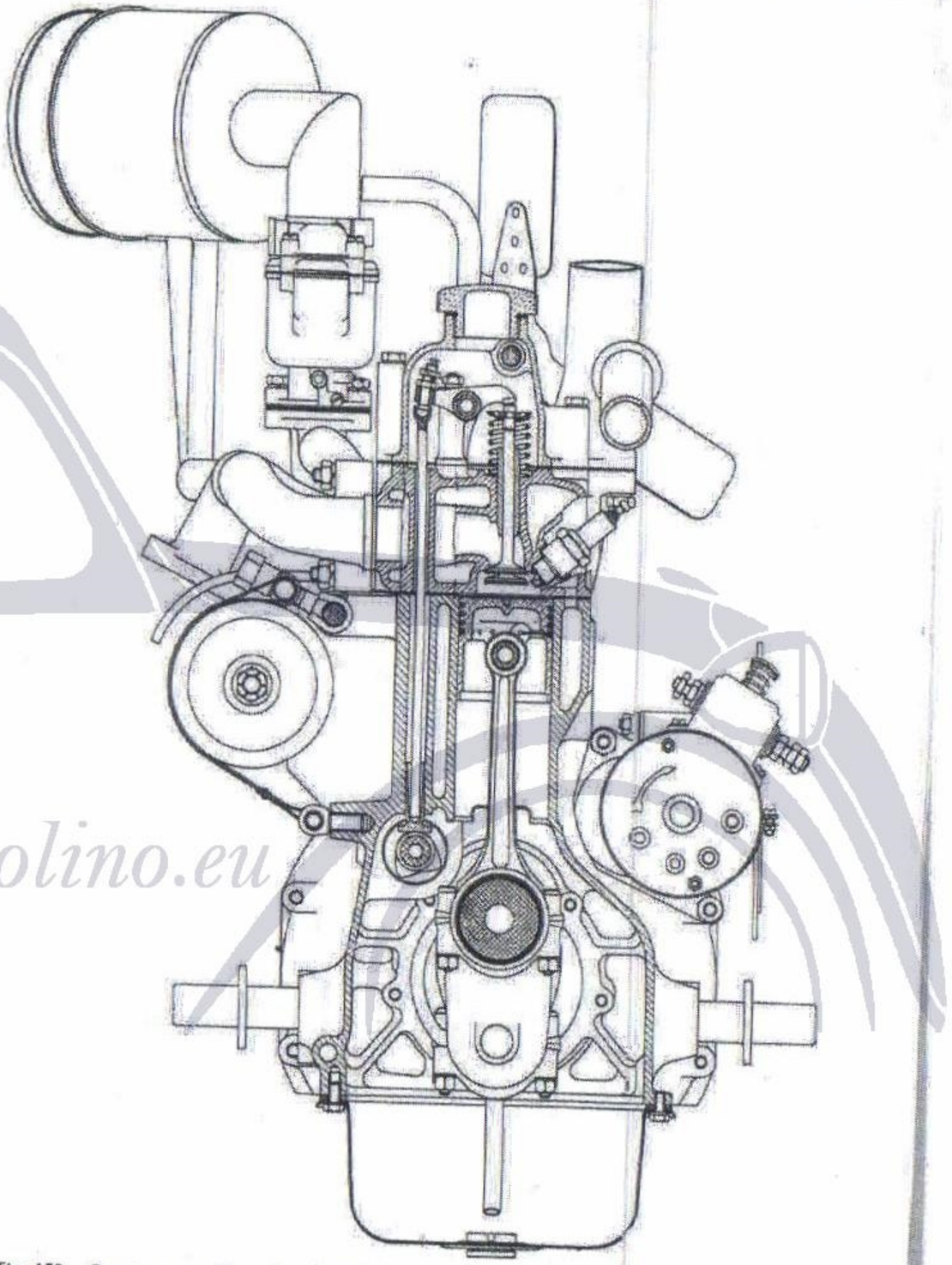


Fig. 150. - Front cross section of engine Mod. « 500 B » on connectings rod and valve gear.

" Marelli " distributor, type				S 50 A
Contact breaker gap			mm	0,47 to 0,53
" Marelli " coil, type				12 Volts 662-04/20
Spark plugs	Early type	MW 125 T3	or	MW 125 T3 P
" Magneti Marelli "	Later type	MW 175 T3 A	or	CW 175 D
Diameter and pitch			mm	14 x 1,25
Spark plug gap			»	0,5 to 0,6

Fuel feeding

by means of a diaphragm pump sucking from the tank situated in front of the dash board, driven from the camshaft and with a filter that can be disassembled.

Downdraught carburetter (Weber 22 DR5) fitted with an easy starting device. Air intake with silencer.

Body	diameter	mm	22
Choke tube	»	»	15,5
Main jet	»	»	0,92
Auxiliary jet	»	»	0,5
Starting jet	»	»	1,05

Inlet manifold warmed in the middle by the exhaust gas.

Lubrication

forced, by a gear pump driven by the camshaft and fitted with a suction filter. Oil pressure release valve on the delivery filter. Delivery filter located on the right side of the crankcase.

Standard oil pressure	kg/cmq	2,5
Capacity of sump	kg	2

Cooling: by the thermo-syphon principle.

Radiator located in the rear of the engine, cooled with the air blown from a fan.

Water capacity	lt 4,5

Starting

by electric motor controlled by a knob on the dash. Emergency starting by handle.

Resilient supporting

of the engine-clutch-gearbox assembly on three rubber blocks.

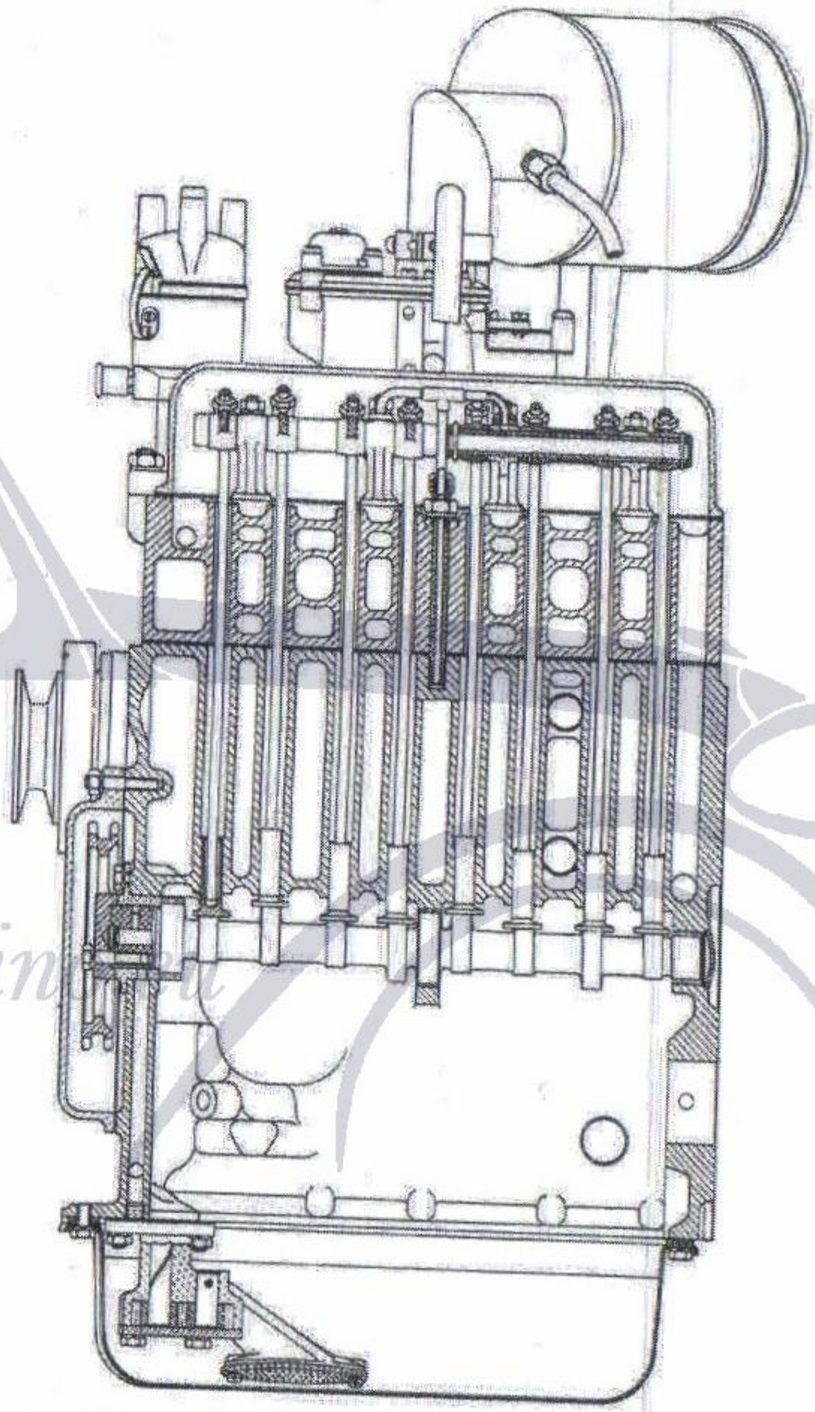


Fig. 151. - Side cross section on camshaft of engine Mod. « 500 B».

TRANSMISSION

Clutch.

Dry single plate, with flexible hub; adjustable by sleeve fitted on the control pedal tie rod.

Gearbox.

4 speeds and reverse, with silent third and synchromesh gears for the quick engagement of the 3.rd and top speed.

First speed ratio	1 : 4,48
Second speed ratio	1 : 2,732
Third speed ratio	1 : 1,705
Direct drive ratio	1 : 1
Reverse ratio	1 : 5,68
Oil capacity	kg 0,750

Tubular transmission shaft.

fitted with flexible joints at the ends and front sliding sleeve.

Rear axle.

Pressed steel housing. Final drive through helical bevel gears. Differential mounted on ball bearings.

Ratio	8/39
Oil capacity	kg 0,600

CHASSIS

Wheelbase	mm	2000
Front wheel track	»	1116
Rear wheel track	»	1083
Ground clearance	»	0,145

Rigid Frame

of pressed steel, fitted with X-cross member. Outer brackets provide attachments for the bodywork.

Suspension.

Front suspension: wheels independently sprung by semi-elliptic springs with variable flexibility, fitted transversally to the frame and triangular swinging arms swivelling on supports attached to the side members. Double acting telescopic shock absorbers.

Rear suspension: by semi-elliptic springs with variable flexibility. Double acting hydraulic telescopic shock absorbers. Transversal stabilizer bar.

Wheels: disc type.

Well base rims		15 x 2,500
Extra low pressure tyres:		
Saloon		4,00-15
Delivery Van		4,00-15 T
Tyre pressure:		
Front — Saloon	kg/cmq	1,5
Front — Delivery Van	»	1,5+1,75
Rear — Saloon	»	1,5
Rear — Delivery Van	»	2

Front wheel toe-in

with statical load mm 2 ± 1

Front wheel camber

with statical load 1°

Front axle caster 6°

Steering

controlled by spiral worm and sector. Indepencent track rods for each wheel.

Hydraulic brakes

on the four wheels, with control through a pedal.

Brake drum diameter	mm	200
Fluid capacity	kg	0,550

Emergency brake on the transmission with hand control.

ELECTRICAL EQUIPMENT

Tension	Volts	12

Battery.

Marelli type		6 VX 7
Capacity (discharge in 10 hours)	Amps/hour	38
Size	mm	175 × 251 × 195
Weight with acid	kg	19,7
Weight without acid	»	17,2

Generator.

Type		T 90-95/12-3000
Number of poles		2
Nominal power	Watt	95
Beginning of charge: with the engine at about		900 r. per m.
Maximum output (with headlamps on)	Amp	6,3
Rotation (drive end)		clockwise
Coupling ratio: $\frac{\text{engine}}{\text{generator}}$		$\frac{1}{1,41}$

Belt drive.

Automatic cut out, type	508 III

Device for increasing the charging current with headlamps on in summer time, while in winter a switch on the dash board allows for increased charge also with lights off.

Automatic voltage regulation by 3.rd-brush system.

Starter.

Type		500
Number of poles		4
Maximum power	HP	0,90
Outer diameter		90
Rotation (pinion end)		clockwise
Coupling ratio: $\frac{\text{engine}}{\text{motor}}$		$\frac{1}{10}$

Starting switch and engagement simultaneously controlled by a pull knob on the dash. Pinion fitted with a free-wheeling-device.

Lamps.

Three-beam headlamps.

Lamps with filament for great range light	Watt	35
Lamps with filament for anti-dazzle light	»	35
Lamps for town driving	»	5
Tail and stop lamp with bulbs	»	3

ACCESSORIES

Direction indicators on windscreen sides, with mechanic control by handle located on the upper part of the dash panel.

Electric screenwiper with twin-blade.

Electric horn with push button on the steering wheel.

Electric petrol gauge float controlled, fitted on tank.

Plug-in connection for inspection lamp located under the instrument panel.

Internal lighting with lamp fitted on the driving mirror.

Gauges and controls on the instrument panel: key switch for external lights and ignition with tell-tale lamp showing when the dynamo is not charging the battery, switch for lighting the instrument board, speedometer and mileage recorder with lighting lamp, knob controlling the carburetter starting device, switch for the screen wiper, oil gauge and petrol level gauge with reserve signal in a single instrument with the lighting lamps, knob controlling the starting motor, knob controlling the accelerator, mechanic control of the direction indicators, switch for summer and winter charge of the generator.

WEIGHTS

Weight of the car as sold in Italy (with a spare wheel and tools), about	kg	580
Weight of the car in running order	»	600
Useful load	2 persons + 50 kg	

PERFORMANCES

Maximum speed on a good level road with run-in engine:

in first speed, about	km/h	20
in second speed, about	»	34
in third speed, about	»	55
in direct drive	»	90

Maximum climbable gradient, under full load, on a road in good condition and with run-in engine:

in first speed, about	22%
in second speed, about	13%
in third speed, about	7%
in direct drive, about	3%

Fuel consumption:

for 100 km (at 2/3 max. speed on level)	lt	5
Cruising range	km	400

REFILLING

Part to be refilled		Quantity	Fill in
Gasoline tank	lt	22	Gasoline
Radiator and water jacket	»	4,5	Water (*)
Engine sump	kg	1,08	Fiat Oil (**)
Gearbox	»	0,7	CP Fiat Oil
Rear axle casing	»	0,6	CP Fiat Oil
Steering box	»	—	CP Fiat Oil (***)
Hydraulic brake system	»	0,55	Lockheed Fluid
Shock absorbers, each	cm³	150	SAI Fiat Special Fluid
Grease cups	kg	—	E Fiat Oil

(*) When the temperature drops below 40° F it is advisable to use antifreezing mixture.

(**) Use V Fiat summer oil when the temperature is above 50° F; for temperature below 50° use V Fiat winter oil.

(***) Refill the steering box with CP Fiat oil in case of disassembling, afterwards squirt E Fiat Oil in the grease cup.

FEATURES OF MODEL 500 B DELIVERY VAN

The differences between the delivery van and passenger car chassis are summarized hereunder. They have no reflection on use and maintenance recommendation, which are the same for both vehicles.

CHASSIS

Transmission.

Rear axle normal ratio: 8/41.

Suspension.

Reinforced rear springs.

Wheels.

Low pressure tyres		4,25-15 T
Tyre pressure	front	kg/cm² 1,75
	rear	» 2,25

ELECTRICAL EQUIPMENT

Lighting.

Internal lighting with spherical 3-watt bulb.

Bodywork.

Steel body with inside wood frame.
Two seats with leather upholstery.
Rear double door.
Rear view mirrors fitted to side doors.
Spare wheel fitted in driver cab.

Performances.

Useful load, without driver	kg	300
Maximum speed in top gear	km/h	90
Maximum climbable gradient in 1.st gear		18%
Gasoline consumption per 100 km (at 2/3 top speed on level), about	lt	6,5

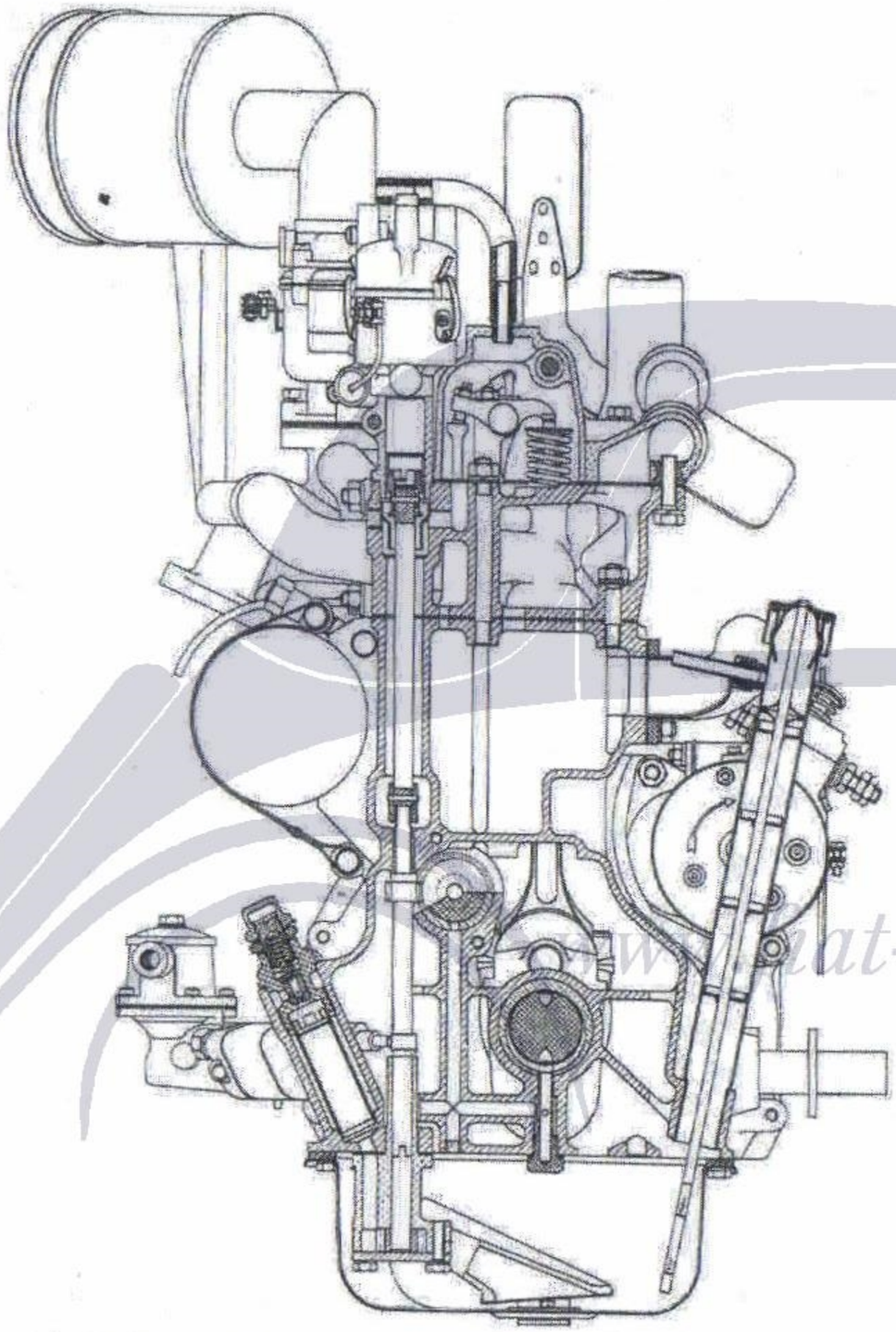


Fig. 152. - Front cross section of engine Mod. 500 B on distributor and oil pump drive.

SERVICE INSTRUCTIONS

DETACHING THE ENGINE-CLUTCH-GEARBOX ASSEMBLY

Drain water from engine and radiator opening the cock located on the front end of the cylinder block.

Detach the battery ground lead, for breaking off the electric circuit.

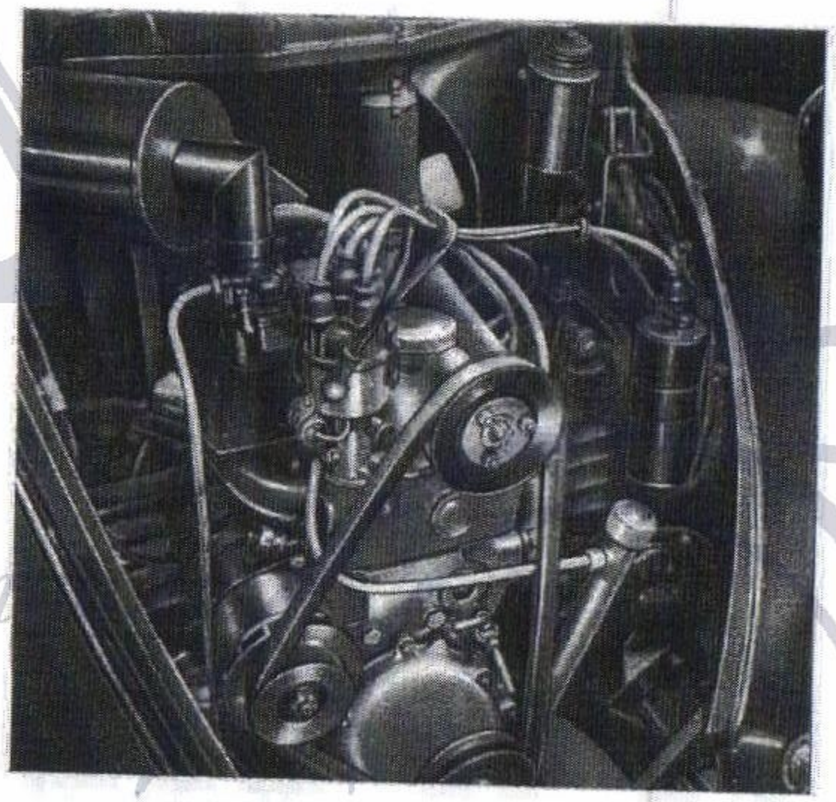


Fig. 153. - View of engine installed on car.

Disassemble the transmission shaft taking off the three bolts fixing the flexible ring of the joint tc the sleeve on the gearbox main shaft;
the brake control rod on the transmission;
the clutch control rod and the speedometer transmission;
the rear support of the engine-clutch-gearbox assembly.

Take off the bolt fixing from the starting motor side, on the rear, the engine support (this bolt must be taken off downwards, while the others fixing the supports are taken off upwards).

Remove the front girdle after having detached the electric horn cables.

For this operation it is necessary to revolve a little the cross member, after taking off all the fixing bolts, so that it is possible to remove it.

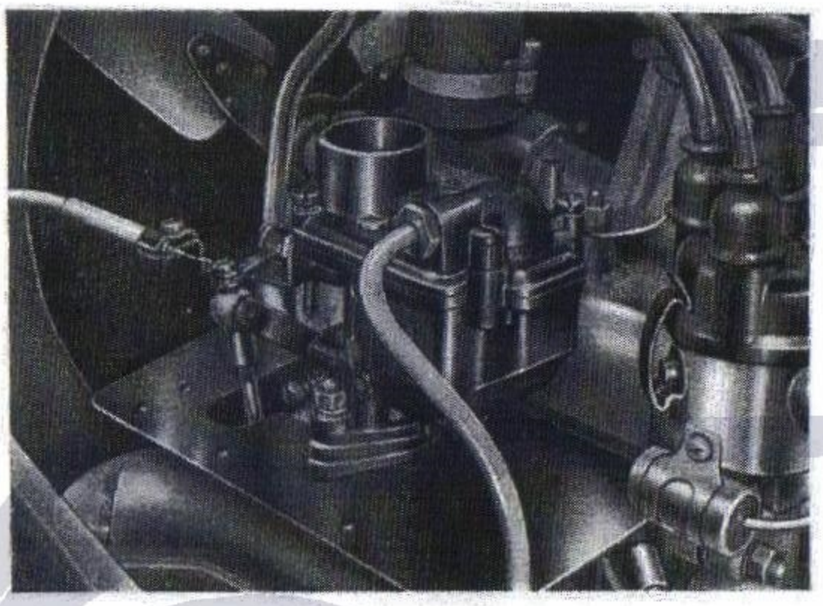


Fig. 154. - Carburetter controls.

Disassemble the exhaust pipe unscrewing the three nuts from the manifold flange on the engine.

Remove from the upper part of the engine the air cleaner after having detached the pipes for the oil fumes.

Disassemble from the carburetter the control cable of the accelerator;
the starting motor cable;
the generator cable;
the primary current cable from the coil and from the ignition distributor.

Take off the apron on the starting motor side;
the apron on the generator side;
the fixing bolts of the front supports of the engine-clutch-gearbox assembly;
the rubber sleeves for water inlet and outlet from the engine pipes.

Loosen the gasoline inlet union on the tank for avoiding the gasoline draining from the union to the fuel pump, then take off this pipe.

Remove the pipes for the oil pressure from the union on the engine; unscrew the gearbox control lever.

Hang up to a tackle the engine-clutch-gearbox assembly, then push it forwards lifting it up a little for allowing it to come out from the car.

ENGINE OVERHAULING

For overhauling the engine follow the instructions for Mod. 500 as concerns the cylinder block: cylinder boring, refacing crankshaft bearings and other generic operations.

For the cylinder head see the following chapter.

As to the engine " 500 B " are fitted the thin wall bearings which have been illustrated in a special pamphlet: " Thin wall bearings ", follow the instructions given in that publication.

For disassembling the carburetter it has been manufactured a special wrench n. A. 8072 that may be used also for the nut holding the pipe for lubricating the rockers.

CYLINDER HEAD

For detaching the cylinder head it is necessary to carry out the following operations:

Take off the air cleaner after removing the pipes for the oil fumes.

Remove the gasoline pipes from the carburetter and the accelerator control rod.

Take off the primary and secondary current cable from the coil, the distributor and the sparking plugs;
the fan driving belt.

Remove the inlet and exhaust pipes, as well as the outlet pipe of the cooling water.

Take off the ignition distributor;
the cylinder head cover.

Remove the pipes for the lubrication of the rocker spindle from the pierced stud fixing the head.

Unscrew all the nuts fixing the cylinder head using the wrench A. 8110.

Caution! — Two cylinder head nuts are located in the cooling water jacket: see figure 155.

Remove the head lifting it up from the cylinder block.

For dismounting the valves, after taking off the spindle with the rockers, using the tool A. 10229, press down the valve springs for being able to take off the holding split washer, then take off the springs and the safety ring.

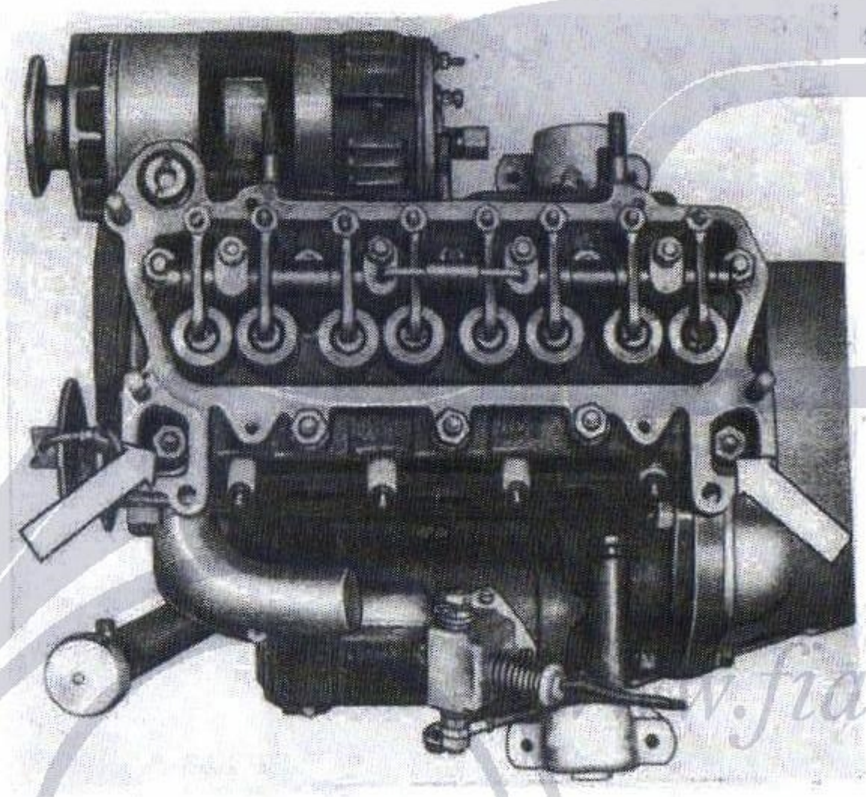


Fig. 155. - The arrows show the two nuts in the water jacket that must be removed along with the external ones to detach the cylinder head.

The refacing of the valve seats on the cylinder head requires:

the conical reamer for refacing valve seats n. A. 11453;
the tool for reaming the valve seats n. A. 11454;
the stone for grinding the valve seats n. 11476;
the expanding reamer n. 11439 (same as for mod. 500);

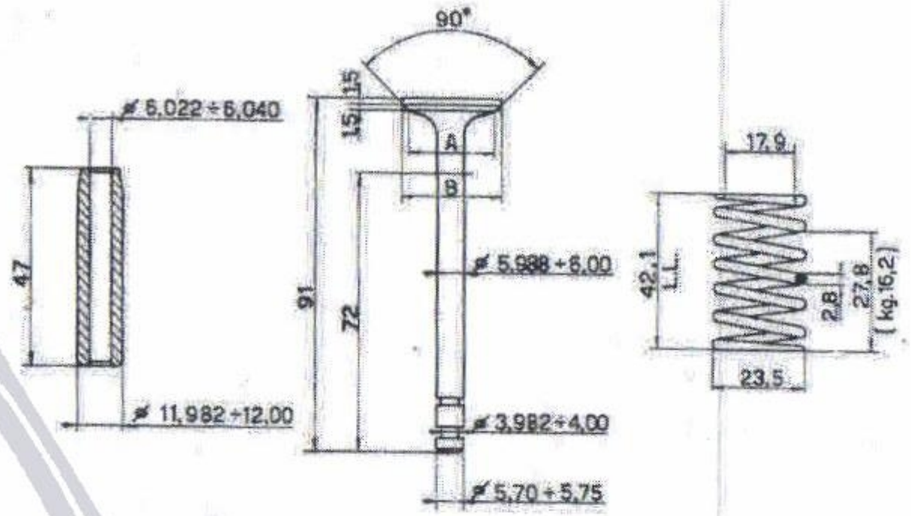


Fig. 156. - Valve, valve guide and valve spring standards.

having to change the valve guides use for disassembling the tool A. 10109 while for assembling apply to this tool the part n. 10109 bis.

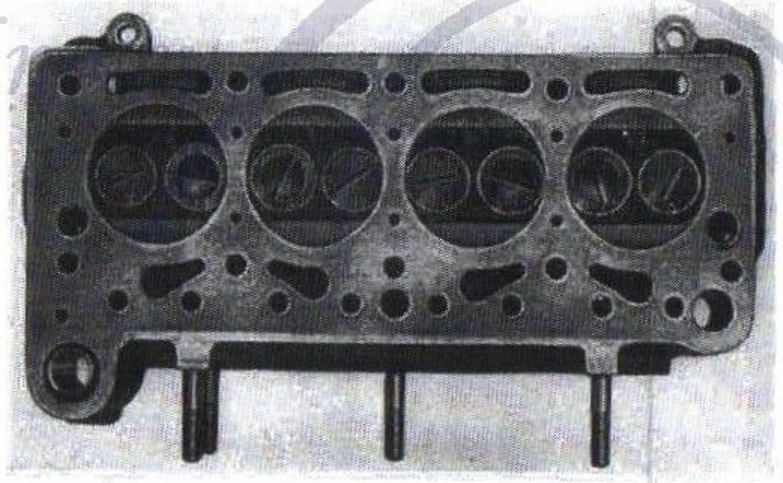


Fig. 157. - Cylinder head with fitted valves, seen from below.

CRANKSHAFT PINS AND BIG END BEARINGS

CRANKSHAFT

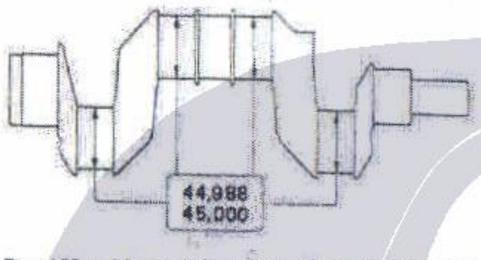


Fig. 158. - Normal diameter of crankshaft pins.

CRANKSHAFT PIN UNDERSIZES

Undersize	—0,25	—0,50	—0,75	—1,00
Pin diameter	44,738 44,750	44,488 44,500	44,238 44,250	43,988 44,000

BIG END BEARINGS

Bearing	Standard	Undersize			
		—0,25	—0,50	—0,75	—1,00
Thickness	1,563 1,569	1,688 1,694	1,813 1,819	1,938 1,944	2,063 2,069
Part number	712173	713377	713378	713379	713380

NOTE. — Big end bearing nuts of engine 500 B should be tightened at a torque of 2000 kg/mm.

PISTONS, PISTON PINS AND CONNECTING RODS

Cylinder bores are divided in three diametrical sizes:

A = mm 52,000÷52,010; B = mm 52,010÷52,020; C = mm 52,020÷52,030.

The four pistons of an engine should be the same weight with a tolerance of 2 gr.

Standard pistons are divided in three sizes according to the diameter on the pin axis:

A = mm 51,957 ÷ 51,967; B = 51,967 ÷ 51,977; C = mm 51,977 ÷ 51,987.

Piston pins are divided in three diametrical sizes:

1 = mm 15,000 to 14,996; 2 = mm 14,996 to 14,992; 3 = mm 14,992 to 14,988.

Interference fit of piston pin in piston hole should be mm 0,001 to 0,007.

The four connecting rods of an engine should be the same weight with a tolerance of 3 gr.

Connecting rods are divided in three sizes according to small end diameter:

1 = mm 15,005 to 15,001; 2 = mm 15,001 to 14,997; 3 = mm 14,997 to 14,993.

Interference fit of piston pin in small end should be no less than 0,001 mm and no more than 0,009.

NOTE. — For oversize spare parts the above tolerances should also be followed.

When overhauling an engine requiring cylinder reboring, be sure that the tolerance in the oversize is from 0,000 to 0,003 mm and divide the obtained bores in three sizes as above specified in order to fit oversize pistons of a suitable diameter.

For balancing connecting rods the excess weight should be reduced by milling the metal in the inside of the rod I-section.

For balancing pistons the excess weight should be reduced by turning on the lathe the bottom inside part.

CRANKCASE VENTILATION

In order to avoid obnoxious fumes and make it possible to use the hot air under the hood for heating purposes and defrosting in winter time by conveying it to the car interior, a crankcase ventilation has been obtained by force circulation of air in the engine.

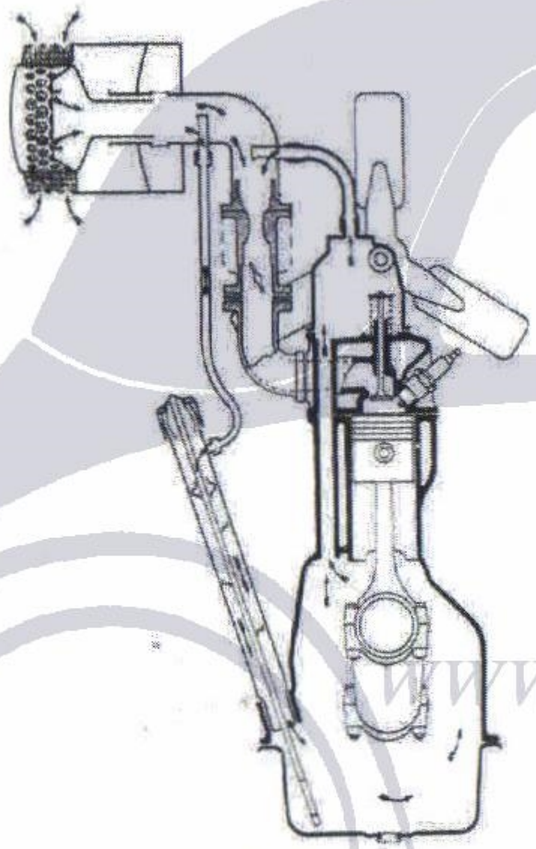


Fig. 159. - Crankcase ventilation.

To this end an air intake under pressure connected to the dip stick pipe and a vacuum intake connected to the cylinder head cover have been fitted to the intake pipe after the air cleaner.

This way a scavenging stream of clean air is obtained through the engine, as shown in fig. 159 and 160.

The pipe holding the dip stick, being no longer used as a breather, is hermetically sealed.

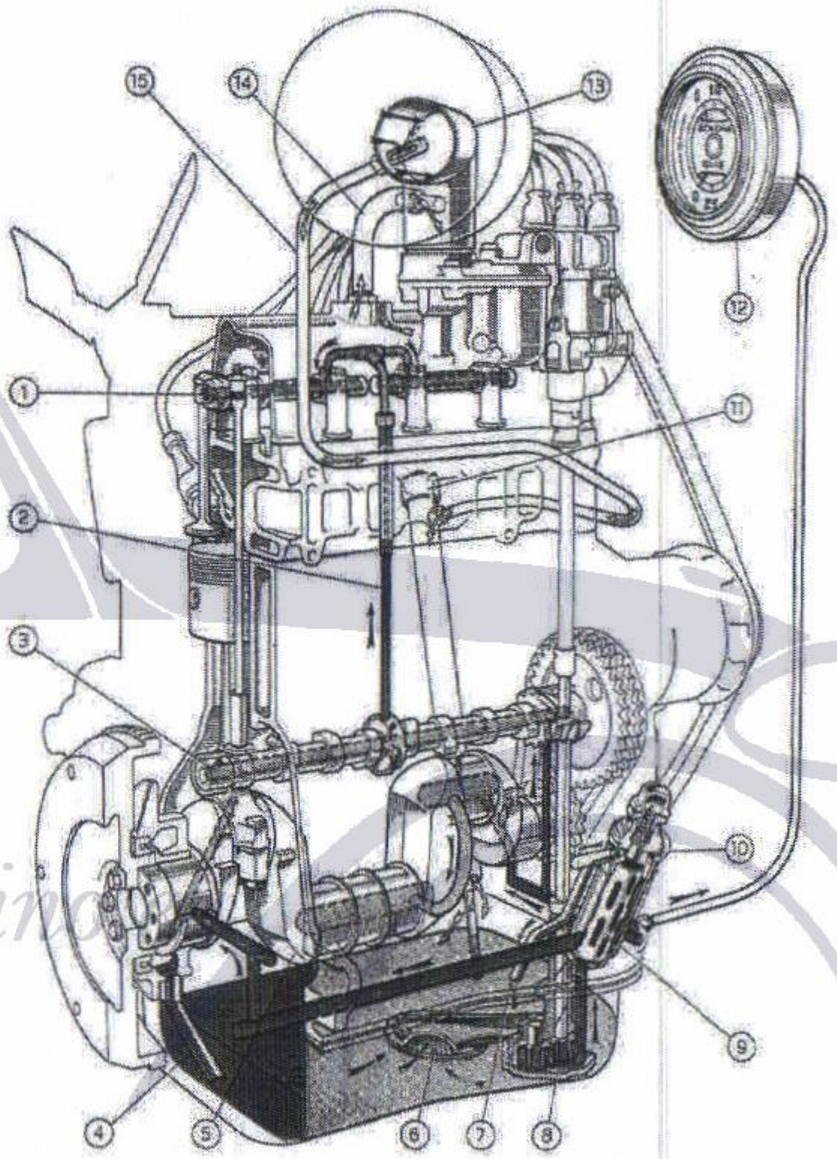


Fig. 160. - Oil and air circulation in engine.

1. Valve rocker spindle. - 2. Oil duct to valve rocker spindles. - 3. Camshaft. - 4. Oil discharge pipe from crankshaft rear support. - 5. Crankshafc. - 6. Oil pump filter. - 7. Oil pressure release valve discharge pipe. - 8. Oil gear pump. - 9. Oil gauze filter. - 10. Oil pressure release valve. - 11. Dip stick. - 12. Oil pressure and fuel level indicator. - 13. Air cleaner connection. - 14. Tube for sucking air and oil fumes from engine interior. - 15. Tube for forced air circulation in engine.

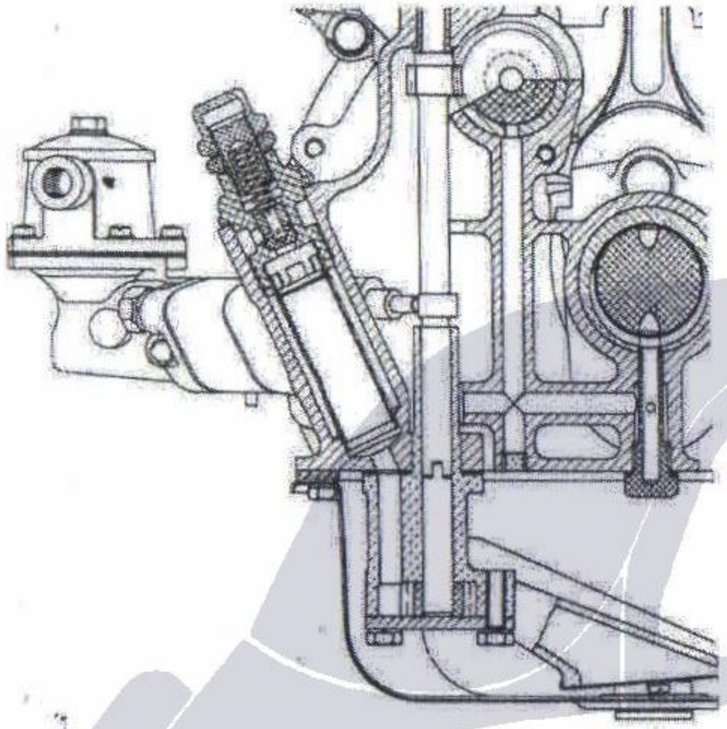


Fig. 161.

Part view of engine cross section on oil pump drive, oil filter and pressure release valve.

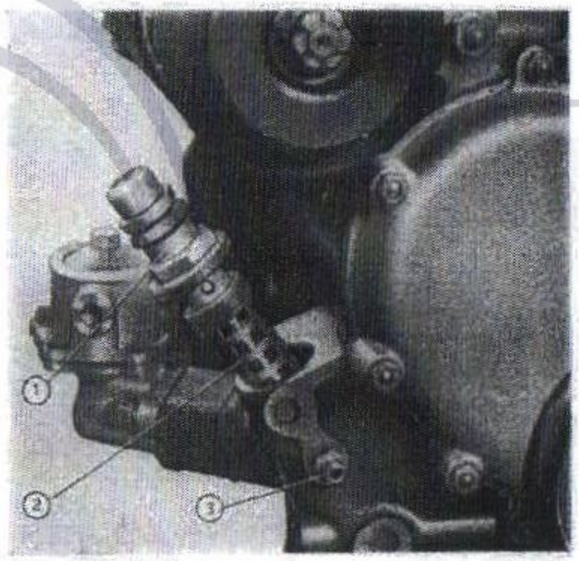


Fig. 162.

Oil filter, taken out from crankcase.

1. Body of pressure release valve.
2. Filter gauze.
3. Union for pipe to oil pressure indicator.

Oil seal on engine rear support.

The oil seal on engine rear support has been improved by fitting a special rubber packing. This has been placed in the crankshaft rear support and fits with the outside diameter of the flywheel hub, as shown in fig. 163.

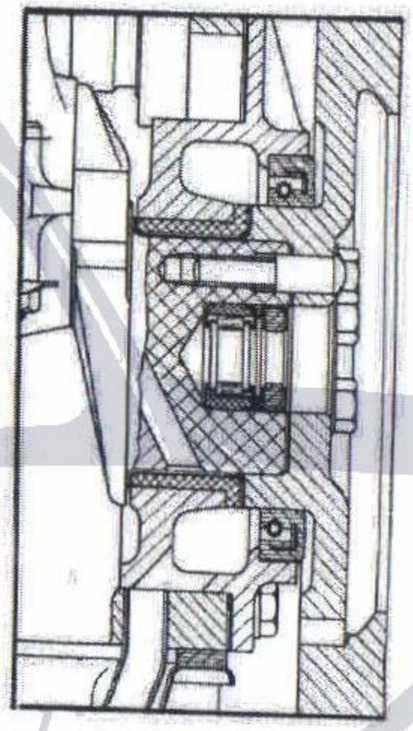


Fig. 163.

Part view of engine side cross section on rear support and oil seal.

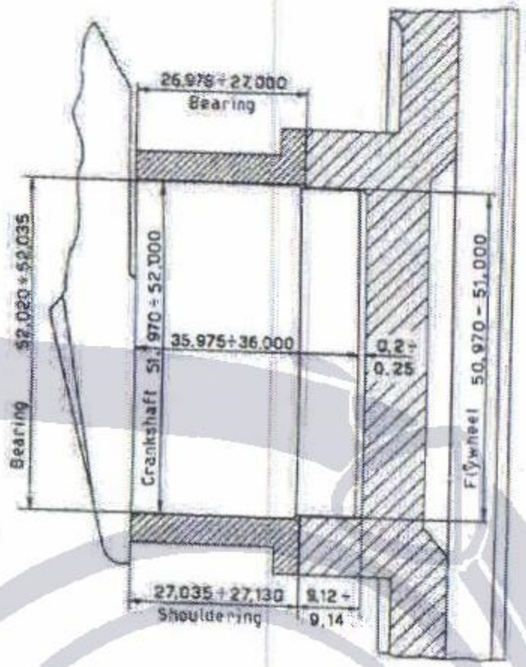


Fig. 164.

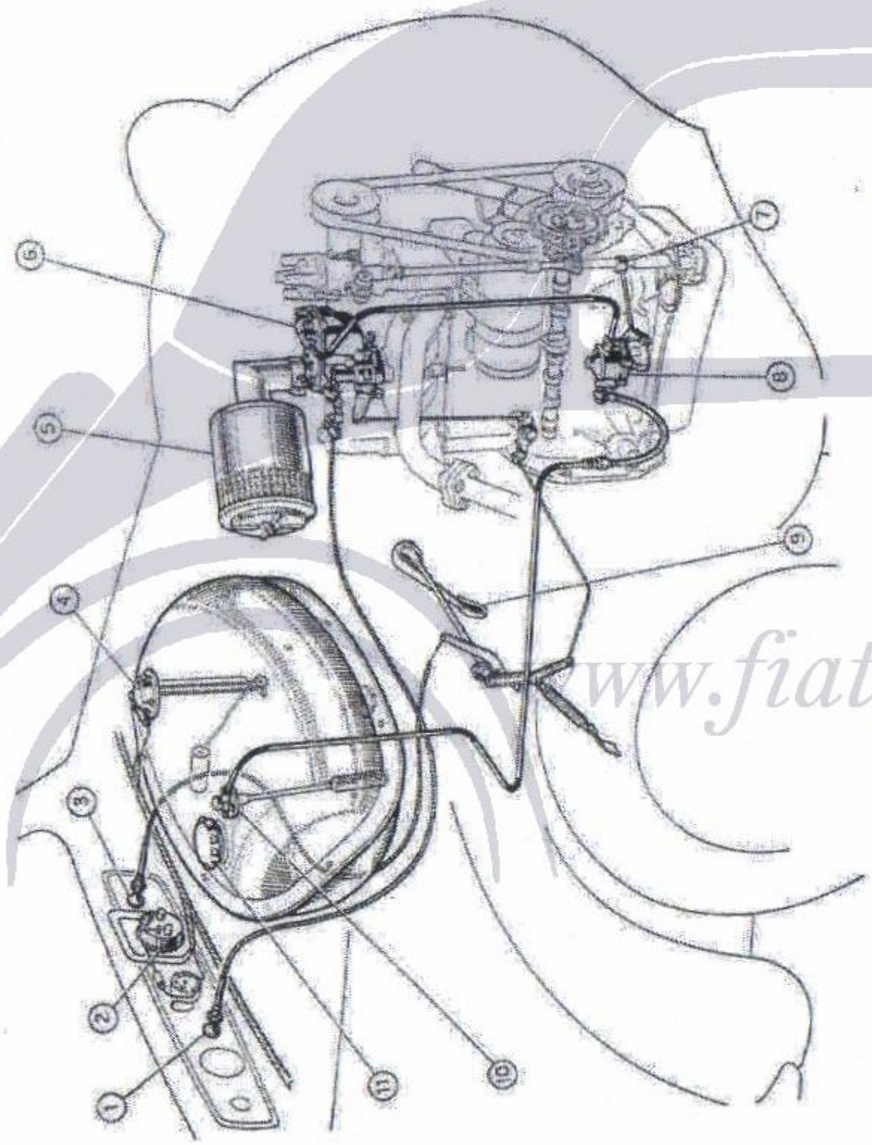
Detail of 500 B engine rear support with tolerance limits of bearing and flywheel on crankshaft.

This improvement can also be effected on Mod. 500 engines, but it is necessary to replace the flywheel and rear support with the corresponding parts of Mod. 500 B.

Fig. 164 shows tolerance limits of rear bearing, crankshaft and flywheel, which are of great interest for overhauls.

Fig. 165.
Fuel feeding system and carburetter controls.

1. Starting device control knob. - 2. Fuel level and oil pressure indicator. - 3. Throttle control knob. - 4. Electric fuel level indicator on tank. - 5. Air cleaner and intake silencer. - 6. Carburetter. - 7. Cam on oil pump drive spindle for operating fuel pump. - 8. Fuel pump. - 9. Accelerator pedal. - 10. Gasoline intake and filter. - 11. Tank filter cap.



WEBER CARBURETTER TYPE "22 DRS".

Main features.

The type "22 DRS" is a downdraught carburetter, with:

Body, diameter	mm	22
Choke tube, diameter	»	15,5
Main jet, diameter	»	0,92
Auxiliary jet, diameter	»	0,5
Starting jet, diameter	»	1,05

Besides the main and idling feeding device, it is also fitted with a cold starting device.

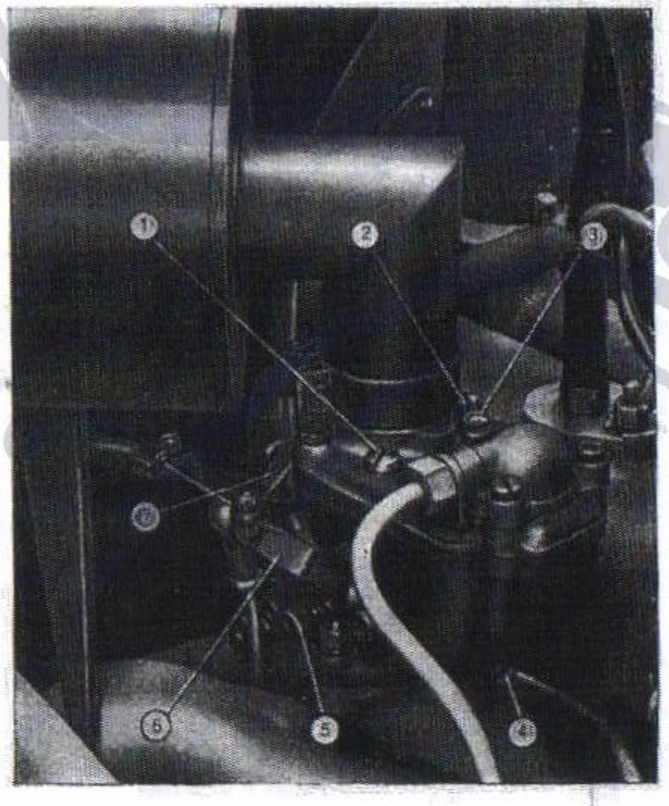


Fig. 166. - Carburetter adjustment.

1. Main jet. - 2. Starting jet. - 3. Idling jet. - 4. Metering screw for idling mixture. - 5. Throttle adjusting screw. - 6. Throttle control lever. - 7. Starting device control lever.

A proper wrench A. 8072 has been designed for carburetter disassembly, being of use also for rocker oil duct retaining nut.

Accessibility.

Jets and mixture wells of various devices can easily be dismantled from outside and slid off from top. Inspection and cleaning do not imply therefore disassembling carburetter from engine.

To free needle valve and float, remove cover which is fixed to carburetter body by two screws.

To inspect filter slip off cover and gasoline inlet connection.

Carburetter troubles and remedies.

Only when it has been established that the erratic running of the engine is attributable to the carburetion, the carburetter should be disassembled according to the following instructions.

Carburetter flooding: needle valve (2, fig. 167) seating badly. Take off the carburetter cover and check the condition of the needle, seat, float fulcrum and float. If foreign matters are impeding the normal action of the float and the hermetical seal of the needle, take off and remount all parts; if some parts are damaged, replace them.

Engine does not start when cold: the starting device does not work properly. Check the jet, the choke tube and the valve (14 and 18, fig. 167). If foreign matters are found, take them off; if some parts are damaged replace them.

Engine does not start when warm: bad working and bad adjustment of the idling device. Check the jet (12, fig. 167) and the adjustment. If foreign matters are found take them off; if some parts are damaged replace them.

Engine does not run at idling speed: bad working or bad adjustment of the idling device. Proceed in the same manner as in the case mentioned above.

Engine lacks flexibility when accelerating: the main jet or the choke tube do not work properly. Check them, take off any foreign matters, and replace any damaged parts.

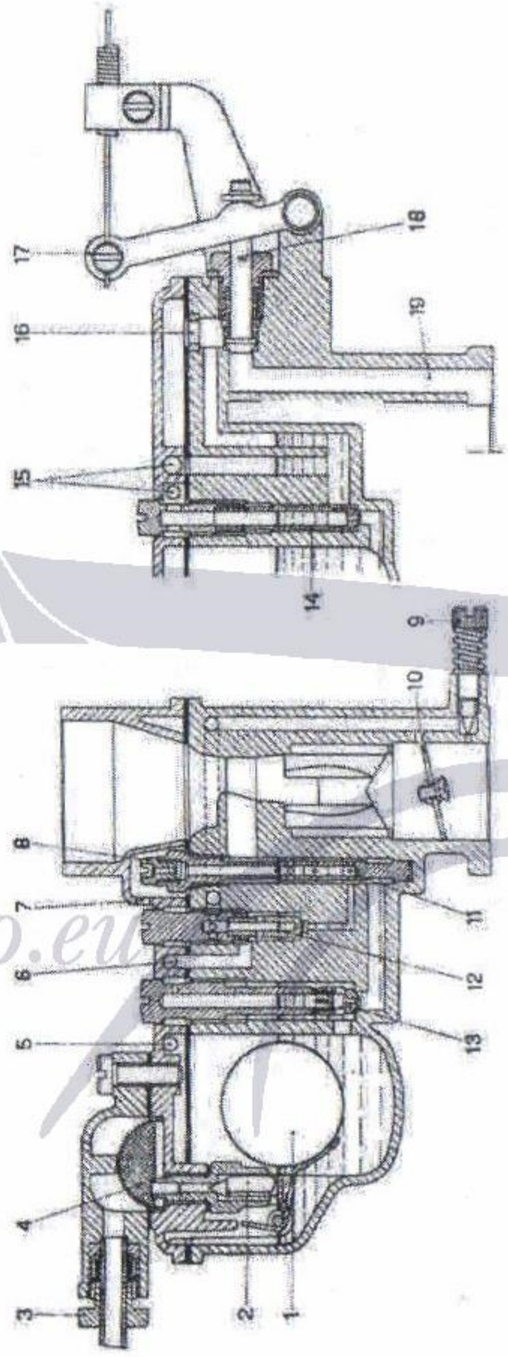


Fig. 167. - Weber 22 DRS downdraught carburetter.

1. Float. - 2. Needle seat. - 3. Nut for gasoline pipe. - 4. Fuel filter. - 5. Air intake. - 6. Idling air intake. - 7. Air intake for mixing chamber. - 8. Mixing chamber screw. - 9. Idling adjusking screw. - 10. Throttle. - 11. Mixing chamber. - 12. Idling jet. - 13. Main jet. - 14. Starting jet. - 15. Starting air intake. - 16. Auxiliary starting air intake. - 17. Starting device control lever. - 18. Starting device valve. - 19. Starting mixture duct.

High gasoline consumption: this may be caused by foreign matters either in the compensator air inlet, or in the main choke tube holes. In this case thoroughly clean the above parts. It may also depend on the main jet hole being bigger than normal or being smaller than normal the compensator air inlet. In this case these parts should be replaced with others correctly gauged according to the data shown on page 163.

Engine does not run at medium and high speed: inspect the man jet, the choke tube with compensator air inlet and proceed in the same manner as in the above mentioned cases.

FUEL PUMP

The fuel pump, of the diaphragm type, fitted on the crankcase and operated by a cam on the oil pump drive spindle, sucks gasoline from the tank and sends it directly to the carburetter (see fig. 165).

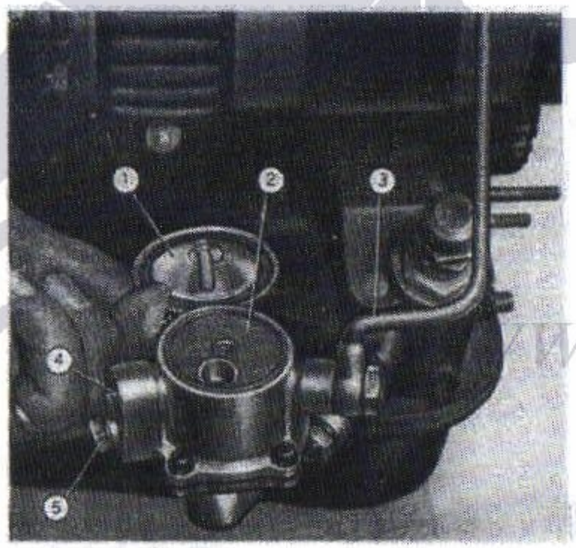


Fig. 168. - Fuel pump with open cover.

1. Cover. - 2. Filter gauze. - 3. Gasoline pipe to carburetter. - 4. Gasoline inlet. - 5. Drain plug.

This pump should be periodically inspected to check conditions of valves, diaphragm and return springs of driving device. It is necessary to change any parts which may be found even slightly damaged.

ENGINE BRAKE TEST

The data of the following table are recommended for the running in cycle of the engine, which should be delivered with a diaphragm on the carburetter:

Time	Turns per min.	Load in kgs. with an arm of 0.716 m.	H. P.
10′	600 ÷ 800	idling	—
10′	1000 ÷ 1200	1	1 ÷ 1,2
10′	1200 ÷ 1600	1,5	1,8 ÷ 2,4
10′	1600 ÷ 2000	2	3,2 ÷ 4
10′	2000 ÷ 2400	2,5	5 ÷ 6
20′	2400 ÷ 2800	3,2	7,7 ÷ 9
20′	2800 ÷ 3200	3,6	10 ÷ 11,5
20′	3200 ÷ 3600	3,6	11,5 ÷ 13
10′	3600 ÷ 4000	3,6	13 ÷ 14,4
2 h			

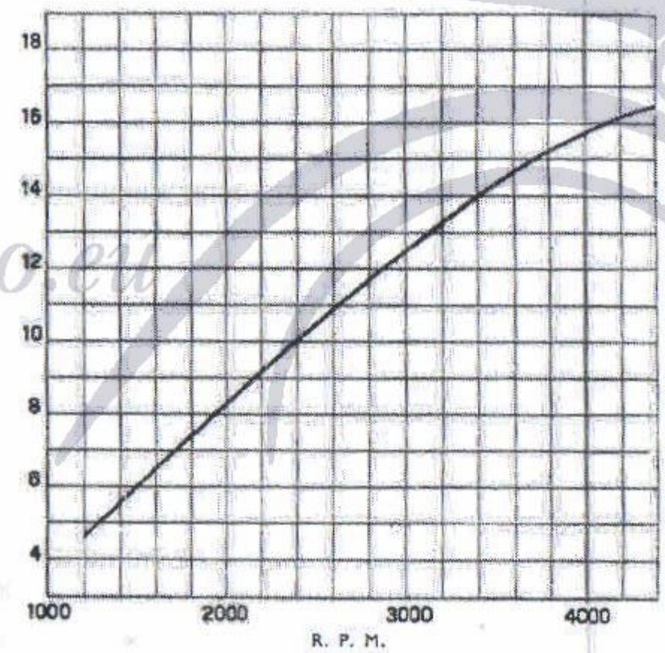


Fig. 169. - Power curve of engine Mod. 500 B.
An allowance of 5 % less is permissible.

Antifreeze mixtures.

GLYCERIN

Specific gravity at 15° C	Glycerin % in volume	Glycerin lt.	Water lt.	Freezing point
1,049	15	0,7	3,8	— 4° C
1,070	25	1,2	3,3	— 8° C
1,115	35	1,6	2,9	— 14° C
1,129	40	1,8	2,7	— 18° C
1,144	45	2,1	2,4	— 22° C
1,160	50	2,25	2,25	— 26° C

ALCOHOL

Specific gravity at 15° C	Alcohol % in volume	Alcohol lt.	Water lt.	Freezing point
0,968	26,50	1,2	3,3	— 9° C
0,965	30,00	1,4	3,1	— 12° C
0,959	35,25	1,6	2,9	— 14° C
0,956	37,40	1,7	2,8	— 15° C

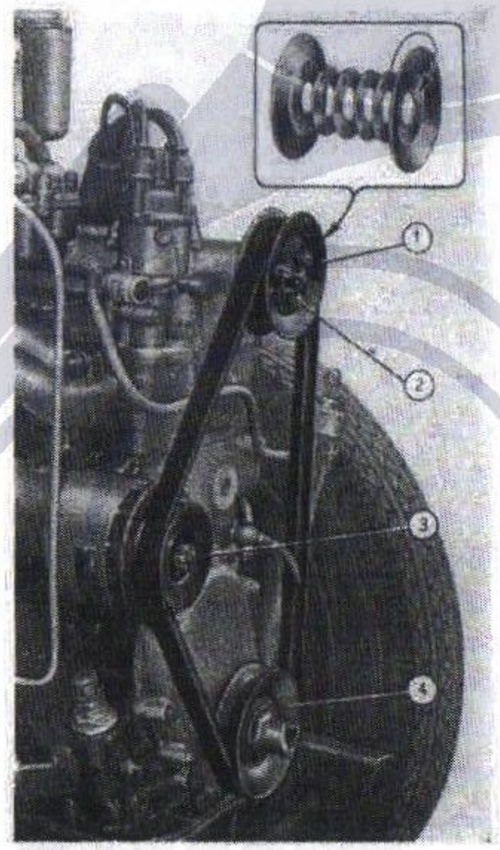


Fig. 170.

Fan belt tension adjustment.

1. Fan driving pulley.
2. Nuts holding pulley discs.
3. Generator driving pulley.
4. Crankshaft pulley.

Adjusting fan belt tension.

Unscrew the three nuts locking the fan pulley to the hub; displace on the outside one or two of the rings forming the pulley base, as needed in accordance with slack of belt, and reassemble.

The suspension is by variable flexibility springs, for both the front end with the transversal semi-elliptic spring, and the rear end with the two longitudinal semi-elliptic springs. On the rear it has been applied a stabilizer bar (see fig. 171).

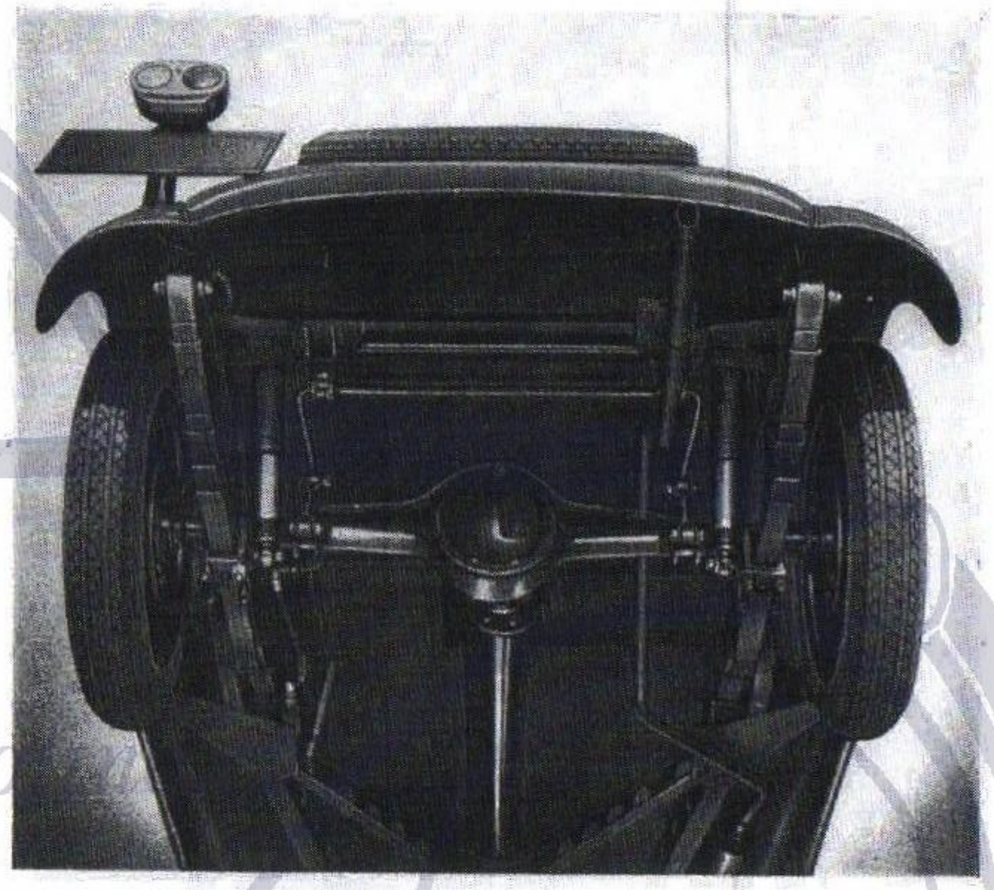


Fig. 171. - Rear suspension of car Mod. 500 B.

Note attachment of hydraulic shock absorbers and stabilizer bar.

The hydraulic shock absorbers applied to the four wheels are of the double acting telescopic type.

Hydraulic shock absorbers.

The telescopic shock absorbers are double acting with rebound and compression braking. They brake therefore, in both directions, the longitudinal displacements of the cylinder and piston.

These shock absorbers are also called "direct action shock absorbers" as they directly act on suspension unit through no linkage. Their use must be recommended for a better suspension control.

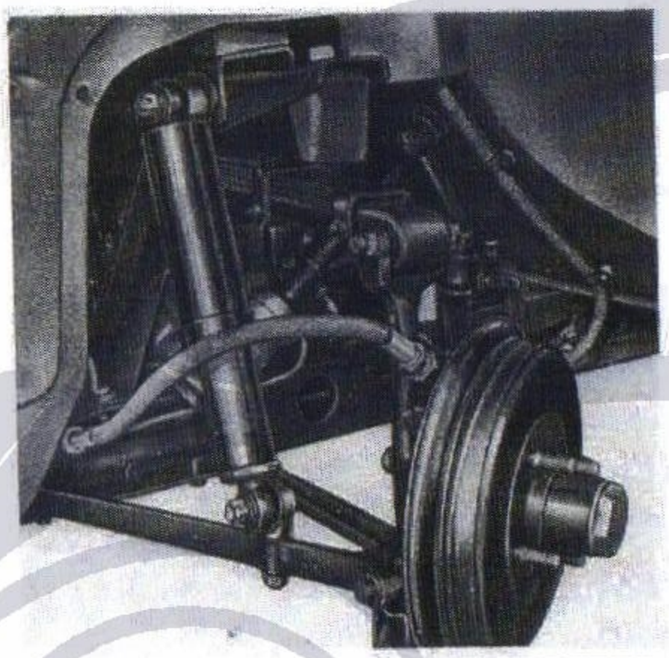


Fig. 172. - Attachment of a front hydraulic shock absorber.

Direct action shock absorbers constructed by RIV Factory are provided with thermostat valves thanks to which braking effect is minimally affected even under heavy temperature alterations.

Description.

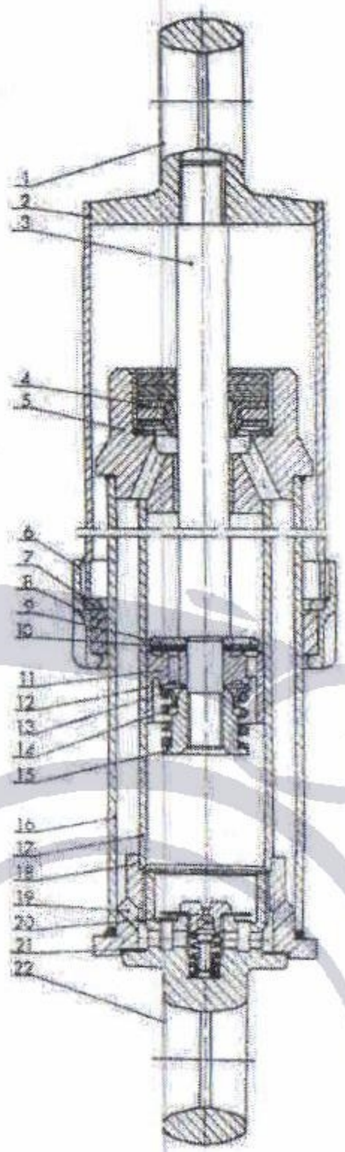
A shock absorber consists in its main parts of a cylindrical body which is formed by two metal sleeves on the same axis (Ref. 16-17, fig. 173), the inner one acting as working cylinder and the outer as housing. The ring-shaped interstice between the two sleeves is a fluid reservoir. A third external sleeve (Ref. 2) acts as a shield, protecting the rod (Ref. 3) from dirt and stones. The

Fig. 173.

Sectional view of hydraulic shock absorber.

1. Upper eye bolt.
2. Dust sleeve.
3. Rod.
4. Housing with packing.
5. Upper cap.
6. Packing holding ring.
7. Packing ring.
8. Felt washer.
9. Disc limiting valve lift.
10. Thickness washer.
11. Piston.
12. Valve disc.
13. Rebound control disc.
14. Rebound control spring.
15. Locking nut.
16. External cylinder.
17. Internal cylinder.
18. Lower ring.
19. Hole connecting external and internal cylinders.
20. Compression valve.
21. Lower cylinder packing.
22. Lower eye bolt.

Note. — Items No. 6-7-8 on both front and rear shock absorbers are by now suppressed.



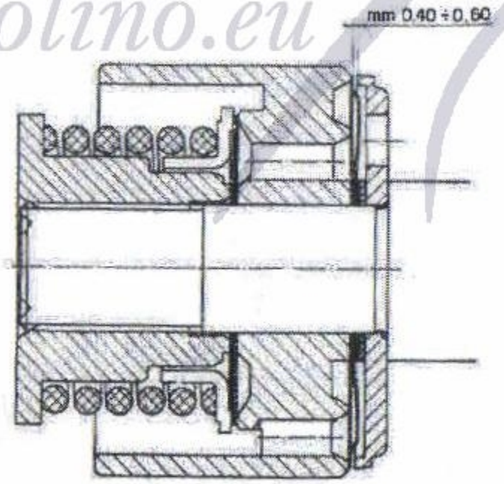


Fig. 174.

Part sectional view of hydraulic shock absorber on rebound valve.

cylindrical body is closed at upper end by a cap (Ref. 5) fitted with a bushing and an oil tight packing (Ref. 4). The rod (Ref. 3) slides though this packing and bears screwed on top end the eyebolt (Ref. 1) for attachment to chassis and on down side a piston (Ref. 11) whereon rebound and inlet valves are located. The shock absorbers is closed at bottom end by a screw cap (Ref. 22) whereon compression and refilling valves are fitted. This cap is eye-shaped and provides an attachment to rear axle. Both upper and lower cap are provided with holes through which fluid can flow into reservoir.

Piston bears two concentric sets of holes (Ref. 6, fig. 175). The inner set is closed on down side by the rebound valve which opens from top to bottom. The outer set of holes is closed on up side by the inlet valve which opens from bottom to top.

Operation.

Let us consider a shock absorber as divided in three imaginary portions;

A) portion of the cylinder above the piston (always full of fluid);

B) portion of the cylinder below the piston (always full of fluid);

C) fluid reservoir (never completely full of fluid).

Now let us take a look at the two separate phases:

1) Rebound phase.

In this phase shock absorber is expanding in length. Fluid above the piston finds the outer set of holes on piston closed and is forced through the holes of inner set. It acts on rebound valve passing in the lower portion of cylinder. Piston travelling upward creates a vacuum in the lower portion of cylinder, drawing therefore a quantity of fluid from the reservoir through the holes of lower cap and compensating valve. The fluid that flows from the reservoir into the cylinder is the same volume as the volume of the rod having got out from the cylinders. In this rebound phase only rebound and compensating valves are operative, whereas compression and inlet valves remain closed.

2) Compression phase.

This phase takes place when shock absorber is compressed. As the piston comes down, the fluid that is underneath lifts the disc of inlet valve (Ref. 10, fig. 173) and flows into the upper portion. Because of the rod re-entering

the cylinder, the fluid present below cannot wholly flow above, but partly acts on compression valve and drains into the reservoir through the holes (Ref. 19) on lower cap. Compression braking results then in the displacement of a volume of fluid equal to the volume of rod re-entering the cylinder. In this phase compensating and rebound valve remain closed whereas compression and inlet valves are operative.

Maintenance.

These shock absorbers do not need any particular maintenance care. Fluid reservoir allows for a very wide mileage range before refilling is required. Shock absorbers, if damaged, may operate badly on account of following defects:

a) noisiness;

b) alteration of braking effect.

Noisiness.

This defect which is often blamed on shock absorbers may be due to several factors; the whole suspension should be therefore inspected, as well as the attachment of shock absorbers to frame and rear axle. See that attaching eyebolts of shock absorbers are well fastened to rubber and that rubber parts are not worn out; if so, replace them. Make sure that shock absorbers do not contact metal parts of rear axle or frame anywhere. Shock absorbers having dust sleeve with felt washer may get noisy due to the felt washer being worn out: as a consequence the packing holding ring hits against the intermediate sleeve when the vehicle is bouncing. In this case unscrew the ring. Shock absorbers may be noisy moreover because of lack of fluid due to occasional leaks. Shock absorber should then be disassembled, washed and fluid filled, complying with recommendations further outlined.

Alterations of braking effect.

Alterations in braking effect may be experienced as either an increase or a reduction in respect to correct adjustment. Generally the former case in rather unfrequent and it is accountable on alterations of fluid which has become thick or reciprocal adjustment of valves and their seats determining a better seal and thus an increase of braking power.

A reduction of braking effect may be caused by breakage of internal parts, lack of fluid or sticking valves.

In all aforementioned cases shock absorbers should be disassembled, inspected and cleaned, and if necessary damaged parts should be replace.

Disassembly of shock absorbers.

Proceed as follows:

1) Wash the external surface with warm water or kerosene.

2) Press the lower eyebolt in a bench vise seing that, if eyebolt is fitted with silentbloc bushings, vise jaws are anchored on eyebolt and not on rubber bushing.

3) Unscrew the cylinder for half a turn by means of a proper open-end wrench.

4) Remove the shock absorber from the vise and holding it vertically upside down loosen out the lower eyebolt (Ref. 22, fig. 173).

5) Extend the shock absorber to full length and drain fluid.

6) Compress back the inner sleeve within the outer one. Place the upper eyebolt (Ref. 1) in the bench vise following recommendations of item 2. If shock absorber has a felt washer, unscrew the holding ring (Ref. 6) with a suitable wrench. Newt slacken piston locking nut (Ref. 15) by means of a socket wrench.

7) Slide the outer sleeve off the cylinder. The outer sleeve will stay connected to the rod and piston with valves will lie in the cylinder. Just turn the cylinder over to have piston and valves come out.

8) Perform inspection of single components, replacing faulty ones. Wash out the interior of shock absorber and disassembled parts with kerosene or gasoline.

9) Take compression valve (Ref. 20) off by unscrewing the nozzle. Valve components are so free for inspection.

Assembly of shock absorbers.

To re-assemble shock absorbers proceed as follows:

1) Insert the rod in the cylinder through upper packing. Not to damage the latter, place the protecting tool A. 10228 on front end.

2) Press shock absorber upside down vertically in a fixture, install parts on rod in the succession shown on fig. 175, make sure that piston travels smootly in the cylinder and gradually tighten the locking nut. Punch front rod end to prevent slackening of nut.

3) Refit components of compression valve on lower cap.

4) Check in a graduated burette the contents of FIAT SAI fluid for shock absorbers which should be 110 cm³.

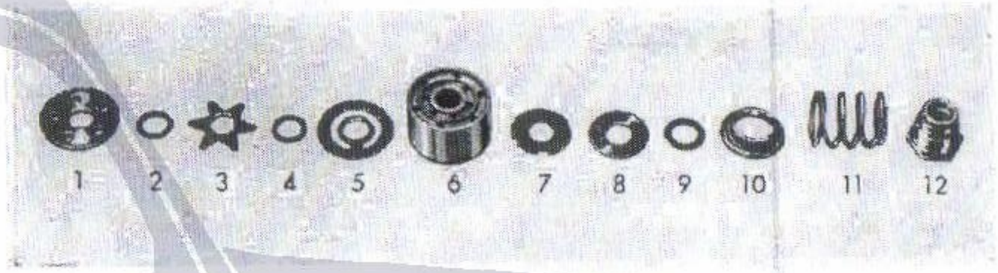


Fig. 175. - Exploded view of shock absorber rebound valve.
Parts must be fitted on shock absorber rod according to their numerical order.

5) Hold the shock absorber upside down, at full lenght and slightly tilted. Pour in the fluid of burette.

6) Replace aluminium packing (Ref. 21). Screw home lower eyebolt complying with item 2 of assembling instructions.

7) Replace packing ring felt washer (only for types with packing ring) if worn and screw home the packing ring taking care not to overtighten felt washer on intermediate housing.

Pointer. — Shock absorbers in stock should be kept in vertical position and not upside down.

Tubular shock absorbers: FIAT SAI fuel capacity.

500 B front and rear shock absorbers	110 cm³

FRONT WHEEL TOE-IN AND CAMBER

The above should be periodically checked and particularly after an impact or when tyres are showing an abnormal wear.

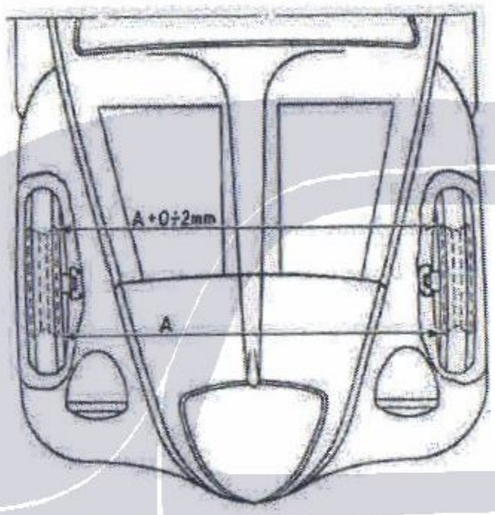


Fig. 176.

Checking front wheel toe-in.

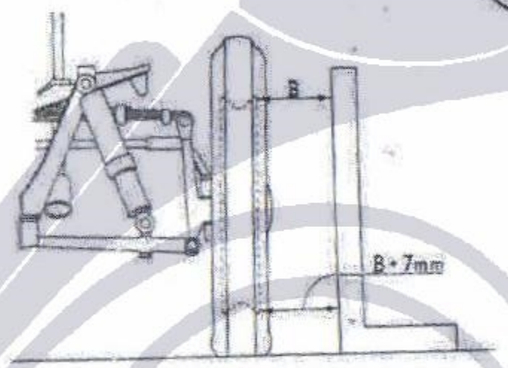


Fig. 177.

Checking front wheel camber (car under normal load).

Caster . . . . . 6°

BALANCING THE WHEELS

For balancing wheels follow instructions for Mod. 500, on page 99.

When tyre covers are repaired or replaced, remember that tyres for Mod. 500 B are supplied with a **red mark** indicating the **lightest point;** tyre covers should therefore be fitted with the red mark near the tyre valve.

By following this recommendation the previous balance may result unaltered. However, it is always necessary to check wheels for correct balance not only in case of repairs to either the wheels or the tyres, but also whenever steering troubles are experienced.

ELECTRICAL EQUIPMENT

See on page 150 the description of the electrical equipment installed on Mod. 500 B.

Fig. 179 shows the wiring diagram and fig. 180 the installation of the electrical equipment on the car.

For overhauling the electrical apparatus follow the instructions contained in the previous handbooks.

S 50 A DISTRIBUTOR AUTOMATIC ADVANCE CURVE

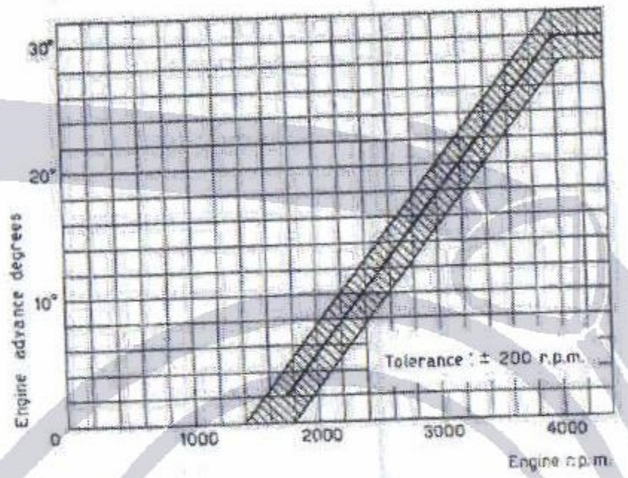


Fig. 178.

« Marelli S 50 A » ignition distributor automatic advance diagram.

WINDSHIELD WIPER ADJUSTING INSTRUCTIONS

When it is necessary to change the electric motor driving the wiper blades, after having loosened the bolt fixing the lever (Fig. 181) to the motor spindle, take off the lever. Then remove the two bolts fixing the bracket (Fig. 181) to the dash for being able to detach the motor with the bracket.

NOTE. — It is most important to carefully see:

1. — On disassembly, the position of shims for fixing motor to bracket, **to be able to well set them up when re-assembling.**

Light switch positions.

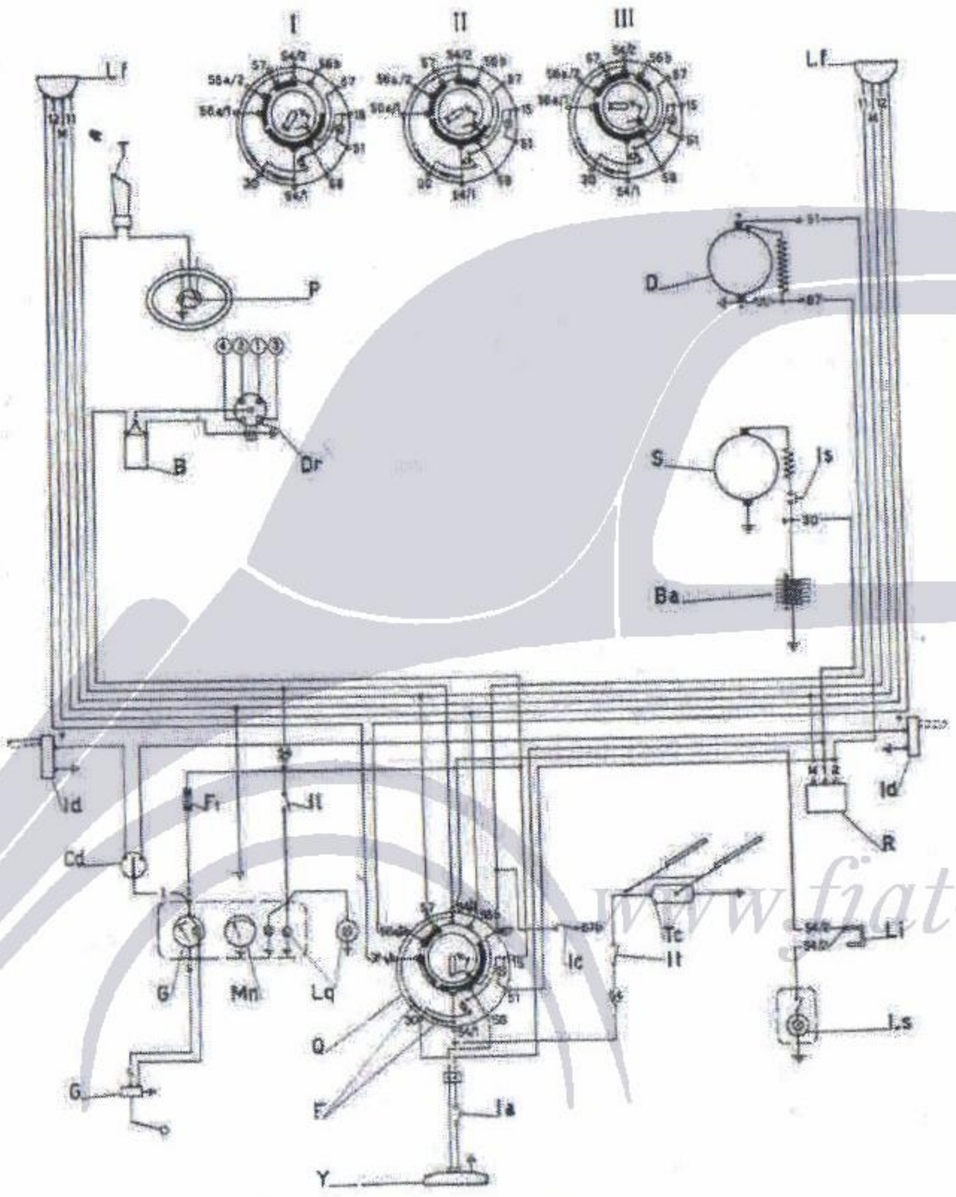
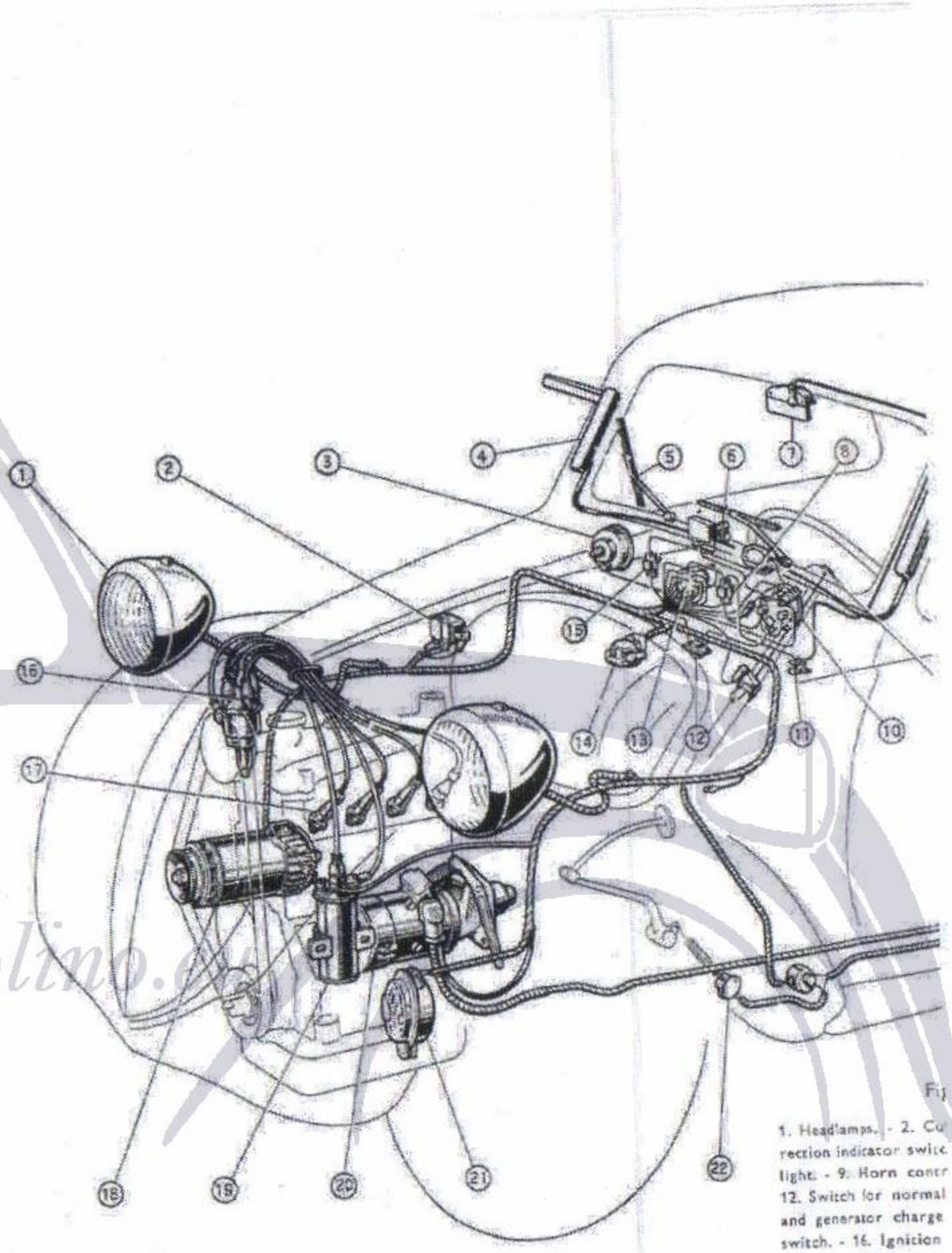


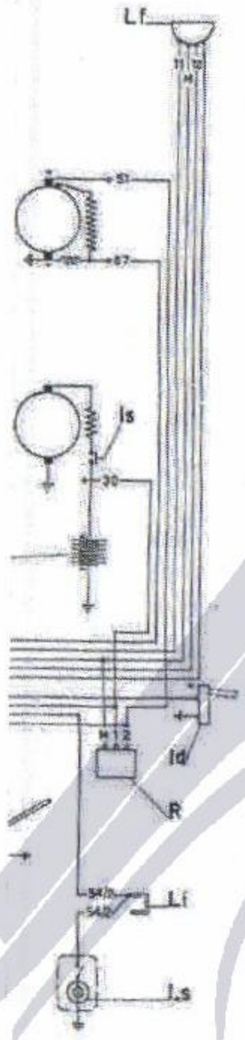
Fig. 179. - Wiring diagram.

B. Ignition coil. - Ba. Battery. - Cd. Direction indicator switch. - D. Generator. - Dr. Ignition distributor. - Ia. Stop light switch. - Ic. Generator charge switch. - Id. Direction indicators. - Il. Instrument light switch. - Is. Starting switch. - It. Windshield wiper switch. - FF_1. Fuses. - G. Fuel gauge. - Lf. Headlamps. - Li. Inspection lamp plug-in connection. - Lq. Instrument light bulbs. - Ls. Interior light bulb. - Mn. Oil gauge (incorporated with fuel gauge). - P. Horn button. - Q. External light switch, with ignition switch and generator charge tell-tale lamp. - R. Cut-out. - S. Starting motor. - T. Horn. - Tc. Windshield wiper. - Y. Tail and stop lamp.



Fi

1. Headlamps. - 2. Cu
rection indicator switc
light. - 9. Horn contr
12. Switch for normal
and generator charge
switch. - 16. Ignition
motor. - 21. Horn.



- Dr. Ignition distributor. - I. Instrument light switch. - f. Headlamps. - Li. Inspection in. Oil gauge (incorporated nd generator charge tell-tale Y. Tail and stop lamp.

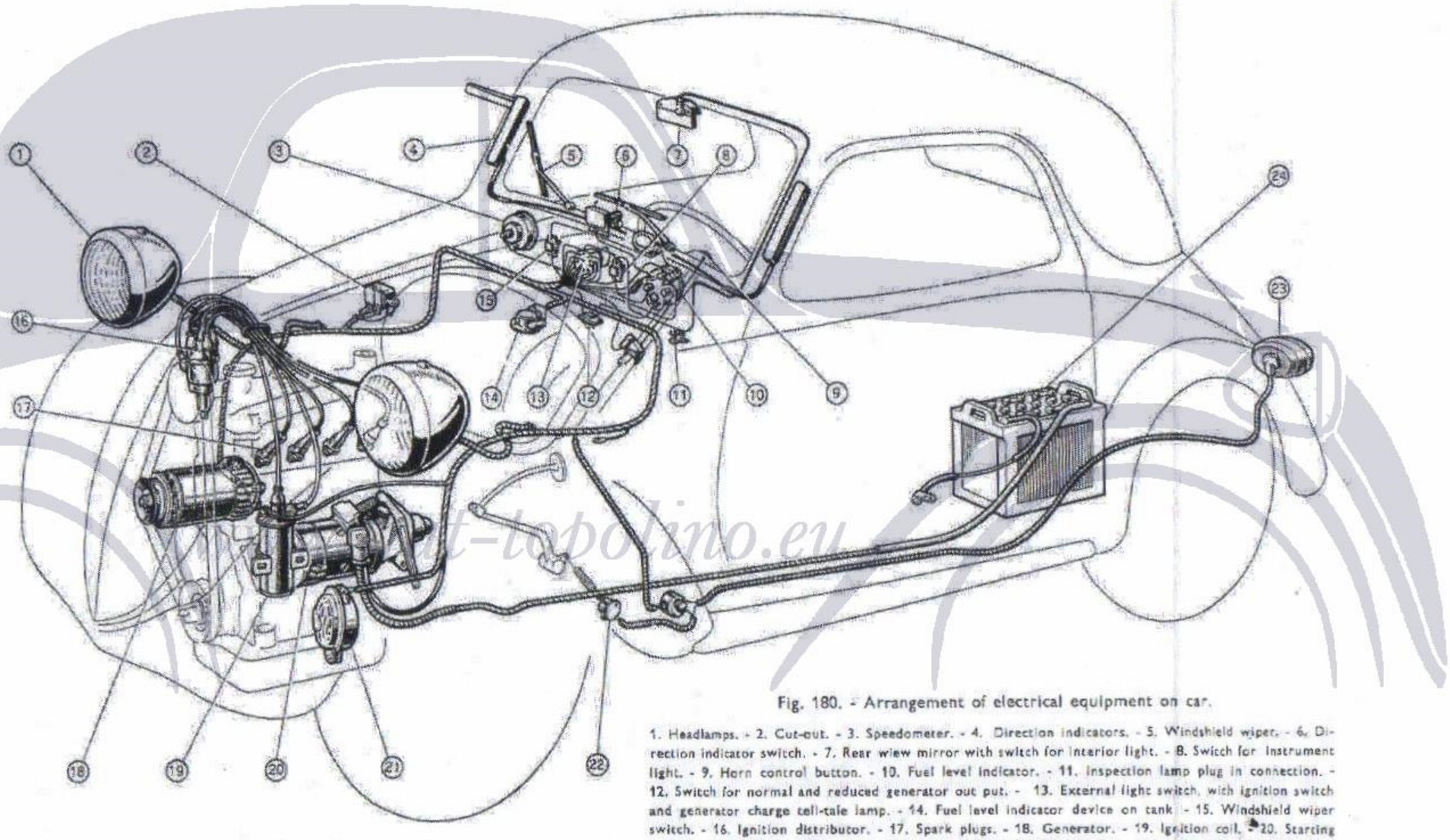


Fig. 180. - Arrangement of electrical equipment on car.

1. Headlamps. - 2. Cut-out. - 3. Speedometer. - 4. Direction indicators. - 5. Windshield wiper. - 6. Direction indicator switch. - 7. Rear view mirror with switch for interior light. - 8. Switch for instrument light. - 9. Horn control button. - 10. Fuel level indicator. - 11. Inspection lamp plug in connection. - 12. Switch for normal and reduced generator out put. - 13. External light switch, with ignition switch and generator charge tell-tale lamp. - 14. Fuel level indicator device on tank. - 15. Windshield wiper switch. - 16. Ignition distributor. - 17. Spark plugs. - 18. Generator. - 19. Ignition coil. - 20. Starting motor. - 21. Horn. - 22. Stop light switch. - 23. Tail and stop light with refractor. - 24. Battery.

B. Igniti
Ia. Stop
Is. Starti
lamp plu
with fuel
lamp

2. — On re-assembly, that motor spindle lever is so positioned as red marks on spindle top end and on lever front side are exactly lined up and that lever fixing bolt is tightly fastened.

3. — On re-assembly, that motor and support bracket are a parallel anchorage, complying with Factory assembling procedure.

Should any part be changed, replacement does not require further suggestions outside the necessity of re-setting everything to its right place, with a special attention to the mounting of motor on support bracket (shims and position). Should shims result a different fit of Factory setting conditions, wiper control lever would no longer be on correct connection plane with other levers, thus causing a faulty operation. Spindle and lever marks out of alignment would likely result in asymmetrical travels and excessive strains.

When adjusting blade rotation angle it is good practise not to tighten the bolt fixing blades on pins too close to be able to set blade position by operating motor. Then lock blades on pins.

To avoid operating troubles, never attempt to vary blade position without first slackening the screws fixing blades on pins, for damage to motor gears may result.

Adjusting screen wiper.

The causes being liable to determine operating troubles are grouped as follows:

a) Friction of pins due to displacement and misalignment.

b) Control lever and motor spindle being a loose junction.

c) Blade fixing clip on pin being a loose fit.

a) Friction of pins due to displacement and misalignment.

As a consequence a reduction of swings per minute takes place and, sometimes, motor gets even stalling after a certain period of operation because of lever linkages gradually stiffening.

The bracket (Ref. 2, Fig. 181) supporting motor may be placed backward with respect to blade pins, so that lever linkages do not operate on parallel planes and are forcing though pins can tilt up to a remarkable extent. Above bracket may be bolted (Ref. 1) to holder push rod with an improper inclination. Blade pins, too, may be a different inclination or an unparallel arrangement.

These troubles should be inspected and rectified accordingly by either forwarding bracket (Ref. 2) with motor toward front dashboard (if necessary, widen holes for passage of bolts fixing bracket to push rod); or by aiming bracket so as to set motor spindle axis as parallel as possible to the axes of blade pins. To this purpose avail of the play between bracket holes and anchoring bolts (Ref. 1), adding moreover some shims between bracket and push rod under either bolt.

To correct the geometry of the axes of blade pins, sheet metal plate can be easily handly re-shaped by a simple side pressure on pin at sheet plate guide baffle.

Check of axes and working planes of lever linkages for parallelism is correctly made by taking motor control lever to various angular positions of its travel, after dismantling tie rods. (Pointer.—To accomplish this operation, insert motor in circuit and have it operate: do not attempt to hand move lever, least to disengage it or to ruin bakelized linen gears of motor, which **is not reversible!**). Try to install tie rods at various positions. See that they drive smootly in and that, once installed, they are a snug fit and force nowhere. **Most accurately inspect opposite travel ends of motor control lever** (Fig. 182). Make furthermore sure that tie rods are operating on the same plane without getting out of alignment inward or outward. Anyhow to compensate residual geometry displacement between axes and working planes of lever linkages, tie rods should be let move more freely by cutting round the corners of tie rod holes, taking care not to widen the center of holes, for excessive play between pins and tie rods might result and slamming noises develop when movement is reversed.

As a final check start windshield wiper and see that swings per minute with **cold motor** (having been somewhat long at rest) and **with 12 volts tension** (check with a right voltmeter) is not inferior to 30 and current absortion of motor not above 1,3 Amp (check with a right ammeter).

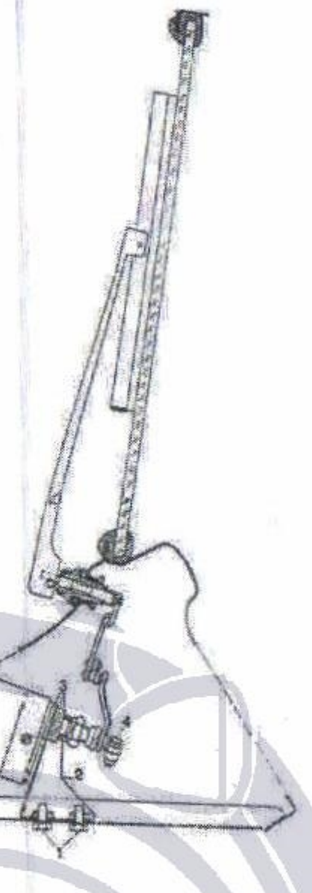
b) Control lever and motor spindle being a loose junction.

This trouble brings about a gradual alteration of angular setting of motor spindle control lever travel with respect to spindle centerline (Fig. 182) and therefore a gradual reduction of the angle formed by one of tie rods with blade control lever at the end of either travel. Should the angle become too acute the effort on the pin would be excessive, whereat a stiffening again, a reduction of swings per minute and sometimes, the stalling of the motor would take place.

Fig. 181.

Windshield wiper (section on blade drive).

1. Bracket locking bolts.
2. Bracket supporting motor.
3. Washers for adjusting motor position in relation to blade control levers.
4. Spindle clamp.



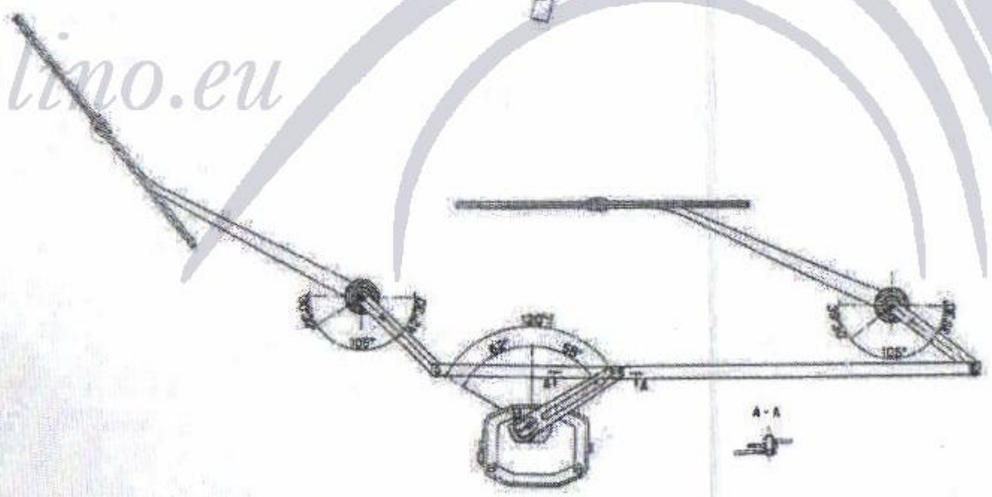


Fig. 182. - Windshield wiper assembly with blade rotation angles.

If the connection is very weak, in a short period of operation motor control lever oversets all apart thus bringing wiper driving leverage near the dead center and causing movement to stop and all the system to idle.

The hole on lever clip may be too wide.

The cross slot permitting the clip jaws to clamp may be inadequate.

If it is impossible to correct these troubles, replace lever, making sure that spindle slides in clip hole smoothly and taking care to screw fixing bolt well home after positioning lever, the **reference mark of which should be exactly lined up with that of motor spindle.** These marks are purposely stamped for right angular adjustment. Should marks not exist, lever must be so positioned that its 120° travel be divided as shown on Fig. 182.

After the positioning has been made, cut reference marks on motor spindle and lever.

c) Blade fixing clip on pin being a loose fit.

This trouble determines a loss of blade angular travel for a play develops between blade clip and pin, thus producing a slipping at every movement reversion.

Pin hole diameter may be excessive or clip lack elasticity and not clamp close.

To overcome above trouble it will be necessary to replace the blade with another having an efficient clip, which sould be tightened home with fixing screw, after positioning blades.

Latest production 500 B cars are equipped with new windshield wipers having rotating rather than alternating movement motor and presenting a new blade control system.

See on page 190 the windshield wiper fitted to model 500 C, which varies from present one in width of blade angular travels only.

HEADLAMPS

Headlamp aiming.

— Place car without load on level floor at 5 m from a white screen in half light (Fig. 141) and make sure that car axis is perpendicular to screen.

— Trace on screen two crosses simmetrical to the vertical axis, as shown in Fig. 141.

— Turn on headlights and carefully adjust them so that the light beams are centered on crosses.

Be sure the light beams have:

a) a vertical tilt of 1% towards the ground;

b) a horizontal tilt of 45' outwards.

Headlamp aiming it effected loosening slightly the clamp nut under wing and tourning lamp body by hand as required. Then securely tighten nut and locking nut.

Specification data are same as those of Mod. 500 shown on page 120, Fig. 141.

Headlamp opening.

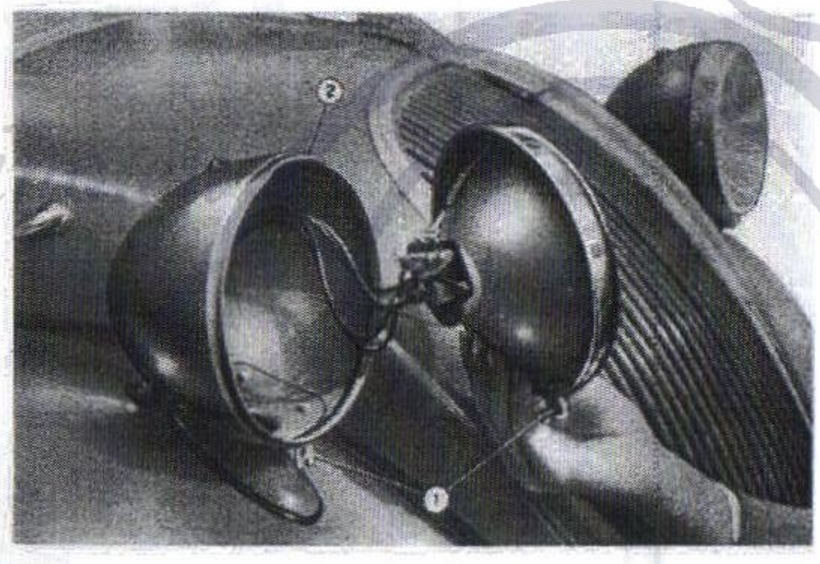


Fig. 183. - Headlamp opening.

1. Screw to be slackened to open headlamp. - 2. Edge connecting lamp rim to housing.

Opening headlamps, for replacement of internal bulbs, is made by unscrewing lower locking screw (Ref. 1, Fig. 183). Pull outwards lamp rim from the underside and lift it slightly so that it can be slid off. Town tubular lamp is thus reached, replacement of which is a quick matter, being retained only by the

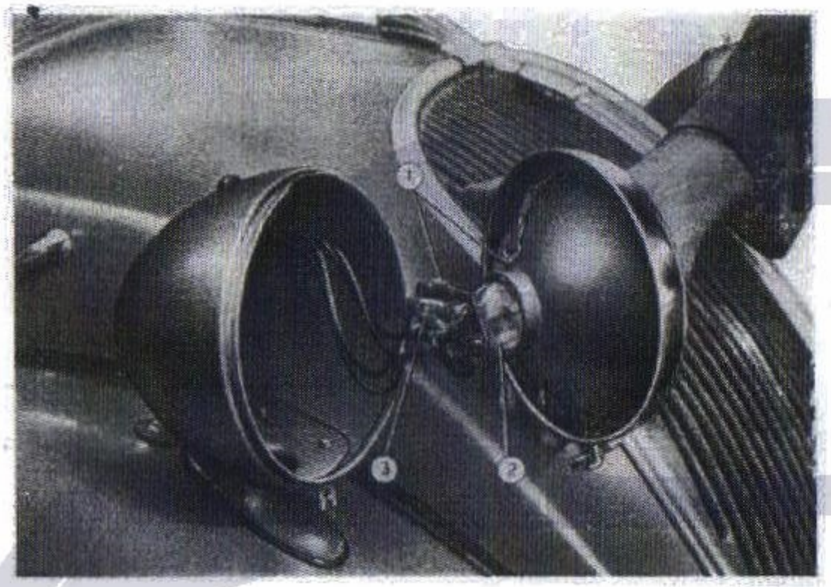


Fig. 184. - Removal of lamp sockets from headlamp.

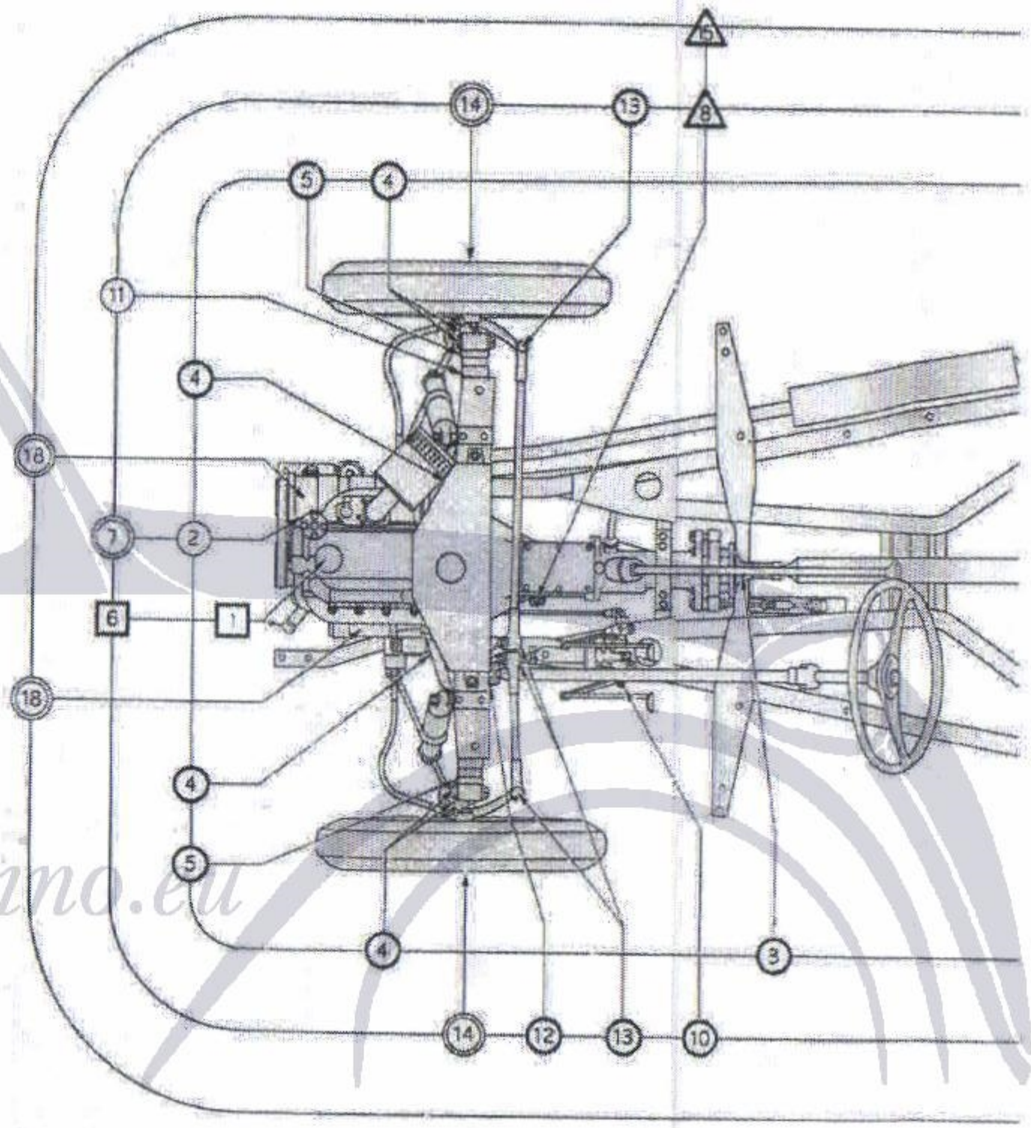
1. Spring rod and hook fixing socket. - 2. Double filament lamp for bright lights and anti-dazzle lights. - 3. Tubular lamp for town driving.

pressure of sheet plate holder. To replace central double filament lamp, unhook first the spring rod (Ref. 1, Fig. 184) fixing lamp socket to reflector, then withdraw socket by slightly forcing on top side so as to free the lower lug. Lamp is fixed to socket by bayonet coupling.

MAINTENANCE CHARTS

Fig. 182 shows a chassis lubrication diagram and Fig. 183 a general maintenance diagram.

A brief description is given of the various operations to be periodically performed.



○ Fiat E Oil

□ Fiat VE or VI oil

△ Fiat CP Oil

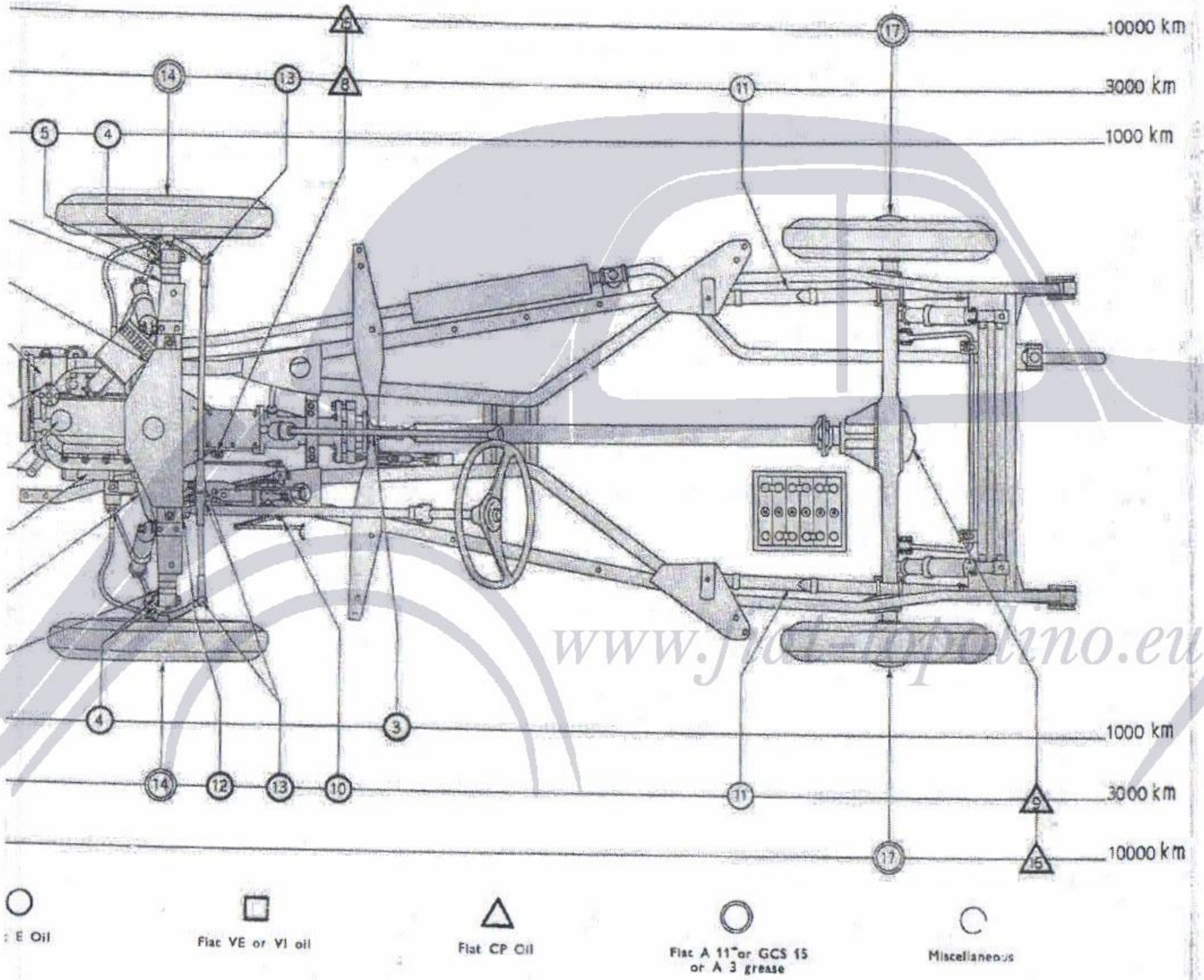


Fig. 185. - Chassis lubrication chart.

Every 300 kms.

1. Crankcase: check lubricating oil level and add oil if necessary.

Every 1000 kms.

2. Ignition distributor: screw in greaser cap 2 or 3 turns.
3. Propeller shaft: squirt Fiat E oil in joint.
4. Front suspension swinging arms: squirt Fiat E oil in joints.
5. Front wheel knuckles: squirt Fiat E oil in joints.

Every 3000 kms.

6. Crankcase: change oil.
7. Ignition distributor: fill greaser with Fiat A 11 grease.
8. Gearbox: check oil level and add Fiat CP oil if necessary.
9. Rear axle: check oil level and add Fiat CP oil if necessary.
10. Pedal shaft: squirt Fiat E oil in joint.
11. Front and rear springs: wash with kerosene and squirt graphited grease between leaves.
12. Steering box: squirt Fiat E oil in joint.
13. Steering rods: squirt Fiat E oil in joints.
14. Front wheel bearings: add Fiat A 11 grease in cups.

Every 10.000 kms.

15. Gearbox: change oil.
16. Rear axle: change oil.
17. Rear wheel bearings: fill inside bearing with Fiat A 11 grease.
18. Generator and starting motor bearings: clean thoroughly and lubricate with Fiat GCS 15 grease.

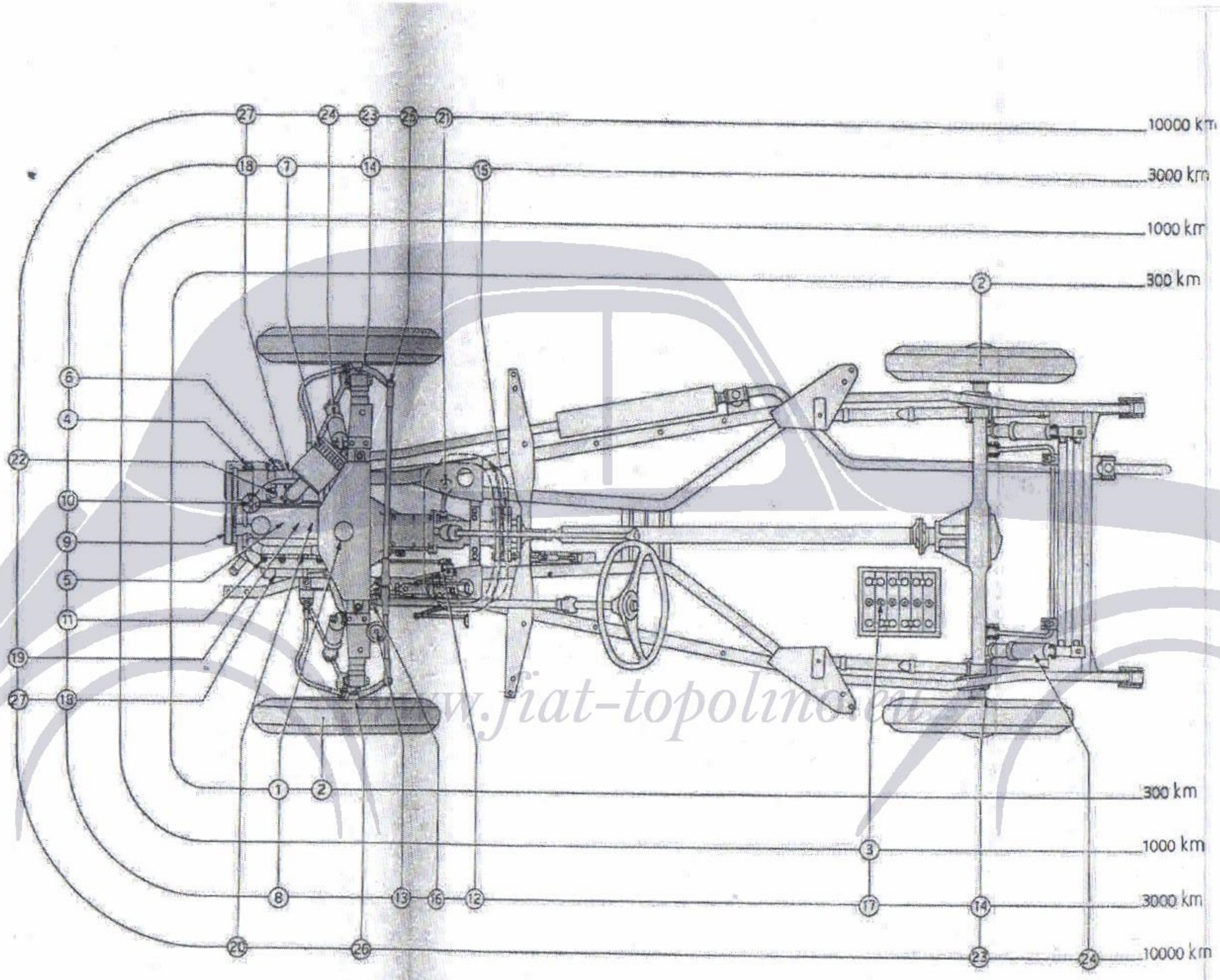


Fig. 186. - Chassis

Every 300

1. Radiator: check level and ad
2. Tires: check pressure.

Every 100

3. Battery: check level and add

Every 300

4. Oil filter: wash gauze and v
5. Tappets adjust clearance bet
6. Fuel pump filter: take out an
7. Air cleaner: dismantle and v
8. Radiator: flush.
9. Fan and generator drive belt
on page 172.
10. Ignition distributor: clean, g
11. Spark plugs: clean and adjust
12. Clutch: adjust pedal play at 1
13. Brake fluid reservoir: check
14. Brake shoes: adjust play at ab
15. Transmission brake: adjust pl
16. Steering worm and sector: adj
eccentric bushing.
17. Battery: check contacts and c
18. Generator and starting motor

Every 10,00

19. Compression chamber: scrape
20. Valve seats: grind in carefull
21. Fuel tank filter: take out and
22. Carburetter: clean float cham
23. Brake shoes: check lining and
chickness.
24. Hydraulic shock absorbers: ch
sary, add Fiat S.A.I. oil.
25. Steering rods: check, clean ar
26. Front wheel bearings: check
27. Generator and starting moto
wear and replace, if necessary.

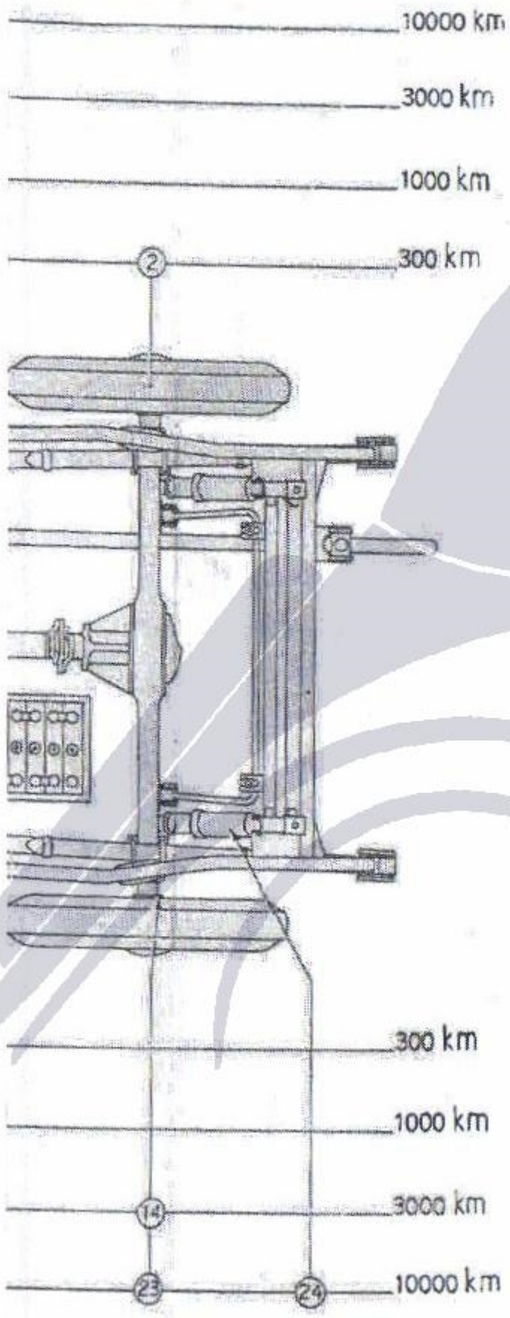


Fig. 186. - Chassis maintenance chart.

Every 300 kms.

1. Radiator: check level and add water.
2. Tires: check pressure.

Every 1000 kms.

3. Battery: check level and add distilled water.

Every 3000 kms.

4. Oil filter: wash gauze and valve assembly.
5. Tappets adjust clearance between valves and rockers.
6. Fuel pump filter: take out and wash.
7. Air cleaner: dismantle and wash steel wool in kerosene.
8. Radiator: flush.
9. Fan and generator drive belt: adjust tension as explained on page 172.
10. Ignition distributor: clean, grind and adjust contacts.
11. Spark plugs: clean and adjust gap.
12. Clutch: adjust pedal play at 14 to 18 mm.
13. Brake fluid reservoir: check level.
14. Brake shoes: adjust play at about 0,9 mm.
15. Transmission brake: adjust play at about 0,5 mm.
16. Steering worm and sector: adjust play, if necessary, rotating eccentric bushing.
17. Battery: check contacts and charge.
18. Generator and starting motor commutator: grind.

Every 10.000 kms.

19. Compression chamber: scrape carbon deposits.
20. Valve seats: grind in carefully.
21. Fuel tank filter: take out and clean.
22. Carburetter: clean float chamber and adjust idle.
23. Brake shoes: check lining and replace if worn down to half thickness.
24. Hydraulic shock absorbers: check fluid level and, if necessary, add Fiat S.A.I. oil.
25. Steering rods: check, clean and oil ball joints.
26. Front wheel bearings: check and, if necessary, adjust play.
27. Generator and starting motor commutator: check brush wear and replace, if necessary, after grinding in commutator.

MODEL 500C

DIFFERENCES FROM MODEL "500 B,,

MODEL "500 C„

MAIN DIFFERENCES FROM MODEL "500 B„

ENGINE

The engine fitted on Model 500 C keeps the same basic features as 500 B engine, the main variances being the following:

1. — Aluminium head replacing former cast-iron head, with bronze valve-seat inserts.

2. — Inlet and exhaust valve diameter reduced respectively from $\frac{29''}{32''}$ (23 mm) to $\frac{101''}{128''}$ (20 mm) and from $\frac{54''}{64''}$ (21,5 mm) to $\frac{45''}{64''}$ (18 mm).

3. — Valve rockers pierced, for better lubrication of valve tappets.

4. — Wider fan spindle diameter; fan assembling procedure is varied, the type of bearing and support bushing being however unaltered.

5. — Aluminium oil filler cap on cylinder head cover replaced by a sheet metal cap with bayonet coupling.

6. — Oil dip stick anchored to filler through a lever.

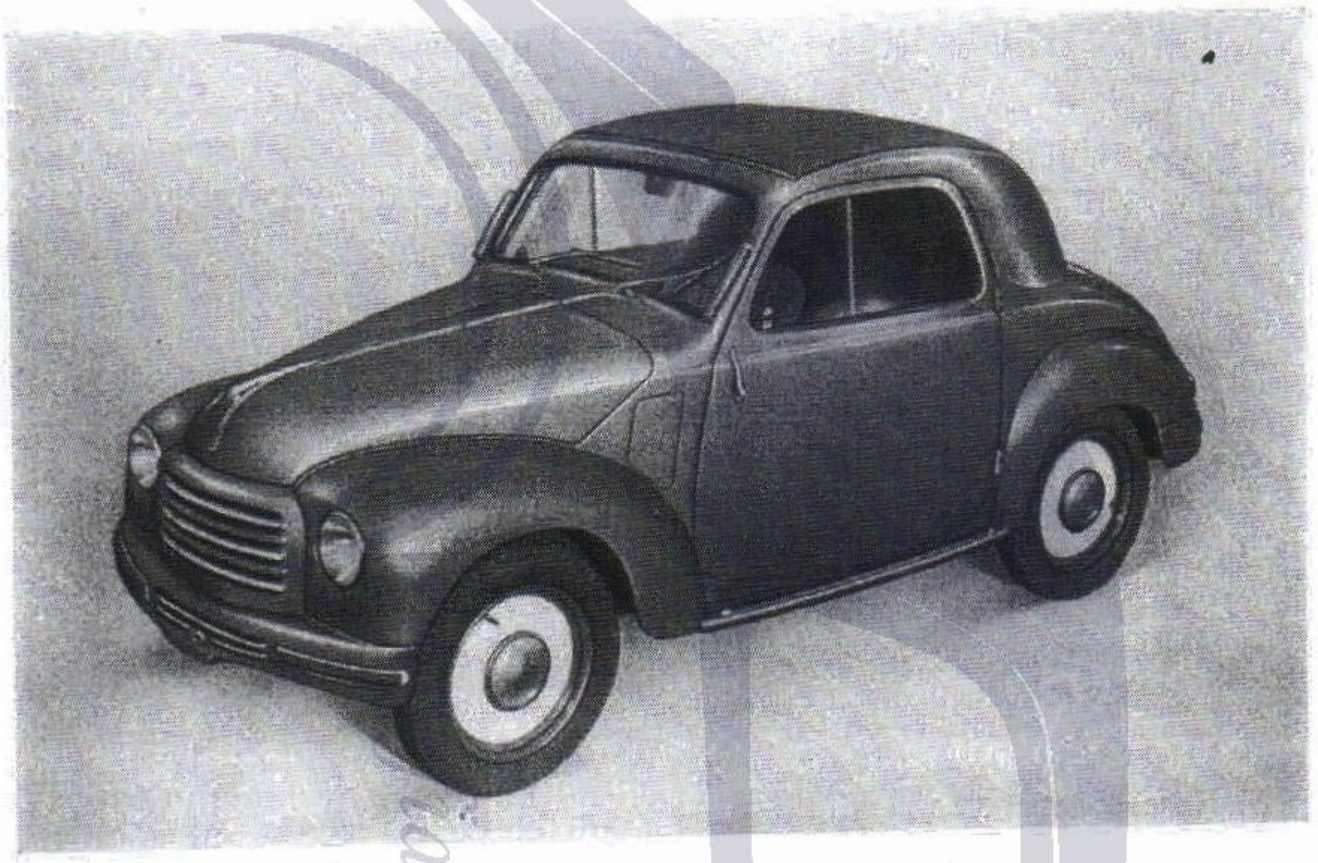


Fig. 187. - Model 500 C Sedan, convertible.

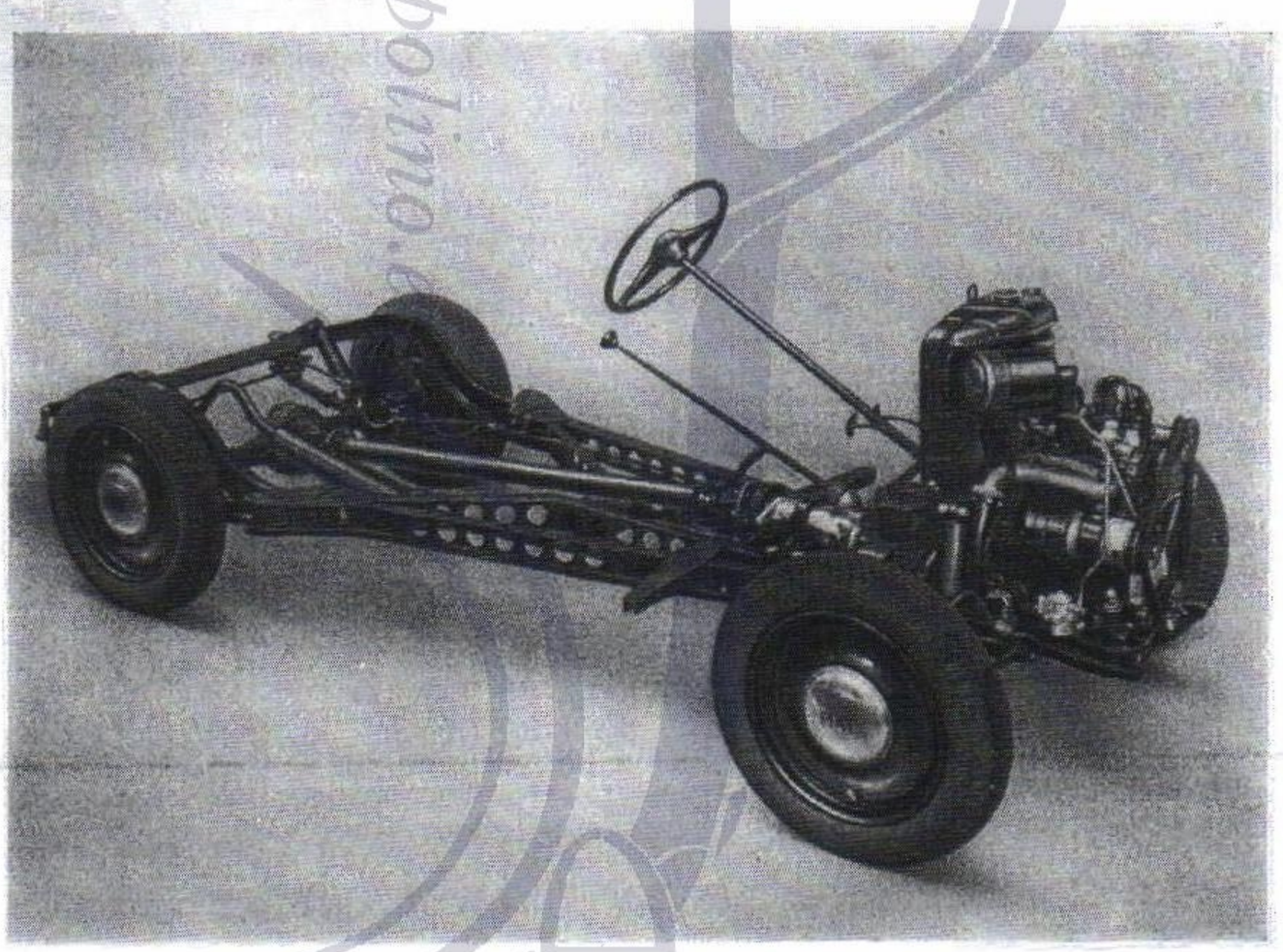


Fig. 188. - Model 500 C Chassis.

CHASSIS

The structure of chassis has not undergone outstanding alterations: the main variances are the following:

Footboard.

1. — A rew footboard support adopted, of use also for Model 1100.
2. — Accelerator pedal lever shape varied.

Shock absorbers.

Larger eye shock absorbers mounted, affording better noiseproof performance.

Clutch.

New type thrust bearing installed.

Greasers.

Ball head greasers " Tecalemit " type, replacing former flat head greasers.

Lifter jack.

The car is raised by means of a " column " handle operated jack, to be placed under suitable plates on both sides of chassis frame.

Caution! While jacking the car both the front and the rear wheel are contemporarily lifted on the side where jack is placed. A wedge block (supplied with car equipment) should be therefore set under the rear wheel being on ground, so to hamper the car from moving if the road is in grade.

ELECTRICAL EQUIPMENT

A new generator installed, with regulator assembly.

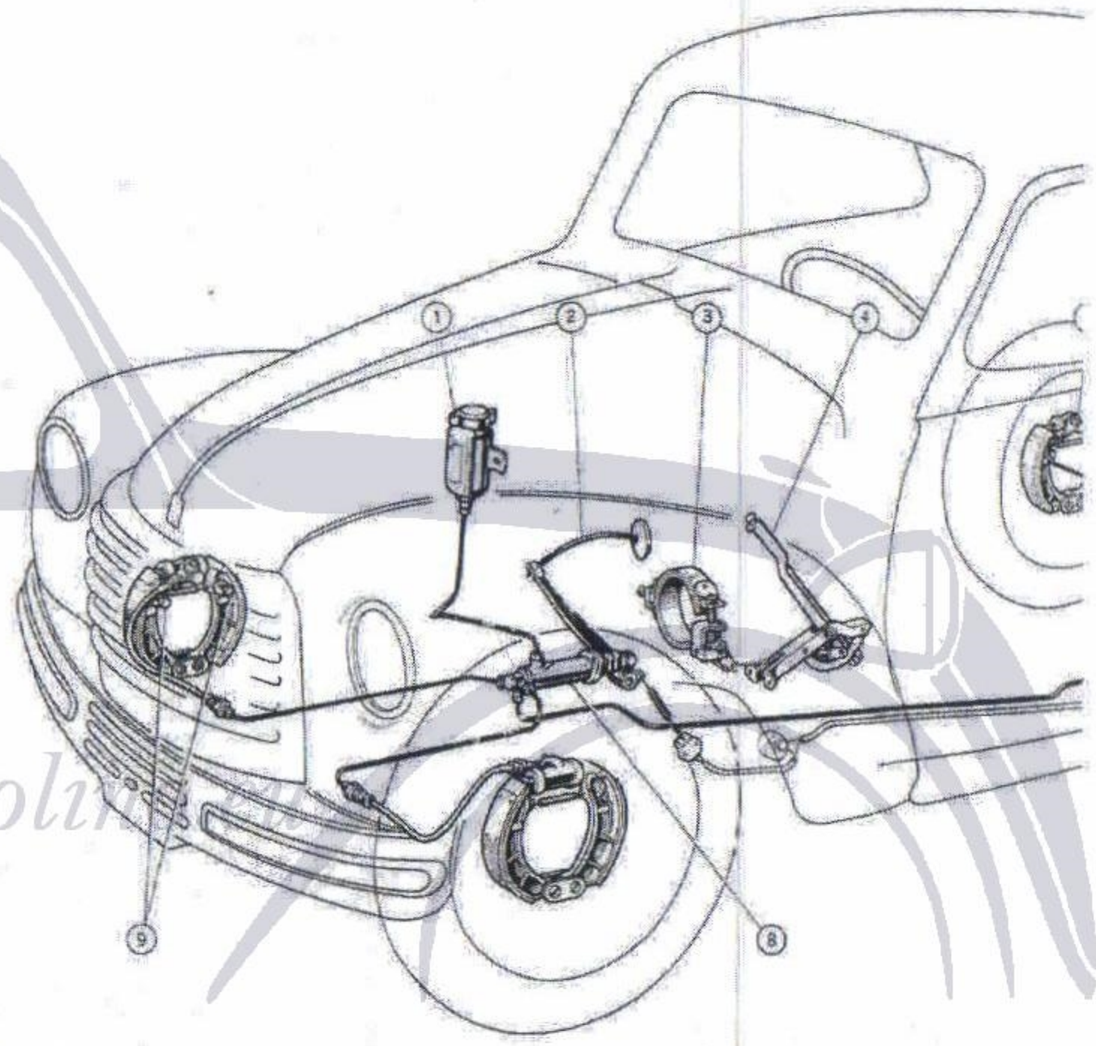


Fig. 189. - Hydraulic and emergency brake d

1. Fluid tank. - 2. Brake control pedal. - 3. Hand brake band. - 4. Hand brake lever. - 5. Connect bleeding pipe lines. - 6. Wheel cylinder. - 7. Brake shoe eccentric pivots. - 8. Master cylinder.

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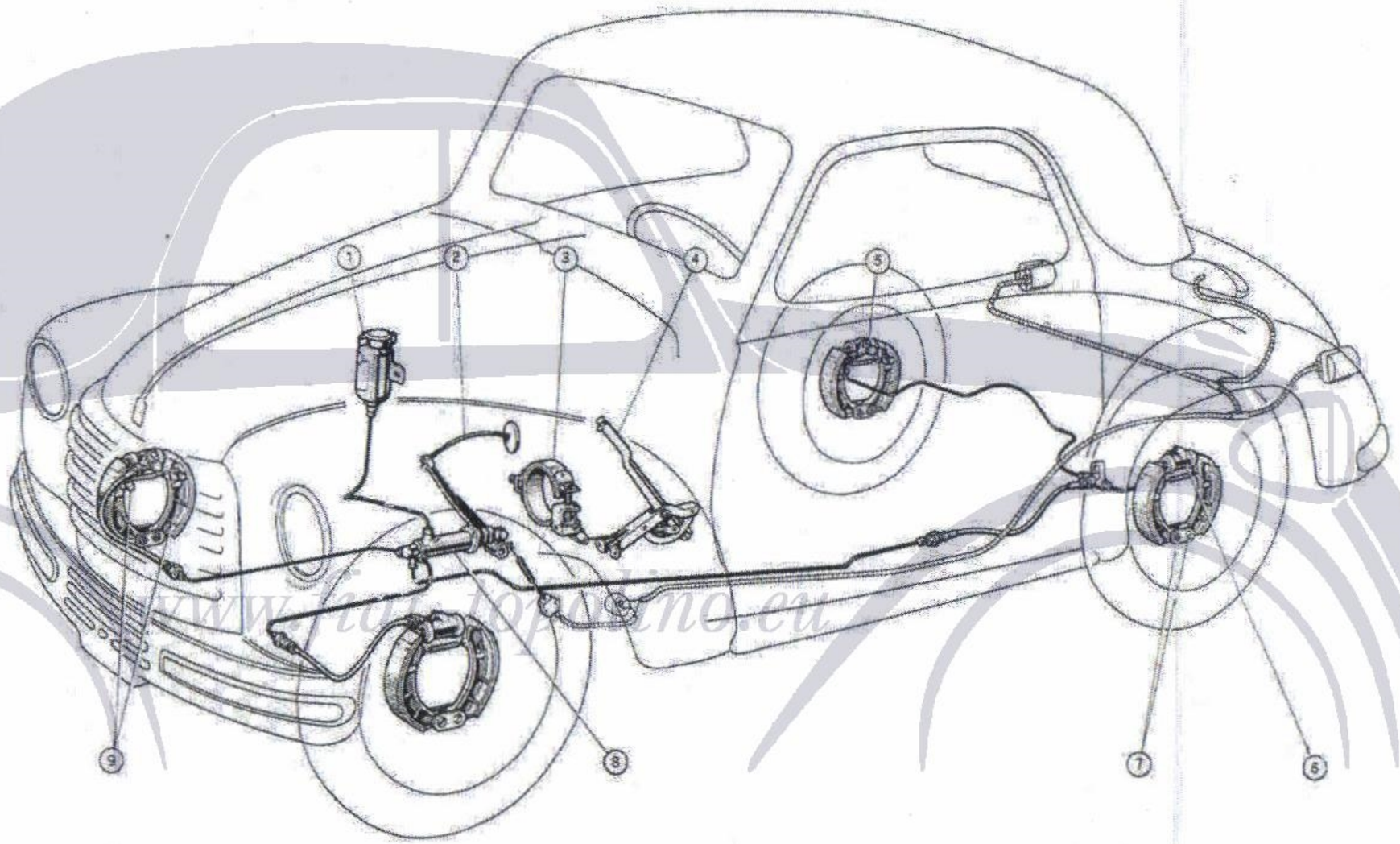

Fig. 189. - Hydraulic and emergency brake diagram.

1. Fluid tank. - 2. Brake control pedal. - 3. Hand brake band. - 4. Hand brake lever. - 5. Connection and plug to be replaced with proper hose for bleeding pipe lines. - 6. Wheel cylinder. - 7. Brake shoe eccentric pivots. - 8. Master cylinder. - 9. Shoe-and-drum play taking-up cams.

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Generator.

Type	R 90-130/12-3000
No. of poles	2
Maximum regulated power	130 Watts
Maximum charge	10,8 Amp.
Charge, with cold generator starts:	
Engine r. p. m.	1100
Rotation, from commutator end	Clockwise
Coupling ratio $\frac{\text{engine}}{\text{generator}}$	$\frac{1}{1,41}$

Regulator assembly.

Type A/2 - 130/12; Power 130 W - Tension 12 V - for generator R 90 - 130/12 - 3000.

This assembly consists of three devices: voltage regulator, current regulator and cut-out relay.

Lamps.

1) No. 2 headlights inbuilt in wings providing 150 mm beam diameter with double filament 35/35 W lamp for flash lights and anti-dazzle lights and 5 W lamp for town lights.
2) No. 1 rear tail light with No. 1 5 W lamp.
3) No. 2 rear fender, stop and refractor lights with No. 1 double filament (3 W - 20 W) lamp for each light.

BODYWORK

Bodywork is completely new-shaped in both front and rear side. The spare wheel and tool kit are lodged in a rear compartment being accessible from outside. All cars are moreover fitted with an internal heater.

MODEL 500 C SERVICING INSTRUCTIONS

ENGINE

To remove engine-clutch-gearbox unit from the car it is necessary to previously take off air filter and cylinder head cover with fan. The unit can be withdrawn by first lowering gearbox rear end and then lifting engine front end upward.

This way the removal operation can be accomplished without dismantling front cross member.

On latest production engines the following variances have been introduced:

1) Cast-iron exhaust valve seats, whereas inlet valve seats are still of bronze.

2) Conical seal edge angle of both inlet and exhaust valves varied from 45° 10' to 45° 30' ± 5'; cylinder head valve seat angle has been accordingly varied from 44° 50' ± 5' to 45° ± 5'.

Two cutters have been designed for overhauling cylinder head valve seats:

A. 11455 valve seat refacing cutter.

A. 11456 valve seat width narrowing cutter.

Model 500 C connecting rods cannot be used for single replacements on 500 and 500 B engines, as they are a major weight. Above new parts can be installed on previous engines only if the whole set of four connecting rods is to be replaced, by duly following factory recommendations for thin-wall bearings (page 39).

FRONT SUSPENSION

The following variances have been introduced on present production 500 C Chassis:

1) Two shims (thickness 1,3 and 2 mm) added to the set of different thickness between front spring and knuckle support.

2) Two shims (thickness 0,1 and 0,2 mm) added to the set of different thickness between steering knuckle and knuckle support;

clearance, thanks to these variances, should not be above .004" (0,10 mm).

3) The set of shims of various sizes between swinging arm and its support on frame has been suppressed and superseded by the only .1" (2,5 mm) shim.

4) Gun nipple 45° tilted on knuckle support replaced by another being 90° tilted, for better hook-up of oil gun.

When overhauling first series 500 C chassis or 500 and 500 B chassis all above variances can be made, excepting the installation of new gun nipples which on Models 500 and 500 B were screwed and hexagon-headed.

WINDSHIELD WIPER

Fig. 191 shows new windshield wiper blade driving system. Motor has a continuous clockwise movement and blade angular displacement is made through the linkage device shown in figure. All the system is carried by a suitable plate under the cowl. This feature makes overhaul and adjustment operations a very easy matter.

Fig. 190.

Windshield wiper.
(Section A-A on blade drive).

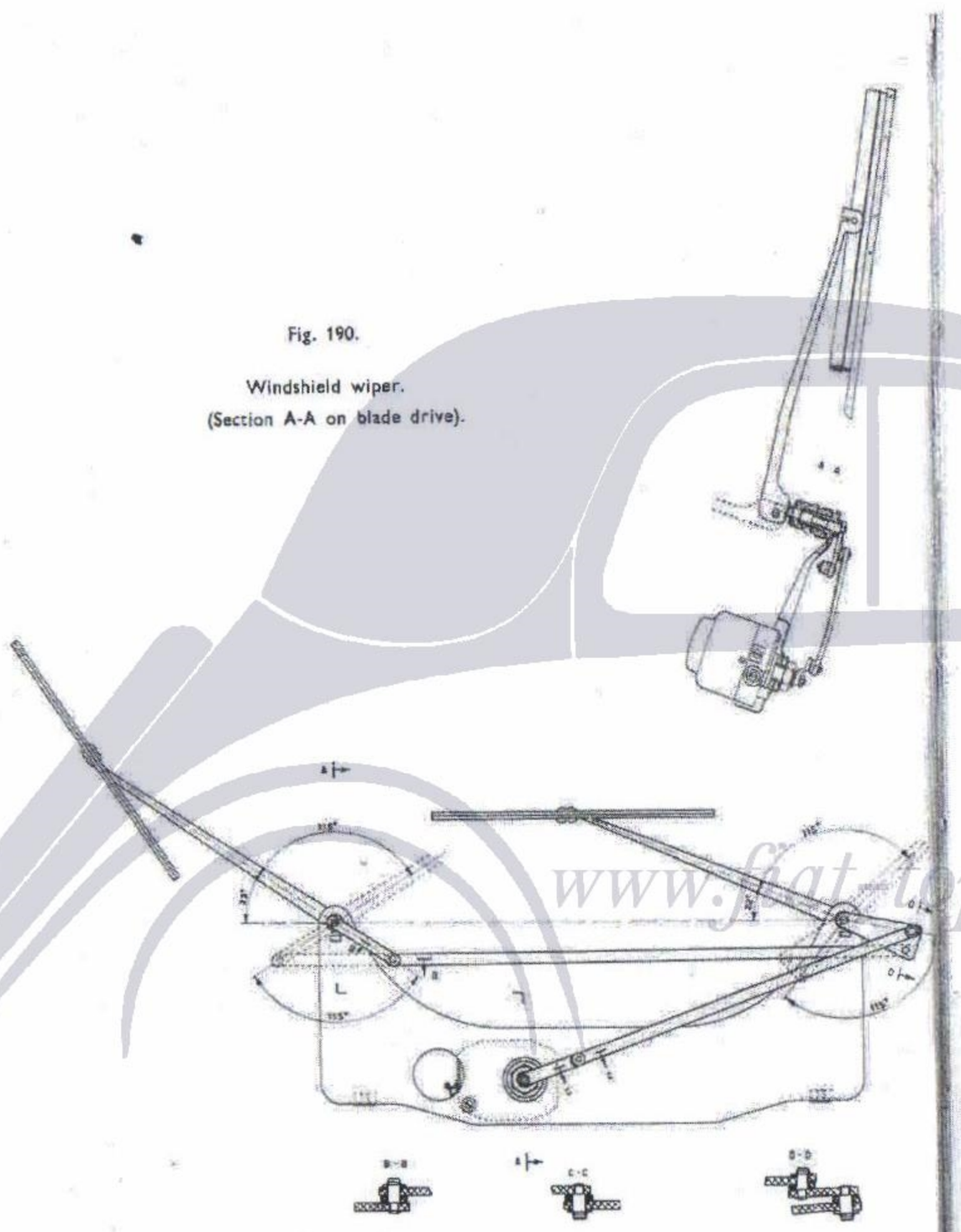
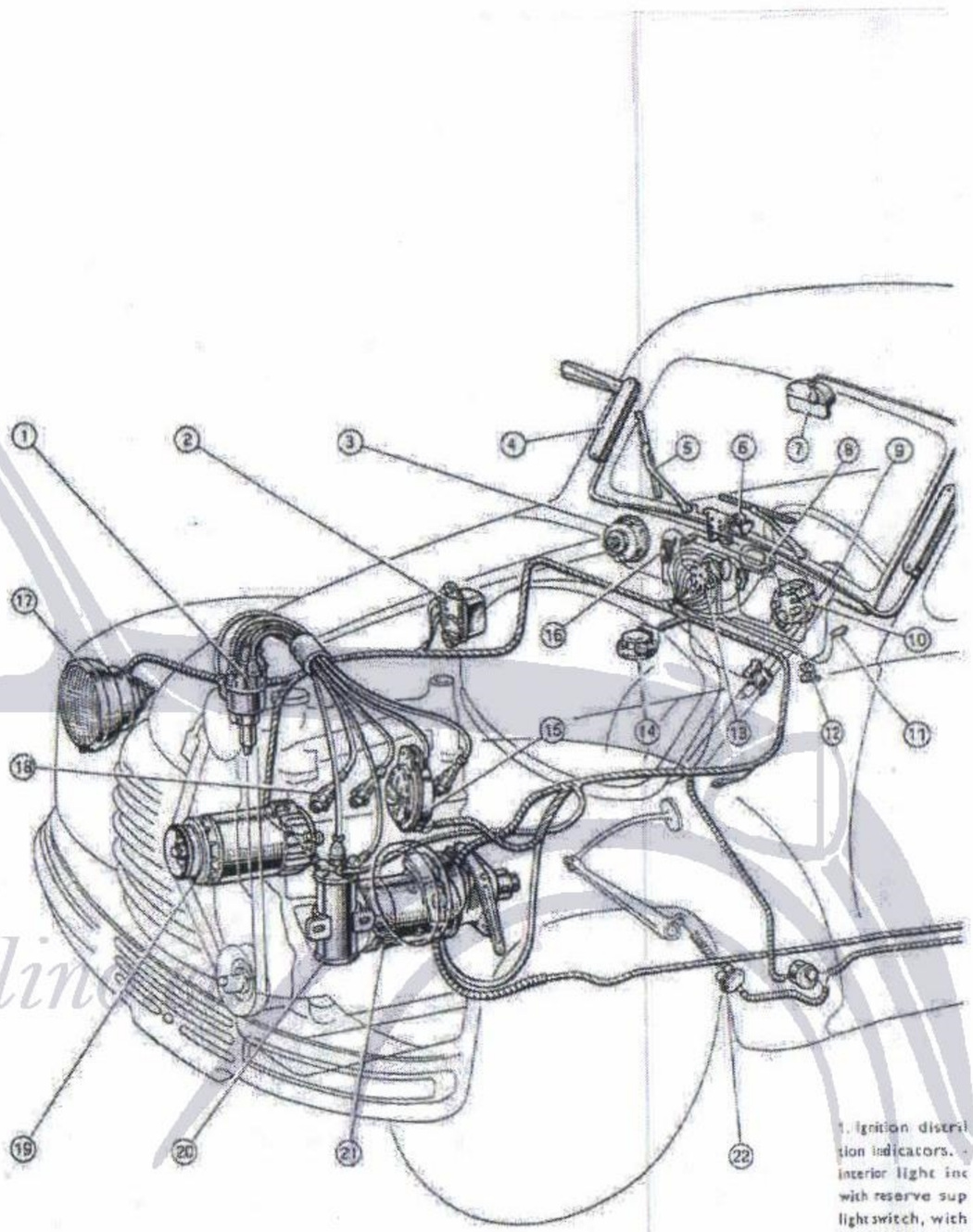


Fig. 191. - Arrangement of wiper blade driving system.



1. Ignition distri
tion indicators.
interior light inc
with reserve sup
light switch, with
16. Windshield w
21. Starter moto

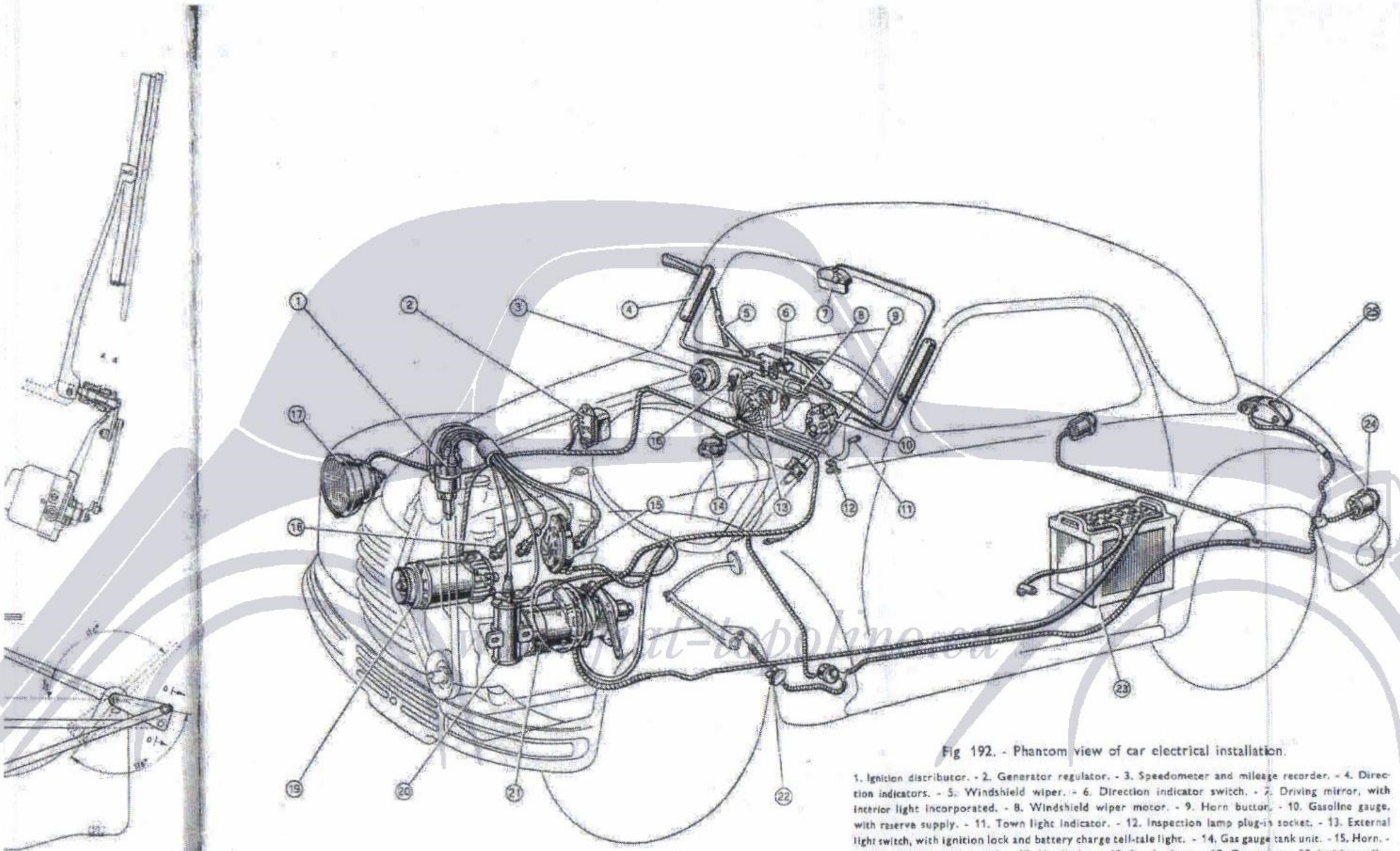


Fig 192. - Phantom view of car electrical installation.

1. Ignition distributor. - 2. Generator regulator. - 3. Speedometer and mileage recorder. - 4. Direction indicators. - 5. Windshield wiper. - 6. Direction indicator switch. - 7. Driving mirror, with interior light incorporated. - 8. Windshield wiper motor. - 9. Horn button. - 10. Gasoline gauge, with reserve supply. - 11. Town light indicator. - 12. Inspection lamp plug-in socket. - 13. External light switch, with ignition lock and battery charge tell-tale light. - 14. Gas gauge tank unit. - 15. Horn. - 16. Windshield wiper switch. - 17. Headlights. - 18. Spark plugs. - 19. Generator. - 20. Ignition coil. - 21. Starter motor. - 22. Stop light switch. - 23. Storage battery. - 24. Rear fender stop and refractor lights. - 25. License plate light.

ystem.

GENERATOR REGULATOR

For check and overhaul operations of generator regulator type A/2 - 130/12 see our pamphlet " Current and voltage regulators - Servicing Instructions ". S. A. T. Print No. 1068-III-1950.

AIMING HEADLAMPS

When overhauling electrical system it is good practise to check headlamp aiming. To this purpose follow recommendations for Model 500 B on page 183; should data result different from specifications on Fig. 193 further proceed as follows:

slightly loosen nut fixing headlamp in back of wing and acting on holding pin hand rotate headlamp in its lodging as long as the correct aiming of lamp beam (shown on Fig. 193) is obtained. Then lock home on the nut.

Above data and instructions are valid also for Station Wagon.

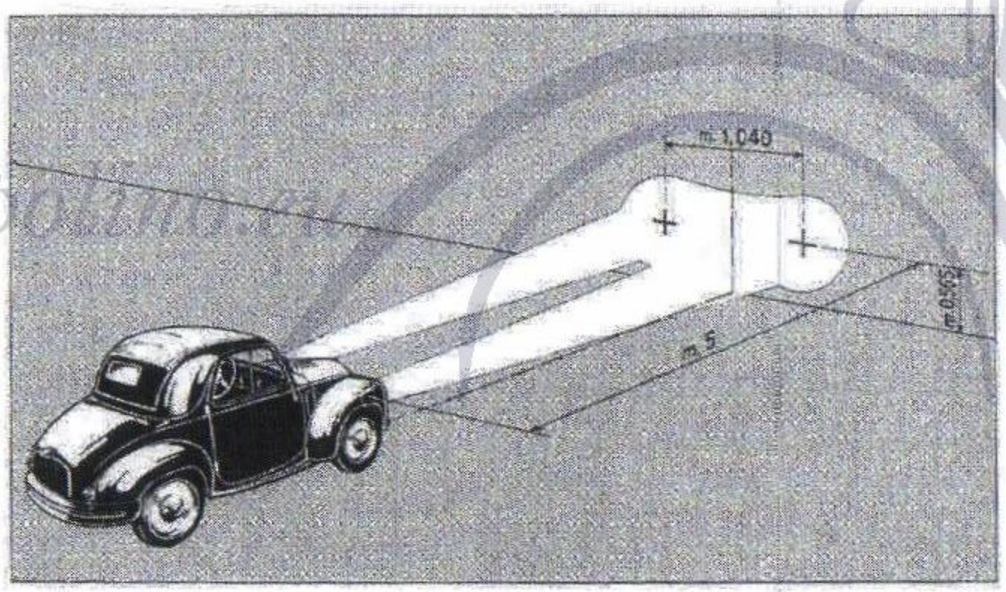


Fig. 193. - Aiming headlamp beam.

Light switch positions.

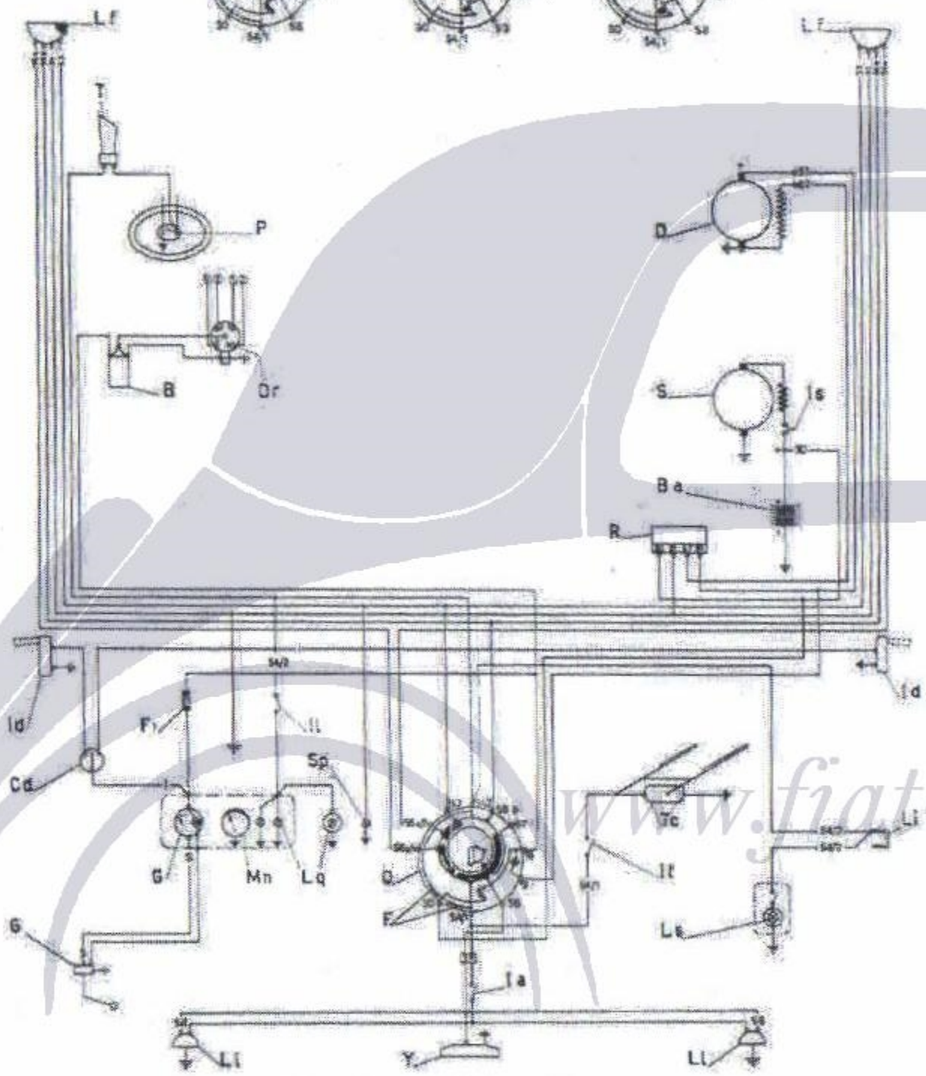


Fig. 194. - Wiring diagram.

B. Ignition coil. - Ba. Battery. - Cd_1 Direction indicator switch. - D. Generator. - Dr. Ignition distributor. - Ia. Stop light switch. - Id. Direction indicators. - Il. Instrument light switch. - Is. Starter motor switch. - It. Windshield wiper/switch. - F-F_3. 8 Amp. fuses. - G. Gasoline gauge, with reserve supply. - Lf. Headlamps. - Li. Inspection light plug-in socket. - Ll. Rear fender, stop and refractor lights. - Lq. Instrument lights. - Ls. Interior light. - Mn. Oil gauge (incorporated with gas gauge). - P. Horn button. - Q. External light switch, with ignition lock and battery charge tell-tale light. - R. Generator regulator. - S. Starter motor. - Sp. Town light indicator. - T. Horn. - Tc. Windshield wiper. - Y. License plate light.

USING CAR HEATER

To warm-up the passenger compartment in winter conditions just turn the knob on dashboard as shown by arrow (Fig. 195).

Two additional levers (Ref. 3) on side hot air conduits allow to convey air at will toward either windshield or footboard, or else in both directions.

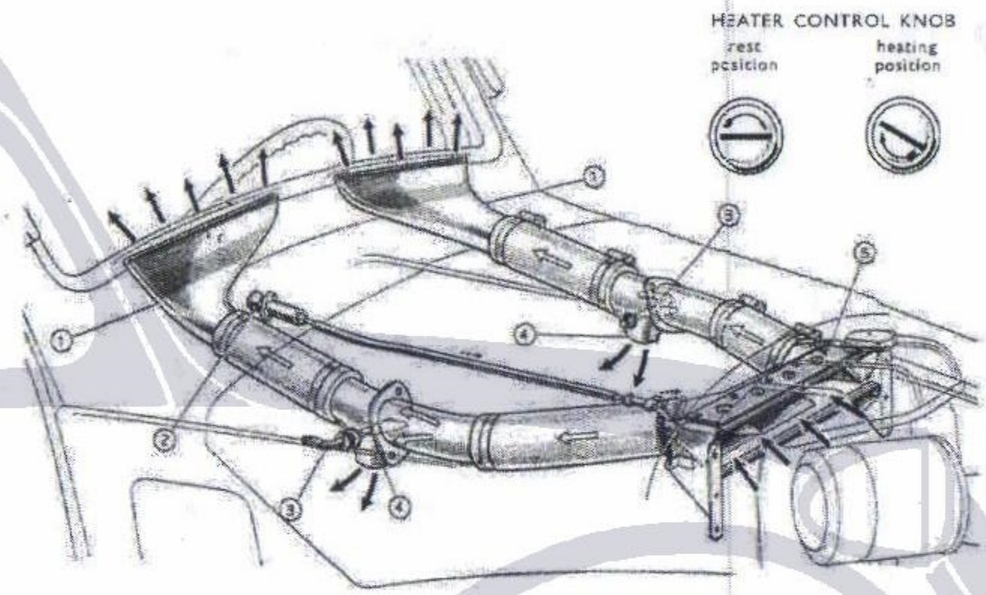


Fig. 195. - Car heating system.

1. Windshield warm air distributors. - 2. Knob on dashboard controlling radiator warmed air deflectors. - 3. Warm air conveying throttle control levers (after the throttle position, air is streamed to either windshield or car interior, or else on both sides). - 4. Warm air outlet in car interior. - 5. Deflector in position for warm air admission to hoses.

Fig. 196. - Delivery Van Model 500 C.

DELIVERY VAN AND STATION-WAGON

Differences between the chassis of Delivery Van and Station Wagon and that of passenger car are summarised hereunder. For parts not being here covered, follow instructions of car.

ENGINE

Brake H. P. 15,5

Downdraft Carburetor (1).

Solex 22 IAC fitted with valve disc starter device operable through a knob on dashboard.

Starter pull knob may be set in three positions: rest; midway out, slightly rich mixture; all out, rich mixture for starting.

Air intake with metal shaving air cleaner and silencer identical to those installed on passenger car.

Adjustment data are the following:

Choke tube, diameter	16	mm
Main jet, diameter	0,90	»
Mixing jet, diameter	2,20	»
Idling jet, diameter	0,40	»
Pilot jet, diameter	1,05	»

(1) On some Delivery Vans and Station Wagons the Weber 22 DRS Carburetor has been mounted, being standard type on passenger cars. For features and adjustment data see page 163.

Fig. 197. - Model 500 C Station Wagon.

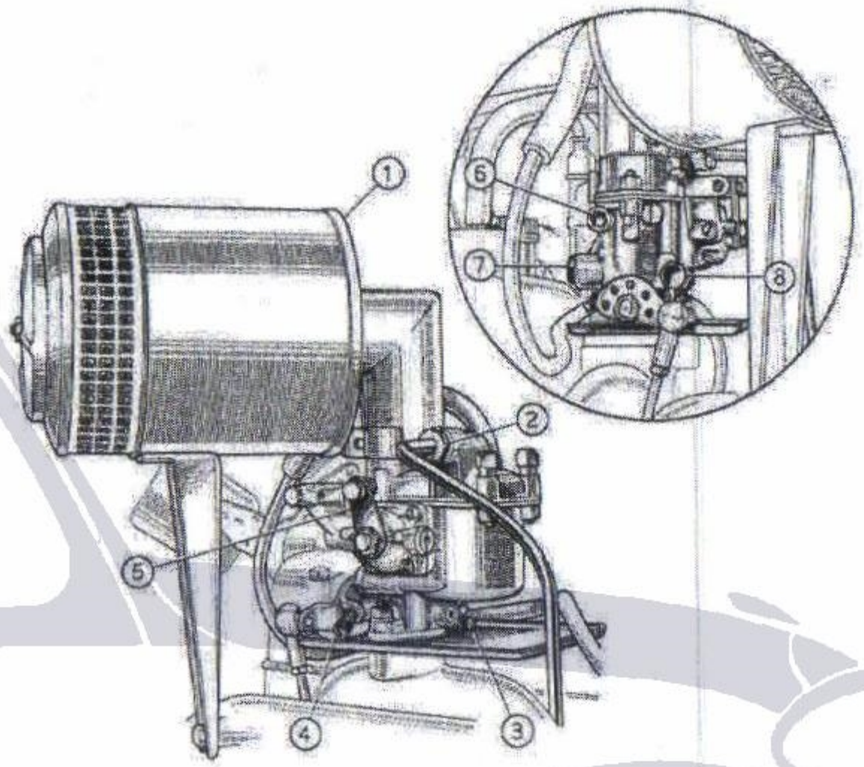


Fig. 198. - Solex Carburetor adjustment.

1. Air cleaner and silencer. - 2. Fuel inlet to carburetor. - 3. Idling air adjusting screw. - 4. Accelerating throttle adjusting screw. - 5. Carburetor starting device control lever. - 6. Idling jet. - 7. Main jet. - 8. Starting jet.

Cleaning and adjusting carburetor.

All the jets are placed outside the carburetor and easily accessible for cleaning which should be made every 6.000 miles (10.000 km). In the same occasion the inner float chamber should be cleaned with a chamois leather and, if necessary, idling speed adjusted adhering to the following suggestions:

— Vary idling speed by operating screw Ref. 4 (Fig. 198) which limits carburetor throttle closing.

— Another screw (Ref. 3) called "idling rating screw" applies for varying mixture richness. Idling will then be heard regular at one only fixed position of this screw.

— To adjust idling set-up first minimum speed by acting on the screw Ref. 4 and letting screw Ref. 3 out by three odd turns. Then gradually screw up the screw Ref. 3 until engine is running over regularly.

— When car is underway, should engine be liable to stall upon accelerator releasing, it will be good practise to tighten the screw 4 so that minimum speed is raised a bit: as consequence mixture rating, too, should be adjusted by means of the screw Ref. 3.

Starting engine.

The procedure for starting engine from cold with Solex carburetor is the same as for engine with Weber 22 DRS carburetor (500 B).

After starting from cold, as soon as engine has slightly warmed up, push starting device knob midway down (slightly rich mixture) and, when engine has got warm enough, reset knob to rest position.

When starting with warm engine or in summer time, starting device Bowden control should be drawn up to mid travel only.

CHASSIS

Frame.

has 2 plates (1 on each side) providing attachment for car jack. (Two more plates are located on back of running board).

Rear axle.

Standard final drive ratio adopted: 8 to 41.

Rear suspension.

Through reinforced leaf springs.

Wheels.

Extra low pressure tires		4,25 - 15 T (1)
Tire pressure	front	1,75 kg/cm²
	rear	2,25 kg/cm²

(1) The letter following tire size is a make mark.

ELECTRICAL

Lighting.

License plate and stop light with refractor, on tail door, fitted with two globular 3-Watt lamps. Access to lamps is obtained by slackening out (not drawing) the screws between the two glasses and withdrawing the lamp front portion. This way the two lamps can be removed from lamp support, whereto they are connected by bayonet coupling.

Dome light and switch with 3-Watt globular lamp (Delivery Van).

Aiming headlamps.

Headlamp aiming adjustment for Model 500 C Delivery Van is same as for passenger car with the exception of centerline of screen crosses which should be at 0,575 m from groun. For Station Wagon follow data and procedure of passenger car (page 193).

Delivery Van Body features.

— Steel body with inside wood frame.

— Two adjustable seats with leather upholstery and drop back.

— Rear double door.

— Adjustable driving mirrors fitted to side doors.

— Spare wheel fitted in driver cab end, on passenger side.

Station Wagon Body features.

— Body with inside wood frame, side panels and rear coor of wood and masonite.

— Top outside is weatherproof fabric lined and locked by a hinge device.

— Two side windows each fitted with two glasses (one being liable to slide).

— Two adjustable front seats with drop back and two-place fixed rear seat with drop back.

— Single rear door with fixed glass, for easy access to luggage compartement.

— Driving mirror with interior light incorporated.

— Spare wheel fitted in a rear underfloor recess.

DIMENSIONS

Over-all, without bumpers	length	Delivery Van	132 1/4" (3,360 m)
		Station Wagon	130 1/4" (3,310 m)
	width	Delivery Van	50 3/4" (1,288 m)
		Giardiniera-Belvedere	60 3/4" (1,288 m)
	height	Delivery Van	54 1/8" (1,375 m)
		Station Wagon	55 1/4" (1,405 m)

WEIGHTS

Weight of the vehicle in running order with a spare wheel and tool kit:

Delivery Van		1446 lbs (655 kg)
Station Wagon		1501 lbs (680 kg)
Useful load	Delivery Van	662 lbs (300 kg) (1)
	Station Wagon	4 seat (2)

PERFORMANCE

Maximum speed in high gear, abt. . . . . 56 m. p. h. (90 km/h)

Climbable gradient in low gear, abt. . . . . 1 in 5 1/8 (18%)

Gasoline mileage: 47 miles to the Imp. Gall. (5,8 lts per 100 kms).

(1) Besides driver.

(2) Besides 110 lbs. (50 kg) luggage.

MODEL 500 - 500 B - 500 C TOOL EQUIPMENT

	TOOL SPECIFICATION	Mod. 500	Mod. 500 B	Mod. 500 C
A. 6466	Axle shaft puller	x	x	x
A. 6469	Wheel hub puller	x	x	x
A. 6473	Steering rod ball pin puller	x	x	x
A. 6474	Puller for pins with bushings of rear spring shackles	x	x	x
A. 6506	Cylinder head pullers	x		
A. 6507	Timing pinion puller	x	x	x
A 6509	Differential cage bearing puller	x	x	x
A. 6511	Puller for outer ring of front wheel roller bearing and drive pinion	x	x	x
A. 6512	Puller for drive pinion rear roller bearing inner ring	x	x	x
A. 6513	Pitman arm puller	x	x	x
A. 6514	Steering worm bearing inner ring puller	x	x	x
A. 6515	Crankshaft ball bearing puller	x	x	x
A. 8035	Axle shaft nut wrench	x	x	
A. 8061	Valve tappet adjusting wrench (No. 2)	x		
A. 8062	Valve tappet adjusting wrench	x		
A. 8063	Spark plug wrench (up to engine No. 060057)	x		
A. 8063 bis	Spark plug wrench (from engine No. 060058)	x		
A. 8064	Fan pulley nut wrench	x	x	x
A. 8065	Steering worm bearing thrust sleeve wrench	x	x	x
A. 8066	Wrench for direct drive shaft bearing lock ring and main shaft intermediate bearing lock ring	x	x	x
A. 8067	Layshaft lock ring wrench	x	x	x
A. 8069	Wrench for shifter yoke fixing screws	x	x	x
A. 8070	Exhaust pipe flange to manifold fixing nut wrench	x	x	x
A. 8071	Wheel hub cap wrench	x	x	x
A. 8072	Wrench for carburetor retaining nuts and rocker lubrication pipe nuts		x	x
A. 8073	Front swinging arm nut wrench		x	x
A. 8110	Cylinder head and inlet and exhaust manifold nut wrench		x	x
A. 8114	Hydraulic shock absorber fixing plug wrench		x	x
A. 8160	Differential cage bearing snap ring adjusting wrench	x	x	x
A. 8261	Spark plug wrench		x	x
A. 8262	Rocker arm adjusting wrench	x	x	x
A. 8273	Engine oil filter retaining plug wrench		x	x
A. 8276	Gearbox oil refilling and draining plug wrench		x	

	TOOL SPECIFICATION	Mod. 500	Mod. 500 B	Mod. 500 C
A. 8277	Gearbox oil refilling and draining plug wrench			x
A. 8299	Box with torque wrench set for tightening up thin-wall bearings		x	x
A. 8444	Drive pinion flange nut wrench	x	x	x
A. 8476	Axle shaft nut wrench		x	x
A. 8541	Hydraulic brake pipe line union wrench	x	x	x
A. 10038	Engine valve stem spring ring plier		x	x
A. 10093	Drive pinion rear roller bearing inner ring installer	x	x	x
A. 10102	Hose and connection for bleeding hydraulic brakes, up to chassis No. 033458	x		
A. 10103	Hose and connection for bleeding hydraulic brakes, from chassis No. 033459	x	x	x
A. 10104	Apparatus for checking steering knuckle support	x	x	x
A. 10105	Mandrel for refacing front wheel brake drums on lathe	x	x	x
A. 10106	Mandrel for refacing rear wheel brake drums on lathe	x	x	x
A. 10107	Engine valve installing and removing tool	x		
A. 10108	Ring compressor for installing pistons	x	x	x
A. 10109	Engine valve guide assembling and dismantling apparatus	x	x	x
A. 10109 bis	Engine valve guide installer (to be used with A. 10109)		x	
A. 10110	Steering box oil seal remover	x	x	x
A. 10111	Steering box rear bearing outer ring remover	x	x	x
A. 10112	Clutch stripping assembling and adjusting device	x	x	x
A. 10113	Axle shaft ball bearing remover	x	x	x
A. 10114	Plier for installing piston rings	x	x	x
A. 10228	Cap tool to be installed on stem end for easier assembly of shock absorbers		x	x
A. 10229	Engine valve installer and remover		x	x
A. 10230	Rear spring shackle pin and bushing installer	x	x	x
A. 10260	Wheel balance checking device	x	x	x
A. 10270	Apparatus for checking rear axle casing for twist	x	x	x
A. 10509	Engine timing crank	x	x	x
A. 11210	Cylinder bore hone equipment	x	x	x
A. 11214	Set of stoneholders for hone A. 11210	x	x	x
A. 11219	Set of medium grade stones for hone A. 11210	x	x	x
A. 11220	Set of extra coarse grade stones for hone A. 11210	x	x	x
A. 11439	Valve seat refacing expansion pilot	x	x	
A. 11443	Valve tightness tester	x		
A. 11444	Valve guide polishing brush	x	x	x
A. 11453	Valve seat refacing cutter	x	x	
A. 11454	Valve seat width narrowing cutter	x	x	
A. 11455	Valve seat refacing cutter			x
A. 11456	Valve seat width narrowing cutter			x
A. 11470	Mandrel to be mounted on apparatus A. 11480 for dressing valve seat stones	x	x	

	TOOL SPECIFICATION	Mod. 500	Mod. 500 B	Mod. 500 C
A. 11475	Stone arbor for refacing valve seats	x	x	
A. 11476	Valve seat grinding stone	x	x	
A. 11482	Valve seat cutter operating mandrel			x
A. 11484	Set of fixed pilots for refacing valve seats			x
A. 11606	Main bearing boring bar	x	x	x
A. 13004	Generator bearing puller	x	x	x
A. 13013	Battery minus terminal scraper	x	x	x
A. 13013 bis	Battery plus terminal scraper	x	x	x
A. 13020	Generator regulator holder on test rig			x
A. 13034	Generator regulator contact adjusting wrench			x
C. 110	Valve tappet feeler gauge	x	x	x
C. 111	Feeler gauge for adjusting center of brake shoes	x	x	x
C. 641	Drum for checking brake shoes for center up to chassis No. 033458	x		
C. 642	Engine timing checking scale	x	x	x
C. 643	Master gauge for setting cylinder bore dial indicator	x	x	x
C. 645	Engine dead center tester		x	x
C. 646	Drum for checking brake shoes for center from chassis No. 033459	x	x	x
C. 900	Engine dead center tester	x		
U. 0315	Valve guide port cutter	x	x	x
U. 0326	Piston pin hole expansion cutter	x	x	x
U. 0386	King pin hole and front swinging arm hole expansion cutter	x	x	x
Arr. 2205/X	Engine to revolving stand fixing clamps	x	x	x
I. 31714/A	Pipe for gas exhaust of engine on test rig-to be connected to exhaust manifold		x	x
I. 31714/B	Pipe for gas exhaust of engine on test rig-to be connected to exhaust muffler		x	x
I. 31730	Front support for fixing engine to test rig.	x	x	x
I. 31730 bis	Rear support for fixing engine to test rig	x	x	x

Please address all orders of tools to:

S. p. Az. FIAT - Servizio Assistenza Tecnica

CORSO MARCONI, 10 - TURIN (Italy)

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