SPECIFICATIONS, ADJUSTMENTS AND SHOP REPAIRS RECOMMENDATIONS

M.R. 34 E.A.

FRÉGATE
CARAVELLE
DOMAINE

R. 1102
R. 1103

RENAULT
RÉGIE NATIONALE

RÉGIE NATIONALE DES USINES
RENAULT
REG. DU COM. : SEINE 55-B-8.620 — NUMÉRO D'ENT. : 261 75012 9001
BILLANCOURT (SEINE)
TÉLÉPHONE : MOL. 52-00 — INTER : MOL. 26-00
ADRESSE TÉLÉGRAPHIQUE : RENOFER-PARIS
TÉLEX-PARIS : 20.094 - 20.095

FRÉGATE (R 1103)
CARAVELLE (R 1102)
DOMAINE (R 1103)

SPECIFICATIONS, ADJUSTMENTS AND PRACTICAL RECOMMENDATIONS

FOR

Repairing purposes

RN
GENUINE SPARE PARTS

M. R. 34 EA
1957

85 034 00 06

Printed by : Imprimerie spéciale de la R.N.U.R. Total print : 1.800

BRINGING THE PRESENT MANUAL UP TO DATE

Improvements in production made after the date of issue of this manual will be covered in Renault Service Notes.

These Notes will bear a special mention.

We recommend that you fill in below the number, date and subject of each of these notes, and also record in the last column the number of the chapter whereto each bulletin corresponds.

R.S. Note	Date	SUBJECT	Chapter

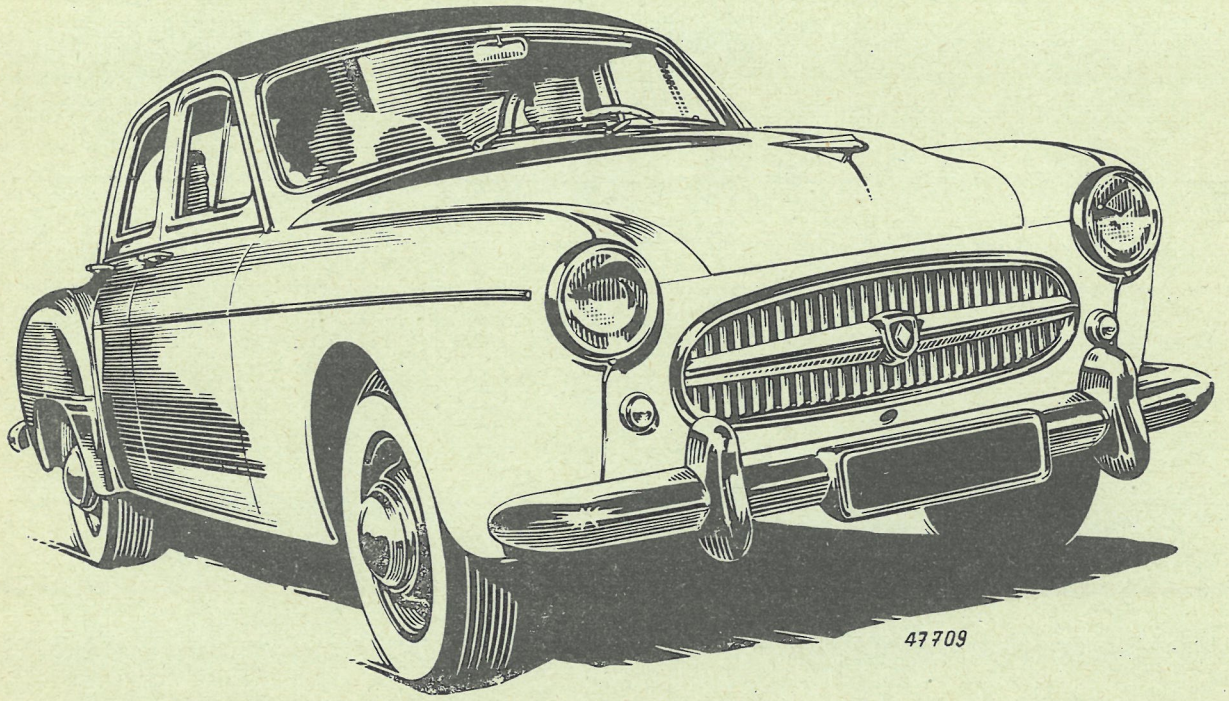
R.S. Note	Date	SUBJECT	Chapter

SPECIFICATIONS, ADJUSTMENTS AND PRACTICAL RECOMMENDATIONS FOR REPAIRING PURPOSES

SUMMARY

1. GENERAL SPECIFICATIONS OF VEHICLE

FREGATE AND CARAVELLE

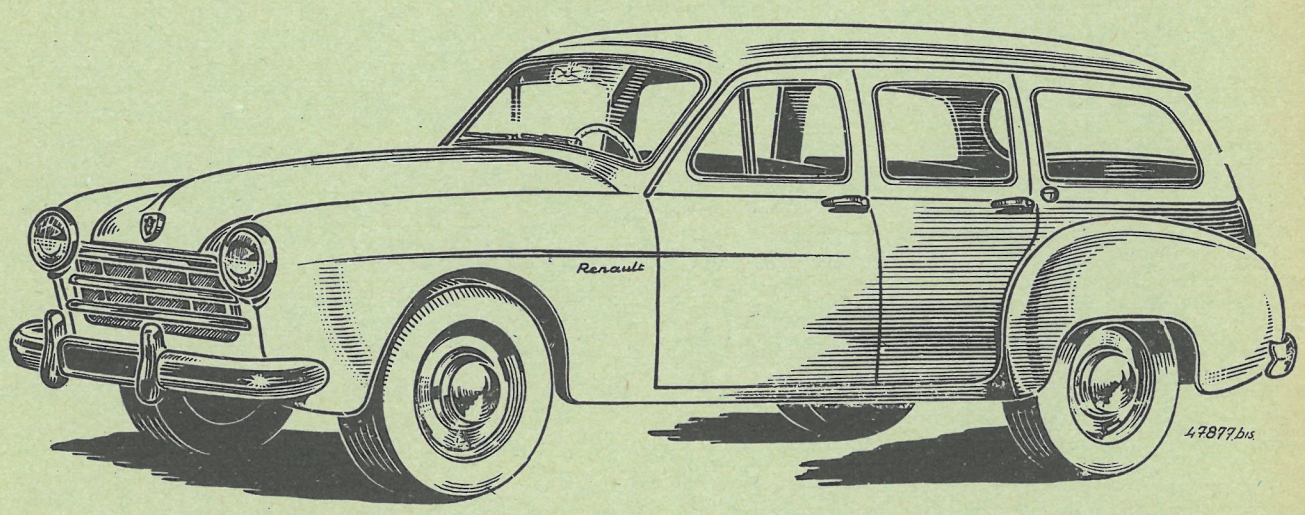


Overall length		4.70 m
Overall width		1.72 m
Height - unladen - (with standard 165 × 380 tyres)	(1)	1.56 m
Total height - under load (ditto)	(1)	1.52 m
Ground clearance (ditto)	(1)	.14 m
Wheelbase		2.80 m
Front and rear tracks		1.40 m
Curb weight (unladen, in running order)		1,300 kg
Maximum total weight, loaded		1,800 kg
Turning radius		5 m
Capacities :		
Cooling system (water)		10.4 l
Engine (oil)		4 l
Gearbox (oil) up to gearbox No. 9910		1 l
Gearbox (oil) from gearbox No. 9911 onwards		1.6 l
Hypoïd rear axle (oil)		1.5 l
Steering gear (oil)		.28 l
Fuel tank (petrol)		58 l
Brake fluid reservoir (H D I Lockheed) (including pipings)		.5 l

(1) Add .02 m for 6,40 × 15 tyres.

GENERAL SPECIFICATIONS OF VEHICLE (continued)

DOMAINE



SAME SPECIFICATIONS AS FOR « FREGATE » AND « CARAVELLE », EXCEPT FOR :

Height - unladen (with standard 6.5 × 15 R tyres)	(1) 1.62 m
Total height under load (ditto)	(1) 1.58 m
Ground clearance (ditto)	(1) .20 m
Weight (unladen, in running order)	1,375 kg
Maximum total weight, loaded	2,100 kg
Height of rear floor from ground :	
unladen (with standard 6.5 × 15 R tyres)	(1) .66 m
loaded (ditto)	(1) .62 m

Interior loading dimensions :	With rear seat in place	With rear seat collapsed
Length	.82 m	1.75 m
Width	1.11 m	1.11 m
Height	.95 m	.95 m
Surface	1.1 sq.m	1.9 sq.m
Volume	1 cu.m	2 cu.m

Width of rear opening	1.11 m
Height of rear opening	.84 m

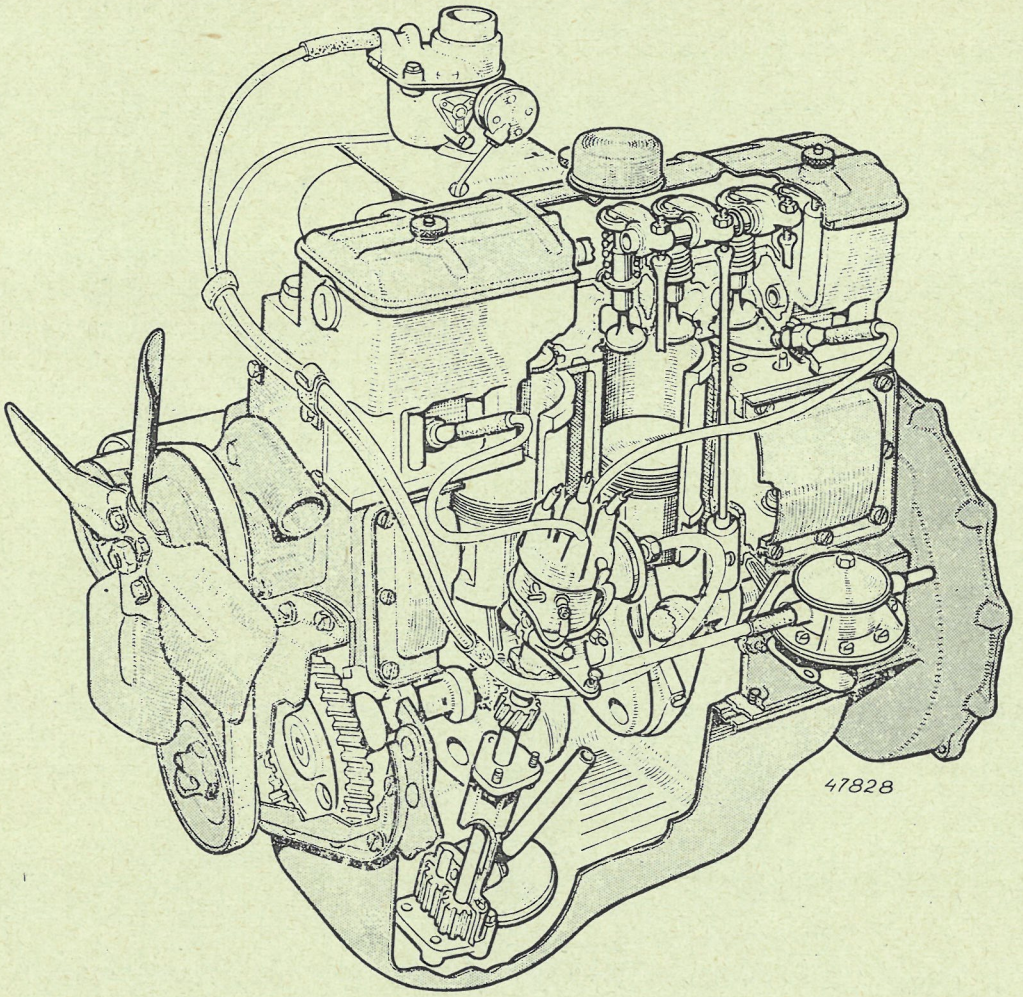
(1) Substract .03 m for 165 × 380 C tyres.

2. ENGINE

" ETENDARD " TYPE 671-1 : " FREGATE " AND " DOMAINE "

" 2-LITRE ", 668-6 TYPE ENGINE : " CARAVELLE "

« ETENDARD » 671-1 TYPE ENGINE



SPECIFICATIONS

4 vertical in line type cylinders (4 stroke cycle).	
Horsepower rating : Taxable	12 HP
Brake, at 4,000 RPM	65 HP
Bore	88 mm
Stroke	88 mm
Piston displacement	2.141 l
Compression ratio	7 to 1
Maximum engine RPM	4,500
Slow running RPM	500
Dry weight	150 kg
Overhead rocker arm operated valves.	
Connecting rod big ends are fitted with elastic bearing shells.	
Pistons have heat compensating inserts and slotted skirts.	
Balanced crankshaft of steel casting, with 3 main journals having elastic bearing shells.	
Cylinder head of aluminium alloy.	

Ignition is through distributor, with :	
— Automatic advance : — centrifugal. — and vacuum type.	
— Manual advance corrector.	
Firing order (No. 1 cylinder is at flywheel end)	1-3-4-2
Sparking plugs : dia.	14 mm
Type	A.C.F. 10
or	Marchal 36
Fuel system featuring : a pump type	4 EW
and a carburetter, type.	32 PICBT
Water type cooling system :	
Capacity	10.4 l
Centrifugal water pump.	
Thermostat : opens at	65° C
Normal operating temperature	80 to 85° C
Lubrication : pressure type, with gear type pump.	
Oil : maximum dipstick capacity	4 l
minimum disptick capacity	2 l
	approxi-mately

REMOVING ENGINE

The " engine and gearbox assembly " should mandatorily be removed before separating the engine from the gearbox.

Remove the battery and the air filter.

Drain the cooling system and the engine oil.

Disconnect from the engine the water system flexible connections and remove the radiator.

Disconnect the petrol inlet piping to the pump and remove the pipe from pump to carburetter.

Remove the distributor to carburetter flexible pipe.

Disconnect the throttle control.

Remove the carburetter with the heat protection plate, the insulating plate and the gaskets, making sure not to distort the choke tube (the tube can be separated at the sleeve location).

Remove the water pipe and position the lift ring (Ref. Mot. 38) using the two bolts on the water pipe (the longest bolts).

Disconnect the feed wires and the manual advance control.

Remove the limiting strap at the rear end of the control.

Disconnect the gearshift and selection controls.

Remove the two engine attaching nuts at the front supports.

Separate the exhaust pipe from the manifold and from the engine crankcase.

Underneath the vehicle :

Disconnect the speedometer control cable.

Remove the exhaust pipe bracket on the gearbox.

Remove the torsion bar bearing support caps.

Clear the torsion bar.

Clear the engine strut towards the rear.

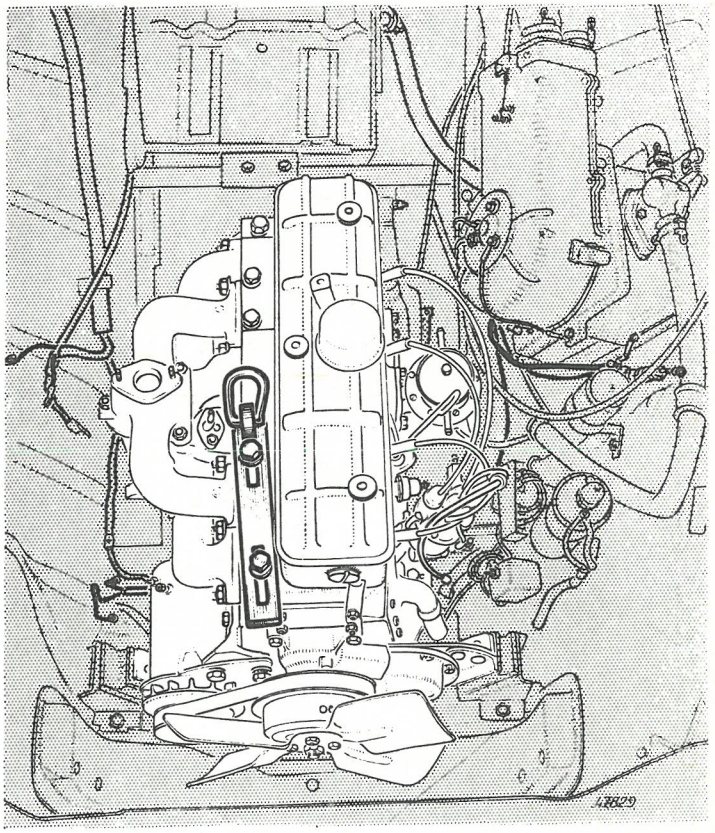
Disconnect the clutch release control and the earth braid on the side-member.

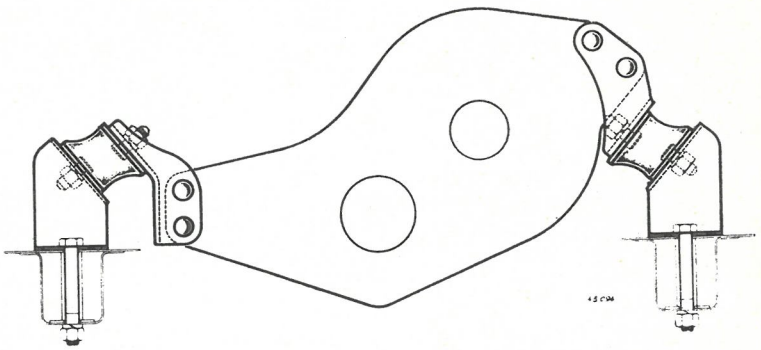
Disconnect the propeller shaft at the gearbox end.

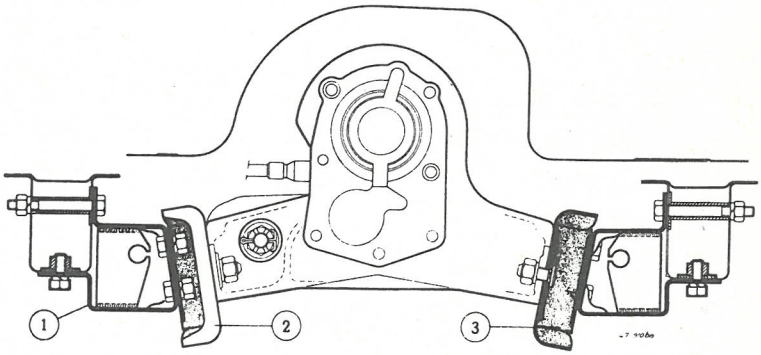
Clear out the gearbox from its rear supports; to this end :

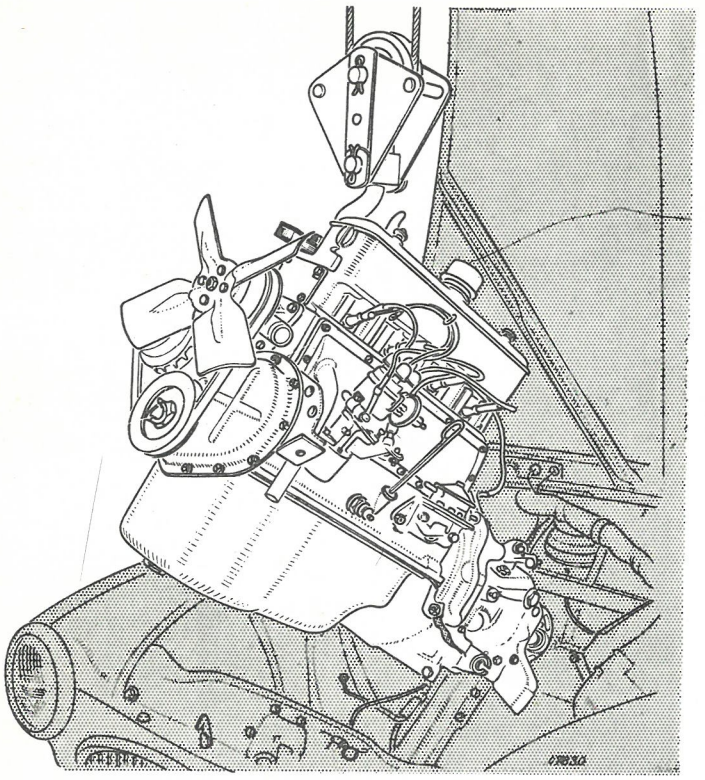
— at the end opposite to the clutch control, remove the support (1) on side-member, and, next, the elastic pad (2),

— at clutch control end, remove the elastic pad (3) mounting nut on the gearbox rear cross-member and clear the gearbox from this pad.







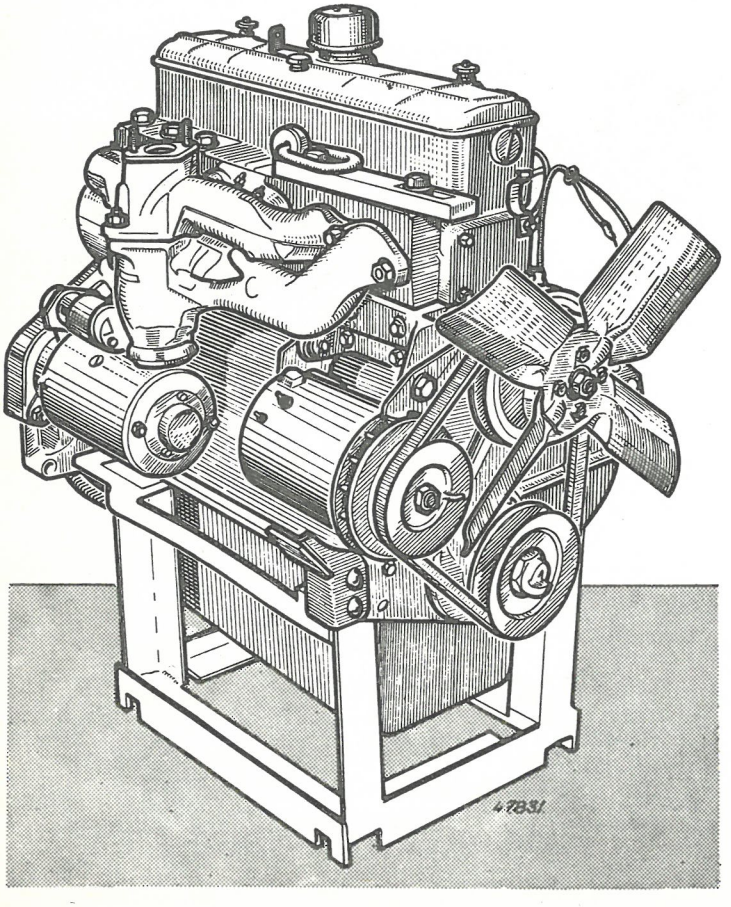


REMOVING ENGINE

(continued)

Gently raise the engine by the lifting ring while pulling engine towards the front and while lifting the gearbox with a jack until it clears above the front cross-member.

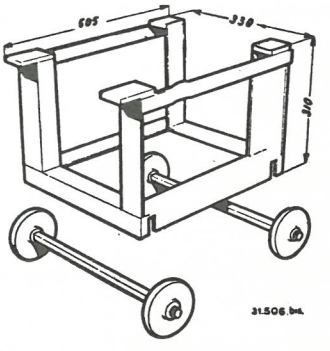
Continue lifting and, at the same time, increase the tilt towards the rear of the power unit.



Remove the clutch housing.

Install the " engine-and-gearbox " assembly on the carrier (Ref. Mot. 47).

Separate the gearbox from the engine by removing the assembly bolts and while pulling it in the correct direction.



REMOVING ENGINE

(Stripping)

Remove :

— the inlet-exhaust manifolds,

— the fan and fan belt,

— the starter, the dynamo with its bracket,

— the engine block water drain cock,

— the fuel pump, the oil pressure switch and the water thermostat,

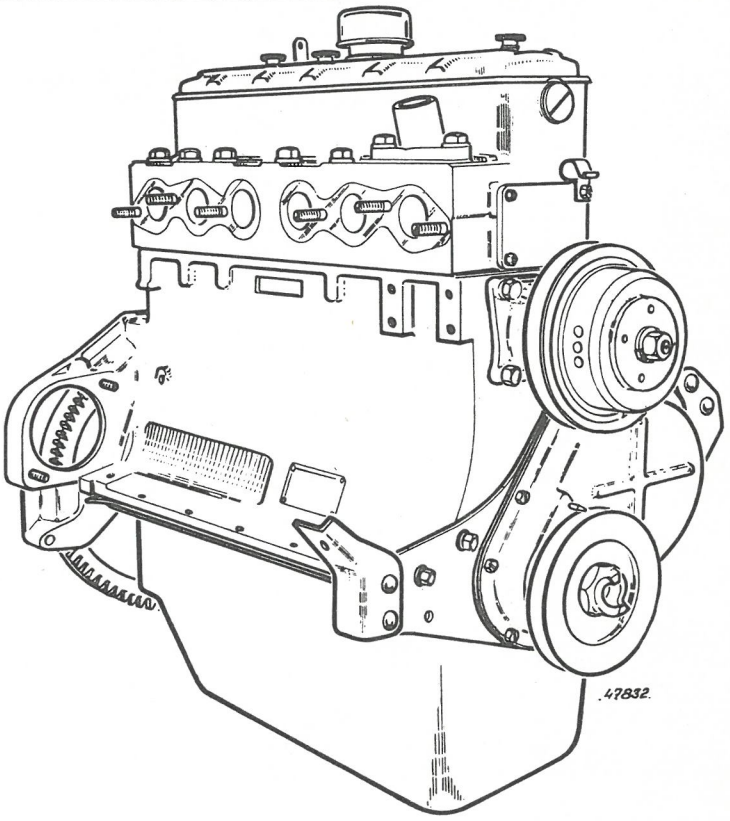
— the distributor and the sparking plugs,

— the clutch mechanism.

NOTE. — Under the " ENGINE EXCHANGE PLAN " refit :

— the cylinder head water pipe,

— the cylinder head attaching bolts.



REFITTING THE ENGINE

Follow in reverse sequence all the operations performed during the removing operations.

— To obtain a correct setting of the vacuum type advance control, fit the flexible vacuum line atop the fuel inlet copper pipe. The flexible pipe should not contact the cylinder head.

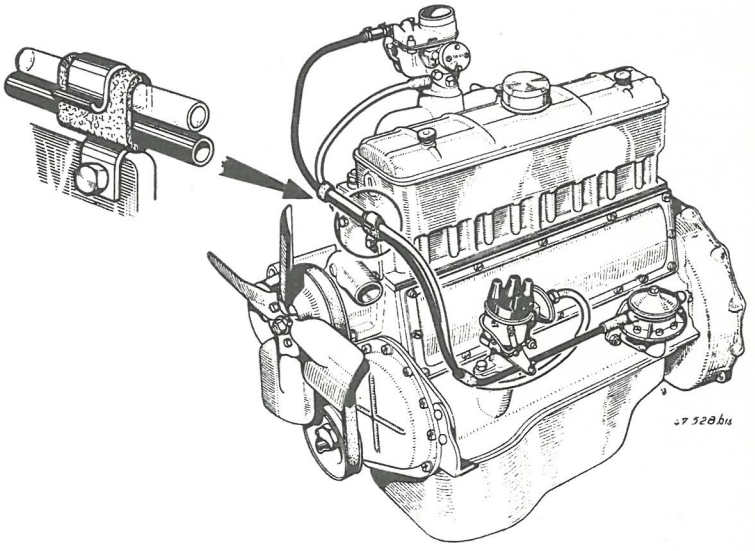
— Adjust the clutch pedal clearance (see page 46).

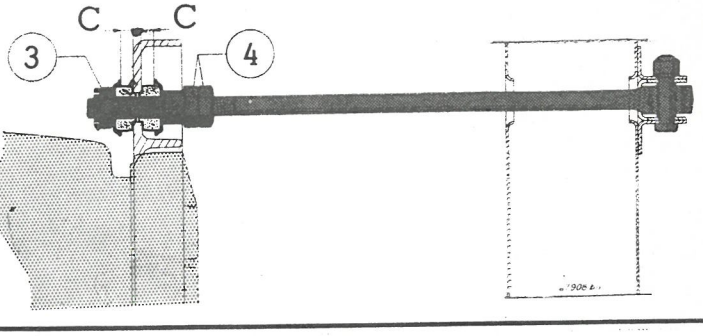
— Adjust the gearshift controls (see page 86).

— Adjust the gearbox housing stay :

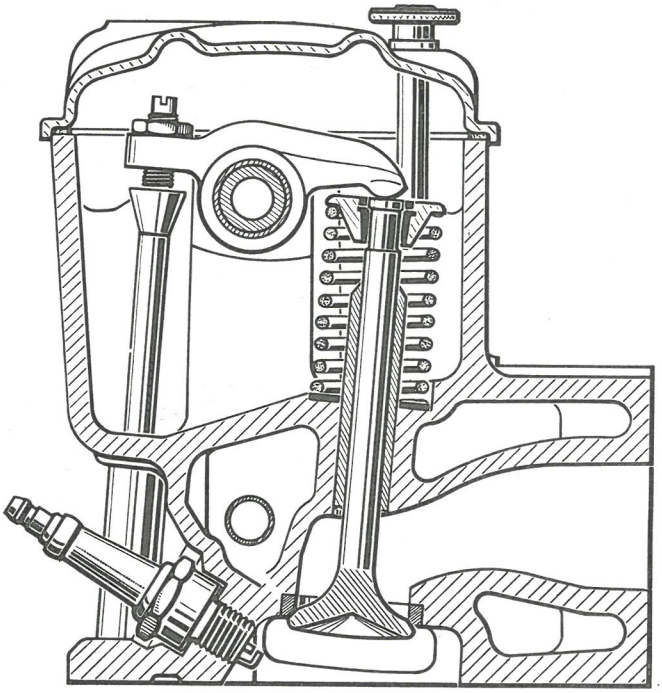
— Run up the castellated nut (3) fully. Insert cotter pin.

— Run up or off the nuts (4) to obtain the dimensions C = 7 mm.





CYLINDER HEAD



SPECIFICATIONS

Material : aluminium alloy	
Height (between joint surfaces)	147.8 mm
Combustion chamber volume	76.2 cm³ ± .25
Thickness of gasket	1.5 mm
Permissible distortion of joint surface	.2 mm
Valves : in head.	
Valve head diameter :	
— Inlet	38.5 mm
— Exhaust	35 mm
Valve stem diameter :	
— Inlet and exhaust	9 mm
Clearance between guides and stems :	
— Inlet	.030 to .080 mm
— Exhaust	.055 to .105 mm
Seating angle	120 degrees
Maximum seating width	1.5 mm
Valve lift :	
— Inlet and exhaust	8.2 mm (.323")
Valve guides.	
Outside diameter :	
— Standard diameter	15 mm
— Repair size	15.25 mm
Clearance in cylinder head	.11 to .15 mm
Valve springs : variable pitch.	
Free length (closed coils towards cylinder head)	61 mm
Number of active coils	7
Length under load of 52,3 kg (valve open)	42.8 mm
Length under load of 25,1 kg (valve closed)	51 mm
Wire diameter	4.2 mm (.165")
Pushrods : maximum out of round	.2 mm
Rocker arms : mounted on clévite bush.	
Diametral clearance on shaft	.005 to .03 mm
Clearance (engine cold) from rocker arm to valve stem :	
— Inlet	.12 mm
— Exhaust	.17 mm
Tightening torques :	
Cylinder head	9 m.kg
Rocker arm shaft bearing bolts	3 m.kg

NOTE. — **Cylinder heads identification** for spare parts : Engine 671-1 : figure " 8 " } Stamped on manifold assembly face at front.
Engine 668-1 : figure " 7 " }

CYLINDER HEAD

(continued)

REMOVING.

The cylinder head may only be removed when the engine is cold.

Remove the cylinder head and position the two washers (Ref. Mot. 16) for holding the cylinder liners on the cylinder block.

NOTE. — Cleaning the pistons and the cylinder heads from scale SHOULD NOT BE PERFORMED unless these parts are removed (some calamine particles may drop in-between the piston and the cylinder liner).

REFITTING.

Remove the cylinder liner holding washers (Ref. Mot. 16). Assemble **DRY** the new cylinder head gasket, with the crimped edges towards the cylinder block.

Align the gasket using two aligning studs (ref. Mot. 87).

NOTE. — The faces at cylinder head and cylinder block sides should be thoroughly cleaned. Make sure that, at the outside edges, some wires of the gasket material are not inserted in-between the gasket and the cylinder head or the cylinder block.

Position the cylinder head, making sure that the pushrods are correctly located in the tappets cups.

Fit the cylinder head mounting bolts, completing the operation by replacing the two aligning studs.

Run up the bolts manually. **Tighten the cylinder head** following the correct bolt tightening sequence.

This operation is a three-step operation, using the torque wrench (Ref. Mot. 50) :

1° Tighten **COLD** to **9 m.kg.**

2° Tighten **HOT** to **9 m.kg.** (at normal operating temperature).

3° Tighten after the engine has COMPLETELY **COOLED DOWN** to **9 m.kg.**

With engine cold, adjust the rocker arms to valve stem clearance.

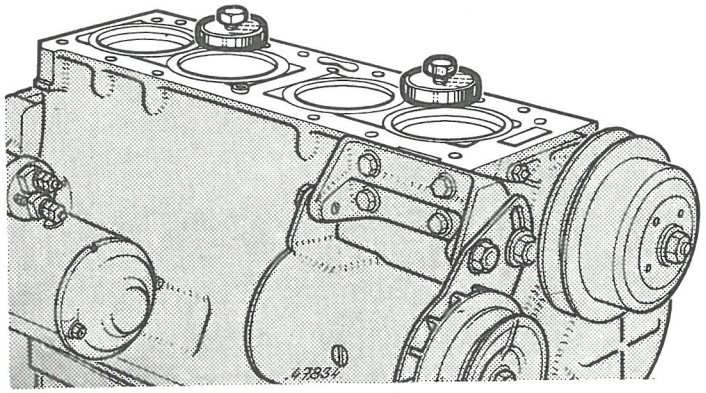
This is a two-step operation with tool (Ref. Mot. 05) :

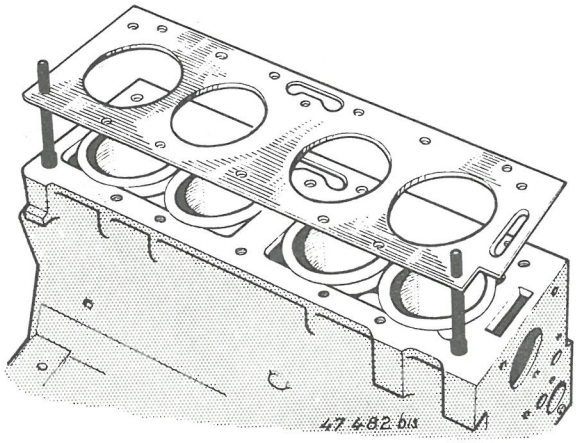
1° **Initial** adjustment :

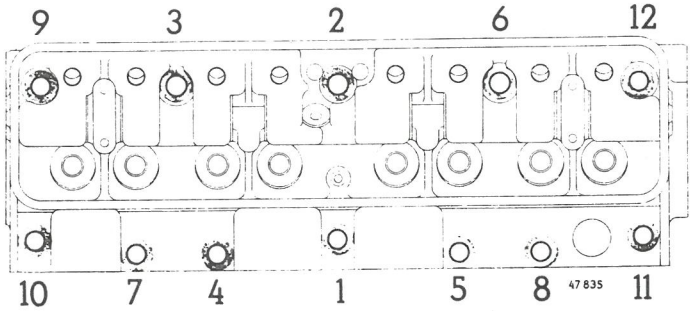
— Inlet ..... .15 to .18 mm
— Exhaust..... .15 mm

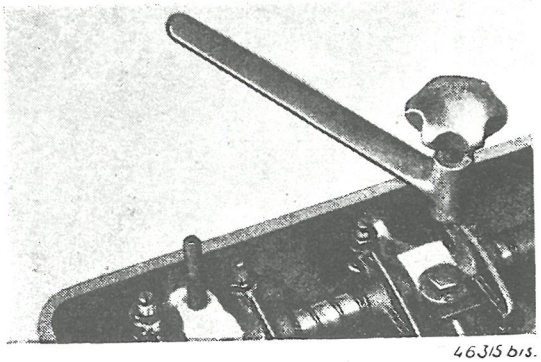
2° **Permanent** adjustment, i.e. after retightening the cylinder head :

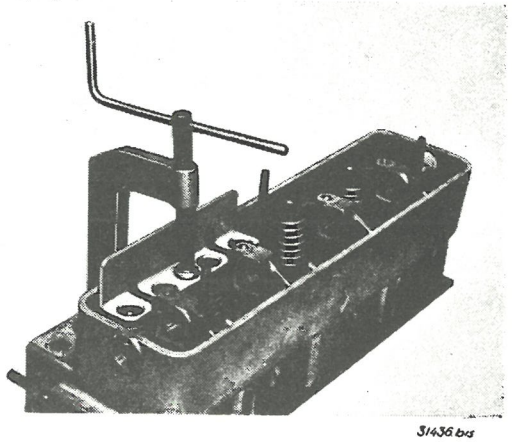
— Inlet ..... .12 mm
— Exhaust ..... .17 mm











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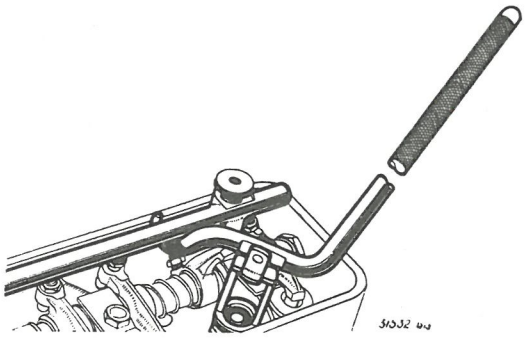

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CYLINDER HEAD

(continued)

DISMANTLING.

Remove the pushrods.

Remove the two rocker arm shaft location plugs, the two rocker arm shaft plugs and the end spacing springs.

Run off the four rocker arm bearing clamping screws, remove the shims and remove the rocker arm shafts using the puller (Ref. Mot. 43).

Remove the rocker arms.

Remove the rocker arm shaft lubricating sleeve, with the gaskets.

Remove the valves and the springs. To this end :

— Remove the rubber sealing washers on the spring cups with a nail.

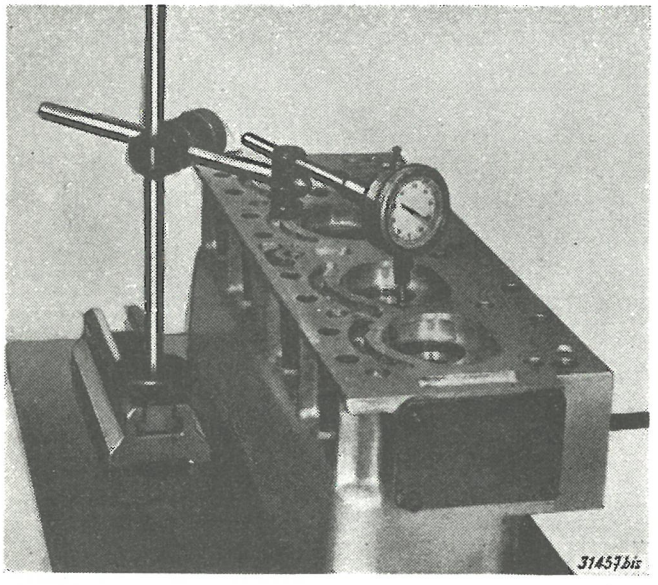
— Clear out the valve stems by compressing the springs using a multiple type compressor (Ref. Mot. 09); with a nail, remove the split cones in two pieces.

— Clear the compressor, remove the caps and the springs.

— Remove the valves, place on a small board with 8 drilled holes, in order to reassemble in the same sequence.

— Tilt the cylinder head in order to save the split cones and the spring lower thrust cups.

NOTE. — The spring compression operation may also be performed using a single type compressor (Ref. Mot. 14).



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Checking the joint surface.

Position the cylinder head on a surface plate making sure that the face at cover side is perfectly clean.

Fit the dial indicator.

Move the dial indicator point over the entire surface to be checked and record on the dial the minimum and maximum values thus measured.

The difference between these values corresponds to the measurement of the hollows or protrusions of the face.

This measurement should not be above .2 mm (.0078"") for a correct assembly.

— from .2 to .3 mm : face without reworking the combustion chambers.

— from .3 to .6 mm : face and rework the combustion chambers.

— beyond .6 mm : replace the cylinder head.

CYLINDER HEAD

(continued)

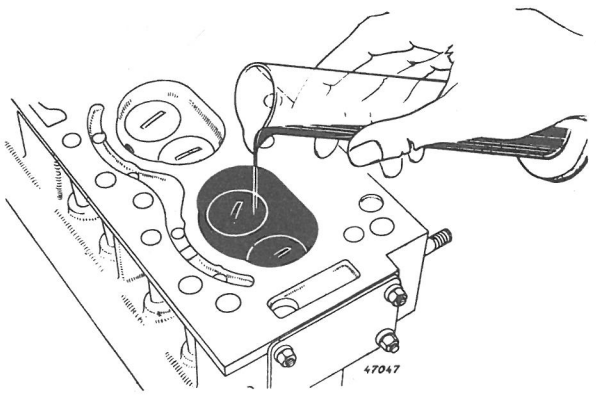
Combustion chambers volume : 76,2 cm³ ± .25 (Sparking plug and valves installed).

Checking the combustion chambers volume :

— The cylinder head should be fitted with the spark plugs and with the valves (the latter being coated with tallow to ensure proper sealing).

— Position cylinder head horizontally (check with water level). Using a test tube (graduated to cubic centimetres) filled with fluid oil or diesel fuel, pour into the chamber to be checked the oil or fuel until flush.

Record the difference in the test tube which will correspond to the combustion chamber volume.

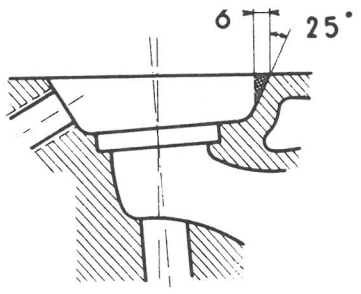


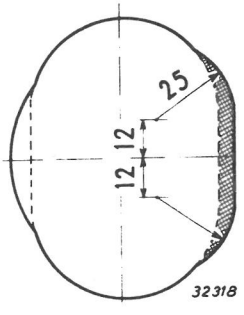
Reworking the combustion chambers.

The reworking of the chambers will permit re-establishing the chambers volumes after face milling the cylinder head joint surface whenever the distortion of this surface is included from .3 to .6 mm.

The milling of the four compression chambers is to be performed at the portions shown cross hatched on the figure.

The chamber reworking operation will be followed by a chamber volume checking operation.





Checking the pushrods.

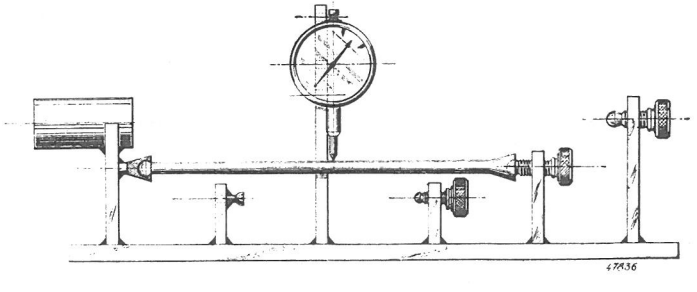
Fit the pushrod on the checking fixture (Ref. Mot. 55). The rod should rotate without any play.

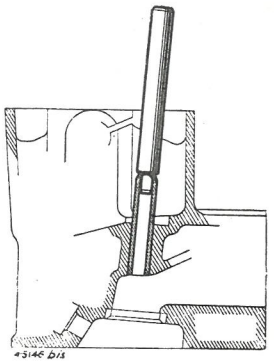
Fit the dial indicator point at the centre of the rod.

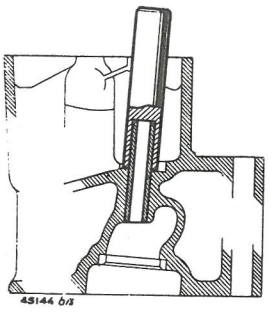
Rotate the rod in order to appreciate the out of round due to distortion.

Maximum permissible pushrod out of round : .2 mm.

If out of round is above .2 mm, straighten the rod with a mallet on a suitable block. Check again.





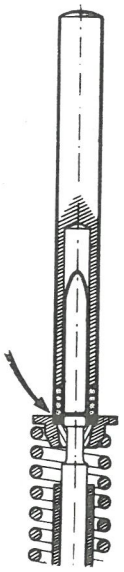


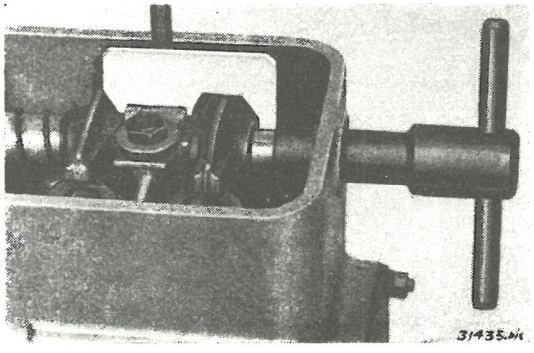
CYLINDER HEAD
(continued)

Replace the valve guides, if required. To this end :

— Drive out the guide using the puller (Ref. Mot. 06).
— Fit the new guide using the inserter (Ref. Mot. 06).
— **Insert until the tool abuts on the cylinder head.**
— Ream the new guide according to the diameter of the valve stem.

Valve guide replacing operation should always be followed by the grinding of the seat.





REASSEMBLING.

Grind the valves and the seats if required (the maximum seating width of 1.5 mm should be adhered to).

NOTE. — **A correctly performed valve and seat grinding operation does not require any lapping operation.** Merely check the valve bearing on the seats.

Check the rocker arms (hammer thrust face and clearance on shaft).

Check the springs pre-load.

Coat the valve stems with oil and fit the valves at their respective locations.

Position the thrust cups under the springs, the springs (the **closed coils towards the cylinder head),** the spring caps and the two piece split cones using a multiple type compressor (Ref. Mot. 09) or a single type compressor (Ref. Mot. 14).

Fit the spring caps rubber washers (new ones) using the tool (Ref. Mot. 44). To this end :

— Fit 8 washers on the tool shaft by pushing them with the tool.
— Fit the whole on the valve stem and apply a manual pressure in order to fully insert the first washer.
— Repeat the operation for the other valves.

Position the rocker arm lubricating sleeve **along with the two gaskets at shaft end** (tighten moderately).

Assemble the rocker arm shafts, the rocker arms and the rest springs, using the puller (Ref. Mot. 43). Adjust the lengthwise position of the rocker arm shafts using the gauge (Ref. Mot. 41) in order to ensure the correct alignment of the lubricating holes and the **proper sealing at the sleeve gaskets.**

Position the bearing shims and tighten the bolts to 3 m.kg.

Lock the bolts.

Remove the puller, fit the end springs and run up the rocker arm shaft plugs and shaft passage plugs.

Reposition the pushrods, holding the rocker arms away.

ENGINE DISMANTLING

TIMING GEAR.

Drain the engine.

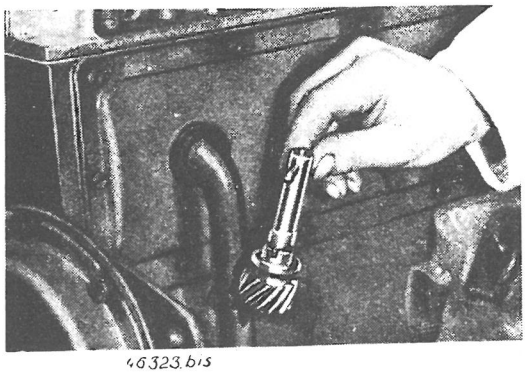
Remove the distributor support and its gasket.

Remove the oil pump drive pinion using a puller (Ref. Mot. 17).

Remove the cylinder head (see page 11). Do not omit positioning the cylinder liner holding washers.

Remove the water pump.

Remove the cylinder block side cover and remove the tappets. **Do not mix the tappets.**



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Remove the engine from the support, turn over and allow to rest on the joint surface with wooden blocks being inserted in-between.

Remove the oil sump.

Loosen and **partially run off the starting dog.**

Loosen the crankshaft pulley **with the dog used as a thrust** for the puller screw (Ref. Mot. 49).

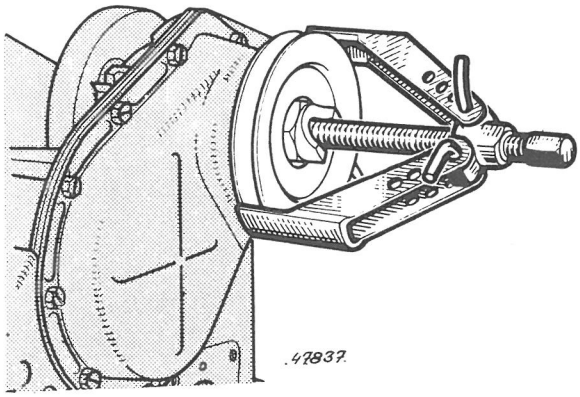
Run off the dog completely and remove the pulley.

Remove the timing gear cover.

Remove the crankshaft pinion oil baffle.

Remove the latter pinion with puller (Ref. Mot. 49). after **temporarily refitting** the starting dog used as a thrust.

Remove the two keys on the crankshaft.



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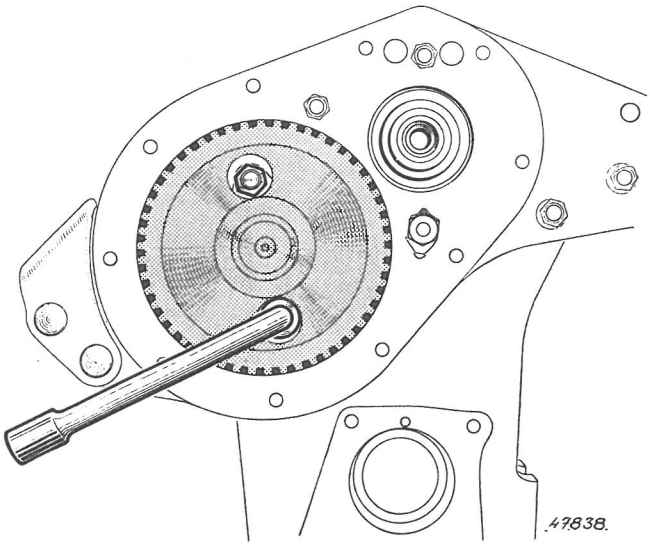
Remove the two camshaft thrust flange attaching screws by fitting a socket wrench through the holes provided in the timing gear.

Remove the camshaft.

Remove the engine front support timing plate after having removed the gear lubricating hole.



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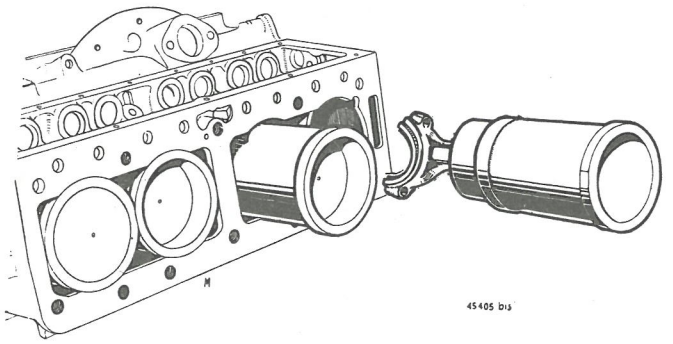


ENGINE DISMANTLING

(continued)

" CYLINDER LINERS - PISTONS - CONNECTING RODS " ASSEMBLY.

Remove the oil pump, the pump to cylinder block lubrication piping and the rocker arm lower lubrication piping (in the pushrod bore).

Remove the connecting rod caps and their bearing shell half. **Do not mix them.**

Position the cylinder block on its RH side.

Remove the cylinder liner holding washers.

Remove the " cylinders liners - pistons - connecting rods " assemblies.

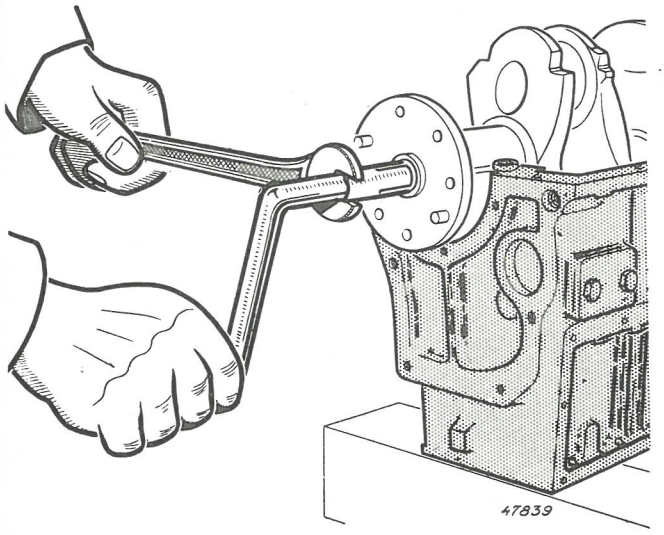
Remove the cylinder liner bottom seals.

Separate the connecting rod half-bearing shells. **Do not mix them.**

Separate the cylinder liners from the pistons (if these parts are not to be replaced, **mark same).**

Separate piston rings from pistons.

Separate connecting rods from pistons.



CRANKSHAFT.

Separate the clutch flywheel from the crankshaft (this operation will only be performed if the grinding of one of these parts is necessary, as this assembly is balanced).

Remove the flywheel housing.

Remove the two bolts assembling the two portions of the rear bearing cover.

NOTE. — Each of these two portions should be removed from the parts which carry them (cylinder block and rear bearing cap) only if they are to be replaced. (See Engine reassembly page 18).

Remove the bearing caps and the elastic half-bearing shells. **Do not mix.**

From the crankshaft, pull off the primary shaft bearing, using a bearing puller (Ref. Mot. 11).

This operation may be performed only if the clutch flywheel has been removed.

Remove the crankshaft, save the thrust half-flanges.

Separate the half-bearing shells on the cylinder block. **Do not mix.**

ENGINE DISMANTLING

(continued)

CYLINDER BLOCK.

On cylinder block, remove the lubricating oil circuit aluminium obturating plugs **(the plugs are run up and hammered).** To this end :

— Drill a hole in the centre of the plug.

— Insert a square slightly tapered point.

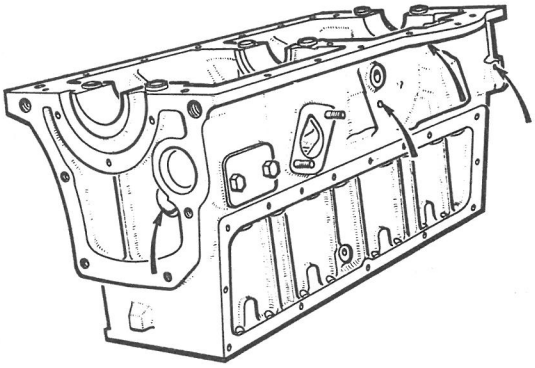
— Run off the plugs.

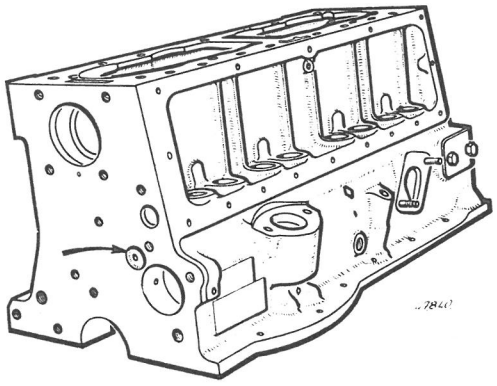
Insert a wire through all the lubricating channels particularly in the channel of the camshaft centre bearing.

Clean with petrol and with compressed air.

Scrape the joint surfaces.

Carefully check each part after cleaning in order to determine whether the part may be reused or is to be reconditioned.

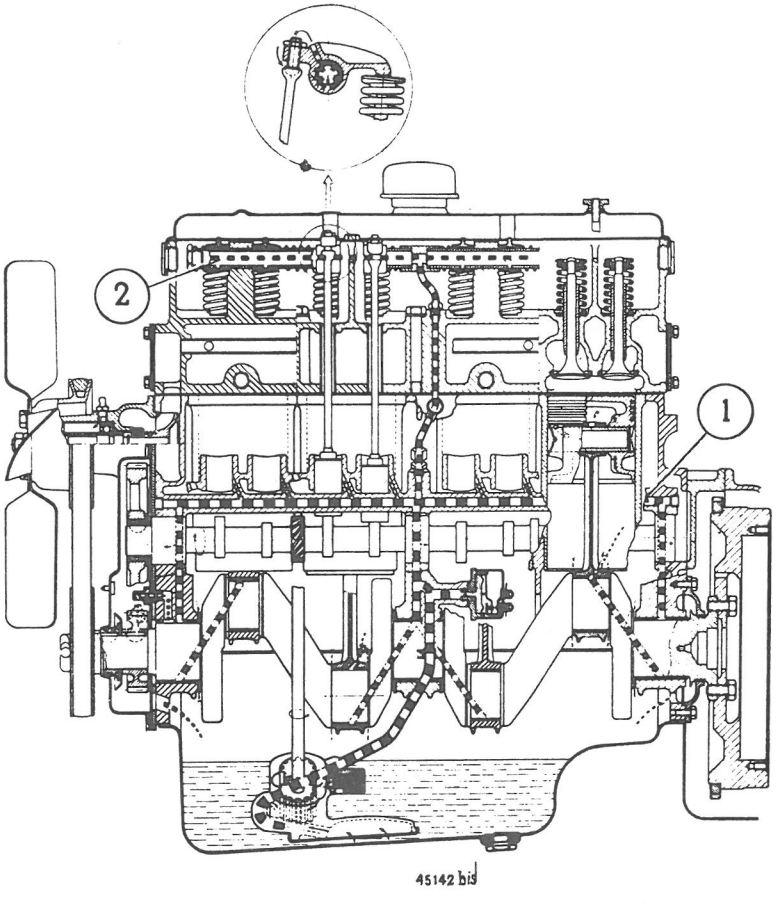


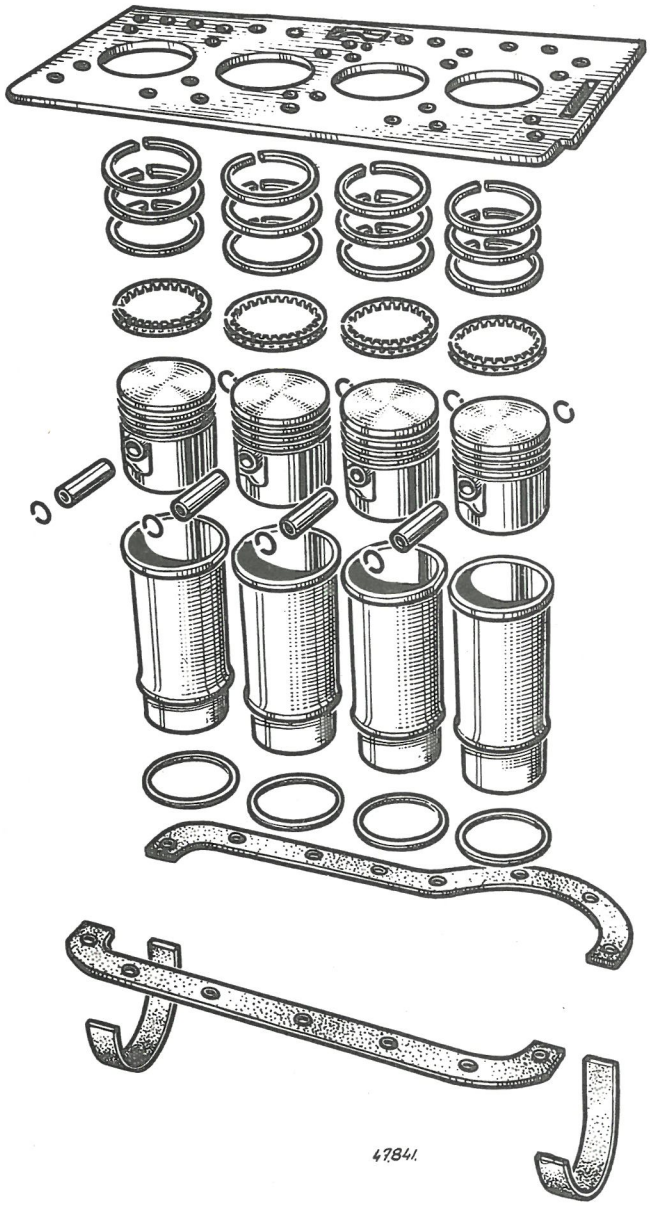


LUBRICATION

(1) Channel for the lubrication of the moving parts.

(2) Channel for the lubrication of the rocker arms (hollow rocker arm shafts).





ENGINE REASSEMBLY

GENERAL.

The replacing of the " cylinder liners - piston - piston rings " assembly is mandatory for a general overhaul.

The Spare Parts Department will supply for the purpose, kits of new parts with 4 cylinder liners and 4 pistons as a matched set.

It is absolutely required to clean these new parts before assembly. The parts are coated with protective coating.

DO NOT SCRAPE. Dissolve the coating with trichloroethylen or petrol.

Preparing the connecting rod, cylinder liner and piston assemblies.

The cylinder liners and pistons being matched (dots of paint of various colours and numbers), do not mix.
Each cylinder liner has a matched bottom seal ensuring correct protrusion.
Before any operation, it is recommended to match each " cylinder liner-piston " assembly with a connecting rod and to mark the pieces of this assembly thus obtained with No. 1, 2, 3 or 4 stamped on the connecting rod big end (connecting rod with mark No. 1 towards clutch).

Preparing the cylinder block.

Install the oil circuit obturating aluminium plugs (new ones) with sealing compound and hammer them.
Assemble the flywheel housing.

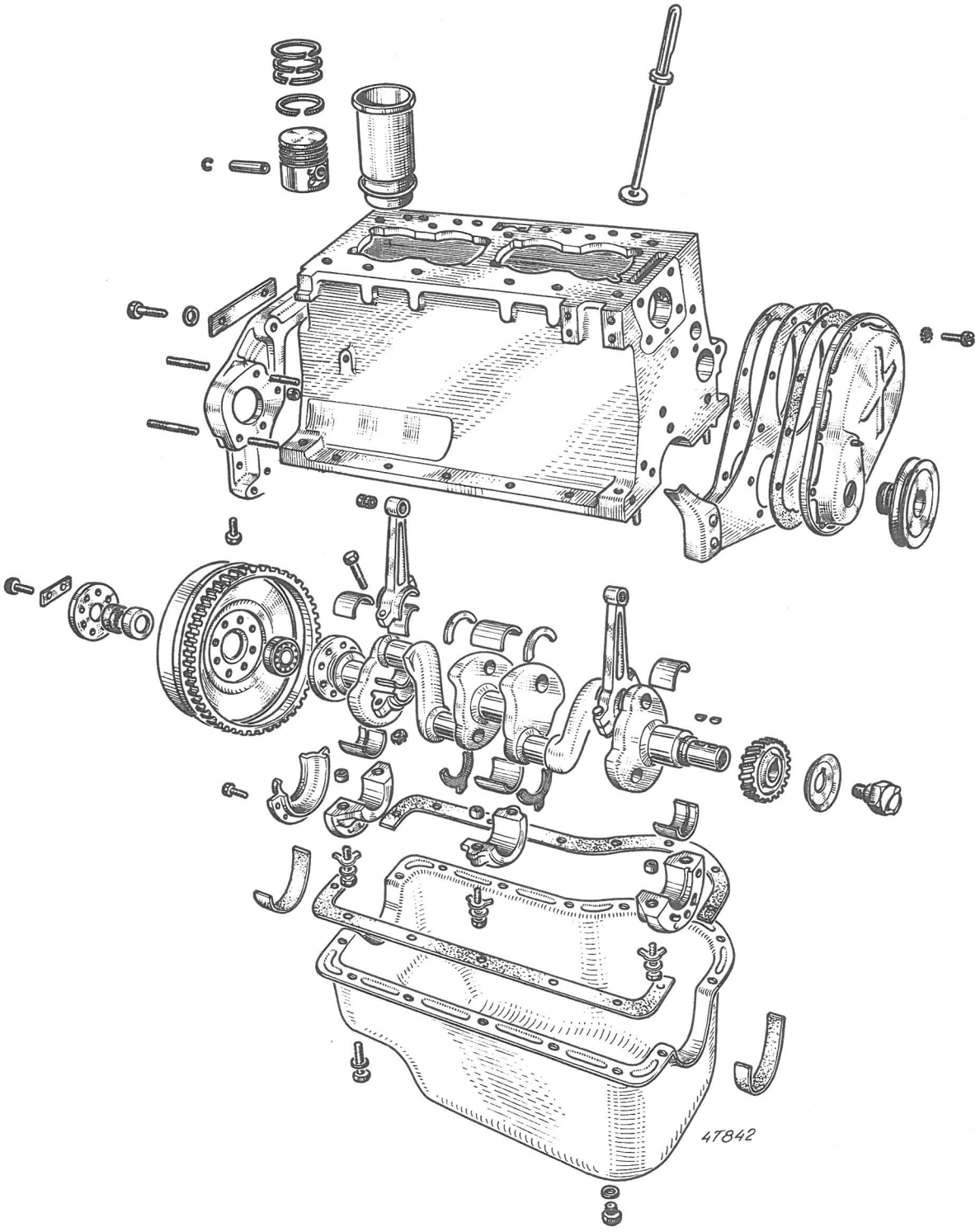
Preparing the crankshaft line.

If required, the crankshaft trunnions and crankpins will be ground by a specialist.
Check the elastic bearing shells and their locations for perfect cleanliness.
Should it be found necessary to replace the **rear bearing cover** (two parts), follow this procedure : (The two parts of the cover are machined together and are made available assembled with two bolts; **never separate the two parts prior to the assembly on the cylinder block)** :

— Fit the rear bearing cap, tighten the attaching bolts in order to ensure its positioning, and next loosen slightly.
— Fit the cover, previously coated with sealing compound, without tightening the attaching bolts to the bearing cap.
— Tighten the bearing cap bolts and next those of the cover.
— It is then possible to separate the bearing cap from the cylinder block by separating the two parts of the cover.
The latter will resume their correct position during the reassembling.

NOTE. — All removed gaskets, whatever they are, should be replaced for new ones.

MOVING PARTS AND CYLINDER BLOCK



Crankshaft and flywheel assembly dynamically balanced with the clutch.

Whenever the clutch is to be replaced, remove the balancing weights (washers fitted under the clutch to flywheel attaching bolts).

ENGINE REASSEMBLY

(continued)

CRANKSHAFT

Crankshaft - 3 main bearing type.

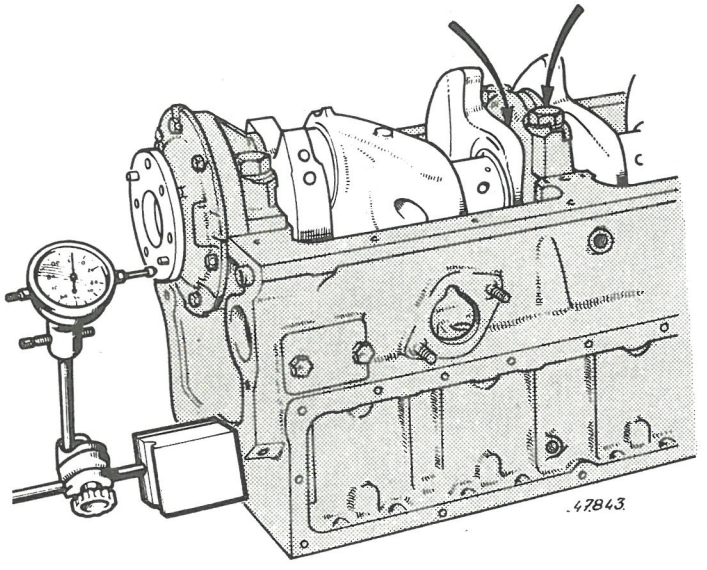
Lengthwise clearance	.045 to .235 mm
Clearance controlled by 2 flanges located at either side of centre main bearing :	
— standard dimension	1.6 mm
— repair dimension	1.7 and 2 mm
Tolerance for ovalization	.1 mm

Crankpins and bearing shells.

Normal diameter	55 mm
Grinding to diameters	54.50 mm
Grinding tolerance	54 mm + .03 + .02
Repair dimension type bearing shells	54.5 mm 54 mm

Trunnions and bearing shells.

Normal diameter	56 mm
Grinding to diameters	55.75 mm 55.50 mm 55 mm
Grinding tolerance	— .01 mm — .02 mm
Repair dimension type bearing shells	55.75 mm 55.50 mm 55 mm
Main bearing bolts tightening torque	11 m.kg
Flywheel attaching bolts tightening torque	8 m.kg
Maximum warpage of flywheel as measured on largest diameter	15 mm



Fit the half bearing shells on the cylinder block and on the bearing caps making sure that the lubricating holes are aligned.

Fit the crankshaft previously coated with oil.

At both ends of the centre main bearing, fit the upper thrust flanges, **with babitted Side having lubricating grooves towards crankshaft.**

Fit the bearing caps with the half shells and and the lower thrust flanges of the centre main bearing.

The locking stud of the bearing shell on this main bearing should be located at the same side as that of the cylinder block.

It is strongly prohibited to rework even lightly the joint surface of the main bearing caps, of the connecting rod big ends and of the elastic bearing shells.

Moderately tighten the main bearing caps bolts.

Make sure the crankshaft rotates freely and check with dial indicator (Ref. Mot. 75) the lengthwise clearance : .045 to .235 mm.

Permanently tighten the bearing caps to 11 m.kg.

Moderately tighten the attaching bolts on the rear cover two sections.

Fill with grease the recess at crankshaft end and fit the primary shaft bearing.

Refit the flywheel, the cage, the felt and the end washer.

Tighten bolts to 8 m.kg.

Check flywheel for warpage.

ENGINE REASSEMBLY

(continued)

" CYLINDER-LINERS - PISTONS - CONNECTING RODS " ASSEMBLY

Cylinder liners (removable, wet type) :	
— Bore	88 mm + .04 + 0
— Protrusion of liner from joint surface prior to cylinder head tightening	.11 to .14 mm
— Thickness of bottom seal	.93-.95 .97-.99 or 1.01 mm
— O.D. of upper flange	104 mm
— O.D. of lower flange	101 mm
— Centering diameter	99 mm
Pistons (slotted type - matched with cylinder liners) :	
— Flat head. Aluminium alloy and compensating insert	
— Diameter of skirt	88 mm — .04 — .02
— Weight difference between pistons on the same engine	2 g
— Diameter of piston pins (the pin, when cold, should be tight in the piston).	24 mm

Connecting rods (oblique cut) :	
— Big ends with clevite bushes.	
— I.D. of big end (bearing shell fitted)	55 mm
— Diameter of connecting rod small end bush (the piston pin, when cold, should slide with a snug fit in the bush).	24 mm
— Cap bolts tightening torque	5 m.kg
— Side clearance	.08 to .22 mm
— Weight difference between the connecting rods on a same engine	3 g
Piston rings :	
— 1 cylindrical, chromium plated top ring **(set gap).**	
Thickness	3 mm
— 2 phosphate coated tapered compression ring. Gap to set	.15 to .25 mmm
Thickness	3 mm
— 1 U-Flex type oil control ring. Set length : **do not disturb.** Thickness	4.4 mm

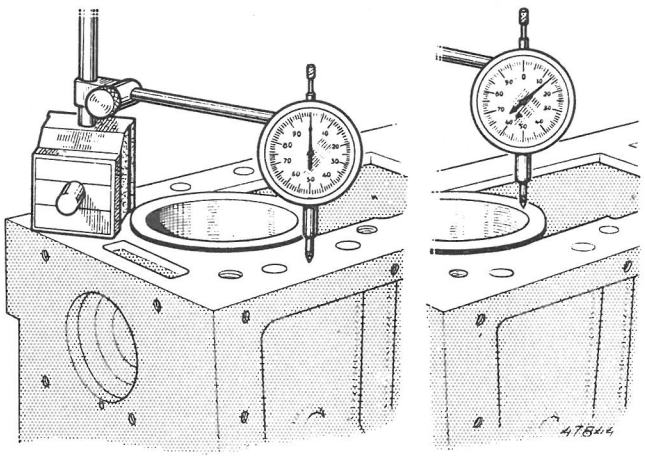
Check cylinder liner protrusion. To this end :

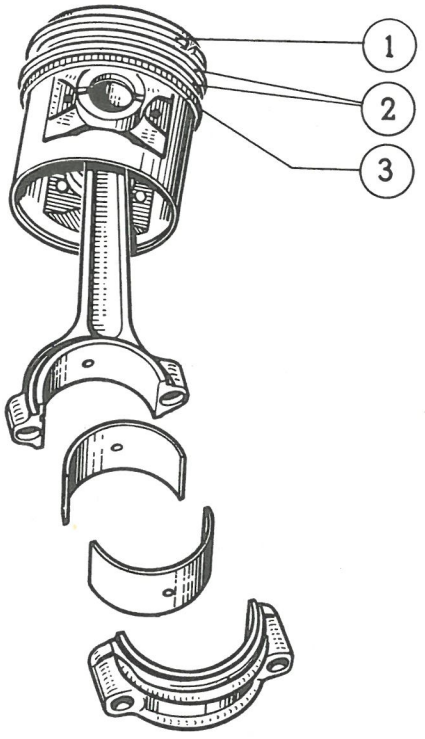
— Fit the liners equipped with their bottom seals at the location corresponding to their reference number (Flange flats should be opposed).

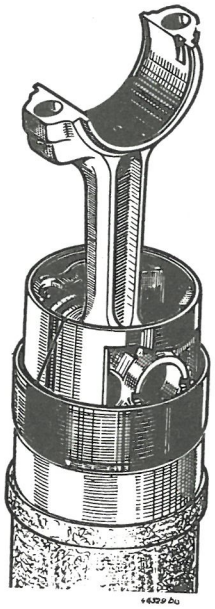
— Apply manual pressure on the liners to ensure a correct bearing on the bottom seals and check protrusion with a dial indicator fitted with a magnetic base (Ref. Mot. 75).

This protrusion should be ..... .11 to .14 mm

If protrusion is small, use a heavier bottom seal.







ENGINE REASSEMBLY

(continued)

" CYLINDER LINERS-PISTONS-CONNECTING RODS " ASSEMBLY
(continued)

With a new piston pin, check he clearance on the connecting rod small end bush.

Replace the bush if required; on a press, insert a new bush previously coated with tallow. Drill the lubricating hole. Rework the bush carefully until the pin slides with a sung fit.

Check the connecting rod for distortion and squareness (Réglobielles checking device).

Fit a piston pin snap ring. Dip piston in boiling water for a few minutes; manually fit the piston pin. Assemble the second piston pin snap ring.

The slot in the piston skirt should be located at the end opposite to the connecting rod lubricating hole.

Should it be required to replace a connecting rod, make sure that its weight is identical, within tolerances, to that of the other connecting rods. The number of 2 figures stamped on the big end at lubricating hole side shows the weight in tens and unities of a gram.

Fitting the piston rings :

A chrome plated (bright finish) top ring (1) is made available with the gap already adjusted. **Do not modify this gap.**

Two tapered phosphate coated compression rings (2). Check and adjust the gap. To this end :

— Insert a stripped piston (with head downwards) through the top of the cylinder liner until the bottom of the skirt is at 5 mm (.196") below the edge of the liner.

— Fit the ring on the piston. Check the gap (.15 to .25 mm). Adjust.

An oil control ring (3) of the U-Flex type : **this ring should not be reworked under any circumstances.**

Clean the piston grooves.

Fit the top and compression rings with the special tool; fit oil ring manually. Make sure they rotate freely. **(On one face of the compression rings, there is a ball mark or 0 mark. Owing to their taper, this mark should always be located towards the top of the cylinder).**

Lubricate and set the rings gap 120° apart. **(The gap of the U-Flex ring should not be in front of a lubricating hole).**

Insert the piston equipped with rings in the assembly ring (Ref. Mot. 85) (or Ref. Mot. 84 for engine 668-6).

Assemble the " connecting rod and piston " assemblies into the cylinder liner while positioning the taper bush on the lower end of the cylinder liners **(the connecting rod big end cut should be tilted towards the camshaft).**

Assemble the piston in the liner by applying a **continuous pressure** on the connecting rod.

ENGINE REASSEMBLY

(continued)

" CYLINDER LINERS - PISTONS. CONNECTING RODS " ASSEMBLY
(continued)

Insert the " cylinder liner - connecting rod - piston " assemblies in the cylinder block, to this end :

— Fit the elastic bearing shells on the connecting rods and the connecting rod caps **(make sure the lubricating holes are aligned). The connecting rod cap shells locking studs should be positioned at the same side as those on the connecting rod bodies.**

— Place the " cylinder liner - connecting rod - piston " assemblies with their respective bottom seal in the cylinder block, following the correct direction of assembly of the connecting rods **(the lubricating hole of the connecting rod should be at the end opposite to the camshaft).**

— Refit the connecting rod caps with the shells. Tighten the bolts to 5 m.kg and lock.

Position the cylinder liners holding washers (page 11).

Make sure the assembly rotates freely.

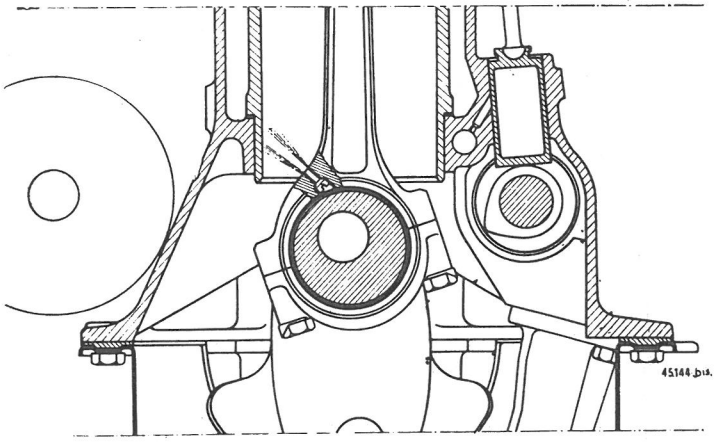
Pre-stressing the bottom seals :

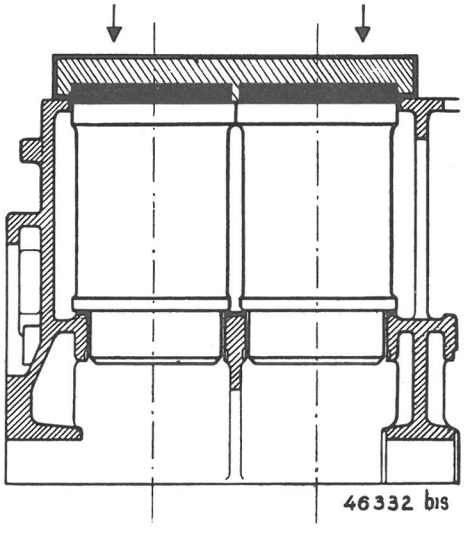
— Remove the cylinder liners 1 and 2 holding washer.

— Position the pre-stressing plate (Ref. Mot. 60) on liners 1 and 2. Secure with 7 bolts tightened to 9 m.kg. Remove bolts and remove the plate.

— Reposition the cylinder liners 1 and 2 holding washer.

— Repeat the pre-stressing operation for liners 3 and 4.





« CYLINDER LINERS - PISTONS » EXCHANGE

The Spare Parts Department makes available kits including :

— 4 matched pistons and cylinder liners,
— 4 piston pin sand snaps rings,
— 4 sets of piston rings,
— 4 cylinder liner bottom seals,
— 1 cylinder head gasket,
— the cork gaskets for the oil sump.

Replacing the " Cylinder liners - Pistons " assemblies is performed on vehicle.

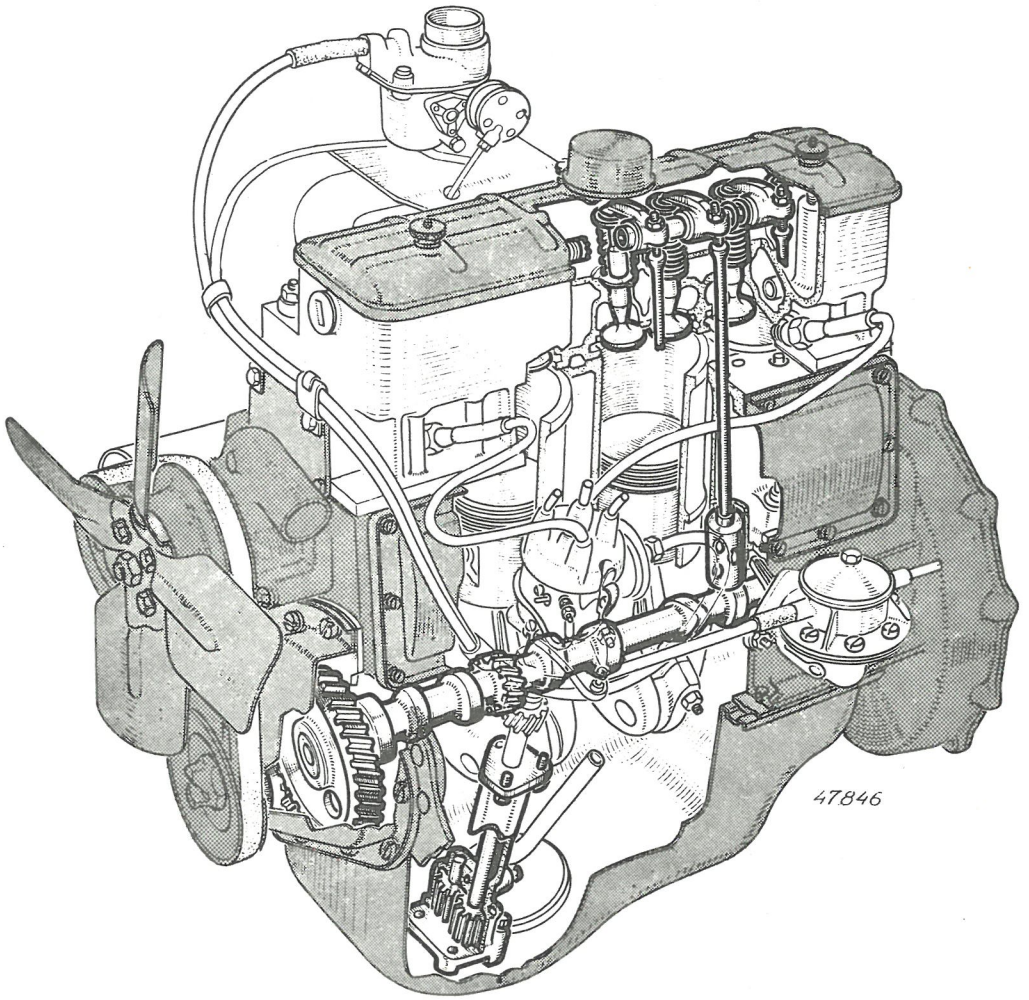
Perform the dismantling and reassembling operations in the following sequence, referring to the chapters " Cylinder Head ", " Engine Dismantling ", " Engine Reassembly " already examined :

— Remove, check and overhaul the cylinder head (See " Cylinder Head " pages 10 to 14).
— Remove the oil sump.
— Remove and reassemble the " Cylinder liner-Piston-Connecting rod " assemblies (See " Engine Dismantling " page 16).
— Reassemble the " Cylinder liner - Piston - Connecting rod " assemblies (See " Engine Reassembly " pages 18 and 21 to 23).
— Refit the oil sump.
— Refit the cylinder head (See " Cylinder Head " page 11).
— Tune up the engine (See " Tuning up the engine " page 28).

ENGINE REASSEMBLY

(continued)

TIMING GEAR



For the valves, valve guides, rocker arms and pushrods, see : Cylinder head, page 10.

Tappets :

— O.D. : Standard dimension		26 mm
Repair dimension		26.2 mm 26.5 mm
— Diametral clearance (Replace the tappet when clearance is .1 mm).		.013 to .017 mm

Camshaft :

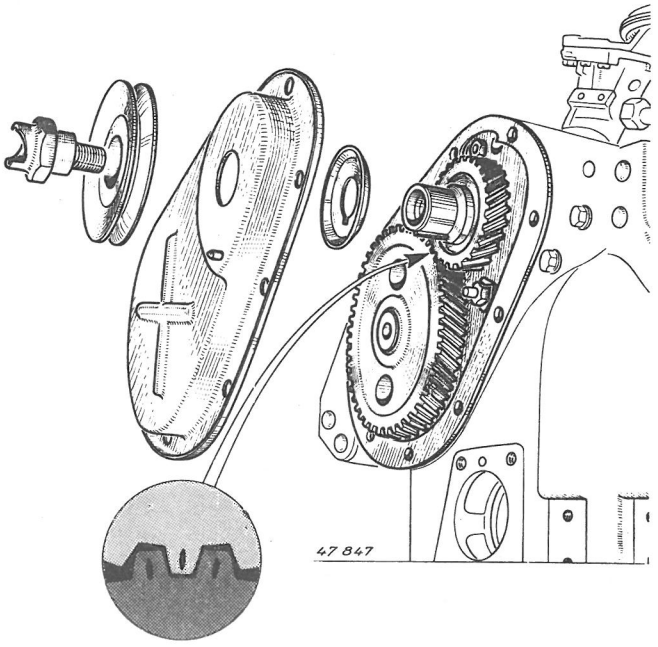
— Clearances	Diametral	minimum	.015 mm
		maximum	.055 mm
	Lengthwise	minimum	.06 mm
		maximum	.12 mm

ENGINE REASSEMBLY

(continued)

TIMING GEAR (continued)

Refit the front engine support timing gear plate with a new paper gasket cemented with sealing compound.
Fit the timing pinions lubricating hole with the gasket and retainer.
Tighten **while directing the hole between the pinions.**
Fit the oil pump and tighten on the cylinder block.
Fit the oil outlet tube and progressively tighten the two flanges.
Refit the rocker arm lubricating lower piping.
Check the pump for rotation by temporarily fitting the pump drive pinion. Remove pinion. Direct the outlet pipe towards the bottom of the sump.
Assemble the camshaft previously coated generously with oil.
Through the timing gear, tighten the two bolts attaching the thrust flange. Make sure the camshaft rotates freely.
Fit the two keys on crankshaft.
Assemble the crankshaft pinion **(with pinion mark outside),** aligning the marks on the crankshaft pinion and on the timing gear.
Fit the pinion oil baffle.



Oil pump :

— Oil pump to engine ratio	.5
— Pressure	3.3 kg/cm²
— Pump output at 4,000 engine RPM	22 to 25 l/min.
— Oil viscosity (See Lubrication and Maintenance Chart).	

— Relief valve spring :

Free length	46 mm
Number of coils	12
Wire diameter	1.5 mm

— Checking the oil pump (after checking the oil viscosity) :

Loosen and remove the valve plug.

Remove the spring and the valve; clean with petrol.

Make sure the valve slides properly in the body.

Check the spring.

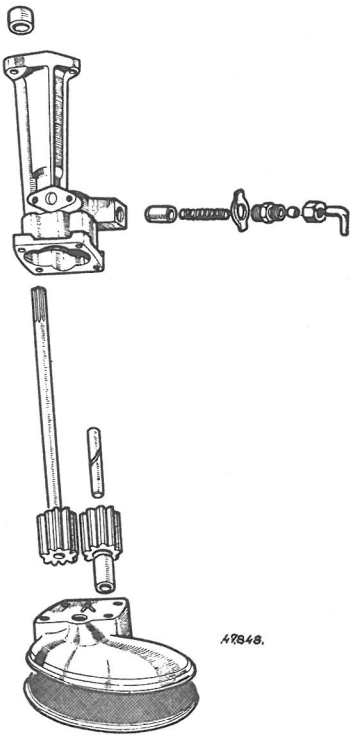
The plug once tightened with the retainer gives a spring compression so as to ensure that the oil pressure at delivery is obtained without adjustment.

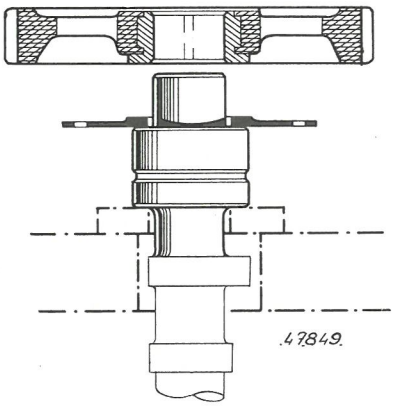
If pressure is still low after checking and overhauling of the relief valve, this condition is due to the wear of the pinions.

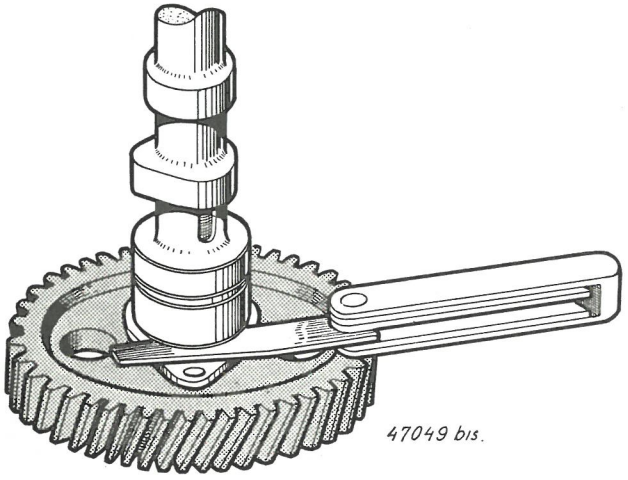
The latter should be replaced and the cover joint surface should be reworked.

Checking the oil pressure on the vehicule.

Remove the oil pressure switch and fit instead the oil pressure checking gauge (Ref. Mot. 73).







ENGINE REASSEMBLY

(continued)

TIMING GEAR (continued)

Case of the timing gear being replaced (it is necessary to remove the camshaft).

Dismantling.

Pull out the gear to be replaced (drive out the shaft on a press, thrust being taken on the thrust flange).

Make sure that the spacer and thrust rest face is correct, replace if necessary.

Reassembling.

Fit the rear face of the first camshaft bearing on blocks.

Never allow to rest on the other end of the camshaft.

Fit the spacer **with the inside chamfer towards the camshaft.**

Position the thrust flange, **with the friction face identified by the two lubrication grooves, towards the gear,** and the key.

Position the timing gear, with groove and key aligned and **with hub flange towards camshaft.**

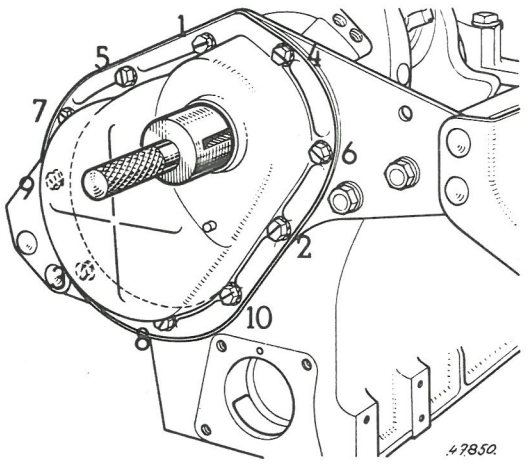
Coat bore with tallow.

Push in the gear with a press until a correct lengthwise clearance is obtained at the flange (.06 to .12 mm).

Check with a set of feeler gauges.

If the lenthwise clearance is small, move back the gear until the correct clearance is obtained.

If the clearance is high, pull off the gear, reduce spacer thickness and refit the gear.



Position the timing gear cover with gasket and align with aligner (Ref. Mot. 39).

Moderately tighten the bolts in the sequence as illustrated.

Place pulley on crankshaft and run up the starting dog.

Assemble the oil sump with new cork gaskets.

Fit engine on support (Ref. Mot. 47).

ENGINE REASSEMBLY

(continued)

TIMING GEAR (continued)

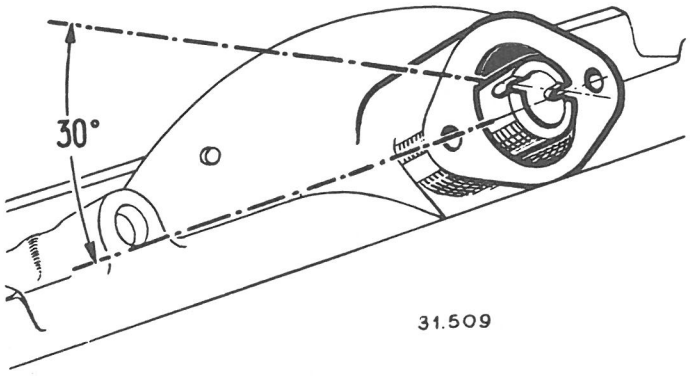
Refit the water pump.
Position the oiled rocker arms in correct sequence.
Remove the cylinder liners holding washers.
Refit cylinder head (See page 11).
Refit the cylinder block side cover with a new gasket.

Position the oil pump pinion and **direct it :**

— move piston No. 1 **(at clutch side)** at top dead center **(the valves on the cylinder N°. 4 should be in balance and the mark on the pulley should be in front of the pointer) ;**

— **direct the slot of the pinion** at 30 degrees with the lengthwise centreline of the engine **(the largest offset towards engine and towards clutch).** Thus, the distributor will be correctly directed when assembling.

Refit the distributor bracket with a new paper gasket.



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Complete the operations by equipping the engine : to this end, perform in reverse sequence the stripping operations (page 9).

REPLACING A VALVE SPRING ON THE VEHICLE.

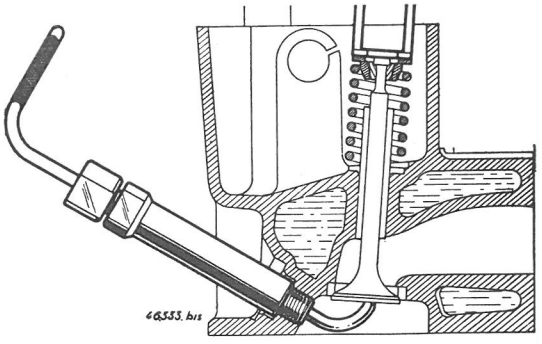
Remove the pushrod of the valve concerned; to this end :

a) **Inlet pushrods :** with the valve closed, and the adjusting screw on the rocker arm being loosened as far as possible, lightly compress the spring with a compressor (Ref. Mot. 14), slide the rocker arm on its shaft and tilt. Remove pushrod.

b) **End exhaust pushrods :** with the valve closed and the adjusting screw being loosened as far as possible, remove the shaft plug and the thrust spring, lightly compress the spring with a compressor, slide the rocker arm on its shaft and tilt. Remove pushrod.

c) **Centre exhaust pushrods :**
Cylinder No. 3 : the 4 valves on the shaft concerned being closed and the adjusting screws loosened as far as possible, clear the rocker arm shaft and remove the retainer shims. Remove the shaft plugs and shaft passage plugs. Remove the shaft enough to remove the rocker arm using the tool (Ref. Mot 43).
Cylinder No. 2: same operations as above except that the tool cannot be used and therefore the shaft will have to be removed by hand by very lightly opening the bores with small wedges inserted in the bearings slot.

Fit the tool (Ref. Mot 36) at the location of the sparking plug and direct the rod in order to block the valve head.
Remove the spring cap rubber sealing washers, compress the spring (Compressor Ref. Mot. 14), remove the spring split cones, remove the cap and the spring.
For reassembly, follow the dismantling operations in reverse sequence : **the spring mounted with closed coils towards the cylinder head — do not omit the two gaskets at end of rocker arm shaft in the lubricating sleeve — adjust the position of the rocker arm shafts** (See page 14). **Check the cylinder head for tightening** (9 m.kg) **and adjust the rocker arms** (See page 11).



TUNING UP THE ENGINE

PRELIMINARY OPERATIONS

SYSTEM	UNIT	OPERATIONS TO PERFORM
FUEL	Carburetter.	Remove. **Check condition of gaskets and of insulating pad.** Replace if necessary. **Check condition of thrust face** of attaching flange. Rework if necessary. Remove top of bowl, float, jets and filter. Clean parts in petrol and blow with compressed air. Reassemble and refit the carburetter. **Moderately tighten** the attaching nuts.
	Fuel pump.	Remove cover, gasket and filter. Clean filter and bowl. **Change gasket.** Reassemble.
	Air filter.	Clean (See " Fuel system " page 33).
IGNITION	Sparking plugs.	Clean : sand blast. Check general condition (insulator, electrodes). Replace if necessary. Set electrodes spacing to .7 to .9 mm. Replace gaskets.
	Ignition wires.	Check condition of sparking plugs wires and of coil to distributor wire. **The wires should be very clean and show no traces of breakage.** Check condition and tightness of connections : **high and low voltage.**
	Distributor.	Clean. Check condition of contact points and set spacing from .4 to .5 mm. Check on test bench (see chapter " Ignition ") : — the position of the 4 sparks, — the centrifugal advance curve, — the vacuum advance curve, — the condenser.

ADJUSTING OPERATIONS

ON	UNIT	OPERATIONS TO PERFORM
Engine COLD	Cylinder head.	Check cylinder head tightening to 9 m.kg. Check manifolds for tightening : at centre : 3.5 m.kg. at ends : 2.5 m.kg.
	Rocker arms.	Set rocker arms clearance : Inlet : .15 to .18 mm. Exhaust : .15 mm.
	Distributor.	Set distributor. To this end : — with the starting handle, bring mark on pulley rim (crankshaftpulley) to 5 mm before the pointer attached to the timing gear housing, — fully push in the manual advance knob, — connect the tell tale lamp between primary wire and earth, — turn ignition on, — rotate distributor body counterclockwise until the tell tale lamp flashes on. — secure distributor. Check the distributor for correct setting. To this end : — slowly rotate with starting handle until the tell tale lamp flashes on, — at this time, the mark on pulley should be at 5 mm before the timing gear housing pointer; if not, resume the setting operation. Check for proper operation of the hand advance.
Engine HOT	Cylinder head.	Check cylinder head tightening to 9 m.kg.
(Normal operation temperature).	Carburetter.	Adjust slow running (See " Fuel System " page 32).
	Engine.	Check compressions with a compressiometer.
Engine COLD	Cylinder head.	Check cylinder head tightening to 9 m.kg.
(After cooling down).	Rocker arms.	Set rocker arm clearance : Inlet : .12 mm. Exhaust : .17 mm.

FUEL SYSTEM

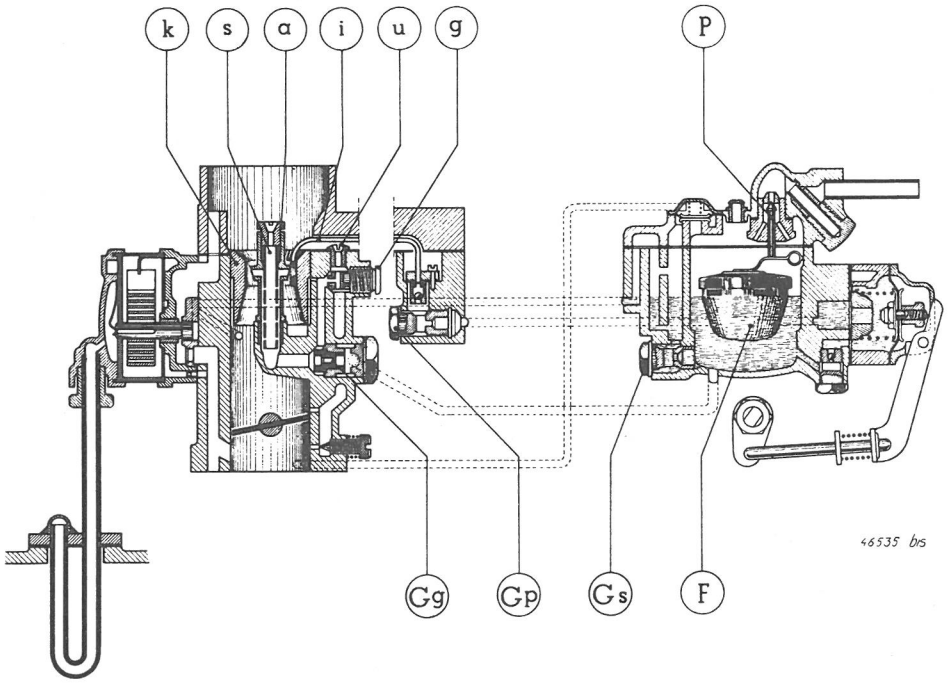


Plate reference	SOLEX 32 P.I.C.B.T. CARBURETTER with automatic choke controlled by thermostatic spring	Reference 258
	NORMAL OPERATION :	
Gg	Main jet	130
a	Air correction jet	175
K	Spray chamber	27
S	Emulsion tube	19
P	Needle valve	1.7
F	Float	5.7 gr (2 oz) nylon
	SLOW RUNNING :	
g	Slow running jet	50
u	Slow running air metering jet	120
	CHOKE :	
Gs	Choke fuel jet	110
(Ga)	Choke air jet	None
	CARBURETTER FUEL :	
Gp	Pump jet	50
i	Pump injector	Low
	Vacuum connection	With

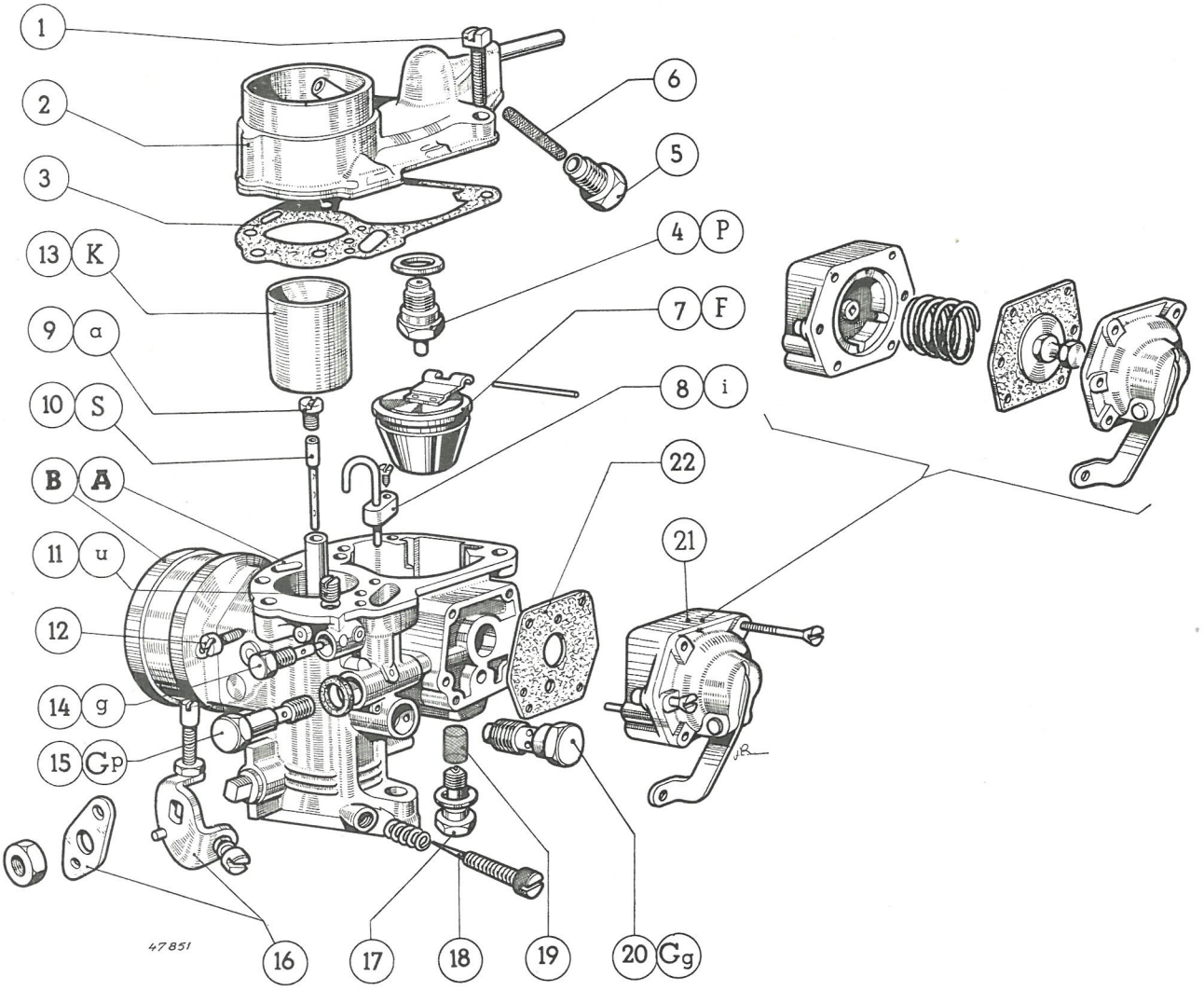
NOTE. — " High altitude " carburetters (Ref. 257-1) and " Tropiques " (Ref. 257) have the same adjustment values. The only differences are :

" High altitudes " : — with altitude corrector,
— without vacuum connection,
— 1.7 needle valve with spring.

" Tropiques " : — without vacuum connection,
— 1.7 needle valve with spring.

FUEL SYSTEM

(continued)



DISMANTLING THE CARBURETTER " A ".

The dismantling of the carburetter itself " A " is to be performed following the reference numbers on the above illustration.

REASSEMBLING THE CARBURETTER.

Carefully clean with petrol and blow with compressed air the fuel inlet filter, its support plug and the jets. **Never insert a metal wire in the jets calibrated holes.**

DISMANTLING THE AUTOMATIC CHOKE " B ". (See illustration on next page.)

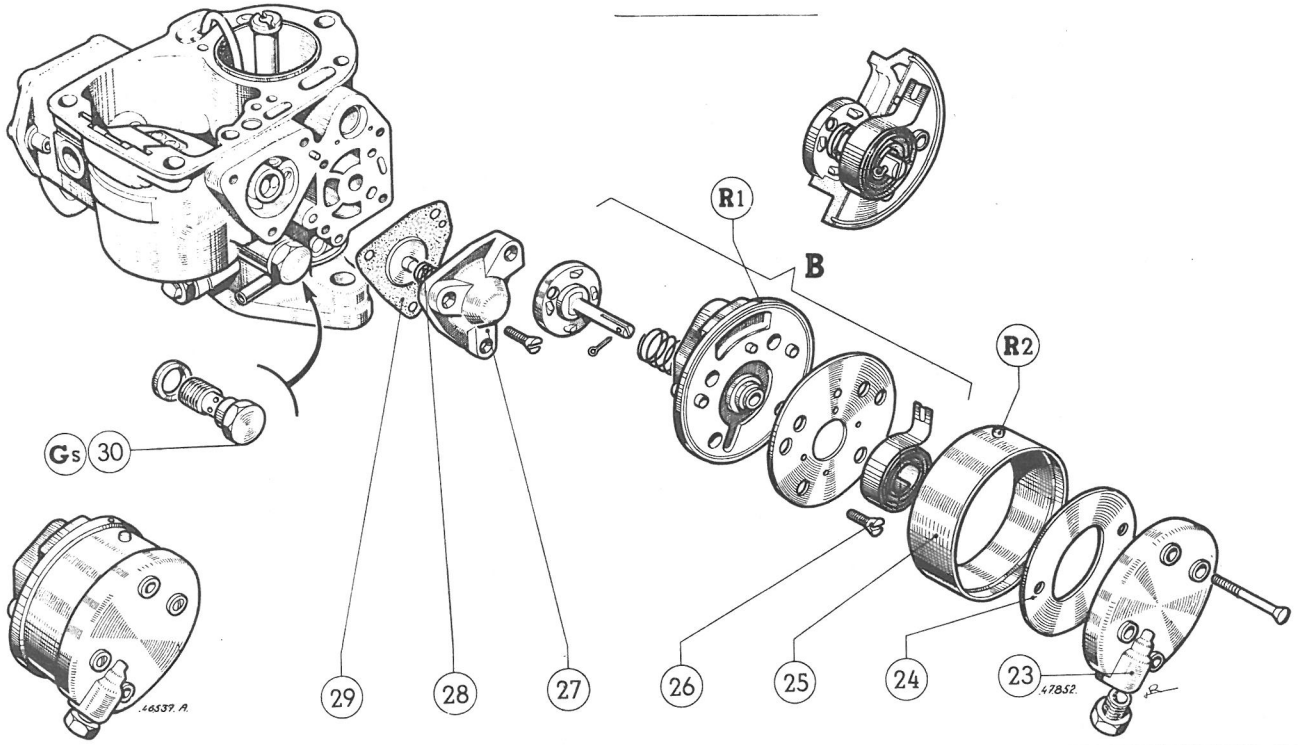
Remove :

— the choke cover (**23**), the insulating washer (**24**) and the case (**25**),
— the 4 choke body attaching screws (**26**),
— the assembly : body, thermostatic spring, pin, plate, gasket (**B**),
— the cover (**27**) of the valve, the spring (**28**) and the diaphragm (**29**),
— the choke fuel jet (Gs) (**30**) and the gasket.

NOTE. — **Should the plate or the thermostatic spring be damaged, replace the assembly " body, thermostatic spring, shaft, pin, gasket " (B).** The adjustment position is determined at the works for this assembly and is identified with a punch mark **(R 1)** on the body.

FUEL SYSTEM

(continued)



REASSEMBLING THE AUTOMATIC CHOKE.

On the carburetter body, install :

— the diaphragm (**29**), with the spring aligner pin outside,
— the spring (**28**) and the cover (**27**).

Direct the plate; to this end, fit :

— **Vertically,** the slot of the pin receiving the thermostatic spring.
— The calibrating hole (the hole through the plate) **towards the carburetter bowl.**

Attach the assembly " body, thermostatic spring, shaft, plate, gasket " (**B**) on to the carburetter body.

Assemble :

— the thermostatic spring positioning case (**25**), with the end of the spring inserted in the case clip,
— the insulating washer (**24**) and the case cover (**23**) with the heating connection towards carburetter bowl.

Fit R2 pointer of case (**25**) in alignment with the punch mark R 1 on the body.

Tighten cover screws (**23**).

NOTE. — If the assembly (**B**) has been dismantled, the thermostatic spring will be inserted on the plate pin, during reassembly, **with the spring coiling being clockwise.**
The adjustment of this assembly (as indicated by punch mark R1) is made at the works by moving the position of the cover whereto the end of the thermostatic spring is connected. This adjustment being made at a pre-set value at a determined ambient temperature, it is absolutely required, when reassembling, that the pointer R2 on the cover be correctly aligned with the punch mark R1 on the body (initial adjustment position).

CHECKING AND FAULT FINDING

Checking the cut-out : make sure the choke is cut out when the engine has attained its normal operation temperature. By plugging the choke air inlet in the carburetter main air inlet, no decrease in RPM should be found.

If no cut out :

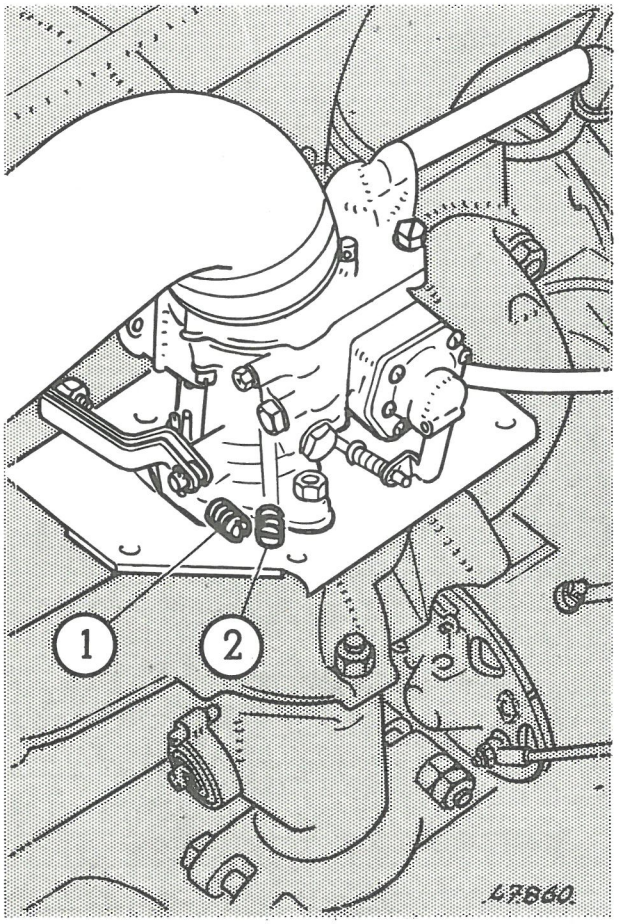
— case unproperly adjusted (marks).
— the plate pin seizes,
— poor bearing of the plate,
— tube punctured or plugged,
— air inlet at case,
— spring broken or not hooked.

If it remains cut :

— case unproperly adjusted (marks),
— plate pin seizes,
— spring broken or not hooked.

Poor cold starting :

— the valve does not bear properly on its seat.



FUEL SYSTEM

(continued)

SLOW RUNNING (IDLING) ADJUSTMENT.

NOTE. — Before adjusting the slow running RPM, it is essential to check the condition of the sparking plugs and to carefully adjust the electrode gap.

Operate on engine when hot.

Tighten the slow running air mixture screw (2) fully and, next, loosen by 3 turns.

Start engine.

Slightly tighten the slow running stop screw (1) in order to accelerate the engine.

Lightly loosen the air mixture screw (2) until the engine " races " and next, progressively tighten until engines runs smoothly.

Very slowly loosen the stop screw (1) to bring engine speed to approximatively 500 RPM.

If engine again " races ", lightly retighten the air screw (2).

Make sure :

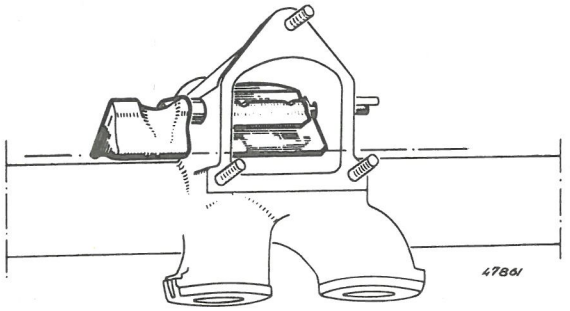
— that, without accelerating, the engine starts ;

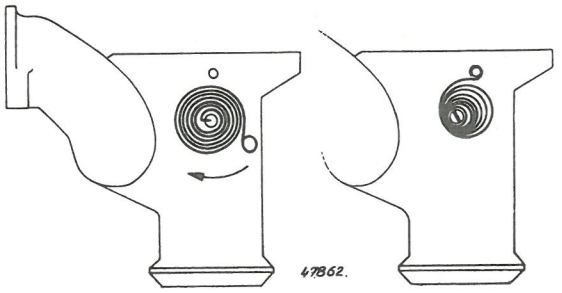
— that, after sudden acceleration, it does not stall.

Eventually, again tighten lightly the stop screw (1).

Make sure, with engine stopped, that the throttle plate opening is complete (the screw should contact the carburetter body when the pedal is at end of stroke).

If not, shorten the accelerator control cable by running up the adjusting nut.





Inlet and exhaust **manifolds.**

— Tightening torques for the attaching nuts :

At centre	3,5 m.kg
At ends	2,5 m.kg

Fitting a new heating flap.

Fit a new flap **(the plate with two holes for the mounting at end opposite to tubes),** and insert the pin assembly with counterweight **(the slotted end towards the spring lock).**

Position the flap with reference to the pin **(the edge of the flap to be aligned with that of the counterweight)** and, next, weld the plate on the pin with two arc welding spots in the two holes provided to this end in the flap.

Fit the thermostatic spring on the flap pin (coiling direction clockwise) and fit cotter pin.

Tighten spring by approximately half a turn, hook on pin and lock.

Through the thermostatic spring, the flap should remain in open contact position.

Reassemble and refit the manifolds, taking care to align the assembly face of the two manifolds (cylinder head end) with a rule before tightening the three mounting nuts of the two manifolds.

FUEL SYSTEM

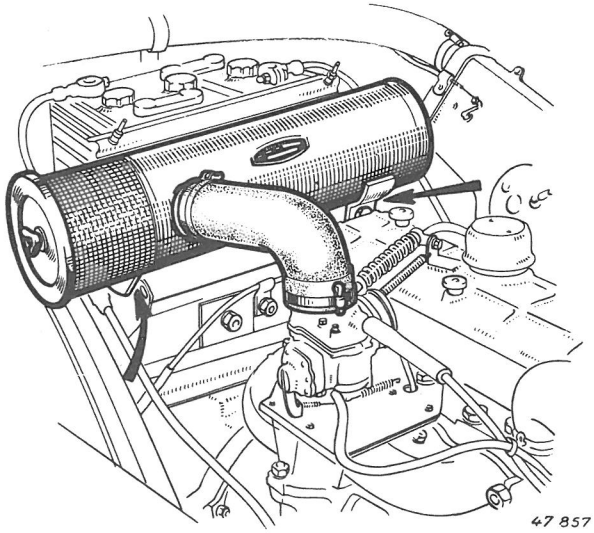
(continued)

DRY TYPE AIR FILTER
" TECALEMIT BTG 12 "

Removing.
Disconnect at the locations shown by the arrows.

Refitting.
Operations in reverse sequence.

Cleaning.
The filtering element (Tecalemit BTG 1010) should be cleaned every 10,000 km, more often in dusty areas.
Remove the wing nut, remove the cover and the filtering element. Blow from the inside and refit.



DRY TYPE AIR FILTER
" VOKES L 228 R "

Removing.

Disconnect at the locations shown by the arrows.

Refitting.

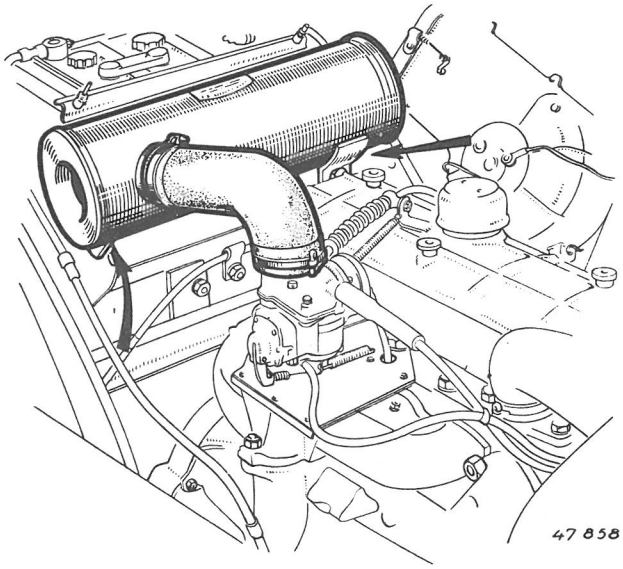
Operations in reverse sequence.

Cleaning.

Replace the filtering element every 10,000 km.

The replacing of the filtering element may only be performed when the filter is removed.

Remove the wing nut, remove the cover and the filtering element.



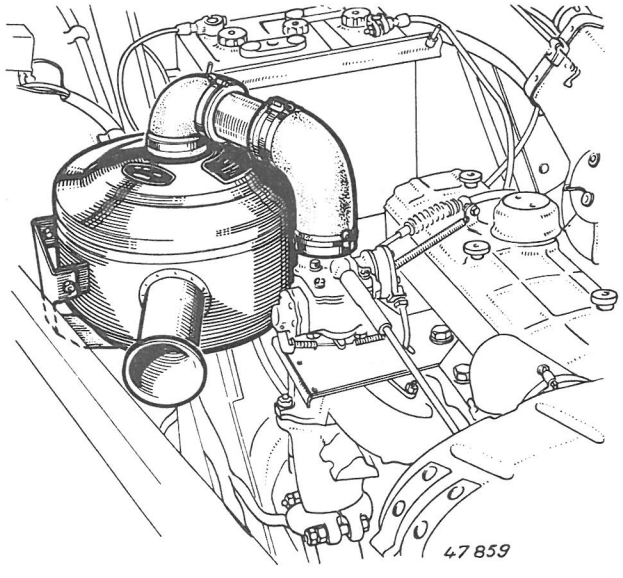
OIL BATH AIR FILTER
" TECALEMIT BT 412 "

Mounted on tropical vehicles.

Removing.
Disconnect at the mounting points on the bracket.

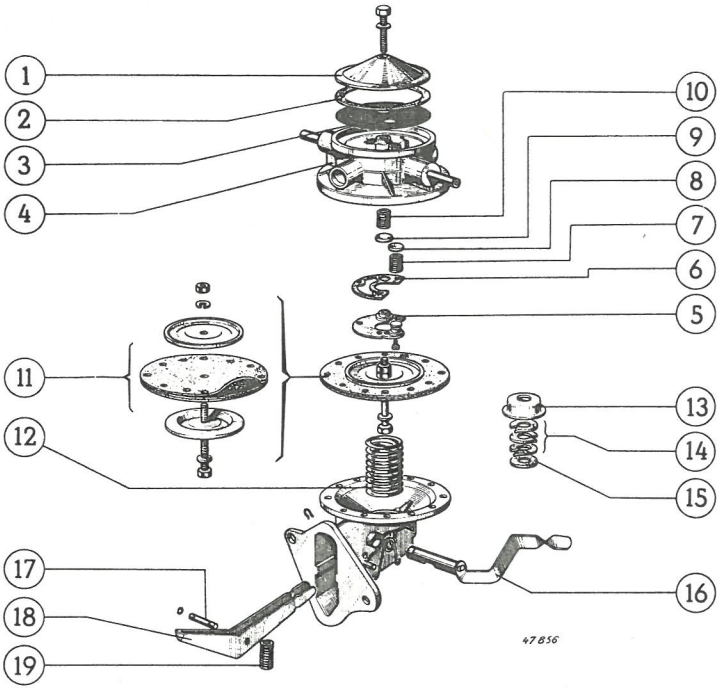
Refitting.
Operations in reverse sequence.

Cleaning.
The checking of the oil level and the cleaning of the filtering element are to be performed every 1,000 km, more often in very dusty areas.
Disconnect the flexible connection.
Remove the wing nut (at lower end of filter) and next remove the cover and the filtering element BTU 1622.
Immerse the filtering element in clean petrol and blow dry.
Check oil level (should be flush with base of baffle).
Check condition of seals.
Reassemble.



FUEL SYSTEM

(continued)



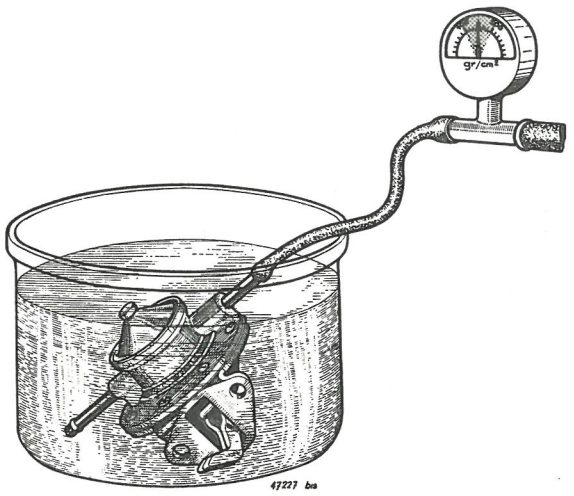
FUEL PUMP S.E.V. TYPE 4 EW
or A.C. TYPE RG

Inlet vacuum and delivery pressure ..... from 150 to 170 g/cm²

DISMANTLING AND REASSEMBLY.

The dismantling and reassembly operations of the fuel pump will be made according to the sequence of the figures shown on the above illustration (mark the position of the upper body (4) with reference to the lower body).

NOTE. — The washer (**15**), the sand protecting washers (**14**) and the gasket cup (**13**) are assembled on the **S.E.V. type 4 FG** carburetters only as used on **tropical vehicles.**



CHECKING the fuel pump :

— Carefully obturate the delivery hole of the pump and connect a flexible tube at inlet.
— Completely immerse the pump in clean petrol. Through the flexible tube, blow compressed air under a pressure of 100 to 300 g/cm².

If bubbles escape :

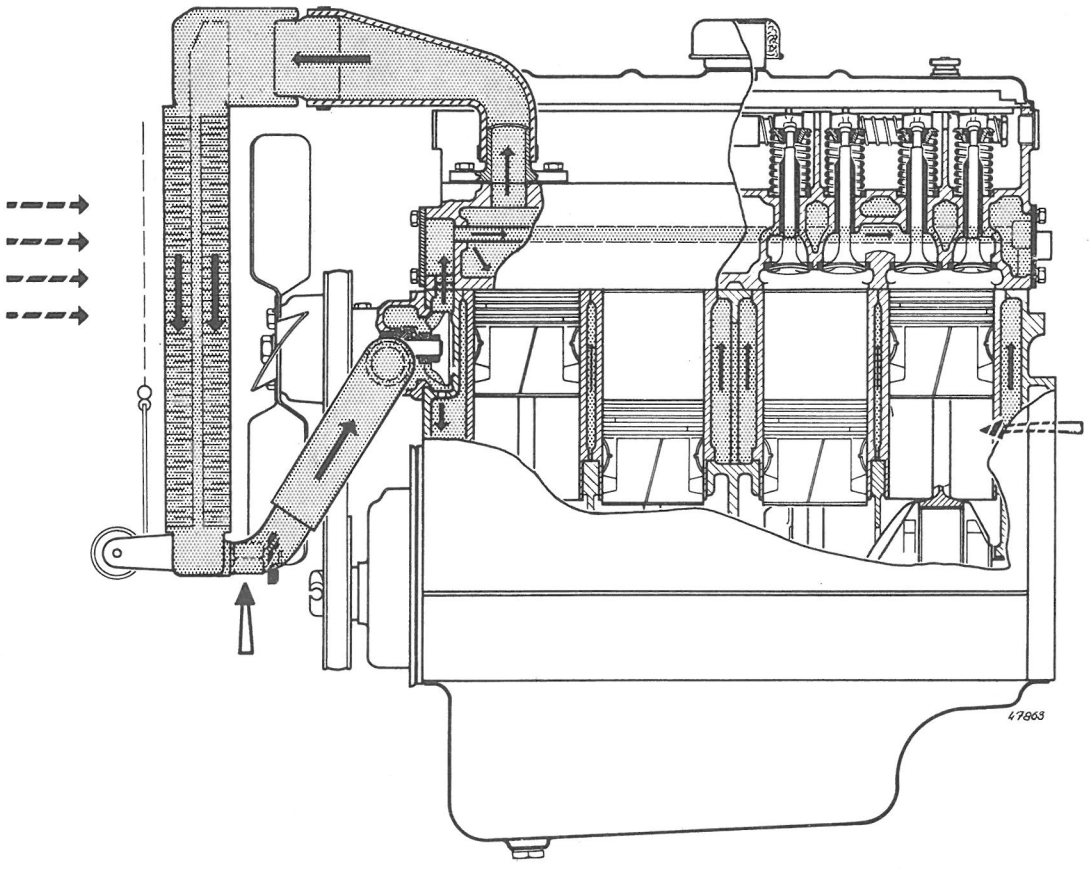
1° Through the drive lever (rocker) location :
— **the diaphragms are not tight** : replace.

2° Through the cover joint surface :
— **the gaskets are defective,**
— **or the diaphragms are not correctly tightened.**
Correct.

NOTE. — At the start, a slight bubbling may be encountered due to the depression of the diaphragms. This condition should cease in a few minutes.

If it is desired to measure the vacuum and pressure values, it will be necessary to have a special test bench.

COOLING SYSTEM

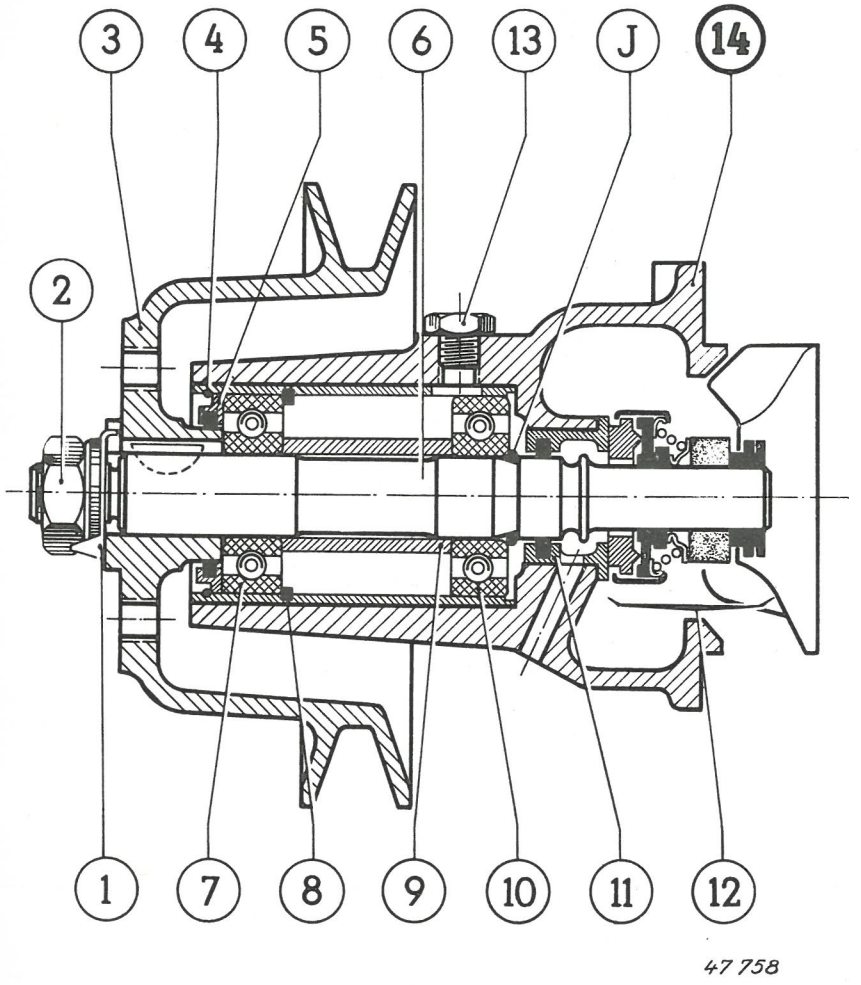


SPECIFICATIONS.

The cooling is through a radiator and a recirculated water acceleration pump.

Cooling system capacity	10.4 l
Normal operation temperature	80 to 85° C
Opening temperature of thermostat valve :	
— opening starts at.	65° C
— fully open at	80° C
Tightening torque for fan pulley	2 m.kg maximum
Deflection of fan belt, measured at longest section	20 mm

Draining of cooling system : remove drain cock located at lower end, rear, of radiator and the cock at rear end of engine above starter. Do not omit draining also the SOFICA heater (at lower end).



COOLING SYSTEM

(continued)

WATER PUMP

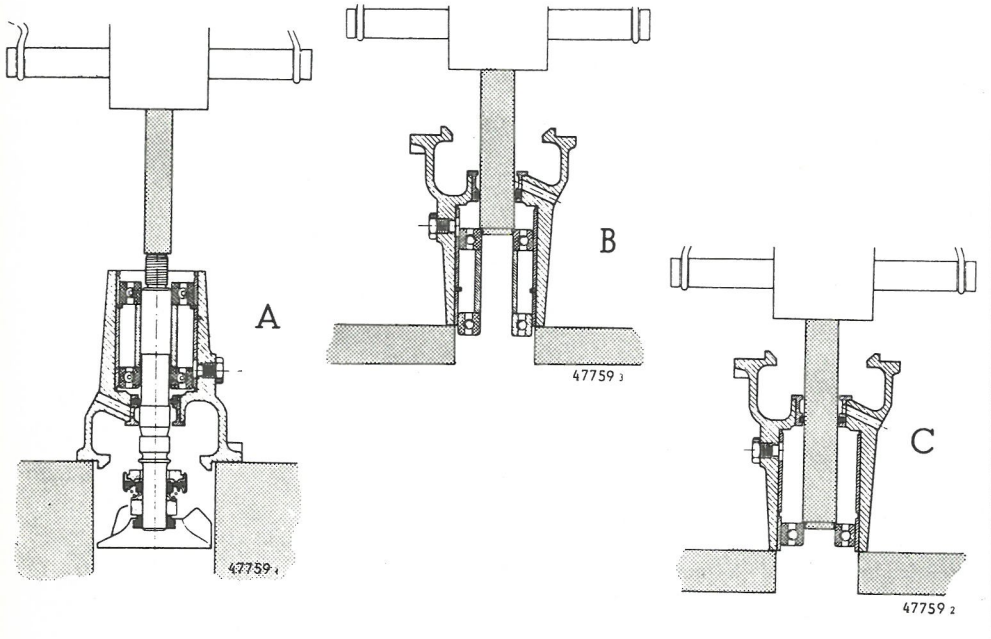
DISMANTLING.

Remove :

— the nut (2) at shaft end after removing lockwire (1),

— the pulley (3) and the key,

— the cage (4) snap ring and the felt cage (5).



A — Drive out the pump shaft (6) on a press.

B — Push the rear bearing (10) on a press.
When the front bearing (7) is cleared, remove the snap ring (8) and the spacer (9).

C — Next, remove on a press the rear bearing (10).

If the bronze bush (11) is defective, replace (see next page).

Never separate the pump shaft (6) from the assembly (12) " friction washer, rubber gasket, gasket cage, thrust spring, rubber spacer and impeller ".

COOLING SYSTEM

(continued)

WATER PUMP (continued)

REASSEMBLING.

For the reassembly, perform the dismantling operations in reverse sequence, attention being paid however to the following points :

— **do not push in the pump shaft (6) entirely, allow the nut (2) to position the shaft,**
— **tighten nut (2) at 2 m.kg (14.4 ft/lbs) maximum in order to avoid that the ring (J) clears its location,**
— fill with grease the pump body by temporarily replacing the plug (13) by a lubricator,
— **replace the pump body gasket.**

OVERHAULING.

Leaks at the water pump may stem from two causes :

— **poor condition of the friction washer : replace,**
— **poor condition of the bronze bush : replace.**

REPLACING THE FRICTION WASHER.

Mandatorily replace the pump shaft assembly (6) and the assembly (12) including : friction washer, rubber gasket, gasket cage, thrust spring, rubber spacer and impeller.

NOTE. — This assembly is not to be separated.

REPLACING THE BRONZE BUSH.

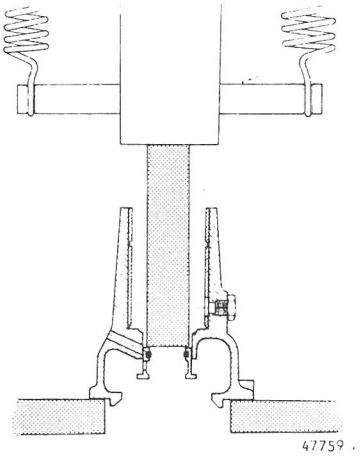
Drive out the bush on a press.

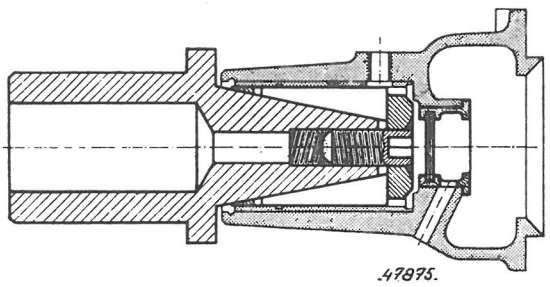
Install a new bush, aligning the bush hole with the one of the pump body.

On a lathe, with a soft jaw chuck, fit the tool (Ref. 02) and, next, place the pump body on it.

Clean the bronze bush thrust face and break the sharp corners.

NOTE. — It is essential that the chuck be made very carefully.



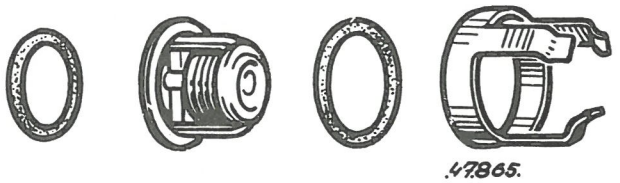


WATER TEMPERATURE SENDERS AND RECEIVERS

Checking : Use the **JAEGER temperature indicators checking device** (Ref. 04). Follow the instructions of the manufacturer for using the tool.

COOLING SYSTEM

(continued)



REMOVING AND REFITTING THE THERMOSTAT.

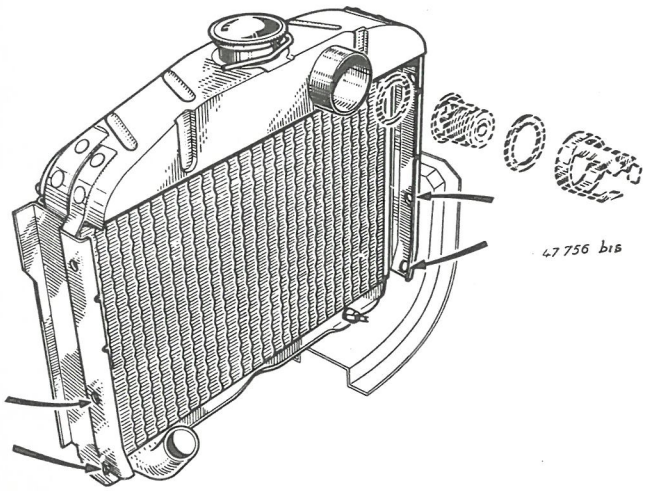
Partially drain the cooling system.

From radiator, disconnect the radiator cylinder head flexible connection.

Remove the clip by bringing the three tabs towards the centre.

Save the valve and the gaskets.

For refitting, perform the removing operations in reverse sequence.



REMOVING AND REFITTING THE RADIATOR.

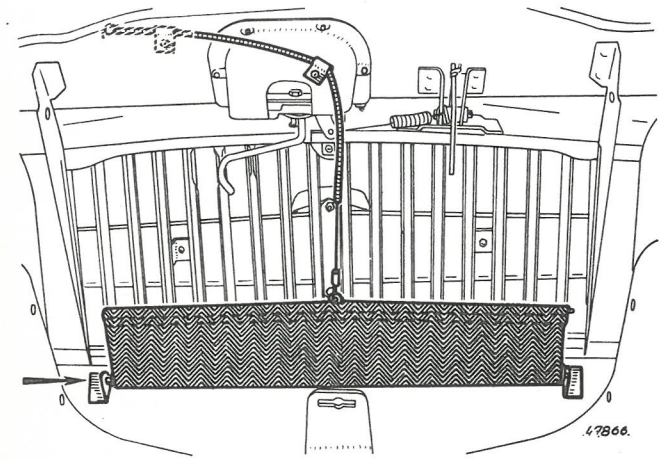
Drain the cooling system.

Disconnect from radiator the two " radiator-cylinder head " and " radiator-pump " flexible connections.

Remove the radiator to radiator support cross member attaching bolts.

Remove the radiator.

For the refitting, perform the removing operations in reverse sequence.



REMOVING AND REFITTING THE BLIND.

Remove the radiator (see above).

Remove the blind control cable retainers on the grille.

Clear the telescopic pin of the blind from its location.

Remove the radiator blind with control cable.

For refitting :

— insert the telescopic pin of the blind into its location,

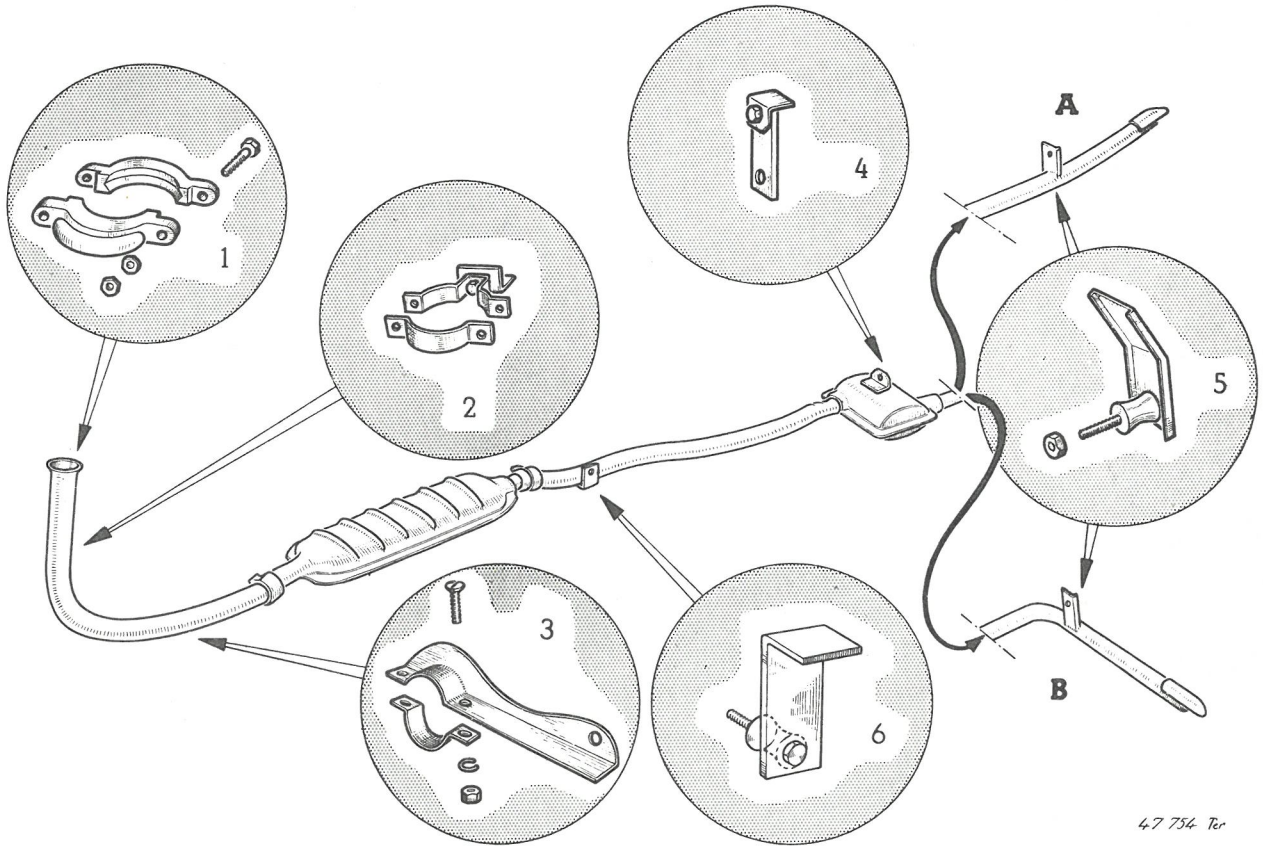
— **rotate the blind by 6 turns** in the unwinding direction in order to tighten the retracting spring,

— insert the second blind pin and hold the blind.

Attach the control cable on grille.

Refit the radiator.

EXHAUST SYSTEM



A — Rear end pipe for " Fregate " and " Caravelle ".
B — Rear end pipe for " Domaine ".

REPLACING THE SILENCER.

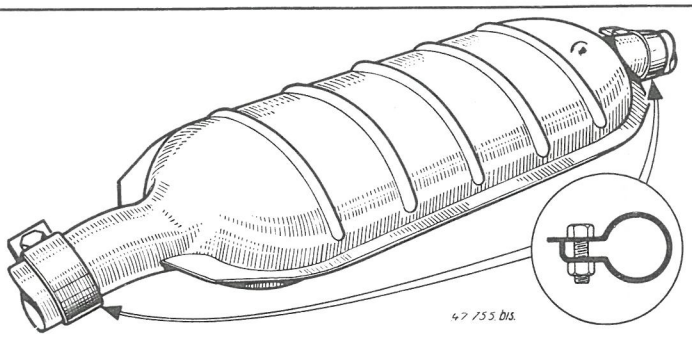
Loosen the clamps, front and rear, of the silencer.

Disconnect the exhaust pipe at its 3 mounting points.

Push the pipe towards front by removing it from the silencer.

Pull out the silencer from the front tail end.

For refitting a new silencer, perform the removing operations in reverse sequence.



REPLACING A RESONATOR.

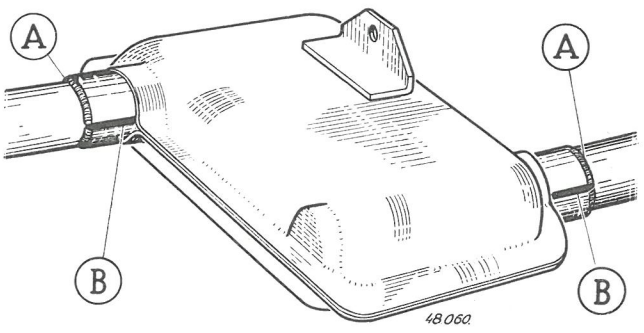
Loosen the silencer rear clamp.

Remove the assembly " resonator - front end pipe and rear end pipe ".

With a hacksaw cut the front and rear end pipes as close as possible to the welding seam (**A**).

For the reassembly, lightly insert the end pipes in the resonator while following their respective direction.

Weld the end pipes on the resonator as per seam (**A**) and weld the two edges of the slot (**B**) of the resonator outlet pipes.



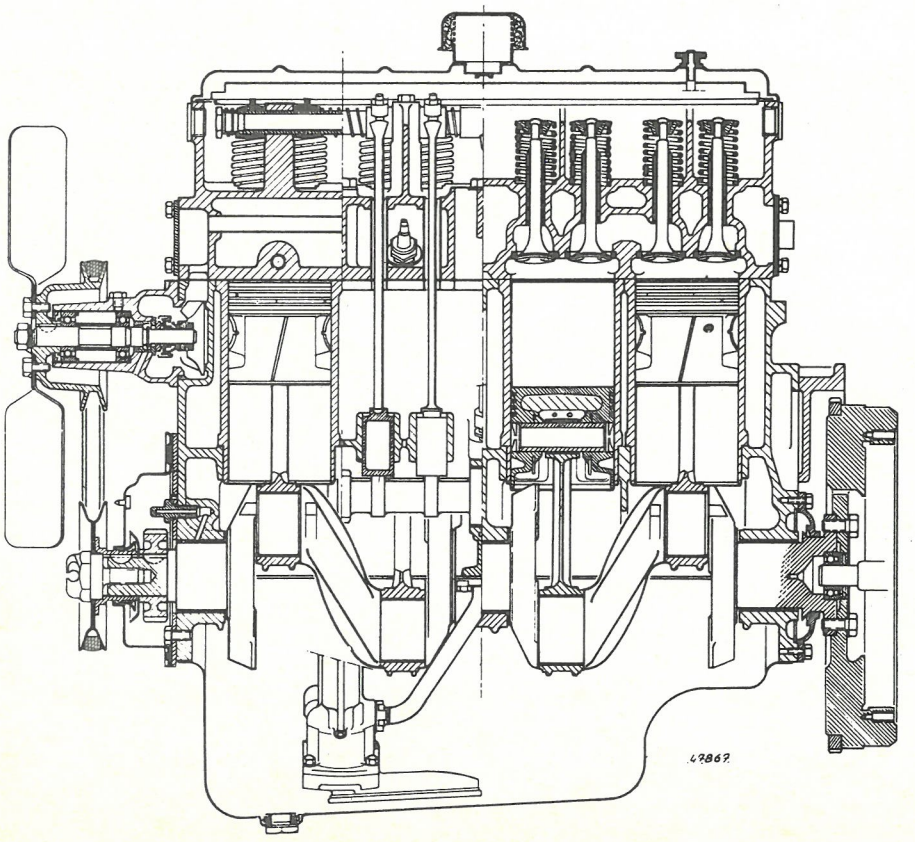
" 2 LITRE ", 668-6 TYPE ENGINE

Same specifications and adjustments as for " Etendard " engine, except for :

General specifications :

Horsepower rating :	
— Taxable	11 HP
— Brake, at 4,000 R P M	62 HP
Bore	85 mm
Piston displacement	1.997 l
Cylinder head :	
Height (between joint surfaces)	146.7 mm
Chambers volume	71.5 cc ± .5
Identification mark (stamped on manifold assembly face, at front)	7
" Cylinder liners - Pistons - Connecting rods " assemblies :	
Cylinder liners : bore	85 mm + .04 + 0
Pistons : skirt diameter	85 mm — .04 — .02

NOTE. — For other dimensions, adjustments and repairs, see : " ETENDARD " ENGINE type 671-1, page 5.



3. CLUTCH

SPECIFICATIONS

Single disc dry type clutch. " FERODO " Type PKSC 13.

Elastic hub type clutch disc.

Lining thickness : 8.4 mm $^{+\ .4}_{+\ 0}$ (under load).

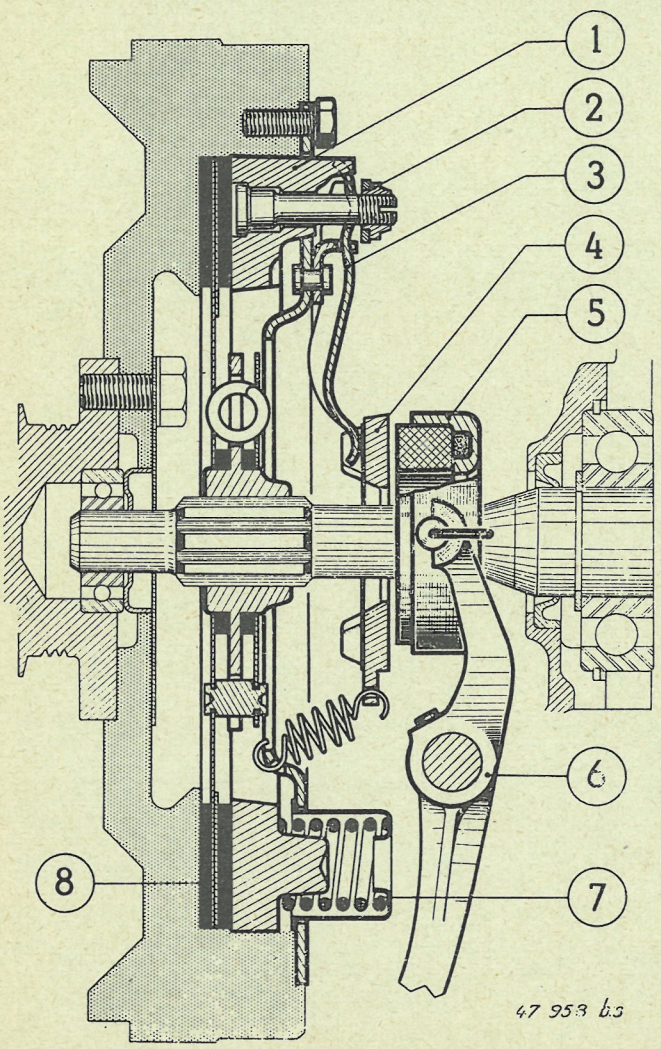
Number of springs : 6 (3 light red colour ones — 3 light grey and black ones).

Pressure springs :

Number	9
Colour	White
Free length	46 mm
Loaded length	29.7 mm under load of 52 kg $^{+\ 3.5}_{+\ 0}$
Pedal free play	20 mm
Tightening torque of flywheel attaching bolts	8 m.kg

IDENTIFICATION

The marking PKSC 13 is stamped on the outside face of the clutch cover.



OPERATION OF CLUTCH

Clutch release stage.

The movement of the pedal is transmitted by a **cable** to the clutch release fork (6).

This fork, by pivoting, moves the clutch thrust bearing (5) forward and the latter contacts the clutch bush (4) (pedal free play compensation) and apply pressure on the bush.

In turn, the bush moves forward and tilts the three clutch release levers (3).

The levers, being made integral with the clutch plate (1) through the 3 bolts and nuts (2), move the plate backwards, thereby compressing the pressure springs (7) and freeing the clutch disc (8); the power flow from the engine to the gearbox is interrupted.

Clutch application stage.

When the pressure on the pedal is released, the thrust bearing is moved backwards, both by the pulling of the retracting spring on the pedal and by the bush and the levers which are actuated by the pressure springs on the plate through the bolts.

The plate moves forwards and compresses the disc against the flywheel. The engine rotation is now transmitted to the gearbox.

REMOVING AND REFITTING

REMOVING.

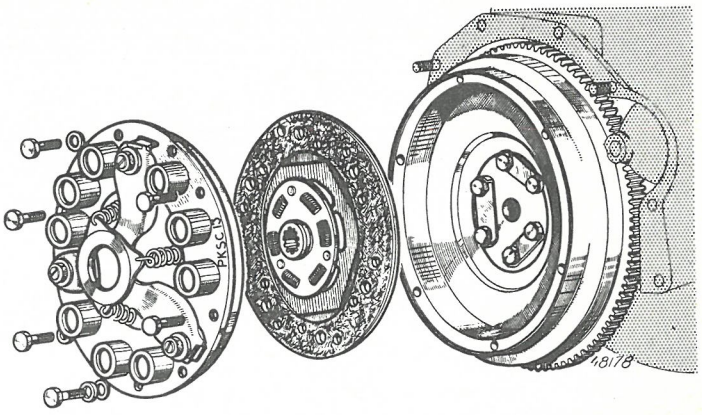
It is to be performed with engine in place.
Remove the gearbox (see page 80).
Mark the position of the mechanism with reference to the flywheel.
Remove the bolts attaching the mechanism to the flywheel and mark, if required, the position of the balancing washers fitted under the bolts.
Remove the mechanism and save the disc.

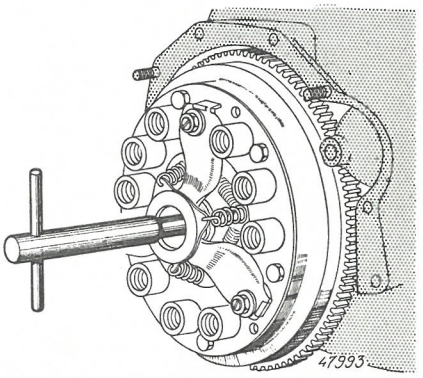
REFITTING.

Clean the location of the mechanism on the flywheel and make sure that the latter is in correct condition (see below).
Position the clutch disc, **with hub offset towards gearbox.**
Position the mechanism, **following the marks made during the dismantling** and hold with two bolts.
Align the disc with the aligner tool (Ref. Emb. 01).
Fit the attaching bolts with balancing washers at their initial location.
Progressively run up the bolts and tighten.
Remove the aligner tool.

NOTE. — When a **new mechanism** is fitted, do not omit **removing the shims** located under the fingers to facilitate the assembly.
Also in this case, **do not refit the balancing washers.** If the mechanism has been dismantled, perform its adjustment before refitting. (See page 45).

Next, refit the gearbox (See page 80).



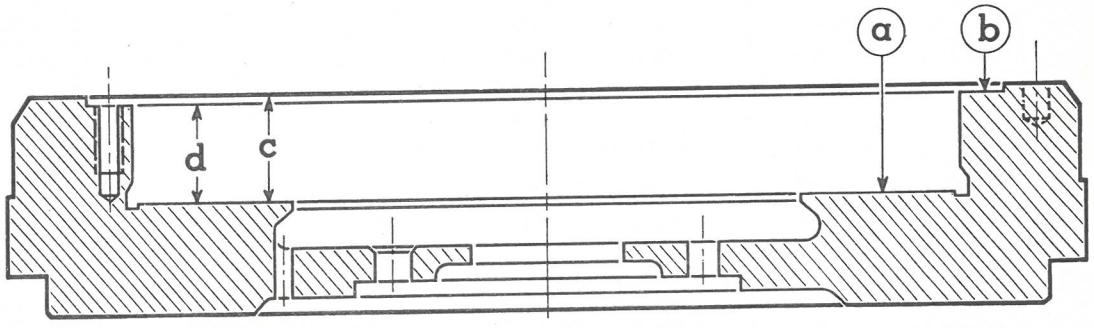


OVERHAULING THE FLYWHEEL

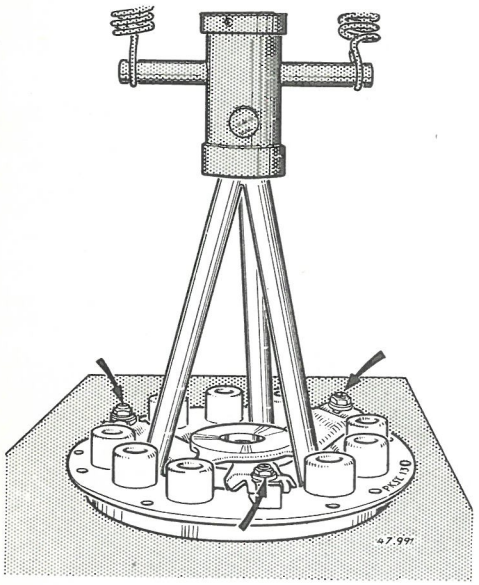
Do not separate the flywheel from the crankshaft unless grinding is necessary.
If the friction face is damaged, (scratches, heating marks, cracks, etc.) it has to be turned on a lathe or, better, on a grinding machine. The finished face should be finely polished.

Rework faces (a) and (b) by the same amount, to maintain the dimension **d** = 26.4 mm $^{-0}_{-.2}$

Under no circumstances should dimension (c) be over 29.5 mm, or the flywheel should be replaced.
It is essential that the flywheel be accurately centered on the fixture before rework.



47 987 bis



MECHANISM

DISMANTLING.

Mark the position of the plate (2) with reference to the cover (5) in order to ensure a correct balance.

Clear the nuts (8) by the stroke of a saw in the adjusting screw slot (1).

On a press, or on a drilling machine, and using a spring compression tripod (Ref. Emb. 05), remove the 3 adjusting nuts (8) previously cleared and unhook the 3 bush maintaining springs (10). Save the thrust plate (11).

OVERHAULING.

— Pressure plate : if scratches are evidenced, or cracks, or mottles, it should be replaced.

— Clutch disc : if damaged, if abnormal clearance is found, or if linings are worn or greasy, exchange for a new one.

— Pressure springs : Check for specifications (see page 42).

REASSEMBLING.

Clean all parts of the mechanism and, next, fit the pressure plate (2) on a press or on a drilling-machine. Insert, from underneath, the 3 adjusting screws (1).

Fit the 9 pressure springs (3) on the plate pins, with the cups (4) on the springs.

Hook the ends of the retracting springs (10) on the cover (5) and on the bush (9).

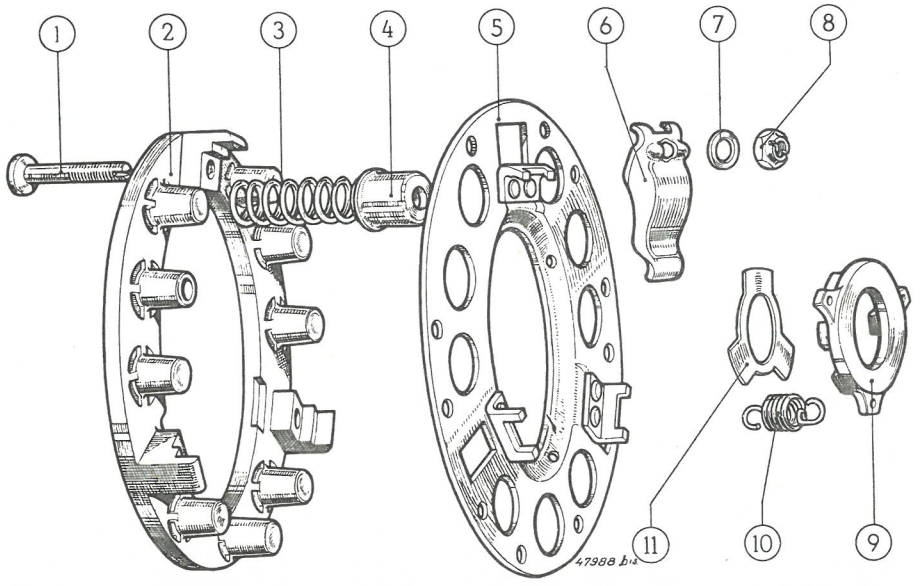
Fit the cover on the plate, **attention being paid to the marks.**

Cement the thrust plate with heavy grease and, next, position the 3 clutch fingers (6).

Using the tripod (Ref. Emb. 05), compress the springs.

Position the washers (7) and the nuts (8) on the 3 screws.

Tighten until screws are flush.



MECHANISM ADJUSTMENT

Adjustment of the mechanism is performed on the flywheel, either in place or removed, using a clutch control rule (Ref. Emb. 12).

Operate several times the mechanism to correctly locate the components.

Fit the 3 magnetic shims of 8.4 mm thickness (supplied with tool Ref. Emb. 12) on the flywheel friction face at three spots 120° apart.

Position the mechanism, making sure that the pressure plate rests on these 3 shims and tighten the 6 attaching bolts.

Fit the base of the rule on the clutch thrust bearing, making sure that the seating is correct.

While holding the base with one hand, allow the slider to move in order to bring the graduated rule at right angles with a flat portion of the cover in contact with the flywheel.

Move rule so that it contacts the cover.

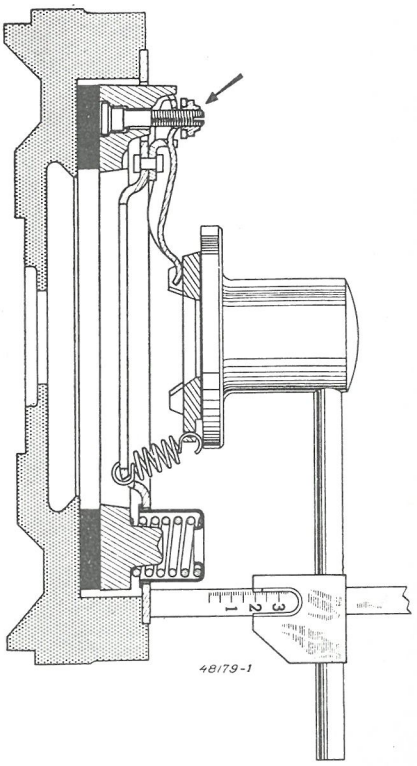
Record in front of the mark the dimension found.

This should be of 23 mm ± .5.

Perform this measurement at 3 spots 120° apart.

For the adjustment, operate the 3 adjusting nuts, checking the assembly when one of the nuts is turned.

When dimension A is obtained at three 120° apart spots, remove the mechanism and lock the nuts on the bolts by hammering metal down.



REPLACING THE THRUST BEARING

Remove the gearbox (see page 80).

DISMANTLING.

Disconnect the two retainers connecting the cage to the clutch fork.

The bearing with the grease recess is integral with the cage and **cannot be dismantled.**

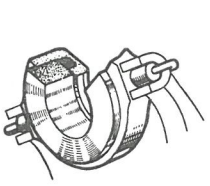
If the bearing is of the ball type, separate it from the cage after removing the spring.

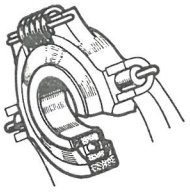
REASSEMBLING.

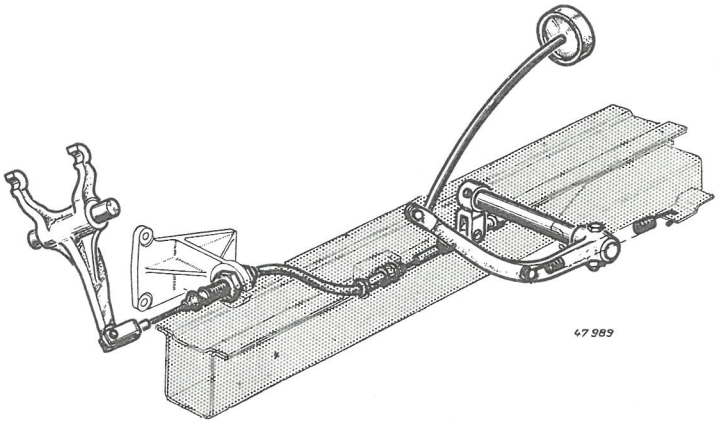
The grease recess type thrust bearing is delivered with the cage.

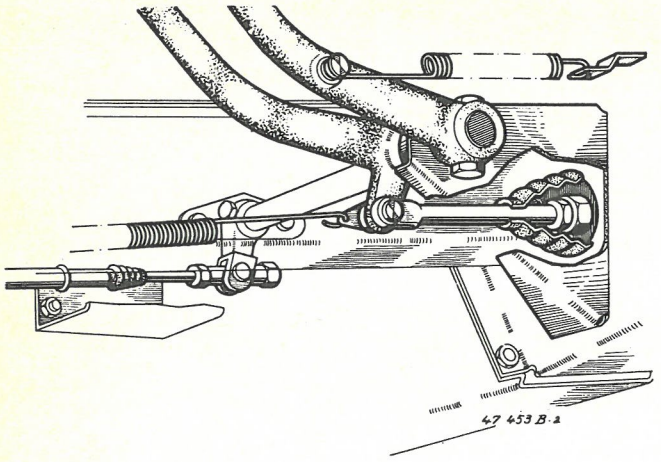
For a ball type thrust bearing, fit bearing in the cage fully and hook the spring.

Fit the cage on the clutch release fork; fit the retainers in the trunnion holes and hook on.









REMOVING AND REFITTING CLUTCH CONTROL

REMOVING.

Remove the pedal linkage protecting housing, disconnect the clutch pedal retracting spring and remove the pedal stem.

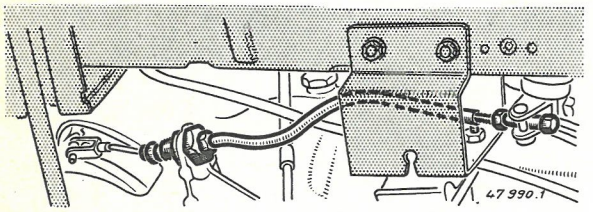
Remove the pedal lock screw on the shaft and remove the pedal.

To remove the clutch control idle lever, run off the threaded end of the control cable and the idle lever lock screw.

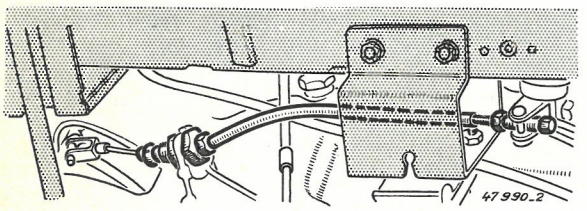
REFITTING.

Perform the removing operations in reverse sequence.

Adjust the pedal free play (see below).



A



B

REPLACING THE CABLE

REMOVING.

Run off the rear threaded end on the control idle lever.

Clear the rod.

Remove the sheath retainer from the rubber pad support.

Clear the sheath from the support on the gearbox.

Separate the cable from the clutch release fork.

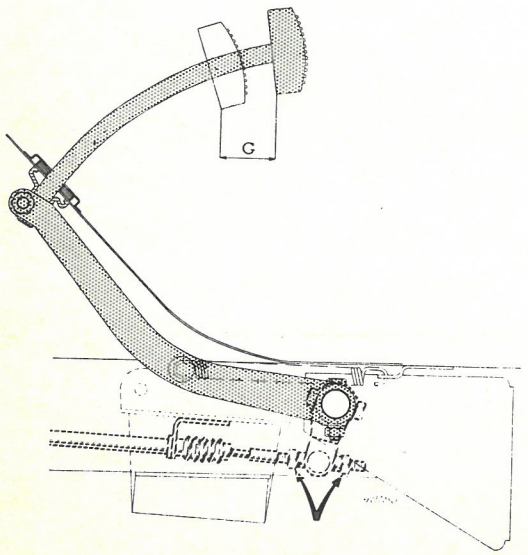
REFITTING.

Perform the removing operations in reverse sequence.

Make sure that the **two ends of the sheath** are not at an angle (**A**) but **parallel** (**B**).

To obtain this result, operate the two nuts attaching the threaded bush.

Adjust the pedal free play (see below).



ADJUSTING THE PEDAL FREE PLAY

Make sure, nrst, that the sheath is in a correct position i.e. does not interfere with the cable (see above).

To adjust the free play, run up or off simultaneously the two threaded ends fitted on the cable end, at idle lever end, until the free play J = **20 mm** is obtained at the pedal pad.

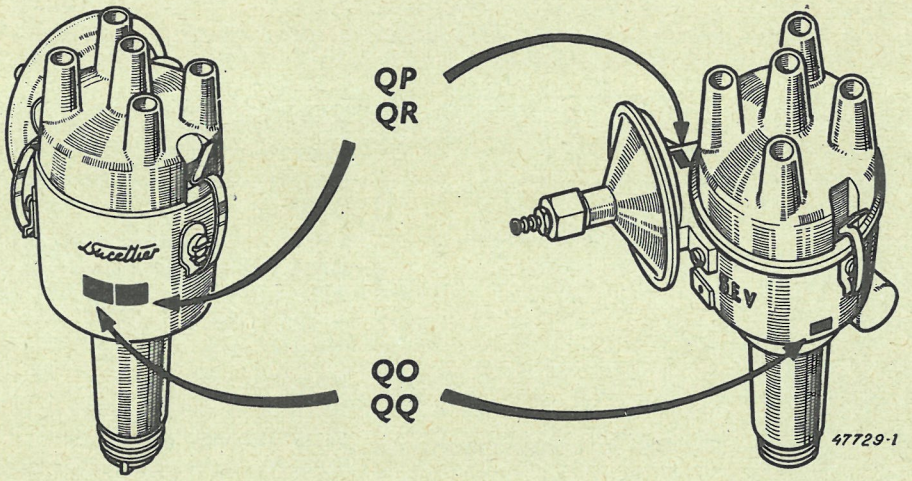
Next, tighten the two ends.

4. ELECTRICAL EQUIPMENT AND IGNITION

SPECIFICATIONS

The electrical equipment is designed for a 6 volt tension.

DISTRIBUTORS

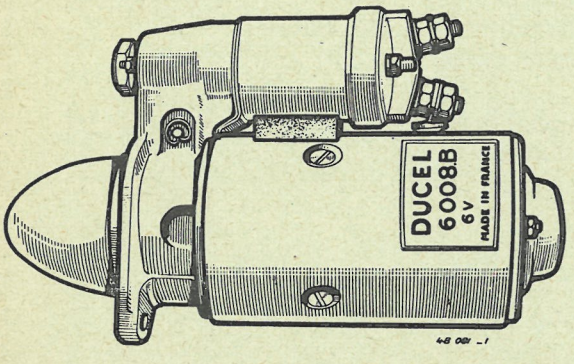


Either :
4 cylinder **Ducellier distributor.**

or ;
4 cylinder **S.E.V. distributor.**

	671-1 engine (Fregate and Domaine).	**668-6 engine** (Caravelle)
"Metropole"	**R. 184.1** curve. Reference **QO.** **R. 184.2** curve. Reference **QP.**	**R. 187-1** curve. Reference **QQ.** **R. 187-2** curve. Reference **QR.**
"Tropiques"	**R. 184.1** curve. Reference **QO** (without vacuum corrector).	**R. 187.1** curve. Reference **QQ.** (without vacuum corrector).

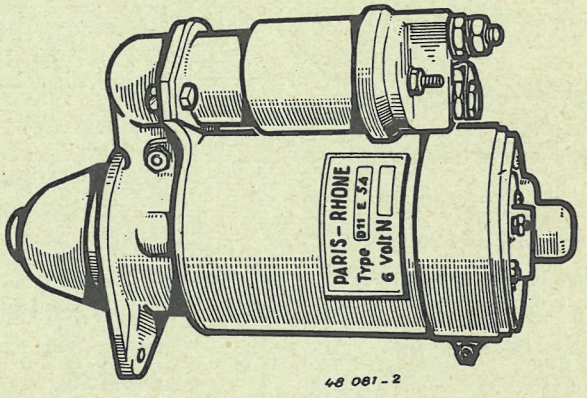
STARTERS



Either :

Ducellier starter, reference 6008 B.

— **with " positive drive " through solenoid relay.**
— Maximum power ..... .9 HP
— Maximum torque ..... 2 m.kg
— Intensity ..... 515 A.
(Static torque on locked starting ring).



Or :

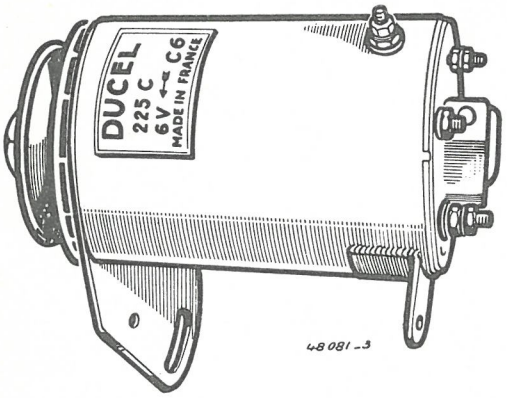
Paris-Rhône, type D 11 E 54 starter.

— **with " positive drive " through solenoid relay.**
— Maximum power ..... 1.1 HP
— Maximum torque ..... 2 m.kg
— Intensity ..... 540 A.
(Static torque on locked starting ring).

SPECIFICATIONS

(continued)

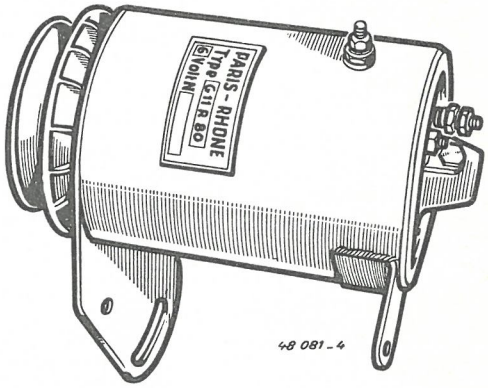
DYNAMO REGULATOR



Either :

Ducellier Dynamo reference 225 C.

— Inlet of **positive field.**
— Starting speed : 970 to 1,000 RPM.
— Intensity under 6.6 volts : 30 A. (limited by regulator).

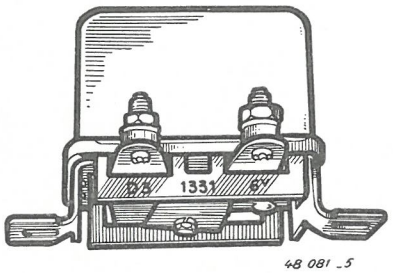


Or :

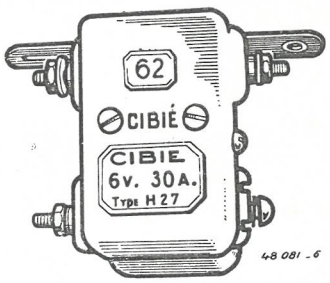
Paris-Rhône type G 11 R 80 dynamo.

— Inlet of **positive field.**
— Starting speed : 950 to 1,000 RPM.
— Intensity under 6.6 volts : 30 A. (limited by regulator).

NOTE. — " Tropiques " vehicles are equipped exclusively with dual sealing bearing :
— Ducellier, Reference 7140.



With **Ducellier, reference 1331 regulator.**
— Intensity under 6.6 volts : 30 A.



With **Cibié, H 27 type regulator.**
— Intensity under 6.6 volts : 30 A.

NOTE. — The Ducellier regulator cannot be fitted with the Paris-Rhône dynamo and the Cibié regulator cannot be fitted with the Ducellier dynamo.

The regulators are sealed : they may be checked **but not adjusted nor revised.**

Battery :

— 6 volts, 90 A/hour,
— electrolyte level .. 10 to 12 mm above top of plates.
— electrolyte density at end of charge .. 25 to 30° Bé
— voltage of a charged cell ..... 2.2 volts

6 volt **ignition coil :**

Either : Ducellier.

Or : S.E.V. type 3 H.

Or : AC.

Sparking plugs :

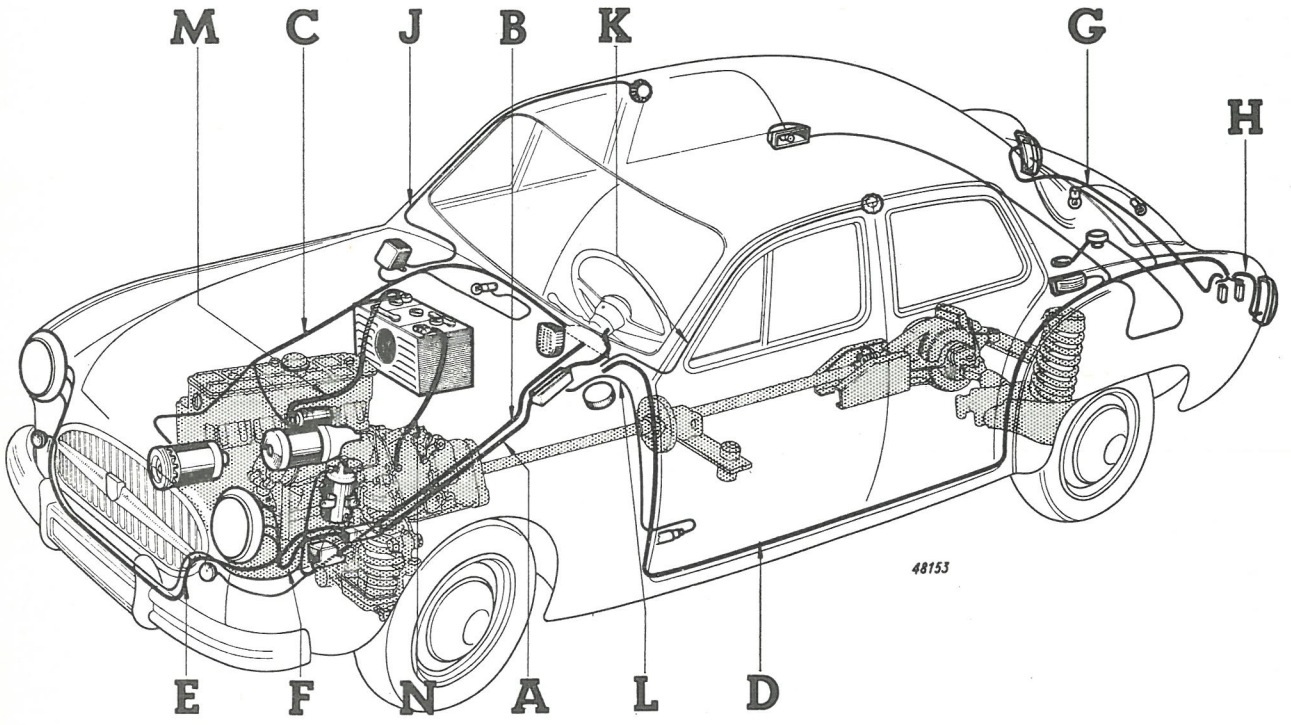
— AC F 10

or

— Marchal 36.

— electrode gap : .7 to .9 mm (.027" to .035").

" FREGATE " WIRINGS AND UNITS



INDEX OF WIRINGS (Details pages 53, 55 and 57)

	No of wires
A — Avercod	100 to 111
B — Instrument panel	120 to 139
C — Charge circuit	150 to 155
D — Chassis	160 to 170
E — Front RH	180 to 183
F — Front LH	190 to 194
G — Rear RH	200 to 202
H — Rear LH	206 to 208
J — RH interior light	216 & 217
K — LH interior light	220 & 221
L — Stop switch	226 & 227
M — Battery positive cable.	
N — Battery earth.	

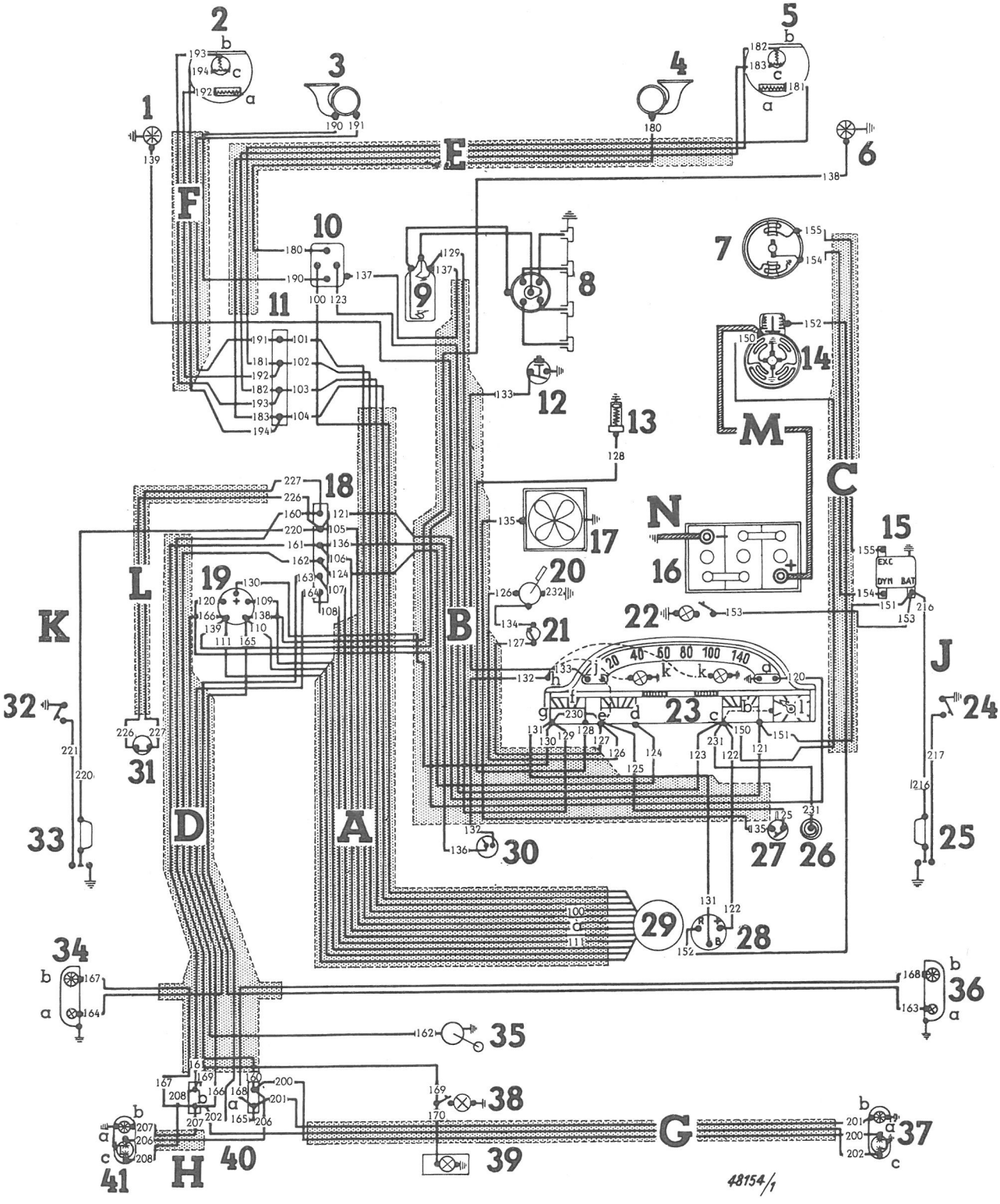
Wires only

Temperature gauge wire	230
Cigar-lighter	231
Windscreen wiper earth	232

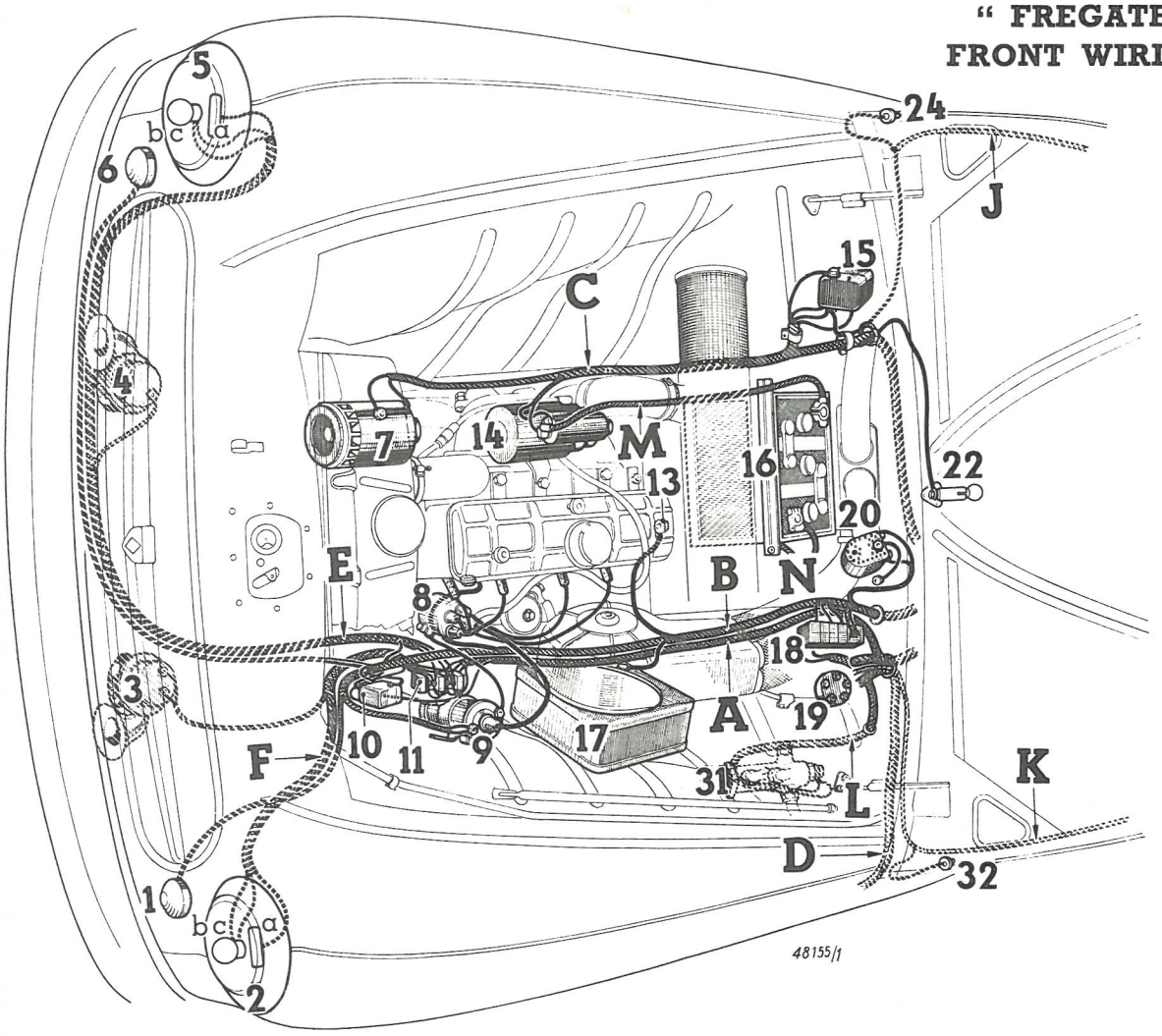
INDEX OF UNITS

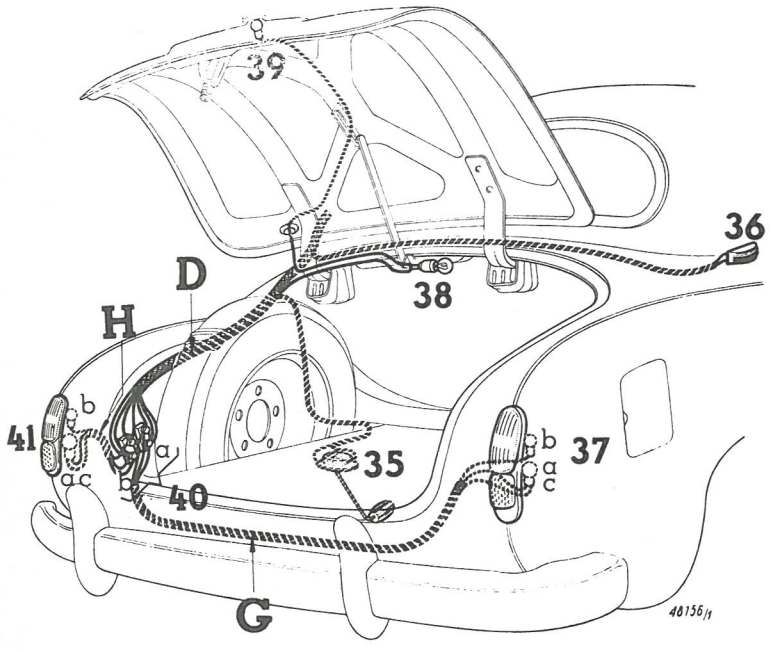
1 — Front LH flashing light.
2 — LH headlamp { a) Town. b) Dipper. c) Road.
3 — Road and town horn.
4 — Road horn.
5 — RH headlamp { a) Town. b) Dipper. c) Road.
6 — Front RH trafficator.
7 — Dynamo.
8 — Ignition distributor.
9 — Coil.
10 — Horn relay.
11 — 4 terminal junction plate (front).
12 — Oil pressure switch.
13 — Temperature sender on engine.
14 — Starter.
15 — Voltage regulator.
16 — Battery.
17 — Heater.
18 — 6-terminal junction plate (scuttle).
19 — Bi-metal switch.
20 — Windscreen wiper.
21 — Windscreen wiper switch.
22 — Engine light.
23 — Instrument panel :
a — Pilot, trafficators.
b — Ammeter.
c — Supply terminal.
d — Fuel level.
e — Supply terminal.
f — Water temperature.
g — Supply terminal.
h — Panel lighting current supply.
j — Oil pressure indicator.
k — Panel lamps.
l — Clock.
24 — RH interior light switch.
25 — RH interior light.
26 — Cigar lighter.
27 — Heater switch.
28 — Ignition and starting switch.
29 — Avercod.
30 — Rheostat.
31 — Stop switch.
32 — LH interior light switch.
33 — LH interior light.
34 — LH side light { a) Parking. b) Flashing.
35 — Fuel tank sender.
36 — RH side light { a) Parking. b) Flashing.
37 — RH taillight { a) Stop. b) Flashing. c) Town.
38 — Rear boot light.
39 — Number plate light.
40 — a) and b) Boot terminal plates.
41 — LH taillight { a) Stop. b) Flashing. c) Town.

" FREGATE " ELECTRICAL DIAGRAM



" FREGATE " FRONT WIRING





" FREGATE " REAR WIRING

" FREGATE " WIRINGS COMPOSITION

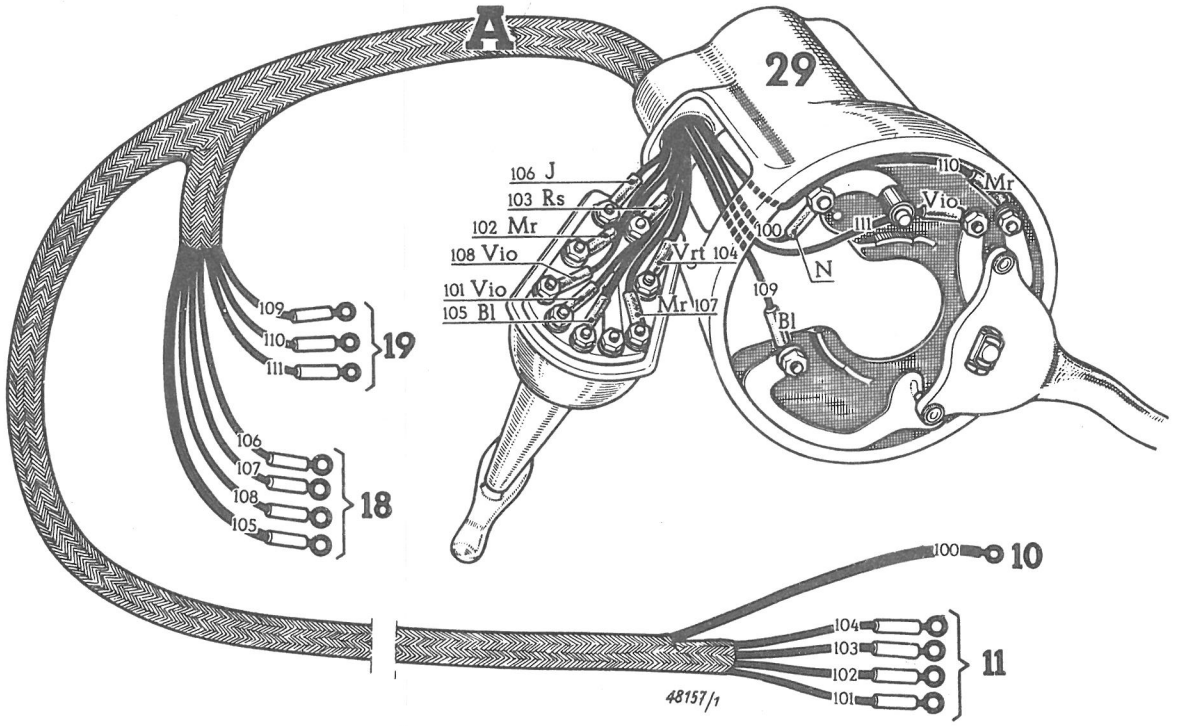
TABLE OF THE CONVENTIONAL COLOURS OF THE ELECTRICAL WIRES

Diameter of wire	Normal colour	Secondary colours *
9/10	Red	Black - White.
12/10	Grey	Green - Salmon - Yellow.
16/10	Red	Yellow - Blue.
20/10	Grey	Beige.
25/10	Black	Brown.
30/10	Yellow	

* Secondary colours are used in cases where the sleeve only is not sufficient to identify the wire.

These colours may also be used instead of the normal colours if a lack of supply is encountered.

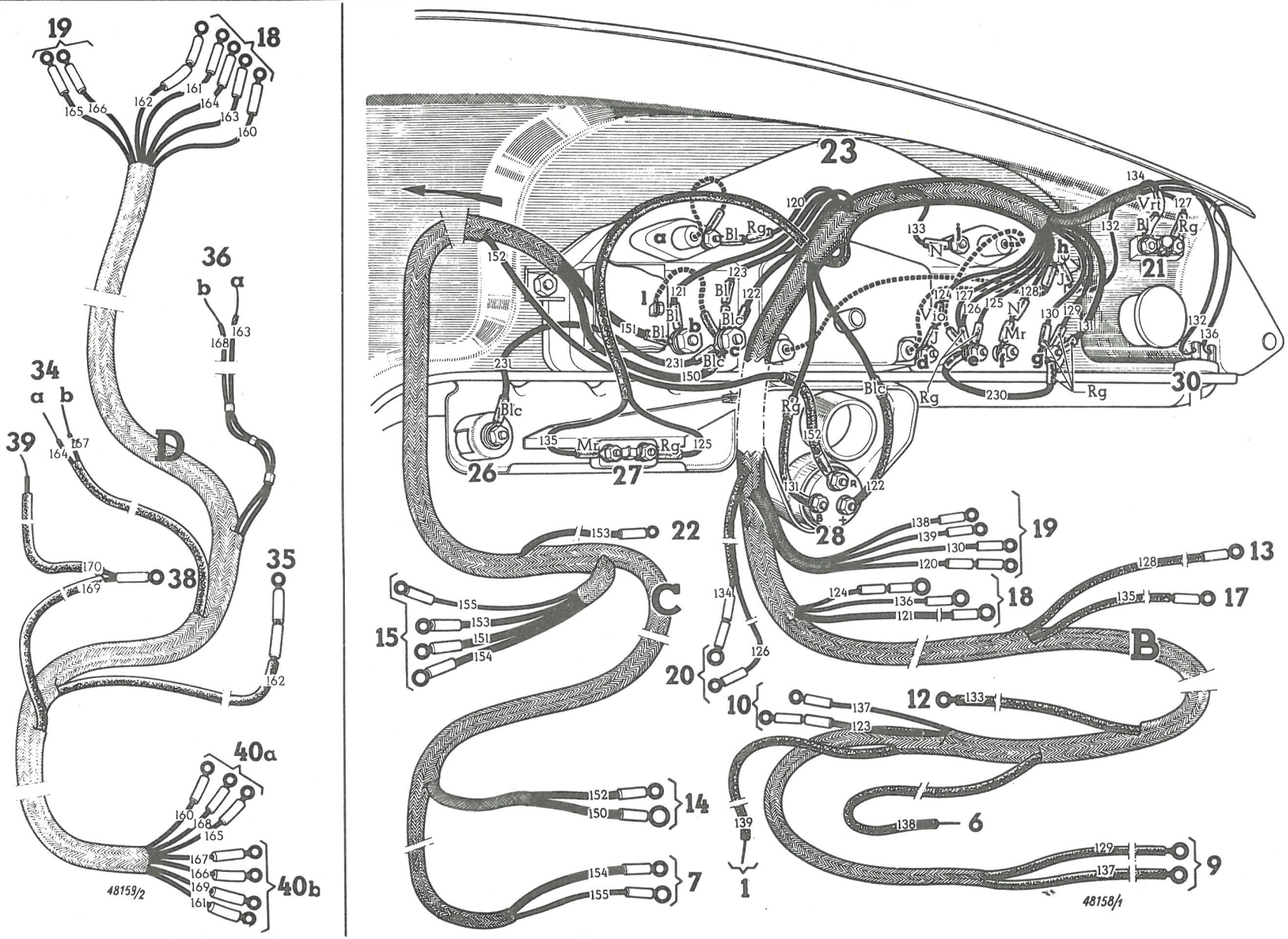
In all cases, first refer to the diameter of the wires.



A **AVERCOD WIRING** — On each junction plate, group the sleeves of same colour on the same terminal.

Reference number of wire	Colour of sleeve	Code on connection diagram	Diameter of wire	Colour of wire	CONNECTED WIRE FROM	CONNECTED WIRE TO
100	Black	N.	12/10	Grey	AVERCOD (29) See sketch above — Horn ring relay	HORN RELAY (10) (see illustration page 58)
101	Purple	Vio.	16/10	Blue	Town horn	FRONT 4 TERMINAL JUNCTION PLATE (11).
102	Brown	Mr.	20/10	Grey	Front town lights	
103	Pink	Rs.	20/10	Grey	Dippers	
104	Green	Vrt.	20/10	Grey	Headlamps	
105	Blue	Bl.	25/10	Black	Avercovir	
106	Yellow	J.	12/10	Grey	Rear town lights	6-TERMINAL JUNCTION PLATE ON SCUTTLE (18).
107	Brown	Mr.	9/10	Black	Side parking light - RH	
108	Purple	Vio.	9/10	Black	Side parking light - LH	
109	Blue	Bl.	16/10	Red	Bi-metal switch	
110	Brown	Mr.	16/10	Red	RH flashing lights	BI-METAL SWITCH (19) (see illustration page 59).
111	Purple	Vio.	16/10	Red	LH flashing lights	

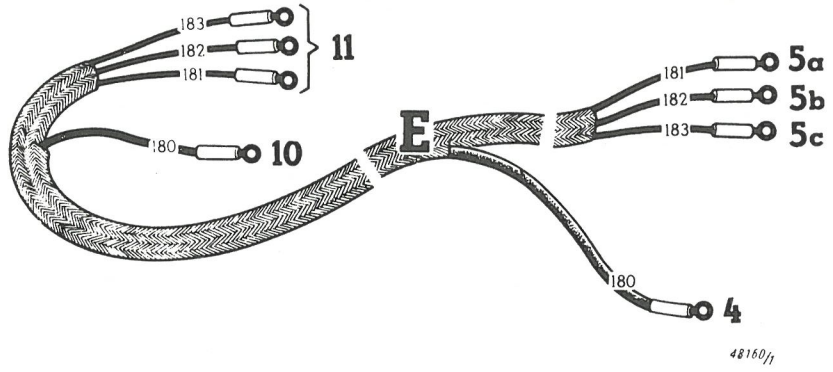
" FREGATE " WIRING COMPOSITION (continued)

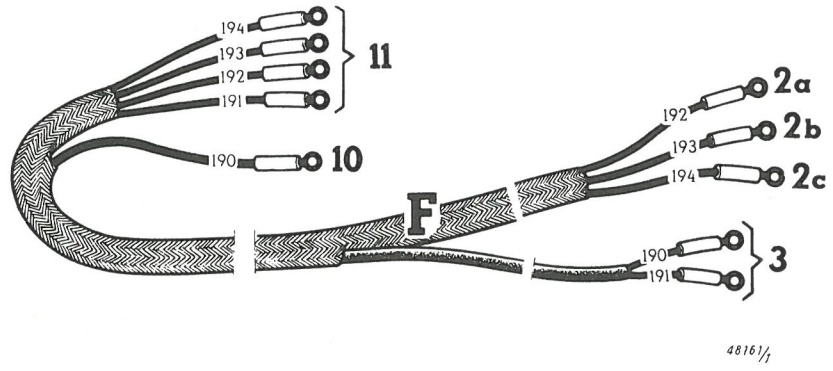


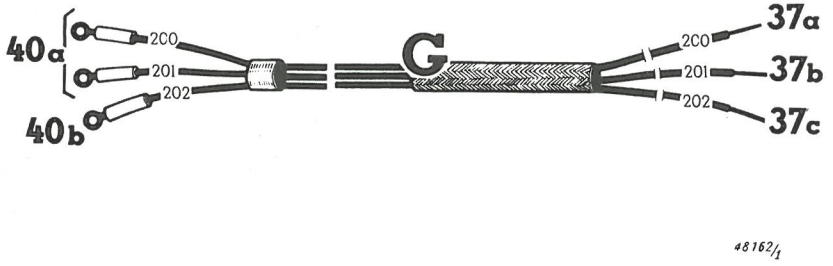
FREGATE WIRING COMPOSITION (continued)

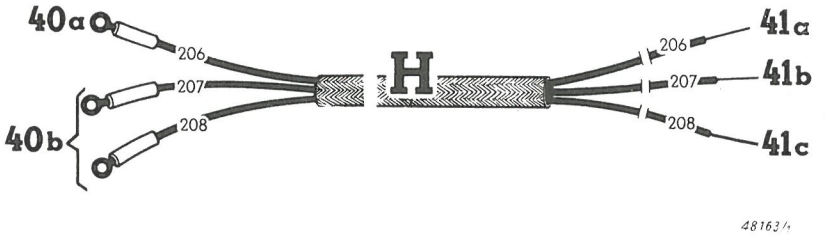
Reference number of wire	Colour of sleeve	Code on connection diagram	Diameter of wire	Colour of wire	WIRE CONNECTED FROM	WIRE CONNECTED TO
B	**INSTRUMENT PANEL WIRING** — On each connection plate, group the sleeves of same colour on the same terminal.					
120	Red-Blue	Rge-Bl.	9/10	Red	INSTRUMENT PANEL (23) (See sketch above) — a — Trafficator pilot lamp	BI-METAL SWITCH (see page 59).
121	Blue	Bl.	25/10	Black	b — Ammeter	6-TERMINAL CONNECTION PLATE ON SCUTTLE (18).
122	White	Blc	25/10	Black	c — Current terminal	SWITCH IGNITION STARTING " + " TERMINAL (28).
123	Blue - White	Bl.-Blc	25/10	Black	c — Curent terminal	HORN RELAY (10) (see page 58).
124	Pur.-Yellow	Vio.-J.	9/10	Red	d — Fuel level indicator	6-TERMINAL CONNECTION PLATE ON SCUTTLE (18).
125	Red	Rg.	16/10	Blue	e — Current terminal	HEATER SWITCH (27).
126	Red	Rg.	12/10	Grey	e — Current terminal	WINDSCREEN WIPER (20) (see page 58).
127	Red	Rg.	12/10	Grey	e — Current terminal	WINDSCREEN WIPER SWITCH (21).
128	Brown-Black	Mr.-N.	12/10	Grey	f — Water temperature indicator	TEMPERATURE SENDER ON ENGINE (13).
129	Red	Rg.	16/10	Red	g — Current terminal	COIL (9) (BAT TERMINAL).
130	Red	Rg.	16/10	Red	g — Current terminal	BI-METAL TERMINAL " + " (19) (see page 59).
131	Red	Rg.	20/10	Grey	g — Current terminal	SWITCH IGNITION STARTING (28).
132	Yellow	J.	9/10	Black	h — Instrument panel lighting	RHEOSTAT (30).
133	Black	N.	12/10	Grey	j — Oil pressure indicator	OIL PRESSURE SWITCH (12).
134	Green-Blue	Vrt.-Bl.	12/10	Green	WINDSCREEN WIPER SWITCH (21)	WINDSCREEN WIPER (20) (see sketch page 58).
135	Brown	Mr.	16/10	Red	HEATER SWITCH (27)	HEATER (17).
136	Yellow	J.	9/10	Black	RHEOSTAT (30)	6-TERMINAL CONNECTION PLATE ON SCUTTLE (18).
137	Red	Rg.	12/10	Grey	COIL (9), horn energizing	HORN RELAY (10) (see page 58).
138	Brown	Mr.	12/10	Yellow	BI-METAL SWITCH (19) (see page 59)	RH FRONT TRAFFICATOR (6).
139	Purple	Vio.	12/10	Grey	BI-METAL SWITCH (19) (see page 59	LH FRONT TRAFFICATOR (1).
C	**CHARGE CIRCUIT WIRING**					
150	White	Blc.	30/10	Yellow	INSTRUMENT PANEL (23) — Current terminal	STARTER (14)
151	Blue and White	Bl. and Blc	30/10	Yellow	— Ammeter (blue sleeve)	REGULATOR (15). " BAT " terminal (White sleeve).
152	Alu.	Alu.	25/10	Black	SWITCH-IGNITION - STARTING (28)	STARTER (14) relay terminal.
153	White	Blc	12/10		REGULATOR (15) - Battery terminal	ENGINE LIGHTING LAMP (22).
154	Blue	Bl.	30/10	Yellow	REGULATOR (15) - Dynamo terminal	DYNAMO (7).
155	Green	Vrt	12/10	Green	REGULATOR (15) - Field terminal	DYNAMO (7).
D	**CHASSIS WIRING** — On each connection plate, group the sleeves of same colour on the same terminal					
160	Pink	Rs.	12/10	Salmon	6-TERMINAL CONNECTION PLATE ON SCUTTLE (18)	REAR CONNECTION PLATE (40a).
161	Yellow	J.	12/10	Grey		REAR CONNECTION PLATE (40b).
162	Purple-Yellow	Vio.-J.	9/10	Red		GAUGE ON FUEL TANK (35).
163	Brown	Mr.	9/10	Black		RH SIDE LIGHT (36a) (see page 59).
164	Purple	Vio.	9/10	Black		LH SIDE LIGHT (34a) (see page 59).
165	Brown	Mr.	12/10	Yellow	BI-METAL SWITCH (19) (see page 59)	REAR CONNECTION PLATE (40a).
166	Purple	Vio.	12/10	Grey		REAR CONNECTION PLATE (40b).
167	Purple	Vio.	12/10	Grey	REAR CONNECTION PLATE (40b)	LH SIDE LIGHT (34b) (see page 59).
168	Brown	Mr.	12/10	Yellow	REAR CONNECTION PLATE (40a)	RH SIDE LIGHT (36b) (see page 59).
169	Yellow	J.	12/10	Grey	REAR CONNECTION PLATE (40b)	LUGGAGE COMPT LIGHT LAMP (38).
170	Yellow	J.	12/10	Grey	LUGGAGE COMPT LIGHT TERMINAL (38). Number plate light	NUMBER PLATE LIGHT LAMP (39).

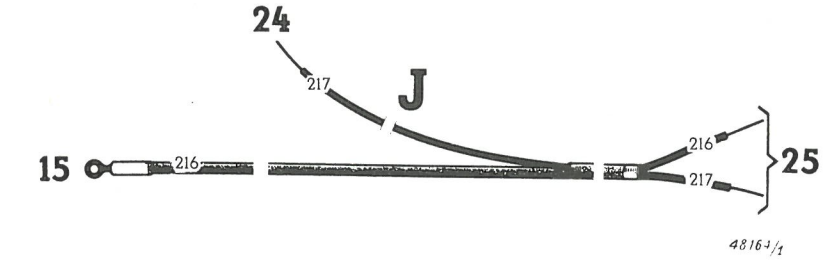
" FREGATE " WIRING COMPOSITION (continued)

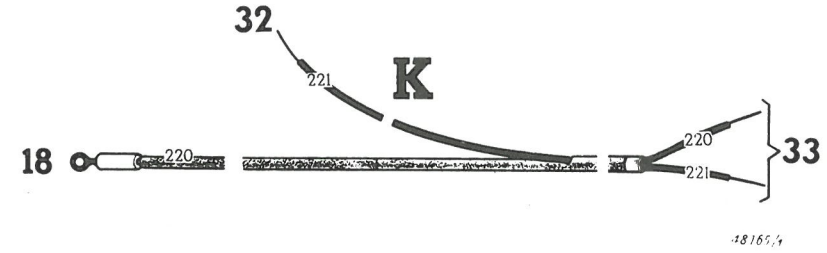








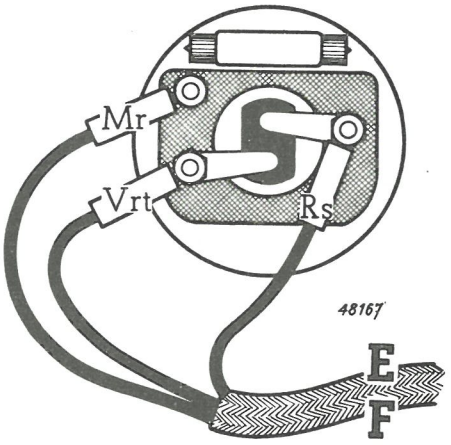




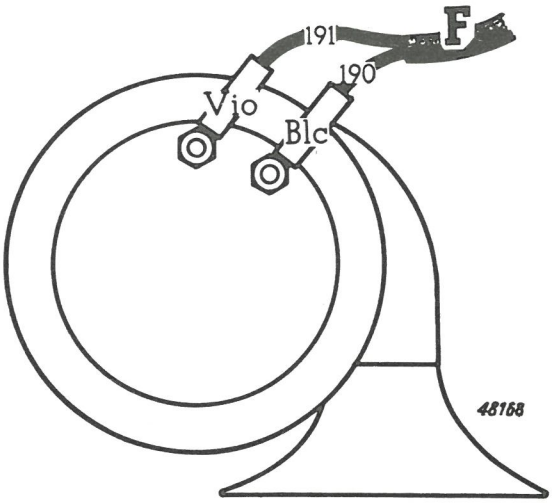
" FREGATE " WIRING COMPOSITION

Reference number of wire	Colour of sleeve	Code on connection diagram	Diameter of wire	Colour of wire	WIRE CONNECTED FROM	WIRE CONNECTED TO
	E	**RH FRONT WIRING** (RH HEADLAMP) — On each connection plate, group the sleeves of same colour on the same terminal				
180	White	Blc	16/10	Red	HORN RELAY (10) (see page 58)	ROAD HORN (4).
181	Brown	Mr.	9/10	Red	4-TERMINAL CONNECTION PLATE (11)	RH HEADLAMP (5a)
182	Pink	Rs.	16/10	Red	4-TERMINAL CONNECTION PLATE (11)	RH HEADLAMP (5b) (See page 58).
183	Green	Vrt.	16/10	Red	4-TERMINAL CONNECTION PLATE (11)	RH HEADLAMP (5c)
	F	**LH FRONT WIRING** (LH HEADLAMP) — On each connection plate, group the sleeves of same colour on the same terminal				
190	White	Blc	16/10	Blue	HORN RELAY (10)	ROAD AND TOWN HORN (3) (See page 58).
191	Purple	Vio.	16/10	Red	4-TERMINAL CONNECTION PLATE (11)	ROAD AND TOWN HORN (3)
192	Brown	Mr.	9/10	Red	4-TERMINAL CONNECTION PLATE (11)	LH HEADLAMP (2a)
193	Pink	Rs.	16/10	Red	4-TERMINAL CONNECTION PLATE (11)	LH HEADLAMP (2b) (See page 58).
194	Green	Vrt.	16/10	Red	4-TERMINAL CONNECTION PLATE (11)	LH HEADLAMP (2c)
	G	**RH REAR WIRING** (RH TAILLIGHT) — On each connection plate, group the sleeves of same colour on the same terminal				
200	Pink	Rs.	12/10	Salmon	REAR CONNECTION PLATE (40a)	REAR RH TAILLIGHT (37a).
201	Brown	Mr.	12/10	Yellow	REAR CONNECTION PLATE (40a)	REAR RH TAILLIGHT (37b).
202	Yellow	J.	9/10	Red	REAR CONNECTION PLATE (40b)	REAR RH TAILLIGHT (37c).
	H	**LH REAR WIRING** (LH TAILLIGHT) — On each connection plate, group the sleeves of same colour on the same terminal				
206	Pink	Rs.	12/10	Salmon	REAR CONNECTION PLATE (40a)	REAR LH TAILLIGHT (41a).
207	Purple	Vio.	12/10	Grey	REAR CONNECTION PLATE (40b)	REAR LH TAILLIGHT (41b).
208	Yellow	J.	9/10	Red	REAR CONNECTION PLATE (40b)	REAR LH TAILLIGHT (41c).
	J	**RH INTERIOR LIGHT WIRING**				
216	White	Blc	9/10	Red	REGULATOR-BAT. TERMINAL (15)	RH INTERIOR LIGHT (25).
217	No sleeve		9/10	Black	RH DOOR SWITCH (24)	RH INTERIOR LIGHT (26).
	K	**LH INTERIOR LIGHT WIRING** — On each connection plate, group the sleeves of same colour on the same terminal				
220	Blue	Bl.	9/10	Red	6-TERMINAL CONNECTION PLATE (18)	LH INTERIOR LIGHT (33).
221	Without sleeve		9/10	Black	LH DOOR SWITCH (32)	LH INTERIOR LIGHT (33).
	L	**STOP SWITCH WIRING** — On each connection plate, group the sleeves of same colour on the same terminal				
226	Blue	Bl.	12/10	Grey	6-TERMINAL CONNECTION PLATE (18)	STOP SWITCH ON MASTER CYLINDER + TERMINAL (31).
227	Pink	Rs.	12/10	Salmon	6-TERMINAL CONNECTION PLATE (18)	STOP SWITCH ON MASTER CYLINDER (31).

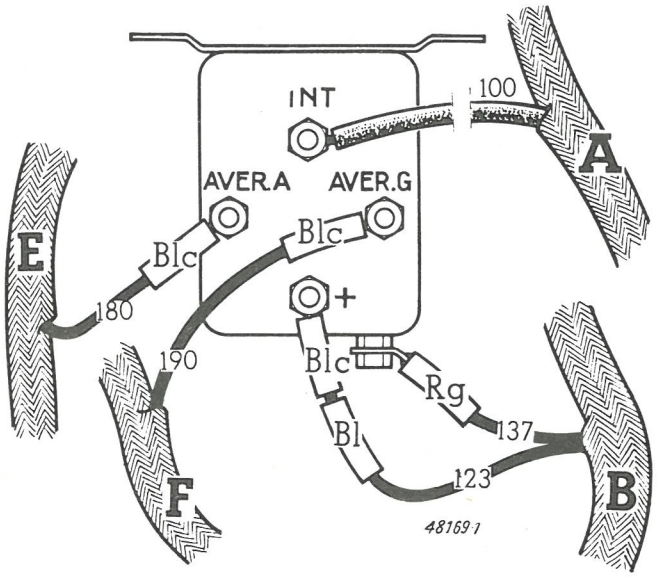
DETAILS OF " FREGATE " CONNECTIONS



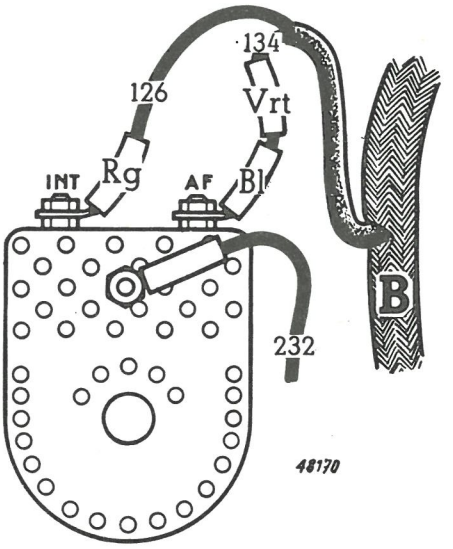
2. - RH HEADLAMP
or 5. - LH HEADLAMP



3. - ROAD AND TOWN HORN



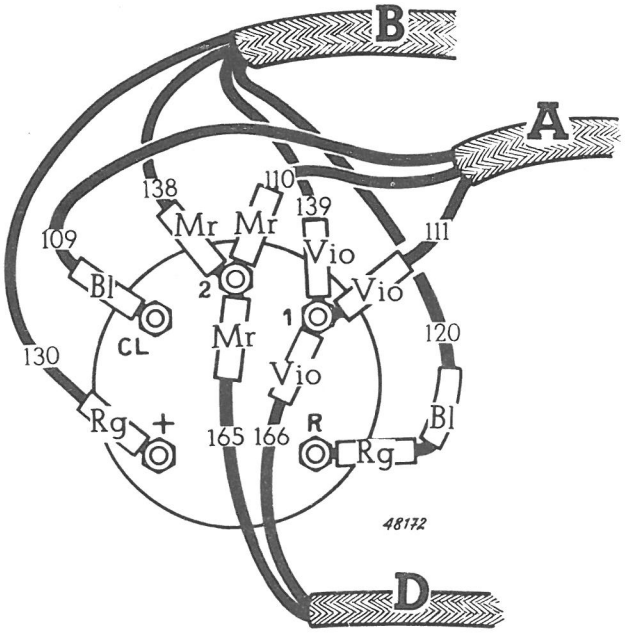
10. - HORN RELAY

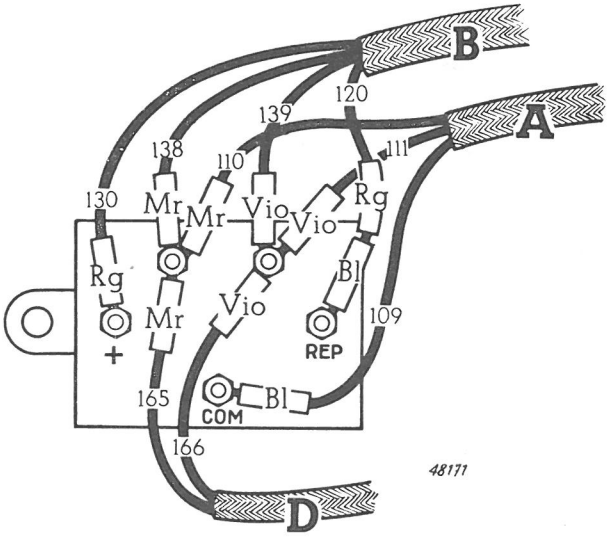


20. - WINDSCREEN WIPER MOTOR

DETAILS OF " FREGATE " CONNECTIONS

(continued)



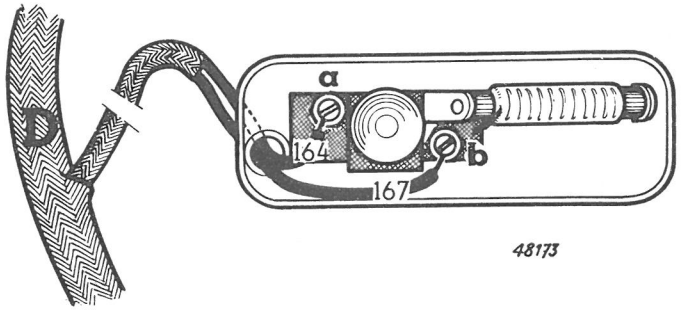


19. - BI-METAL SWITCH, POSITIVE TYPE (round or square)

34. - LH SIDE LIGHT

a — Parking light.

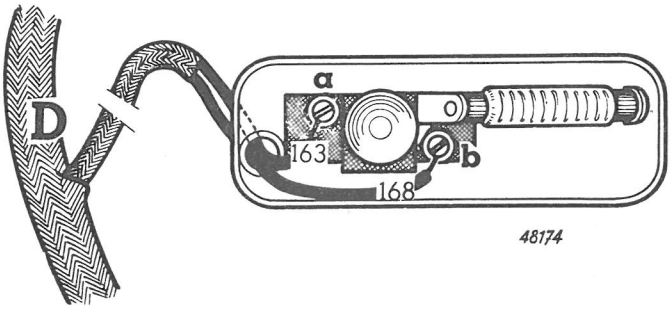
b — Trafficator.



36. - RH SIDE LIGHT

a — Parking light.

b — Trafficator.



" CARAVELLE " AND " DOMAINE " WIRINGS AND UNITS

INDEX OF WIRINGS

	Numbers of wires
A — Avercod	101 to 112
B — Instrument panel	120 to 135
C — Charge circuit	150 to 156
D — Chassis	160 to 170
E — RH front	180 to 183
F — LH front	191 to 194
G — RH rear	200 & 202

	Numbers of wires
H — LH rear	206 & 208
J — RH interior light (1)	216 & 217
K — LH interior light	220 & 221
L — Stop switch	226 & 227
M — Battery positive cable.	
N — Battery negative cable.	

Wires only

Temperature gauge wire **(230)**.
Windscreen wiper earth **(232)**.
Rear interior light wire **(235)** (1).
Number plate lighting wire **(240)**.
LH light wire **(241)** (1).
RH light wire **(242)** (1).

(1) For " Domaine " only.

INDEX OF UNITS

2 — LH headlamp { a) Town. b) Dipper. c) Headlamp.
3 bis — Town horn.
4 — Road horn.
5 — RH headlamp { a) Town. b) Dipper. c) Road.
7 — Dynamo.
8 — Ignition distributor.
9 — Coil.
11 bis — 8-terminal connection plate.
13 — Temperature sender on engine.
14 — Starter.
15 — Voltage regulator.
16 — Battery.
17 — Heater.
18 bis — 4-Terminal connection plate.
19 bis — Bi-metal switch.
20 — Windscreen wiper.
21 — Windscreen wiper switch.
23 — Instrument panel :
a — Pilotlamp, trafficators.
b — Ammeter.
c — Current terminal.
d — Fuel level.
e — Current terminal.
f — Water temperature
g — Current terminal.
h — Panel light lamps current supply.
j — Ignition pilot lamp.
k — Instrument panel lamps.
24 — RH interior light switch (1).
25 — Interior light (1).
27 — Heater switch.
28 — Control - ignition and starting.
29 — Avercod.
31 — Stop switch.
32 — LH interior light switch (1).
33 — LH interior light.
34 — LH side light { a) Parking. b) Flashing.
35 — Fuel tank gauge.
36 — RH side light { a) Parking. b) Trafficator.
37 bis — RH taillight { a) Stop. b) Light.
39 — Number plate light (2).
39 bis — Number plate light (1).
40 bis — Terminal plate in luggage compt.
41 bis — LH taillight { a) Stop. b) Light.
42 — Rear interior light (1).

(1) For " Domaine " only.
(2) For " Caravelle " only.

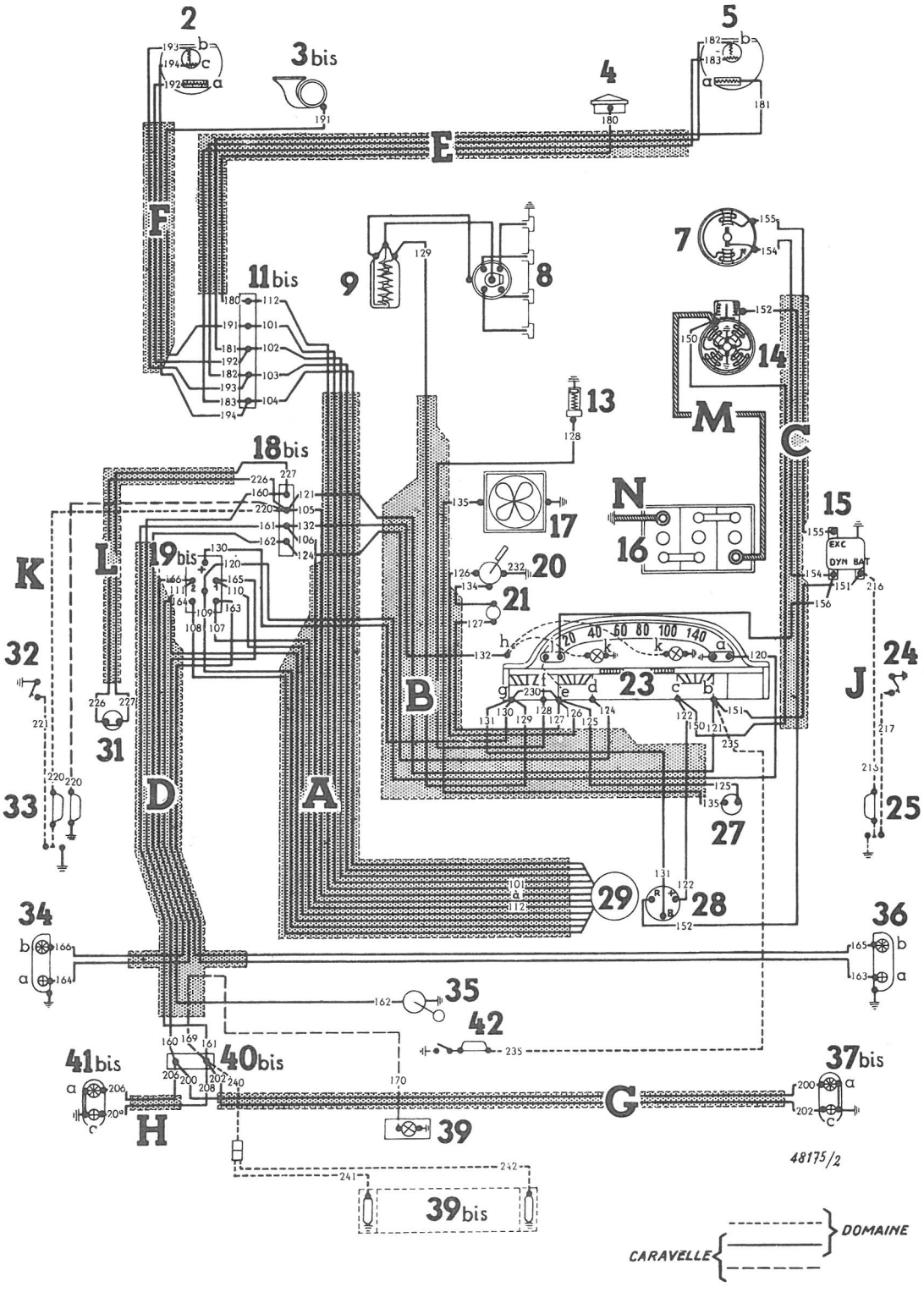
" CARAVELLE " and " DOMAINE " WIRING COMPOSITION

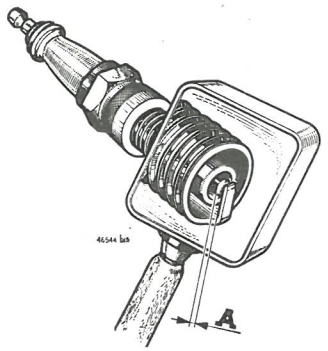
WIRES FOR " CARAVELLE " AND " DOMAINE " ONLY

Wiring	Reference number of wire	Colour of sleeve	Diameter of wire	Colour of wire	WIRE CONNECTED FROM	WIRE CONNECTED TO
A	112	White	16/10	Red	Avercod **(29)** - Road horn	FRONT TERMINAL PLATE **(11 bis)**.
C	156	Black-Blue	12/10	Grey	REGULATOR **(15)** (DYN terminal)	INSTRUMENT PANEL **(23)** - Pilot lamp (j).
Wires only	235	Blue	9/10	Red	INSTRUMENT PANEL **(23)** - Ammeter (b)	REAR INTERIOR LIGHT **(42)**.
	240	Yellow	12/10	Grey	REAR CONNECTION PLATE **(40 bis)**	NUMBER PLATE CURRENT INTAKE **(39 bis)**.
	241	Without sleeve	12/10	Grey	NUMBER PLATE CURRENT OUTLET **(39 bis)**.	LH light of NUMBER PLATE **(39 bis)**.
	242		12/10	Grey	NUMBER PLATE CURRENT OUTLET **(39 bis)**.	RH LIGHT OF NUMBER PLATE **(39 bis)**.

NOTE. — THE OTHER WIRES BEING COMMON TO THE " FRÉGATE ", REFER TO PAGES 53, 55 and 57.

" CARAVELLE " AND " DOMAINE " ELECTRICAL SYSTEM DIAGRAM





SPARKING PLUGS

ADJUSTMENT.

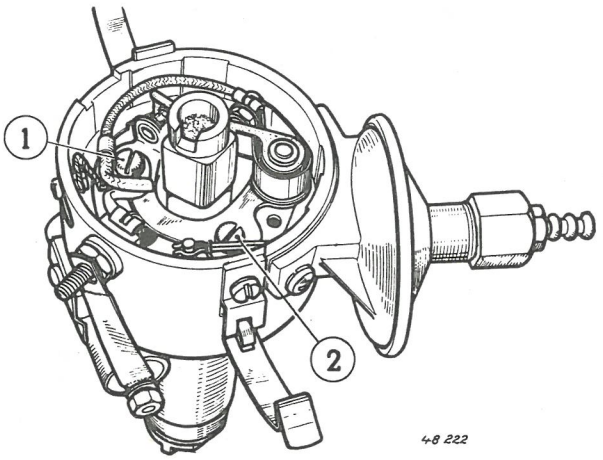
Every 5,000 km, approximately, adjust the electrodes spacing (Adjust through earth electrode).

Spacing **A = .7 to .9 mm.**

DISTRIBUTORS

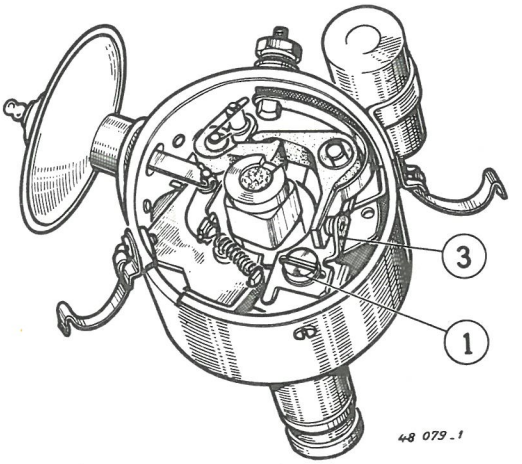
ADJUSTING THE CONTACT POINT SPACING.

Check condition of contact points.
Locate the moving contact block on the highest spot of one of the cam boss.
Adjust **contact points spacing to .4 to .5 mm** to this end :

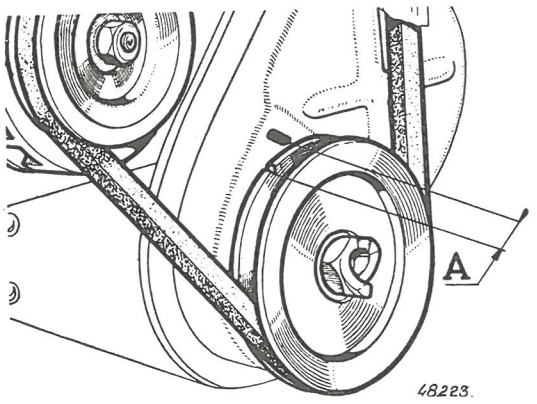


S.E.V. Distributor : operate the adjusting screw (2) after loosening the lockscrew (1).

NOTE. — Retighten the screw (1) while holding the rotating plate in order to avoid the vacuum advance control system disconnection.



Ducellier distributor : loosen the lock screw (1) and, with a screwdriver, move the stationary contact bracket (3) in order to adjust the spacing.



REFITTING AND SETTING.

Refit the distributor (carefully fit the shaft in the drive slot).
Connect the primary terminal wire.

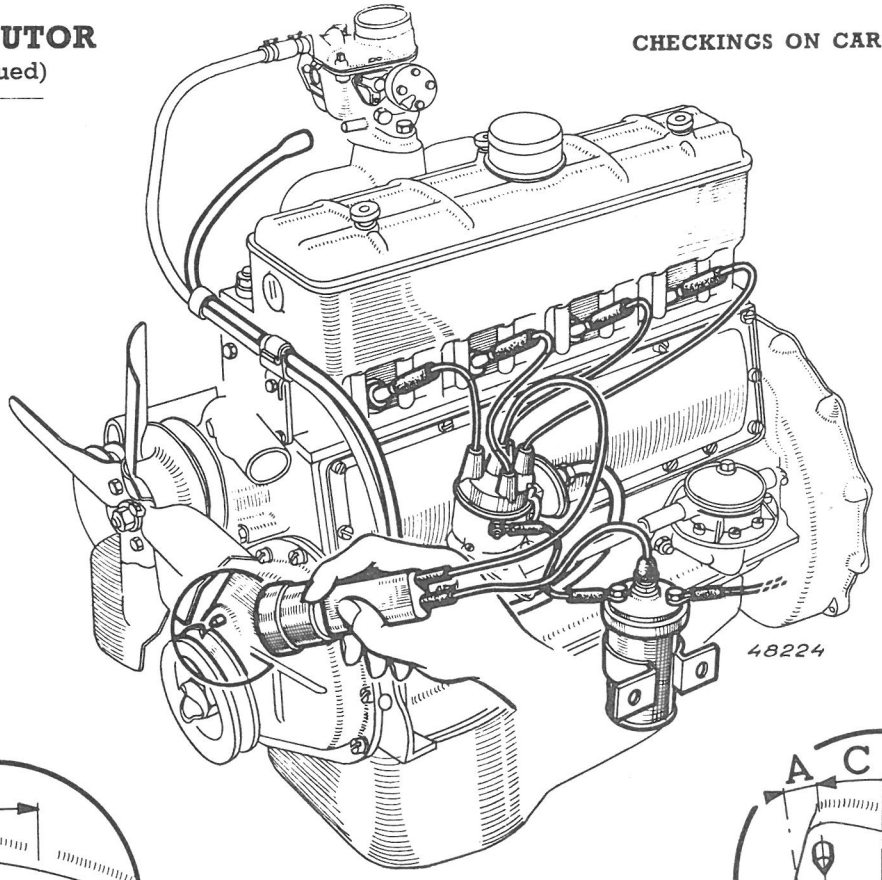
Fully push in the hand advance corrector knob.
Remove the rocker arm cover, bring the **rocker arms of cylinder N° 4 in balance,** and next the mark on the pulley to a distance **A = 5 mm** before the pointer.

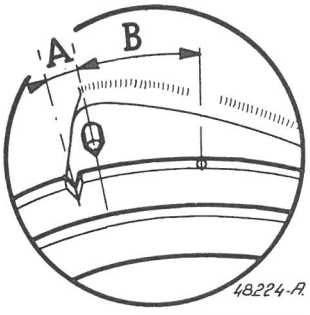
Connect a tell tale lamp between the primary and the earth.
Turn ignition on. Rotate distributor counterclockwise. **As soon as tell tale lamp flashes on secure the distributor.**
Connect the sparking plug wire of the first cylinder to the terminal corresponding to the distributor finger.
Connect the other wires.

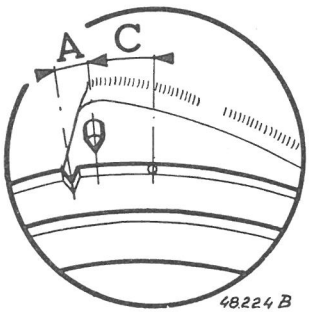
Firing order : 1-3-4-2.

DISTRIBUTOR
(continued)

CHECKINGS ON CAR







CENTRIFUGAL ADVANCE

Remove the fan belt and set the distributor.
Connect a stroboscope lamp (Ref. Mot. 24) on the secondary current between distributor and coil.
With engine at ignition point (mark on the pulley rim at 5 mm before the pointer, attached to the timing gear cover, and the manual advance corrector knob pushed fully in) scribe on the pulley rim, at right hand of the timing gear cover pointer, a mark with a piece of chalk at a distance **B a 28 mm.**
Disconnect from carburetter the distributor vacuum take off piping.
Rotate the engine and bring the stroboscopic lamp at 5 or 6 cm from the pulley.
Accelerate progressively : in the luminous beam of the lamp, the mark with the chalk on the pulley rim should :

1° **Start moving towards the pointer at** ..... } **800 RPM for the 671-1 engine. 750 RPM for the 668-6 engine.**

2° **Be in front of the pointer at :** ..... } **3.000 RPM for the 671-1 engine. 4.000 RPM for the 668-6 engine.**

NOTE. — The speed will be checked with a revolution counter on the starting dog.

VACUUM ADVANCE

Same procedure as for centrifugal, however the chalk mark on pulley should be at a distance :

C = 22 mm for 671-1 engine.

C = 29 mm for 668-6 engine.

Reconnect the distributor vacuum piping to a depressiometer (vacuum meter).

Rotate the engine at 700 RPM maximum.

Progressively operate the depressiometer.

The chalk mark on the pulley rim should :

1° **Start moving towards the pointer when the vacuum is** ..... } **340 g/cm² for 671-1 engine. 240 g/cm² for 668-6 engine.**

2° **Be in front of the pointer when the vacuum reaches** ..... } **610 g/cm² for 671-1 engine. 620 g/cm² for 668-6 engine.**

If correct motions of the chalk mark for either one of these two checkings (centrifugal or vacuum) are not obtained, remove distributor and check on test bench.

DISTRIBUTOR (continued)

CHECKINGS ON THE TEST BENCH.
Check contact points condition and adjust spacing (see page 62).

Check :

a) the position of the 4 sparks : if distribution is not correct, replace the cams.

b) the centrifugal advance curve by comparing it to the operating curve :

671-1 engine : curve R. 184-1 Reference QO.
668-6 engine : curve R. 187-1 Reference QQ.

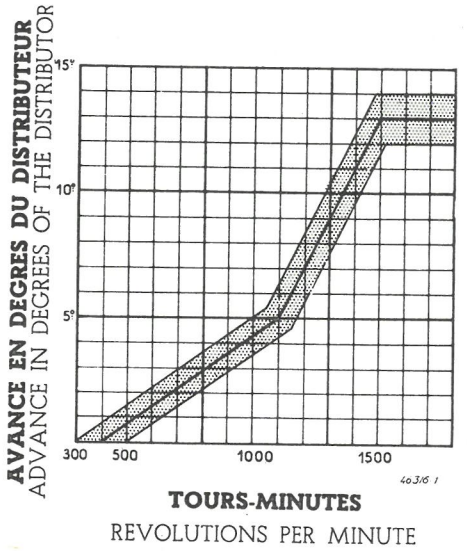
If curve is not correct, replace springs and check centrifugal weights.

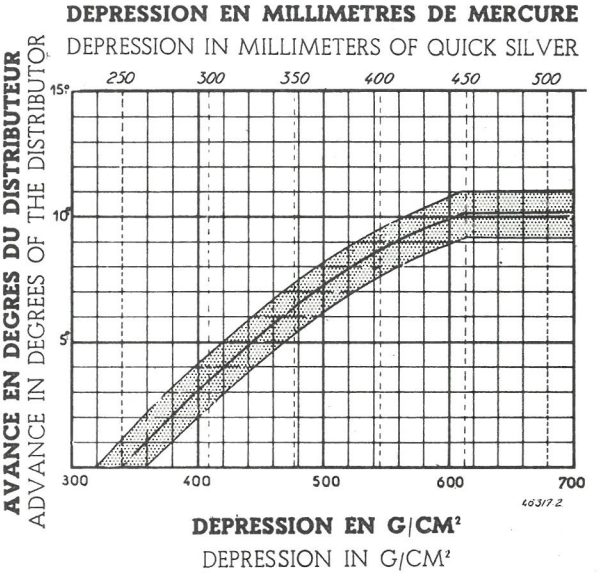
c) the vacuum advance curve by comparing it to the operating curve :

671-1 engine : curve R. 184-2 Reference QP.
668-6 engine : curve R. 187-2 Reference QR.

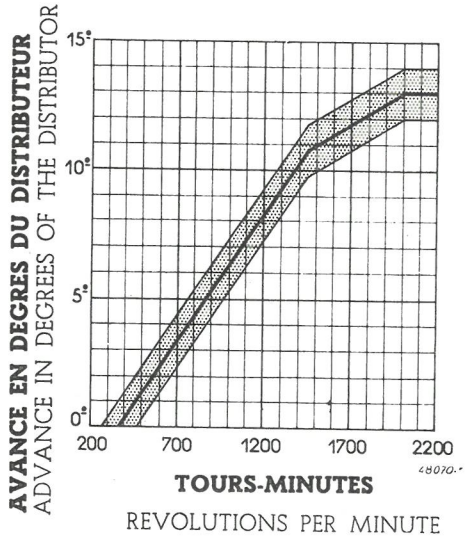
If curve is not correct, check motion of mobile parts. Replace correction pump and anti-vacuum spring if required.

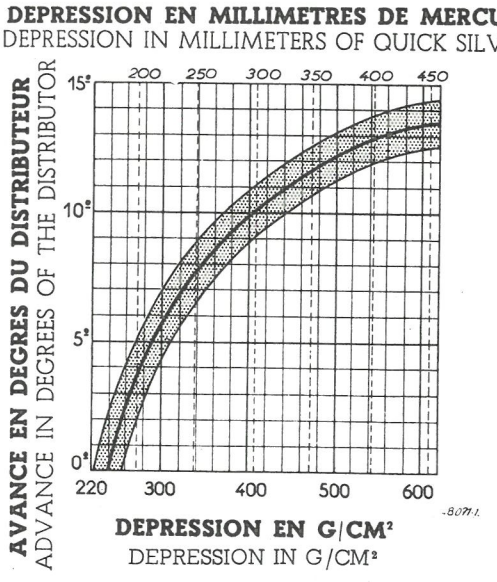
ENGINE 671-1





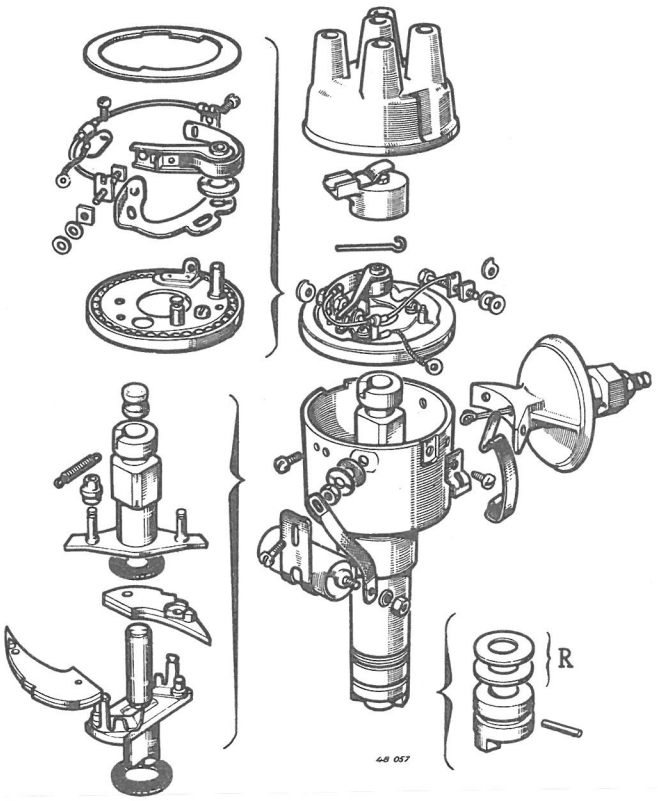
ENGINE 668-6





DISTRIBUTOR

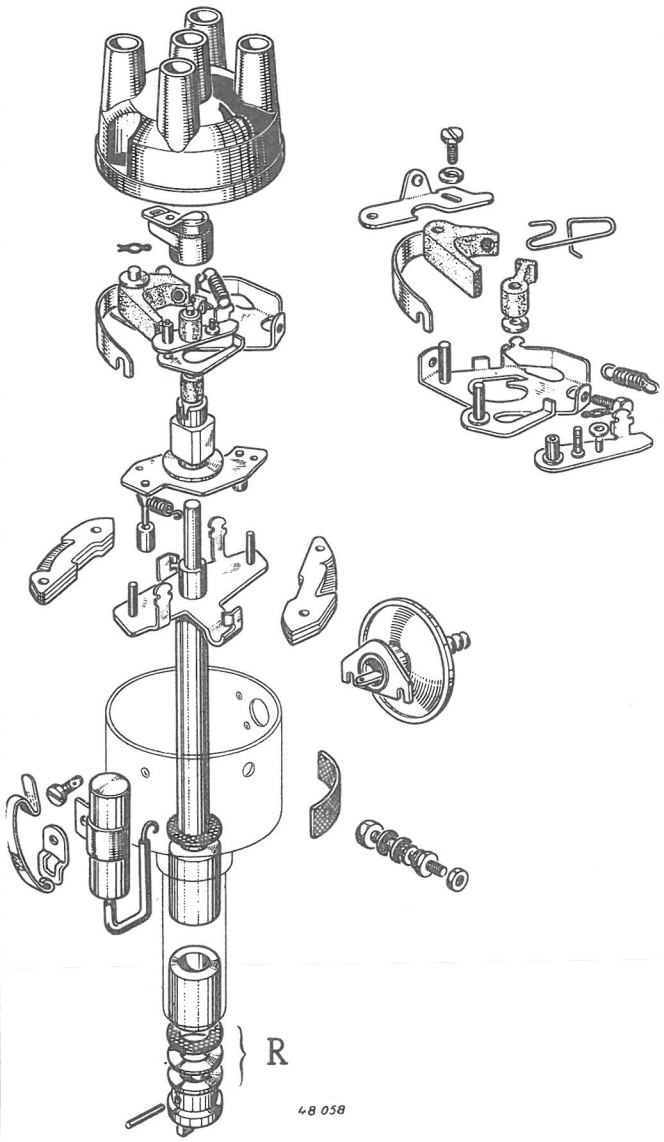
(continued)



S.E.V. distributor :

— **References QO — QP** for **671-1 engine.**
— **References QQ — QR** for **668-6 engine.**

— Lengthwise clearance of shaft .... .2 to .3 mm.
— Adjusting washers **(R)** ..... .2 and .3 mm.

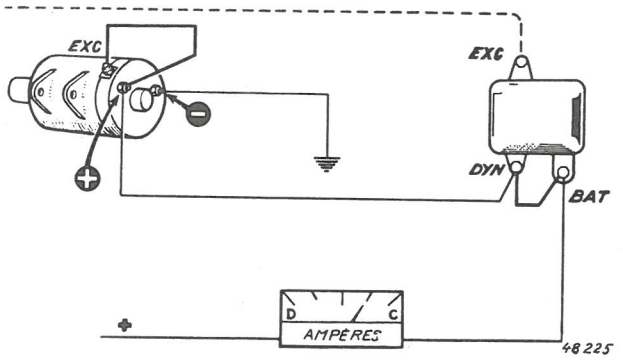


Ducellier distributor :

— **References QO — QP** for **671-1 engine.**
— **References QQ — QR** for **668-6 engine.**

— Lengthwise clearance of shaft ..... .2 to .3 mm.
— Adjusting washers **(R)** ..... .1 and .2 mm.

DYNAMO



Checking the dynamo-regulator assembly.

When a charging trouble occurs, make the following test :

— connect a wire between the " **BAT** " terminal and the " **DYN** " terminal **of the regulator,**

— disconnect the wire from the " **EXC** " terminal **of the dynamo (do not earth wire),**

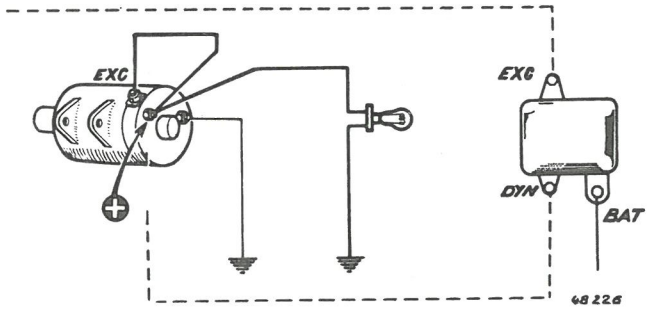
— connect a wire between the " + " terminal and the " **EXC** " terminal **of the dynamo.**

Allow engine to run at 1,000 RPM approximately **(do not exceed this speed).**

If the ammeter on the instrument panel :

— shows a charge : **the regulator is at fault,**

— does not show a charge : **the dynamo or the connections are at fault.**



Checking the dynamo.

— disconnect the two wires from the dynamo **(do not earth the wires),**

— connect a voltmeter or a tell tale lamp between the " + " **terminal of the dynamo and earth,**

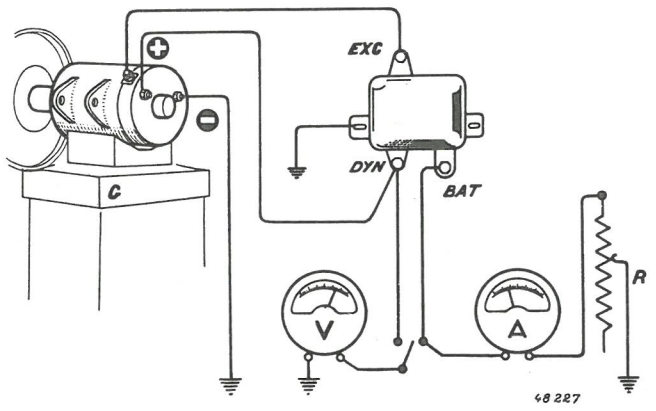
— connect a wire between the " + " terminal and the " **EXC** " terminal **of the dynamo.**

Allow engine to rotate at 1,000 RPM approximately **(do not exceed this speed):**

— if the voltmeter shows 6 to 7 volts, or if the tell tale lamp flashes on : **the dynamo is O.K.**

— if the voltmeter does not register or if the lamp stays off : **the dynamo is defective.**

NOTE. — The regulator may be the cause for the dynamo trouble (regulator offset). It will thus be necessary to check the regulator on the bench before refitting the dynamo.



Checking the regulator.

A test bench is necessary :

— connect the voltmeter to the " **DYN** " terminal,

— progressively increase the speed of the dynamo. At the time of the cut-in, the needle of the voltmeter moves back. The highest point attained by the needle before this motion gives the **cut-in tension.** This tension should be between :
6 and 6.5 volts for the Ducellier, reference 1331 regulator,
6.3 and 6.7 volts for the Cibié, type H 27 regulator,

— connect the voltmeter to the " **BAT** " terminal,

— have the dynamo rotate at 3,000 RPM,

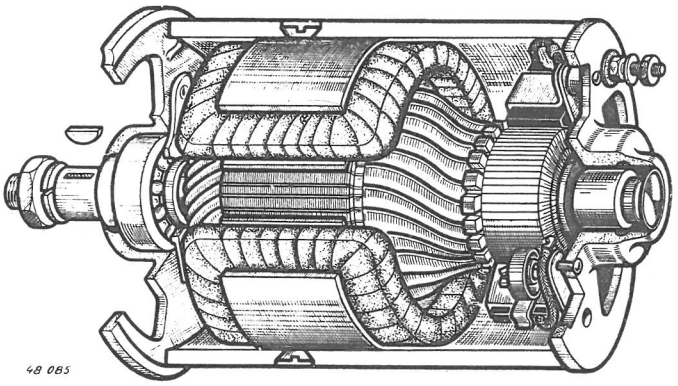
— adjust the sliding resistance R in order to record 30 A at ammeter,

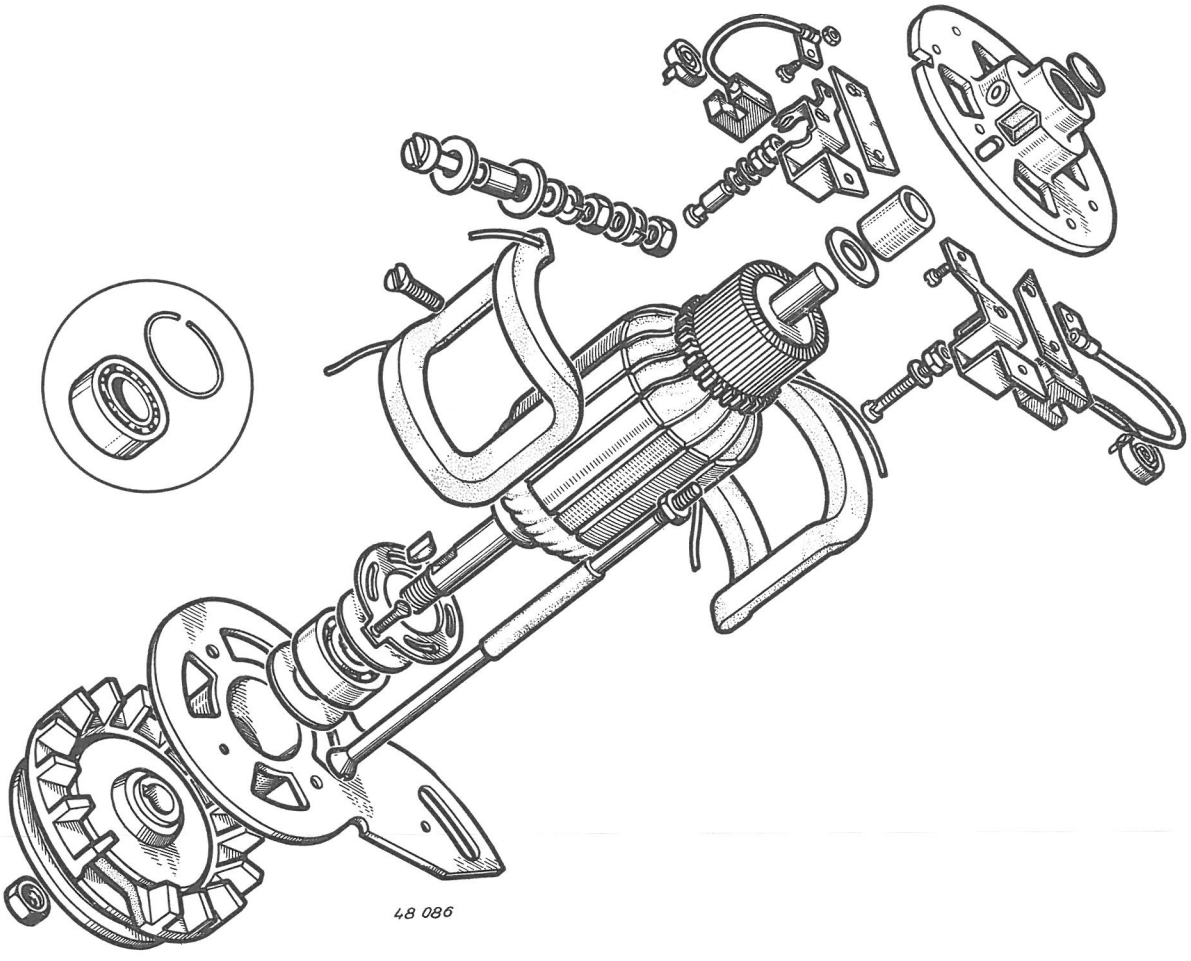
— the corresponding voltage should range from 6.4 to 6.8 volts,

— adjust resistance to obtain 4 A, the tension should be between 7 and 8 volts.

NOTE. — The adjusting of the regulator is a matter of high accuracy and we prohibit its repair (replace).

DYNAMO
(continued)


48 085


48 086

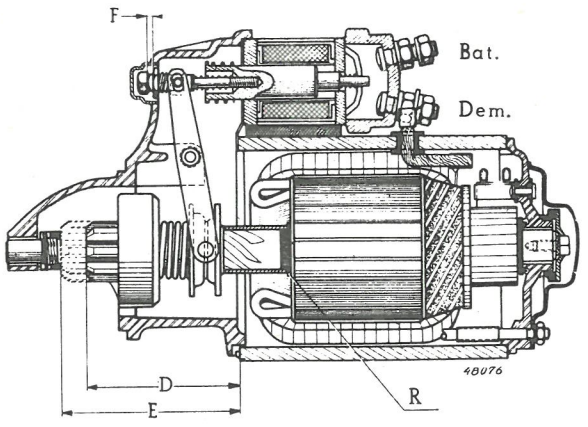
Ducellier dynamo, Reference 225 C.

— Minimum length of brushes ..... 8 mm
— Minimum diameter of commutator ..... 45.5 mm
— Mica insert, milling depth ..... .5 mm
over entire width of insert.

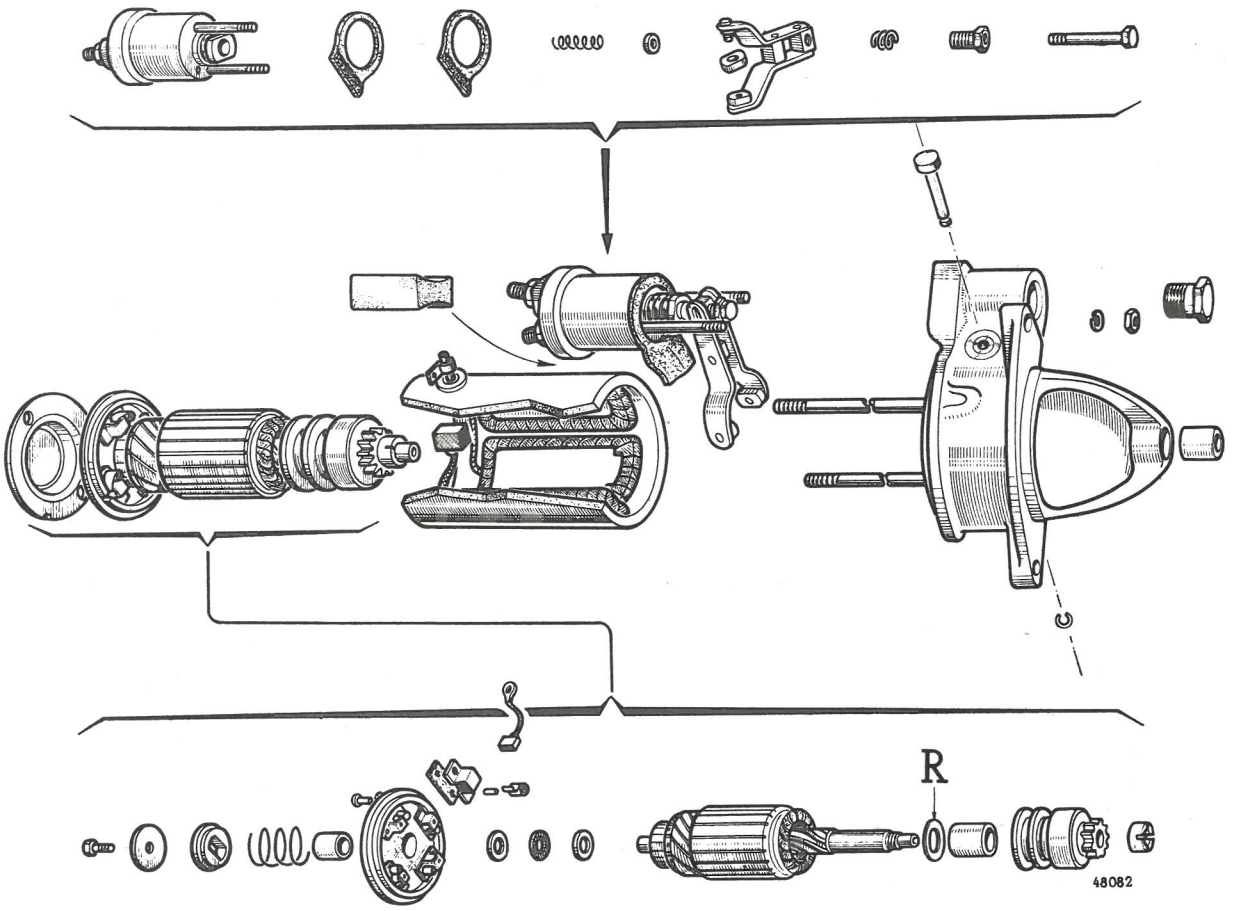
Paris-Rhône dynamo, Type G 11 R 80.

— Minimum length of brushes ..... 8 mm
— Minimum diameter of commutator ..... 38 mm
— Mica insert, milling depth ..... 6 mm
over entire width of insert.

NOTE. — Difference with Ducellier dynamo : in the bearing cover, the 2 washers and the bearing have been replaced by a seal and a bearing.



DUCELLIER STARTER



Ducellier starter — Reference 6.008 B.

— Minimum length of brushes	10 mm
— Minimum grinding diameter of commutator	39 mm
— Mica inserts, milling depth	.5 mm over entire width of insert
— Position of pinion when at rest	D = 79 mm ± .5
— Position of pinion when in operation	E = 92 mm ± 0 .5
— Clearance between control screw and bush	F = .1 to .5 mm
— Thickness of adjusting washers (R)	.2 and .5 mm

DUCELLIER STARTER

(continued)

If it is necessary to dismantle the Ducellier starter, **the following adjustments will have to be performed during the reassembling :**

After reassembling the armature in the housing and before reassembling the end plate at drive end :

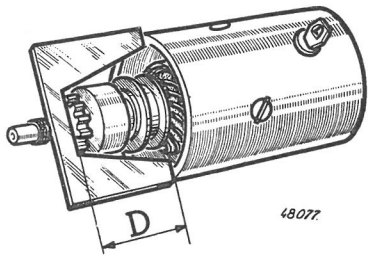
Adjustment of the rest position of the drive :

Make sure the end plate at commutator end contacts the housing and that the armature rests on this end plate.

Position the template (Ref. Ele. 08) **which corresponds to the dimension D.**

With the template resting on the housing, the front face of the pinion should be contacting the face of the template.

If the position of the pinion is not correct, **change shims (R).**

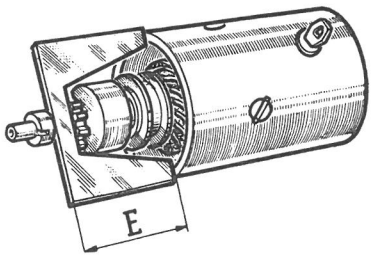


Adjusting the forward position of the drive :

Position the template (Ref. Ele. 08) as with the above adjustment.

Run up the front thrust and move it to contact the **outside of the template, which corresponds to the dimension E.**

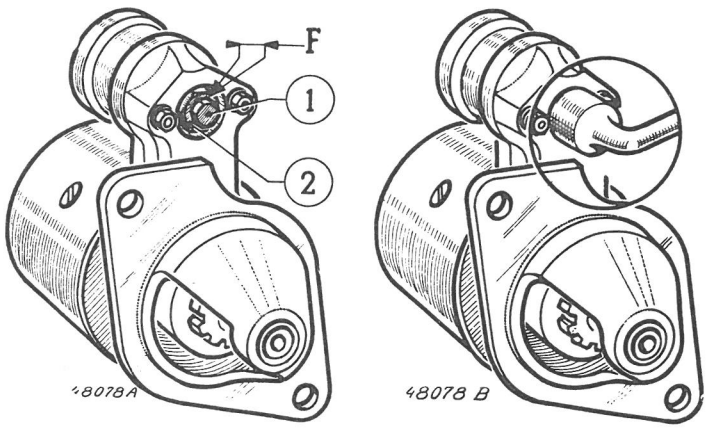
Lock the thrust, and fold down the ends of the cotter pin (maximum protusion of pin : 5 mm).



After assembling the " switch-end plate " assembly on the housing, perform :

The adjustment of the core and fork connection.

Run up the adjusting bush (2) in order to obtain **an accurate clearance** (1 mm) approximately between this bush and the control rod (1). Make sure that, at this time, the drive contacts the spacer, hold at this position and run off the bush (2) until it is flush with the head of the control rod (1), **with a clearance (F) as small as possible.**

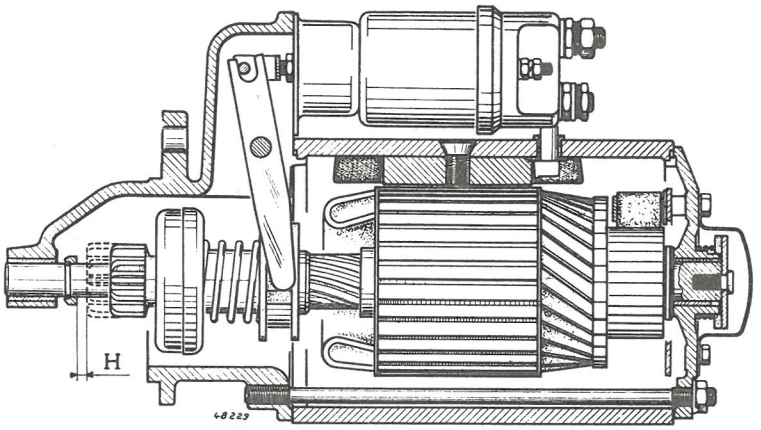


Final check of the switch.

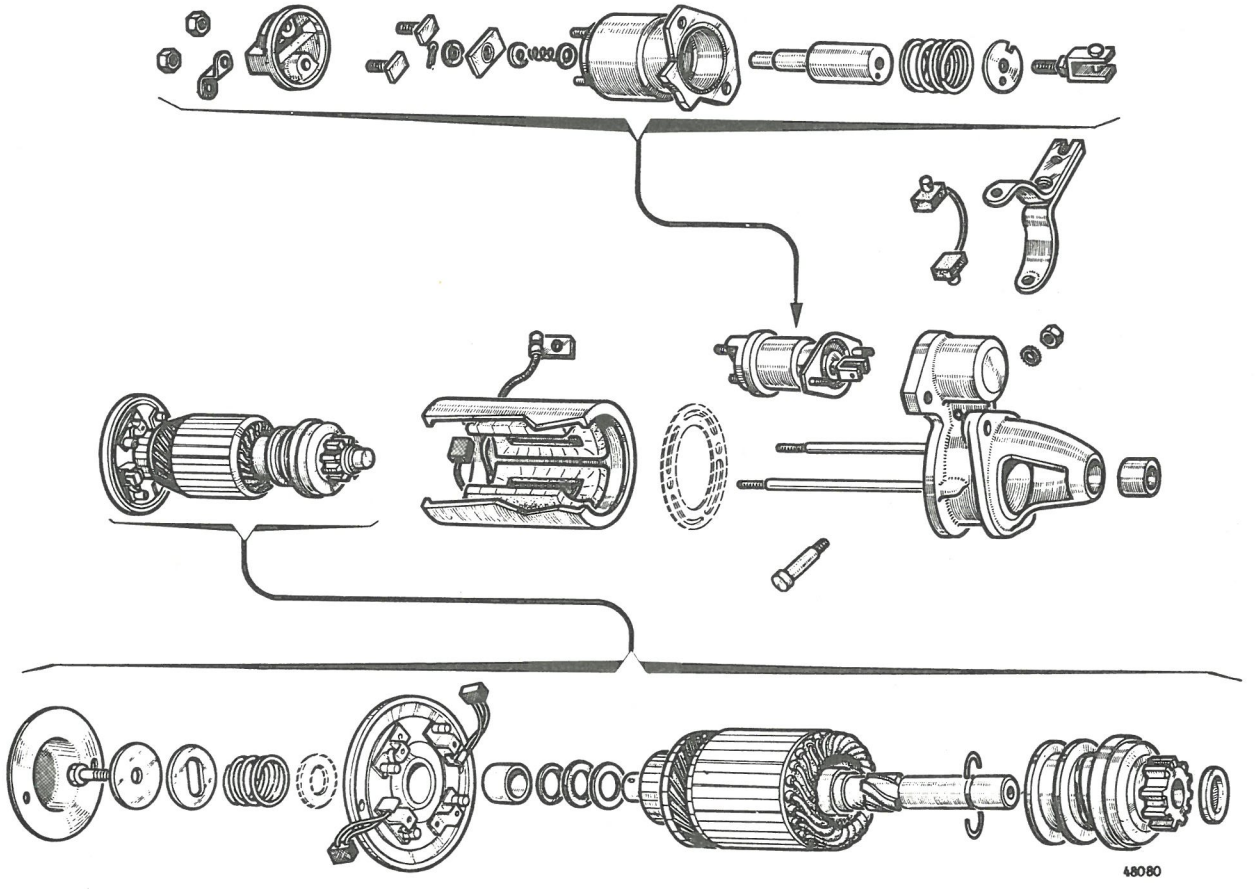
1° **Checking the contact cut-off :** Close the circuit of a tell tale lamp on the two **DEM** and **BAT** terminals of the switch. Hold the drive pinion against the front thrust. At this position the lamp should be off. (This position corresponds to the case of the pinion being meshed fully and the switch current supply cut off : the starter current supply should be off).

Push at the end of the rod (1); the latter should move by a few millimetres before contact is made (the lamp flashes on) and should resume its position with contact cut off when one let go (the lamp flashes off). **This free stroke of the rod should be at least 1.5 mm.**

2° **Checking the contact :** Make sure, when the switch is supplied with current, that the contacts are closed. For the purpose, no clearance should be experienced when applying pressure on the rod head (1).



PARIS-RHONE STARTER



Paris-Rhône starter. Type : D 11 E 54.

— Minimum length of brushes	8 mm
— Minimum grinding diameter of commutator	40 mm
— Mica insert milling depth	.6 mm over entire width of insert
— Clearance between front thrust and pinion when in operation	H = .5 to 2.5 mm

NOTE. — Fit the 2 washers shown in dotted lines, only if found upon disassembly.

PARIS-RHONE STARTER

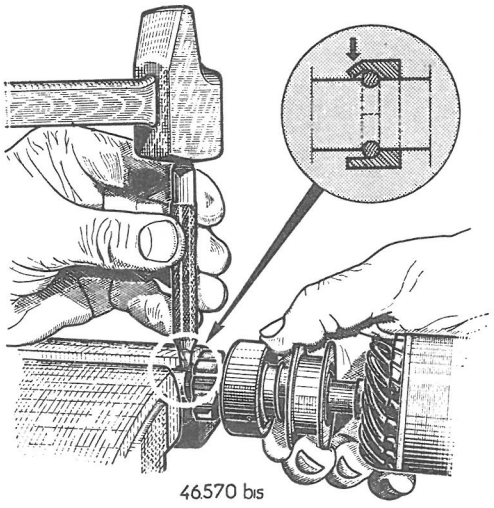
(continued)

If it is found necessary to dismantle the PARIS-RHONE starter, **the following points should be paid attention to during reassembling :**

Always fit a new front thrust.

Straddle the snap ring with the thrust.

Flatten the end of the thrust at four points, as shown on illustration, in order to hold the snap rings.

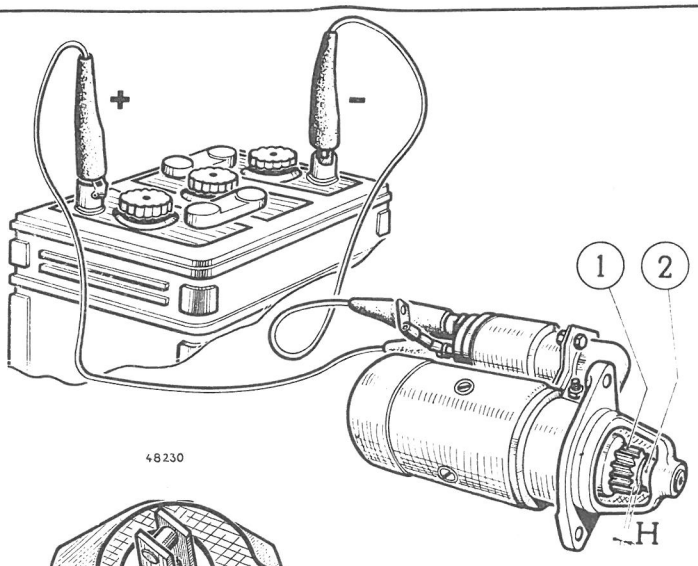


46.570 bis

Adjusting the connection between the core and the fork.

Energize the solenoid as shown on illustration.

NOTE. — **The induction coils current inlet terminal should not be connected.**

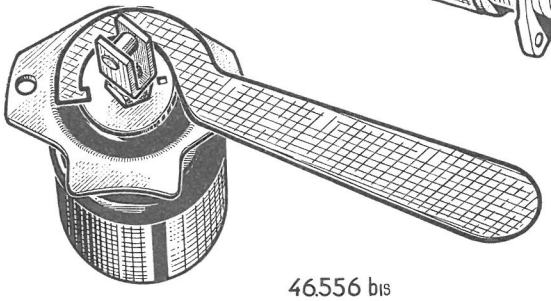


48230

The pinion (1) is then moved to its forward position.

A clearance H of .5 to 2.5 mm should exist between pinion (1) and thrust (2).

If this clearance is not correct, remove the switch, lock the switch washer with a spanner (Ref. Ele. 06) and run up or off.



46.556 bis

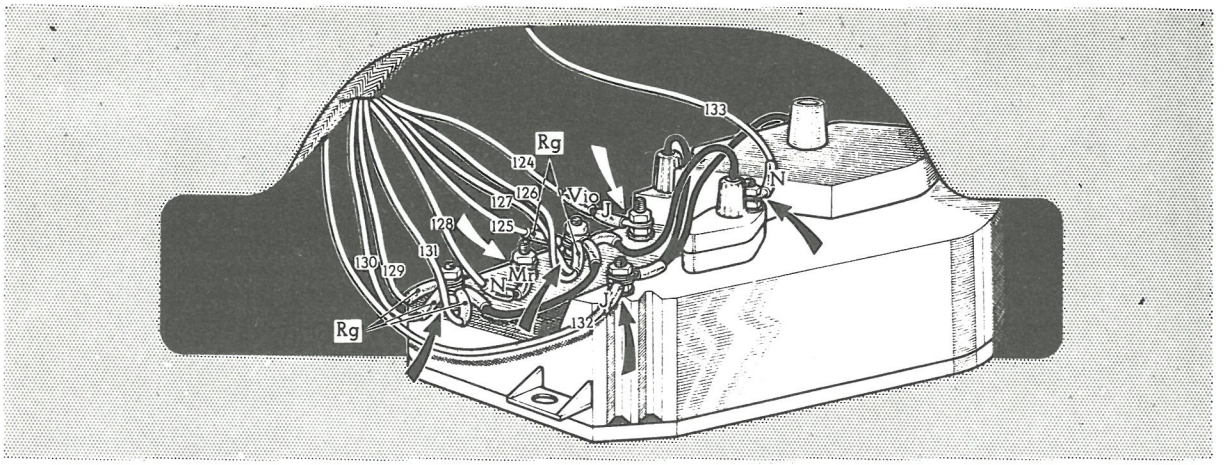
STARTER SWITCH

Inspections for both the Ducellier and Paris-Rhône starters.

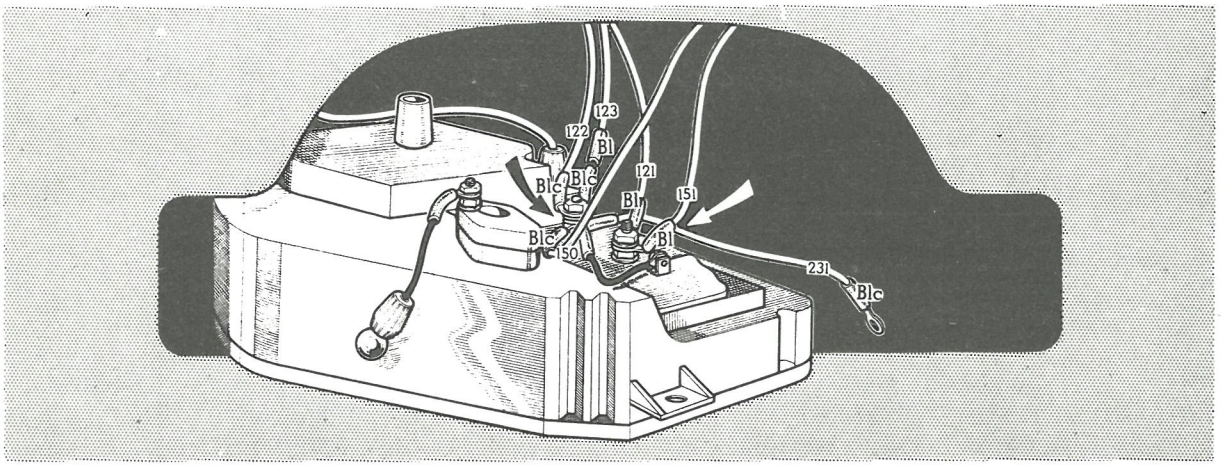
1° **Checking the current supply to switch.**
With the starter correctly assembled on the car, connect a tell tale lamp between the switch current supply terminal (side terminal) and earth. Operate the ignition switch. If the lamp does not flash on, check the lead between switch and ignition switch. If this wire is in good condition, replace the ignition switch after making sure the latter is correctly supplied with current.

2° **Checking the switch.**
With the starter removed, connect the " DEM " terminal of the switch to the " + " terminal of the battery and connect the housing to the " — " terminal of this battery. If starter rotates, the switch only is at fault. Replace (Ducellier) or repair (Paris-Rhône).
If starter does not rotate, check it. With the starter removed, check the switch only : connect its side terminal to the " + " terminal of a battery and connect the " — " to a metal portion of the switch. Make sure the contacts are closed by connecting the " BAT " and " DEM " terminals to a tell tale lamp. The lamp should flash on.

INSTRUMENT PANEL



48216



48217

REPLACING.

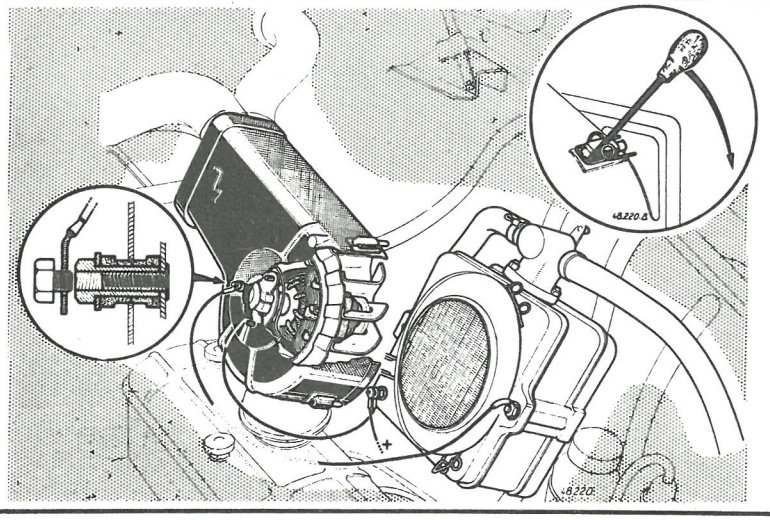
Disconnect the battery, the speedometer cable, the clock control sheath, the trip recorder control sheath and the cigar-lighter lead (231).

Remove the nuts on the two instrument panel to dash board mounting screws.

Tilt the panel in order to locate the dials underneath.

Clear the LH side of the panel and disconnect, at the locations shown by the arrows, the numbered wires. Next, clear the RH side and perform the same operations.

When refitting, make sure that the spacers (on the attaching screws) are correctly located between the dashboard and the panel tabs.



HEATER MOTOR

Replacing.

Disconnect the earth wire and the current supply wire.

Clear off the 3 springs attaching the bakelite case to the cover, the proper locations being used for the purpose.

Remove the 3 screws attaching the motor-blower in the case and remove. When reassembling, be sure to correctly install the motor-blower assembly mounting washers on the case and apply pressure on the two loops of the springs in order to fix same.

WINDSCREEN WIPER MOTOR SUPPORT AND CONTROLS

REMOVING.

Disconnect battery and remove the centre glove compartment (or the radio).
From each shaft, remove :
— the blade carrier,
— the shield (1) and the nut (2),
— the cup washer (3) with the gasket (4).

Under engine bonnet, remove the windscreen wiper motor; to this end :
— disconnect the earth wire and the 2 current supply wires,
— remove the 3 attaching screws (5) with their cup washer (6) and gasket (7).

Next, remove :
— the rubber pads (8) and (9), the spacer (10) and the cup (11),
— the screw (12) securing support to body.

Inside the car, clear out the mechanism, save the pad (13), the cup washer (14) and pads (15) and (16).

REFITTING.

The mechanism is delivered with the washers (19) and (18) and te nut (17) (correctly positioned and locked with some paint). When repairing, if the nut (17) has been removed (for replacing washers [18] and [19]), **again lock the nut at its pre-determined position, so that A = 44 mm.**

NOTE. — The 2 shafts of the mechanism are not parallel.

On each shaft, install :
— the cup washer (14),
— the pad (13) (with shoulder located outwards).

IMPORTANT. — To facilitate the refitting of the motor on the support (after assembling the latter), attach with the screws the pads (16) and spacer (10) on support.

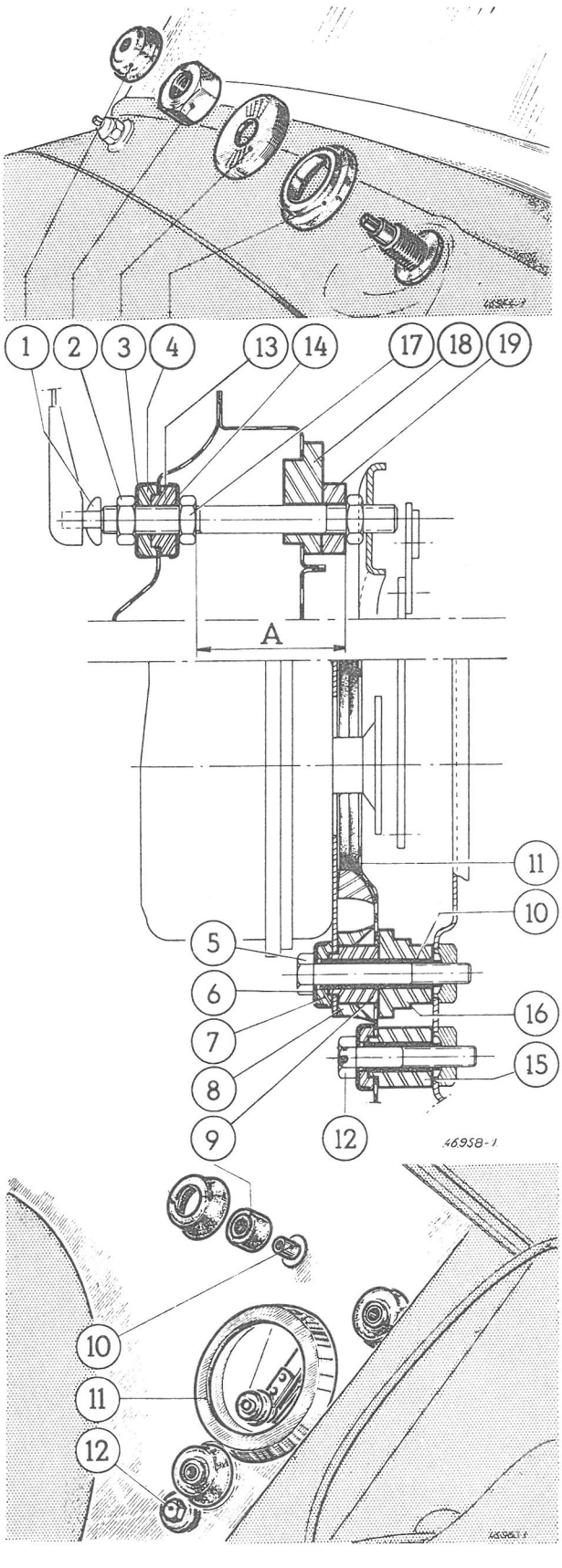
Inside the car, reposition the mechanism; to this end :
— position one of the shafts in the body location, insert the eccentric washers (18) and apply pressure on shaft. If the latter is not at the centre of the location, rotate the eccentric washer as required,
— maintain shaft while a second operator fits on shaft :
  — the seal (4) and the cup washer (3),
  — the nut (2) and the shield (1),
— follow same operations for the second shaft.

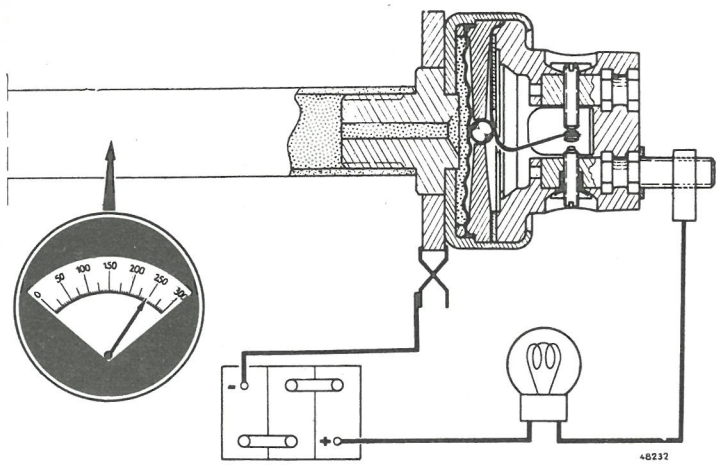
Fit the pad (15) with the spacer (shoulder outwards) and install screw (12) fitted with a seal and a cup washer.

Under engine bonnet, reassemble the windscreen wiper motor; to this end :
— remove the 3 screws previously fitted and attaching the 3 pads (16) on the support,
— on each spacer (10) fit a rubber pad (9) (with shoulder outwards) and the other pad (8),
— on body, fit cup (11),
— position motor and locate the shoulder of pads (9) in the motor support holes,
— fit the 3 screws with their cup washer (6) and gasket (7),
— connect :
  — the 2 current supply wires (with clips of different dia.),
— the earth wire.

Refit the 2 wiper blade carriers and the glove compartment (or the radio set).
Reconnect the battery.

NOTE. — Upon the first revolutions of the motor, the mechanism drive shaft will insert in the groove of the drive plate.





OIL PRESSURE SWITCH

Checking.

It is necessary to have a source of **compressed air** and a pressure reducing valve of suitable accuracy.

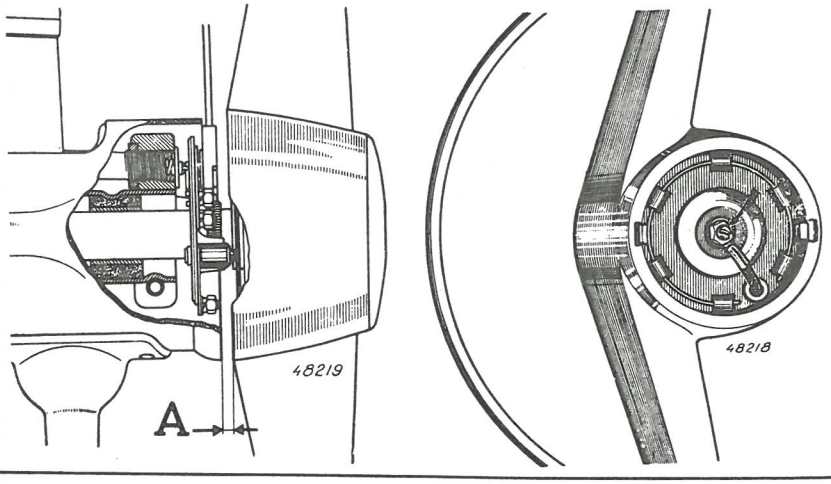
Connect the pressure switch at the air inlet, using a flexible pipe. Connect a tell tale lamp.

With air inlet being **closed off,** the tell tale lamp should be **on. The lamp should go out when the pressure on the valve is : 250 g/cm² + 25.**

If the lamp stays on, or if it flashes out too soon, replace the pressure switch.

WATER TEMPERATURE INDICATOR SENDERS OR RECEIVERS

Checking : use the JAEGER temperature sender and receiver checking device (Ref. Ref. 04). Follow the manufacturer's instructions.



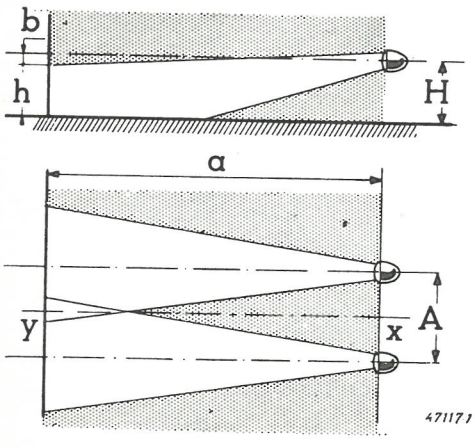
HORN RING SWITCH

When reassembling the " Avercod Covir " case, make **sure the dimension A = 4 mm is correct,** between the case and the steering wheel, in order to ensure a proper contact between rubbing piece and rubbing washer, the latter being for current supply to the road horn ring switch.

Similarly, when refitting the steering wheel, the horn ring switch adjusting screw should be adjusted until the horn has the required action.

HEADLAMPS

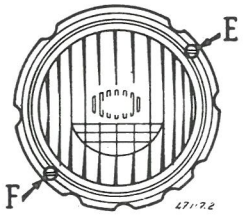
To adjust the headlamps, use a "Regloscope " adjusting device and refer to the manufacturer's instructions. Or use the following procedure :



ADJUSTMENT : with the vehicle **being loaded** and located on a flat, horizontal area, at a **distance a = 10 m from a wall,** adjust the headlamps so that :

a) the light beams be **parallel to the axis of the car,**

b) the section, **at dipper position,** be at a **height (h) lower by 10 to 25 cm (b)** than the height of the glass centre (H).

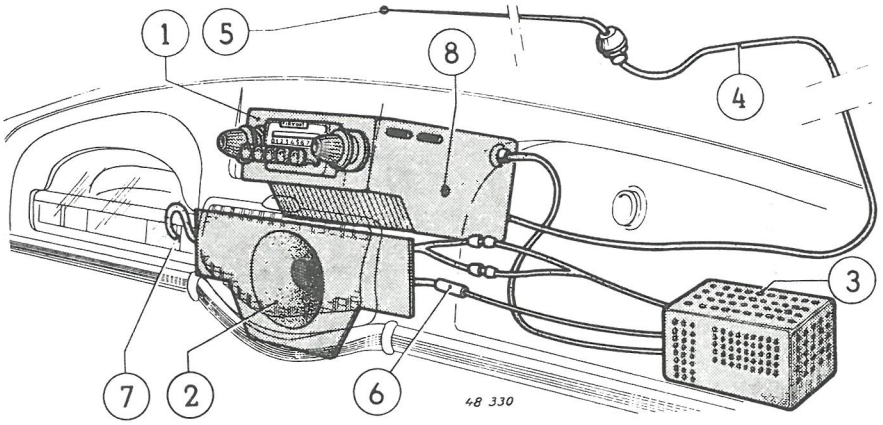


Set parallelism of beams (directional adjustment) with screw E. **Adjust for height of section** (depth adjustment) **with screw F.**

FIRVOX AUTO RADIO

GENERAL LAY-OUT OF INSTALLATION

1. Receiver ..... RA. 28
2. Loudspeaker .. 80.622
3. Power supply case.
4. Antenna cable.
5. Antenna ..... SA. 11
6. Fuse ..... 10 Amp
7. In - current connection.
8. Antenna adjustment.



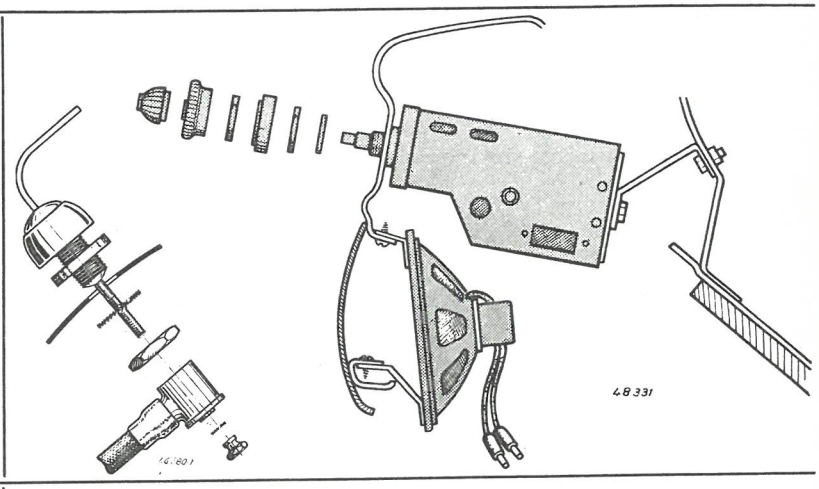
INSTALLATION OF SETS

Receiver : it is attached with the 2 tapered knobs and with a rod and 2 bolts at rear.

Loudspeaker : the loudspeaker is mounted with 3 angle plates bolted to the baffle and attached to the instrument panel with self-tapping screws.

Power supply : attached under scuttle through a threaded 8 mm rod and nuts.

NOTE. — Around the holes, the sheet metal should be cleaned thoroughly to ensure a good earth connection.



RADIO INTERFERENCE ELIMINATING

Ignition system. Install :

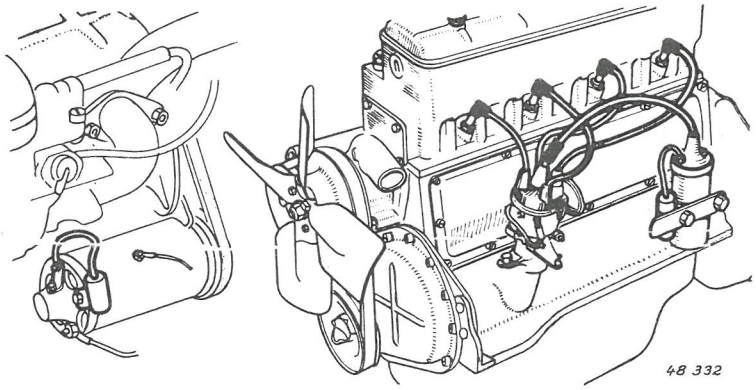
— a FT 603 resistance on each sparking plug wire,

— a FT 605 resistance on the distributor centre lead as close as possible to distributor,

— a .5 mf condenser between " + " terminal and earth connection of coil.

Dynamo.
Fit a .5 mf (RT 604 bis) condenser between earth and " + " terminal.

Front wheels.
Fit a AT. 1078 anti-statics spring in wheel covers.

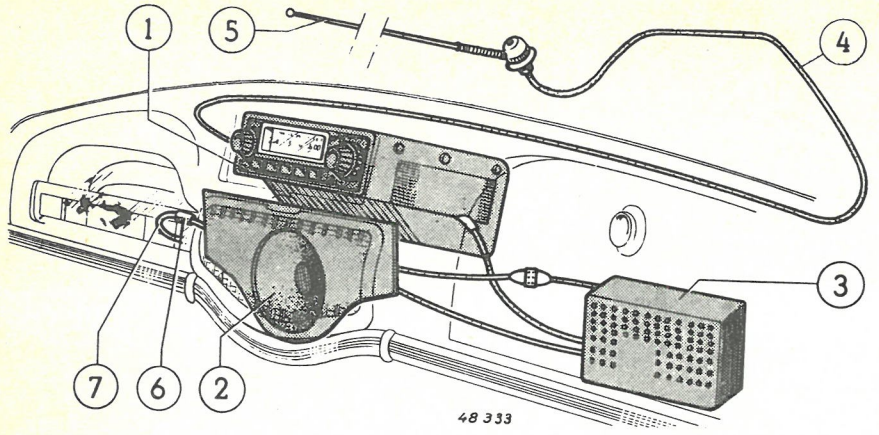


ADJUSTMENTS AND INSPECTIONS

Adjusting the tuning circuit.
Select an area free from industrial interference sources. Set receiver, with volume control knob to maximum, to a very weak station in the " medium wave " range in the area between 8 and 10 of the scale. With a screwdriver, turn the compensator screw (8 - Top illustration), to the right or to the left until a maximum sound intensity level is obtained.

Checking the antenna cable.
The antenna cable should be as far as possible from electrical leads. Make sure it adheres, as extensively as possible, to the body metal.

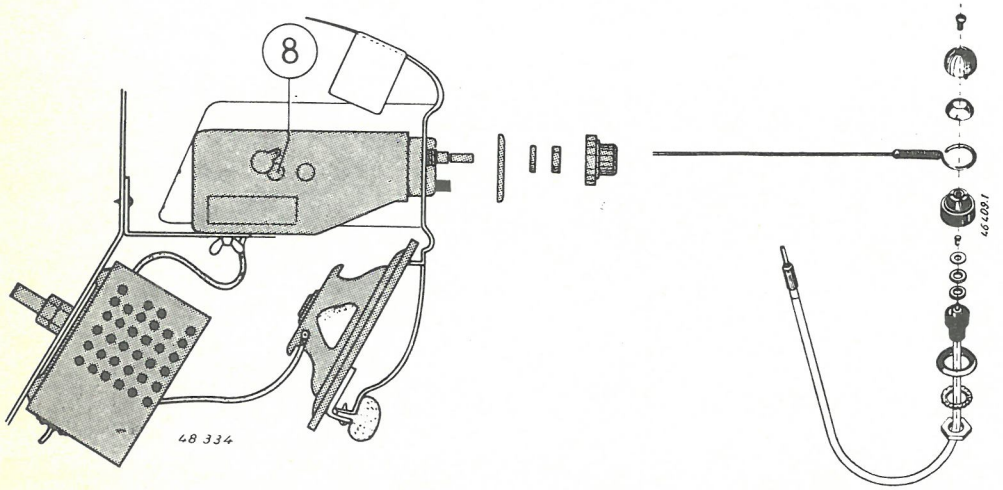
Checking the interference elimination.
If radio interference elimination at dynamo or coil is insufficient, fit there a 2 mf (FT 604) condenser.
If regulator causes interference, install on regulator a 50 mf (FT 634) condenser between earth and battery terminal.
Interference suppression at accessories is achieved with a .5 mf (FT 604 bis) condenser. It is recommended to connect to chassis, with a earth strap, the moving parts of the vehicle.



PHILIPS AUTO-RADIO

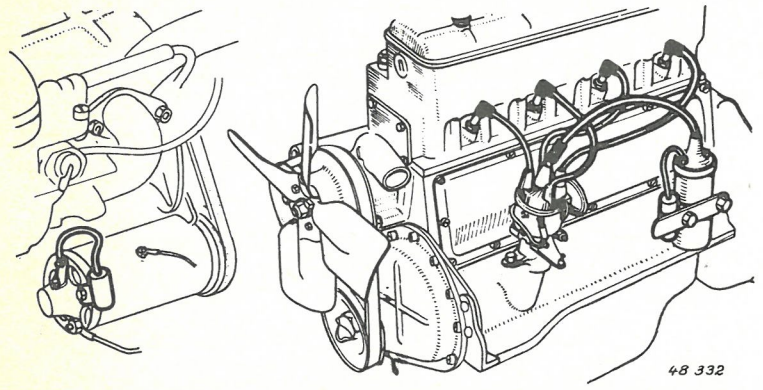
GENERAL LAY-OUT OF INSTALLATION

1. Receiver ..... 644 V
2. Loudspeaker .... AF 19 R 11
3. Power supply case
4. Antenna cable
5. Antenna..... AF 7420
6. Fuse ..... 10 Amp.
7. Connection to instrument panel.



INSTALLATION OF SETS

Receiver : the receiver is maintained by its two knobs and by a perforated strip with screws at the rear.
Loudspeaker : the loudspeaker is secured to the lower flange of the dashboard with 2 self tapping screws.
Power supply : attached to scuttle with a threaded rod and nuts.
NOTE. — Around the holes, the sheet metal should be cleaned thoroughly in order to ensure a correct earthing.



RADIO INTERFERENCE ELIMINATION

Ignition system. Install the following : On ignition coil, between the " + " terminal and the earth, fit a 2 mf (No. 5126) paper type condenser. On the distributor central lead, as close as possible to distributor, install a 7783.35.1 resistance. One 7783.35.C resistance on each sparking plug.

Dynamo.
Install, between " + " terminal and earth, a .5 mf (No. 7350) condenser.

Front wheels.
Fit an anti-statics spring 7974.F in the wheel covers.

ADJUSTMENTS AND INSPECTIONS

Adjusting the tuning circuit.
Select an area free from industrial interference sources. Tune radio to the short wave range in somewhat over the 500 metres band, on a very weak station, and, next, adjust the antenna trimmer (8 — Centre illustration) using the special spanner No. 23.981.02, tightening or loosening in order to obtain a maximum output between 2 minima.

Checking the antenna cable.
Move the antenna cable as far as possible from the electrical leads. Apply cable, as extensively as possible, to the body metal.

Checking the interference elimination.
If interference suppression at dynamo is not satisfactory, fit a 2 mf (n° 5126) condenser to replace the .5 mf one.
If regulator is the source of radio interference, fit a 2 mf (No. 5126) condenser between earth and battery terminal.
Interference suppression at accessories can be achieved with a .5 mf (No. 7350) condenser. A proper electrical connection (earth braid) between the various moving parts of the vehicles is recommended.

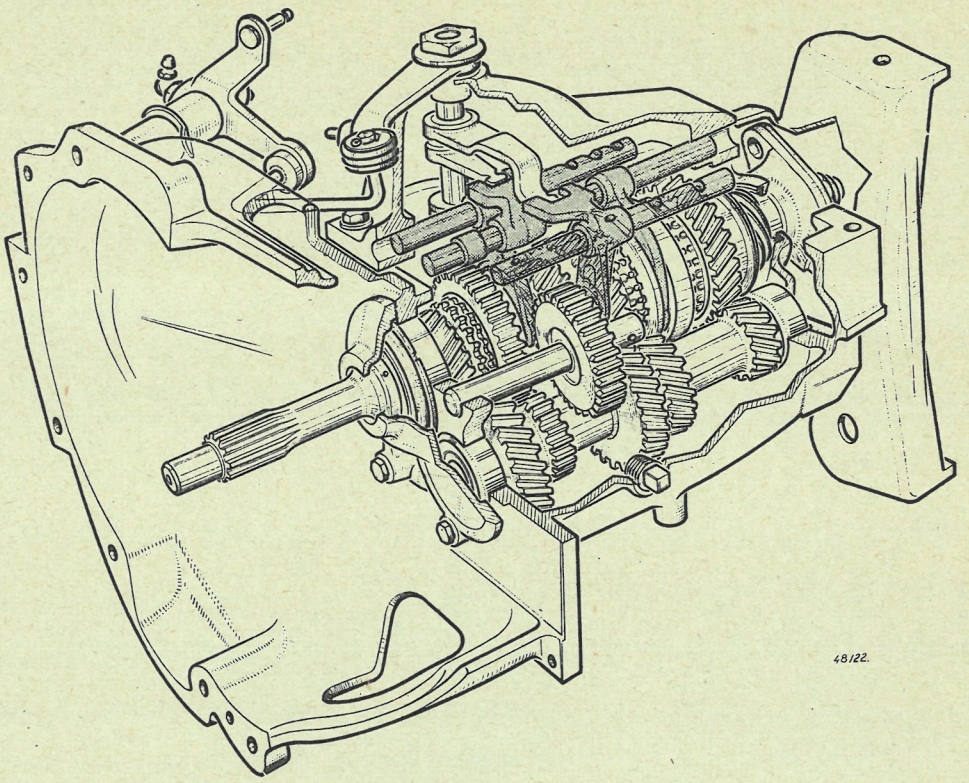
5. GEARBOX

IDENTIFICATION

Type **295.02.**
for LH drive.

Type **295.03**
for RH drive.

(The type, the mark and the manufacturing number are shown on an identification plate riveted at left hand on the clutch housing).

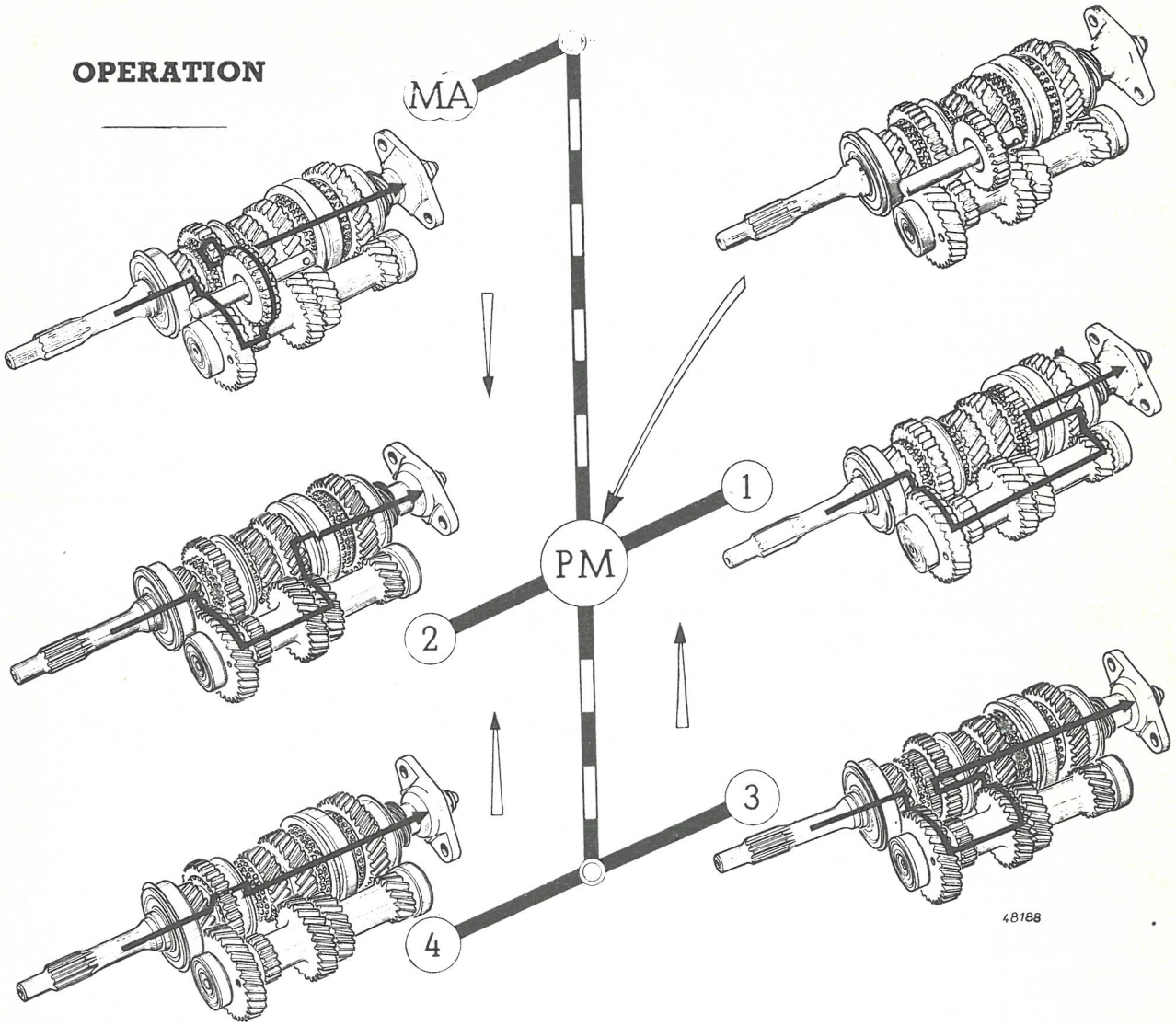


SPECIFICATIONS

4 synchronized forward speeds (Borg-Warner) and one reverse. 4th speed is direct drive.

Gear ratios :	
— 1st	3.81
— 2nd	2.08
— 3rd	1.39
— 4th	1
— Reverse	3.36
Oil :	
— capacity : until gearbox n° 9910	1 litre
from gearbox N° 9911	1.6 litre
Weight	37.5 kg
Tachometer :	
— Worm	7 threads
— Gear	13 teeth
Tightening torques :	
— Steering column flange attaching bolts	1 m.kg
— Drive flange nut	15 m.kg
Distance from avercod to steering wheel	A = 4 mm
Pre-stressing of thru-bolts damping washers	C = 7 mm
Loosening load of sliding gears from synchronizers	3 to 6 kg
Width of fork thrusts :	
— To 1st	D = 3 mm
— To 2nd	E = 14 mm
— To 3rd	F = 3 mm
— To 4th	G = 3.5 mm
— To Reverse	H = 13.5 mm
— To Neutral	J = 5.5 mm
Thrust adjusting washers	.5 mm
Adjusting washers between intermediate shaft and shaft rear bearing	.1 - .2 mm

OPERATION



The 4th speed gear, integral with the primary shaft, is always in mesh with the intermediate shaft, the latter being in turn in constant mesh with the first, second and third speed gears, rotating idle on the secondary shaft.

Three parts only can move laterally :
— the reverse speed sliding gear mounted on an auxiliary shaft,
— the 1st-2nd speed synchronizer.
— the 3rd-4th speed synchronizer.

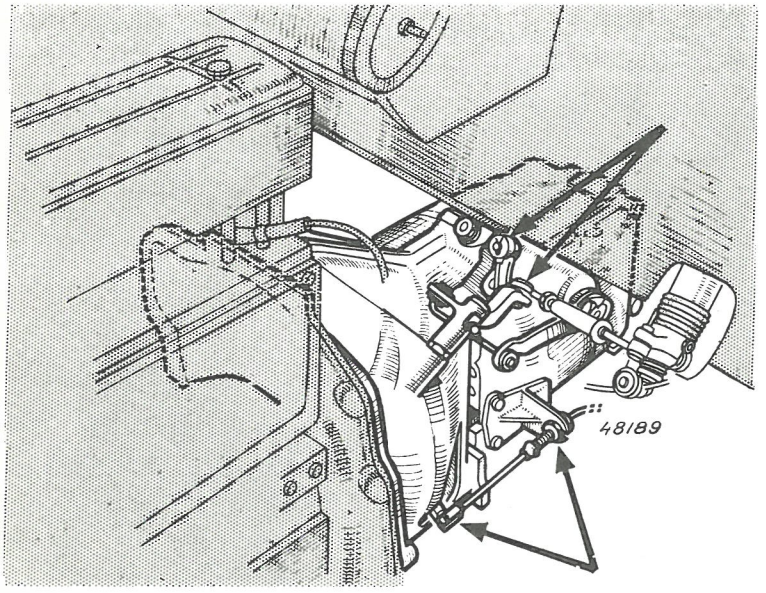
Neutral.
The two synchronizers and the reverse speed sliding gear are at their medium position. No motion is transmitted to the secondary shaft.

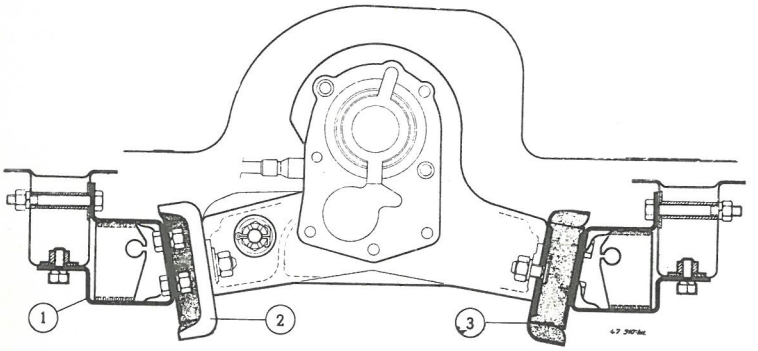
First and second speeds.
The 1st-2nd speed synchronizer moves and meshes the 1st or 2nd speed gear with the secondary shaft, thereby transmitting the power flow to this shaft.

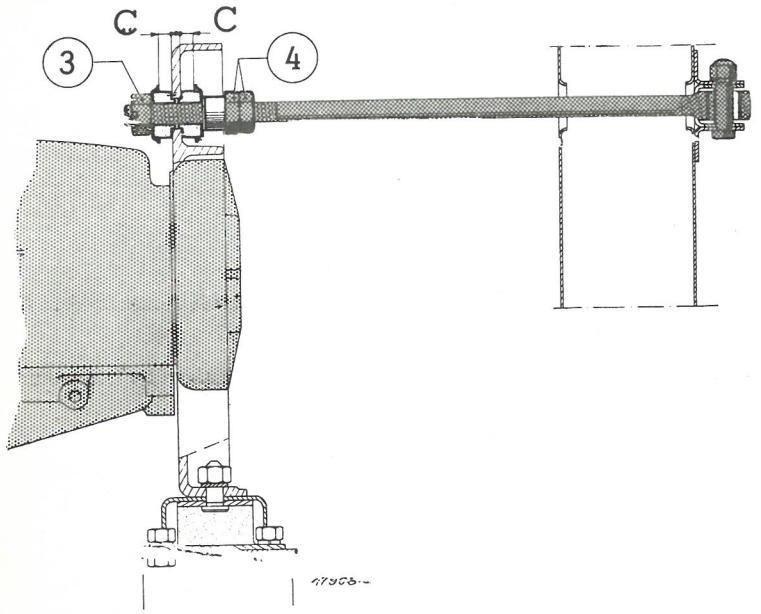
Third speed.
The 3rd-4th speed synchronizer moves and meshes the 3rd speed gear with the secondary shaft, thereby transmitting the power flow to this shaft.

Fourth speed.
The 3rd-4th speed synchronizer meshes the 4th speed gear on the secondary shaft thereby making directly integral the primary and secondary shafts (direct drive).

Reverse.
The reverse sliding gear meshes with both the intermediate shaft and the 3rd-4th speed synchronizer, thereby transmitting the power flow to the secondary shaft.







REMOVING

Disconnect the battery and remove the limiting rod as well as the exhaust pipe.
Remove the gearbox to engine 4 upper attaching bolts.
Disconnect the gear controls for selecting and shifting the speeds.
Underneath the vehicle :
Remove the torsion bar bearing support caps. Clear the torsion bar.
Remove the clutch housing.
Remove the front transmission.
Disconnect :
— the gearbox thru-bolt at both ends,
— the clutch cable,
— the tachometer control cable.
Fit a jack under the gearbox.
Clear the gearbox from its rear supports; to this end :
— **at end opposite to the clutch control,** remove the support on side-member (1) and the elastic pad (2),
— **at clutch control end,** remove the elastic pad (3). Remove the two last bolts fixing the gearbox to the engine and remove the gearbox, **pulling it in line.**

REFITTING

Install the gearbox on a jack.
Check the clutch disc alignment using a tool (Ref. Emb. 01).
Position the gearbox and attach on engine with the two lower bolts, being sure to insert the **earth braid** and the 4 upper bolts, inserting the limiting rod thrust plate and the battery earth wire.
Refit the limiting rod. Connect the tachometer control cable.
Mount the rear suspension of the gearbox on the side-members.
Reconnect :
— the front transmission,
— the gearbox thru-bolt.
Pre-stress the damping washers of the thru-bolt by running up fully the castellated nut (3). Insert cotter pin and operate the nuts (4) to obtain a **dimension C = 7 mm.**
Connect the clutch cable and adjust the pedal free play (see page 46).
Refit :
— the clutch housing,
— the two torsion bar bearing support caps,
— the exhaust pipe.
Reconnect the controls for gear selecting and shifting and **adjust** (see pages 86 and 87).
Reconnect the battery.

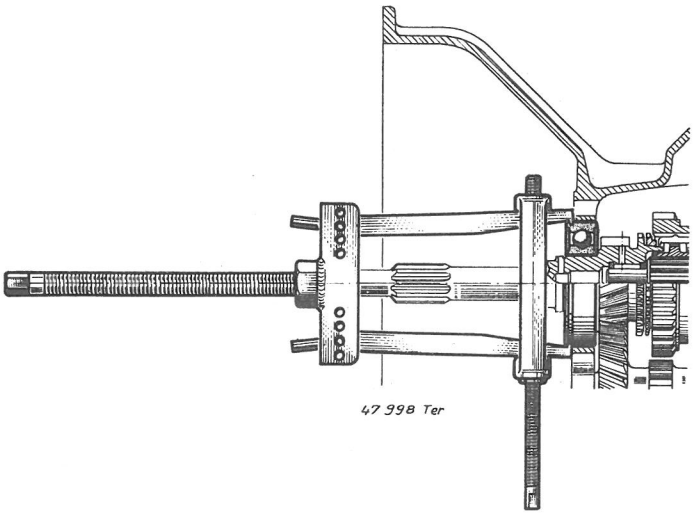
DISMANTLING

Remove :

— the clutch fork and thrust bearing,
— the gearbox front cover,
— the gear shift lower link. For the purpose, temporarily shift into the 4th speed,
— the fork control cover after shifting to neutral,
— the drive flange and the washer, for the purpose, shift two speeds,
— the gearbox rear cover and tachometer worm,
— the reverse gear and shaft.

Removing the primary shaft :

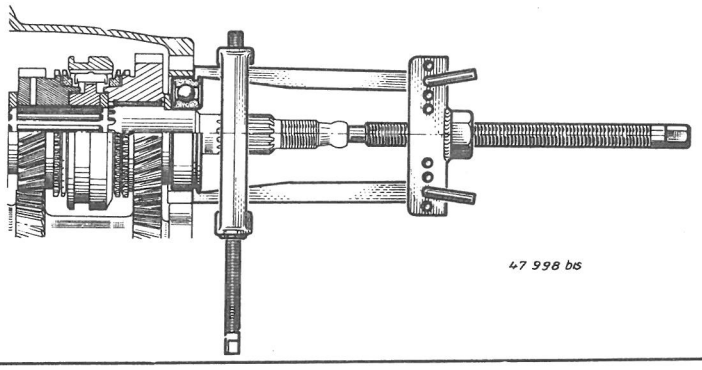
Remove the primary shaft bearing retainer and the bearing outer snap ring using a special snap ring pliers (Ref. SAPRAR 12.279).
Pull out the bearing with a puller (Ref. SAPRAR 12.273).
Remove the primary shaft and save the 4th speed gear synchronizer ring.



Removing the secondary shaft.

Remove the bearing outer snap ring with snap ring pliers (Ref. SAPRAR 12.279).

Remove this bearing with a puller (Ref. SAPRAR 12.273).



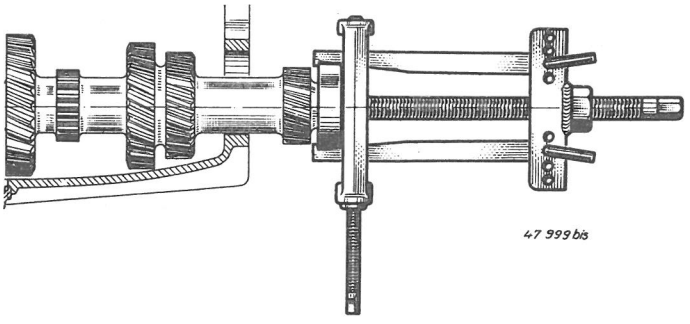
Removing the intermediate shaft.

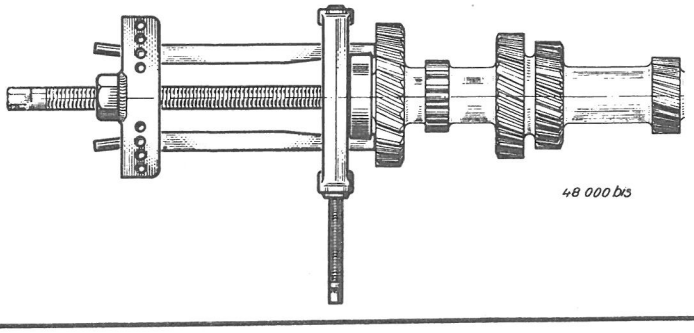
Remove the intermediate shaft towards the rear of the gearbox.

Remove the bearing with a puller (Ref. SAPRAR 12.273).

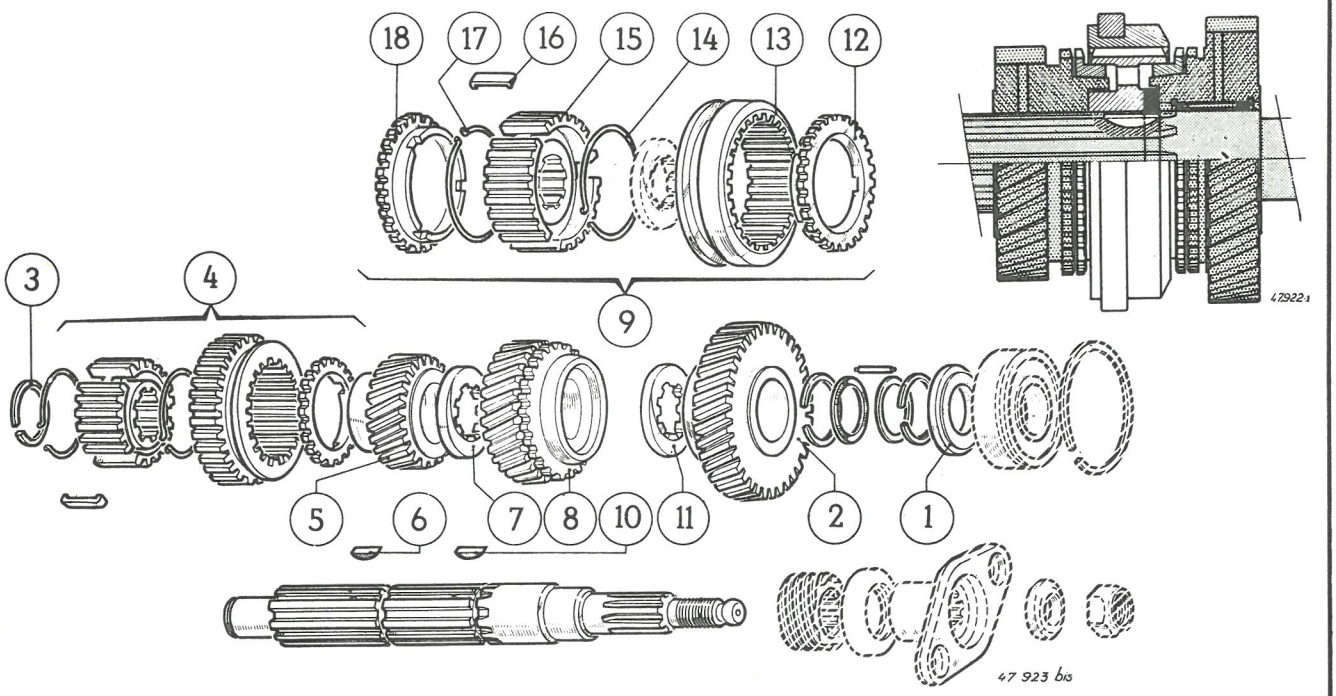
Remove the intermediate shaft.

Pull out the front bearing with the same puller.





SECONDARY SHAFT



DISMANTLING.

Remove the rear bearing thrust washer (**1**), the 1st speed gear (**2**), the synchronizer retainer (**3**), the 3rd-4th speed synchronizer assembly (**4**), the 3rd speed gear (**5**) and the key (**6**).
Rotate the 2nd speed gear thrust washer (**7**) by one spline and remove.
Remove the 2nd speed gear (**8**), the 2nd and 1st synchronizer assy (**9**) and the key (**10**).
Rotate the 1st speed gear thrust washer (**11**) by one spline and remove.
Dismantle the 1st-2nd (**9**) speed and 3rd-4th (**4**) speed synchronizers.

NOTE. — **The hub and sleeve on a synchronizer are matched.**

REASSEMBLY.

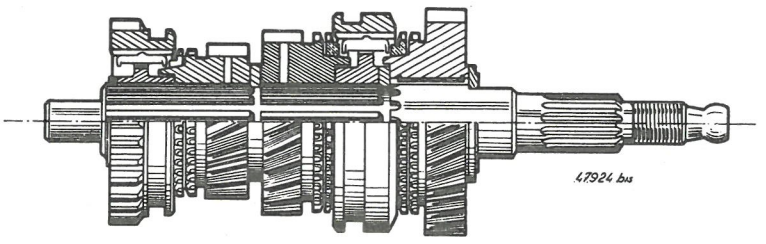
Reassemble the 1st-2nd speed synchronizer. To this end :

— assemble the sleeve (**13**) on the hub (**15**), **with fork grooves towards largest offset of hub,**
— install the 3 keys (**16**) at their location,
— at one side of hub, fit spring (**17**) one of the spring ends being fitted into the key (**16**),
— at the other side of the hub, install the other spring (**17**) with one end of the spring fitted into another key,
— position the 2 synchronizer blocking rings (**12**) and (**18**).

Operate in the same manner for the 2nd and 4th synchronizers.
Check loosening load of synchronizer sleeve. Load to be 3 to 6 kg.

Perform the dismantling operations in reverse sequence :

— 1st-2nd synchronizer : **fork groove towards clutch and splineless portion in front of key (10),**
— 3rd-4th synchronizer : **fork groove towards 3rd speed gear.**
— rear bearing thrust washer (**1**) : **small offset towards bearing.**



FORK CONTROL COVER

DISMANTLING.

Dismantle the gear selection and shifting mechanism.
Remove the fork shafts (after removing the elastic pins attaching the forks to their shaft) in the sequence 3rd-4th speed (**35**), 1st-2nd speed (**30**) and next reverse (**26**). Save springs and locking balls as well as locking plungers. Separate gear selection levers (**19**).

REASSEMBLING.

Assembling the gear selection and shifting mechanism :

— Assemble the gear selection levers (**19**) as per figure A and make them integral with 2 elastic pins,

— fit the gearshift lever on the gearbox (**20**) on the gearshift shaft (**21**) and insert shaft through the cover, the shifting fingers (**22**) (the latter being meshed with the lower shifting lever as per figure B), the cover and the locking sector (**23**).

Tighten nuts (**24**) and (**25**).

NOTE. — During this assembling, follow the respective position of parts (**20**), (**22**) and (**23**) as shown on figures C and D.

Assembling forks and fork shafts. Reverse control shaft :

— Insert, reverse speed fork shaft (**26**) through cover, thrust H (thick.: 13.5 mm), fork (**27**) and thrust J (thick. : 5.5 mm),

— install the spring and the locking ball (**28**),

— fully insert the fork shaft and temporarily attach the fork on the shaft with a pin,

— check gear shifting : therefore, shift speed and check whether thickness of thrust H permits the shifting. A small clearance should exist,

— if clearance is high, add adjusting washers (thick. : 5 mm),

— if the gear is not entirely shifted in, fabricate a thrust which will limit the stroke of the fork upon the gear shifting only,

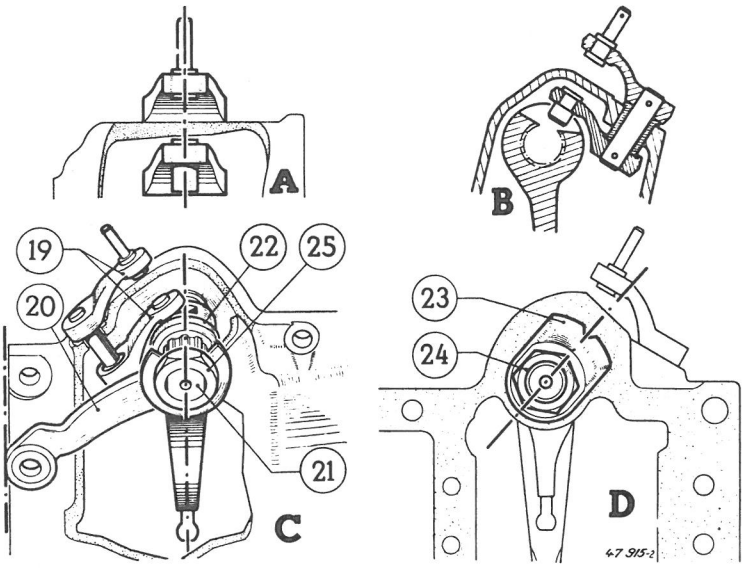
— attach fork on shaft with an elastic pin.

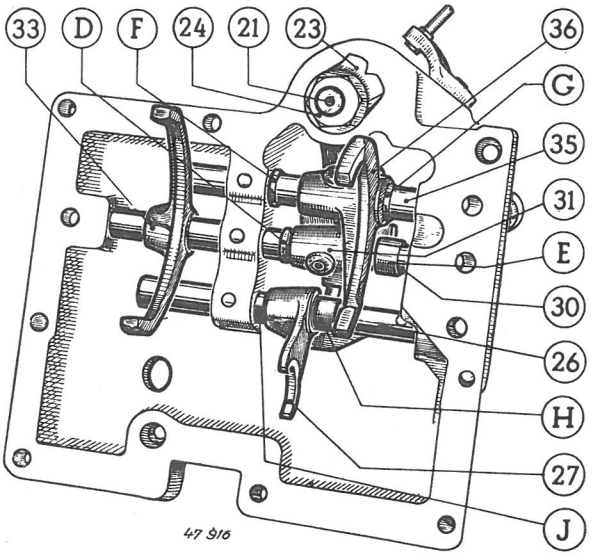
1st-2nd speed fork :

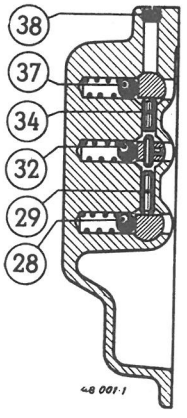
Position the longest locking plunger (**29**). Perform the same operations as for the reverse fork (above), following the references in the sequence illustrated.
Check speed shifting for thrust E (thick. : 14 mm) and thrust D (thick. : 3 mm).

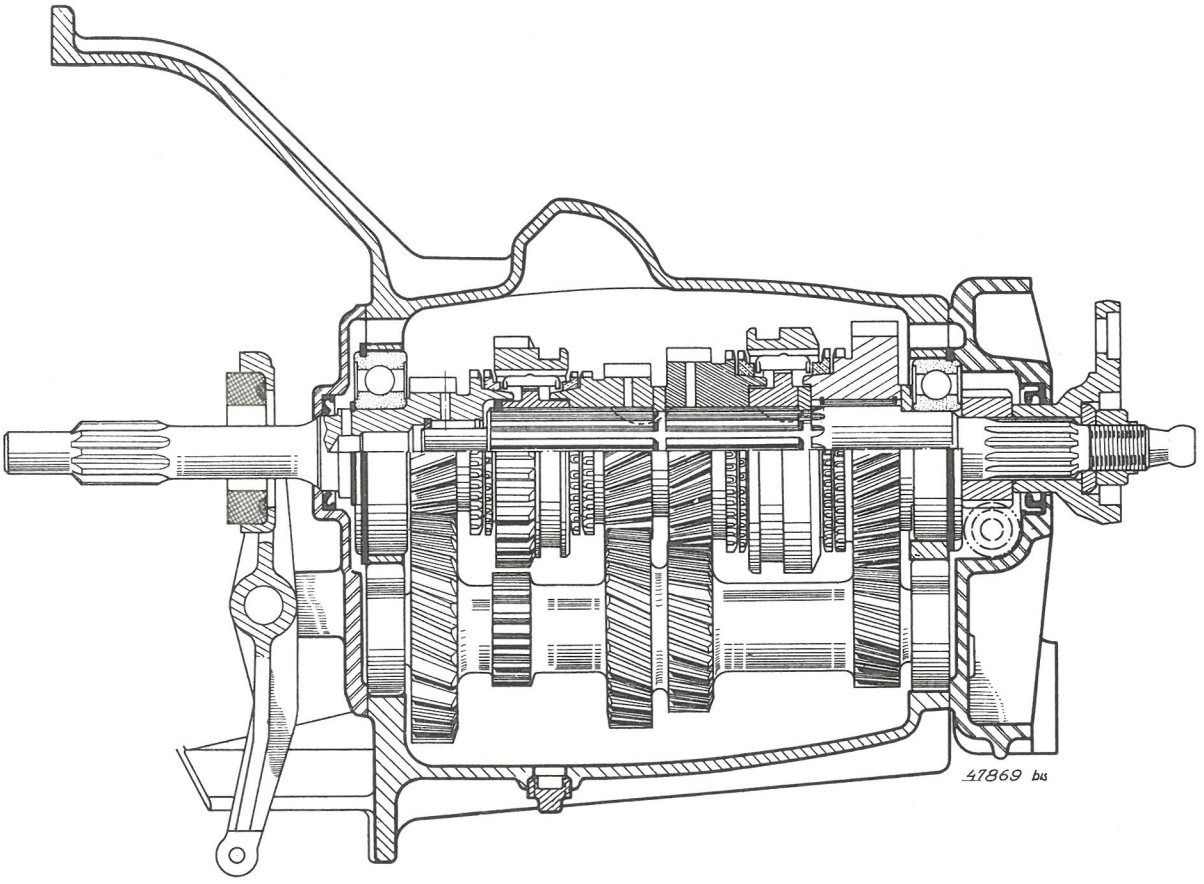
3rd-4th speed fork :

Install the locking plunger (**34**).
Perform the same operations as for the reverse speed fork (above), following the references in the sequence illustrated.
Check gear shifting for thrust G (thick. : 3.5 mm) and thrust F (thick. : 3 mm).
Fit the plugs obturating the fork shaft shifting holes in the cover. Fit the obturating screw (**38**) of plungers passage.





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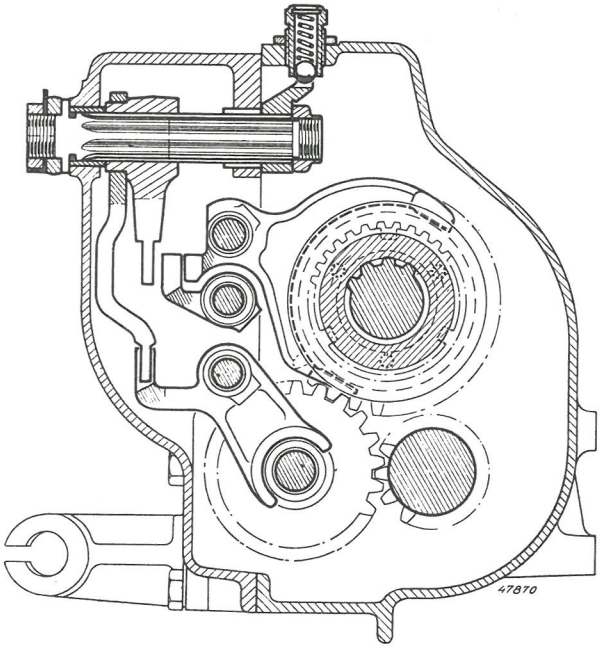
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REASSEMBLING

Reassemble the retainers on the primary and secondary shafts bearings.

Install bearing on primary shaft (retainer at end opposite to gear) and lock with a snap ring.

Refitting the primary and secondary shafts :

Install in housing the intermediate shaft and, next, the reassembled secondary shaft (do not omit the 1st speed gear thrust washer with small offset towards bearing) and lightly pass in the secondary shaft bearing in the housing (with **retainer outside).**

Install gearbox to rest on bearing and install the secondary shaft in place, on a press.

Hold 1st speed gear in contact with synchronizer, using a screwdriver.

Insert primary shaft with bearing without omitting the **4th speed gear synchronizing ring.**

Refitting the intermediate shaft :

Lightly install the front bearing of the intermediate shaft in the housing and on the shaft. Allow housing to rest on this bearing, position the rear bearing and fit home on a press; the 2 bearings are installed as follows :

— **the end of the shaft, the front bearing and the face of the housing at clutch end should be in one plane,**

— **the rear bearing should have a good rest on the shaft and should be in the same plane as the face of the gearbox housing.**

Should the bearing be recessed, fit a shim (.1 or .2 mm) between shaft and bearing.

Install the reverse speed gear **(fork groove towards the rear of the gearbox)** and its shaft. Lock gear.

Fit the tachometer worm on secondary shaft. Attach the gearbox rear cover with a new sealing bush and without omitting the gasket.

Assemble :

— the drive flange, the washer and the nut. Tighten nut at 15 m.kg and lock,

— the front cover with a new sealing bush,

— the clutch shaft and fork,

— the fork control cover.

To this end :

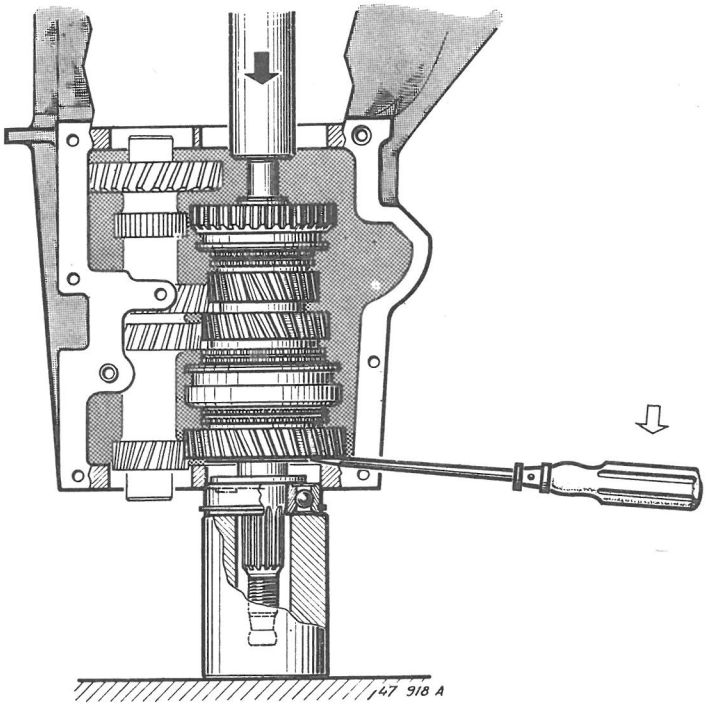
— run off the locking sector adjusting sleeve,

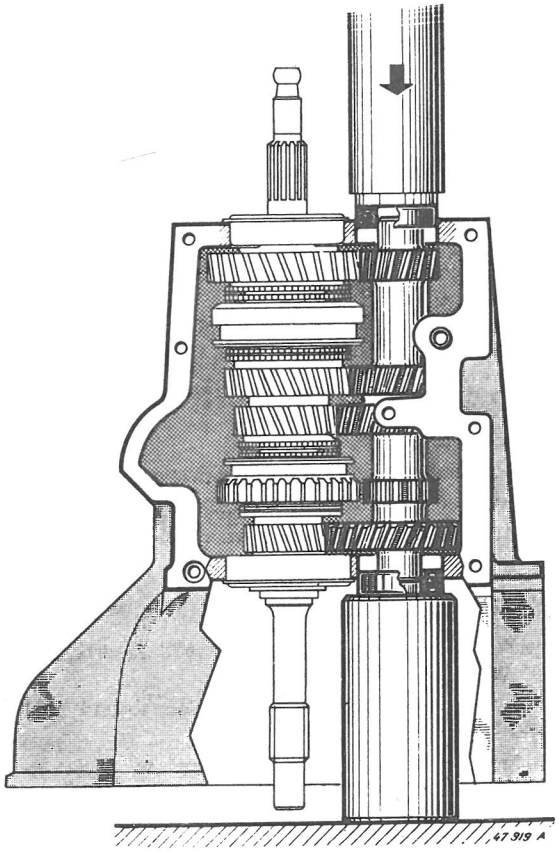
— shift to neutral,

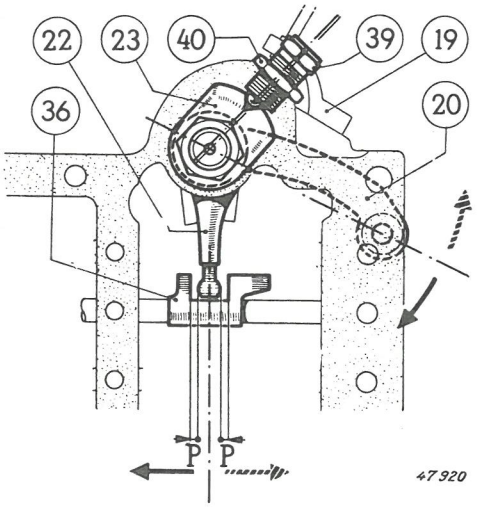
— fit cover with a new gasket,

— fix cover by inserting the clutch release cable sheath stop.

Adjust the speed locking (see next page).







REASSEMBLING (continued)

ADJUSTING THE SPEED LOCKING.

This adjustment consists in **centering the gear shift finger (22) at the centre of the fork (36) notch,** through an eccentric ball fitted in a sleeve (39) and a locking sector (23) :

— shift to neutral and position selection lever (19) in 3rd-4th speed,

— run up the adjusting sleeve (39) fully in without overtightening. The shifting finger (22) thus contacts one of the sides of the fork location (36) and the shift lever on gearbox (20) will be locked,

— slowly loosen sleeve (39) while operating up and down the shift lever (20),

— continue running off the sleeve until the clearance of the shift lever on gearbox (20) is equal in both directions : at this stage, the shift finger (22) is at an equal distance P from the sides of the fork location (36),

— when this adjustment is completed, tighten check nut (40).

NOTE. — Under no circumstances should the adjusting sleeve (39) be modified on account of the difficulty a new adjustment would imply without removing the gearbox.

SPEED CONTROL
LH DRIVE

(See Figures on the opposite page)

OPERATION.

The gear change involves 2 distinct and successive operations :

1° **Speed selection** : this is made by operating the gear change lever in the plane of the steering column. By pushing towards the instrument panel, the 3rd and 4th speeds are selected; by pulling towards the steering wheel, the reverse speed is selected. After shifting speeds, the gear lever is **always moved back to 1st-2nd selection.** These selection movements are transmitted to the gearbox through the selection rod (42) which moves forward or rearward the selection lever on the gearbox (19).

2° **Gear shifting** : it is made by rotating the gear change lever around the steering column upwards or downwards. These motions are transmitted to the gearbox through the shock absorbing or dampening link (43).

ADJUSTING THE LINKAGES.

Before the adjustment, check :

— that the check nut on the speed locking adjusting sleeve is correctly tightened,

— that the various attaching nuts on the linkage are tightened,

— that the shaft clips and staples are correctly located and assembled.

ADJUSTING THE SPEED SELECTION.

Loosen nut (41) on the adjusting core (44) in order to free the selection rod (42).

Push the gear lever to 3rd-4th speed selection and hold at this position.

Push selection lever on gearbox (19) to contact as shown by arrow to 3rd-4th selection and hold at this position.

Operate rod (42) in adjusting core and, next, push all clearance towards core without therefore the rod being tight. Tighten nut (41).

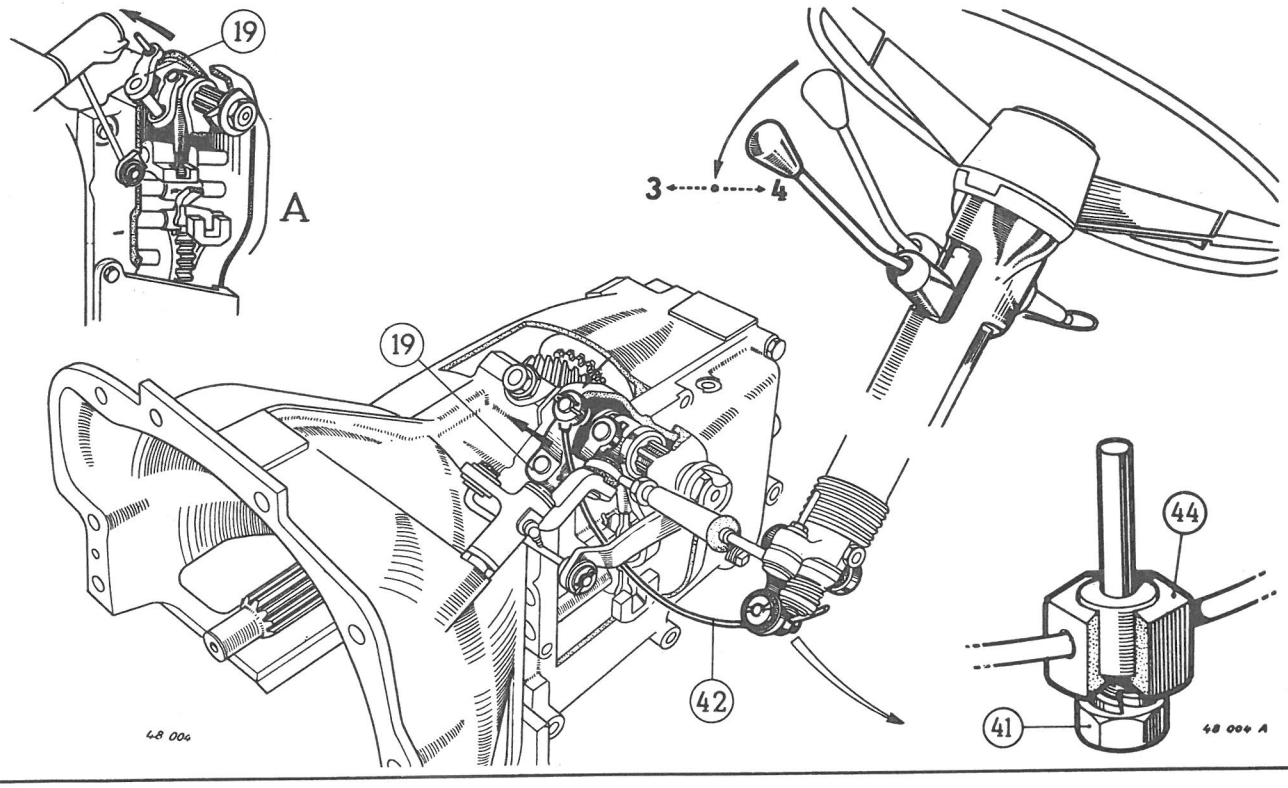
ADJUSTING THE GEAR SHIFTING.

Loosen nut on dampening link (43).

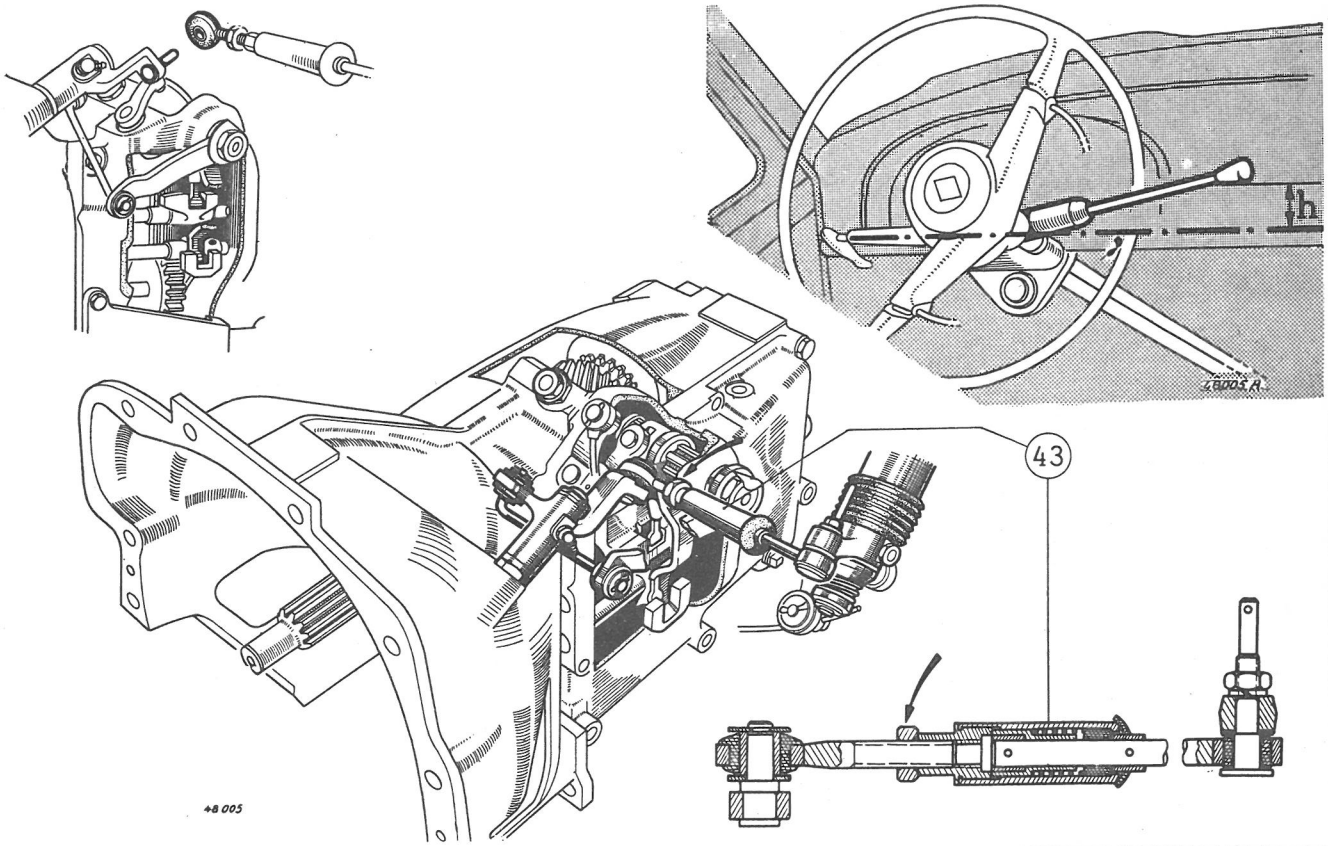
Run up or off the end of the link in order to bring the speed control lever end at a distance **h = 2 cm approx. above the horizontal.**

(Run up end to lower lever, run off to raise).

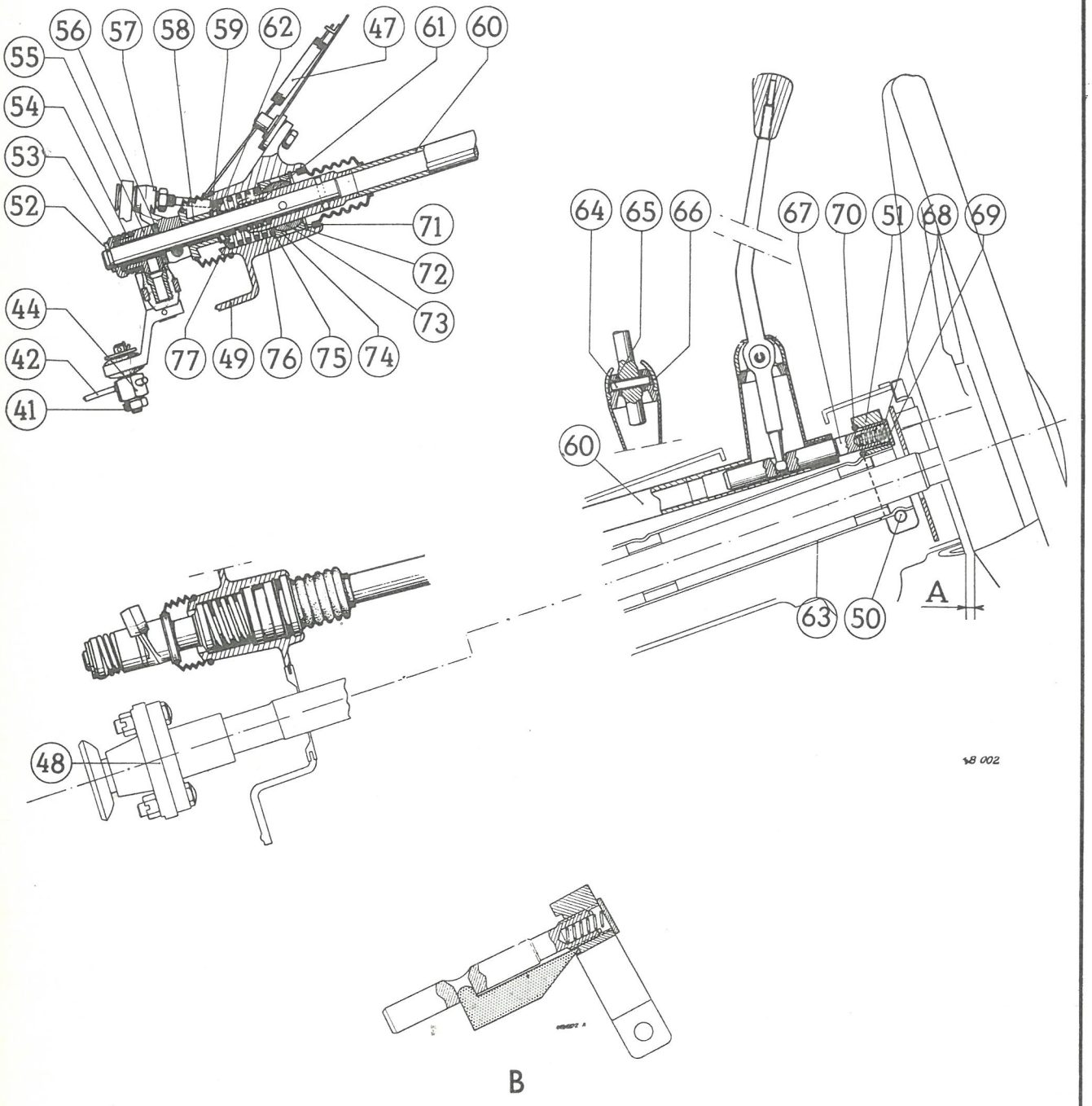
GEAR SELECTION



GEAR SHIFTING



GEAR CONTROLS
LH DRIVE
(continued)



GEAR CONTROLS

LH DRIVE

(continued)

(see figures next page)

REMOVING.

Disconnect :

— selection rod (42) on gearbox and at adjusting core (44),

— gear shifting dampening link on gearbox,

— steering column at flector flange (48).

Unhook spring (47).

Remove steering wheel, noting its position and the switch after marking the wires connections.

Mark and disconnect the " Neiman " wires.

Lift the rubber mat.

Remove :

— the screws attaching hood on scuttle,

— the 2 nuts fixing the steering column support on the instrument panel.

Remove the whole.

REFITTING.

Perform removing operations in reverse sequence.

Make sure that :

— the gear change lever is **at centre** of the avercod opening; if not, loosen the 2 nuts attaching the avercod to the instrument panel and position correctly,

— the gear change lever, when the 3rd-4th speed selection **freely resumes the 1st-2nd speed selection** without loosening the clamp (51) screw (50) and operate the avercod.

Tightening torque of clamp screw (50) : 1 m.kg.

Dimension A = **4 mm should exist** between the steering wheel and the avercod.

Therefore, loosen the nut on the flector flange (48) and push or pull the steering column.

Reconnect and adjust : the selection rod (see page 86), the speed shifting link (see page 86).

DISMANTLING.

Remove the steering shaft and the trafficator switch.

Remove the clamp (51) screw (50).

On the speed control tube (60), remove the parts in the following sequence : the staple (52), the spring thrust cup (53), the spring (54), the shift finger (55), the fiber washer (56), the upper idler lever (57) and the thrust washer (58).

Remove the speed control tube (60), save the spring (61) and the thrust washer (62).

Remove the stationary steering column (63).

Drive out the elastic pin (64) on the gear change lever, save washers (65) and (66).

Remove the lever.

Remove the steering column attaching flange (51).

Run off the thrust shaft (67). Save the spring (68), remove the rest plate (69) and the felt (70).

Clear the speed control tube (60) from the avercod.

On the protecting hood (49), remove the snap ring (71) and remove the parts in the following sequence : ball joint cup (72), ball joint (73), the other ball joint cup (74), the spring thrust washer (75), the spring (76) and the other spring thrust washer (77).

REASSEMBLING.

In the protecting hood (49) reinstall the parts in the reverse sequence of the references shown on the illustration.

Prior, assemble the ball joint (73) on the speed control tube (60). **The joint should slide by its own weight.**

Insert the speed control tube (60) in the avercod.

Run up the thrust shaft (67) on flange (51) **by holding the gauge** (Ref. B. Vi. 25) as shown in **illustration B.**

NOTE. — This shaft has in its centre a hole where the gear change lever ball joint rests. At the medium position, 1st-2nd speed selection, the lever should have a given direction which is determined by the thrust shaft hole. Therefore, the shaft should be positioned with a gauge.

Put the felt (70), the spring (68) and attach the thrust plate (69).

Assemble the flange (51) and attach after refitting the stationary steering column (63).

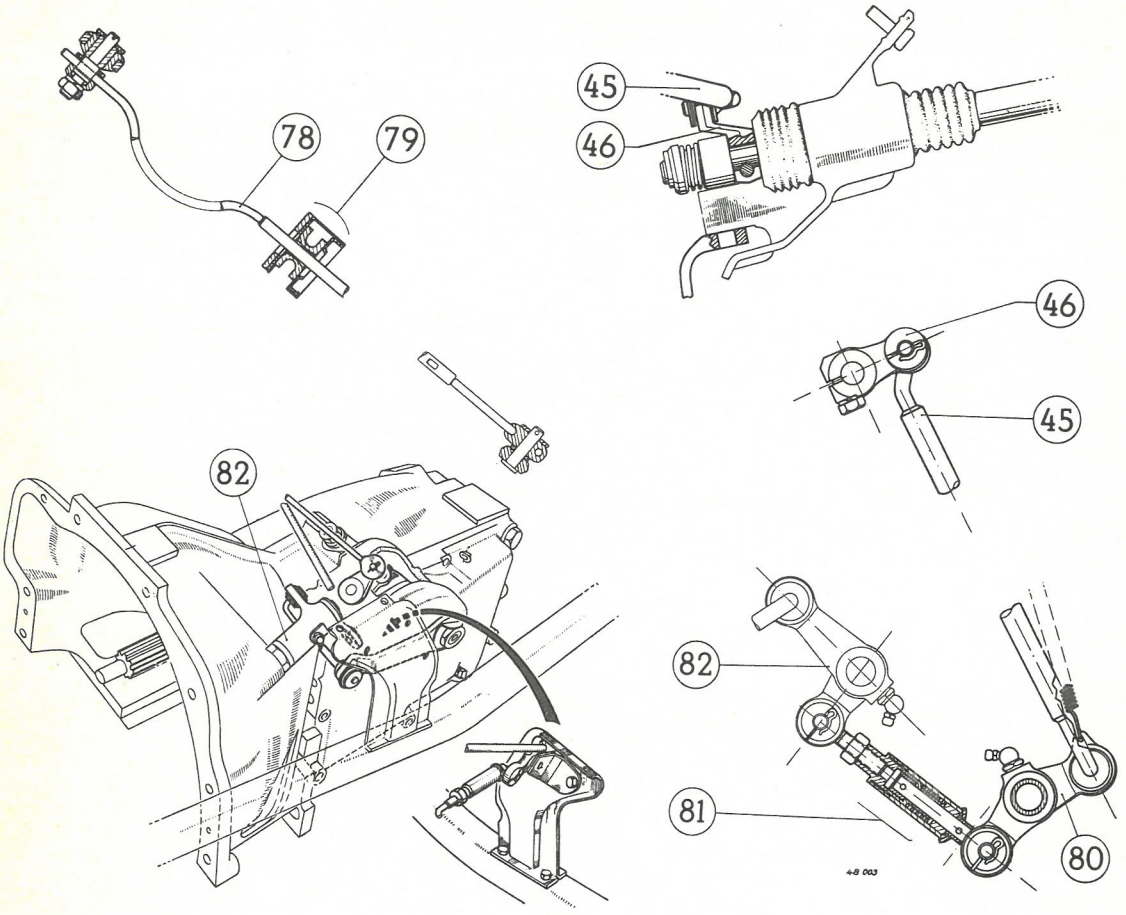
Reassemble the gear shift lever.

Position on the speed control tube (60) the spring (61) and the thrust washer (62).

Insert the speed control tube (60) in the protecting hood (49) and reassemble the parts in the reverse sequence of the references on the figure. Prior, make sure that the **shifting finger (55) freely slides on the tube (60).**

Refit the trafficator switch and the steering shaft.

SPEED CONTROLS
RH DRIVE



OPERATION.

The gear control operation for RH drive is identical to the one for LH drive (see page 86). However :

— **the speed selection** is transmitted to the gearbox through a selection rod (**78**) longer and supported by a relay (**79**),

— **the gear shifting** is transmitted to the gearbox through an upper link (**45**) attached to the upper shifting lever (**46**) and to a relay lever (**80**) mounted on the steering idler support. The gear shifting is transmitted to the idle lever on gearbox (**82**) through a dampening link (**81**).

ADJUSTMENTS.

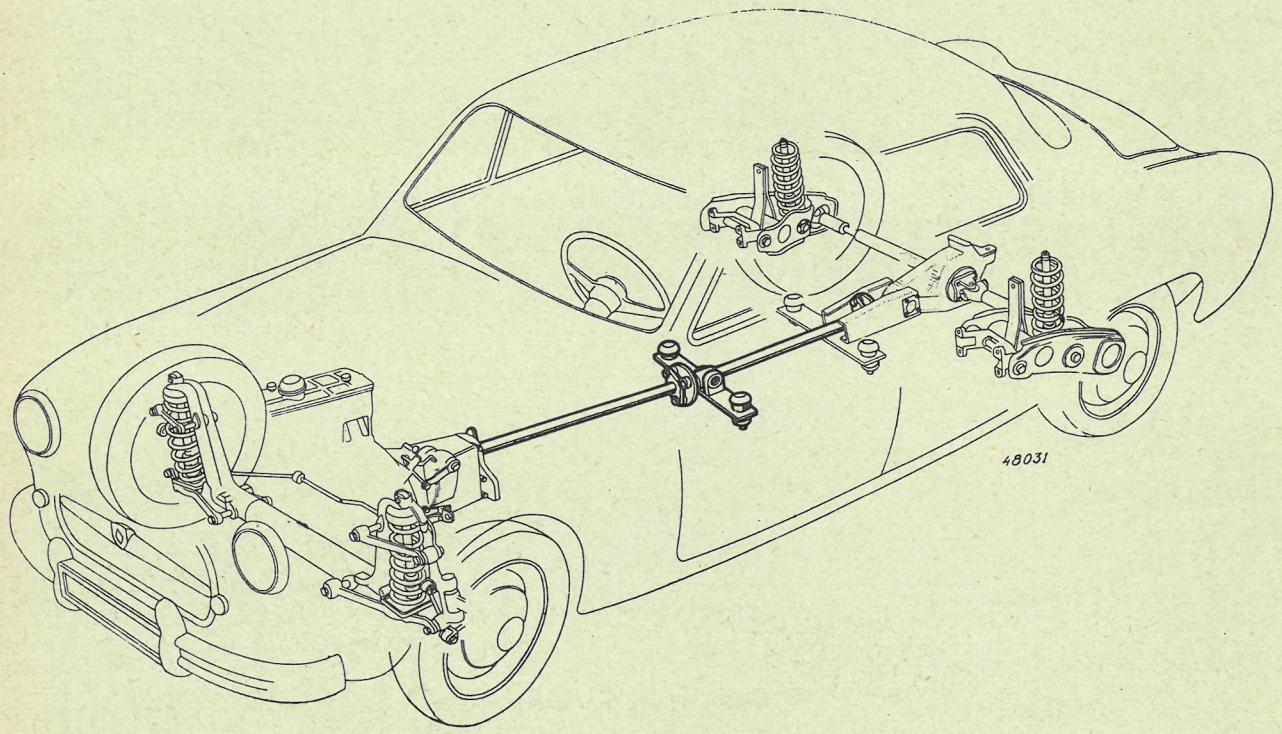
Adjustments of the speed selection and shifting linkages are identical as for LH drive (see page 86).

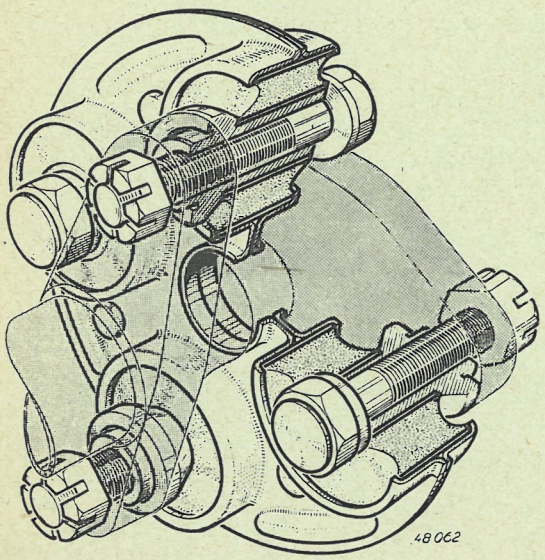
REMOVING, REFITTING AND DISMANTLING, REASSEMBLING.

The gear controls for RH drive are mechanically similar but symmetrical to the gear controls for LH drive and therefore the operations are identical (see page 89).

However, during removal, disconnect the upper link (**45**) to the upper shifting lever (**46**) and not the dampening link (**81**).

6. PROPELLER SHAFTS





SPECIFICATIONS

The lengthwise transmission is of the LAYRUB type.

It consists of two sections :

— one front shaft,
— and one rear shaft.

It therefore includes :

— a relay featuring a splined shaft on a ball bearing mounted in a cage. The latter oscillates on rubber sleeves in turn integral with a spring leaf attached to the chassis with silentblocks mounted in-between,

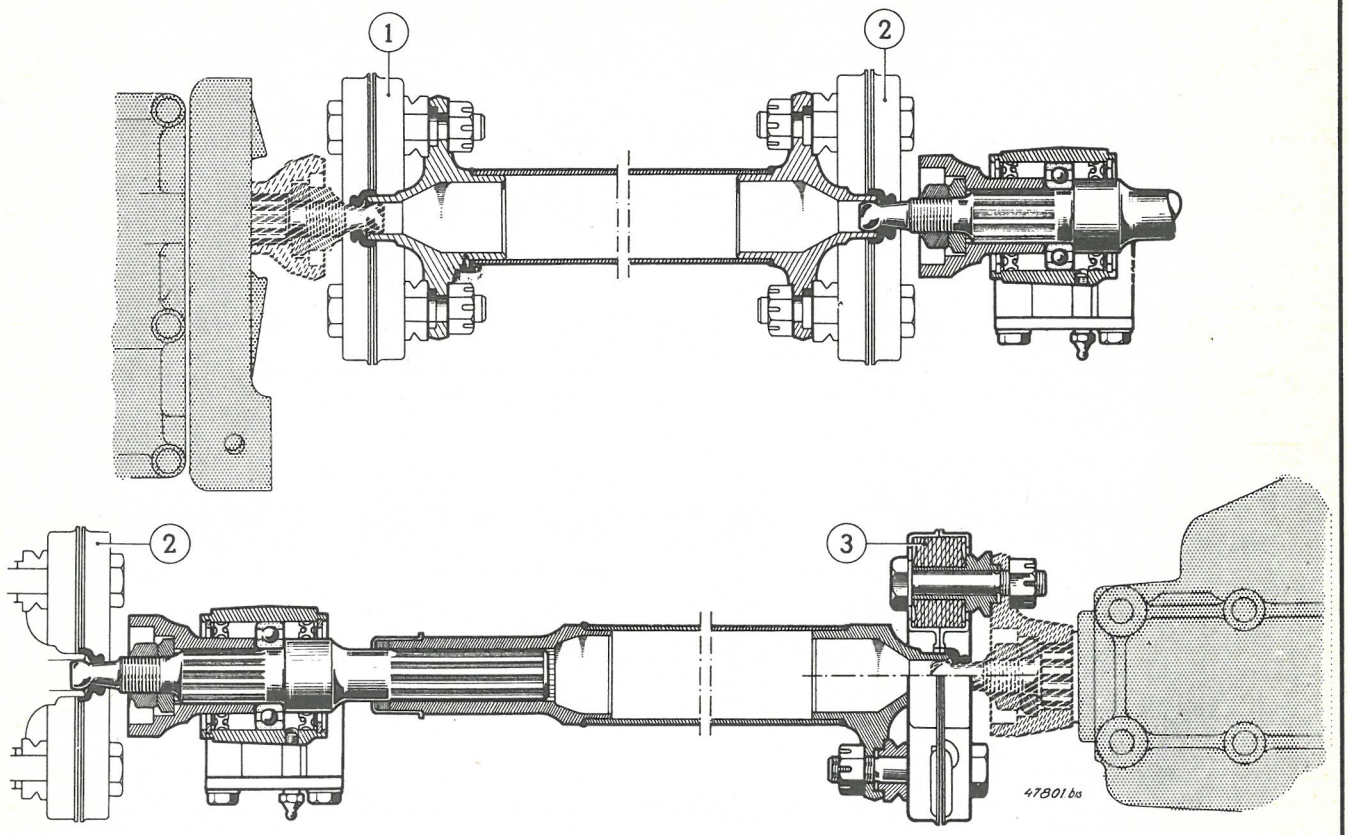
— a front shaft between gearbox and relay. This shaft is of fixed length,

— a rear shaft between relay and rear axle; this shaft slides on the splines of the relay shaft.

These components are assembled by means of 3 elastic plates.

The whole of the transmission is perfectly balanced through sheet metal plates welded to the shafts. (If vibrations are encountered, make sure the plates exist.)

PROPELLER SHAFTS



REMOVING.

1° **Front shaft between gearbox and relay :**
Separate the front coupling plate from the front propeller shaft and the centre plate (2) from the relay shaft.
Push back fully the relay shaft and remove the front propeller shaft.

2° **Rear shaft between relay and rear axle :**
This shaft should mandatorily be removed with the relay and after removing the front shaft.
Separate the rear coupling plate (3) from the rear shaft and push in the splined section.
Run off the relay suspension leaf attaching nuts and remove the assembly " rear shaft-relay ".
Separate the rear shaft from the relay.

REFITTING.

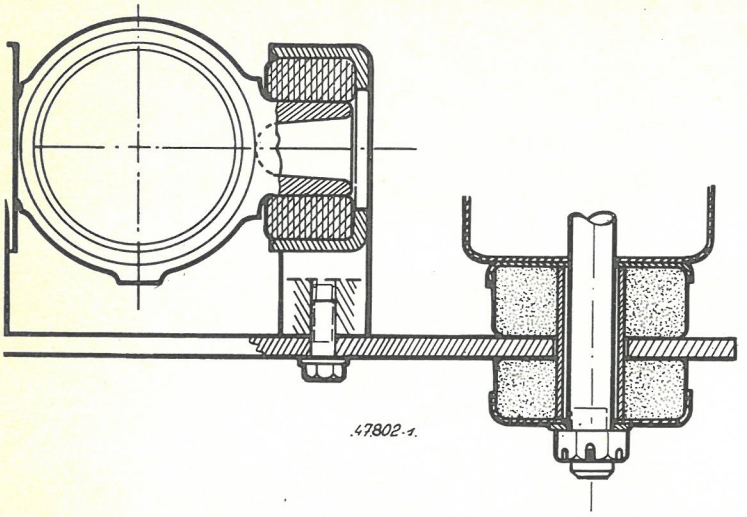
Perform the same operations in reverse sequence.

However, follow the direction of assembly of the shafts

— **front shaft** : one possibility only,

— **rear shaft** : insert the splines of the rear shaft in the splines of the relay shaft in order that **the shaft flange be parallel with the relay shaft flange.**

NOTE. — The flat washers provided with the plates assembly bolts are always fitted at end opposite to the spacer whatever the direction of assembly of the bolts.
The relay shaft and the rear transmission shaft being matched in order to obtain a correct backlash, replace these two parts simultaneously.



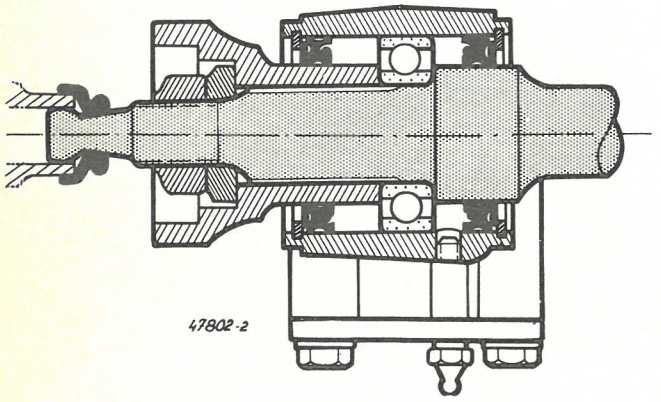
TRANSMISSION RELAY

REMOVING.

Separate the centre drive plate from the relay shaft and from the front transmission shaft.

Remove the relay suspension leaf to chassis attaching nuts and remove the relay-suspension leaf assembly.

Separate relay from suspension leaf.



DISMANTLING.

Clear and remove the drive flange attaching nut.

Remove flange.

Pull out the relay shaft.

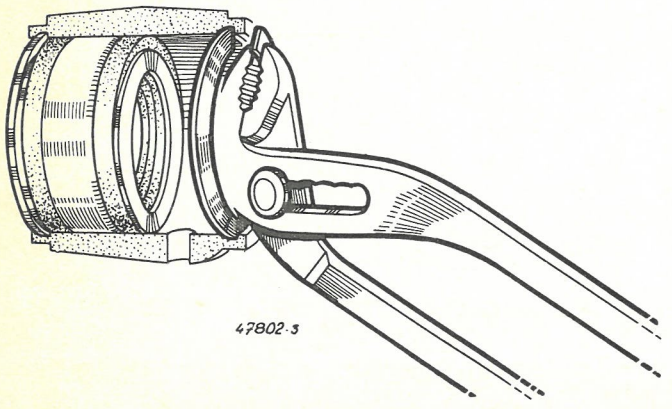
Push back the two seals and the protecting washers using a mandrel (of 44 mm diameter).

Remove the snap rings, using pliers and next the washers and the seals.

Pull out the bearing.

REASSEMBLING.

Perform the same operations in reverse sequence.

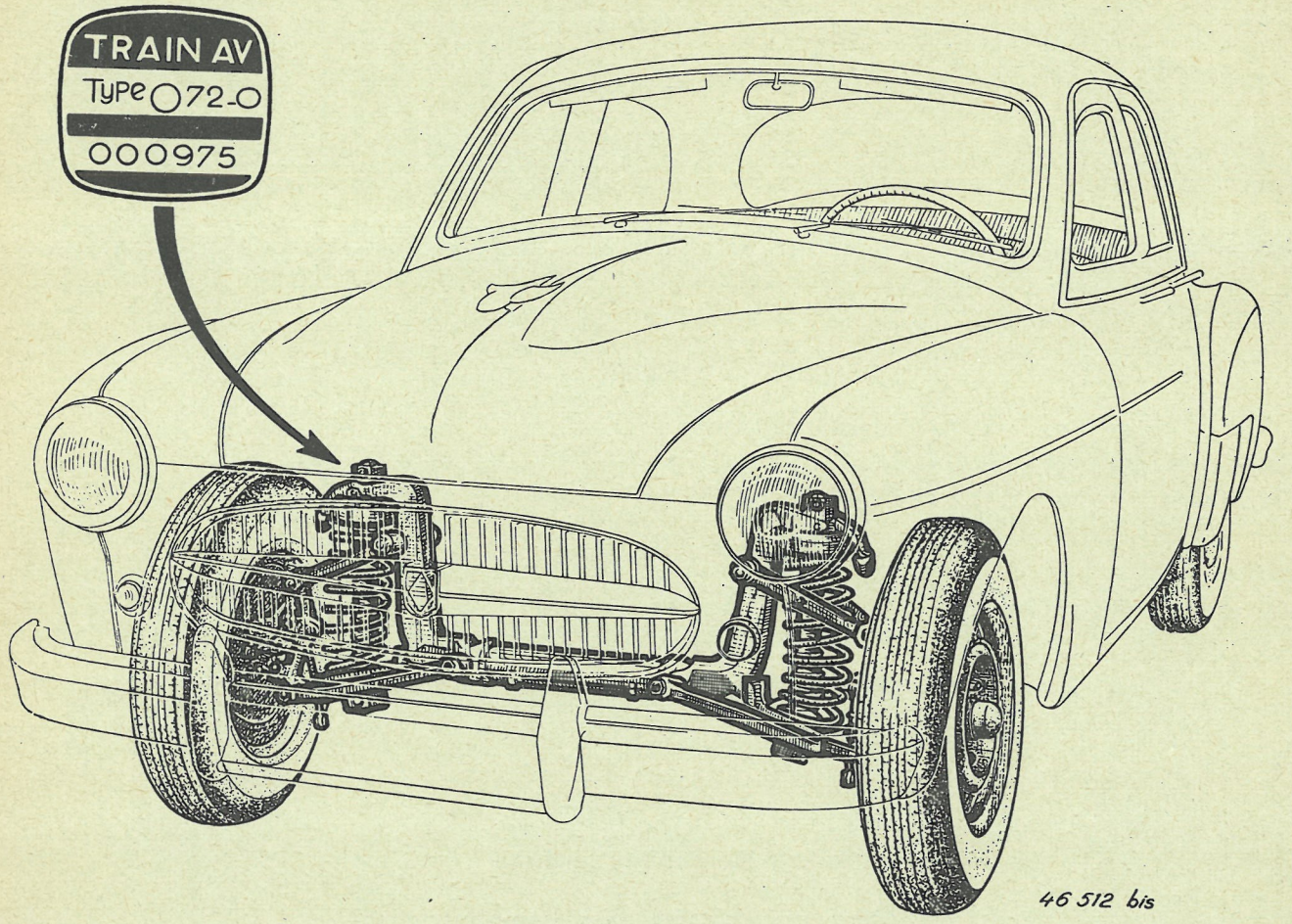


REFITTING.

Perform the removing operations in reverse sequence.

When inserting the relay shaft splines into the rear transmission shaft, make sure that the drive flange at rear of this shaft is parallel to the drive flange of the relay shaft.

7. FRONT AXLE



SPECIFICATIONS

Front axle mounting is on rubber bushes.

Track	1.4 m
King pin angle	11°
Camber angle	1° 30
Castor angle	3° ± 1
Toe-in	3 mm ± 1
King pin diameter	22 mm
Rim warpage	2 mm

Tightening torque of rubber bushes :

Stub axle end :

— upper hinge bolt (14 mm diam.)	8.5 m.kg
— lower hinge bolt (16 mm diam.)	13 m.kg

Chassis end :

— upper and lower hinge bolts (16 mm diam.)	13 m.kg
Locking position of rubber bushes : dimension A (see page 101)	268 mm ± 1

SPECIFICATIONS

Systematically check the front axle specifications :
— after an impact at the front of the car,
— in case of steering troubles,
— in case of abnormal wear of the front tyres.

Preliminary inspections.

In order to check the front axle for correct specifications, **the points listed below should be inspected first :**
— king pins play,
— steering connection link ball joints play,
— tyre inflation pressure,
— rims for warpage,
— hub bearing play,
— tyre tread for uniform wear pattern,
— condition of springs,
— shock absorbers for proper operation,
— rubber bushes for proper condition.

If, during these inspections, abnormal conditions are found, these should be corrected before performing any other operation.

If, after these inspections and correction, if required, **the trouble continues, then the front axle should be inspected for correct specifications.**

MEASURING TOE-IN.

a) Preliminary inspections :
   — tyres to be inflated at same pressure,
   — various clearances to be normal,
   — condition of rubber bushes.

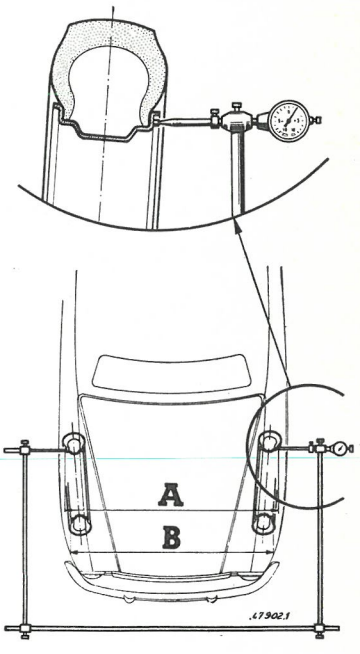
b) Locate vehicle on a flat horizontal surface. Stop vehicle in forward position.

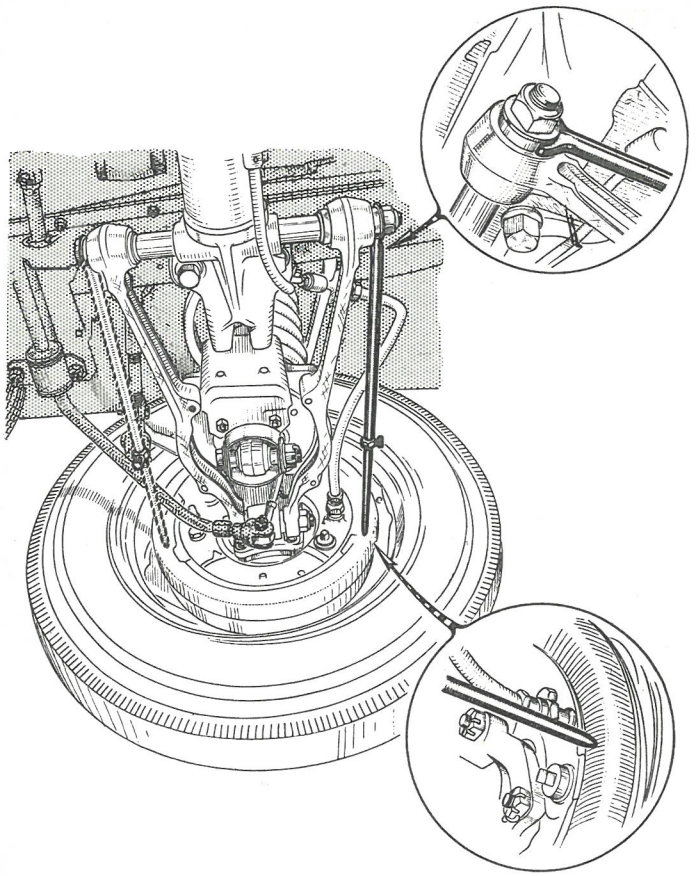
c) Check value of toe-in with a fixture (Ref. SAPRAR 10.678) :
   — adjust the height of the indicator points to the height of the wheel hubs,
   — have points contact the rims (position A),
   — mark the contact points with a piece of chalk and set dial indicator to zero,
   — move car by half a wheel turn forward, completing the movement in the forward direction (the marks on the rims should be at the level of the indicator points),
   — fit fixture in position B and record the value of the toe-in directly on the dial indicator.

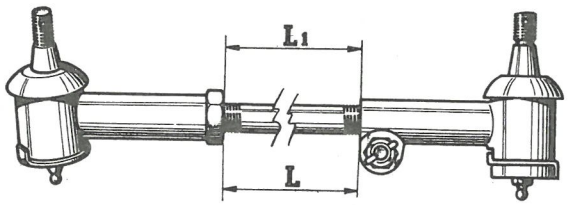
   This value should be between 2 and 4 mm.

   Adjust toe-in if required.

NOTE. — Measuring the toe-in may also be performed with the optical equipment for checking front axle alignment (Ref. SAPRAR 12.277).







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CHECKING THE SPECIFICATIONS
(continued)

ADJUSTING THE TOE-IN.
The toe-in is to be adjusted according to the following two stages :
— 1° **Adjusting the steering links,**
— 2° **Adjusting the toe-in itself.**

NOTE. — During all these adjustments, the steering should not move.

Adjusting the links :
The sum of the link lengths (measured at L and L1) should always equal 156 mm.

Fit the steering gear assembly at the medium point of the clearance free area (The mark on the drive flange to be in front of the case mark).

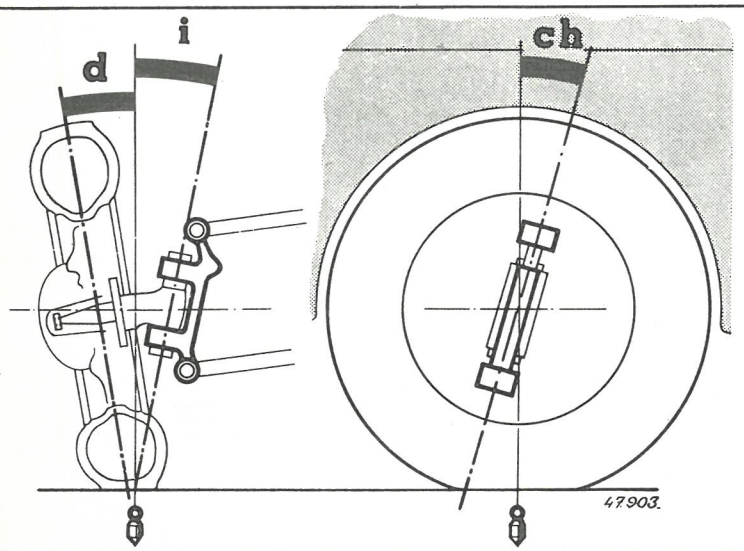
— At **steering end,** adjust the link in order that the wheel be parallel with the lower hinge bolt at chassis-side, which corresponds to the straight ahead position using the positioning tool (Ref. T. Av. 30) and resting on the rubber bushes.
Measure the dimension L on the link thus adjusted.

— **At end opposite to steering,** adjust the link as per dimension L1 equals 156 mm — L.
For example : If L is 75 mm (the link opposite to steering should be adjusted to L1 = 156 — 75 = 81 mm).

Adjusting the toe-in itself : 3 mm ± 1.
The links being adjusted, the toe-in will be achieved **solely by operating the connection bar** with opposed threads.

NOTE. — In order to increase toe-in, the connection bar should be shortened, to open up it should be lengthened.

Check the toe-in with the gauge.
Position the steering wheel if necessary; the wheel spokes should have the same angle with the horizontal line.



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MEASURING THE SPECIFICATIONS.

This operation is to be performed on a flat horizontal area. The car should be stopped :

1° After having been moved forward.

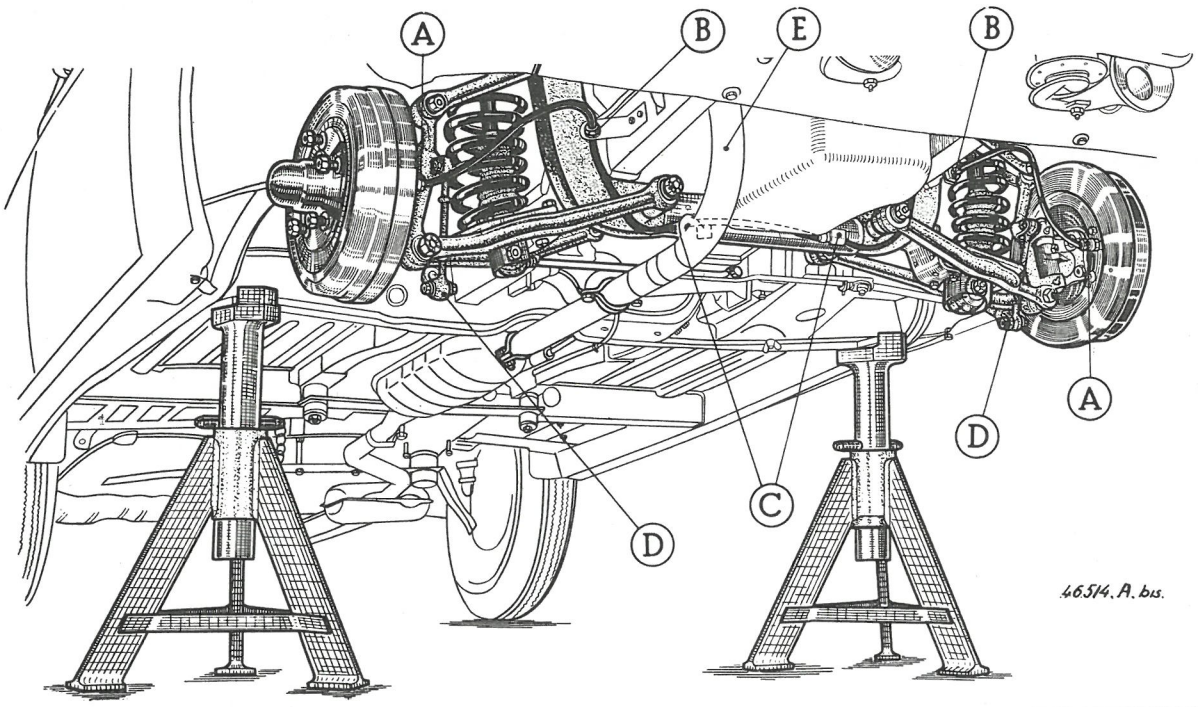
2° With the wheels in the straight ahead position.

First, adjust the toe-in and next measure with special devices (refer to the manufacturer's instructions for this equipment) :

— camber angle ..... d = 1°30
— castor angle ..... ch = 3° ± 1
— king pin angle..... i = 11°

Should the values recorded not correspond to the theoretical values, dismantle and check the front axle parts with the gauges provided to this end.

REMOVING AND REFITTING



REMOVING.

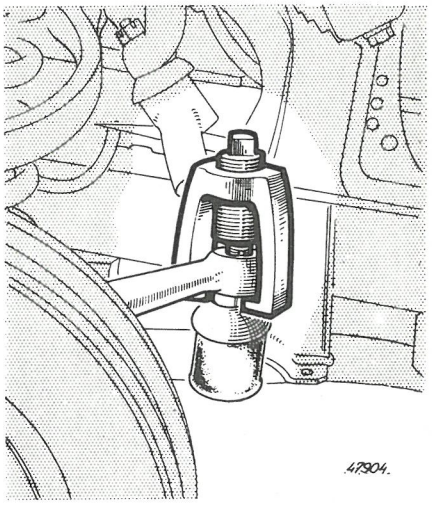
Disconnect :

— all Lockheed brake lines (**A**), (**B**) and (**C**),

— the torsion bar at (**D**),

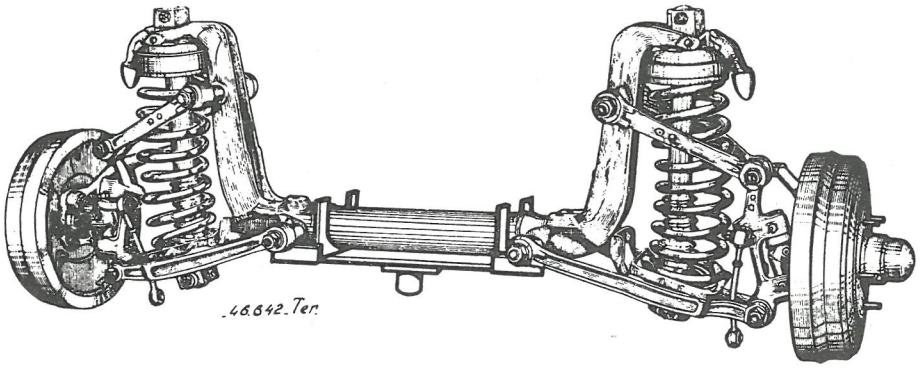
— the steering links at stub axle control lever using a puller (Ref. Dir. 04).

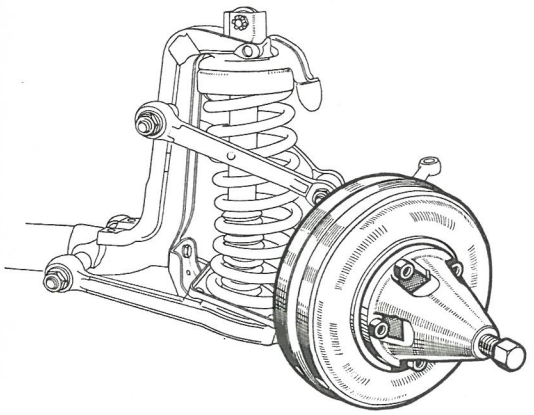
Remove the front end (**E**) of the exhaust pipe.
Fit a rolling jack with a support (Ref. T. Av. 31) under the cross-member.
Remove the 4 attaching nuts of the cross-member to the side-members and the 2 cross-member end supports attaching bolts, using a special spanner (Ref. T. Av. 02 of 21 mm).
Remove the front axle and save the cross-member end supports.

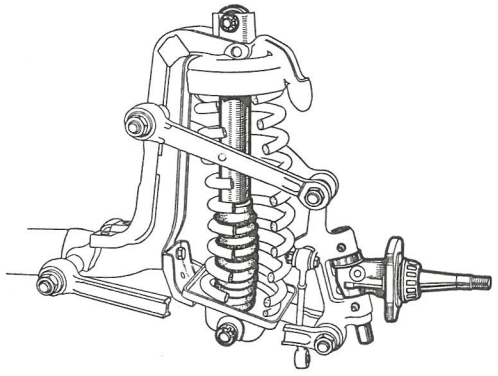


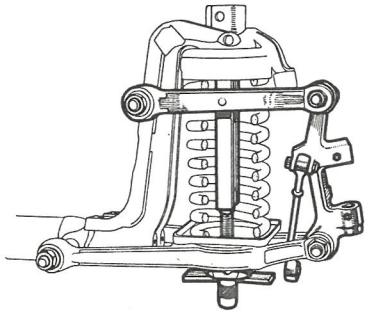
REFITTING.

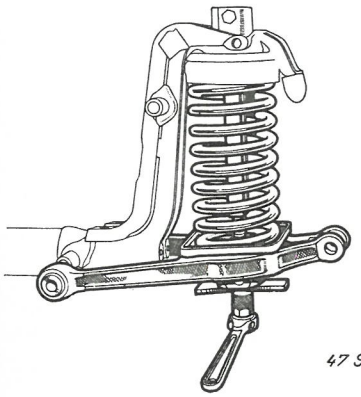
Perform the removing operations in reverse sequence.
Bleed and adjust the brakes.
Adjust wheels toe-in.











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FRONT AXLE HALF

(LH or RH)

DISMANTLING.

Remove the " hub and drum " assembly with a hub puller (Ref. Rou. 05), the brake carrier plate and the stub axle control lever.

Remove the stub axle (5), to this end :

— remove the lower plug by removing the cotter pin (1),

— remove the upper plug (2) with a chisel,

— remove the key (3) securing the king pin,

— drive out the king pin (4) from top to bottom,

— remove the stub axle (5) with thrust (6).

Remove the shock absorber.

Fit compressor (Ref. Sus. 02) and compress the spring.

Remove the lower impact bumper with support (7).

Remove the stub axle support (10) by removing the upper (8) and lower (9) hinge bolts at stub axle end.

Remove the two upper arms (12) and (13) by removing the bolt (11).

Remove the lower hinge bolt at body end (14).

Remove the compressor, remove the spring and save the lower arms assembly (15) and (16).

Separate the lower cup (17) from the two lower arms.

REASSEMBLING.

NOTE. — All the nuts on the hinge bolts should be assembled towards the front of the car.

Before reassembling, check the front axle components (see page 104).

Reassemble the lower cup (17) on the lower arms (15) and (16) without tightening the screws.

Fit and compress the spring between the cups using the compressor (Ref. Sus. 02).

Assemble :

— the lower hinge bolt (14) at body side **without tightening the nut.**

— the lower impact bumper with support (7),

— the upper arms (12) and (13) with the upper hinge bolt (11) at body side **without tightening the nut,**

— the stub axle support (10) with the upper (8) and lower (9) hinge bolts at stub axle side, **without tightening the nuts.**

Reassemble the stub axle (5); to this end :

— fit thrust (6) on stub (pin in its location and steel washer at stub axle end),

— insert stub axle-thrust assembly in stub axle support (10),

— insert king pin (4) from bottom to top (with flat at top),

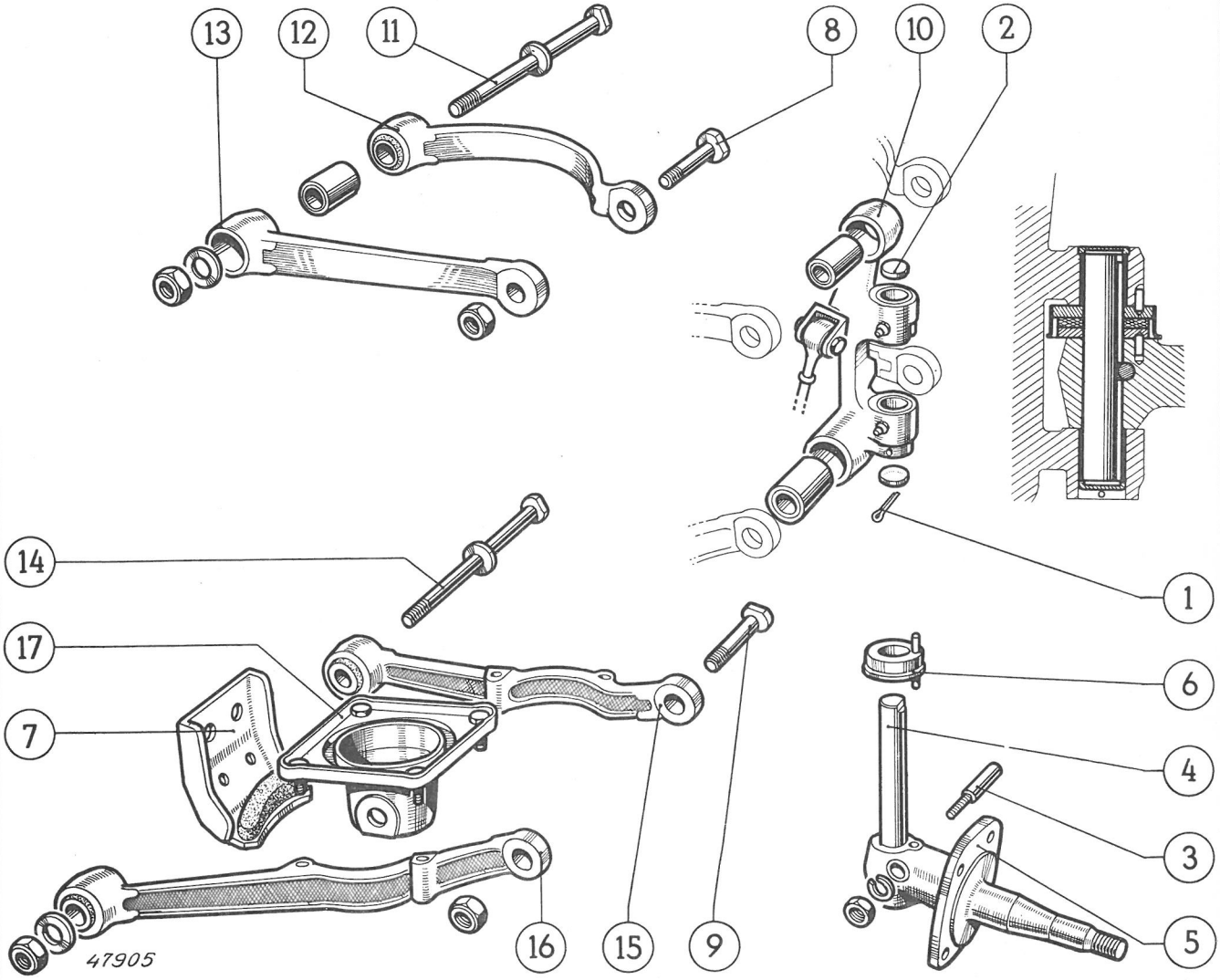
— direct the king pin and fit the key (3),

— fit the king pin plugs. Refit cotter pin (1).

Refit the brake support plate, the control lever and the " hub and drum " assembly.

FRONT AXLE HALF (continued)

(LH or RH)



REASSEMBLING (continued).

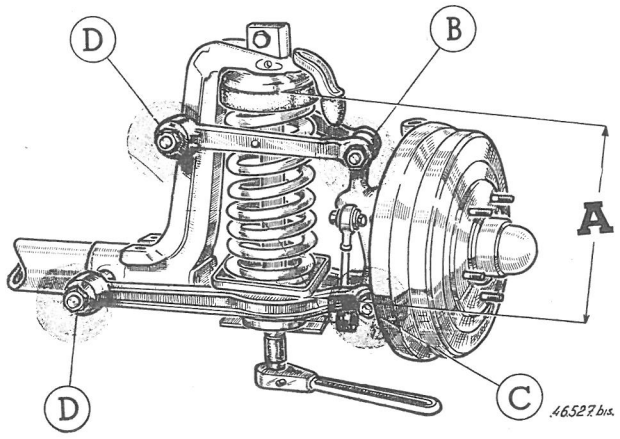
Tighten the rubber bushes locking nuts; to this end :

1° **Position the front axle** by compressing the spring, using the compressor, **to obtain the dimension A = 268 mm + 1 between the rest face of the lower cup and the edge of the upper sheet metal cup.**

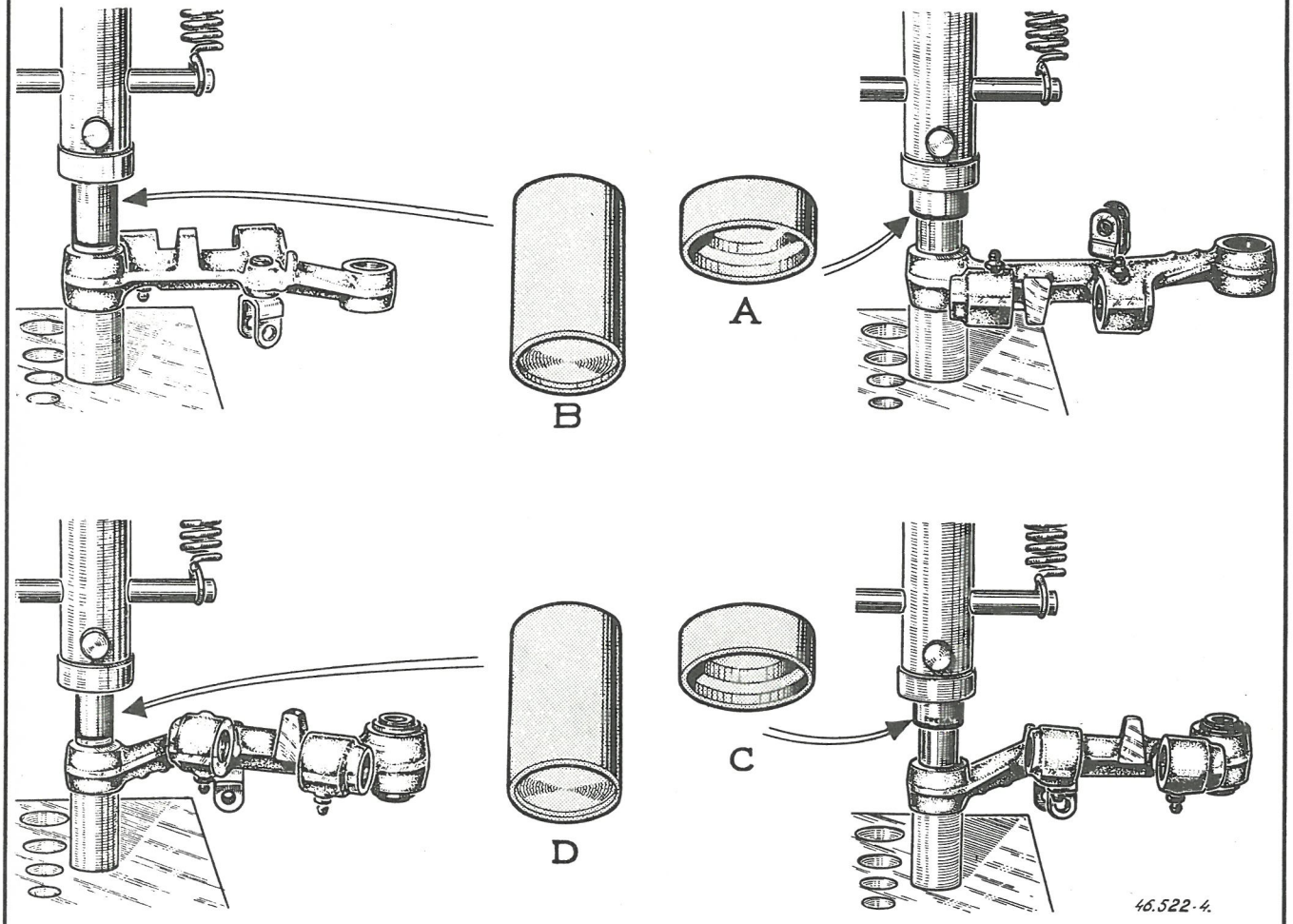
2° Tighten the nuts, following the **torques** :

D and C nuts : 13 m.kg.
B nut : 8.5 m.kg

Reassemble the shock absorber.



REPLACING THE RUBBER BUSHES



NOTE. — The removing of the front axle and the dismantling of the axle halves are necessary (see pages 99 and 100). The pulling and the inserting of the bushes are performed using special tools (Ref. T. Av. 28).

Use :

On stub axle support :

— for the lower rubber bush with an inside diameter of 16 mm the mandrels references A and B,

— for the upper rubber bush with an inside diameter of 14 mm the mandrels references C and D.

On the upper and lower arms :

— for rubber bushes with an inside diameter of 16 mm the mandrels references A and B.

NOTE. — Apply tallow on the rubber bushes locations before inserting. The protrusions of the rubber bushes are obtained by contact of the inserter on the part.

REPLACING THE STUB AXLE SUPPORT BUSHES

PULLING.

a) **On press :**

Use the special tool (Ref. T. Av. 29 B).

Drive out the bushes from the outside, the spacer being used as a rest.

b) **With puller :**

Use the special puller (Ref. T. Av. 29 A).

Remove the bushes, using the stub axle support inside faces as a rest.

INSERTING.

a) **On press :**

Use the inner face of the stub axle support as a rest.

Insert the bush with the tool (Ref. T. Av. 29 B) until **contact is made on the press table.**

b) **With puller :**

Use the special puller (Ref. T. Av. 29 A) without the puller spacer.

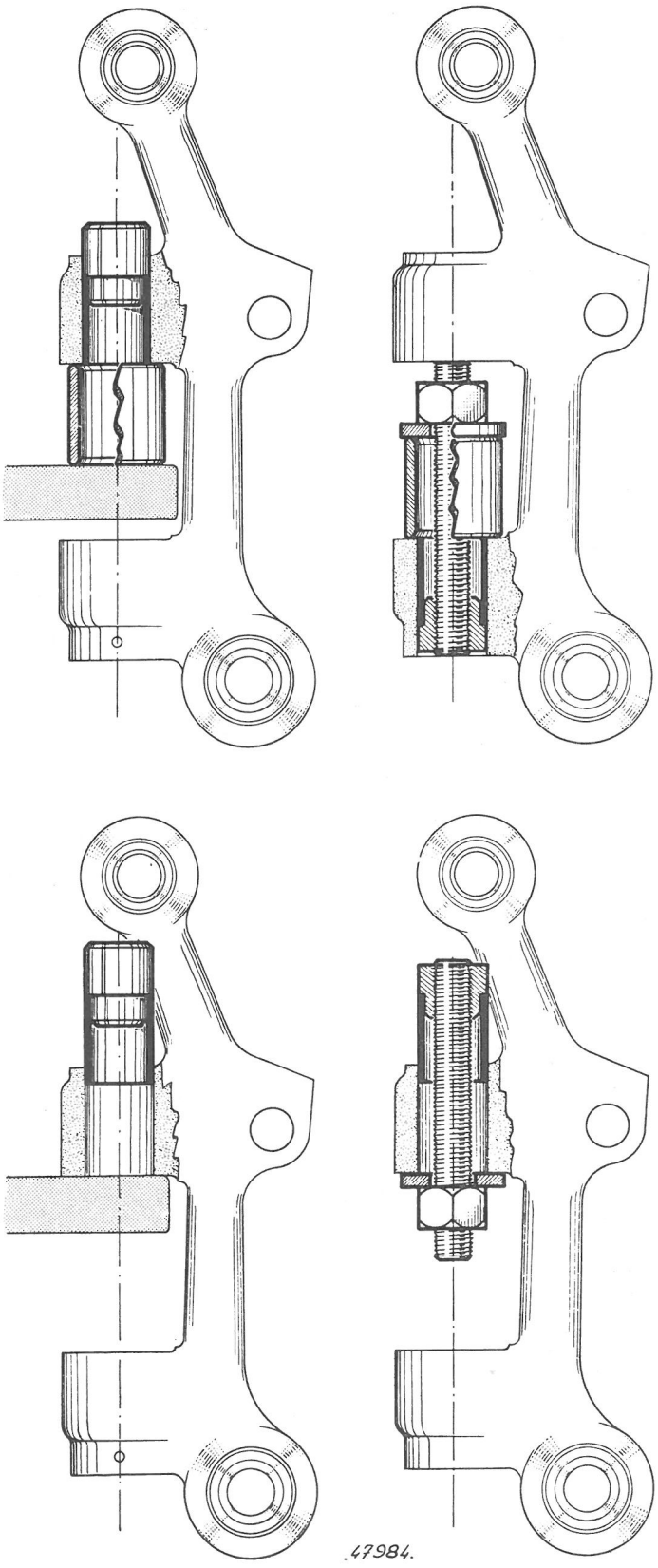
Use the inner face of the stub axle support as a rest, using the **puller washer as a thrust.**

REREAMING.

Re-ream the bushes after inserting.

The king pin should slide with a snug fit in the bushes.

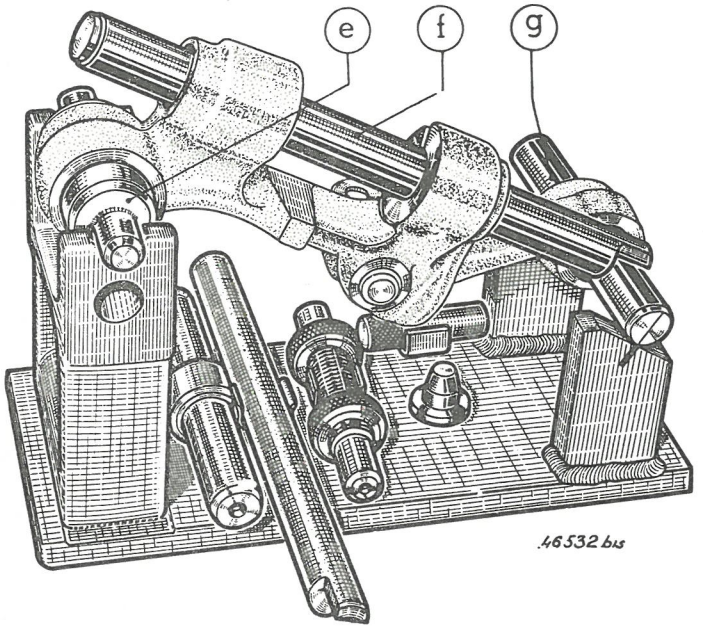
King pin diameter : 22 mm.



CHECKING THE FRONT AXLE COMPONENTS

Checking the front axle components, exception being made for the stub axle and for the stub axle control lever (see page 106), is performed using the checking fixture (Ref. T. Av. 15). This fixture is completed with a set of parts (Ref. T. Av. 15 A) marked a, b, c, d, e, f, g, h.

NOTE. — It is required to first pull out the elastic berring shells.



STUB AXLE SUPPORT.

The inspection of the stub axle support is made with the stub axle support checking gauge (Ref. T. Av. 15) and the complementary parts (Ref. T. Av. 15 A), marks e, f, and g.

The 2 end bolts are represented in the fixture by 2 shafts e and g resting on the gauge. The axis of the shaft g is to be located in the alignment of the gauge reference mark.

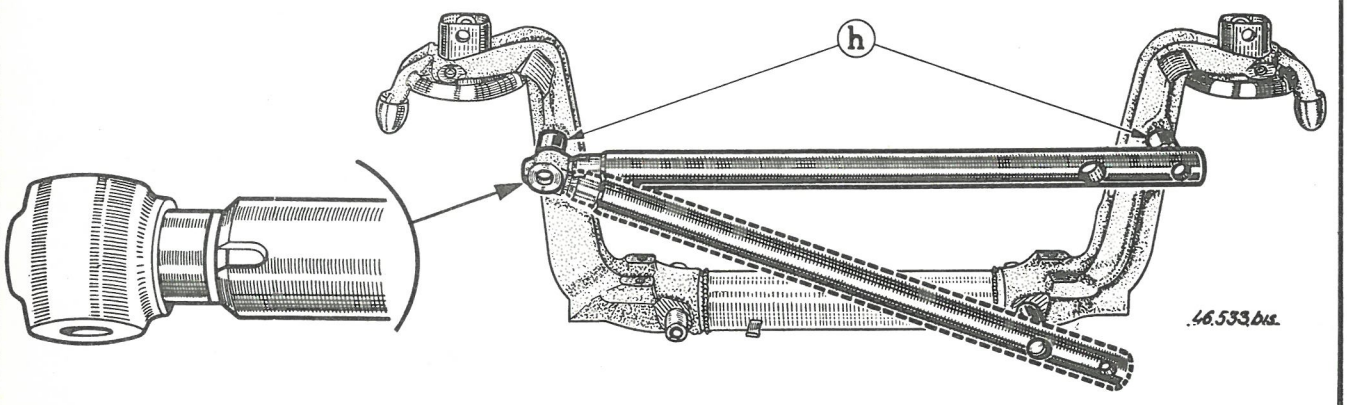
The shaft f has one partially cut off end and should be positioned tangential to the shaft g.

FRONT CROSS-MEMBER.

The inspection of the front cross-member is made with the checking bar (Ref. T. Av. 15) and the two complementary pieces mark h (Ref. T. Av. 15 A).

Insert shafts h in lieu of the hinge bolts and check centre distance, using the bar.

The bar has a sliding end where the tolerance area is determined by lines.



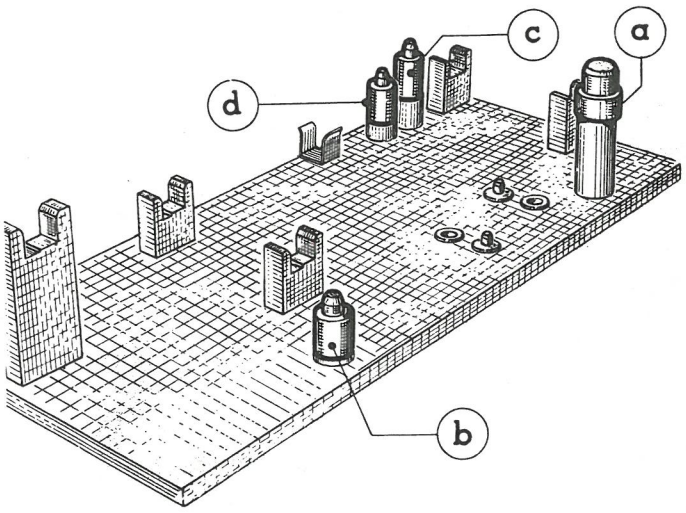
CHECKING THE FRONT AXLE COMPONENTS

(Continued)

SUSPENSION ARMS

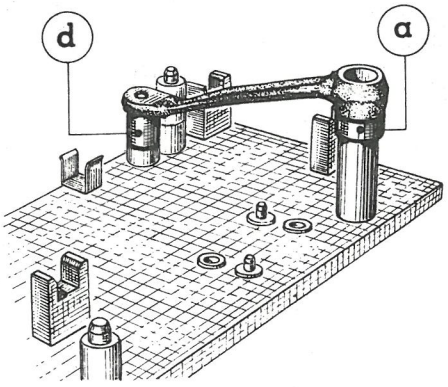
The checking of the suspension arms is made with the checking fixture (Ref. T. Av. 15) and with the 4 complementary parts a, b, c and d (Ref. T. Av. 15 A).

The arms should fit easily in the complementary parts centerings.



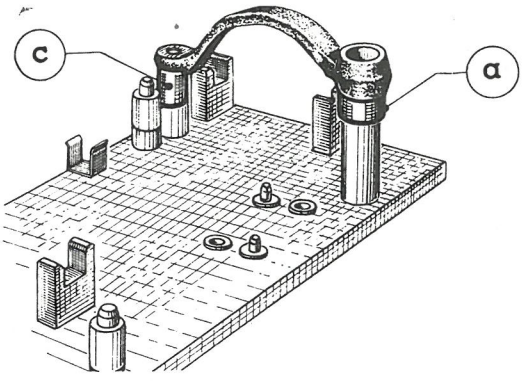
Front upper suspension arm :

— Use complementary parts a and d.



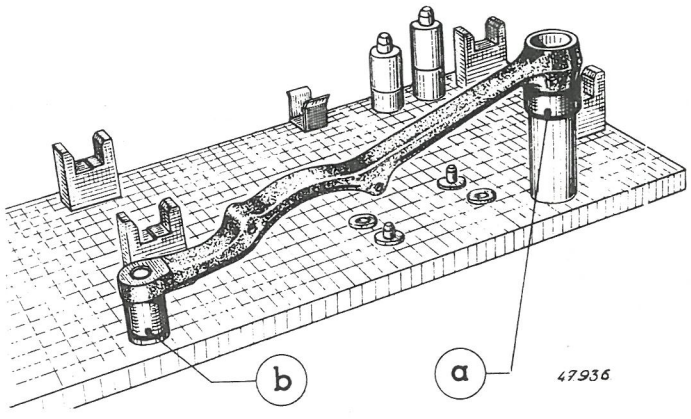
Rear upper suspension arm :

— Use complementary parts a and c.

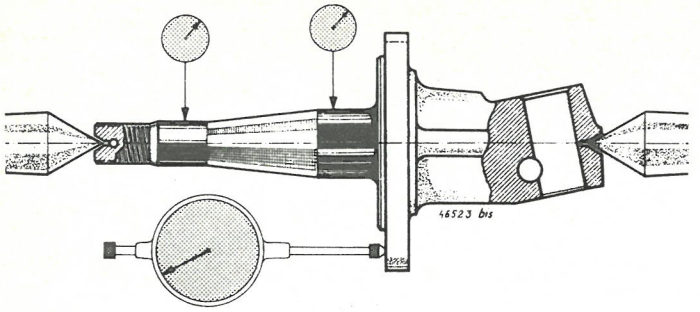


Front and rear lower suspension arms :

— Use complementary parts a and b.



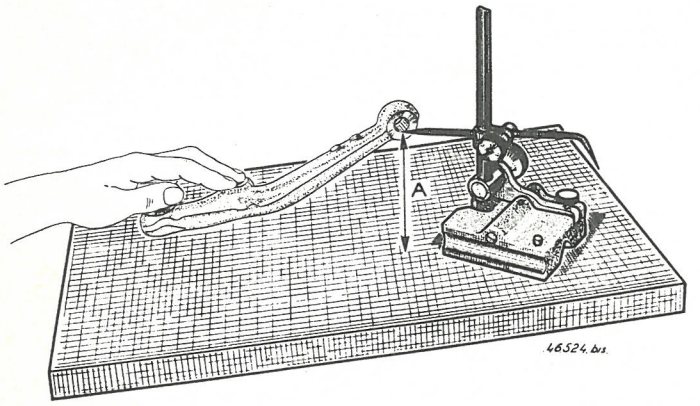
January 1958. — *To be inserted in M. R. 34 E. A. Workshop Manual instead of the 105-106 sheet.*



CHECKING THE FRONT AXLE COMPONENTS
(Continued)

STUB AXLE

Install the stub axle between centres and check with dial indicator.



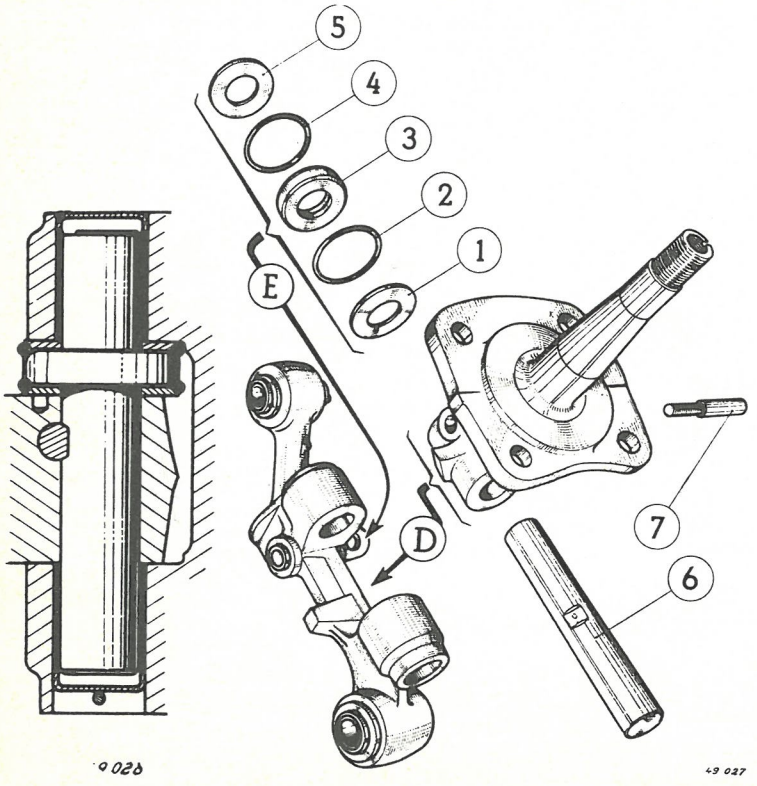
STUB AXLE CONTROL LEVER

Check dimension A using a scriber gauge set to this dimension, A being
83 mm ± .5.

FRONT AXLE Type 72-04

The FREGATE R 1 103 is equipped, as the TRANSFLUIDE R 1 104, with a front axle of the 72-04 type, since August 27/1957.

This type of front axle includes : — Pivot stops mounted on needles.
The remainder of the front axle is identical to the front axle type 72-00.



FRONT AXLE

Reassembling the stub axle.

Pile up the following parts successively :
— washer (**1**) (chamfer upwards) ;
— rubber ring (**2**) ;
— needle thrust bearing (**3**) (cover upwards) ;
— rubber ring (**4**) ;
— washer (**5**) (chamfer towards bearing).

Take this pile between the fingers and compress in order that the rubber rings (**2-4**) be expelled outwards of the washers (**5**) and locate in their chamfers.

Apply some graphite grease at the location where the washers will contact the stub axle carrier and the stub axle.

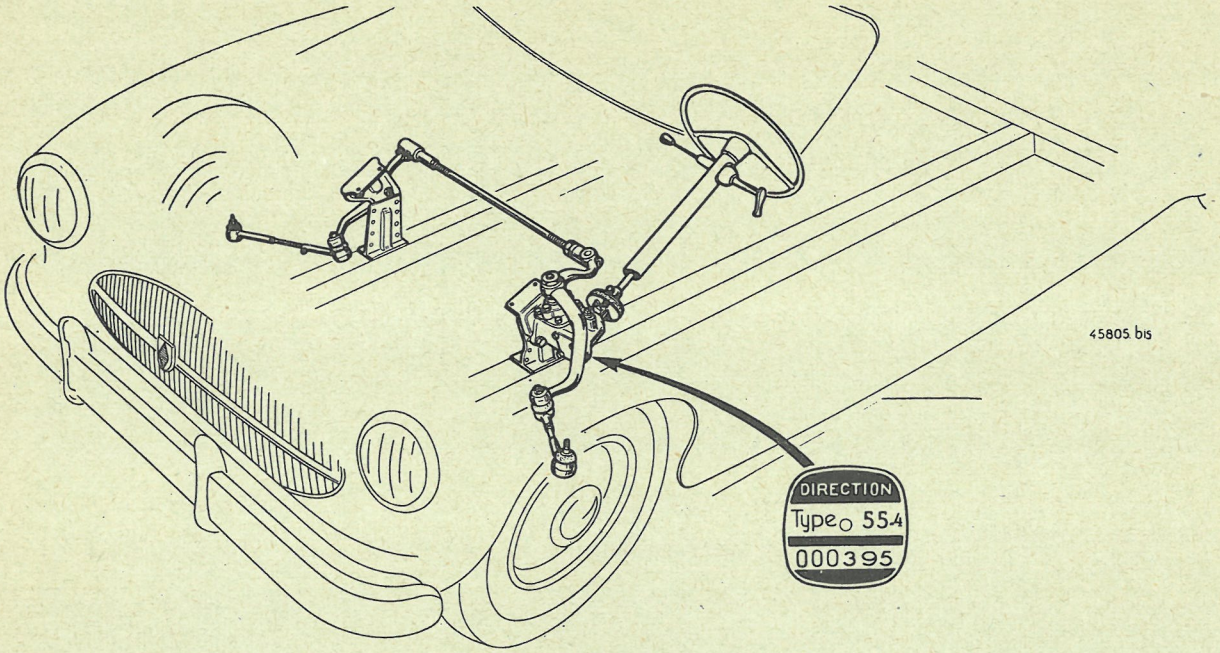
In the stub axle carrier, fit : the stub axle (**D**) and the " thrust washers " assembly (**E**).

Insert the king pin (**6**) in an upward direction and with flat upwards.

Correctly position king pin and fit key (**7**).

Fit king pin plugs and cotter.

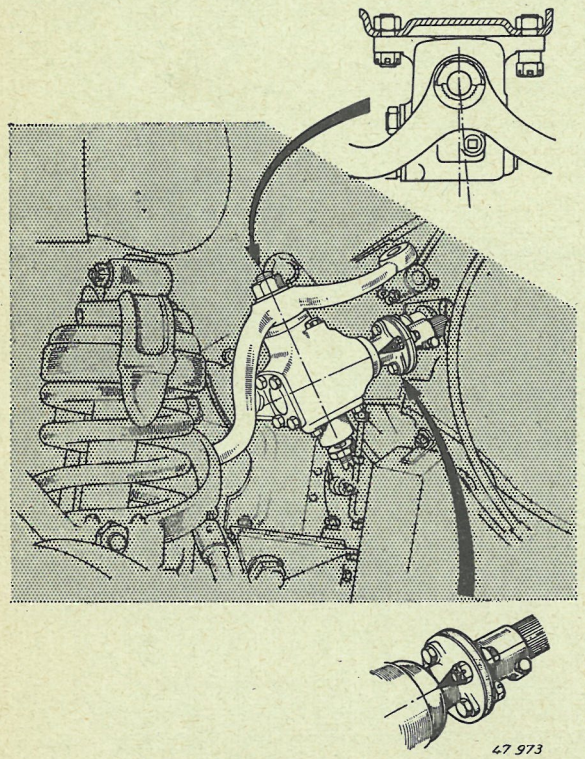
8. STEERING GEAR



SPECIFICATIONS

Type 55, Mark 4 (Gemmer type 50 R 12) for LH drive
Type 55, Mark 5 (Gemmer type 50 R 13) for RH drive
} Symmetrical and mechanically identical.

Steering motion is transmitted by worm and roller system.
Steering ratio : 18.2 to 1.
Minimum turning diameter : 10 m.
Flector flange bolts tightening torque : .300 m.kg.



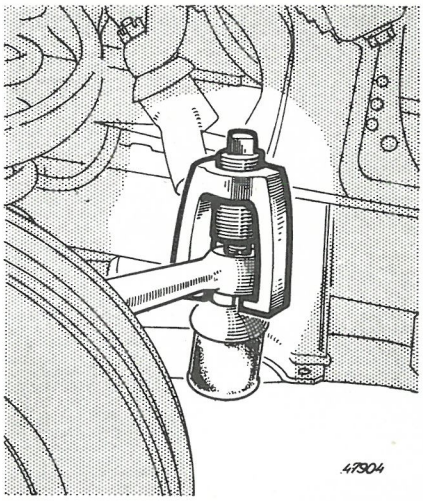
DETERMINING THE " MEDIUM POINT " OF THE STEERING CASE

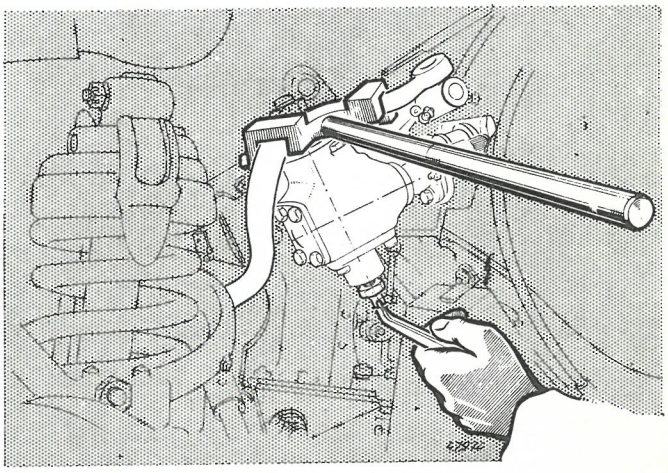
The steering gear case has its components at the " medium point " position when :

1° **The two arms of the steering lever** are located at **approximately the same angle with centreline of the steering case** (or the centre of the indentation-free roller carrier shaft is approximately in the centreline of the steering gear case).

2° **The marking on the driving flange** (or the centre of the toothed sector of the worm axis) is in front of the **marking stamped on the case** close to its centreline (saw mark).

CHECKING AND ADJUSTING THE STEERING GEAR





PRELIMINARY OPERATIONS.

Preparing the vehicle.

Place front end of vehicle on stands.

Remove the two wheels.

Make sure the play does not originate from the various hinges.

Disconnect the two steering links, using a puller (Ref. Dir. 04).

Checking the worm bearings play.

On steering lever, install the steering clamp (Ref. Dir. 23) which permits a greater accuracy. (Tighten the screws).

Position the steering gear at the " medium position ".

Rotate the steering wheel by approximately **one turn** and hold in this position.

Hold the flector flange at steering case height, the side of the finger contacting lightly the case.

By shaking the end of the clamp, the play of the bearing will be appreciated. This play is identified by a lenghtwise motion of the flector flange carrying shaft.

If some play is experienced, remove case and perform adjustment on a vise.

CHECKING THE MESHING OF THE " WORM AND ROLLER ".

NOTE. — This checking may be performed only if there is no play at the worm bearings. If this clearance exists, the adjustment of the " WORM AND ROLLER " meshing will have to be made on a vice when reassembling the case. The steering gear case play should be measured at the steering lever and not at the steering wheel.

Position the steering gear case at the " medium position ". At this position, no play should be experienced at the end of the clamp.

From this position, or medium point, operate the clamp tool in order to have the steering worm rotate successively by 1/4, 1/2, 3/4 of a turn in one direction. Lock the steering wheel at these positions and look for play by shaking the end of the clamp.

Same inspection to be performed in the opposite direction.

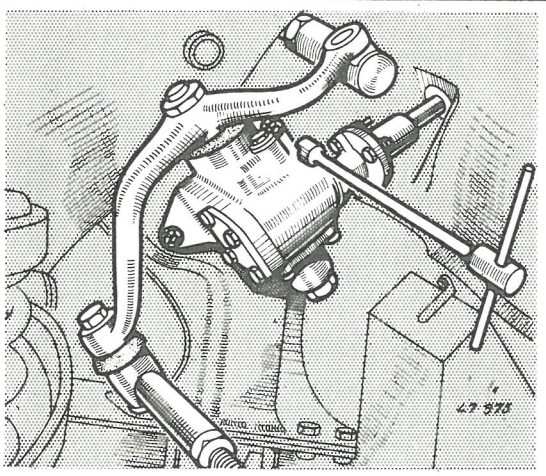
Should some play exist at the " medium point " position, or if the play originates at less than 1/4 of a turn in each direction, adjust the meshing.

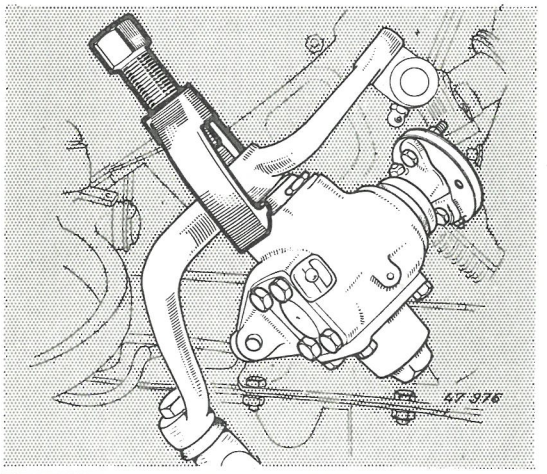
NOTE. — Initial plays experienced at the clamp tool may correspond to uneven rotations in both directions from the " medium point ".
Select the smallest rotation to reach a decision.

ADJUSTING THE MESHING OF THE " WORM AND ROLLER ".

Loosen the check nut. With a screwdriver, operate the adjusting screw clockwise.

Turn by increments of 1/6 of a turn and each time, check initial play at right and left. When initial play at clamp tool will be experienced between 90 and 180° (1/4 and 1/2 turn) at either side of the " medium point " position, the steering gear case will be correctly adjusted. Tighten check nut at 2 m.kg maximum.





STEERING GEAR CASE

REMOVING.

Disconnect the flector flange at steering control end.

Clear and loosen the steering lever locking nut.

Remove cotter pin from and loosen the steering case three attaching bolts with a spanner (Ref. Dir. 07).

From vehicle, pull off the steering case steering lever from the case with a puller (Ref. Dir. 22).

NOTE. — The purpose of this operation is to not destroy the front wheel alignment by not removing the connection bar.

REFITTING.

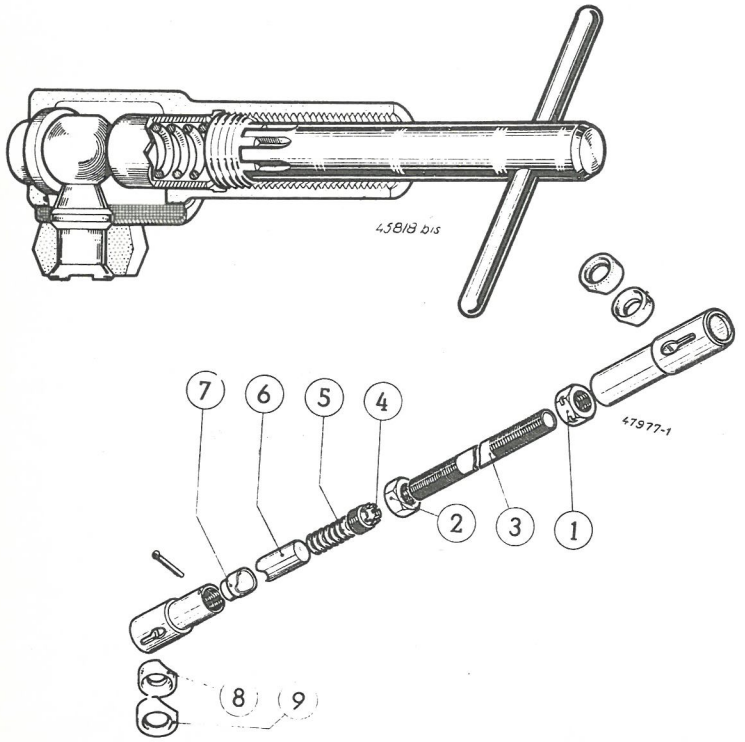
Position the steering gear case and attach with the spanner (Ref. Dir. 07). Fit cotter pin.

Position the steering lever (only one possible position) and, next, tighten the nut. Lock the nut.

Reconnect the driving flector flange.

Check front wheel alignment.

NOTE. — With vehicle on ground, check that, when operating, the steering lever does not contact any chassis part.



CONNECTION BAR

DISMANTLING.

Run off the two check nuts (1) and (2) and run off bar (3).
From each end, remove cotter pins from thrust plugs (4) and next, remove plugs with a special spanner (Ref. Dir. 03). Pull off the end from the ball joint and save spring (5), the cups (6) and (7) and the ball joint rubber protector (8) with cage (9).

REASSEMBLING.

Position the rubber protector (8) and cage (9) and insert the cup (7) in the end piece. Install the ball joint into the end and, next, the cup (6) and the spring (5).
Assemble and tighten the plug (4) using the spanner (Ref. Dir. 03) in order to close the coils of the spring.
Loosen **by 1/3 of a turn** to achieve an operational clearance of .25 to .5 mm.
Fit cotter pin on plug.
Reassemble the ends on the connection bar (3) and, after adjusting the toe-in, tighten the check nuts (1 and 2).

STEERING LINK

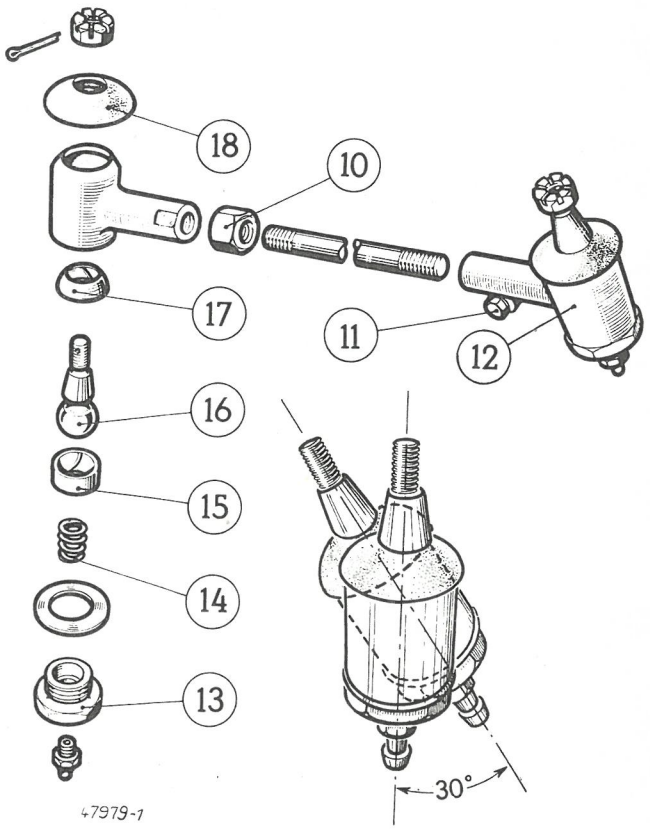
DISMANTLING.

Run off the check nut (10) or the stop bolt (11) and remove the link end (12).
Run off the plug (13) at link end, using a spanner (Ref. Dir. 06).
Save the spring (14), the ball joint cup (15), the ball joint (16), the other cup (17) and the rubber protector (18).

REASSEMBLING.

In the link end, install the ball joint cup (17), the ball joint (16), the other cup (15), the spring (14), the retainer and lock the plug (13).
After locking the plug, check the axial clearance of the ball joint.
If this clearance equals or is beyond .55 mm fit a .5 mm thick washer between the spring (14) and the upper cup (15).
Position the rubber protector (18).
On the threaded rod, install the two ends without tightening the check nut and the stop nut.
The length of the link will be determined during the toe-in adjusting operation.

NOTE. — **When reassembling, the centrelines of the ball joint ends should be offset by 30°** with the end, at body side (with the check nut), being tilted towards the front end of the vehicle.



STEERING IDLER LEVER

REMOVING,

Run off the check nuts on the connection bar and remove the bar.
Disconnect the steering link at idler lever end, using a puller (Ref. Dir. 04).
Clear and run off the steering idler lever attaching nuts.

REFITTING.

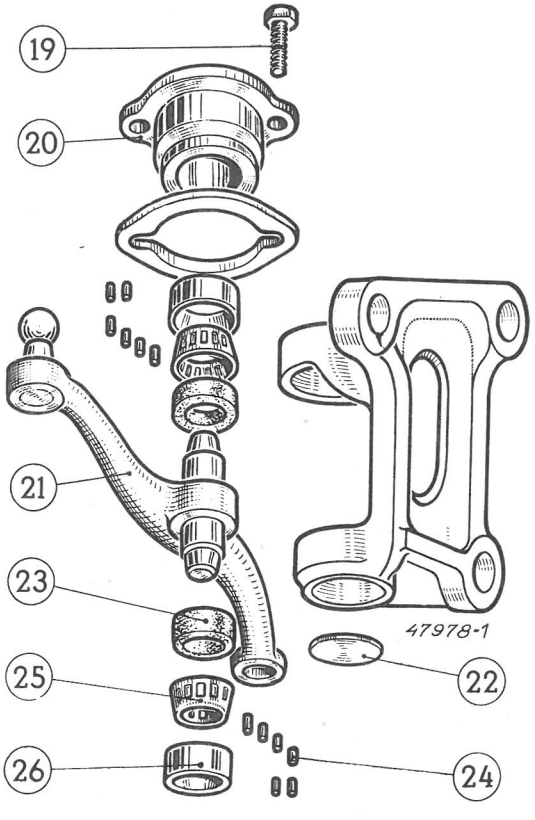
Follow reverse sequence of removing operations. Adjust the toe-in.

DISMANTLING.

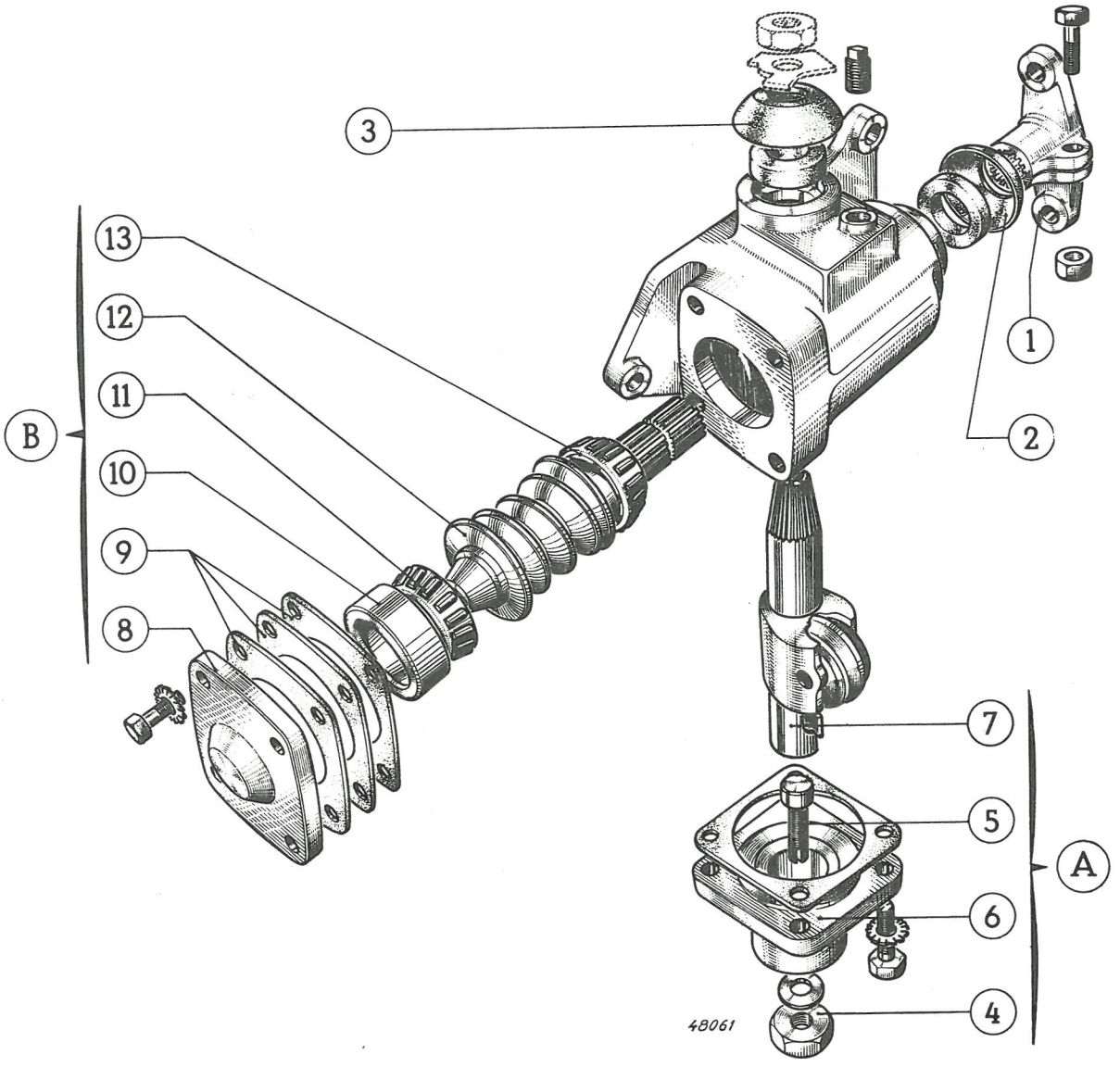
From the idler lever, separate the connection bar end.
Remove the idler cover (20) two attaching bolts (19).
Pull out this cover and combination bearing cage.
From the support, clear the idler lever (21).
From the inside, drive out the expansion plug (22) from the support.
Remove the bearing sealing bushes (23), the tapered rollers (24) and the bearing cages (25) from the idler support and the cover; remove cups (26).

REASSEMBLING.

Follow the dismantling operations in reverse sequence.
Replace the adjusting shim if necessary, in order for the idler lever to rotate freely but without play.



STEERING GEAR CASE



DISMANTLING (on vice).

Drain the steering case through the drain plug.
Remove the drive flange (1) and the rubber protectors (2) and (3).

Remove assembly A, to this end :

— remove the 4 bolts attaching the lower cover (6) and run off the check nut (4),
— run up the adjusting screw (5) and save the side cover (6),
— remove the roller carrier shaft (7) and save the adjusting screw (5).

Remove the assembly B, to this end :

— remove the front cover (8) with the bakelite gaskets (9) without damaging same,
— from the case, remove the front bearing cup (10), the front bearing (11), the worm (12) with the rear bearing (13).

NOTE. — The rear bearing cup (13) may not be disassembled.

STEERING GEAR CASE (continued)

REASSEMBLING (on vice).

If necessary, replace the seals.

Reassemble the assembly B, to this end :

— position, inside the case, the worm (**12**), fitted with its rear bearing (**13**) and next, the front bearing (**11**) and the front bearing cup (**10**).
— temporarily mount the front cover (**8**) by inserting the bakelite gaskets (**9**) used as adjusting shims.

Set the lenghtwise clearance of the worm bearings :

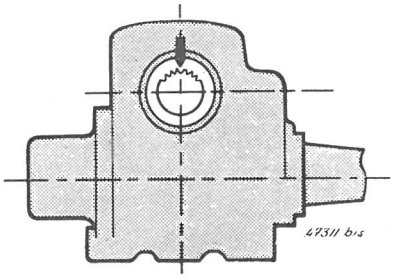
— add or remove one or several bakelite gaskets (**9**) between cover (**8**) and case, by increments, until the worm rotates freely (after the cover bolts habe been tightened to 2 m.kg) but without end play.

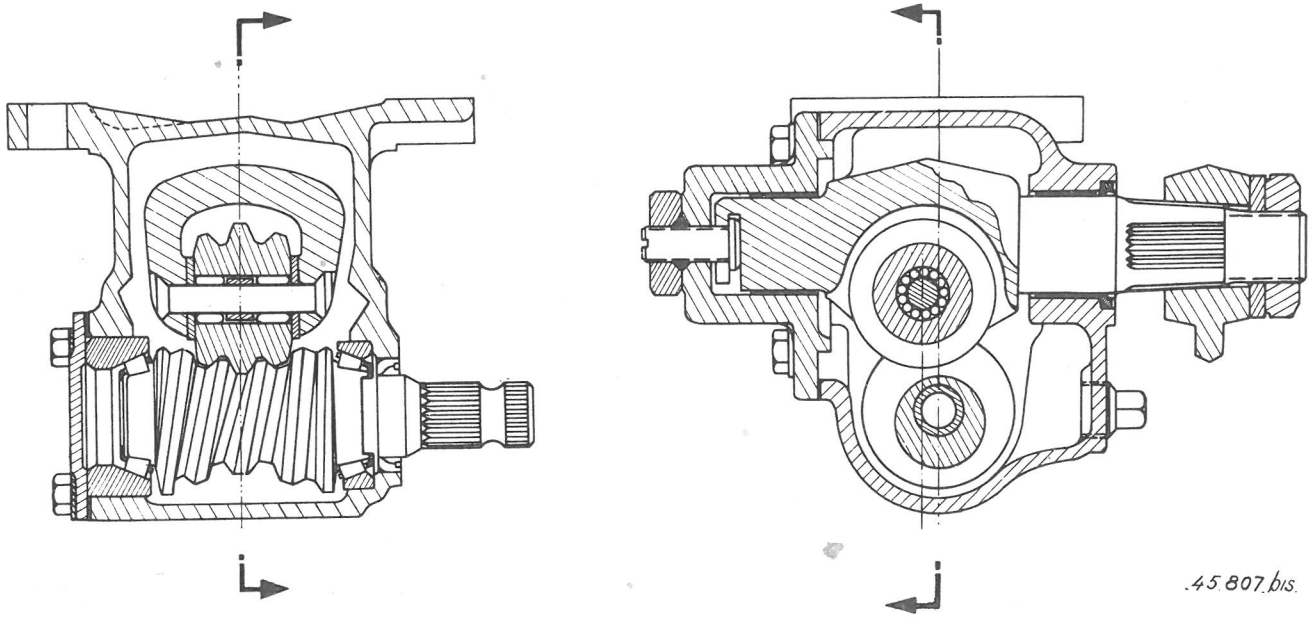
Reassemble the assembly A; to this end :

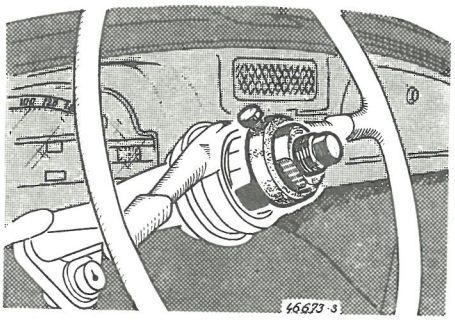
— position the adjusting screw (**5**) in the roller carrier shaft (**7**) location and fully tighten on the lower cover (**6**),
— fit a new paper gasket on the cover and insert the roller carrier shaft (**7**) in the case,
— tighten the lower cover attaching bolts,
— position the sealing washer (Buna type) and the check nut (**4**) without tightening.

Adjust the " worm and roller " meshing :

— mount the steering gear case in a vice, assemble a steering lever on the roller carriers haft and, on this lever, install the special clamp (Ref. Dir. 23),
— position the case at its " medium point " position :
  — centre of the number of teeth of the worm shaft in the centreline of the case,
  — centre of the toothless area of the roller carrier shaft in the centreline of the case,
— with a screwdriver, turn the adjusting screw (**5**), clockwise, until no play is experienced at the end of the clamp,
— starting from this medium point position, operate the clamp tool in order to rotate the worm by increments of 1/4, 1/2 ; 3/4 of a turn in one direction,
— at these positions, look for play by shaking the end of the clamp,
— **if initial play is found at less than 1/4 of a turn,** turn the screw clockwise,
— same adjustment in the opposite direction.
— **when the initial play as experienced at the clamp tool will occur between 90 and 180° (1/4 and 1/2 of a turn), at either side from the " medium point " position, the steering gear case will then be correctly adjusted,**
— tighten the check nut (**4**).

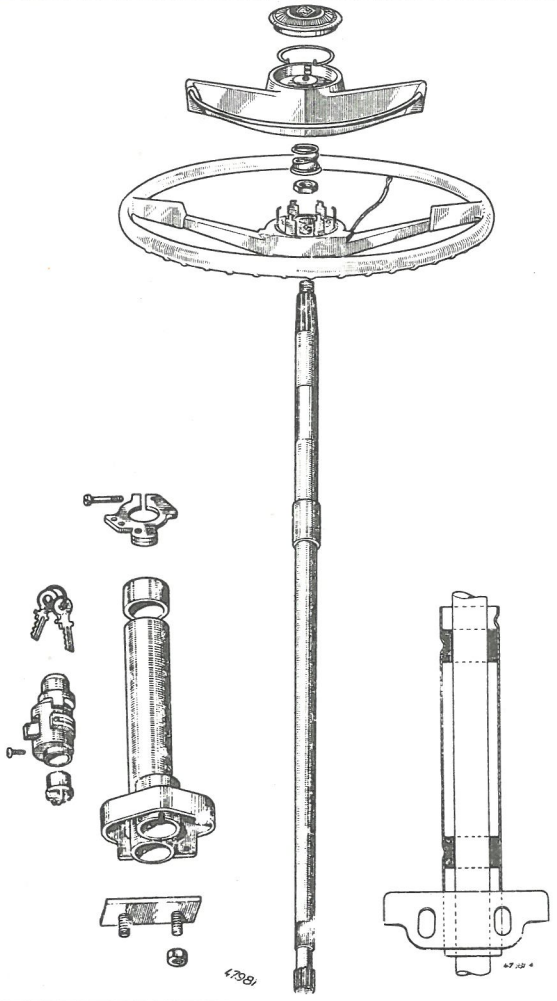






REPLACING THE STEERING WHEEL

Pull off the steering wheel ornament. Disconnect the horn ring wire, remove the retainer and remove the horn ring.
Run off the steering wheel locking nut and pull off wheel, using the wheel-puller (Ref. Dir. 21). When reassembling, locate the steering wheel spokes in order that both are at an identical angle with the horizontal, the wheels being in the straight ahead position and steering wheel horn ring being located downwards.
Set the adjusting screws, after connecting onto the screw, the horn wire, in order for the horn to operate under a light action of the horn ring.



STEERING CONTROL

REMOVING AND REFITTING.

See : Removing and Refitting the gear control. (Page 89).

REPLACING THE SUPPORT BUSHES.

With the steering control removed and the steering wheel off :

Remove the steering wheel shaft downwards.

Remove the stationary steering column to flange attaching bolt.

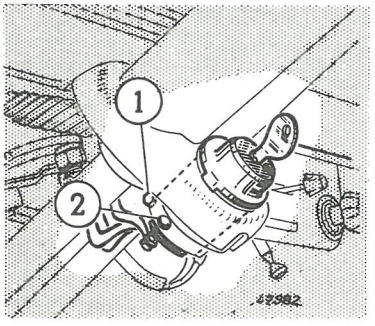
Clear the latter, also in downwards direction, out of the Avercod combination switch.

Remove the 2 worn rubber bushes.

Apply talcum powder on the 2 new bushes and push in the tube **until the protrusions of the tube are located centrally in the centre of the bushes.**

Next, follow the dismantling operations in reverse sequence to perform the reassembling of the column.

Tightening torque of the flange attaching bolt : 1 m.kg.



REPLACING THE ANTI-THEFT DEVICE

Disconnect the battery.
Position anti-theft device at the " Garage " position.
Disconnect the three wires after marking same.
Remove the 2 screws (1) attaching the device to the bracket.
Apply pressure on the ball through the opening (2) and on the diametrally opposite tab, in order to remove device.
Fit in place a new device, **at " Garage " position,** and perform the reassembling, following the dismantling operations in reverse sequence.

January 1958. — To be inserted in M. R. 34 E. A. Workshop Manual, between pages 114 and 115.

STEERING Type 55-12

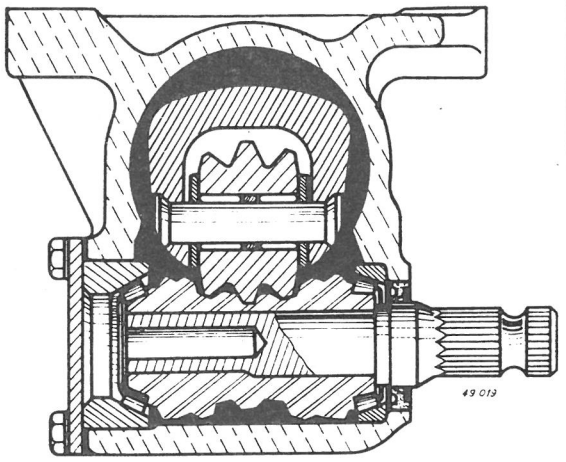
The FREGATE R 1 103 is equipped, as the Transfluide R 1 104, with a GEMMER 55-12 steering gear since August 27/1957.

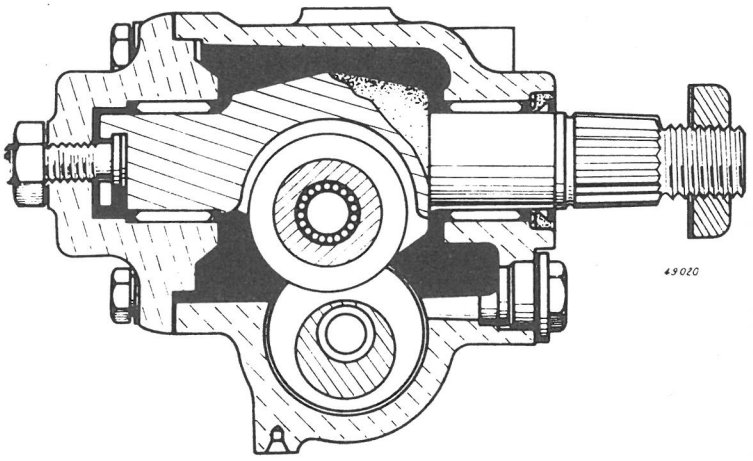
This steering gear includes :

— A steering case of aluminium with cast iron cover, with roller-carrier shaft mounted on needle cages.
— A steering relay mounted on needle bushes.
— Steering links with bakelite fabric back cups and Belleville washers.
— A longer steering tube with one single bush.
— A steering wheel with a diameter of 435 mm.

STEERING CASE

For operations in connection with adjustments, checking, removing and dismantling, refer to pages 109 - 110 - 112 and 113.





STEERING RELAY

Dismantling :

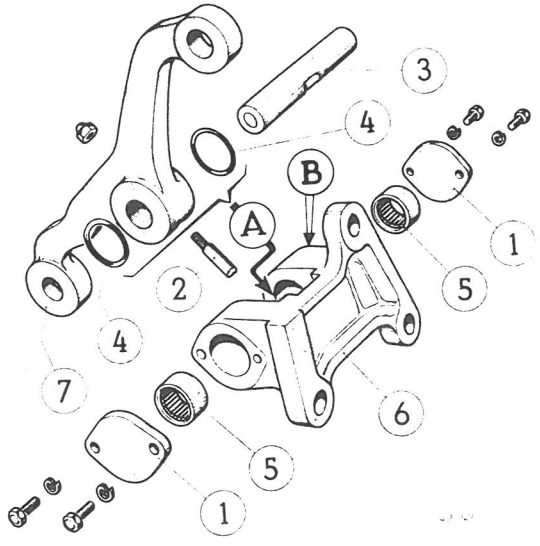
From idle lever, remove the end of the connection bar and run off the bar.

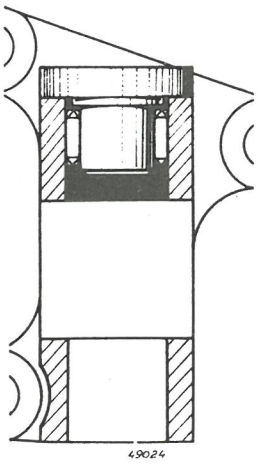
Remove the 2 covers (**1**).

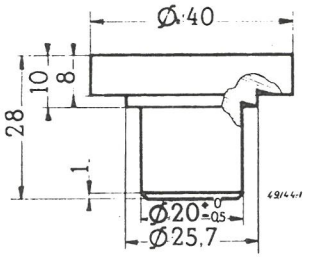
Drive out the pin (**2**) and remove shaft from lever (**3**).

Pull idle lever (**7**) from support (**6**).

Drive out the needle bushes (**5**) from the support.







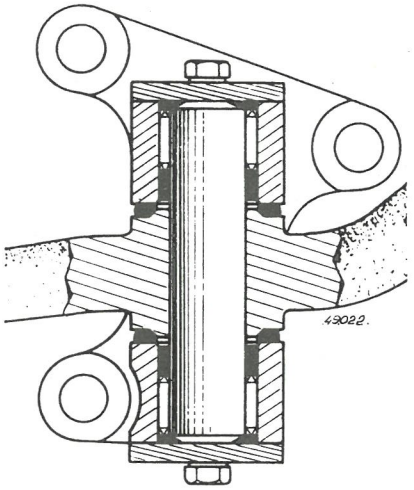
STEERING Type 55-12

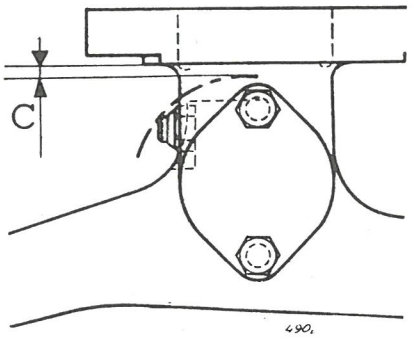
(Continued)

STEERING RELAY (continued)

Reassembling :

Assemble the new needle cages in the idle lever support, using the mandrel Ref. **Dir. 24, with the markings on the cage turned towards the mandrel.**





Reassembling (continued) :

At each side of the lever hub, fit a rubber ring (**4**) and a tinfoil strip. This strip is used as a protection for the rubber rings when the lever (**7**) is inserted in the support (**6**).

Position the assembly (**A**) in the support, remove the 2 tinfoil strips.

Insert shaft (**3**) of the idle lever [with slot in shaft directed towards top of support (**B**)].

Direct shaft (**3**) in order to fit key (**2**) (make sure by turning the wheels that the end of the key clears by approx. **C** = 3 mm the support web).

Refit the covers (**1**).

STEERING Type 55-12

(Continued)

STEERING LINK

Dismantling :

Free and slacken nut (**2**) and, next, remove end (**5**) from link.

Remove snap ring (**11**).

Collect all parts.

Reassembling :

In link end, assemble :

— cup (**6**),

— ball joint (**7**),

— the bakelited fabric back cup (**8**),

— the 6 Belleville washers (**9**), following the direction of assembly as illustrated,

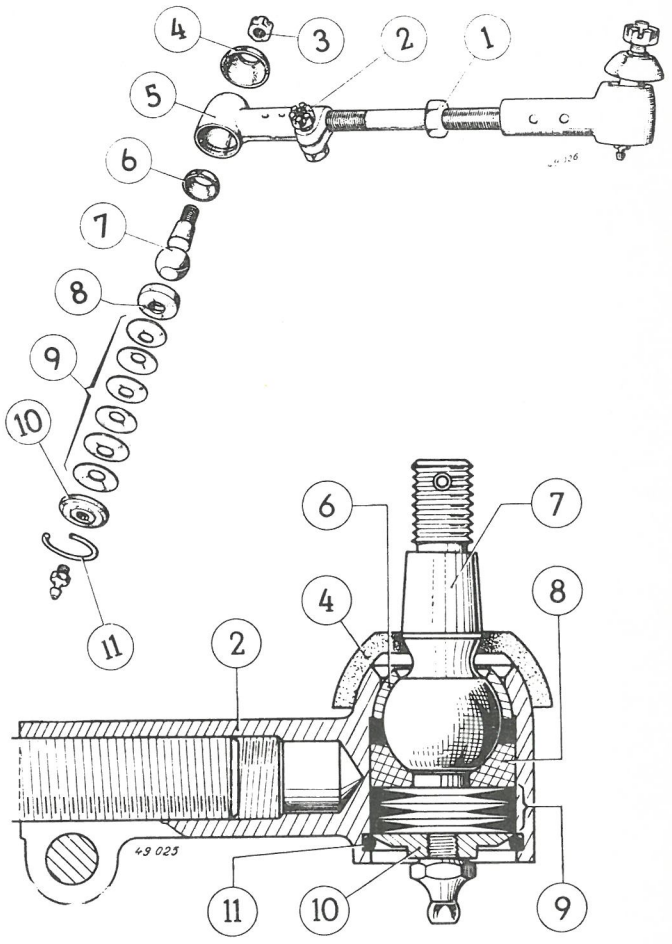
— the cover (**10**) and the snap ring (**11**).

Fit the rubber protector (**4**).

Assemble the 2 ends on the threaded rod without tightening the nut (**2**) and the check nut (**1**).

The length of the link will be determined when adjusting the toe-in.

NOTE. — When reassembling, **the ball joint ends axis** should be **offset by 30 degrees,** with the end at body side (with check nut) tilted towards front of vehicle.



ADJUSTING THE STEERING GEAR

Set the steering case at play-free point in straight ahead direction.

Set the LH link in order for the wheel to be in the straight ahead position ; the opposite link should then be adjusted to such a length that the sum of the lengths of the 2 links remains constant and equal to 510 mm without any exceeding the tolerance of 255 ± 10.

The toe-in should then be adjusted solely through the coupling bar.

NOTE :

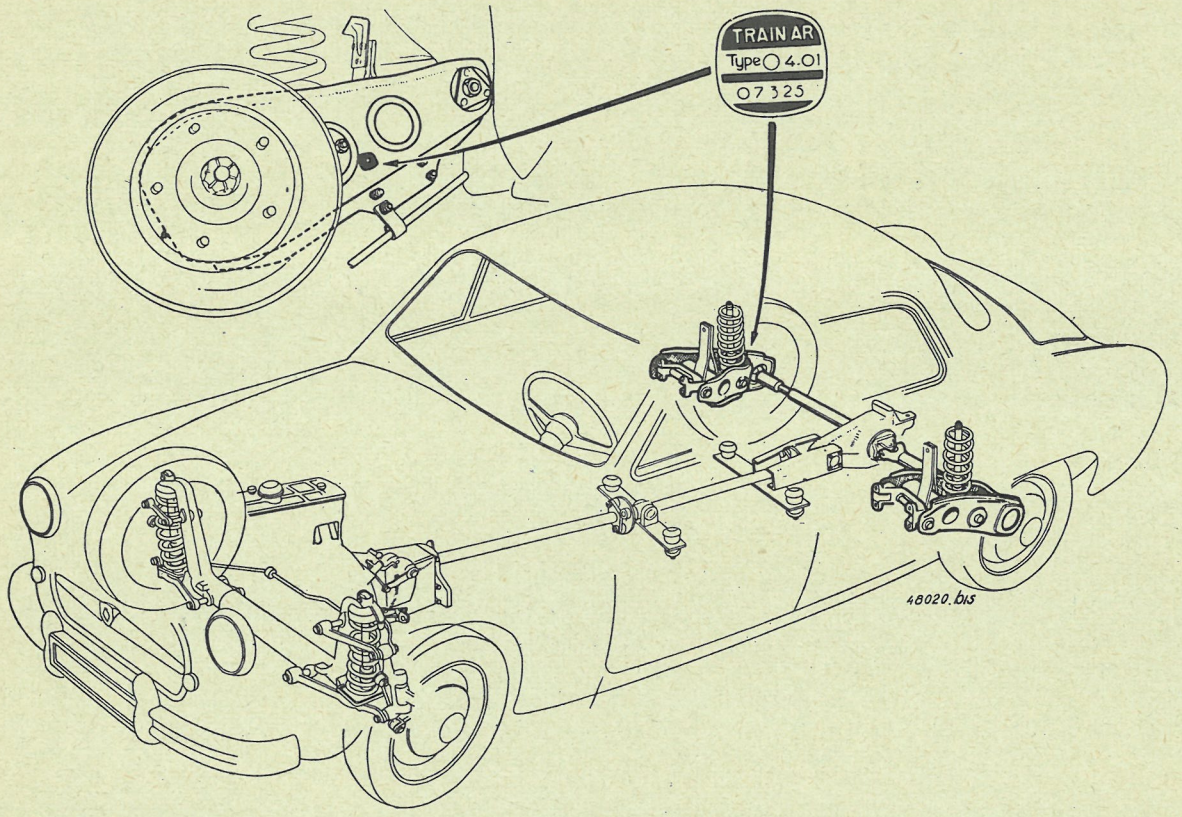
1° For service, for FREGATE R 1 100 - 1 102 - 1 103, the former type steerings will be delivered until the stock is completely exhausted.

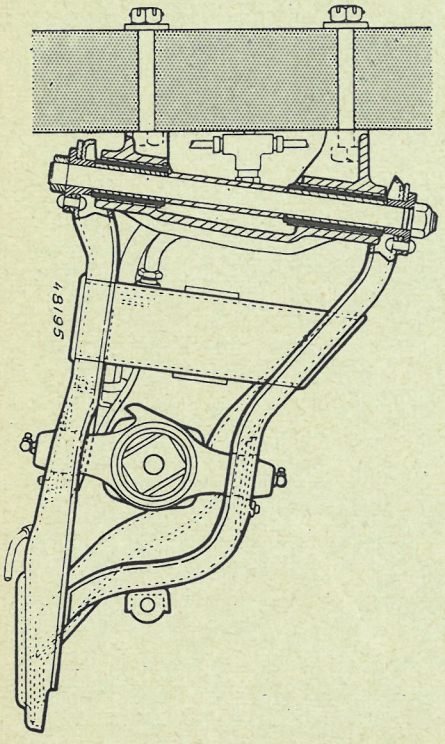
Once the stock has been exhausted, the Spare Parts Department will deliver the new steering gears, the mounting bolts and the Nylstop nuts.

2° The needle bushes are matched with the steering case ; therefore, for repairs it is not permitted to change same. This supply as Spares is not to be obtained.

January 1958. — To be inserted in M. R. 34 E. A. Workshop Manual, between pages 114-2 and 115.

9. REAR AXLE





SPECIFICATIONS

Independent wheels with rear axle shafts hinged crosswise on rubber bushes.

Up and down motion is limited through a strap and an impact pad.

— Tightening torque for rubber bushes locking nut	18 m.kg
— 2 rubber bushes per arm. Length	56 and 90 mm
— Diameter of hinge bolt	20 mm
— Locking position of rubber bushes	A = 88 mm

(The dimension A is obtained by adjusting the tool T. Ar. 44 to the dimension B = 374 mm).

The illustration at left shows the rear suspension arm as seen from below.

REAR AXLE HALF

(R or LH)

REMOVING.

Remove the rear seat.

Remove :

— the wheel and the drum (see page 146),

— the shock absorber and the spring (see page 150),

— the rigid brake line.

Disconnect :

— the hand brake cable at wheel end,

— the flexible connection with the 2-way connection of the sheet metal support.

Remove the torsion bar two attaching plates.

Remove the 4 crosswise transmission to reduction gear fixing nuts.

Run off the 4 suspension arm to thrust cross-member attaching bolts and remove the rear axle half.

REFITTING.

Position the rear axle half and temporarily attach the strap.

Mount the rear axle half following the decreasing order of bolts lengths (a, b, c, d). Fit cotter pins on nuts.

Refit the spring (see page 150).

Tighten the rubber bushes locking nut.

To this end :

— assemble the shock absorber lower support on the tool (Ref. T. Ar. 44) and set the latter to the dimension B = 374 mm.

— install the tool thus set, in lieu of the shock absorber (this tool once set to the dimension B, permits obtaining the dimension A = 88 mm).

— tighten the Nylstop nut to 18 m.kg torque, using a torque wrench (Ref. Mot. 50) and a 29 mm socket (Ref. SAPRAR 12.276).

Reassemble the shock absorber (see page 150) and refit the torsion bar.

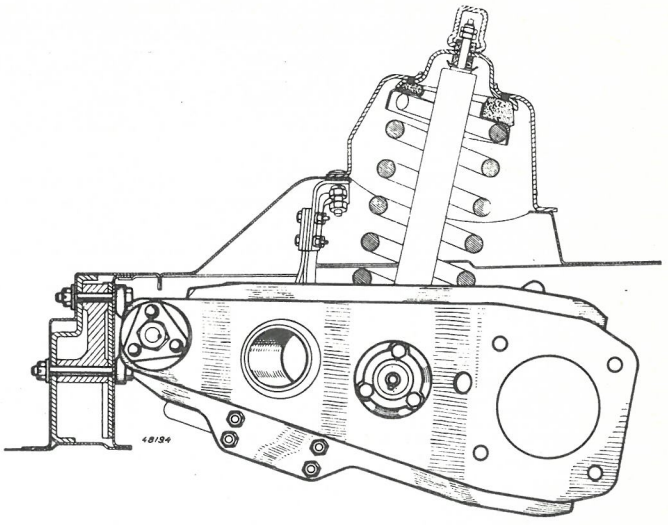
Mount the crosswise transmission to the reduction gear.

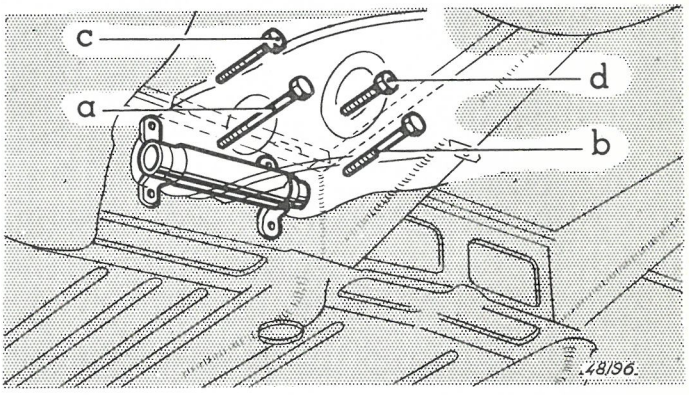
Reconnect the braking lines (see page 138) and the hand brake cable (see page 139).

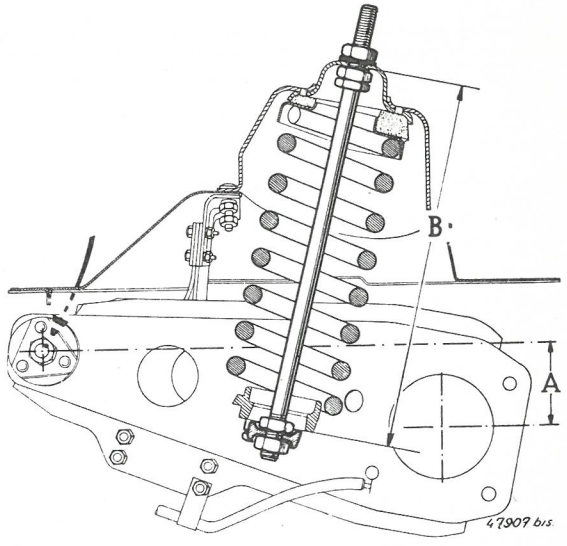
Refit the drum and the wheel (see page 146).

Bleed the brakes (see page 141).

Reinstall the rear seat.

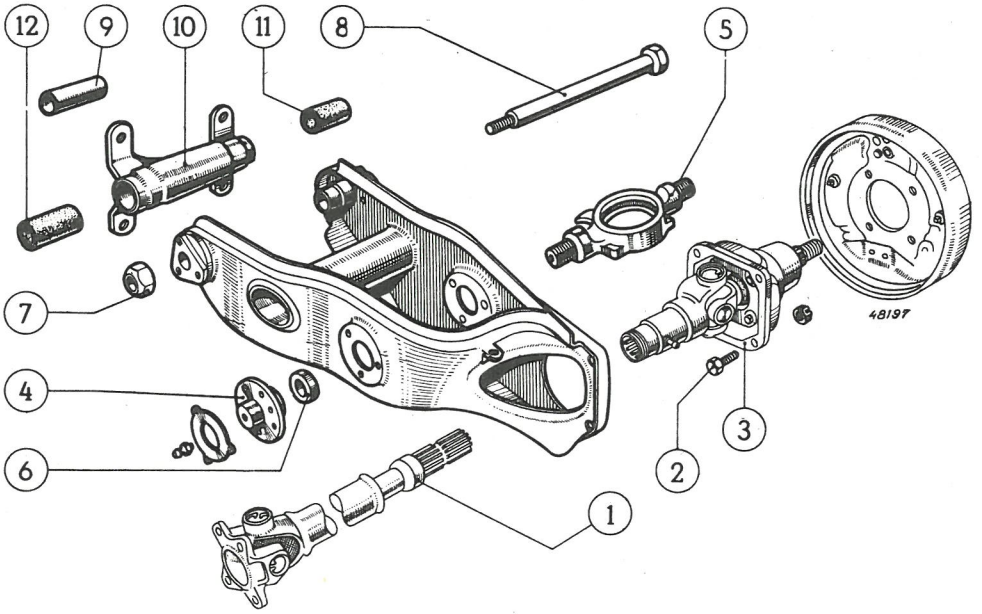


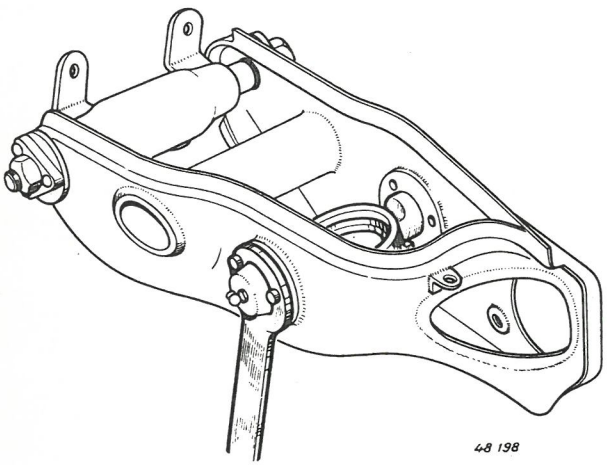




REAR AXLE HALF (continued)

(R or LH)





DISMANTLING.

Run off the bush (1) on the transmission tube and separate the tube from the outer universal joint.

Remove the 4 bolts attaching the brake carrier plate and remove the plate.

Run off the 4 bolts (2) attaching the bearings case and separate the hub-stub axle - outer universal joint assembly (3) from the suspension arm.

Remove the screws attaching the spring lower support (5) bushes (4) and remove the bushes, using a special spanner (Ref. T. Ar. 11).

Remove the spring lower support (5) and save the sealing washers (6).

Run off the Nylstop nut (7) and drive out the hinge bolt (8).

Save spacer (9) and remove the bushes support (10).

Check condition of rubber bushes (11) and (12) and replace if necessary.

Check the suspension arm.

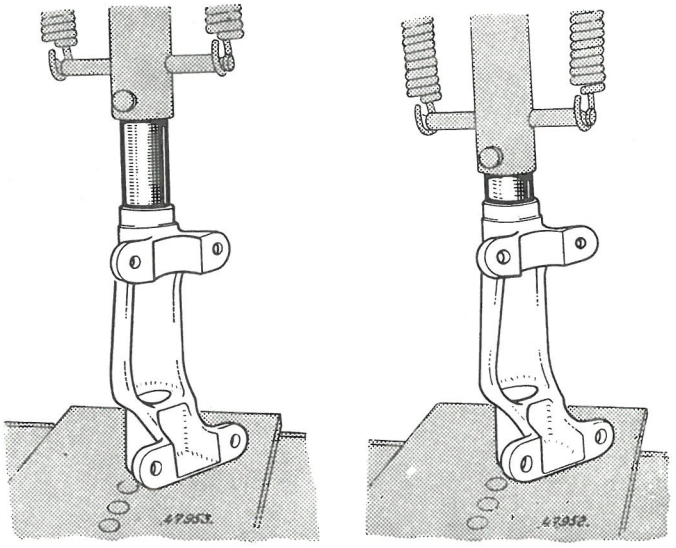
REAR AXLE HALF
(R or LH)

(continued)

Replacing the rubber bushes.

— Drive out the 2 bushes on a press using a mandrel (Ref. T. Ar. 42).

— Insert two new bushes on a press, using a mandrel (Ref. T. Ar. 42), the shortest bush being located at the outside. The bush outer ring should be flush with the support.



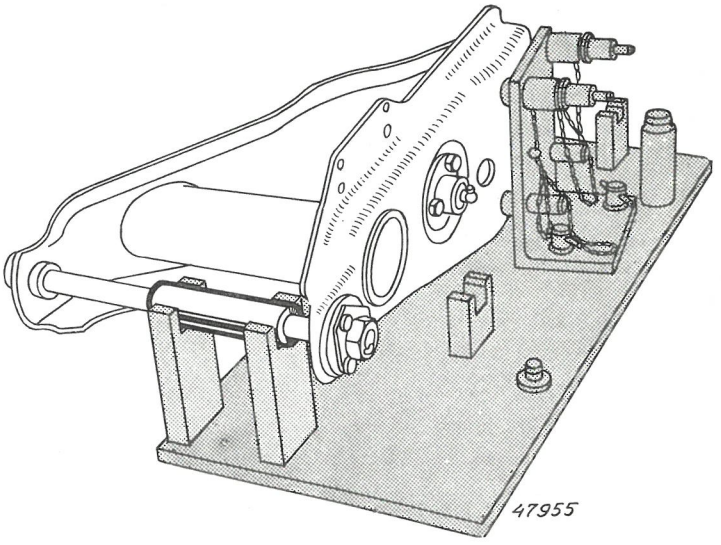
Checking the suspension arm.

This operation is to be performed with a checking fixture (Ref. T. Ar. 15).

Use the hinge bolt by fitting on the bolt the complementary bush (Ref. T. Ar. 43).

The checking is performed using the 4 shafts guided in the angle plate as the shafts centre distances correspond to the 4 holes of the suspension arm.

The different diameters of the gauges make it possible to check the inclination of the right or left arms.



REASSEMBLING.

Install the spring lower support (**5**) equipped with its sealing washers (**6**).

Run up the bearing bushes (**4**) and bring bushes to contact the washers.

Run up the bushes by equal amounts at each side in order to obtain a sufficient clamping, with the 3 holes in the suspension arm in front of the 3 holes in the bush.

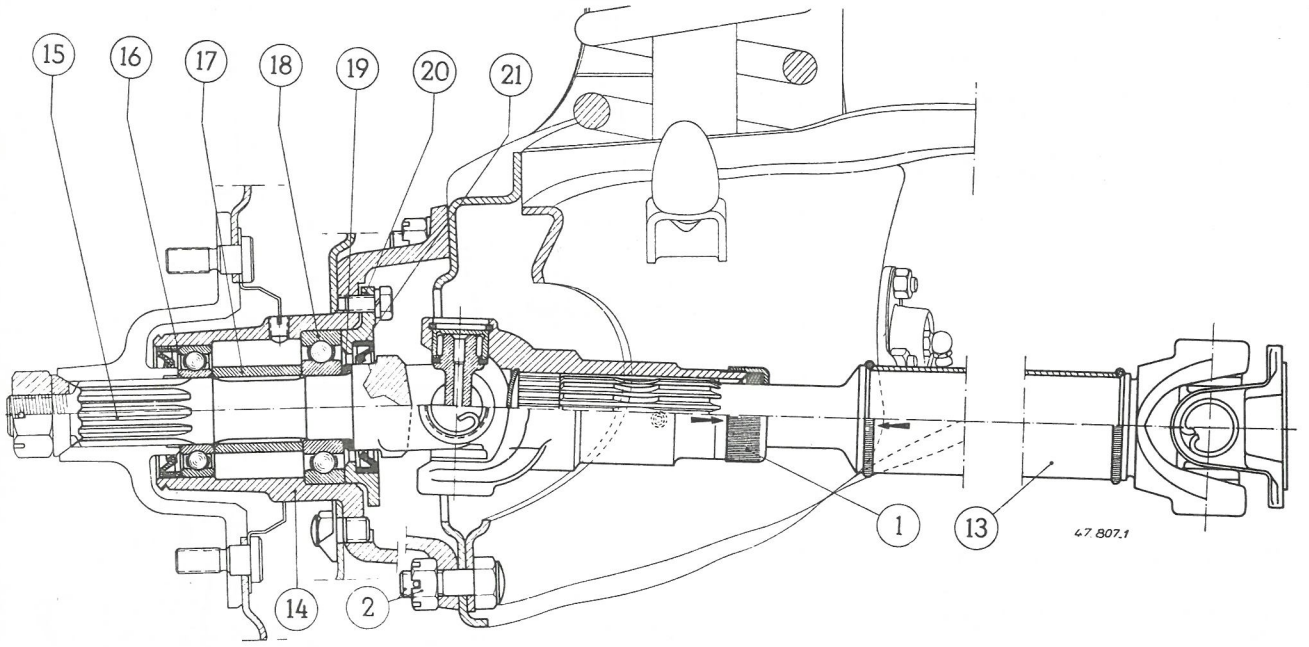
The clamping action should be such that the support is able to rotate manually without binding.

Tighten the bolts and lock.

Position the support (**10**) and insert the hinge bolt (**8**) in the rubber bushes by inserting the spacer (**9**).

NOTE. — The nut welded onto the hinge bolt is mounted at the outside.
Run up the Nylstop nut (**7**) without tightening same, **as this operation is performed on the car when refitting the rear axle half** (see page 117).

CROSSWISE TRANSMISSION



REMOVING.

Remove the wheel and the drum (see page 146).

Disconnect the hand brake cable at wheel end and the rigid brake line to the wheel cylinder.

Clear and remove the 4 bolts attaching the brake carrier plate and remove the plate.

Run off the bush (**1**) from the transmission tube (**13**).

Remove cotter pins from and remove the 4 bolts (**2**) fixing the bearings cage (**14**).

Remove the stub axle - outer universal joint assembly.

Remove cotter pins from and remove the nuts attaching the transmission tube to the reduction gear and remove the tube.

REFITTING.

Connect the transmission tube to the reduction gear outlet plate.

Engage the stub axle-outer universal joint assembly in the suspension arm.

Mark the two arrows at both ends of the transmission tube and of the sliding jaw. Align the two arrows and insert the sliding jaw onto the transmission tube.

Mount the bearing cage (**14**) on the suspension arm and fit pins on the nuts.

Run up the bush (**14**) on the transmission tube.

Fix the brake carrier plate and lock the bolts.

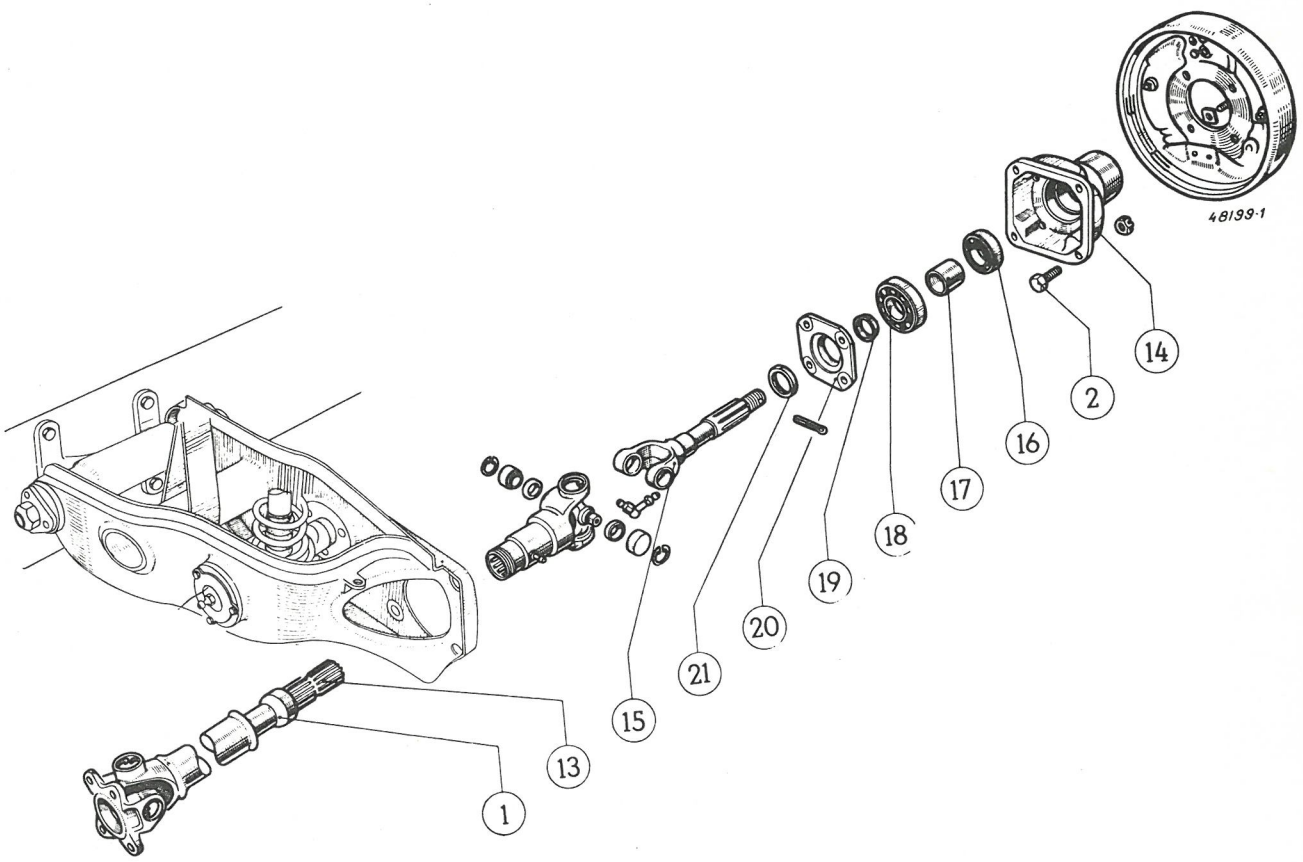
Reconnect the rigid line to the wheel cylinder as well as the hand brake cable (see pages 138 and 139).

Reassemble the drum and the wheel (see page 146).

Bleed the brakes (see page 141).

CROSSWISE TRANSMISSION

(continued)



DISMANTLING.

Before dismantling, clean the whole transmission and, next, check the play of the universal joints and of the splines of the transmission tube in the sliding jaw.

Remove the bolts on the cover (**20**) of the bearings cage (**14**) and remove the cage.

On a press, drive out the combination universal joint yoke and stub axle (**15**) and save the stub axle bearings (**16**) and (**18**), the spacer (**17**), the thrust washer (**19**) and the cover (**20**).

Pull out the sealing bush (**21**) if required.
Disassemble the universal joints (see next page).

REASSEMBLING.

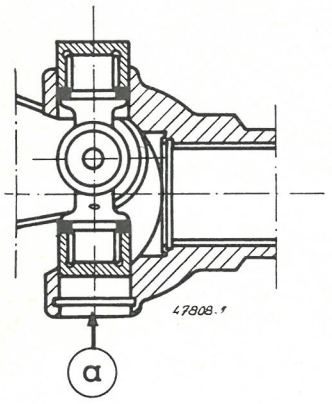
Succesively assemble on the universal joint yoke (**15**), the cover (**20**) equipped with its sealing bush (**21**) and the thrust washer (**19**) (inner chamfer to contact the shoulder).

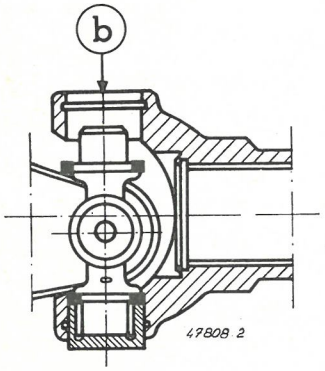
Insert the bearings (**18**) and (**16**), by inserting the spacer (**17**). Use, for the purpose, a tube having an inside diameter of 31 mm and a length of 200 mm.

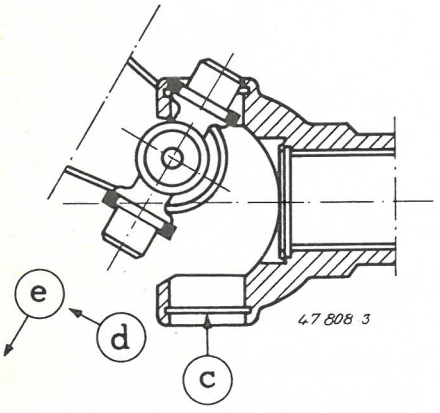
Straddle the assembly with the bearings cage (**14**) wherein the sealing bush will have been replaced first, if required.

Reassemble the universal joints (see next page).

NOTE. — If one of the parts, transmission tube or sliding jaw, has to be replaced, it is advisable to replace both parts.







UNIVERSAL JOINTS

DISMANTLING.

Remove :

— the two sections forming the spider lubricator,

— the needle bearing cages retainers.

Drive out the needle bearing cages **(at lubricator shoulder end)** towards the inside of the jaws **(arrow a)** in order that the spider by way of consequence, drives out the other cage at the outside of the jaw.

NOTE. — Always drive out first, towards the inside of the jaws, the needle cage at lubricator shoulder end, or the lubricator would contact a jaw and therefore would not drive out sufficiently the other needle cage from its location.

Remove the needle cage thus driven out.

Drive the spider towards the other cage to clear same from the jaw **(arrow b).**

Next, clear out the spider following the **arrows c, d and e.**

Follow the same procedure for the other jaw.

REASSEMBLING.

NOTE. — When some play is found at the universal joints, replace the spider-needle cage as an assembly. The Spare Parts Dpt makes available a special kit which includes a spider with lubricator, bearings, stop pieces, needles, cups and cork gaskets.

As the arrows indicate the dismantling sequence, follow their indications in reverse sequence.

Hold the needles with grease in their cage.

Assemble the cork gaskets on the trunnions of the spider.

Insert a trunnion in a jaw : trunnion opposite to the shoulder of the lubricator **(arrow e).**

Bring the other trunnion into its location **(arrows d and c).**

Push the trunnion (shoulder side of the lubricator) fully in its location, insert the needle cage on the trunnion and into its location in the jaw, push in as far as possible in order that the trunnion at apposite end is pushed out of its location **(arrow b).**

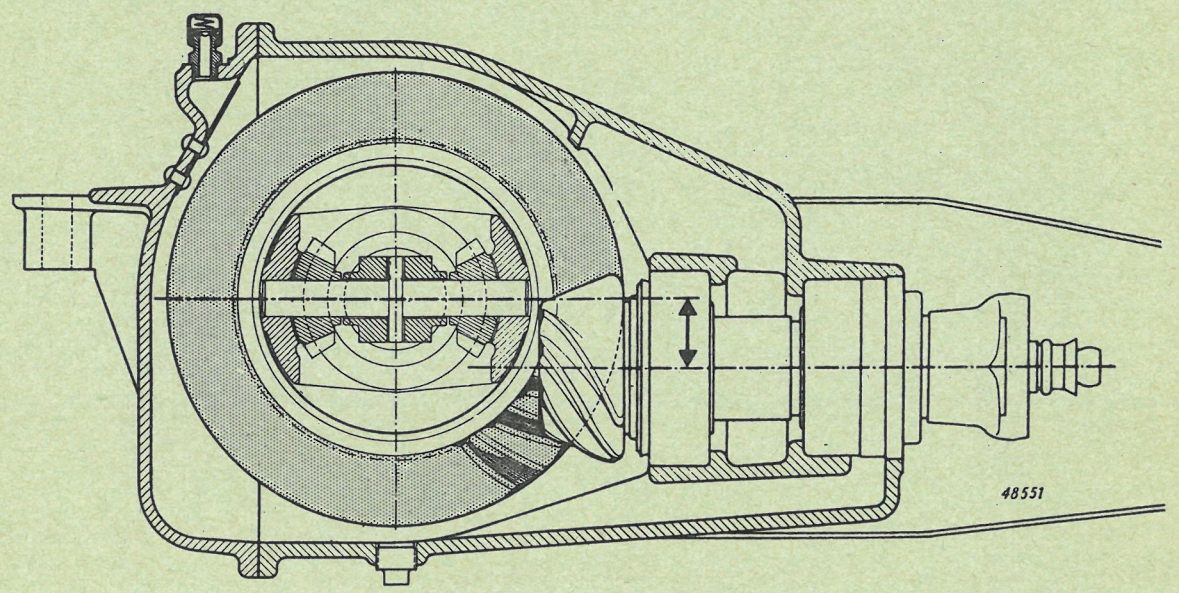
Install the other needle cage.

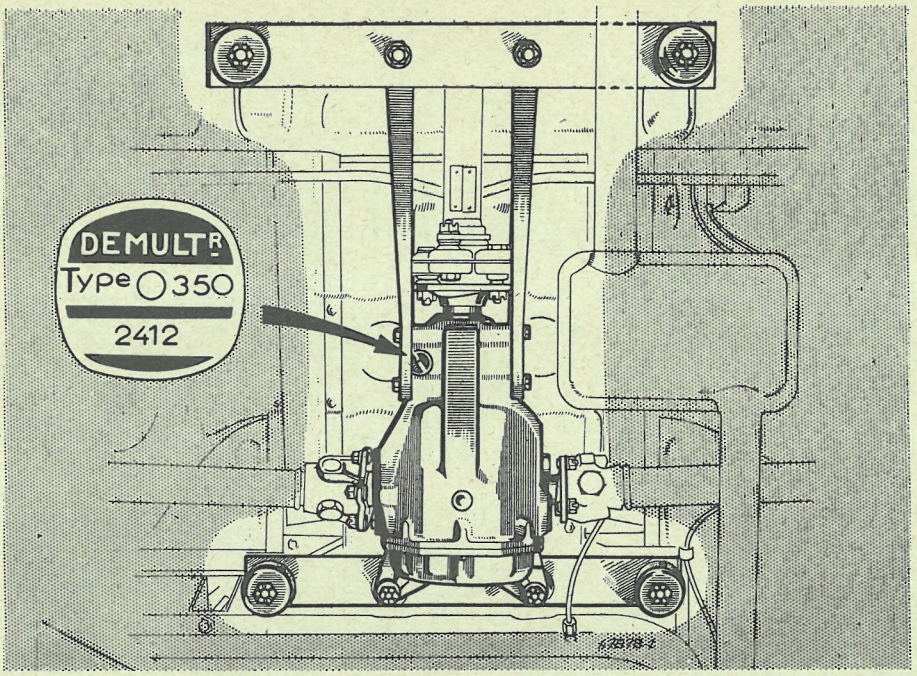
Position the needle cages at their location and fit retainers.

Follow the same procedure for the other jaw.

10. REDUCTION GEAR

Hypoïd Type





SPECIFICATIONS

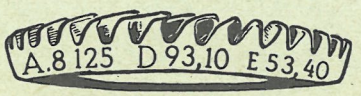
Hypoïd reduction gear mounted onto the body.

Crown wheel and pinion :	
— Pinion	9 teeth
— Crown wheel	35 teeth
Ratio	3.89
Theoretical cone distance	93 mm
Crown wheel and pinion blacklash	.15 to .20 mm
Differential with two side gears and two side pinions.	
Splash type lubrication :	
— Oil capacity	1.5 l
— Quality	EP 80
Torque required to rotate the drive pinion	.18 to .28 m.kg
Side gears friction washers (select by measures)	2 thicknesses (machining tolerances are different).

Adjusting shims :	
— for cone distance (C)	.1 - .2 - .5 - 1 - 1.2 - 1.4 - 1.6 - 1.8 - 2 mm
— for pinion bearings (C^1)	2 to 3 mm per 1/10 mm 3 to 3.1 mm per 1/100 mm 3.1 to 3.9 mm per 1/10 mm
— for differential bearings (C^2 & C^3)	.1 - .2 - .5 - 1 - 1.2 - 1.4 - 1.6 - 1.8 - 2 mm
Tightening torques :	
— drive pinion locking nut	14 to 18 m.kg
— flange shafts attaching bolts	7 to 8 m.kg
— crown wheel attaching bolts	6 to 7 m.kg

Matching of the crown wheel and pinion.

In manufacture, the pinion and the crown wheel are lapped together on a special machine. They cannot be separated afterwards and are delivered as a matched set by the Spare Parts Department.
They carry a common indication marked with an electrical marking point, for instance : A 8.125.
For service, the two parts have to be replaced as a set.



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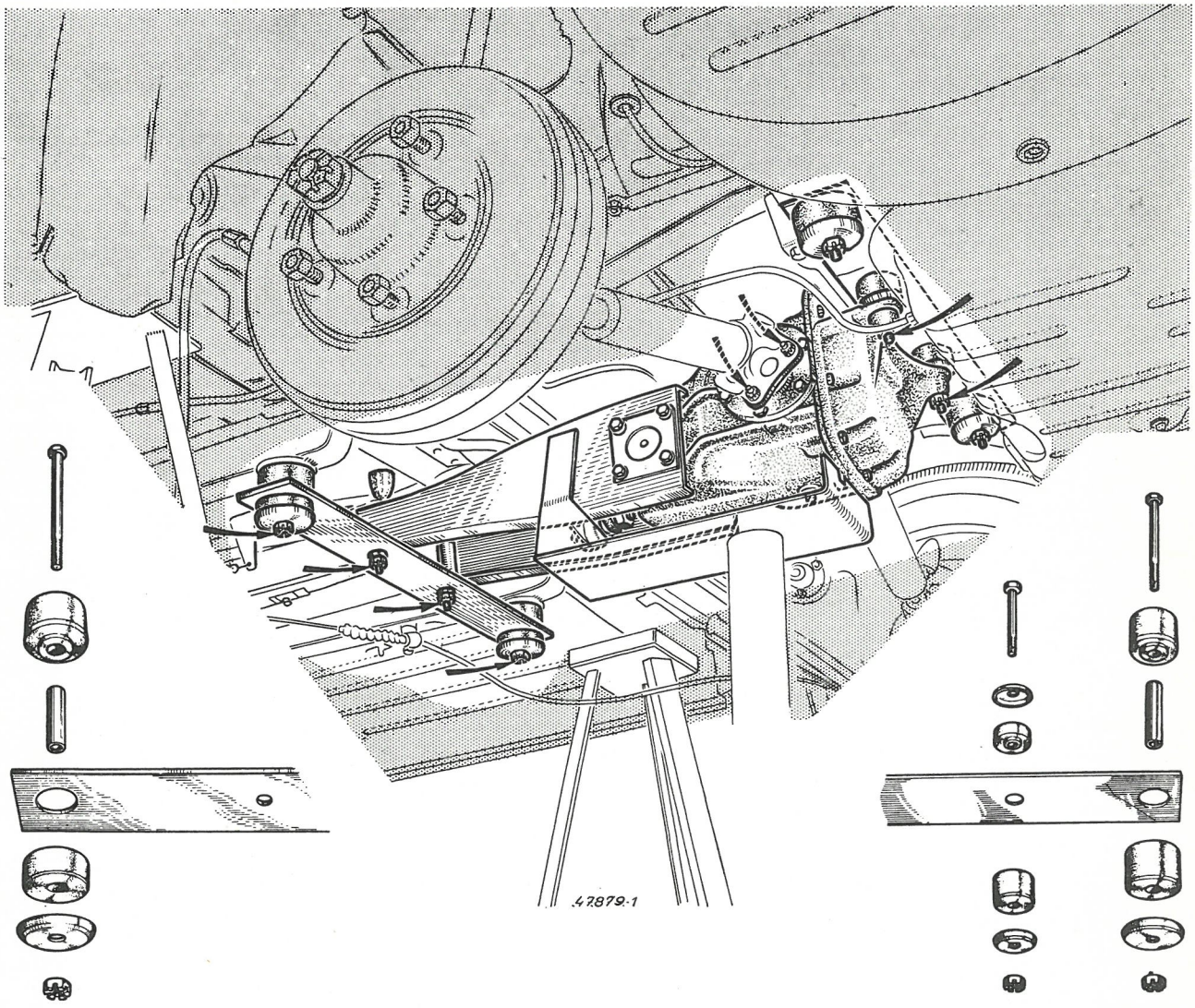
Cone distance.

The dimension for positioning the pinion with reference to the crown wheel (optimum cone distance) is marked electrically on the crown wheel, for instance D = 93.10. This dimension D is measured from the axis of the crown wheel to the rear face of the drive pinion.

NOTE. — The dimension E marked on the crown wheel is used in manufacture and is not to be used for service adjustments.

REMOVING AND REFITTING



REMOVING.

Raise the car.

From reduction gear, disconnect :

— the propeller shafts (separate the coupling plate from the drive shaft, the plate remaining on the reduction gear),

— the crosswise transmissions.

Fit the jack with the support (Ref. T. Ar. 12) under the reduction gear.

Remove the nuts on the bolts attaching the flanges to the front suspension leaf and remove the leaf.

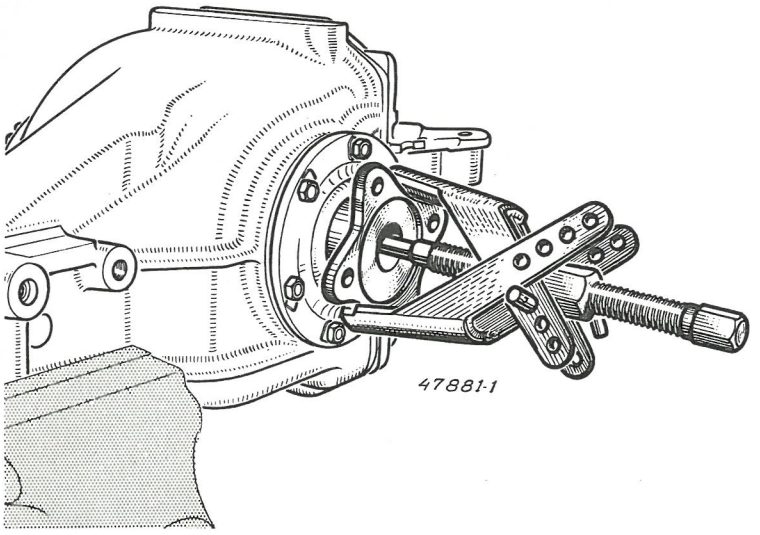
Remove the rear attaching nuts and remove the reduction gear.

REFITTING.

Perform the removing operations in reverse sequence, taking care to properly locate the pads and the attaching spacers.

Tighten the leaves attaching nuts on the floor until clamping action on the spacers and the rear attaching nuts of the reduction gear until flush with the cotter pin holes.

NOTE. — The front leaf attaching bolts come out in the car under the rear seat.



DISMANTLING

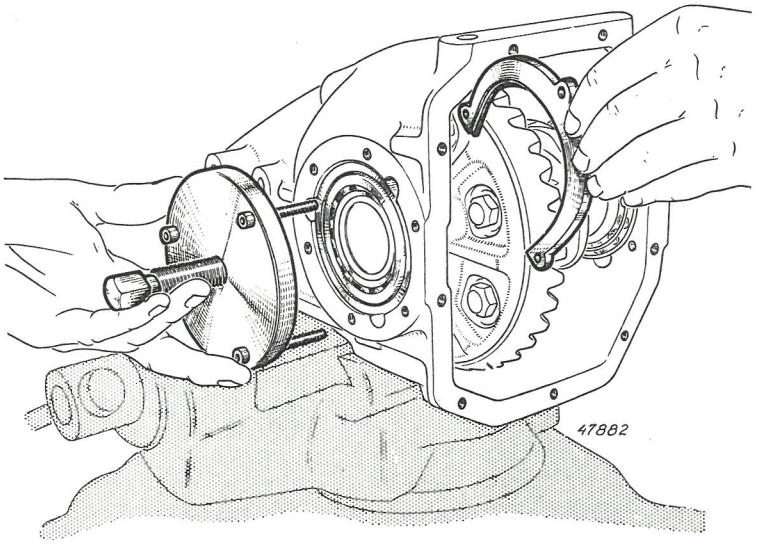
Drain the oil.

Remove the two front suspension flanges and the coupling plate.

Removing the " crown wheel - differential " assembly.

Remove the rear cover.

Remove the attaching bolts on the drive plate shafts and remove the plates using a puller (Ref. Mot. 49) and a rod of 10 mm diameter, 140 mm long, being used as a thrust for a puller screw.



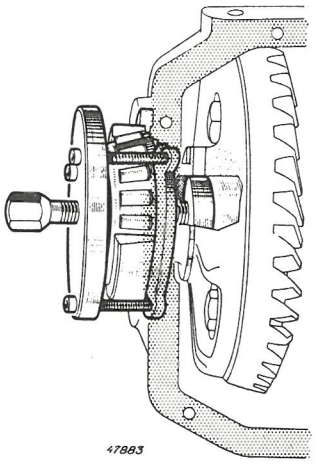
Remove the cover and the differential bearing shims at crown wheel side.

Pull out the differential bearing outer cup and the bearing at crown wheel side using a puller (Ref. T. Ar. 39), to this end :

— From the rear, insert the staple on the bearing (the deepest of the inner grooves to be located towards the bearing) and align the bolts attaching locations in front of the housing recesses,

— assemble the plate to the staple with 3 bolts,

— tighten the plate bolt until the bearing is removed.



Remove the cover and the differential bearing shims at the end opposite to the crown wheel.

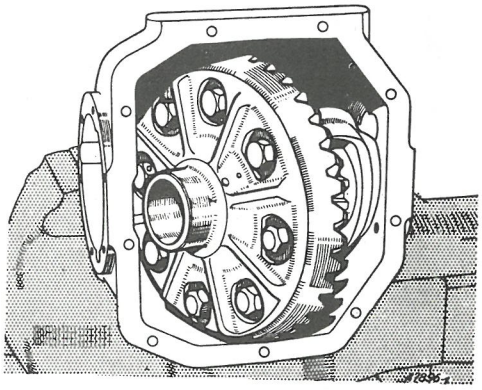
Remove the second bearing, following the same procedure as for the first one (during this pulling operation, the differential case rests on the housing).

DISMANTLING

(continued)

Remove the differential from the housing.

Dismantle the differential, to this end :
— separate crown wheel from differential,
— drive out the elastic pin attaching the thrust on the shaft,
— remove the shaft and the other parts of the differential.



Removing the drive pinion.

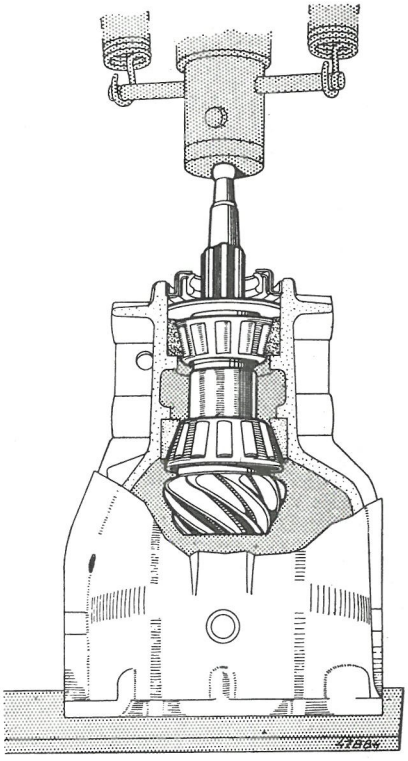
Clear the drive flange locking nut (raise the folded down portion with a small chisel) and run off (hold the flange with a broach).

Remove the flange.

Drive out the pinion towards the inside of the housing, using a press and remove pinion as well as bearing spacer and adjusting washers.

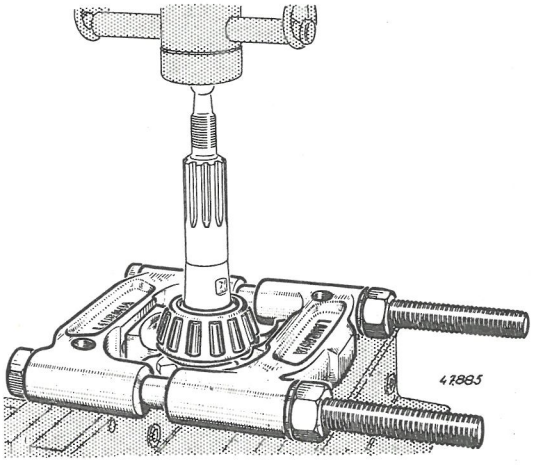
From the inside of the housing, drive out the other bearing : the latter is backed off and contacts the baffle, thereby loosening the seal.

If both bearings are to be replaced, remove the housing cups.

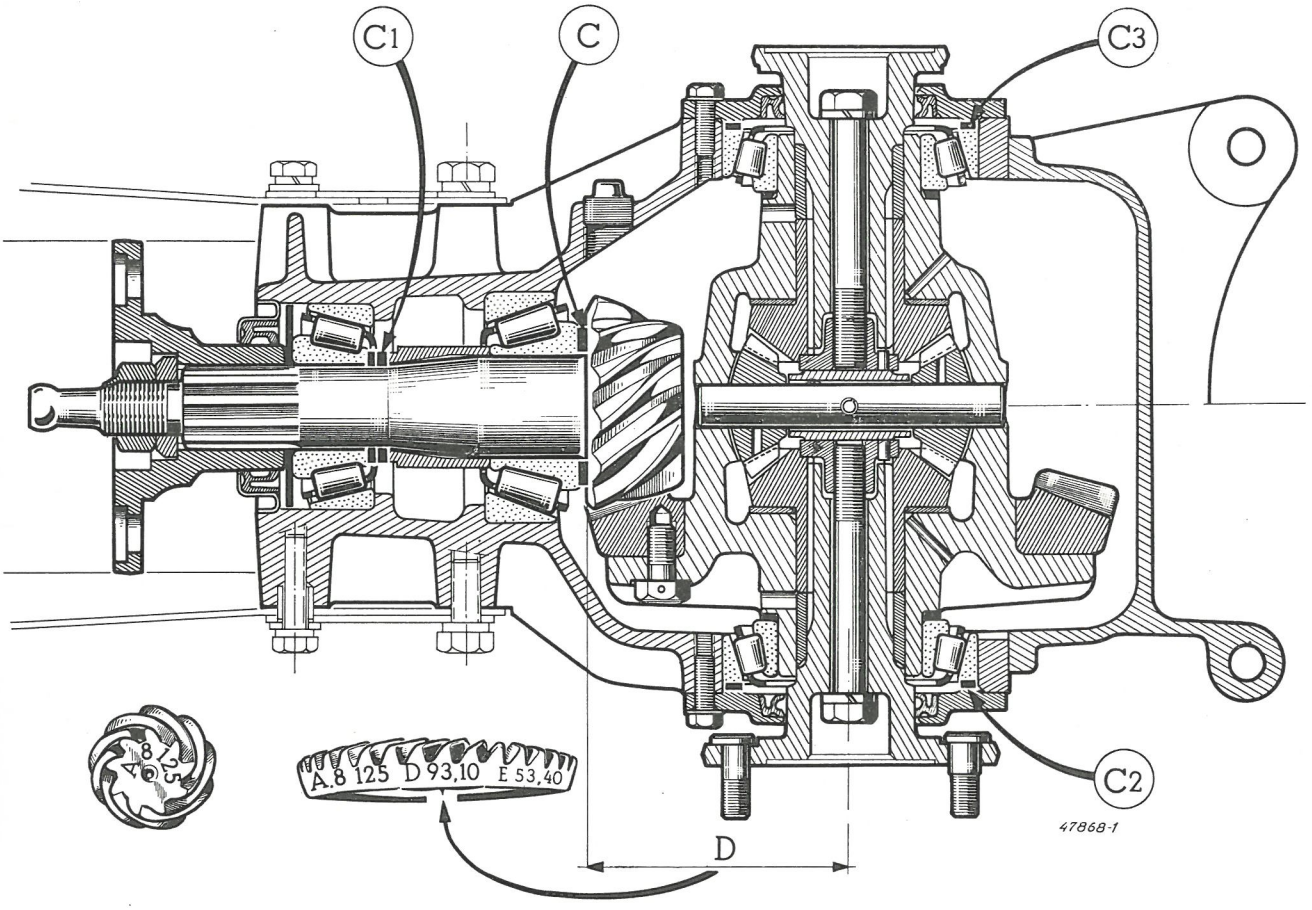


Pull out the drive pinion bearing with a bearing loosener (Ref. T. Ar. 23 A) with special jaws (Ref. T. Ar. 23 C) and the press.

If the seal has to be replaced, remove same from its cage.



REASSEMBLING



ADJUSTMENTS

DRIVE PINION.

The assembling of the drive pinion includes two adjusting operations :

— **positioning the pinion. Setting C** (page 129).

This C setting is dependent on the cone distance C marked on the crown wheel.

— **Adjusting the bearings. Setting C¹** (page 130).

DIFFERENTIAL.

The assembling of the differential includes three adjusting operations :

— **adjusting the backlash** ..... (Page 131)
— **adjusting the bearing clearance at crown wheel end. Setting C²** (Page 132)
— **adjusting the bearing clearance at end opposite to the crown wheel** ..... **Setting C³** (Page 132)

These latter two adjustments are also intended to maintain the correct backlash.

REASSEMBLING

(continued)

ASSEMBLING THE DRIVE PINION

Positioning the pinion : Setting C.

The pinion is positioned by fitting a shim setting C between the rear face of the pinion and the rear bearing.

This setting C is determined with a device (Ref. T. Ar. 40) including a mandrel A fitted instead of the pinion and a shaft B corresponding to the axis of the crown wheel and resting in the differential bearings bores.

Assemble the cups of the two pinion bearings in the housing.

Fit the bearing at pinion side on the mandrel A and, next, the assembly into the housing.

Fit the other bearing, the mandrel washer and tighten by hand the knurled screw until the bearings rotate without play (rotate the mandrel in order to position the bearings).

Fit the shaft B in the housing, with the ends resting in the bearings bores.

- **With a set of feeler gauges, measure the dimension x between the front face of the mandrel and the shaft.**
- **Add this dimension x to the dimension 94.5 marked on the mandrel A.**
- **From the value thus obtained, substract the dimension D marked on the crown wheel.**
- **The result will indicate the setting C for use with the pinion.**

NOTE. — The dimension 94.5 mm represents the height of the mandrel A (84.5 mm) plus the radius of the shaft B (10 mm).

For instance :

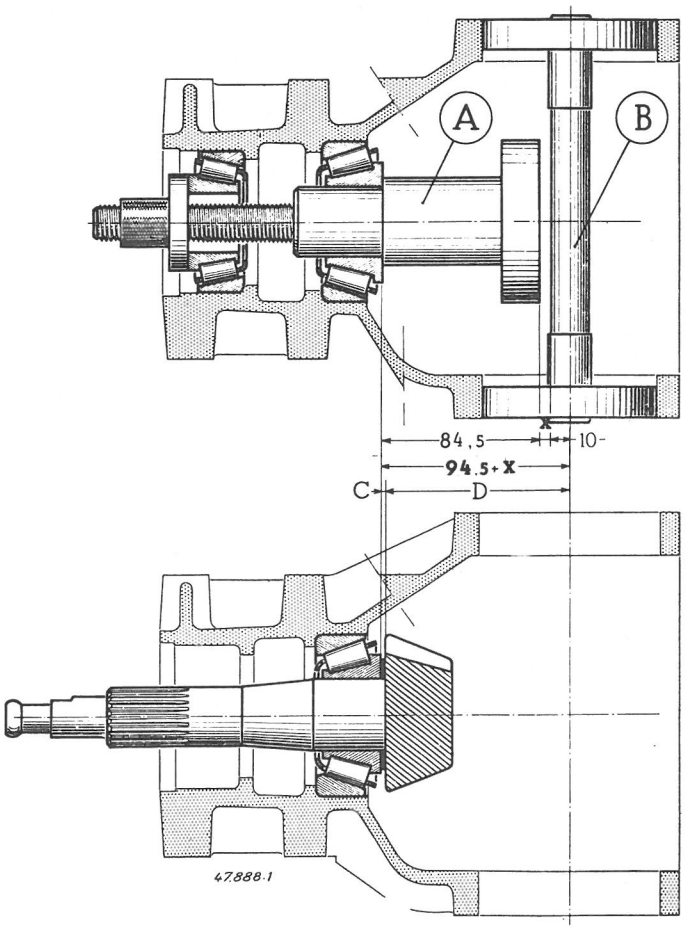
- **dimension marked on the crown wheel : D = 93.10,**
- **dimension x recorded with the gauges : x = .45.**
  C = (94.5 + .45) — 93.10 = 1.85 mm.

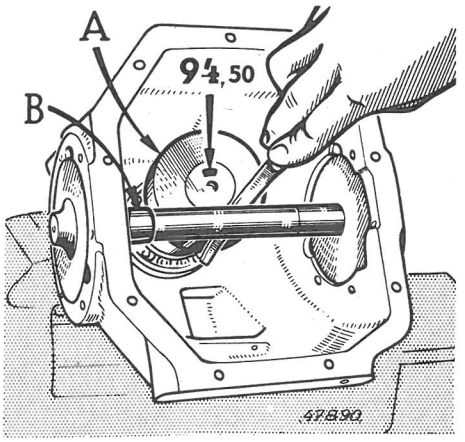
With the shims of .1 - .2 - .5 - 1 - 1.2 - 1.4 - 1.6 - 1.8 - 2 mm to perform the setting, the following shims will be used :

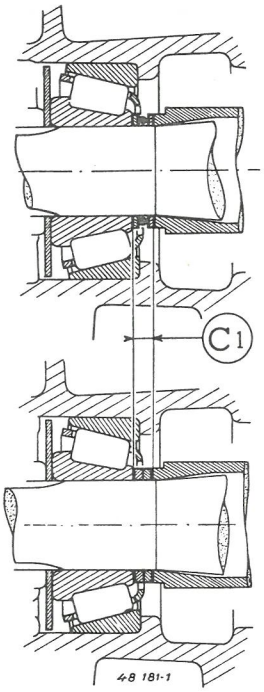
— a shim of 1.8 mm,
— a shim of .1 mm.

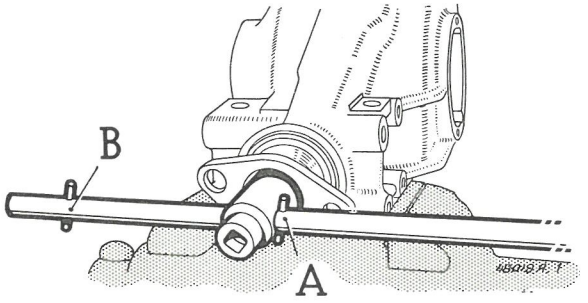
Remove the tools from the housing.

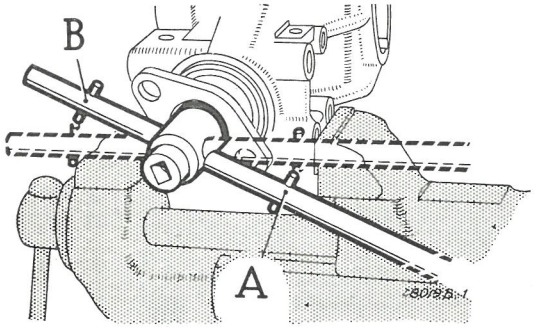
Install the shims C as determined (for instance 1.8 and .1 mm) on the drive pinion and assemble the bearing using a tube of inside diameter 36 mm, 170 mm long and a press.











REASSEMBLING (continued)

ASSEMBLING THE DRIVE PINION (continued)

Adjusting the bearings : Setting C_1.

The adjustment of the bearings is obtained by fitting a setting C_1 between the spacer and the front bearing. To determine the thickness of the shim stack C_1, make a preliminary assembly with a lead wire of 3 mm diameter.

On the pinion, fit, to rest on the rear bearing, the spacer, a 2 mm shim, the wire wound around the pinion stem and a second shim of 2 mm. Fit the pinion in the housing and assemble on the latter the second bearing, the oil baffle, the drive flange, the washer and the nut.

Tighten the nut until the pinion rotates without play. Remove the pinion.

Measure the thickness of the wire, for instance : 2.4 mm.

The setting C_1 will equal the thickness of the wire and of the two 2 mm washers used for the preliminary assembly i.e. :

$C_1 = 2.4 + 2 + 2 = 6.4$ mm for instance.

Use :

— an adjustable washer to 1/10 mm, for instance : 3.3 mm,

— an adjustable washer to 1/100 mm, for instance : 3.1 mm.

NOTE. — This setting is only approximate and it will be completed after checking the bearings tightening.

Assemble the pinion (lightly coated with oil) and equipped with a spacer and the two washers (of 3.3 and 3.1 mm as in the above example) in the housing. Fit the second bearing (lightly coated with oil), the oil baffle, the drive flange whereon will be placed the seal fitted in its cage, the washer and the nut.

NOTE. — Do not insert into the housing the seal cage in order to avoid the friction of the pinion when checking the bearings tightening.

Tighten the nut to 14 m.kg : bush (Ref. T. Ar. 41) and spanner (Ref. Mot. 50).

Check the bearings tightening using the tool (Ref. T. Ar. 41); to this end fit the bar horizontally.

The bearings tightening is correct when :

a) the weight of the bar does not rotate the pinion when the mark A is against the bush,

b) the weight of the bar rotates the pinion when the mark A is moved away from the bush.

If, during the " a " test, the pinion rotates, the tightening is not satisfactory :

— tighten the nut to 18 m.kg.

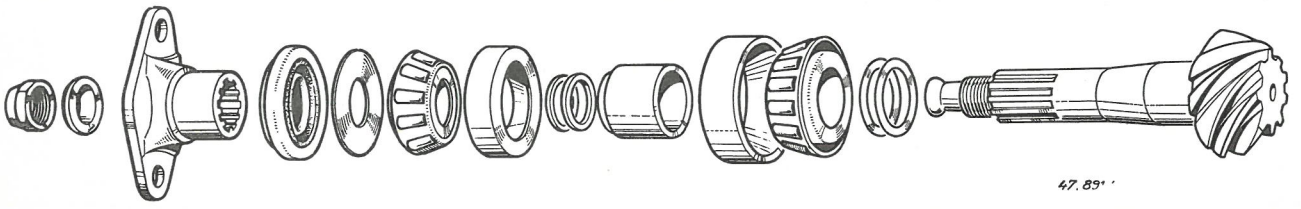
If, after retightening, the pinion still rotates, the setting is too important :

— reduce the latter by increments of a hundredth of a millimetre (use for instance 3.3 and 3.07 = 6.37). Again check.

If, during the " b " test, the pinion does not rotate, the setting is not sufficient :

— increase this setting by increments of a hundredth of a millimetre (for instance use 3.4 and 3.02 = 6.42). Again check.

NOTE. — By using a shim adjustable to 1/10 (from 2 to 3 mm and from 3.1 to 3.9 mm) and an adjustable shim to 1/100 (from 3 to 3.1 mm) any setting to 1/100 mm may be performed.



REASSEMBLING

(continued)

ASSEMBLING THE DIFFERENTIAL

On each differential wheel, fit a friction washer of smaller thickness (there are two washers) with the lubricating groove towards pinion, and assemble the whole in the case.

Position the two differential pinions and their bearing shells on the differential wheels.

Fit the tab nuts on the differential wheels (the tab engages one of the grooves), insert the core and the shaft.

Make sure that the assembly of the pinions and wheels rotates with a light tightness.

If some play exists, disassemble to replace the friction washer (washers) on the differential wheels for heavier ones.

Lock the shaft (new pin) and assemble the crown wheel on the case with the correct tightening torque : 6 to 7 m.kg.

Setting the backlash.

On the differential case, at crown wheel side, assemble the bearing thrust washer (inner chamfer towards case) and the bearing; fit the assembly into the housing.

Assemble the second bearing with its thrust washer.

At end opposite to crown wheel, fit on the housing the bearing outer cup and push in on press until it is recessed by approximately 5 mm with reference to the joint surface.

At crown wheel end, assemble the bearing cup and push in until it protrudes by approximately 5 mm with reference to the joint surface. Fit a bearing cover (without shim) and attach with 3 bolts.

Mount a dial indicator (Ref. Mot. 75) on the housing with the feeling point at right angles with a tooth. Progressively tighten the 3 cover bolts to push in the cage : the cage will back off the differential case and the opposite bearing.

NOTE. — To facilitate the backing off of the cage at end opposite to crown wheel, hit with a mallet during the tightening operation.

As the cup at crown wheel end is pushed in, the backlash diminishes.

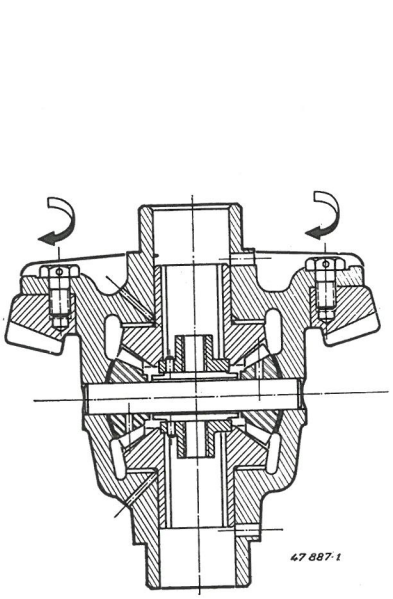
Tighten the cover until it contacts the housing : the correct clearance is not obtained, then.

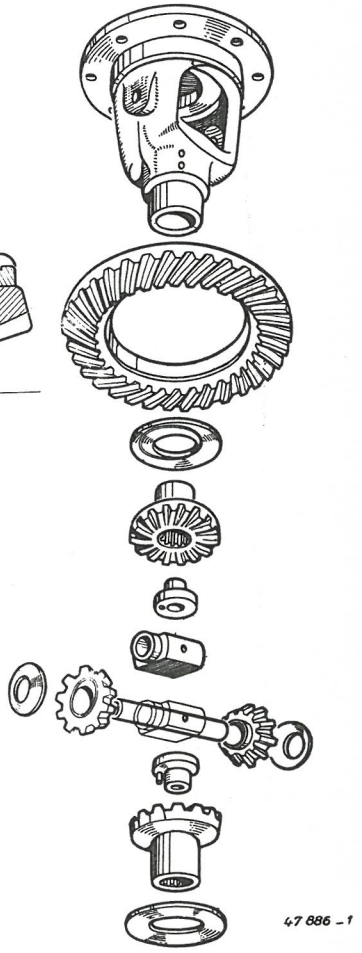
Remove the cover and reassemble with 2 washers of 1 mm between cup and cover.

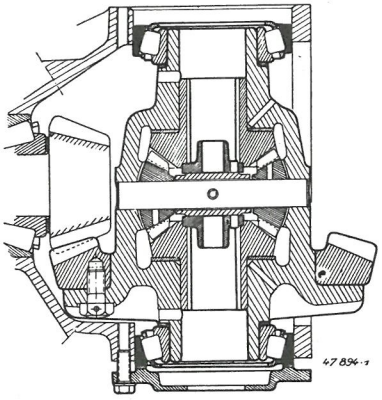
Tighten the bolts until the backlash in included between .15 and .20 mm.

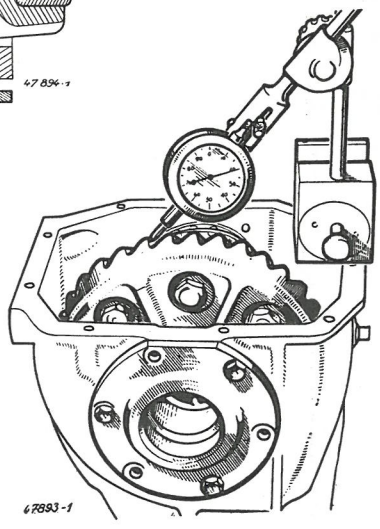
Remove the cover and the shims.

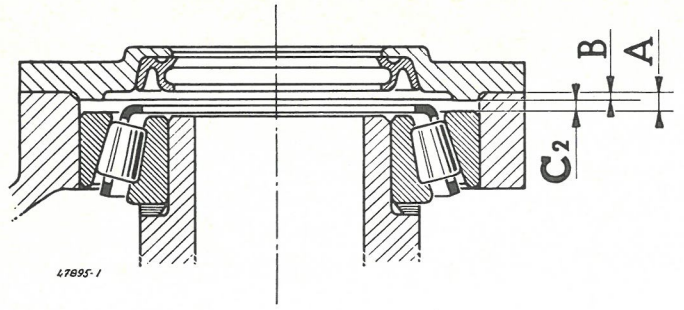
NOTE. — This cover should not be reused upon reassembly.

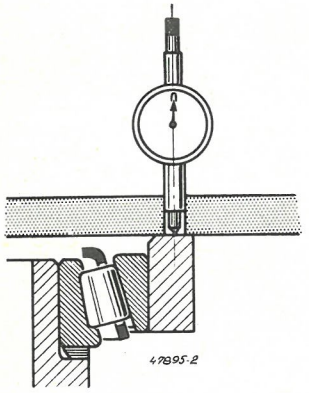


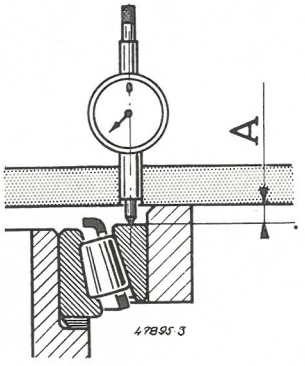


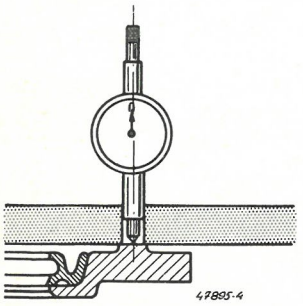


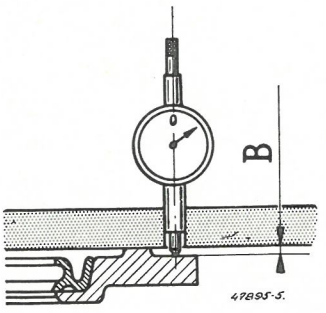












REASSEMBLING

(continued)

ASSEMBLING THE DIFFERENTIAL

(continued)

Setting the bearings clearance : Settings C_2 and C_3.

The setting of the bearings clearance is obtained by installing two shim stacks C_2 and C_3 between the bearings outer cups and the covers, in order to maintain the bearings in the position where they are after setting the backlash.

The dimension A being the height between the housing joint surface and the top of the bearing cup and the **dimension B** being the height of the cover boss $C_2 = A - B$.

Constitute the shim stack, using as few shims as possible.

Determining the dimension A.

Mount a dial indicator on the support (Ref. Mot 76) and set dial to zero by fitting the support and dial indicator feeler point on the housing joint surface. Move the support to bring the point on the cup. Record the dimension A from the dial indicator.

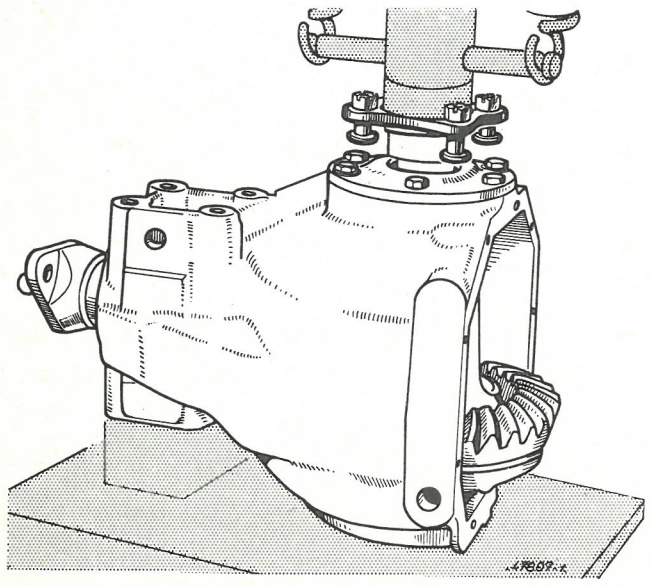
Determining the dimension B.

Perform the same operation on the cover to measure the height of the cover boss, after fitting a new gasket on the cover.

Record dimension B from the dial indicator.

Perform the same operations to determine the setting C_3 of the other bearing.

Install the respective shim stack on each bearing case and mount the covers with the gaskets being coated with sealing compound.



On a press, push in the flange shafts equipped with the four bolts for assembly to the transmissions.

Tighten the flange shafts attaching bolts to 7 to 8 m.kg.

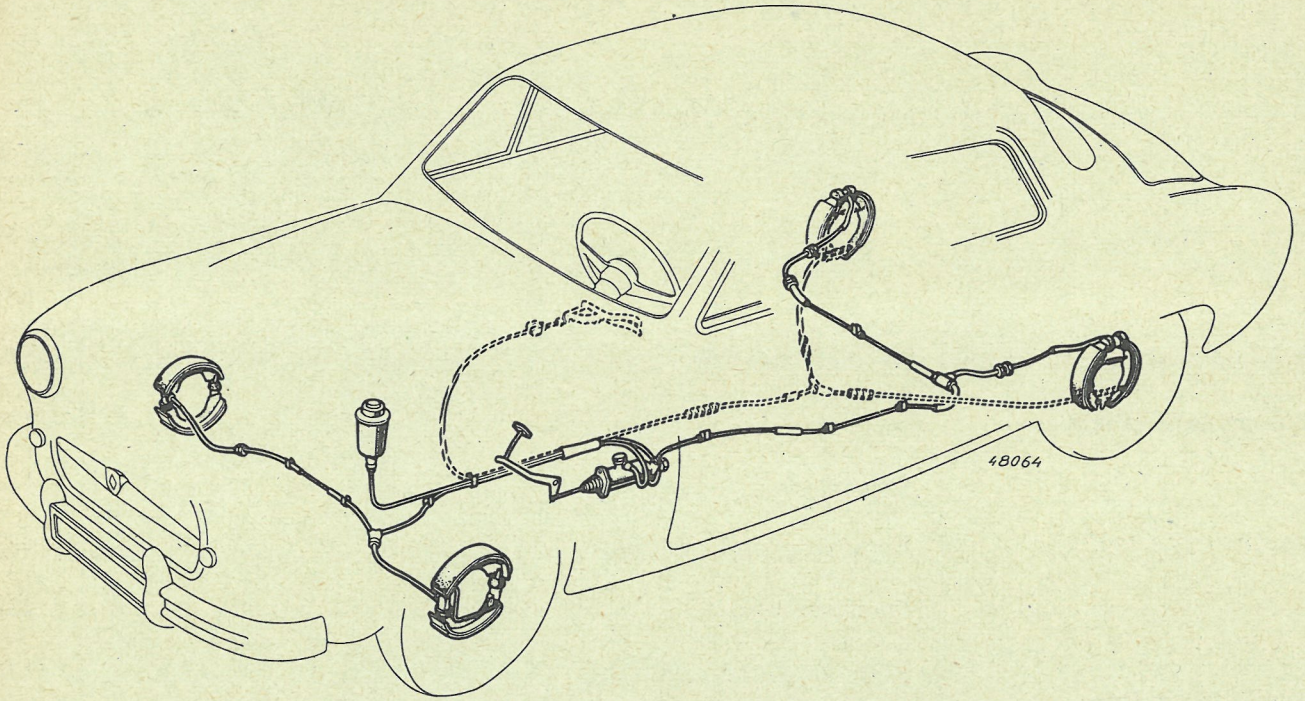
Mount the rear cover with a new gasket coated with sealing compound.

Assemble the coupling flange to the dial flange.

Fit the shearing bushes on the housing and attach the suspension flanges (the most tilted part is placed on top).

Fill with oil (1.5 litre) EP 80 grade.

11. BRAKING SYSTEM



SPECIFICATIONS

11 inches type brakes of the floating shoes and hydraulic control type. Self energizing brakes in front.
Mechanical type hand (or parking) brake on rear wheels.

The hydraulic control includes :

— a reservoir loaded with reference to the master cylinder,
— a master cylinder controlled from a pedal,
— rigid and flexible lines,
— 2 brake cylinders per front wheel and 1 brake cylinder per rear wheel.

The braking action itself is achieved by friction between :

— a drum mounted integral with the wheel and 2 lined shoes assembled to the carrier plate.

BRAKE LININGS.

In front : the 2 linings are identical and both of the primary (compressed) type :

— length	280 mm
— width	65 mm
— thickness	5 mm
— relief chamfer	13 mm

At the rear :

— length : primary lining (C)	280 mm
— secondary lining (T)	248 mm
— width	50 mm

Same thickness and relief chamfer as for front linings :

PEDAL FREE PLAY : as measured at pedal pad	20 mm
TYPE OF FLUID (do not mix with Lockheed n° 5 fluid)	Lockheed HD 1
Operation pressure of stop switch	8 to 10 kg/cm²

TIGHTENING TORQUES :

— Taper unions	2 m.kg
Inspection before reassembling : thickness of copper collar not to be below	.7 or .8 mm
— Flexible lines :	
1st tightening stage	5 m.kg
2nd tightening stage	6 m.kg
— Flat unions with union screw (master-cylinder)	4 m.kg
— Stop switch	2 m.kg

GENERAL RECOMMENDATIONS FOR THE REPAIRS

Use LOCKHEED H D 1 fluid exclusively.

" HYDRAULIC CONTROL " SECTION.

The fluid **should be free from impurities and from air,** therefore :

— brush the parts **dry** before any disconnection,
— **obturate** the disconnected pipings with a plug,
— clean the parts with **alcohol only,**
— **bleed the pipings** after reconnecting.

" MECHANICAL " SECTION.

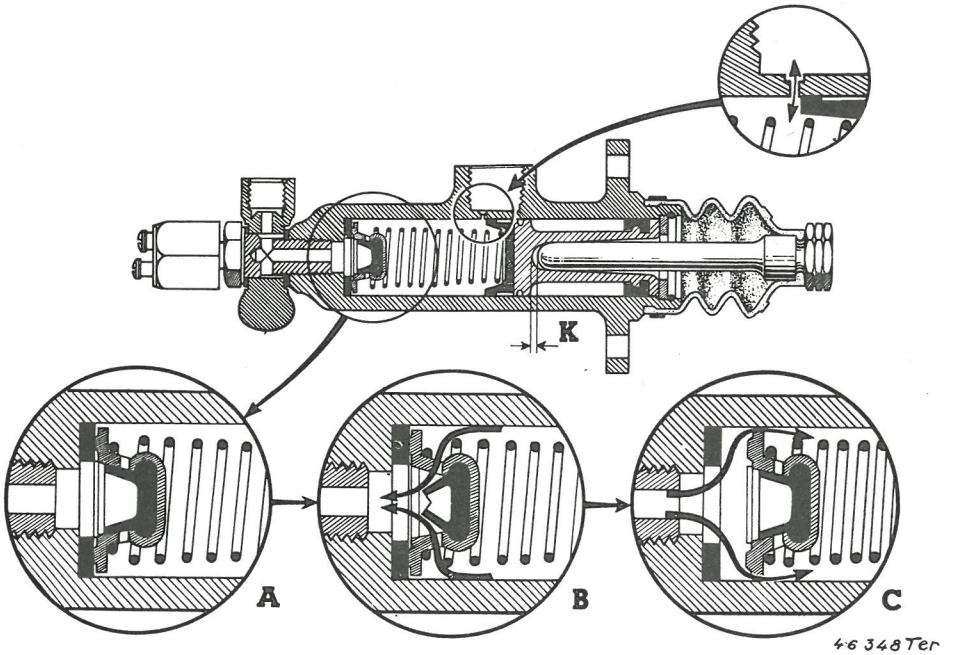
The linings should not be soiled with **any grease or fluid lubricants** (do not touch with dirty hands).
The new linings should be of same **quality, correct size** and have **identical relief chamfers.**
The **drums** should have a **smooth, clean and dry** surface condition.

The replacing of the linings or the grinding of the drums should mandatorily be performed per set.

OPERATIONAL TROUBLES

TROUBLES	CAUSES	CORRECTION
Spongy pedal. Poor braking	Air in pipings	Bleed the brakes.
Excessive pedal stroke. When pedal is operated several times this stroke is reduced.	Excessive clearance between lining and drum. Flexible lines are inflated	Adjust the brakes. Replace.
Fast drop of level in reservoir	Leaks at master-cylinder or at pipings	Overhaul or replace.
Brakes seize, overheat and do not resume initial position.	The expansion hole is not clear : the pedal free play is inexistant or insufficient (see page 136, top figure). Poorly adjusted brakes Poorly adjusted hand brake Brake shoe retracting springs are weak Flexible lines are damaged at the inside	Adjust. Adjust. Adjust. Replace. Replace.
Unbalanced brakes	Linings are greasy or of different qualities Drums are out-of-round Brake plates are warped The front piston does not actuate the shoe at the centre and operates not in alignment. Wheel cylinder in poor condition Reduced section of pipings	Replace. Overhaul. Overhaul. Correct position or replace flange. Replace. Replace.
Wheels lock at start of braking	Linings are not properly cut away	Cut away.

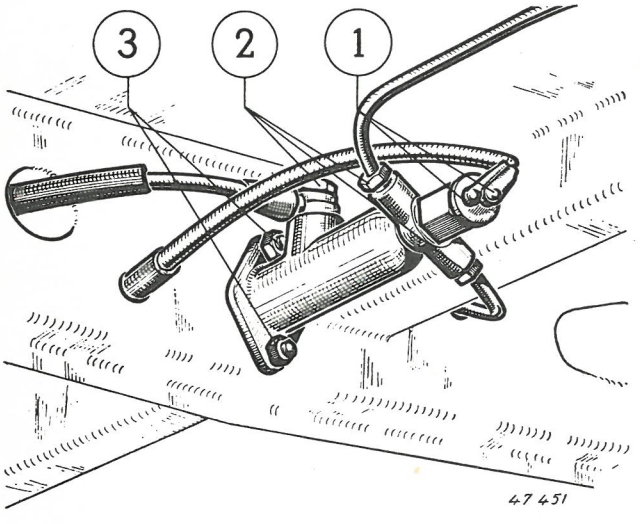
MASTER-CYLINDER



A. — Released position : The hole for communication with the reservoir is cleared.
A **clearance K** exists between piston and pushrod. The valve is closed by the spring.

B. — Braking position : The main cup moves, obturates the inlet hole and slightly forces the fluid back by opening the valve.

C. — Brake release position : The brake shoe retracting springs force the fluid from the wheel cylinders to the master-cylinder. The fluid compresses the spring and lifts the valve.



REMOVING.

Disconnect :

— the battery,
— the stop switch two wires (1),
— the fluid inlet and outlet pipings (2), after obturating the Lockheed fluid outlet at the reservoir.

Remove the pedals protecting cover.
Remove the nuts (3) and remove the master-cylinder.

REFITTING.

Perform the operations in reverse sequence of the removing operations.

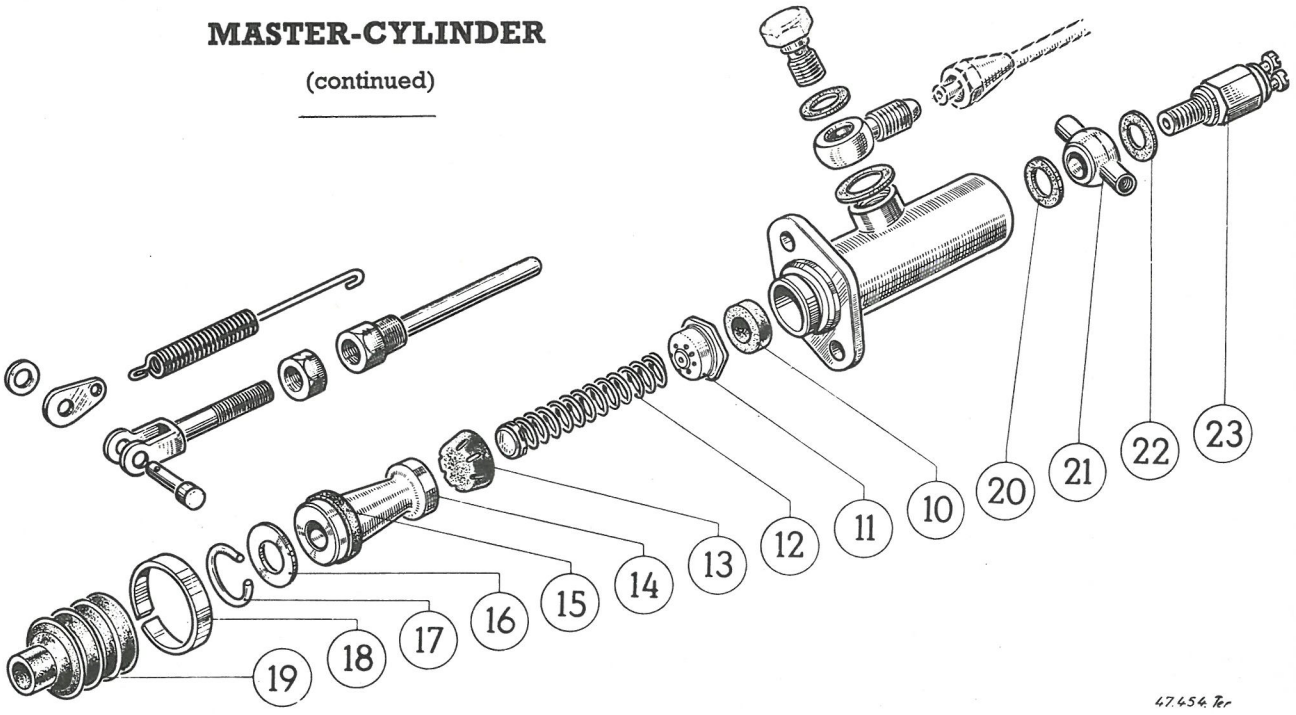
Follow the tightening torques.

— Taper unions	2 m.kg
— Flat unions	4 m.kg
— Stop	2 m.kg

Bleed the brakes and check the pedal free play.

MASTER-CYLINDER

(continued)



OVERHAULING.

Dismantle the parts of the master-cylinder.
The cylinder bore should be perfectly smooth, and should not show any marks or traces of out-of-round (scratches, wear or flats). **Do not rework cylinder but replace.**

The **rubber parts** should be **genuine** and show **no traces of moulding marks.**

Upon reassembling, successively assemble the parts in the sequence as illustrated.

Assemble :
— the main cup **(13)** with flat bottom towards piston,
— the auxiliary cup **(15)** on the piston before inserting same in the cylinder.
Coat the sliding parts with the special fluid.

Make sure the parts slide freely.

WHEEL CYLINDERS

REMOVING — REFITTING.

At the front :

— remove the brake shoes and the two wheel cylinders connection tube,
— loosen the Lockheed flexible union at the front cylinder if necessary,
— remove the cylinder by removing the cylinder attaching screw to the flange (for the front cylinder, run off same from the flexible union).

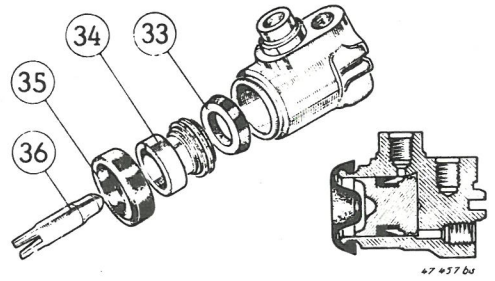
At the rear :

— disconnect the hand brake cable and remove the brake shoes,
— disconnect the Lockheed fluid inlet piping,
— remove the cylinder by removing the two cylinder to flange attaching screws.
For refitting, follow removing operations in reverse sequence.

Use correct tightening torques :

— taper unions	2 m.kg
— flexible lines :	
1st tightening stage	5 m.kg
2nd tightening stage	6 m.kg
— Flat unions	4 m.kg

Adjust and bleed the brakes.



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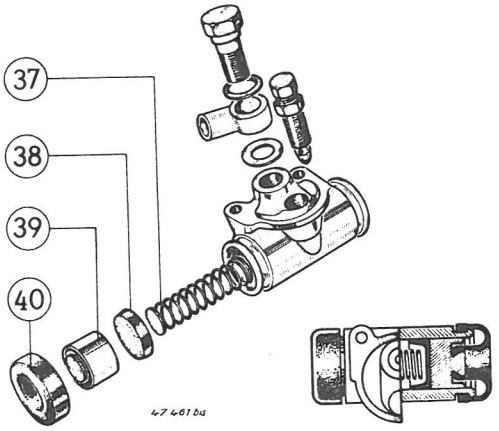

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WHEEL CYLINDERS

(continued)

OVERHAULING.

Front cylinders.

Dismantle the parts in reverse sequence from the numbers shown on the illustration.
When reassembling, assemble the cup **(33)** on piston **(34)** before inserting piston in the cylinder.

Rear cylinders.

Disassemble the parts in reverse sequence from the numbers shown on illustration.
After reassembling, hold the parts in place, using a brake wheel cylinder clip (Ref. Fre. 05 A).
In both cases, make sure that the cylinder bore is perfectly smooth and does not show any out-of-round condition, or any scratches, wear or flats. **Do not rework but replace.**

The rubber parts should be genuine and should not have any moulding marks.

Before reassembly, coat all parts with the Lockheed fluid.
Make sure, before refitting, that the parts slide freely.

FLEXIBLE LINES

During the removing and refitting operations, do not distort the flexible lines. First, disconnect the rigid lines from the two or three way unions and, next, run off these unions from the flexible lines; finally, run off the latter at the other ends.

Clear the flexible lines from any panels or sharp edges which may cut the lines during driving.

Do not refit such copper rigid lines where the taper union copper collar thickness is below .7 to .8 mm.

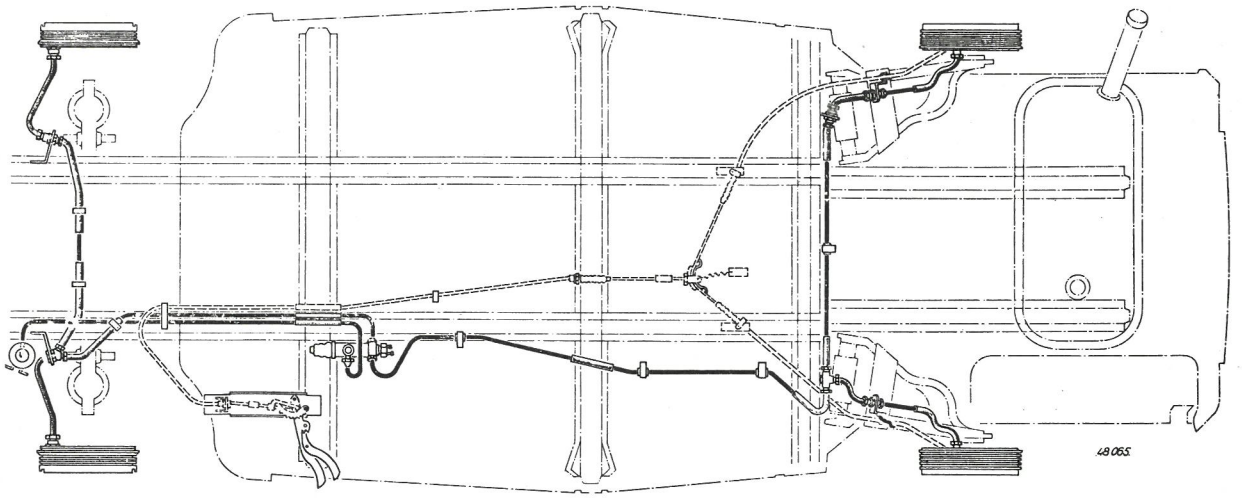
Use the correct tightening torques :

— Taper unions ..... 2 m.kg

— Flexible lines :
1st tightening stage ..... 5 m.kg
2nd tightening stage ..... 6 m.kg

— Flat unions ..... 4 m.kg

After any operation on the pipings, bleed the circuit.



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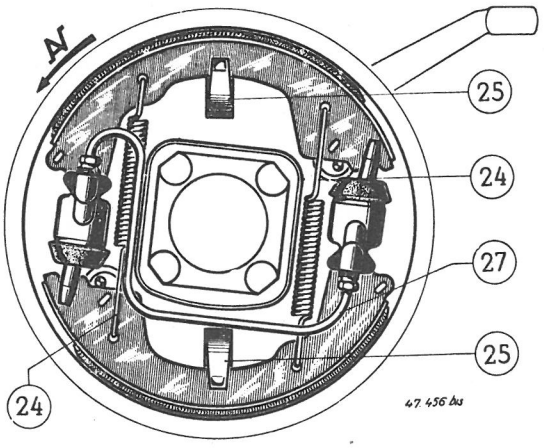
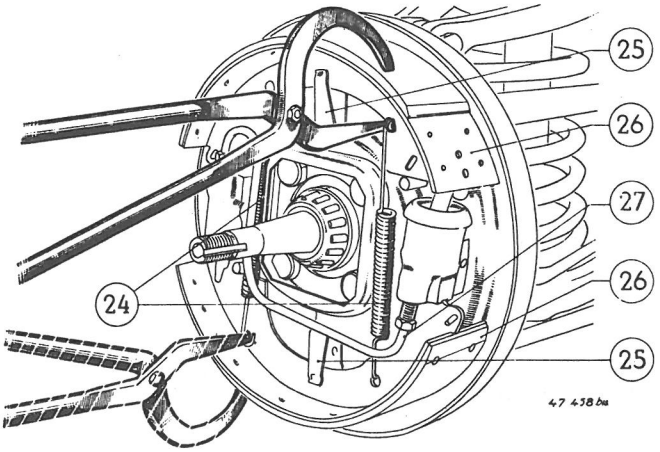
BRAKE SHOES
FRONT AND REAR





REMOVING.

Remove the wheel and the drum hub (see pages 144 and 146).
At the rear, fit the **clip** (Ref. **Fre. 05 A**) on the wheel cylinder and disconnect the hand brake cable.

Using the **clip** (Ref. **Fre. 03**) remove the retracting springs (**24**) at front and the upper retracting spring (**28**) at rear.

Remove retainers (**25**) and (**29**) and pull apart the shoes [at the rear, secure the hand brake link (**32**)].

Remove the shoes by clearing same from the lower retracting spring for the rear.

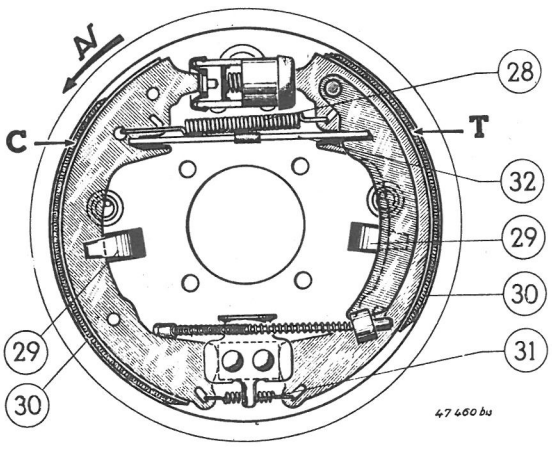
REFITTING.

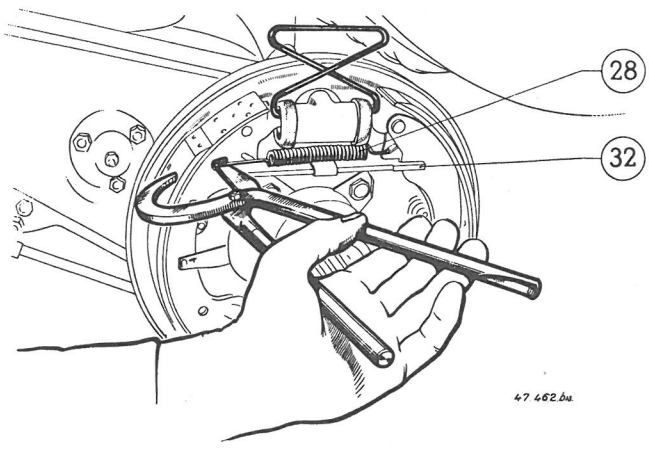
NOTE. — **The relining of the shoes or the reworking of the linings are not recommended. Use the " standard exchange plan ".**

Follow the reverse sequence of operations as for removing.

The front brake shoes are identical as both are of the primary type
At the rear, the primary (**C**) brake shoe, with the **longest lining,** is fitted in **front** and the secondary shoe (**T**) at the **rear.**

Do not omit covering the clips, **at the outside,** with a sealing compound. After refitting, **adjust the brakes.**





BRAKE ASSEMBLIES (Plates, shoes, cylinders)

REMOVING.

Remove the wheels and the drums.
Remove the flexible line at the front, disconnect the rigid line at the rear.
Disconnect the hand brake cable at the rear.
Clear and remove the four attaching nuts for each assembly.
Remove the whole.

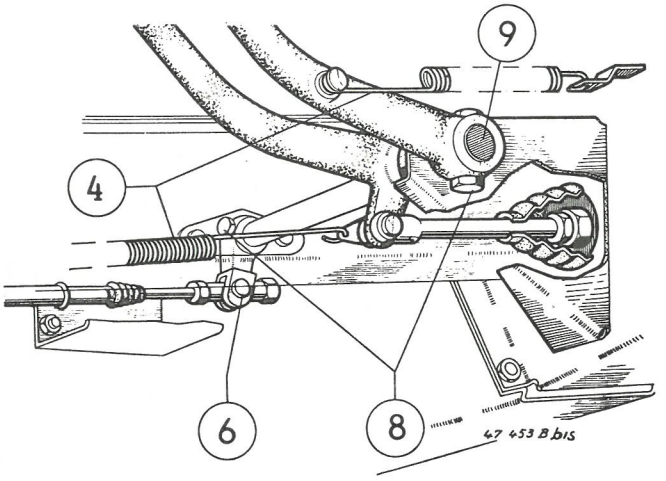
REFITTING.

Follow reverse sequence of operations.
Adjust and bleed the brakes.

BRAKE LININGS ADJUSTING CAM

REPLACING.

Remove the brake shoes.
With a chisel, remove the mounting collar of the cam at side opposite to the square.
Drive out the cam applying pressure behind the flange with a tube.
Fit the repair cam without tightening the nut.
Reassemble the brake shoes and the drum.
Adjust the brake linings. Hold the square to tighten nut.



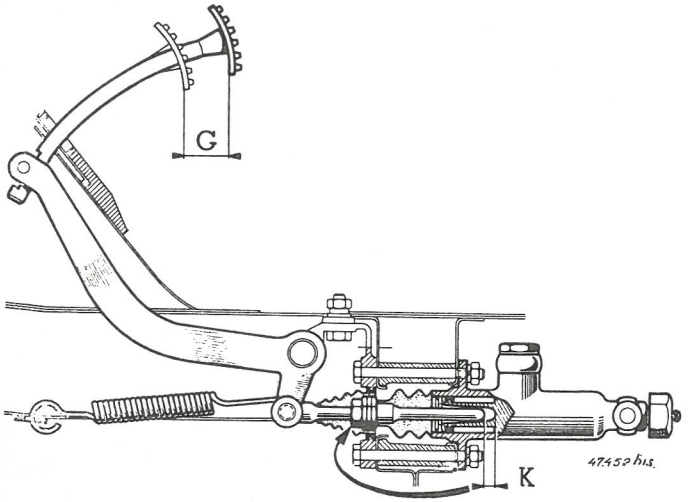
BRAKE PEDAL

REMOVING.

Remove the pedal protecting cover.
Clear the springs (4).
Remove the brake pedal rod.
Disconnect the clutch disengagement control rod (6).
Remove the clutch disengagement control stop bolts (8).
Remove the brake pedal snap ring.
Remove the brake linkage (9).

REFITTING.

Follow reverse sequence of operations and, next, adjust the pedal free play.



ADJUSTING PEDAL FREE PLAY

This adjustment is obtained by operating the master-cylinder push rod.

Loosen the check nut and rotate the rod.

Normal clearance K is obtained for a movement G = 20 mm of the brake pedal.

ADJUSTING THE BRAKES

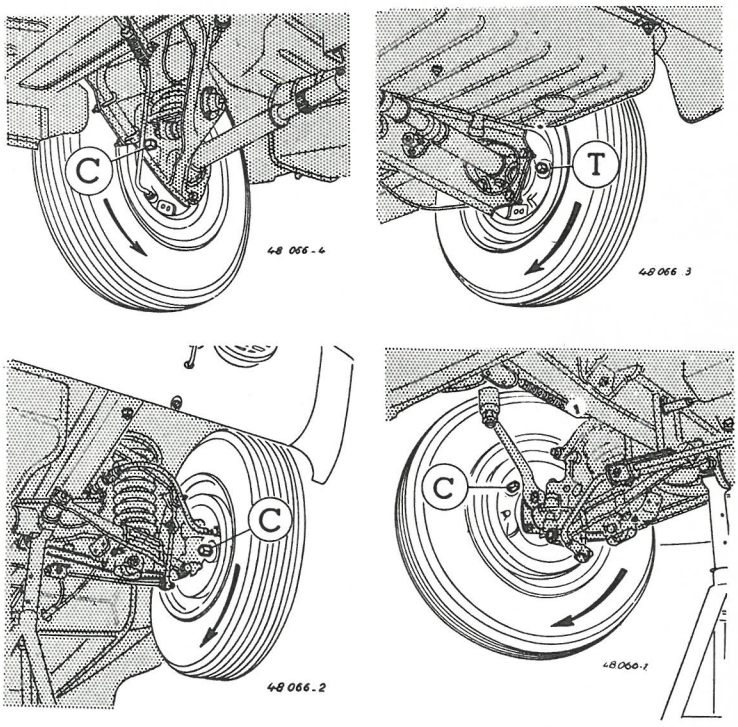
This adjustment should be performed for each brake shoe (therefore two times per wheel). It consists **in moving each brake shoe closer to the drum** in order to compensate for the linings wear by **operating the adjusting squares** as follows :

Rear wheel :

Rotate the wheel in the " **forward driving** " direction.
Tighten the square (**C**) of the **primary** front shoe until the wheel is **just locked** and next **back off** until the wheel rotates **freely.**
Turn the wheel in the " **reverse driving** " direction and follow the **same procedure for the square (T)** of the rear **secondary** shoe.

Front wheel :

Follow the **same procedure** on both **squares** (**C**) by turning the wheel in the " **forward driving** " direction in both cases, as the **two linings** are of the **primary type.**



BLEEDING
THE HYDRAULIC CIRCUIT

This operation is performed at the wheel cylinder of each rear wheel and at the rear wheel cylinder of each front wheel.

Before bleeding, check the **pedal free play** and the fluid **level** in the reservoir.

First bleed the wheel cylinder as remote as possible from the master cylinder and end by the closest located one.

For each cylinder :

Brush dry the bleed screw, remove the cap and install the spanner and the bleed pipe.

Dip the free end of the pipe in some Lockheed fluid in a transparent container.

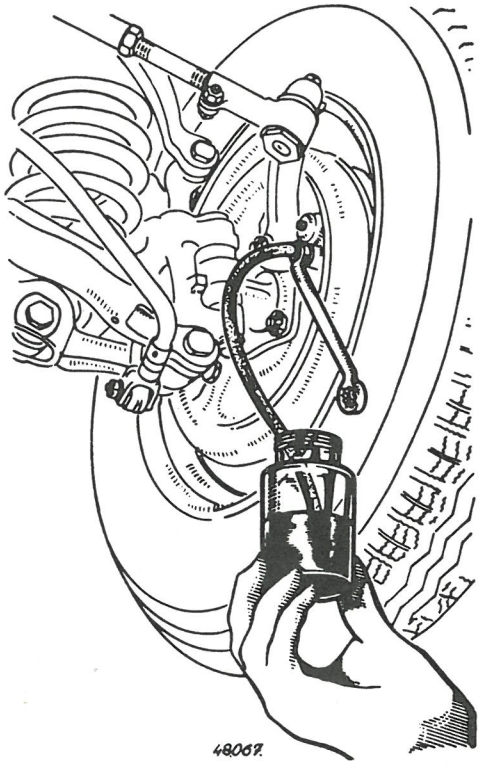
Loosen the bleed screw by 1/4 of a turn.

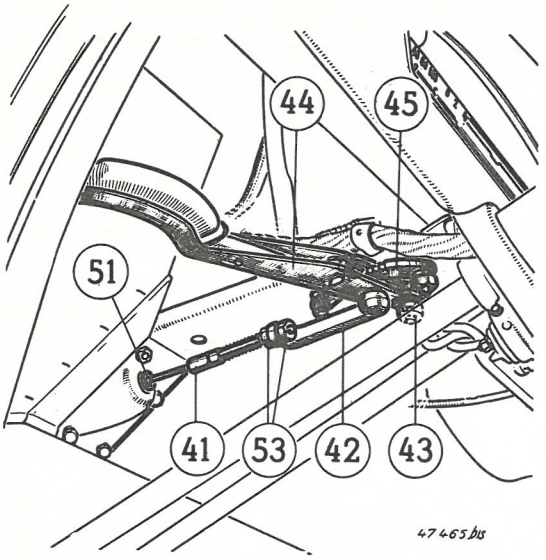
Have another operator operate the pedal **slowly and in order that it bottoms until air bubbles disappear completely. Tighten the bleed screw when the pedal is at end of stroke.**

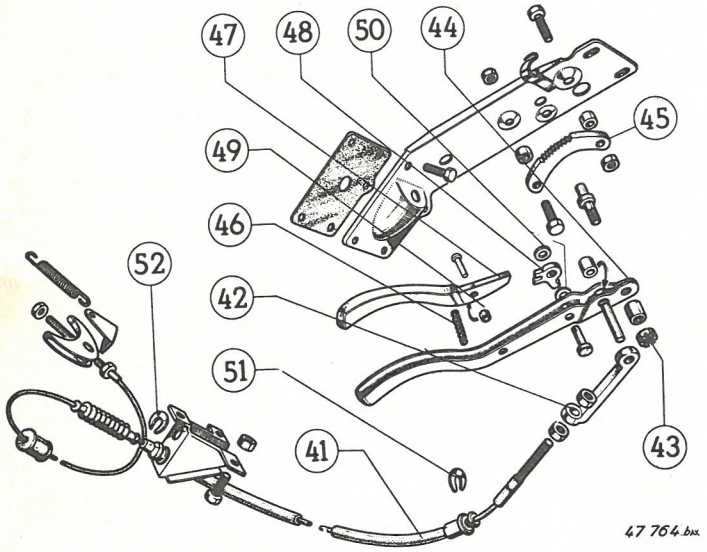
Remove the pipe and the spanner. Refit the cap.

After bleeding each cylinder, top up the reservoir fluid level with clean fluid.

NOTE. — The removed fluid should be used only after filtering. A contaminated fluid after handling may not be used until after having been allowed to settle for 15 minutes.







HAND BRAKE LEVER

REMOVING.

Disconnect the hand brake cable (**41**) from the idle lever (**42**).
Clear and remove nut (**43**) from the lever shaft (**44**).
Remove sector (**45**) and lever (**44**).

REASSEMBLING.

Fit the spring (**46**) in the handle (**47**) controlling the pawl (**48**) and the spacer (**49**).
Attach this assembly on the hand brake support.
Rivet the shaft.
Fit the pawl (**48**) in-between the two washers (**50**).
Assemble the hand brake cable idle lever (**42**).

REFITTING.

Insert sector in the lever and follow removing operations in reverse sequence.

HAND BRAKE CABLE

REFITTING.

Install the cable from underneath the vehicle in the scuttle and the support.
Fit the stop ring (**51**).
Guide the cable in the mounting tabs.
Fit the stop ring (**52**) at the other end and connect the cable to the linkage.

HAND BRAKE ADJUSTMENT

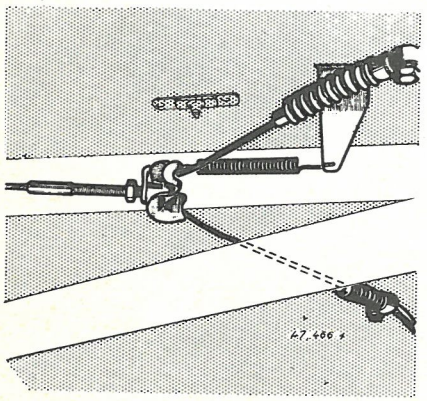
This operation is performed only after adjusting the hydraulic brake.

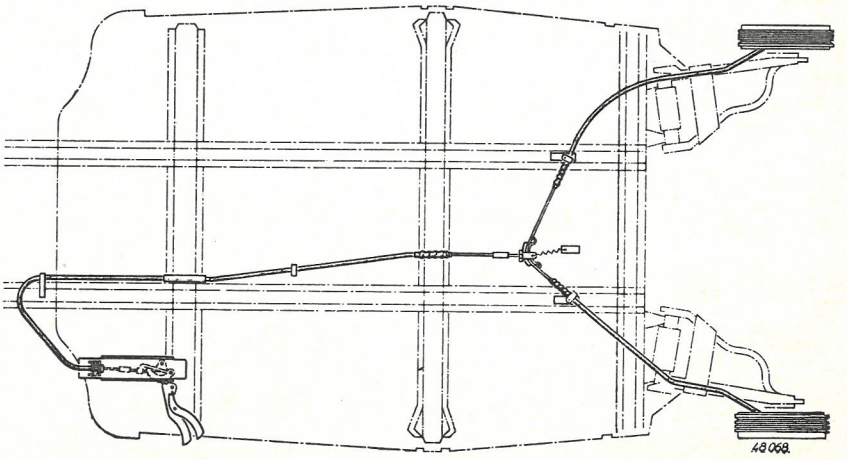
Raise the rear of the vehicle, release the hand brake and shift gearbox to neutral.
Loosen the nuts (**53**) on the hand brake idle lever and turn nuts to adjust cable tension.

Make sure that wheels turn freely.
The lever should start the braking action only after 3 notches on the sector.

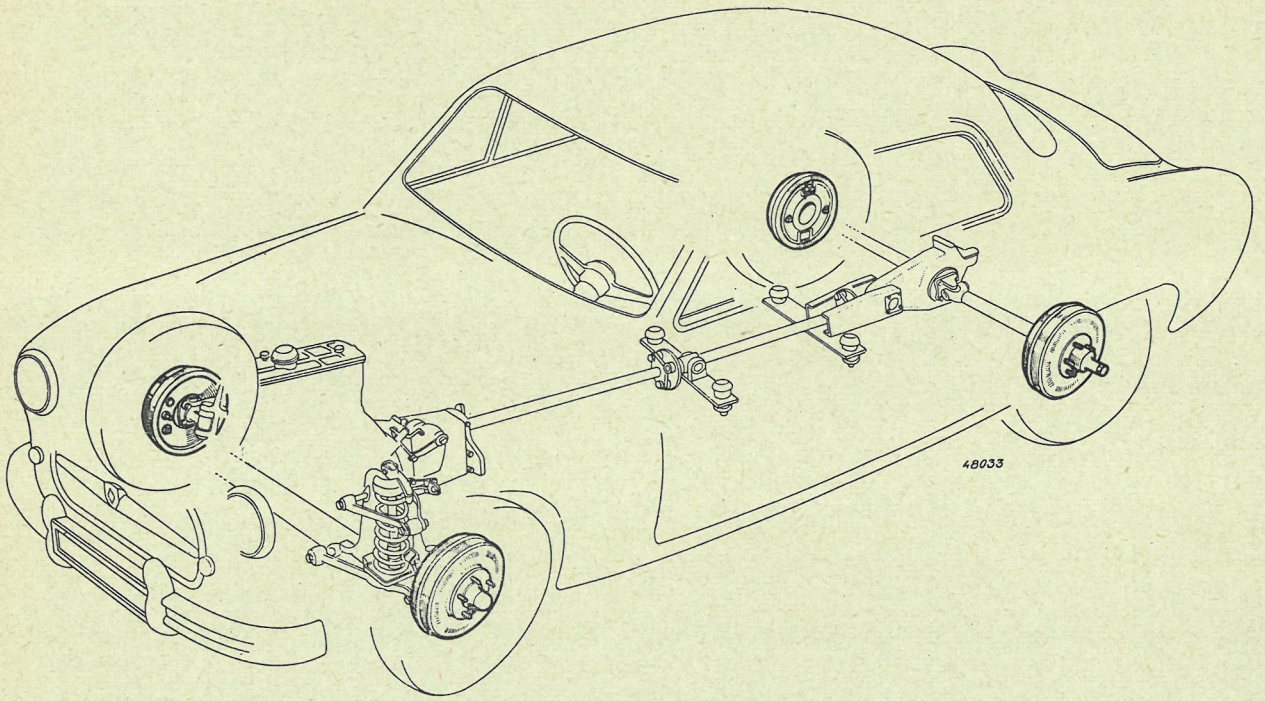
Retighten the nuts (**53**) and lower the vehicle.

NOTE. — Should it occur that all the threads at idle lever end have been used, the adjustment may still be performed under the vehicle at the equalizer.



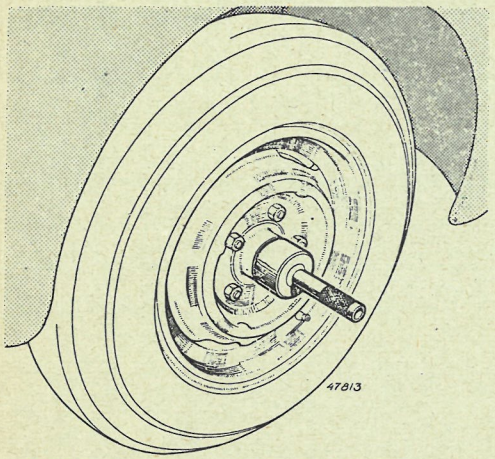


12. WHEELS - HUBS - DRUMS



SPECIFICATIONS

Diameter of brake drums	280 mm + .210 + 0
Maximum diameter of drums after reworking	281 mm + .210 + 0
Brake drum diameter, rough size, for service	278 mm
Diameter of wheel mounting studs (not serrated) :	
— standard	14 mm
— repair	14.25 mm
Maximum eccentricity of brake drums friction area with reference to hub — front	.05 mm
Maximum eccentricity of brake drums friction area with reference to hub — rear	.1 mm
Tightening torque of rear hub	28 m.kg



FRONT HUB AND DRUM

REMOVING.

Remove wheel cover.

Loosen wheel plug (1) with special tool (Ref. Rou. 03 A). Raise car on stands and remove the wheel.

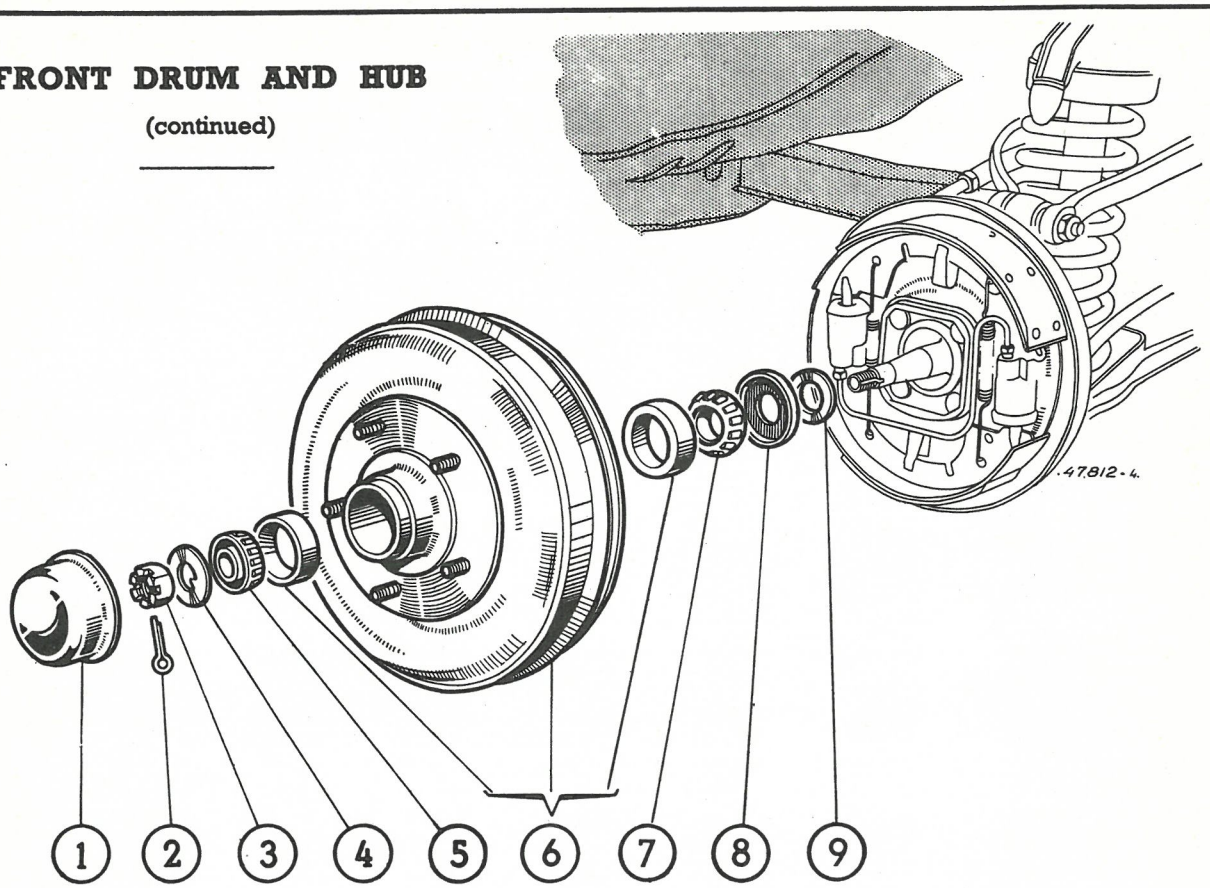
Move brake linings as far as possible away from drum.

Remove cotter pin from and run off stub axle nut.

Remove washer (4), outer bearing (5) and hub and drum assembly (6). If necessary, use a hub puller (Ref. Rou. 05).

FRONT DRUM AND HUB

(continued)



REPLACING THE BEARINGS.

Remove the inner bearing (7), the oil baffle (8) and the bearing thrust washer (9).
It is absolutely required to also replace the bearing cups.
Make sure the cups locations are clean and insert each cup at right angles and, finally, push in on a press using 51 mm and 61 mm diameter tubes, with a length of 100 mm.

REFITTING.

Perform the removing operations in reverse sequence :

— **assemble the bearing thrust washer (9) with inner chamfer against brake carrier plate,**

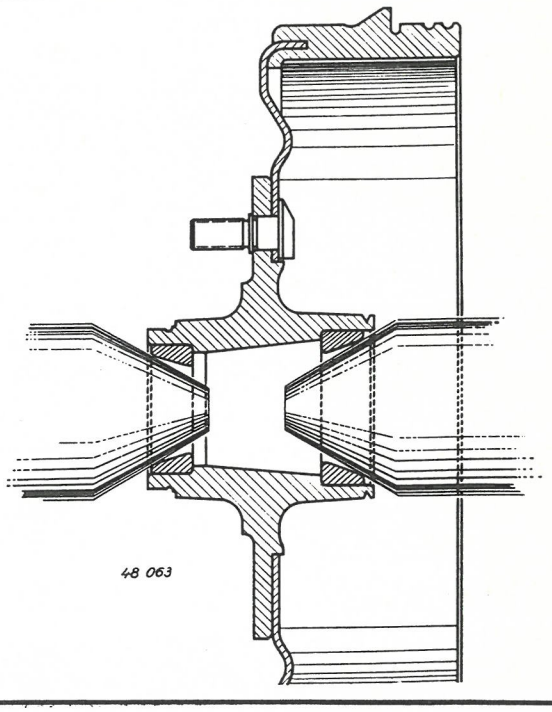
— coat with grease the bearings and the hub (see chapter **" lubrication "**).

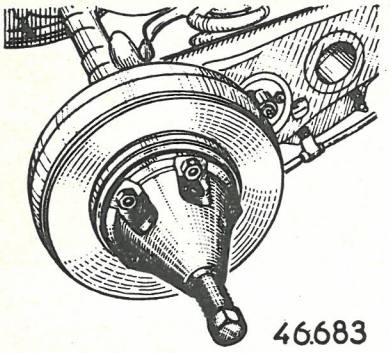
ADJUSTING THE CLEARANCE.

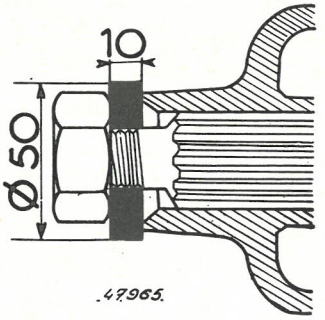
Tighten the stub axle nut while rotating the wheel until a slight binding is experienced. Loosen by 1/6 of a turn or slightly more in order to be able to insert the cotter pin. With a mallet, hit a stub axle end in order to position the bearings.
Fit cotter pin on nut and fit the wheel cap filled 3/4 with grease (see chapter **lubrication**). Adjust the brakes.

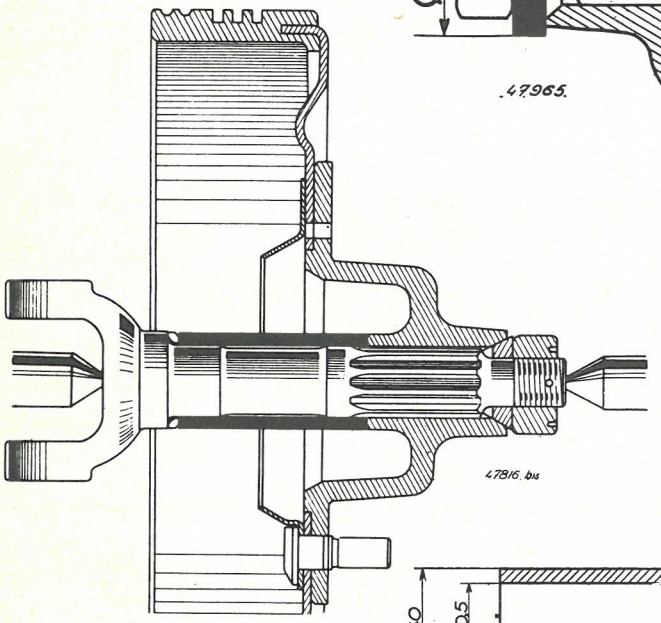
REWORKING A DRUM.

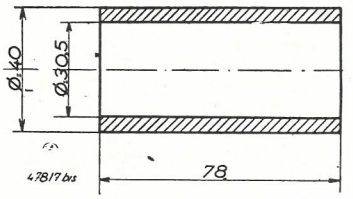
The surface of a drum should be reworked every time it shows traces of scratches, out-of-round or warpage conditions.
Maximum diameter of drum after reworking : 281 mm $^{+\ .210}_{+\ 0}$
If, after reworking, the drum diameter is higher than this dimension, replace the drum.
Installing on a lathe: centering is on the bearing cups.











REAR DRUM AND HUB

REMOVING.

Remove the cover.

Clear and remove the hub lock nut.

Raise the car and remove the wheel.

Make sure the hand brake is released and **move linings as far away from the drum as possible.**

Pull out the hub and drum assembly using a puller (Ref. Rou. 05).

REFITTING.

Install the hub and drum assembly.

Perform a pre-stressing operation with a 10 mm thick thrust washer.

Fit the taper thrust washer and tighten nut to a torque of 28 m.kg.

Fit cotter pin.

Reassemble the wheel and the cover.

Adjust the brakes.

REWORKING A DRUM.

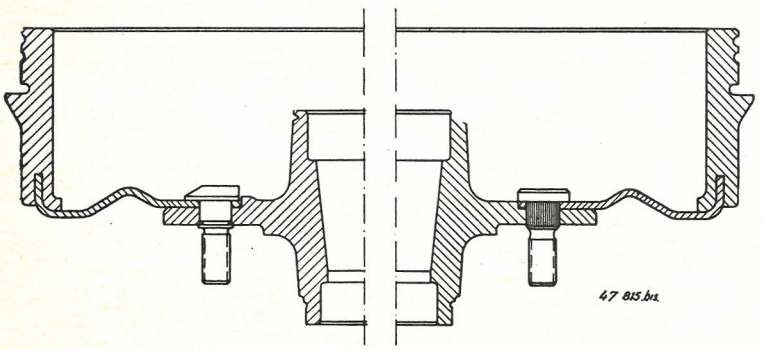
Specifications for reworking are identical to those for a front drum reworking.

Maximum diameter of drum after reworking :

281 mm $^{+\ .210.}_{+\ 0.}$

Installing on a lathe :

— the centering is on the universal joint yoke after inserting a spacer in-between.



REPLACING A FRONT OR REAR BRAKE DRUM.

Drive out on a press the wheel mounting studs, thrust being taken on the inner face of the hub.

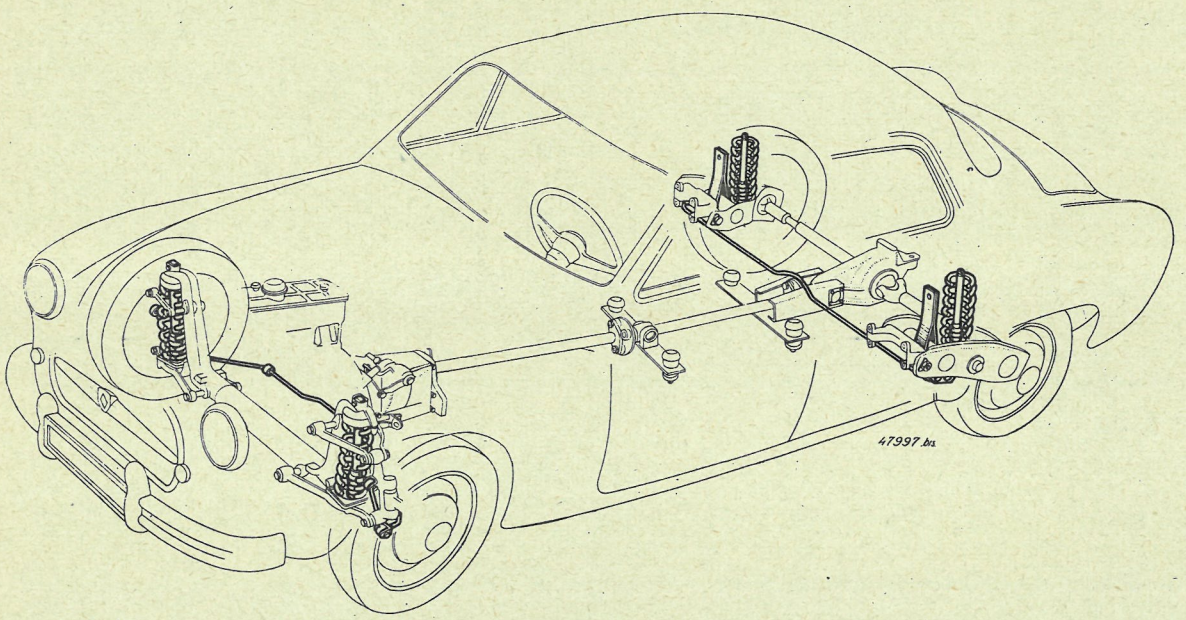
— **If studs are crimped** in the hub and drum assembly, the studs to be used upon reassembling should have a diameter higher by .25 mm than those of the initial studs.

— **If the studs are not crimped,** use upon reassembling new studs of same diameter.

Reassemble the new drum on the hub and push in on a press the wheel mounting studs, rest being taken on the outer face of the hub.

NOTE. — The new drums are delivered at a rough size of 278 mm in order to allow for their reworking after assembly.

13. SUSPENSION - SHOCK ABSORBERS

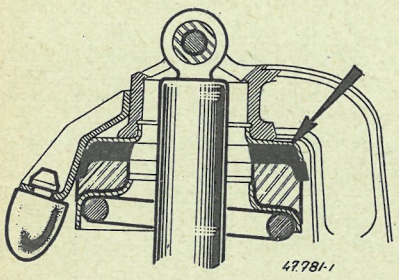


SPECIFICATIONS

The suspension is of the 4 independent wheels type through coil springs.
Telescopic, double action hydraulic shock absorbers in centre of springs.
Torsion bar at front and at rear.

Springs specifications :

	Wire diameter	Outside diameter	Free length
— Front spring :			
Frégate, Caravelle and Domaine	15.2 mm	125.4 mm	424 mm
— Rear spring :			
Frégate and Caravelle	15.5 mm	115 mm	396 mm
Domaine	18.5 mm	116.8 mm	375 mm



NOTE. — For the " Domaine " station wagon, there is a shim inserted in-between the front cross-member and the front spring upper cup. Thereby, a higher ground clearance (vehicle unloaded) is obtained on the Domaine than with the Frégate. Similarly, the rear limiting strap is longer.

FRONT SHOCK ABSORBER

REMOVING.

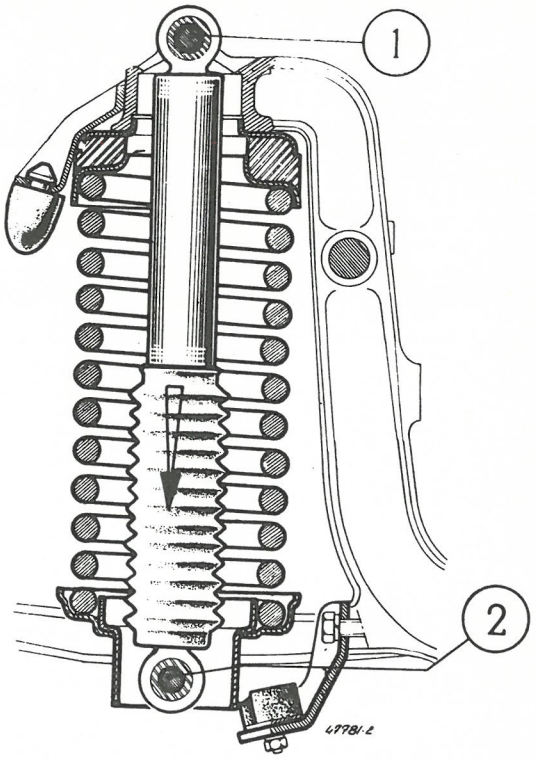
Remove pin from and remove upper (1) and lower (2) attaching bolts on the shock absorber.

Clear out the shock absorber downwards.

REFITTING.

Bring shock absorber at maximum length.

Install in place and attach without omitting the two flat washers and the 2 spacers at the lower mounting.



FRONT SPRING

REMOVING.

Remove wheel and shock absorber.

Compress spring with compressor (Ref. Sus. 02).

Remove suspension arm lower thrust (3).

Disconnect the torsion bar at the stub axle pivot (4) and at side member.

Remove the lower hinge bolt (5) at stub axle end.

Loosen the lower hinge bolt (6) at body end.

Remove the compressor and allow the lower suspension arm to pivot in order to clear the spring.

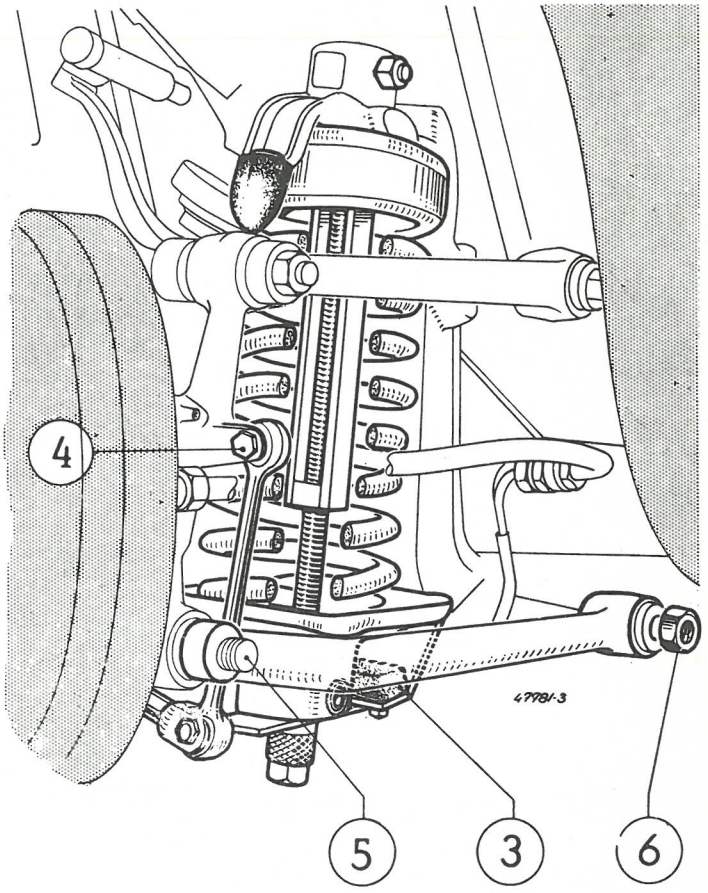
Remove the spring and, if necessary, the upper cup.

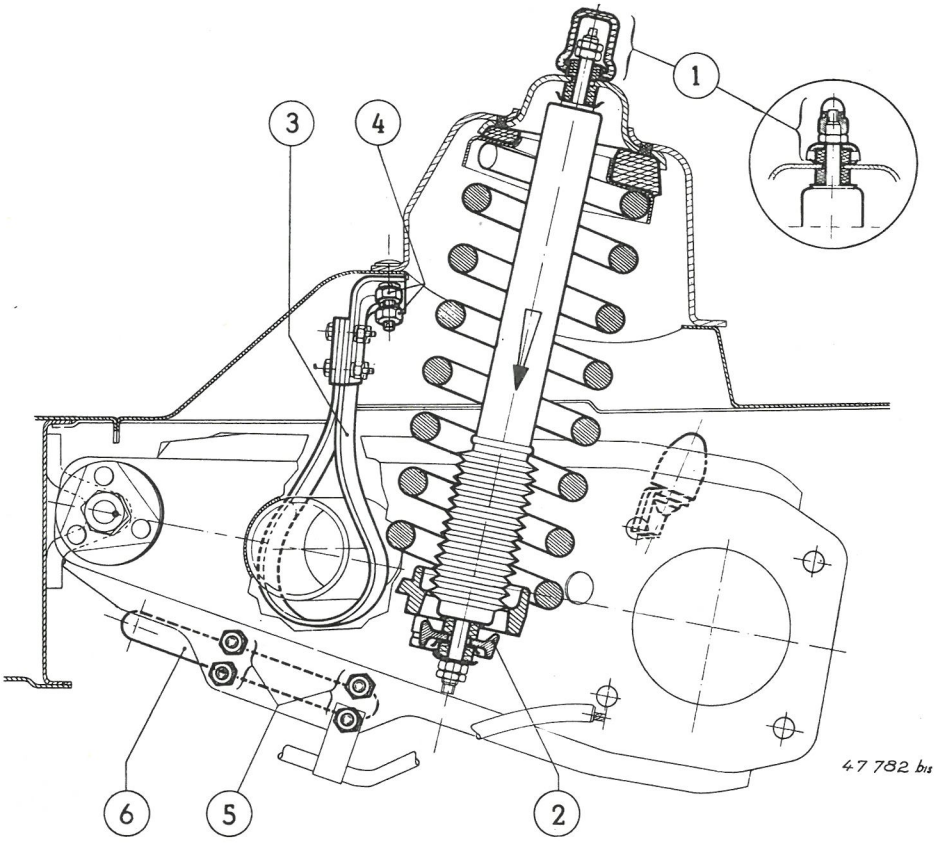
REFITTING.

Perform the removing operations in reverse sequence.

For locking the rubber bushes, on the lower hinge bolts, see chapter " Front Axle " page 101.

NOTE. — For the " Domaine " station wagon, do not omit to reinstall the shim between the cross-member and the upper cup.





REAR SHOCK ABSORBER

REMOVING.

Run off the two shock absorber upper attaching nuts (1). (On " Domaine ", the check nut is a blind nut.)

Remove the two bolts attaching the shock absorber lower support (2).

Clear out the shock absorber downwards and separate from lower support.

REFITTING.

Perform the removing operations in reverse sequence after bringing shock absorber to maximum length.

REAR SPRING

REMOVING.

Remove the wheel and the shock absorber.

Remove the limiting strap (3); to this end :

— Compress the spring with a compressor (Ref. T. Ar. 44).
— Remove the 2 nuts (4) attaching the strap to the body.

Remove the two U bolts (5) attaching the torsion bar (6) and clear from the suspension arm.

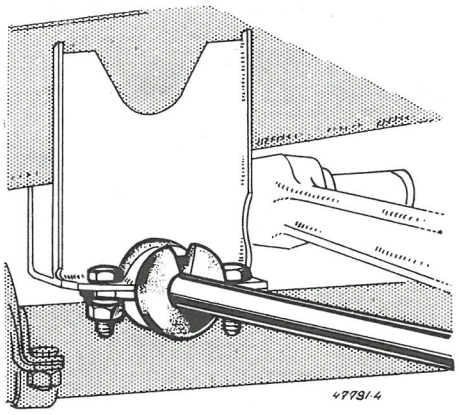
Remove the spring with its upper cup.

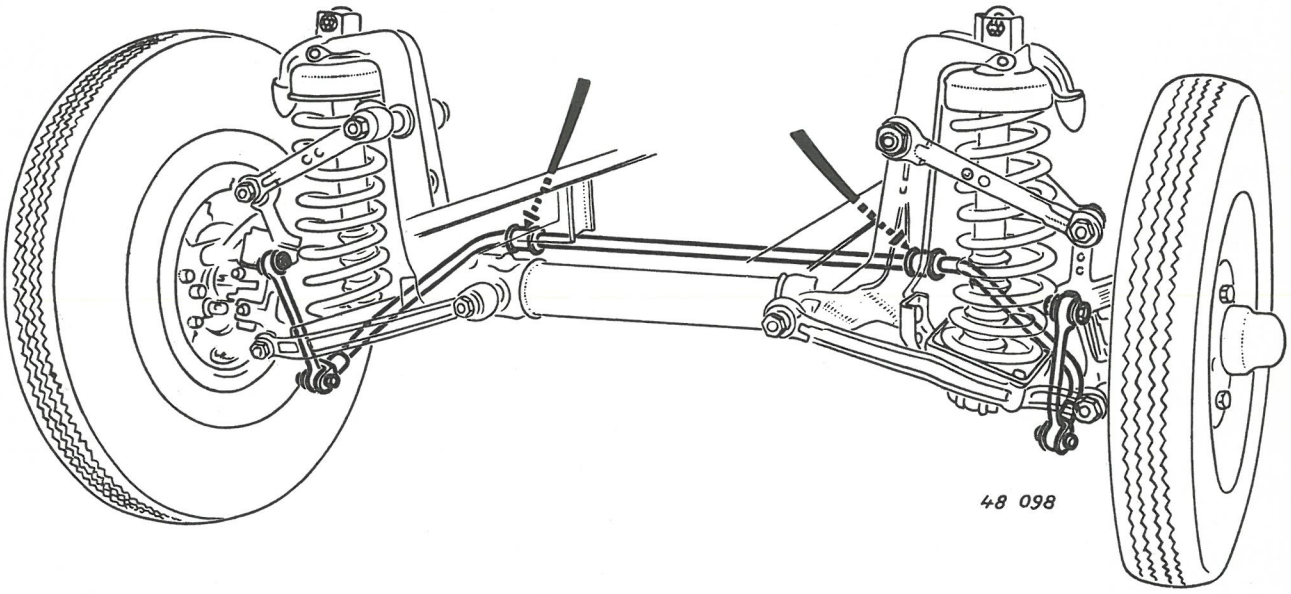
REFITTING.

Perform the removing operations in reverse sequence.

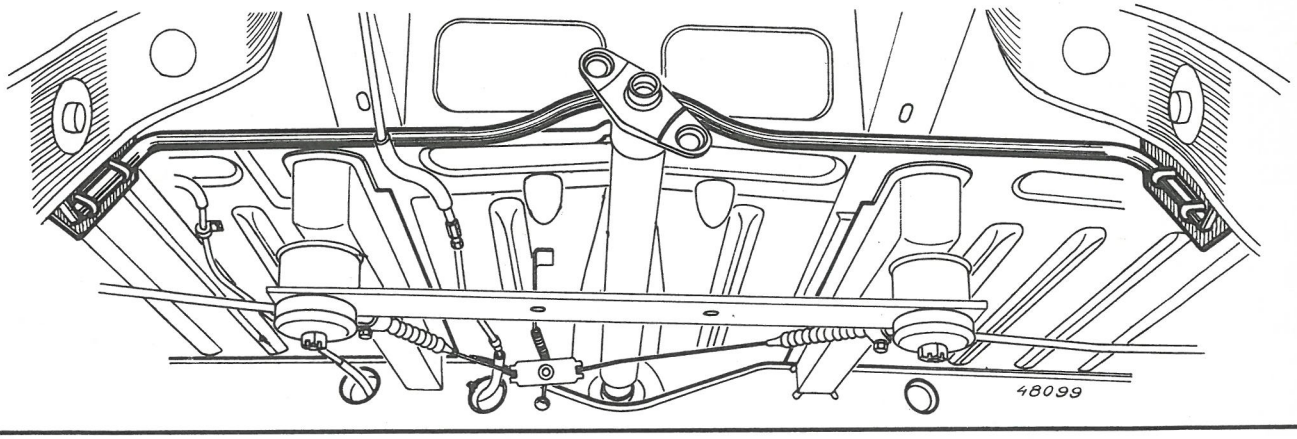
NOTE. — If the " Nylstop " nut on the suspension arm hinge bolt has been loosened, follow the correct rubber bushes locking position (see chapter " Rear Axle " page 117).

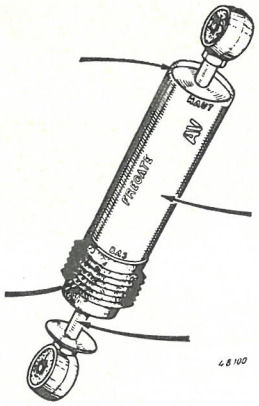
FRONT TORSION BAR





REAR TORSION BAR





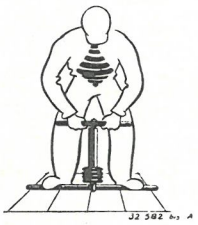
INSPECTION OF A SHOCK ABSORBER

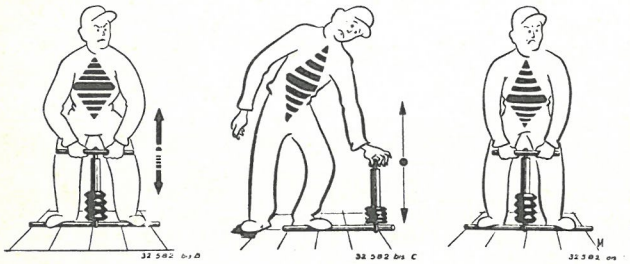
The inspection of a shock absorber is performed in two successive stages :

Outside inspection :

A shock absorber which should have one of the following outside defects is to be scrapped :

— warped piston rod,
— loosened mounting,
— leaks (at gland or at crimping),
— body damaged or dented.





Operational test :

If no outside defect has been found, **perform a manual test.**

NOTE. — **The comparison with a new shock absorber would lead to erroneous diagnosis :** a shock absorber which has not been run in is automatically harder.
The hand test will only permit a rough appreciation. To obtain a sure conclusion, it is necessary to use a special testing machine.

Follow this procedure :

Hold shock absorber vertically with a rod inserted in the rubber bush or a tube drilled with a 10 mm diameter hole attached on the rod according to conditions.

Operate the shock 8 to 10 times along its stroke.

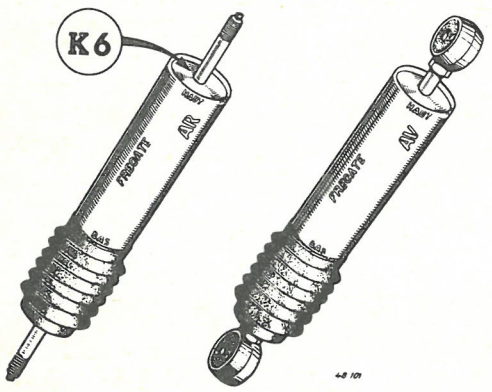
The resistance encountered should be uniform.

REPLACE SHOCK ABSORBER if one finds :

A — **A cavitation when reversing directions.**

B — **A resistanceless operation** even on a portion of the stroke.

C — **Whenever it is impossible to operate the shock absorber by hand.**



IDENTIFICATION OF A SHOCK ABSORBER

Each shock absorber has on its body the indication of the vehicle and of the axle (front or rear) wherefore it is designed. This indication is shown with white paint.

In addition, **on the upper face** of the shock absorber, a **manufacturing date** has been stamped according to the following code :

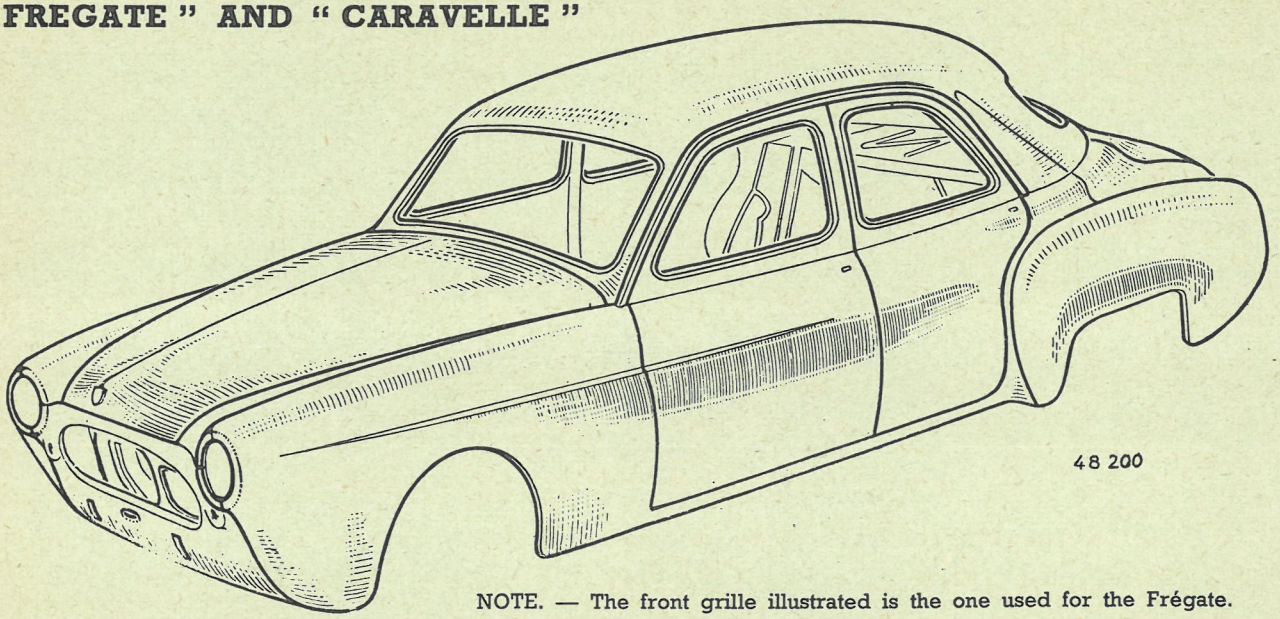
— month indicated by a letter (from A to L),
— year, indicated by a figure, the last digit of the current year.

For instance : indications on the shock absorber : K 6

Meaning : November 1956.

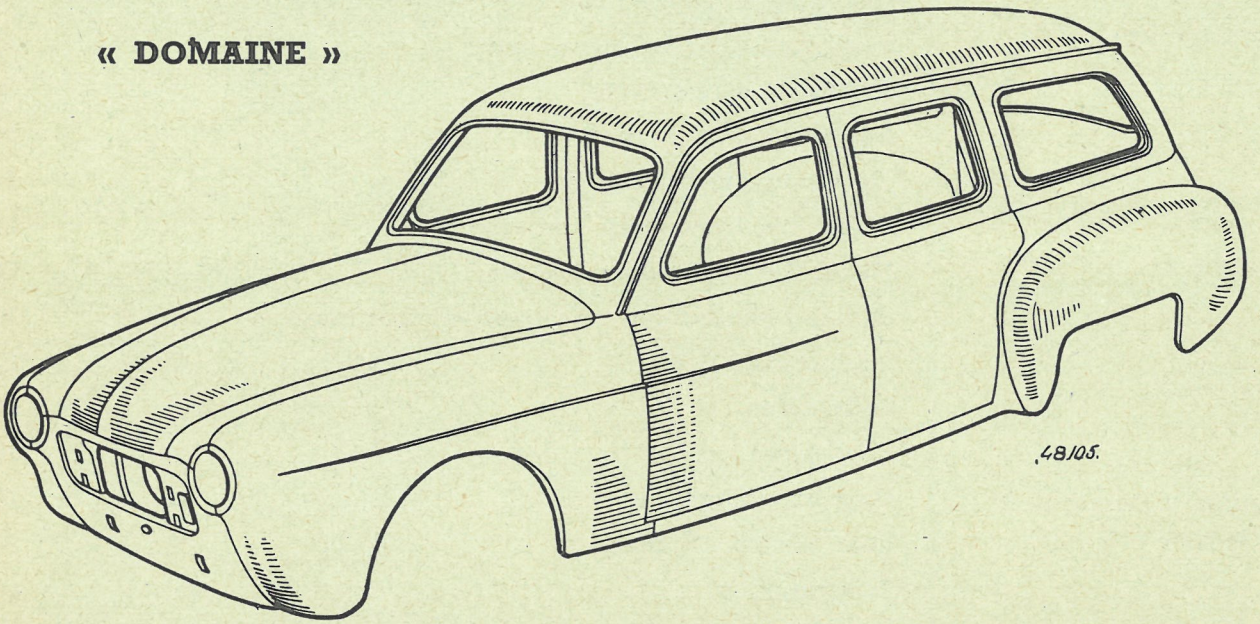
14. BODY

" FREGATE " AND " CARAVELLE "



NOTE. — The front grille illustrated is the one used for the Frégate.

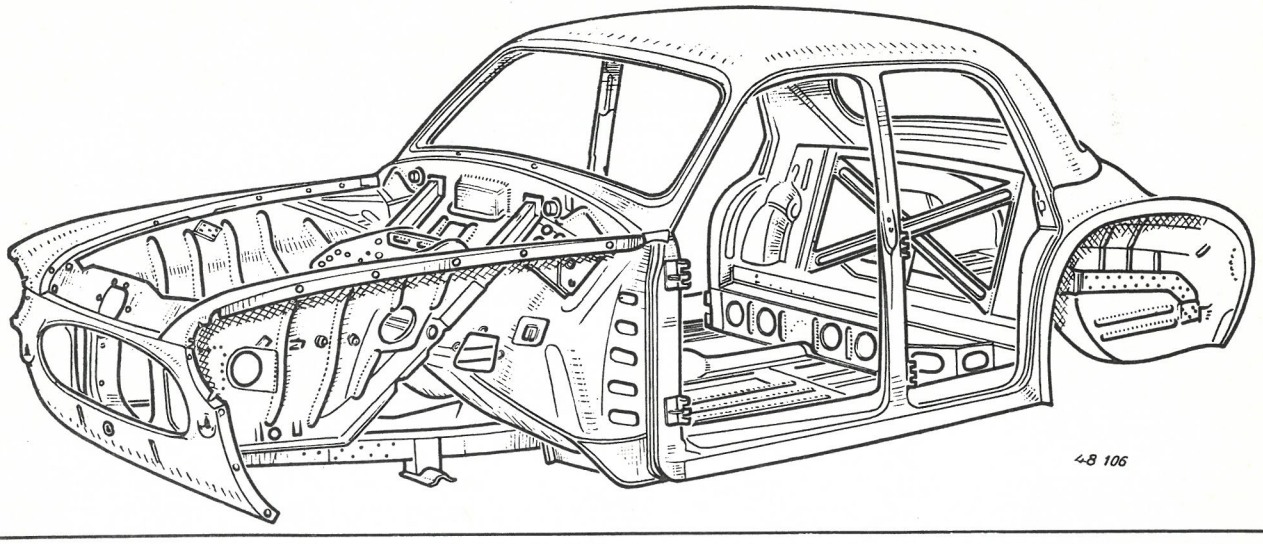
« DOMAINE »



SPECIFICATIONS

The " Frégate, Caravelle and Domaine " bodies are made of steel sheet panels, 95/100 mm thick, and are of the Monocoque integral type.
The " Frégate and Caravelle " bodies differ only by minor accessories and inside arrangements.

	CARAVELLE	DOMAINE
Weight of body shell only	380 kg	460 kg
Dimensions of body shell :		
Overall length	4.400 m	4.400 m
Overall width	1.720 m	1.720 m
Total height	1.310 m	1.310 m



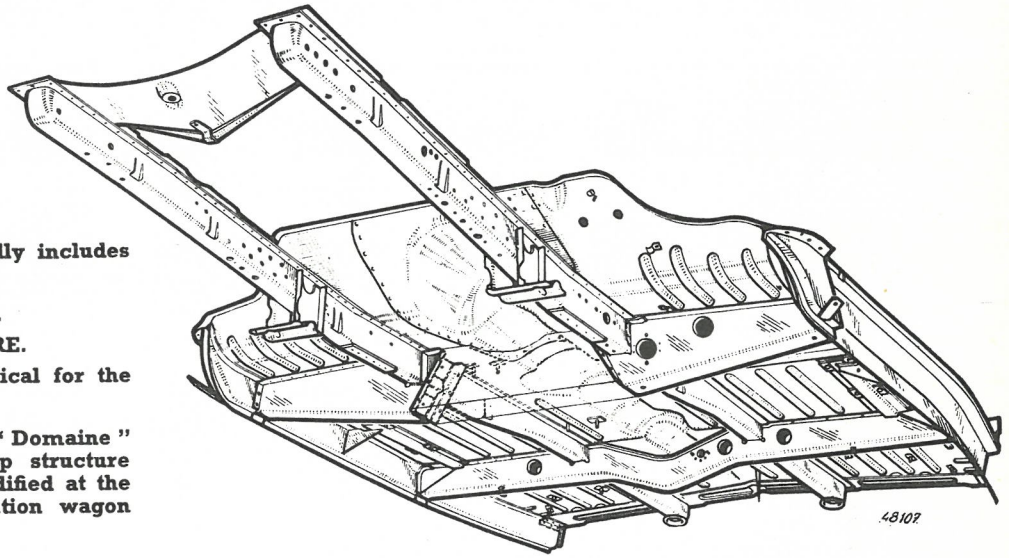
The body shell essentially includes 2 sections :

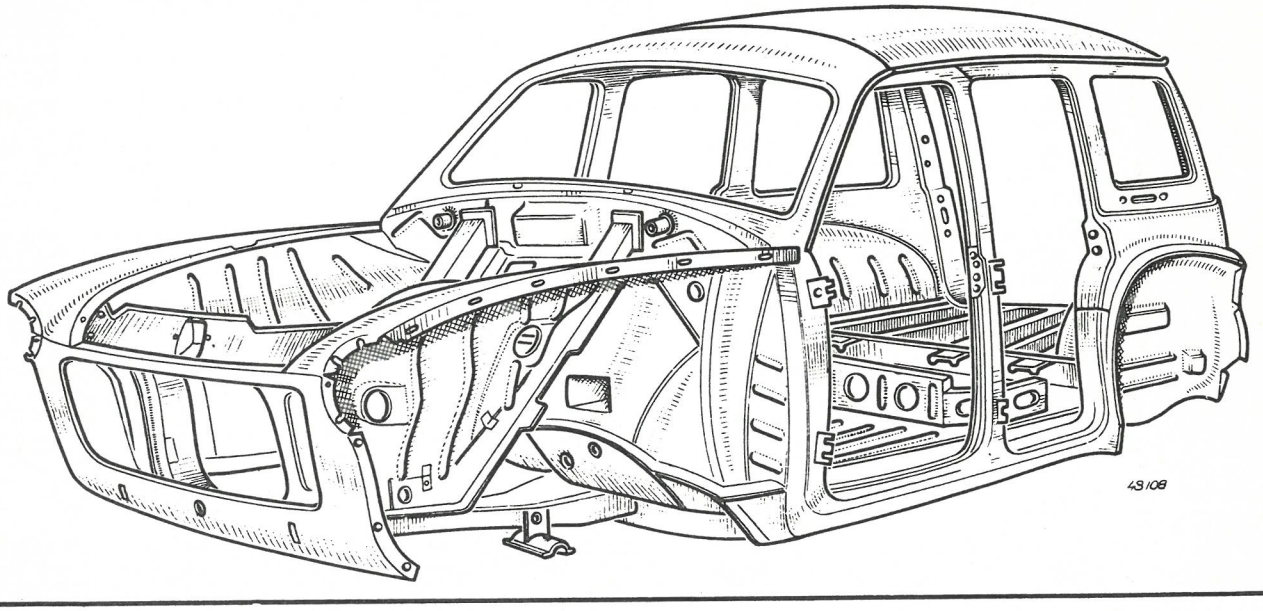
1° THE FRAME-FLOOR.

2° THE TOP STRUCTURE.

The frame-floor is identical for the 3 types of bodies.

The top structure of the " Domaine " is derived from the top structure of the " Caravelle " modified at the rear end to give a station wagon design.



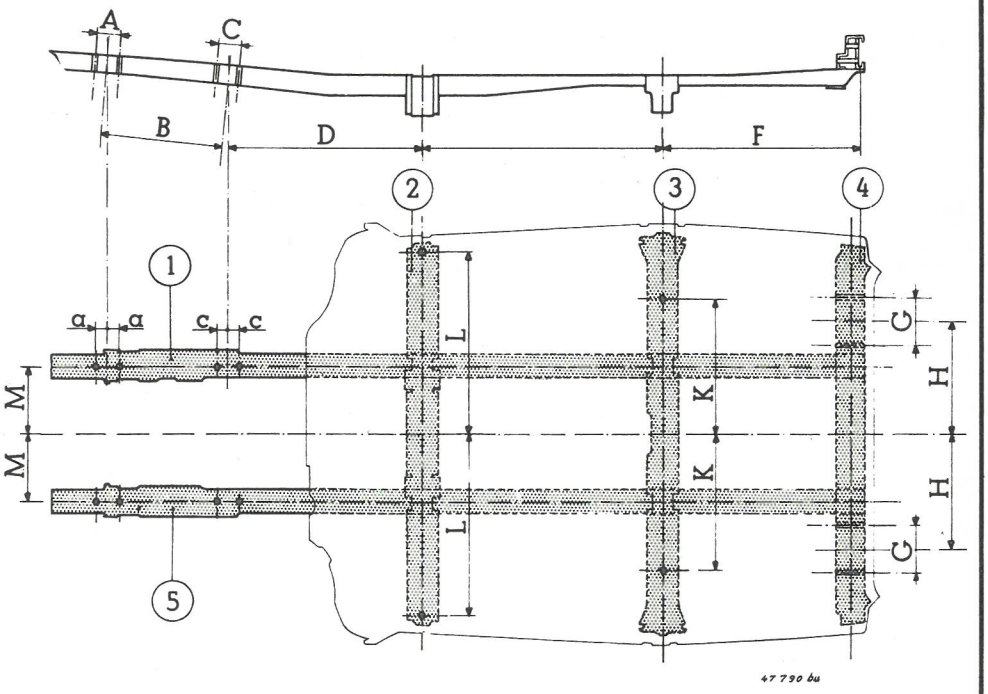


FRAME-FLOOR

The frame-floor involves a framing and a covering panel.

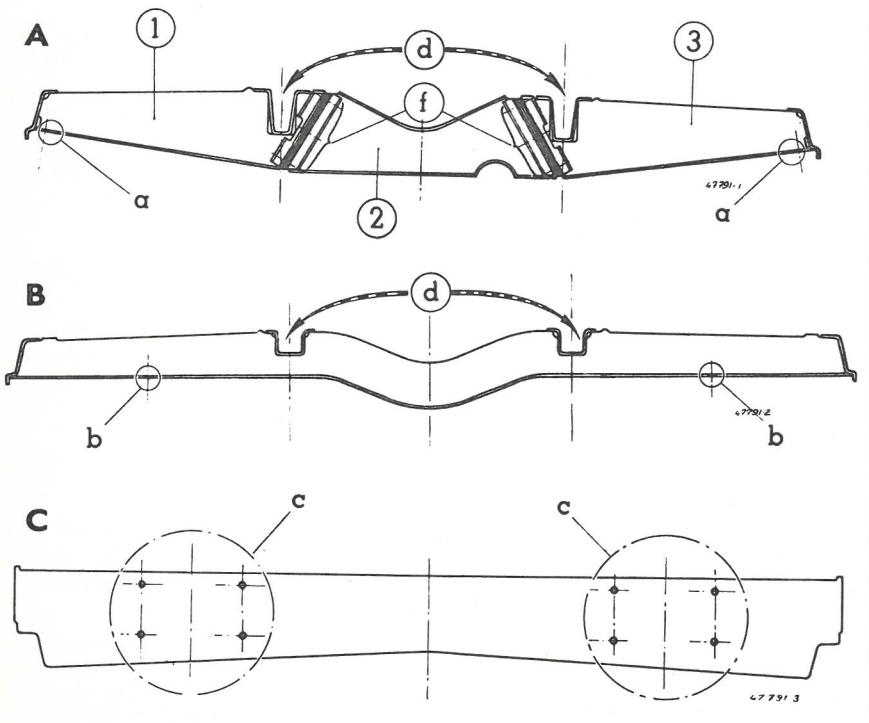
Centre distance of the reference points on the floor-frame :

A = 93 mm
B = 430 mm
C = 88 mm
D = 735 mm
E = 880 mm
F = 735 mm
G = 180 mm
H = 420 mm
K = 500 mm
L = 670 mm
M = 250 mm



COMPONENTS :

— **a RH side-member (1) :** extending until the rear thrust cross-member (4)
— **a LH side-member (5)** symmetrical to the RH side-member,
— **three cross-members :**
— one front door pillar cross-member (2),
— one centre pillar cross-member (3),
— one rear thrust cross-member (4).



CROSS-MEMBERS

1° **Front door pillar cross-member A** including 3 parts :
— **LH** front door pillar crossmember (1),
— **RH** front door pillar cross-member (3),
— **removable type centre** cross-member (2) attached at (**f**) on the two RH and LH front door pillar cross-members with 12 bolts of 8 mm diameter length : 20 mm.

2° **Centre pillar cross-member B** featuring at its central part a stamped panel (or cradled) for propeller shaft location. The fixing of these cross-members is made by welding spots (resistance welding) on the R and LH lower body panels and on the floor-frame covering panel. Each member includes at (**d**) recesses for the side-members location and at (**a**) and (**b**) it has pilot holes.

3° **Rear thrust cross-member :** the reference (**c**) are used for mounting the rear wheel suspension arms supports.

FLOOR : the floor is made from a 1 mm thick sheet metal panel, a stamped part.
It has, in its lengthwise centre section, a tunnel for the propeller shaft and, at its front end, a gearbox cover attached with electrical spot welds.

FRAME-FLOOR (continued)

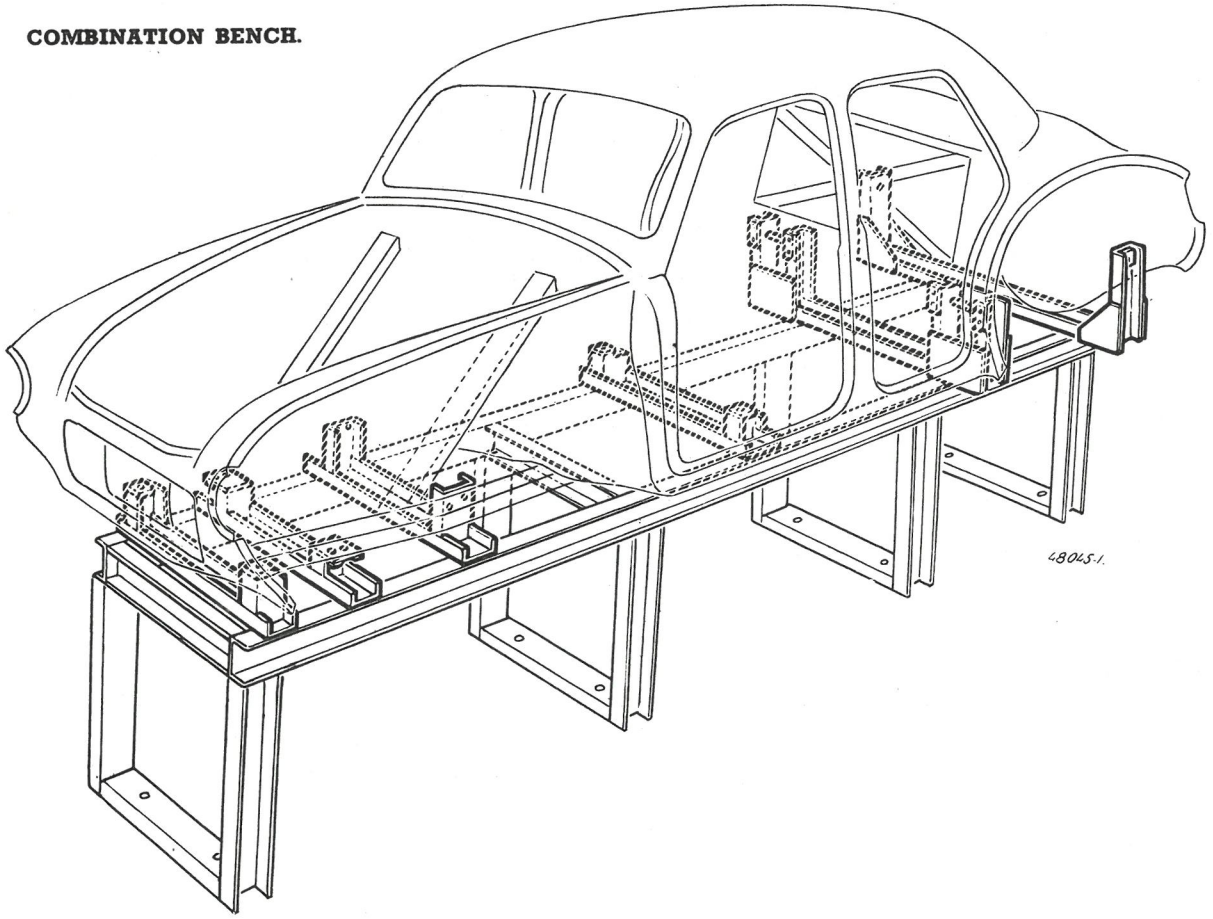
CHECKING THE BODY SHELL

The various mechanical units of the car are secured on the frame-floor : in other words, this is the essential part of the shell and it is the basic part to be checked.

The checking of the frame-floor may be made according to two procedures :

— using the combination checking and repair bench (Ref. Car. 08) and a set of supports (Ref. Car. 11),
— or using the **FREGATE body shell checking fixture** (Ref. Car. 03).

COMBINATION BENCH.



The combination bench has been designed in order to perform under the best possible conditions the checking and the overhauling of the body shells damaged, due to accidents :

1° **Checking.** — It is a fixture comparable basically to the assembly fixtures used at manufacturing level. The bolts for attaching the body shell to the bench are used as broaches or locators; therefore, it should be possible to fit **all the bolts in order for the body shell to be considered as correct.**

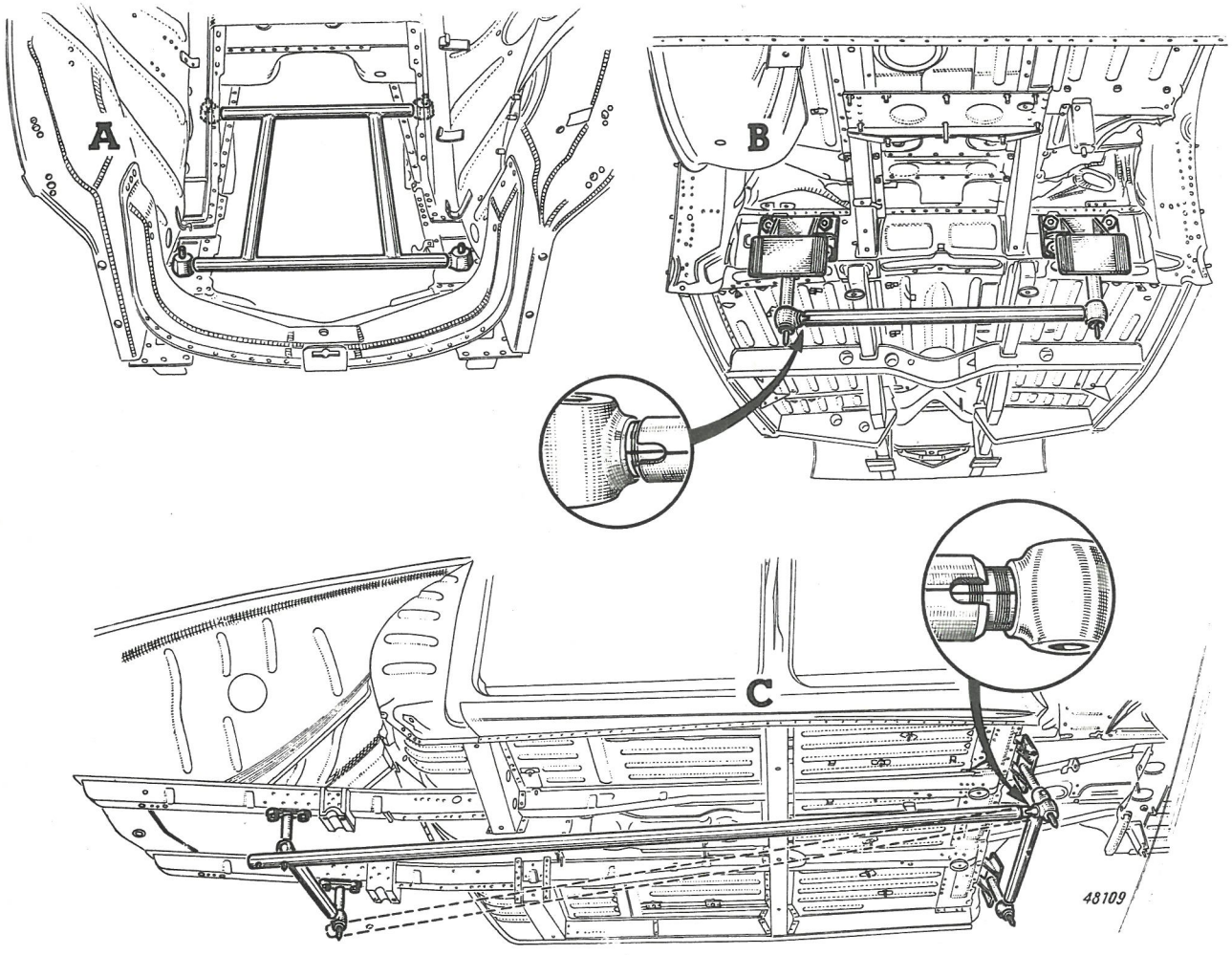
2° **Straightening.** — It enables the operator to perform all of the required operations to straighten the damaged components by pulling or compressing, starting from a point exterior or interior to the bench. These operations should be made with jacks or clamps.

The combination bench includes a **base** (Ref. Car. 08) **mounted on the ground** for a horizontal plane and a **set of 6 supports** (Ref. Car. 11), each one marked with a number painted yellow :

— the support marked 21 is centered on the rear wheelhouse panels in the bumper bar reinforcement attaching holes,
— the support marked 22 is centered on the rear thrust cross-member in the rear suspension arms mounting holes,
— the support marked 23 is centered under the side-members in the transmission relay attaching holes,
— the support marked 24 is centered under the side-members in the gearbox lower attaching holes.
— the support marked 25 is centered under the side-members in the front axle cross-member attaching holes,
— the support marked 26 is centered under the side-members in the engine pads rear mounting holes.

BODY FRAME-FLOOR (continued)

CHECKING THE BODY SHELL (continued)



BODY SHELL CHECKING FIXTURE.

In order to check the floor, use the Frégate body shell checking fixture (Ref. Car. 03) which features :

— **a gauge, of the ladder type,** with taper and cylindrical pins to be mounted on the side-members in the engine attaching holes and the front axle cross-member attaching holes (Fig. A),
— **two front hangers** to be attached in the front axle cross-member mounting holes (Fig. C),
— **two rear hangers** to be attached in the rear axle halves attaching holes (Fig. B and C),
— **a rear checking bar** (Fig. B) with sliding end connecting the rear hangers and including two sets of marks (shown on illustration) :
  — a set of marks made of two longitudinal lines : they show the distortion or warping of the portion of the floor being checked,
  — a set of circular marks : they show the lengthening of the part being inspected. The central mark shows the theoretical dimension and the outer marks indicate the permissible limit,
— **a front checking bar** (Fig. C), connecting the front hangers, and identical to the rear checking bar,
— **an indicator pin** (Fig. C), with sliding end, connecting the front hangers to the rear hangers for measuring the squareness.

The sliding end of this pin also has two sets of marks (shown on illustration) :
  — a set of marks made of two longitudinal lines : they show the distortion or warping of the floor,
  — a set of circular marks to record the dimensions of the sides and the diagonals of the squareness (the centre portion not graduated corresponds to the minimum and maximum limits; the circular lines vary by increments of a millimetre).

The other end has 2 holes representing the length difference between the side and the diagonal of the squareness.

FRAME-FLOOR (continued)

CHECKING THE BODY SHELL (continued)

BODY SHELL CHECKING FIXTURE (continued).

Checking the side-members.

Use the ladder type gauge (Fig. A) :

— position the cylindrical locator pins in the front axle attaching holes and the taper pins in the engine attaching holes,

— **if the inserting of the 4 pins can be made normally,** or **at least at half length** of their tapered portion for the front pins: there is no distortion,

— if the pin cannot be positioned correctly, then determine the distortion by checking the squareness.

Checking the rear cross-member.

Use the two rear hangers (Fig. B) which include each a small surface plate and a pin for connection to the rear checking bar :

— the two sets of marks (inset) show the warping and the lengthening of the cross-member,

— apply a **rule** in **horizontal position** on the two surface plates : the cross-member may thus be found **bent towards the rear or towards the front,**

— apply a **rule** in **vertical position** on each surface plate : by visually checking the parallelism of the two rules, it may be found that the cross-member is **twisted.**

Any further checking demands that the rear cross-member be first overhauled (see page 161).

Checking the warping of the whole of the floor.

The front and rear checking bars being installed, visually check for their parallelism.

Checking the squareness.

Checking the squareness consists in comparing the front portion of the side-members with reference to the rear cross-member. The latter being the basis for comparison, it is important that it complies with the above described checkings; if not, overhaul (see page 161).

The basic checking is as follows :

— on the damaged floor, indicate the tops of a AB' C' D trapezium using the locator pins of the front and rear hangers,

— using the checking bars and the indicator pin, measure the difference in length of the bases, the sides and the diagonals of this AB' C' D trapezium with reference to the theoretical dimensions,

— compare these various measures with those of a theoretically isosceles trapezium ABCD representing a new frame-floor.

Checking example :

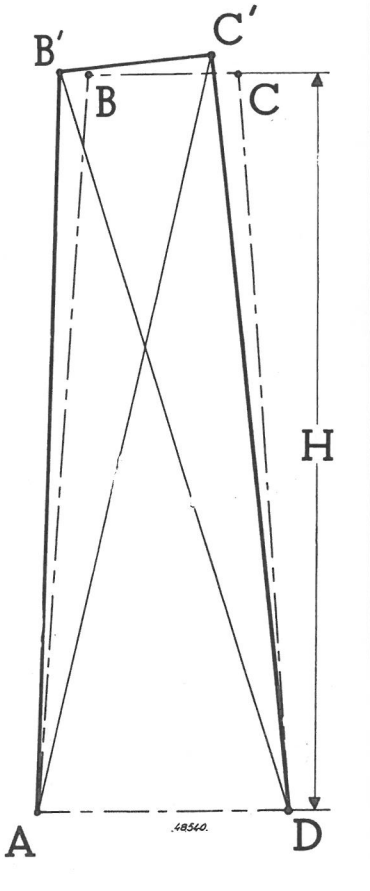
Trace the theoretical ABCD isosceles trapezium with dimensions :

Bases : AD = 840 mm, BC = 500 mm Height = 2.460 mm

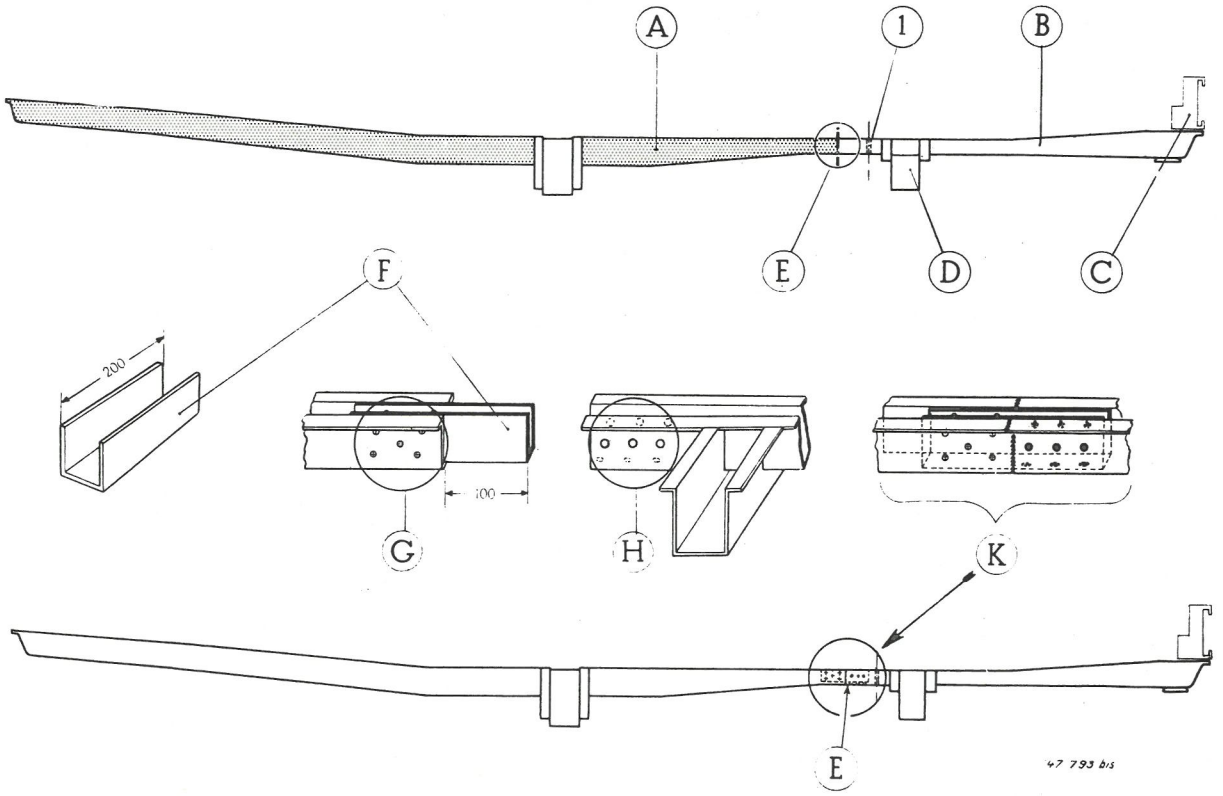
In the example selected, we find on the checking bars and the indicator pin :

Bases	AD	correct	Side	C'D	+ 7 mm
	B'C'	correct	Diagonals	AC'	+ 5 mm
Side	AB'	correct		B'D	+ 5 mm

Next determine trapezium AB'C'D superposed to the theoretical isosceles trapezium ABCD and having for common base AD, as the rear cross-member is correct. We find that the distortion of the floor is localized in the front side-members and that the impact came from the right.



FLOOR-FRAME (continued)



REPLACING A SIDE-MEMBER

The procedure for replacing a side-member consists in separating the latter in two parts :
1° a removable part (**A**), the one to be replaced,
2° a stationary part (**B**), the one which is in proper condition.

Removing the part (A).

With a hand saw, cut the side-member at (**E**), 100 mm aproximately in front of the transmission relay attaching hole (**1**).
With a chisel, remove at both sides of the front door pillar cross-member the electrical welding seams attaching the side-member to the cross-member.
With a sharp chisel, cut the side-member at both sides and parallel to the floor; this cutting should be made at approximately 5 mm above the side-member to floor mounting.
Remove the removable part (**A**).
Remove the portions of the side-member still attached to the floor by cutting the welding spots one by one with a sharped nosed pliers.
Remove the welding spots on the floor (two operators are required).

Preparing.

On a new side-member secure the part corresponding to the one removed (**A**).
Fabricate a gusset (**F**) of 2 mm thick sheet metal, 200 mm long, according to the side-member section; insert the gusset in the new side-member on a distance of 100 mm and assemble the gusset and side-member at (**G**) by welding spots.
Smoothen with a file the cut made with a saw on the portion of the side-member (**B**).
Along approximately 100 mm after the cut, and on each other three faces of the side-member, drill a number of 3 holes (**H**) of 8 mm diameter.

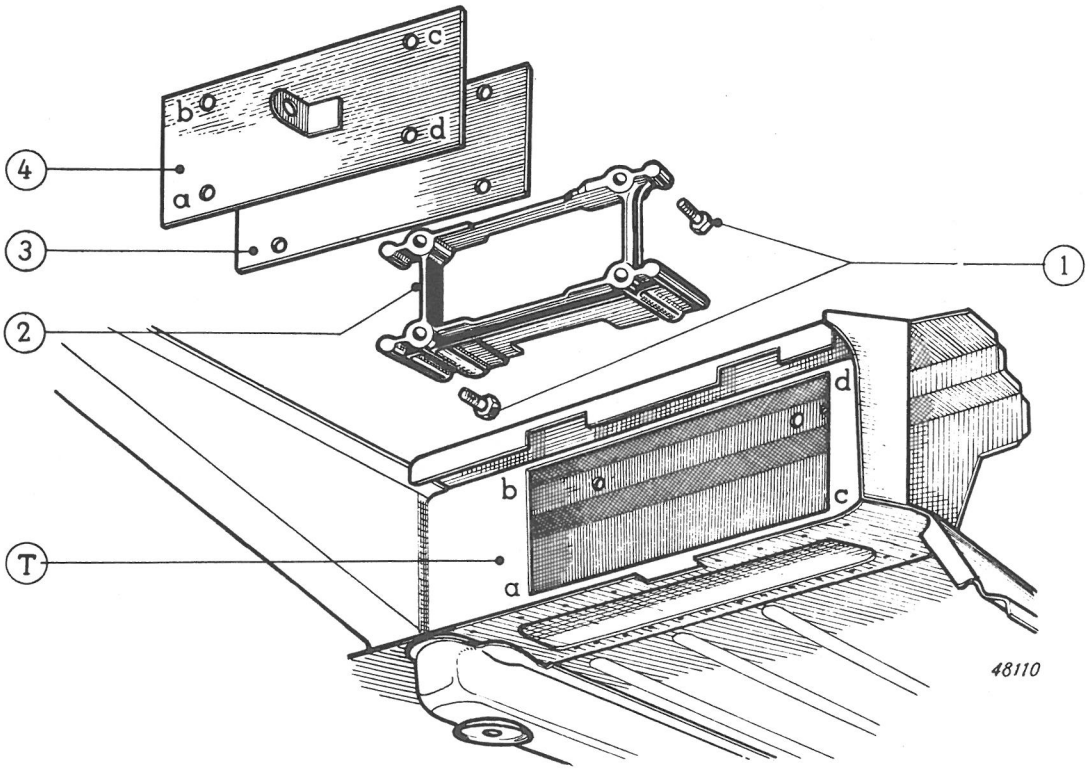
Assembling the new side-member.

Slide the new side-member portion with the gusset from the front towards the rear, passing in the front door pillar cross-member, and fit the gusset (**F**) in the portion of the side-member still in place and correctly adjust (**B**).
Position the side-member, using the ladder type checking gauge (Ref. Car. 03) or the combination checking bench.
Plug up by arc welding spots the holes drilled on the three faces of the portion (**B**) of the side-member, to connect the gusset and the side-member (**K**); connect the two parts of the side-member at (**E**) by oxiacetylen welding.
Attach the side-member to the floor, using 4 × 15 bolts 20 cm apart. Lock the bolts with a welding spot; between each bolt apply a welding spot to connect the side-member to the floor-frame.
Complete the junction of the side-member and of the front door pillar cross-member by an electrical welding seam.

NOTE. — This procedure is applicable only for a distortion of the side-member at its front end beyond the front door pillar cross-member.
Should a distortion also involve the portion welded to the floor, all the floor and the framing is also distorted. It is then necessary to replace the complete component, i.e. a floor assembly.

FRAME-FLOOR

(continued)



OVERHAULING THE REAR THRUST CROSS-MEMBER

The overhauling of the rear thrust cross-member is an important operation which should be performed before any checking of the frame-floor.

The distortions of this cross-member are generally located in the area where the rear supports are attached.

Cut out the sheet metal of the rear cross-member (**T**) as per contours a, b, c, d.

This cutting out should be made very regularly with a chisel.

It should be noted that a reinforcement panel of 2 mm thickness (**3**) is welded internally to that of the cross-member (**4**).

When the two panels are cut out, the spacer (**2**) will be seen. To remove, it will merely be necessary to remove the two screws of 8 (**1**) mounting the spacer to the cross-member.

Fit the spacer on a surface plate for checking; any distortion requires that it be replaced.

Straighten on a surface plate the cut out sheet metal panel (**4**).

Attach the new spacer with 2 screws of 8 mm (**1**).

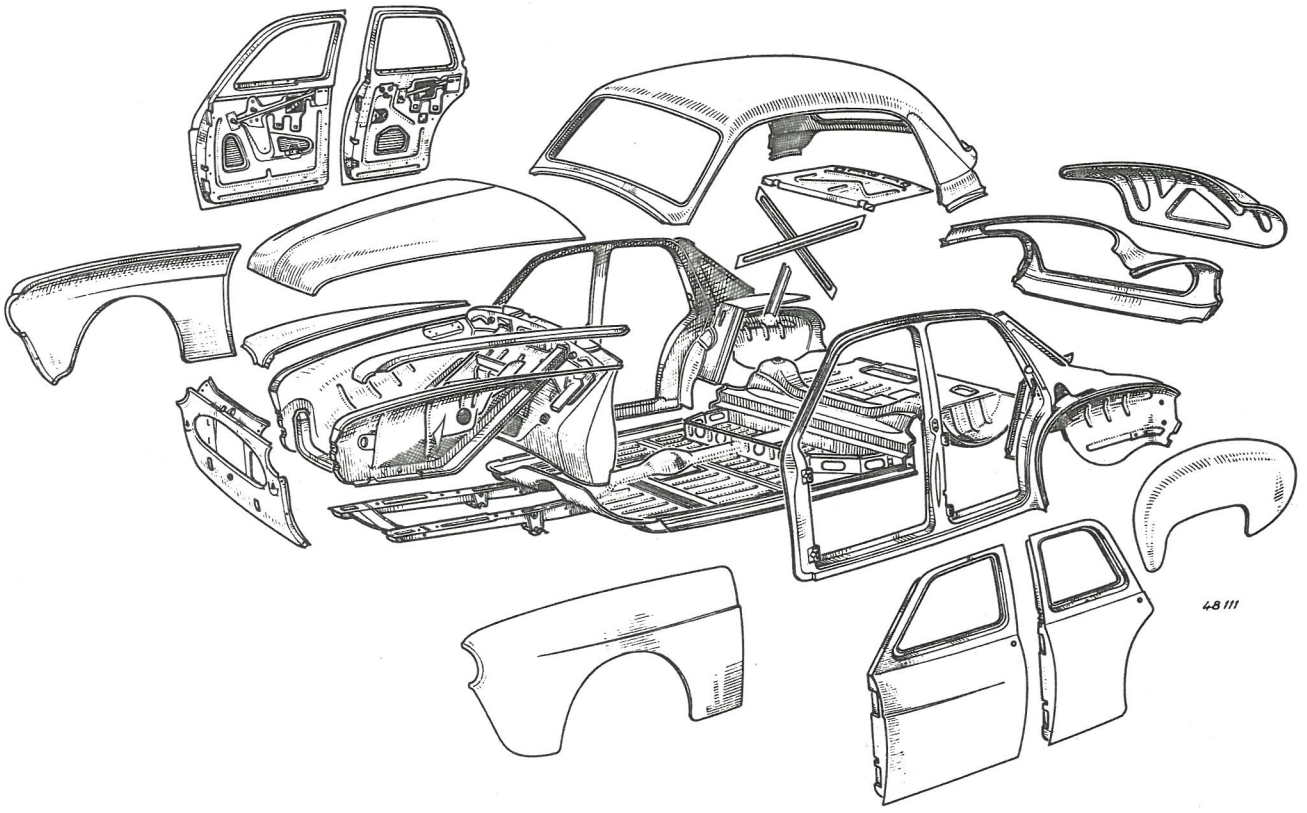
Very carefully adjust at its initial place the sheet metal panel (**4**), by aligning its mounting holes with those of the spacer.

Secure and weld the sheet metal to the cross-member, applying arc welding seams.

Any overhauling of the cross-member should be followed by a checking operation with the hangers (Ref. Car. 03).

TOP STRUCTURE

FRÉGATE AND CARAVELLE



REPLACING COMPONENTS

Where lightly distorted components are involved, use the standard repair tools : table, dolly block, flattening hammer, etc., and the portable hydraulic press which, owing to the wide range of its accessories, permits pulling, pushing, straightening operations, etc.

For the replacing of the components of the body shell, perform the cuttings following the junction lines in manufacturing or repair and wherefore a blow torch, pneumatic saw or nippers will be used.

To clear the welding spots, use a hand type or electrical drill with flat bottom sharpened tool, a flat nose pliers or a special chisel, taking care not to distort the component still in place which should be in proper condition : holes plugged with the torch, sheet metal panels cleaned and carefully straightened (no traces of paint or primer).

The new component will be positioned before welding, using C-clamps (Ref. SAPRAR 12.222) or ordinary clamps.

TOP STRUCTURE

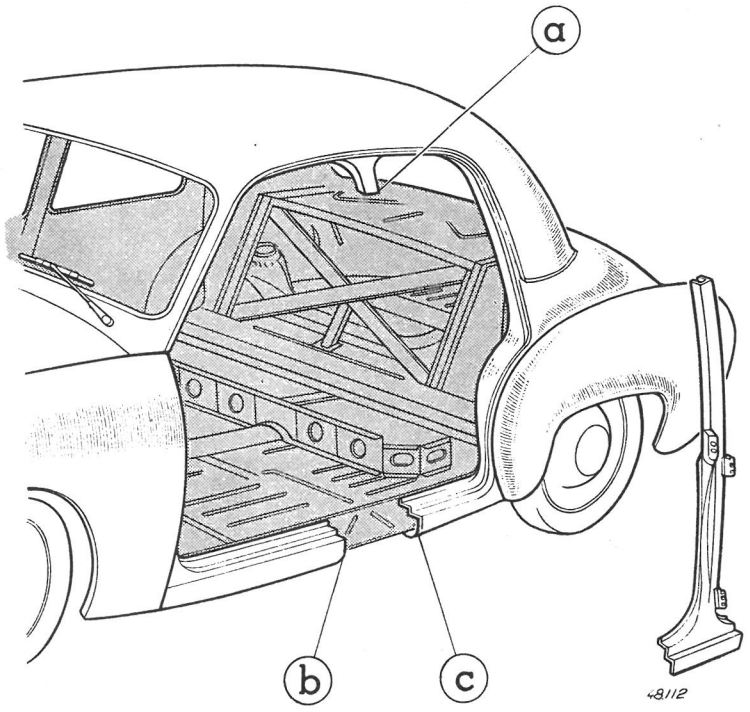
(continued)

REPLACING A CENTRE PILLAR.

When the damage involves the body centre pillar and when the pillar is only lightly distorted, its overhauling will be possible, using the hydraulic press and wooden shims to avoid crushing the panels.

If distortion is extensive, it will be required to replace the pillar :

— saw the centre pillar :
  — at the upper section, at (**a**); this cutting delineates the good portion connected to the body side,
  — at the lower part, at (**b**) and (**c**), at the body side lining panels,
— clear the component,
— smoothen out the sharp edges with a file,
— position and adjust the new component after welding at inside a reinforcement panel of 95/100 on the centre pillar (at top and bottom),
— secure the assembly with a few oxiacethylen spot welds; operate the doors and next perform the complete welding of the connections to the centre pillar and to the body sides; smoothen out the weld and complete operation by applying tin solder if necessary.

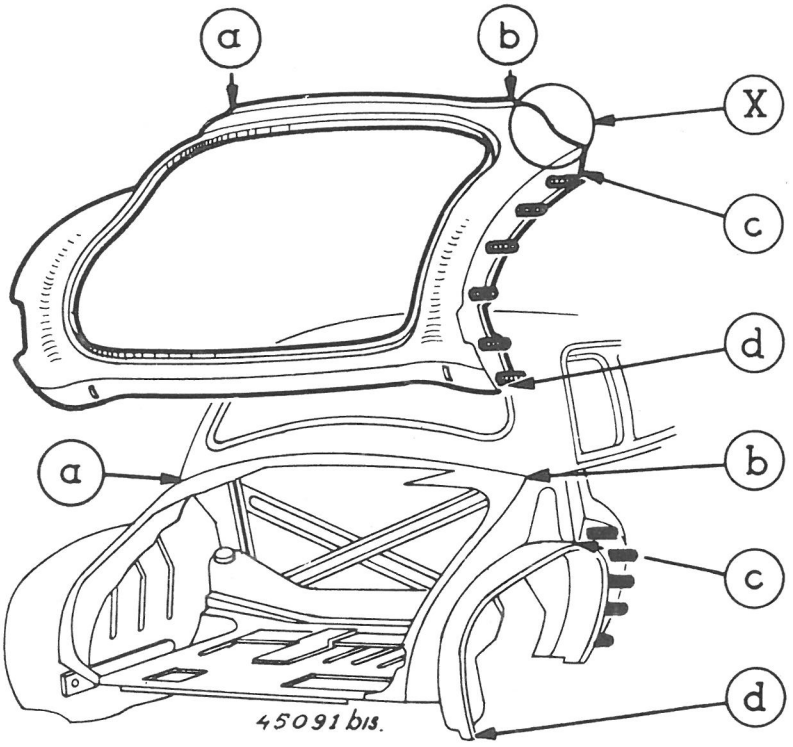


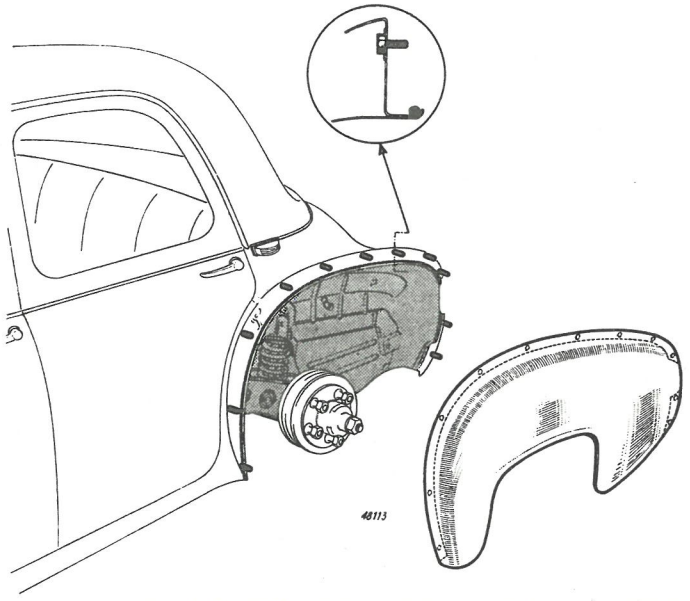
REPLACING THE REAR LOWER PANEL.

This component should be accurately to its initial form in order to ensure the closing of the rear bonnet.

When the lower panel is distorted, its overhauling is a delicate operation and **it is recommended to replace the panel.**

— clear the tin welding located at the junction points of the rear lower panel and of the roof panel at (**x**),
— with a chisel, loosen the welding spots connecting the lower panel to the back window framing panels, to the rear quarter lining panel and to the rear wheelhouse as per (**a**), (**b**), (**c**), (**d**),
— straighten the panels for correct junction of the new panel, smoothen out with a blow torch the welding spots, clean the panels,
— position the rear lower panel, adjust and hold in position, using clamps; secure with oxiacethylen torch,
— position the rear bonnet, adjust and operate; if its closing is correct, complete the welding of the rear lower panel on the body by electrical spot weld (resistance welding).





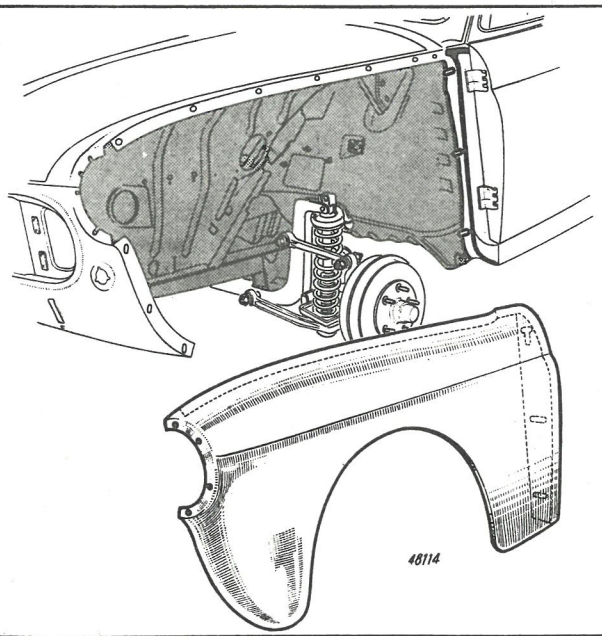
TOP STRUCTURE

(continued)

REPLACING A REAR WING.

Remove the wheel.
Remove the 11 nuts attaching the wing to the wheelhouse panel and to the rear lower panel.
Remove the damaged wing.
Make sure that the bolts or studs welded to the wheelhouse panel and to the rear lower panel are in good condition; replace if necessary.

To ensure the watertight seal between the wing, the wheelhouse and the rear lower panel, insert a bead of sealer as shown on the illustration and in the inset. Position the new wing, adjust by correctly positioning the wing moulding and tighten the nuts. Reassemble the wheel.



REPLACING A FRONT WING.

Remove the wheel and the headlamp.

Run off the wing to wing plate and to front pillar and radiator grille attaching nuts.

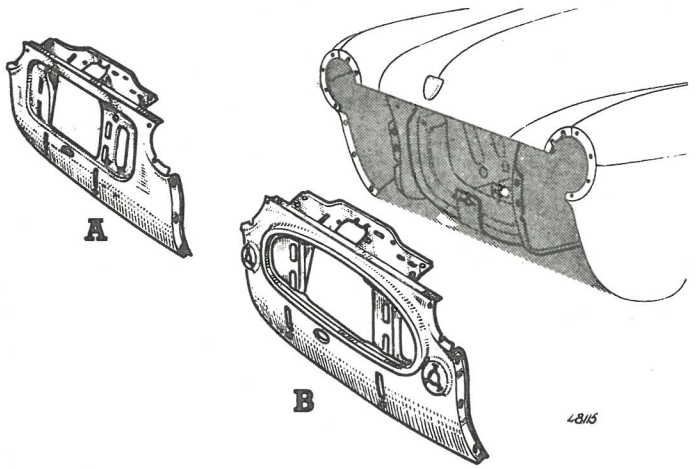
Remove the damaged wing.

Make sure the bolts or studs on the rear pillar are in good condition; replace if required.

To ensure a watertight seal between the wing, the front pillar and the roof panel, apply two sealer beads as shown on the illustration.

Position the new wing, adjust by correctly positioning the wing mouldings, replace the wing plate and the radiator grille attaching bolts and tighten the nuts.

Reassemble the headlamp and the wheel.



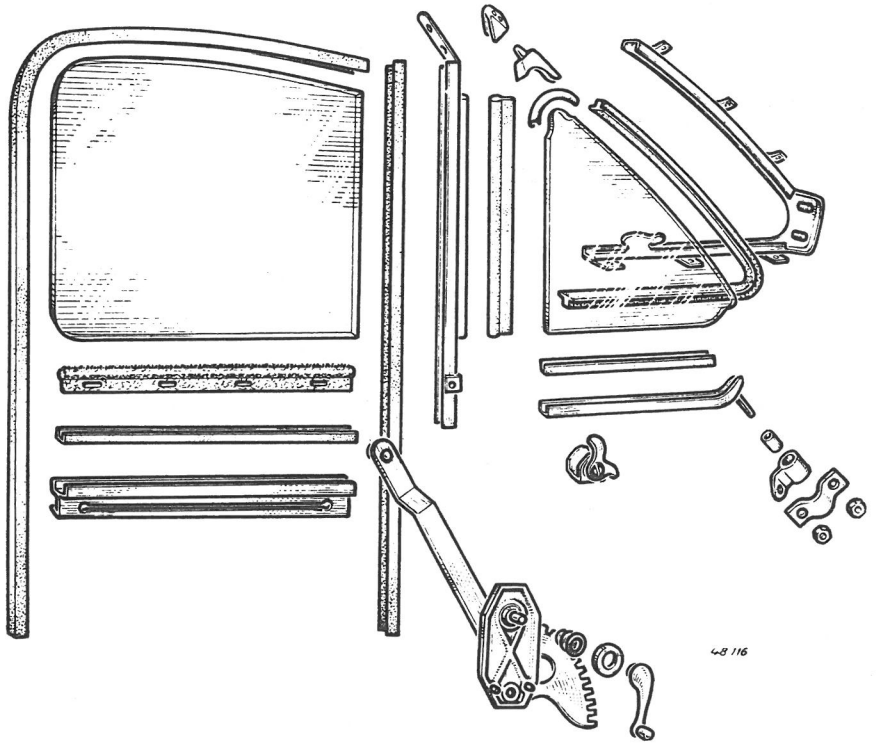
REPLACING THE FRONT RADIATOR GRILLE.

Remove the headlamps and the bumper with the bumper bars.
Disconnect the trafficators (for " Fregate " only).
Run off the grille to wings, wing plates cowl sides and side members attaching bolts.
Remove the damaged grille and disassemble.
Reassemble the new grille, install and adjust by positioning correctly the two wing mouldings.
Tighten the grille attaching bolts.
Connect the trafficators (for " Fregate " only).
Refit the headlamps and the bumpers with bars.

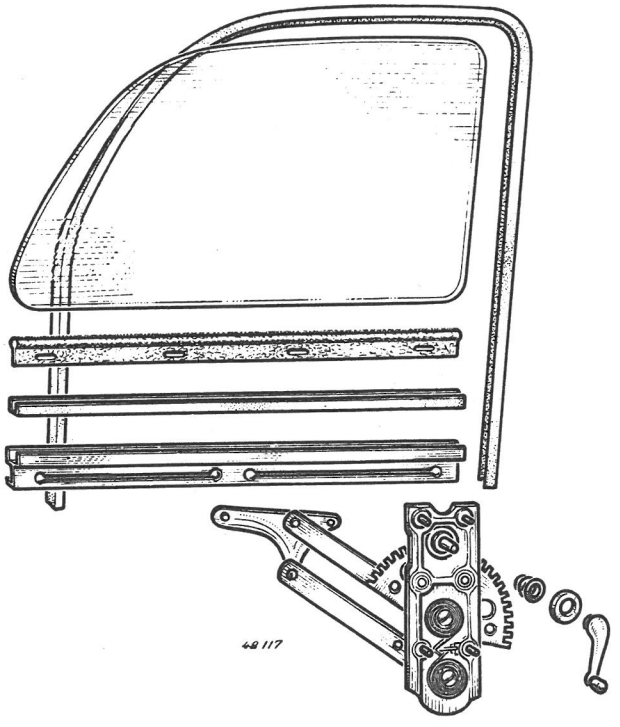
A — Front grille for " Caravelle " and " Domaine ".
B — Front grille for " Fregate ".

GLASS

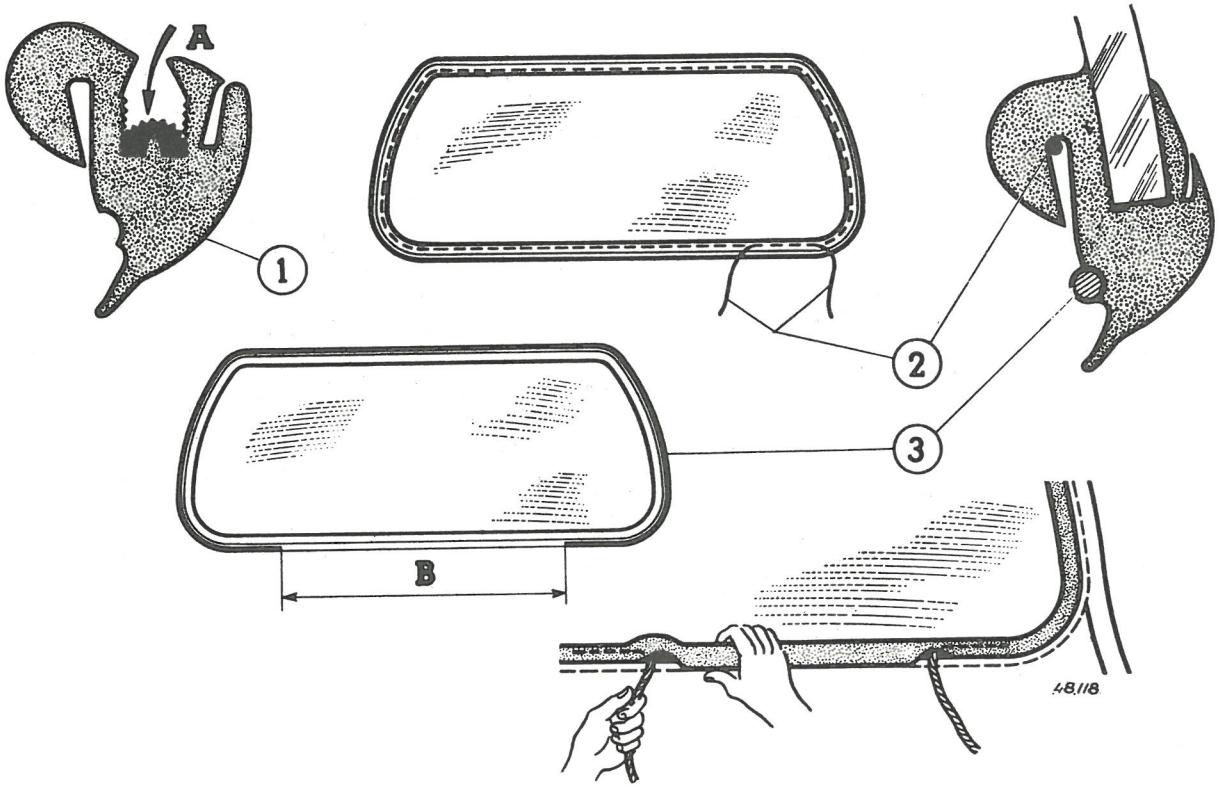
FITTING THE FRONT DOORS CLASSES



FITTING THE REAR DOORS CLASSES



GLASS (continued)



FITTING A WINDSCREEN OR A BACK WINDOW GLASS

PREPARING.

At (**A**), all around the rubber weatherstrip (**1**), insert a coat of Bostick type colourless cement.

Fit the weatherstrip on the glass with the portion of circular section of the strip being at the side opposite to the protrusion of the glass.

Install the glass (with protruding side down) on a covered table. In the free notch of the weatherstrip, insert a cord of 3 to 4 mm diameter around the weatherstrip, taking care to cross the cord by 10 cm at the lower end and towards an angle. Allow the two ends of the cord to hang by approximately 20 cm.

On the rubber weatherstrip, in the groove provided, apply a bead of " Prestick " sealer (**3**).
Do not touch the lower part (**B**).

NOTE. — If " Prestick " sealer is not available, use the " Bostick " type cement which should be brushed on.

INSTALLING :

Position the glass with its weatherstrip from the outside, the end of the cord hanging inside.
Position the glass with reference to the frame, hold and apply pressure at the point where the cord overlaps.

From the inside of the car, successively pull on each end of the cord, starting from the lower part of the glass which results in raising the tongue of the strip which is thus forced inside, thereby straddling the frame.

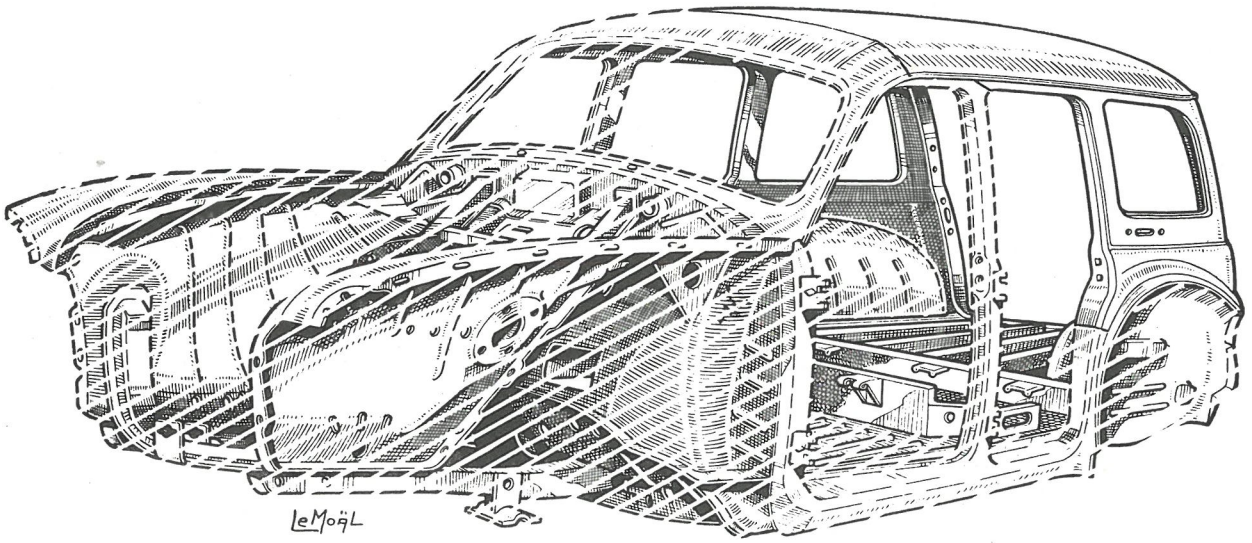
(The other operator at the outside facilitates, by successive pressures on the glass, the installing of the weatherstrip).

Continue installing the glass at the sides in the same manner.
At half height of the sides, the second operator hits the glass with a rubber mallet while the cord is pulled out.

Complete the removal of the cord at the upper part.

Once the cord is removed, the second operator makes sure that the rubber strip perfectly adheres to the body all around and completes, if necessary, the adherence by a few blows of the rubber mallet.

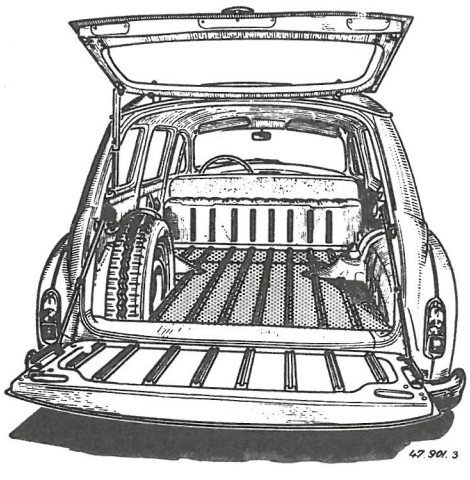
SPECIFIC " DOMAINE " FEATURES

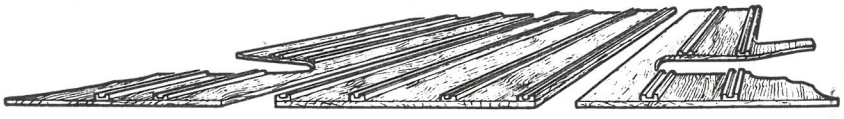


48035.bis.

For the " **TOP STRUCTURE** " of the Domaine, refer to the plate of the components for the Fregate body, page 162, except for a few items specific to the Domaine : intermediate floor - body sides - rear section components - roof panel - drip mouldings - tailgate - rear doors - glass - rear seat - details of which are illustrated in the following plates :

INTERMEDIATE FLOOR.


47 901 3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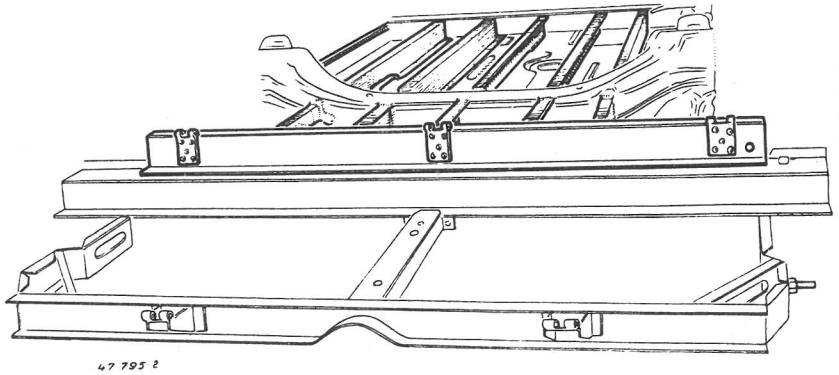
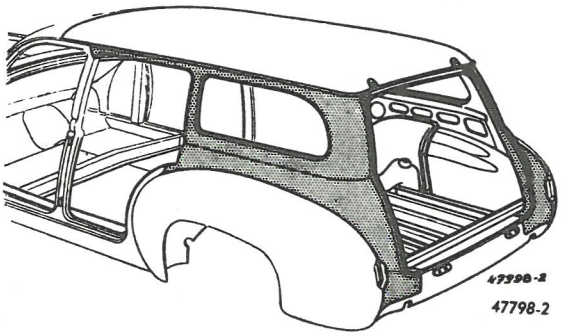
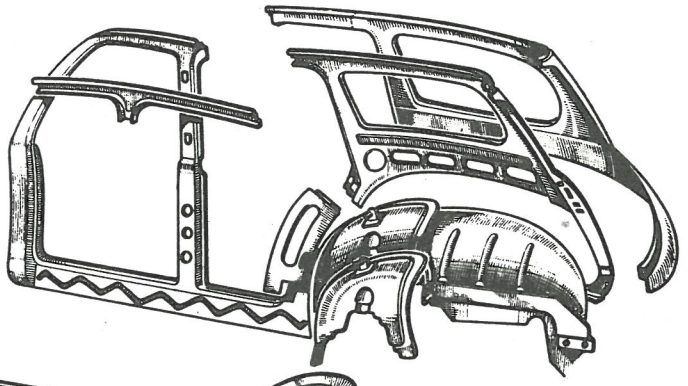
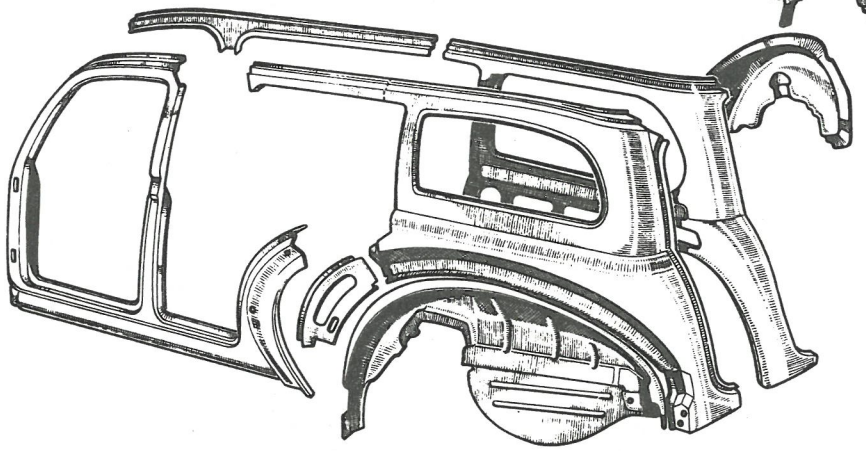

47 795 2

SPECIFIC " DOMAINE " FEATURES (continued)



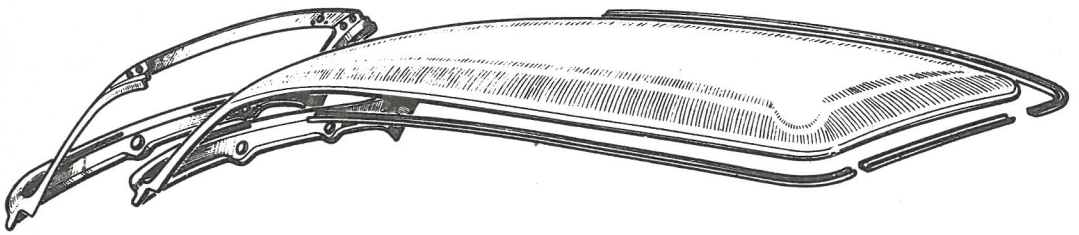
47798-2

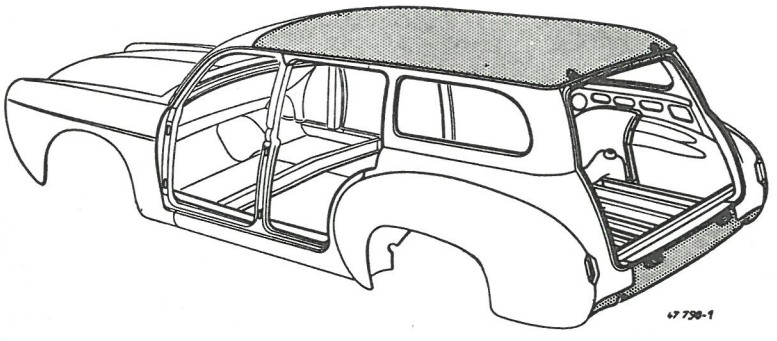




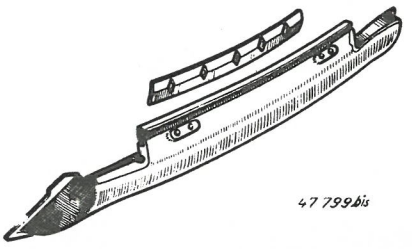
BODY SIDES

47.796 bis





ROOF PANEL — DRIP MOULDINGS
REAR SECTION COMPONENTS



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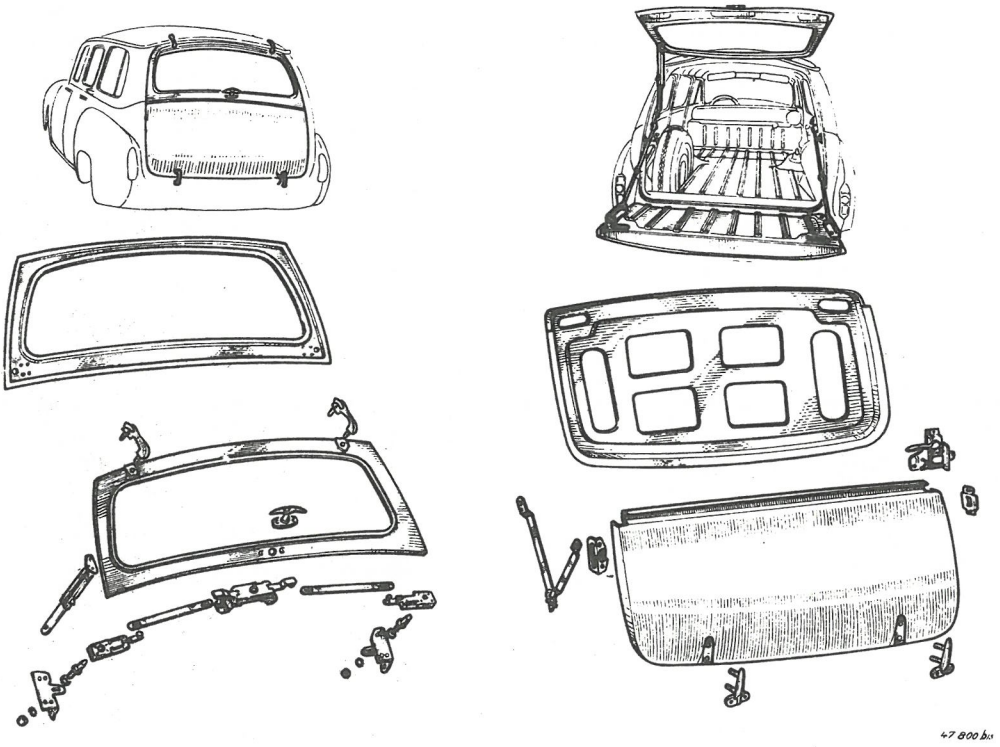
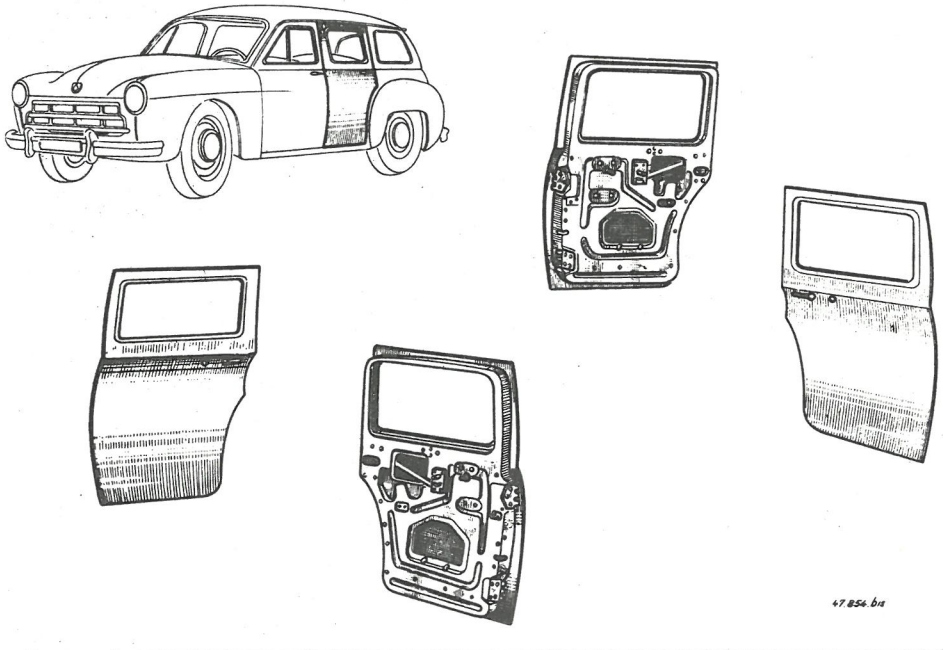
SPECIFIC " DOMAINE " FEATURES (continued)

TAILGATE



47 800 b/1

REAR DOORS



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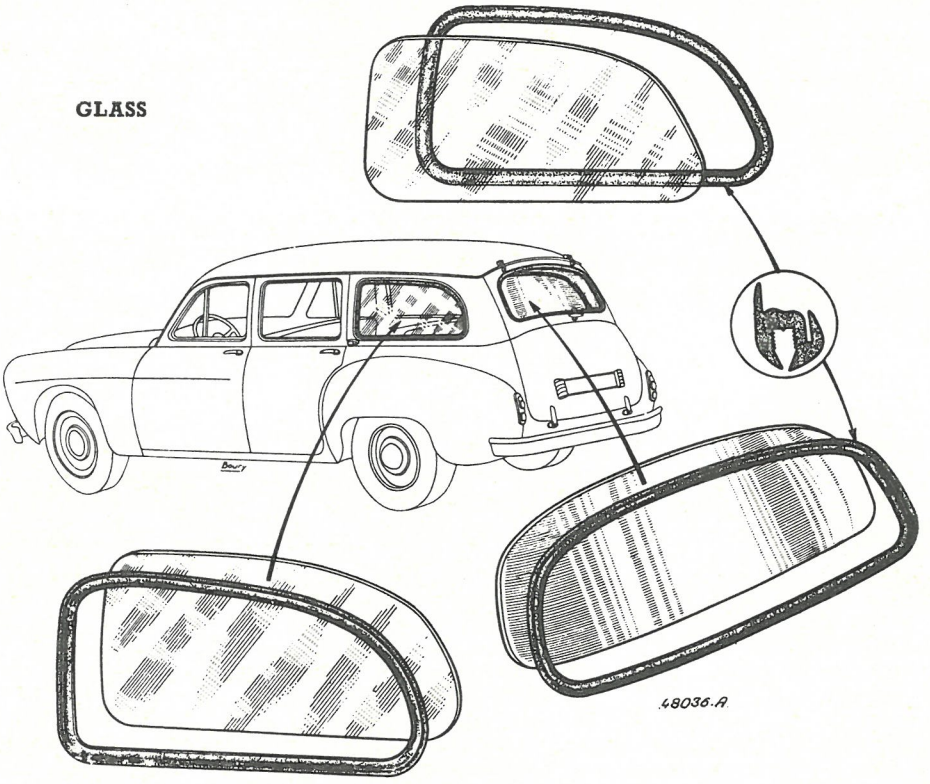
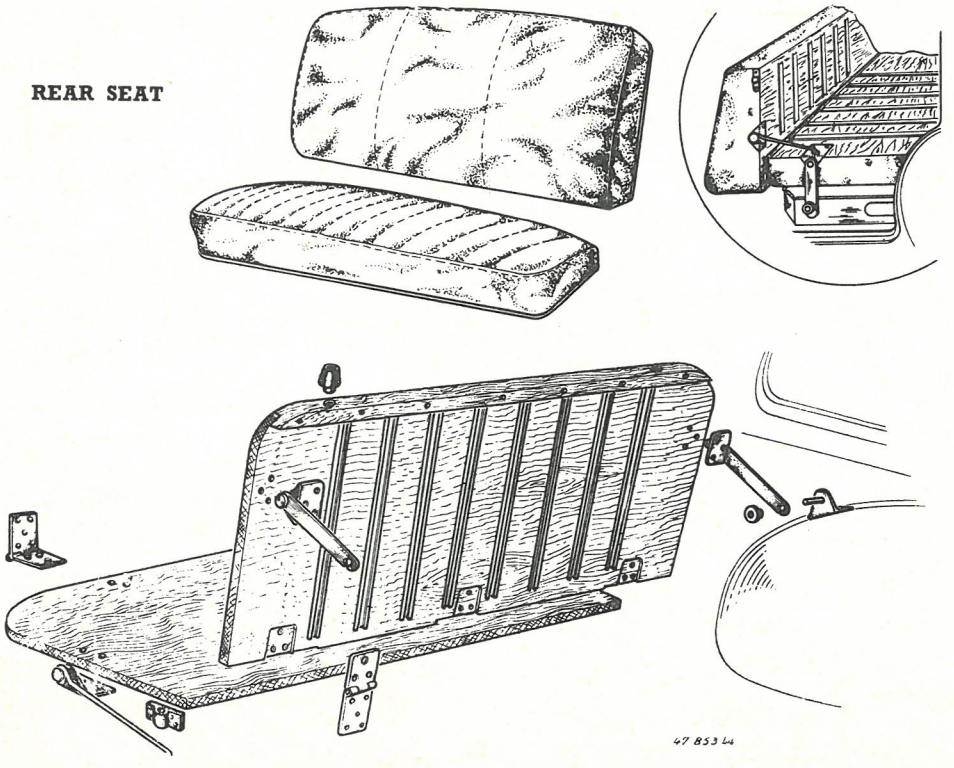
SPECIFIC " DOMAINE " FEATURES (continued)

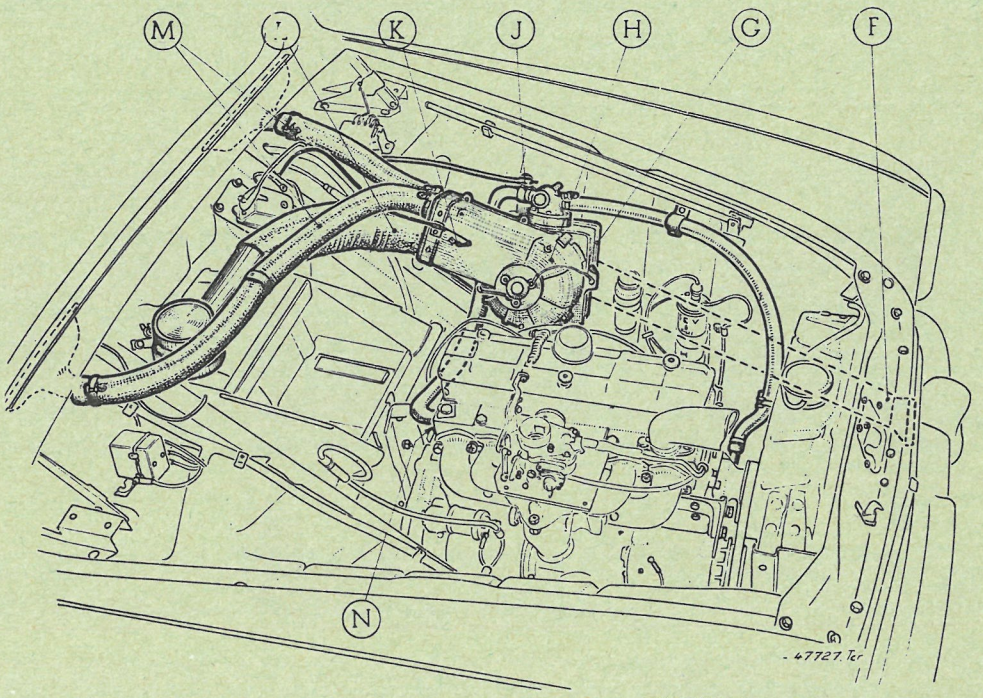
GLASS

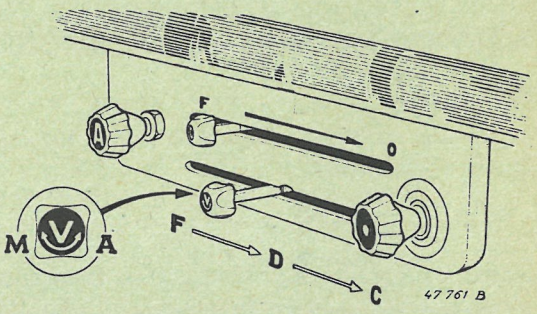


REAR SEAT



15. HEATER





Heating and demisting are achieved by a fresh or heated air inlet through a SOFICA heater fitted under the bonnet and which includes :

1° **A radiator (G)** supplied from the hot water of the engine taken at the cylinder head cover plate (**N**). The water flow is regulated by the opening of the valve (**J**) controlled by the knob " **C** " (heating) on the instrument panel :

— " C " knob at extreme left position F : no water flow, the device blows fresh air,

— " C " knob at the extreme right position O : the hot water flow is open, the device blows hot air.

2° **A blower (H)** electrically controlled which forces hot or fresh air towards the opening under the instrument panel through a piping (**L**) and towards two demisting nozzles at the bottom of the windscreen through two pipings (**M**).

A flap (**K**) mounted at the outlet of the blower and controlled by the knob " V " (Ventilation) of the instrument panel for :

— either eliminate the ventilation : knob " **V** " at extreme left F,

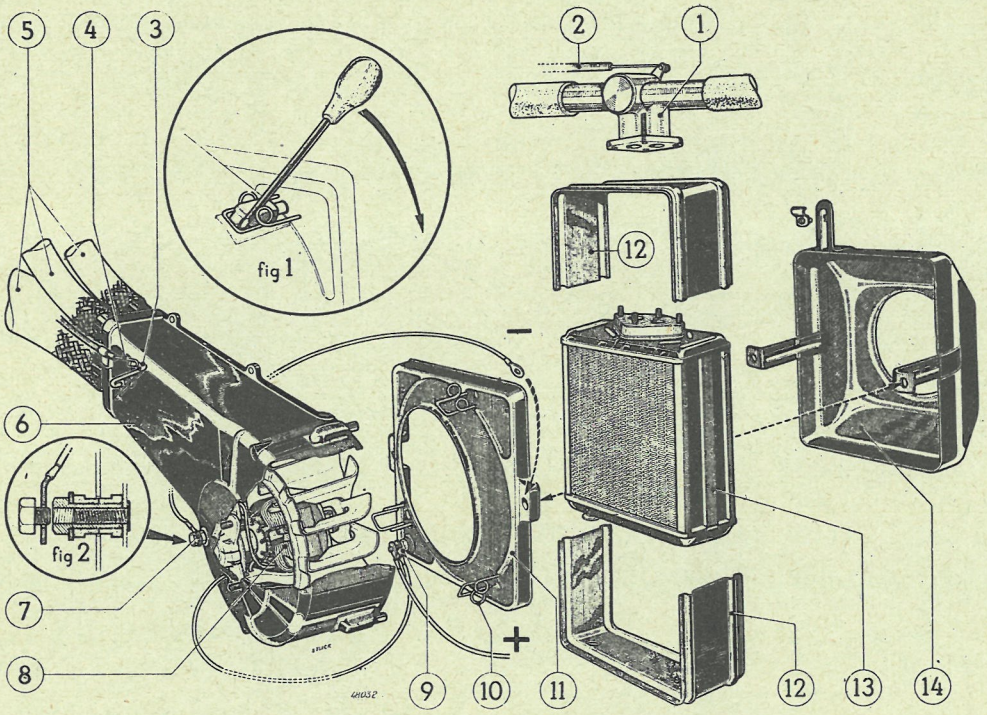
— or supply both demisting nozzles only : knob " **V** " at medium position D,

— or supply both demisting and heating : knob " **V** " at extreme right C.

This knob " **V** " also controls the starting of the blower by having it rotate by 1/4 of a turn to the right.

The air drawn by the blower is taken at the front of the car through a special opening located behind the radiator grille and leads to the heater through a piping (**F**) routed under the left wing.

This permits eliminating the blower action when the vehicle is driven at high speed, and to use air not contaminated by vapours and gas which could stagnate under the engine bonnet.



REPLACING THE MOTOR-BLOWER ASSEMBLY.

Disconnect :

— the flap (3) control cable (4) and free the sheath,
— the 3 pipings (5),
— the 2 wires supplying current to terminal (9) of the cover (11),
— the earth wire attached to one of the motor attaching screws (7).

Loosen the 3 springs (10) attaching the bakelite housing (6) on the cover (11).

To this end, rest should be taken on the locations provided to this purpose on the 3 ears of the housing (Fig. 1), and remove the housing-motor-blower assembly.

Separate the motor-blower assembly from the housing by removing the 3 bolts (Fig. 2).

When reassembling, take care to correctly fit the motor-blower assembly attaching washers on the housing (Fig. 2) and apply pressure on the two loops of the springs (10) in order to hook on.

REPLACING THE RADIATOR.

Drain the heater (at its lower part) and partially the cooling system.

Remove the housing-motor-blower assembly (see above).

Glear the sheath (2) controlling the stop cock (1).

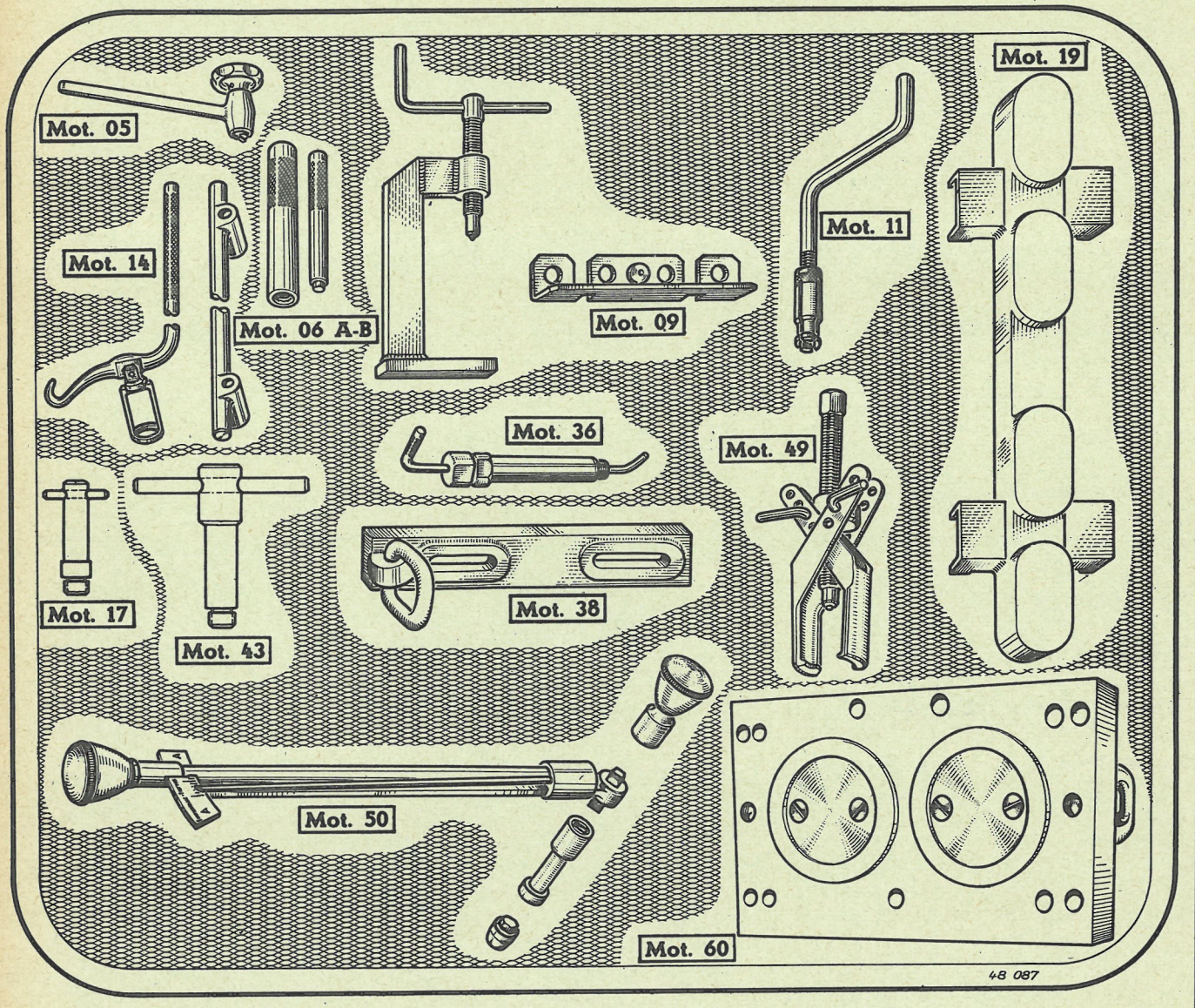
Separate the stop cock (1) from radiator (13).

Remove the two bolts attaching cover (11).

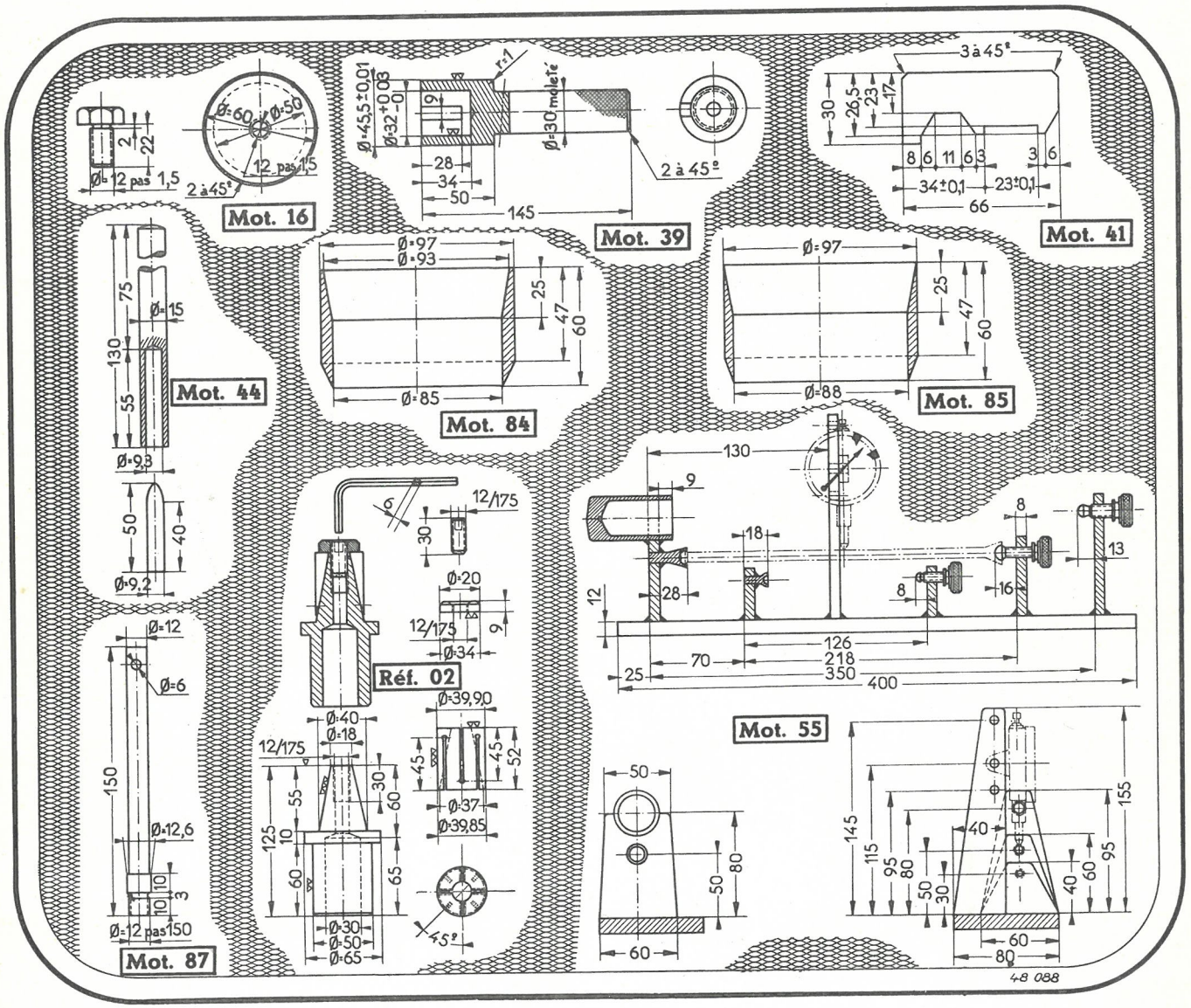
On support (14), remove radiator (13) and the two protectors (12).

When reassembling, do not omit attaching the earth wire with the bolt assembling the cover (11) to the support (14).

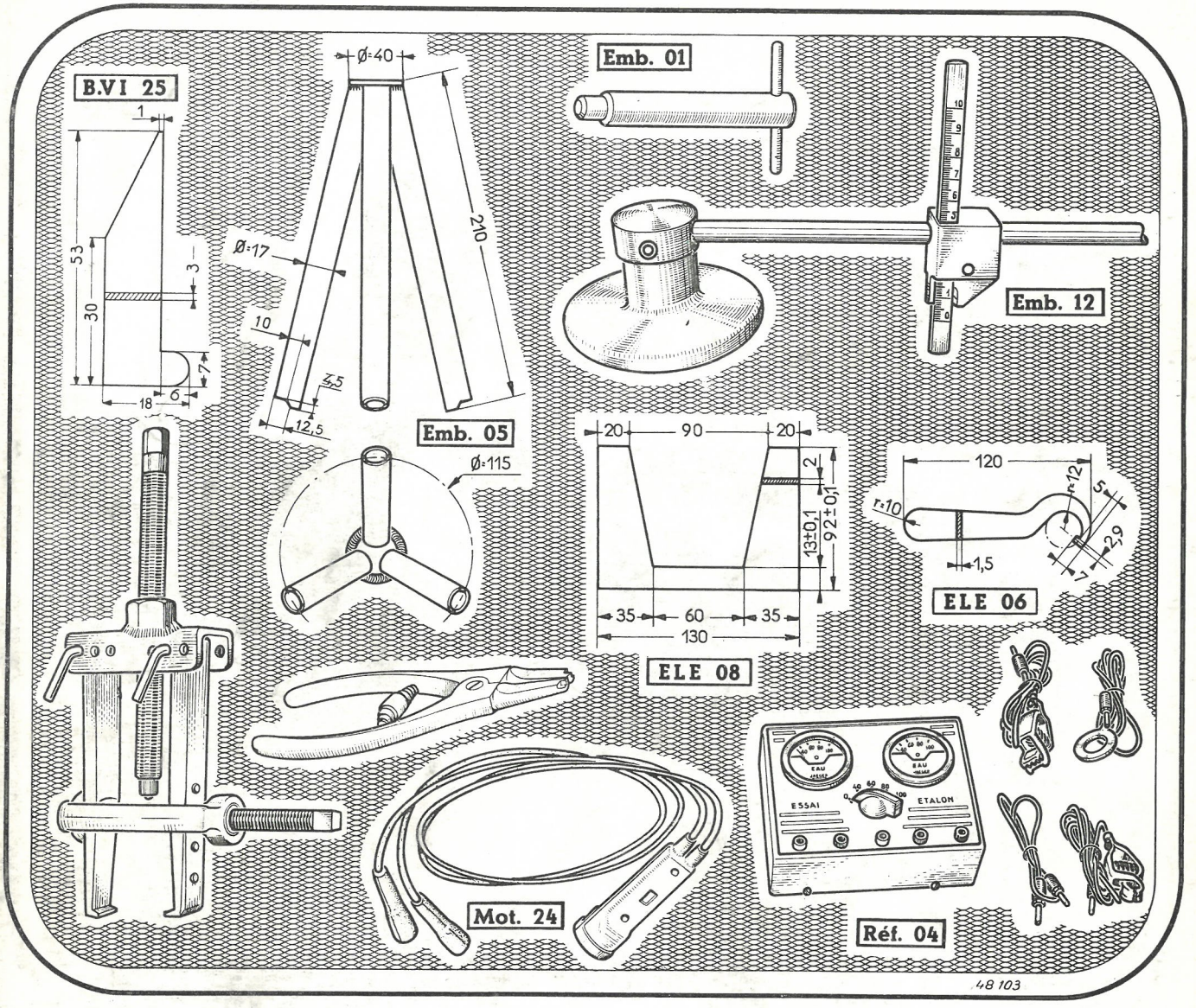
16. SPECIAL TOOLS



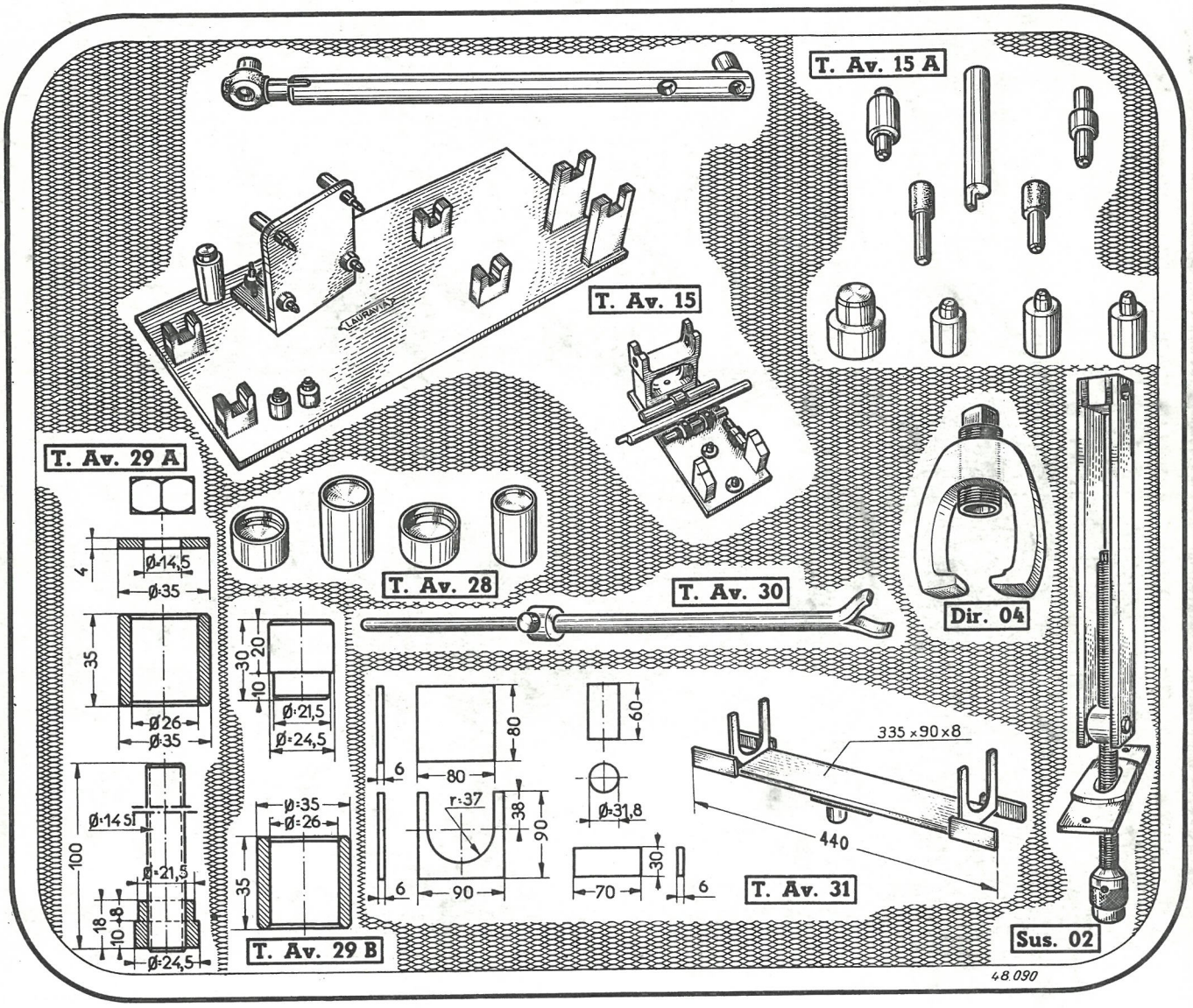
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
ENGINE	**Mot. 05**	10.788	Spanner, rocker arm adjustment.
	Mot. 06	10.732	Puller and inserter, valve guides.
	Mot. 09	10.737	Compressor, valve springs - multiple type.
	Mot. 11	10.725	Puller, crankshaft bearing.
	Mot. 14	10.738	Compressor, valve springs - single type.
	Mot. 17	10.739	Puller, oil pump drive pinion.
	Mot. 19	10.740	Base plate, cylinder head (in conjunction with Mot. 09).
	Mot. 36	10.724	Holder, valves.
	Mot. 38	10.746	Ring, engine lifting.
	Mot. 43	10.747	Puller, rocker arm shaft.
	Mot. 49	10.756	Gear puller.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg).
	Mot. 60	12.143	Plate for pre-stressing the cylinder liners bottom seals.
	Mot. 75	12.056	Magnetic support for dial indicator (see Special tools, Reduction gear, page 179).



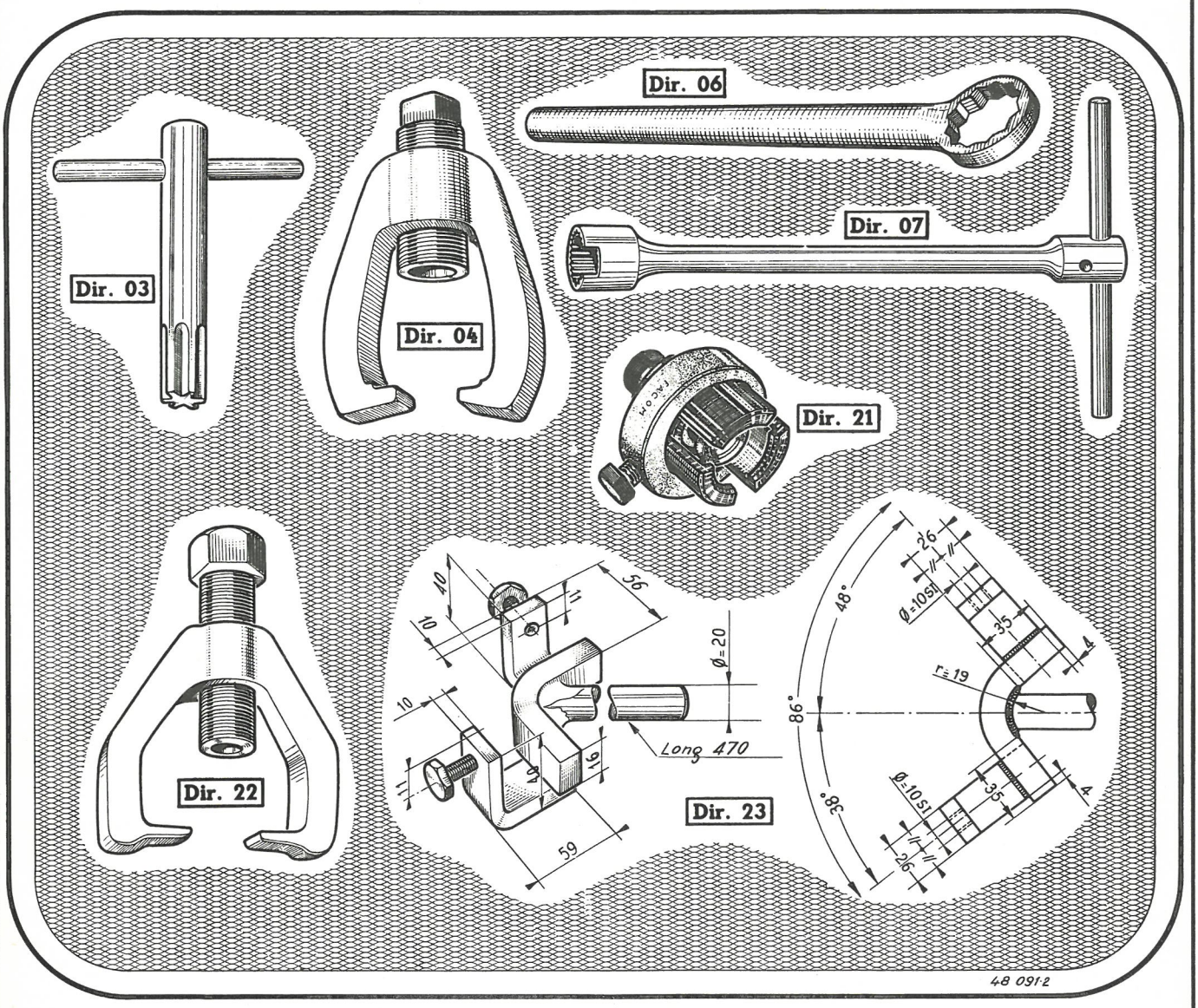
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
ENGINE (continued)	**Mot. 16**	F.L.	Washers, cylinder liners holding.
	Mot. 39	F.L.	Aligner, timing gear cover.
	Mot. 41	F.L.	Gauge for adjusting rocker arm shafts.
	Mot. 44	F.L.	Inserter, valve stem sealing washers.
	Mot. 55	F.L.	Fixture for checking push rods.
	Mot. 84	F.L.	Ring piston assembly : for 2 litres 668-6 ENGINE.
	Mot. 85	F.L.	Ring for piston assembly : for 671-1 Etendard ENGINE.
	Mot. 87	F.L.	Stud for aligning cylinder head gasket.
	Ref. 02	F.L.	Expansion reamer for water pump bush.



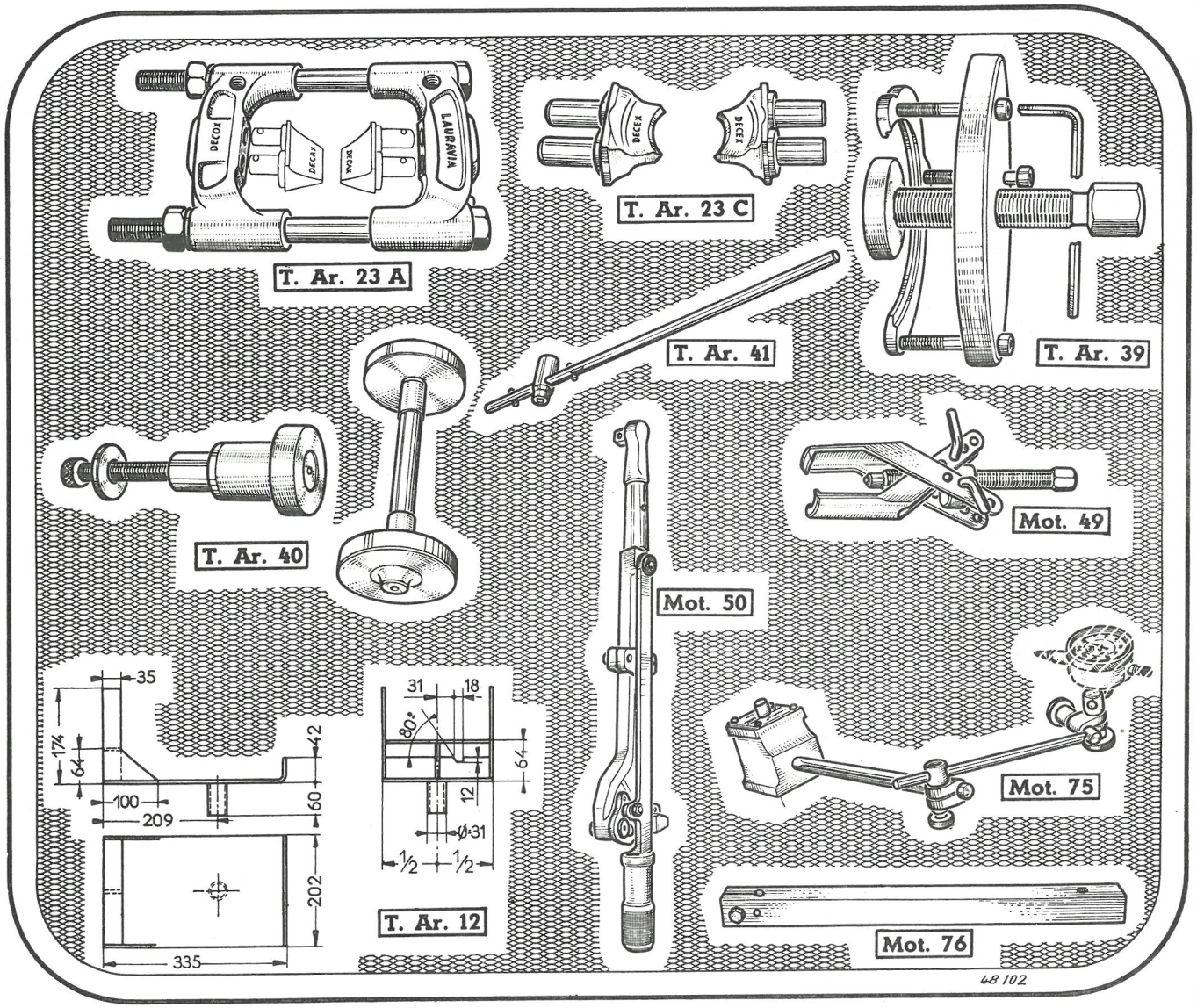
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
CLUTCH	**Emb. 01**	10.742	Aligner, clutch disc.
	Emb. 05	F.L.	Tripod, springs compression.
	Emb. 12	12.191	Rule, clutch checking.
ELECTRICAL EQUIPMENT	**Ele. 06**	F.L.	Spanner, pin type, for switch washer.
	Ele. 08	F.L.	Gauge, starter pinion to relay adjusting.
	Mot. 24	9.477	Stroboscope lamp.
	Ref. 04	12.124	Checking device for Jaeger temperature sender and receiver.
GEARBOX	**B. Vi. 25**	F.L.	Positioner for gear shift lever thrust pin.
	No R.S. reference	12.273	Puller for groove type bearings.
	No R.S. reference	12.279	Pliers, snap ring.



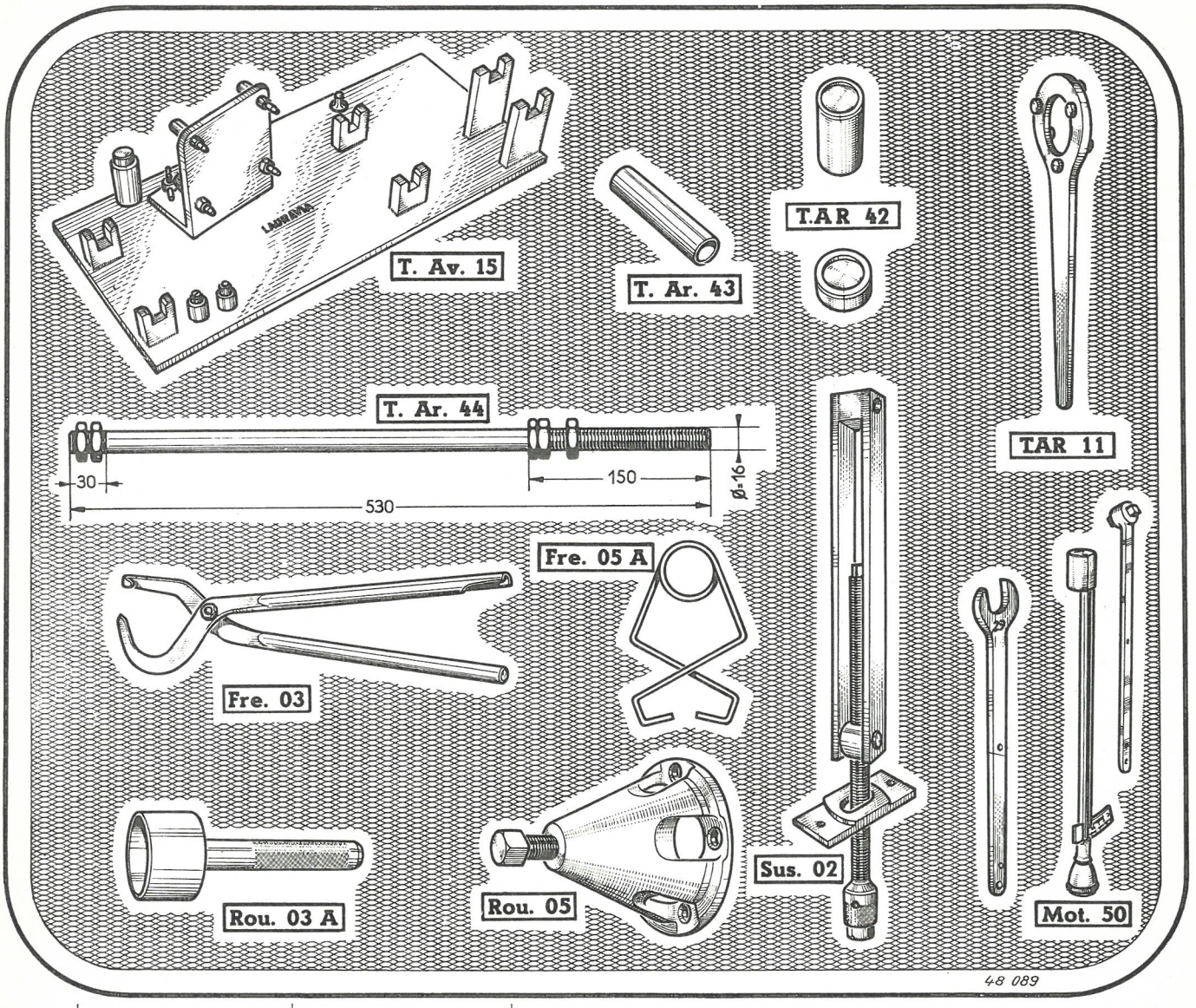
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
FRONT AXLE	**T. Av. 15**	11.887	Fixture for checking front axle components.
	T. Av. 15 A	12.162	Set of complementary pieces for T. Av. 15.
	T. Av. 28	12.163	Pullers and inserters for rubber bushes.
	T. Av. 29 A	F.L.	Puller, hand type, stub axle bushes.
	T. Av. 29 B	F.L.	Inserter and remover for stub axle bushes.
	T. Av. 30	12.169	Rod, wheels positioning.
	T. Av. 31	F.L.	Support, front cross-member — fits on rolling jack.
	Dir. 04	10.751	Puller, link ball joint.
	Sus. 02	10.745	Compressor, suspension spring.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg) (see Special Tools, Engine - page 174).



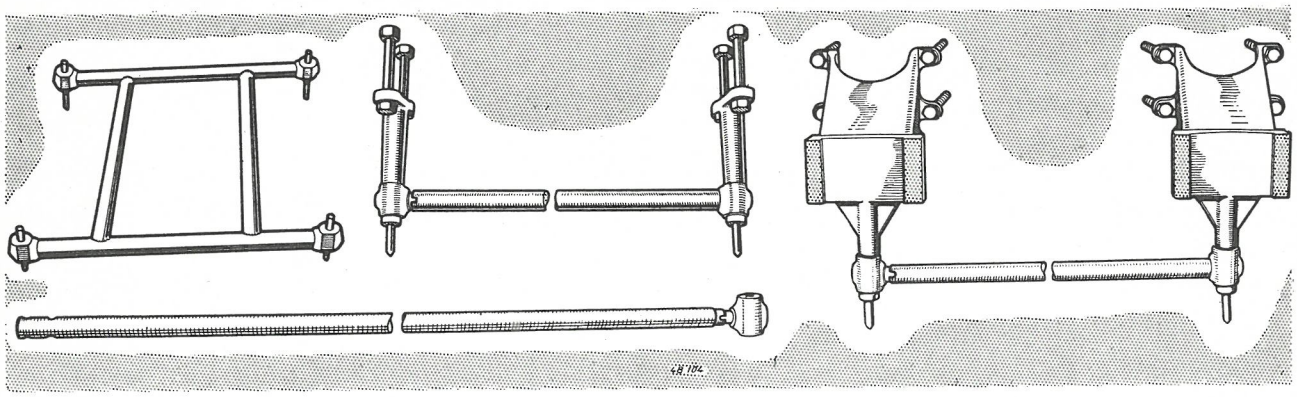
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
STEERING	**Dir. 03**	10.744	Spanner, steering track rod ball joints.
	Dir. 04	10.751	Puller, links ball joint.
	Dir. 06	12.066	Spanner for steering link end plugs.
	Dir. 07	10.727	Spanner for steering case and relay mountings.
	Dir. 21	12.153	Puller (elastic type) steering wheel.
	Dir. 22	12.166	Puller, steering lever.
	Dir. 23	F.L.	Clamp, steering clearance checking.



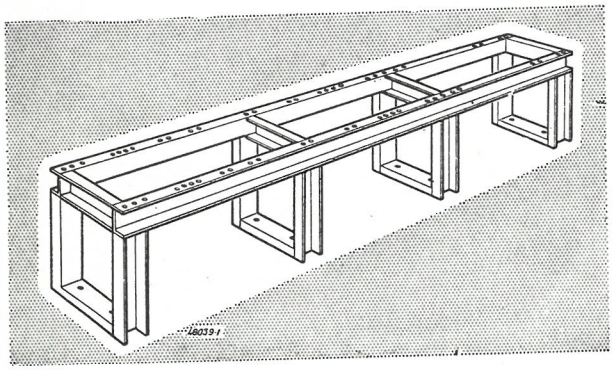
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
REDUCTION GEAR	**T. Ar. 12**	F.L.	Support, reduction gear.
	T. Ar. 23 A	10.755	Loosener, bearing - with asymmetric jaws.
	T. Ar. 23 C	11.808	Special jaws for T. Ar. 23 A.
	T. Ar. 39	12.262	Puller, differential bearings.
	T. Ar. 40	12.263	Tool for drive pinion setting (dummy pinion).
	T. Ar. 41	12.274	Long sleeve with control bar.
	Mot. 49	10.756	Puller, gear.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg).
	Mot. 75	12.056	Support, magnetic type, for dial indicator.
	Mot. 76	12.065	Support, dial indicator.



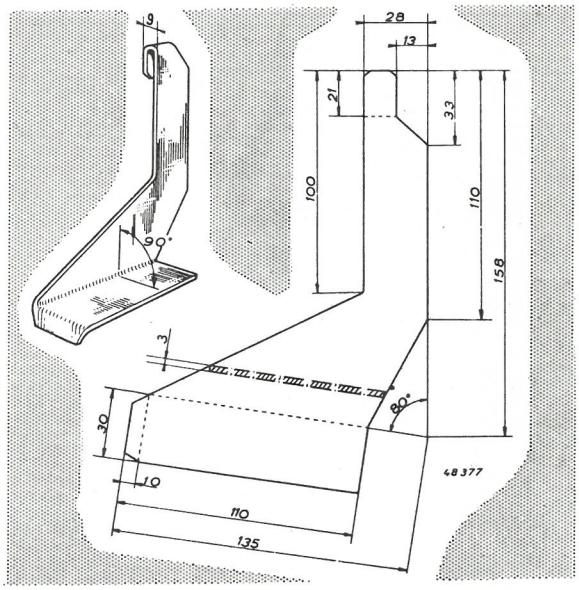
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
REAR AXLE	**T. Ar. 11**	12.141	Spanner for suspension arm bushes.
	T. Ar. 42	12.264	Puller and inserter, rubber bushes.
	T. Ar. 43	12.265	Bush, complementary to T. Av. 15.
	T. Ar. 44	F.L.	Positioner, for bolts locking.
	T. Av. 15	11.887	Gauge for checking the rear arm.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg).
	No. R.S. reference	12.276	Spanner, 29, fits to Mot. 50.
BRAKING SYSTEM	**Fre. 03**	10.569	Pliers for assembling retracting springs.
	Fre. 05 A	9.994	Clip, wheel cylinder.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg).
WHEELS HUBS DRUMS	**Rou. 03 A**	10.763	Puller, front hub plugs.
	Rou. 05	10.899	Puller, hub.
SUSPENSION	**Sus. 02**	10.745	Compressor, suspension spring.
	T. Ar. 44	F.L.	Positioner, for locking bolts.
	Mot. 50	9.877	Torque wrench (0 to 20 m.kg).
	No. R.S. reference	12.276	Spanner, 29, fits to Mot. 50.



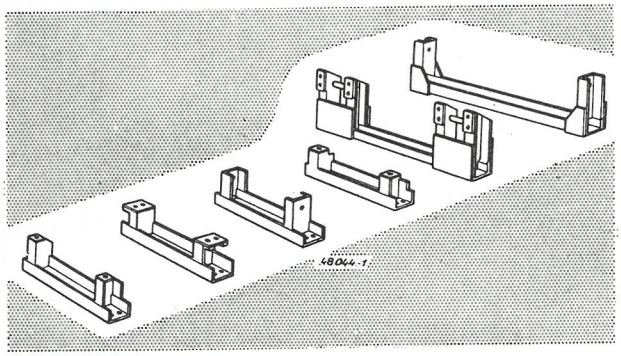
Car. 03



Car. 08



Car. 17



Car. 11

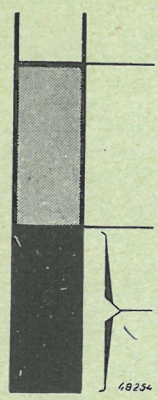
	RENAULT-SERVICE REFERENCE	SAPRAR REFERENCE	DESCRIPTION
BODY	**Car. 03**	10.897	Tools for checking the Fregate body.
	Car. 08	12.182	Base for complete combination bench.
	Car. 11	12.185	Set of 6 supports for Fregate (completes Car. 08).
	Car. 17	F.L.	Angle plate for holding engine bonnet (raised position).

17. LUBRICATION AND MAINTENANCE

Refer to the DRIVER's HANDBOOK AND TO THE LUBRICATION AND MAINTENANCE GUIDE of the vehicle, paying attention to the following points :

Every 500 Km

ENGINE

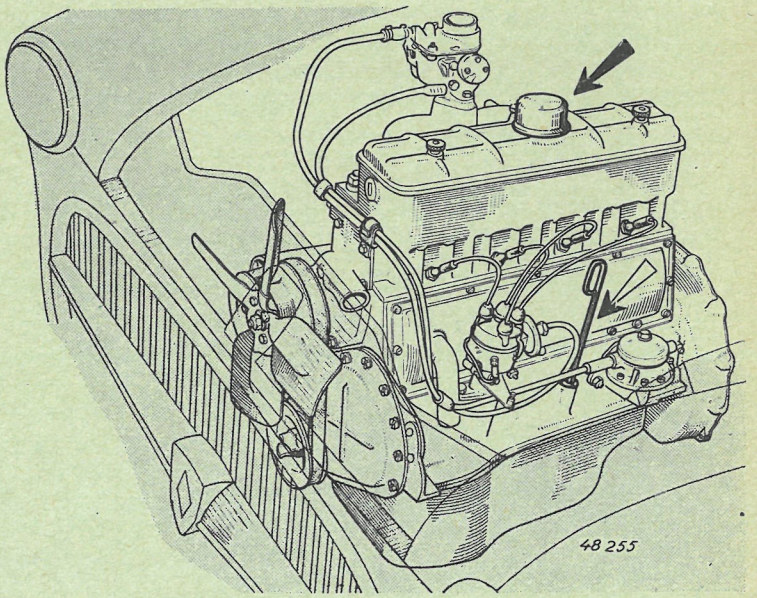


MAXIMUM : 4 LITRES - DO NOT EXCEED

Minimum : 2 litres.

DANGER

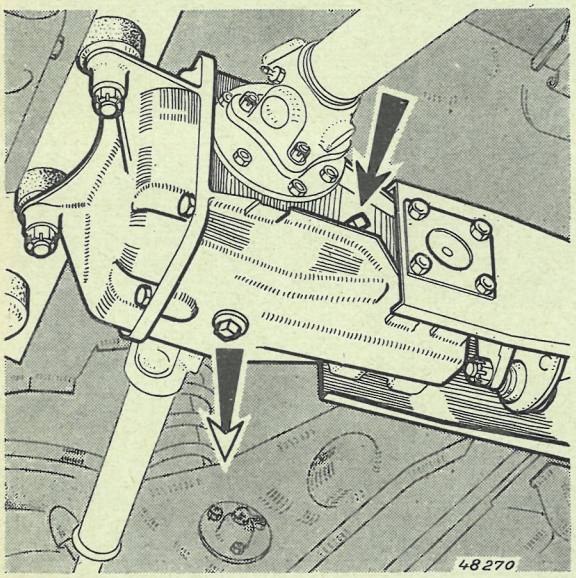
DIPSTICK



ENGINE OIL

Every 10,000 Km

REDUCTION GEAR



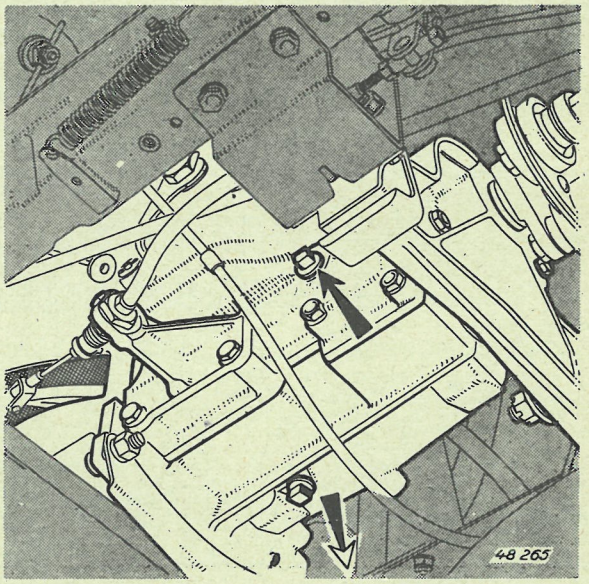
Drain and refill until plug hole level. Capacity :

Reduction gear : 1.5 l.

Use the offset spanner for plugs (B. Vi. 03).

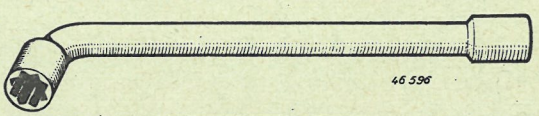
Gearbox and rear axle oil.

GEARBOX



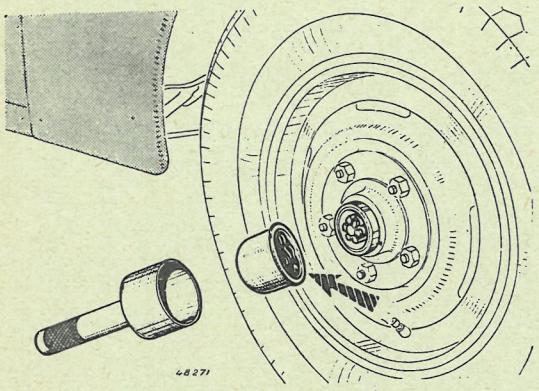
Gearbox :

— up to N° 9.910 : 1 l.
— from N° 9.911 : 1.6 l.



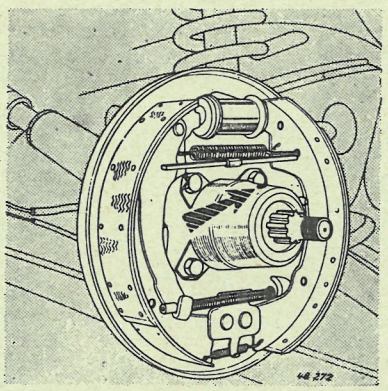
Every 25,000 Km

FRONT WHEELS (Hubs)



Remove the front hub plugs using the special tool (Ref. Rou. 03 A) and fill up to 3/4.

REAR WHEELS (Hubs)



Remove the drum with a hub puller (Ref. Rou. 05). Temporarily replace the plug by a lubricator.

BEARING GREASE.

18. MEMORANDUM

MEMORANDUM (continued)