

# CITROEN

REPAIR MANUAL  
SUPPLEMENT

## ID 19 - DS 19

1963 MODELS



## Editor's note

Welcome to 498, the Supplement to the DS19 and ID19 manuals 465 and 472. It has been scanned by Joe Hovel from the original owned by Roger Wilkinson. This is a big committment of patience and generosity on their part. Please do your best to prevent people selling this commercially, and complain if you have been persuaded to pay for it!

It may be updated, and you may wish to know of other manuals for these cars which are available free. I've made a list of the publications I know of, with links to those which can be downloaded, here:

<http://www.you-me-and-us.com/Site/Citroen%20publications%20list.html>

There are two indices near the front of the document, one for use with the DS19 manual 45, the other with the ID manual 472. Trouble is that each of these manuals exists in several forms, each differently paginated.

We now have the last version of the DS19 Manual 465, which is the one to which the supplement index relates. It is not yet in a form which can easily be printed onto A4, so it is not as easy to print out as the earlier version which I scanned some years back. It is not hard to trim the pages to suit, but it takes a lot of time. The early manual also is ocr'd for the first 250 pages or so, which means it is searchable. That \*really\* took some time, and I don't see that getting done for the new version! For a while I will leave both up, so you can choose.

The situation is as yet less clear for the ID manual. The latest version we have of this is 444 pages long, and will soon be available. The one presently available is only 329 pages long, but it does correspond with the pagination in the ID index of 498 (I checked, and found only one error!)

I've also checked the later 444-page edition, and it contains many small changes, but it does not incorporate the Supplement revisions verbatim, so it does not appear to remove the need for the Supplement. Various possibilities - a new ID19 index for the Supplement perhaps?

As to the use of this edition - the bookmark index will hopefully help you find your way around it, and I've paginated it as per the original, so where you come a reference to an illustration ("see Pl. nnn") you can drag the scroll button on the right until you see "Pl. nnn" and release it, whereupon you will have the illustration on the screen. Use the 'back' button at the foot of the screen (or a Bookmark) to return to the page you were looking at in the text.

Please let me know of errors or annoyances you find via [tony@you-me-and-us.com](mailto:tony@you-me-and-us.com)

The operations shown in this Repair Manual  
relate only to vehicles produced since  
September 1962.

*Printed in England*  
by  
*PHOTOLITH TECHNICAL SERVICES LTD., HOUNSLOW.*

# METHOD OF USING THE REPAIR MANUAL

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This manual is primarily intended for left-hand drive cars, but the application to right-hand cars should present no difficulties as any differences are obvious. In this book are shown the operation necessitated by new or modified units since September 1962. It constitutes an additive to the Repair Manuals DS 19 No.465 and ID 19 No.472.

## CLASSIFICATION

We have shown at the beginning of this additive a classification of the main units of the car. The 3 figured number in front of each unit corresponds to the operation number relating to this particular unit, this classification is followed by an index of operations relating to the cars DS 19 and ID 19,

## METHOD OF NUMBERING

The operations are given the same number as in the Repair Manual then suffixed by the letter "A".

The number is composed of:

- a) The indication of the type of vehicle : DS or ID. The letter D, if the operation is common to both types of cars.
- b) A number of 3 figures indicating the unit or part of the unit (this number is shown in the general classification).
- c) A code number indicating the type of work, dealt with in the operation. These figures are separated from the number by a hyphen.

### Use of the code:

The figure 0 indicates the adjustments.

The figures 1, 4, 7 indicate the replacement of units (removal and refitting).

The figures 2, 5, 8 indicate the stripping down and assembling.

The figures 3, 6, 9 indicate overhauling (reconditioning).

## EXAMPLES:

Operation No. DS 334-0 : *Adjustment* on the change speed control (on DS 19).

Operation No. ID 372-1 : *Replacement* of a driveshaft or a pivot (on ID 19).

Operation No. DS 100-2 : *Stripping and assembling* an engine gearbox assembly DS 19.

Operation No. D 442-3 : *Overhauling* a power assisted steering (on DS 19 or ID 19).

Operation No. ID 451-4 : *Replacement* of a rear brake drum (on ID 19).

### PARTICULAR POINTS

At the beginning of each operation the particular points are given (tightening torsions, adjustment dimensions, special assembly precautions, etc.).

The number of the line of the particular points corresponds with the number of the paragraph in the operation.

### ILLUSTRATIONS

At the top left-hand corner of each illustration is shown the number of the operation concerned with this particular illustration (this information is not given on the illustration for the tools).

### TOOLS

The special tools used for repairing the DS 19 or the ID 19 are indicated as follows:

1. By a number, suffixed by the letter T. These tools are sold by Etablissements FENWICK, 15, rue Fenelon, PARIS (10e).
2. By a number prefixed by the letters MR, which are not supplied by us. The necessary information and dimensions for making them are shown in this manual.

### TECHNICAL INFORMATION

Any enquiries should be addressed to:

Service Department, Citroen Cars Limited, SLOUGH, Bucks, England.

# GENERAL CLASSIFICATION

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The number in front of each unit corresponds to the operation number relating to this particular unit.

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Replacement of a sealing ring (Cyclam) (see Op. DS 314-1, para 81).						
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COMPONENT	See Additive			DESCRIPTION	See Repair Manual No. 465	
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				Replacement of the front brake shoes .....	ID 451-1	277
			1	Replacement of a brake unit.		
				Replacement of a brake disc (see Op. D 330-4).		
				Overhauling a brake unit .....	ID 451-3	281
				Work on the rear brakes .....	ID 451-4	286
				Replacement of a rear brake drum .....		286
				Replacement of a rear brake shoe .....		287
				Replacement of a rear brake back plate .....		288
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				Adjustments of the hydraulic brake control .....	ID 453-0	291
				Bleeding the brake system .....		291
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				Work on the hydraulic brake control .....	ID 453-1	293
				Replacement of a master cylinder .....		293
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				Work on the hydraulic brake control .....	ID 453-3	297
				Overhauling a master cylinder .....		297
				Overhauling a pedal gear .....		298
				Overhauling a wheel cylinder .....		299
				Replacement of an articulating rear brake pipe .....	ID 453-4	300

COMPONENT	See Additive			DESCRIPTION	See Repair Manual No. 472	
	Operation No.	Page No.	Para.		Operation	Page
Mechanical brake control .....	D 454-0			Adjustment of the mechanical brake control.....	ID 454-0	302
				<i>Adjustment of the brake handle lock .....</i>		302
				<i>Adjustment of the control cable.</i>		
				<i>Adjustment of the connecting cable.</i>		
				Work on the mechanical brake control.....	ID 454-1	303
				Replacement of a hand brake lever.....		303
				Replacement of a hand brake release trigger .....		305
				Replacement of a locking ratchet .....		306
				Replacement of a control cable .....		306
				Replacement of a connecting cable .....		307
ELECTRICAL .....				Overhauling a brake control.....	ID 454-3	308
				Arrangement of an electrical installation .....	ID 510-1	309
Dynamo.....				Schedule of bulbs fitted on the car .....		313
				Replacement of a dynamo .....	ID 532-1	314
				Overhauling a dynamo .....	ID 532-3	315
				Overhauling a Ducellier 7158-A dynamo .....		315
				Overhauling a Paris-Rhone G 11. R 91 dynamo.....		318
Starter motor.....	D 533-1		1	Replacement of a starter motor.		
				Overhauling a starter motor. ....	ID 533-3	322
				Overhauling a Ducellier 6003-A starter motor .....		322
				Overhauling a Paris-Rhone D 11. B 42 starter motor .....		325
HEATING AND DEMISTING.....	D 642-1			Replacement of a heating and demisting radiator.		
				D 642-3		

**PARTICULAR POINTS****Removal**

- 8 *Remove the steering: mark its position in relation to the relays and the steering wheel.*
- 18 *Remove the front exhaust pipe (connecting pipe) from the underside of the car.*
- 22 *Remove the screws securing the front crossmember support. Do not lose the adjusting shims fitted between the crossmember and sidemembers.*

**Refitting**

- 23 *Pre-adjust the rear flexible blocks: 98 mm between the face of the nut receiving the engine support arm and the bearing face of the flexible block on the support on the body (cars produced before October, 1962) and 94 mm, this dimension being taken in the same condition for the flexible blocks with the body painted green (cars produced since October, 1962).*
- 24 *Adjust the front crossmember support: place the shims found when dismantling between the crossmember and sidemembers so that the distance between the brake disc and the sidemember on the left side is greater by  $70 \pm 2$  mm than the same distance measured on the right hand side. Use the shims found when dismantling.*
- 27 *For the front exhaust pipe : carefully follow the instructions given in the paragraph.*
- 30 *After having connected the mechanical control cables to the front brakes, adjust the connecting cables: the control levers must be at the limit of their separation from their eccentric stop.*
- 38 *Fit the steering, note the markings made when dismantling: position of the steering in relation to the steering wheel and steering relays. Adjust the angular position of the steering: groove of the steering pinion in contact with the gauge pin of the fixture 1955-T (see Pl. 25) (cars with power assisted steering).*

*NOTE - If the steering is to be renewed, the alignment and steering lock must then be adjusted (see Op. ID 440-0).*

- 47 *Adjust the clutch clearance (see Op. ID 314-0).*
- 48 *Bleed the brakes (see Op. ID 453-0).*
- 51 *With the manual height control in the high position, check the level of the fluid in the hydraulic reservoir.*

		TOOLS
REMOVAL		
1	Hold the bonnet open (stop MR-4158, see Pl. 2, fig. 1) and put the front of the car on stands (jacking bracket 2505-T, see Pl. 51). . . . .	Stop MR-4158 Jacking bracket 2505-T
2	Remove the spare wheel. Release the pressure in the whole of the hydraulic system. Drain the hydraulic fluid reservoir. Retain the fluid in a clean sealed container.  Drain the radiator, retain the water which contains anti-freeze. . . . .	8 mm spanner
3	Remove the assembly of the crossmember supporting the spare wheel and the air ducts of the radiator: a) Disconnect the bonnet locking cables from their catch. b) Remove the screws fixing the crossmember on the front wings. . . . . c) Disconnect the flexible pipe, from the radiator: remove the right-hand fixing screw and unscrew the left-hand screw. d) Disconnect the strap retaining the spare wheel, from the front crossmember. . . . . e) Disengage the assembly of the crossmember, strap and air ducts.	8 mm box spanner 8 mm box spanner 8 mm spanner 8 mm box spanner
4	Disconnect the battery cables, from the regulator and from the coil. Remove the battery and its tray. . . . .	12 mm spanner 12 mm box spanner
5	Disconnect the high pressure pump feed pipe, from the hydraulic fluid reservoir (Break (Safari) type cars and saloon type cars with power assisted steering). Remove the straps securing the reservoir. . . . .	8 mm box spanner
6	Remove the battery bracket: a) Disconnect the leads, from the starter motor solenoid. Loosen the starter motor cable fixing plate. Disengage the starter motor solenoid and cable assembly, from the battery support. . . . . b) Disengage the speedometer cable from its retaining plate. c) Remove the screws securing the battery support. Remove the washers, distance pieces and silentblocs of the heater group front fixing. . . . . d) Disengage the support. Let it rest on the wheel.	8 mm box spanner  8-12 mm spanners 8-12 mm box spanners 14 mm box spanners
7	Disconnect the speedometer cable from the gearbox.	
8	Remove the steering: a) Unscrew the screw of the steering wheel retaining collar (spanner 1994-T see Pl. 36, fig. 4). . . . . b) Mark the position of the steering pinion with a spot of paint, opposite the slot of the flexible coupling or steering column tube.	Spanner 1994-T

		T O O L S
	c) Mark, with a spot of paint, the position of a steering in its bearings.	
	d) Disconnect the steering levers from the relay spindles. ....	14-16 mm box spanners
	e) Disconnect the feed pipe assembly, from the steering. Seal the pipe assembly, using a seal plate ( <i>cars with power assisted steering</i> ). ....	10 mm box spanner
	f) Remove the bearing caps and disengage the steering. Do not damage the paint of the steering wheel. ....	12 mm box spanner
9	Remove the air filter. ....	12 mm box spanner
10	Disconnect the feed pipe, from the left-hand brake unit (saloon type cars). Disconnect the front brake pipe assembly, from the feed pipe of the hydraulic brake control ( <i>Break (Safari) type cars</i> ). ....	12 mm spanner
11	Disconnect the change speed control, from the gearbox cover (see Op. ID 334-1).	
12	a) Remove the change speed control cable guide and the speedometer cable, from the sidemember. Disengage the connecting pipe (1) and disengage the cables on the sidemember. ....	12 mm box spanner
	b) Disconnect the change speed control rod (2), from the bell crank lever and disengage the tube (see Pl. 24). ....	12 mm box spanner
13	Disconnect the accelerator control and the choke control, from the carburettor. ....	7-8 mm box spanner
14	Disconnect the feed pipe from the petrol pump.	
15	Disconnect the overflow return pipe and the feed pipe from the pressure control valve. ....	9 mm spanner
16	Disconnect the mechanical brake control cable from the left-hand brake unit.	
17	Remove the front right-hand suspension sphere (strap wrench 2223-T, see Pl. 3 fig. 2). ....	Strap wrench 2223-T
18	Remove the front exhaust pipe: a) Loosen the clip coupling the front pipe to the intermediate pipe (ringed). ....	12 mm box spanner
	b) Remove the fixing screws of the plate retaining the front pipe on the crankcase. ....	17 mm box spanner
	c) Remove the half collars coupling the front pipe to the exhaust manifold. ....	12 mm box spanner
	d) Engage the pipe from the underside of the car.	
19	Disconnect the hot water feed pipe, from the water pump cover and remove the upper screen from the exhaust manifold.	8-12 mm box spanners

		TOOLS
20	Disconnect the flexible couplings (Bibax), from the brake discs. .... Remove the screws fixing the brake cooling ducts and move the latter forward as far as possible .....	14 mm socket + extension 8-10 mm box spanners
21	Hold the engine gearbox assembly with a hoist (sling 1696-T see Pl. 23). ....	Sling 1696-T
22	Remove the screws fixing the rear flexible blocks and the screws fixing the front crossmember support. Do not lose the shims fitted between the crossmember and sidemembers.  Raise the engine and remove it from the car. Place the engine gearbox assembly on a stand (stand 2497-T, see Pl.5).	14 mm box spanners Stand 2497-T
REFITTING		
23	Adjust the rear flexible supports: a) Make sure that the pre-adjustment of the flexible blocks is correct. The upper face of a lower nut of the arm must be at a distance of 98 mm from the bearing face of the flexible block on the steel support on the body ( <i>cars produced before October, 1962</i> ). This dimension must be 94 mm on the flexible blocks with the body painted green ( <i>cars produced since October, 1962</i> ). b) Fit the flexible blocks on the engine and offer up the upper nut of the arm (shakeproof washer). Loosen the fixing nuts of the steel support on the body. ....	12-23 mm box spanners
24	Offer up the engine gearbox assembly on the car. Lower this assembly, pressing as far as possible towards the rear, in order to avoid damage to the brake cooling ducts. With the rear flexible blocks a few millimetres above the supports on the body, fit their fixing screws (plain and spring washers under the heads).  Complete the lowering of the engine-gearbox assembly. Fit the shims found when dismantling between the crossmember and sidemembers so that the distance between the brake disc and sidemember on the left-hand side is greater by $70 \pm 2$ mm than this same distance measured on the right-hand side. Use the shims found when dismantling.  Tighten the crossmember fixing screws (plain and spring washers).  Slightly raise the engine in order to free the flexible blocks and position them correctly. Lower the engine. Tighten the fixing screws of the flexible blocks. ....	14 mm box spanner
25	Fit the brake cooling ducts. Tighten the fixing screws (plain and spring washers). ....	8-10 mm box spanners
26	Connect the flexible couplings (Bibax) to the brake disc. Tighten the fixing screws (plain washers). ....	14 mm socket + extension

		TOOLS
27	<p>Fitting the front exhaust pipe:</p> <p>a) Offer up the pipe, from the underside of the car.</p> <p>b) Fit the half collars coupling the pipe to the exhaust manifold, without locking the nuts (spring washers).</p> <p>c) Offer up the fixing screws of the plate retaining the pipe on the crankcase (spring washer). . . . .</p> <p>d) Loosen the rear clip of the intermediate pipe (ringed pipe). . . . .</p> <p>e) Straighten the front pipe, so that the intermediate pipe slides and turns freely at its two extremities.</p> <p>f) Lock the nuts of the half collars fixing the front pipe to the exhaust manifold and the fixing screw of the plate retaining the front pipe on the crankcase. Make sure that the intermediate pipe is still free. . . . .</p> <p>g) Position the fixing clips of the intermediate pipe to 5 mm approximately from the ends of the pipe. Make sure that the slot of the collar does not coincide with a slot of the pipes and that the collar and fixing screws do not reduce the ground clearance or touch the body when the exhaust moves with acceleration or braking. Tighten the screws of the front collar to 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) and the screws of the rear collar to 6½ to 8½ ft.lbs. (0.9 to 1.1 m.kg). . . . .</p> <p>h) For the upper shield of the exhaust manifold, tighten the screws (plain and spring washers). . . . .</p>	<p>17 mm box spanner</p> <p>12 mm box spanner</p> <p>12-17 mm box spanners</p> <p>12 mm box spanner</p> <p>8-12 mm box spanners</p>
28	Connect the heater pipe to the steel pipe. Tighten the clip.	
29	Fit the front right-hand suspension sphere. Tighten by hand.	
30	Connect the mechanical brake control cable to the left-hand brake unit. Adjust the connecting cable : tension the cable, to do this, the control levers must be at the limit of separation from their stop. . . . .	<p>12 mm spanner</p> <p>12 mm box spanner</p>
31	Connect the overflow return pipe, to the pressure control valve. Tighten the clip.	
32	Connect the feed pipe, to the pressure control valve. . . . .	9 mm spanner
33	Connect the front brake feed pipe assembly, to the left-hand brake unit. . . . .	12 mm spanner
34	<p>Assemble the change speed control (see Pl. 24 and 25):</p> <p>a) Engage the connecting pipe (1) on the ball control (3). Put the support (4) in position on the sidemember. Tighten the screws. . . . .</p> <p>b) With the control tube (5) on the gearbox cover in the neutral position, place the joint (6) on this tube for the connecting pin.</p> <p>c) Bring the flange (7) against the cover of the gearbox. Hold the flange and pull on the sheath of the ball control in order to fit the key (8). Fit the key retaining circlip (9).</p>	<p>12 mm box spanner</p>

		TOOLS
	d) Put the connecting tube (1) in position. Fit the distance washers (10) and tighten the flange fixing screws (spring washers).....	12 mm box spanner
	e) Fix the connecting tube (1) on the support (4) on the sidemember. The connecting pin must be in perfect alignment with the axis of the control pipe (5) on the gearbox cover. ....	12 mm spanner 12 mm box spanner
	f) Connect the control rod (2) to the bell crank lever (11). Tighten the nut (spring washer). ....	12 mm box spanner
35	Adjust the gear change control (see Pl. 24 and 25) :	
	a) Adjust the ball control: turn the threaded sleeve (12) to obtain a measurement of "a" = 18.5 mm at the change speed control lever. Tighten the locknut (13).....	17-21 mm spanners
	b) Adjust the control rod : Place the change speed lever in a position so that the selector is at a dimension "b" = 37.5 mm.  With the control tube (5) on the cover of the gearbox in the neutral position, move the yoke (14) until the hole is exactly opposite the hole of the lever (11) on the connecting tube (1). Fit the spindle and tighten the nut (spring washer).....	12 mm spanner
	c) Make sure that the dimension "b" does not vary. Check the change speed lever operation.	
36	Connect the speedometer cable, to the gearbox.	
37	Connect the feed pipe, to the petrol pump.	
38	Fitting the steering :	
	a) Engage the steering pinion in the flexible coupling or in the steering column and place the steering in its bearings, noting the marks made when dismantling. Fit the bearing cap fixing screws (spring washers under the heads).	
	b) Adjust the angular position of the steering. Turn the steering wheel ( <i>cars with mechanical steering</i> ) or fit the fixture 1955-T, as shown on Pl. 35 and bring the groove "c" of the pinion in to contact with the gauge pin (D) ( <i>cars with power assisted steering</i> ). Tighten the bearing cap fixing screws. ....	Fixture 1955-T
	c) Connect the feed pipe assembly to the steering. Insert the seal plates. Tighten the nuts (spring washers) ( <i>cars with power assisted steering</i> ). ....	8 mm box spanner
	d) Connect the steering levers to the relays, the nuts engine side. Tighten the nuts to 18 ft.lbs. (2.5 m.kg). ....	14-16 mm box spanners
	e) Compress the spring retaining the steering wheel (spring compressor 1991-T, see Pl. 36, fig. 3) and when the spring coils are touching, tighten the screw of the collar (spanner 1994-T, see Pl. 36, fig. 4). ....	Spring compressor 1991-T Spanner 1994-T
39	Fit the battery bracket. Place a plain washer under the head of the fixing screw on the crossmember and a plain washer between the support and the distance piece. Place a plain washer under the head of the front fixing screw on the sidemember, a plain washer and a spring washer under the nut. Place a plain washer and a spring washer under the head of the two rear screws fixing the support on the sidemember.....	12 mm spanner 8-12-14 mm box spanners



		T O O L S
40	Fit the hydraulic fluid reservoir. Make sure that the rubber sections are fitted on the support. Fit the straps and tighten. Connect the feed pipe to the high pressure pump. The feed pipe of the high pressure pump must be fitted without strain.....	8 mm box spanner
41	Fit the battery tray, the battery, the battery frame. Connect the cables, to the regulator to the starter solenoid, to the coil and to the battery. Adjust the battery cable support. ....	8-12 mm box spanners
42	Fit the air filter. ....	12 mm box spanner
43	Fit the front wings (note the position of the air ducts and the horn harness). Connect the feed cables for the headlamps and for the horns.....	14-16 mm box spanners
44	Fit the assembly of the spare wheel support and radiator air duct : a) Offer up the assembly and put the flexible duct in position against the radiator. b) Tighten the flexible duct fixing screws (plain and spring washers). .... c) Put the spare wheel support in position and tighten the fixing screws on the front wings (plain and spring washers)... d) Tighten the strap fixing screws on the front crossmember (plain washer under the screw, plain washer and spring washers under the nut). .... e) Connect the bonnet lock cable to the hooks.	8 mm box spanner 8 mm box spanner 8 mm spanner 8 mm box spanner
45	Refill the radiator, if necessary (open the vane of the heater control in order to bleed the system) ( <i>cars with heater type - 50</i> ).	
46	Unscrew the bleed screw of the pressure regulator. Fill the reservoir with hydraulic fluid. Start the engine, and leave running for a few minutes. Re-tighten the bleed screw to put the systems under pressure. Check the unions for leakage. ....	8 mm spanner
47	Adjust the clutch clearance (see Op. ID 314-0).	
48	Bleed the brakes (see Op. ID 453-0).	
49	Adjust the idling (see Op. ID 142-0).	
50	Fit the spare wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 51). ....	Jacking bracket 2505-T
51	Place the manual height control lever in the high position and check the level of the fluid in the reservoir.	

**PARTICULAR POINTS****Removal**

- 8 *Remove the steering: mark its position in relation to its steering wheel and to the relays.*
- 17 *Remove the front exhaust pipe (connecting pipe) from underneath the car.*
- 21 *Remove the screws fixing the front crossmember support. Do not lose the shims fitted between the crossmember and sidemembers.*

**Assembly**

- 22 *Pre-adjust the rear flexible blocks : 98 mm between the face of the nut receiving the engine support arm and the bearing face of the flexible block on the support on the body (cars produced before October 1962) and 94 mm, the dimension being taken in the same conditions, for the flexible blocks with the body printed green (cars produced since October 1962).*
- 23 *Adjust the front crossmember support ; place the shims found when dismantling between the crossmember and sidemember in order that the distance between the brake disc and the sidemember on the left-hand side must be greater by  $70 \pm 2$  mm than the same distance measured on the right side. Use the shims found when dismantling.*
- 29 *After having connected the mechanical brake cables to the front brakes, adjust the connecting cable: the control levers must be at the limit of separation from their eccentric stops.*
- 38 *When fitting the steering, note the marks made when dismantling: position of the steering in relation to the steering wheel and to the relays. Adjust the angular position of the steering: groove of the steering pinion in contact with the gauge pin of the fixture 1955-T (see Pl. 35).*

*NOTE - If the steering has been renewed, position the assembly then adjust the alignment and steering lock (see Op. DS 440-0).*

- 47 *Adjust the clutch clearance (see Op. DS 314-0).*
- 48 *Bleed the brakes (see Op. DS 453-0).*
- 49 *Bleed the hydraulic gear selector, operate the auxiliary clutch control lever several times and make successive movements with the gear lever through all the gears.*
- 50 *Adjust the slow running (see Op. DS 142-0).*
- 52 *With the lever of the manual height control in the high position, check the level of the hydraulic fluid.*

		TOOLS
	REMOVAL.	
1	Hold the bonnet open (retaining bar MR-4158, see Pl. 2, fig. 1) and put the front of the car on stands (jacking bracket 2505-T, see Pl. 51).....	Retaining bar MR-4158 Jacking bracket 2505-T
2	Remove the spare wheel. Release the pressure in the whole of the hydraulic system. Drain the hydraulic fluid reservoir. Retain the fluid in a clean sealed container. Drain the radiator, retain the water which contains anti-freeze. ....	8 mm spanner
3	<u>Remove the assembly of the spare wheel support and radiator air ducts :</u>	
	a) Disconnect the bonnet catch cables from their hook.	
	b) Remove the crossmember fixing screws on the front wings. ....	8 mm box spanner
	c) Disconnect the flexible duct, from the radiator: remove the screws fixing the right-hand side and loosen the screws on the left-hand side.....	8 mm box spanner
	d) Disconnect the strap retaining the sparewheel, from the front crossmember.....	8 mm spanner
	e) Disengage the assembly of the crossmember, strap and air ducts.	8 mm box spanner.
4	Disconnect the battery cables, from the regulator and the coil. Remove the battery and its tray. ....	12 mm spanner 12 mm box spanner
5	Disconnect the high pressure pump feed pipe and the centrifugal regulator overflow return pipe, from the hydraulic reservoir. Remove the reservoir fixing straps. ....	8 mm box spanner
6	<u>Remove the battery bracket :</u>	
	a) Disconnect the leads, from the starter solenoid. Loosen the starter motor cable fixing clip. Disengage the assembly of the cable and the starter motor solenoid, from the battery support.....	8 mm box spanner
	b) Disengage the speedometer cable from its retaining plate.	
	c) Remove the screws fixing the battery support. Disengage the washer, the distance pieces and silentblocs of the front fixing of the heater group. ....	8-12 mm spanners 8-12-14 mm box spanners
	d) Remove the support. Let it rest on the wheel.	
7	Disconnect the speedometer cable, from the gearbox.	
8	<u>Remove the steering,</u>	
	a) Loosen the screw of the collar retaining the steering wheel (spanner 1994-T, see Pl. 36, fig. 4). ....	Spanner 1994-T
	b) Mark the position of the steering pinion (with a spot of paint), opposite the slot of the steering column.	
	c) Mark the position of the steering, in its bearings (with a spot of paint).	

		TOOLS
	d) Disconnect the steering levers, from the relay spindles. ....	14-16 mm box spanners
	e) Disconnect the feed pipe assembly, from the steering. Seal the pipe assembly, using a plate. ....	10 mm box spanner
	f) Remove the bearing caps and disengage the steering. Do not damage the paint of the steering wheel. ....	12 mm box spanner
9	Remove the air filter. ....	12 mm box spanner
10	Disconnect the front brake pipe assembly, from the feed pipe of the hydraulic brake control, the feed pipe assembly of the centrifugal regulator, from the hydraulic gear selector, and the feed pipe of the clutch cylinder, from the pipe of the clutch re-engagement control. ....	9-12 mm spanners
11	Disconnect the accelerator control and the choke control, from the carburettor. ....	7-8 mm box spanners
12	Disconnect the feed pipe, from the petrol pump.	
13	Disconnect the return pipe, of the control valve and the feed pipe, from the 4-way union. ....	9 mm spanner
14	Disconnect the control pipe assembly, from the gearbox. ....	10 mm box spanner
15	Disconnect the mechanical brake control cable, from the left-hand brake unit.	
16	Remove the right-hand front suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2). ....	Strap wrench 2223-T
17	<u>Remove the front exhaust pipe :</u>	
	a) Loosen the clip coupling the front pipe to the intermediate pipe (ringed). ....	12 mm box spanner
	b) Remove the screws fixing the plate retaining the front pipe on the crankcase. ....	17 mm box spanner
	c) Remove the half collars coupling the front pipe to the exhaust manifold. ....	12 mm box spanner
	d) Remove the pipe, from underneath the car.	
18	Disconnect the hot water inlet pipe, from the water pump cover and remove the upper shield of exhaust manifold. ....	8-12 mm box spanners
19	Disconnect the flexible couplings (Bibax), from the brake discs. Remove the screws fixing the brake cooling ducts and move the latter forward as far as possible. ....	14 mm socket + extension 8-10 mm box spanners
20	Hold the engine gearbox assembly with a hoist (sling 1696-T, see Pl. 23). ....	Sling 1696-T

TOOLS

21	<p>Remove the screws fixing the rear flexible blocks and the screws fixing the front support crossmember. Do not lose the shims fitted between the crossmember and sidemembers.</p> <p>Raise the engine and remove from the car.</p> <p>Place the engine-gearbox assembly on a stand (stand 2497-T, see Pl. 5).</p>	<p>14 mm box spanners Stand 2497-T</p>
REFITTING.		
22	<p><u>Adjust the rear flexible support :</u></p> <p>a) Make sure that the pre-adjustments of the flexible blocks is correct. The upper face of the lower nut securing the arm must be at a distance of 98 mm from the bearing face of the flexible block on the steel support on the body (<i>cars produced before October 1962</i>).</p> <p>This distance must be 94 mm on flexible blocks with the body painted green (<i>cars produced since October 1962</i>).</p> <p>b) Fit the flexible blocks on the engine and offer up the upper nut securing the arm (shakeproof washer). Loosen the nuts fixing the steel support on the body.</p>	<p>12-28 mm box spanners</p>
23	<p><u>Fitting the engine gearbox assembly.</u></p> <p>Place a sling (sling 1696-T, see Pl. 23), under the cover of the water pump, raise the engine gearbox assembly.</p> <p>Offer up the engine-gearbox assembly on the car. Lower the assembly, pressing as far as possible towards the rear, in order not to damage the brake cooling ducts.</p> <p>With the rear flexible blocks a few millimetres above their supports on the body, fit their fixing screws (plain and spring washers).</p> <p>Complete the lowering of the engine-gearbox assembly. Fit the shims found when dismantling between the cross-member and sidemembers.</p> <p>NOTE - The distance between the brake disc and sidemember on the left-hand side must be greater by <math>70 \pm 2</math> mm than this same dimension measured on the right-hand side. If necessary, alter the number of shims inserted between the crossmember and sidemembers. Use the total number of shims: one shim removed from one side must be fitted to the other side.</p> <p>Tighten the crossmember fixing screws (spring and plain washers).</p> <p>Slightly raise the engine in order to free the flexible blocks and put correctly in position. Lower the engine. Tighten the screws securing the flexible blocks and the nuts fixing the supports on the body.</p>	<p>12-14 mm box spanners</p>
24	<p>Fit the brake cooling ducts. Tighten the fixing screws (plain and spring washers).</p>	<p>8-10 mm box spanners</p>
25	<p>Connect the flexible couplings (Bibax) to the brake discs. Tighten the fixing screws (plain washers).</p>	<p>14 mm socket + extension</p>

		TOOLS
26	<p><u>Fit the front exhaust pipe:</u></p> <p>a) Offer up the pipe, from underneath the car.</p> <p>b) Fit the half collars coupling the pipe to the exhaust manifold, without locking the nuts (spring washers).</p> <p>c) Fit the fixing screws of the plate retaining the pipe on the crankcase (spring washer) . . . . .</p> <p>d) Loosen the rear clip of the intermediate pipe (ringed pipe) . . . . .</p> <p>e) Straighten the front pipe, in order that the intermediate pipe slides and turns freely in its two ends.</p> <p>f) Tighten the nuts on the exhaust manifold and the fixing screws of the plate retaining the pipe on the crankcase and make sure that the intermediate pipe is still free . . . . .</p> <p>g) Position the clips fixing the intermediate pipe, to 5 mm approximately from the ends of the pipe. Make sure that the slot of the clip does not coincide with the slot of the pipes and that the clip and the screw does not reduce the ground clearance or touch the body when the exhaust moves with acceleration or braking.</p> <p style="padding-left: 20px;">Tighten the screws of the front clip to 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) and the screw of the rear clip to 6½ to 8 ft.lbs (0.9 to 1.1 m.kg) . . . . .</p> <p>h) Fit the upper exhaust manifold screen, tighten the screws (plain and spring washers) . . . . .</p>	<p>17 mm box spanner</p> <p>12 mm box spanner</p> <p>12-17 mm box spanners</p> <p>12 mm box spanner</p> <p>8-12 mm box spanners</p>
27	Connect the heater pipe to the steel pipe. Tighten the collar.	
28	Fit the right-hand front suspension sphere. Tighten by hand.	
29	Connect the mechanical brake control cable to the left-hand brake unit. Adjust the connecting cable: tension the cable, so that the control levers are at the limit of their separation from the stop . . . . .	<p>12 mm spanner</p> <p>12 mm box spanner</p>
30	Connect the overflow return pipe, to the pressure control valve. Tighten the clip.	
31	Connect the feed pipe, to the pressure control valve . . . . .	9 mm spanner
32	Connect the control pipe assembly, to the gearbox . . . . .	10 mm box spanner
33	Connect the front brake feed pipe assembly, to the pipe from the control . . . . .	12 mm spanner
34	Connect the feed pipe of the centrifugal regulator, to the hydraulic gear selector . . . . .	9 mm spanner
35	Connect the clutch cylinder feed pipe, to the pipe from the clutch re-engagement control . . . . .	9 mm spanner
36	Connect the speedometer cable, to the gearbox.	

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**TOOLS**


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37	Connect the feed pipe, to the petrol pump.	
38	<u>Fit the steering :</u>	
	a) Engage the steering pinion in the steering column and place the steering in its bearings, noting the marks made when dismantling. Offer up the bearing cap fixing screws (spring washers).	
	b) Adjust the angular position of the steering: Fit the fixture 1955-T as shown on Pl. 35 and bring the groove "c" of the pinion into contact with the gauge pin "b" of the fixture. Tighten the bearing cap fixing screws.....	Fixture 1955-T 12 mm box spanner
	c) Connect the steering feed pipe assembly. Insert the seal plate. Tighten the nuts (spring washers). ....	8 mm box spanner
	d) Connect the steering levers to the relays, the nuts engine side. Tighten the nuts to 18 ft.lbs. (2.5 m.kg). ....	14-16 mm box spanners
	e) Compress the spring retaining the steering wheel (spring compressor 1991-T, see Pl. 36). When the spring is compressed, tighten the screw of the clip (spanner 1994-T, see Pl. 36). ....	Spring compressor 1991-T Spanner 1994-T
39	Fit the battery support. Place a plain washer under the head of the fixing screws of the crossmember and a plain washer between the support and the distance piece. Place a plain washer under the head of the front fixing screws on the sidemember, a plain washer and a spring washer under the nut. Place a plain washer and a spring washer under the head of the 2 rear fixing screws of the support on the sidemember. ....	8-12-14 mm box spanners 12 mm spanner
40	Fit the hydraulic fluid reservoir. Make sure that the rubber sections are fitted on the support. Fit the straps and tighten. Connect the high pressure pump feed pipe and the centrifugal regulator overflow return, to the reservoir. The high pressure pump feed pipe must be fitted without strain.....	8 mm box spanner
41	Fit the battery tray, the battery, the battery frame. Connect the cables, to the regulator, to the starter solenoid, to the coil and to the battery. Adjust the starter motor cable support clip. ....	8-12 mm box spanners
42	Fit the air filter. ....	12 mm box spanner
43	Fit the front wings (pay attention to the air ducts and to the horn harness). Connect the feed cables to the headlamps and to the horns.....	14-16 mm box spanners
44	<u>Fit the assembly of the spare wheel support and radiator air ducts :</u>	
	a) Offer up the assembly and put the flexible duct against the radiator.	
	b) Tighten the flexible duct fixing screws (plain and spring washer). ....	8 mm box spanner
	c) Put the sparewheel support in position and tighten the fixing screws on the front wings (plain and spring washers). ...	8 mm box spanner

## T O O L S

	d) Tighten the fixing screws of the strap on the front crossmember (plain washer under the screw, plain and spring washers under the nut). . . . .	8 mm spanner
	e) Connect the bonnet lock control cable to the hooks.	8 mm box spanner
45	Refill the radiator (open the heater control vane in order to bleed the system).	
46	Unscrew the bleed screw of the pressure regulator. Refill the hydraulic fluid reservoir. Start the engine, leave running for a few moments. Re-tighten the bleed screw in order to put the systems under pressure. Check the unions for leakage. . . . .	8 mm spanner
47	Adjust the clutch clearance (see Op. DS 314-0).	
48	Bleed the brakes (see Op. DS 453-0).	
49	Bleed the hydraulic gear selector : operate the auxiliary clutch control lever several times and make successive movements with the gear lever through all the gears several times.	
50	Adjust the idling (see Op. DS 142-0).	
51	Fit the sparewheel. Lower the car to the ground (jacking brakcet 2505-T, see Pl. 51). . . . .	Jacking bracket 2505-T
52	Put the manual height control lever in the high position and check the level of the hydraulic reservoir. Put the manual height control lever in the normal position.	



TOOLS

STRIPPING AND ASSEMBLING (for replacement of the engine).

Stripping.

1	Drain the oil from the engine then place the engine gearbox assembly on a stand (stand 2497-T, see Pl. 5). Remove the radiator.....	Stand 2497-T 8-12-14 mm box spanners
2	<u>Remove the dynamo:</u> Remove the dynamo tie-rod. Remove the rear fixing screws and loosen the front fixing screws. Swing the dynamo towards the engine and disengage the belt. Remove the dynamo. ....	12-14 mm spanners 12-14 mm box spanners
3	<u>Remove the carburettor :</u> a) Disconnect the heater pipe, from the inlet housing. b) Disconnect the petrol feed pipe, from the carburettor. c) <i>DS 19 cars</i> : Disconnect the brake pipe, from the accelerated idling apparatus and from the cylinder head. .... d) Remove the carburettor and inlet housing assembly. ....	9-12 mm spanners 12 mm box spanner
4	Remove the sparking plugs (spanner 1603-T, see Pl. 2, fig. 4). Remove the oil dipstick and its support tube, the distributor and its housing. In order to withdraw the sparking plugs use a rubber tube 4 diameter x 11 with a length of approximately 125 mm, cut from the petrol pipe DS 141-88. Engage this pipe on the sparking plug connecting rod.	Spanner 1603-T 12 mm box spanner
5	Remove the petrol pump and the oil breather.....	12-14 mm box spanners
6	<u>Remove the pressure control valve - accumulator assembly and bracket :</u> a) Disconnect the high pressure pump - control valve connecting pipe, from the control valve..... b) Unscrew the front lower fixing screw of the support and remove the rear screw and the upper screw. .... c) Disengage the pressure control valve - accumulator assembly and support.	14 mm spanner 12-17 mm spanners 12-17 mm box spanners
7	Remove the flexible block and rear left-hand engine support arm assembly.....	14-17 mm spanners 14-17 mm box spanners
8	<u>Remove the centrifugal regulator (DS 19 cars) :</u> a) Remove the hydraulic gear selector-regulator connecting pipe assembly. .... b) Remove the connecting pipe between the right-hand brake unit and regulator. .... c) Remove the front tie-rod, the rear reinforcing arm and its angle plate, unscrew the regulator fixing nut and disengage the belt, the centrifugal regulator and its adjusting washers. ....	10 mm box spanner 9 mm spanner 12-17 mm box spanners

		TOOLS
10	<u>Remove the high pressure pump (DS 19, ID 19 Break (Safari), ID 19 saloon with power assisted steering) :</u>	
	a) Remove the high pressure pump tie-rod. ....	12 mm spanner 12 mm box spanner
	b) Disconnect the high pressure pump-control valve connecting pipe, from the high pressure pump. ....	12-14 mm spanners
	c) Remove the nut and the screw fixing the high pressure pump. Remove the belts and the pump. ....	14-16 mm box spanners
10 A	<u>Remove the high pressure pump (ID 19 saloon cars) :</u>	
	a) Remove the high pressure pump fixing screws. ....	12 mm box spanner
	b) Disengage the high pressure pump, connecting pipe, distance piece and joint assembly.	
11	Remove the water pump and its cover. ....	14-17 mm spanners 14-17 mm box spanners
12	Remove the lower and rear exhaust shields and support plates of the shields. Remove the manifold and its joints. ....	8-12-14 mm box spanners
13	Remove the flexible block and right-hand rear engine support arm assembly. ....	14-17 mm spanners 14-17 mm box spanners
14	Remove the starter motor shield, the starter motor and its cable. ....	12-14-17 mm box spanners 17 mm spanner
15	Remove the driving pulley, the belts and the adjusting shims. ....	17 mm box spanner
16	Disconnect the gearbox from the engine (spanner 1677-T, see Pl. 19, fig. 4 and spanner 2431-T, see Pl. 3, fig. 4). ....	Spanners 1677-T and 2431-T
	IMPORTANT NOTE - Do not roll the gearbox on the brake discs.	
	<u>Assembling :</u>	
17	<u>Connect the gearbox to the engine:</u>	
	a) Place the centring dowels together with their locking circlips in the crankcase.	
	b) Engage the gearbox (resting on its chariot) by turning the primary shaft by the starting handle relay. Also turn the driving shaft, with the aid of the pulley mounted provisionally, in order to facilitate the introduction of the splines.	
	c) Tighten the clutch casing fixing screws (spanner 1677-T, see Pl. 19, fig. 4 and spanner 2431-T, see Pl. 3, fig. 4).	Spanner 1677-T and 2431-T
18	Fit the driving pulley, insert the adjusting washers and fit the high pressure pump and dynamo belts. Tighten the fixing screws (plain and spring washers). ....	17 mm box spanner

		TOOLS
19	Fit the starter motor. Moderately tighten the contact screw and lock the locknut. Fit the starter motor shield.....	12-14-17 mm box spanners 17 mm spanner
20	Fit the flexible block and rear right-hand engine support arm assembly.....	14-17 mm spanners 14-17 mm box spanners
21	Fit the exhaust manifold, inserting the C & A joints. Fit the manifold shield fixing plates and tighten the nuts fixing the plates and the manifold (spring washers).....	12 mm box spanner
22	Fit the exhaust shield (plain and spring washers).....	8-12-14 mm box spanners
23	<u>Fitting the water pump:</u>	
	a) Fit the water pump cover, inserting the joint smeared with hermetic. Tighten the nuts (plain washers).....	14-17-32 mm box spanners
	b) Fit the water pump, inserting the joints smeared with hermetic. Tighten the nuts and fixing screws.....	12 mm box spanner
	c) Align the water pump pulley (see Op. ID or DS 231-0). Tighten the pulley fixing nut to 18 to 21 ft.lbs. (2.5 to 3 m.kg) (plain washer and lockwasher).....	14 mm box spanner
	d) Fit the fan. Tighten the screw to 7.5 ft.lbs. (1 m.kg) maximum.....	10 mm box spanner
	e) Put the flexible pipes in position. Tighten the clips.	
24	<u>Fitting the centrifugal regulator (DS 19 cars) :</u>	
	a) Offer up the regulator, insert the adjusting washer, moderately tighten the fixing nut (spring washer).....	17 mm box spanner
	b) Align the pulley (see Op. DS 231-0).	
	c) Fit the rear reinforcing arm and its angle plate (plain and spring washer).....	12 mm spanner 12 mm box spanner
	d) The connecting pipe between the regulator and right-hand brake unit.....	9 mm spanner
	e) The hydraulic gear selector-regulator connecting pipe. Insert the seal plate. Tighten the nuts (spring washer).....	10 mm box spanner
25	<u>Fitting the high pressure pump (DS 19, ID 19, Break (Safari), ID 19 saloon with power assisted steering) :</u>	
	a) Offer up the high pressure pump. The articulating spindle and fit the fixing nut.	
	b) Put the high pressure pump-control valve connecting pipe in position, connect to the high pressure pump and fit the pipe retaining plate.....	12-14 mm spanners
	c) Put the belts of the high pressure pump and centrifugal regulator in position (DS 19 cars only).	
	d) Fit the high pressure pump and centrifugal regulator tie-rods (DS 19 cars only). Fit the nuts (plain and spring washer).....	12 mm spanner 12 mm box spanner

		TOOLS
26	Fit the high pressure pump ( <i>ID 19 saloon cars</i> ) : See Op. ID 391-0.	
27	Fit the radiator. Fit the tie-rod. ....	8-12-14 mm box spanners
28	<u>Fit the pressure control valve-accumulator and support assembly:</u> a) Offer this assembly on the engine and fit the rear screw and the upper screw fixing the support without tightening (spring washers). b) Connect the high pressure pump-control valve connecting pipe, to the control valve. .... c) Tighten the 3 support fixing screws. ....	14 mm spanner 12-17 mm spanners 12-17 mm box spanners
28	Fit the oil breather, insert a joint. Tighten the fixing screws (spring washers). ....	12 mm box spanner
29	Fit the petrol pump, insert a joint. Tighten the fixing nuts (spring washers). ....	14 mm box spanner
30	<u>Fitting the carburettor:</u> a) Offer up the carburettor and inlet housing assembly, insert a joint. Tighten the fixing screws (plain washers). .... b) Connect the heater pipe, to the inlet housing. Tighten the clip. c) Connect the petrol feed pipe, to the carburettor. d) <i>DS 19 cars</i> : connect the brake pipe to the accelerated idling control and to the cylinder head. ....	12 mm box spanner   9-12 mm spanners
31	Fit the dynamo and its tie-rod. Offer up the dynamo fixing screws and the tie-rod fixing nuts (plain and spring washers).	12-14 mm spanners 12-14 mm box spanners
32	<u>Fit the distributor:</u> a) Put the distributor housing in position and the housing fixing plate, distributor and advance control lever assembly. b) Position the dog of the distributor so that it coincides with that of the oil pump and put the distributor in position. c) Tighten the screws securing the plate retaining the housing (spring washer). ....	12 mm ring spanner
33	Fit the oil dipstick tube. Place the terminal of the distributor earth wire under the fixing plate of the tube and tighten the screw (plain and spring washer). Put the dipstick in position and hook on the distributor return spring. ....	12 mm box spanner

		TOOLS
34	Fit the sparking plugs. Connect the distributor leads to the sparking plugs. In order to fit the sparking plugs, use a rubber tube 4 x 11 diameter 125 mm long approximately, cut from the petrol pipe DS 141-88. Engage this pipe on the sparking plug connecting rod.	
35	Fit the flexible block and rear left-hand engine support arm. ....	14-17 mm spanners 14-17 mm box spanners
36	Refill the engine with oil (7 pints (4 litres) SAE 20 or 10 W 30 oil).	
37	Adjust the tension of the belts (see Op. ID or DS 231-0).	
STRIPPING AND ASSEMBLING (for replacement of the gearbox).		
<u>Stripping :</u>		
38	Disconnect the flexible pipes, from the water pump cover and the steel pipe. Remove the radiator tie-rod and remove the radiator. ....	8-12-14 mm box spanners
39	Remove the dynamo tie-rod and remove the dynamo. ....	12-14 mm spanners 12-14 mm box spanners
40	Remove the screw of the plate securing the pump-control valve connecting pipe on the gearbox and disconnect the pipe, from the pressure control valve. ....	14 mm spanner
41	Remove the lower nuts of the brake unit support tie-rods. Remove the fixing screws of the crossmember on the gearbox support arm (turn down the lockwashers) and disengage the crossmember. ....	21 mm box spanner 14 mm spanner 14 mm box spanner
42	<u>Remove the brake units.</u>	
	a) Remove the adjusting nut, disengage the sheath stop and remove the connecting cable, from the right-hand side. ....	12 mm spanner 12 mm box spanner
	b) Remove the fixing screws of the brake unit rear supports. ....	14-19 mm box spanners
	c) Disconnect the feed pipes, of the brake unit. Disconnect the accelerated idling feed pipe, from the left-hand brake unit (spanner 2219-T see Pl. 3, fig. 1). ( <i>DS 19 cars</i> ) ....	Spanner 2219-T
	d) Remove the brake units. If necessary, remove the protection cover and remove one brake shoe (extractor 2133-T, see Pl. 49, fig. 2). ....	Extractor 2133-T

		T O O L S
43	<u>Remove the centrifugal regulator (DS 19 cars) :</u>	
	a) Disconnect the rear tie-rod on the cylinder head, from the regulator. ....	12 mm box spanner
	b) Disconnect the tie-rod between the regulator and high pressure pump, from the regulator. Disengage the angle plate.	12 mm box spanner
	c) Disconnect the pipe assembly flange between the centrifugal regulator and hydraulic gear selector, from the regulator and remove the seal plate.....	10 mm box spanner
	d) Remove the pipe between the right-hand brake unit and centrifugal regulator (spanner 2219-T see Pl. 3, fig. 1). ....	Spanner 2219-T
	e) Remove the nut from the centrifugal regulator articulating spindle and disengage the regulator. ....	17 mm box spanner
44	<u>Remove the high pressure pump (DS 19, ID 19 Break (Safari), ID 19 saloon with power assisted steering) :</u>	
	a) Disconnect the tie-rod from the high pressure pump.....	12 mm box spanner
	b) Remove the high pressure pump-control valve connecting pipe, .....	12-14 mm spanners
	c) Remove the high pressure pump pivoting spindle (spanner 2280-T, see Pl. 3, fig. 3) and remove the high pressure pump. ....	Spanner 2280-T
45	Remove the driving pulley fixing screw. Remove the pulley, the key and the pulley adjusting washers. Disengage the belts.....	14 mm box spanner
46	Unlock the locknuts and unscrew the starter motor fixing screw.....	12 mm box spanner
47	<i>DS 19 cars :</i>	
	Remove the clutch cylinder feed pipe (spanner 2219-T, see Pl. 3, fig. 1). Disconnect the control rod, from the clutch fork and remove the clutch cylinder. ....	Spanner 2219-T 12 mm box spanner
48	<i>DS 19 cars :</i>	
	Disconnect the control rod, from the clutch fork and remove the rod, the relay lever and its bearing, and the control cable. ....	12 mm spanner 12 mm box spanner
49	Remove the clutch housing fixing screws (spanner 1677-T, see Pl. 19, fig. 4, and spanner 2431-T, see Pl. 3, fig. 4) and disconnect the gearbox, from the engine. Leave in position on the chariot of the stand (stand 2497-T, see Pl. 5) in order to carry out this operation. ....	Spanners 1677-T and 2431-T Stand 2497-T

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**TOOLS**


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	<u>Stripping :</u>	
50	<u>Connect the gearbox to the engine:</u>	
	a) Make sure that the centring dowels are fitted (together with their locking circlips) in the crankcase.	
	b) Engage the gearbox (resting on its chariot) by turning the primary shaft by the starting handle relay, also turn the driving pulley in order to facilitate the introduction of the splines.	
	c) Tighten the clutch housing fixing screws (spanner 1677-T, see Pl. 19, fig. 4 and spanner 2431-T, see Pl. 3, fig.4) . . . . .	Spanners 1677-T and 2431-T
51	Fit the driving pulley and put the belts in position. Align the pulley (see Op. DS or ID 231-0). . . . .	14 mm box spanner
52	<i>DS 19 cars :</i>	
	Fit the clutch cylinder, connect the control rod to the clutch fork and fit the high pressure pump belts. Fit the feed pipe and connect it to the clutch cylinder (spanner 2219-T, see Pl. 3, fig. 1). . . . .	Spanner 2219-T
53	<i>ID 19 cars :</i>	
	Fit the clutch control relay lever, together with its bearing. Connect the control rod to the clutch fork. . . . .	12 mm spanner 12 mm box spanner
54	<u>Fit the centrifugal regulator (DS 19 cars) :</u>	
	a) Offer up the centrifugal regulator and align the pulley (see Op. DS 231-0).	
	b) Mount the tie-rod between the centrifugal regulator and high pressure pump, offer up the fixing nuts (insert a plain and spring washer).	
	c) Fit the articulating angle plate and the reinforcing arm forming the rear tie-rod. Tighten the fixing nuts (insert a plain and spring washer). . . . .	12 mm box spanner
	d) Connect the pipe assembly flange between the centrifugal regulator and hydraulic gear selector, to the regulator. Insert the seal plate (spring washers under the nuts). . . . .	10 mm box spanner
	e) Fit the pipe between the right-hand brake unit and centrifugal regulator (spanner 2219-T, see Pl. 3, fig. 1). . . . .	Spanner 2219-T
55	<u>Fit the high pressure pump (DS 19, ID 19 Break (Safari), ID 19 saloon with power assisted steering) :</u>	
	a) Offer up the high pressure pump. Offer up the articulating spindle and fit the fixing nut (spanner 2280-T, see Pl. 3, fig. 3). . . . .	Spanner 2280-T
	b) Fit the high pressure pump-control valve connecting pipe. . . . .	14 mm spanner
	c) Fit the screw of the connecting pipe fixing plate on the gearbox. . . . .	12 mm box spanner

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**TOOLS**


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- d) Connect the tie-rod to the high pressure pump, offer up the nuts without tightening (plain and spring washers)..... 12 mm box spanner
- e) Put the belts in position.

56 Fit the brake units (see Pl. 141 and 142) :

- a) Offer up the brake units fitted with their rear support. Tighten the support fixing screws and put an iron wire between the 2 upper screws in order to avoid unscrewing. .... 14-19 mm box spanners
- b) Connect the feed pipes to the brake units. Connect the accelerated idling pipe to the left-hand brake and the centrifugal regulator pipe to the right-hand brake (*DS 19 cars*) (spanner 2219-T, see Pl. 3, fig. 1)..... Spanner 2219-T
- c) Fit the connecting cable, pull the central part towards the rear, in order to fit the sheath end pieces. Connect the cable to the brake levers and fit the adjusting nuts.

57 Fit the dynamo :

- a) Offer up the dynamo and fit the fixing screws (plain and spring washers). Put the belts in position..... 14 mm spanner  
14 mm box spanner
- b) Fit the dynamo tie-rod. Offer up the fixing nuts, without locking (plain and spring washers). .... 12 mm spanner  
12 mm box spanner
- c) Tension the belts (see Op. DS or ID 231-0).

NOTE. - The crossmember support and the radiator are fitted after the gearbox is fitted in position on the car.



**PARTICULAR POINTS.**

Removal.

- 5 Remove the rear closing panel of the cylinder head shield : remove the upper screws on the cylinder head, unscrew the lower fixing screws on the crankcase and disengage the panel by pulling towards the right.
- 13 Raise the exhaust rocker shaft and disengage the rocker push rods before removing the cylinder head.

Refitting.

- 15 Fit the cylinder head gasket dry, the crimping towards the cylinder barrels.  
 Raise the inlet rocker shaft in order to fit the push rods (the exhaust rods are the longest).  
 Tightening the cylinder head fixing screws : 1st. tightening 21.75 ft. lbs. (3 m.kg), 2nd. tightening 43.5 ft. lbs. (6 m.kg). Do not exceed this tightening torsion, and observe the order of tightening indicated on Pl. 1 and make sure that the push rods are correctly positioned.  
 It is an obligatory procedure to re-tighten the cylinder head when a distance of 300 miles (500 km) then 1,250 miles (2.000 km) has been covered. (Unscrew, then re-tighten the screws one at a time to 43.5 ft. lbs. (6 m.kg).
- 21 Fit the centrifugal regulator : align the pulley if the cylinder head or the water pump cover has been replaced (see Op. DS 231-0).
- 22 Position the exhaust : proceed according to the instructions given in the paragraph.
- 28 Bleed the centrifugal regulator (see Op. DS 314-0).
- 29 Adjust the idling and the clutch drag (see Op. DS 142-0).

**TOOLS**

- |   |   |                                  |
|---|---|----------------------------------|
| 1 | Drain the radiator and cylinder block (retain this water which contains anti-freeze). . . . . | 21 mm spanner                    |
| 2 | Remove the air filter and manifold assembly. . . . .  | 12 mm box spanner                |
| 3 | Disconnect the leads from the sparking plugs.   |                                  |
| 4 | <u>Remove the carburettor.</u>  |                                  |
|   | a) Disconnect the return spring, from the accelerator control.                                |                                  |
|   | b) Disconnect the clutch re-engagement control spring, from the accelerator control.          |                                  |
|   | c) Disconnect the choke control from the carburettor. . . . .                                 | 7 mm spanner<br>7 mm box spanner |

		TOOLS
	d) Disconnect the accelerator control from the carburettor.....	7 mm box spanner
	e) Disconnect the accelerated idling control pipe union, from the carburettor and disconnect the tube fixing plate on the cylinder head. Seal the openings of the pipe and carburettor, using the protection plugs.....	9 mm spanner 12 mm box spanner
	f) Disconnect the heater pipe from the inlet housing.	
	g) Disconnect the flexible petrol feed pipe from the carburettor.	
	h) Unscrew the fixing nuts and remove the carburettor (spanner 1623-T, see Pl. 2, fig. 2).....	Spanner 1623-T
	<u>Remove the exhaust shield :</u>	
	a) Release the pressure and remove the front right-hand suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2). ..	Strap wrench 2223-T
	b) Remove the fixing screws of the upper part of the exhaust shield and disengage the shield. ....	8-12 mm spanners 8-12 mm box spanners
	c) Disconnect the collar securing the front exhaust pipe (connecting pipe) to the manifold. ....	12 mm box spanner
	d) Unscrew the nuts and remove the assembly of the articulating angle plate and reinforcing arm securing the centrifugal regulator. ....	12 mm box spanner
	e) Remove the front support plate of the manifold shield (upper and lower parts).....	8 mm box spanner
	f) Remove screw and nut securing the manifold shield, lower part, unscrew the nut fixing the flange retaining the exhaust connecting pipe in order to disengage the pipe, and disengage the nut.....	12 mm box spanner
	g) Remove the upper fixing screw of the rear shield closing panel on the cylinder head. Unscrew the lower screw fixing the shield on the crankcase and disengage the shield, by pulling towards the right. ....	12-17 mm box spanners
6	<u>Remove the centrifugal regulator :</u>	
	a) Unscrew the articulating spindle nut, remove the regulator tie-rod and disengage the belt.....	12-17 mm box spanners
	b) Disconnect the connecting pipe between the right-hand brake unit and centrifugal regulator, from the regulator.....	9 mm spanner
	c) Disconnect the centrifugal regulator-hydraulic gear selector connecting pipe assembly, from the regulator and from the hydraulic gear selector. ....	9 mm spanner 10 mm box spanner
	d) Remove the centrifugal regulator.	
	e) Disconnect the high pressure pump feed pipe. Remove the screw and nut securing the radiator tie-rod and disengage the tie-rod assembly, pump feed pipe and centrifugal regulator-hydraulic gear selector connecting pipe assembly on the left-hand side of the engine. ....	8-12 mm box spanners
7	Remove the upper flexible pipe between the radiator and water pump.	
8	Remove the fan. ....	10 mm box spanner

		TOOLS
9	Remove the dynamo tie-rod, unscrew the dynamo fixing screws and disengage the belt. ....	12-14 mm spanners 12-14 mm box spanners
10	Disconnect the battery negative cable, from the water pump. ....	12 mm box spanner
11	Remove the screwed union and disconnect the rocker shaft oil pipe, from the cylinder head. ....	12 mm box spanner
12	Disconnect the rubber pipe from the steel hot water inlet pipe and disconnect the flexible feed pipe from the water pump.	
13	<u>Remove the cylinder head :</u>	
	a) Remove the cylinder head cover. Disengage the spark plug tube sealing joints and their thrust washers. ....	12 mm box spanner
	b) Completely unscrew the cylinder head fixing screws. ....	14 mm box spanner
	c) Remove the nuts and caps securing the exhaust rocker shaft. Disengage the rocker shaft. ....	12 mm box spanner
	d) Raise the inlet rocker shaft and disengage the push rods.	
	e) Disengage the cylinder head. Remove the cylinder head joint.	
	<u>Assembly.</u>	
14	Assemble the cylinder head, if necessary (see Op. DS 112-3).	
15	<u>Fit the cylinder head :</u>	
	a) Make sure that the 2 centring dowels are in position on the cylinder block and put the cylinder head gasket in position, the crimping towards the cylinder barrels (the varnished joints are fitted dry).	
	b) Put the cylinder head in position. Pay attention to the oil pipes and petrol overflow pipes.	
	c) Raise the inlet rocker shaft and fit the push rods (the exhaust push rods are longer).	
	d) Fit the exhaust rocker shaft. Tighten the nuts, insert the caps. ....	12 mm box spanner
	e) Fit and tighten the cylinder head fixing screws (torsion spanner 2471-T, see Pl. 1, fig. 2).	
	1st tightening 21.75 ft.lbs. (3 m.kg).	
	2nd tightening 43.5 ft.lbs. (6 m.kg).	
	The tightening torsion is of the greatest importance. On no account must the tightening torsion of 43.5 ft.lbs. (6 m.kg) be exceeded. Note the order of tightening the screws (see Pl. 1, fig. 1).	
	During the tightening, make sure that the push rods are properly engaged in the adjusting screw ball pins. ....	Torsion spanner 2471-T 14 mm socket

		TOOLS
	NOTE. - It is an obligatory procedure to re-tighten the cylinder head when a distance of 300 miles (500 km) has been covered, then 1,250 miles (2.000 km). It is imperative to proceed in the following manner:	
	1. Work on the screws one at a time.	
	2. Loosen each screw. Then tighten to 43.5 ft.lbs. (6 m.kg) (torsion spanner 2471-T).	
	3. After a few thousand miles again tighten the cylinder head under the same conditions.	
16	Connect their flexible feed pipe to the water pump and tighten the clip.	
17	Connect the rubber pipe to the steel hot water inlet pipe and tighten the clip.	
18	Fit and tension the dynamo and water pump belt (see Op. DS 231-0): Fit the fan.....	12-14 mm spanners 12-14 mm box spanners
19	Fit the upper flexible pipe between the radiator and water pump. Tighten the clips.	
20	Connect the feed pipe to the high pressure pump. Tighten the clip. Fit the radiator tie-rod.....	8-12 mm box spanners
21	<u>Fit the centrifugal regulator :</u>	
	a) Put the regulator in position, insert the adjusting washers and offer up the fixing nut (spring washer).	
	b) Fit the centrifugal regulator belt.	
	c) Fit the tie-rod (plain and spring washers under the fixing nuts).	
	d) Fit the connecting pipe between the right-hand brake unit and centrifugal regulator, to the regulator. ....	9 mm spanner
	e) Fit the centrifugal regulator-hydraulic gear selector connecting pipe assembly. ....	9 mm spanner
	f) Align the centrifugal regulator pulley (see Op. DS 231-0).	
	NOTE. - This operation is only carried out if the cylinder head, the water pump cover or the centrifugal regulator has been renewed.	
	g) Tension the centrifugal regulator belt (see Op. DS 231-0).	
22	<u>Fit the exhaust shield :</u>	
	a) Fit the rear shield closing panel. Tighten the fixing screws on the cylinder block. Fit and tighten the fixing screws on the cylinder head (plain and spring washers). ....	12-17 mm box spanners
	b) Put in position the manifold shield, lower part. Tighten the fixing screw and nut (plain and spring washer). ....	12 mm box spanner
	c) Fit the manifold shield front support plate. ....	8 mm box spanner
	d) Fit the assembly of the articulating angle plate and reinforcing arm to the centrifugal regulator. ....	12 mm box spanner

TOOLS

	<p>e) Fit the exhaust connecting pipe fixing clip (front pipe) on the manifold. Tighten the flange fixing nuts retaining this pipe. ....</p>	<p>12 mm box spanner</p>
	<p>f) Fit the manifold shield, upper part and tighten the fixing screws (plain and spring washers). ....</p>	<p>8-12 mm spanners 8-12 mm box spanners</p>
	<p>g) Fit the right-hand front suspension sphere. Tighten by hand.</p>	
	<p>h) Check the alignment of the intermediate pipe (ringed pipe) :</p> <p>Loosen the fixing clips of the intermediate pipe and make sure that it slides and turns without strain at the two extremities.</p> <p>Position the fixing clips of the intermediate pipe to 5 mm approximately from the ends of the pipe. Make sure that the slot of the clips do not coincide with the slots of the tube and that the clips and screws do not reduce the ground clearance or touch the body when the exhaust pipe moves. Tighten the front fixing clip screws to 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) and the rear fixing clip screws to 6½ to 8 ft.lbs. (0.9 to 1.1 m.kg). ....</p>	<p>12 mm box spanner</p>
<p>23</p>	<p><u>Fitting the carburettor :</u></p>	
	<p>a) Fit the carburettor, inserting the joint.</p>	
	<p>b) Slightly raise the carburettor and fit the nuts (spring washers) then tighten (spanner 1623-T, see Pl. 2, fig. 2). ....</p>	<p>Spanner 1623-T</p>
	<p>c) Connect the accelerator control. Tighten the nuts (plain washers) and the locknuts. Connect the return spring and the clutch spring engagement control spring to the accelerator control. ....</p>	<p>7 mm box spanner</p>
	<p>d) Connect the choke control. Make sure that it opens and closes correctly. ....</p>	<p>7 mm box spanner</p>
	<p>e) Connect the pipe to the accelerated idling control and tighten the screw of the retaining plate of the pipe on the cylinder head (plain and spring washers). ....</p>	<p>9 mm spanner 12 mm box spanner</p>
	<p>f) Connect the heater pipe to the inlet housing and tighten the clip.</p>	
	<p>g) Connect the flexible petrol feed pipe to the carburettor.</p>	
	<p>24 Connect the leads to the sparking plugs.</p>	
	<p>25 Fit the air filter and manifold assembly. ....</p>	<p>12 mm box spanner</p>
	<p>26 Refill the radiator (vane of the heater control open).</p>	
	<p>27 Start the engine. Unscrew the pressure control valve bleed screw, leave the engine running for a few minutes and re-tighten the bleed screw. Check the unions for leakage. ....</p>	<p>8 mm spanner</p>
	<p>28 Bleed the centrifugal regulator (see Op. DS 314-0).</p>	
	<p>29 Adjust the slow running and the clutch drag (see Op. DS 142-0).</p>	

**PARTICULAR POINTS.****Removal.**

- 5 *Remove the rear closing panel of the cylinder head shield : remove the upper screws on the cylinder head, unscrew the lower fixing screws on the crankcase and disengage the panel by pulling towards the right.*
- 13 *Raise the exhaust rocker shaft and disengage the rocker push rods before removing the cylinder head.*

**Refitting.**

- 15 *Fit the cylinder head gasket dry, the crimping towards the cylinder barrels.*  
*Raise the inlet rocker shaft in order to fit the push rods (the exhaust rods are the longest).*  
*Tightening the cylinder head fixing screws : 1st tightening 21.75 ft. lbs. (3 m.kg), 2nd tightening 43.5 ft. lbs. (6 m.kg). Do not exceed this tightening torsion, and observe the order of tightening indicated on Pl. 1 and make sure that the push rods are correctly positioned.*  
*It is an obligatory procedure to re-tighten the cylinder head when a distance of 300 miles (500 km) then 1,250 miles (2.000 km) has been covered. (Unscrew, then re-tighten the screws one at a time to 43.5 ft. lbs. (6 m.kg).*
- 22 *Position the exhaust : proceed according to the instructions given in the paragraph.*

**TOOLS****REMOVAL.**

- |   |  |                     |
|---|--|---------------------|
| 1 | Drain the radiator and cylinder block. Retain this water which contains anti-freeze. ....              | 21 mm spanner       |
| 2 | Remove the air filter and manifold assembly. ....  | 12 mm box spanner   |
| 3 | Disconnect the leads from the sparking plugs.  |                     |
| 4 | <b><u>Remove the carburettor :</u></b>   |                     |
|   | a) Unhook the return spring, disconnect the accelerator and choke controls, from the carburettor. .... | 7-8 mm box spanners |
|   | b) Disconnect the flexible petrol feed pipe and the suction tube, from the carburettor.                |                     |
|   | c) Remove the carburettor (spanner 1645-T, see Pl. 2, fig. 3). ....                                    | Spanner 1645-T      |

		T O O L S
5	<u>Remove the exhaust shield :</u>	
	a) Release the pressure and remove the front right-hand suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2). . .	Strap wrench 2223-T
	b) Remove the screws fixing the upper part of the exhaust shield and disengage the shield. . . . .	8-12 mm spanners 8-12 mm box spanners
	c) Remove the collar fixing the front exhaust pipe (connecting pipe) to the manifold. . . . .	12 mm box spanner
	d) Undo the nuts and remove the assembly of the articulating angle plate and reinforcement arm securing the centrifugal regulator. . . . .	12 mm box spanner
	e) Remove the front support plate of the manifold shield (upper and lower parts). . . . .	8 mm box spanner
	f) Remove the screws and nuts securing the manifold shield, lower part, unscrew the nuts securing the exhaust connecting pipe flange in order to disengage the pipe, and remove the shield. . . . .	12 mm box spanner
	g) Remove the upper screw securing the shield rear closing panel on the cylinder head. Unscrew the lower screw securing the shield on the crankcase and disengage the shield, by pulling towards the right. . . . .	12-17 mm box spanners
6	Remove the upper flexible pipe between the radiator and water pump.	
7	Disconnect the feed pipe, from the high pressure pump ( <i>Break (Safari) type cars or saloon type cars with power assisted steering</i> ). Remove the screws and nuts securing the radiator tie-rod and disengage towards the left-hand side of the engine. . . . .	8-12 mm box spanners
8	Remove the fan. . . . .	10 mm box spanner
9	Remove the dynamo tie-rod, unscrew the dynamo fixing screws and disengage the belt. . . . .	12 mm spanners 12 mm box spanners
10	Disconnect the battery negative cable, from the water pump. . . . .	12 mm box spanner
11	Remove the screwed union and disconnect the rocker shaft oil pipe, from the cylinder head. . . . .	12 mm box spanner
12	Disconnect the flexible feed pipe, from the water pump.	
13	Disconnect the rubber pipe, from the steel hot water inlet pipe ( <i>cars fitted with heater type - 5<sup>o</sup></i> ).	
14	<u>Remove the cylinder head :</u>	
	a) Remove the cylinder head cover. Disengage the sealing joints of the spark plug tubes and their thrust washers. . . . .	12 mm box spanner
	b) Completely unscrew the cylinder head fixing screws. . . . .	14 mm box spanner

TOOLS

- c) Remove the nuts and caps securing the exhaust rocker shaft. Disengage the rocker shaft. ....
- d) Raise the inlet rocker shaft and disengage the push rods.
- e) Remove the cylinder head. Remove the cylinder head joint.

12 mm box spanner

REFITTING.

15 Fit the cylinder head.

- a) Make sure that the 2 centring dowels are in position on the crankcase and put the cylinder head joint in position, the crimping towards the cylinder barrels. (The varnished joints are fitted dry).
- b) Put the cylinder head in position. Pay attention to the oil pipes and petrol overflow pipes.
- c) Raise the inlet rocker shaft and place the push rods in position (the exhaust push rods are longer).
- d) Fit the exhaust rocker shaft. Tighten the nuts inserting the caps. ....
- e) Fit and tighten the cylinder head fixing screws (torsion spanner 2471-T, see Pl. 1, fig. 2).

12 mm box spanner

- 1st tightening 21.75 ft.lbs. (3 m.kg).
- 2nd tightening 43.5 ft.lbs. (6 m.kg).

The tightening torsion is of the greatest importance. Do not exceed the tightening torsion of 43 ft.lbs. (6 m.kg). Observe the order of tightening as indicated on Pl. 1, fig. 1.

During the tightening make sure that the spherical ends of the tappet adjusting screws are properly seated in the sockets on the rocker push rods. ....

Torsion spanner 2471-T  
14 mm socket

NOTE. - It is an obligatory procedure to re-tighten the cylinder head when a distance of 300 miles (500 km) has been covered, then 1,250 miles (2.000 km).

It is imperative to proceed in the following manner :

1. Work on the screws one by one.
2. Loosen each screw. Then tighten to 43.5 ft.lbs. (6 m.kg) (torsion spanner 2471-T, see Pl. 1, fig. 1).
3. After a few thousand miles, again re-tighten the cylinder head, proceeding in the same manner.

16 Connect the oil pipe to the cylinder head, inserting a double joint. ....

12 mm box spanner

17 Connect the rubber pipe, to the steel hot water inlet pipe (*cars fitted with heater type -5<sup>0</sup>*).

18 Adjust the valve rockers (see Op. ID 112-0).

19 Fit the upper flexible pipe to the water pump. Tighten the clip.



		TOOLS
20	Connect the high pressure pump feed pipe ( <i>Break (Safari) type cars or saloon type cars with power assisted steering</i> ).	
21	Fit the fan. Tighten the fixing screw to 7.5 ft.lbs. (1 m.kg) maximum. ....	10 mm box spanner
22	Fit the radiator tie-rod and connect the battery negative cable, to the water pump (plain and spring washer). ....	8-12 mm box spanners
23	Fit and tension the water pump and dynamo belt (see Op. ID 231-0).	
24	<u>Fit the exhaust shield :</u>	
	a) Fit the shield rear closing panel. Tighten the fixing screws on the crankcase. Fit and tighten the fixing screws on the cylinder head (plain and spring washers). ....	12-17 mm box spanners
	b) Put in position the manifold shield, lower part. Tighten the fixing screws and nuts (plain and spring washers). ....	12 mm box spanner
	c) Fit the front support plate of the manifold shield. ....	8 mm box spanner
	d) Fit the fixing clip of the exhaust connecting pipe (front pipe) on the manifold and tighten the fixing nuts of the flange retaining this pipe. ....	12 mm box spanner
	e) Fit the manifold shield, the upper part and tighten the fixing screws (plain and spring washers). ....	8-12 mm spanners
	f) Fit the right-hand front suspension sphere. Tighten by hand.	8-12 mm box spanners
	g) Check the alignment of the intermediate pipe (ringed pipe) :	
	Loosen the fixing clips of the intermediate pipe and make sure that it slides and turns without strain at the two ends.	
	Position the fixing collars of the intermediate pipe to 5 mm approximately from the ends of the pipe. Make sure that the slot of the collars does not coincide with the slot of the pipe and that the collar and fixing screw do not reduce the ground clearance or touch the body with the exhaust movement. Tighten the screws of the front collar to 12 to 13 ft.lbs. (1.7 to 1.9 m.kg) and the screws of the rear collar to 6½ to 8 ft.lbs. (0.9 to 1.1 m.kg). ....	12 mm box spanner
25	<u>Fit the carburettor :</u>	
	a) Fit the carburettor, insert a joint.	
	b) Slightly raise the carburettor in order to fit the fixing nuts (spring washers) then tighten (spanner 1645-T, see Pl. 2, fig. 3). ....	Spanner 1645-T
	c) Connect the choke control. Make sure that it opens and closes correctly.	
	d) Connect the accelerator control. Tighten the nuts (plain washers) and locknuts. Hook on the return spring. ....	7 mm box spanner
	e) Connect the petrol inlet pipe and the suction pipe.	
26	Connect the leads, to the sparking plugs.	
27	Fit the air filter and manifold assembly. ....	12 mm box spanner
28	Refill the radiator, engine running. On cars fitted with heater type - 5° open the heater control vane.	

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**TOOLS**


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**REPLACEMENT OF AN EXHAUST MANIFOLD.**
Removal (see Pl. 6 and 7).

- |   |   |                                    |
|---|---|------------------------------------|
| 1 | Place the manual height control in the low position and remove the right-hand front suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2). . . . . | Strap wrench 2223-T                |
| 2 | Remove the fixing screws of the manifold shield (1) (upper part) and disengage the shield towards the front. . . . .                                    | 12 mm box spanner                  |
| 3 | Remove the manifold shield fixing plates (4, 5 and 6). . . . .  | 8-12 mm box spanners               |
| 4 | Remove the collar (11) assembling the exhaust pipe to the manifold. . . . .   | 12 mm spanner<br>12 mm box spanner |
| 5 | Remove the manifold fixing nuts. Disengage the manifold and its joints.   | 12 mm box spanner                  |

Refitting.

- |    |  |                      |
|----|--|----------------------|
| 6  | Offer up the manifold, inserting joints. Fit the manifold shield fixing plates (4, 5 and 6) and tighten the nuts fixing the plates to the manifold (spring washers). . . . .   | 12 mm box spanner    |
| 7  | Fit the clip (11) assembling the exhaust pipe to the manifold. If necessary, loosen the nuts of the collar (10) in order to straighten the latter. Tighten the nuts of the collar (11) and of the retaining collar (10) (spring washer). . . . . | 12 mm box spanner    |
| 8  | Fit the manifold shield (1) (upper part) and tighten the fixing screws (plain and spring washers). . . . .   | 8-12 mm box spanners |
| 9  | Fit the right-hand front suspension sphere (fit a new seal previously smeared with hydraulic fluid between the suspension sphere and the suspension cylinder). Screw up the suspension sphere by hand.   |                      |
| 10 | Put the manual height control in the "normal" position.  |                      |
| 11 | Check the alignment of the intermediate pipe (13) (ringed pipe) and rectify if necessary, see para. 28.  |                      |

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**TOOLS**


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**REPLACEMENT OF A FRONT EXHAUST PIPE (CONNECTING PIPE).**

Removal (see Pl. 6).

- |    |   |   |
|----|---|---|
| 12 | Remove the collar (11) assembling the connecting pipe on the manifold.....                                      | 12 mm spanner<br>12 mm box spanner      |
| 13 | Remove the fixing clip (10) from the connecting pipe. ....  | 12 mm ring spanner<br>or spanner 2431-T |
| 14 | Place the car on a lift or over a pit.  |   |
| 15 | Unscrew the front collar (13) retaining the intermediate pipe. ....   | 12 mm box spanner                       |
| 16 | Disengage the connecting pipe (12) from the intermediate pipe (14) and withdraw from the under side of the car. |   |

Refitting

- |    |  |  |
|----|--|--|
| 17 | Offer up the connecting pipe (12) from the under side of the car, engage it in the intermediate pipe (14) and press up to the shoulder and put in position on the manifold.  |  |
| 18 | Fit the assembling collar (11) of the connecting pipe on the manifold. Tighten the nuts (spring washers) without completely locking in order to permit alignment of the pipe. ....   | 12 mm spanner<br>12 mm box spanner                         |
| 19 | Fit the collar (10) securing the connecting pipe, tighten the nuts (special nuts, plain and spring washers) without locking completely in order to permit alignment of the pipe. ....  | 12 mm ring spanner<br>or spanner 2431-T                    |
| 20 | <u>Align the connecting pipe with the intermediate pipe :</u><br>a) Loosen the rear collar (15) retaining the intermediate pipe. ....<br>b) Position the connecting pipe (12) so that the intermediate pipe (14) then slides and turns without strain.<br>c) Note the clearance of 6 to 8 mm between the connecting pipe and the shields.<br>d) In the case where alignment is impossible, re-centre the exhaust silencer (see para. 35).<br>e) Lock the nuts retaining the collars (11) and (10) and make sure that the intermediate pipe is still free. .... | 12 mm box spanner<br><br><br><br><br><br>12 mm box spanner |
| 21 | Position the retaining collars (13) and (15) of the intermediate pipe. Tighten the nuts of the collar fixing screws to 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) for the front collar and 6½ to 8 ft.lbs. (0.9 to 1.1 m.kg) for the rear collar.....   | Torsion spanner and<br>12 mm socket                        |

## TOOLS

## REPLACEMENT OF AN INTERMEDIATE PIPE (see Pl. 6).

Removal.

- |                   |   |   |
|-------------------|---|---|
| 22                | Place the car on a lift or over a pit.  |   |
| 23                | Loosen the collars (13 and 15) retaining the intermediate pipe (14).....  | 12 mm box spanner                           |
| 24                | Engage the pipe in the exhaust silencer in order to disengage the connecting pipe (12).   |   |
| 25                | Disengage the pipe from the exhaust silencer, disengage the front clip (13) of the pipe.  |   |
| <u>Refitting.</u> |   |   |
| 26                | Fit the front collar (13) on the intermediate pipe (14), put the pipe in position by engaging in the exhaust silencer.  |   |
| 27                | Slide the intermediate pipe on the connecting pipe up to the shoulder. The intermediate pipe must slide and turn without strain; if not re-align the exhaust silencer and connecting pipe.  |   |
| 28                | <u>Align the intermediate pipe :</u>  |   |
|                   | a) Centre the exhaust silencer in its housing and lock the fixing screws.....   | 12 mm box spanner                           |
|                   | b) Unlock the collars (11) and (10) securing the connecting pipe.....   | 12 mm ring spanner and<br>12 mm box spanner |
|                   | c) Adjust the position of the connecting pipe so that the intermediate pipe slides and turns without strain at its two ends.  |   |
|                   | d) Lock the collars (11) and (10) securing the connecting pipe and make sure that the intermediate pipe is still free. ....   | 12 mm ring spanner and<br>12 mm box spanner |
| 29                | Position the collars (13) and (15) retaining the intermediate pipe. Make sure that the slot of the collar does not coincide with the slots of the pipes and make sure that the collar and fixing screw by their position, does not reduce the ground clearance or touch the body when the exhaust moves with acceleration or braking. |   |
| 30                | Tighten the fixing screws of the collars to a torsion of 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) for the front collar and 6½ to 8 ft.lbs. (0.9 to 1.1 m.kg) for the rear collar (torsion spanner 2473-T).....   | Torsion spanner and<br>12 mm socket         |

**TOOLS**

**REPLACEMENT OF AN EXHAUST SILENCER.**

**Removal.**

**31 Remove the exhaust outlet pipe :**

- a) Unscrew the nuts of the collar securing the outlet pipe in the exhaust silencer..... 12 mm spanner  
12 mm box spanner
- b) Remove the fixing screws on the body for the intermediate rubber straps. .... 12 mm box spanner
- c) Remove the screw and nut assembly of the rear fixing clip..... 12 mm spanner  
12 mm box spanner
- d) Disengage the rear pipe.

**32 Remove the exhaust silencer :**

- a) Unscrew the nut of the collar (15) securing the intermediate pipe (ringed) in the exhaust silencer. .... 12 mm spanner  
12 mm box spanner
- b) Remove the screw securing the exhaust silencer on the body. .... 12 mm box spanner
- c) Disengage the exhaust silencer, at the same time have the intermediate pipe held by an assistant.

**33 Strip the exhaust silencer :**

- a) Disengage the fixing collars (16) and (15) of the exhaust outlet pipe and of the intermediate pipe, from the exhaust silencer.
- b) Remove the lateral fixing, from the exhaust silencer..... 12 mm box spanner

**Refitting.**

**34 Assembling the exhaust silencer :**

- a) Place the fixing collars (16) and (15) of the exhaust outlet pipe and intermediate pipe on the exhaust silencer.
- b) Successively engage on the exhaust silencer fixing screws : 1 spring washer, 1 plate (the turned edge towards the out side and towards the top), 1 spring support, 1 plate (the turned edge towards the inside and towards the bottom), 1 distance piece, and tighten the fixing screws. .... 12 mm box spanner.
- c) Place on the front end of the support spring the 2 rubber half blocks and the steel clamp.

**35 Fit the exhaust silencer :**

- a) Engage the exhaust silencer on the intermediate pipe (14).
- b) Fix the exhaust silencer to the body, and centre in its housing.

		TOOLS
	c) Check that a clearance of 15 mm minimum exist between the silencer and the silencer shield.	
	d) Tighten the silencer fixing screws on the body (plain and spring washers).	12 mm box spanner
36	Check the alignment of the intermediate pipe (see paragraph 28 and 29 this operation).	
37	<u>Fit the exhaust outlet pipe :</u>	
	a) Make sure that the distance pieces are fitted (shoulder towards the top) in the three rubber bands securing the pipe.	
	b) Fit the fixing screws securing the rubber bands on the body (spring washers). Fit one plate with 2 turned edges between the rubber band and the body (turned edges towards the bottom) and fit 1 plate with 1 turned edge between the rubber band the screw head (turned edge towards the bottom and towards the inside).	
	c) Fit the fixing screws, without tightening.	12 mm box spanner
	d) Fit the rear fixing collar on the exhaust outlet pipe (plain washers under the heads of the screws and spring washer under the nut). The clip should be 10 mm approximately to the rear of the large diameter of the tube.	
	e) Align the pipe and tighten the screws and nuts fixing the collars and rubber fixing straps.	12 mm spanner 12 mm box spanner
 REPLACEMENT OF AN EXHAUST OUTLET PIPE.  		
<u>Removal.</u>		
38	<u>Remove the exhaust outlet pipe</u> (see paragraph 31 this operation).	
39	<u>Strip the exhaust outlet pipe :</u>	
	a) Unscrew the rear fixing collar and disengage the collar.	12 mm spanner 12 mm box spanner
	b) Unscrew the half collar intermediate fixing screws and disengage the rubber straps and half collar assemblies.	12 mm spanner 12 mm box spanner
<u>Refitting.</u>		
40	<u>Assemble the exhaust outlet pipe :</u>	
	a) Engage the intermediate rubber fixing straps and half collar assemblies on the pipe.	
	b) Engage the rear fixing collar (without screw or nut).	
41	<u>Fit the exhaust outlet pipe</u> (see paragraph 37, this operation).	

***PARTICULAR POINTS.***

Checking a thermostat.

- 27 *The valve should commence to open between 72 and 76<sup>o</sup>C.*
- 28 *The valve must be completely open, after 20 seconds, in water at 90<sup>o</sup>C.*

REPLACEMENT OF A RADIATOR.

Removal.

- |   |  |                            |
|---|--|----------------------------|
| 1 | Drain the radiator (filler cap removed) and retain the water which contains anti-freeze.   |                            |
| 2 | Remove the sparewheel. Remove the 2 right-hand fixing screws of the air duct and loosen the 2 left-hand screws.<br>Disengage the duct, from the radiator. .... | 8 mm box spanner           |
| 3 | Disconnect the upper flexible pipe, from the radiator and the lower flexible pipe, from the steel pipe.  |                            |
| 4 | Remove the screws and nuts securing the radiator tie-rod and disengage the tie-rod. ....   | 8-12 mm box spanners       |
| 5 | Remove the radiator fixing screws and disengage.....   | 14 mm socket and extension |
| 6 | Remove the fan cowl and the flexible feed pipe, from the radiator. ....  | 12 mm box spanner          |

Refitting.

- |   |   |  |
|---|---|--|
| 7 | Fit the flexible feed pipe on the radiator and tighten the clip. Fit the fan cowl, offer up the fixing screws without tightening (plain washers and spring washers under the head).   |  |
| 8 | Make sure that the rubber plates are in position in the supports on the crossmember. Offer up the radiator and connect the flexible pipes.  |  |
| 9 | Fit the radiator fixing screws (plain washers). Fit the tie-rod, tighten the nut and offer up the fixing screw, without locking (plain and spring washers). Centralise the radiator and fan cowl : the blades of the fan must not touch the cowling. Tighten the fixing screws of the radiator, fan cowl and radiator tie-rod. .... | 8-12 mm box spanners<br>12 mm socket with extension. |

TOOLS

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**TOOLS**


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10	Fit the air duct, tighten the fixing screws (plain and spring washers). Re-fit the spare wheel.....	8 mm box spanner
11	Refill the radiator, engine running and vane of the heater control open. (DS 19 and ID 19 cars with heater type - 5°).	
REPLACEMENT OF A RADIATOR VENTILATION DUCT.		
<u>Removal.</u>		
12	Disconnect the unlocking cables, from the bonnet locks. Remove the fixing screws of the spare wheel crossmember support on the front wings and on the rigid duct. Remove the crossmember. ....	8 mm box spanner
13	Disconnect the flexible duct, from the radiator: remove the right-hand fixing screws and loosen the left-hand screw.....	8 mm box spanner
14	Disengage the flexible duct, from the radiator. Remove the fixing screws of the rigid duct on the front crossmember. Disengage the ducts. ....	8 mm box spanner
15	Remove the clips and disconnect the flexible duct, from the rigid duct and the fixing frame, from the flexible duct.	
<u>Refitting.</u>		
16	Put the frame in position, on the flexible duct and fit the duct clips, the back of the clips against the felt.	
17	Put the flexible duct in position on the rigid duct, the stitching positioned towards the bottom. Clip the flexible duct, inserting a steel reinforcement between the back of the clips and the flexible duct.	
18	Offer up the air ducts on the car. Put the flexible duct frame in position against the radiator. Tighten the frame fixing screws on the radiator and tighten the rigid duct fixing screws on the front crossmember (plain and spring washers)..	8 mm box spanner
19	Put the spare wheel crossmember support in position. Tighten the fixing screws (plain and spring washers). ....	8 mm box spanner
20	Connect the unlocking cables to the bonnet locks	



## TOOLS

**REPLACEMENT OF A THERMOSTAT.****Removal.**

- 21 Drain the radiator, retain the water which contains anti-freeze.
- 22 Disconnect the water flexible pipe, from the pump cover.
- 23 Remove the clip securing the thermostat in the flexible pipe. Disengage the thermostat. If necessary, use a screwdriver to unstick the flexible pipe.

**Refitting.**

- 24 Put the thermostat in position in the flexible pipe. Engage it until the turned edge of the thermostat body is in contact with the shoulder of the flexible pipe. Tighten the clip securing the thermostat.
- 25 Connect the flexible pipe to the water pump cover. Fit and tighten the clip.
- 26 Refill the radiator (see paragraph 11, this operation).

**CHECKING A THERMOSTAT.**

- 27 Plunge the thermostat in hot water. When this water attains a temperature between 72 and 76°C, the valve should commence to open.
- 28 The regulator being plunged into water at a temperature of 90°C, the valve must be completely open within 20 seconds.

**NOTE.** - No work is possible on this apparatus. If it does not comply with conditions defined above, it must be replaced.

**PARTICULAR POINTS.**Removal.

- 5 *Remove the steering : mark its position in relation to the relays and the steering wheel.*
- 18 *Do not mislay the adjusting shims fitted between the front crossmember support and the sidemember.*

Refitting.

- 19 *Make sure that the centring dowels for the gearbox are in position in the crankcase before connecting the latter to the engine.*
- 20 *If the bearing or the driving shaft, or the gearbox casing are renewed, align the driving pulley (see Op. ID 231-0).*
- 22 *Adjust the gearbox front crossmember support: place the shims found when dismantling between the crossmember and sidemember in order that the distance between the brake disc and sidemember on the left-hand side must be greater by  $70 \pm 2$  mm than this same dimension measured on the right-hand side. Use the shims found when dismantling.*
- 23 *Adjust the heights of the brake units : the linings must stand proud of the discs at the front by 1 mm approximately.*
- 25 *After having connected the mechanical control cables to the front brakes, adjust the connecting cable so that the control levers are at the limit of separation from their eccentric stop.*
- 29 *Adjust the gear selector (see Pl. 24) :*  
*Adjust the control rods, in order to obtain a dimension "a" = 18.5 mm.*  
*Adjust the gear selector lever, in order to obtain a dimension "b" = 37.5 mm.*  
*Check the operation of the selector. If necessary modify the adjustment of the control rods and the gear selector lever.*
- 30 *Offer up the steering : Note the marks made when dismantling. Adjust the angular position of the steering : groove of the pinion in contact with the gauge pin of the fixture 1955-T (see Pl. 35).*
- NOTE. - If the steering has been renewed, position the assembly then adjust the track and lock (see Op. ID 440-0).*
- 37 *Align the exhaust : carefully follow the instructions given in the paragraph.*
- 39 *Refill the gearbox : 3.6 pints (2 litres SAE 90 EP oil).*
- 40 *Refill the cooling system, vane of the heater control open (cars fitted with heater type "cold climate").*
- 41 *Bleed the front brakes (see Op. ID 453-0).*
- 42 *Adjust the clutch clearance (see Op. ID 314-0).*

TOOLS

**REMOVAL.**

1	<p><b>Hold the bonnet open (clamp MR-4158 see Pl. 2, fig. 1).</b></p> <p><b>Drain the cooling system, save the water which contains anti-freeze.</b></p> <p><b>Put the front of the car on stands, place the stands under the jacking supports (jacking bracket 2505-T, see Pl. 51).</b></p> <p><b>Release the pressure in all the systems and drain the suspension fluid reservoir .....</b></p>	<p><b>Clamp MR-4158</b>  <b>Jacking bracket 2505-T</b>  <b>8-21 mm spanners</b></p>
2	<p><b>Remove the sparewheel, the sparewheel support and front wings .....</b></p>	<p><b>8 mm spanner</b>  <b>8 mm box spanner</b>  <b>14-17 mm box spanners</b></p>
3	<p><b><u>Remove the radiator:</u></b></p> <p><b>a) Remove the starting handle extension.</b></p> <p><b>b) Remove the radiator air duct (remove the 2 front fixing screws and the 2 fixing screws on the right side of the radiator, loosen the 2 fixing screws on the left side of the radiator .....</b></p> <p><b>c) Loosen the clips and disconnect the flexible pipes, from the radiator.</b></p> <p><b>d) Disconnect the tie-rod, from the radiator and water pump .....</b></p> <p><b>e) Remove the radiator fixing screws and disengage .....</b></p>	<p><b>8 mm box spanner</b></p> <p><b>8-12 mm box spanners</b>  <b>14 mm box spanner</b></p>
4	<p><b>Disconnect the cables, from the battery and regulator. Remove the battery frame and battery. Remove the battery tray and support. Do not lose the distance piece between the battery support and front engine crossmember.</b></p> <p><b>Disengage the suspension reservoir on the side (pay attention to the height corrector overflow return pipes).....</b></p>	<p><b>8-12 mm spanners</b>  <b>8-12 mm box spanners</b>  <b>14 mm box spanner</b></p>
5	<p><b><u>Remove the steering.</u></b></p> <p><b>a) Mark the position of the steering pinion with a spot of paint opposite the slot of the steering column or opposite the slot of the flexible coupling.</b></p> <p><b>b) With a spot of paint mark the position of the steering in its bearings.</b></p> <p><b>c) Disconnect the steering levers, from the relay shafts .....</b></p> <p><b>d) Disconnect the steering pinion, from the steering wheel .....</b></p> <p><b>e) Disconnect the steering feed pipe assembly (<i>cars with power assisted steering</i>) .....</b></p> <p><b>f) Remove the bearing caps and disengage the steering .....</b></p>	<p><b>14-16 mm box spanners</b>  <b>12 mm spanner</b>  <b>12 mm box spanner</b>  <b>8 mm ring spanner</b>  <b>12 mm box spanner</b></p>
6	<p><b>Loosen the nut of the tie-rod and the 2 screws securing the dynamo. Swing the dynamo towards the engine and disengage the belt .....</b></p>	<p><b>12-14 mm spanners</b>  <b>12-14 mm box spanners</b></p>

		TOOLS
7	Loosen the nuts of the high pressure pump tie-rods and the nut of the articulating spindle (spanner 2431-T, see Pl. 3, fig. 4 and spanner 2280-T, see Pl. 3, fig. 3). Swing the high pressure pump towards the engine ( <i>cars with power assisted steering or Break (Safari) type cars</i> ) .....	Spanner 2431-T Spanner 2280-T
8	Remove the driving pulley fixing screw and disengage the pulley. Do not lose the key and the adjusting washer. Hold the shaft in position, using a flange retained by the pulley fixing screw so that the shaft does not recede when disconnecting the gearbox .....	17 mm box spanner
9	Unhook the return spring and disconnect the accelerator control, from the carburettor .....	7 mm box spanner
10	Disconnect the speedometer cable, from the gearbox .....	10 mm box spanner
11	<u>Disconnect the gear selector from the gearbox cover</u> (see Pl. 25):	
	a) Disconnect the connecting tube (1) from the control tube (5) on the gearbox cover (do not lose the rubber joint (6) and the 2 washers (10). Disconnect the tube (1) from the support on the sidemember .....	12 mm spanner 12 mm box spanner
	b) Disconnect from the connecting tube lever (11), the end piece (14) of the control rod (2) .....	12 mm spanner
	c) Pull the selector cable towards the front and disengage the connecting tube (1) towards the front.	
	d) Remove the circlip (9) retaining the key (8) and remove the key. Remove the pin coupling the cable (3) to the locking lever (16). Do not mislay the locking circlip of the locking lever.	
12	Disconnect the feed pipe of the brake units. Disconnect the high pressure pump pressure control valve connecting pipe, from the pressure control valve ( <i>cars with power assisted steering or Break (Safari) type cars</i> ) .....	9-14 mm spanners
13	Remove the clutch fork control rod. Disengage the sheath, from its guide on the clutch housing and disengage the cable.	12 mm spanner 12 mm box spanner
14	Remove the front wheels and disconnect the flexible couplings (bibax), from the brake discs .....	14 mm socket and extension
15	Disconnect the mechanical brake control: press on the control lever of the right-hand brake unit, disconnect the connecting cable from the right-hand brake unit, disconnect the control cable and its sheath from the left-hand brake unit.	
16	Remove the dynamo tie-rod. Remove the high pressure pump tie-rod and disconnect the high pressure pump feed pipe ( <i>cars with power assisted steering or Break (Safari) type cars</i> ). Remove the fan, as a precaution .....	10-12 mm box spanners

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**TOOLS**


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17	<p>Remove the fixing screws of the front brake cooling ducts. Remove the screws coupling the front unit closing panel to the front panel.</p> <p>Disconnect the intermediate pipe (ringed pipe), from the exhaust connecting pipe (front pipe). Engage the intermediate pipe as far as possible into the exhaust silencer.</p> <p>Move the brake cooling ducts forwards as far as possible, under the front unit crossmember, and swing the rear of the ducts upwards. ....</p>	<p>8-12 mm spanners 8-12 mm box spanners</p>
18	<p><u>Remove the gearbox:</u></p> <p>a) Pass a sling (sling 1696-T, see Pl. 23) under the cover of the water pump and hold the engine-gearbox assembly (stand 1797-T, see Pl. 23).....</p> <p>b) Remove the engine-gearbox assembly front support crossmember (do not lose the shims placed between the crossmember and sidemembers). ....</p> <p>c) Raise the engine-gearbox assembly in order to disengage the gearbox, from the front crossmember.</p> <p>d) Place the support fixture 1799-T (see Pl. 23) on the gearbox support arms and hold the gearbox with a hoist, in order to avoid damage to the shaft or clutch disc when disconnecting the gearbox from the engine. ....</p> <p>e) Unlock the locknut and loosen the contact screw of the starter motor.....</p> <p>f) Remove the screws securing the clutch housing on the engine (spanners 1677-T, see Pl. 19, fig. 4 and 2431-T, see Pl. 3, fig. 4) and remove the gearbox.....</p> <p style="text-align: center;">REFITTING.</p>	<p>Sling 1696-T Stand 1797-T</p> <p>12 mm box spanner</p> <p>Support fixture 1799-T</p> <p>12 mm box spanner</p> <p>Spanner 1677-T Spanner 2431-T</p>
19	<p><u>Fit the gearbox:</u></p> <p>a) Place the support fixture 1799-T (see Pl. 23) on the gearbox and raise the latter with a hoist.....</p> <p>b) Make sure that the centring dowels are fitted on the gearbox.</p> <p>c) Offer up the gearbox. Engage the splines of the gearbox mainshaft in the clutch disc by turning the shaft from the front of the gearbox, using the starting handle relay. If necessary, also turn the pulley driving shaft in order to facilitate the introduction of the splines on the end piece of the camshaft.</p> <p>d) Fit the gearbox fixing screws and tighten (spanner 1677-T, see Pl. 19, fig. 4 and spanner 2431-T, see Pl. 3, fig. 4)</p> <p>e) Fit the starter motor contact screw and lock the locknut. ....</p>	<p>Support fixture 1799-T</p> <p>Spanner 1677-T Spanner 2431-T</p> <p>12 mm spanner</p>
20	Fit and align the driving pulley and fit the belts (see Op. ID 231-4).	
21	Fit the tie-rods of the dynamo and high pressure pump ( <i>cars with power assisted steering or Break (Safari) type cars</i> ).	<p>12 mm spanner 12 mm box spanner 17 mm box spanner</p>

## TOOLS

22	<u>Fit the gearbox front crossmember support:</u>	
	a) Engage the adjustable supports in the brake unit end piece. Note their position.	
	b) Remove the support fixture from the gearbox. Fix the crossmember on the gearbox support arms. Tighten the screws and turn over the lock washers.....	14 mm box spanner
	c) Lower the engine-gearbox assembly until the crossmember rests on the sidemembers. Disengage the sling and the stand retaining the engine.	
	d) Fit the shims found when dismantling between the crossmember and sidemembers and tighten the crossmember fixing screws on the latter (plain and spring washers under the head). After assembly, the distance between the brake disc and sidemember, left-hand side must be greater by $70 \pm 2$ mm than the same distance, measured on the right-hand side .....	14 mm box spanner
23	Adjust the heights of the brake units : turn the nuts of the front supports so that the linings stand proud of the disc at the front (1 mm approximately) (see Pl. 47, fig. 1).	
24	Connect the control cable and its sheath, to the left-hand brake unit. Press the lever of the right-hand brake unit and hook the connecting cable end piece, to the lever.	
25	Turn the adjusting nut (101) of the brake connecting cable (110) until the right and left-hand control levers (103) are at the limit of separation from their eccentric stop (104) (see Pl. 47, fig. 2).....	12 mm spanner 12 mm box spanner
26	Connect the feed pipe, to the left-hand brake unit. Connect the high pressure pump pressure control valve connecting pipe, to the pressure control valve ( <i>cars with power assisted steering or Break (Safari) type cars</i> ).	
27	<u>Fit the change speed control</u> (see Pl. 24 and 25).	
	a) Engage the connecting tube (1) on the ball control (3). Put the support (4) in position on the sidemember. Tighten the fixing screw.....	12 mm box spanner
	b) The control tube (5) on the gearbox cover being in the neutral position, fit the joint (6) and the pin.	
	c) Bring the flange (7) against the gearbox cover. Hold the flange and pull on the ball control sheath in order to fit the key (8). Fit the retaining circlip (9) of the key (8).	
	d) Put the connecting tube (1) in position. Fit the spacing washers (10) and tighten the flange fixing screws (spring washers) .....	12 mm box spanner
	e) Fix the connecting tube (1) on the support (4) on the sidemember. The connecting tube (1) must be positioned accurately in the centre of the control tube (5) on the gearbox cover .....	12 mm spanner 12 mm box spanner
	f) Connect the control rod (2) to the bellcrank lever (11). Tighten the nut (spring washer).....	12 mm box spanner

		T O O L S
28	Connect the speedometer cable, to the gearbox.	
29	<u>Adjust the change speed control (see Pl. 24) :</u>	
	a) Adjust the ball control: turn the threaded sleeve (12) in order to obtain at the gear selector lever a dimension "a" = 18.5 mm and tighten the locknut (13). . . . .	17-21 mm spanners
	b) Adjust the control rod: place the selector lever in such a position, to obtain at the selector lever a dimension "b" = 37.5 mm. With the control tube on the gearbox cover in the neutral position, shift the end piece (14) until the hole is exactly opposite the hole in the lever (11) on the connecting tube (1). Fit the pin and tighten the nut (spring washer)	12 mm spanner
	c) Make sure that the distance "b" has not been altered. Check the operation of the selector lever.	
30	<u>Fit the steering (see Pl. 35 and 36).</u>	
	a) Position the pinion so that it corresponds to the marks made when dismantling.	
	b) Engage the pinion in the steering column or in the flexible coupling. Fit the coupling screw and tighten the nut. . . . .	12 mm spanner 12 mm box spanner
	c) Fit the steering in its bearings noting the marks made when dismantling. Offer up the fixing screws (spring washers).	12 mm box spanner
	d) Adjust the angular position of the steering ( <i>cars with mechanical steering</i> ) : Turn the steering wheel and tighten the bearing cap fixing screws. . . . .	12 mm box spanner
	e) Adjust the angular position of the steering ( <i>cars with power assisted steering</i> ) : Fit the fixture 1955-T, as indicated on Pl. 35. Turn the steering in its bearings in order to bring the groove "c" in contact with the central gauge pin (D) of the fixture. Tighten the bearing cap fixing screws. . . . .	12 mm box spanner Fixture 1955-T
	f) Connect the steering levers to the relay spindles, the nuts towards the outside. Tighten the nuts to 18 ft.lbs. (2.5 m.kg). . . . .	14-16 mm box spanners
	g) Lightly tighten the screw (75) of the collar (76) retaining the steering wheel. Move the spring (80) until the coils touch and retighten the screw (75) (spanner 1994-T and spring compressor 1991-T, see Pl. 36, fig. 3 and 4). . . . .	Spanner 1994-T Spring compressor 1991-T
	h) Connect the steering feed pipe assembly to the rotating union ( <i>cars with power assisted steering</i> ). . . . . Fit the battery tray. Fit the battery. Fit the battery frame (a plain washer at each side of the springs). Connect the cables, to the battery and to the regulator. . . . .	18 mm ring spanner 12-14 mm box spanners
31	Fit the fan. Fit the radiator. . . . .	10-14 mm box spanners

		T O O L S
32	Fit the battery bracket. Place a plain washer under the head of the fixing screws on the crossmember and a plain washer between the bracket and the distance piece. Place a plain washer under the head of the front fixing screws on the sidemember, a plain washer and a spring washer under the nut. Place a plain washer and a spring washer under the head of the 2 rear fixing screws of the bracket on the sidemember. Fit the battery tray. Fit the battery. Fit the battery frame (a plain washer at each side of the springs). Connect the cables to the battery and to the regulator. ....	12-14 mm box spanners
33	Put the fluid reservoir in position and fix. ....	8 mm box spanner
34	Connect the accelerator control to the carburettor. ....	7 mm box spanner
35	Fix the flexible couplings (bibax) on the brake discs and fit the front wheels. ....	14 mm socket and extension
36	Put the front brake cooling ducts in position. Tighten the fixing screws (plain and spring washers). Tighten the screws coupling the front unit closing panel to the front panel (plain and spring washers under the head). ....	8-10 mm box spanners
37	Put the exhaust intermediate pipe (ringed pipe) in position then loosen its rear fixing collar. Make sure that the pipe slides and turns freely at its two extremities.  Position the fixing collars to 5 mm approximately from the ends of the pipe. Make sure that the slots of the collars do not coincide with the slot of the tube and that the collars and their fixing screws do not diminish the ground clearance or touch the body when the exhaust pipes move. Tighten the screw of the front collar to 12 to 13½ ft.lbs. (1.7 to 1.9 m.kg) and the screw of the rear collar to 6½ to 8 ft.lbs. (0.9 to 1.1 m.kg). ....	12 mm spanner 12 mm box spanner
38	Fit the radiator air duct. ....	8 mm box spanner
39	Refill the gearbox with oil : 3.6 pints (2 litres SAE 90 EP oil). ....	21 mm box spanner
40	Refill the hydraulic fluid reservoir and the cooling system. With the engine running, unscrew the bleed screw of the pressure control valve, open the vane of the heater control re-tighten the bleed screw of the pressure control valve in order to put the systems under pressure. ....	8 mm spanner
41	Bleed the front brakes (see Op. ID 453-0).	
42	Adjust the clutch clearance (see Op. ID 314-0).	
43	Fit the front wings and the spare wheel support. Connect the bonnet opening controls. Fit the spare wheel.	
44	Lower the car to the ground (jacking bracket 2505-T, see Pl. 51). Tighten the front wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg). Bleed the suspension system by operating the manual height control and put the car in the "high" position. Check the level of the fluid in the hydraulic reservoir, top up if necessary. ....	Jacking bracket 2505-T



**PARTICULAR POINTS.****Removal.**

- 5 *Remove the steering: mark its position in relation to the steering wheel and to the steering relays.*
- 16 *Do not lose the adjusting shims fitted between the front crossmember support of the gearbox and the sidemembers. Disconnect the clutch housing from the crankcase : the right-hand fixing screws of the clutch cylinder also fix the clutch housing on the crankcase.*

**Refitting.**

- 17 *Make sure that the centring dowels are in position in the crankcase before connecting the gearbox to the engine.*
- 18 *If the bearing or the driving shaft, or the gearbox casing are renewed, align the driving pulley (see Op. DS 231-0).*
- 20 *Adjust the front crossmember support of the gearbox : place the shims found when dismantling between the crossmember and sidemembers in order that the distance between the brake disc and the sidemember on the left-hand side is greater by  $70 \pm 2$  mm than this same distance measured on the right side. Use the shims found when dismantling.*
- 21 *Adjust the heights of the brake units: the linings must stand proud of the disc at the front 1 mm approximately.*
- 23 *After having connected the mechanical control cables to the front brakes, adjust the connecting cable so that the control levers are at the limit of separation from their eccentric stops.*
- 26 *Fit the steering : note the markings made when dismantling. Adjust the angular position of the steering: groove of the pinion in contact with the gauge pin of the fixture 1955-T (see Pl. 35).*
- NOTE - If the steering has been renewed, position the assembly then adjust the track and the lock (see Op. DS 440-0).*
- 31 *Straighten the exhaust : carefully observe the instructions given in the paragraph.*
- 35 *Refill the gearbox: 3.6 pints (2 litres SAE 90 EP oil).*
- 36 *Refill the cooling system, vane of the heater control open.*
- 37 *Bleed the front brakes (see Op. DS 453-0).*
- 38 *Operate the auxiliary clutch control and pass the gear lever successively through each gear.*
- 39 *Adjust the clutch clearance (see Op. DS 314-0).*

		TOOLS
	REMOVAL.	
1	<p>Hold the bonnet open (stop MR-4158 see Pl. 2, fig. 1).</p> <p>Drain the cooling system, save this fluid which contains anti-freeze.</p> <p>Put the front of the car on stands, place the stands under the jacking supports (jacking bracket 2505-T, see Pl. 51).</p> <p>Release the pressure in all the systems and syphon the fluid reservoir. ....</p>	<p>Stop MR-4158 Jacking bracket 2505-T 8-21 mm spanners</p>
2	Remove the spare wheel, the spare wheel support and the front wings. ....	8 mm spanner 14-17 mm box spanners
3	<p><u>Remove the radiator :</u></p> <p>a) Remove the starting handle extension.</p> <p>b) Remove the air duct from the radiator (remove the 2 front fixing screws and the 2 fixing screws on the right-hand side of the radiator, slacken the 2 fixing screws on the left side of the radiator). ....</p> <p>c) Loosen the clips and disconnect the flexible pipes, from the radiator.</p> <p>d) Disconnect the tie-rod, from the radiator and water pump. ....</p> <p>e) Remove the screws securing the radiator and disengage. ....</p>	<p>8 mm box spanner</p> <p>8-12 mm box spanners</p> <p>14 mm box spanner</p>
4	<p>Disconnect the cables, from the battery and from the regulator. Remove the battery frame and the battery. Remove the battery tray and the battery bracket. Do not lose the distance piece between the battery bracket and the front engine crossmember bracket.</p> <p>Disengage the suspension reservoir on the side (pay attention to the height corrector overflow return pipes). ....</p>	<p>8-12 mm spanners 8-12 mm box spanners 14 mm box spanner</p>
5	<p><u>Remove the steering</u> (see Pl. 35 and 36) :</p> <p>Mark (with a spot of paint) at "b" the transverse position of the steering in relation to the bearing caps.</p> <p>Also mark the position of the steering column in relation to the pinion (mark the pinion with a centre punch or a spot of paint opposite the slot of the steering tube at "a").</p> <p>Disconnect the steering levers, from the relays.</p> <p>Disconnect the steering feed pipe assembly (68), from the rotating union. Remove the bearing caps and disengage the steering. Seal the steering pipe assembly, using a plate. ....</p>	<p>8-12 mm spanners 8-12 mm box spanners 14-16 mm box spanners 10 mm ring spanner</p>
6	Slacken the nut of the tie-rod and the 2 fixing screws of the dynamo. Swing the dynamo towards the engine and disengage the belt. ....	12-14 mm spanners 12-14 mm box spanners

		TOOLS
7	Unscrew the nuts of the high pressure pump tie-rods and the nut of the articulating spindle (spanner 2431-T, see Pl. 3, fig. 4 and spanner 2280-T, see Pl. 3, fig. 3). Swing the high pressure pump towards the engine .....	Spanner 2431-T Spanner 2280-T
8	Remove the driving pulley fixing screw and disengage the pulley. Do not lose the key and the adjusting washer. Hold the shaft in position, using a flange held by the pulley fixing screw in order to avoid the shaft receding when disconnecting the gearbox .....	17 mm box spanner
9	Unhook the return spring and disconnect the accelerator control, from the carburettor .....	7 mm box spanner
10	Disconnect the 5-pipe pipe assembly and the speedometer cable from the gearbox .....	10 mm box spanner
11	Disconnect the feed pipes from the brake units. Disconnect the feed pipe from the pressure regulator. Disconnect the feed pipe from the clutch cylinder. Disconnect the accelerated idling feed pipe from the left-hand brake unit and from the rear support of the brake unit. Disconnect the pipe between the right-hand brake unit and the centrifugal regulator from the brake unit .....	9-14 mm spanners
12	Remove the front wheels and disconnect the flexible couplings (bibax) from the brake discs .....	14 mm socket and extension
13	Disconnect the mechanical brake control; press on the control lever of the right-hand brake unit, disconnect the connecting cable of the right-hand brake unit, disconnect the control cable and its sheath from the left-hand brake unit.	
14	Remove the tie-rods of the dynamo, high pressure pump and centrifugal regulator. Disconnect the high pressure pump feed pipe. Remove the fan as a safety measure .....	10-12 mm box spanners
15	Remove the screws securing the front brake cooling ducts. Remove the screws coupling the front unit closing panel to the front panel. Disconnect the exhaust intermediate pipe (ringed pipe), from the connecting pipe (front pipe). Engage the intermediate pipe as far as possible into the exhaust silencer. Move the brake cooling ducts forward as far as possible under the front unit crossmember, and swing the rear of the ducts towards the top .....	8-12 mm spanners 8-12 mm box spanners
16	<u>Remove the gearbox:</u> a) Pass a sling (sling 1696-T, see Pl. 23) under the water pump cover and hold the engine-gearbox assembly (stand 1797-T, see Pl. 23) .....	Sling 1696-T Stand 1797-T
	b) Remove the front crossmember support of the engine-gearbox assembly (do not lose the shims fitted between the crossmember and sidemembers) .....	14 mm box spanner
	c) Raise the engine-gearbox assembly in order to disengage the gearbox from the front crossmember.	

		TOOLS
	<p>d) Place the support fixture 1799-T (see Pl. 23) on the support arm of the gearbox and hold the gearbox with a hoist, in order to avoid damage to the shaft or the clutch disc when disconnecting the gearbox from the engine .....</p> <p>e) Unlock the locknuts and slacken the contact screw of the starter motor .....</p> <p>f) Remove the screws fixing the clutch bellhousing on the engine, spanner 1677-T (see Pl. 19, fig. 4) and 2431-T, see Pl. 3, fig. 4 and disengage the gearbox .....</p> <p>NOTE - The right-hand fixing screw of the clutch cylinder also fixes the clutch bellhousing on the engine crankcase.</p> <p style="text-align: center;">REFITTING.</p>	<p>Support fixture 1799-T</p> <p>12 mm box spanner</p> <p>Spanner 1677-T</p> <p>Spanner 2431-T</p>
17	<p><u>Fit the gearbox:</u></p> <p>a) Place the support fixture 1799-T (see Pl. 23) on the gearbox and hold the latter with a hoist .....</p> <p>b) Make sure that the centring dowels are in position on the engine.</p> <p>c) Offer up the gearbox in position. Engage the splines of the gearbox mainshaft in the clutch disc by turning the shaft by the front of the gearbox, using the starting handle relay. If necessary, also turn the pulley driving shaft in order to facilitate the introduction of the splines on the end piece of the camshaft.</p> <p>d) Offer up the gearbox fixing screws and tighten (spanner 1677-T, see Pl. 19, fig. 4 and spanner 2431-T, see Pl. 3, fig. 4) .....</p> <p>e) Offer up the starter motor contact screw and lock the locknuts .....</p>	<p>Support fixture 1799-T</p> <p>Spanner 1677-T</p> <p>Spanner 2431-T</p> <p>12 mm box spanner</p>
18	Fit and align the driving pulley and fit the belts (see Op. DS 231-4).	
19	Fit the tie-rods of the dynamo of the high pressure pump and of the centrifugal regulator .....	<p>12 mm spanner</p> <p>12 mm box spanner</p> <p>17 mm box spanner</p>
20	<p><u>Fit the gearbox front crossmember support:</u></p> <p>a) Engage the adjustable supports in the brake unit end pieces. Note their position.</p> <p>b) Remove the support fixture from the gearbox. Fix the crossmember on the support arms of the gearbox. Tighten the screws and turn over the lockwashers .....</p> <p>c) Lower the engine-gearbox assembly until the crossmember rests on the sidemembers. Disengage the sling and the stand retaining the engine.</p> <p>d) Fit the shims found when dismantling between the crossmembers and sidemembers and tighten the crossmember fixing screws on the latter (plain and spring washers under the heads of the screws).</p> <p>After assembly, the distance between the brake disc and the sidemember, left side, must be greater by <math>70 \pm 2</math> mm than the same distance, measured on the right side .....</p>	<p>14 mm box spanner</p> <p>14 mm box spanner</p>

TOOLS

21	Adjust the heights of the brake units; turn the nuts of the front supports so that the linings stand proud of the disc at the front (1 mm approximately) (see Pl. 47, fig. 1).	
22	Connect the control cable and its sheath to the left-hand brake unit. Press on the control lever of the right-hand brake unit and hook the connecting cable end piece, to the lever.	
23	Turn the adjusting nut (101) of the brake connecting cable (110) until the right and left-hand control levers (103) are at the limit of their separation from the eccentric stop (104) (see Pl. 48, fig. 2) .....	12 mm spanner 12 mm box spanner
24	Connect the feed pipes, to the brake units. Connect the feed pipe to the pressure regulator. Connect the feed pipe to the clutch cylinder. Connect the accelerated idling feed pipe to the left-hand brake unit and to the brake unit rear support. Connect the pipe between the right-hand brake unit and the centrifugal regulator to the regular .....	9-14 mm spanners 17 mm box spanner
25	Connect the 5-pipe pipe assembly controlling the gears and the speedometer cable to the gearbox .....	10 mm box spanner
26	<u>Fit the steering</u> (see Pl. 35 and 36). a) Position the pinion so that it corresponds to the marks made when dismantling (centre punch mark or spot of paint opposite the slot of the steering column at "a"). b) Engage the pinion in the steering column. Fit the steering in its bearings noting the marks made when dismantling, at "b". Offer up the bearing cap fixing screws .....	12 mm box spanner
	<u>Adjust the angular position of the steering</u> (see Pl. 35): c) Fit the fixture 1955-T as indicated on Pl. 35 .....	Fixture 1955-T
	d) Turn the steering in its bearings, in order to bring the groove "c" in contact with the central gauge pin (D) of the fixture. e) Tighten the bearing cap fixing screws (73) and remove the adjusting fixture .....	12 mm box spanner
	f) Connect the steering levers to the steering relays, the nuts towards the outside. Tighten the nuts (74) to 18 ft. lbs (2.5 m. kg) .....	14-16 mm box spanners
	g) Connect the feed pipe assembly (68) to the rotating union. Insert the seal plate, the holes for the fluid corresponding to those of the distributor .....	8 mm ring spanner

		TOOLS
27	Fit the fan. Fit the radiator .....	10-14 mm box spanners
28	Fit the battery bracket. Place a plain washer under the head of the fixing screw on the crossmember and a plain washer between the bracket and the distance piece. Place a plain washer under the head of the front fixing screw on the sidemember, a plain washer and spring washer under the nut. Place a plain washer and a spring washer under the head of the two rear fixing screws of the support on the sidemember. Fit the battery tray. Fit the battery. Fit the battery frame (a plain washer on either side of the springs). Connect the cables to the battery and to the regulator .....	12-14 mm box spanners
29	Fix the hydraulic fluid reservoir in position .....	8 mm spanner
30	Connect the accelerator control to the carburettor .....	7 mm box spanner
31	Fix the flexible coupling (bibax) on the brake discs and fit the front wheels .....	14 mm socket and extension
32	Put the front brake cooling ducts in position. Tighten the fixing screws (plain and spring washers). Tighten the screws coupling the front unit closing panel to the front panel (plain and spring washers under the head).....	8-10 mm box spanners
33	Put the exhaust intermediate pipe in position (ringed pipe) then slacken the rear fixing clip. Make sure that the pipe turns and slides freely at its two ends.  Position the fixing clips to 5 mm approximately from the ends of the pipe, Make sure that the slots of the clips do not coincide with the slots of the pipes and that the clips and their screws do not reduce the ground clearance or touch the body with movements of the exhaust. Tighten the screw of the front clip to 12 to 31½ ft.lbs (1.7 to 1.9 m.kg) and the screw of the rear clip to 6½ to 8 ft.lbs (0.9 to 1.1 m.kg) .....	8-12 mm spanners 8-12 mm box spanners
34	Fit the radiator air duct .....	8 mm box spanner
35	Refill the gearbox with oil 3.6 pints (2 litres SAE 90 EP oil) .....	21 mm box spanner
36	Refill the hydraulic fluid reservoir and the cooling system. With the engine running, slacken the bleed screw of the pressure regulator, open the vane of the heater control, retighten the bleed screw of the pressure regulator in order to put the systems under pressure .....	8 mm spanner

TOOLS

37 Bleed the front brakes (see Op. DS 453-0).

38 Bleed the gear control system (see Op. DS 334-0).

39 Adjust the clutch clearance (see Op. DS 314-0).

40 Fit the front wings and the spare wheel support. Connect the bonnet opening controls. Fit the spare wheel .....

8 mm spanner  
8-14-17 mm box  
spanners

41 Lower the car to the ground (jacking bracket 2505-T, see Pl. 51). Tighten the front wheel fixing screws to 108 to 144 ft.lbs (15 to 20 m.kg).

Bleed the suspension system by operating the manual height control and put the car in the high position. Check the level of the fluid in the hydraulic reservoir, top if necessary .....

Jacking bracket 2505-T

**PARTICULAR POINTS.****Dismantling.**

- 3 *The centre line of the differential not being in the same plane as the joint of the casing, remove the outer differential bearing races sideways.*
- 14 **Strip the mainshaft:**  
*Do not pull the second speed synchro by the collar; if so, the driving pins will fall from the pinion.  
The needle bearing assemblies are not of the same length, mark them.  
Make sure that the position of the 3rd and 4th speed synchro sliding gear is marked (blue paint 4th speed side). If not, mark before dismantling.*
- 17 *To remove the assembly of the retaining washer and thrust washer, heat the thrust washer to 200<sup>o</sup>C (using a blow pipe fitted with a 150 to 200 litre nozzle).*

**Assembly.**

- 21 *The end of the clutch thrust guide stud should be set at a distance "a" = 97 ± 1 mm from the face of the joint with the engine.*
- 22 *In order to align the driving pulley correctly, carry out the instructions given in the paragraph.*
- 23 **Prepare the gearbox cover:**  
*The lateral clearance of the fork shaft control levers = 0.15 to 0.25 mm.  
Calibration of locking spindle spring: length = 52 mm, under load of 29 ± 1.5 kg.  
Adjust the reverse speed selector shaft: place the shaft in the neutral position, bring the thrust cap in contact with the shaft, then slacken one  $\frac{1}{4}$  of a turn and lock the locknut.  
The 1st and 2nd speed selector shaft is adjusted with the gearbox cover in position on the gearbox.*
- 24 **Prepare the differential:**  
*Lateral clearance of the satellites and planet wheels: these parts should turn freely, with a clearance of 0.1 mm minimum.  
Tighten the crown wheel fixing screws to: 47 to 50 ft.lbs (6.5 to 7 m.kg). Do not fit lock plates under the screw heads.*
- 25 **Prepare the differential shafts:**  
*Rectify the brake discs (shaft mounted between centres) by grinding or using a facing tool. Avoid removing in order to rectify the 2nd face.  
Difference in thickness at any point on the disc: 0.02 mm maximum. Maximum run-out, measured at the greatest diameter: 0.17 mm maximum.  
Do not reduce the original thickness of the disc by more than 0.5 mm on each face (original thickness = 12 ± 0.1 mm).*
- 26 **Prepare the shaft and bearing assemblies:**  
*The differential shaft and housing is shorter on the right-hand side (by 10 mm).  
Tighten the bearing nuts to: 72 ft.lbs (10 m.kg).*



- 27 Prepare the mainshaft:  
*Fit the 3rd and 4th speed sliding pinions, note the paint marks on the 4th speed side. Clearance of the ball pads = 0.04 to 0.25 mm (the 3 ball pads can be of different thickness).*  
*Clearance of the 3rd speed locking segments = 0.04 mm maximum.*  
*Lateral clearance of the 2nd speed synchro ring = 0.15 to 0.40 mm.*  
*Clearance of the rear bearing locking circlips = 0.04 mm maximum.*  
*Clearance between the front bearing collar and the thrust face on the cap = 0.*
  
- 28 Prepare the bevel pinion shaft:  
*Clearance between the front bearing collar and cap = 0.*
  
- 29 Adjust the reverse speed pinion: *Clearance between the 2nd speed synchro ring and the reverse speed pinion = 0.30 mm minimum.*  
*Lateral clearance of the needle thrust bearing = 0.1 to 0.5 mm.*
  
- 34 Fit the bevel pinion shaft:  
*Tighten the starting handle dog to 87 ft. lbs (12 m.kg) and the bevel pinion shaft nut to 144 ft. lbs (20 m.kg).*  
*Place behind the distance tube, a shim which will give a dimension (e-d, see Pl. 8) =  $16.2 \pm \frac{1}{0}$  when the clutch housing and gearbox casing are connected for fitting of the sealing joint.*
  
- 38 *Fit and adjust the differential; carefully carry out the instructions given in the paragraph.*
  
- 41 *Adjust the 1st and 2nd speed selector fork shafts; engage the 2nd speed, bring the thrust cap into contact with the shaft, then screw up one  $\frac{1}{4}$  of a turn and lock the locknut.*

TOOLS

**DISMANTLING (see Pl. 8).**

- |   |  |  |
|---|--|--|
| 1 | Fit the gearbox on a stand (stand MR-3053-130, see Pl. 18). Remove the cover .....   | Stand MR-3053-130<br>14 mm box spanner                             |
| 2 | <p><u>Remove the shaft, housing, brake disc assemblies (see Pl. 10):</u></p> <p>a) Remove the screw (58) securing the support arm (57).<br/>                 Disengage the support arm and remove the 4 fixing screws (67) from the housing.<br/>                 Disengage the assembly from the gearbox. Remove the adjusting washer (69) and the distance washer (68) .....</p> <p>b) In the same way remove the other shaft, housing and brake disc assembly.</p> <p>c) Protect the brake disc .....</p> | <p>12 mm spanner<br/>14 mm box spanner</p> <p>Rubber protector</p> |

		TOOLS
3	<p>Disconnect the clutch bellhousing from the gearbox casing. Remove the bearing cages from the clutch bellhousing.</p> <p>NOTE - The centre of the differential is not on the line of the joint between the clutch bellhousing and the gearbox casing; for this reason the bearing races can only be taken out sideways. Hold the differential against the gearbox casing and remove the clutch bellhousing. Disengage the differential .....</p>	<p>12-17 mm spanners 12-17 mm box spanners</p>
4	Remove the upper bearing cap (1) and the lower bearing cap (22). Save the adjusting washers (20) .....	14 mm box spanner
5	Put two gears in mesh. Remove the starting handle dog (24) and the nut (21) locking the bearing (spanner 1734-T, see Pl. 19, fig. 3) .....	Spanner 1734-T
6	Remove the rear oil seal (11) from the mainshaft, the washer (10), the distance piece (9), the circlips (8) (use circlip pliers). Remove the shim (7), the bearing (6), the 1st speed pinion (5) .....	Circlip pliers
7	Loosen the front bearings (2 and 19), by striking on the rear end of the mainshaft (13) and on the bevel pinion shaft (17) with a mallet. Extract the bearings (extractor 1750-T, with half shells and pressure pad 1738-T, see Pl. 22, fig. 1 and 3) .....	Extractor 1750-T Half shells and pressure pad 1738-T
8	Remove the 1st speed control lever spindle and push the fork towards the rear .....	21 mm box spanner
9	Remove the assembly of the mainshaft and pinions through the top of the gearbox casing.	
10	Drive out the bevel pinion shaft (17) by striking the end with a bronze drift. Remove the bevel pinion shaft.	
11	<p><u>Remove the layshaft reverse speed (see Pl. 11)</u></p> <p>a) Unlock the locknut and remove the screw (81) locking the spindle (84) .....</p> <p>b) Drive out the steel plug (84) blocking the hole for the spindle in the front face of the gearbox casing.</p> <p>c) Remove the locking circlip (76). Disengage the spindle (84) by means of a screwdriver. Disengage the sliding pinion (80), the circlips (76), the adjusting washer (79), the needle thrust bearing (78) the adjusting washer (77).</p> <p>d) Remove the circlip (83) and disengage the needle bearing cage (82) and the distance piece from the sliding pinion.</p>	<p>12 mm box spanner</p>
12	Remove the intermediate train pinions and remove the 1st speed selector fork .....	21 mm box spanner
13	Remove the speedometer drive pinion and the oil filler plug .....	12-21 mm box spanners

TOOLS

14 Strip the mainshaft (see Pl. 9):  
 a) Disengage the 4th speed loose pinion (3) and the bronze bush (4) from the synchro. Remove the 2nd speed synchromesh assembly (30).  
 NOTE - Do not pull the synchromesh by the collar, otherwise the driving pins (29) will escape from the pinion. Do not lose the adjusting shim (31) if found between the pinion and the synchro.  
 b) Disengage the 2nd loose pinion (28), the washer (32) retaining the half segments (27), the half segments, the 3rd speed loose pinion (33), the synchromesh bronze bush (34).  
 c) Remove the needle bearing assemblies from the loose pinions. (Note these needle bearing assemblies are not of the same length).  
 d) Remove the 3rd and 4th speed synchro collar:  
 Make sure that the position of the collar (35) in relation to the hub (36) is marked by a stroke of blue paint, 4th speed side; if not, make a mark. Push the collar, without force, towards the front.  
 By holding the collar, bring the synchro ball pads (26) towards the rear.  
 Remove the sliding collar towards the front. (Take care not to lose the balls and springs during this operation).

15 Strip the intermediate train (see Pl. 9, fig. 2):  
 a) Disengage the pinion assembly (43), the hub (51) and the meshing plunger (49), from the sliding collar (16) of the 1st speed pinion (15).  
 b) Disengage the meshing plunger (49) and the hub (51) from the 2nd and reverse speed pinion (43).  
 c) Disengage the circlip (50) from the synchro hub (51).

16 Dismantle the differential (see Pl. 10):  
 Disconnect the crown wheel (70) from the differential housing (73).  
 Remove the planet wheel (55) from the crown wheel. Remove the satellite spindles, the cross-heads (54), the satellites (72) and their thrust washers (71), the second planet wheel (53) and the fibre washer (52).  
 Remove the taper roller bearings from the differential housings and from the crown wheel (extractor 1750-T with half shells 1753-T and pressure pad 1742-T, see Pl. 17, fig. 1) .....

17 mm box spanner  
 Extractor 1750-T  
 Half shells 1753-T  
 Pressure pad 1742-T

17 Strip the differential shafts (see Pl. 10):  
 a) Unscrew the screw (59) retaining the nut (65) locking the bearing (61) on the differential shaft.  
 Remove the nut (65) (spanner 1770-T, see Pl. 20, fig. 6).  
 Drive out the shaft and disc assembly and remove the support arm (57) from the bearing .....

7 mm box spanner  
 Spanner 1770-T

TOOLS

	<p>b) Remove the screw (60) retaining the nut (66) locking the bearing (61) in the housing.                  Remove the nut (66) (spanner 1771-T, see Pl. 20, fig. 5).                  Remove the oil seal (62) and drive out the bearing (61) from the housing .....</p>	<p>12 mm box spanner                  Spanner 1771-T</p>
<p>18</p>	<p><u>Strip the cover</u> (see Pl. 12 and 13):                  Remove the circlip (94) retaining the locking spindle (93).                  Remove the locking spindle.                  Remove the cup (95) the spring (96), from the locking spindle (spring compressor 1792-T, see Pl. 22, fig. 4).                  Remove the circlip (99) and the support tube (86), (be careful not to lose the locking balls).                  Remove the ring seal (97), from the support tube (86).                  Remove the screws (103 and 113), the springs (102 and 112), the balls (101 and 111) locking the selector fork shafts.                  Remove the selector shaft stop screws (116 and 122) and their locknuts (115 and 121) (spanner MR 3691-80, see Pl. 22, fig. 2).                  Slackening the screws fixing the forks.                  Remove the adjusting shims (98) the distance pieces (100 and 88), the levers (87, 89 and 91) controlling the fork shafts.                  Remove the fork shafts and the forks, the locking piece (109) and the locking plungers (114).                  Remove the sealing plugs (85 and 104) .....</p>	<p>Spring compressor 1792-T                  17-21 mm box spanners                  Spanner MR-3691-80                  9 mm spanner</p>
<p>19</p>	<p><u>Strip the clutch bellhousing</u> (see Pl. 14):                  a) Remove the driving pulley:                  Remove the screw (131) and disengage the pulley and the key (126).                  Remove the nut (127) locking the bearing (128) (spanner 1640-T, see Pl. 22, fig. 5).                  Drive the shaft and bearing assembly towards the front. Disengage the bearing (128) and the thrust washer (129) ..                  b) Remove the circlips (134) retaining the clutch thrust and remove the clutch thrust and support assembly.                  Remove the clutch thrust guide stud (135) and its locknut .....</p>	<p>14 mm box spanner                  Spanner 1640-T                  14 mm box spanner</p>

TOOLS

	<p>c) Remove the clutch fork: Remove the dust cover. Remove the circlips (137) and drive out the spindle (125), disengage the return spring (124). Remove the thrust race support hub (136) .....</p>	<p>8-12 mm box spanners</p>
	<p>d) Remove the starter motor reaction screws, and the dynamo fixing screws .....</p>	<p>12-14 mm box spanners</p>
<p>20</p>	<p>Clean the parts.</p> <p style="text-align: center;">ASSEMBLY.</p>	
<p>21</p>	<p><u>Prepare the clutch bellhousing</u> (see Pl. 14):</p>	
	<p>a) Fit the thrust race support hub (136), inserting a paper joint. Tighten the screws and fixing nuts (spring washer under the head of the lower screw). Fit the clutch thrust guide stud (135) together with its locknut. Adjust the position of the screw so that its end is set at a dimension "a" = <math>97 \pm 1</math> mm from the face of the joint with the engine. Tighten the locknut .....</p>	<p>12 mm box spanner</p>
	<p>b) Fit the clutch fork: Engage the spindle (125) previously oiled in the right-hand bore and offer up the fork together with its return spring. Fit the circlip (137) on the spindle. Fit the dust cover. Put the clutch thrust race in position, then fix to the fork using the circlips (134).....</p>	<p>8 mm box spanner</p>
	<p>c) Fit the driving shaft: Put the bearing (128) in the bore of the casing. Tighten the nut (127) and fit a split pin (spanner 1640-T, see Pl. 22, fig. 5). Fit the circlip (129) on the shaft and engage the assembly in the bearing (128). Fit the key (126) and the pulley. Tighten the pulley fixing screw .....</p>	<p>Spanner 1640-T 19 mm box spanner</p>
	<p>d) Fit the dynamo fixing screws, the starter motor reaction screws and their locknut .....</p>	<p>12-14 mm box spanners</p>
<p>22</p>	<p><u>Adjust the position of the driving pulley</u> (see Pl. 4):</p> <p>In order to carry out this operation correctly, use the fixture 1685-T or the fixture 1686-T (used on DS 19 since September 1960) .....</p>	<p>Fixture 1685-T or Fixture 1686-T</p>

## TOOLS

ALIGNMENT OF THE PULLEYS USING THE FIXTURE 1685-T.

NOTE - If the pulley is correctly aligned, the rod will rest on the 2 gauge pins at "f" and "g".

Offer up the gauge pin bracket (B), the face marked 2 pulleys positioned towards the front and fix this bracket on the boss provided for fixing the high pressure pump (7 piston pump).

Fit the rod (A), the ball end engaged as far as possible in the groove of the pulley to be aligned (see fig. 4).

The rod is then resting on one of the gauge pins (C), in the zone "f" or the zone "g".

Adjust the driving pulley.First case:

The rod resting at "f". Reduce the thickness of the pulley adjusting washers by 3 times the amount of clearance at "d" measured at "g". The pulley is then adjusted correctly.

Second case:

The rod resting at "g". Increase the thickness of the pulley adjusting washers by twice the amount of clearance "d" measured at "f".

ALIGNMENT OF THE PULLEYS USING THE FIXTURE 1686-T.

Offer up the gauge pin bracket (B). The 2 long gauge pins positioned towards the front and fix the bracket on the boss provided for fixing the high pressure pump (7 piston pump).

Adjust the driving pulley.

NOTE - If the water pump pulley is correctly aligned, the rod resting at "g" and the clearance existing at "f" between the gauge pin and rod is  $2 \pm 0.1$  mm.

First case:

The rod resting at "f". Reduce the thickness of the pulley adjusting washer by 3 times the amount of the clearance "d" measured at "g" increased by  $2 \text{ mm} \times 2 = 4 \text{ mm}$  in order to obtain a clearance of  $2 \pm 0.1$  mm at "f". The pulley is then correctly aligned.

Example 1 - The clearance "d" measured at "g" = 0.1 mm. It is necessary to reduce the thickness of the adjusting washer by  $(0.1 \times 3) + (2 \times 2) = 0.3 + 4 = 4.3$  mm.

Second case:

The rod resting at "g". If the clearance "d" measured at "f" is greater than  $2 \pm 0.1$  mm, it is necessary to increase the thickness of the adjusting washers of the pulley by twice the difference between the clearance measured and  $2 \pm 0.1$  mm.

Example 2 - The clearance "d" measured at "f" = 2.8 mm. It is necessary to increase the thickness of the adjusting washers by:  $(2.8 - 2) \times 2 = 1.6$  mm.

Third case:

The rod resting at "g". If the clearance "d" measured at "f" is less than  $2 \pm 0.1$  mm, it is necessary to reduce the thickness of the pulley adjusting washers by twice the difference between  $2 \pm 0.1$  mm and the clearance measured.

Example 3 - The clearance "d" measured at "f" = 0.4 mm. It is necessary to reduce the thickness of the adjusting washers by:  $(2 - 0.4) \times 2 = 3.2$  mm.

TOOLS

23

Prepare the gearbox cover (see Pl. 12, 13 and 21):

a) Use the mandrel 1793-T (see Pl. 21).

Insert the mandrel (A) through the right-hand side of the gearbox cover. Fit on the latter the reverse speed fork shaft control lever (87) (this lever is shaped differently than the other two. See Pl. 12 for position of the levers. Fit one distance piece (88), the 3rd and 4th speed control lever (89), a distance piece (88), the 1st and 2nd speed fork shaft control lever (91), the distance piece (100) and the circlip (99). Using a set of feeler gauges, measure the clearance "b" between the thrust face of the cover and the circlip (99).

Select a shim of appropriate thickness from those sold by our Spare Parts Department, in order to obtain a clearance of between 0.15 and 0.25 mm .....

Mandrel 1793-T

b) Fit the forks (see Pl. 13):

Remove the circlip (99), the shim (98), the distance piece (100) (see Pl. 12).

Engage the locking plungers (114), the 1st and 2nd speed fork shaft (118), fit the fork (117) on the shaft. Put the control lever (120) in position in the groove on the shaft.

Engage the 3rd and 4th speed fork shaft (119), fit the locking plate (109), fit the fork (105) on the shaft and put the control lever (106) in position in the groove on the shaft. Tighten the screw fixing the fork.

With the shafts (118 and 119) in the neutral position, engage the reverse gear shaft (108) through the rear of the cover.

Engage the fork (110) on the shaft and put the lever (107) in position in the groove of the shaft.

Tighten the screws fixing the forks (117) and (110).

Lock the screws with iron wire, fitted in such a way, to avoid any rotation in the direction of unscrewing.

Fit the locking balls (111), the springs (112), the screws (113) (copper joint under the head) .....

9 mm spanner  
17 mm spanner  
17 mm box spanner

c) Fit the distance piece (100) and the shim (98) on the portion (A) of the mandrel 1793-T (see Pl. 21, fig. 1).

Fit the ring seal (97) on the support tube (86).

Fit the portion (B) of the mandrel 1793-T, in the support tube (see Pl. 21, fig. 2).

Put 18 balls (92) in the tube, hold them in position with grease.

The shafts of the forks being in the neutral position, engage the assembly of the mandrel (B) and the tube (86) in the cover of the gearbox.

Then push on the mandrel (A) with the tube (86) (see Pl. 21, fig. 3).

Fit the circlip (99) in the groove of the tube (86), between the distance piece (100) and the shim (98).

Check the calibration of the spring (96), under a load of  $29 \pm 1.5$  kg, the length should be 52 mm (fixture for calibrating springs 2420-T) .....

Fixture for calibrating  
springs 2420-T  
Spring compressor  
1792-T

Fit the spring (96) and the cup (95) on the locking spindle (93) (spring compressor 1792-T, see Pl. 22, fig. 4).....

Engage the locking spindle in the support tube (86) and with the latter, push out the mandrel (B) (see Pl. 21, fig. 4).

Fit the circlip (94) retaining the locking spindle.

TOOLS

Fit the sealing plugs (85) and the sealing washers in the holes for the fork shafts, with hermetic.  
Screw in the threaded stop screws (116 and 122), for a few threads into the fork shafts and fit their locknuts (115 and 121).

Put the shaft (108) in the neutral position, screw in the threaded stop screw in order to bring it against the shaft, unscrew the stop screw  $\frac{1}{4}$  of a turn and lock the locknut (spanner MR-3691-80, see Pl. 22, fig. 2).

IMPORTANT NOTE - The shaft (118) of the 1st and 2nd speed is adjusted when the cover is mounted on the gearbox.

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Prepare the differential (see Pl. 10):

- a) Fit in the housing a satellite (72), a thrust washer (71) (the locking tab in the notch in the housing) and a spindle.
- b) Put the crown wheel in position, together with a planet wheel (55). Progressively tighten the crown wheel fixing screws, at the same time checking that the pinions turn freely. At any point the minimum clearance of 0.1 mm must exist, the crown wheel fixing screws being tightened to 47 to 50 ft.lbs (6.5 to 7 m.kg) (torsion spanner 2471-T, see Pl. 1, fig. 2).

Select from the washers sold by our Spare Parts Department a washer (71) which will obtain this condition . . . . .

- c) Remove the crown wheel and its planet wheel. Remove the satellite (72) and the thrust washer (71). Mark these parts and their position in the housing.
- d) Carry out the same operations as above for the other satellites.
- e) Place in the housing a planet wheel thrust washer (52) and the second planet wheel (53). Fit the satellite spindle and each assembly of the satellite (72) and thrust washer (71). Fit the crown wheel and its planet wheel, as indicated in line b) above.

Select from the washers sold by our Spare Parts Department the washer which will give a minimum clearance at any point of 0.1 mm.

- f) Finally fit the planet wheel (53) and its thrust washer (52), the satellites and their thrust washer, the satellite spindles and the cross-head, the other planet wheel and the crown wheel, all the parts being oiled. Tighten the crown wheel fixing screws to 47 to 50 ft.lbs (6.5 to 7 m.kg).

- g) Fit the bearings on the differential (mandrel 1768-T, see Pl. 17, fig. 2) . . . . .

Torsion spanner 2471-T

Mandrel 1768-T

25

Prepare the differential shafts (see Pl. 10):

- a) Reface the brake discs:

Mount the shaft between centres, the disc at the tailstock end, drive by means of a lathe carrier or dog.

Face up the disc face using a facing tool, or better still, a grinding wheel.

If the lathe permits, face up the other face of the disc without removing. If not, screw a stud in one of the holes for fixing the bibax, and reverse the assembly between the lathe centres.

Reface the other face of the disc.





TOOLS

b) Check the disc faces. They conform to the following conditions:

Maximum run-out at the greatest diameter: 0.17 mm at two diametrically opposite points.

Difference in thickness of any point on the disc: 0.02 mm.

NOTE - Do not reduce the original thickness of the disc ( $12 \pm 0.1$  mm) by more than 1 mm.

c) Put the oil retaining washer (64) on the shaft. Offer up the distance piece (63), put the mandrel 1767-T in position (see Pl. 20, fig. 1). Cap the oil sealing washer with the centring bush (A) of the mandrel and fit the distance piece in a press (see Pl. 20, fig. 1) .....

Mandrel 1767-T

26

Prepare the shaft and bearing assemblies (see Pl. 10):

NOTE - The differential shaft and housing are shorter on the right-hand side (by 10 mm).

a) Put the bearing (61) in the housing, tighten the ring nut (66) to 72 ft.lbs (10 m.kg) (spanner 1771-T, see Pl. 20, fig. 5).

Lock the nut with the pointed screw (60) .....

Spanner 1771-T

12 mm box spanner

b) Fit the oil seal (62) (mandrel 1772-T, see Pl. 20, fig. 2). Ease the fitting of the joint in the bush and the housing with petrol, use no other products .....

Mandrel 1772-T

NOTE - During the manipulation of the joint, be careful not to damage the face of the oil seal. One scratch made even with a finger nail is sufficient to cause a leakage.

c) Offer up the housing thus prepared, together with the bracket (57) on the differential shaft, and put in position in a press, using a tube.

Tighten the nut (57) locking the bearing on the shaft to 72 ft.lbs (10 m.kg) (spanner 1770-T, see Pl. 20, fig. 6).

Tighten the screw (59), locking the nut .....

Tube: internal dia. 30

external dia. 39

length = 200

Spanner 1770-T

7 mm box spanner

27

Prepare the mainshaft (see Pl. 9, fig. 1 and 3) :

a) Fit the 3rd and 4th speed synchro collar (35) on the hub (36), the shouldered face towards the 3rd speed and corresponding to the paint marks.

b) Determine the thickness of the ball pads (26):

Fit a ball pad of a thickness = 5.2 mm in its housing.

With a set of feeler gauges, measure the clearance "f" between the ball pad and the hub. For example: 0.15 mm, this gives the height of the housing:  $5.2 + 0.15 = 5.35$  mm.

Knowing that the ball pad should have a clearance of 0.04 to 0.25 mm, select a ball pad which will permit a minimum clearance being obtained. In the example chosen, the ball pad thickness = 5.30 mm.

Mark the housing so that it corresponds to the thickness of the ball pad determined and recommence the same operation for the other two ball pads (the thickness of the 3 ball pads can be different).

## TOOLS

## c) Fit the ball pads:

For each ball pad, proceed in the following manner, the sliding gear being approximately in the 3rd speed position.

Put the spring (25) in the hole in the hub. Place a ball in the hole in the ball pad corresponding to that of the hub, at the same time holding it by hand. Press on the spring with the end of the ball pad then push fully onto the hub by engaging in its housing.

## d) Fit the 3rd speed loose pinion (33) fitted with its needle bearing cage and the bronze bush (34). Make sure that a clearance exists between the bronze bush and the front face of the pinion, the cones being in contact.

Select from the half segments (27), sold by our Spare Parts Department, those which are slightly tight or which will have a maximum play of 0.04 mm in the groove of the shaft.

Fit the half segment retaining washer (32).

## e) Fit the second speed loose pinion (28) fitted with its needle bearing cage.

Fit the synchro bush and the synchro hub carrying the driving pins, the collar with the greater thickness, to be fitted towards the front.

## f) Adjust the movement of the 2nd speed synchro bush:

Hold the mainshaft pinion (30) against the second speed loose pinion (28) (shoulder of the shaft).

With the bush of the synchro in contact with the cone of the second speed loose pinion, using a set of feelers, measure the clearance between the rear face of the synchro bush and the front face of the reverse speed pinion.

Select a shim (31), from those sold by our Spare Parts Department to give a clearance of between 0.15 and 0.40 mm.

## g) Fit the shim (31), the mainshaft pinion (30), the 1st speed pinion (5), the bearing (6).

Select a shim (7), from those sold by our Spare Parts Department which will allow the circlips (8) to just enter the groove in the shaft, or with a maximum clearance of 0.4 mm.

Move the synchro into the 2nd speed position.

## h) Adjust the front bearing cap (see Pl. 8):

Fit a paper joint and tighten the cap (1) on the housing, in order to compress the joint.

Remove the bearing cap.

Put a dial gauge on a straight edge (dial gauge 2437-T, straight edge MR-3377, see Pl. 16, fig. 3).

Put this assembly on a surface plate. Push the dial gauge point in approximately 7 mm and set the dial gauge to zero. Mark the position of the totalising needle. Example: between 7 and 8.

With the joint in position on the cap, place the straight edge with the dial gauge on the joint, the point of the dial gauge in contact with the face which rests against the bearing.

TOOLS

Bring the needles of the dial gauge to the position they occupied previously (large needle at "0" and totalising needle between 7 and 8) by pulling on the spindle of the dial gauge.

Release the spindle of the dial gauge slowly, counting the numbers of turns and fractions of turns described by the large needle, until the point of the dial gauge spindle rests on the thrust face of the bearing.

Example: the large needle has turned 5.63 turns.

With a micrometer measure the thickness of the shoulder on the bearing, for example: 5.48 mm.

Subtract this thickness from the dimension found previously. The difference between the 2 dimensions represents the thickness of the shims (23) to be placed between the cap and the bearing.

In the example chosen: 5.63 - 5.48 = 0.15 mm.

Do not mislay the shims thus determined .....

Dial gauge 2437-T  
Straight edge MR-3377

28 Prepare the bevel pinion shaft (see Pl. 9):

**IMPORTANT NOTE** - If on removal of the bevel pinion shaft the circlip (45) retaining the rollers of the bearings (46) has come out of the groove in the shaft and made a groove on the journals of the 1st speed intermediate loose speed pinion (15), it is necessary to remove the burrs with abrasive paper or a stone, in effect the journals should be perfectly smooth.

Refit the bearing (14) in the following manner:

Put the rollers (46) in the outer cup of the bearing.

The bevel pinion shaft should be placed in a vertical position while fitting the outer cup and roller assembly of the bearing.

Put the roller retaining circlip (45) in position (use circlip pliers in order not to scratch the journals of the 1st speed intermediate loose pinion (15) .....

Circlip pliers

**NOTE** - The bevel pinions sold by our Spare Parts Department are supplied with the bearing fitted.

a) Engage the 1st speed sliding pinion (16) on the splines of the 1st speed pinion (15), the collar towards the pinion.

Fit the ring (50) on the synchro hub (51) and mount the hub thus prepared on the second and reverse speed pinion (43). Mount the meshing plunger (49) on the second and reverse speed pinion (43), the tooth entry facing the pinion.

Engage the assembly of the pinion (43), hub (51) and meshing plunger (49) in the sliding pinion (16) mounted on the 1st speed pinion (15).

b) Adjust the setting of the front bearing (19). (Carry out the same operation as that in paragraph 27 h).

29 Adjust the reverse speed sliding pinion (see Pl. 11):

a) Engage the shaft (84) in the front bearing. Position it so that the housing for the locking screw (81) is towards the front of the gearbox.

Fit on the shaft (84) the needle bearing thrust race (78) (note the direction of assembly), the reverse speed sliding pinion (80) fitted with the needle bearing cage (82) the locking circlip (83) and the stop MR-4420 (see fig. 3 and 6).

Fix the shaft (84) by means of the locking screw (81) .....

Stop MR-4420

TOOLS

b) (see Pl. 9, fig. 1). Remove from the mainshaft as prepared in paragraph 27 the circlips (8), the shim (7), the bearing (6), the mainshaft pinion (5), the 2nd speed synchro complete (30), the 2nd speed idling pinion (28), the bush (32), the half segments (27), the 3rd speed loose pinion (33), fitted with its needle bearing sleeve and bronze bush (34).

Fit on the mainshaft (13), the synchro complete (30), adjusting washer and wheel (31).

Place the shaft in the box by inclining the shaft towards the rear, to engage first in the bore for the rear bearing.

Put the front bearing (2) in position (see Pl. 8).

Fit on the shaft (13) the mainshaft pinion (5), the bearing (6) (mandrel MR-3045, see Pl. 19, fig. 1), the shim (7) and the circlips (8), tighten the starting handle dog. Put the bearing cap (2) in position fitted with the adjusting shims determined in paragraph 27 h) .....

Mandrel MR-3045

c) (see Pl. 11, fig. 2). Place the dial gauge 2437-T, fitted with a special point (point 2441-T, see Pl. 11, fig. 5) on a straight edge bracket (straight edge 1754-T, see fig. 7).

Place the straight edge fitted with the dial gauge on the front face of the gearbox casing, the gauge pin pressing on the end of the shaft (84). Set the large needle to "0" on the dial gauge face and mark the position of the totalising needle. For example: between 2 and 3 .....

Dial gauge 2437-T  
Dial gauge point 2441-T  
Straight edge support  
1754-T

d) (see Pl. 11, fig. 1 and 3). Place the ring of the 2nd speed synchro (74) against the reverse speed mainshaft pinion (75). Holding the synchro ring, bring the reverse speed pinion (80) against the ring. Place the stop MR-4420 against the pinion (80) and tighten its locking screw.

Slacken the locking screw (81) of the shaft (84) and press on the stop MR-4420 in order to bring the pinion (80) against the needle thrust bearing (78). Hold the parts in this position.

Place the straight edge support 1754-T on the front face of the gearbox casing, the dial gauge pointer pressing on the end of the shaft (84). Mark the position of the needles, then pull lightly on the assembly of the dial gauge and straight edge support in order to bring the needles to the position which they occupied in line c).

Count the turns and fractions of turns. For example:  $j = 3.05$  mm.

To this dimension  $j = 3.05$  mm, add 0.30 mm which represents the clearance "a" to be obtained after assembly, between the 2nd speed synchro ring and the reverse speed intermediate pinion. In the example chosen:  $3.05 + 0.30 = 3.35$  mm.

e) Select from among the washers sold by our Spare Parts Department, the thrust washer (77) of this thickness or a thickness immediately greater.

In the example chosen, take a thrust washer of a thickness: 3.45 mm (No. DM 333-80d).

f) (see Pl. 11, fig. 4). Unscrew the locking screw of the stop MR-4420. Put the locking circlip (76) in position on the shaft (84). Put the reverse speed sliding pinion shaft (84) in position and tighten the locking screw (81).

Check the setting of the dial gauge (as indicated in line c). For example: large needle on zero and totalising needle between 2 and 3.

Slacken the locking screw (81) of the shaft (84). With the aid of a screwdriver, pull the latter towards the front, until the locking circlip (76) presses on the needle bearing thrust race (78).

Hold the shaft in this position and place the straight edge support fitted with a dial gauge on the front face of the gearbox casing, the dial gauge pointer pressing on the end of the shaft (84).

## TOOLS

Set the position of the dial gauge needle; for example:

large needle on 98,  
small needle between 8 and 9.

Allow the dial gauge to return slowly to its setting position (large needle on zero, small needle between 2 and 3) by counting the turns and fractions of turns: 5.98.

From this value, subtract 0.10 mm which represents the clearance "b" to be obtained after assembly, between the adjusting washer (79) and the needle bearing thrust race (78) (see fig. 1). In the example chosen:  $2.52 - 0.10 = 2.42$  mm.

g) Select from the washers sold by our Spare Parts Department, the adjusting washer (79) of this thickness or of a thickness immediately lower.

In the example chosen, take an adjusting washer of a thickness: 2.20 mm (No. DM 333-74f).

**IMPORTANT REMARK** - The assembly of the intermediate train (paragraph 31) and the 1st speed mainshaft pinion (paragraph 32) are carried out after the assembly of the reverse speed sliding pinion (paragraph 30).

30 Fit the reverse speed sliding pinion (see Pl. 11):

a) Remove the locking circlip (76) from the shaft (84). With the aid of a screwdriver, pull the shaft towards the front and successively disengage the stop MR-4420, the reverse speed sliding pinion (80) and the needle thrust bearing (78).

b) Engage the shaft (84) in the front bearing, position so that the housing for the locking screw is towards the front.

Successively fit on the shaft (84) the adjusting washer (77) (the flat positioned towards the inside of the box), the needle bearing thrust race (78) (note the direction of assembly), the adjusting washer (79), the reverse speed sliding pinion (80).

Put the locking circlip (76) in position.

Tighten the pointed screw (81) and its locknut.

31 Fit the intermediate train (see Pl. 9):

a) Place in the casing the assembly prepared in paragraph 28 a, above.

b) Fit the 3rd and 4th speed intermediate train (42).

32 Fit the 1st speed selector fork:

Fit the 1st speed fork in the groove of the sliding pinion (16), see Pl. 9, fig. 2. Position the fork so that the articulating spindle in the lever is towards the front. Position the lever so that the boss with the greater length is towards the casing. Do not fit the shaft of the lever and swing the latter towards the rear of the box.

TOOLS

33

Fit the mainshaft (see Pl. 9):

- a) Remove from the mainshaft prepared in paragraph 27 the circlips (8), the shim (7), the bearing (6), the mainshaft pinion (5).  
Fit on the mainshaft, the bronze bush (4), the 4th speed loose pinion (3) together with its needle bearing cage. Make sure that a clearance exists between the 4th speed loose pinion and the bronze bush, the cones being in contact .....
- b) Place the assembly in the box, by inclining the shaft towards the rear, to fit it first in the bore for the rear bearing.
- c) Put the bearing (2) in position.
- d) Put on the shaft (30) the mainshaft pinion (5) and the rear bearing (6) (mandrel MR-3045, see Pl. 19, fig. 1) ...

Circlip pliers

Mandrel MR-3045

34

Fit the bevel pinion shaft (see Pl. 9):

- a) Engage the bevel pinion (17) in the pinions of the intermediate train.  
Put the roller bearings (14) in position in the bore of the casing (mandrel MR-3676-30, see Pl. 19, fig. 2).  
Fit an adjusting shim (18) 3.7 mm thick, for example: then fit the bearing (19) on the front end of the bevel pinion
- b) Fit the spindle of the 1st speed lever. Insert a copper joint .....
- c) Put 2 gears in mesh and tighten the nut (21) to 144 ft.lbs (20 m.kg) (see Pl. 8).  
Tighten the starting handle dog to 86 ft.lbs (12 m.kg). Insert a lockwasher (spanner 1734-T, see Pl. 19, fig. 3)

Mandrel MR-3676-30

21 mm box spanner

Spanner 1734-T

35

Adjust the bevel pinion (see Pl. 8 and 9):

NOTE - This adjustment is of the greatest importance. Giving the teeth the correct bearing will ensure silence and long service from the crown wheel and pinion. The setting dimension is given in millimetres and hundredths of millimetres and is etched on the ground end of the bevel pinion.

This dimension represents the dimension "1", which should exist when the adjustment is completed, between the centre line of the differential shaft and the ground end of the bevel pinion.

This will vary with each crown wheel and pinion.

The adjustment of the bevel pinion setting should be made by using the adjusting fixture 2044-T, fitted with the dial gauge 2437-T (see Pl. 15).

This fixture is constructed so that the distance between the centres of the semi-circular ground bearing faces and the two bearing pads is 55 mm. This number is etched between the two pads.

The measurement should not be taken from the face of the joint of the casing as this differs in relation to the centres of the differential bearings .....

Dial gauge 2437-T  
Fixture 2044-T



TOOLS



- a) Fit the bearing cap (22), together with the adjusting shims (20) determined in paragraph 27 h and a paper joint, without hermetic.  
Tighten the screw .....
- b) Carefully clean the bearing faces for the differential bearings and the ground faces of the adjusting fixture 2044-T. All the faces should be free from scratches or burrs.
- c) Put the adjusting fixture on a surface plate resting on the 2 ground bearing pads. (In this position the pointer on the dial gauge is at 55 mm from the centre line of the ground bearing faces).  
Turn the figure "0" on the movable dial on the dial gauge opposite the large needle.  
Note the position taken up by the needles on the dial gauge.  
Example: totalising needle between 4 and 5: large needle on "0".
- d) Measure the actual bevel pinion setting.
  - 1. Put the adjusting fixture in place of the differential. Turn the adjusting fixture by means of the knurled handle until the large needle of the dial gauge changes its direction of rotation.  
Mark the information given by the needles of the dial gauge.  
Example: totalising needle between 1 and 2: large needle on 82.
  - 2. Bring the needles to the position in which they were in line "c" (in the example chosen: totalising needle between 4 and 5, large needle on "0") by pulling on the dial gauge spindle.
  - 3. Release the spindle of the dial gauge slowly, counting the numbers of turns and fractions of turns described by the large needle, until the point of the dial gauge spindle rests on the ground face of the bevel pinion.  
Check that the dial gauge needles have taken up the position indicated in paragraph 1.  
  
Example: the large needle has turned 1.45 turns, that is to say that the difference between the positions when the adjusting fixture 2044-T was checked on the surface plate (see line c), and the point of the dial gauge has moved forward 1.45 mm.  
  
The actual bevel pinion setting "1" is:  $55.00 + 1.45 = 56.45$  mm.  
  
The dimension etched on the ground end of the bevel pinion being for example : 56.70, it is necessary to withdraw the bevel pinion shaft from the centre line of the differential by  $56.70 - 56.45$  mm = 0.25 mm.  
  
The adjusting shim being 3.7 mm thick, it will be necessary to replace it by a shim of a thickness:  $3.7 - 0.25 = 3.45$  mm.  
  
Remove the bearing cap (22), the nut (21), extract the bearing, replace the shim.  
  
Refit the bearing cap. The joint should be fitted greased. Insert a spring washer under the head of the screws. Put hermetic under the heads of the screws passing through the casing.  
  
Check the adjustment (fixture 2044-T).....

14 mm box spanner

14 mm box spanner  
Fixture 2044-T

TOOLS

- 36 a) Put the tubular distance piece (9) on the mainshaft (13) (see Pl. 8).
- b) Measure the distance "d" between the joint face of the gearbox and clutch bellhousing and the rear end of a tubular distance piece (9).
- c) Measure the distance "e" between the joint face of the gearbox and the clutch bellhousing and the face of the sealing joint (11) on the hub of the thrust race (12).
- d) Take the difference between the 2 dimensions (e-d) and choose from those sold by our Spare Parts Department a shim (10) of appropriate thickness to bring this difference to  $16.2 \pm \frac{1}{0}$  mm.
- e) Fit the sealing joint (11).

- 37 Fit the speedometer pinion, the bush and the flange. Tighten the fixing screws (spring washer under the head).  
Fit the filler and drain plugs (joints under the heads).  
Smear with hermetic and fit the plugs closing the hole for the reverse speed pinion spindle .....

12 mm box spanner  
21 mm spanner

- 38 Fit and adjust the differential (see Pl. 10 and 16).
- a) Put the crown wheel and differential assembly together with its bearings in the clutch bellhousing.  
Connect the clutch bellhousing to the gearbox. Smear the face of the joint with liquid hermetic or linseed oil.  
Fit the screws and nuts assembling the casings.
- b) Fit the differential shaft and bearing assembly, right side.  
Place against the outer bearing race of the differential a distance piece 3.3 mm thick and an adjusting washer 3.2 mm thick, in order to obtain a thickness of 6.5 mm.
- c) Remove the gearbox from the stand and let it rest vertically on the clutch bellhousing face.
- d) Put the fixture 1766-T, together with the dial gauge 2437-T, fitted with the extension 2438-T on the left-hand housing (see Pl. 16, fig. 2).  
  
In order to carry out this operation, it is necessary for the pressure plate (A) to be totally enclosed in the recess in the support base (B) and the dial gauge should indicate about 10 mm when the extension is in contact with the bearing face (P) of the housing.  
  
Hold the fixture firmly by hand.  
  
Set the dial gauge at "0" and note the position of the needles .....

Fixture 1766-T  
Dial gauge 2437-T  
Extension 2438-T



TOOLS

e) Fit the fixture on the gearbox (see Pl. 16, fig. 1).

Tighten the adjusting screw (C) in order to move the pressure plate (A) forward. Do not alter the setting of the dial gauge. Offer up the fixture on the box. Insert a paper joint. Locate the pin in the splines of the planet wheel.

Fit the fixture. Tighten the adjusting screw (C) to 72 ft.lbs (10 m.kg) and then unscrew it 1/3rd of a turn. Tighten the locking screw (D). Pull on the dial gauge spindle in order to put the needles in the position taken in a line d). Release the spindle of the dial gauge slowly and count the turns and fractions of turns.

For example: a distance 8.2 mm.

f) Measure the clearance between the teeth (see Pl. 15).

Fit the dial gauge support on the box (see fig. 2). Fit the extension 2439-T, on the dial gauge. Then fix the dial gauge on the support 2039-T, the point of the extension resting perpendicular to the flank of the tooth of the crown wheel as near as possible to the outside diameter, with the dial gauge reading several millimetres. Take up the clearance between the teeth by moving the differential housing by the right-hand brake disc. Check this clearance on 4 teeth spaced 90° approximately. Take the average of these 4 readings.

For example: a clearance of 0.62 mm, the clearance between the teeth should be between 0.19 and 0.24 mm, it is necessary to reduce it by 0.38 mm. In order to reduce the clearance between the teeth by 0.1 mm, it is necessary to increase the thickness of the washers by 0.2 mm. In the preceding example, in order to reduce the clearance by 0.38 mm, increase the thickness of the washers (68 and 69) (see Pl. 10) fitted between the right-hand housing and the outer race of the bearing by:

$$\frac{0.2 \times 0.38}{0.1} = 0.76 \text{ mm.}$$

The thickness of the washers needed will be 6.5 + 0.76 = 7.26 mm.

g) In order to obtain the bearing clearance, the total thickness of the washers and distance pieces determined in line e) should be 8.2 mm.

The thickness of the shims fitted on the left side:

$$8.2 - 0.76 = 7.44 \text{ mm.}$$

Select from the washers and distance pieces sold by our Spare Parts Department in order to obtain:

On the right side: 7.26 mm, an adjusting washer (68) of 3.15 mm and a distance piece (69) of 4.10 mm.

On the left side: 7.44 mm, an adjusting washer (68) of 3.35 mm, and a distance piece (69) of 4.10 mm.

Remove the dial gauge.

Remove the adjusting fixture and right-hand housing .....

Support for dial gauge  
2039-T  
Extension 2439-T

TOOLS

39

Fit the shaft and bearing assemblies (see Pl. 10):

Put the adjusting washers (68) and the distance pieces (69) previously prepared, in their respective positions.

Fit a paper joint on the housing.

Put the housing in position, the oil drain channel towards the bottom (the longer housing fitted on the left side).

Make sure that the distance piece (56) is in position.

Tighten the screws (67) fixing the housing.

Check the clearance between the teeth (see preceding paragraph).

Screw up, without tightening, the screws (58) fixing the brackets (57). Fit on the bracket arms the straight edge 1799-T (see Pl. 23) and tighten the screws fixing the straight edge.

Tighten the screws (58) fixing the bracket arms (plain washers under the head) .....

14 mm box spanner  
Straight edge 1799-T

40

Fit the gearbox cover:

With the sliding gears and forks in the neutral position, fit the gearbox cover (insert a paper joint stuck with grease on the cover).

Smear the thrust pads of the 3rd and 4th speed selector fork with grease to prevent them falling out of position.

Make sure that the forks are properly engaged in the grooves of the sliding pinion.

Fit the centring screws. Fit the other screws.

41

Adjust the 1st and 2nd speed selector fork shaft (see Pl. 12 and 13):

a) Push on the locking lever (93) and turn the support tube (86) towards the rear of the box in order to engage the gear.

b) Screw the threaded stop screw (122) in order to bring the stop against the selector shaft (118). Then unscrew the screw  $\frac{1}{4}$  of a turn and tighten the locknut (spanner MR-3691-80, see Pl. 22, fig. 2) .....

Spanner MR-3691-80

TOOLS

REMOVAL.

- 1 Remove the brake unit (see Op. D 451-1A).
  - 2 Remove the wheel (jacking bracket 2505-T, see Pl. 51) .....
  - 3 Disconnect the steering rod from the lever on the pivot (extractor 1964-T and pressure pad 1698-T, see Pl. 20, fig. 3).  
 Disconnect the upper axle arm from the pivot (extractor and pressure pad 1864-T, see Pl. 20, fig. 4).  
 Remove the clip and disconnect the rubber protector, from the flexible coupling (bibax).  
 Disengage the driveshaft from the flexible coupling and let the pivot and driveshaft assembly rest on the ground (protect the splines of the driveshaft) .....
  - 4 Remove the flexible coupling (bibax) .....
  - 5 Remove the housing and brake disc assembly:  
 a) Remove the gearbox support arm fixing screws and draw the arm towards the brake disc .....
  - b) Remove the four fixing screws from the differential shaft housing .....
  - c) Disengage the brake disc and housing assembly from underneath the car.
- IMPORTANT - Do not mislay the housing adjusting washers.
- 6 Strip the differential shaft housing (see Op. ID 330-3A, paragraph 17).

Jacking bracket 2505-T  
1968-T, see Pl. 20.

Extractor 1964-T  
Pressure pad 1968-T  
Extractor and pressure pad 1864-T  
21-26 mm box spanners

14 mm socket and extension

14 mm spanner and 14 mm ring spanner

12 mm spanner and 12 mm ring spanner

REFITTING.

- 7 If the differential shaft housing has been replaced, it is necessary to adjust. Proceed as follows:-  
 a) Place the fixture 1766-T, fitted with the dial gauge 2437-T and the dial gauge extension 2438-T as indicated on Pl. 16, fig. 2 on the old housing.  
 Place the moving dial of the dial gauge on "0" and note the position of the totalising needle.  
 For example: between 1 and 2 .....

Fixture 1766-T  
Dial gauge 2437-T  
Dial gauge extension 2438-T

TOOLS

b) Place the fixture 1766-T on the new housing and note the position of the needles. For example: totalising needle between 1 and 2 and large needle at 16. The new housing is shorter than the old housing by: 0.16 mm. On assembly, it is necessary to increase the thickness of the assembly of the distance piece (68) and adjusting washer (69) (see Pl. 10) by 0.16 mm in order to preserve the adjustment of the differential bearings.

c) If the new housing is of greater length than the old (large needle at 90, for example), it is necessary to reduce the thickness of the assembly of the distance piece and bearing adjusting washer (by 0.10 mm, in the example chosen).

NOTE - This adjustment can only be obtained by using a straight edge MR-3377 (see Pl. 16, fig. 3), fit it with a dial gauge 2437-T and an extension 2437-T, and extension 2438-T, or by means of a depth gauge fitted with a straight edge .....

Straight edge MR-3377  
Dial gauge 2437-T  
Dial gauge extension  
2438-T or depth gauge  
and straight edge

8

Assemble the differential shaft housing (see Pl. 10):

a) Fit the bearing (61) in the housing, tighten the castellated nut (66) to 72 ft. lbs (10 m. kg) (spanner 1771-T, see Pl. 20, fig. 5).

Lock the nut with the pointed screw (60) .....

Spanner 1771-T  
12 mm box spanner

b) Fit the sealing joint (62) (bushes 1772-T, see Pl. 20, fig. 2). Facilitate the sliding of the joint in the bush and the housing with petrol, to the exclusion of all other products .....

Bushes 1772-T

NOTE - During the manipulation of the joint, take great care not to scratch the bearing face of the oil seal. A scratch with a finger nail is sufficient to cause a leak.

c) Offer up the housing thus prepared and fitted with the gearbox support (57) on the differential shaft and fit in position with a press, using a tube.

Tighten the nut (65) locking the bearing on the shaft to 72 ft. lbs (10 m. kg) (spanner 1770-T, see Pl. 20, fig. 6). Tighten the locking screw (59) of the nut .....

Tube dia. = 30 x 39  
length = 200  
Spanner 1770-T  
7 mm box spanner

9

Fit the brake disc and housing assembly:

a) Put in position the distance piece (68) and the differential bearing adjusting washer (69) (see Pl. 10).

b) Offer up the support arm-brake disc assembly, the paper joint being stuck with grease on the housing.

c) Tighten the 4 fixing screws of the housing .....

12 mm spanner and  
12 mm ring spanner

d) Tighten the fixing screws of the support arm on the gearbox .....

14 mm spanner and  
14 mm ring spanner

10

Fit the flexible coupling (bibax) .....

14 mm socket and  
extension

TOOLS

11 Engage the transmission in the flexible coupling and connect the upper arm on the pivot, after having thoroughly degreased the tapers. Tighten the nut and fit a split pin.

Put the rubber protector in position on the flexible coupling and fit a ligarex clip. Connect the steering rod to the lever on the pivot, after having thoroughly degreased the tapers. Tighten the nut, fit a split pin .....

21-26 mm box spanners  
Pliers 2483-T

12 Fit the brake unit (see Op. D 451-4).

13 Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 51). Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg) .....

Jacking bracket 2505-T

14 Bleed the front brakes (see Op. DS 453-0 or ID 453-0).

## TOOLS

BENCH TESTING A PRESSURE REGULATOR.

CHECKING A PRESSURE REGULATOR (on the car).

CHECKING THE INITIAL PRESSURE OF AN ACCUMULATOR OR A SUSPENSION SPHERE.

Proceed as indicated in the DS 19 or ID 19 Repair Manuals. The pressures must be as follows:

1. Pressure of cut-out (*DS 19, ID 19 Break (Safari) type cars, ID 19 saloon with power assisted steering*):  
2130 to 2420 p. s. i. (150 to 170 kg/cm<sup>2</sup>).
2. Pressure of cutting-in (*DS 19, ID 19 Break (Safari) type cars, ID 19 saloon with power assisted steering*):  
1850 to 1990 p. s. i. (130 to 140 kg/cm<sup>2</sup>).
3. Pressure of cutting-out (*ID 19, saloon cars*): 1850 to 1990 p. s. i. (130 to 140 kg/cm<sup>2</sup>).
4. Pressure of cutting-in (*ID 19, saloon cars*): 1422 to 1564 p. s. i. (100 to 110 kg/cm<sup>2</sup>).
5. Initial pressure of main accumulator (*DS 19 and ID 19 Break (Safari) type cars*):  
 $925 \pm \frac{70}{210}$  p. s. i. ( $65 \pm \frac{5}{15}$  kg/cm<sup>2</sup>).
6. Initial pressure of main accumulator (*ID 19 saloon cars and saloon cars with power assisted steering*):  
 $570 \pm \frac{70}{140}$  p. s. i. ( $40 \pm \frac{5}{10}$  kg/cm<sup>2</sup>).
7. Initial pressure of a brake accumulator (*DS 19 and ID 19 Break (Safari) type cars*):  
 $570 \pm 30$  p. s. i. ( $40 \pm 2$  kg/cm<sup>2</sup>).
8. Initial pressure of a front suspension sphere (*DS 19 and ID 19 all type cars*):  
 $840 \pm \frac{30}{220}$  p. s. i. ( $59 \pm \frac{2}{15}$  kg/cm<sup>2</sup>).
9. Initial pressure of a rear suspension sphere (*DS 19 and ID 19 saloon type cars*):  
 $370 \pm \frac{30}{150}$  p. s. i. ( $26 \pm \frac{2}{10}$  kg/cm<sup>2</sup>).
10. Initial pressure of a rear suspension sphere (*ID 19 Break (Safari) type cars*):  
 $540 \pm \frac{30}{150}$  p. s. i. ( $37 \pm \frac{2}{10}$  kg/cm<sup>2</sup>).

**PARTICULAR POINTS.**

*This operation is valid for cars DS 19 and ID 19 with power assisted steering.*

Removal.

6 *Remove the pressure regulator: the fixings and the pipes being disconnected, pivot the body of the regulator towards the front and the accumulator towards the rear. Withdraw the pressure regulator-accumulator assembly from underneath the car.*

Refitting.

10 *Fit the pressure regulator: offer up the regulator and incline it, the body towards the front, pass the accumulator between the breather and the pipe assembly, by rocking the regulator.*

**TOOLS**

This operation is valid for cars DS 19 and ID 19 with power assisted steering.

**REMOVAL.**

- |   |  |  |
|---|--|--|
| 1 | Release the pressure by unscrewing the bleed screw of the pressure regulator .....   | 8 mm spanner                                       |
| 2 | Disconnect the cable from the negative terminal of the battery .....   | 12 mm spanner                                      |
| 3 | Remove the left-hand front suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2) .....  | Strap wrench 2223-T                                |
| 4 | Remove the petrol pump .....   | 14 mm ring spanner                                 |
| 5 | Completely unscrew the high pressure pump-pressure regulator connecting pipe union, from the pressure regulator.<br>Disconnect the high pressure outlet pipe from the pressure regulator.<br>Disconnect the overflow return pipe to the reservoir from the pressure regulator .....  | 9-14 mm spanners                                   |
| 6 | Slacken the clip retaining the pressure regulator.<br>Remove the upper fixing screw from the pressure regulator.<br>Disengage the clip from the support and slightly disengage the pressure regulator from its support in order to obtain access to the high pressure pump-pressure regulator connecting pipe union. Disconnect this pipe from the pressure regulator.<br>Pivot the body of the pressure regulator towards the front and disengage the accumulator towards the rear.<br>Remove the high pressure outlet pipe of the pressure regulator. Withdraw the pressure regulator-accumulator assembly from underneath the car. Care must be taken not to deform the pipe assembly remaining on the car. | 12 mm spanner<br>12 mm box spanner<br>9 mm spanner |
| 7 | Disconnect the accumulator from the pressure regulator (strap wrench 2223-T, see Pl. 3, fig. 2) .....  | Strap wrench 2223-T                                |

		TOOLS
	REFITTING.	
8	Mount the accumulator on the pressure regulator. Tighten by hand. Insert the joint, previously smeared with hydraulic fluid.	
9	Fit the retaining clip on the pressure regulator.	
10	<u>Fit the pressure regulator:</u>	
	a) Offer up the pressure regulator on the car. Incline the body of the pressure regulator towards the front, pass the accumulator between the oil breather and the pipe assembly by rocking the pressure regulator.	
	b) Put the pressure regulator high pressure outlet pipe in position and connect to the pressure regulator. Offer up the union, without tightening .....	9 mm spanner
	c) Connect the high pressure pump-pressure regulator connecting pipe to the pressure regulator. Offer up the union without tightening .....	14 mm spanner
	d) Screw in the pressure regulator upper fixing screw for a few threads (plain and spring washer).	
	e) Put the pressure regulator retaining clip in position on the support. Offer up the nut.	
	f) Tighten the upper fixing screw of the pressure regulator and tighten the clip nut .....	12 mm spanner
	g) Connect the pressure regulator high pressure outlet pipe to the 4-way union.	
	h) Tighten the unions of the pressure regulator high pressure outlet pipe and the high pressure pump-pressure regulator connecting pipe .....	9-14 mm spanners
	i) Connect the overflow return pipe to the reservoir, to the pressure regulator. Tighten the clip (flexible bush).	
11	Fit the petrol pump, inserting a joint. Tighten the nuts .....	14 mm ring spanners
12	Fit the left-hand front suspension sphere. Tighten by hand.	
13	Connect the cable to the negative terminal of the battery .....	12 mm spanner
14	Start the engine, leave running for a few minutes. Put the systems under pressure. Check the unions for leakage. Check the level of the fluid in the hydraulic reservoir .....	8 mm spanner



TOOLS

OVERHAULING A HEIGHT CORRECTOR (rapid return type).

Dismantling (see Pl. 26).

- 1 Remove the support plate from the corrector ..... 12 mm box spanner
- 2 Slacken the locknut (15), remove the control (16) and the washer (14) ..... 8 mm spanner
- 3 Remove the sealing cups (10) and (5) and unscrew the nut (2) ..... 8 mm box spanner
- 4 Remove the steel rings (6) and (8) retaining the diaphragms (4) and (11).
- 5 Remove the outer steel cups (3) and (12), the diaphragms (4) and (11), the inner steel cups (7) and (13) and the springs (17) and (20), the circlips (18) and (21) and the valves (9) and (19). Disengage the slide valve (22), from the body of the corrector.
- 6 Remove the overflow return pipe union pipe (1) ..... 10 mm box spanner
- 7 Dismount the dashpot (see fig. 2):  
Remove the screw (23) locking the jets and disengage the 8 jets (26), the 6 distance washers (25) and the central distance piece (24) (spanner MR-1376-50, see fig. 5) ..... Spanner MR-1376-50
- 8 Thoroughly clean the parts with alcohol. Blow with compressed air (except the small parts forming the dashpot).

Assembly (see Pl. 26).

- 9 *Mount the dashpot (see fig. 2) :*  
Fit successively 1 jet (26), 1 distance washer (25), 1 jet (26), 1 distance washer (25), 1 jet (26), 1 distance washer (25), 1 jet (26), 1 central distance piece (24), 1 jet (26), 1 distance washer (25), 1 jet (26), 1 distance washer (25), 1 jet (26), 1 distance washer (25), 1 jet (26) and the locking screw (23). Make sure that the jets are positioned correctly: in effect, the jets on the tightening screw side can become engaged in the thread receiving this screw and when tightening can become deformed. Tighten the screw (23) moderately 1.8 to 2.1 ft. lbs (0.25 to 0.03 m. kg) (spanner MR-1376-50, see fig. 5) ..... Spanner MR-1376-50
- 10 Fit a valve (9) and a circlip (18) on the slide valve (22) and engage this assembly in the body of the corrector, the threaded part of the slide valve with the greatest length, towards the rear.

TOOLS

11 Fit the second valve (19) and the second circlip (21), the springs (17) and (20) (the coil against the valve side), the inner steel cups (7) and (13), the diaphragms (4) and (11), the outer steel cups (3) and (12), the nut (2), the washer (14) and the control (16) (tighten to 1½ ft.lbs (0.2 m.kg). Position the control (see fig. 1). Tighten the locknut (15).

Do not fit the steel rings (6) and (8) or the sealing cups (5) and (10).

12 Bleed the correctors (see Pl. 27):

a) Connect the test bench pump to the pressure gauge M 1 (0 to 100 kg/cm<sup>2</sup>). Connect the opening "a" of the test bench pump to the overflow return opening of the corrector, using the pipe (A) and a union (union 2218-T). The corrector being fitted (overflow return opening positioned towards the bottom) on its support (support MR-3053-240, see fig. 2) .....

Test bench 2290-T  
 Union 2218-T  
 Support MR-3053-240  
 9-10 mm spanners  
 12 mm box spanner

b) Disengage the upper part of the diaphragms (4) and (11), from the grooves of the corrector body (at "c").

c) Tighten the bleed screw of the test bench pump and operate the pump in order to fill the corrector with fluid. Do not exceed a pressure of 80 p. s. i. (5 kg/cm<sup>2</sup>). Stop when the fluid flows through the opening between the diaphragms and the corrector body at "c".

d) Put the diaphragms (4) and (11) in position and fit the retaining rings (6) and (8). Fit the sealing cups (5) and (10).

e) Slacken the test bench bleed screw. Disconnect the union 2218-T, from the corrector overflow return opening and fit the end piece (1) (fit a rubber protector on the latter) .....

9-10-12 mm spanners

f) Clean the exterior of the corrector with alcohol and remove from its support .....

12 mm box spanners

**PARTICULAR POINTS.**

*This operation is valid for cars DS 19 and ID 19 with power assisted steering.*

- 1 Adjust the lateral position of the steering.  
*Obtain a dimension "g" of  $122.5 \pm 2.5$  mm between the centre line of the left-hand lower relay lever and the centre line of the rack pressure pad cap (see Pl. 39).*
  
- 5 Adjust the angular position of the steering.  
*The groove "c" of the pinion should be in contact with the gauge pin (D) of the fixture (see Pl. 35).*
  
- 7 Adjust the alignment.  
*The wheels should toe-in at the front from 1 to 3 mm.*
  
- 10 Adjust the point "0" (position of the steering in which the car runs in a straight line).  
*On the road, determine the position of the steering wheel for running-in a straight line. Then mark with chalk on the dashboard and on the rim of the steering wheel.  
Stop the car, turn the steering wheel so that the marks correspond and move the cam so that the roller is in the hollow of the cam.  
An effort of  $7 \pm 0.5$  kg applied on the spindle of the roller, should be required to raise the roller.*
  
- 13 Adjust the steering lock.  
*The lock should be set to  $42 \pm 1^{\circ}$ .*
  
- 17 Pressure cross-over adjustment (Test bench 2290-T).  
*Using the assembly indicated on Pl. 45, operate the steering (engine running) in order to bleed the system.  
Turn the steering to one side in order to obtain a difference of pressure 853 p.s.i. (60 kg/cm<sup>2</sup>), between the 2 gauges.  
Turn the steering wheel in the reverse direction and note the pressure at the moment when the 2 pressure gauges indicate the same pressure.  
It should be  $995 \pm 150$  p.s.i. ( $70 \pm 10$  kg/cm<sup>2</sup>); if not, adjust the pressure distributor.*

**TOOLS**

**ADJUSTMENT OF THE LATERAL POSITION OF THE STEERING (see Pl. 39).**

- |   |  |  |
|---|--|--|
| 1 | Put the front of the car on stands (jacking bracket 2505-T, see Pl. 51) .....  | Jacking bracket 2505-T                           |
| 2 | Remove the left-hand front wing and the battery .....  | 12-14-17 mm spanners<br>12-14-17 mm box spanners |
| 3 | With the bearing cap screws loosened, move the steering in its bearings, in order to obtain a dimension "g" of $122.5 \pm 2.5$ mm, between the centre line of the lower relay lever and the centre line of the rack pressure pad cap | 12 mm box spanner                                |
| 4 | Fit the bearing cap fixing screws, without tightening and adjust the angular position of the steering (see following paragraphs, this operation).  |  |

TOOLS

ADJUSTMENT OF THE ANGULAR POSITION OF THE STEERING (see Pl. 35).

5 Remove the left-hand front wing, the battery, the battery tray and the bracket .....

8-12-14 mm spanners  
8-12-14 mm box spanners

6 With the front of the car on stands and the bearing cap fixing screws loose, fit the fixture 1955-T, as shown on Pl. 35.

Turn the steering assembly in its bearings, in order to bring the groove "c" in contact with the centre gauge pin (D) of the fixture.

Tighten the bearing cap fixing screws. Remove the fixture .....

Fixture 1955-T  
12 mm box spanner

ADJUSTMENT OF THE ALIGNMENT (see Pl. 31).

NOTE - In order to carry out this adjustment, it is necessary to have the car at the "normal" height.

7 Use a gauge, of which several types are in general use in the trade. Measure at the height of the wheel centres, the distance between the wheel rims, at the rear. Mark with chalk, the points of the rim where the measurements have been made. Turn the wheels half a turn and measure at the front on the points previously marked.

*The wheels should toe-in at the front.*

The difference between the measurement at the rear and at the front should be from 1 to 3 mm.

8 In order to correct the alignment, raise the front of the car, right-hand side (jacking bracket 2505-T, see Pl. 51). Loosen the screws of the collars (4). Turn the sleeve (5). Work by fractions of turns ( $\frac{1}{4}$  of a turn corresponds to an alteration of alignment of approximately 1 mm) .....

Jacking bracket 2505-T  
12 mm box spanner

9 Lower the car to the ground. Again check the adjustment in the manner given above. Position the collars (4) so that the locking screws are opposite the slot in the sleeve. Make sure that the ball joint of the steering rod is not strained. Tighten the nuts of the collar screws to  $7\frac{1}{4}$  ft.lbs (1 m.kg). Turn the steering fully to the right and then to the left, to make sure that there is sufficient clearance between the screws of the collars and the front crossmember or the radiator air intake cowl .....

12 mm box spanner

NOTE - The alignment is set by altering the length of the right-hand push-rod, after this operation, it is necessary to adjust the steering lock (see paragraphs 13 and following, this operation) and the point "0" (position of the steering in which the car runs in a straight line) (see paragraphs 10 and following, this operation).

TOOLS

ADJUSTMENT OF THE POINT "0" (position of the steering in which the car runs in a straight line) (see Pl. 35).

This adjustment can only be carried out on the road.

NOTE - This adjustment is very important. It controls the direction of the car on the road.

10 Determine the position of the steering wheel for running in a straight line. Travel on a straight flat road. Hold the steering wheel, in order to follow a straight line. Then mark with chalk on the dashboard and on the rim of the steering wheel. Stop the car.

NOTE - If there is a strong side wind, run slowly in 2nd speed, holding the steering wheel, in order to run in a straight line for 500 m approximately.

11 Adjust the position of the cam. Turn the steering wheel so that the marks made previously correspond. Loosen the fixing collar (71) of the cam (70) and turn these until the roller is in the hollow of the cam. Tighten the collar to  $3\frac{1}{4}$  ft.lbs. (0.4 m.kg).

8 mm box spanner

12 Again drive along the road and check that the car runs in a straight line.

NOTE - The roller should be parallel to the cam and in the centre of it to within 2 mm precisely. With the roller in the hollow of the cam an effort of  $7 \pm 0.5$  kg, should be required to raise the roller when applied to the spindle of the roller perpendicular to the torsion rod (72) (spring balance 2472-T), place a washer of appropriate thickness under the bearing in order to reduce the effort or slightly beat down the panel in order to increase the effort.

Spring balance 2472-T

ADJUSTMENT OF THE STEERING LOCK (see Pl. 31).

NOTE - The lock should be set at  $42 \pm 1^{00}$ , in order to avoid undue strain on the driveshafts.

13 Put the front of the car on stands (jacking bracket 2505-T, see Pl. 51).

Remove the front wings.

12-14-17 mm spanners  
12-14-17 mm box spanners  
Jacking bracket 2505-T

- 14 a) Place the steering wheel as for running in a straight line (the point "0", see paras. 10 to 12, this operation).
- b) Turn the steering wheel  $1\frac{1}{2}$  turns exactly, for DS 19 cars or ID 19 cars with power assisted steering and 2  $\frac{1}{6}$ th turns exactly for ID 19 type cars with mechanical steering towards the left. Fit the thrust cap (1) untighten the locknut (2).
- c) Carry out the same operation to the right (from the position of running in a straight line). Fit the cap, (6). Tighten the locknut.

36 mm spanner

15 Fit the front wings.

12-14-17 mm spanners  
12-14-17 mm box spanners

16 Lower the car to the ground (jacking bracket 2505-T, see Pl. 51).

Jacking bracket 2505-T

## TOOLS

## ADJUSTMENT OF THE CROSS-OVER PRESSURE (see Pl. 45 and 46).

17	Prepare the test bench 2290-T. The two 0-2844 p.s.i. (0-200 kg/cm <sup>2</sup> ) pressure gauges should be connected as indicated below.....	Test bench 2290-T
18	Release the pressure, by unscrewing the bleed screw of the pressure regulator.....	8 mm spanner
19	Place the cloth under the steering pipe assembly, right side, in order to avoid spilling fluid on the brake unit. Remove the connecting pipe assembly from the end piece side of the casing.....	8 mm box spanner
20	Fit the pipe assembly (R) on the connecting pipe assembly flange (insert a seal plate). Connect the ends "i" and "j" of the pipe assembly (R), by means of the pipes (A) and (B) to the pressure gauges (M2) and (M3) of the test bench .....	8 mm box spanner 9 mm spanner
21	Start the engine and tighten the bleed screw of the pressure regulator. Turn the steering from left to right, in order to bleed the pipes of the pressure gauges. Place the wheels as for running in a straight line (roller in the hollow of the cam) .....	8 mm spanner
22	Turn the steering wheel to the right or to the left, in order to obtain a difference of pressure 853 p.s.i. (60 kg/cm <sup>2</sup> ) between the 2 pressure gauges (example 290 p.s.i. (20 kg/cm <sup>2</sup> ) and 1137 p.s.i. (80 kg/cm <sup>2</sup> ) or 711 p.s.i. (50 kg/cm <sup>2</sup> ) and 1564 p.s.i. (110 kg/cm <sup>2</sup> ) etc.). Turn the steering wheel slowly in the reverse direction and note the pressure when the 2 pressure gauges show the same reading. This pressure should be 995 ± 150 p.s.i. (70 ± 10 kg/cm <sup>2</sup> ).	
23	If the pressure does not read 995 ± 150 p.s.i. (70 ± 10 kg/cm <sup>2</sup> ), it is necessary to adjust the pressure distributor. Stop the engine. Remove the battery and its bracket. Disengage the rubber protector from the distributor, in order to obtain access to the value adjusting screw (60). Unscrew the locknut (61) of one of the screws (60).	
	NOTE - Do not turn the adjusting screw during the unscrewing of the locknut. If the cross-over pressure is too high, unscrew one of the adjusting screws (60) and tighten if the pressure is too low (work on the screw approximately 1/12 of a turn at a time; the action of the screw is very sensitive) .....	12 mm ring spanner
	NOTE - Do not release the steering wheel when the pressures are stabilised (needles of the pressure gauges stationary), otherwise a movement of the steering wheel will upset the reading of the pressure gauges.	

**PARTICULAR POINTS.**

Replacement of a steering wheel.

Removal.

6 *Disconnect the speedometer cable, gearbox side, from the speedometer cable, speedometer side, in order to disengage the distance tube of the steering wheel.*

Refitting.

9 *If the steering wheel is to be replaced, turn the pinion in order to obtain a dimension "f" = 275 mm (see Pl. 39) and put the steering wheel in position. In order to connect the steering wheel to the pinion, only fit a coupling screw DM 441-100 (with a plain portion under the head).*

REPLACEMENT OF A STEERING WHEEL.

Removal (see Pl. 36).

NOTE - If the same steering wheel is to be refitted, mark its position in relation to the steering pinion.

1 Remove the cover from the instrument panel.

2 Unscrew the nut and remove the screw coupling the steering wheel to the flexible coupling or to the pinion (cars with power assisted steering) .....

12 mm box spanner

3 Unscrew the screw (75) of the clip (76) (spanner 1994-T, see fig. 4) .....

Spanner 1994-T

4 Lightly pull on the steering wheel towards the rear and disengage the clip (76) and the cup (77).

5 Have an assistant disengage the steering wheel, and hold the distance tube (78) in order that the securing parts rest against the bearing in the support of the steering wheel.

6 Disconnect the speedometer cable, gearbox side, from the speedometer cable, speedometer side and disengage the distance tube (78).

7 Disengage the cup (79), the spring (80), the cup (81) and the split bush (82).

TOOLS

TOOLS

Refitting (see Pl. 36).

- |    |   |   |
|----|---|---|
| 8  | Engage the steering wheel in its support. Successively engage on the steering wheel the split bush (82), the cup (81), the spring (80), the cup (79). Offer up the distance tube (78) and engage the steering wheel inside. Place on the steering wheel tube the cup (77) and the clip (76). Note the positioning of the cups (see fig. 2).   |   |
| 9  | Fit the steering wheel tube on the flexible coupling or on the pinion (cars with power assisted steering) corresponding to the markings made when dismantling, if the steering wheel has not been renewed. If the steering wheel has been renewed, turn the pinion in order to bring the outer bush of the flexible bearing of the left-hand steering rod to a dimension "f" = 275 mm to the centre line of the rack plunger (see Pl. 39 and offer up the steering wheel, the arm being at 30° under the horizontal, left side. Put the fixing screw in position.<br><br>(Only use the coupling screw DM 441-100, with a plain portion under the head) and tighten the nut after having made sure that the screw is correctly engaged in the groove ..... | 12 mm box spanner                             |
| 10 | Compress the spring (80) (spring compressor 1991-T, see fig. 3). When the coils of the springs touch, tighten the screw (75) of the collar (76) (spanner 1994-T, see fig. 4) .....  | Spring compressor<br>1991-T<br>Spanner 1994-T |
| 11 | Connect the speedometer cable, gearbox side, to the speedometer cable, speedometer side.  |   |
| 12 | Fit the instrument panel cover.   |   |



**PARTICULAR POINTS.**

*The operation is valid for the DS 19 and ID 19 with power assisted steering.*

Replacement of a steering.Removal.

3 *Drain the fluid reservoir, or seal the steering feed pipe flange, after having released the pressure.*

Refitting.

9 *Bring the outer bush of the left-hand rod silentblocs to a distance "f" = 275 mm to the centre of the rack pressure pad, and set the steering wheel arm at 30° under the horizontal on the left side. Connect the steering column to the pinion. Only fit the screw DM 441-100 with a smooth portion under the head.*

10 *Position the steering in its bearings, in order to obtain a dimension "g" of 122.5 ± 2.5 mm between the centre of the lower relay and the centre of the rack pressure pad (see Pl. 39).*

11 *Adjust the angular position of the steering : bring the groove "c" of the pinion in contact with the gauge pin (D) of the fixture 1955-T (see Pl. 35) (cars with power assisted steering) or turn the steering wheel before tightening the bearing cap (ID 19 mechanical steering).*

16 *Adjust the point "O" (see Op. D 440-0).*

19 *Adjust the alignment and the lock (see Op. D 440-0).*

Replacement of a rack hydraulic control.

*It is possible to carry out this operation without removing the steering.*

Refitting.

31 *Adjust the lock (see Op. D 440-0).*

Replacement of a pinion and rotating union assembly.Removal.

34 *Remove the steering.*

36 *When disengaging the pinion from the steering, do not lose the ballbearings.*

Refitting.

37-38 *Grease the pinion bearings (special castor oil Antar RC). Tighten the nut. Follow the instructions given in the paragraph.*

40 *Fit the steering, and note the instructions given in the paragraphs 9 to 19 above.*

TOOLS

REPLACEMENT OF A STEERING.

Removal (see Pl. 35).

- 1 Remove the sparewheel, and the left-hand front wing. Release the pressure ..... 14-16 mm box spanners  
8 mm spanner
- 2 Remove the battery. Remove the battery tray ..... 12 mm spanner
- 3 Drain the hydraulic fluid from the reservoir.

NOTE - One can avoid draining the reservoir by fitting a closing plate to the flange of the steering feed pipe assembly (68).

Remove the collars fixing the reservoir. Disengage the high pressure pump feed pipe from the battery bracket. Remove the battery bracket with the bonnet lock control cable .....

8-12 mm box spanners

- 4 Disconnect the steering column from the pinion ..... 12 mm box spanner

- 5 Disconnect the pipe assembly (68) from the pinion housing. Remove the seal plates. Fit a closing plate on the flange of the pipe assembly, if the reservoir has not been drained .....

8 mm ring spanner

- 6 Disconnect the steering levers from the relay shafts .....

14-16 mm box spanners

- 7 Remove the steering bearing caps .....

12 mm box spanner

- 8 Remove the steering assembly from the steering column. Withdraw the steering from the left-hand side of the car.

Refitting (see Pl. 35).

- 9 Turn the steering wheel to bring the arm to 30° under the horizontal, left side.

Turn the pinion to bring the outer bush of the left-hand steering rod silentbloc to a distance "f" = 275 mm from the centre of the rack pressure pad (see Pl. 39, fig. 2 and 4).

IMPORTANT NOTE - A difference of more than 1mm in the dimension "f" will give excessive play on the steering wheel (tolerance  $\pm 9^\circ$ ).

- 10 Offer up the steering from the left side of the car. Engage the pinion into the splines of the steering column. Fit the steering into its bearings. Adjust the lateral position, in order to obtain a distance "g" of  $122.5 \pm 2.5$  mm between the centre line of the lower left-hand relay lever and the centre of the rack pressure pad (see Pl. 39). Fit the bearing caps. Fit the screws without tightening (spring washers). Fit the screw (69), coupling the steering column to the pinion. Tighten the nut (spring washer). Only fit the coupling screw DM 441-100 (with a plain portion under the head). *Make sure that the screw is correctly positioned in the groove of the pinion* .....

12 mm box spanner

		TOOLS
11	<p>Adjust the angular position of the steering.                      Fit the fixture 1955-T as indicated on Pl. 35.                      Turn the steering assembly in its bearings, in order to bring the groove "c" into contact with the central gauge pin (D) of the fixture. Tighten the fixing screws (73) of the bearing caps. Remove the fixture .....</p>	<p>Fixture 1955-T                      12 mm box spanner</p>
12	<p>Connect the steering levers to the relay shafts (the nuts (74) towards the outside). Tighten the nuts to 18 ft.lbs. (2.5 m.kg). Remove the setting gauge 1993-T .....</p>	<p>14-16 mm box spanners</p>
13	<p>Connect the feed pipe assembly (68) to the pinion housing. Fit the seal plates, so that the holes for the fluid correspond to those on the union plate. Tighten the nuts (spring washer).....</p>	<p>8 mm ring spanner</p>
14	<p>Fit the assembly of the battery bracket and bonnet lock control cable. Fit the high pressure pump feed pipe on the battery bracket. Fit the reservoir fixing collars.                      Fit the battery tray. Fit the battery. Connect the cables.....</p>	<p>12 mm spanner                      8-12 mm box spanners</p>
15	<p>Refill the reservoir (special hydraulic fluid). Start the engine. Put the systems under pressure. Check the unions for leakage.....</p>	<p>8 mm spanner</p>
16	<p>With the car at its "normal" height ("running" position):                      Adjust the alignment (see Op. D 440-0, paras. 7 to 9).</p>	
17	<p>Fit the wing. Fit the bonnet lock connecting cable .....</p>	<p>14-16 mm box spanners</p>
18	<p>Fit the sparewheel.</p>	
19	<p>Adjust the point "O" (see Op. D 440-0 paras. 10 to 12).                      Adjust the lock (see Op. D 440-0 paras. 13 to 16).</p>	
<p>REPLACEMENT OF A RACK HYDRAULIC CONTROL (without removing the steering).</p>		
<p><u>Removal</u> (see Pl. 32).</p>		
20	<p>Put the front of the car on stands (jacking bracket 2505-T, see Pl. 51). Remove the front right-hand wing and wheel...</p>	<p>14-16 mm box spanners</p>
21	<p>Release the pressure .....</p>	<p>8 mm spanner</p>
22	<p>Disconnect the steering pipe assembly flange, from the end steering housing. Place a cloth under the flange, in order to avoid spilling fluid on the brake unit.                      Drain the steering system by turning the steering on full lock on both right and left sides.....</p>	<p>8 mm ring spanner</p>

		T O O L S
23	Unscrew the locknut of the right-hand steering lock cap (spanner 1974-T, see Pl. 40, fig. 1) and remove the cap .....	Spanner 1974-T
24	Turn the steering fully to the left. Remove the circlip (48). Remove the connecting pin (47) holding the piston to the rack control rod (extractor 1969-T, see Pl. 37, fig. 4) .....	Extractor 1969-T
25	Remove the right-hand bearing cap .....	12 mm box spanner
26	Unscrew the locknut (39) of the steering end piece (spanner 2186-T, see Pl. 40, fig. 2) and hold the steering in a straight line. Unscrew the rack control assembly with the right-hand and remove by pulling within the limit permitted by the steering column, towards the front of the car.  <u>Refitting</u> (see Pl. 32).  IMPORTANT - Make sure that the piston-cylinder assembly is properly cleaned, and also the bore of the casing. Thoroughly oil the parts (special hydraulic fluid) before assembly. Make sure also that the seals (33) and (40) are in position on the cylinder end piece and in the casing end piece.	
27	Engage the rack control in the steering tube. This operation is made easier by pulling the steering towards the front, within the limits permitted. Screw the rack control assembly until the pipe assembly flange is in position, without using force.	
28	Fit the right-hand bearing cap, tighten the fixing screws (spring washers).....	12 mm box spanner
29	Hold the steering housing end piece (42) and tighten the locknut (39) (spanner 2186-T, see Pl. 40, fig. 2). Connect the control pipe assembly flange, inserting a seal plate. Tighten the nuts (spring washer).....	8 mm ring spanner Spanner 2186-T
30	Turn the steering on the left lock, so that the hole in the control rod (36) is in line with the holes at the end of the piston (38). Align the 2 parts with a conical drift. Put the connecting pin (47) in position (fixture 1969-T, see Pl. 37, fig. 4). Fit the circlip (48).....	Conical drift: small dia. = 5 large dia. = 6.5 length of taper = 20 Fixture 1969-T

		TOOLS
31	Fit the wheel and lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg). Adjust the steering lock (see Op. D 440-0 paras. 13 to 16). Tighten the locknut of the lock adjusting cap (spanner 1974-T, see Pl. 40, fig. 1) .....	34 mm spanner or spanner 1974-T
32	Start the engine. Put the systems under pressure and check the unions for leakage .....	8 mm spanner
33	Fit the wing and the sparewheel .....	14-16 mm box spanners
REPLACEMENT OF A PINION AND ROTATING UNION ASSEMBLY.		
<u>Removal</u> (see Pl. 31).		
34	Remove the steering (see paras. 1 to 8 this operation).	
35	Remove the rod (11) from the rotating union. Remove the pipe assembly (7) from the steering, Remove the steel cap (24). Remove the metal locking the nut (25) from the groove in the pinion and remove the nut (25) .....	12 mm box spanner 8 mm ring spanner
36	Remove the split pin and remove the nut (21), retaining the rack pressure pad, the spring (22) and the pressure pad (23). Disengage the pinion and rotating union assembly, from the steering by striking, if necessary, the end of the pinion, with a bronze drift. Note: be careful not to lose the balls (28) of the rear bearing (29). <i>One should withdraw 13 balls, in the contrary case, check to see if any remain in the steering</i> .....	19 mm box spanner
<u>Refitting</u> (see Pl. 31).		
37	Fit and adjust the pinion and rotating union assembly. See Op. D 442-3 para. 42.	
38	Fit the pipe assembly (7) on the steering, inserting the seal plates. Tighten the fixing nuts (spring washers) .....	8 mm ring spanner
39	Fit the steering, on the car (see paras. 9 to 19, this operation).	

**PARTICULAR POINTS.**

*This operation is valid for DS 19 cars and ID 19 cars with power assisted steering.*

*If the steering shows signs of leakage, stiffness in operation, knocking during operation, or flickers in the central position, note observations given in the paragraph "IMPORTANT REMARKS" at the beginning of the operation.*

Overhauling a rack control.Dismantling (see Pl. 32).

1 *When disconnecting the cylinder from the housing end piece, do not cause burrs on the bearing face of the feed pipe assembly as this will cause leakage.*

3 *On no account must the cylinder end piece be removed.*

Refitting (see Pl. 32).

6 *Obtain a dimension "d" of 2.4 to 2.5 mm by selection of the washers (50) (see fig. 3).*

7 *Make sure that a chamfer exists at the entrance of the cylinder, if not, provide one.*

*In order to fit the washer (32), curve the convex part towards the top and fit in the groove in a slanting direction (see Pl. 41 fig. 3).*

8 *In order to fit the washer (45), introduce it through the end "f" of the end piece.*

*The fibre joint (43) must be immersed in hydraulic fluid for 48 hours before assembly.*

9 *Operate the piston in the cylinder several times. Check that the teflon seal (53) is correctly positioned and refit the piston in the cylinder.*

10 *Tighten the casing end piece on the cylinder, 3 times to a torsion of 43 ft.lbs. (6 m.kg).*

Overhauling a pinion and rotating union assembly.Dismantling (see Pl. 33).

13 *The valves are paired with their cylinders, and should be marked when dismantling.*

14 *The cups (64) are paired with their caps (65), and should be marked when dismantling. If one part requires replacing, replace the assembly.*

*If necessary, remove any burrs which may exist at "d" in the cap.*

*A light rubbing (No. 600 abrasive paper) is tolerated on the cap).*

15 *A light rubbing (No. 600 abrasive paper) is tolerated on the ground portion of the pinion.*

Refitting (see Pl. 33).

17 *Tighten the caps (65) to 7 ft. lbs (1 m.kg).*

Overhauling a steering.

Dismantling.

25 *When disconnecting the housing end piece, from the steering, care should be taken not to cause burrs on the bearing face of the feed pipe assembly, otherwise leakage may occur.*

27 *In order to disconnect the control rod, from the rack, the use of the special vice adaptor 1999-T (see Pl. 39, fig. 1) is indispensable, the control rod being tightened to 50 ft. lbs. (7 m.kg).*

32 *The ball joints of the rod cannot be dismantled, proceed by exchange,  
If the ball joints are in good condition, do not clean by immersion, this will remove all grease.*

Refitting (see Pl. 31 and 32).

38 Assemble the steering rods.

*a) The silentbloc should project an equal amount on each side of the eye.*

*b) Screw the sleeve (5) an equal distance on each side, in order to obtain a dimension "i" = 402 mm between the centre line of ball pin and the centre line of the silentbloc.*

*c) Connect the relay levers to the steering rods. Tighten the nuts to 29 ft. lbs. (4 m.kg) (split pin).*

39 *Tighten the nuts of the pins (19) (see fig. 3) to 25 ft. lbs. (3.5 m.kg) (split pin).*

*The pinion bearing should be fitted with special castor oil based grease, type Antar RC.*

*Adjust the pinion: follow the instructions given in the paragraph and tighten the nut to 36 ft. lbs. (5 m.kg).*

47 *Tighten the rack control rod to 50 ft. lbs. (7 m.kg) (lockwasher). The use of the special support is indispensable (vice adaptor 1999-T, see Pl. 39, fig. 1).*

49 *Fit the bush (41) at a distance of 140 to 145 mm from the centre line of the pin (47).*

*The connecting pin (47) should be replaced after each dismantling.*

51 *Tighten the nut (14) to 29 ft. lbs. (4 m.kg).*

52 *Turn the end piece housing so that the flange of the feed pipe assembly corresponds perfectly with the bearing face on the end piece. Tighten the locknut (39) to 72 ft. lbs. (10 m.kg). Do not leave any burrs on the bearing face of the feed pipe assembly otherwise leakage may occur.*

54

*Fit the flexible dust covers:*

*On the left side, the dimension "j" =  $56 \pm 2.5$  mm.*

*On the right side, the dimension "k" =  $574 \pm 2.5$  mm.*

55

*Adjust the cross-over pressure. This operation can only be carried out on the test bench (2298-T) or on the car by means of the test bench 2290-T.*

Check the rotating union for leakage (test bench 2290-T, see Pl. 43).

62

*Build up the pressure to 2490 p.s.i. ( $175 \text{ kg/cm}^2$ ). Without touching the pinion there should be no drop in pressure nor flow through the end "h" of the pipe assembly (Q).*

63

*Release the pressure. Turn the pinion and keep it on full lock (so that the fork holds the slide valve open). Build up the pressure to 2490 p.s.i. ( $175 \text{ kg/cm}^2$ ). There should be no drop in pressure, nor flow through the end "h" of the pipe assembly (Q).*

Check for leakage from the piston-cylinder (test bench 2290-T, see Pl. 44).

69

*Build up the pressure to 2490 p.s.i. ( $175 \text{ kg/cm}^2$ ). There should be no drop in pressure, nor flow through the end "j" of the pipe assembly (R).*

72

*Disconnect the pipe (I) from the pipe assembly (R) and connect it on the other end "j". Build up the pressure to 2490 p.s.i. ( $175 \text{ kg/cm}^2$ ). There should be no drop in pressure, nor flow through the end of the pipe "i" of the pipe assembly (R).*

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 TOOLS
 

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## IMPORTANT REMARK.

A. Before doing any work on the hydraulic control of the steering, make sure that the ball joints of the steering side rods are in good condition.

To do this:

Disconnect the steering rod from the ball pin on the pivot lever (use the ball pin extractor 1964-T, see Pl. 20, fig. 3).

The ball pins (on the pivot lever and on the relay spindle) should move *without binding and without tight spots* even at the limits of their movement (ball pin stem in contact with the bore of the levers).

If the ball pin binds, it is necessary to replace:

- either the pivot lever (see Op. ID 413-1 or DS 413-1);
- or the lower relay lever and the steering rod assembly (see Op. ID 443-1 or DS 443-1).

Extractor 1964-T



## TOOLS

**B. If the steering shows signs of leakage, it may be:**

1. A leakage causing a noise resembling an escape of gas when turning the steering a few degrees without moving the wheels.

Disconnect the pipe assembly controlling the rack from the steering end housing. Close the openings of the flange with a steel plate, using a seal plate.

- a) If the leak persists, it comes from the rotating union, which must be replaced (see Op. D 442-1, paragraphs 34 and following) or repaired (see paragraphs 11 to 19 this operation).
  - b) If the leak disappears, it came from the rack piston and cylinder assembly, which must be replaced (see Op. D 442-1 para. 20 and following) or repaired (see paras. 1 and following this operation).
2. A leak causing the inflation of the rubber dust covers, leading to exterior leakage of fluid. It is necessary to overhaul the steering.

NOTE - It is possible to measure these leakages (see para. 74 to 76 this operation).

**C. If the steering is abnormally harsh in operation or stiff in movement on the locks:**

1. Check that the steering is properly aligned (see Op. D 440-0).
  - Lateral position: see paras. 1 to 4.
  - Angular position: see paras. 5 and 6.
2. Adjust the cross-over pressure (see Op. D 440-0, paras. 17 and following).

**D. If the steering knocks, it is necessary to adjust the cross-over pressures (see Op. D 440-0, paras. 17 and following).**

The knocking can equally be caused by excessive clearance on the shackle pin (47) (see Pl. 32), an excessive clearance on the rack support plunger (23) (see Pl. 31), or harsh spot of the slide valves or dash-pot.

In this case, it is necessary to overhaul the steering.

**E. If the steering flickers in the central position:**

1. Check the cross-over pressure.
2. Check the assembly of the plug (65) and cup 64) (see Pl. 33).

Remove the battery and its tray.

Disengage the dust cover (59), from the rotating union in order to obtain access to the plugs (65).

Release the pressure.

Remove the plugs (65), do not mix the parts; each cup (64) is paired with its plug (65).

## TOOLS

Disengage the cup and its spring (66). Check that it does not bind in the bore of the plug.

If necessary, using a small scraper, remove the burr which possibly exists at "d" in the plug.

In the case of light scratches on the cup, a very slight cleaning up with No. 600 abrasive paper is permitted.

Thoroughly clean the parts.

In the case of the cup (64) being beyond use, replace the plug and cup assembly.

Fit the plug and cup assemblies and springs. Insert the joint (63). Tighten the plugs moderately  $7\frac{1}{4}$  ft.lbs. (1 m.kg) and adjust the cross-over pressure (see Op. D 440-0 paras. 17 and following).

## OVERHAULING A RACK CONTROL.

Dismantling (see Pl. 32).

- 1 Disconnect the cylinder (37) from the end piece of the housing (42) (the cylinder is screwed in the end piece of the housing). Hold the cylinder in a vice (soft jaw MR-3407-20, see Pl. 38, fig. 1) and unscrew the housing end piece; using a milled jawed spanner with the end of the jaws held under the face of the seal face, otherwise there is a risk of burring the metal of the joint face, and, in consequence, causing an oil leak (see Pl. 38, fig. 4).

Disengage the housing end piece (42), from the piston-cylinder assembly.

Disengage the piston (38) from the cylinder, through the end which was screwed into the end housing .....

Soft jaws MR-3407-20

- 2 Stripping the housing end piece (42) (see Pl. 32):

Remove the ring seal (40) and the fibre joint (43).

Remove the teflon joint (46), the rubber joint (44) and the rilsan washer (45).

- 3 Stripping the cylinder (37) (see Pl. 32).

Remove the ring seal (33).

Remove the teflon joint (35), the rubber joint (34) and a rilsan washer (32).

NOTE - On no account must the cylinder end piece be dismantled, which is aligned with the cylinder.

- 4 Stripping the piston (38) (see fig. 3).

Remove the teflon joint (53) and the rubber joint (54). Remove the circlips (51), the shouldered washers (50) and the piston washers (52).

- 5 Clean the parts in alcohol, to the exclusion of all other products. Blow with compressed air, particularly in the fluid ducts.

TOOLS

- Assembly (see Pl. 32).
- 6 Prepare the piston (38) (see fig. 3):
- a) Fit on the piston (38), a circlip (51), a shouldered washer (50), 2 Rilsan washers (52), a shouldered washer (50), and a circlip (51).
  - b) Separate the 2 washers (52) from each other and measure the width "d" housing the joints (53) and (54) (gauge 1983-T, see Pl. 38, fig. 2). Obtain the distance "d" = 2.4 to 2.5 mm, by replacing the washers (50) .....
  - c) Put in position the ring seal (54) smeared with hydraulic fluid (cone assembly) (A) sold under the number 1985-T, see Pl. 41, fig. 1). The chamfer should be towards the inside of the seal. Hold the gap between the washers (52) using the gauge 1983-T. Fit the ring seal (54) on the cone (A) smeared with fluid, bring the cone in contact with the washer (52) and progressively slide the ring seal (54) on the cone, then put it between the 2 washers (52). Finally fit the ring seal in position by means of a small wooden spatula .....
  - d) Fit the teflon joint (53) (see Pl. 41):  
 Put the joint (53) on the cone (A) smeared with hydraulic fluid. Bring the cone (A) into contact with the washer (52). Progressively slide the joint on the cone and fit it between the 2 washers (52). The teflon joint is made of plastic, but not flexible. In order to complete the fitting, it is necessary to press between the washers (52) (mandrel (B) of the assembly 1985-T).  
  
 Release the flexible part of the mandrel (B) by sliding the bush (C) backwards. Offer up the mandrel on the piston from the side opposite the spindle, bring the pin of the mandrel against the end of the piston and slide the bush (C) until it presses against the collar, in order to compress the joint (53). Return the bush (C) to the rear and disengage the mandrel (B), from the piston .....
- 7 Prepare the cylinder (see Pl. 32):
- a) Smear the Rilsan washer (32) with castor oil and fit in the groove of the cylinder (see Pl. 41, fig. 3).
  - b) Place the cylinder on the support (support 1971-T, see Pl. 42, fig. 1) .....
  - c) Hold the Rilsan washer (32) towards the top pressing against the face of the groove.
  - d) Put the rubber joint (34) in position, after having smeared it with castor oil.
  - e) Offer up the teflon joint (35) (smeared with castor oil) and held with a pair of tweezers, as shown on Pl. 42, fig. 5. Hold the joint with the tweezers and commence fitting the part opposite the tweezers, in the groove (brass hook). Continue fitting the larger part of the joint, then progressively release the pressure of the tweezers.
  - f) Remove the cylinder from its support and complete the fitting of the teflon joint with the fingers.
  - g) Put the ring seal (33) in position in the outer groove of the cylinder end piece.

Gauge 1983-T

Cone 1985-T

Cone and Mandrel 1985-T

Support 1971-T

TOOLS

8

Prepare the housing end piece (see Pl. 32):

- a) Fit the Rilsan washer (45) (smeared with castor oil) in the groove.
- b) Place the housing end piece on the support (support 1971-T, see Pl. 42, fig. 2).....
- c) Put the rubber joint (44) in position, after having smeared it with castor oil.
- d) Put the teflon joint (46) in position, after having smeared it with castor oil. Proceed as indicated in para. 7 line e), above.
- e) Remove the housing end piece from its support and complete the fitting of the teflon joint with the fingers.
- f) Put the ring seal (40) in position, previously smeared with hydraulic fluid.
- g) Put the fibre joint (43) previously smeared with hydraulic fluid, on the bearing face of the cylinder in the housing end piece.

Support 1971-T

IMPORTANT REMARK - The fibre joints must be immersed in hydraulic fluid for 48 hours before assembly.

9

Fit the piston in the cylinder (see Pl. 32):

- a) Fit the cone 1970-T (see Pl. 42, fig. 3) on the end of the piston and engage this assembly in the cylinder (37) previously smeared with hydraulic fluid .....
- b) After having carried out several strokes of the piston, check the fit of the teflon joint (53) and (35).  
If a displacement is produced, replace the defective joint or joints.
- c) Again fit the cone 1970-T on the end of the piston and replace the piston in the cylinder. The refitting is easy, the teflon joint having then taken a definite position (see Pl. 42, fig. 3, for position of the piston).

Cone 1970-T

10

Screw the casing end piece (42) on the cylinder (37). In order to carry out this operation place the cone 1970-T on the piston (see Pl. 42, fig. 4), engaging the housing end piece on the piston then withdraw in order to check the teflon joint (46). Hold the cylinder in a vice (soft jaws MR-3407-20 see Pl. 38, fig. 1) and tighten the end piece on the cylinder. Use a milled jawed spanner, the end of the jaws of the spanner held under the face of the feed pipe flange (see Pl. 38, fig. 4). Unscrew the end piece and retighten to  $43\frac{1}{2}$  ft.lbs. (6 m.kg), 3 times in succession, in order to make sure that the cylinder is seating on the fibre joint (43).....

Soft jaws MR-3407-20  
Cone 1970-T

## TOOLS

## OVERHAULING A PINION AND ROTATING UNION ASSEMBLY.

Dismantling (see Pl. 33).

- 11 Remove the dust cover (59), from the pinion and disengage the pinion (55) from the rotating union.
- 12 Disengage the ring seals (56) from the rotating union, using a small brass wire hook, the end of which should be flattened. Check that there are no scratches on the ground bore of the union.
- 13 Dismantle the pinion:
- Untighten the locknuts (61) of the adjusting screw (60) and remove the screw.
  - Disengage the valve push rods (62).
  - Remove the split pin (57) from the fork and remove the flexible bushes.
  - Disengage the valves. Note: These valves are paired with their cylinders, do not intermix.
- 14 Remove the plugs (65), do not intermix the parts: each cup (64) is paired with its plug (65). Disengage the cup and its spring (66). Check that it does not bind in the bore of the plug. If necessary, use a small scraper, to remove the burr which is possibly existing at "d" in the plug. In the case of light scratches on the cup, a very slight cleaning up with abrasive paper No. 600 is permitted.
- Carefully clean the parts.
  - In the case of the cup (64) being beyond use, replace the cup and plug assembly.
- 15 Examine the ground portion of the pinion with great care: the journal for the seal should be free from markings also the bore of the rotating union should be free from burrs or scratches.
- If necessary, *a light rubbing* with abrasive paper No. 600 moistened with alcohol is permitted. If the scratches are too pronounced, replace the pinion and rotating union assembly.
- 16 Carefully clean all the parts with alcohol, to the exclusion of all other products. Blow with compressed air, particularly in the fluid passages.

TOOLS

- Assembly (see Pl. 33).
- 17 Prepare the pinion:
- a) Fit the assemblies of the plugs, cups and springs, previously smeared with fluid. Insert the joint (63), tighten the plug moderately to 7¼ ft.lbs. (1 m.kg).  
Put the valves previously smeared with fluid in the cylinders, in the same order as when dismantled.
  - b) Fit the flexible bushes (58) on the journal of the fork. Engage the fork in the pinion (locknuts (61) fitted on the machined part of the fork). Split pin.  
Fit the valve push rods (62). Fit the adjusting screws (60) and the locknuts (61).
- 18 Prepare the rotating union:
- a) Examine the rotating union with great care, making sure that there are no chamfers or burrs on the grooves.
  - b) Put the ring seals (56) smeared with hydraulic fluid in the grooves of the rotating union. Complete the fitting of the seals, by pressing with a brass rod or polished wood. Do not damage the seal by rubbing in the grooves or by exaggerated stretching.
- NOTE - Certain steerings are fitted with teflon joints with a rubber joint at the bottom of the groove. These joints are fitted by hand. If one does not possess these joints, it is possible to fit the ring seal (56) in their place.
- The teflon joints can only be fitted in the rotating unions with a shoulder on the groove as shown in fig. 3 at "f" and must not, under any circumstances be fitted in a rotating union with a shoulder on the groove as shown in fig. 2 at "e".
- 19 Moisten the ground portion of the pinion (hydraulic fluid). Engage the pinion (55) in the rotating union, the boss for the retaining rod towards the pinion (cone MR-3384-19, see fig. 4).  
Put the dust cover (59) in position, without fitting the fixing clip .....

Cone MR-3384-19

OVERHAULING A STEERING.

- Dismantling (see Pl. 31 and 32).
- 20 Remove the rack control pipe assembly (7).  
Remove the seal plates .....
- 21 Hold the steering in a vice (vice adaptor 1999-T, see Pl. 39, fig. 1).  
Remove the clip for the left-hand dust cover (9). Remove it, in order to fix the vice adaptor .....

8 mm box spanner

Vice adaptor 1999-T

TOOLS

<p>22 Remove the nut (14) and the retaining spring (15).                  Disconnect the steering rods from the central shackle (3).                  Disconnect the shackle (3) from the ball pin (16) (extractor 1967-T, see Pl. 37, fig. 2).                  Disengage the rubber sealing washer (13) .....</p> <p>23 Drain the fluid from the steering by turning wheel to the extreme right and then the left.</p> <p>24 Unscrew the locknuts (2) of the caps (spanner 1974-T, see Pl. 40, fig. 1).                  Remove the right and left-hand caps (6) and (1) (Stillson wrench) .....</p> <p>25 <u>Disconnect the cylinder and piston assembly:</u>                  Turn the steering to the extreme right-hand side.                  Remove the circlip (48) from the connecting pin. Remove the connecting pin (47) from the rack control piston (extractor 1969-T, see Pl. 37, fig. 4).                  Unlock the locknut (39) from the housing end piece: hold the end piece with milled jawed spanner (the end of the jaws of the spanner held under the face of the seal plate face; otherwise there is a risk of burring the metal of the joint face, and, in consequence, causing an oil leak) (see Pl. 38, fig. 4).                  Disconnect the cylinder and piston assembly by unscrewing the housing end piece.                  Remove the locknut (39) (spanner 2186-T, see Pl. 40, fig. 2) .....</p> <p>26 Disengage the right-hand flexible dust cover (8), the steel dust covers (17) and (49) and the ball guide (30).</p> <p>27 <u>Disconnect the rack control rod:</u>                  Put the steering in the vice adaptor 1999-T as indicated on Pl. 39, fig. 1 with the pinion underneath.                  Engage the tongued arm in the slot in the rack.                  Adjust the position of the rack and of the steering, in order to fix the tongued arm.                  Turn up the tongue on the lock plate (31).                  Hold the ball pin (16) using the extractor 1966-T, as shown on Pl. 40, fig. 3.                  Disconnect the control rod (36) by unscrewing it (spanner 1982-T, see Pl. 37, fig. 3) .....</p> <p>REMARK - The vice adaptor 1999-T, and its tongued arm and the extractor 1966-T are indispensable. The control rod is tightened to 51 ft. lbs. (7 m.kg), if the ball pin fouls the casing, it will strain the latter.</p>	<p>16-21-23 mm box spanners                  Extractor 1967-T</p> <p>Stillson wrench                  34 mm spanner or spanner 1974-T</p> <p>Extractor 1969-T,                  Spanner 2186-T</p> <p>Spanner 1982-T                  Vice adaptor 1999-T                  Extractor 1966-T</p>
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TOOLS

28 Loosen the vice adaptor collar. Move the steering to the left, in order to make room for the ball pin extractor.  
Screw the pressure pad on the rack. Fit the extractor. Place the shackle (30) on the stem of the ball pin (as a distance piece) and lightly tighten the nut of the ball pin. Extract the ball pin (16) from the rack by turning on the screw of the extractor (extractor 1966-T, see Pl. 37, fig. 1; spanner 1982-T, see Pl. 37, fig. 3).

NOTE - After separation, the ball pin immediately comes into contact with the extractor pressure pad, it is therefore useless to try to completely disengage the ball pin with the extractor.

Remove the extractor and the tongued arm .....

Extractor 1966-T  
Spanner 1982-T

29 Remove the nut (21) (spanner MR-3691-70, see Pl. 37, fig. 5).

If the thread in the housing is damaged, recut it, using a tap 24 diameter 150 pitch.

Disengage the spring (22) and the rack support plunger (23).

Disengage the rack .....

Spanner MR-3691-70  
Tap 24 dia. 150 pitch

30 Disconnect the pinion and rotating union assembly:

Remove the steel cap (24). Remove the rod (11) retaining the rotating union.

Remove the metal locking the nut (25) from the groove of the pinion. Remove the nut.

Remove the pinion and rotating union assembly, by striking the end of the pinion with a brass drift if necessary. Be careful not to lose the balls (28) of the upper pinion bearing (29).....

12 mm spanner  
21 mm box spanner

31 Drive out the lower bearing (26) and the outer race of the upper bearing (29).

Remove the locknut (2) from the left-hand cap (1).

Remove the steering from the stand.

32 Dismantle the steering rods:

Disconnect the steering levers from the rods (extractor 1964-T pressure pad 1968-T, see Pl. 20, fig. 3).

Disengage the rubber joint and the cup sealing the ball pin.

Disconnect the adjustable coupling (5) from the right-hand rod.

Remove the silentblocs (18) in a press (mandrel MR-3676-110 see Pl. 37, fig. 6) .....

12-21 mm box spanners  
Extractor 1964-T  
Pressure pad 1968-T  
Mandrel MR-3676-110

NOTE - The ball pins of the side rods are not removable. Change the left-hand rod or the right-hand end piece.

If the ball pins on the side rods are in good condition, they should not be cleaned by soaking, to avoid removing the grease from the ball pins.

33 Clean the parts.

34 Dismantle the pinion and rotating union assembly (see paras. 11 to 16, this operation).

35 Dismantle the rack control (see paras. 1 to 5, this operation).



TOOLS

Assembly (see Pl. 31 and 32).

36 Prepare the rack control (see paragraphs 6 to 10 this operation).

37 Prepare the pinion and rotating union assembly (see paragraphs 17 to 19 this operation).

38 Assemble the steering rods:

a) Fit the silentblocs (18) in position in the eye of the steering side rods, in a press (mandrel MR-3676-110 see Pl. 37, fig. 6). Make sure that the silentbloc projects an equal amount on each side of the eye.

b) Fit on the right-hand steering rod, the adjustable coupling (5) together with its collar (4), the locating pips in the groove of the clamp. Screw it the same distance on the side rod and on the end with the ball pin, in order to obtain a dimension "i" = 402 mm between the centre line of the ball pin and the centre line of the silentbloc.

Fit the nuts on the collars without tightening.

c) Connect the relay lever:

Put a small quantity of grease in the annular space, between the stem of the ball pin and housing (adhesive grease).

Fit the nylon cup. Carefully remove any grease from the stem of the ball pin with trichlorethylene.

Fit the rubber cup.

Fit the relay lever (see Pl. 31, fig. 1 for position).

Tighten the nut to 29 ft.lbs. (4 m.kg) and fit the split pin .....

21 mm box spanner

39 Connect the fork to the steering side rods (see fig. 1 and 3 for position). Fit the pins (19). Tighten the nuts to 25 ft.lbs. (3.5 m.kg). Fit the split pin .....

17 mm box spanner

40 Make sure of the cleanliness of the bore of the housing, particularly between the hole for the stem of the ball pin and the extreme right-hand side of the housing and the machined outside zone at the end of the housing, right side.

These two parts of the housing ensure: firstly, effective sealing by the ring seals and secondly, the circulation of the fluid between the housing and the cylinder.

Hold the steering in a vice (vice adaptor 1999-T, see Pl. 39, fig. 1) .....

Vice adaptor 1999-T

41 Fit the outer race of the upper bearing (29) and the lower bearing (26).

42 Fit and adjust the pinion and rotating union assembly (see Pl. 31, fig. 2 and Pl. 34).

a) Fit the lower bearing (26) in position in the steering (note the order of assembly).

Fit the pinion without the balls for the rear bearing (29) and without the rotating union and screw on the nut (25) inserting an adjusting washer (27) between the nut and the bearing. Fix the pinion in a vice, tighten moderately.

Tighten the nut (25) to 36 ft.lbs. (5 m.kg) (torsion spanner 2471-T, see Pl. 1, fig. 2) .....

Torsion spanner 2471-T  
19 mm socket

TOOLS

- b) Put the steering in a support (vice support 1999-T, see Pl. 39, fig. 1), the pinion towards the bottom. Turn the pinion by pulling towards the bottom, in order to make sure that the balls are correctly fitted.
- Place a new ball of 6 mm diameter (ball (28) of the upper bearing (29) in the centre point of the pinion and fit the support 1997-T, (together with a dial gauge 2437-T, fitted with a contact plate), on the steering (see Pl. 34, fig. 1). The dial gauge should have a spindle of 6 mm diameter approximately.
- With the spindle of the dial gauge resting on the ball placed on the end of the pinion, put the dial gauge face of the large needle on zero and mark the position of the totalising needle, between 7 and 8 .....

Vice adaptor 1999-T  
Dial gauge support 1997-T  
Dial gauge 2437-T

NOTE - If the pinion has no centre point, use a dial gauge with a standard spindle.

- c) Remove the dial gauge support and the ball fitted on the end of the steering pinion.  
Remove the steering from the support. Remove the nut (25) and the pinion from the steering.
- d) Fit the outer race of the bearing (29). Fit the steering on the support (vice adaptor 1999-T, see Pl. 39, fig. 1), the pinion towards the bottom. Place 13 balls (28) of the bearing (29) on the pinion. *The balls should be fitted dry.*  
Engage the pinion thus prepared in the steering. Tighten the nut (25) in order to obtain free movement without play on the pinion. ....
- e) Place the 6 mm diameter ball (used in paragraph b) in the centre point of the pinion and put the support 1997-T together with the dial gauge, on the steering (see Pl. 34, fig. 2).  
Place the small needle of the dial gauge to the position which it occupied in paragraph b, then bring the spindle into contact with the ball placed on the end of the pinion, counting the number of turns and fractions of turns. For example : 4.28 mm.  
Select from among the adjusting washers sold by our Spare Parts Department, one with a thickness corresponding to thickness obtained above. In the example, fit a washer No. DS 442-346 .....
- f) Remove the dial gauge support and the ball which was placed on the end of the steering pinion.  
Remove the nut (25), the pinion and the balls (28) of the bearing (29), from the steering.
- g) Put the rubber seal (20) in position on the collar of the rotating union. Place 13 balls (28) on the inner cage of the pinion, stick with grease (special castor oil based grease, type Antar RC, only).  
Place the adjusting washer (27) on the pinion, the chamfer towards the pinion. Grease pinion (special castor oil based grease, type Antar RC) and fit it in the steering housing.  
Hold the pinion in a vice and tighten moderately. Tighten the nut (25) to 36 ft.lbs. (5 m.kg) (torsion spanner 2471-T, see Pl. 1, fig. 2) .....

Vice adaptor 1999-T

Support 1997-T  
Dial gauge 2437-T

Torsion spanner 2471-T  
19 mm socket

TOOLS

<p>h) Make sure that the pinion functions freely without play in the steering housing. If not, alter the thickness of the washer (27).</p>	
<p>i) Support the end of the pinion and knock the metal of the nut into the groove of the pinion. Fit the steel cap (24) filled with grease (special castor oil based grease, type Antar RC).</p>	
<p>j) Fit the rotating union locking rod : screw the rod (11) to the end of the thread and tighten the locknut .....</p>	<p>12 mm spanner</p>
<p>43 Offer up the rack properly degreased on the taper for the rack ball pin, and engage with the pinion. Fit the rack support plunger (23). Fit the spring (22). Tighten the nut (21) and then unscrew 1/6th of a turn (spanner MR-3691-70 see Pl. 37, fig. 5). This nut should be locked with a centre punch mark after adjusting the cross-over pressures .....</p>	<p>Spanner MR-3691-70</p>
<p>44 Fit the left-hand dust cover (9). Commence with the end with the small diameter.</p>	
<p>45 Fit the rack ball pin (16). Fit the tongued arm on the vice adaptor : position the steering and set the rack so that the tongued arm penetrates the slot in the rack (pinion downwards). Put the ball pin through the opening in the housing, the taper previously degreased. Fit the guide plate MR-4369 (see Pl. 40, fig. 4) (if not fit a guide block). Fit the shackle and moderately tighten the nut on the ball pin stem (see Pl. 40, fig. 3) ..... Tighten the taper by striking on the eye of the ball pin with a tube. Fit the lockwasher (31). Screw the rack control rod (36), tighten to 50 ft.lbs. (7 m.kg) (spanner 1982-T, see Pl. 40, fig. 3). Turn over the lockwasher. Remove the tongued arm. Remove the nut, the shackle and the guide plate or guide block, from the ball pin. Through the opening for the ball pin in the housing, put 50 gr. of grease (special castor oil based grease, type Antar RC) on the pinion side .....</p>	<p>Guide plate MR-4369 21 mm box spanners  Spanner 1982-T Extractor 1966-T</p>
<p>46 Fit the right-hand flexible dust cover (8). Commence with the end with the large diameter. Place the ball guide (30), previously greased on the stem of the ball pin. Fit the movable dust shields (17) and (49). Put the dust covers on the ends of the movable dust shields (17) and (49). Fit the clips.</p>	

		TOOLS
47	<p>Fit the locknut (39) on the housing end piece. Engage the cylinder and piston assembly previously smeared with hydraulic fluid, in the steering housing. Screw the housing right home, then unscrew slightly (1 turn maximum). Tighten the locknut (39).</p> <p>Put the anti-rattle bush (41) on the rack control rod so that the distance = <math>140 \pm \frac{5}{0}</math> mm from the pin (47).</p> <p>Turn the piston with the aid of a tommy bar passing through the hole for the connecting pin, in order to make the holes in the piston and of the control rod correspond. Fit the connecting pin (47) (extractor 1969-T, see Pl. 37, fig. 4) and the circlip (48) (the connecting pin is to be replaced after each dismantling) .....</p>	Extractor 1969-T
50	Fit the locknut and the right-hand cap (6).	
51	<p>Fit the rubber sealing washer (13) and the steering side rod assembly on the rack ball pin.</p> <p>Fit the spring (15). Tighten the nut (14) to 29 ft. lbs. (4 m. kg); during this operation, make sure that the springs do not foul the lower edge of the movable dust shields (fit a shim between the inner spring and the dust shields, in order to facilitate the movement of the spring). The fork must remain parallel to the longitudinal centre line of the steering. After tightening the nut, the spring should be in a position as shown on fig. 4 (see Pl. 31). Fit a split pin to the nut and remove the guide plate from the springs .....</p>	21 mm box spanner
52	<p>Fit the rack pipe assembly.</p> <p>Connect the pipe assembly (7) to the rotating union (10).</p> <p>Insert a seal plate together with its ring seals, making sure that the fluid holes correspond. Tighten the nuts (spring washers).</p> <p>Connect the pipe assembly to the steering end housing : if necessary, turn the steering end housing so that the flanges coincide perfectly.</p> <p>Tighten the steering end housing locknut (39) to 72 ft. lbs. (10 m. kg) (spanner 2186-T, see Pl. 40, fig. 2).</p> <p>Hold the housing with a milled jawed spanner with the jaws held under the flange of the feed pipe assembly (see Pl. 38, fig. 4). Fix the pipe assembly (7).</p> <p>Insert a seal plate together with its ring seals.</p> <p>Tighten the nuts (spring washers) .....</p>	Spanner 2186-T 8 mm box spanner
53	Fit the locknut (2) and the left-hand steering lock adjusting cap (1). Put the flexible dust cover in position, do not fit the clip.	
54	<p>Remove the steering from the vice adaptor. Put the flexible dust covers in position : the left-hand dust cover (9) so that the dimension "j" = <math>56 \pm 2.5</math> mm and the right-hand dust cover (8) so that the dimension "k" = <math>574 \pm 2.5</math> mm.</p> <p>Fit the clips.</p>	

TOOLS

55 Check the sealing of the piston and cylinder assembly (see paras. 65 and following, this operation).  
 Adjust the cross-over pressures. This operation can only be carried out on the car (see Op. DS 440-0, paras. 17 to 23). One can also use the test bench 2298-T.  
 Protect the rotating union pipe flange with masking tape or a seal plate.

56 Paint the assembly, except on the threads, pinion splines and feed pipe joint face.

CHECKING THE ROTATING UNION (see Pl. 43).

57 Use the test bench 2290-T, connect the test bench pump to the pressure gauge (M2) 0 to 200 kg/cm<sup>2</sup>. . . . .

Test bench 2290-T

58 Remove the pipe assembly connecting the rotating union to the end piece.

59 Close the corresponding holes by fitting the plate (F) on the rotating union (insert a seal plate).

60 Fit the pipe assembly (Q) on the rotating union in place of the feed pipe assembly (insert a seal plate).

61 Connect the pipe assembly (Q) on the opening "a" of the test bench pump, using the pipe (I).

62 Tighten the bleed screw "b" on the test bench.

Operate the pump, in order to build up pressure to 2490 p. s. i. (175 kg/cm<sup>2</sup>). If the steering wheel is not turned, there should be neither loss of pressure nor flow of fluid through the hole "h" of the pipe assembly (Q).

63 Turn the steering wheel or the steering pinion and keep on full lock (so that the fork holds the slide valve open).

Operate the pump, in order to build up pressure to 2490 p. s. i. (175 kg/cm<sup>2</sup>).

There should be no drop in pressure, nor flow through the hole "h" of the pipe assembly.

64 Release the pressure by unscrewing the bleed screw "b" of the best bench.

CHECKING FOR LEAKS FROM THE RACK HYDRAULIC CONTROL (see Pl. 44).

65 Use the test bench 2290-T. Connect the test bench pump to the pressure gauge (M2) 0 to 200 kg/cm<sup>2</sup>. . . . .

Test bench 2290-T

66 Disconnect the rack feed pipe assembly from the steering end housing . . . . .

8 mm box spanner

		TOOLS
67	Connect the pipe assembly (R) (insert a seal plate), in place of the feed pipe assembly .....	8 mm box spanner
68	Connect one of the ends "i" of the pipe assembly (R) to the opening "a" of the test bench pump by using the pipe (I) .....	9 mm spanner
69	Retighten the bleed screw "b" of the test bench. Operate the pump, in order to build up pressure. Turn the pinion until the rack is against the stop. Build up the pressure to 2490 p. s. i. (175 kg/cm <sup>2</sup> ).	
70	There should be no drop in pressure, or flow through the open end "j" of the pipe assembly (R).	
71	Release the pressure.	
72	Disconnect the pipe (I) from the pipe assembly (R) and connect on the other pipe end "j" .....	9 mm spanner
73	Operate the pump to build up pressure. Repeat the operations described in paras. 69 to 71.  TESTING THE STEERING ON THE CAR.	
74	<u>Warm the fluid and prepare the test.</u> a) Place the manual height control in the "low" position. b) Start the engine, slightly unscrew the pressure regulator bleed screw in order to put the pump under pressure. Let the engine idle for a $\frac{1}{4}$ of an hour approximately. Stop the engine and unscrew the pressure regulator bleed screws . c) Empty the brake accumulator by operating the hydraulic control ( <i>Break (Safari) type cars</i> ). d) Remove the left-hand front wing and the lateral protection panel .....	8 mm spanner
	e) Connect a 3-way union (union 2296-T), to the pressure regulator high pressure outlet pipe, to the 3-way union supplying the suspension, steering and pressure gauge (M3) (0-200 kg/cm <sup>2</sup> ) of the test bench.....	8-14-16 mm box spanners  Union 2296-T Test bench 2290-T 9 mm spanner
	f) Start the engine. Operate the steering to the right and to the left, several times. Tighten the pressure regulator bleed screw .....	8 mm spanner

## TOOLS

75

Check the rack hydraulic control.

Have the steering turned by an assistant (keep the valves under tension). Obtain a cutting-out. Check the pressure gauge. Note the time for the needle to move from 2133 to 1849 p. s. i. (150 to 130 kg/cm<sup>2</sup>). This time must be greater than 31 seconds.

NOTE - Carry out this operation first to the right and then to the left. Take note only of the shortest time.

NOTE - If the pressures of cutting-in and cutting-out do not permit the use of the schedule 2133-1849 p. s. i. (150 kg/cm<sup>2</sup>-130 kg/cm<sup>2</sup>) indicated above, reposition the range of the needles by retaining the difference of 290 p. s. i. 20 kg/cm<sup>2</sup>) (for example : 2204 - 1920 p. s. i. (155-135 kg/cm<sup>2</sup>), or 2062-1777 p. s. i. (145-125 kg/cm<sup>2</sup>).

76

Check the rotating union.

a) Turn the steering to the right and to the left, several times.

Stop the engine. Release the pressure by operating the steering.

b) Untighten the flange of the pipe assembly controlling the rack and insert a blanking plate (see fig. 3) between the seal plate and the rack. Tighten the nuts.

c) Start the engine. Obtain a cutting-out.

d) Note the time for the needle to move from 2133 to 1849 p. s. i. (150 to 130 kg/cm<sup>2</sup>) (pressure gauge M3) (see NOTE paragraph 75).

1. Steering locked to the left.

2. Steering locked to the right.

Take note only of the shortest time. This time must be greater than 102 seconds.

3. Without moving the steering.

Note the time for the needle to move from 2133 to 1849 p. s. i. (150 to 130 kg/cm<sup>2</sup>). This time should be greater than 102 seconds.

TOOLS

ADJUSTMENT OF A FRONT BRAKE UNIT (see Pl. 47 and 48).

1 Operate the mechanical brake control several times, in order to take up the play on the shoes. (Do not use the hydraulic control).

2 Level the brake unit:

a) Untighten the locking screw (118) of the pin (119) so that the pin will slide freely in the ball (120).

NOTE - Excessive untightening of the screw (118) will cause the thrust pad (121) to fall out of position.

b) Make sure that the slot of the ball is in the vertical position.

c) Lock the brake by operating the mechanical brake pedal and lock in the locked position. Tighten the screw (118) in order to lock the pin (119).

d) Make sure that the end of the pin (119) is level with the inside face of the brake unit, at "t" (see Pl. 48, fig. 2). Tighten the screw (118) locking the pin (119) to 28 ft.lbs. (4 m.kg).

e) Lock the screw (118) with iron wire passing through the holes in the head of the screw (118) and the lower screw (153) fixing the bracket (116) in such a manner so as to prevent any rotation in the direction of unscrewing.....

14 mm box spanner

3 Adjust the height of the brake unit:

a) Remove the sparewheel support and the radiator air duct assembly:

1. Disconnect the cables, from the bonnet locks.

2. Remove the screws fixing the spare wheel support on the front wings.

3. Disconnect the flexible duct, from the radiator: remove the right-hand fixing screws and slacken the left-hand screw.

4. Remove the front screws fixing the rigid duct.

5. Disconnect the strap retaining the sparewheel, from the front crossmember.

6. Disengage the crossmember, strap and air duct assemblies .....

8 mm spanner

b) Move the nuts of the front support tie-rod so that the linings stands slightly proud of the disc at the front by approximately 1 mm (see Pl. 48, fig. 1) .....

21 mm spanner

21 mm box spanner



TOOLS

c) Fit the sparewheel support and radiator air duct assembly:

1. Offer up the crossmember, strap and air duct assembly. Place the frame for the flexible air duct against the radiator. Tighten the fixing screws (plain and spring washers).
2. Tighten the fixing screws of the spare wheel support on the front wings.
3. Connect the unlocking cables to the bonnet locks.
4. Tighten the front fixing screws of the rigid duct (plain and spring washers).
5. Position the strap retaining the spare wheel and fix on the crossmember (plain and spring washers) .....

8 mm spanner  
8 mm box spanner

NOTE - The operations mentioned in paragraphs a) and c) are only carried out in order to adjust the height of the left-hand brake unit.

ADJUSTMENT OF THE CONTROL LEVER ECCENTRIC ADJUSTING STOP (see Pl. 47 and 48).

- 4 Remove the fixing screws of the rigid duct from the radiator. Disconnect the flexible duct from the radiator: remove the right-hand fixing screws and slacken the left-hand screws. Remove the rigid duct and flexible duct assembly towards the right .....

8 mm box spanner

- 5 Left side : remove the battery and its tray .....

12 mm box spanner

- 6 Unlock the locknut and unscrew the adjusting nut (101) of the front brake connecting cable (110). Unscrew the fixing screw (148) of the eccentric stop (104) .....

12 mm spanner  
12 mm box spanner

- 7 Operate the mechanical brake control and make sure that the locking rod (113) takes up its position at the base of the teeth. Engage the spanner 2129-T (see Pl. 49, fig. 3) in the hole "a" in the housing and make sure that it engages with the adjusting wheel .....

Spanner 2129-T

- 8 Turn the spanner towards the rear of the car, bring the teeth of the wheel (131) against the locking rod (133). While maintaining this pressure, operate the control lever (103) towards the outside (the direction in which the lever will come into contact with the eccentric stop). The ratchet lever should then be in contact with the same tooth of the adjusting wheel as the locking rod (133). At this moment adjust the eccentric stop (104) so that there is a clearance of 0.1 to 0.4 mm between the eccentric stop (104) and the lever (103). Tighten the stop fixing screw (148). Remove the spanner 2129-T .....

12 mm box spanner

- 9 Operate the brake control lever and check to see if one complete stroke of the ratchet lever moves one complete tooth of the adjusting wheel.

Check also if the locking rod takes up its position at the base of the tooth, if not, re-check the adjustment of the eccentric stop (104).

Carry out the same operation on the other brake unit.

TOOLS

10	Adjust the connecting cable (see Op. D 454-0).	
11	Fit the battery tray and the battery. Connect the cables .....	12 mm box spanner
12	Put the radiator air ducts in position. Tighten the fixing screws of the frame retaining the flexible duct and the fixing screws of the rigid duct (plain and spring washer) .....	8 mm box spanner
CENTRALISING THE REAR BRAKE SHOES.		
13	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 51). Remove the wing, the wheel and the brake drum.	Jacking bracket 2505-T 14 mm box spanner
14	<p><u>Setting the diameter of the drum</u> (fixture 2117-T or fixture 2115-T, see Pl. 50):</p> <p>Place the fixture in the drum, with the 2 dowels (A) engaged in the drum locating holes.</p> <p>Keep the fixture flat against the drum web by means of the 2 screws 6 diameter 100 pitch.</p> <p>Describe a complete turn with the pointer (B) and tighten the pointer fixing screw (C) .....</p>	Fixture 2117-T or 2115-T
15	<p><u>Adjust the brake shoes:</u></p> <p>Place the centring fixture on the hubs, with the dowels engaged in the hole in the fixture.</p> <p>Tighten the screw (D) in order to bring the fixture against the face of the drum, on the hub.</p> <p>Adjust the brake shoes by means of the adjusting cams, so that the pointer (B) is flush with the linings or round the periphery .....</p>	Fixture 2117-T or 2115-T
16	Fit the brake drum, tighten the 2 screws. Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 51). Tighten the wheel fixing screw to 108 to 144 ft.lbs (15 to 20 m.kg). Fit the wing .....	Jacking bracket 2505-T 14-16 mm box spanners

TOOLS

REPLACEMENT OF A BRAKE UNIT.

Removal

- |   |   |  |
|---|---|--|
| 1 | Put the front of the car on stands (jacking bracket 2505-T, see Pl. 51). Protect or remove the front wings. Drain the radiator, save the fluid which contains anti-freeze .....   | Jacking bracket 2505-T                               |
| 2 | Remove the battery and the battery tray .....   | 12 mm box spanner                                    |
| 3 | Remove the sparewheel support and radiator air duct assembly. Remove the 2 front fixing screws, the 2 fixing screws on the right-hand side of the radiator and only loosen the 2 fixing screws on the left-hand side of the radiator .....  | 8 mm box spanner                                     |
| 4 | Disconnect the flexible water pipes and tie-rod, from the radiator. Remove the 2 fixing screws and disengage the radiator .....   | 8-14 mm box spanners                                 |
| 5 | Disconnect the speedometer cable and the 5-pipe pipe assembly, from the gearbox.....  | 10 mm box spanner                                    |
| 6 | Remove the protection panel under the gearbox .....   | 8 mm box spanner                                     |
| 7 | Pass a sling (sling 1696-T, see Pl. 23) under the cover of the water pump and hold the engine-gearbox assembly with a hoist.<br><br>Remove the fixing screws of the gearbox support arms on the crossmember, lower the engine-gearbox assembly until it rests on the crossmember under the engine ..... | Sling 1696-T<br>14 mm box spanner                    |
|   | NOTE - Make sure that a clearance exists between the high pressure pump-pressure regulator connecting pipe and the steering. If not, disconnect the connecting pipe, from the high pressure pump.   |  |
| 8 | <u>Remove the brake unit</u> (see Pl. 47):  |  |
|   | a) Remove the brake shoes (extractor 2133-T, see Pl. 49, fig. 2) .....  | 8 mm spanner<br>8 mm box spanner<br>Extractor 2133-T |
|   | b) Remove the lower nuts of the front support tie-rod from the brake unit .....   | 21 mm spanner  |
|   | c) Disconnect the pipes, from the moving carrier .....  | 9 mm spanner   |
|   | d) Remove the locking wire from the locking screw (118) of the ball (120). Slacken the screw, do not unscrew fully, otherwise the thrust pad (121) will drop out of position. Remove the pin and disengage the spindle (119); if necessary, extract it, using a 10 mm diameter 125 pitch screw .....    | 14 mm box spanner                                    |
|   | e) Disconnect the connecting cable and remove the sheath stop, from the brake unit. Disconnect the control cable (left-hand brake unit) .....   | 12 mm spanner<br>12 mm box spanner                   |
|   | f) Disengage the brake unit towards the front.  |  |

		T O O L S
	<u>Refitting:</u>	
9	<u>Fitting the brake unit:</u>	
	a) Offer up the brake unit and engage the spindle (19) in the bore of the brake unit and in the ball (120), the hole for the pin being vertical. Engage the flexible bearing in the front support tie-rod.	
	b) Connect the connecting cable and put the sheath stop in position. Connect the control cable to the levers (left-hand brake unit) .....	12 mm spanner 12 mm box spanner
	c) Connect the pipes to the moving carrier .....	9 mm spanner
	d) Fit the brake shoes, moderately tighten the contact screws and lock the locknuts .....	8 mm spanner 8 mm box spanner
10	Raise the engine-gearbox assembly and tighten the fixing screws of the front support arms to the crossmember. Turn over the lockwashers .....	14 mm box spanner
11	Adjust the lateral position and the height of the brake unit (see Op. D 451-0).	
12	Adjust the front brake connecting cable (see Op. D 454-0).	
13	Fit the radiator. Connect the flexible water pipes. Tighten the fixing screws. Put the radiator tie-rod in position and tighten the fixing screws. After fitting the radiator, the blades of the fan must not touch the fan cowl .....	8-14 mm box spanners
14	Fit the radiator air duct and the sparewheel support assembly .....	8 mm box spanner
15	Fit the protection panel under the gearbox .....	8 mm box spanner
16	Refill the radiator, engine running and vane of the heater control open.	
17	Bleed the front brakes (see Op. DS 453-0 or ID 453-0).	
18	Lower the car to the ground (jacking bracket 2505-T, see Pl. 51) .....	Jacking bracket 2505-T

TOOLS

ADJUSTMENT OF THE CONTROL CABLE (see Pl. 48 A).

- 1 Remove the battery and the battery tray ..... 12 mm box spanner
- 2 With the mechanical brake control in the fully off position, measure the dimension "a" using a tape rule passed from the front, under the crossmember of the gearbox.  
  
This dimension "a" must be 60 mm. If not, proceed as follows:
- 3 Remove the front left-hand wing and the suspension mechanism lateral protection panel. Turn the threaded sleeve (1) in the required direction and tighten the locknut (2) to 32½ ft.lbs. (4.5 m.kg). Fit the suspension mechanism lateral protection panel and the left-hand front wing ..... 8-14-16 mm box spanners
- 4 Fit the battery tray and the battery ..... 12 mm box spanner

ADJUSTMENT OF THE CONNECTING CABLE (see Pl. 48 A).

- 5 With the mechanical brake control in the fully off position, the levers (3 and 9) being at the limit of their separation from the stops (4 and 8) but still in contact with the latter. If not, proceed as follows:
- 6 Disconnect the radiator flexible duct: slacken the left-hand fixing screws and remove the right-hand screws. Remove the fixing screws from the rigid duct on the sparewheel support and the front crossmember. Disengage the duct towards the right..... 8 mm box spanner
- 7 Unlock the locknut (5) and tighten the nut (6) until the levers (3 and 9) separate from the stops (4 and 8). Slightly untighten the nut (6) so that the levers (3 and 9) are just in contact with the stops (4 and 8)..... 12 mm spanner  
12 mm box spanner
- 8 Untighten the brake shoes, by turning the spanner towards the rear of the car (spanner 2129-T, see Pl. 49,) and also operate the mechanical brake control in order to take up the clearance on the shoes. Again check that the levers (3) and (9) are in contact with the stops (4 and 8), at the limit of separation. Also check that there is clearance at "c", if not, re-adjust the control cable (see paragraphs 1 and following, this operation) ..... Spanner 2129-T

		TOOLS
	REMOVAL (see Pl. 7).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 51) .....	Jacking bracket 2505-T
2	Release the pressure, by unscrewing the pressure regulator bleed screw. Disconnect the earth cable from the battery.	8-12 mm spanners
3	Remove the right-hand front suspension sphere (strap wrench 2223-T, see Pl. 3, fig. 2) .....	Strap wrench 2223-T
4	Remove the air filter and manifold assembly .....	12 mm box spanner
5	Remove the exhaust manifold screen (1) (upper part). Remove the reinforcing arm securing the centrifugal regulator on the cylinder head ( <i>DS 19 cars</i> ). Remove the front support plate of the exhaust shield (6) .....	8-12 mm spanners 8-12 mm box spanners
6	Slacken the clip (10) securing the exhaust connecting pipe (front pipe) to the crankcase. From underneath the car, remove the fixing screw of the connecting pipe fixing plate (9), pivot the latter towards the rear .....	12-17 mm box spanners
7	Remove the starter motor shield (8). Remove the fixing screws of the shield (2) from the exhaust manifold (lower part), disengage the shield towards the rear and raise as far as possible under the manifold. Without removing from the car .....	12 mm spanner 12 mm box spanner
8	Disconnect the cable, from the starter motor. Unlock the locknuts and slacken the starter motor contact screws. Unlock the locknut and remove the pointed screw securing the starter motor .....	12-14-17 mm spanners
9	<u>Remove the starter motor:</u> Disengage the starter motor, from the clutch bellhousing. Then swing towards the front and engage the nose of the starter motor between the crankcase, the clutch bellhousing and the exhaust front pipe (connecting pipe), by turning towards the left, half a turn approximately. Disengage the starter motor from under the car, between the exhaust connecting pipe and the slot of the exhaust shield (2) (lower part). Do not bend the shield.  REFITTING (see Pl. 7).	
10	Engage the starter motor between the exhaust connecting pipe and the slot of the lower exhaust shield (2), the terminal positioned towards the bottom. Engage the nose of the starter motor between the crankcase, the clutch bellhousing and the exhaust connecting pipe. Draw the starter motor back by straightening and by turning towards the right, half a turn approximately. Complete the fitting in position in the clutch bellhousing.	

TOOLS

11	<p>Moderately tighten the pointed fixing screw. Tighten the locknut, suitably positioning the fixing plate (7) of the starter motor shield (8).</p> <p>Moderately tighten the contact screws of the starter motor and tighten the locknuts. Connect the cable to the starter motor.....</p>	12-14-17 mm spanners
12	<p>Put the lower exhaust shield (2) in position. Fit the starter motor shield (8). Tighten the fixing screws (plain and spring washers).....</p>	12 mm spanner 12 mm box spanner
13	<p>Put the connecting pipe fixing plate (9) in position on the crankcase. Tighten the screw (spring washer). Tighten the pipe collar (10) .....</p>	12-17 mm box spanners
14	<p>Fit the front fixing plate of the exhaust shields. Tighten the nuts (spring washer).</p> <p>Fit the reinforcement arm securing the centrifugal regulator. Tighten the nuts (plain and spring washers).</p> <p>Fit the exhaust shield (1) (upper part). Tighten the screws (plain and spring washers).....</p>	8-12 mm spanners 8-12 mm box spanners
15	<p>Fit the air filter. Tighten the nuts (spring washers) .....</p>	12 mm box spanner
16	<p>Fit the right-hand front suspension sphere. Tighten by hand.</p>	
17	<p>Lower the car to the ground (jacking bracket 2505-T, see Pl. 51).....</p>	Jacking bracket 2505-T
18	<p>Connect the earth cable to the battery. Start the engine. Put the systems under pressure. Check the joint between the right-hand front suspension cylinder and the suspension sphere for leakage .....</p>	8-12 mm spanners

## TOOLS

## REPLACEMENT OF A HEATER GROUP.

Removal.

1	Remove the left-hand front wing, after having disconnected the wiring harness .....	8-14-16 mm box spanners
2	Close the heater cut-out valve. Disconnect the rubber inlet and heater return pipes, from the heater radiator.	
3	Remove the rubber collar anchoring the harness, disconnect the feed wires and the earth .....	8 mm box spanner
4	Remove the 2 fixing screws and nuts securing the heater group and remove the silentblocs .....	8 mm box spanner
5	Remove the heater group. Drain the fluid contained in the heater radiator.	
	<u>Refitting.</u>	
6	Put the heater group in position, connect the flexible union to the hot air duct (take care that the flexible union is not creased).	
7	Fit the silentblocs, tighten the 2 fixing screws and the nut securing the group (the longest screw on the ignition coil side). Insert a shakeproof washer .....	8 mm box spanner
8	Connect the flexible union to the cold air ventilation duct.	
9	Connect the water inlet and return pipes to the heater radiator. Tighten the Ligarex clips (inserting a protective sheath under the clips).	
10	Anchor the wiring harness on the heater radiator using a rubber collar.	
11	Coil the earth wire around the wiring harness, then fix to the ignition coil support (plain washer and shakeproof washer for the other part of the terminal). Connect the feed wire .....	8 mm box spanner
12	Fit the left-hand front wing and connect the wiring harness on the wing .....	8-14-16 mm box spanners
13	Make sure that the heater group functions correctly.	



TOOLS

OVERHAULING A HEATER GROUP.

Dismantling.

1 Remove the collar tightening the hot air duct flexible union and remove the flexible union.

2 Remove the retaining spring from the radiator.

3 Remove the 5 screws assembling the 2 half casing and disconnect. Remove the radiator..... 7 mm box spanner

4 Remove the 3 sleeve nuts securing the motor, disengage the silentblocs.  
Disengage the motor-impeller assembly ..... 8 mm box spanner

5 Unscrew the driving screws and disconnect the impeller from the motor.

6 Clean the parts and replace any defective parts. Raise the bushes in the housing. Thoroughly clean the motor commutator, then refit the brushes.

7 Check the radiator : close the return orifice by means of a plug. Fit a rubber tube on the feed orifice. Immerse the radiator in the water. Blow compressed air at a pressure of 2.8 to 4 p.s.i. (200 to 300 g/cm<sup>2</sup>) through the rubber tube. There should be no air bubbles visible.

Assembly.

8 Connect the impeller to the motor, the flat of the motor spindle towards the side of the driving screws, tighten the driving screws.

9 Put in position on the motor studs the parts for the silentblocs (shouldered bushes and plain washers).

10 Connect this assembly to the half casing of the heater group.

11 Fit the other parts of the silentblocs and tighten the 3 sleeve nuts ..... 8 mm box spanner

12 Put the heater radiator in position.

13 Connect the other half casing and fit the fixing screws (the heads of the screws must be in their housing), tighten the nuts moderately (shakeproof washers) ..... 7 mm box spanner

14 Put the radiator retaining springs in position.

15 Put the hot air duct flexible union in position and tighten the clip.

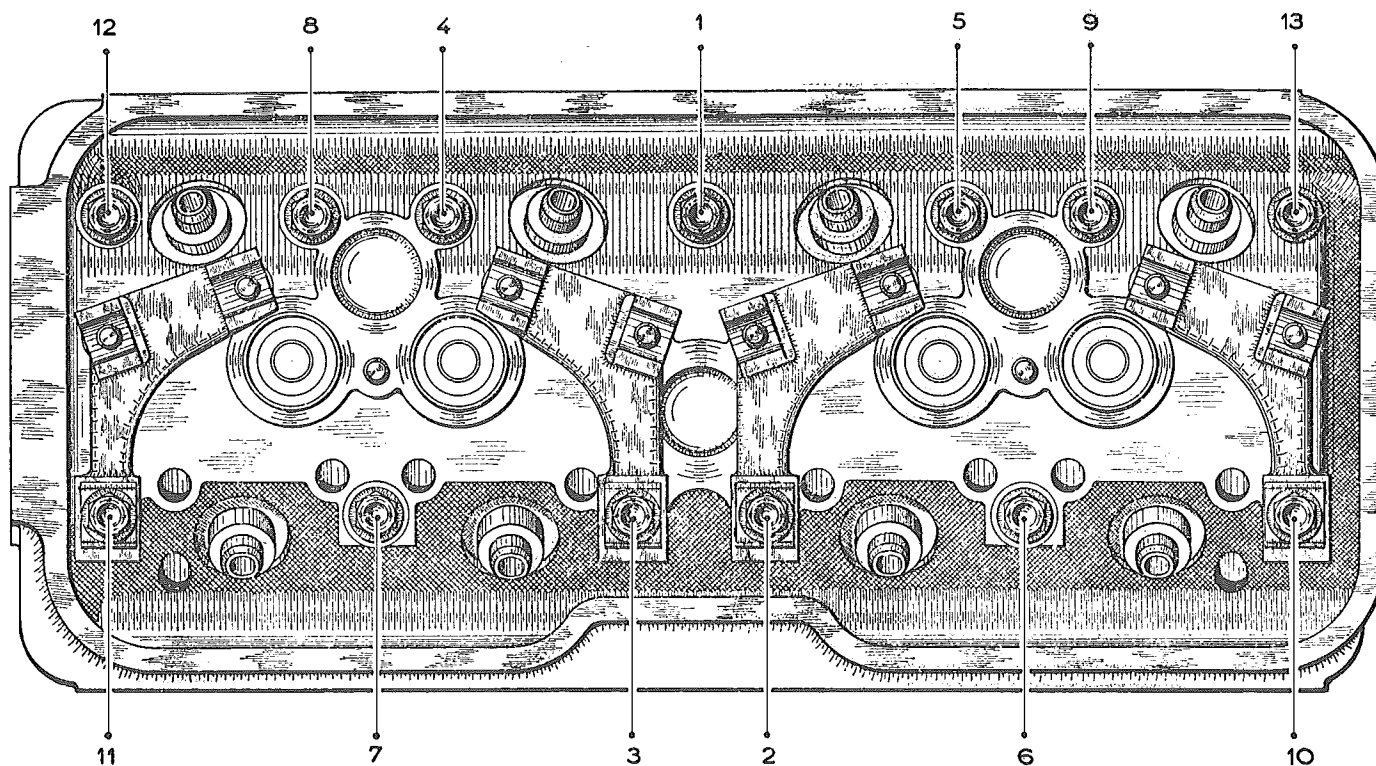
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	3	Various tools.
	4	Alignment of the pulleys.
	5	Stand for removed engine - gearbox assembly.
Exhaust system .....	6	Exhaust : assembly.
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	17	Differential bearing.
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## CYLINDER HEAD

Fig. 1. SEQUENCE OF TIGHTENING SCREWS



TIGHTENING TORSION (COLD) FIRST TIGHTENING 21.75 FT/LBS. (3 M.KG.); SECOND TIGHTENING 43.5 FT/LBS. (6 M.KG). IT IS ADVISABLE TO TIGHTEN THE SCREWS IN THE ORDER INDICATED ABOVE. THE TIGHTENING TORSION IS OF THE GREATEST IMPORTANCE AND THE USE OF A TORSION SPANNER IS INDISPENSABLE WITH SOCKET WITH A 12.7 SQUARE (SOLD UNDER No. 2465-T).

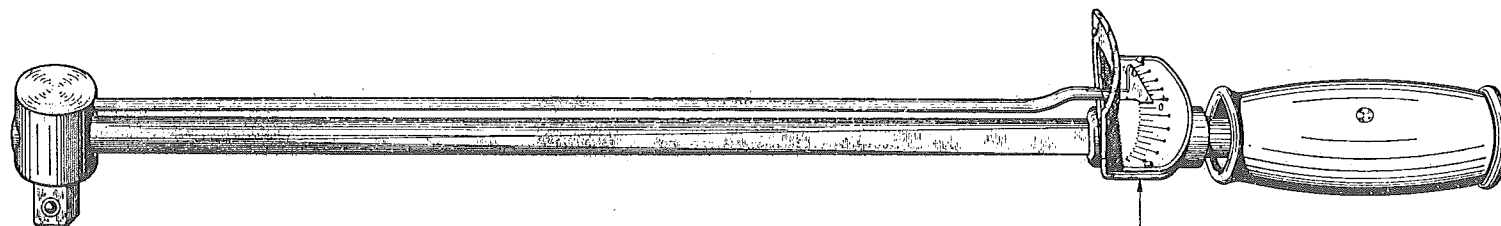


Fig. 2. TORSION SPANNER  
sold under No. 2471-T

vernier graduated in m.kg.

VARIOUS TOOLS

Fig. 1. STOP MR 4158  
not sold

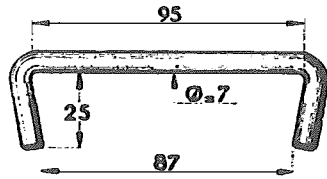


Fig. 2. SPANNER  
sold under No. 1623-T

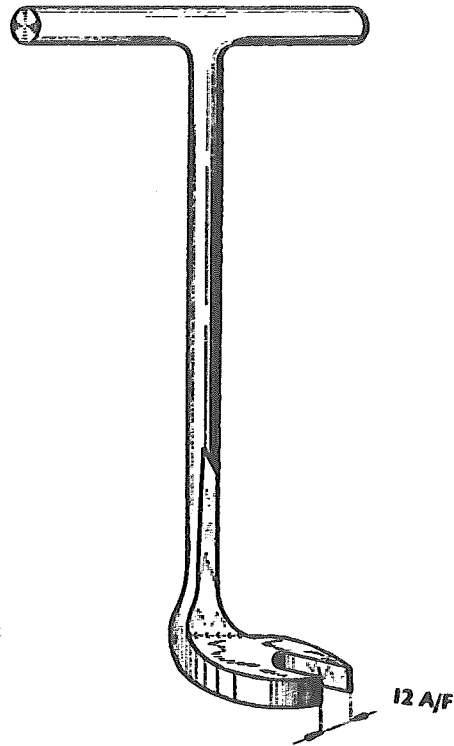


Fig. 3. SPANNER  
sold under No. 1645-T

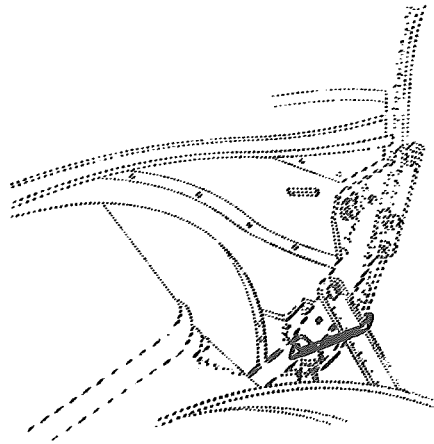
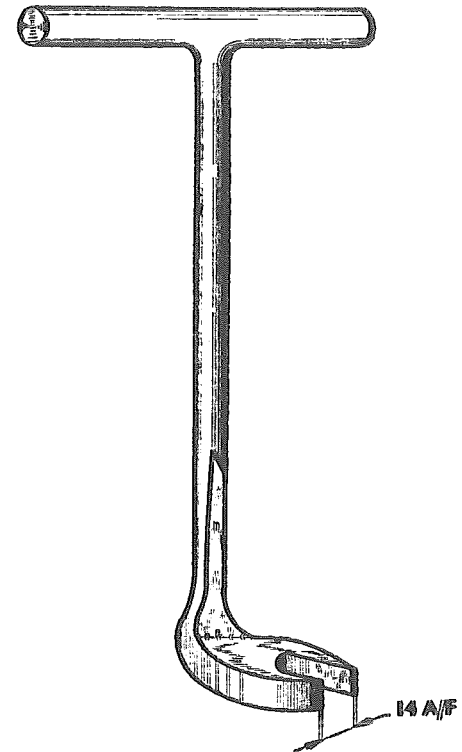


Fig. 4. SPANNER  
sold under No. 1603-T

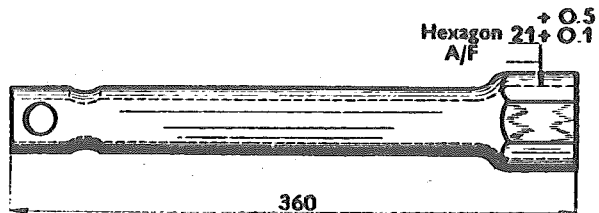
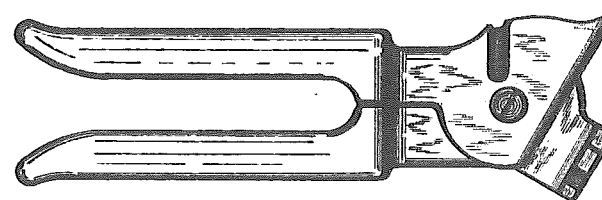


Fig. 5. LIGAREX PLIERS  
sold under No. 2483-T



VARIOUS TOOLS

Fig. 1. SPANNER FOR UNIONS  
sold under No. 2219-T

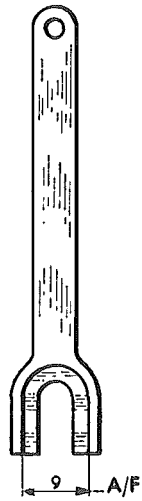


Fig. 2. STRAP WRENCH  
sold under No. 2223-T

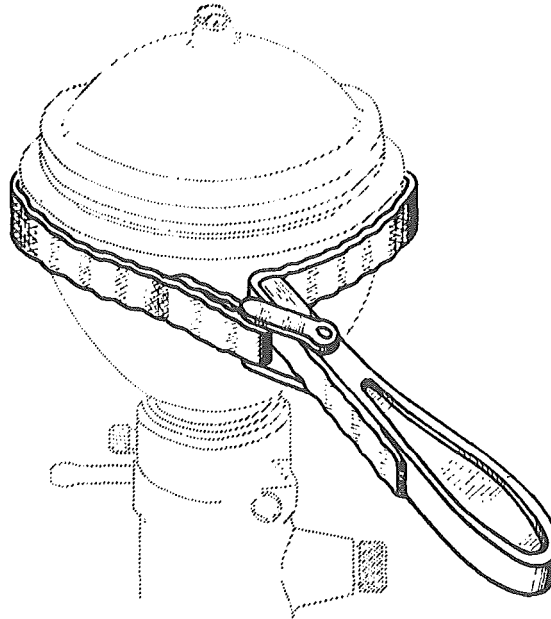


Fig. 3. SPANNER  
sold under No. 2280-T

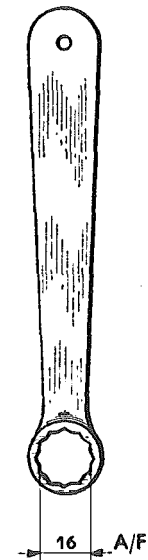
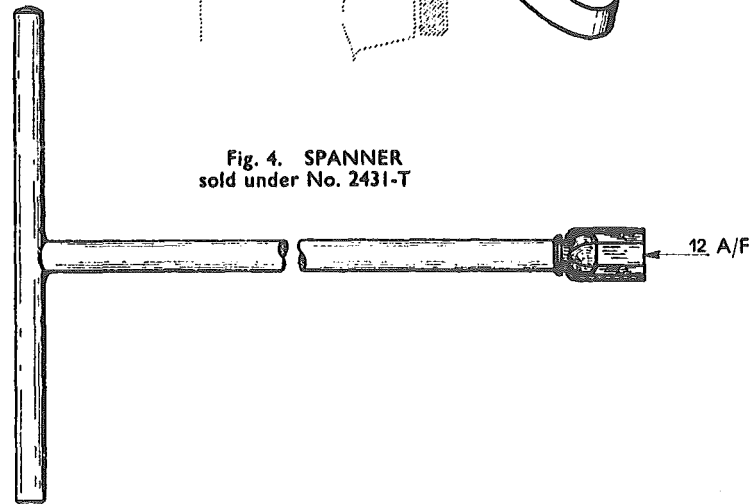
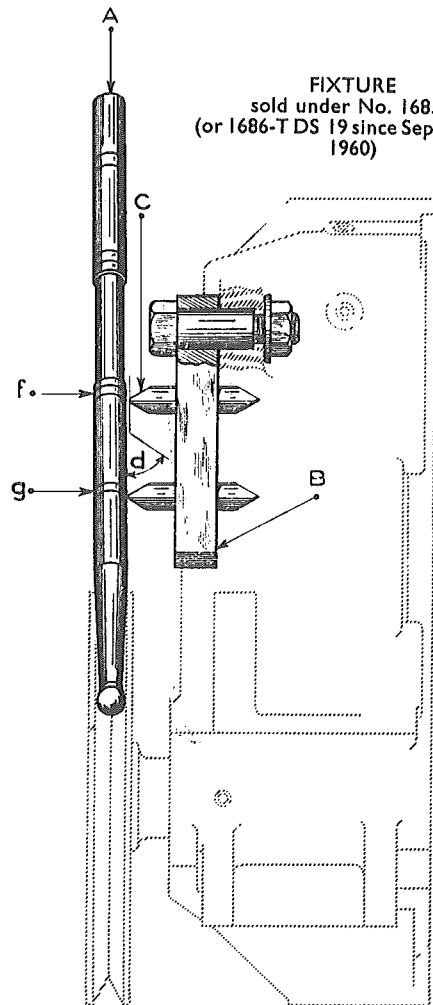


Fig. 4. SPANNER  
sold under No. 2431-T



# ALIGNMENT OF PULLEYS

Fig. 1.



FIXTURE  
sold under No. 1685-T  
(or 1686-T DS 19 since September,  
1960)

Checking the position  
of the driving pulley

Fig. 2.  
CHECKING THE POSITION  
OF THE WATER PUMP PULLEY

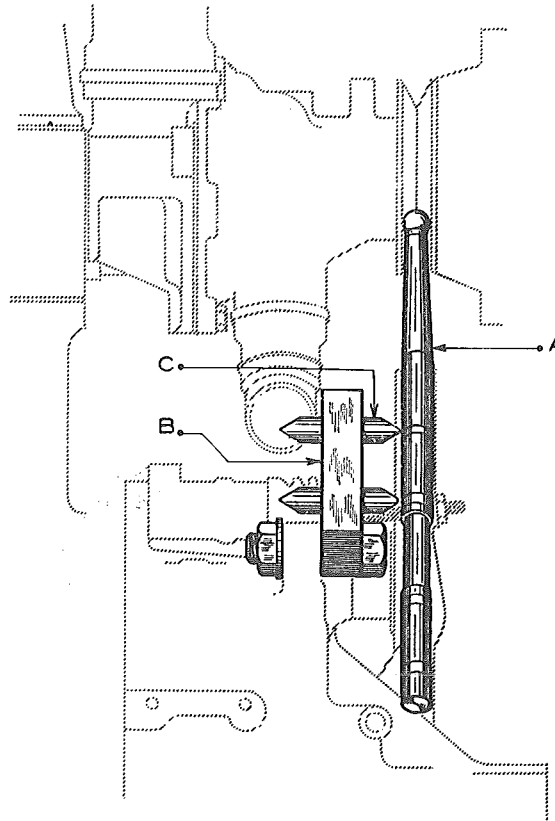
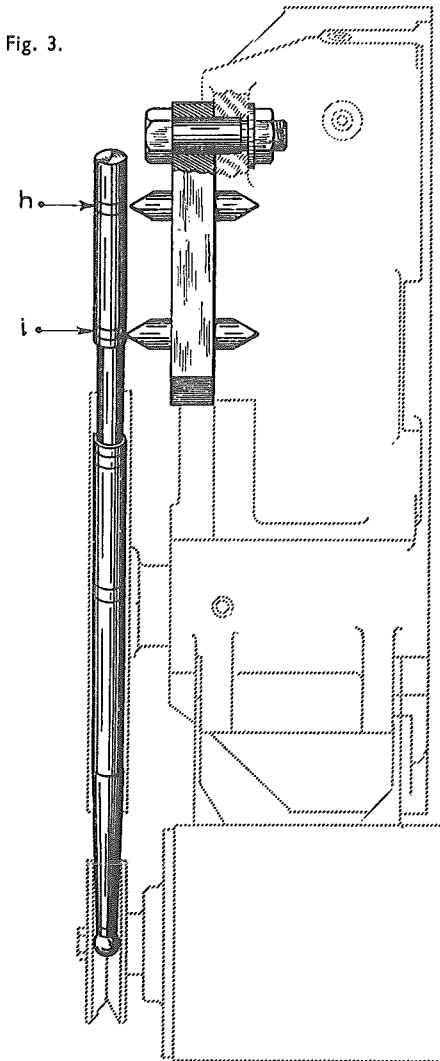


Fig. 4.



Fig. 3.

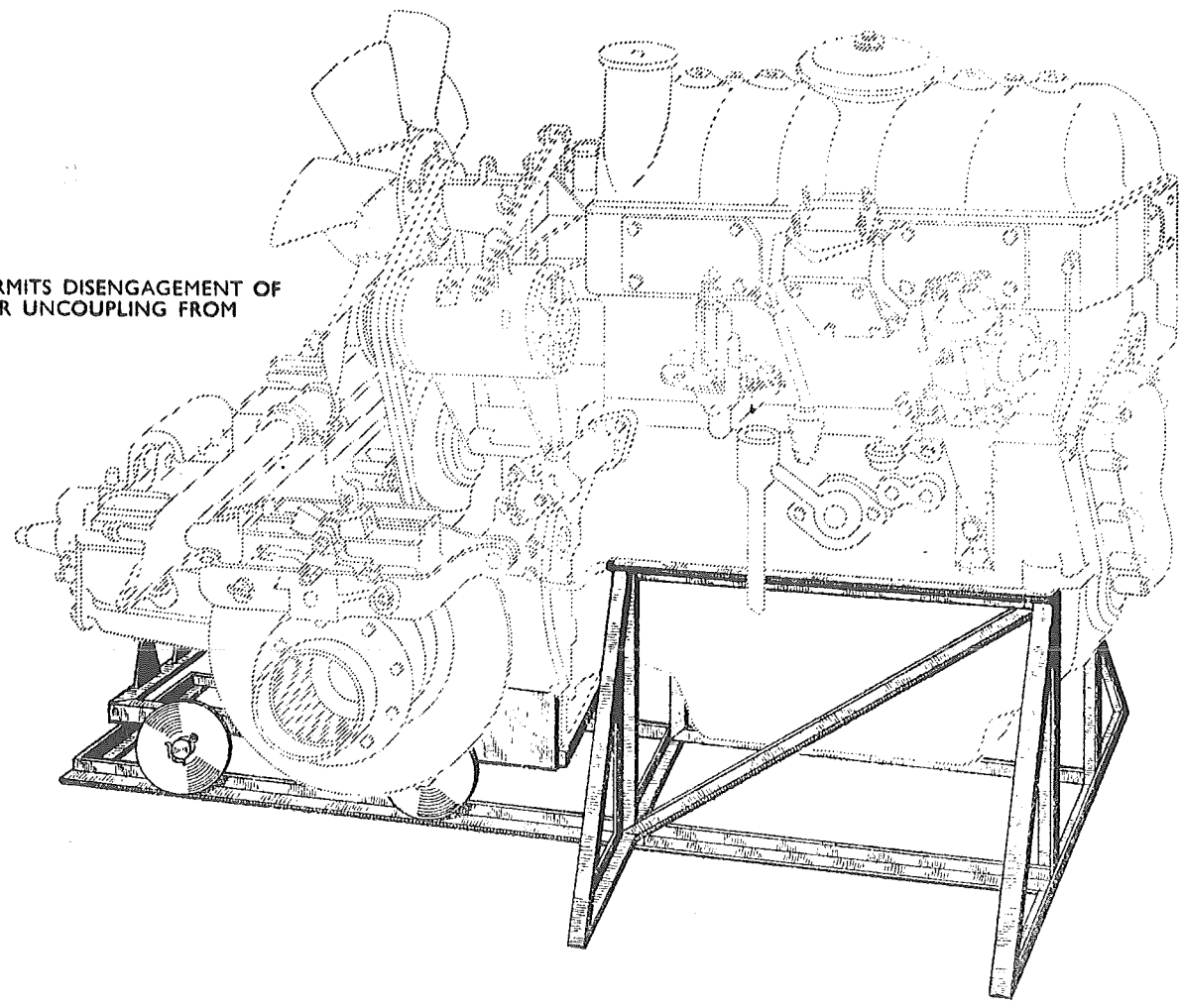


Checking the position  
of the dynamo pulley

**STAND FOR REMOVED ENGINE—  
GEARBOX ASSEMBLY**

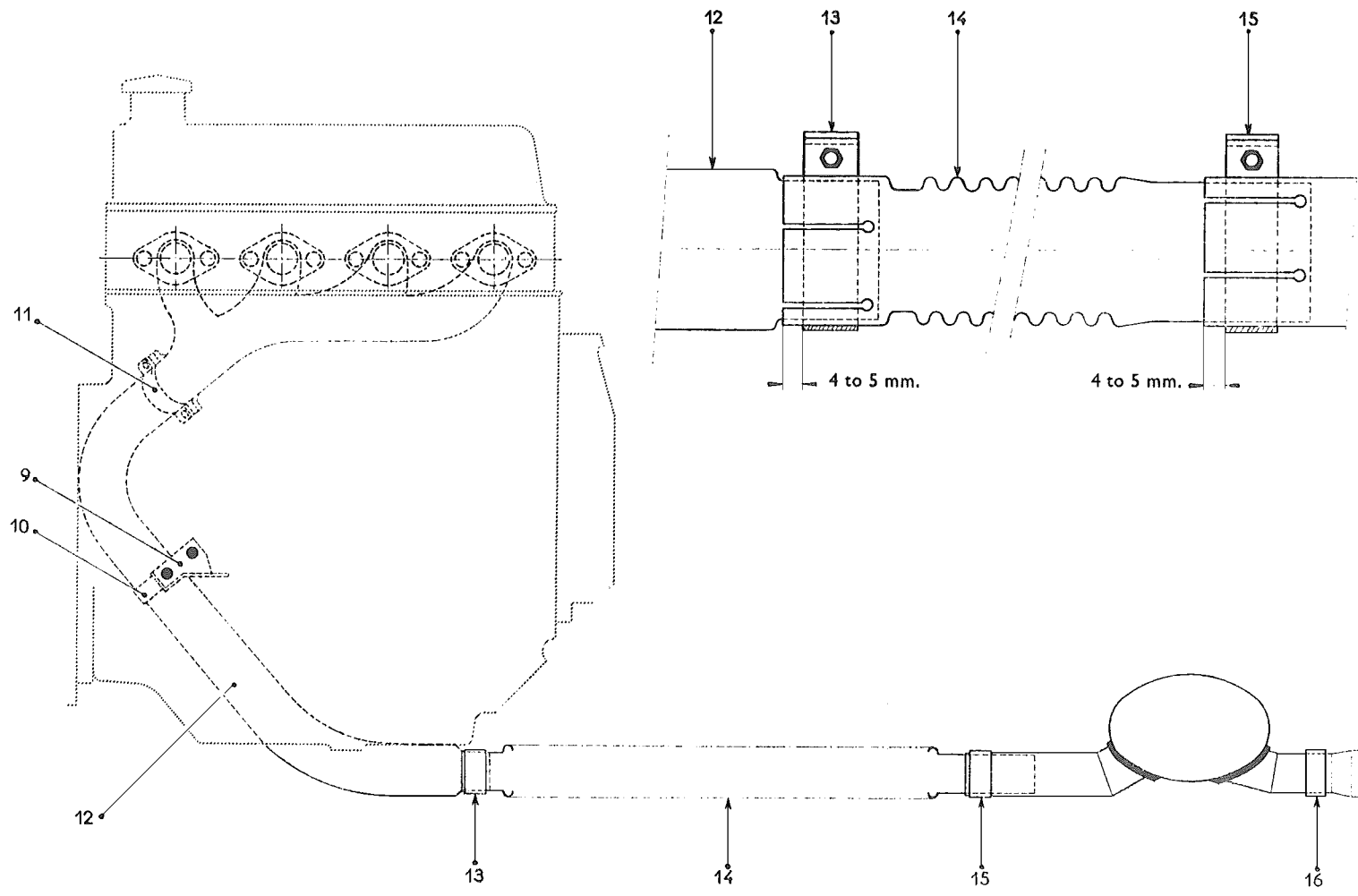
THE TRUCK PERMITS DISENGAGEMENT OF  
GEARBOX AFTER UNCOUPLING FROM  
THE ENGINE

STAND AND TRUCK  
sold under No. 2497-T

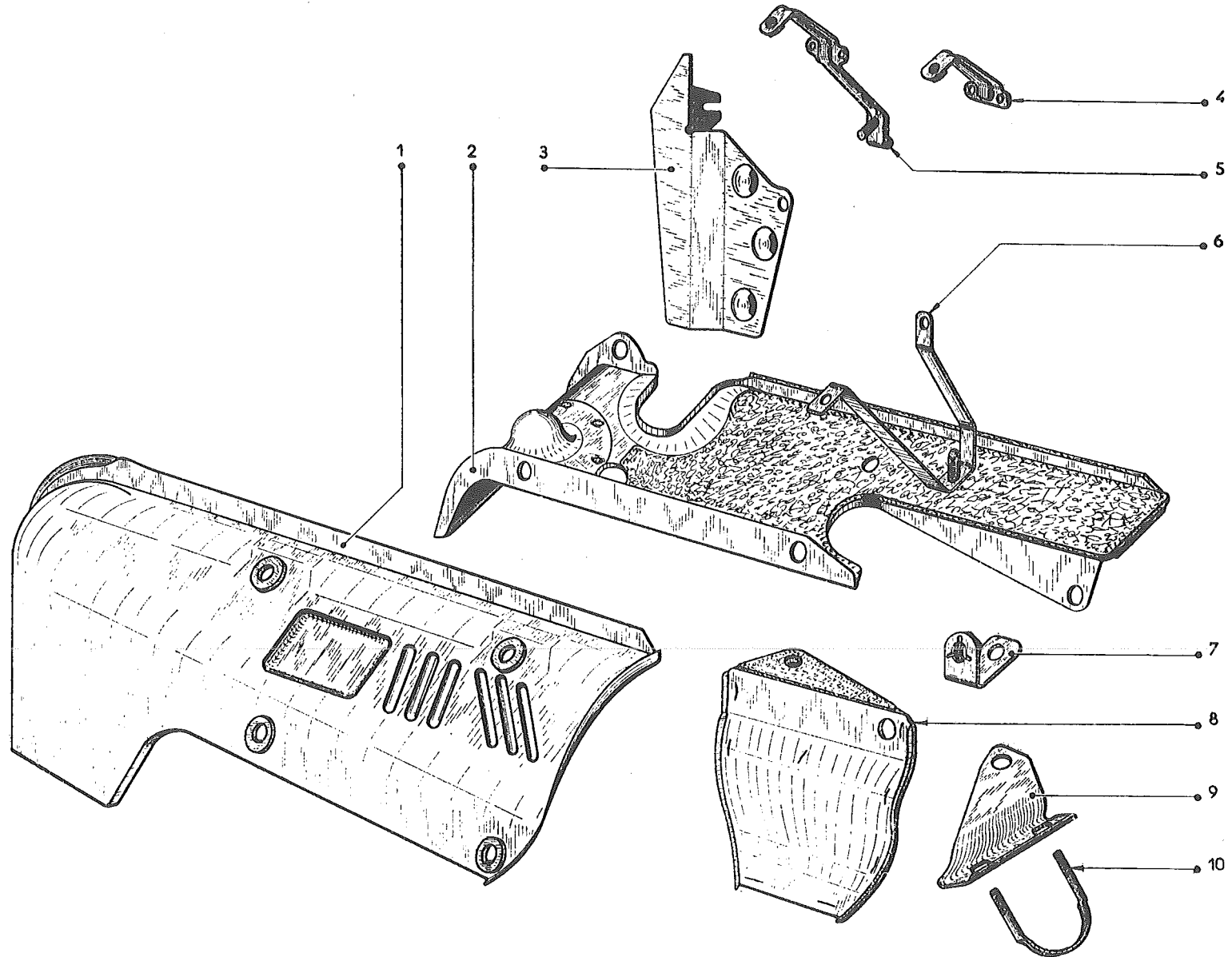




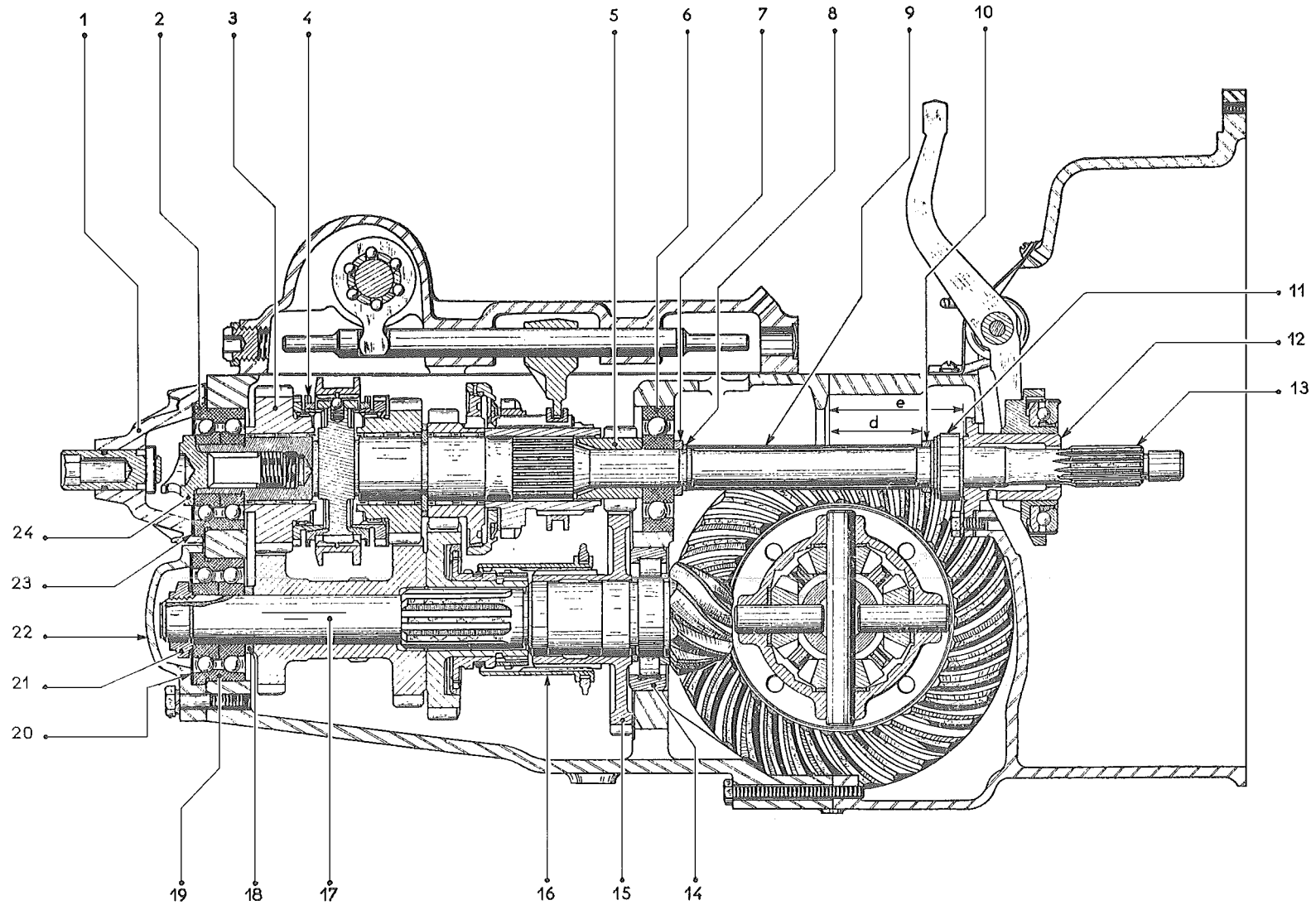
EXHAUST



EXHAUST SHIELDS



ASSEMBLY



32  
31  
8/8

Fig. 1. MAINSHAFT

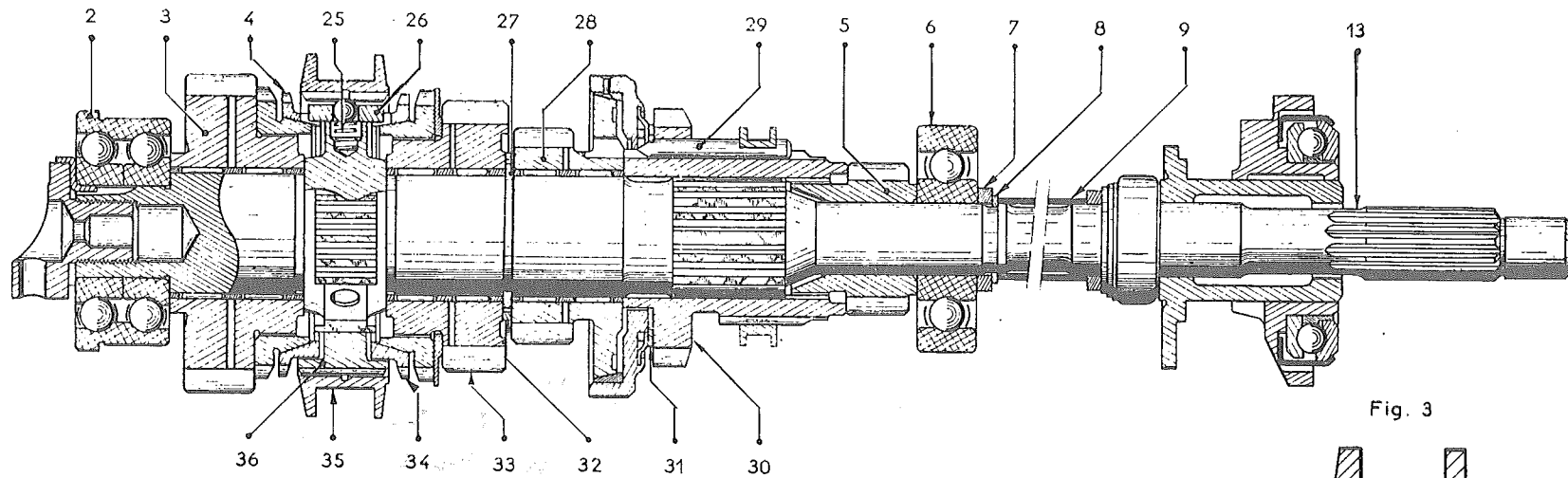


Fig. 2. BEVEL PINION

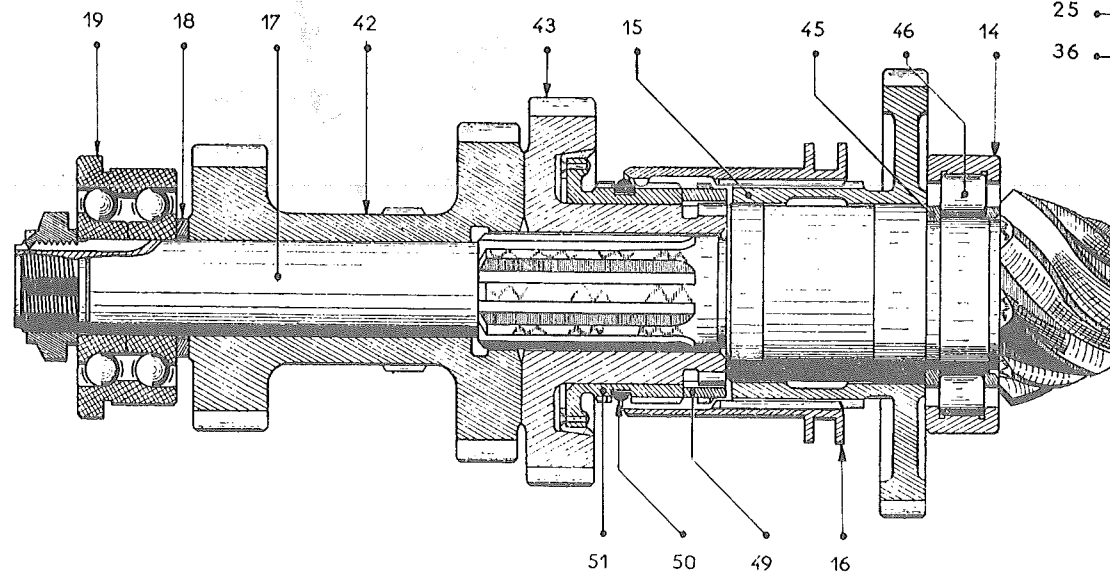
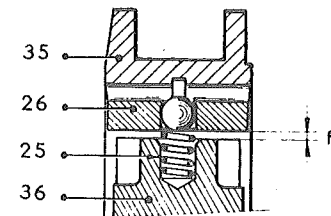
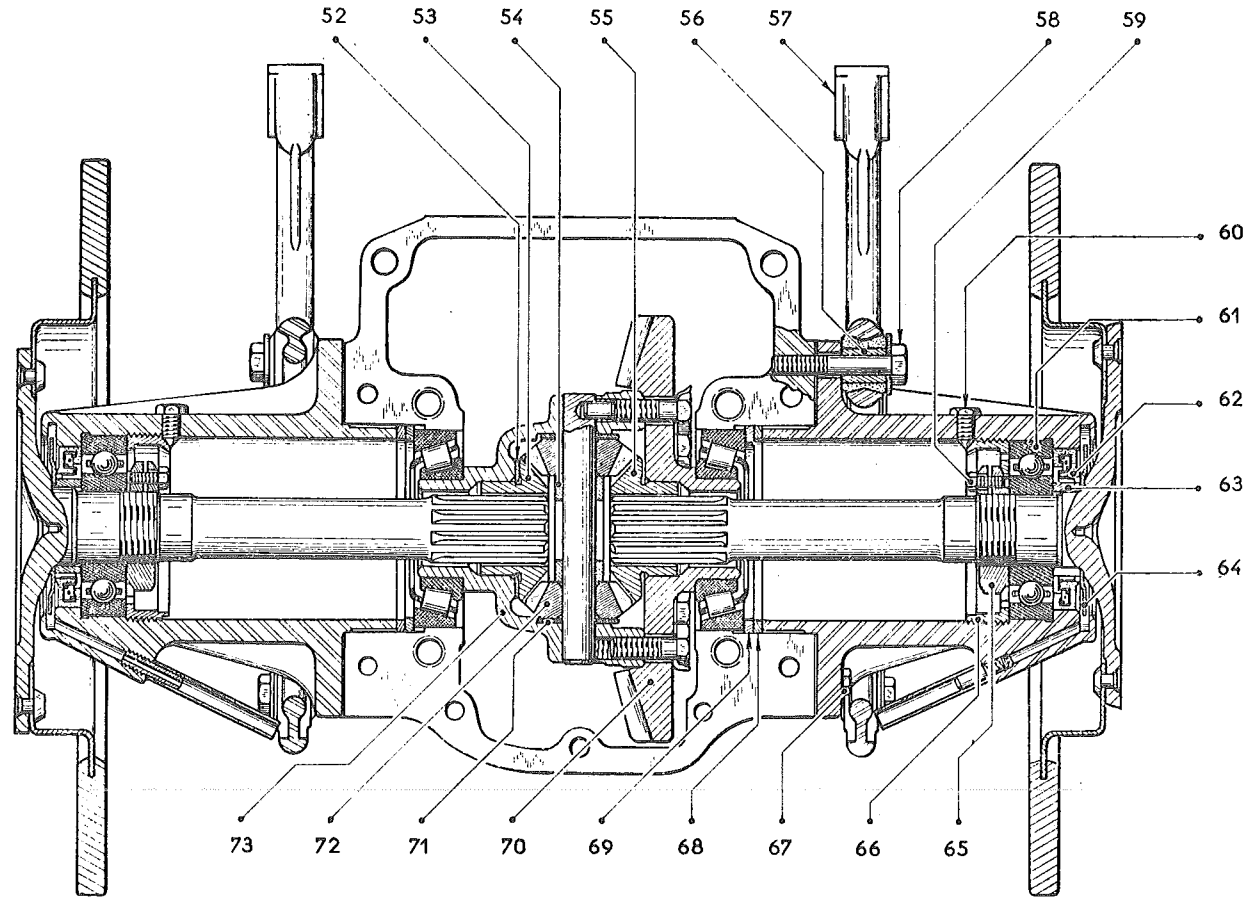


Fig. 3



DIFFERENTIAL



REVERSE SPEED

Fig. 1. MAINSHAFT ASSEMBLY

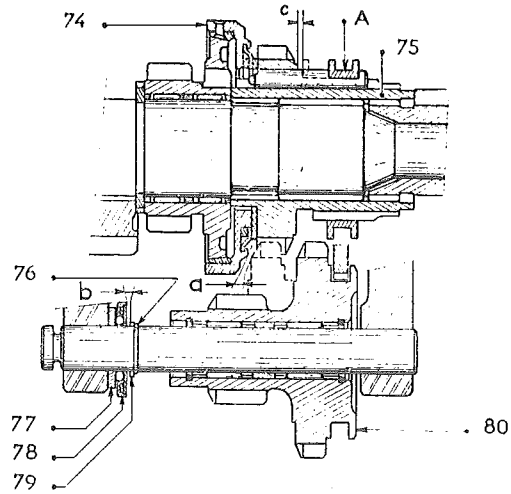


Fig. 2. SETTING THE DIAL GAUGE

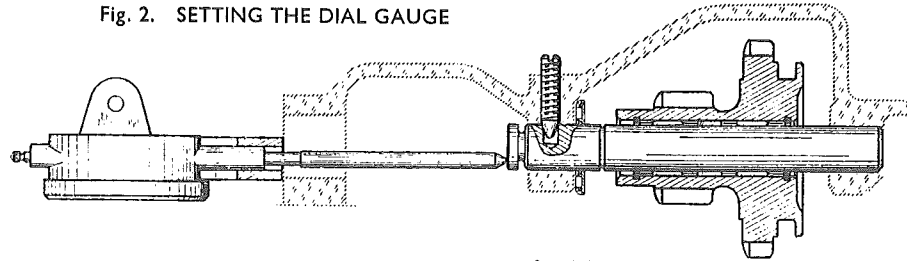


Fig. 3. ADJUSTING THE REVERSE SPEED  
SLIDING PINION

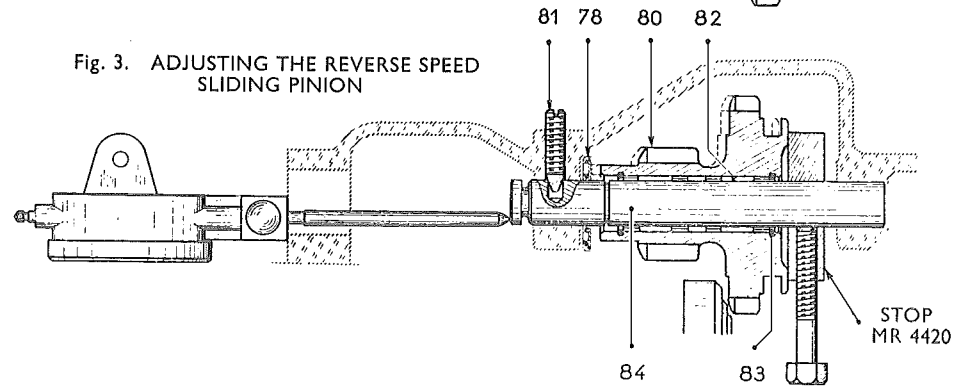


Fig. 6. STOP MR 4420  
not sold

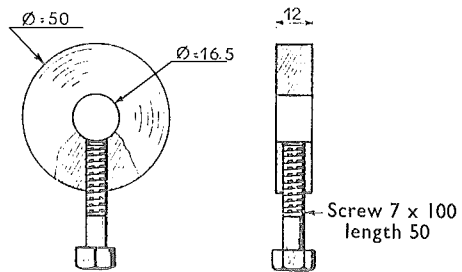


Fig. 7. ADJUSTABLE SUPPORT  
sold under No. 1754-T



Fig. 4. ADJUSTING THE NEEDLE THRUST BEARING

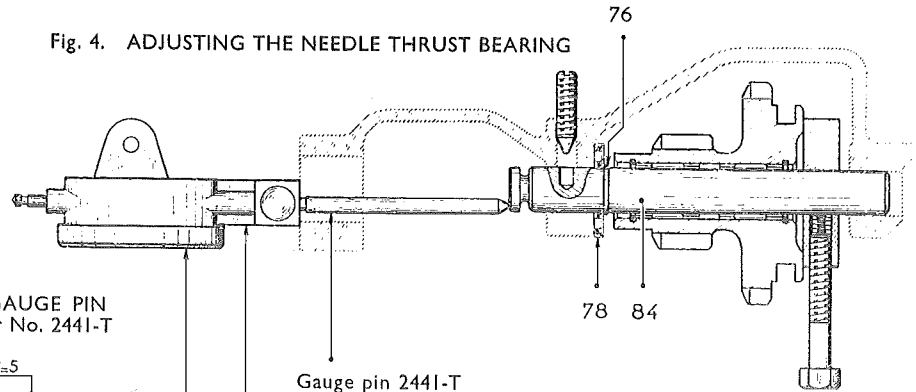
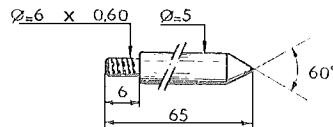


Fig. 5. GAUGE PIN  
sold under No. 2441-T



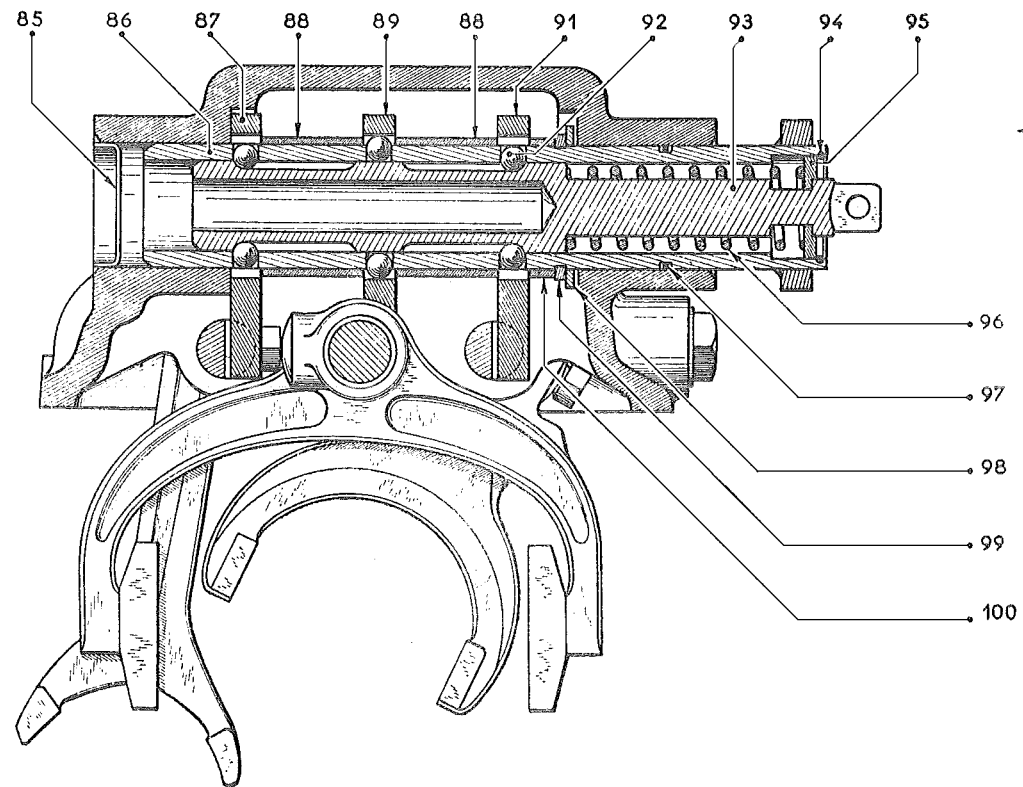
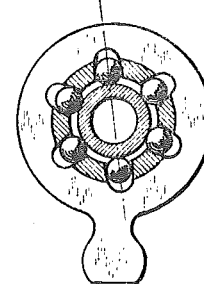
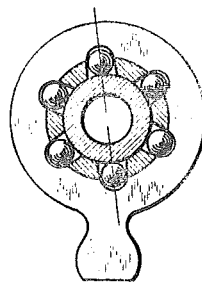
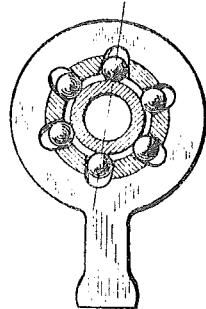
LEVERS CONTROLLING THE SELECTOR FORK SHAFTS

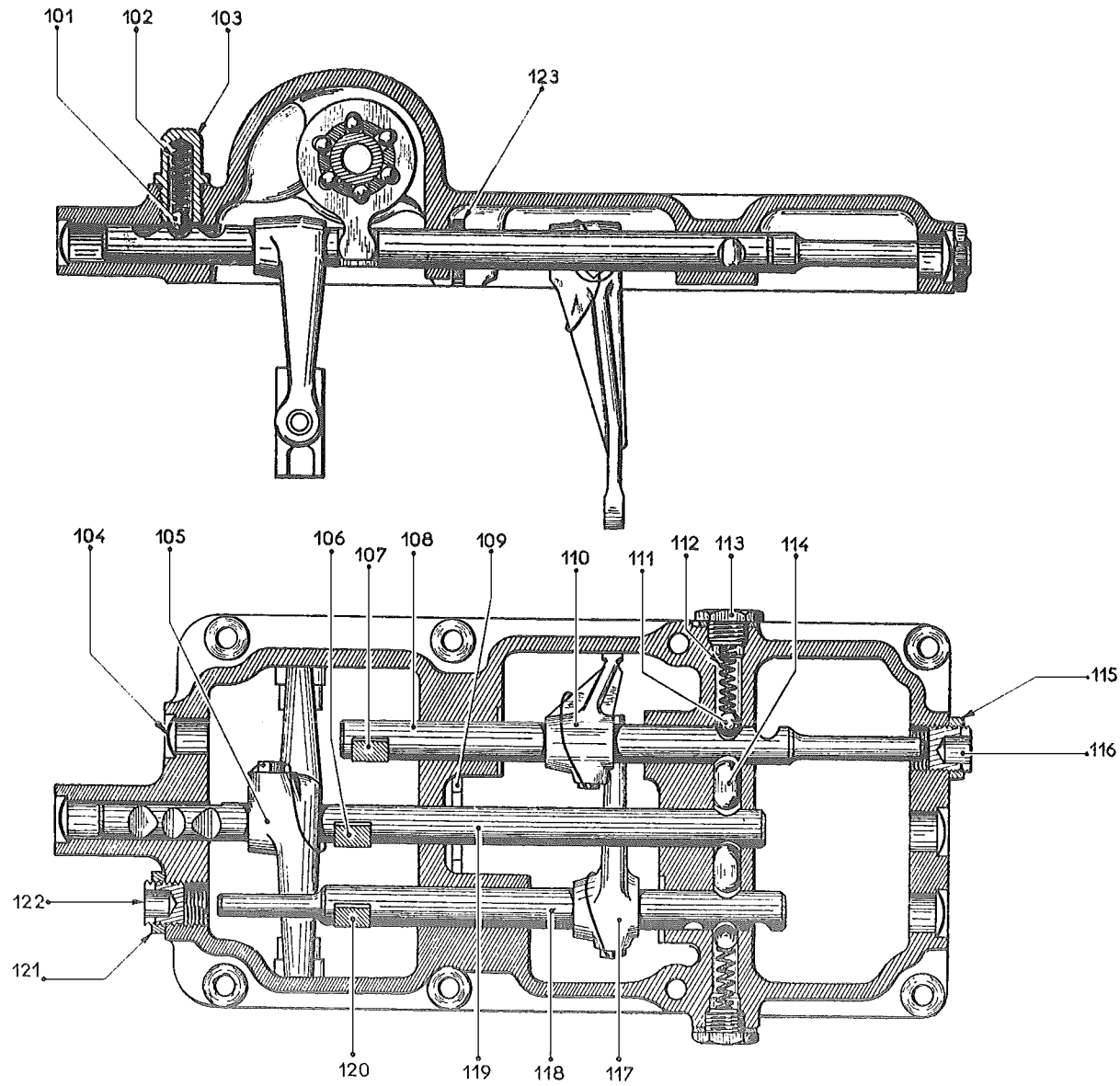
View in direction F

REVERSE SPEED

3rd and 4th speed

1st and 2nd speed







CLUTCH HOUSING

Fig. 1.

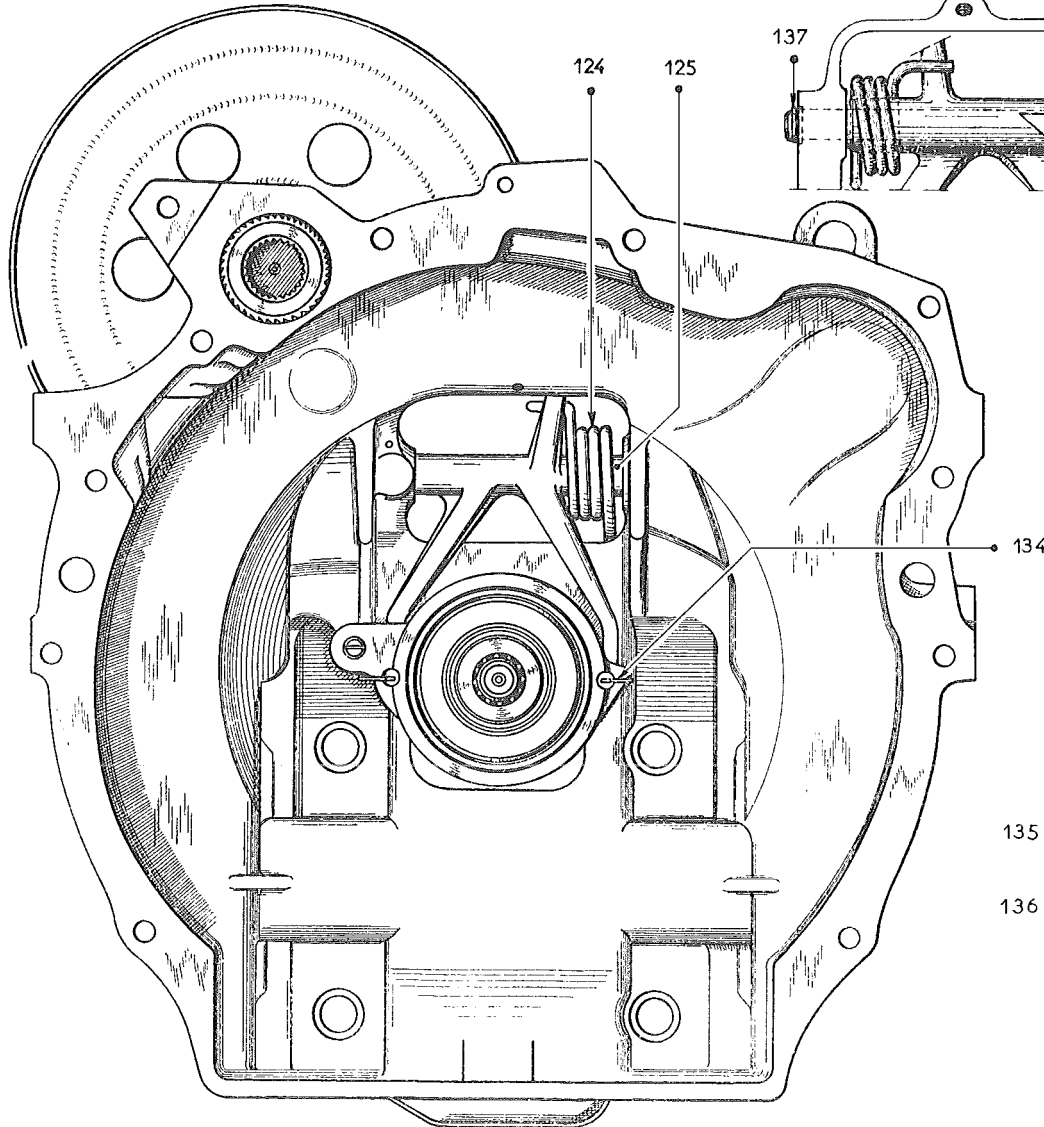


Fig. 3.

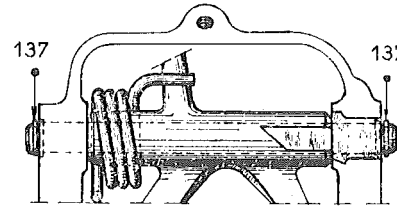
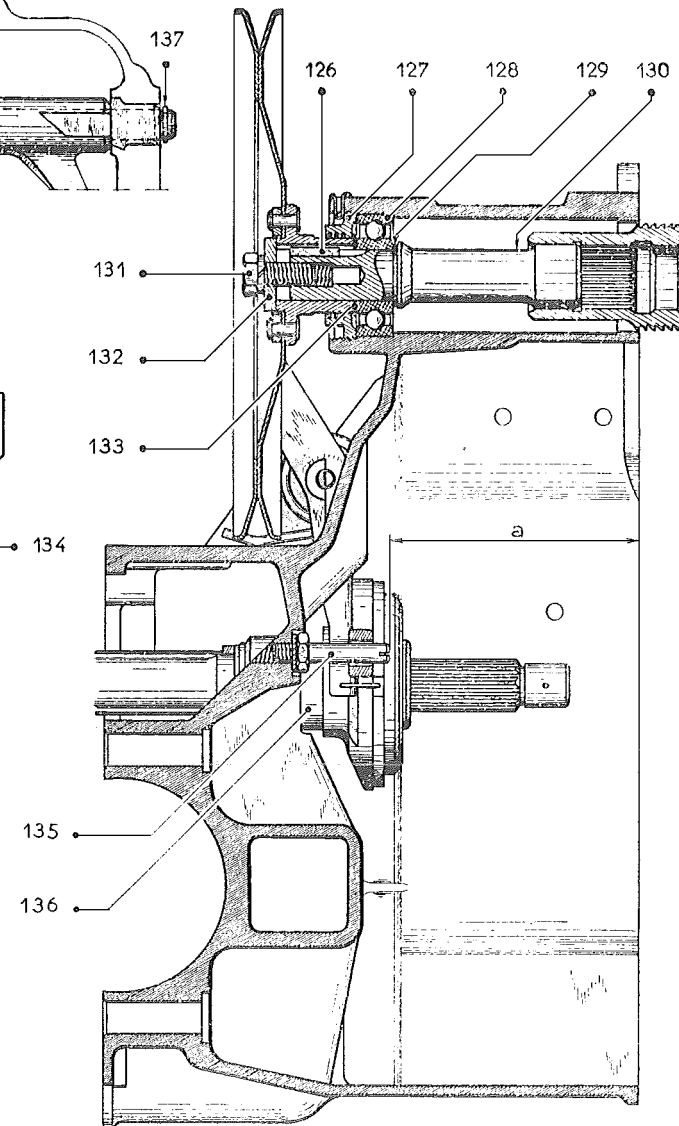


Fig. 2.



# ADJUSTMENT OF CROWN WHEEL AND BEVEL PINION

Fig. 1. ADJUSTMENT OF BEVEL PINION SETTING

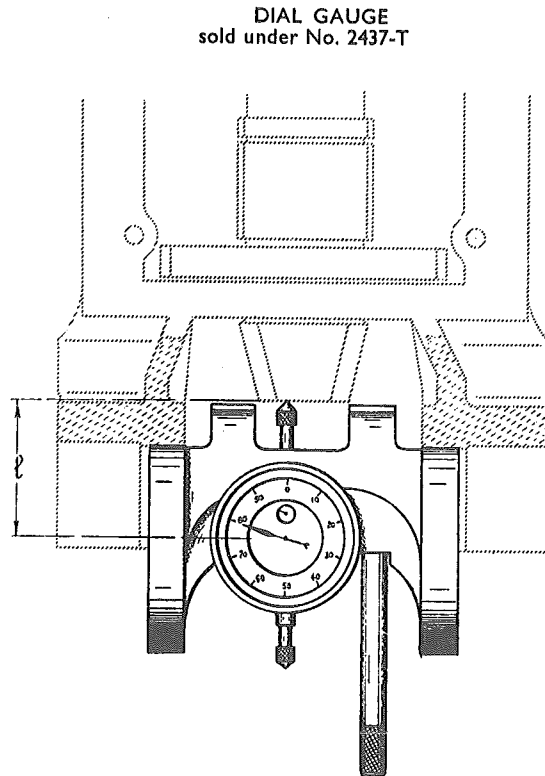


Fig. 2. ADJUSTMENT OF TOOTH CLEARANCE

SUPPORT FOR DIAL GAUGE  
sold under No. 2039-T

EXTENSION  
sold under No. 2439-T

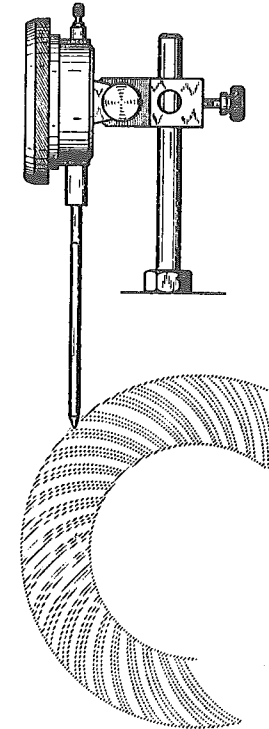
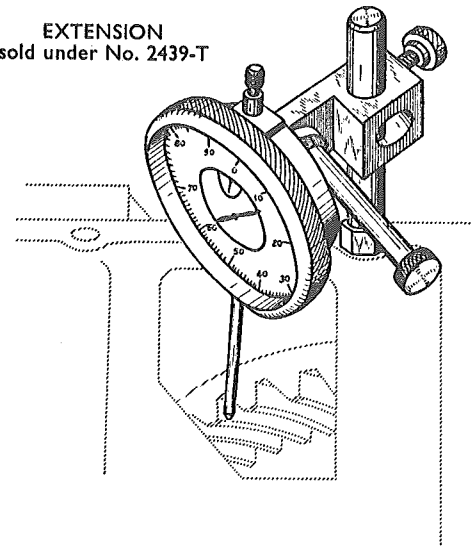
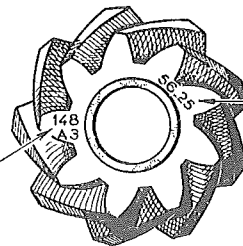


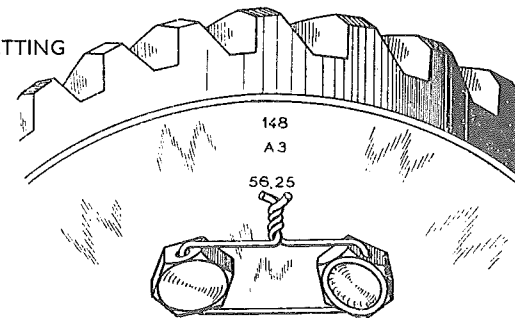
Fig. 3. MARKING

ADJUSTING FIXTURE  
sold under No. 2044-T

PAIRING NUMBER

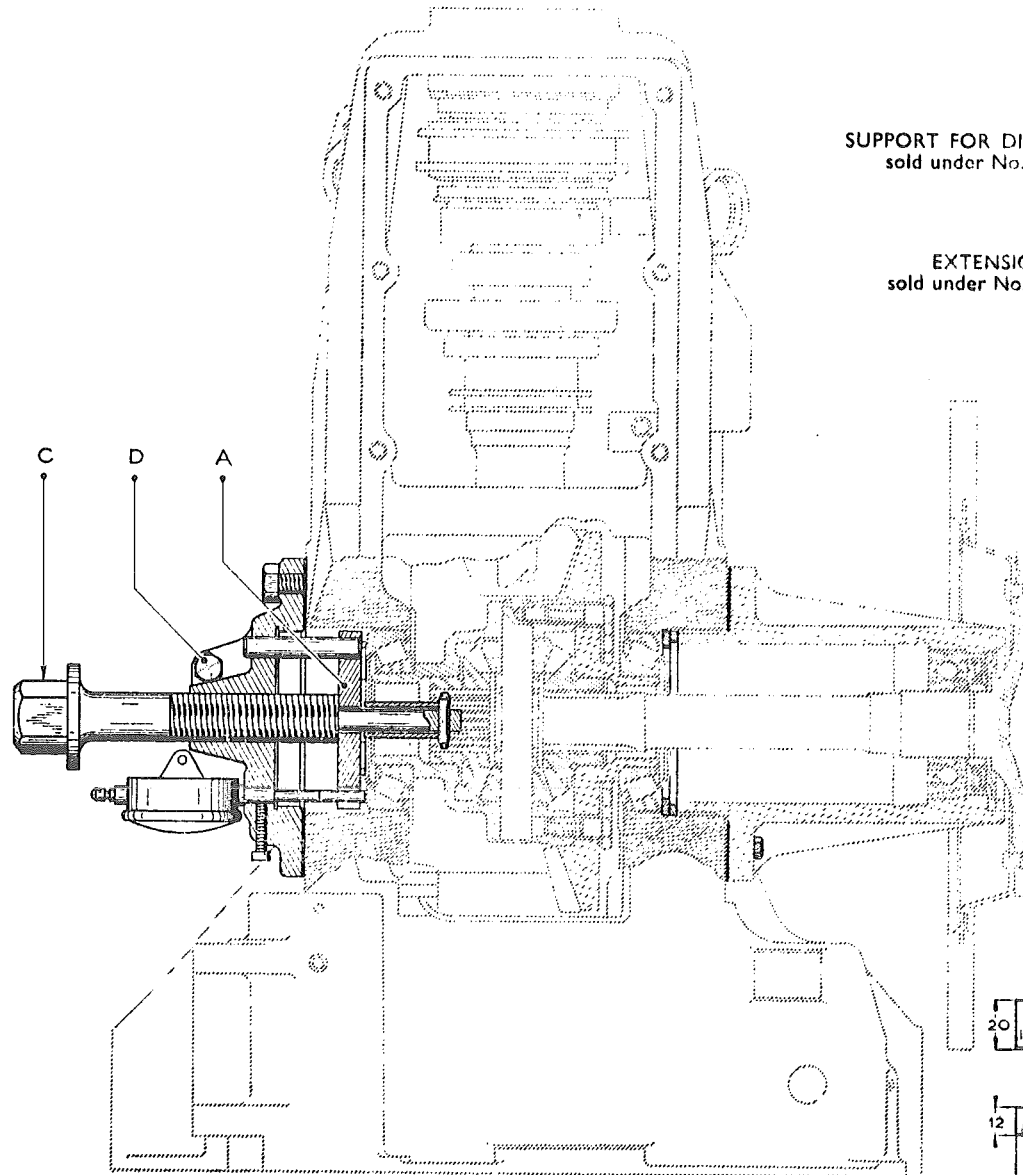


BEVEL PINION SETTING



# ADJUSTMENT OF THE DIFFERENTIAL BEARINGS

Fig. 1. MEASURING THE DEPTH OF THE HOUSING



SUPPORT FOR DIAL GAUGE  
sold under No. 1766-T

EXTENSION  
sold under No. 2438-T

Fig. 2. MEASURING THE HEIGHT OF THE SHOULDER OF THE HUB

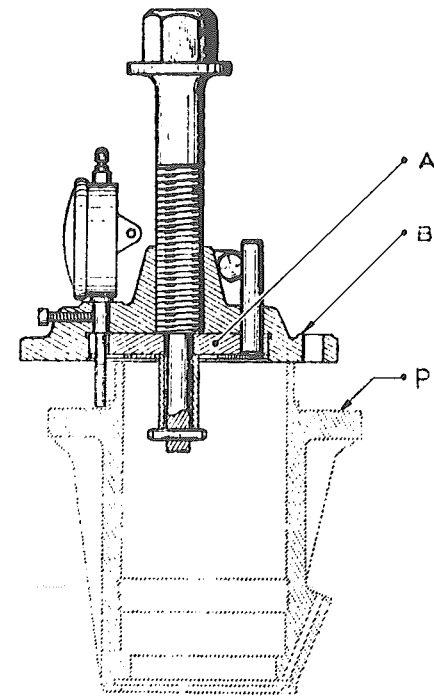
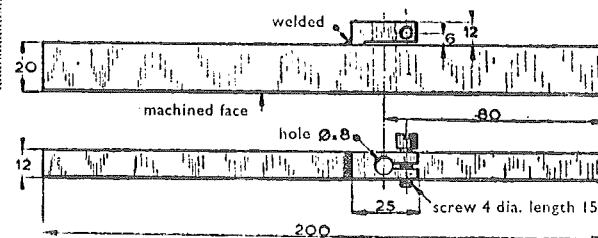


Fig. 3. STRAIGHT EDGE MR 3377  
not sold



DIFFERENTIAL BEARING

Fig. 1. EXTRACTION OF BEARING

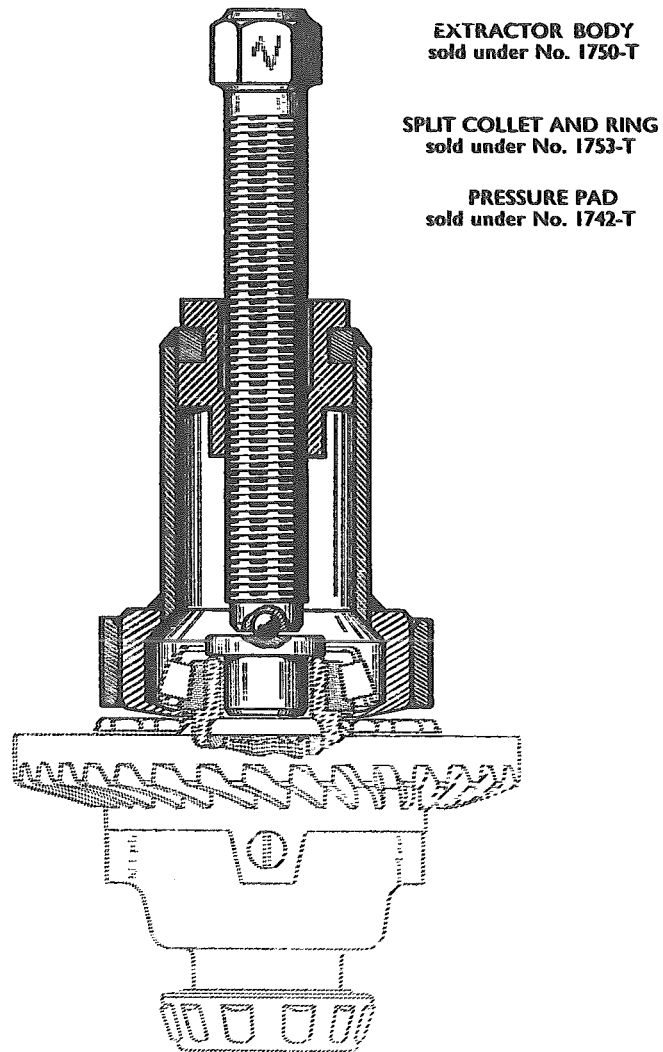
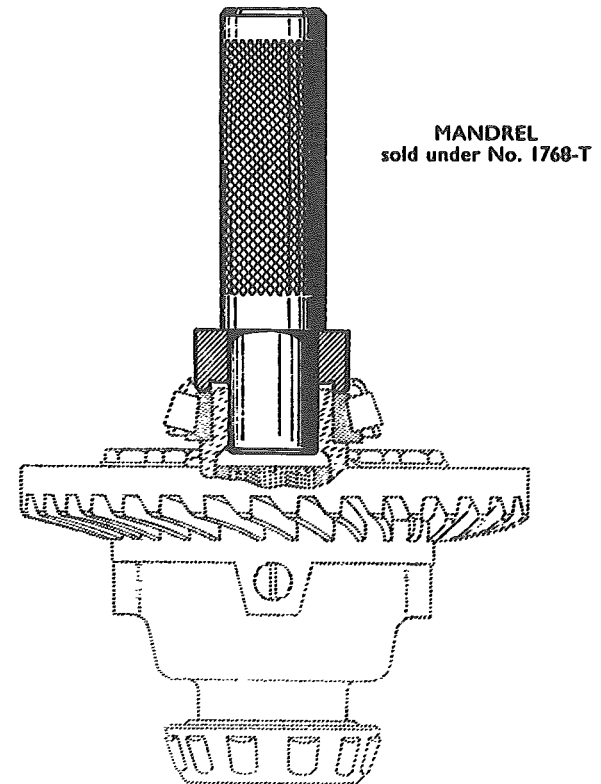
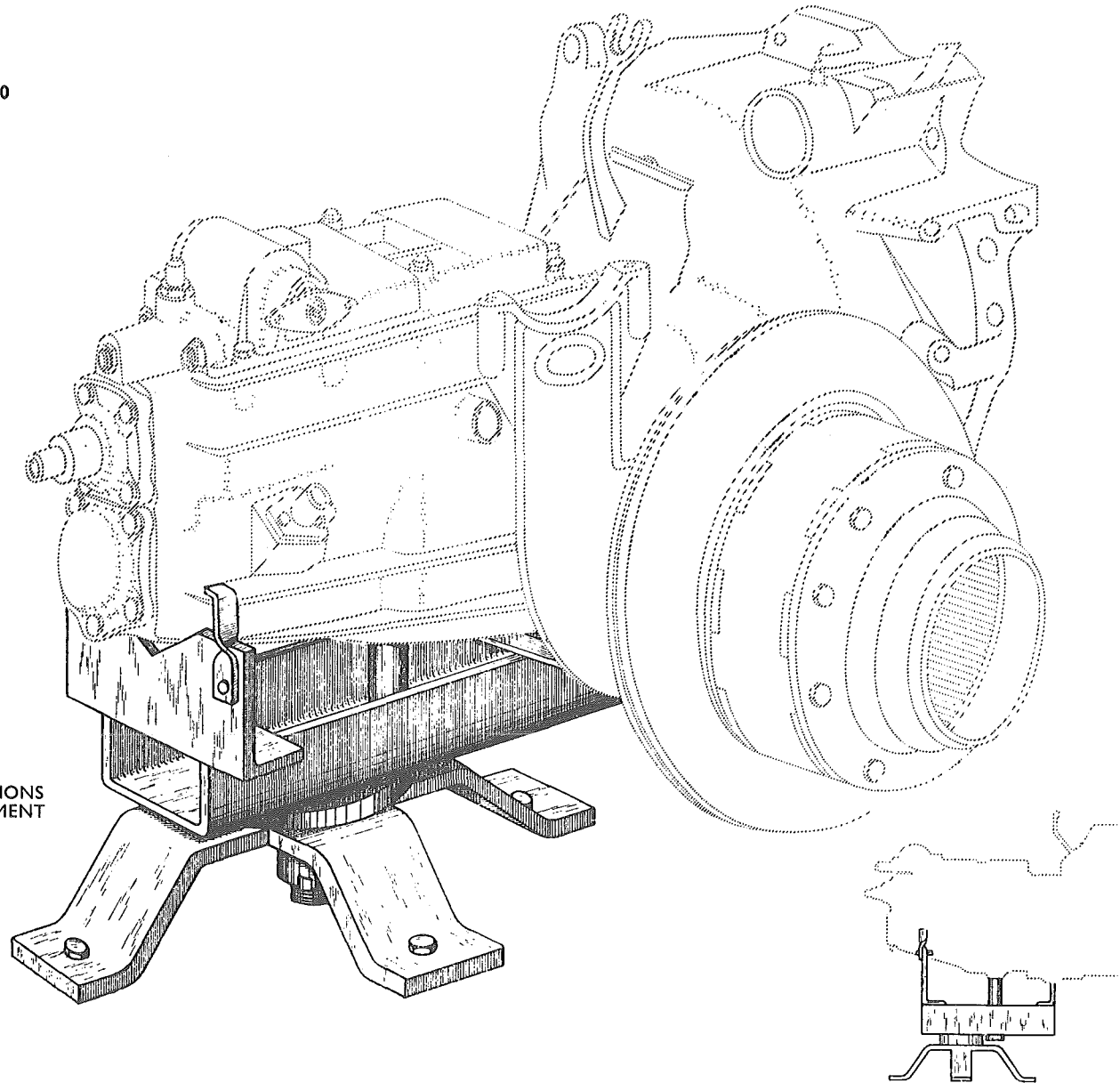


Fig. 2. FITTING BEARING



STAND FOR GEARBOX FOR USE ON BENCH

STAND MR 3053-130  
not sold



FOR CONSTRUCTIONAL DIMENSIONS  
APPLY TO THE SERVICE DEPARTMENT

VARIOUS TOOLS

Fig. 1. MANDREL MR 3045  
not sold

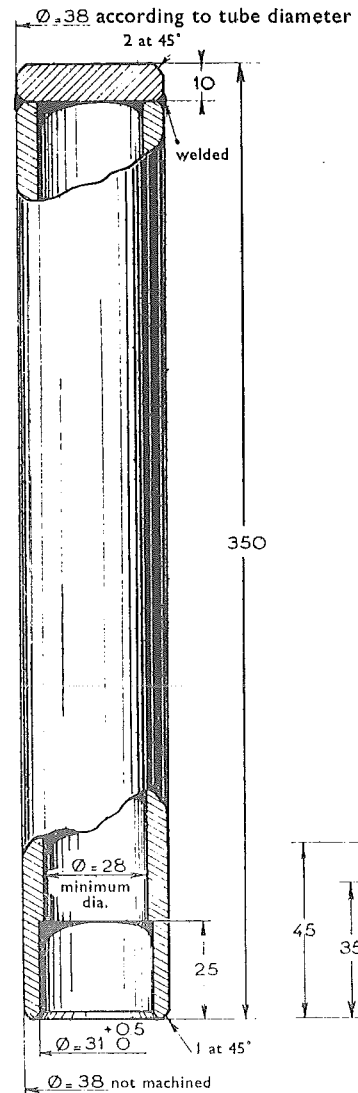


Fig. 2. MANDREL MR 3676-30  
not sold

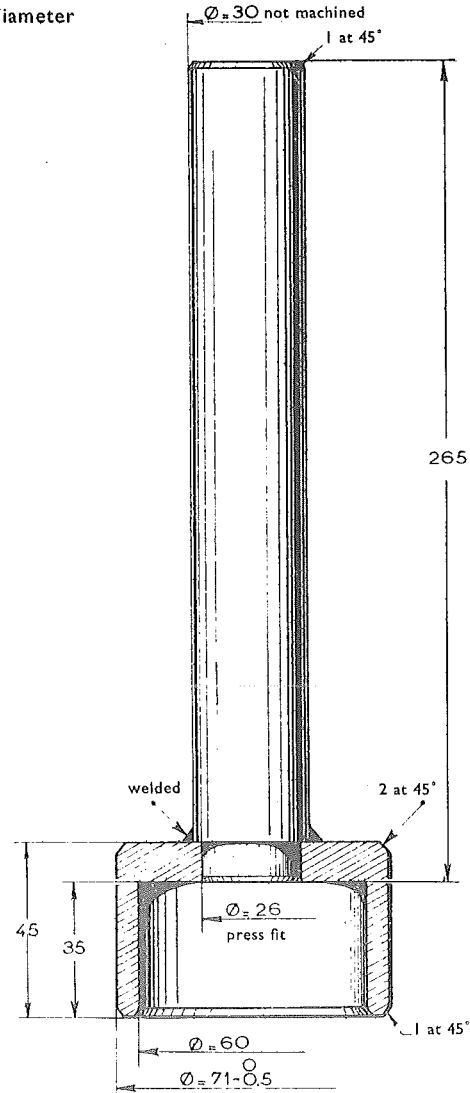


Fig. 3. SPANNER  
sold under No. 1734-T

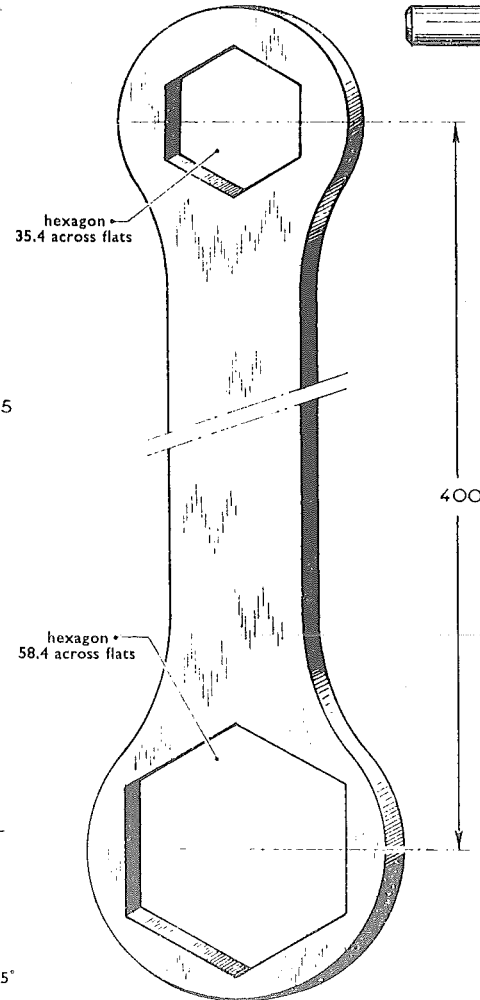
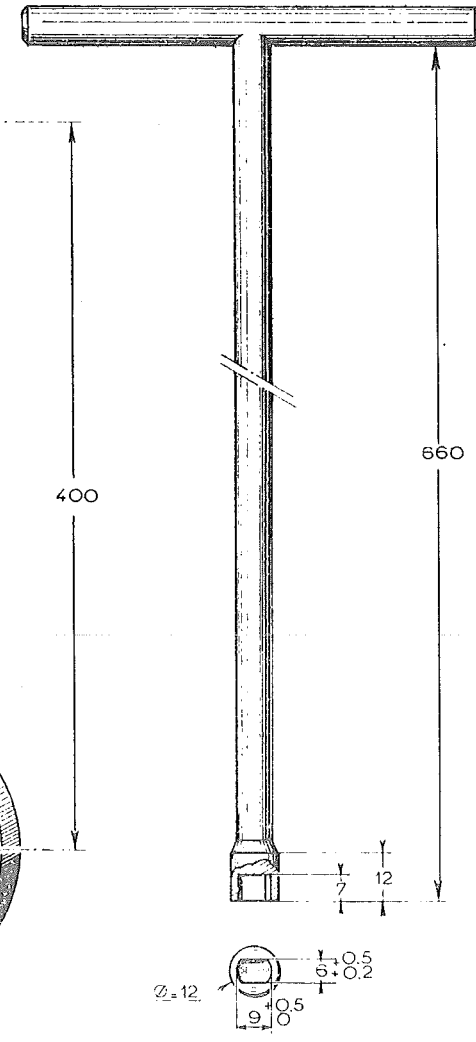


Fig. 4. SPANNER  
sold under No. 1677-T



VARIOUS TOOLS

Fig. 1. MANDREL  
sold under No. 1767-T

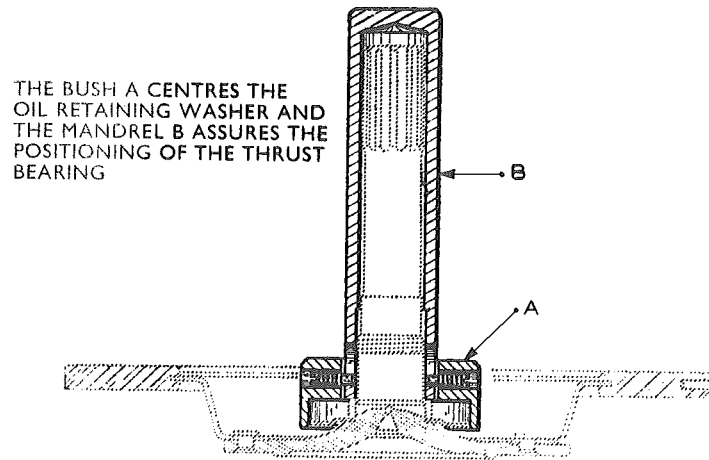
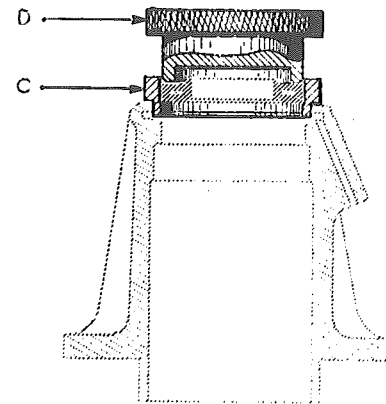


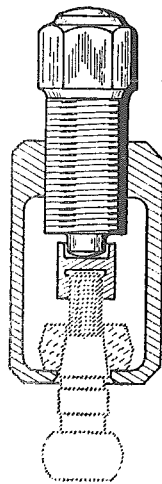
Fig. 2. MANDREL  
sold under No. 1772-T



THE BUSH C CENTRES THE SEALING JOINT AND THE MANDREL D ASSURES THE POSITION OF THE JOINT

Fig. 4. EXTRACTOR AND PRESSURE PAD  
sold under No. 1864-T

Fig. 3. EXTRACTOR  
sold under No. 1964-T



PRESSURE PAD  
sold under No. 1968-T

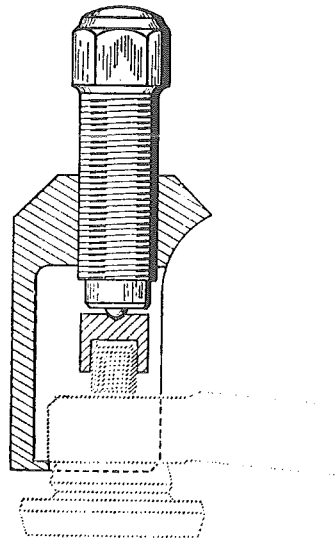


Fig. 5. SPANNER  
sold under No. 1771-T

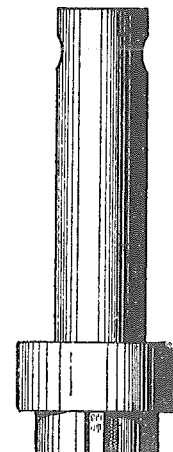
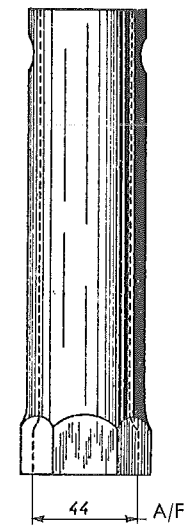


Fig. 6. SPANNER  
sold under No. 1770-T



### ASSEMBLY OF THE LEVERS

### CONTROLLING THE SELECTOR FORK SHAFTS

Fig. 1

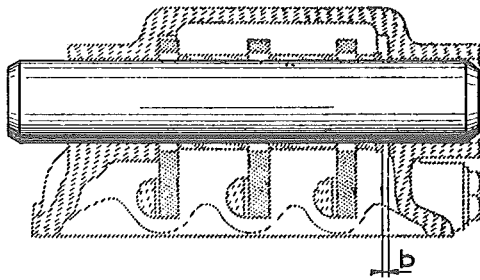


Fig. 3

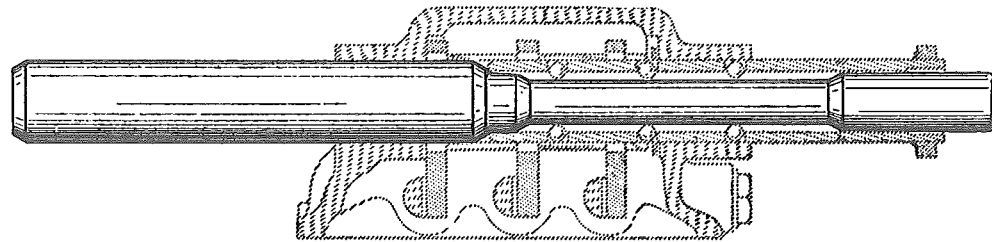


Fig. 2

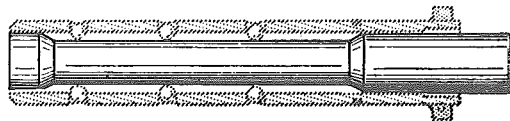


Fig. 4

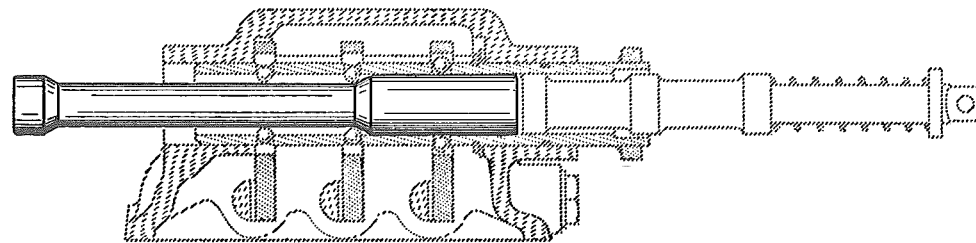
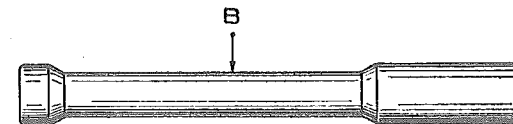
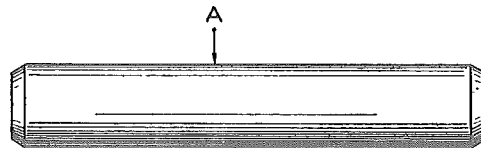


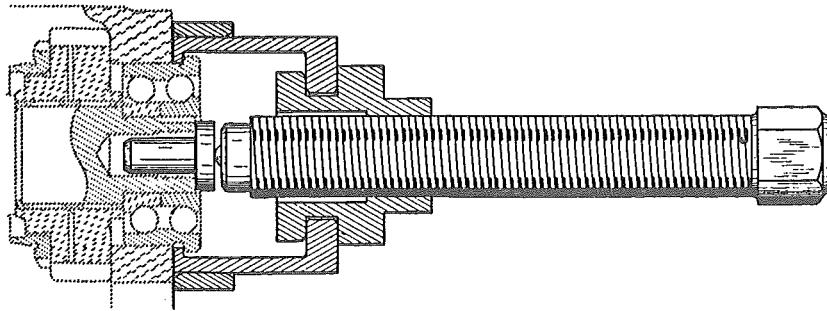
Fig. 5. MANDRELS  
sold under No. 1793-T





VARIOUS TOOLS

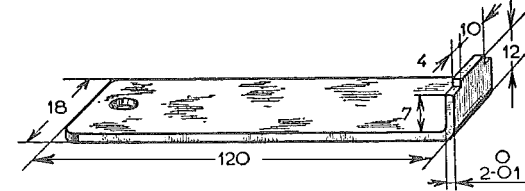
Fig. 1. EXTRACTION OF FRONT MAINSHAFT BEARING



EXTRACTOR BODY  
sold under No. 1750-T

SPLIT COLLET, RING AND PRESSURE PAD  
sold under No. 1738-T

Fig. 2. SPANNER MR 3691-80  
not sold



No. 5. SPANNER  
sold under No. 1640-T

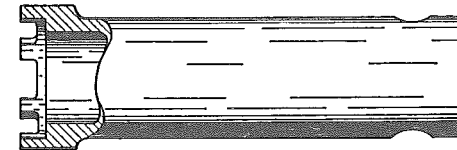


Fig. 3. EXTRACTION OF THE BEVEL PINION BEARING

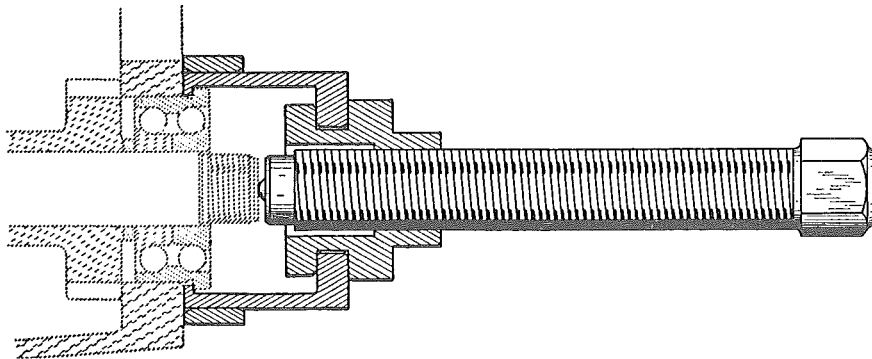
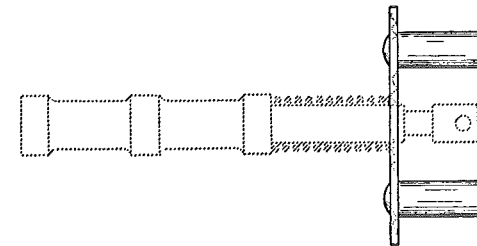


Fig. 4. SPRING COMPRESSOR  
sold under No. 1792-T

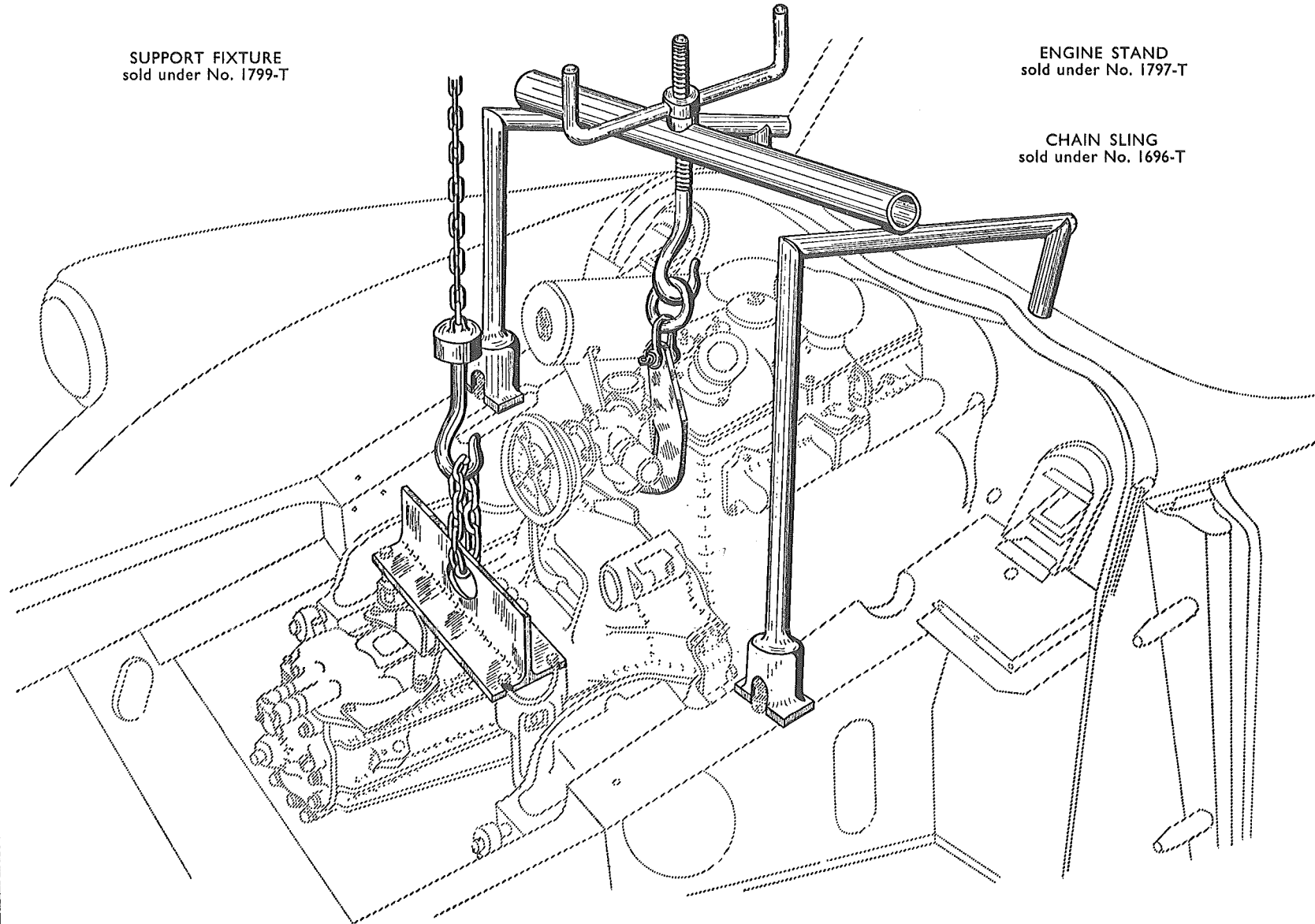


REMOVAL AND REFITTING

SUPPORT FIXTURE  
sold under No. 1799-T

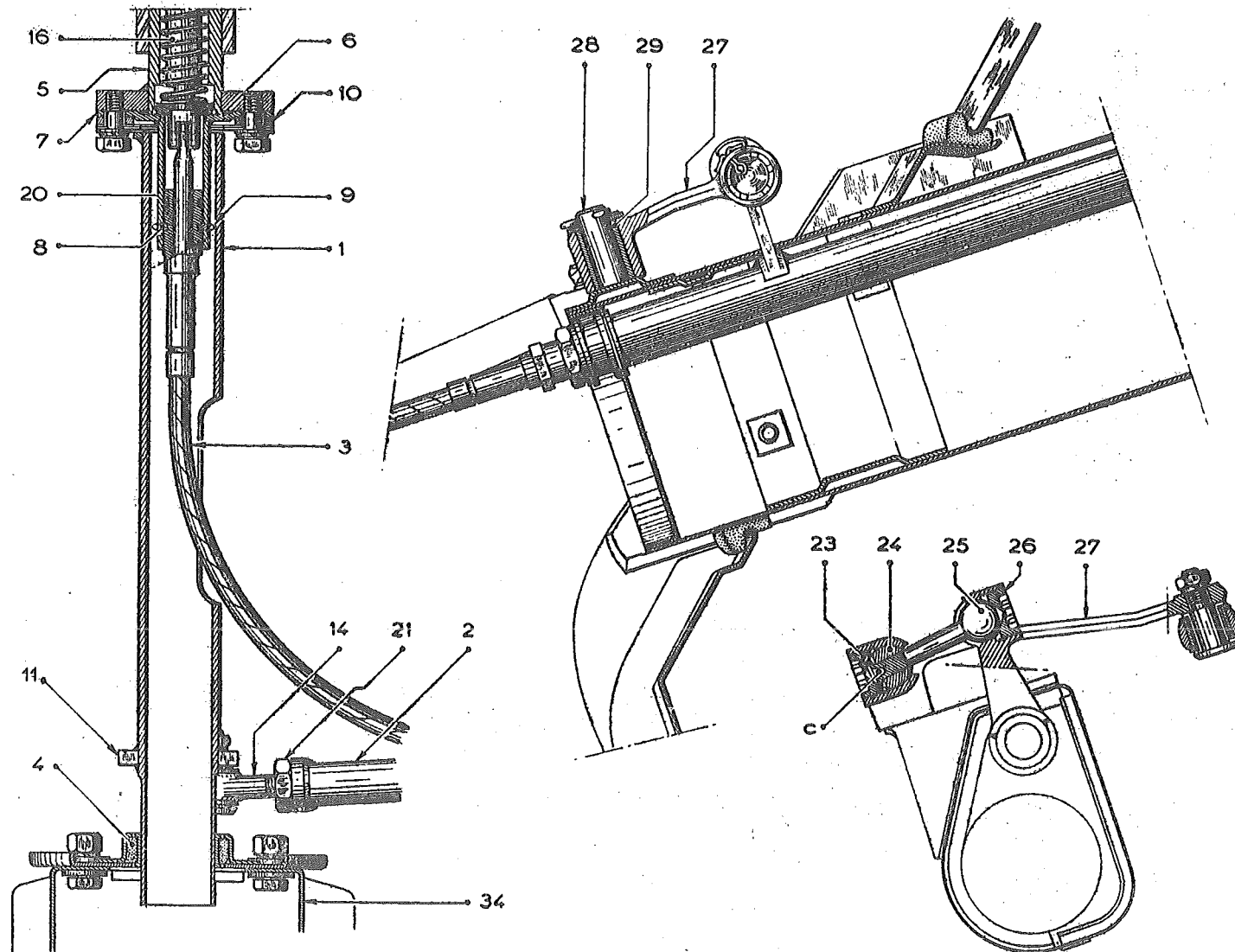
ENGINE STAND  
sold under No. 1797-T

CHAIN SLING  
sold under No. 1696-T





CHANGE SPEED CONTROL



OLD PAGE 291 - OR. 9

# HEIGHT CORRECTOR

## VARIOUS VIEWS

Fig. 1

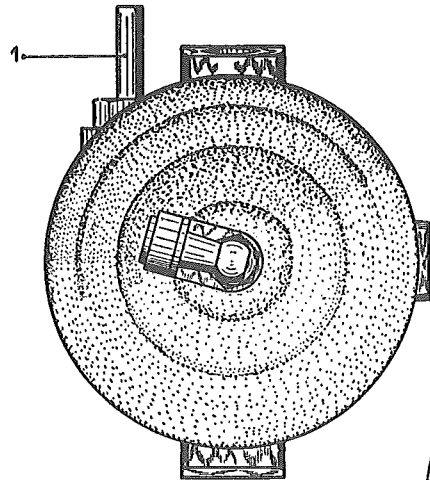


Fig. 3

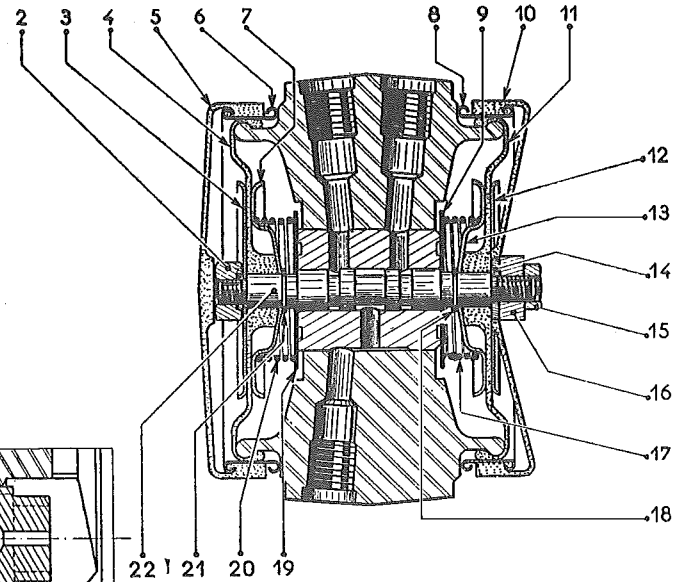


Fig. 2

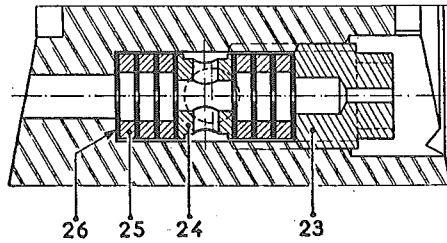
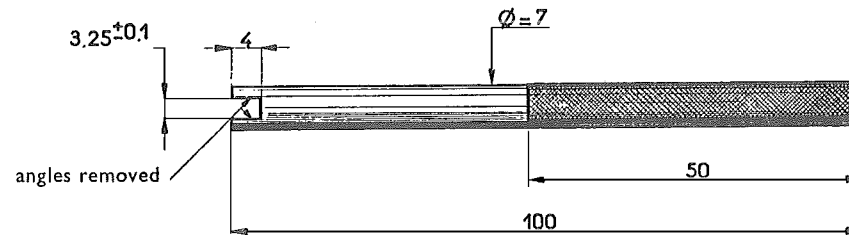
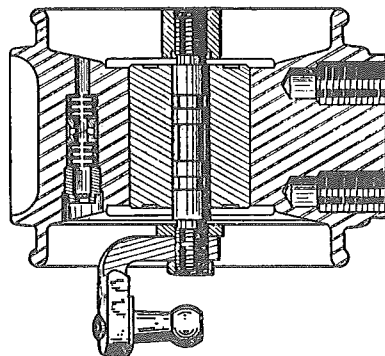


Fig. 5. SPANNER MR 1376-50  
not sold

Fig. 4



# HEIGHT CORRECTOR

BLEEDING

Fig. 2. SUPPORT MR 3053-240  
not sold

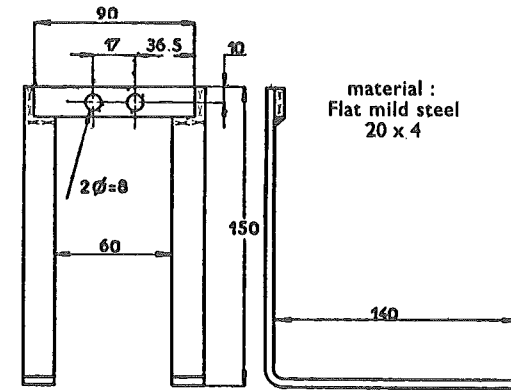
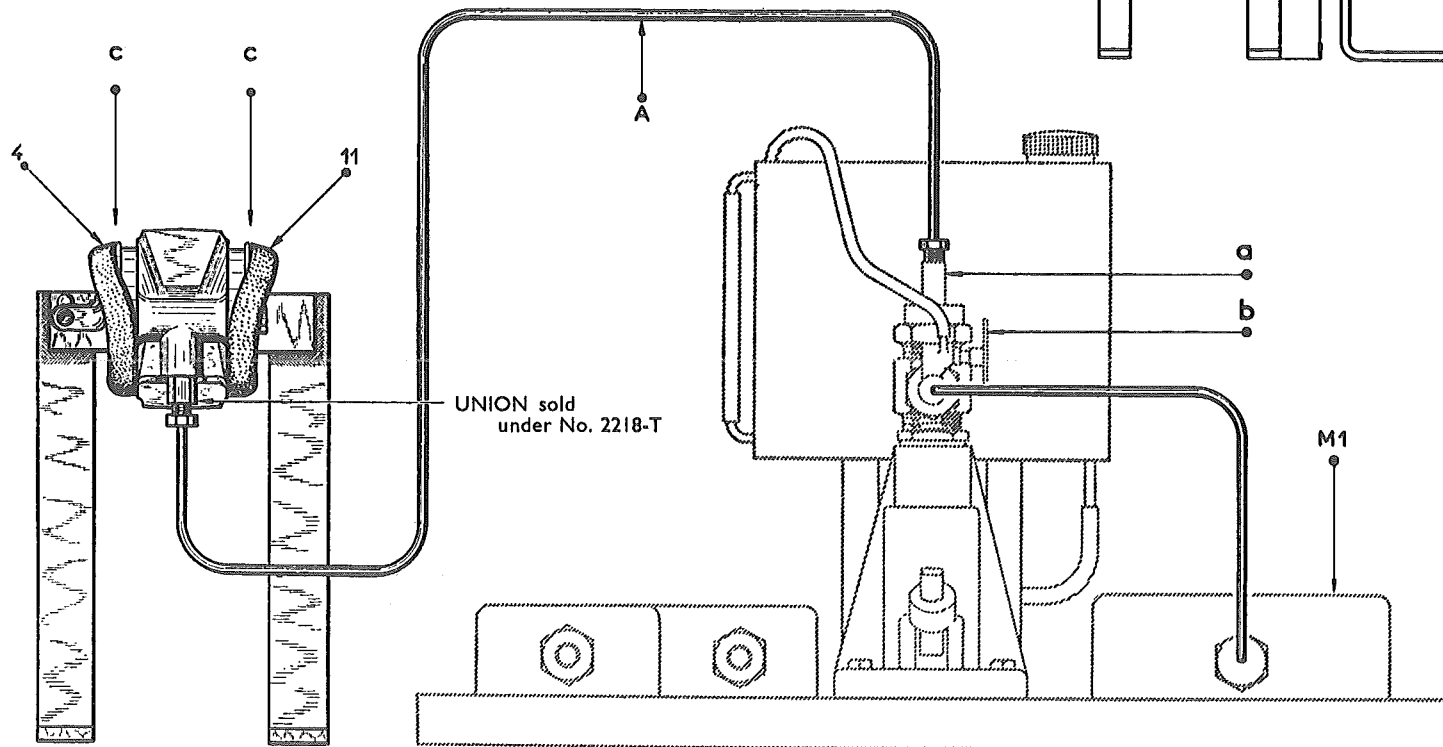
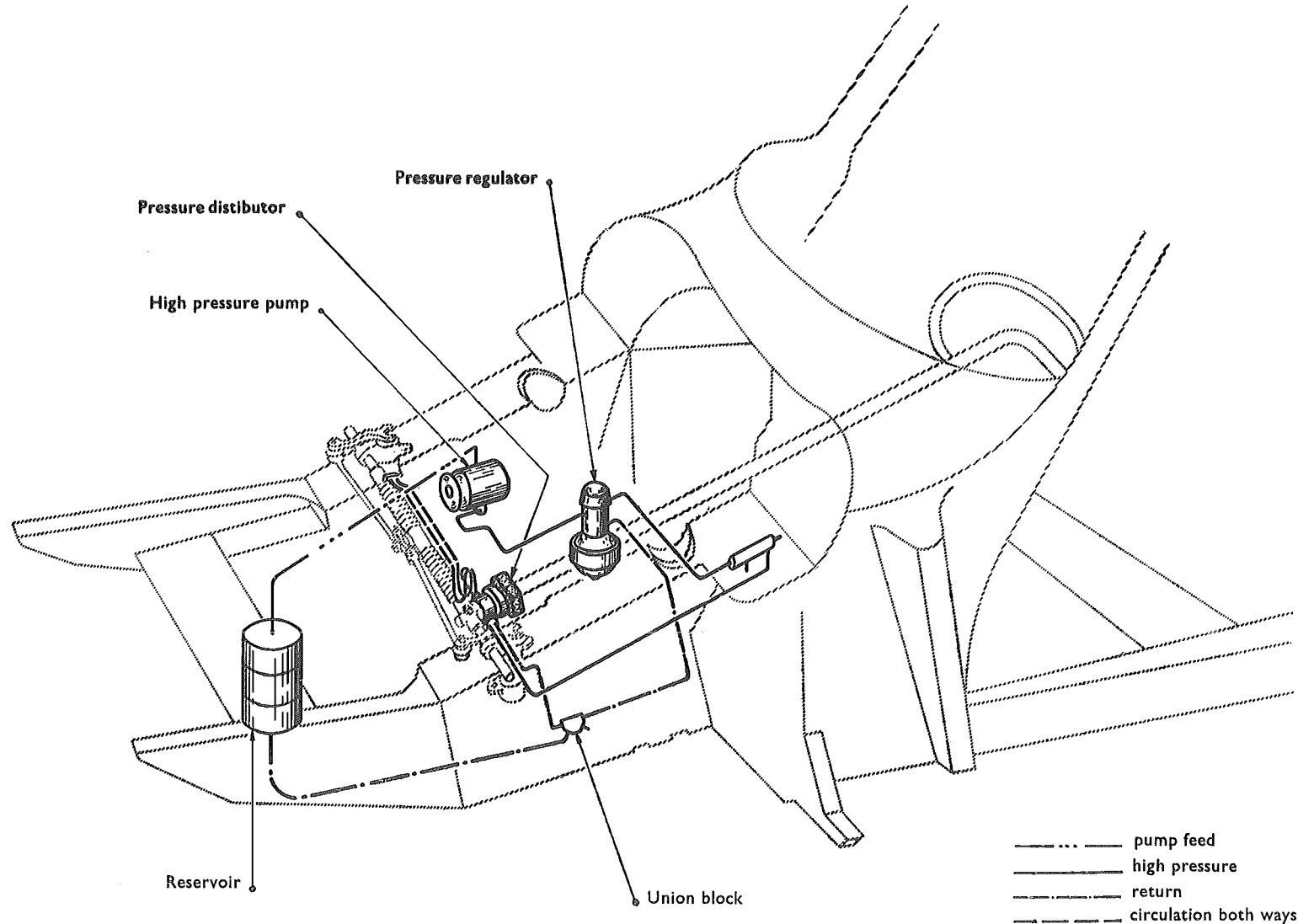


Fig. 1

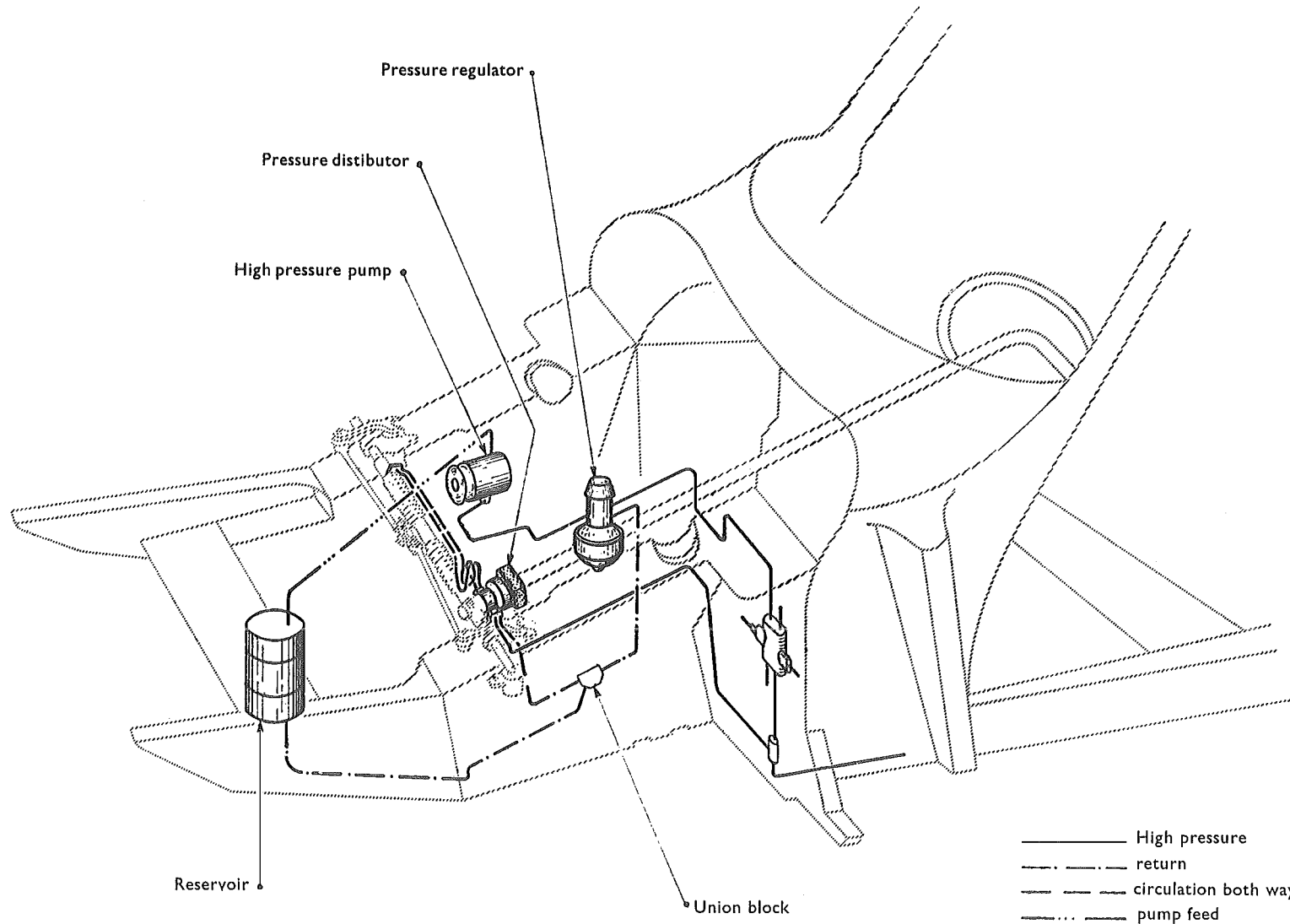


STEERING CIRCUIT



STEERING CIRCUIT

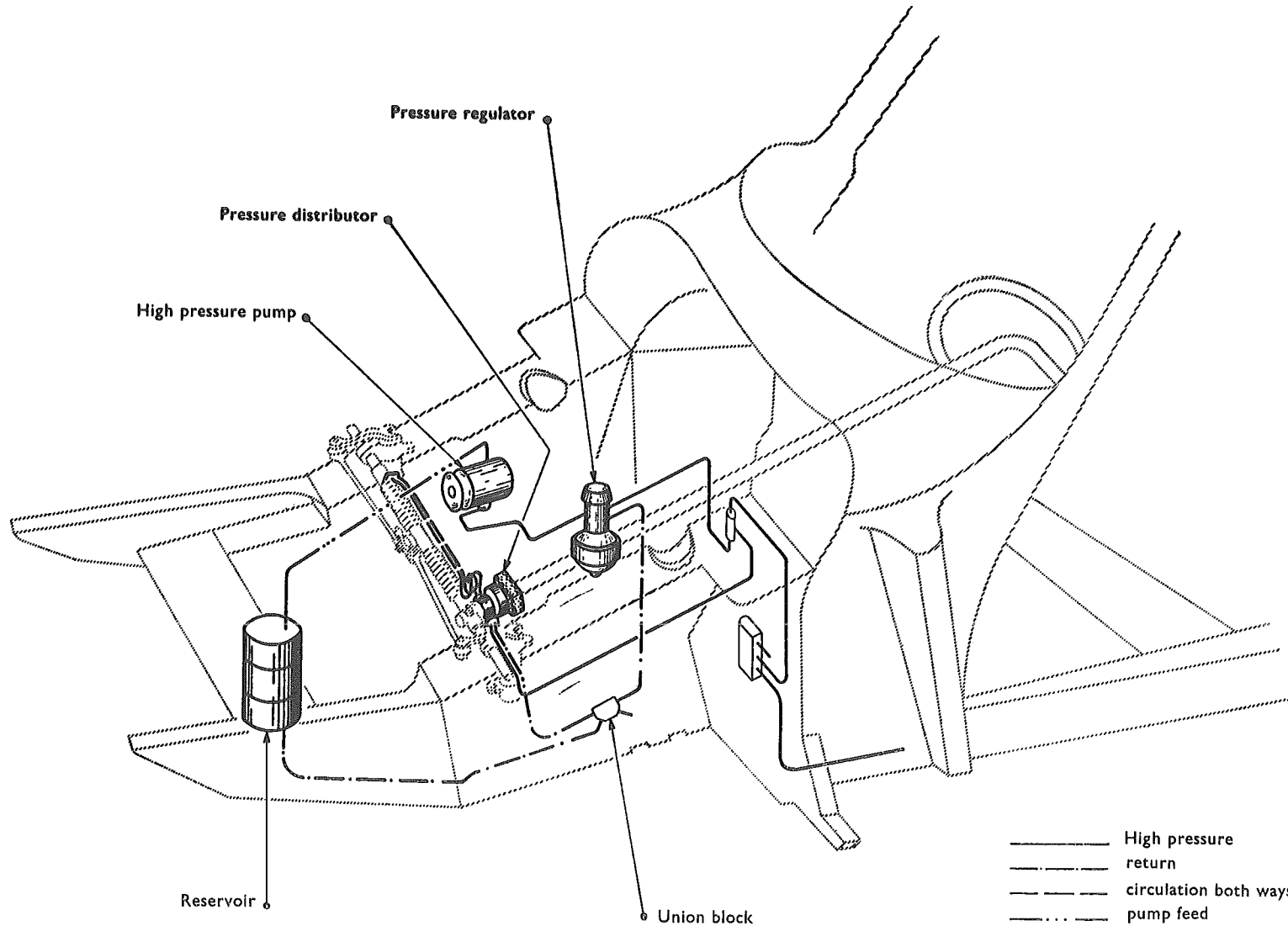
SALOON





STEERING CIRCUIT

BRAKE (SAFARI)



OPERATIONS

D 440 \_0

D 442 \_1

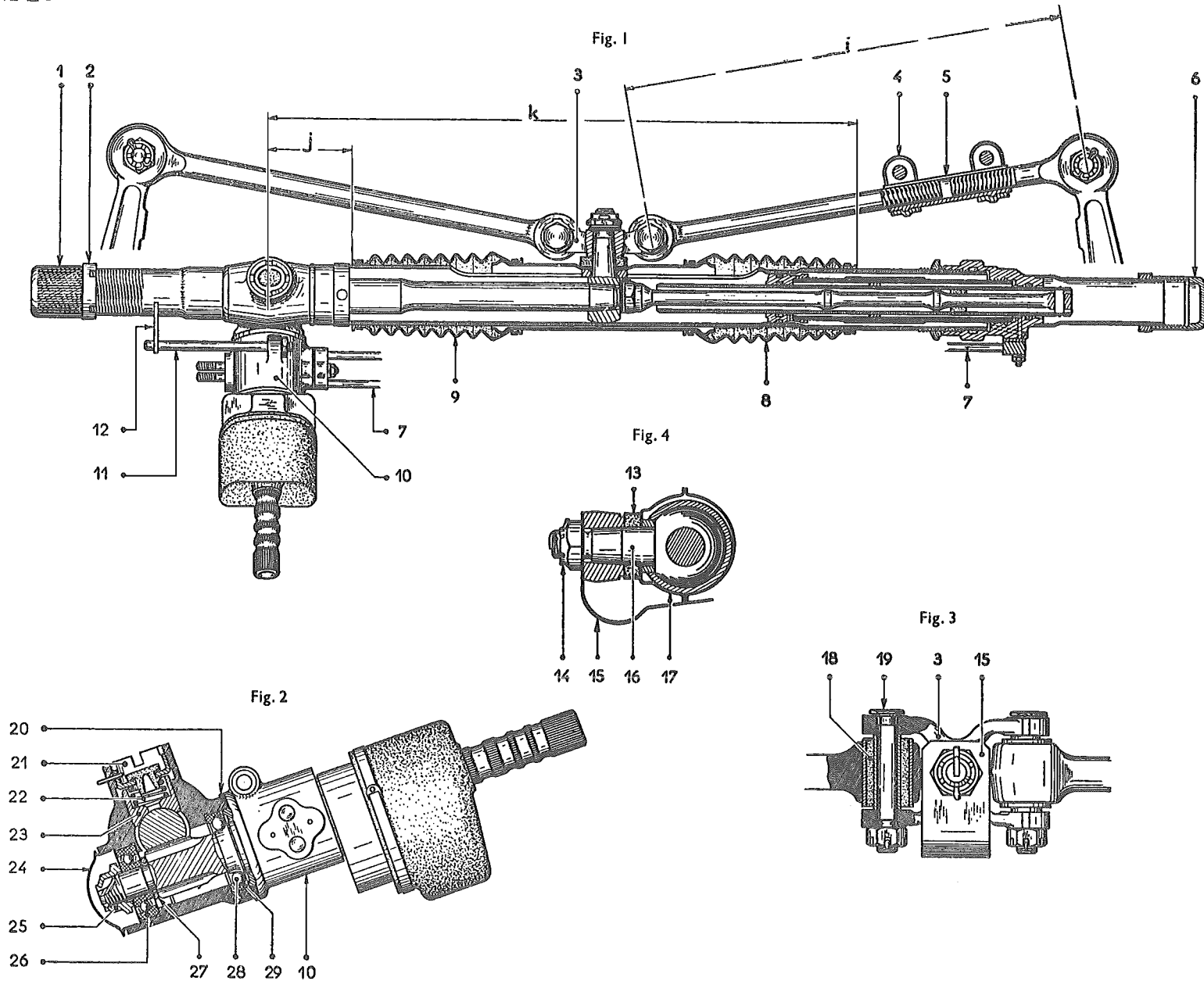
D 442 \_3

POWER ASSISTED STEERING

DS19... ID19

PL. 31

ASSEMBLY



SECTIONAL VIEW

Fig. 1

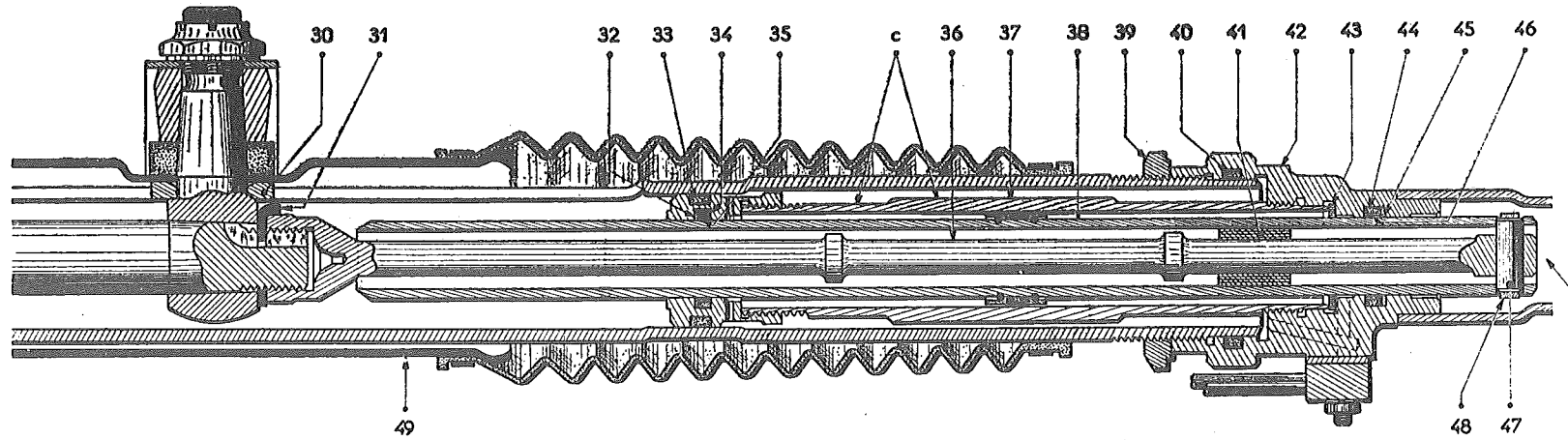


Fig. 2

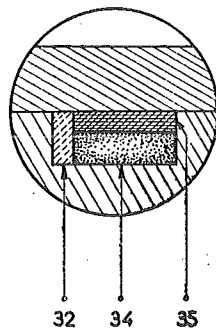


Fig. 3

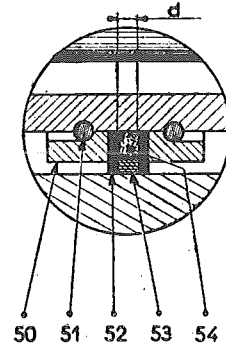


Fig. 4

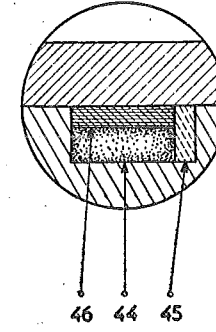


Fig. 2

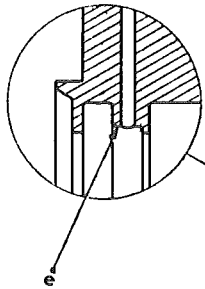


Fig. 3

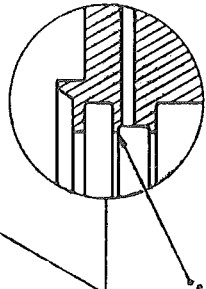


Fig. 1

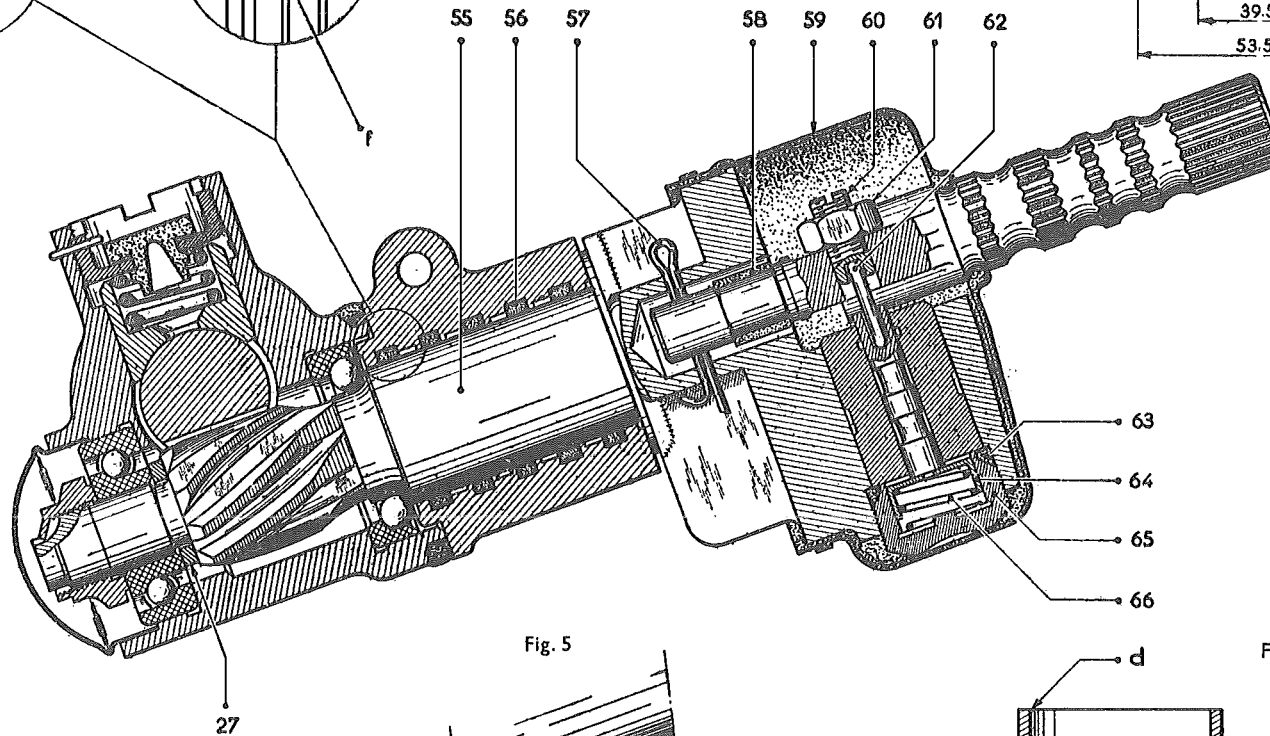


Fig. 4. Cone MR 3384-19 not sold

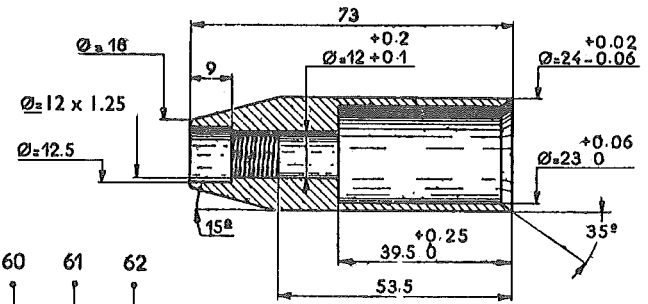


Fig. 5

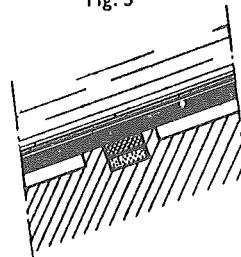
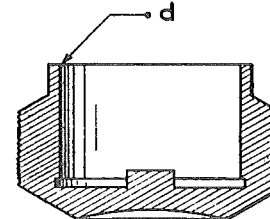


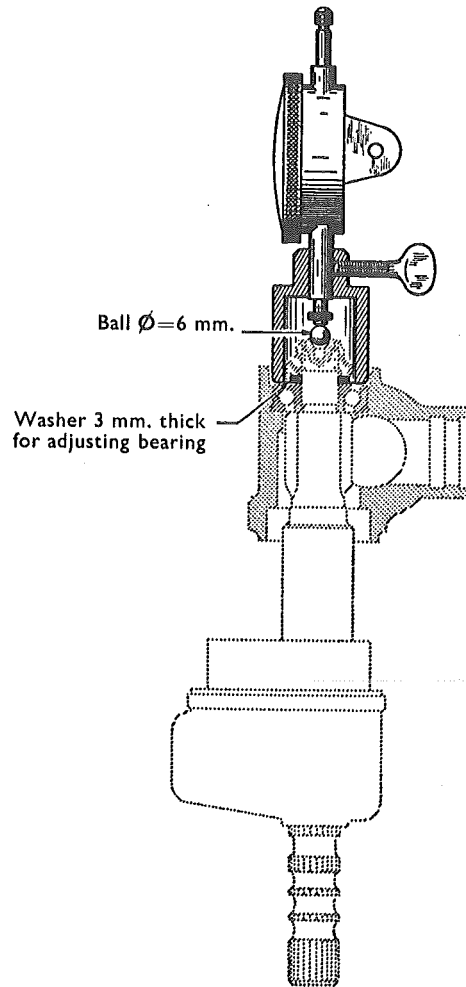
Fig. 6



ADJUSTMENT OF THE PINION

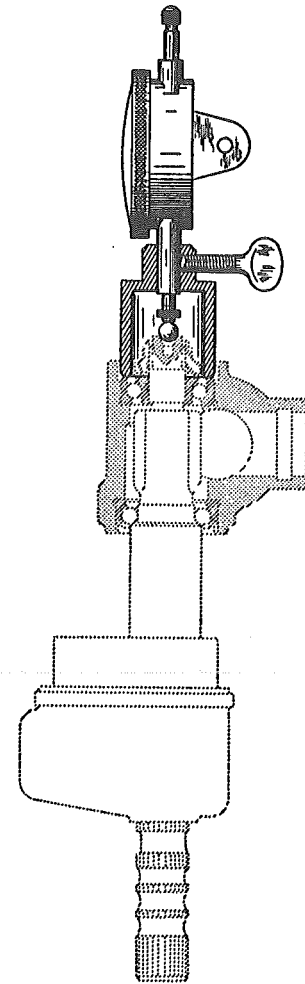
Fig. 1. SETTING THE DIAL GAUGE

Fig. 2. MEASURING THICKNESS OF ADJUSTING WASHER



SUPPORT FOR DIAL GAUGE  
AND CONTACT PLATE  
sold under No. 1997-T

DIAL GAUGE  
sold under No. 2437-T



OPERATIONS

DS 100-1A

ID 100-1A

DS 330-1A

ID 330-1A

D 440-0

ID 441-1A

D 442-1

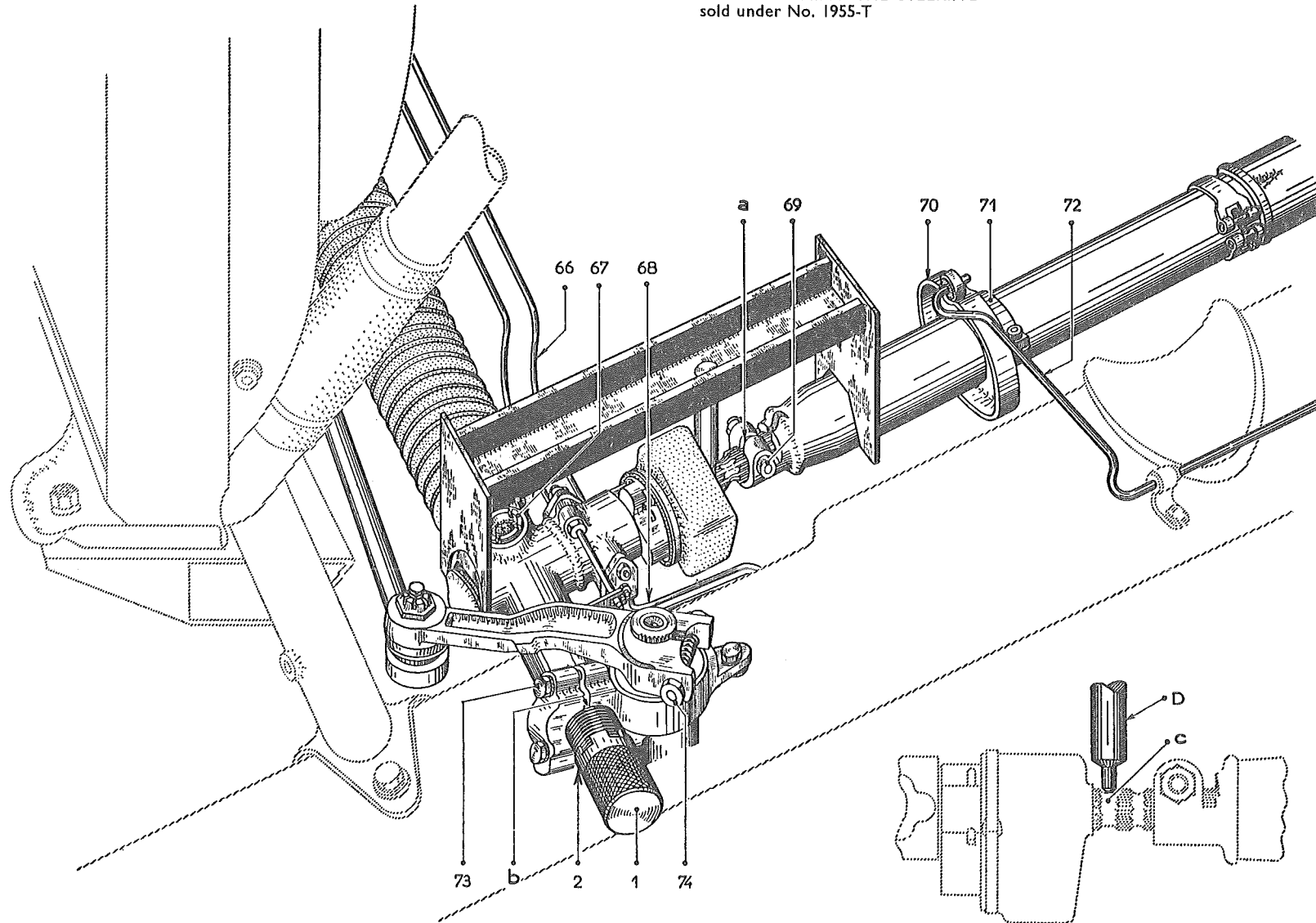
POWER ASSISTED STEERING

DS.19- ID.19

ADJUSTMENTS

PL. 35

FIXTURE FOR POSITIONING THE STEERING  
sold under No. 1955-T



### FITTING THE STEERING WHEEL

Fig. 2

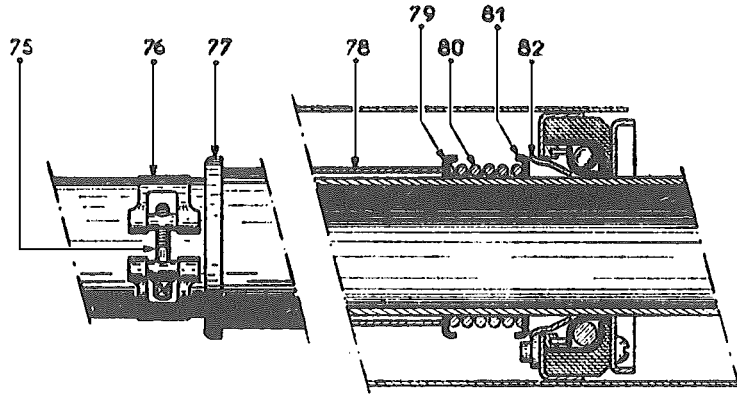


Fig. 1

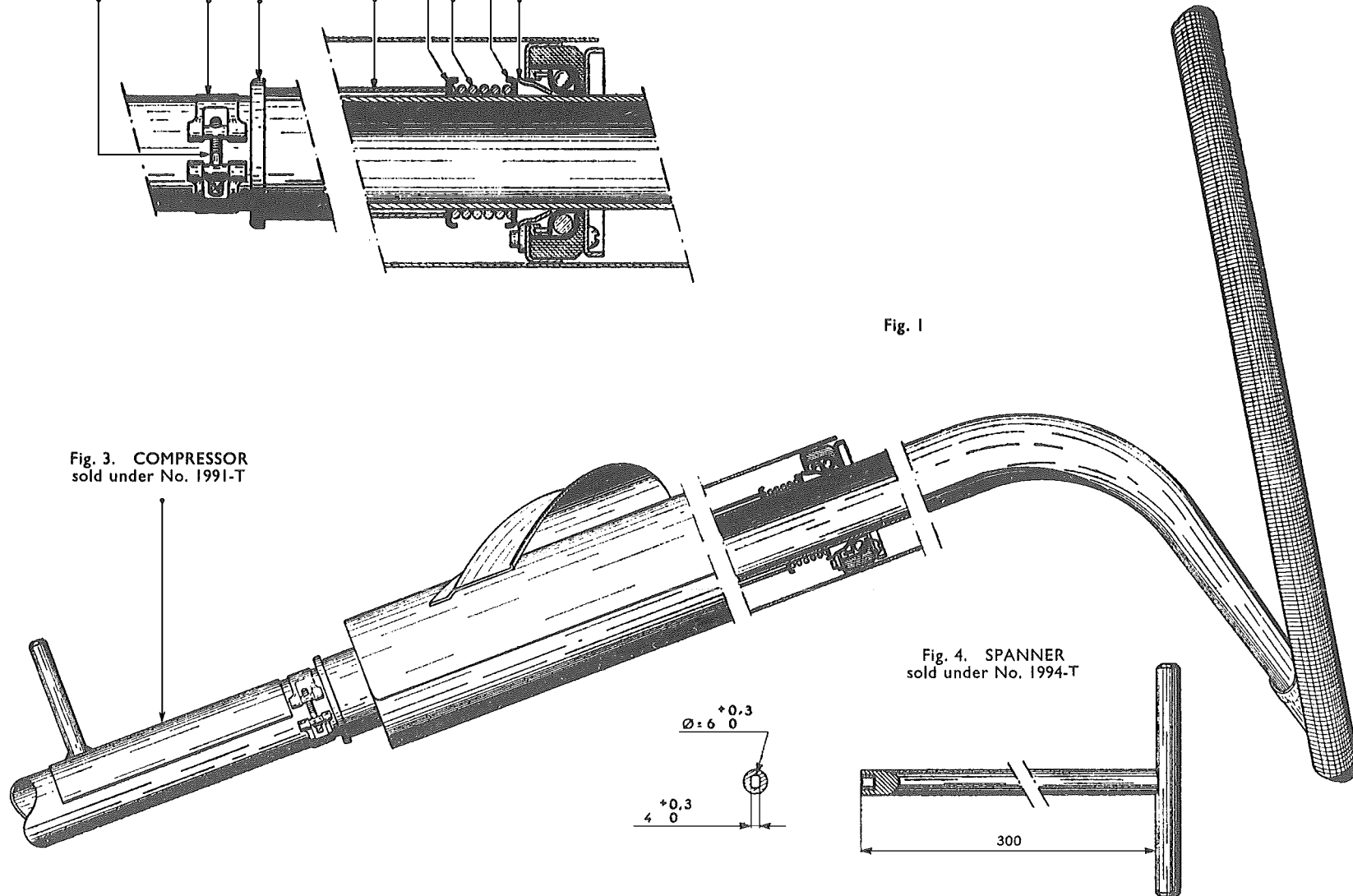
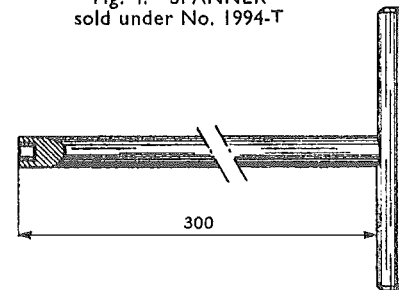
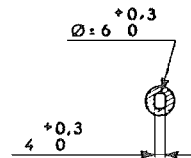


Fig. 3. COMPRESSOR  
sold under No. 1991-T

Fig. 4. SPANNER  
sold under No. 1994-T



VARIOUS TOOLS

Fig. 1. EXTRACTOR  
sold under No. 1966-T

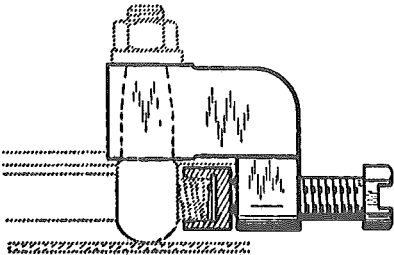


Fig. 2. EXTRACTOR  
sold under No. 1967-T

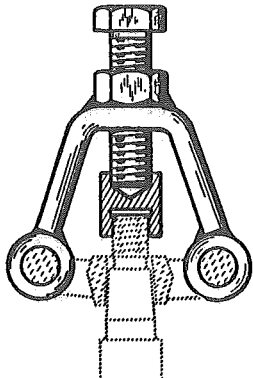


Fig. 3. SPANNER  
sold under No. 1982-T

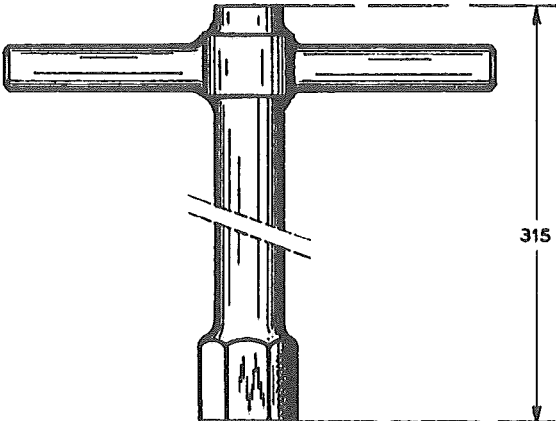


Fig. 4. EXTRACTOR  
sold under No. 1969-T

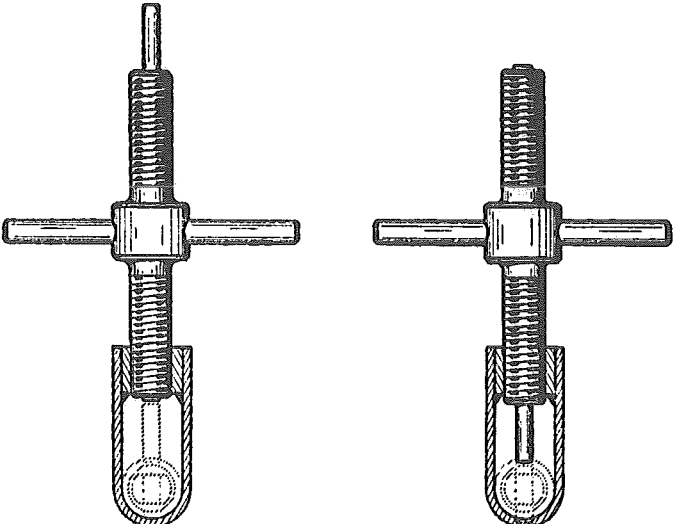


Fig. 5. SPANNER MR 3691-70  
not sold

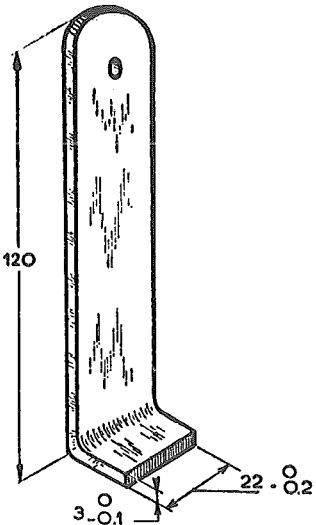
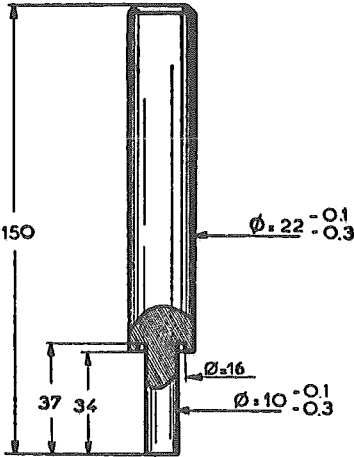


Fig. 6. MANDREL MR 3676-110  
not sold





VARIOUS TOOLS

Fig. 1. WOODEN JAWS MR 3047-20  
not sold

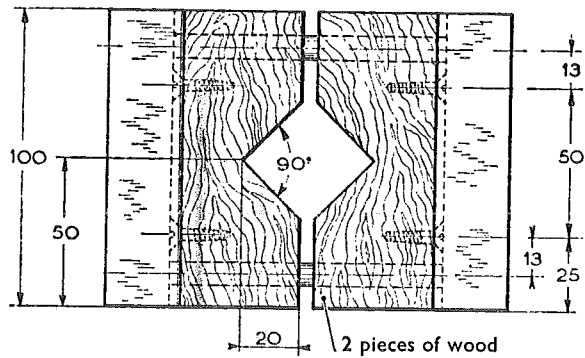
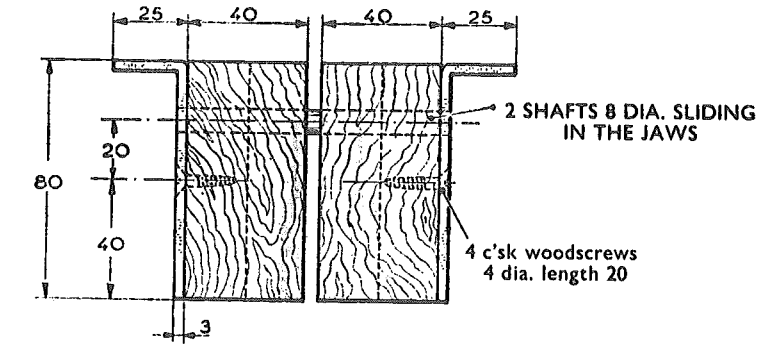
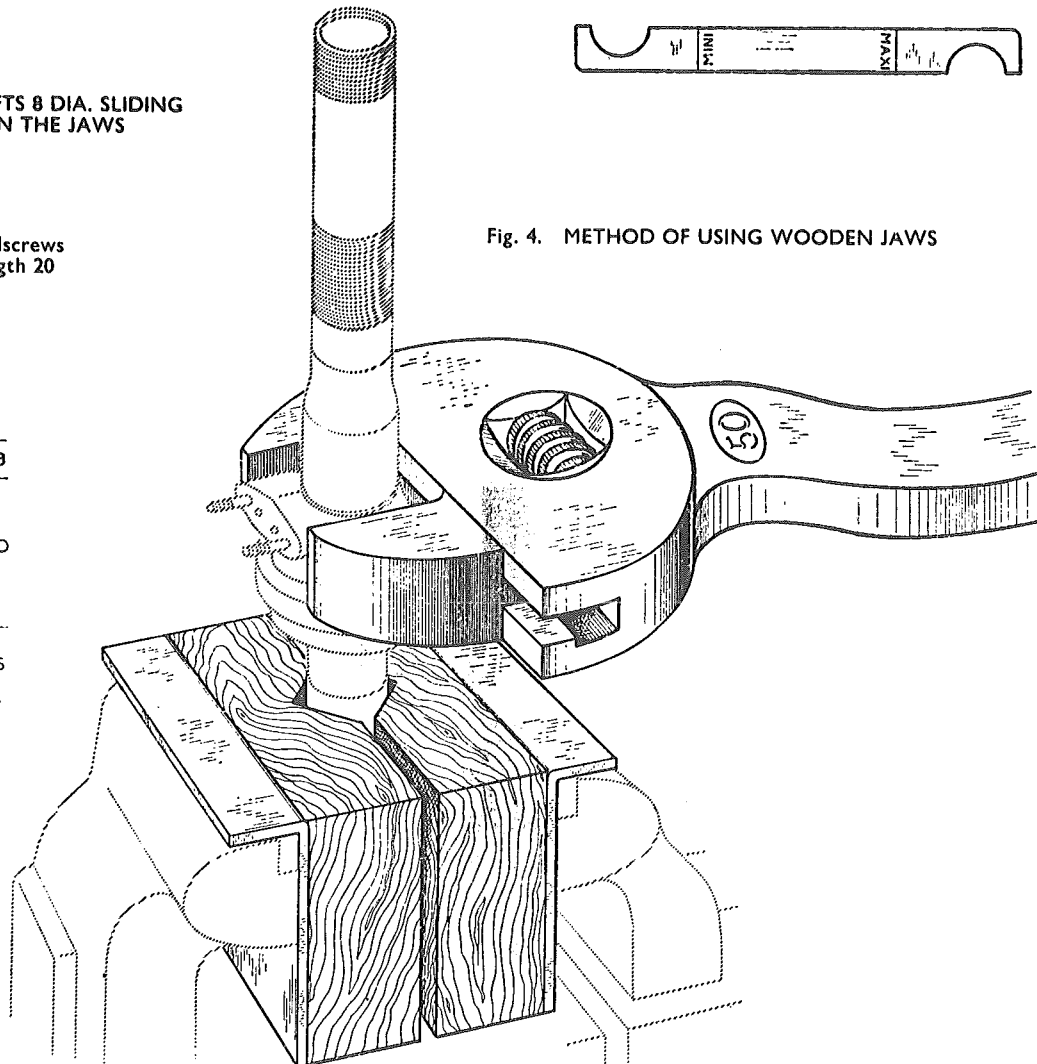


Fig. 2. GAUGE  
sold under No. 1983-T



Fig. 4. METHOD OF USING WOODEN JAWS



D 440\_0

D 442\_1

D 442\_3

VARIOUS TOOLS

Fig. 1. SUPPORT  
sold under No. 1999-T

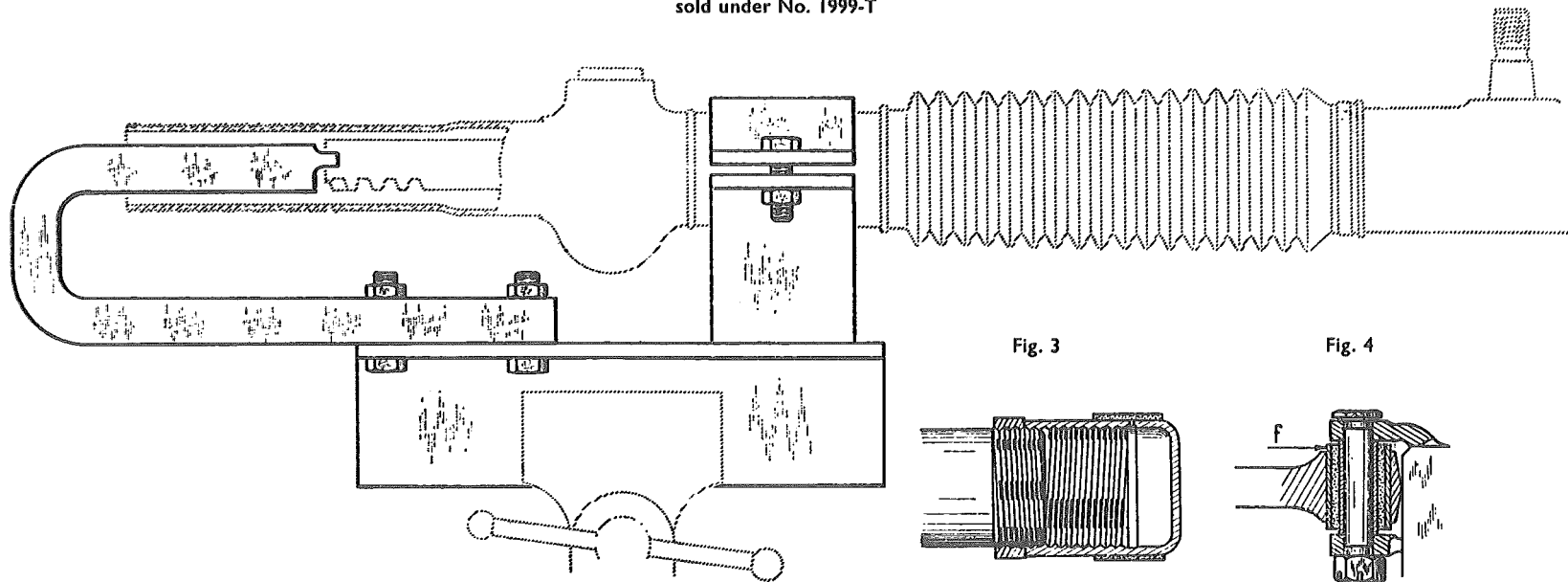
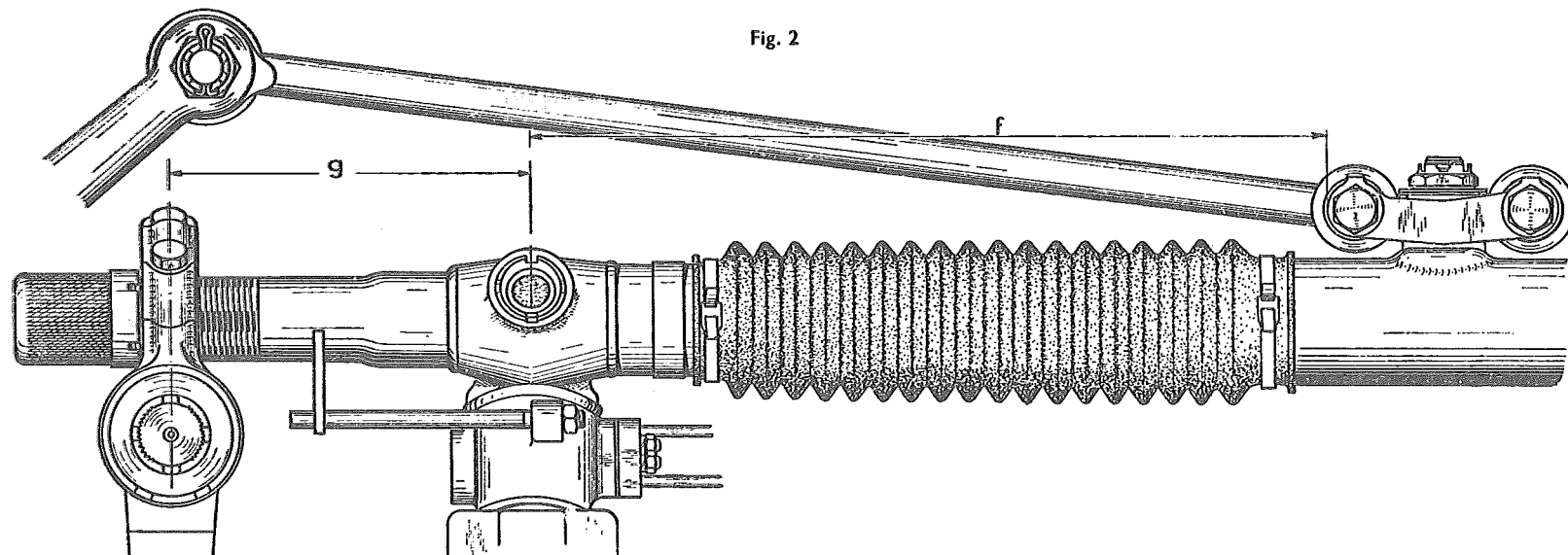


Fig. 3

Fig. 4

Fig. 2



VARIOUS TOOLS

Fig. 1. SPANNER  
sold under No. 1974-T

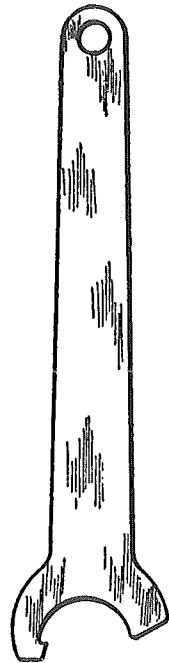


Fig. 2. SPANNER  
sold under No. 2186-T

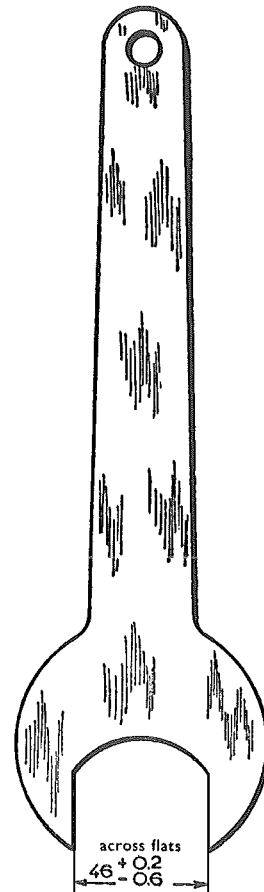
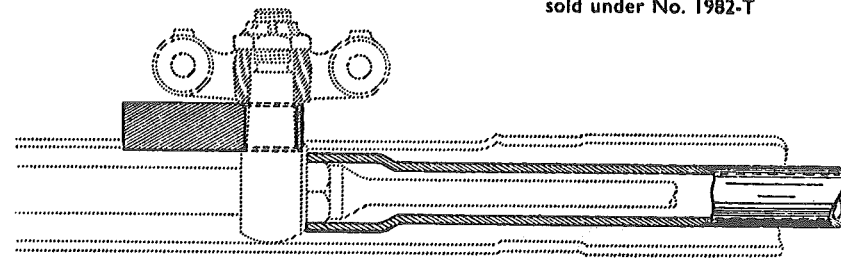
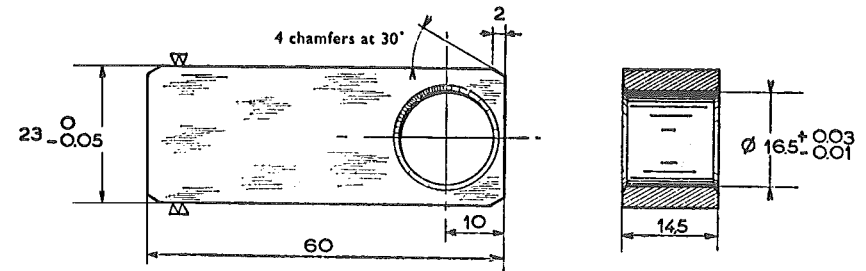


Fig. 3. ADJUSTING THE RACK  
CONTROL ROD



SPANNER  
sold under No. 1982-T

Fig. 4. PLATE MR 4369  
not sold



ASSEMBLY OF JOINTS

Fig. 1

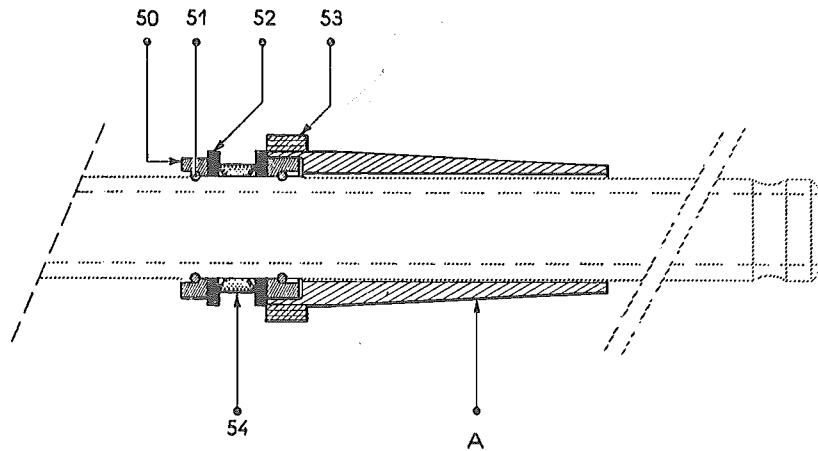


Fig. 3.  
FITTING THE RILSAN 32 WASHER  
ON THE CYLINDER END PIECE

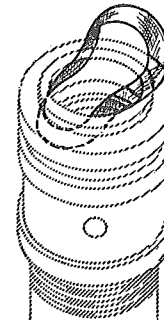
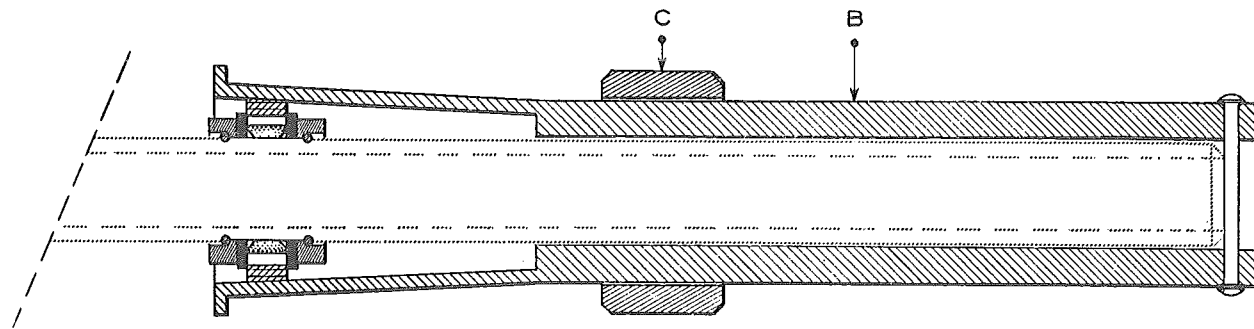


Fig. 2



ASSEMBLY OF CONE AND WASHER  
sold under No. 1985-T

ASSEMBLY OF JOINTS

Fig. 1  
Support and bush sold under No. 1971-T

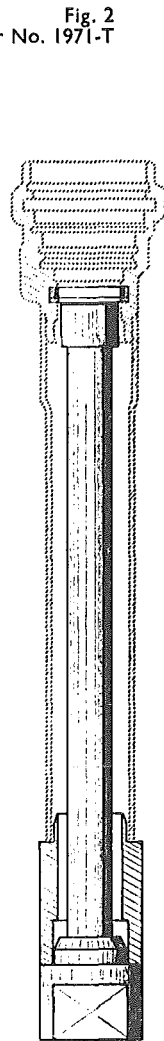
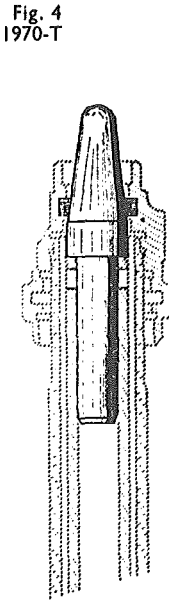
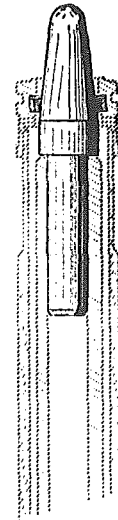
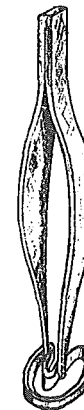


Fig. 3  
Taper sold under No. 1970-T

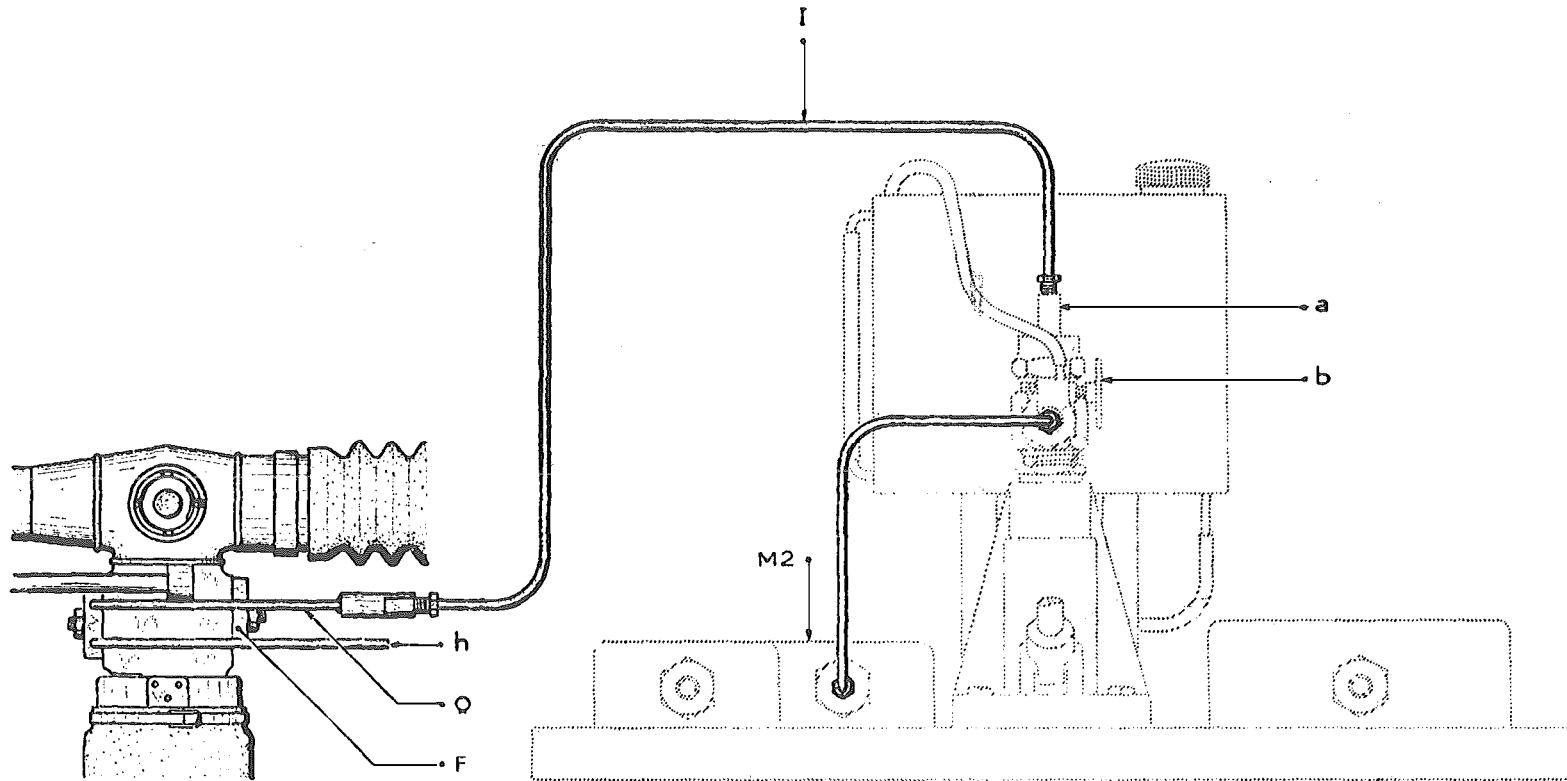


Holding the teflon joints



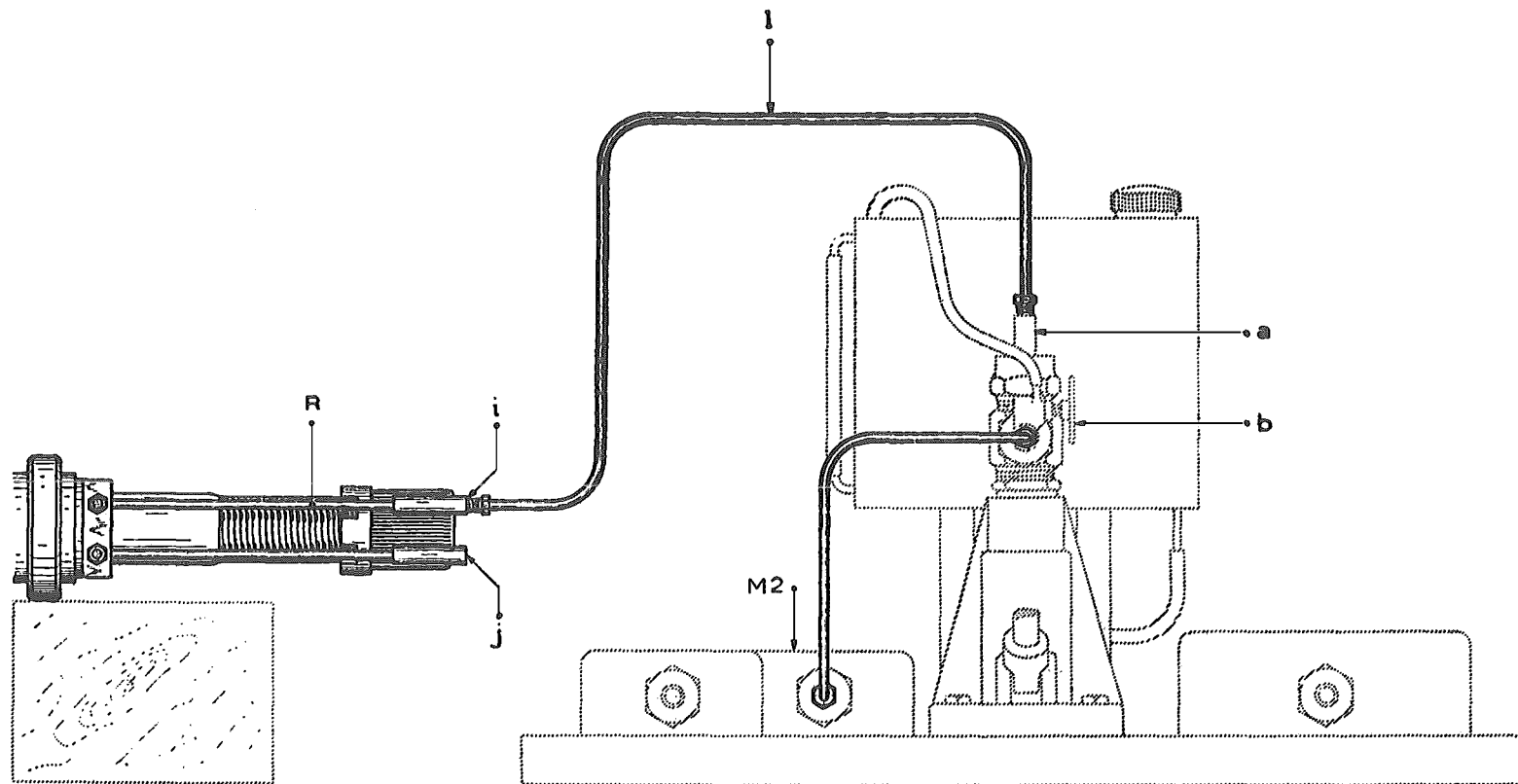
**ROTATING UNION**

CHECKING FOR LEAKAGE

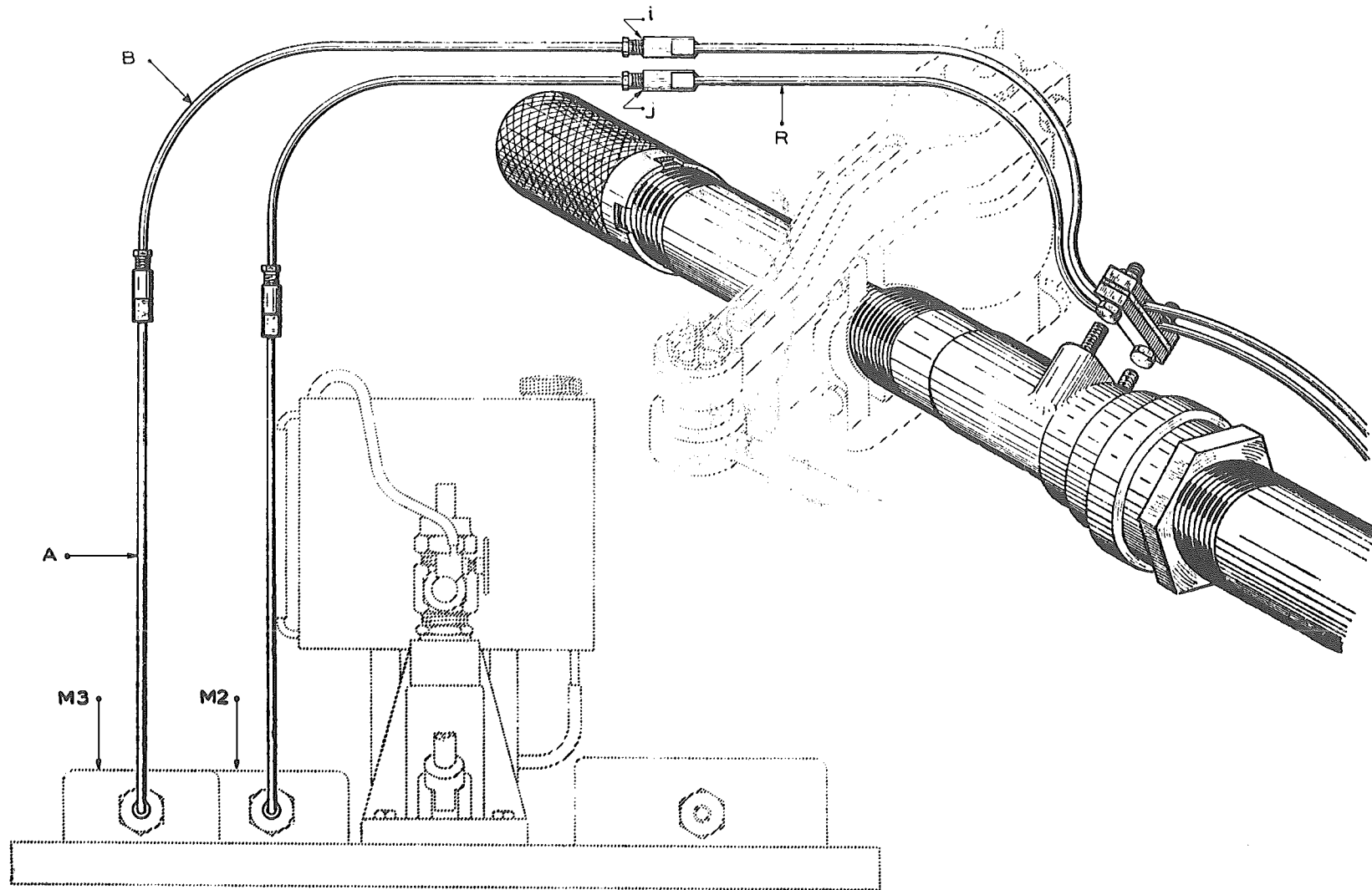


PISTON-CYLINDER ASSEMBLY

CHECKING FOR LEAKAGE

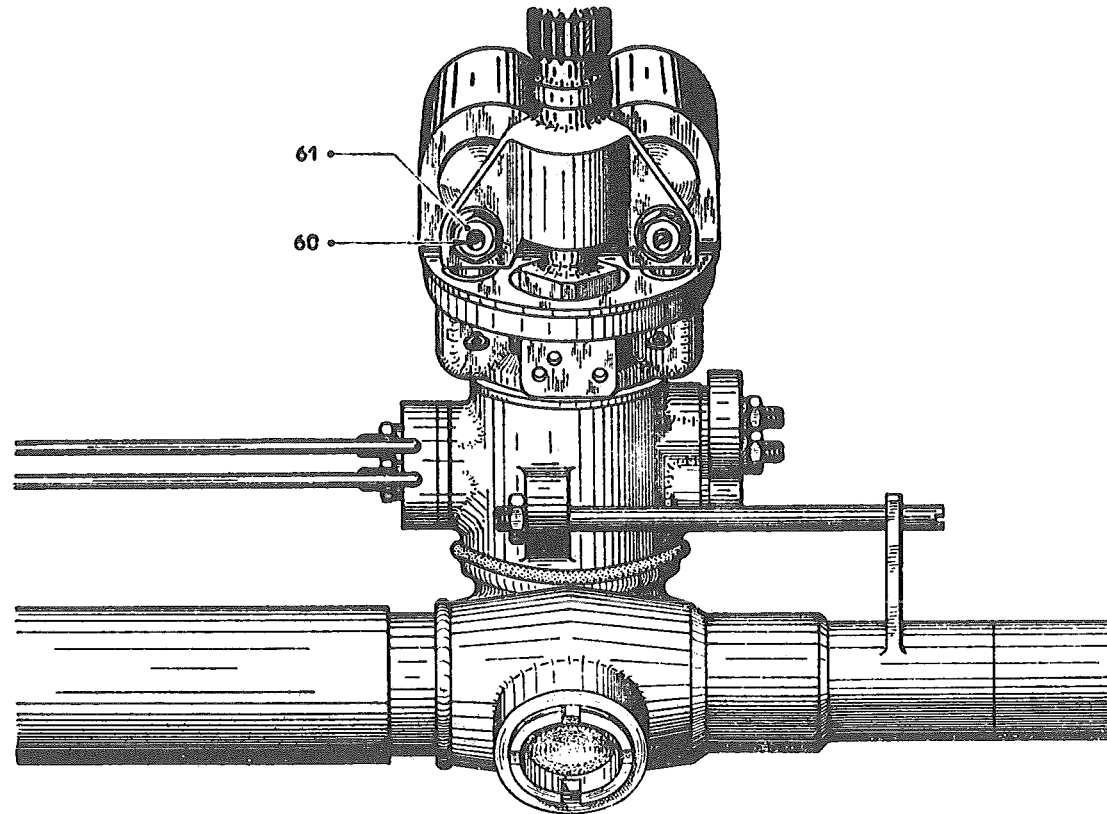


ADJUSTMENT OF THE CROSS-OVER PRESSURES





ADJUSTMENT OF THE CROSS-OVER PRESSURES



BRAKE UNIT

Fig. 1

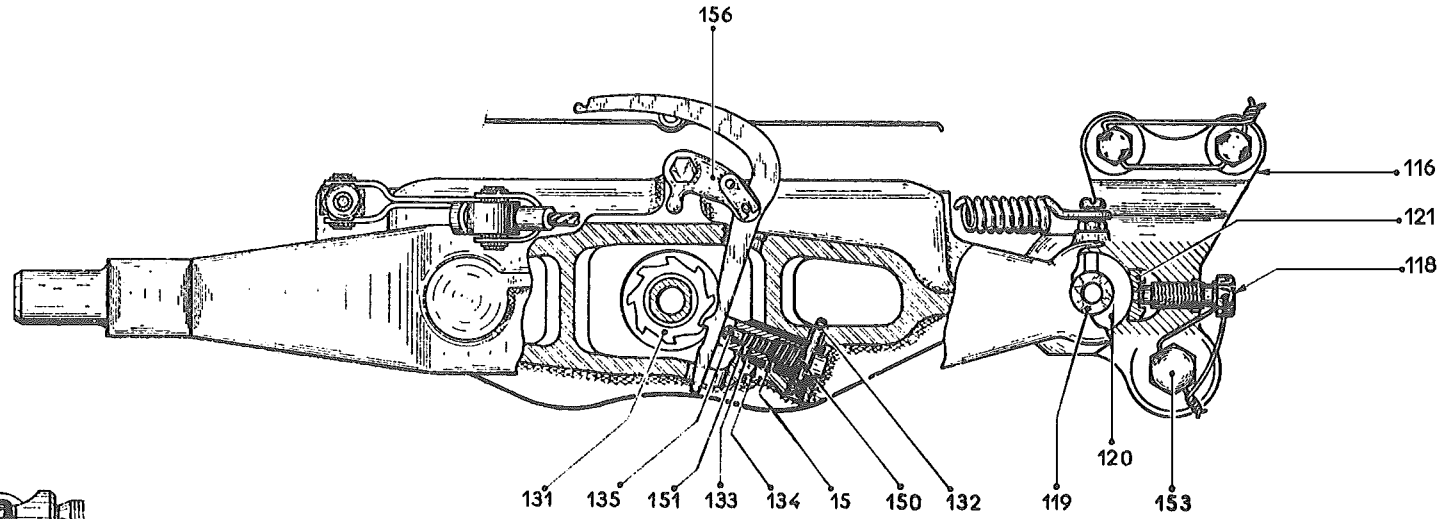


Fig. 2

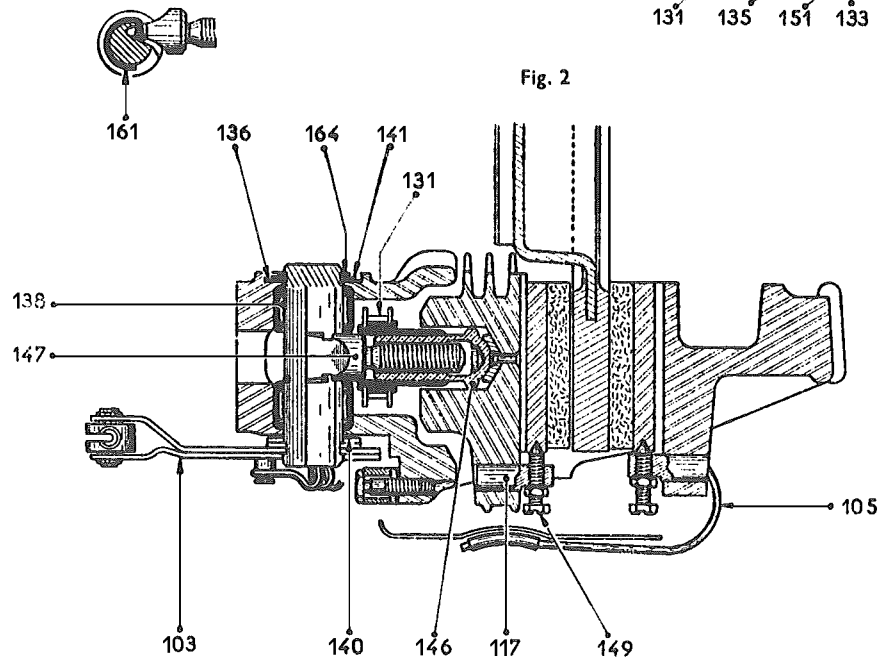
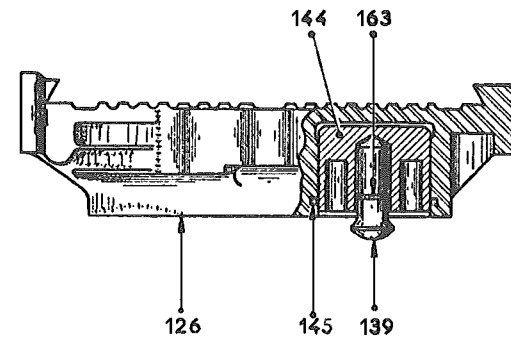


Fig. 3



OPERATIONS  
DS 330-1A  
ID 330-1A  
D 451-0  
D 451-1

BRAKES  
**BRAKE UNIT**

ID 19- DS 19  
**PL. 48**

Fig. 1

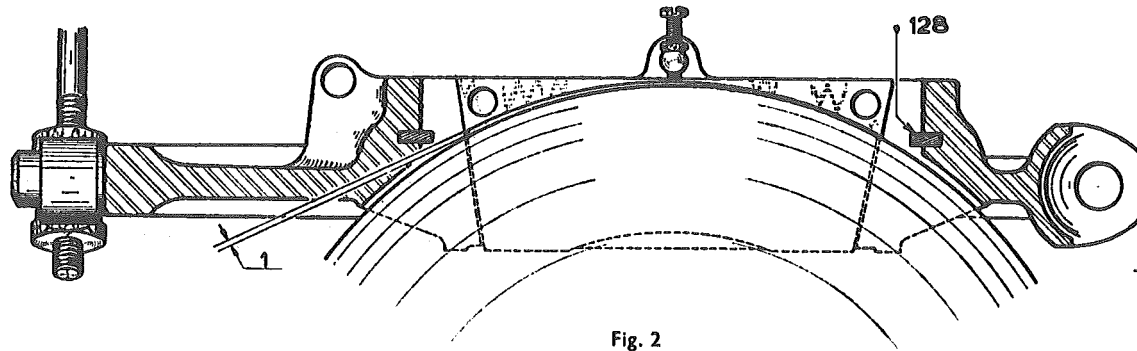


Fig. 2

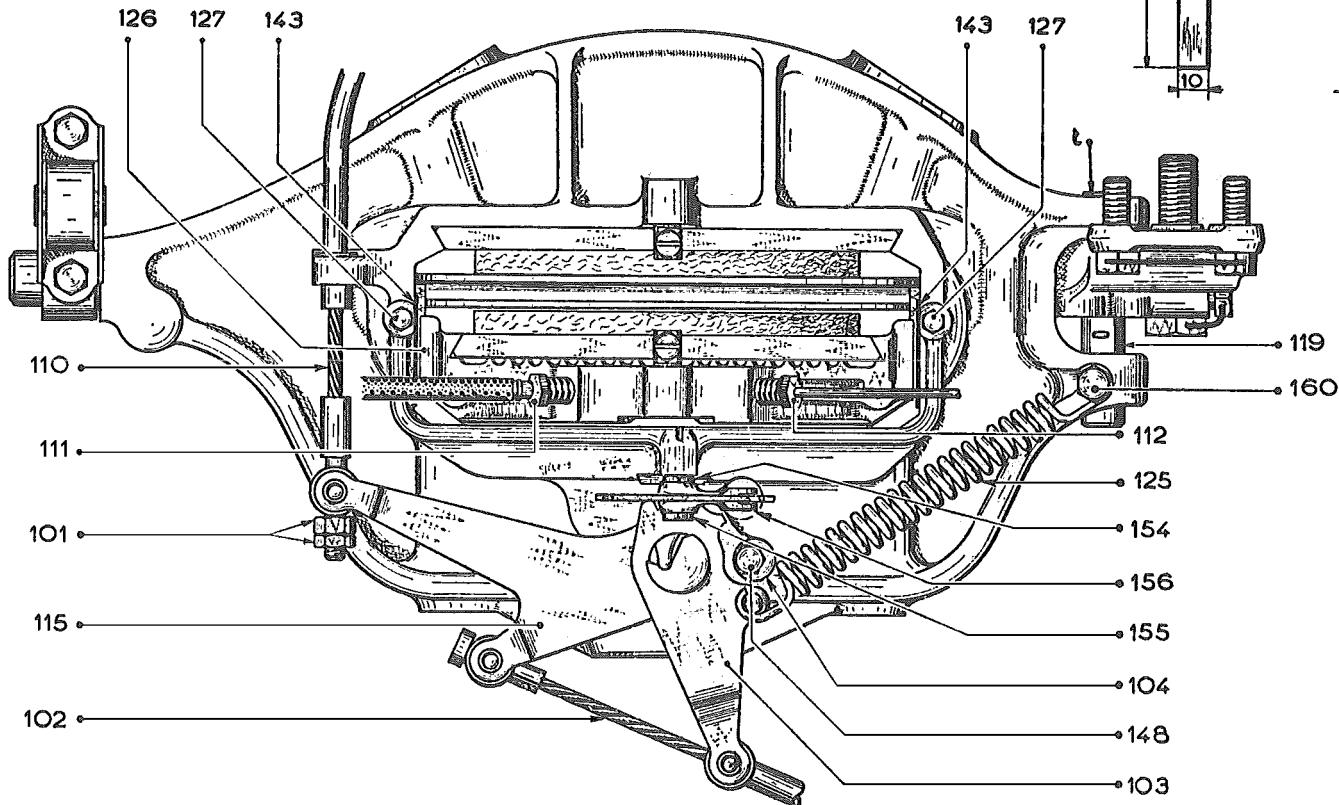
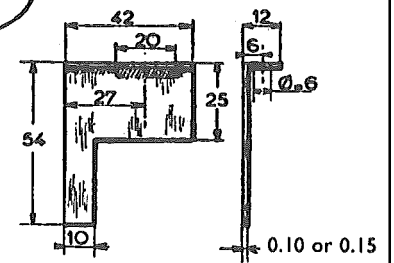


Fig. 3  
SHIM FOR LEFT HAND UNIT  
SYMMETRICALLY OPPOSITE FOR  
RIGHT HAND UNIT  
not sold



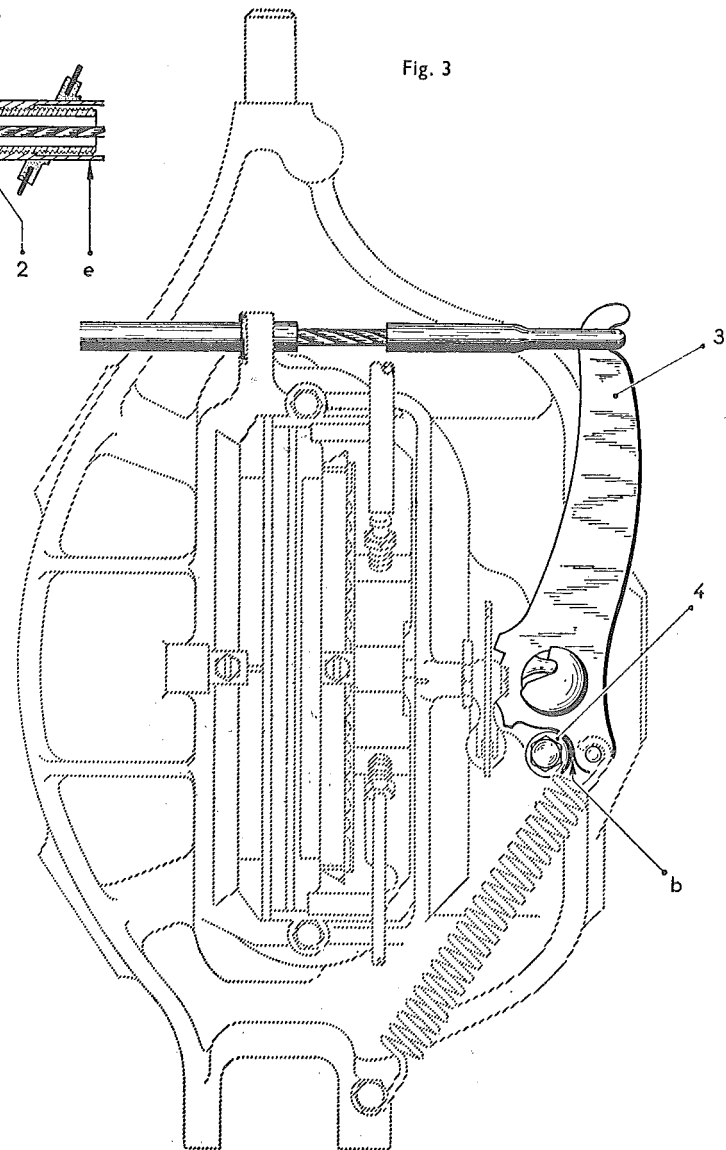
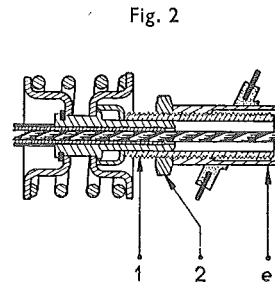
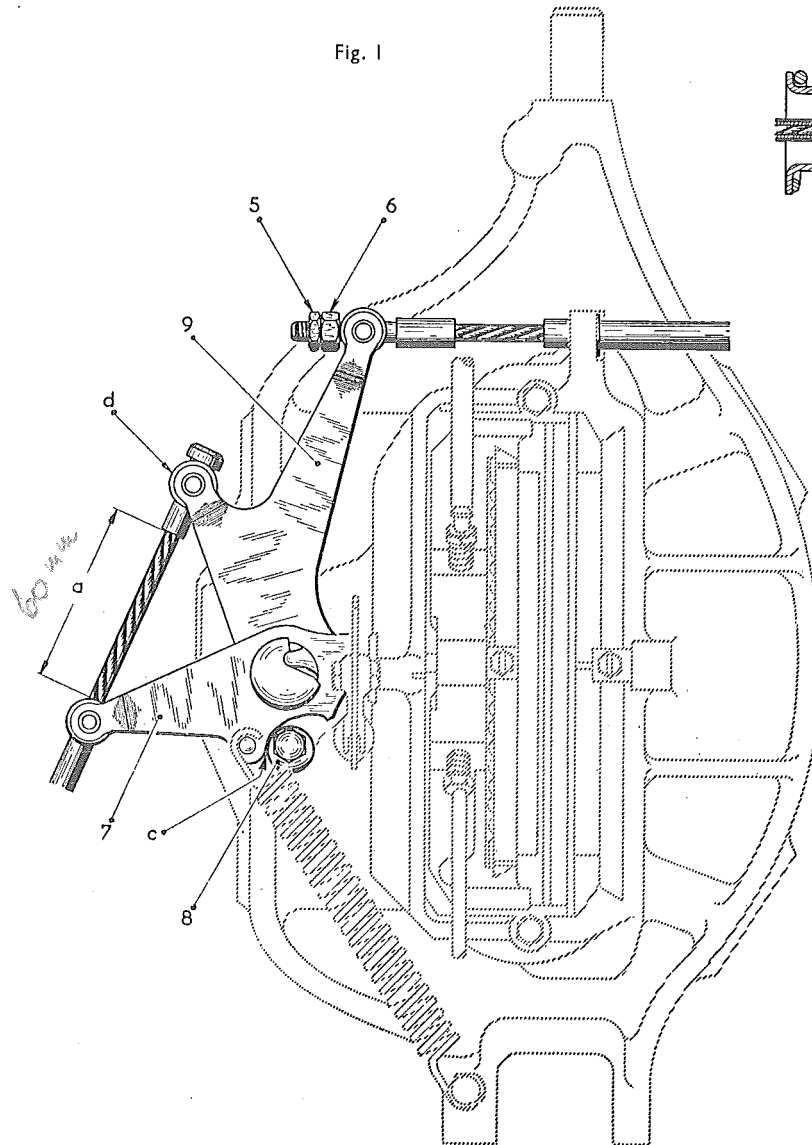
OPERATIONS  
DS 330-1A  
ID 330-1A  
D 454-0

BRAKES

ID 19- DS 19

PL. 48A

MECHANICAL BRAKE CONTROL



TOOLS FOR BRAKES

Fig. 4. SPANNER  
sold under No. 2141-T

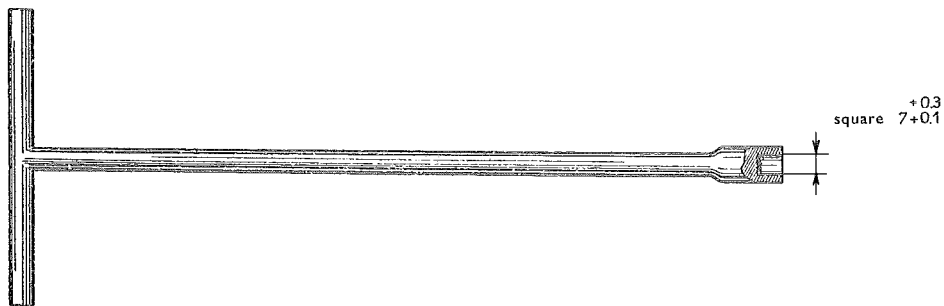


Fig. 2. EXTRACTOR  
sold under No. 2133-T

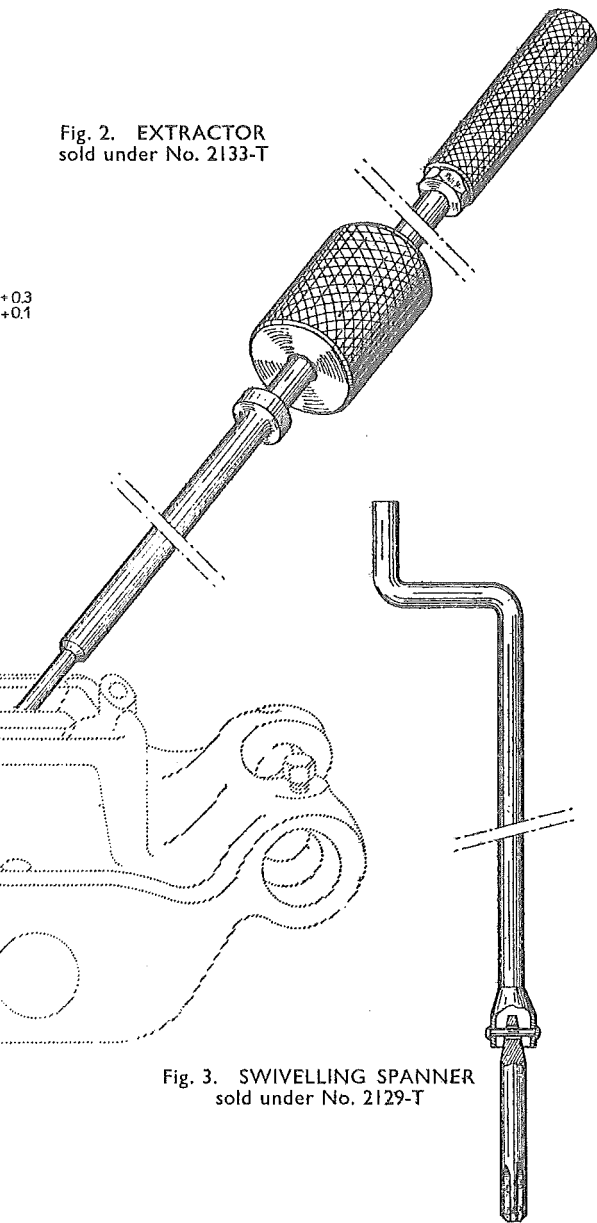


Fig. 1. FORK  
sold under No. 2128-T

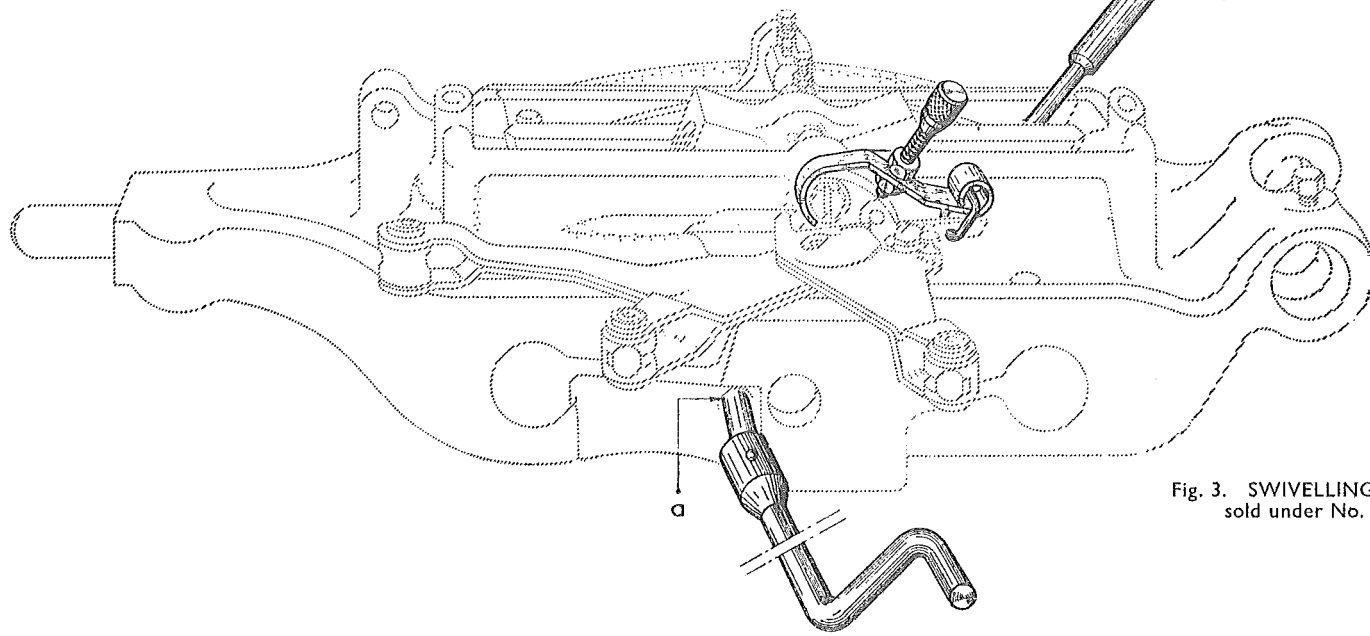
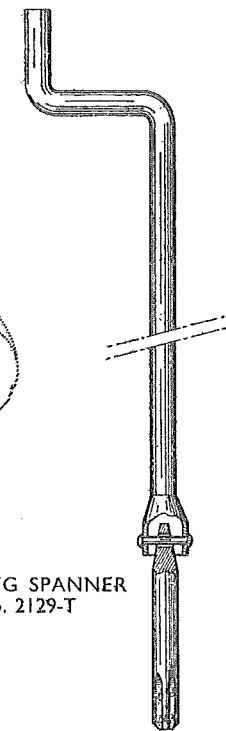


Fig. 3. SWIVELLING SPANNER  
sold under No. 2129-T



## CENTRING THE BRAKE SHOES

PL. 50

Fig. 1. SETTING THE DIAMETER OF THE DRUM

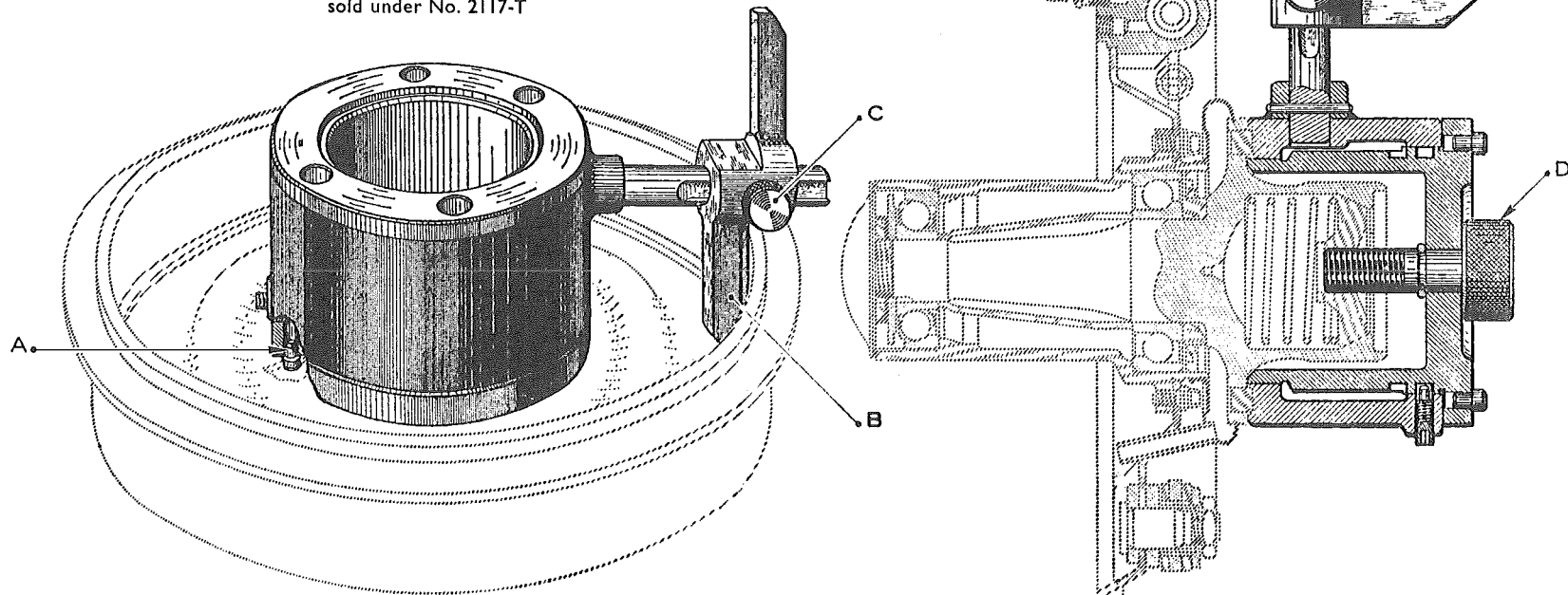
Place the gauge in the brake drum with the two dowels A engaged in the centring holds.  
Turn the gauge one complete revolution with the index B held against the drum.

Fig. 2. ADJUSTMENT OF THE BRAKE SHOES

Place the gauge on the hexagon of the stub axle. Tighten the screw D.  
Move the shoes by means of the adjusting cams so that the index B is level with the lining all the way round.

### GAUGE FOR INSPECTION OF THE CENTRING OF THE BRAKES

sold under No. 2117-T



AFTER INSPECTION UNSCREW THE CAMS SO AS TO ALLOW THE BRAKE DRUMS TO BE FITTED

LIFTING POINTS ON THE COQUE

Fig.1. POSITIONING THE JACKING BRACKET

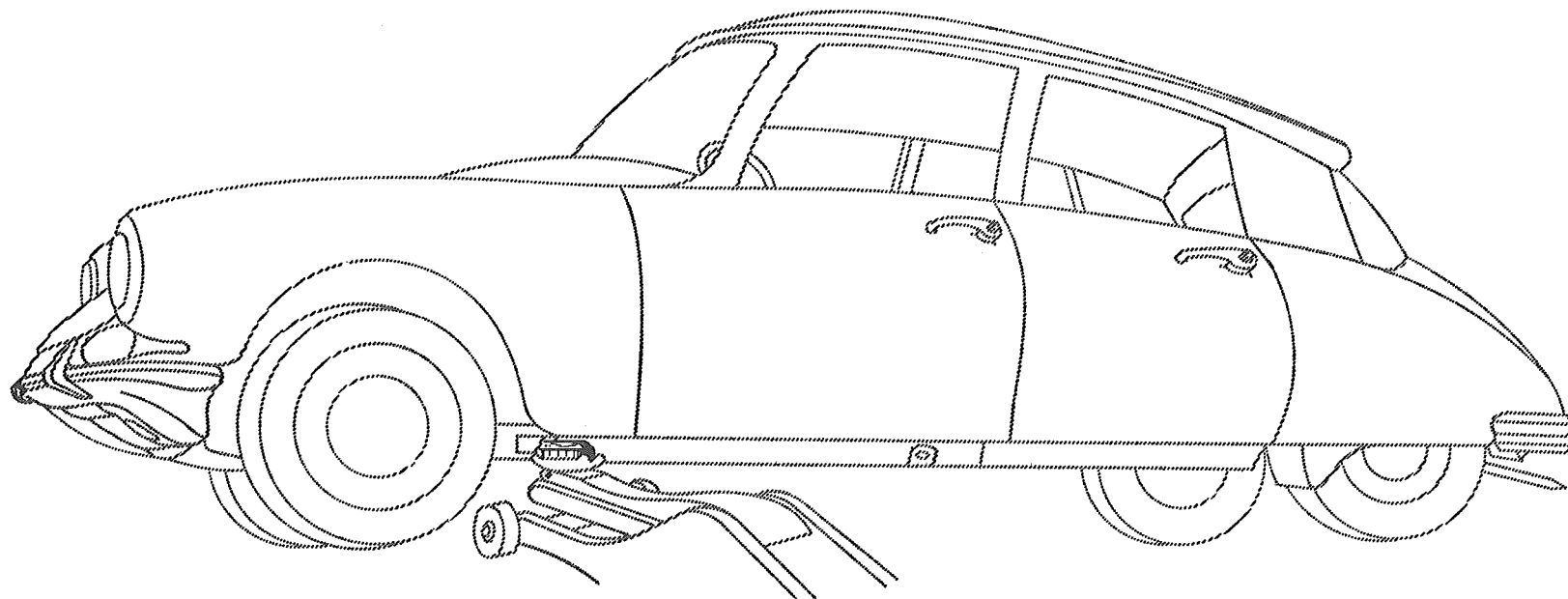


Fig. 2. JACKING BRACKET  
sold under No. 2505-T

