CITROEN

REPAIR MANUAL

DS 19

TEXT

METHOD OF USING THE REPAIR MANUAL

This manual includes all main service operations. Primarily it is intended for left-hand drive cars, but the application to right-hand cars should present no difficulties as any differences are obvious.

CLASSIFICATION

We have shown at the beginning of this manual a classification of the main units of the car.
The three figured number in front of each unit corresponds to the operation number relating to this particular unit.

METHOD OF NUMBERING

The number is composed of :-

a) The indication of the type of vehicle : DS.

b) A number of three 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 the overhauling (reconditioning)

EXAMPLES :

Operation No. DS 334-0 : *Adjustments* on the change speed control.
Operation No. DS 372- 1 : *Replacement* of a driveshaft or a pivot.
Operation No. DS 100-2 : *Stripping and assembling* an engine-gearbox assembly.
Operation No. DS 442-3 : *Overhauling* a steering assembly.
Operation No. DS 451-4 : *Replacement* of a rear brake drum.

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 are indicated as follows :

1. By a number, suffixed by the letter T. These tools are sold by Etablissements FENWICK, 15, rue Fénelon, Paris (10^{e}).

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.

WORK ON THE HYDRAULIC UNITS

When carrying out work on the hydraulic units, precautions must be taken to ensure conditions of the strictest cleanliness (see Op. DS 00).

GENERAL CLASSIFICATION

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

ENGINE 100

- Crankcase 111
- Cylinder head 112
- Timing gear 120
- Suspension 133
- Feed system :
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  - Air filter 171
  - Petrol pump 173
  - Piping 174
  - Petrol tank 175
- Exhaust system 180
- Ignition system :
  - Contact breaker 211
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		Sealing of the hydraulic control slide valves (first assembly)	17	426
		Replacement of a hydraulic brake control (second assembly)	22	427
		Sealing of the hydraulic slide valve (second assembly)	41	428
		Replacement of a braking distributor	62	430
		Checking the braking distributor for leakage	70	431

COMPONENT	OPERATION No.	DESCRIPTION	PARA. No.	PAGE No.
Hydraulic brake control (cont'd)	DS 453-3	Overhauling a hydraulic brake control	1	433
Piping	DS 453-4	Replacement of a rear brake articulating piping	1	436
Mechanical brake control.	DS 454-0	Adjustment of the mechanical brake.		
		Adjusting the control cable	3	437
		Adjusting the connecting cable	4	437
	DS 454-1	Work on the mechanical brake control.		
		Replacement of a control	1	439
		Replacement of a control cable	13	440
		Replacement of a connecting cable	27	441
ELECTRICAL	DS 510-1	Arrangement of electrical installation.		443
		Schedule of bulbs fitted on the car		455
Dynamo	DS 532-1	Replacement of a dynamo.	1	456
	DS 532-3	Work on the dynamo		
		Overhauling a DUCELLIER dynamo	31	460
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Starter motor	DS 533-1	Replacement of a starter motor	1	464
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		Overhauling a DUCELLIER starter motor	1	466
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HEATING AND DEMISTING	DS 642-1	Work on the cut-out valve.		
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		Replacement of a cut-out valve	13	473
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No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on sale	Remarks	Importance
	NOTE: Numbers in the column "IMPORTANCE" have the following significance: 1. Indispensable in all workshops. | 4. Of small use. 2. Indispensable in order to save time. | 5. For use on actual vehicle. 3. Indispensable in order to recover parts. | 6. Only for very large workshop.				
	ENGINE				
16	Retaining clip for bonnet	MR-4158			1
168	Jacking bracket		2505-T		1
125	Setting gauge for steering column		1993-T	see steering	
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T		1
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T		1
72	Spanner for hydraulic pipe unions (13 mm opening)		2222-T		1
72	Spanner for hydraulic pipe unions (15 mm opening)		2220-T		1
95	Strap wrench		2223-T		1
20-22	Fixture for engine suspension adjustment		1698-T		2
127	Fixture for adjusting the angular position of the steering		1955-T	see steering	
19	Stand for dismantled engine-gearbox assembly		2497-T		6
65	Spanner for clutch housing screws (two flats)		1677-T		1
72	Spanner for clutch housing screws (hexagon)		2431-T		1
16	Carburettor spanner		1623-T		1
16	Spark plug spanner		1603-T		1
143	Lever for removing front brake shoes		2127-T	see brakes	
143	Fork for disengagement of front brake catch		2128-T	see brakes	
72	Spanner for high pressure pump nut		2280-T		1
15	Spanner for camshaft nut		1667-T		3
15	Spanner for crankshaft nut		1731-T		3
15	Setting gauge for timing pinion		1680-T		2
16	Spanner for crankshaft plugs		1624-T		1
5	Spring compressor		1614-T		1
5	Assembly for removal and refitting the valves		1616-T		1
10	Extractor		1964-T		1
4	Grinding wheel for inlet valve seat		1662-T		1
4	Grinding wheel for upper and lower clearance		1630-T		1
4	Grinding wheel for exhaust valve seat and upper clearance		1627-T		1
4	Grinding wheel for lower clearance		1633-T		1
4	Valve grinding tool		1615-T		1
6	Fixture for calibrating springs		2420-T		3
11	Fixture for testing the oil pump	MR-1811			2
	Dial gauge for measuring bores		2440-T		3
7	Torsion spanner		2471-T		1

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on Sale	Remarks	Importance
16	Spanner for plugs closing front shaft oil-ways (with dowels)	MR-3462-2O			4
16	Spanner for plugs closing front shaft oil-ways (hexagon)	MR-3462-70			4
12	Plate for fitting cylinder joints	MR-4134			1
18	Stand for engine resting on cylinder head	MR-3053-l70			6
13	Piston ring clip		1656-T		1
44	Mandrel for centralising clutch plate		1712-T		1
18	Stand for engine resting on crankcase	MR-3053-160			6
	Revolution counter – electric		2436-T		1
	or	or			
	Revolution counter – mechanical		2434-T		1
35	Lever for driving belt adjustment	MR-4208			1
	Torsion spanner		2472-T		1
9	Tools for valve guide replacement		1644-T		1
9	Reamer for valve guides		1642-T		1
5	Yoke for retaining inlet rockers	MR-4158-20			2
17	Sleeve for removal and refitting valve springs (on the car)	MR-4244			1
17	Tappet extractor		1608-T		2
51	Chain sling		1697-T		1
24	Spanner for engine suspension		1699-T		1
24	Spanner for engine suspension		1700-T		1
24	Spanner steering rack control rod and engine suspension		1982-T	see steering	
51	Engine stand		1797-T		1
63	Spanner for differential shaft nut		1770-T	see gearbox	
36	Fixture for pulley alignment		1685-T		1
	WATER AND LOW PRESSURE PUMP				
41	Stand for water and low pressure pump	MR-3676-180			1
41	Spanner for low pressure pump bearing nut		1634-T		2
41	Low pressure pump bearing extractor		1684-T		1
39	Extractor for Calcar bush of water pump		2291-T		1
38	Dolly and mandrel for assembly of friction washers		2292-T		1
39	Grinder for friction washers and pump body		2289-T		1
38	Assembly for setting the Calcar bush of the water pump		2288-T		1
41	Sleeve for assembly of water pump shaft seal	MR-3470-20			I
94	Taper for fitting joints on pump shaft	MR-3384-10			1
40	Bush for retaining pump shaft	MR-4251			l
41	Tube for compressing the springs	MR-3676-190			1
41	Spanner for low pressure pump bearing nut		1646-T		2
63	Spanner for driving shaft bearing nut		1640-T		2
17	Extractor for driving shaft	MR-3404-30			2

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on Sale	Remarks	Importance
	CLUTCH				
44	Mandrel for centring clutch disc		1712-T	see engine	
6	Fixture for calibrating the springs		2420-T	see engine	
43	Fixture for toggle adjustment		1701-T		6
44	Simplified clutch adjustment assembly	MR-3457-100			1
43	Finger, ring and clamp for fixture 1701-T		1704-T		6
49	Hydraulic test bench		2290-T		1
49	Spanner for fork spindle screw		1705-T		1
	Electric or mechanical revolution counter		2434-T		
or	see engine				
			2436-T		
7	Torsion spanner		2471-T	see engine	
48	Mandrel for fitting ring seal of clutch cylinder	MR-3045-60			1
72	Spanner for hydraulic unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic unions (10 mm opening)		2221-T	see engine	
17	Ligarex pliers		2483-T		1
72	Spanner for high pressure pump nut		2280-T	see engine	
	GEARBOX				
16	Retaining clip for bonnet	MR-4158		see engine	
168	Jacking bracket		2505-T	see engine	
143	Spanner for leading the front brakes		2141-T	see brakes	
125	Setting gauge for steering column		1993-T	see engine	
72	Spanner for high pressure pump nut		2280-T	see engine	
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
72	Spanner for hydraulic pipe unions (13 mm opening)		2222-T	see engine	
72	Spanner for hydraulic pipe unions (is mm opening)		2220-T	see engine	
51	Chain sling		1697-T	see engine	
51	Engine stand		1797-T	see engine	
51	Gearbox support		1799-T		2
65	Spanner for clutch housing screws (two flats)		1677-T	see engine	
72	Spanner for clutch housing screws (hexagon)		2431-T	see engine	
127	Fixture for adjusting the angular position of the steering		1955-T	see steering	
63	Spanner for driving shaft bearing nut		1640-T	see engine	
62	Stand for gearbox	MR-3053-130			2
41	Spanner for bevel pinion nut		1734-T		2
61	Extractor body		1750-T		1
61	Split collet and ring for differential bearing extractor		1753-T		1
51	Pressure pad for extraction of differential bearing		1742-T		3
63	Spanner for differential shaft nut		1770-T		2
63	Spanner for nut of differential bearing		1771-T		2
64	Socket for gear control cylinder screws		1773-T		2

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on sale	Remarks	Importance
56	Spring compressors for gearbox cover		1798-T		
64	Mandrel for fitting the seals of the cylinders controlling the gears	MR-3676-120			
64	Mandrel for fitting the seals of the cylinders controlling the gears	MR-3676-130			1
6	Fixture for calibrating the springs		2420-T	see engine	
61	Mandrel for fitting the differential bearings		1768-T		2
63	Mandrel for fitting the oil seals and distance washer on the differential shaft		1767-T		2
63	Mandrel and bush for fitting the seal in the outside of the differential bearing housing		1772-T		2
56	Straight edge for dial gauge	MR-3377			1
56	Dial gauge		2437-T		1
65	Mandrel for mainshaft bearing	MR-3045			3
65	Mandrel for assembly for bevel pinion	MR-3676-30			3
59	Fixture for adjustment of bevel pinion		2044-T		1
60	Fixture for adjustment of differential bearing		1766-T		2
60	Dial gauge extension		2438-T		2
59	Support for dial gauge (adjustment of tooth clearance)		2039-T		1
59	Extension for dial gauge		2439-T		1
97	Extractor		1964-T	see engine	
97	Pressure pad for extractor 1964-T		1968-T		1
97	Extractor and pressure pad		1864-T	see front axle	
64	Mandrel	MR-3676-120			2
65	Mandrel	MR-3676-130			2
	GEARBOX CONTROL				
171–173	Hydraulic test bench		2290-T		1
72	Ratchet spanner for hydraulic gear selector fixing nuts		2428-T		1
72	Spanner for screws of clutch housing and nuts fixing hydraulic gear selector		2431-T	see engine	
67	Setting rod for hydraulic gear selector		2429-T		1
71	Vice support for hydraulic gear selector	MR-3053-200			2
71	Rack for hydraulic gear selector pistons and valves	MR-3053-210			1
71	Gauge for checking the bores of the synchronising pistons		2277-T		1
	TRANSMISSION				
97	Extractor		1964-T	see engine	
97	Pressure pad		1968-T	see gearbox	
95	Extractor and pressure pad		1864-T	see front axle	
97	Stand for pivot		1922-T		2
97	Spanner for nut between cardan shaft and hub		1920-T		1
101	Taper fitting for positioning dust cover		1930-T		1

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on Sale	Remarks	Importance
	SOURCE AND RESERVE OF PRESSURE				
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
72	Spanner for hydraulic pipe unions (13 mm opening)		2222-T	see engine	
72	Spanner for hydraulic pipe unions (15 mm opening)		2220-T	see engine	
72	Spanner for high pressure pump nut		2280-T	see engine	
17	Ligarex pliers		2483-T	see engine	
94	Tapered sleeve for fitting ring seals on high pressure pump articulating spindle	MR-3384- 11			1
93	Tommy bar and spanner for pressure regulator cap		2224-T		1
93	Tapered sleeve for fitting pressure regulator piston ring seal		2226-T		1
93	Tapered sleeve for fitting pressure regulator bleed screw ring seal		2225-T		1
79	"T" union for checking hydraulic units on the car		2296-T		1
171	Hydraulic test bench		2290-T		1
79	Reservoir for checking high pressure pump output		2299-T		1
	Pipe for separate high pressure pump outlet (used with test bench 2290-T)		2297-T		1
82	Spanner for holding high pressure pump pulley		2281-T		1
82	Extractor for body and high pressure pump shaft		2282-T		1
83	Rack for high pressure pump cylinders and pistons	MR-3301-80			1
7	Torsion spanner		2471-T	see engine	
83	Mandrel for centring high pressure pump distance piece and assembly of bearing	MR-3436-110			1
83	Retainers (set of 7) for high pressure pump pistons		2284-T		1
84	Mandrel for assembly of high pressure pump shaft		2286-T		1
84	Arrangement for fitting the high pressure pump casing		2287-T		1
84a	Support for dial gauge for measuring the length of the push-rods	MR-2265-60			1
80a	Stroboscopic revolution counter	MR-4142-20			6
80b	Revolution counter		2432-T		1
	FRONT AXLE				
169	Fixture for checking the camber		2314-T		1
102	Fixture for checking the castor angle		2321-T		1
168	Jacking bracket		2505-T	see engine	
97	Extractor		1964-T	see engine	
97	Pressure pad		1968-T		1
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
16	Spanner for carburettor fixing and height corrector eccentric		1623-T	see engine	
98	Vice support for half axle	MR-3053-120			3
97	Extractor and pressure pad		1864-T	see engine	

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on sale	Remarks	Importance
97	Spanner for anti-roll bar ball joint cap	MR-3691-40			2
99	Vice support for pivot		1922-T	see transmission	
99	Spanner for nut between hub and cardan shaft		1920-T	see transmission	
99	Spanner for pivot bearing nut		1921-T		1
96	Extractor for lower cup of upper pivot ball joint		1856-T		1
96	Fixture for fitting the lower cup of the upper pivot ball joint		1857-T		1
96	Straight edge for dial gauge	MR-3377		see gearbox	
96	Dial gauge		2437-T	see gearbox	
7	Torsion spanner		2471-T	see engine	
100	Mandrel for fitting the front seals	MR-3676-140			2
100	Mandrel for fitting the rear seal	MR-3676-150			2
102	Bush for adjusting the castor angle		1865-T		2
102	Bush for adjusting the castor angle		1866-T		2
97	Fixture for adjusting the steering lever on the pivot		1867-T		2
95a	Fixture for tightening the wheel locking screw		1868-T		1
	REAR AXLE				
168	Jacking bracket		2505-T	see engine	
105	Spanner for nut fixing half axle		1757-T		3
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
72	Spanner for hydraulic pipe unions (13 mm opening)		2222-T	see engine	
106	Vice support for half axle	MR-3053-90			2
107	Extractor for stub axle		2018-T		1
108	Extractor for outer cup of outer stub axle bearing		2019-T		1
65	Spanner for brake backplate screws		1677-T	see engine	
145	Spring compressor		2110-T		6
109	Extractor for inner cup of outer stub axle bearing		2020-T		1
146	Spanner for tightening the brake shoe adjusting cam	MR-3354-40			6
147	Mandrel for rectification of brake drums	MR-3700-100			1
110	Fixture for stub axle bearing adjustment		2021-T		1
110	Dial gauge		2437-T	see engine	
147	Mandrel for fitting the oil seal	MR-3676-170			2
148	Centring fixture for brake shoes		2115-T		2
145	Spanner for positioning brake shoes		2120-T		2
99	Vice support for stub axle		1922-T	see transmission	

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on Sale	Remarks	Importance
	SUSPENSION				
97	Spanner for adjusting height corrector eccentric		2285-T		2
170	Gauges for pre-adjustment of the front heights		2307-T		1
169	Fixture for adjusting the camber		2314-T		1
93	Strap wrench		2223-T		1
168	Jacking bracket		2505-T	see engine	
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
16	Spanner for height corrector fixing nuts		1623-T	see engine	
17	Ligarex pliers		2483-T	see engine	
7	Torsion spanner		2471-T	see engine	
118	Mandrel for fitting the height corrector steel cups	MR-3045-80			1
118	Soft jaws for holding the suspension cylinder in a vice	MR-3407-30			1
	Spring balance		2472-T		1
171 - 173	Hydraulic test benches		2290-T	see gearbox	
119	Support for checking the suspension cylinder		2293-T		1
	STEERING				
168	Jacking bracket		2505-T	see engine	
125	Fixture for adjusting the angular position of the steering		1955-T		1
	Spring balance		2472-T	see suspension	
171 - 173	Hydraulic test benches		2290-T	see gearbox	
126	Spring compressor		1991-T		2
126	Spanner for steering column retaining collar		1994-T		2
72	Spanner for steering wheel bracket screws		2428-T	see gear control	
124a	Support for dial gauge for adjustment of steering pinion		1997-T		1
125	Setting gauge for steering wheel		1993-T		3
127	Extractor for hydraulic piston pin		1969-T		3
130	Spanner for locknut of steering lock adjusting cap		1974-T		3
130	Spanner for end cap locknut		2186-VA	2CV	2
97	Extractor		1964-T	see engine	
128	Soft jaws for holding cylinder in a vice	MR-3407-20			1
128	Gauge for checking the housing of the piston ring seal		1983-T		1
131	Tapered sleeve and mandrel for fitting the piston ring seals		1985-T		1
129	Vice adaptor for steering		1999-T		1

No. of Illustration	DESCRIPTION	Service Methods No.	Reference of Tool on Sale	Remarks	Importance
127	Extractor for central ball joint		1967-T		1
127	Spanner for rack control rod		1982-T		1
127	Extractor for rack ball joint		1966-T		1
127	Spanner for rack thrust pad nuts	MR-3691-70			3
97	Extractor		1964-T	see engine	
97	Pressure pad		1968-T	see engine	
127	Mandrel for fitting flexible bearings	MR-3676-110			1
188	Gauge for adjusting the angular position of the steering relay		1995-T		2
139	Spanner for relay upper bearing nut		1988-T		2
139	Spanner for relay lower bearing nut		1989-T		3
139	Tube for positioning relay lower bearing		1990-T		3
	BRAKES				
143	Spanner for adjusting the movable shoe		2129-T		1
148	Fixture for centring the rear brake shoes		2115-T	see rear axle	
168	Jacking bracket		2505-T	see engine	
143	Lever for removing the front brake shoes		2127-T		1
143	Fork for retaining brake block catch		2128-T		1
143	Spanner for front brake bleed screw		2141-T		1
72	Spanner for hydraulic pipe unions (9 mm opening)		2219-T	see engine	
72	Spanner for hydraulic pipe unions (10 mm opening)		2221-T	see engine	
92	Strap wrench		2223-T	see suspension	
16	Spanner for screw fixing pedal bracket		1623-T	see engine	
145	Spring compressor		2110-T	see rear axle	
107	Extractor for stub axle		2018-T	see rear axle	
65	Spanner for brake backplate screws		1677-T	see engine	
146	Spanner for tightening the brake shoe adjusting cam	MR-3354-40		see rear axle	
171 - 173	Hydraulic test benches		2290-T	see gearbox	
150	Spanner for hydraulic brake control caps	MR-3691-50			1
83	Rack for hydraulic brake control valves	MR-3053-210		see source and reserve of pressure	
	ELECTRICAL				
163	Screwdriver for fitting pole pieces	MR-1601-4			1
163	Mandrel for fitting pole pieces	MR-1601-2			1
153	Support for dynamo	MR-1601-3			1
162	Lever for preparation of "Benada" Bendix springs	MR-3526-12			1
152	Support for preparation of "Benada" Bendix springs	MR-3526-11			1
162	Support for fitting the "Benada" Bendix springs	MR-3526-13			1

TOOLS

IMPORTANT REMARK

If any irregularity of working occurs make certain that the hydraulic system is under pressure before doing anything else. To do this :-

With the engine idling :-

- Unscrew the pressure regulator bleed screw about one to one and a half turns (one should be able to hear the release of pressure in the control valve) . . . . . 8 mm spanner
- Screw up the bleed screw and the valve should cut-out in less than 20 seconds (the point of cut-out is indicated by a reduction in the noise of operation) . . . . . 8 mm spanner

If the above is not the case, check in the order shown, the following points :

- That there is sufficient hydraulic fluid in the reservoir.
- That the filter in the reservoir is perfectly clean and in good condition.
- That the air is not being sucked in through the pump inlet pipe.
- That the belt of the high pressure pump is not slipping.
- That the bleed screw has been screwed up.
- Carry out the checking as indicated in Op. DS 391-0.

TOOLS

For correct functioning of all the hydraulic system, it is essential that the fluid and the units of the hydraulic system should be perfectly clean. The strictest precautions must be observed during work on the car and for storage of the fluid and spare parts.

1 STORAGE

Pipes, units and spare parts must be protected from exposure to dust and from impact. Seals and rubber pipes must be protected from exposure to dust, air, light or heat.

The fluid must be kept in its original container, securely sealed. We recommend the use of 1 quart (1 litre) containers (for topping up) or 1 gallon (5 litres) (in the case of draining or refilling) in order to avoid keeping many small containers.

2 PRECAUTIONS DURING WORK

Before starting work, carefully wash the car or round the area in which the work is to be carried out.
Example : When replacing a rear suspension cylinder, carefully wash the corresponding wheel arch.
Before disconnecting a union, carefully wash it and the surrounding area with alcohol.
Then proceed as follows:-

a) Work on all the units except brakes and brake control :

1. Remove the spare wheel.
2. Unscrew the bleed screw on the pressure regulator.
3. Move the manual height control lever to the low position

b) Work on the brake system :

1. Carry out all the operations mentioned in the preceding paragraph.
2. Connect a flexible pipe (plastic or rubber) on the front brake bleed pipe, on the accelerated idling hydraulic control. Connect also a pipe on the rear brake cylinder bleed screw and press on the hydraulic brake pedal until the fluid ceases to flow.
3. If the union is situated below the level of the fluid in the reservoir, drain the latter in order to avoid a loss of fluid, or immediately close the pipe with the appropriate plug.

3 PRECAUTIONS AFTER DISCONNECTING THE UNIONS

Seal the open ends of pipes with caps.

1. Metal pipes with screwed unions :

3.5 mm dia.	cap	. . . . .	D 435-91
4.5 mm dia.	cap	. . . . .	D 453-131
6.35 mm dia.	cap	. . . . .	D 453-132
8 mm dia.	cap	. . . . .	D 391-60

TOOLS

2. For the pipe assemblies, protect the union flanges with cellulose tape.
   Protect plastic pipes in the same manner.
3. For the rubber pipes, use cylindrical pegs :-
   8 mm dia. 50 mm long.
   12 mm dia. 50 mm long.

4 PROTECTION OF HYDRAULIC UNITS AFTER REMOVAL

Seal the openings of the units as dismantling proceeds.

a) On the high pressure pump :

1 cap	D 391-58	for the feed pipe.
2 caps	D 391-57	for the high pressure pump outlet (8 mm dia. connecting pipe).
or 1 rubber cap		for the high pressure pump outlet (6.35 mm dia. connecting pipe).

b) On the pressure regulator :

1 cap	D 391-60	for the return pipe.
1 plug	D 391-63	for the union of the pressure regulator - brake accumulator connecting pipe.
1 plug	D 391-88	for the intake union of the pump.
1 cap	D 391-111	for the union on the pressure regulator accumulator (accumulator removed).
1 cap	D 433-82	for the main accumulator (pressure regulator disconnected).

c) On the brake accumulator :

1 plug	D 391-88	for the outlet union.
2 plugs	D 391-63	for the inlet unions and connecting pipe with the other brake accumulator.

d) Oh the distribution block :

5 plugs	D 391-63	

e) On the height corrector :

3 plugs	D 391-63	
1 plug	D 435-91	

f) On the suspension cylinder :

1 plug	D 434-95	for the inlet union.
1 plug	D 434-70	for the union on cylinder of suspension sphere.
1 cap	D 433-82	for the suspension sphere.

g) On the front brake cylinders:

2 plugs	D 391-63	for the inlet unions and bleed pipe.

h) Oh the rear brake cylinders :

1 plug	D 391-63	

TOOLS

i) On the clutch cylinder :
1 plug . . . . . D 391-63.

j) On the low pressure pump :
2 plugs . . . . . D 391-63.

IMPORTANT NOTE : All plugs, caps and pegs must be *properly cleaned before using.*

5 PRECAUTIONS PRIOR TO ASSEMBLY

The steel pipes must be blown through with compressed air. Rubber pipes and ring seals must be washed in alcohol and then blown off with compressed air. Cleaning of the hydraulic units must be carried out with alcohol, to the exclusion of all other products. After cleaning, blow off the parts with compressed air.

6 FITTING THE SEALS

a) Seal plates :

Before refitting a seal plate, make sure that the ring seals are in position and in good condition (not deformed or split). It is necessary to examine the ring seals very carefully, if need be with a magnifying glass, *it is preferable to replace the ring seals.*

When fitting position, make sure that the fluid holes in the plate correspond to those in the flanges.

b) Sealing sleeves (see P1. 94, fig. 2):

NOTE - Sealing sleeves must be replaced after each dismantling operation.

1. Place the sealing sleeve (3) on the pipe. This sleeve must be set back 2 mm from the end of the pipe.
2. Centralise the pipe in the bore by aligning it with the axis of the bore.

VERY IMPORTANT - Make sure that the end of the pipe enters the small bore (at "a").

3. Screw the union nut by hand. On certain units the axis of the bore is oblique relatively to the face of the boss for the nut.
4. Lightly tighten the nut, 4.3 to 5.7 ft/lbs. (0.6 to 0.8 m. kg).

This light tightening of the nut is sufficient to ensure a good seal. Excessive tightening will cause leakage.

c) Ring seals :

NOTE - Because of their design, the efficiency of these seals increases with pressure. One does not increase the sealing by increasing the tightening of the unions.

Replacement of the ring seals :

1. Moisten the ring seal with hydraulic fluid.
2. Fit a tapered sleeve (tapered sleeve MR-3384-l1 for the union of the high pressure pump, see Pl.94, fig.3 and tapered sleeve MR-3384-l0 for the spindle of the low pressure pump, see Pl. 94, fig. 1), etc

Tapered sleeve MR-3384-11
Tapered sleeve MR-3384-10

3. Fit the ring seal in position by sliding it over the tapered sleeve.

TOOLS

7 REVOLUTION COUNTERS

Certain adjustments and checking cannot be carried out effectively without the use of a revolution counter.
In order that these adjustments and checks shall be accurate, it is necessary to use an instrument which is sufficiently accurate for this work. In particular the instrument should be accurate to within 20 r.p.m. at 600 r.p.m.

Electric Revolution Counters

The following instruments have been tested by us with satisfactory results :
"RABOTTI" sold by Société FENWICK, 15, rue Fénelon, Paris, 10e, under number 2436-T.
"SOURIAU, type 1094" sold by Société SOURIAU, 9, rue du Général-Gallieni, Billancourt (Seine).
"L.T.I. type CT1" sold by Société LE TRANSISTOR INDUSTRIEL, 1, rue Anatole-France, Puteaux (Seine).
"GUYOT ELECTRONIC" sold by Société R.E.M., 44, rue Brunel, Paris, 17e.
"SPEED-O-METER JUNIOR", sold by Société C.I.D., 71, rue Chauveau, Neuilly-sur-Seine (Seine).

The electric revolution counters should be periodically checked (approximately every month). This operation can be carried out by means of a stroboscopic disc, MR-4142-20 (see Pl. 80A).

Mechanical Revolution Counters

These mechanical revolution counters are sold by Société FENWICK, under number 2434-T.

It is preferable to use this revolution counter on a test bench with an appropriate coupling (contact breakers, dynamo, injection pump, speedometer etc.).

This instrument can also be used on the car, by comparison with an electric revolution counter with a curve which is known.

In order to carry out this operation, the pulleys and belts should be in good condition, the pulleys should be in correct alignment and the belts tensioned correctly (see Op. DS 231-0).

These conditions are also imperative in order to use the instrument when carrying out adjustments on the car.

Stroboscopic Disc

This instrument can easily be made. For constructional dimensions ask for note MR-4142-20 from Service "Méthodes Réparations", 11 bis, rue de la Source, Paris, 16e.

Fit the disc on the high pressure pump pulley and fit the light in position as indicated on Pl. 80A.

The pulleys and belts should be in good condition, the pulleys in correct alignment and the belts correctly tensioned (see Op. DS 231-0).

a) Checking on the car :

We particularly recommend this instrument in order to check the output of the high pressure pump (see Op. DS 391-0). In effect the precision of this is greater than that of the better tachometers (it does not depend on the current frequency).

TOOLS

b) Checking of the revolution counter.

This instrument permits the checking of the electric revolution counter. It permits of checking engine revolutions at 600 r.p.m. i.e. :300 r.p.m. high pressure pump, 1,200 engine r.p.m. i.e. : 600 r.p.m. high pressure pump and all the multiples of 300 r.p.m. high pressure pump. but beyond 1,200 engine r.p.m. reading becomes very difficult.

NOTE - The disc does not replace a tachometer, it will only check the speeds given above.

8 PRESSURE GAUGES

In order to carry out the various checking and adjustments on the hydraulic units on the car, the use of pressure gauges is indispensable. As it is necessary to use accurate revolution counters to obtain accurate checking and adjustment, so it is necessary to use accurate pressure gauges.

The pressure gauges of the test bench Z290-T possess the required accuracy. In order to preserve this accuracy, it is necessary to use dampers (dash-pots) for protection, sold by Société FENWICK.

We advise the checking of these pressure gauges by comparison with a new pressure gauge reserved for this purpose.

PARTICULAR POINTS

Removal.

Release the pressure in the hydraulic system and drain the fluid reservoir.

Drain the radiator and cylinder block.

Mark the position of the steering pinion in relation to the steering column and mark the position of the steering in its bearings, before removal.

Do not lose the adjusting shims, fitted between the engine front crossmember and the sidemembers.

Assembly.

Adjust the position of the rear engine mountings, using the fixture 1698-T (see Op. DS 133-0 and Pl. 20-21-22-23).

Refit the front crossmember of the engine-gearbox assembly: replace the shims, found when dismantling, between the crossmember and the sidemember in order that the dimension between the brake disc and the sidemember on the left side is greater by 70 2 mm than the same dimension on the right side (use the total number of shims found when dismantling).

Couple up the flexible coupling (bibax) to the brake discs, make sure that the dowels are in position.

After having connected the mechanical brake control cables to the front brakes, adjust the connecting cable, the control levers being at the limit of separation from their eccentric stop.

Adjust the manual ignition control: put the control in the centre position (count the number of notches) and put the contact breaker in the central position (between the 2 stops). Check that the contact breaker can move into the "fully advanced" and "fully retarded" positions.

Fit the steering, note the markings made when dismantling (position of the pinion in relation to the steering column and the position of the steering in its bearings).

Adjust the alignment of the steering (fixture 1955-T, see Pl. 125) the groove "C" should be in contact with the centre gauge pin (D) of the fixture.

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

Fit the ignition coils: connect the wire with the yellow terminal to the lower breaker (rear terminal) and the wire with the red terminal to the upper breaker (front terminal) (cars produced before July 1959).

Refill the water cooling system (bleed) the vane of the heater control being open. Make sure that the pipe (48) (see PL 25) is warm.

Refill the hydraulic fluid reservoir (bleed screw loosened). With the engine idling, tighten the bleed screw and check the unions for leaks.

Adjust the clutch clearance: 1 to 2 mm (see Op. DS 314-0, paragraphs 20 to 23).

Bleed the hydraulic gear selector: operate the auxiliary clutch control lever several times and make successive movements with the gear lever through all gears, several times, with the front wheels raised (see Op. DS 334-0).

Bleed the brake system (see Op. DS 453-0).

Adjust the slow running: normal idling = 550 to 600 r.p.m. and accelerated idling 900 ± 25 r.p.m. (see Op. DS I42-0).

		TOOLS
	STRIPPING DOWN	
1	Hold the bonnet open (retaining bar MR-4158, see Pl. 16, fig. 1) and put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Retaining bar MR-4158 Jacking bracket Z505-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 sealed container)	8 mm spanner
3	Drain the radiator and cylinder block. Retain the water, which contains anti-freeze)	23 mm spanner
4	Remove the crossmember supporting the spare wheel, the air deflection panel, the two front wings and the protecting covers for the steering (disengage the end of the bonnet catch cable). Remove the front brake cooling ducts	12-14 mm box spanners
5		Remove the battery.
	Disconnect the dynamo wires from the regulator. Remove the coil and bracket assembly. Disconnect the starter cable from the terminal on the solenoid switch. Remove the battery tray	12 mm spanner 8-14 box spanners
6	Disconnect the feed pipe for the high pressure pump from the outlet pipe on the reservoir and remove the fixing straps from the hydraulic fluid reservoir	8 mm box spanner
7	To remove the battery support : Disengage the feed pipe for the high pressure pump from the battery support. Disconnect the bonnet lock control cable from the lever on the scuttle and remove the support and cable assemblies	12 mm box spanner
8	To remove the expansion chamber (L. H. drive only) : Remove the fixing clips on the silencer and the manifold. Remove the fixing collar from the exhaust pipe. Remove the expansion chamber.	12 mm box spanner
9	Disconnect the earth cable from the gearbox and remove the cable harness assembly and protecting tube (cars produced before February 1957)	14 mm box spanner
10	To remove the steering (see Pl. 125) :	
	a) Mark the driving pinion with a centre punch or a spot of paint opposite the slot in the tube (at "a"). Remove the screw (1) connecting the steering tube to the driving pinion. Fit the stop 1993-T for the steering tube	Stop 1993-T 12 mm box spanner
	b) With a dab of cellulose paint, mark the position of the steering in the relay bearings, at "b". Disconnect the steering levers from the relay spindles	14-16 box spanners

		TOOLS
	c) Disconnect the feed pipe assembly (5) from the steering. Remove the sealing plate. Seal the pipe assembly with a plate	8 mm ring spanner
	d) Remove the bearing caps, take off the steering towards the left-hand side of the car	12 mm box spanner
11	Disconnect the hose (2) on the heating system, from the feed pipe and disconnect the heater pipe from the steel tube, right-hand side	8-10 mm box spanners
12	Disconnect the petrol feed pipe from the pump.	
13	Disconnect the brake feed pipe, from the three-way union (41) (see Pl. 25) (spanner 2222-T, see Pl.72, fig.4)	Spanner 2222-T
14	Disconnect the union (42) on the distribution block (spanner 2219-T or 2221-T, see Pl. 72, fig. 4), the union plates on the hydraulic gear selector and on the clutch re-engagement control (47) (see Pl. 25) . . .	Spanner 2219-T or 2221-T 8 mm ring spanner
15	Remove the left-hand suspension sphere. (strap wrench 2223-T, see Pl. 93, fig. 1)	Strap wrench 2223-T
16	Disconnect the feed pipe (43) and the delivery pipe (44) from the selector (see Pl. 25).	
17	Disconnect the choke control from the carburettor lever . Disconnect the accelerator control from the crosspiece of the throttle valve control. Disconnect the control from the pivot on the scuttle and twist it towards the left	7 mm spanner
18	Disconnect the advance and retard control, from the contact breaker.	
19	Disconnect the S pipe assembly from the gearbox.	
	Disconnect the speedometer cable from the gearbox	8 mm ring spanner 12 mm box spanner
20	Remove the pipe between the control valve and the rear brake accumulator (situated at the front) (spanner 2222-T, see Pl. 72, fig. 4)	Spanner 2222-T
21	Remove the right-hand suspension sphere. Remove the heat insulating screen	12 mm box spanner
22	Remove the nuts from the engine fixing studs on the rear side brackets	23 mm spanner 23 mm box spanner
23	Disconnect the flexible coupling (bibax) from the driving plates on the gearbox	12 mm socket with extension
24	Remove the brake protection covers. Unscrew the nuts (101) on the connecting cable (110) and remove the end of the cable (102), from the lever (115) and from the lever (103) (see Pl. 141).	

		TOOLS
25	Remove the fixing screws from the crossmembers on the sidemembers. Do not mislay them or the adjusting shims which will be found between the end of the crossmember and the sidemember	14 mm box spanner
26	Put a chain sling in position (chain sling 1697-T, see Pl. 51). Raise the engine and remove it from the car. *Pay particular attention to the pipes remaining on the car. Do not damage or distort them.* Place the engine-gearbox assembly on a stand (stand 2497-T, see Pl. 19)	Chain sling 1697-T Stand 2497-T
	ASSEMBLY (see Pl. 25)	
27	Adjust the rear flexible supports (gauging fixture 1698-T, see Pl. 20, 21, 22 and 23) :	
	1. To adjust the side position of the brackets :-	
	a) Take the dimension on the engine-gearbox assembly. Place the gauging fixture as shown on Pl. 20, the point of the pin (A) being engaged in the top fixing hole of the crossmember, undo the screw (B) and move the sliding rod (c) so as to engage the pin in the hole in tile plate (D) and in the hole in the suspension arm. Tighten the screw (B)	12 mm box spanner Gauging fixture 1698-T
	b) Transfer this to the car (see Pl. 21) move the bracket (45) as required in the slots at "a" so that the collar of the nut (48) (see Pl. 22) enters the hole on the plate (D). Tighten the nuts	12 mm box spanner Gauging fixture 1698-T
	c) Carry out the same operation for the other side.	
	2. Adjust the height of the supports (see Pl. 22):-	
	a) Remove the top fixing screw of the front half axle on the right and left.	
	b) Place the pin (F) in the bore of the relay spindle. Screw the pin (G) in place of the screw fixing the front half axle.	
	c) Fit the hub (H) of the fixture on the pin (F). Move the movable rod (C) until it rests on the pin (G). Tighten the locking screw (B). Unscrew or screw up the nut (48) so that the shouldered face "c" is level with the underside of the plate (D) (hole "d" for the right-hand side, hole "e" for the left-hand side).	
	3. Adjust the distance between the brackets (see Pl. 23) :- Offer up the gauge (I) move the left-hand bracket (46) in the slot "f" so that the collar of the nut (48) enters into the hole of the gauge (I).	
28	Pass a sheathed chain sling under the water pump and raise the engine-gearbox assembly (chain 1697-T, see Pl. 51). Offer it up on the hull and put it into position. Pay particular attention to the pipes remaining on the hull and to the accelerator control. Remove the chain sling.	

		TOOLS
29	To adjust the front crossmember bracket :	
	Fit the front crossmember to the hull. Fit the shims found when dismantling between the crossmember and the sidemembers.	
	NOTE - The dimension between the left-hand brake disc and the sidemember is greater by 70 ± 2 mm than the same dimension on the right side. If not, alter the number of shims fitted between the crossmember and the sidemember. Use the total number of shims found when dismantling:	
	A shim removed from one side must be fitted on the other side.	
	Tighten the screws (plain and spring washers).	
	Fit and tighten the nuts on the rear mounting studs	14 mm box spanner 23 mm spanner 23 mm box spanner
30	Couple up the flexible coupling (bibax) to the driving plates on the gearbox, make sure that the dowels are in position in the dowel holes in tile coupling. Tighten the screws	12 mm socket with extension
31	Couple the brake control cable (102) to the lever. Adjust the connecting cable (110). Tension the cable to the maximum without moving the levers (103) from their stop (104) (see Pl. 141).	
32	Put the brake cover plates in position, retain them in position with the clips (105) fitted with the rubber sheath (see Pl. 142, fig. 2).	
	Couple up the speedometer cable to the gearbox. Tighten the screw or put the circlip in position	10 mm box spanner
33	Couple up the ignition advance and retard control to the plate on the contact breaker. Tighten the screw clamping the sheath. Place the advance control in the centre position (count the number of notches).	
	Put the plate on the contact breaker in mid-course between the two stops.	
	Tighten the fixing screw of the cable. Move the control and check that the contact breaker can move into the fully retarded and fully advanced positions (stops in contact)	5-8 mm spanners
34	Couple up the union plates to the hydraulic gear selector and to the clutch corrector (47) (insert the seal plates). Tighten the nuts (spring washer). Tighten the union (42) on the distribution block to 6.5 ft/lbs (0.9 m. kg) (spanner 2219-T to Z221-T, see Pl. 72, fig. 4)	8 mm ring spanner 100 long maximum Spanner 2219-T or 2221-T
35	Couple the accelerator control to the carburettor.	
	Couple up and adjust the choke control. Check that it works correctly	7 mm box spanner
36	Connect the feed pipe (43) and the outlet pipe (44) from the hydraulic gear selector.	
37	Connect the brake pipe to the three-way union (41), (see Pl. 25) (spanner 2219-T or 2222-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2222-T

		TOOLS
38	Connect the feed pipe to the petrol pump.	
39	Connect the five-pipe assembly to the gearbox. Insert the seal plates. Tighten the screws (spring washers)	8 or 10 mm box spanners
40	Connect the dynamo cables to the terminals on the regulator	8-10 mm box spanners
41	Fit the cooling ducts for the brake discs. Make sure they do not touch the discs. If necessary, move the ducts in the slots.	
42	Connect the pipe between the regulator and the brake accumulator. Tighten the unions to 4.3 to 5.75 ft/lbs (0.6 to 0.8 m.kg) (spanner 2219-T or 222l-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
43	Fit the steering (see Pl. 125). Locate the pinion so as to correspond with the marks made when dismantling (centre punch mark or paint mark opposite the slot in the tube at "a"). Engage the pinion in the tube. Place the steering assembly in its bearings paying attention to the paint marks made at "b" when dismantling. Screw up the fixing screws on the bearing caps. NOTE - If the steering has been replaced, it is necessary to adjust the position correctly (see Op. DS 440-0).	
44	Fit the tube for the cable harness. Provisionally fix the wire and the earth cable as well as the left-hand plate on the tube for the cable harness, on the gearbox cover (cars produced before February 1957).	
45	Adjust the position of the steering (see Pl. 125). Fit the fixture 1955-T as shown on the illustration. Turn the steering in its bearings so as to bring the groove "c" in contact with the centre locator (D) of the fixture. Tighten the fixing screws (4) of the bearing caps. Remove the fixture. Couple the steering levers to the relay spindles (the nuts engine side). Tighten the nuts to 18 ft/lbs (2.5 m. kg). Remove the stop 1993-T. Couple the feed pipe assembly (5) to the steering box. Insert the seal plate, with the holes for the passage of fluid opposite those in the distributor	Fixture 1955-T 8-12-14-16 mm box spanners
46	Connect the right and left-hand heater hoses. Tighten the clips.	
47	Couple up the exhaust down pipe to the manifold and to the silencer. Fit the clips. Tighten the nuts (spring washers). Fit the clip fixing the tube to the bracket. Tighten the nuts (plain washers and spring washers)	12 mm spanner 12 mm box spanner

		TOOLS
48	Fit the coil and bracket assembly. Connect the leads to the contact breaker, the yellow terminal to the lower contact breaker (rear terminal) and the red terminal to the top contact breaker (front terminal). Connect the leads to the sparking plugs	8 mm box spanner
49	Fit the cover plates for the steering	
50	Fit the battery brackets. Fit the hydraulic fluid reservoir by means of its clips. Fit the battery tray. Fit the battery, fix it by means of the tie-rods. Fit the channel for the electric cable harness on the outside tie-rod. Connect the cables to t he battery. Connect the cable control for the bonnet lock to the rods on the scuttle	8-10-12 mm box spanners 8 mm spanner
51	Pass the feed pipe for the high pressure pump through the rubber grommet in the radiator tie-rod, then in the rubber collar on the water pipe, and through the rubber grommet on the battery support. Couple the tube to the outlet pipe on the reservoir. Fit the rubber bush. Fit the clip.	
52	Fit the suspension spheres (tighten by hand). Insert the joints.	
53	Fill up with water. During this operation, open the heater control vane and undo the bleed screw (46) (see Pl. 125) so as to let the air escape from the engine.	
54	Unscrew the screw on the pressure control valve. Fill up the reservoir with hydraulic fluid. Start the engine, let it run for some minutes. Retighten the bleed screw so as to put the hydraulic system under pressure. Check all unions for leakage. With the vane of the heater open, make sure that the pipe (48) is warm (see Pl. 25)	8 mm spanner
55	Adjust the clutch clearance (see Op. DS 314-0). NOTE - It is sometimes necessary to remake this adjustment after running 30 to 40 miles.	
56	Bleed the hydraulic gear selector: operate the auxiliary clutch control lever several times. Make successive movements with the gear lever through all gears several times so as to bleed the gearbox and clutch hydraulic system (see Op. DS 334-0).	
57	Bleed the brakes (see Op. DS 453-0).	
58	Adjust the idling speeds (see Op. DS 142-0).	
59	Fit the air deflector panel and the front wings (plain and serrated washers). Couple up the bonnet lock control; adjust the control cable if necessary	14 mm spanner 14 mm box spanner
60	Fit the air sleeves, fix them by means of the rubber clips. Fit the crossmember supporting the spare wheel. Fit the spare wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	12-14 mm box spanners Jacking bracket 2505-T

		TOOLS
	STRIPPING AND ASSEMBLING (for replacement of the engine).	
	Stripping.	
1	Place the engine gearbox assembly on the stand Z497-T (see Pl. 19)	Stand 2497-T
2	Disengage the high pressure pump feed pipe from its attachment plate on the water tube.	
	Remove the radiator tie-rod and remove the radiator.	
	Remove the driving belts from the dynamo and water pump. Remove the dynamo tie-rod.	
	Remove the dynamo. Remove the rear fixing screw. Unscrew the front screw	8-12-14 box spanners 12-14 mm spanners
3	Disconnect the high pressure pump tie-rod from the water pump	12mm box spanner
4	Remove the starter motor cable	14mm box spanner
5	Disconnect the feed pipe from the clutch cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Disconnect the gearbox from the engine (spanners 1677-T, see P1. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1). Pass the spanner through the holes of the driving pulley.	
	Leave the gearbox on the truck	Spanners 1677-T, 2431-T, 2219-T or 2221-T.
	IMPORTANT NOTE - Do not roll the gearbox on the brake discs	Rubber protectors
6	To strip the engine :	
	a) Drain the engine (oil) 21 mm box spanner	
	b) Remove the air cleaner and tube assembly	12-17 mm box spanners
	c) Remove the carburettor (spanner 1623-T, see P1. 16, fig. 2)	Spanner 1623-T
	d) Remove the petrol pump	14 mm spanner or spanner 1621-T
	e) Remove the water and heater pipe assembly, right side	8 mm box spanner
	f) Remove the inlet manifold. Remove the oil dipstick to allow the removal of the manifold	12mm box spanner
	g) Remove the contact breaker, its plate and return spring	12mm ring spanner
	h) Remove the crankcase breather	12 mm box spanner
	1) Remove the plates fixing the exhaust manifold shield	12mm box spanner
	j) Remove the starter motor	17mm spanner 14mm box spanner
	k) Remove the sparking plugs (spanner 1603-T, see P1. 16, fig. 7)	Spanner 1603-T
	l) Remove the fan	12mm spanner
	m) Remove the low pressure pump feed pipe (spanner 2220-T, see P1. 72, fig. 4)	Spanner 2220-T or 14 mm spanner
	n) Remove the gearbox dowel pins from the engine crankcase.	

		TOOLS
	Assembly.	
7	To fit the contact breaker.	
	Put the metal fixing plate on the flat lever.	
	Position the driving dog of the contact breaker so that it corresponds to the oil pump driveshaft. Fit the contact breaker. Tighten the metal fixing plate screw (spring washer under the head)	12 mm ring spanner
8	Fit the oil dipstick tube. Fit the contact breaker earth wire terminal under the fixing plate of the tube. Tighten the screw (plain and spring washers). Fit the dipstick	12 mm box spanner
9	Fit the inlet manifold, insert the gaskets, progressively tighten the nuts (without washers)	12 mm box spanner
10	To fit the carburettor.	
	Assemble in the following order : a gasket, steel distance piece, a gasket, the carburettor (the float chamber towards the front).	
	Tighten the nuts (serrated washers) (spanner 1623-T, see Pl. 16, fig. 2)	Spanner 1623-T
11	To fit the crankcase breather.	
	Remove the element, wash with petrol, blow with compressed air, soak in engine oil and refit. Moderately tighten the nut (plain washer).	
	Fit the breather on the engine. Insert a paper joint. Tighten the screw (spring washer)	8-12 mm box spanners
	NOTE - On earlier cars the filter element is omitted.	
12	Fit the air cleaner and tube assembly. Tighten the nut on the cylinder head cover (serrated washer).	
	Tighten the nuts on the water pump cover (serrated washer). Tighten the clip on the carburettor	12-17 mm box spanners
13	Fit the petrol pump. Insert a cork joint. Tighten the nuts (serrated washers). Fit the petrol feed pipe from the pump to the carburettor	12 mm box spanner
14	To connect the gearbox.	
	Fit the dowel pins together with their circlips in their housings on the engine crankcase.	
	Engage the gearbox resting on its truck, by turning the mainshaft by means of the starting handle relay, also turn the driving pulley in order to engage the splines.	
	Tighten the fixing screws (spanner 2431-T, see Pl. 72, fig.1 for hexagon headed screws and spanner 1677-T, see Pl. 65, fig. 4 for screws with two flats)	Spanner 2431-T Spanner 1677-T
15	Fit the starter motor. Fit the fixing screws, tighten moderately.	
	Tighten the locknuts	12-14 mm box spanners 17 mm spanner

		TOOLS
16	Fit the fixing plates for the exhaust manifold shield, the smaller at the rear. Tighten the nuts (spring washer)	12 mm box spanner
17	Fit the low pressure pump feed pipe, (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T
18	Align the water pump pulley (see Op. DS 231-0).	
	Fit the pulley, tighten the nut to 18 to 22 ft/lbs (2.5 to 3 m. kg), insert a plain washer and a lockwasher.	
	Turn over the lockwasher	16 mm box spanner
19	Fit the fan. Tighten the screws to 6.5 ft/lbs (0.9 m. kg).	
	IMPORTANT - Do not exceed this tightening torsion	12 mm box spanner
20	Tension the water pump and dynamo belts (see Op. DS 231-0). Tighten the screw fixing the tie-rod on the water pump (spring washer and the nut, on the high pressure pump (plain and spring washers)	12 mm box spanner
	STRIPPING AND ASSEMBLING (for replacement of the gearbox).	
	Stripping.	
21	Remove the bracket for the expansion chamber. Do not mislay the distance piece for the left-hand14 mm box spanner fixing plate	
22	Disconnect the flexible pipes from the water pump cover and the steel tube. Remove the tie-rod from the radiator and remove the radiator.	8-12-14 mm box spanners
23	Remove the dynamo tie-rod and remove the dynamo	12-14 mm spanners 12-14 mm box spanners
24	Remove the screw from the plate fixing the pump - regulator connecting pipe on the gearbox and disconnect the pipe from the pressure control valve (spanner 2220-T, see Pl. 72, fig. 4, or 14 mm spanner).	
	Remove the pressure control valve and its bracket from the crossmember	Spanner 2220-T 14 mm spanner 12 mm box spanner
25	Remove the lower nuts from the tie- rods supporting the brake units.	
	Remove the fixing screws from the crossmember on the support arms of the box (knock down the lockwashers) and disengage the crossmember	21 mm box spanner 14 mm spanner 14 mm box spanner
26	To remove the brake unit.	
	a) Remove the adjusting nuts disengage the stops of the sheath and remove the connecting cable from the right-hand side	12 mm spanner 12 mm box spanner
	b) Remove the fixing screws of the rear supports of the brake unit	14-19 mm box spanners

		TOOLS
	c) Disconnect the feed pipes from the brake units and disconnect the accelerated idling pipe from the left-hand brake unit (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
	d) Remove the brake unit. If necessary, remove the protection cover and remove one brake shoe (lever 2127-T and fork 2128-T, see Pl. 143, fig. 1)	Lever 2127-T Fork 2128-T
27	To remove the high pressure pump :	
	a)Disconnect the high pressure pump tie-rod	12 mm box spanner
	b) Remove the high pressure pump fixing spindle nut and remove the pipe assembly connecting the pump to the pressure regulator. Remove the high pressure pump fixing spindle. Remove the pump (cars produced before October 1958) (spanner 2280-T, see Pl. 72, fig. 5)	Spanner 2280-T
	c) Remove the fixing spindle of the high pressure pump (spanner 2280-T, see Pl. 72, fig. 5) and remove the high pressure pump and the pipe connecting the pump to the pressure regulator (cars produced after October 1958)	Spanner 2280-T
28	Remove the driving pulley fixing screw. Remove the pulley, the key and the adjusting washers. Disengage the driving belts	14 mm box spanner
29	Unlock the locknut and loosen the fixing screw from the bendix housing	12 mm box spanner
30	Remove the clutch cylinder feed pipe (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
	Disconnect the control rod from the clutch fork and remove the clutch cylinder	12 mm box spanner
31	Remove the clutch bellhousing fixing screws (spanners 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1) and disconnect the gearbox from the engine. Let it rest on the truck of the stand during this operation (stand 2497-T, see Pl. 19)	Spanner 1677-T and Spanner 2431-T
	Assembly.	
32	Fit the driving pulley and put the belts in position. Align the pulley (see Op. DS 231-0)	14 mm box spanner
-33	To connect the gearbox to the engine :	
	a) Make sure that the dowel pins (together with their circlips) are in position in the crankcase.	
	b) Engage the gearbox (resting on its truck) by turning the mainshaft by the starting handle relay, turning at the same time the driving pulley in order to engage the splines.	
	c) Tighten the clutch bellhousing fixing screws (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1)	Spanner 1677-T and Spanner 2431-T

		TOOLS
34	Fit the clutch cylinder, connect the control rod to the fork and fit the belts on the high pressure pump. Fit the feed pipe and connect to the clutch cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
35	To fit the high pressure pump :	
	a) Offer up the high pressure pump assembly together with the connecting pipe between the pump and pressure regulator. Fit the fixing spindle and fit the nut (cars produced after October 1958) (spanner 2280-T, see Pl. 72, fig. 5)	Spanner 2280-T
	a) Offer up the high pressure pump assembly together with the connecting pipe between the pump and b) Offer up the pump and fixing spindle assembly together with the connecting pipe between the pump and pressure regulator fitted with new ring seals (cars produced before October 1958). Fit the spindle fixing nut.	
	c) Fit the screw of the plate securing the connecting pipe on the gearbox.	
	d) Connect the high pressure pump tie-rod, fit the nut without tightening (plain and spring washers)	12 mm box spanner
	e) Put the driving belts in position.	
36	To fit the brake unit (see P1. 141 and 142):	
	a) Offer up the brake units fitted with their rear brackets. Tighten the fixing screws of the brackets and fit an iron locking wire between the two upper screws in order to avoid unscrewing	14-19 mm box spanners
	b) Connect the feed pipes to the brake units and connect the accelerated idling pipe to the left-hand brake (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
	c) Fit the connecting cable, pull the centre part towards the rear, in order to fit the sheath end pieces. Connect the cable to the brake levers and fit the adjusting nuts.	
37	To 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. Fit the fixing nuts, without locking (plain and spring washers)	12 mm spanner 12 mm box spanner
	c) Adjust the dynamo and high pressure pump belts (see Op. DS 231-0).	
	NOTE - The crossmember, the pressure regulator, the radiator and the expansion chamber bracket should be fitted after the gearbox has been fitted on the car.	

PARTICULAR POINTS

Dismantling.

11 *When removing the assembly of the crankshaft, connecting rods and pistons, make sure that the order and direction of assembly of the central bearing is marked. If the crankshaft and bearings are to be re-used make a reference mark so that they are not reversed on assembly.*

16 *Do not remove the connecting rod small end bushes.*

17 *The cylinder head, being made of aluminium, one cannot remove the sparking plug tubes or valve seats without the use of special tools. It is possible to replace the valve guides (see Op. DS 112-3).*
If a thread is damaged it is possible to replace it by a "Heli-coil" thread (see note MR-4279).

Assembly.

23 *Characteristics of the valve springs.*
Outer springs. L = 37 mm under load of 24.200 ± 1.350 kg and L = 28.5 mm under load of 52 ± 2.800 kg.
Inner springs. L = 24.5 mm under load of 5.250 ± 0.300 kg and L = 16 mm under load of 11 ± 0.600 kg.
Do not fit the rubber seal on the exhaust valves.

24 *Check the oil pump on a test bench.*
With S.A.E. 20 engine oil at 60° C. and the pump outlet through a jet of 2.8 mm dia. the pressure should be at 1000 r.p.m. equal to 50 p.s.i. (3.5 kg/cm^2).

25 *To fit a starter gear ring on the flywheel.*
Heat the bore of the starter gear ring to a temperature of 200 to 250° C (straw colour). Do not exceed this temperature.

26 *If the clutch bearing face "a" has been ground, remove the same amount from the bearing face "b" of the clutch casing (see Pl. 42). The distance between the bearing face of the crankshaft and the face of the Ferodo disc should not be less than 15.4 mm.*

27 *To prepare the parts for the crankshaft.*
The tightening torsion of the bearing cap screws is 58 ft./lb. (8 m.kg), admissible clearance = 0.06 mm max. between the crankshaft and bearings.
The tightening torsion of the connecting rod screws is 36 ft./lb. (5 m.kg), admissible clearance = 0.06 mm max. between the crankshaft and the connecting rods.
Note the reference marks made when dismantling the bearings and caps.

29 *To fit the pistons: heat the piston to 60°C (oil bath) in order to fit the gudgeon pins, note the order of assembly, do not interchange the pins.*

30 *The tightening torsion of the connecting rod screws is 36 ft/lb (5 m.kg). This tightening torsion must be strictly adhered to.*

31 *Tighten the fixing screws of the camshaft rear thrust plate to 7.5 ft/lb (1 m.kg) (lockwashers).*

33 *Fitting the cylinder barrels: adjust their height with one paper joint only.*
Cylinder head gasket: smear with boiled linseed oil, the crimping towards the barrels; the new type gasket should be fitted dry, the varnished side towards the cylinder head.

34 *Fitting the cylinder head: First tightening 21.75 ft/lb (3 m.kg), second tightening 43.5 ft/lb (6 m.kg). Observe the tightening torsion and order of tightening the screws indicated on Pl.7.*
Check the bores of the cylinder barrels: deformation or ovality = 0.03 mm max., except for 20 mm at the bottom of the cylinder barrel: 0.05 mm max.

35 *Oil seals: Insert a shim steel strip (L = 200, 1 = 10, thickness 0.1 mm) around the oil thrower and tighten the fixing screws of the half-shells. Remove the bearing cap and remove the shim. Refit the new assembly.*
Tighten the bearing cap fixing screws to 72 ft/lb (10 m.kg).

36 *Crankshaft endfloat = 0.03 to 0.09 mm adjusted by means of a shim placed between the end cheek of the bearing and the washer on the timing pinion.*

37 *Fitting the timing gear: align the reference marks (punch marks); a line passing through the centre-line of the pinions.*
Tightening torsion of the nuts: camshaft nut = 110 ft/lb (15 m.kg), crankshaft nut = 145 ft /lb (20 m.kg).

38 *Fitting the oil pump (tightening torsions):*
Fixing screws = 11 ft/lb (1.5 m.kg) max. and locknut 22 ft lb (3 m.kg). Pipe unions = 43 ft/lb (6 m.kg) and locknuts = 29 ft/lb (4 m.kg).

39 *Fitting the timing cover: liquid Hermetic or Festinol on the face of the bearing cap receiving the timing cover gasket.*
Brass washer under the head or Hermetic (new screws with circular base), for the three screws projecting on the inside of the cover.
Tighten the screws to 11 ft/lb (1.5 m.kg).

40 *Engine flywheel: tighten the screws to 36 ft/lb (5 m.kg) (lockwasher).*

41 *Clutch: tighten the screws to 14 ft/lb (2 m.kg) (spring washer).*

43 *Adjustment of the valves: clearance = .008 in (0.20 mm) inlet and .010 in (0.25 mm) exhaust.*
Adjust the valves of a cylinder with the piston at T.D.C. (end of compression stroke), the valves of an opposite cylinder are then at the point of balance: 1st cylinder, the valves of the 4th cylinder being at the point of balance, 3rd cylinder, the valves of the 2nd cylinder being at the point of balance, 4th cylinder, the valves of the 1st cylinder being at the point of balance, 2nd cylinder, the valves of the 3rd cylinder being at the point of balance.

	DISMANTLING (see Pl. 1).	TOOLS
1	Place the engine on a suitable stand or on a work bench.	
2	Remove the cylinder head lubrication pipe	12-17 mm box spanners
3	Remove the side engine mounting arms	14-17 mm box spanners
4	Remove the clutch and engine flywheel. Disengage the bearings from the flywheel	12 mm box spanner
5	Remove the cylinder head cover. Remove the steel cup (3) and the rubber seals (4) from the sparking plug tubes .	12 mm box spanner
6	<u>To remove the cylinder head</u> :	
	a) Unscrew the inlet rocker assembly fixing screws (5) without removing them from the brackets (6). Remove the assembly with the screws in place in order to keep the parts in their correct position	14 mm box spanner
	b) Remove the exhaust rocker assemblies and brackets. Remove the rocker push-rods	12 mm box spanner
	c) Remove the cylinder head fixing screws, right-hand side. Remove the cylinder head, cylinder head gasket and locating dowels	14 mm box spanner

		TOOLS
7	To remove the tappets:	
	Hold the cylinder barrels in position by means of two washers inserted between the barrels 1-2 and 3-4 and secure by screws	Washers: Internal dia. = 10.5 External dia. = 46
	Turn the engine over and rest it on the face for the cylinder head.	
8	Remove the sump and the timing gear cover	12 mm box spanner
9	Remove the oil pump	14-16-17-26mm spanners
10	To remove the timing chain and timing pinions (spanners 1667-T and 1731-T, see Pl. 15, fig. 1 and 3).	
	When unscrewing the nuts, wedge the pinions with the setting gauge 1680-T (see Pl. 15, fig. 2, if not available insert a wooden wedge between one of the crank pins and the crankcase. Disengage the keys, the steel washer (12) the bearing thrust ring (9) and the adjusting shims (10)	Spanner 1731-T Setting gauge 160-T Spanner 1667-T
11	To remove the crankshaft, connecting rod and piston assembly (see Pl. 14) :	
	a) Remove the assembly screws (11) from the crankshaft oil seals (13) and (14).	
	b) Remove the fixing screws from the bearing caps. Remove the bearing caps (make sure that the direction of assembly is clearly marked).	
	NOTE – If the crankshaft and bearings are to be re-used, make a reference mark on the centre and rear half bearing, which are of the same dimensions, so that they are not reversed on assembling.	
	c) Remove the crankshaft, connecting rod and piston assembly. Remove the crankshaft bearing thrust ring (8) (see Pl. 1).	
12	Remove the upper section of the crankshaft oil seal (13)	12 mm box spanner
13	To remove the camshaft (see Pl. 1)	
	Remove the thrust plate (15) and disengage the shaft from the crankcase	12 mm box spanner
14	To strip the cylinder block (see Pl. 1)	
	a) Remove the timing chain lubricator, oil circulation plugs and water drain plug	5-12mm spanners 1-23mm box spanners
	b) Remove the cylinder barrels.	
	c) Remove the conical oil circulation unions from the cylinder block.	
15	To strip the crankshaft :	
	Remove the connecting rod caps and the connecting rods (make sure that the arts are marked). (Socket 1624-T, see Pl. 16, fig. 3). Mark the bearings if they are to be re-used	Socket 1624-T

		TOOLS
16	To remove the pistons from the connecting rods :	
	a) Remove the gudgeon pin circlips from the groove in the piston.	
	b) Heat the pistons to a temperature of 60°C. approximately by immersion in an oil bath or by heating in an oven.	
	c) Remove the gudgeon pins. Do not mix them up since they are paired with their respective pistons.	
	NOTE – It is advisable to remove the small end bushes.	
	The machining and tolerances are of such high precision that this delicate work cannot be carried out with normal tools.	
17	To strip the cylinder head (See Pl. 3):	
	Remove the valves (spring compressor 1614-T and support 1616-T, see Pl. 5)	Spring compressor
	Remove the rear closing plate.	1614-T Support 1616-T
	NOTE – As the cylinder head is made of aluminium, the sparking plug tubes and valve seats cannot be repaired without the use of special tools.	12 mm box spanner
	Nevertheless, in certain cases, the valve guides can be replaced (see Op. DS-112-3, paragraphs 2 to 4).	
	Do not remove the studs.	
18	To strip the oil pump (see Pl. 3)	
	a) Remove the delivery pipe and remove the conical union.	14–26 mm spanners
	b) Remove the filters (17)	12 mm box spanner
	c) Remove the pump base (18) and the idler pinion (19)	12 mm spanner
	d) Withdraw the driving pinion (20) (extractor 1964-T, see Pl. 10 fig. 4)	Extractor 1964-T
	Do not use the socket; insert a cylindrical pressure pad 12 mm dia. 40 mm long between the extractor screw and the pump shaft.	
	Remove the assembly of the shaft (21) and the pinion (22) from the pump body.	Pressure pad12mm dia, 40mm long
	e) Move the fixed pinion (22) on the shaft, release the retaining cotters (23), take off the pinion and its key from the shaft.	
	f) Remove the positioning screw from the tube support and remove the tube (24)	14 mm spanner
	g) Drive out the spindle (25) from the idler pinion.	14 mm box spanner
	h) Remove the bush (26), the spring (27) and the piston (28) from the non-return valve	12 mm box spanner
	i) Remove the bush (29) from the support tube (24) with the aid of a mandrel	Mandrel = 15 dia. x 250 long
19	Remove the water and low pressure pump (see Op. DS 231-3).	
20	Strip the inlet rockershaft assembly.	

TOOLS

21 Clean the parts. Do not wash the crankshaft bearing in order to avoid removing the grease.

The bearing should be packed with new grease.

22 With a spray gun paint the inside of the crankcase. Use a paint resisting the action of hot oil (paint such as AC.8, sold by CLEMENT and RIVIERE or MOUQUET).

ASSEMBLY (see Pl. 1)

23 To prepare the cylinder head (see Pl. 4)

a) Grinding the cylinder head:-

A deviation of 0.05 mm in the truth of the surface is admissible.

A slight grinding on the surface is possible. The original thickness of the cylinder head must not be reduced by more than .3 mm.
If it is suspected that the cylinder head has been ground, check the dimension “c” (see fig. 6).
This dimension should be “c” = 26.5 +0.1/-0.2 mm.

b) Grinding the valves (Black and Decker type valve grinder).

NOTE – The angle of the exhaust valve face is 90˚.
The angle of the inlet valve face is 120˚.

There should be a radius of approximately 0.5 mm on the corners of the valve heads (at “a” and “b”. see fig. 3).

c) Grinding the valve seats.

NOTE – the width “l” of the seat must be between 0.9 and 1.5 mm. Use the following grinding wheels to obtain these dimensions:-

Inlet valve seat:

For the seating	120˚	biconical wheel	1662-T
For the top clearance	150˚	biconical wheel	1630-T
For the lower clearance	90˚	biconical wheel	1630-T

Exhaust valve seat

For the seating	90˚	biconical wheel	1627-T
For the top clearance	150˚	biconical wheel	1627-T
For the lower clearance	60˚	wheel	1633-T

The large diameter of the seating must be equal to the largest diameter of the valve (see fig. 1 and 2) .....

Grinding wheels 16 62-T, 1630-T, 1627-T and 1633-T

d) Grind the valves (suction tool 1615-T, see fig.4) driven by an electric, pneumatic or hand operated grinder

Suction valve grinder 1615-T

TOOLS

e) Clean the cylinder head with great care so as to eliminate all traces of emery in the valve chambers or gas passages

This operation should always be carried out with very great care. The powdered emery (even in very small quantities), entering the engine, will cause rapid wear.

f) Calibrating the springs.
(Spring calibration fixture 2420-T, see Pl. 6) . . . . . Spring calibration fixture 2420-

SPRING CHARACTERISTICS

Outer spring		Inner spring	
Length in mm	Load in Kg	Length in mm	Load in Kg
37 28.5	24.2 ± 1.350 52 ± 2.800	24.5 16	5.250 ± 0.300 11 ± 0.600

g) Fit the valves. Oil the valve stems and the faces. Put the valves in position. Fit the sealing ring (3) on the inlet valve stems only (see Pl. 3, fig. 2).

For each valve fit (see fig. 3):

One thrust washer (31) for the outer spring.

One shouldered thrust washer (32) for the inner spring.

Fit the valve springs. Make sure that the split cotters retaining the cups are properly seated (spring compressor 1614-T and support 1616-T, see Pl. 5). . . . . Spring compressor 1614-T
Fit the exhaust valve springs; fit the spring thrust cap, the split cotter locating cup and the split cotters . . . . . Support 1616-T

NOTE – It is not necessary to fit a sealing ring on the exhaust valves.

h) Remove the filter on the cylinder head cover. Wash the filter element in petrol, blow dry with compressed air, then dip into engine oil.
Replace the filter.

24 To prepare the oil pump (see Pl. 10)

a) Fit the bush (29) into the support tube (24) using a press.

b) Fit the idler pinion spindle (25) using a press, fit the idler pinion (19) making sure that it turns freely. Place the fixed pinion (22) in the body of the pump and with a set of feelers and a straight edge resting on the base of the pump, measure the pinion clearance. This clearance must not exceed 0.05mm.
Remove the pinions.

		TOOLS
	c) Fit the support tube (24). Fit the fixed pinion (22) on the shaft (key and split cotters (23) in position). Insert the shaft (21) in the body of the pump. Fit the support tube locking screw. Tighten the nut to 18 ft/lbs (2.5 m.kg) and fit a split pin	14 mm box spanner
	d) Grease the entry side of the bore of the driving pinion and fit on the shaft, with a press. During this operation the shaft should be supported on a cylindrical block. The pinion should not take any strain. When the pinion (20) is on the spindle, an end float of between 0.03 and 0.1 mm must be left. If the pinion is pressed down too far, hold the pinion in the hand and with the aid of a copper drift and a hammer tap on the end of the shaft until the pinion is in the correct position.	Block = 12 dia. x 10 long.
	e) Fit the idler pinion (19), the paper gasket and pump base (18), (with the filter support on the outlet pipe side). Tighten the screws t 9.4 ft/lbs (1.3 m.kg) (spring washers under the head), lock the milled head screw by tapping the metal of the pump base into the slot of the screw	12 mm spanner 12 mm box spanner
	f) Fit the piston (28), the spring (27) and the spring retaining flange (26). Tighten the screws (lockwashers under the heads).	12 mm box spanner
	g) On the intake opening fit : one cork seal, the top cover, the upper filter plate, a filter (large diameter hole), the distance piece, a second filter and the lower plate. Tighten the screws to 9.4 ft/lbs (1.3 m.kg). Tighten the locknut	12 mm box spanner
	h) Check the pressure on a test bench. With SAE 20 oil heated to 60 ± 5˚C and the pump outlet through a 2.8mm diameter jet, the pressure must be 50 p.s.i. (3.5 kg/cm^2) at 1000 r.p.m. If this pressure is not obtained, change the spring (27) (see Pl. 10)	
	NOTE – If a test bench is not available, use the simplified unit MR-1811 (see Pl. 11)	Test bench or unit MR-1811
25	<u>To replace a starter gear ring</u> :	
	a) Detach the starter gear ring from the flywheel, driving it off with a hammer.	
	b) To fit the starter gear ring on the flywheel. Heat the starter ring with a blow torch fitted with a jet of 800 to 1000 litres. Heat only the bore, at the same time rotating the ring continuously to ensure the uniform expansion. Cease heating when the ring reaches a temperature of 200˚ to 250˚ (pale yellow colour) . Above this temperature the heat treatment of the ring will be modified. Make sure that the flywheel is perfectly clean, offer up the starter ring perfectly level and fit it rapidly.	
26	<u>Grinding the bearing face of the clutch disc on the flywheel</u> (see Pl. 42):	
	Every time that the bearing of the flywheel is ground at “a”, remove the same amount from the bearing face “b” of the clutch casing. Carry out these two operations without removing the flywheel from the lathe, so that both faces reworked are parallel. The grinding should never exceed 0.3 and 0.5 mm. The distance between the bearing face of the crankshaft and the face of the Ferodo disc should not be less than 15.4 mm.	

TOOLS

27 To prepare the parts for the crankshaft (see Pl. 13)

In general proceed by renewing the parts.
Nevertheless some repairs are possible.

a) Crankcase :

If the bearing caps have been filed by unskilled repairers, it is not possible to fit the standard crankshaft – connecting rod assemblies. It will be necessary to renew the cylinder block, or failing this, the cylinder block bearings must be rebored. To do this :

On a surface plate, check that the bearing faces of the caps are in alignment. If necessary, retouch them with a file or better still, on a milling machine. Place the bearing caps (without the bearings) on the cylinder block and tighten the screws to 58 ft/lbs (8 m.kg) (spanner 2471-T, see Pl. 7, fig. 2).

Using a dial gauge (dial gauge 2440-T) measure the diameter "a" (see fig. 2).

Make sure that the dimension "a" measured at one of the extremities of the bearings is the same as dimension "b" measured at the other extremity. If this is not the case, the bearing faces of the cap are not parallel to the centre line of the crankshaft, it is necessary to correct them with a file or better still a milling machine.
The difference between the two dimensions "a" and "b" should not exceed 0.01 mm.

Continue again by taking the diameter "a".

The difference between this diameter "a" and the original dimension ($58.01 \begin{smallmatrix}+0.025\\0\end{smallmatrix}$ mm) represents the thickness "e" of the shims to be placed between the cap and the cylinder block (see fig. 2) :

$$"e" = 58.01 \begin{smallmatrix}+0.025\\0\end{smallmatrix} - a.$$

The shims must be machined with the greatest care. Their faces must be parallel within 0.01 mm.

Again fit the caps without the bearings, but this time fitting the shims, tighten the screws to 58 ft/lbs (8 m.kg) and measure the dimension "a". It must be ($58.01 \begin{smallmatrix}+0.025\\0\end{smallmatrix}$ mm); if not, correct the shims.

We strongly advise this method which, while taking longer, allows the use of the standard crankshaft – connecting rod assemblies, sold by our Spare Parts Department, without any reworking. We definitely Prohibit the taking up of the clearance of these assemblies. The clearance is measured with very great precision at the works and cannot be modified without risk of damage. . . . . Dial gauge 2440-T
Torsion spanner 2471-T

b) Crankshaft :

If necessary a better finish of the bearings can be obtained by lapping them slightly, provided that the following maximum clearances are adhered to :
on the crankshaft bearing : 0.06 ..
On the connecting rods : 0.06
With a micrometer, measure the diameter of the bearings; they should be :

On the crankshaft main bearings : $54 \begin{smallmatrix}0\\-0.015\end{smallmatrix}$ mm or $53.5 \begin{smallmatrix}0\\-0.015\end{smallmatrix}$ mm.

On the bearing for the connecting rod : $48.01 \begin{smallmatrix}-0.01\\-0.02\end{smallmatrix}$ mm.

TOOLS

c) Connecting rods :

1. The connecting rod bearings can be changed.
2. On engines produced before June 1957, it is necessary to replace the four connecting rods at the same time (thickness in the centre of the body 19 mm).
3. On engines produced after June 1957, the connecting rods are interchangeable, it is possible to replace only one connect rod (thickness in the centre of the body 22 mm).

28 To clean the crankshaft :

NOTE – In all circumstances, the crankshaft must be cleaned as indicated below :

a) Remove the crank pin oilway plugs (spanner MR-3462-20 or MR-3462-70, see Pl. 16 fig. 4 and 5) . . . . . — Spanner MR-3462-20 or MR-3462-70

b) Thoroughly clean the crank pin bores and the oilways in the journals. Make sure that the connecting rod lubricating holes in the crank pins are clean. Finally clean with petrol.

c) Fit the plugs, tightening them to 29 ft/lbs (4 m.kg). This tightening torsion is absolutely essential to prevent the plugs unscrewing when the engine is running.

29 To fit the pistons on the connecting rods :

NOTE – 1. Certain pistons are marked at the top with an arrow and the word “FRONT”.

2. The assembly face of the cap of the connecting rod and of the body is oblique. This direction of assembly must be observed (see Pl. 2).
3. To allow for the taper of the bores in the piston and of the gudgeon pins, the direction of fitting must be observed.

   The largest bore is marked with a grease pencil on the boss and the smallest diameter of the gudgeon pin is marked with a grease pencil on the end.

a) Fit a circlip for the gudgeon pin in the side of the boss, not marked with a grease pencil.

b) Bring the pistons to a temperature of 60°C approximately, either in an oil bath or by heating in an oven, so that the gudgeon pins (first coated with oil) can be inserted by hand (do not interchange the gudgeon pins; they are weighed and paired with their respective pistons).

c) Fit the other circlip. Make sure that the circlips are seating properly in the groove.

30 To fit the bearings in the flywheel bore :

The circlip being in position in the flywheel, insert the bearing in its housing (use a tube) . . . . . — Tube :
Internal dia. = 35
External dia. = 41.5

		TOOLS
31	To fit the connecting rods on the crankshaft :	
	Oil the bearing faces with an oil-can (SAE 20 engine oil), do not use a brush as this is liable to cause the introduction of dirt of brush hairs.	
	Fit the half bearings in the rod and in the cap. Make sure that the lugs engage in the grooves. If the old bearings are to be used, make sure that they are fitted in accordance with the reference marks made when dismantling.	
	Fit the rods on the crankshaft (see Pl. 2, for position). Do not reverse the position of the cap on the rod. Tighten the screws to 36 ft/lbs (5 m.kg) (socket 1624-T, see Pl. 16 fig. 3). This tightening torsion must be observed	Torsion spanner 2471-T Socket 1624-T
	NOTE – The bearings are narrower than the cap and the big end of the connecting rod. The cap is also narrower than the big end of the connecting rod.	
32	To fit the camshaft :	
	a) Fit the camshaft after first oiling its bearings.	
	Tighten the screws of the thrust plate to 7.5 ft/lbs (1 m.kg) and turn over the lockwashers	12 mm box spanner
	b) Fit the oiled tappets in the bores.	
33	To fit the cylinder barrels (see Pl. 12) :	
	NOTE – The precision machining of the cylinder barrels allows them to be assembled in the cylinder block without the adjustment of the heights, there is therefore, only one type of paper joint (blue marking).	
	a) Make sure that the base of the cylinder barrels and the bearing face in the cylinder block are perfectly clean; offer up the cylinder barrels to the cylinder block and make sure they seat squarely.	
	b) Offer up a joint on the cylinder barrel, the straight edge on the joint parallel to the flat on the cylinder barrel, the reinforcement towards the cylinder barrel.	
	By hand, work the joint on to the cylinder barrel until it is as far as the first shoulder on the barrel at “a”. Then complete the fitting by using the punched plate MR-4134 (see Pl. 12 fig. 3)	Punched plate MR-4134
	c) Fit the cylinder barrels in the bores of the cylinder block. Make sure they are correctly in position.	
34	To fit the cylinder head (see Pl. 3) :	
	a) Put the dowels for the cylinder head in position in the cylinder block, the chamfer towards the cylinder head.	
	b) Fit the cylinder head gasket smeared with boiled linseed oil, the crimping towards the cylinder barrels. Fit the cylinder head, making sure that no foreign matter is trapped between the cylinder head and the cylinder head gasket during this operation.	
	c) Put the rocker push-rods in position (the exhaust valve rods are longer).	

TOOLS

d) To prepare the inlet rocker assembly:

1. Dismantle the assembly.
2. Drive out the plugs from the rockershaft by means of a pin punch, passing through the holes for the fixing screws. Carefully clean the inside of the shaft with a metal pin making sure that the oil hole in the inlet shafts and the exhaust shafts, as well as those in the rockers and rockershaft brackets are clear.
3. Fit the plugs, tin solder them on assembly.
4. Fit on the inlet rockershaft (previously oiled, the oil holes located towards the bottom and towards the valve) commencing by the front:
   1 long screw (5) fitted with a bearing cap (33) for fixing the spindle,
   1 washer,
   1 spring,
   1 left-hand rocker (34),
   1 washer,
   1 long screw fitted with a bearing cap,
   1 washer,
   1 right-hand rocker (35),
   1 spring,
   1 washer,
   1 long screw fitted with a bearing cap,
   1 long screw fitted with a bearing cap,
   1 washer,
   1 spring,
   1 left-hand rocker (34),
   1 washer,
   1 long screw fitted with a bearing cap,
   1 washer,
   1 right-hand rocker (35),
   1 spring,
   1 washer,
   1 long screw fitted with a bearing cap.

e) Fit the rocker assembly supports (6) (inlet and exhaust) in position. Offer up the inlet rockershaft. Insert the cylinder head fixing screws.
During this operation, make sure that the rocker push-rods are properly located in the sockets of the adjusting screws.

f) Put the exhaust rockers in position (see Pl. 3):
1st and 3rd cylinders : Fit on the shaft (oil holes facing downwards) commencing at the front : 1 spring (37), the rocker (36), 1 washer (29).
2nd and 4th cylinders : Fit on the shaft (oil holes facing downwards) commencing at the front : 1 washer (29), the rocker (38), 1 spring (37).
Fit these assemblies according to their preparation. Put the caps (7) on the studs. Tighten the nuts . . . . . 12 mm box spanner

NOTE – On cars produced before April, 1956, the exhaust rockershafts are shouldered. On these cars the side clearance should be 0.3 maximum, the adjustment being carried out by means of washers. If the shouldered rockershafts require replacing, fit the new type rockershaft (smooth).

TOOLS

h) Fit the short cylinder head fixing screws. Screw up without tightening.

i) Tighten the screws in the order indicated (see Pl. 7), first tightening 21.75 ft/lbs (3 m.kg), second tightening 43.5 ft/lbs (6 m.kg). These tightening torsions are very important, (torsion spanner 2471-T, see Pl. 7, fig. 2) . . . . — Torsion spanner 2471-T

Observe the order indicated. Do not exceed the tightening torsion of 43.5 ft/lbs (6 m.kg) . . . . . — 14 mm socket.

NOTE – After having travelled 300 miles (500 km), then 1,250 miles (2,000 km), it is necessary to retighten the cylinder head. Loosen the screws, then proceed as indented line "i". One should drain the radiator.

j) Turn the engine over (stand MR-3505-170, see Pl. 18, fig. 1).
Check the barrel bores for deformation (dial gauge 2440-T for checking bores): the distortion or ovality must not exceed 0.03 mm except in the part 20 mm from the bottom where 0.05 mm is admissible . . . . . — Stand MR-3053-170
Dial gauge 2440-T

35 To fit the crankshaft and pistons into the cylinder block (see Pl. 13 and 14) :

a) Cut from shim steel 0,10 mm thick, a shim 200 mm long and 10 mm wide.

b) Fit the top half bearing (13) on the cylinder block and the lower half bearing (14) on the bearing cap (smear the faces of the shells with Festinol).
Insert the fixing screws (40) without tightening (no washers under the head of the screws).

c) Fit the main bearings, making sure that the bores in the cylinder block are clean, oil with an oil-can.

d) Oil the pistons. Place the gap of the 1st and 3rd ring at 180° in relation to the gaps in the 2nd and 4th rings.
Fit the ring clips on the pistons (ring clip 1656-T, see Pl. 13, fig. 1).
Fit the bearing thrust ring (8) (see Pl. 1) on the crankshaft, with the chamfer towards the ground face of the crankshaft, the slot for retaining the washer towards the bearing cap.
Fit the crankshaft by guiding the pistons so as to avoid pinching or breaking the rings. Also ease the bearing thrust ring into position. Remove the piston ring clip.

e) Insert the shim steel strip (prepared as shown in paragraph "a") around the oil thrower on the crankshaft as shown on Pl. 14, fig. 1. Fit the crankshaft on its bearings.

f) Fit the bearing cap. Tighten the two assembly screws (11) of the half shells. Tighten the bearing cap screws to 72 lb/ft (10 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2) . . . . . — 8 mm box spanner
Torsion spanner 2471-T
17 mm socket spanner

NOTE – Do not turn the crankshaft during the centring of the half shells.

g) Tighten the shell fixing screws (40) alternately up to 9.5 ft/lbs (1.3 m,kg).

h) Remove the assembly screws (11) from the half shells. Remove the bearing cap. Lift the crankshaft in order to remove the shim steel strip.

TOOLS

i) Smear the assembly faces of the two half shells with Festinol around the fixing screw holes.

Offer up the bearing caps together with their bearings. Put the sump gaskets in position, the end under the front and rear bearing caps. Smear these areas with Festinaol. Tighten the bearing screws to 72 ft/lbs (10 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2).

There are no lockwashers under the heads of the screws.

Tighten the assembly screws (11) . . . . . Torsion spanner 2471-T

IMPORTANT NOTE – Do not turn the crankshaft after it has been fitted. Actually, the valves are not under control, and if one of them is raised, the piston of the corresponding cylinder cannot pass top dead centre without fouling it.

NOTE – Festinol is sold by Societe Ripolin.

36 To adjust the end float of the crankshaft (see Pl. 1) :

a) Fit the bearing thrust ring (9) with the groove engaged on the retaining pin, an adjusting shim (10) 0.05 mm thick, the thrust washer (12), the crankshaft pinion (temporarily without key), tighten the nut (spanner 1667-T, see Pl. 15, fig. 1) . . . . . Spanner 1667-T

Push the crankshaft towards the bearing, timing side, by means of a lever or wedge placed between a throw of the crankshaft and the cylinder block.

b) Measure the clearance between the thrust ring (9) and the thrust washer (12) (at “g”).

This clearance should be between 0.03 and 0.09 mm. Select from the shims sold by our Spare Parts Department, one which will allow the correct clearance to be obtained.

Remove the pinion.

37 To fit the timing gear :

a) Fit the timing chain lubricator (16) with the hole located on the centre line of the crankshaft, tighten to 7.5 ft/lbs (1 m. kg) and the locknut to 10 ft/lbs (1.4 m. kg).

Fit the oil-way plugs together with their joints. Smear the threads with Hermetic . . . . . 21-23 mm box spanners

b) Place the two pinions for the crankshaft and camshaft on a bench.

Align the two reference marks : a straight edge passing through the centre line of the two pinions should pass through the mark (centre punch on one tooth) on the camshaft pinion and in between the teeth marked by a centre punch (see Pl. 15, fig. 2). This tool has a centre line marked on it to enable the reference marks to be aligned . . . Setting gauge 1680-T

c) Fit the chain and pinion assembly. Without displacing the pinions, offer up the chain and pinion assembly : turn the camshaft by means of the pinion so as to bring the keyways in the pinions and shafts opposite one another.

		TOOLS
	d) Fit the chain and pinion assembly, making sure that the keys are properly located on the camshaft and crankshaft. Tighten the camshaft nut to 108 ft/lbs (15 m.kg) (spanner 1731-T. see Pl. 15 fig. 3) and that of the crankshaft to 144 ft/lbs (20 m.kg) (spanner 1667-T, see Pl. 15, fig. 1) wedging the crankshaft by means of a wedge inserted between the crankshaft throw and the crankcase or with the aid of the setting gauge 1680-T. Turn down the locking tabs on the nuts.	Spanner 1731-T Spanner 1667-T Setting gauge 1680-T
38	To fit the oil pump :	
	a) Bring the crankshaft to top dead centre on the 1st cylinder (end of compression).	
	b) Engage the oil pump so that the driving groove is parallel to the centre line of the engine, and the small side towards the inside of the engine after it is put in position. Tighten the pointed screw to 11 ft/lbs (1.5 m.kg) maximum so as not to crush the tube and tighten the locknut to 22 ft/lbs (3 m.kg)	17 mm spanner
	c) Place the tapered unions in the cylinder of the body of the pump.	
	Fit the oil pipe between the pump and the cylinder, tighten the union nuts to 43 ft/lbs (6 m.kg) and the locknuts to 29 ft/lbs (4 m.kg)	12-26 mm spanners
39	To fit the sump and timing cover :	
	a) In the bearing grooves place :	
	at the front : the cork joint (of which the ends have been smeared with Festinol).	
	at the rear : the cork joint (of which the ends have been smeared with Festinol) and the sealing plate for the groove in the cap.	
	Put Festinol on the joints and in particular in the corners.	
	Fit the sump. Tighten the sump screws. No washers are fitted under the heads of the screws. The longest screws are fitted to the front and rear bearings	Tee spanner 12 mm socket
	b) Fit the timing cover, insert a paper joint. Smear the surface receiving the joint with Hermetic or Festinol.	
	Fit a brass washer under the heads of the three screws projecting on the inside of the timing cover or smear the underside of the heads with Hermetic (new screws have a collar).	
	Tighten the screws to 11 ft/lbs (1.5 m.kg)	12 mm box spanner
40	Fit the flywheel, tighten the screws to 36 ft/lbs (5 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2). There are no lockwashers under the heads of the screws	Torsion spanner 2471-T 17 mm socket
41	To couple the clutch to the engine flywheel :	
	a) Make sure that the bearing faces for the disc on the flywheel and the clutch are clean.	
	b) Couple the clutch to the flywheel using a mandrel (mandrel 1712-T, see Pl. 44, fig. 4) of a primary shaft to centre the disc. Make sure in the course of tightening that the mandrel slides normally, thus indicating a good centring of the disc. Tighten the screws to 14 $+^{2}_{0}$ ft/lbs (2 $+^{0,250}_{0}$ m.kg) (spring washers under the heads). Remove the mandrel.	Mandrel 1712-T 12 mm box spanner

		TOOLS
42	Turn the engine over. Support it on a stand (stand MR-3053-160. See Pl. 18, fig. 2)	Stand MR-3053-160
43	To adjust the valve clearance :	
	This clearance should be .008 ins (0.20 mm) for the inlet and .010 ins (0.25 mm) for the exhaust. Adjust the valves of one cylinder, the piston being at top dead centre, end of compression. The valves of a cylinder opposite are then in balance, that is to say, inlet valve at the commencement of admission, exhaust valve at the end of exhaust.	
	Adjust the valves of :-	
	1st cylinder, the valves of the 4th cylinder being in balance. 3rd cylinder, the valves of the 2nd cylinder being in balance. 4th cylinder, the valves of the 1st cylinder being in balance 2nd cylinder, the valves of the 3rd cylinder being in balance.	
44	Oil the valve springs and the sockets of the rockers. Put in position, the metal cups (3) and the seals (4) on the sparking plug tubes.	
	Fit the cylinder head cover, the gasket is stuck only to the cover with Hermetic. Make sure that the gasket and the bearing face of the cylinder head cover are properly clean.	
	Tighten the nuts (leather and plain washers)	12 mm box spanner
45	Fit the engine side support arms (spring washers under the heads of the screws)	14–17 mm box spanners
46	Fit the cylinder head lubrication tube, using a double leather joint when securing to the cylinder head and two fibre joints when securing to the crankcase.	
47	Paint the unit.	

PARTICULAR POINTS

Replacement of the sump.

Remove the engine-gearbox assembly and leave suspended from a pulley block for this operation (see Op. DS 100-1).

Before assembly, cut the old joint close to the bearing caps using a sharp blade. Smear the bearing surface, on the crankcase, with very thin *Hermetic (slightly dilute with alcohol if necessary). Do not fit paper joints.*

Replacement of the oil seals.

Removal .

Remove the engine-gearbox assembly and disconnect the gearbox from the engine.
After having removed the sump, turn the engine over, turn the crankshaft so that the throws are horizontal.
Then remove the timing chain and pinion assembly without displacing them.

Assembly .

22 *Fitting the half-shells:*
Fit a shim steel strip (L=200, l=10, thickness = 0.10) round the crankshaft oil thrower.
Fit the half-shells and the rear bearing cap (Festinol on the bearing faces) and tighten the screws of the bearing cap to 72 ft/lb (10 m.kg).
Tighten the assembly screws of the half-shells.
Tighten the screws fixing the half-shells to 9.5 ft/lb (1.3 m.kg) and remove the assembly screws.
Remove the bearing cap and disengage the shim steel strip. Reassemble the parts (bearing tightening 72 ft/lb (10 m.kg).

23 *Adjust the end float on the crankshaft: 0.03 to 0.09 mm (shims fitted between the outer face of the bearing and the timing pinion thrust washer).*

24 *Fit the timing pinions. Tighten the camshaft nut to 108 ft/lb (15 m.kg) and the crankshaft nut to 145 ft/lb (20 m.kg).*

26 *Fit the timing cover: smear the bearing face receiving the timing cover join, with liquid Hermetic or Festinol.*

Brass washers or Hermetic under the heads of the three screws projecting on the inside of the timing cover (new screws with circular base).

Tighten the screws to 11 ft/lb (1.5 m.kg)

27 *Engine flywheel: Tighten the screws to 36 ft/lb (5 m.kg) (no locktabs).*

28 *Clutch: Tighten the screws to 14 ft/lb (2 m.kg) (spring washers).*

30 *Connect the gearbox to the engine: smear with Festinol or liquid Hermetic round the area of the driving shaft on the clutch housing.*

		TOOLS
	REPLACEMENT OF THE SUMP	
	Removal.	
1	Remove the engine-gearbox assembly (see Op. DS 100-1).	
2	Leave the engine-gearbox assembly suspended from a pulley block. Drain the engine oil	21 mm box spanner
3	Remove the fixing nuts and screws from the sump, disengage the sump	12 mm socket with extension
4	Remove the cork gaskets from the front and rear bearing caps. Carefully clean the grooves in the bearing caps.	
	Assembly.	
5	Fit the cork joints on the bearing caps, the grooves being smeared with Festinol. At the front, fit a cork gasket, the ends of which must be smeared with Festinol. At the rear, fit a cork gasket, the ends of which must be smeared with Festinol and the front sealing plate of the groove in the bearing cap.	
	NOTE - Festinol is sold by Société Ripolin.	
6	If the gaskets between the sump and the cylinder block are to be renewed, cut each gasket level with the bearing caps, with a sharp blade. Carefully clean the gasket faces of the cylinder block and sump. Do not fit a paper gasket, smear the bearing faces, on the crankcase, *with thin* Hermetic (slightly dilute with alcohol, if necessary).	
7	Fit the drain plug on the sump, inserting a copper and asbestos washer. Offer up the sump, tighten the fixing nuts and screws, using the longer screws for the front and rear bearings (no washers under the screw heads)	21 mm box spanner 12 mm socket with extension
8	Fit the engine-gearbox assembly to the car (see Op. DS 100-1). Refill the engine with oil, 7 pints (4 litres) S. A. E. 20 oil.	
	REPLACEMENT OF THE SEALING SHELLS	
	Removal (see Pl. 1).	
9	Remove the engine-gearbox assembly (see Op. DS 100-1). Drain and remove the radiator. Remove the expansion chamber	12-14 mm box spanners
10	Remove the fan in order to avoid damaging it when handling the parts	12 mm box spanner
11	Remove the air filter and pipe assembly. Disconnect the flexible feed pipe to the carburettor. Remove the inlet manifold and carburettor assembly (spanner 1623-T, see Pl. 16, fig. 2)	12-17 mm box spanners Spanner 1623-T

		TOOLS
12	Remove the flexible pipe and water pipe assembly, left-hand.	
13	Remove the rubber and bakelite caps from the sparking plug tubes. Remove the sparking plugs (spanner 1603-T, see Pl. 16, fig. 7).	
	Remove the cylinder head cover, take off the sealing cups and rubber joints from the sparking plug tubes	Spanner 1603-T 12 mm box spanner
14	Remove the clutch cylinder feed pipe. Disconnect the accelerated idling pipe from the left-hand brake unit (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Disconnect the gearbox from the engine (spanner 1677-T, see Pl. 65, fig 4 and spanner 2431-T, see Pl. 72, fig. 1).	
	IMPORTANT NOTE - Do not roll the gearbox on the brake disc, use the stand 2497-T (see Pl. 19)	Spanner 2219-T or Spanner 2221-T Spanner 1677-T Spanner 2431-T Stand 2497-T
15	Remove the clutch and the engine flywheel	12-17 mm box spanner
16	Drain the engine oil	21 mm box spanner
17	Turn the engine over and place it on a stand (stand MR-3053-170, see Pl. 18, fig. 1). Remove the timing cover and the sump	Stand MR-3053-170 12 mm box spanner 12 mm tee spanner
18	<u>To remove the timing chain and pinion assembly</u> : a) Unscrew the nuts. Hold the pinions by means of the setting gauge 1680-T (see Pl. 15, fig. 2) or wedge the crankshaft by means of a wooden wedge placed between a crankshaft throw and the crankcase (spanner 1731-T, see Pl. 15, fig. 3) for the camshaft nut and spanner 1667-T, (see Pl. 15, fig. 1), for the crankshaft nut	Setting gauge 1680-T Spanner 1731-T Spanner 1667-T
	b) Turn the crankshaft until the throws are horizontal.	
	IMPORTANT - It is essential to place the crankshaft in this position before removing the timing chain and pinion assembly. Since the camshaft is not under control, if one of the valves is lifted and the crankshaft rotated, the corresponding piston cannot pass top dead centre without fouling the valve.	
	c) Remove the timing chain and pinion assembly without displacing them. Place the chain and pinion assembly on a bench, held by the setting gauge 1680-T (see Pl. 15, fig. 2).	
	Remove the keys, the thrust washer (12), the adjusting shims (10), the bearing thrust ring (9) (see Pl. 1)	Setting gauge 1680-T

		TOOLS
19	To remove the sealing shells (see Pl. 14):	
	a) Remove the assembly screws (1l} from the sealing shells (13 and 14)	8 mm box spanner
	b) Remove the bearing fixing screws. Mark the direction of assembly of the centre bearing cap, remove the bearing caps together with their bearings and mark the latter	17 mm box spanner
	c) Raise the crankshaft, connecting rod and piston assembly without removing the pistons from their liners.	
	Pack up the crankshaft from the cylinder block far enough to enable the fixing screws (40) of the upper section (13) to be removed.	
	Remove the sealing shells (13 and 14)	12 mm spanner
20	Clean the parts. Carefully scrape the joints.	
	<u>Assembly.</u>	
21	From shim steel 0.10 mm thick, cut a strip 200 mm long and 10 mm wide.	
22	<u>To fit the sealing shells</u> (see Pl. 14) :	
	a) Fit the upper shell (13) on the cylinder block and the lower shell (14) on the bearing cap (smear the bearing faces of the shells with Festinol). Insert the fixing screws (40) without tightening them.	
	b) Make sure that the upper bearings (in the crankcase) are clean. Oil the journals with an oil-can. Place the shim steel strip (prepared in paragraph 21) round the crankshaft oil thrower (see Pl. 14, fig. 1) and mount the crankshaft in its bearings.	
	With the lower bearing in position in the front bearing cap, fit the bearing cap. Guide the thrust washer (8) (see Pl. 1) during this operation.	
	Tighten the assembly screws (11) of the half shells. Tighten the bearing cap fixing screws to 72 ft/lbs (10 m. kg) (torsion spanner 2471-T, see Pl. 7, fig. 2)	8 mm box spanner Torsion spanner 2471-T 17 mm socket
	NOTE - Do not rotate the crankshaft while centring the caps.	
	c) Tighten the fixing screws (40) of the half shells alternately to 9.5 ft/lbs (1.3 m. kg)	12 mm spanner
	d) Remove the assembly screws (11) of the half shells. Remove the bearing cap, raise the crankshaft and remove the shim steel strip	8 mm box spanner
	e) Smear the bearing surfaces of the half shells with Festinol around the holes for the screws only.	

		TOOLS
	Offer up the bearing caps fitted with their bearings (according to the reference marks made when dismantling). Put the joints in position under the front and rear bearing caps and level with the face of the joint with the half shells and timing cover; smear these areas with Festinol. Tighten the bearing screws to 72 ft/lbs (10 m. kg) (torsion spanner 2471-T, see Pl. 7, fig. 2).	
	Tighten the half shell assembly screws. Do not rotate the crankshaft (see note, paragraph 22)	Torsion spanner 2471-T 17 mm socket 8 mm box spanner
	NOTE - Festinol is sold by Société Ripolin.	
23	<u>To adjust the end float of the crankshaft:</u>	
	See Op. DS 100-3, paragraph 36.	
24	<u>To fit the timing gear</u> :	
	a) Fit the chain and pinion assembly making sure that the keys are properly in position on the camshaft and on the crankshaft.	
	b) Tighten the camshaft nut to 108 ft/lbs (15 m.kg) (spanner 1731-T, see Pl. 15, fig. 3) and that of the crankshaft to 145 ft/lbs (20 m. kg) (spanner 1667-T, see Pl. 15, fig. 1). Hold the pinions with the setting gauge 1680-T (see Pl. 15, fig. 2) or wedge the crankshaft with a wooden wedge inserted between a crankshaft throw and the crankcase.	
	Turn down the nut locking tabs	Spanner 1731-T Spanner 1667-T Setting gauge 1680-T
25	<u>To fit the sump</u> :	
	See paragraphs 6 and 7, this operation.	
26	<u>To fit the timing cover</u> :	
	Insert a paper joint. Tighten the fixing screws to 11 ft/lbs (1.5 m. kg) (brass washers under the heads of the three screws projecting inside the timing cover)or smear the base of the screw heads (new screws have a circular base) with Hermetic	12 mm box spanner
27	Fit the engine flywheel. Tighten the fixing screws to 36 ft/lbs (5 m. kg) (no locking tabs) (torsion spanner 2471-T, see Pl. 7, fig. 2)	Torsion spanner 2471-T 17 mm socket
28	<u>To connect the clutch to the flywheel</u> :	
	See Op. DS 100-3, paragraph 41.	
29	Turn the engine over and place it on the stand 2497-T (see Pl. 19).	
	Insert the sealing cups and the rubber joints on the sparking plug tubes.	

		TOOLS
	Fit the cylinder head cover, sticking the gasket only on the cover with Hermetic. Check that the gasket and the bearing face on the cylinder head cover are properly clean. Tighten the fixing nuts (leather and plain washers).	
	Fit the sparking plugs (spanner 1603-T, see Pl. 16, fig. 7). Fit the bakelite and rubber caps on the sparking plug tubes	12 mm box spanner Spanner 1603-T
30	Smear LIQUID Hermetic on the bearing face of the cylinder block, on the clutch housing and in the area beneath the oil thrower of the driving shaft.	
	Connect the gearbox to the engine (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1).	Spanner 1677-T Spanner 2431-T
31	Fit the inlet manifold and carburettor assembly, insert the gaskets. Tighten the fixing nuts (spring washers) (spanner 1623-T, see Pl. 16, fig. 2). Connect the flexible feed pipe to the carburettor	Spanner 1623-T 8 mm box spanner
32	Fit the air filter and pipe assembly.	
	Fit the fan, tighten the screws to 7.5 ft/lbs (1 m. kg). Do not tighten beyond this	12-17 mm box spanners
33	Fit the engine-gearbox assembly on the car. See Op. DS 100-1.	
34	Fit the radiator. Connect the hoses. Fill the radiator with water.	
	Fit the expansion chamber	12-14 mm box spanners
35	Connect the accelerated idling pipe to the left-hand brake unit. Fit the clutch cylinder feed pipe (spanner 2219-T or spanner 2221-T, see Pl. 72, fig 4)	Spanner 2219-T or Spanner 2221-T

PARTICULAR POINTS

Checking the oil pressure (on the car).

1 Start the engine and leave it running in order to bring the oil temperature to 600 C.

2 Fit a pressure gauge 0 to 150 p.s.i. (0 to 10 kg/cm2) in place of the oil feed pipe to the cylinder head.

3 The pressure should read between 54 and 58.5 p.s.i. (3.8 and 4.1 kg/cm 2) with the engine running at 4,000 r.p.m.

Replacement of an oil pump.

Removal.

Remove the engine-gearbox assembly and leave it suspended from a pulley block.

Refitting.

10-11 Rotate the crankshaft to top dead centre of the first cylinder and fit the pump, the drive dog for the distributor is parallel to the centre-line of the engine, the small side towards the engine after fitting.
Tightening torsions:
Pump fixing screws 11ft/lb (1.5 m.kg) and the locknuts 22 ft/lb (3 m.kg).
Pipe unions 43 ft/lb (6 m.kg) and the locknuts 29 ft/lb (4 m.kg).

12 Fitting the sump: replace the bearing cap cork joints, smear the bearing surface of the crankcase with very thin Hermetic. Do not fit the joint between the sump and the crankcase.

14 Fill the engine with oil: 7 pints (4 litres) of S.A.E. 20 oil.

CHECKING THE OIL PRESSURE (on the car)

TOOLS

1 Start the engine and let it run in order to bring the oil temperature to 60°C approximately. Stop the engine.

2 Remove the cylinder head lubrication screw. Connect the pressure gauge feed pipe using the union MR-3705 (see Pl. 16, fig. 6).
Use a pressure gauge graduated from 0 to 150 p.s.i. (0 to 10 kg/cm 2) — 12-17 mm box spanner

Union MR-3705
Pressure gauge
0 to 150 p.s.i.
0 to 10 kg/cm^2)

		TOOLS
3	Start the engine and let it run at 4000 r.p.m.: read the pressure which should be between 54 and 58.5 p.s.i. (3.8 and 4.1 kg/cm^2). (Electric revolution counter 2436-T or mechanical revolution counter 2434-T)	Revolution counter 2434-T or 2436-T
	NOTE — if the pressure is not correct, the oil pump must be removed. For this operation, it is necessary to remove the engine.	
4	Stop the engine. Disconnect the pressure gauge. Replace the cylinder head lubrication screw. Insert a double copper joint	12-17 mm box spanners
	REPLACEMENT OF AN OIL PUMP	
	Removal.	
5	Remove the engine-gearbox assembly (see Op. DS 100-1). Leave the engine-gearbox assembly suspended from a pulley block. Drain the engine oil	21 mm box spanner
6	Remove the sump	12 mm box spanner
7	Remove the carburettor and inlet manifold assembly. Remove the distributor	12 mm box spanner
8	Unscrew the pipe union from the oil pump. Unscrew the pipe union on the cylinder block and rotate the pipe in order to release it	14 - 26 mm spanners
9	Unlock the locknut and unscrew the screw fixing the oil pump. Remove the pump	16 mm box spanner 17 mm spanner
	Refitting.	
10	To fit the oil pump : a) Rotate the crankshaft to top dead centre of 1st cylinder (end of compression). b) Engage the oil pump so that the driving dog for the distributor is parallel with the centre line of the engine, the small side towards the engine after the pump has been placed in position. c) Moderately tighten the pointed screw fixing the pump, so as not to deform the tube, 11 ft/lbs (1.5 m.kg) maximum. Lock the locknut to 22 ft/lbs (3 m.kg)	16 mm box spanner 17 mm spanner
11	Place the piping in position after making sure that the conical union is in the pump. Tighten the pipe union nuts to 43 ft/lbs (6 m.kg) and the locknuts to 29 ft/lbs (4 m.kg)	14—26 mm spanners
12	To fit the sump : See Op. DS 111-1, paragraphs 5-6 and7.	
13	Fit the distributor (see Op. DS 211-1). Fit the carburettor and inlet manifold assembly	12 mm box spanner
14	Fit the engine-gearbox assembly, on the car (see Op. DS 100-1). Fill the engine with oil - 7 pints (4 litres of S.A.E. 20 oil).	

PARTICULAR POINTS

Valve clearance = 0.008 in (0.20 mm) for the inlet and 0.010 in (0.25 mm) for the exhaust.

Adjust the valves of one cylinder with the piston at top dead centre, end of compression, the valves of the corresponding cylinder are then at the point of balance: 1st cylinder, the valves of the 4th cylinder being at the point of balance, 3rd cylinder, the valves of the 2nd cylinder being at the point of balance, 4th cylinder, the valves of the 1st cylinder being at the point of balance, 2nd cylinder, the valves of the 3rd cylinder being at the point of balance.

	ADJUSTING	TOOLS
1	Remove the air filter and pipe assembly	12 – 17 mm box spanners
2	To remove the cylinder head cover (see Pl.1):	
	a) Disconnect the leads from the sparking plugs. Remove the rubber and bakelite caps from the sparking plug tubes.	
	b) Remove the sparking plugs (spanner 1603-T, see Pl. 16, fig. 7) so as to avoid breaking the electrodes when moving the cylinder head cover	Spanner 1603-T
	c) Remove the cylinder head cover, do not mislay the sealing joints (4) of the sparking plug tubes	12 mm box spanner
3	Adjust the clearance of the valve rockers to : 0.008 ins (0.20 mm) for the inlet valves. 0.010 ins (0.25 mm) for the exhaust valves.	
	Adjust the valves of one cylinder with the piston at top dead centre, end of compression. The valves of the corresponding cylinders are then in balance, that is the inlet valve is at the start of admission and the exhaust valve at the end of exhaust. (Turn the engine by means of the starting handle, after having pressed the auxiliary clutch control forward and upwards).	
	Adjust the valves of: 1st cylinder, the valves of the 4th cylinder being at the point of balance. 3rd cylinder, the valves of the 2nd cylinder being at the point of balance. 4th cylinder, the valves of the 1st cylinder being at the point of balance. 2nd cylinder, the valves of the 3rd cylinder being at the point of balance.	
4	To fit the cylinder head cover. With Hermetic, stick the gasket to the cover only. Clean the gasket and its seating on the cylinder head. Clean the joint face, engine side. Make sure that the sealing joints (4) are properly located in the sparking plug tube caps (3). Tighten the nuts fixing the cylinder head cover (leather and plain washers).	12 mm box spanner
5	Fit the air filter and pipe assembly. Tighten the fixing nuts (spring washers). Tighten the hose clip on the pipe to the carburettor	12 – 17 mm box spanners

PARTICULAR POINTS

Removal.

15 *Disengage the push-rods by lifting the inlet rockershaft slightly.*

16 *Remove the cylinder head fitted with the inlet rockershaft.*

Assembly.

19 *Place the cylinder head gasket in position with the crimping towards the cylinder barrels. The old type joints should be smeared with linseed oil before fitting, the new type joints (varnish) are fitted dry.*
Fit the cylinder head, make sure that the two locating dowels are on the cylinder block. The early type engines are not fitted with locating dowels; fit the two end screws, exhaust side, in order to centre the cylinder head gasket.
Slightly raise the inlet rockershaft in order to fit the pushrods.
Tighten the cylinder head fixing screws; 1st tightening 21.75 ft/lb (3 m.kg), 2nd tightening 43.5 ft/lb (6 m.kg) (do not exceed this tightening torsion and observe the order of tightening indicated on Pl. 7. Make sure that the pushrods are correctly positioned).

28 *Tighten the fan fixing screws to 6.5 to 7.25 ft/lb (0.9 – 1 m.kg). Do not exceed this tightening torsion.*

32 *Adjust the valve clearances to: inlet 0.008 in (0.20 mm), exhaust 0.010 in (0.25 mm) (see Op. DS 112-0).*

33 *The cylinder head cover joint should be stuck with Hermetic on the cylinder head cover only (note the direction of fitting).*

34 *Fill the water-cooling system with water, with the heater control open (bleed).*

35 Adjust the idling (see Op. DS 142-0).

		TOOLS
	REMOVAL	
1	Drain the cooling system. Retain the water which contains anti-freeze	21 mm spanner
2	Remove the air filter and pipe assembly	12 - 17 mm box spanners
3	Disconnect the leads from the sparking plugs	
4	To remove the carburettor (see Op. DS 142-1).	
	Remove the screw from the plate fixing the accelerated idling pipe on the hot spot cover plate on the inlet manifold	8 mm spanner

		TOOLS
5	Disconnect the rubber heater tube from the inlet manifold and the rubber feed pipe from the water pump.	
6	On the low pressure system : Disconnect the feed pipe union from the low pressure pump, (lower union). Disconnect the return pipe from the low pressure pump. Protect the clutch from any spillage of fluid.	
7	Remove the water return hose.	
8	Disconnect the high pressure pump feed pipe from the reservoir. Seal the opening. Disconnect the radiator tie-rod from the radiator and water pump	8 – 12 mm box spanners
9	Disconnect the dynamo tie-rod from the water pump. Unscrew the dynamo fixing screw. Remove the fan. Disengage the belts from the water pump pulley. Disconnect the high pressure pump tie-rod from the water pump	12–14 mm box spanners
10	Disconnect the flange coupling the exhaust manifold to the expansion chamber. Disconnect the heater pipe from the water pump cover	8 – 12 mm box spanners 12 mm spanner
12	Remove the rubber and bakelite caps from the sparking plug tubes. Remove the sparking plugs (spanner 1603-T, see Pl. 16, fig. 7)	Spanner 1603-T
13	Remove the cylinder head cover	12 mm box spanner
14	Remove the sealing cups and their rubber joints from the sparking plug tubes.	
15	Completely unscrew the screws fixing the cylinder head. Remove the nuts and the distance pieces (early models) or the caps (7) (new models) (see Pl. 3) from the exhaust valve rockershaft studs; raise the rockershaft slightly to remove the push-rods	Ratchet spanner 12 – 14 mm sockets
16	Remove the cylinder head. Remove the cylinder head gasket (note the centring dowels). Hold the cylinder barrels using two washers placed between the cylinder barrels 1-2 and 3-4 and fixed by a screw	Washers : Internal dia. = 10.5 External dia. = 45
17	Strip down the cylinder head. Remove the exhaust manifold shield and rear plate.	

	ASSEMBLY	TOOLS
18	Assemble the cylinder head Refit the rear plate and exhaust manifold shield (plain and spring washers)	12 mm spanner 12 mm box spanner
19	<u>To fit the cylinder head</u>. Remove the washers holding the cylinder barrels. Fit the cylinder head gasket, previously oiled with boiled linseed oil (early models). The new varnished type gaskets should be fitted dry. Place the crimping of the gasket towards the cylinder barrel. Make sure that the cylinder head dowels are in position. Centre the gasket. Fit the cylinder head. Pay attention to the rockershaft oil feed pipe and the inlet manifold drain pipe. On the early models, fit the two end screws, exhaust side, in order to centre the cylinder head gasket. Disengage the rockers slightly and fit the push-rods (the exhaust push-rods are longer). Fit the caps or distance pieces (early cars) and tighten the nuts on the studs of the exhaust valve rockers. Fit the cylinder head fixing screws, then tighten (torsion spanner 2471-T, see Pl. 7, fig. 2). 1st tightening 21.75 ft/lbs (3 m.kg). 2nd tightening 43.5 ft/lbs (6 m.kg). The torsion of tightening is of the greatest importance. Do not exceed the tightening torsion of 43.5 ft/lbs (6 m.kg). Observe the order of tightening as indicated on Pl. 7 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. NOTE – It is an obligatory procedure to retighten the cylinder head when a distance of 300 miles (500 km) has been covered. 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). 3. After a few thousand miles, proceed to retighten the cylinder head following the same conditions.	12 mm box spanner Torsion spanner 2471-T 14 mm socket
20	Connect the rockershaft oil feed	12 mm box spanner
21	Put the driving belts in position in the grooves of the driving pulleys of the water pump and dynamo. Connect the dynamo tie-rod, tension the belts (see Pl. 35). Tighten the dynamo fixing screws. Tighten the tie-rod screw (plain and spring washers)	12 mm box spanner 14 mm spanner Lever MR-4208 Torsion spanner 2472-T
22	Connect the feed pipe to the low pressure pump (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T or 14 mm spanner
23	Connect the high pressure pump tie-rod to the water pump (spring washer)	12 mm box spanner

		TOOLS
24	To fit the carburettor (see Op. DS 142-1).	
	Refit the accelerated idling pipe to the hot spot cover plate (spring washers)	7 mm box spanner
25	Connect the water hose to the inlet manifold hot spot, to the water pump and to the heater return pipe.	
	Fit the hose clips.	
26	Connect the low pressure pump return pipe.	
	Fit the clips (rubber bush).	
27	Connect the heater outlet pipe to the water pump cover.	
28	Fit the fan. Start the screws by hand, then tighten to 6.5 to 7.25 ft/lbs (0.9 to 1 m.kg). Do not exceed this tightening torsion. Fit the radiator tie-rod (plain and spring washers).	
	Connect the feed pipe to the reservoir	7-12-14 mm box spanners
29	Connect the exhaust pipe to the manifold	12 mm box spanner
30	Fit the sparking plugs (spanner 1603-T, see Pl. 16, fig. 7)	Spanner 1603-T
31	Fit the water return pipe. Fit the clips.	
32	Adjust the rockers (see Op. DS 112-0).	
33	Refit the steel cups and the sealing joints on the sparking plug tubes. Refit the cylinder head cover. If the gasket is renewed, stick it with Hermetic on the cylinder head cover only. Make sure that the gasket and the bearing face of the cylinder head are properly clean.	
	Tighten the nuts (plain and leather washers). Fit the bakelite and rubber caps on the sparking plug tubes. Connect the sparking plug leads	12 mm box spanner
34	Refit the air cleaner. Tighten the clip	12 – 1 mm box spanners
35	Refill the radiator with water. During this operation, unscrew the bleed screw and open the heater control vane.	
36	Start the engine. Unscrew the pressure control valve bleed screw, leave the engine running for a few minutes and retighten the bleed screw. Check the union for leakage.	
	Adjust the slow running (see Op. 142-0).	

PARTICULAR POINTS

Dismantling.

1 *Since the cylinder head is made of aluminium, one cannot replace he sparking plug tubes or the valve seats without he use of special tools. Do not remove the studs.*
One can replace the valve guides (see paragraph 2). If a thread is damaged (except sparking plug holes) it is possible to replace it by a "Heli-Coil" thread (see note MR-4279).

Assembly.

7 *Characteristics of the valve springs.*
Outer springs: L = 37 mm under load of 24.200±1.350 kg and L = 28.5 mm under load of 52 ± 2.800 kg.
Inner springs L = 24.5 mm under load of 5.250 ± 0.300 kg and L = 16 mm under load of 11 ± 0.600 kg.

8 *Do not fit the rubber sealing ring on the exhaust valves*

	TOOLS
DISMANTLING	
1 Stripping down the cylinder head (see Pl. 3).	
a) Remove the short screws fixing he cylinder head, the inlet rockershaft and the rockershaft supports.	
b) Stripping the inlet rockershaft assembly :	
Remove the fixing screws (5), the caps (33), the washers (38), the springs (39), the rocker arms (34 and 35). Drive out the plugs from the rockershaft by means of a pin punch passing through the fixing screw holes. Clean the interior of the shaft using a metal pin and make sure that the lubrication holes of the inlet and exhaust shafts as well as those of the rocker arms and shaft supports are clear.	
c) Remove the water pump and water pump cover	12-14-17 mm box spanners
d) Remove the exhaust manifold and the manifold screen fixing brackets.	
Remove the inlet manifold	12 mm box spanner
e) Remove the valves (spring compressor 1614-T, and support and base assembly 161-T, see Pl. 5)	Spring compressor 1614-T
f) Remove the rear closing plate.	12 mm box spanner

TOOLS

NOTE – Since the cylinder head is made of aluminium, one cannot replace the sparking plug tubes or the valve seats without the use of special tools. Avoid removing the studs. It is however possible to replace a stripped or damaged thread by a "HELI-COIL" thread, see note MR-4279

2 To replace the valve guides (Fixture 1644-T, see Pl. 9)

a) To withdraw the faulty guide or guides (see Pl. 8, fig.1) :
Place the screw (D) in the guide to be withdrawn by inserting it through the combustion chamber.
Place the tube (C) and the washer (B) in position and screw the nut (A) on the screw (D). Grease the thread of the screw (D) and the faces of the washer (B) with tallow.
Hold the screw (D) and tighten the nut (A) until the guide is withdrawn.

b) To refit a new guide.

On the screw (D) fit the socket (E) (for the inlet guide, see Pl. 8, fig. 2) or the socket (G) (for the exhaust valve guide, see Pl. 8, fig. 3).
Insert the screw (D) together with the socket (E or G) in the guide bore.
Insert the screw, socket and guide assembly through the combustion chamber and put the socket (F), the washer (B) and the nut (A) in position. Grease the thread of the screw (D) and the faces of the washer (B) with tallow.
Hold the screw (D) and tighten the nut (A) after making sure that the guide is correctly positioned (see l. 8, fig. 2 and 3), the lowest part of the end of the guide must be directed towards the centre of the combustion chamber. If necessary, make a reference mark at this point with a spot of paint before fitting the guide.
Tighten the nut (A) until the bearing face of the socket (E o G) rests on the face of the valve seat (the latter must be clean)

Fixture 1644-T
17 mm spanner

c) Reamer the new valve guides to a diameter of $9 \pm \begin{matrix} 0.015 \text{ mm} \\ 0.010 \text{ mm} \end{matrix}$ (reamer 1642-T, see Pl. 9, fig. 2).

Check the bore with a "GO-NO GO" plug gauge or failing this, with a valve stem. Too much clearance leads to excessive oil consumption

Reamer 1642-T

3 To grind the valves (valve grinder, Black and Decker type).

NOTE – The face angle of the inlet valve is 120°.
The face angle of the exhaust valve is 90°
Chamfer the corners of the valve heads to approximately 0.5 mm (at "a" and "b", see Pl. 4, fig. 3).

4 To grind the valve seats (see Pl. 4).

NOTE – The width "l" of the seat must be between 0.9 and 1.5 mm (see fig. 3).
In order to obtain these dimensions, use the following grinding wheels :

Inlet valve seating:

For the seating	120°	wheel	1662-T
For the top clearance	150°	biconical wheel	1630-T
For the bottom clearance	90°	biconical wheel	1630-T

TOOLS

Exhaust valve seating:

For the seating	90°	wheel	1627-T
For the top clearance	150°	biconical wheel	1627-T
For the bottom clearance	60°	biconical wheel	1633-T

Wheels 1627-T, 1633-T

It is essential that the large diameter seating must be equal to the largest diameter of the valve (see fig. 1 and 2).

5 Grind the valves (suction valve grinder 1615-T, see Pl. 4 fig. 4).

This attachment can be driven by an electrically, pneumatically or manually operated grinder . . . . . Suction valve grinder 1615-T

6 Clean the cylinder head with great care so as to eliminate all traces of emery in the valve chambers or gas passages. This operation must be carried out with very great care. Powdered emery (even in very small quantities) entering the engine, will cause rapid wear.

ASSEMBLY

7 <u>To calibrate the valve springs</u> (spring calibration fixture 2420-T, see Pl. 6).

a) Outer springs :
Length = 37 mm under load of 24.2 ± 1.350 kg.
Length = 28.5 mm under load of 52 ± 0.600 kg.

b) Inner springs :
Length = 24.5 mm under load of 5.250 ± 0.300 kg.
Length = 16 mm under load of 11 ± 2.800 kg. . . . . Spring calibration fixture 2420-T

8 <u>To assemble the cylinder head</u> (see Pl. 3) :

a) Fit the valves (spring compressor 1614-T and support and base assembly 1616-T, see Pl. 5).

Oil the faces and stems of the valves. Place the valves in position, fit a sealing ring (30) on the stems of the inlet valves only (see fig. 2).

For each valve, fit one thrust washer (31) for the outer spring and one shouldered thrust washer (32) for the inner spring.

Fit the exhaust valve springs. Fit the spring thrust cups, the cup retaining the split cotters, the split cotters (see fig. 4) . . . . . Spring compressor 1614-T
Support and base assembly 1616-T

NOTE – It is important not to fit sealing rings on the exhaust valves.

TOOLS

b) To assemble the inlet rockershaft assembly (see Pl. 3) :

Oil the inlet rockershaft (40) and with the lubrication holes facing downwards (on valve side), commence fitting at the front :

1 long screw (5) together with the shaft fixing cap (33).
1 washer (38).
1 spring (39).
1 left-hand rocker (34).
1 washer (38).
1 long screw together with cap.
1 washer.
1 right-hand rocker (35).
1 spring.
1 washer.
1 long screw together with cap.
1 long screw together with cap.
1 washer
1 spring
1 left-hand rocker.
1 washer.
1 long screw together with cap.
1 washer.
1 right-hand rocker.
1 spring.
1 washer.
1 long screw together with cap.

c) Fit the brackets and the inlet rockershaft, on the cylinder head.

d) Fit the water pump cover, inserting a joint smeared with Hermetic. Fit the water pump, inserting a joint smeared with Hermetic. Tighten the fixing screws and nuts.

e) Fit the rear closing plate, inserting a joint smeared with Hermetic.

f) Fit the exhaust manifold, inserting copper and asbestos gaskets, fit the manifold screen fixing brackets (the upper bracket which is the longest is fitted at the front). Tighten the fixing nuts (spring washers).

g) Fit the inlet manifold, inserting the gaskets . . . . . 12 mm spanner
12 mm box spanner
14-17 mm box spanners

PARTICULAR POINTS

Replacement of an inlet rocker assembly.

Removal.

1 *Drain the radiator and the cylinder block.*

4 *It is necessary to remove the last exhaust rockershaft, in order to allow the removal of the last fixing screw of the inlet rockershaft and the cylinder head (remove the 4th exhaust rockershaft, the first five fixing screws of the inlet rockershaft, the washer and the spring of the 1st inlet rocker, in order to disengage the inlet rockershaft with its rear bracket).*

Assembly

8 *Make sure that the cylinder head fits correctly on the centering dowels.*
When fitting the inlet rockershaft and rear bracket assembly, position the lubrication holes of the rockershaft towards the bottom, valve side.
Tighten the cylinder head: 1st tightening 21.75 ft/lb (3 m.kg), 2nd tightening 43.5 ft/lb (6 m.kg) (do not exceed the tightening torsion and observe the order of tightening indicated on Pl.7. Make sure that the push rods are correctly positioned).

10 *Adjust the valve rocker clearances: inlet = 0.008 in (0.20 mm), exhaust 0.010 in (0.25 mm) (see Op. 112-0).*

14 *Fill the water cooling system, the vane of the heater control open (bleed).*

Replacement of an exhaust valve rocker assembly.

In order to replace a bracket, it is necessary to remove the inlet rockershaft (see above).

Replacement of an inlet valve sealing ring or spring.

Removal.

29 *Drain the radiator and cylinder block. Unscrew the cylinder head fixing screws.*
Raise the inlet rockershaft, in order to disengage the push-rod of the valve in question and put the rockershaft in position.

30 *With piston of the valve in question at top dead centre, release the rocker at the side, place the collar MR-4244 in position and compress the valve springs.*
If necessary, release the cup retaining cotters with a light tap with a hammer.

Assembly.

33 *Raise the inlet rockershaft, in order to put the removed push-rod into position (see paragraph 29).*

34 *Tighten the cylinder head: 1st tightening 21.75 ft/lb (3 m.kg), 2nd tightening 43.5 ft/lb (6 m.kg) (do not exceed the tightening torsion and observe the order of tightening indicated on Pl.7. Make sure that the push rods are correctly positioned).*

35 *Check the valve rocker clearances: inlet = 0.008 in (0.20 mm), exhaust 0.010 in (0.25 mm) and adjust if necessary.*

Replacement of a valve spring.

This operation is only an emergency repair. If the engine has been running for some time, the valve will have to be refaced. For the dismantling and assembly proceed as indicated in paragraph 29 (replacement of sealing ring).

Cleaning a cylinder head filter.

This operation should be carried out after every 3,700 miles (6,000 km) approximately. Wash the filter element in petrol, then immerse in engine oil and refit.

		TOOLS
	REPLACEMENT OF AN INLET ROCKERSHAFT ASSEMBLY	
	Removal (see Pl. 1).	
1	Drain the radiator and cylinder block, retain the water which contains anti-freeze	21 mm spanner
2	Remove the air filter and tube assembly	12-17 mm box spanners
3	Disconnect the lead from the sparking plugs. Remove the rubber and bakelite caps from the sparking plug tubes.	
	Remove the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7) as a precautionary measure	Spanner 1603-T
4	Remove the cylinder head cover, the sealing joint (4) and the cup (3) of the 4th sparking plug tube. In order to remove the inlet rockershaft assembly, it is necessary to remove the last exhaust rockershaft bracket so that the last fixing screw of the inlet rockershaft and the cylinder head can also be removed.	
	Unscrew the fixing screws (5) of the inlet rockershaft, and the screws fixing the cylinder head, right-hand side.	
	Remove the 4th rockershaft, the first five screws fixing the inlet rockershaft and their caps, the washer and the spring of the first inlet rocker	12-14 mm box spanners
5	Remove the inlet rockershaft assembly and rear bracket (6) of the inlet and exhaust rockershafts.	
6	To strip the rockershaft (see Pl. 3).	
	Remove the fixing screw (5) and its cap (33), the springs (39), the rockers (34 and 35).	
	Drive out the plugs of the shaft (40) with a in punch passing through the holes for the fixing screws. Carefully clean the inside of the shaft with a metal pin and make sure that the lubrication holes in the shaft are clear.	

		TOOLS
	Assembly (see Pl. 1).	
7	To assemble the rockershaft (see Pl. 3) :	
	Fit the plugs to the shaft (40) and tin solder.	
	Place in position on the shaft (previously oiled, and with the lubrication holes facing downwards, valve side, (see fig. 3), commencing from the front :	
	1 left-hand rocker (34). 2 washers (38). 1 right-hand rocker (35). 1 spring (39). 2 washers 1 spring (39) 1 left-hand rocker (34). 2 washers (38). 1 right-hand rocker (35). 1 spring (39). 1 washer (38). 1 long screw (5) together with its cap (33). Hold each assembly of spring (39) and washer (38) with a yoke (yoke MR-4158-20, see Pl. 5, fig. 3) in order to avoid tightening the caps (33) on the washers (38), this can cause damage to the shaft	Yoke MR-4158-20
8	Make sure that the cylinder head is properly located on the locating dowels and that the intermediate supports (41) are in position on the cylinder head. Fit the rockershaft and rear brackets assembly. Fit the shaft in position on the other brackets. Fit the spring (39) and the washer (38) of the first rocker. Fit the first five fixing screws (5) together with their cap (33). Offer up the rockershaft fixing screw and the cylinder head fixing screws, right-hand side. Remove the retaining yoke from the assembly of the spring(39) and washer (38). Tighten the cylinder head fixing screws (torsion spanner 2471-T, see Pl. 7, fig. 2): 1st tightening 21.75 ft/lbs (3 m.kg) 2nd tightening 43.5 ft/lbs (6 m.kg).	
	NOTE – It is an obligatory procedure to retighten the cylinder head when a distance of 300 miles (500 km) has been covered, then 1,250 miles (2000 km) (see Op. DS 112-1, paragraph 19, NOTE).	
	The tightening torsion is of great importance. Observe the order of tightening (see Pl.7, fig. 1). During the tightening, make sure that the tappet adjusting screws are properly located in the sockets of the push-rods	Torsion spanner 2471-T 14 mm socket
9	Fit the 4th rockershaft. Tighten the fixing nuts, inserting the caps or distance pieces	12 mm box spanner
10	Adjust the valve rocker clearance, 0.008 ins (0,20 mm) for the inlet and 0.010 ins (0,25 mm) for the exhaust (see Op. DS 112-0).	

		TOOLS
11	Fit the cups (3) and the sealing joints (4) on the sparking plug tubes (see Pl. 1). Fit the cylinder head cover, secure the gasket with Hermetic to the cylinder head cover only. Check that the gasket and the bearing face on the cylinder head cover are properly clean. Tighten the fixing nuts (leather and plain washers	12 mm box spanner
12	Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7). Fit the bakelite and rubber caps on the sparking plug tubes. Connect the sparking plug leads	Spanner 1603-T
13	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers). Tighten the collar securing the piping on the carburettor	12-17 mm box spanners
14	Fill the radiator. During this operation , open the vane of the heater control and bleed the water system.	

REPLACEMENT OF AN EXHAUST ROCKER ASSEMBLY

Removal (see Pl. 1 and 3).

15	Remove the air filter and tube assembly	12-17 mm box spanners
16	Disconnect the leads from the sparking plugs. Remove the rubber and bakelite caps from the sparking lugs. Remove the 4th sparking plug as a precautionary measure (spanner 1603-T, see Pl. 16, fig. 7)	Spanner 1603-T
17	Remove the cylinder head cover, the sealing joints (4) and the cups (3) from the sparking plug tubes	12 mm box spanner
18	Remove the rockershaft assembly fixing nuts. Remove the rockershaft and the caps (7) or the distance pieces . . .	12 mm box spanner
19	To strip the rockershaft assembly : Remove the washer (29), the spring (37) or the adjusting washer (1st arrangement), the rocker (36 or 38). Remove the expanding washer from the shaft with a punch. These washers must be renewed after each dismantling operation. Carefully clean the inside of the shaft with a metal pin and make sure that the lubrication holes are not blocked.	

NOTE – To replace a bracket, it is necessary to remove the inlet rockershaft (see paragraphs 4 and 5, this operation).

		TOOLS
	Assembly (see Pl. 1 and3).	
20	To assemble the rockershaft assembly :	
	a) Before assembly, smear the expanding washer seating face with Hermetic.	
	b) To fit the rockershaft assembly :	
	1st and 3rd cylinders : place on the shaft, starting from the front, a spring (37), the rocker (38) and a washer (29).	
	2nd and 4th cylinders : place on the shaft starting from the front, a washer (29), the rocker (38), a spring (37).	
	NOTE – On cars produced before April 1956, if the shafts are to be removed, fit a new smooth type model.	
21	Place the shaft in position on its bracket, with the lubrication hole towards the bottom. Fit the caps (7) on the fixing studs. Tighten the nuts; when tightening, make sure that the tappet adjusting screws are properly located in the sockets of the push-rods	12 mm box spanner
22	Adjust the valve rocker clearance to 0.008 ins (0.20 mm) for the inlet valves and 0.010 ins (0.25 mm) for the exhaust valves (see Op. DS 112-0).	
23	Fit the cups (3) and the sealing joints (4) on the sparking plug tubes. Fit the cylinder head cover, secure the gasket with Hermetic to the cover only.	
	Tighten the fixing nuts (leather and plain washers)	12 mm box spanner
24	Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7). Fit the bakelite and rubber caps on the sparking plug tubes. Connect the sparking plug leads	Spanner 1603-T
25	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers).	
	Tighten the clip securing the pipe to the carburettor	12-17 mm box spanners
	REPLACEMENT OF AN INLET VALVE SEALING RING OR A SPRING	
	Removal.	
26	Remove the air filter and pipe assembly	12-17 mm box spanners
27	Disconnect the leads from the sparking plugs. Remove the rubber and bakelite caps from the sparking plug tubes. Remove the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7) as a precautionary measure. Remove the cylinder head cover	Spanner 1603-T
28	Remove the rubber joints (4) and the cups (3) (see Pl. 1)	

		TOOLS
29	Drain the radiator and cylinder block. Save the water which contains anti-freeze. Unscrew the cylinder head fixing screws. Unscrew the inlet rockershaft fixing screws. Raise the rockershaft and disengage the push-rod of the valve in question. Replace the rockershaft and tighten the fixing screws moderately. When tightening, make sure that the spherical ends of the adjusting screws are engaged in the sockets of the push-rods.	21 mm spanner 14 mm box spanner
30	Release the rocker at the side, place the collar MR 4244 in position (see Pl. 17 fig. 4). With the piston of the valve in question at top dead centre, compress the valve spring (spring compressor 1614-T, see Pl. 5). If necessary, free off the split cotters by lightly tapping on the edge of the cup with a hammer	Collar MR-4244 Spring compressor 1614-T
31	Remove the split cotters, the upper spring retaining cup, the springs and the sealing ring (30) (see Pl. 3, fig. 2).	
	<u>Assembly</u> (see Pl. 3).	
32	Make sure that the thrust washers (31 and 32) for the springs are in position. Put in position the sealing ring (30), then the springs and upper thrust cap.	
33	Fit the split cotters (collar MR-4244 and spring compressor 1614-T, see Pl. 17, fig. 4). Raise the inlet rockershaft and fit the push-rod removed in paragraph 29	Collar MR-4244 Spring compressor 1614-T
34	Offer up the cylinder head fixing screws and tighten (torsion spanner 2471-T, see Pl. 7, fig. 2). 1st tightening 21.75 ft/lbs (3 m.kg), 2nd tightening 43.5 ft/lbs (6 m.kg). On no account must the tightening torsion of 43.5 lbs (6 m.kg) be exceeded. Observe the sequence of tightening the screws (see Pl. 7, fig.1). During the tightening, make sure that the tappet adjusting screws are properly located in the sockets of the push-rods.	Torsion spanner 2471-T 14 mm socket
	NOTE – It is an obligatory procedure to retighten the cylinder head when a distance of 300 miles (500 km) has been covered, then 1,250 miles (2000 km) (see Op. DS 112-1, paragraph 19, NOTE).	
35	Check the valve rocker clearances 0.008 ins (0.20 mm) for the inlet valves and 0.010 ins (0.25 mm) for the exhaust valves. If necessary, re-adjust (see Op. DS 112-0).	
36	Fit the cups (3) and the rubber joints (4) on the sparking plug tubes (see Pl. 1). Fit the cylinder head cover, securing the gasket with Hermetic to the cover only. Tighten the nuts (leather and plain washers). Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7), the bakelite and rubber caps. Connect the sparking plug leads	12 mm box spanner Spanner 1603-T

		TOOLS
37	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers). Tighten the clips fixing the piping on to the carburettor	12-17 mm box spanners
	REPLACEMENT OF A VALVE SPRING	
	NOTE – This operation is only an emergency repair. If the engine has been running for some time with a broken valve spring, the valve will have to be refaced (see Op. DS 112-3).	
	Replacement of an inlet valve spring.	
38	See paragraphs 26 to 37, this operation.	
	Replacement of an exhaust valve spring (see Pl. 3).	
	Removal.	
39	Remove the cylinder head cover (see paragraphs 15 to 17, this operation).	
40	Remove the rockershaft. Strip the shaft, disengage the washer (29), the rocker (36 or 38), the spring (37)	12 mm box spanner
41	Provisionally fit the shaft. Put the caps (7) or the distance pieces in position and tighten the nuts	12 mm box spanner
42	Move the piston, corresponding to the valve, to top dead centre.	
	Remove the split cotters, the cotter retaining cup, the spring upper thrust cup, the springs (collar MR-4244 and spring compressor 1614-T, see Pl. 17, fig. 4)	Collar MR-4244 Spring compressor 1614-T
	Assembly	
43	Make sure that the spring thrust washers (31 and 32) are in position. Fit the new springs and the upper spring housing cup.	
	Compress the assembly (collar MR-4244 and spring compressor 1614-T, see Pl. 17, fig. 4) and fit the split cotter retaining cup and the split cotters	Collar MR-4244 Spring compressor 1614-T
	NOTE – No sealing ring should be fitted on the exhaust valve.	
44	Remove the shaft from the cylinder head :	
	Fit the washer (29), the rocker (36 or 38), the spring (37) or fit an adjusting washer and the rocker in order to obtain a side clearance of 0.3 mm maximum (cars produced before April, 1956). Fit the rockershaft on its bracket the lubrication holes located towards the bottom, fit the caps (33) or the distance pieces and tighten the rocker-shaft fixing nuts. Make sure that the tappet adjusting screws are properly located in the sockets of the push-rods.	12 mm box spanner

TOOLS

45 Adjust the valve rocker clearance (see Op. DS 112-0).

46 Refit the cylinder head cover and the air filter (see paragraphs 23 to 25, this operation).

CLEANING A CYLINDER HEAD COVER FILTER (see Pl. 1).

NOTE – The filter element should be cleaned after every 3,700 miles (6000 km) approximately, (when the car is used on normal roads).

47 Unscrew the knurled nut (49). Remove the cover (50) and disengage the filter element (51).

48 Clean the parts. Wash the filter element (51) in petrol. Brush the filter element and blow with compressed air. Then immerse in engine oil and allow to drain.

49 Replace the filter element (51) on the cylinder head cover. Fit the cover (50) and tighten the nut (49).

PARTICULAR POINTS

Replacement of a timing chain or timing pinions.

On assembly align the reference marks (punch marks). A straight line passing through the centre-line of the pinions.

Tighten the crankshaft pinion nut to 145 ft/lb (20 m.kg) and the camshaft pinion nut to 110 ft/lb (15 m.kg) (lockwashers).

Replacement of a camshaft.

Assembly.

12 Insert a ring seal in the front groove of the camshaft.
Tighten the screws of the rear thrust flange to 7.5 ft/lb (1 m.kg) (lockwashers).

18 Tighten the cylinder head fixing screws: 1st tightening 21.75 ft/lb (3 m.kg), 2nd tightening 43.5 ft/lb (6 m.kg) (do not exceed this tightening torsion and observe the sequence of tightening indicated on Pl. 7. Make sure that the push-rods are correctly positioned).

19 Adjust the valve rocker clearance: inlet 0.008 in (0.20 mm) and exhaust 0.010 in (0.25 mm) (see Op. 112-0).

27 Fill up the engine with oil: 7 pints (4 litres) S.A.E. 20 engine oil.

Replacement of a tappet.

Removal.

37 It is preferable to replace the tappets one at a time (extractor 1608-T, see Pl. 17, fig. 1).

Refitting.

40 Tighten the cylinder head: see paragraph 18 above.
Adjust the valve rocker clearance: see paragraph 19 above.

48 Refill with water, the heater control vane open (bleed).

49 Adjust the slow running (see Op. DS 142-0).

	REPLACEMENT OF A TIMING CHAIN OR TIMING PINIONS	TOOLS
	Removal.	
1	Remove the engine-gearbox assembly (see Op. DS 100-1).	
2	Remove the timing case	12 mm box spanner
3	To remove the timing chain and pinion assembly :	
	a) Retain the pinions of the crankshaft and camshaft by means of the setting gauge 1680-T (see Pl. 15, fig. 2)	Setting gauge 1680-T

		TOOLS
	b) Turn back the lockwashers and unscrew the pinion fixing nuts (spanner 1731-T for the camshaft nut, see Pl. 15, fig. 3 and spanner 1667-T for the crankshaft nut, see Pl. 15, fig. 1)	Spanner 1731-T Spanner 1667-T
	c) Remove the setting gauge 1680-T	
	d) Remove the timing chain and pinion assembly from the engine.	
	Assembly.	
4	Place the two pinions of the crankshaft and camshaft on a bench.	
	Align the reference on the two pinions. A straight edge passing through the centre lines of the two pinions must pass through the reference mark (punch mark on a tooth) of the camshaft pinion and through the reference mark (punch mark between two teeth) of the crankshaft pinion. One can also use the setting gauge 1680-T (see Pl. 15, fig. 2), for alignment of the reference marks.	
	Then fit the chain on the two pinions	Setting gauge 1680-T
5	To fit the timing chain and pinion assembly :	
	a) Without displacing the pinions, offer up the assembly on the engine.	
	b) Rotate the camshaft by means of its pinion, so that the keyways on the pinions and shafts correspond.	
	c) Fit the chain and pinion assembly, making sure that the keys are properly located on the camshaft and the crankshaft.	
6	Retain the crankshaft by means of the setting gauge 1680-T (see Pl. 15, fig.2).	
	Tighten the camshaft nut to 110 ft/lbs (15 m.kg) (spanner 1731-T, see Pl. 15, fig. 3) (insert a lockwasher).	
	Tighten the crankshaft nut to 145 ft/lbs (20 m.kg) (spanner 1667-T, see Pl. 15, fig. 1) (insert a lockwasher).	
	Remove the setting gauge 1680-T and turn down the lockwashers on the nuts	Setting gauge 1680-T Spanner 1731-T Spanner 1667-T
7	Fit the timing cover inserting a gasket. Tighten the fixing screws to 11 ft/lbs (1.5 m.kg) and fit a brass washer under the head of the three screws projecting inside the timing cover or smear the base of the screw head with Hermetic (new type screws have a circular base).	12 mm box spanner
8	Fit the engine-gearbox assembly on the vehicle (see Op. DS 100-1).	
	REPLACEMENT OF A CAMSHAFT	
	Removal (see Pl. 1).	
9	Remove the engine-gearbox assembly (see Op. DS 100-1).	
10	Remove the sump, distributor and oil pump (see Op. DS 111-4, paragraphs 5 to 9).	

		TOOLS
11	Place the engine-gearbox assembly on a stand (stand 2497-T, see Pl. 19)	Stand 2497-T
31	Remove the air filter and tube assembly. Remove the cylinder head cover	12-17 mm box spanners
32	To remove the cylinder head (see Op. DS 112-1, paragraphs 3 to 16).	
33	Remove the tappets (extractor 1608-T, see Pl. 17, fig. 1)	Extractor 1608-T
34	Remove the timing cover	12 mm box spanner
35	Remove the timing chain and pinion assembly (see paragraph 3, this operation). Remove the key from the camshaft.	
36	Remove the screws fixing the camshaft thrust flange (15). Remove the flange (15)	12 mm box spanner
37	Remove the petrol pump	14 mm box spanner
38	Withdraw the camshaft from the rear of the engine.	
	Assembly (see Pl. 1).	
39	Fit the ring seal (47) in the groove on the splined portion of the camshaft. Oil the bearing surfaces of the camshaft and engage it from the rear of the engine.	
	Fit the rear thrust flange (15), tighten the screws to 7.2 ft/lbs (1 m.kg) and turn down the lock-tabs	12 mm box spanner
40	Fit the timing chain and pinion assembly, fit the timing cover (see paragraphs 4 to 7, this operation).	
41	Fit the petrol pump, inserting a cork joint. Tighten the fixing nuts (spring washers)	14 mm box spanner
42	Fit the tappets, previously oiled (extractor 1608-T, see Pl. 17, fig. 1)	Extractor 1608-T
43	Fit the cylinder head (see Op. DS 112-1, paragraphs 19 and 20).	
44	Adjust the valve rocker clearances (see Op. DS 112-0).	
45	Fit the steel cups (3) and the rubber joints (4) on the sparking plug tubes.	
	Fit the cylinder head cover, using Hermetic to secure the gasket to the cover only. Tighten the fixing nuts (plain and leather washers).	
	Fit the air filter and tube assembly. Tighten the fixing nuts (spring washers)	12-17 mm box spanners
46	Fit the accelerated idling control	8 mm ring spanner

		TOOLS
47	Fit the water pump and dynamo driving belt. Tension the belt, tighten the screw fixing the dynamo and the nut fixing the tie-rod on the dynamo (Op. DS 231-0)	14 mm spanner 14 mm ring spanner 12 mm box spanner
48	Connect the petrol feed pipe to the carburettor.	
31	Fit a covered chain around the water pump cover (chain 1697-T, see Pl. 51) and raise the engine on a pulley block	Chain 1697-T
32	Fit the oil pump (see Op. DS 111-4, paragraphs 10 and 11).	
33	Fit the sump (see Op. DS 111-4, paragraphs 5 to 7)	
34	Fit the contact breaker (see Op DS 211-1, paragraphs 14-18).	
35	Fit the engine-gearbox assembly on the car (see Op. DS 100-1). Fill the engine with oil, 7 pints (4 litres) SAE 20 oil.	

REPLACEMENT OF TAPPETS

Removal.

36	Drain the cooling system (radiator and cylinder block). Retain the water which contains anti-freeze	21 mm spanner
37	Remove the air filter and tube assembly	12-17 mm box spanners
38	Remove the cylinder head (see Op. DS 112-1, paragraphs 3 to 16).	
39	Remove the tappets (extractor 1608-T, see Pl. 17, fig. 1). NOTE – It is advisable to replace the tappets one at a time, otherwise the replacement tappet may fall into an empty bore upside down. In this position, it would be almost impossible to recover without dismantling the engine.	Extractor 1608-T

Assembly (see Pl. 1).

40	Fit the tappets, previously oiled (extractor 1608-T, see Pl. 17, fig 1)	Extractor 1608-T
41	Fit the cylinder head (see Op. DS 112-1, paragraphs 19 and 20).	
42	Adjust the valve rocker clearances (see Op. DS 112-0).	

		TOOLS
43	Fit the flange coupling the exhaust downpipe to the pipe	12 mm box spanner
44	Fit the accelerated idling control, insert the rubber sleeve and turn down the plate on the pipe	
45	Fit the water pump and dynamo belt in position. Fit the dynamo tie-rod, tension the belt (see Op. DS 231-0) and tighten the dynamo fixing screw and the nut fixing the tie-rod on the dynamo (plain and spring washers)	12 mm spanner 12 mm box spanner 14 mm ring spanner
46	Connect the petrol feed pipe, the choke control and the accelerator control to the carburettor.	
47	Fit the sealing cups (3) and the rubber joints (4) on the sparking plug tubes. Fit the cylinder head cover. If the gasket has to be renewed, secure it with Hermetic to the cylinder head cover only. Tighten the fixing nuts (leather and plain washers)	 12 mm box spanner
48	Fit the 4th sparking plug (spanner 1603-T, see Pl. 16, fig. 7). Fit the bakelite and rubber caps on the sparking plug tubes. Connect the caps to the sparking plugs	Spanner 1603-T
49	Fit the air filter and tube assembly (spring washers under the fixing nuts)	12-17 mm box spanners
50	Fill the radiator, the vane of the heater control open. Bleed. Check the joints for leakage (water and oil).	
51	Adjust the slow running (see Op. DS 142-0).	

		TOOLS
	ADJUSTMENT (see Pl. 24).	
	IMPORTANT NOTE – This operation should not be carried out on cars produced after July 1959.	
1	Raise the car on a lift or put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
2	<u>To adjust the left-hand mounting</u> :	
	Hold the rubber block adjusting nut (5) with the spanner 1700-T	
	Loosen the locknut (12) with the spanner 1699-T. Tighten or loosen the adjusting nut until the fibre and rubber washer (9) turns freely without play (spanner 1700-T).	
	Tighten the locknut (12) (spanner 1699-T)	Spanner 1700-T Spanner 1699-T
3	<u>To adjust the right-hand mounting</u> :	
	Proceed in the same manner but hold the adjusting nut (5) with the spanner 1699-T and loosen the locknut (12) with the spanner 1982-T	
	Check that the nuts fixing the mounting to the body are tight	Spanner 1699-T Spanner 1982-T 12 mm ring spanner
4	Lower the car to the ground.	
5	Check that the nut (1) locking the arm (2) is tight (see fig 2)	23 mm box spanner

PARTICULAR POINTS

Replacement of a front upper crossmember.

Assembly.

11 *Between the sidemembers and the crossmembers insert the number of shims required to give a difference in the measurement between the brake disc and the sidemembers, on the left-hand side which should be greater by 70 ± 2 mm than the same dimension measured on the right-hand side.*

17 *Fill the radiator, heater control vane open. Bleed the system. Make sure that the hot water circulates.*

Replacement of a rear flexible mounting (cars produced before July 1959).

Removal.

It is necessary to remove the threaded spindle downwards from the car and the flexible mounting upwards from the car, after having measured the distance "a" (see Pl. 24) between the bearing face for of the engine support arm on the upper nut and the bearing face of the flexible mounting on the steel support fixed on the body.

Assembly.

31-34 *Insert the threaded spindle (fitted with the lower parts) from underneath the car, in the flexible mounting and screw the bearing nut of the engine support arm, until the dimension "a" measured when dismantling, is obtained.*

38 *Check the adjustment of the engine mountings (see Op. DS 133-0).*

Replacement of a rear flexible mounting (cars produced since July 1959).

It is necessary to remove the flexible mounting and rear support assembly from the engine.

Pre-adjustment of a rear flexible mounting (cars produced before July 1959).

41 *Bring the rubber washer in contact with the flexible mounting bracket and tighten the lower cupped nut 8 complete turns (10 mm).*

Pre-adjustment of a rear flexible mounting (cars produced since July 1959).

Work on the lower cap, in order to obtain a dimension of 98 mm between the upper face of this cap and the lower bearing face of the flexible mounting on the body support.

Replacement of a rear support (cars produced before July 1959).

Removal.

It is necessary to remove the flexible mounting (see above) and its threaded spindle.

Assembly.

Lower the engine then displace the support and flexible mounting, in order to centralise the parts in relation to the support arm on the engine. Check the adjustment of the engine mountings (see Op. DS 133-0).

Replacement of a rear support (cars produced since July 1959).

It is necessary to remove the flexible mounting and rear support assembly from the engine.

		TOOLS
	REPLACEMENT OF AN UPPER FRONT CROSSMEMBER	
	Removal.	
1	Drain the radiator retaining the water which contains anti-freeze.	
2	Remove the spare wheel, the support bar, the front wings	12-14 mm spanners 12-14 mm box spanners
3	Remove the battery, the battery tray, the straps from the hydraulic fluid reservoir and the battery support	8-12 mm box spanners
4	Remove the radiator tie-bar. Disconnect the water pump return hose from the radiator and disconnect the hose between the radiator and steel pipe from the steel pipe	8-12 mm box spanners
5	Loosen the screw holding the fixing plate on the pressure regulator and pivot the plate towards the front.	
6	Remove the radiator fixing screws on the lower front crossmember. Remove the distance pieces. Remove the radiator	12-14 mm box spanners
7	Pass a covered chain (chain 1697-T, see Pl. 51) around the water pump cover and support the engine-gearbox assembly either by means of a stand (stand 1697-T, see Pl. 51) or by means of a pulley block.	Chain 1696-T Stand 1797-T
8	Remove the cups of the flexible half collars between the upper and lower crossmembers, remove the upper flexible half collars	14 mm box spanner
9	Remove the screws securing the upper crossmember to the sidemembers and remove the crossmember, Withdraw the adjusting shims between the crossmember and sidemember	14 mm box spanner

		TOOLS
	Assembly.	
10	Slightly raise the engine-gearbox assembly and offer up the upper crossmember. Place the upper flexible half collars and caps in position. Insert and tighten the screws securing the crossmember on the support arms, inserting locking tabs and tuning down on the screws	14 mm box spanner
11	Lower the engine-gearbox assembly until the crossmember rests on the sidemember. The difference in the measurements between the brake disc and the sidemember, on the left-hand side should be greater by 70 ± 2 mm than the same dimension measured on the right-hand side.	
	Between the sidemembers and the crossmember, insert the number of shims required to give this dimension, the crossmember must be a good fit between the sidemembers. Tighten the screws securing the crossmember to the sidemembers (plain and spring washers under the heads of the screw).	
	Withdraw the chain and remove the stand	14 mm box spanner
12	Make sure that the rubber blocks are in position on the supports on the crossmember and place the radiator in position.	
	Connect the hoses and tighten the clips.	
	Place he distance piece between the exhaust downpipe bracket and radiator in position and the distance piece	
	Between the regulator support and the radiator (the longer distance piece is fitted on the exhaust downpipe bracket side). Insert the fixing screws and centre the radiator; the fan blades must not touch the cowling. Tighten the radiator fixing screws (plain and spring washers)	14 mm box spanner
13	Fit the radiator tie-bar. Tighten the fixing screw and nut (plain and spring washers)	12 mm spanner 12 mm box spanner 8 mm box spanner
14	Fit the battery bracket. Tighten the fixing screw (plain and spring washers under the screw heads), insert the distance piece between the battery bracket and the gearbox support crossmember	12 mm box spanner
15	Fit the front wings, the spare wheel support and the spare wheel	12-14 mm spanners 12-14 mm box spanners
16	Fill the radiator. During this operation, open the heater control and bleed the system.	
	REPLACEMENT OF A FRONT SUPPORT ARM	
	Removal (see Pl. 54).	
17	Remove the differential shaft bearing assembly, the differential shaft, support arm, flexible coupling (bibax) left side or the differential shaft bearing assembly, the differential shaft and support arm, right side (see Op. DS 330-4).	

		TOOLS
18	Unscrew the retaining screw (50) from the locknut (51) of the differential bearing (52) on the differential shaft and remove the nut (51) (spanner 1770-T, see Pl. 63, fig. 4)	7 mm box spanner Spanner 1770-T
19	Drive out the disc and shaft assembly. Remove the bearing support bracket (2).	
	Assembly (see Pl. 54).	
20	Put the bearing support bracket (2) on the differential shaft bearing.	
	Offer up the bearing as prepared on the differential shaft. Using a tube and a press, press into position. Pay attention to the centring dowel on the differential shaft	Tube: dia. = 30 x 39 length = 200
21	Tighten the locknut (51) of the shaft bearing (52) to 72 ft/lbs (10 m.kg) (spanner 1770-T, see Pl. 63, fig. 4).	
	Tighten the locking screw (50) of the nut (51)	7 mm box spanner Spanner 1770-T
22	Fit the differential shaft and bearing assembly (see Op. DS 330-4).	
	REPLACEMENT OF A REAR FLEXIBLE MOUNTING (cars produced before July 1959)	
	Removal (see Pl. 24).	
23	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
24	Left-hand side : disconnect the distributor return spring.	
	Right-hand side : remove the exhaust manifold screen	12 mm box spanner
25	Remove the upper nut (1) from the arm (2)	23 mm box spanner
26	Pass a covered chain sling (chain sling 1697-T, see Pl. 51) round the water pump cover and suspend the engine on a chain block.	
	Measure the distance “a” between the bearing face “b” of the arm on the nut (3) and the bearing face “c” of the flexible block on the support plate (4).	
	Remove the lower nut (3) from the arm (2)	Chain sling 1697-T 23 mm box spanner
27	Hold the nut (5) from beneath the car (spanner 1700-T, see fig. 3) and remove the nut (6) and the cup (7).	
28	Withdraw the spindle (8) with the rubber washer and fibre washer (9), the rubber block (11), the nut (5) and the locknut (12) from underneath the car.	
29	Remove the flexible mounting (13) together with the distance piece (14). Remove the distance piece from the flexible mounting.	

		TOOLS
	Assembly (see Pl. 24).	
30	Offer up the flexible mounting on the support plate (4), fitted with the distance piece (14) and the steel cup (15).	
31	Insert the spindle (8) complete with the rubber washer and fibre washer (9), the rubber block (11), the nut (5) and the locknut (12) in the flexible mounting.	
32	Place the steel cup (7) in position and tighten the nut (6). Hold the nut (5) from underneath the car (spanner 1700-T, see fig. 3)	23 mm box spanner Spanner 1700-T
33	Tighten the lower nut (3) on the arm (2) until the measurement "a" measured in paragraph 26 is obtained.	
34	Engage the spindle (8) in the bore of the arm (2). Gently lower the engine and engage the shoulder of the lower nut (3) in the bore of the arm (2).	
35	Insert and tighten the screws securing the flexible mounting on the steel support (4). Tighten the upper nut (1) on the arm (2)	14-23 mm box spanners
36	Left-hand side : hook on the distributor return spring.	
	Right-hand side: fit the exhaust manifold screen. Tighten the fixing screws (plain washers under the heads)	12 mm box spanner
37	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Remove the chain sling 1697-T.	
	REPLACEMENT OF A REAR FLEXIBLE MOUNTING (cars produced since July 1959)	
	Removal.	
38	Left-hand side : unhook the distributor return spring.	
	Right-hand side: remove the exhaust manifold screen	12 mm box spanner
39	Pass a covered chain sling (chain sling 1697-T, see Pl. 51) round the water pump cover and suspend the engine on a chain block	Chain sling 1697-T
40	Remove the screws fixing the support arm on the engine and the screw fixing the flexible mounting on the body support. Disengage the flexible mounting and the support arm	14-17 mm spanners 14-17 mm box spanners
41	Remove the upper nut fixing the arm on the flexible mounting and disconnect the arm from the flexible mounting	23 mm box spanner
	No work is possible on the flexible mounting.	

		TOOLS
	Refitting.	
42	Fit the arm on the flexible mounting previously adjusted (see paragraph 50) and tighten the upper nut on the arm (shakeproof washer)	23 mm box spanner
43	Fit the flexible mounting and support arm assembly on the car. Insert and tighten the fixing screws of the flexible mounting and support arm, after having correctly positioned these parts (spring washers under the heads of the screws fixing the arms, plain washers and spring washers under the heads of the screws fixing the flexible mounting)	14-17 mm spanners 14-17 mm box spanners
44	Left-hand side : hook on the distributor return spring.	
	Right-hand side: fit the exhaust manifold screen. Tighten the fixing screws (plain washers under the heads of the screws)	12 mm box spanner
	REPAIRING A FLEXIBLE MOUNTING AFTER REMOVAL (cars produced before July 1959)	
	Dismantling (see Pl. 24).	
45	Remove the spindle (8), the rubber washer and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12). Clean the parts.	
	Assembly (see Pl. 24).	
46	On the spindle (8), fit the rubber washer and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12).	
	PRE-ADJUSTMENT OF THE REAR FLEXIBLE ENGINE MOUNTING (cars produced before July 1959) (see Pl. 24)	
47	Tighten the cupped nut (5) until the upper face of the washer (9) comes into contact with the face “d” of the support (4). The washer (9) must turn freely, without play	23 mm box spanner
48	Hold the spindle (8) by the nut (6) fixing the cup (7) and tighten the cupped nut (5) eight complete turns, which corresponds to a movement of 10 mm	23 mm spanner 23 mm box spanner
49	Tighten and lock the locknut (12)	23 mm spanner 23 mm box spanner

		TOOLS
	PRE-ADJUSTMENT OF THE REAR FLEXIBLE ENGINE MOUNTING (cars produced since July 1959)	
50	Bring the upper face of the lower nut tightening the arm, to a distance of 98 mm from the bearing face of the flexible mounting on the steel support on the body	21 mm spanner
	REPLACEMENT OF A REAR ARM (cars produced before July 1959)	
	Removal (see Pl. 24).	
51	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
52	Left-hand support arm : unhook the distributor return spring.	
	Right-hand support arm: remove the exhaust manifold screen	12 mm box spanner
53	Remove the upper arm (1) fixing the arm (2) on the flexible mounting	23 mm box spanner
54	Place a covered chain sling around the water pump cover (chain sling 1697-T, see Pl. 51) and support the engine on a chain block	Chain sling 1697-T
55	Remove the screws fixing the rear arm (2) and remove the arm	14 mm spanner 17 mm spanner 17 mm box spanner
	Assembly (see Pl. 24).	
56	Place the rear arm (2) in position and tighten the fixing screws (spring washers)	14-17 mm spanners 14-17 mm box spanners
57	Engage the spindle (8) in the bore of the arm (2). Lower the engine slightly and engage the shoulder of the nut (3) in the bore of the arm (2). Tighten the upper nut (1)	23 mm box spanner
58	Left-hand side : hook on the distributor return spring.	
	Right-hand side: fit the exhaust manifold screen	12 mm box spanner
59	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Remove the chain sling 1697-T	Jacking bracket 2505-T
	REPLACEMENT OF A REAR ARM (cars produced since July 1959)	
60	Proceed as indicated for the replacement of a flexible mounting (see paragraphs 38 and onwards, this operation).	

		TOOLS
	REPLACEMENT OF A REAR FLEXIBLE MOUNTING SUPPORT (cars produced before July 1959)	
	Removal (see Pl. 24).	
61	Remove the spindle of the flexible mounting (see paragraphs 23 to 28, this operation).	
62	Remove the screws fixing the flexible mounting (13) on the support (4) and remove the flexible mounting	14 mm box spanner
63	Remove the nuts fixing the support (4) and remove the support	14 mm spanner
	Assembly (see Pl. 24)	
64	Place the support in position, fit the fixing nuts, without tightening (plain and spring washers).	
65	Place the rubber block in position on the bracket and insert the fixing screws without tightening (plain and spring washers under the heads).	
66	Engage the spindle (8), complete with rubber washer and fibre washer (9), the rubber block (11), the cupped nut (5) and the locknut (12) in the flexible mounting (13).	
67	Place the steel cup (7) in position and tighten the nut (6). Have the cupped nut (5) held from underneath the car by an assistant (spanner 1700-T, see fig. 3)	Spanner 1700-T 23 mm box spanner
68	Tighten the lower nut (3) of the arm (2) until the measurement “a” mentioned in paragraph 26 is obtained.	
69	Engage the spindle (8) in the bore of the arm (2). Gently lower the engine and engage the shoulder of the nut (3) in the bore of the arm (2). Fit and tighten the upper nut (1) on the arm (2)	23 mm box spanner
70	Tighten the screws fixing the flexible mounting (13) on the support (4) (plain and spring washers under the heads) and tighten the nuts fixing the steel support (4) on the body (pain and spring washers)	14 mm spanner 14 mm box spanner
71	Left-hand side : replace the distributor return spring. Right-hand side: fit the exhaust manifold screen. Tighten the fixing screws (plain and spring washers under the heads).	12 mm box spanner
72	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Remove the chain sling 1687-T	Jacking bracket 2505-T Chain sling 1697-T
73	Check the adjustment of the engine mountings. Re-adjust if necessary (see Op. DS 133-0).	

PARTICULAR POINTS

Removal.

1 *It is necessary to drain the water from the radiator and cylinder block.*

12 *It is often necessary to remove the two rear studs in order to remove the manifold.*

Assembly.

20 *Refill with water, the vane of the heater control open (bleed).*

21 *Adjust the slow running (see Op. DS 142-0).*

	REMOVAL	TOOLS
1	Drain the water from the radiator and cylinder block. (Retain this water which contains anti-freeze). Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1)	21 mm spanner Stop MR-4158
2	Disconnect the negative terminal of the battery	12 mm spanner
3	Remove the pipe between the carburettor and air filter.	
4	Disconnect the leads from the sparking plugs.	
5	Remove the coil and bracket assembly	8 mm spanner
6	Disconnect the heater pipe from the inlet manifold.	
7	Disconnect the petrol feed pipe from the carburettor.	
8	Disconnect the accelerator control from the butterfly crosshead	7 mm spanner
9	Remove the spring (13) upwards from the support (14) (see Pl. 28).	
	Remove the screw fixing the accelerated idling control on the cover of the carburettor.	
	Remove the screw fixing the hydraulic control plate on the hot spot plate of the manifold. Disconnect the choke control from the carburettor. Unhook the clutch re-engagement control spring.	
	Remove the carburettor (spanner 1623-T, see Pl. 16, fig. 2)	Spanner 1623-T

		TOOLS
10	Disengage the accelerator control on the scuttle and turn towards the left.	
11	Remove the oil dipstick.	
12	Remove the inlet manifold. It is often necessary to remove the two rear studs in order to disengage the manifold . .	12 mm box spanner
	ASSEMBLY	
13	Refit the inlet manifold (renew the joints at each removal). Smear the studs removed with Hermetic, then refit. Fit the carburettor (plain and spring washers) (use the spanner 1623-T, see Pl. 16, fig 2)	12 mm box spanner Spanner 1623-T
14	Refit the accelerated idle control. Insert a plain washer between the control and the carburettor, then a second plain washer and a spring washer under the heads of the screws. Hook on the spring (13) by pressing on the support (14) (see Pl. 28).	
15	Engage the accelerator control on its joint on the scuttle, connect the control to the carburettor, tighten the nut and the locknut. Connect the choke control, the heater pipe to the inlet manifold, and the petrol feed pipe to the carburettor. Hook on the clutch re-engagement control spring	7 – 8 mm box spanners
16	Connect the pipe between the carburettor and air silencer.	
17	Fix the coil and bracket assembly on the scuttle	8 mm spanner
18	Connect the leads on the sparking plugs.	
19	Refit the oil dipstick.	
20	Refill the radiator. During this operation, open the heater valve and bleed the system.	
21	Adjust the slow running (see Op. DS 142-0).	

PARTICULAR POINTS

The adjustment should be carried out with the engine hot, choke closed, ignition control in the mid-way position.
The use of a revolution counter is indispensable. In practice, this adjustment should be carried out after the adjustment of the clutch drag (see Op. DS 314-0.

2 *Adjust the slowrunning on cars produced before March 1956 (accelerator control with 2 rods): 550 r.p.m.*

4 *Adjust the accelerated idling: 950 to 1,000 r.p.m. to the point where increased resistance is felt on the control, adjust only by turning on the outside rod.*
Adjust the slow running on cars produced since 1956 (accelerator control with 1 rod): 550 to 600 r.p.m., unhook the accelerated idling spring.
Adjust the accelerated idling: 900 ± 25 r.p.m. hook on the spring, work on the adjusting screw..

TOOLS

IMPORTANT REMARKS

a) The adjustment described above should be carried out with the engine hot. Make sure that the choke control is fully closed and that the ignition control is in the midway position.

b) The use of a revolution counter is indispensable. Use the mechanical revolution counter 2434-T, connected to the high pressure pump pulley, or the electric revolution counter 2436-T, connected to the yellow terminal of the upper coil

1. MECHANICAL REVOLUTION COUNTERS

In order to compensate for an error due to belt slip or irregular running of the engine during the checking, unscrew the bleed screw of the pressure control valve or place the manual height control lever in the low position.

2. ELECTRIC REVOLUTION COUNTERS

The electric evolution counters should be checked periodically (periods varying according to use and quality).

If it is desired to use a commercial revolution counter, it should conform to the following specifications :-

- Large diameter graduated from 0 to 1500 r.p.m. maximum.
- Work on a contact breaker with two cams.
- Needle steady whilst in use.

ADJUSTMENT OF THE SLOW RUNNING (on cars produced before March 1956).

Accelerator control with 2 rods.

1 Make sure that the accelerator control works normally and that the spring returns the throttle butterfly to the closed position.

2 Adjusting the slow running to 550 r.p.m. (see Pl. 26, fig. 4).

Only adjust the screw (2) of the throttle valve and the volume screw (3) controlling the richness of the mixture for idling.

TOOLS

Set the screw (2) to give the minimum opening of the secondary throttle which will allow the engine to idle evenly.

Turn the volume screw (3) to increase the richness of the mixture to give the highest speed at the throttle opening already determined. In order to reduce the speed to that desired, unscrew the screw (2).

NOTE – After each alteration to the setting of the secondary throttle valve screw (2), give the throttle a flick open and shut to ensure that the throttle returns fully to stop on the screw.

3 Checking the maximum opening of the throttle valve (see Pl. 46).

Remove the tube between the carburettor and the air cleaner-silencer. Press the accelerator pedal right down. If necessary, adjust the maximum opening of the throttle valve by adjusting only on the inside rod (16) (engine side)

Connect the tube to the carburettor.

4 Adjustment of the accelerator control rods (see Pl. 46, fig. 1).

Press down the accelerator slightly to the point where increased resistance is felt on the control. Hold the accelerator in this position.

Check the speed of the engine, it should be from 950 to 1000 r.p.m.

If necessary, adjust the outside rod (17). In no circumstances, must the inside rod (16) be adjusted.

ADJUSTMENT OF THE SLOW RUNNING (on cars produced since March 1956)

Accelerator control with 1 rod and accelerated idling (see Pl. 28).

5 Adjusting the slow running :

a) Unhook the spring (13) by removing it from the support tube (14) (pull it upwards) to disengage it from the accelerator control.

b) Adjusting the slow running on a Weber carburettor (see paragraph 2, this operation).

c) Adjusting the slow running on a Zenith carburettor (see Pl. 27).

Adjust the screw (36) and the screw (30) controlling the richness of the mixture for idling, by proceeding as indicated in paragraph 2, this operation).

6 Checking the maximum opening of the throttle valve:

See paragraph 3. Adjust the accelerator rod.

7 Adjusting the accelerated idling (see Pl. 28).

Hook the spring (13) in position by pressing on the support tube (14).

Adjust the screw (15) in order to obtain a speed which exceeds the speed at which the clutch drags by 150 r.p.m. (900 ± 25 r.p.m.).

NOTE – In practice, this adjustment should be carried out after the adjustment of the clutch drag (see Op. DS 314-0).

		TOOLS
	REMOVAL.	
1	Disconnect the petrol feed pipe from the carburettor.	
2	Loosen the clip fixing the tube between the carburettor and the air filter and remove the tube.	
3	Disconnect the choke control	7 mm box spanner
4	Disconnect the accelerated idling control (take care of the washers between the control and the carburettor)	8 mm ring spanner
5	Disconnect the cruciform coupling controlling the throttle valves on the carburettor	7 mm box spanner
6	Remove the carburettor (spanner 1623-T, see Pl. 16, fig. 2). Remove the joint	Spanner 1623-T
	FITTING	
7	Fit the carburettor, putting the joint in position.	
8	Slightly raise the carburettor to enable the nuts to be fitted. Insert under each nut: a plain washer and a spring washer. Tighten the nuts (spanner 1623-T, see pl. 16, fig. 2)	Spanner 1623-T
9	Couple up the throttle control. Insert plain washers under the nuts. Tighten the locknuts	7 mm box spanner
10	Couple up the accelerated idling control. Insert a plain washer between the accelerated idling control and the carburettor and a second plain washer and a spring washer under the heads of the screws. Tighten the screws.	8 mm ring spanner
11	Couple up the choke control. Make sure that it opens and closes correctly	7 mm box spanner
12	Fit the tube between the carburettor and the air filter and tighten the clip.	
13	Couple up the petrol feed pipe to the carburettor.	
14	Adjust the slow running (see Op. DS 142-0).	

PARTICULAR POINTS

44 Adjust the closing of the throttle valve of the 1st body on the Zenith 24/30 EEAC carburettor: unscrew the stop screw until the throttle valve is totally closed, bring the screw into contact with the stop then screw up three quarters of a turn exactly and lock the locknut.

		TOOLS
	OVERHAULING A WEBER 24/30 DCZCI or 24/30 DCLC CARBURETTOR	
	Dismantling (see Pl. 26).	
1	To remove the cover (21) complete.	
	a) Unscrew the fixing screws (22) and raise the cover vertically in order to disengage the floats (23).	
	b) Remove the paper joint.	
	c) Remove the floats (23) by withdrawing the pin (24).	
	d) Remove the needle valve (25) and unscrew the needle valve seat (26). In cases of defect, replace the assembly.	10 mm box spanner
	e) Remove the cover (27) from the filter, disengage the joint (28), disengage the filter gauze (29)	10 mm box spanner
	f) Clean the parts, blow through the channels with compressed air.	
2	Remove the accelerator pump (30) by drawing out the connecting rod (31).	
3	Remove the main jets (32 and 35) and the volume screw (3) with its spring (37). Remove the emulsion tubes (38)	10 mm box spanner
4	Remove the pump delivery valve (39). Be careful not to mislay the joints (40), also that of the pump jet (41) . . .	8 mm box spanner
5	Remove the starter jet (42) and the corrector (43) (24/30 DCLC). Remove the pump inlet valve (44)	12 mm box spanner
6	Remove the complete choke control (45).	
7	Remove the primary and secondary venturi sleeves (46 and 47). To do this remove the screw (48).	
	NOTE – It is imperative that the disassembly of the carburettor should be limited to the operations described above otherwise it may be made unusable. It is important that in no event should the adjustment of the stop screw (49) of the throttle valve in the first body be disturbed, the adjustment is carried out by Messrs Weber and is particular to each carburettor.	

		TOOLS
8	Clean the parts in petrol and blow out the passages in the carburettor and the different jets carefully with compressed air.	
	NOTE – Never use metallic wire to unblock the jets, the holes in these are machined with great precision and such an action may modify their output.	
	Assembly (see Pl. 26).	
9	To assemble the cover (21) on the carburettor.	
	a) Fit the needle valve seat (26), interposing the aluminium joint	10 mm box spanner
	b) Put the needle valve (25) in position.	
	c) Put the floats (23) in position and fit the pin (24), then carry out the levelling of the floats.	
	- with the cover (21) of the carburettor turned towards the front, the dimension “a” between the float and the surface of the cover should be 5 mm ± 0.5 mm.	
	- when the levelling has been carried out, make sure that the movement of the float (23) is “b” = 12 ± 0.5 mm; if necessary, modify the position of the stop (50.	
	d) Put the filter gauze (29) in position, the joint (28), the cover (27) and the screw. Tighten the screw, fitting a joint under the head	10 mm box spanner
	NOTE – If the filter was fitted with a rubber joint, it must be replaced by a joint of the new type.	
10	Put the accelerator pump (30) in position and engage the retaining plate (51) as far as possible.	
11	Fitting the jets.	
	a) Put the primary venturi slow running jet (34) in position (diameter = 0.45 mm).	
	b) Put the primary venturi main jet (32) in position (diameter = 1.05 mm). Fit a copper joint under the head of the jet carrier	10 mm box spanner
	c) Put the secondary venturi slow running jet (35) in position (diameter = 0.65 mm).	
	d) Put the secondary venturi main jet (33) in position (diameter = 1.45 mm).	
	e) Fit the volume screw (3) and the spring (37).	
12	Put the emulsion tubes complete (38) in position.	
	a) The emulsion tube with 220 air jet (primary venturi side).	
	b) The emulsion tube with 230 air jet, (secondary venturi side) (DCLC carburettor) or with 240 air jet (DCZCI carburettor)	8 mm box spanner

		TOOLS
13	Put the pump jet (41) in position (position marked with a dowel). Fit the joint (40) between the jet and the carburettor body. Put the delivery valve (39) in position, fitting the joint (40) between the pump jet (41) and the head of the valve.	
14	Put the starter jet (42) in position, fitting an aluminium joint under the head. Fit the starter corrector (43) (DCLC carburettor) in its housing (52)	12 mm box spanner
15	Put the pump feed valve (44) in position.	
16	Put he primary and secondary venturi sleeves (46 and 47) in position, tighten the screws (48).	
17	Check that there is no dirt on the seating (53) of the choke control (45) and put it in position. Tighten the screws (54).	
18	Put the joint of the cover (21) in position. Engage the cover (21) vertically on the body of the carburettor. Put the fixing screws (22) in position with serrated washers under the heads. Tighten the screws.	
	NOTE – (see fig. 5). On the 24/30 DCLC carburettor, the correct working of the "starter" is dependant upon the temperature; in consequence : in summer, turn the corrector (43) so that the letter "E" is on the same side as the mark C". in winter, turn the corrector (43) so that the letter "I" is on the same side as the mark "C".	

OVERHAULING A ZENITH 24/30 EEAC CARBURETTOR

Dismantling (see Pl. 27).

19 To remove the cover complete (1) :

9 Unscrew the fixing screws (2).

10 Disengage the connecting rod (3) and the retainer (37) and turn the throttle control (5) in order to disengage the connecting rod (6), after having removed the retaining clip (4).

11 Lift the cover (1) vertically, in order to avoid damage to the accelerator pump (7).

12 Remove the paper joint from the cover.

13 Remove the pin (8), the screw (10), the lever (11), the spring (12) and the piston (7) from the accelerator pump. Disengage from the rod (9), the rubber washer (13) and the steel washer (14).

14 Remove the connecting rod (6) from the control lever (15) of the choke (16).

15 Clean the parts.

20 Remove the float (17) with the needle valve (19) by unscrewing the pin (18). The needle valve (19) is attached to the float (17) by the connecting pin (20).

		TOOLS
21	Remove the plug (22). Remove the filter (21).	
22	Remove the plugs (23 and 24) as well as the plug (25).	
23	Remove the pump inlet valve (26).	
24	Remove the slow running jets (27) and the emulsion tubes (28).	
25	Remove the delivery valve (29) from the accelerator pump.	
26	Remove the volume screw (30) with its spring.	
27	Remove the retaining clip (31) and remove the connecting rod (3).	
28	Remove the main jets (35).	Special ZENITH spanner
29	Clean the parts with petrol and blow with compressed air.	
	NOTE – Never use metallic wire to unblock the jets. The calibration is carried out with great precision and such an action may modify their output.	
	Assembly (see Pl. 27).	
30	Put the main jets (35) in position : the jet 35 in the small bore and the jet 46 in the large bore.	
31	Put the volume screw (30) with its spring in position and tighten a few turns.	
32	Put the delivery valve (29) in position in the accelerator pump. Insert a joint under the head.	
33	Put the emulsion tubes (28) in position together with the slow running jets (27).	
34	Put the pump inlet valve (26) in position.	
35	Put the plug (25) in position, inserting an aluminium joint.	
36	Put the plugs (24 and 23 in position, inserting aluminium joints.	
37	Put the filter (21) in position, then the plug (22).	
38	Engage the assembly of the needle valve (19), the float (17), then fix with the pin (18).	

TOOLS

39 To prepare the cover (1) :

a) Fit on the rod (9) of the piston (7) the steel washer (14) and the rubber washer (13).

b) Engage the rod (9) thus prepared in the cover (1).

c) Engage the rod (9) in the lever (11), fitting the spring (12) and the screw (10).

d) Fit the pin (8) and open out the ends.

40 To fit the cover (1) :

a) Put the connecting rod (3) in position and secure with the retaining clip (31).

b) Put the connecting rod (6) in position on the lever (15)

c) Fit the float chamber paper joint. Offer up the float chamber cover (1) and lower vertically in position on the accelerator pump (7).

41 Couple up the connecting rod (6) and fix with the retaining clip (4).

42 Couple up the connecting rod (3) and fix with the retaining clip (37).

43 Put the fixing screws (2) in position and tighten (spring washers under the heads).

44 To regulate the closing of the butterfly of the 1st body :

a) Unscrew the locknut (32 and the screw (33) until the butterfly is totally closed.

b) Bring the screw (33) into contact with the stop (34) and then tighten the screw (33) exactly three quarters of a turn.

Tighten the locknut (32)

PARTICULAR POINTS

Replacement of a control rod.

Removal.

4 *Withdraw the rod from underneath the car.*

Assembly.

6 *Cars produced before March 1956.*
In the case of replacement of the outside rod, press down the accelerator slightly in order to obtain an engine speed of between 950 and 1,000 r.p.m.
Do not work on the rod, engine side.

Replacement of a control relay.

Assembly.

9 *Adjust the slow running (see Op. DS 142-0).*

10 *Adjust the clutch re-engagement control (see Op. DS 314-0).*

Replacement of an accelerated idling control assembly.

Removal (cars produced before January 1959):

On these cars, it is possible to replace the control assembly, without replacing the feed pipe.

Assembly.

23 *Bleed the brake system (see Op. DS 453-0).*

24 *Adjust the slow running (see Op. DS 142-0).*

Replacement of the accelerated idling control joints (cars produced before January 1959) :

27 *It is preferable to fit the new type accelerated idling control assembly.*

Replacement of the accelerated idling control joints (cars produced since January 1959) :

In order to carry out this operation it is preferable to remove the control assembly (see this operation paragraphs 11 to 16) and then proceed as for overhauling (see Op. DS 142-6).

		TOOLS
	REPLACEMENT OF AN ACCELERATOR PEDAL	
	Removal.	
1	Place the car on a lift or over a pit. Unscrew the nut from the screw fixing the lever on the pedal spindle. Disengage the accelerator pedal spindle from the bearing by pressing on the end of the spindle, if necessary, use a small bronze drift. Remove the plain washer and the rubber washer fitted between the bearing and the pedal spindle lever	12 mm spanner 12 mm box spanner
	Assembly.	
2	Offer up the accelerator pedal spindle (previously greased with graphite grease) in the bearing. Hold the pedal in the raised position. From underneath the car, fit on the pedal spindle, the rubber washer, the plain washer and the return lever. Fit the lever fixing screw and tighten the nut (plain and spring washers). Lower the car to the ground	12 mm spanner 12 mm box spanner
3	Disconnect the carburettor air intake pipe and make sure that the throttle butterflies open and close correctly.	
	REPLACEMENT OF A CONTROL ROD	
	Removal.	
4	Place the car on a lift or over a pit. Unlock the locknut and remove the adjusting nut and the locknut from the rod. Remove the nut fixing the rod on the pedal lever and remove the rod from the lever. Withdraw the rod from underneath the car	7 mm spanner 7 mm box spanner
	Assembly.	
5	Engage the rod from underneath the car and provisionally fit the adjusting nut (to the upper part). Make sure that the rubber distance piece is fitted on the fixing trunnion. Connect the rod to the trunnion, insert a plain washer, tighten the fixing nut moderately and tighten the locknut	7 mm spanner 7 mm box spanner
6	Lower to the ground. Disconnect the carburettor air intake pipe and set the adjusting nut of the rod in such a position to enable the throttle butterflies to open and close correctly.	
	NOTE – (Cars produced before March 1956).	
	In the case of replacement of the rod (16) engine side (see Pl. 46, fig. 1), proceed as indicated above.	
	In the case of replacement of the outer rod (17) (see Pl. 46, fig. 1), proceed as follows : Press the accelerator pedal down until a resistance is felt on the pedal; hold the pedal in this position; the engine should then be between 950 and 1000 r.p.m. If necessary, work on the adjusting nut of the rod (17). On no account, work on the rod (16), engine side	7 mm spanner 7 mm box spanner

		TOOLS
	REPLACEMENT OF A CONTROL RELAY	
	Removal (see Pl. 46).	
7	Disconnect the accelerator control return spring (22) and the spring (1) of the clutch re-engagement control from the control relay. Disconnect the carburettor control rod from the carburettor and disconnect the control rod or rods from the relay. Disengage the relay, if necessary, remove the ball joint from the relay	12 mm spanner 12 mm box spanner
	Refitting (see Pl. 46).	
8	Fit the control relay and the ball joint (the ball joint previously being smeared with graphite grease). Make sure that the ball joint is located in the cylindrical part of the bore of the relay. Connect the relay control to the carburettor. Connect to the relay, the control rod or rods, the accelerator return spring (22) and the spring (1) of the clutch re-engagement control	7-12 mm spanners 7-12 mm box spanners
9	Adjust the slow running (see Op. DS 142-0).	
10	Adjust the clutch re-engagement control (see Op. DS 314-0).	
	REPLACEMENT OF AN ACCELERATED IDLING CONTROL ASSEMBLY	
	Removal (cars produced before January 1959).	
11	Release the pressure in the front brake system (spanner 2141-T, see Pl. 143, fig. 4)	Spanner 2141-T
12	Disconnect the clip retaining the slow running pipe to the rear support of the left-hand brake unit	14 mm box spanner
13	Disconnect the clip retaining the slow running pipe to the closing plate of the inlet manifold	12 mm spanner
14	Disconnect the union of the slow running pipe, from the left-hand brake unit (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2221-T or Spanner 2219-T
15	Remove the screw fixing the accelerated idling control assembly support on the carburettor	8 mm ring spanner
16	Remove the accelerated idling control assembly and pipe from the car. Do not mislay the washers fitted between the support and the carburettor.	

		TOOLS
	Removal (cars produced since January 1959).	
	NOTE – On these cars, it is possible to replace the accelerated idling control without replacing the pipe.	
17	Release the pressure in the front brake system (spanner 2141-T, see Pl. 143, fig. 4)	Spanner 2141-T
18	Disconnect the connecting pipe between the left-hand brake unit and the accelerated idling control from the accelerated idling control (spanner 2219-T or 2221-T, see Pl. 72, fig.. 4)	Spanner 2219-T or Spanner 2221-T
19	Remove the screw fixing the accelerated idling control on its steel support and remove the accelerated idling control. Do not mislay the washers fitted between the support and the carburettor	8 mm box spanner
	Refitting.	
	NOTE – On the cars produced before January 1959, it is preferable to fit a new type of accelerated idling control.	
20	Offer up the new accelerated idling control, inserting the washers between the carburettor and the support.	
	Place the assembly in position at the top of the slots. Tighten the fixing screws (plain and spring washers under the heads of the screws)	8 mm ring spanner
21	Connect the feed pipe to the control assembly (cars produced since January 1959) (spanner 2219-T, see Pl..72, fig.4).	Spanner 2219-T
22	To fit the feed pipe (cars produced before January 1959) :	
	a) Put the rubber guides and fixing plates on the pipe.	
	b) Offer up the pipe, connect the unions of the control assembly and the left-hand brake unit (spanner 2219-T, see Pl. 72, fig. 4)	Spanner 2219-T
	c) Fix the rear clip fixing the feed pipe to the inlet manifold closing plate (spring washer under the heads of the screws)	12 mm spanner
	d) Fix the front clip fixing the feed pipe to he rear support of the left-hand brake unit.	
	Insert a lockwasher or place a washer under the head of the fixing screw. Lock the two upper fixing screws of the brake units, using iron locking wire in such a manner to avoid rotation in the unscrewing direction, or turn over the lockwashers.	14 mm box spanner
	e) *Make sure that the rubber guide for the pipe* is in position in fixing the clip on the left-hand brake unit.	
23	Start the engine and bleed the brake system. Make sure there are no leaks from the unions.	
24	Adjust the slow running (see Op. DS 142-0).	

		TOOLS
	REPLACEMENT OF THE ACCELERATED IDLING CONTROL SEALS (cars produced before March 1959).	
	Dismantling.	
25	Remove the coils and bracket assembly	8 mm spanner
26	Disconnect the low pressure pipe assembly from the hydraulic gear selector	8 or 10 mm spanner
27	Disengage the return spring engagement plate.	
	Disengage the dust cover from the body of the control. Remove the cap. During the unscrewing, hold the support with a flat spanner.	
	Remove the seal from the cap. Remove the piston from the cap and remove the ring seal from the piston	28 mm spanner 24 mm spanner or 24 mm angled ring spanner
	NOTE – It is preferable to fit a new type of accelerated idling control.	
28	Clean the parts *with alcohol only*. Do not use trichlorethylene.	
	Assembly.	
29	Fit the seal, previously smeared with fluid on the piston.	
	NOTE – In the case where slight scratches are found on the piston, a light rubbing with No. 600 abrasive paper smeared with alcohol is permitted. Clean and blow with compressed air.	
	Engage the piston in the bore of the cap.	
	Fit the ring seal on the cap. Fit the assembly in the body of the control. Tighten the cap (hold the support with a flat spanner	28 mm spanner 24 mm spanner or 24 mm angled ring spanner
30	Connect the low pressure pipe assembly to the hydraulic gear selector	8 or 10 mm spanner
31	Offer up the coils and bracket assembly	8 mm spanner
32	Bleed the control (see Op. DS 453-0). Put the control under pressure by pressing on the brake pedal; maintain this pressure for a few moments and check for leakage from the control.	
33	Put the control lever in its normal position and put the dust cover in position on the body and on the collar of the control lever. Refit the attachment plate and return spring.	
34	Adjust the slow running (see Op. DS 142-0).	
	REPLACEMENT OF THE ACCELERATED IDLING CONTROL SEALS (cars produced since March 1959).	
35	In order to carry out this operation, it is preferable to remove the control assembly (see this operation. Paragraphs 11 to 16) and proceed as for overhauling (see Op. DS 142-6).	

		TOOLS
	DISMANTLING (see Pl. 28, fig. 1 and 2).	
1	Remove the support (14) of the spring (13) from the body of the control assembly.	
2	Remove the support (14) and the spring (13) from the lever (26).	
3	Remove the adjusting screw (15), the spring (27) and the washer (28), from the lever (26).	
4	Disengage the dust cover (21) from the cap (22) and from the lever (26).	
5	Unscrew the cap (22) holding the assembly by its support and remove the assembly of the cylinder (23) and the piston (24). Disengage the seal (29) between the cylinder and the body.	27-28 mm spanners
6	Disengage the piston (24) from the cylinder (23). Remove the seal (25) from the cylinder (23) using a small brass wire hook.	
7	Remove the bleed screw (30), from the body of the control assembly.	
8	Clean the parts *with alcohol only*. Do not use trichlorethylene.	
	ASSEMBLY see Pl. 28, fig. 1 and 2).	
	NOTE – In the case of slight scratches being found on the piston, a light rubbing with No. 600 abrasive paper smeared in alcohol is permitted. Clean with alcohol and blow with compressed air. When refitting the parts, they should be smeared with hydraulic fluid..	
9	Put the ring seal (25) in position and fit the piston (24) in the cylinder (23).	
10	Put the cylinder piston in the cap (22), fit the seal (29) in the body of the control assembly and screw the cap (22) on the body.	27-28 mm spanners
11	Put the dust cover (21) in position on the cap (22) and the lever (26).	
12	Fit the lever (26), the washer (28), the spring (27) and the adjusting screw (15).	
13	Put the spring (13) in position on its support (14). Engage the support in the body of the assembly.	
14	Fit the bleed screw (30).	

		TOOLS
	REMOVAL	
1	Loosen the fixing clip on the air filter-silencer of the tube between the air-filter-silencer and the carburettor. Disconnect the tube from the air filter-silencer.	
2	Remove the air filter-silencer fixing nuts. Disengage the air filter-silencer	12-17 mm box spanners
	ASSEMBLY	
3	Offer up the air filter-silencer. Connect the tube between the air filter-silencer to the air filter-silencer.	
4	Tighten the air filter-silencer fixing nuts (spring washers). Tighten the clip fixing the tube on the air filter-silencer.	12-17 mm box spanners

TOOLS

OVERHAULING A VOKES AIR FILTER-SILENCER

Dismantling (see Pl. 28 fig. 4)

NOTE– It is important to clean the air-filter-silencer every 3700 miles (6000 km) (the car running on normal roads).

1 Unscrew the wing nut 18, remove the cover (19), remove the interior tube (21) complete with the filter element (20),

Remove the filter element (20) from the inner tube (21).

2 Clean the parts. Hold the filter element vertically and release the dust covers by tapping gently with the hand on the ends.

Assembly (see Pl. 28, fig. 4)

3 Fit the filter element (20). Make sure that the felt joints (22 and 23) on the inner tube assembly (21) are stuck in position. If not, restick with EC 847 paste, sold by Société Minnesota de France, 135, boulevard Serrurier, Paris 9e. Tel BOL 71-79 and BOT 42-80. Engage these parts in the body of the air filter-silencer. Put the cover (19) in position together with its felt joint (24). Position the rear fixing plate (25) in relation to the front fixing plate (26) and tighten the wing nut (18) (plain washer).

NOTE – for efficient operation the filter element should be under pressure at the two ends on the felt joints (22 and 24). Make sure that the element is sufficiently compressed by the cover, if not, add a second felt washer (22) and stick it to the first one with EC 847 paste.

OVERHAULING A MIOFILTRE AIR FILTER-SILENCER

Dismantling (see Pl. 28, fig. 3)

NOTE– It is important to clean the air-filter-silencer every 3700 miles (6000 km) (the car running on normal roads).

4 Unscrew the wing nut (1) and remove the shake-proof washer (2).

Remove the front cover (3) together with its felt joint (4) and disengage the filter element (5) with the cork joint (9).

5 Remove the rear cover and tube assembly (6) from the air filter-silencer body (7).

6 Clean the parts. Wash the filter element (5) in petrol. Brush the filter element (5) then blow with compressed air. Following this, soak the element in engine oil and leave to drain.

TOOLS

Assembly.

7 Make sure that the felt joint (8) for the rear cover is stuck in position. If not, restick (EC 847 paste, see paragraph 3, this operation). Engage the rear cover and tube assembly (6) in the body of the air filter-silencer (7). Put the front cover (3) in position together with its felt joint (4).

8 Position the rear fixing plate (10) in relation to the front fixing plate (11). Tighten the win nut (1) inserting the shake-proof washer (2).

Make sure that the filter element (5) is applied correctly to the felt joint (4); if not, add a second felt washer and stick it to the first one with paste (paste EC 847).

		TOOLS
	REMOVAL	
1	Disconnect the inlet and outlet pipes from the pump.	
2	Remove the nuts from the pump fixing studs	14 mm box spanner
3	Remove the pump and the cork joint.	
	REFITTING	
4	Fit the cork joint and put the pump in position. Fit the front nut, without tightening, to hold the pump on the crankcase (serrated washer).	
	Fit the rear nut (shake-proof washer).	
	Tighten the nuts	14 mm box spanner
5	Connect the rubber pipes. Tighten the clips.	

PARTICULAR POINTS

Overhauling a GUIOT pump.

The seats of the inlet and outlet valves are set in the cover of the pump. In case of poor functioning of the valves it will be necessary to replace the pump.

The diaphragms should be fitted dry (important).

Immerse the pump in a container filled with clean petrol, no leak should occur when compressed air is injected through the feed pipe at a pressure of $1^1/_2$ p.s.i. to $4^1/_2$ p.s.i. (100 to 300 g/cm^2).

		TOOLS
	OVERHAULING A GUIOT PETROL PUMP	
	Dismantling (see Pl. 29).	
1	Remove the filter cover (1), disengage the filter (2). Extract the cover joint (3).	
2	Disengage the upper part of the pump (4) from the body (5). Drive out the pin (6) from the operating lever. Disengage the diaphragm assembly (7) and the push-rod (8).	
3	Unscrew the nut (9), withdraw the serrated washer. Disengage the rod (8), the upper support washer (10), the set of 4 diaphragms (7), the lower support washer (11), the joint (12), the spring (13), the cup (14), the joint (15), the cap pressure washer (16) and the sealing cap (17).	10 mm spanner
	NOTE – The seats of the inlet and outlet valves are set in the cover of the pump, in cases of poor functioning of the valves it will be necessary to replace the pump.	
4	Clean the parts.	
	Assembling (see Pl. 29).	
5	Put the sealing cap (17) on the push-rod (8). Then place on the rod (8) in the following order; the cap pressure washer (16), the joint (15), the cup (14), the joint (12), the spring (13), the end with the large diameter on the washer (16). Fit the lower support washer (11), the set of 4 diaphragm washers (7), the upper support washer (10), a serrated washer and screw on the nut (9) without tightening.	
6	Offer up the diaphragm and push-rod assembly in the pump body. Fit the operation lever and press in the pin (6) and peen it lightly.	

		TOOLS
7	Make sure that the screw holes in the diaphragm correspond with the threaded holes in the pump body, tighten the nut (9).	
	Connect the upper part of the pump (4) to the body (5). *The diaphragms should be fitted dry without any hermetic or similar product.*	
	Tighten the screws without inserting washers	10 mm spanner
8	Put the filter cover joint (3) into position. Fit the filter element (2). Fit the filter cover (1), tighten the yoke knurled nut.	
9	Check for leaks (see paragraphs 10 and onwards).	
	INSPECTION FOR LEAKS (see Pl. 30).	
10	Block up the outlet to the carburettor by means of a plug. Fit a rubber tube on the inlet pipe.	
11	Completely immerse the pump in a receptacle containing clean petrol.	
12	Blow compressed air at a pressure of $1^1/_2$ p.s.i. to $4^1/_2$ p.s.i. (100 to 300 g/cm^2) through the rubber tube. At first, this can cause bubbling, due to the movement of the diaphragm.	
	Hold the pressure for a short time.	
	If air bubbles continue to escape through the opening for the operating lever at “a”, there is a leakage through the diaphragms and they must be replaced.	
	If air bubbles escape between the faces of the cover and the body or at the screws holding the cover to the body at “b”, the faces are defective or the screws are not tightened down sufficiently.	
	If air bubbles continue to escape between the filter cover and the faces of the cover at “c”, the joint is defective or the filter cover is insufficiently tightened.	

PARTICULAR POINTS

In order to avoid leakage from the rear rubber pipe, fit two Ligarex clips as indicated in Pl. 29 fig. 3. Tighten the clips moderately in order to avoid deformation of the nylon pipe.

		TOOLS
	REMOVAL.	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the right-hand front wing and the side protection panel	Jacking bracket 2505-T 8-12-14 mm box spanners
2	Remove the finishing panels, under the sidemember.	
3	Unscrew the fixing screws and remove the rubber protectors from the straps securing the petrol feed pipe to the right-hand sidemember and panel and front crossmember under the engine (lower part). Withdraw the pipe from the straps	8 mm box spanner
4	Remove the rear seat and squab. Remove the petrol tank cover plate, unstick the trimming from the sidemembers.	12 mm box spanner
5	Remove the petrol feed pipe together with the rubber pipe from the tank and from the opening on the rear part of the sidemember.	
6	Remove the rubber connecting pipe to tank from petrol feed pipe. Disconnect the front rubber union from the petrol pump and remove the union from the feed pipe.	
7	Disconnect the front part of the feed pipe from the front crossmember under the engine from the right-hand sidemember and from the side panel.	
8	Disengage the pipe from the sidemember, by pulling towards the front.	
	ASSEMBLY	
9	Close the front and rear openings in the petrol feed pipe. Drain the petrol tank by the right-hand drain plug	21 mm box spanner
10	Engage the rear part of the pipe in the hole in the closing panel, then fit the pipe in the straps in the sidemember.	
11	With the narrow part of the feed pipe towards the rear, slide the rubber connecting pipe towards the front of the narrow part of the feed pipe, with the rear end of the rubber pipe 370 mm from the rear end of the feed pipe. Use talc only for sliding the pipes.	

		TOOLS
12	Insert the rear end of the feed pipe in the petrol tank and couple the rear end of the rubber pipe in the union of the tank. Cut the rear end of the feed pipe obliquely close to the bottom of the tank and fit the drain plug (insert the joint)	21 mm box spanner
13	Refit the petrol tank cover plate. Tighten the fixing screws (plain washers under the heads)	12 mm box spanner
	IMPORTANT NOTE - In order to avoid leakage from the rubber connecting pipe to the tank, make sure that there is a tight joint between the rubber pipe and the tank and between the rubber pipe and the nylon pipe by using two Ligarex clips, fitted as shown on Pl. 29, fig. 3. Tighten the clips moderately, in order to avoid deformation of the nylon pipe (pliers 2483-T, see Pl. 17, fig. 2).	Pliers 2483-T
	Paste the siderail trimming on the petrol tank cover plate (Glutafix T Paste, sold by Establissements Bessier, 125, rue de Reuilly, Paris 12e).	
	Refit the rear seat and squab	Pliers 2483-T
14	Engage the front part of the pipe in the opening. on the closing panel.	
	Put the feed pipe under the clips on the right-hand siderail. Insert the rubber protector. Tighten the strap fixing screws	8 mm box spanner
15	Fit the finishing panels on the side rail. Tighten the screws (plain washers under the heads).	
16	Place the front part of the feed pipe against the closing panels, then behind the front axle arm bracket against the sidemember and in the front crossmember under the engine. Then insert the pipe through the opening on the left-hand side of the lower part of the crossmember.	
17	Place in position the rubber coupling sleeve to the petrol pump on the front end of the feed pipe. Fit the pipe in the rubber sleeve using talc to facilitate the work. Connect the sleeve to the petrol pump.	
18	Place the feed pipe in the fixing straps on the front closing panel of the sidemember, the front crossmember under the engine and insert the rubber protectors. Tighten the strap fixing screws	8 mm box spanner
19	Fit the side protection panel and the right-hand front wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168).	
	Fill the petrol tank and prime the petrol pump using the hand control	Jacking bracket 2505-T 8-12-14 mm box spanners

TOOLS

NOTE - This repair can be carried out by fitting a sleeve on the pipe system (petrol feed or suspension return) or by replacing one of the unions (return).

If two sleeves have to be fitted on the same pipe, they must be about 800 mm apart in order to retain the flexibility of the pipe assembly.

The flexible pipes and Rilsan unions are sold by our Spare Parts Department.

Petrol system, pipe dia. 6 x 8, length 1 metre	No. DS	391-151
Suspension return, pipe dia. 8 x 10, length 1 metre	No. DS	391-152
Returns from the height correctors (since January 1957),		
pipe dia. 3 x 4, length 470 mm	No. DM	211-14a
length900mm	No. DM	211-14
'T" union for front right-hand suspension cylinder return	No. DS	391-148
'Y' union for rear right-hand suspension cylinder return	No. DS	391-149
T' union for securing return rubber pipe to petrol tank	No. DS	391-146

NOTE - The unions are sold complete with 60 mm pipe on each outlet. Also obtain a bottle (60 cm^3) Rilsan glue, sold by Société Boyriven, 37 bis, rue de Villiers, Neuilly-sur-Seine (Seine). Tel. MAI 36-11.

1 After trimming the pipes, remove the polish from the ends of the pipes for a length of approximately 90 mm or remove the polish from the union outlets using No. 600 abrasive paper.

2 Carefully remove all grease from the rubbed down ends, with trichlorethylene, also on the sleeve.

3 Heat the Rilsan paste in a bath and bring it to a temperature of 60° C. *Do not heat beyond this temperature.*
This operation is essential to reduce the hardening period.

4 IMPORTANT NOTE - Rilsan paste attacks the skin and must not be touched with the fingers.
Rilsan paste destroys the bristles of nylon or Rilsan brushes; use a wooden stick or spatula.

a) Smear the ground ends of the pipes and the inside of the unions with paste.
b) Let the parts dry for a few minutes.
c) Insert the ends of the pipes or the union outlets in the sleeves.
d) Leave the assembly for 3 to 4 hours to dry before using the repaired pipe.

PARTICULAR POINTS

Replacement of a petrol tank. in order to avoid leakage from the rubber pipe between the feed pipe to the pump and the petrol tank, fit two Ligarex clips as indicated in Pl. 29 fig. 3. Tighten the clips moderately in order to avoid deformation of the nylon pipe.

	REPLACEMENT OF A PETROL TANK	TOOLS
	Removal.	
1	Drain the tank by the right and left-hand plugs	12-21 mm box spanners
2	Lift and remove the rear squab. Remove the rear seat. Remove the petrol tank cover plate	12 mm box spanner
3	Disconnect the flexible air vent hose from the tank. Close the orifices of the hose and tank.	
4	Remove the rear closing panel under the right-hand sidemember.	
	Remove the fixing strap of the rear flexible pipe of the feed pipe from the tank. Close the orifices of the pipe and tank	7 mm box spanner
5	Remove the right-hand rear wing. Remove the right-hand rear side protection panel. Carefully clean the area where work is to be carried out round the flexible pipe between the filler pipe and the tank.	
	Remove the front collar from the flexible pipe between the filler pipe and the tank.	
	Disconnect the flexible pipe from the tank. Close the orifice of the tank and the pipe	8 mm spanner 8 mm box spanner 14 mm box spanner
6	Disconnect the battery negative cable. Disconnect the leads from the petrol gauge tank unit.	
7	Turn back the clips securing the transverse packings of the tank and remove the packings.	
8	Unscrew the fixing screws of the tank fixing straps and disengage the straps and the rear rubber packings.	
	Remove the tank.	
9	To strip the tank :	
	Remove the petrol gauge tank unit.	
	Remove the rubber sound deadening blocks.	
	Remove the tank protection packings.	

		TOOLS
	Refitting.	
10	To assemble the tank a) Place the petrol gauge tank unit in position, inserting a rubber joint. Tighten the fixing screws (fibre washers under the heads). Fit and tighten the drain plugs, inserting copper joints	12-21 mm box spanners
	b) Fit the glue (Bostick) the rubber sound deadening blocks in position at the front and rear of the tank (one block about 100 mm from the left-hand end of the tank, one block in the centre and one block about 150 mm from the right-hand end). Glue the rubber bands, under the tank (Bostick).	
11	Put the tank in position, insert the flexible pipe between the filler pipe and the tank on the petrol tank filler neck channel.	
12	Glue the tank protection packings in position under the fixing straps (Bostick). Place the fixing straps in position, insert the rear rubber packings, tighten the strap fixing screws.	
13	Place the transverse packings of the tank in position, turn down the retaining clips on the packings.	
14	Place the Ligarex clip on the front part of the flexible pipe, between the filler pipe and tank (pliers 2483-T, see Pl. 17, fig. 2). Fit the side protection panel. Fit the wing	Pliers 2483- 8 mm spanner 8 mm box spanner 14 mm box s
15	Connect the rear end of the flexible pipe of the petrol pump feed pipe at about 370 mm from the rear end of the pipe. Insert the feed pipe in the tank and connect the flexible pipe to the filler neck.	
	IMPORTANT NOTE - In order to avoid leakage from the rubber connection to the tank, make sure that the joints between the rubber pipe and the tank and between the rubber pipe and the nylon hose are tight by using two Ligarex clips, fitted as indicated on Pl. 29, fig. 3. Tighten the clips moderately, in order to avoid deformation of the nylon pipe (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
16	Connect the flexible air vent hose to the tank. Fit a Ligarex clip (pliers 2483-T)	Pliers 2483-T
17	Fit the clip to the rear flexible pipe of the petrol pump feed pipe. Tighten the fixing screws (spring washer under the head).	
	Fit the sidemember closing panel. Tighten the fixing screws (plain washers under the heads)	7 mm box spanner
18	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under the heads). Glue the sidemember trimming on the petrol tank cover plate (Glutafix T, sold by Etablissements Beissier, 125, rue de Reuilly, Paris 12e).	
	Fit the rear squab and seat	12 mm box spanner

		TOOLS
	REPLACEMENT OF A FILLER PIPE	
	Removal.	
19	Remove the right-hand rear wing and the side protection panel. Glean the working area carefully	8- 14 mm box spanners
20	Remove the rear clip of the flexible pipe between the filler pipe and the petrol tank. Remove the rear clip of the flexible pipe between the filler pipe and the air pipe of the tank.	
21	Remove the clip of the filler pipe from the wheel arch panel	8 mm box spanner
22	Remove the collar joint between the filler pipe and the wheel arch connecting panel. NOTE - It is unnecessary to remove the filler cap from the pipe.	
23	Disconnect the flexible pipe between the air pipe and the filler pipe from the pipe. Disconnect the flexible pipe between the filler pipe and the tank from the pipe. Remove the pipe towards the front.	
	Refitting.	
24	Put the filler pipe in position and engage in the flexible connection pipe of the tank. Engage the flexible air pipe on the filler pipe channel. Put the collar joint in position between the filler pipe and the wheel arch connecting panel.	
25	Fit the fixing collar of the filler pipe on the wheel arch. Tighten the fixing nuts (plain and spring washers)	8 mm box spanner
26	Fit a Ligarex clip on the flexible pipe between the filler pipe and the tank and on the flexible pipe between the filler pipe and the tank air pipe (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
27	Fit the side protection panel (plain and spring washers under the fixing nuts). Fit the wing	8-14 mm box spanners
	REPLACEMENT OF AN AIR PIPE AND AN AIR VENT PIPE	
	Removal.	
28	Lift and remove the rear squab. Remove the rear seat.	
29	Remove the petrol tank cover plate. Disconnect the flexible tank connecting pipe from the air pipe	12 mm box spanner

		TOOLS
30	Remove the right-hand rear wing and the side protection panel. Clean the working area carefully	8-14 mm box spanners
31	Remove the tank air pipe and air vent pipe fixing collars on the wheel arch.	
	Turn back the clips retaining the air vent pipe on the wheel arch. Remove the pipe and the rubber protection rings from the pipe	8 mm box spanner
32	Remove the fixing screws of the rear vent pipe cup and remove the rear cup and gasket. Remove the gasket from the front cup.	
33	Disconnect the flexible pipe between the air pipe and the filler pipe of the tank from the air pipe. Remove the air pipe and air vent pipe assembly from the rear of the car.	
	NOTE - On cars produced before February 1958, the air pipe and the air vent pipe (metallic) are assembled with a rubber sleeve.	
	<u>Assembly.</u>	
34	Engage the front end of the air pipe in the hole in the rear closing panel of the right-hand sidemember.	
	Make sure that the rubber guide rings are in position.	
	Connect the air pipe to the flexible pipe to the tank. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
35	Connect the rear end of the air pipe to the flexible connection pipe of the filler pipe of the tank. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
36	Fit the air pipe fixing clips on the wheel arch panel. Tighten the nuts (plain and spring washers)	8 mm box spanner
37	Place the rear cups of the air vent pipe in position and insert the rubber joints.	
	Tighten the nut moderately on the fixing screw (plain washer)	8 mm box spanner
38	Fit the tank fixing collar, tighten the nut (plain and spring washer).	
	Fit the rubber protectors for the air vent pipe, turn down the retaining clips	8 mm box spanner
39	Fit the side protection panel, insert the rubber protectors for the air vent pipe. Tighten the screws and nuts fixing the panel (plain and spring washers)	8-14mm box spanners
40	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under the heads).	
	Glue the siderail trimming on the cover plate (Glutafix T, sold by Etablissements Beissier, 125, rue de Reuilly, Paris 12e)	12 mm box spanner
41	Replace the rear seat and squab.	

		TOOLS
	REPLACEMENT OF A PETROL GAUGE TANK UNIT	
	Removal.	
42	Lift and remove the rear squab. Remove the rear seat.	
43	Remove the petrol tank cover plate	12 mm box spanner
44	Disconnect the negative battery cable, disconnect the leads from the tank unit terminals.	
45	Remove the tank unit fixing screws. Remove the tank unit complete with float. Remove the rubber joint between the tank unit and the petrol gauge.	
	Refitting.	
46	Place the rubber joint for the tank unit on the petrol tank. Insert the tank unit float into the tank and place the tank unit in position. Tighten the fixing screws (fibre joints under the heads).	
47	Connect the leads to the tank unit terminals. Connect the battery cable (switch on the ignition) and make sure that the petrol gauge functions.	
48	Fit the petrol tank cover plate. Tighten the fixing screws (plain washers under the heads). Glue the siderail trimming on the cover plate (Glutafix T, sold by Etablissements Beissier, 125, rue de Reuilly, Paris, 12e)	12 mm box spanner
49	Replace the rear seat and squab.	

		TOOLS
	REPLACEMENT OF AN EXHAUST MANIFOLD	
	Removal.	
1	Release the pressure in suspension system. Unscrew the bleed screw of the pressure control valve and place the manual height control lever in the low position.	
2	Remove the air filter-silencer assembly and pipe between the filter and carburettor	12-17 mm box spanners
3	Remove the suspension sphere from the front right-hand suspension cylinder (strap wrench 2223-T, see Pl. 93, fig. 1). Close the openings of the suspension sphere and the suspension cylinder (see Pl. 94)	Strap wrench 2223-T
4	Remove the exhaust manifold fixing screws. Remove the screen	12 mm spanner 12 mm box spanner
5	Remove the flange coupling the downpipe to the expansion chamber	12 mm box spanner
6	Unscrew the manifold fixing nuts. Remove the manifold screen retaining clips	12 mm box spanner
7	Remove the exhaust manifold. Remove the gaskets.	
	Refitting.	
8	Place the manifold in position and insert the copper and asbestos gaskets.	
9	Fit the manifold screen retaining clips. The longest upper clip is fitted at the front. Tighten the fixing nuts of the manifold and the manifold screen retaining clips (spring washers under the heads).	12 mm box spanner
10	Unscrew the fixing nuts of the collar securing the expansion chamber	12 mm box spanner
11	Put the flange, coupling the expansion chamber to the exhaust manifold in position. Tighten the nuts (spring washers under the heads). Tighten the nuts fixing the collar, securing the expansion chamber	12 mm box spanner
12	Put the manifold screen in position. Tighten the fixing screws and nuts (plain washer)	12 mm box spanner
13	Fit the suspension sphere on the right-hand front suspension cylinder.	
14	Fit the air filter-silencer assembly and pipe between the filter and carburettor (spring washers under the nuts fixing the air filter-silencer)	12-17 mm box spanners
15	Start the engine. Tighten the pressure control valve bleed screw. Put the suspension system under pressure. Check the joint between the suspension sphere and suspension cylinder for leakage.	

		TOOLS
	REPLACEMENT OF AN EXPANSION CHAMBER	
	Removal.	
16	Remove the nuts of the collar fixing the expansion chamber on its support and remove the collar	12 mm box spanner
17	Remove the nuts of the fixing screws of the half collar assemblies fixing the expansion chamber and silencer to the manifold. Remove the expansion chamber	12 mm box spanner
	Refitting.	
18	Offer up the expansion chamber. Place the half collar assemblies in position, fixing the expansion chamber and silencer to the manifold, the head of the screws on the right-hand countersunk side. Screw on the nuts, without tightening (spring washers).	
19	Fit the collar fixing the expansion chamber to the support. Screw on the nuts, without tightening (plain washers).	
20	Tighten the nuts of the half collar assembly and the nuts of the collar fixing the pipe to the support	12 mm box spanner
	REPLACEMENT OF AN EXHAUST SILENCER	
	Removal.	
21	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the spare wheel and the air deflection panel	Jacking bracket 2505-T 12 mm box spanner
22	Remove the half collars fixing the silencer to the expansion chamber	12 mm box spanner
23	Disconnect the silencer outlet pipes from the exhaust pipes	12 mm box spanner
24	Disconnect the silencer from the flexible support	12-14 mm box spanners
25	Remove the silencer from the joint between the pipes.	
	Refitting.	
26	Offer up the silencer. Connect the outlet pipe and insert the joints	12 mm box spanner
27	Fit the silencer on the flexible support	12-14 mm box spanners
28	Fit the half collars fixing the silencer to the expansion chamber, the head of the screws on the right-hand countersunk side. Tighten the fixing nuts (spring washers)	12 mm box spanner
29	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Fit the air deflection panel, tighten the fixing screws (plain and spring washers). Fit the spare wheel	Jacking bracket 2505-T 12 mm box spanner

		TOOLS
	REPLACEMENT OF THE EXHAUST OUTLET PIPES	
	Removal.	
30	Put the car on stands or on a lift (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
31	Remove the fixing screws of the rubber straps under the body and remove the steel plates. During this operation, support the rear of the exhaust pipes	12 mm box spanner
32	Disconnect the exhaust outlet from the silencer and remove	12 mm box spanner
33	To strip the pipes remove the rubber buffers, the half collar assemblies, the rear collars and the front flange . . . . On cars produced before February 1958, untighten the collar and remove the outlet pipe fishtail. Disconnect the rubber straps, the half collars and the front flange.	12 mm box spanner
	Refitting.	
34	To assemble the pipes	
	a) Engage the front flange on the pipes.	
	b) Make sure that the steel distance pieces are in the rubber straps. Fit the fixing collars, screw on the fixing nuts of the collars, without tightening them (spring washers).	
	Fit the rubber buffers	12 mm box spanner
35	Engage the exhaust outlet pipes on the silencer. Insert the joints. Support the rear of the pipes and tighten the flange fixing screws	12 mm box spanner
36	Fit and tighten the fixing screws of the rubber straps under the body, make sure that the distance pieces are in position: insert the steel plates (spring washers under the heads of the screws).	
37	Tighten the nuts of the rear collar fixing screws (cars produced since February 1958). Fit the outlet pipe fishtail, tighten the collar (cars produced before February 1958)	12 mm box spanner
38	Check the clearance between the exhaust pipes and the body.	
39	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T

PARTICULAR POINTS

Adjustment of ignition advance.

In order to carry out this operation it is necessary to set the ignition control in the midway position. After adjustment, do not forget to remove the rod from the flywheel.

Adjustment of the contact breaker.

Adjust the synchronisation of the breaker.
The angle should be equal to 90 ± I and working on the contact gap (0.3 to 05 mm). When the adjustment is obtained, make sure that the average of the two gaps is 04 mm.

Bench Test of a contact breaker.

The centrifugal advance should be between 3˚ 30' and 7˚ 30' at 1,000 r.p.m. and 10˚ 30' and 15˚ 30' at 1,500 r.p.m. On an adjustable contact breaker, one should obtain sparks of 12 mm at 500 r.p.m. and 5 mm at 2,000 r.p.m.

TOOLS

ADJUSTMENT OF IGNITION ADVANCE

1 Put the auxiliary clutch control lever in the engaged position by pushing forward and then locking in that position by pushing towards the top. The clutch is then in the engaged position.

2 Insert a 6 mm diameter locating pin into the special hole in the clutch bellhousing (left side).

NOTE - This hole is partly covered by the dynamo.

3 Turn the engine slowly using the starting handle, until the pin falls into the recess in the flywheel. In this position, the engine is at the firing point (10˚ on flywheel).

4 Fit the lead from a test lamp on the condenser terminal (red terminal, blue cable) of the lower coil, the lamp bracket connected to earth.

5 Switch on the ignition. Turn the ignition control until the distributor is in the midway position, to do this:

a) Put the control in the 'retard" position.

b) By counting the clicks, set the lever to the middle position of its effective movement.

		TOOLS
6	Untighten the screw fixing the distributor. Find the point at which the contact breaker points open, at this exact moment the lamp should light. Tighten the fixing screw	12 mm spanner
	NOTE - This operation is made easier by removing the coil and bracket assembly. (Let the assembly rest on the suspension sphere).	
7	Switch off the ignition, remove the test lamp.	
	IMPORTANT - Remove the locating pin. Move the auxiliary clutch control lever in the original disengaged position.	
	ADJUSTMENT OF THE CONTACT BREAKER (with two breakers).	
	<u>To adjust the synchronisation of the breaker</u> (bench test).	
8	Make sure that the contact points are in good condition. Adjust the gap to 0.4 mm. Use a set of very clean feeler gauges, so that no trace of grease is deposited on the contact points.	
9	Mount the contact breaker on a bench tester comprising a graduated scale and a pointer..	
	Connect a 6 volt test lamp between the positive terminal of a battery and one of the breakers. The negative terminal of the battery connected to the earth of the bench tester.	
10	Turn the contact breaker by its drive in a clockwise direction until the lamp lights, then continue turning until the moment that the light goes out. Turn the graduated scale to bring zero on the scale in line with the pointer.	
11	Connect the test lamp on the second breaker and turn the drive in the same direction as before, never turn backwards. Note the angle indicated by the pointer at the moment the light goes out. This angle should be between 89˚ and 91˚	
12	If the angle is less than 89^0,proceed as follows a) Reduce the contact gap of the breaker which is connected to the test lamp. Do not reduce the gap below 0.3 mm. b) If necessary, increase the contact gap of the other breaker. Do not exceed 0.5 mm. c) If these operations are insufficient, replace the cam.	
13	If the angle is greater than 91˚, proceed as follows a) Increase the contact gap of the breaker which is connected to the test lamp. Do not exceed 0.5 mm. b) Reduce the contact gap of the other breaker. Do not reduce the gap below 0.3 mm. c) If the operations are insufficient, replace the cam.	

TOOLS

14 Final adjustment having been obtained, make sure that the average of the two gaps is equal to 0.4 mm.

Examples : 0.35 and 0.45 mm.
0.30 and 0.50 mm.

Avoid settings such as 0.30 and 0.45 mm.

<u>To Adjust the synchronisation of the breakers</u> (test bench 2209-T, see Pl. 32).

15 To mount the contact breaker on the bench tester

a) Put the contact breaker in position.

b) Fit the test lamp (23) on the contact breaker. Connect the crocodile clip of the lamp feed (A) to the positive terminal of a 6 volt battery and connect the crocodile clip of the earth wire (B) to the negative terminal of the battery.

c) Fit the pointer (24) on the contact breaker . . . . . Test bench 2209-T

16 To adjust the synchronisation

Turn the contact breaker in the direction of the arrow. The lamps should go out alternately each time the pointer passes through 90 ± 1°. If not, reset the gaps as indicated in paragraphs 12, 13 and 14.

<u>To bench test a contact breaker</u> (see Pl. 32A, fig. 1).

17 Bench test the contact breaker as normal contact breaker, dealing successively with each contact.

The centrifugal advance should be between 3° 30' and 7° 30' at 1000 r.p.m. contact breaker and between 10° 30' and 15° 30' at 1500 r.p.m. contact breaker.

On an adjustable contact breaker and with a production type coil, sparks of 12 mm minimum should be obtained (some misfires will be accepted) at 500 r.p.m. and 5 mm minimum at 2000 r.p.m. contact breaker.

ADJUSTMENT OF THE CONTACT BREAKER (with one breaker) DUCELLIER 3944-A or SEV N4-YG.

18 Make sure that the contact points are in good condition. Adjust the gap to 0.4 mm. Use a set of very clean feeler gauges, so that no trace of grease is deposited on the contact points.

<u>To bench test a contact breaker</u> (see Pl. 32A, fig. 2).

19 The centrifugal advance should be between 4.5° and 7.5° at 1000 r.p.m. contact breaker and between 7.5° and 9.5° at 1500 r.p.m. contact breaker.

On an adjustable contact breaker and with a production type coil, sparks of 12 mm minimum should be obtained (some misfires will be accepted) at 500 r.p.m. and 5 mm minimum at 2000 r. p. m. contact breaker.

NOTE - This contact breaker is not fitted with a suction control.

TOOLS

CLEANING THE SPARKING PLUGS

IMPORTANT NOTE - Incomplete cleaning of the plugs after sand blasting can cause rapid engine wear. It is necessary to eliminate all traces of sand after this operation.

20 Eliminate all lead and oil deposits on the insulators and electrodes by using a hardwood spatula to the exclusion of all metallic objects.

21 Clean the plug in petrol and then blow with compressed air.

22 Sparking plug sand blasting machine. Supply the fixture with compressed air at 85 p.s.i. (6 kg/cm^2) maximum. Use an air jet with a maximum pressure of 56 p. s. i. (4 kg/cm^2) in order to remove the sand in between the insulator and the body.

23 Remove the sand from the base of the insulator by scraping with a hardwood spatula.

24 Maintenance of a sand blasting machine.

a) Use the sand sold by the manufacturer of the machine.

b) Store the sand in a dry place.

c) Renew the sand in the machine after cleaning approximately 100 plugs.

25 Adjust the electrode gaps to 0.60 mm.

PARTICULAR POINTS

Replacement of a contact breaker (with two breakers).

Removal.

Drain the radiator and remove the inlet manifold (it may be necessary to remove the two upper rear studs).

Refitting.

15 *Set the firing point. Do not forget to remove the rod from the flywheel.*

23 *Refill the radiator, heater control vane open, bleed the system. Check the hot-water circulation.*

24 *Adjust the slow running (see Op. DS 142-U).*

Replacement of a variable ignition control.
Refitting.
Set the firing point (see Op. DS 211-0) after setting the control in the midway position. Do not forget to remove the rod from the flywheel.

REPLACEMENT OF A CONTACT BREAKER (with two breakers).

		TOOLS
	Removal.	
1	Drain the water from the radiator and cylinder block. (Retain this water which contains anti-freeze). Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1)	21 mm spanner Stop MR-4158
2	Disconnect the battery negative terminal	12 mm spanner
3	Remove the tube between the carburettor and air filter-silencer.	
4	Disconnect the sparking plug leads.	
5	Remove the ignition coils and bracket assembly	8 mm spanner
6	Disconnect the rubber heating pipe from the inlet manifold.	
7	Disconnect the petrol feed pipe from the carburettor.	

		TOOLS
8	Disconnect the accelerator control from the butterfly control	7 mm spanner
9	To remove the carburettor. a) Remove the spring (13) by pulling towards the top of the support tube (14) (see Pl. 28). Unhook the spring from the clutch engagement control. b) Remove the screws fixing the accelerated idling control on the carburettor cover. Remove the screw on the plate fixing the accelerated idling control pipe to the hot spot cover plate on the inlet manifold. c) Remove the carburettor (spanner 1623-T, see Pl. 16, fig. 2)	Spanner 1623-T
10	Disengage the accelerator control from its spindle on the scuttle and turn it to the left.	
11	Remove the oil dipstick.	
12	Remove the inlet manifold	12 mm box spanner
	NOTE - It is necessary to remove the two rear upper studs of the manifold.	
13	Remove the screw fixing the contact breaker. Disconnect the primary leads from the contact breaker. Disengage the contact breaker, then disconnect the earth lead. Take out the contact breaker	12 mm spanner
	<u>Refitting.</u>	
14	<u>Remove the contact breaker cover.</u> a) Offer up the contact breaker, connect the earth lead. b) Lower the contact breaker into the housing, turning the shaft in order to make sure that the dog on the contact breaker engages correctly in the dog of the driving shaft. c) Put the screw fixing the contact breaker in position. Do not tighten.	
15	<u>To set the firing point</u> a) Release the pressure in the clutch cylinder by operating the auxiliary clutch control. b) Introduce a 6 mm diameter rod in the hole provided in the bellhousing, left side. (This hole is partly obscured by the dynamo). Turn the engine slowly in the running direction, up to the point where the rod enters the recess in the flywheel. The engine is now set at the firing point.	
	IMPORTANT - Remove the rod from the flywheel.	

		TOOLS
	c) Set the manual ignition control in the midway position. (To do this, it is necessary to count the number of clicks).	
	d) Connect the negative terminal on the battery.	
	Connect the primary leads on the contact breaker.	
	Connect a test lamp on the red terminal of the lower coil. Switch on the ignition.	
	e) Turn the body of the contact breaker until the contacts break, the lamp will light at the moment of breaking.	
	f) Tighten the screw fixing the contact breaker in position.	
	g) Switch off the ignition. Disconnect the test lamp. Fit the cover on the contact breaker.	
16	Fit the inlet manifold (renew the gaskets each time it is removed).	
	Smear the two rear upper studs with Hermetic and refit them.	
	Fit the carburettor. (plain and spring washers) (spanner 1623-T, see Pl. 16, fig. 2)	12 mm box spanner Spanner 1623-T
17	Fit the accelerated idling control. Insert a plain washer between the slow running control and the carburettor, then a second plain washer and a spring washer under the head of the screw. Hook on the spring (13) by fitting the support (14} (see Pl. 18).	
18	Engage the accelerator control on its spindle on the scuttle, connect the control to the carburettor, tighten the nuts and locknuts.	
	Connect the choke control	
	Fit the rubber heating tube to the inlet manifold, the petrol feed pipe to the carburettor.	
	Hook on the clutch engagement control spring	7-8 mm box spanners
19	Connect the pipe between the carburettor and air filter-silencer.	
20	Refit the ignition coils and bracket assembly on the scuttle	8 mm spanner
21	Connect the sparking plug leads.	
22	Refit the oil dipstick.	
23	Refill the radiator. During this operation, open the vane of the heater and the water system.	
24	Adjust the slow running (see Op. DS 142-0).	
	Check that the heater pipe to the inlet manifold is warm.	

		TOOLS
	REPLACEMENT OF A CONTACT BREAKER (with one breaker).	
25	If any difficulty is experienced, proceed as indicated in ID 19 Repair Manual, operation ID 211-1.	
	REPLACEMENT OF A VARIABLE IGNITION CONTROL.	
	Removal.	
26	Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1).	Stop MR-4158
27	Unscrew the fixing screw of the cable, on the movable plate of the contact breaker and unscrew the cable sheath fixing screw on the contact breaker fixing plate	5 mm spanner 8 mm box spanner
28	Remove the glove box. Hold the body of the mechanism (behind the dashboard) and unscrew the hollow screw found behind the control (inside the car)	14-17 mm spanners
29	Remove the control assembly from the body of the mechanism, through the opening for the glove box.	
	Refitting.	
30	Engage the mechanism and cable assembly through the opening for the glove box. Fit the cable and sheath assembly through the hole in the scuttle panel; make sure that the rubber grommet is fitted.	
31	Fit a shake-proof washer between the body of the mechanism and the inside of the instrument panel and fit the control in the body of the mechanism, inserting a chromium plated washer between the dashboard and the hexagon of the hollow screw. Hold the body of the mechanism and tighten the hollow screw of the control assembly	14-17 mm spanners
32	Fit the glove box (cup washers under the heads of the screws).	
33	Connect the cable to the movable plate of the contact breaker and connect the cable sheath on the contact breaker fixing plate	5 mm spanner 8 mm box spanner
34	Set the firing point (see Op. DS 211-0).	

TOOLS

OVERHAULING A CONTACT BREAKER (with two breakers).

Dismantling (see Pl. 31).

1 Remove the cover. Remove the upper condenser (I) and the lower condenser (2) with their bracket.

2 Remove the upper moving contact (3) with its spring (4) and the lower moving contact (5) with its spring (6). Do not mislay the insulators (7) and (8). Remove the insulating sleeves (9).

3 Remove the fixed contact carriers (10) and (11). Remove the contact carrier plate (12).

4 Remove the circlip (13) retaining the cam (14), the thrust washer (15) and remove the cam.

5 Remove the centrifugal advance weights (21).

6 Remove the spring (16) retaining the pin (17) of the driving dog (18). Remove the driving dog and the adjusting washer (19). Remove the shaft (20) from the contact breaker.

7 Clean the parts with trichlorethylene and blow off with compressed air.

8 Make sure that the base of the contact breaker is drilled. If not, drill a 3 mm diameter hole in the base of the body.

Assembly (see Pl. 31).

NOTE - If the surface of the contact points are badly pitted, it is necessary to renew the contacts.

9 Fit the shaft (20) previously oiled, into the body of the contact breaker. Fit the adjusting washer (19) and the driving dog (18) on the shaft.

Press in the pin (17).

NOTE - The direction of fitting the driving dog is immaterial.

Check the end play which should be approximately 0.1 mm; if not, replace the adjusting washer (19) in order to obtain this clearance.

Fit the retaining pin (17) and the spring (16). Make sure that the direction of winding the spring is left-hand, in order to avoid oil leakage (see fig. 4).

10 Oil the centrifugal balance weight spindles (22) and fit the advance weights (21) on the spindles. Fit the cam (14) on the shaft (20) previously oiled and the spindles in the centrifugal balance weights (21).

Fit the thrust washer (is) and the circlip (13).

11 Put the contact carrier plate (12) in position. Insert a spring washer under the heads of the screws.

TOOLS

12 Put the fixed contact carriers (10) and (11) in position. Insert a plain washer and a spring washer under the heads of the screws and tighten provisionally.

13 Put the insulating sleeves (9) in position and the moving contacts (3) and (5) with their springs (4) and (6).

Insert under the current feed for the lower moving contacts (5), the insulator (7) with the edges turned over.

14 It is possible to check the condensers before assembly on the contact breaker. Use a resistance /capacity meter to check the resistance, the capacity and the insulation of the condenser.

Offer up the lower condenser (2) and fix it with the current feed.

Insert a shake-proof washer under the head of the screw.

Insert under the current feed for the upper moving contact (3), the insulators (8) without the edges turned over.

15 Offer up the upper condenser (1) and fix with the current feed.

Insert a shake-proof washer under the head of the screw.

Fix the earthing supports of the condensers on the body of the contact breaker.

Insert a shake-proof washer under the heads of the screws.

16 Adjust the contacts and bench test the contact breaker (see Op. DS 211-0).

17 Fit the contact breaker cover, insert serrated washers under the heads of the screws.

OVERHAULING A CONTACT BREAKER (with one breaker).
DUCELLIER 3944A or SEV N4-YG.

If any difficulty is experienced with this work, proceed as shown in the ID 19 Repair Manual, operation ID 211-3.

TOOLS

CHECKING A COIL (see Pl. 33).

1 To mount the coil on a test bench:

Connect the positive terminal of the coil to the positive terminal of a 6 volt battery and the negative terminal to a DS 19 contact breaker (contact gaps set to 0. 4 mm) fitted with condensers in good condition.

2 Connect 1. The secondary outlet “a” to the insulated terminal of the first spark gap (A) which is set during the test.

2. The secondary outlet “b” to the insulated terminal of the second spark gap (B) set to 1 mm throughout the test.

3 Operational conditions

- At 2000 r. p. m. contact breaker, the minimum length of spark (between the points of the spark gap (A) should be 5 mm.
- At 60 r.p.m. contact breaker, this length should be 11 mm cold and 9 mm hot (after 30 minutes running).

NOTE - Do not attempt to obtain a longer spark by increasing the terminal gap of the spark gap (A), because this will cause internal sparking of the coil and rapid deterioration.

4 Test the two outlets “a” and “b” of the coil successively.

IMPORTANT NOTE - One can proceed as indicated above. It is, however, preferable to use the bench designed by our Service Department and sold by Etablissements de Sarello, 7 bis Villa Berthier, Paris, 17e) (see Pl. 34).

5 To check the continuity of the primary winding

Supply the test bench from a 6 volt battery.

Connect the primary wires on to the primary terminal (A) of the coil. Switch on the main switch (B) (top left-hand) and put the two-way switch (C) in feed position for the light (D) (pull downwards).

Test : The filament of the lamp should glow without bright fluctuations, likewise, by moving the primary terminals of the coil.

6 To check the operation (see Pl. 34)

a) Secondary outlet No. 1.
Connect the secondary outlets (E) of the coil to the two spark gaps. Start the motor by means of the motor switch (F) (top right-hand) and by immediately pressing on the button of the starter switch (G) (lower right-hand).
Put the two-way switch (C) in the position to supply the contact breaker (towards the top). There should be practically no misfires in the sparks with the spark gap set at 8 mm. Put the two-way switch in the neutral position.

TOOLS

b) Secondary outlet No. 2.

Reverse the secondary wires to the spark gaps.

Put the two-way switch (C) in position to supply the contact breaker (towards the top). There should be practically no misfires in the sparks with the spark gap set at 8 mm.

Leave running for a quarter of an hour. After this time, there should be no misfires.

Put the two-way switch in the neutral position.

c) Secondary outlet No. 1 (after a quarter of an hour warming up).

Reverse the secondary wires to the spark gaps.

Put the two-way switch (C) in position to supply the contact breaker (towards the top).

The results should be identical to those indicated above.

Put the two-way switch in the neutral position.

Stop the apparatus, disconnect the wires.

PARTICULAR POINTS

Adjust the tension of the belts (see Pl. 35).

The leverage for tensioning the high pressure pump belt is 24 ft./lb. (3m. kg.) and the dynamo belt 29 ft./lb. (4m. kg.).

TOOLS

ALIGNMENT OF PULLEYS (see Pl. 36).

NOTE - In order to carry out this operation, it is necessary to remove the high pressure pump (see Op. DS 391-1) and the water pump belts (see Op. DS 231-4).

1 Use the fixture 1683—T . . . . . Fixture 1683-T

Fit the gauge pin bracket (B) in place of the high pressure pump on the boss on the clutch bellhousing, using the face corresponding to the type of assembly (1 or 2 pulleys) towards the front.

2 Place the rod (A) with the ball end engaged as far as possible in the rear groove of the pulley, the rod resting on one or both of the gauge pins (C) in the zones “f or “g” for the water pump pulley and for the driving pulley.

3 <u>To adjust the alignment of the driving pulley or the water pump pulley</u>

a) Using a set of feeler gauges, measure the gap between the gauge pin and the rod.

b) The rod resting at “f”, reduce the thickness of the pulley adjusting washer by three times the amount of the gap “d” measured at “g”. The pulley is in alignment when the gap is between 0 and .003” (0 and 0. 08 mm).

c) The rod resting at “g”, add to the thickness of the washer, twice the amount of the gap “d” measured at “f”. The pulley is in alignment when the gap is between 0 and . 007” (0 and 0. 12 mm).

4 <u>To adjust the alignment of the dynamo pulley</u> *(Cars produced since May 1959.)*

a) Using a set of feeler gauges, measure the gap between the gauge pin and the rod.

b) The rod resting at “h”, reduce the thickness of the pulley adjusting washer by five times the amount of the gap “d” measured at “i”.

The pulley is in alignment when the gap is between (0 and 0. 1 mm)

c) The rod resting at “i”, add to the thickness of the washer, four times the amount of the gap “d” measured at ‘‘h’’.

The pulley is in alignment when the gap is between (0 and 0. 1 mm).

		TOOLS
5	Remove the pulley being adjusted. Remove the adjusting washer, measure its thickness and select a washer of suitable thickness from among those sold by our Spare Parts Department.	
6	Fit the washer and the pulley. Check the alignment (see paragraphs 3 or 4, above).	
7	Remove the gauge pin bracket (B).	
	ADJUSTMENT OF THE BELT TENSION (see Pl. 35).	
8	<u>Tensioning the high pressure pump belt or belts</u>	
	a) Unscrew the nut fixing the tie-rod to the pump. Slightly unscrew the pump bearing spindle nut (spanner 2280-T, see Pl. 72, fig. 5)	12 mm box spanner Spanner 2280-T
	b) Tension the belts, using a lever (lever MR-4208, see fig. 2) resting on the clutch cylinder with one end and on the body of the pump with the other part. Exert a pull of l6 lbs (7.5 kg) on the end of the lever (spring balance 2472-T), which corresponds to a tension of 22 ft/lbs (3 m.kg)	Lever MR-4208 Spring balance 2472-T
	c) With the belts under tension, tighten the pump bearing spindle nut (spanner 2280-T, see Pl. 72, fig. 5), and tighten the nut fixing the tie-rod to the pump	12 mm box spanner Spanner 2280-T
9	<u>Tensioning the water pump and dynamo belts</u>	
	a) Unscrew the nut fixing the dynamo to its tie-rod. Slightly unscrew the screw fixing the dynamo to the clutch housing	12 mm box spanner 14 mm spanner 14 mm ring spanner
	b) Tension the belts, using a lever (lever MR-4208, see fig. 2), resting on the boss between the two dynamo fixing plates, with one end and on the body of the dynamo with the other part. Exert a pull of 22 lbs (10 kg) on the end of the lever (spring balance 2472-T) which corresponds to a tension of 28 ft/lbs (4 m.kg)	Lever MR-4208 Spring balance 2472-T
	c) With the belts under tension, tighten the screw fixing the dynamo and tighten the nut fixing the dynamo to its tie-rod	12 mm box spanner 14 mm spanner 14 mm ring spanner

PARTICULAR POINTS

8 *Since October 1957, the pumps are fitted with a new impeller (marked with No. DS 231-7 on the outer face). These pumps should befitted with a new type cover, which has a groove provided for securing the water outlet hose.*

9 *Measure the distance "d" on the pump and fit spacing washer under the pulley (when fitting the above on a new pump) in order to obtain the same dimensions at "d" (see Pl. 37).*

13 *Adjust the tension of the belts: High-pressure pump = 22 ft/lb (3 m.kg), Dynamo 28 ft/lb (4 m.kg) (see Pl. 35).*

14 *Tighten the fan fixing screws to 72 ft/lb (1 m.kg) maximum.*

16 *Refill the radiator (open the heater vane and bleed the system).*

17 *Start the engine, check the adjustment of clutch drag (see Op. DS 314-0) and make sure that the hot water circulates.*

		TOOLS
	REMOVAL (see Pl. 37).	
1	Drain the radiator and pipes, save the water which contains anti-freeze.	
2	Disconnect the radiator tie-bar without disconnecting the feed pipe to the high pressure pump	8-12 mm box spanners
3	Remove the fan	12 mm box spanner
4	Disconnect the adjusting rods of the dynamo and high pressure pump from the water pump. Slacken the water pump belts	12 mm box spanner
5	Disconnect the feed and return pipes from the low pressure pump, (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T
6	Disconnect the water pump feed pipe.	
7	Disconnect the water pump with its cover (4). Remove the pump	12 mm box spanner
8	Scrape the joint face.	
	NOTE - Since October 1957, the water pumps are fitted with a new type impellor and new cover which has a water passage of different section than that of the old type cover. The new pumps (fitted with an impellor worked with No. DS 231-7 on the outer face (c) must be fitted with the new cover having a groove on the water outlet.	

		TOOLS
	ASSEMBLY (see Pl. 37).	
9	To position the pulley on the new pump	
	a) Place the old pump on a surface plate and measure the distance “d” between the bearing face “a” on the cover and the boss face “b” of the pulley receiving the fan.	
	b) Fit the pulley on the new pump and carry out the same procedure as above.	
	c) Fit the distance washer (3) under the pulley, in order to obtain a dimension “d” equal to that obtained in line a).	
	d) Carry out the new assembly of the pulley by fitting the key (1), the plain washer (2) and the lockwasher. Tighten the nut	16 mm box spanner
10	Smear the face of the cover (4) and the pump with Hermetic. Stick the joint on the cover.	
11	Offer up the pump. Tighten the nuts and fixing screws	12 mm box spanner
12	Connect the feed and return pipe unions to the low pressure pump (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T
13	Put the belts in position. Connect the dynamo and high pressure pump adjusting rods to the water pump (spring washers). Adjust the tension of the belts (see Op. DS 231-0).	
14	Fit the fan. Tighten the nuts to 7.2 ft/lbs (1 m.kg) maximum	12 mm box spanner
15	Fit the radiator tie-bar	8-12 mm box spanners
16	Connect the water pump feed pipe. Refill the radiator with water. Open the heater control vane and bleed the system.	
17	Start the engine. Check the clutch drag and adjust if necessary (see Op. DS 314-0). Check that the heater pipe to the carburettor is hot.	

TOOLS

PARTICULAR POINTS

Dismantling.

7 *In order to make sure of perfect sealing after a complete pump overhaul, it is necessary to lap the thrust washers and the thrust face of the joint. In order to avoid impregnating the porous bronze bush, it must be removed.*

Proceed with great care during this operation.

Assembly.

12 *Do not refit the greaser, seal the hole by means of a screw.*

16 *Fit the bearing by means of a press. Support it by the end of the shaft and not by the impeller or the body of the pump.*

17 *Tighten the bearing nut to 22 ft/lb. (3 m.kg) and split pin.*

18 *Tighten the screws fixing the pump to the body to 12 to J3-~ ft/lb (1 7 to 1 9 m.kg). Turn the shaft during the tightening of the screws.*

Checking for leakage (see Pl. 40).

The pump should be immersed in hydraulic fluid and the sealing checked under a compressed air pressure of 14 psi. (1 kg/cm^2).

OVERHAULING A PUMP (on cars produced before December 1957).

		TOOLS
	Dismantling (see Pl. 37).	
1	Fix the pump on a stand (stand MR-3676-180, fitted with the dowel pin (A) see Pl. 41, fig. 1)	Stand MR-3676-180
2	Remove the pulley fixing nut, remove the distance washer (2), the pulley, its key (1) and the adjusting washers (3).	16 mm box spanner
3	Disengage from the groove, the metal locking the nut (5), remove the nut (5) retaining the ball bearing (spanner 1634-T, see Pl. 41, fig. 2)	Spanner 1634—T
4	Remove the ball bearing (6) (extractor 1684-T, see Pl. 41, fig. 3). Remove the steel cup (7), the half retaining rings (8) and the spring (9)	Extractor 1684-T
5	Remove the pump body fixing screws. Remove the pump body (10). Remove the thrust washer (11), the seal ring (12) and the cup (13) from the body of the pump. Remove the pump pinions (14) and (15) from the pump and the key (16)	12 mm box spanner

TOOLS

6 Remove the pump from the stand. Remove the spindle and impellor assembly (17) from the water pump body. Remove the thrust washer (18), the ring seal (19) and the cup (20) from the pump body. Remove the spring (21), the cyclam joint (22) and the spindle thrust washer (23).

Remove the greaser and the overflow unions (24) and (25).

IMPORTANT REMARK - In order to make sure of perfect sealing after a complete pump overhaul, it is necessary to lap the thrust washers (26) and (27) and the thrust face on the pump of the joint (22). The lapping of the washers is carried out with extremely fine emery powder. In order to avoid impregnating the porous bronze bush (28), it must be removed.

This delicate operation demands great care in order to avoid damage to the pump body.

7 <u>Lapping the thrust washers</u>

Before doing anything else, the pump body must be very carefully cleaned, in order to eliminate every trace of grease or oil.

Use alcohol only. Blow with compressed air especially in the bores, the greaser hole and the oil-way between the pump body and grease retainer.
Two conditions are possible

a) If the thrust washer (27) is in good condition and only' requires grinding, remove the bronze bush, using the threaded extractor 2291-T (see Pl. 39, fig. 3). Screw the thread in the bush, then turn the pump body and . . . press out the assembly on a press with a round bar

Extractor 2291-T
Drift = 14 dia.
Length = 150 mm.

b) If the thrust washer (27) is to be replaced, it is necessary to dismantle the bush and washer assembly <u>with heat</u> (see paragraph 1 below).

1. For the water pump body

   Heat the body of the water pump to 200^0C (400^0F) approximately.

   Use a furnace for preference or failing this, form a tunnel with fire bricks, then heat the fire bricks with a blow pipe. When the bricks are hot, put the pump body in the tunnel.

   An indication that the correct temperature is attained is when a wood shaving projecting from the pump body begins to blacken.

   Avoid direct heat which will deform the parts.

   Push out the bush and thrust washer in a press. Let the parts cool off. (The bush and washers are to be replaced) . . . . . .

Mandrel :
Large dia. = 18.5
Small dia. = 14.9
Length = 150 mm

2. For the low pressure pump body
   Do not remove the thrust washer, unless it is necessary (deep scratches). Heat the body of the pump in the same manner as for the water pump body. When the correct temperature is reached, tap lightly on the pump body, bearing side, with a piece of wood, the thrust washer should drop out.

8 Carefully clean the parts..

TOOLS

Assembly (see Pl. 37).

9 To prepare the pump body

a) If the body of the water pump has no groove at ‘e’ (see fig. 5), cut one with a chisel.
Remove the burrs.
Do not damage the joint face.

b) To fit the thrust washers (26) and (27) (if required).
Heat the pump body (see paragraph 7b).
Fit the thrust washers with a press (see Pl. 38, fig. 1, for positioning) (mandrel 2292-T). Maintain the pressure for approximately 30 seconds, the time necessary for the thrust washer to heat and expand and the body of the pump to cool and contract, in order to avoid this washer lifting when the mandrel is withdrawn, which would cause leakage.
Leave the parts to cool . . . . . Anvil and mandrel 2292- T

c) To lap the thrust washers and joint cups.

1. Low pressure pump body (use a lapping spindle 2289-T, see Pl. 38, fig. 2)
Fit the guide bush (A) in place of the bearing.
Tighten the nut (B).
Fit on the spindle (C), the spring (9), the thrust washer (11), a ring seal (12), a cup joint (13).
Put the ring seal in position in the cup by compressing until it rests on the thrust washer.
Put a small quantity of very fine polishing paste on the seating of the cup joint and lap the thrust washer.
Do not exert pressure on the lapping spindle.
Make sure that there are no burrs round the screw holes, which will cause leakage. If necessary, remove the burrs with a scraper.

2. Water pump body (use lapping spindle 2289-T, see Pl. 39, fig. 2).
Fix the body of the pump on the guide bush (A).
Hold the bush in a vice. Tighten the vice moderately.
Fit on the spindle (B), a spring (21), a thrust washer (18), a ring seal (19), a cup joint (20) and carry out the same procedure as in the previous paragraph . . . . . Lapping spindle 2289-T

d) Lap the thrust face of the seal on the body of the water pump (lapping spindle 2289-T, see Pl. 39, fig. 1). This operation is necessary in order to avoid leakage.
The abrasive paper washers should be moistened with water or alcohol.

		TOOLS
	Fit an abrasive paper washer on the lapping spindle (choose the grain number according to the condition of the surface). During the lapping, raise the lapping spindle frequently to avoid scratching the seating. Always finish off the lapping with a washer of No. 600 abrasive paper. Remove the lapping spindle and guide bush	Lapping spindle 2289-T
	e) *Clean the parts very carefully* using alcohol only. Blow with compressed air.	
	f) To fit the bronze bush (28) in the body of the water pump. This bush should be soaked in SAE 20 oil for a minimum of ten minutes before fitting. Offer up the bush vertically, the pump body resting on the table of a press (fixture 2288-T, mandrel (D), see Pl. 38, fig. 3). Put the bush in position in a press. Remove the mandrel (D) and replace by the mandrel (E) and bore the bush with the mandrel	Fixture 2288-T
10	Measure the distance "f" from the joint face and the bearing face of the seal, for example f = 39. 3 mm. This distance should be 38. 3 ± 0. 2 mm. Consequently, in order that the seal has the same pressure, it is necessary to add a washer 39. 3 - 38. 3 being 1 mm thick behind the thrust washer (23). Fit the washer of a size determined above, then the thrust washer (23) on the shaft (17), the chamber towards the impellor. Put the bush MR-3470-20 (see Pl. 41, fig. 5) on the shaft. Put the seal (22) in position. Ease the sliding of the joint by moistening with hydraulic fluid. Remove the bush MR-3470-20	Bush MR-3470-20
11	Oil the bronze bush (28) (with SAE 20 oil). Oil the seal (22) with *castor oil*. Fit on the shaft (17), a spring (21), a thrust washer (18), a ring seal (19), (use the cone MR-3384-l0, see Pl. 94, fig. 1), the cap joint (20). Compress the above until they touch the thrust washer (18). Engage the shaft thus prepared in the water pump body Fix the shaft using the bush MR-4251 (see Pl. 40, fig. 3) and the half retaining rings (8)	Cone MR-3384-10 Bush MR-4251
12	Fit the overflow unions (24) and (25). Do not refit the greaser on the low pressure pump body. Seal the orifice with a screw. Check for leakage (see paragraphs 40 and onwards, this operation). Fix the assembly on the stand MR-3676-180 (see Pl. 41, fig. 1)	Stand MR-3676-180
13	Fit the key (16), the inner pinion (15), and the outer wheel (14) previously oiled with hydraulic fluid. Offer up the body of the low pressure pump (10). Turn the assembly over in order to bring the water and hydraulic fluid drain pipes (24) and (25) one opposite the other, with the clearance holes lining up with the tapped holes in the water pump body. Disengage the low pressure pump body (10), without moving the pinions.	

		TOOLS
14	Fit the paper joint with the narrow part to the side nearest the inlet union (union is located near the drain pipes (24) and (25)). Fit the body of the low pressure pump. Tighten the screws	12 mm box spanner
15	Fit the cup (13), a new ring seal (12), (use the cone MR-3384-10, see Pl. 94, fig. 1), the thrust washer (11) and the spring (9). Compress the spring using the mandrel MR-3676-190 (see Pl. 41, fig. 6). Fit the half retaining rings (8) in the groove of the spindle, the ground face towards the bearing. Fit the bush MR-4251 (see Pl. 40, fig. 3). Fit the nut, check the sealing of the thrust washers (see paragraphs 43 and onwards, this operation)	Mandrel MR-3676-190 Cone MR—3384-10 Bush MR-4251
16	Remove the bush. Unscrew the pump body screws. Fit the bearing (6) (previously greased) using a press. IMPORTANT NOTE - During this operation, support it by the end of the spindle (not by the impellor) and the pump body, in order to avoid either displacement of the impellor or damage to the pump by the key (16) of the pinion (15) (stand MR-3676-180, see Pl. 41, fig. 1)	Stand MR-3676-180
17	Tighten the nut (5) to 20 - 22 ft/lbs (2.7 to 3 m.kg) (spanner 1634-T, see Pl. 41, fig. 2) and lock by tapping the metal into the groove provided on the body of the low pressure pump	Spanner 1634-T
18	Tighten the screws fixing the pump to the body to 12 - 13~ ft/lbs (1.7 to 1.9 m.kg). Turn the spindle during the tightening of the screws, to make sure there is no binding due to uneven tightening of the screws.	
19	Fit the adjusting washers (3), the key (1). Fit the pulley on the shaft. Fit the distance washer (2), the lockwasher. Tighten the nut to 18 - 22 ft/lbs (2.5 to 3 m.kg). Do not turn up the lockwasher, the operation of aligning the pulley is carried out finally when assembled on the engine (see Op. DS 231-0)	16 mm box spanner
20	Remove the pump from the stand.	
	OVERHAULING A PUMP (on cars produced since December 1957).	
	Dismantling (see Pl. 37).	
21	Fix the pump on a stand (stand MR-3676-180, fitted with the dowel pin (B), see Pl. 41, fig. 1). Remove the overflow pipes (24) and (25)	Stand MR-3676-180
22	Remove the pulley fixing nut, the distance washer (2), the pulley, the key (1) and the adjusting washers (3)	16 mm box spanner
23	Remove the split pin locking the nut (5) and remove the nut (5) retaining the bearing (6) (spanner 1646-T, see Pl. 41, fig. 4)	Spanner 1646-T

		TOOLS
24	Remove the bearing (extractor 1684-T, see Pl. 41, fig. 3). Remove the steel cup (7), the half retaining rings (8) and the spring (9)	Extractor 1684-T
25	Remove the screws fixing the low pressure pump body (10) to the water pump body. Remove the low pressure pump body (10) and the joint from the water pump body. Remove the thrust washer (11), the ring seal (12), the ring seal cup (13)	12 mm box spanner
26	Remove the pump from the stand. Remove the pinion (15) and the wheel (14). Press on the pump spindle (17) impellor side and remove the key (16) from the shaft. Remove the pump shaft and impellor assembly from the body of the water pump. Remove the ring seal cup (20), the ring seal (19), the thrust washer (18) and the spring (21) from the pump shaft. Remove the cyclam bush (22) and the thrust washer (23) from the impellor	12 mm box spanner
	<u>Assembly</u> (see Pl. 37).	
	IMPORTANT REMARK - In order to make sure of perfect sealing after a complete pump overhaul, it is necessary to lap the cups (13) and (20) on their thrust washers (26) and (27) and the thrust face on the pump of the seal (22) (see paragraph 7, this operation).	
27	To prepare the pump body (see paragraph 9, this operation).	
28	Oil the bronze bush (28) (SAE 20 oil) and the bush (22) *(castor oil).*	
29	Fit on the shaft (17): a spring (21), the long tag end engaged in the hole in the impellor, a thrust washer (18), a ring seal (19) (cone MR-3384-l0, see Pl. 94, fig. 1) and the ring seal cup (20) having been lapped with the thrust washer (27). Compress the ring seal cup (20) and engage the tag end of the spring (21) in the groove of the cup (20).	
30	Fit the shaft thus prepared in the body of the water pump. Hold the shaft by means of the bush MR-4251 (see Pl. 40, fig. 3), and the half retaining rings (8). Fit the overflow unions (24) and (25)	Bush MR-4251
31	Check for leakage (see paragraphs 40 and onwards, this operation).	
32	Remove the shaft, from the pump body and blow the parts with compressed air. Fit the new shaft in the water pump body and put the assembly on a stand (stand MR-3676-180, fitted with the dowel pin (B), see Pl. 41, fig. 1).	

		TOOLS
33	Put in position the key (16), the pinion (15) and the wheel (14) previously smeared with hydraulic fluid.	
	Offer up the low pressure pump body (10), turn the assembly over in order to bring the overflow pipes (24) and (25) one opposite the other, with the clearance holes lining up with the tapped holes in the water pump body.	
	Disengage the low pressure pump body (10), without moving the pinions and fit the paper joint in position. Fit the low pressure pump body, tighten the fixing screws	12 mm box spanner
34	Fit the cup (13), the ring seal (12) (use the cone MR-3384-l0, see Pl. 94, fig. 1), the thrust washer (11), the spring (9), the long tag towards the top and the other end engaged in the groove in the cup (13).	
	Compress the spring (9) (tube MR-3676-190, see Pl. 41, fig. 6) and put the half retaining rings (8) in position in the groove of the shaft with the ground face towards the bearing and the tag end of the spring engaged in the small space between the two half retaining rings.	
35	<u>To check the thrust washer for leakage.</u>	
	a) Fit the bush MR-4251 (see Pl. 40, fig. 3), the distance washer (2) on the pump shaft and tighten the nut moderately	Bush MR-4251
	b) Check the thrust washers for leakage (see paragraphs 43 and onwards, this operation).	
	c) Remove the nut, the washer (2), the bush MR-4251. Tighten the pump body fixing screws.	
36	Fit the bearing (6) previously greased, using a press.	
	IMPORTANT REMARK - During this operation, support it by the end of the spindle (not by the impellor) and the pump body in order to avoid either displacement of the impellor or damage to the pump by the key (16) of the pinion (15) (stand MR-3676-180, see Pl. 41, fig. 1)	Stand MR-3676-180
37	Tighten the nut (5) locking the bearing (6) to 22 ft/lbs (3 m.kg) (spanner 1646-T, see Pl. 41, fig. 4), and fit the split pin. Tighten the pump body fixing screws (turn the spindle (17) during the tightening of the screws to make sure there is no binding, due to uneven tightening of the screws)	Spanner 1646-T 12 mm box spanner
38	Fit the pulley adjusting washers (3), the key (1), the pulley, the distance washer (2) and lockwasher. Tighten the nut to 18 - 22 ft/lbs (2. 5 to 3m. kg). Do not turn up the lockwasher, the operation of aligning the pulley is carried out finally when assembled on the engine (see Op. DS 231-0).	
39	Remove the pump from the stand.	

TOOLS

CHECKING THE BUSH FOR LEAKS (see Pl. 40, fig. 1).

40 To carry out this test, it is necessary to obtain a supply of compressed air at a pressure of 14 p.s.i.. (1 kg/cm^2).

Use an acetylene cylinder connected on a compressed air pipe.

Close the hole “a” of the pump with a plug. Connect the drain pipe union (25) to the outlet of a pressure regulator, using a rubber pipe. Set the pressure to 14 p.s.i. (1 kg/cm^2).

41 Completely immerse the pump in hydraulic fluid. There should be no air bubbles visible.

If air bubbles are seen escaping at “b”, the thrust washer (27) is leaking, it is therefore necessary to repeat the lapping operation.

If air bubbles are seen escaping at “c”, the seal (22) is leaking and should be reseated.

42 Disengage the pump. Disconnect the pipe from the pressure regulator.

Remove the plug.

Remove the bush MR-4251.

CHECKING THE THRUST WASHERS FOR LEAKS (see Pl. 40, fig. 2).

43 Fit the pipe (29), part number DS 314-91 or DS 314-87 on the outlet union “d” of the pump.

Fit a plug and a sealing washer on the feed union.

Connect the pipe (29) to the outlet of a pressure regulator, using a rubber pipe. Set the pressure to 14 p.s.i. (1 kg/cm^2).

44 Completely immerse the pump in hydraulic fluid.

There should be no air bubbles visible.

If air bubbles are seen escaping at “e”, the thrust washer (26) is leaking, it is therefore necessary to repeat the lapping operation.

If air bubbles are seen escaping though the hole “a” or through the hole for the union (25) (see fig. 1), the thrust washer (27) is leaking, it is therefore necessary to repeat the lapping operation.

45 Disengage the pump. Disconnect the pipe from the pressure regulator. Remove the pipe (29) and the plug.

46 Clean the pump with alcohol. Blow with compressed air.

PARTICULAR POINTS

Replacement of the water pump belts.

The belts are sold as a paired set of two by our Spare Parts Department. It is necessary to replace the two belts even if one is in good condition. Adjust the tension of the belts to 28 ft/lb (4 m.kg) (see Op. DS 231-0).

Replacement of the high pressure pump belts.

Removal.

4 *Remove the belts from the dynamo and water pump.*

5 - 6 *Put the auxiliary clutch control lever in the declutched position and disconnect the control rod from the clutch fork, in order to remove the belts. In the case of abnormal wear of the belts, they should be replaced, then adjust the driving pulley.*

The belts are sold as a paired set of two by our Spare Parts Department. It is necessary to replace the two belts even if one is in good condition.

8 *Adjust the tension of the high-pressure pump belts to 22 ft/lb (3 m.kg) and that of the water pump belts to 28 ft/lb (4 m.kg) (see Op. 231-0).*

11 *Put the auxiliary clutch control lever in the normal running position, after having connected the control rod to the clutch fork.*

Replacement of the pulley driving the dynamo, water pump and high pressure pump.

Removal.

13 *Mark the position of the steering assembly in its bearings and the position of the pinion in relation to the wheel, before removing the steering.*

Refitting.

18 *Align the pulley (see Op. DS 231-0).*

20 *Put the belts in position; adjust the tension (see Op. DS 231-0).*

21 *Fit the steering, note the markings made when removing (paragraph 13 above).*

Replacement of a driving shaft.

Removal.

23 *Mark the position of the steering assembly in its bearings and the position of the pinion in relation to the wheel, before removing the steering.*

Refitting.

28 *Tighten the nut retaining the driving shaft bearing to 18 ft/lb (2.5 m.kg) and split pin.*

29 *Align the pulley (see Op. DS 231-0).*

31 *Adjust the tension of the high-pressure pump belts to 22 ft/lb (3 m.kg) and that of the dynamo to 28 ft/lb (4 m.kg) (see Op. DS 231-0).*

32 *Fit the steering, note the markings made when removing.*

		TOOLS
	REPLACEMENT OF THE WATER PUMP BELTS	
	Removal.	
1	Loosen the screws fixing the dynamo and tie-rod. Move the dynamo as far as possible towards the engine. Disengage the 1st belt by passing it between the blades of the fan. Bend one fan blade slightly.	
	Special care should be taken in very cold weather, the fan is more fragile when cold. Disengage the 2nd belt by passing it first into the front groove of the pulley	12 mm box spanner 14 mm spanner
	Assembly.	
	NOTE - Our Spare Parts Department sell these belts in sets of two. The belts are paired and their dimensions are identical, for this reason: it is necessary to renew both belts even if one is in good condition.	
2	Put the belts in position by passing them between the fan blades.	
3	Adjust the tension of the belts (see Op. DS 231-0). Tighten the screw of the dynamo tie-rod. Tighten the screw fixing the dynamo	12mm box spanner 14 mm spanner
	REPLACEMENT OF THE HIGH PRESSURE PUMP BELTS	
	Removal (see Pl. 45).	
4	Remove the dynamo and water pump belts (see paragraph 1, this operation).	
5	Put the auxiliary clutch control in the disengaged position (push towards the front, then upwards, in order to lock it in this position).	
6	Loosen the front nut (1) of the clutch fork control rod (4). Disconnect the rod from the fork. Do not loosen the rear nuts (2) and (3) to avoid having to re-adjust the clutch	12 mm spanner 12 mm box spanner
7	Loosen the nut of the high pressure pump fixing spindle (spanner 2Z80-T, see Pl. 72, fig. 5). Loosen the nut of the tie-rod fixing screw on the high pressure pump and on the water pump. Remove the belt or belts	Spanner 2280-T 12 mm box spanner
	NOTE 1. In the case of abnormal belt wear, it may be necessary to change it and to adjust the driving pulley (see paragraphs 12 and onwards, this operation). NOTE 2. Our Spare Parts Department sell the belts in sets of two. The belts are paired and their dimensions are identical, for this reason it is necessary to renew both belts even if one is in good condition (cars produced since July 1956).	

		TOOLS
	Assembly (see Pl. 45).	
8	Put the belt or belts on the driving pulley, then on the high pressure pump pulley. Pass the belts between the clutch fork and the clutch housing. Tension the belts (see Op. DS 231-0).	
9	Connect the control rod to the clutch fork. Tighten the front nut (1)	12 mm box spanner 12 mm spanner
10	Fit the dynamo and water pump belts (see paragraphs 2 and 3, this operation).	
11	Put the auxiliary clutch control lever in the normal running position (pull downwards and towards the rear).	
	REPLACEMENT OF THE PULLEY DRIVING THE DYNAMO AND HIGH PRESSURE PUMP	
	Removal (see Pl. 58).	
12	Disconnect and remove the battery.	
13	Remove the steering (see Op. DS 100-1, paragraph 10).	
14	Loosen the dynamo fixing screw. Remove the nut fixing the dynamo tie-rod and disengage the tie-rod from the dynamo	12 mm box spanner 14 mm spanner 14 mm ring spanner
15	Remove the belts from the driving pulley.	
16	Remove the pulley fixing screw (67), the spring washer and the distance washer.	
	Disengage the pulley towards the left-hand side of the car. Remove the key (68) and the adjusting washer (69).	14 mm spanner
	Assembly (see Pl. 58).	
17	Put the adjusting washer (69) in position, the pulley and the washer. Tighten the fixing screw (67)	14 mm spanner
18	Align the pulley (see Op. DS 231-0).	
19	Remove the screw (67), the washer and the pulley. Fit the key (68). Fit the pulley, put the belts in position and tighten the fixing screw (67) (spring washer under the head)	14 mm spanner
20	Put the belts in position on the pulleys. Tension the belts (see Op. DS 231-0). Tighten the dynamo fixing screw and tighten the nut fixing the tie-rod on the dynamo	12 mm box spanner 14 mm spanner
21	Fit the steering (see Op. DS 100-1, paragraphs 43 and 45).	14 mm ring spanner
	Fit and connect the battery	12 mm spanner

		TOOLS
	REPLACEMENT OF A DRIVESHAFT	
	Removal (see Pl. 58).	
22	Remove the battery, the battery tray, the spare wheel and the left-hand front wing	12-14mm box spanners
23	Remove the steering (see Op. DS 100-1, paragraph 10).	
24	Remove the pulley from the driveshaft (see paragraph 12 and onwards, this operation)	12 mm box spanner 14 mm ring spanner
25	Remove the nut (70) locking the bearing (71) after removing the split pin (spanner 1640-T, see Pl. 63, fig. 5)	Spanner 1640-T
26	Remove the assembly of the driveshaft bearing (71), and the thrust washer (72) (extractor MR-3404-20, see Pl. 17, fig. 3). Remove the bearing (71) and the thrust washer (72) from the shaft	Extractor MR-3404-20
	Assembly (see Pl. 58).	
27	Fit the thrust washer (72) and the bearing (71) previously greased.	
28	Fit the assembly prepared above, in the bore in the bellhousing. Tighten the bearing locking nut (70) to 18 ft/lbs (2.5 m.kg) and split pin (spanner 1640-T, see Pl. 63, fig. 5). (If necessary, drill a hole opposite a groove)	Spanner 1640-T
29	Align the pulley (see Op. DS 231-0).	
30	Fit the pulley (put the belt in position), the washer and tighten the pulley fixing screw (67) (spring washer under the head)	14 mm box spanner
31	Put the belt in position on the water pump and dynamo pulleys and tension moderately (see Op. DS 231-0). Tighten the dynamo fixing screw and the nut fixing the tie-rod on the dynamo	12-14 mm box spanners 14 mm ring spanner
32	Fit the steering (see Op. DS 100-1, paragraphs 43 to 45).	
33	Fit the battery tray. Fit and connect the battery. Fit the left-hand front wing and the spare wheel	12-14 mm box spanners

PARTICULAR POINTS

Replacement of a fan.

Refitting.

3 *Tighten the fan fixing screw to 72 ft/lb (1 m.kg). Do not exceed this tightening torsion.*

Replacement of a radiator.

Refitting.

21 a) *The longest distance piece (on the radiator fixing plate) should be fitted on the right-hand side.*

26 *Refill with water, the vane of the heater control open (bleed).*

Checking a thermostat.

34 *The valve should commence to open between 72 and 76˚ C.*

35 *In water at a temperature of 90˚ C, the valve should be completely open in less than 20 seconds.*

		TOOLS
	REPLACEMENT OF A FAN	
	Removal.	
1	Remove the screws and nuts fixing the radiator tie-bar. Disengage the tie-bar towards the high pressure pump. . .	8-12 mm box spanners
2	Remove the fan fixing screws and disengage towards the top	12 mm box spanner
	Refitting.	
3	Offer up the fan, inserting it by the upper part of the fan cowl. Fit the fixing screws and tighten to 7.2 ft/lbs (1 m.kg). *Do not exceed this tightening torsion*	12 mm box spanner
4	Put the radiator tie-rod in position. Fit and tighten the fixing screws and nuts (plain and spring washers)	8-12 mm box spanners
	REPLACEMENT OF A FAN COWL	
	Removal.	
5	Disconnect and remove the battery	12 mm spanner

		TOOLS
6	Remove the fan (see paragraphs 1 and 2, this operation).	
7	Remove the fan cowl fixing screws and remove it	12 mm box spanner
	Refitting.	
8	Offer up the fan cowl, fit the fixing screws, without tightening (plain and spring washers under the heads).	
9	Fit the fan (see paragraph 3, this operation).	
10	Put the radiator tie-rod in position, offer up the fixing screws (plain and spring washers).	
11	Tighten the fan cowl fixing screws and the screws and nuts fixing the radiator tie-bar. Make sure that the fan blades do not touch the fan cowl	8-12 mm box spanners
12	Fit and connect the battery	12 mm spanner
	REPLACEMENT OF A RADIATOR	
	Removal.	
13	Drain the radiator (filler cap removed). Retain this water which contains anti-freeze.	
14	Remove the spare wheel.	
15	Disconnect the rubber connections, the upper from the radiator and the lower from the steel tube.	
16	Disconnect the radiator tie-bar from the fan cowl and the water pump	8-12 mm box spanners
17	Remove the radiator fixing screws. Unscrew the screws fixing the plate on the pressure regulator and pivot this plate towards the front. Remove the expansion chamber bracket. Remove the distance pieces. Remove the radiator	12-14 mm box spanners
18	Remove the fan cowl from the radiator and remove the flexible pipe	12 mm box spanner
	Assembly.	
19	Fit the flexible pipe on the radiator, tighten the clip. Fit the fan cowl, offer up the fixing screws without tightening (plain and spring washers).	
20	Make sure that the rubber distance pieces are in position in the brackets on the crossmember. Offer up the radiator and connect the rubber connections to the radiator and to the steel tube.	

		TOOLS
21	<u>To fit the radiator</u> a) Put the radiator in position, connect the rubber connections and fit the distance pieces in position on the radiator fixing plates (the longest distance piece on the right-hand side). b) Fit the radiator fixing screws without tightening and position the fixing plate on the pressure regulator. c) Centralise the radiator and fan cowl, the blades of the fan must not touch the cowl. d) Put the expansion chamber bracket in position. Insert the fixing plate of the wiring harness tube between the bracket and the nut (cars produced before January 1956). e) Tighten the radiator fixing screws and those of the fan cowl	12-14mm spanners 12-14mm box spanners
22	tighten the screw fixing the plate on the pressure regulator	12-mm box spanner
23	put the radiator tie-rod in position. Tighten the fixing screws and nuts (plain and spring washers)	8-12 mm box spanners
24	Fit and tighten the clips on the rubber connections.	
25	fit the clip fixing the expansion chamber on its bracket. Tighten the nuts (plain and spring washers)	12 mm box spanner
26	Refill the radiator with water (open the heater control vane and bleed the system). Start the engine and check that the heater pipe to the carburettor is warm.	
27	Fit the spare wheel.	
	REPLACEMENT OF A THERMOSTAT	
	<u>Removal.</u>	
28	Drain the radiator; retain this water which contains anti-freeze.	
29	Disengage the water return pipe from the pump cover.	
30	Disengage the clip fixing the thermostat in the rubber pipe. Disengage the thermostat. If need be, use a screwdriver to unstick the rubber pipe.	
	<u>Assembly.</u>	
31	Fit the thermostat in the rubber pipe, engage it so that the turned edge of the thermostat is in contact with the shoulder of the rubber pipe. Tighten the clip fixing the thermostat.	
32	Connect the rubber pipe to the pump cover. Fit and tighten the clip.	
33	Refill the radiator (see paragraph 26, this operation).	

TOOLS

CHECKING A THERMOSTAT

34 Immerse the thermostat in hot water. When the water reaches a temperature between 72 and 76^{0}C, the valve should commence to open.

35 When the thermostat is shaken in water at a temperature of 90 ^{0}C, the valve should be fully open in less than 20 seconds.

NOTE - The thermostat cannot be repaired. If it does not satisfy the tests described above, it must be replaced.

PRECAUTIONS AGAINST FROST

36 The cooling system contains 19 pints (11 litres) of liquid. This mixture should contain 14 pints (8 litres) of water and 5* pints (3 litres) anti-freeze.

Our Service Department issue technical notes indicating the anti-freeze materials approved by our laboratory.

It is also necessary to add to this mixture, an anti-rust product, the only inhibitor recommended by our laboratory is the Chausson inhibitor (used in accordance with the instructions supplied).

It is advised that you check each year at the approach of cold weather, that the cooling system of your car contains the prescribed dosage of anti-freeze and anti-rust.

		TOOLS
	REMOVAL	
1	Remove the gearbox (see Op. DS 330-1).	
2	Disconnect the clutch from the engine flywheel and remove	12 mm box spanner
3	Check the condition of the crankshaft spigot bearing. Also check the thrust race, the clutch operation, its shaft and tighten the fixing screw.	
	REFITTING.	
4	To connect the clutch to the engine flywheel	
	a) Make sure that the thrust faces on the clutch and flywheel are clean.	
	b) Connect the clutch to the flywheel. Use the mandrel (mandrel 171Z-T, see Pl. 44, fig. 4) or a clutch shaft in order to centralise the disc.	
	During the tightening of the fixing screws, make sure that the mandrel slides normally, indicating that the disc has been properly centralised. Tighten the screws to 14.5 $^{+\ 1.9}_{-\ 0}$ ft/lbs (2 $^{+\ 0.250}_{-\ 0}$ m.kg) (spring washers under the heads).	
	Remove the mandrel	Mandrel 1712-T 12 mm box spanner
5	Replace the gearbox (see Op. DS 330-1).	
6	Adjust the clutch drag (see Op. DS 314-0).	

PARTICULAR POINTS

Dismantling.

1 *Mark the position of the clutch driving plate on the toggle carrier plate.*

Assembly.

5 *Compensate for the loss of thickness of the clutch driving plate, after rectification, by fitting steel washers under the spring equal in thickness to the amount removed from the driving plate (original thickness 13.0 — $^{0.3}_{0}$ mm. Do not reduce the thickness below 12 mm)*

6 *Spring characteristics.*

6 springs, marked white: length 29' 7 mm under a load of 64 $^{+\ 4.5}_{0}$ kg.

3 springs, marked green: length 29 7 mm, under a load of 52 $^{+\ 4}_{0}$ kg.

8 *When refitting the toggle carrier plate, see that the marks made when dismantling correspond. Do not forget to fit the washers, determined in paragraph 5, under the springs.*

9 *Adjust the clutch on the fixture placing the clutch in the engaged position. Use the fixture (see Pl. 43, fig. 2).*
Obtain the dimension (a) 37 mm, between the toggles and the driving plate and dimension (b) 17.8 mm, between the toggle carrier plate and the driving plate.

		TOOLS
	DISMANTLING (see Pl. 42).	
1	Mark the position of the clutch driving plate (1) on the toggle carrier plate (2). Clear the metal locking the nuts (3) from the slots of the screws (4). Remove the toggles (5) by unscrewing the adjusting nuts (3)	14 mm spanner
2	Disengage the clutch driving plate (1), the springs (6) and the spring cups (7).	
3	Disengage the toggles (5) and the toggle springs (8).	
4	Clean the parts.	
	ASSEMBLY (see Pl. 42).	
5	Grind the clutch driving plate (1) on a lathe (it is preferable to carry out this operation by grinding but if this is not possible, it can be carried out with a facing tool).	

		TOOLS
	NOTE - Each rectification of the clutch driving plate surface causes loss of pressure on the clutch disc. To compensate for this loss of pressure, fit steel washers to the springs, equal in thickness to the amount removed from the clutch driving plate.	
	In order to obtain the thickness of these washers, take the dimension “c”, see fig. 3, which was originally $13-\begin{smallmatrix}0\\0.3\end{smallmatrix}$ mm.	
	If the dimension “c” is less than 12 mm, the driving plate cannot be rectified and must be replaced.	
6	Test the springs (use the fixture 2420-T, see Pl. 6):	
	6 springs, marked white : length 29.7 mm under a load of 64 $\begin{smallmatrix}+4.5\\0\end{smallmatrix}$ kg.	
	3 springs, marked green: length 29.7 mm under a load of 52 $\begin{smallmatrix}+3.5\\0\end{smallmatrix}$ kg.	
	NOTE - If the testing fixture is not available, it is advisable to replace the springs at each overhaul	Fixture 2420-T
7	Hook the springs (8) on the toggle carrier plate (2).	
8	Put the clutch springs (6) on the bosses of the clutch driving plate (I), placing a spring marked white between two springs marked green in the group of three between two toggles. Place on each spring, the cup (7), insert if necessary, between the spring and the cup, the distance washers indicated in paragraph 5.	
	Offer up the carrier plate (2) on the cups corresponding to the marks made when dismantling, put the toggles (5) under the springs (8). Put the screws (4) in position. Compress the assembly, put the washers (9) on the toggle screws. Tighten the nuts (3).	
9	To adjust the mechanism.	
	Put the clutch assembly on a fixture (use fixture 1701-T, see Pl. 43). Tighten the nuts (3) in order to bring the toggles (5) into contact with the underside of the central pivoting lug (C) of the fixture (see Pl. 43, fig. 3). In these conditions (clutch in the engaged position), the dimensions obtained should be “a” = 37 mm between the toggles and the plate and “b’ = 17. 8 mm between the plate and the toggle carrier plate (see Pl. 43, fig. 2). Operate the clutch and adjust the toggles. Lock the nuts by driving the metal. of the nuts into the slot of the screw (4) using a chisel	14 mm spanner
	NOTE - If the fixture 1701-T is not available, the simplified fixture MR-3457-100 (see Pl. 44) can be used. In order to check the positioning of the toggles, operate the clutch with the aid of the press, before locking the nuts.	Fixture 1701-T Finger, ring and clamp 1704-T
	On this assembly, the dimension ‘c” between the top of the toggles and the face plate is 57 mm	Fixture MR-3457-l00
	IMPORTANT - The clutch can only be adjusted in the engaged position. Using the fixtures shown on Pl. 43 and 44 automatically puts the clutch in this position.	
	The dimensions indicated can only be checked on these fixtures. When the clutch is released from the fixture, *the toggles rest on an uneven surface and it is impossible to obtain a correct dimension.*	

PARTICULAR POINTS

Checking the clutch cylinder for leakage (test bench 2290-T).

The clutch cylinder should be free from leakage under a pressure of 1,070 p.s.i. (75 kg/cm^2).

Checking the clutch (test bench 2290-T).

6 *Put the manual control in the "engaged" position.*

8 *With a tension of 72 ft/lb (1 m.kg) exerted on the starting handle with a torsion spanner the clutch should disengage when a pressure of 425 p.s.i. (30 kg/cm^2) is applied in the clutch cylinder.*

Checking the clutch pressure (test bench 2290-T).

9 *Build up the pressure in the clutch cylinder to 570 p.s.i. (40 kg/cm^2) then let it drop very slowly.*
Raise the pressure again to the exact moment when the clutch slips with a tension of 7 2ft/lb (1 m.kg) being applied on the starting handle. The difference between this pressure and that in paragraph 8, should not be greater than 98 p.s.i. (7 kg/cm^2).

Check the hydraulic gear selector pressure (test bench 2290-T).

This test should be carried out with a warm engine, the springs of the clutch engagement control and the accelerated idling control unhooked. Apply the parking brake.

12 *Connect the clutch cylinder feed pipe to a pressure gauge 0-1,500 p.s.i. (0-100 kg/cm^2) the second opening of the test bench pump connected to a pressure gauge 0-3,000 p.s.i. (0-200 kg/cm^2). Using the test bench pump, raise the pressure in the clutch cylinder to 995 p.s.i. (70 kg/cm^2).*

13 *Put the manual clutch control in the normal running position.*

With the engine running at 550 r.p.m. (revolution counter) engage first gear, the pressure should be 420 p.s.i. (29 kg/cm^2) minimum.

14 *Stop the engine. The pressure should increase to 530 to 690 p.s.i. (37 to 48 kg/cm^2); the needle of the pressure gauge should swing between these two figures.*

15 *Start the engine. The pressure should drop to 420 p.s.i. (29 kg/cm^2) minimum.*

IMPORTANT - *During each operation the pressure in the clutch cylinder should not drop below 570 p.s.i. (40 kg/cm^2).*

Adjustment of the clutch drag (revolution counter).

This check should be carried out with the engine warm, the car on a level surface the springs of the clutch engagement control and the accelerated idling control unhooked, the clutch clearance being set (1 to 2 mm).

19 *By accelerating very slowly, movement should commence between 700 and 750 r.p.m. If movement commences at a speed less than 700 r.p.m. tighten the adjusting screw. Untighten the adjusting screw if movement commences at a greater speed than 750 r.p.m. The end of the screw should be at a distance of 17 to 25 mm from the end of the body.*

Adjust the clutch clearance.
Pre-adjustment.

21 *This adjustment should be carried out with the engine stopped, and the hydraulic system under pressure. Move the clutch fork towards the rear, have the starting handle turned by an assistant.*

22 *Start the engine. By pressing on the starting handle extension, it should be driven back.*

Move the clutch fork towards the front (by fractions of turns on the adjusting nuts). The pre-adjustment is obtained when, by pressing on the starting handle extension, it turns some degrees and stabilises itself, without being driven back.

Adjustment.

23 *Unscrew the front adjusting nut of the fork one to two turns, to obtain a clearance of I to 2 mm, then tighten the rear nut and the locknut.*

Adjustment of the clutch engagement control.

Accelerator control with 2 rods (until March 1956).

24 *With the engine stopped, press the accelerator pedal right down, clearance "d" of I to 2 mm between the pin and the hook of the spring, with the pin resting at the lower part of the slot.*

If not, adjust the length of the spring by moving its end in the trunnion (see Pl. 46).

Accelerator control with 1 rod.

25 a) (Until December 1956) (Spring outside diameter 13. 2 mm).
With the engine stopped press the accelerator pedal right down, the hook of the spring should be without tension or without clearance on the pin with the pin resting on the lower part of the slot. If necessary, adjust the length of the spring by moving its end in the trunnion.
b) (Since December 1956) (Spring outside diameter 15. 5 to 16. 1 mm).
This spring can be fitted in place of the old spring. Proceed as follows:—
Hook the spring on the pin, the pin being in the lower part of the slot, the other end engaged in the trunnion.
Press the accelerator pedal right down, push the lever until it stops (towards the engine) the hook of the spring resting on the pin.
Measure the distance "1" from the trunnion to the end of the spring, pull on the spring so that the end is at a distance "l" + 6 mm from the trunnion and tighten the screw of the trunnion (see Pl. 47).
c) (Since July 1959) (Spring with adjusting screw).
Proceed as indicated in line (b) above, pull on the spring in order to increase the distance "l" by 2 mm, the adjusting screw being in the middle position.
Complete the adjustment on the road.
Checking the adjustments (on the road).
Change from 1st gear to 2nd gear at 20 m.p.h. and release the accelerator pedal. Clutch engagement should occur without delay and without jerk.
Running in 4th gear at 56 m.p.h., maintain the accelerator pedal in this position and change to 3rd gear. Clutch engagement should occur without delay or without a jerk.
Check a non-return valve and low pressure system (see Pl. 76).

27 *Insert the union and pressure gauge assembly (2294-T) in the return of the low-pressure pump.*

28 *With the engine idling, bleed the hydraulic gear selector. Stop the engine. Check the pressure. It should be between 8 and 14 p.s.i. (0.600 and I kg/cm^2).*

29 *Stop the engine, the pressure should not drop.*
No alteration is possible on this part.

		TOOLS
	CHECKING A CLUTCH CYLINDER FOR LEAKAGE (see Pl. 49).	
1	In order to carry out this operation, prepare a long pipe by connecting the pipes (A) and (B) (see Pl. 173) and prepare the test bench as indicated on Pl. 171	Test Bench 2290-T
2	Release the pressure in the clutch system by operating the auxiliary clutch control.	
3	Disconnect the pressure feed pipe from the clutch cylinder. Connect the pipe (B) on the clutch cylinder, place the test bench by the side of the car and connect the end of the pipe (A) to the pump orifice “a” (bend the pipe if necessary).	
4	Tighten the bleed screw “b” of the test bench and operate the pump in order to build up pressure. Unscrew the bleed screw “b” in order to bleed the system. Carry out this operation three times, then build up the pressure to 1070 p.s.i. (75 kg/cm^2). The pressure gauge (MI) should indicate no drop in pressure, if so, the joint or piston assembly is defective.	
	CHECKING THE CLUTCH (see Pl. 49).	
	NOTE - This operation is carried out only When the engine frequently stalls when braking, even if the slow running and clutch are properly adjusted. When the gears “crash” when engaging.	
5	In order to carry out this operation, prepare a long pipe by connecting the pipes (A) and (B) (see Pl. 173) and prepare the test bench as indicated on Pl. 171	Test Bench 2290-T
6	Release the pressure in the clutch system by operating the auxiliary clutch control.	
7	Disconnect the pressure feed pipe from the clutch cylinder. Connect the pipe (B) on the clutch cylinder, place the test bench by the side of the car and connect the end of the pipe (A) to the pump orifice “a” (bend the pipe if necessary). Tighten the bleed screw “b”.	
8	<u>To check the clutch pressure</u>. Put the starting handle in position, fitted with a socket 14 mm across flats and a torsion spanner (torsion spanner 2471-T, see Pl. 7, fig. 2). Exert a pressure of 10.8 ft/lbs (1.5 m.kg) on the starting handle in order to turn the engine. While maintaining this pressure, have the pump operated by an assistant, so as to gradually raise the pressure in the clutch cylinder. Note carefully the pressure at which the clutch is disengaged, (the moment when the handle can be turned without turning the engine). With a pressure of 7.2ft/lbs (1 m.kg), this pressure should be less or at the most equal to 425 p.s.i. (30 kg/cm^2).	

		TOOLS
	NOTE - If this pressure is greater than 425 p. 6.1. (30 kg/cm^2), it is probably caused by piston seizure (in this case, it is necessary to replace the piston and cylinder assembly) or a mechanical cause Thrust race slides badly. Fork out of alignment in relation to the thrust race. Screw fixing the fork unscrewed (in order to retighten this screw without any dismantling, use the spanner 1705-T, see Pl. 64, fig. 3). Bent or seized clutch fork. Incorrect toggle adjustment	Torsion spanner 2471-T 14 mm socket
9	<u>To check the pressure of the clutch.</u> Operate the pump in order to build up the pressure to 570 p.s.i. (40 kg/cm^2). Release the pressure slowly by unscrewing the bleed screw “b” of the test bench. Slowly turn the starting handle, noting the reading on the scale of the torsion spanner. Note the pressure indicated on the pressure gauge (MI) at the precise moment that the clutch slips with a tension of 7. 2 ft/lbs (1 m.kg) being applied on the starting handle. The difference between this pressure and that in paragraph 8 should not be greater than 98 p.s.i. (7 kg/cm^2). Untighten the bleed screw “b” of the test bench.	Spanner 1705-T
	CHECKING THE PRESSURE OF THE HYDRAULIC GEAR SELECTOR	
	This check should be carried out with a warm engine, choke closed, ignition control in the midway position, clutch engagement control spring disconnected from the accelerator control and the accelerated idling unhooked. Apply the parking brake.	
10	Using the pipe (A) or the assembly of the pipes (A) and (B), connect the end of the clutch cylinder feed pipe to the pressure gauge (MI) of the test bench.	
11	Prepare the test bench as indicated on Pl. 172 and connect the clutch cylinder to the pump of the test bench using the pipes (A) and (B) prepared in paragraph 1	Test bench 2290-T
12	Tighten the bleed screw “b” of the test bench and operate the pump in order to raise the pressure in the clutch cylinder to approximately 995 p.s.i. (70 kg/cm^2).	
13	Put the auxiliary clutch control lever in the normal running position. With the engine idling (550 r.p.m. checked with a revolution counter, see paragraph 17 below). Engage first gear. The pressure indicated on the pressure gauge (MI) should be 420 p. s. 1. (29 kg/cm^2) minimum.	
14	Stop the engine. The pressure (MI) should increase to 530 to 690 p.s.i. (37 to 48 kg/cm^2).This pressure is not constant; the needle of the pressure gauge should swing between these two figures (37 to 48 kg/cm^2). If the movement of the needle of the pressure gauge is not steady, this points to the bad grooving of the 38 mm diameter piston, or the automatic clutch control valve (19) (see Pl. 70, fig. 1).	

TOOLS

15 Start the engine and note the pressure gauge (M1) : the needle should drop to a pressure of 420 p.s.i. (29 kg/cm^2) minimum.

If the pressure indicated by the pressure gauge is lower than 420 p.s.i. (29 kg/cm^2), the hole of the 38 mm diameter piston is partially blocked (when this hole is totally blocked, the pressure falls to zero). It is then necessary to remove the front face of the hydraulic gear selector.

16 To remove the front face of the hydraulic gear selector, disconnect the flange of the low pressure pipe assembly. Using a syringe, inject alcohol (only) into the hole in the 38 mm diameter piston and in the low pressure inlet and return holes. Blow with compressed air and make sure that no rubber particles remain in the groove in the bore receiving the 38 mm diameter piston.

IMPORTANT - During this operation, frequent checks of the pressure in the clutch control cylinder should be made (indicated on the pressure gauge M2). The latter should not drop below 570 p.s.i. (40 kg/cm^2).

ADJUSTMENT OF CLUTCH DRAG

17 In order to carry out this operation, the use of a revolution counter is indispensable.
Use a mechanical revolution counter 2434-T, driven by the high pressure pump pulley or an electric revolution counter 2436-T, connected to the yellow terminal of the top ignition coil, (in the case of a contact breaker with 2 breakers) or on the outlet terminal of the coil (in the case of 1 breaker).

If one uses a mechanical revolution counter and in order to avoid errors in reading due, on the one part to belt slip on the high pressure pump or, on the other part, to uneven running of the engine during the test, unscrew the pressure control valve bleed screw or put the manual height control in the low position.

The electric revolution counters should be periodically checked (periods vary according to use and quality of material).

The electric revolution counters should comply with the following conditions

- Large diameter dial graduated from 0 to 1500 r.p.m. (maximum).
- Operate on a contact breaker with two cams and four cams.
- Needle steady during operation . . . . . Mechanical revolution counter 2434-T
  Electric revolution counter 2436-T

NOTE - This adjustment should be carried out after checking and adjusting the clutch clearance (see paragraphs 20 to 23, this operation), also the engine should be hot, choke control closed and the ignition control in the midway position.

18 Put the car on a level surface.

Disconnect the spring (19) between the accelerator control and the clutch engagement control lever (21) from the accelerator control (see Pl. 47).
Disconnect the plate (14) from the accelerated idling control (cars produced since March 1956) (see Pl. 28).

		TOOLS
19	Adjustment of the clutch drag (see Pl. 45).	
	Accelerate *very slowly*. The clutch drag should occur between 700 and 750 r.p.m. If not, proceed as follows	
	a) Stop the engine. Remove the plug (10), loosen the body (11) acting as a locknut and turn the adjusting screw (12). If the speed of engagement is below 700 r.p.m., screw up the screw and unscrew it if the speed of engagement is above 750 r.p.m.	
	b) Tighten the body (11) at the same time holding the screw (12). The position of the head of the adjusting screw should give a dimension "c" between 17 and 25 mm from the base of the body (11).	
	c) If the distance "c" is greater than 25 mm, the following may be the cause	
	- The spring of the control piston (38 mm dia.) is seized or by leakage (too great a clearance between the piston and cylinder), or the hole in the 38 mm diameter piston is partially blocked.	
	d) If the distance "c" is less than 17 mm, this can be due to the spring of the control piston (38 mm dia.) being weak.	
	e) If the adjustment is unstable, check the operation of the clutch control valve.	
	ADJUSTMENT OF THE CLUTCH CLEARANCE	
	Pre-adjustment (see Pl. 45, fig. 1).	
20	Put the hydraulic system under pressure, then stop the engine (it will be necessary to run it each time the pressure falls).	
21	Put the starting handle in position and have it turned by an assistant. Untighten the nut (1), unscrew the nuts (2) and (3). Stop when the engine begins to be turned by the handle. Start the engine. Remove the starting handle leaving the extension in position. Push the starting handle extension into engagement with the starting dog, it will be repelled by the dog rotating.	
22	Unscrew the nut (1) and retighten the nut (2), move the nuts a fraction of a turn each time. The pre-adjustment is completed when, without exerting any effort on the starting handle extension, this being pushed into engagement with the starter dog, it is stabilised without ratcheting over the dog on the primary shaft	12 mm spanner
	Adjustment.	
23	Slacken the nut (1) by 1 to 2 turns, so as to obtain a clearance between the nut and the fork of 1 to 2 mm. Tighten the nut (2) and tighten the locknut (3).	
	ADJUSTMENT OF THE CLUTCH ENGAGEMENT CONTROL	
24	Accelerator control with 2 rods (see Pl. 46, fig. 1).	
	Stop the engine, press the accelerator right down. There should now be a clearance at "d" of 1 to 2 mm between the pin (6) and the hook of the spring, with the pin resting on the lower part of the slot. If necessary, adjust the length of the Spring by moving its end in the trunnion (7).	

TOOLS

25 Accelerator control with 1 rod (see Pl. 46, fig. 2).

Stop the engine, press the accelerator pedal right down. The hook of the spring should be fitted without strain or without clearance on the pin (6) with the pin resting at the lower part of the slot "a". If necessary, adjust the length of the spring by moving its end in the trunnion (7). Make sure that the spring does not touch the nut (8).

26 New clutch re-engagement control spring (since December 1956, see Pl. 47).

This spring has a diameter of 15.5 to 16.1 mm (for identification).

The earlier spring has a diameter of 13.2 mm. The new spring can be fitted in place of the old spring, if the adjustments given below are carried out.

With the pin (18) resting on the lower part of the slot "a", hook the spring (19) on the pin.

Engage the end of the spring in the hold "b" of the trunnion, the screw (20) being sufficiently unscrewed to allow it to slide freely.

With the engine stopped, have the accelerator pedal pressed right down, by an assistant. Push the lever (21) in the direction "F" until it stops. The hook of the spring should fit without restraint on the pin (18), measure the distance "l".

a) Hold the lever (21), pull on the spring so that the end is at a distance of 1 + 6 mm from the trunnion. Tighten the screw (20).

b) (Cars produced since July 1959) : Pull on the spring in order to increase the distance "1" by 2 mm (1 + 2 mm), the adjusting screw being in the middle position. Complete the adjustment on the road.

NOTE - It is sometimes necessary to make the adjustments (idling, clutch drag, clutch clearance and clutch engagement) again after a few dozen miles.

To carry out the clutch engagement adjustment on the road

1. On a level road, change from 1st gear to 2nd gear at 20 m.p.h. (30 km/h) and completely release the accelerator pedal. Clutch engagement should occur without a jerk.
2. On a level road, running at 56 m. p. h. (90 km/h) in 4th gear, maintain the accelerator pedal in this position and change to 3rd gear. Clutch engagement should occur without a jerk.
   If a jerk occurs, tighten the clutch engagement control spring. If there is delay, lengthen the spring.

CHECKING A NON-RETURN VALVE (see Pl. 76).

27 Disconnect the return pipe union from the low pressure pump (spanner 2220-T, see Pl. 72, fig.4) and insert the union and pressure gauge assembly (sold under number 2294-T, see Pl. 76), between the low pressure pump and the return pipe

Spanner 2220-T or 14 mm spanner
Union and gauge 2294-T

28 With the engine idling, bleed the hydraulic gear selector. Stop the engine. Check the pressure. It should be between 8 and 14 p.s. i. (0. 600 and 1 kg/cm^2).

29 The pressure should not drop. If so, the valve is defective. No alteration is possible on this part and it should be replaced by a part which will comply with the above conditions.

PARTICULAR POINTS

Replacement of a clutch cylinder.

When assembling, pass the control rod through the belts. Adjust the tension of the belts to 21 ½ ft/lb (3 m.kg) (see Op. DS 231-0 and Pl. 35).

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

Replacement of a clutch cylinder joint.

Dismantling.

17 *Wrap the cylinder and piston assembly, in a cloth and blow out the piston with compressed air (circlips removed).*

18 *Clean the parts with alcohol only.*

Assembly.

21 *Check the piston cylinder assembly for leakage (see Op. DS 314-3).*

Replacement of a clutch engagement control.

30 *Clean the parts in alcohol only.*

31 *Adjust the engagement control (see Op. DS 314-0).*

Replacement of a clutch fork.

Removal.

It is necessary to remove the gearbox (see Op. DS 330-1).

Assembly.

42 *It is essential to fit a clutch fork spindle fixing screw fitted with a locknut.*

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

Replacement of a thrust race.

It is necessary to remove the gearbox in order to carry out this operation.

Replacement of a thrust race nut.

Removal.

It is necessary to remove the gearbox and disconnect the clutch bellhousing from the gearbox casing. Mark the differential bearing distance pieces and adjusting shims. Disengage the bearing outer cups laterally.

Assembly.

61 W*hen mounting the casings, fit the differential bearing distance pieces and adjusting shims in their respective positions, marked when dismantling. If the parts are not marked it is necessary to adjust the differential bearings (see Op. DS 330-3).*
The longest bearing is fitted on the left-hand side.
Replacement of an oil seal (Cyclam).

In order to carry out this operation, it is necessary to remove the gearbox and disconnect the clutch bellhousing from the gearbox casing (see Op. 66 this operation).

		TOOLS
	REPLACEMENT OF A CLUTCH CYLINDER	
	Removal (see Pl. 45).	
1	Release the pressure in the clutch cylinder by means of the auxiliary clutch control.	
2	Disconnect the tie-rod on the high pressure pump	12 mm spanner
3	Loosen the pump spindle fixing nut, remove the belt, work the pump towards the outside (spanner 2280-T, see Pl. 72, fig. 5)	Spanner 2280-T
4	Disconnect the pressure feed pipe from the clutch cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
5	Remove the front nut (1) on the clutch fork control rod (4)	12 mm spanner 12 mm box spanner
6	Remove the screws fixing the clutch cylinder and remove the control rod and cylinder assembly.	
7	Remove the control rod and dust cover from the clutch cylinder.	
8	Clean the parts with alcohol.	
	Assembly (see Pl. 45).	
9	Put the control rod (4) and the rubber dust cover in position on the clutch cylinder.	
10	Fit the clutch cylinder. Tighten the screws (spring washers) (Note - The screw on the high pressure pump side is longer and secures the cylinder and clutch housing). Pass the control rod through the high pressure pump belts. Put it in position on the clutch fork. Fit the spigot nut (1).	

TOOLS

11 Connect the pressure feed pipe to the clutch cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). The pipe must be fitted without any strain, set it if necessary.

Spanner 2219-T or 2221-T

12 Fit the driving belt on the pump pulley and connect the tie-rod to the pump. Tension the belt or belts moderately (see Op. DS 231-0) and lock the nut. Tighten the pump spindle fixing nut (spanner 2280-T, see Pl. 72, fig. 5).

12 mm box spanner
Spanner 2280-T

13 Put the system under pressure, check the unions for leaks. Bleed the hydraulic gear selector unit.

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

REPLACEMENT OF A CLUTCH CYLINDER JOINT

Dismantling (see Pl. 48, fig. 1).

15 Remove the dust cover and control rod assembly from the cylinder. Remove the control rod from the dust cover.

16 Using circlip pliers, remove the circlip (1) retaining the piston (2) from the cylinder.

17 Wrap the cylinder and piston assembly in a cloth and blow out the piston with compressed air. Remove the ring seal (3) using a small brass wire hook. (Do not use steel wire, in order to avoid scratches on the cylinder or damage to the sides of the groove).

18 Clean the parts thoroughly using alcohol only to the exclusion of all other products. Blow with compressed air.

Assembly (see Pl. 48, fig. 1).

19 Insert the mandrel MR-3045-60 (see Pl. 48, fig. 2 and 3) in the cylinder, moisten the joint with hydraulic fluid.

Offer up the joint in the bore of the cylinder. Obtain the positioning of the joint by pushing with the piston. Remove the piston. Remove the mandrel using a screw. . . . . Mandrel MR-3045-60
Screw 6 dia. x 100 pitch
Length = 60

20 Oil the bore of the cylinder and the piston with hydraulic fluid. Insert the piston (2) and push it to the bottom of the cylinder. Put the circlip (1) retaining the piston in the groove of the cylinder . . . . . Circlip pliers.

21 Check the cylinder for leaks (see Op. DS 314-3).

22 Put the cylinder dust cover on the control rod and put the dust cover and control rod assembly on the cylinder.

		TOOLS
	REPLACEMENT OF A CLUTCH ENGAGEMENT CONTROL	
	Removal (see Pl. 46, fig. 2).	
23	Release the pressure.	
24	Remove the coils and bracket assembly	8 mm box spanner
25	Disconnect the pressure inlet union from the pressure distribution block (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221 - T
26	Disconnect the union plates from the hydraulic gear selector and from the clutch engagement control. Disconnect the seal plates from the studs. Remove the seal plates.	8-10 mm spanners
27	Unhook the clutch engagement control spring (1) from the accelerator connecting rod (2).	
28	Remove the clutch engagement control (3) and its bracket	8 mm box spanner
29	Remove the bracket (4) from the clutch engagement control. Note : only remove the two screws (5) which project beyond the others.	
	IMPORTANT NOTE - In order not to lose adjustment, do not remove the control spring unless replacing the clutch engagement control.	
	Assembly (see Pl. 46, fig. 2).	
30	Clean all the parts in alcohol (do not use any other product). Replace the seals of the seal plates.	
31	Fit the bracket (4) on the clutch engagement control (3). Fit a spring washer under the heads of the screws.	
32	Fit the clutch engagement control and bracket assembly on the steering column tunnel (spring washers)	8 mm box spanner
33	Put in position the seal plates making certain that the oil holes correspond with the oil holes in the joints.	
34	Put the union plates in position and the feed pipe in the bore of the pressure distribution block. Tighten this union (spanner 2219-T or 2221-T, see Pl. 72 fig. 4)	Spanner 2219-T or 2221-T
35	Tighten the nuts of the union plate fixing studs (fit spring washers under the nuts)	8-10 mm spanners 8-10mm box spanners
36	Hook the clutch engagement control spring (1) on the accelerator connecting rod (2).	
37	Adjust the clutch engagement control (see Op. DS 314-0).	

		TOOLS
	REPLACEMENT OF A CLUTCH FORK	
	Removal (see Pl. 58).	
38	Remove the gearbox (see Op. DS 330-1).	
39	Unscrew the nuts (2) and (3) and disengage the rod (4) from the fork (see Pl. 45, fig. 1).	
40	Remove the clutch thrust retaining spring (73). Remove the thrust race.	
41	a) *Cars produced before June 1959.* Remove the locknut and the screw (75) retaining the clutch fork spindle (77). Remove the spindle (77), the spring and the fork	8 mm box spanner
	b) *Cars produced since June 1959 (see fig. 3).* Remove the two circlips locking the spindle (77) and remove the spindle, the spring and the fork.	
	Refitting (see Pl. 58).	
42	a) *Cars produced before June 1959.* Insert the spindle (77) previously oiled in the bore and offer up the fork together with its return spring. Tighten the screw (75) (plain washer under the head) retaining the spindle (77) and tighten the locknut	8 mm box spanner
	b) *Cars produced since June 1959* Engage the spindle (77), the fork and the spring. Fit the two spindle retaining circlips.	
43	Put the thrust race in position, then fix to the fork using the spring (73).	
44	Fit the rubber sealing plate on the clutch fork opening.	
45	Offer up the gearbox and connect to the engine (see Op. DS 330-1).	
46	Adjust the clutch clearance (see Op. DS 314-0).	
	REPLACEMENT OF A CLUTCH THRUST RACE	
	Removal (see Pl. 58).	
47	Remove the gearbox (see Op. DS 330-1).	
48	Remove the clutch thrust retaining spring (73). Remove the thrust race from its hub (76) (see Pl. 52).	
	Refitting (see Pl. 58).	
49	Put the thrust race in position, then fix to the clutch fork using the spring (73).	
50	Offer up the gearbox and connect to the engine (see Op. DS 330-1).	

		TOOLS
	REPLACEMENT OF A CLUTCH THRUST RACE HUB	
	Removal (see Pl. 58).	
51	Remove the gearbox (see Op. DS 330-1).	
52	Remove the clutch thrust retaining spring (73). Remove the thrust race.	
53	Remove the mechanical handbrake cable.	
54	Remove the brake unit assemblies and front supports. It may be necessary to remove a brake shoe	12 mm spanner 12 mm box spanner 14-19 mm box spanners
55	Drain the gearbox	21 mm box spanner
56	To remove the differential shaft, bearing and brake disc assembly (see Pl. 54).	
	a) Remove the screw (1) fixing the support arm (2).	
	Disengage the support arm (2) and remove the four bearing fixing screws (3).	
	Disengage the assembly from the gearbox. Remove the adjusting washer (4), and the distance washer (5). Mark these parts in order to avoid having to re-adjust the differential bearings when reassembling	12 mm spanner 14 mm box spanner
	b) Remove the other shaft, bearing and brake disc assembly in the same manner.	
	c) Protect the brake discs	Rubber protector
57	Disconnect the clutch bellhousing from the gearbox casing. Remove the differential bearing races from the clutch housing.	
	NOTE - The differential shaft is not in the same plane as the joint between the housings. The bearing races must therefore only be removed sideways.	
	Hold the differential against the gearbox casing and remove the clutch bellhousing. Remove the differential.	12-17 mm spanners 12-17 mm box spanners
58	Remove the fixing screws from the thrust bearing hub (76) (see Pl. 52). Remove the thrust bearing hub and the paper joint	12 mm box spanner
	Refitting.	
59	Fit the thrust bearing hub (76), insert a paper joint smeared with Hermetic. Tighten the fixing screws and nuts (spring washers under the heads of the lower screws)	12 mm box spanner

		TOOLS
60	To connect the clutch housing to the gearbox housing :	
	a) Place the differential and crown wheel assembly, complete with bearings in the clutch housing.	
	b) Secure the clutch housing to the gearbox. Smear the joint faces with Hermetic *fluid* or linseed oil. Tighten the screws and nuts	12-17 mm spanners 12-17 mm box spanners
61	To fit the differential shaft, bearing and brake disc assemblies (see Pl. 54) :	
	a) Place the adjusting washers (4) and the distance washers (5)in their correct positions (marked in paragraph 56 a)).	
	NOTE - If the parts are not marked, the differential must be adjusted (see Op. DS 330-3, paragraph 43 and onwards).	
	b) Place the paper gasket on the bearing and fit the bearing in position, the oil drain duct towards the bottom (the longest bearing fitted on the left).	
	Make sure that the distance piece (92) is fitted. Tighten the bearing fixing screw (3).	
	c) Insert the screws (1) (without tightening them), securing the support arms (2) (plain washers under the heads). On the support arms, fit the support fixture 1799-T (see Pl. 51) and tighten the fixture fixing screws.	
	Tighten the support arm fixing screws (1)	14 mm spanner 14 mm box spanner
62	Fit the brake unit and rear support assemblies	12 mm spanner 12 mm box spanner 14-19 mm box spanners
63	Fit the mechanical brake connecting cable.	
64	Fit the thrust race, then secure the clutch withdrawal fork using the springs (73) (see Pl. 58).	
65	Offer up the gearbox and connect to the engine (see Op. DS 330-1). Fill the gearbox $3^1/_2$ pints (2 litres) (SAE 90 EP oil).	
	REPLACEMENT OF A SEALING RING (Cyclam).	
	Removal (see Pl. 52).	
66	Remove the gearbox (see Op. DS 330-1).	
67	Disconnect the clutch housing from the gearbox housing (see paragraph 57, this operation).	
68	Remove the sealing ring (13) from the mainshaft (22).	
	Refitting (see Pl. 52).	
69	Place the sealing ring (13) in position on the mainshaft (22).	
70	Connect the clutch housing to the gearbox housing (see paragraph 60, this operation). a).	

		TOOLS
71	Fit the differential shaft, bearing and brake disc assemblies (see paragraph 61,. this operation).	
72	Fit the brake unit and rear support assemblies	12 mm spanner 12 mm box spanner 14-19 mm box spanners
73	Fit the mechanical brake connecting cable.	
74	Offer up the gearbox and connect to the engine (see Op. DS 330-1). Fill the gearbox 3{ pints (2 litres) (SAE 90 EP oil).	
	REPLACEMENT OF A PIPE ASSEMBLY BETWEEN A PRESSURE DISTRIBUTOR AND HYDRAULIC GEAR SELECTOR, CLUTCH ENGAGEMENT CONTROL AND CLUTCH CYLINDER.	
	Removal.	
75	Release the pressure	8 mm spanner
76	Remove the flexible pipe between the petrol pump and the carburettor. Remove the oil dipstick and remove the coils and bracket assembly	8 mm box spanner
77	Disconnect the pipe from the clutch cylinder (swing the high pressure pump towards the outside of the car). Disconnect the pipe from the pressure distributor (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
78	Disconnect the front flange from the hydraulic gear selector and the rear flange from the clutch engagement control.	8 or 10 mm box spanners
79	Remove the pipe assembly from the car, commencing with the rear part.	
	NOTE - On cars produced since February 1959, the pipe assembly is in two parts, with a union situated above the oil dipstick.	
	Refitting.	
80	Offer up the pipe assembly, commencing with the front part (if necessary, swing the dynamo towards the outside of the car). The pipe assembly should pass (from the clutch cylinder) against the front of the engine and follow along the left-hand side, behind the oil dipstick tube, between the contact breaker and the hydraulic gear selector, then above the speedometer cable up to the pressure distributor.	
	IMPORTANT REMARK - During this operation, avoid if possible, the bending of the pipes. In no case should the radius of the bend be less than 30 mm.	

		TOOLS
81	Connect the flanges to the hydraulic gear selector and to the clutch engagement control. Insert the seal plates (renew the ring seals). Fit the nuts without tightening (spring washers). Connect the pipes to the pressure distributor and the clutch cylinder. Tighten the flange fixing nuts and tighten the pipe unions (spanner 2219-T or 2221-T, see Pl. 72, fig. 4), during this operation, make sure that the pipes are not under strain and *are not in contact with any unit of the car*	8 or 10 mm spanners Spanner 2219-T or 2221-T
82	Refit and tension the high pressure pump and dynamo belts (see Op. DS 231-0).	
83	Fit the coils and bracket assembly. Fit the oil dipstick and the flexible pipe between the pump and the carburettor	8 mm box spanner
84	Start the engine, put the systems under pressure and check the unions for leakage	8 mm spanner
85	Bleed the hydraulic gear selector.	
	REPLACEMENT OF A NON-RETURN VALVE	
	<u>Removal.</u>	
86	Release the pressure. Remove the left-hand suspension sphere (strap wrench 2223-T, see Pl. 93, fig. 1)	Strap wrench 2223-T 8 mm spanner
87	Disconnect the low pressure pipe assembly from the hydraulic gear selector. Remove the seal plates	8 or 10 mm box spanners
88	Remove the non-return valve from its bracket on the body. Disengage the valve and flexible pipes, disconnect the flexible pipes from the valve (do not mislay the rubber bushes fitted under the clips). Be careful not to spill the fluid.	
	<u>Refitting.</u>	
89	Connect the flexible pipes to the non-return valve. The body of the valve (large diameter) is fitted to the pipe connecting to the hydraulic gear selector. Fit a rubber bush under each clip. Tighten the clips (pliers 2483-T, see Pl. 17, fig. 2). Put the valve in position on its bracket on the body	Pliers 2483-T
90	Fit the seal plate of the low pressure pipe assembly on the hydraulic gear selector, making sure that the ring seals correspond with the oil holes. Connect the low pressure pipe assembly to the hydraulic gear selector. Tighten the nuts (spring washers)	8 or 10 mm box spanners
91	Fit the left-hand suspension sphere, tighten by hand,	
92	Start the engine. Put the systems under pressure. Check the unions for leakage	8 mm spanner
93	Operate the auxiliary clutch control lever several times in order to bleed the hydraulic gear selector.	

		TOOLS
	OVERHAULING A CLUTCH SYSTEM	
	See Op. DS 314-1, paragraphs 15 and onwards.	
	CHECKING FOR LEAKAGE (see Pl. 49).	
	In order to carry out this operation, the test bench should be prepared as indicated on Pl. 171. Connect the clutch cylinder to the pump orifice “a”, using the pipe (H). Tighten the bleed screw “b” and operate the pump to obtain a pressure of 1070 p.s.i. (75 kg/cm^2). The pressure gauge (MI) should not indicate a drop in pressure, if so, the joint or assembly is defective	Test bench 2290-T
2	Release the pressure by unscrewing the pump bleed screw “b”. Remove the pipe (H).	
	OVERHAULING A CLUTCH ENGAGEMENT CONTROL	
	Dismantling (see Pl. 48, fig. 4).	
3	Remove the connecting screws (6) from the body (7) and from the bearing block (8). Disengage the bearing block from the body. Do not lose the ball (9).	
4	Remove the upper plug (10). Remove the lower plug (11). Disengage the spring (12), the piston (13) and the ball (14). Remove the seal (15), (16) and (17)	8-14-17 mm box spanners
5	Clean the parts in alcohol to the exclusion of all other products, do not use trichlorethylene and blow with compressed air.	
	Assembly (see Pl. 48, fig. 4).	
6	Make sure that the lever (18) is tight on the spindle, if not, replace the clutch engagement control. Make sure that the lever (19) is tight on the spindle, if not, weld at one point.	
7	To remake the seating of the ball (14). Insert a ball that is in good condition in the bore of the body and make an impression by striking the ball with a drift and a mallet	Drift = 6 dia. Length = 100
	NOTE - Never carry out this procedure on the ball (9), the flow through the clutch engagement control being controlled by the notches on the seating, spreading the metal by hammering destroys the notches and will modify the flow; in this case, replace the clutch engagement control.	
8	Put in the body of the clutch engagement control : a new ball (14), the piston (13) (see illustration for position).	
	A light cleaning up of the piston with No. 600 abrasive paper moistened with alcohol is permitted, if there are any signs of slight seizure. Make sure that there is no obstruction in the hole. Fit the spring (12), the plug (11), together with a ring seal (17)	17 mm box spanner
9	Put in the body, the ring seal (15), then the ball (9). Fit the bearing block (8) in the body (see illustration for position). During this operation, see that the ball (9) rests in position on its seating. Fit the screws (6) (spring washer), hold the lever (18) on the ball (9). Fit the plug (10) together with its seal (16) This is a square sectioned seal	8-14 mm box spanners

PARTICULAR POINTS

Replacement of a gearbox.

Removal.

3 *Release the pressure and bleed the front brakes.*

7 *Mark the position of the steering wheel in relation to the pinion and the position of the steering in its bearings, before removal.*

16 *Do not mislay the adjusting shims fitted between the front support crossmember and the sidemembers.*

Refitting.

19 *Make sure that the dowel pins are in position in the crankcase before connecting the gearbox to the engine.*

20 *Align the driving pulley (see Op. DS 231-0).*

22 *Before tightening the fixing screws of the flexible coupling (bibax) (tightening torsion 18 ft lb (25 m.kg), make sure that the dowel pins are in position in their housing in the flexible couplings.*

23 *Fit the shims found when dismantling, between the front support crossmember and the sidemembers. Make sure that the distance between the brake disc and the sidemember on the left side, is greater by 70 ± 2 mm than the same distance measured on the right-hand side.*

24 *Adjust the height of the brake units. The lining should stand slightly proud of the disc at the front by approximately 1 mm.*

27 *To fit the steering: note the markings made during dismantling.*

28 *To adjust the angular position of the steering. The groove of the pinion should be in contact with the gauge pin of the adjusting fixture.*

36 *Refill the gearbox: 3I~ pints (2 litres) SAE 90 EP oil.*
Refill the radiator, vane of the heater control open (bleed).

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

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

Replacement of a 1st speed selector lever.

Removal.

Remove the gearbox cover.

In order to remove the lever, carefully observe the instructions given in paragraph 49.

Refitting.

In order to refit the lever, carefully observe the instructions given in paragraph 50.

		TOOLS
	REPLACEMENT OF A GEARBOX	
	Removal.	
1	Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1).	
	Drain the water cooling system (save this water which contains anti-freeze).	
	Put the front of the car on stands, supporting the car under the jacking points (jacking bracket 2505-T, see Pl. 168).	Stop MR-4158 Jacking bracket 2505-T 21 mm spanner
2	Remove the spare wheel, the spare wheel support, the air deflection panel, the heater hoses, the front wings, the brake cooling ducts and the steering relay protection shields	8-12-14mm box spanners
3	To release the pressure (see Pl. 50).	
	Loosen the bleed screw (107) on the pressure control valve (108).	
	Connect a rubber pipe on the bleed screw of the front left-hand brake. This screw is situated on the hydraulic control, on the carburettor. Raise the attaching plate holding the return spring of the slow running control lever (see Pl. 28, fig. 2).	
	Put the end of the pipe in the fluid reservoir.	
	Unscrew the bleed screw (30) (spanner 2141-T, see Pl. 143, fig. 4).	
	Press on the brake pedal until the fluid no longer flows	Spanner 2141-T 8 mm spanner
4	Disconnect and remove the battery.	
	Disengage the battery tie-rods from the bracket, rest the tie-rod and starter solenoid on the sidemember. Remove the battery bracket, disconnect the bonnet lock control cable from the control rods on the scuttle and remove the bracket and cable assembly	12 mm spanner 8 mm box spanner
5	Remove the expansion chamber with its bracket (L.H. drive cars)	12-14mm box spanners
6	Disconnect the high pressure pump feed pipe from the reservoir. Disconnect the rubber inlet and outlet pipes from the radiator. Remove the radiator tie- rod. Remove the screws fixing the radiator on the crossmember. Remove the radiator. Remove the headlamp harness tube, the cable and the earth lead (cars produced before February 1957)	8-12-14 mm box spanners
7	Remove the steering (see Pl. 125). Mark (with a spot of paint) at “b”, the angular and transverse position of the steering in relation to the bearing caps.	
	Mark also the position of the steering column in relation to the pinion (mark with a centre punch or a spot of paint opposite the slot at “a”).	

		TOOLS
	Disconnect the steering levers from the relay. Hold the steering column (setting gauge 1993-T, see Pl. 125). Disconnect the steering feed pipe assembly (5), from the pinion housing. Remove the bearing caps and remove the steering. Seal the steering pipe assembly with a plate	8-12 mm spanners 8-12 mm box spanners 14-16 mm box spanners 10 mm ring spanner
8	Unscrew the swivel union nut of the high pressure pump (spanner 2280-T, see Pl. 72, fig. 5) and the nut of the high pressure pump tie-rod. Remove the belts. Remove the pressure control valve (spanner 2220-T, see Pl. 72, fig. 4 or 14 mm spanner). Seal the return pipe to the reservoir	Setting gauge 1993-T 12-14 mm box spanners Spanner 2280-T Spanner 2220-T or 14 mm spanner
9	Disconnect the wires to the dynamo from the regulator. Disconnect the tie-rod. Untighten the front screw. Remove the rear screw. Remove the two belts	8-10-12mm box Spanners 14 mm spanner
10	Remove the driving pulley (109) (do not mislay the key and the adjusting washer). Hold the shaft in position using a clamp held by the pulley fixing screw, in order to avoid the shaft being pulled through the ball-race when removing the gearbox (see Pl. 50)	14 mm ring spanner 14 mm box spanner
11	Disconnect the 5 pipe assembly from the gearbox. Disconnect the speedometer cable	10 mm ring spanner
12	Disconnect the clutch cylinder feed pipe (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Disconnect : the brake feed pipe from the 3-way union (41) (see Pl. 25), the union (111) of the accelerated idling control pipe, from its fixing plate on the rear brake unit support and the brake feed pipe union (112). Pass the feed pipe over the idling pipe (see Pl. 141)	Spanner 2219-T or 2221-T
13	Disconnect the accelerator control from the carburettor	7 mm box spanner
14	Remove the wheels. Disconnect the flexible coupling (bibax) from the gearbox driving plate	12 mm socket extension
15	Disconnect the mechanical brake control. Press on the right-hand brake control lever (3) and unhook the control cable of the left-hand lever (9) (see Pl. 153).	
16	Pass a rubber sheathed chain sling (chain sling 1697-T, see Pl. 51) under the water pump. Support the engine (engine stand 1797-T, see Pl. 51). Remove the front engine support crossmember (do not mislay the shims fitted between the crossmember and the sidemember). Raise the engine gearbox assembly so that the gearbox will clear the front crossmember. (Note : do not damage the accelerator controls)	Chain sling 1697-T Supportfixture1797~T 14 mm box spanner

		TOOLS
17	Put the support fixture 1779-T on the gearbox (see Pl. 51). Hold the gearbox with a lifting tackle in order to avoid damage to the shaft or clutch plate when disconnecting the gearbox from the engine	Support fixture 1799-T
18	Remove the screws fixing the clutch bellhousing (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1). Disengage the gearbox	Spanner 1677-T Spanner 2431-T
	<u>Refitting.</u>	
19	Put the support fixture 1799-T on the gearbox (see Pl. 51). Make sure that the dowel pins are in position on the engine. Offer up the gearbox, make sure that it is in alignment with the engine. Engage the splines of the mainshaft in the splines of the clutch plate by turning the mainshaft with a starting handle. If necessary, turn the driving shaft in order to facilitate the entry of the splines in the camshaft. Fit the screws fixing the gearbox (spanner 1677-T, see Pl. 65, fig. 4 and spanner 2431-T, see Pl. 72, fig. 1).	Spanner 1677-T Spanner 2431-T Support fixture 1799-T
20	Fit and align the driving pulley and fit the belts (see Op. DS 231-4).	
21	Connect the feed pipe to the clutch control cylinder without strain, tighten the nut moderately to 4.3 to 5.7 ft/lbs (0.6 to 0.8 m.kg), the pipe should pass in front of the brake pipe (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	Spanner 2219-T or 2221-T 12 mm box spanner
22	Remove the support fixture 1799-T, from the gearbox. Fit the starter motor alignment fixing screws, tighten lightly and lock the locknuts. Lower the engine slightly. Fit the flexible couplings. Make sure that the dowel pins are in position in their housings in the coupling. Tighten the screws to 18 ft/lbs (2.5 m.kg)	12mm socket extension 12 mm spanner
23	Offer up the crossmember on the gearbox brackets (see Pl. 50). Engage the brake unit adjusting rods (113) in the yokes (114). Pay attention to the positioning. Fix the crossmember on the brackets, tighten the screws and turn down the lockplates. Lower the engine gearbox assembly until the crossmember rests on the sidemember. Remove the chain sling. Fit the shims found when dismantling between the crossmember and the sidemembers and tighten the screws to 25 ¼ ft/lbs (3. 5 m. kg) (plain and spring washers). The distance between the brake disc and the sidemember on the left side should be greater by 70 ± 2 mm than the same distance measured on the right side	14 mm box spanner

		TOOLS
24	To adjust the height of the brake units (see Pl. 141), work on the length of the adjusting rods (113) (see Pl. 50) so that the linings stand slightly proud of the disc at the front by approximately 1 mm (see fig. 1). Tighten the adjusting nut (101) on the brake connecting cable (110) until the right and left control levers (103) are at the limit of separation of their eccentric stops (104). Lock the locknut (101). Hook on the mechanical brake cable (102). To do this : push with a screwdriver on the short lever (115) and fix the cable. Connect the cables of the dynamo to the terminals of the regulator. Refit the brake cooling ducts. Make sure the ducts do not foul the discs. If necessary, reposition the ducts in the slots	12-14mm box spanners 12-21mm spanners 10mm ring spanner
25	Connect the 5 pipe assembly to the gearbox	
26	Pass the idling control pipe under the brake feed pipe. Connect the union (112) to the brake unit. Connect the union (111) and put the fixing plate on the rear support of the unit (see Pl. 141). Connect the brake feed pipe union on the 3-way union (41) (see Pl. 25). Tighten the nut to 4.3 to 5.75 ft/lbs (0.6 to 0.8 m.kg) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
27	<u>To fit the steering</u> (see Pl. 125) a) Position the steering pinion to correspond with the marks made when dismantling (centre punch or paint marks opposite the slot on the column at a'). b) Engage the steering pinion in the steering column. Put the steering assembly in the bearings in accordance with the paint marks made when dismantling at "b. Fit the fixing screws of the bearing cap	12 mm box spanner
28	<u>To adjust the angular position of the steering</u> (see Pl. 125): a) Fit the fixture 1955-T as indicated on Pl. 125	Fixture 1955-T
	b) Turn the steering assembly in its bearings so that the groove "c" touches the centre gauge pin (D) of the fixture.	
	c) Tighten the fixing screws (4) of the bearing cap and remove the fixture	12 mm box spanner
	d) Connect the steering relay levers on the relay shafts, the nuts towards the outside. Tighten the nuts (8) to 18 ft/lbs (2.5 m.kg)	14-16mm box spanners
	e) Connect the pipe assembly (5) to the pinion housing. Fit the seal plates so that the holes for the fluid correspond to those in the union plates	10 mm ring spanner

		TOOLS
29	<u>To fit the radiator</u> a) Place the rubber blocks in the cups on the crossmember. b) Offer up the radiator and put the distance pieces in position on the plates on the radiator, the longer on the right-hand side. c) Fit the expansion chamber bracket. Fit the screws fixing the radiator and the bracket. d) Centralise the radiator so that the blades of the fan do not touch the cowling. Position the plate fixing the pressure regulator. e) Tighten the fixing screws of the expansion chamber, radiator and pressure regulator	12-14 mm box spanners
30	Put the cable harness tube in position (cars produced before February 1957). Provisionally fix the wire and the earthing wire together with the left-hand plate of the tube on the gearbox cover.	
31	Put the pressure control valve in position. Connect the pipe between the pump and the pressure control valve, to the pressure control valve (spanner 2220-T, see Pl. 72, fig. 4 or 14 mm spanner)	Spanner 2220-T or 14 mm spanner 12 mm box spanner
32	Fit the battery support. Fit the collars fixing the fluid reservoir. Pass the feed pipe for the high pressure pump through the rubber grommet in the radiator tie-rod, then in the rubber collar on the water pipe and through the rubber grommet on the battery support, then to the reservoir unit	8-12 mm box spanners
33	Fit the expansion chamber. Fit the clip fixing the exhaust downpipe. Make sure that there is a clearance of 5 mm between the radiator and bracket.	
34	Fit the battery. Fit the protection plate. Connect the cables to the terminals of the battery and starter motor. Tighten the screw fixing the earth lead and the cable harness tube on the gearbox cover (cars produced before 1957).	12 mm spanner 12 mm box spanner 8-14mm box spanners
35	Couple up the accelerator control to the carburettor	7 mm box spanner
36	Refill the gearbox 3~ pints (2 litres) (SAE 90 EP oil). Refill the radiator. Open the vane of the heater control and unscrew the bleed screw (46) (see Pl. 125) in order to eliminate the air.	
37	Unscrew the bleed screw of the pressure control valve. Start the engine and tighten the bleed screw in order to put the systems under pressure	8 mm spanner
38	Fit the wheels. Tighten the screws to 108 to 144 ft/lbs (15 to 20 m.kg).	
39	Bleed the front brakes (see Op. DS 453-0). Note : do not spill fluid on the brake shoes.	

		TOOLS
40	Adjust the clutch clearance (see Op. DS 314-0, paragraphs 20 to 23).	
	NOTE - It is sometimes necessary to make this adjustment again after a few dozen miles	12 mm spanner 12 mm box spanner
41	Fit the steering relay protection shields. Fit the wings. Fit the air ducts. Fit the air deflection panel. Fit the spare wheel support. Connect the bonnet lock control cable. Check the closing of the bonnet	12-14mm box spanners
42	Fit the spare wheel and lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
	REPLACEMENT OF A FIRST SPEED SELECTOR LEVER	
	Removal (see Pl. 57).	
43	Remove the spare wheel, the spare wheel support, the front wings and the air deflection panel	12-14mm box spanners 14 mm spanner
44	Drain the radiator (retain this water which contains anti-freeze). Release the pressure.	
45	Remove the battery and its support	12 mm spanner 8 mm box spanner
46	Remove the clips fixing the pressure control valve.	
	Remove the radiator. Support the gearbox by using the stand 1797-T (see Pl. 51) or a wooden wedge between the casing and crossmember.	12-14 mm box spanners Stand 1797-T
47	Disconnect the steering levers from the relay shafts. Remove the front crossmember. Remove the steering (see Op. DS 100-1, paragraph 10)	14-16 mm box spanners
48	Remove the gearbox cover thrust block.	
	Remove the brake connecting cable. Remove the pipe connecting the high pressure pump to the regulator (spanner 2220-T and 2280-T, see Pl. 72, fig. 4 and 5), let the regulator rest on the engine protection panel. . . .	12-14mm box spanners Spanner 2280-T Spanner 2220-T
49	Disconnect the gear control pipe assembly from the gearbox pipe assemblies. Unscrew the nuts from the screws fixing the pipe assembly on the bracket to remove the pipe assembly bracket, disengage it towards the front. On early models, it is necessary to remove the studs fixing the pipe assemblies	8-14 mm box spanners
50	Remove the screws and studs fixing the gearbox cover. Disengage the cover vertically in order to avoid dropping the shoes of the 3rd and 4th speed selector fork	14 mm box spanner

		TOOLS
51	<u>To remove the 1st speed selector lever</u>	
	a) Unscrew the lever spindle (23) until the lever is free from its trunnion, the fork being in contact with the 1st speed pinion on the bevel pinion shaft. (The head of the spindle becomes forced against the front edge of the gearbox support arm which twists it slightly. It is unnecessary to remove the spindle).	
	Hold the end of the lever with the left-hand.	
	b) Using a small iron wire hook, held with the right-hand, grip the spindle of the fork (24) and turn the fork towards the top, at the same time holding the lever with the left-hand in a horizontal position. (The lever is 3/4 free from the fork spindle). Let go the lever. Hold the hook with the right-hand. Hold the fork and lever by the fork spindle boss with the left-hand. Disengage the hook. Move the assembly towards the front by easing the end of the lever, using a hook held in the right-hand. When the fork boss of the lever passes the spindle (23), disengage the lever.	
	<u>Refitting.</u>	
52	To fit the 1st speed selector lever	
	a) Using a hook held in the right-hand, raise the spindle on the fork towards the top (the pinion being positioned towards the front). Using the middle finger of the left-hand, hold the trunnion, disengage the hook.	
	b) Offer up the lever horizontally in the box, the boss for the fork spindle towards the rear, the long part of the boss towards the top. Hold the lever in this position between the thumb and index finger of the left-hand and try to engage the lever on the trunnion. Engage the lever approximately 8 mm.	
	c) Hold the end of the lever using a hook held in the right-hand and ease the assembly back until it rests on the pinion. It is sometimes necessary to push the pinion back with a screwdriver. Turn the assembly to its normal position by raising the lever with a hook.	
	d) Engage the lever on its spindle. Screw the spindle holding the lever in order to avoid binding. Tighten the spindle (23)	21 mm spanner
53	Put the pinions in neutral position. Put the cover in position : the fork of the 3rd and 4th speed being fitted with its shoes (stick with grease to avoid dropping the shoes), lower the cover vertically; make sure that the forks engage in the grooves of the sliding gears and the 1st speed lever in the groove of the fork. Fix the cover by its 2 positioning screws, then by the other. screws and studs	14 mm box spanner
54	Fit the pipe assembly bracket by engaging the studs in the slots of the rear pipe assembly flange. Tighten the nuts of the pipe assembly fixing studs (plain and spring washers). Connect the pipe assembly	8-14 mm box spanners

		TOOLS
55	Fit the connecting pipe between the pump and the pressure regulator (spanner 2220-T and 2280-T, see Pl. 72, fig. 4 and 5)	Spanner 2220-T and Spanner 2280-T
56	Fit the brake connecting cable and adjust (see Op. DS 454-0). Fit the thrust block bracket	12 mm spanner 12-14 mm box spanners
57	Fit the steering (see Op. DS 100-1, paragraphs 43 to 45). Note the markings made when dismantling.	
	Fit the front crossmember. Connect the steering levers to the relay shafts. Position and tighten the screws. Fixing the gearbox support arms to the crossmember. Remove the stand 1797-T or disengage the wooden wedge.	14-16 mm box spanners
58	Fit the radiator. Fix the pressure regulator	12-14mm box spanners
59	Fit the battery bracket and the battery. Fix the earth lead	12 mm spanner 8-14mm box spanners
60	Refill the radiator. Start the engine, bleed the water system.	
	Put the systems under pressure. Make successive movement through all the gears. Check the unions for leakage. Stop the engine	8 mm spanner
61	Fit the air deflection panel. Fit the wings and spare wheel support. Fit the spare wheel	14 mm spanner 12-14 mm box spanners

		TOOLS
	STRIPPING	
1	<u>To remove the front crossmember bracket</u>.	
	a) Remove the lower nuts from the tie-rod front brackets of the brake units	21 mm spanner 21 mm box spanner
	b) Remove the screws fixing the crossmember of the gearbox brackets and remove the crossmember	14 mm box spanner
2	Remove the dynamo tie-bar. Remove the dynamo and the belts	12-14 mm spanners 12-14 mm box spanners
3	<u>To remove the high pressure pump</u>	
	a) Remove the tie- rod from the pump and remove the belts	12 mm box spanner
	b) *Cars produced before October 1958:* Remove the high pressure pump fixing spindle nut and remove the assembly of the pump pressure regulator connecting pipe and spindle. Remove the pump (spanner 2280-T, see Pl. 72, fig. 5)	 Spanner 2280-T
	c) *Cars produced since October 1958:* Remove the high pressure pump fixing 4indle (spanner 2280-T, see Pl. 72, fig. 5) and remove the assembly of the high pressure pump and connecting pipe between the pump and pressure regulator	 Spanner 2280-T 14 mm spanner
4	Disconnect the control rod (4) from the clutch fork. Remove the clutch cylinder (see Pl. 45)	12 mm spanner 12 mm box spanner
5	Remove the flange, fitted in order to hold the fan, dynamo and pump driving shaft during removal. Remove the ring nut (70) (see Pl. 58) and remove the assembly of the shaft and bearing (71) towards the front (spanner 1640-T, see Pl. 63, fig. 5)	 14 mm box spanner Spanner 1640-T
6	Remove the brake unit and rear support assembly. It may be necessary to remove a brake shoe	14-19 mm box spanners
7	Remove the pointed screw from the starter motor housing	12 mm box spanner
8	Drain the gearbox	21 mm box spanner
	REFITTING	
9	Fit the shaft and bearing assembly. Tighten the ring nut to 18 ft/lbs (2.5 m.kg) (spanner 1640-T, see Pl. 63, fig. 5) and fit a split pin. Drill a 2. 5 mm diameter hole if there is not one opposite a recess	 Spanner 1640-T
10	Fit the front fixing of the dynamo without tightening, (spring washers under the heads).	

		TOOLS
11	Fit the brake unit and rear support assemblies. Tighten the screws fixing the supports	14-19 mm box spanners
12	Fit the front brake connecting cable. Fit the sheath stops and connect the cable to the control levers	12mm box spanner
13	Fit the pulley on the driving shaft. Adjust the position of the pulley (see Op. DS 231-0)	14 mm box spanner
14	Fit the belts on the driving pulley.	
15	Fit the clutch cylinder, connect the control rod to the clutch fork.	
16	<u>To fit the high pressure pump</u>.	
	a) *Cars produced since October 1958.*	
	Offer up the assembly of the high pressure pump and connecting pipe between the pump and pressure regulator.	
	Fit the fixing bolt and offer up the fixing nut (plain and spring washers) (spanner 2280-T, see Pl. 72, fig. 5) .	Spanner 2280-T
	b) *Cars produced before October 1958.*	
	Offer up the high pressure pump and the assembly of the spindle and connecting pipe between the pump and pressure regulator fitted with new ring seals. Fit the spindle fixing nut (spanner 2280-T, see Pl. 72, fig. 5)	Spanner 2280-T
	c) Fix the connecting pipe clamp on the gearbox	14 mm box spanner
	d) Fix the tie-rod on the high pressure pump (plain and spring washers under the nuts).	
	e) Put the belts in position.	
17	Fit the dynamo (plain and spring washers under the fixing screws). Put the belts in position. Fit the tie-rod (plain and spring washers under the nuts).	
18	<u>To fit the front crossmember bracket</u>.	
	a) Offer up the crossmember. Tighten the fixing screws of the crossmember on the gearbox support arms. Turn over the lockwashers	14 mm box spanner
	b) Fit and tighten the lower nuts of the tie-rod front brackets of the brake units	21 mm spanner 21 mm box spanner

PARTICULAR POINTS

Dismantling.

After having disconnected the clutch housing from the gearbox casing, remove the outer differential bearing races sideways, the centre of the differential is not on the line of the joint between the clutch bellhousing and the gearbox casing.
The needle bearing assemblies of the intermediate train are not of the same length, mark before dismantling.
To remove the assembly of the retaining washer and thrust washer, heat the thrust washer to 2000 C (using a blow pipe fitted with a 150 to 200 litre nozzle). Only carry out this operation if the washer assembly is to be renewed (scratches or loose).

Assembly.

23 To prepare the clutch housing

The rear-end of the clutch thrust guide stud should be set at a distance "b" = 97 ± 1 mm from the face of the joint with the engine. (see Pl. 58, fig. 2).
Do not refit the oil tube, if one existed when dismantling.
Adjust the position of the driving pulley (see Op. DS 231-0).

24 To prepare the gearbox cover:

Calibrate the fork return springs: Length 68 mm, under load of 245 to 26 kg.

25 To prepare the differential:

Lateral clearance of planet wheels = 0.30 mm maximum.
Lateral clearance of satellites = 0.30 mm maximum.
Tighten the screws fixing the crown wheel to 47 to 50 ft/lb (6.5 to 7 m.kg). Do not fit lockplates under the screw heads, fit an iron locking wire through the heads of the screws in a manner to stop unscrewing.

26 To prepare the differential shafts

(a)Rectify the brake discs (shaft mounted between centres) by grinding or using a facing tool. Avoid removing in order to rectify the second face.
(b) Maximum run-out at the greatest diameter = 0.17 mm. Difference in thickness at any point on the disc 003 maximum. Do not reduce the original thickness of the disc (original thickness 12 ± 0.1 mm) by more than 1 mm.

27 To prepare the shaft and housing assemblies.
The differential shaft and housing is shorter on the right-hand side.

(a) Tighten the slotted nut locking the bearing to 72 ft/lb (10 m.kg) (spanner 1771- T).
(c) Fit the housing assembly (fitted with the bearing and oil seal) and support arm on the differential shaft, using a press.
(d) Tighten the nut on differential shaft to 72 ft/lb (10 m.kg) (spanner I 770-T).

28 To prepare the mainshaft.
Note the descriptions given in the text. There are different types of assemblies.
(a) Clearance of the third-speed pinion locking segments 0.02 to 0.06 mm.
(c) Movement of the synchro bush 0.20 to 0.65 mm.
(d) Clearance of the rear bearing circlip = 0.02 to 0.06 mm.
(e and f) Clearance between the front bearing and the thrust face on the cap = 0.

29 To prepare the bevel pinion shaft.
(c) Clearance between the front bearing and the thrust face of the cap = 0.

32 To assemble the reverse gear layshaft.
The ground face of the thrust bearing, against the pinion. Lateral clearance of the assembly 0.05 to 0.20 mm.
Make sure that the screw, fitted with hermetic, is in the shaft (at the front).

33 To assemble the bevel pinion.
On cars produced before October 1957, it is necessary to fit the mainshaft before fitting the bevel pinion. Fit an adjusting shim of any thickness, then the front bearing and the nut.

34 To assemble the mainshaft.
Tighten the starting handle dog to 72 to 87 ft/lb (10 to 12 m.kg). Tighten the bevel pinion shaft nut to 144 ft/lb (20 m.kg) (do not fit a nut with a small collar).

36 To adjust the bevel pinion shaft.
The dimension which should be obtained at the end of the adjustment, between the centre-line of the differential and the rear face of the bevel pinion, is engraved on this face, this will vary with each crown wheel and pinion.
Use the adjusting fixture 2044- T.

38 To adjust the engagement of the gears.
Measure the dimension c (see Pl. 55, fig. 7) and select an adjusting washer of a thickness equal to this dimension, reduce the value of between 0.10 and 0.30 mm for the cylinder controlling the 3rd and 4th speed or the value of between 0.30 and 0.65 mm, for the cylinder controlling the 1st speed.

42 To adjust the mainshaft rear sealing joint.
The distance to be obtained after assembly, between the adjusting washer and the joint face on the hub of the support block is 16.2 ± 1 mm.

43 To fit and adjust the differential.
Adjust the clearance of the bearings using the support 1766-T and the clearance between the teeth using the fixture 2039-T.
In order to reduce the clearance between the teeth by 0.1 mm it is necessary to increase the thickness of the adjusting washers of the right-hand differential housing by 0.2 mm.
Clearance between teeth 0.19 to 0.24 mm.

44 *On assembly of the differential shaft and housing assemblies, again check the clearance between the teeth.*

46 To fit the rear pipe assembly.

The tightening flange of the control cylinders being placed on the 4th speed cylinder, the clearance between the flange and the other cylinders (fitted with their retaining plates for cars produced before March 1957) should be between 0 and 03 mm.
Tighten the fixing screws evenly to 12 to 14 ft/lb (1.7 to 1.9 m.kg).

48 To fit the front pipe assembly.

The flange should fit equally on the control cylinders to 03 mm precisely.

	DISMANTLING (see Pl. 52).	TOOLS
1	Fit the gearbox on a stand (stand MR-3053-130, see Pl. 62). Remove the cover	Stand MR-3053-130 14 mm box spanner
2	To remove the shaft bearing housing assembly and brake disc (see Pl. 54).	
	a) Remove the screws (1) fixing the bracket (2).	14 mm spanner
	b) Remove the bracket and take out the four screws (3) fixing the bearing housing. Remove the assembly from the gearbox	12 mm spanner
	c) Remove the adjusting washer (4) and the spacing washer (5). In the same way remove the other shaft bearing housing assembly and brake disc. Protect the brake discs	Rubber protectors
3	Disconnect the clutch bellhousing from the gearbox casing. Take out the bearing races (6) from the bellhousing. Hold the differential against the gearbox casing. Remove the clutch bellhousing. Take out the differential	12-17 mm spanners 12-17mm box spanners
	NOTE - The centre of the differential is not on the line of the joint between the clutch housing and the gearbox casing; for this reason, the bearing races can only be taken out sideways.	
4	Remove the top bearing cover plate (7) and the lower bearing cover plate (8). Retain the adjusting shims (9) and (10).	14 mm box spanner
5	Put the two gears in mesh. Remove the starting handle dog (11) and the nut (12) locking the bearings (spanner 1734-T, see Pl. 65, fig. 3)	Spanner 1734-T
6	Remove the rear oil seal (13) from the mainshaft (this can be removed by hand). Remove the washer (14) and the distance tube (15) (since January 1957) or the circlip retaining the oil seals (1st arrangement).	

		TOOLS
7	Remove the circlip (16) retaining the rear mainshaft bearing (17) (use circlip pliers). Remove the distance piece (18), the bearing (17) and the 1st speed pinion (19)	Circlip pliers
8	Loosen the housing of the front bearing (21) by striking the end of the shaft (22) with a mallet. Extract the assembly of the bearing and housing by means of small levers (cars produced before October 1957) or extract the shouldered bearing (21) (extractor body 1750-T, split collet and ring 1738-T, see Pl. 64, fig. 1) (cars produced after October 1957)	Extractor 1750-T Split collet and ring 1738-T
9	Remove the spindle (23) of the 1st speed selector fork (24) (see Pl. 57) and push the fork towards the rear	21 mm box spanner
10	Put the synchromeshes in 2nd and 4th gear positions. Remove the mainshaft assembly and pinions through the top of the gearbox casing.	
11	<u>To remove the reverse gear layshaft</u> (see Pl. 54, fig. 2):	
	a) Remove the screw (27) locking the spindle (untighten the locknut)	14 mm box spanner
	b) Drive out the steel plug (28) closing the hole for the spindle in the front face of the gearbox casing.	
	c) Draw out the spindle (29) by means of a 7 mm dia. x 100 pitch screw with several threads screwed into the spindle. Remove the assembly of the reverse gear layshaft and ball thrust race (30), the adjusting shims (31), the needle bearing assemblies (32) and their distance piece (33).	
12	Drive out the bevel pinion (25) by striking the end with a bronze drift. Do not mislay the rollers from the bearing (26). Remove the bevel pinion (25) from the box.	
	NOTE - On early models, it is necessary to drive out the bevel pinion before removing the mainshaft.	
13	Move the bevel pinion shaft front bearing assembly (35), some millimetres out of the gearbox casing, in order to remove the pinions comprising the intermediate train and the 1st speed selector fork.	
14	With a drift, drive out the front bevel pinion shaft bearing and the outer race of the rear bevel pinion shaft bearing (26).	
15	Remove the speedometer pinion, the filler and drain plugs	21 mm box spanner
16	<u>To strip the mainshaft</u> (see Pl. 53, fig. 1)	
	a) Disengage the 4th speed loose pinion (36), the 2nd speed synchromesh assembly (37).	
	NOTE - Do not pull the synchromesh by the collar, otherwise the driving pins (38) will escape from the pinion and will fall out. Do not mislay the synchromesh adjusting shims (39) found between the synchromesh and the pinion.	
	b) Disengage the 2nd speed loose pinion (40), the washer (41) retaining the half segments (42), the 3rd speed loose pinion (43). Remove the needle bearing assemblies from the loose pinions. (Note : these needle bearing assemblies are not of the same dimensions).	

		TOOLS
17	<u>To strip the intermediate train</u> (see Pl. 53, fig. 2). Disconnect the 2nd speed intermediate pinion (44), the 3rd and 4th speed intermediate pinion (45). Take out the driving pins (46).	
18	<u>To dismantle the differential</u> (see Pl. 54, fig 1). Uncouple the crown wheel from the differential housing. Disengage the planet wheel (47), the spindles for the satellite wheels, the satellite wheels (48) and their thrust washers (49), the other planet wheel (47). Remove the taper roller bearings from the differential housing and from the crown wheel (extractor 1750-T, split collet and ring 1753-T and thrust block 1742-T, see Pl. 61, fig. 1)	17 mm box spanner Extractor 1750-T Split collet and ring 1753-T Thrust block 1742- T
19	<u>To strip the differential shafts</u> (see Pl. 54, fig. 1): a) Unscrew the screw (50) retaining the nut (51), locking the bearing (52) on the shaft. Remove the nut (spanner 1770-T, see Pl. 63, fig. 4). Drive out the shaft assembly and disc	Spanner 1770-T
	b) Remove the screw (53) retaining the nut (54) locking the bearing (52) in the housing. Remove the nut (spanner 1771-T, see Pl. 63, fig. 3)	Spanner 1771-T
	c) Remove the oil (55) by means of a screwdriver. Drive out the bearing (52) from the housing.	
	d) To remove the assembly of the retaining washer and thrust washer. Heat the thrust washer (83) (200^0C approximately) with a blow pipe fitted with a 150 to 250 litre nozzle. Assist the removal of the thrust washer with a screwdriver if necessary, (use this method only if the washer is to be renewed).	
20	<u>To strip the cover plate</u> (see Pl. 55) a) To remove the selector control cylinders (cars produced before March 1957, see fig. 2 and 6). Remove the fixing clamps (56). Remove the plates (57) and the adjusting packings (58). Remove the cylinder and pipe assemblies. Remove the adjusting washers (59) from the cylinders	12 mm box spanner
	b) To remove the selector control cylinders (cars produced since March 1957, see fig. 1): Remove the cylinder fixing clamps (20), (end piece 1773-T, see Pl. 64, fig. 6). Remove the clamp adjusting washers (99). Remove the cylinder and pipe assemblies. Remove the adjusting washers (59) from the cylinders	End piece 1773-T
	c) Take out the screws fixing the forks so that they slide freely on the shaft. Check that all the shafts are in the neutral position.	

		TOOLS
	d) Remove the spring cup (60) from the 4th speed selector shaft (61) (spring compressor 1798-T, see Pl. 56, fig. 1). Slide the shaft (61) towards the front until the front cup (62) is on the small diameter of the shaft in the area "a". Fit the spring compressor (as shown on Pl. 56. fig. 1), the nose pieces engaged between the end coils of the spring. Compress the spring. Remove the cup (62). Remove the shaft (61) and the tongue (63). Remove the spring. Disengage the selector fork (64) and its thrust pad. Carry out the same operation for the other selector shaft. . . . . Knock out the expanding washers (65). Remove the locking plungers (66)	Spring compressor 1798-T 7-8 mm spanners
21	<u>Replacement of the control cylinder ring seals</u>	
	a) Mark each piston and the corresponding cylinder. The pistons can easily be removed with compressed air. Cover the cylinders with a clean cloth to prevent the pistons being thrown out.	
	b) Remove the ring seals from the cylinders, using a brass wire hook.	
	c) Clean the cylinders and pistons by immersing them in clean alcohol to the exclusion of all other products. Blow them with compressed air. In the case of scratches on the pistons, a light rubbing with No. 600 abrasive paper dipped in alcohol is permitted.	
	d) Place the mandrel successively in each cylinder (mandrels MR-3676-120 or MR-3676-130, see Pl. 64, fig. 4). Offer up the ring seal smeared with hydraulic fluid and put it in position in the groove of the cylinder, using a reversed piston (see Pl. 64, fig. 5). Remove the mandrel with a 6 dia. x 100 pitch screw	Mandrels MR-3676-120 and MR-3676-130
	e) Oil the cylinder and pistons with hydraulic fluid. Engage the bottom of the pistons in the corresponding cylinders.	
22	<u>To strip the clutch bellhousing</u> (see Pl. 58)	
	a) To remove the driving shaft: Remove the nut (70) locking the bearing (71) (spanner 1640-T, see Pl. 63, fig. 5). Drive out the shaft and bearing assembly towards the front. Take out the bearing (71) and the oil retaining washer (72). Remove the dynamo fixing screw. Remove the springs (73) retaining the thrust race. Remove the thrust race and support assembly. Remove the thrust guide screw (74)	Spanner 1640-T 14 mm box spanner
	b) To remove the clutch fork :- *Cars produced before June 1959.* Remove the locking screw (75), drive out the spindle (77). Remove the return spring and the pipe from the oiler (if one is fitted)	8 mm spanner 8 mm box spanner
	Cars produced since June 1959 (see fig. 3). Remove the two circlips retaining the spindle (77).	
	c) Remove the thrust race hub support (76) (see Pl. 52).	
	d) Remove the starter switch screws	12 mm box spanner
	Clean the parts. except the driveshaft bearing, if this is to be used again.	

		TOOLS
	Assembly.	
23	To assemble the clutch housing (see Pl. 58)	
	a) Fit the thrust race support hub (76) (spring washers under the heads of the screws, previously smeared with Hermetic, see Pl. 52). Insert a joint smeared with Hermetic. Fit the thrust guide screw (74) with its locknut (shake-proof washer under the nut). Adjust the position of the screw, so that its end is set at a dimension "b" 97 ± 1 mm from the face of the joint with the engine. Tighten the locknut. To fit the clutch fork : Engage the previously oiled shaft in the right-hand bore, offer up the fork fitted with its return springs. *Cars produced before June 1959.* Tighten the screw (75) locking the shaft (plain washer under the head) and tighten the locknut. *Cars produced since June 1959 (see fig. 3).* Fit the two circlips retaining the spindle (77). Put the thrust bearing in position, fix it in position by means of the retaining springs (73)	8-12mm box spanner 14 mm ring spanner
	NOTE - Do not refit the oil tube if one was found when dismantling.	
	b) To fit the pulley driving shaft: Put in position, the bearing (71) previously greased in the bore of the bellhousing. Tighten the nut (70) (spanner 1640-T, see Pl. 63, fig. 5), split pin. Fit the oil retaining washer (72) on the shaft and insert the assembly in the bearing	Spanner 1640-T
	c) Adjust the alignment of the pulley (see Op. DS 231-0).	
24	To assemble the cover plate (see Pl. 55):	
	a) To check the selector fork return springs: under a load of 54 to 56 lbs (24.5 to 26kg), the length should be 68 mm. (Fixture for calibrating the springs 2420-T, see Pl. 6)	Fixture for calibration 2420-T
	b) To fit the selector forks : Fit the 1st and 2nd speed selector shaft (77) through the rear of the cover plate. Fit the return spring without the cups, then selector fork (78) (spring compressor 1798-T, see Pl. 56, fig. 1). Insert the selector shaft locking plunger (66). Fit the reverse selector shaft (79), its return spring and the selector fork (80). Insert the 3rd and 4th speed selector shaft (61), its return spring, fit the selector shaft plungers (66), the rocker (63), the 3rd and 4th speed selector fork (64). Tighten the locking screws on the selector forks. Lock the screws with iron wire, fitted so as to prevent any rotation in the direction of unscrewing	7-8 mm spanners Spring compressor 1793-T
25	To prepare the differential (see Pl. 54, fig. 1):	
	a) Fit the taper roller bearing (mandrel 1768-T, see Pl. 61, fig. 2)	Mandrel 1768-T

TOOLS

b) Fit the planet gear (47) in the box. Insert a fibre washer, the oil groove towards the planet wheel, and a satellite wheel (48), a thrust washer (49) (the locking tab in the slot in the box) a spindle.

Determine the thickness of the thrust washer for this satellite so that there is no stiffness when turning the planet wheel. The longitudinal clearance on the planet wheel is 0.30 mm.

Carry out the same operation for the other satellite wheel.

c) Fit the second planet wheel. Fit the crown wheel. The spindles for the satellite wheels are locked by the set-screw (81).

Tighten the screws to 47 to 50 ft/lbs (6. 5 to 7 m. kg). Make sure that there is no stiffness when turning the planet wheel and that the longitudinal clearance on the planet wheel is 0. 30 mm; if not, try another planet wheel.

d) Dismantle the box. Mark the parts, oil and refit. Tighten the crown wheel fixing screws to 47 to 50 ft/lbs (6.5 to 7 m. kg). Fit an iron locking wire through the holes in the heads of the screws so as to prevent any rotation in the direction of unscrewing. (Do not fit lockplates).

26 <u>To prepare the differential shafts</u> (see Pl. 54)

a) To rectify the brake discs.

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

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

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

Rectify the other face.

b) To check the disc faces. They should conform to the following conditions

- maximum “run-out” at the greatest diameter; 0.17 mm measured at two points diametrically opposite;
- difference in thickness at any point on the disc; 0.03 mm maximum.

NOTE - 1. Do not reduce the original thickness of the disc by more than 1 mm (0.5 mm on each face), the original thickness of the disc is 12 ± 0.1 mm.

2. It is preferable to use a disc after rectification, rather than fitting a new disc.

c) To fit the brake discs
Put the oil retaining washer (82) on the shaft, see Pl. 54, for position. Offer up the distance piece (83). Put the mandrel 1767-T in position (see Pl. 63, fig. 1). Cap the oil sealing washer with the centring bush and fit the distance piece in a press. Put a block under the disc in order to avoid damage to the dowel pins on the bibax . . . . . Mandrel 1767-T

27 <u>To prepare the shaft and bearing assembly</u> (see Pl. 54)

NOTE - The differential shaft and housing is shorter on the right-hand side.

TOOLS

a) Put the bearing (52) in the housing. Tighten the ring nut (54) to 72 ft/lbs (10 m.kg) (spanner 1771-T, see Pl. 63, fig. 2). Lock the nut with the pointed screw (53) . . . . . — Spanner 1771-T 12 mm box spanner

b) Put the oil seal (55) in position, (mandrel 1772-T, see Pl. 63, fig. 2). Ease the fit of the joint in the bush and the housing with petrol, use no other product . . . . . — 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 leakage.

c) Offer up the housing thus prepared, together with the bracket (2) on the differential shaft. Put it in position, in a press (use a tube) . . . . . — Tube : Internal dia. = 30 mm External dia. = 39 mm Length = 200 mm

d) Tighten the nut (51) locking the bearing to 72 ft/lbs (10 m.kg) (spanner 1770-T, see Pl. 63, fig. 4) — Spanner 1770-T

e) Tighten the screw (50) locking the nut.
Carry out the same operations for the other housing . . . . . — 7 mm box spanner

28 <u>To prepare the mainshaft</u> (see Pl. 53, fig. 1):

IMPORTANT REMARK (see Pl. 53A, fig. 1) - Since production commenced on DS 19 cars, we have fitted two types of 3rd and 4th speed pinions (pinion on mainshaft and intermediate train). The two types of assemblies should be carefully noted. The parts which they comprise form an assembly and should never be mixed.

1st type assembly (cars produced before July 1957) : helix angle of pinions 31˚ 50'.

2nd type assembly (cars produced since July 1957) : helix angle of pinions 33˚ 30'.

Identification of pinions

Type of gearbox	3rd Speed pinion	4th Speed pinion	Intermediate train
Cars produced before July 1957 (3rd speed pinion with 31˚ 50' helix angle)	No. D 333-8 (no mark)	No. D 333-17 (no mark)	No. D 333-16 (no mark)
Cars produced since July 1957 (3rd speed pinion with 33˚ 30' helix angle)	No.D5333-8 3 centre punch marks at a or groove at c	No.D5333-17 groove at b (washer between rods and pinion)	No. D5333-16 number "33" stamped on face d

TOOLS

Our Spare Parts Department only sell parts for the second type assembly. If one of the two pinions (3rd speed pinion on the mainshaft or double pinion of the intermediate train) is to be renewed, it is necessary to renew the other pinion of this assembly.

One can replace a 4th speed pinion, 1st type, by a 2nd type pinion, without other modification.

a) Fit on the shaft, the 3rd speed sliding pinion (43), fitted with its needle bearing cages. Select from the half segments (42) those with a slight tightness or a clearance between 0.02 and 0.06 mm in the groove of the shaft. Fit the half segment retaining washer (41).

b) Fit the 2nd speed sliding pinion (40) fitted with its needle bearing cages, the synchro bush, the synchro hub carrying the driving pins.

IMPORTANT REMARK - There are two types of 2nd speed driving pinions.

1st type assembly (cars produced before June 1958) : taper 7˚

2nd type assembly (cars produced since June 1958) : taper 7˚ 30'.

The two types of assemblies should be carefully observed (see Pl. 53A, fig. 2). These parts should not be mixed. One can indiscriminately fit the parts of the two assemblies shown on Pl. 53 A, fig. 2 or 3.

c) To adjust the movement of the synchro bush

Hold the synchro hub against the 2nd speed loose pinion (shoulder of the shaft) by hand. The bush of the synchro in contact with the cone of the 2nd speed loose pinion (40), using a set of feelers, measure the clearance "c" existing between the rear face of the synchro bush and the front face of the reverse speed pinion.

Select from shims sold by our Spare Parts Department, to give a clearance at "c" of between 0.20 and 0.65 mm.

d) Fit the shim, the synchro hub, the pinion (19), the bearing (17). Select a shim (18) which will allow the circlip (16) to just enter the groove in the shaft or permits a clearance of between 0.02 and 0.06 mm.

e) *(Cars produced before October 1957.)* To adjust the clearance of the front bearing

Remove the circlip, the shims, the bearing and the pinion (19). Move the synchro in the 2nd speed position. Fit the front bearing in its cage.

Fit a paper joint. Tighten the cap on the housing in order to compress the joint. Remove the cap.

With the joint in position on the cap, put a straight edge with a dial gauge (straight edge MR-3377, see Pl. 56, fig. 2 and dial gauge 2437-T) on the joint, the point of the dial gauge in contact with the thrust face of the bearing. Set the dial gauge at "0" (the straight edge flat on the joint).

Mark the position of the totalising needle. The dial gauge being thus set, put the straight edge on the outer cage of the bearing, the point of the dial gauge resting on the outer face of the steel housing.

Check the difference with the first measurement. Reduce this difference by 0.05 mm in order to compensate for the compressing of the joint.

This difference represents the thickness of the shims placed between the cap and the bearing.

Do not mix the shims thus determined . . . . . Straight edge MR-3377
Dial gauge 2437-T

TOOLS

f) *(Cars produced since October 1957, see Pl. 52.)* To adjust the clearance of the front bearing.

Fit a paper joint and tighten the cap (7) on the housing, in order to compress the joint. Remove the cap.

Fit a straight edge with a dial gauge (dial gauge 2437-T, straight edge MR-3377, see Pl. 56, fig. 2).

Place this assembly on a surface plate. Push the dial gauge point in approximately 7 mm and set the dial gauge face of the large needle at "0". 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.

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 number 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 of the bearing, for example: 5.48 mm. Subtract this thickness from the dimension found previously. The difference between these two dimensions represents the thickness of the shims to be placed between the cap and the bearing.

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

Do not mix the shims thus determined . . . . . Dial gauge 2437-T
Straight edge MR-3377

29 <u>To adjust the bevel pinion shaft</u> (see Op. 53, fig. 2):

a) Put the driving pins (46) in position in the 2nd speed intermediate pinion (44).

b) Put the 2nd speed intermediate pinion (44) on the bevel pinion (25). Offer up the 3rd and 4th speed intermediate pinion (45) and fit as far as possible on the driving pins (use a press, if necessary). Use a tube . . . . . Tube :
Inside dia. = 26
Length = 50

IMPORTANT REMARK - During this operation, check for the formation of any burrs on the driving pins and that the pinion assemblies slide freely on the shaft in several positions. If, on removal of the bevel pinion the circlip (84) retaining the rollers of the bearing (26) has come out of the groove in the shaft and made a groove on the journals of the 1st speed sliding pinion (85), it is necessary to remove the burrs with abrasive paper, or a stone. In effect, the journals should be perfectly smooth.

Refit the bearing (26) in the following manner

Put the rollers in the outer cup of the bearing.

The bevel pinion should be maintained in a vertical position while fitting the outer cup and roller assembly. Put the roller retaining clip (84) in position. Use circlip pliers in order not to scratch the journals of the 1st speed loose pinion (85).

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

TOOLS

c) To adjust the setting of the front bearing. Carry out the same procedure as in paragraph 28 “e” or “f”.

30 To assemble the intermediate train (see Pl. 52):

Place in the box the intermediate train and the 1st speed loose pinion (85) together with its sliding pinion (86). Put the sliding pinion in the 1st speed position in order to obtain an approximate centring of the intermediate train and of the loose pinion.

31 To assemble the 1st speed fork in the groove of the sliding pinion

Position the fork so that the articulating spindle in the lever is towards the front and the large boss of the lever is towards the casing (see Pl. 57 for position). Do not fit the pin for the lever and swivel the latter towards the rear of the box.

32 <u>To assemble the reverse gear layshaft</u> (see Pl. 54, fig. 2)

Make sure that the screw (87) is in the spindle (29).

Smear this screw with Hermetic when fitting. Offer up the spindle (29) in its bearings; position the hole for the spindle locking screw (27) towards the front. With the sliding pinion (89) in position, the groove for the fork should be towards the rear.

Fit in the bore of the pinion (88), the needle bearing cages and a thrust bearing (30) at each end. (The ground face against the pinion).

Put the assembly in position on the spindle, measure the end play with a set of feelers.

Determine the thickness of the adjusting shims (31), in order to obtain a clearance of between 0.05 mm and 0.20 mm.

Fit the shim in front of the pinion between the pinion and the thrust bearing.

Tighten the pointed screw (27) and the locknut.

33 <u>To assemble the bevel pinion shaft</u> (see Pl. 52)

NOTE - On cars produced before October 1957, it is necessary to fit the mainshaft before the bevel pinion (see following paragraph).

Engage the bevel pinion (25) in the intermediate gear train.

In order to fit the roller bearing in the bore of the casing, (use the mandrel MR-3676-30) (see Pl. 65, fig. 2).

Fit an adjusting shim, for example : 3.7 mm thick, then the bearing (35) on the end of the bevel pinion . . . . . Mandrel MR-3676-30

IMPORTANT - 1. It is necessary to fit split adjusting shims.

2. If the nut (12) was retained by a lockwasher, do not refit either this nut or the lockwasher. Obtain from our Spare Parts Department, a new nut with a thin collar No. DS 344-5.

		TOOLS
34	<u>To assemble the mainshaft</u> (see Pl. 52):	
	a) Fit on the mainshaft prepared in paragraph 28, the 3rd and 4th speed synchromesh (90) (the shouldered face against the 3rd speed), the 4th speed loose pinion (36) with its needle bearing cage.	
	b) Place the assembly in the box by inclining the shaft towards the rear; engage it first into the bore of the rear bearing.	
	c) Fit a paper joint on the front face of the casing, stick on with grease. Put the bearings (21) and (35) in position.	
	d) Put on the shaft (22), the 1st speed pinion (19) and the rear bearing (17) (mandrel MR-3045, see Pl. 65, fig. 1).	Mandrel MR-3045
	e) Put two gears in mesh and tighten the starting handle dog (11) to 72 to 87 ft/lbs (10 to 12 m.kg) (insert a lockwasher) (spanner 1734-T, see Pl. 65, fig. 3). Turn over the lockwasher	Spanner 1734-T
	f) Tighten the bevel pinion shaft nut (12) to 144 ft/lbs (20 m. kg). (Do not fit a lockwasher). If the nut (12) was retained by a lockwasher, do not refit the nut on the lockwasher. Obtain from our Spare Parts Department, a new nut with a thin collar No. DS 344-5.	
35	Fit the mainshaft bearing cover plate (7) together with a paper joint smeared with grease and the adjusting shims (9) determined in paragraph 28 “e” or “f”. Put the rear bearing in position. Fit the distance piece (18) and the circlip (16) (circlip pliers)	circlip pliers
36	<u>To adjust the bevel pinion shaft</u> (see Pl. 52 and 59, fig. 1)	
	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 distance “y” 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, together with the dial gauge 2437-T, see Pl. 59, fig. 1).	
	This fixture is constructed so that the distance between the centres of the semi-circular ground bearing faces and the two ground 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 casing, as this differs in relation to the centres of the differential bearings	Dial gauge 2437-T Adjusting fixture 2044-T
	a) Fit the lower bearing cover plate (8) together with the adjusting shims (10) (determined in paragraph 29 “c”) and a paper joint without Hermetic.	
	Tighten the screw	14 mm box spanner
	b) Carefully clean the bearing faces for the differential bearings and the semi-circular faces of the adjusting fixture 2044-T. All faces should be free from scratches or burrs.	

		TOOLS
	c) Put the adjusting fixture on a surface plate, resting on the two ground bearing pads. (In this position, the pointer of the dial gauge is at 55 mm from the centre line of the ground semi-circular 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) To 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 location. 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 paragraph “c” (in the example chosen, the totalising needle was between 4 and 5; the 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 paragraph “c”) and the point of the dial gauge has moved forward 1.45 mm. The actual bevel pinion setting “y” 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 = 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 lower bearing cover plate (8). the nut (12), extract the cage and bearing assembly, replace the shim. Refit the lower bearing cover plate. The joints to be fitted with grease. Insert a spring washer under the head of the screws. Put Hermetic under the heads of the screws passing though the casing. Check the adjustment	14 mm box spanner
37	Fit the speedometer pinion, the bush and the flange. Insert a spring washer under the head of the screw.	
38	<u>To adjust the engagement of the gears</u> (see Pl. 52 and 55). a) Put the selector fork (64) in the 3rd or 4th speed position. The object of this operation is to immobilise the selector shafts. Put the synchromesh gear (90) in the position corresponding to that of the fork. Put the other sliding gears in the neutral position.	

		TOOLS
	Fit the cover, the 3rd and 4th speed selector fork together with its thrust pads (smear with grease to prevent them falling out of position) Make sure that the forks are properly engaged in the grooves of the sliding pinions. Fix the cover by the two centring screws.	
	b) To adjust the 3rd speed cylinder. Bring the base of the 4th speed synchro (90) as far as possible into contact with the thrust washer of the pinion, by pushing on the selector shaft (61). Measure the distance by which the shaft stands proud at "e" (see Pl. 55, fig. 5), use the straight edge MR-3377 (see Pl. 56, fig. 2), together with the dial gauge 2437-T. Set the dial gauge, by putting the fixture on a surface plate. Set the dial at "0". Mark the position of the needles. Put the straight edge on the thrust face of the cylinders, on the cover, the pointer of the dial gauge in contact with the end of the shaft. Using a drift, maintain a pressure of approximately 25 kg on the end of the shaft. Bring the needles of the dial to their original position (setting position). Release the spindle of the dial gauge slowly, counting the number of turns and fractions of turns. For example: a distance of 1.40 mm. Measure the distance that the piston stands proud of the bearing face of the cylinder on the casing (see Fl. 55, fig. 7). Push the piston to the base of the cylinder. Place a bush 20 mm high on the cylinder and measure the distance "d" between the face "x" of the bush and the end of the piston by means of a depth gauge. For example: "d" = 18.65 mm. The distance between the face of the piston and the bearing face of the cylinder on the cover is therefore "e" = 20 - 18.65 = 1.35 mm. In order to obtain a clearance of 0.1 to 0.3 mm between the face of the synchro and the thrust washer, the adjusting washer should have a thickness of between 1.35 - 0.1 = 1.25 and 1.35- 0.3 = 1.05 mm. Select from the adjusting washers sold by our Spare Parts Department, a washer of the appropriate thickness. In the example a suitable washer would be 1.1 mm thick	Depth gauge
	c) To adjust the 1st speed cylinder. Put the gearbox in the neutral position. Engage the 2nd speed as far as possible by pushing on the shaft (77). Proceed as mentioned in paragraph 'b', the clearance obtained between the synchro and the reverse pinion should be between 0.30 and 0.65 mm.	
	d) Fit on each cylinder the washers determined above.	
	e) Put the gearbox in the neutral position. Engage 3rd speed as far as possible by pushing on the shaft (61). Carry out the same procedure for the 4th speed. Put the washers thus determined on the 4th speed cylinder. Check that the other gears work normally by pushing successively on the shafts.	
39	Remove the cover plate	14 mm box spanner
40	Fit the spring cups (compressor 1798-T, see Pl. 56, fig. 1)	Compressor 1798-T

TOOLS

41 *On cars produced before January 1957.* put on the mainshaft (22), the circlip, the distance piece and the oil seals in the bearings.

42 *On cars produced since January 1957.* fit the distance tube (15).

a) Measure the distance "a" between the joint face on the gearbox of the clutch bellhousing and the rear end of the distance tube (is).

b) Measure the distance "a" between the joint face on the clutch bellhousing of the gearbox and the bearing face of the oil seal (13) on the hub of the thrust race support (74).

c) Take the difference between the two above dimensions and select from those sold by our Spare Parts Department a shim (14) of appropriate thickness in order to bring this difference to $16.2 \begin{smallmatrix} +1 \\ 0 \end{smallmatrix}$ mm. Fit the oil seal (13).

43 <u>To fit and adjust the differential</u> (see Pl. 59 and Pl. 60)

a) Put the crown wheel and differential housing assembly, together with its bearings in the clutch bellhousing. Connect the clutch bellhousing to the gearbox. Smear the face of the joint with Hermetic *fluid* or linseed oil. Tighten the screws and nuts.

b) To fit the differential shaft and bearing housing, right-hand 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.

Offer up the shaft and bearing housing assembly, insert a paper joint.

Tighten the screws (3) fixing the bearing on the box. Make sure that the crown wheel is not binding on the bevel pinion.

c) Remove the gearbox from the stand and let it rest vertically on the clutch bellhousing face.

d) Put the dial gauge support 1766-T, together with the dial gauge 2437-T, fitted with the extension 2438-T on the left-hand housing (see Pl. 60, 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 (91).
Hold the fixture by hand. Set the dial at "0" and mark the position of the needles . . . . . Support 1766-T
Dial gauge 2437-T
Extension 2438-T

e) To fit the fixture on the gearbox (see Pl. 60, 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.

Fix 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 paragraph "d". Release the spindle of the dial gauge slowly and count the turns and fractions of turns.

For example : a distance of 8.20 mm.

TOOLS

f) To measure the clearance between the teeth.

Fit the dial gauge support on the box (see Pl. 59, fig. 2). Fit the extension 2439-T on the dial gauge. Then fix the dial gauge on to the support 2039-T. The point of the extension resting perpendicular to the flank of a tooth on 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 four teeth spaced at 90° approximately. Take the average of these four 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 (4 and 5) 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.

In order to obtain the bearing clearance, the total thickness of the washers and distance pieces determined in paragraph “e” should be 8.20 mm.

The thickness of the shims fitted on the left side should be :

$$8.20 - 0.76 = 7.44 \text{ mm.}$$

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 (4) of 3.15 mm and a distance piece (5) of 4.10 mm.

On the left side : 7.44 mm, an adjusting washer (4) of 3.35 mm and a distance piece (5) 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

43 To prepare the left-hand bearing housing assembly (see paragraph 27).

44 <u>To prepare the shaft and bearing assembly</u> (see Pl. 54, fig. 1).

Put the adjusting washers (4) and the distance piece (5) 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 (92) is in position. Put the large diameter washer (93) between the bracket and the housing and the washer (94), under the head of the screw.
Tighten the screws fixing the housing. Check the clearance between the teeth as indicated in the preceding paragraph. Screw up, without tightening the screws (1) fixing the brackets. Fit on the bracket arms (2), the support fixture 1799-T (see Pl. 51), tighten the screws fixing the fixture. Tighten the screws (1) fixing the brackets on the box. Remove the support fixture. The object of this operation is to line up the brackets (2) Support fixture 1799-T

		TOOLS
45	To fit the cover plate on the box. Insert a paper joint stuck with grease on the cover plate. Fit the centring screws. Put the expanding washers in position, using Hermetic. Fit the other screws. Fit the pipe assembly bracket and the silentbloc bracket. Tighten the screws	14 mm box spanner
46	<u>To fit the rear pipe assembly</u> (see Pl. 55) :	
	a) <u>To determine the number of shims fitted on the outer cylinders</u>.	
	1. *(Cars produced before March 1957* see fig. 6).	
	Put the 4th speed cylinder together with its adjusting shims (59), on the edge of a surface plate. Using a depth gauge, check the dimension "r" (see fig. 8). Carry out the same operation to check each of the outer cylinders, for these cylinders, a dimension 's". The difference of the height is : r – s = t. This last dimension "t" is reduced by the thickness of the retaining plates (each retaining plate is 0.3 mm thick), in order to obtain the thickness of the shims placed on the cylinder.	
	NOTE - In the case where "t" = 0.3 mm, replace the shim by a retaining plate.	
	2. *(Cars produced since March 1957* see Pl. 55, fig. 3).	
	Put the 4th speed cylinder together with its adjusting shims, on the edge of a surface plate. Using a depth gauge, check the dimension "r" (see fig. 8). Carry out the same operation to check each of the outer cylinders, for these cylinders, a dimension "s". The difference of the height is : r – s = t. Select a shim from those sold by our Spare Parts Department, in order to obtain a difference of between 0 and 0.3 mm.	
	b) <u>To fit the pipe assembly and cylinders</u>.	
	1. *(Cars produced before March 1957* see Pl. 55, fig. 6). On each of the outer cylinders, fit the height adjusting shims (58) and their retaining plates (57). Fit the cylinder fixing clamp (56) (serrated washers)	12 mm box spanner
	2. *(Cars produced since March 1957* see Pl. 55, fig. 3). On each of the outer cylinders, fit the adjusting washer (99). Fit the clamp (20) and tighten the screws fixing the clamp to 12 to 14 ft/lbs (1.7 to 1.9 m.kg) equal tightening (socket 1773-T, see Pl. 64, fig. 6)	Socket 1773-T
47	Fix the pipe assembly plate to the pipe assembly bracket. Tighten the nuts (plain and spring washers)	8-10 mm ring spanners
48	Fit the front pipe assembly (see Pl. 55) Carry out the same procedure as in paragraph 46.	
49	<u>To fit the clamp on the rear pipe assembly</u> (see Pl. 55, fig. 3):	
	a) Put the rubber protectors (98) on the pipes, the slot towards the top. Position so that the dimension "u" = 15 to 20 mm as indicated on fig. 3.	
	b) Open the triple collar slightly, then put in position on the rubber protectors. Fit the tightening screw, the nut from the left side. Tighten the nut (spring washer)	8 mm box spanner

PARTICULAR POINTS

Removal.

Mark the position of the steering in its bearings and the position of the wheel in relation to the pinion before removing the steering.

Do not lose the spacer (4) and the differential bearing adjusting washer (5) (see Pl. 54).

Assembly.

If the differential housing is renewed, it is necessary to readjust the new housing (follow the instructions given in paragraph 9).

Adjust the position of the brake unit after fitting in position (see Op. DS 451-0).

Fit the steering and note the marks made when dismantling.

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

Refill the radiator, vane of the heater control open (bleed).

		TOOLS
	REMOVAL	
1	Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1). Release the pressure in all the systems. Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Stop MR-4158 Jacking bracket 2505-T
2	Remove the spare wheel, the spare wheel support, the front wings, the air deflection panel, the battery, the brake cooling duct and the wheel on the side to be worked upon	8-12-14 mm box spanners
3	Remove the steering (see Op. DS 100-1, paragraph 10).	
4	Remove the radiator and the brake unit (see Op. DS 451-1).	
5	To remove the assembly or the pivot, driveshaft and flexible coupling (bibax) :	
	a) Remove the screws fixing the sealing plate lining on the sidemember, remove the lining, ...	8 mm box spanner
	b) Disconnect the steering rod from the lever on the pivot (extractor 1964-T, and pressure pad 1968-T, see Pl. 97, fig. 2). Remove the rubber cup and the nylon cup	Extractor 1964-T Pressure pad 1968-T
	c) Disconnect the front axle arms, from the pivot (extractor and pressure pad 1864-T, see Pl. 97, fig. 3). Remove the rubber cups and the nylon cups	Extractor and pressure pad 1864-T

		TOOLS
	d) Disconnect the “bibax” from the brake disc	12 mm socket and extension
	e) Disengage the assembly of the flexible coupling, driveshaft and pivot, through the opening in the sidemember.	
6	Remove the closing panels, under the brake discs. Drain the gearbox	21 mm box spanner
7	Remove the screws fixing the gearbox support arm on the front crossmember and on the gearbox. Move the support arm towards the brake disc and remove the four screws fixing the housing to the gearbox. Disengage the assembly of the housing and brake disc from underneath the car	14 mm spanner 14 mm ring spanner 14 mm box spanner 12 mm spanner
	IMPORTANT - Do not lose the spacer (4) and the differential bearing adjusting washer (5) (see Pl. 54).	
8	Prepare the bearing face on the gearbox (see Op. DS 330-3, paragraph 19).	
	REFITTING.	
9	If the differential shaft housing is renewed, it is necessary to re-adjust. Proceed as follows	
	a) Put the dial gauge support 1766-T, together with the dial gauge 2437-T, fitted with the extension 2438-T, as shown on Pl. 60, fig. 2, on the old housing. Set the dial at “0” and note the position of the totalising needle. For example : between 1 and 2	Support 1766-T Dial gauge 2437-T Extension 2438-T
	b) Put the support 1766-T on the new differential shaft housing and note the position of the needles. For example totalising needle between I and 2 and large needle at 16. The new housing being shorter than the old one by 0.16 mm. When assembling, it is necessary to increase the thickness of the assembly of the distance piece (4) and the adjusting washer (5) (see Pl. 60, fig. 1), by 0.16 mm, in order to retain the adjustment of the differential bearings.	
	c) If the new housing is longer than the old housing (large needle at 90, for example), it is necessary to reduce the thickness of the bearing adjusting washer and distance piece assembly (by 0.10 mm in the example selected).	
	NOTE - This setting can also be obtained by using a straight edge MR-3377 (see Pl. 56, fig. 2) fitted with a dial gauge 2437-T and an extension 2438-T, or using a depth gauge fitted with a straight edge	or straight edge MR- 3377 Dial gauge 2437-T Extension 2438-T or Depth gauge and straight edge.
10	Prepare the bearing face on the gearbox (see Op. DS 330-3, paragraph 27).	

		TOOLS
11	Put the distance piece (4) and the differential bearing adjusting washer (5) in position (see Pl. 54). Offer up the bearing housing assembly (the oil drain channel positioned towards the bottom), insert a paper joint stuck with grease on the housing. Tighten the four screws fixing the housing to the gearbox	12 mm spanner
12	Fit, without tightening, the screws fixing the support arm on the gearbox (special flat washers under the heads). Tighten the screws fixing the support arm on the front crossmember, turn over the lockwashers. Tighten the screws fixing the support arm on the gearbox	14 mm box spanner 14 mm spanner 14 mm ring spanner
13	<u>To fit the assembly of the pivot, driveshaft and flexible coupling (bibax)</u> :	
	a) Couple up the flexible coupling to the brake disc. Make sure that the dowels of the brake disc are in position in the dowel holes in the flexible coupling "bibax" and tighten the fixing screws	12 mm socket and extension
	b) Thoroughly degrease the tapers of the front axle arms and the pivot ball joints. Couple up the axle arm to the pivot ball joint, inserting the nylon and rubber cups. Tighten the nuts and fit split pins	26 mm box spanner
	c) Degrease the tapers of the steering rod and of the pivot lever ball joint. Connect the rod to the lever, inserting the nylon and rubber cups. Tighten the nuts and fit split pins	21 mm box spanner
	d) Put the sealing linings in position on the sidemember. Tighten the fixing screws (plain and spring washers under the heads)	8 mm box spanner
14	Fit the closing panels under the brake disc. Refill the gearbox with 3 ½ pints (2 litres) SAE 90 EP oil.	
15	Fit the brake unit and the radiator (see Op. DS 451-1).	
16	Fit the steering (see Op. DS 100-1, paragraphs 43 and 45).	
17	Bleed the front brakes (see Op. DS 453-0) and put the systems under pressure.	
18	Fit the brake cooling duct and the wheel on the side which the work has been carried out. Fit the air deflection panel, the front wings, the spare wheel support, the spare wheel and the battery	8-12-14 mm box spanners
19	Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Refill the radiator, the vane of the heater control open. Bleed the system. Make sure that the flexible heater pipe of the carburettor is warm.	

PARTICULAR POINTS.

Removal.

3 *Mark the position of the steering in its bearings and the position of the steering wheel in relation to the pinion, before removing the steering.*

4 *When removing the engine-gearbox assembly front crossmember support, do not lose the adjusting shims fitted between the crossmember and the side-members.*

8 *Commence removing the cover vertically and remove the 3rd and 4th speed selector fork thrust pads in order to avoid dropping them downwards.*

Refitting.

10 *Assemble the cover. Do not fit the fork return spring thrust cups.*

12 To adjust the 4th speed cylinder.

(a)~ Engage the 3rd speed as far as possible and hold the shaft in this position.

(b) Hold the rear pipe assembly in position (without the adjusting washers) and measure the clearance between the cylinder and the cover (feeler gauges).

(c) Reduce the clearance obtained to 0.1 to 0.3 mm.

13 To adjust the 3rd speed cylinder.

Proceed as indicated in paragraph 12 above, by engaging the 4th speed as far as possible.

14 To adjust the 1st speed cylinder.

Proceed as indicated in paragraph 12 above, by engaging the 2nd speed as far as possible, then reduce the clearance obtained at "b" to 0.30 to 0.65 mm.

16 *Adjust the clamps fixing the pipe assembly (see Op. DS 334-0) and fit the fork return spring cups.*

20 *Connect the front pipe assembly clamp. On cars produced since March 1957, screw the studs on the rear pipe assembly flange before fitting the feed pipe assembly flange (5 pipes).*

23 To fit the front crossmember support.

Fit the shims found when dismantling, between the crossmember and sidemembers.

25 *Adjust the front brake connecting cable (see Op. DS 454-0).*

26 For the steering.

Note the marks made when dismantling.

29 *Refill the radiator, vane of the heater open. Bleed.*

30 *Bleed the system controlling the gears (see Op. DS 334-0).*

		TOOLS
	REMOVAL.	
1	Hold the bonnet open (stop MR-4158, see Pl. 16, fig. 1). Remove the spare wheel, the spare wheel support, the front wings, the air deflection panel and the battery tray. Release the pressure in the hydraulic systems	Stop MR-4158 8-12-14 mm spanners 8-12-14 mm box spanners
2	Drain the radiator, retain the water which contains anti-freeze. Remove the radiator (see Op. DS 232-1).	
3	Remove the steering (see Op. DS 100-1, paragraph 10).	
4	<u>To remove the front crossmember support</u> :	
	a) Support the engine-gearbox assembly by means of a sheathed chain sling, passed around the water pump cover (chain sling and stand 1797-T (or lifting tackle), see Pl. 51)	Chain sling 1697-T Stand 1797-T
	b) Remove the clamp fixing the expansion chamber and its support	12-14 mm box spanners
	c) Remove the lower adjusting nuts of the brake unit front support tie-rods	21 mm spanner 21 mm box spanner
	d) Remove the screws fixing the crossmember (lower part) on the gearbox support arms	14 mm box spanner
	e) Remove the screws fixing the crossmember (upper part) on the sidemember. Disengage the crossmember, retain the adjusting shims fitted between the crossmember and the sidemember	14 mm box spanner
5	Remove the front brake connecting cable.	
6	Remove the connecting pipe between the high pressure pump and pressure regulator (spanner 2222-T, see Pl. 71, fig. 4 or 14 mm spanner)	Spanner 2222-T or 14 mm spanner
7	Disconnect the pipe assembly (5 pipes) controlling the gears, from the gearbox cover	8 or 10 mm box spanners
8	To remove the gearbox cover. Commence by lifting the cover vertically, from the gearbox. Remove the 3rd and 4th speed selector fork thrust pads in order to avoid dropping them downwards. Remove the cover, together with the control pipe assembly	14 mm box spanner
9	Dismantle the cover (see Op. DS 330-3, paragraph 20).	
	ASSEMBLY	
10	<u>To fit the selector forks on the gearbox cover</u> (see Pl. 55) :	
	a) Engage the 1st and 2nd speed shaft (77) through the rear of the cover, fit the return springs without the cups then fit the selector fork (78) (spring compressor 1798-T, see Pl. 56, fig. 1). Fit the locking plungers (66)	Spring compressor 1798T
	b) Fit the reverse selector shaft (79), its return spring and the selector fork (80)	

		TOOLS
	c) Insert the 3rd and 4th speed selector shaft (61) and its return spring. Fit the locking plungers (66), the rocker (63) and the 3rd and 4th speed selector fork (64).	
	d) Tighten the locking screws on the selector forks. Lock the screws with an iron wire so as to prevent any rotation in the direction of unscrewing	9 mm spanner
11	<u>To fit the cover on the gearbox</u> :	
	a) Make sure that the selector fork shafts and the sliding pinions are in the neutral position.	
	b) With grease, stick the paper cover joint on the cover. Also stick the 3rd and 4th speed selector fork thrust pads in position, with grease.	
	c) Put the cover in position on the gearbox. Make sure that the selector forks are correctly positioned in the groove of the sliding pinions and that the 1st speed control lever is engaged in the 1st and 2nd speed selector fork.	
	d) Fix the cover on the gearbox with the two centring screws, then with the other screws and studs.	
12	<u>To adjust the 4th speed control cylinder</u> (see Pl. 52):	
	a) With the help of an assistant, bring the base of the 3rd speed synchro (90) as far as possible into contact with the thrust washers of the pinion, by pushing the selector shaft (61) and holding the shaft in this position. Put the rear pipe assembly in position (do not fit the adjusting washers between the 4th speed control cylinder and the joint face on the gearbox cover.	
	b) Hold the pipe assembly and, with a set of feeler gauges, measure the clearance (at several points) between the control cylinder and the gearbox cover, for example : 1.35 mm.	
	In order to obtain a clearance of 0.1 to 0.3 mm between the face of the synchro and the thrust washer, it is necessary to fit an adjusting washer with a thickness of between	
	$1.35 - 0.3 = 1.05$ mm and $1.35 - 0.1 = 1.25$ mm.	
	c) Select from the adjusting washers sold by our Spare Parts Department, a washer of the appropriate thickness. In the example: a suitable washer would be 1.1 mm.	
13	<u>To adjust the 3rd speed control cylinder</u> :	
	Proceed as in paragraph 12 above, after having engaged the 4th speed as far as possible (push the shaft (61) towards the front).	
14	<u>To adjust the 1st speed control cylinder</u> (see Pl. 55).	
	Put the 3rd and 4th speed shaft in the neutral position. Engage the 2nd speed as far as possible by pushing on the shaft (77). Proceed as mentioned in paragraph 12 above. The clearance obtained between the synchro and the reverse pinion should be between 0.30 and 0.65 mm.	
15	Remove the cover, fitted with the pipe assembly from the gearbox	14 mm hex spanner
16	Adjust the clamps fixing the pipe assembly (see Op. DS 334-0) and fit the clamp fixing screws (socket 1773-T, see Pl. 64, fig. 6)	Socket 1773-T

		TOOLS
17	Fit the fork return spring cups (compressor 1798-T, see Pl. 56, fig. 1)	Spring compressor 1798-T
18	Fit the cover on the gearbox (see paragraph 11, this operation).	
19	Fit the gearbox end thrust block fitted with its bracket and fit the pipe assembly bracket on the gearbox cover (plain and spring washers under the nuts)	14 mm box spanner
20	Put the pipe assembly flanges in position, inserting seal plates. Tighten the fixing screws and nuts (plain and spring washers).	
	NOTE - On cars produced since March 1957, tighten the studs on the rear pipe assembly flange before fitting the feed pipe assembly flange (5 pipes)	8-10 mm box spanners
21	Fit the connecting pipe between the high pressure pump and the pressure regulator (spanner 2222-T, see Pl. 72, fig. 4 or 14 mm spanner)	Spanner 2222-T or 14 mm spanner
22	Fit the front brake connecting cable. Put the sheath stop in position	12 mm spanner 12 mm box spanner
23	<u>To fit the front crossmember</u> :	
	a) Offer up the crossmember on the gearbox brackets. Engage the front adjusting rods in the yokes on the brake units and fit the lower nuts on the rods.	
	b) Fix the crossmember (lower part) on the gearbox brackets. Tighten the screws and turn over the lockplates.	
	c) Lower the engine-gearbox assembly until the upper part of the crossmember rests on the sidemember.	
	Fit the shims found when dismantling, between the crossmember and sidemember. Tighten the fixing screws (plain and spring washers under the heads)	14 mm box spanner
24	Fit and tighten the lower nuts of the brake unit front adjusting rods	21 mm spanner 21 mm box spanner
25	Adjust the front brake connecting cable (see Op. DS 454-0).	
26	Fit the steering (see Op. DS 100-1, paragraphs 43 to 45).	
27	Fit the radiator and the expansion chamber bracket (see Op. DS 232-I). Fit the clip fixing the expansion chamber on the bracket	12-14 mm box spanners
28	Fit the air deflection panel, the front wings, the spare wheel Support and the spare wheel. Fit the battery tray and the battery	12 mm box spanner
29	Refill the radiator, the vane of the heater control open. Bleed the water system.	
30	Bleed the system controlling the gears (see Op. DS 334-0).	

PARTICULAR POINTS

Assembly.

5 *(a) Remove the pistons from the cylinders with compressed air.*
(c) It is permissible to lightly clean the pistons with No. 600 abrasive paper moistened with alcohol.
(d) Fit the seals (mandrels MR-3676-120 and 130, see Pl. 64, fig. 4 and 5).

6 *Calibrate the fork return springs..*
Length 68 mm under a load of 24.5 to 26 kg.

8 To adjust the pipe assembly controlling the gears :
(a) If a pipe assembly is replaced, see Op. DS 334-0.
(b) If the cover is replaced, see Op. DS 33 I-I.

	DISMANTLING (see Pl. 55).	TOOLS
1	To remove the cylinders controlling the selector forks :	
	a) Cars produced before March l957 see fig. 2 and 6).	
	Remove the fixing clamps (56). Remove the clips (57) and the adjusting shims (58). Remove the cylinder and pipe assembly. Remove the cylinder adjusting shims (59)	12 mm box spanner
	b) Cars produced since March 1957(see fig. 1).	
	Remove the cylinder clamp plate (20) (socket 1773-T, see Pl. 64, fig. 6). Remove the clamp plate adjusting shims (99). Remove the cylinder and pipe assembly. Remove the cylinder adjusting shims (59)	Socket 1773-T
2	Remove the selector fork fixing screws. Check that all the shafts are in the neutral position	9 mm spanner
3	Remove the cup (60) from the 4th speed selector shaft (61) (spring compressor 1798-T, see Pl. 56, fig. 1). Slide the shaft towards the front until the front cup (62) is on the small diameter of the shaft, zone “a’. Fit the spring compressor as shown on Pl. 56, the nose pieces engaged between the two end coils of the spring. Compress the spring. Remove the cup (62), the shaft (61), the rocker (63), the spring, the selector fork (64) and its thrust pad. Carry out the same operation for the other selector shafts	Spring compressor 1793-T
4	Remove the expanding washers (65) and remove the locking plungers (66).	

		TOOLS
	ASSEMBLY (see Pl. 55).	
	NOTE - Except for the replacement of seals (which is an obligatory procedure) no work can be carried out on the control cylinders, except for cleaning in alcohol.	
5	<u>To replace the seals for the control pistons</u> :	
	a) Mark each piston and corresponding cylinder. The pistons can easily be removed with compressed air (put the cylinders in a clean rag in order to prevent the pistons being thrown out).	
	b) Remove the seals from the cylinders, using a small brass wire hook.	
	c) Clean the cylinders and pistons by immersing them in *clean* alcohol. Blow with compressed air. In the case of a few scratches on the piston a light rubbing with No. 600 abrasive paper moistened with alcohol is permitted.	
	d) Place successively in each cylinder a mandrel (mandrel MR-3676- 120 and MR-3676-130, see Pl. 64, fig. 4). Offer up the seal, smeared with hydraulic fluid and put it in position in the groove of the cylinder by means of a reversed piston (see Pl. 64, fig. 5). Remove the mandrel by means of a 6 dia. 100 pitch screw	Mandrel MR-3676-120 and MR-3676-130
	e) Oil the cylinders and pistons with hydraulic fluid. Push the pistons as far as possible into their corresponding cylinders.	
6	To check the selector fork return springs : Under a load of 24.5 to 26 kg, the length should be 68 mm (fixture for calibrating springs 2420-T, see Pl. 6). .	Fixture for calibration 2420-T
7	<u>To fit the selector forks</u> :	
	a) Fit the 1st and 2nd speed selector shaft (77) through the rear of the cover. Fit the return spring without the cup, then the selector fork (78) (spring compressor 1798-T, see Pl. 56, fig. 1). Insert the selector shaft locking plunger (66)	Spring compressor 1798-T
	b) Fit the reverse selector shaft (79), its return spring and the selector fork (80).	
	c) Insert the 3rd and 4th speed selector shaft (61) and its return spring. Fit the selector shaft locking plunger (66), the rocker (63) and the selector fork (64).	
	d) Tighten the fork locking screws and lock the screws with iron wire fitted so as to prevent any rotation in the direction of unscrewing	9 mm spanner
8	<u>To adjust the pipe assembly controlling the gears</u> : a) In the case of the pipe assembly being renewed, proceed as indicated in Op. DS 334-0. b) If the cover of the gearbox is renewed, proceed as indicated in Op. DS 331-1.	
9	Fit the cups for the selector shaft return springs (spring compressor 1798-T, see Pl. 56, fig. I).	

PARTICULAR POINTS

Important remark.

Before carrying out any work on the gearbox or its controls, check the following adjustments:

(a)The adjustment of the slow running, of the clutch clearance, clutch drag, and clutch engagement control.
(b) The setting of the hydraulic gear selector.
(c) If it is not possible to engage 2nd gear by passing from 1st to 2nd gear, check the assembly of the gear lever washers.
(d) Check the distribution of the pressure by observing the operation of the clutch fork (car raised at the front). If not proceed to check the following:

To check the pressure (test bench 2290-T).

Insert the pipe assembly (P) or (P1) between the feed pipe assembly (5 pipes) and the front pipe assembly of the gearbox. Fit the pipe (W) successively in each of the openings of the pipe assembly (P) or (P1), the other openings being closed, the other end of the pipe (W) connected to the pressure gauge (M^2) or (M') using the pipes (A).
Operate the gear lever successively through each gear. One should read a pressure between 1,920 p.s.i. and 2,490 p.s.i. (135 to 170 kg/cm^2) The needle will pause for a short period at 570 p.s.i. (40 kg 'cm^2) (on the synchronised gears). If not, check the hydraulic gear selector.

To check the hydraulic gear selector (test bench 2290-T).

Connect the pipe assembly (P or P1) to the feed pipe assembly (5 pipes) and blank off the pipe assembly (P or P1) using the blank flange (D).
Proceed as indicated above. One should read a pressure between 1,920 p.s.i. and 2,490 p.s.i. (135 to 170 kg/cm^2). The needle will pause for a short period at 570 p.s.i. (40 kg/cm^2) (on synchronised gears).

To check the sealing of the cylinders controlling the gears (test bench 2290-T).

Insert the pipe assembly (P) or (P1) between the feed pipe assembly (5 pipes) and the front pipe assembly of the gearbox. Fit the pipe (B) successively on each of the openings of the pipe assembly (P) or (P1), the other openings being closed, the end of the pipe (B) connected to the test bench pump.
Build up the pressure to 2,490 p.s.i. (170 kg/cm^2). There should be no drop in pressure.

To check the operation of the gears (test bench 2290-T, assembled as in the above paragraph).

Engine stopped, one wheel raised, declutch (hand control). Pass successively through each gear.
Operate the pump and turn the wheel by hand. Read the pressure at the precise moment that the wheel stops turning, this pressure should be less than 1,920 p.s.i. (135 kg/cm^2).
If not, check the pipe assembly, the synchro and the gearbox cover.

To adjust the pipe assemblies controlling the gears (Replacement of a pipe assembly).

20 *Check the position of the piston in relation to the bearing face of the cylinder, using a depth gauge placed on one washer (distance "d", see Pl. 55, fig. 7).*
21 *Check the same measurement on the corresponding cylinder of the new pipe assembly.*
22 *Modify the thickness of the shims in order to keep the same setting.*
23 *Carry out the same operations on each cylinder of the old and new pipe assemblies.*

To adjust the clamps fixing the pipe assemblies.

25 *When the cylinders are in position with their adjusting washers, the flange should rest on the cylinders to within 03 mm precisely.*

To adjust the pipe assembly controlling the gears (replacement of the cover).

In order to carry out this operation, the selector fork return spring thrust cups should not be fitted.

30 To adjust the 4th speed cylinder.

(a)Engage the 3rd speed as far as possible and retain it in this position.
(b)Hold the pipe assembly in position (without the adjusting washers) and measure the clearance between the cylinder and the cover. Reduce this clearance by 0.1 to 0.3 mm, in order to obtain the thickness of the adjusting washers.

31 To adjust the 3rd speed cylinder.

Proceed as indicated above, after having engaged the 4th speed.

32 To adjust the 1st speed cylinder.

Proceed as indicated in paragraph 30, above, by reducing the clearance by 030 to 065 mm in order to obtain the thickness of the adjusting washers.

34 *Do not forget to fit the selector fork return spring thrust cups.*

To bleed the hydraulic gear selector.

With the parking brake on, engine running, make successive movements through all gears and operate the auxiliary clutch lever (gear lever in the neutral position).
Carry out this procedure for about ten minutes.

TOOLS

ADJUSTMENT OF THE AUXILIARY CLUTCH CONTROL LEVER ROD (see Pl. 67).

1 Remove the cover from the dashboard. Remove the fixing screws (left side) and disengage the three anchor plates. Do not break these plates.

2 Make sure that the front end of the control rod (12) is in position in the hole of the valve on the hydraulic gear selector.

3 Unscrew the screw (6) locking the rod (12) in the trunnion (13). Push the rod (12) as far as it will go towards the hydraulic gear selector, the lever (14) pulled towards the driver and tighten the screw (6) locking the rod (12).

PRELIMINARY CHECKS

TOOLS

In the case of difficulty in operating the gears, before removing the gearbox or the hydraulic gear selector, one should carry out the following checks :

a) Make sure that the following adjustments are correct :-

Adjust the slow running (see Op. DS 142-0).

Adjust the clutch clearance (see Op. DS 314-0, paragraphs 20 to 23).

Adjust the clutch drag (see Op. US 314-0, paragraphs 18 and 19).

Adjust the clutch engagement control (see Op. DS 314-0, paragraphs 24 to 26).

b) Make sure that the hydraulic gear selector and the gear lever are correctly set (see Op. DS 334-1, paragraph 2).

c) If the 2nd gear will not engage (by moving from 1st to 2nd gear) and if 2nd gear jumps out by pressing lightly on the lever towards the 1st gear position, it is necessary to check the gear lever (play on the rivets assembling the washers forming the selector gate).

d) Make sure that the distribution of the pressure is correct for each gear.

Raise the front of the car, engine running at accelerated idling. Engage 1st gear and observe the movement of the clutch fork, it should move slowly towards the rear (engaged position). Proceed in the same manner for the four other gears.

If the fork remains in the declutched position, it is necessary to carry out the following checks :

CHECKING THE PRESSURE (see Pl. 73).

In order to carry out this operation, use the test bench 2290-T.

Raise the car with a jack.

Remove the air deflection panel. Disconnect the pipe assembly (30) between the gearbox and the hydraulic gear selector, from the front and rear pipe assemblies of the gearbox.

4 Insert the pipe assembly (P) or (P1) between the flange of the pipe assembly (30) and the flange of the gearbox front pipe assembly. Connect the assembly on the flange of the gearbox rear pipe assembly by means of the screw (U).

Insert a seal plate between each flange.

Close four of the openings of the pipe assembly (P) or (P1) by means of the plugs (V).

Connect the restricted flowpipe (W) on the fifth opening of the pipe assembly (P).

Connect the other end of the restricted flowpipe (W) to the pressure gauge (M2) or (M3) using the pipe assembly (A). — Test bench 2290-T

Start the engine and engage the gear corresponding to that to which the connection is made (on each union of the pipe assembly (P) or (P1) the number of the corresponding gear is engraved).

5 The pressure gauge should indicate a pressure between 1920 p.s.i. and 2490 p.s.i. (135 to 170 kg/cm^2), the needle will pause for a short period at 570 p.s.i. (40 kg/cm^2) on synchronised gears : (2nd, 3rd and 4th gears). The gear selector lever being shifted to one of the other synchronised gears, the pressure will drop to zero. Repeat the operation for the other gears.

TOOLS

REMARK - Before each alteration to the pipe, make sure that the gear lever is in the neutral position.

If for one or several gears, the pressure indicated is not obtained, check the functioning of the hydraulic gear selector (see paragraphs 6 and onwards, this operation).

CHECKING A HYDRAULIC GEAR SELECTOR

This check can only be carried out when the gear selector is fitted to the car (see Pl. 74).

6 Disconnect the pipe assembly (25) connecting the gearbox to the selector unit from the front and rear gearbox pipe assemblies (26) and (27).

7 Connect the pipe assembly (P) or (P1) to the flange of the pipe assembly (25). Using the blank flange (D) insert a seal plate and blank off the outer face of the flange of the pipe assembly (P) or (P1).

8 Fit the end of the restricted flowpipe (W) to one of the holes of the pipe assembly (P) or (P1) and close the four other holes with the plugs (V).

9 Connect the other end of the restricted flowpipe (W) to the pressure gauge (M3). Use the two pipes (A) connected together (the pressure gauge (M2) can be used).

10 Start the engine and move the gear lever to the gear corresponding to that to which the connection is made (on each union the number of the corresponding gear is engraved).

11 The needle of the pressure gauge (M3) should indicate a pressure of between 1920 p.s.i. and 2490 p.s.i. (135 and 175 kg/cm^2) (on the synchronised gears, the needle will pause for a short period at 750 p.s.i. (40 kg/cm^2). The gear selector lever being moved to another synchronised gear, the pressure should drop to zero.

12 Repeat the operation on the four other holes of the pipe assembly.

IMPORTANT - Put the gear selector lever in the neutral position, before disconnecting the pressure gauge.

CHECKING FOR LEAKAGE FROM THE GEAR CONTROL CYLINDERS (see Pl. 75).

13 Remove the pipe (W). Prepare the test bench as indicated on Pl. 172.

Replace the pipe (A) by the pipe (B) and connect it to one of the unions of the pipe assembly (P) or (P1).

Disconnect the pipe assembly (30) and seal the outer face of the flange of the pipe assembly (P) or (P1) using the blank flange (D).

Insert a seal plate.

TOOLS

14 Tighten the bleed screw (b). Operate the pump in order to build up the pressure to 2490 p.s.i. (170 kg/cm^2). Check the pressure gauge which should not show a drop in pressure.
Release the pressure by unscrewing the bleed screw (b) on the test bench.

15 Repeat the operation on the four other unions of the pipe assembly (P) or (P1).
If there is a drop in pressure, the joint of the cylinder being tested is defective and it will be necessary to replace it or to replace the pipe assembly.

CHECKING THE GEAR OPERATION (see Pl. 75).

16 With the engine stopped, put one front wheel on the ground (the other being already raised). Engage the clutch by using the auxiliary clutch control.
The test pipe (B) being connected to one of the unions of the test pipe assembly (P) or (P1), tighten the bleed screw (b) and operate the pump.
During this period, have the wheel turned by hand by an assistant. When the wheel can no longer be turned, the gear is engaged. At this moment, read the pressure indicated by the pressure gauge. This pressure should be less than 711 p.s.i. (50 kg/cm^2).
Release the pressure by unscrewing the bleed screw (b).

17 Carry out the operation successively on the four other unions of the pipe assembly (P) or (P1).

REMARK - If on one of the gears of the gearbox, the speed does not change for a pressure less than 711 p. s. i. (50 kg/cm^2), it may be caused by pipe assembly stoppage, defective gearbox cover or a defective synchromesh.

18 Release the pressure by unscrewing the bleed screw (b).
Remove the pipe assemblies (A) and (B).
Remove the blank flange (D), disengage the pipe assemblies (P) or (P1).
Connect the pipe assembly (30) to the front and rear pipe assemblies.
Insert the seal plates.
Fit the air deflection panel.
Put the auxiliary clutch control in the “running” position.

TO ADJUST THE PIPE ASSEMBLY CONTROLLING THE GEARS (in the case of a replacement pipe assembly (see Pl. 55).

<u>To adjust the pipe assembly of the front cylinders</u>.

19 Push the piston to the bottom of the cylinders on the pipe assembly removed and on the new pipe assembly.

20 On the 3rd speed cylinder, check the position of the piston in relation to the bearing face of the cylinder on the cover (see fig. 7). To do this : place a bush about 20 mm long on the cylinder, using a depth gauge, measure the dimension “d” between the face “x” of the bush and the end of the piston, for example : “d” = 15. 5 mm

Bush:
Internal dia. = 16 mm
External dia. = 22 mm
Length 20 mm

TOOLS

21 Carry out the same procedure on the corresponding cylinder of the new pipe assembly. For this, the dimension "d" = 15.8 mm.

22 In the example, in order to keep the same selector fork adjustment, it is necessary to reduce the thickness of the shims (59) between the cylinder and the cover by : d' – d = 15.8 – 15.5 = 0.3 mm.

If the dimension "d" measured on the new pipe assembly is smaller than the dimension "d" measured on the old pipe assembly, it is necessary, on the contrary to increase the thickness of the shims by a thickness equal to the difference measured (d-d').

23 Carry out the same operations on the 1st speed cylinder of each of the pipe assemblies.

<u>To adjust the clamp fixing the front pipe assemblies</u>.

24 Fit the shims (59) determined in paragraph 22 on the cylinders.

25 *(Cars produced before March 1957.)* To determine the number of shims (58) to be fitted on the 1st speed cylinder.

a) Put the 3rd speed cylinder together with its adjusting shims (59) on the edge of a surface plate. By means of a depth gauge, take the dimension "r" (see fig. 8). Carry out the same operation on the 1st speed cylinder to obtain a dimension "s".

b) The difference of the height is: r - s = t. Subtract from the dimension "t", the thickness of the plates (57) (each plate is 0.3 mm thick) to obtain the thickness of the shims (58) to be placed on the 1st speed cylinder (tolerance = 0.3 mm).

26 *(Cars produced since March 1957.)* To determine the number of shims (99) to be fitted between the clamps (20) and on the cylinders.

As indicated in paragraph 25 above, measure the dimension "r'" and "s'" (see fig. 3), in order to obtain the difference of the height "t'". Select from the adjusting washers sold by our Spare Parts Department, a washer which will bring this difference to a maximum of 0.3 mm.

<u>To adjust the cylinders of the rear pipe assembly</u>.

27 Only the central cylinder is adjustable (4th speed). Proceed as indicated in paragraph 22, this operation.

<u>To adjust the clamp fixing the rear pipe assembly</u>.

28 *(Cars produced before March 1957.)* (see fig. 8).

a) Put the 4th speed cylinder, together with the adjusting shims determined in paragraph 27 above, on the edge of a surface plate. With a depth gauge, measure the dimension "r". Carry out the same operation successively on each of the outside cylinders, in order to obtain a dimension "s".

b) The difference in height is : r – s = t. Subtract from the measurement "t", the thickness of the plates (57) (each plate is 0.3 mm thick), in order to obtain the thickness of the shims (58) to be placed on the outside cylinder being measured (tolerance = 0.3 mm).

c) Carry out the same operation on the other outside cylinder.

TOOLS

(Cars produced since March 1957.) (see fig. 3).

29 As indicated in paragraph 28, measure the dimensions "r'" and "s'" in order to obtain the difference of the height: Select from the adjusting washers sold by our Spare Parts Department, a washer which will bring this difference to a maximum of 0.3 mm.

TO ADJUST THE PIPE ASSEMBLIES CONTROLLING THE GEARS (in the case of replacement of the gearbox cover (see Pl. 52 and 55).

REMARK - In order to carry out this operation, the selector fork return spring thrust cups should not be fitted.

30 To adjust the 4th speed control cylinder

a) With the help of an assistant, bring the base of the 3rd speed synchro (90) as far as possible into contact with the thrust washers of the pinion by pushing the selector shaft (61) and holding the shaft in this position. Put the rear pipe assembly in position (do not fit the adjusting washers between the 4th speed control cylinder and the joint face on the gearbox cover).

b) Hold the pipe assembly and, with a set of feeler gauges, measure the clearance (at several points) between the control cylinder and the gearbox cover, for example: 1.35 mm. In order to obtain a clearance of 0.1 to 0.3 mm between the face of the synchro and the thrust washer, it is necessary to fit an adjusting washer with a thickness between: 1.35 – 0.3 = 1.05 mm and 1.35 – 0.1 = 1.25 mm.

c) Select from the adjusting washers sold by our Spare Parts Department, a washer of the appropriate thickness. In the example : a suitable washer would be 1.1 mm.

31 To adjust the 3rd speed control cylinder.
Proceed as in paragraph 30 above, after having engaged the 4th speed as far as possible (push the shaft (61) towards the front).

32 To adjust the 1st speed control cylinder.
Put the 3rd and 4th speed shaft in the neutral position. Engage the 2nd speed as far as possible by pushing on the shaft (77). Proceed as mentioned in paragraph 30 above. The clearance obtained between the synchro and the reverse pinion should be between 0.30 and 0.65 mm.

33 Place on each of the cylinders, the washers determined in paragraphs 30, 31 and 32 and adjust the pipe assembly fixing clamps (see paragraphs 24 to 26, this operation for the front pipe assembly and paragraphs 27 to 29, this operation for the rear pipe assembly).

34 Fit the selector fork return spring cups (spring compressor 1798-T, see Pl. 56, fig. 1) . . . . . Spring compressor 1798-T

TO BLEED THE HYDRAULIC GEAR SELECTOR

35 Apply the parking brake. Put the front of the car on stands and start the engine. Pass the gear lever successively through each gear. Operate the auxiliary clutch control several times, the gear selector lever being in the neutral position. Carry out this operation for 10 to 15 minutes.

PARTICULAR POINTS

Replacement of a gear selector lever.

Removal.

1 *In order to carry out this operation it is necessary to remove the facia board.*

2 *Put the selector lever in the 1st speed position. Place the setting rod (2429- T) in the hydraulic gear selector.*

4 *Disengage the selector, leaving the auxiliary clutch control rod connected on the hydraulic gear selector.*

Refitting.

6 *Check that the gear selector lever is in the 1st speed position before connecting to the hydraulic gear selector.*

7 *Pull the auxiliary clutch control rod as far as possible towards the front and the lever pressed towards the rear, then fix the rod in the trunnion of the lever.*

Replacement of a hydraulic gear selector.

Refitting.

21-22 *Put the sliding valve in the 1st speed position, the rod (2429- T) engaged in the locating hole and offer up the hydraulic gear selector on the gear selector lever which should also be in the 1st speed position.*

26 *The hydraulic gear selector being in position, remove the locating rod.*

27 *Pull the auxiliary clutch control rod as far as possible towards the front and the lever pressed towards the rear then fix the rod in the trunnion of the lever.*

35 *Bleed the hydraulic gear selector (see Op. DS 334-0).*

36 *Adjust the slow running, the clutch clearance, the clutch drag and the clutch engagement control.*

	REPLACEMENT OF A GEAR SELECTOR LEVER	TOOLS
	Removal (see Pl. 67).	
1	To remove the dashboard : Remove the negative cable from the battery. Remove the cover from the dashboard; remove the fixing screws, right-hand side and remove the anchor plates. Remove the upper part of the glove box. Through this opening, remove the two screws fixing the facia board surround. Remove the facia board surround. Remove the screws fixing the facia surround, the nuts fixing the facia board, the earth wire, disconnect the speedometer cable, disconnect the wires and remove the facia board	8 mm spanner 12mm spanner 8 mm box spanner

		TOOLS
2	Put the change speed lever in the 1st speed position. Insert in the locating hole a rod 3.94 mm diameter (rod 2429-T, see Pl. 67, fig. 2)	Rod 2429-T
3	Remove the rubber plug from the steering tunnel and unscrew the screw (4) of the clamp (5) connecting the change speed lever rod to the sliding valve of the hydraulic gear selector. Do not unscrew the screw (3). Unscrew the trunnion screw (6) locking the auxiliary clutch control rod	8 mm box spanner
4	Remove the screw (17) fixing the change speed lever on the bracket of the steering tube. Remove the nuts (7) from the studs fixing the hydraulic gear selector to the change speed lever (spanner 2431-T, see Pl. 72, fig. 1). Disconnect the sockets from the starter switch (15). Disengage the change speed lever, leaving the auxiliary clutch control rod (12) in position on the hydraulic gear selector	12 mm box spanner Spanner 2431-T
	<u>Refitting</u> (see Pl. 67).	
5	Put the change speed lever in the 1st speed position. Put the selector in position, carefully passing the auxiliary clutch control rod (12) through the hole in the flange, then in the trunnion (13) of the auxiliary clutch control lever. Engage the change speed lever rod in the clamp (5) connecting the gear selector to the hydraulic gear selector. Put the nuts (7) in position on the fixing studs (ratchet spanner 2428-T, see Pl. 72, fig. 3) and tighten (spanner 2431-T, see Pl. 72, fig. 1). Fit and tighten the screw (17) fixing the selector on the steering tube bracket (plain and spring washers under the heads)	Spanner 2428-T Spanner 2431-T 12 mm box spanner
6	Check that the change speed lever is in the 1st speed position. Tighten the screw (4) of the clamp connecting the change speed lever rod to the sliding valve of the hydraulic gear selector. *Remove the locating rod,* plug the locating rod hole in the hydraulic gear selector and in the steering tunnel (rubber plugs)	8 mm box spanner
7	Push the rod (12) of the auxiliary clutch control as far as possible, towards the hydraulic gear selector, the lever (14) towards the driver. Lock the screw (6) of the trunnion (13). Connect the sockets to the terminals of the starter switch (15).	
8	<u>To fit the facia board</u> : a) Put the facia board in position, the centring dowels perpendicular in the rubber sockets. Connect the wires, noting the colour of the end terminals. Connect the speedometer cable. To fix the facia board : fit a plain washer on the two fixing studs and tighten the nuts moderately. Put a locknut on the right-hand stud and lock it. Put the earth wire on the other stud, fitting a shake-proof washer and tighten the nut. Fix the facia board surround and the stop for the glove box. b) Put the facia board surround in position, position the beading correctly. Fit the three fixing screws. c) Put the facia board cover in position and engage the anchor plates in their housing. Tighten the fixing screws. d) Connect the negative cable to the battery	12 mm box spanner

		TOOLS
	REPLACEMENT OF A HYDRAULIC GEAR SELECTOR	
	Removal (see Pl. 67).	
9	Remove the facia board (see paragraph 1, this operation).	
10	To release the pressure: unscrew the bleed screw on the pressure control valve (½ a turn approximately). Put the manual height control lever in the low position. On early models, without the manual height control, raise the front of the car with the wheels resting on the ground	8 mm spanner
11	Unscrew the left-hand suspension sphere. Place a cloth under the union in order to avoid spilling the fluid.	
12	Disconnect the pressure feed pipe from the pressure distribution block (2nd union (42) from the right) (see Pl. 25).	10 mm spanner
13	Disconnect the union plates from the clutch engagement control and from the hydraulic gear selector. Remove the pipe assembly from the fixing studs. Remove the seal plates (see Pl. 25)	8 or 10 mm spanner 8 or 10 mm box spanner
14	Disconnect the union plate of the gearbox pipe assembly (1) (5 pipes under the hydraulic gear selector) without bending the pipes. Remove the seal plates	8 mm ring spanner 12 flats length = 100 mm
15	Disconnect the rubber pipe (2) feeding the low pressure pump and the low pressure pipe assembly (10) from the hydraulic gear selector	8 or 10 mm box spanner
16	Remove the rubber grommet in the steering tunnel, and through the hole “a”, untighten the screw (3) in the coupling of the selector lever to the sliding valve of the hydraulic gear selector (hydraulic gear selector side). Do not untighten the screw (4) in order to avoid moving the flange (5).	
17	Disengage the speedometer cable from the steel plate on the hydraulic gear selector. On early models, it is necessary to disconnect the plate from the hydraulic gear selector	12 mm box spanner
18	Untighten the fixing screw (6) from the auxiliary clutch control rod.	
19	Remove the nuts (7) from the studs fixing the hydraulic gear selector to the selector lever assembly (spanner 2431-T, see Pl. 72, fig. 1). Disengage the hydraulic gear selector	Spanner 2431-T
	Assembly (see Pl. 67).	
20	Put the sliding valve in the 1st speed position. To do this Pull and turn the sliding valve (11) until the hole in the sliding valve corresponds with that of the rear cap on the hydraulic gear selector. Fit a rod of 3.94 mm diameter in the locating hole (rod 2429-T, see fig. 2). It should penetrate approximately 30 mm; if not, turn the sliding valve half a turn	Rod 2429-T

		TOOLS
21	Put the gear selector lever in the 1st speed position.	
22	Put the hydraulic gear selector in position and with care, pass the auxiliary clutch control rod (12) through the hole in the selector flange, then in the trunnion (13) of the auxiliary clutch control lever. Engage the sliding valve (11) of the hydraulic gear selector in the selector clamp (5).	
23	Put the nuts (7) on the fixing studs (spanner 2428-T, see Pl. 72. fig. 3). Tighten the nuts (7) (spanner 2431-T, see Pl. 72, fig. 1)	Spanner 2428-T Spanner 2431-T
24	Make sure that the lever is in the 1st speed position. Tighten the screw (3) of the clamp (5)	8 mm box spanner
25	*Withdraw the rod 2429-T, from the hydraulic gear selector*. Refit the rubber plug in the locating hole. Refit the rubber plug in the hole "a" of the steering tunnel.	
26	Push the rod (12) of the auxiliary clutch control as far as possible towards the hydraulic gear selector, the lever (14) towards the driver. Lock the screw (6) of the trunnion (13).	
27	Check that the sockets are connected to the terminals of the starter switch (15).	
28	Fit the pressure pipe to the pressure distribution block and engage the union flanges on the clutch engagement control and on the hydraulic gear selector (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Fit the seal plates (pay attention to the assembly position of the seal plates, the rubber seal rings corresponding to the fluid holes). Tighten the pipe union (42) on the pressure distribution block (see Pl. 25)	8 mm box spanner Spanner 2219-T or 2221-T
29	Connect the gearbox pipe assembly (1) to the hydraulic gear selector. Insert the seal plate after having checked that the holes are correctly positioned. These should be renewed after each removal	8 or 10 mm ring spanner
30	Connect the flange of the low pressure pipe assembly (10) to the hydraulic gear selector. Inserting the seal plate, make sure that the holes of the hydraulic gear selector correspond to the rubber joints	8 or 10 mm spanner 8 or 10 mm box spanner
31	Connect the rubber pipe (2) feeding the low pressure to the hydraulic gear selector. Insert a rubber bush and fit a clip.	
32	Put in position, the rubber grommet and the speedometer cable on the hydraulic gear selector or fit the fixing plate	12 mm box spanner
33	Refit the facia board (see paragraph 8, this operation).	

		TOOLS
34	Start the engine, let it idle for a few minutes. Tighten the bleed screw in order to put the systems under pressure. Check the joints for leakage. Change into each gear in succession in order to check the sealing of the flanges . .	8 mm spanner
35	Bleed the hydraulic gear selector (see Op. DS 334-0).	
36	Adjust the slow running (see Op. DS 142-0). Adjust the clutch clearance (see Op. DS 314-0, paragraphs 20 to 23). Adjust the clutch drag (see Op. DS 314-0, paragraphs 18 and 19). Adjust the clutch engagement control (see Op. DS 314-0, paragraphs 24 to 26).	
	REPLACEMENT OF A GEAR CHANGE SPEED CONTROL (Adjustment of Pressure)	
	Removal.	
37	Release the pressure in the system. Put the auxiliary clutch control lever in the “declutched” position. Remove the nuts fixing the flange of the feed pipe assembly from the gear change speed control. Remove the screw fixing the gear change speed control on its bracket and remove the control. Remove the seal plate	8 or 10 mm ring spanner
	Refitting.	
38	Put the gear change speed control in position, insert the seal plate. Offer up the nuts fixing the feed pipe assembly flange to the gear change speed control without tightening (spring washers). Tighten the screws fixing the gear change speed control on its bracket (plain and spring washers under the heads) and tighten the nuts fixing the feed pipe assembly flange to the gear change speed control.	8 or 10 mm ring spanner
39	Bleed the system controlling the gearbox (see Op. DS 334-0).	

PARTICULAR POINTS

To overhaul a gear selector lever assembly.

Assembly.

All the joints and moving parts should be greased (Antar Cardrex EP grease).

19 *To adjust the selector gate.*
(a) Put the gear lever and the gate in the 4th speed position. Tighten the screw fixing the gate.
(b) Make sure that the gate slides normally on all gears.
(c) Place the lever in the 1st speed position and pin the gate and the control rod.

20 *To adjust the tension in the reverse speed position.*
(a) Put the selector lever in the - 1st speed position.
(b) Bring the locking clamp against the tension spring, without clearance or pressure. Tighten the clamp.
(c) Make sure that the lever can occupy the reverse speed position.

To overhaul a gear change speed control.

Dismantling.

23 *Do not turn the adjusting screw (55) for the spring (54).*

25 *Clean the parts with alcohol only.*

Assembly.

26 *It is imperative to fit a filter (57) even if the gear change speed control was not so fitted (1st model).*

To overhaul a hydraulic gear selector.

Dismantling.

Clean the parts in alcohol only.

Assembly.

All the parts should be immersed in hydraulic fluid. Note the markings made when dismantling.

	OVERHAULING A GEAR SELECTOR LEVER ASSEMBLY	TOOLS
	Dismantling (see Pl. 68).	
	Unscrew the screw (1) and remove the clamp (2) coupling the lever control rod (3) to the sliding valve on the hydraulic gear selector	8 mm box spanner
2	To remove the auxiliary clutch control lever (10) : Unhook and remove the spring (9), remove the pin (5), the thrust washer (6), the spring (7), the thrust washer (8), remove the lever (10) and remove the washer (11).	
3	Remove the pin (12), holding the selector gate (13) in position. Unscrew the screw (14) locking the selector gate (13).	
4	Unscrew the screw (15) locking the clamp (16)	8 mm box spanner
5	Remove the pin (17), the thrust washers (18), the spring (19), the thrust washer (20), and disengage the spindle (21) of the sector (22). This spindle is screwed into the housing (23)	10 mm box spanner
6	Disengage the assembly of the lever (24), sector (22) and control rod (3). Disengage the selector gate (13), the thrust washer (25), the spring (26), the thrust washer (27) and clamp (16) of the control rod (3).	
	NOTE - Do not lose the 1st and 2nd speed locking ball and its spring.	
7	Disconnect the housing (23), from the steel support (30) : disengage the locking circlip (31), the washers (32), the spring (33), the thrust washer (34) and disengage the housing (23) from the support (30). Do not lose the ball (28) and the spring (29). Remove from the housing (23), the felt joint (35) and its cup (36), the spring (37), the felt joint (38) and its cup (39).	
8	Drive out the rivet (40) and disengage the guide tongue (41) of the selector gate (13).	
9	Using a 7.5 mm diameter drill, remove the peening at “a” of the rivet (42) retaining the starter switch (43) and remove the switch	Drill = 7.5 mm dia.
10	Remove the pin (44), the washer (45) and the spring (46). Remove the control rod (3) from the lever (24) and remove the felt washer from the yoke of the control rod (3).	
11	Clean the parts.	

		TOOLS
	Refitting (see Pl. 68).	
	NOTE - When refitting, all joints and moving parts should be greased (ANTAR Cardrex EP grease only).	
12	To connect the control rod (3) to the lever (24) a) Put the felt joint, previously soaked in engine oil, in the recess in the yoke of the control rod (3). b) Put the lever in position in the yoke of the control rod (3); fit the spring (46), a washer (45) and the pin (44). When the parts are assembled, the coils of the spring (46) should be touching or should have a lateral clearance of between 0 and 0.2 mm. If not, add a second washer (45) of a thickness suitable to obtain this clearance.	
13	Put in position and rivet the starter switch (43) on the steel support (30) (see fig. 5).	
14	Put the selector guide tongue (41) in position, the flat “b” positioned on the side facing the switch (see fig. 5).	
15	Engage the aluminium housing (23) in the steel support (30). Put the felt joint (38) (previously soaked in engine oil) in position together with its cup (39), the spring (37), the felt joint (35) (previously soaked in engine oil) and the thrust cup (36). Fit the thrust washer (34), the spring (33), the washers (32) and the circlip (31). When the parts are assembled, the coils of the spring (33) should be touching or should have a lateral clearance of between 0 and 0.2 mm. If not, modify the thickness of the washers (32) in order to obtain this clearance.	
16	Engage the control rod (3) in the housing (23). Fit the clamp (16), the thrust washer (27), the spring (26), the thrust washer (25), the selector gate (13) (the guide finger (41) engaged in the gate).	
17	Fit the spring and locking ball for the 1st and 2nd speed in the housing (23). Engage the sector (22) in the housing (23) and screw in the spindle (21). Fit the thrust washer (20), the spring (19), the washer or washers (18) and fit the pin (17). When the parts are assembled, the coils of the spring (19) should be touching or should have a lateral clearance of between 0 and 0.2 mm. If not, modify the thickness of the washers (18) in order to obtain this clearance.	10 mm box spanner
18	Put the spring (29) in position and the locking ball (28) in the housing (23).	
19	To adjust the selector gate : a) Place the lever (24) and the gate (13) in the 4th speed position (see fig. 5). Tighten the fixing screw (14). b) Make sure that the gate (13) slides the full distance on guide tongue (41). c) Put the lever (24) in the 1st speed position. Using a 2 mm diameter drill, drill through the gate (13) and the control rod (3). Fit a pin and rivet the ends (see fig. 4). (The replacement of the gate (13) necessitates the replacement of the rod (3)	Drill = 2 mm dia.

		TOOLS
20	To adjust the tension in the reverse speed position : a) Put the lever (24) in the 1st speed position (the locking ball being in position in the corresponding hole in the sector). b) Bring the clamp (16), the assembly of the washer (25), the spring (26), the thrust washer (27), the spring being practically without lateral clearance or tension. Tighten the screw (15) fixing the clamp (16) . . . . . . c) Make sure that the lever (24) can occupy the reverse speed position.	8 mm box spanner
21	To fit the auxiliary clutch control lever : Place in the following order on the spindle (4) : the thrust washer (11), the lever (10), the thrust washer (8), the spring (7), the thrust washer (6) and the pin (5). After assembly, the lever (10) should have a lateral clearance of between 0 and 0.2 mm. If not, modify the thickness of the washers (6) in order to obtain this clearance. Put in position the return spring (9) of the lever (10).	
22	Fit the double clamp (2) on the end of the control rod (3)	8 mm box spanner
	OVERHAULING A GEAR CHANGE SPEED CONTROL	
	Dismantling (see Pl. 68, fig. 6).	
23	Remove the plugs (51) and (52). Remove the piston (53) and the spring (54)	27 mm box spanner
	NOTE - It is essential not to alter the spring adjusting screw (55); otherwise the flow through the gear change speed control will be changed which will bring about fluctuations in the operation of the gears and will even cause damage to the gearbox.	
24	Remove the screw (56) from the piston. Disengage the disc restrictors (58) and (59), the distance pieces (60) and the filter (57).	
25	Clean the parts with alcohol to the exclusion of all other products. Do not use trichlorethylene.	
	Assembly (see Pl. 68, fig. 6).	
26	To prepare the piston.	
	IMPORTANT NOTE - It is imperative to fit the filter (57) even if the gear change speed control was not so fitted; note the order of assembly.	
	a) Early model gear change speed control without filter. Remove the washer with the central hole (58) and assemble the parts in the following order 1 distance piece (60). 1 filter (57). 1 distance piece (60). 1 disc with an eccentric hole (59). 1 distance piece (60). 1 disc with a central hole (58) etc.	

TOOLS

b) New model gear change speed control with flat base.

Assemble the parts in the following order

1 filter (57).
1 distance piece (60).
1 disc with a central hole (58).
1 distance piece (60).
1 disc with an eccentric hole (59) etc.

For information, there are in the gear change speed control

15 distance pieces.
8 discs with a central hole
7 discs with an eccentric hole.
Tighten the screw (56).

27 Put the spring (54) in the body of the change speed control. Put the piston (53) in position, smeared with hydraulic fluid, the screw engaged in the spring.

28 Put a ring seal (61) on each plug. Fit the plugs (the plug (52) with the slotted end should be fitted by hand; if not, the spring is out of position). Do not reverse the plugs (51) and (52) . . . . . 27 mm box spanner

NOTE - The adjustment of the flow of the change speed control can be carried out on the hydraulic unit test bench 2298-T (see Pl. 176) . . . . . Test bench 2298-T

OVERHAULING A HYDRAULIC GEAR SELECTOR

IMPORTANT REMARK - In the case of difficult gear engagement, it is necessary to carry out the following checks before removing the hydraulic gear selector

A - Make sure that the engine adjustments are correct

Adjust the slow running (see Op. DS 142—0).

Adjust the clutch clearance (see Op. DS 314-0, paragraphs 20 to 23).

Adjust the clutch drag (see Op. DS 314-0, paragraphs 18 and 19).

Adjust the clutch engagement control (see Op. DS 314-0, paragraphs 24 to 26).

B - Make sure that the hydraulic gear selector and the gear change speed lever assembly are correctly set (see Op. DS 334—1).

C - If the 2nd gear will not engage (by moving from 1st to 2nd gear) and if 2nd gear jumps out by pressing lightly on the lever towards the 1st gear position, it is necessary to check the gear lever (play on the rivets assembling the washers forming the selector sate).

		TOOLS
	D - Make sure that the distribution of pressure is correct for each gear.	
	Raise the front of the car with the engine running at accelerated idling speed. Engage 1st gear and observe the clutch fork; it should move slowly towards the rear (engaged position).	
	Carry out the same procedure for the four other gears.	
	If the fork remains in the declutched position, it is necessary to repair the hydraulic gear selector.	
	NOTE - One can also carry out this operation by means of the test bench 2290-T (see Op. DS 334-0, paragraphs 6 to 12) or better still, check the leakage as indicated in the operation DS 391-0).	
	E - It is possible to check the operation of a removed hydraulic gear selector by means of the test bench 2298-T. . . .	Test bench 2298-T
	Dismantling (see Pl. 70).	
28	Fix the hydraulic gear selector in a vice by the rear cover end (stand MR-3053-200, see Pl. 71, fig. 4)	Stand MR-3053-200
29	Remove the nuts fixing the union plates of the pipe assembly connecting the hydraulic gear selector to the gear change speed control.	
	Remove the gear change speed control and bracket. Remove the pipe assembly and seal plates. Replace the nut fixing the bracket and the front cover	8 mm spanner 8 mm box spanner 12 mm box spanner
30	To remove the front cover (5) :	
	Unscrew the screws and nuts progressively in order to avoid jamming the cover. Remove the cover, the springs (4) and (7), the spring cups (8) and (9), the vellumoid joint, the ring seal (1) of the automatic gear control piston (3) *(on the first models only).*	
	Remove the automatic clutch control piston (2).	
	NOTE - On the second assembly model, the synchronising pistons (11) are positioned by the spring cups (28) and (29) and the pistons are slightly different (see fig. 6), the spring (30) is also different.	
	Remove the gear control valve (10).	
	Remove the 3rd speed synchronising piston (11) and its joint. Raise the 2nd speed piston (31) by pushing with the clutch control valve (12). Immediately after their dismantling, put the pistons (3), (11) and (31) in a wooden rack (rack MR-3053-210, see Pl. 71, fig. 3).	
	Clean the bores of the hydraulic gear selector with alcohol, blow out with compressed air.	
	Check the diameter of the bore at “d’ (see fig. 2), between the end of the selector and the first groove. Use the plug gauge 2277-T (see Pl. 71, fig. 1), and check the diameter in several positions.	
	If the “not go” end can be inserted or if deep scratches exist in the bore, the selector is unusable	Plug gauge 2277-T Rack MR-3053-210
31	To remove the synchronising pistons :	
	Press on the valve (12) using a brass drift in order to remove the pistons. Place them in the rack in the order of disassembly	Rack MR-3053-210 Brass drift = 5 mm dia. Length = 60 mm.
	Remove the auxiliary clutch control valve (12)	

		TOOLS
32	Remove the ring seals (27) from the synchronising pistons. Use a brass wire hook. Be careful not to scratch the bore or damage the groove, the edge of which must be a sharp angle.	
33	Remove the unit from the stand :	
	a) If the 3rd speed automatic control piston is sealed by a seal ring, do not turn the unit over, in order to avoid dropping the other pistons. Proceed as follows To remove the rear cover (13). Remove the screws and studs, then remove the cover, the springs (14) and (15) and the spring caps (16) and (17) and the joint (21). Remove the automatic gear control pistons through the front face of the selector, by pushing with the valve, then with a brass drift. Put the pistons (3) in a rack MR-3053-210 (see Pl. 71, fig. 3), in their order of disassembly. Remove the automatic gear control valve (18).	Rack MR-3053-210 Drift = 5 mm dia. Length = 60 mm.
	b) If the 3rd speed automatic control piston is sealed by an aluminium plug, proceed to dismantle in the following manner Remove the rear cover as indicated above (line a). To drive out the aluminium plug (22) : tap lightly on the gear change automatic control valve (18) (brass drift), until the plug (22) is removed. Take care not to drive out all the pistons. Disengage the pistons and place in the rack. Remove the valve (18). Remove the clutch automatic control valve (19)	Drift = 5 mm dia. Length = 60 mm
34	Remove the ring seals (20) from the gear control valve (10).	
35	Remove the bleed screw (23) and its joint (24) (1st model).	
36	Very carefully clean all the parts with alcohol and blow with compressed air.	
	Assembly (see Pl. 70).	
	NOTE - All the parts should be dipped in hydraulic fluid before assembly.	
37	Fix the unit on a stand by the front cover (stand MR-3053-200, see Pl. 71, fig. 4)	Stand MR-3053-200
38	Fit the auxiliary clutch control valve (12), through the front face of the unit. Fit the rubber distance piece (25) with the slot facing the overflow return hole, then the cup (26).	

		TOOLS
39	Fit the clutch automatic control valve (19), the rim towards the rear.	
40	Fit the rear ring seal (20) of the gear change control valve. To do this: engage the valve in the reverse direction to normal assembly, bring the valve level with the first groove "b". Engage the ring seal and put it in position in the groove by pushing with a brass or polished wooden rod. Remove the valve.....	Drift = 6 mm dia. Length = 150 mm.
41	Engage the gear change automatic control valve (18), the ground portion towards the rear. Put the spring cap (16) on the valve. Put the cup (17) on the automatic clutch control valve (19). Put the ring seal (21) in the recess in the selector. Fit the spring (15) (the weak one) on the cap. Put the vellumoid joint in position, smeared with fluid. Fit the automatic gear change control spring (14). Put the rear cover (13) in position. Fit the studs by hand, then the screws (plain washers). Turn the screws and studs progressively. During this operation, make sure that the springs and joints remain in position. Tighten the screws and studs.	
42	Turn the unit over and fix it to the stand by the studs.	
	Fit the automatic gear control pistons (3) in the same order as when dismantled. The stem of each piston should be positioned towards the front :- If the piston (3) is of the 1st series, grind the stem to the dimension "c" = $7 - \frac{0}{0.05}$ mm.	
	This operation can be carried out on a valve grinder (Black and Decker type). Set the mandrel at 90° (use the mandrel MR-3045-50, see Pl. 71, fig. 5). Carefully clean the piston. Refit the piston.	
	Put the aluminium plug (22) in position, using a press, the large diameter in the hydraulic gear selector. In order to make the plug stand proud of the face of the selector by 0.1 mm, fit a washer 0.1 mm thick over the plug. Insert a flat steel plate between the nose of the press and the selector. Remove any burrs found round the plug after fitting	Mandrel MR-3045-50
	NOTE - If the necessary tools are not available, retain the old assembly. Fit the piston (3) without modifying and a ring seal (1). In this case, it is necessary to use a paper joint without the hole "a" (see Pl. 69, fig. 2 and 3).	
	NOTE - Fit only the pistons and synchronisation guides.	
43	Fit the ring seal (27) for the first synchronising piston. Insert the ring seal in the groove in the unit, using a brass or polished wooden rod. Fit the corresponding piston (following the order of disassembly).	
	Carry out the same procedure for the other pistons (31).....	Drift = 6 mm dia.
44	Fit the automatic clutch control piston (2). Check for any sign of seizure (see Op. DS 334-4).	
	Fit a vellumoid joint (the joint only rests on the periphery of the unit).	
	Fit the spring (7) in the piston, then the spring cup (9).	

		TOOLS
	NOTE - It is not necessary to fit the spring cup (8), or the spring (4), fit the cup (28), the spring (30) and the cup (29) (see fig. 6).	
	Check the guide cups (28) and (29) of the synchronising pistons (11) for any sign of seizure.	
	If need be, lightly rub the stem of the upper cup (28) with abrasive paper. Clean with alcohol and blow with compressed air.	
	Put on the piston, the assembly of the upper cup (28), the spring (30) and the lower cup (29) with the hole located so that it will be towards the bottom when assembled on the car.	
	Engage the gear control valve (10).	
45	Fit the front cover (5), tighten the screws (plain washers) and nuts progressively. During this operation, check that the springs and cups are in position, especially the cup (9) of the automatic clutch control spring (spigot end of the screw in the hole in the cup)	12 mm box spanner
46	Remove the nut from the stud (6) engine side (see Pl. 69, fig. 1).	
	Fit the gear change speed control, bracket and pipe assembly. Insert a seal plate together with the seal rings. Tighten the nuts (spring washers) (use a seal plate 1.6 mm thick). Remove the plate fixing the speedometer cable. Remove the hydraulic gear selector from the stand	8 mm spanner 8-12 mm box spanners
47	Fit the joint (24) on the bleed screw, the conical part towards the outside (on early models). Fit the bleed screw (23). Tighten moderately.	
48	Test the hydraulic gear selector: use the test bench 2290-T, after refitting the hydraulic gear selector on the car (see Op. DS 334-0, paragraphs 6 to 12) or better still, use the test bench 2298-T, before fitting the hydraulic gear selector on the car (see Pl. 175).	Test bench 2298-T

PARTICULAR POINTS

Replacement of a 3rd speed automatic control piston ring seal.

Dismantling.

Unscrew the screws and nuts fixing the front cover of the hydraulic gear selector, progressively. As a safety precaution place a clean cloth under the hydraulic gear selector.

Clean the parts in alcohol, only.

Assembly.

In place of a ring seal, it is preferable to modify the piston and replace the ring seal with an aluminium plug (see Op. DS 334-3, paragraph 42).

When fitting a ring seal, cut a vellumoid paper joint as indicated in Pl. 69, fig. 3 (without the hole "a" shown with a dotted line).

Bleed the hydraulic gear selector.

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

Seizure of an automatic clutch control piston.

In order to dismantle and assemble the front cover of the hydraulic gear selector, carry out the same precautions as in the operation above.

		TOOLS
	REPLACEMENT OF A 3rd SPEED AUTOMATIC CONTROL PISTON RING SEAL	
	Dismantling (see Pl. 70).	
1	Release the pressure (unscrew the bleed screw of the pressure control valve and put the manual height control in the low position)	8 mm spanner
2	Remove the front left-hand suspension sphere. Use a cloth in order to avoid spilling the fluid.	
	Clean the hydraulic gear selector with alcohol particularly round the front cover. Blow with compressed air.	
3	Disconnect the union plate on the low pressure pipe assembly from the hydraulic gear selector and rest the pipe assembly on the right side of the hydraulic gear selector.	
	Disconnect the feed pipe from the hydraulic gear selector	8 mm box spanner

		TOOLS
4	Disconnect the union plate on the pipe assembly on the gear change speed control.	
	Remove the assembly of the bracket and gear change speed control	8 mm ring spanner 12 mm box spanner
5	Remove the front cover (5) from the hydraulic gear selector. Refit and screw up the nut on the stud (6) fixing the gear change speed control bracket. Afterwards, untighten the screws and nuts progressively in order to avoid the cover jamming. Put a cloth under the hydraulic gear selector to avoid spilling the fluid	12 mm box spanner
	NOTE - Hold the cover during the untightening: the springs force the cover towards the front.	
	Remove the cover, the springs, the spring cups and the vellumoid joint.	
	IMPORTANT NOTE - The automatic clutch control piston (2) tends to come out freely from the hydraulic gear selector. In addition, the pistons (3) may fall out if they are not held by the seal ring (1).	
	As a security measure, place a cloth under the hydraulic gear selector, in order to prevent the loss of parts or damage by impact.	
6	Remove the piston (2). Remove the seal ring (1).	
7	Clean the parts carefully and in particular, the housing of the piston (2) (use alcohol exclusively). Blow the compressed air through the low pressure inlet hole, and thoroughly clean the groove and bore receiving the piston.	
	Assembly (see Pl. 70).	
	NOTE - It is preferable to modify the piston (2) and replace the seal ring by an aluminium plug (see Op. DS 334-3, paragraph 42).	
8	Put the piston (2) in its housing, after having dipped it in hydraulic fluid.	
9	Put in position the seal ring (1) smeared with fluid.	
10	Cut a vellumoid paper gasket (as indicated on Pl. 69, fig. 3). This gasket should not have the hole "a" existing in the old gasket (shown with a dotted line). Put the gasket in position on the hydraulic gear selector.	
	NOTE - This gasket should be fitted dry. If absolutely necessary, fit with the aid of hydraulic fluid to the exclusion of all other products.	
	Put the spring (7) in position in the hydraulic gear selector.	
	Offer up the cover with the spring (4) and the spring cups (8) and (9) or offer up the cover with the cups (28) and (29) of the spring (30), and of the cup (9) (new assembly with synchronising piston guides). Hold the cover in order to guide the clutch control piston spring so that the coils do not foul the paper gasket when tightening down. Make sure that the spring cups are in position. Tighten the screws and nuts progressively. Tighten by half a turn at a time in order to avoid jamming the cover. Fit the speedometer cable bracket on the left upper screw	12 mm box spanner

		TOOLS
11	Remove the right upper nut. Fit the gear change speed control and bracket assembly. Tighten the screws and nuts.	12 mm box spanner 8 mm ring spanner
12	Connect the union plate on the pipe assembly to the gear change speed control. Fit the seal plates. Tighten the nuts (spring washers)	8 mm ring spanner
13	Connect the low pressure pipe assembly. Fit the seal plates. Make sure that the fluid holes correspond with the holes in the seal plate. Tighten the nuts (spring washers)	8 mm ring spanner
14	Connect the feed pipe to the front cover of the hydraulic gear selector. Fit a rubber sleeve under the clip. Tighten the clip.	
15	Start the engine. Put the systems under pressure	8 mm spanner
	Check the unions for leakage. Apply the parking brake. Bleed the hydraulic gear selector by changing gears and by operating the auxiliary clutch control lever (engine idling and the gear selector lever in the neutral position).	
16	Adjust the clutch drag (see Op. DS 314-0).	

SEIZURE OF AN AUTOMATIC CLUTCH CONTROL PISTON (38 mm diameter piston).

17 Remove the front cover from the hydraulic gear selector (see paragraphs 1 to 7, this operation).

18 Examine the piston carefully in order to find the high spots. The seizure does not always reveal itself by more or less deep scratches, but more often by high spots which stiffen the sliding movement of the piston.

Remove these spots using *No. 600 abrasive paper* moistened with hydraulic fluid.

Check the sliding movement of the automatic clutch control valve.

19 Carefully clean the piston with alcohol, blow with compressed air, immerse it in *clean* hydraulic fluid.

20 Fit the front cover (see paragraphs 8 to 16, this operation).

PARTICULAR POINTS

Replacement of a front pipe assembly on the gearbox cover.

Refitting.

Adjust the cylinder (see Op. DS 334-0, paragraphs 19 to 23).

Adjust the clamps fixing the cylinder (see Op. DS 334-0, paragraphs 24 to 26).

Replacement of a rear pipe assembly on the gearbox cover.

Removal.

In order to carry out this operation, it is necessary to remove the radiator and the front crossmember (complete) supporting the engine gearbox assembly.
Do not lose the packing pieces fitted between the crossmember and sidemember.

It is necessary to remove the two studs connecting the pipe assembly flanges in order to disengage the rear pipe assembly.
Place a clean cloth under the control cylinders and retain the adjusting washers (clamp and cylinders).

Assembly.

Adjust the cylinders (see Op. DS 334-0, paragraph 27).

Adjust the cylinder fixing flange (see Op. DS 334-0, paragraphs 28 and 29).

Fit the front crossmember. Put the packing washers found when dismantling, between the crossmember and the sidemembers.

Replacement of the ring seal of the cylinders controlling the gears.

Removal.

Remove the pipe assembly. Mark the cylinder adjusting washers and the fixing clamp adjusting washers.

The parts should only be cleaned with alcohol.

		TOOLS
	REPLACEMENT OF A FRONT PIPE ASSEMBLY ON THE GEARBOX COVER	
	Removal (see Pl. 55).	
1	Remove the spare wheel, the spare wheel support and the air deflection panel	12 mm box spanner
2	Release the pressure	8 mm spanner
3	Disconnect the pipe assembly for the gear control from the gearbox. Remove the seal plates	8 mm box spanner

		TOOLS
4	Remove the clamp (56) from the cylinders on the gearbox. Save the adjusting shims (58) fitted between the clamp and the cylinders and also the clips (57) which hold them on the cylinder (cars produced before March 1957, see fig. 2) or remove the clamp (20), save the shims (99) adjusting the clamp (cars produced since March 1957, see fig. 1) (socket 1773-T, see Pl. 64, fig. 6). Remove the pipe assembly and the cylinders. Save the cylinder adjusting shims (59)	12 mm box spanner Socket 1773-T
	Assembly (see Pl. 55).	
5	Adjust the cylinders (see Op. DS 334-0, paragraphs 19 to 23).	
6	Adjust the clamps fixing the cylinders (see Op. DS 334-0, paragraphs 24 to 26).	
7	To fit the pipe and cylinder assembly :	
	a) *Cars produced before March 1957* (see fig. 2).	
	Place in position the pipe and cylinder assembly (fitted with the adjusting washers). Place the adjusting washers retained by their clips on the 1st speed cylinder.	
	Fit the cylinder clamp (56). Tighten the screw (shake-proof washer)	12 mm box spanner
	b) *Cars produced since March 1957* (see fig. 1).	
	Place in position the pipe and cylinder assembly (fitted with the adjusting washers). Fit the adjusting washers (99) between the clamp and the cylinders. Fit the cylinder clamp (20) and tighten the screw (socket 1773-T, see Pl. 64, fig. 6)	Socket 1773-T
8	Connect up the pipe assembly. Insert the seal plates (only use 1.7 mm thick seal plates with new seal rings). See that all the seal rings are correctly positioned inside the plates. Tighten the screws (spring washers).....	8 or 10 mm box spanners
9	Start the engine. Put the systems under pressure. Check the movement of the gears. Stop the engine.....	8 mm spanner
10	Fit the air deflection panel. Fit the spare wheel support. Fit the spare wheel	12 mm box spanner
	REPLACEMENT OF A REAR PIPE ASSEMBLY ON THE GEARBOX COVER	
	Removal (see Pl. 55).	
11	Remove the spare wheel, the spare wheel support, the air deflection panel	12 mm box spanner
12	Drain and remove the radiator (save the water which contains anti-freeze).	
13	Support the engine-gearbox assembly by means of a sheathed chain sling passed around the water pump (chain sling 1697-T, see Pl. 51).	
	Remove the battery and its support	Chain sling 1697-T 8-12 mm box spanners

		TOOLS
14	Release the pressure	8 mm spanner
15	To remove the front crossmember (see Pl. 50) :	
	Remove the brake air cooling duct, left side. Remove the fixing collar (100) from the pressure control valve. Remove the screws fixing the crossmember to the sidemember. Remove the lower nuts trom the brake assembly adjustment rods (113).	
	NOTE - Do not touch the upper nuts on the adjustment rods, so as not to disturb the adjustments of the brake units.	
	Remove the screws fixing the crossmember to the gearbox support. Remove the crossmember.	
	Do not lose the shims fitted between the crossmember and the sidemember.....	8-12-14 mm box spanners 21 mm spanner
16	Disconnect the pipe assembly controlling the gearbox (5 pipes).....	8 or 10 mm ring spanner
17	Remove the two studs coupling the flanges (cars produced since March 1957) and remove the screws. Remove the clamp (56) on the cylinders at the rear of the gearbox	12 mm box spanner
	NOTE - Using a piece of rag or paper, block the hole through which the clutch fork passes so that the washers do not fall into the clutch mechanism.	
	Retain the adjusting shims (58) located between the clamp and the cylinders and also the clips (57) which hold them on the outside cylinders (cars produced before March 1957, see fig. 6), or remove the clamp (20) and retain the clamp adjusting shims (99) (cars produced since March 1957) (socket 1773-T, see Pl. 61, fig. 6). Remove the assembly of the cylinders and control pipes.	
	Retain the adjusting shims (59) on the centre cylinder	Socket 1773-T
	Assembly (see Pl. 55).	
18	To adjust the cylinders (see Op. DS 334-0, paragraph 27).	
19	To adjust the clamp fixing the cylinders (see Op. DS 334-0, paragraphs 28 or 29).	
20	To fit the assembly of the cylinders and pipes :	
	a) (*Cars produced before March 1957.*) (see fig. 6)	
	On each of the outside cylinders, place the adjusting shims (58) for regulating their height and the corresponding clamps (57). See that the shims do not fall into the clutch mechanism. Fit the cylinder clamp (56).(Insert the adjusting shims and clips)	12 mm box spanner
	b) (*Cars produced since March 1957.*) (see fig. 1). Put the assembly of the cylinders and pipes in position (the central cylinder fitted with the adjusting washer (59). Put the adjusting washers (99) between the clamp and the cylinders. Fit the clamp (20) to the cylinders and tighten the screw (socket 1773-T, see Pl. 64, fig. 6)	Socket 1773-T

		TOOLS
21	Connect up the pipe assemblies. Insert the seal plates (only use 1.6 mm thick plates and new seal rings)	8 or 10 mm box spanners
22	To fit the retaining clamp on the pipe assembly (see fig. 3). a) Place the rubber sleeves (98) on the pipes, the split upwards. Arrange them at a distance "u" = 15 to 20 mm. b) Open the clip slightly and with a piece of wire, fit it over the rubber sleeves. Fit the locking screw in position, the nut on the left side. Tighten the nut (spring washer).	
23	To fit the front crossmember (see Pl. 50). Between the sidemembers and the crossmembers, fit the shims found when dismantling. The distance between the brake disc and the sidemember, left-hand side should be greater by 70 ± 2 mm than the same distance measured on the right-hand side. Engage the ends of the adjusting rods (113) supporting the front of the brake unit, in the sockets. Tighten the screws fixing the crossmember on the sidemembers (plain and spring washers). Fit the screws fixing the crossmember on the gearbox brackets (turn down the lock plates). Fit the lower nuts on the adjusting rods supporting the front of the brake unit. Fit the brake air cooling duct, left side	8-12-14-21 mm box spanners 21 mm spanner
24	Fit the radiator (see Op. DS 232-1).	
25	Start the engine. Tighten the bleed screw on the pressure control valve. With systems under pressure, check the joints for leakage. Check the movement of the gears	8 mm spanner
26	Fit the air deflection panel, the spare wheel support. Fit the spare wheel	12 mm box spanner

REPLACEMENT OF THE RING SEAL OF THE CYLINDERS CONTROLLING THE GEARS

Removal (see Pl. 55).

27 Remove the pipe assembly for the cylinder concerned: front pipe assembly see paragraphs 1 to 4, this operation; rear pipe assembly, see paragraphs 11 to 17, this operation.

NOTE - (*Cars produced since March 1957.*) Do not lose the cylinder adjusting washers (59) and the adjusting washers (99) of the clamp (20) (see fig. 1).

(*Cars produced before March 1957.*) Do not lose the adjusting washers (59) and the adjusting shims (58) (see fig. 6).

28 Mark each piston and corresponding cylinder and drive out the pistons from the cylinders with compressed air. Hold the cylinders in a cloth in order to avoid the loss of the piston.

		TOOLS
29	Remove the seal rings from the cylinder, using a brass wire hook in order to avoid scratching the bore of the cylinder. NOTE - Interference, other than the replacement of the seal rings is not permissible on the control cylinders. In the case of a few light scratches on the pistons, a light rubbing with No. 600 abrasive paper (moistened with alcohol) is permitted. Blow with compressed air.	
30	Carefully clean the cylinders and pistons by immersion in clean alcohol. Blow the parts with compressed air. Smear the cylinders and pistons with hydraulic fluid.	
	Assembly (see Pl. 50).	
31	Place successively in each cylinder, a mandrel (mandrel MR-3676-120 and MR-3676-130, see Pl. 64, fig. 4). Offer up the seal smeared with hydraulic fluid and put it in position in the groove of the cylinder, using a reversed piston (see Pl. 64, fig. 5).	
	Remove the mandrel by means of a screw 6 dia. 100 pitch	Mandrel MR-3676-120 and MR-3676-130
32	Smear the cylinders and pistons with hydraulic fluid and engage the pistons in the corresponding cylinders.	
33	Fit the cylinder and pipe assembly on the gearbox (see paragraphs 7 to 10, this operation for the front pipe assembly, or paragraphs 20 to 26, this operation for the rear pipe assembly).	
	REPLACEMENT OF A GEAR CHANGE SPEED CONTROL PIPE ASSEMBLY	
	Removal (see Pl. 67).	
34	Release the pressure in the system controlling the gears. Place a cloth under the hydraulic gear selector, in order to avoid spilling fluid on units remaining on the car	8 mm spanner
35	Remove the screws fixing the gear change speed control (8) on its bracket (18) and remove the nuts fixing the front flange (9). Remove the gear change speed control. Remove the nuts fixing the rear flange (19) on the hydraulic gear selector	8-10 mm ring spanners
36	Remove the gear change speed control bracket (18) from the hydraulic gear selector	8-12 mm ring spanners
37	Remove the pipe assembly from the hydraulic gear selector; avoid bending the pipes.	
	Assembly (see Pl. 67).	
38	Offer up the pipe assembly, fit the nut fixing the rear flange (19) on the hydraulic gear selector without tightening (spring washers). Insert the seal plates.	

		TOOLS
39	Put the gear change speed control bracket (18) in position. Tighten the fixing screws and nuts (spring washers)....	8-12 mm ring spanners
40	Offer up the gear change speed control and connect the front flange (9) to the gear change speed control, inserting a seal plate. Fit the fixing nuts without tightening (spring washers).	
41	Fit and tighten the screws fixing the gear change speed control on its bracket. Tighten the nuts fixing the feed pipe assembly on the gear change speed control and on the hydraulic gear selector	10 mm ring spanner
42	Bleed the system controlling the gears (see Op. DS 334-0, paragraph 35). Check the unions for leaks.	
	REPLACEMENT OF A NON-RETURN VALVE	
	Removal.	
43	Release the pressure	8 mm spanner
44	Remove the front left-hand suspension sphere.	
45	Disconnect the low pressure pipe assembly from the hydraulic gear selector. Remove the seal plates.....	8 mm box spanner
46	Disengage the non-return valve from its bracket on the body. Disconnect the flexible pipe from the valve (do not mislay the flexible bushes fitted under the clips).	
	Refitting.	
47	Connect the flexible pipes to the non-return valve. The body of the non-return valve (large diameter) is fixed on the inlet pipe of the hydraulic gear selector. Fit a flexible bush under each clip. Tighten the clips. Put the non-return valve in position in its bracket on the body.	
48	Fit the seal plate of the low pressure pipe assembly on the hydraulic gear selector with the holes of the seal rings corresponding with the fluid holes. Connect the low pressure pipe assembly to the hydraulic gear selector. Tighten the nuts (spring washers)	8 mm box spanner
49	Fit the left-hand suspension sphere, tighten by hand.	
50	Start the engine. Put the systems under pressure. Check the unions for leakage	8 mm spanner
51	Operate the auxiliary clutch lever several times in order to bleed the hydraulic gear selector.	

PARTICULAR POINTS

Replacement of a driveshaft or a pivot.

Removal.

5 *Drill out the centre punch marks locking the screw of the nut fixing the driveshaft in the pivot (2 mm dia. drill).*

Assembly.

6 *Tighten the nut fixing the driveshaft in the pivot to 288 ft/lb (40 m.kg). Lock the locking screw of the nut with two centre punch marks.*
NOTE. On cars produced before February 1956, if the pivot is to be replaced, drive in the driving dowels of the new pivot. If the driveshaft is replaced it is necessary to replace the driveshaft and pivot assembly.

13 *Tighten the wheel fixing screw to 108 to 144 ft/lb (15 to 20 m. kg.).*

14 *Check the alignment and the steering lock (see Op. DS 440-0).*

TOOLS

REPLACEMENT OF A DRIVESHAFT OR A PIVOT

NOTE - If a pivot bearing is noisy, before removing the pivot make sure that the tightening torsion of the nut (34) is 576 ft/lbs (80 m.kg) (spanner 1921-T, see Pl. 99, fig. 1) ..... Spanner 1921-T

Removal (see Pl. 95).

1 Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the spare wheel, the wing and the front wheel. Release the pressure in the suspension system ..... Jacking bracket 2505-T
12-14 mm spanner
12-14 mm box spanner
8 mm spanner

2 Disconnect the flexible dust cover (18) from its support on the flexible coupling (bibax) (see Pl. 113).

3 Disconnect the ball joint on the steering lever from the steering rod on the pivot (extractor 1964-T and pressure pad 1968-T, see Pl. 97, fig. 2). Remove the rubber cup and the nylon cup from the ball joint ..... 21 mm box spanner
Extractor 1964-T
Pressure pad 1968-T

4 Disconnect the axle arm from the pivot ball joints (extractor and pressure pad 1864-T, see Pl. 97, fig. 3).

Remove the rubber cups and the nylon cups. Disengage the driveshaft and pivot assembly ..... 26 mm box spanner
Extractor and pressure pad 1864-T

		TOOLS
5	To disconnect the driveshaft from the pivot :	
	a) Drill out the centre punch marks locking the screw (17), locking the driveshaft fixing nut (21) (drill 2 mm dia.). Remove the locking screw (17) and the greaser.	
	Put the pivot and driveshaft assembly in a vice (stand 1922-T, see Pl. 99, fig. 1)	Stand 1922-T
	b) Unrivet the half shells fixing the dust cover (32). Remove the dust cover towards the splined drive coupling.	8 mm spanner
	c) Using a screwdriver, disengage the seal (20) from the groove in the hub of the pivot.	
	d) Hold the driveshaft vertically and engage the spanner 1922-T on the nut (12)(see Pl. 99, fig. 2). Unscrew the ring nut (21) (this nut is tightened to 288 ft/lbs (40 m.kg).	
	Remove the spanner and disengage the driveshaft assembly and nut (21) from the pivot. Remove the seal (20) from the driveshaft. Remove the spring (20) and the cone (30)	Spanner 1922-T
	Assembly (see Pl. 95).	
	NOTE - On cars produced before February 1956, if the pivot is to be replaced, drive in the driving dowels of the new pivot. If the driveshaft is replaced, it is necessary to replace the pivot and driveshaft assembly.	
6	To connect the driveshaft to the pivot :	
	a) Put the cone (30) for locking the wheel, in position (the dowel engaged in the slot of the hub) and put the spring (14) in position.	
	b) Put the pivot in a vice (stand 1922-T, see Pl. 99, fig. 1)	Stand 1922-T
	c) Offer up the driveshaft in the hub of the pivot, the holes of the driving plate of the driving shaft opposite the driving dowels of the pivot and the hole for the locking screw (17) lined up with the tapped hole in the hub.	
	d) Engage the driving dowels in their housing by striking the end of the driveshaft. Tighten the nut (21) to 288 ft/lbs (40 m.kg) (spanner 1920-T, see Pl. 99, fig. 2). Remove the assembly of the driveshaft and pivot from the stand. Tighten the screw (17) locking the nut (21) and lock by two centre punch marks	Spanner 1920-T
7	Fit the seal (20), squeeze the seal by hand, incline the splined end of the shaft and work the seal over the splines. Do not damage the interior threads of the seal by rubbing them on the splines. Engage the lip of the seal in the groove of the hub, using a rod with a rounded end in order not to damage the seal. Put the seal in position by working round the bore of the hub with the rod.	
8	Put the driveshaft dust cover (32) in position on the double universal (cone 1930-T, see Pl. 101). Position the half shells, draw the edges of the half shells together using pliers and rivet them. Fit the greaser	8 mm spanner
9	Fit the dust cover, gearbox side, on the driveshaft (taper fitting, see Pl. 101).	Taper fitting 1930-T

		TOOLS
10	Offer up the driveshaft and pivot assembly on the car. Carefully degrease the tapers of the ball joints and the axle arms. Engage the driveshaft in the splines of the flexible coupling (bibax) previously greased (bearing grease). Connect the ball joints of the axle arms, fit the nylon cups (1) and the rubber cups (2). Tighten the nuts and fit split pins	26 mm box spanner
11	Put the dust cover in position, gearbox side and fit the clips.	
12	Connect the steering lever ball pin on the pivot to the steering relay rod. Fit the nylon cup and the rubber cup. Tighten the nuts and fit split pins.....	21 mm box spanner
13	Fit the wing and the spare wheel. 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). Put the system under pressure	8 mm spanner 12-14 mm spanners 12-14 mm box spanners
14	Check the alignment and the steering lock (see Op. DS 440-0).	
	REPLACEMENT OF A DUST COVER (gearbox side).	
	Removal (see Pl. 113).	
15	Remove the driveshaft and pivot assembly (see paragraphs 1 to 4, this operation).	
16	Place the driveshaft and pivot assembly in a vice (stand 1922-T, see Pl. 99, fig. 1). Remove the clip fixing the dust cover (18) on the driveshaft and remove the dust shield	Stand 1922-T
	Refitting (see Pl. 113).	
17	Fit the dust cover (18) on the driveshaft (taper fitting 1930-T, see Pl. 101)	Taper fitting 1930-T
18	Fit the driveshaft and pivot assembly on the car (see paragraphs 10 to 13, this operation).	
	REPLACEMENT OF A DUST COVER (pivot side).	
	Removal (see Pl. 95).	
19	Remove the driveshaft and pivot assembly (see paragraphs 1 to 4, this operation).	
20	Place the driveshaft and pivot assembly in a vice (stand 1922-T, see Pl. 99, fig. 1). Unrivet the half shells (19) retaining the dust cover (32). Remove the dust cover	Stand 1922-T

		TOOLS
	Refitting (see Pl. 95).	
21	Remove the clip retaining the dust cover (18) and remove towards the double universal (see Pl. 113).	
22	Put the taper fitting 1930-T (see Pl. 101) in position on the driveshaft. Slide the dust cover (32) on the taper fitting, previously greased and engage it on the driveshaft.....	Taper fitting 1930-T
23	Pass the dust cover (32) over the dust cover (18) (see Pl. 113) and put it in position on the double universal. Fit the half shells (19), draw the edges together using pliers and rivet them.	
24	Fit the driveshaft and pivot assembly on the car (see paragraphs 10 to 13, this operation).	

TOOLS

These tests are carried out in order to determine whether the hydraulic system is in normal good condition or if not which unit or units are failing.

IMPORTANT REMARKS

1. One can carry out this check on cars on which no fault is apparent as preventive maintenance operation (normally assisted steering), proceed as indicated in paragraphs 1 to 7 (RAPID CHECK).
2. If the car shows a fault in operation, it is necessary to proceed as indicated in paragraph 8 and onwards (CHECKING THE UNITS).
3. These tests should be carried out when the units are warm (fluid at a minimum temperature of 122°F (50°C). If necessary, leave the engine running at accelerated idling speed with the bleed screw of the pressure control valve slightly unscrewed (the movement of fluid increases its temperature).
4. The driving belts should be in good condition and at the correct tension, the reservoir filter clean and the fluid level normal.

RAPID CHECK

IMPORTANT - The fluid should be at a temperature of 122°F (50°C).

To check the pump and the pressure control valve.

1 Fit the stroboscopic disc MR-4142-20 (see Pl. 80 A) on the pulley of the high pressure pump (if not available, use a mechanical or electric revolution counter).

2 Put the manual height control in the "LOW" position.
Put the auxiliary clutch control in the "CLUTCH" position.
Put the ignition control in the "RETARD" position.

3 Release the pressure by unscrewing the bleed screw of the pressure control valve.

Adjust the slow running to 600 r.p.m. exactly (spring of the accelerated idling control unhooked). At this speed, the disc appears to be stationary.

If the disc appears to be turning in the direction of pump rotation, the engine is running too fast.

In the contrary case, the engine is not turning fast enough.

4 Tighten the bleed screw and start the stop watch.

Note the time (TI) elapsing between this moment and that when the pressure control valve commences to make a hissing noise. If (TI) is lower than or equal to 20 seconds, the pump is in good condition and one can proceed to check the total leakage (see paragraphs 5 and onwards).

If (TI) is greater than 20 seconds, it is necessary to proceed with the CHECKING THE UNITS (paragraphs 8 and onwards) so as to determine the condition with greater precision (this does not imply that the pump is defective).

TOOLS

To check the total leakage.

5 Put the auxiliary clutch control in the "RUNNING" position.

6 Move the steering in order to cause the valve to cut in. Hold the steering steady. Start the stop watch at the moment the valve cuts out.

Stop the watch when the valve cuts in again.

7 Hold the steering on lock (valve under pressure).

Move the steering, in order to cause the valve to cut in, hold the steering on the lock and start the stop watch at the moment the valve cuts out.

Stop the stop watch at the moment the valve cuts in again. The time registered should be 30 seconds or more.

NOTE - If the time registered in paragraphs 6 and 7 is greater than 30 seconds, the total leakage is acceptable. The checking of the units is not necessary.

TESTING THE HYDRAULIC UNITS

NOTE - These tests can only be carried out if in possession of the test bench 2290-T, fitted with the volume gauge 2299-T and the union 2296-T .....

Test bench 2290-T
Volume gauge 2299-T
Union 2296-T

The pipes, unions, caps and pressure gauges mentioned in the text are designated by the same symbols as those used in the instructions supplied with the test bench.

NOTE - The results obtained during the course of the tests should be entered on a test sheet, a sample of which is shown on page 265.

8 To warm the fluid and the units.

a) Put the manual height control in the "LOW" position.

b) Start the engine, slightly unscrew the bleed screw of the pressure control valve so that the pump is functioning under pressure.

Allow the engine to run at accelerated idling for a quarter of an hour.

Remove the air deflection panel and the left-hand front wing.

c) Stop the engine, unscrew the bleed screw of the pressure control valve in order to release the pressure. Empty the brake accumulator by operating the hydraulic brake pedal.

Tighten the bleed screw. Start the engine and obtain a cut out of the valve.

Stop the engine.

TOOLS

To prepare a test (1st assembly) (see Pl. 79).

9 To check the pump of the test bench 2290-T for leakage.

To do this, blank off the opening "a" of the test bench with the plug (V).

Connect the orifice of the pump "c" to the pressure gauge (M2). Tighten the bleed screw "b". Operate the pump in order to obtain a pressure of 1422 p.s.i. (100 kg/cm^2) approximately.

Unscrew the bleed screw. Screw up the bleed screw and bring the pressure to 2133 p.s.i. (150 kg/cm^2). After five minutes, there should be practically no variation in pressure.

10 Disconnect the pipe between the pressure control valve and brake accumulator.

To prepare the assembly as shown on the illustration. Remove the filler cap from the reservoir and fix the volume gauge on the radiator. Connect the pipe to the union (T). Connect the orifice "f" of the union to the orifice of the tap (R2) using the pipe (B).

Connect the orifice "h" of the union to the pressure gauge (M3) of the test bench 2290-T.

Disconnect the return pipe to the reservoir from the pressure control valve and blank off immediately (to avoid spilling fluid).

Connect the pipe (2) of the volume gauge to the orifice "d" of the control valve.

11 Fit a stroboscopic disc on the pulley of the high pressure pump (see RAPID CHECK, paragraphs 1 and onwards).

NOTE - 1. If difficulty is experienced in obtaining a steady speed of 600 r.p.m., it is preferable to use a revolution counter (revolution counter 2432-T, see Pl. 80 B). The use of such an instrument eliminates errors due to erratic running of the engine and facilitates the checking of the high pressure pump ..... Revolution counter 2432-T

2. The revolution counter sold under the number 2432-T is driven by a reduction gear 2433-T. This reduction gear is the same as that which is fitted to the mechanical revolution counter 2434-T. Reduction gear 2433-T

12 Connect the orifice "e" of the front accumulator (car position) to the orifice "a" of the test bench pump by means of the pipe (B) (the test bench fitted as indicated on Pl. 172, the pipe is connected on the pressure gauge (M2).

13 Disconnect the pipe (1) of the rear accumulator (car position) and blank off the orifice by means of the plug (V).

Pre-check of the high pressure pump and control valve.

14 Make sure that the tap (R1) is open. Start the engine.

TOOLS

15 Tighten the bleed screw of the pressure regulator. By means of the tap (R2), regulate the pressure to 1777 p.s.i. (125 kg/cm^2).

Two possibilities present themselves.

1st case : The pressure builds up normally and should be stabilised at 1777 p.s.i. (125 kg/cm^2), the test can proceed.

2nd case : The pressure 1777 p.s.i. (125 kg/cm^2) cannot be obtained even with the tap (R2) closed.

a) The bleed screw of the pressure control valve being screwed in and the tap (R2) closed, close the tap (R1) and note the level of the fluid in the volume gauge. If the level increases, replace the pressure control valve (check the pressure of the accumulator, see paragraph 23).

b) If the level does not increase, see belts and filter, then replace the pump before continuing with the test.

16 To warm the fluid.

a) The pressure being regulated to 1777 p.s.i. (125 kg/cm), put the pump outlet in the volume gauge (tap R1 closed). Check the temperature.

b) In order to obtain a temperature of 122°F (50°C), let the engine run at 1500 r.p.m. approximately. Leave the tap (R1) partially open in order to maintain the level in the volume gauge, place the thermometer in the fluid. During this period, check the valves of the brake accumulator and brake control for leakage.

Checking the brake accumulator valves for leakage.

17 To check the front brake accumulator (fitted at the rear on the car).

Tighten the bleed screw "b" of the test bench 2290-T. Make sure that pressure existing in the brake accumulators is greater than 853 p.s.i. (60 kg/cm^2), pressure gauge (M2). Give a few strokes with the pump. Give a few strokes on the hydraulic brake, then have an assistant press on the hydraulic brake pedal and check by movement that the accelerated idling control lever is functioning.

18 To check the rear brake accumulator (fitted at the front).

Raise one rear wheel and check that the wheel is locked by the brake. Release the brake pedal: the rear wheel should be free.

NOTE - This test is carried out in order to eliminate a fault in an accumulator due to a split diaphragm.

TOOLS

19 Checking the valves for leakage.

Tighten the bleed screw "b" of the test bench. Operate the pump in order to obtain a pressure of 2133 p. s. i. (150 kg/cm^2). Unscrew the test bench bleed screw "b", wait for ten seconds and retighten the bleed screw. Check the pressure gauge (M2). Wait for one minute approximately, if there is an increase in pressure, the valves are leaking. If on the contrary, the pressure gauge remains at "0", operate the brake a few times in order to slightly reduce the pressure, then operate the pump to increase the pressure in the brake accumulators, and recommence the checking operation. If the pressure gauge remains at "0", the valves are not leaking. Make a note of the result on the test sheet at (14) : "Good or Bad".

Preparation for testing a brake control unit for leakage.

20 Operate the pump in order to increase the pressure of the brake accumulators to 2133 p. s. i. (150 kg/cm^2). Note the moment this pressure is reached. After 20 minutes, carry out the operations mentioned in paragraph 30. During this time continue with the test.

To check the high pressure pump.

21 1st case : Checking with a stroboscopic disc or revolution indicator (see Pl. 80 A).

a) Check the temperature of the fluid in the volume gauge. The temperature 122°F (50°C) being obtained, unhook the accelerated idling control spring. Adjust the speed of the engine to 600 r. p. m. exactly. (To use a stroboscopic disc, see RAPID CHECK, paragraph 1). Check the pressure on the pressure gauge (M3). Finally set the pressure at 1777 p. s. i. (125 kg/cm^2) by means of the tap (R2). Drain the volume gauge. Close the tap (R1) and simultaneously, start the stop watch. Stop the stop watch at the moment the level reaches the upper mark. Open the tap (R1). Take the time indicated on the stop watch. Carry out this operation three times and take the average time. Make a note of the result on the test sheet at (1).

This average should be less than 82 seconds, if not, it is necessary to work on the pump when the tests are finished.

b) Carry out the same test at 853 p. s. i. (60 kg/cm^2). Adjust the pressure by means of the tap (R2). Make a note of the result on the test sheet at (2).

22 2nd case : Checking with a revolution counter (see Pl. 80 B).

a) Adjust the engine speed to 600 r. p. m. approximately.

Check the pressure on the pressure gauge (M3). Finally set the pressure at 1777 p. s. i. (125 kg/cm^2) by means of the tap (R2). Drain the volume gauge. Close the tap (R1) and simultaneously engage the revolution counter. Disengage the revolution counter at the exact moment when the level reaches the upper mark. Open the tap (R1). Take the number of turns registered. This number should be less or equal to 816, if not, it is necessary to work on the pump when the tests are finished (the pump turns at half engine speed). Make a note of the result on the test sheet at (1a).

b) Carry out the same test at 853 p. s. i. (60 kg/cm^2). Adjust the pressure by means of the tap (R2). Make a note of the result on the test sheet at (2a).

TOOLS

To check the pressure control valve.

23 To check the inflation pressure of the accumulator.

Open the tap (R1). Close the tap (R2). Obtain a cutting out. Stop the engine. Slightly open the tap (R2) to obtain a slow drop in pressure. Note the precise moment that the needle of the pressure gauge (M3) springs rapidly to "0". Enter the result on the test sheet at (3).

This pressure should be $924 \begin{smallmatrix} + 70 \\ - 220 \end{smallmatrix}$ p. s. i. ($65 \begin{smallmatrix} + 5 \\ - 15 \end{smallmatrix}$ kg/cm^2). If not, replace the accumulator.

24 To check the cutting out.

Start the engine. Hook on the accelerated idling spring. Close the tap (R2). The regulator should cut out by itself, or sharply accelerating very slightly.

The pressure of cut out should be between 2133 and 2493 p. s. i. (150 and 175 kg/cm^2). Enter the pressure on the test sheet at (4). If a cut out is not obtained, and in order to avoid having to continue the test, obtain this cut out by acceleration or by tapping lightly on the body of the regulator.

25 To check the cutting in.

Open the tap (R2) in order to obtain a very slow drop in pressure and note the pressure at the moment of cutting in. This pressure should be between 1777 and 1991 p. s. i. (125 and 140 kg/cm^2). Enter this pressure on the test sheet at (5).

26 Checking for leakage.

After a slight drop in pressure which is normal when cutting out, start the stop watch when the needle of the pressure gauge (M3) indicates a pressure of 2133 p. s. i. (150 kg/cm^2) and stop the stop watch when the pressure gauge indicates 1849 p. s. i. (130 kg/cm^2). Enter on the test sheet at (6) the leakage "A" in cm^3/mn (see schedule of times and leakage, page 264).

Stop the engine.

If "A" is greater by 10 cm^3/mn, it is necessary to work on the regulator before proceeding with the tests.

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^2-130 kg/cm^2) indicated in preceding paragraph, reposition the range of the needles by retaining the difference of 290 p. s. i. (20 kg/cm^2) (for example : 2204-1920 p. s. i. (155 kg/cm^2-135 kg/cm^2) or 2062-1777 p. s. i. (145 kg/cm^2-125 kg/cm^2).

To prepare a test (2nd assembly) (see Pl. 80).

27 Release the pressure by operating the tap (R2).

Remove the volume gauge, make up the assembly indicated on Pl. 80.
Connect the return pipe from the reservoir to the pressure control valve.
Connect the orifice "f" of the union (T) to the pipe (1) by means of the pipe (C).
Start the engine. Move the steering from right to left several times.

TOOLS

To check the steering.

28 To check the hydraulic control of the rack.

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^2) (see NOTE, paragraph 26d) and note the leakage "C" on the test sheet (at 8).

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

29 To 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^2) (pressure gauge M3), see NOTE, paragraph 26 d).

1st steering locked to the left.
2nd steering locked to the right.
Take note only of the shortest times, and note corresponding to the leakage "A1" on the test sheet at (8a).
3rd without moving the steering.
Note the time for the needle to move from 2133 to 1849 p. s. i. (150-130 kg/cm^2) and note corresponding to the leakage "B" on the test sheet at (7).

To check the brake control unit.

30 To check the brake control unit for leakage.

This test should take place 20 minutes after building up pressure in the brake accumulators (see paragraph 20).

Give a slow stroke of the pump and note the pressure existing in the accumulators (pressure on the needle of the pressure gauge (M2) appears to be steady).
This pressure should be greater than 1137 p. s. i. (80 kg/cm^2). Note the result on the test sheet at (15) "Good or Bad". If not, it is necessary to work on the brake control unit when the tests are completed.

32 To check the pressure switches.

1st case : Switch on the ignition. If the pressure obtained before is greater by 1137 p. s. i. (80 kg/cm^2), operate the brake pedal until the red light comes on. Give a slow stroke of the pump and note the pressure (see preceding paragraph) on the test sheet at (12). This pressure should be $853 \,^{+290}_{0}$ p. s. i. ($60 \,^{+20}_{0}$ kg/cm^2).

TOOLS

2nd case : If the pressure obtained in paragraph 30 is less by 853 p.s.i. (60 kg/cm^2), the light should be alight (otherwise the pressure switches are defective). Pump until it is extinguished which should produce a pressure between 853 and 1137 p.s.i. (60 and 80 kg/cm^2).

32 To check the inflation pressure of the brake accumulators.

a) Drain the brake accumulators by operating the hydraulic brake pedal.

b) Make sure that the bleed screw "b" of the test bench is closed. Operate the pump. The pressure mounts rapidly, then remains steady. Note this pressure on the test sheet at (13).

This is the inflation pressure of the brake accumulator with the lowest inflation. This pressure should be $580 \overset{+\ 28}{-\ 150}$ p.s.i. ($40 \overset{+\ 2}{-\ 10}$ kg/cm^2). If not, replace one or both accumulators.

To check the hydraulic gear selector.

33 If the leakage "B" (see paragraph 29 d) 3rd) is greater by 10 cm^3/mn, it is necessary to disconnect the steering feed pipe from the pressure distributor. Close the orifice of the pressure distributor by means of the plug (V). With the engine running, put the auxiliary clutch control lever in the "RUNNING" position.

34 Operate the gear lever several times through all the gears. Put the lever in the neutral position. Note the time for the needle to move from 2133 to 1849 p.s.i. (150 to 130 kg/cm^2) (see NOTE, paragraph 26), after the 2nd cutting out, after having put the lever in the neutral position. Note the leakage :

D when the steering is connected (at 9) on the test sheet.
E when the steering is disconnected (at 10) on the test sheet..

IMPORTANT NOTE - Remove the blanking plate fitted during the course of the operation mentioned in paragraph 24.

Interpretation of the results.

Calculate the total leakage on the test sheet as indicated at (11).
In any case, this leakage (at 122°F) (50°C) should not exceed 80 cm^3/mn. With the leakage C - A1, it should not exceed 30 cm^3/mn.
Do not interfere with the hydraulic gear selector if the leakage is less or equal to 50 cm^3/mn.

TO CHECK A NON-RETURN VALVE (see Pl. 76).

35 Insert the assembly of the pressure gauge and union, sold under the number 2294-T between the low pressure pump and the delivery pipe. Start the engine and bleed the low pressure system by operating the gear selector lever several times .....

Union and pressure gauge 2294-T

36 Stop the engine, note the pressure gauge. The pressure should be between 8 and 14 p.s.i. (0.600 and 1 kg/cm^2) and should not fall, if so, the valve is defective. No interference is possible on this unit. It is necessary to replace it with a unit complying with the above characteristics.

Relationship between leakage and fall in pressure from 2133 to 1849 p. s. i. (150 to 130 kg/cm^2) for different main accumulator pressures.

TIME		Pressure of accumulator (obtained in paragraph 23)			
		50	55	60	65
Seconds	Hundredths of a minute	Leakage in cm^3/mn			
120	200	10	11	12	13
114	190	10	12	13	14
108	180	11	12	14	14
102	170	12	13	15	15
96	160	12	14	16	16
90	150	13	15	17	17
84	140	14	16	18	19
78	130	15	17	19	20
72	120	15	18	21	22
66	110	18	20	23	24
60	100	20	22	25	26
57	95	21	23	26	27
54	90	22	24	28	29
51	85	24	26	29	30
48	80	25	27	31	32
45	75	26	29	33	35
42	70	29	31	36	37
39	65	31	34	38	40
36	60	33	37	42	43
33	55	36	40	45	47

TIME		Pressure of accumulator (obtained in paragraph 23)			
		50	55	60	65
Seconds	Hundredths of a minute	Leakage in cm^3/mn			
30	50	40	44	50	52
29	48	42	46	52	54
28	46	43	48	54	56
26	44	45	50	57	59
25	42	48	52	59	62
24	40	50	55	62	65
23	38	52	58	65	68
22	36	55	61	69	72
20	34	59	64	73	76
19	32	62	68	78	81
18	30	66	73	83	86
17	28	71	78	89	92
16	26	77	84	96	100
14	24	83	91	104	108
13	22	91	100	113	118
12	20	100	110	125	130
11	18	110	122	140	144
10	16	125	137	156	162
8	14	140	157	178	200
7	12	165	183	208	216
6	10	200	220	250	260

Example : Rack control (leakage "C").

The time for the needle to move from 2133 to 1849 p. s. i. (150 to 130 kg/cm^2) (obtained in paragraph 28) is 25 seconds.

The main accumulator pressure (obtained in paragraph 23) being 782 p. s. i. (55 kg/cm^2).

The leakage "C" is 52 cm^3.

Service Department

HYDRAULIC TEST

M	CHASSIS No.	DATE OF TEST .....
RECORD	DATE PURCHASED	MILEAGE .....

The fluid should be at a temperature of 122°F. (50°C.) in order to carry out these tests.

ASSEMBLY 1

HIGH PRESSURE PUMP (engine at 600 r.p.m.)

Pressure	Seconds	Reading of Indicator
1777 p.s.i. (125 kg/cm^2)	(1).....	(1a).....
853 p.s.i. (60 kg/cm^2)	(2).....	(2a).....

REGULATOR

Accumulator	Cut-out	Cut-in	Time Noted	Leakage "A"
(3)...kg/cm^2	(4)...kg/cm^2	(5)...kg/cm^2	(6).....mn	(6)... cm^3/mn

ASSEMBLY 2

STEERING

	Time Noted	Apparent Leakage	Unit Leakage
Rotating union (free)	(7).....	B = ...cm^3/mn	B-A= .....cm^3/mn
Rack control	(8).....	C = ...cm^3/mn	C-A$_1$= .....cm^3/mn
Rotating union (locked)	(8a).....	A$_1$= .....cm^3/mn	A$_1$-A= .....cm^3/mn

HYDRAULIC GEAR SELECTOR

	Time Noted	Apparent Leakage	Unit Leakage
Highest reading steering connected.....	(9).....	D = ...cm^3/mn	D-B or E-A } =.....cm^3/mn
Highest reading steering disconnected	(10).....	E= .....cm^3/mn	

BRAKES

Pressure switches	(12).....
Accumulators — Pressure.	(13).....
Accumulators — Valve leakage	(14).....
Hydraulic control	(15).....

TOTAL LEAKAGE

Highest reading steering connected...	(11) D or E+B-A } = cm^3/mn
Highest reading steering disconnected	

PARTICULAR POINTS

Replacement of the high pressure pump belts.

Removal.

In the case of abnormal belt wear, it is necessary to replace the driving pulley (see Op. DS 231-4).
It is necessary to replace the two belts, even if one of them appears to be in good condition.

Assembly.

Tension the belts (see Op. DS 231-0).

Replacement of a high pressure pump (cars produced since October 1958).

Removal.

In order to carry out this operation it is necessary to remove the pipe connecting the pump to the pressure regulator.

Assembly.

Tension the belts (see Op. DS 231-0).

Replacement of a high pressure pump (interchangeability).

The new pump (with high pressure outlet separate from the fixing) can be fitted in place of the old type. Fit a new connecting pipe, a new pump tie-rod (L = 137 mm) and fit a reduction bush in the bore receiving the articulating spindle.
Also fit a reduction bush in the pressure control valve if it has not been replaced.

		TOOLS
	REPLACEMENT OF THE HIGH PRESSURE PUMP BELTS	
	Removal (see Pl. 45).	
1	Remove the belts from the dynamo and water pump (see Op. DS 231-4).	
2	Put the auxiliary clutch control lever in the declutched position (push towards the front, then towards the top, in order to lock the lever in this position).	
3	Unscrew the front nut (1) of the clutch fork control rod (4). Disengage the rod from the fork. Do not unscrew the rear nuts (2) and (3) in order to avoid having to re-adjust the clutch clearance	12 mm spanner 12 mm box spanner

		TOOLS
4	Unscrew the nut of the high pressure pump articulating spindle (spanner 2280-T, see Pl. 72, fig. 5). Unscrew the nuts fixing the tie-rod on the high pressure pump and on the water pump. Remove the belt or belts	Spanner 2280-T 12 mm spanner 12 mm box spanner
	1st Note : In the case of abnormal belt wear, it may be necessary to change or adjust the driving pulley (see Op. DS 231-4). 2nd Note : Our Spare Parts Department only sell belts in sets of two. The belts are paired and their dimensions are identical, this is the reason why it is necessary to change both belts even if one appears to be in good condition.	
	Refitting (see Pl. 45).	
5	Put the belts on the driving pulley, then on the high pressure pump pulley. The belts pass between the clutch fork and the clutch casing. Tension the belts (see Op. DS 231-0).	
6	Connect the clutch fork control rod. Tighten the front nut (1)	12 mm spanner 12 mm box spanner
7	Fit the belts on the dynamo and water pump (see Op. DS 231-4).	
8	Put the auxiliary clutch control lever in the engaged position (pull downwards and then towards the rear).	
	REPLACEMENT OF A HIGH PRESSURE PUMP OR A PIPE BETWEEN THE PUMP AND PRESSURE REGULATOR (cars produced before October 1958).	
	Removal (see Pl. 50).	
9	Remove the spare wheel. Remove the spare wheel support and the air deflection panel	12 mm box spanner
10	Release the pressure and retighten the bleed screw (107) of the pressure control valve	8 mm spanner
11	Disconnect the high pressure pump connecting pipe (99) from the pressure control valve (108) (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T
12	Remove the screw from the connecting pipe fixing clip on the gearbox cover	14 mm box spanner
13	Remove the high pressure pump fixing spindle nut on the clutch housing, (spanner 2280-T, see Pl. 72, fig. 5). Remove the thrust washer. Disconnect the pump tie-rod from the pump and unscrew the nut from the fixing stud on the water pump. Remove the belt or belts from the pulley	Spanner 2280-T 12 mm box spanner

		TOOLS
14	Disconnect the pump feed pipe from the reservoir. Remove the pump fixing spindle from the boss on the clutch housing and disconnect the pump from the connecting pipe. NOTE - In the case of replacing a connecting pipe, remove the pump assembly and pipe. When assembling, engage the connecting pipe in the bore of the pump front plate and put the pump assembly and connecting pipe in position.	
15	Remove the pump feed pipe from the pump. Refitting (see Pl. 50).	
16	Connect the feed pipe to the pump. Fit a rubber bush under the clip. Tighten the clip (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2438-T
17	Fit the seal rings on the fixing spindle (tapered sleeve MR-3384-11, see Pl. 94, fig. 3).....	Tapered sleeve MR-3384-11
18	Fit the pump on the fixing spindle, the flat on the spindle facing the pulley.	
19	Engage the fixing spindle in the bore in the clutch housing. Fit the distance washer. Fit the nut.	
20	Put the pump feed pipe in position: pass it through the rubber grommet on the radiator tie-bar, through the rubber ring on the radiator water hose pipe, then through the rubber grommet on the battery support.	
21	Put the belt in position on the pump pulley. Tension the belt (see Op. DS 231-0). Tighten the nut of the tie-rod (plain and spring washers). Tighten the pump fixing spindle (spanner 2280-T, see Pl. 72, fig. 5).....	12 mm box spanner Spanner 2280-T
22	Refill the pump with fluid through the feed pipe. Connect the feed pipe to the outlet pipe. Fit the rubber bush on the pipe and tighten the clip. Fit the connecting pipe (99) to the pressure control valve (108) (spanner 2220-T, see Pl. 72, fig. 4). Fix the clip for the pipe to the gearbox cover	Spanner 2220-T 14 mm box spanner
23	Unscrew the bleed screw (107) of the pressure control valve. Start the engine. Let it idle for a few minutes. Tighten the bleed screw. Put the system under pressure. Check the unions for leaks. Stop the engine.	8 mm spanner
24	Fit the air deflection panel. Fit the spare wheel support. Fit the spare wheel	12-14 mm box spanners

		TOOLS
	REPLACEMENT OF A HIGH PRESSURE PUMP (cars produced since October 1958).	
	Removal.	
25	Remove the spare wheel, the spare wheel support and the air deflection panel	12 mm box spanner
26	Release the pressure and retighten the pressure control valve bleed screw	8 mm spanner
27	Disconnect the pipe between the pump and the pressure regulator, from the pump and remove the pipe	12 mm spanner
28	Remove the nut from the high pressure pump fixing spindle (spanner 2280-T, see Pl. 72, fig. 5). Unscrew the nut fixing the pump tie-rod on the water pump and disconnect the tie-rod from the pump.	
	Remove the belts from the high pressure pump pulley	Spanner 2280-T
29	Disconnect the pump feed pipe from the reservoir. Remove the pump fixing spindle and remove the pump. Remove the pump feed pipe	12-14 mm box spanners
	Refitting.	
30	Connect the feed pipe to the pump. Tighten the Ligarex clip inserting a rubber sleeve (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
31	Offer up the pump and put the fixing spindle in position. Fit the thrust washer and the nut without tightening.	
32	Put the pump feed pipe in position: pass it through the rubber grommet on the radiator tie-bar through the rubber ring on the radiator water hose, then through the rubber grommet on the battery support.	
33	Put the belts in position on the pump pulley. Tension the belts (see Op. DS 231-0).	
	Tighten the nut of the tie-rod and the pump fixing spindle (spanner 2280-T, see Pl. 72, fig. 5)	12-14 mm box spanners Spanner 2280-T
34	Fill the pump with fluid through the feed pipe. Connect the pipe to the reservoir and tighten the Ligarex clip, inserting a flexible sleeve (pliers 2483-T, see Pl. 17, fig. 2).....	Pliers 2483-T
35	Connect the pipe between the pump and pressure regulator	12 mm spanner
36	Start the engine. Put the systems under pressure and check the unions for leakage	8 mm spanner
37	Fit the air deflection panel, the spare wheel support and the spare wheel	12 mm box spanner

		TOOLS
	REPLACEMENT OF A CONNECTING PIPE BETWEEN THE HIGH PRESSURE PUMP AND PRESSURE REGULATOR (cars produced since October 1958).	
	Removal.	
38	Remove the spare wheel, the spare wheel support and the air deflection panel	12 mm box spanner
39	Release the pressure, then retighten the pressure regulator bleed screw	8 mm spanner
40	Remove the screw of the clamp fixing the connecting pipe on the gearbox cover. Unscrew the unions and disconnect the connecting pipe from the pump end plate and from the pressure regulator. Remove the pipe from the front of the car	12-14 mm spanners
	Refitting.	
41	Offer up the connecting pipe. Connect the unions to the pressure regulator and to the high pressure pump and tighten moderately. Tighten the screw of the clamp fixing the connecting pipe on the gearbox cover.....	12-14 mm spanners
42	Start the engine. Put the systems under pressure and check the unions for leakage.....	8 mm spanner
43	Fit the air deflection panel, the spare wheel support and the spare wheel	12 mm box spanner
	REPLACEMENT OF A HIGH PRESSURE PUMP (Interchangeability).	
44	The new type pump (with high pressure outlet separate from the fixing) can be fitted in place of the old type pump, on condition that a new connecting pipe between the pump and pressure regulator and a new pump tie-rod (length 137 mm) are fitted. In order to fit the pump articulating spindle, it is necessary to fit a reduction bush, sold by our Spare Parts Department under the number DS 391-50,in the bore of the fixing boss on the clutch housing. If the pressure regulator is suited for an 8 mm diameter connecting pipe, it is also necessary to fit a reduction bush, sold by our Spare Parts Department under the number DS 391-161, in the boss of the pressure regulator receiving the connecting pipe.	

PARTICULAR POINTS

Dismantling (see Pl. 81).

3 *Retain the tie-rod fixing plate if it is of the type shown on fig 4 and 5. If not replace it.*

5 *If the shaft is replaced, it is necessary to replace the needle bearings.*

6-7 *Do not separate or mix the piston and cylinder assemblies. Use a rack in order to avoid mixing the pistons and cylinders. (Adopt an order of dismantling).*

9 *The bearing of the end plate is renewed after each dismantling.*

Assembly (see Pl. 81).

12 *Grind the valve seats on the cylinders, by rubbing lightly on abrasive paper No 600 dipped in alcohol and placed on a surface plate.*
Carry out the same operation on the front face of the distance piece (15).

13 *(a) Make sure that the cylinders are manufactured according to the drawing fig. 1 and possesses a diameter of 18·5 ± 0·05 mm. at the seating for the ring seal (24). If not, replace the piston and cylinder assemblies and the pump body.*
(b) With the cylinders in position make sure that their face "d" is level with the lower part of the hole "e".
(c-d) Do not fit old valves, replace them. The valve guides (10) are only in position when they are below the level of the pump body.
(e) Tighten the screws of the tie-rod to 25¼ ft/lb (3·5 m.kg)

14 *Check for leakage from the valves (see paragraph 22 below)*

15 *If the face of the inner cage of the bearing (nylon cage side) shows signs of scratches or if grinding has left criss-cross marks, the bearing cannot be used. Offer up the bearing, the nylon bush towards the pump and the inner cage greased with castor oil.*

16 *Select a push-rod in good condition and measure with a micrometer. Select from the push-rods sold by our Spare Parts Department, 7 push-rods of the next greater length. All the push-rods should be the same length within 0.05 mm.*

20 *Tighten the pulley nut to 25¼ ft./lb (3·5 m. kg.).*

21 *Check the output of the pump (see Op. DS 391-0, paragraphs 10 and 11 and 17 to 22), on the car or by means of the test bench 2298-T.*

Checking for leakage from the valves (see Pl. 85).

23 *Build the pressure up to 2150 p.s.i. (150 kg/cm²) The needle of the pressure gauge should remain steady, or drop so slowly as to be scarcely perceptible.*
There should be no leakage between the end plate and the casing, otherwise the ring seals of the valve guides should be replaced.
There must be no leakage between the cylinder and the pump body, if so this indicates faulty assembly of the cylinders or ring seals (24). If the pressure does not rise or if the needle falls rapidly, bleed the system (three or four times). If the needle does not remain stationary, the valves are defective.

		TOOLS
	DISMANTLING (see Pl. 81).	
1	Drain all fluid from the pump.	
2	Hold the mounting bracket of the front end plate in a vice. Use vice soft jaws made of copper or aluminium. Remove the pulley nut. Hold the pulley whilst undoing the nut, using the spanner 2281-T (see Pl. 82, fig. 1). Remove the pulley and its key. Disengage the steel dust cover (1), the thrust washer (2) and the seal ring (3)	Spanner 2281-T 19 mm box spanner
3	Remove the nut (4) and the screws (5) fixing the end plate. Remove the tie-rod fixing plate. Retain this plate if it is of the type shown on fig. 4 and 5. If not, replace it...	12 mm box spanner
4	Remove the pump housing (extractor 2282-T, see Pl. 82, fig. 2). Remove the joint (6) from the body of the pump	Extractor 2282-T
5	Extract the shaft from the end plate bearing (extractor 2282-T, see Pl. 82, fig. 3)	Extractor 2282-T
	NOTE - If the shaft is to be replaced, it is also necessary to replace the needle bearings (25).	
6	Remove the pump and hold it vertically by hand, the swash plate towards the top. Remove the shaft.	
	NOTE - The pistons and cylinders are paired on assembly and must not be separated or mixed. Remove the push-rods (7).	
7	To dismantle the pistons. Use the wooden rack MR-3301-80 (see Pl. 83, fig. 1) in order to avoid mixing the parts. Disengage the pistons from the cylinders. Commence the operation with the piston situated nearest to the rod supporting the swash plate. Adopt an order of dismantling, for example, in a clockwise direction and put the piston from left to right in the rack, with the holes for the cylinders towards the operator, after having removed the cups and springs	Rack MR-3301-80
8	Using a mallet, drive out the end plate (8) from the body of the pump (9) steadying the assembly by hand. When the end plate is free, turn the assembly over in order to avoid dropping the cylinders. Pay attention to the order of disassembly of the parts. Remove the valve guides (10), the springs (11) and the valves (12). Remove the cylinders (13) carrying out the same order of dismantling as for the pistons (in an anti-clockwise direction, when holding the pump body by hand, the valve seats positioned towards the top), and put the cylinders in the rack facing the corresponding pistons, remove the cylinder seal rings (24). Drive out the rod (14) from the pump body.	
9	Drive out the distance piece and seal assembly (15) and end plate bearing, by using a mandrel. The bearing must be replaced after each dismantling. Disengage the seal ring (16) from the end plate and the joint (17) from the distance piece	Mandrel = 17 mm dia. Length = 150 mm.

TOOLS

10 Remove the nut locking the thrust bearing. Remove the thrust bearing and the swash plate. With a magnifying glass make sure that there is no pitting or coppering of the thrust plates and ball bearings. The bearing must not be refitted if there is any trace of defect. Tighten the nut to $25\frac{1}{4}$ ft/lbs (3.5 m.kg) (lockwasher) ..... — 21 mm box spanner

11 Clean the parts with alcohol.

ASSEMBLY (see Pl. 81).

12 To prepare the cylinders and distance pieces.
Grind the valve seat on the cylinder, by rubbing lightly on abrasive paper No. 600 dipped in alcohol.
The abrasive paper should be placed in a surface plate.
Clean with alcohol and blow with compressed air.
Return each cylinder to its original position in the rack.
Carry out the same operation on the front face of the distance piece (15).

13 To prepare the pump body :

NOTE - Since January 1959, the DS 19 is fitted with a modified high pressure pump.
This modification consists of the addition of a seal ring between the cylinders and the pump body.
The modified parts are as follows : pump body and cylinders.
Our Spare Parts Department will only supply new parts.
Make sure that the cylinders are manufactured as shown on Pl. 81, fig. 6, and have a diameter "b" = 18.5 ± 0.05 mm. If not, replace the piston and cylinder assembly.

a) Put the rod (14) in position using a press (see Pl. for position).

b) Place the body of the pump on two vee blocks whose thickness is less than 50 mm. Do not use the stand MR-3053-190 which can damage the bore of the pump body when pressure is used for fitting the cylinders in position. Put the seal rings (24), previously smeared with hydraulic fluid, in the grooves of the bores receiving the cylinders, in the pump body. If necessary, press the seals in position by means of an old steering piston or a tube.

Put the cylinders (13) in osition in the pump body (9) in the same order as when dismantling (from left to right). Smear the collar of the cylinder with alcohol. Offer up the cylinder.in the bore of the pump body and press sufficiently strongly by means of a mandrel up to the moment when it becomes locked (seal in the collar). Make sure that the face "d" is level with the lower part of the hole "e" in the body (see fig. 6)..... — Tube : External dia. = 20.5 mm Internal dia. = 15 mm Length = 150 mm

c) Fit the valves (12) smeared with hydraulic fluid.

NOTE - Do not fit old valves, replace them.

d) Fit the valve guides (10). The guides are only in position when they are below the level of the pump, if not, the guides are bearing on the valves. Put the ring seals (18) smeared with hydraulic fluid, on the guides. Fit the valve springs (11)

TOOLS

e) Fit the end plate seal ring (16) (soaked in fluid) on the hub of the front end plate.

Offer up the end plate (8) in the pump body (pay attention to the positioning) and fit by hand. Fit the screw (5) (serrated washer).

Fit the tie-rod fixing plate. Insert the serrated washer between the fixing plate and the end plate (not under the heads of the screws). Tighten the screw to $25\frac{1}{4}$ ft/lbs (3.5 m.kg) ..... Torsion spanner 2471-T and 12 mm socket.

14 To check the valves for leakage.

Use the test bench 2290-T. Place the pump on the stand MR-3365-60 and proceed as indicated in paragraph 21 and onwards ..... Test bench 2290-T Stand MR-3365-60

15 To measure the length of the push-rods (7) (see Pl. 84 A).

a) Maintain a pressure of 2133 p.s.i. (150 kg/cm^2).
Mark a cylinder and insert a ball 6 mm diameter (ball 2707.S).
Insert the piston corresponding to the cylinder and fit a new push-rod 29.50 mm long (push-rod D 391-519).
Push the shaft in position in the pump body and centre in the fixture (A).
Fit the rod (B) in the hole in the upper part of the shaft and position the dial gauge pin in the centre of the rod (dial gauge sold under the number 2437-T).

b) Turn the upper plate of the shaft, in order to bring its thrust shoulder on the fixture (A) and place the large needle on "0" of the dial gauge face.
Continue to turn the plate until the position corresponds to the maximum lift of the shaft, recorded by the dial gauge. Count the number of turns and fractions of turns, thus "m".
In the example selected, the length of the push-rods fitted in the cylinder being $l_1 = 35 - m$.

c) Remove the push-rod, the piston and the ball from the cylinder.

d) Carry out the same operations as in lines a) and b) above on the two other cylinders and calculate the length of the push-rods, thus "l_2" and "l_3".

e) Take the average of these measurements in order to obtain length "l" of the push-rods fitted on the pump.

$$l = \frac{l_1 + l_2 + l_3}{3}$$

16 To fit the bearing in the end plate. To fit the pistons :

a) Fit the seal ring (17) soaked in castor oil, on the distance piece (15). Fit the spring (20) and the distance piece (15) in the pump. Check the condition of the surface of the inner cage of the bearing (nylon cage side). This face should show no signs of scratches, blows or markings. If grinding the face has left criss-cross marks, the bearing cannot be used. Grease this face with castor oil. Offer up the bearing in the end plate. The nylon bu h towards the interior of the pump. Put the bearing in position using a press. Position the distance piece with the mandrel MR-3436-110 (see Pl. 83, fig. 3).

b) Fit the cup (21) on the piston. Make sure that the circlip (22) is in position in the cup. Oil the piston by dipping it in hydraulic fluid. Fit the return spring (23), engage the piston in the corresponding cylinder. Observe the order of disassembly. Hold the piston using the clip 2284-T, see Pl. 83, fig. 4. The long clip is fitted on the piston facing the outlet. Carry out the same procedure on the other pistons ..... Mandrel MR-3436-110 Clip 2284-T

TOOLS

17 Fit the push-rods (7). Offer up the shaft, engage by hand. Fit the olive (19) in the groove in the swash plate and on the rod (14) and complete the fitting of the shaft in a press (mandrel 2286-T, see Pl. 84, fig. 1).
Remove the clips retaining the pistons.
Make sure that the push-rods enter the sockets in the swash plate and that the olive does not bind on the guide.
Turn the shaft and check to see that there is no stiffness anywhere ..... Mandrel 2286-T

18 Grease the bearing (bearing grease).

Fit the seal ring (3), the thrust washer (2) and the dust cover (1) ..... Tube :
External dia. = 56 mm
Internal dia. = 48 mm
Length = 60 mm

19 Fit the seal (6) in the groove of the pump body.

Offer up the pump casing on the body. Its position is located by the fixture. Put the casing in position in a press after having smeared the pump body with hydraulic fluid (fixture 2287-T, see Pl. 84, fig. 2) ..... Fixture 2287-T

20 Fit the key, the pulley and lockwasher. Tighten the nut to $25\frac{1}{4}$ ft/lbs (3.5 m.kg). Hold the pulley with the spanner 2281-T (see Pl. 82, fig. 1). Turn over the lockwasher ..... 19 mm box spanner
Spanner 2281-T

21 Bench test the pump.

The output of the pump can only be checked after the pump has been fitted on the car (see Op. DS 391-0, paragraphs 10 and 11 and 17 to 22) or by means of the test bench 2298-T (see Pl. 174 and 177) ..... Test bench 2298-T

CHECKING FOR LEAKAGE FROM THE VALVES (see Pl. 85).

In order to carry out this operation, the test bench should be prepared as indicated on Pl. 172. (The orifice of the pump connected to a pressure gauge 0-2844 p.s.i. (0-200 kg/cm^2)..... Test bench 2290-T

22 *Cars produced before December 1958*:

Connect the union (T) on the pump, using the pipe (I), connect the orifice "a" of the test bench pump to the union (T).

23 *Cars produced since December 1958:*

Connect the orifice "a" of the test bench pump to the high pressure pump, using the pipe (SI).

Make sure that the bleed screw "b" has been tightened. Operate the pump.
The pressure should be raised to 2150 p.s.i. (150 kg/cm^2). If the sealing is good, the needle of the pressure gauge should remain stationary, or drop so slowly, as to be scarcely perceptible. There must be no leakage of fluid between the end plate and the body, otherwise the seal rings of the valve guides should be replaced.
There must be no leakage of fluid between the cylinder and the pump body (casing side), otherwise this indicates faulty assembly of the cylinders or the joints (24).
If the pressure does not rise or if the needle falls quickly, unscrew the bleed screw "b" in order to bleed the system.
Retighten the bleed screw and operate the pump. In this way, any impurities under a valve can be carried away by the flow of fluid. If after 3 or 4 tests, the needle does not remain stationary, the valves are defective.

24 Unscrew the test bench bleed screw "b". Remove the pump.

PARTICULAR POINTS

Removal.

Hold the pressure regulator above the level of the fluid in the reservoir and disconnect the rubber pipe from the pressure regulator.

Disconnect the accumulator from the pressure regulator and check the pressure (see Op. DS 391-6)

Assembly.

Tighten the accumulator on the pressure regulator by hand.

		TOOLS
	REMOVAL (see Pl. 50).	
1	Remove the spare wheel, the spare wheel support and the air deflection panel	12 mm box spanner
2	Release the pressure	8 mm spanner
3	Disconnect from the brake accumulator; the pipe between the pressure regulator and the brake accumulator (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
4	Loosen the strap (100) fixing the pressure regulator, remove the upper screw. Disconnect the pipe (99) between the high pressure pump and the pressure regulator from the pressure regulator (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T or 14 mm spanner
5	Remove the pressure regulator (108), hold it above the level of the fluid in the reservoir and disconnect the rubber pipe from the pressure regulator. Attach this pipe to the upper part of the reservoir.	
6	Remove the connecting pipe between the pressure regulator and the brake accumulator from the pressure regulator (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
7	Disconnect the accumulator from the pressure regulator and check the pressure.	
	REFITTING (see Pl. 50).	
8	Connect the accumulator to the pressure regulator. Tighten by hand.	
9	Connect to the pressure regulator; the connecting pipe between the pressure regulator and the brake accumulator.	

		TOOLS
10	Connect the rubber pipe to the pressure regulator, position the reservoir end of the pipe towards the front. Where the clip is fitted, fit a rubber sleeve. Fit the clip and tighten it.	
11	Put the pressure regulator in position. Do not distort the pipe between the pressure regulator and the brake accumulator. Connect the pipe (99) between the high pressure pump and the pressure regulator, to the pressure regulator, tighten the union by hand. Refit the upper fixing screw (plain and spring washers under the head). Fit the screws without tightening.	
12	Tighten the union on the pressure regulator, of the pipe connecting the pump to the pressure regulator (spanner 2220-T, see Pl. 72, fig. 4)	Spanner 2220-T or 14 mm spanner
13	Put the strap (100) fixing the pressure regulator in position. Tighten the upper screw. Tighten the strap. Check that the rubber return pipe to the reservoir is not rubbing on the brake accumulator outlet pipes.....	8-12 mm spanners 8-12 mm box spanners
14	Connect the pipe between the pressure regulator and the brake accumulator to the accumulator. Check the tightening of the pipe union on the pressure regulator (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or 2221-T
15	Unscrew the bleed screw (107) on the pressure regulator. Start the engine, let it idle for a few minutes, retighten the bleed screw. Put the systems under pressure. Check the unions for leakage. Check and if necessary, top up the level of the fluid in the reservoir	8 mm spanner
16	Refit the air deflection panel and the spare wheel support. Fit the spare wheel	12 mm box spanner

PARTICULAR POINTS

Dismantling.

4 *Remove the cap. Compensate the thrust of the inner spring, by means of a press, in order to eliminate any strain on the threads for the cap. This precaution is necessary in order to avoid stripping the last threads.*

Assembly.

9 *Adjust the position of the plate retaining the ball forming the non-return valve. Clearance "d" between the plate and the ball — 0,1 to 0,2 mm for the thin plates and the clearance "d" 0.3 to 0.4 mm for the thick plates (see Pl 86, fig 2).*

10 *Check the tightening of the cylinder nut, 22 ft./lb (3 m. kg.).*

11 *Make sure that centre spring thrust cup is drilled; if not drill it (see Pl 86, fig 1 and 3).*
The threads of the cap should be thoroughly clean and freely greased with castor oil before being fitted on the body of the pressure regulator.
Compensate the thrust of the inner spring, by means of a press, in order to eliminate any strain on the threads for the cap.

Check the cutting-out (test bench 2290-T, see Pl. 87).

15-16 *Build up the pressure. At the exact moment of cut-out, the fluid should flow through the orifice (f) to the reservoir. Read the maximum pressure at the exact moment of cut-out (the needle drops immediately afterwards). This pressure should be between 3.130 and 2.420 p.s.i. (150 and 170 kg/cm²).*

Checking for leakage.

17 *After cutting out, the pressure gauge should show no drop in pressure.*

Checking the cutting-in.

18 *After cutting out, unscrew the bleed screw of the pressure regulator in order to reduce the pressure to 1,990 p.s.i. (140 kg/cm²). Retighten the bleed screw and operate the pump. If there is a flow the control valve has not cut-in. If there is no flow, the control valve has cut-in.*

Recommence the operation at 1,920 p.s.i. (135 kg/cm²) and at 1,850 p.s.i. (130 kg/cm²) if necessary. The cut-in should be between 1,850 and 1,990 p.s.i. (130 and 140 kg/cm²).

Checking the initial pressure of the accumulator.

22 *Build up the pressure. The pressure will not rise, then rises rapidly and remains steady at the pressure of the accumulator.*
At 20 C, this pressure should be 925 ± 70 p.s.i. (65 ± 5 kg/cm²)
— 210 — 15

TOOLS

DISMANTLING (see Pl. 86).

1 Disconnect the accumulator from the pressure regulator (strap wrench 2223-T, see Pl. 93, fig. 1)..... — Strap wrench 2223-T

2 Remove the piston (1). Remove the plate (2) retaining the ball valve (3).

Do not lose the shim or shims (4) found under the plate. Remove the ball.

3 Remove the bleed screw (5), take out the ball (6).

4 To remove the cap (7). Screw the spindle in the thread of the union of the connecting pipe. Hold the regulator, if need be, with an extension placed on the spindle resting against the framework of a press.

Put the spanner in position on the cap and hold it in this position in a press, (the cap is tightened to 72 ft/lbs (10 m.kg). Unscrew the cap. There is a very great thrust by the spring (9). Compensate this thrust by using a press. During the unscrewing of the cap, ease off the press in order to avoid binding on the threads (assembly of spanner and spindle is sold under the number 2224-T, see Pl. 93, fig. 2).

NOTE - This precaution is absolutely necessary in order to avoid stripping the threads.

Remove the adjusting washers (8), the spring (9) and the spring washer (10)..... — Spanner and spindle 2224-T

5 Remove the cap seal (11), the accumulator joint, the ring seal (12) from the bleed screw and the ring seal (13) from the piston.

6 Clean the parts with alcohol. Blow with compressed air.

ASSEMBLY (see Pl. 86).

7 To prepare the body of the regulator.

1. Remake the seating of the ball (3) on the return valve seat "a".

(a) Place the body vertically on a wooden board.
Place a ball that is *in good condition on the seat.*

(b) Make a good seating by striking on the ball, using a hammer and a drift. Remove the ball..... — Drift 5 dia. Length 60.

2. Remake the seating of the ball (6) on the seat "b" of the bleed screw.
Place a ball that is in good condition on the seat. Make a good seating by striking *lightly* on the ball, using a hammer or a drift. Remove the ball ..... — Drift 10 dia. Length 120.

		TOOLS
8	Fit the seal ring (13) smeared with fluid on the piston (1) (cone 2226-T, see Pl. 93, fig. 4). Plunge the piston in fluid and put in position in the cylinder. Check the grease groove in the cylinder (14)	Cone 2226-T
9	Fit a new ball (3) on the non-return valve seat. Fit two adjusting shims (4) and the plate (2) found when dismantling. Tighten the screw. Hold the plate in position during the tightening with a screwdriver. Using feelers with the ends bent at right angles, check the clearance existing between the plate and the ball. The clearance "d" should be between 0.3 and 0.4 mm for the thick plates and 0.1 and 0.2 mm for the thin plates with a round head screw. Obtain this condition by changing the number of shims (4).	
10	Check the tightening of the cylinder nut (15) 22 ft/lbs (3 m.kg)	24 mm box spanner
11	Place the spring washer (10) fitted with the ball in the body of the regulator. Make sure that the piston returns sufficiently to allow the ball to seat correctly on its seating. NOTE - If the ball is not marked, you can refit the spring washer after having drilled a hole to the dimensions shown on fig. 3, the spring washer must not be fitted undrilled. Put the seal (11) in the body of the regulator. Fit the spring (9). Put the adjusting washer (8) in the cap. VERY IMPORTANT - The threads of the cap should be thoroughly clean and free from all traces of aluminium dust and freely greased with *castor oil* to the exclusion of all other products. If the adjustment necessitates the removal of the cap, it is necessary *on each occasion* to carry out the cleaning and greasing precautions	Spanner and spindle 2224-T
	The regulator being held by means of the spindle as indicated in paragraph 4, put spanner in position on the cap. With a press, compensate for the thrust of the spring and bring the first threads of the cap and the pressure regulator into contact without using force. Increase the tension on the press as the cap is screwed into position. If the pressure is not correct, the tightening will become stiff.	
12	Fit the seal ring (12) on the bleed screw (5) (cone 2225-T, see Pl. 93, fig. 3). Fit a *new ball* (6), moderately tighten the screw	Cone 2225-T
13	Bench test the pressure regulator (see this operation, paragraphs 14 and onwards)	Test bench 2290-T
	CHECKING THE CUTTING-OUT (see Pl. 87).	
	In order to carry out this operation, close the pump orifice with the plug (V).	
14	Fit the plug (L) in place of the accumulator. Insert a joint. Connect the inlet orifice "d" of the pressure regulator to the orifice "a" of the test bench pump, using the pipe (S) or the pipe 2297-T. Connect the outlet orifice "e" of the pressure regulator to the pressure gauge (M3) using the pipe (J)	Pipe 2297-T

TOOLS

15 Make sure that the bleed screw "b" is tightened and operate the pump in order to build up pressure to obtain a cut-out. At this moment, the fluid should flow through the orifice "f" to the reservoir and the pump lever is operated without any resistance.

Read the maximum pressure at the precise moment of cut-out. The needle drops immediately afterwards.

The needle of the pressure gauge (M3) should indicate a maximum pressure between 2130 and 2420 p. s. i. (150 and 170 kg/cm^2).

If the pressure regulator is defective, the pressure shown on the pressure gauge (M3) will not remain steady, the fluid flows through the orifice "f" and the lever is hard to operate.

NOTE - If the pressure indicated is outside the limits mentioned above, without leakage (see following paragraph), it is necessary in consequence to modify the number of shims (8) (see Pl. 86).

If one cannot obtain a cut-out, or constant flow of fluid through the orifice "f" to the reservoir; the pressure regulator is defective.

CHECKING FOR LEAKAGE

16 After cutting-out, check the pressure gauge (M3); it should not show a drop in pressure, if so, the pressure regulator is defective. It is then necessary to reseat the balls.

CHECKING THE CUTTING-IN

17 After having obtained a cutting-out, unscrew the bleed screw "g" of the pressure regulator in order to bring the pressure indicated on the pressure gauge (M3) to 1990 p. s. i. (140 kg/cm^2). Retighten the bleed screw "g". Operate the pump. If there is a flow, the control valve has not cut-in.

Recommence the operation and obtain a pressure of 1920 p. s. i. (135 kg/cm^2). Operate the pump. If there is no flow through the orifice "f" and the needle of the pressure gauge (M3) begins to rise between 1920 p. s. i. and 1990 p. s. i. (135 and 140 kg/cm^2), the control valve has cut-in.

If the valve has not cut-in, recommence the operation at a pressure of 1850 p. s. i. (130 kg/cm^2). The cut-in should be between 1850 and 1990 p. s. i. (130 and 140 kg/cm^2).

NOTE :

1. If the pressure of cut-in is outside the limits shown above, it is necessary to alter the number of shims (8) (see Pl. 86).
2. These checks can also be carried out on the car (see Op. DS 391-0).

18 Release the pressure by unscrewing the bleed screw "b" on the test bench pump and the bleed screw "g" of the pressure regulator. Remove the pipes (S) or (SI) and (J) and the cap (L).

TOOLS

CHECKING THE INITIAL PRESSURE OF AN ACCUMULATOR (see Pl. 88).

In order to carry out this operation, the test bench should be prepared as shown on Pl. 171 ..... Test bench 2290-T

19 Remove the accumulator (see Op. DS 392-1).

20 Screw on the union (K). Insert a joint. Read the number engraved on the cap of the accumulator. This number indicates the inflation pressure of the accumulator 925 p.s.i. (65 kg/cm^2).

Connect the union (K) to the orifice "a" of the pump, using the pipe (H).

21 Tighten the bleed screw "b". Operate the pump in order to build up the pressure. Check the pressure gauge, the pressure will not rise, then rises rapidly and remains steady at the pressure of the accumulator.

NOTE - At 20°C, this pressure should be $925 \pm \frac{70}{210}$ p.s.i. ($65 \pm \frac{5}{15}$ kg/cm2).

22 Release the pressure by unscrewing the bleed screw "b".

Remove the pipe (H) and the union (K).

		TOOLS
	REMOVAL	
1	Remove the spare wheel, the spare wheel support, the air deflection panel and the left-hand front wing	12-14 mm box spanners
2	Release the pressure in the main accumulator and the brake accumulators	8 mm spanner
3	Remove the clip fixing the fluid reservoir.	
4	Disconnect the pipes from the brake accumulators (spanners 2219-T, 2220-T and 2221-T, see Pl. 72, fig. 4)	Spanners 2219-T, 2220-T and 2221-T.
5	Remove the accumulator fixing plate. Remove the accumulators	12 mm box spanner
	REFITTING	
6	Offer up the accumulators in their bracket on the sidemembers. Fit the fixing plate, position the screws without tightening (plain washer under the head)	12 mm box spanner
7	Fit the accumulator connecting pipe. Tighten the unions (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
8	Connect the brake feed pipes (large pipes) (spanner 2220-T, see Pl. 72, fig. 4).	
	NOTE - Fit the rubber return pipe to the reservoir from the pressure regulator correctly. It must not rub on the brake feed pipes, otherwise a fracture of the pipe will occur	Spanner 2220-T
9	Connect the other pipes to the accumulators (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or 2221-T
10	Position the accumulators so that the pipes are not strained or touching one another. Tighten the fixing plate screws.	12 mm box spanner
11	Fit the fluid reservoir.	
12	Start the engine. Loosen the bleed screw of the pressure regulator. Allow the engine to idle for a few minutes and retighten the bleed screw. Check the unions for leakage.	8 mm spanner
13	Bleed the brake system (see Op. DS 453-0).	
14	Fit the air deflection panel, the wing, the spare wheel support and the spare wheel	12-14 mm box spanners

PARTICULAR POINTS

Assembly.

5 *If, in the course of operation on the car, the accumulator emits a whistling noise, it is necessary to remove the piston (5) (see Pl 89, fig 3).*

7 To check the seating of the valve (test bench 2290-T, see Pl. 92).

The valve should satisfy the following conditions:
For a pressure lower than 21 p.s.i. (1. 5 kg/cm²) there should be no flow through the orifice "r" of the accumulator.
For a pressure greater than 49 p.s.i. (3.5 kg/cm²) there should be a flow through the orifice "r".

8 To check the initial pressure of the accumulator (test bench 2290-T).

Operate the pump in order to build up the pressure. The pressure will not rise, then rises rapidly and remains steady at the inflation pressure. At 20 C, this pressure should be 570 ± 30 p.s.i. (40 + 2 kg/cm²)

9 To check the valve for leakage.

Operate the pump in order to bring the pressure to 700 p.s.i. (50 kg/cm²). There should be no drop in pressure.

		TOOLS
	DISMANTLING (see Pl. 89).	
1	Remove the screw (1) (use a hexagon rod), disengage the distance piece (2), the spring (3), the ball (4) and the piston (5) if it exists; if necessary, blow out with compressed air; blow through one of the openings "b" whilst closing the other	Hexagon rod 6 mm A/F
2	Clean the parts with alcohol. Blow with compressed air.	
	ASSEMBLY (see Pl. 89).	
3	To remake the ball seating; use a ball in good condition. Fit the ball on the seating and strike with a hammer and a rod	Drift - 7 mm dia. Length = 100 mm
4	Clean the parts with alcohol and blow with compressed air.	
5	Put the piston (5) previously smeared with fluid in the bore of the accumulator, the full face of the piston positioned towards the ball.	

TOOLS

NOTE - If the piston (5) was not found during the dismantling, do not fit one.

If in the course of operation on the car, the accumulator emits a whistling noise, it is necessary to remove the piston (5). Fit the ball (4), the distance piece (2) and the spring (3). Tighten the screw (1) ..... Hexagon rod 6 mm A/F

6 Test the accumulator (see following paragraphs) .....

BENCH TESTING A BRAKE ACCUMULATOR

7 To check the seating of the valves (see Pl. 92).

a) In order to carry out this operation prepare the test bench 2290-T as indicated on Pl. 171.

b) Close the outlet "*l*" of the accumulator, using the plug (V).
Connect the orifice "p" of the accumulator to the orifice "a" of the pump, using the test pipe (I).

c) Tighten the bleed screw "b" and operate the pump in order to build up the pressure. The valve should satisfy the following conditions :

- for a pressure lower than 21 p. s. i. (1.5 kg/cm^2) there should be no flow through the orifice "r" of the accumulator.
- for a pressure greater than 49 p. s. i. (3.5 kg/cm^2) there should be a flow through the orifice "r".

d) Release the pressure by unscrewing the bleed screw "b". Disconnect the pipe (I) from the accumulator.
Remove the plug (V).

8 To check the initial pressure (see Pl. 92).

a) Connect the pipe (I) to the orifice "r" of the accumulator, using the union (Y).

b) Tighten the bleed screw "b" and operate the pump in order to build up pressure. Watch the pressure gauge (M1); at first, the pressure does not rise, then rises rapidly and remains steady at 570 ± 30 p. s. i. (40 ± 2 kg/cm^2) at 20°C. (This number is stamped on the plug of the accumulator).

NOTE - If the pressure will not build up or if when built up, falls rapidly, or if there is a flow through the orifice "*l*" or "p", the valve is not seating and it will be necessary to reseat the ball.

c) Release the pressure by unscrewing the bleed screw "b".

9 To check the valve for leakage (see Pl. 92).

a) Prepare the test bench as indicated on Pl. 171.

b) Tighten the bleed screw "b" and operate the pump in order to bring the pressure to 700 p. s. i. (50 kg/cm^2). This is a fairly long procedure. Check the needle of the pressure gauge, it should not show a drop in pressure, if so, the valve is leaking and the ball should be reseated.

c) Release the pressure by unscrewing the bleed screw "b".
Remove the pipe (I) and the union (Y).

PARTICULAR POINTS

Replacement of a reservoir.

Our Spare Parts Department only supply the latest type reservoir.
On cars produced before October 1956, it is necessary to replace the feed pipe by a new type pipe and fit a rubber plug on the orifice for the overflow return.
On cars produced between October 1956 and January 1957, it is also necessary to fit a rubber plug on the orifice for these pipes.

		TOOLS
	REPLACEMENT OF A DISTRIBUTION BLOCK	
	Removal.	
1	Release the pressure. Put the car in the low position	8 mm spanner
2	Disconnect the unions of the distribution block (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or 2221-T
3	Remove the screws fixing the distribution block. Do not mislay the distance washers fitted between the distribution block and the body. Remove the distribution block	8 mm box spanner
	Refitting.	
4	Hold the five unions in the hand before fixing the distribution block.	
5	Fit the distribution block. Insert the distance washers between the distribution block and the body. Tighten the screws (plain washers under the head)	8 mm box spanner
6	Tighten the unions (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or 2221-T
7	Start the engine. Put the systems under pressure. Check the unions for leakage	8 mm spanner
	REPLACEMENT OR CLEANING A HYDRAULIC RESERVOIR FILTER	
	Removal.	
8	*Cars produced before March 1957:* Unscrew the cap on the reservoir outlet pipe and remove the pipe. Unscrew the filter by the knurled part at the base of the outlet pipe. *Cars produced since March 1957:* Disengage the spring retaining the outlet pipe. Withdraw the outlet pipe from the reservoir by pulling upwards.	
9	Remove the filter.	

TOOLS

Cleaning.

10 Clean the filter by immersing in clean alcohol. Blow compressed air through *from the outside.*

Refitting.

11 *Cars produced before March 1957:*

Fit the filter on the outlet pipe, fit the joint. Tighten the knurled cap. Engage the outlet pipe in the reservoir, fit a rubber joint under the cap.

12 *Cars produced since March 1957:*

Make sure that a seal ring is fitted on the upper part of the outlet pipe.

Fit the outlet pipe retaining spring.

REPLACEMENT OF A HYDRAULIC RESERVOIR

Removal (see Pl. 78).

13 Release the pressure ..... 8 mm spanner

14 Remove the spare wheel, the spare wheel support and the left-hand front wing ..... 12-14 mm spanners
12-14 mm box spanners

15 Drain the reservoir.

16 Disconnect the unions of the steel pipes from the reservoir and the feed pipe to the pump from the outlet pipe (spanners 2219-T, 2221-T and 2222-T, see Pl. 72, fig. 4) ..... Spanners 2219-T, 2221-T and 2222-T

17 Remove the clips fixing the reservoir.

18 Disconnect the rubber pipes from the reservoir. Remove the reservoir. Clean the parts with alcohol.

Refitting (see Pl. 78).

Our Spare Parts Department only supply the latest type reservoir.

NOTE - On cars produced before October 1956, it is necessary to replace the feed by a new type pipe and fit a rubber plug on the orifice for the overflow return (see fig. 1).
On cars produced between October 1956 and January 1957, it is also necessary to fit a rubber plug on the orifice for the overflow return (see fig. 2).

		TOOLS
19	Connect the rubber pipes to the reservoir. The return pipe from the pressure regulator to the reservoir is larger at the front. Tighten the clips. Insert under each clip, a flexible bush in order to avoid damage to the pipes.	
20	Fit the fixing clips of the reservoir, fit the reservoir, fit the screws without tightening.	
21	Connect the unions of the steel pipes to the reservoir. Tighten the unions (2219-T, 2221-T and 2222-T, see Pl. 72, fig. 4)	Spanners 2219-T, 2221-T and 2222-T
22	Position the reservoir in order to avoid putting the pipes under tension. Tighten the clips.	
23	Connect the pump feed pipe to the outlet pipe. In the position for the clip, fit a flexible bush. Fit the clip and tighten.	
24	Refill the reservoir.	
25	Unscrew the pressure regulator bleed screw. Start the engine and leave it idling for a few minutes. Retighten the bleed screw. Put the systems under pressure. Check the unions for leakage. Check the level of the fluid in the reservoir with the engine running	8 mm spanner
26	Bleed the brakes (see Op. DS 453-0).	
27	Fit the wing, the spare wheel support and the spare wheel	12-14 mm box spanners

PARTICULAR POINTS

Checking the adjustment of the non-return valve for the rear suspension (test bench 2290-T).

11 *Connect the test bench pump to the central orifice of the distribution block, fit an outlet pipe to the end orifice, long plug end, and close the other openings. Build up the pressure. There should be no flow with a pressure lower than 500 p.s.i. (35 kg/cm²) and there should be a flow for a pressure above 600 p.s.i. (42 kg/cm²).*

12 Check the adjustment of the non-return valve for the front suspension.

Release the pressure. Fit the outlet pipe on the end orifice, flat plug end, and close the orifice, long plug end. Slowly build up pressure; there should be no flow with a pressure lower than 70 p.s.i. (5 kg/cm²) and there should be a flow for a pressure above 98 p.s.i. (7 kg.cm²).

Checking the valves for leakage.

15 *Connect each of the end holes successively to the test bench pump and build up the pressure to 2130 p.s.i. (150 kg/cm²). There should be no drop in pressure.*

TOOLS

DISMANTLING (see Pl. 89, fig. 2).

1 Remove the flat plug (12). Remove the spring (13) and the ball (14). Remove the piston (15) by tapping the block lightly on a piece of wood or blowing with compressed air through one of the centre holes, the others being blocked up.

2 Remove the domed plug (16) and proceed as in the previous operation.

3 Remove the joints (17) from the plugs

4 Clean the parts with alcohol.

ASSEMBLY (see Pl. 89, fig. 2).

5 To reseat the ball on its seating; with a ball in good condition, make an imprint on the seating by striking lightly on the ball with a hammer and a rod. This ball should not be used again..... — Drift 10 dia. Length 150.

6 Clean the block with alcohol. Blow with compressed air.

7 Place in one end of the block; a piston (15) (see illustration for position of the hole "a") a new ball (14), the weaker spring (13), the flat cap (12), together with its joint (17).

8 Carry out the same procedure for the other side. Pay attention to the direction of assembly of the piston (15).

9 Bench test the distribution block (see paragraph 10 and upwards).

TOOLS

CHECKING A DISTRIBUTION BLOCK

In order to carry out this operation, prepare the test bench as indicated on Pl. 171.

Checking the adjustment of the non-return valve for the rear suspension (see Pl. 90).

10 Close the holes of the block using the plug (V) except the central hole "m" and the end hole "n" (long plug end).

Connect the central hole "m" in the block with the hole "a" of the test bench pump using the pipe (H).

Connect the outlet pipe (N) to the hole "n".

11 Make sure that the bleed screw "b" is tight, operate the pump in order to increase the pressure progressively.

The valve should respond to the following conditions :

With a pressure lower than 500 p. s. i. (35 kg/cm^2) there should be no flow through the pipe (N).

With a pressure greater than 580 p. s. i. (42 kg/cm^2) there should be a flow through the pipe (N).

NOTE - If the pressure at which the oil starts to flow is outside the limits, change the spring.

If the pressure drops to "0", the valve is not seating, it is necessary to remake the seating of the ball (see paragraph 5, this operation) or replace the flat based piston (15) with a hollow based piston.

Checking the adjustment of the non-return valve for the front suspension.

12 Release the pressure by unscrewing the bleed screw "b".

Remove the outlet pipe (N) and connect to the hole "0" (flat plug end), after having transferred the plug (V) to plug up the hole "n".

13 Tighten the bleed screw "b" and operate the pump in order to increase the pressure progressively. The valve should respond to the following conditions :

With a pressure lower than 70 p. s. i. (5 kg/cm^2) there should be no flow through the pipe (N).

With a pressure greater than 98 p. s. i. (7 kg/cm^2) there should be a flow through the pipe (N).

In the contrary case, the remarks in paragraph 11 apply.

TOOLS

Checking the valves for leakage (see Pl. 91).

In order to carry out this operation, prepare the test bench as indicated on Pl. 172.

14 Connect the end hole "o" of the distribution block to the hole "a" of the test bench pump, using the pipe (H).

15 Tighten the bleed screw "b". Operate the pump in order to increase the pressure to 2130 p.s.i. (150 kg/cm^2).

The pressure gauge (M2) should not indicate loss of pressure, if so, the valve is defective. It is necessary to replace the ball and remake the seating (see paragraph 5, this operation).

16 Release the pressure unscrewing the bleed screw "b" of the pump and carry out the preceding operations for the end hole "n" of the distribution block.

17 Release the pressure by unscrewing the bleed screw "b" of the pump. Remove the pipe (H).

NOTE - These different checks cannot be effectively carried out on the car, it is necessary to remove the distribution block (see Op. DS 393-1).

PARTICULAR POINTS

Adjustment of the camber.

This operation should be carried out after having adjusted the heights (see Op. DS433-0), the car being on a level and horizontal surface in the "normal" position. Note the position indicated by the plumb line, the difference between right and left side must not be greater than 1 mm.

Checking the castor angle.

It is necessary to remove the pivots in order to carry out this operation. The adjustment is correct, when the dimension "f" (see Pl.102. fig 2) is between 24.75 and 25.25 mm.

Adjusting the castor angle.

This adjustment cannot be carried out in position, it is necessary to remove the driveshaft (see Op. DS 410-1).

		TOOLS
	ADJUSTMENT OF THE CAMBER (see Pl. 113).	
1	Put the car on level and horizontal surface, the heights adjusted (see Op. DS 433-0) and the car on the "normal" running position (lever of the manual height control on the thick white line).	
2	Fit the fixture 2314-T (see Pl. 169) on the rim. Note the position indicated by the plumb line	Fixture 2314-T
3	Carry out the same operation on the other rim. The difference between the two readings must not be greater than 1 mm.	
4	In the contrary case :	
	Remove the wing, remove the protection panel. Adjust the sleeve (35). Retighten the collars (34), the screws opposite the slot in the sleeve	12 mm spanner 12-14 mm box spanners
5	Check the camber again. Fit the protection panel and wing	12-14 mm box spanners
	CHECKING THE CASTOR ANGLE	
6	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168).	
	Remove the front wheels	Jacking bracket 2505-T
7	Release the pressure	8 mm spanner

		TOOLS
8	Disconnect the upper and lower pivot ball joints (extractor 1864-T, see Pl. 97, fig. 3). Disengage the steel and nylon cups without disconnecting the splined drive coupling, disengage the pivot and driveshaft assemblies from the arms	26 mm box spanner
9	Carefully clean the bores of the arms into which the stems of the ball pins fit and put the castor angle fixture in position (fixture 2321-T, see Pl. 102, fig. 1). Measure the castor angle as indicated on Pl. 102, fig. 2. The adjustment is correct when the dimension "f" is between 24.75 and 25.25 mm. In the contrary case, it is necessary to reset the castor angle. NOTE - The adjustment cannot be carried out in position, it is necessary to remove the driveshaft (see Op. DS 410-1). Remove the castor angle fixture	Fixture 2321-T Caliper gauge
10	Place the steel and rubber cups on the stems of the ball pins. Degrease the tapers of the ball pins and the arms. Refit the pivot and driveshaft assemblies. Connect the ball pins in the lower and upper arms. Tighten the nuts and split pins	26 mm box spanner
11	Fit the wheels. Start the engine, let it idle for a few minutes in order to put the systems under pressure. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the screws fixing the wheels to 108 to 144 ft/lbs (15 to 20 m.kg)	Jacking bracket 2505-T

PARTICULAR POINTS

Refitting.

Our Spare Parts Department only supply the later type half axle.
On cars produced before October 1956, if the half axle is replaced, it is necessary to fit a packing piece 3 mm. thick under the upper fixing and one approximately 2 mm. thick between the central fixing bosses (measure the clearance for the packing pieces).
On cars produced between October 1956 and April 1958, it is necessary to fit a packing of approximately 2 mm thick between the central fixing bosses (measure the clearance for the packing pieces).
On cars produced since April 1958 only fit packing between the half axle and the body.

18 *Adjust the lateral position of the anti-roll bar, the bearings of the anti-roll bar and the lateral clearance of the bar (see Op. DS 433-0).*

19 *To position the sleeves of the anti-roll bar; obtain a dimension "l" of 198 mm. on the right and 199 mm. on the left, between the centres of the ball pins of the anti-roll bars and the lever controlling the suspension.*

28 *Adjust the heights (see Op. DS 433-0).*

29 *Adjust the manual height variation control (see Op. DS 437-0).*

30 *Adjust the camber and caster angle (see Op. DS 440-0).*

34 *Adjust the point "0", on the road (see Op. DS 440-0) (Position of the steering in which the car runs in a straight line).*

		TOOLS
	REMOVAL (see Pl. 113).	
1	Untighten the wheel. Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel..	Jacking bracket 2505-T
2	Remove the spare wheel, the spare wheel support, release the pressure. Remove the front wings	8-12-14 mm spanners 8-12-14 mm box spanners
3	Drain the fluid from the reservoir.	
4	Remove the right and left side protection shields and under shields	8 mm spanner 8 mm box spanner
5	Untighten the screw fixing the clamp (33) on the height corrector control rod to the anti-roll bar (spanner 1623-T, see Pl. 16, fig. 2)	12 mm box spanner or spanner 1623-T

		TOOLS
6	Untighten the screw of the collars (34) of the anti-roll bar coupling sleeve (35). Mark with paint, the position of the coupling sleeves on the connecting rods. Remove the sleeves by unscrewing	12 mm spanner 12 mm box spanner
7	Disconnect the overflow return pipe (55) from the height corrector. Disconnect the corrector pipe assembly union plate (56). Remove the height corrector assembly and pipes (see Pl. 114)	8 mm box spanner
8	Remove the anti-roll bar bearing cap (36)	12 mm box spanner
9	To remove the suspension cylinder.	
	a) Remove the suspension sphere and its distance piece (there is no distance piece on the right-hand side, left-hand drive cars, or on the left-hand side, right-hand drive cars). Disconnect the union on the pipe from the cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig.4)	Spanner 2219-T or 2221-T
	b) Disconnect the dust cover from the cylinder and from the suspension buffer bracket. Remove the dust cover (37) from the suspension buffer bracket.	
	Remove the connecting pin (38).	
	Push the arm down as far as possible and disengage the piston rod from the bracket (the holes for the connecting pin (38) in the piston rod and in the bracket must be parallel).	
	If necessary, remove the lower rubber stop (13) from the suspension buffer bracket.	
	c) Unscrew the cylinder fixing screw (47). Remove the suspension cylinder (leave the rubber dust cover fixed to the overflow return pipe. Note : the overflow return pipe is fragile).	
10	To remove the height control :	
	Manual height control by cable (see Pl. 120).	
	a) Put the control in the high position.	
	b) Unscrew the locknut and remove the rod (17) by unscrewing. Put the control in the low position in order to disengage the rod	7-8 mm spanners
	Manual height control by rods (see Pl. 121).	
	c) Remove the control rod (39).	
11	Disconnect the steering lever ball pin from the steering rod (extractor 1964-T, with pressure pad 1968-T, see Pl. 97, fig. 2)	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
12	Disconnect the rubber dust cover (18) from the splined coupling on the gearbox (bibax).	
13	Remove the screw fixing the half axle. Disengage the half axle. Do not mislay the existing adjusting washers (54) between the half axle and the sidemember	19-21-24 mm box spanners

		TOOLS
	ASSEMBLY (see Pl. 113).	
	NOTE - Our Spare Parts Department only supply the late type half axles.	
	On cars produced before October 1956, it is necessary to fit packing pieces 3 mm thick under the upper fixing of the half axle (at "a").	
14	Offer up the half axle on the car and engage the driveshaft in the splined coupling. Fix the half axle at the following points : the nut (40) on the locating stud (plain and serrated washers) and the outer screw (41) (plain and serrated washers), the inner screw upper screw (42) (plain and serrated washers). Tighten these screws and nut slightly so as to seat the bosses on the half axle on those on the sidemember	19-21-24 mm box spanners
	NOTE - On cars produced since April 1958, only fit a packing between the half axle and the body.	
15	Using a set of feelers, measure the gap existing between the central fixing bosses on the sidemember and the half axle. Select from among the shims sold by our Spare Parts Department, two shims (54) of a thickness corresponding to the gap measured. Untighten the fixing of the assembly.	
	Put the shims in position. Fit the screws (plain and serrated washers). Tighten the screws	19-21-24 mm box spanners
16	Put the rubber dust cover in position on the flexible coupling (bibax). Fit the clip	Socket spanner 12 mm socket
17	Connect the steering lever ball pin to the steering rod. Fit the steel and nylon cups on the stem of the ball pin. Tighten the nut and split pin	21 mm box spanner
18	To adjust the lateral position of the anti-roll bar (see Op. DS 433-0).	
	Adjust the bearings of the anti-roll bar (see Op. DS 433-0).	
	Adjust the lateral clearance of the anti-roll bar (see Op. DS 433-0).	
19	To connect the anti-roll bar coupling sleeve.	
	Screw the coupling sleeve (35) fitted with its collar (34) for a few threads on the connecting rod (46) of the suspension buffer bracket. Connect the threaded sleeve on the anti-roll bar connecting rod. Carry out the same operation on the other side. Simultaneously, screw up the right and left coupling sleeves in order to obtain, between the centres of the ball joints of the anti-roll bar and the suspension buffer bracket, the dimension "*l*" = 198 mm on the right-hand side and 199 mm on the left-hand side.	
	Tighten the collars.	
	The slot in the collars should be in line with the slot in the sleeve	12 mm spanner 12 mm box spanner
20	To fit the suspension cylinder :	
	a) Engage the cylinder in its bracket. Lightly tighten the cylinder fixing screw (47) the point of the screw engages in the groove "m" on the collar of the cylinder. Tighten the locknuts	12 mm spanner

		TOOLS
	b) Insert the piston rod in the cylinder dust cover (37). Fit the dust cover on the cylinder. Fit the rubber band (48) for the fixing clip.	
	c) Put the ball (16) in the suspension buffer bracket after having filled the ball housing with hydraulic fluid. Fit the rubber collar on the suspension buffer bracket. *Put the arm in its lowest position.* The centres of the holes for the connecting pin in the suspension bracket and in the rod should be parallel, engage the piston rod in its housing in the suspension buffer bracket. Make sure it is in contact with the ball. Raise the arm, it should not be possible to disengage the rod from the suspension buffer bracket. Fit the connecting pin (38). Put the dust cover (37) in position on the suspension buffer bracket, together with the rubber band (49) on the dust cover. Fit the clips.	
	d) Fit the lower suspension buffer (13) on the suspension buffer bracket, if it was removed.	
	e) Fit the suspension sphere. Connect the suspension cylinder union (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	Spanner 2219-T or 2221-T
21	To fit the height corrector (see Pl. 113 and 114) :	
	a) Engage the corrector control rod spherical bearing (50) in the bore of the bearing cap (36).	
	b) Offer up the corrector assembly and pipes. Connect the union plate (56) on the pipe assembly to the union block. Fit the seal plates (note : make sure that the fluid holes in the seal plates correspond to the holes in the flanges). Tighten the screws (spring washers)	8 mm ring spanner
	c) Fix the height corrector, the ball joint engaged in the control lever. Tighten the screw (plain and spring washers), (spanner 1623-T, see Pl. 16, fig. 2).....	Spanner 1623-T
	d) Connect the overflow return pipe (55) to the height corrector.	
22	Pre-adjust the heights (see Op. DS 443-0).	
23	Fit the wheels. Tighten the fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).	
24	Fill the reservoir with fluid.	
25	Start the engine. Put the systems under pressure. Check the unions for leakage	8 mm spanner
26	Lower the car to the ground. Put the manual height control in the "normal" position.	
27	Adjust the heights (see Op. DS 433-0).	
28	Adjust the manual height variation control (see Op. DS 437-0).	

		TOOLS
29	Adjust the toe-in and the lock (see Op. DS 440-0).	
30	Top up the level of the fluid in the reservoir with the engine running and the car in the "normal" position.	
31	Fit the lower and side protection panels	8 mm spanner 8 mm box spanner
32	Fit the front wings, the spare wheel support and the spare wheel	12-14 mm spanners 12-14 mm box spanners
33	Test the car. Adjust the point "0" (see Op. DS 440-0). (Position of the steering in which the car runs in a straight line).	

PARTICULAR POINTS

Dismantling.

6 *It is necessary, by means of a 2 mm diameter drill to drill out the centre punch marks locking the screw in the ring nut fixing the driveshaft.*

7 *Do not clean the pivot assembly by immersion, but clean only the housings of the ball joints and driveshafts with a rag dipped in petrol.*
In the case of worn pivot bearings it is necessary to replace the pivot and bearing assembly. If the bearings are in good condition, it is possible to replace the sealing joints and the steel deflectors.

Assembly.

9 *Using a hammer or a press to fit the socket will cause damage to the pivot. Use the fixture 1857-T.*
Determine the thickness of the upper ball joint adjusting shims: pay particular attention to the information given in the paragraph.
The lower ball joint should be adjusted with a clearance of 0·10 mm. Tighten the screws to 36 ft/lb (5 m.kg).

10 *Tighten the ring nut fixing the driveshaft to 289 ft/lb (40 m.kg). Lock the locking screw with 2 centre punch marks.*
On cars produced before February 1956, if the pivot is replaced, drive out the driving dog from the new pivot. If the driveshaft is replaced, it is necessary to replace the pivot and driveshaft assembly.

14 *To prepare the arm support:*
(b) The outer face of the rear joint of the upper arm should be at a distance "p" = 6·25 — 0·5 mm, from the outer face of the inner bearing race (see Pl. 95) and the outer face of the front joint of the upper arm should be at a distance "r" = 2·5 ± 0·25 mm from the outer face of the bracket.
(e) Tighten the nut locking the upper arm to 65¼ ft/lb (9 m.kg), then unscrew the nut from 15° to 30°.
(f) Adjust the camber, in order to obtain a dimension "f" of between 24·75 and 25·25 mm (see Pl. 102). The outer face of the front joint of the lower arm should be level with the outer face of the bracket.
(g) Tighten the nut locking the lower arm to 65¼ ft/lb (9 m.kg) then unscrew the nut from 10° to 15°.

		TOOLS
	DISMANTLING (see Pl. 95).	
1	Fit the half axle in a vice (stand MR-3053-120, see Pl. 98)	Stand MR-3053-120
2	To disconnect the driveshaft and pivot assembly from the arm : a) Disconnect the upper and lower ball joints (extractor and pressure pad 1864-T, see Pl. 97, fig. 3) ..... b) Remove the nylon cups (1) and the rubber cups (2).	26 mm box spanner Extractor and pressure pad 1864-T

		TOOLS
3	<u>To remove the arms</u> :	
	a) Extract the steel cap (3) from the lower arm with the aid of a screwdriver.	
	b) With the aid of a chisel, remove the metal locking the nuts (4) and (5). Remove the nuts	38 mm box spanner
	c) Remove the arms in a press or with the aid of a bronze drift.	
	Remove the suspension control arm (6) and its distance piece (7) from the upper arm.	
	d) Remove the oil seals (8) and (9) from the upper arm housing and the joint (10) from the lower arm housing.	
	e) Remove the taper roller bearings.	
	f) Remove the oil retaining washer (11) from the arms.	
4	<u>To strip the arm bracket</u> :	
	a) Clean the arm bracket.	
	b) Using a blowpipe, heat slightly, the bracket around the housing of the outer races of the bearing. If necessary, drive out the races, striking lightly with a sharp-edged drift. Remove the castor angle adjusting washer (12).	
5	<u>To strip the suspension buffer arm</u> (see Pl. 113) :	
	a) Remove the rubber buffer (13).	
	b) Remove the adjusting nut (14) from the ball joint on the anti-roll bar connecting rod (spanner MR-3691-40, see Pl. 97, fig. 4). Remove the cup (15) and the ball (16)	Spanner MR-3691-40
	NOTE - In the case of pronounced wear, it is necessary to change the suspension buffer arm.	
6	<u>To dismount the pivot</u> (see Pl. 95) :	
	a) Drill out the centre punch marks locking the screw (17) in the ring nut fixing the driveshaft (2 mm dia. drill).	
	Remove the locking screw	Drill 2 mm dia.
	b) Put the pivot in a vice (stand 1922-T, see Pl. 99, fig. 1)	Stand 1922-T
	c) Undo the half shells (19) fixing the double universal dust cover (32). Remove the dust cover (32) towards the sliding coupling.	8 mm spanner
	d) Using a screwdriver, disengage the oil seal (20) from the groove in the pivot hub.	
	e) Remove the ring nut (21) fixing the driveshaft,from the pivot hub. To do this :	
	Hold the driveshaft straight and fit the spanner (spanner 1920-T, see Pl. 99, fig. 2). Put a tubular extension on the spanner, the nut is tightened to 288 ft/lbs (40 m.kg).	
	Remove the driveshaft assembly and nut, from the pivot. Disengage the spring (29) and the cone (30).	
	Remove the seal (20) from the guide	Spanner 1920-T

		TOOLS
	f) To remove the upper ball pin (see Pl. 95 and 113) :	
	1st case (cars produced before November 1959):	
	1. Remove the steering lever (22), keep the adjusting washers (23). Remove the ball pin and the distance piece (24)	14 mm box spanner
	2. Extract the lower socket (25) (extractor 1856-T, see Pl. 96, fig. 1)	Extractor 1856-T
	2nd case (cars produced since November 1959):	
	1. Remove the steering lever (22), keep the adjusting washers (23). Remove the ball pin	14 mm box spanner
	2. Extract the lower socket (25) (extractor 1856-T, see Pl. 96, fig. 1)	Extractor 1856-T
	g) To remove the lower ball pin :	
	Remove the flange (26), disengage the ball pin, the upper socket (27), the spring (28)	14 mm box spanner
	h) Remove the upper ball pin greaser	8 mm box spanner
7	Clean the parts.	
	IMPORTANT NOTES :	
	1. Do not clean the pivot assembly by immersion, but clean only the housings of the ball joints and driveshafts with rag dipped in petrol.	
	2. In the case of worn pivot bearings, it is necessary to replace the pivot and bearing assembly.	
	3. If the bearings are in good condition, it is possible to replace the sealing joints and steel deflectors. These are removed by means of a screwdriver.	
	ASSEMBLY (see Pl. 95)	
8	To fit the oil seals :	
	a) Degrease the taper receiving the seal, by means of a cloth dipped in petrol. Also smear the outside of the seal in order to facilitate the fitting.	
	b) Offer up the seal on the pivot, using a certain amount of pressure by hand and engage the bottom of the seal in the pivot with a spatula or a screwdriver, the edges of which are not sharp (be careful not to cut the rubber).	
	c) The base of the seal being inserted in the pivot, press on the periphery of the joint and engage on all of its height. Check that the rubber is not creased. Complete the fitting of the seal with a press and a tube	Tube: 163 outside dia. 158 inside dia. 70 long.
	d) Check that the outside lip of the seal is in position in the groove of the pivot, by means of a blunt scriber.	
	e) Fit the two steel deflectors by means of a mallet.	
9	Place the pivot in a vice (stand 1922-T, see Pl. 99, fig. 1)	Stand 1922-T
10	To fit the upper ball joint (see Pl. 95 and 113) :	
	a) Put the lower socket (25) in position in the pivot (fixture 1857-T, see Pl. 96, fig. 2)	Fixture 1857-T

TOOLS

IMPORTANT NOTE - Using a hammer or a press to fit the socket will cause damage to the pivot (ovality of the bearing housing).
Remove the clamp. Fit the distance piece (24).

b) Determine the thickness of the adjusting shims (23).

NOTE - This operation is of great importance, because it ensures a good adjustment of the ball joint and a good seating of the pivot bearing, in effect, excessive tightening of the ball joint (washers (23) too thin), will cause ovality of the outer bearing races.

1st case (cars produced before November 1959):

1. Put in position in the steering lever, the upper ball joint socket (31). Hold the assembly under light pressure using the body of the extractor 1856-T (see Pl. 96, fig. 3).
Tighten the ball joint nut by hand. Check that the face "b" of the cup is parallel to the face "c" of the lever on the pivot; if not, level the cup by loosening and retightening the nut.
Measure the clearance "d" in relation to the bearing face of the lever (use the straight edge, MR-3377, fitted with the dial gauge 2437-T, see Pl. 96, fig. 3). The straight edge should be on the bearing face of the steering lever, the point of the dial gauge resting on the socket, set the dial gauge at "0". Note the position of the totalising needle.....

Extractor 1856-T
Straight edge MR-3377
Dial gauge 2437-T

2. With the distance piece (24) in position on the socket, put the straight edge on the distance piece, the point of the dial gauge resting on the face on which the shim (23) will rest at "e".
Put the dial gauge needles in their preceding position by counting the turns and fractions of turns. Take for example : 1.40 mm.
In order to obtain a correct adjustment, it is necessary to reduce this dimension by 0.1, which will give 1.30 mm. Choose two adjusting shims (23) 1.3 mm thick, from amongst those sold by our Spare Parts Department.

3. Assemble the ball joint previously oiled. Fit the shims (23) and the steering lever. Tighten the screws to 36 ft/lbs (5 m.kg) (shakeproof washers). (Torsion spanner 2471-T, see Pl. 7, fig. 2), the tightening torsion is of the greatest importance .....

Torsion spanner 2471-T
14 mm socket

NOTE - Our Spare Parts Department supply early type assemblies until stocks are exhausted. On cars produced before November 1959, it is possible to fit new parts. When replacing a coupling lever on the pivot, replace the assembly of the upper socket, ball pin, distance piece, lower socket together with the nylon cup and rubber cup.
The ball assembly, sockets and distance pieces are sold by our Spare Parts Department under the number DS 413-03a.

2nd case (cars produced since November 1959): (see Pl. 95 A, fig. 1).

1. Put in position on the pivot: the ball pin, the upper socket and the coupling lever. The parts should be thoroughly degreased.
Hold the ball pin vertically and fit the lever fixing screws, until the stem of the ball pin functions freely, but without play. Tighten each of the coupling lever fixing screws equally in order that the lower face of the lever is visibly parallel to the thrust face of the distance washers (23) on the pivot.

TOOLS

2. By means of a set of feeler gauges, measure the clearance between the coupling lever and the pivot at each side of the ball pin. For example : 2.04 and 2.10 mm.

   Take the average of the two distances : $\frac{2.04 + 2.10 \text{ mm}}{2} = 2.07$ mm.

   To ensure the functioning clearance of the ball pin, it is necessary to increase this dimension by 0.03 mm. In the example, two adjusting shims 2.10 mm will be satisfactory.

3. Fit the parts previously greased. Fit the shims (23) and the coupling lever. Tighten the fixing screws to 36 ft/lbs (5 m.kg) (shakeproof washer) (torsion spanner 2471-T, see Pl. 7, fig. 2).
   Check that the functioning of the ball pin is correct .....

Torsion spanner 2471-T
14 mm socket

3rd case. Fitting the new type ball joint and lever assemblies on cars produced before November 1959. (see Pl. 95 A, fig. 2) :

1. Put in position in the steering lever (22), the upper socket (31) and the ball pin.
2. To determine the thickness of the adjusting shims: proceed as indicated in the indented line, 1st case.

11 To assemble the lower ball joint (see Pl. 95 and 113) :

a) Put in position, the upper socket (27), the ball pin and the flange (26). Fit the flange as far as possible on the pivot (using a tube).
   Strike lightly with a mallet. Measure the clearance existing between the pivot and the flange with a set of feeler gauges.
   Pass the feelers all round the flange, in order to check the level; the clearance should be constant, for example : 1.30 mm.
   As the ball pin must be adjusted with a clearance of 0.10 mm, choose two washers (32) of 1.30 + 0.10 = 1.40 mm thick from amongst those sold by our Spare Parts Department.....

Tube: 39 inside dia.
100 long

b) Remove the parts.

c) Put the clearance retaining spring (28) in its housing. Put adhesive grease in the seating of the ball pin and grease the parts. Fit the upper socket (27), the ball pin, the flange (26) and the washers (32).
   Tighten the screws to 36 ft/lbs (5 m.kg). Do not exceed this tightening, as excessive tightening will damage the pivot (torsion spanner 2471-T, see Pl. 7, fig. 2) .....

Torsion spanner 2471-T

12 To fit the driveshafts (see Pl. 95) :

a) Put the cone (30) in position (the positioning dowel in one of the slots of the driving hexagon) and the spring (29). Put the pivot in a vice (vice adaptor 1922-T, see Pl. 99, fig. 1).
   Fit the driveshaft in the hub of the pivot, the driving dowels opposite the holes in the hub (1st arrangement) or opposite the holes in the driving plate (2nd arrangement) and the hole for the locking screw (17) lined up with the hole in the hub. Engage the driving dowels in their housing by striking on the end of the driveshaft. Tighten the ring nut (21) to 289 ft/lbs (40 m.kg) (spanner 1920-T, see Pl. 99, fig. 2) .....

Vice adaptor 1922-T
Spanner 1920-T

NOTE - On cars produced before February 1956, if the pivot is replaced,drive out the driving dowels from the new pivot. If the driveshaft is to be replaced, it is necessary to replace the pivot and driveshaft assembly.

		TOOLS
	b) Fit the seal (20). Squeeze the seal by hand, incline the splined end of the shaft and work the seal over the splines. Do not damage the interior threads of the seal by rubbing them on the splines. Engage the lip of the seal in the groove of the hub. Use a rod with a rounded end in order not to damage the seal. Put the seal in position by working it round the bore with the rod. Put the dust cover (32) in position on the double universal joint. Position the half shells (19). Bring the edges of the half shells together using pliers and rivet. Fit the greaser. Fit the locking screw (17) of the ring nut (21) and lock by two centre punch marks. Fit the greaser for the upper ball pin.....	8 mm spanner
13	<u>To prepare the suspension control arm</u> (see Pl. 113) :	
	a) Put adhesive grease in the ball pin housing. Fit the cup (15). Tighten the nut (14) to 9 ft/lbs (1.2 m.kg) and split pin (spanner MR-3691-40, see Pl. 97, fig. 4).	
	b) Fit the upper rubber buffer (13). To ease the fitting of the rubber buffer, moisten it with hydraulic fluid or water.	Spanner MR-3691-40
14	<u>To prepare the arm support</u> (see Pl. 95) :	
	a) Heat slightly the bearing housing of the upper arm, using a blowpipe. Put the outer bearing races in position with the aid of a tube	Tube : 71.5 outside dia. 150 long
	b) Smear the upper arm bearings with adhesive grease and fit them in the bracket. Put the seal (8) in position, the outer face of the seal should be at a distance "p" = 6.25 - 0.5 mm from the outer face of the inner bearing race (mandrel MR-3676-150, see Pl. 100, fig. 2). Put the seal (9) in position, the outer face of the seal should be at a distance "r" = 2.5 ± 0.25 mm from the outer face of the bracket (mandrel MR-3676-140, see Pl. 100, fig. 1).	Mandrel MR-3676-140 Mandrel MR-3676-150
	c) Put 50 gr. of adhesive grease in the bore of the bracket between the two bearings.	
	d) Fit the arm in its bearings, then in the distance piece (7) (the plain face against the bearing) (see fig. 2 for position). Fit the suspension control arm (6) on the splines of the axle arm. Knock on the suspension buffer arm, using a tube and a block at the opposite end of the arm. During this operation, take care not to displace the rear seal (8). As soon as a few threads are visible, tighten the nut (5) in order to complete the fitting of the upper arm assembly and the suspension control arm.....	Tube: 33 inside dia. 150 long
	e) Put the assembly in a vice (vice adaptor MR-3053-120, see Pl. 98, fig. 1). Fit the nut (5) and tighten to $65\frac{1}{4}$ ft/lbs (9 m.kg). During the tightening operation, turn the arm to make sure that the bearings are working freely. Unscrew the nut from 15^{o} to 30^{o}. Lock the nut by beating the metal of the nut collar into the groove in the arm.	38 mm box spanner Vice adaptor MR-3053-120

TOOLS

f) To determine the thickness of the castor angle adjusting shim (see Pl. 102).

1. Fit the setting bush 1865-T on the arm.

   Put the arm in the bracket. Fit the bush 1866-T on the arm. Tighten the nut (4).

   Put the castor angle fixture in position (fixture 2321-T, see fig. 2). Bring the rod (A) into contact with the rod (B), the end (D) of the rod (A) engaged in the groove (E) of the rod (B).

   The setting is correct when the dimension "f" is between 24.75 and 25.25 mm. Set this dimension, using a caliper gauge, as indicated in fig. 2.

   Select an adjusting washer (12) (see Pl. 95), in order to obtain this setting ..... — Setting bush 1865-T, Setting bush 1866-T, Fixture 2321-T

2. Take out the arm, then refit and fit the adjusting washer (12) determined above, between the arm bracket and the setting bush 1865-T.

   Check the castor angle.

3. Remove the arm and the castor angle fixture.

4. Fit the adjusting shim (12). Fit the outer race of the front bearing using a tube.

   Fit the bearing cage.

   Fit the seal (10) (mandrel MR-3676-140, see Pl. 100, fig. 1). Put the outer race of the rear bearing in position using a tube..... — Tube: 71.5 outside dia. 150 long; Tube: 61.5 outside dia. 150 long; Mandrel MR-3676-140

5. Put 50 gr. of adhesive grease in the bore of the bracket between the two bearings. Fit the arm. Tighten the nut (4) to $65\frac{1}{4}$ ft/lbs (9 m.kg). During the tightening operation, turn the arm to make sure that the bearings are working freely.

   Unscrew the nut from 10^{o} to 15^{o}. Lock the nut by beating the metal of the nut collar into the groove in the arm.

6. Fill the steel cup with adhesive grease and put in position using a mallet.

15 To fit the pivot (see Pl. 95) :

a) Place on the upper ball pin, the nylon cup (1) and the rubber cup (2). Remove the grease from the tapers of the ball pin and the arm.

   Engage the ball pin in the bore of the arm. Tighten the nut firmly and split pin.

b) Carry out the same operation for the lower ball pin ..... — 26 mm box spanner

16 Paint the assembly.

IMPORTANT NOTE - Do not paint the wheel flange, the stem of the steering lever ball pin or the boss faces for fixing the half axle on the sidemember.

PARTICULAR POINTS

Replacement of a steering lever on a pivot.

Assembly.

10 *Determine the thickness of the adjusting washers.*
This operation is of great importance. Carefully follow the instructions given in the paragraph.

1st case (cars produced before November 1959).
This setting can be carried out with the fixture 1867-T or a straight-edge MR-3377 fitted with a dial gauge.

2nd case (cars produced since November 1959).
This setting can be carried out by using a set of feeler gauges.

11 *Tighten the screws fixing the lever to 36 ft/lb (5 m.kg) (torsion spanner).*
Important. If the work carried out has been made necessary by seizure of the ball joints (even at the limits of its movement) it is necessary to check the operation of the other lever and the two lower relay levers.

15 *Check the alignment and steering lock. Adjust if necessary (see Op. DS 440-0).*

Replacement of an upper pivot ball pin.

Assembly.

23 *Determine the thickness of the adjusting washers.*
This operation is of great importance. Carefully follow the instructions given in the paragraph.

24 *Tighten the screws fixing the lever to 36 ft/lb (5 m.kg) (torsion spanner).*

Replacement of a lower pivot ball pin.

Assembly.

31 *The ball pin should be adjusted with a clearance of* 0.10 *mm.*
Tighten the fixing screws of the flange to 36 ft/lb (5 m.kg) (torsion spanner).

Replacement of a wheel locking cone.

In order to carry out this operation it is necessary to remove the pivot and driveshaft assembly and disconnect the driveshaft from the pivot (see Op. DS 372-1).

TOOLS

REPLACEMENT OF A PIVOT SEAL

Removal (see Pl. 95).

1 Remove the pivot and driveshaft assembly (see Op. DS 372-1, paragraphs 1 to 4).

2 Place the pivot and driveshaft assembly in a vice (vice adaptor 1922-T, see Pl. 99, fig. 1). Remove the seal (20) by means of a screwdriver.

		TOOLS
	Refitting (see Pl. 95).	
3	To fit the seal (20) : Deform the seal by hand, incline the driveshaft sliding coupling and work the seal on to splined end; do not damage the inner threads of the seal by rubbing on the coupling splines. Engage the outer lip of the seal in the hub groove. Use a tool with a rounded end so as not to damage the seal. Put the seal in position by working round the hub bore with the tool.	
4	Fit the pivot and driveshaft assembly on the car (see Op. DS 372-1, paragraphs 10 to 13).	
	REPLACEMENT OF A PIVOT STEERING LEVER	
	Removal (see Pl. 95 and 113).	
5	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel	Jacking bracket 2505-T
6	Release the pressure in the suspension system by unscrewing the bleed screw of the pressure regulator	8 mm spanner
7	Disconnect the lever (22) from the steering rod (extractor 1964-T and pressure pad 1968-T, see Pl. 97, fig. 2). Remove the rubber cup and the nylon cup	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
8	Disconnect the upper arm from the upper pivot ball (extractor and pressure pad 1864-T, see Pl. 97, fig. 3). Remove the rubber cup (2) and the nylon cup (1)	Extractor and pressure pad 1864-T 26 mm box spanner
9	Remove the lever (22). Mark the position of the adjusting washers (23)	14 mm box spanner
	Refitting (see Pl. 95 and 113).	
10	To determine the thickness of the adjusting washer to be fitted with the new lever : NOTE - This operation is of great importance. In effect, an excessive tightening of the ball pin (adjusting washers too thin) will cause deformation of the cups and rapid wear on the bearings. *1st case (cars produced before November 1959):* 1st POSSIBILITY Adjustment by means of the fixture 1867-T (see Pl. 97, fig. 1). a) Put the fixture 1867-T in the removed lever (22). Tighten the fixing screw (A). Under each of the contact screws (B), fit the adjusting washers (23) found when dismantling. ..... Tighten each contact screw (B) until the washer passes freely, but without play, under the point. Lock the screw (B) with the locknut (C). Remove the fixture from the lever.	Fixture 1867-T

TOOLS

b) Fit the fixture on the new lever.
Select from the adjusting washers sold by our Spare Parts Department, those which will pass freely, but without play, under the point of the screw (B) in the same conditions as in line "a".
Mark the position of the adjusting washers. Remove the fixture.

2nd POSSIBILITY

Adjustment by means of a dial gauge (see Pl. 96, fig. 3).

a) Put in position in the removed lever (22), the upper socket (31) and the ball pin (3).
Hold the assembly under slight pressure by means of the extractor body 1856-T and a nut tightened by hand.
Check that the face "b" of the socket is parallel to the bearing face "c" of the lever on the pivot; if not, level the cup and retighten the nut.

b) Measure the clearance "d" of the cup by comparison to the bearing face "c" of the lever (straight edge MR-3377 together with the dial gauge 2437-T).
With the straight edge bearing on the face "c" of the lever, the point of the dial gauge resting on the face "b" of the cup, set the dial gauge at "0".
Note the position of the totalising needle .....

Straight edge MR-3377
Dial gauge 2437-T

c) With the distance piece (24) in position on the lower cup (25), place the straight edge on the distance piece, the point of the dial gauge resting on the bearing face of the washers (23) (see Pl. 95) at "e" (see Pl. 96, fig. 3).
Put the dial gauge needles in their preceding position by counting turns and fractions of turns. For example : 1.40 mm.
In order to obtain a correct adjustment, it is necessary to reduce this dimension by 0.1 mm.
In the example, it is necessary to fit two adjusting washers, selected from those sold by our Spare Parts Department of a thickness :

$$1.40 - 0.10 = 1.30 \text{ mm.}$$

NOTE - Our Spare Parts Department supply early type assemblies until stocks are exhausted. On cars produced before November 1959, it is possible to fit new parts. When replacing the steering lever on the pivot, it is necessary to replace the assembly of the upper socket, ball pin, distance pieces, lower socket, together with the nylon cup and rubber cup.

The assembly of the ball pin, sockets and distance pieces are sold by our Spare Parts Department under the number DS 413-03a.

2nd case (cars produced since November 1959): (see Pl. 95 A, fig. 1) :

1. Fit on the pivot: the ball pin, the upper socket and the steering lever. These parts should be thoroughly degreased.

   Hold the ball pin vertically and tighten the lever fixing screws so that the ball pin moves freely but without play. Tighten each of the lever fixing screws so that the bearing face of the lever is parallel to the bearing face for the adjusting washers (23) on the pivot.

		TOOLS
	2. With a set of feeler gauges, measure the clearance between the steering lever and the pivot at each side of the ball pin. For example : 2.04 and 2.10 mm. Take the average of these two dimensions : $\frac{2.04 + 2.10}{2} = 2.07$ mm. In order to obtain a correct adjustment for the ball pin, it is necessary to increase this dimension by 0.03 mm. In the example, two adjusting washers 2.10 mm thick will be satisfactory.	
	3. Fit the parts previously greased. Fit the washers (23) and the steering lever. Tighten the fixing screws to 36 ft/lbs (5 m.kg) (shakeproof washers) (torsion spanner 2471-T, see Pl. 7, fig. 2). Make sure that the ball pin functions correctly	Torsion spanner 2471-T 14 mm socket
	3rd case. Fitting a new type steering lever and ball pin assembly on a car produced before November 1959. (see Pl. 95 A, fig. 2).	
	1. Put in position in the steering lever (22), the upper socket (31) and the ball pin.	
	2. To determine the thickness of the adjusting washers : proceed as indicated in the indented line, 1st case.	
11	Put in position the adjusting washers (23) and the lever (22) (see Pl. 113). Tighten the lever fixing screws to 36 ft/lbs (5 m.kg) (spring washers under the heads). Use the torsion spanner 2471-T (see Pl. 7, fig. 2), the tightening torsion is of great importance	Torsion spanner 2471-T
12	Connect the upper arm to the ball pin. Insert the nylon cup (1) and the rubber cup (2). Thoroughly degrease the tapers of the ball pin and the arm. Tighten the nut and split pin	26 mm box spanner
13	Connect the ball pin of the lever (22) to the steering rod. Insert the rubber cup. Degrease the tapers of the ball pin and the rod. Tighten the nut and split pin.....	21 mm box spanner
14	Fit the wheel. Put the suspension system under pressure. Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg)	8 mm spanner
	NOTE - *If the work carried out has been necessary by siezure of the ball joint even at the limits of its movement, it is necessary to check the operation of the ball pin of the other steering lever and also the ball pins of the two lower relay levers.*	
15	Check the alignment and the lock (see Op. DS 440-0). Adjust if necessary.	
	REPLACEMENT OF AN UPPER PIVOT BALL PIN	
	Removal (see Pl. 95 and 113).	
16	Release the pressure in the suspension system by unscrewing the bleed screw on the pressure regulator and put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel.....	8 mm spanner Jacking bracket 2505-T
17	Disconnect the upper arm from the upper pivot ball pin (extractor and pressure pad 1864-T, see Pl. 97, fig. 3). Remove the rubber cup (2) and the nylon cup (1)	26 mm box spanner Extractor and pressure pad 1864-T
18	Disconnect the lever (22) from the steering rod (extractor 1964-T and pressure pad 1968-T, see Pl. 97, fig. 2). Remove the rubber cup and the nylon cup	21 mm box spanner Extractor 1964-T Pressure pad 1968-T

		TOOLS
19	Remove the lever (22), disengage the ball pin, the upper socket (31), the adjusting washers (23). Remove the distance piece (24) (*cars produced before November 1959*)	
20	Remove the lower ball pin socket (25) (extractor 1856-T, see Pl. 96, fig. 1)	Extractor 1856-T
21	Thoroughly clean the parts.	
	Refitting (see Pl. 95 and 113).	
22	Put the lower ball pin socket (25) in position (fixture 1857-T, see Pl. 96, fig. 2). Put the distance piece (24) in position	Fixture 1857-T
	IMPORTANT NOTE - Using a hammer or a press to fit the socket will cause damage to the pivot (ovality of the bearing housing).	
23	To determine the thickness of the adjusting washer.	
	NOTE - This operation is of great importance. In effect, an excessive tightening of the ball pin (adjusting washers too thin) will cause deformation of the cups and rapid wear on the bearings.	
	1st case (cars produced before November 1959): (see Pl. 96, fig. 3) :	
	a) Put in position, the removed lever (22), the upper socket (31) and the ball pin. Hold the assembly under light pressure, using the body of the extractor 1856-T and a nut tightened by hand.	
	b) Check that the face "b" of the socket is parallel to the bearing face "c" of the lever on the pivot; if not, level the cup and retighten the nut.	
	c) Measure the clearance "d" of the socket, in relation to the bearing face "c" of the lever (straight edge MR-3377 together with the dial gauge 2437-T). With the straight edge resting on the face "c" of the lever, the point of the dial gauge resting on the face "b" of the socket, set the dial gauge at "0". Mark the position of the totalising needle	Straight edge MR-3377 Dial gauge 2437-T
	d) With the distance piece (24) in position on the lower socket (25), fit the straight edge on the distance piece, the point of the dial gauge resting on the bearing face of the washers (23) at "e". Bring the needles of the dial gauge to their preceding positions by counting the turns and fractions of turns, for example: 1.40 mm. In order to obtain the correct adjustment, it is necessary to reduce this dimension by 0.1 mm. In the example; it is necessary to fit two adjusting washers, selected from amongst those sold by our Spare Parts Department of a thickness : 1.40 - 0.10 = 1.30 mm.	
	NOTE - Since November 1959, the assembly of the upper ball pin is modified. The new ball pins are fitted without the distance piece (24) and the parts are different. Our Spare Parts Department supply the early type assemblies until stocks are exhausted. On cars produced before November 1959, it is possible to fit the new parts. When replacing the steering lever on the pivot, it is necessary to replace the assembly of the upper socket ball pin lower socket, together with the nylon cup and the rubber cup.	

		TOOLS
	2nd case (cars produced since November 1959):	
	In order to determine the thickness of the adjusting washers (23), proceed as indicated in paragraph 10, (2nd case), this operation.	
	3rd case. Fitting the new type ball joint and lever assemblies on cars produced before November 1959.	
	In order to determine the thickness of the adjusting washers (23), proceed as indicated in paragraph 10, (3rd case), this operation.	
24	Fit the ball pin previously greased. Put the washers (23) determined in paragraph 23,in position and the lever (22). Tighten the lever fixing screws to 36 ft/lbs (5 m.kg) (spring washers under the heads). Use the torsion spanner 2471-T (see Pl. 7, fig. 2), the tightening torsion is of great importance	Torsion spanner 2471-T
25	Connect the upper arm to the ball pin. Insert the nylon cup (1) and the rubber cup (2). Thoroughly degrease the tapers of the ball pin and the arm. Tighten the nut and split pin	26 mm box spanner
26	Connect the ball pin of the lever (22) to the steering rod. Insert the nylon cup and the rubber cup. Degrease the tapers of the ball pin and the rod. Tighten the nut and split pin	21 mm box spanner
27	Fit the wheel. Put the system under pressure ..... Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).	8 mm spanner
	REPLACEMENT OF A LOWER PIVOT BALL PIN	
	Removal (see Pl. 95).	
28	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168) and remove the wheel	Jacking bracket 2505-T
29	Disconnect the lower arm from the lower pivot ball pin (extractor and pressure pad 1864-T, see Pl. 97, fig. 3). Remove the rubber cup (2) and the nylon cup (1).	
30	Remove the screws fixing the flange (26). Remove the flange (26), the adjusting washers, the ball pin, the upper cup (27) and the spring (28)	14 mm box spanner
	Refitting (see Pl. 95).	
31	To fit the lower ball pin :	
	a) Put in position, the upper socket (27), the ball pin and the flange (26). Engage the flange as far as possible on the pivot (use a tube).	
	Strike lightly with a mallet. Measure the clearance existing between the pivot and the flange with a set of feeler gauges.	
	Pass the feelers all round the flange in order to check the level, the clearance should be constant, for example: 1.30 mm. The ball pin should be adjusted with a clearance of 0.10 mm, select two washers (32) (see Pl. 113) of 1.30 + 0.10 = 1.40 mm thick from those sold by our Spare Parts Department	Tube: 39 inside dia. 100 long

		TOOLS
	b) Remove the parts.	
	c) Fit the spring (28) in its housing.	
	Put adhesive grease in the ball pin housing and smear the parts.	
	Fit the upper socket (27), the ball pin (26) and the washers (32) (see Pl. 113).	
	Tighten the screws to 36 ft/lbs (5 m.kg). Pay particular attention to this tightening torsion; in effect, an excessive tightening will cause deformation of the pivot (torsion spanner 2471-T, see Pl. 7, fig. 2)	Torsion spanner 2471-T
32	Thoroughly degrease the tapers of the ball pin and the lower arm. Put the nylon cup (1) and the rubber cup (2) in position; connect the arm to the ball pin, tighten the nut and split pin	26 mm box spanner
33	Fit the wheel. Tighten the fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
	REPLACEMENT OF A WHEEL LOCKING CONE	
	See Op. DS 372-1.	
	REPLACEMENT OF A WHEEL POSITIONING DOWEL	
	Removal (see Pl. 95).	
34	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168) and remove the wheel	Jacking bracket 2505-T
35	With a drift passed through the slot in the hub opposite the dowel (33), drive out the dowel	Drift = 5 dia. 120 long
	Refitting (see Pl. 95).	
36	Offer up the dowel (33) on its housing in the hub and put it in position with a drift	Drift = 8 dia. 60 long
37	Fit the wheel. Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg)	Jacking bracket 2505-T
	REPLACEMENT OF A WHEEL LOCKING SCREW	
	Removal (see Pl. 95 A, fig. 3).	
38	Press out the screw (101) and disengage the retaining collet (102) and the thrust washer (103).	
	Refitting (see Pl. 95 A, fig. 3).	
39	Put the screw (101) fitted with the thrust washer (103) on the wheel (see illustration for position). Fit the retaining collet (102) on the screw (101).	
40	Place the locking fixture in a vice (fixture 1868-T, see Pl. 95 A, fig. 3). Offer up the wheel and screw the locking screw (101) in the body of the fixture untii the collar is locked on the retaining collet (102).....	Fixture 1868-T

PARTICULAR POINTS

Assembly.

16 *Check that there is not less than 0·5 mm clearance between the arm and the ridge of the support, at "a" (see Pl. 115). If necessary file the support after having removed the rubber buffer.*

19 *Tighten the screws of the flanges, coupling the anti-roll bar to the axle arm, to 36 ft/lb (5 m.kg).*

20 *Position the corrector control rod in order to obtain a side clearance "b" = 1 mm approximately, between the ball pin of the corrector and the base of the control rod fork (see Pl. 115, fig. 2).*

If the anti-roll bar or the corrector control rod have been replaced, proceed with the pre-adjustment of the heights (see Op. DS 433-0).

21 To fit the brake pipes.

Align the pipes in order that the articulation movement is not under strain, otherwise there is a risk of seizure.

23 *Bleed the brake system (see Op. DS 453-0).*

24 *Adjust the heights (see Op. DS 433-0).*

		TOOLS
	REMOVAL (see Pl. 115).	
1	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
2	Remove the rear wing, remove the wheel	14 mm box spanner
3	Release the pressure in the system	8 mm spanner
4	Remove the mud shield from the height corrector.	
5	Remove the rear crossmember closing plate.	
6	Disconnect the clamp (1) of the corrector control rod (2) after having marked its position on the anti-roll bar.....	12 mm spanner
7	Disconnect the anti-roll bar coupling flanges (3), and disengage the anti-roll bar	14-16 mm box spanners
8	Clear the metal, locking the ring nut (4) from the groove in the sidemember (see Pl. 104). Remove the nut (spanner 1757-T, see Pl. 105)	Spanner 1757-T

		TOOLS
9	To remove the brake pipe assembly :	
	a) Remove the bleed screw and disconnect the brake feed pipe from the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T 10 mm spanner
	b) Remove the union locking screw (5)	5-8 mm ring spanners
	c) Disconnect the three-way union (16) from the feed pipe and the right-hand brake pipe	Spanner 2219-T or Spanner 2221-T
	NOTE - In order to remove the right-hand half axle, remove the rear wing, the wheel and the left-hand mud shield and remove the pipes from the retaining bushes in the sidemember in order to remove the pipe assembly.	
10	To disconnect the piston rod (7) (see Pl. 116) :	
	a) Remove the retaining clip (8).	
	b) Remove the clip (9) fixing the ball joint dust shield to the buffer support and disengage the dust shield (10) towards the rear.	
	c) *Press on the arm* and disengage the piston rod (the rod can be removed only when the holes for the connecting pin in the rod and in the buffer support are parallel).	
11	Remove the three nuts (11) fixing the bearing housing on the sidemember. Disengage the arm (if necessary, strike the end of the spindle with a mallet) (see Pl. 116)	Ratchet spanner 14 mm socket and extension
12	Drive out the housing fixing screws (12) only if they are damaged or worn (do not lose them inside the sidemember) (see Pl. 104).	
13	Clean the housing with petrol in order to remove the ball (13) from the buffer support (see Pl. 116).	
	REFITTING (see Pl. 115).	
14	Hammer in position the screws (12) fixing the bearing housing in the sidemember (see Pl. 104).	
15	Fit the arm in the sidemember and provisionally screw on the ring nut (4), the thin collar in contact with the sidemember (see Pl. 104).	
16	Tighten the three shouldered nuts (11) fixing the bearing housing (do not fit a washer). Check that there is not less than 0.5 mm clearance between the arm and the ridge of the support at "a". If not, remove the front rubber buffer (14) and file the support.	Ratchet spanner 14 mm socket and extension
17	Finally tighten the ring nut (4) (spanner 1757-T, see Pl. 105). Knock over at one point, the metal of the nut into the grooves in the sidemember (see Pl. 104)	Spanner 1757-T

		TOOLS
18	To assemble the piston rod (see Pl. 116) :	
	a) Put the ball (13) previously greased in its housing.	
	b) With the arm in its lowest position, engage the piston rod (7) in the buffer support and line up the holes for the retaining clip (8) in the piston rod, in the dust cover (10) and in the buffer support. Fit the retaining clip with the longest leg through the buffer support. Turn down the end of the retaining clip on the support (see fig. 2).	
	Fit the clip (9) on the dust cover.	
	NOTE - Before fitting the retaining clip, make sure that the piston rod is in good contact with the ball, so that when raising the arm, the piston rod will not slip out of the buffer support.	
19	Fit the anti-roll bar, giving equal clearance on both sides. Fit the anti-roll bar in the original position so as to be able to line up the marks made when dismantling the corrector control rod. Tighten the flange screws to 36 ft/lbs (5 m.kg)	14-16 mm box spanners
20	Place the corrector control rod (2) on the mark made when dismantling so as to give a side play at "b" of 1 mm approximately between the base of the fork and the corrector ball pin (see fig. 2). Tighten the clamp (1).....	12 mm spanner
	NOTE - If the anti-roll bar or the corrector control rod have been replaced, proceed to pre-adjust the heights (see Op. DS 433-0).	
21	To fit the brake pipes :	
	a) Engage the trunnion of the union in the bore of the arm spindle. Tighten moderately the locking screw (5). Tighten the locknut	5-8 mm ring spanners
	b) Connect the pipe (15) to the wheel cylinder and fit the bleed screw (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	Spanner 2219-T or Spanner 2221-T 10 mm spanner
	c) Align the pipe (6) so that the centre line of the feed pipes in the three-way union and the centre line of the articulating union are parallel.	
	NOTE - This operation is very important. It is necessary that the articulating movement is not under strain, otherwise there is a risk of seizure.	
	d) Tighten the pipe union nuts on the three-way union (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or Spanner 2221-T
	NOTE - If the left-hand half axle has been removed, do not fit either the protection panel or the left-hand wing.	
22	Fit the wheels and put the systems under pressure by running the engine	8 mm spanner
23	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Bleed the brake system (see Op. DS 453-0)...	Jacking bracket 2505-T
24	Put the car on a ramp. Adjust the heights (see Op. DS 433-0).	

		TOOLS
25	Put the car on a stand (jacking bracket 2505-T, see Pl. 168). Remove the left-hand wheel. Fit the mud shield and refit the wheel and lightly oil the hexagon	Jacking bracket 2505-T
26	Tighten the wheel to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the wing.....	14 mm box spanner
27	Fix the pipe assembly in the sidemember by fitting the pipes in the sockets of the retaining bushes.	
28	Fit the crossmember closing plate.	

PARTICULAR POINTS

Assembly.

10 To prepare the brake backplate (*cars produced before December 1957*).

Fit the distance washers between the brake shoe guide pins and the brake backplate so that the dimension "d" = 3·25 ± 0·1 mm (see Pl. 144, fig. 6).
Pay attention to the position of the split-pin holes so that the pins will not foul when in position.

12 To grind the drums.

Do not increase the diameter by more than 2 mm, the original diameter is 255 mm. The maximum tolerance of eccentricity is 0·04 mm.

13 To prepare the stub axle bearings.

If the arm, the bearings or distance pieces are to be replaced, it is necessary to use a distance piece permitting the correct adjustment to be obtained. To do this proceed as indicated in paragraph 13.

14 To prepare the axle arm.

Fit the oil seal at a distance "e" = 4·5 mm from the face of the hub (see Pl. 103).
Fit the brake backplate. Tighten the screws to 17¾ ft/lb (2·4 m.kg).
Tighten the nut locking the bearings to 72 ft/lb (10 m.kg) surface and threads greased (lockplate).

16 *Mark the position of the drum and centre the brake shoes.*

17 To fit the articulating housing of the axle arm.

Tighten the nut locking the bearings to 65¼ ft/lb (9 m.kg), surface and threads greased, and untighten the nut 1/6th of a turn.

		TOOLS
	DISMANTLING	
1	Place the axle arm in a vice (vice adaptor MR-3053-90, see Pl. 106)	Vice adaptor MR-3053-90
2	To remove the stub axle (see Pl. 103) :	
	a) Remove the hub sealing cap (17) with the aid of a chisel.	
	b) Lock the drum by tightening the brake adjusting cams. Remove the stub axle nut (18), the lockplate and the bearing thrust washer (19).	
	c) Unlock the brake drum. Remove the brake drum fixing screws and remove the drum.	
	d) Remove the stub axle (extractor 2018-T, see Pl. 107). Remove the ball bearing (20) and the distance piece (21). Be careful that the balls of the outer bearing (22) do not fall out of place	36 mm box spanner Extractor 2018-T

		TOOLS
3	To remove the articulating bearing housing (see Pl 104).. Remove the nut (23) and take out the roller bearing cage and the inner race (24). Disengage the seal (33) and the roller cage (34) from the bearing housing	40 mm spanner
4	To strip the arm (see Pl. 103) : a) Remove the oil retainer (25) from the stub axle. b) Remove the brake backplate (spanner 1677-T, see Pl. 65, fig. 4). c) Remove the seal (26) and the outer race (27) of the outer bearing (22) (extractor 2019-T, see Pl. 108). d) Drive out the outer race (28) of the inner bearing (20) with the aid of a tube. e) Drive off the oil retainer (29) (see Pl. 104) with the aid of a chisel. Be careful not to damage the articulating spindle	Extractor 2019-T Spanner 1677-T Tube : outside dia. = 53.5 length = 200
	NOTE - We have fitted successively anti-roll bars and axle arm of two dimensions. These parts are not interchangeable.	
5	To strip the stub axle (see Pl. 103) : a) Remove the inner cage of the outer bearing (extractor 2020-T, see Pl. 109). Remove the bearing distance piece (30). NOTE - In order to allow the extractor to grip on the first assembly, make a groove in the bearing distance piece (see Pl. 109, fig. 2). b) Remove the wheel locking cone (31) and the spring (32). Remove the wheel dowel (51) with the aid of a drift	Extractor 2020-T
6	To strip the brake backplate (see Pl. 144) (*cars produced before December 1957*): a) Remove the brake shoe return spring (35) (pliers 2110-T, see Pl. 145) ..... b) Remove the split pins from the brake shoe guide pins (36). Remove the washers (37), the spring (38) and the brake shoe retaining washers (39). c) Remove the nuts from the anchor pins (40). Remove the retaining washers, the distance pieces (42), the brake shoes and the eccentric bushes. ..... d) Drive out the brake shoe anchor pins with the aid of a bronze drift. e) Remove the nuts fixing the brake shoe guide pins (36) and remove the brake shoe guide pins and their distance washer (44). f) Remove the wheel cylinder. Remove the dust cover (45), the pistons (46) and the circlips (47)..... g) Unrivet and remove the brake shoe adjusting cams (48) (assembly MR-3354-40, see Pl. 146)	Pliers 2110-T 21 mm box spanner 12-14 mm box spanners Assembly MR-3354-40

		TOOLS
7	To strip the brake backplate (*cars produced since December 1957*)(see Pl.144):	
	a) Remove the brake shoe return spring (35) (pliers 2210-T, see Pl. 145)	Pliers 2110-T
	b) Remove the cups (56) by turning $\frac{1}{4}$ of a turn in order to unlock them from their rod, remove the springs (57) and the rods (58).	
	c) Remove the nuts from the anchor pins (40), the lockplate (41), the brake shoes and the eccentric bushes (43). Drive out the anchor pins (40) from the brake backplate	21 mm box spanner
	d) Remove the wheel cylinder. Remove the rubber cups (45), the pistons (46), the circlips (47) and the bleed screw.	8-12 mm box spanners
	e) Unrivet and remove the brake shoe adjusting cams (48) (assembly MR-3354-40, see Pl. 146).....	Assembly MR-3354-40
8	Clean the parts.	
	REFITTING	
9	To prepare the wheel cylinder (see Pl. 144) :	
	Use only alcohol or hydraulic fluid for cleaning the parts, any other product will cause rapid deterioration of the rubber seals. Moisten the cylinder and piston with hydraulic fluid.	
	Fit the circlips (47), the pistons (46) with their ring seals (49) and dust covers (45).	
	NOTE - We have fitted successively two types of brake backplates and brake drums. Note the original type of assembly.	
10	To prepare the brake backplate (*cars produced before December 1957*)(see Pl.144):	
	a) Fit the adjusting cams (48), rivet the pins (assembly MR-3354-40, see Pl. 146).	
	b) Fit the brake shoe anchor pins (40) with the aid of a bronze drift.	
	c) Fit the brake shoe guide pins (36). Place the distance washers (44) between the brake shoe guide pins and the brake backplate so that the dimension "d" = 3.25 ± 0.1 mm (see fig. 6).	
	NOTE - Pay attention to the position of the split pin holes so that the pins will not foul when in position.	
	d) Fit the wheel cylinder.	
	e) Put the brake shoe eccentric bushes (43) lightly oiled, in position on the brake shoe anchor pins (40).	
	Fit the brake shoes on the eccentric bushes. Fit the distance washers (42), the retaining washers and fit the nuts.	
	f) Fit on the brake shoe guide pins (36), the washers (39), the springs (38) and the washers (37). Split pin. Fit the brake shoe return spring (35) (pliers 2210-T, see Pl. 145)	Assembly MR-3354-40 Pliers 2210-T

		TOOLS
11	To prepare the brake backplate (see Pl. 144) (*cars produced since December 1957*):	
	a) Fit the adjusting cams (48), rivet the pins (assembly MR-3354-40, see Pl. 146)	Assembly MR-3354-40
	b) Fit the brake shoe anchor pins (40) with the aid of a bronze drift.	
	c) Fit the wheel cylinder (spring washers under the fixing screw heads)	12 mm box spanner
	d) Fit the brake shoe eccentric bushes (43) on the brake shoes.	
	Offer up the brake shoes on the brake shoe anchor pins (40) lightly oiled. Put the lockplate (41) in position and fit the nuts.	
	e) Fit the rods (58), the springs (57) and the cups (56) by turning them $\frac{1}{4}$ of a turn in order to lock them on their rod.	
	f) Fit the brake shoe return springs (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T
12	To grind the drums :	
	Grind the braking surface in a lathe. Do not increase the diameter by more than 2 mm, the original diameter is 225 mm. The maximum tolerance for eccentricity is 0.04 mm. Check this condition with a dial gauge. To ensure good concentricity, use the mandrel MR-3700-120 (see Pl. 147, fig. 3)	Mandrel MR-3700-120
13	To prepare the stub axle bearings (see Pl. 103) :	
	a) Fit the outer races (27) and (28) of the bearings (22) and (20). Lightly oil the races in order to ease their fitting. Use the tubes	Tube: outside dia. = 79.5 length = 150 Tube: outside dia. = 61.5 length = 150
	b) Determine the length of the distance piece (21).	
	IMPORTANT NOTE - If the arm, the bearings or one of them or the bearing distance pieces are to be replaced, it is necessary to use a distance piece permitting the correct adjustment to be obtained.	
	To do this, proceed as follows (fixture 2021-T, see Pl. 110) :	
	1. To set the dial gauge (see fig. 1).	
	Put the outer bearing (inner race and ball cage assembly) on a surface plate. Fit the support plates (A) fitted with the dial gauge 2437-T on the bearing race. Set the dial gauge at "0" and mark the position of the totalising needle (the reading should be from 4 to 5 mm).	
	2. Put the fixture in position within the hub of the arm (see fig. 2).	
	Engage the inner bearing on the shaft (B) of the fixture, the inner race in contact with the spring (C).	
	Place the assembly within the hub of the arm, then in position on the shaft (B) : the bush (D), the bush retaining spring (E) the assembly of the inner race and ball cage of the outer bearing, the support plate assembly (A), the dial gauge and washer (F). Tighten the nut (G). Care should be taken not to alter the setting of the dial gauge. Turn this assembly several turns to make sure that the bearings are in position.	

TOOLS

3. Bring the index needles of the dial gauge in their first position; let the dial gauge spindle return slowly until it is in contact with the bush, counting the turns and numbers of turns, for example : 0.97 mm.

   In order to obtain a bearing setting with clearance = "0", the length of the distance piece would be 0.97 mm plus the length of the bush. This length is marked on the bush, for example : 74.71 mm.

   The length of the distance piece required would be : 74.71 + 0.97 mm = 75.68 mm in the example.

NOTE - In order to facilitate the stocking of parts, only one distance piece will be sold by our Spare Parts Department of a length 72.78 ± 0.02 mm. Only the hundredth number is marked on the distance piece. For example: "80" will mean that the distance piece measures 72.80 mm (dimensions measured under load and in consequence cannot be measured with a vernier). A series of washers permits the desired adjustment to be obtained.

These washers are shown on the schedule in the Spare Parts Catalogue.

In the example chosen, we have to find one for play of "0", the length of the distance piece being 75.68 mm.

The length of the distance piece of the repair, for example : 72.80 mm, the thickness of the washer required is :

$$75.68 - 72.80 = 2.88 \text{ mm.}$$

Select the appropriate washer from those sold by our Spare Parts Department. In the example chosen, use washer D 426-322.

(The washers are marked with the three last figures of their part number).

IMPORTANT NOTE - In the case where the washer thickness required is equal to one limit dimension of a washer :

1. For example: 2.86, choose a washer of immediately lower thickness; D 426-321 (2.82 to 2.86 mm).
2. For example: 2.90, choose a washer D 426-322 (2.86 to 2.90 mm).

4. Remove the fixture ..... Fixture 2021-T
   Dial gauge 2437-T

14 To prepare the arm (see Pl. 103) :

a) Grease the outer bearing (22) (special bearing grease) and put in position.

   Fit the oil seal (26) to the dimension "e" = 4.5 mm from the face of the hub (mandrel MR-3676-170, see Pl. 147, fig. 2) ..... Mandrel MR-3676-170

b) Fit the brake backplate. Tighten the screw to $17\frac{3}{4}$ ft/lbs (2.4 m.kg) (spring washer) (spanner 1677-T, see Pl. 65, fig. 4) ..... Spanner 1677-T

c) Fit the oil retainer (25).

15 To fit the stub and drum assembly on the arm (see Pl. 103) :

a) Put in position the wheel locking cone (31) and its spring (32) after lightly oiling.

		TOOLS
	b) Hold the stub axle in a vertical position (vice adaptor 1922-T, see Pl. 99, fig. 1). Engage the bearing stop (30) on the stub axle (see Pl. for position)	Vice adaptor 1922-T
	c) Fit the arm on the stub axle. Hold the arm by hand and fit the bearing (22) on the journal on the stub axle, in a press using a tube. Fill the bearing housing with $3\frac{1}{2}$ ounces (100 g) of special bearing grease. Fit the distance piece and the washer selected in paragraph 13. Fit the ball cage (20) previously greased. Put the inner race in position with a press. Hold the assembly in a vice (vice adaptor MR-3053-90, see Pl. 106). Fit the bearing distance washer (19) (see Pl. for position), the lockplate and the nut (18). Tighten the nut to 72 ft/lbs (10 m.kg) (surface and threads greased). Turn over the lockplate. Fit the steel hub sealing cap, filled with grease (special bearing grease). Fit the rubber drain tube to the oil retainer	Tube: outside dia. = 32 inside dia. = 25 length = 250 36 mm box spanner Vice adaptor MR-3053-90
16	Remove the drum (after having marked its position on the stub axle) (see Pl. 144). Centre the brake shoes by adjusting the eccentric bushes (43) and the cams (48) (centring fixture 2115-T, see Pl. 148) and (for cars produced before December 1957) spanner 2120-T (see Pl. 145, fig. 2). Tighten the nuts on the brake shoe anchor pins (40) and split pin. Fit the drum. Fit the wheel dowel (51) (see Pl. 103)	Fixture 2115-T Spanner 2120-T 21 mm spanner
17	<u>To fit the articulating bearing housing</u> (see Pl. 104) : a) Fit the oil retainer (29) with the aid of a tube. Put in the housing, the bearing (34) and fit the oil seal (33) with the aid of a tube	Tube: outside dia. = 60 inside dia. = 56 length = 200 Tube: outside dia. = 79 inside dia. = 67 length = 100
	b) Fit the prepared housing on the articulating spindle arm. Fill the housing with $1\frac{3}{4}$ ounces (50 g) special bearing grease. Fit the inner bearing (24), the nut (23), fitted with its washer and rubber joint. Tighten the nut to 65 ft/lbs (9 m.kg) (surface and threads greased), turn the bearing body, in order to position the rollers. Untighten the nut 1/6th of a turn and knock down the metal of the nut into the slot of the shaft. NOTE - If the part of the nut to be used for locking on the shaft has been used before, it is necessary to renew the nut in order to avoid altering the conditions of adjustment.	
18	Remove the arm from the stand.	
19	Paint the assembly, except for the bearing housing and the hexagon for fixing the wheel.	

PARTICULAR POINTS

Replacement of a wheel stub axle.

Replacement of a bearing oil seal or a bearing thrust collar.

Fit the oil seal at a distance "e" = 4·5 mm from the face of the hub (see Pl. 103).
Tighten the nut locking the stub axle bearings to 72 ft/lb (10 m.kg) surface and threads greased (lockwasher).
Centre the brake shoes.

TOOLS

REPLACEMENT OF A WHEEL STUB AXLE

Removal (see Pl. 103).

1 Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168).

Remove the wing and the wheel ..... — Jacking bracket 2505-T, 14 mm box spanner

2 To remove the stub axle :

a) Remove the hub sealing cap (17). Locking the drum by tightening the brake adjusting cams; remove the nut (18), the lockwasher and the thrust washer (19) ..... — 36 mm box spanner

b) Untighten the brake adjusting cams. Untighten the brake drum fixing screws and remove the drum after having marked its position.

c) Remove the stub axle (extractor 2018-T, see Pl. 107) ..... — Extractor 2018-T

d) Remove the ball bearing (20) and the distance piece (21). Be careful that the balls of the outer ball bearing (22) do not fall out of position (early type cars).

Remove the oil seal (26) and remove the outer race (27) of the outer bearing (22) from the axle arm (extractor 2019-T, see Pl. 108) ..... — Extractor 2019-T

3 To strip the stub axle :

a) Remove the inner race of the outer bearing from the hub (extractor 2020-T, see Pl. 109, fig. 2) and remove the distance piece (30) ..... — Extractor 2020-T

b) Remove the wheel locking cone (31) by pressing in the housing of the spring (32) and by pivoting around the centre line past the dowel pin (39). Remove the spring (32).

c) Remove the wheel dowel (51) with the aid of a drift.

		TOOLS
	Refitting (see Pl. 103).	
4	To prepare the hub bearings :	
	a) Fit the outer race (27) of the outer bearing (22) and fit the inner bearing (20) in the hub with a press. Lightly oil the outer races in order to ease their fitting (tube outside diameter = 79.5 mm for the bearing race (27) and tube outside diameter = 61.5 mm for the bearing race (20)	Tube: outside dia. = 79.5 length = 150 Tube: outside dia. = 61.5 length = 150
	b) Grease the outer race (22) and put in position. Fit the oil seal (26) at a distance "e" = 4.5 mm from the outer face of the axle arm.	
5	To assemble the stub axle :	
	a) Put the spring (32) and the wheel locking cone (31) in position, after lightly oiling.	
	b) Fit the wheel positioning dowel (51). Offer up on its housing and put in position with a drift.....	Drift: dia. = 8 length = 80
	c) Hold the hub vertically (stand 1922-T, see Pl. 99, fig. 1) and position the distance piece (30)	Stand 1922-T Tube: outside dia. = 32 inside dia. = 25 length = 250
6	To fit the stub axle :	
	a) Fit the axle arm on the stub axle. Hold the arm by hand and fit the bearing (22) on the journal on the stub axle, in a press using a tube. Fill the bearing housing with $3\frac{1}{2}$ ounces (100 g) of special bearing grease. Fit the distance piece (21) and the washer (60) (if found when dismantling). Fit the ball cage (20) previously greased. Put the inner race in position with a press	Tube: outside dia. = 32 inside dia. = 25 length = 250
	b) Fit the bearing retaining washer (19) (see Pl. for position), the lockwasher and the nut (18). Tighten the nut to 72 ft/lbs (10 m.kg) (surface and threads greased). Turn over the lockwasher	36 mm box spanner
	c) Fit the steel end cap filled with grease (special bearing grease). Fit the rubber pipe to the outlet of the oil retainer.	
7	Centre the brake shoes by working on the eccentric bushes (43) and on the cams (48) (see Pl. 144) (fixture 2115-T, see Pl. 148). Lock the nuts of the brake shoe articulating spindles. Turn over the lockwasher (41)	Fixture 2115-T 21 mm box spanner
8	Fit the brake drum, note the marks made when dismantling. Tighten the fixing screws. Fit the wheel and the wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T 14 mm box spanner

		TOOLS
	REPLACEMENT OF A BEARING OIL SEAL OR A BEARING THRUST COLLAR	
	Removal (see Pl. 103).	
9	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wing and the wheel	Jacking bracket 2505-T 14 mm box spanner
10	Remove the stub axle (see paragraph 2, this operation) and remove the bearing oil seal (26).	
11	Remove the inner race of the outer hub bearing (extractor 2020-T, see Pl. 109) and remove the distance piece (30).	Extractor 2020-T
	Refitting (see Pl. 103).	
12	With the outer bearing (22) in position, fit the bearing oil seal (26) at a distance "e" = 4.5 mm from the outer face of the axle arm.	
13	Make sure that the journal for the bearing oil seal on the distance piece (30) is free from scratches or dents; if not, it should be replaced.	
14	Offer up the stub axle in the axle arm and put in position in the bearings (20) and (22). Fit the thrust washer (19), the lockwasher, the nut (18). Tighten the nut to 72 ft/lbs (10 m.kg) surface and threads greased. Turn over the lockwashers	36 mm box spanner
15	Centre the brake shoes by working on the eccentric bushes and on the adjusting cams (fixture 2115-T, see Pl. 148). Lock the nuts of the brake shoe articulating spindles. Turn over the lockwashers	Fixture 2115-T 21 mm box spanner
16	Fit the brake drum and note the marks made when dismantling. Tighten the fixing screws.	
17	Fit the wheel and the wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the screw fixing the wheel to 108 to 144 ft/lbs (15 to 20 m.kg)	Jacking bracket 2505-T 14 mm box spanner
	REPLACEMENT OF A WHEEL LOCKING CONE	
	Removal (see Pl. 103).	
18	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wing and the wheel	14 mm box spanner
19	To remove the wheel locking cone : Press the cone (31) in the housing of the spring (32) and then turn $\frac{1}{4}$ of a turn, around a centre line passing through the centre of the cone locking dowel (39).	

TOOLS

Refitting (see Pl. 103).

20 Offer up the cone (21) previously oiled in the hub (the locking dowel engaged in one of the slots in the hub) and then turn $\frac{1}{4}$ of a turn by pressing in the housing of the spring (32) in order to put in position.

21 Fit the rear wing and the wheel.

Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg) ..... 14 mm box spanner
Jacking bracket 2505-T

PARTICULAR POINTS

Pre-adjustment of the front heights.

With the front of the car on stands, raise the assembly of the arm (a jack under each lower arm) in order to bring the threaded gauge rod to a distance "n" = 175 mm from the smooth gauge rod at each side of the car at the same time (see Pl. 170) and fix the height corrector control rod on the anti-roll bar.

Pre-adjustment of the rear heights.

With the rear of the car on stands, position the two arms in order to obtain a distance "c" = 35 mm (see Pl. 116, fig 1). Position the height corrector in the fully open position and fit the control rod on the anti-roll bar.

To adjust the heights.

7 *Check the tyre pressures: at the front (165 X 400 X) = 24 p.s.i. (1·7 kg/cm²) – at the rear (155 X 400 X.) 20 p.s.i. (1·4 kg/cm²).*

10 *Adjust the front heights, in order to obtain an average height of 255 ± 3 mm from under the anti-roll bar to the surface upon which the wheels are resting.*
Adjust the rear heights in order to obtain an average height of 335 + $^{10}_{0}$ mm from under the anti-roll bar to the surface upon which the wheels are resting.

16 *Check the camber of the front wheels. The difference in camber of the two wheels should not exceed 1 mm.*

17 To adjust the manual height control rods (*cars produced before November 1957*).

Make sure that there is a gap "a" = 0·5 mm between the control lever and the edge of the slot, the corrector being in the fully open position, then in the fully closed position (front and rear).

18 To adjust the manual height control rods (*cars produced since November 1957*):

(*a*) *Make sure that there is a gap "f", front corrector in the fully open position, and a gap "g", front corrector in the fully closed position (see Pl. 121).*
(*b*) *Make sure that there is a gap "h", rear corrector in the fully open position, and a gap "i" rear corrector in the fully closed position.*
(*c*) *Check the functioning of the manual height control; if necessary check that the control levers do not touch the coque. If this is the case, adjust the position of the control bearings.*

19 To adjust the lateral position of the anti-roll bars.

Put the right-hand stop in a position to obtain a distance "h" = 110 ± 0·5 mm (see Pl. 114).

20 To adjust the anti-roll bar bearings.

The nuts of the "U" bolts are tightened to 9 ft/lb (1·2 m.kg), the anti-roll bar should turn under a load of 9 – 13 lb. (4 to 6 kg) applied on the bali joint, the bearings being greased (graphite grease).

To adjust the lateral clearance of the anti-roll bar.

Put the left-hand stop in a position to obtain a gap "k" = 0·5 to 1 mm (see Pl. 114).

		TOOLS
	PRE-ADJUSTMENT OF THE FRONT HEIGHTS (see Pl. 121).	
1	Connect the height control rod (39), to the rod (34) and to the trunnion on the corrector control lever (29). (The manual height control lever being in the low position)	7 mm spanner
2	Put the manual height control lever in the high position. Make sure that the valve of the corrector is in the fully open position. (The lever being pushed towards the front with a screwdriver).	
3	Unscrew the locknut (53) of the adjusting screw and put the eccentric in the neutral position by working on the screw (57) (spanner 2285-T, see Pl. 97, fig. 5), or place the slot in the middle position.....	Spanner 2285-T
4	Put the gauges 2307-T in position (see Pl. 170). The threaded gauge in the wheel hub cone and the smooth gauge in the bore of the steering relay. By means of two jacks (one under each lower arm), raise the assembly of the arm in order to bring the threaded gauge to a dimension "n" = 175 mm from the gauge of the steering relay. Make sure that a gap of 1 mm approximately exists between the base of the control lever and the corrector ball joint, if not, move the control rod. Tighten the control rod clamp (33) on the anti-roll bar (see Pl. 114) (spanner 1677-T, see Pl. 65, fig. 4, for the screw with flats). Remove the gauges 2307-T	12 mm box spanner or Spanner 1677-T Gauges 2307-T
	PRE-ADJUSTMENT OF THE REAR HEIGHTS (see Pl. 116).	
5	Fit the two arms in a manner to obtain a dimension "c" = 35 mm between the upper edge of the cup of the rubber stop (14) and the thrust face on the steel stop.	
6	Place the height correct in the fully open position with the control rod. Tighten the clamp (spanner 1677-T, see Pl. 65, fig. 4, for the screw with flats)	12 mm box spanner or Spanner 1677-T
	ADJUSTMENT OF THE HEIGHTS	
	In order to carry out this operation, the car must be unladen and ready for the road (with spare wheel, tool kit and $1\frac{1}{2}$ gallons (5 litres) petrol in the tank. Place the height control lever in the "normal" position (opposite the thick white line).	
7	Check the tyre pressures :- At the front : 165 x 400 X = 24 p.s.i. (1.7 kg/cm^2). At the rear : 155 x 400 X = 20 p.s.i. (1.4 kg/cm^2).	

		TOOLS
8	Put the car on a lift or over a pit. Leave the engine idling. Release the parking brake. Do not check the wheels.	
	To adjust the front heights (see Pl. 114) :	
9	Remove the insulating plate protecting the piping, fixed on the crossmember under the engine	8 mm box spanner
10	Slightly loosen the screw of the clamp (33) fixing the height corrector control rod (46).	
	Turn the clamp (33) in the direction required to obtain an average height of 225 ± 3 mm from the underside of the anti-roll bar to the surface on which the wheels are resting. Carry out this operation by fractions of turns, by turning the clamp (33) towards the front, one increases the height of the car and one decreases the height by turning the clamp towards the rear.	
	Retighten the screw of the clamp (33) (spanner 1677-T, see Pl. 65, fig. 4, for screw with flats).....	12 mm box spanner or Spanner 1677-T
11	Fit the protection plate on the crossmember. Tighten the fixing screws (plain and spring washers under the heads)...	8 mm box spanner
12	To check the front heights. Proceed as follows :	
	a) Place a straight edge, resting on the sides of the lift or pit, immediately below and parallel to the anti-roll bar. The lower edge of this straight edge must be exactly level with the surface on which the wheels are resting.	
	b) Raise the car very slowly by the front bumper, stop when resistance is felt, wait in this position until a whistling noise is heard;indicating the commencement of exhaust of hydraulic fluid.	
	NOTE - The time taken to raise the car should be a minimum of 20 seconds.	
	At this exact moment, have an assistant measure the distance between the underside of the anti-roll bar (level with the sidemember on the right side) and the surface on which the wheels stand (lower edge of straight edge mentioned in paragraph "a").	
	Use a 50 cm rule. In the same conditions, take the distance level with the left sidemember.	
	Take the average of the two dimensions, for example: 245 mm.	
	c) Let the car stabilise itself. It should rise and then descend.	
	d) Press the car down slowly by the front bumper, stop when resistance is felt. Wait in this position until a whistling noise is heard; indicating the commencement of the inlet of hydraulic fluid. Have an assistant take the dimensions between the underside of the anti-roll bar and the surface on which the wheels stand (level with the right and left sidemembers (see paragraph "b", Note). Take the average of these two dimensions,for example: 210 mm.	
	e) Take the average of the figures given in paragraphs "b" and "d", for example :	
	$$\frac{245 + 210}{2} = 227.5 \text{ mm.}$$	
	This average should be between 222 and 228 mm.	
	f) If this is not the case, again carry out the operations mentioned in paragraphs 9 and 10.	

TOOLS

To adjust the rear heights.

13 Proceed as for the adjustment of the front heights (see paragraph 10), after having removed the panel protecting the corrector control (on the inside of the rear boot).

The height to be obtained is : $335 \begin{smallmatrix} +10 \\ 0 \end{smallmatrix}$ mm from the underside of the anti-roll bar to the ground.

14 To check the rear heights. Proceed as follows :

a) Place a straight edge resting on the sides of the lift or pit, immediately below and parallel to the anti-roll bar.

b) Remove the rubber grommet, from the floor board, it will be found to the right of the exhaust pipe.

c) Raise the car very slowly by the rear bumpers, stop when resistance is felt, wait in this position until a whistling noise is heard indicating the commencement of the exhaust of hydraulic fluid.

NOTE - The time taken to raise the car should be a minimum of 20 seconds.

At this exact moment, have an assistant measure the distance between the underside of the anti-roll bar and the surface on which the wheels stand (put a rule through the hole in the floor board, the end of the rule resting on the anti-roll bar), for example: 347 mm.

d) Let the car stabilise itself.

e) Press the car down slowly by the rear bumper, stop when resistance is felt. Wait in this position until a whistling noise is heard; indicating the commencement of the inlet of hydraulic fluid. Have an assistant measure the distance between the underside of the anti-roll bar and the surface on which the wheels stand, for example : 329 mm.

Take the average of the dimensions, for example:

$$\frac{347 + 329}{2} = 338 \text{ mm.}$$

This average should be between 335 and 345 mm.

f) If this is not the case, again carry out the operations mentioned in paragraphs 13 and 14.

g) Put the rubber grommet in position in the floor board.

15 Check the front heights again and adjust if necessary.

16 Check the camber of the front wheels (fixture 2314-T, see Pl. 169, fig. 2). The difference of the camber of the two front wheels should not exceed 1 mm; if so, adjust the sleeve (35) (see Pl. 114).....

12-14 mm box spanners
Camber adjusting fixture 2314-T

TOOLS

17 To adjust the manual height control rods (*cars produced before November 1957.*)

a) At the front (see Pl. 120).

Put the corrector slide valve in the fully open position (push towards the front), check that there is a gap "a" = 0.5 mm between the lever (15) and the edge of the slot of the connecting rod (16). Put the corrector slide valve in the fully open position, (push towards the rear), check that there is a gap "a" of 0.5 mm between the lever and the other edge of the slot.

b) If need be, adjust the control rod (17), unscrew the locknut (21), turn the rod (17) in the suitable direction, tighten the locknut.

c) At the rear (see Pl. 120).
Proceed as for the front; the gap "b" is greater when the corrector is in the fully open position, then in the fully closed position, it should be 0.5 mm.

d) In the contrary case, unscrew the locknut (22), move the sleeve nut (23) in the required direction. Tighten the locknut (22).

18 To adjust the manual height control rods (*cars produced since November 1957):*

a) At the front, make sure that there is a gap "f", the corrector being at the end of the inlet stroke (lever (34) pushed towards the front) and a gap "g", the corrector being at the end of the exhaust stroke (lever (34) pushed towards the rear). If necessary, turn the rod (39).

b) At the rear, make sure that there is a gap "h", the corrector being at the end of the inlet stroke (lever (35) pushed towards the front) and a gap "i", the corrector being at the end of the exhaust stroke (lever (35) pushed towards the rear). If necessary, work on the nuts (36) and (37).

c) Check the functioning of the manual height control. Make sure especially that the control levers do not touch the coque. If so, adjust the position of the control bearings.

NOTE - In the case of it being impossible to adjust the heights by working on the control rods, carry out the pre-adjustment of the heights (see paragraphs 1 to 4, this operation, for the front and paragraphs 5 and 6, this operation, for the rear).

ADJUSTMENTS ON THE FRONT ANTI-ROLL BAR

19 To adjust the lateral position of the anti-roll bar (see Pl. 114).

a) Remove the lateral protection panel.

b) Place a straight edge on the inner face of the right-hand fixing boss, hold this straight edge by hand, with a rule measure the distance "h" between the stop (44) and the outer face of the straight edge. If necessary, move the stop in a convenient direction so that the distance "h" is equal to 110 ± 0.5 mm. Tighten the stop fixing screw.

TOOLS

20 To adjust the lateral clearance of the anti-roll bar (see Pl. 114).

To adjust the lateral clearance of the bar :

Put the right-hand stop (44) against the bearing (43) of the right-hand bearing block, pushing on the anti-roll bar.

Move the left-hand stop (45) in the direction required to obtain a gap "k" of 0.5 to 1 mm between the stop and the lower bearing of the left-hand bearing block.

21 To adjust the bearings of the front anti-roll bar (see Pl. 114).

a) Place the bearing on the bar as indicated in fig. 2, hold it in this position and measure the gap "j" by means of a set of feeler gauges. For example: "j" = 1.80 mm.

NOTE - If the bearing cap is made of aluminium, it should be replaced by a steel cap.

These bearings are assembled with a light tightening torsion.

Select from among the shims sold by our Spare Parts Department, those with a thickness equal to :

$$\frac{j - 0.2}{2}$$ therefore, in the example above : $$\frac{1.80 - 0.2}{2} = 0.8$$ mm.

b) Fit the bearing. Fit two shims determined above, between the cap and the bearing. Tighten the nuts of the "U" bolts to 9 ft/lbs (1.2 m.kg) (spring washers) ..... 12 mm box spanner

c) Remove the bearing caps. Smear the bearings (43) with graphite grease and refit the bearing caps. Tighten the nuts of the "U" bolts to 9 ft/lbs (1.2 m.kg).

d) Check the leverage required to turn the anti-roll bar. It should turn under a load of 9 to 13 lbs (4 to 6 kg) applied on the ball joint, if not, alter the thickness of the shims accordingly.

e) Make sure that there is a gap "*l*" = 1 mm approximately between the yoke of the control rod and the ball joint of the corrector.

f) Fit the lateral protection panels.

PARTICULAR POINTS

Replacement of a suspension sphere or a damper valve.

Refitting.

4 *Screw the damper in the suspension sphere to a torsion of 13 ft/lb (1·9 m.kg).*
Screw the distance piece on the suspension sphere to a torsion of 25·32 to 36·17 ft/lb (3·5 to 5 m.kg) (left side).

5 *Screw the suspension sphere on to the suspension cylinder by hand.*

Replacement of a height corrector.

Removal.

9 *Immediately after having disconnected the return pipe (rear upper union) from the corrector, connect it to the overflow return pipe to avoid draining the reservoir.*

Refitting.

16 *Check and adjust the heights (Op. DS 433-0).*

Replacement of a suspension cylinder.

Replacement of a dust cover or a suspension cylinder piston rod.

In order to remove or refit the piston rod, it is necessary that the holes for the connecting pin are parallel.

		TOOLS
	REPLACEMENT OF A SUSPENSION SPHERE OR A DAMPER VALVE	
	Removal.	
1	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Put the lever of the manual height control in the low position	8 mm spanner
2	Remove the suspension sphere from the suspension cylinder (strap wrench 2223-T, see Pl. 93, fig. 1). On the left-hand side, make sure that the distance piece is removed with the suspension sphere. Seal the opening of the suspension cylinder (see Pl. 94). Place a cloth under the cylinder in order to avoid spilling fluid on the sidemember and the steering	Spanner 2223-T
3	Disconnect the distance piece from the suspension sphere (left side) and remove the damper, remove the joints. Seal the opening of the suspension sphere (see Pl. 94).....	19 mm box spanner

		TOOLS
	Refitting.	
4	Screw the damper in the suspension sphere and tighten to 13 ft/lbs (1.9 m.kg). Hold the suspension sphere against oneself and tighten the damper; when the suspension sphere slips, the tightening torsion is correct. Fit the distance piece to the suspension sphere, inserting a joint smeared with hydraulic fluid (left side).	19 mm box spanner
5	Connect the suspension sphere to the suspension cylinder, inserting the joint smeared with hydraulic fluid. Tighten the suspension sphere by hand.	
6	Put the system under pressure and check the joints for leakage	8 mm spanner
	REPLACEMENT OF A HEIGHT CORRECTOR	
	Removal (see Pl. 113).	
7	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel, the left-hand front wing and the lateral protection panel of the corrector	Jacking bracket 2505-T 8-12-14 mm spanners 8-12-14 mm box spanners
8	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Put the manual height control in the low position	8 mm spanner
9	Disconnect the unions on the corrector in the following order : a) Overflow return pipe (55). b) Feed pipe to the cylinders (60) (lower union). c) Feed pipe (61) for the corrector (front upper union). d) Return pipe (62) (rear upper union). Connect it immediately to the overflow return pipe union (55), in order to avoid draining the reservoir (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Seal the openings of the corrector and the pipes as the work proceeds (see Pl. 94)	Spanner 2219-T or Spanner 2221-T
10	Remove the corrector assembly and bracket (spanner 1623-T, see Pl. 16, fig. 2). Remove the bracket plate from the corrector	Spanner 1623-T 12 mm box spanner
	Refitting (see Pl. 113).	
11	Fit the bracket plate on the corrector, the fixing holes towards the two unions of the corrector. Tighten the fixing screws (spring washers under the heads)	12 mm box spanner
12	Offer up the corrector. Fit the fixing screws without tightening (plain and spring washers under the heads).	

		TOOLS
13	Connect the pipes to the corrector in the following order :	
	a) Return pipe (62). Tighten the union immediately (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or Spanner 2221-T
	b) Feed pipe (61) to the corrector.	
	c) Feed pipe to the cylinders (60).	
	d) Overflow return pipe (55)	Spanner 2219-T or Spanner 2221-T
14	Push the corrector as far as possible in the slots towards the front. Tighten the fixing screws (spanner 1623-T, see Pl. 16, fig. 2). Make sure that there is a clearance "*l*" = 1 mm approximately between the control lever arm and the corrector ball joint (see Pl. 114). If not, move the control rod (46) and tighten the clamp (33) on the anti-roll bar (see Pl. 114) (spanner 1677-T, see Pl. 65, fig. 4 for screw with flats).....	Spanner 1623-T Spanner 1677-T
15	Start the engine. Put the suspension system under pressure and check the unions for leakage and the level of the fluid in the reservoir. Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the screw fixing the wheel to 108 to 144 ft/lbs (15 to 20 m.kg).....	8 mm spanner Jacking bracket 2505-T
16	Check and adjust the heights (see Op. DS 433-0).	
17	Fit the lateral protection panel of the corrector. Fit the wing	8-12-14 mm box spanners
	REPLACEMENT OF A SUSPENSION CYLINDER	
	Removal (see Pl. 113).	
18	Remove the wing. Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel.....	Jacking bracket 2505-T
19	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Put the manual height control lever in the low position	8 mm spanner
20	Remove the suspension sphere from the suspension cylinder (strap wrench 2223-T, see Pl. 93, fig. 1). Seal the openings of the suspension cylinder and the suspension sphere (see Pl. 94)	Spanner 2223-T
21	Disconnect the feed pipe from the suspension cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Seal the openings of the pipe and the suspension cylinder (see Pl. 94).....	Spanner 2219-T or Spanner 2221-T
22	Remove the lateral protection panel	8 mm spanner 8 mm box spanner
23	Remove the clips fixing the dust covers (37) on the cylinder and on the cup of the rod (16). If necessary, drain any fluid from the dust cover. Remove the dust cover from the cup of the rod and from the cylinder; leave it fixed on the overflow return pipe.	
	NOTE - This pipe is not flexible and must not be folded or bent.	

		TOOLS
24	Remove the connecting pin (38) from its anchor hole on the cup of the ball (16) and remove the rod from the piston by pressing the arm down as far as possible. *The rod can only be disengaged when the holes for the connecting pin are parallel.*	
25	Unlock the locknut and unscrew the pointed cylinder fixing screw (47). Remove the suspension cylinder	12 mm spanner 12 mm box spanner
	Refitting (see Pl. 113).	
26	Offer up the suspension cylinder. Put the dust cover (37) in position on the cylinder and fit the rubber sleeve on the dust cover, holding the cylinder by hand.	
27	Fit the cylinder, the grooves "m" positioned towards the pointed fixing screws. Position the dust cover overflow channel in relation to the nylon overflow pipe. Fit a Ligarex clip on the rubber sleeve (48) (pliers 2483-T, see Pl. 17, fig. 2).....	Pliers 2483-T
28	Fix the suspension cylinder. Tighten the pointed screw (47) moderately in their housings. Lock the locknuts	12 mm spanner 12 mm box spanner
29	Put the piston rod (63) in position together with the connecting pin (38) in the cylinder and in the cup of the lever, by lowering the arm as far as possible. Make sure that the rubber sleeve (49) is fitted on the dust cover (37). Make sure that the ball (16) is in position. Engage the ends of the connecting pin in the holes of the cup.	
30	Put the dust cover (37) in position on the cup of the ball (16). Put the rubber sleeve in position. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2).....	Pliers 2483-T
31	Connect the feed pipe to the suspension cylinder. Tighten the union (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	Spanner 2219-T or Spanner 2221-T
32	Fit the suspension sphere and tighten by hand. For the left side, make sure that the suspension sphere is fitted with its distance piece. NOTE - The front suspension spheres are marked with the number "59" stamped on the cap.	
33	Start the engine. Retighten the pressure regulator bleed screw and put the suspension system under pressure. Check the unions for leakage	8 mm spanner
34	Fit the lateral protection panel, the wheel and the wing. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).....	8-12-14 mm box spanners Jacking bracket 2505-T

TOOLS

REPLACEMENT OF A DUST COVER OR A SUSPENSION CYLINDER PISTON ROD

Removal (see Pl. 113).

35 Remove the front wing. Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel ..... — Jacking bracket 2505-T

36 Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw.
Put the manual height control lever in the low position ..... — 8 mm spanner

37 Remove the lateral protection panel ..... — 8 mm spanner
8 mm box spanner

38 Remove the clips fixing the dust cover (37) on the cylinder and on the cup of the ball (16).
If necessary, drain any fluid from the dust cover. Disengage the dust cover from the piston rod bearing cup and from the cylinder; leave fixed on the overflow return pipe.

39 Disengage the connecting pin (38) from its anchor holes on the cup of the ball (16) and remove the piston rod (63) by lowering the arm to its limit.

Refitting (see Pl. 113).

40 Put the dust cover (37) in position on the cylinder and fit the rubber sleeve (48) on the dust cover. Fit a Ligarex clip on the dust cover (pliers 2483-T, see Pl. 17, fig. 2)..... — Pliers 2483-T

41 Put the piston rod (63) in position together with the connecting pin (38) in the cylinder and in the lever cup by lowering the arm to its limit. Make sure that the rubber sleeve (49) is fitted on the dust cover (37). Make sure that the ball (16) is in position.
Engage the ends of the connecting pin in the holes in the cup.

42 Put the dust cover (37) in position on the cup of the ball (16).
Put the rubber sleeve in position. Fit a Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2)..... — Pliers 2483-T

43 Start the engine. Retighten the pressure regulator bleed screw and put the suspension system under pressure .... — 8 mm spanner

44 Fit the lateral protection panel, the wing and the wheel.
Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg) ..... — 8-12-14 mm box spanners
Jacking bracket 2505-T

PARTICULAR POINTS

Overhauling a front or rear damper.

Tighten the nut of the stud to 16 ft/lb (2.2 m.kg).. Do not exceed this tightening torsion.

Overhauling a height corrector.

Dismantling.

In the hole drilled in the body, parallel to the spindle, there is a steel wire which must not be removed.

Assembly.

11 *Screw up the valve control. Tighten to 3.6 ft/lb (0.5 m.kg).*

12 *The nut at the opposite end of the control should be tightened to 1.8 ft/lb (0.25 m.kg).*

14 *When fitting the rubber cups, all the parts should be dipped in hydraulic fluid.*

Overhauling a suspension cylinder.

Overhauling a suspension cylinder.

Assembly.

The seal retaining washer is paired with the piston. If one of these parts are replaced it is necessary to fit a part of the same classification; a number is engraved on the edge of the washer and stamped on the head of the piston.
The felt joints should only be fitted after a few hours immersion in hydraulic fluid.

21 *Tighten the cylinder on the nut to 14 ft/lb (2m.kg). Pay particular attention to this tightening torsion.*

Testing a suspension cylinder (test bench 2290-T).

Put the cylinder, together with the piston rod, on the stand 2293–T (see Pl. 119) and build up pressure to 570 p.s.i. (40 kg/cm²). There should be no drop in pressure.

Checking the initial pressure of a suspension sphere (test bench 2290-T).

Operate the pump in order to build up pressure. At first the pressure will not rise, then rises rapidly and remains steady at the pressure of the sphere. This should be 839 $\pm \frac{30}{220}$ p.s.i. (59 $\pm \frac{2}{15}$ kg/cm²) for the front and 370 $\pm \frac{30}{150}$ p.s.i. (26 $\pm \frac{2}{10}$ kg/cm²) for the rear at a temperature of 20°C.

		TOOLS
	OVERHAULING A FRONT DAMPER VALVE	
	NOTE - These damper valves are marked with the letters "AV" stamped on the hexagon.	
	Dismantling (see Pl. 113, fig. 5).	
1	Hold the damper valve in a vice by the hexagon (64) suspension sphere side. Remove the hexagon (65), disengage the valve (66), the body (67), the valves (68) and (69). Remove the hexagon (64) from the stud	19 mm box spanner
2	Clean the parts with alcohol and blow with compressed air. Rub the body of the damper valve, lightly, with No. 600 abrasive paper moistened with alcohol, on a surface plate.	
	Assembly (see Pl. 113, fig. 5).	
3	Screw the hexagon (65) to the bottom thread on the longest threaded end of the stud and hold this assembly in a vice. Fit the parts in the following order : The valve (66), 0.30 mm thick. The damper body (67). The valve (68), 0.03 mm thick. The valve (69), 0.20 mm thick.	
	NOTE - For the damper valve to be quiet in operation, it is necessary that the valves are centred correctly on the smooth portion of the stud.	
	Tighten the hexagon (65) to 14 to 16 ft/lbs (2 to 2.2 m.kg). Do not exceed this tightening torsion (torsion spanner 2471-T, see Pl. 7, fig. 2)	Torsion spanner 2471-T 19 mm socket
	NOTE - This valve assembly for the damper valve is sold by our Spare Parts Department under the number DS 436-07a.	
	OVERHAULING A REAR DAMPER VALVE	
	Dismantling (see Pl. 116).	
4	Hold the shock absorber in a vice by the hexagon (65), suspension sphere side. Remove the hexagon (66). Remove the valves (67) and (68), the body (69), the valves (70), (71), (72) and (73). Remove the hexagon (65)...	19 mm box spanner
5	Clean the parts with alcohol. Blow with compressed air. Rub the body of the damper valve lightly, with No. 600 abrasive paper moistened with alcohol, on a surface plate.	

TOOLS

Assembly (see Pl. 116).

6 Screw the hexagon (66) to the bottom thread on the longest threaded end of the stud.

Hold the assembly in a vice.

Fit the parts in the following order :

The two valves (68) and (67) 0.3 mm thick (marked III, see Note) :

The body (69).

The two valves (71) and (70) 0.30 mm thick.

The valve (72) 0.20 mm thick (marked II).

The valve (73) 0.15 mm thick (marked I).

Tighten the hexagon (65) to 14 to 16 ft/lbs (2 to 2.2 m.kg). Do not exceed this tightening torsion (torsion spanner 2471-T, see Pl. 7, fig. 2) ..... Torsion spanner 2471-T
19 mm socket

NOTE - For the damper valve to be quiet in operation, it is necessary that the valves are centred correctly on the smooth portion of the stud.

REMARK :

1. The arrangement of parts mentioned above corresponds to rear damper valves fitted on cars since May 1957. The first type damper valve should be modified; the set of valve discs for one damper valve is sold by our Spare Parts Department under the number DS 436-07.

   Fit the valve discs in the order indicated, the valve discs of large diameter are marked : I, II and III.

   It is necessary to modify both rear damper valves of the car.

2. In the case of replacing a suspension sphere fitted with a damper, it is necessary to replace the other damper valve or fit a damper valve of the new type.

   In the same way, when replacing a damper valve, it is necessary to replace the other or to replace the set of valve discs. The new damper valves are marked "AR.I" on the outer face of the hexagon.

OVERHAULING A HEIGHT CORRECTOR

Dismantling (see Pl. 117).

7 Remove the steel caps (1) and (2) by blowing compressed air through the overflow return pipe (A).

If one of the caps remains in position, screw a plug D 391-63 (see Pl. 94, fig. 6), in the opening nearest to the cap and disengage by levering with a small screwdriver. Remove the plug.

8 Remove the nut (3) fixing the front cups on the corrector.

Disengage the steel cup (4), the rubber cup (5), the inner steel cup (6).

Disengage the valve and the rear cup assembly ..... 8 mm box spanner

		TOOLS
9	Hold the control arm (7) in a vice and remove the locknut (8) from the control. Remove the control. Disengage the flat washer (9), the outer steel cup (10), the rubber cup (11), the inner steel cup (12)	8 mm spanner
10	Thoroughly clean the parts with alcohol. Blow with compressed air.	
	NOTE - In the hole drilled in the body, parallel to the spindle, a steel wire will be found, this must not be removed when dismantling.	
	Assembly (see Pl. 117).	
11	To assemble the front cups :	
	On the end of the valve (13) with the longer threaded portion, fit an inner steel cup (12), a rubber cup (11) previously dipped in hydraulic fluid, an outer steel cup (10), the flat washer (9).	
	Screw on the valve control arm (7) and tighten to 4 ft/lbs (0.5 m.kg) (without bending the steel cup).	
	Fit the locknut (8), (the thinner nut)	8 mm spanner
12	Oil the valve (hydraulic fluid) and insert it in the body of the corrector, the control arm on the side nearest the return union (B).	
13	On the other end of the valve: put an inner steel cup (6), the rubber cup (5) previously dipped in hydraulic fluid, the outer steel cup (4).	
	Tighten the nut (3) to $1\frac{3}{4}$ ft/lbs (0.25 m.kg).....	8 mm box spanner
14	Immerse the corrector in hydraulic fluid.	
	Position the control arm by turning the valve and cup assembly (cars produced before November 1957 and fitted with a cable height variation control, see fig. 2; cars produced since November 1957 and fitted with rod height variation control, see fig. 1). Put the rubber cups (5) and (11) in the grooves of the corrector body.	
	Fit the sealing plugs on the unions and on the overflow return pipe.	
15	Remove the corrector from the fluid bath. Clean the exterior of the rubber cups and immediately fit the retaining cups (1) and (2) by hand.	
	Finally fit them in position, using a press (a light pressure is sufficient) (use two mandrels MR-3045-80,see Pl. 118, see fig. 1 and 2)	**Mandrels MR-3045-80**

TOOLS

OVERHAULING A SUSPENSION CYLINDER

Dismantling (see Pl. 117).

16 To remove the piston (14) from the cylinder.

Hold the cylinder in a vice by the shoulder "b", using wooden jaws MR-3407-30 (see Pl. 118, fig. 3 and 4), the nut towards the top. Tighten the vice moderately in order to avoid distorting the cylinder. Disengage the cup (15) maintaining the felt joint (16), by using a screwdriver or a chisel. This cup should only be removed if damaged. Remove the felt joint ..... Wooden jaws MR-3407-30

17 Turn the cylinder over and hold the nut (17) in a vice, using wooden jaws MR-3407-30 (see Pl. 118, fig. 3 and 4). Tighten the vice moderately, the nut is tightened to 14 ft/lbs (2 m.kg). Unscrew the cylinder from the nut (use a "C" spanner on the boss of the feed pipe union (C). Remove the seal retaining washer (18) and the joint (19).... Wooden jaws MR-3407-30

18 Thoroughly clean the parts with alcohol. Blow with compressed air.

Assembly (see Pl. 117).

19 Fit the felt washer retaining cup (15) on the nut (17) on a press (use a bush).

Fit the rubber seal (19) previously smeared with hydraulic fluid in the seal retaining washer (18)..... Bush: outside dia. = 60
inside dia. = 44
height = 10

IMPORTANT REMARK - The seal retaining washer (18) is paired with the piston (14).

If one of these parts is replaced, it is necessary to fit a part of the same classification: a number is engraved on the edge of the retaining washer and a number is stamped on the head of the piston (see fig. 1).

Example: A washer "4" should be assembled with a piston "4".

Put the felt washer impregnated with hydraulic fluid in the nut.

NOTE - The felt washers should be immersed in hydraulic fluid for a few hours before being fitted.

Fit the joint and retaining washer assembly on the cylinder (see fig. 4, for position).

Fit the nut without tightening.

20 Fit the piston.

NOTE - In the case of not very deep scratches, a light cleaning with abrasive paper No. 600 smeared with alcohol, is permitted.
Carefully clean the parts with alcohol and blow with compressed air.
Oil the piston (hydraulic fluid). Insert the piston in the cylinder.

		TOOLS
21	Hold the cylinder in a vice by the nut (17) (wooden jaws MR-3407-30) (see Pl. 118, fig. 3). Tighten the vice moderately. Tighten the cylinder in the nut to 14 ft/lbs (2 m.kg). Use a "C" spanner on the feed pipe union boss "c" and a torsion spanner (torsion spanner 2472-T). *The tightening torsion is of the greatest importance.* This must be observed, in order to make sure that the joint retaining washer is a good fit and to avoid the piston chattering in the cylinder or a leakage of fluid. Take care not to drop the piston during this operation. Check the sliding movement of the piston. Check the sealing of the piston and cylinder assembly (see following paragraphs).....	Wooden jaws MR-3407-30 Torsion spanner 2472-T
	BENCH TESTING AFTER OVERHAULING A SUSPENSION CYLINDER (see Pl. 119).	
	In order to carry out this operation, the test bench should be prepared as indicated on Pl. 171 (test bench 2290-T).	Test bench 2290-T
22	Put the cylinder together with the piston rod on the stand (stand 2293-T, see Pl. 119). Fit the cap (L) fitted with the seal. Engage the end of the rod in the socket of the stand. Connect the feed pipe orifice in the cylinder to the orifice "a" on the pump, using the pipe (B).....	Stand 2293-T
23	Tighten the bleed screw "b" of the test bench and operate the pump in order to build up pressure to 570 p.s.i. (40 kg/cm^2). Check the pressure gauge. There should be no drop in pressure.	
24	Release the pressure by unscrewing the bleed screw "b". Remove the pipe (B). Remove the cap (L), remove the cylinder from the stand.	
	CHECKING THE INITIAL PRESSURE OF A SUSPENSION SPHERE (see Pl. 88).	
	In order to carry out this operation, the test bench should be prepared as indicated on Pl. 171 (test bench 2290-T).	Test bench 2290-T
25	Screw on the union (K). Fit a seal. Read the number engraved on the cap. This number indicates the pressure in kg/cm^2) : FRONT : 59 = 840 p.s.i. (59 kg/cm^2). REAR : 26 = 370 p.s.i. (26 kg/cm^2). Connect the union (K) to the orifice "a" on the pump, using the pipe (H).	
26	Tighten the bleed screw "b", operate the pump in order to build up pressure. Check the pressure gauge, at first the pressure will not rise, it then rises rapidly and remains steady at the pressure of the sphere. REMARK - At 20°C, this pressure should be equal to the number engraved on the cap. Tolerances for the front : $840\ ^{+\ 30}_{-\ 220}$ p.s.i. ($59\ ^{+\ 2}_{-\ 15}$ kg/cm^2) and for the rear : $370\ ^{+\ 30}_{-\ 150}$ p.s.i. ($26\ ^{+\ 2}_{-\ 10}$ kg/cm^2).	
27	Release the pressure by unscrewing the bleed screw "b". Remove the pipe (H) and the union (K).	

PARTICULAR POINTS

Replacement of an anti-roll bar.

Refitting.

8 *Adjust the anti-roll bar (lateral position, bearings, lateral clearance) (see Op. DS 433–0).*

9 *Connect the anti-roll bar to the half axle and screw the coupling sleeves until a dimension "1" = 198 mm. for the right and 199 mm. for the left is obtained, between the centre of the ball joint of the bar and the lever of the half axle.*

11 *Pre-adjust the heights (see Op. DS 433–0).*

14 *Adjust the heights (see Op. DS 433–0).*
It is possible to fit anti-rattle springs on cars produced before May 1958. Carry out the instructions given in the paragraph.

Replacement of the anti-roll bar bearings.

Refitting.

21 *Check the lateral position of the anti-roll bar (see Op. DS 433–0).*

22 *Check that the lateral clearance of the anti-roll bar is k = 0.5 mm. (see Pl.114).*

23 *Adjust the bearings of the anti-roll bar (see Op. DS 433–0). Tighten the "U" bolt nuts to 9 ft/lb (1.2 m.kg); the bar should turn under a load of 9 to 13 lb (4 to 6 kg) applied on the ball joint.*

25 *Connect the anti-roll bar to the half axle and screw the coupling sleeves until a dimension "1" = 198 mm. for the right and 199 mm. for the left is obtained, between the centre of the ball joint of the bar and the lever of the half axle.*

26 *Pre-adjust the heights (see Op. DS 433–0).*

28 *Adjust the heights (see Op. DS 433–0).*

Replacement of a corrector control rod.

Removal.

The rod is removed from the left hand side of the car, after having removed the corrector.

Refitting.

39 *Adjust the front heights (see Op. DS 433–0).*

40 *Adjust the front part of the manual height control (see Op. DS 437–0).*

		TOOLS
	REPLACEMENT OF AN ANTI-ROLL BAR	
	Removal (see Pl. 113-114).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the front wheels, the spare wheel, the spare wheel support, the lateral and lower protection panels	Jacking bracket 2505-T 8-12-14 mm box spanners
2	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw and put the manual height control lever in the low position	8 mm spanner
3	Disconnect the corrector feed pipe (61) (front upper union). Disconnect the return pipe (62) from the corrector (rear upper union). Disconnect the overflow return pipe (55) from the corrector and connect it to the return pipe in order to avoid draining the reservoir. Disconnect the feed pipe (60) for the suspension (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
4	Unscrew the screw of the clamp (33) fixing the corrector control rod (46) on the anti-roll bar (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats). Unscrew the screws of the clamps (34) of the anti-roll bar coupling sleeves (35). Unscrew the sleeves (35) in order to disconnect the anti-roll bar from the front half axle (spanner 1677-T, see Pl. 65, fig. 4,for screws with flats).	12 mm spanner 12 mm box spanner or Spanner 1677-T
5	Remove the corrector fixing screws and disengage the corrector, fitted with its bracket. Remove the adjustable rod (39) (spanner 1623-T, see Pl. 16, fig. 2).	12 mm box spanner or Spanner 1623-T 8 mm spanner
6	Remove the "U" bolts (21) fixing the anti-roll bar bearings; remove the bearing caps (36), the adjusting shims (20), the nylon bearings (43). Remove the anti-rattle springs (cars produced since May 1958). Remove the anti-roll bar from the left-hand side of the car	8-12 mm box spanners
	Refitting (see Pl. 113 -114).	
7	Smear the anti-roll bar bearings with graphite grease. The longest bearing is fitted on the lower bearing block. Put the anti-roll bar in position, engaging it from the left side of the car.	
8	To adjust the anti-roll bar bearing (see Op. DS 433-0).	
9	To connect the anti-roll bar to the half axle: Connect the anti-roll bar sleeve (35). Screw the sleeve (35) on a few threads together with the clamps (34) on the connecting rod (46) of the suspension control lever. Connect the threaded sleeve on the anti-roll bar rod. Carry out the same operation for the other side. Simultaneously,screw the right and left sleeves in order to obtain between the centres of the anti-roll bar ball joints and the suspension control lever, the dimension "l" = 198 mm on the right-hand side and 199 mm on the left-hand side. Tighten the clamp. The slot in the clamps should be in line with the slot in the sleeve	12 mm spanner

		TOOLS
10	To fit a height corrector :	
	a) Engage the ball joint (50) of the corrector control rod (46) in the bore of the bearing cap (36).	
	b) Offer up the corrector and bracket assembly. Connect the return pipe (62), the feed pipe (61), the overflow return pipe (55) to the corrector and the feed pipe (60) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4) (spanner 1623-T, see Pl. 16, fig. 2)	Spanner 2219-T or Spanner 2221-T 12 mm box spanner or Spanner 1623-T
	c) Fit the adjustable rod (39).	7-8 mm spanners
11	Pre-adjust the heights (see Op. DS 433-0).	
12	Fit the front wheels, lower the car to the ground (jacking bracket 2505-T, see Pl. 168), tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).....	Jacking bracket 2505-T
13	Put the suspension system under pressure and check the unions for leakage. Put the manual height control in the "normal" position (opposite the white line).....	8 mm spanner
14	Adjust the heights (see Op. DS 433-0). Fit the anti-rattle springs (cars produced since May 1958), the bearing being previously smeared with graphite grease.....	8 mm box spanner
	NOTE - It is possible to fit anti-rattle springs on cars produced before May 1958. Proceed as indicated as follows (see Pl. 114 A) :	
	a) Fix the pressure pads (5) on the springs (6) and (7) and smear them with graphite grease.	
	b) Compress the springs with a pair of pliers and put them in position (the shortest part towards the centre of the car).	
	c) To stop the lateral displacement of the springs, fix two rubber stops (1). Insert a plain washer (2) under the fixing screw (3) and a spring washer under the nut (4). For this purpose, drill two holes 5.5 mm diameter in the sidemember, as shown on fig. 2.	
	d) Move each spring (6) and (7) in order to bring them against the stops (1). Then bend the end of the fixing strip over the rear edge of the crossmember (see fig. 2).	
15	Adjust the manual height control (see Op. DS 437-0).	
16	Fit the lateral and lower protection panels, the front wings, the spare wheel support and the spare wheel	8-12-14 mm box spanners
	REPLACEMENT OF THE ANTI-ROLL BAR BEARINGS	
	Removal (see Pl. 113 - 114).	
17	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the spare wheel, the spare wheel support, the front wings, the front wheels and the lateral protection panels	Jacking bracket 2505-T 8-12-14 mm box spanners

		TOOLS
18	Remove the anti-rattle springs (*cars produced since May 1958*) Loosen the screws of the clamps (34) of the anti-roll bar coupling sleeves (35). Unscrew the sleeves (35) in order to disconnect the anti-roll bar from the front half axle	12 mm spanner 12 mm box spanner
19	Disengage the "U" bolts (21) fixing the anti-roll bar bearings, remove the bearing caps (36), the adjusting shims (20) and the bearings (43)	12 mm box spanner
	Refitting (see Pl. 113 and 114).	
	NOTE - The half bearings are of different lengths, the lower half bearing is longer.	
20	Place each lower bearing (43) in its housing, with the dowel in its housing, the longest part of the bearing is on the engine side.	
21	Check the adjustment of the lateral position of the anti-roll bar (see Op. DS 433-0). Modify if necessary.	
22	Check the lateral clearance of the anti-roll bar, this gap should be "k" = 0.5 mm between the clamp (45) and the upper bearing cap of the left-hand bearing (43), the right-hand clamp (44) resting against the bearing cap of the right-hand bearing, if necessary, move the clamp (45) in order to obtain the correct clearance.....	12 mm box spanner
23	To adjust the anti-roll bar bearings (see Op. DS 433-0).	
24	Remove the bearing caps (36). Smear the bearings (43) with graphite grease and fit the bearing caps. Tighten the nuts of the "U" bolts (21) to 9 ft/lbs (1.2 m.kg) (spring washers). Check the rotating torsion of the anti-roll bar; it should turn under a load of 9 to 13 ft/lbs (4 to 6 m.kg) applied on the ball joint, if not, modify the thickness of the bearing adjusting shims (20).....	12 mm box spanner
25	Connect the anti-roll bar to the front half axle (paragraph 9, this operation).	
26	Pre-adjust the heights (see Op. DS 433-0).	
27	Fit the front wheel, lower the car to the ground (Jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screws to 108 to 144 ft/lbs (15 to 20 m.kg)	Jacking bracket 2505-T
28	Adjust the heights (see Op. DS 433-0). Fit the anti-rattle springs (cars produced since May 1958), the bearings being previously smeared with graphite grease.....	8 mm box spanner
29	Fit the lateral protection panels, the front wings, the spare wheel support and the spare wheel	8-12-14 mm box spanners

TOOLS

REPLACEMENT OF A HEIGHT CORRECTOR CONTROL ROD

Removal (see Pl. 113 and 114).

30 Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the spare wheel, the spare wheel support, the front wing, the wheel and the protection panel, left side. Release the pressure in the suspension system ..... — Jacking bracket 2505-T; 8-12-14 mm spanners; 8-12-14 mm box spanners

31 Remove the height corrector and its support plate (see paragraphs 3 and 5, this operation).

32 Disconnect the manual height control adjustable rod (39) from the yoke (52) of the corrector control rod ..... — 7 mm spanner

33 Remove the insulating plate protecting the piping, fixed under the engine crossmember ..... — 8 mm box spanner

34 Remove the screw of the clamp (33) fixing the height corrector control rod (46) (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats).

Remove the ball joint (50) of the control rod (46), from the bore in the boss of the anti-roll bar bearing cap. Disengage the complete control rod from the left-hand side of the car ..... — 12 mm box spanner or Spanner 1677-T

Refitting (see Pl. 113 and 114).

35 Engage the control rod (46) from the left-hand side of the car. Fit (without tightening) the screw of the clamp (33), fixing the corrector control rod (46) and engage the ball joint of the control rod in the bore in the boss of the anti-roll bar bearing cap. Tighten the screw of the clamp (33) (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats) ..... — 12 mm box spanner or Spanner 1677-T

36 Connect the manual height control adjustable rod (39) to the yoke (52) of the corrector control rod ..... — 7 mm spanner

37 Fit the height corrector (see paragraph 10, this operation).

38 Fit the left-hand front wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg) ..... — Jacking bracket 2505-T

39 Adjust the front heights (see Op. DS 433-0). Make sure that the manual height control does not keep the corrector valve under tension.

40 Adjust the front part of the manual height control (see Op. DS 437-0).

41 Fit the insulating plate protecting the pipe under the engine crossmember. Tighten the fixing screws ..... — 8 mm box spanner

42 Fit the lateral protection panels, the left-hand front wing, the spare wheel support and the spare wheel ..... — 8-12-14 mm spanners; 8-12-14 mm box spanners

PARTICULAR POINTS

Replacement of a height corrector.

Removal.

3 *Immediately after having disconnected the overflow pipe (rear upper union), from the corrector, connect it to the overflow return union in order to avoid draining the fluid reservoir.*

Refitting.

9 *Check and adjust the heights (see Op. DS 433-0).*

Replacement of a suspension cylinder.

Replacement of a dust cover or a suspension cylinder piston rod.

In order to remove or refit the cylinder piston rod, it is necessary that the holes for the connecting link are parallel.

TOOLS

REPLACEMENT OF A HEIGHT CORRECTOR

Removal (see Pl. 115).

1 Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168).
Remove the left-hand rear wing and wheel. Remove the lateral protection panel ..... — Jacking bracket 2505-T, 8-14 mm box spanners

2 Release the pressure in the suspension system. Unscrew the pressure regulator bleed screw and put the manual height control in the low position ..... — 8 mm spanner

3 Disconnect the pipes from the corrector in the following order :

a) The overflow return pipe (63).
b) The corrector overflow pipe (62). Connect it immediately to the overflow return pipe (63) in order to avoid draining the fluid reservoir.
c) The corrector feed pipe (61).
d) The pipe (64) between the corrector and suspension cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).
Seal the openings of the pipes and the corrector (see Pl. 94)..... — Spanner 2219-T or Spanner 2221-T

4 Remove the screws fixing the corrector. These screws are fitted inside the rear boot at the front of the wheel arch ..... — 12 mm box spanner

		TOOLS
	Refitting (see Pl. 115).	
5	Connect the pipes to the corrector in the following order :	
	a) The pipe (64) between the suspension cylinder and corrector.	
	b) The corrector feed pipe (61).	
	c) The corrector overflow pipe (62) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	d) The overflow return pipe (63)	Spanner 2219-T or Spanner 2221-T
6	Fit and tighten the corrector fixing screws (spring washers under the heads).....	12 mm box spanner
7	Start the engine. Put the suspension system under pressure. Check the unions for leakage	8 mm spanner
8	Fit the wheel. Lower the car to the ground and tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).	
9	Check the heights and adjust if necessary (see Op. DS 433-0).	
10	Fit the lateral protection panel and fit the wing.....	8-14 mm box spanners
	REPLACEMENT OF A SUSPENSION CYLINDER	
	Removal (see Pl. 116).	
11	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168).....	Jacking bracket 2505-T
12	Remove the rear wing, remove the wheel	14 mm box spanner
13	Release the pressure in all the systems	8 mm spanner
14	Disconnect the feed pipe (52) from the suspension cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
15	Remove the collar fixing the dust cover on the cylinder, the fixing clip on the overflow return pipe and disconnect the overflow return pipe (53) from the dust cover.	
16	To disconnect the piston rod :	
	a) Remove the connecting link (8).	
	b) Remove the clip (9) fixing the ball joint dust cover on the buffer bracket and disengage the dust cover (10) towards the rear.	
	c) Press on the arm and disengage the piston rod (7) (the rod can only be disengaged when the holes for the connecting link in the rod and in the buffer bracket are parallel).	
	If necessary, remove the front stop (14).	

		TOOLS
17	Remove the dust cover (10) from the ball joint of the piston rod. Remove the clip and disengage the cylinder dust cover (2) from the piston rod.	
18	Remove the suspension sphere (54) (strap wrench 2223-T, see Pl. 93, fig. 1)	Strap wrench 2223-T
19	Remove the retaining plate (55) from the suspension cylinder and remove the suspension cylinder towards the front. NOTE - Do not withdraw the piston from the cylinder.	8 mm box spanner
	Refitting (see Pl. 116).	
20	To prepare the piston rod : a) Engage the dust cover on the piston rod (7) and position the aperture of the overflow return pipe perpendicular to the connecting link pin hole. Put it in position on the knurled portion of the piston rod and place the fixing clip on a band of insulating tape (at "f"). Fit the rubber bush (57) on the dust cover. b) Engage the ball joint dust cover (10) on the piston rod.	
21	Engage the suspension cylinder in its support on the body. Put the retaining plate (55) in position and tighten the fixing screws, inserting plain and spring washers under the heads. Screw on the suspension sphere (54) and connect the feed pipe (52) to the cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	8 mm box spanner Spanner 2219-T or 2221-T
22	To fit the piston rod : a) Clean the extremities of the piston and the cylinder with alcohol and the cylinder dust cover. b) With the arm in its lowest position, put the piston rod (7) in the piston, then in the buffer support, the overflow return pipe towards the top of the dust cover. NOTE - Before fitting the connecting link, make sure that the piston rod is in good contact with the ball, so that when raising the arm, the piston rod will not slip out of the buffer support. c) Put the ball joint dust shield (10) in position so that the holes for the connecting link correspond and fit the clip (9). Fit the connecting link with the longest leg through the buffer support. Turn down the end of the connecting pin on the support (see fig. 2). If it has been removed, replace the buffer (14).	

		TOOLS
	d) Put the rubber bush (58) on the overflow return pipe. Put the overflow return pipe (53) in the dust cover. Position the rubber bush and fit the clip.	
	e) Put the dust cover on the suspension cylinder. Put the flexible bush (57) in position and tighten the clip.	
23	Fit the wheel. Fit the rear wing and lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	14 mm box spanner Jacking bracket 2505-T
24	Put the systems under pressure. Check the unions for leakage.	
	REPLACEMENT OF A DUST COVER OR A REAR SUSPENSION CYLINDER PISTON ROD	
	Removal (see Pl. 116).	
25	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the rear wing and wheel	Jacking bracket 2505-T 14 mm box spanner
26	Release the pressure in the suspension system by unscrewing the pressure regulator bleed screw. Put the manual height control lever in the low position.....	8 mm spanner
27	Remove the clips fixing the dust cover (2) on the suspension cylinder and on the overflow return pipe (53); if necessary, drain any fluid from the dust cover. Disconnect the overflow return pipe (53) from the dust cover (2).	
28	To remove the piston rod (7) :	
	a) Remove the connecting link (8).	
	b) Remove the fixing clip of the ball joint dust cover (10). Remove the dust cover (10) towards the rear.	
	c) Disengage the piston rod (7) from the buffer support (3). The rod (7) can only be disengaged from the support (3) when the holes for the connecting link (8) are parallel.	
	d) Disengage the dust cover (2) from the suspension cylinder and remove the piston rod (7) together with the dust covers (2) and (10).	
29	Remove the dust cover (10) from the piston rod (7).	
	Remove the clip fixing the dust cover (2) on the piston rod (7) and remove the dust cover (2).	

TOOLS

Refitting (see Pl. 116).

30 To prepare the piston rod :

a) Engage the dust cover (2) on the piston rod (7) and position the aperture of the overflow return pipe perpendicular to the connecting link hole. Put the dust cover (2) in position on the knurled part of the piston rod and fit Ligarex clip (pliers 2483-T, see Pl. 17, fig. 2); insert a rubber sleeve ..... Pliers 2483-T

b) Fit the flexible sleeve (57) on the dust cover (2).

Engage the ball joint dust cover (10) on the piston rod (7).

31 Fit the piston rod (see paragraph 24, this operation).

32 Fit the rear wing and wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168).

Retighten the pressure regulator bleed screw ..... Jacking bracket 2505-T
14 mm box spanner
8 mm spanner

PARTICULAR POINTS

Replacement of an anti-roll bar.

We have fitted successively, anti-roll bars and axle arms of two dimensions. These parts are not interchangeable.

Refitting.

Pre-adjust the rear heights (see Op. DS 433-0).

Adjust the rear heights (see Op. DS 433-0).

Replacement of a corrector control rod.

Refitting.

Pre-adjust the rear heights (see Op. DS 433-0).

Adjust the rear heights (see Op. DS 433-0).

TOOLS

REPLACEMENT OF AN ANTI-ROLL BAR

Removal (see Pl. 115).

1 Release the pressure. Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168) ..... — 8 mm spanner, Jacking bracket 2505-T

2 Remove the rear corrector control protection panel ..... — 8 mm box spanner

3 Disconnect the clamp (1) of the rear corrector control rod (2) from the anti-roll bar (spanner 1677-T, see Pl. 65, fig. 4, for screw with flats).

Remove the anti-roll bar coupling flanges (3), disengage the bar ..... — 12 mm spanner, 12 mm box spanner or Spanner 1677-T, 19-21 mm box spanners

Refitting (see Pl. 115).

NOTE - We have fitted successively, anti-roll bars and axle arms of two dimensions. These parts are not interchangeable.

4 Fit the anti-roll bar, giving equal clearance between the anti-roll bar and the articulating spindle on each side. Fit the coupling flanges (3) and tighten the nuts fixing the flanges to 36 ft/lbs (5 m.kg). Fit the control rod (2), tighten the clamp (1) (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats) ..... — 19-21 mm box spanners, Spanner 1677-T

5 Pre-adjust the rear heights (see Op. DS 433-0) ..... — 8 mm spanner, 8 mm box spanner

		TOOLS
6	Adjust the rear heights (see Op. DS 433-0).	
	Fit the corrector control protection panel and fit the corrector lateral protection panel	8 mm box spanner
	REPLACEMENT OF A CORRECTOR CONTROL ROD	
	Removal (see Pl. 115).	
7	Release the pressure	8 mm spanner
8	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the left-hand rear wing and wheel, the corrector control protection panel and the corrector lateral protection panel	Jacking bracket 2505-T 14 mm box spanner
9	Disconnect the clamp (1) of the corrector control rod (2), from the anti-roll bar (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats).	
	Disconnect the height variation control rod (66) from the yoke (65) of the control rod (2) and disengage the control rod from the corrector.	
	Disengage the sealing sleeve from the opening in the wheel arch panel and disengage the corrector control rod (2) towards the outside of the car. Remove the sleeve from the control rod	7-8-12 mm box spanners or spanner 1677-T
	Refitting (see Pl. 115).	
10	Engage the rubber sleeve on the control rod (2) and put the control rod in position.	
	Connect the clamp (1) to the anti-roll bar (spanner 1677-T, see Pl. 65, fig. 4, for screws with flats) and connect the corrector control yoke (65) to the adjustable rod (66).	
	Fit the securing nuts, without tightening	Spanner 1677-T
11	Pre-adjust the heights (see Op. DS 433-0).	
12	Fit the wheel and lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T 14 mm box spanner
13	Start the engine. Put the system under pressure.	
	Adjust the heights (see Op. DS 433-0).....	8 mm spanner
14	Fit the corrector control protection panel and fit the lateral corrector protection panel and the rear wing	8-14 mm box spanners

PARTICULAR POINTS

Replacement of a front suspension feed pipe assembly.

Removal.

2 *Drain the fluid from the reservoir.*

12 *Mark the position of the steering column in relation to the splines of the steering pinion and disconnect the steering column, from the pinion in order to obtain access to the coupling flange of the pipes.*

Refitting.

17 *Connect the steering column to the steering pinion, noting the marks made when dismantling. Check that there is no play, by pushing and pulling alternately on the steering wheel.*

19 *Bleed the suspension system, by working on the manual height control lever.*

REPLACEMENT OF A FRONT HEIGHT CORRECTOR PIPE ASSEMBLY

		TOOLS
	Removal (see Pl. 113).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168).	
	Remove the spare wheel, the spare wheel support, the wing and the front left-hand lateral protection panel.....	Jacking bracket 2505-T 8-12-14 mm box spanner 8-12-14 mm spanners
2	Release the pressure in the systems. Drain the fluid reservoir	8 mm spanner
3	Disconnect the pipe unions, from the corrector (in the following order) :	
	a) The overflow return pipe (55).	
	b) The cylinder feed pipe (60) (lower union).	
	c) The corrector feed pipe (61) (front upper union).	
	d) The corrector overflow (62) (rear upper union) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or Spanner 2221-T
4	Disconnect the corrector pipe assembly union flange from the suspension six pipe flange and remove the seal plate. Remove the pipe assembly	8-10 mm ring spanner length = 100

		TOOLS
	Refitting (see Pl. 113).	
5	Offer up the pipe assembly, avoid bending the pipes. Connect the union flange to the suspension six pipe flange, insert the seal plate, fit the securing screws without tightening (spring washers under the heads).	
6	To connect the pipe unions to the corrector (in the following order) :	
	a) The cylinder feed pipe (60) (lower union).	
	b) The corrector feed pipe (61) and overflow pipe (62) (upper unions) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Tighten the unions moderately 6 ft/lbs (0.9 m.kg)	Spanner 2219-T or Spanner 2221-T
	c) The overflow return pipe (55).	
7	Refill the reservoir with hydraulic fluid. Lower the car to the ground. Start the engine, put the systems under pressure and check the unions for leakage.	8 mm spanner
8	Fit the lateral protection panel and the front left-hand wing. Fit the spare wheel support and the spare wheel	8-12-14 mm spanners 8-12-14 mm box spanners
9	With the engine idling and the car in the normal running position, check the level of the fluid in the reservoir, top up if necessary (hydraulic fluid).	
	REPLACEMENT OF A FRONT SUSPENSION FEED PIPE ASSEMBLY	
	Removal.	
10	Disconnect the remove the battery; remove the battery tray	12 mm box spanner
11	Release the pressure. Drain the hydraulic fluid from the reservoir	8 mm spanner
12	Mark the position of the steering column in relation to the splines of the steering pinion (centre punch mark or a spot of paint opposite the slot of the steering column at "a" (see Pl. 125). Untighten the screw of the collar retaining the steering wheel spring (spanner 1994-T, see Pl. 126, fig. 5). On cars produced before May 1958, it is necessary to remove the glove box and disengage the sealing sheath (46) towards the front (see Pl. 126). Disconnect the steering column from the steering pinion, disengage the roller from the locating cam and remove the wheel towards the rear.	Spanner 1994-T 12 mm spanner 12 mm box spanner
13	Disconnect the suspension feed pipe from the distribution block (1st union on the engine side). Disconnect the rear suspension feed pipe union from the connecting pipe of the rear piping.	

		TOOLS
	Disconnect the rubber pipe (connecting the return to reservoir) from the suspension return pipe.	
	Disconnect the steering return pipe and the feed pipe of the right-hand suspension cylinder (front and rear unions), from the suspension feed pipe assembly flange (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Remove the collar from the sleeve retaining the pipes and disengage the pipe assembly	Spanner 2219-T or Spanner 2221-T
14	Disconnect the flange of the suspension feed pipe assembly from the union flange of the height corrector pipe assembly. Remove the seal plate. Disengage the suspension feed pipe assembly	8-10 mm ring spanners length = 100
	Refitting.	
15	Offer up the suspension feed pipe assembly on the car and connect the union flange of the height corrector pipe assembly, inserting a seal plate. Offer up the securing screws, without tightening (spring washers under the heads).	
16	Connect the steering return pipe union and the right-hand suspension cylinder feed pipe (front and rear unions) to the suspension feed pipe assembly flange.	
	Connect the rubber pipe (connecting the return to reservoir) to the suspension return pipe.	
	Connect the rear suspension feed pipe union to the connecting pipe of the rear piping.	
	Connect the suspension feed pipe to the distribution block (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Engage the pipes in the retaining sleeve. Fit the collar	Spanner 2219-T or Spanner 2221-T
17	Connect the steering column to the steering pinion (note the markings made when dismantling). Tighten the coupling screw nut (spring washer). Put the roller in position on the locating cam. Compress the steering wheel retaining spring (49); when the spring coils are touching, tighten the screw (47) on the collar (48) (see Pl. 126) (spring compressor 1991-T, see Pl. 126, fig. 3 and spanner 1994-T, see Pl. 126, fig. 5). Make sure that there is no play when pushing and pulling alternatively on the steering wheel.	
	On cars produced before May 1958, put the sealing sleeve (46) in position (see Pl. 126) and fit the glove box.	12 mm spanner 12 mm box spanner Spring compressor 1991- Spanner 1994-T
18	Fit the battery tray and the battery. Refill the reservoir with hydraulic fluid.	
19	Start the engine and put the systems under pressure. Bleed the suspension system by operating the manual height control. Check the unions for leakage	8 mm spanner
20	With the car in the "normal" running position, check the level of the hydraulic fluid in the reservoir and top up if necessary. This operation should be carried out with the engine idling.	

PARTICULAR POINTS

Adjustment of a cable control (*see Pl. 120*).

With the engine idling and the control lever in the "normal" position the clearances "a" at the front should be equal and the clearances "b" at the rear should be equal. Make sure that the control functions in the extreme positions.

Adjustment of a control rod (*see Pl. 121*)

6 *At the front, select a hole "a" in order to obtain a dimension "b" between 7·5 and 9 mm; if necessary move the sector (23).*
At the rear, select a hole "a" in order to obtain a dimension "d" between 8 and 9·5 mm; if necessary turn the fork (31).

8 *At the front, with the corrector in the fully open position (push towards the front) there should be a slight clearance at "f" and with the corrector in the fully closed position (push towards the rear) there should be a slight clearance at "g"; if necessary, adjust the rod (39).*

At the rear, with the corrector in the fully open position (push towards the front) there should be a slight clearance at "h" and with the corrector in the fully closed position (push towards the rear) there should be a slight clearance at "i"; if necessary, adjust the nuts (36) and (37).

ADJUSTMENT OF A CABLE CONTROL

(Cars produced since November 1957). (see Pl. 120).

		TOOLS
1	Remove the left-hand front and rear wings. Remove the corrector lateral protection panels	8-12-14 mm spanners 8-12-14 mm box spanners
2	With the manual height control lever in the "normal" position (lever on the thick white line) and the engine idling, make sure : a) At the front : that the lever (15) is in the centre of the slot of the yoke (16). The clearances "a" should be equal (see fig. 2). Adjust, if necessary, by turning the long nut (17). b) At the rear : that the lever (18) is positioned in the centre of the distance piece (19). The clearances "b" should be equal (see fig. 3). Adjust, if necessary, by turning the hexagonal part (20) in order to move the distance piece (19)	8 mm box spanner
3	To check the functioning : in the extreme high position, the lower rubber buffer of the axle arm should be compressed, and in the low position, the suspension cylinders should be free.	
4	Fit the corrector lateral protection panels and fit the left-hand front and rear wings	8-12-14 mm spanners 8-12-14 mm box spanners

TOOLS

ADJUSTMENT OF A ROD CONTROL

(Cars produced since November 1957) (see Pl. 121).

5 Remove the left-hand front and rear wings and the corrector lateral protection panels ..... — 8-12-14 mm spanners, 8-12-14 mm box spanners

6 Put the control lever (22) in the "normal" position and adjust the control :

a) At the front, select a hole "a" on the front connecting rod (20) which will give a dimension "b" of between 7.5 and 9 mm (see fig. 1). If necessary, move the sector (23) in its slots in order to obtain this dimension.

b) At the rear, select a hole "a" on the rear connecting rod (21) which will give a dimension "d" of between 8 and 9.5 mm (see fig. 2). If necessary, move the yoke (31) in order to obtain this dimension.

7 With manual height control lever in the "low" position, one should obtain a dimension "e" of between 10 and 15 mm, between the upper trimming of the sidemember and the knob of the control lever (22) (see fig. 1). If necessary, hold the lever (22) in order to obtain this dimension.

8 To check the adjustment of the height corrector control levers.

a) At the front, make sure that there is a clearance "f" with the corrector in the fully open position (lever (34) pushed towards the front) and a clearance "g" with the corrector in the fully closed position (lever (34) pushed towards the rear). If necessary, work on the rod (39).

b) At the rear, make sure that there is a clearance "h" with the corrector in the fully open position (lever (35) pushed towards the front) and a clearance "i" with the corrector in the fully closed position (lever (35) pushed towards the rear). If necessary, work on the nuts (36) and (37).

PARTICULAR POINTS

Replacement of a cable control (*see Pl. 120*)

Refitting.

13 *Engage the control in the opening "c" of the sidemember and by means of a steel wire hook passed through the hole for the yoke (9) pass the control through the hole "d". Then put the rod (2) and the dust cover (13) in the hole "e".*

REPLACEMENT OF A CABLE CONTROL

(Cars produced before November 1957).

Removal (see Pl. 120).

		TOOLS
1	Put the car on a lift or the left side on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
2	Remove the left-hand front and rear wings. Remove the front and rear height corrector protection panels	8-12-14 mm box spanners
3	Remove the nut (1) and disconnect the rod end (2) from the ball pin on the front rod	8 mm spanner
4	Remove the control fixing screw (3) also the nut (4)	8 mm spanner 8 mm box spanner
5	Remove the screw (6) together with its washer (7)	7 mm spanner
6	Remove the nut (8) fixing the rear shield bracket (11).....	8 mm box spanner
7	Remove the finishing panels (sealing the sidemembers).	
8	Remove the Ligarex clips holding the sheath in the retaining sleeve on the pipes passing through the sidemember.	
9	Remove the rod end (9) by loosening the nut (10) and unscrewing	7 mm spanner
10	Disengage the bracket (11) from the end of the sidemember and remove the nut (12)	14 mm spanner 14 mm box spanner
11	Remove the control assembly and cables by pushing the control towards the front, at the same time raising it in order to allow the lower part to pass through the opening "c" in the sidemember.	

		TOOLS
	Refitting (see Pl. 120).	
12	Screw the rod end (9) on a few threads at the end of the cable.	
13	Engage the cable and its sheath in the opening "c" in the sidemember, using a steel wire hook passing through the hole in the rod end (9),then pass the cable and sheath through the hole "d", then the rod (2) through the hole "e" and the dust cover (13).	
14	Secure the control on the sidemember by the screws (3) (plain and spring washers) and by the nut (4) on the side panel (plain and spring washers)	8 mm spanner 8 mm box spanner
15	Connect the rod end (2) to the ball pin on the front rod	7 mm box spanner
16	Pass the cable and sheath assembly along the length of the sidemember and through the holes in the panel in the centre of the sidemember.	
17	Fit the bracket (11) on the end piece of the sheath after having removed the rod end (9). Fit and tighten the nut (12).	14 mm spanner 14 mm box spanner
18	Fit the bracket (11) on the body. Fit and tighten the securing nut (8) (plain and spring washers).....	8 mm box spanner
19	Fit the nut (10) and the rod end (9) on the end piece of the cable (14).	
20	Connect the rod end (9) with the rear rod. Fit the screw (6) together with its washer (7). Tighten the nut (spring washer)	7 mm spanner
21	Fit the Ligarex clips holding the sheath in the retaining sleeve of the pipes (pliers 2483-T, see Pl. 17, fig. 2)	Pliers 2483-T
22	Fit the sidemember finishing panels, after having fitted the 5 rubber sound deadeners on the lower part of the sidemember. Tighten the securing screws (cup washers under the heads).	
23	To adjust the control : With the control lever in the "normal" position (on the broad white mark), make sure that : a) At the front : (see fig. 2) with the lever (15) in the middle of the rod end (16). The clearances "a" on each side of the lever should be equal. Adjust if necessary, by working on the long nut (17). b) At the rear : (see fig. 3) with the lever (18) in the middle of the distance piece (19). The clearances "b" should be equal. Adjust if necessary, by moving the distance pieces screwed on the hexagonal part (20).	
24	Fit the front and rear corrector protection shields	8 mm box spanner
25	Fit the left-hand front and rear wings	12-14 mm box spanners
26	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168).....	Jacking bracket 2505-T

		TOOLS
	REPLACEMENT OF A ROD CONTROL *(cars produced before November 1957).*	
	Removal (see Pl. 121).	
27	Put the left-hand side of the car on stands.	
28	Remove the left-hand front and rear wings and wheels. Remove the front and rear height corrector lateral protection panels	8-12-14 mm box spanners
29	Remove the pin from the spindle (19), coupling the front connecting rod (20) and the rear connecting rod (21) to the control lever. Disengage the connecting rods and the spindle (19).	
30	Remove the screws securing the sector (23) on the scuttle side panel and remove the sector. Untighten the nut of the screw locking the lever (25). Remove the assembly of the lever (25) and sector (23). Remove the lever (22) from the bracket (27) welded on the body.....	8 mm box spanner
31	Untighten the nut (28) and disconnect the front connecting rod (20) from the front torsion rod (29). Remove the connecting rod (20) and the sealing sleeve (30).....	8 mm box spanner
32	Remove the rivet coupling the yoke (31) of the rear connecting rod to the torsion rod (32). Unscrew and remove the yoke (31).	
33	Engage the front part of the rear connecting rod (21) in the hole for the front connecting rod. Remove the rear connecting rod (21) from the front of the car.	
34	Remove the lower closing panels of the left-hand sidemember.	
	Refitting (see Pl. 121).	
35	Engage the rear connecting rod (21) through the hole for the front connecting rod, then (through the opening of the upper part of the sidemember) in the nylon bearings (33) and in the hole of the sidemember rear closing panel.	
36	Screw the yoke (31) on the rear end of the rear connecting rod (21), approximately halfway on the threaded portion. Connect the yoke (31) to the rear torsion rod (32). Provisionally fit the rivet.	
37	Fit the sealing sleeve (30). Connect the front connecting rod (20) to the front torsion rod (29). Tighten the nut (28)	8 mm box spanner

		TOOLS
38	Put the lever (25) in position on the steel bracket and engage the control lever (22), fitted with the sector (23) in the yoke of the lever (25) and in the hole of the steel bracket (27). Bring the front end of the lever (22) against the scuttle lateral panel. Tighten the nut (24).	8 mm box spanner
39	Put the sector (23) in position and tighten the two fixing screws, the latter being in the centre of the slots of the sector (plain and spring washers under the heads).	
40	Put the control lever (22) in the "normal" position (opposite the broad white mark). Connect the front connecting rod (20) and the rear connecting rod (21) to the lever (25). Offer up the coupling spindle (19) passing through the third hole of each connecting rod.	
41	To adjust the control : a) At the front : select a hole "a" on the front connecting rod (20), in order to obtain a dimension "b" of between 7.5 and 9 mm (see fig. 1). If necessary, move the sector (23) in the slots in order to obtain this dimension. b) At the rear : select a hole "a" on the rear connecting rod (21), in order to obtain a dimension "d" of between 8 and 9.5 mm (see fig. 2). If necessary, work on the yoke (31), in order to obtain this dimension. Fit the rivet. c) Fit the split pin on the spindle (19), coupling the connecting rods to the lever (25). Grease the rear connecting rod in the area of the nylon bearings (33) (adhesive grease). Fit the sidemember lower closing panels. d) With the control lever (22) in the "low" position, there should be a distance "e" of between 10 and 15 mm between the upper cover of the sidemember and the knob of the control lever (22) (see fig. 1). If necessary, hold the lever (22), in order to obtain this dimension.	
42	To check the adjustment of the height corrector control levers : a) At the front : make sure that there is a clearance "f", the corrector being in the fully open position (lever (34) pushed towards the front) and a clearance "g", the corrector being in the fully closed position (lever (34) pushed towards the rear). If necessary, work on the rod (39). Tighten the locknut. b) At the rear : make sure that there is a clearance "h", the corrector being in the fully open position (lever (35) pushed towards the front) and a clearance "i", the corrector being in the fully closed position (lever (35) pushed towards the rear). If necessary, work on the nuts (36) and (37).	
43	Offer up the lateral protection panels, the left-hand front and rear wings and wheels. Lower the car to the ground. Tighten the wheel fixing screws to 108 to 144 ft/lbs (15 to 20 m.kg)	8-12-14 mm spanners 8-12-14 mm box spanners

PARTICULAR POINTS

1 To adjust the lateral position of the steering.

Obtain a dimension "g" of 122·5 ± 2·5 mm between the centreline of the left-hand lower relay lever and the centreline of the rack pressure pad cap (see Pl. 129).

5 To 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. 125).

7 To adjust the alignment.

The wheels should toe-in at the front from 1 to 3 mm.

10 To 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 $7^{+0}_{-0.5}$ kg applied on the spindle of the roller, should be required to raise the roller.

13 To adjust the steering lock.

The lock should be set to 42^{+0}_{-1}°

17 Pressure crossover adjustment.

Using the assembly indicated on Pl. 135, 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/cm²), between the two gauges.
Turn the steering wheel in the reverse direction and note the pressure at the moment when the two pressure gauges indicate the same pressure. It should be 995 ± 150 p.s.i. (70 ± 10 kg/cm²); if not adjust the pressure distributor.

		TOOLS
	ADJUSTMENT OF THE LATERAL POSITION OF THE STEERING (see Pl. 129).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
2	Remove the left-hand front wing and the battery	12-14 mm spanners 12-14 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 ± 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

		TOOLS
4	Fit the bearing cap fixing screws, without tightening and adjust the angular position of the steering (see following paragraphs, this operation).	
	ADJUSTMENT OF THE ANGULAR POSITION OF THE STEERING (see Pl. 125).	
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 screw loose, fit the fixture 1955-T, as shown on the illustration. Turn the steering assembly 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. Remove the fixture	Fixture 1955-T 12 mm box spanner
	ADJUSTMENT OF THE ALIGNMENT (see Pl. 122).	
	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 centre, 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 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. 168). Loosen the screws of the collars (11). Turn the sleeve (12). Work by fractions of turns (one quarter 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 (11) 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 11 and following, this operation) and the point "0" (see paragraphs 8 and following, this operation).	

		TOOLS
	ADJUSTMENT OF POINT "0" (Position of the steering in which the car runs in a straight line) (see Pl. 125).	
	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	To 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	To adjust the position of the cam. Turn the steering wheel so that the marks made previously correspond. Loosen the fixing collar (42) of the cam (43) 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 approximately.	
	With the roller in the hollow of the cam, an effort of $7 \begin{smallmatrix}0\\-0.5\end{smallmatrix}$ kg. should be required to raise the roller when applied to the spindle of the roller perpendicular to the torsion rod (44), (spring balance 2472-T). Turn the nut (45), in order to obtain this setting.	
	On cars produced since July 1957, 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. 122).	
	NOTE - The lock should be set at $42 \begin{smallmatrix}0^\circ\\-1^\circ\end{smallmatrix}$ in order to avoid undue strain on the driveshafts.	
13	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the front wings. Remove the steering relay protection shields	12-14 mm spanners 12-14 mm box spanners Jacking bracket 2505-T
14	a) Place the steering wheel as for running in a straight line (the point "0", see paragraphs 10 to 12, this operation).	
	b) Turn the wheel one and a half turns, exactly towards the left. Fit the cap (9) and tighten the locknut (10).....	36 mm spanner
	c) Carry out the same operation to the right (turn exactly one and a half turns from the position of running in a straight line). Fit the cap (18). Tighten the locknut (on early models, the right-hand lock is set by the stop screw (3).	
15	Fit the steering relay protection shields. Fit the front wings	12-14 mm spanners 12-14 mm box spanners
16	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168).....	Jacking bracket 2505-T

		TOOLS
	ADJUSTMENT OF PRESSURE CROSS-OVER (see Pl. 135 and 136).	
17	Prepare the test bench 2290-T. The two 0-2844 p.s.i. (0-200 kg/cm^2) pressure gauges should be connected as indicated below	Test bench 2290-T
18	Release the pressure by unscrewing the bleed screw of the pressure control valve.	
19	Place a cloth under the steering pipe assembly flange, 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
21	Start the engine and tighten the bleed screw of the pressure control valve. 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 (the roller in the hollow of the cam).	
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^2) between the two pressure gauges (example : 290 p.s.i. (20 kg/cm^2) and 1137 p.s.i. (80 kg/cm^2) or 711 p.s.i. (50 kg/cm^2) and 1564 p.s.i. (110 kg/cm^2) etc.). Turn the steering wheel slowly in the reverse direction and note the pressure when the two pressure gauges show the same reading. This pressure should be 995 ± 150 p.s.i. (70 ± 10 kg/cm^2).	
23	If the pressure does not read 995 ± 150 p.s.i. (70 ± 10 kg/cm^2), 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 valve adjusting screw (75). Unscrew the locknut (74) of one of the screws (75). NOTE - Do not turn the adjusting screw during the unscrewing of the locknut. If the pressure cross-over is too high, unscrew one of the adjusting screws (75) and tighten if the pressure is too low (work on the screw approximately 1/12th of a turn at a time; the action of this screw is very sensitive) ..... REMARK - 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.	12 mm ring spanner

PARTICULAR POINTS

Replacement of a steering wheel.

Removal.

1 *On cars produced before May 1958, it is necessary to remove the glove box in order to gain access to the steering wheel collar fixing screw.*

Refitting.

7 *Select a groove on the steering pinion, in order to obtain a dimension "m" of 40 to 60 mm between the knob of the gear selector lever and the edge of the steering wheel rim, with the selector lever in the 2nd speed position (see Pl. 126). Only fit a coupling screw DM441-100 (with a smooth portion under the head).*

12 *Adjust the point "O" (see Op. DS 440-0).*

Replacement of a steering locating cam.

Removal.

13 *On cars produced before May 1958, it is necessary to remove the glove box in order to gain access to the steering wheel collar fixing screw.*

14 *Mark the position of the steering wheel in relation to the pinion.*

Refitting.

18 *Connect the steering column to the pinion, positioned to the marks made when dismantling.*
Select a groove on the steering pinion, in order to obtain a dimension "m" of 40 to 60 mm between the knob of the gear selector lever and the edge of the steering wheel rim, with the selector lever in the 2nd speed position (see Pl. 126). Only fit a coupling screw DM441-100 (with a smooth portion under the head).

22 *Adjust the point "O" (see Op. DS 440-0).*

Replacement of the steering locating apparatus.

Refitting.

27 *An effort of $7^{+0}_{-0.5}$ kg should be required to raise the roller when applied to the spindle of the roller.*

TOOLS

REPLACEMENT OF A STEERING WHEEL

Removal (see Pl. 125-126).

1 *Cars produced before May 1958.* Remove the glove box.

2 If the steering wheel is to be refitted :

Mark (with a scriber), the position of the steering locating cam (43) in relation to the steering column. Mark with a centre punch or with a spot of paint, the position of the pinion, opposite the slot of the steering column at "a".

		TOOLS
3	Unscrew the screw of the collar (42), fixing the cam and remove the cam towards the front end of the column	8 mm box spanner
4	By passing the hand through the glove box opening, disengage the sealing sleeve (46) towards the front. Turn the steering wheel, in order to bring the screw (47) of the collar (48) to a position permitting the unscrewing of this screw.	
5	Have the spring (49) held by an assistant (spring compressor 1991-T) (see Pl. 126 , fig. 3). Unscrew the screw (47) of the collar (48) (spanner 1994-T, see Pl. 126, fig. 5)	Spring compressor 1991-T Spanner 1994-T
6	Remove the screw (1), coupling the steering column to the steering pinion; disengage the steering column. Disengage the locating cam, the collar (48), the distance piece (60) (cars produced since May 1958), the steel cup (50), the spring (49), the steel cup (51) and the conical cup (52)	12 mm box spanner
	Refitting (see Pl. 125-126).	
7	Offer up the steering column in its bracket on the scuttle shelf. Fit on the steering column; the conical cup (52), the steel cup (51), the spring (49), the steel cup (50), the distance piece (60), the collar (48), the cam (43) together with its collar (42). Engage the steering column on the pinion, with the marks made when dismantling (centre punch marks or paint marks) corresponding with the slot on the steering column. 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 distance "f" = 275 mm from the centre line of the rack pressure pad (see Pl. 129), and offer up the steering wheel, the arm being at 30° below the horizontal, left side.	
	NOTE - A difference greater than 1 mm on the distance "f" will cause excessive play on the steering wheel (tolerance ± 9°).	
	Place the coupling screw (1) in the 1st groove of the pinion. *Only fit the screw DM 441-100 with a smooth portion under the head.*	
	Place the gear selector lever in the 2nd speed position. Press lightly on the steering wheel and measure the distance "m" between the knob of the gear selector lever and the edge of the steering wheel rim. This distance "m" should be between 40 to 60 mm; if not, use another groove on the pinion. Tighten the nut of the coupling screw (1), *after making sure that it is properly in position in the groove.*	
8	Have the spring (49) compressed by an assistant (spring compressor 1991-T). When the spring coils are touching (see Pl. 126, fig. 2), tighten the screw (47) on the collar (48) (spanner 1994-T, see Pl. 126, fig. 5). Make sure that there is no play when pushing and pulling alternatively on the steering wheel	Spring compressor 1991-T Spanner 1994-T
9	Put in position, the sealing sleeve (46) on the support tube.	
10	*Cars produced before May 1958.* Fit the glove box.	
11	Place the steering locating cam on the positioning mark made when dismantling. Tighten the collar (42).....	8 mm box spanner
12	Adjust the point "0" (see Op. DS 440-0).	

TOOLS

REPLACEMENT OF A STEERING LOCATING CAM.

Removal (see Pl. 125-126).

13 *Cars produced before May 1958.* Remove the glove box.

14 Mark with a centre punch or a spot of paint, the position of the steering pinion, opposite the slot in the steering column at "a".

15 Untighten the screw on the fixing collar (42) and remove the cam towards the front of the steering column ..... — 8 mm box spanner

16 By passing the hand through the glove box opening, disengage the sealing sheath (46) towards the front.
Turn the steering wheel so as to bring the screw (47) on the collar (48) into a position in which it can be unscrewed. Have the spring (49) held by an assistant (spring compressor 1991-T, see Pl. 126, fig. 3) and unscrew the screw (47) (spanner 1994-T, see Pl. 126, fig. 5) ..... — Spring compressor 1991-T; Spanner 1994-T

17 Remove the screw(1), coupling the steering column to the pinion and slightly move the steering wheel towards the rear in order to remove the locating cam (43).

Refitting (see Pl. 125 and 126).

18 Engage the locating cam (43) on the steering column (note the position of assembly). Engage the steering column on the pinion so that the marks made when dismantling correspond. Place the coupling screw in the 1st groove of the pinion.(*Only fit the screw DM 441-100 with a smooth portion under the head*).

Place the gear selector lever in the 2nd speed position. Press lightly on the steering wheel and measure the distance "m" between the knob of the gear selector lever and the edge of the steering wheel rim. This distance "m" should be between 40 to 60 mm; if not, use another groove on the pinion.

Tighten the nut of the coupling screw (1). *Make sure that the screw is correctly positioned in the groove.*

19 Have the spring (49) compressed by an assistant (spring compressor 1991-T, see Pl. 126, fig. 3).
When the spring coils are touching, tighten the screw (47) on the collar (48) (spanner 1994-T, see Pl. 126, fig. 5). Make sure that there is no play when pushing and pulling alternatively on the steering wheel ..... — Spring compressor 1991-T; Spanner 1994-T

20 With the car in an approximate position for running in a straight line, put the locating cam in position, the roller resting in the hollow of the cam (43).

21 *Cars produced before May 1958.* Fit the glove box.

22 Adjust the point "0" (see Op. DS 440-0).

TOOLS

REPLACEMENT OF THE STEERING LOCATING APPARATUS.

Removal (see Pl. 125).

23 Unscrew the screw fixing the front bearing bracket and of the clip fixing the rear of the torsion rod (44).

Remove the rear fixing clip and the assembly of the front bearing and locating apparatus.

Stripping.

24 Remove the split pin from the end of the torsion rod. Remove the steel washer, the rubber washer, the ball bearing and its rubber bearing, the second rubber washer and the second steel washer. Remove the front bearing from the torsion rod.

Thoroughly clean the parts.

Reassembling.

25 Place on the torsion rod (44), a steel washer, a rubber washer, the ball bearing (previously greased with special castor oil, Antar R. C.), fitted with its rubber bearing, a rubber washer, a steel washer. Fit the split pin.

Place the front bearing on the torsion rod.

Refitting.

26 Offer up the locating apparatus. Put the front bearing and the rear clip in position. Tighten the fixing screws. Make sure that the roller is correctly positioned; parallel to the cam and in the centre of it to within 2 mm approximately, if not, move the cam (43).

27 To adjust the tension on the torsion rod (44) :
Cars produced before July 1958.
Turn the adjusting nut (45) so that an effort of 7 kg. applied on the roller, is required to raise the roller from the cam.
Cars produced since July 1958.
In order to reduce the pressure of the roller on the cam, fit a washer of appropriate thickness under the bearing and, in order to increase the pressure, slightly beat down the panel on the sidemember ..... 8 mm spanner

REPLACEMENT OF A STEERING COLUMN BRACKET.

Removal (see Pl. 126).

28 Remove the instrument panel (see Op. DS 334-1, paragraph 1).

29 Disconnect the speedometer from the steering column bracket. Disconnect the speedometer cable from the speedometer. Rest the speedometer on the left side of the scuttle shelf, remove the washers and springs ..... 8 mm box spanner

		TOOLS
30	Remove the steering wheel (see this operation, paragraphs 1 and following).	
31	Remove the screws fixing the left-hand part of the instrument panel dashboard.	
32	Remove the two upper screws fixing the left-hand bulkhead trim panel.	
33	Put the control lever of the parking brake in the off position and displace slightly, the trimming panel.	
34	Remove the two front fixing screws (53) on the steering column bracket. Pass a spanner through the hole provided in the scuttle shelf. Remove the other fixing screw on the dashboard and the screw (54) fixing the gear lever assembly, on the steering column bracket	12 mm box spanner
35	Remove the steering column finisher (55). Remove the steering column bracket	8 mm box spanner
	Refitting (see Pl. 126).	
36	Offer up the steering bracket. Make sure that the rubber washers (56) centring the instrument panel are fitted. Fit the fixing screws (53) fixing the bracket on the scuttle shelf (spanner 2428-T, see Pl. 72, fig. 3). Fit the screws without tightening (plain and spring washers)	12 mm box spanner Spanner 2428-T
37	Put the finisher (55) on the steering column (be careful not to damage it). Fit the wheel in the bracket. Fit on the column: the conical cup (52), the steel cup (51), the flanged side towards the spring, the spring (49), the steel cup (50), the flanged side towards the spring, the distance piece (60), the collar (48), the steering locating cam (43) together with its collar (42) (see Pl. 125). Connect the steering column to the pinion so that the positioning marks made when dismantling correspond. Tighten the nut.....	12 mm spanner 12 mm box spanner
	Only fit the coupling screws DM 441–100 (with a plain portion under the head). Make sure that the screw is correctly positioned in the groove of the steering pinion.	
38	Pull the steering wheel sideways towards the left, within the limit permitted by the play on the fixing screws in the support. Let go of the steering wheel, in order to allow it to return to its correct position of alignment. Carry out the same procedure towards the right. Tighten the screws (53) fixing the bracket on the scuttle shelf, holding it to prevent it turning whilst tightening the screws. Tighten the screw (54) fixing the gear lever assembly (plain and spring washers)	12 mm box spanner
39	Fit the finisher (55) on the steering bracket. Centralise the finishers, so that the plan between the column and bracket is evenly distributed. Tighten the nuts (plain and spring washers).....	8 mm box spanner
40	Fix the bulkhead trim panel, tighten the screws with cup washers under the heads.	
41	Fix the left-hand part of the scuttle shelf to the steering bracket.	
42	Connect the speedometer cable to the speedometer, fit the speedometer	8 mm box spanner
43	Fit the instrument panel (see Op. DS 334-1, paragraph 8).	

PARTICULAR POINTS

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 silentbloc to a distance "f" = 270 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 lever and the centre of the rack pressure pad.*

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. 125).*

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

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

Replacement of a pinion and rotating union.

Removal.

34 *Remove the steering.*

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

Refitting.

37-38 *Grease the pinion bearings (special castor oil ANTAR R.C.). Tighten the pinion nut (new) 7 ft/lb (1 m.kg), turn the pinion, loosen the nut $\frac{1}{12}$ of a turn and beat down the metal of the nut into the groove on the pinion.*

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

		TOOLS
	REPLACEMENT OF A STEERING.	
	Removal (see Pl. 125).	
1	Remove the spare wheel. Remove the spare wheel support and the left-hand front wing. Release the pressure	8-12-14 mm spanners 8-12-14 mm box spanners
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 (5).	
	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	Remove the steering relay protection shields.	
	Put the steering column setting gauge 1993-T in position. Disconnect the steering column from the pinion	Setting gauge 1993-T 12 mm box spanner
5	Disconnect the pipe assembly (5) 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.....	12 mm box spanner 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. 125).	
9	Turn the steering wheel to bring the arm to 30° under the horizontal, left side.	
	Turn the pinion to bring the outer bush (6) of the left-hand steering rod silent bloc to a distance "f" = 275 mm from the centre of the rack pressure pad (see Pl. 129, fig. 2 and 4).	
	IMPORTANT NOTE - A difference of more than 1 mm in the dimension "f" will give excessive play on the steering wheel (tolerance ± 9°).	
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 ± 2.5 mm between the centre line of the lower left-hand relay lever and the centre of the rack pressure pad (see Pl. 129). Fit the bearing caps. Fit the screws without tightening (spring washers). Fit the screw (1), coupling the steering column to the pinion. Tighten the nut (spring washer). *Only fit the coupling screws 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	To adjust the angular position of the steering. Fit the fixture 1955-T as indicated on Pl. 125. Turn the steering assembly in its bearings, in order to bring the groove "c" into contact with the gauge pin (D) of the fixture. Tighten the fixing screws (4) of the bearing caps. Remove the fixture	Fixture 1955-T 12 mm box spanner
12	Connect the steering levers to the relay shafts (the nuts (8) towards the outside). Tighten the nuts to 18 ft/lbs (2.5 m.kg). Remove the setting gauge 1993-T	14-16 mm box spanners
13	Connect the feed pipe assembly (5) 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 washers).....	8 mm ring spanner
14	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.....	12 mm spanner 8-12 mm box spanners
15	Refill the reservoir (special hydraulic fluid). Start the engine. Put the systems under pressure. Check the unions for leakage.....	8 mm spanner
16	With the car at its "normal" height (running position) : Adjust the alignment (see Op. DS 440-0).	
17	Fit the left-hand relay protection shield. Fit the wing. Fit the bonnet lock control cable to the catch on the wing and to the locking lever	12-14 mm spanners 12-14 mm box spanners
18	Fit the spare wheel support. Fit the spare wheel.	
19	Adjust the point "0" (see Op. DS 440-0, paragraphs 11 to 13). Adjust the steering lock (see Op. DS 440-0).	
	REPLACEMENT OF A RACK HYDRAULIC CONTROL (without removing the steering).	
	Removal (see Pl. 123).	
20	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the front right-hand wing and wheel	12-14 mm spanners 12-14 mm box spanners
21	Release the pressure	8 mm spanner
22	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	8 mm ring spanner

		TOOLS
23	Remove the protection shield from the right-hand steering relay housing. Unscrew the locknut of the right-hand steering lock cap (34 mm spanner or spanner 1974-T, see Pl. 130) and remove the cap	34 mm spanner or Spanner 1974-T
24	Turn the steering fully to the left. Remove the circlip (40). Remove the connecting pin (19) holding the piston to the rack control rod (extractor 1969-T, see Pl. 127, fig. 4).....	Extractor 1969-T
25	Remove the right-hand bearing cap	12 mm box spanner
26	Unscrew the locknut (21) of the steering casing end piece (spanner 2186-VA, see Pl. 130) 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.	
	Refitting (see Pl. 123).	
	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 (84) and (81) 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 (79) and tighten the locknut (21) (spanner 2186-VA, see Pl. 130). Connect the control pipe assembly flange, inserting a seal plate. Tighten the nuts (spring washers).....	8 mm ring spanner Spanner 2186-VA
30	Turn the steering on the left lock, so that the hole in the control rod (20) is in line with the holes at the end of the piston (80). Align the two parts with a conical drift. Put the connecting pin (19) in position (fixture 1969-T, see Pl. 127, fig. 4). Fit the circlip (40)	Conical drift : Small diameter = 5 Large diameter = 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. DS 440-0). Tighten the locknut of the lock adjusting cap (34 mm spanner or spanner 1974-T, see Pl. 130)	34 mm spanner or Spanner 1974-T
32	Start the engine. Put the systems under pressure and check the unions for leakage.	
33	Fit the relay housing protection shield. Fit the wing.	
	REPLACEMENT OF THE PINION AND ROTATING UNION ASSEMBLY	
	Removal (see Pl. 122).	
34	Remove the steering (see paragraphs 1 and onwards, this operation).	
35	Remove the rod (38) from the rotating union. Remove the pipe assembly (13) from the steering. Remove the steel cap (28). Remove the metal locking the nut (29) from the groove in the pinion and remove the nut (29)	12 mm box spanner 8 mm ring spanner
36	Remove the split pin and remove the nut (68), retaining the rack pressure pad, the spring (35) and the pressure pad (27). Disengage the pinion and rotating union assembly from the steering by striking the end of the pinion with a bronze drift. Note : be careful not to lose the balls (30) of the rear bearing (31). *One should withdraw 13 balls, in the contrary case, check to see if any remain in the steering*	19 mm box spanner
	Refitting (see Pl. 122).	
37A	To fit the pinion and rotating union assembly (*Cars produced before November 1959*). See Op. DS 442-3, paragraph 43 A.	
37B	To fit and adjust the pinion and rotating union assembly (*Cars produced since November 1959*). See Op. DS 442-3, paragraph 43 B.	
38	Fit the pipe assembly (13) 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 paragraphs 9 to 19, this operation).	

PARTICULAR POINTS

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. 123).

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.*

4 *The Rilsan washers (74) and (75) (see figs. 2, 3 and 8) fitted on cars produced since July 1958, can only be fitted on cylinders and housing end pieces so provided. One cannot adopt this solution on the old type parts. The width of the groove has been increased from 4·8 to 5·1 mm (check this width).*

If the piston has a groove at "b" (see fig. 4), it should be replaced (retain the adjusting washers (89)).

If the cylinder is replaced, fit the washers (89) of a type suitable for this cylinder (engraved at "c", see fig. 2) (see schedule).

Refitting (see Pl. 123).

6 *Obtain a dimension "d" of 2·4 to 2·5 mm by selection of the washers (87) (see fig. 5).*

Since 31st January 1958, the central ring seal of the piston is replaced by the assembly of the rubber seal (85) and the teflon seal (76). This assembly should also be fitted on early type steerings.

7 *Make sure that a chamfer exists at the entrance of the cylinder, if not, provide one (see fig. 7). In order to fit the washer (74), curve the convex part towards the top and fit in the groove in a slanting direction (see Pl. 131, fig. 3).*

8 *In order to fit the washer (75), introduce it through the end "f" of the end piece.*

9 *Operate the piston in the cylinder several times. Check that the teflon seal (76) is correctly positioned and refit the piston in the cylinder.*

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

Overhauling a pinion and rotating union assembly.

Dismantling (see Pl. 124).

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

14 *The cups (91) are paired with their caps (90) 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 with No. 600 abrasive paper is tolerated on the cap.

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

Refitting (see Pl. 124).

17 *Tighten the caps (90) to 7 ft/lb (1 m.kg).*

18 To prepare the adjustable union.

Make sure that there is no chamfer or burrs at "a"; if so, replace the pinion and rotating union assembly or proceed as indicated in paragraph 18a (we do not advise carrying out this very delicate operation). This exchange is indispensable on steerings with a number plate bearing a number lower than DA 3816.

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. 129) is indispensable, the control rod being tightened to 50 ft/lb (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.

34 *To strip the pinion and rotating union assembly (see paragraphs 11 to 16, this operation).*

35 *To dismantle the rack (see paragraphs 1 to 5, this operation).*

Refitting (see Pl. 122 and 123).

36 *To prepare the rack control (see paragraphs 6 to 10, this operation).*

37 *To prepare the pinion and rotating union assembly (see paragraphs 17 to 19, this operation).*

38 To assemble the steering rods :

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

(*b*) *Screw the sleeve (12) an equal distance on each side, in order to obtain a dimension "i" = 402 mm between the centreline of the ball pin and the centreline of the silentbloc.*

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

39 *Tighten the nuts of the pins (34) (see fig. 3) to 25 ft/lb (3·5 m.kg) (split pin).*

43A *(Cars produced before November 1959).*

The pinion bearings should be fitted with special castor oil based grease, type ANTAR R.C. Tighten the nut (29) to $7\frac{1}{4}$ ft/lb (1 m.kg) and then untighten the nut $1\frac{1}{2}$ of a turn.

43B *(Cars produced since November 1959.) Carry out the instructions set out in the paragraph.*

46 *Tighten the rack control rod to 50 ft/lb (7 m.kg) (lockwasher). The use of the special support is indispensable (vice adaptor 1999-T, see Pl. 129, fig. 1).*

48 *Fit the bush (94) at a distance of 140 to 145 mm from the centreline of the pin (19).*

It is necessary to fit a bush with four flats on the outside (see fig. 6).

The connecting pin (19) should be replaced after each dismantling.

50 *Tighten the nut (14) to 29 ft/lb (4 m.kg).*

51 *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 (21) to 72 ft/lb (10 m.kg). Do not leave any burrs on the bearing face of the feed pipe assembly, otherwise leakage may occur.*

53 *To fit the flexible dust covers.*

On the left side, the dimension "j" = 56 ± 2·5 mm.

On the right side, the dimension "k" = 574 ± 2·5 mm.

54 *To 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.*

To check the rotating union for leakage (test bench 2290-T, see Pl. 133).

61 *Build up the pressure to 2,490 p.s.i. (175 kg/cm²). Without touching the pinion there should be no drop in pressure, nor flow through the end of the pipe assembly (Q).*

62 *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 2,490 p.s.i. (175 kg/cm²). There should be no drop in pressure, nor flow through the end of the pipe assembly (Q).*

To check for leakage from the piston cylinder (test bench 2290-T, see Pl. 134).

68 *Build up the pressure to 2,490 p.s.i. (175 kg/cm²). There should be no drop in pressure, nor flow through the open end "j" of the pipe assembly (R).*

71 *Disconnect the pipe (I) from the pipe assembly (R) and connect it on the other end "j". Build up the pressure to 2,490 p.s.i. (175 kg/cm²). There should be no drop in pressure, nor flow through the end of the pipe "i" of the pipe assembly (R).*

TOOLS

IMPORTANT REMARK.

A. On cars on which the front axle number plate bears a number which is lower than 9099, 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. 97, fig. 2) ..... Extractor 1964-T

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) at "a" and at "b" (see Pl. 137, fig. 2).

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

- either the pivot lever (see Op. DS 413-1, paragraphs 5 and onwards);
- or the lower relay lever and steering rod (see Op. DS 443-1, paragraphs 24 and onwards).

TOOLS

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

1st. 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. DS 442-1, paragraph 34 and onwards) or repair (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. DS 442-1, paragraphs 20 and onwards) or repaired (see paragraphs 1 and onwards, this operation).

2nd. 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 Op. DS 391-0).

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

1st. Check that the steering is properly aligned (see Op. DS 440-0).

- Lateral position : see paragraphs 1 to 4.
- Angular position : see paragraphs 5 and 6.

2nd. Adjust the cross-over pressure (see Op. DS 440-0, paragraphs 17 and onwards).

D. If the steering "knocks", it is necessary to adjust the cross-over pressures (see Op. DS 440-0, paragraphs 17 and onwards).
The knocking can equally be caused by excessive clearance on the joint between the piston washers (89) (early assembly, ring seal), a clearance on the shackle pin (19), an excessive clearance on the rack support plunger (27) (see Pl. 123), or harsh spot of the slide valves or dash-pots.
In this case, it is necessary to overhaul the steering.

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

1st. Check the cross-over pressure.

2nd. Check the assembly of the plug (90) and cups (91) (see Pl. 124).

Remove the battery and its tray.

Disengage the dust cover (70), from the rotating union in order to obtain access to the plugs (90).

Release the pressure.

Remove the plugs (90), do not mix the parts; each cup (91) is paired with its plug (90)

Disengage the cup and its spring (92). 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.

TOOLS

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 (91) being beyond use, replace the plug and cup assembly.

Fit the plug and cup assemblies and springs. Insert the joint (93). Tighten the plugs moderately $7\frac{1}{4}$ ft/lbs (1 m.kg) and adjust the cross-over pressure (see Op. DS 440-0, paragraphs 17 and onwards).

OVERHAULING A RACK CONTROL

Dismantling (see Pl. 123).

1 Disconnect the cylinder (78) from the end piece of the housing (79) (the cylinder is screwed in the end piece of the housing). Hold the cylinder in a vice (soft jaws MR-3407-20, see Pl. 128, fig. 1) and unscrew the housing end piece; use a milled jawed spanner with the end of the jaws 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. 128, fig. 4).

Disengage the housing end piece (79) from the piston-cylinder assembly.

Disengage the piston (80) from the cylinder, through the end which was screwed into the end housing.

2 To strip the housing end piece (79) :

Remove the ring seal (81), the fibre joint (86), the ring seal (82).

Remove the Rilsan washer (75) (cars produced since July 1958, starting from chassis number DE 2833). Use a small brass wire hook.

3 To strip the cylinder (78) :

Remove the ring seal (84) and the ring seal (83).

Remove the Rilsan washer (74) (cars produced since July 1958).

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

4 To strip the piston (80) (see fig. 5) :

Remove the teflon joint (76) and the rubber joint (85). Remove the circlips (88), the shouldered washers (87) and the washers (89).

IMPORTANT REMARK -

1st. The Rilsan washers (74) and (75) can only be fitted on cylinders and housing end pieces so provided. One cannot adopt this solution on the old type parts.

In effect, the width of the groove has been increased from 4.8 to 5.1 mm. In case of doubt, check the width of the grooves with a gauge or a 5 mm diameter rod with the end bent at a right angle.

TOOLS

2nd. If the piston has a groove at "b" (see fig. 4), it must be replaced by a new type piston without a groove. Keep the piston washers (89) which are matched with the cylinder.

In the case of a replacement cylinder, it is necessary to fit the piston washers (89) of a type corresponding to this cylinder (number engraved at "c" either on the machined portion, or on the body of the cylinder) (see fig. 2).

Thus :-

Type of cylinder : 8, assemble with washers D 444-307
Type of cylinder : 9, assemble with washers D 444-308
Type of cylinder : 10, assemble with washers D 444-309
Type of cylinder : 11, assemble with washers D 444-310
Type of cylinder : 12, assemble with washers D 444-311
Type of cylinder : 13, assemble with washers D 444-312
Type of cylinder : 14, assemble with washers D 444-313
Type of cylinder : 15, assemble with washers D 444-314
Type of cylinder : 16, assemble with washers D 444-315

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

Assembly (see Pl. 123).

6 To prepare the piston (80) (see fig. 5) :

a) Fit on the piston (80), a circlip (88), a shouldered washer (87), two washers (89), a shouldered washer (87) and a circlip (88).

b) Separate the two washers (89) from each other and measure the width "d" housing the joints (76) and (85) (gauge 1983-T, see Pl. 128, fig. 2). Obtain the distance "d" = 2.4 to 2.5 mm by replacing the washers (87) ..... Gauge 1983-T

IMPORTANT REMARK - Since the 31st January 1958, the central ring seal of the piston (80) is replaced by the assembly of the rubber seal (85) and the teflon seal (76). This arrangement can also be fitted on early type steerings without modification. It is strictly necessary to replace the ring seal (early type) when overhauling a rack control.

c) Put in position, the ring seal (85) smeared with hydraulic fluid (cone assembly (A) sold under the number 1985-T, see Pl. 131, fig. 1). The chamfer should be towards the inside of the seal. Hold the gap between the washers (89) using the gauge 1983-T. Fit the ring seal (85) on the cone (A) smeared with fluid, bring the cone in contact with the washer (89) and progressively slide the ring seal (85) on the cone, then put it between the two washers (89). Finally fit the ring seal in position by means of a small wooden spatula..... Cone 1985-T

d) To fit the teflon joint (76) (see Pl. 131) :

Put the joint (76) on the cone (A) smeared with hydraulic fluid. Bring the cone (A) into contact with the washer (89).

Progressively slide the joint on the cone and fit it between the two washers (89).

TOOLS

The teflon joint is made of plastic, but not flexible. In order to complete the fitting, it is necessary to press between the washers (89) (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 (76). Return the bush (C) to the rear and disengage the mandrel (B) from the piston ..... Cone and mandrel 1985-T

7 To prepare the cylinder (78) :

a) Make sure that a chamfer exists at the entrance of the cylinder; if not, provide one by means of abrasive paper, working to the dimensions indicated on fig. 7.

b) Fit the Rilsan washer (74), smeared with hydraulic fluid, in the groove of the cylinder end piece; curve the washer, the convex part towards the top, and fit in a slanting direction in the groove (see Pl. 131, fig. 3). Complete the fitting by means of a brass wire hook.

c) To fit the ring seal (83) : insert the ring seal, smeared with hydraulic fluid, in the end piece of the cylinder. With a brass wire hook, hold the washer (74) against the face "e" of the groove. Using a second hook, put the ring seal (83) in position (see fig. 3).

d) Put the ring seal (84) in the outer groove of the cylinder end piece.

8 To prepare the housing end piece (79) :

a) Put the Rilsan washer (75), smeared with hydraulic fluid, in the groove of the housing end piece (79). Introduce the washer through the end "f" of the end piece and, with a brass wire hook, pull the washer and fit it in the groove.

b) Put the ring seal (82), smeared with hydraulic fluid in the groove of the end piece. Make sure that the washer (75) is against the face "g" of the groove (see fig. 8), and not at the other side of the ring seal (82).

c) Put the ring seal (81), smeared with fluid in position.

d) Put the fibre joint (86) previously dipped in fluid, on the bearing face for the cylinder in the housing end piece.

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

9 Engage the piston (80) previously oiled with hydraulic fluid, in the cylinder (78). After having carried out several strokes of the piston, check the fit of the teflon joint (76); the refitting is easy, the teflon joint having then taken a definite position (see fig. 2) for position of the piston.

10 Screw the casing end piece (79) on the cylinder (78). Hold the cylinder in a vice (soft jaws MR-3407-20, see Pl. 128, 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. 128, fig. 4). Unscrew the end piece and retighten to $43\frac{1}{2}$ ft/lbs (6 m.kg) three times in succession, in order to make sure that the cylinder is seating on the fibre joint (86) ..... Soft jaws MR-3407-20

TOOLS

OVERHAULING A PINION AND ROTATING UNION ASSEMBLY.

Dismantling (see Pl. 124).

11 Remove the dust cover (70) from the pinion and disengage the pinion (71) from the rotating union.

12 Disengage the ring seals (72) 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 To dismantle the pinion :

Untighten the locknut (74) of the adjusting screw (75) and remove the screw.

Disengage the valve push-rods (76).

Remove the split pin (77) from the fork and remove the flexible bushes.

Disengage the valves. Note : these valves are paired with their cylinders, do not intermix. Note the order of disassembly; for example : with the pinion towards you and the valves upwards, place the left-hand valve in the left-hand hole of the rack MR-3053-210 (position the small holes towards you (see Pl. 71, fig. 3) and the right-hand valve in the right-hand hole ..... Rack MR-3053-210

14 Remove the plug (90), do not intermix the parts; each cup (91) is paired with its plug (90). Disengage the cup and its spring (92). 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 abrasive paper No. 600 is permitted.

Carefully clean the parts.

In the case of the cup (91) being beyond use, replace the cup and plug assembly.

15 Examine the ground portion of the pinion with great care: the journal for the seals 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. 124).

17 To prepare the pinion :

a) Fit the assemblies of the plugs, cups and springs, previously smeared with fluid. Insert the joint (93), tighten the plug moderately to $7\frac{1}{4}$ 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 (73) on the journal of the fork. Engage the fork in the pinion (the locknuts (74) fitted on the machined part of the fork). Split pin.

Fit the valve push-rods (76). Fit the adjusting screws (75) and the locknuts (74).

18 To prepare the rotating union :

a) Examine the rotating union with great care, make sure there are no chamfers or burrs on the grooves at "a". If there are any burrs, they may be removed by proceeding as follows (this is a very delicate operation and demands great care).

Mount a small screwdriver or similar tool, so that when it is offered up to the union its extremity is parallel to the side of the grooves.

Put a thin strip of abrasive paper No. 600 over the end of the screwdriver and hold the paper on the rod portion of the screwdriver.

Remove the burrs by rubbing lightly on the sides of the groove (moistened with alcohol). Check that there are no sharp edges on the bore of the union, otherwise this can be removed with a light rubbing with abrasive paper No. 600, moistened with alcohol.

Carefully clean the parts in alcohol, to the exclusion of all other products. Blow with compressed air, particularly in the fluid passages.

In cases of chamfer on the grooves at "a" or scratches on the journal, replace the pinion and rotating union.

IMPORTANT REMARK - This is a very delicate operation. It is much preferable to use the assembly of the rotating union and pinion sold by our Spare Parts Department. This exchange is indispensable on steerings with a number on the plate which is lower than DA-3816.

b) Put the ring seals (72) 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.

19 Moisten the ground portion of the pinion (hydraulic fluid).

Engage the pinion (71) in the rotating union, the boss for the retaining rod towards the pinion.

20 Put the dust cover (70) in position, without fitting the fixing collar.

		TOOLS
	OVERHAULING A STEERING.	
	Dismantling (see Pl. 122 and 123).	
20	Remove the rack control pipe assembly (13).	
	Remove the seal plates	8 mm box spanner
21	Hold the steering in a vice (vice adaptor 1999-T, see Pl. 129, fig. 1).	
	Loosen the clip for the left-hand dust cover (26). Remove it, in order to fix the vice adaptor	Vice adaptor 1999-T
22	Remove the nut (14) and the retaining springs (15) (on early models there is only one spring).	
	Disconnect the steering rods from the central shackle (16).	
	Disconnect the shackle (16) from the ball pin (17) (extractor 1967-T, see Pl. 127, fig. 2). Disengage the rubber sealing washer (41)	16-21-23 mm box spanners Extractor 1967-T
23	Drain the fluid from the steering by turning the wheel to the extreme right and then left.	
24	Unscrew the locknuts (10) of the caps (34 mm spanner or spanner 1974-T, see Pl. 130).	
	Remove the right and left-hand caps (18) and (9) (stillson wrench)	Stillson type wrench 34 mm spanner or Spanner 1974-T
25	To disconnect the cylinder and piston assembly :	
	Turn the steering to the extreme right-hand side.	
	Remove the circlip (40) from the connecting pin. Remove the connecting pin (19) holding the piston to the rack control rod (extractor 1969-T, see Pl. 127, fig. 4).	
	Undo the housing end piece locknut (21), hold the end piece with a 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. 128, fig. 4).	
	Disconnect the cylinder and piston assembly by unscrewing the housing end piece.	
	Remove the locknut (21) (spanner 2186-VA, see Pl. 130)	Extractor 1969-T Spanner 2186-VA
26	Disengage the right-hand flexible dust cover (22), the steel dust covers (23) and (67) and the ball guide (24).	
27	To disconnect the rack control rod :	
	Put the steering in the vice adaptor 1999-T, as indicated on Pl. 129, 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 lockplate (25).	
	Hold the ball pin (17), using the extractor 1966-T, as shown on Pl. 130, fig. 3 . Disconnect the control rod (20), by unscrewing it (spanner 1982-T, see Pl. 127, fig. 3)	Spanner 1982-T Vice adaptor 1999-T

		TOOLS
	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.	
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 (24) on the stem of the ball pin (as a distance piece) and lightly tighten the ball pin nut. Extract the ball pin (17) from the rack by turning on the screw of the extractor (extractor 1966-T, see Pl. 127, fig. 1, spanner 1982-T, see Pl. 127, fig. 3).	
	NOTE - After separation, the ball pin immediately comes into contact with 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	Drill out the centre punch mark, locking the nut (68) of the rack support plunger (early models) or remove the split pin. Remove the nut (spanner MR-3691-70, see Pl. 127, fig. 5). If the thread in the housing is damaged, recut it, using a tap 24 diameter, 150 pitch. Disengage the spring (35) and the rack support plunger (27). Disengage the rack (69)	Spanner MR-3691-70 Tap = 24 dia. x 150 pitch
30	To disconnect the pinion and rotating union.	
	Remove the steel cap (28). Remove the rod (38) retaining the rotating union. Remove the metal locking the nut (29) from the groove. 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 (30) of the upper pinion bearing (31)	12 mm spanner 21 mm box spanner
31	Drive out the lower bearing (32) and the outer race of the upper bearing (31). Remove the locknut (10) from the left-hand cap (9). Remove the lock adjusting screw (3) and its locknut (1st arrangement). Remove the steering from the stand	12 mm box spanner
32	To dismantle the steering side rods :	
	Disconnect the steering levers from the rods (extractor 1964-T, pressure pad 1968-T, see Pl. 97, fig. 2). Disengage the rubber joint and the cup sealing the ball pin. Disconnect the adjustable coupling (12) from the right-hand rod. Remove the silentblocs (36) in a press (mandrel MR-3676-110, see Pl. 127, fig. 6).....	12-21 mm box spanners Extractor 1964-T Pressure pad 1968-T Mandrel MR-3676-110

TOOLS

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 To dismantle the pinion and rotating union assembly (see paragraphs 11 to 16, this operation).

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

Assembly (see Pl. 122-123).

36 To prepare the rack control (see paragraphs 6 to 10, this operation).

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

38 To assemble the steering side rods :

a) Fit the silentblocs (36) in position in the eye of the steering side rods, in a press (mandrel MR-3676-110, see Pl. 127, 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 (12) together with its collar (11), 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 the 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) To connect the relay levers :

Put a little grease in the annular space, between the stem of the ball pin and the 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. 122, 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 (34). Tighten the nuts to 25 ft/lbs (3.5 m.kg) and fit the split pin ..... 17 mm box spanner

40 *1st arrangement:* fit the lock adjusting screw (3) and its locknut.

Do not tighten the latter ..... 12 mm box spanner

		TOOLS
41	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. 129, fig. 1)	Vice adaptor 1999-T
42	Fit the outer race of the upper bearing (31) and the lower bearing (32).	
43A	To fit the pinion and rotating union assembly (*cars produced before November 1959*) a) Put the 13 balls (30) in position on the inner race, stick them in position with grease (special castor oil based grease, type Antar R C). NOTE - It is necessary to use castor oil based grease, in order to avoid deterioration of the special rubber joints. b) Put the rubber sealing joint (37) in position on the collar of the rotating union. Grease the pinion (special castor oil based grease, type Antar RC). Offer up the pinion in the steering housing. Tighten the nut (29) to $7\frac{1}{4}$ ft/lbs (1 m.kg). After rotating the steering several times, untighten the nut 1/12th of a turn. Lock the nut by hammering the metal of the nut into the groove in the pinion, (support the end of the pinion while striking). c) Fit the steel cap (28) refilled with grease, (special castor oil based grease, type Antar R C). d) Fit the rotating union locking rod; screw the rod (38) to the end of the thread. Tighten the locknut	19 mm box spanner 12 mm spanner
43B	To fit and adjust the pinion and rotating union assembly (*cars produced since November 1959*) (see Pl. 122, fig. 2 and Pl. 124 A). a) Fit the lower bearing (32) in position in the steering (note the order of assembly). Fit the pinion without the balls for the rear bearing (31) and without the rotating union and screw on the nut (29) inserting an adjusting washer (100) (see Pl. 124), *between the nut and the bearing*. Fix the pinion in a vice, tighten moderately. Tighten the nut (29) to 36 ft/lbs (5 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2) ..... b) Put the steering in a support (vice support 1999-T, see Pl. 129, 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 (30) of the upper bearing (31) 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. 124 A, 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. ..... NOTE - If the pinion has no centre point, use a dial gauge with a standard spindle.	Torsion spanner 2471-T 19 mm socket Vice adaptor 1999-T Dial gauge support 1997-T Dial gauge 2437-T

TOOLS

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 (29) and the pinion from the steering.

d) Fit the steering on the support (vice adaptor 1999-T, see Pl. 129, fig. 1), the pinion towards the bottom.
Place 13 balls (30) of the bearing (31) on the pinion. *The balls should be fitted dry.*
Engage the pinion thus prepared in the steering. Tighten the nut (29) in order to obtain free movement without play on the pinion..... — Vice adaptor 1999-T

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. 124-A, 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 the thickness obtained above. In the example, fit a washer number DS 442-346..... — Support 1997-T, Dial gauge 2437-T

f) Remove the dial gauge support and the ball which was placed on the end of the steering pinion.
Remove the nut (29), the pinion and the balls (30) of the bearing (31), from the steering.

g) Put the rubber seal (37) in position on the collar of the rotating union.
Place 13 balls (30) on the inner cage of the pinion, stick with grease (special castor oil based grease, type Antar R C only).
Place the adjusting washer (100) (see Pl. 124) on the pinion, the chamfer towards the pinion.
Grease the pinion (special castor oil based grease, type Antar R C) and fit it in the steering housing.
Hold the pinion in a vice and tighten moderately. Tighten the nut (29) to 36 ft/lbs (5 m.kg) (torsion spanner 2471-T, see Pl. 7, fig. 2) ..... — Torsion spanner 2471-T, 19 mm socket

h) Make sure that the pinion functions freely without play in the steering housing. If not, alter the thickness of the washer (100).

i) Support the end of the pinion and knock the metal of the nut into the groove of the pinion. Fit the steel cap (28) filled with grease (special castor oil based grease, type Antar R C).

j) Fit the rotating union locking rod; screw the rod (38) to the end of the thread and tighten the locknut ..... — 12 mm spanner

44 Offer up the rack properly degreased on the taper for the rack ball pin, and engage with the pinion.
Fit the rack support plunger (27). Fit the spring (35). Tighten the nut (68) and then unscrew 1/6th, of a turn (spanner MR-3691-70, see Pl. 127, fig. 5). This nut should be locked with a centre punch mark after adjusting the cross-over pressures. ..... — Spanner MR-3691-70

45 Fit the left-hand dust cover (26). Commence with the end with the small diameter.

TOOLS

46 To fit the rack ball pin (17).

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. Place the ball pin guide block MR-4369 (see Pl. 130, fig. 4) on the stem of the ball pin and tighten the nut moderately (see Pl. 130, fig. 3) ..... Guide block MR-4369
21 mm box spanner

Tighten the taper by striking on the eye of the ball pin with a tube.

Fit the lockwasher (25). Screw the rack control rod (20), tighten to 50 ft/lbs (7 m.kg) (spanner 1982-T, see Pl. 127, fig. 3).

Turn over the lockwasher. Remove the tongued arm. Remove the nut, the shackle and the guide 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 R C) on the pinion side ..... Spanner 1982-T
Extractor 1966-T

47 Fit the right-hand flexible dust cover (22). Commence with the end with the large diameter.

Place the ball guide (24), previously greased on the stem of the ball pin. Fit the movable dust shields (23) and (67).

Put the dust covers on the ends of the movable dust shields (23) and (67). Fit the clips.

48 Fit the steering end housing locknut (21). 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 (21).

Put the anti-rattle bush (94) on the rack control rod so that the distance = $140\ ^{+5}_{0}$ mm from the pin (19).

IMPORTANT REMARK - If the bush disassembled was cylindrical, discard it and fit a bush with 4 flats on the outside (see fig. 6).

Turn the piston with the aid of a tommy bar passed 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 (19) (extractor 1969-T, see Pl. 127, fig. 4) and the circlip (40) (the connecting pin is to be replaced after each dismantling) ..... Extractor 1969-T

49 Fit the locknut (10) and the right-hand cap (18).

Fit the conical stop and the right-hand cap (1st arrangement).

		TOOLS
50	Fit the rubber sealing washer (41) and the steering side rod assembly on the rack ball pin. Fit the springs (15), the smaller on the inside (1st arrangement). On the 2nd arrangement, the springs are identical. At the present time, cars are fitted with one spring only. 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) and that the fork remains parallel to the longitudinal centre line of the steering. After tightening the nut, the springs should be in a position as shown on fig. 4 (see Pl. 112). Fit a split pin to the nut and remove the guide plate from the springs	21 mm box spanner
51	To fit the pipe assembly. Connect the pipe assembly (13) to the rotating union (33). Insert a seal plate together with its ring seals, making sure that the fluid holes correspond. Tighten the nuts (spring washers). Connect the pipe assembly to the steering end housing, if necessary, turn the steering end housing so that the flanges coincide perfectly. Tighten the steering end housing locknut (21) to 72 ft/lbs (10 m.kg) (spanner 2186-VA, see Pl. 130). Hold the housing with a milled jawed spanner with the jaws held under the flange of the feed pipe assembly (see Pl. 128, fig. 4). Fix the pipe assembly (13). Insert a seal plate together with its ring seals. Tighten the nuts (spring washers). Use only thick seal plates with ring seals	Spanner 2186-VA 8 mm box spanner
52	Fit the locknut (10) and the left-hand steering lock adjusting cap (9). Put the flexible dust cover (70) in position, do not fit the clip.	
53	Remove the steering from the vice adaptor. Put the flexible dust covers in position; the left-hand dust cover (26) so that the dimension "j" = 56 ± 2.5 mm and the right-hand dust cover (22) so that the dimension "k" = 574 ± 2.5 mm. Fit the clips.	
54	To check the sealing of the piston and cylinder assembly (see paragraphs 64 and onwards, this operation). Adjust the cross-over pressures. This operation can only be carried out on the car (see Op. DS 440-0, paragraphs 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.	
55	Paint the assembly, except on the threads, pinion splines and feed pipe joint face.	
	CHECKING THE ROTATING UNION (see Pl. 133).	
56	Use the test bench 2290-T, prepared as indicated on Pl. 172	Test bench 2290-T

TOOLS

57 Remove the pipe assembly from the rotating union to the end piece.

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

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

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

61 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^2). 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).

62 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 249 p.s.i. (175 kg/cm^2).

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

63 Release the pressure by unscrewing the bleed screw "b" of the test bench.

CHECKING FOR LEAKS FROM THE PISTON-CYLINDER (see Pl. 134).

64 Use the test bench 2290-T, prepared as indicated on Pl. 172 ..... Test bench 2290-T

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

66 Connect the pipe assembly (R) (insert a seal plate) in place of the feed pipe assembly.

67 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).

68 Tighten 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^2).

69 There should be no drop in pressure, or flow through the open end "j" of the pipe assembly (R).

70 Release the pressure.

71 Disconnect the pipe (I) from the pipe assembly (R) and connect on the other pipe end "j".

72 Operate the pump to build up pressure. Repeat the operations described in paragraphs 68 to 70.

PARTICULAR POINTS

Replacement of a steering relay.

Removal.

5-7 *Mark the position of the steering in its bearings, before removing the bearing caps.*

Release the pressure and disconnect the feed pipe assembly, from the steering, in order to remove it towards the front of relays.

9 *Do not lose the washers for adjusting the angular position of the steering.*

Refitting.

Since June 1958, the relay spindle is reversed. The new type spindle can be fitted in place of the early type. The flat on the washer under the head should be positioned towards the bottom.

The adjustment of the angular position of the relays is carried out in the case of replacement of the body or the front body unit. In the case of replacement of the relays, fit the adjusting washers found when dismantling.

12 *Connect the rod of the lower lever to the lever on the pivot. Tighten the nut to 28 ft/lb (4 m.kg) (split pin).*

13 *Place the steering in its bearings, noting the marks made when dismantling.*

Adjust the angular position of the steering: the groove "c" of the pinion in contact with the pin (D) of the fixture 1955-T (see Pl. 125).

14 *Connect the steering lever to the relay. Tighten the nut (engine side) to 18 ft/lb. (2·5 m.kg).*

21-22 *Adjust the alignment (see Op. DS 440-0).*

23 *Adjust the point "O" and the steering lock (see Op. DS 440-0).*

Replacement of a lower relay lever.

Refitting.

29 *After assembly of the parts, tighten the upper nut to 43 ft/lb (6 m.kg) at the same time turning the lever. Loosen the nut and then retighten to 14 to 22 ft/lb (2 to 3 m.kg).*

If the work carried out has been made necessary by seizure of the ball joint, it is necessary to check the operation of the ball joints of the other relay spindle and levers.

REPLACEMENT OF A STEERING RELAY

		TOOLS
	Removal (see Pl. 137).	
1	Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168).	
	Remove the spare wheel. Remove the spare wheel support, the front wings, the battery and the battery tray ...	8-12-14 mm spanners 8-12-14 mm box spanners Jacking bracket 2505-T
2	Release the pressure and drain the hydraulic fluid reservoir	8 mm spanner

		TOOLS
3	Remove the reservoir fixing collars. Disengage the high pressure pump feed pipe from the battery support. Remove the battery support together with the bonnet lock control cable	8-12 mm box spanners
4	Remove the relay housing mud shields.	
5	Disconnect the pipe assembly (5) (see Pl. 125) from the steering distributor. Remove the seal plates	8 mm ring spanner
6	Disconnect the steering lever from the spindle of the relay to be replaced.....	14-16 mm box spanners
7	Mark the position of the steering in the relay bearings, with a spot of paint at "b" (see Pl. 125). Remove the bearing caps and lower the steering assembly and column assembly slowly, in order to avoid damage to the steering wheel.	12 mm box spanner
8	Disconnect the steering rod from the steering lever on the pivot (extractor 1964-T, with pressure pad 1968-T, see Pl. 97, fig. 2). Remove the rubber seal and nylon cup	21 mm box spanner Extractor 1964-T Pressure pad 1968-T
9	Remove the screw (60) fixing the relay assembly on the sidemember. Remove the nut from the relay fixing spindle (63). Disengage the relay assembly and steering rod. Do not lose the relay assembly adjusting washers (62)....	12 mm box spanner 26 mm ring spanner
	Refitting (see Pl. 137).	
10	Offer up the relay and steering rod assembly. Put the relay fixing spindle (63) fitted with its washer and previously oiled, in position. Fit the nut on the spindle without tightening. NOTE - Since the 1st June 1958, the fitting of the spindle is reversed; the head of the spindle is on the engine side and the nut on the outside. The spindle is fitted with a washer under the head. The new type relay spindle can be fitted in place of the early type. Note the position of the washer: the concave part towards the head of the spindle and the flat positioned downwards.	
11	To adjust the position of a relay assembly (only if the coque or front unit is replaced). NOTE - This operation is only carried out in the case of replacement of the coque or repairs to the coque (replacement of the front unit). This adjustment should be carried out before fitting the front half axle. In the case of replacement of the relay, refit the washers (62) found when dismantling. Determine the thickness of the adjusting washer, fitted at "p", the tolerance for the position of the relay being $0 \pm 30'$, it is necessary to use a gauge (fixture 1995-T, see Pl. 138). Fit the fixture as shown on the illustration. Fit the washers required between the relay fixing lug and the sidemember. Fit the washers (62), tighten the screw (60) (spring washer), tighten the nut of the spindle (63). Check the adjustment	12 mm box spanner 26 mm ring spanner Fixture 1995-T

		TOOLS
12	Connect the rod of the steering lever on the pivot. Insert a nylon cup and a rubber seal (65). Tighten the nut to 29 ft/lbs (4 m.kg) and split pin	21 mm box spanner
13	Fit the steering in its bearings, noting the paint marks made when dismantling at "b" (see Pl. 125). Put the roller in position on the steering locating cam. Fit the bearing cap fixing screws (66). Adjust the angular position of the steering, using the fixture 1955-T. Fit the fixture 1955-T as indicated on Pl. 125. Turn the steering assembly in its bearings, so that the groove "c" touches the centre gauge pin (D) of the fixture. Tighten the fixing screws (4) of the bearing caps. Remove the fixture	12 mm box spanner Fixture 1955-T
14	Connect the steering lever to the relay spindle (nut on the engine side). Tighten the nut to 18 ft/lbs (2.5 m.kg).....	14-16 mm box spanners
15	Connect the feed pipe assembly (5) (see Pl. 125) to the rotating union. Fit the seal plates (use plates (1.7 mm thick) with new ring seals), so that the holes for the fluid correspond to those in the union plates. Tighten the nuts (spring washers)	8 mm ring spanner
16	Fit the relay housing mud shields.	
17	Fit the battery support. Tighten the screws (plain and spring washers). Connect provisionally the bonnet lock control cable to the control lever. Fit the fluid reservoir, using the collars. Fit the battery tray. Fit the battery and secure by tie-rods, after having fitted a protection panel (even if one did not exist when dismantling). Fix the wiring harness channel on the outer tie-rod. Tighten the nuts (plain and spring washers). Engage the high pressure pump feed pipe in the battery support.....	8-12-14 mm box spanners
18	Refill the reservoir (special hydraulic fluid). Start the engine.	
19	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Allow the engine to idle, in order to put the systems under pressure. Check the unions for leakage	Jacking bracket 2505-T
20	With the car in the "normal" position and the engine idling, check the level of the fluid in the reservoir. Top up if necessary.	

		TOOLS
21	Adjust the alignment (see Op. DS 440-0, paragraphs 7 to 9).	
22	Fit the front wings, the spare wheel support and the spare wheel. If necessary, adjust the bonnet lock control cable. Fit the aid ducts	12-14 mm box spanners
23	Test the car. Adjust the point "0" (position of the steering in which the car runs in a straight line) (see Op. DS 440-0, paragraphs 10 to 12). Adjust the steering lock (see Op. DS 440-0, paragraphs 13 to 16).	
	REPLACEMENT OF A LOWER RELAY LEVER (On the car).	
	Removal (see Pl. 137).	
24	Remove the front wing from the side on which the work is to be carried out. Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wheel	Jacking bracket 2505-T
25	Disconnect the upper lever (67) from the relay spindle (68) ..... NOTE - In the case of replacement of the left-hand lever, remove the battery, the battery tray and its bracket.	14-16 mm box spanners
26	To remove the relay spindle : a) Remove the rubber bush (69) protecting the lower nut. b) Push the metal locking the nut towards the inside, using special pliers. Remove the nut (70) (spanner 1989-T, see Pl. 139, fig. 1)..... c) Disengage the relay lever assembly, the outer race (71) of the bearing and the ball bearings of the lower and upper bearings.	Spanner 1989-T
27	Push the metal, locking the upper nut (72) towards the inside. Remove the upper nut (72) (spanner 1988-T, see Pl. 139, fig. 3). Remove the outer race of the upper bearing (73).	Spanner 1988-T
	Refitting (see Pl. 137).	
28	To fit a relay lever : a) Fit on the new spindle: the rubber protection bush (69), the lower nut (70), together with its felt washer and the outer race of the lower bearing (71). b) Pack the lower groove of the relay spindle with grease (graphite grease, type Antar Cardrex E P or if this grease is not available, Compound grease). Put 15 ball bearings in this groove. Put the outer race (71) of the bearing on the ball bearings and keep them in position with the nut (70).	

		TOOLS
	c) Hold the outer race in position on the ball bearings with the nut, engage the relay spindle vertically in the housing. Push the outer race with the nut, in order to engage in the bore of the housing, then disengage the nut and finish the positioning of the outer race by using the tube 1990-T (see Pl. 139, fig. 4). Tighten the nut (spanner 1989-T) and lock by hammering down the metal	Tube 1990-T Spanner 1989-T
	d) Put the rubber protection bush (69) in position.	
29	<u>To fit the upper bearing</u> : a) Pack the outer race of the upper race (73) with grease (graphite grease, type Antar Cardrex E P or, if this is not available, compound grease) and put 14 ball bearings in this race. b) Put the race together with the ball bearings in the housing. c) Tighten the upper nut (72), together with its felt washer, to 43 ft/lbs (6 m.kg), at the same time turning the relay spindle (spanner 1988-T). Loosen the nut, then retighten to 14 to 22 ft/lbs (2 to 3 m.kg). Lock the nut by hammering down the metal	Spanner 1988-T
30	Connect the upper lever (67) to the relay spindle (68). Tighten the nut to 18 ft/lbs (2.5 m.kg)	14-16 mm box spanners
31	Fit the wheel. Lower the car to the ground. Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the wing. NOTE - If the work carried out has been made necessary by seizure of the ball joint, even at the limits of its movement, it is necessary to check the operation of the other relay lever and the pivot levers.	

PARTICULAR POINTS

Assembly.

Tighten the upper nut to 43 ft/lb (6 m.kg) at the same time turning the lever. Slacken the nut and retighten to 14 to 22 ft/lb. (2 to 3 m.kg).

If the work has been made necessary by seizure of the ball joint, it is necessary to check the operation of the ball joints of the other lever and the pivot levers.

		TOOLS
	DISMANTLING (see Pl. 137).	
1	Disengage the rubber bush (69).	
2	Force the metal locking the lower nut (70) inwards and remove the nut (spanner 1989-T, see Pl. 139, fig. 1).....	Spanner 1989-T
3	Disengage the lower lever (68) and steering rod assembly and the lower bearing race (71). Do not lose the ball bearings. Remove the race (71), lower nut (70), the rubber seal (69) from the lever (68).	
4	Force the metal locking the upper nut (72) inwards and remove the nut (spanner 1988-T, see Pl. 139, fig. 3).....	Spanner 1988-T
5	Remove the upper bearing race (73).	
6	Clean the parts.	
	ASSEMBLY (see Pl. 137).	
7	Fit the upper bearing race (73). Put the upper nut (72) in position and screw up until the upper face is about 1 mm. from the upper face of the relay housing. Introduce 20 g of grease in the housing (Antar Cardrex E. P. grease or if not available, Compound grease).	
8	Put 14 ball bearings into position and secure with grease, in the upper bearing race (73).	
9	On the lower lever (68) fit the rubber bush (69), the lower nut (70) and the lower bearing race (71).	

		TOOLS
10	Fix the lower lever (68) in a vice. Fit the bearing race (71) slightly below the lower groove in the lever and put 14 balls in position in the race and secure them with grease. Also use grease to hold the lower nut (70) on the bearing race (71). Place the race in position on the lever (the balls in position in their bearing groove.	
11	Turn the housing over and engage the lever (68) prepared as above, vertically. Hold the bearing race (71) and screw up the nut (70). If necessary, use a tube to position the race in the housing (tube 1990-T, see Pl. 139, fig. 4). Lock the nut (70) by turning down the metal. Place the rubber bush (69) in position	Tube 1990-T
12	Tighten the upper nut (72) to 43 ft/lbs (6 m.kg),at the same time turning the lever (68) (spanner 1988-T, see Pl. 139, fig. 3). Unscrew the nut and retighten to 14 to 22 ft/lbs (2 to 3 m.kg). Lock the nut by turning down the metal	Spanner 1988-T
	NOTE - If the work carried out has been made necessary by seizure of a ball joint, even at the limit of its movement, it is necessary to check the operation of the ball joints of the other relay lever and the pivot levers.	

PARTICULAR POINTS

1 To adjust the lateral position of the brake unit.

Free off the articulating spindle pressure pad. Take up the brakes by operating the mechanical brake pedal and lock the lock. Tighten the screw locking the articulating spindle.

3 To adjust the heights of the brake unit.

The linings should stand proud of the disc at the front, by 1 mm approximately.

To adjust the control lever eccentric stop.

Follow the information given in paragraphs 4 to 8.

		TOOLS
	ADJUSTMENT OF A FRONT BRAKE UNIT (see Pl. 141 and 142).	
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	To 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. 141, 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 a manner so as to prevent any rotation in the direction of unscrewing.....	14 mm box spanner
3	To adjust the height of the brake unit :	
	Move the nuts of the front support tie-rod so that the lining stands slightly proud of the disc at the front by approximately 1 mm (see Pl. 141, fig. 1)	21 mm spanner 21 mm box spanner

		TOOLS
	ADJUSTMENT OF THE CONTROL LEVER ECCENTRIC ADJUSTING STOP (see Pl. 141 and 142).	
4	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
5	Operate the mechanical brake control and make sure that the locking rod (133) takes up its position at the base of the teeth. Engage the spanner 2129-T (see Pl. 143) in the hole "a" in the housing and make sure that it engages with the adjusting wheel	Spanner 2129-T
6	Turn the spanner towards the rear of the car and 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
7	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, recheck the adjustment of the eccentric stop (104). Carry out the same operation on the other brake unit.	
8	Adjust the connecting cable (see Op. DS 454-0).	
	CENTRALISING THE REAR BRAKE SHOES	
9	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wing, the wheel and the brake drum	Jacking bracket 2505-T 14 mm box spanner
10	Setting the diameter of the drum (use the fixture 2115-T, see Pl. 148) : Place the fixture in the drum, with the two dowels (A) engaged in the drum locating holes. Keep the fixture flat against the drum web by means of the two screws 6 diameter, 100 pitch. Describe a complete turn with the pointer (B) and tighten the pointer fixing screw (C).....	Fixture 2115-T
11	To adjust the brake shoes : Place the fixture 2115-T on the hub, with the dowels engaged in the holes in the fixture. Tighten the screw (D) in order to bring the fixture against the face of the brake drum, on the hub. Adjust the brake shoes by means of the adjusting cams, so that the pointer (B) is flush with linings all round the periphery	Fixture 2115-T
12	Fit the brake drum, tighten the two screws. Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the wing	Jacking bracket 2505-T 14 mm box spanner

PARTICULAR POINTS

Replacement of the brake shoes.

Removal.

On cars produced since June 1958, the moveable shoe return spring is no longer fitted. Using a screwdriver press the moveable shoe backwards so that it remains in contact with the plunger.

Refitting.

7 *To level the brake unit (see Op. DS 451-0).*

8 *To adjust the height of the brake unit (see Op. DS 451-0).*

Replacement of a brake unit.

Refitting.

23-25 *To adjust the lateral position and the height of the brake unit (see Op. DS 451-0).*

26 *To adjust the front brake connecting cable (see Op. DS 454-0).*

30 *To bleed the front brakes (see Op. DS 453-0).*

TOOLS

REPLACEMENT OF THE FRONT BRAKE SHOES

Removal (see Pl. 141, 142).

1 Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168).

Remove the wheel on the side on which the work is to be carried out ..... 12-14 mm box spanners
Jacking bracket 2505-T

NOTE - 1st. For the replacement of the shoes, left side, remove the battery and the battery tray.

2nd. In order to equalise the braking, it is necessary to replace the four shoes at the same time.

2 Turn the protection cover retaining spring (105). Remove the cover.

3 Unscrew the brake shoe locking spring and remove the trunnion (117) and the screw (149).

4 To remove the brake shoes from the brake disc :

Put the fork 2128-T (see Pl. 143) in position. Slightly tighten the screw, in order to free the clearance adjustment ratchet.

Press down the rubber dust shield on the sidemember and insert the spanner and extension (2129-T, see Pl. 143) in the hole "a" in the brake unit. Turn the spanner towards the rear of the car (in a clockwise direction on the left side, and anti-clockwise on the right side).

		TOOLS
	IMPORTANT - During this operation of removing the brake shoes, take care that they do not become wedged; the adjustable thrust sleeve which is now free can catch on the mechanical brake control pin which will necessitate the complete dismantling of the brake unit.	
	Disengage the extension spanner, remove the fork.	
	On cars produced since June 1958, the movable brake shoe return spring is no longer fitted. Using a screw-driver, press the movable shoe backwards so that it remains in contact with the plunger	Fork 2128-T Extension spanner 2129-T
5	Disengage the brake shoes. If necessary remove, using the lever 2127-T (see Pl. 143)	Lever 2127-T
	NOTE - Scoring on the brake shoe linings presents no danger. The brake shoes should be replaced when the thickness of the linings is less than 1.5 mm. The linings should be dry and free from oil.	
	Refitting (see Pl. 141 and 142).	
6	Put the brake shoes in position. Fit the trunnions (117), locking the brake shoes. Position the trunnions so that the point of the screw enters the conical impression milled in the brake shoes. Tighten the screw, tighten the locknut.	
	Operate the mechanical brake pedal several times, in order to take up the clearance on the brake shoes.....	8 mm spanner 8 mm box spanner
	(Do not operate the hydraulic control).	
7	To level the brake unit (see Pl. 142, fig. 1).	
	a) Untighten the locking screw (118) of the pin (119) so that the pin will slide freely in the ball (120)	14 mm box spanner
	NOTE - Excessive untightening of this screw will cause the thrust pad (121) to drop out of position.	
	b) Make sure that the slot of the ball is in the vertical position.	
	c) Lock the brakes by working the control lever (103) (see Pl. 141, fig. 2). Tighten the screw (118) in order to lock the pin (119).	
	d) Make sure that the end of the pin is level with the inside face of the unit at "t" (see Pl. 141, fig. 2). Lock the screw with iron wire, passing through the holes in the head of the screw and the head of the lower screw (153) fixing the rear support, fitted so as to prevent any rotation in the direction of unscrewing.	
8	To adjust the height of the brake unit :	
	Move the nuts and locknuts of the support rod so that the lining stands slightly proud of the disc at the front by approximately 1 mm (see Pl. 141, fig. 1).	
9	Fit the protection cover, held in position by the retaining spring (105) together with its rubber sheath.	
10	Fit the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T

		TOOLS
	REPLACEMENT OF A BRAKE UNIT	
	Removal (see Pl. 142).	
11	Remove the radiator (retain the water which contains anti-freeze) (see Op. DS 232-1).	
12	Remove the front engine support crossmember (see Op. DS 331-1, paragraph 4).	
13	Remove the brake cooling duct. Remove the front brake connecting cable, disconnect the cable from the control levers and remove the sheath stop	12 mm spanner 12 mm box spanner
14	Release the pressure (spanner 2141-T, see Pl. 143, fig. 4)	Spanner 2141-T
15	Remove the brake shoes (spanner 2127-T, see Pl. 143, fig. 2)	8 mm spanner 8 mm box spanner Spanner 2127-T
16	Disconnect the brake feed pipe (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Disconnect the accelerated idling control feed pipe (left-hand brake unit)	Spanner 2219-T or Spanner 2221-T
17	To remove the brake unit articulating spindle :	
	a) Remove the locking wire from the locking screw (118) of the ball (120).	
	b) Untighten the screw (118); do not unscrew fully, otherwise the thrust pad (121) will drop out of position.	
	c) Remove the pin from the spindle (119) and remove the spindle (119) from the brake unit. If necessary, extract it, using a 10 diameter, 125 pitch screw	14 mm box spanner
18	Disengage the brake unit after working it towards the front.	
	Refitting (see Pl. 142).	
19	Offer up the brake unit and engage the spindle (119) in the bore of the brake unit and in the ball (120), the hole for the pin being vertical.	
20	Connect the feed pipe to the brake unit (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	
	Connect the accelerated idling control feed pipe to the left-hand brake unit	Spanner 2219-T or Spanner 2221-T
21	Fit the brake shoes (spanner 2127-T, see Pl. 143, fig. 2).....	Spanner 2127-T 8 mm spanner 8 mm box spanner
22	Fit the brake connecting cable in position, fit the sheath stops and connect the cable to the brake control levers. Fit the brake cooling duct	12 mm spanner 12 mm box spanner

TOOLS

23 Adjust the lateral position of the brake unit (see Op. DS 451-0).

24 Fit the front engine support crossmember (see Op. DS 331-1, paragraph 23).

25 Adjust the height of the brake unit (see Op. DS 451-0).

26 Adjust the front brake connecting cable (see Op. DS 454-0).

27 Fit the radiator (see Op. DS 232-1).

28 Refill the radiator. Heater control vane open. Bleed the system.

29 Start the engine. Check to see that the pressure regulator bleed screw is tight and check the unions for leakage.
Check that the carburettor heater control pipe is warm.

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

PARTICULAR POINTS

Assembly.

15 *The pistons should show no signs of having been knocked or scratched, if so they should be replaced.*

16 To prepare the automatic clearance adjustment assembly.

The adjustable thrust sleeve of the left-hand brake unit has a right-hand thread and the adjustable sleeve of the right-hand brake unit has a left-hand thread (marked by a groove).

It is imperative to do away with the movable brake shoe return spring and fit a new type male and female adjustable thrust sleeve assembly with a circlip. Also replace the movable shoe and control lever. Modify both brake units at the same time.

If the ratchet, the locking rod and adjusting wheel are to be replaced, for preference fit the new type parts with a wheel with 10 teeth. This modification should be carried out on both brake units at the same time.

17 (*a*) *The lower face of the upper bearing should stand proud of the bore receiving the thrust sleeve by 0·3 mm. The upper face of the lower bearing must be 16 mm from the other bearing.*

(*b*) *Adjust the lateral clearance of the movable shoe to 0·25 mm. If necessary use a gauge of 0·10 or 0·15 mm cut as shown on Pl.141, fig. 3.*

(*c*) *Adjust the clearance of the mechanical control lever to 0·5 mm maximum.*

20 *Adjust the lateral clearance of the ratchet to between 0·03 mm and 0·05 mm.*

23 *Adjust the control lever eccentric stop. Carefully follow the directions given in the paragraph.*

		TOOLS
	DISMANTLING (see Pl. 141 and 142).	
1	Draw back the movable brake shoe block (126), as far as it will go. Insert the fork 2128-T and slightly slacken off the screw, in order to free the ratchet of the adjusting wheel. Engage the spanner 2129-T in the hole "a" of the brake unit (see Pl. 143). Turn the spanner towards the rear of the brake unit (in a clockwise direction for the left-hand brake unit and in an anti-clockwise direction for the right-hand brake unit). Hold to movable shoe during the untightening	**Fork 2128-T** **Spanner 2129-T**
2	To remove the brake shoes : Unscrew the locknut, unscrew the screw (149) and remove the trunnion (117) and screw assembly. Remove the brake shoe (spanner 2127-T, see Pl. 143)	**8 mm spanner** **Spanner 2127-T**
3	Remove the return spring (125) from the lever (103) (use the arm of the spring pliers 2110-T, see Pl. 145, fig. 1).	**Pliers 2110-T**

		TOOLS
4	Remove the pipe and bleed screw assembly (on the right-hand brake unit) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
5	Turn over the brake housing. Remove the screw (132) from the thrust spring of the locking rod (133). Disengage the assembly of the locking rod (133), guide bush (134), plunger (135), springs (150) and (151) and discs (152). Care should be taken not to lose these parts.	
6	Turn over the brake housing. Unscrew the locknut (154) and remove the spindle (155) of the ratchet (156). Remove the ratchet, the locknut and the plate fixing the bleed tube (on the right-hand brake unit).	
7	*On cars produced before February 1958.* Remove the anchor pins (157) of the movable shoe return springs (158) (pull on the spring with a steel wire hook). Draw the spring back lightly, in order to avoid marking the ground faces of the shoe and housing. Remove the bushes (159) of the pins (157).	
8	Remove the screws (127) locking the guide plates (128) for the movable shoes (126). Remove the guide plates (128) and the movable shoe adjusting shims (143). Disengage the movable shoe and spring assembly from under the housing (hold the assembly of the adjusting wheel (131) and thrust sleeves (146) and (147) against the spindle of the control lever (103)). Remove the adjusting wheel and thrust sleeve assembly.	
9	Remove the circlip (159) from the pin of the control lever (103), remove the lower washer or washers (141). Remove the control lever (103) and the return lever (115) (left-hand brake unit). Remove the control lever (103) and the cup between the lever and the housing (right-hand brake unit). Remove the circlip (161) retaining the thrust sleeve (147)	Circlip pliers
10	Remove the eccentric stop (104) for adjusting the control lever (103). Unscrew the anchor screw (160) for the return spring of the control lever (103)	10 mm box spanner
11	Remove the anchor screw (160), disengage the pin (119) and the support (116). Remove the screw (118), the cup (121), the ball (120) from the support (116).	
12	Drive out the needle bearings (138) from the brake housing (shouldered mandrel)	Shouldered mandrel : Small dia. = 19.5 Length = 50 Large dia. = 25.5 Length = 150
13	<u>To strip the movable brake shoe</u> : a) *On cars produced before February 1958.* Remove the anchor pins (162) of the movable shoe return springs (158). Remove the springs.	

TOOLS

b) Disengage the piston rods (139) and remove the pistons (144).

c) Remove the ring seals (145) from the cylinder (brass wire hook 2 mm diameter with a flattened end).
Avoid scratching the cylinders.

d) Remove the circlips (163) retaining the piston rods (139).

14 Carefully clean the parts. Avoid all products containing potash which will cause corrosion of the aluminium.

ASSEMBLY (see Pl. 141 and 142).

15 To assemble the movable shoe (see Pl. 142, fig. 4 and 5) :

a) Clean the movable shoe (126) and the pistons (144) with alcohol. Blow with compressed air.

b) Fit the ring seals (145), previously smeared with hydraulic fluid, in the grooves of the movable shoe cylinders.

c) Insert the pistons (144), previously greased (castor oil based grease, type Antar R C), in the cylinders.

NOTE - The pistons should show no sign of having been knocked or scratched, if so, replace them.

d) Fit the circlips (163) on the piston rods (139) and put the rods (139) in the pistons (144).

16 To prepare the automatic adjustment assembly (see Pl. 142, fig. 2 and 3) :

a) Check the adjusting wheel (131). If the teeth are worn, replace the wheel.

b) Check the adjustable thrust sleeves (146) and (147). Screw the male thrust sleeve (147) into the female sleeve (146) as far as possible by hand.
Smear the parts with graphite grease (powdered graphite based grease, not flake graphite).

NOTES

1st The adjustable thrust sleeve of the left-hand brake unit has a right-hand thread and the adjustable thrust sleeve of the right-hand brake unit has a left-hand thread, marked by a groove on the smooth portion.

2nd It is imperative to do away with the movable brake shoe return spring (158) and fit a new type assembly of a male thrust sleeve (147) with a groove for the circlip (161) and a female thrust sleeve (146) with a collar. Replace the movable shoe (126) by a new type shoe with a non stepped housing for the thrust sleeve and also replace control lever (103) by a new type lever with a groove for the circlip (161) (see fig. 3).
It is necessary to modify both brake units at the same time.

3rd If the ratchet (156), the locking rod (133) and the adjusting wheel (131) are to be replaced, for preference fit a new type wheel (131) with 10 teeth, locking rod (133) with new shape and a ratchet (156) with new shaped lower portion.
It is imperative to carry out the modification on both brake units at the same time.

		TOOLS
17	To prepare the brake housing (see Pl. 141 and 142) : a) Fit the needle bearings (138) smeared with grease (bearing grease) (use a shouldered mandrel). The lower face of the upper bearing should stand proud of the bore "b" for the thrust sleeve by 0.3 mm. The upper face of the lower bearing should be 16 mm from the other bearing	Shouldered mandrel : Small dia. = 19.5 Length = 50 Large dia. = 25.5 Length = 150
	b) *To adjust the lateral clearance of the movable block.* (see Pl. 141, fig. 2). Offer up the movable block (126), held on the face of the housing. Using a set of feeler gauges, measure the clearance between the movable block and the other face of the housing. Place on either side of the movable block (143) a shim selected from those supplied by our Spare Parts Department, or cut the shims as shown on Pl. 141, fig. 3, of 0.10 or 0.15 mm thick, in order to obtain a clearance of 0.25 mm.	
	c) *To adjust the clearance of the mechanical control lever:* Put on the lever (129), the circlip (161) retaining the thrust sleeve and the return lever (115) (for the left-hand housing) or the steel cup (for the right-hand housing). Engage the lever spindle (103) in the housing. Fit the lower washers (136) and the circlip (159). Push the spindle towards the top and measure with a set of feeler gauges, the clearance between the return lever (115) (left side) or the steel cup (right side) and the face of the housing. This clearance should be 0.5 mm maximum with the spindle turning freely. Obtain this clearance by placing a washer (141) 0.5 mm thick between the circlip (159) and the lower washer (136).	Circlip pliers.
18	Put the housing in a vice (use soft jaws). Put the assembly of the adjusting wheel (131) and the adjustable thrust sleeve (146) and (147) in the housing, the wedge of the thrust sleeve in its housing on the mechanical control lever spindle (129) and the circlip (161) engaged in the groove on the thrust sleeve. Put the movable block (126) in the housing. Guide the different parts during this operation, with the help of a small screwdriver. Fit the adjusting shims (143) determined in paragraph 17 b, and the guide plates (128). Tighten the screw (127) locking the plates (128).	
19	Hold the movable block (126) against the housing and place the housing horizontally in a vice.	
20	Fit the ratchet (156) in the housing, insert the bleed tube retaining plate (130) (right-hand brake unit) between the locknut (154) and the housing. Tighten the screw (155) and untighten slightly. Tighten the locknut (154). The lateral clearance should be between 0.03 mm and 0.05 mm	10 mm spanner 10 mm box spanner

TOOLS

21 Put the locking rod (133) smeared with graphite grease, in the guide bush (134).
Put the thrust sleeve (135) in the bore of the locking rod, the flat end towards the spring, then the thrust sleeve (151) and the thrust sleeve spring disc (152) and the locking rod spring (150).
All these parts should be smeared with graphite grease before assembly.
Fit the assembly in the housing, the rounded part of the locking rod positioned towards the top and the ratchet in the fork of the rod. Compress the spring and engage the screw (132) of the thrust spring in the housing and in the hole of the guide bush. Tighten the screw.

22 Fit the control lever eccentric adjusting stop (104). Fit the screw (spring washer).
Work on the control lever (103) several times, in order to check the functioning of the ratchet, the ratchet should always rest on the adjusting wheel, and the locking rod should return correctly after each tooth passes; if not, change the locking rod return spring and check how it slides in the guide bush.
Check also the movement of the ratchet lever.

23 To adjust the control lever eccentric adjusting stop.

The movable shoe should be in contact with the housing (operate the control lever several times, in order to advance the block), then in contact with the adjustable thrust sleeve, make sure that the locking rod (133) takes up its position at the base of the teeth. Engage the spanner 2129-T (see Pl. 143) in the hole "a" in the housing, make sure that it engages with the adjusting wheel (131). Turn the spanner to bring the teeth of the wheel against the locking rod. While maintaining this pressure, operate the control lever (103) towards the outside (the direction in which the lever will come in 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 . At this precise moment, adjust the eccentric stop (104) so that there is a clearance of 0.1 to 0.4 mm between the eccentric stop and the lever (103). Tighten the screw (148). Remove the spanner. Operate the 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, recheck the adjustment of the eccentric stop (104).

Move the movable block as far as possible (spanner 2129-T and fork 2128-T, see Pl. 143). The block should then rest against the housing ..... Spanner 2129-T
Fork 2128-T

24 To fit the anchor screw (160) of the control lever return spring (125).
Fit the return spring (125). Hook it on the anchor screw (160), then the trunnion on the lever (103) (use the arm of the pliers 2110-T, see Pl. 145, fig. 1) ..... Pliers 2110-T

25 Fit the pipe and bleed screw assembly (spanner 2219-T or 2221-T, see Pl. 72, fig. 4) on the right-hand brake unit. Spanner 2219-T or
Spanner 2221-T

26 Put the ball (120) in position in the support (116). Engage the spindle (119) in its bore in the brake housing and engage the ball and support assembly on the spindle (119).
Put the cup (121) and the screw (118) in position.

27 To fit the brake shoes (see Pl. 142, fig. 2) :

Put the shoe in position. Fit the trunnion (117) and the screw (149). Position the trunnions, so that the point of the screw (149) enters the conical impression milled in the brake shoes. Tighten the screw (149) and tighten the locknut ..... 8 mm spanner

PARTICULAR POINTS

Replacement of the brake shoes.

In order to make sure of even braking, it is necessary to replace the brake shoes on both rear wheels at the same time.

Refitting.

12 *Fit the brake shoe, with the longer lining, at the front.*
The brake shoes should be fitted with the paint mark facing the operator.

15 *Centralise the brake shoes (see Pl.148).*

Replacement of a rear brake backplate.

Refitting.

24 *Fit the adjusting washers between the guide pins and the backplate in order to obtain a dimension "d" = 3·25 ± 0·1 mm (see Pl.144, fig. 6). Pay attention to the position of the split pin holes so that the pins will not foul when in position (cars produced before December 1957).*

26 *Fit the oil seal to the dimension "e" = 4·5 mm from the outer face of the hub (see Pl.103).*

31 *Bleed the rear brakes (see Op. DS 453-0).*

Replacement of a wheel cylinder.

41 *Bleed the brake system (see Op. DS 453-0).*

TOOLS

REPLACEMENT OF A BRAKE DRUM

Removal.

1 Put the front of the car on stands (jacking bracket 2505-T, see Pl. 168) ..... Jacking bracket 2505-T

2 Remove the wing and the wheel ..... 14 mm box spanner

3 Mark the position of the drum in relation to the stub axle. Remove the drum fixing screws.
Remove the drum.

Refitting (see Pl. 144).

4 Untighten the nut locking the eccentric bushes (43) (turn down the lockplate).
Centralise the brake shoes (fixture 2115-T, see Pl. 148). 16 mm box spanner
Tighten the nuts locking the eccentric bushes (43). Turn up the lockplates. ..... Fixture 2115-T

		TOOLS
5	Put the brake drum in position on the hub. Lightly grease the bearing face of the drum on the stub axle. Fit and tighten the brake drum fixing screws.	
6	Fit the wheel.	
7	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg).	
	Fit the wing.....	14 mm box spanner Jacking bracket 2505-T
	REPLACEMENT OF THE BRAKE SHOES (cars produced since December 1957).	
	Removal (see Pl. 144).	
8	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wings and the wheels. Mark the position of the drums on the stub axles.	
	Remove the brake drum fixing screws. Remove the drum.....	Jacking bracket 2505-T
9	Unhook the brake shoe return spring (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T
10	Remove the cups (56) from the springs (57) by turning $\frac{1}{4}$ of a turn, in order to unlock them from their rods. Hold the rods (58).	
11	Turn down the lockwasher (41) and remove the nuts from the spindles (40).	
	Remove the lockwasher (41) and disengage the brake shoes together with the eccentric bushes (43).	
	Remove the bushes (43) from the brake shoes	16 mm box spanner
	NOTE - In order to make sure of even braking, it is necessary to replace the brake shoes on both rear wheels at the same time.	
	Refitting (see Pl. 144).	
12	Put the eccentric bushes (43) on the brake shoes.	
	Fit the brake shoes on the brake backplate, the shoe with the longer lining towards the front. The shoes should be fitted with the paint mark towards the operator. Fit the lockplate (41). Fit the nuts without tightening.	
13	Fit the rods (58), the springs (57) and the cups (56).	
	Lock the cups (56) on their rods by turning $\frac{1}{4}$ of a turn (hold the rods (58)).	
14	Hook on the brake shoe return springs (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T

		TOOLS
16	Fit the brake drum. Note the marks made when dismantling. Lightly grease the bearing face on the hub. Tighten the brake drum fixing screws.	
17	Fit the wheel. Lower the car to the round and tighten the wheel fixing screws to 108 to 144 ft/lbs (15 to 20 m.kg) (jacking bracket 2505-T, see Pl. 168). Fit the rear wing	Jacking bracket 2505-T 14 mm box spanner
	REPLACEMENT OF THE BRAKE SHOES (cars produced before December 1957)	
	Removal (see Pl. 144).	
18	Remove the brake drum (see paragraph 8, this operation). Remove the brake shoe return spring (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T
19	Remove the split pins from the brake shoe guide pins (36). Disengage the washers (37), the springs (38) and the brake shoe retaining washers (39).	
20	Remove the nuts from the anchor pins (40). Remove the retaining washers, the distance washers (42), the brake shoes and the eccentric bushes	21 mm box spanner
21	Drive out the brake shoe anchor pins with a bronze drift.	
22	Remove the nuts fixing the brake shoe guides (36) and remove these guides and their distance washers (44).	
23	Remove the wheel cylinders. Remove the dust covers (45), the pistons (46) and the circlips (47).....	12-14 mm box spanners
24	Unrivet and remove the brake shoe adjusting cams (48) (assembly MR-3354-40, see Pl. 146)	Assembly MR-3354-40
25	Clean the parts.	
	Refitting (see Pl. 144).	
26	Fit the adjusting cams (48), rivet the pins (assembly MR-3354-40, see Pl. 146)	Assembly MR-3354-40
27	Fit the brake shoe anchor pins (40) with the aid of a bronze drift.	
28	Fit the brake shoe guide pins (36). Place the distance washers (44) between the brake shoe guide pins and the brake backplate so that the dimension "d" = 3.25 $\pm$ 0.1 mm (see fig. 6). NOTE - Pay attention to the position of the split pin holes so that the pins will not foul when in position.	
29	Fit the wheel cylinder.	

		TOOLS
30	Put the brake shoe eccentric bushes, lightly oiled, in position on the brake shoe anchor pins (40). Fit the brake shoes on the eccentric bushes, the paint mark towards the operator. Fit the distance washers (42), the retaining washers and fit the nuts.	
31	Fit on the brake shoe guide pins (36), the washers (39), the springs (38) and the washers (37). Split pin (see fig. 5). Fit the brake shoe return spring (35) (pliers 2110-T, see Pl. 145). Fit the brake drum (see paragraphs 16 and 17, this operation)	Pliers 2110-T
	REPLACEMENT OF A BRAKE BACKPLATE	
	Removal (see Pl. 144).	
32	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Remove the wing, the wheel and the brake drum	Jacking bracket 2505-T 14 mm box spanner
33	Remove the wheel hub (see Pl. 103) :	
	a) If the half axle has been removed, place it in a vice (vice adaptor MR-3053-90, see Pl. 106).....	Vice adaptor MR-3053-90
	b) Remove the hub sealing cap (17). Lock the drum by tightening the brake adjusting cams and remove the nut (18), the lockwasher and the retaining washer (19).....	36 mm box spanner
	c) Untighten the brake adjusting cams and remove the drum.	
	d) Remove the stub axle (extractor 2018-T, see Pl. 107)	Extractor 2018-T
	e) Disengage the seal (26), the distance piece (21) and the adjusting washer (60) if one exists.	
34	Disconnect the rear brake articulating piping from the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Plug the wheel cylinder opening and that of the articulating piping (see Pl. 94). Remove the brake backplate (spanner 1677-T, see Pl. 65, fig. 4).....	Spanner 2219-T or Spanner 2221-T Spanner 1677-T
35	To strip the brake backplate (see Pl. 144) :	
	a) Remove the brake shoe return spring (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T
	b) Remove the cups (56) by turning $\frac{1}{4}$ of a turn to unlock them from their rods, remove the spring (57) and the rods (58).	
	c) Remove the nuts from the brake shoe anchor pins (40), the lockwasher (41), the brake shoes, and the eccentric bushes (43). Drive out the anchor pins (40) from the brake backplate.....	21 mm box spanner
	d) Remove the nuts fixing the brake shoe guides (36) and remove the guides and their distance washers (44) (cars produced before December 1957)	14 mm box spanner
	e) Remove the wheel cylinder	12 mm box spanner
	f) Unrivet and remove the brake shoe adjusting cams (48) (assembly MR-3354-40, see Pl. 146)	Assembly MR-3354-40

		TOOLS
	Refitting (see Pl. 144).	
36	To prepare the brake backplate :	
	a) Fit the brake adjusting cams (48), rivet the pins (assembly MR-3354-40, see Pl. 146)	Assembly MR-3354-40
	b) Fit the brake shoe guide pins. Fit the distance washer (44) between the guide pins and the backplate, in order to obtain the dimension "d" = 3.25 ± 0.1 mm (see fig. 6).	
	NOTE - Pay attention to the position of the split pin holes so that the pins will not foul when in position (cars produced before December 1957).	
	c) Fit the brake shoe anchor pins (40) with the aid of a bronze drift.	
	d) Fit the wheel cylinder (spring washers under the heads of the fixing screws)	12 mm box spanner
	e) Fit the brake shoe eccentric bushes (43). Fit the brake shoes, lightly oiled, on the anchor pins (40). Fit the lockwashers (41) and fit the nuts without tightening.	
	f) Fit the rods (58), the springs (57) and the cups (56) by turning $\frac{1}{4}$ of a turn in order to lock them on their rods (cars produced since December 1957).	
	g) Fit the brake shoe return spring (35) (pliers 2110-T, see Pl. 145)	Pliers 2110-T
37	Fit the brake backplate. Tighten the fixing screws (spring washers under the heads) (spanner 1677-T, see Pl. 65, fig. 4).	
	Connect the articulating piping, to the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 1677-T Spanner 2219-T or Spanner 2221-T
38	Fit the distance washer (21) and the adjusting washer (60) found when dismantling (see Pl. 103).	
	Fit the oil seal (26) to the dimension "e" = 4.5 mm from the outer face of the axle arm. Make sure that the bore for the oil seal on the stop (30) for the bearing (22) is free from burrs or damage, if not, it should be replaced.	
39	Offer up the hub and put the bearings (20) and (22) in position. Fit the thrust washer (19), the lockwasher and tighten the nut (18). Fit the hub sealing cap (17) (see Pl. 103)	36 mm box spanner
40	Centralise the brake shoes by working on the eccentric bushes and on the adjusting cams (centring fixture 2115-T, see Pl. 148). Tighten the nuts of the brake shoe anchor pins and turn over the lockwashers	Centring fixture 2115-T 21 mm box spanner
41	Refit the half axle on the car, if it has been removed (see Op. DS 420-1).	
42	Fit the brake drum and the wheel. Lower the car to the ground (jacking bracket 2505-T, see Pl. 168) and tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the wing.....	Jacking bracket 2505-T 14 mm box spanner
43	Bleed the rear brakes (see Op. DS 453-0).	

		TOOLS
	REPLACEMENT OF A WHEEL CYLINDER	
	Removal (see Pl. 144).	
44	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168). Release the pressure. Remove the wing and the wheel. Mark the position of the drum on the stub. Remove the brake drum fixing screws. Remove the drum	Jacking bracket 2505-T
45	Disconnect the feed pipe from the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Plug the opening of the cylinder and feed pipe (see Pl. 94)	Spanner 2219-T or Spanner 2221-T
46	Unhook the return spring from the brake shoes (pliers 2210-T, see Pl. 145)	Pliers 2110-T
47	Remove the screws fixing the wheel cylinder and disengage.....	12 mm box spanner
48	To strip the wheel cylinder : Remove the bleed screw, the dust covers (45), the pistons (46), and the circlip (47). Remove the ring seals (49) from the pistons (46). Use a brass wire hook flattened at the end	10 mm box spanner
	Assembly (see Pl. 144).	
49	To assemble the wheel cylinder : Clean the parts. Use alcohol only. Blow with compressed air. Put the circlip (47) in position. Fit the ring seals (49) on the pistons (46). Fit the pistons (46), smeared with hydraulic fluid, in the wheel cylinders after having made sure that there are no scratches or burrs or signs of seizure. Refit the dust covers (45) and the bleed screw	10 mm box spanner
50	Fit the wheel cylinder on the brake backplate. Tighten the fixing screws (spring washers under the heads).....	12 mm box spanner
51	Hook the brake shoe return springs (35) on to the brake shoes (pliers 2110-T, see Pl. 145).....	Pliers 2110-T
52	Connect the feed pipe to the wheel cylinder. Tighten the union moderately (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
53	Bleed the brake system (see Op. DS 453-0).	
54	Lightly oil the bearing face on the hub. Fit the brake drum. Note the marks made when dismantling. Tighten the fixing screws.	
55	Fit the wheel.	
56	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the wing	Jacking bracket 2505-T 14 mm box spanner

PARTICULAR POINTS

Bleeding the brake system.

Do not bleed the system under pressure in order to avoid the formation of small air bubbles in the fluid and in consequence the eventual formation of air pockets in the system.

Follow the instructions given in paragraphs 2 and 5.

To adjust the distribution of pressure (test bench 2290-T).

The checking and adjustment of brake compensation should be possible without removing the hydraulic control.

12 - 21 *Prepare the assembly as shown on Pl.151. Build up the pressure to 1,420 p.s.i. (100 kg/cm²) and put a few drops of fluid on the piston rod and release the pressure.*

22 *Operate the pump and build up the pressure to 1,110 p.s.i. (78 kg/cm²).*

23 *Press on the control knob: the pressure gauges (M2) and (M3) should indicate the same increase in pressure. Carry out this test for 570 p.s.i. (40 kg/cm²). 860 p.s.i. (60 kg/cm²), 1,137 p.s.i. (80 kg/cm²) 1,420 p.s.i. (100 kg/cm²). If the result is not obtained, it is necessary to adjust the compensation.*

24 *Turn the piston rod in a clockwise direction, if the pressure is greater at the front or in an anti-clockwise direction if the pressure is greater at the rear.*

25 *Again carry out the check (see paragraph 23 above).*

34 *Bleed the brake system (see paragraphs 1 to 8, this operation).*

Checking the pressure switches (switches removed) (test bench 2290-T).

35 *Prepare the assembly as shown on Pl.152.*

36 *The light should go out when a pressure between 860 and 1,137 p.s.i. (60 and 80 kg/cm²) is reached. If not, the pressure switches should be replaced.*

NOTE - *It is possible to carry out this operation on the car (see Op. DS 391-0).*

To adjust the stop lamp switch.

40 *The blade of the switch should not be under tension, the end of the adjusting screw should be at a distance of 0·4 to 0·6 mm from the blade with the screw perpendicular and in the centre of the blade.*

IMPORTANT REMARKS

1st. In order to obtain correct braking, it is necessary :
that the front brake linings are dry;
that the clearance ratchet functions correctly;
that the brake units are fitted and adjusted correctly.

2nd. If a leak exists from the valves, it is unnecessary to dismount the hydraulic control. Proceed as indicated in paragraph 41 and onwards (Op. DS 453-1).

3rd. The adjustments and check of the distribution pressure can be carried out without removing the hydraulic control, by proceeding as indicated (see paragraph 9, and onwards).

TOOLS

		TOOLS
	BLEEDING THE BRAKE SYSTEM.	
	IMPORTANT REMARK - Do not bleed the system under pressure, in order to avoid the formation of small air bubbles in the fluid and in consequence the eventual formation of air pockets in the system.	
1	Put the rear of the car on stands (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
2	Release the pressure in all the systems including the brake accumulators (see Op. DS 00, paragraph 2).	
3	Fit a flexible tube on each of the front brake cylinder bleed tubes; on the brake unit for the front right and on the accelerated idling control for the front left-hand. Put the end of the tube in the reservoir. Remove the rubber caps protecting the rear cylinder bleed screws. Fit a flexible tube on each rear cylinder bleed screws. Put the end of these tubes in a transparent container, already holding a small quantity of hydraulic fluid.	
4	Untighten the front bleed screw (spanner 2141-T, see Pl. 143, fig. 4). Untighten the rear bleed screw.....	Spanner 2141-T 10 mm spanner
5	Tighten the pressure regulator bleed screw. Depress the brake pedal, using a force approximately 10 kg. Start the engine. Let the fluid flow through the tubes until it is clear of air bubbles. At this moment, tighten the bleed screws. Remove the bleed tubes. Leave the engine idling, in order to put the systems under pressure. With the manual height control in the "low" position, top up the fluid level, if it has dropped, in order to avoid the entry of air into the high pressure system. Check the bleed screws for leakage, by pressing down on the brake pedal. Maintain this pressure for approximately one minute. Stop the engine	Spanner 2141-T 10 mm spanner
6	Put the rubber protecting caps on the rear bleed screws.	
7	Lower the car to the ground (jacking bracket 2505-T, see Pl. 168)	Jacking bracket 2505-T
8	Start the engine. Top up the level of the fluid in the reservoir (the manual height control lever in the "normal" position).	
	NOTE - If you do not possess the materal necessary to bleed the four brake cylinders at the same time, proceed axle by axle, but in this case, before bleeding, it will be necessary to release the pressure in the corresponding accumulator.	

TOOLS

ADJUSTING THE DISTRIBUTION OF BRAKING PRESSURE (see Pl. 150 and 151).

For this operation, the test bench should be prepared as indicated on Pl. 171 ..... — Test bench 2290-T

9 Remove the left-hand front wing ..... — 12-14 mm spanners, 12-14 mm box spanners

10 Remove the suspension dust cover ..... — 8 mm spanner, 8 mm box spanner

11 Put the car in the "low" position.

12 Remove the plate fixing the front pipe assembly (30).

Disconnect the front pipe assembly (30) from the rear pipe assembly (31).

13 Connect on the flange of the pipe assembly (30), the pipe assembly (M) inserting a seal plate.

14 Connect on the flange of the pipe assembly (31), a blank flange (E) inserting a seal plate.

15 Using the pipe (A), connect the orifice "d" of the pipe assembly (M) to the pressure gauge (M2) of the test bench.

16 Using the pipe (B), connect the orifice "f" of the pipe assembly (M) to the orifice "a" of the test bench.

17 Remove the bleed screw from the front right-hand brake unit and connect in its place, a pipe (G) which is bent as required to avoid the expansion chamber.

18 Using the pipe (A), connect the pipe (G) to the pressure gauge (M3) of the test bench.

19 Remove the steel pedal panel. Refit the pedal knob.

20 Operate the pump, in order to build up the pressure to 1420 p.s.i. (100 kg/cm^2) approximately and put a few spots of hydraulic fluid on the piston rod (8).

21 Release the pressure by unscrewing the bleed screw "b" of the pump.

22 Operate the pump, in order to build up the pressure to $1110\ ^{+\ 30}_{\ 0}$ p.s.i. ($78\ ^{+\ 2}_{\ 0}$ kg/cm^2).

23 Press on the main brake control knob (3). For the pressure exerted on the control knob, the reading on the pressure gauges (M2) and (M3) should indicate the same increase in pressure. Carry out the test for 570 p.s.i. (40 kg/cm^2), 860 p.s.i. (60 kg/cm^2), 1137 p.s.i. (80 kg/cm^2), 1420 p.s.i. (100 kg/cm^2).

If this result is not obtained, it is necessary to adjust the compensation.

24 Raise the pedal (5) and turn the screw (8) in a clockwise direction, if the pressure is greater at the front, or in an anti-clockwise direction if the pressure is greater at the rear.

		TOOLS
25	Press on the brake control knob (3) and carry out the same operations as in paragraph 23.	
26	Release the pressure by unscrewing the bleed screw "b".	
27	Refit the pedal panel.	
28	Remove the blank flange (E) and the pipe assembly (M).	
29	Connect the flanges of the front and rear pipe assemblies (30) and (31) inserting seal plates. Only use seal plates 1.7 mm thick, fitted with ring seals.	
30	Put the pipe assembly retaining plate and the protection panel in position	8 mm spanner 8 mm box spanner
31	Disconnect the pipe (G) from the front right-hand brake unit and refit the bleed screw.	
32	Refit the left-hand front wing	12-14 mm spanners 12-14 mm box spanners
33	Start the engine and put the car in the "high" position.	
34	Bleed the brake system (paragraphs 1 and onwards, this operation). NOTE - If it is impossible to obtain correct compensation, it is necessary to overhaul the hydraulic control.	

CHECKING THE PRESSURE SWITCHES (pressure switches removed) (see Pl. 152)

In order to carry out this operation, the test bench should be prepared as indicated on Pl. 171.

35	Connect the orifice "r" of the pressure switch to the orifice "a" of the pump, using the pipe (H). Connect the green and blue plugs of the wiring harness to the corresponding coloured terminals of the test bench. Connect the crocodile clips of the wiring harness to the positive and negative terminals of a 6 volt battery. Using the yellow wire, connect the plug "s" of the pressure switch to the vacant terminal of the test bench. The lamp should light, if not, the pressure switch is defective.	
36	Tighten the bleed screw "b" and operate the pump, in order to build up pressure progressively until the light is extinguished. This light should go out when a pressure between 860 and 1137 p.s.i. (60 to 80 kg/cm^2) is reached. If this occurs above or below these pressures, the pressure switch should be replaced.	

TOOLS

37 Release the pressure by unscrewing the bleed screw "b". Disconnect the battery. Remove the wiring harness and the pipe (H).

NOTE - It is possible to carry out this operation on the car (see Op. DS 391-0).

ADJUSTMENT OF THE STOP LAMP SWITCH (see Pl. 150).

38 Remove the rubber mat from the pedal panel. Remove the carpet (fixed by clips).

39 Remove the rubber protector (1), unscrew the screw (2) and unscrew the control knob (3).

Remove the screw fixing the pedal panel and the accelerator bracket. Remove the screws fixing the hydraulic control to the floor panel and remove the panel.

40 To adjust the switch: the blade of the switch should not be under tension, work on the adjusting screw (25) in order to obtain a clearance at "j" between 0.4 and 0.6 mm between the end of this screw and the blade.

Tighten the locknut ..... 8 mm spanner

NOTE - The screw should be perpendicular and in the centre of the blade (see fig. 3). If necessary, bend the blade.

41 Put the pedal panel in position. Through the 16 mm diameter hole provided in the panel, pass a screw to bring the support assembly and control unit up to the panel. Fit the fixing screws for the unit on the panel (spring washers).

42 Fix the panel (plain and spring washers). Fix the accelerator bracket (spring washer).

Fasten the carpet on the panel.

43 Fit the pedal knob (3). Tighten the countersunk head screw (2) and, while holding the screw, unscrew the pedal knob (3) and lock it against the head of the screw.

44 Put the rubber mat in position and the rubber protector on the pedal knob.

PARTICULAR POINTS

Replacement of the hydraulic brake control.

To adjust the stop lamp switch; the blade of the switch should not be under tension, obtain a clearance of 0·4 to 0·6 mm between the end of the adjusting screw and the blade.
Bleed the brakes (see Op.DS 453-0).

Checking the hydraulic control valves for leakage.

In order to carry out this operation, it is necessary to remove the pedal floor and hydraulic control assembly. Fit the rubber distance pieces on the valve stems, even if these distance pieces did not exist when dismantling.

Replacement of a braking distributor.

In order to carry out this operation, it is necessary to remove the pedal floor and the hydraulic control. Adjust the distribution of braking pressure (see Op.DS 453-0).

REPLACEMENT OF THE HYDRAULIC BRAKE CONTROL (1st arrangement)

		TOOLS
	Removal.	
1	Release the pressure. Drain the hydraulic fluid reservoir. Remove the left-hand front wing	12-14 mm spanners 12-14 mm box spanners
2	Remove the left-hand suspension sphere (strap wrench 2223-T, see Pl. 93, fig. 1)	Strap wrench 2223-T
3	Remove the nuts from the studs fixing the union plates, on the pedal gear	8 mm ring spanner length = 100
4	Take out the floor carpet. Unstick the felt round the screws, or unfasten the clip on the felt. Remove the panel fixing screws. Disengage the accelerator control.	
5	Withdraw the panel and hydraulic brake control assembly by disengaging the studs from the union plates and the dust cover. Disconnect the wires from the pressure switches and stop lamp switch.	
	Stripping.	
6	Disconnect the pipe assembly from the unit and from the pressure switches (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T 8 mm ring spanner
7	Remove the pressure switches	8 mm box spanner
8	Remove the stop lamp switch	7 mm box spanner

		TOOLS
	Assembly.	
9	Fit the stop lamp switch	7 mm box spanner
10	Connect the pipe assembly to the unit and to the pressure switches. Insert a seal plate (using only a thick plate (1.7 mm), fitted with new ring seals) and tighten the union plate. Insert a spring washer under the heads of the screws. Tighten the unions (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).....	Spanner 2219-T or Spanner 2221-T 8 mm ring spanner
11.	To adjust the stop lamp switch; the blade of the switch should not be under tension, turn the adjusting screw in order to obtain a clearance of 0.4 to 0.6 mm between the end of this screw and the blade. Tighten the locknut.	8 mm spanner
	Refitting.	
12	Connect the wires on the terminals of the stop lamp switch and pressure switches.	
13	Offer up the panel and hydraulic brake control assembly. Put the dust cover in position. Put the pedal gear in position and fit on the studs in the following order, a seal plate, a union plate, a seal plate, a union plate (use only thick seal plates (1.7 mm) with new ring seals). Tighten the nuts (spring washers). Put the dust covers in position.	
	Fit the left-hand suspension sphere. Refill the reservoir (hydraulic fluid).	8 mm ring spanner
14	Fix the pedal floor and the accelerator pedal. Stick down or clip the felt. Refit the floor carpet.	
15	Start the engine. Let the engine idle for a few minutes in order to put the system under pressure.	
	Check the unions for leakage.	
	Fit the left-hand front wing	12-14 mm spanners 12-14 mm box spanners
16	Bleed the brake system (see Op. DS 453-0).	
	SEALING OF THE HYDRAULIC CONTROL SLIDE VALVES (1st arrangement).	
	NOTE - In order to carry out this operation, it is necessary to remove the pedal panel assembly and the hydraulic brake control (see paragraphs 1 and onwards, this operation).	
17	To remove the pedal knob: remove the metal of the spindle locking the pedal knob and unscrew the knob. Remove the screws fixing the pressure switches and the bracket. Disengage the panel.	
18	Operate as indicated in paragraphs 44 to 46 and 48 to 55.	

		TOOLS
19	Assemble the pedal panel. Tighten the nuts (spring washers). Fit the pressure switches to their brackets	12 mm box spanner
20	Screw on the pedal knob and lock by punching the metal of the spindle in the hole in the knob.	
21	Fit the panel assembly and hydraulic brake control (see paragraphs 12 and onwards).	
	REPLACEMENT OF A HYDRAULIC BRAKE CONTROL (2nd arrangement).	
	Removal (see Pl. 149).	
22	Release the pressure. Drain the hydraulic fluid reservoir. Remove the left-hand front wing	12-14 mm spanners 12-14 mm box spanners
23	Remove the left-hand front suspension sphere (strap wrench 2223-T, see Pl. 93, fig. 1)	Strap wrench 2223-T
24	Remove the rubber mat from the pedal panel. Remove the felt (fixed by clips).	
25	Remove the rubber protector, unscrew the screw (2) and unscrew the pedal knob (3). Remove the screw fixing the panel to the accelerator support and the screw fixing the hydraulic control bracket to the panel.	
26	Disconnect the wires from the stop lamp switch and the pressure switches.	
27	Remove the nuts from the studs fixing the union flanges. Remove the hydraulic brake control	8 mm ring spanner length = 100
	Stripping.	
28	Disconnect the pipe assembly from the unit and the pressure switches (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T 8 mm ring spanner
29	Remove the pressure switches	8 mm box spanner
30	Remove the stop lamp switch	7 mm box spanner
	Assembly.	
31	Fit the stop lamp switch	7 mm box spanner
32	Connect the pipe assembly to the unit and to the pressure switches. Insert a seal plate and tighten the union plate (use thick seal plates (1.7 mm) fitted with new ring seals). Insert a spring washer under the head of the screws. Tighten the unions (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T 8 mm ring spanner

TOOLS

33 To adjust the stop lamp switch; the blade of the stop lamp switch should not be under tension; turn the adjusting screw (25) in order to obtain a clearance of 0.4 to 0.6 mm between the end of this screw and the blade. Tighten the locknut ..... — 8 mm spanner

Refitting (see Pl. 149).

34 Offer up the hydraulic brake control. Fit on the studs in the following order, a seal plate (21) (check that the holes in the seal plate are correctly positioned) the union flange (20), a seal plate (19) and the union flange of the pipe assembly (use thick seal plates (1.7 mm) with new ring seals). Tighten the nuts (spring washers). Put the dust cover (27) in position.

Fit the left-hand suspension sphere, making sure that the distance piece is fitted, tighten by hand.

Refill the reservoir with fluid (special hydraulic fluid). ..... — 8 mm ring spanner length = 100

35 Start the engine. Put the systems under pressure. Hold the control unit. Check the functioning of the brakes by pressing on the pedal knob (3). Check the unions for leakage. Stop the engine.

36 Connect the terminals to the stop lamp switch and to the pressure switches. Fit the pedal panel.

Through the 16 mm diameter hole provided in the panel, pass a screw to bring the support assembly and control unit up to the panel.

Fit the fixing screws for the unit on the panel (spring washers).

37 Fix the panel (plain and spring washers). Fix the accelerator bracket (spring washers).

38 Clip the felt on the pedal panel.

39 Fit the pedal knob (3). Tighten the countersunk headed screw. Unscrew the pedal knob and lock it against the head of the screw.

40 Fit the rubber mat and the pedal rubber.
Fit the left-hand front wing.
Bleed the brake system (see Op. DS 453-0).

SEALING OF THE HYDRAULIC CONTROL SLIDE VALVES (2nd arrangement).

Removal (see Pl. 149 and 150).

41 Release the pressure. Drain the hydraulic fluid reservoir.

42 Disengage the rubber mat from the pedal panel. Remove the felt (fixed by clips).

		TOOLS
43	Remove the rubber protector (1), unscrew the screw (2) and unscrew the pedal knob (3). Remove the screws fixing the panel to the accelerator support and the screws fixing the hydraulic control bracket to the panel. Raise the rear of the panel, disengage the panel from the pedal control knob rod (4) and remove the panel.	
44	Lift the pedal (5) as far as possible. Disengage the roller connecting trolley (6), pivot it approximately 90° on its control spindle in order to make the flats on the spindle (7) correspond with the hooks on the trolley. NOTE - Do not turn the spindle (7) on the screw (8), otherwise the adjustment of the brake compensator will be altered.	
45	To remove the compensator plate (9). Unhook the ends of the spring retaining plate (10) from under the compensator plate. Disengage the compensator plate (9), disengage the retaining plate (10).	
46	Unscrew the union (11) on the compensator cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
47	Remove the pressure switch fixing screws (12).	
48	Remove the screws fixing the control unit to the bracket. The screw found partly under the compensator cylinder can only be removed by raising the bracket.	
49	Pivot the compensator cylinder and bracket assembly as far as possible towards the front and hold this position with a block (as indicated on Pl. 149, fig. 2). Disengage the cup (14); if necessary, tap lightly with a piece of wood on the periphery of the cup. Disengage the rubber cups (15) from the steel cups.	
50	Carefully clean the parts. Use alcohol only to the exclusion of all other products.	
	Refitting (see Pl. 149 and 150).	
51	Put the rubber cups (15) previously moistened with hydraulic fluid in the cups (14). *Put the rubber distance pieces (16) on the stem of the compensator slide valves* even if no distance pieces were present when dismantling. Put the cups, prepared above, in position.	
52	Check that the faces of the distribution unit (17) and the bracket (18) are clean. Put the bracket assembly and compensator cylinder on the distribution unit. Fit the front fixing screws and tighten by hand. Tighten the countersunk head screws. Tighten the two other screws (spring washers) (spanner 1623-T, see Pl. 16, fig. 2).	Spanner 1623-T 12 mm box spanner

		TOOLS
53	Put the retaining plate (10) on the stem of the slide valves. Fit the compensator plate (9). Anchor the compensator roller trolley (6) to its control spindle (7).	
54	Fit the pressure switches (spring washers).	
55	Put the pedal (5) in position. Tighten the union (11) on the compensator cylinder. Refill the reservoir with hydraulic fluid (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
56	Start the engine. Put the systems under pressure. Check the unions for leakage. Hold the control unit. Check the functioning of the brakes by pressing on the pedal knob (3). Stop the engine.	
57	Fit the pedal panel after having checked that the terminals have been connected on the stop lamp switch and the pressure switches. Through the 16 mm diameter hole provided in the panel, pass a screw to bring the support assembly and control unit up to the panel. Fit the fixing screws for the unit on the panel (spring washers).	
58	Fix the panel (plain and spring washers). Fix the accelerator bracket (spring washer).	
59	Fasten the carpet on to the pedal panel.	
60	Fit the pedal (3). Tighten the countersunk head screw (2). Untighten the pedal knob and lock against the head of the screw.	
61	Fit the rubber carpet and the pedal rubber (1).	

REPLACEMENT OF A BRAKING DISTRIBUTOR

Removal (see Pl. 150).

62	Release the pressure and put the manual height control lever in the "low" position. Remove the hydraulic brake control (see paragraphs 1 to 5, this operation).....	12 mm box spanner
63	Remove the pedal panel from the hydraulic brake control support. Remove the two brake pedal articulating screws and remove the pedal. Pivot it $\frac{1}{4}$ of a turn and disengage the roller connecting trolley (6) from its spindle (7)...	12 mm box spanner
64	Disconnect the suspension feed pipe union from the distributor (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Remove the fixing screw from the braking distributor (32)	8 mm box spanner Spanner 2219-T or Spanner 2221-T

		TOOLS
	Refitting (see Pl. 150).	
65	Put the braking distributor (32) in position and fit the fixing screws (spring washers). Put the roller connecting trolley (6) in position and line up the distributor in order to make sure of the correct positioning of the rollers on the compensator plate (9). Tighten the screws fixing the braking distributor. Connect the suspension feed pipe to the distributor (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	8 mm box spanner Spanner 2219-T or Spanner 2221-T
66	Fit the pedal (5) and tighten the articulating screw. To check that the pedal articulates normally: bring the valves (37) into operation by pressing on the pedal (5). When the pressure is released, the valves and the pedal should return to the normal position	12 mm box spanner
67	Connect the brake control to the pipe assembly on the car, connect the wires on the terminals of the stop lamp switch and the pressure switches.	
68	Adjust the braking distribution (see Op. DS 453-0, paragraphs 12 to 34).	
69	Fit the pedal panel on the hydraulic brake control support.	
	CHECKING THE BRAKING DISTRIBUTOR FOR LEAKAGE	
	Removal (see Pl. 150).	
70	Remove the hydraulic brake control (see paragraphs 1 to 5, this operation).	
71	Remove the pedal panel from the hydraulic brake control support. Remove the two brake pedal articulating screws. Pivot the roller connecting trolley (6) a $\frac{1}{4}$ of a turn and disengage it from its spindle (7).	
72	Disconnect the suspension feed pipe union from the distributor (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Remove the fixing screw from the braking distributor (32) and disengage the distributor	Spanner 2219-T or Spanner 2221-T 8 mm box spanner
73	Hold the distributor in a vice (use lead soft jaws). Remove the spindle (7) and the guide cap (39). Disengage the control rod (8), the spring (40) and the cup (41)	26 mm box spanner
74	Disengage the joint between the cap and the distributor from the cap and disengage the ring seal (42) (use a small brass wire hook).	
75	Clean the parts with alcohol and blow with compressed air. In the case of parts moving on the rod (8) showing scratches of negligible depth, a light polishing with No. 600 abrasive paper moistened with fluid is tolerated. Clean the parts and blow with compressed air. Also examine the guide cap and replace if necessary.	

		TOOLS
	Refitting (see Pl. 150).	
76	Put the ring seal (42) previously smeared with fluid in the groove in the guide cap (39) (use a brass wire hook or a polished wooden rod). Fit the joint between the body and the cap, on the cap (39) (note the direction of fitting).	
77	Put on the rod (8) (previously oiled with hydraulic fluid), the spring cup (41) and the spring (40) (fit a new spring). Engage the rod in the guide cap (39) and fit the assembly in the distributor. Tighten the guide cap to 14 to 18 ft/lbs (2 to 2.5 m.kg) (hold the cylinder in a vice, using lead soft jaws). Screw the spindle (7) on the rod (8).	26 mm box spanner
78	Fit the distributor on the brake control support and fit the fixing screws without tightening (spring washers). Put the roller connecting trolley (6) in position and line up the distributor in order to make sure of the correct positioning of the rollers on the compensator plate (9). Tighten the screws fixing the braking distributor and connect the suspension feed pipe to the distributor (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
79	Fit the pedal (5) and tighten the articulating screw. To check that the pedal articulates normally; bring the valves (37) into operation by pressing on the pedal (5). When the pressure is released, the valves and the pedal should return to the normal position	12 mm box spanner
80	Fit the brake control on the car, connect the wires on the terminals of the stop lamp switch and the pressure switches.	
81	Adjust the braking distribution (see Op. DS 453-0, paragraphs 12 to 34).	
82	Fit the pedal panel.	

PARTICULAR POINTS

6 *The valves are paired with their cylinders. They should be marked when dismantling.*

8 *If the valves show signs of scratches of negligible depth, a light polishing with No. 600 abrasive paper, moistened with hydraulic fluid, is permissible. It is often preferable to replace the hydraulic control (possible internal leakage).*

9 *Fit the rubber distance pieces on the valve stems, even if they did not exist when dismantling.*

10 *If there are signs of seizure on the compensator rod, a light rubbing with No. 600 abrasive paper, moistened with hydraulic fluid is permitted. If there are signs of wear on the guide cap, it should be replaced. The tightening torsion of the cap is 14 to 18 ft/lb (2 to 2·5 m.kg).*

15 *To adjust the stop lamp switch; the clearance between the end of the adjusting screw and the blade should be between 0·4 and 0·6 mm.*

16 *Check the pressure switches (see Op.DS 453-0) or use the test bench 2298-T.*

19 *The adjustment of the braking can be carried out on the car (see Op.DS 453-0).*

20 *Select a rubber washer, in order to obtain a clearance "1" = 2 mm (see Pl.150, fig.1).*

		TOOLS
	DISMANTLING (see Pl. 149 and 150).	
1	Remove the pedal (5)	12 mm box spanner
2	Disengage the roller connecting trolley (6) : pivot it approximately 90° on its control spindle (7), in order to make the flats on the spindle correspond with the hooks on the trolley. To remove the distributor plate (9) : unhook the ends of the spring retaining plate (10) from under the distributor plate. Disengage the distributor plate, disengage the retaining plate.	
3	Disconnect the pipe assembly of the pressure switches (22) from the brake distributor and from the unit (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Remove the seal plate	Spanner 2219-T or Spanner 2221-T
4	Remove the pressure switches. Remove the stop lamp switch (24), only if faulty.	7-8 mm box spanners
5	Remove the braking distributor (32). Remove the unit from the casing. Remove the thrust cup (14), the rubber cups (15) and the distance pieces (16).....	8-10 mm box spanners
	ASSEMBLY (see Pl. 149 and 150).	
6	Remove the plugs (33) (hold the control in a vice, use lead soft jaws), (spanner MR-3691-50, see Pl. 150, fig. 2). Remove the springs (34), the spring cups (35). Remove the valves (36) and (37) and place them in a rack (rack MR-3053-210) (see Pl. 71, fig. 3). Note the order of disassembly, in order not to separate the parts, for example: the holes receiving the plugs turned upwards, and the face for the pipe assembly towards the operator, put the left-hand valve in the left-hand hole in the rack (the row of small holes towards the operator), and the right-hand valve in the right-hand hole	Rack MR-3053-210 Spanner MR-3691-50

		TOOLS
7	Clean the parts. Blow with compressed air, especially in the fluid holes.	
8	Put each valve, previously oiled with hydraulic fluid, in the corresponding cylinder (note the order of disassembly).	
	NOTE - In the case of valves showing scratches of negligible depth, a light polishing with No. 600 abrasive paper, moistened with hydraulic fluid is allowed. Clean the parts and blow with compressed air.	
	It is preferable to replace the control unit, by reason of possible internal leakage (see Op. DS 391-0).	
	Put the spring cups (35) in position, the springs (34), the plugs (33) together with their joints (38), tighten the plugs to 14 to 18 ft/lbs (2 to 2.5 m.kg) (spanner MR-3691-50, see Pl. 150, fig. 2)	Spanner MR-3691-50
9	Turn the hydraulic unit over. Put the rubber cup (15), previously moisted with hydraulic fluid, in the thrust cup (14).	
	Fit the rubber distance pieces (16) the slot positioned towards the overflow return hole, on the stem of the valves, *even if they did not exist*, when dismantling.	
	Put the thrust cups (14) prepared above, in position.	
	Make sure that the bearing faces of the unit and bracket are properly clean.	
	Fix the unit to the bracket (18). Tighten the two countersunk head screws, then fit and tighten the two other screws (spring washers)	12 mm box spanner
10	To prepare the distributor :	
	a) Remove the spindle (7), remove the guide cap (39), disengage the control rod (8), the spring (40) and the spring cup (41).	
	b) Disengage the joint of the cap (39) and the ring seal (42), to do this, use a small brass wire hook.	
	c) Clean the parts and blow with compressed air.	
	If there is any sign of seizure on the bearing surface of the rod, a light cleaning up with abrasive paper No. 600 is permitted. Clean and blow the parts with compressed air.	
	d) Also check the guide cap (39). If there is any trace of wear, replace it.	
	e) Put the ring seal (42) previously moistened with hydraulic fluid, in the groove of the guide cap (39), use a brass wire hook or a polished wooden rod for fitting. Fit the joint on the cap (39).	
	Put on the control rod (8) previously oiled with hydraulic fluid, the circlip (13), the spring cup (41) and the spring (40) (which should be replaced after each dismantling). Engage the rod in the bore of the guide cap. Fit the assembly in the distributor. Tighten the guide cap to 14 to 18 ft/lbs (2. to 2.5 m.kg) (hold the cylinder in a vice, use lead soft jaws).	
	Screw the spindle (7) on the rod (8)	8 mm spanner

		TOOLS
11	Fit the distributor on the housing. Offer up the screws without tightening (spring washers).....	8 mm box spanner
12	Put the retaining plate (10) on the stem of the valves (36) and (37). Put the compensator plate (9) in position. Hook the roller trolley (6) on its control spindle (7). Line up the compensator cylinder, using the roller trolley so that the roller trolley moves parallel to the centre line of the distributor plate. Tighten the screws fixing the compensator cylinder	8 mm box spanner
13	Refit the pedal (5), tighten the screw. To check that the pedal articulates normally: bring the valves into operation by pressing on the pedal. When the pressure is released the valves and the pedal should return to their normal position.....	12 mm box spanner
14	Fit the stop lamp switch (24), tighten the nut (spring washer).....	7 mm box spanner
15	To adjust the stop lamp switch : Hold the end of the pedal so that the screw (25) is perpendicular to the contact and that its end is in the centre of this contact (see fig. 3). Adjust the clearance between the end of the screw and the contact. This clearance should be "j" = 0.5 ± 0.1 mm. Tighten the locknut (26)	8 mm spanner
16	Check the pressure switches (see Op. DS 453-0, paragraphs 35 to 37).	
17	Connect the pipe assembly. Insert a thick seal plate (1.7 mm), fitted with the ring seals. Tighten the screws (spring washers). Tighten the unions of the distributor cylinder and of the pressure switches to 3.25 to 4.3 ft/lbs (0.4 to 0.6 m.kg).	Spanner 2219-T or Spanner 2221-T 8 or 10 mm box spanners
18	Fix the pressure switches, tighten the screws (spring washers)	8 mm box spanner
19	The adjustment of braking distribution is to be carried out on the car (see Op. DS 453-0, paragraphs 9 to 34) or by means of the test bench 2298-T (see Pl. 182)	Test bench 2298-T
20	Offer up the pedal floor panel on the control. Fix it by a few screws, measure the movement of the pedal : Place a rule on the pedal at "k", the pedal being in the neutral position, without any pressure on the rollers, raise the pedal until it comes into contact with the pedal rod protection rubber. With a rule, measure this movement. The clearance "*l*" should be a maximum of 2 mm, select from the rubber washers sold by our Spare Parts Department, those which will give the clearance mentioned above. Be careful not to fit washers of such a thickness as to cause the pedal to put pressure on the valves. Remove the pedal floor panel. Fit the washers. Offer up the pedal panel, in order to check the clearance of the pedal. Remove the panel. Provisionally fit the pedal knob (3) and its screw (2).	

		TOOLS
	REPLACEMENT OF A REAR BRAKE ARTICULATING PIPING	
	Removal (see Pl. 115).	
1	Release the pressure in the brake system.	
2	Raise the car at the rear (jacking bracket 2505-T, see Pl. 168). Remove the mud shields (lateral and lower)	Jacking bracket 2505-T 8 mm spanner 8 mm box spanner
3	Disconnect the union (16) (left side) of the rear brake feed pipe (17) and of the right-hand brake connecting pipe (18) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Disconnect the pipe (19) (right side) from the union (16) (cars produced before May 1956) or disconnect the pipe (18) from the union of the pipe (19) (cars produced since May 1956) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
4	Untighten the locknut and remove the screw (5) retaining the articulating spindle (20). Remove the fixing screws of the support (21) on the rear closing panel of the sidemember. Disengage the rear part of the articulating piping from the retaining plate (22) on the rear axle arm. Disengage the articulating spindle (20) from the rear arm	5-8 mm box spanners
5	Disconnect the articulating pipe (15) from the wheel cylinder (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). Disengage the piping. Seal the orifice of the wheel cylinder	Spanner 2219-T or Spanner 2221-T
	Refitting (see Pl. 115).	
6	Engage the articulating spindle (20) in the arm. Offer up the retaining screw (5) together with its locknut. Tighten the screw (5) moderately and lock the locknut	5-8 mm box spanners
7	Put the support (21) on the rear closing panel of the sidemember. Tighten the fixing screws (spring washers under the heads)	8 mm box spanner
8	Connect the articulating piping (15) to the wheel cylinder. Tighten the union moderately (spanner 2219-T or 2221-T, see Pl. 72, fig. 4)	Spanner 2219-T or Spanner 2221-T
9	On the left side, connect the unions (16) to the brake feed pipe (17) and to the right-hand brake connecting pipe (18) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4). On the right side, connect the pipe (19) to the union (16) (cars produced before May 1956) or connect the pipe (18) to the union of the pipe (19) (cars produced since May 1956) (spanner 2219-T or 2221-T, see Pl. 72, fig. 4).	Spanner 2219-T or Spanner 2221-T
	IMPORTANT NOTE - During this operation, offer up the pipes carefully in the centre of the unions, in order to avoid breakage of the pipes and damage to the union threads.	
10	Bleed the brakes (see Op. DS 453-0).	
11	Put the systems under pressure and check the unions for leakage.	
12	Fit the mud shield (lateral and lower). Fit the wheel and lower the car to the ground (jacking bracket 2505-T, see Pl. 168). Tighten the wheel fixing screw to 108 to 144 ft/lbs (15 to 20 m.kg). Fit the rear wing	Jacking bracket 2505-T 8 mm spanner 8 mm box spanner 14 mm box spanner

PARTICULAR POINTS

This adjustment is carried out after replacement of the front brake shoes or replacement of a brake unit.

Adjustment of the control cable (see Pl. 153).

With the pedal in the normal position, obtain the dimension "a" = 60 mm. Tighten the locknut (2) to 32½ ft/lb (4·5 m. kg).

Adjustment of the connecting cable (see Pl. 153).

The cable is set when the lever (3) is on the point of separation from the stop (4), at "b", but still in contact with it. Make sure that there is no play at "d". If so, again carry out the adjustment of the control cable (see above).

NOTE - *After replacement of the brake shoes, do not take up all the clearance. This operation should be carried out after testing the car. Otherwise there is a risk of burning the linings.*

		TOOLS
	NOTE - This adjustment is carried out after replacement of the front brake shoes or replacement of a brake unit.	
1	Remove the spare wheel, the spare wheel support, the wing and the lateral protection panel, left side	8-12-14 mm spanners 8-12-14 mm box spanners
2	Disconnect the cables, from the battery. Remove the battery and the battery tray.....	8-12 mm box spanners
3	To adjust the control cable (see Pl. 153) :	
	a) With the brake lock in the "running" position, pull the pedal upwards to make sure that it is in the fully "off" position.	
	b) Pass a tape rule from the front, under the crossmember and measure the dimension "a". This dimension should be "a" = 60 mm.	
	c) Obtain this dimension by turning the threaded sleeve (1) after having untightened the locknut (2). Turn the threaded sleeve (1) by hand. Tighten the locknut (2) to 32½ ft/lbs (4.5 m.kg)	21 mm spanner
4	To adjust the connecting cable (see Pl. 153).	
	The cable is set when the lever (3) is on the point of separation from the stop (4) at "b" but still in contact with it.	
	a) With the lock in the "parking" position, press the pedal ¾ of its travel (see fig. 4).	
	b) Remove the locknut (5), hold the nut (6) with a spanner and unscrew the locknut with a straight ring spanner. These spanners should be passed from the front between the radiator and the fluid reservoir.....	12 mm spanner 12 mm ring spanner

		TOOLS
	c) Remove the brake shoe dust shields : Tighten the nut (6) until the lever (3) separates from the stop (4). Release the pedal, in order to check this position. Unscrew the nut slightly so that the lever is just in contact with the stop	12 mm ring spanner
	d) Untighten the brake shoes (extension spanner 2129-T, see Pl. 143). Raise the catch (fork 2128-T, see Pl. 143).	Spanner 2129-T Fork 2128-T
	e) Press heavily on the pedal, several times. Make sure that the clearance on the brake shoes has been taken up. Check also that the levers (3) and (7) are in contact with their stops (4) and (8) at "b" and "c" also that there is no play at "d", if this is not the case, recommence the control cable adjustment operation (see paragraph 3, this operation).	
	NOTE - After replacement of the brake shoes, do not take up all the clearance. This operation should be carried out after testing the car. Otherwise there is a risk of burning the linings.	
	f) Fit the locknut (5). Fit the brake shoe dust shields	12 mm spanner 12 mm ring spanner
5	Fit the battery tray and fit the battery. On cars produced before November 1957, fit a battery protector, even if one was not fitted when dismantling.	
6	Fit the lateral protection panel and the left-hand front wing. Fit the spare wheel support and the spare wheel	8-12-14 mm spanners 8-12-14 mm box spanners

PARTICULAR POINTS

Replacement of a control.

Refitting.

Carry out the adjustment of the control cable and the connecting cable (see Op.DS 454-0).

Replacement of a control cable.

Refitting.

Carry out the adjustment of the control cable and the connecting cable (see Op.DS 454-0).

Replacement of a connecting cable.

In order to carry out this operation, it is necessary to remove the radiator and front engine crossmember (see Op.DS 133-1).

Refitting.

31 *If necessary adjust the connecting cable and control cable (see Op.DS 454-0).*
34 *Refill the radiator, the vane of the heater control open (bleed).*

TOOLS

REPLACEMENT OF A CONTROL

Removal (see Pl. 153).

1 Remove the spare wheel and the spare wheel support. Remove the left-hand wing and lateral protection panel ..... — 8-12-14 mm spanners, 8-12-14 mm box spanners

2 Remove the battery and the battery tray ..... — 8-12 mm box spanners

3 Disengage the retaining springs and remove the brake unit protectors. Have the right-hand brake control lever (3) held in the "locked" position by an assistant. Disengage the sheath end piece, from the control lever (7) and disengage the cable end piece from the lever (9).

4 Remove the finishing panel under the scuttle shelf, left side.
Close the split portion of the spindle connecting the control cable to the pedal. Remove the plain washer and the right-hand rubber stop. Disengage the connecting spindle, from the pedal. Remove the left-hand rubber stop from the spindle.

5 Remove the four front fixing nuts and the two upper fixing screws from the brake control.
Remove the control ..... — 12 mm box spanner

		TOOLS
	Refitting (see Pl. 153).	
6	Offer up the control. Fit the fixing nuts and screws (plain and spring washers).	
7	Connect the control cable to the pedal. Fit the retaining spindle, fitted with the left-hand rubber stop. Fit the right-hand rubber stop and the plain washer. Open out the end of the retaining spindle, while a hammer is held against the head of the spindle, by an assistant.	
8	Fit the finishing panel under the scuttle shelf (cup washers under the fixing screws).	
9	Have an assistant hold the right-hand brake control lever (3) in the "locked" position. Connect the cable to the lever (9) and connect the sheath to the control lever (7).	
10	Carry out the adjustment of the control cable and the connecting cable (see Op. DS 454-0).	
11	Fit the brake unit protectors.	
	Fit the battery tray and the battery	8-12 mm box spanners
12	Fit the front left-hand protection panel and wing. Fit the spare wheel support and the spare wheel.....	8-12-14 mm spanners 8-12-14 mm box spanners
	REPLACEMENT OF A CONTROL CABLE	
	Removal (see Pl. 153).	
13	Remove the spare wheel and the spare wheel support. Remove the left-hand wing and protection panel	8-12-14 mm spanners 8-12-14 mm box spanners
14	Remove the battery and the battery tray	8-12 mm box spanners
15	Remove the sheath from the control lever (7) and disconnect the cable from the lever (9) (see paragraph 3, this operation).	
16	Remove the finishing panel under the scuttle shelf, left-hand. Close the split portion of the spindle connecting the control cable to the pedal. Remove the plain washer and the right-hand rubber stop from the spindle. Remove the connecting spindle from the pedal and the left-hand rubber stop from the spindle.	
17	Unlock the locknut (2) and completely unscrew the threaded sleeve (1). Unscrew the locknut (2) from the threaded sleeve (1) and disengage the sleeve from the cable.....	21 mm spanner
18	Disengage the cable sheath and spring assembly from the car.	

TOOLS

Refitting (see Pl. 153).

19 Fit the threaded sleeve (1) on the cable, screw the locknut (2) on the sleeve (1).

20 Offer up the cable, sheath, springs and adjusting sleeve assembly on the car. Pass the front of the assembly in the guide on the sidemember and screw the threaded sleeve (1) a few threads in the tube nut "e" (the sleeve is screwed by hand).

21 Connect the control cable to the brake pedal. Fit a new retaining spindle fitted with the left-hand rubber stop. Fit the right-hand rubber stop and plain washer. Open out the slotted end of the retaining spindle, while a hammer is held against the head of the spindle by an assistant.

22 Fit the finishing panel under the scuttle shelf (cup washers under the heads of the fixing screws).

23 Have an assistant hold the right-hand brake control lever (3) in the "locked" position.

Connect the cable to the lever (9) and connect the sheath to the control lever (7).

24 Carry out the adjustment of the control cable and the connecting cable (see Op. DS 454-0).

25 Fit the brake unit protectors.

Fit the battery tray. Fit the battery, connect the cables ..... 8-12 mm box spanners

26 Fit the left-hand front lateral protection panel and wing. Fit the spare wheel support and the spare wheel ..... 8-12-14 mm spanners
8-12-14 mm box spanners

REPLACEMENT OF A CONNECTING CABLE

Removal (see Pl. 153).

27 Drain the radiator, retain the water which contains anti-freeze.

Remove the radiator and the front engine crossmember (see Op. DS 133-1).

28 Disengage the retaining springs and remove the brake unit protectors.

Remove the adjusting nuts (5) and (6) from the connecting cable.

Unhook the end piece of the connecting cable from the right-hand control lever (3).

Remove the sheath sockets from the brake units, then from the cable.

Remove the cable and sheath assembly, from the right-hand side of the car ..... 12 mm spanner
12 mm box spanner

TOOLS

Refitting (see Pl. 153).

29 Engage the cable and sheath assembly, from the right-hand side of the car. Then fit it successively in the bore of the right-hand brake unit, in the holes of the gearbox support arms and in the bore of the left-hand brake unit.

Pull the central part of the connecting cable towards the rear and fit the sheath sockets.

Connect the cable to the right-hand brake control lever (3) and to the lever (9) on the left-hand brake unit. Fit the cable adjusting nuts (5) and (6).

30 Fit the front engine crossmember and the radiator (see Op. DS 133-1).

31 Adjust the connecting cable and adjust the control cable, if necessary (see Op. DS 454-0).

32 Fit the brake unit protectors.

33 Fit the battery tray. Fit the battery and connect the cables ..... 8-12 mm box spanners

34 Refill the radiator, engine idling and the bleed screw (on the steel tube between the radiator and water pump) unscrewed, with the vane of the heater control open.

SCHEDULE OF PARTS
(see Pl. 164).

1. Headlamp, right.
2. Headlamp, left.
3. Horn, right, low note.
4. Horn, high note.
5. Flashing direction indicator lamp, front right.
6. Flashing direction indicator lamp, front left.
9. Dynamo.
10. Starter motor.
12. Regulator.
13. Battery.
14. Contact breaker.
15. Windscreen wiper motor.
16. Stop lamp switch.
17. Coils.
18. Direction indicator switch.
19. Flashing direction indicator time switch.
20. Rheostat for instrument panel lights.
21. Ammeter.
22. Petrol gauge dial.
23. Dashboard lights.
24. Interior light switch.
25. Lighting and ignition switch.
27. Lighting and horn switch.
28. Side lamp, left.
29. Side lamp, right.
30. Interior lamps.
31. Petrol gauge tank unit.
33. Flashing direction indicator lamp, rear, right.
34. Flashing direction indicator lamp, rear, left.
36. Rear lamps (red light, stop lights, number plate light).
37. Rear boot light.
38. Switch for rear boot light.
39. Switch for interior lights on front door, left.
40. Pressure switches.
41. Starter motor solenoid switch.
42. Starter motor switch on gear selector.
43. Rheostat for demister motor.
44. Switch for windscreen wiper motor.
45. Inspection light socket.
46. Demister motor.
47. Terminal for accessories.
48. Warning light panel.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT	(see Pl. 164).	
1	Until June 1957	Rear light terminal on lighting and horn switch (27) ..... to mauve terminal on lighting switch (25). to rear male connector (1).	Mauve.
2		Violet terminal on the ignition switch (25) ..... to coils (17). to male connector (2) on pressure switch warning light (48). to petrol gauge dial (22). to flashing direction indicator switch (19). to switch for windscreen wiper motor (44). to stop lamp switch (16). to rheostat for demister motor (43).	Violet.
3		Black terminal on ignition switch (25) ..... to switch for direction indicator lights (18). to BAT terminal on regulator (12). to ammeter (21). to accessory terminal (47). to inspection socket (45). to feed terminal of the combined lighting and horn switch (27). to rear male connector (3).	Black.
4		Red terminal on ignition switch (25) ..... to rheostat for instrument panel lights (20).	Red.
5		Green terminal of the flashing lamp time switch (19)..... to male connector (5) on the direction indicator tell-tale light.	Green.
6		Blue terminal of the flashing lamp time switch (19) ..... to male connector (6) of the flashing direction indicator lamp, front right (5). to blue terminal on the direction indicator switch (18). to rear male connector (6).	Blue.
7		White terminal on the flashing time switch (19) ..... to male connector (7) on the flashing direction indicator lamp, front left (6). to white terminal on the direction indicator switch (18). to rear male connector (7).	White.
8		Green terminal on direction indicator switch (18) ..... to rear male connector (8).	Green.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
9		Male connector (7) on the harness. to the left direction indicator.	
10		Red terminal on the direction indicator switch (18) ..... to rear male connector (10).	Red.
11		Male connector (6) on the harness. to right direction indicator.	
12		Green terminal on the ammeter (21) ..... to green terminal on the starter motor solenoid (41).	Green.
13		Headlamp terminal on the combined lighting and horn switch (27)..... to male connector (13) on the headlamp tell-tale (48). to male connector (13) on the headlamp terminal from the front right headlamp (1). to male connector (13) on the headlamp terminal from the front left headlamp (2).	Yellow.
14		Pressure switches (40) ..... to male connector (14) on pressure switch warning light (48).	Red.
15		Rheostat for instrument panel lights (20) ..... to male connector (15) of the dashboard lights (23).	Red.
16		Petrol gauge dial (22) ..... to male connector (17).	Yellow.
17		Male connector (17) on petrol gauge dial (22) ..... to rear male connector (17).	Yellow.
18		Earth for tell-tales (48).	
19		Front lamp terminal on combined lighting and horn switch (27) ..... to male connector (19) on the harness.	Red.
20		Terminal on combined lighting and horn switch (27) ..... to male connector (20) on the harness.	Green.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
21		Second horn terminal on combined lighting and horn switch (27) ..... to left-hand high note horn (4).	Blue.
22		First horn terminal on combined lighting and horn switch ..... to right-hand low note horn (3).	White.
23		Chestnut terminal on interior light switch (24) ..... to rear male connector (23).	Chestnut.
24		Yellow terminal on interior light switch (24) ..... to door switch (29).	Yellow.
25		Yellow terminal on windscreen wiper motor switch (44) ..... to windscreen wiper motor (15).	Yellow.
26		Mauve terminal on demister rheostat (43) ..... to demister motor (46).	Mauve.
27		Starter motor switch on gear selector (42)..... to male connector (27) on the solenoid (41).	Red.
28		Starter motor switch on gear selector (42)..... to DYN terminal on the regulator (12) or since December 1956, to earth on regulator.	Red.
29		Stop lamp switch (16) ..... to rear male connector (29).	Violet.
30		Headlamp earth wire and front direction indicators.	
31		Male connector (19) on the front headlamp harness, right or left ..... to bulb holder terminal on the front headlamp, right (1) and left (2).	Red.
32		Male connector (20) on the harness ..... to connector on front headlamp, right (1) or left (2).	Green.
33		Male connector (13) on the harness ..... to connector on front headlamp, right (1) or left (2).	Yellow.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
36		Connector on upper coil (17) ..... to rear male connector on contact breaker (14).	Yellow.
37		Connector on lower coil (17) ..... to front male connector on contact breaker (14).	Red.
40	Dynamo to regulator.	Dynamo (9) ..... to regulator earth (12).	Black.
41		Dynamo (9) ..... to field terminal on regulator (12).	Yellow.
42		Dynamo (9) ..... to DYN terminal on regulator (12).	Red.
	REAR	(see Pl. 166).	
1		Rear male connector (1) ..... to rear light, right and left (36).	Mauve.
3		Rear male connector (3) ..... to interior lamp (30)	Black. Without connector.
		to rear boot lamp (37)	Without connector.
6		Rear male connector (6). ..... to rear direction indicator lamp, right (33).	Blue.
7		Rear male connector (7) ..... to rear direction indicator lamp, left (34).	White.
8		Rear male connector (8) ..... to side lamp, left (28).	Green.
10		Rear male connector (10) ..... to side lamp, right (29).	Red.
17		Rear male connector (17) ..... to male connector on petrol gauge tank unit (31).	Yellow.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	REAR		
23		Rear male connector (23) ..... to interior lamps (30)	Chestnut. Without connector.
29		Rear male connector (29)..... to rear stop lamp, right and left (36).	Violet.
45		Rear boot lamp (37). to switch for rear boot lamp (38).	
50		Earth for petrol gauge tank unit (31). to earth of the car.	

SCHEDULE OF PARTS
(see Pl. 165)

1. Headlamp, right.
2. Headlamp, left.
3. Horn, low note.
4. Horn, high note.
5. Flashing direction indicator lamp, front right.
6. Flashing direction indicator lamp, front left.
9. Dynamo.
10. Starter motor.
12. Regulator.
13. Battery.
14. Contact breaker.
15. Windscreen wiper motor.
16. Stop lamp switch.
17. Coils.
18. Direction indicator switch.
19. Flashing direction indicator time switch.
20. Rheostat for instrument panel lights.
21. Ammeter.
22. Petrol gauge dial.
23. Dashboard lights.
24. Interior light switch.
25. Lighting and ignition switch.
27. Lighting and horn switch.
28. Side lamp, left.
29. Side lamp, right.
30. Interior lamps.
31. Petrol gauge tank unit.
33. Flashing direction indicator lamp, rear, right.
34. Flashing direction indicator lamp, rear, left.
36. Rear lamps (red lights, stop lights, number plate light)
37. Rear boot light.
38. Switch for rear boot light.
39. Switch for interior lights on front door, left.
40. Pressure switches.
41. Starter motor solenoid switch.
42. Starter motor switch on gear selector.
43. Rheostat for demister motor.
44. Switch for windscreen wiper motor.
45. Inspection light socket.
46. Demister motor.
47. Terminal for accessories.
48. Warning light panel.
49. Clock.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
1	Since June 1957	Rear light terminal on lighting and horn switch (27) ..... to mauve terminal on ignition switch (25). to rear male connector (1).	Mauve.
2		Violet terminal on ignition switch (25)..... to coils (17). to male connector (2) to warning light of pressure switch (48). to petrol gauge dial (22). to switch for windscreen wiper motor (44). to stop lamp switch (16). to rheostat for demister motor (43).	Violet.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
3		Black terminal on ignition switch (25)	Black.
		to direction indicator time switch (19).	
		to BAT terminal on the regulator (12).	
		to the ammeter (21).	
		to the accessory terminal (47).	
		to the inspection lamp socket (45).	
		to the feed terminal of the combined lighting and horn switch (27).	
		to rear male connector (3).	
		to clock (49).	
		to switch of the direction indicator lights (18).	
4		Red terminal on the ignition switch (25)	Red.
		to the rheostat for the instrument panel lights (20).	
5		Green terminal of the flashing light time switch (19).....	Green.
		to male connector (5) on direction indicator tell-tale light.	
6		Blue terminal on the flashing light time switch (19)	Blue.
		to blue terminal on indicator switch (18).	
		to rear male connector (6).	
		to male connector (6) on flashing direction indicator light, right	Violet.
7		White terminal on flashing lamp time switch	White.
		to white terminal on direction indicator switch (18).	
		to rear male connector (7).	
		to male connector (7) on flashing direction indicator light, left.....	Violet.
8		Green terminal on direction indicator switch (18)	Green.
		to rear male connector (8).	
9		Male connector (7) of the harness	Violet.
		to direction indicator, left.	
10		Red terminal on the direction indicator switch (18)	Red.
		to rear male connector (10).	
11		Male connector (6) of the harness	Violet.
		to direction indicator, right.	

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
12		Green terminal on the ammeter (21) ..... to the green terminal on the starter motor solenoid.	Green.
13		Headlamp terminal on the combined lighting and horn switch (27) ..... to male connector (13) on headlamp tell-tale. to male connector (13) on headlamp terminal from the front right headlamp. to male connector (13) on headlamp terminal from the front left headlamp.	Yellow.
14		Pressure switch ..... to male connector (14) on pressure switch tell-tale.	Red.
15		Rheostat for instrument panel lights ..... to male connector (15) of the dashboard lights (23).	Red.
16		Petrol gauge dial (22) ..... to male connector (17).	Yellow.
17		Male connector on the petrol gauge dial (22) ..... to rear male connector (17).	Yellow.
18		Earth for the tell-tale lights (48).	
19		Front lamp terminal on the combined lighting and horn switch (27) ..... to male connector (19) of the headlamp terminal from the front right headlamp. to male connector (19) of the headlamp terminal from the front left headlamp.	Red.
20		Terminal of the combined lighting and horn switch (27) ..... to male connector (20) of the headlamp terminal from the front right headlamp. to male connector (20) of the headlamp terminal from the front left headlamp.	Green.
21		Second horn terminal on the combined lighting and horn switch (27) ..... to male connector (21) of the harness.	Blue.
22		First horn terminal on the combined lighting and horn switch (27) ..... to male connector (22) of the harness.	White.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
23		Chestnut terminal on the interior light switch (24) ..... to rear male connector (23).	Chestnut.
24		Yellow terminal on interior light switch (24) ..... to door switch (39).	Yellow.
25		Yellow terminal on windscreen wiper motor switch (44) ..... to windscreen wiper motor (15).	Yellow.
26		Mauve terminal on demister motor rheostat (43) ..... to demister motor (46).	Mauve.
27		Starter motor switch on gear selector (42) ..... to male connector (27) on solenoid (41).	Red.
28		Clock (49). to starter motor switch on gear selector (42). to earth.	
29		Stop lamp switch (16) ..... to rear male connector (29).	Violet.
30		Headlamp earth wire and front direction indicators.	
31	Headlamps	Male connector (19) on headlamp harness, right or left ..... to bulb holder terminal on the right-hand headlamp (1) and left (2).	Red.
32		Male connector (20) on the harness ..... to the connector on the right-hand headlamp (1) and left (2).	Green.
33		Male connector (13) on the harness ..... to the headlamp connector on the right-hand headlamp (1) and left (2).	Yellow.
34		Male connector (22) on the harness ..... to low note horn (3).	White.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	FRONT		
35		Male connector (21) on harness ..... to high note horn (4).	Blue.
36		Male connector on the upper coil (17) ..... to rear male connector on the contact breaker (14).	Yellow.
37		Male connector on the lower coil (17) ..... to front male connector on the contact breaker (14).	Red.
38		Rheostat for instrument panel lights (20) ..... to clock (49).	Red.
40	Dynamo to regulator.	Dynamo (9). to regulator earth (12).	
41		Dynamo (9). to terminal on regulator (12).	
42		Dynamo (9). to field terminal on regulator (12).	
	REAR	(see Pl. 166).	
1		Rear male connector (1). ..... to rear light, right and left (36).	Mauve.
3		Rear male connector (3) ..... to interior lamp (30)	Black. Without connector.
		to rear boot lamp (37)	Without connector.
6		Rear male connector (6) ..... to rear direction indicator lamp, right (33).	Blue.
7		Rear male connector (7) ..... to rear direction indicator lamp, left (34).	White.
8		Rear male connector (8) ..... to side lamp, left (28).	Green.

WIRE NUMBER	HARNESS	SCHEDULE OF WIRING	COLOUR OF ENDS
	REAR		
10		Rear male connector (10) ..... to side lamp, right (29).	Red.
17		Rear male connector (17) ..... to male connector on petrol gauge tank unit (31).	Yellow.
23		Rear male connector (23) ..... to interior lamp (30)	Chestnut. Without connector.
29		Rear male connector (29) ..... to stop lamp, right and left (36).	Violet.
45		Rear boot lamp (37). to switch for rear boot lamp (38).	
50		Earth for petrol gauge tank unit (31). to earth of the car.	

	Production 6 volts	Export 6 volts	Export 12 volts
Speedometer bulbs	2 - 706.616	2 - 706.616	2 - 706.722
Clock lighting	1 - 706.616	1 - 706.616	1 - 706.722
Brake tell-tale	1 - 707.193	1 - 707.193	1 - 707.194
Headlamp and indicator tell-tale	2 - 707.194	2 - 707.194	2 - 706.714
Headlamps	2 - 706.670	2 - 706.665	2 - 706.665
Side lamps	2 - 707.193	2 - 707.193	2 - 707.194
Parking lamps	2 - 706.616	2 - 706.616	Without fitting
Rear lamp	2 - 706.620	2 - 706.620	2 - 706.609
Stop lamp	2 - 706.620	2 - 706.570	2 - 706.604
Number plate lamp	2 - 706.620	2 - 706.701	2 - 706.704
Front direction indicator lamp	2 - 706.570	2 - 706.699	2 - 706.702
Rear direction indicator lamp	2 - 706.570	2 - 706.700	2 - 706.703
Quarter interior lamp	2 - 707.193	2 - 707.193	2 - 707.194
Front interior lamp	2 - 707.193	2 - 707.193	2 - 707.194
Rear boot lamp	1 - 707.193	1 - 707.193	1 - 707.194

		TOOLS
	REMOVAL	
1	Remove the battery. Remove the clamping rods and the protection plate	8 mm box spanner
2	Remove the battery tray, with its drain pipe.	
3	Disconnect the dynamo wires from the regulator.	
4	Disconnect the dynamo tie-rod and remove it	12 mm box spanner
5	Unscrew the two screws fixing the dynamo	14 mm spanner 14 mm ring spanner
6	Swing the dynamo towards the engine and disengage the belts from the pulley.	
7	Unscrew the front fixing screw a few turns. Remove the rear fixing screw	14 mm spanner 14 mm ring spanner
8	Remove the dynamo.	
	REFITTING	
9	Engage the dynamo by placing the slot in the front fixing plate between the plain washer of the fixing screw and the bellhousing.	
10	Put the rear fixing screws in position, fitting a spring washer and a plain washer under the head. Fit the fixing screws	14 mm spanner 14 mm ring spanner
11	Swing the dynamo towards the engine and put the belts on the pulley.	
12	Couple up the dynamo tie-rods. Tension the belts (see Op. DS 231-0). Lock the tie-rod and tighten the dynamo fixing screws	12 mm box spanner 14 mm spanner 14 mm ring spanner
13	Connect the dynamo wires to the regulator.	
14	Put the battery tray in position with its drain pipe.	
15	Put in position, the dynamo clamping rods, the protection plate, the battery and fix it. Tighten up, moderately, fitting under the left-hand serrated washer, the plate fixing the protecting trough for the front harness (cars produced before February 1957)	8 mm box spanner

PARTICULAR POINTS

Overhauling a Paris-Rhone G11-R75 dynamo.

16 *Face up the commutator. Do not reduce the original diameter of 41·5 mm. by more than 2 mm.*

22 *To fit the field coils. To ensure correct positioning of the pole pieces and coils in the dynamo and to obtain a clearance of 0·45 mm. maximum, it is necessary to use a mandrel 72·6 mm. diameter (Mandrel MR1601-2 and support block MR1601-3 see Pl.163).*

30 To bench test a dynamo.

Dynamo without regulator and field on positive terminal:
No load *and cold: 6·5 volts at 900 r.p.m. maximum.*
Under load and cold: 6·5 volts at 1,800 r.p.m. 32 amps. minimum.
Under load and warm: 6·5 volts at 2,100 r.p.m. 32 amps. minimum.

Overhauling a Ducellier 7116-A dynamo.

42 *Face up the commutator. Do not reduce the original diameter of 47 mm. by more than 2 mm.*

48 *To fit the field coils. To ensure correct positioning of the pole pieces and coils in the dynamo and to obtain a clearance of 0·45 mm. maximum, it is necessary to use a mandrel 68·5 mm. diameter (Mandrel MR1601-2 and support block MR1601-3, see Pl.163).*

54 To bench test a dynamo.

(*see paragraph 30 above.*)

		TOOLS
	OVERHAULING A PARIS-PHONE G11-R75 DYNAMO	
	Dismantling (see Pl. 156 and 157).	
1	Remove the driving pulley (1), remove the Woodruff key (2)	21 mm box spanner
2	Knock back the tabs of the lockwashers (3), remove the fixing screws (4) from the end bearing plates (5) and (6)	10 mm box spanner
3	Remove the end bearing plate (5) driving side with the armature (7).	
4	Remove the end bearing plate-brush holder (6), disconnect the terminal (8) from the positive brush holder	7 mm box spanner
5	Remove the end bearing plate (5) from the armature (7), in a press if necessary, remove the washer (9).	

		TOOLS
6	Remove the centre closing plate (10) by grinding the end of the screws. Take out the bearing (11) from the end bearing plate (5).	
7	Unsolder the connection (12) of the field coils (13).	
8	Unsolder the terminal (14) from the end of the yellow field cable. Withdraw the cable from the sheath.	
9	Remove the earth terminal (15) of the field coils by driving out the rivet (16).	
10	To remove the field coils :	
	a) Mark and remove the pole pieces (17), (use the special screwdriver MR-1601-4, fitted on a bench press, see Pl. 163).....	Screwdriver MR-1601-4
	b) Remove the pole pieces (17) and the field coils (13).	
11	Drive out the bush (18) from the end bearing plate brush holder (6) and the closing plate (19) using a shouldered mandrel.....	Shouldered mandrel : Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150
12	Remove the positive brush (20) and the negative brush (21).	
13	Clean the parts.	
	Assembly (see Pl. 156 and 157).	
14	Check the armature shaft on vee blocks or between centres.	
15	Check the insulation of the armature with a suitable insulation tester.	
16	Face up the commutator. Do not reduce the original diameter of 41.5 mm by more than 2 mm.	
17	Remove the commutator insulation after rectification by means of a saw blade thinned down to the width of the insulation, or with a file.	
18	Check the field coils with a test lamp.	
19	With a 110 volt or 220 volt test lamp, check the insulation of the positive brush holder (22) in relation to earth.	
20	Unrivet the positive brush holder (22).	

TOOLS

21 To assemble the end bearing plate brush holder :

a) Put the bush (18) in position in the end bearing plate (using a shouldered mandrel) and fit the closing disc (19). Knock back the metal of the end bearing plate to retain it .....

Shouldered mandrel :
Small dia. = 16.8
Length = 15
Large dia. = 20
Length = 150

b) To rivet the brush holder (22) :

1st. Spring side : Place on the round head rivet the insulating washer and the insulating bush. Insert the rivet thus prepared into the end bearing plate; then fit the insulating plate (24), the steel packing (25), the brush holder (22). Rivet the rivet.

2nd. Connection side : Engage the flat head rivet in the square of the connection (26) and in the brush holder (22), the steel packing (25), the insulating plate. Turn over the end bearing plate. Insert the insulating bush (27), the insulating washer (28), the plain washer (29). Rivet the rivet (30).

3rd. Check, using a 110 volt or 220 volt test lamp, the insulation of the brush holder.

c) Fit the brushes (20) and (21) in the brush holder. Connect the cables and tighten the screws (serrated washer under the head). Hold the brushes in the raised position by means of the springs as shown on Pl. 157, fig. 2.

22 To fit the field coils :

To ensure the correct positioning of the pole pieces and coils in the body of the dynamo and to obtain a clearance of 0.45 mm maximum, it is necessary to use a mandrel of 72.6 mm diameter.

a) Put the field coils (13) in the body of the dynamo. Fit the pole pieces (17) according to the markings, tighten the screws provisionally.

b) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-2 with the support block MR-1601-3, see Pl. 163). Tighten the fixing screws (using screwdriver MR-1601-4, fitted under a bench press, see Pl. 163). Take out the mandrel from the opposite side to that from which it was put in .....

Mandrel MR-1601-2
Support MR-1601-3
Screwdriver MR-1601-4

23 Fix the earth terminal (15) for the field coils (13) with the terminal of the earth lead (31) of the regulator. Replace the original rivet by a round head screw with a nut and spring washer .....

7 mm box spanner

24 Insert the yellow field cable in the sheath.

25 Solder the terminal (14) on the end of the yellow cable and solder the connection on the field coils, then carefully insulate the soldering.
NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.

26 To assemble the end bearing plate (5), driving side :
a) Grease the bearing (11) with high melting point grease.
b) Place the bearing (11) in the end plate and fix the plate (10) with screws, the ends of which will be expanded.
c) Fit the washer (9).

		TOOLS
27	Insert the armature (7) in the end bearing plate brush holder (6). Bring the brushes into contact with the commutator. Make sure that the brush springs (32) are correctly positioned.	7 mm box spanner
28	Insert the assembly of the armature and end bearing plate in the body of the dynamo. Connect the output cable. Engage the end bearing plate, driving side, on the armature (7). Fix the two plates (5) and (6) by means of the screws (4), fitting a serrated washer in place of the lockwashers (3) under the nuts (33). Lock the head of the screw with a centre punch.	
29	Fit the Woodruff key (2) on the shaft. Fit the driving pulley (1) placing a spring washer under the nut (34)	21 mm box spanner
30	Bench test the dynamo : Dynamo without regulator and field on the positive terminal : No load and cold : 6.5 volts : 900 r.p.m. maximum. Under load and cold : 6.5 volts at 1800 r.p.m. 32 amps minimum. Under load and warm : 6.5 volts at 2100 r.p.m. 32 amps minimum.	

OVERHAULING A DUCELLIER 7116-A DYNAMO

Dismantling (see Pl. 154 and 155).

31	Remove the driving pulley (1), disengage the Woodruff key (2).....	21 mm box spanner
32	Remove the screw (3) fixing the end bearing plate	10 mm box spanner
33	Remove the end bearing plate (4), driving side, and the steel cap (5).	
34	Remove the armature (6), remove the fibre washer (7), commutator side.	
35	Disconnect the output terminal (8) from the positive brush holder (9). Disengage the rear end bearing plate (10). Remove the brushes (11) and (12).	
36	Remove the closing plate (13) for the housing of the bearing (14) from the end bearing plate (4) by grinding the heads of the rivets. Take out the bearing (14) and the dust covers, inside (15) and outside (16).	
37	Drive out the bush (17) from the end bearing plate-brush holder (10) and the closing plate (18) by means of a shouldered mandrel	Shouldered mandrel : Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150

		TOOLS
38	<u>To remove the field coils</u> : a) Unrivet the feed leads (19) and (20) from the field coils (21). b) Remove the closing plate (22) with the cable harness (23). c) Mark and remove the pole pieces (24) (using the screwdriver MR-1601-4, mounted on a bench press, see Pl. 163). d) Remove the pole pieces (24) and the field coils (21) and unsolder them.	Screwdriver MR-1601-4
39	Clean the parts.	
	<u>Assembly</u> (see Pl. 154 and 155).	
40	Check the armature shaft on vee blocks or between centres.	
41	Check the armature on a suitable insulation tester.	
42	Face up the commutator. Do not reduce the original diameter of 47 mm by more than 2 mm.	
43	Remove the insulation from the commutator after rectification, by means of a saw blade thinned down to the width of the insulation or with a file.	
44	Check the field coils by means of a test lamp.	
45	With a 110 volt or preferably a 220 volt test lamp, check the insulation of the positive brush holder (9) in relation to earth.	
46	If necessary, unrivet the positive brush holder (9).	
47	<u>To reassemble the end bearing plate brush holder</u> : a) Put the bush (17), previously oiled with engine oil, in the end bearing plate (use a shouldered mandrel) and the closing plate (18) putting the felt washer in between after having soaked it with engine oil. Knock the metal back lightly so as to retain the closing plate (18)	Shouldered mandrel : Small dia. = 16.8 Length = 15 Large dia. = 20 Length = 150
	b) Rivet the positive brush (9). Insert the rivets in the end bearing plate (10), then insert the insulating plate (25), the brush holder (9) : - spring side, insert the insulating bush (26), then insulating washer (27), the steel washer (28); rivet the rivet (29). - opposite side, insert the insulating bush, the connecting plate (30), the insulating washer (31), the steel washer (32); rivet the rivet (33).	

		TOOLS
	c) With a 110 volt or preferably a 220 volt test lamp, check the insulation of the brush holder.	
	d) Fit the brushes in the brush holders. Connect the cables and tighten the screws (spring washer under the head). Hold the brushes in the raised position by means of the springs, as shown on Pl. 155.	
48	To assemble the field coils :	
	To ensure correct positioning of the pole pieces and coils in the body of the dynamo and to obtain a clearance of 0.45 mm maximum, it is necessary to use a mandrel 68.5 mm diameter.	
	a) Put the field coils (21) in position in the body of the dynamo. Fit the pole pieces (24) according to the markings made when dismantling, and provisionally tighten the screws.	
	b) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-2 with the support block MR-1601-3, see Pl. 163). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 163). Take out the mandrel from the opposite side to that from which it was put in	Mandrel MR-1601-2 Support block MR-1601-3 Screwdriver MR-1601-4
	c) Put the cable harness (23) in position in the closing plate (22). Insert a round headed screw 4 mm diameter, 15 long, (plain washer under the head), in the plate (34) and the body of the dynamo. Fix the terminals (37) and (20) with this screw. Tighten the nut, fitting a serrated washer under the head	7 mm spanner
	d) Fix the field terminals (19) and (41). Use a round headed screw 4 mm diameter, 20 long and fit in the following order : one plain washer, one insulating washer (38), the insulating bush (36). Insert the screw thus prepared in the closing plate (34), then in the body of the dynamo. Fit on the screw, the insulating plate (35), the output terminal (19) of the field coils (21), the terminal of the field cable, a serrated washer. Tighten the nut	7 mm spanner
	e) Tin solder with a soldering iron, the joint between the two field coils.	
	NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.	
49	To assemble the end bearing plate, driving side :	
	a) Grease the bearing (14) with high melting point grease.	
	b) Fit in the bearing end cap, the dust excluding washer (16), the bearing (14), the dust excluding washer (15).	
	c) Fix the retaining plate (13) on the end bearing plate (4). Replace the original rivets by round headed screws of 4 mm diameter, 15 long with serrated washers and nuts	7 mm box spanner
50	Fit on the armature, the thrust washer (7) and the steel cap (5). Insert the armature (6) in the end bearing plate brush holder (10). Bring the brushes into contact with the armature. Make sure that the springs (39) of the brushes are correctly positioned.	

		TOOLS
51	Insert the assembly of the armature and the end bearing plate in the body of the dynamo. Insert the end bearing plate (4) driving side, on the armature shaft (6). Fix the two end bearing plates by means of the screw (3) fitted with their insulators; fix serrated washers under the nuts	10 mm box spanner
52	Connect the output (8) to the positive brush holder.	
53	Place the key (2) on the shaft. Fit the driving pulley (1); insert a shakeproof washer under the nut (40)	21 mm box spanner
54	To bench test the dynamo : Dynamo without regulator; field on the positive terminal. No load and cold : 6.5 volts; 900 r.p.m. maximum. Underload and cold : 6.5 volts at 1800 r.p.m. 32 amps minimum. Underload and warm : 6.5 volts at 2100 r.p.m. 32 amps minimum.	

		TOOLS
	REMOVAL	
1	Release the pressure.	
2	Remove the sphere from the right-hand suspension cylinder (strap wrench 2223-T, see Pl. 93, fig. 1). Seal the cylinder and the sphere (see Pl. 94).	
3	Remove the exhaust manifold shield. It may be necessary to bend this shield, in order to move it towards the front. Do not lose the fixing plate for the screw fixing the heater tube.....	12 mm box spanner
4	Disconnect the starter feed cable.	14 mm box spanner
5	To remove the starter motor: unlock the locknut and unscrew the pointed screw a few turns from the housing. Unscrew for a few turns, the two pointed reaction screws situated under the clutch bellhousing. Move the starter motor from its housing and disengage from the rear. If necessary, turn the body of the starter to simplify this operation	14-17 mm box spanners 12 mm spanner
	REFITTING	
6	Engage the bendix housing of the starter motor in its housing in the crankcase, if necessary, turn the body of the starter motor to simplify this operation: a slight push should be sufficient to pass the starter motor between the manifold and the body.	
7	Tighten the pointed screw and its locknut. Do not tighten excessively as this will only distort the bendix housing	14-17 mm box spanners
8	Tighten the pointed reaction screws. Lock the locknuts	12 mm spanner
9	Connect the starter motor cable, insert a shakeproof washer under the terminal and tighten the nut	14-17 mm box spanners
10	To refit the exhaust manifold shield : Using a fixing bolt of the heater tube, fix, through the upper hole of the fixing plate, making sure that the lower holes correspond perfectly. Engage the shield from the front of the manifold. It may be necessary to slightly bend the shield in order to put it in position. Fit and tighten the fixing screws (plain and spring washers under the heads).....	12 mm box spanner
11	Remove the upper screw and fix the heater tube collar. Tighten the screw (spring washer under the head).....	12 mm box spanner
12	Fit the sphere (replace the joint after each removal).	
13	Start the engine and put the systems under pressure. Check for leakage between the sphere and the suspension cylinder.	

PARTICULAR POINTS

Overhauling a Ducellier 6008-A starter motor.

Dismantling.

If the field coils are to be removed, it is preferable to remove the positive brush after this operation. With a soldering iron heat the brush wire on its connection and disengage by pulling the wire with pliers.

8 *It is possible to replace the Benada pinion springs. Proceed as shown in paragraph 8.*

Assembly.

12 *Do not reduce the original diameter of the commutator which is 40 mm. by more than 2 mm.*

16 *In order to obtain a correct positioning of the coils and pole pieces in the body of the starter motor and to obtain a clearance of 0·5 mm. maximum it is necessary to use a mandrel of 74·4 mm. diameter (mandrel MR1601-1 and support block MR1601-3, see Pl.163).*

17 *The bearings in the bearing plate are made of porous bronze. Before assembly soak the bearings for approximately 24 hours in a bath of engine oil.*

23 *Adjust the end play of the armature to 0·2 to 1·3 mm.*

24 *Test the starter motor on a bench. The current consumption is:—*
When starting up: 180 to 200 amps.
Rotating with no load: 50 to 80 amps.

Overhauling a Paris-Rhone D11-B42 starter motor.

Dismantling.

(see same paragraphs as for Ducellier starter).

Assembly.

43 *In order to obtain a correct positioning of the coils and pole pieces in the body of the starter motor and to obtain a clearance of 0·5 mm. maximum, it is necessary to use a mandrel of 76·8 mm. diameter (mandrel MR1601-1 and support block MR1601-3, see Pl.163).*

44 *The bearings in the bearing plate are made of porous bronze. Before assembly soak the bearings for approximately 24 hours in a bath of engine oil.*

47 *Adjust the end play of the armature to 0·2 to 1·3 mm.*

53 *Test the starter motor on a bench. The current consumption is:*
When starting up: 180 amps to 200 amps.
Rotating with no load: 50 to 80 amps.

		TOOLS
	OVERHAULING A DUCELLIER 6008-A STARTER MOTOR	
	Dismantling (see Pl. 158 and 159).	
1	Remove the circlip (1) and disengage the distance washers (2).	
2	Remove the nuts (3) fixing the front and rear end bearing plates	10 mm box spanner
3	Disengage the bendix housing (4). Disengage the armature (5) with the intermediate bearing (6). Disengage the rear thrust washer (7). Disengage the end bearing plate brush holder (8) from the body of the starter motor, remove the positive brush (9) from its holder, completely remove the rear bearing plate (8).	
4	Remove the bendix assembly (10) from the armature shaft (5). Disengage the Woodruff key (11). Disengage the intermediate bearing plate (6).	
5	To dismantle the end bearing plate brush holder :	
	a) Grind the heads of the rivets of the positive brush holder (12), drive out the rivets. Remove the insulating washers and insulating bushes.	
	b) Grind the heads of the rivets of the negative brush holder (13), drive out the rivets. Disengage the negative brush.	
6	Drive out the bearing (14) from the rear bearing plate (8) and the centre bearing plate (6) and from the bendix housing (4) using a shouldered mandrel	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18.5 Length = 150
	NOTE - If the field coils are to be removed, it is preferable to remove the positive brush after this operation. With a soldering iron, heat the brush wire on its connection and disengage by pulling the wire with pliers.	
7	To remove the field coils :	
	a) Unscrew the nut (15), remove the serrated washer (16), the steel washer (17), the shouldered insulating bush (18).....	14 mm box spanner
	b) Remove the four screws fixing the pole pieces (use the special screwdriver MR-1601-4, fitted on a bench press, see Pl. 163).....	Screwdriver MR-1601-4
	c) Mark and remove the pole pieces (19).	
	d) Remove the field coils (20) with the terminal (21). Remove the insulating washer (22).	
	e) Unsolder the terminal (21).	

TOOLS

8 Replacement of the "Benada" pinion springs (see Pl. 162) :

a) Disengage the spring to be replaced, from the sleeve and from the pinion by cutting with a grinder, if necessary.

b) Obtain the tool shown on fig. 6, 7 and 8.

c) To prepare the new spring : open the 4 pegs of the spring, using the lever MR-3526-12, as shown on fig. 1 and 3, by bending the end coils of the spring in order to bring the pegs to a dimension "a" = 24 mm approximately from the other (see fig. 2).

d) To fit the springs in position (see fig. 4 and 5) :

1. Engage the threaded sleeve (1) on the threaded rod, tighten in a vice.
2. Offer up the springs. If necessary, open the pegs of the springs, using two screwdrivers, in order to engage them in the holes in the threaded sleeve (1).
3. Offer up the pinion and the sleeve (1). If necessary, open the pegs of the springs, using two screwdrivers, in order to engage them in the holes of the pinion sleeve (2).
4. Remove the pinion assembly from the threaded rod.

e) To put the spring pegs in position (see fig. 4) :

1. Offer up the spring on the support MR-3526-13 (see fig. 5) and compress the coils of the spring, using a press. Insert a plate between the press and the support.
2. Repeat the operation several times, in such a manner that the spring is restored to its original shape.

Make sure that the spring pegs are properly engaged in the holes of the sleeve (1) and of the pinion sleeve (2).

Support MR-3526-11
Lever MR-3526-12
Support MR-3526-13

9 Clean the parts.

Assembly (see Pl. 158 and 159).

10 Check the armature on vee blocks or between centres.

11 Check the armature on a test meter.

12 Face up the commutator. Do not reduce the original diameter of 40 mm by more than 2 mm.

Remove the commutator insulation after rectification by means of a saw blade thinned down to the width of the insulation, or with a file.

13 Check the field coils with a test lamp.

14 If the end bearing plate-brush holder (8) has not been stripped, check with a 110 volt or preferably a 220 volt test lamp, the insulation of the positive brush holder (12) in relation to earth.

		TOOLS
15	To connect the positive brush (9). Solder the brush wire on its connection using a soldering iron.	
	NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.	
16	To assemble the field coils :	
	a) Place on the terminal (21) the insulating washer (22). Fit the terminal (21) on the starter motor. Then fix provisionally, positioning the slot of the terminal to allow the fitting of the connection.	
	NOTE - To ensure correct positioning of the pole pieces and coils in the body of the starter motor and to obtain a clearance of 0.5 mm maximum, it is necessary to use a 74.4 mm diameter mandrel.	
	b) Insert the field coils (20), fit the pole pieces (19), tighten the screws provisionally.	
	c) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-1 and support block MR-1601-3, see Pl. 163). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 163). Take out the mandrel from the opposite side from which it was put in	Mandrel MR-1601-1 Support MR-1601-3 Screwdriver MR-1601-4
	d) Fit the ends of the connections in the slot of the terminal (21). With a soldering iron, tin solder the connection and the terminal.	
	e) Put on the terminal (21), the shouldered insulating sleeve (18), the steel washer (17), the serrated washer (16). Tighten the nut (15)	14 mm box spanner
17	To assemble the bearing plates :	
	NOTE - The bearings of the bearing plate are made of porous bronze. Before assembly, soak the bearings for approximately 24 hours in a bath of engine oil, so that the bronze becomes impregnated. No further oiling should be necessary.	
	a) Put the bearings (14) in position, using a shouldered mandrel, stop driving when the bearing is level with the outer face of the bearing plate	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18.5 Length = 150
	b) To fit the negative brush holder (13), insert the terminals in the 2 holes, of the brush (23). Fit the brush holder (13), peen over the rivets (24).	
	c) To fit the positive brush holder (12), insert the insulating plate (25), between the bearing plate and the brush holder.	
	Put in position, the insulating bushes (26), the insulating washer (27), the rivets (28). Peen over the rivets. Check with a 110 volt or preferably a 220 volt test lamp, the insulation of the brush holder.	

TOOLS

18 Fit the bearing (14) in position in the intermediate bearing plate (6) and the bendix housing (4). Use a shouldered mandrel .....

Shouldered mandrel :
Small dia. = 15.5
Length = 15
Large dia. = 18.5
Length = 150

19 Fit on the armature shaft, the intermediate bearing plate (6). Put the Woodruff key (11) in position.

Fit the "Benada" pinion assembly (10) : tighten the grub screw (29), put the circlip (30) in the slot of the screw.

20 Engage the armature (5) in the body of the starter, the intermediate bearing plate is positioned by a dowel pin.

21 Engage the bendix housing (4) on the armature shaft (5) and assemble to the body of the starter motor, tighten the fixing studs fitted with their insulation.

22 To fit the end bearing plate brush holder :

a) Fit on the armature shaft, commutator end, the thrust washer (7).

b) Engage the positive brush (9) in its holder (12). In order to allow the armature to enter, hold the brushes by their springs, in the raised position as shown on Pl. 159, fig. 3.

c) Offer up the bearing plate brush holder (8). Before completely putting the bearing plate in position, release the brushes so that they come in contact with the armature. Make sure that the brushes are correctly positioned.

d) Tighten the nuts (3) and insert a spring washer under the nuts ..... 10 mm box spanner

23 To adjust the end play of the armature :

Fit the distance washers (2), fit the circlip (1). Using a feeler gauge, make sure that the end play is between 0.2 and 1.3 mm. If necessary, alter the thickness of the distance washers (2).

24 Bench test the starter motor.

The current consumed is :
When starting up : 180 to 200 amps.
Rotating with no load : 50 to 80 amps.

25 Paint the unit.

OVERHAULING A PARIS-RHONE D.11.B.42 STARTER MOTOR

Dismantling (see Pl. 160 and 161).

26 Remove the screws (1) fixing the front and rear end bearing plates ..... 14 mm box spanner

27 Remove the bendix housing (2).

		TOOLS
28	Remove the armature (3) from the body of the starter motor with centre bearing plate (4).	
29	Disconnect the brush holder assembly (5) from the rear bearing plate (6) by removing the screw (7).....	8 mm box spanner
30	Disengage the positive brushes (8) from their holder, disengage the brush holders (5).	
31	Remove the bendix assembly (9) from the armature (3). Disengage the Woodruff key (10), the adjusting washers (11), the centre bearing plate (4), the adjusting washers (11).	
32	Drive out the bearings (13) from the rear bearing end plate (6), from the centre bearing plate (4) and from the bendix housing (2) (use a shouldered mandrel).....	Shouldered mandrel : Small dia. = 15.5 Length = 15 Large dia. = 18 Length = 150
	NOTE - If the field coils are to be changed, it is preferable to remove the brushes before this operation. With a soldering iron heat the brush wire on its connection and disengage by pulling the wire with pliers.	
33	To remove the field coils :	
	a) Remove the nut (14), the steel washer (15), the two fibre washers (16).....	16 mm box spanner
	b) Remove the screws (17), fixing the pole pieces (18) (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 163).....	Screwdriver MR-1601-4
	c) Mark and remove the pole pieces.	
	d) Disengage the field coils (19) with the terminal (20). Disengage the insulating washers (21).	
	e) Unsolder the terminal (20) and disengage.	
	f) Disengage the insulating bush (22) from the starter body.	
34	To strip a "Benada" pinion assembly : Press back the sleeve (23) in order to gain access to the circlip (24). Remove the circlip (24), the sleeve (23), the spring (25), the washer (26) and the pinion (27).	
35	To replace the springs of the "Benada" pinion (see paragraph 8, this operation).	
36	Clean the parts.	

TOOLS

Assembly (see Pl. 160 and 161).

37 Check the armature on vee blocks or between centres.

38 Check the insulation of the armature with a suitable tester.

39 Face up the commutator. Do not reduce the original diameter of 45 mm by more than 2 mm.

Remove the commutator insulation after rectification by means of a saw blade thinned down to the width of the insulation or with a file.

40 Check the field coils with a test lamp.

41 Check with a 110 volt or preferably a 220 volt test lamp, the insulation of the positive brush holders (28) in relation to their bracket. If the insulation is defective, replace the assembly.

42 To connect the positive brush (8). Solder the brush wire on its coil connection using a soldering iron.

NOTE - Never use killed hydrochloric acid, but special soldering paste or resin.

43 To assemble the field coils :

a) Put on the terminal (20), the insulating washers (21) and the insulating bush (22). Fit the terminal on the starter motor. Then fix provisionally, positioning the slot of the terminal to allow the fitting of the connection.

NOTE - To ensure correction positioning of the pole pieces and coils in the body of the starter and to obtain a clearance of 0.5 mm maximum, it is necessary to use a 76.8 mm mandrel.

b) Insert the field coils (19), take the precaution of fitting the ends of the connections in the slot of the terminal. Fit the pole pieces (18). Tighten the screw (17) provisionally.

c) Insert the mandrel between the pole pieces, in a press (use the mandrel MR-1601-1 and the support block MR-1601-3, see Pl. 163). Lock the screws fixing the pole pieces (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 163). Take out the mandrel from the opposite side to that from which it was put in ..... **Mandrel MR-1601-1**
Screwdriver MR-1601-4

d) With a soldering iron, tin solder the connection and the terminal.

e) Put on the terminal (20), the two fibre washers (16), the steel washer (15). Tighten the nut (14) ..... **16 mm box spanner**

		TOOLS
44	To assemble the bearing plates : NOTE - The bearings of the bearing plate are made of porous bronze. Before assembly soak the bearings for approximately 24 hours in a bath of engine oil, so that the bronze becomes impregnated, no further oiling should be necessary. Put the bearings (13) in position using a shouldered mandrel, stop driving in when the bearing is level with the outer face of the bearing plate	Shouldered mandrel : Small dia. = 15.5 Length = 16 Large dia. = 18 Length = 158
45	To assemble the "Benada" pinion assembly : Screw the pinion (27) on the shaft, fit the plain washer (26), the spring (25), the sleeve (23). Lock by fitting the circlip (24). Slide the sleeve (23) up to the stop.	
46	Put on the armature shaft (3), the steel washer (11), a fibre washer (12), the centre bearing plate (4), the fibre washer (12), the steel washer (11).	
47	To fit the "Benada" pinion assembly : Put the Woodruff key (10) in position, engage the pinion assembly (9). Tighten the grub screw (29), put the circlip (30) in position. The end play should be between 0.2 mm and 1.3 mm.	
48	Put the armature in the body of the starter.	
49	Fit the brush holder assembly (5) on the rear bearing plate (6), insert a spring washer under the head of the screws (7)	8 mm box spanner
50	Put the rear bearing plate (6) on the armature shaft (3) and put the brushes in their holder; slightly engage the rear bearing plate (6) and bring the brushes into contact with the armature. Engage the rear bearing plate fully (positioned by a slot and a dowel pin).	
51	Put the bendix housing (2) on the armature (3). The position is marked by a notch which will be found on the upper part of the starter motor.	
52	Fix the bendix housing (2) and the rear bearing end plate (6) with the screws (1). Insert a serrated washer under the nuts (31).	
53	Bench test the starter motor. Current consumed : When starting up : 180 to 200 amps. Rotating with no load : 50 to 80 amps.	
54	Paint the unit.	

		TOOLS
	REPLACEMENT OF A CUT-OUT VALVE DIAPHRAGM	
	Removal.	
1	Drain the radiator and the cylinder block. Retain the water which contains anti-freeze	21 mm spanner
2	Remove the trimming panel under the scuttle, right side.	
3	Remove the rubber cap from the cut-out valve knob.	
4	Remove the heater control indicator plate and its joint.	
5	Remove the screws assembling the valve and disengage the assembly of the diaphragm and control system	8 mm box spanner
6	Disengage the diaphragm.	
	Refitting.	
7	Put the diaphragm in position on the control.	
8	Offer up the assembly of the diaphragm and control in the valve body. Tighten the fixing screws (spring washers under the heads)	8 mm box spanner
9	Fit the joint and the heater control indicator plate.	
10	Fit the rubber cap on the cut-out valve knob.	
11	Fit the trimming panel under the scuttle, right side.	
12	Refill the water system. Open the heater cut-out valve. Bleed the water system.	
	REPLACEMENT OF A HEATER CUT-OUT VALVE	
	Removal.	
13	Drain the radiator and the cylinder block. Retain the water which contains anti-freeze	21 mm spanner
14	Remove the trimming panel under the scuttle, right side.	
15	Remove the rubber cap, from the cut-out valve knob.	
16	Remove the heater control indicator plate and its joint.	

TOOLS

17 Remove the accelerator control relay (see Op. DS 142-4).

18 Disconnect the flexible hot water inlet pipes and the feed pipes of the heating and demisting radiators from the cut-out valve.

19 Remove the fixing screws and disengage the cut-out valve body.

Refitting.

20 Put the cut-out valve body in position and tighten the fixing screws (spring washers under the heads).

21 Connect the flexible hot water inlet pipes and feed pipes of the heating and demisting radiators to the cut-out valve. Fit the fixing clips, insert a flexible sleeve.

22 Fit the accelerator control relay (see Op. DS 142-4).

23 Fit the joint and the heater control indicator plate.

24 Fit the rubber cap on the cut-out valve knob.

25 Fit the trimming panel under the scuttle, right side.

26 Refill the water system. Open the heater cut-out valve.
Bleed the water system.

27 Adjust the slow running (see Op. DS 142-0).

28 Adjust the clutch engagement control (see Op. DS 314-0).

		TOOLS
	DISMANTLING (see Pl. 167).	
1	Remove the rubber cap from the cut-out valve knob.	
2	Remove the screws (1) and disengage the assembly by working it from the cut-out body	8 mm box spanner
3	Disengage the rubber diaphragm (2) from the screw of the valve.	
4	Turn the control knob in a clockwise direction and disconnect the valve screw (3) from the knob support (4).	
5	Clean the parts.	
	ASSEMBLY (see Pl. 167).	
6	Grease the valve screw (Antar Cardrex graphite grease) and connect to the knob support (4). These parts should be screwed in an anti-clockwise direction.	
7	Put the rubber diaphragm (2) on the support (5) of the valve screw.	
8	Put the assembly in position in the valve body. Tighten the screws (1) moderately (spring washers under the heads)	8 mm box spanner
9	Fit the rubber cap on the cut-out valve knob.	

COMPONENT	No. of Illustration	DESCRIPTION
ENGINE	1	Longitudinal section.
	2	Cross section.
	4	Valve seats.
	5	Fitting of valves.
	6	Calibration of springs.
	7	Cylinder head.
	8	Replacement of valve guides.
	9	Replacement of valve guides.
	10	Oil pump.
	11	Adjustment of oil pump.
	12	Fitting cylinder barrel joints.
	13	Piston and connecting rod.
	14	Assembly of oil seals.
	15	Setting timing wheels.
	16	Various tools.
	17	Various tools.
	18	Stands for dismantled engine.
	19	Stand for dismantled engine-gearbox assembly.
	20	Checking the distance between support and crossmember.
	21	Adjusting the longitudinal position of rear engine supports.
	22	Adjusting the height of rear engine supports.
	23	Adjusting centres of rear engine supports.
	24	Spanners for adjustment of rear engine supports.
	25	Engine and gearbox assembly.
CARBURETTOR	26	Weber 24/30 DCZCI.
	27	Zenith 24-30 EEAC.
	28	Controls – Filters.
PETROL PUMP	29	Section of GUIOT pump.
	30	Inspection for leaks.
IGNITION	31	Contact breaker.
	32	Adjusting the synchronisation of the breakers.
	33	Testing ignition coil.
	34	Testing ignition coil insulation.
PULLEYS AND TENSIONS	35	Belt tensions.
	36	Alignment of pulleys.

COMPONENT	No. of Illustration	DESCRIPTION
WATER PUMP	37	Low pressure pump and water pump.
	38	Low pressure pump and water pump.
	38A	Ignition advance curve.
	39	Low pressure pump.
	40	Low pressure pump and water pump.
	41	Low pressure pump and water pump.
CLUTCH	42	Assembly.
	43	Adjustment of the toggles.
	44	Adjustment of the toggles.
	45	Controls..
	46	Re-engagement control – accelerated idling.
	47	Re-engagement control – accelerated idling.
	48	Clutch engagement control – clutch cylinder.
	49	Clutch cylinder.
GEARBOX	50	Exterior view.
	51	Removal and replacement.
	52	Assembly.
	53	Shafts.
	53A	Assembly of pinions.
	54	Differential
	55	Cover.
	56	Cover.
	57	First speed selector lever.
	58	Clutch housing.
	59	Adjustment of crown wheel and bevel pinion.
	60	Adjustment of the differential bearings.
	61	Differential bearing.
	62	Stand for gearbox for use on bench.
	63	Various tools.
	64	Various tools.
	65	Various tools.
GEARBOX CONTROLS	66	Gearbox and clutch system.
	67	Hydraulic gear selector.
	68	Hydraulic gear selector.
	69	Hydraulic gear selector.
	70	Hydraulic gear selector.
	71	Hydraulic gear selector.
	72	Various tools.

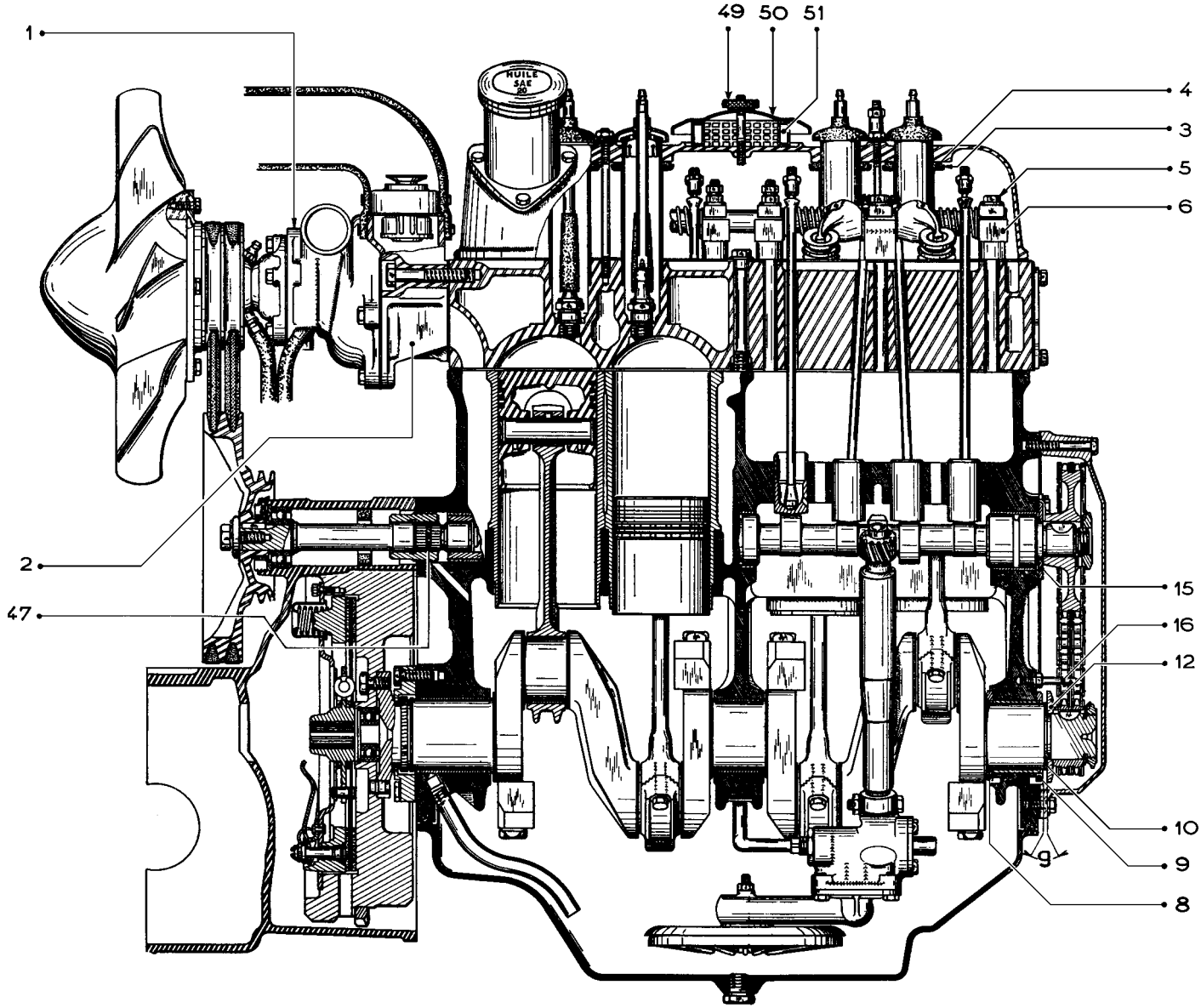
COMPONENT	No. of Illustration	DESCRIPTION
GEARBOX CONTROLS (cont'd)	73	Hydraulic gear selector..
	74	Hydraulic gear selector.
	75	Gearbox.
	76	Checking non-return valve.
SOURCE OF RESERVE OF PRESSURE	77	High pressure system.
	78	High pressure reservoir.
	79	Checking hydraulic units on the car.
	80	Checking hydraulic units on the car (second arrangement).
	80A	Stroboscopic revolution counter.
	80B	Revolution counter.
HIGH PRESSURE PUMP	81	High pressure pump.
	82	High pressure pump.
	83	High pressure pump.
	84	High pressure pump.
	84A	High pressure pump.
	85	High pressure pump.
PRESSURE CONTROL	86	Pressure control valve.
	87	Pressure control valve.
	88	Suspension sphere – accumulator.
PRESSURE DISTRIBUTION BLOCK, BRAKE ACCUMULAOR	89	Pressure distribution block, brake accumulator.
	90	Pressure distribution block.
	91	Pressure distribution block.
	92	Brake accumulator.
	93	Pressure control valve – accumulator.
	94	Sealing plugs – tapered sleeves.
FRONT AXLE	95	Sectional views.
	95A	Section of upper ball joints.
	96	Various tools.
	97	Various tools.
	98	Support for half-axle.
	99	Various tools.
	100	Fitting of seals.
	101	Assembly of the driveshaft cover.
	102	Adjusting the castor angle.

COMPONENT	No. of Illustration	DESCRIPTION
REAR AXLE	103	Hub drum assembly.
	104	Articulating bearing.
	105	Locking the articulating bearing.
	106	Holding the arm in a vice.
	107	Extraction of the hub – brake drum.
	108	Extraction of the outer hub bearings.
	109	Extraction of the inner ring of the outer hub bearing.
	110	Adjustment of the bearing clearances.
SUSPENSION	111	Hydraulic suspension circuit.
	112	Hydraulic suspension circuit.
	113	Front axle suspension.
	114	Anti-roll bar and height corrector control.
	114A	Arrangement of anti-roll bar springs.
	115	Rear axle assembly.
	116	Rear suspension cylinder.
	117	Height corrector – suspension cylinder.
	118	Various tools.
	119	Suspension cylinder.
	120	Height variation control.
	121	Height variation control.
STEERING	122	Assembly.
	123	Sectional views.
	124	Rotating union.
	124A	Adjustment of pinion.
	125	Adjustments.
	126	Fitting the steering wheel.
	127	Various tools.
	128	Various tools.
	129	Various tools.
	130	Various tools.
	131	Assembly of joints.
	132	Hydraulic steering system.
	133	Rotating union.
	134	Piston-cylinder assembly.
	135	Adjusting the pressures.
	136	Adjusting the pressures.
RELAYS	137	Section of relay assembly.
	138	Adjusting the position of a relay.

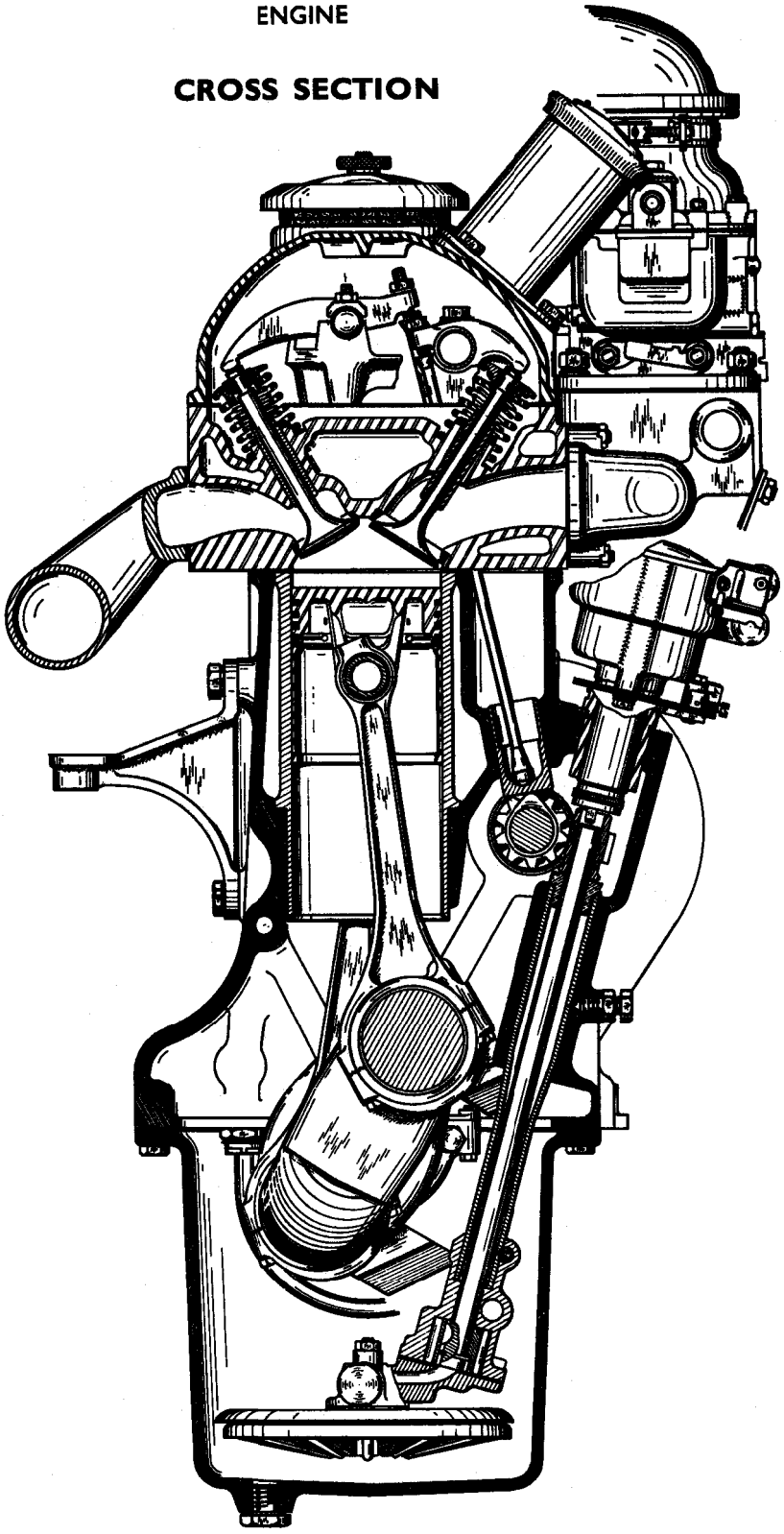
COMPONENT	No. of Illustration	DESCRIPTION
RELAYS (cont'd)	139	Various tools.
BRAKES	140	Hydraulic system for brakes.
	141	Brake assembly.
	142	Brake assembly.
	143	Tools for brakes.
REAR BRAKES	144	Rear brake backplate.
	145	Removing and fitting the return springs.
	146	Rivetting the brake – cam pins.
	147	Grinding the rear brake drum.
	148	Centring the brake shoes.
CONTROLS		149Hydraulic brake control.
	150	Hydraulic brake control.
	151	Hydraulic brake control.
	152	Brake pressure switches.
	153	Mechanical brake control.
ELECTRICAL	154	DUCELLIER dynamo 7116-A.
	155	DUCELLIER dynamo 7116-A.
	156	PARIS-RHÔNE dynamo G 11 R 75.
	157	P PARIS-RHÔNE dynamo G 11 R 75.
	158	DUCELLIER starter 6008-A,
	159	DUCELLIER starter 6008-A.
	160	PARIS-RHÔNE starter D 11 B 42.
	161	PARIS-RHÔNE starter D 11 B 42.
	162	BENADA drive.
	163	Assembly of the field coils and field magnets.
	164	Wiring diagram.
	165	Wiring diagram.
	166	Wiring diagram.
HEATING AND DEMISTING	167	Heating and demisting circuit.
HYDRAULIC	168	Lifting points of the body.
	169	Inspection of camber angle.
	170	Pre-adjustments of the front heights.
	171	Test bench.
	172	Test bench.
	173	Pipes and unions.

COMPONENT	No. of Illustration	DESCRIPTION
HYDRAULIC (CONT'D)	174	Dynamic test bench assembly.
	175	Hydraulic gear selector.
	176	Regulator feed.
	177	High pressure pump.
	178	Accumulator –pressure distribution block – suspension spheres.
	179	Steering.
	180	Steering.
	181	Hydraulic brake control.
	182	Steering.
BODYWORK	183	Lifting for towing.
	184	Lifting the car for towing.
	129	Pressure control valve.
	130	Pressure distribution block. Inspection for leakage of the valve settings.
	131	Pressure distribution block. Inspection of the valve settings.
	132	Main accumulator - pressure test.
	133	Pressure control valve.
	134	Suspension cylinder. Inspection for leakage.
BODY	135	Lifting the car for towing. Points of anchorage.
	136	Lifting the car for towing (details).
	137	Support for towing.
	138	Support for towing (details).
	139	Support for towing (assembly).

LONGITUDINAL SECTION



CROSS SECTION



ASSEMBLY OF VALVE ROCKERS

Fig. 1

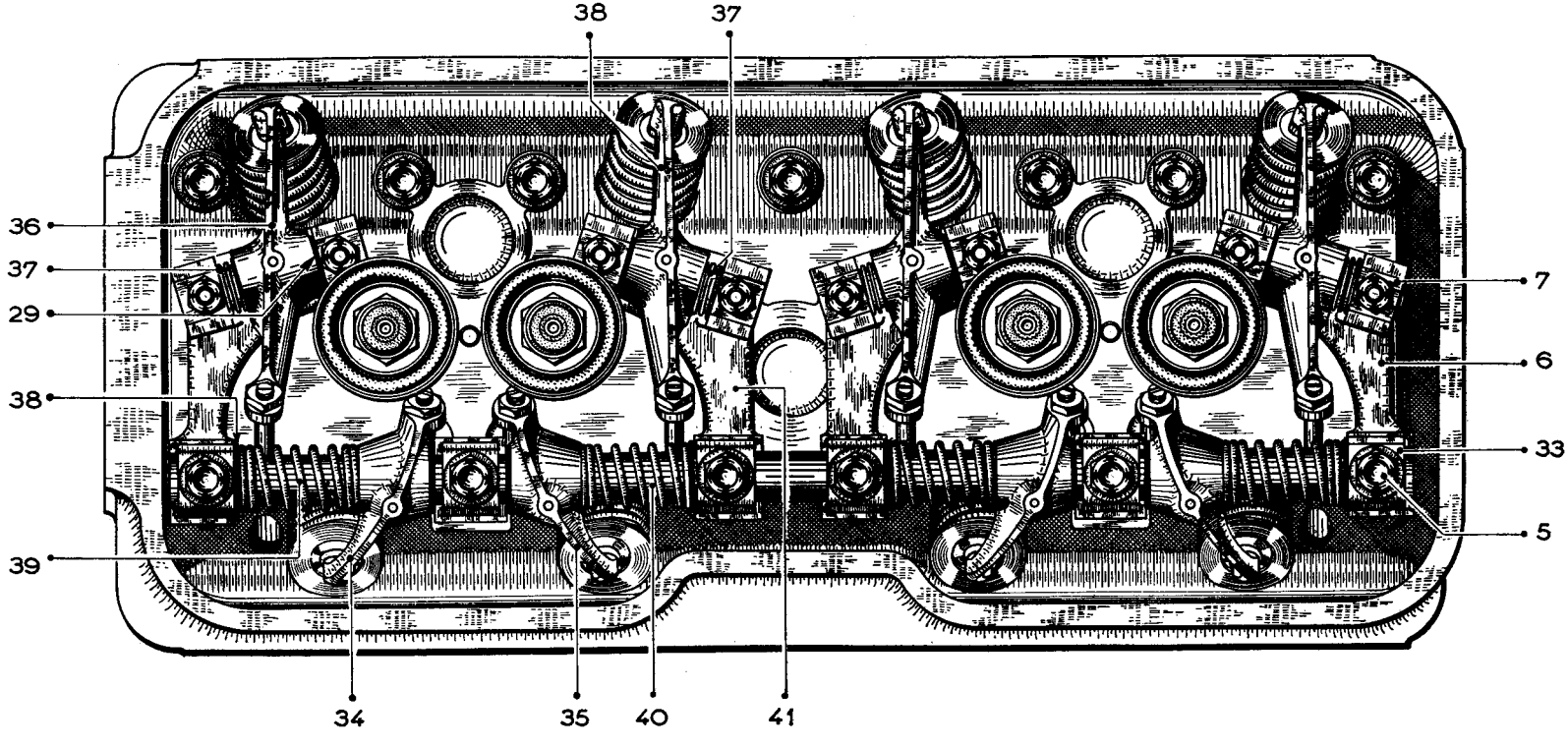


Fig. 2

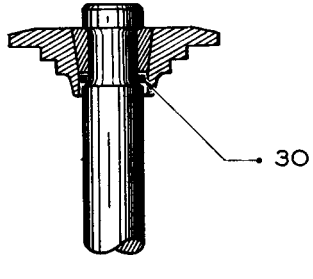


Fig. 3

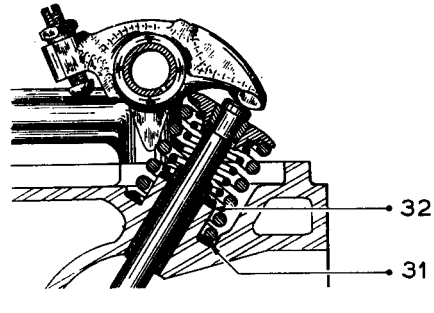
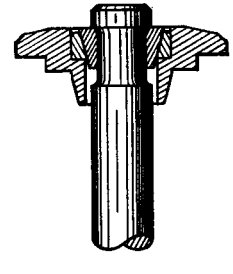


Fig. 4



VALVE SEATS

Fig. 1 EXHAUST VALVE SEAT

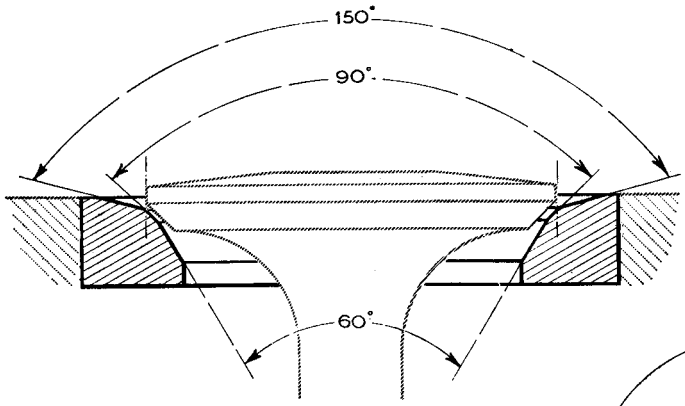


Fig. 2 INLET VALVE SEAT

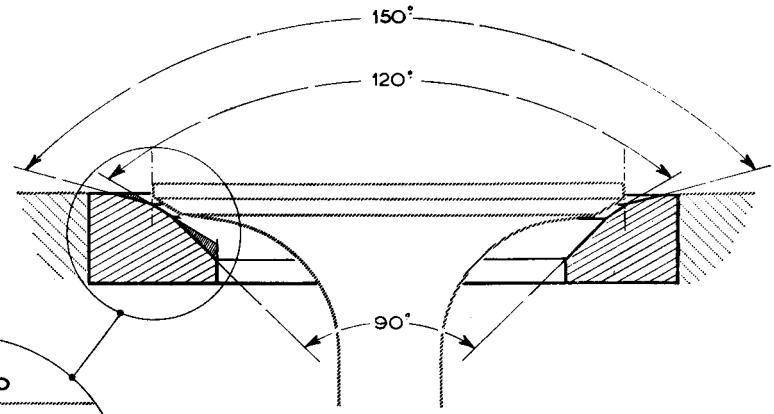


Fig. 3

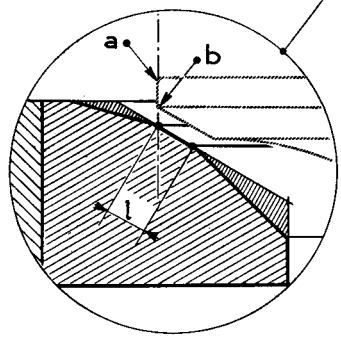


Fig. 6

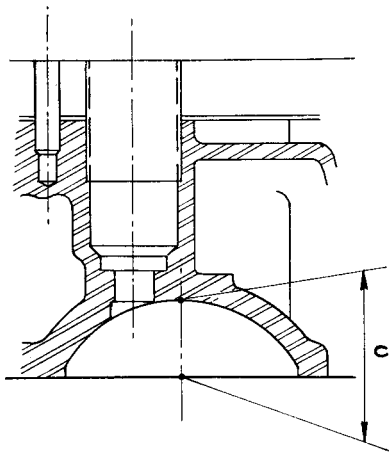


Fig. 4 VALVE GRINDING TOOL sold under No. 1615-T

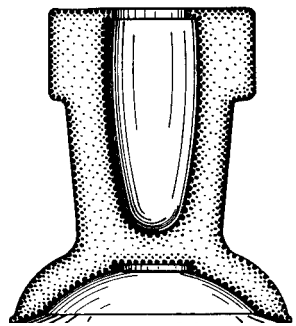
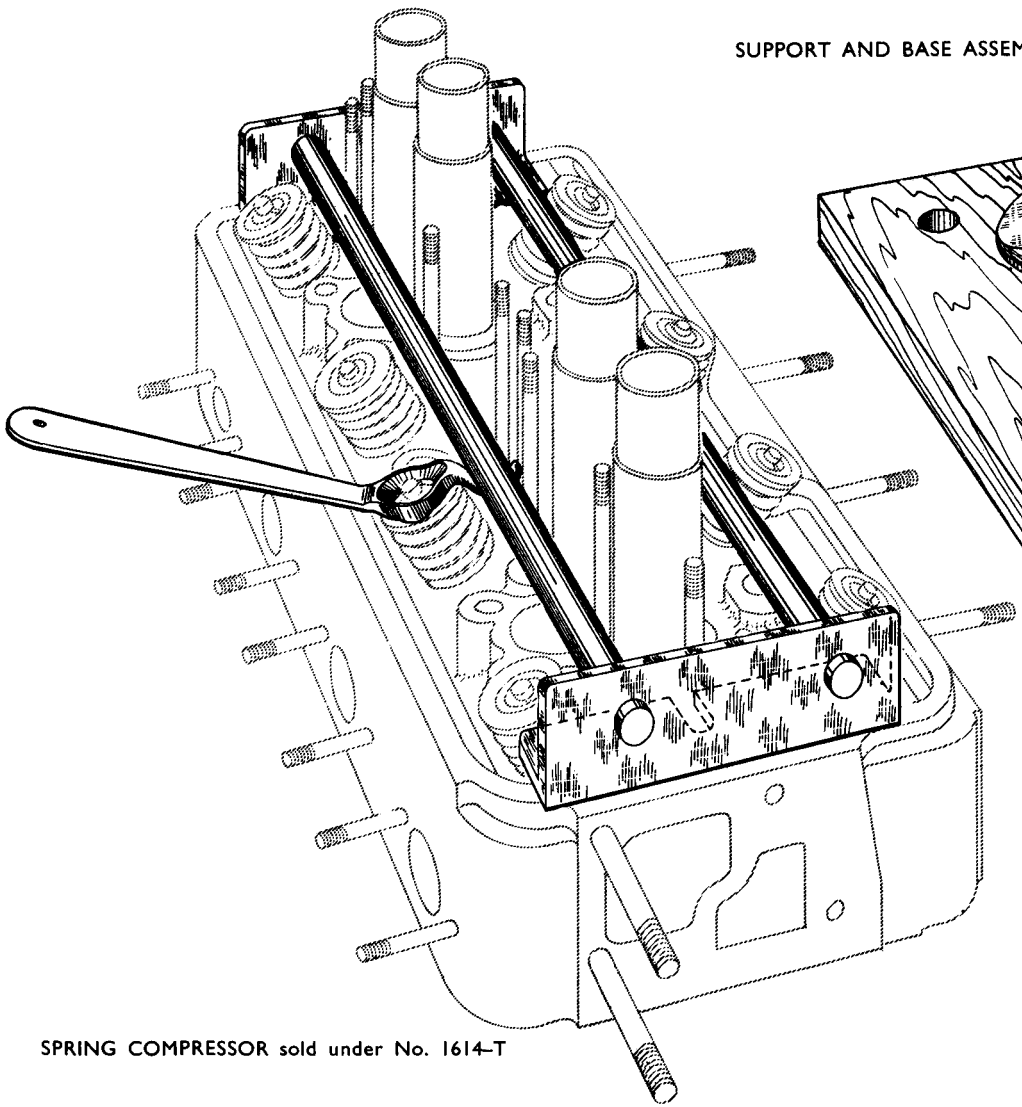


Fig. 5 TABLE OF GRINDING WHEELS

SEATS TO BE GROUND	USE OF WHEEL	ANGLE	DESCRIPTION OF GRINDING WHEEL
INLET	Valve Seat	120°	Single Cone 44 dia. 1662-T
	For top clearance	150°	Biconical 44 dia. 1630-T
	For lower clearance	90°	
EXHAUST	Valve Seat	90°	Biconical 40 dia. 1627-T
	For top clearance	150°	
	For lower clearance	60°	Single Cone 40 dia. 1633-T

FITTING OF VALVES

Fig. 1



SPRING COMPRESSOR sold under No. 1614–T

Fig. 2

SUPPORT AND BASE ASSEMBLY sold under No. 1616–T

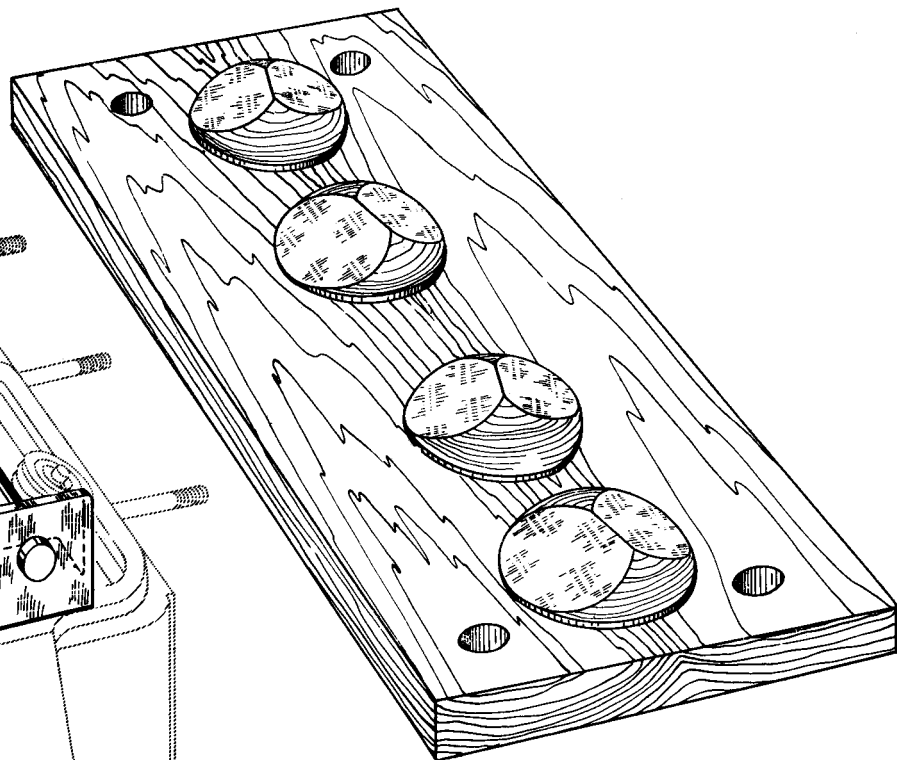
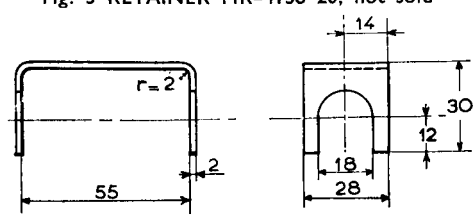


Fig. 3 RETAINER MR–4158–20, not sold



CALIBRATION OF SPRINGS

1st CHECKING THE FREE LENGTH OF A SPRING

Place the spring to be checked (1) in the two guides (2). By hand bring the slide (3) into contact with it. The index mark (4) is now opposite the figure on the scale (5) (length) showing the free length of the spring (1).

2nd CHECKING THE LENGTH UNDER LOAD

A – Place the calibrated spring (6) or 12 as the case may be in the two holes (a) and bring the slide (8) into contact with it by turning the handwheel.

B – By the handwheel (9) bring the spring (1) to be checked to the length under load shown in the text. Read this length opposite the index mark (4) on the scale of length (5).

C – Read on the scale { (10) (load in kg) opposite the index mark (11) if using the calibrated spring (6) / (14) (load in kg) opposite the index mark (13) if using the calibrated spring (12) } the corresponding load.

Fig. 1 FIXTURE FOR CALIBRATING SPRINGS

sold under No. 2420–T

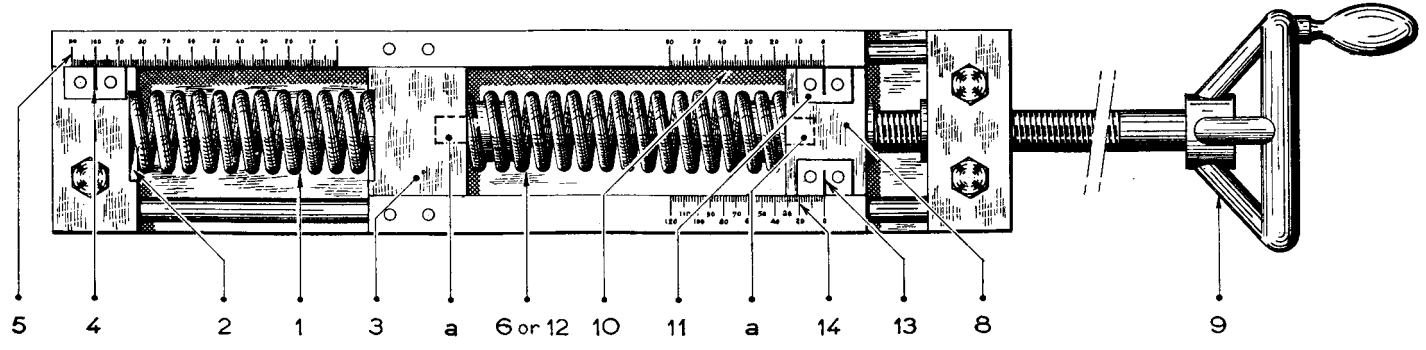
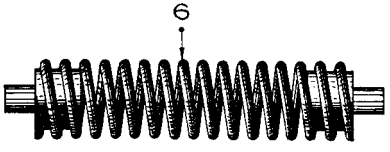


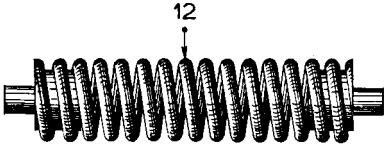
Fig. 2 CALIBRATED SPRINGS



SPRING DEFLECTING 1 mm per kg

sold under No. 2421–T

this spring is painted yellow



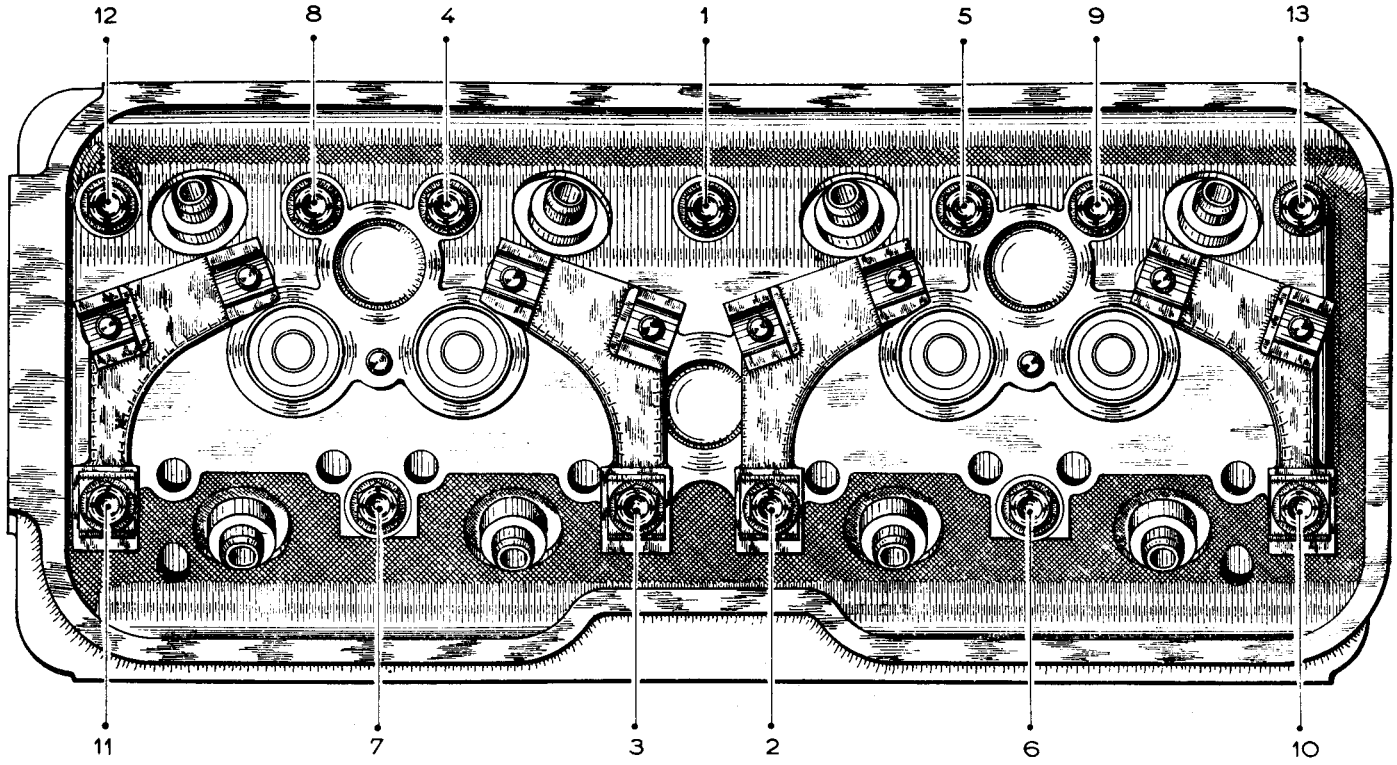
SPRING DEFLECTING 1 mm per 2 kg

sold under No. 2422–T

this spring is painted red

CYLINDER HEAD

Fig. 1 SEQUENCE OF TIGHTENING SCREWS



TENSION OF TIGHTENING (COLD)

First tightening 21·75 ft./lb. (3 m/kg) Second tightening 43·5 ft./lb. (6 m/kg)

It is advisable to tighten the screws in the order indicated above. The tension of the tightening is of the greatest importance and the use of a torsion spanner is indispensable.

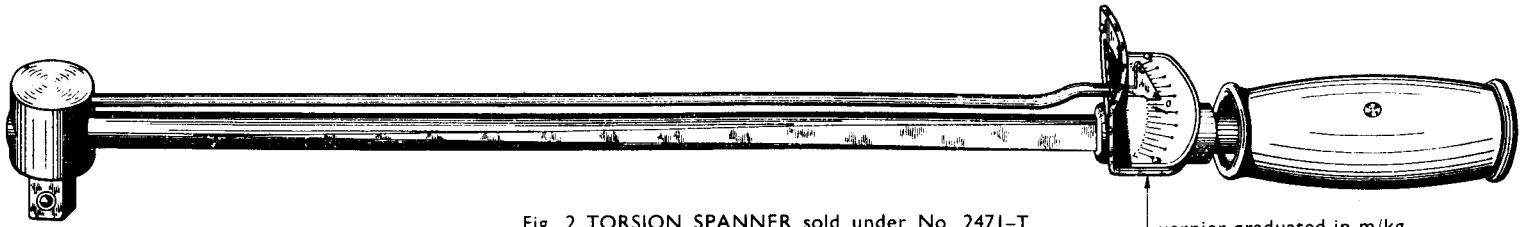


Fig. 2 TORSION SPANNER sold under No. 2471-T

REPLACEMENT OF VALVE GUIDES

Fig. 1 EXTRACTING A GUIDE

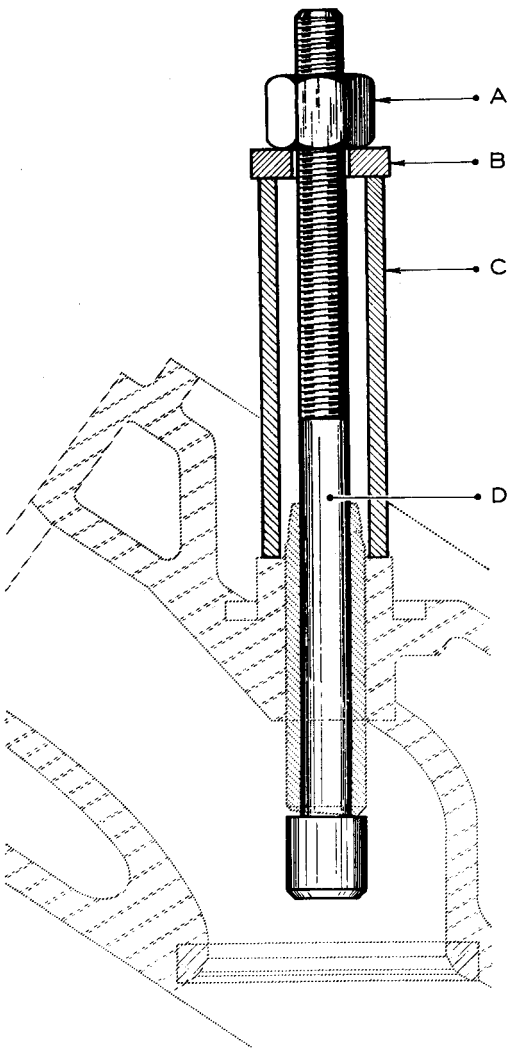


Fig. 2 FITTING AN INLET VALVE GUIDE

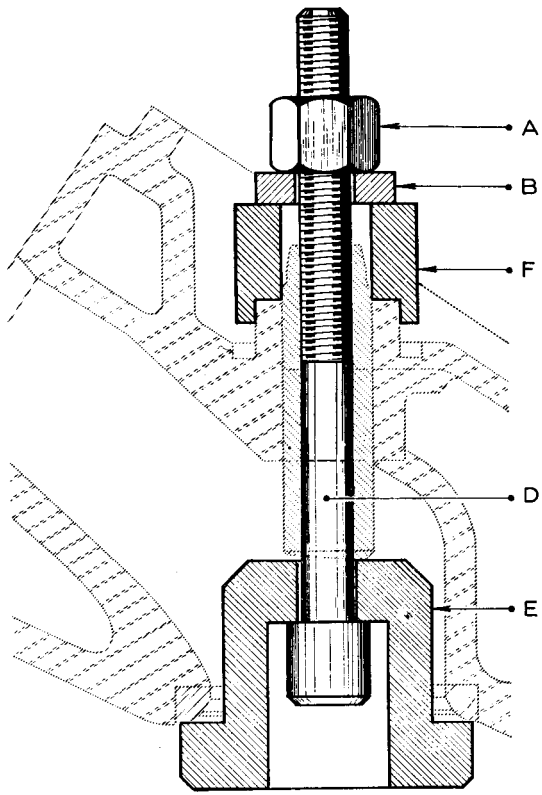
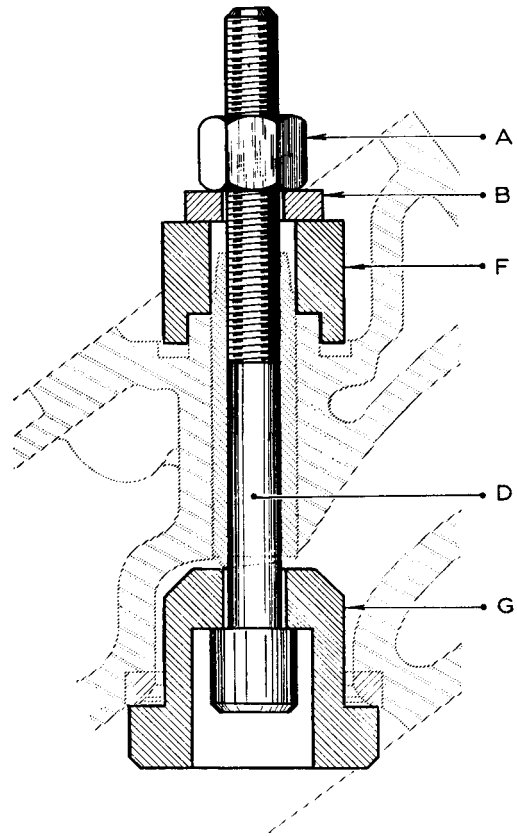


Fig. 3 FITTING AN EXHAUST VALVE GUIDE



tool sold under No. 1644–T

REPLACEMENT OF VALVE GUIDES

Fig. 1 TOOL sold under No. 1644–T

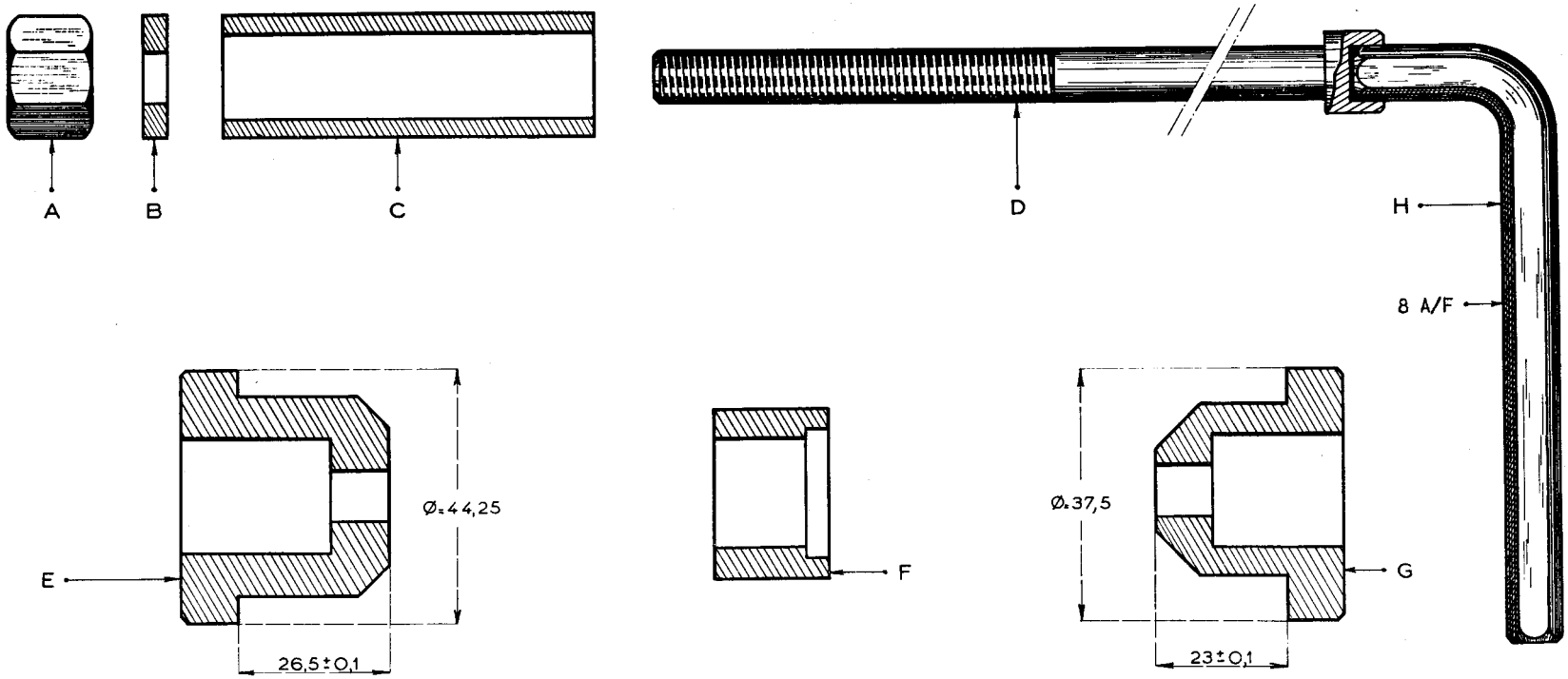
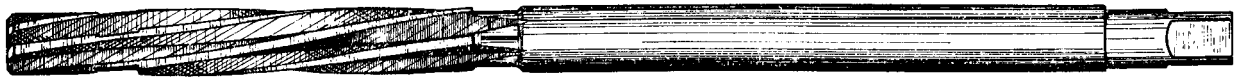


Fig. 2 REAMER sold under No. 1642–T



OIL PUMP

Fig. 1

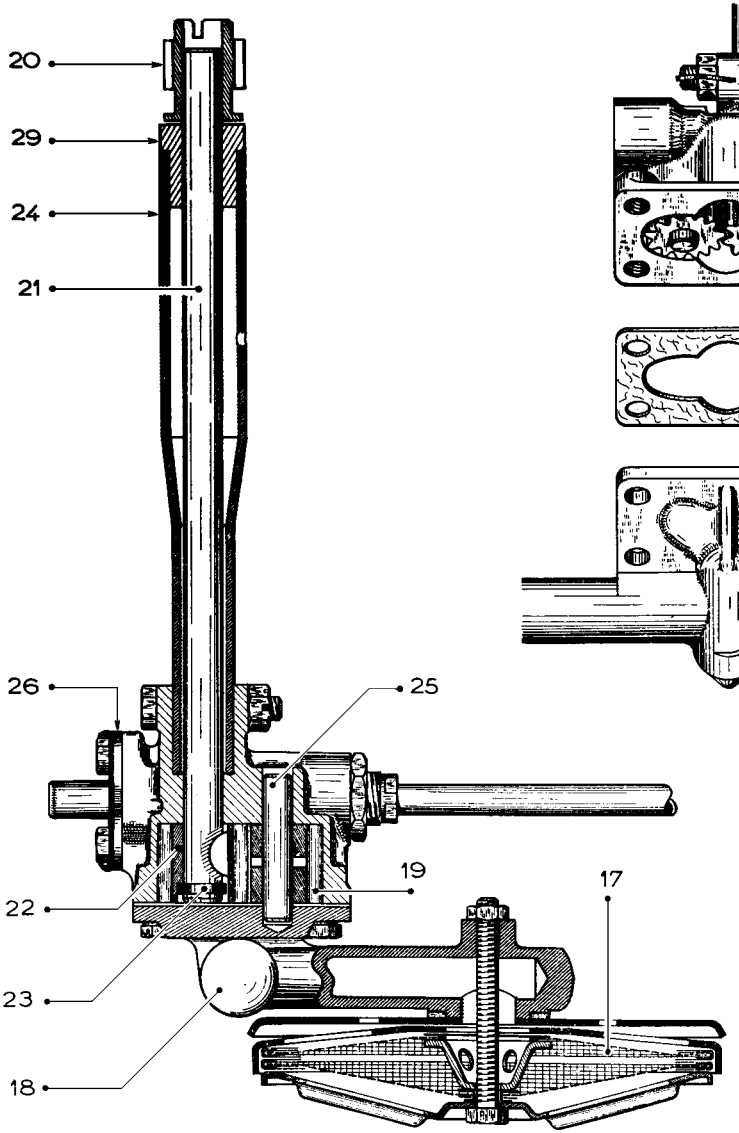


Fig. 2

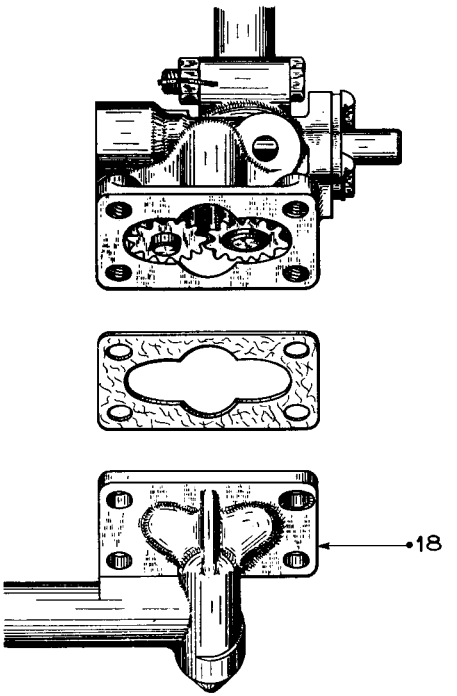


Fig. 3

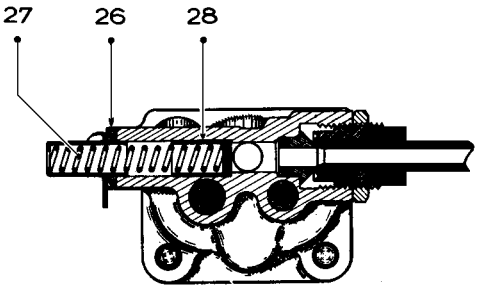
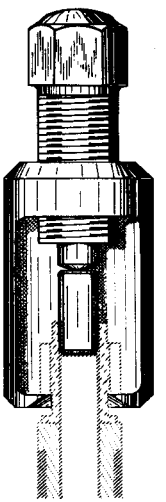


Fig. 4 EXTRACTOR sold under No. 1964-T



PRESSURE PAD
dia. 12 length 40

ADJUSTMENT OF OIL PUMP

Fig. 1 SIMPLIFIED ASSEMBLY MR-1811 not sold

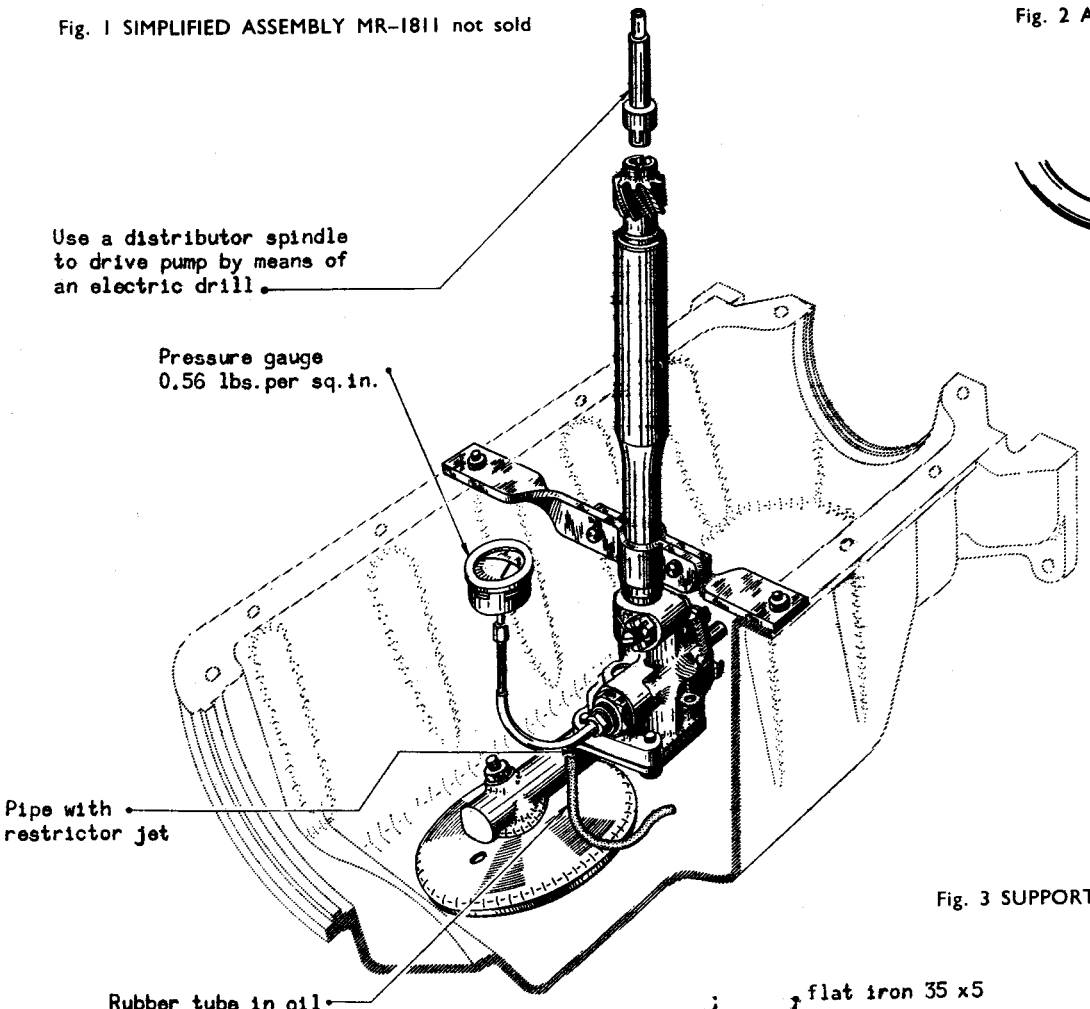
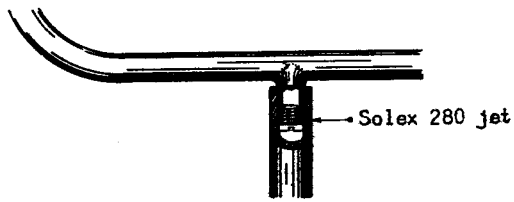
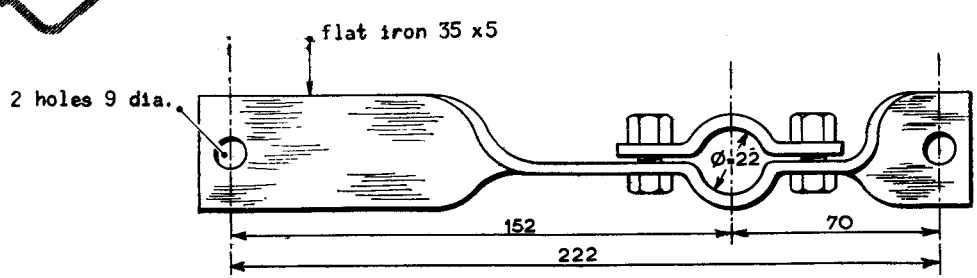


Fig. 2 ASSEMBLY OF RESTRICTOR JET



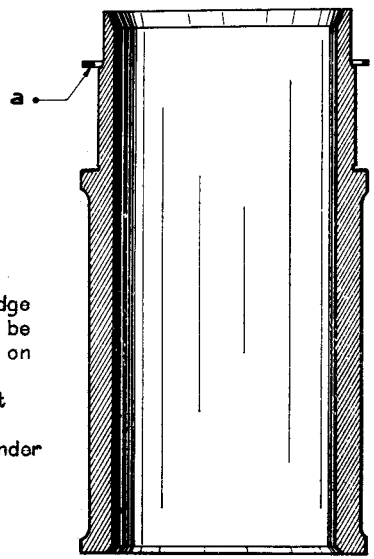
Oil of SAE 20 viscosity warmed to 60° ± 5° C.
The pressure should be 50 lb. per sq. in. (3·5 kg/cm²) at 1,000 r.p.m. If this pressure is not obtained change the spring No. 27 (see illustration No. 8).

Fig. 3 SUPPORT FOR PUMP



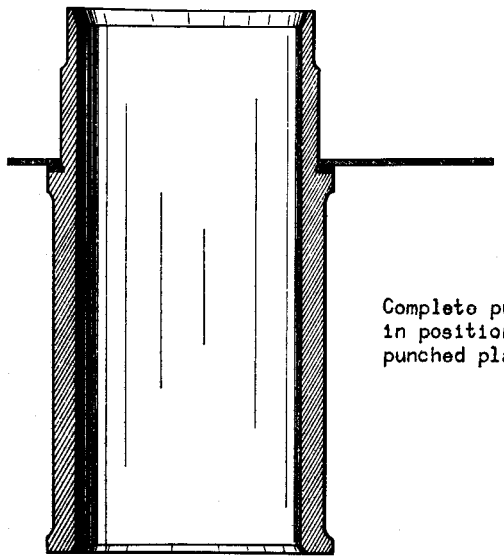
FITTING CYLINDER BARREL JOINTS

Fig. 1



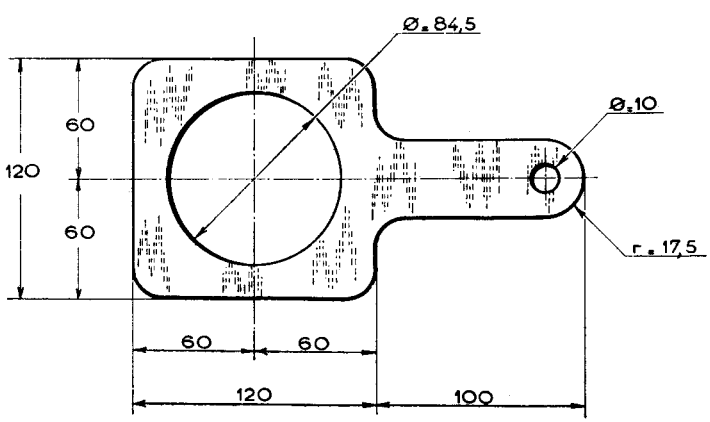
NOTE: The straight edge of the joint should be parallel to the flat on the cylinder barrel. By hand fit the joint as far as the first shoulder on the cylinder barrel.

Fig. 2



Complete putting the joint in position by means of the punched plate MR 4134

Fig. 3 PUNCHED PLATE MR-4134 not sold



PISTON AND CONNECTING ROD

Fig. 1 METHOD OF USING SPRING CLIP

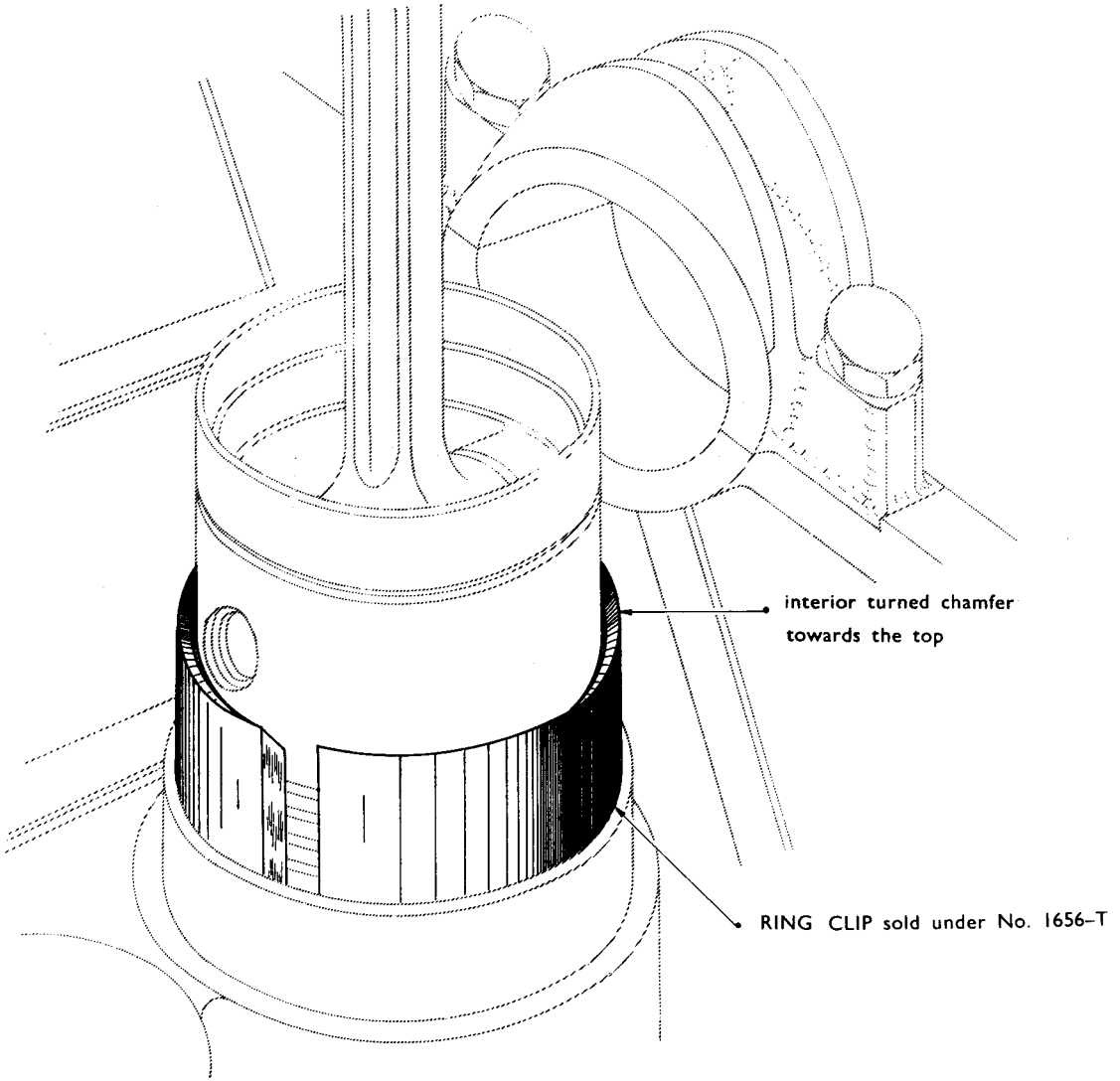
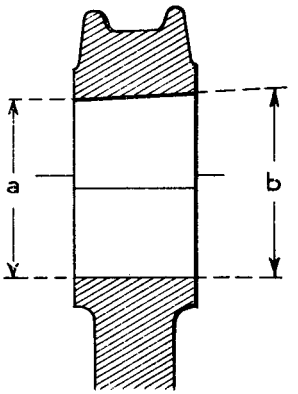
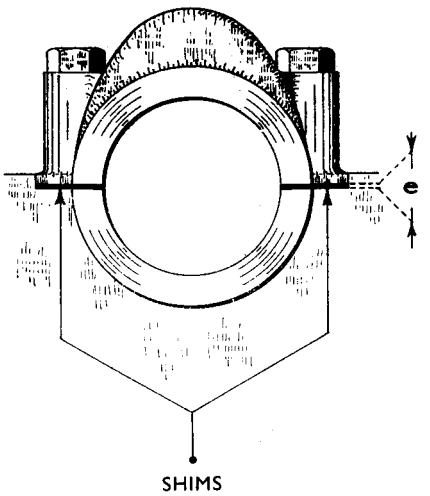


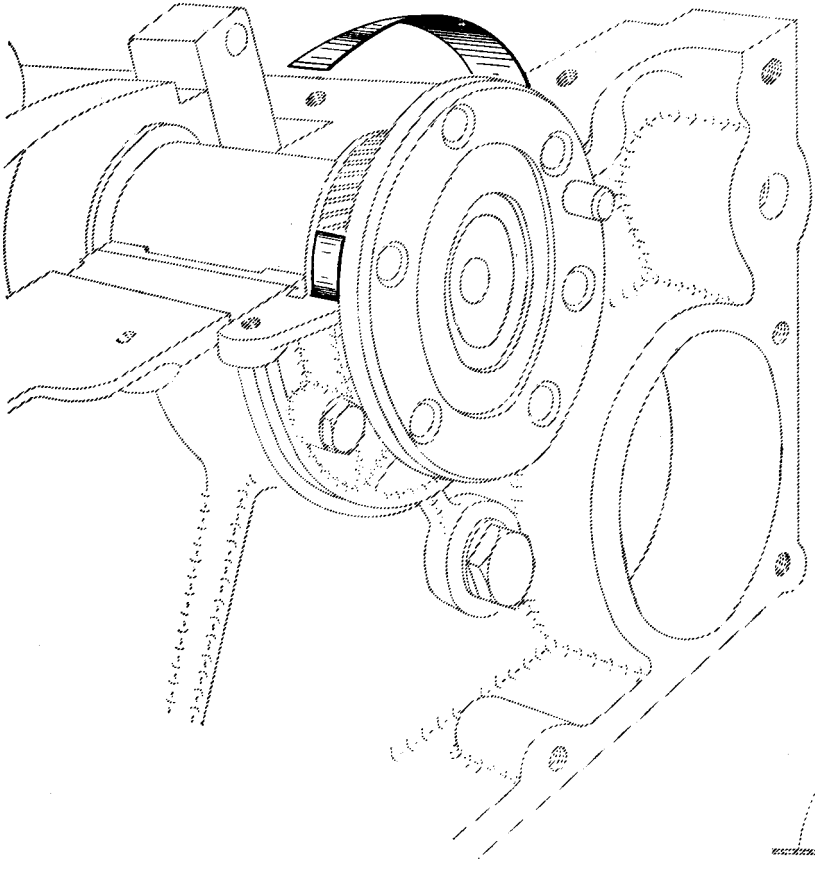
Fig. 2 FITTING A CAST BEARING





ASSEMBLY OF OIL SEALS

Fig. 1



The extremities of the shim must not overlap when the half shells are assembled

Fig. 2

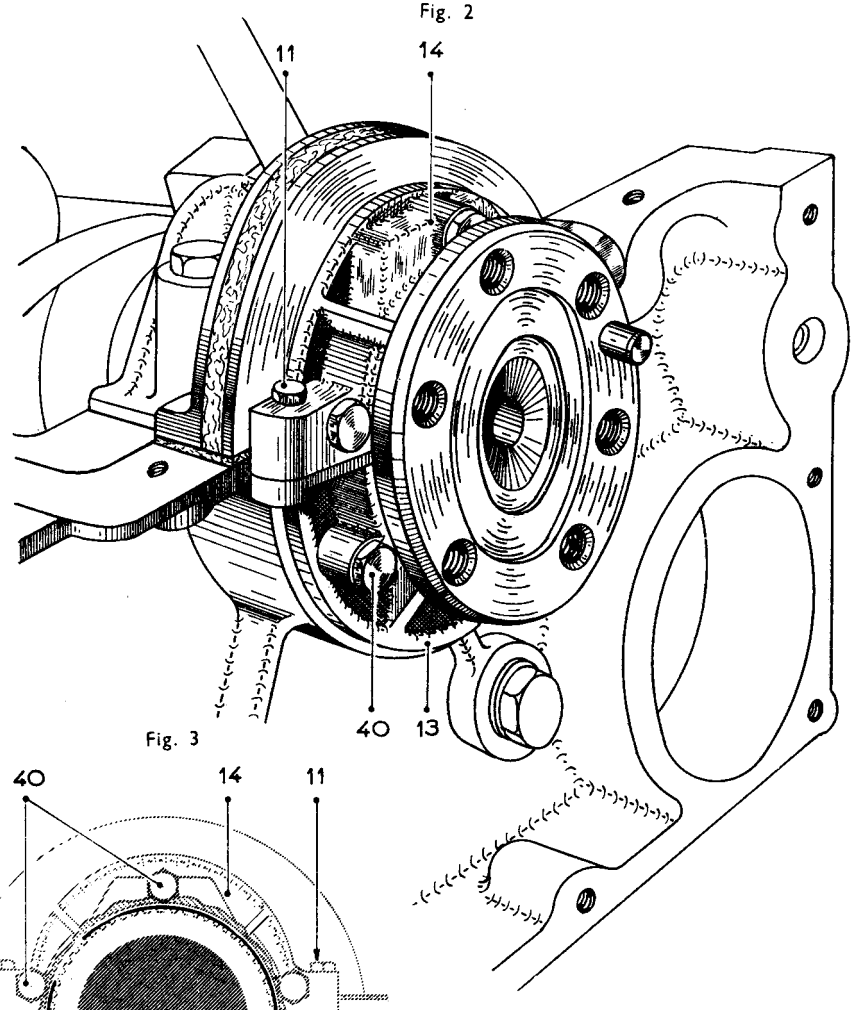
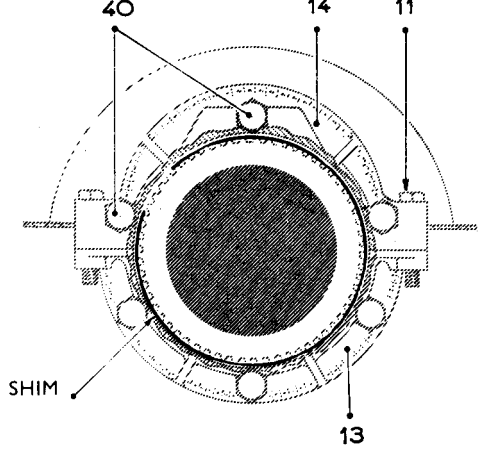


Fig. 3



SETTING TIMING WHEELS

Fig. 1 SPANNER sold under No. 1667–T

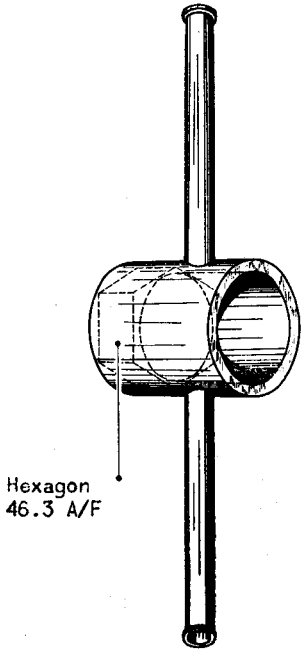
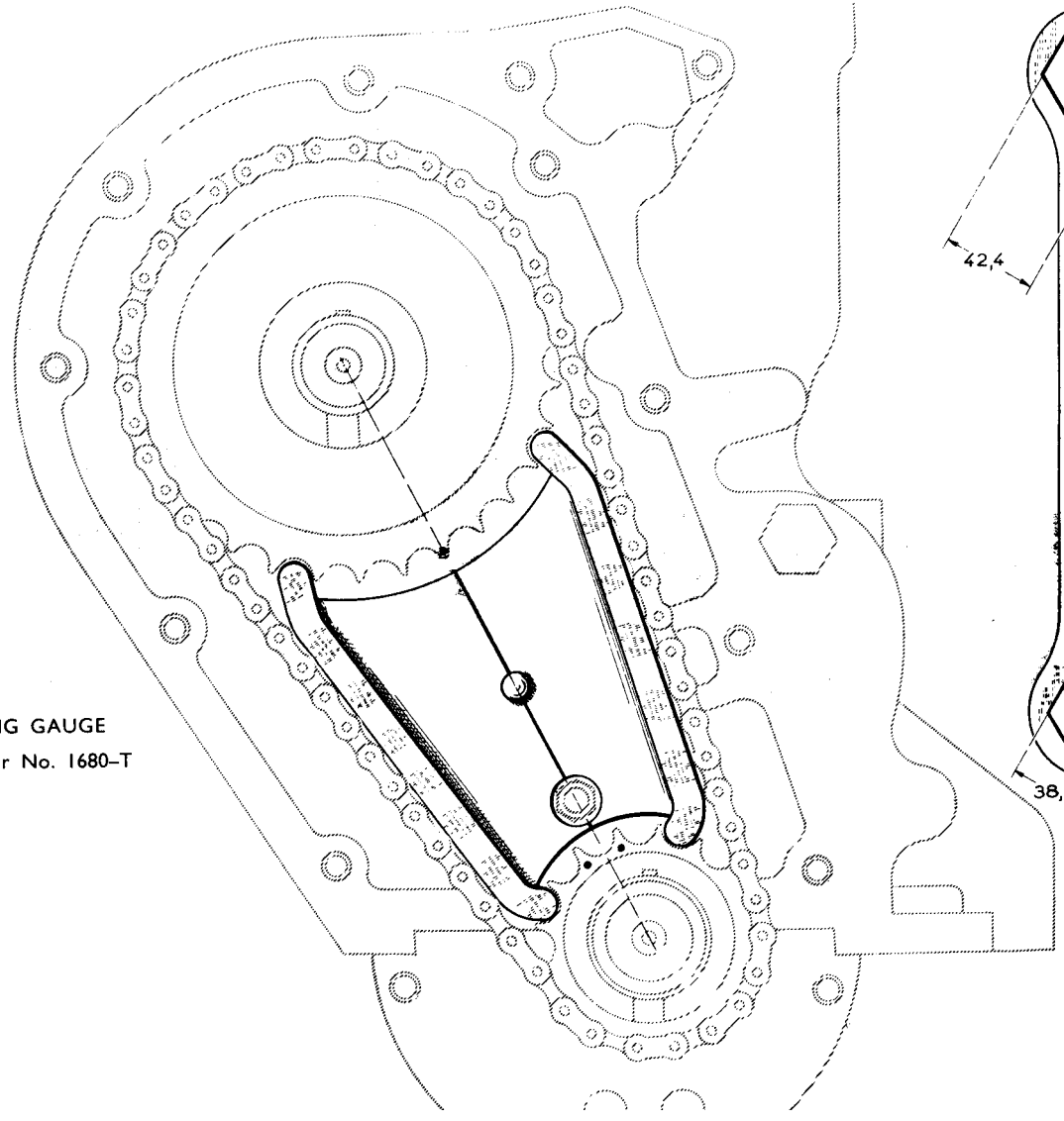
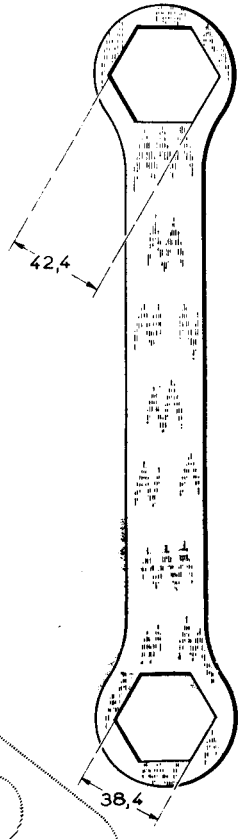


Fig. 2 POSITION OF TIMING MARKS



SETTING GAUGE
sold under No. 1680–T

Fig. 3 SPANNER
sold under No. 1731–T



VARIOUS TOOLS

Fig. 1 STOP MR–4158 not sold

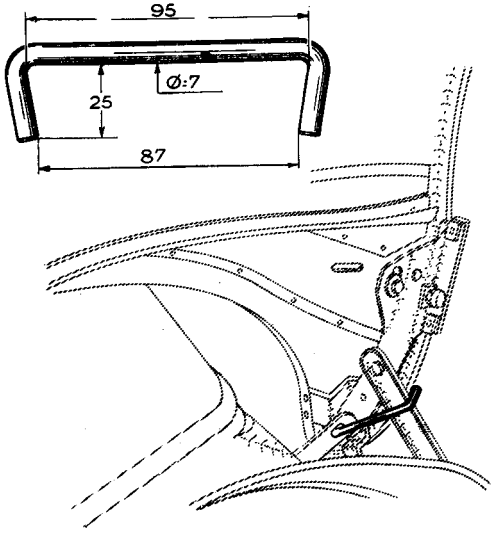


Fig. 2 SPANNER sold under No. 1623–T

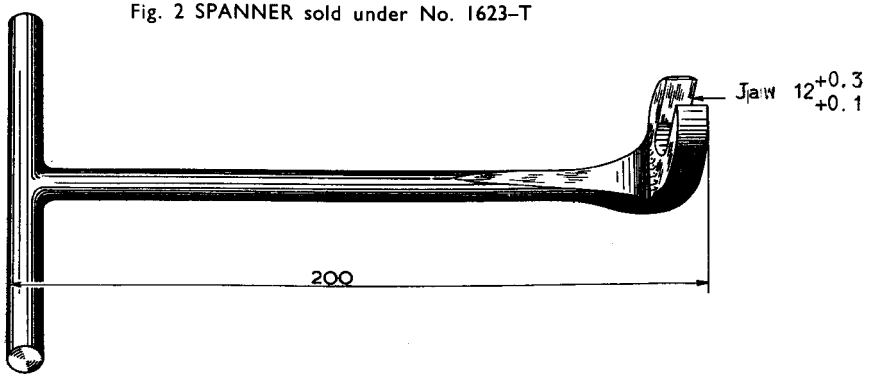


Fig. 3 SPANNER
sold under No. 1624–T



Fig. 4 SPANNER MR 3462–20
not sold

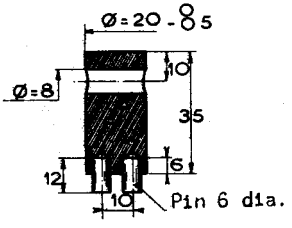


Fig. 5 SPANNER MR 3462–70
not sold

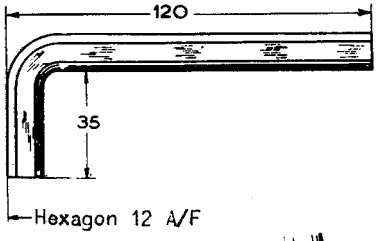


Fig. 6 UNION SCREW MR3705 not sold

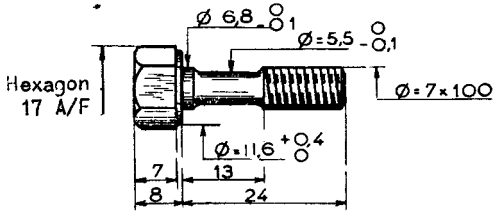
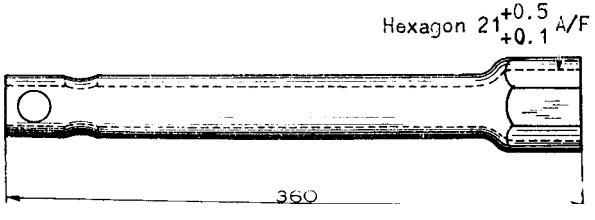
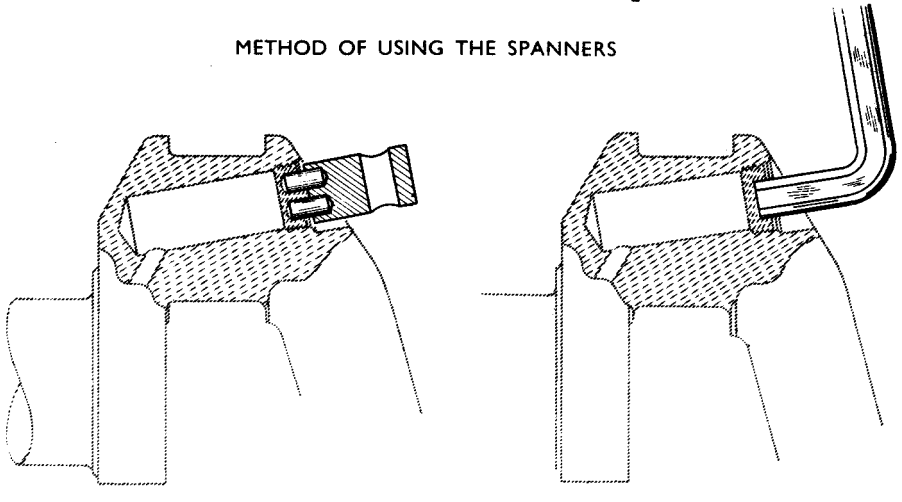


Fig. 7 SPANNER sold under No. 1603–T



METHOD OF USING THE SPANNERS



VARIOUS TOOLS

Fig. 1 EXTRACTOR sold under No. 1608–T

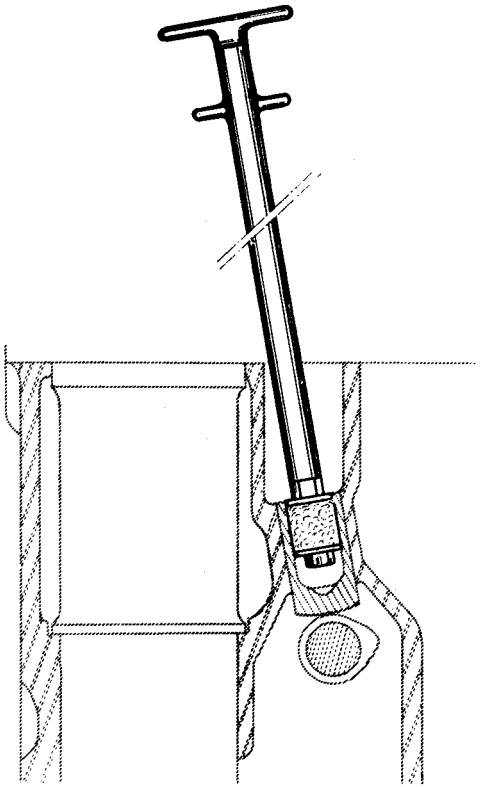


Fig. 3 EXTRACTOR MR 3404–20 not sold

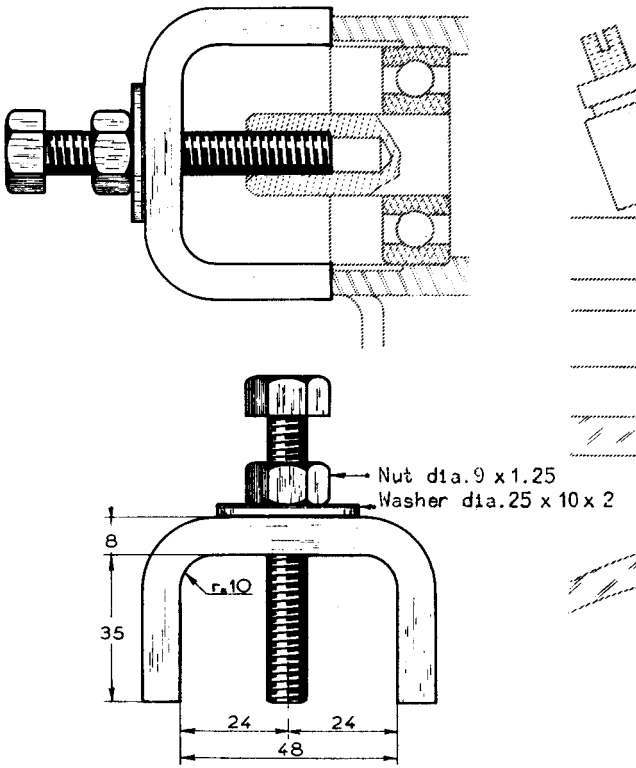


Fig. 4 USE OF THE BUSH MR 4244

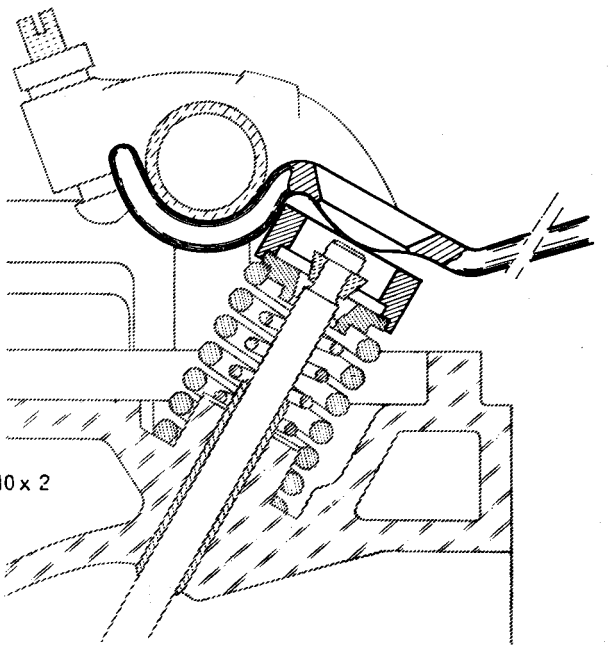
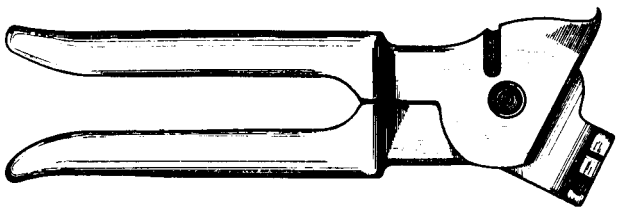


Fig. 2 LIGAREX PLIERS sold under No. 2483–T



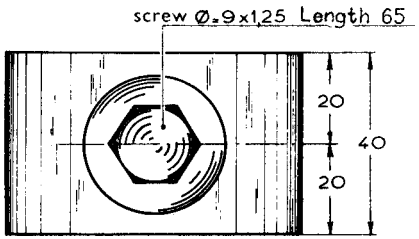
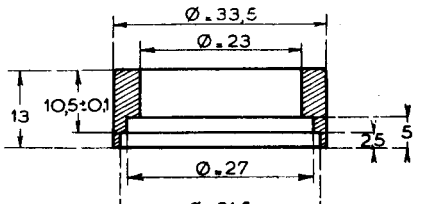


Fig. 5 BUSH MR 4244 not sold



STANDS FOR DISMANTLED ENGINE

Fig. 1 STAND MR 3053–170 not sold

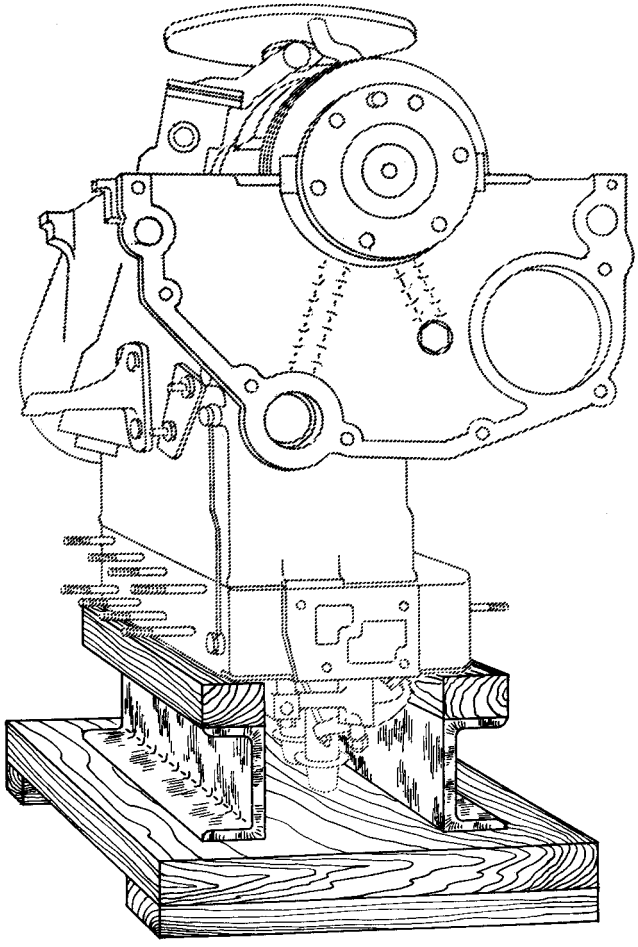
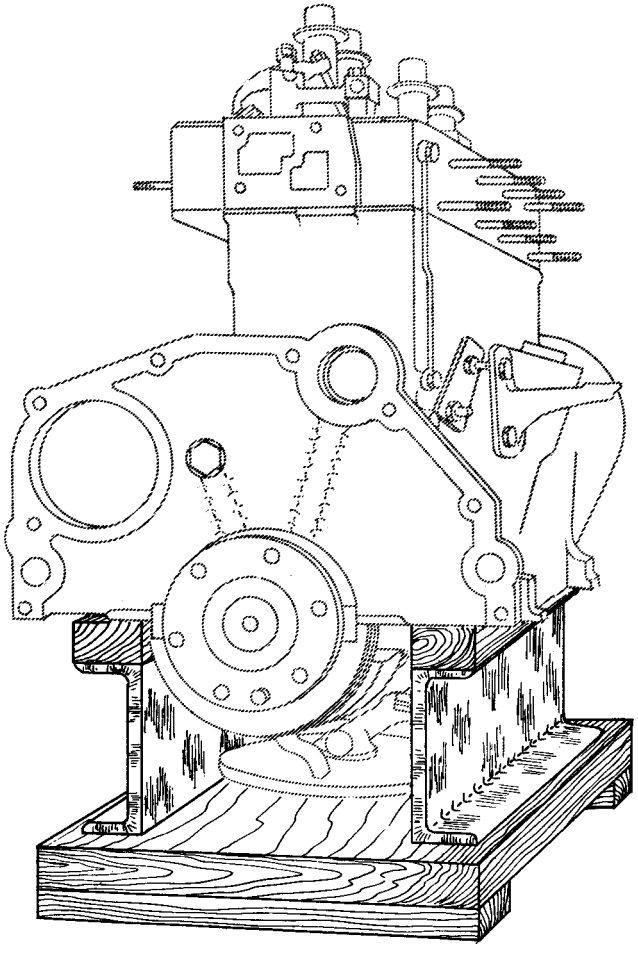


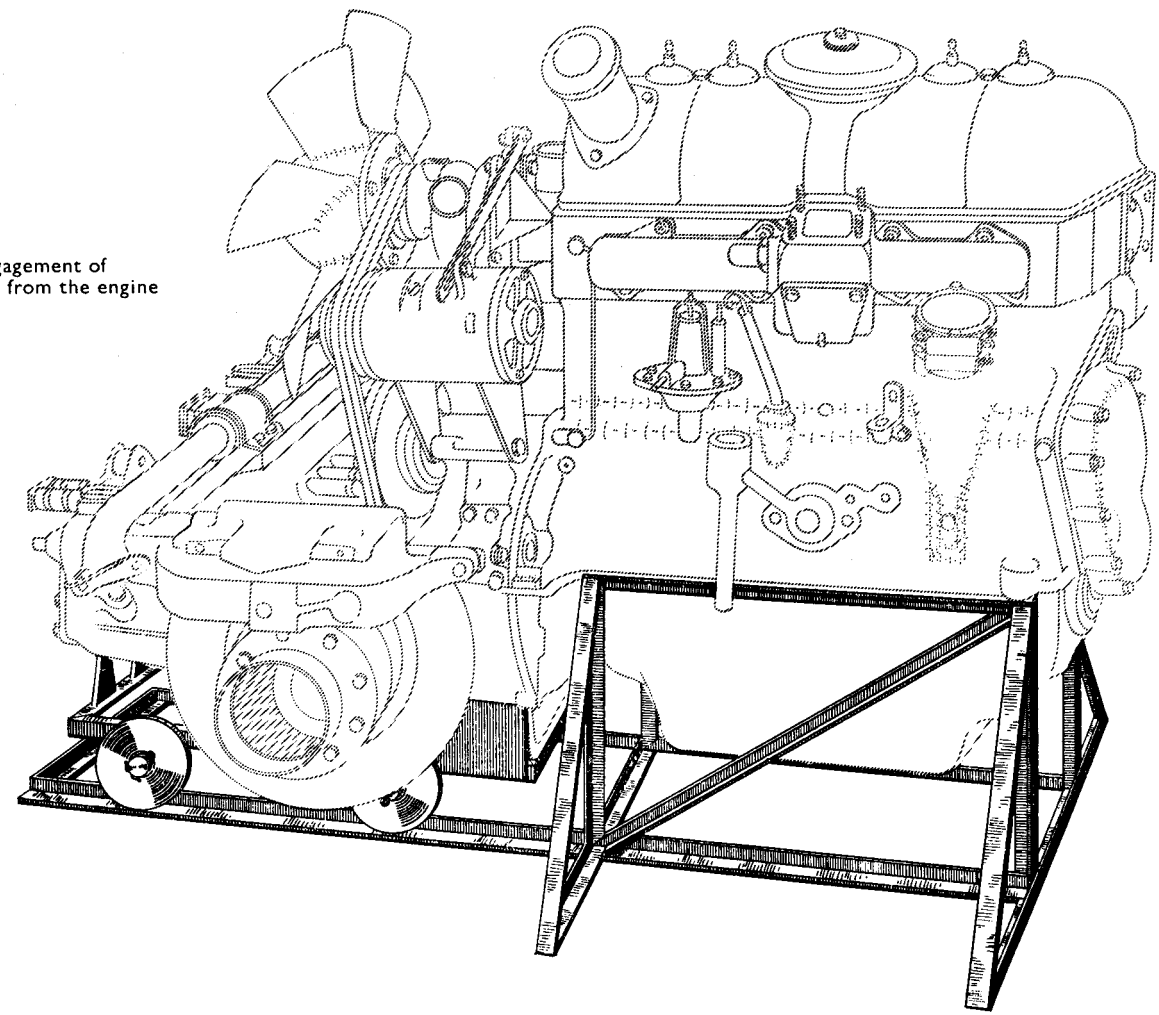
Fig. 2 STAND MR 3053–160 not sold



For constructional dimensions apply to the Service Department

STAND FOR DISMANTLED ENGINE - GEARBOX ASSEMBLY

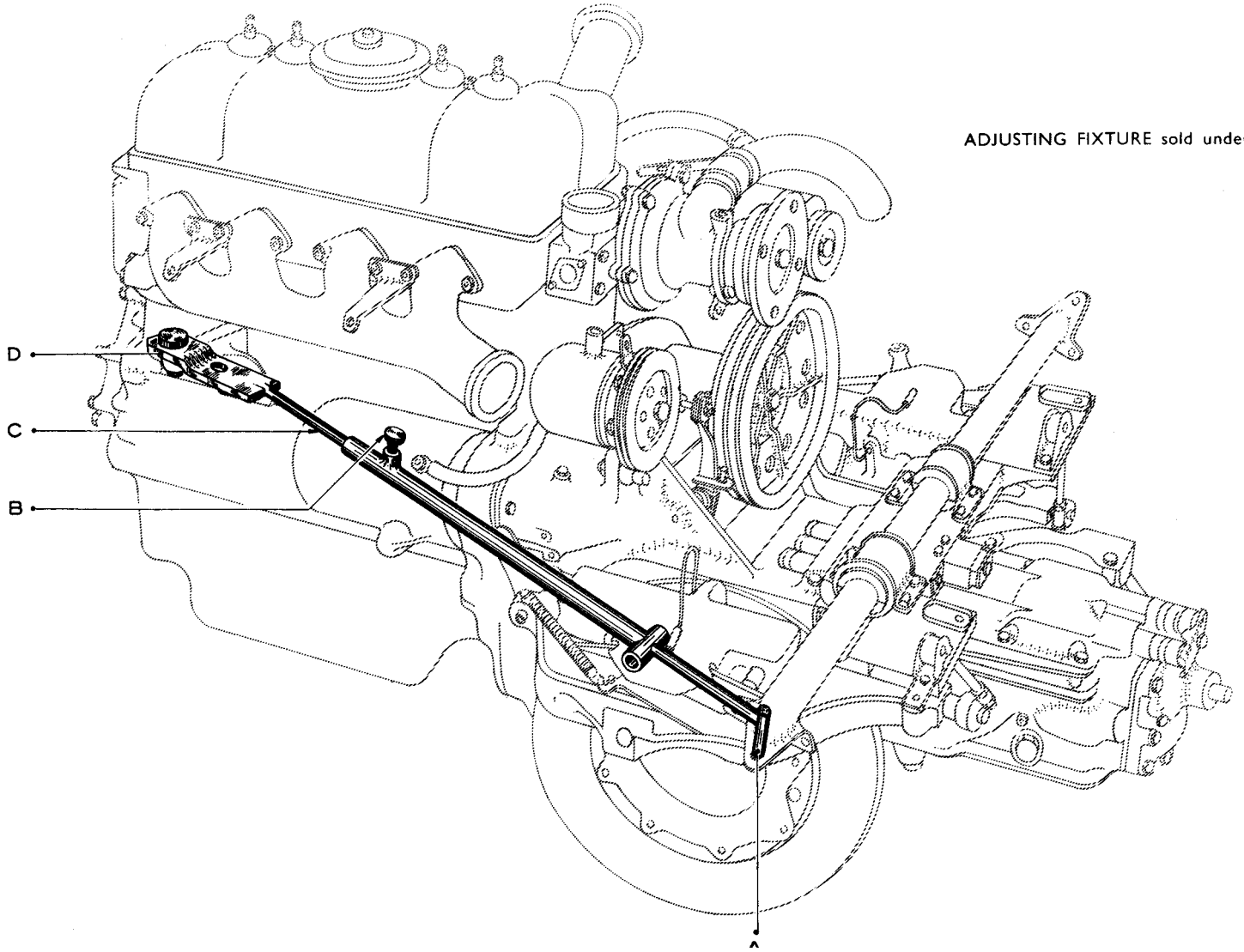
The truck permits disengagement of gearbox after uncoupling from the engine



STAND AND TRUCK
sold under No. 2497-T

CHECKING THE DISTANCE

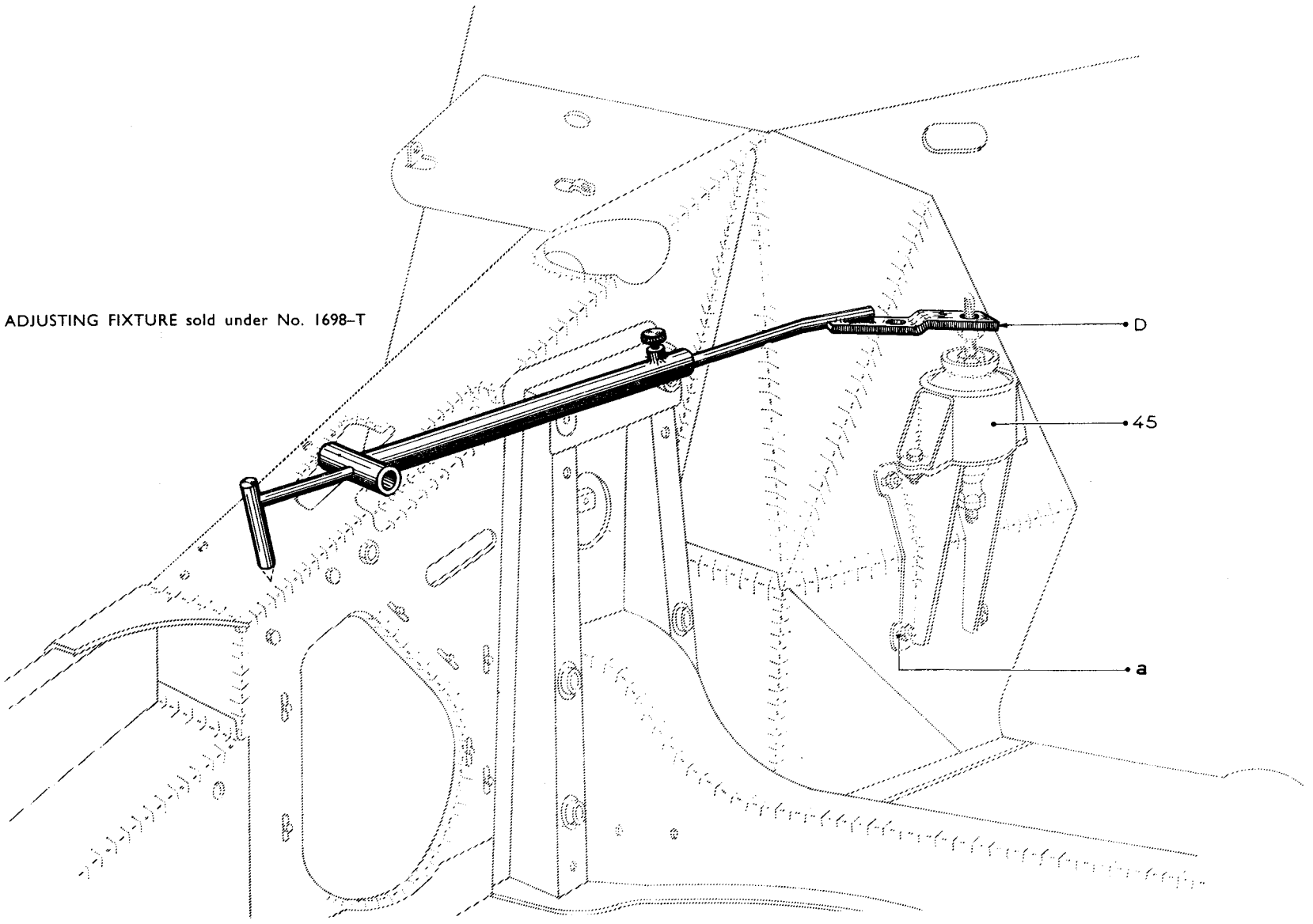
BETWEEN SUPPORT AND CROSSMEMBER



ADJUSTING FIXTURE sold under No. 1698–T

ADJUSTING THE LONGITUDINAL POSITION OF REAR ENGINE SUPPORTS

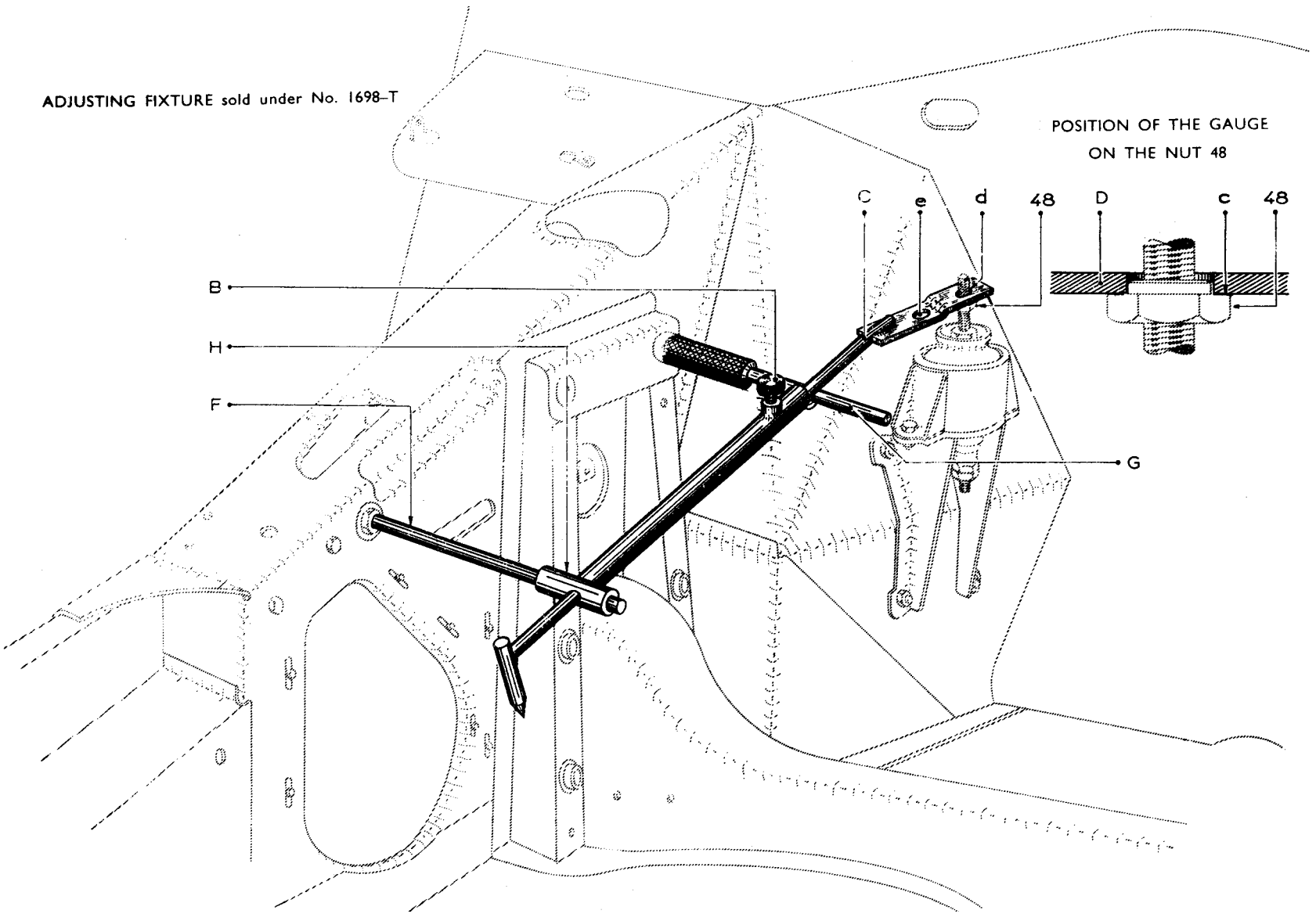
ADJUSTING FIXTURE sold under No. 1698–T



ADJUSTING THE HEIGHT

OF REAR ENGINE SUPPORTS

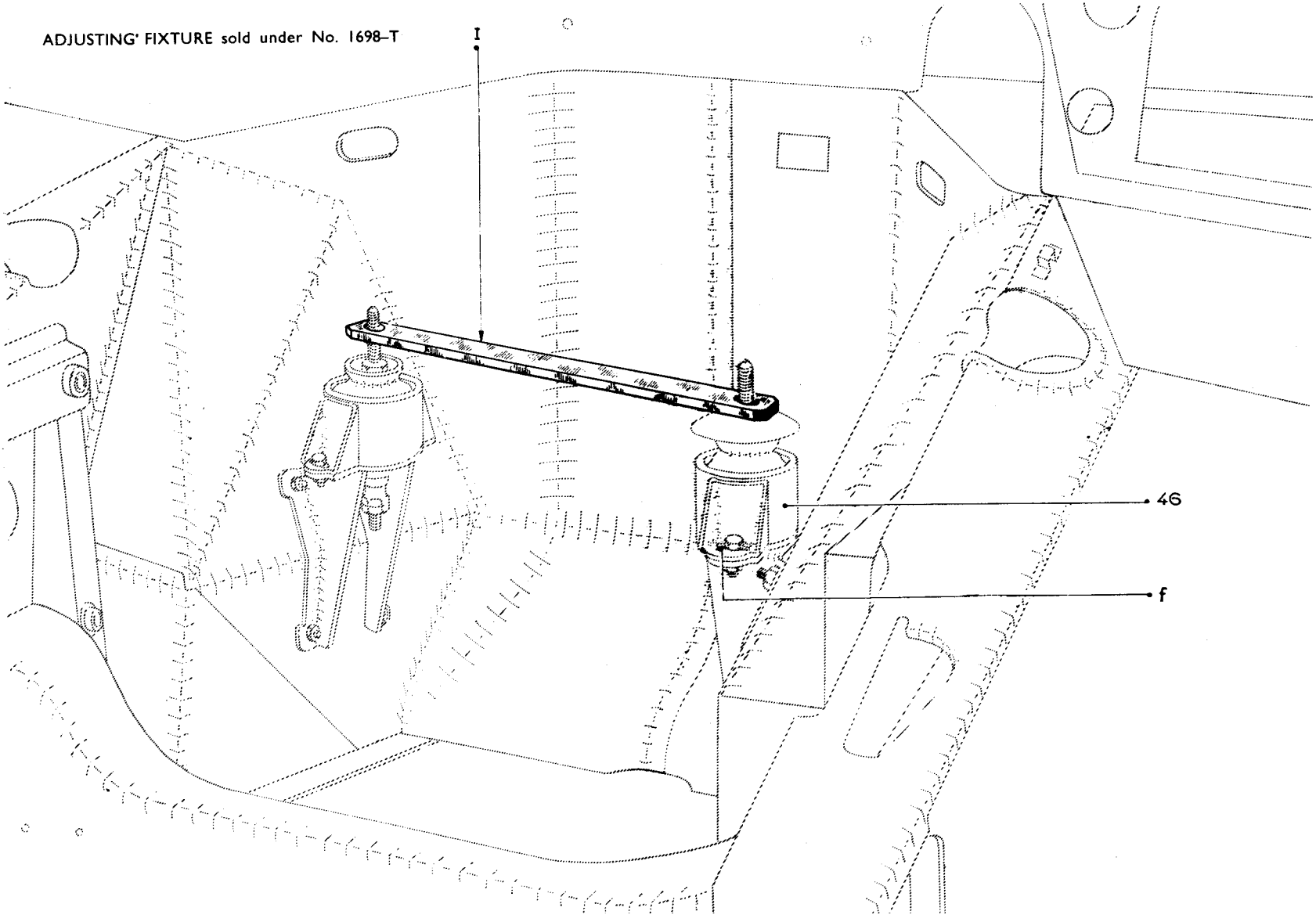
ADJUSTING FIXTURE sold under No. 1698–T



ADJUSTING CENTRES

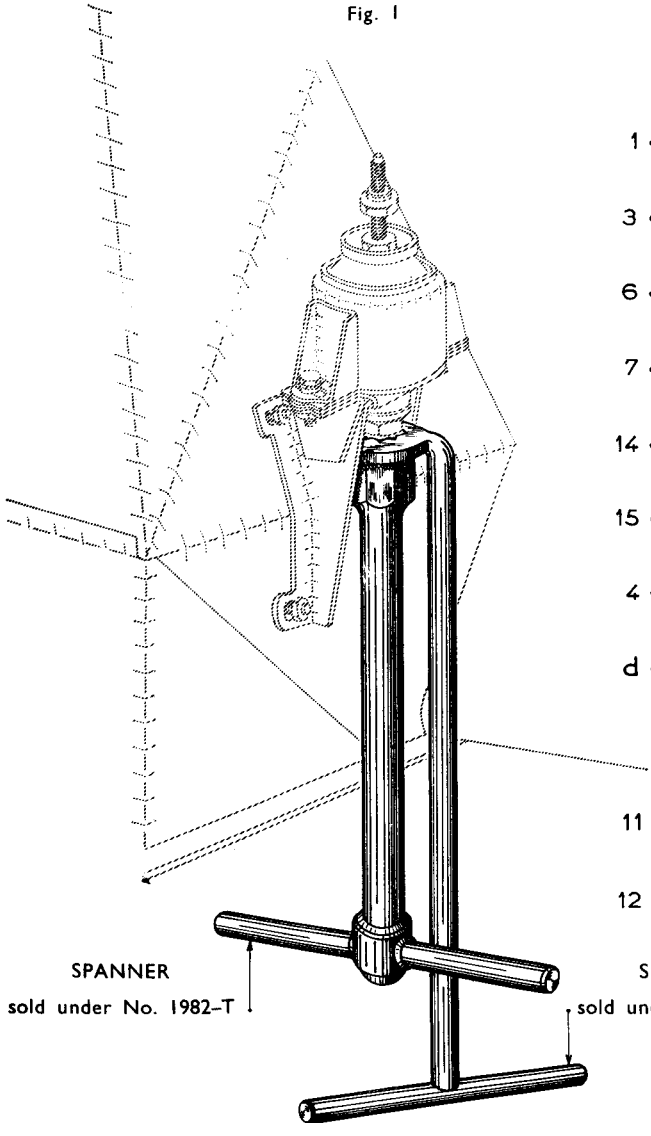
OF REAR ENGINE SUPPORTS

ADJUSTING FIXTURE sold under No. 1698–T



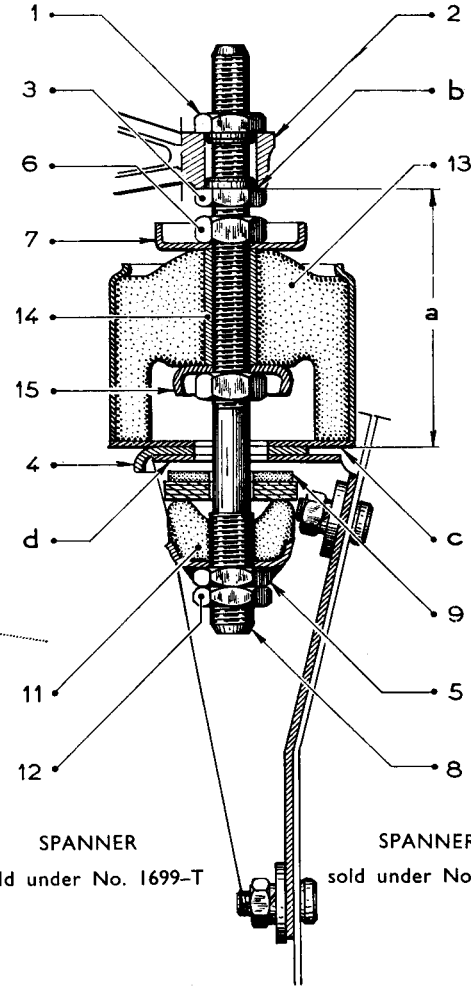
SPANNERS FOR ADJUSTMENT OF REAR ENGINE SUPPORTS

Fig. 1



SPANNER
sold under No. 1982-T

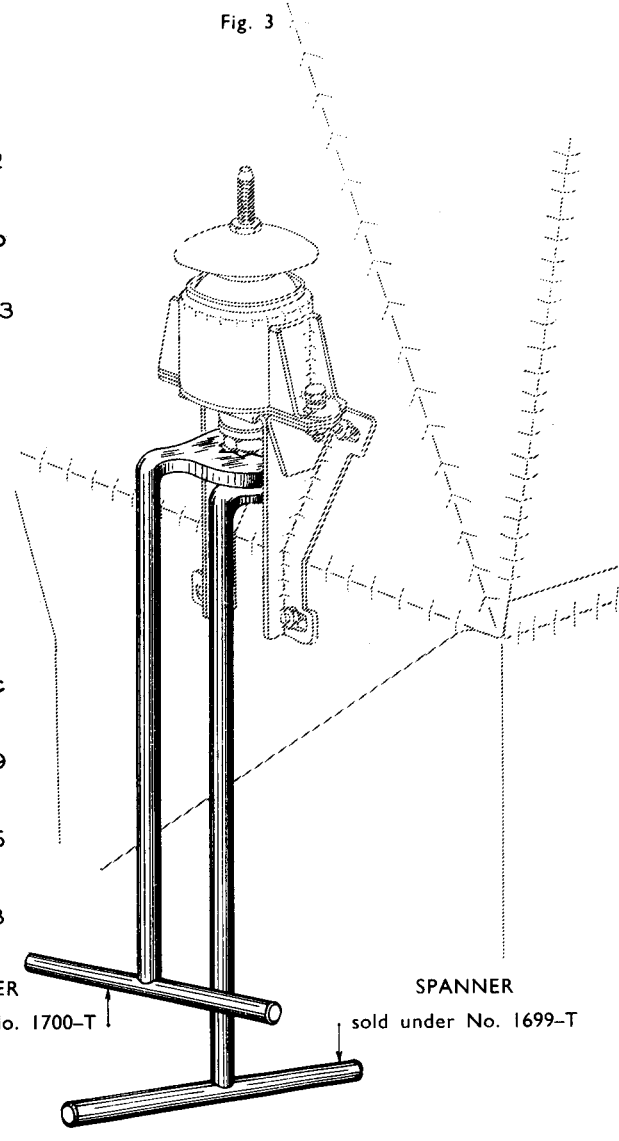
Fig. 2



SPANNER
sold under No. 1699-T

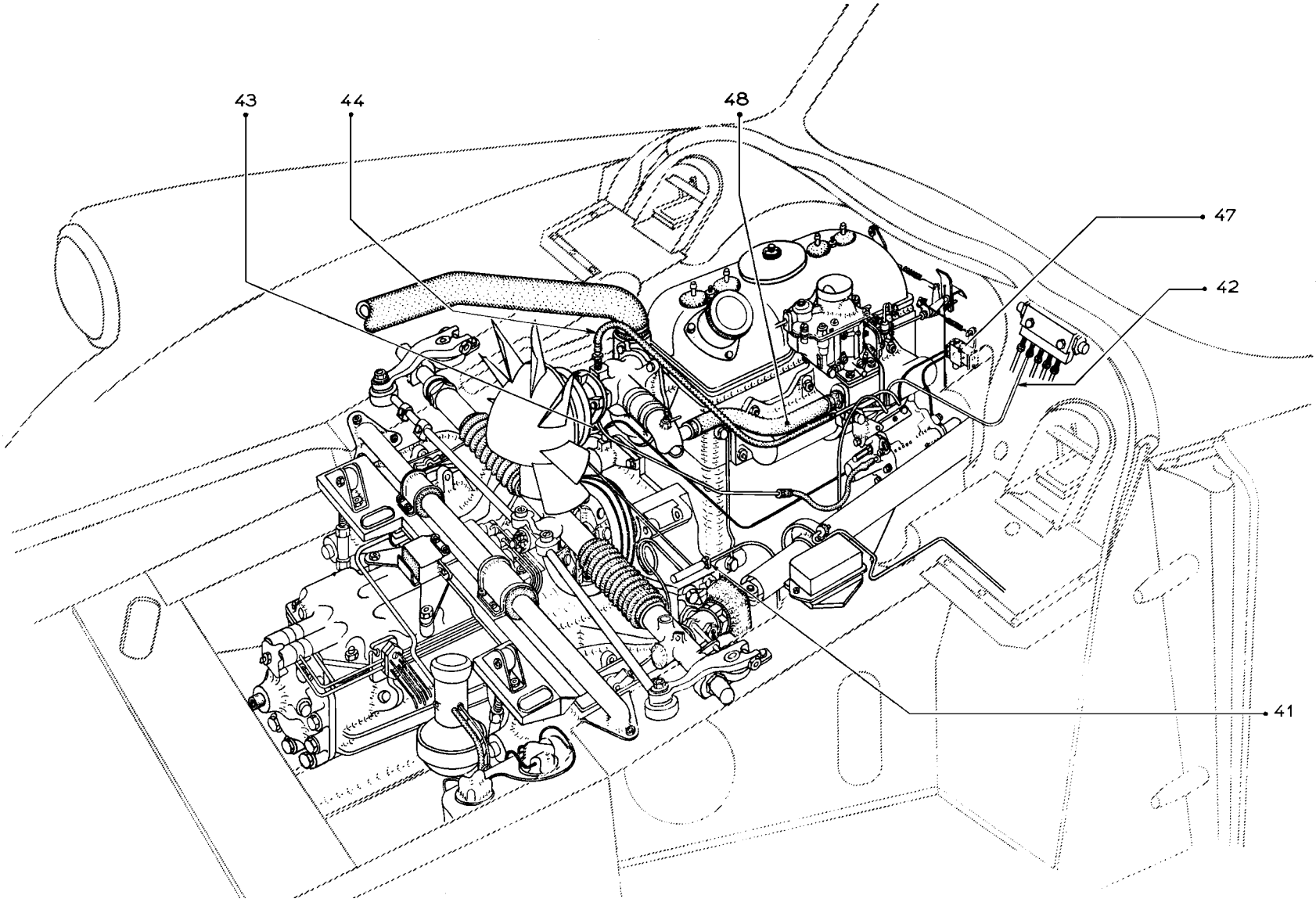
SPANNER
sold under No. 1700-T

Fig. 3



SPANNER
sold under No. 1699-T

ENGINE AND GEARBOX ASSEMBLY



WEBER 24/30 DCZCI

Fig. 1

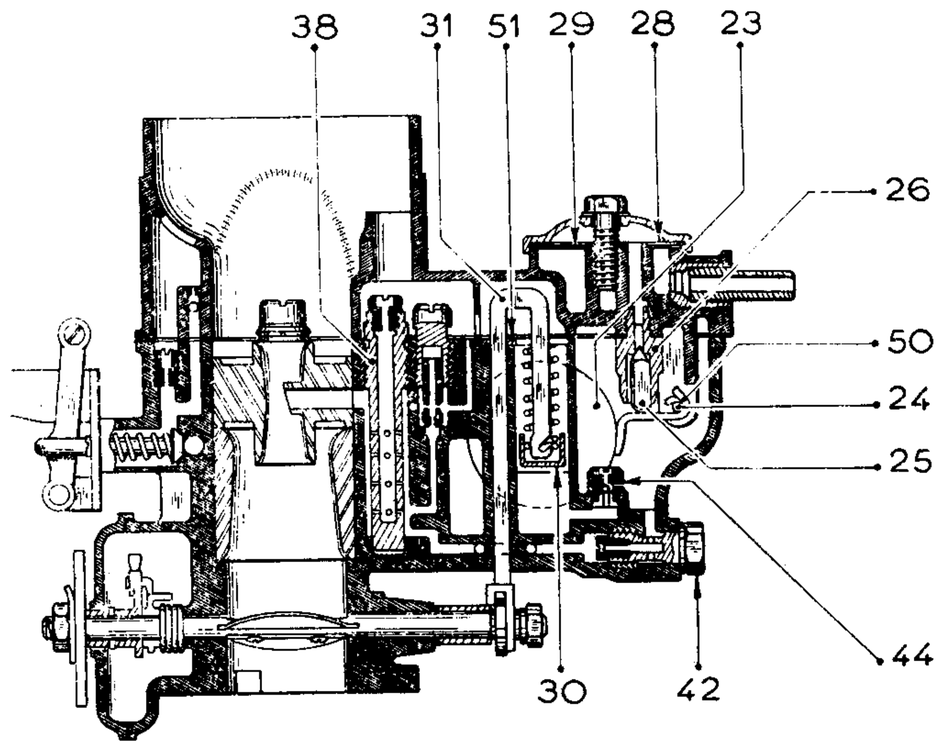
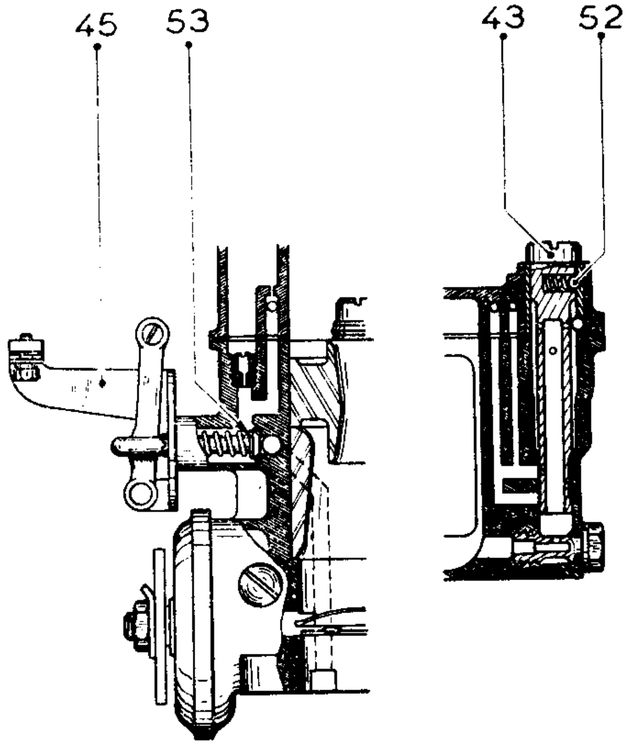


Fig. 6



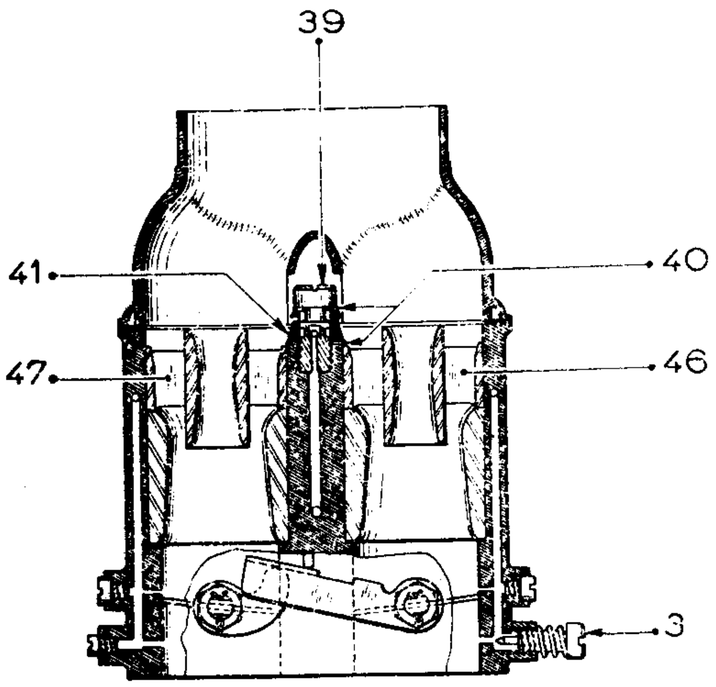


Fig. 2

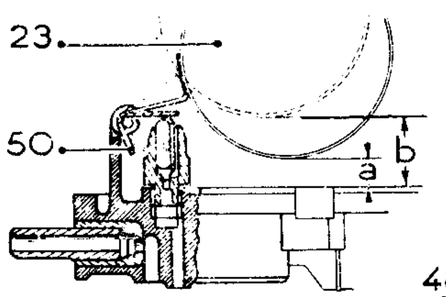


Fig. 3

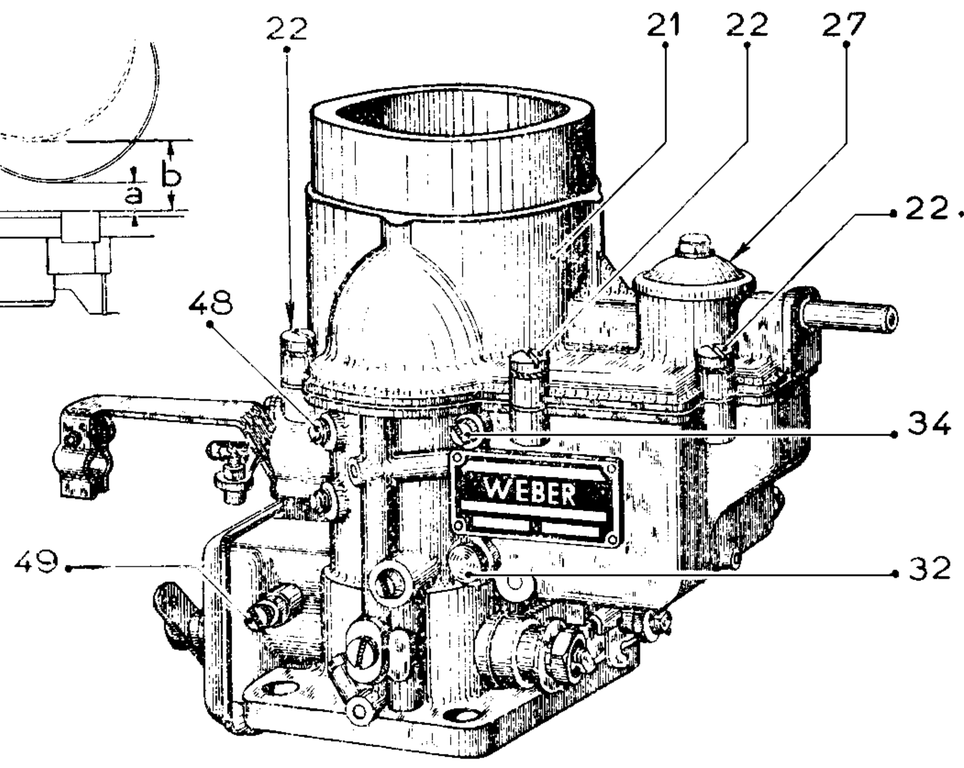


Fig. 4

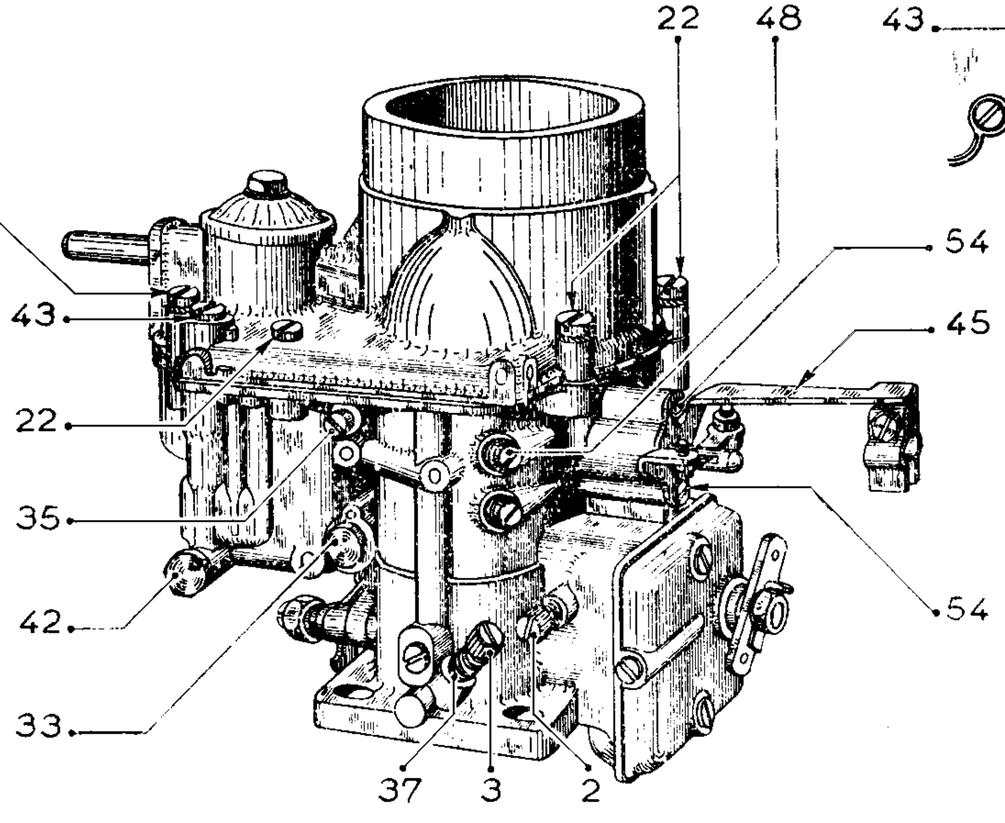
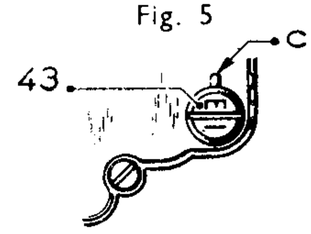
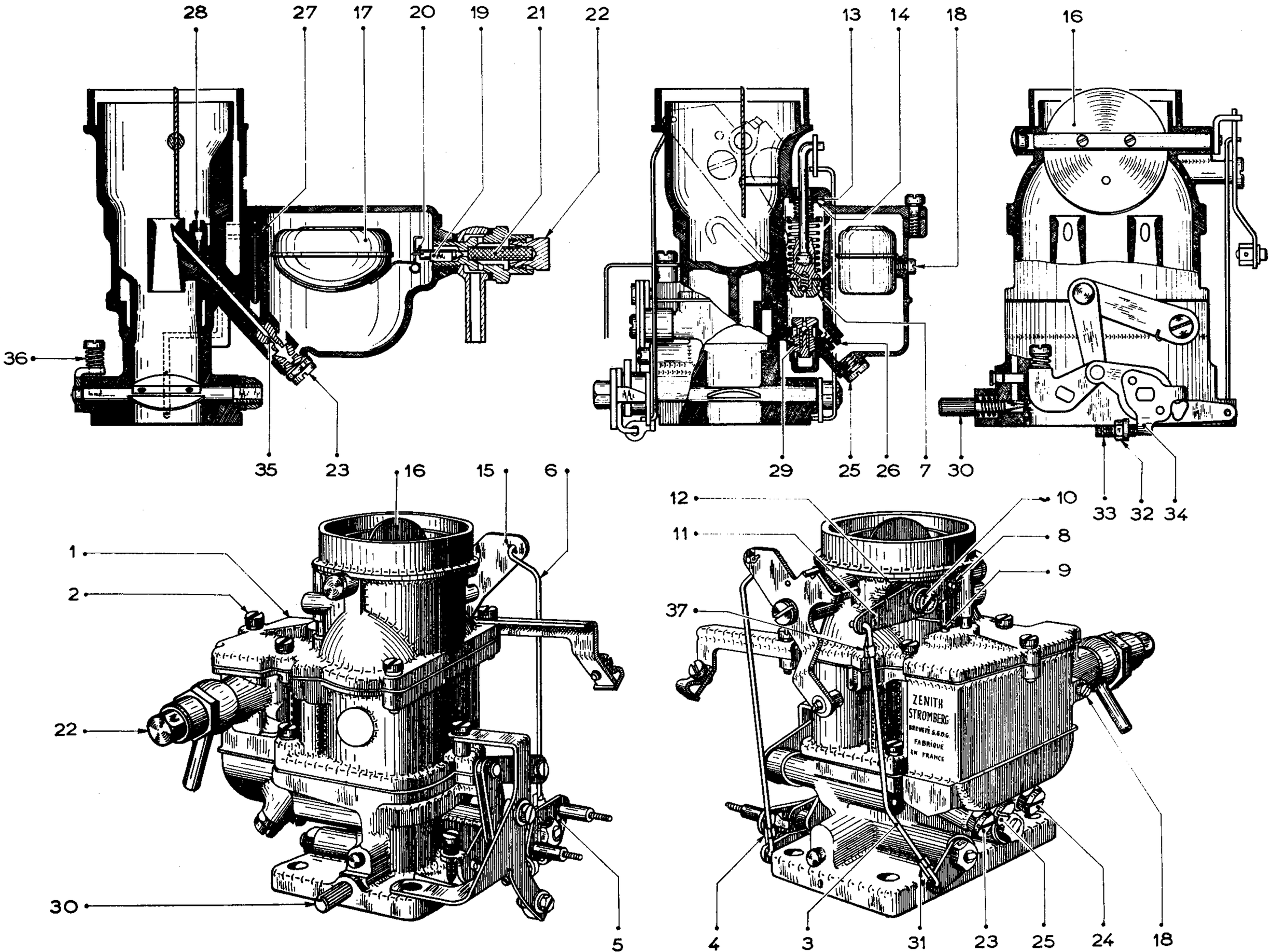


Fig. 5



ZENITH 24-30 EEAC



CONTROLS—FILTERS

Fig. 1

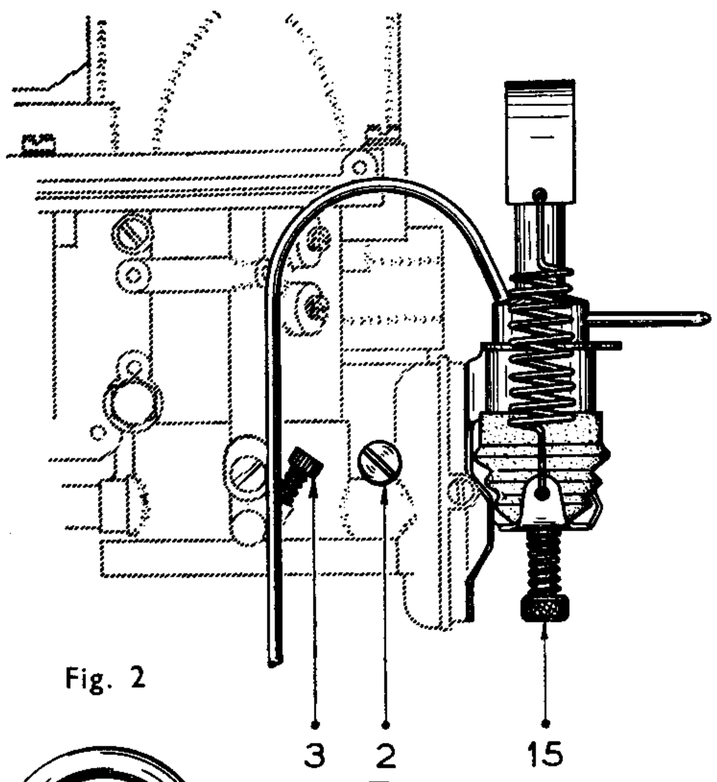


Fig. 2

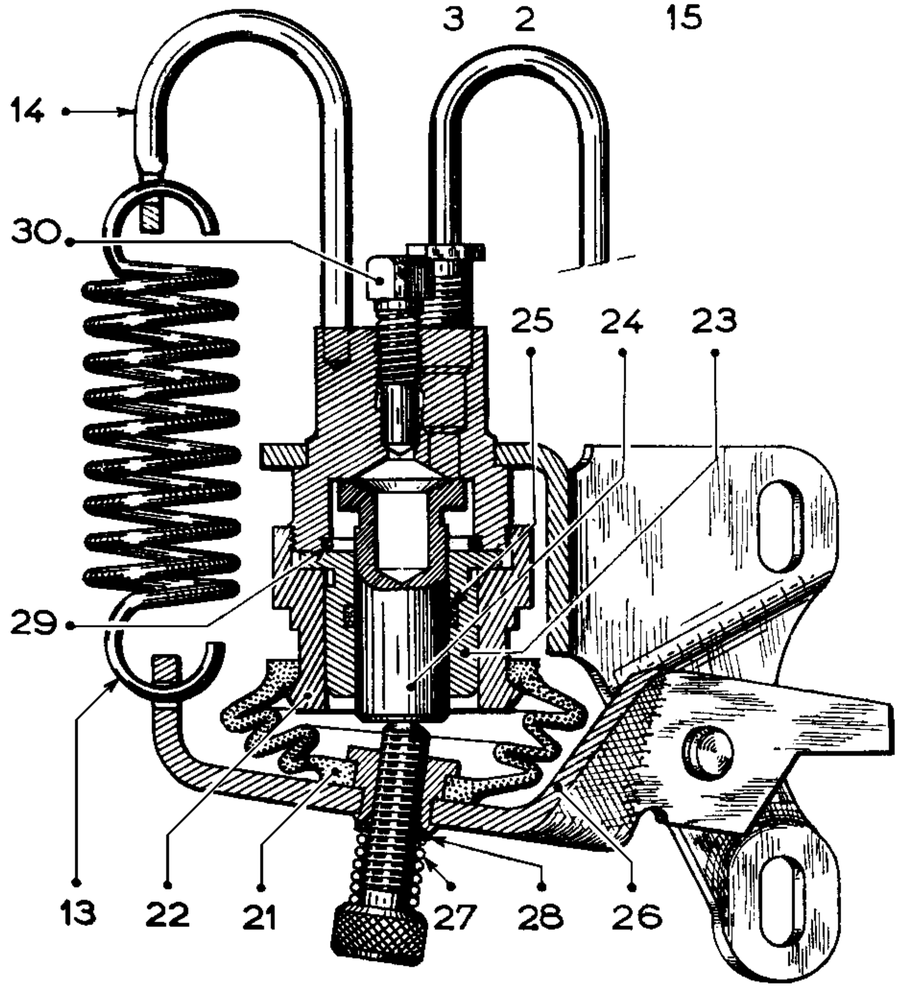


Fig. 3

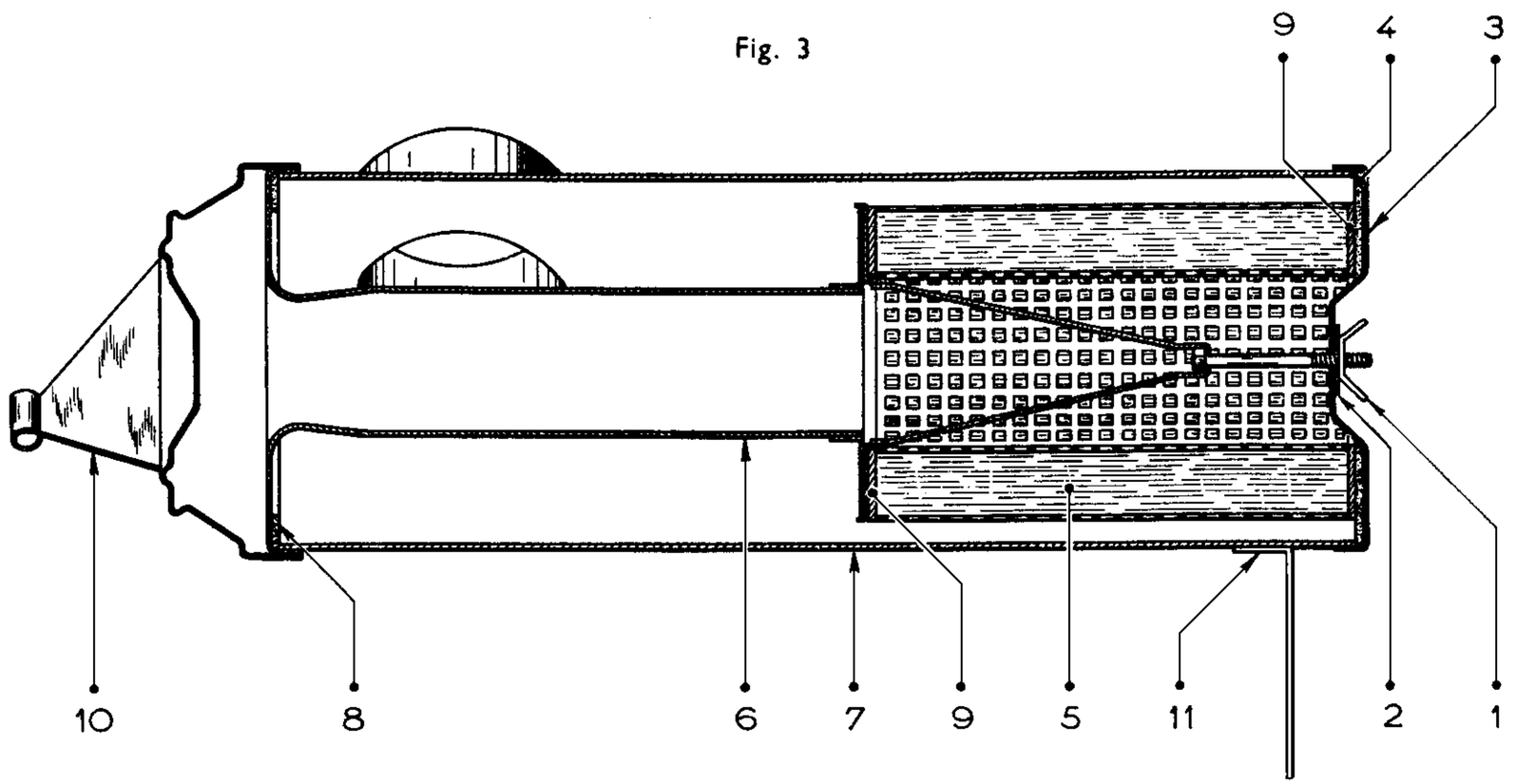
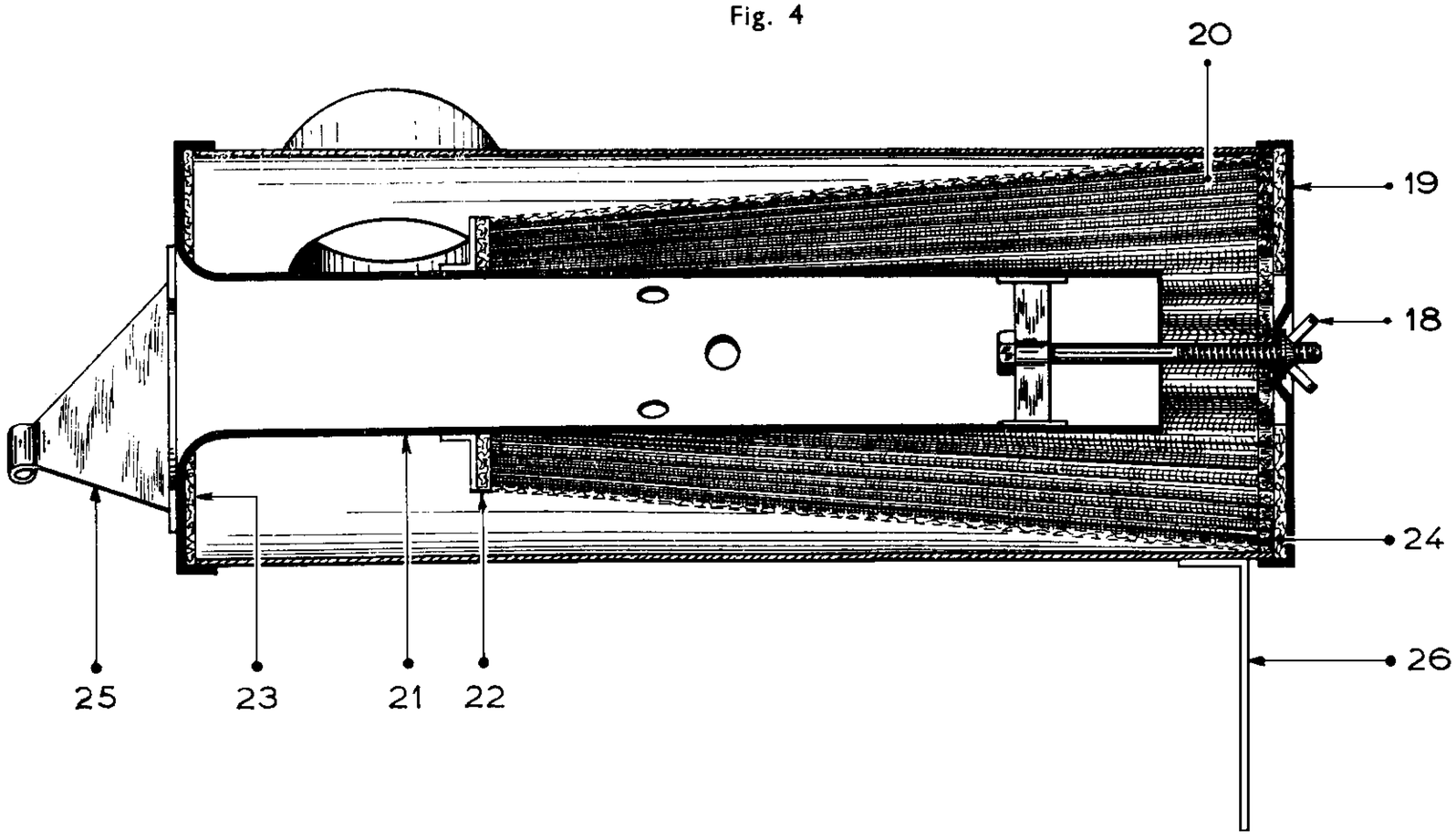


Fig. 4



SECTION OF GUIOT PUMP

Fig. 1

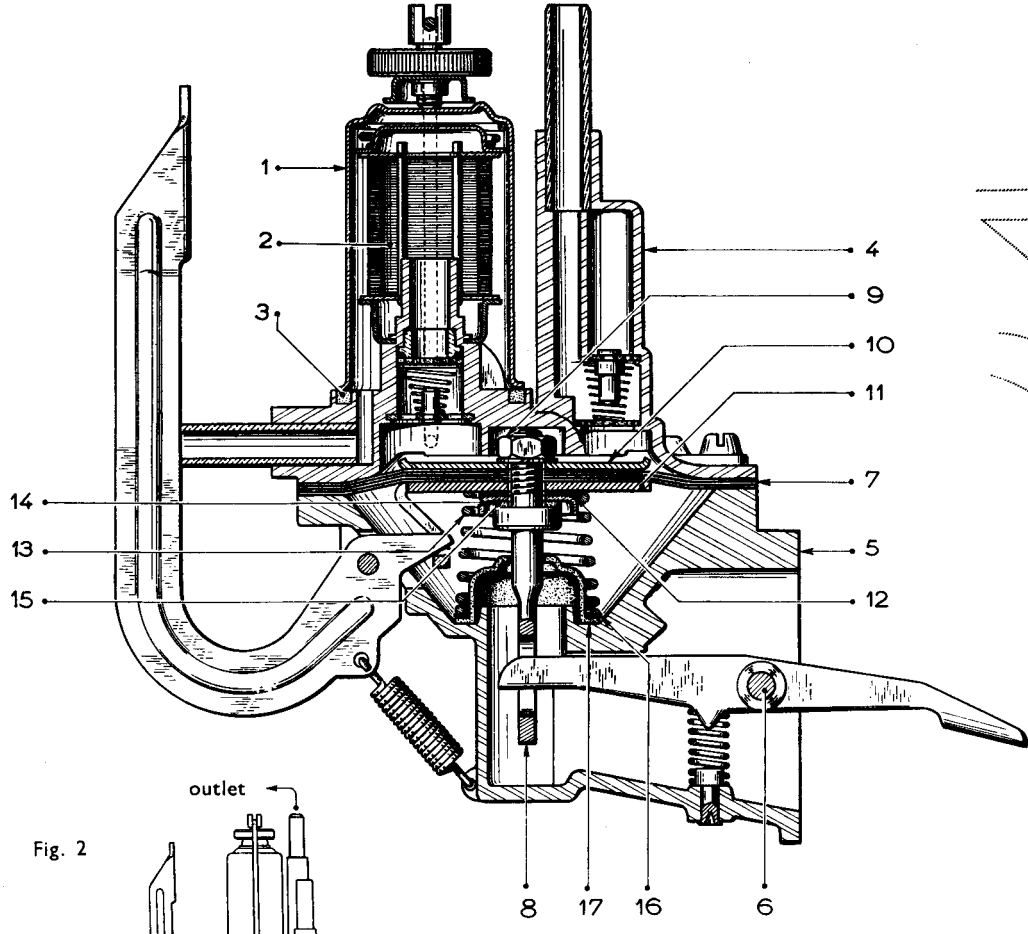


Fig. 2

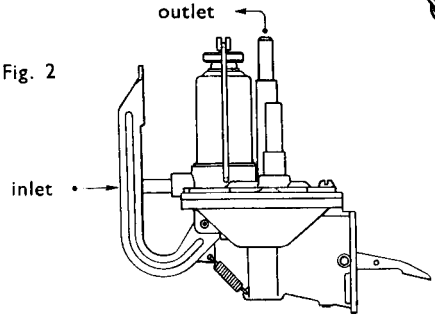
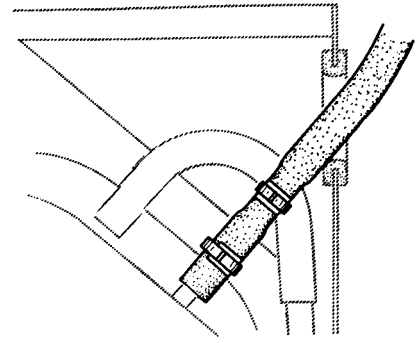
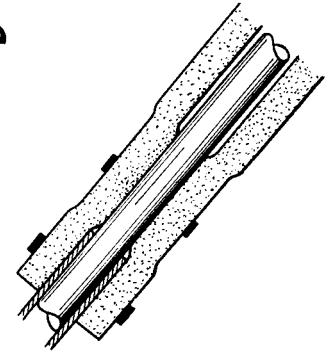
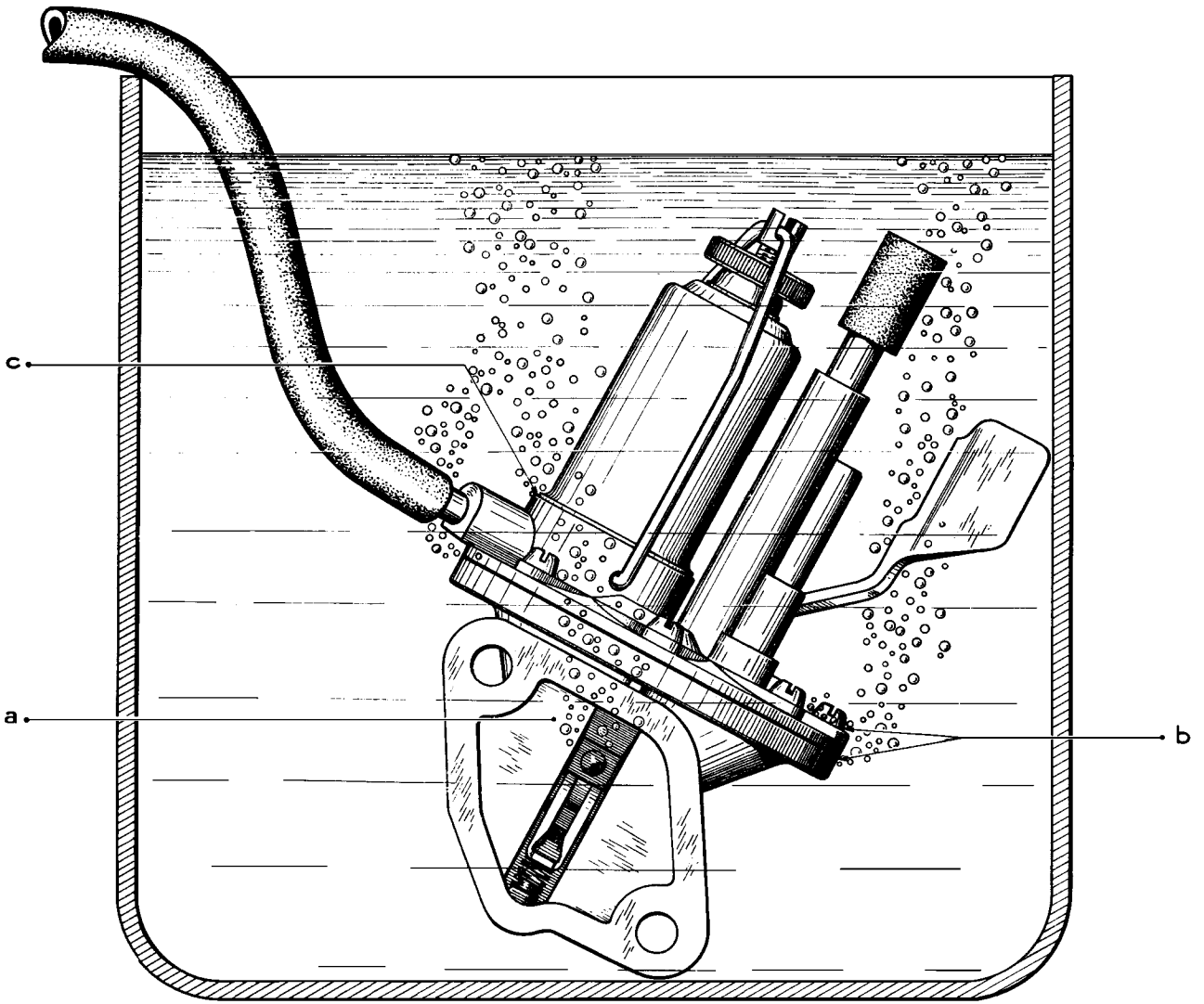


Fig. 3





INSPECTION FOR LEAKS



CONTACT BREAKER

Fig. 1

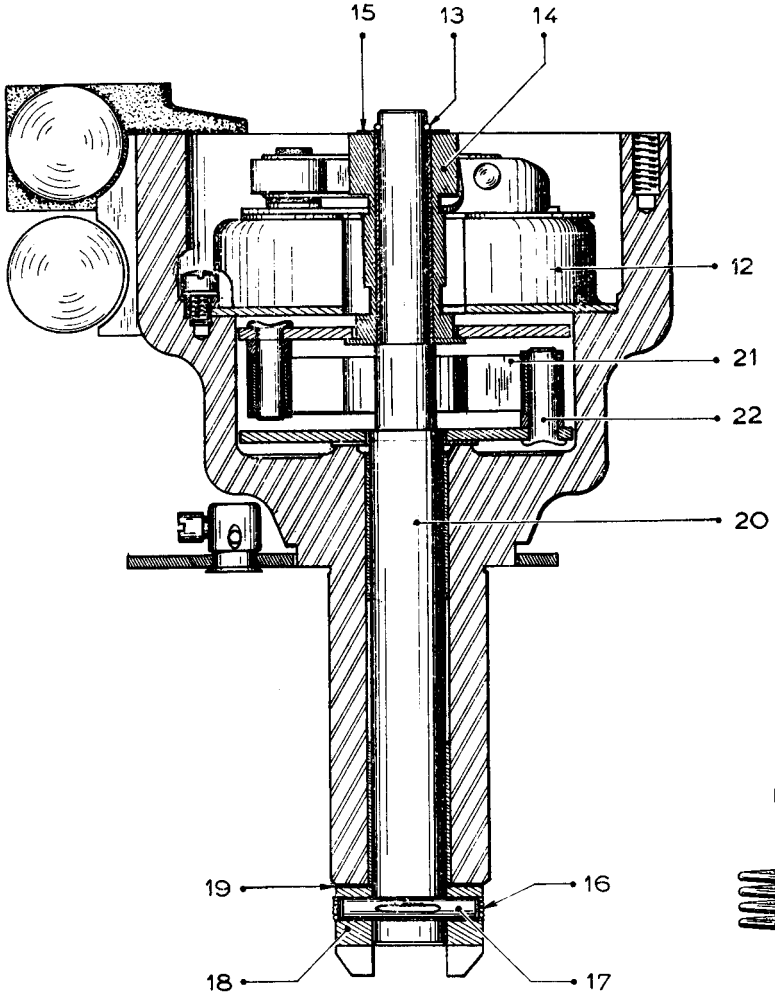


Fig. 2

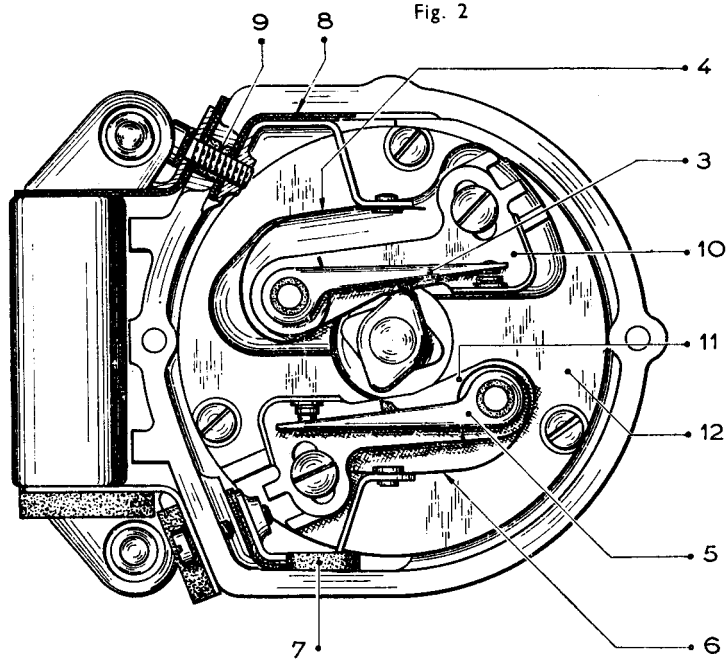


Fig. 3

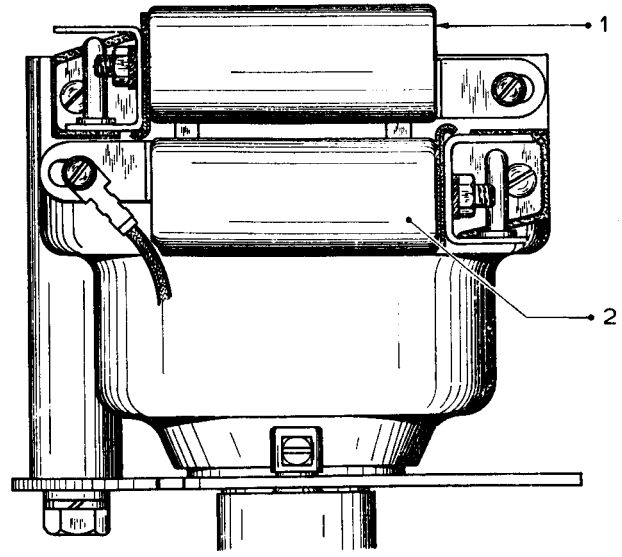
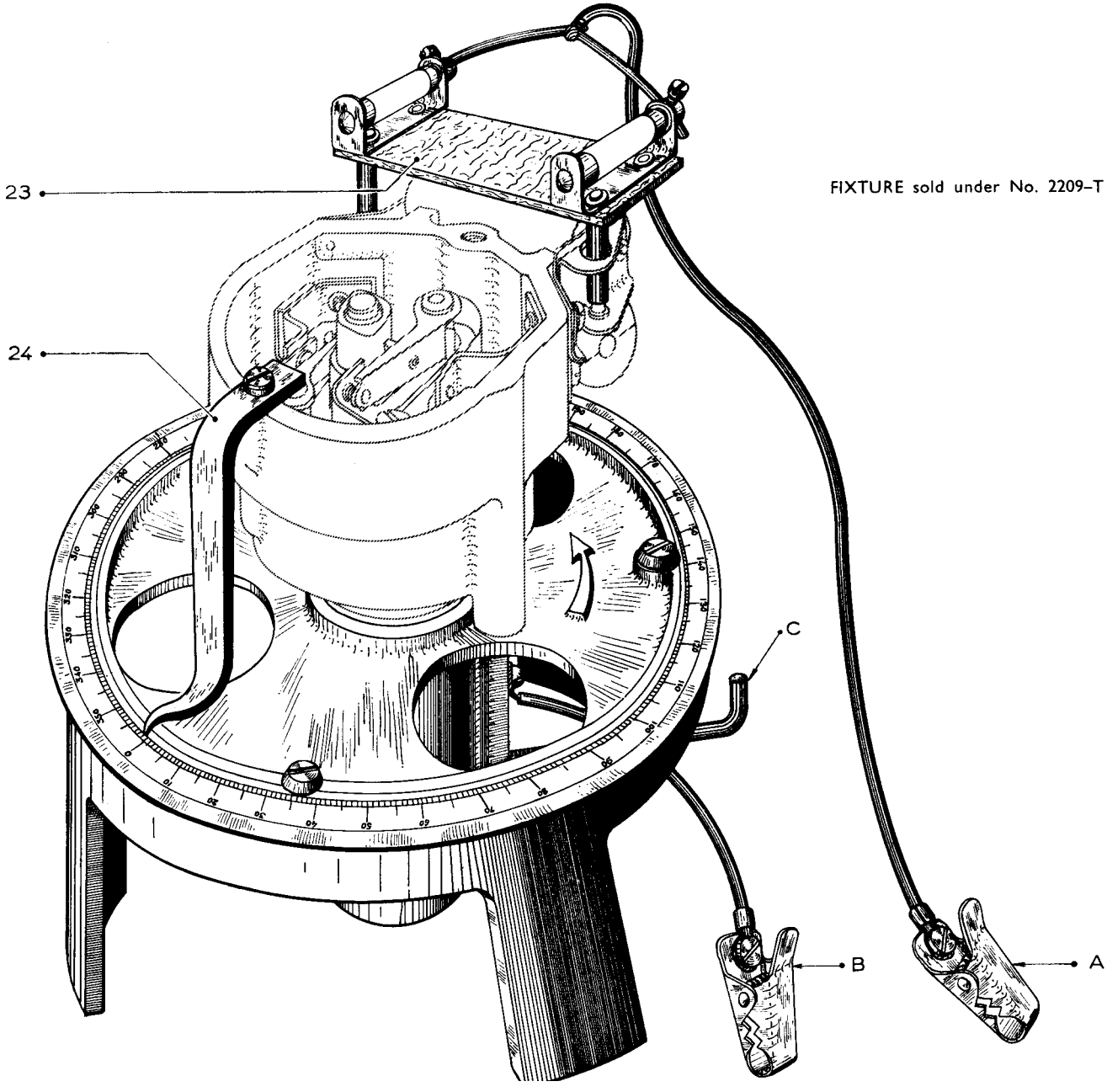


Fig. 4



ADJUSTING THE SYNCHRONISATION OF THE BREAKERS

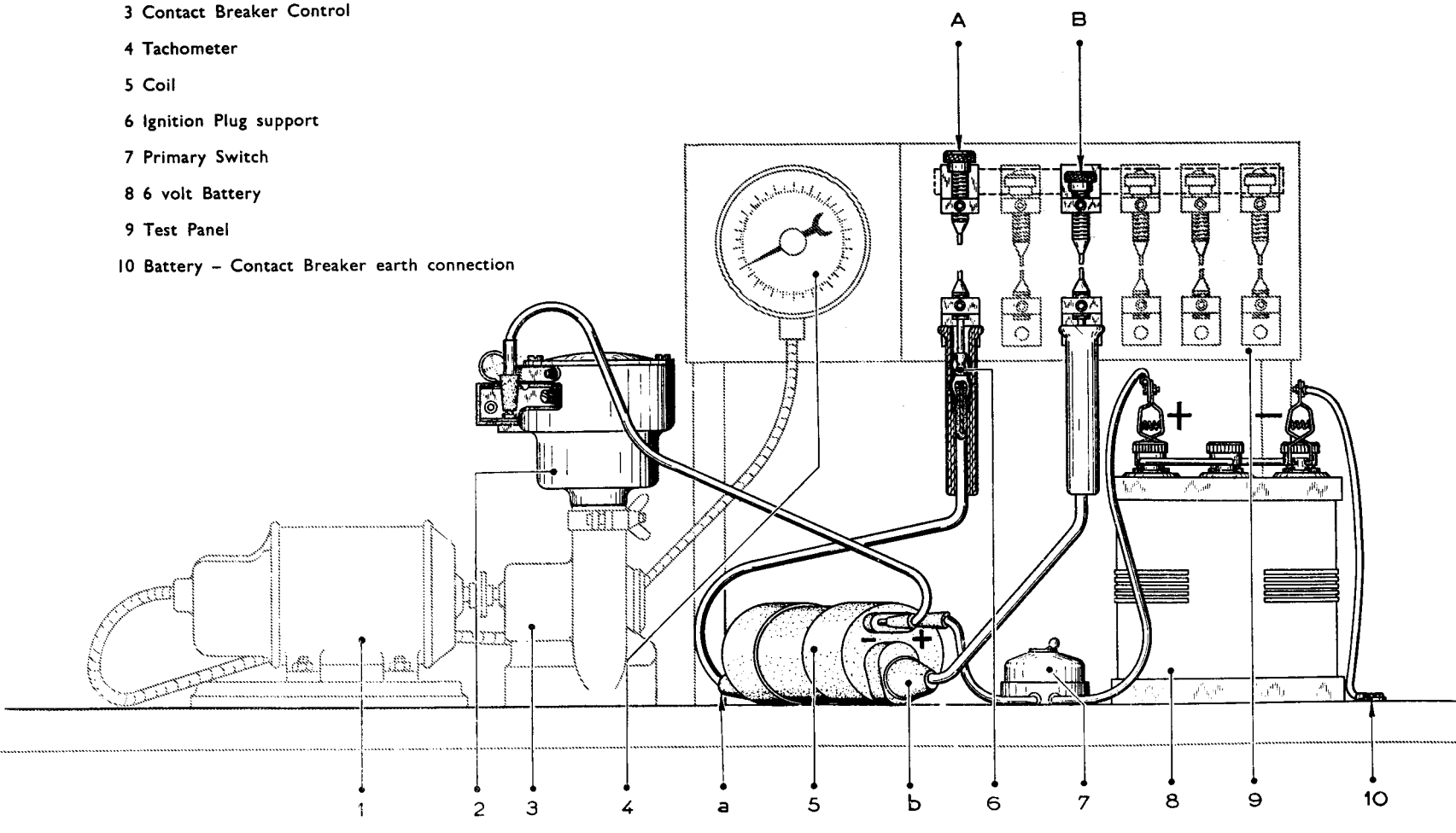


FIXTURE sold under No. 2209–T

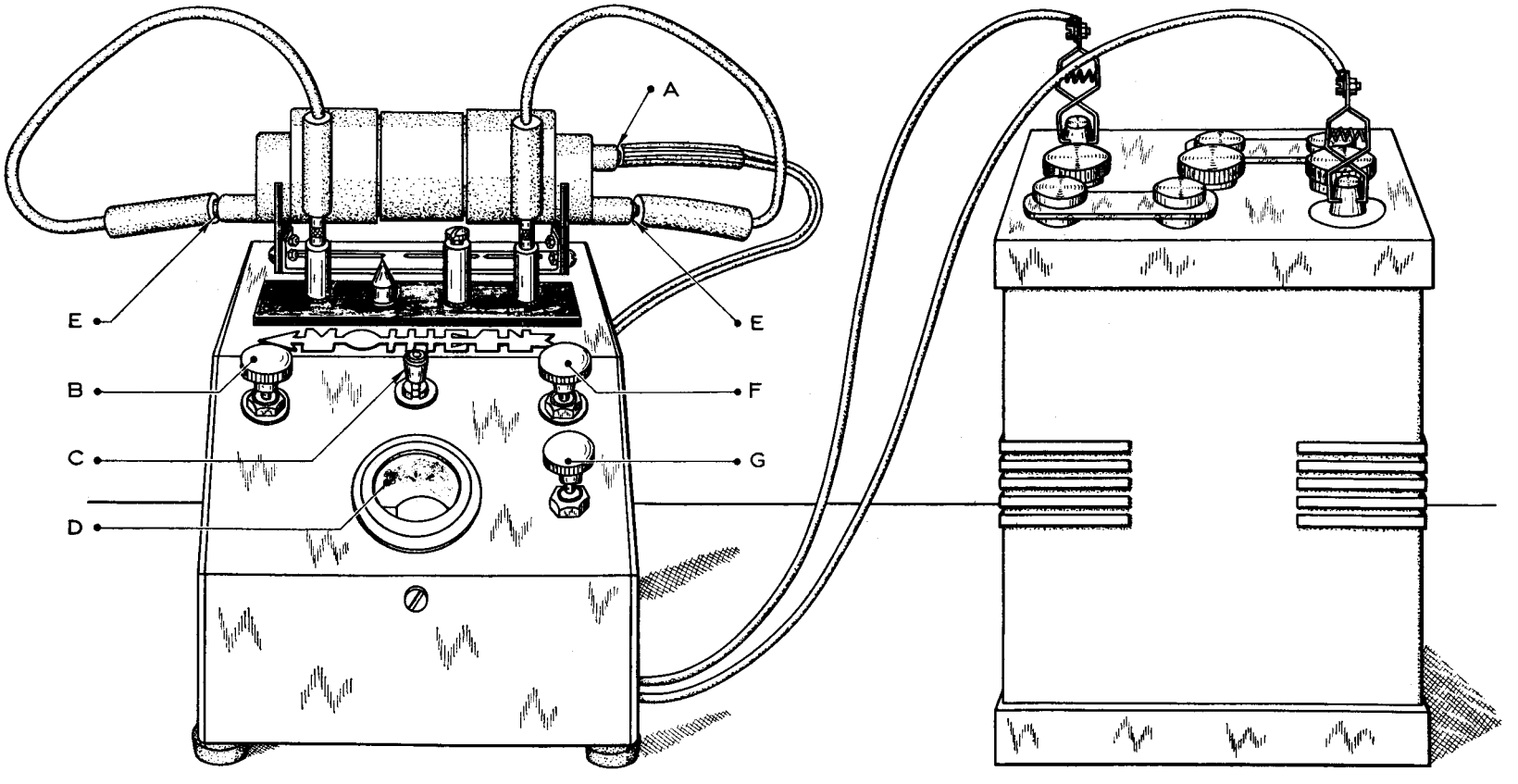
Hold the Contact Breaker in the fixture by tightening the screw 'C' moderately

TESTING IGNITION COIL

1 Engine Drive
2 DS19 Contact Breaker with its condenser
3 Contact Breaker Control
4 Tachometer
5 Coil
6 Ignition Plug support
7 Primary Switch
8 6 volt Battery
9 Test Panel
10 Battery – Contact Breaker earth connection



TESTING IGNITION COIL INSULATION



TEST BENCH SOLD BY ETABLISSMENTS DE SARELLO

BELT TENSIONS

Fig. 1

HIGH PRESSURE PUMP BELTS
tension 22 ft/lb (3 m/kg)

Pull at end of lever = 16½ lb. (7·5 kg)

DYNAMO BELT
tension 28 ft/lb (4 m/kg)

Pull at end of lever = 22 lb (10 kg)

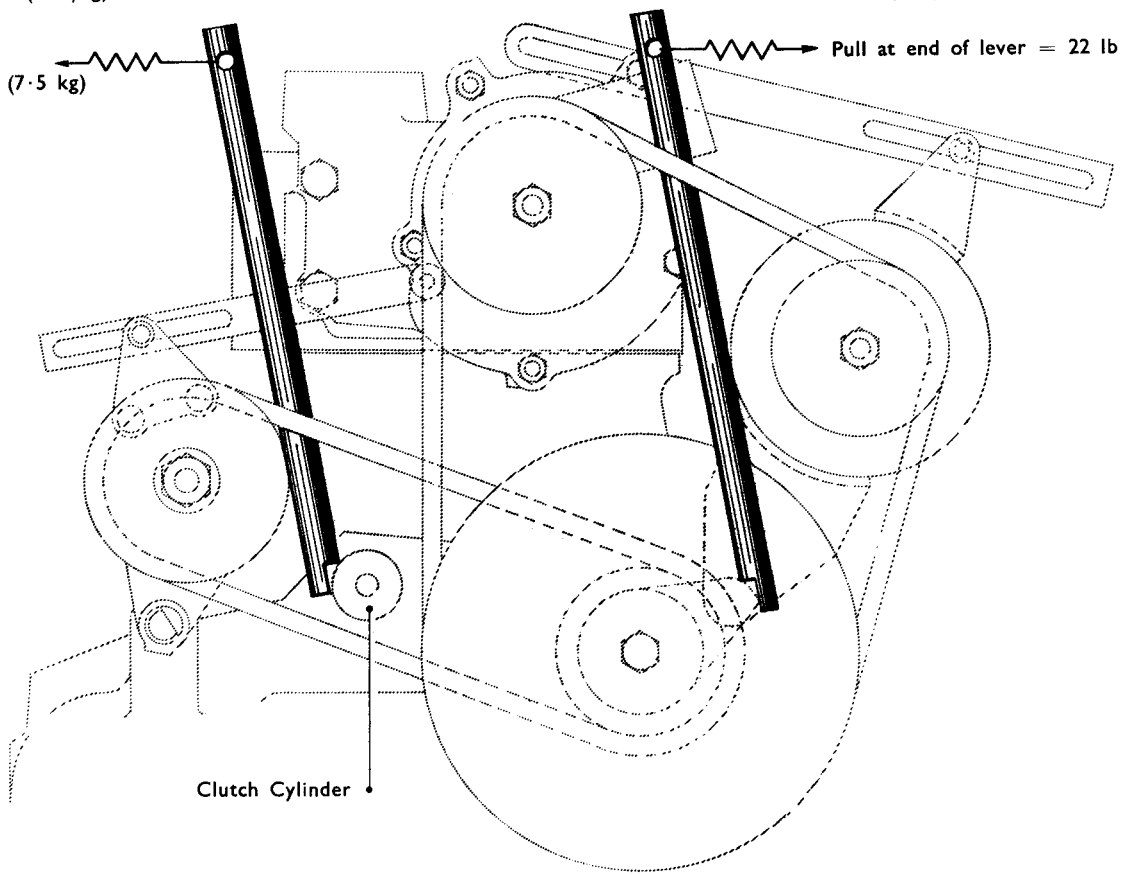
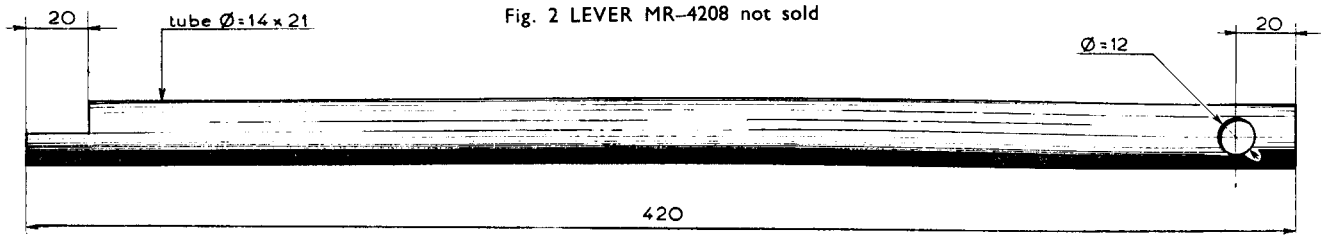


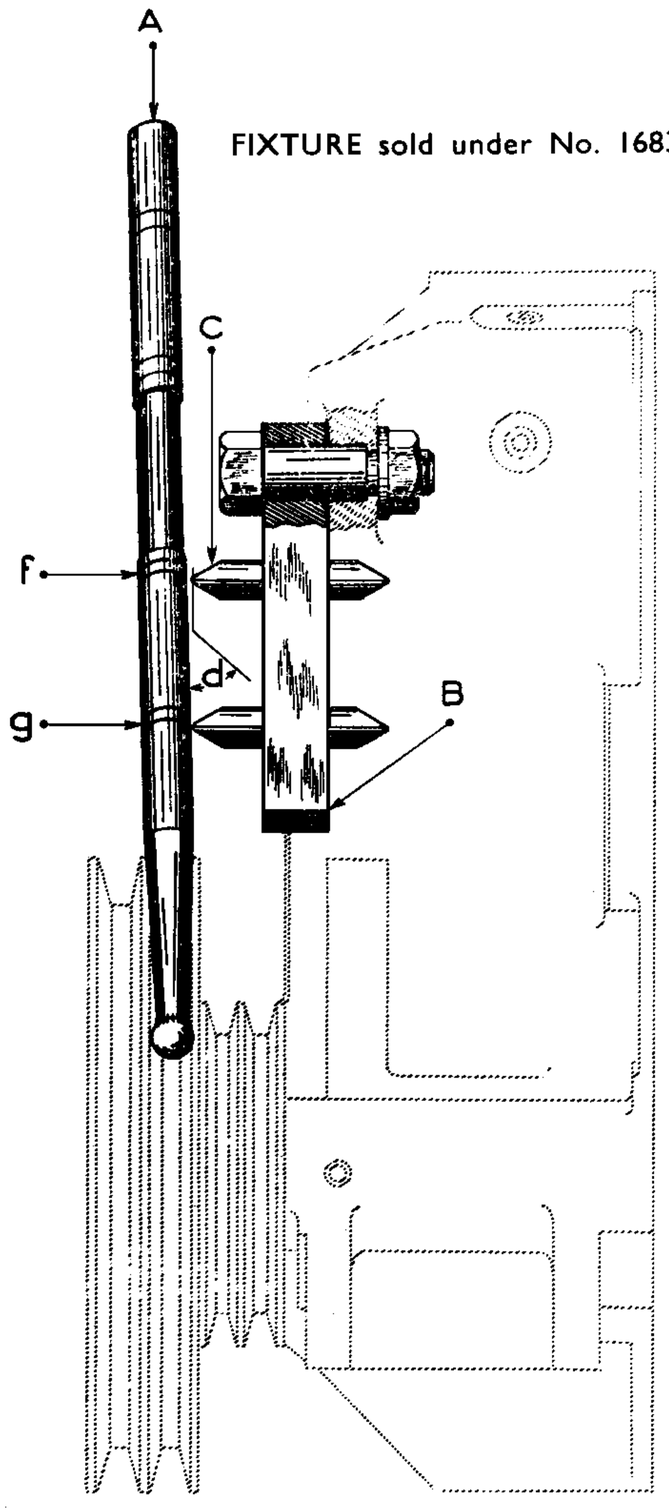
Fig. 2 LEVER MR–4208 not sold



Use with Spring Balance 2472–T

ALIGNMENT OF PULLEYS

Fig. 1



FIXTURE sold under No. 1683–T

Checking the position of the Driving Pulley

Fig. 2

Checking the position of the Water Pump Pulley

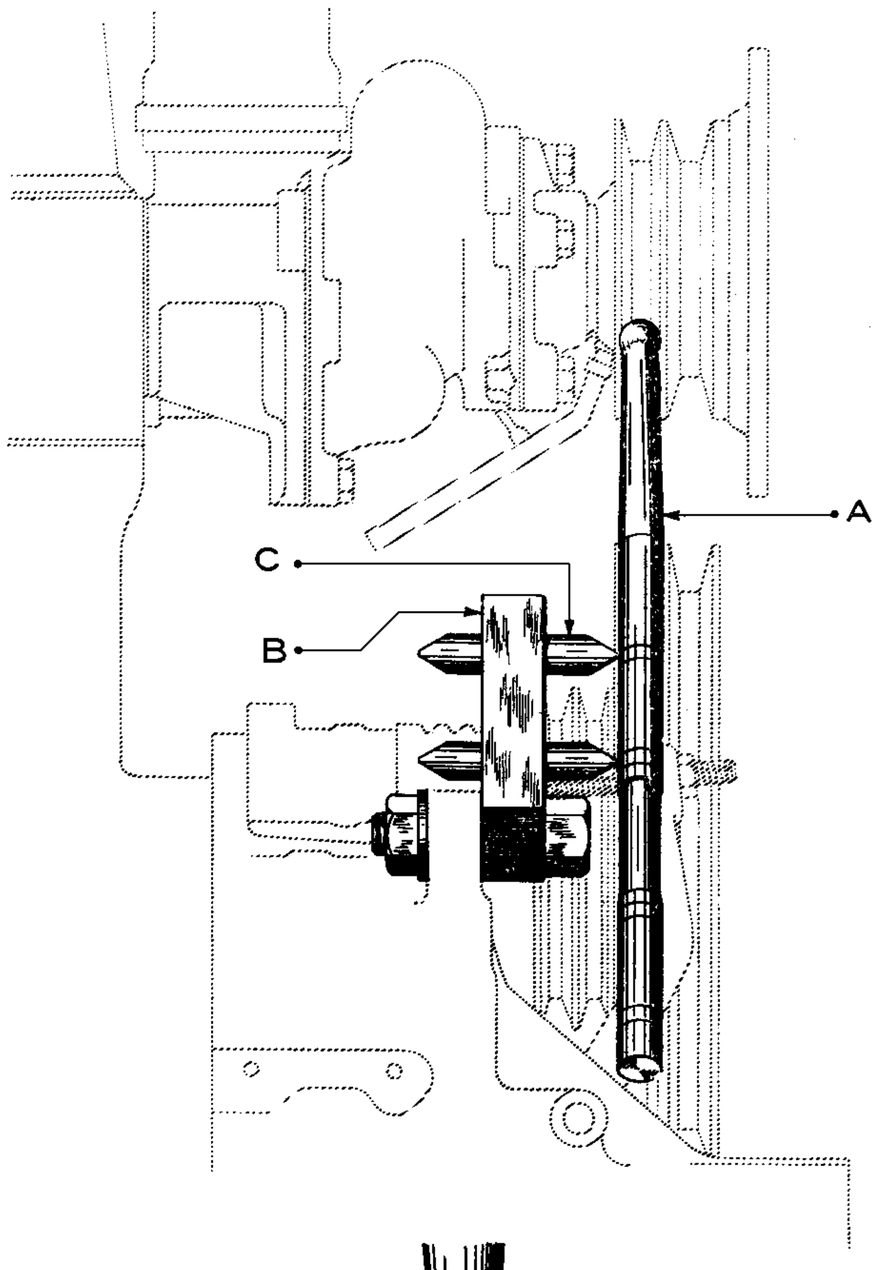


Fig. 4

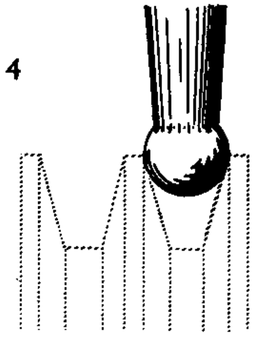
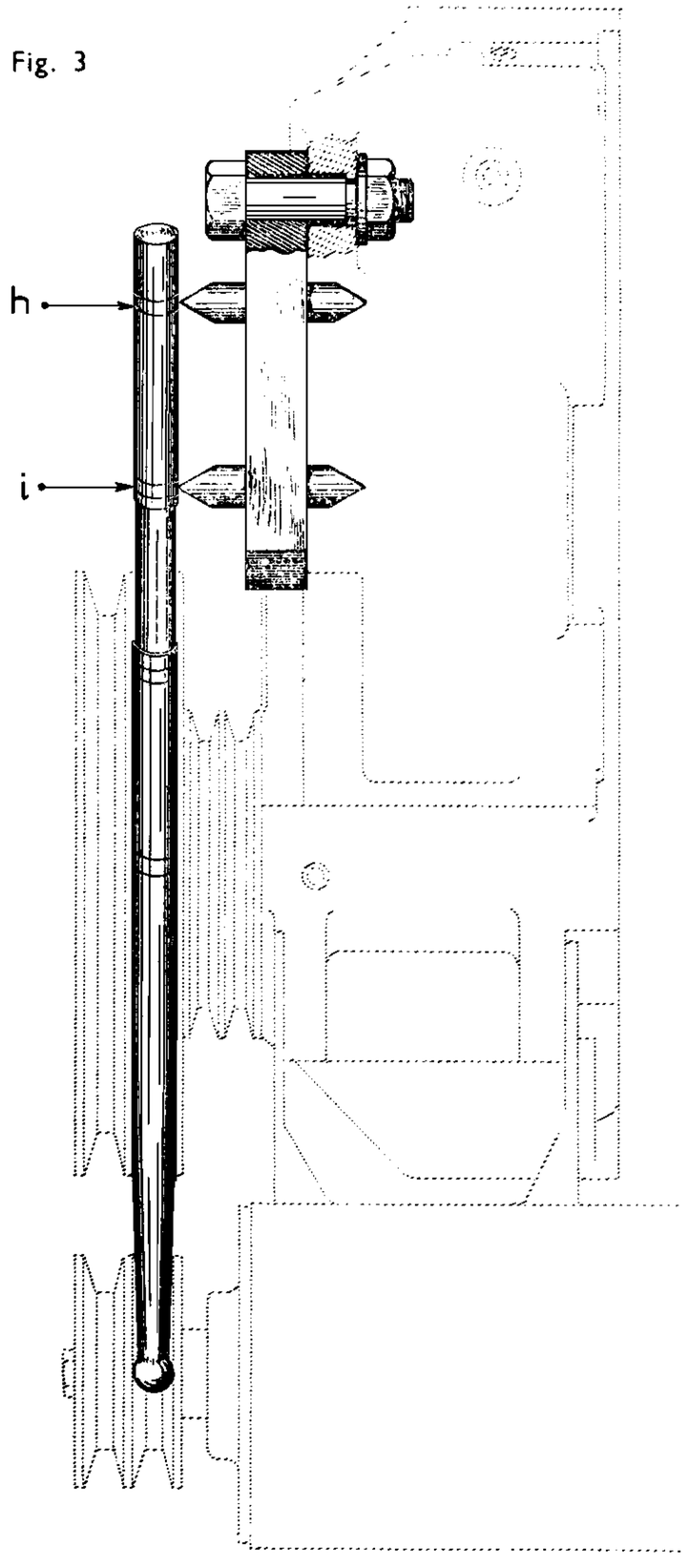


Fig. 3



Checking the position of the Dynamo Pulley

LOW PRESSURE PUMP AND WATER PUMP

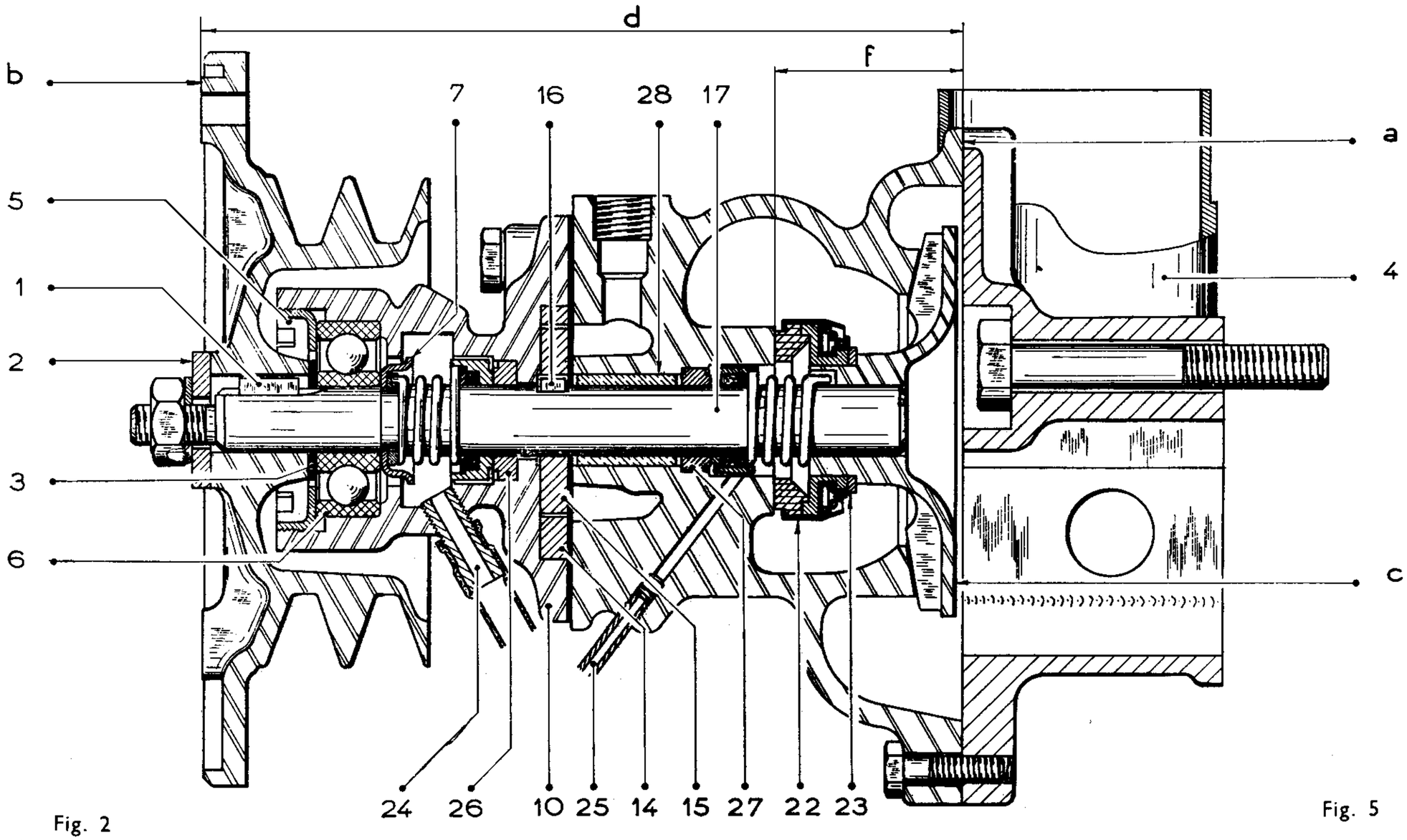


Fig. 2

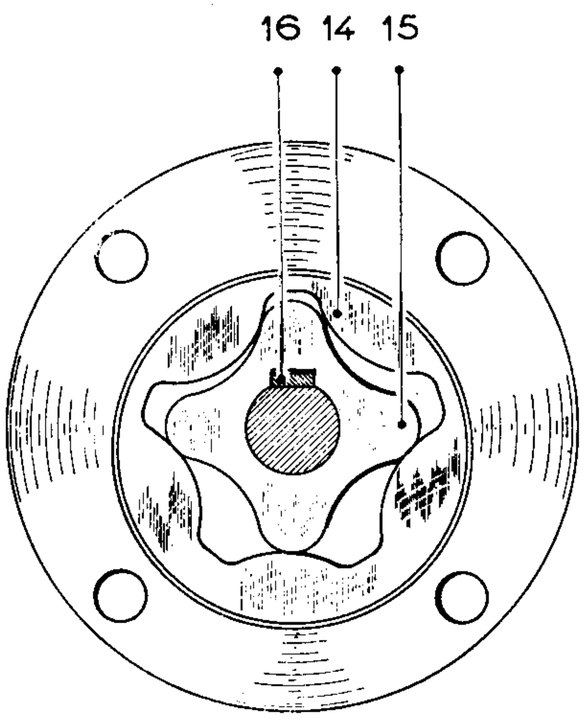


Fig. 3

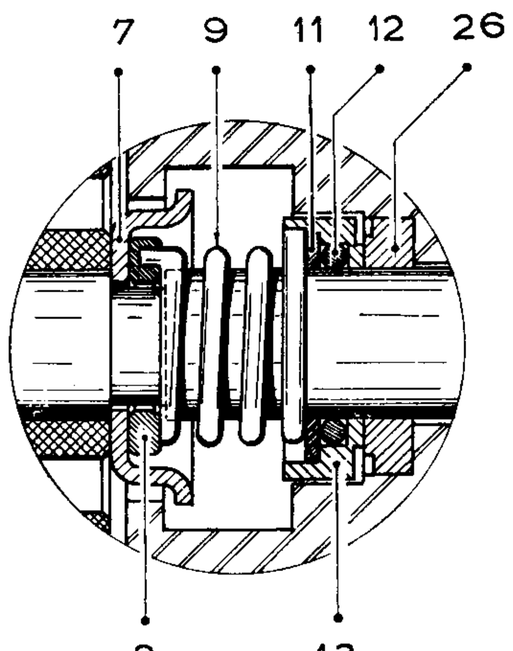


Fig. 4

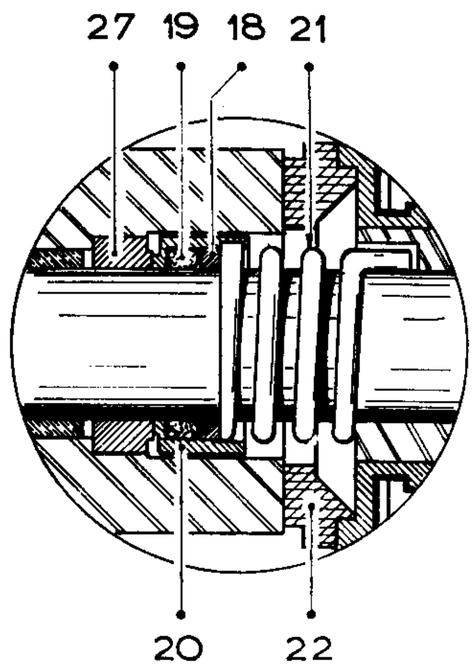
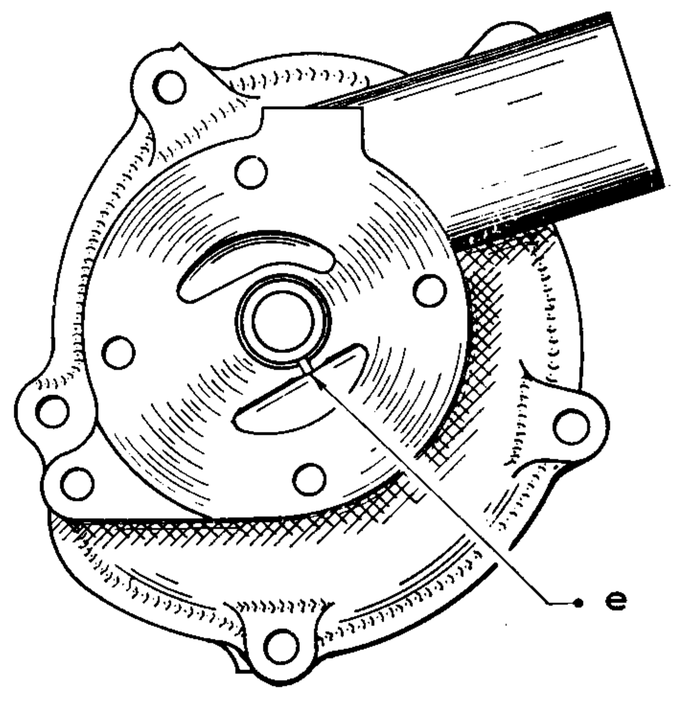


Fig. 5



LOW PRESSURE PUMP AND WATER PUMP

VARIOUS TOOLS

Fig. 1 MANDREL AND DOLLY RING
sold under No. 2292–T

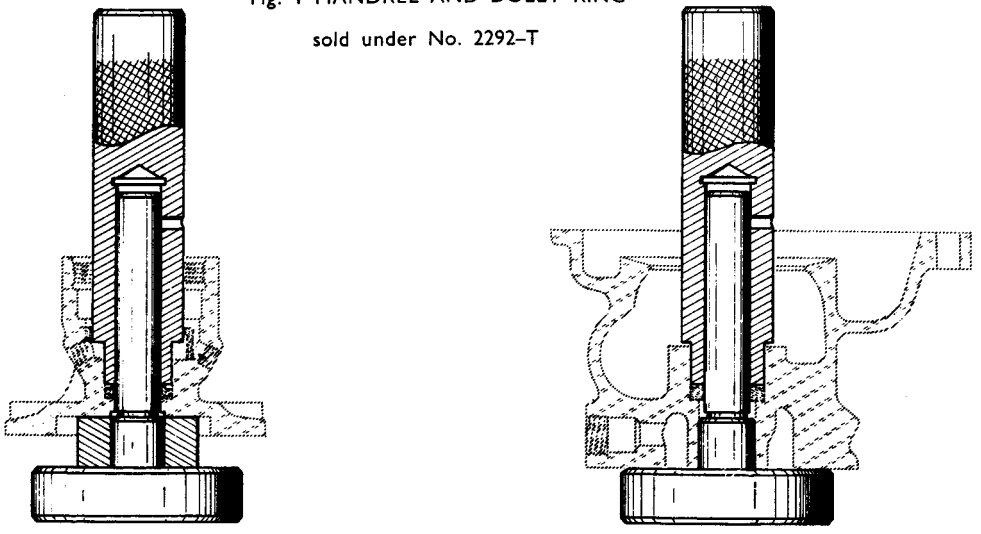


Fig. 2 LAPPING SPINDLE
sold under No. 2289–T

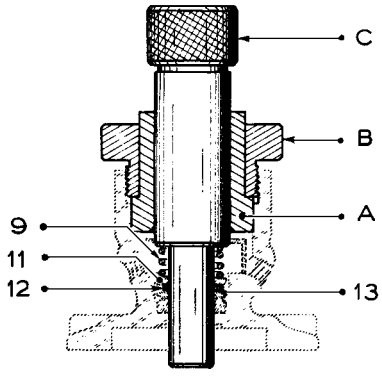
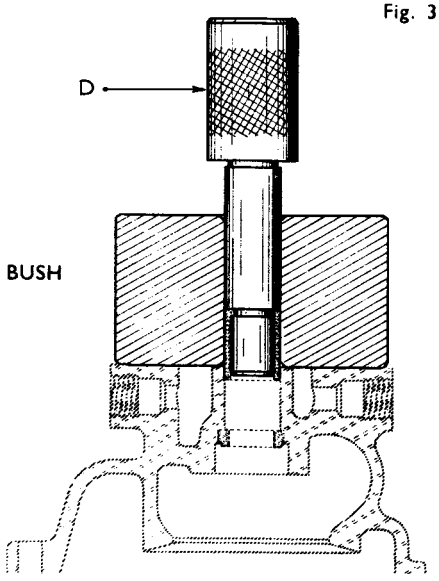
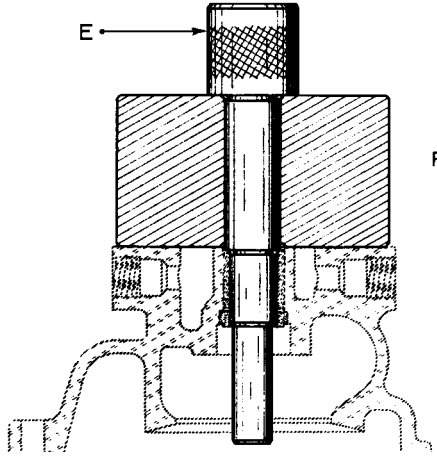


Fig. 3 MANDREL AND DOLLY RING
sold under No. 2288–T

FITTING THE BUSH



POSITIONING THE BUSH



IGNITION ADVANCE CURVE

Fig. 1 TWIN CONTACT BREAKER

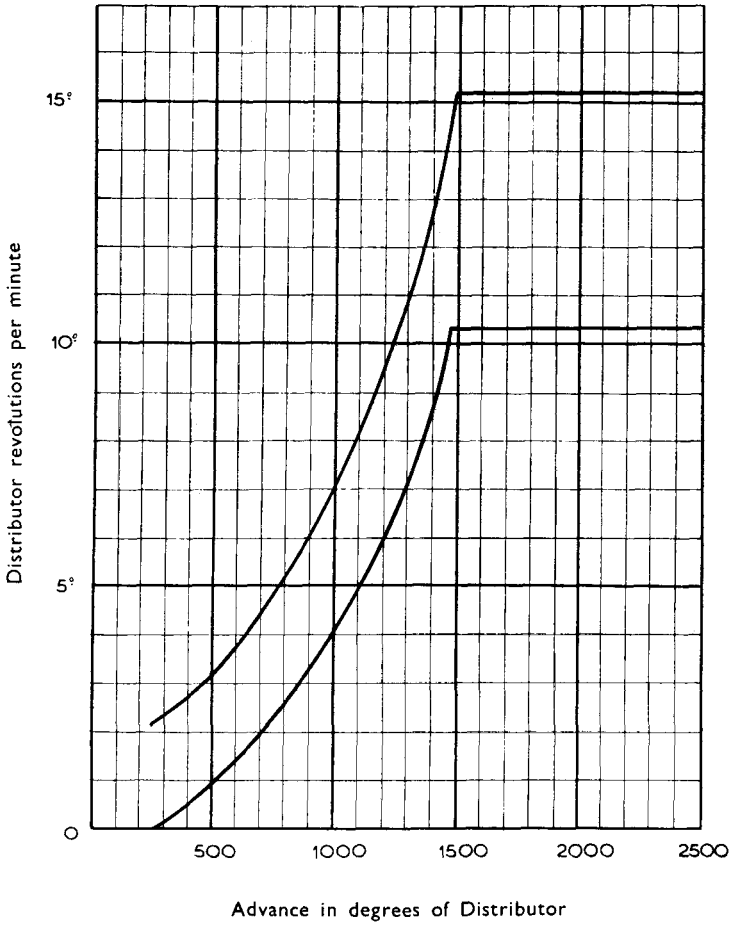
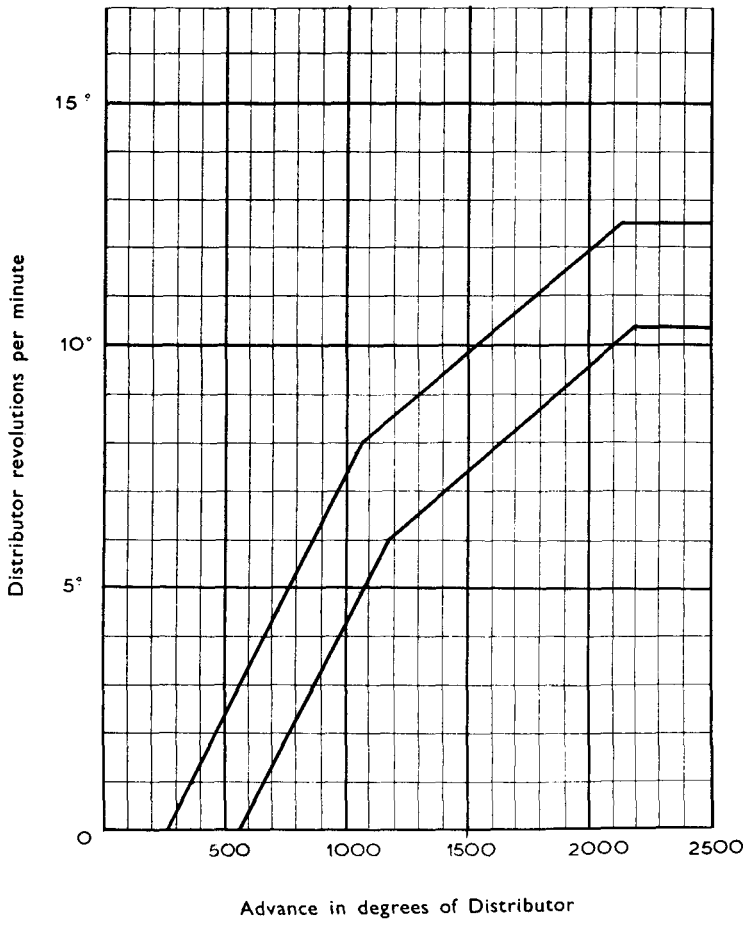


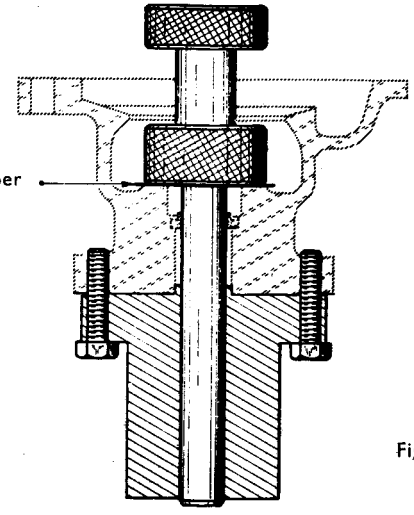
Fig. 2 SINGLE CONTACT BREAKER



LOW PRESSURE PUMP

VARIOUS TOOLS

Fig. 1



LAPPING SPINDLE

sold under No. 2289-T

Fig. 2

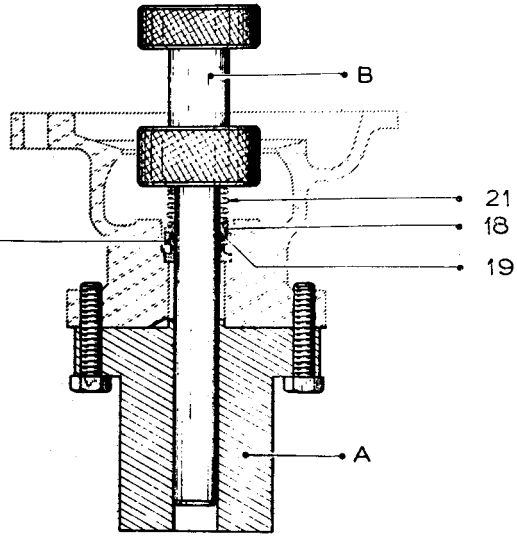
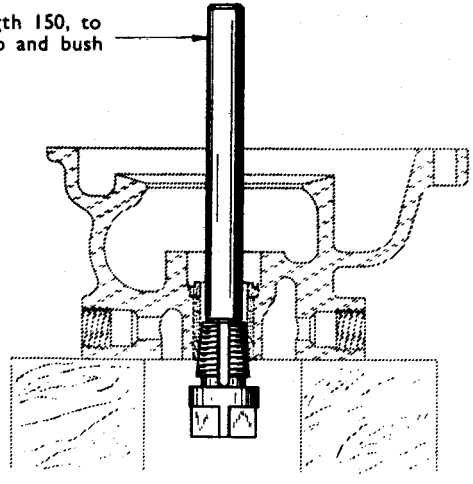


Fig. 3 — THREADED EXTRACTOR

sold under No. 2291-T



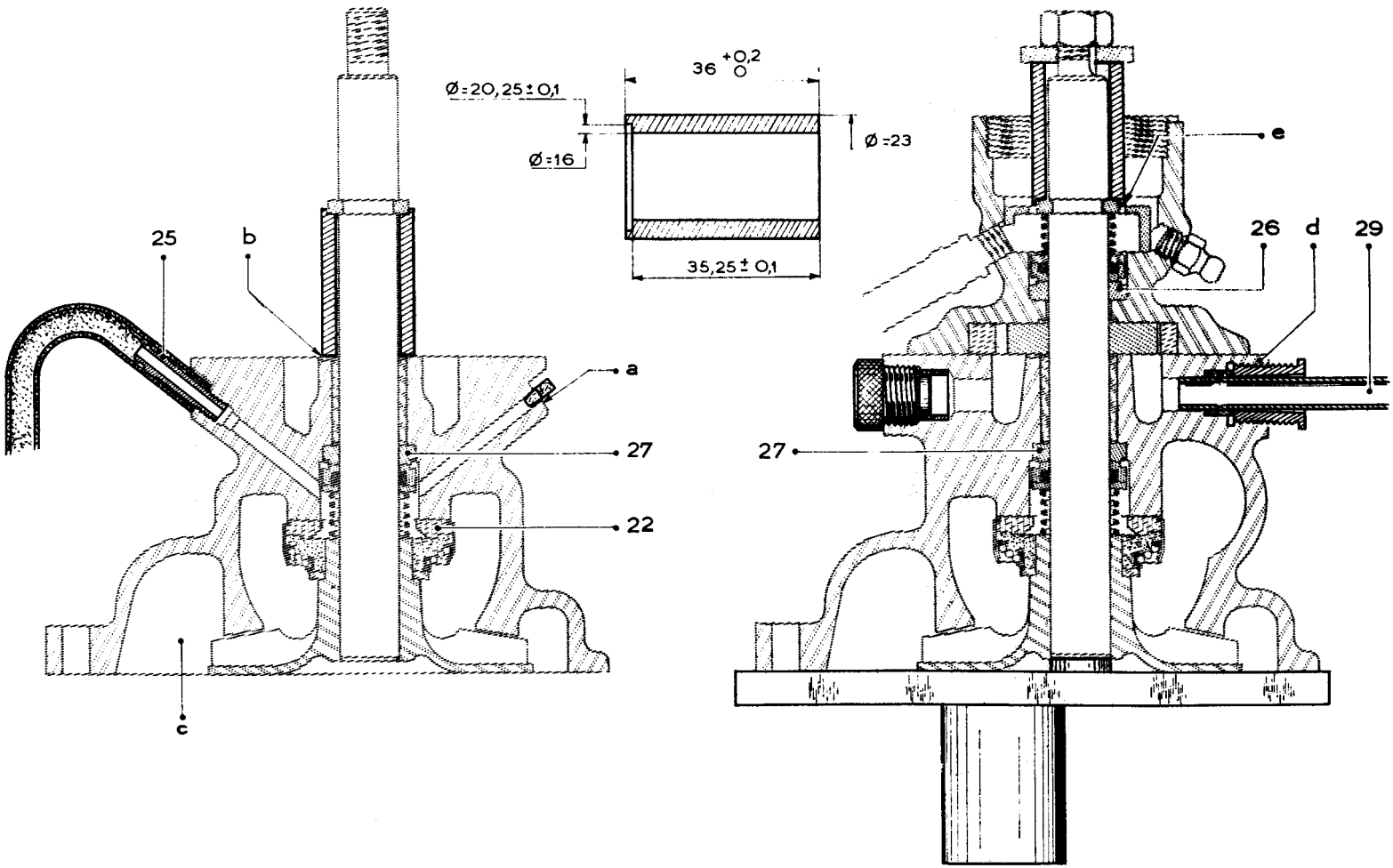
LOW PRESSURE PUMP AND WATER PUMP

CHECKING FOR LEAKAGE

Fig. 1 CHECKING FOR LEAKAGE FROM THE BUSH

Fig. 2 CHECKING FOR LEAKAGE FROM THE THRUST WASHERS

Fig. 3 BUSH MR 4251 not sold



LOW PRESSURE PUMP AND WATER PUMP

Fig. 1 SUPPORT MR 3676-180 not sold

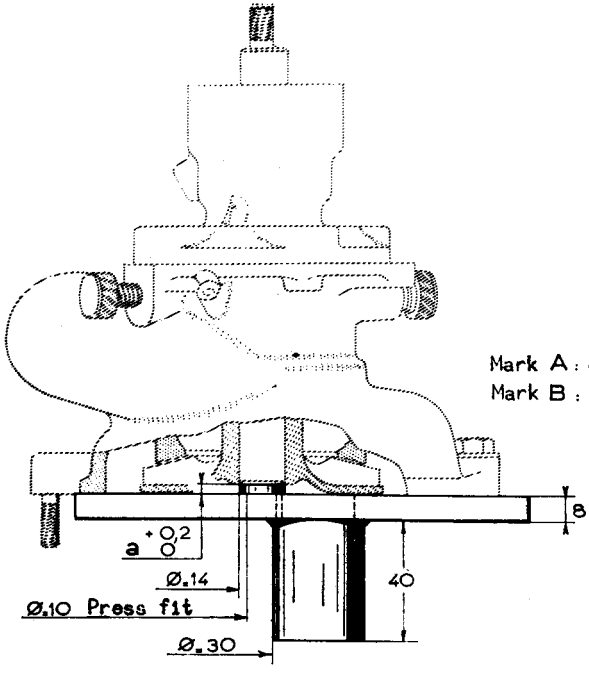


Fig. 2 SPANNER sold under No. 1634-T

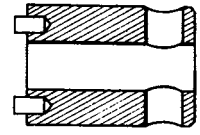


Fig. 3 EXTRACTOR sold under No. 1684-T

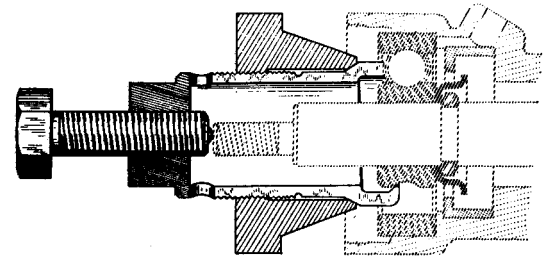


Fig. 4 SPANNER sold under No. 1646-T

Mark A : a = 3
Mark B : a = 10,5

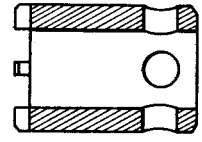
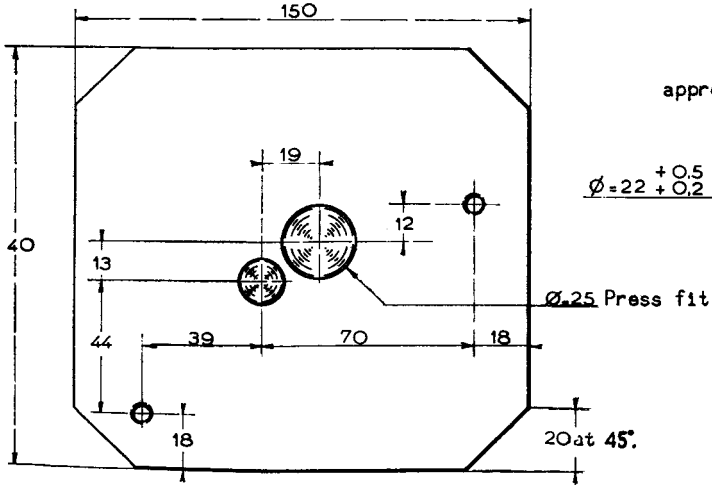


Fig. 5 BUSH MR 3470-20 not sold



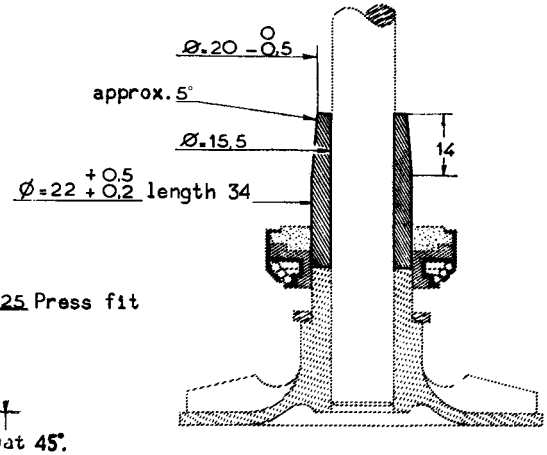
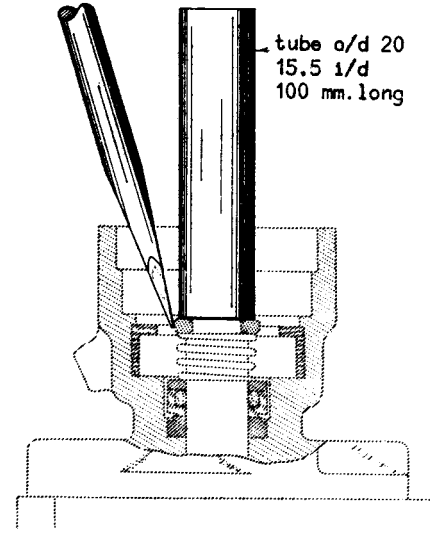


Fig. 6 TUBE MR 3676-190 not sold



ASSEMBLY

Fig. 1

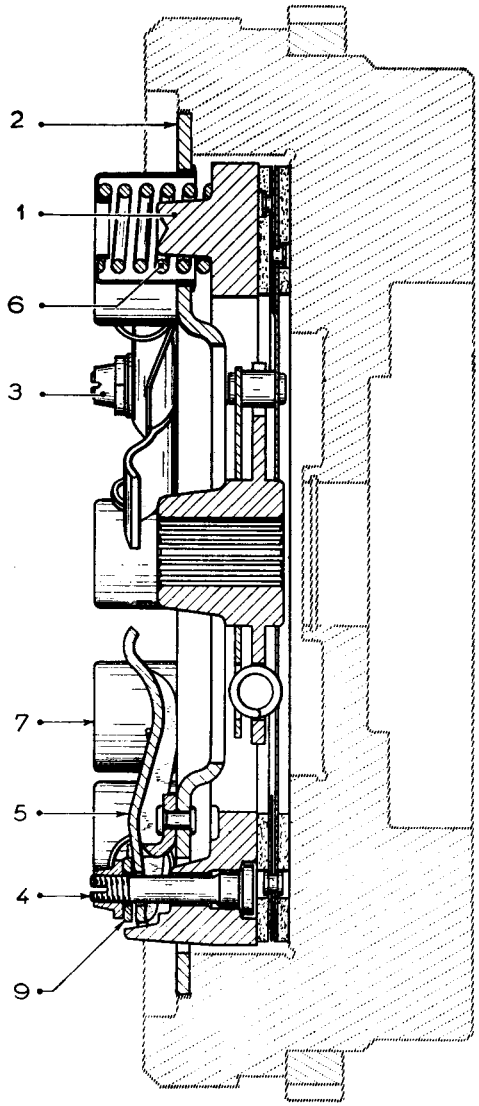


Fig. 3

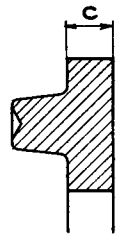
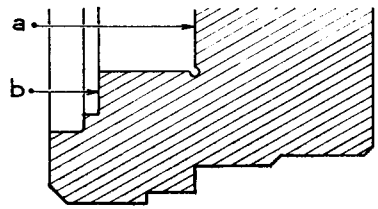
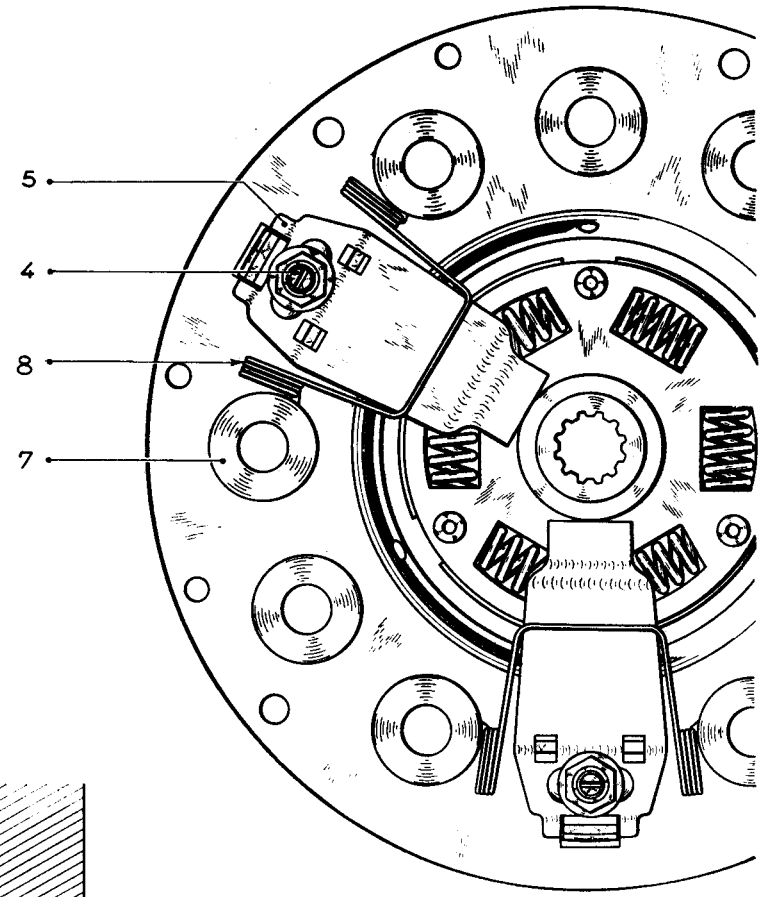


Fig. 4



Grind the two faces by the same amount

Fig. 2



ADJUSTMENT OF THE TOGGLES

Fig. 1 FIXTURE FOR CLUTCH ADJUSTMENT

sold under No. 1701–T

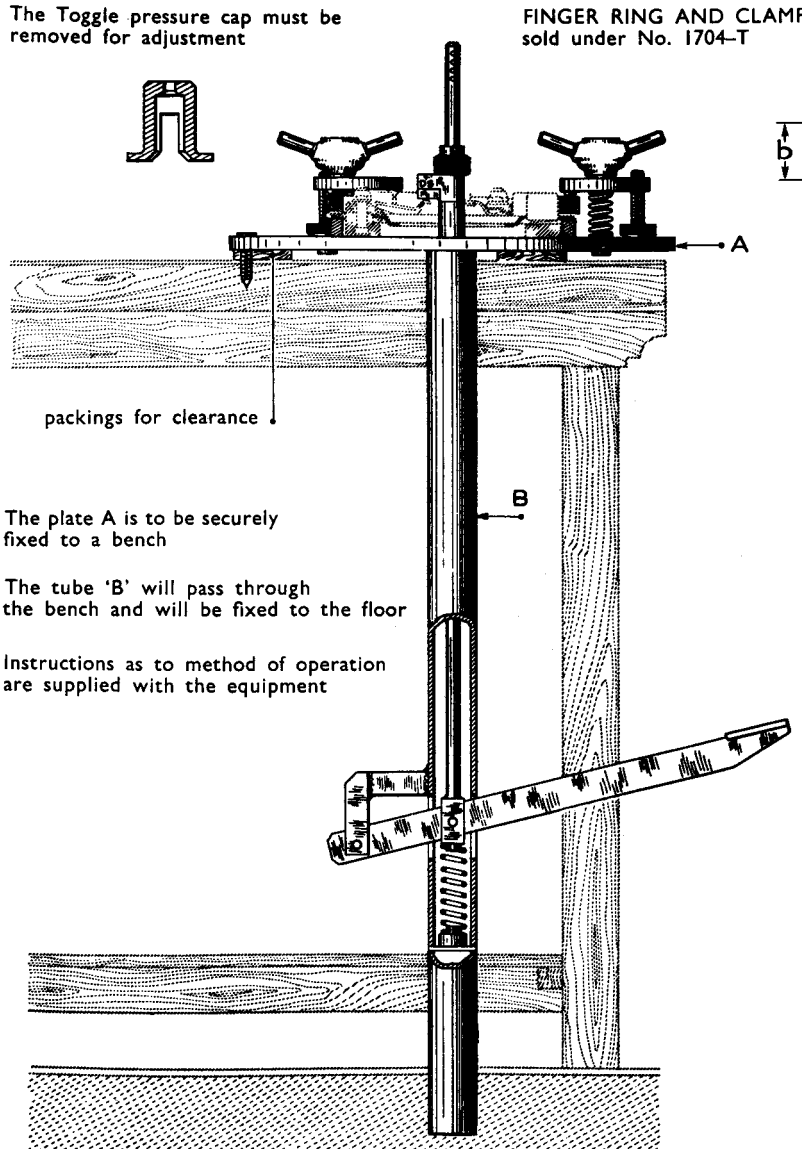


Fig. 2 CLUTCH MECHANISM IN ENGAGED POSITION

These dimensions can only be measured on a fixture

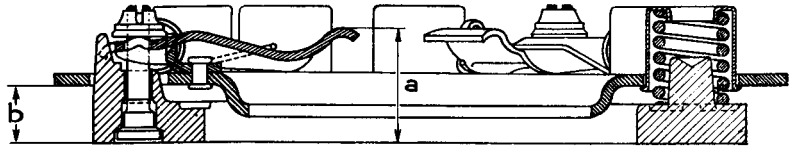
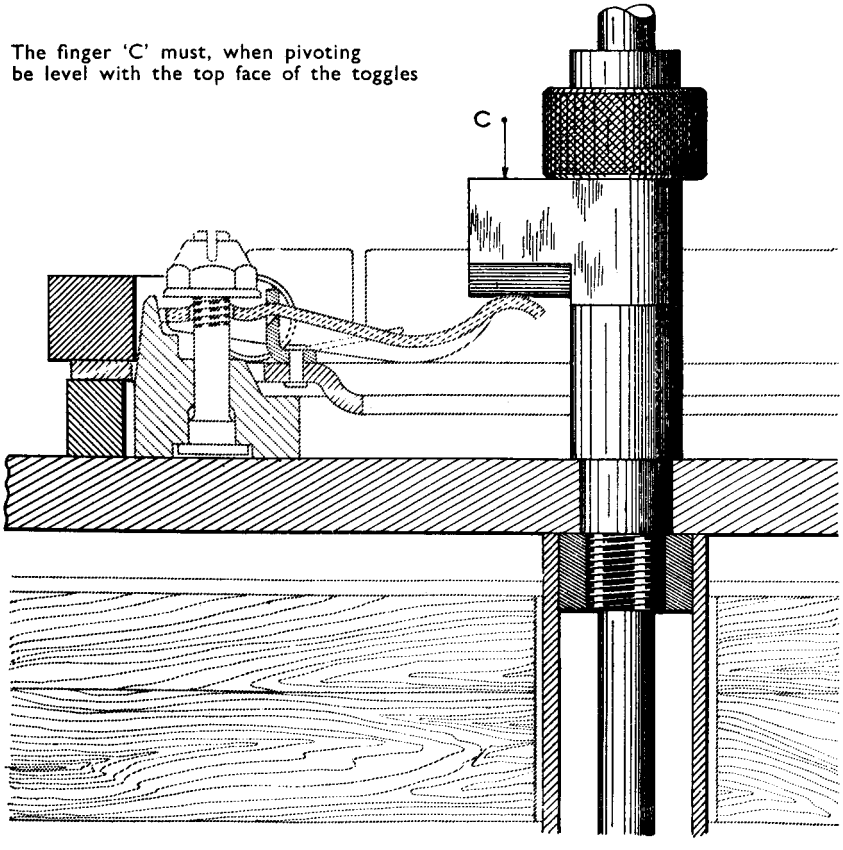


Fig. 3 CHECKING THE ADJUSTMENT



ADJUSTMENT OF THE TOGGLES

Fig. 1 ADJUSTMENT

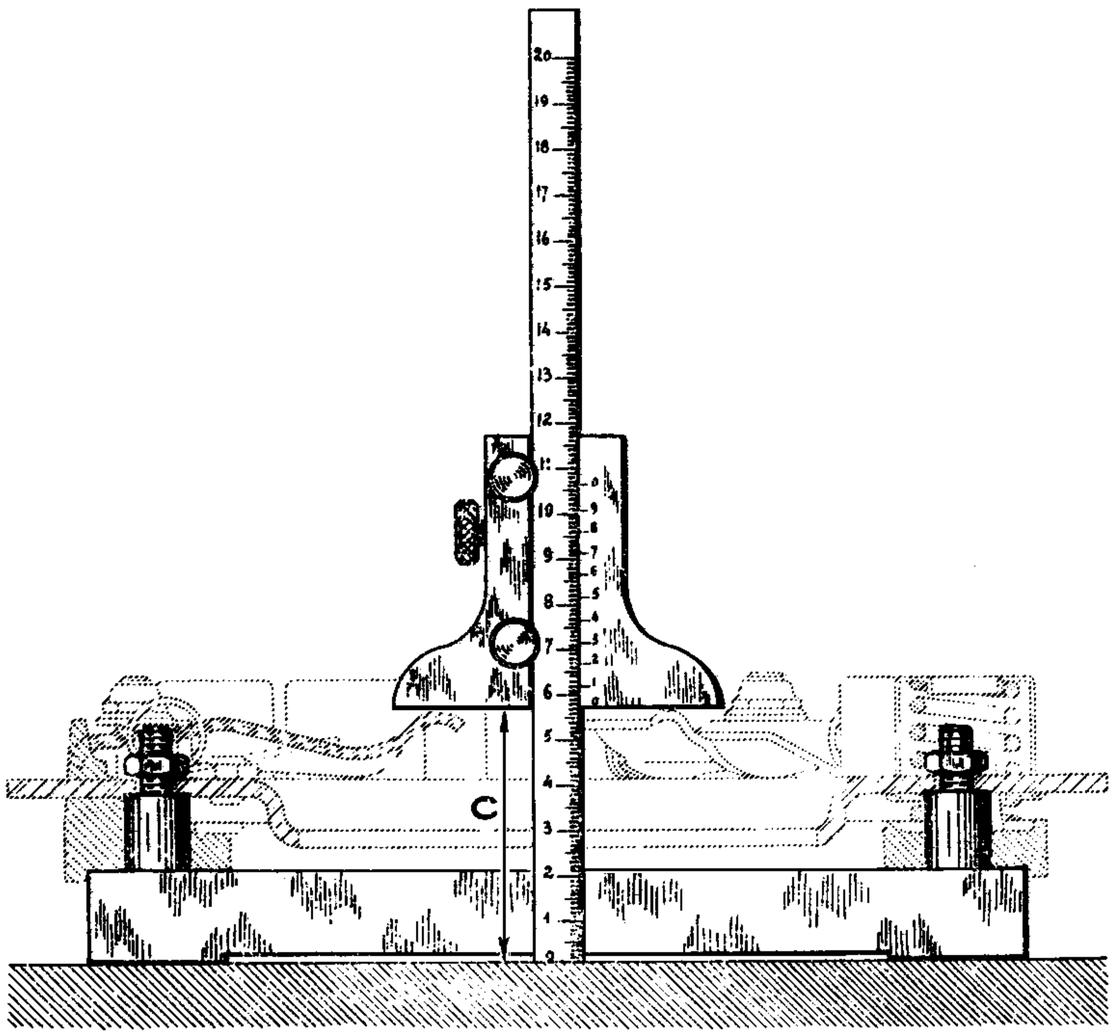


Fig. 2 ASSEMBLY OF THE BLOCKS

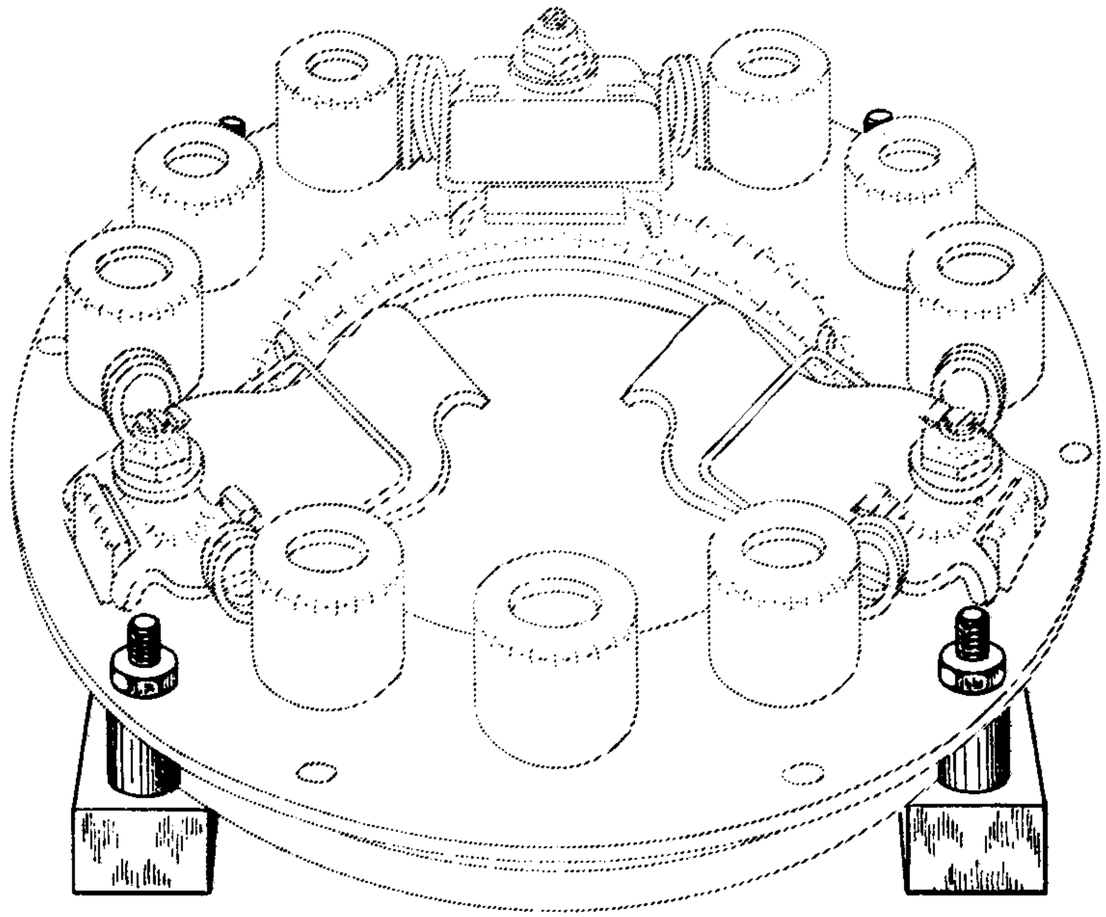


Fig. 3 BLOCK MR 3457-100 not sold

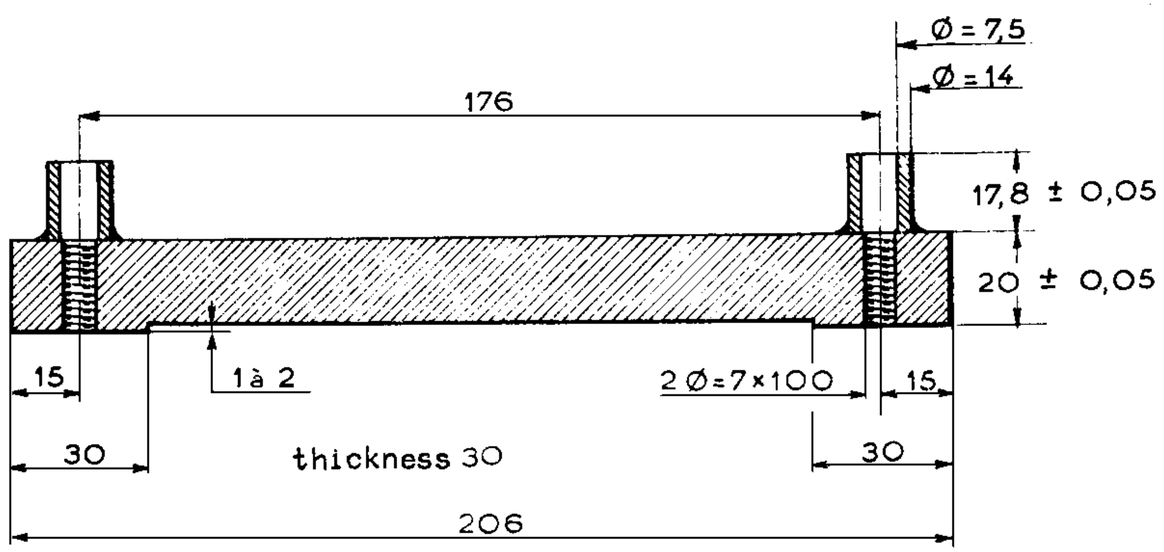
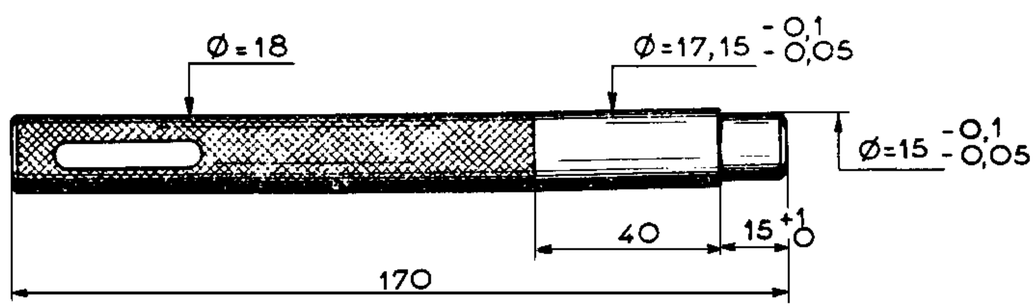
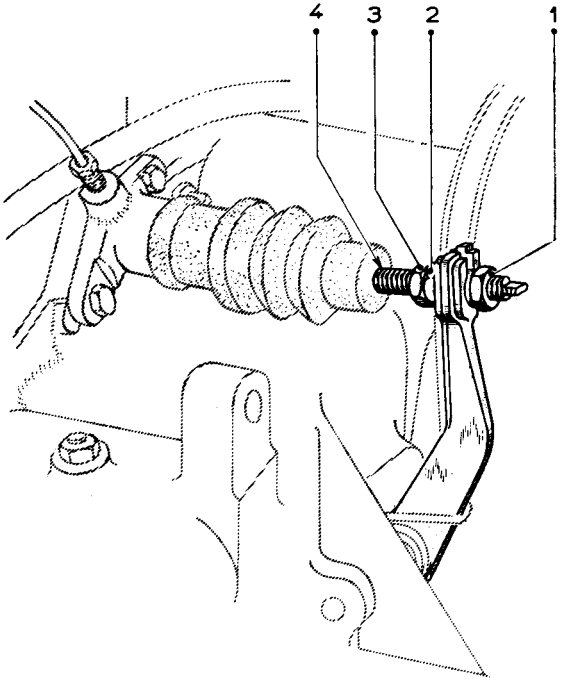


Fig. 4 MANDREL sold under No. 1712-T



CONTROLS

Fig. 1



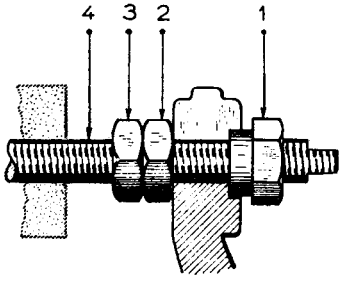
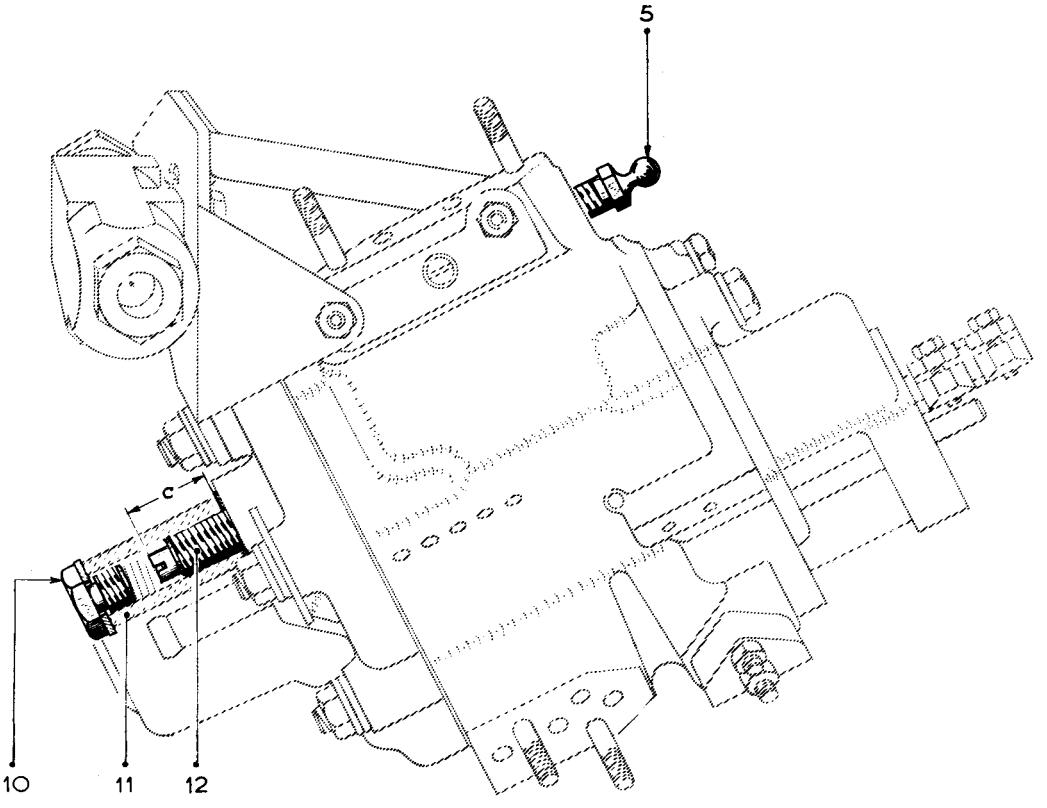
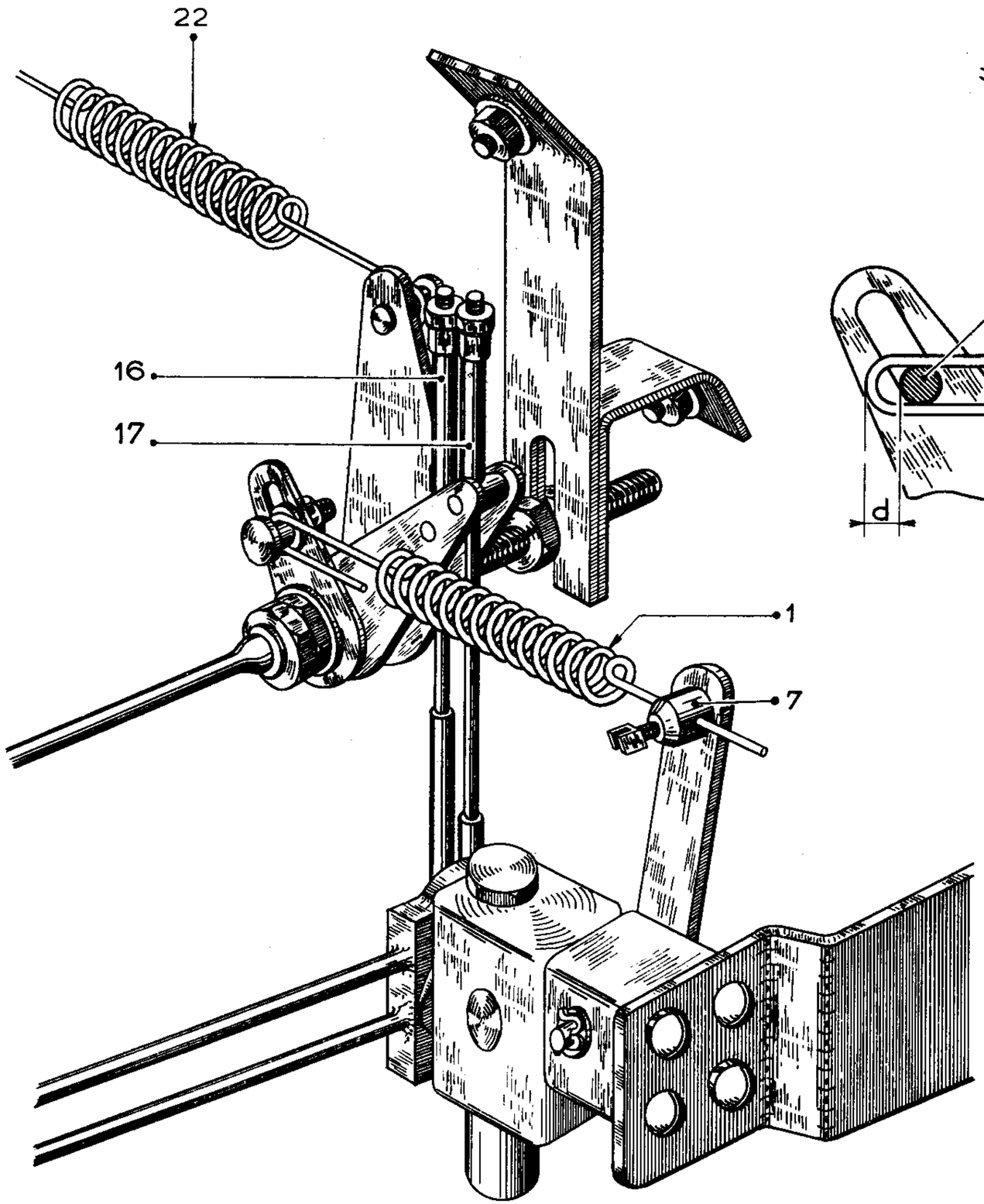


Fig. 2



RE-ENGAGEMENT CONTROL—ACCELERATED IDLING

Fig. 1



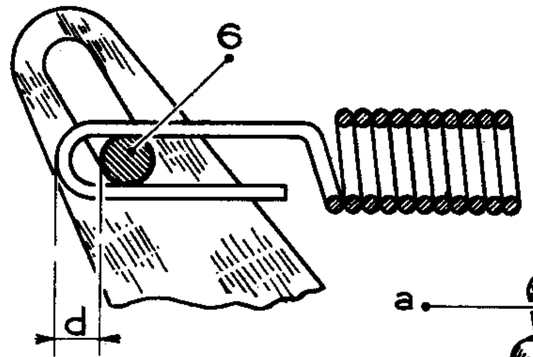
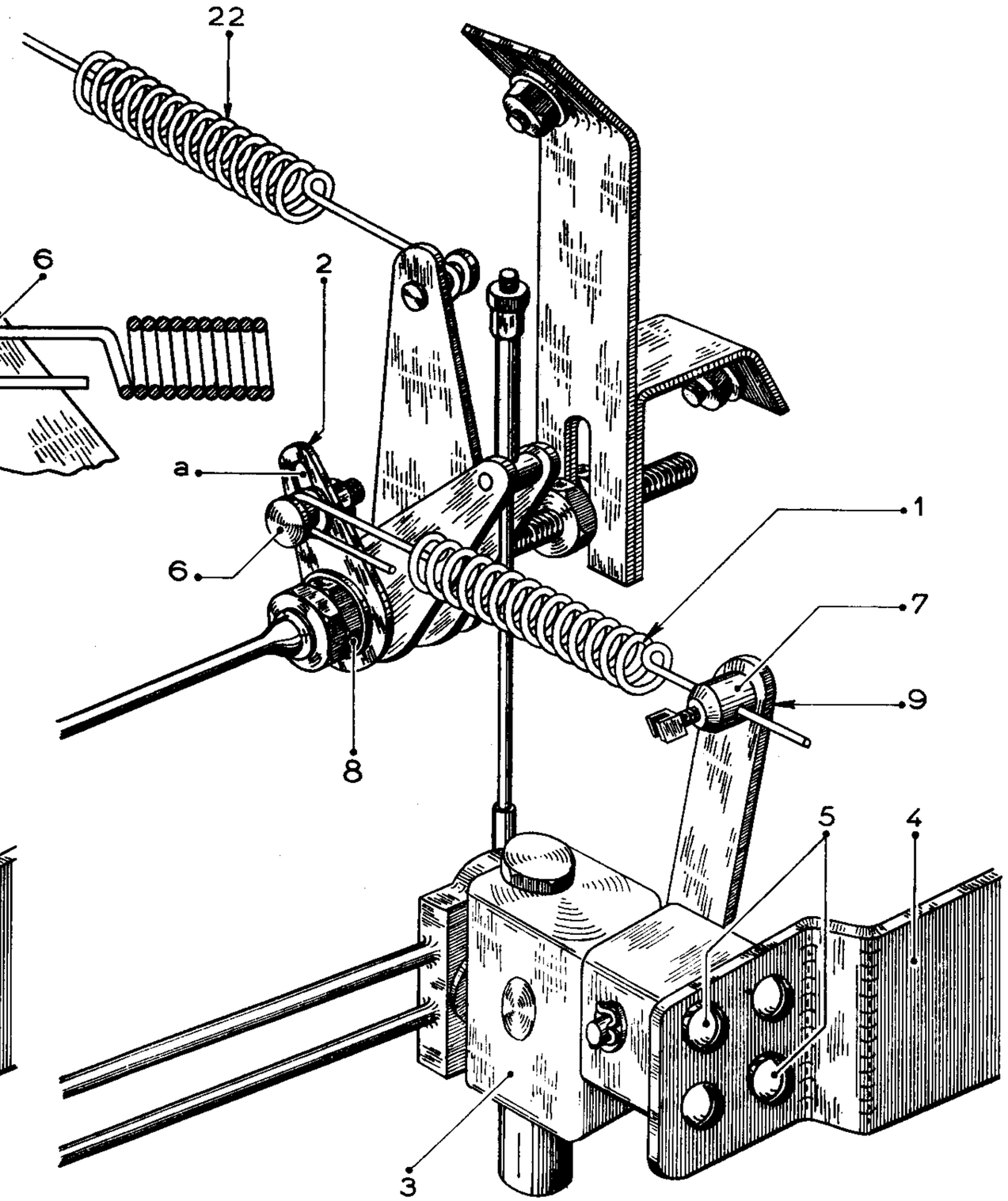
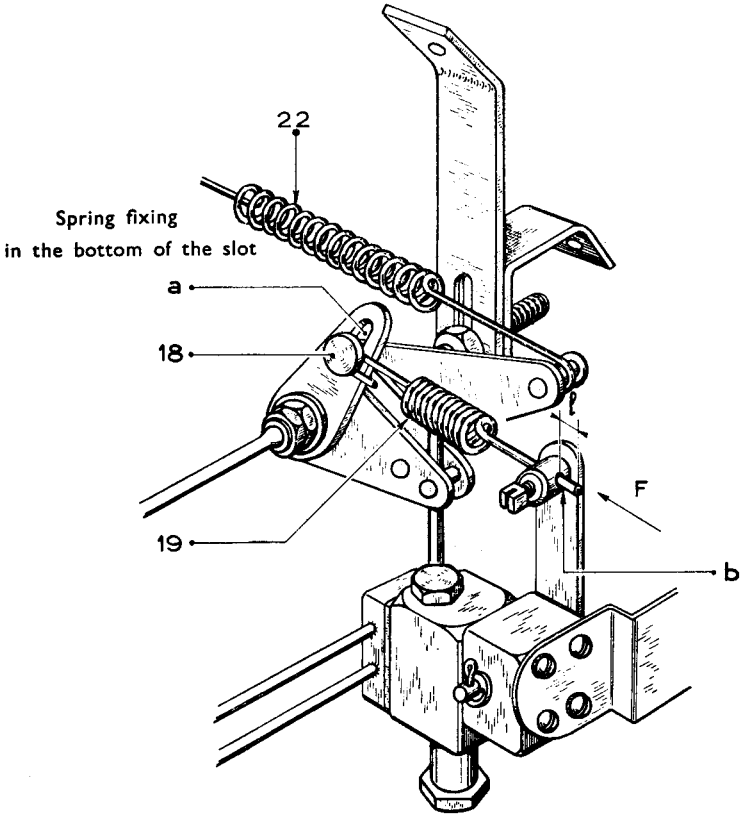


Fig. 2



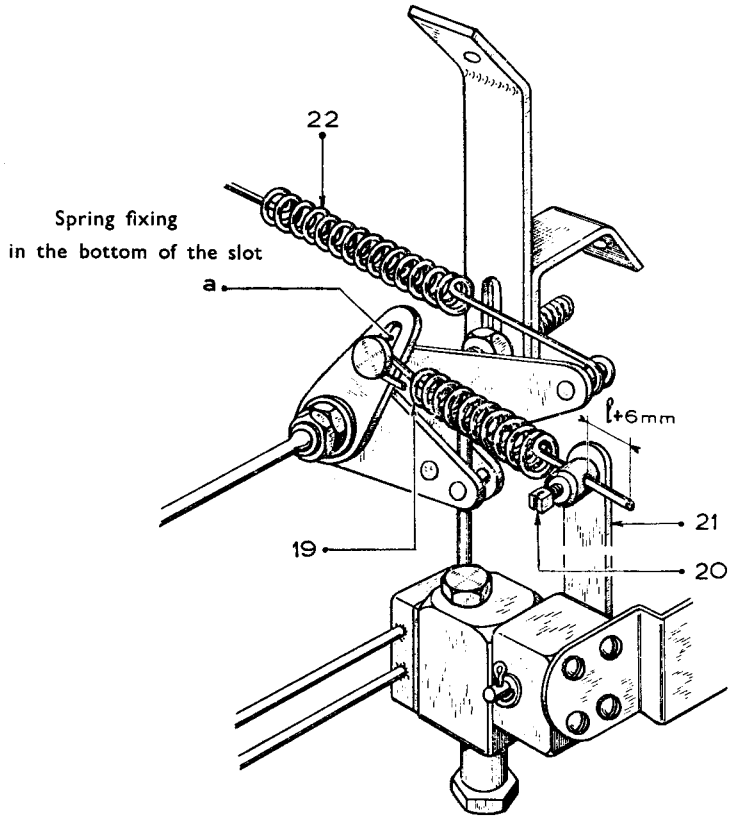
RE-ENGAGEMENT CONTROL—ACCELERATED IDLING

Fig. 1



1. Anchor the spring 19 on the spindle 18, engage the end of the spring in the hole 'b', push the lever 21 in the direction of 'F' until it stops. Measure the distance 'ℓ'

Fig. 2



2. Pull the spring 19 so that the end is at a distance of 'ℓ' plus 6 mm from the trunnion. Tighten screw 20

CLUTCH ENGAGEMENT CONTROL—CLUTCH CYLINDER

Fig. 1 CLUTCH CYLINDER

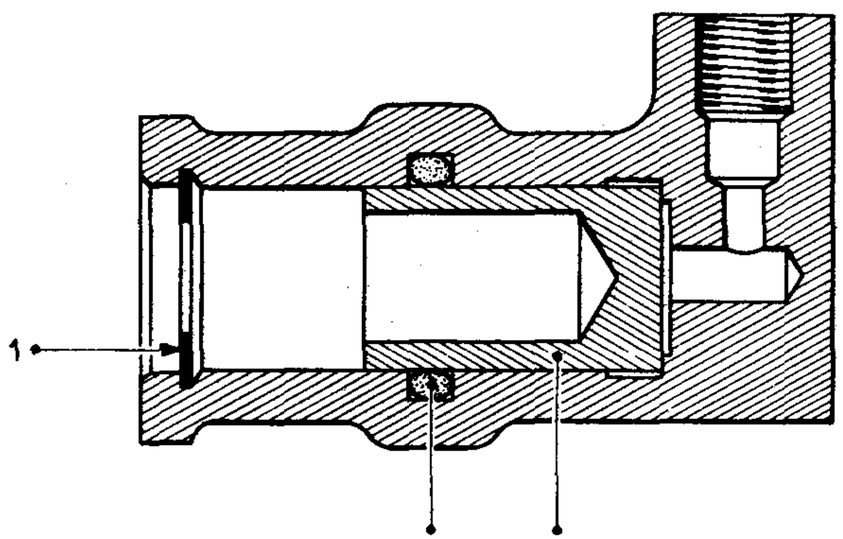


Fig. 2 USE OF MANDREL

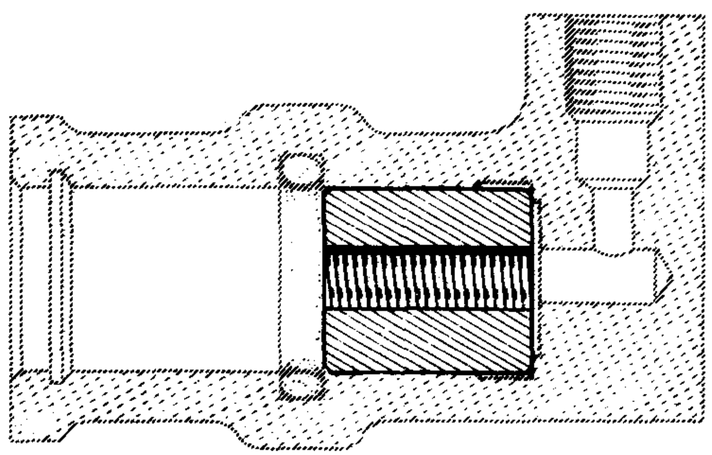


Fig. 3 MANDREL MR 3045–60 not sold

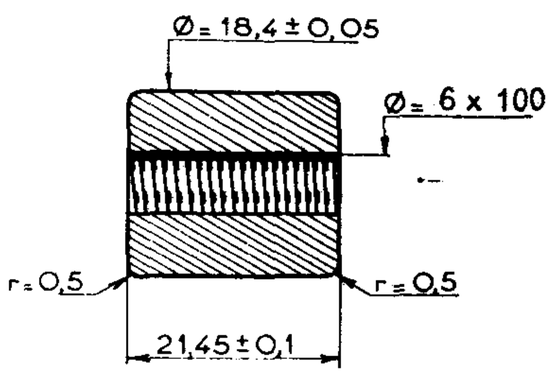
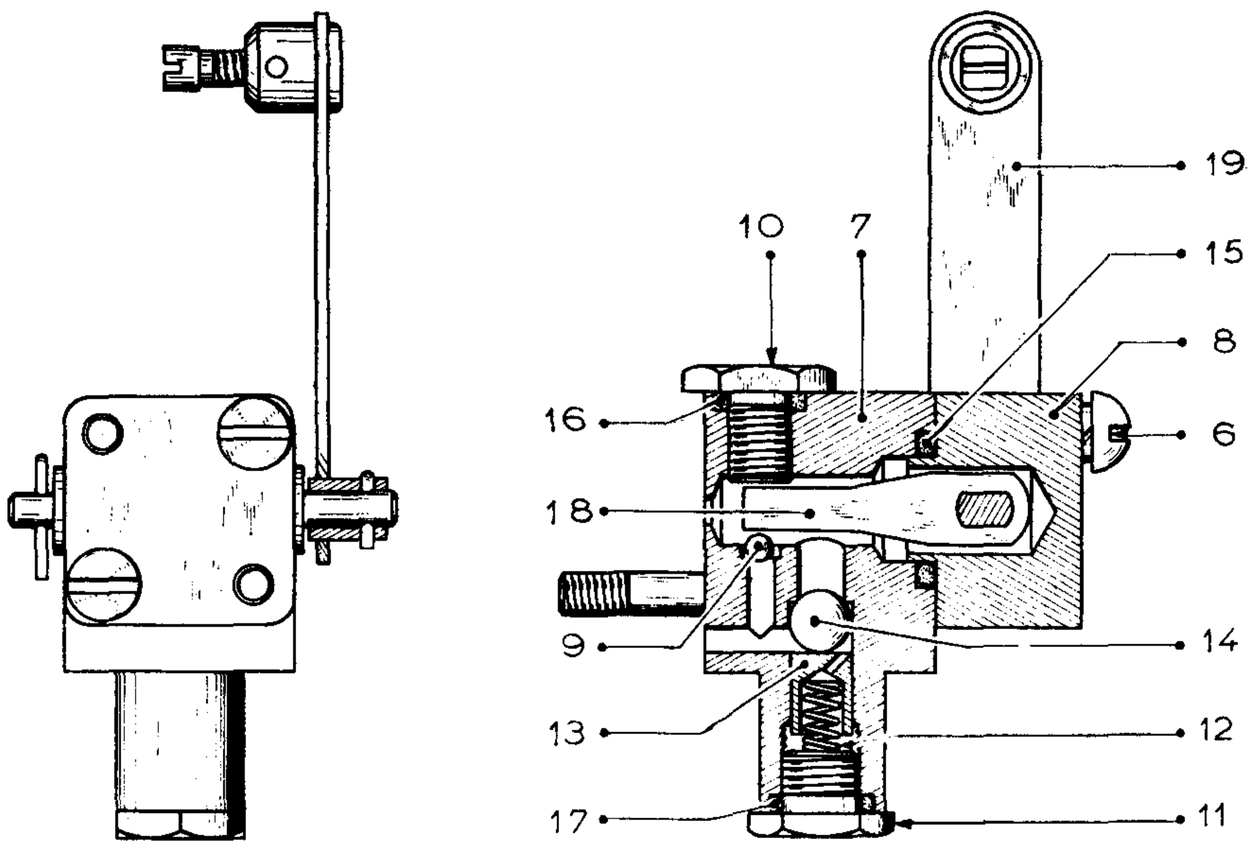
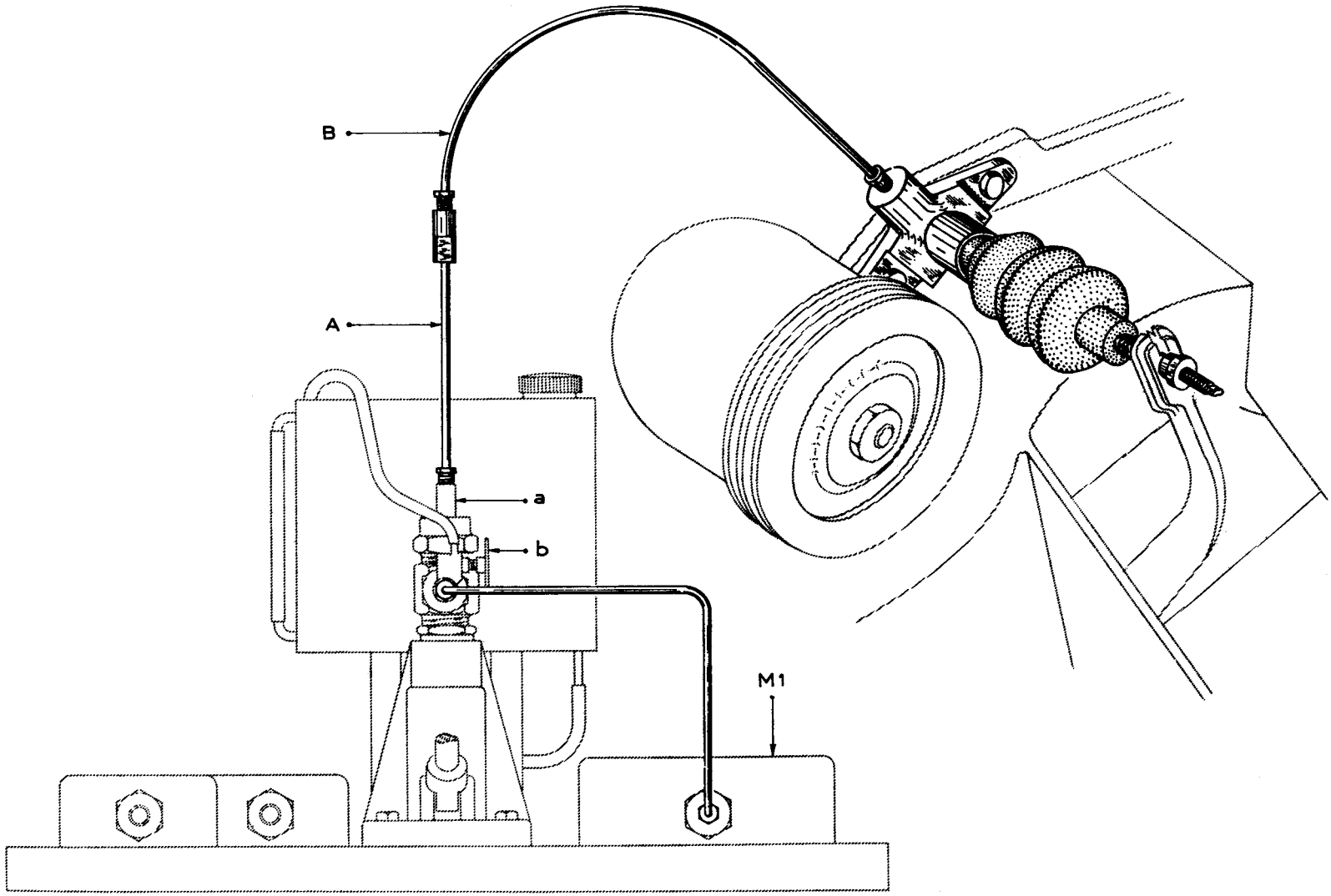


Fig. 4 CLUTCH RE-ENGAGEMENT CONTROL

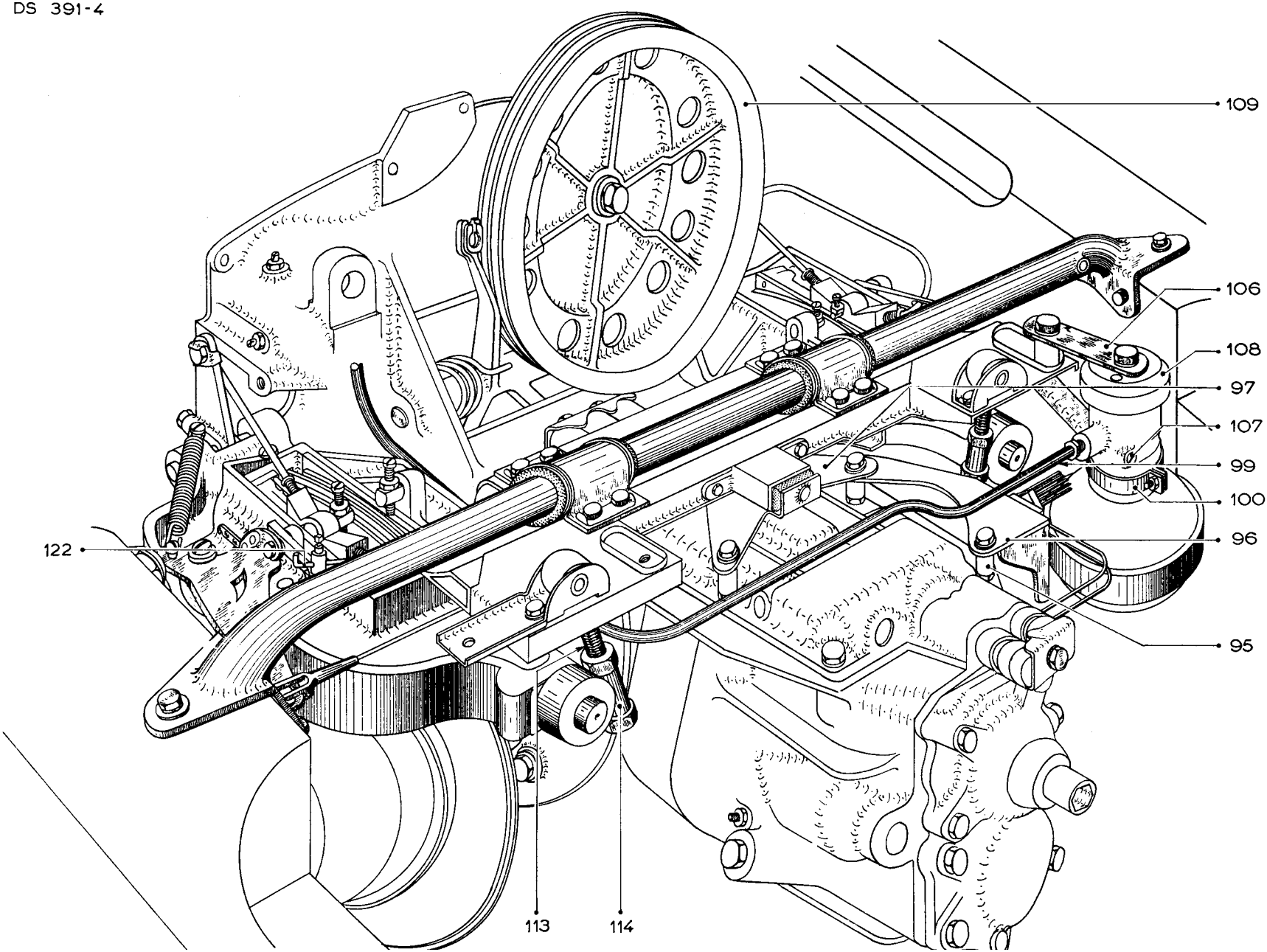


CLUTCH CYLINDER

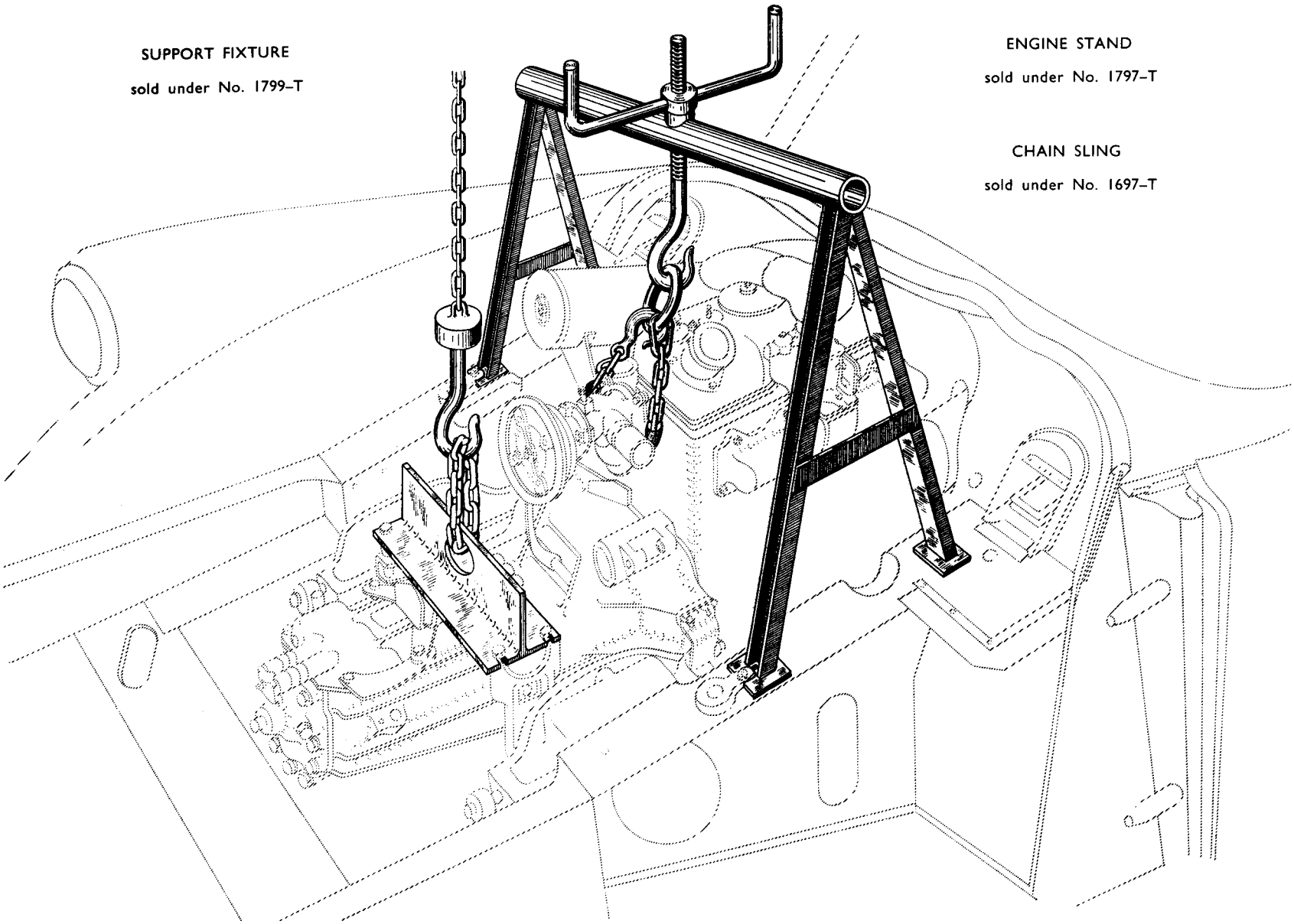
CHECKING FOR LEAKAGE AND OPERATION



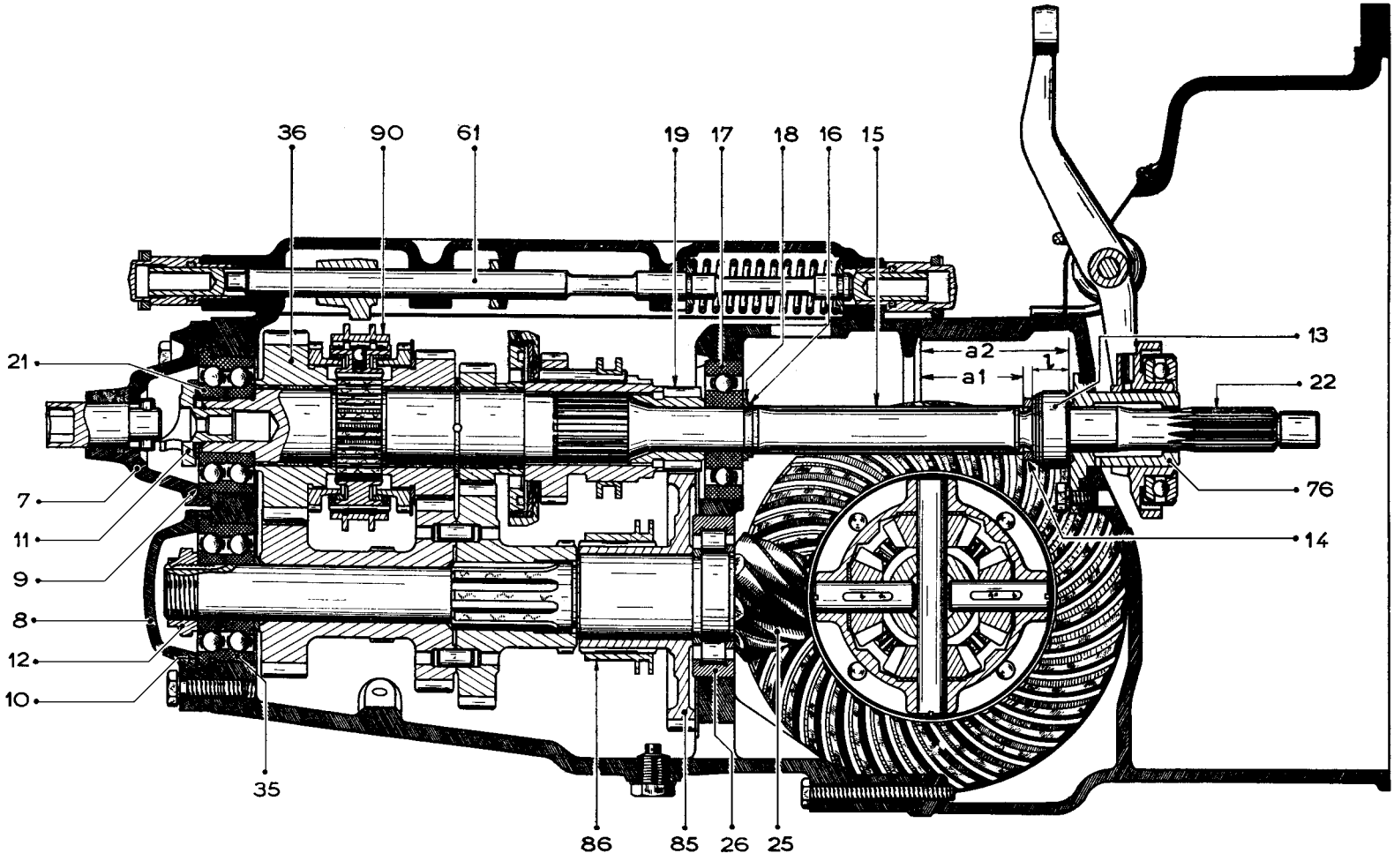
EXTERIOR VIEW



REMOVAL AND REPLACEMENT



ASSEMBLY


36
90
61
19
17
18
16
15
13
a2
a1
1
22
21
7
11
9
8
12
10
76
14
35
86
85
26
25

SHAFTS

Fig. 1 MAINSHAFT

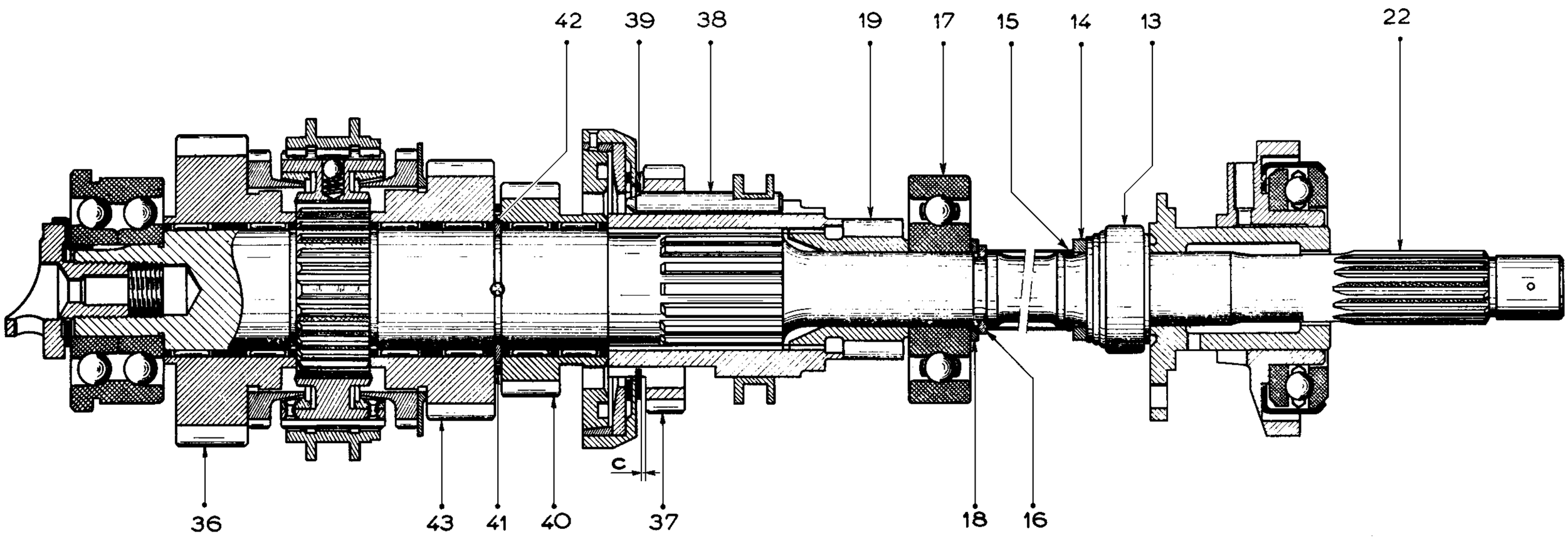
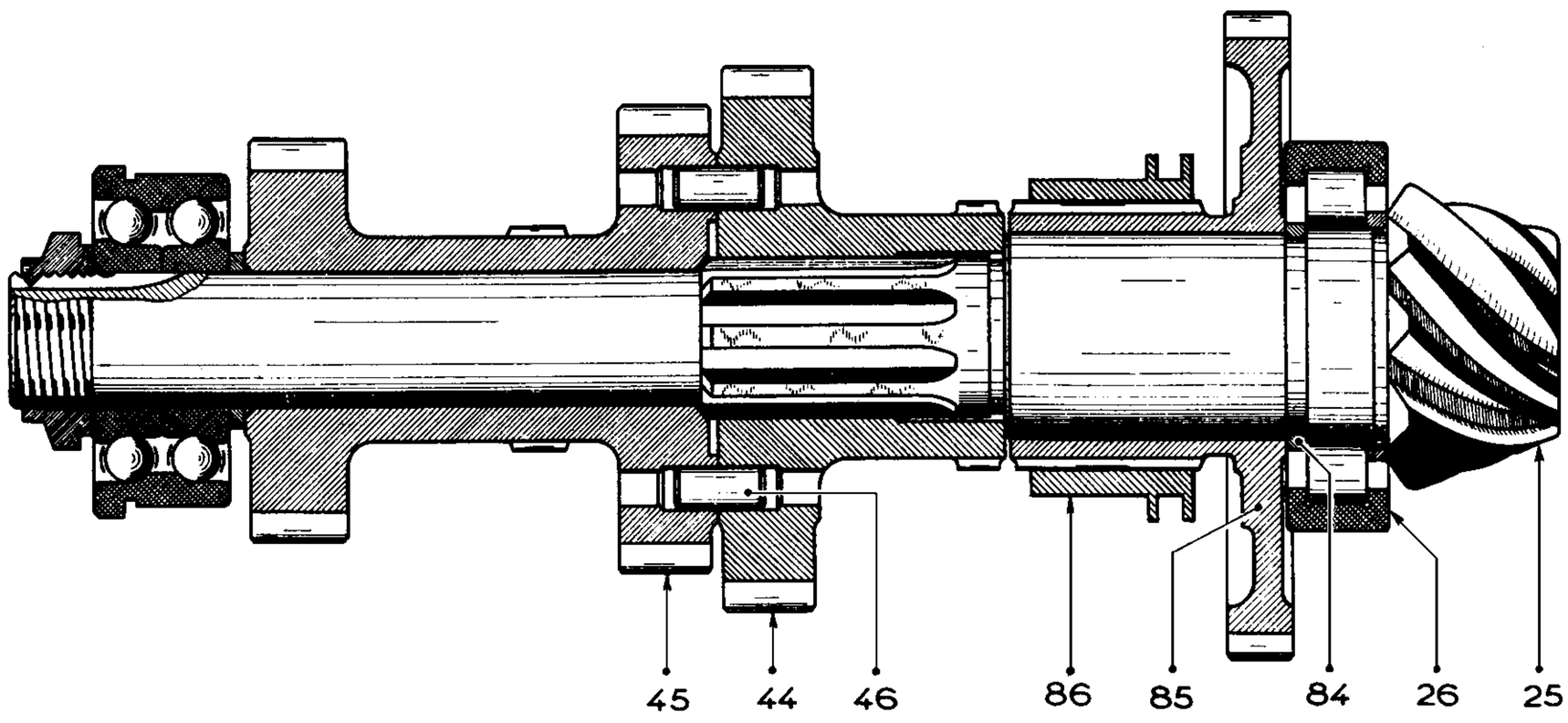


Fig. 2 BEVEL PINION



ASSEMBLY OF PINIONS

Fig. 1 3rd and 4th SPEED PINIONS

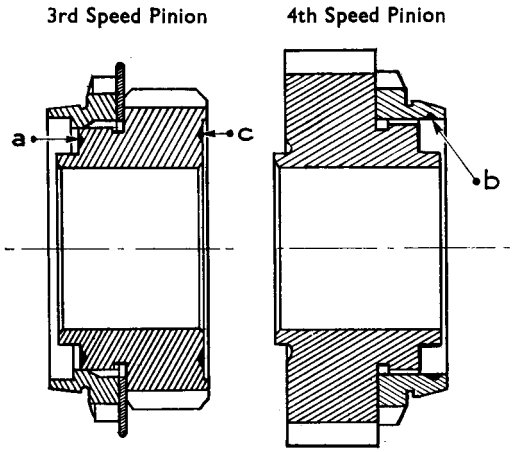


Fig. 2 2nd SPEED PINION

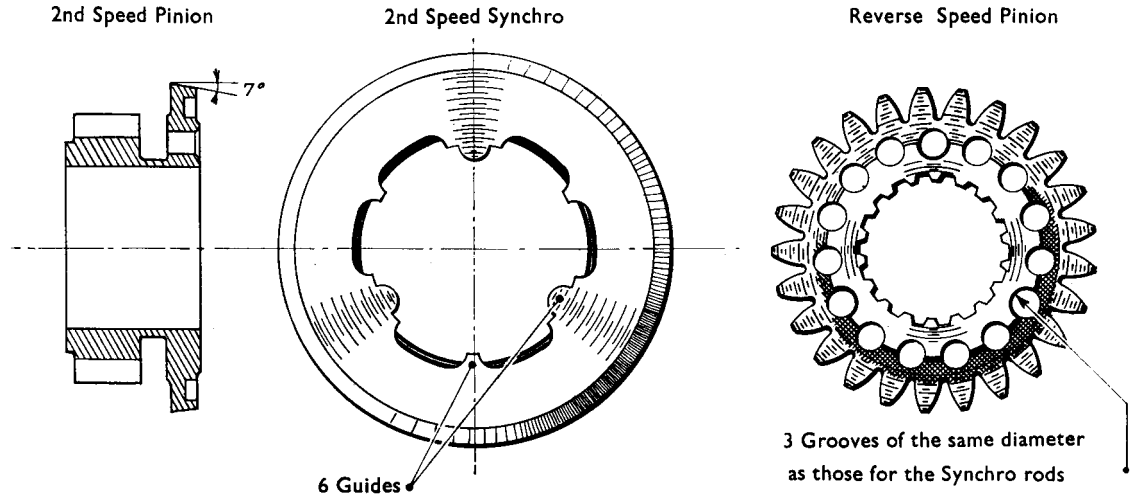
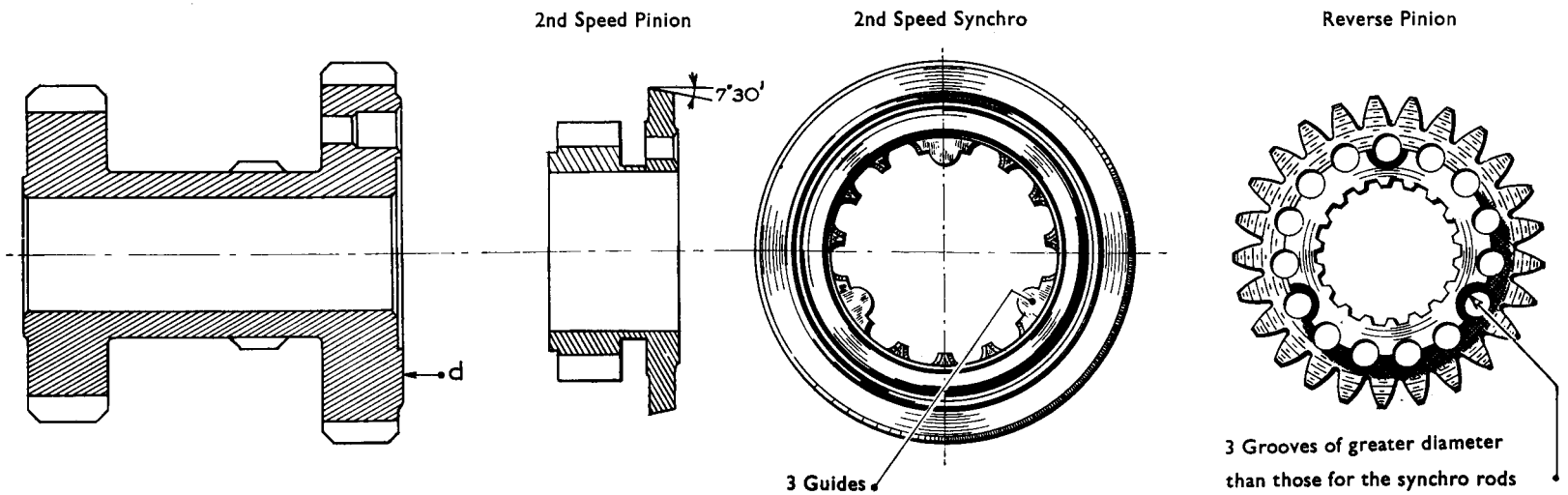


Fig. 3 2nd SPEED PINION (2nd arrangement)

intermediate train



DIFFERENTIAL

Fig. 1

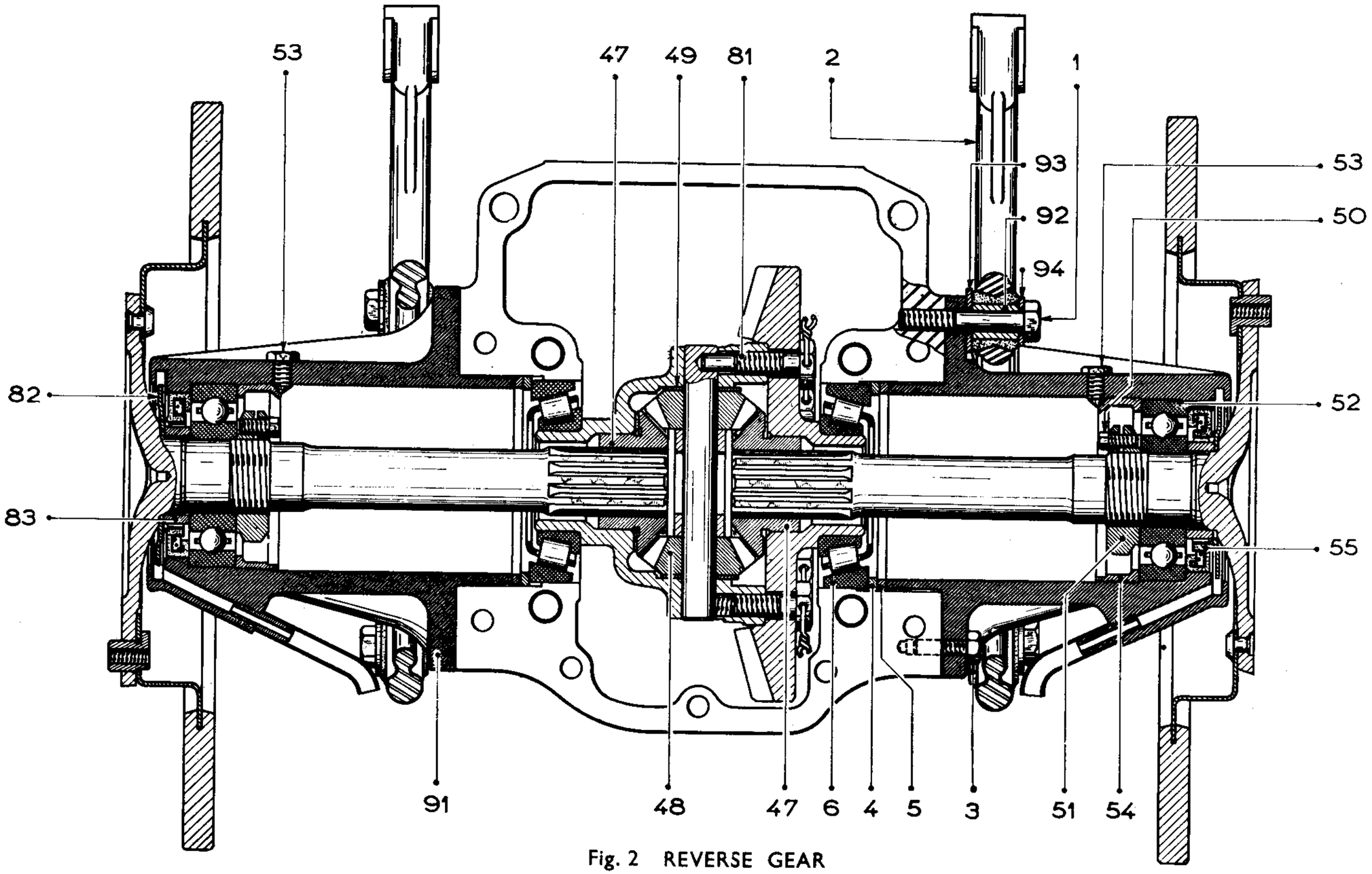
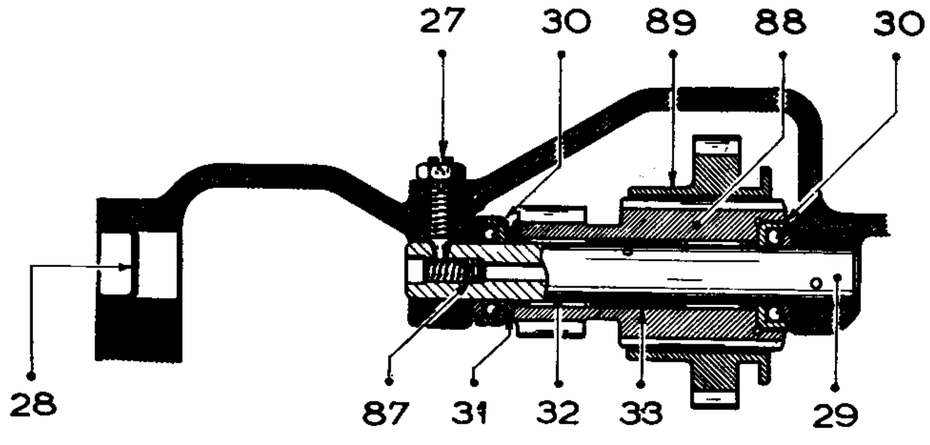


Fig. 2 REVERSE GEAR



COVER

Fig. 1

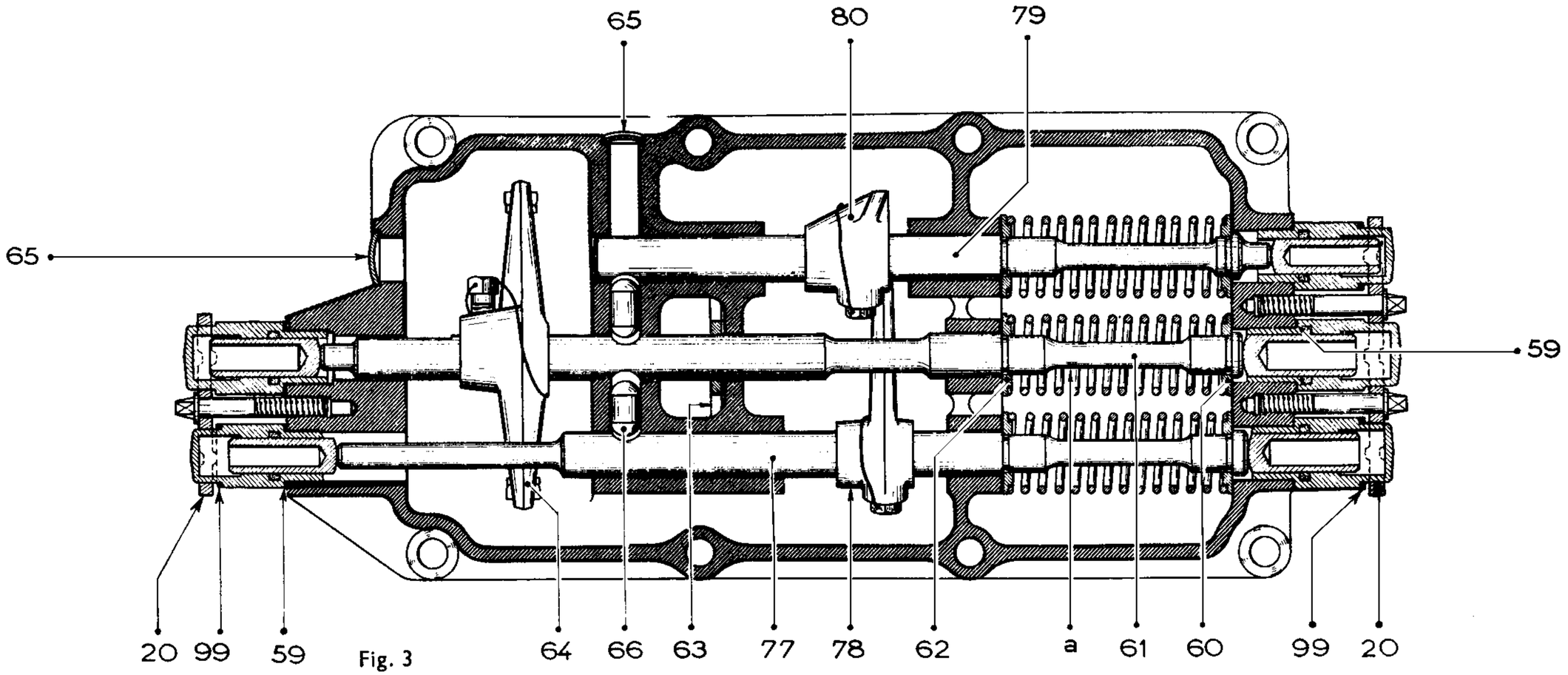


Fig. 2

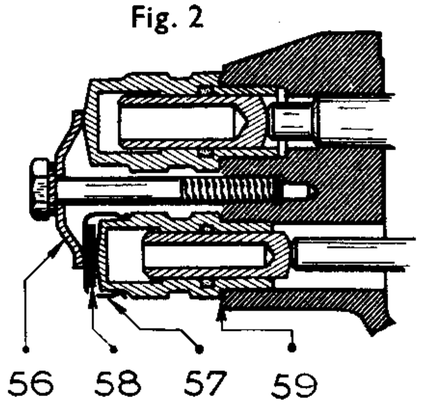


Fig. 3

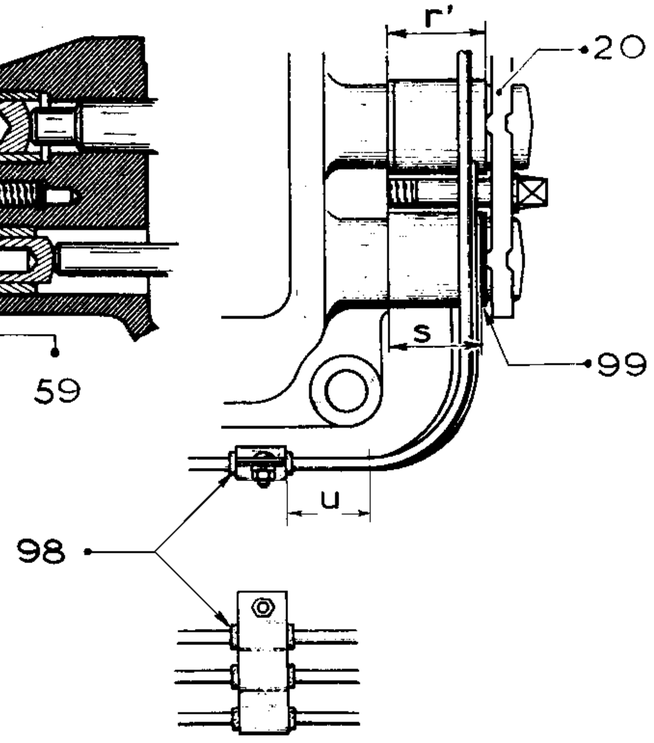


Fig. 5

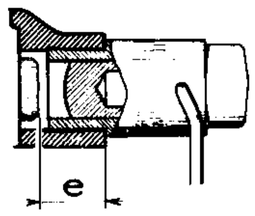


Fig. 6

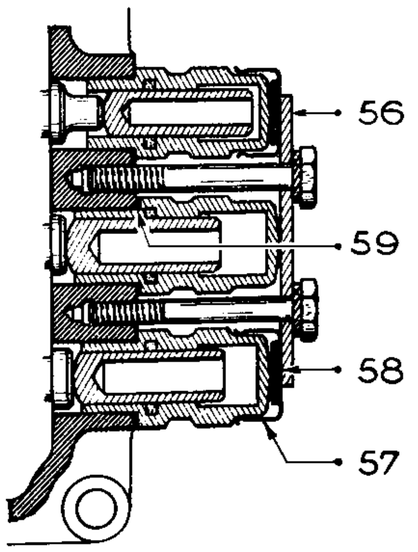


Fig. 7

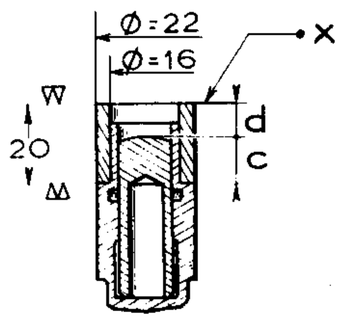
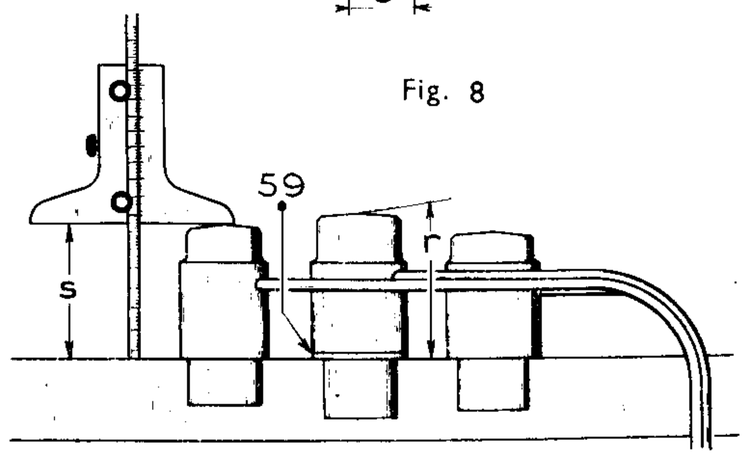


Fig. 8



COVER

Fig. 1 ASSEMBLY AND DISMANTLING OF SELECTOR SHAFT SPRINGS

COMPRESSOR

Sold under No. 1798–T

Turn the wing nut **A** in order to engage the forks **B** between the extreme coils of the springs. Compress the spring coils in order to assemble or dismantle

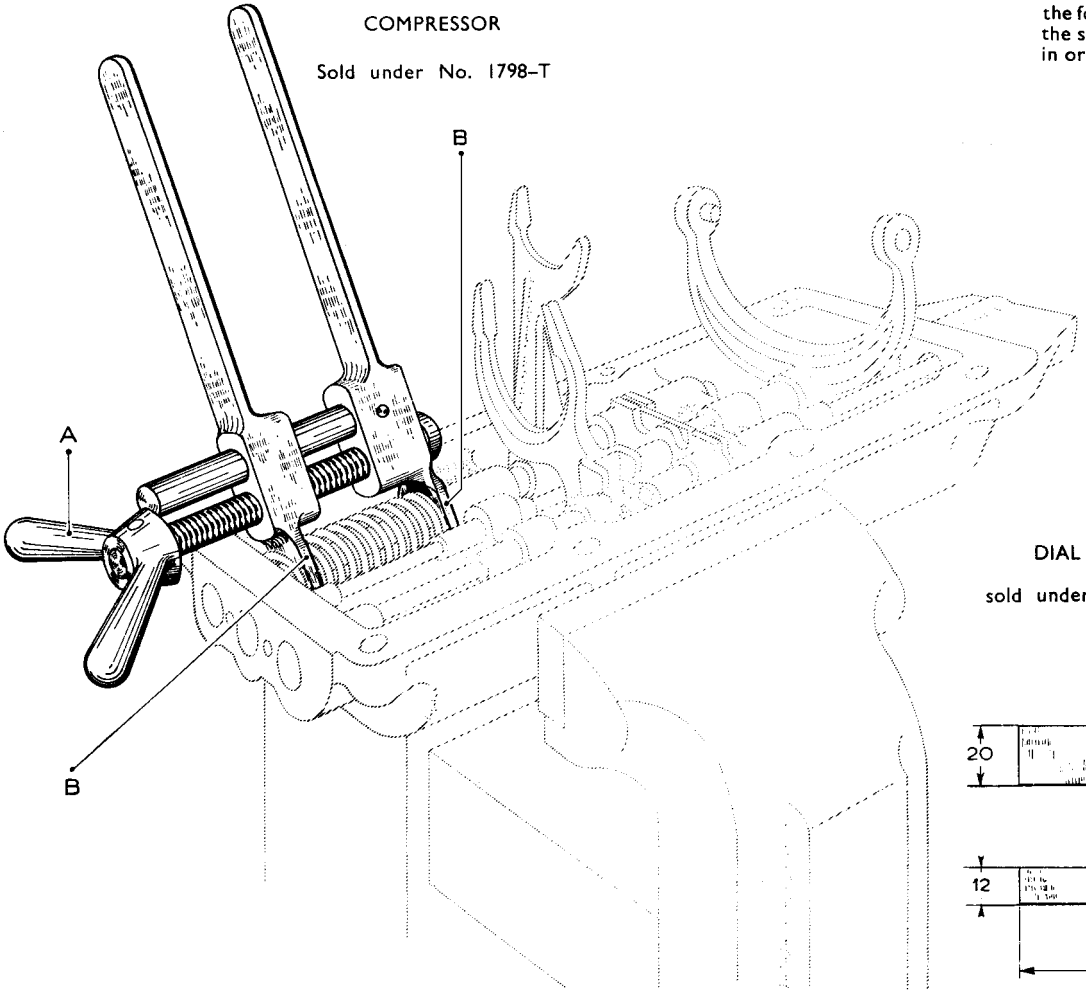
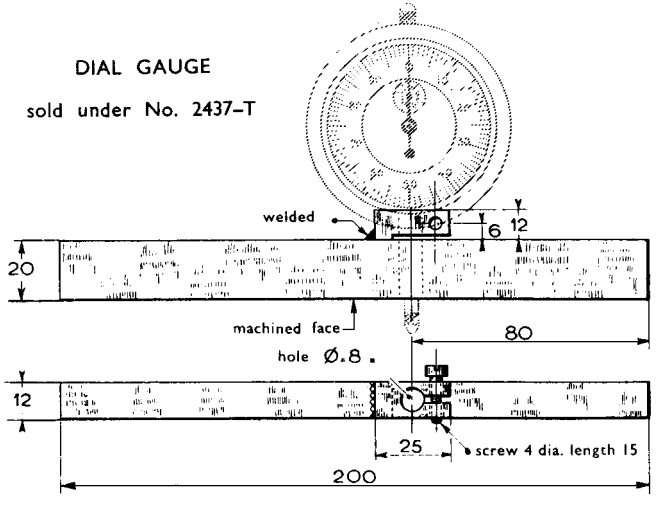


Fig. 2 STRAIGHT EDGE MR3377

not sold

DIAL GAUGE

sold under No. 2437–T



FIRST SPEED SELECTOR LEVER

Fig. 1

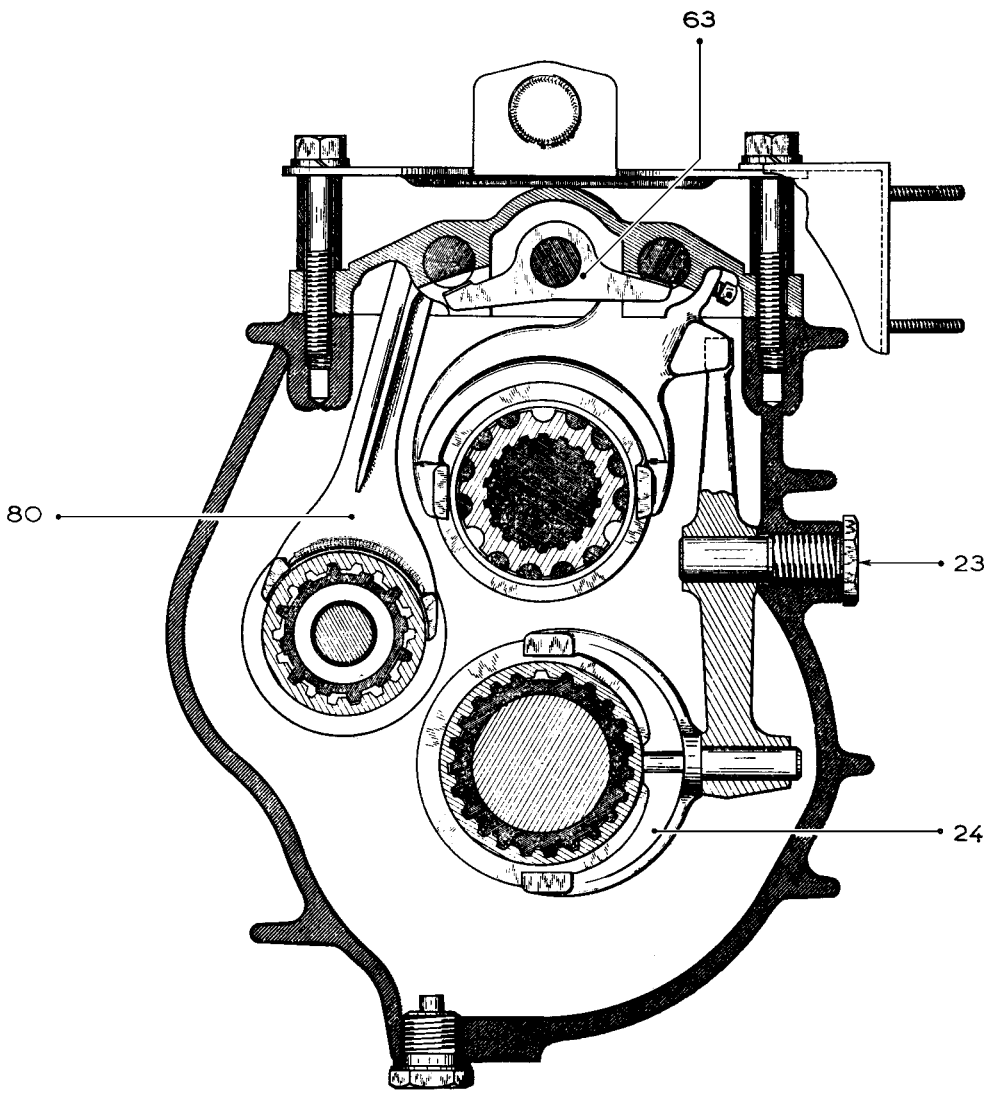
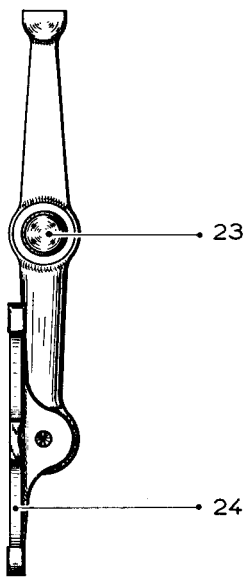


Fig. 2



CLUTCH HOUSING

Fig. 1.

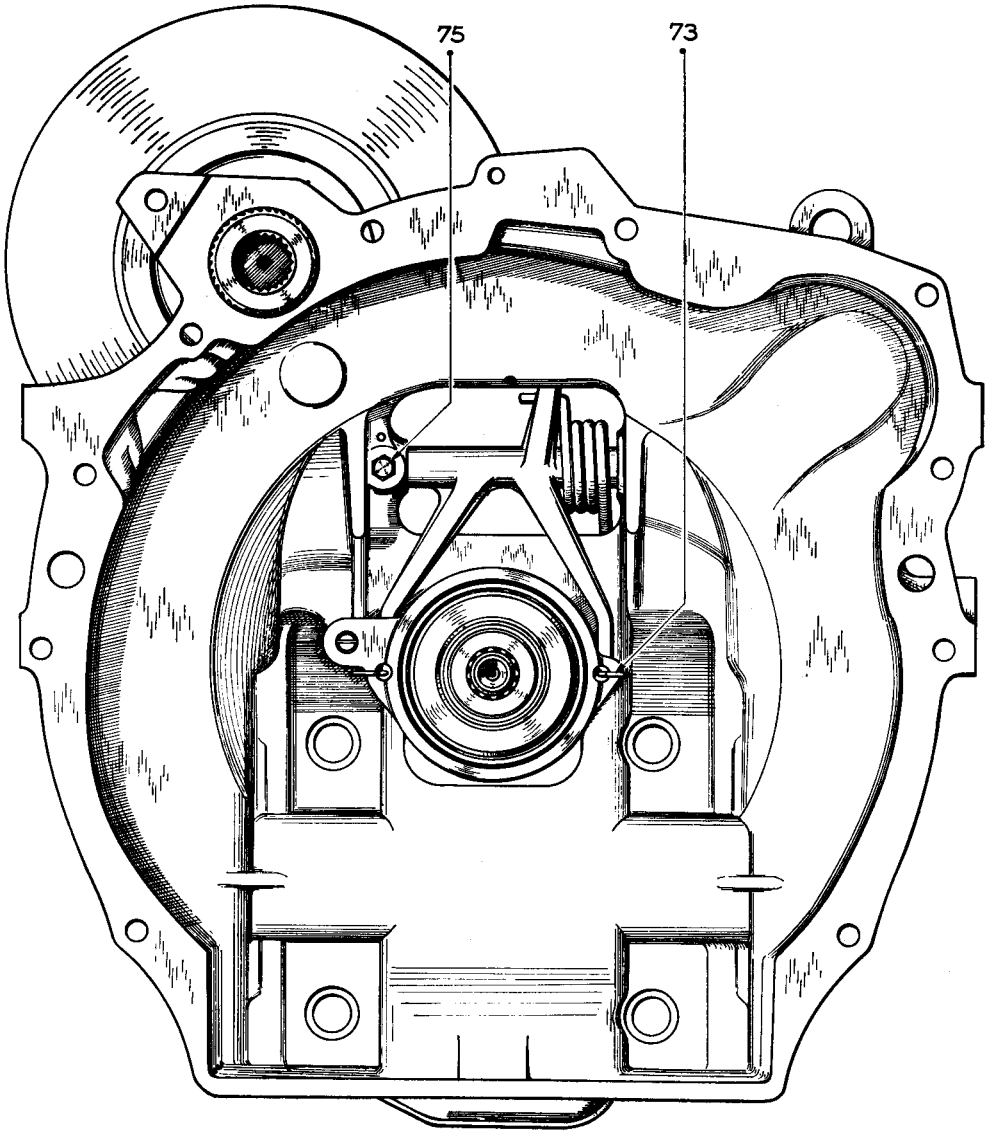
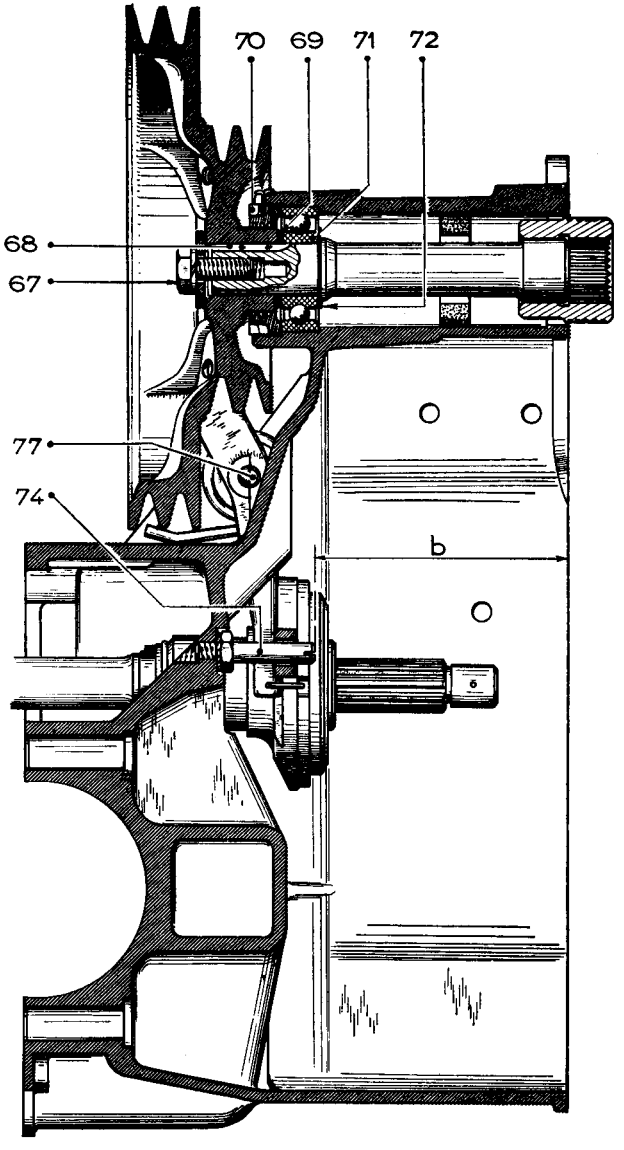


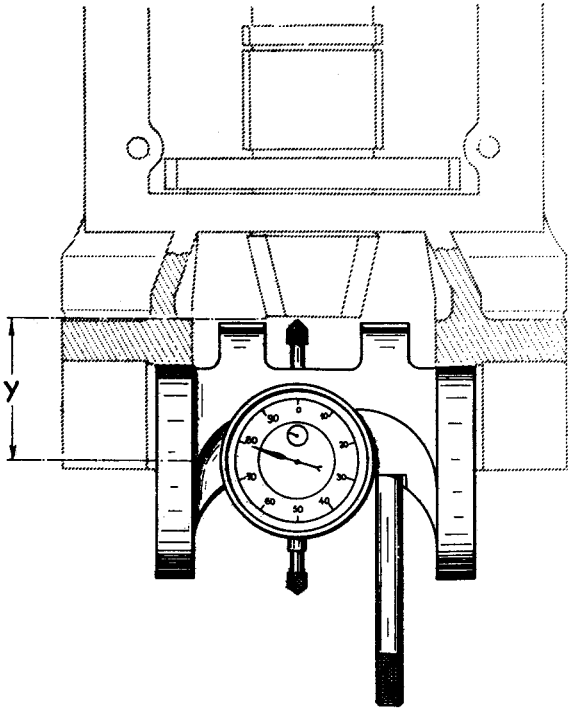
Fig. 2



ADJUSTMENT OF CROWN WHEEL AND BEVEL PINION

Fig. 1 ADJUSTMENT OF BEVEL PINION SETTING

DIAL GAUGE sold under No. 2437–T



ADJUSTING FIXTURE sold under No. 2044–T

Fig. 2 ADJUSTMENT OF TOOTH CLEARANCE

EXTENSION sold under No. 2039–T

SUPPORT FOR DIAL GAUGE

sold under No. 2439–T

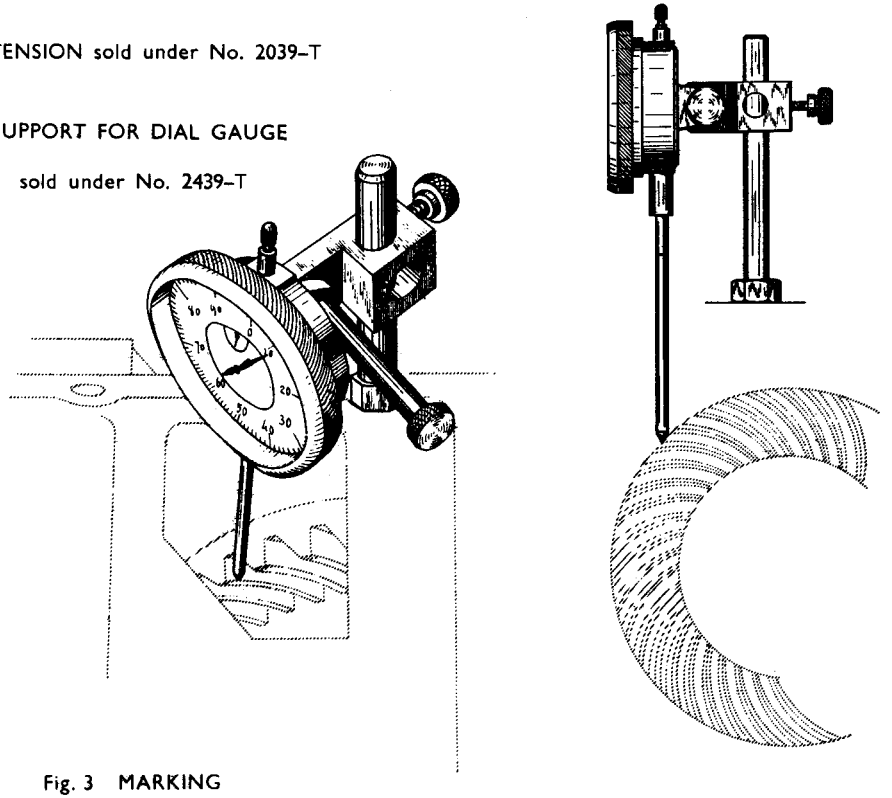
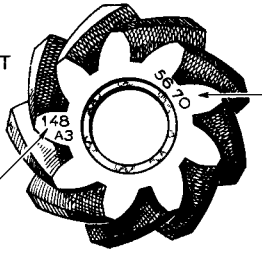
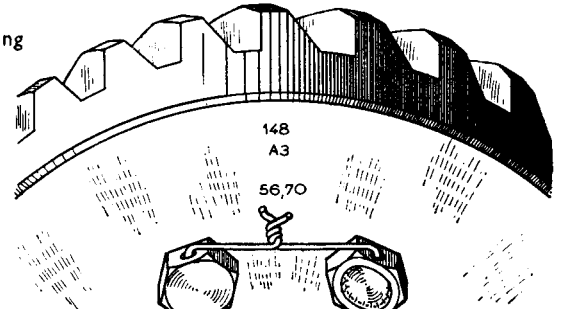


Fig. 3 MARKING





ADJUSTMENT OF THE DIFFERENTIAL BEARINGS

Fig. 1 MEASURING THE DEPTH OF THE HOUSING

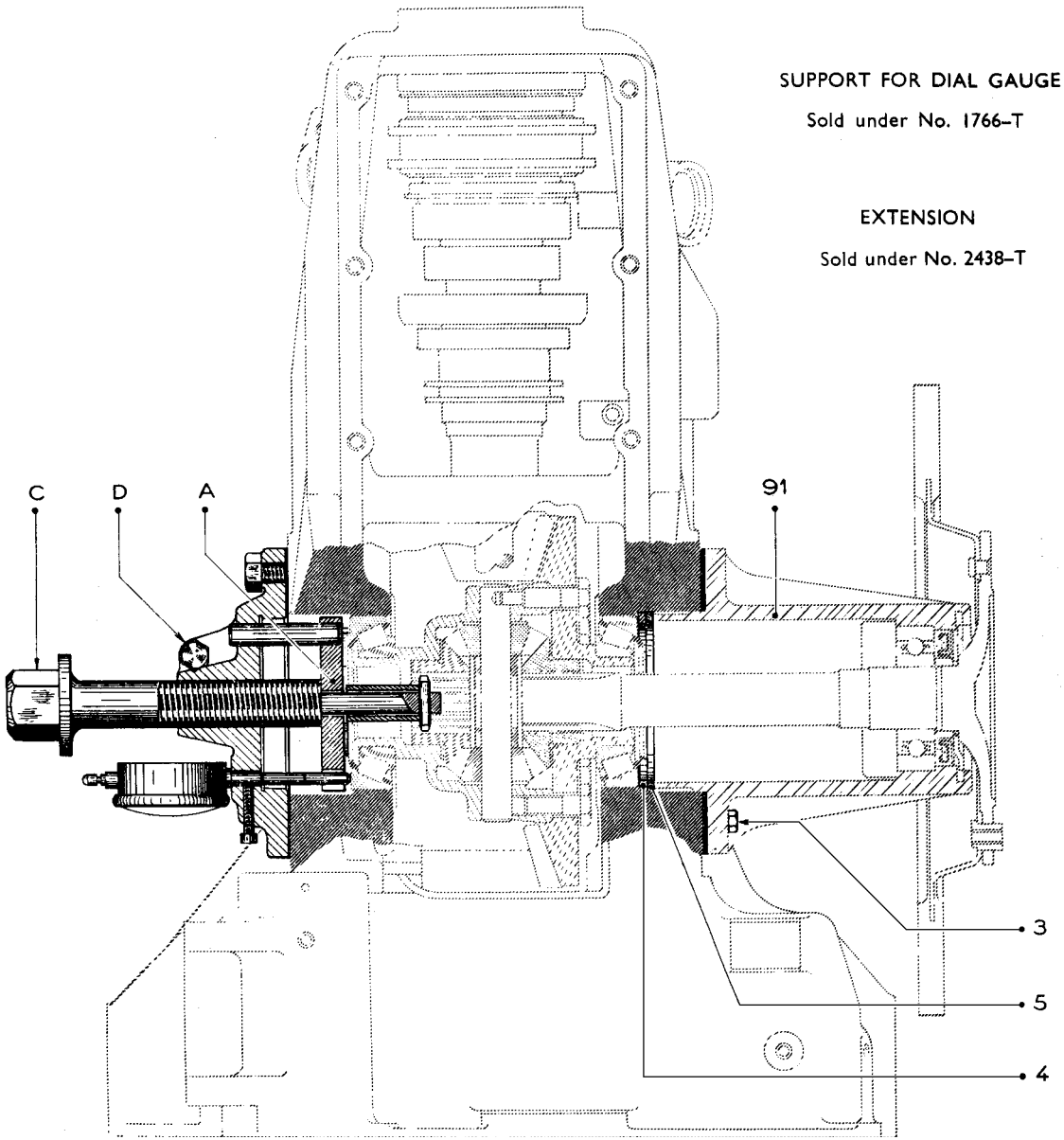
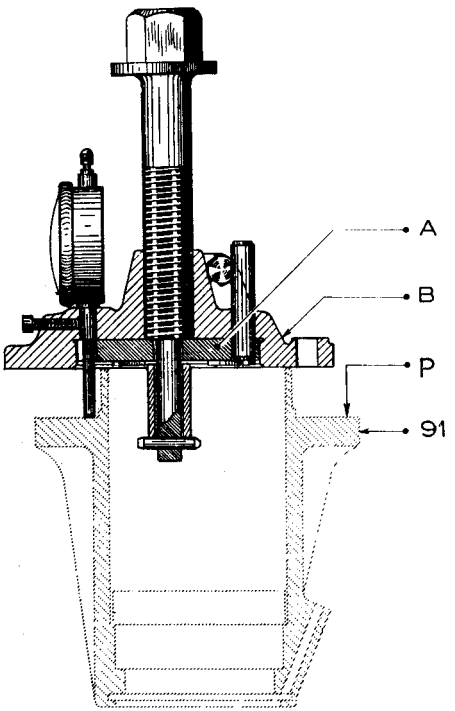


Fig. 2 MEASURING THE HEIGHT OF THE SHOULDER OF THE HUB



DIFFERENTIAL BEARING

Fig. 1 EXTRACTION OF BEARING

EXTRACTOR BODY

Sold under No. 1750–T

SPLIT COLLET AND RING

Sold under No. 1753–T

THRUST BLOCK

Sold under 1742–T

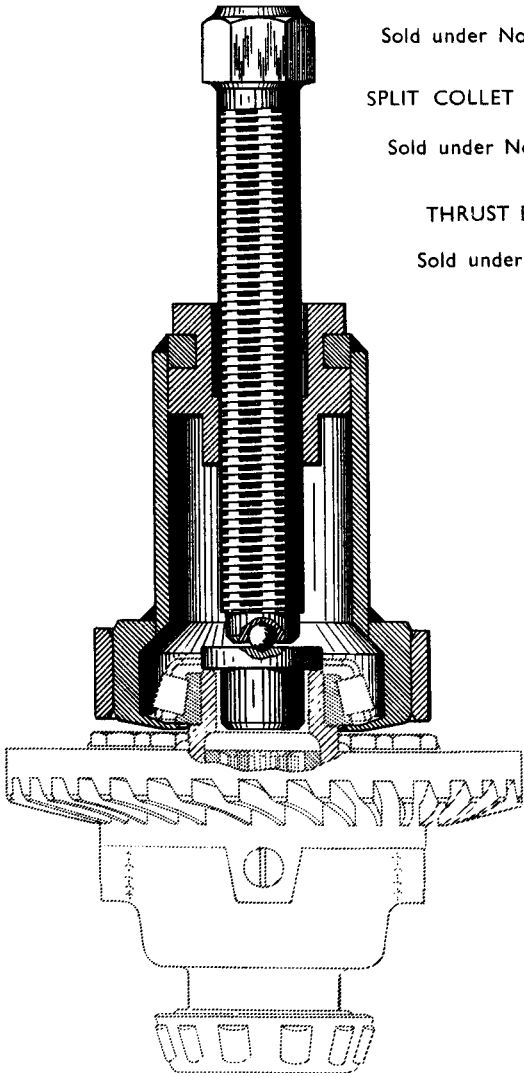
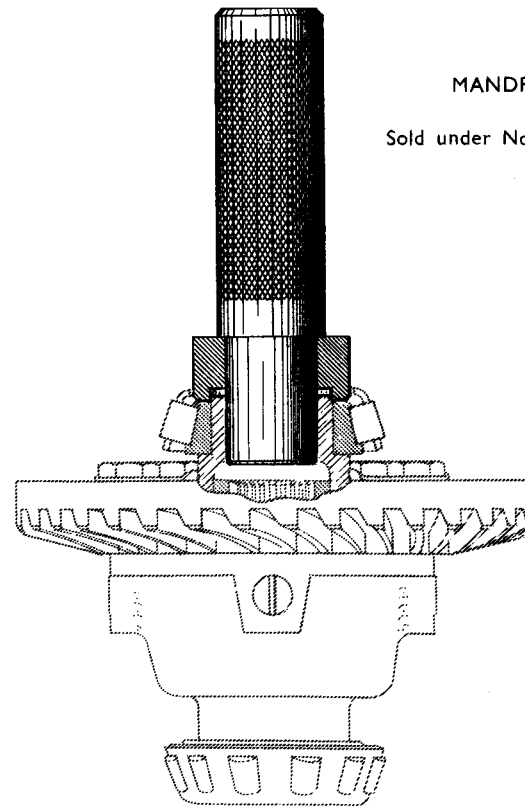


Fig. 2 FITTING BEARING

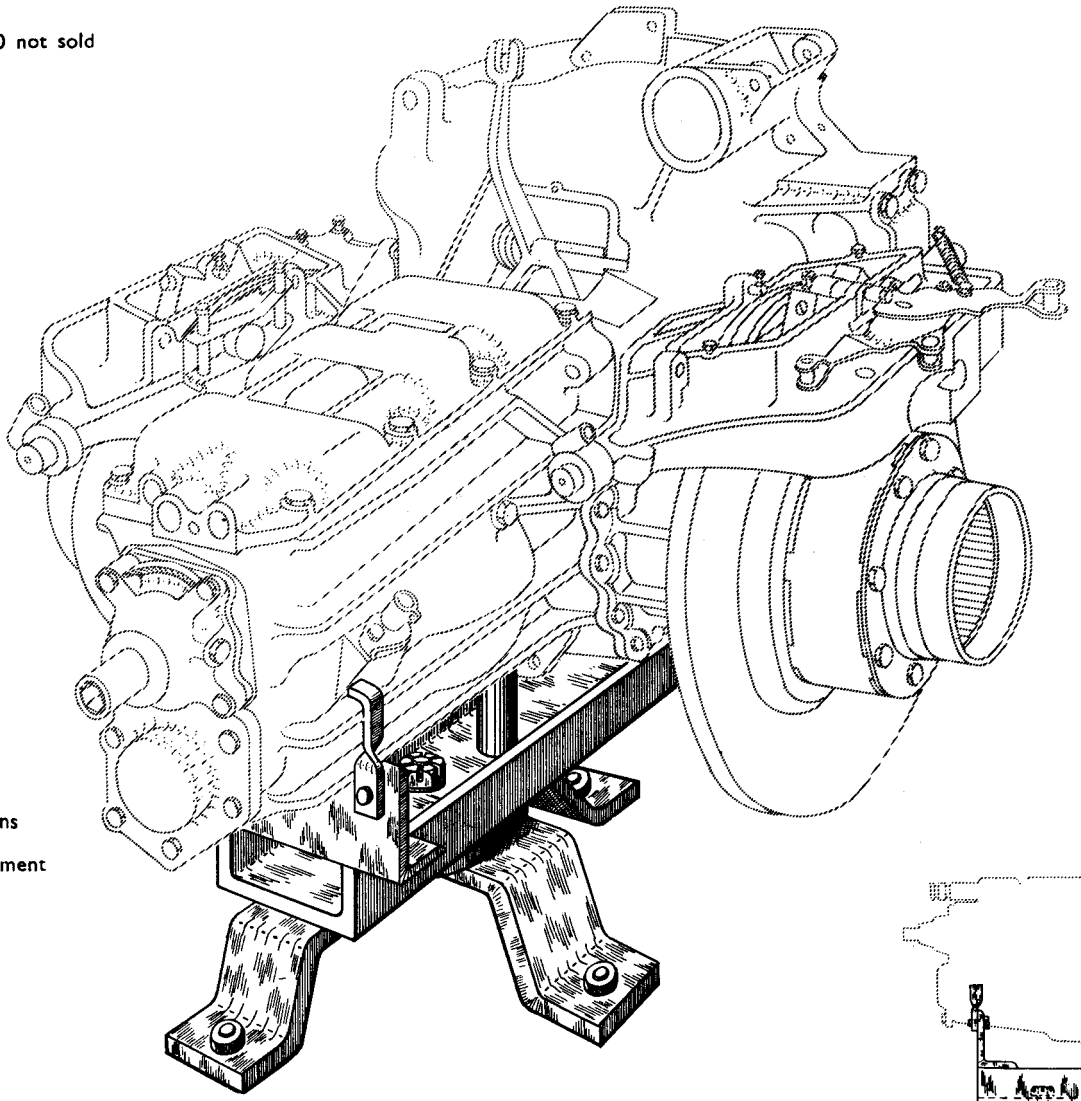
MANDREL

Sold under No. 1768–T

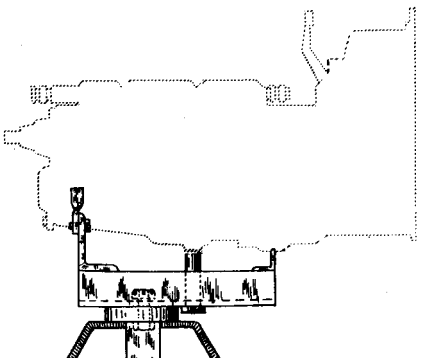


STAND FOR GEARBOX FOR USE ON BENCH

STAND MR3053–130 not sold

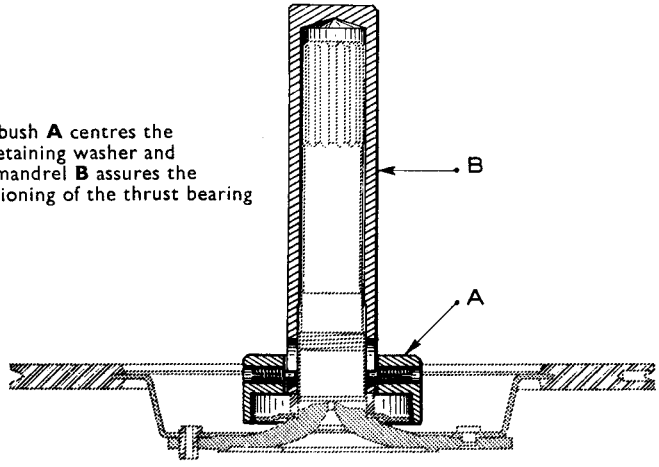


For constructional dimensions apply to the Service Department



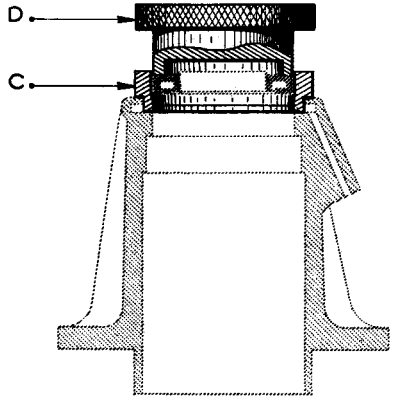
VARIOUS TOOLS

Fig. 1 MANDREL Sold under No. 1767–T



The bush **A** centres the oil retaining washer and the mandrel **B** assures the positioning of the thrust bearing

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. 3 SPANNER Sold under No. 1771–T



Fig. 4 SPANNER Sold under No. 1770–T

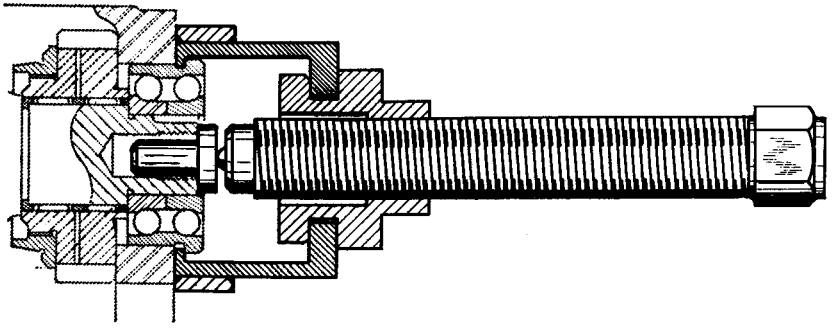


Fig. 5 SPANNER Sold under No. 1640–T



VARIOUS TOOLS

Fig. 1 EXTRACTION OF THE FRONT MAIN SHAFT BEARING



Extractor body sold under No. 1750–T

Split collet ring and thrust block

Sold under No. 1738–T

Fig. 2 EXTRACTION OF THE REAR BEVEL PINION BEARING

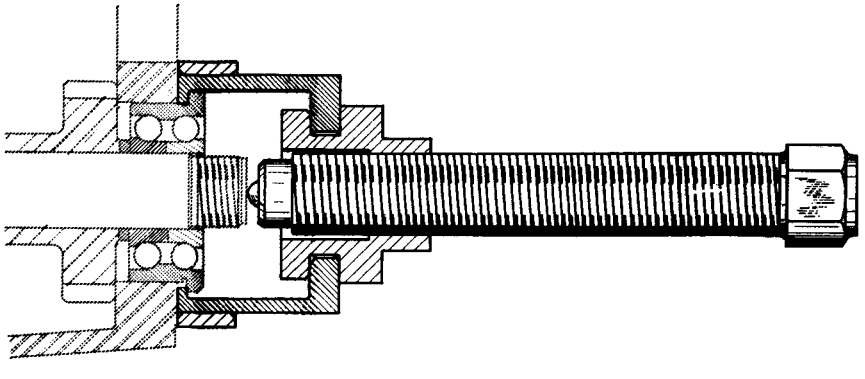


Fig. 3 SPANNER Sold under No. 1705–T

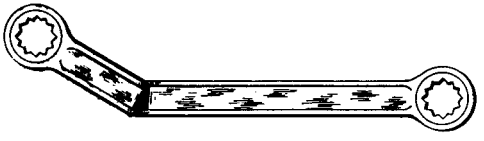


Fig. 4 MANDRELS Not sold

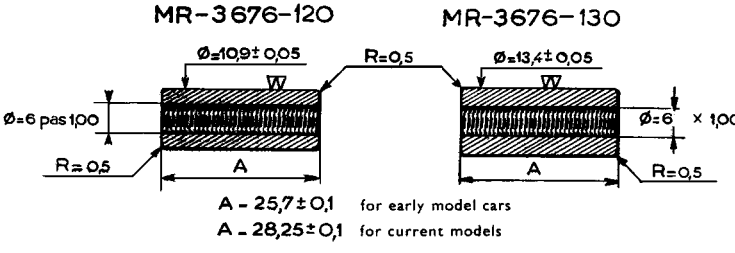


Fig. 5 ASSEMBLY OF THE SEAL

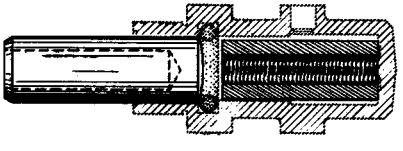


Fig. 6 SOCKET Sold under No. 1773–T



VARIOUS TOOLS

Fig. 1 MANDREL MR3045

Not sold

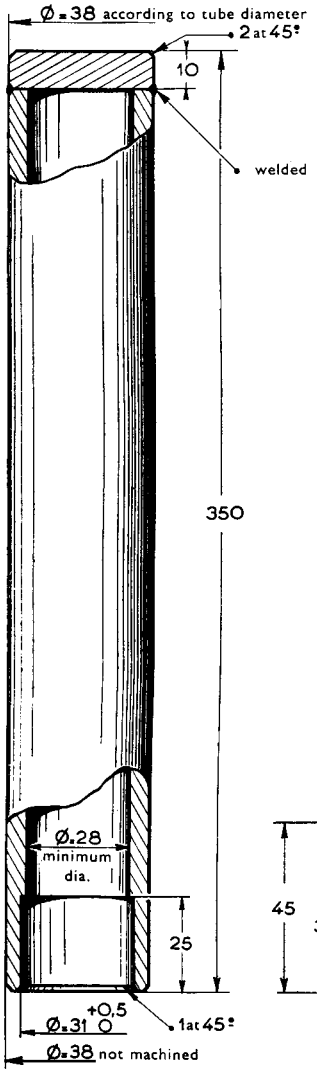


Fig. 2 MANDREL MR3676–30

Not sold

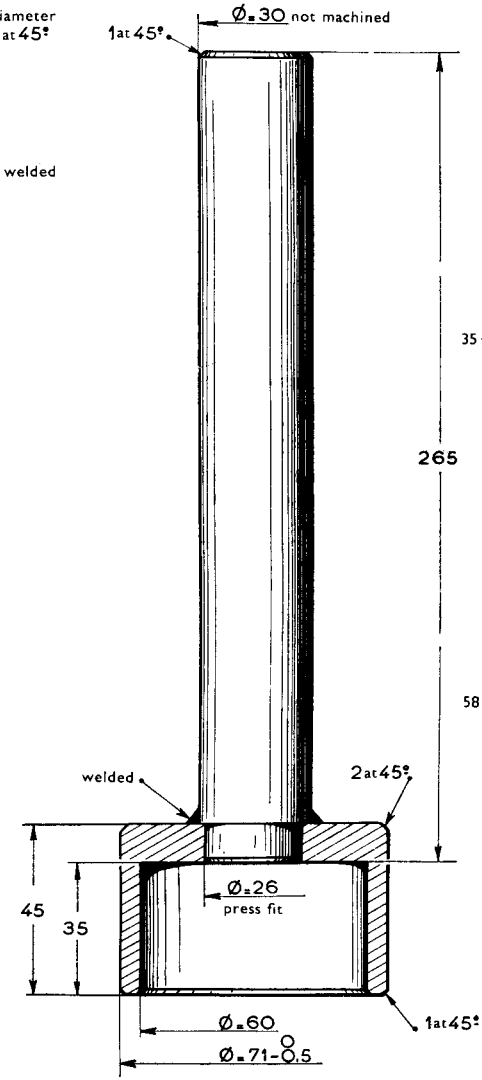


Fig. 3 SPANNER

Sold under No. 1734–T

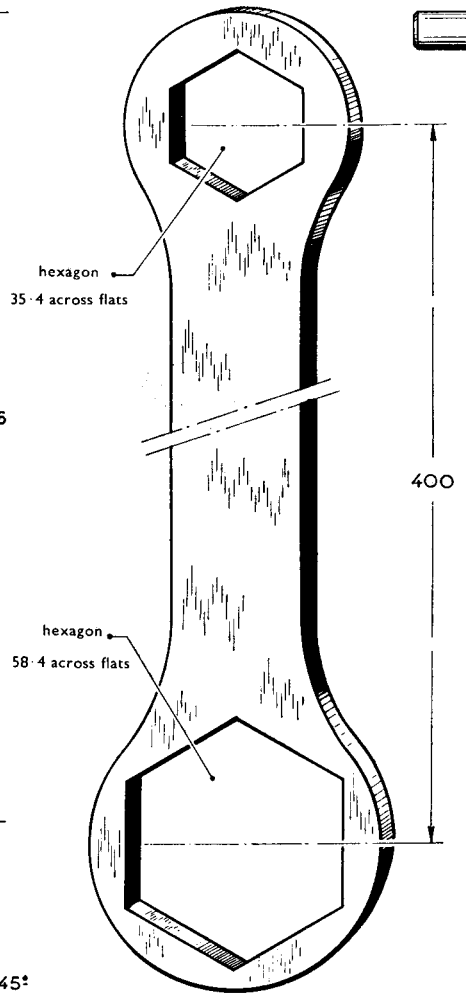
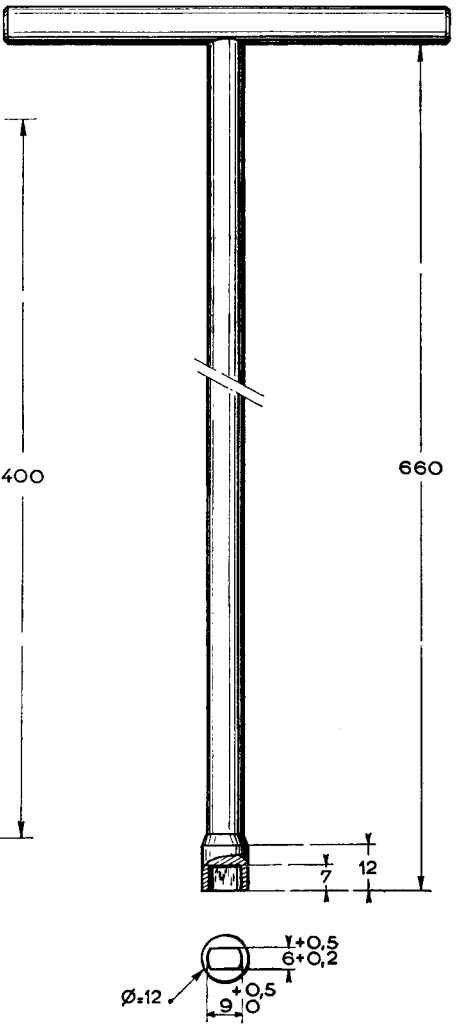
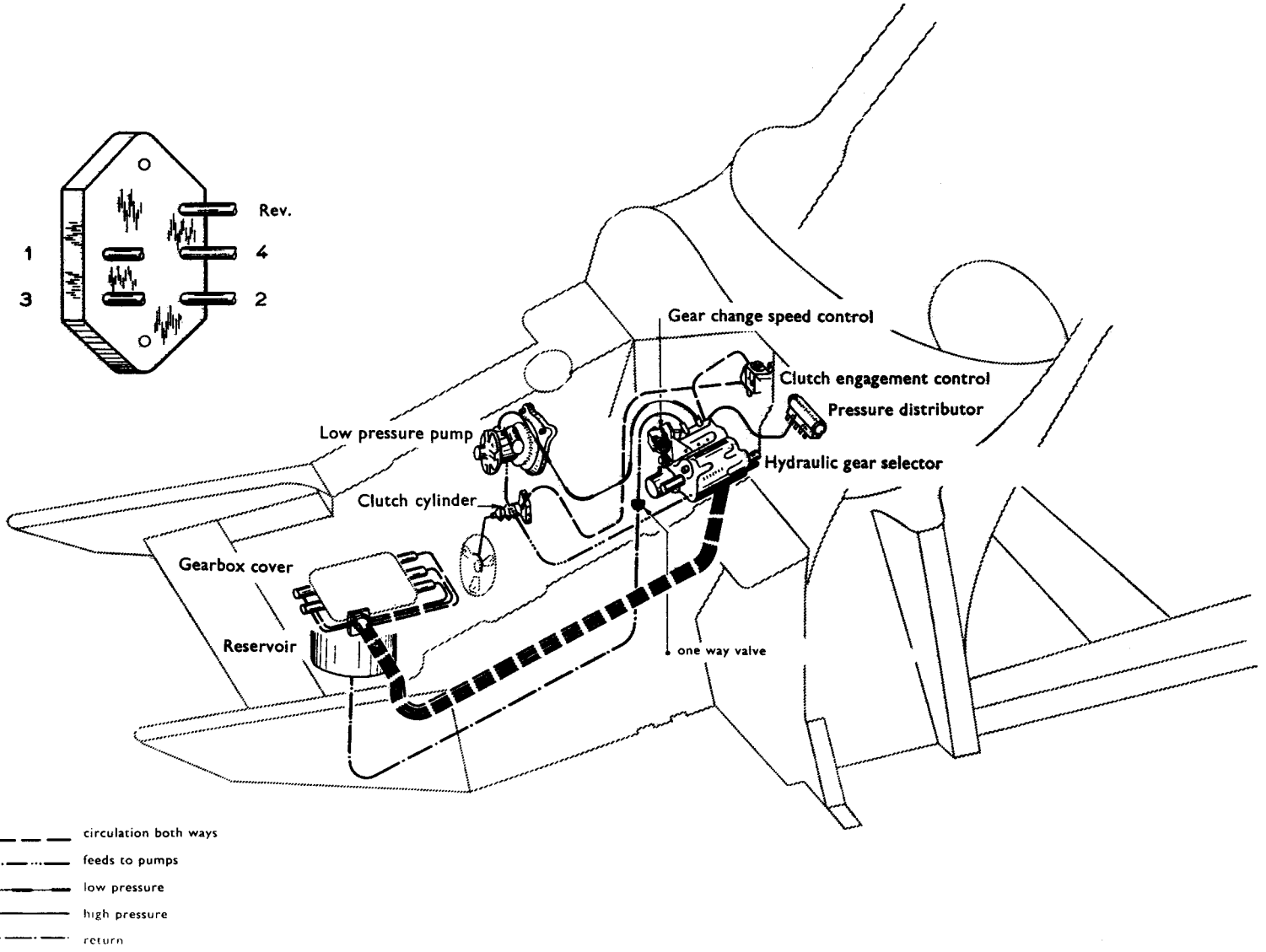


Fig. 4 SPANNER

Sold under No. 1677–T



GEARBOX AND CLUTCH SYSTEM



HYDRAULIC GEAR SELECTOR

Fig. 1

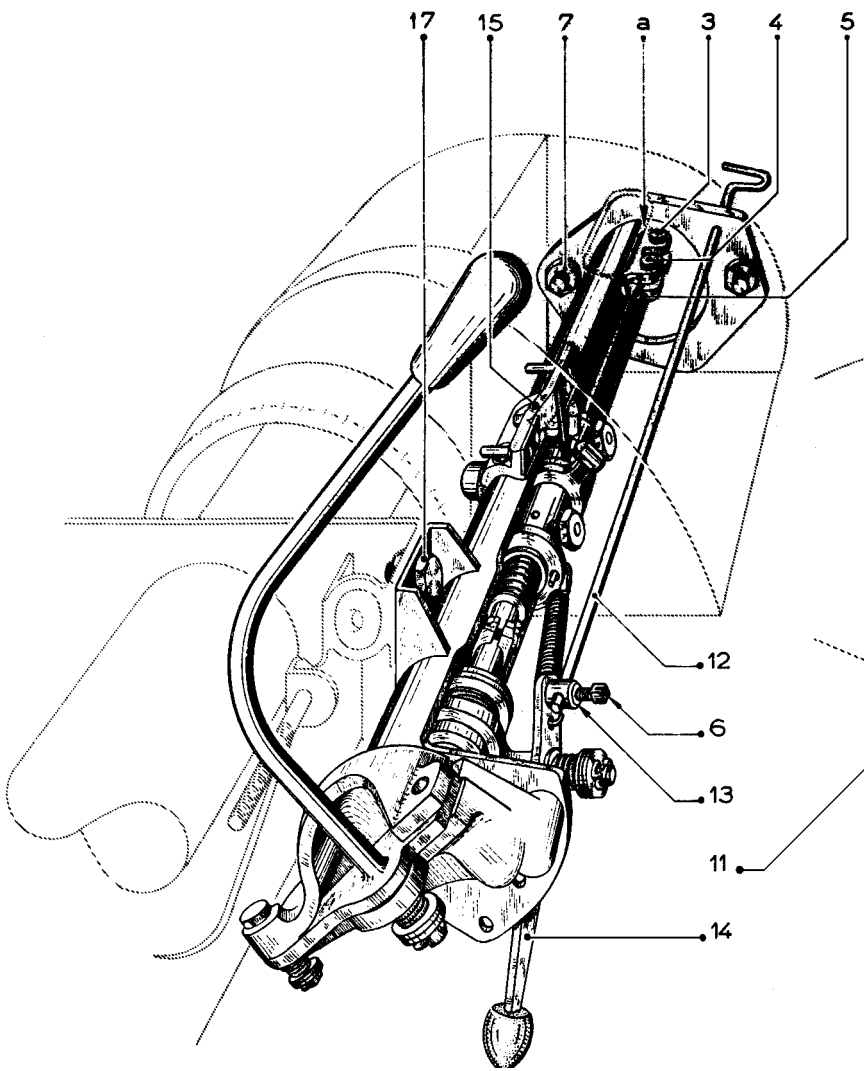
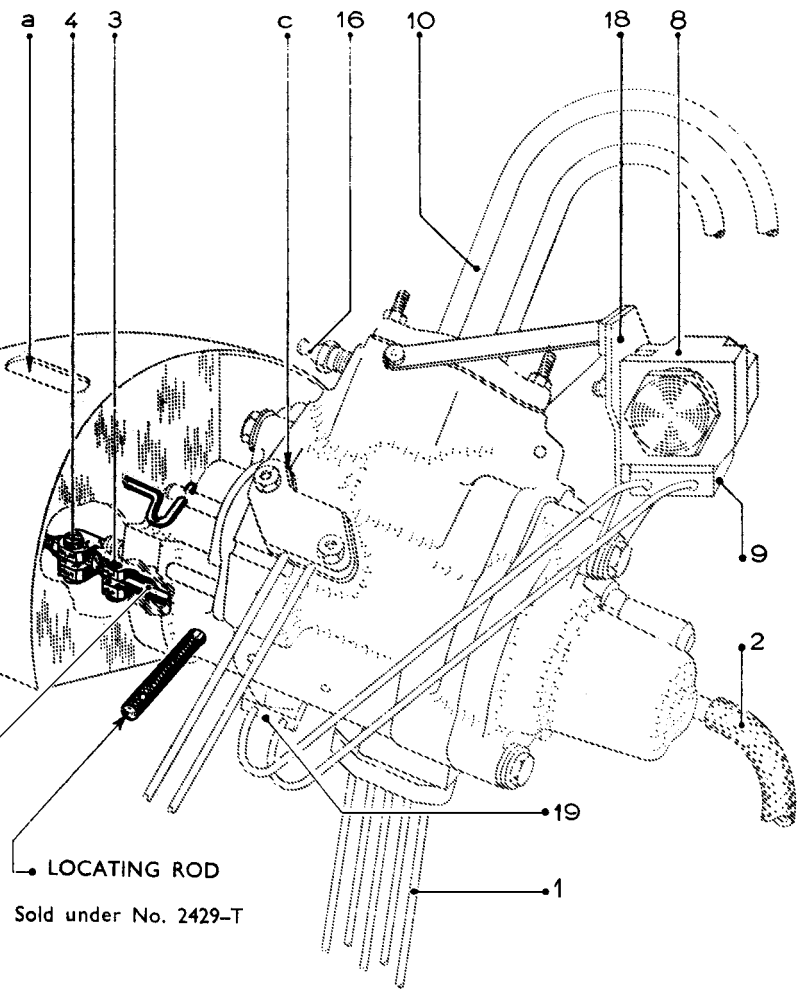


Fig. 2



HYDRAULIC GEAR SELECTOR

Fig. 1

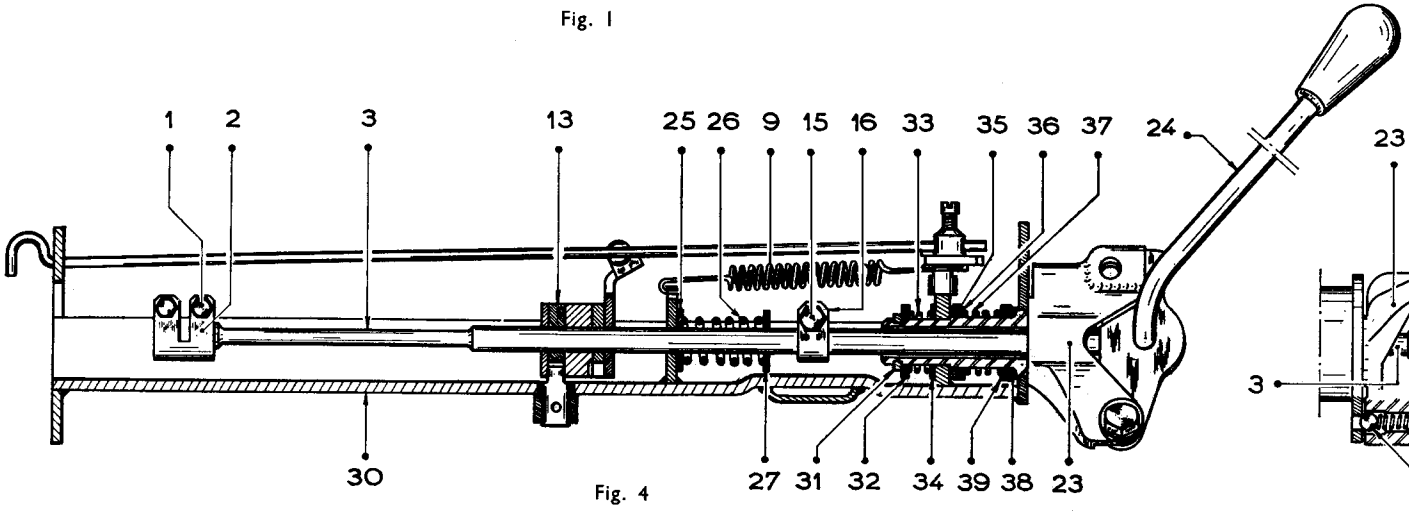


Fig. 2

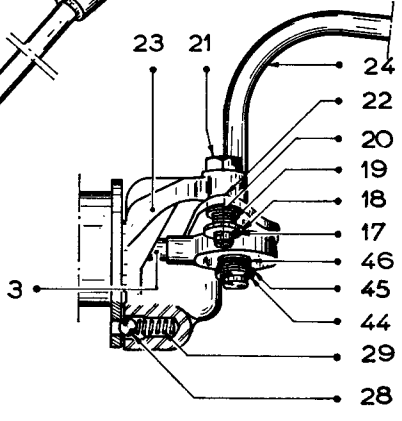


Fig. 3

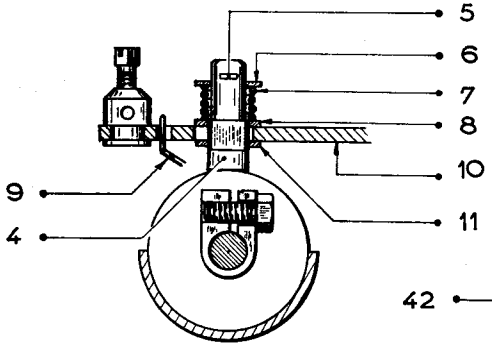


Fig. 4

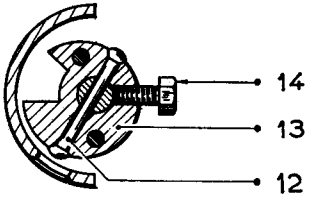


Fig. 5

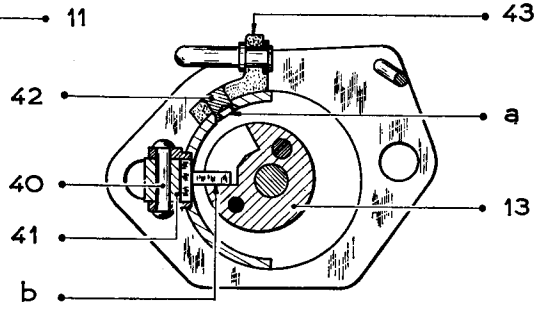
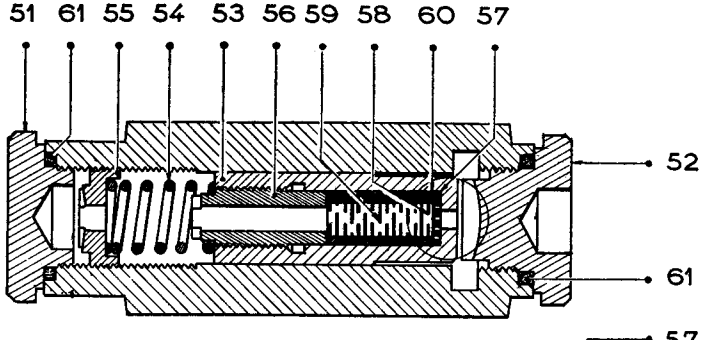
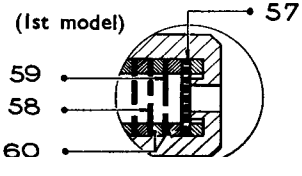


Fig. 6 GEAR CHANGE SPEED CONTROL
(2nd model)



(1st model)



HYDRAULIC GEAR SELECTOR

Fig. 1

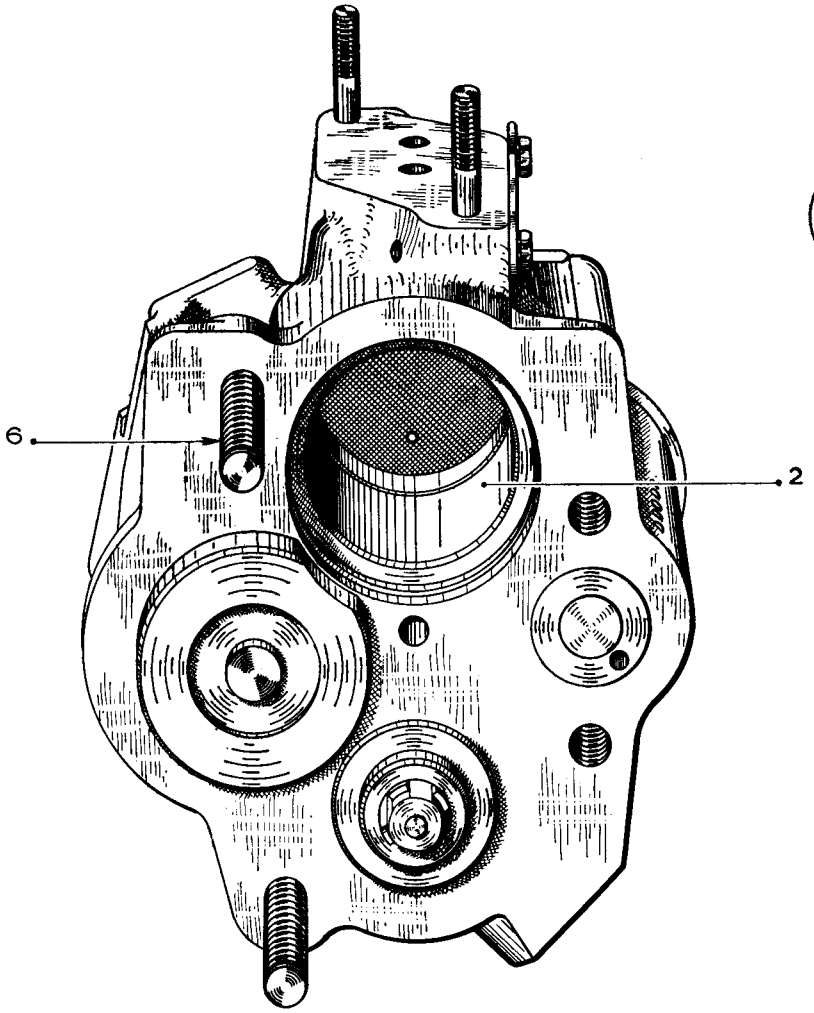


Fig. 2

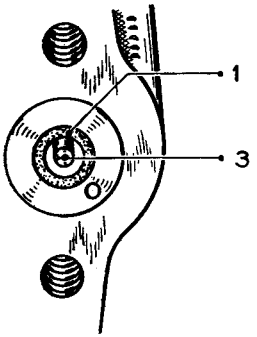


Fig. 3

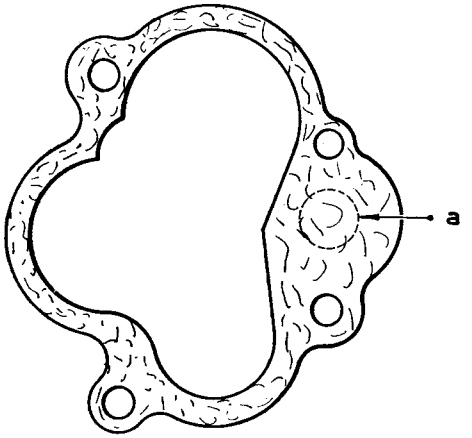
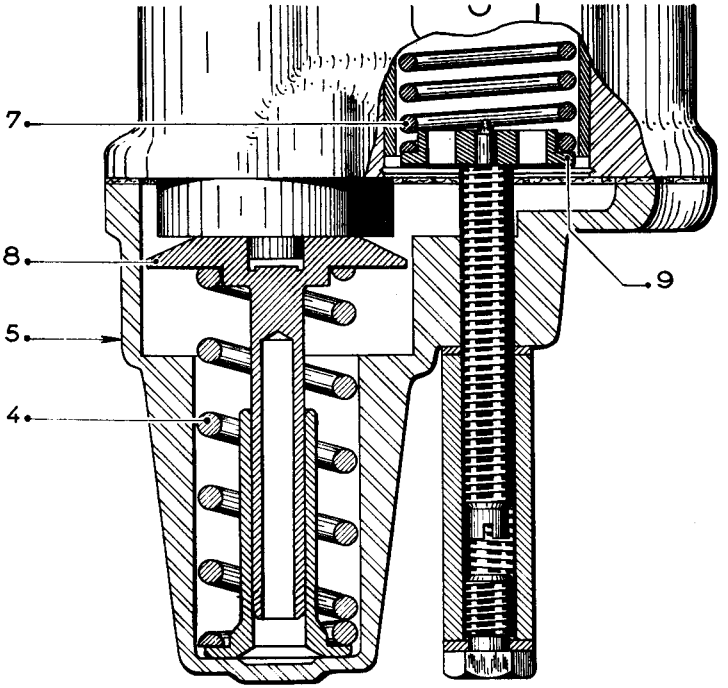


Fig. 4



HYDRAULIC GEAR SELECTOR

Fig. 1

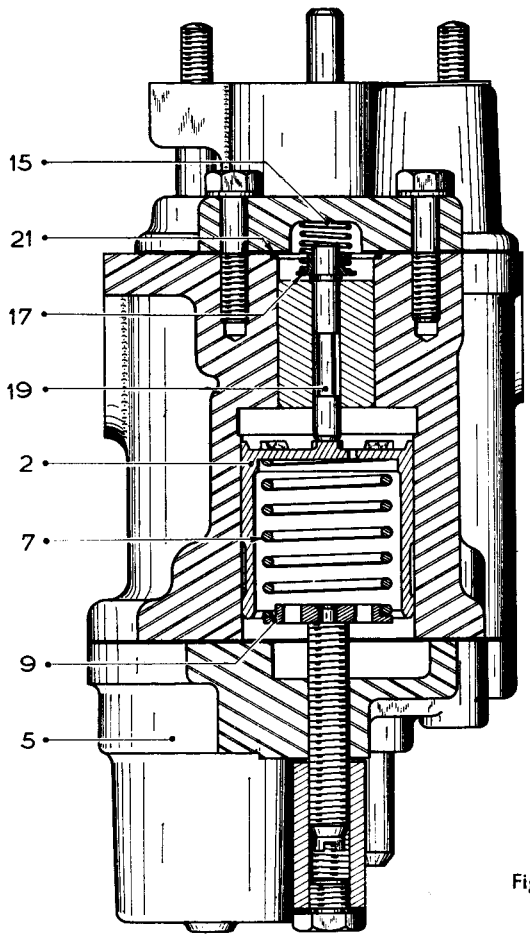


Fig. 2

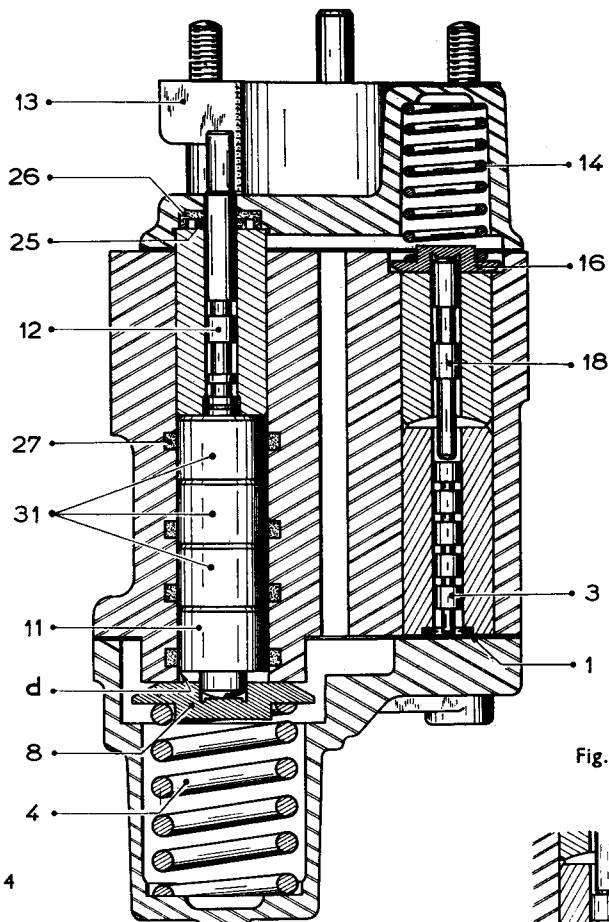


Fig. 3

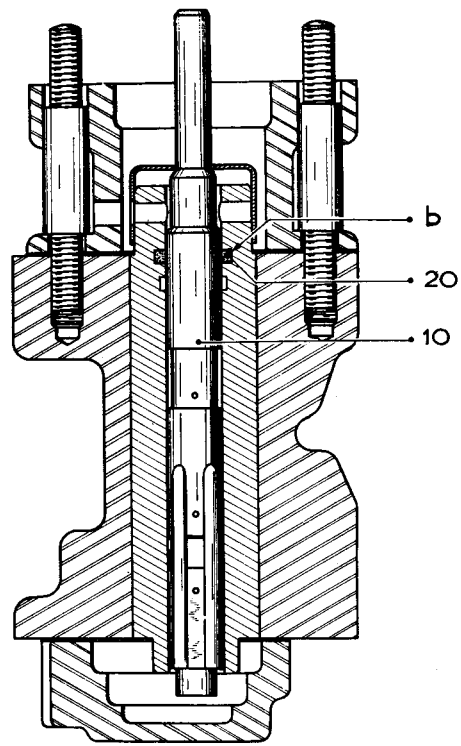
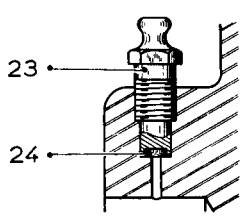


Fig. 4



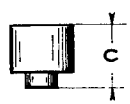


Fig. 5

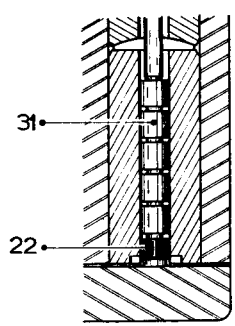
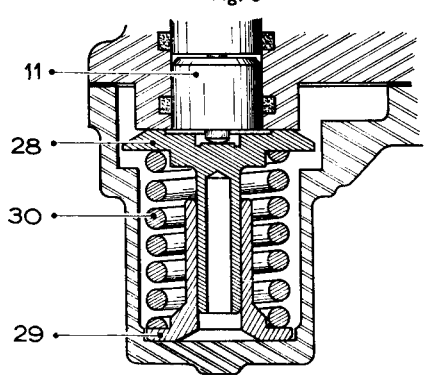


Fig. 6



HYDRAULIC GEAR SELECTOR

VARIOUS TOOLS

Fig. 1 GAUGE Sold under No. 2277-T



Fig. 2

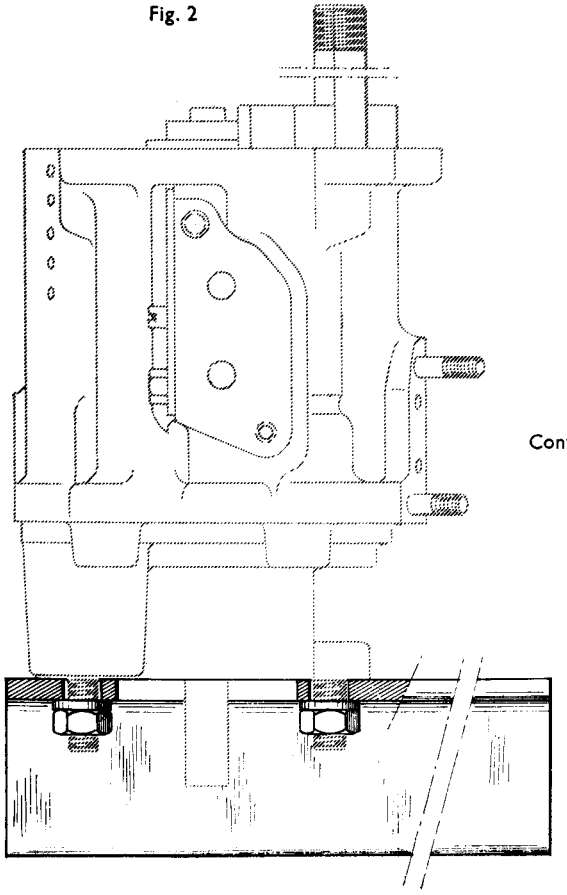


Fig. 3 RACK MR3053-210 Not sold

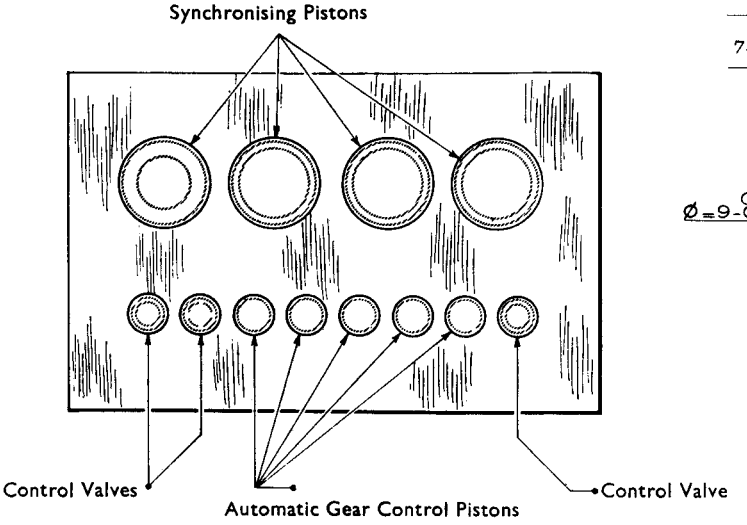


Fig. 4 STAND MR3053-200 Not sold

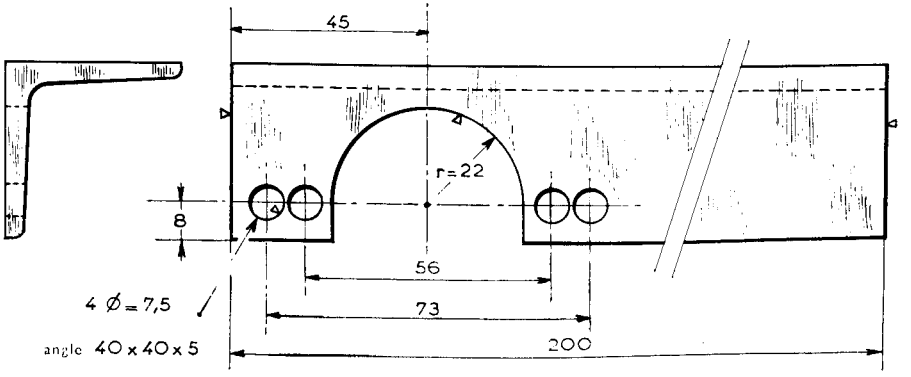
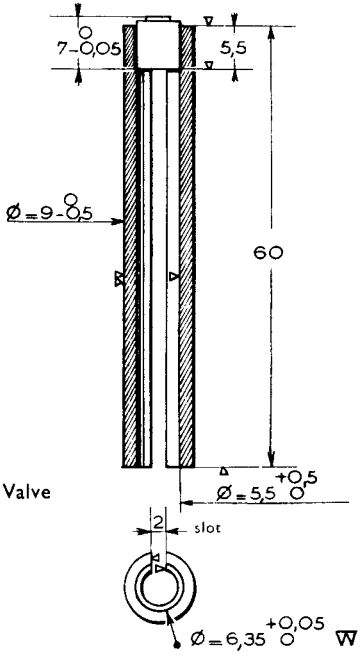


Fig. 5 MANDREL MR3045-50



VARIOUS TOOLS

Fig. 1 SPANNER Sold under No. 2431–T

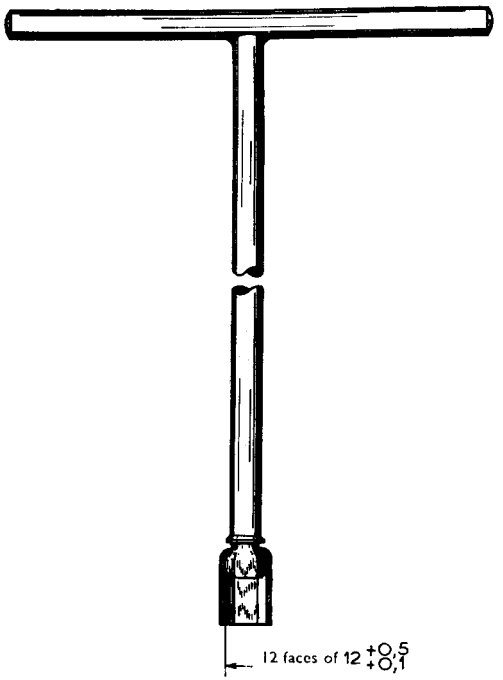


Fig. 2 ROD Sold under No. 2429–T

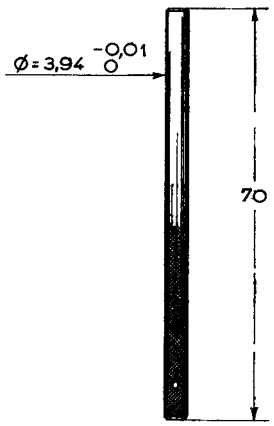
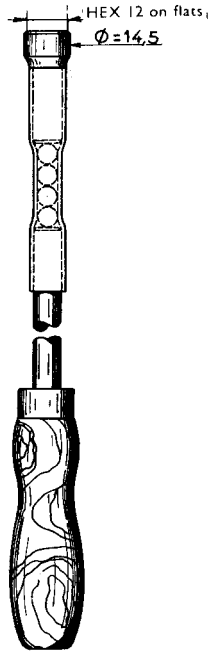


Fig. 3 SPANNER

Sold under No. 2428–T



SPANNERS

2219_T a = 9 +0,2 0

2220-T a = 15 +0,3 +0,1

2221-T a = 10 +0,2 0

2222-T a = 13 +0,3 +0,1

Fig. 4 SPANNER

Sold under No. 2220–T



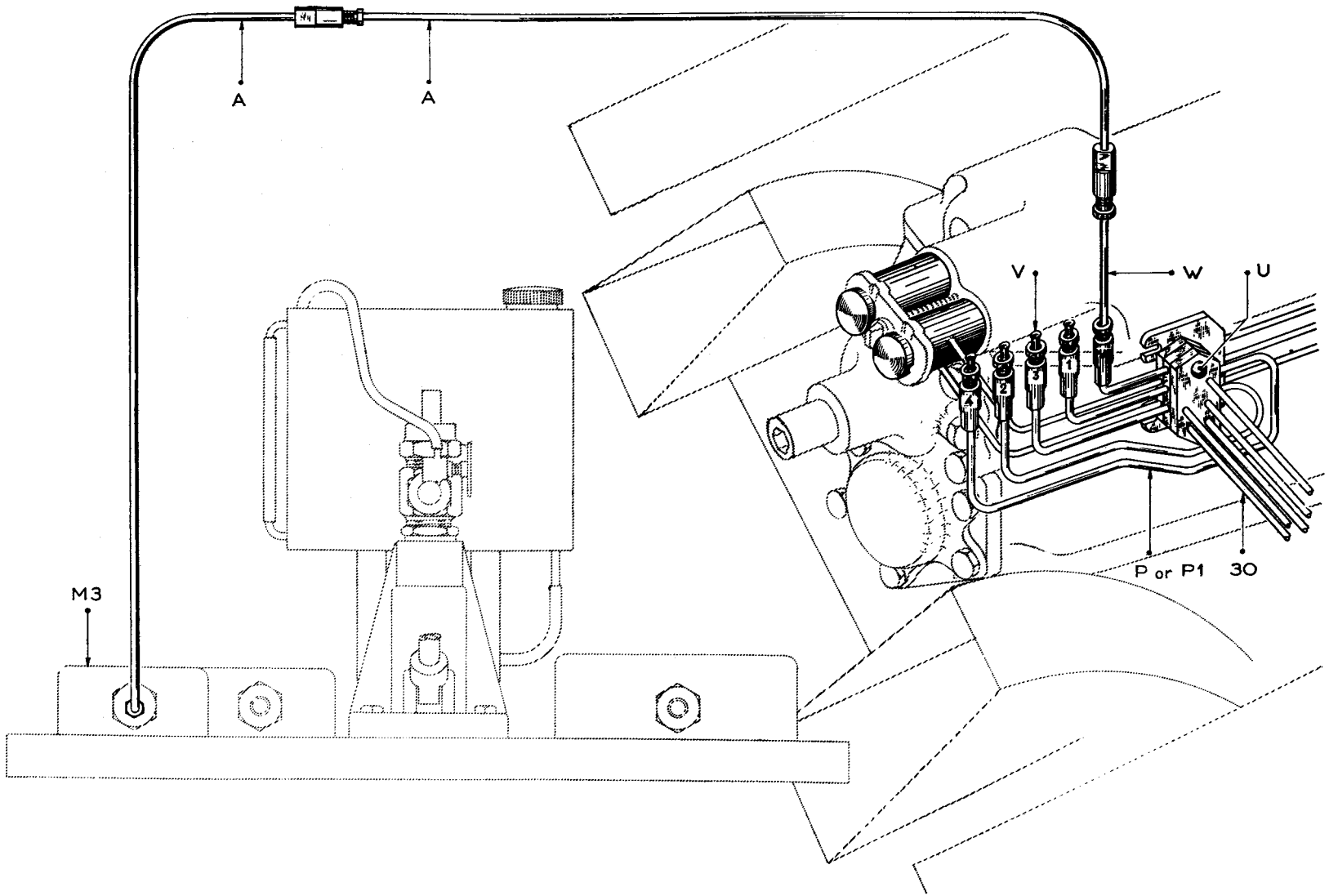
Fig. 5 SPANNER

Sold under No. 2280–T



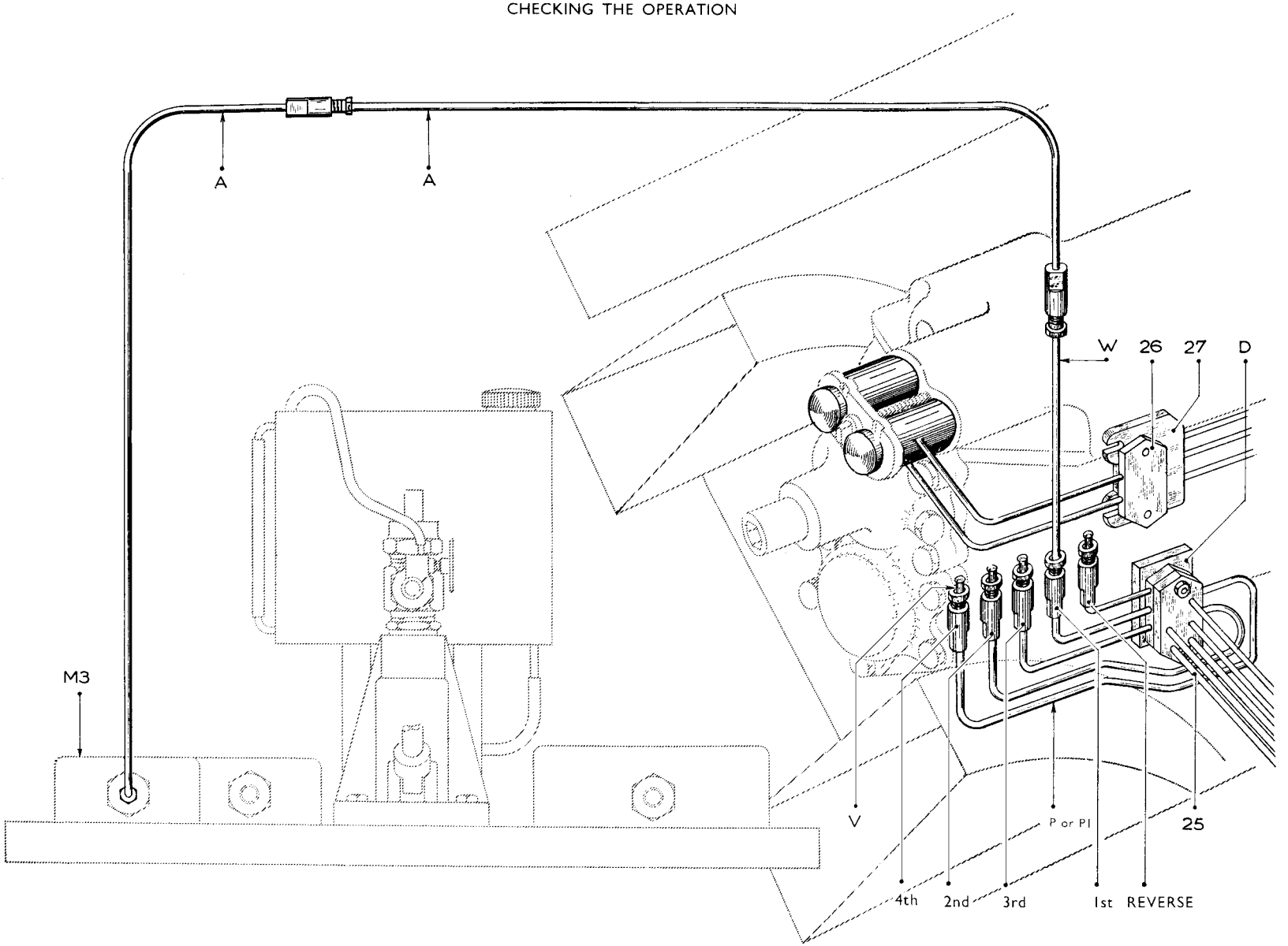
HYDRAULIC GEAR SELECTOR

CHECKING THE SYSTEM



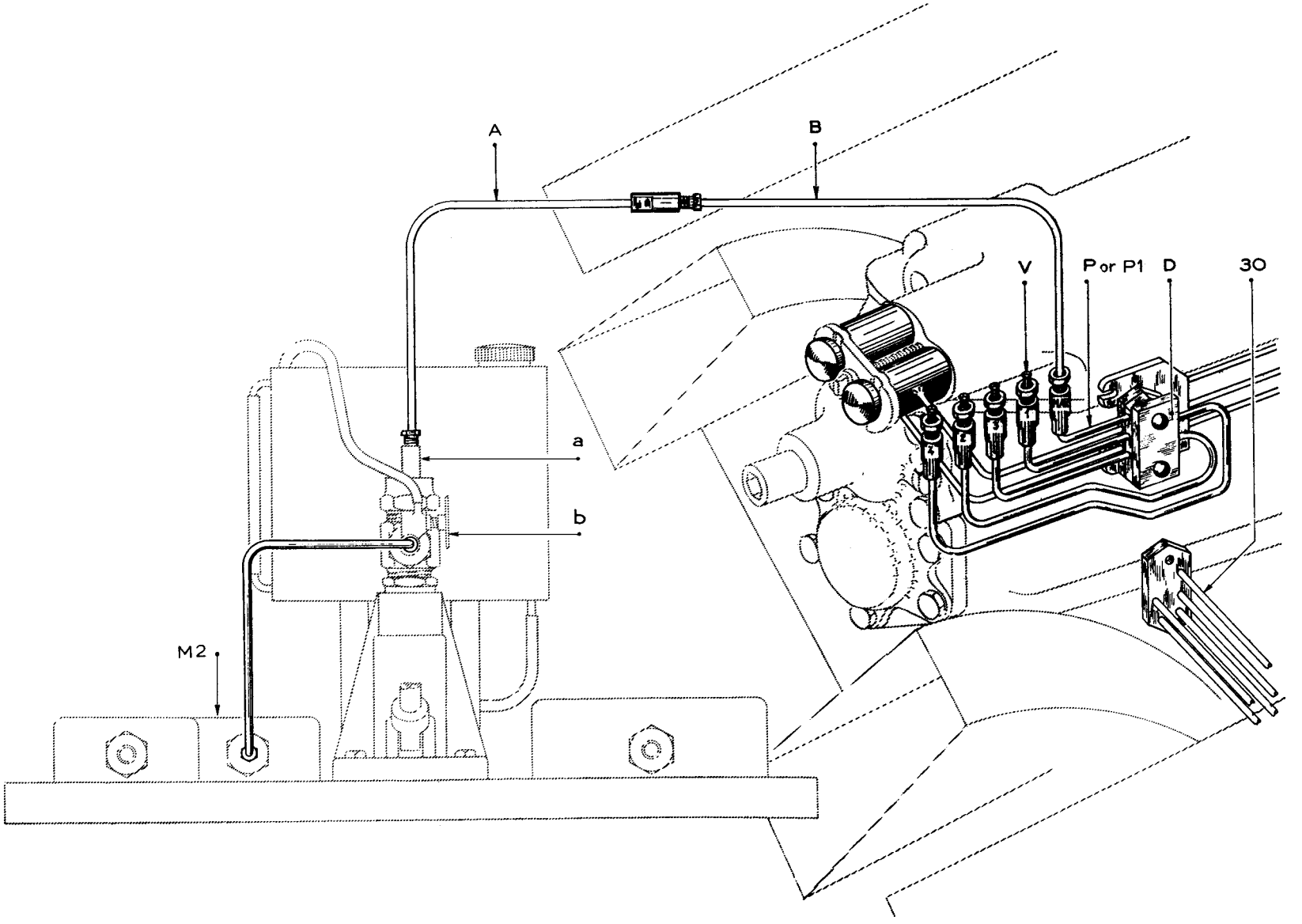
HYDRAULIC GEAR SELECTOR

CHECKING THE OPERATION



GEARBOX

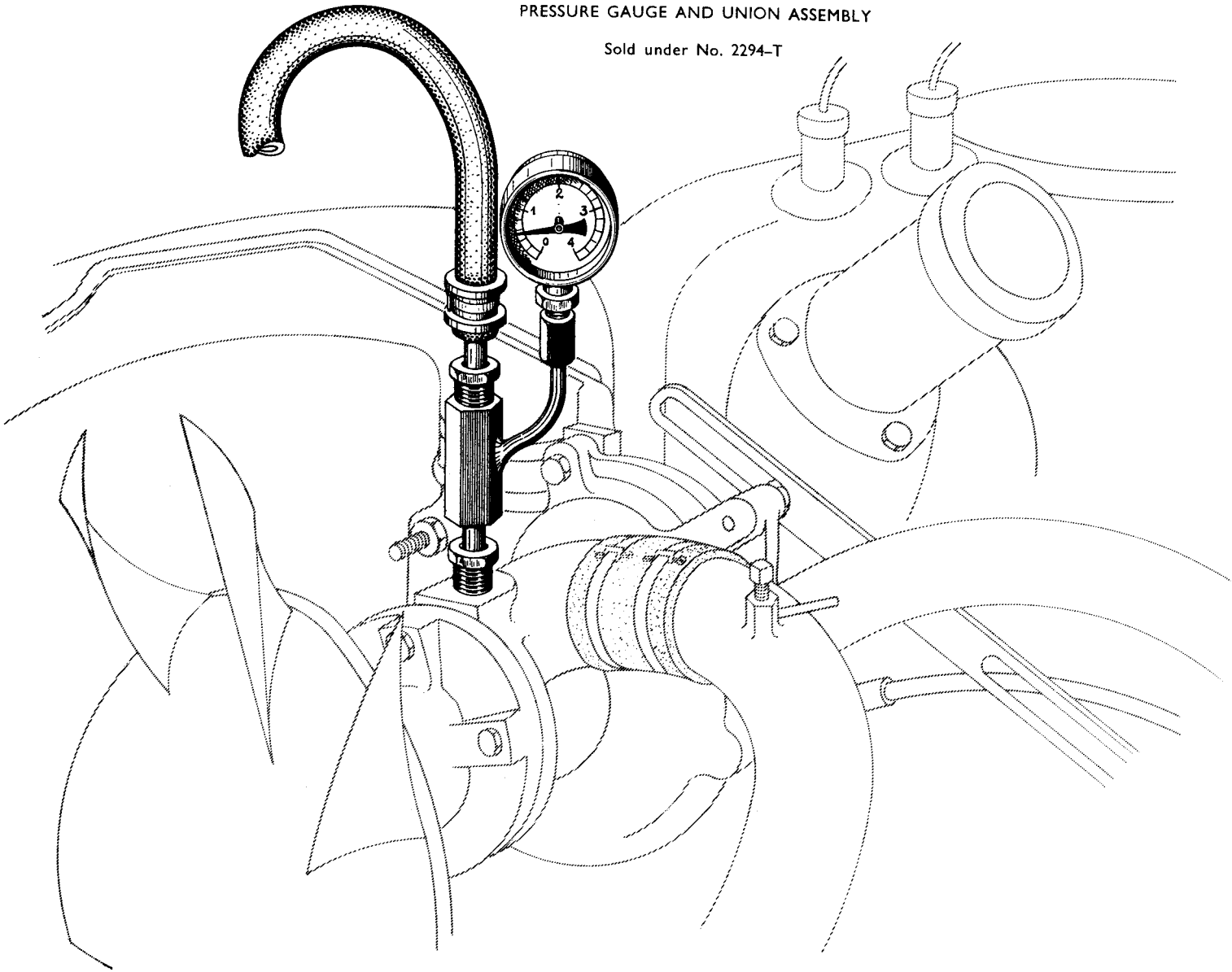
CHECKING FOR LEAKAGE AND OPERATION OF GEARS



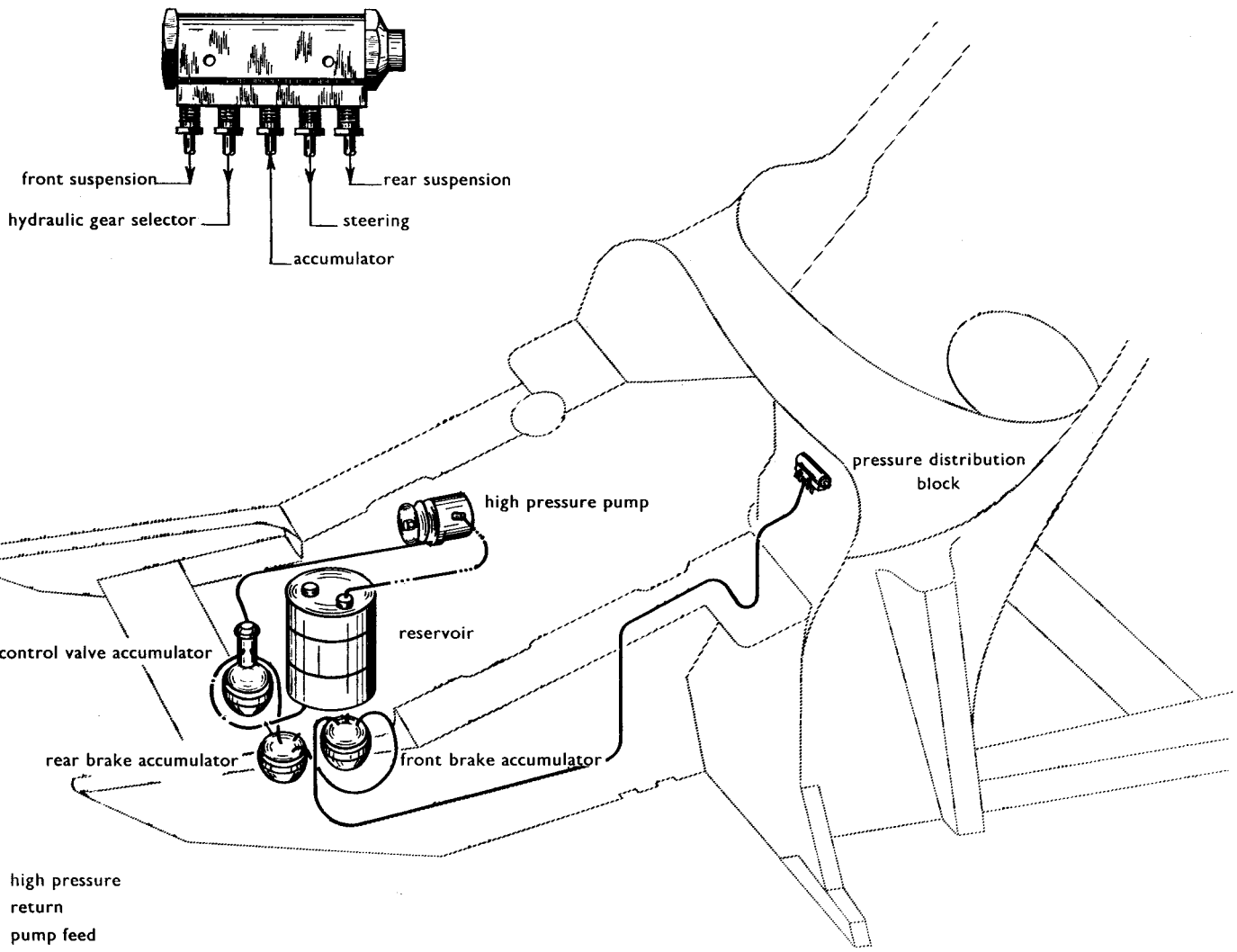
CHECKING NON-RETURN VALVE

PRESSURE GAUGE AND UNION ASSEMBLY

Sold under No. 2294–T



HIGH PRESSURE SYSTEM



HIGH PRESSURE RESERVOIR

Fig. 1
OCTOBER 1955 to OCTOBER 1956

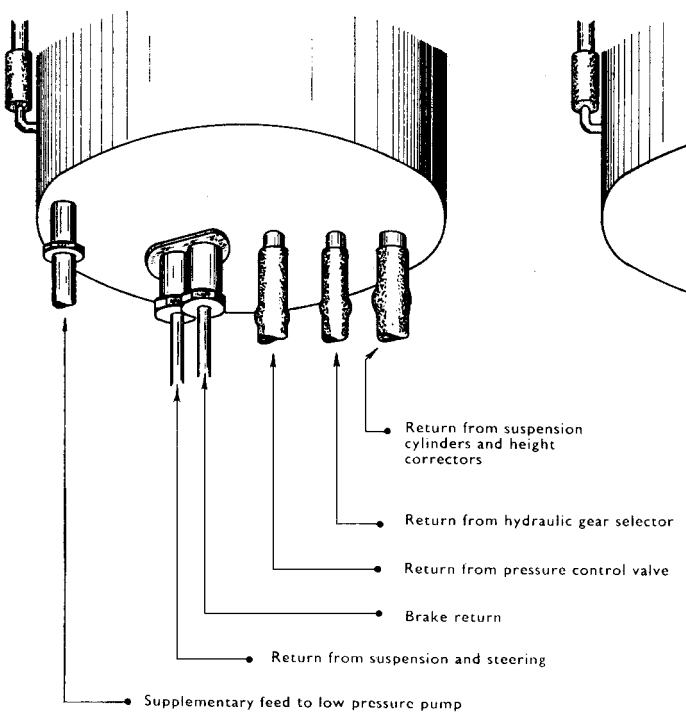


Fig. 2
OCTOBER 1956 to JANUARY 1957

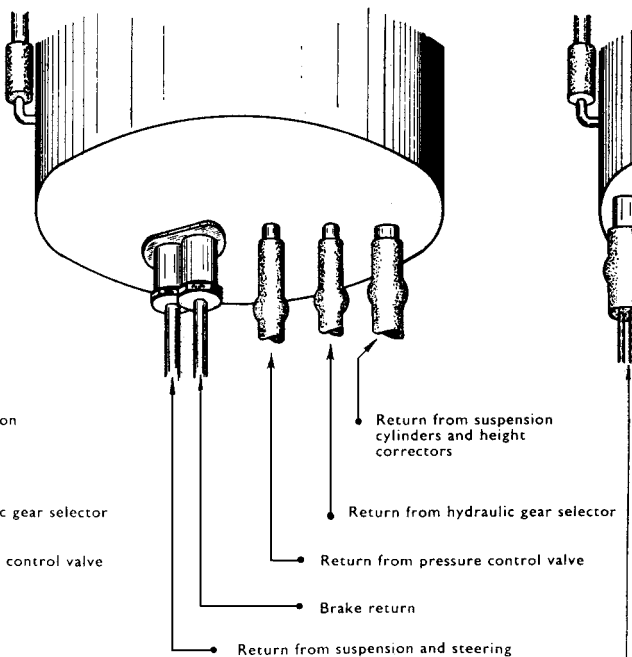
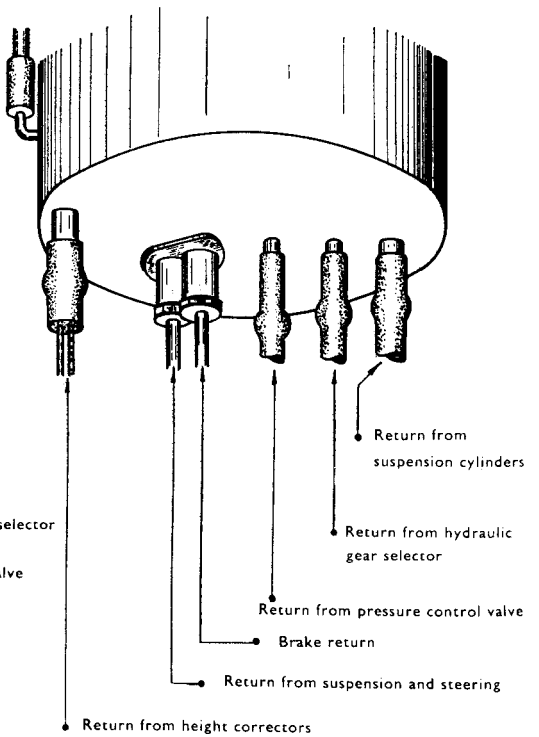
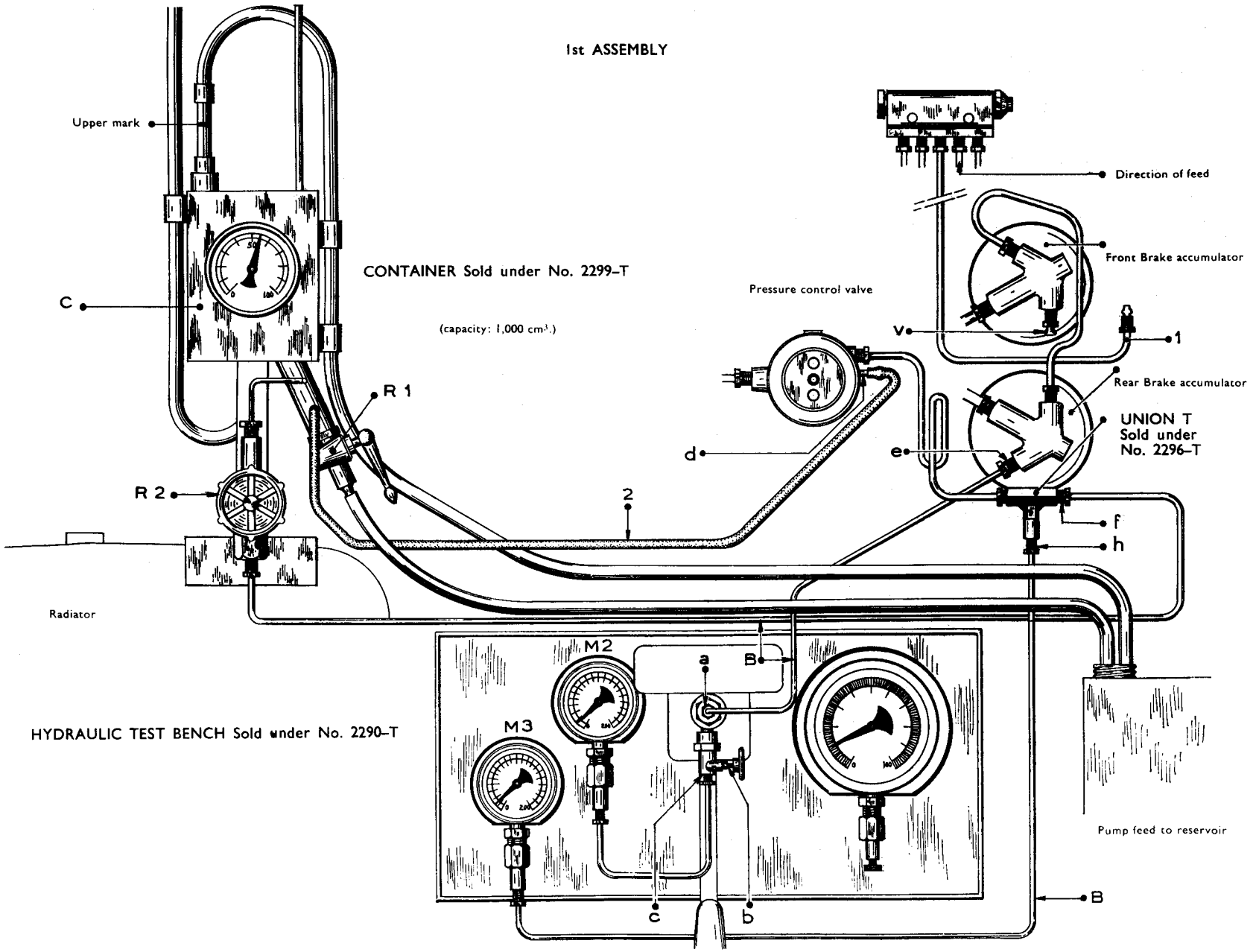


Fig. 3
SINCE JANUARY 1957



CHECKING HYDRAULIC UNITS ON THE CAR



CHECKING HYDRAULIC UNITS ON THE CAR

2nd ASSEMBLY

Fig. 2

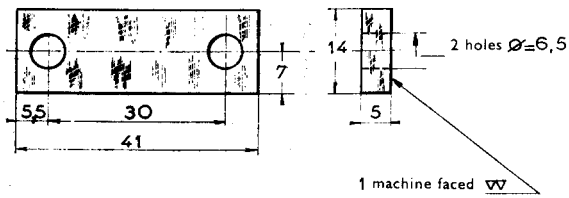
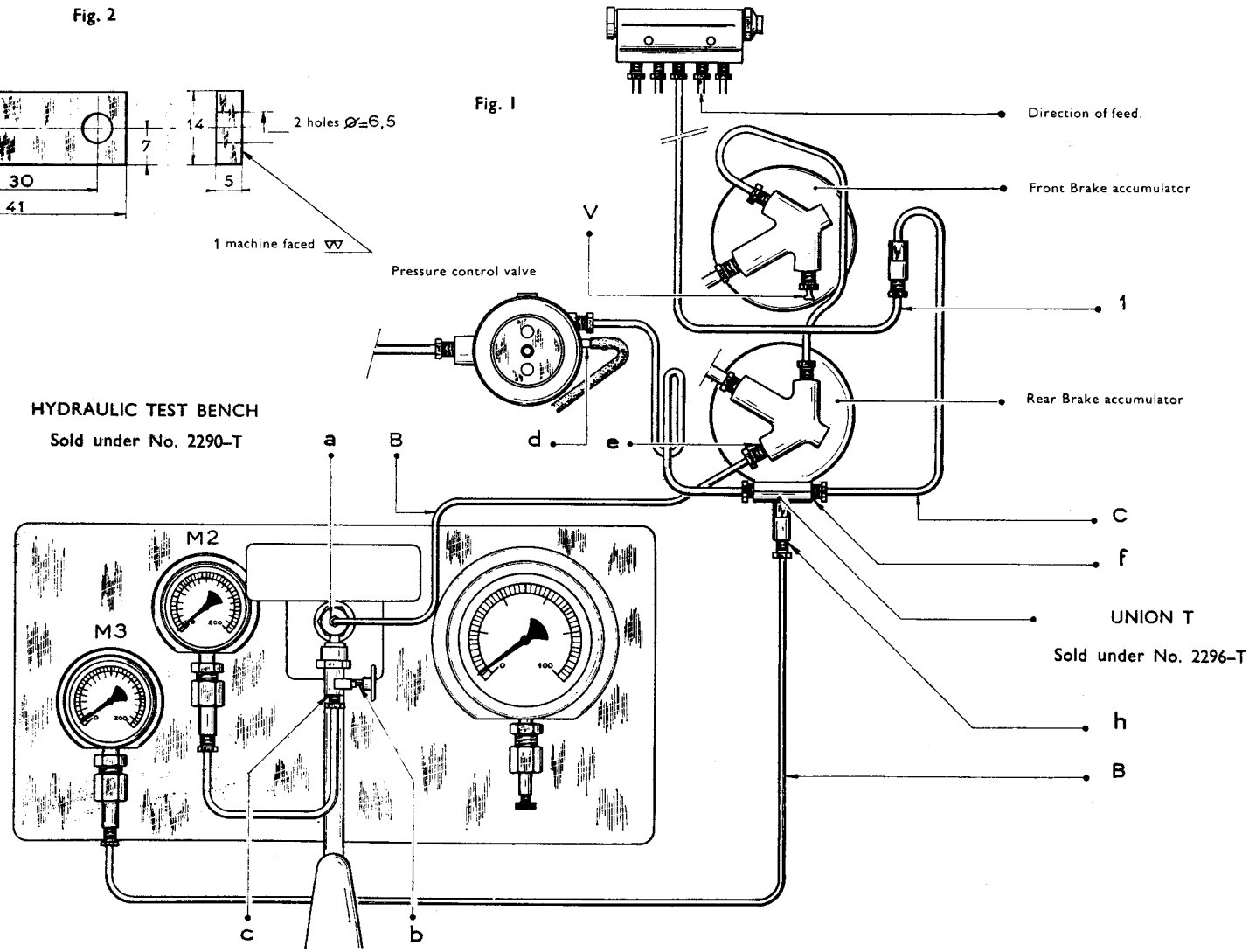


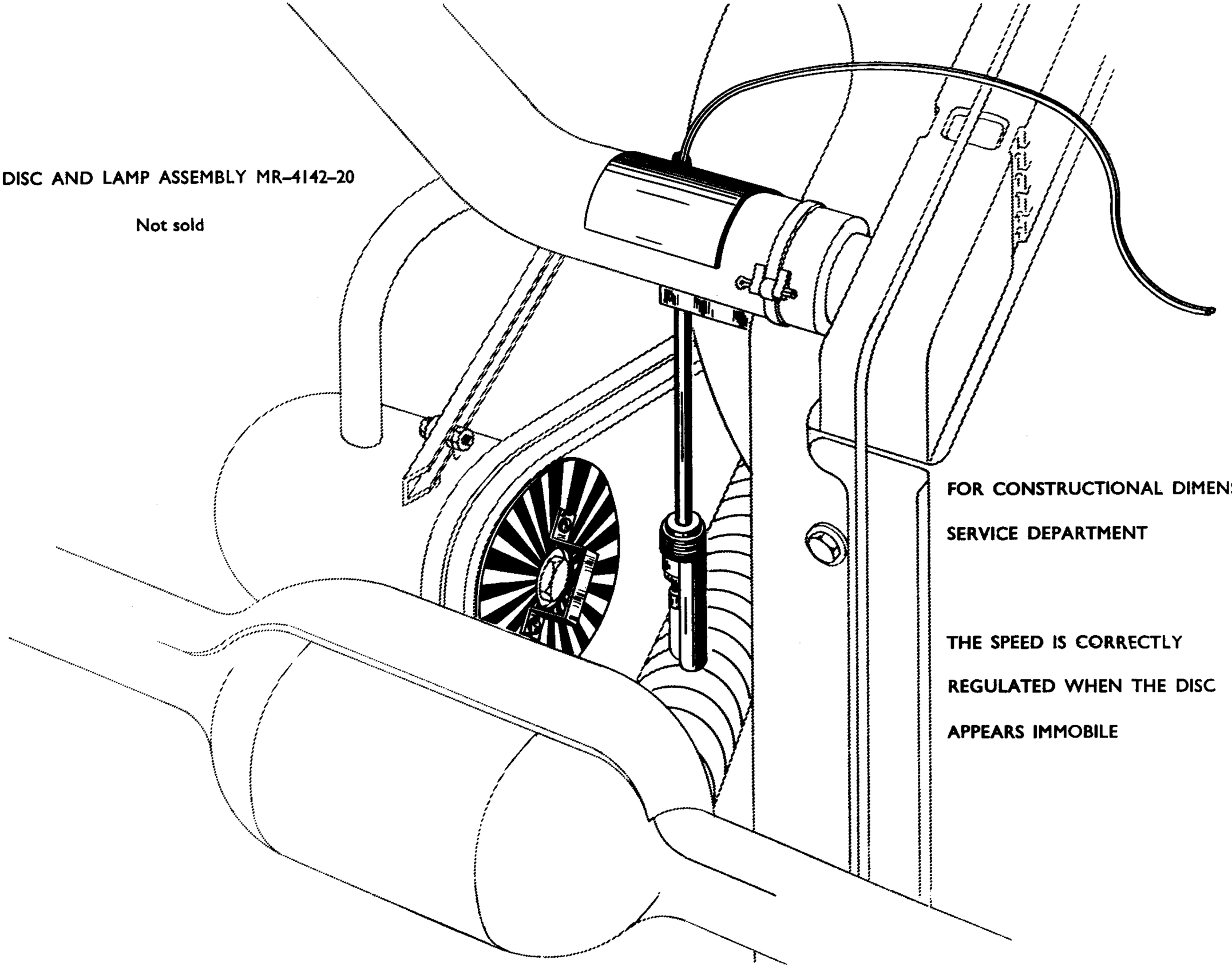
Fig. 1



STROBOSCOPIC REVOLUTION COUNTER

DISC AND LAMP ASSEMBLY MR–4142–20

Not sold



FOR CONSTRUCTIONAL DIMENSIONS APPLY TO

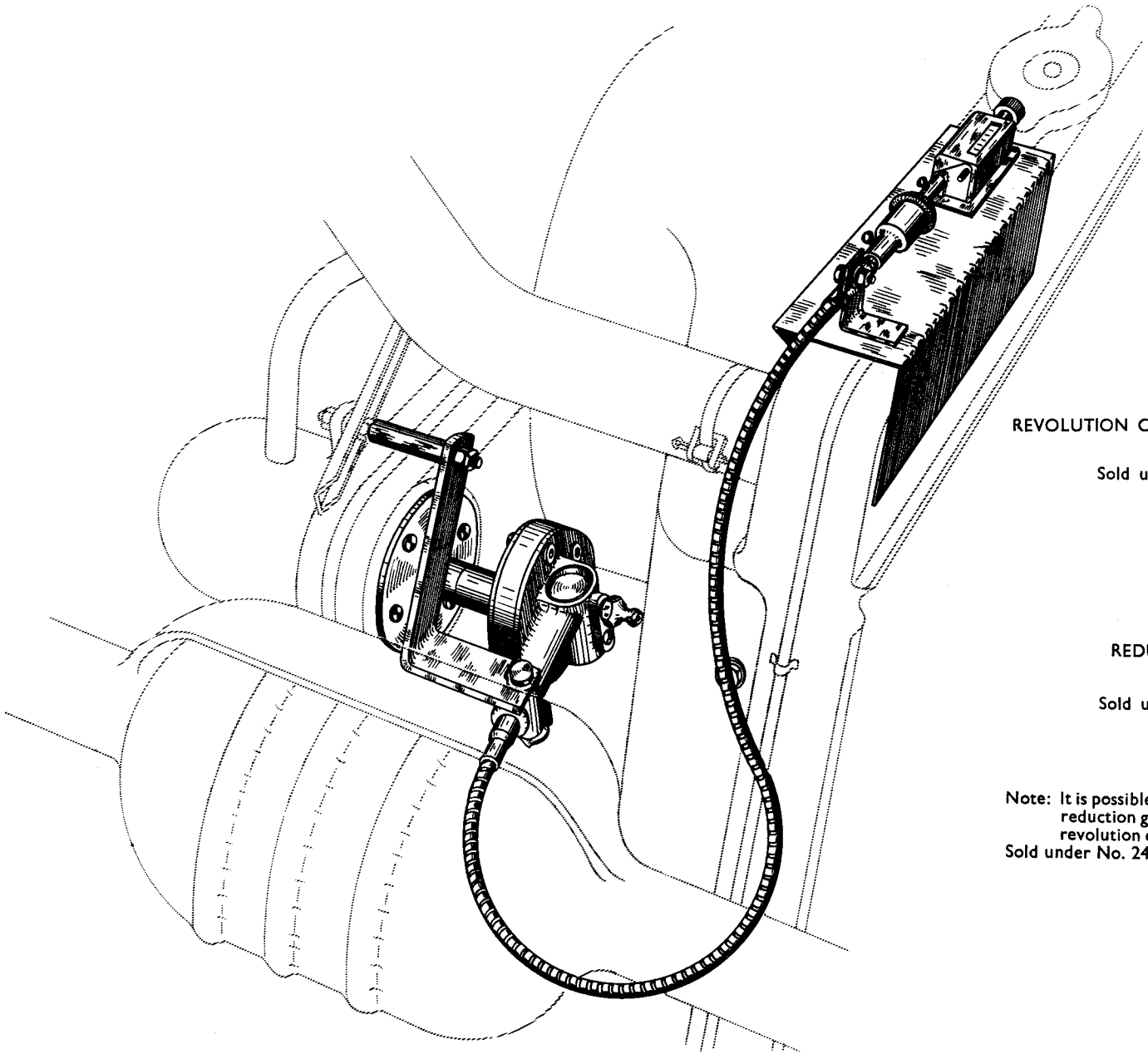
SERVICE DEPARTMENT

THE SPEED IS CORRECTLY

REGULATED WHEN THE DISC

APPEARS IMMOBILE

REVOLUTION COUNTER



REVOLUTION COUNTER AND BRACKET

Sold under No. 2432–T

REDUCTION GEAR

Sold under No. 2433–T

Note: It is possible to use the reduction gear of the mechanical revolution counter
Sold under No. 2434–T

HIGH PRESSURE PUMP

Fig. 2

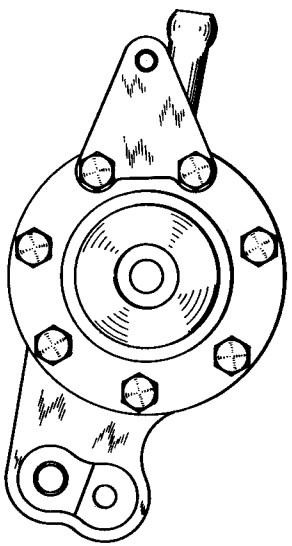


Fig. 1

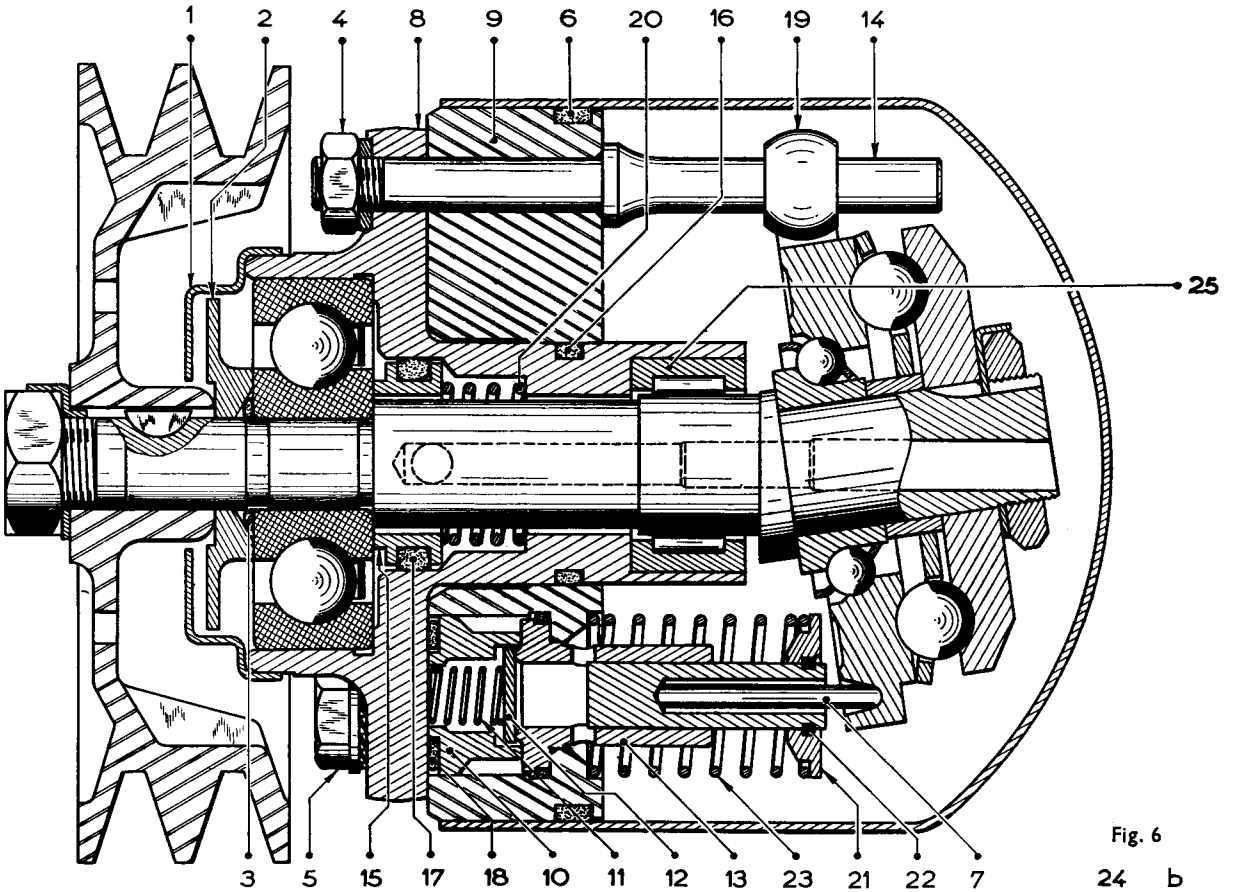


Fig. 3

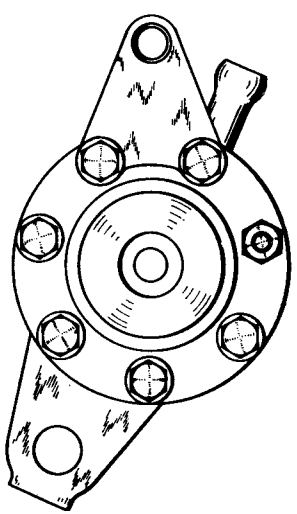


Fig. 4

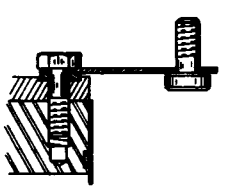


Fig. 5

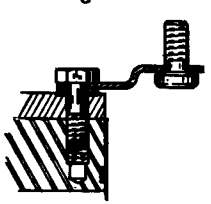
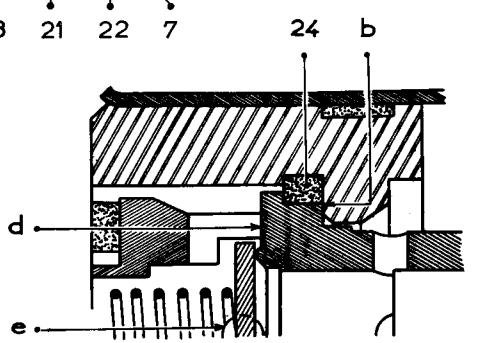


Fig. 6



HIGH PRESSURE PUMP

VARIOUS TOOLS

Fig. 1 SPANNER

Sold under No. 2281–T

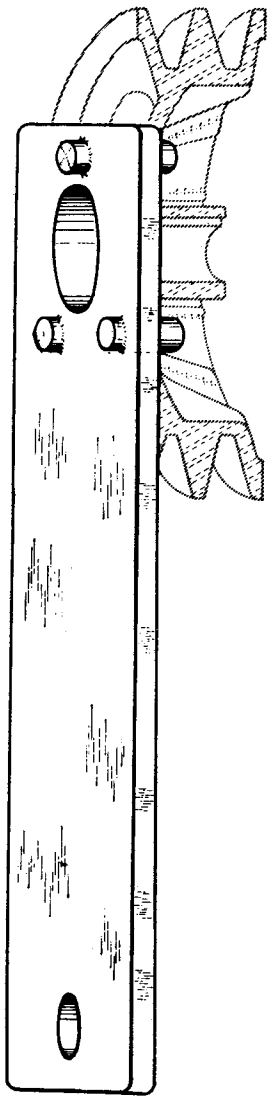
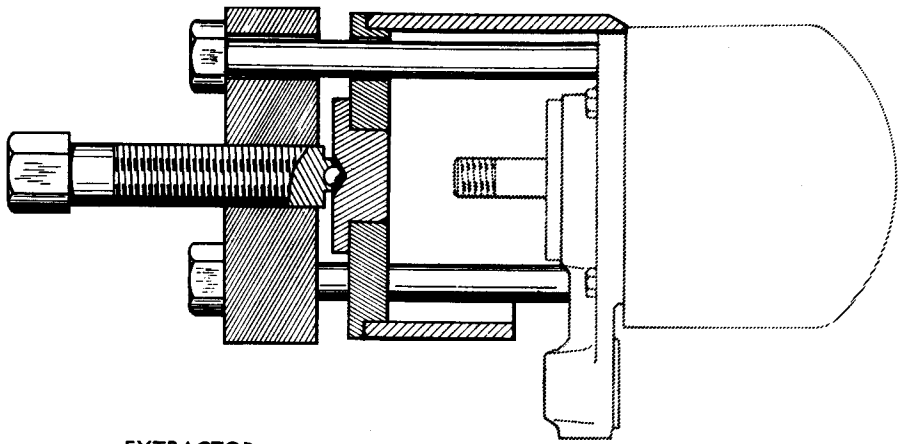


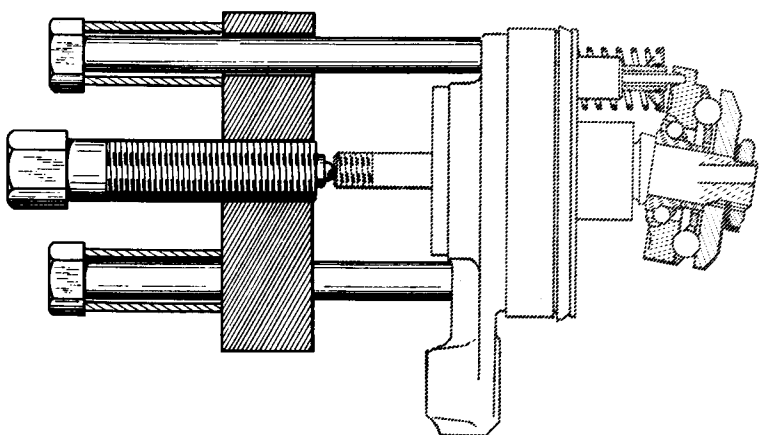
Fig. 2 EXTRACTION OF THE COVER



EXTRACTOR

Sold under No. 2282–T

Fig. 3 EXTRACTION OF THE SHAFT



HIGH PRESSURE PUMP

VARIOUS TOOLS

Fig. 1 ALUMINIUM RACK MR-3301-80

Not sold

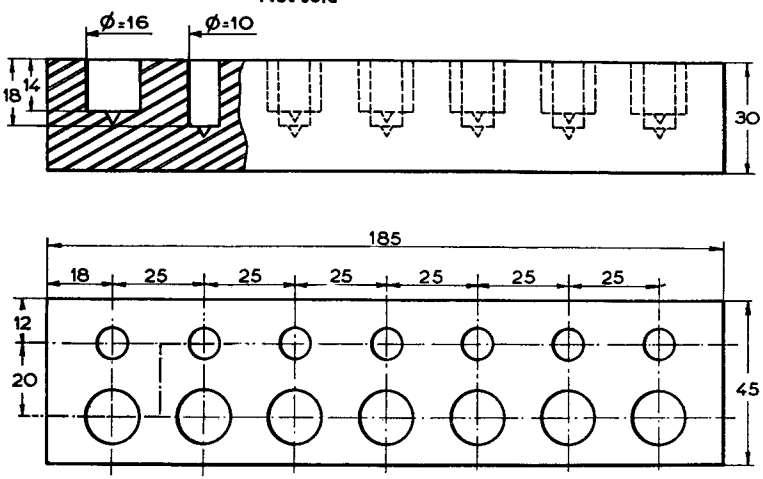


Fig. 2 STAND MR-3053-190

Not sold

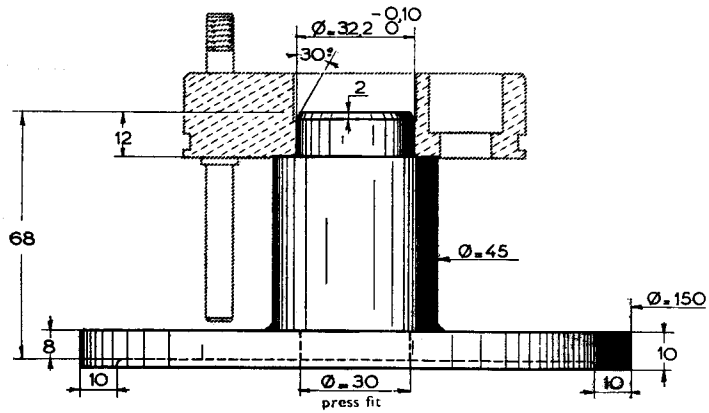


Fig. 3 MANDREL MR-3436-110

Not sold

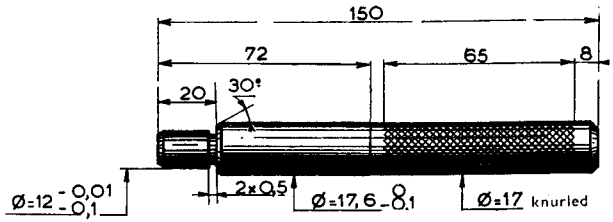
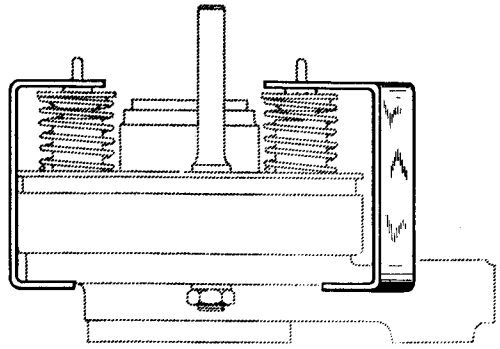


Fig. 4 YOKE

Sold under No. 2284-T



HIGH PRESSURE PUMP

VARIOUS TOOLS

Fig. 1 MANDREL AND DOLLY RING

Sold under No. 2286–T

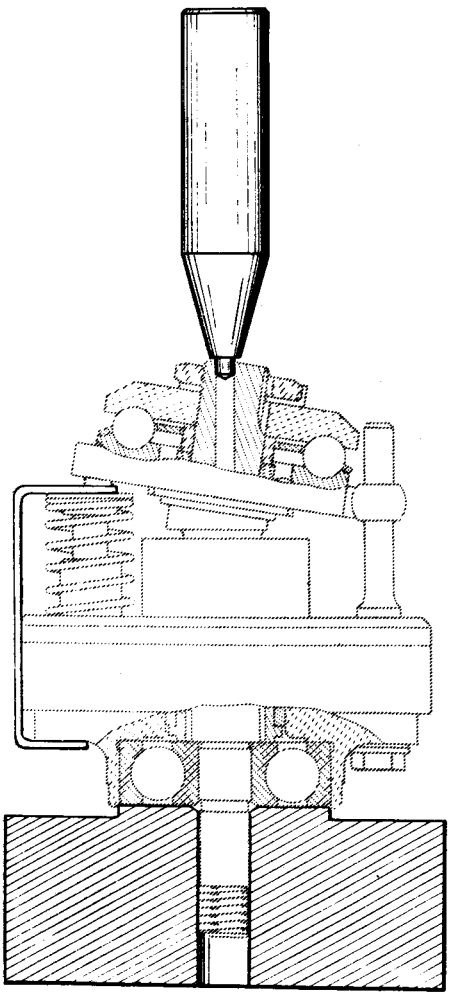
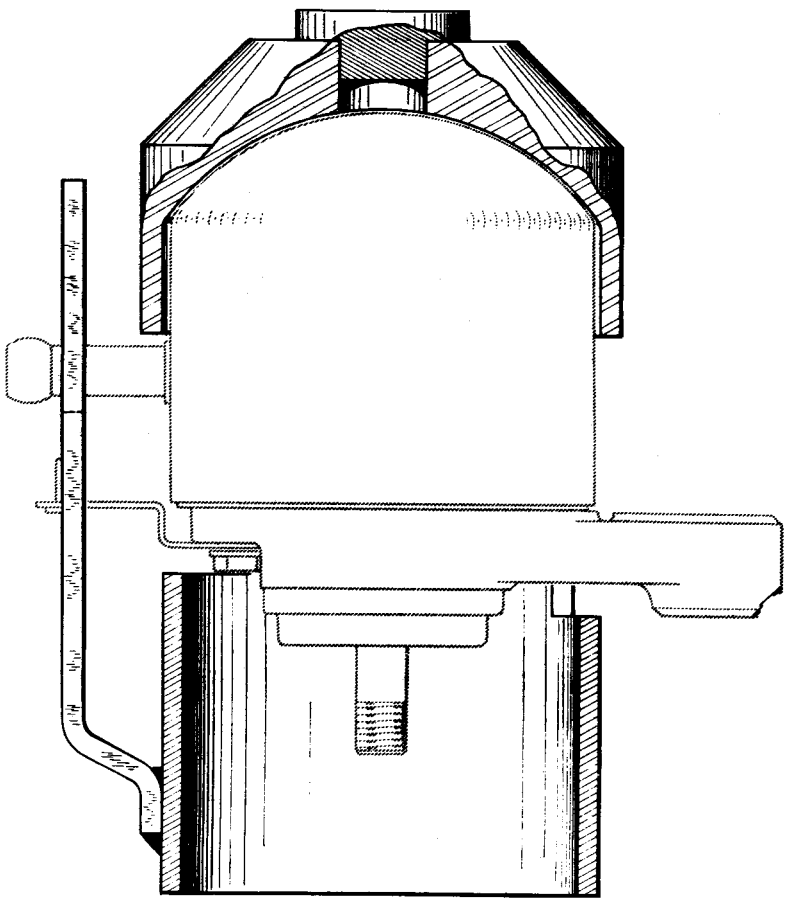


Fig. 2 ASSEMBLY

Sold under No. 2287–T

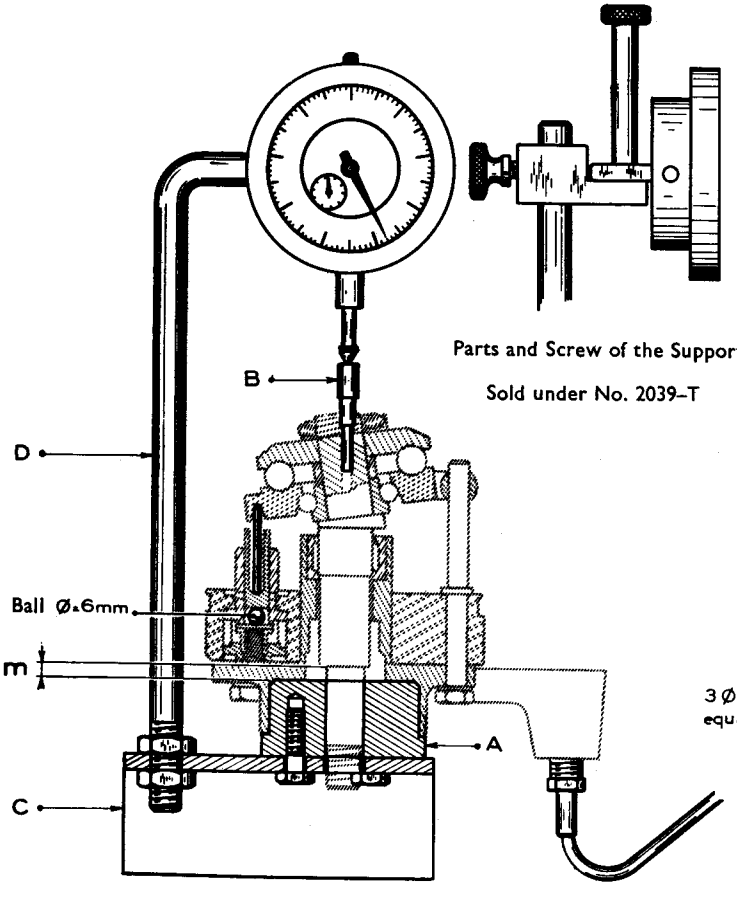


HIGH PRESSURE PUMP

MEASURING THE LENGTH OF THE PUSH RODS

Fig. 1 SUPPORT FOR DIAL GAUGE MR3365-60

Not sold

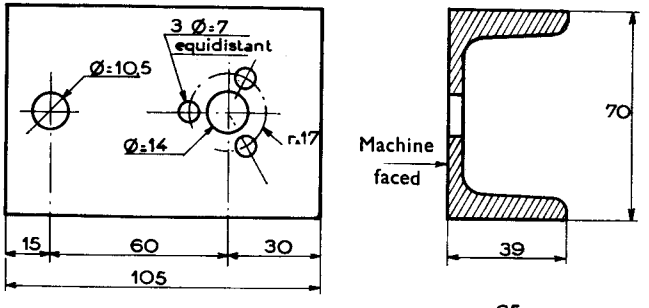


Parts and Screw of the Support

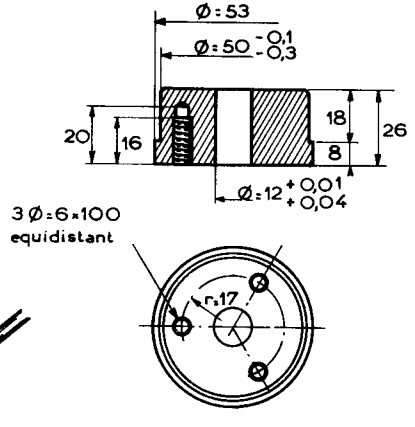
Sold under No. 2039-T

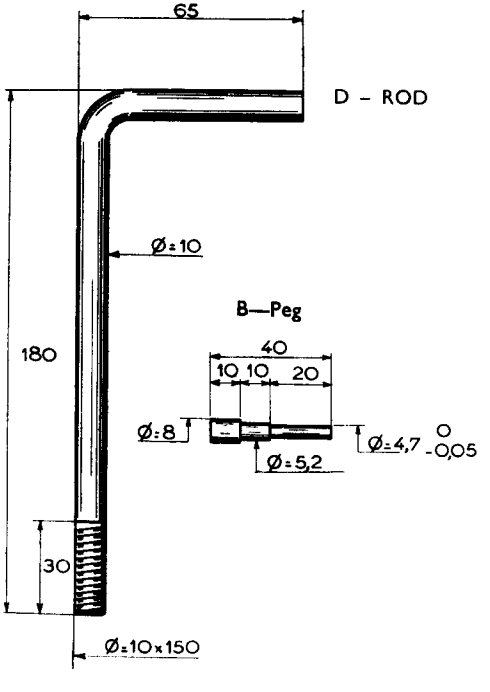
Fig. 2 DETAILS OF SUPPORT

C—BASE



A—BLOCK





HIGH PRESSURE PUMP

TESTING FOR LEAKAGE

Fig. 2

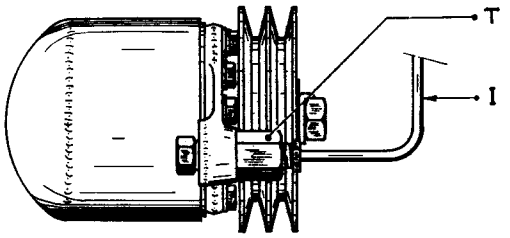
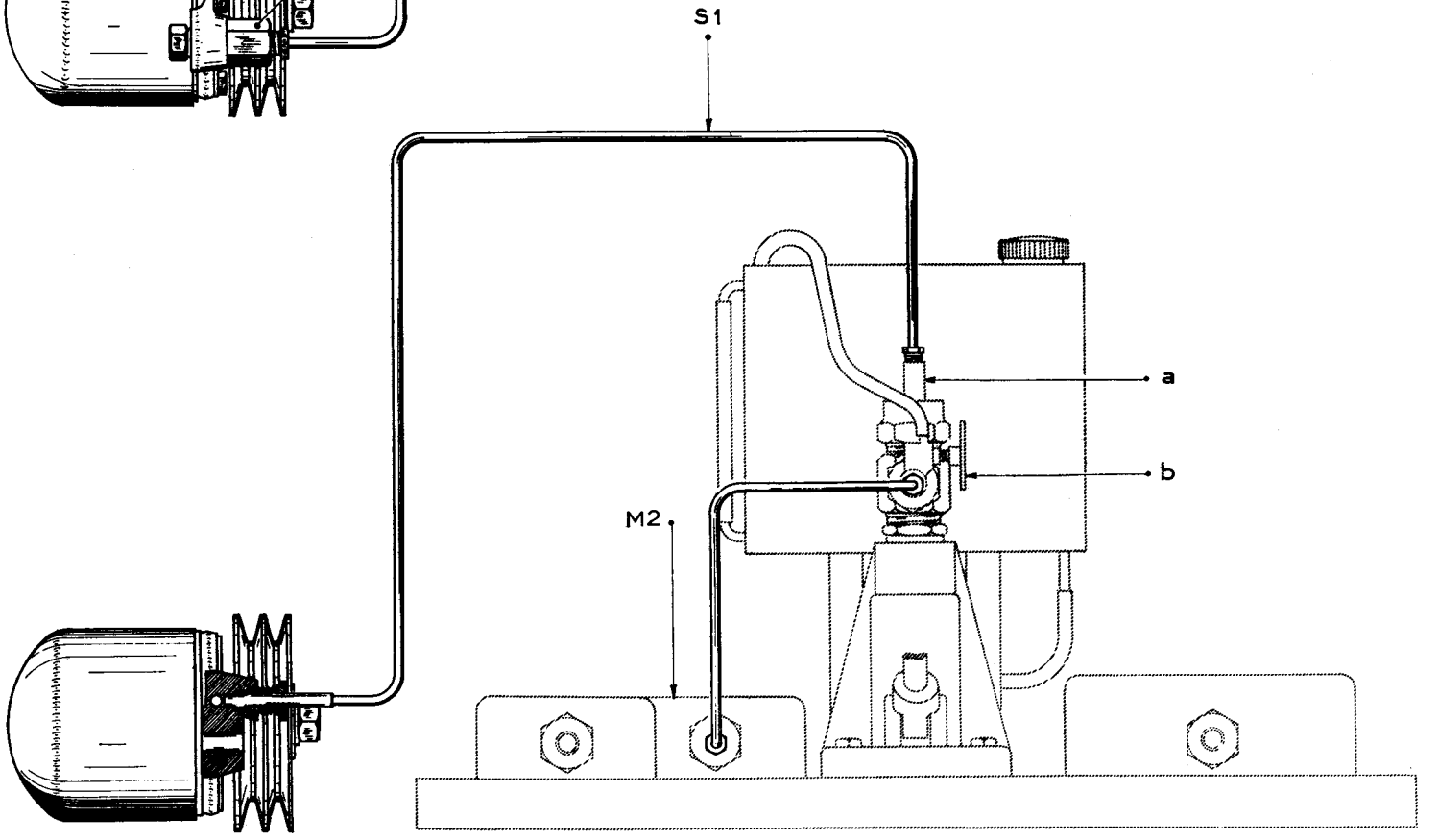


Fig. 1



PRESSURE CONTROL VALVE

Fig. 1

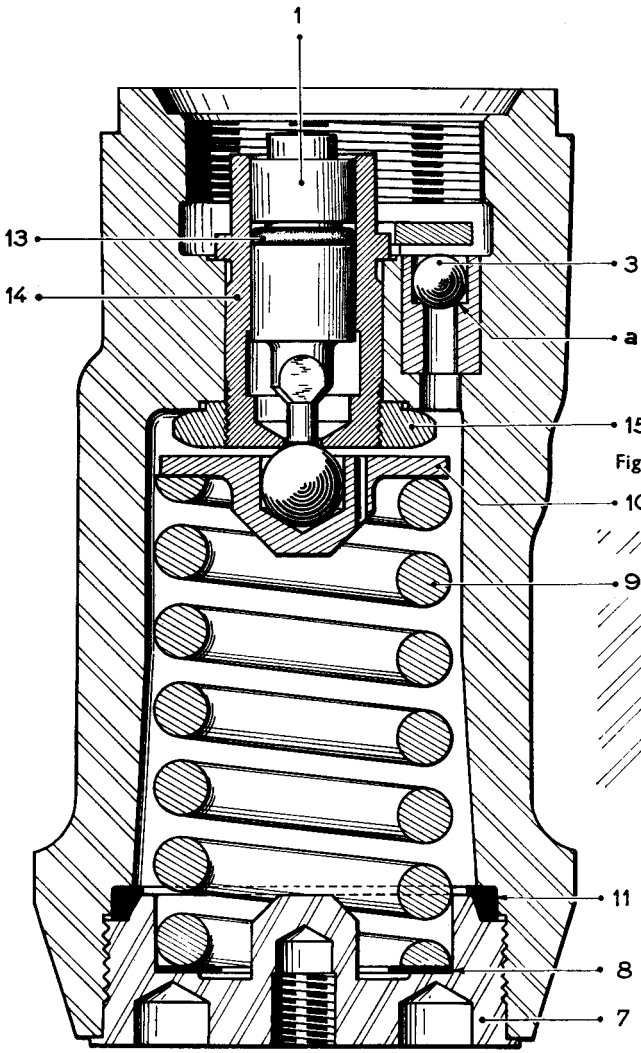


Fig. 2

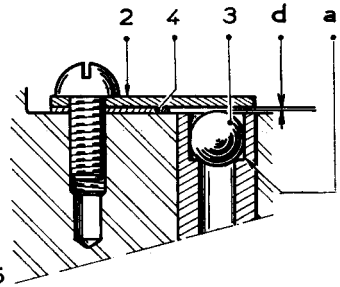


Fig. 5 ASSEMBLY SINCE MAY 1959

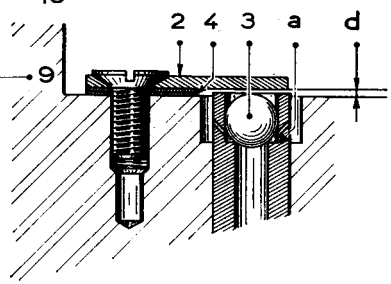


Fig. 3

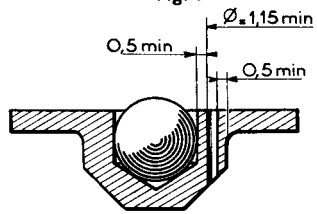
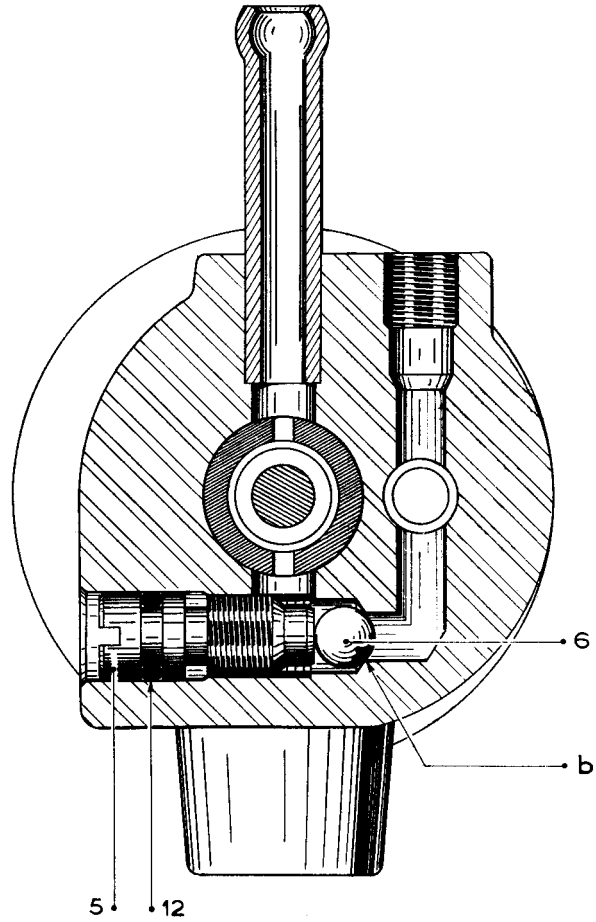
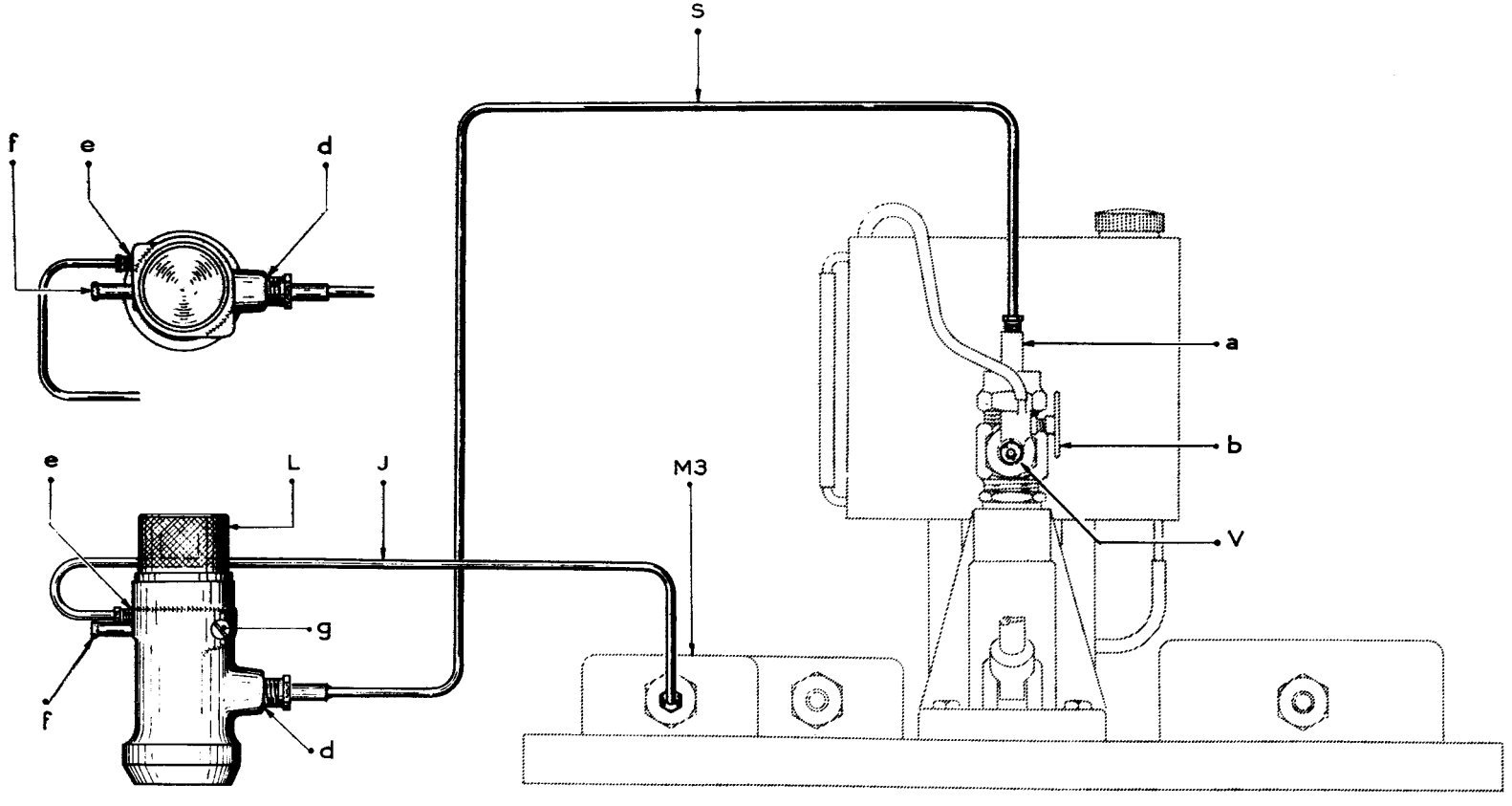


Fig. 4



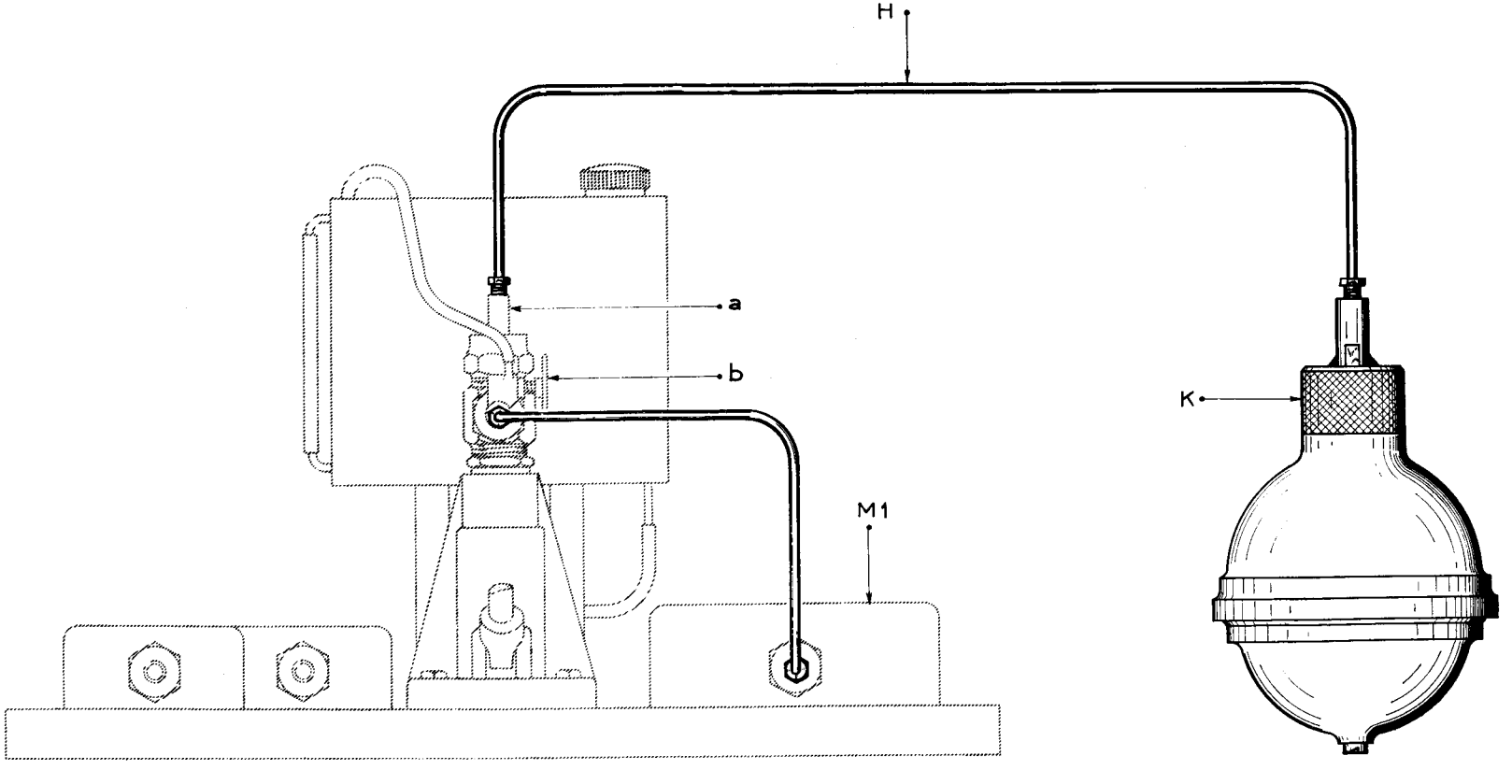
PRESSURE CONTROL VALVE

CHECKING THE CUTTING-IN, LEAKAGE AND CUTTING-OUT



SUSPENSION SPHERE—ACCUMULATOR

CHECKING THE PRESSURE



PRESSURE DISTRIBUTION BLOCK BRAKE ACCUMULATOR

Fig. 1

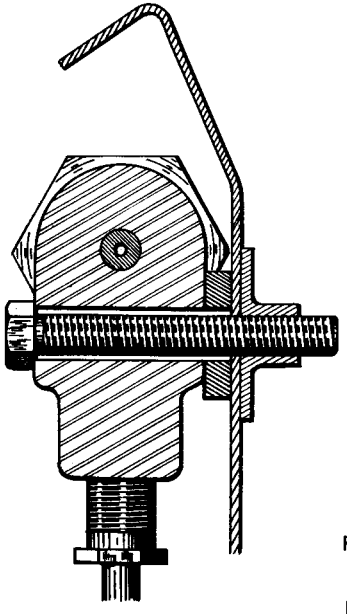


Fig. 2

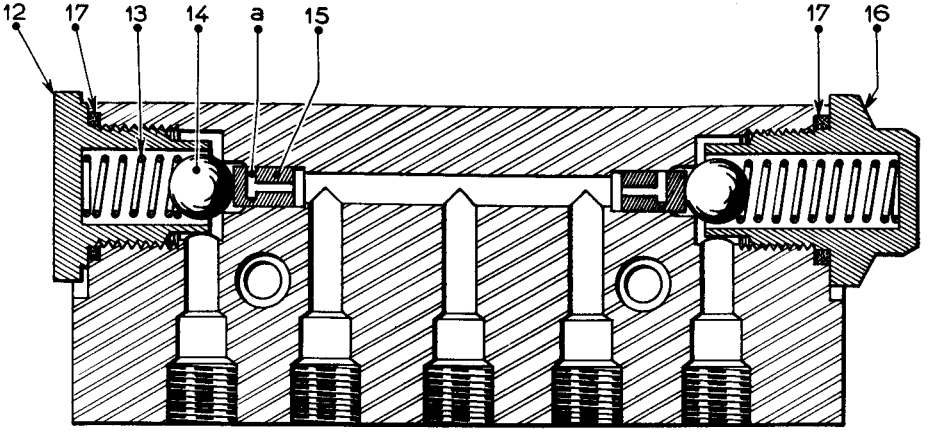


Fig. 3

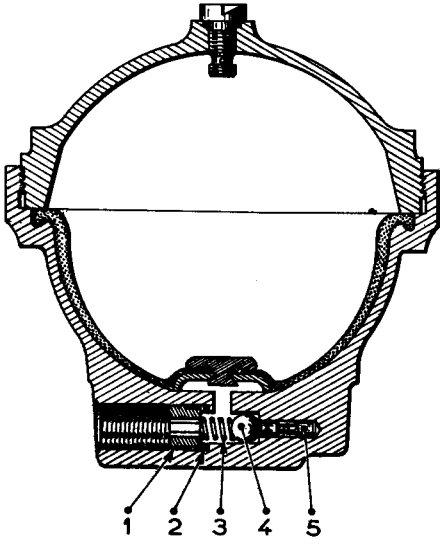
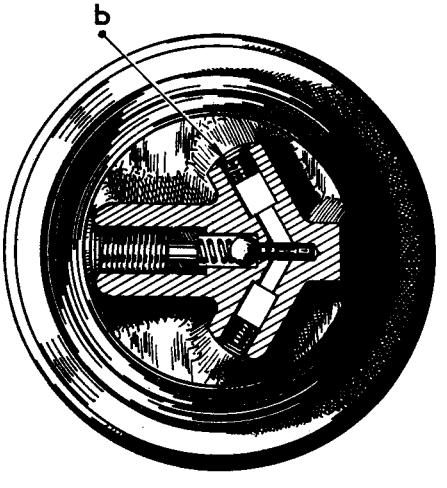
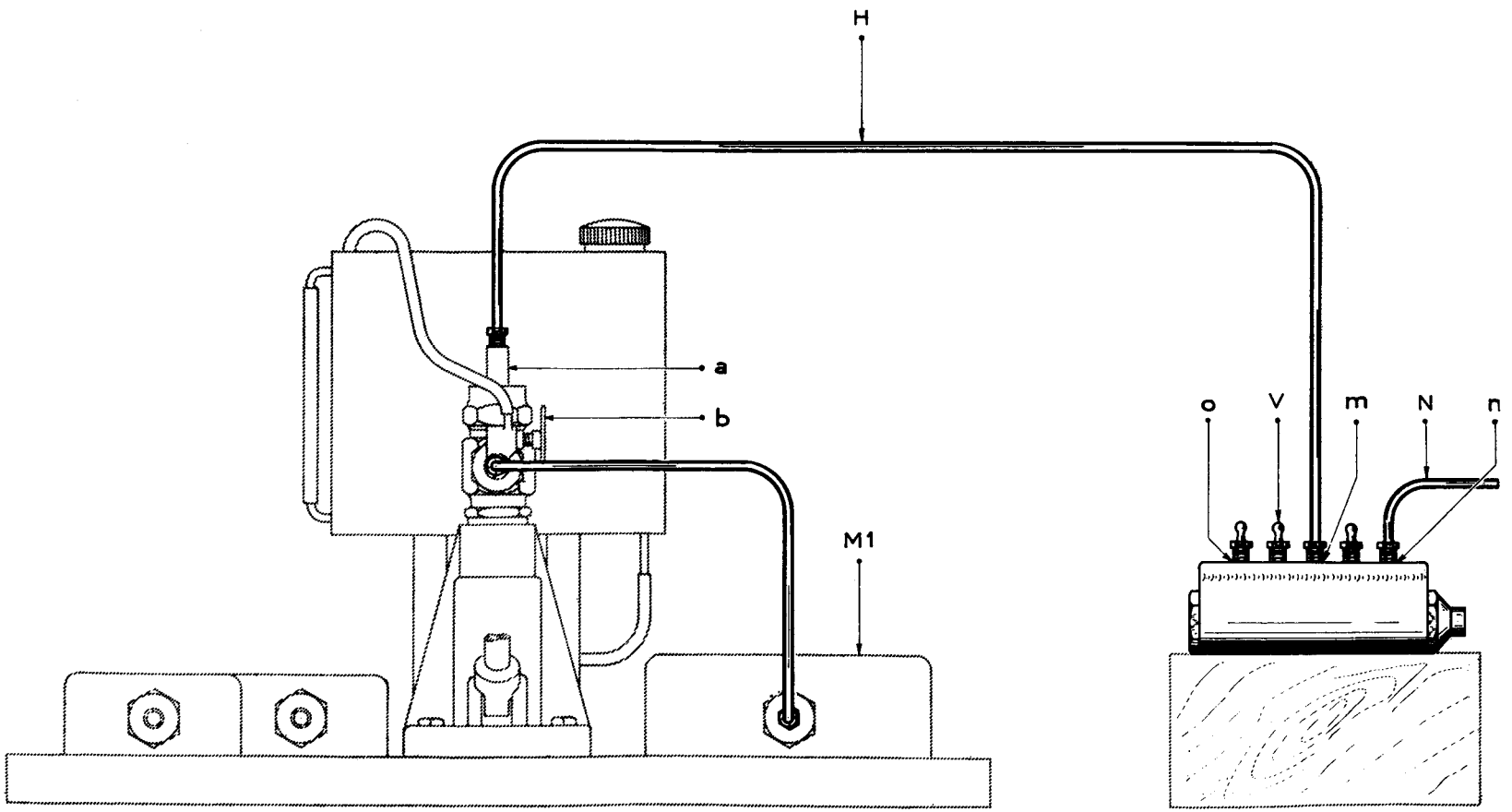


Fig. 4



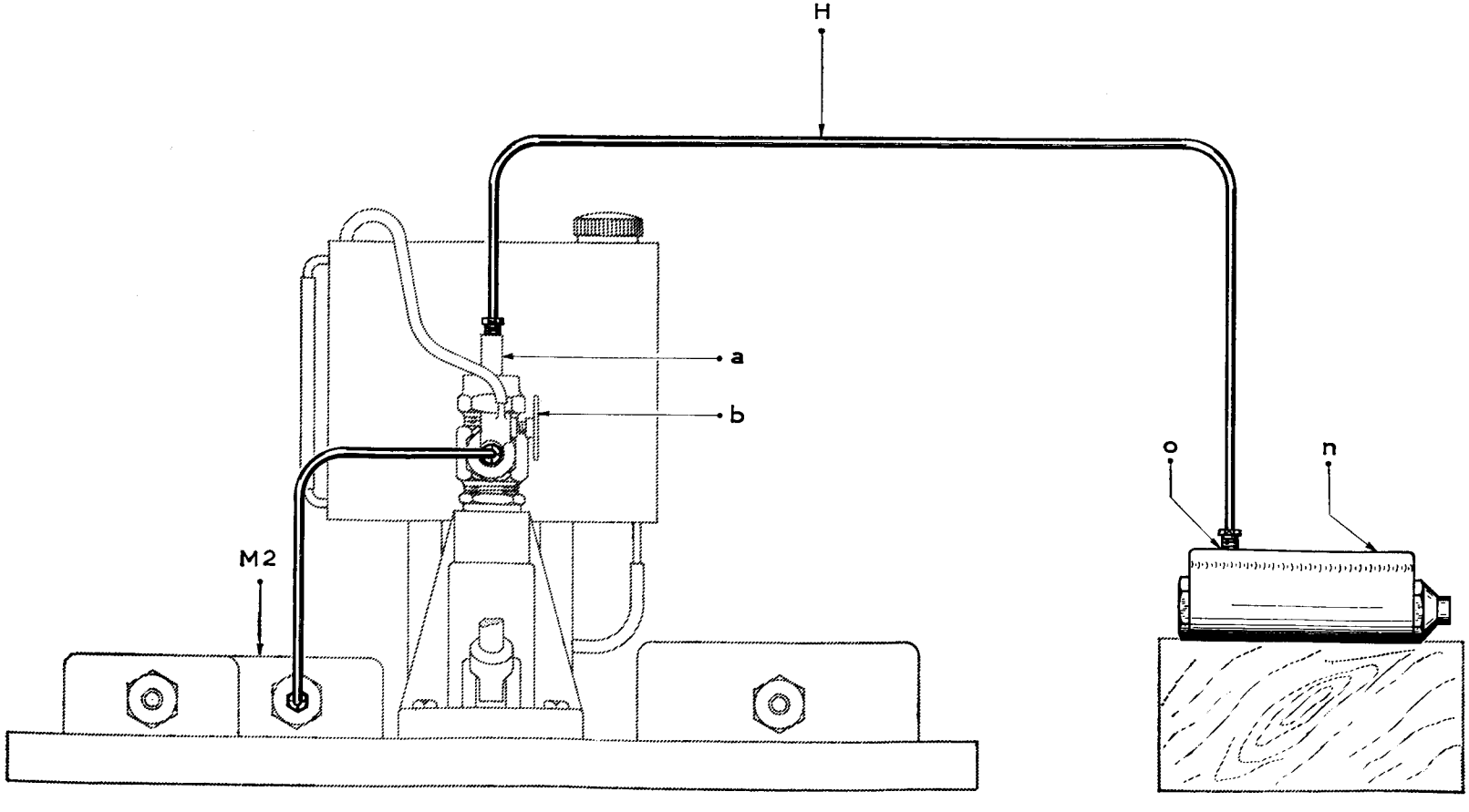
PRESSURE DISTRIBUTION BLOCK

CHECKING FOR LEAKAGE FROM VALVE



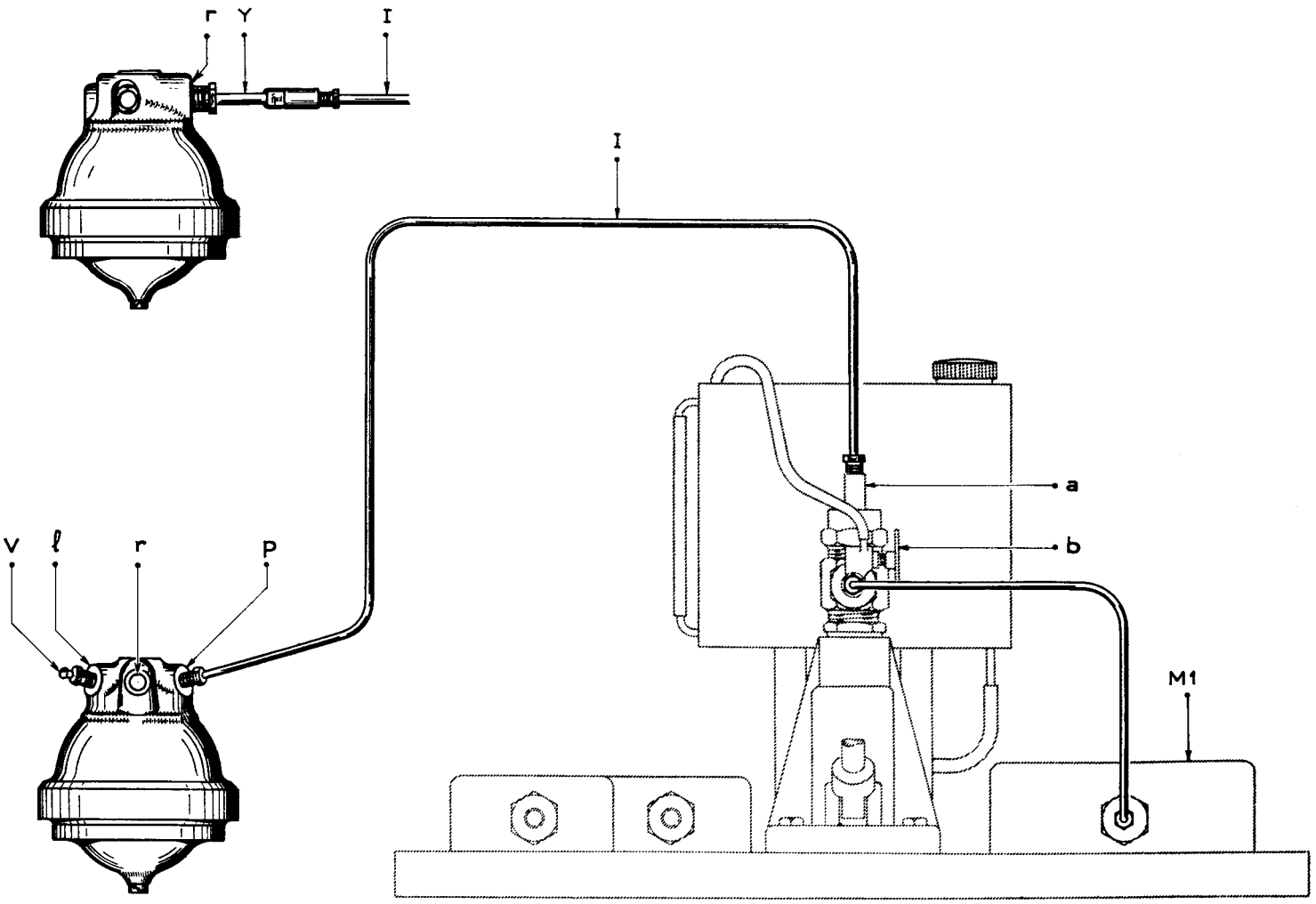
PRESSURE DISTRIBUTION BLOCK

CHECKING FOR LEAKAGE



BRAKE ACCUMULATOR

CHECKING THE PRESSURE AND FOR LEAKAGE



PRESSURE CONTROL VALVE—ACCUMULATOR

VARIOUS TOOLS

Fig. 1 STRAP WRENCH

Sold under No. 2223–T

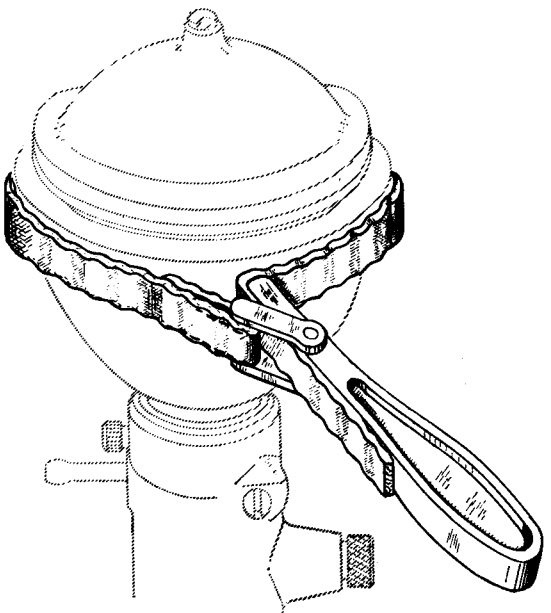


Fig. 2 SPANNER AND SPINDLE

Sold under No. 2224–T

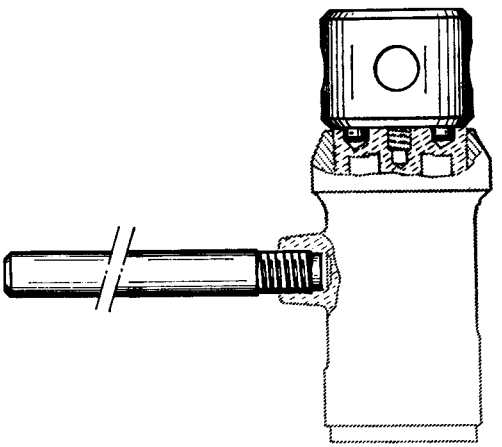


Fig. 3 TAPERED SLEEVE

Sold under No. 2225–T

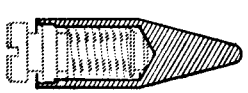


Fig. 3 TAPERED SLEEVE

Sold under No. 2226–T



SEALING PLUGS—TAPERED SLEEVES

Fig. 1 TAPERED SLEEVE : MR3384-10

Not sold

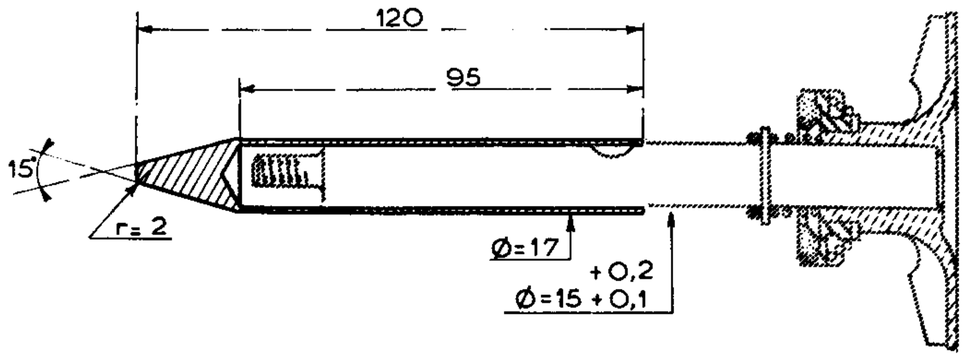


Fig. 4

Fig. 2 ASSEMBLY OF THE SEAL RING

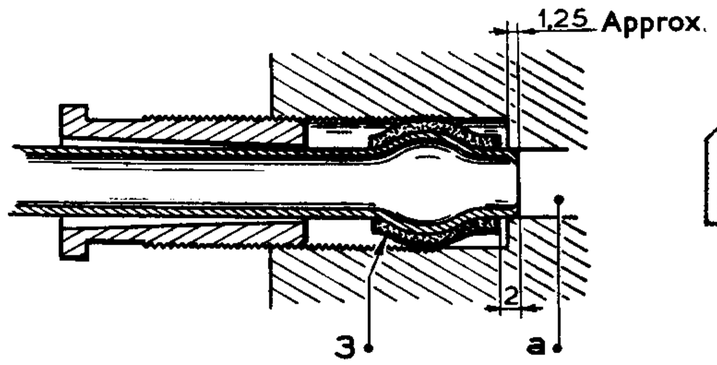


Fig. 5

Fig. 3 TAPERED SLEEVE MR3384-11

Not sold

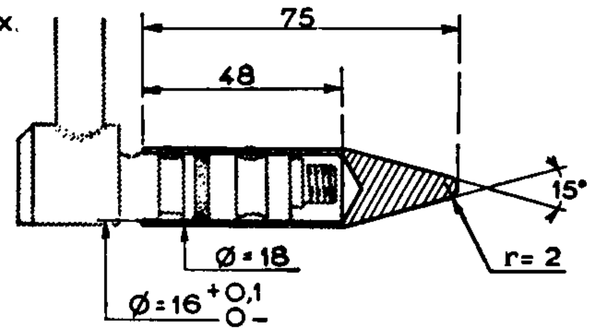
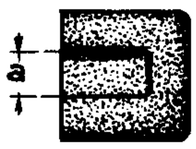


Fig. 6

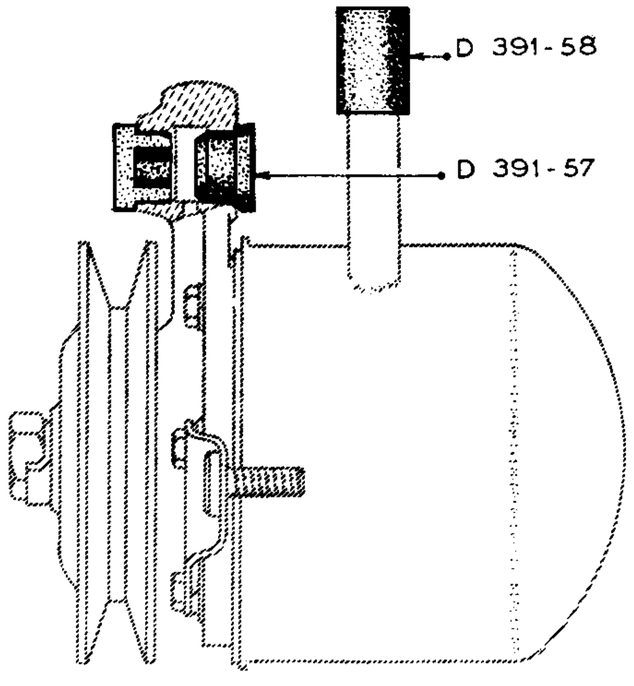


D 435-91 a= 3 mm

D 453-131 a= 4,5 mm

D 453-132 a= 6,35 mm

Fig. 7



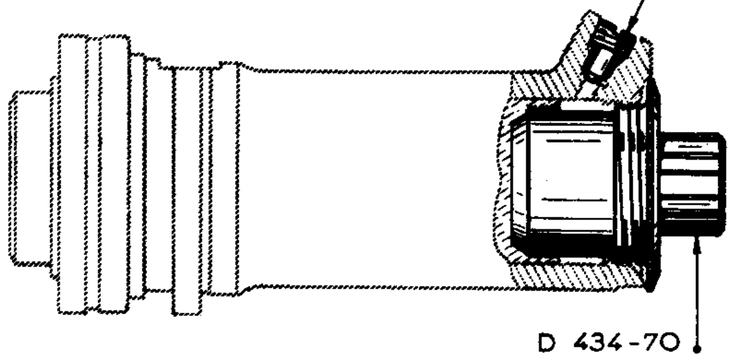


Fig. 8

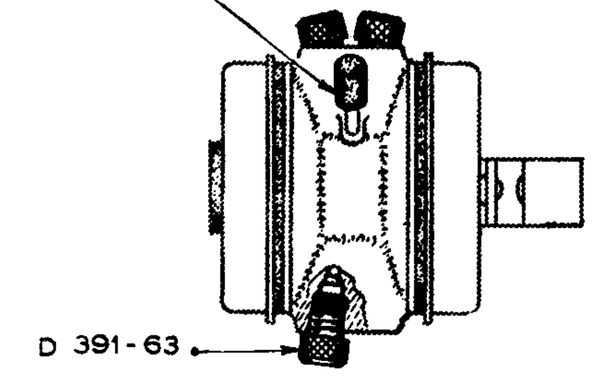
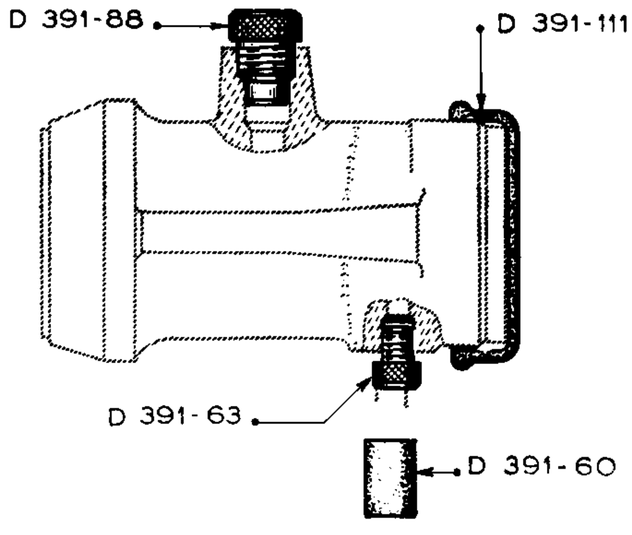
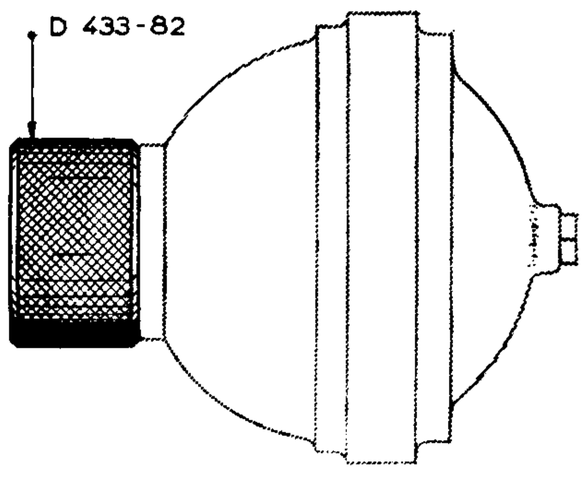


Fig. 3





SECTIONAL VIEWS

Fig. 1

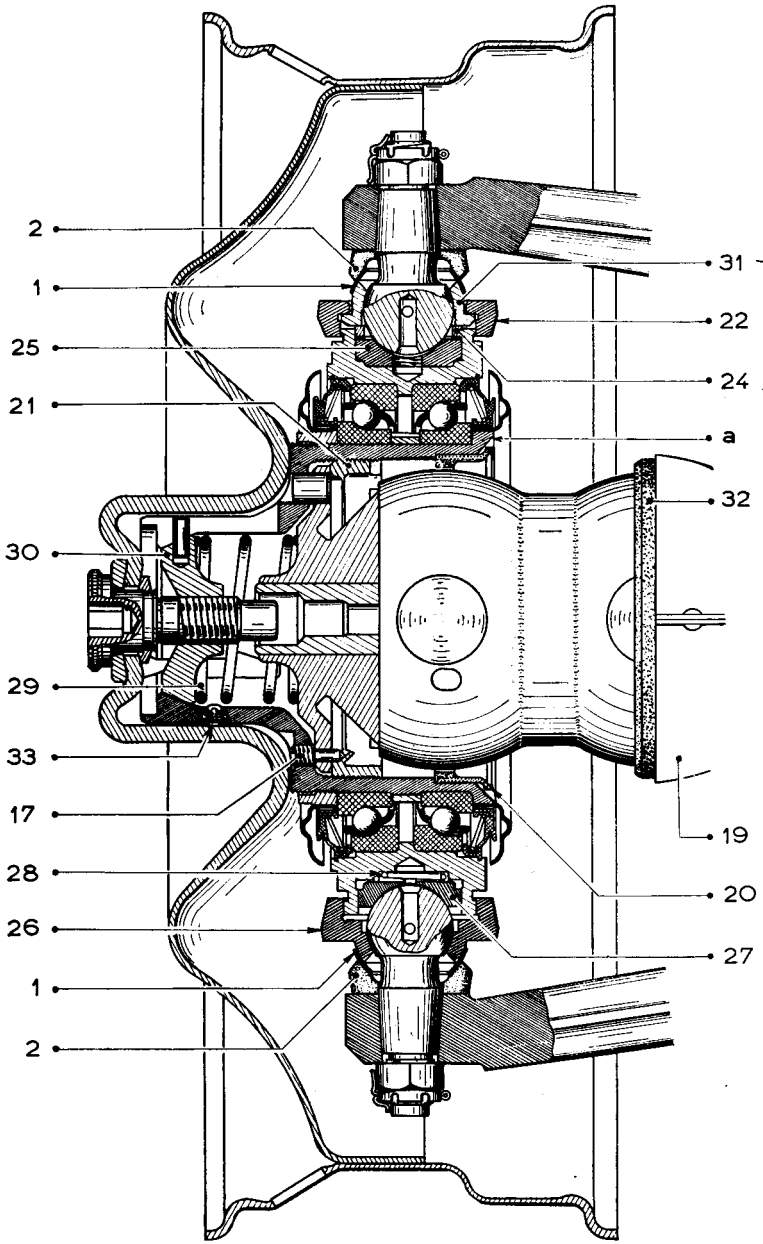
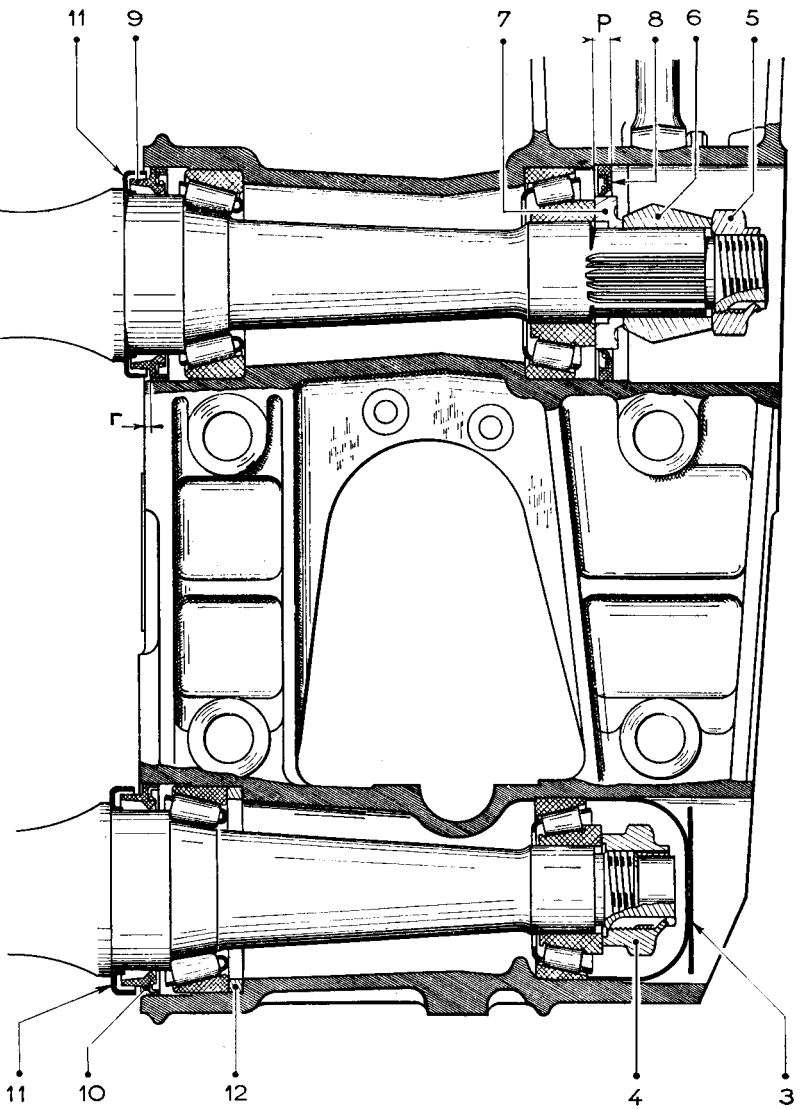


Fig. 2



SECTION OF UPPER BALL JOINTS

Fig. 1

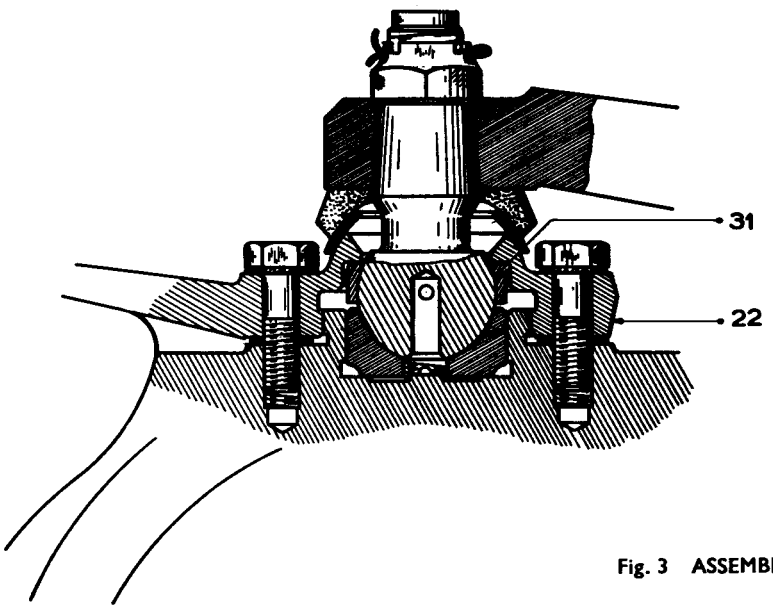


Fig. 2

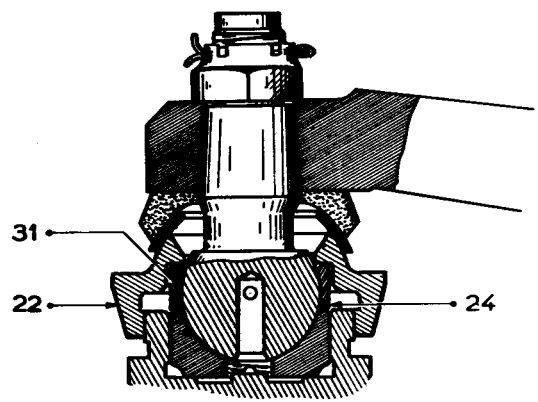
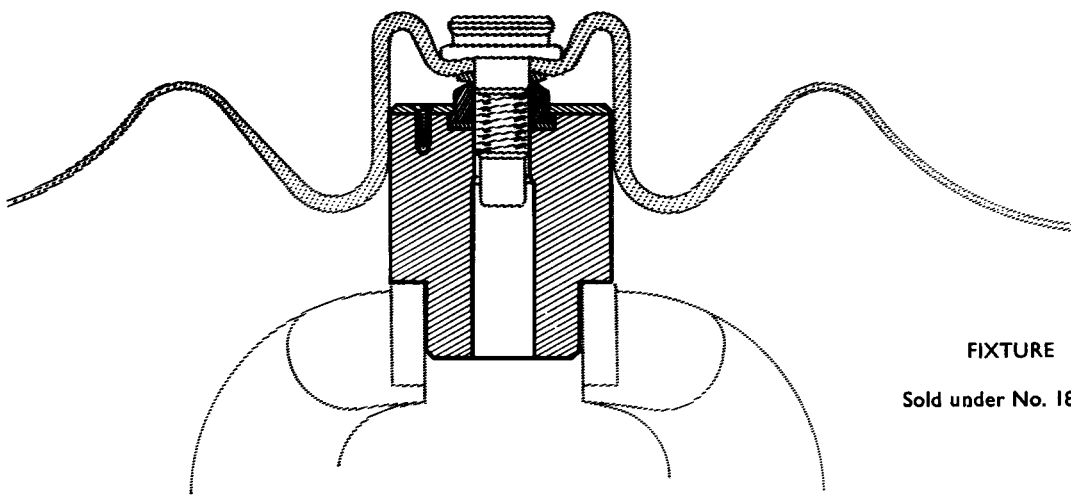


Fig. 3 ASSEMBLY OF REAR LOCKING SCREW



FIXTURE

Sold under No. 1868–T

VARIOUS TOOLS

Fig. 1 EXTRACTOR

Sold under No. 1856–T

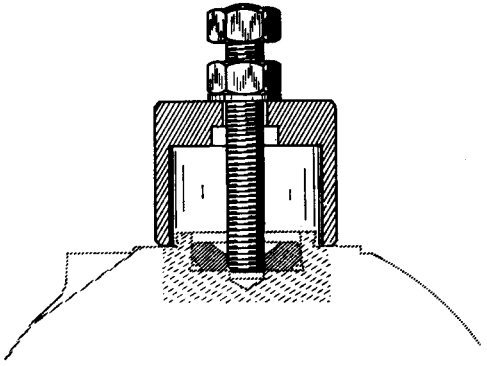


Fig. 2 FIXTURE

Sold under No. 1857–T

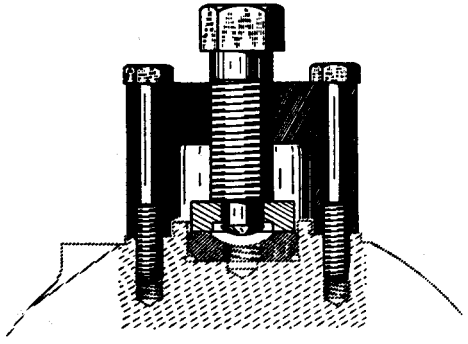
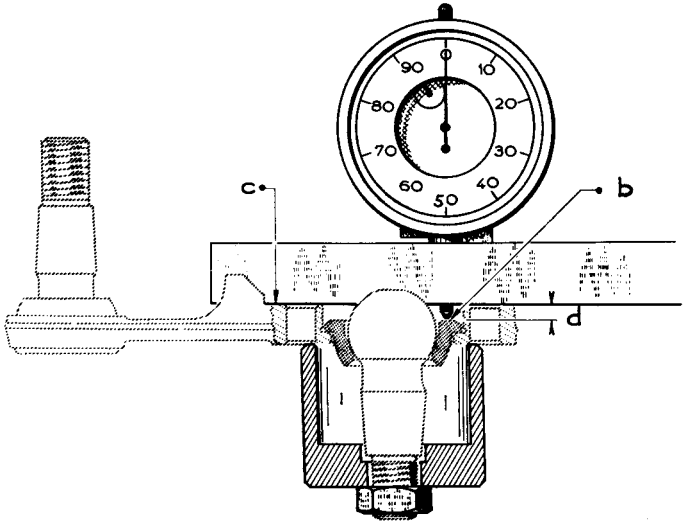


Fig. 3 ADJUSTING THE UPPER BALL JOINT

Setting dial gauge using the body of the extractor 1856–T



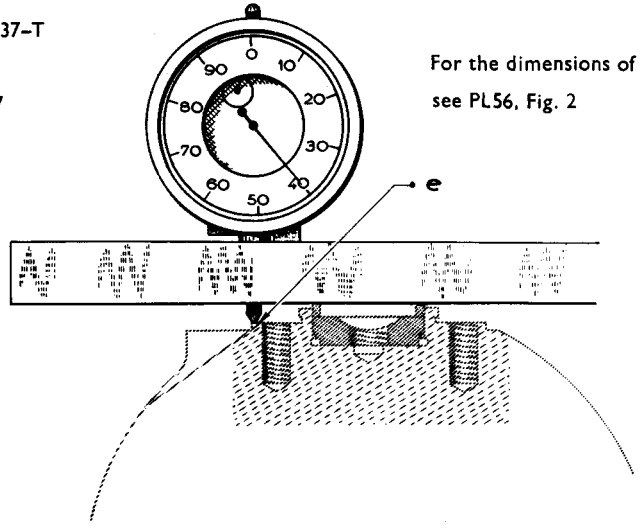
DIAL GAUGE

Sold under No. 2437–T

FIXTURE MR3377

Not sold

Measuring the thickness of Adjusting Washer



For the dimensions of fixture MR3377 see PL56, Fig. 2

VARIOUS TOOLS

Fig. 1 ADJUSTING FIXTURE

Sold under No. 1867–T

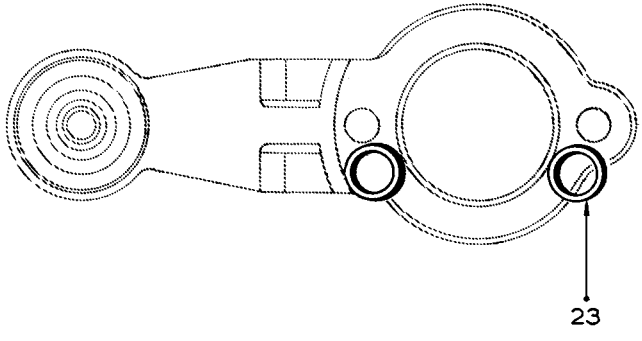


Fig. 2 EXTRACTOR

Sold under No. 1964–T

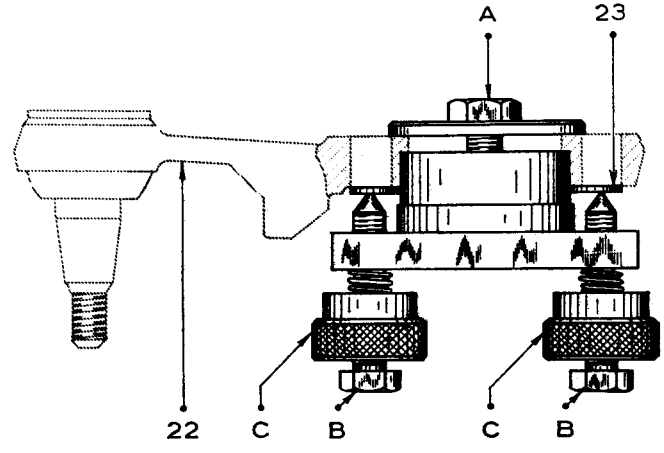
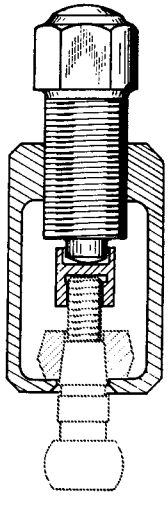


Fig. 4 SPANNER MR3691–40

Not sold

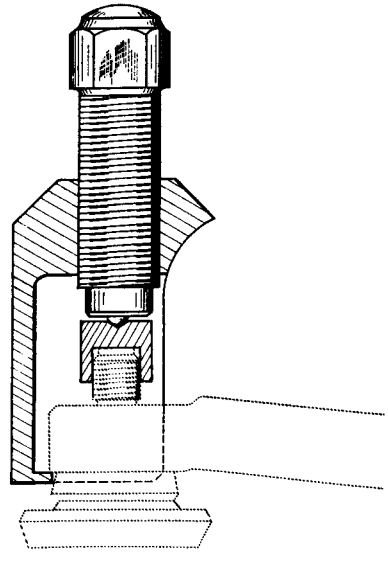


PRESSURE PAD

Sold under No. 1968–T

Fig. 3 EXTRACTOR AND PRESSURE PAD

Sold under No. 1864–T



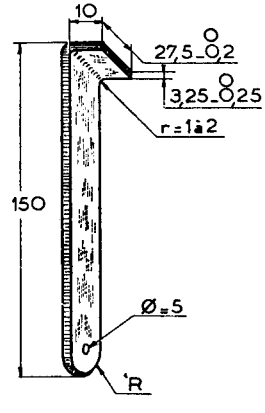
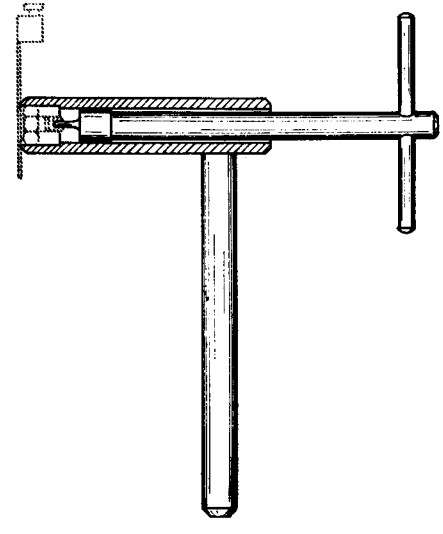


Fig. 5 SPANNER

Sold under No. 2285–T

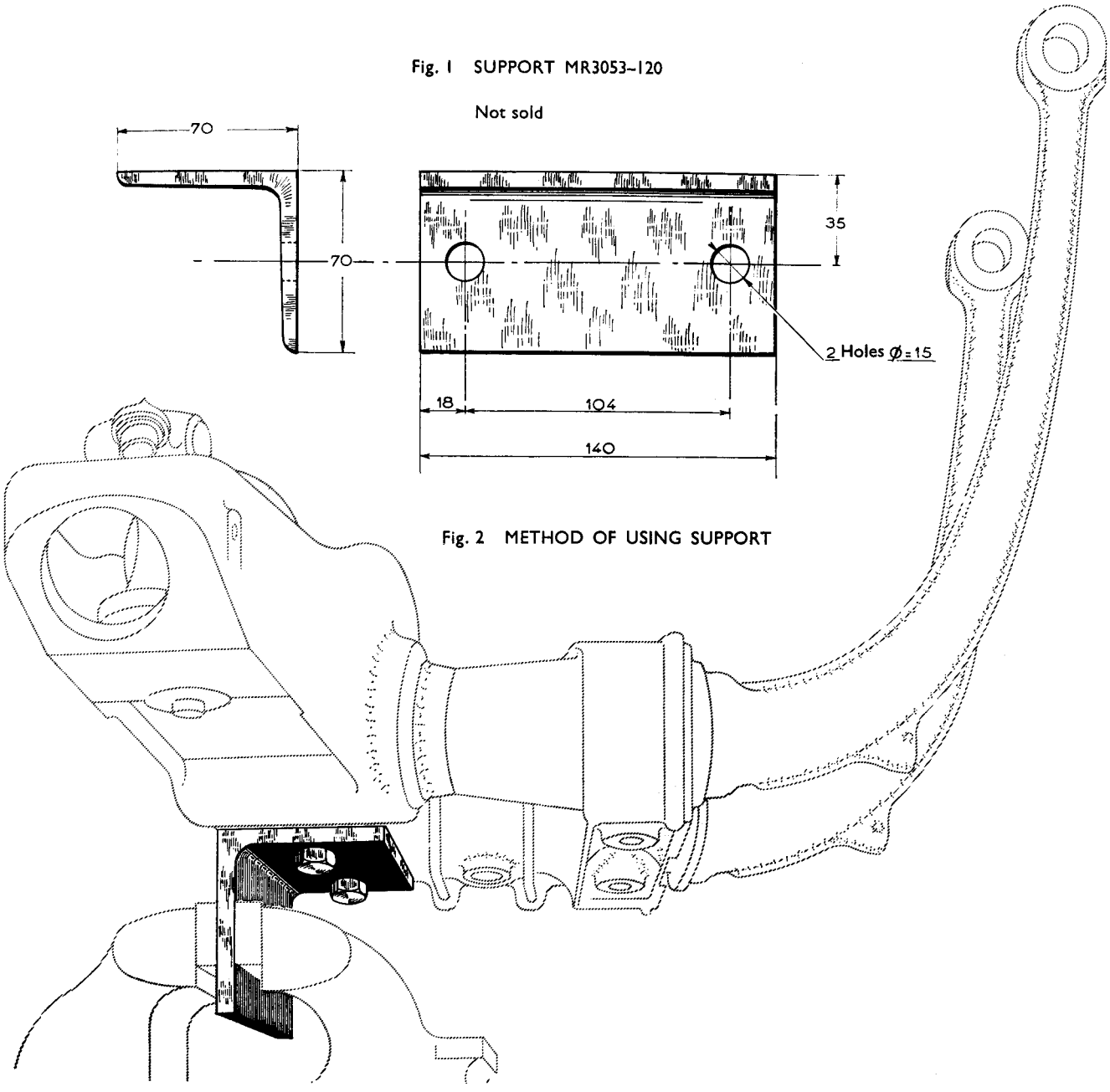


SUPPORT FOR HALF-AXLE

Fig. 1 SUPPORT MR3053-120

Not sold

Fig. 2 METHOD OF USING SUPPORT



VARIOUS TOOLS

Fig. 1 SPANNER

Sold under No. 1921–T

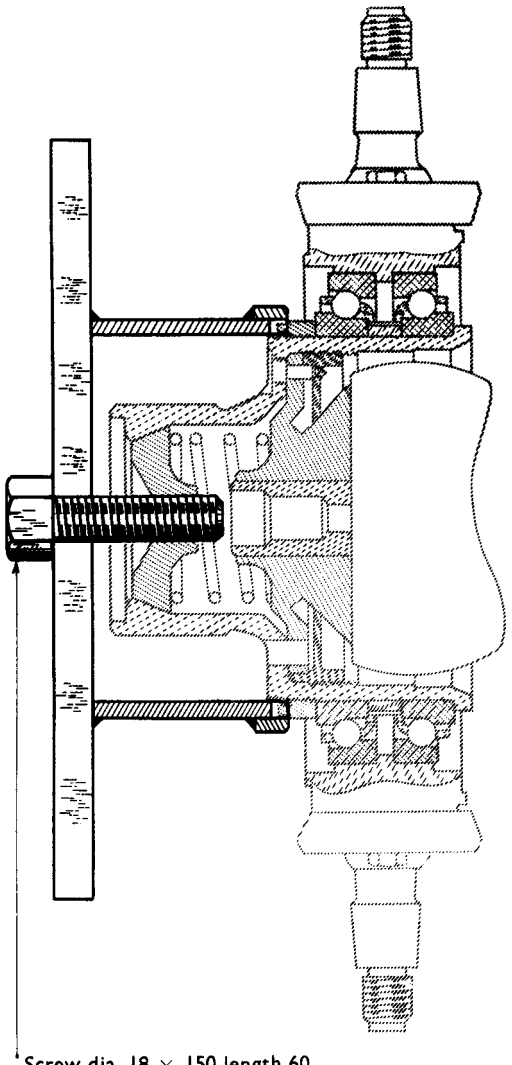
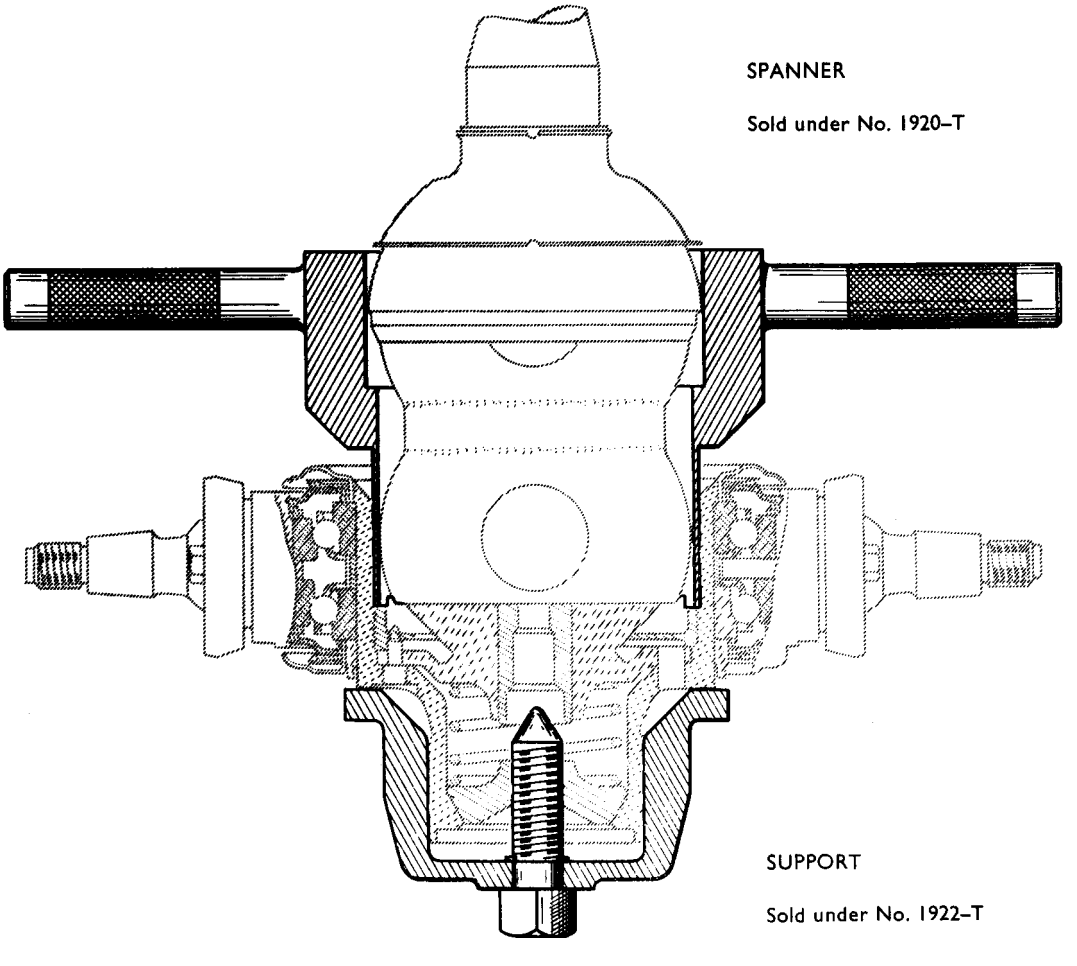


Fig. 2



SPANNER

Sold under No. 1920–T

SUPPORT

Sold under No. 1922–T

FITTING OF SEALS

Fig. 1 USE OF THE DOLLY RING

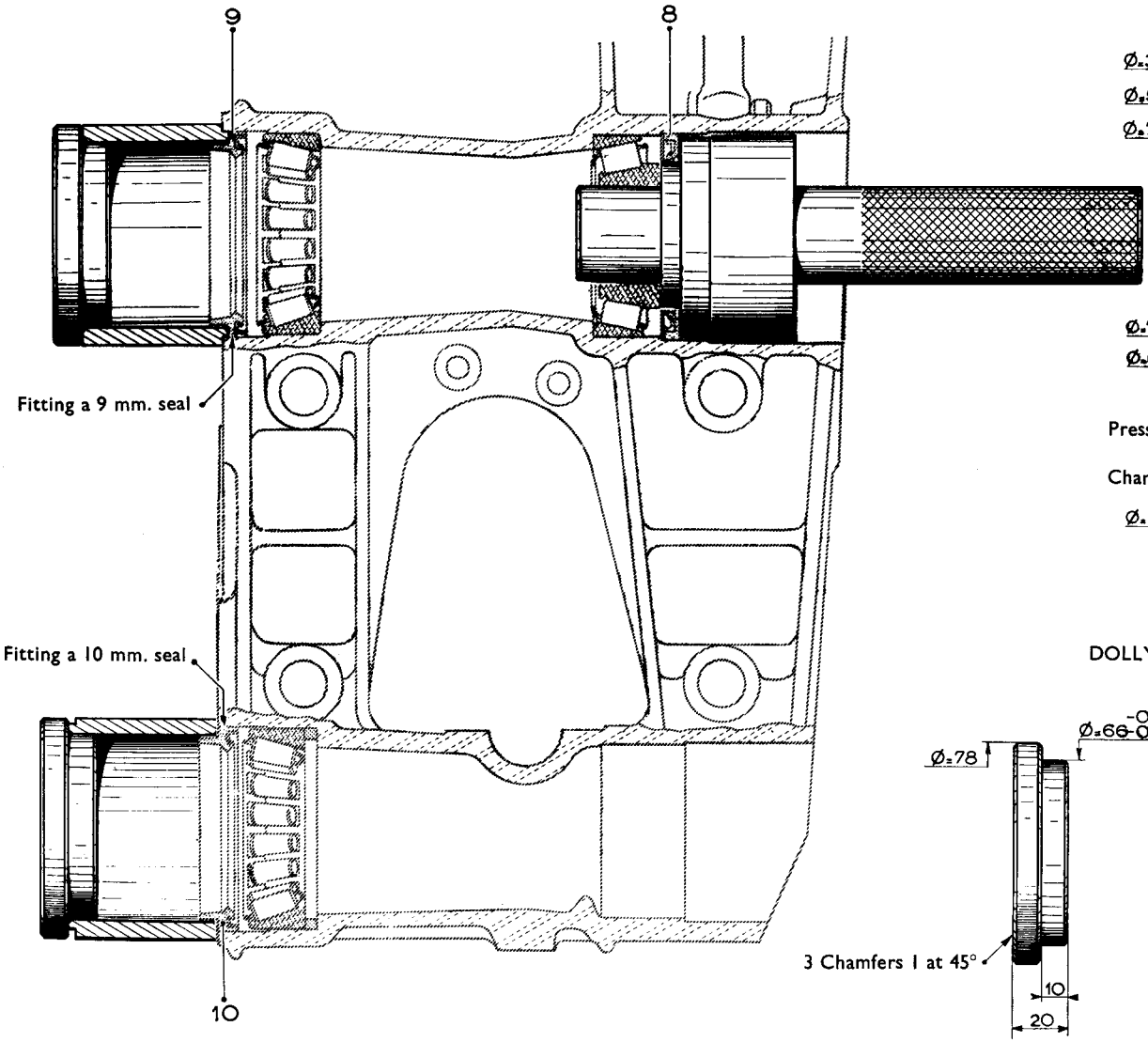
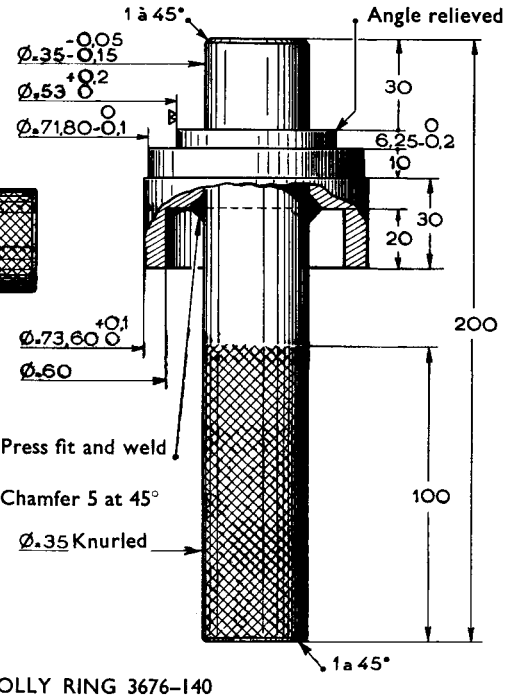


Fig. 2 USE OF THE MANDREL

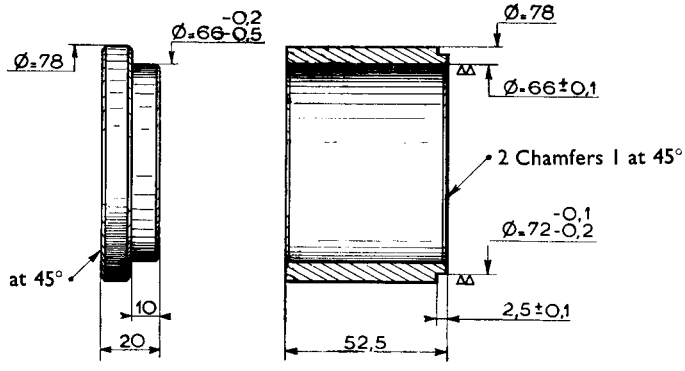
MANDREL MR3678–150

Not sold



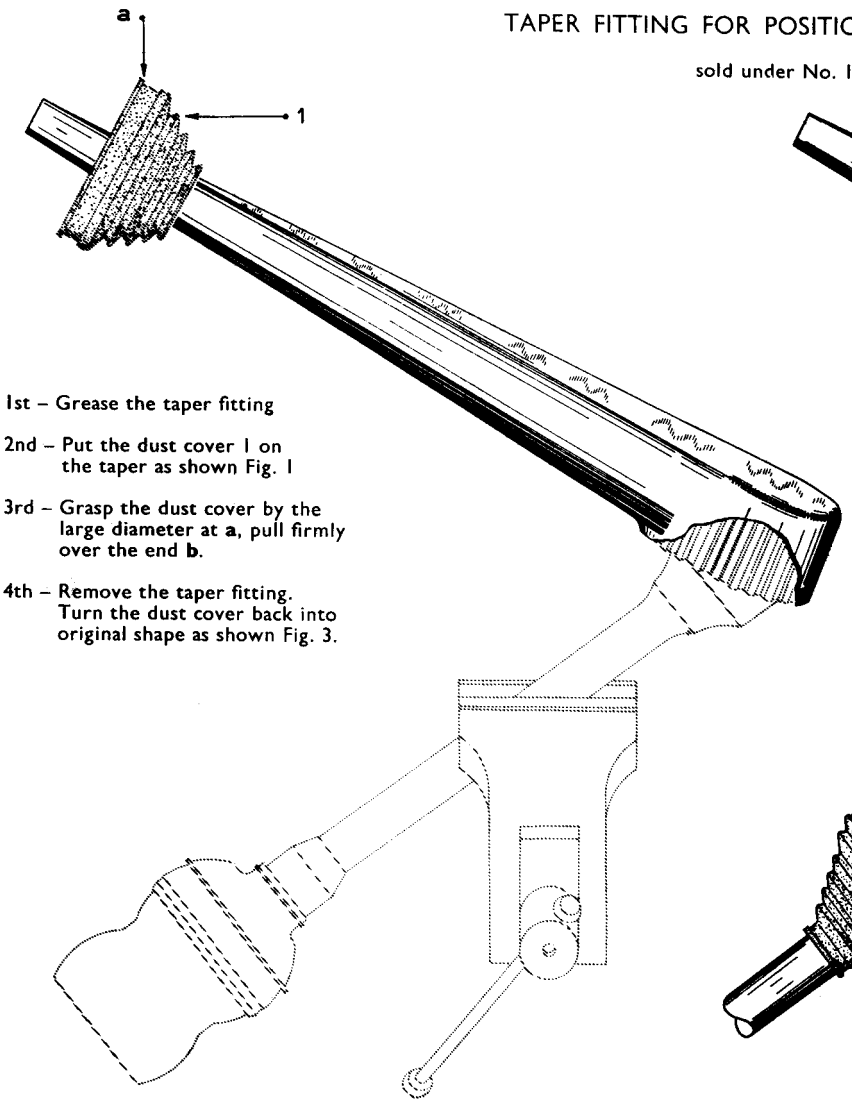
DOLLY RING 3676–140

Not sold



ASSEMBLY OF THE DRIVE SHAFT COVER

Fig. 1



1st – Grease the taper fitting

2nd – Put the dust cover 1 on the taper as shown Fig. 1

3rd – Grasp the dust cover by the large diameter at **a**, pull firmly over the end **b**.

4th – Remove the taper fitting. Turn the dust cover back into original shape as shown Fig. 3.

Fig. 2

TAPER FITTING FOR POSITIONING DUST COVER

sold under No. 1930–T

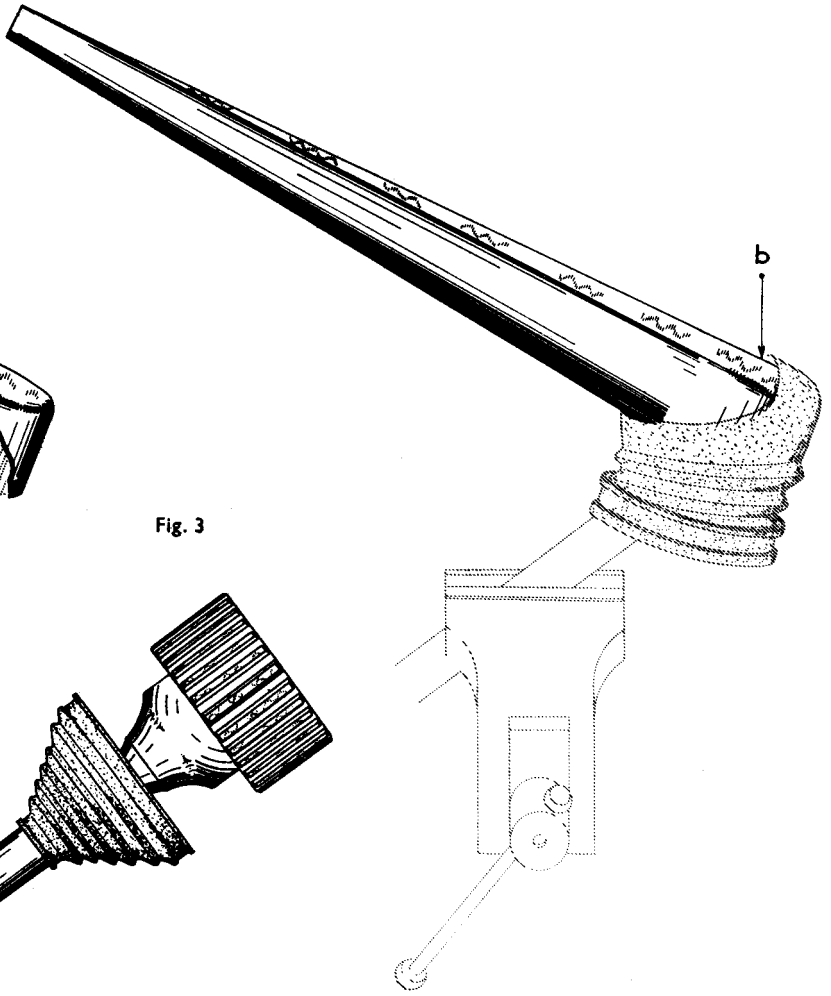
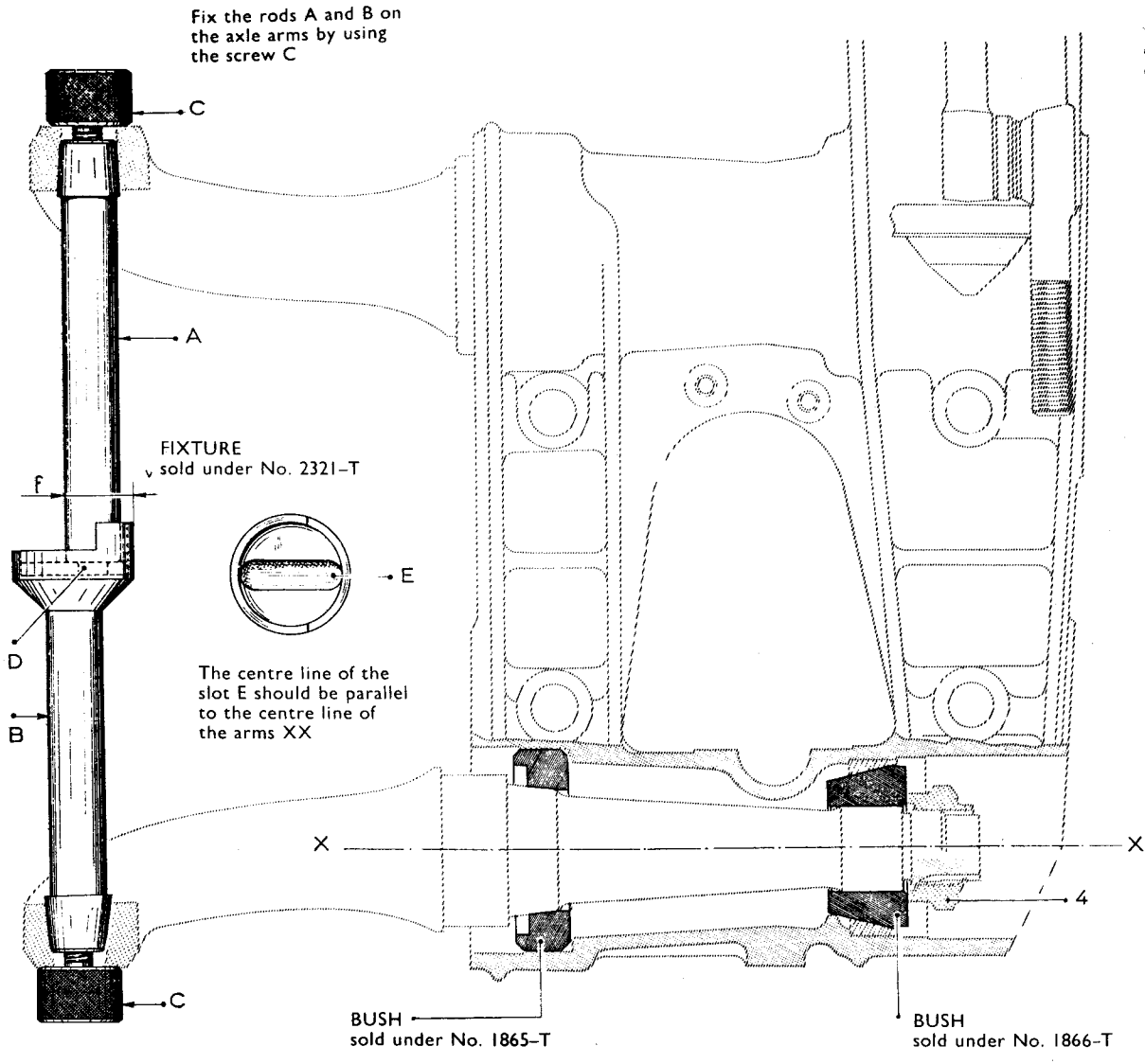


Fig. 3



ADJUSTING THE CASTOR ANGLE

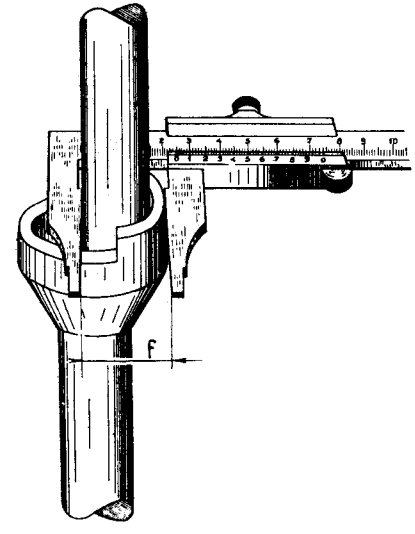
Fig. 1



Bring the rod A into contact with the cup of the rod B, the head D of the rod A engages in the slot E of the rod B

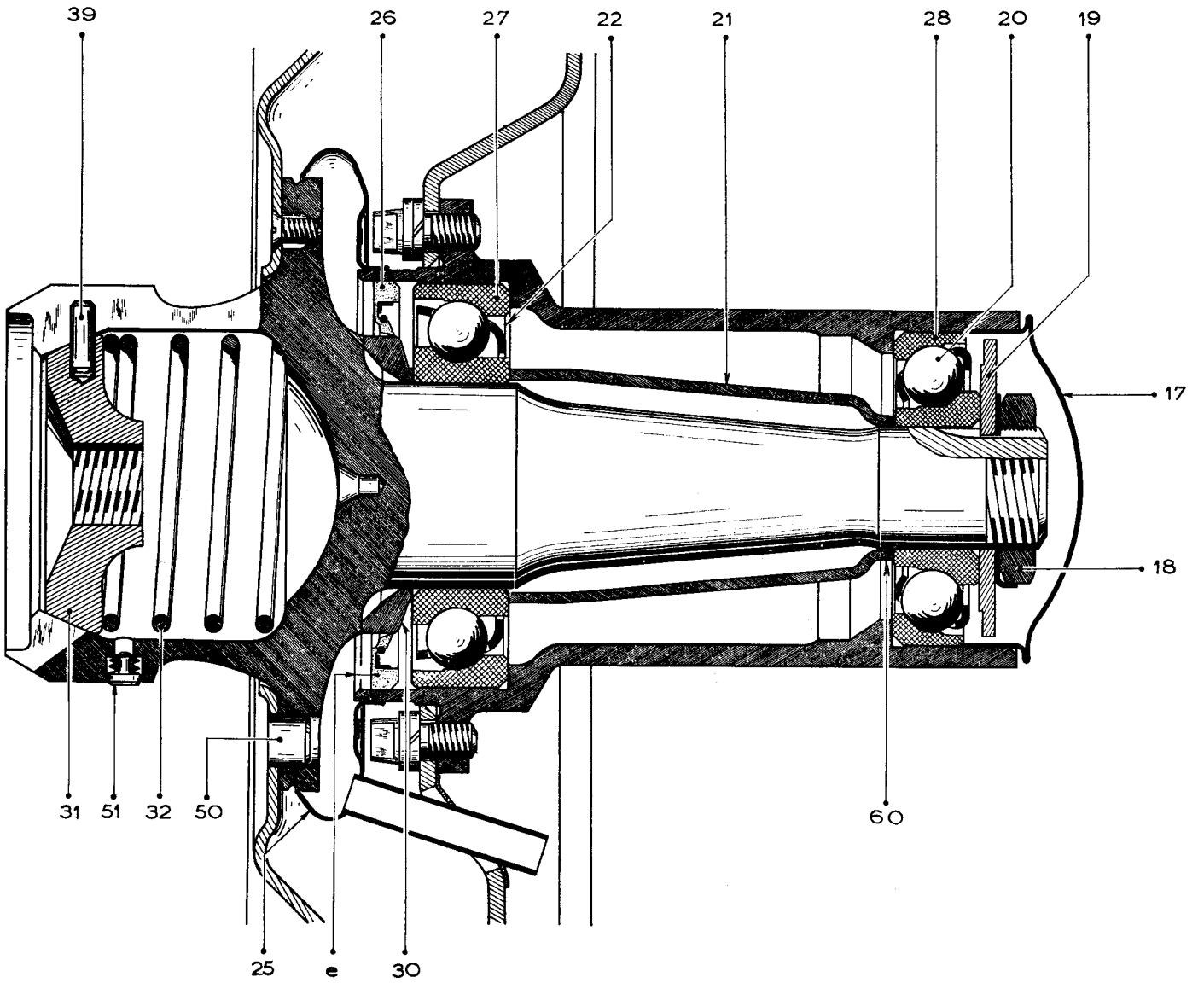
The setting is correct when the dimension F is between 24·75 and 25·25 mm.

Fig. 2

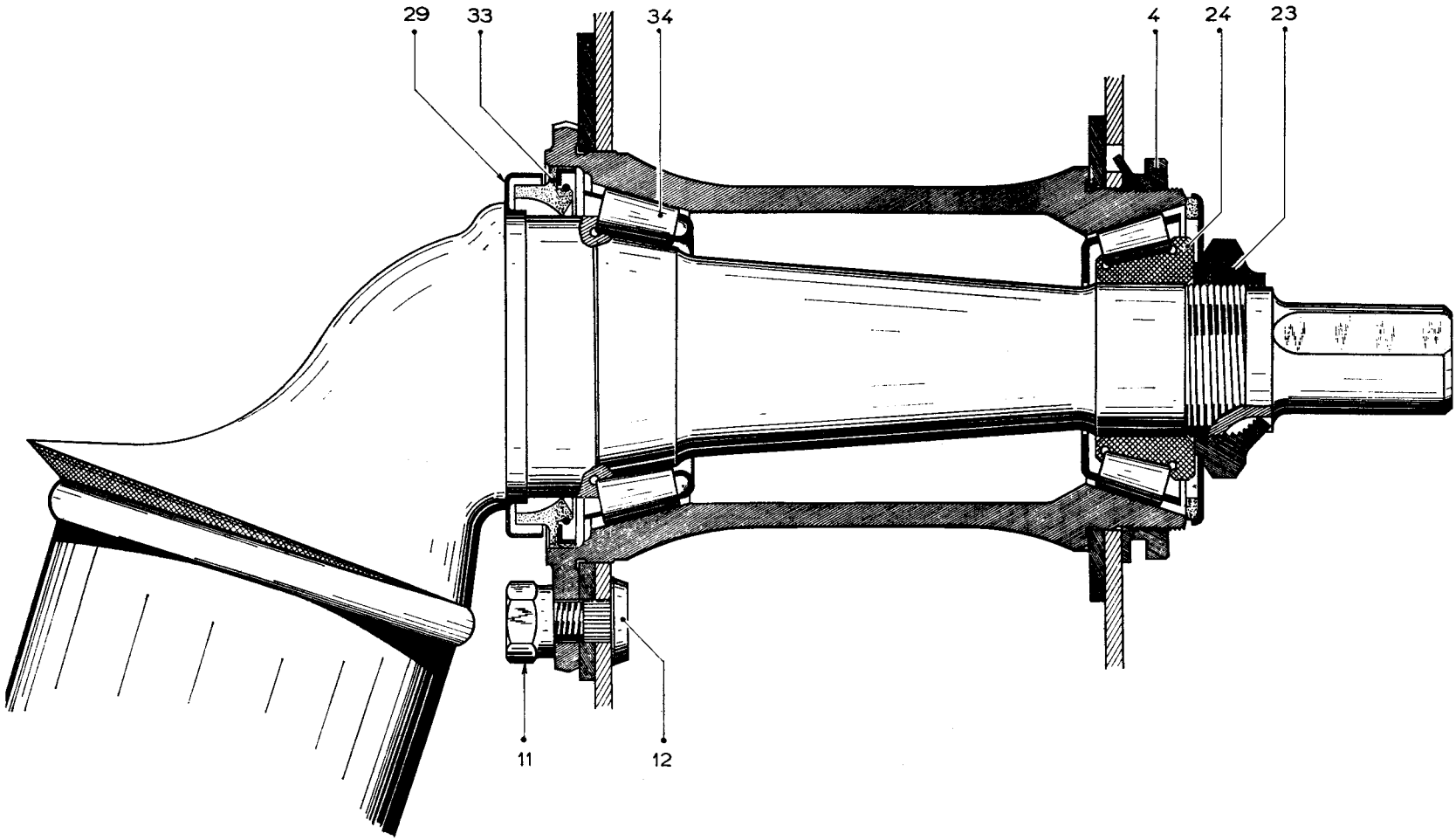


NOTE—The dimension F must be measured parallel to the centre line of the arms, to ensure this rock the caliper gauge slightly up and down. The dimension F is the smallest reading on the vernier

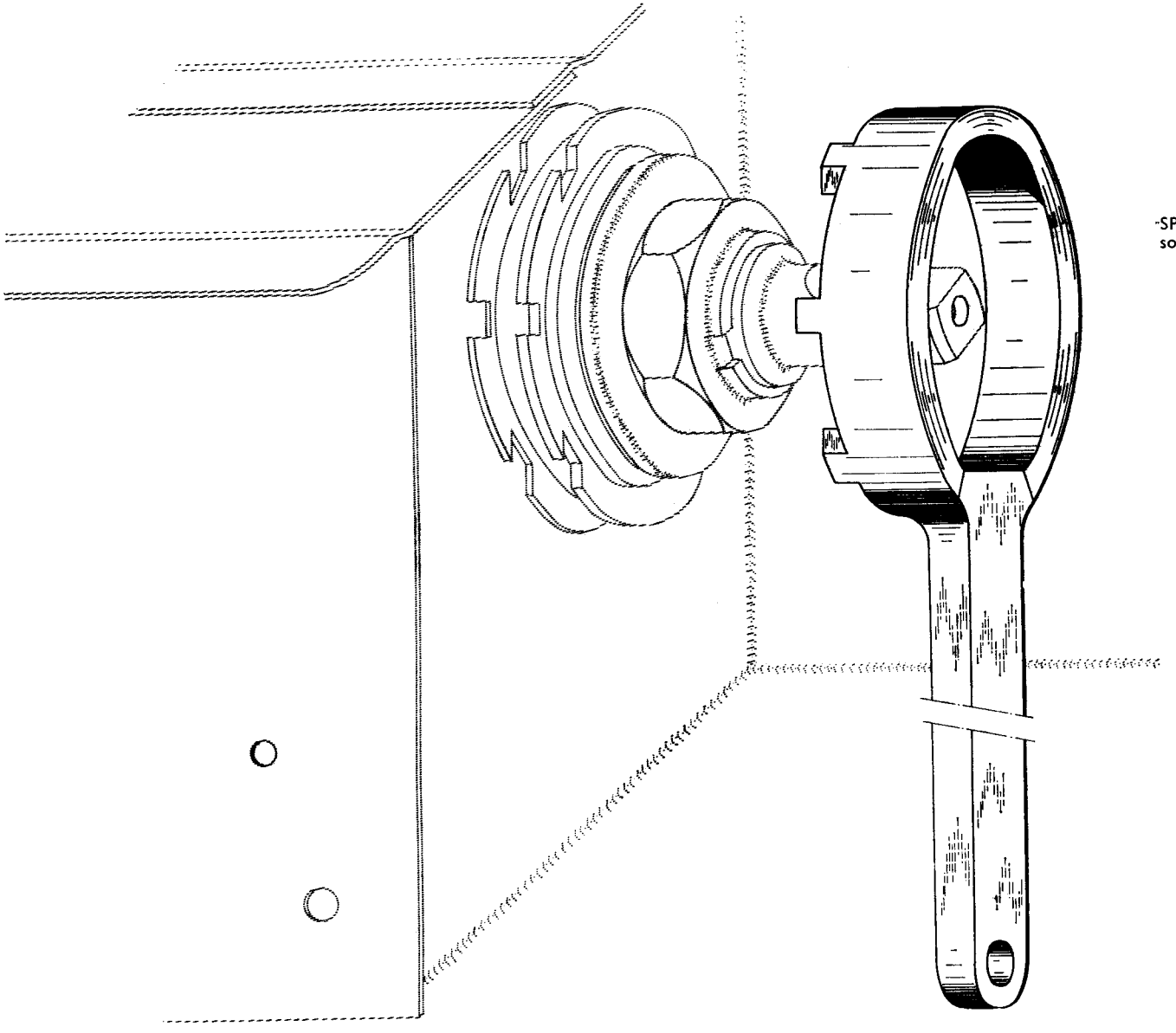
HUB-DRUM ASSEMBLY



ARTICULATING BEARING



LOCKING THE ARTICULATING BEARING



-SPANNER
sold under No. 1757–T

HOLDING THE ARM IN A VICE

Fig. 1 METHOD

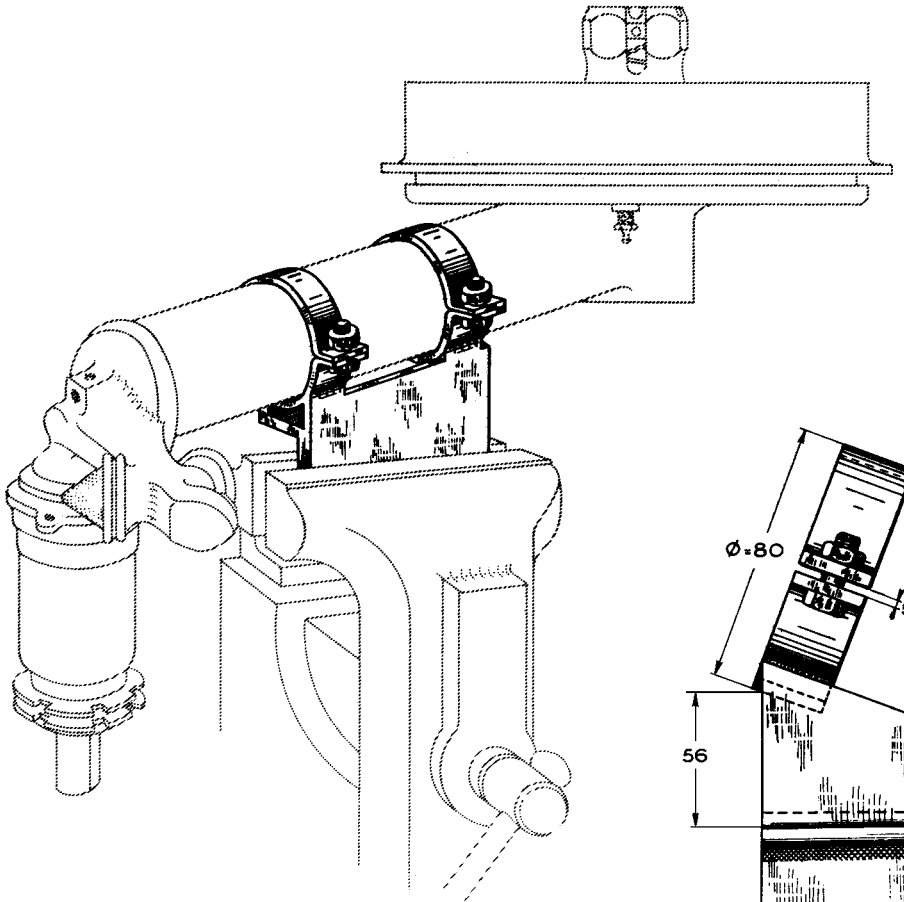
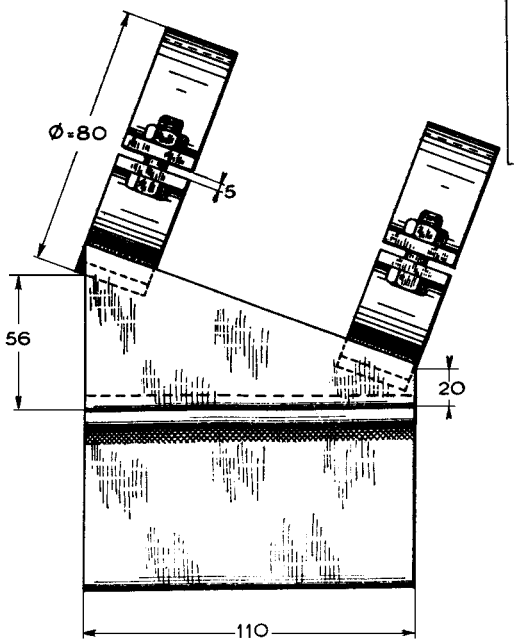
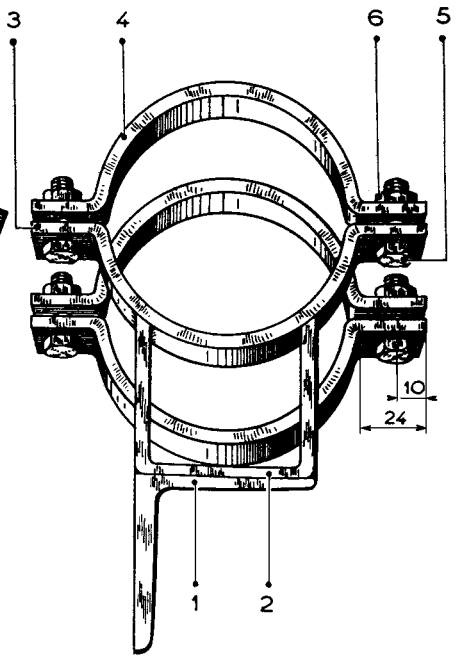


Fig 2 BRACKET MR–3053–90
not sold

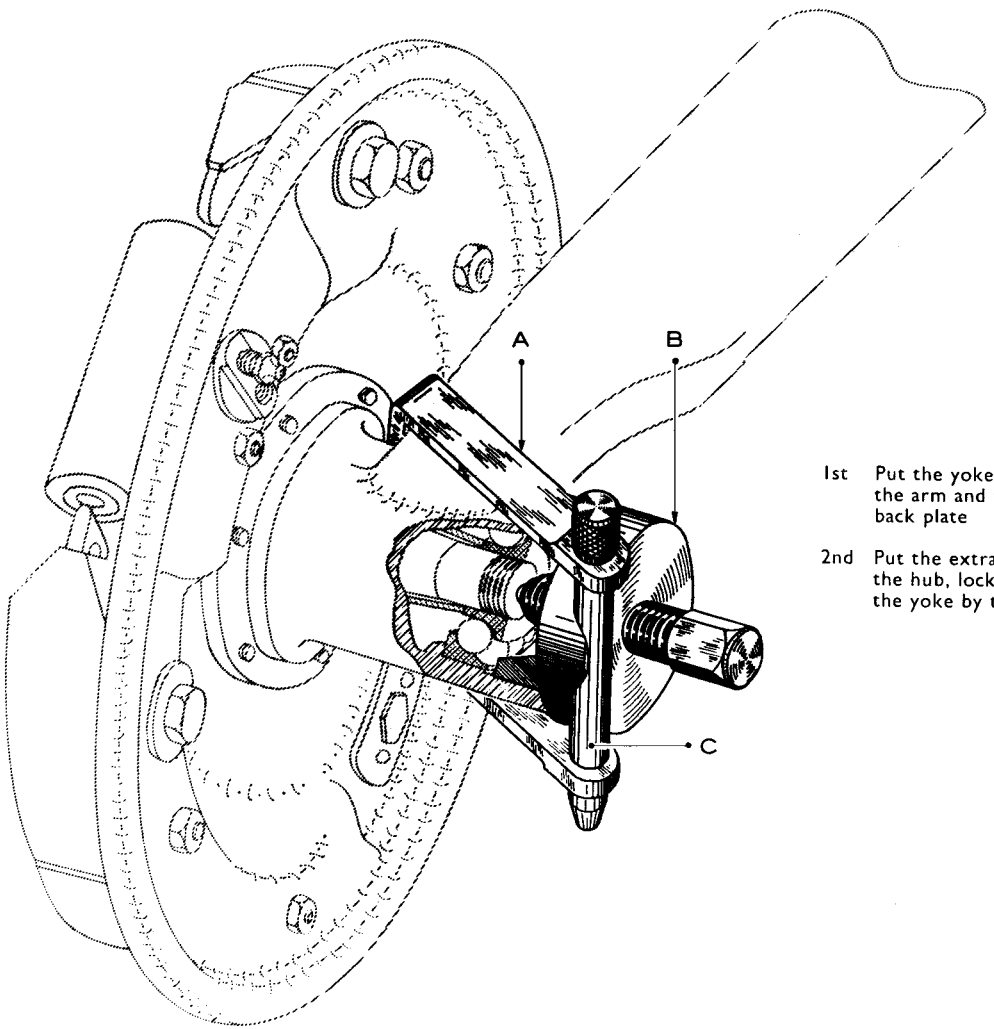
1 Angle iron 60 60 6 – 110 mm. long
2 Sheet steel 4 mm. thick, developed length 170 mm.
3 Split collars 4 mm. thick, 25 mm. wide, developed length 180 mm
4 Split collars 4 mm. thick 25 mm. wide developed length 180 mm.
5 Bolts, Hex. 10 mm. 1·5 30 mm. long
6 Nuts Hex. 10 mm. 1·5





EXTRACTION OF THE HUB—BRAKE DRUM

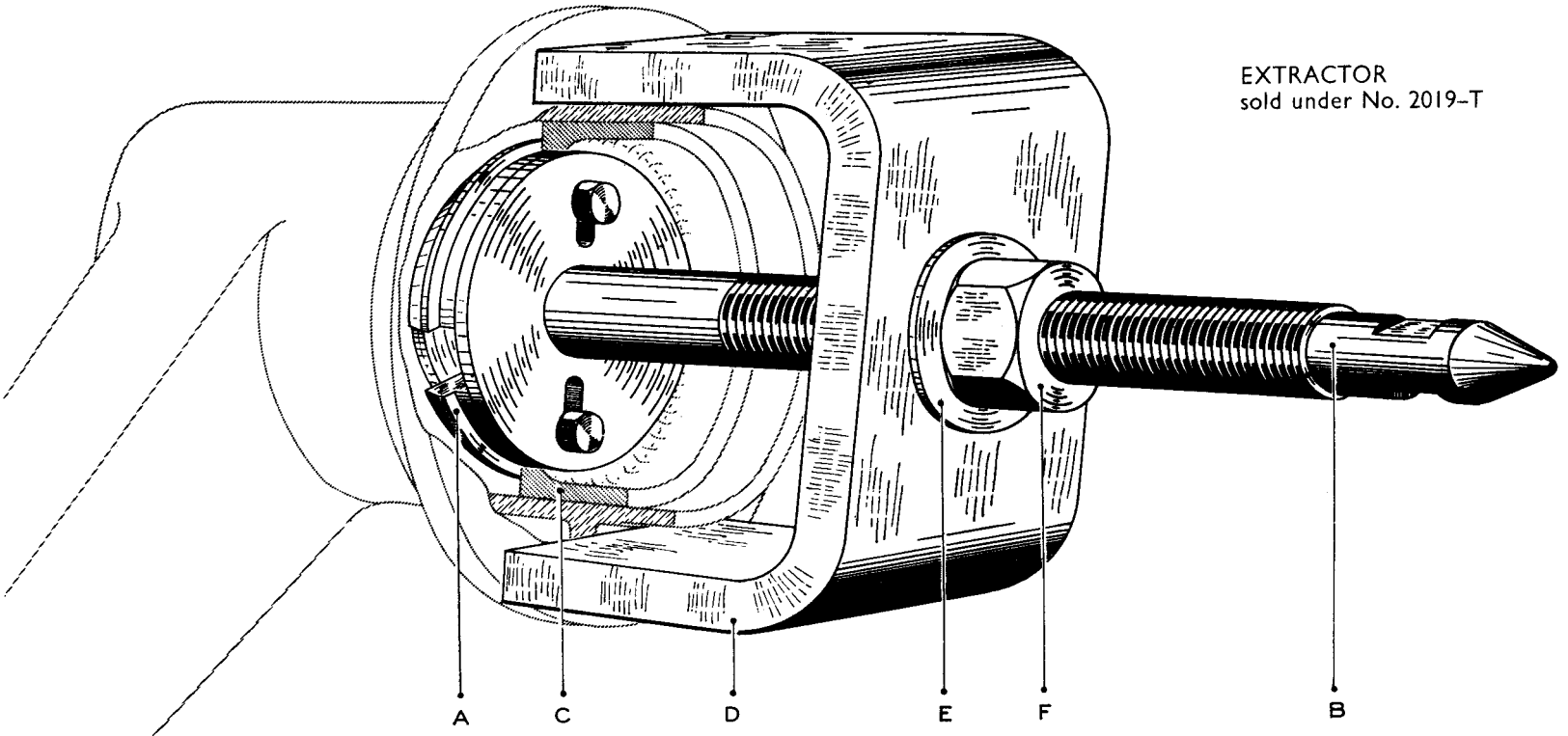
EXTRACTOR
sold under No. 2018–T



1st Put the yoke A between the arm and the brake back plate

2nd Put the extractor B on the hub, locking it to the yoke by the pin C

EXTRACTION OF THE OUTER HUB BEARINGS



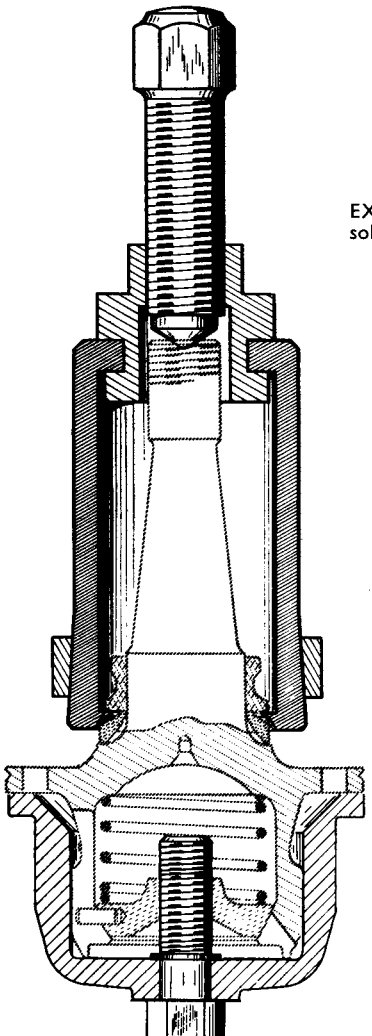
EXTRACTOR
sold under No. 2019-T

1. PLACE THE SPLIT RING A WITHOUT THE SPINDLE B BEHIND THE RING C.
2. PUT THE SPINDLE B IN THE SPLIT RING A SO AS TO SPREAD AND LOCATE IT.
3. FIT THE U PIECE D, THE WASHER E, SCREW UP THE NUT F.

NOTE:—THE SPINDLE B IS FITTED THROUGH THE INSIDE OF THE HUB.

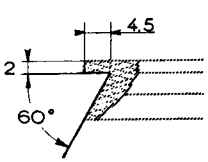
EXTRACTION OF THE INNER RING OF THE OUTER HUB BEARING

Fig. 1 2nd ASSEMBLY



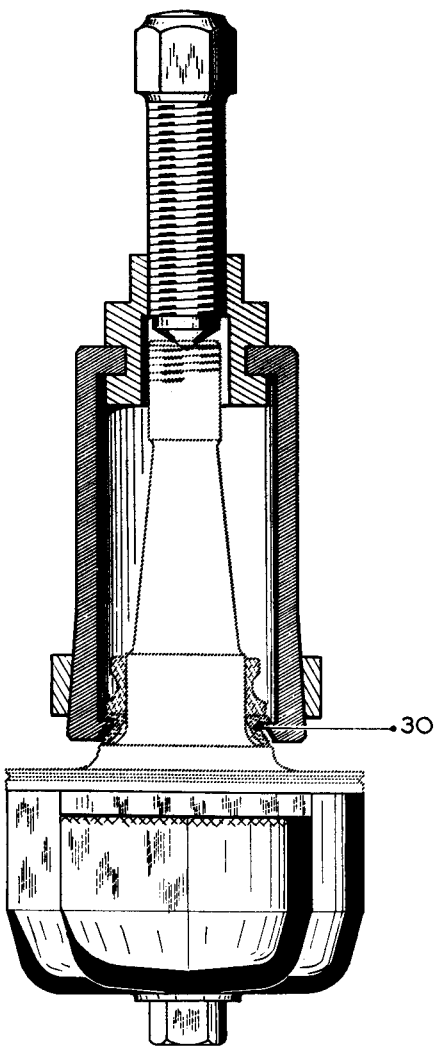
EXTRACTOR
sold under No. 2020–T

In order to fit the extractor collet, cut a 60° groove on the bearing thrust 30 as indicated



SUPPORT
sold under No. 1922–T

Fig. 2 1st ASSEMBLY



ADJUSTMENT OF THE BEARING CLEARANCES

Fig. 1 SETTING THE DIAL GAUGE

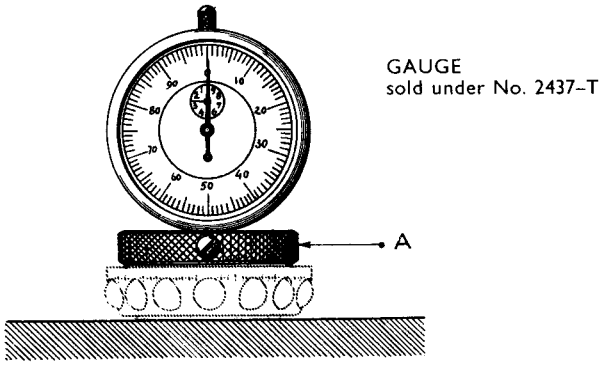


Fig. 3 FITTING THE BEARING OUTER RACES

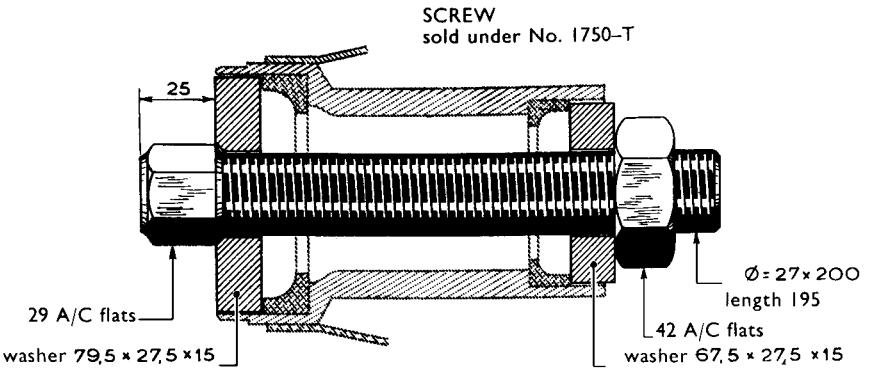
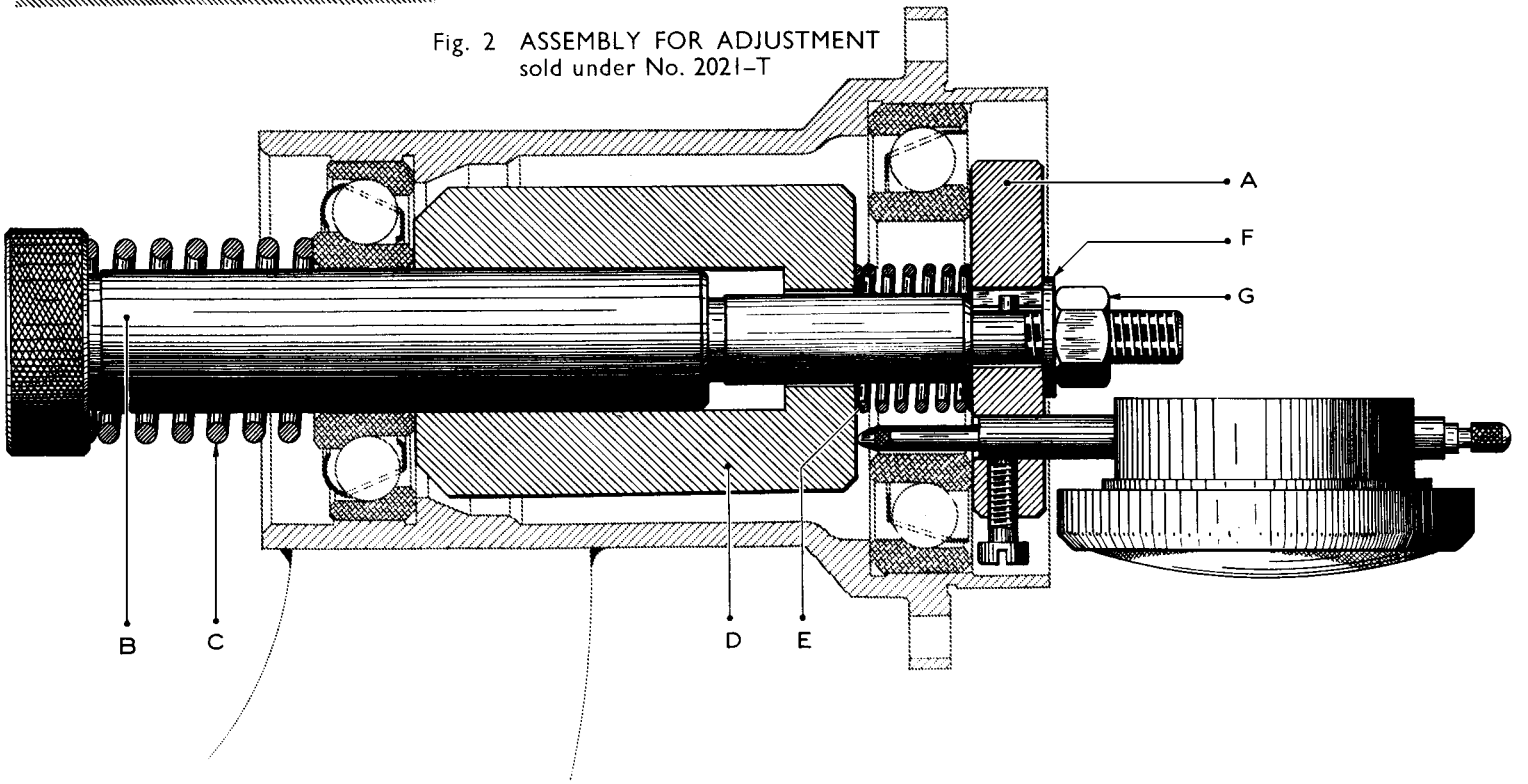
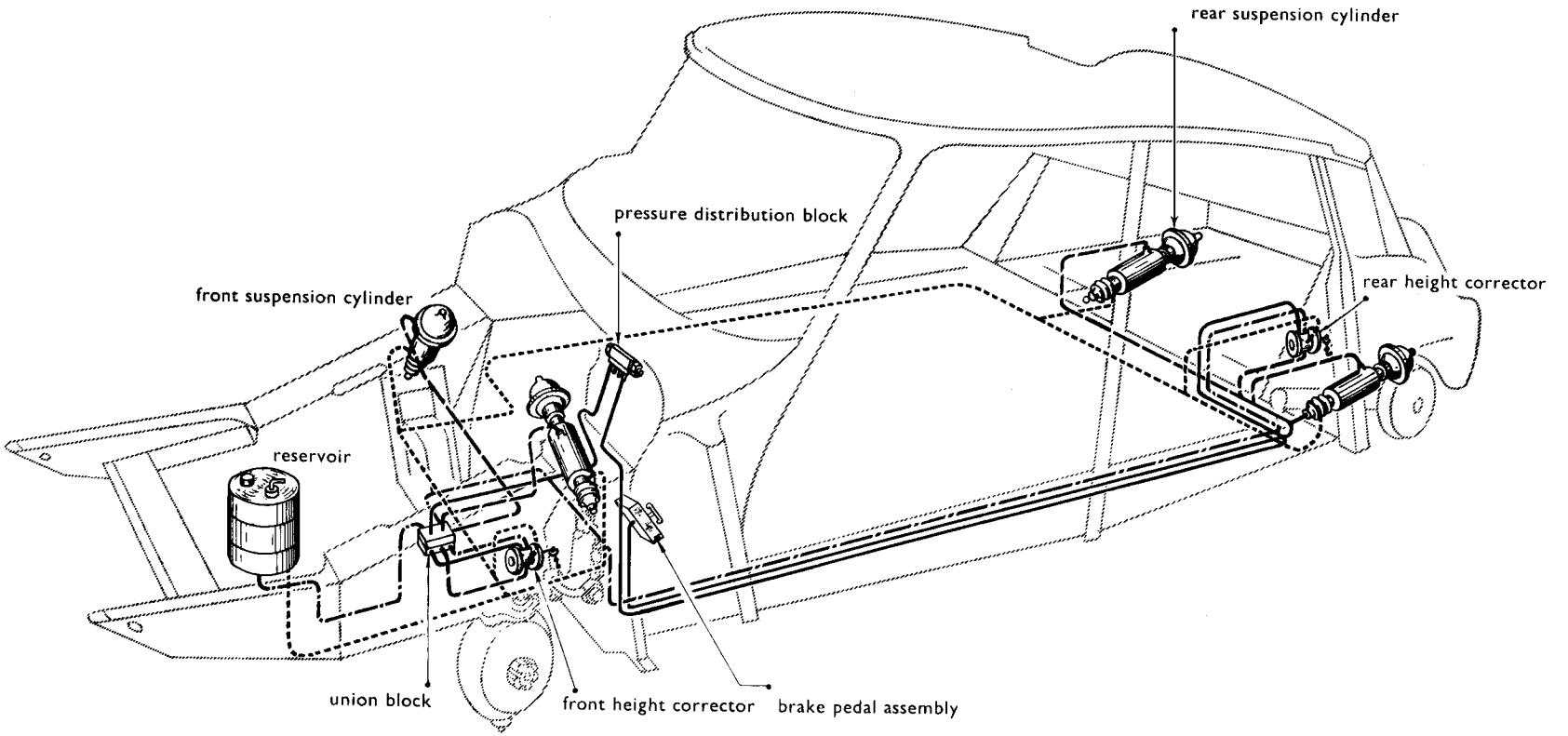


Fig. 2 ASSEMBLY FOR ADJUSTMENT
sold under No. 2021-T



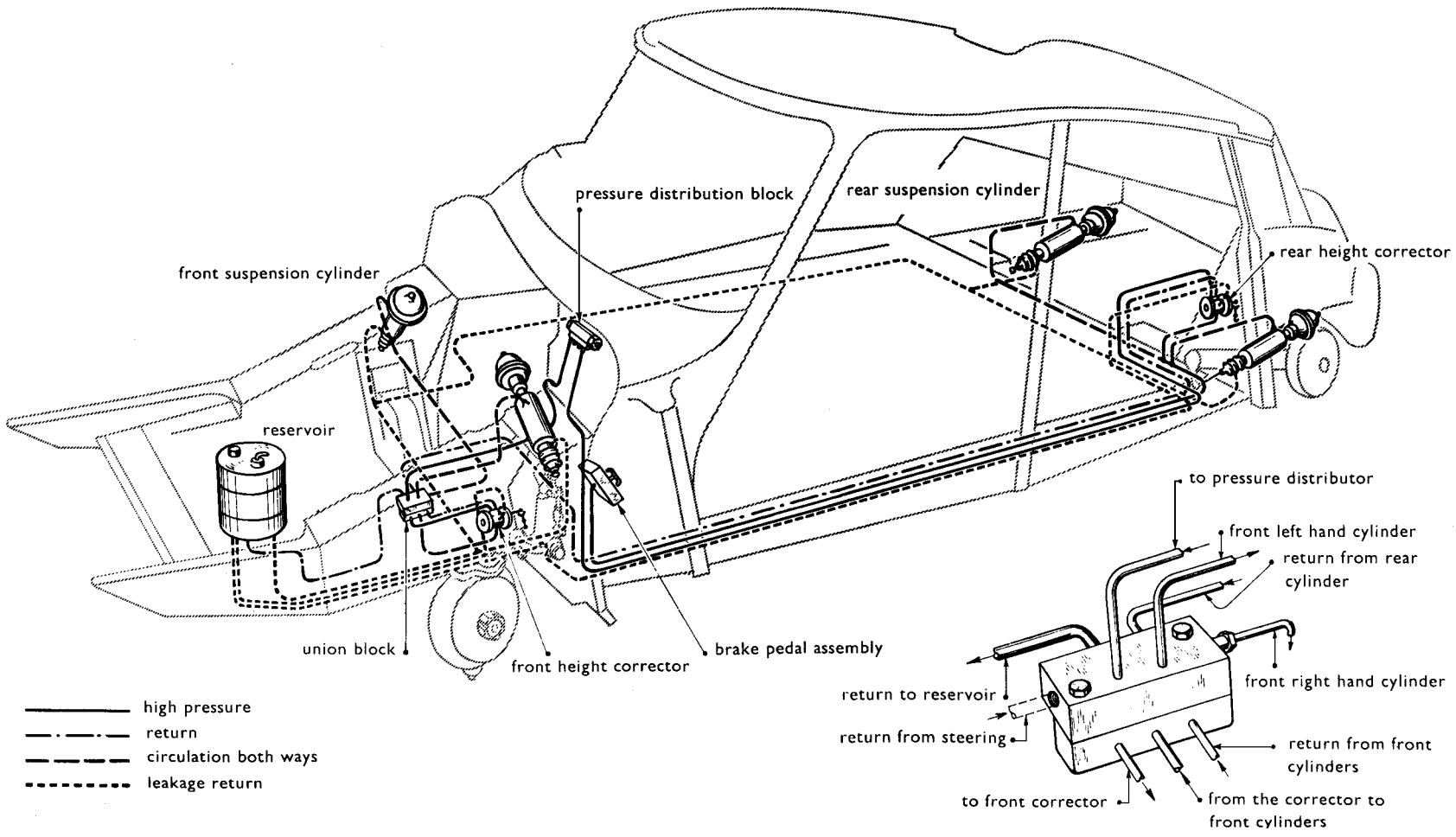
HYDRAULIC SUSPENSION CIRCUIT

VEHICLES SOLD BEFORE JANUARY 1957



HYDRAULIC SUSPENSION CIRCUIT

VEHICLES SOLD SINCE JANUARY 1957



FRONT AXLE SUSPENSION

Fig. 1

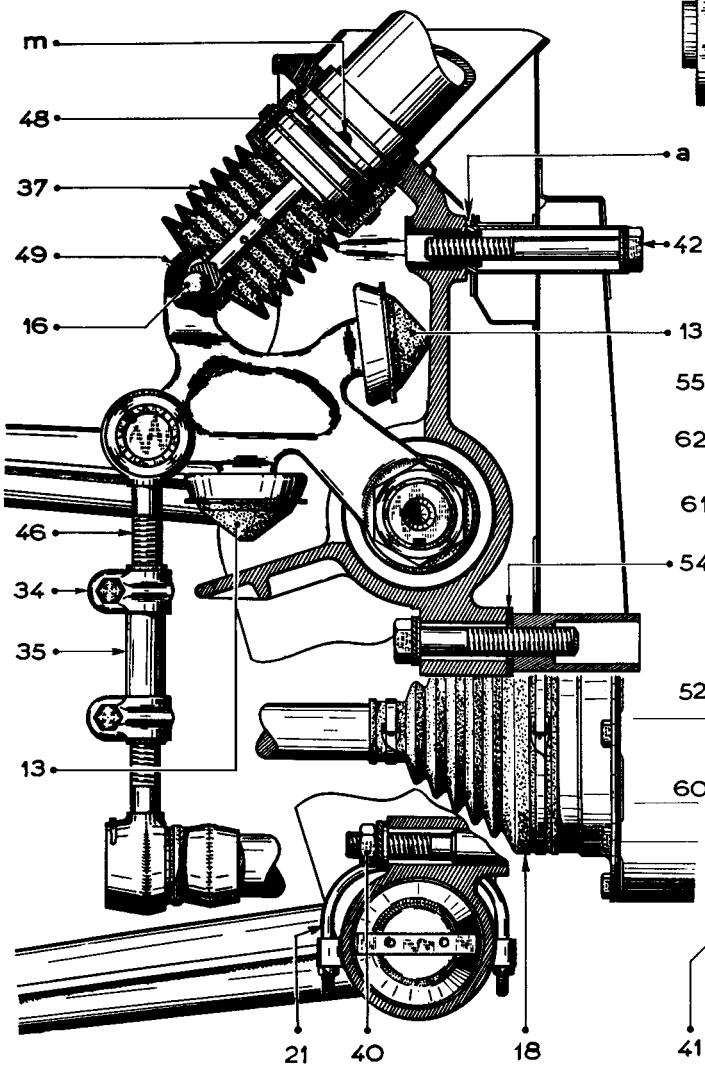


Fig. 5

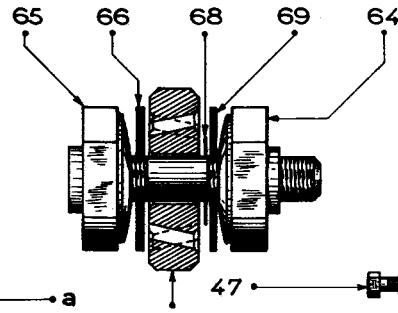


Fig. 2

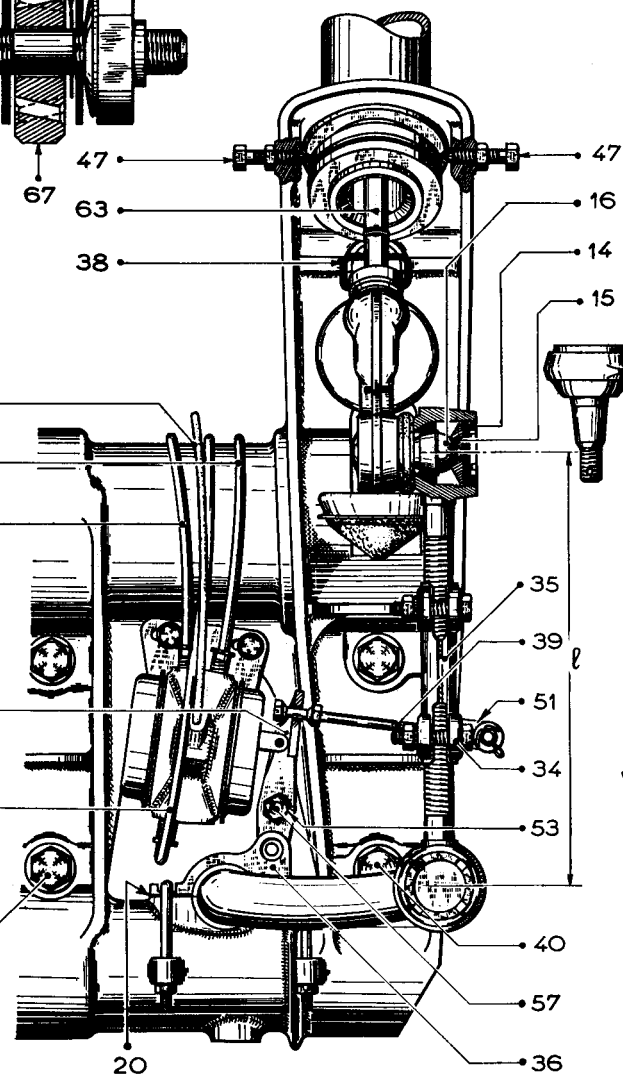


Fig. 3

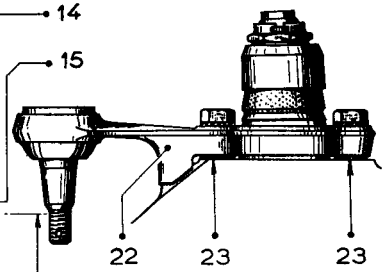


Fig. 4

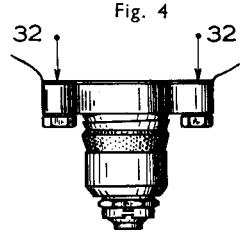
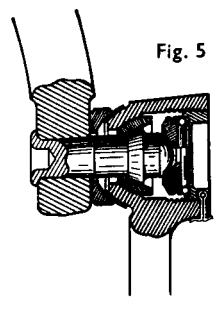


Fig. 5



ANTI-ROLL BAR AND HEIGHT CORRECTOR CONTROL

Fig. 1

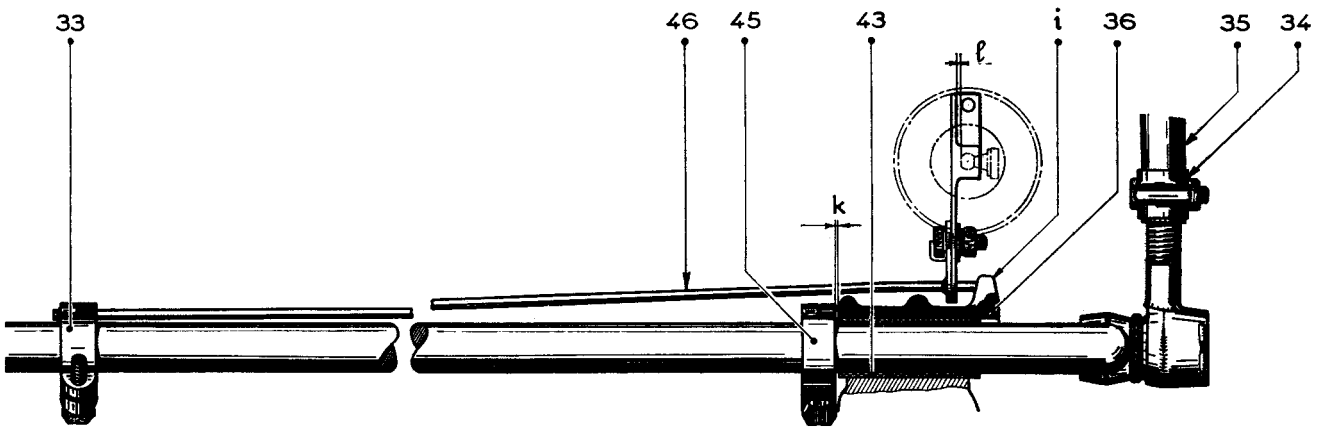


Fig. 2

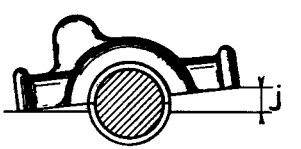


Fig. 3

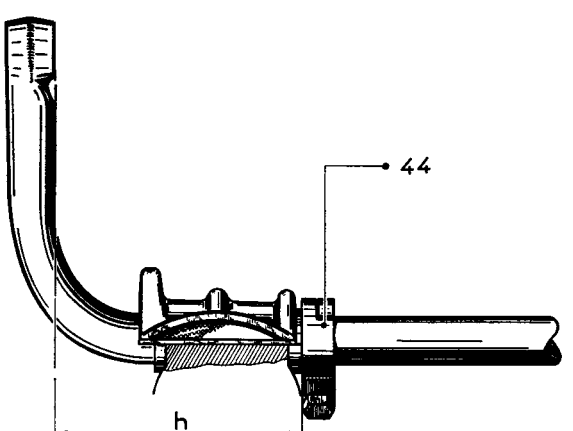


Fig. 4

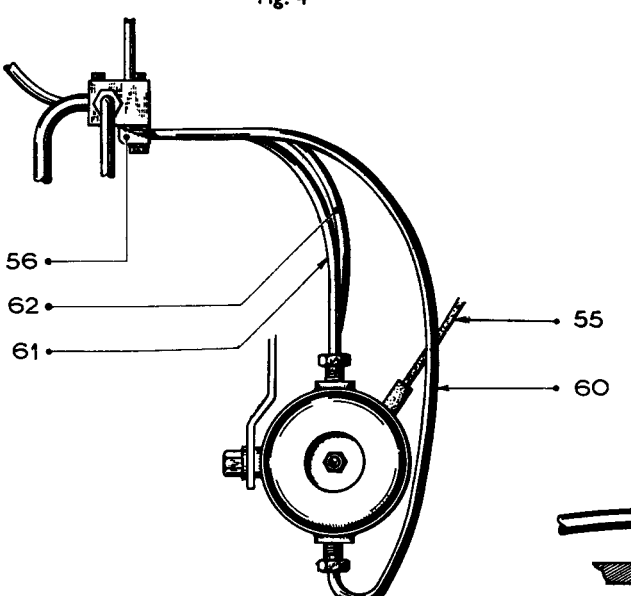
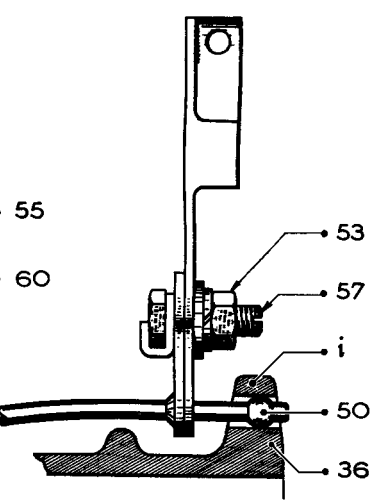


Fig. 5



ARRANGEMENT OF ANTI-ROLL BAR SPRINGS

Fig. 1

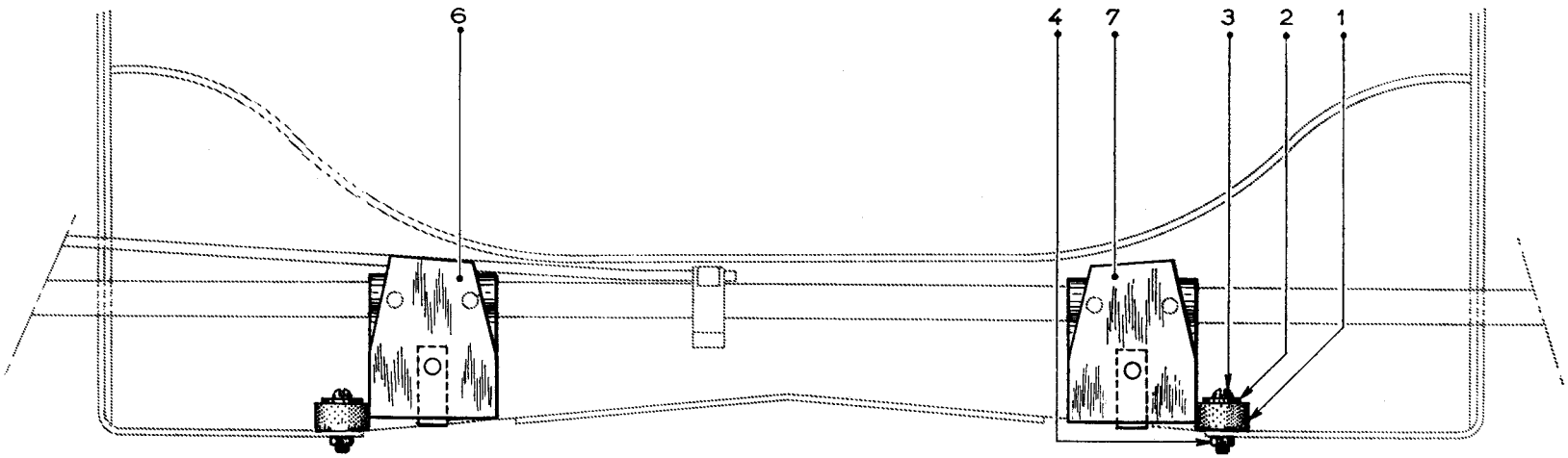
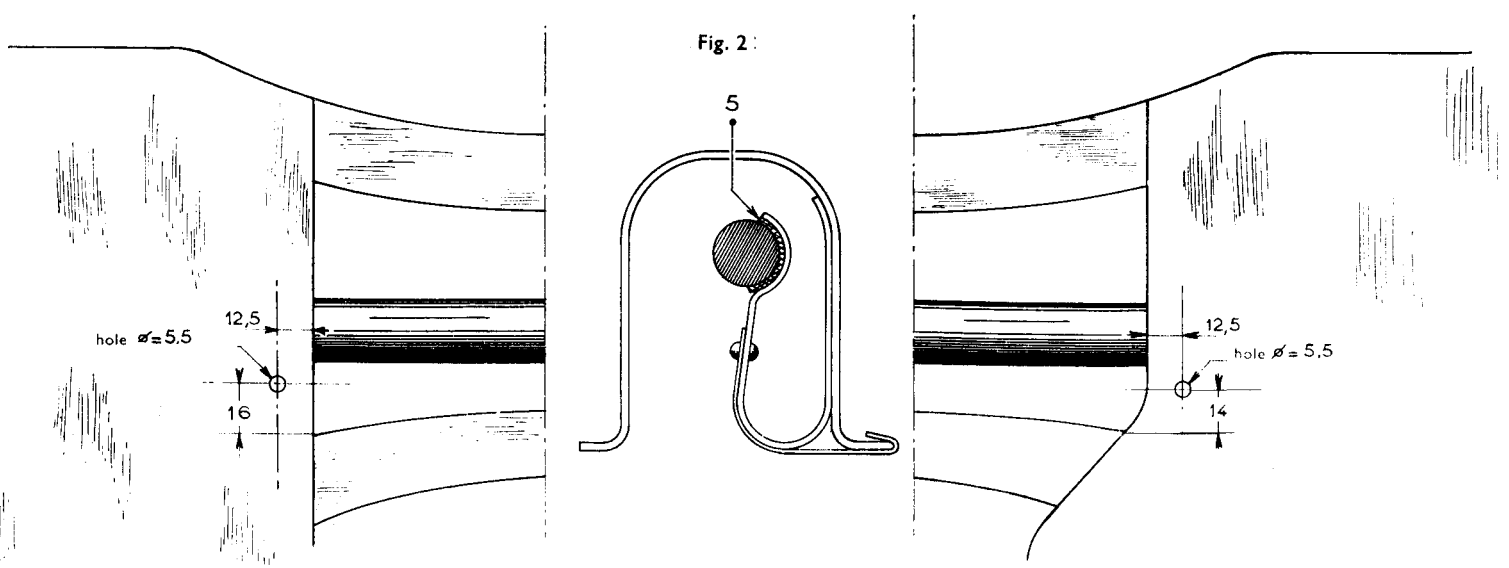


Fig. 2



REAR AXLE ASSEMBLY

Fig. 1

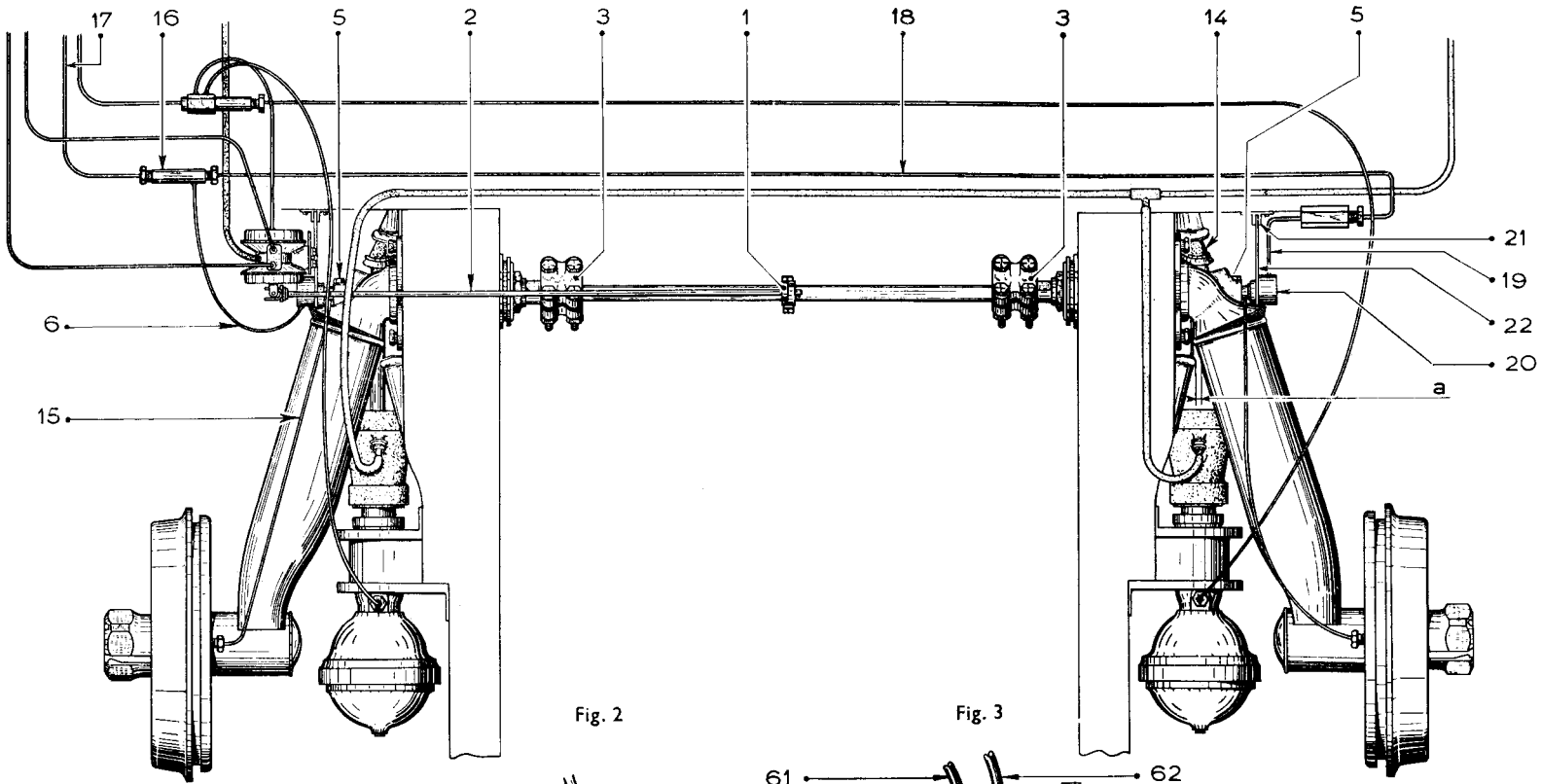


Fig. 2

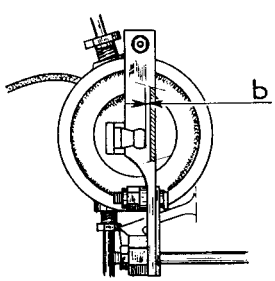
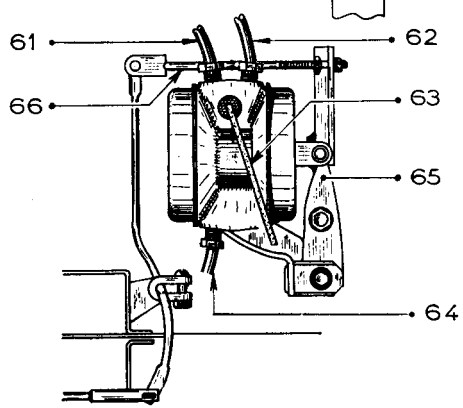


Fig. 3



REAR SUSPENSION CYLINDER

Fig. 2

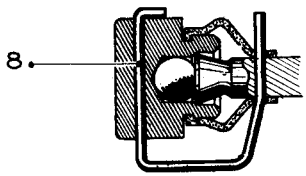


Fig. 3

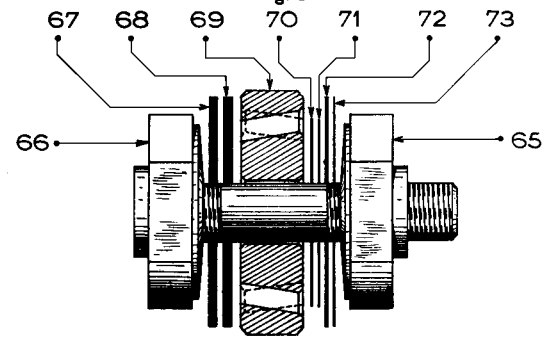


Fig. 1

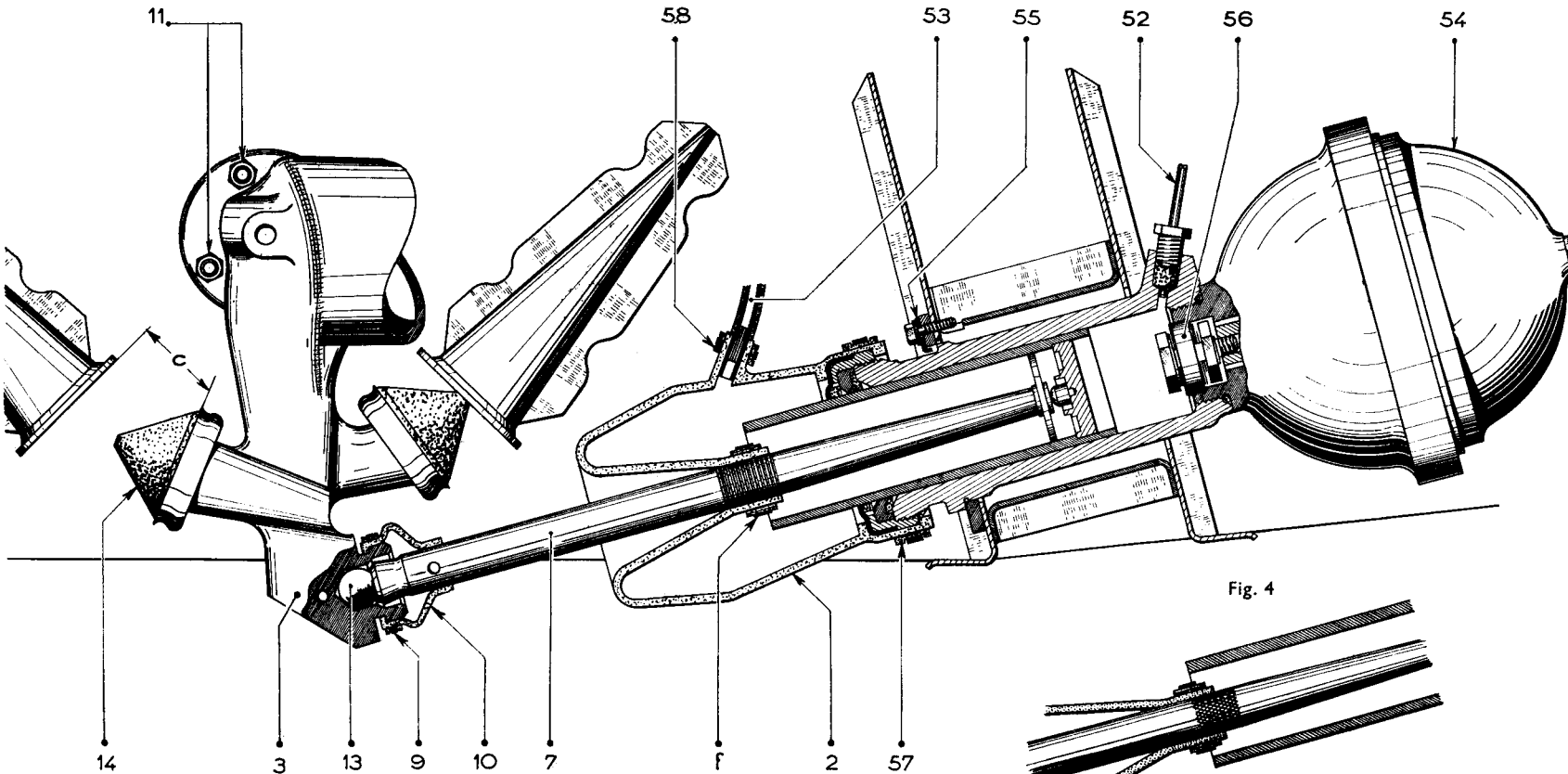
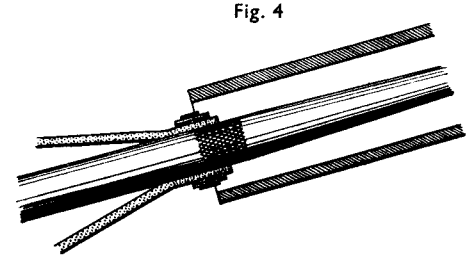


Fig. 4



HEIGHT CORRECTOR—SUSPENSION CYLINDER

Fig. 1

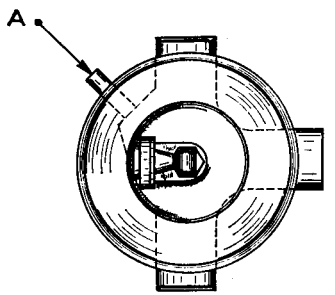


Fig. 2

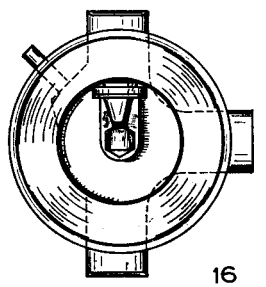


Fig. 3

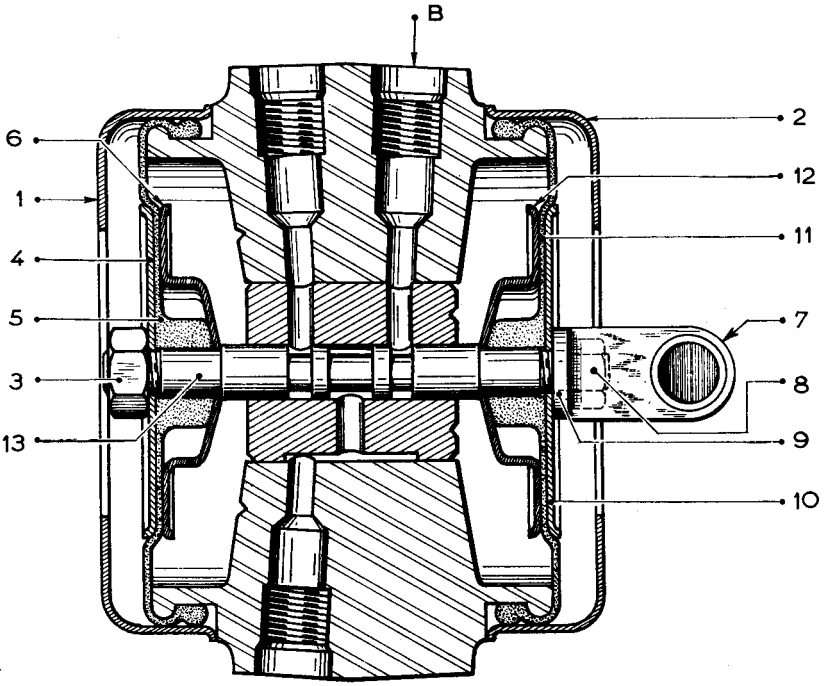
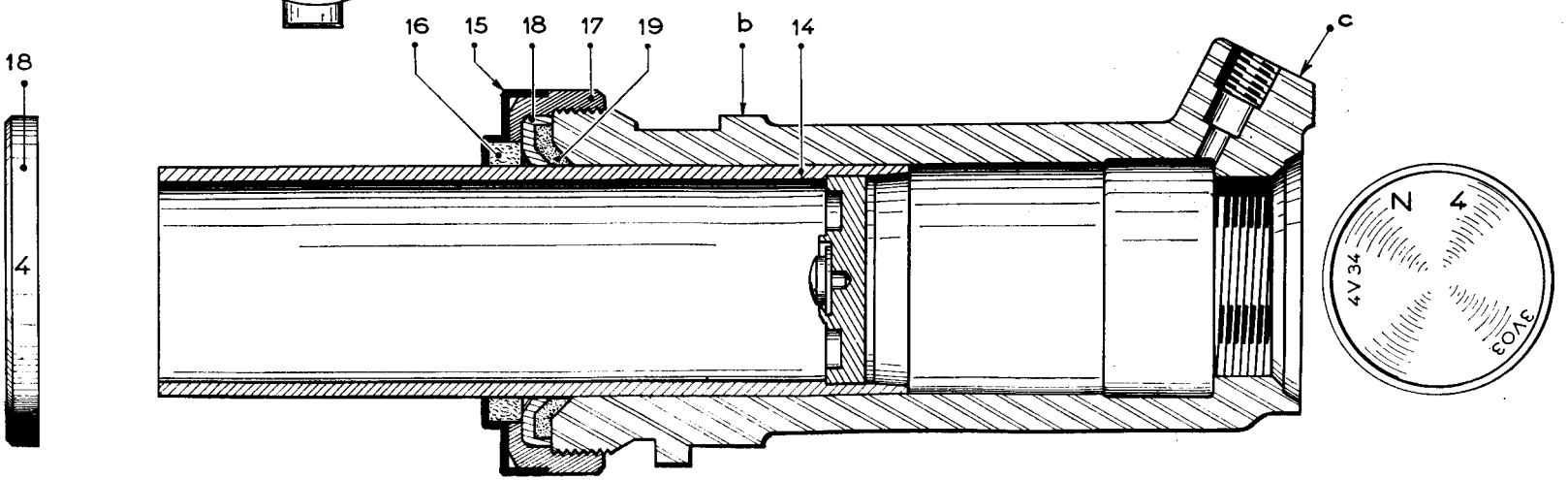


Fig. 4



VARIOUS TOOLS

Fig. 1 ASSEMBLING THE STEEL CUPS

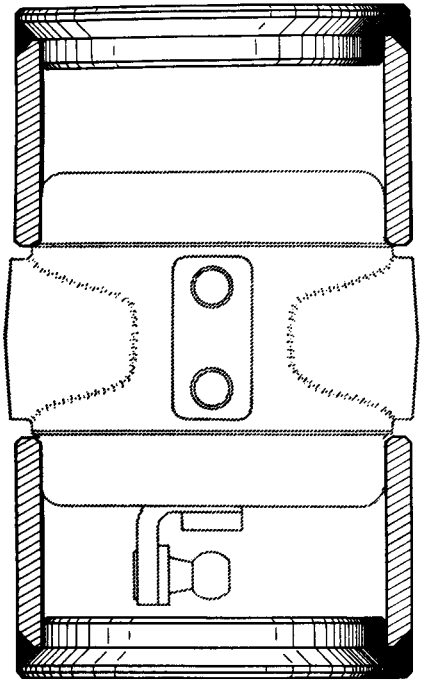


Fig. 2 MANDREL MR 3045-80
not sold

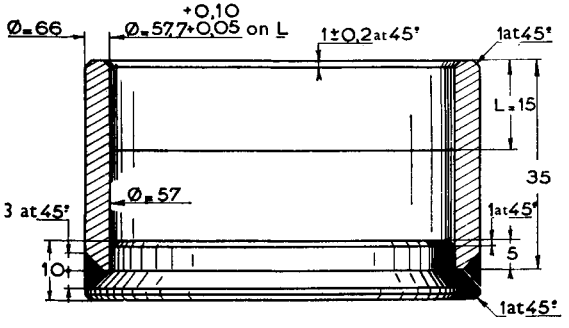


Fig. 3 HOLDING THE CYLINDER IN A VICE

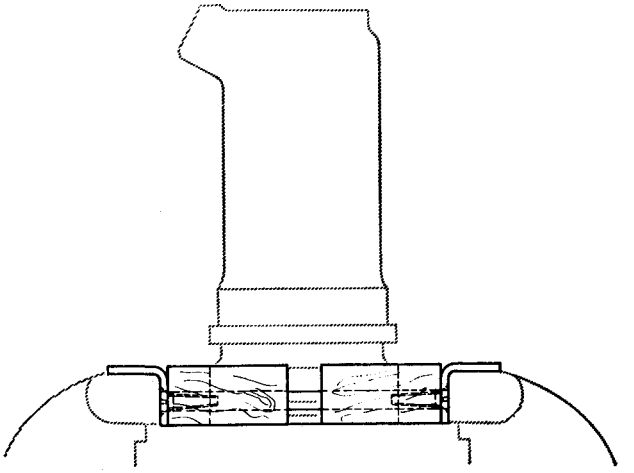
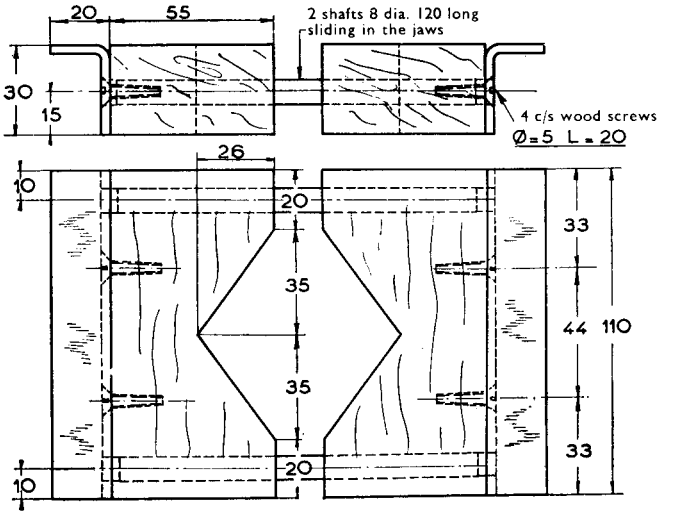
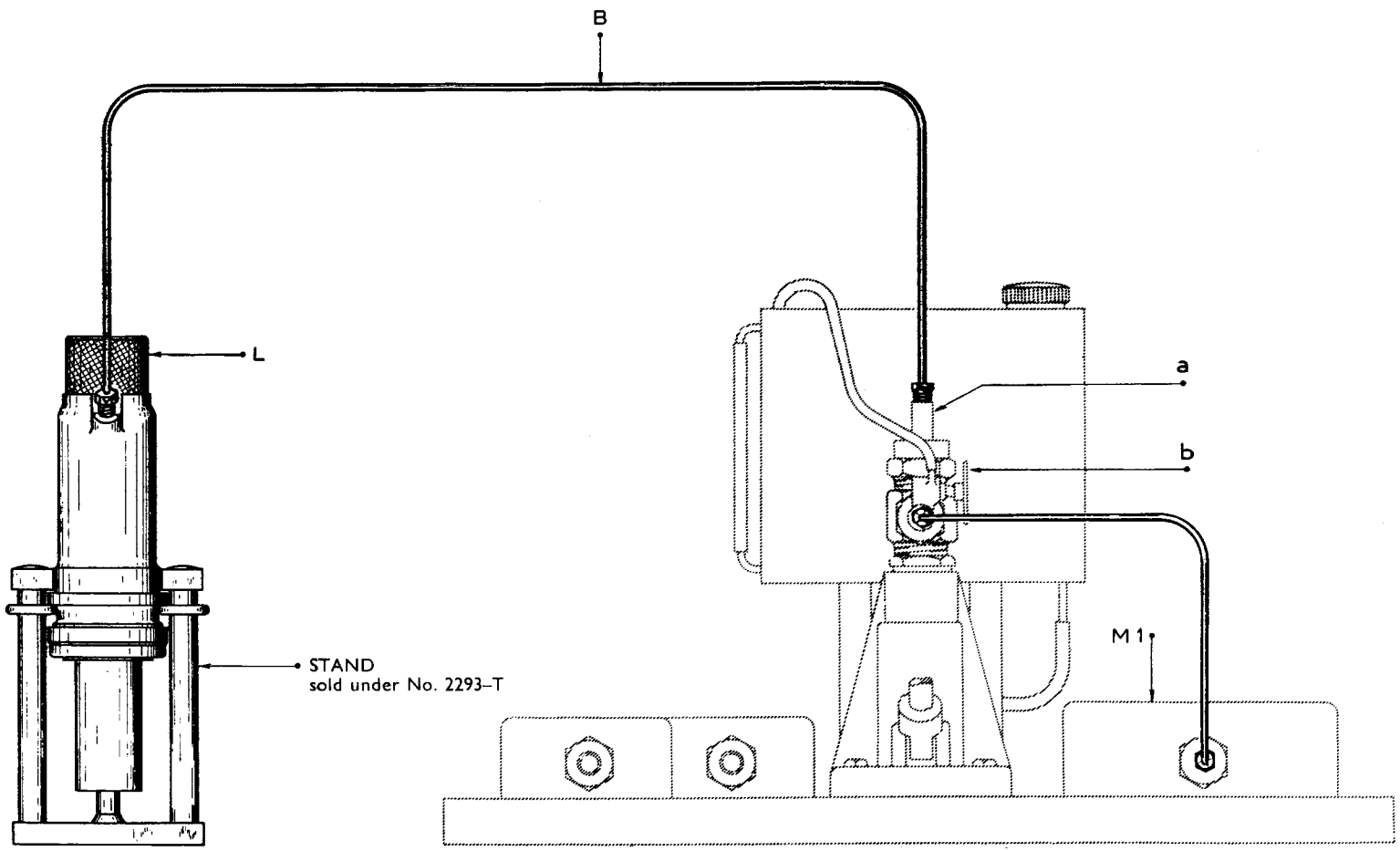


Fig. 4 WOODEN JAWS MR 3407-30
not sold



SUSPENSION CYLINDER

CHECKING FOR LEAKAGE



HEIGHT VARIATION CONTROL

Fig. 1

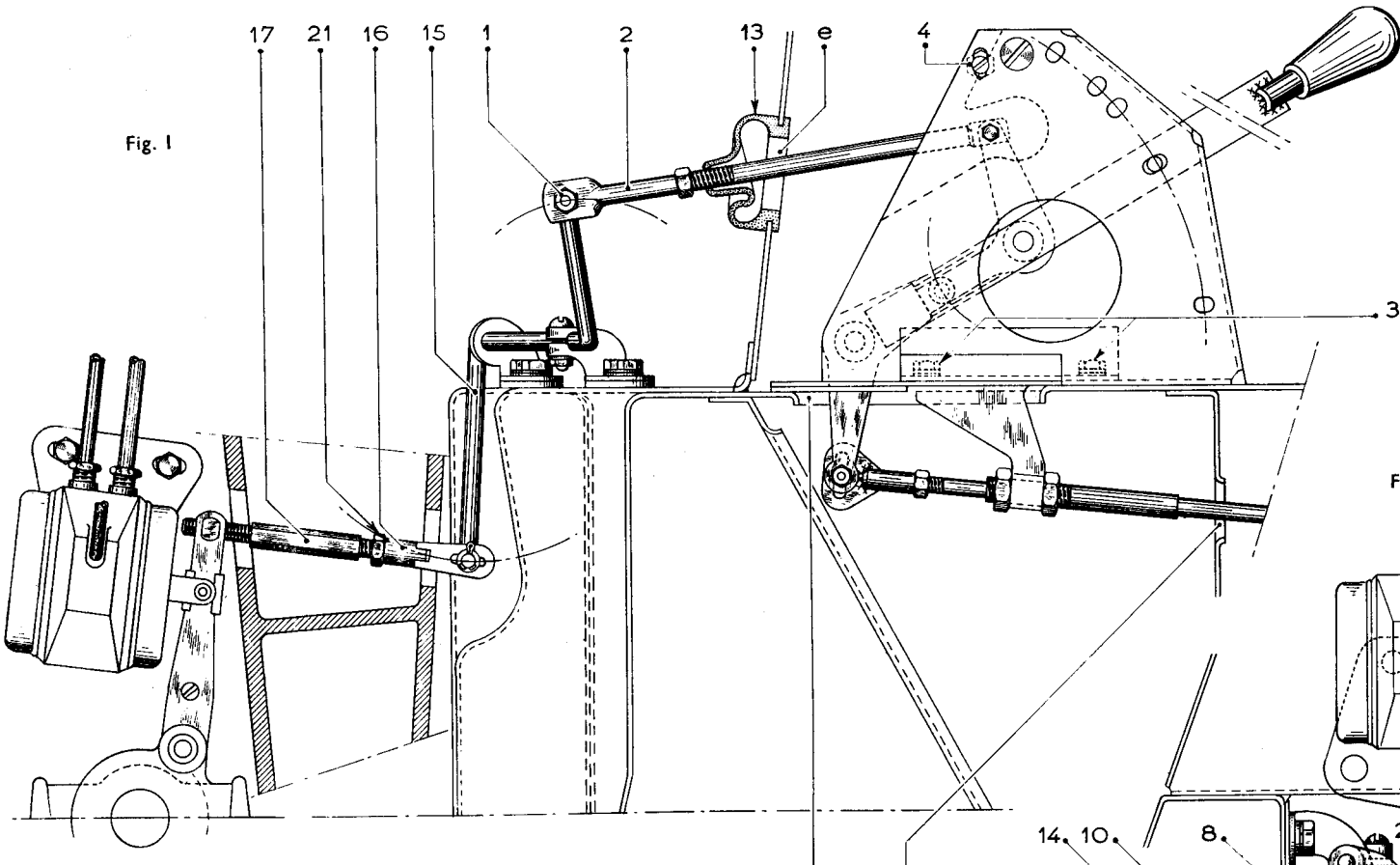


Fig. 2

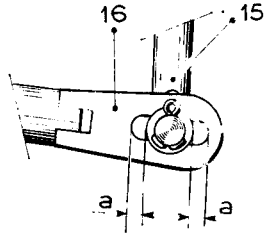
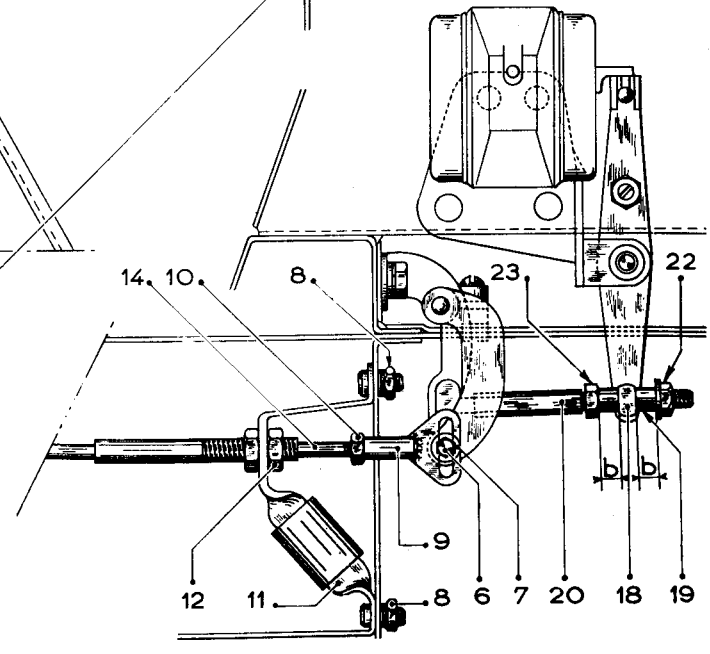


Fig. 3



HEIGHT VARIATION CONTROL

Fig. 1

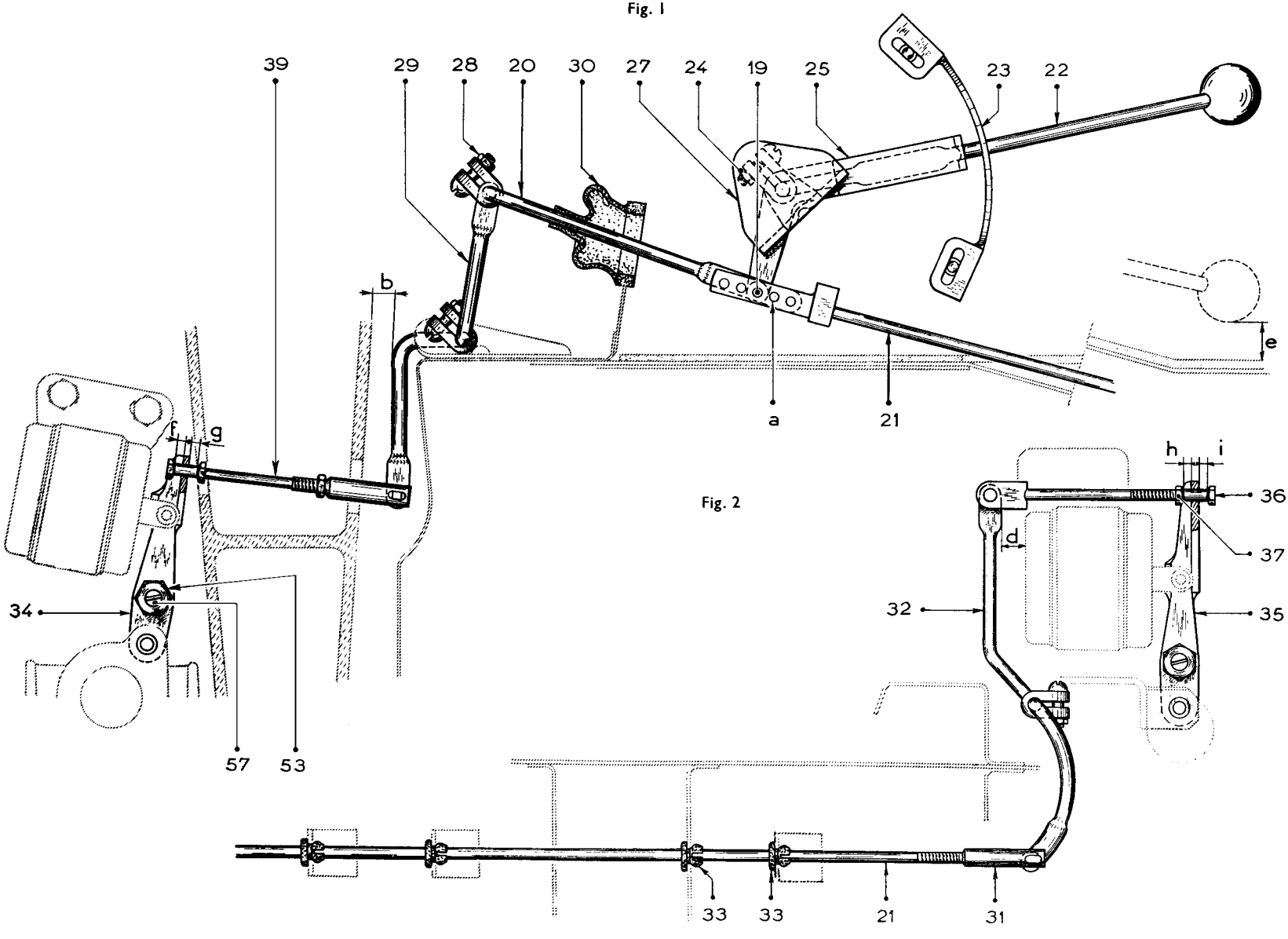


Fig. 2

ASSEMBLY

Fig. 1

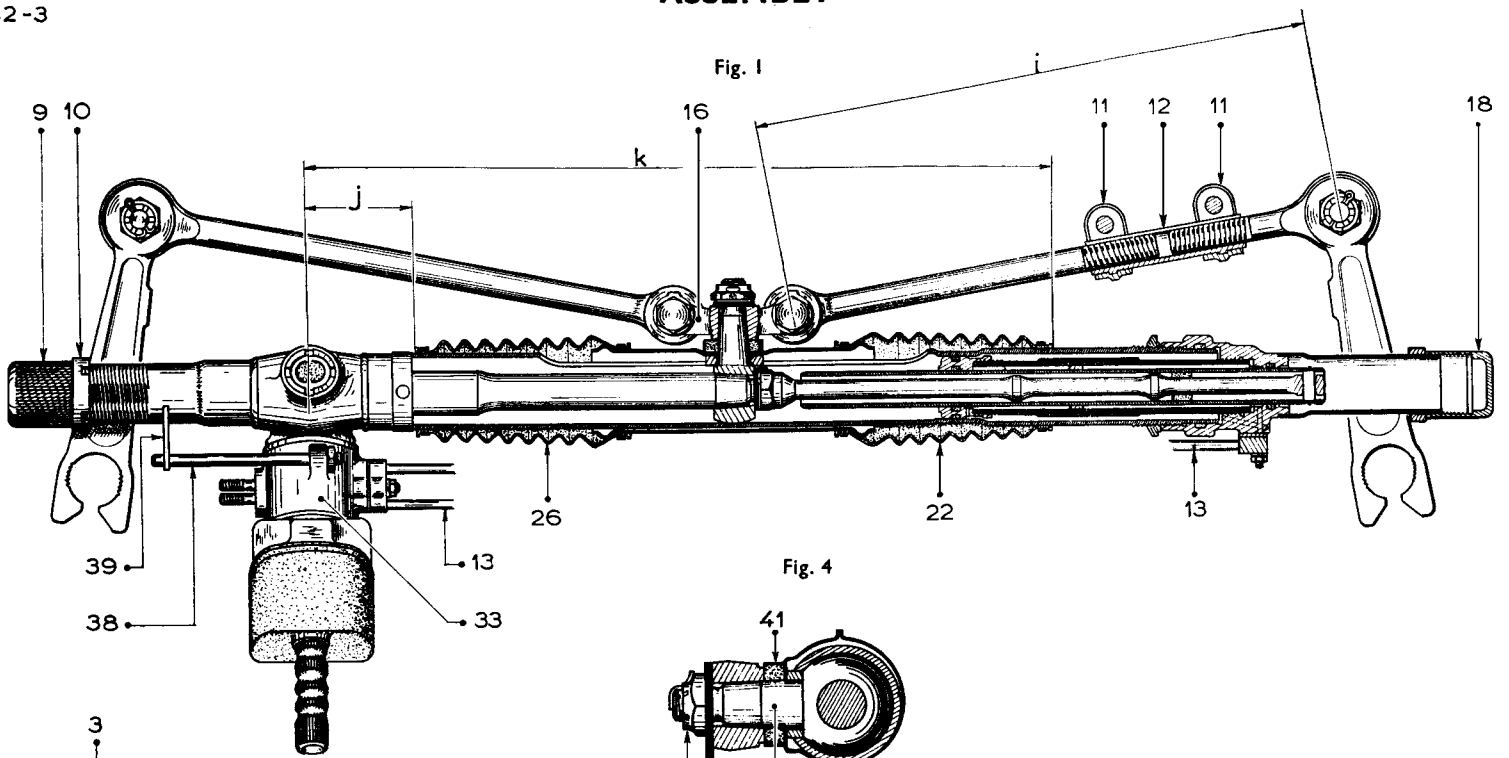
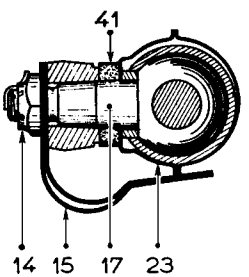


Fig. 4



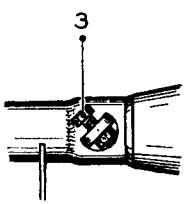


Fig. 2

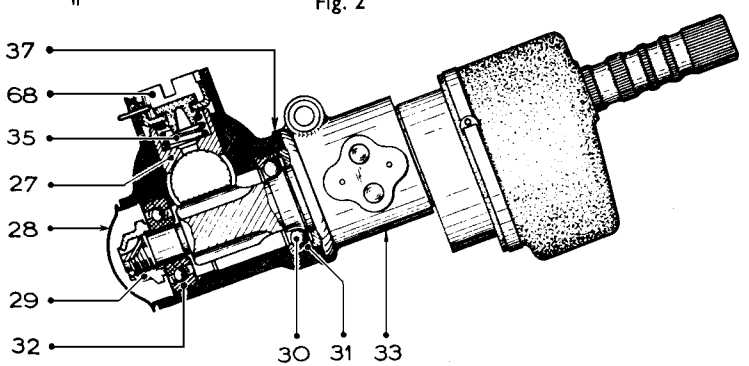
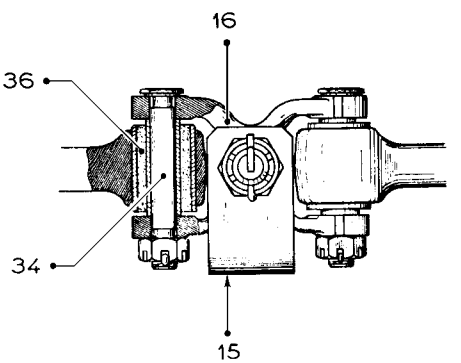


Fig. 3



SECTIONAL VIEWS

Fig. 1

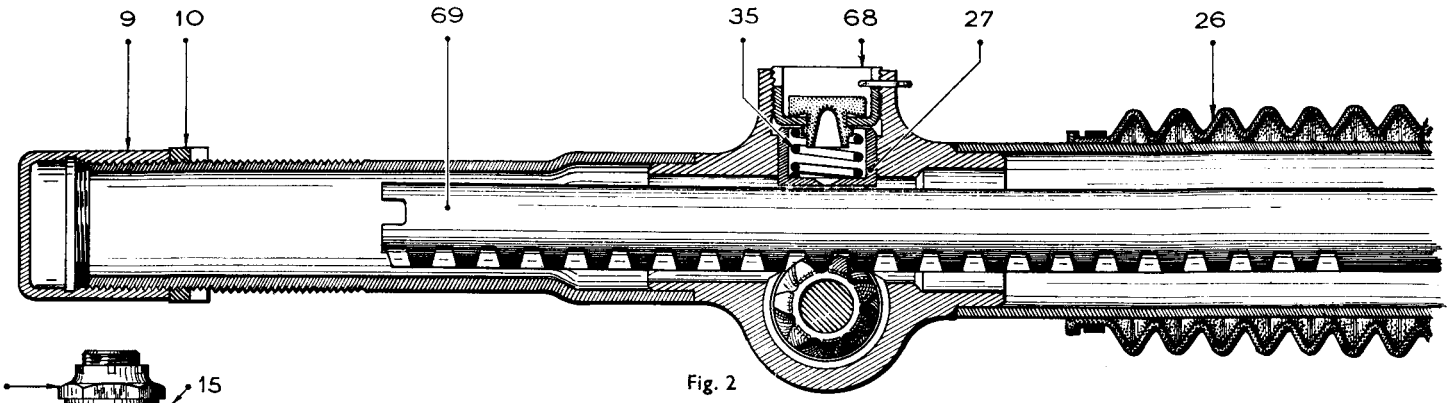


Fig. 2

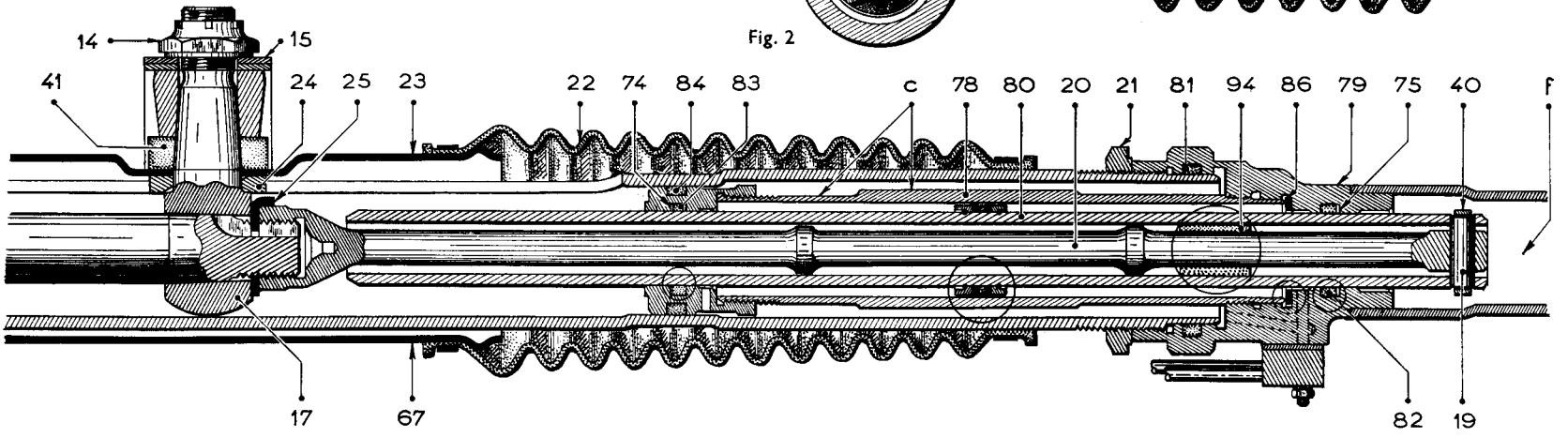


Fig. 3

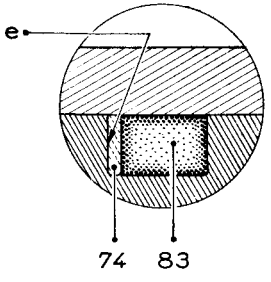


Fig. 4

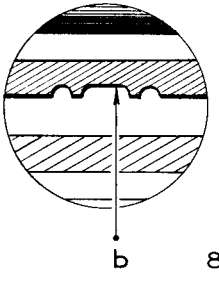


Fig. 5

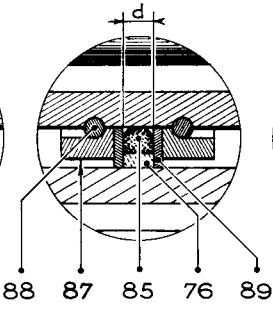


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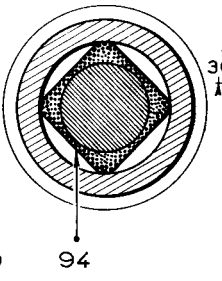


Fig. 7

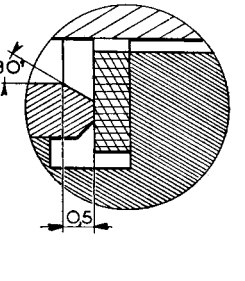
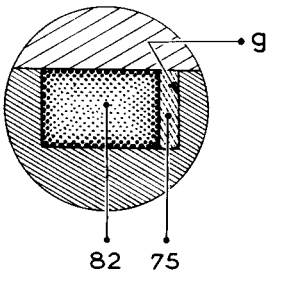
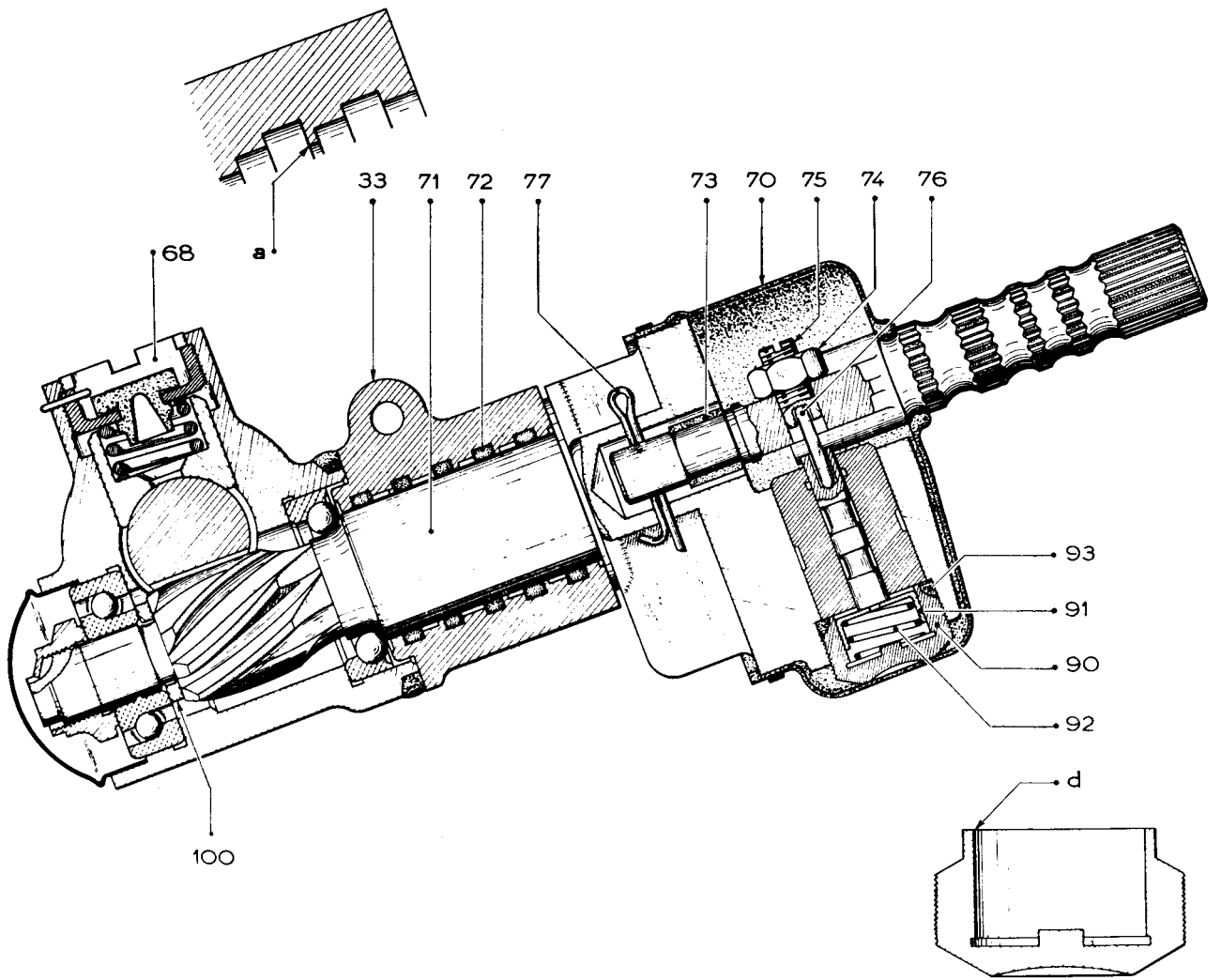


Fig. 8

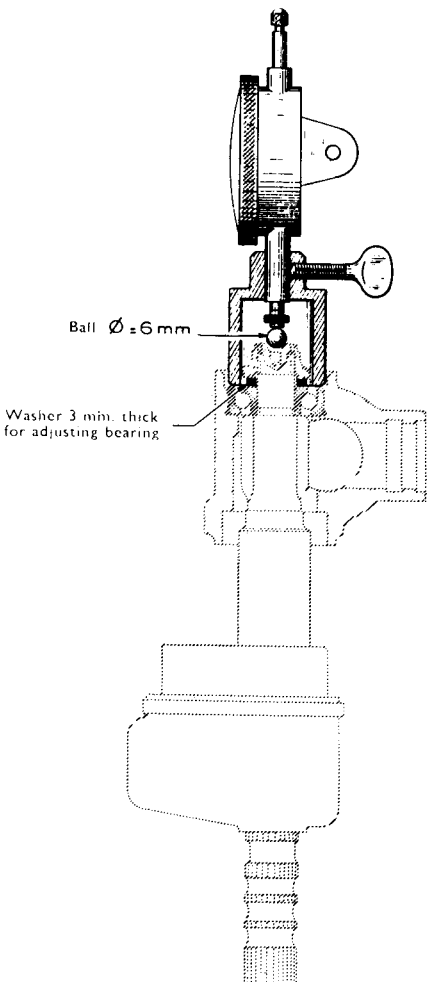


ROTATING UNION



ADJUSTMENT OF PINION

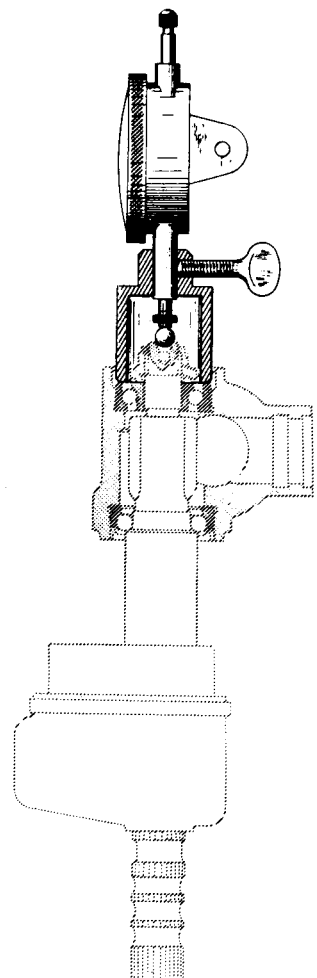
Fig. 1 SETTING DIAL GAUGE



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

DIAL GAUGE
sold under No. 2437-T

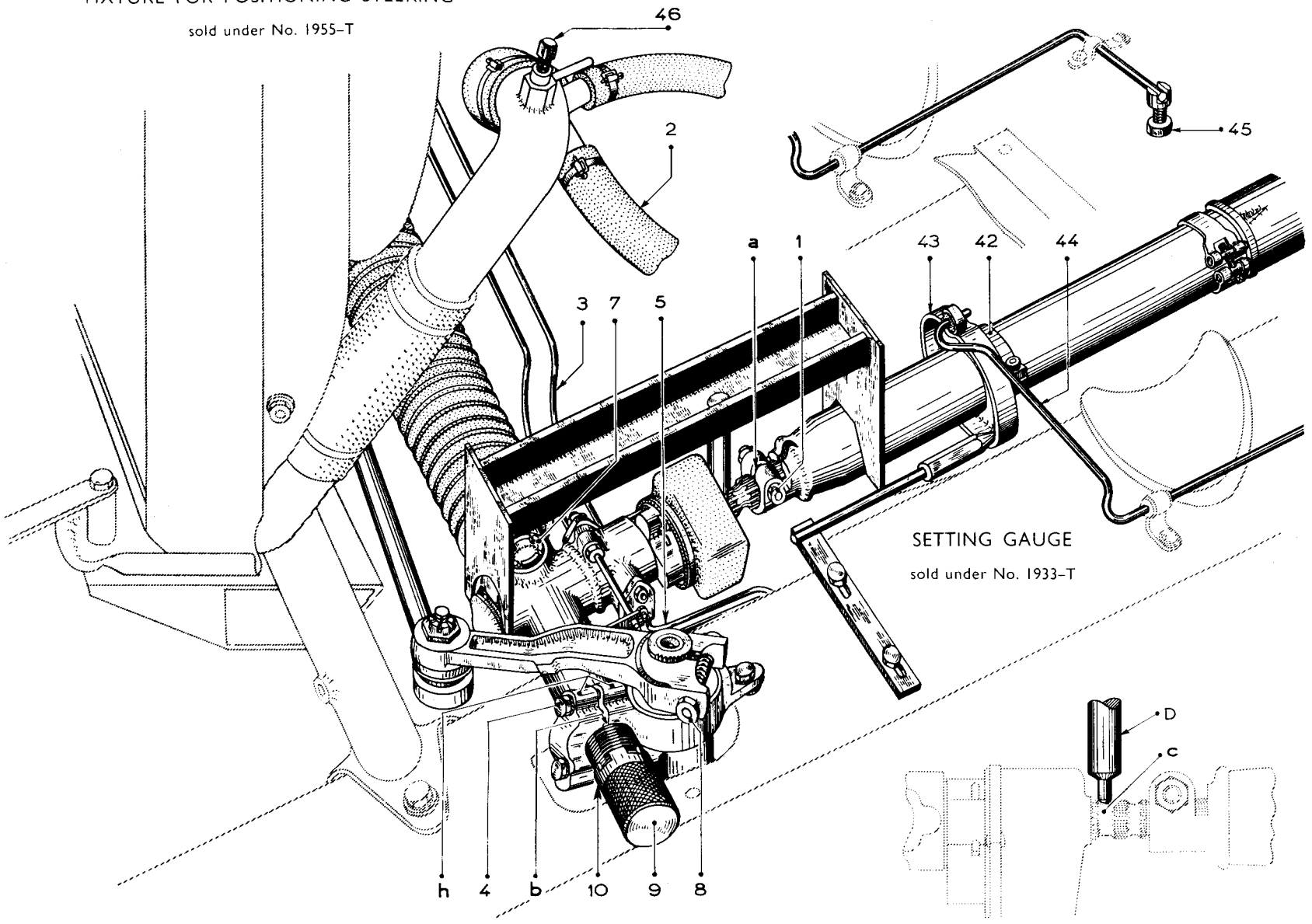
Fig. 2 MEASURING THICKNESS OF ADJUSTING WASHER



ADJUSTMENTS

FIXTURE FOR POSITIONING STEERING

sold under No. 1955-T



FITTING THE STEERING WHEEL

Fig. 1

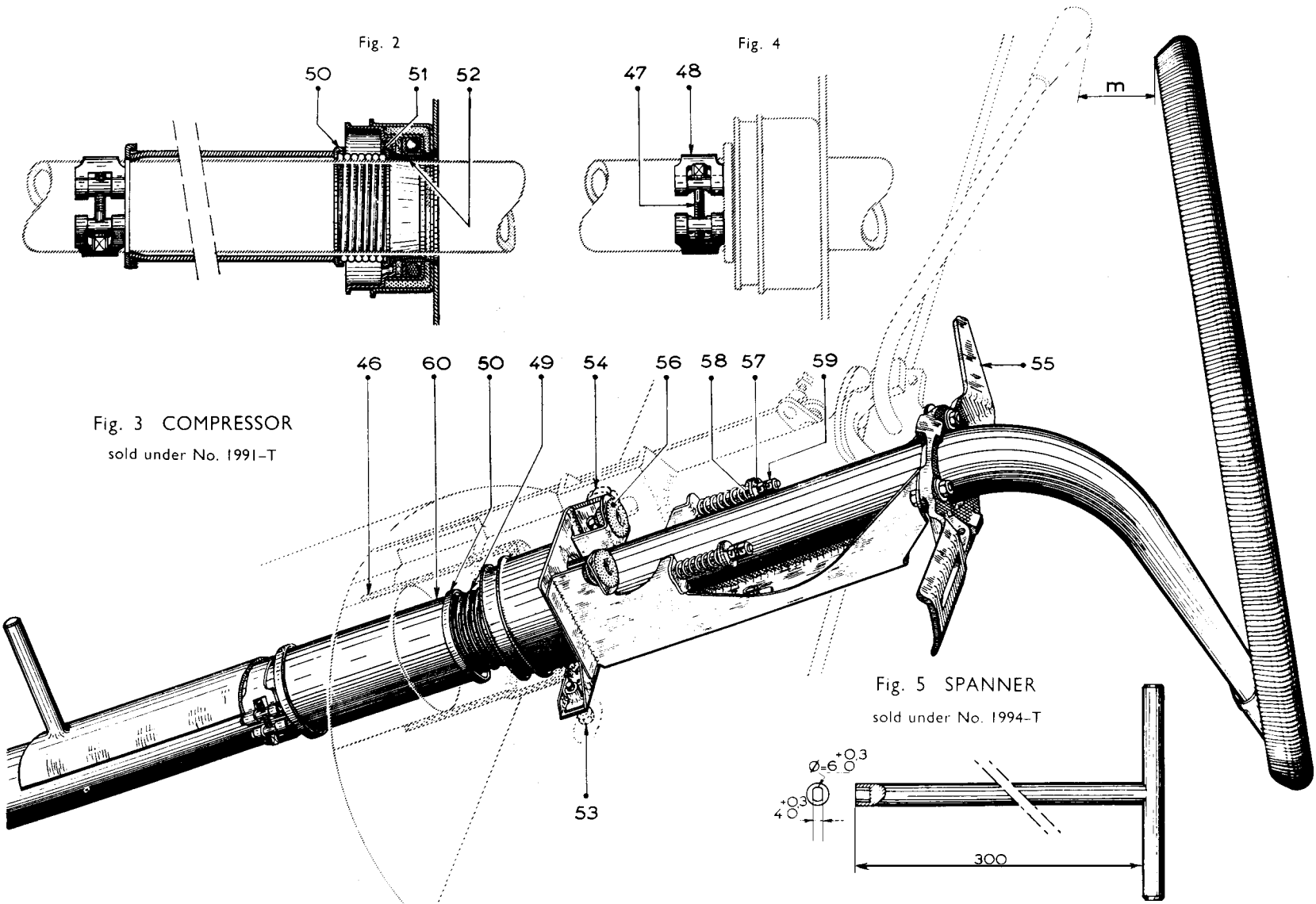


Fig. 2

Fig. 4

Fig. 3 COMPRESSOR
sold under No. 1991-T

Fig. 5 SPANNER
sold under No. 1994-T

VARIOUS TOOLS

Fig. 1 EXTRACTOR
sold under No. 1966–T

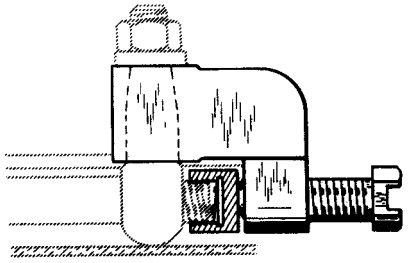


Fig. 2 EXTRACTOR
sold under No. 1967–T

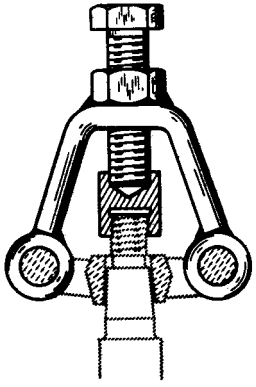


Fig. 3 SPANNER
sold under No. 1982–T

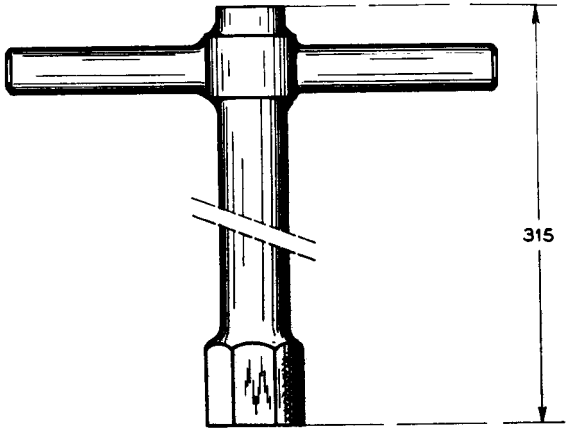


Fig. 4 EXTRACTOR
sold under No. 1969–T

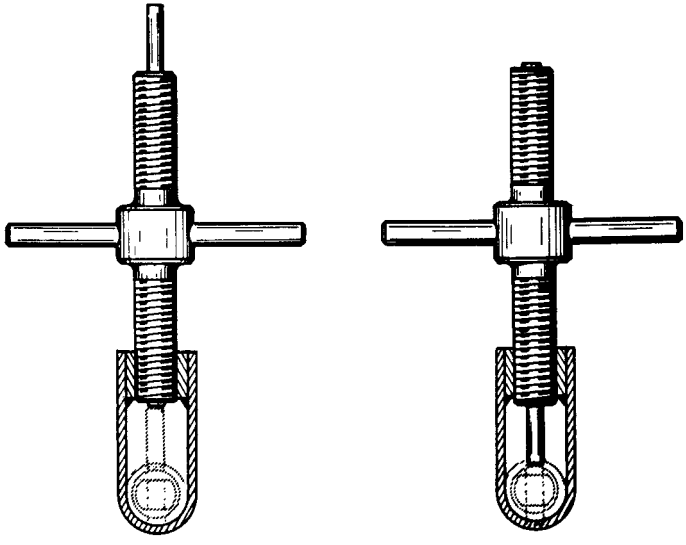


Fig. 5 SPANNER MR–3691–70
not sold

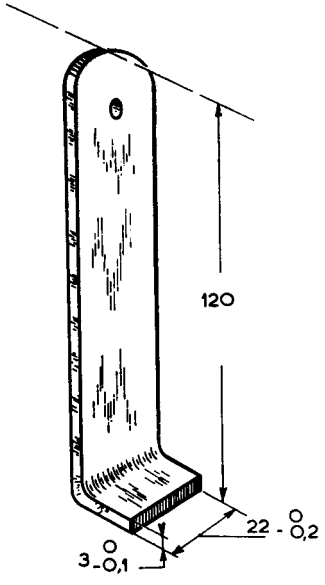
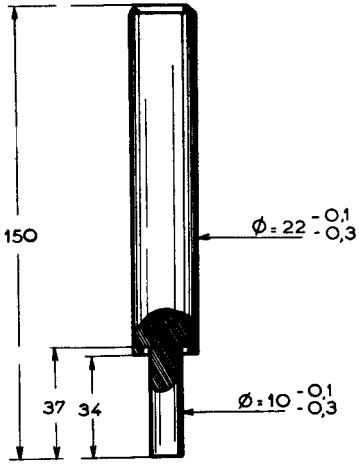


Fig. 6 MANDREL MR–3676–110
not sold



VARIOUS TOOLS

Fig. 1 WOODEN JAWS MR-3407-20
not sold

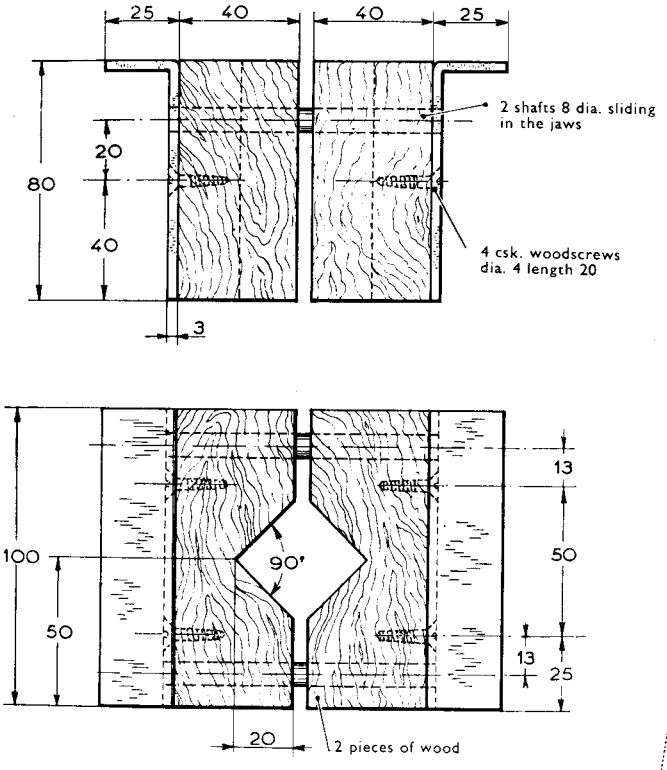
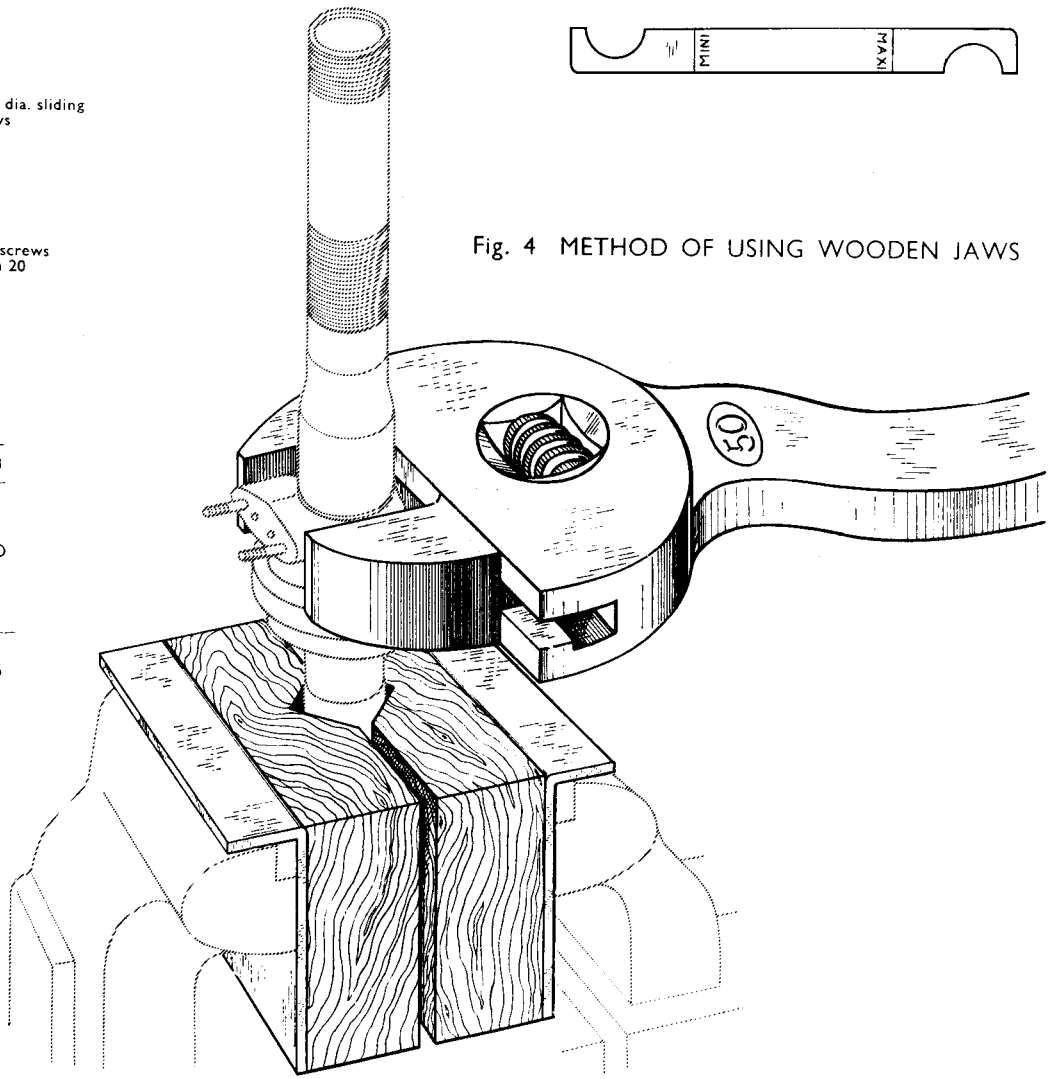


Fig. 2 GAUGE
sold under No. 1983-T

Fig. 4 METHOD OF USING WOODEN JAWS



VARIOUS TOOLS

Fig. 1 SUPPORT

sold under No. 1999-T

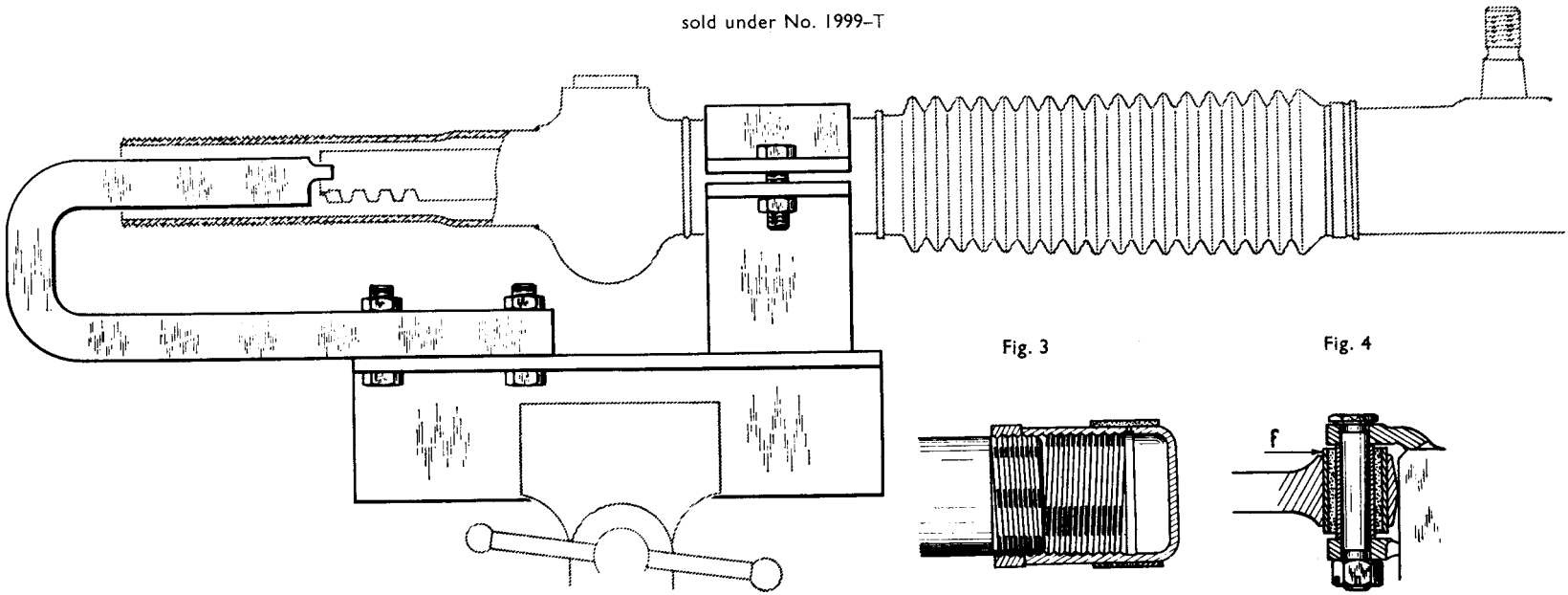
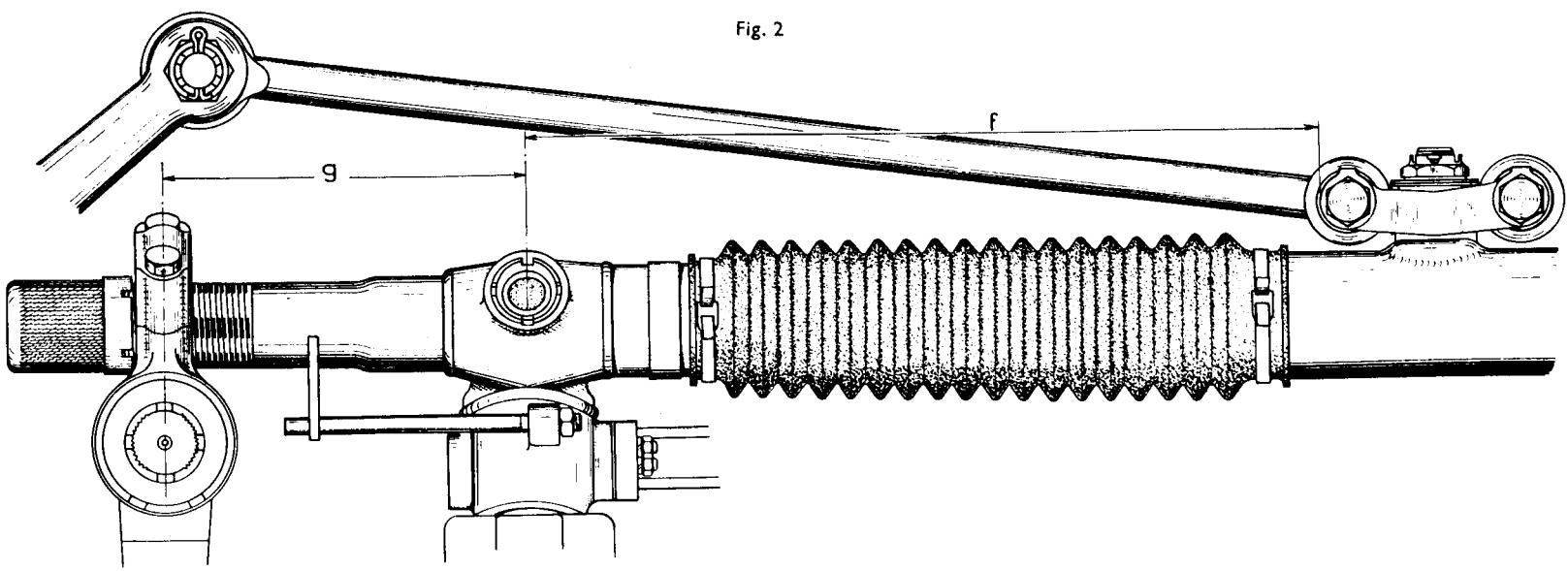


Fig. 3

Fig. 4

Fig. 2



VARIOUS TOOLS

Fig. 1 SPANNER
sold under No. 1974-T

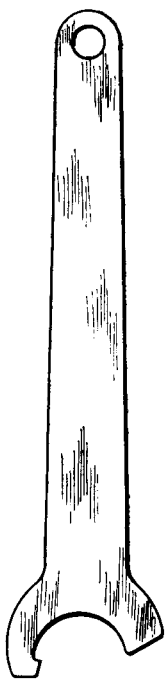


Fig. 2 SPANNER
sold under No. 2186-VA

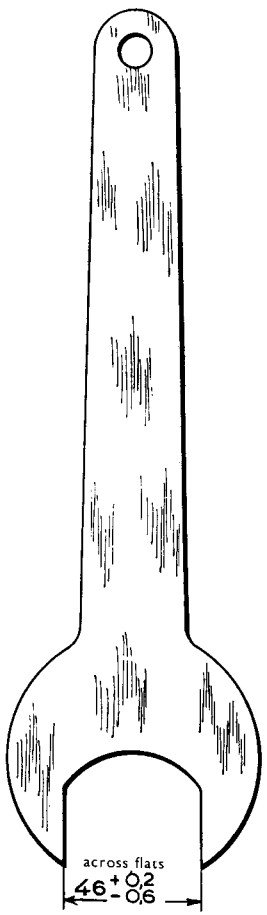


Fig. 3 ADJUSTING THE RACK CONTROL ROD

SPANNER
sold under No. 1982-T

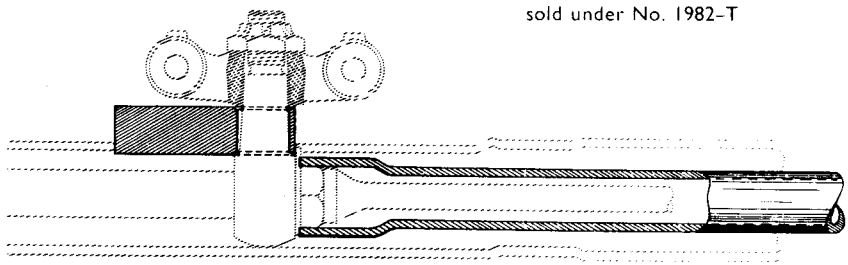
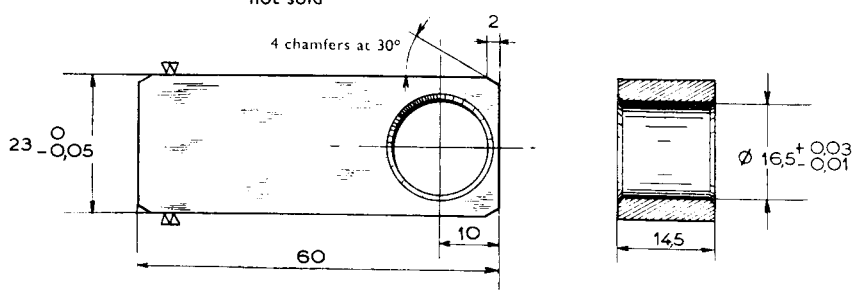


Fig. 4 PLATE MR-4369
not sold



ASSEMBLY OF JOINTS

Fig. 1

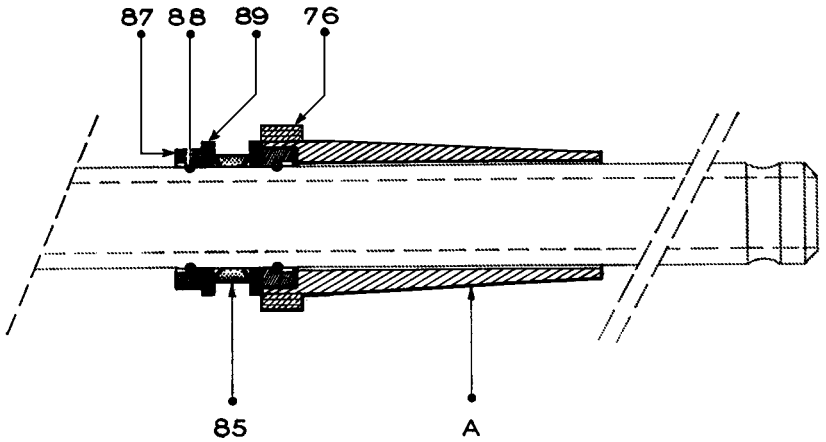
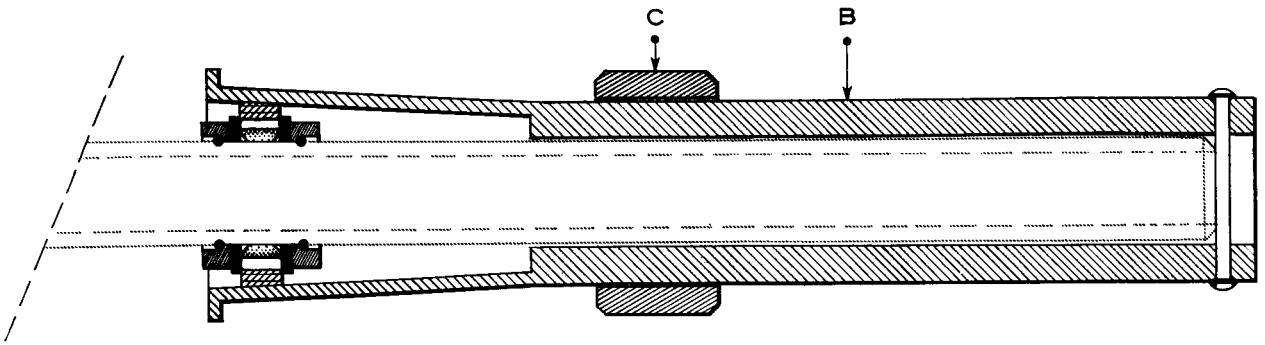


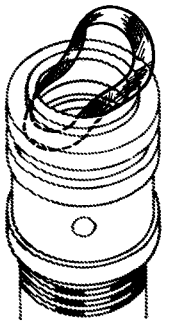
Fig. 2



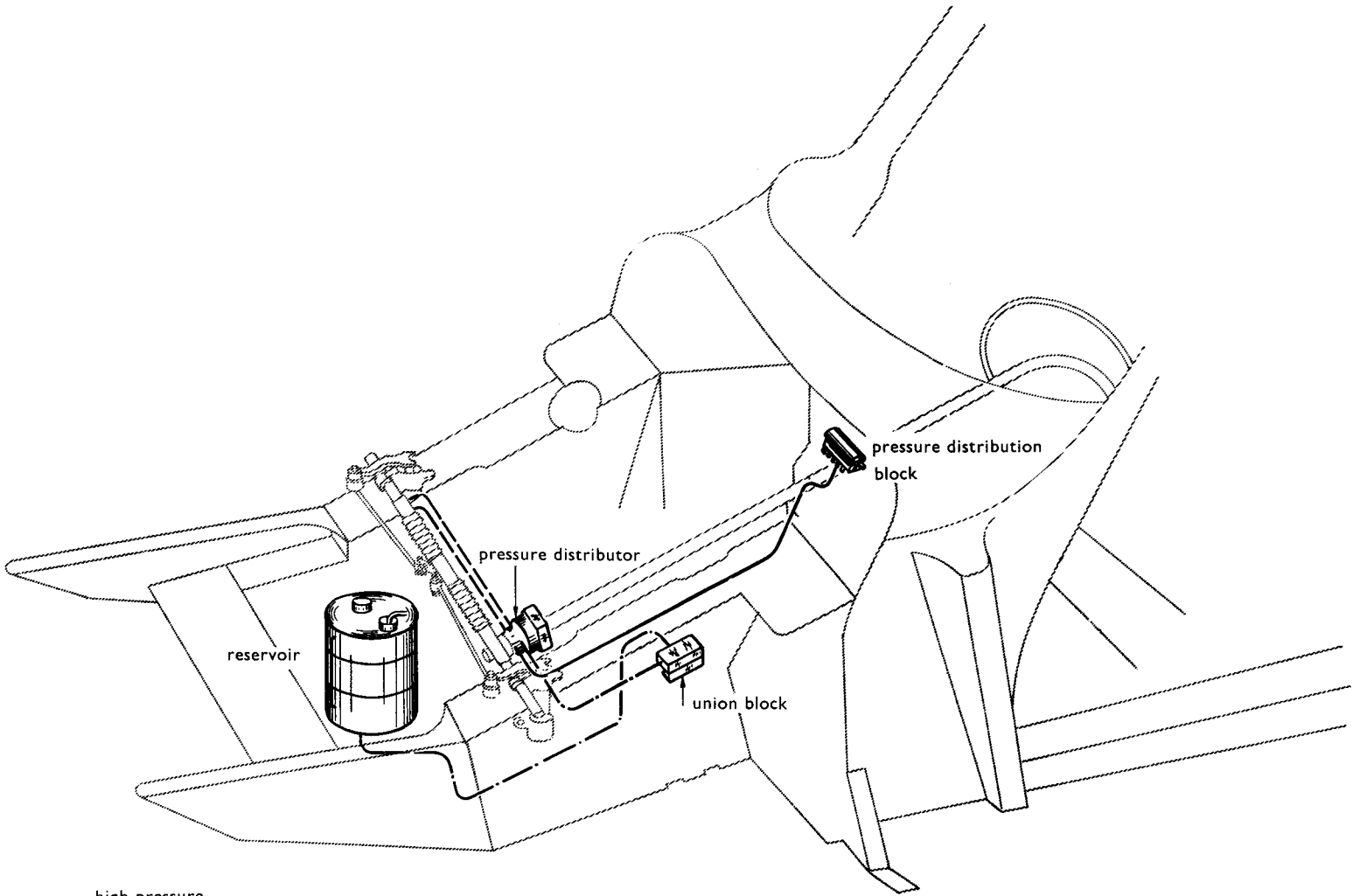
ASSEMBLY OF CONE AND WASHER

sold under No. 1985–T

Fig. 3 FITTING RILSAN 74 WASHER ON THE CYLINDER END PIECE

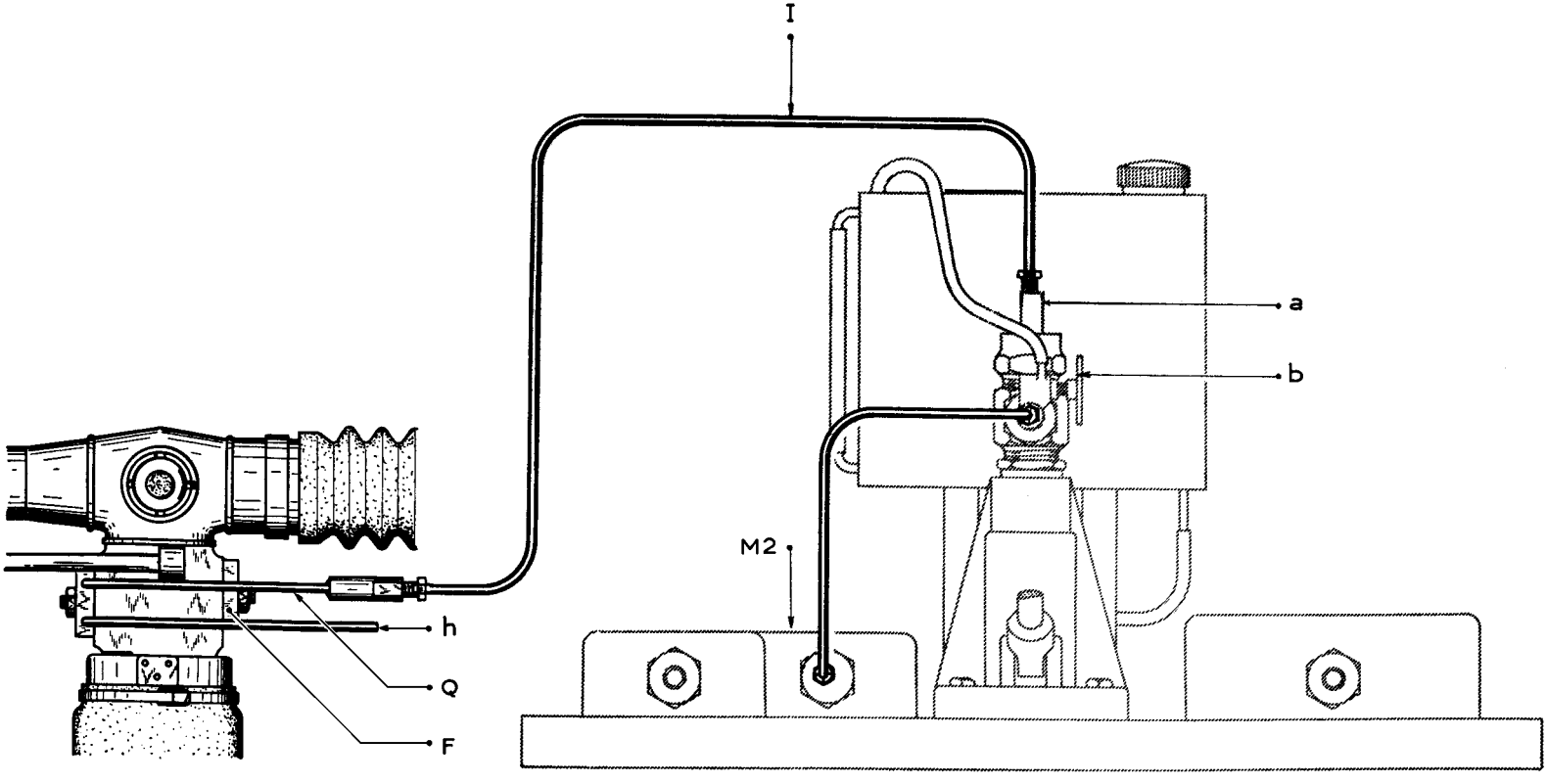


HYDRAULIC STEERING SYSTEM



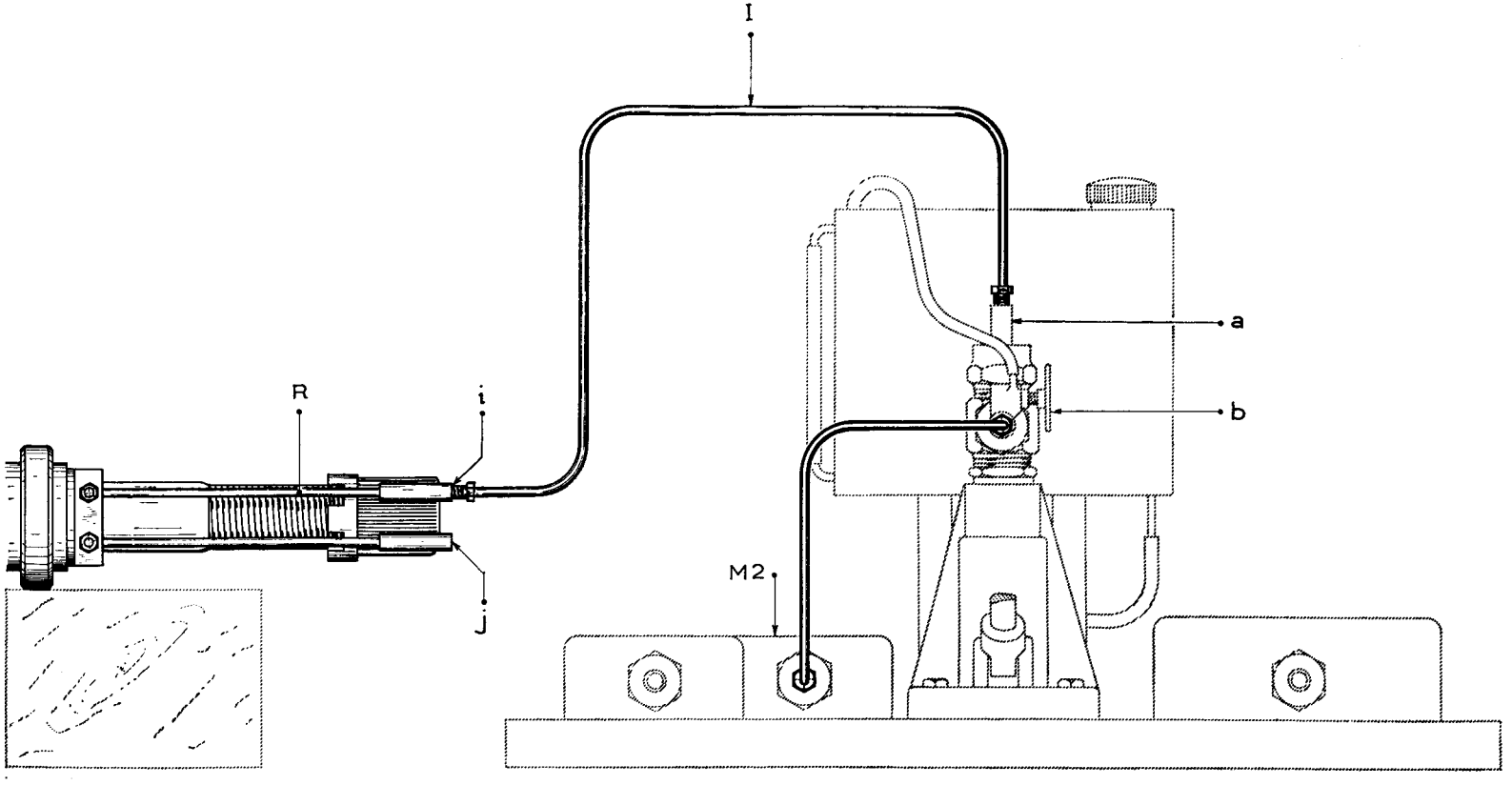
ROTATING UNION

CHECKING FOR LEAKAGE

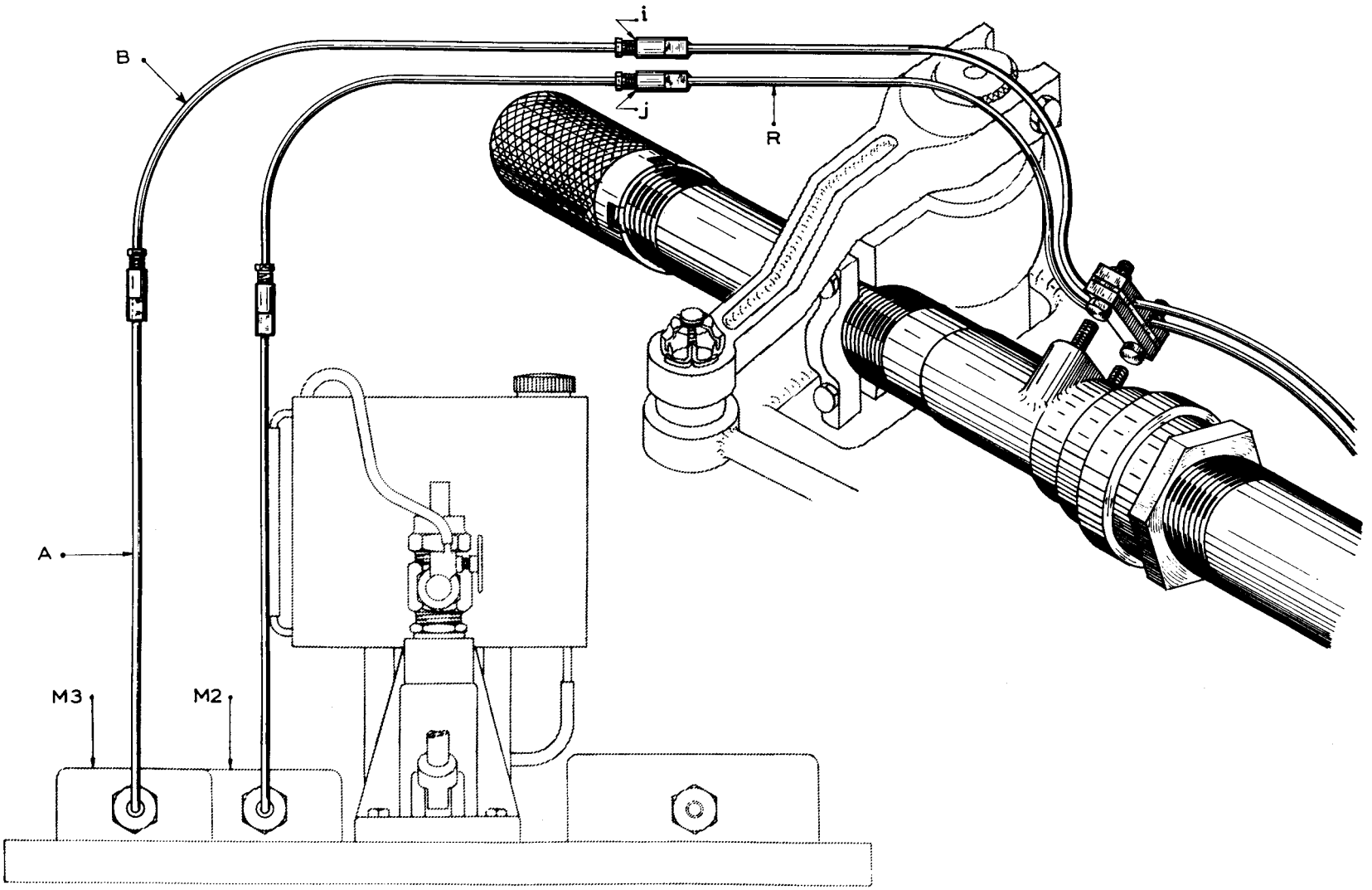


PISTON—CYLINDER ASSEMBLY

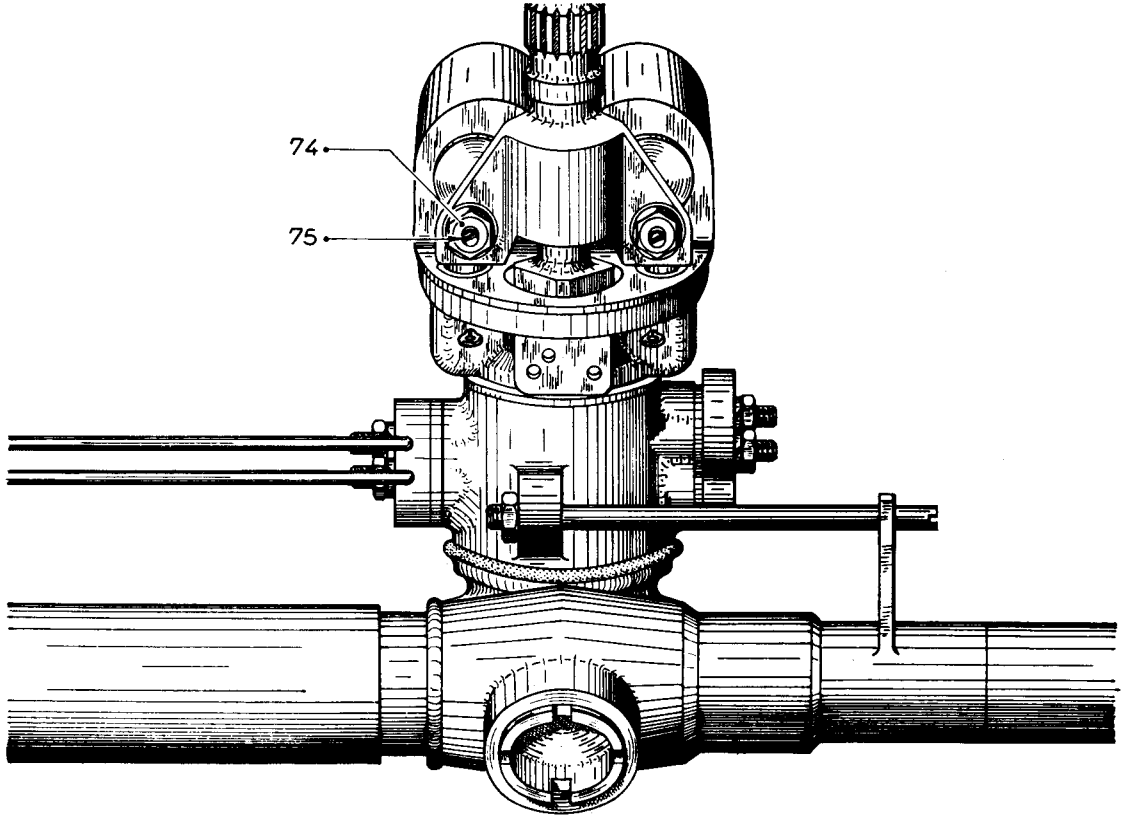
CHECKING FOR LEAKAGE



ADJUSTING THE PRESSURES



ADJUSTING THE PRESSURES



SECTION OF RELAY ASSEMBLY

Fig. 1

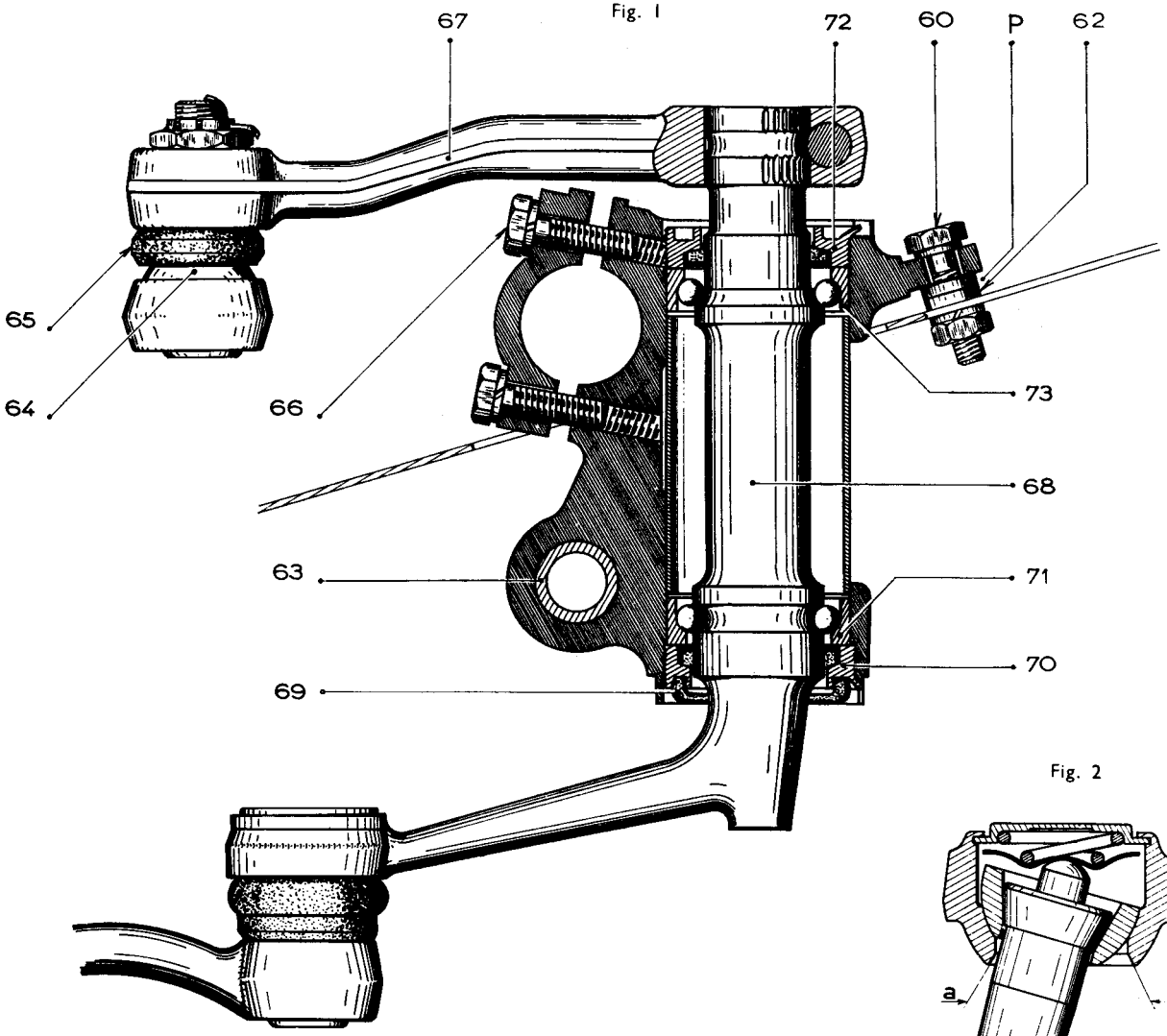
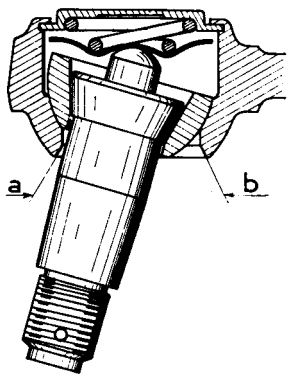


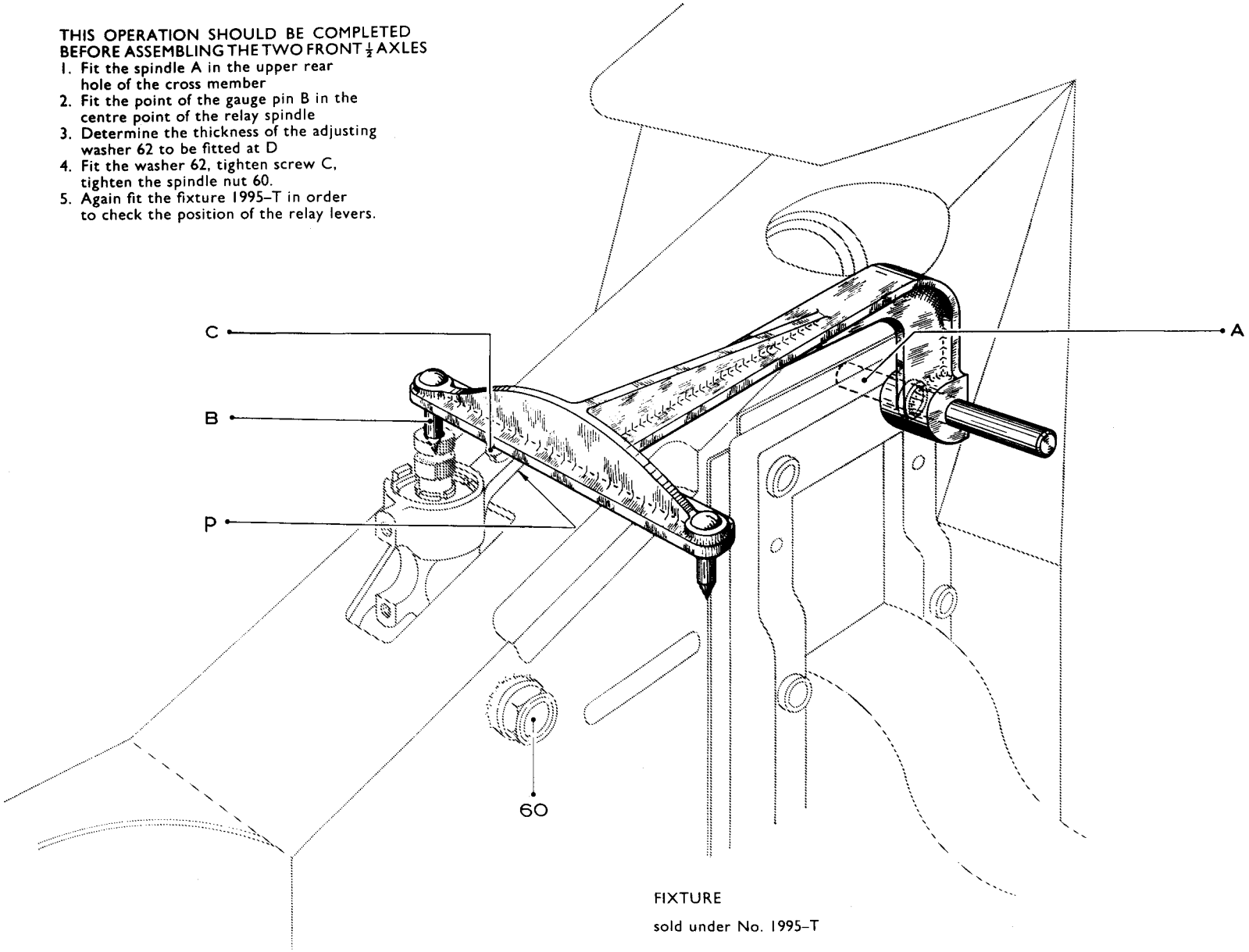
Fig. 2



ADJUSTING THE POSITION OF A RELAY

THIS OPERATION SHOULD BE COMPLETED BEFORE ASSEMBLING THE TWO FRONT ½ AXLES

1. Fit the spindle A in the upper rear hole of the cross member
2. Fit the point of the gauge pin B in the centre point of the relay spindle
3. Determine the thickness of the adjusting washer 62 to be fitted at D
4. Fit the washer 62, tighten screw C, tighten the spindle nut 60.
5. Again fit the fixture 1995–T in order to check the position of the relay levers.



FIXTURE

sold under No. 1995–T

VARIOUS TOOLS

Fig. 1 SPANNER

sold under No. 1989–T

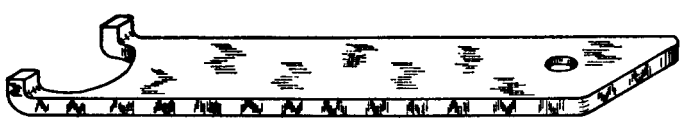


Fig. 2 SPANNER MR–3691–70

not sold

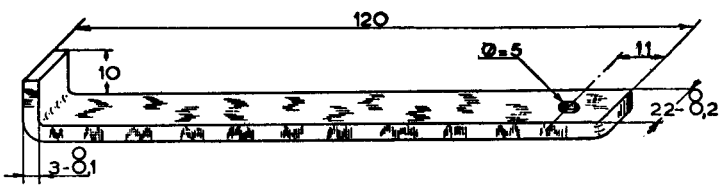


Fig. 3 SPANNER

sold under No. 1988–T

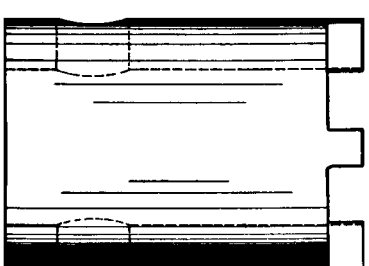
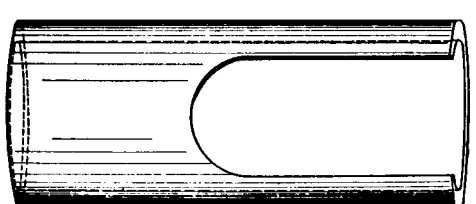
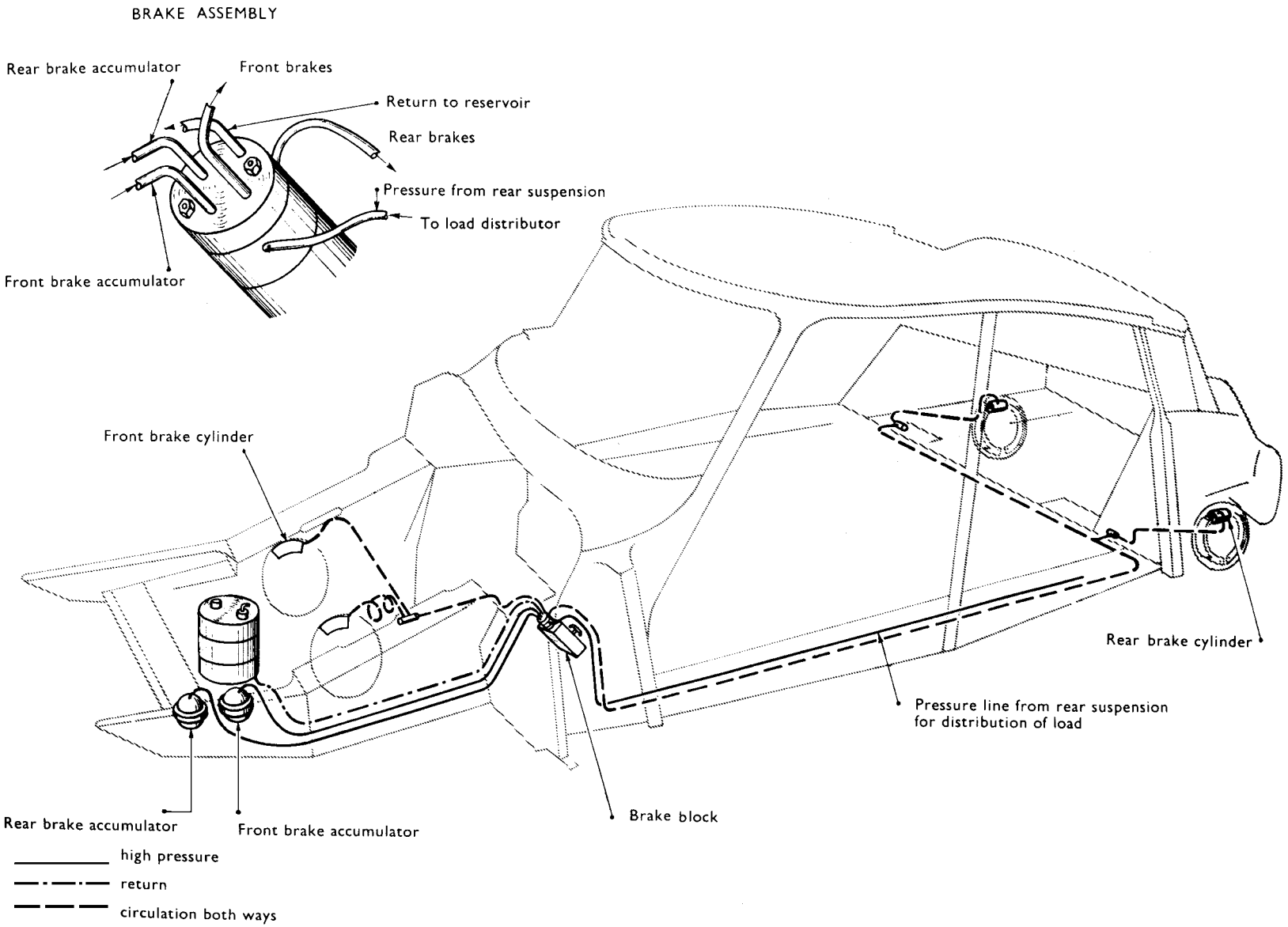


Fig. 4 TUBE

sold under No. 1990–T



HYDRAULIC SYSTEM FOR BRAKES



BRAKE ASSEMBLY

Fig. 1

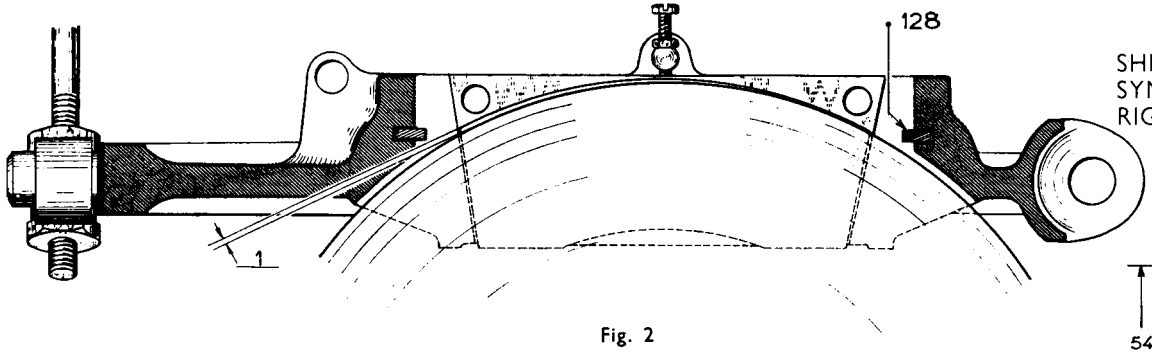


Fig. 3

SHIM FOR LEFT HAND UNIT
SYMETRICALLY OPPOSITE FOR
RIGHT HAND UNIT
not sold

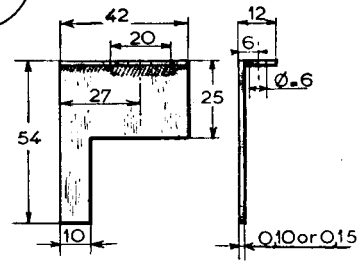
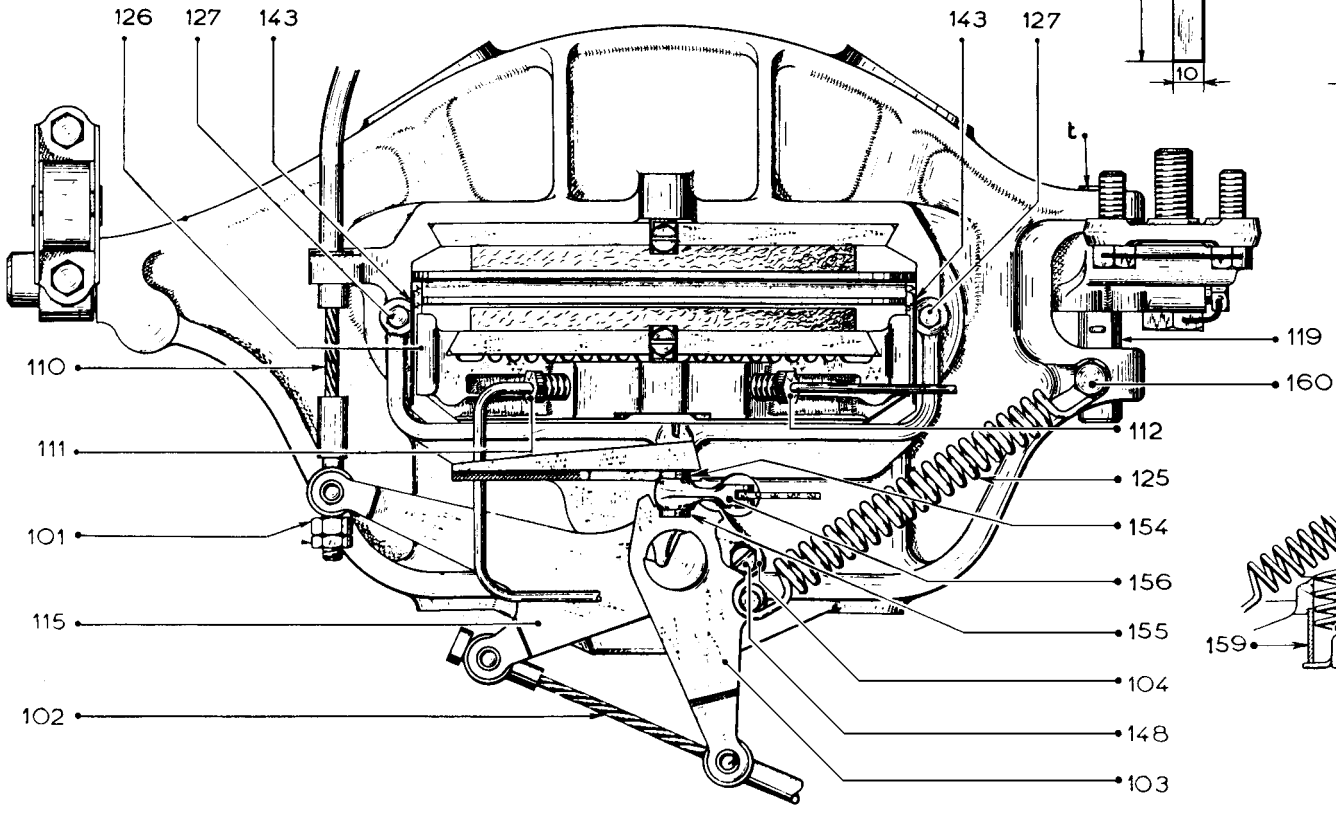


Fig. 2



BRAKE ASSEMBLY

Fig. 1

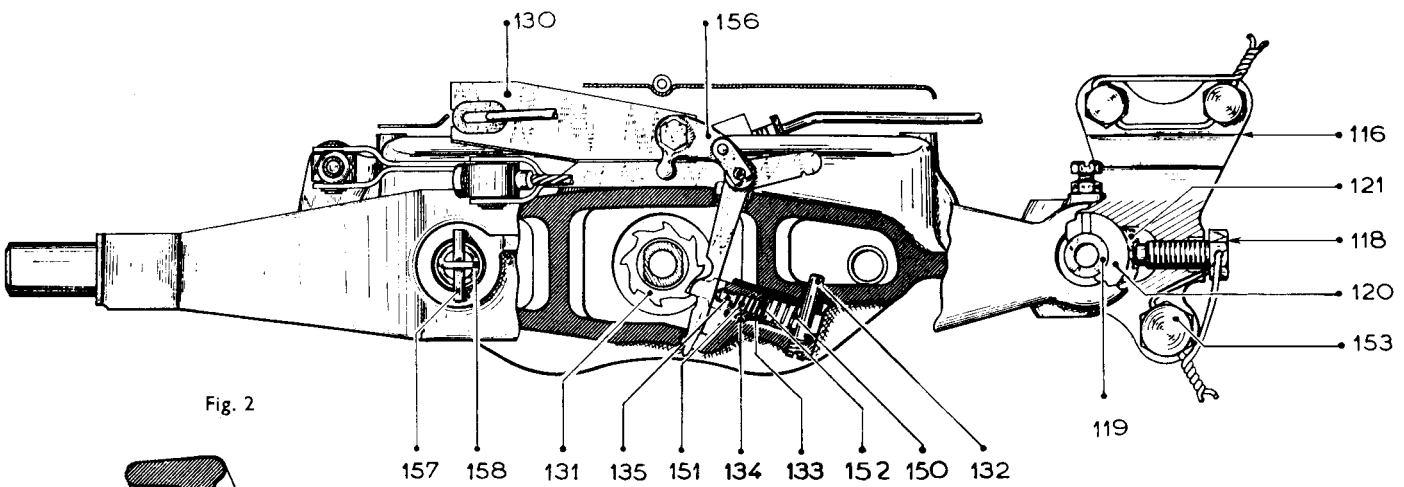


Fig. 2

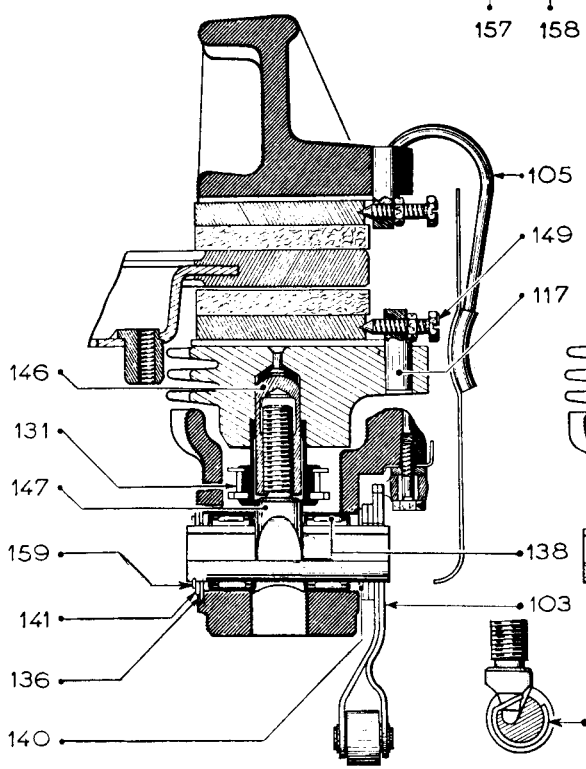


Fig. 3

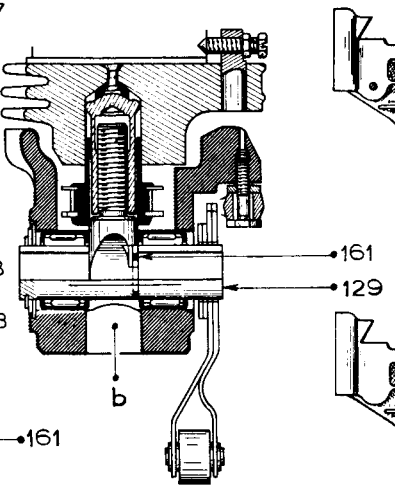


Fig. 4

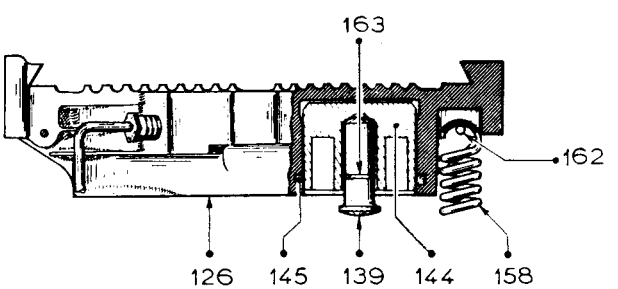
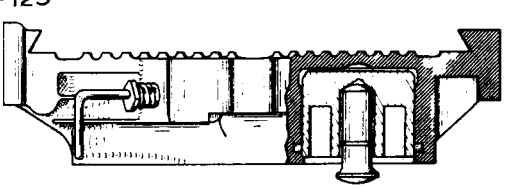


Fig. 5

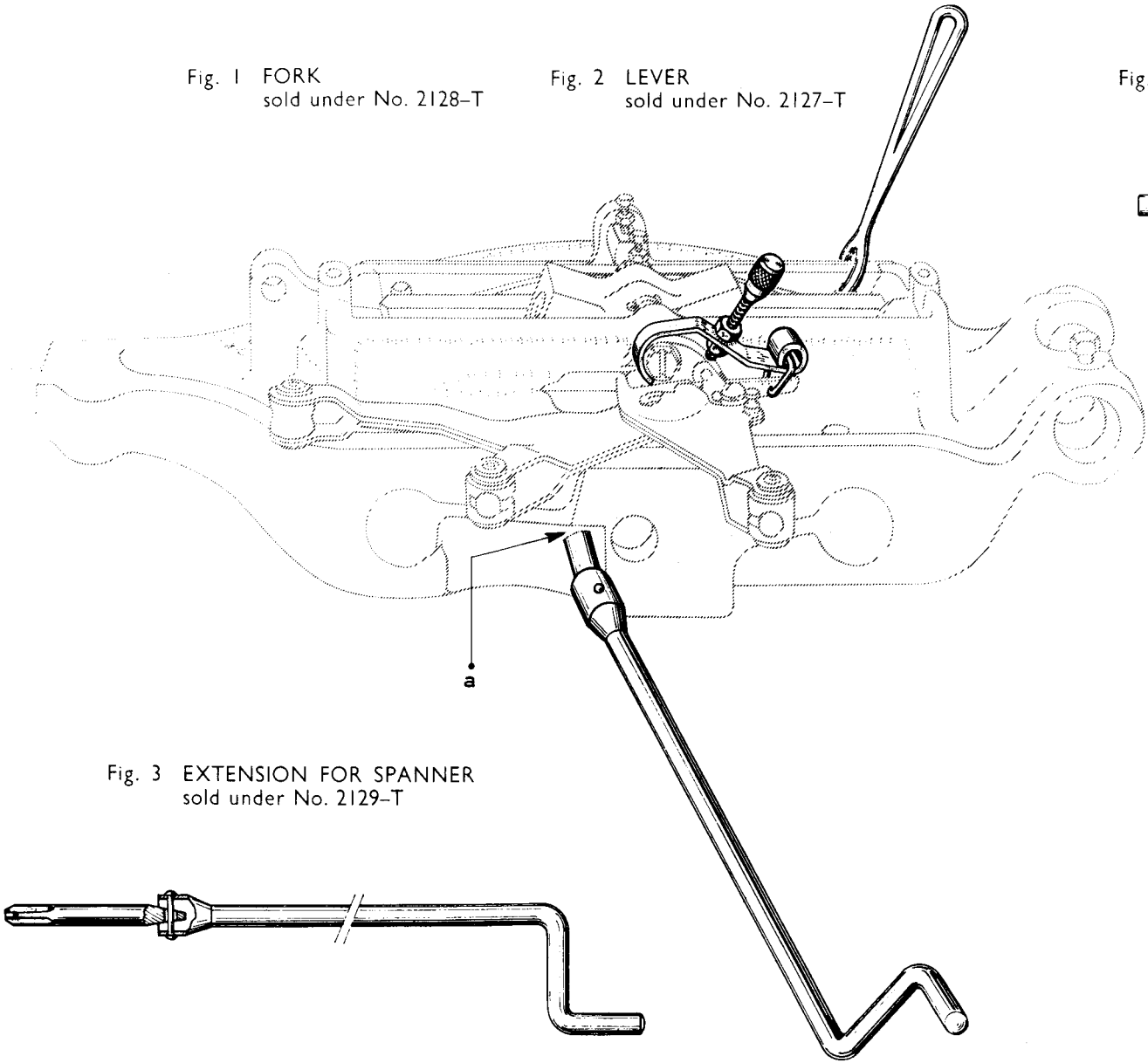


TOOLS FOR BRAKES

Fig. 1 FORK
sold under No. 2128–T

Fig. 2 LEVER
sold under No. 2127–T

Fig. 4 SPANNER
sold under No. 2141–T



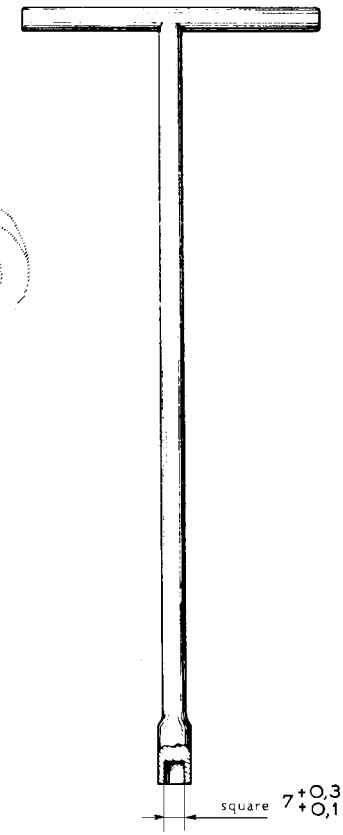


Fig. 3 EXTENSION FOR SPANNER
sold under No. 2129–T

REAR BRAKE BACKPLATE

Fig. 2

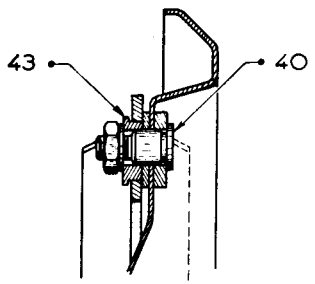


Fig. 4

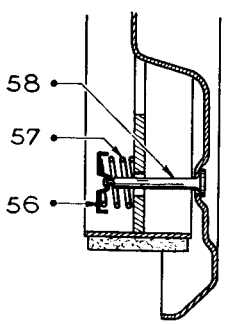


Fig. 1

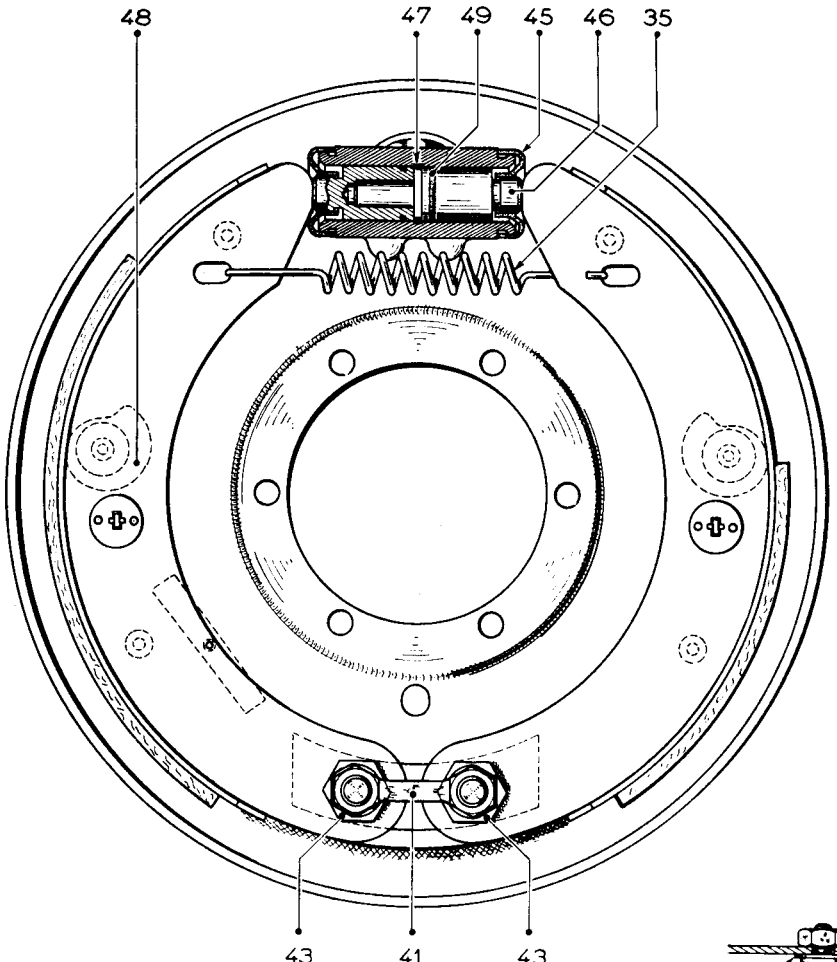


Fig. 3

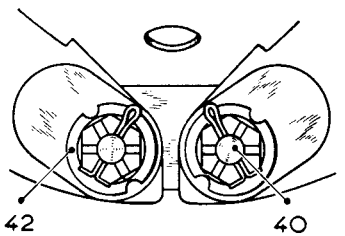


Fig. 5

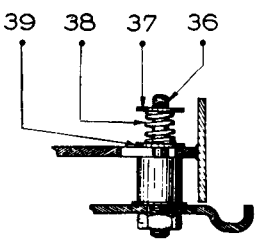
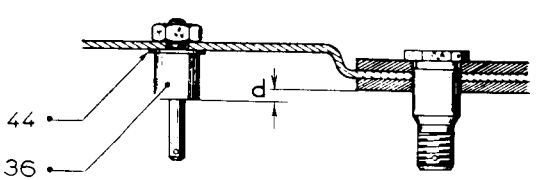
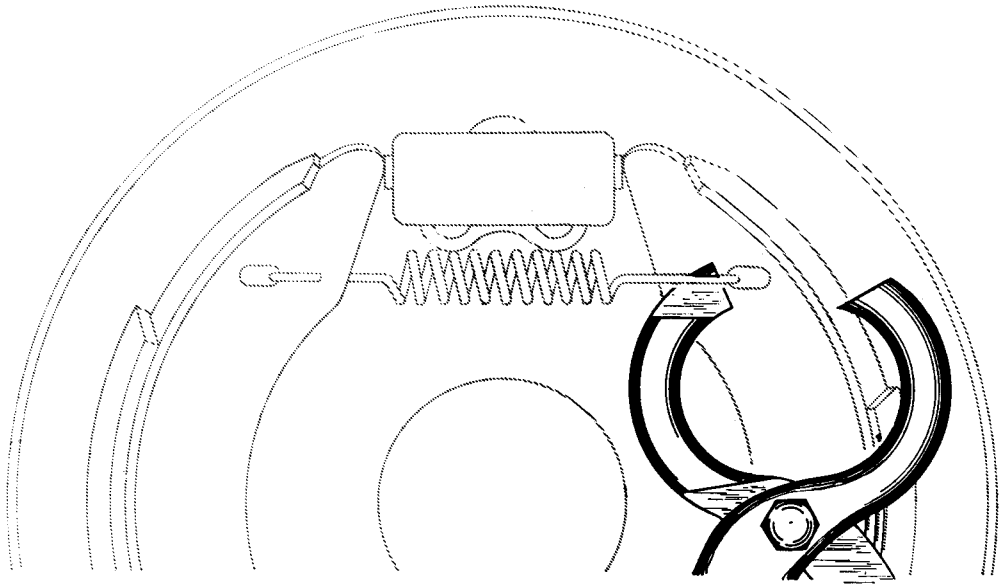


Fig. 6

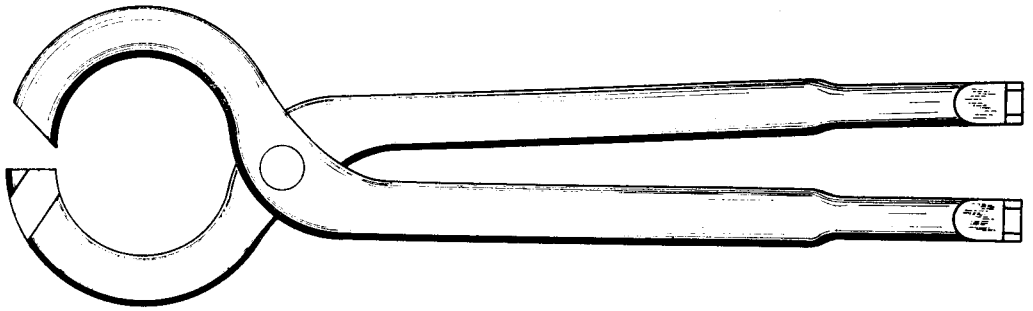


REMOVING AND FITTING THE RETURN SPRINGS

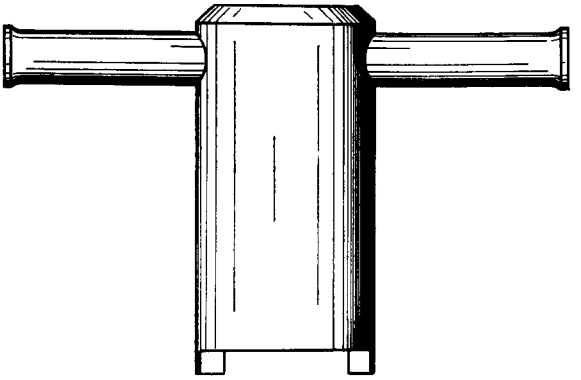
Fig. 1 METHOD OF USING THE PINCERS



SPRING PINCERS
sold under No. 2110–T



SPANNER
sold under No. 2120–T



RIVETTING THE BRAKE—CAM PINS

Fig. 1 METHOD OF USE

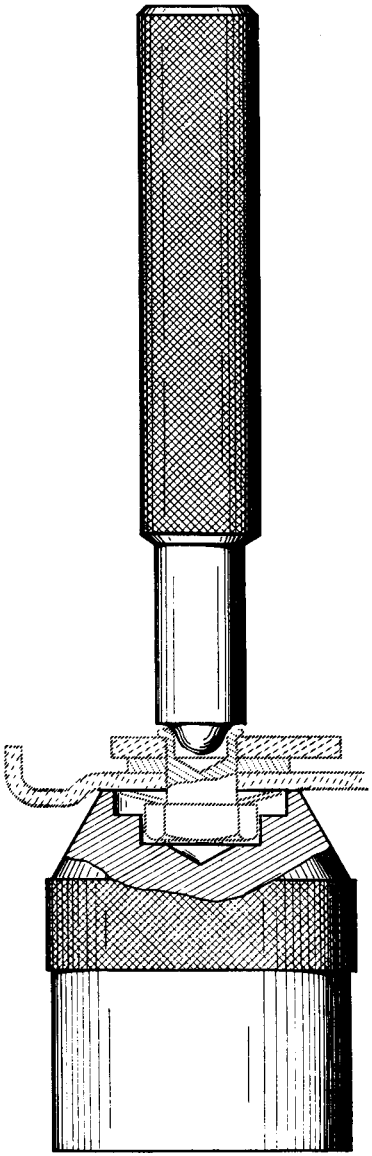


Fig. 2 PUNCH MR–3354–2
not sold

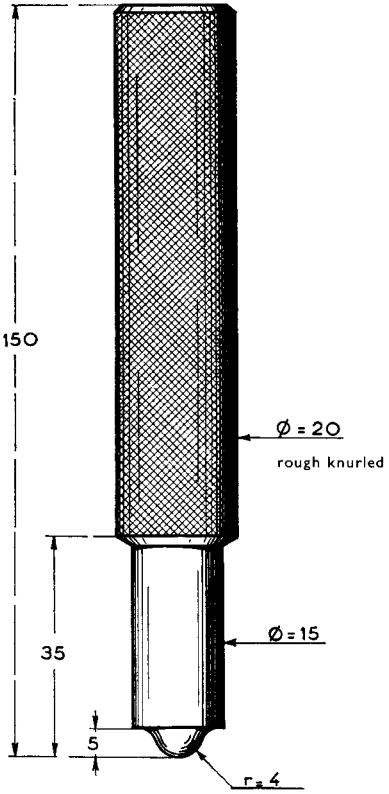
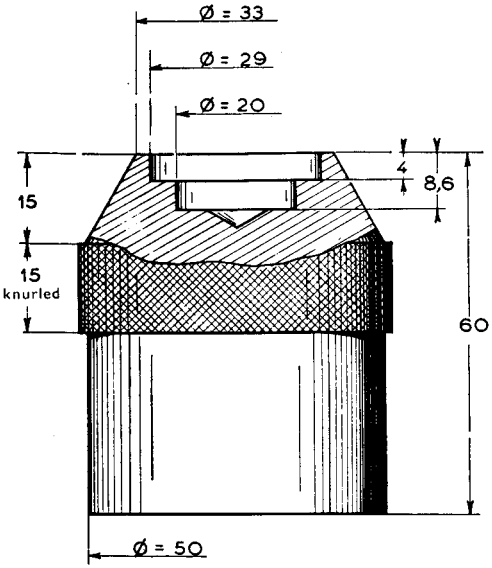


Fig. 3 DOLLY BLOCK MR–3354–40
not sold



GRINDING THE REAR BRAKE DRUM

Fig. 1 METHOD OF USING MANDREL MR-3700-120

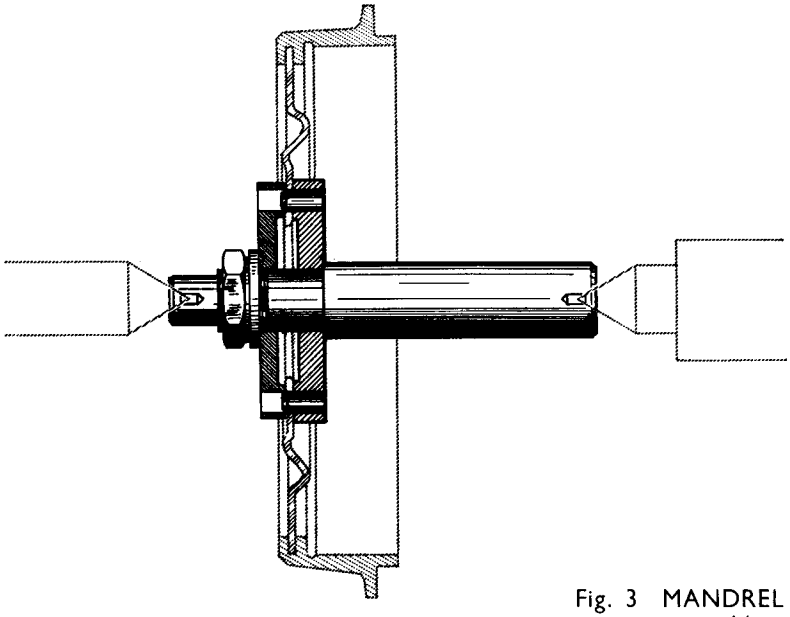


Fig. 2 MANDREL MR-3676-170
not sold

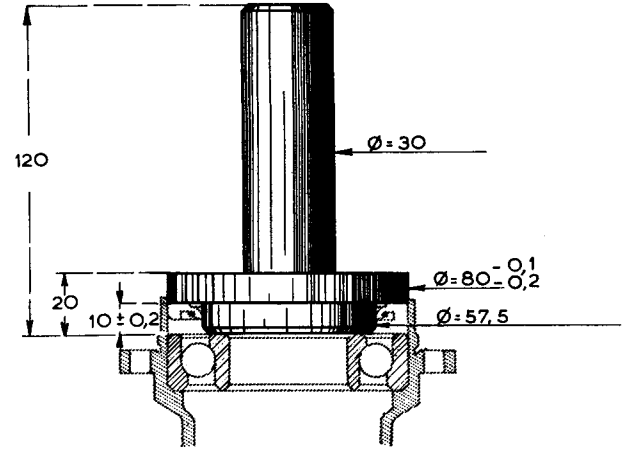
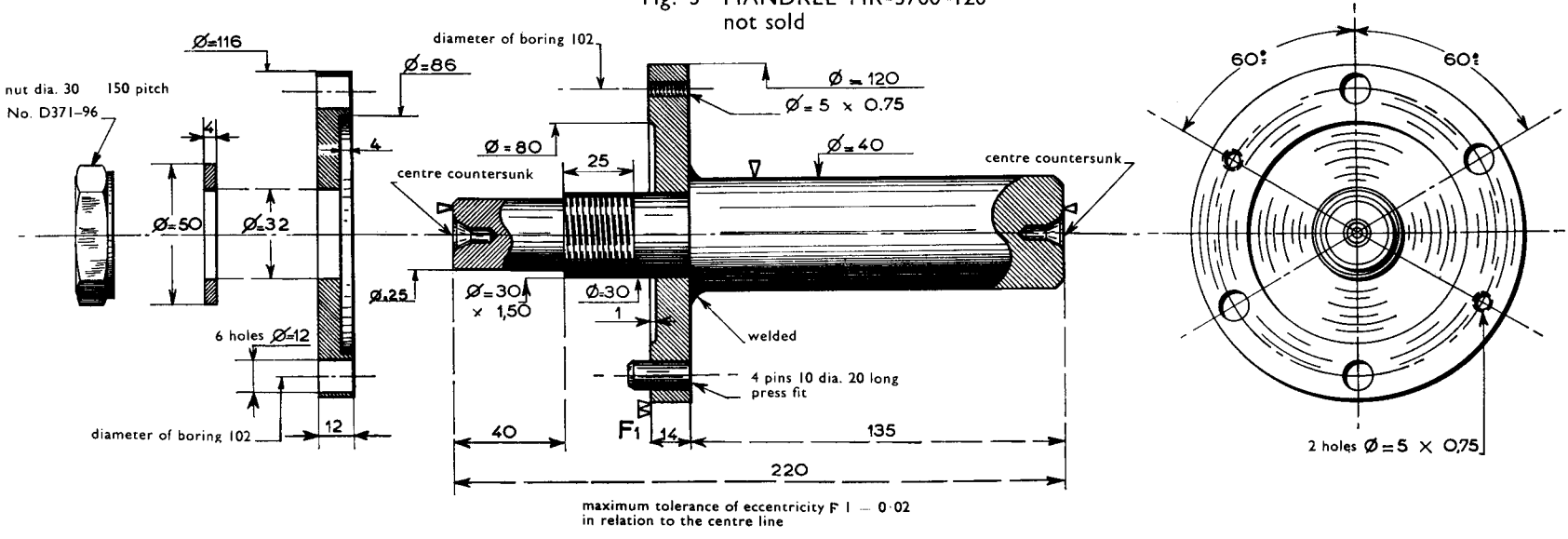


Fig. 3 MANDREL MR-3700-120
not sold



CENTRING THE BRAKE SHOES

Fig. 1 SETTING TO THE DIAMETER OF THE DRUM

Place the gauge in the brake drum with the two dowels engaged in the centring holes.

Turn the gauge one complete revolution with the index B held against the drum

Tighten the screw C

GAUGE FOR THE INSPECTION OF THE CENTRING OF THE BRAKES
sold under No. 2115–T

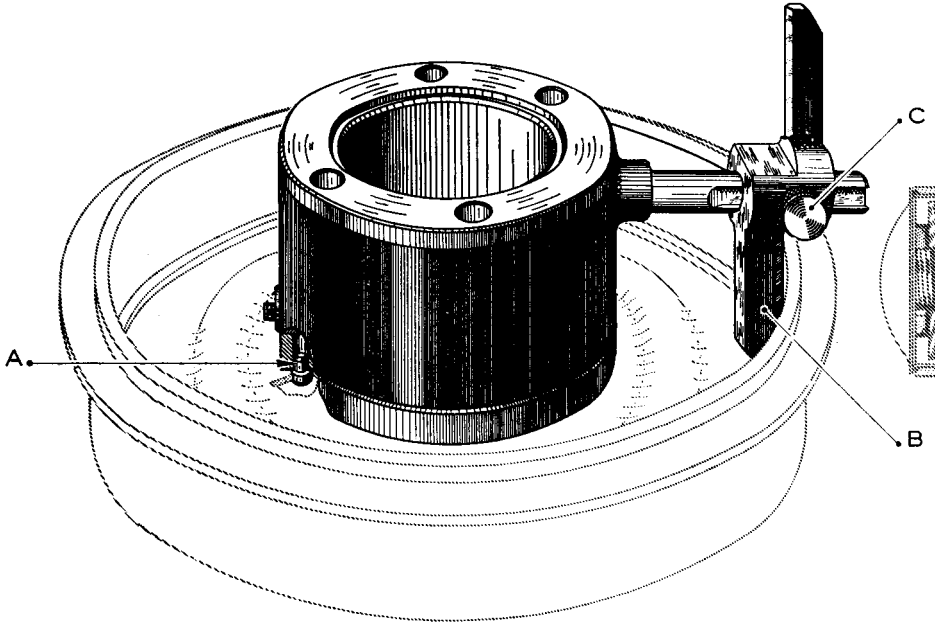
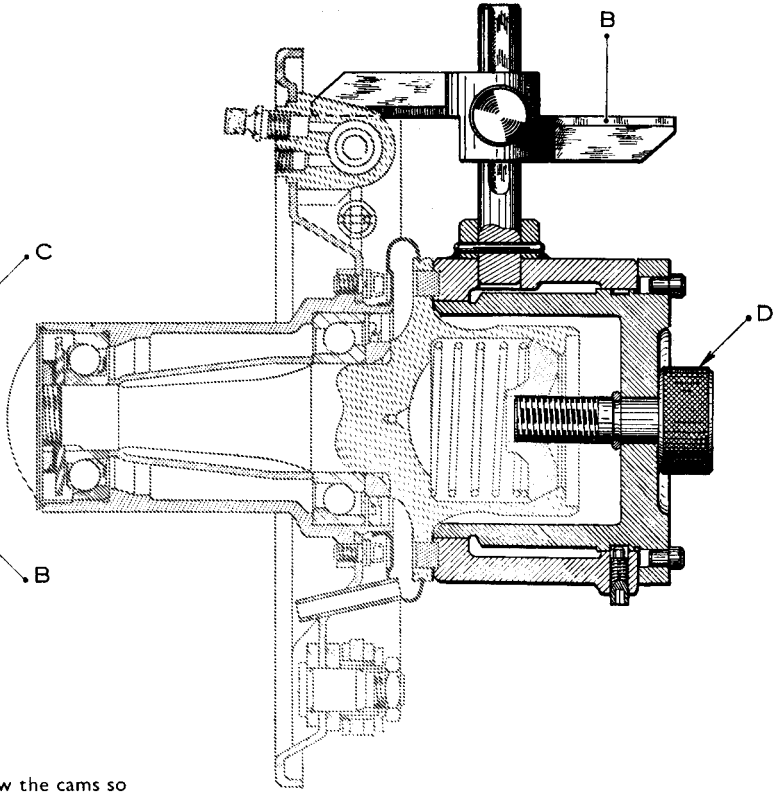


Fig. 2 ADJUSTMENT OF THE BRAKE SHOES

Place the gauge on the hexagon of the stub axle

Tighten screw D

Move the brake shoes by means of the adjusting cam so that the index B is level with the lining all the way round.



After inspection unscrew the cams so as to allow the brake drums to be fitted.

HYDRAULIC BRAKE CONTROL

Fig. 1

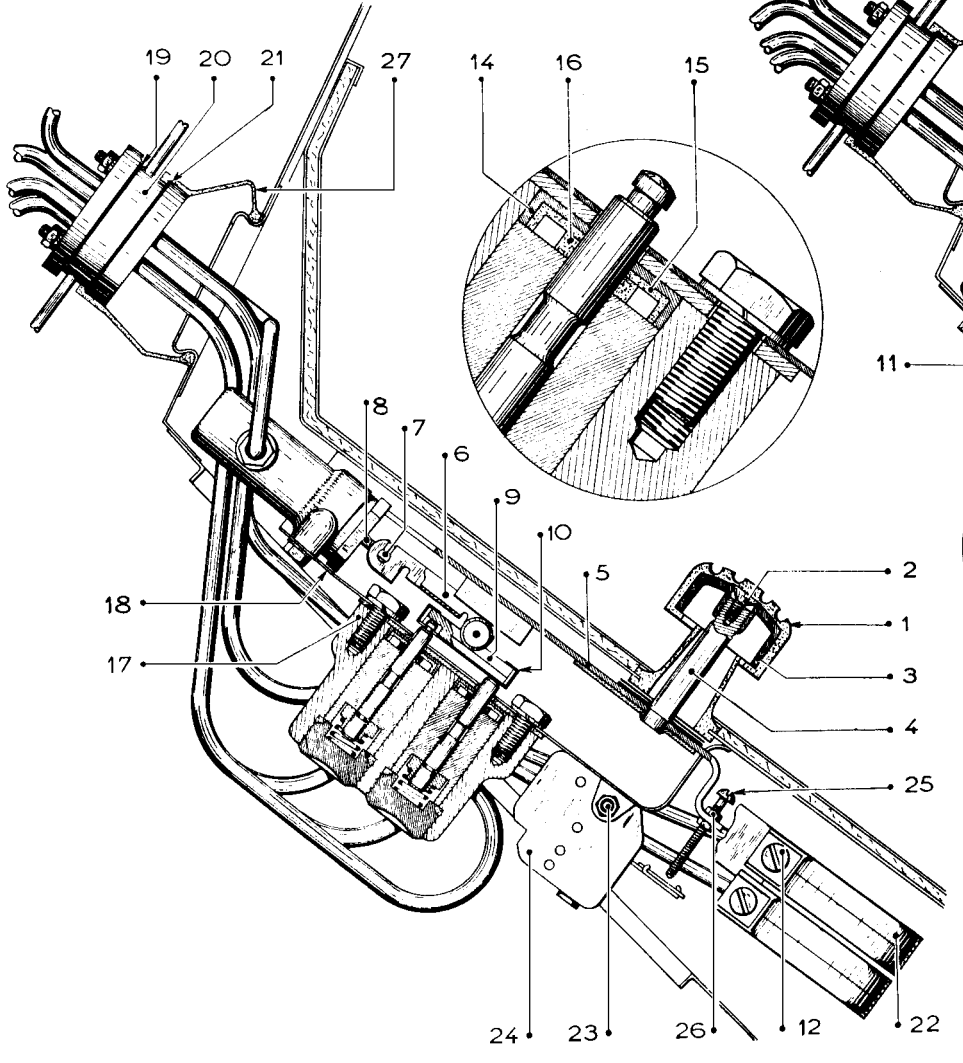
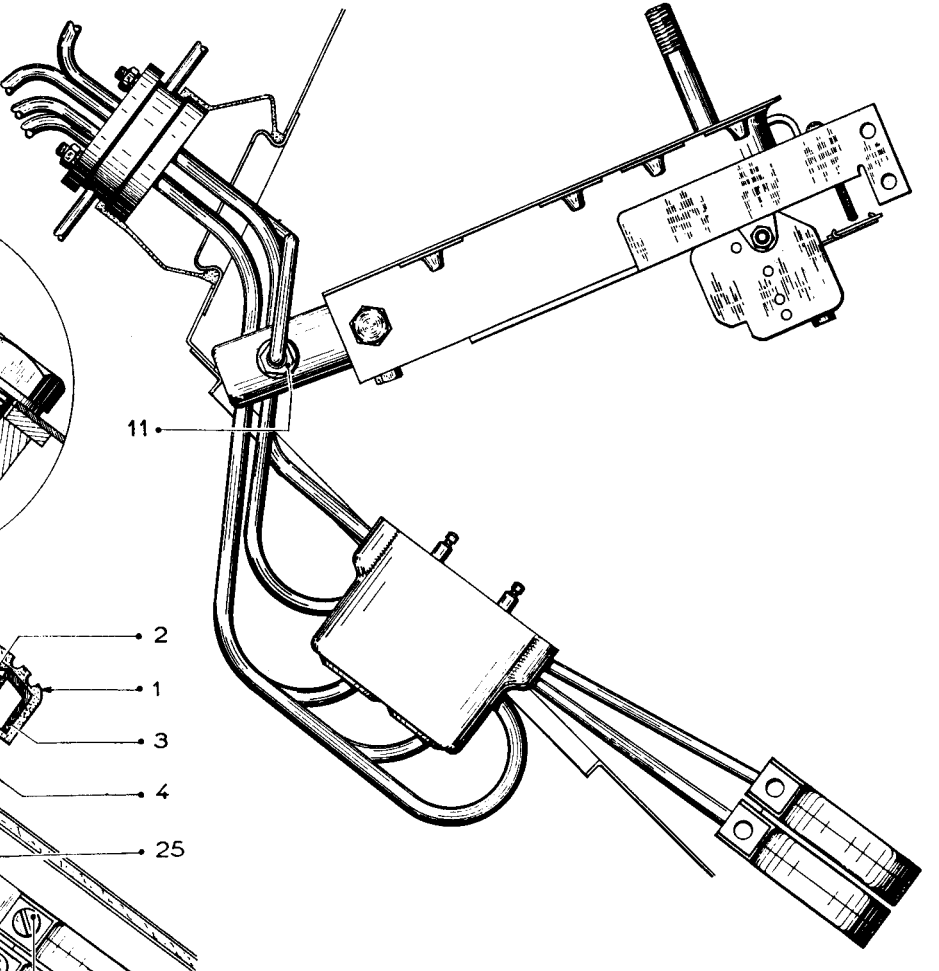


Fig. 2



HYDRAULIC BRAKE CONTROL

Fig. 1

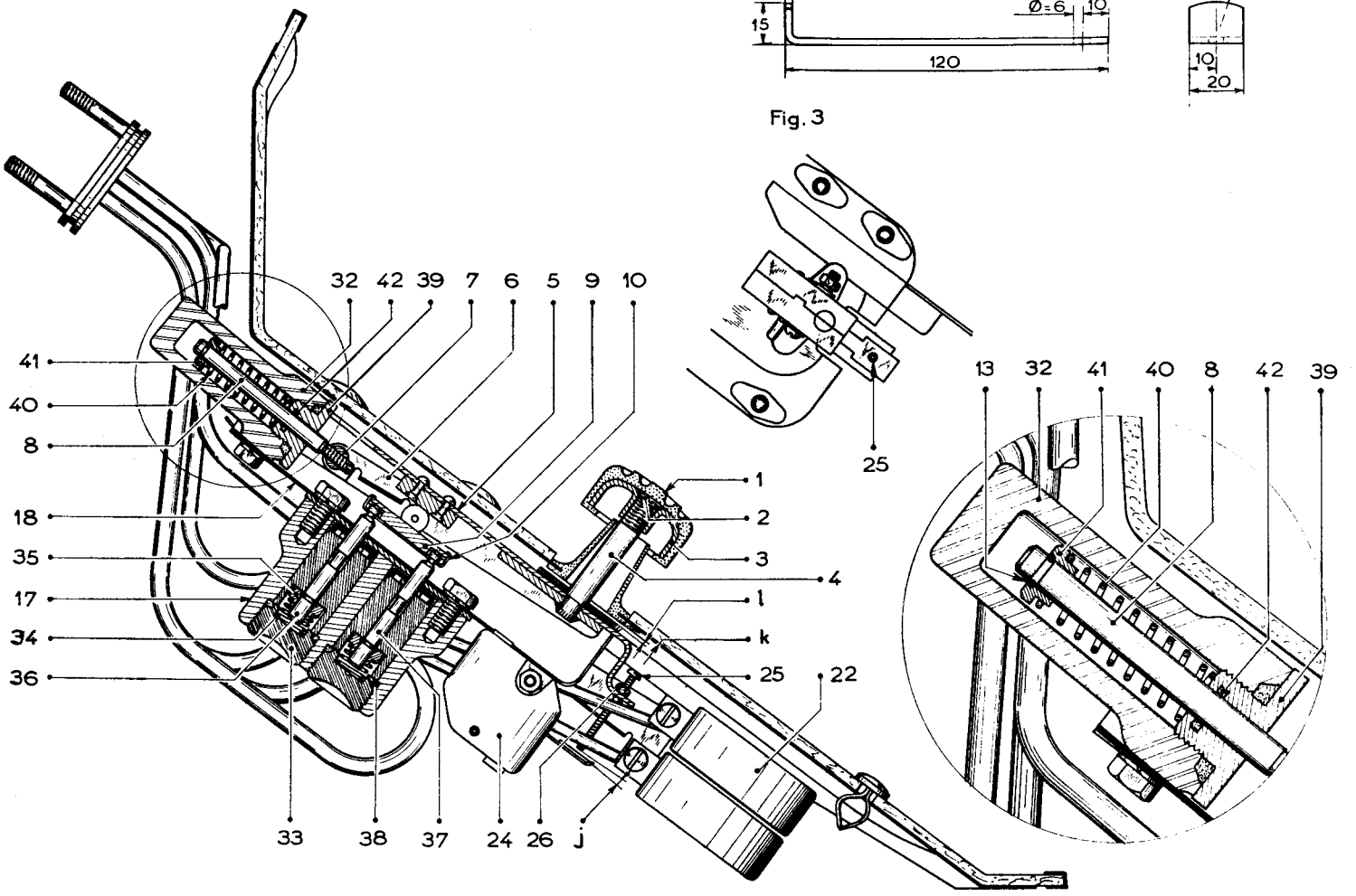


Fig. 2 SPANNER MR-3691-50
not sold

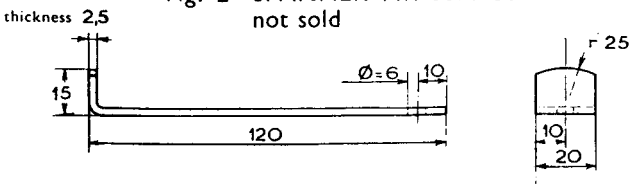
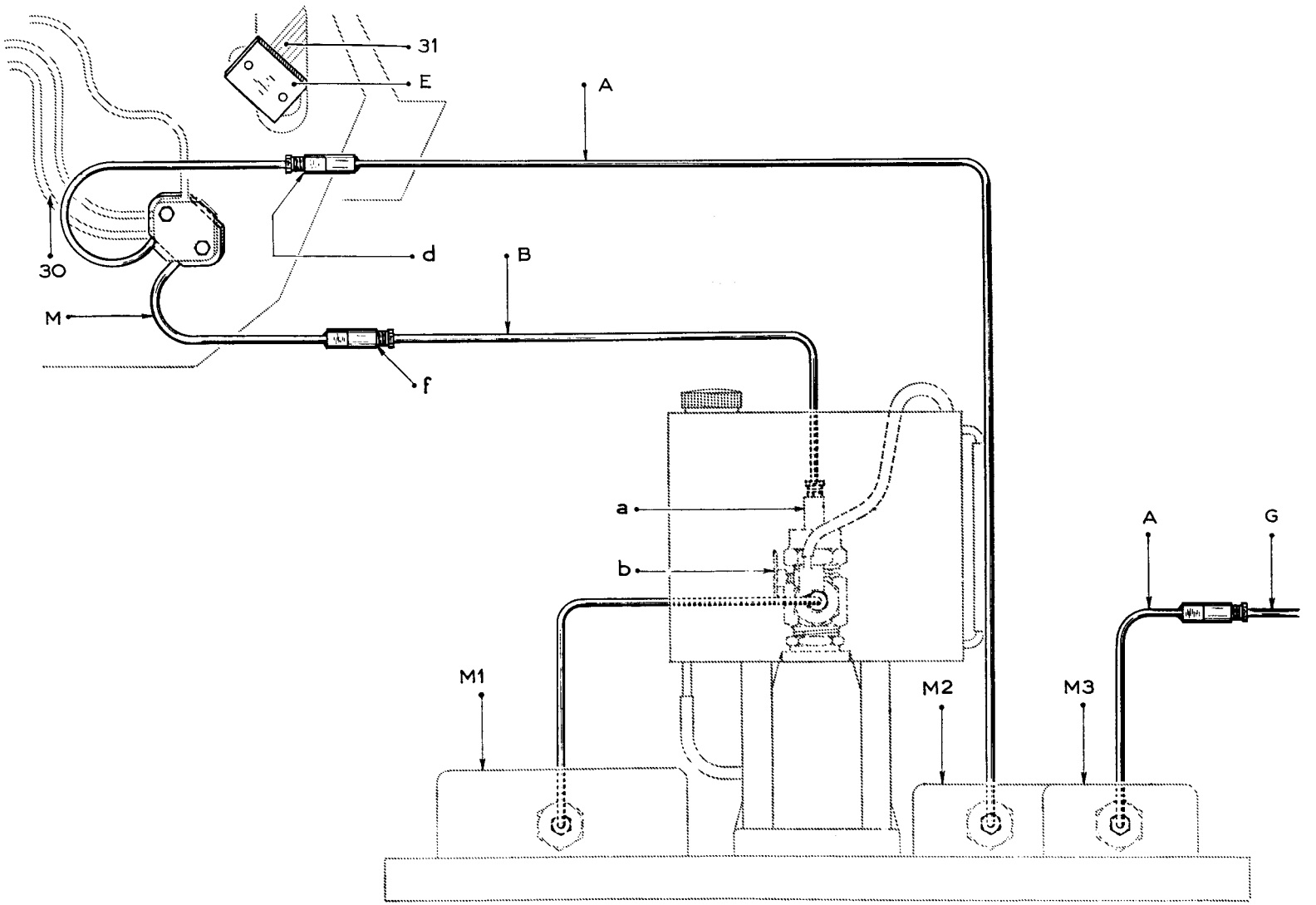


Fig. 3

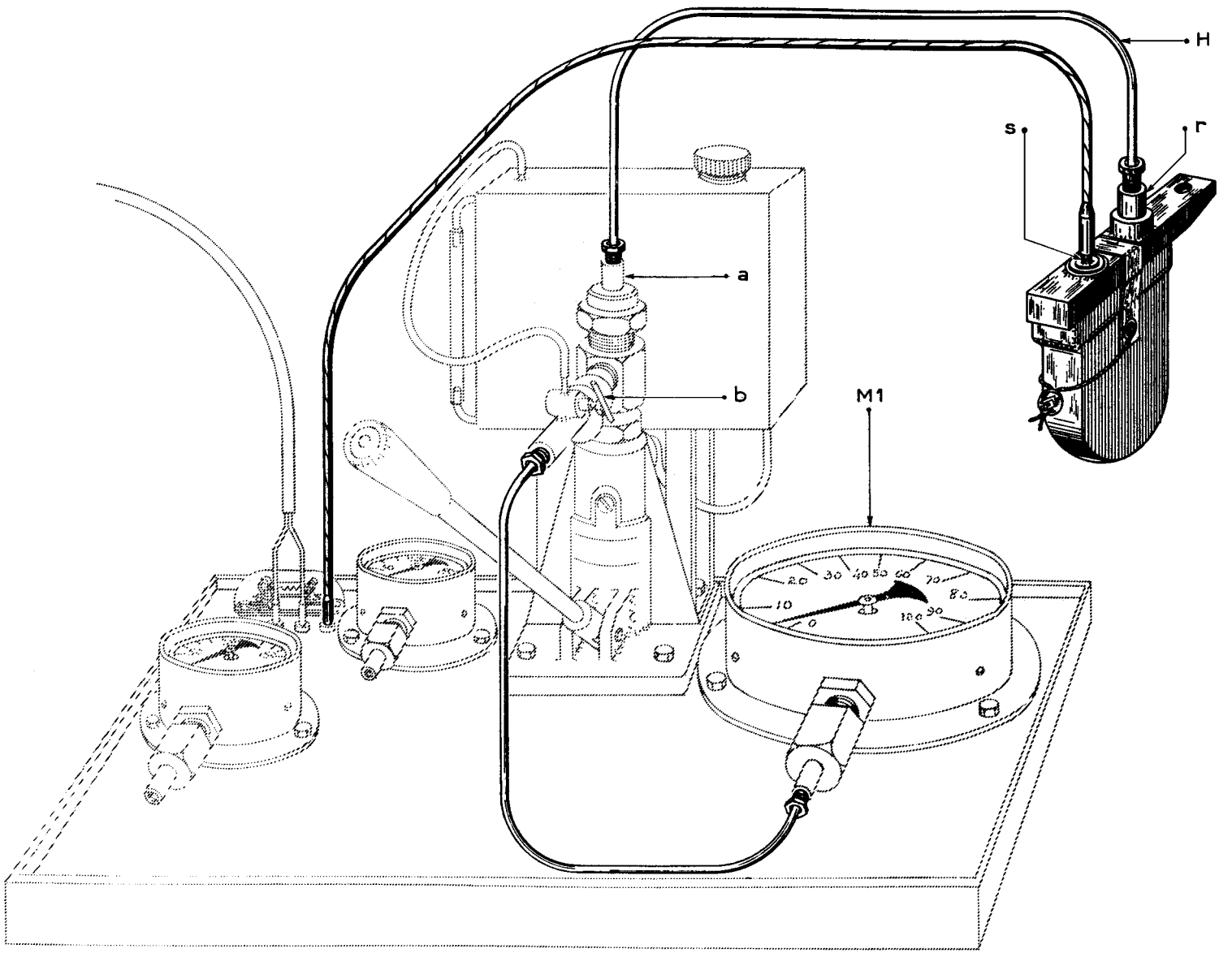
HYDRAULIC BRAKE CONTROL

ADJUSTING THE BRAKE COMPENSATION ON THE CAR



BRAKE PRESSURE SWITCHES

CHECKING THE OPERATION



MECHANICAL BRAKE CONTROL

Fig. 1

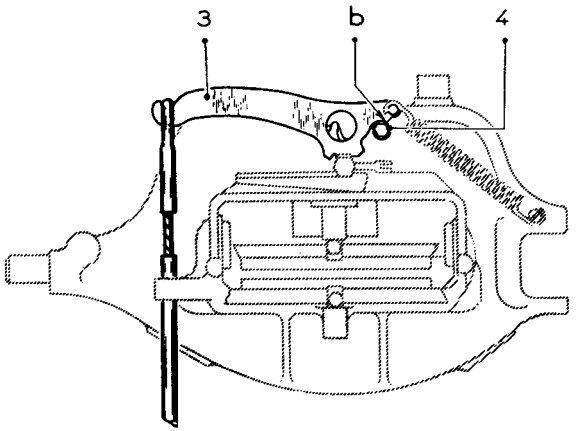


Fig. 2

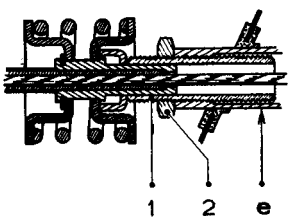
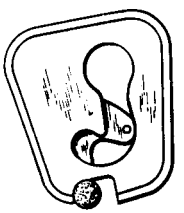


Fig. 3



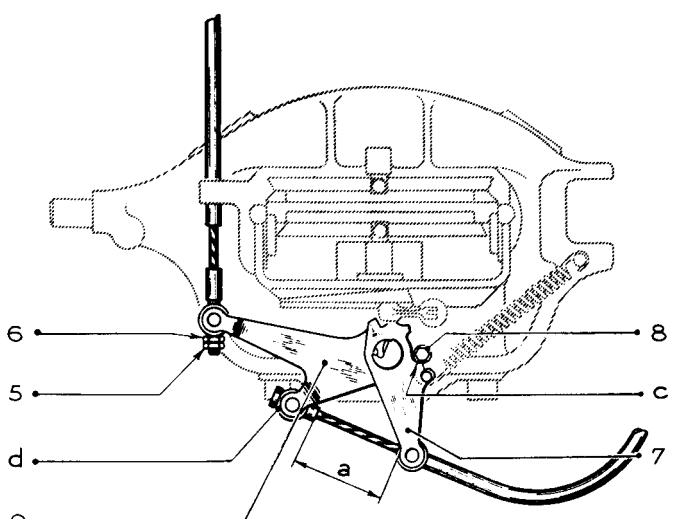
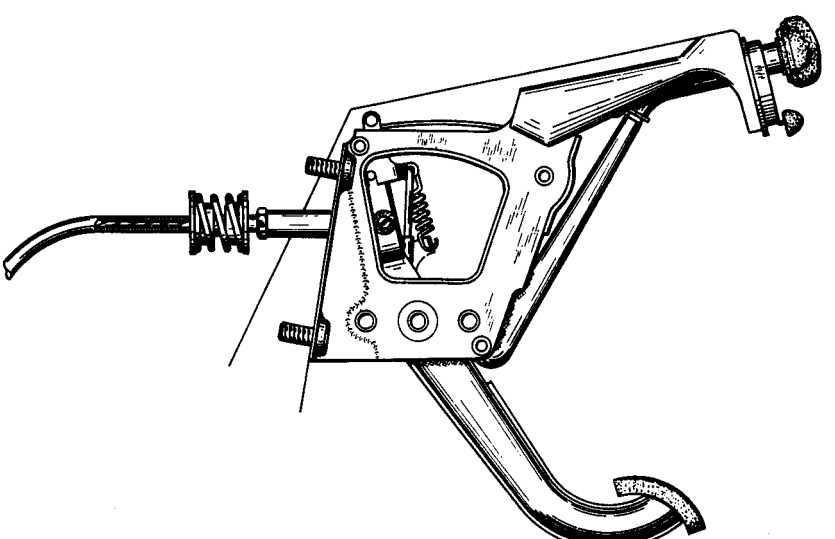
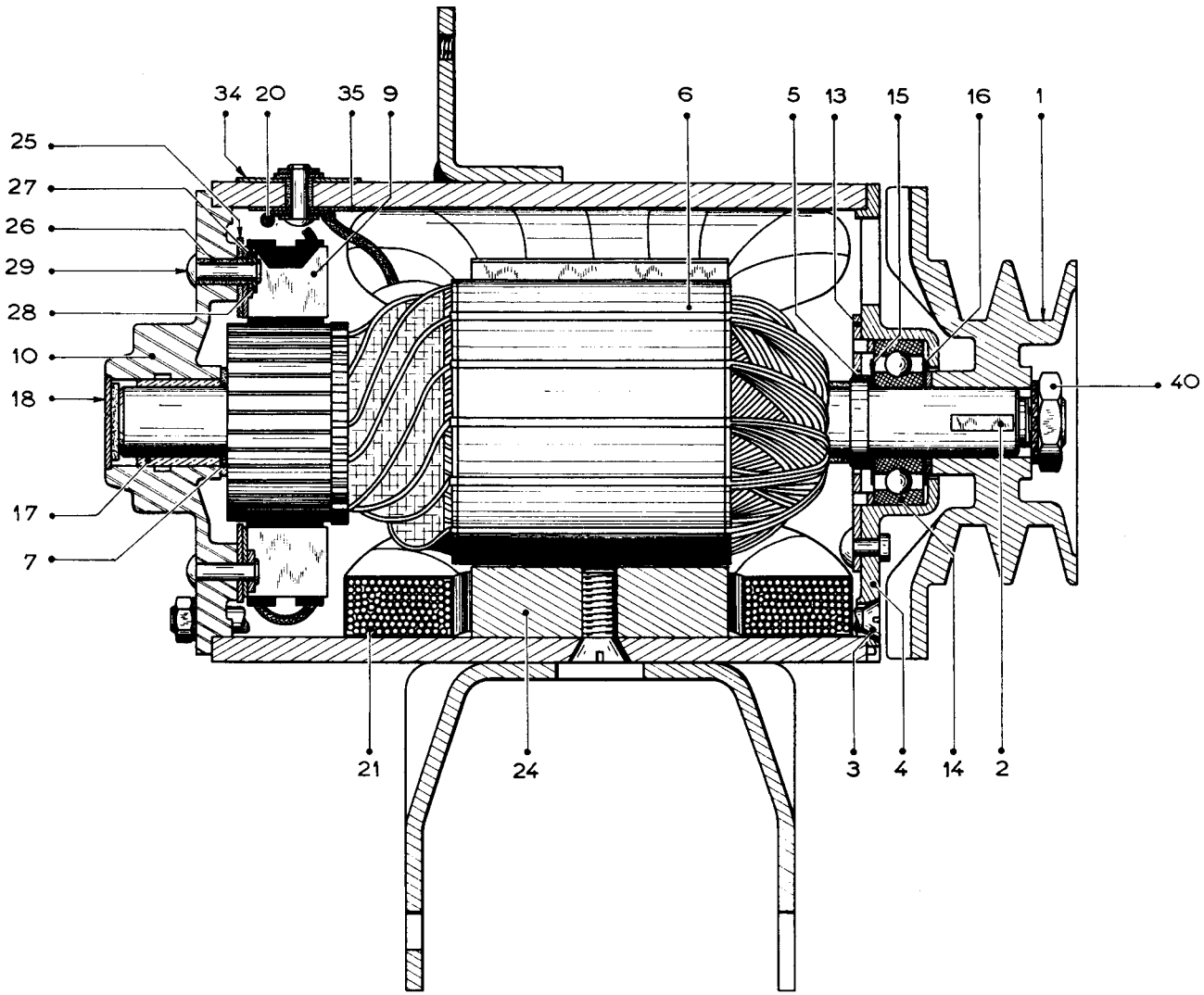


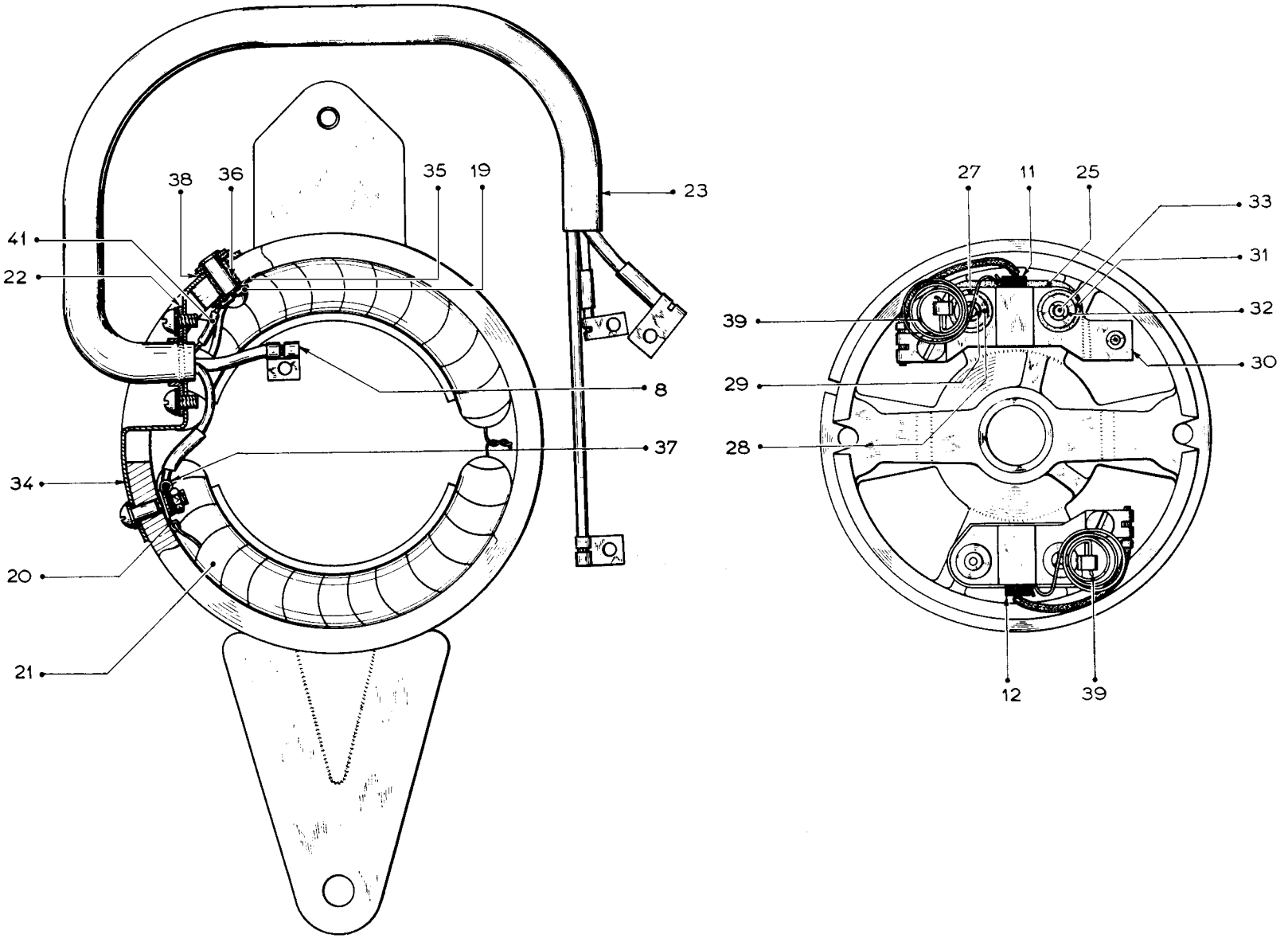
Fig. 4



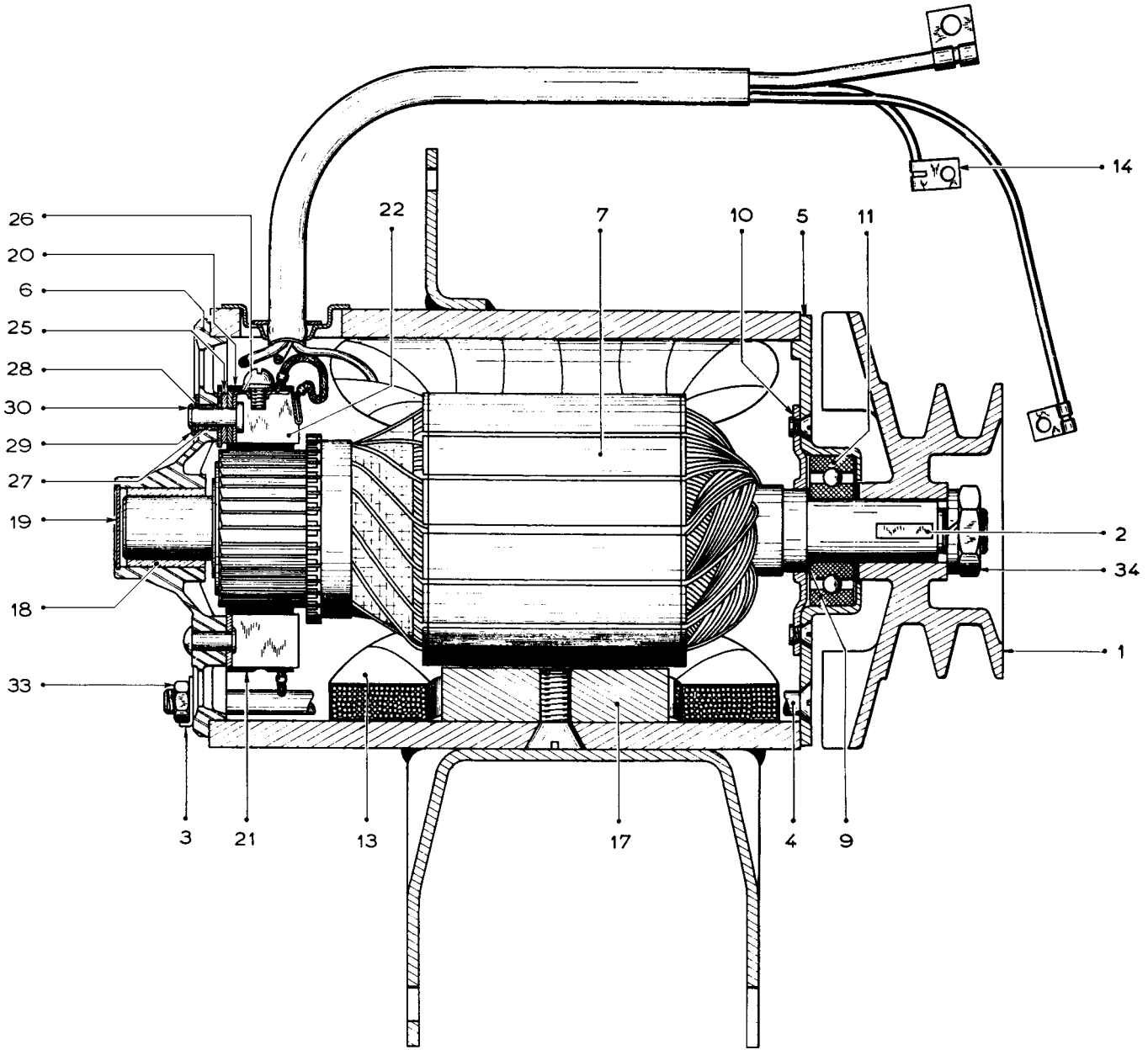
DUCELLIER DYNAMO 7116A



DUCELLIER DYNAMO 7116A



PARIS-RHONE DYNAMO G11R75



PARIS-RHONE DYNAMO G1IR75

Fig. 1

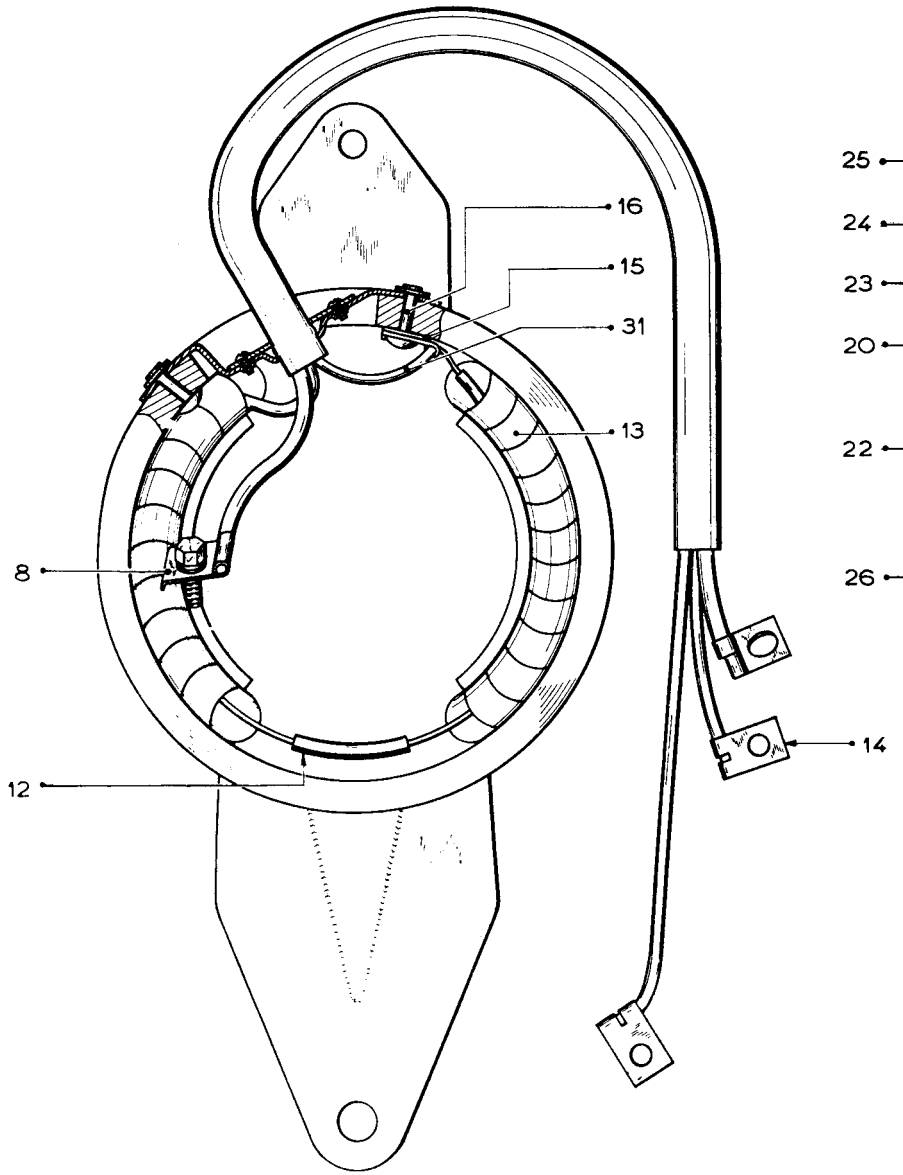
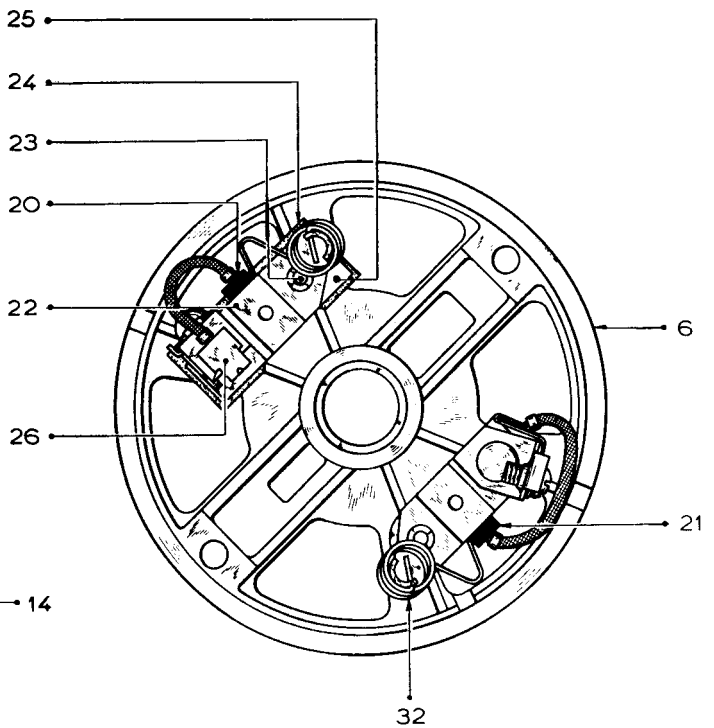
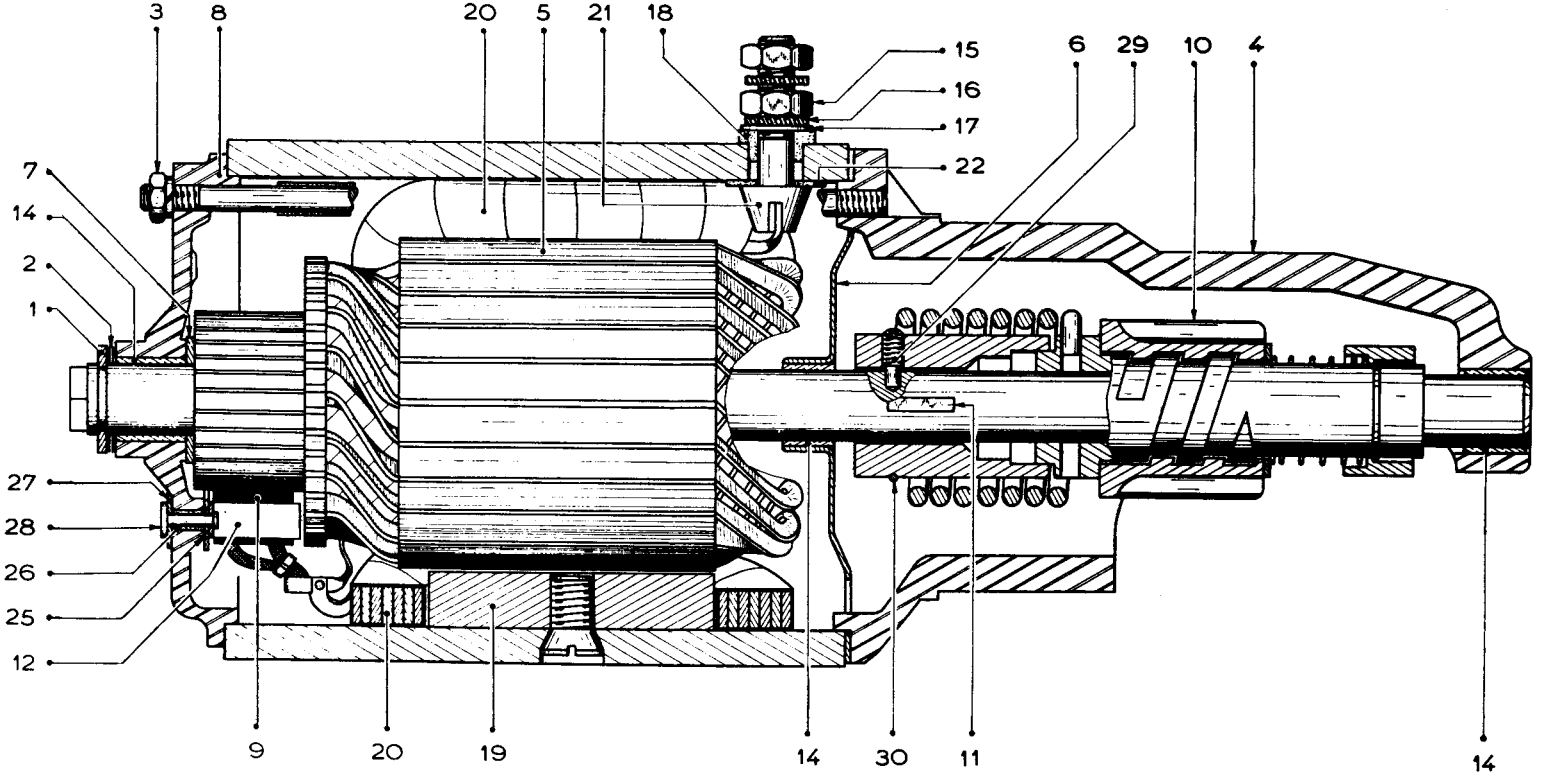


Fig 2



DUCELLIER STARTER 6008A



DUCELLIER STARTER 6008A

Fig. 1

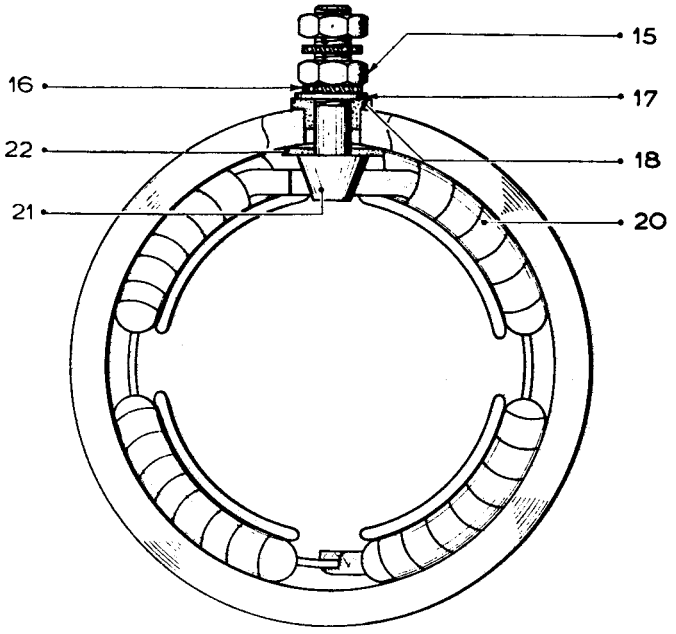


Fig. 2

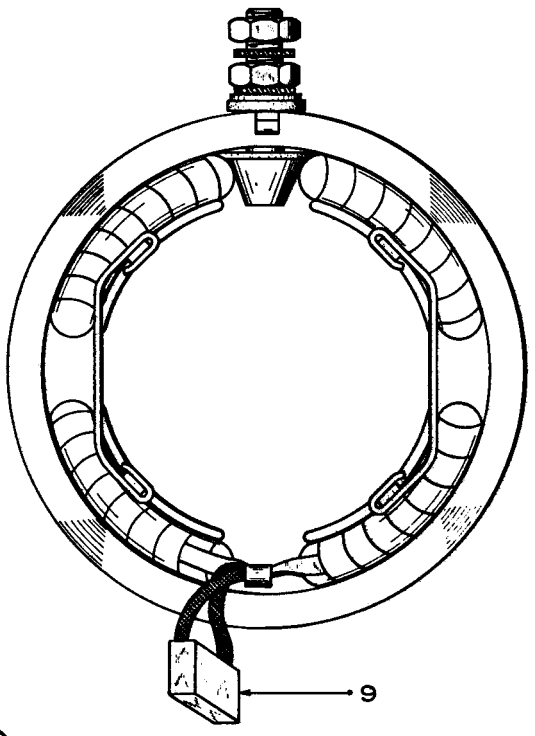
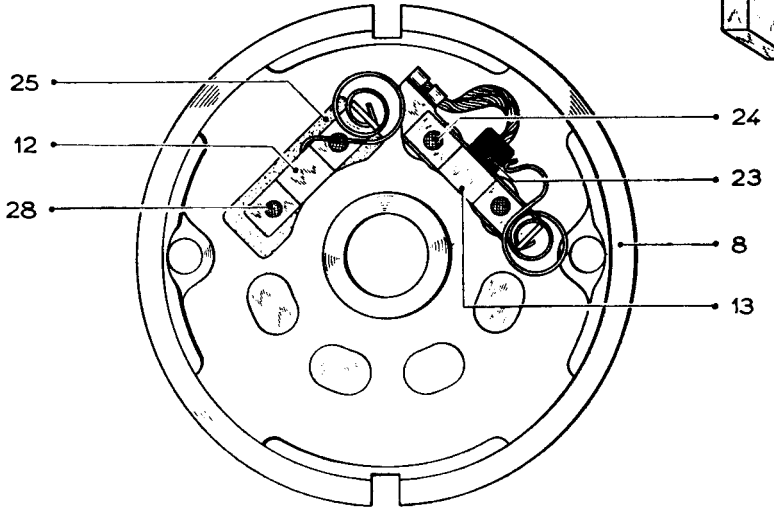
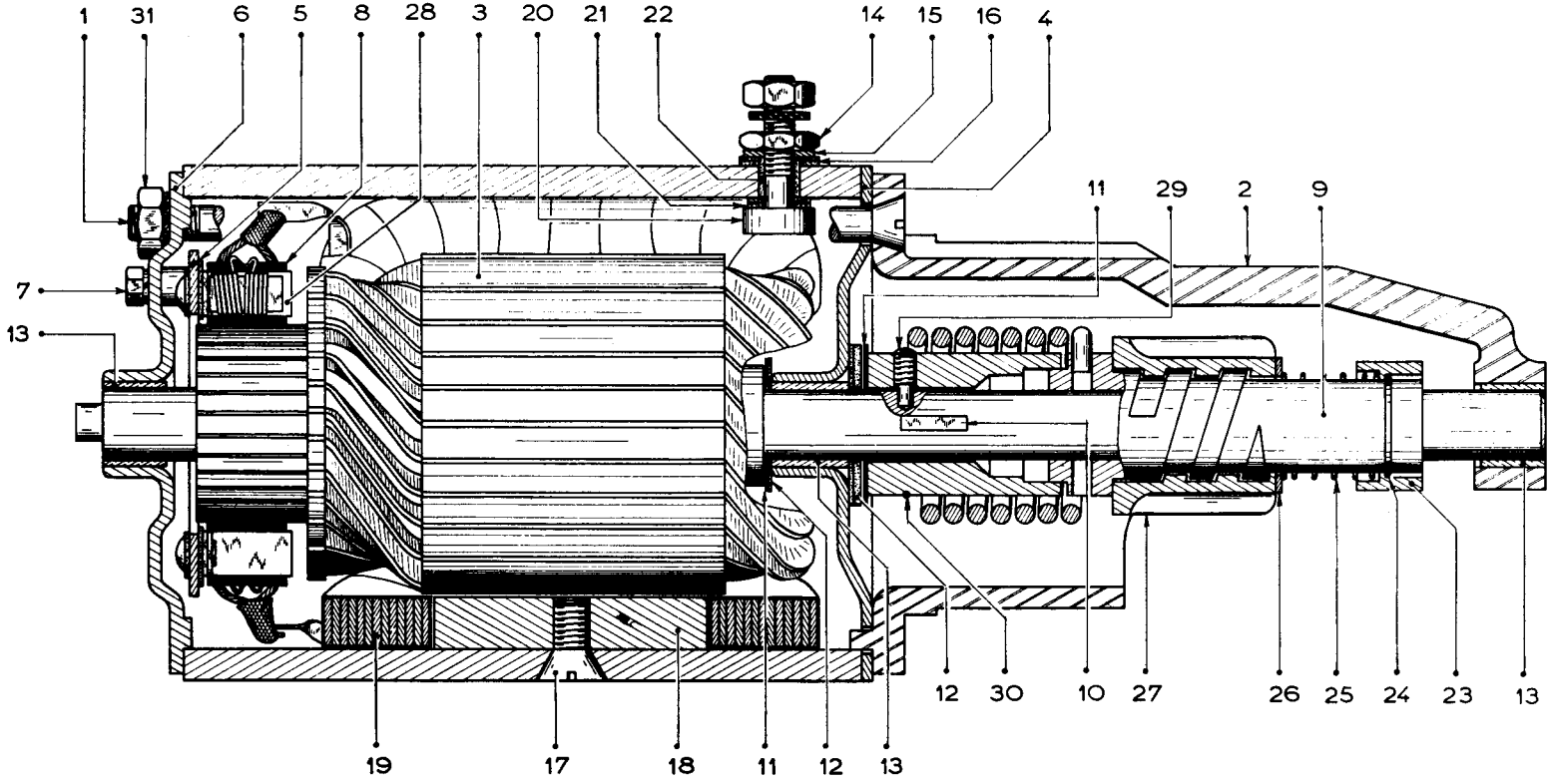


Fig. 3



PARIS-RHONE STARTER D11B42



PARIS-RHONE STARTER D11B42

Fig. 1

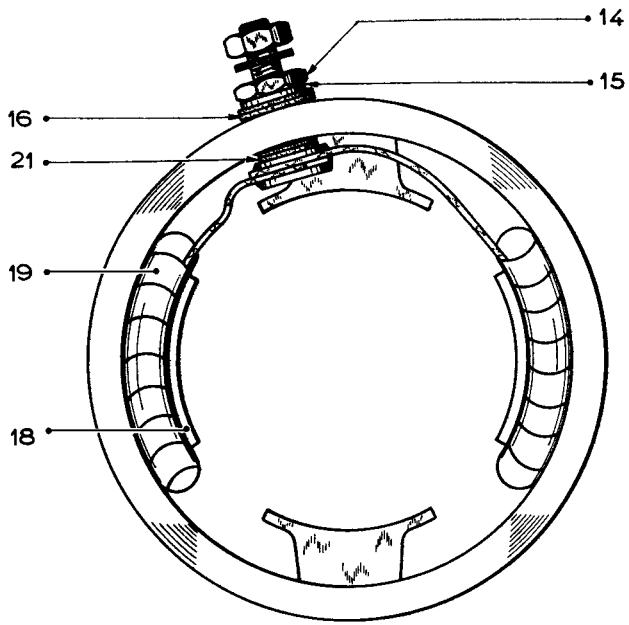


Fig. 2

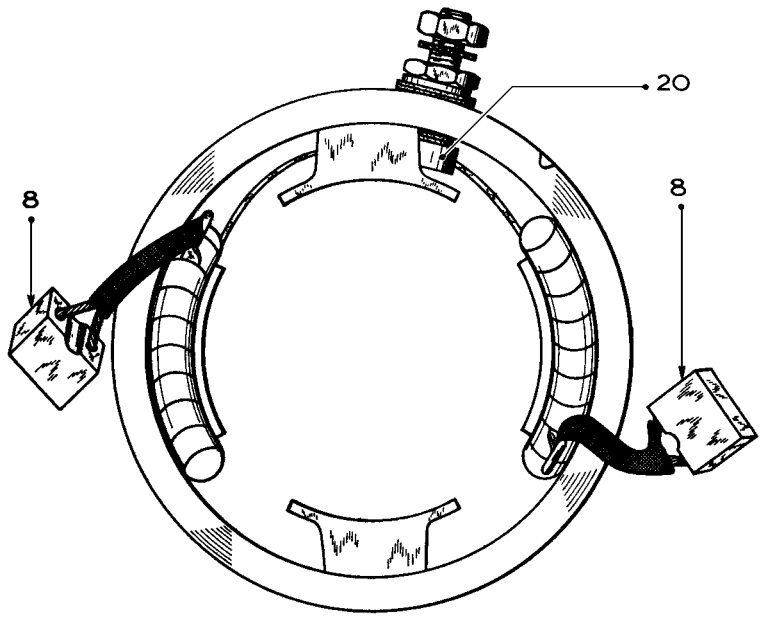
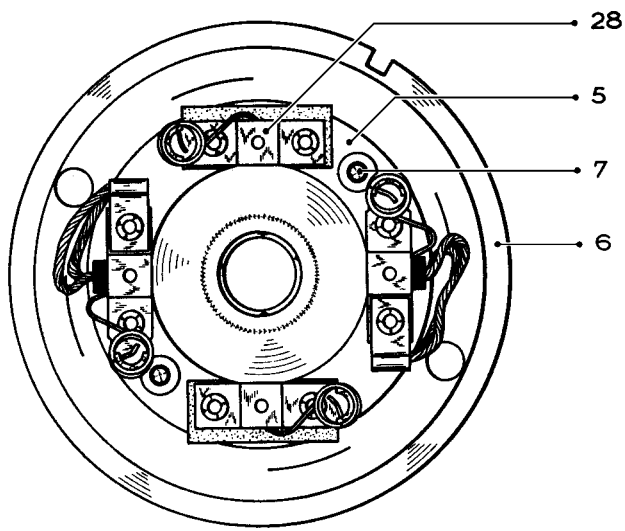


Fig. 3



BENADA DRIVE

Fig. 1

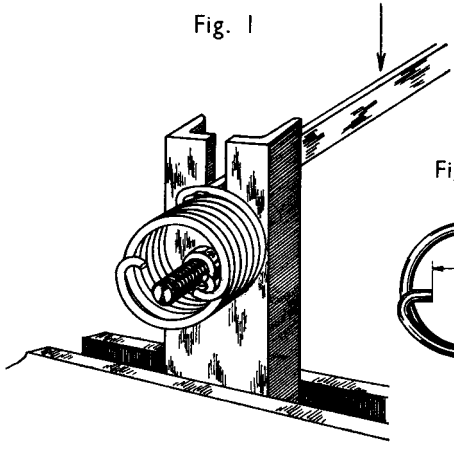


Fig. 2

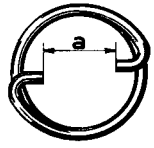


Fig. 3

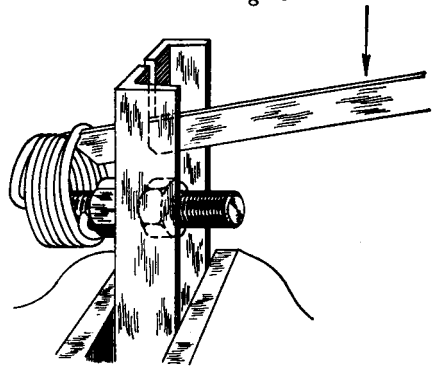


Fig. 4

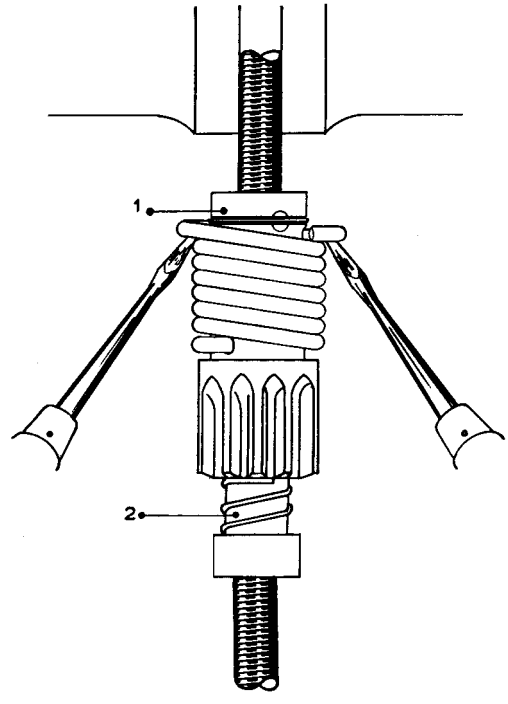


Fig. 5

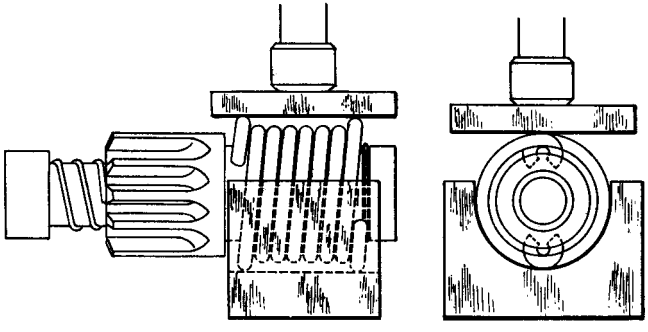


Fig. 6 SUPPORT MR-3526-13

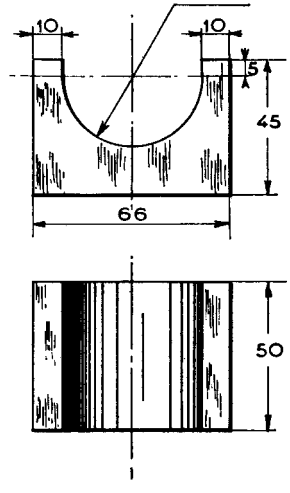


Fig. 8 SUPPORT MR-3526-11
not sold

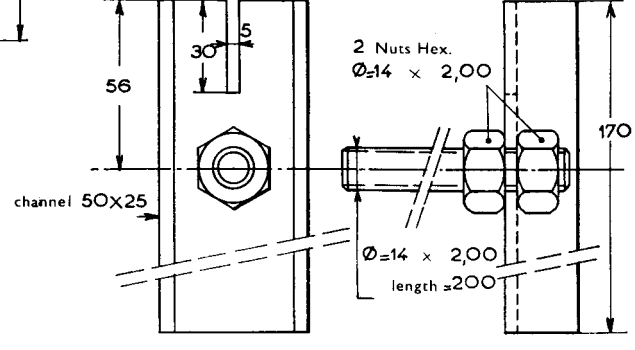
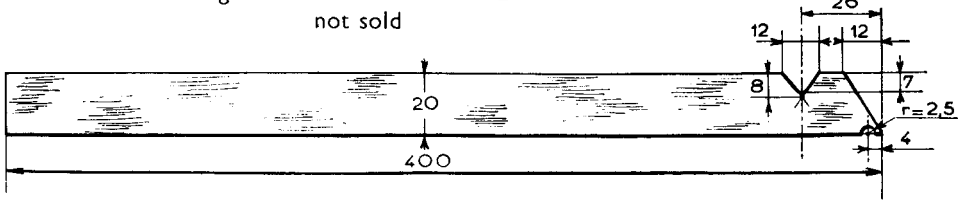


Fig. 7 LEVER MR-3526-12
not sold



ASSEMBLY OF FIELD COILS AND FIELD MAGNETS

Fig. 1 POSITIONING THE COILS

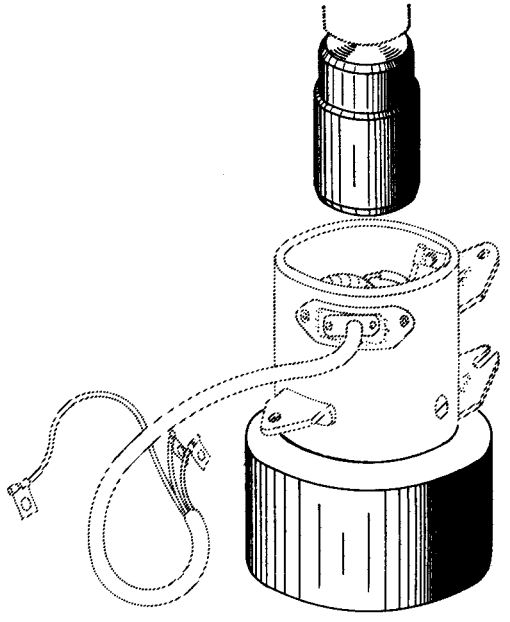
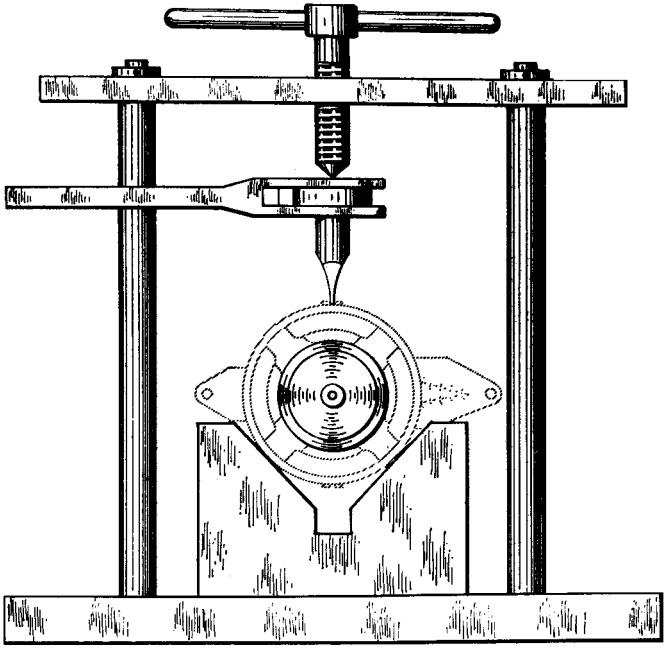


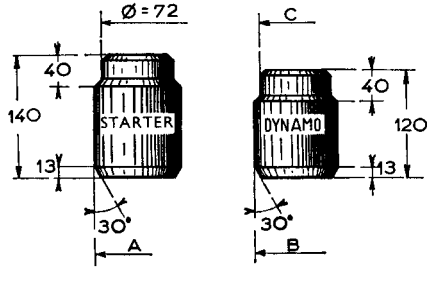
Fig. 2 ASSEMBLY OF THE FIELD MAGNETS

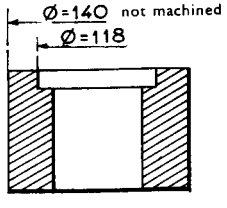


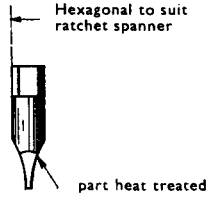
MR-1601-1 MR-1601-2 MR-1601-3 MR-1601-4

Tools not sold.

		Paris-Rhône	Ducellier
Starter	A	Ø = 76,8 $^{+0,15}_{-0,10}$	Ø = 74,4 $^{+0,15}_{-0,10}$
Dynamo	B	Ø = 72,5	Ø = 68,5
	C	Ø = 69	Ø = 65



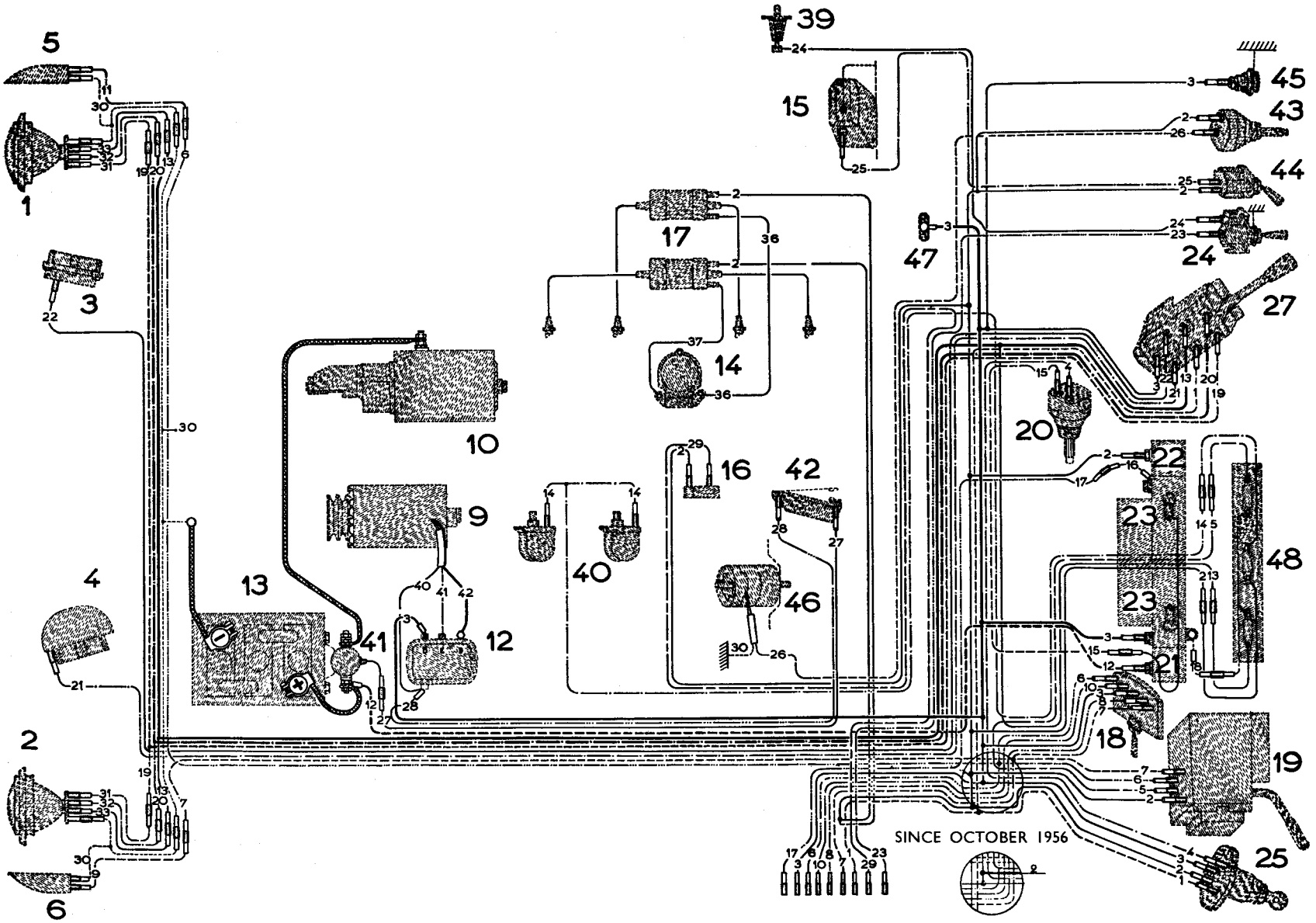




Mild steel case hardened and ground

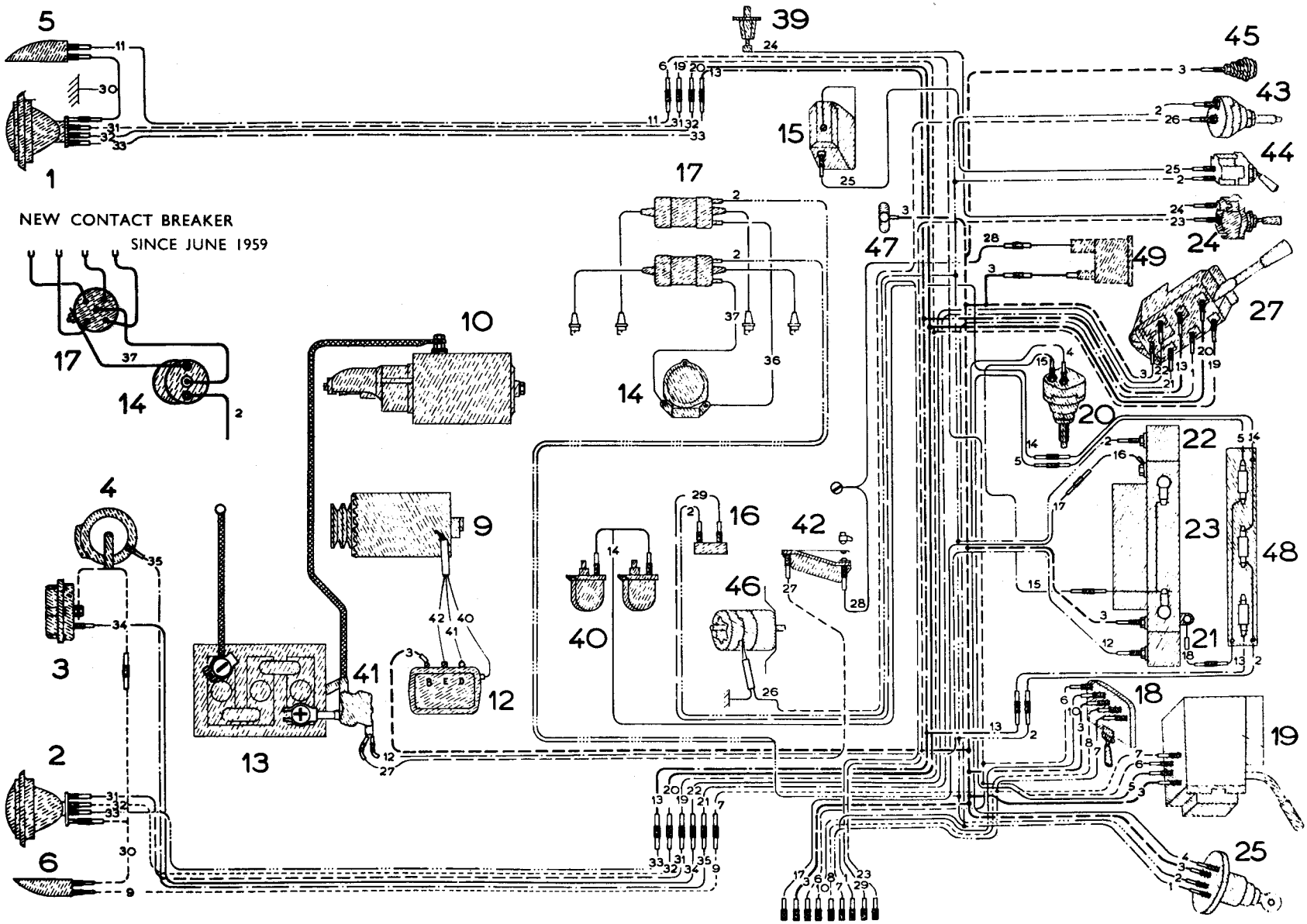
WIRING DIAGRAM

FRONT HARNESS



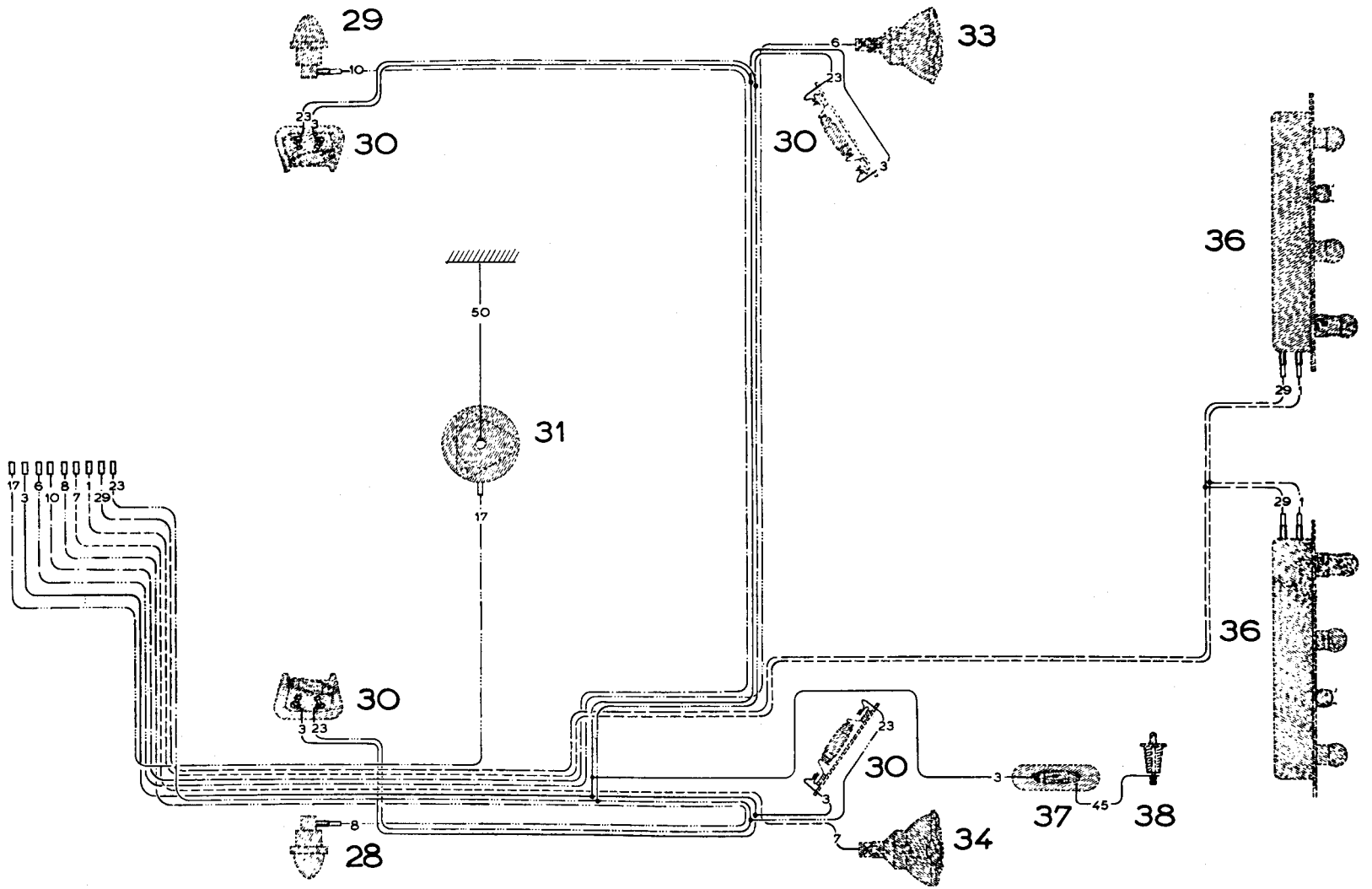
WIRING DIAGRAM

FRONT HARNESS SINCE 1957



WIRING DIAGRAM

REAR HARNESS



HEATING AND DEMISTING CIRCUIT

Fig. 1

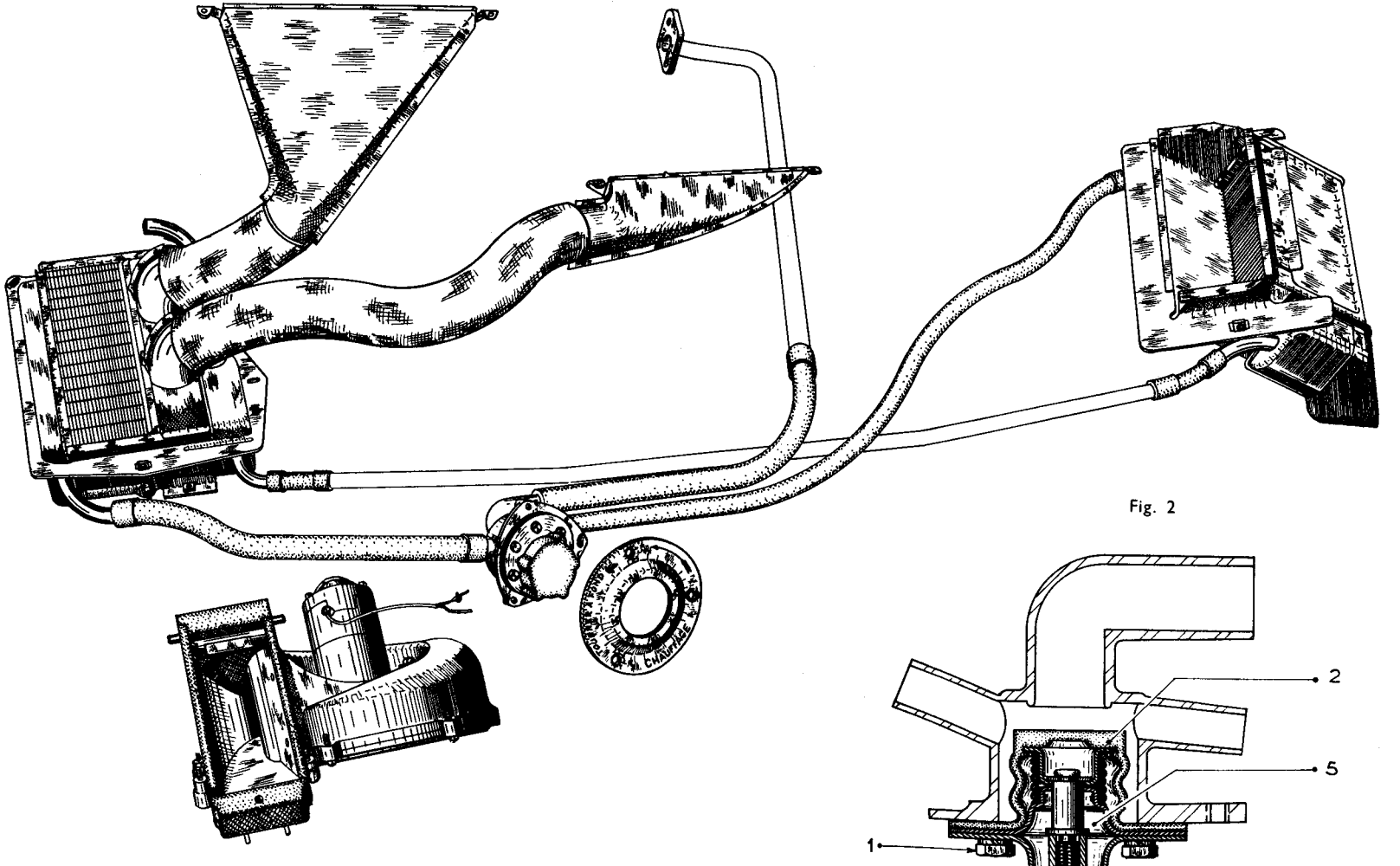
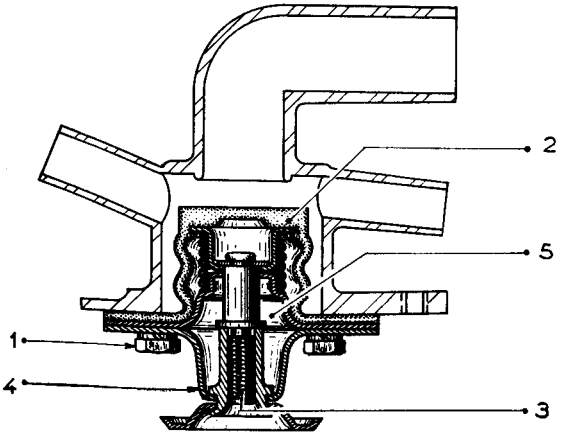


Fig. 2



LIFTING POINTS OF THE BODY

Fig. 1 POSITIONING THE SUPPORT

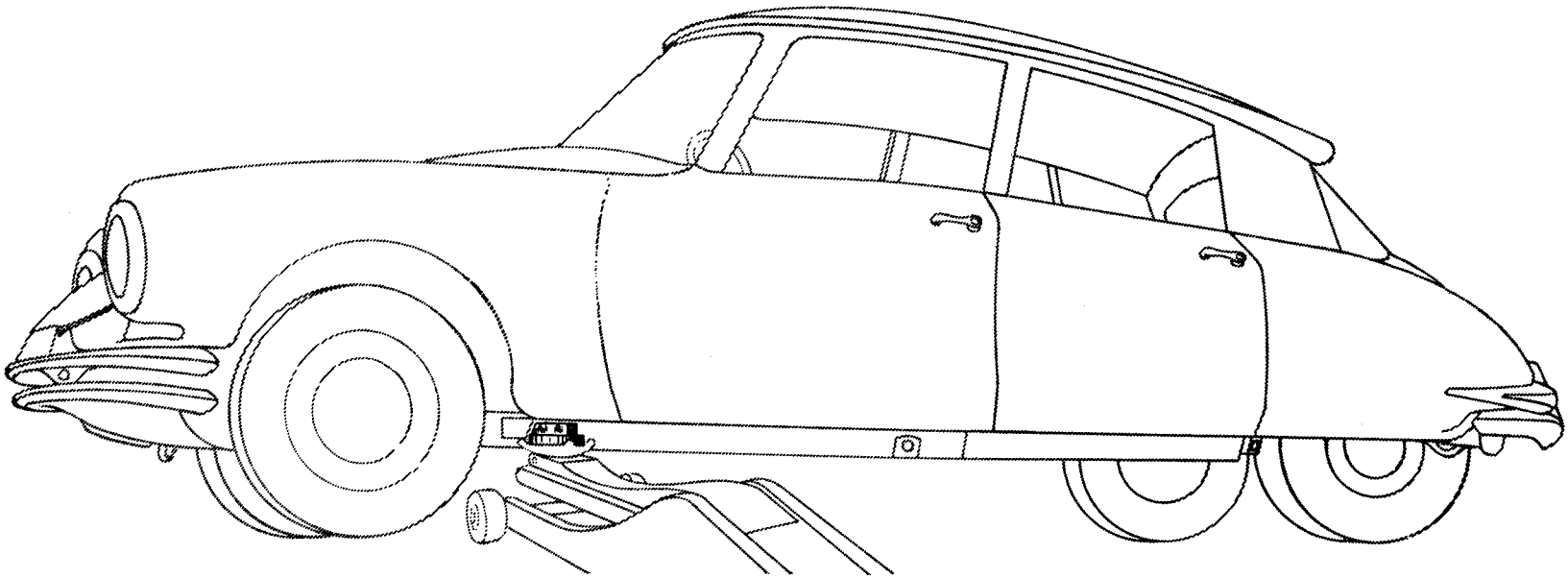
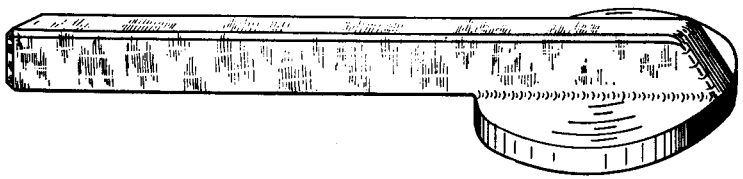


Fig. 2 JACKING SUPPORT
sold under No. 2505-T



INSPECTION OF CAMBER ANGLE

Fig. 1 METHOD OF USING THE CHECKING FIXTURE

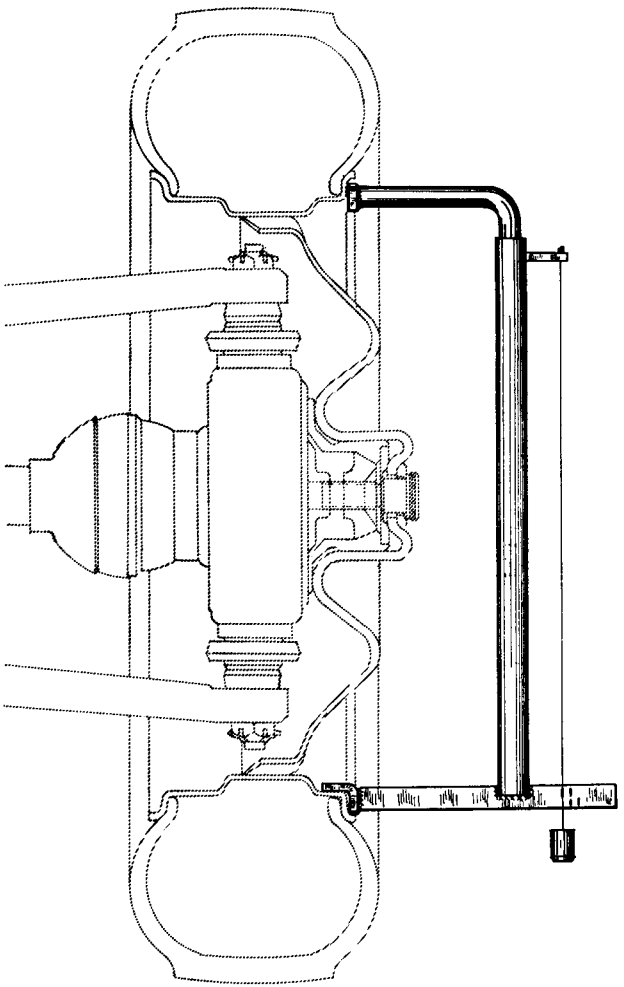
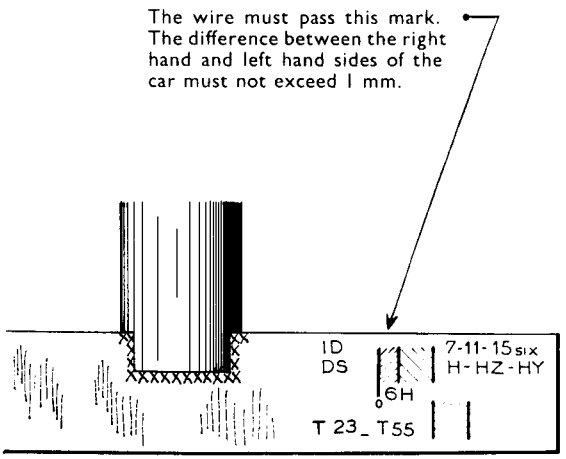


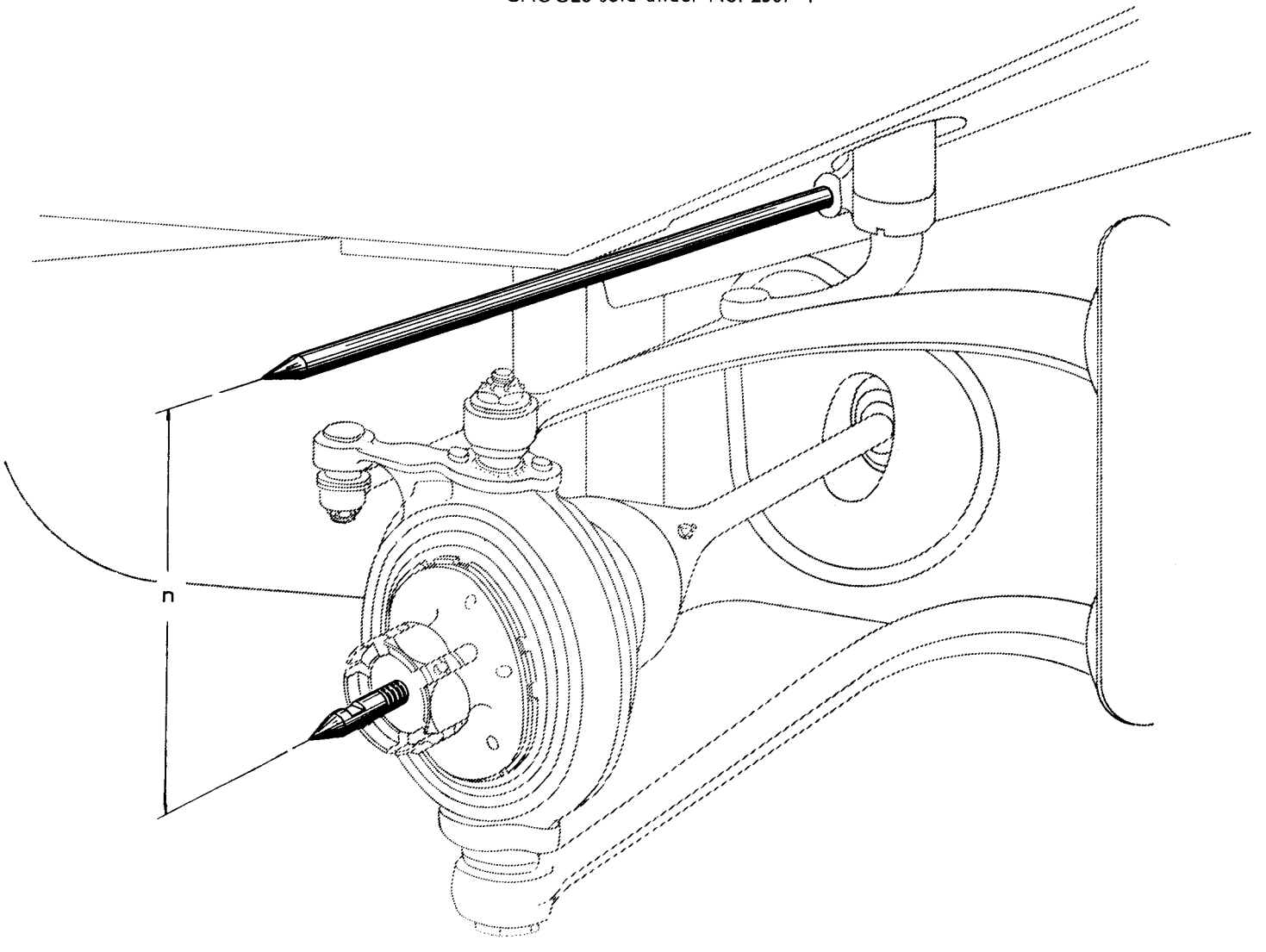
Fig. 2 DETAILS OF MARKING



CHECKING FIXTURE
sold under No. 2314–T

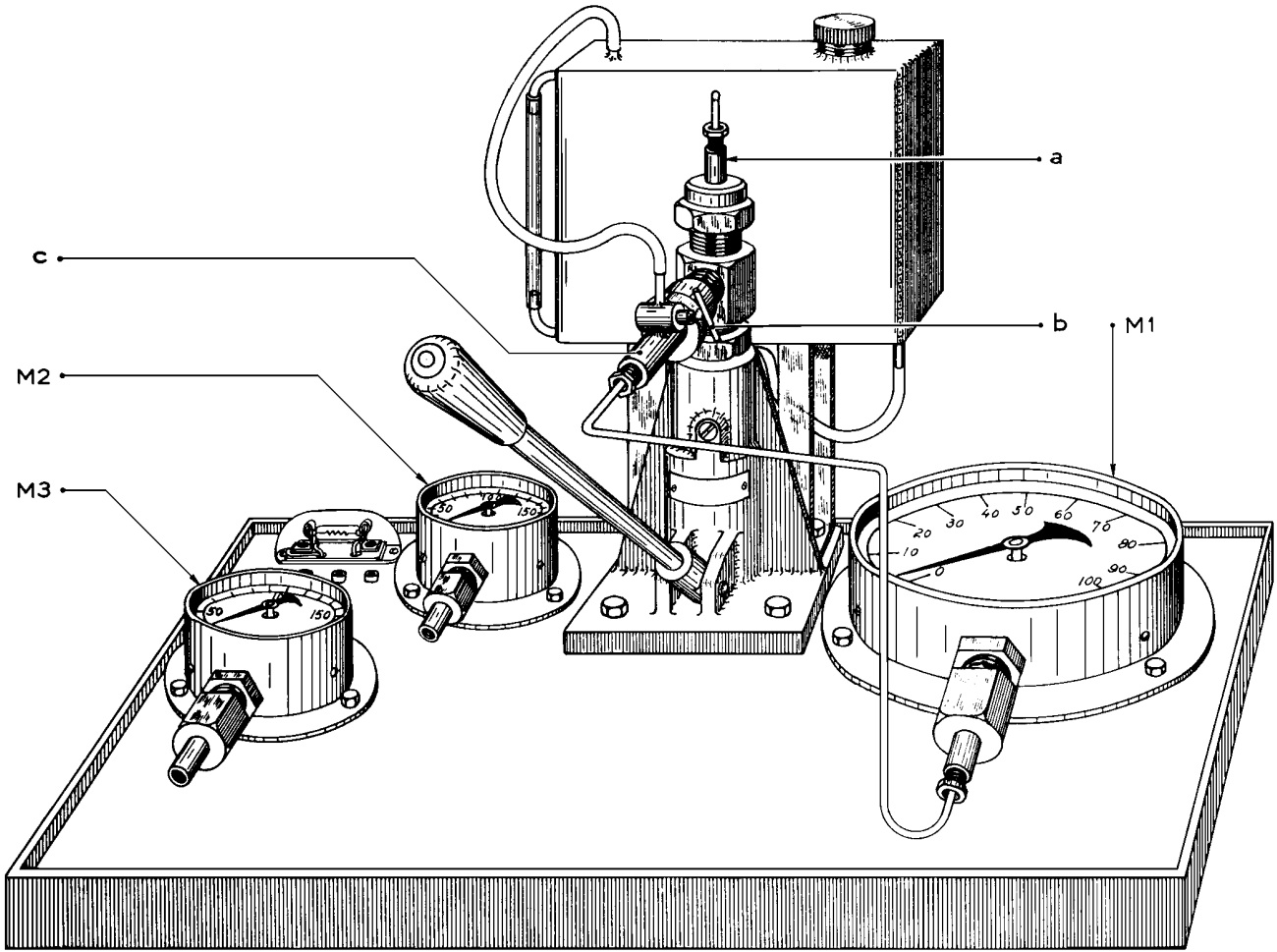
PRE-ADJUSTMENTS OF THE FRONT HEIGHTS

GAUGES sold under No. 2307-T



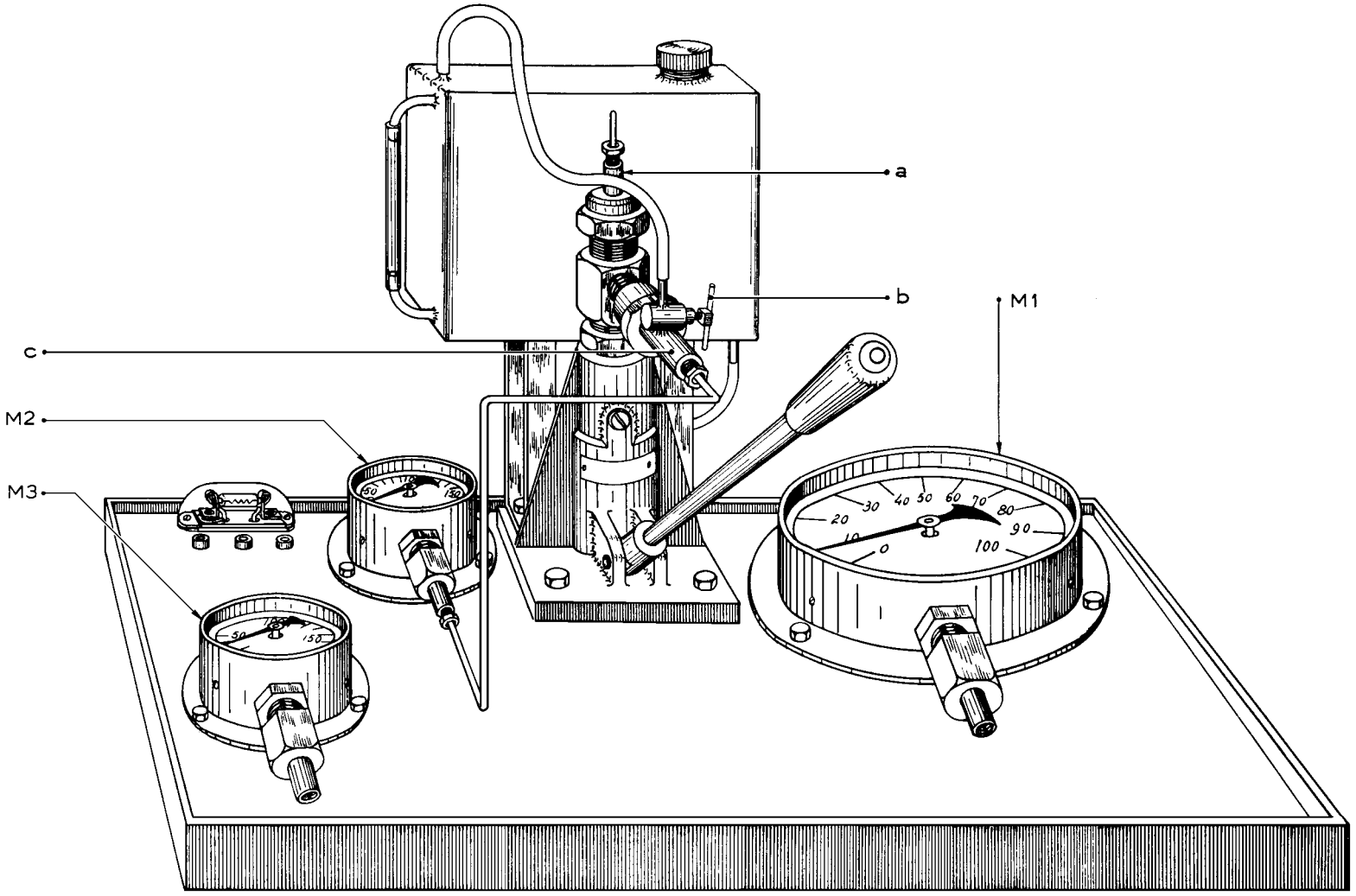
TEST BENCH

CONNECTIONS FOR PRESSURE GAUGE 0–1500 p.s.i. (0–100 kg.)

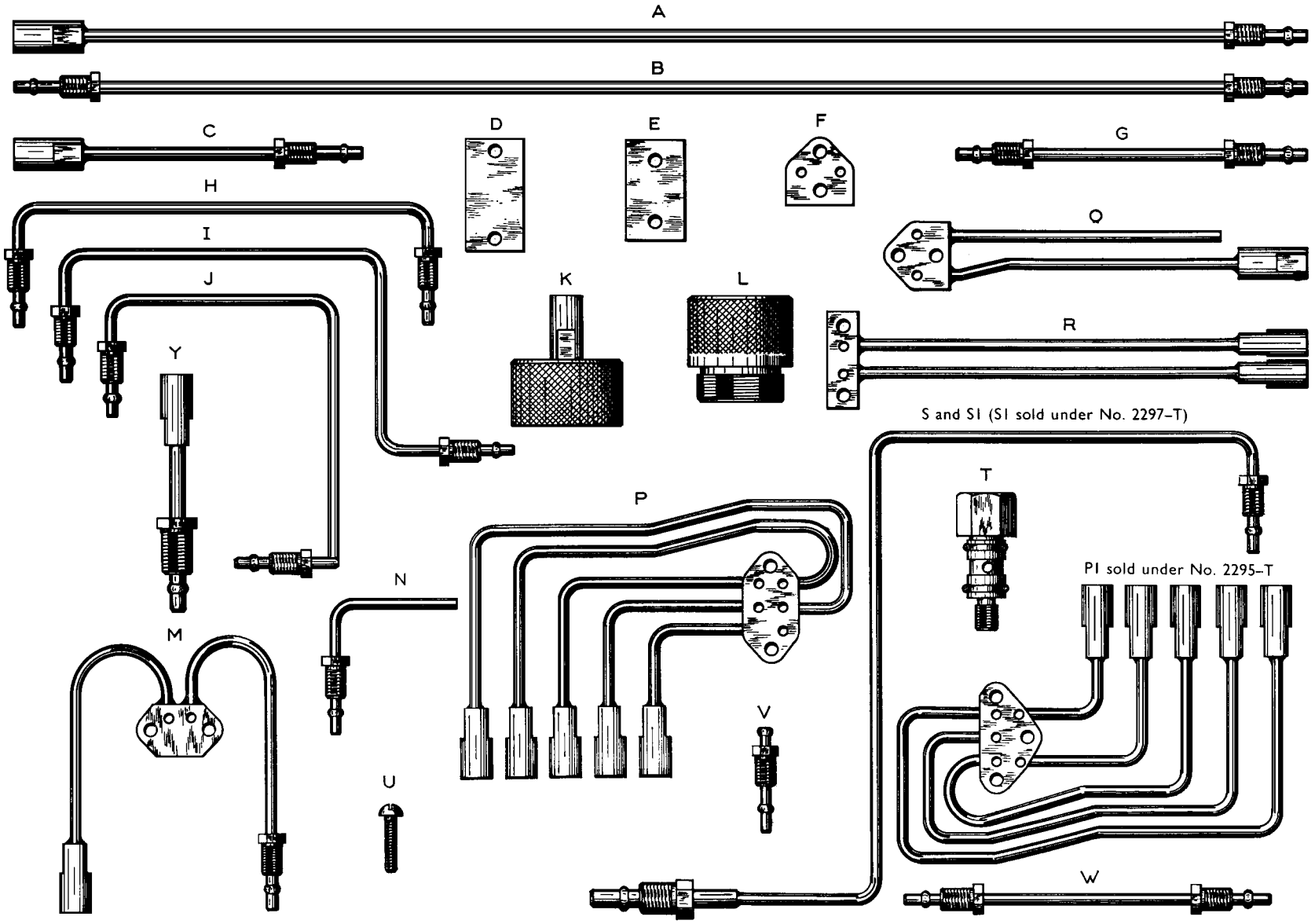


TEST BENCH

CONNECTIONS FOR PRESSURE GAUGE 0–3000 p.s.i. (0–200 kg.)

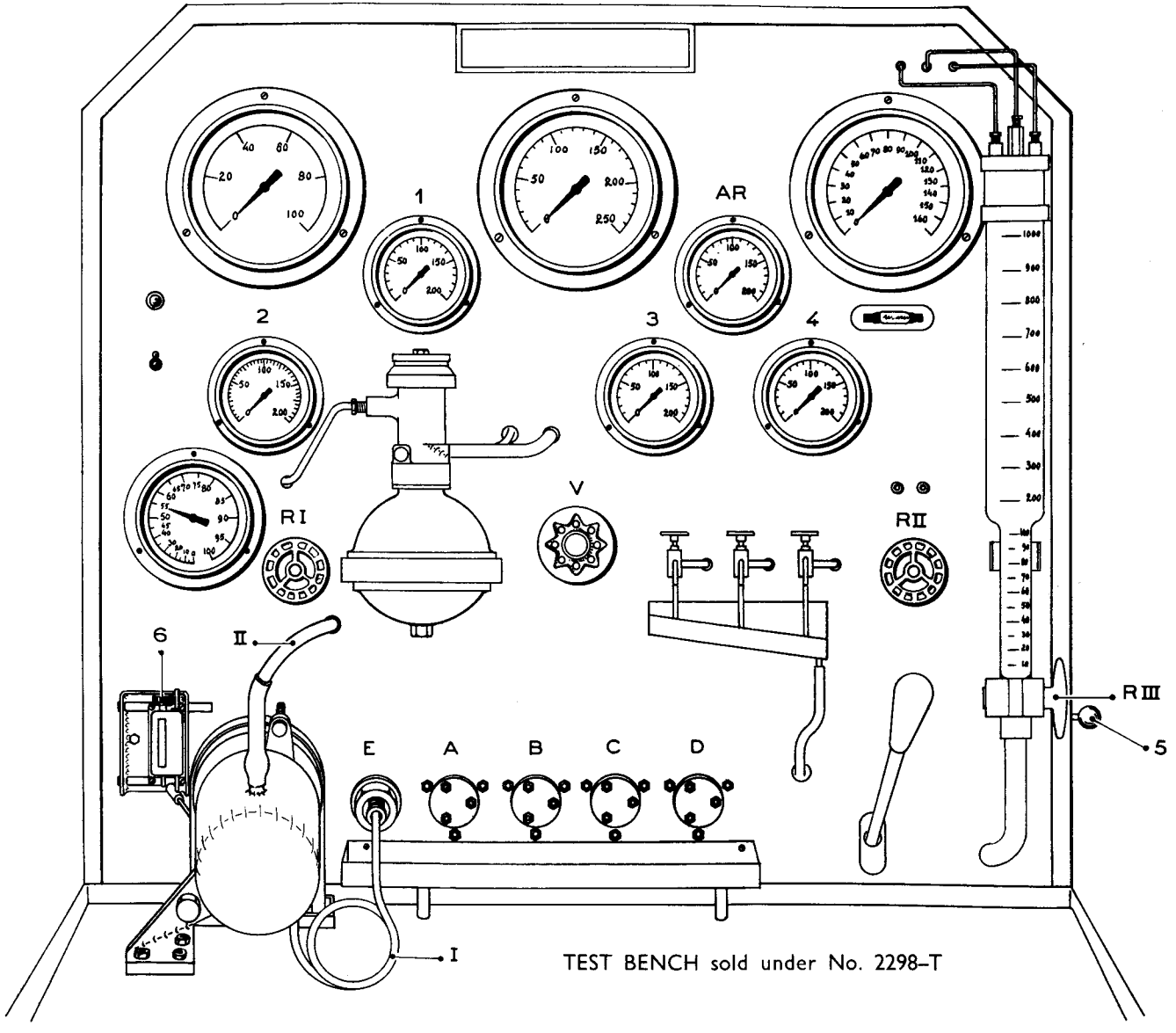


PIPES AND UNIONS



DYNAMIC TEST BENCH ASSEMBLY

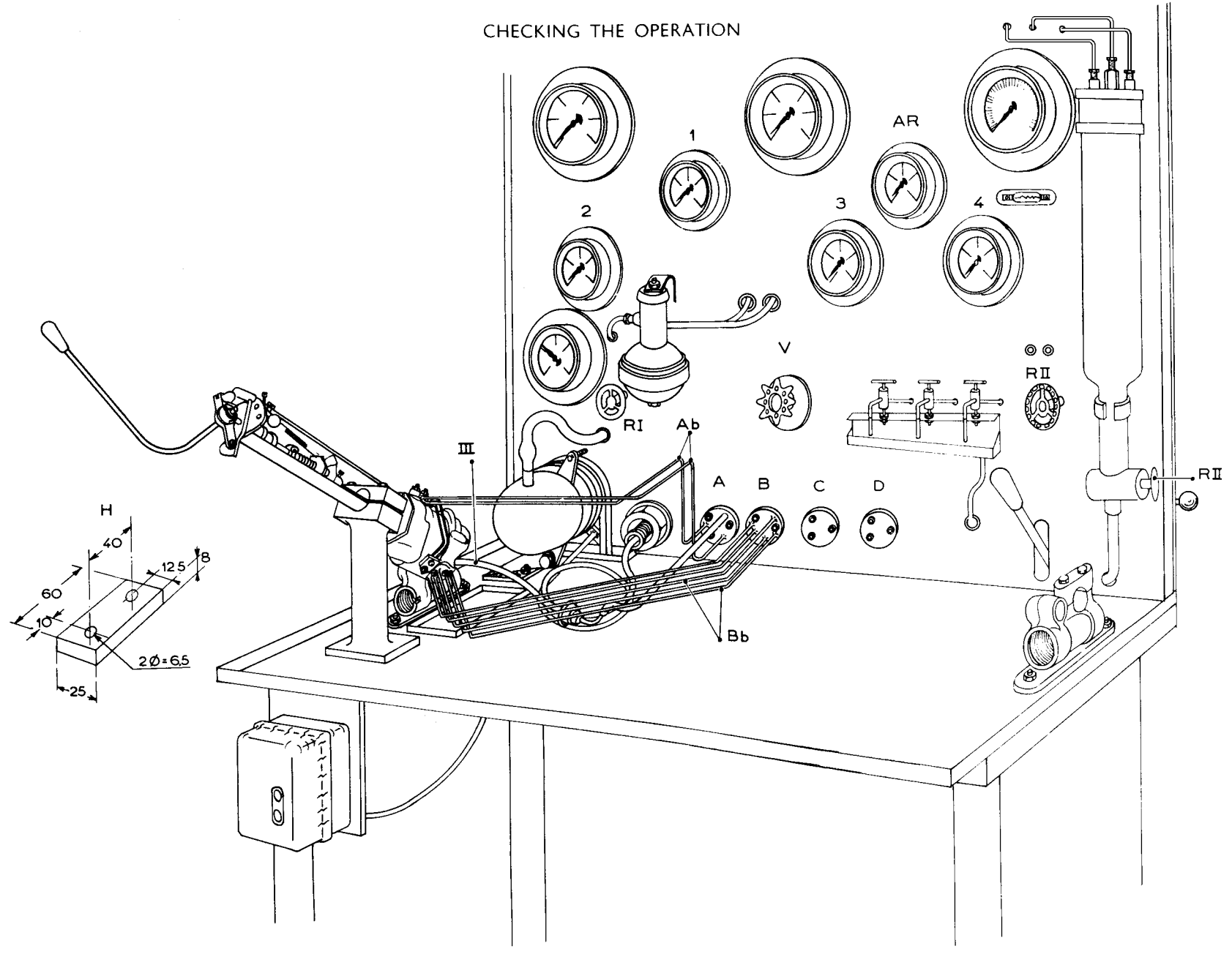
CHECKING HP PUMP and PRESSURE CONTROL VALVE



TEST BENCH sold under No. 2298–T

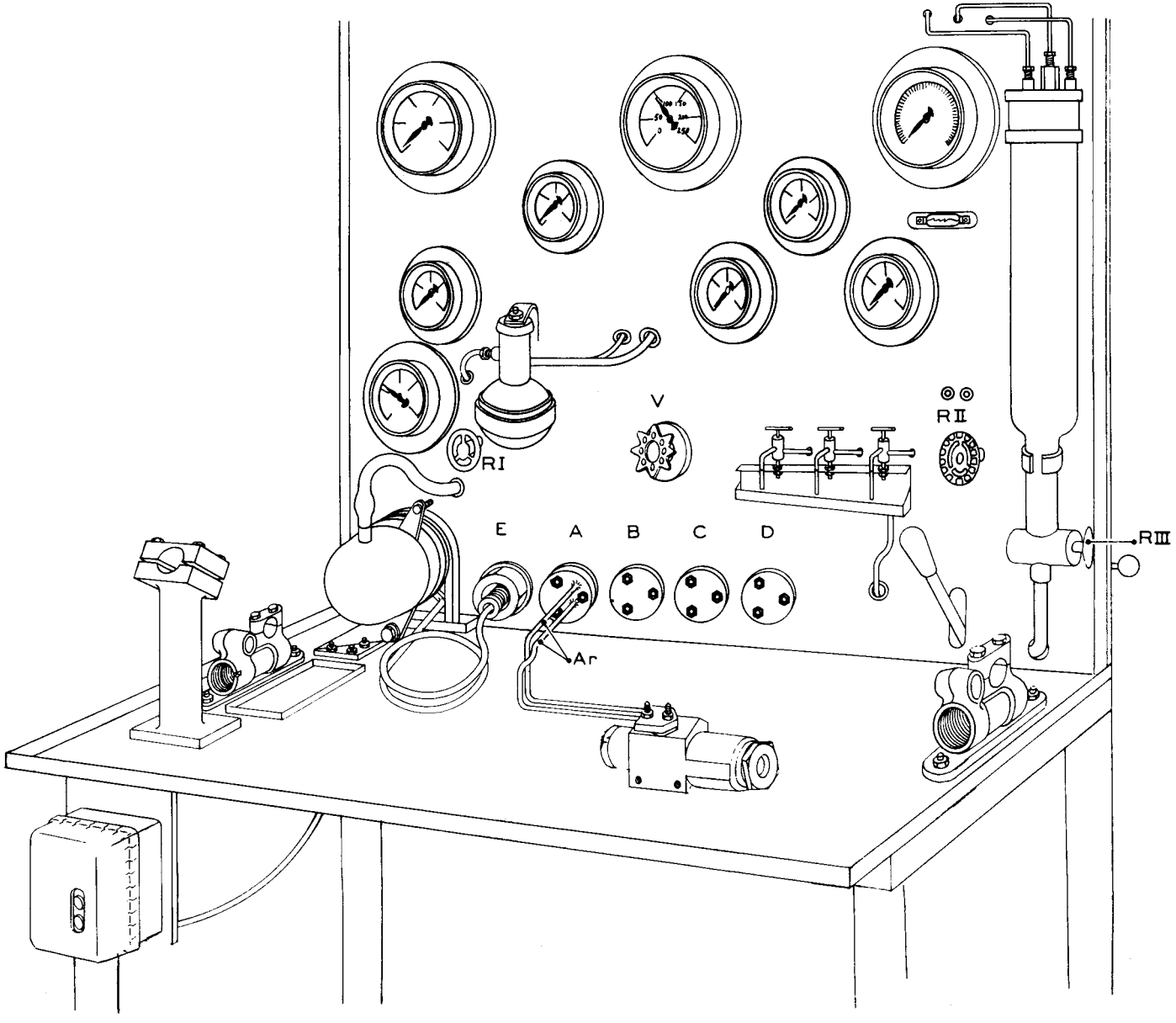
HYDRAULIC GEAR SELECTOR

CHECKING THE OPERATION



REGULATOR FEED

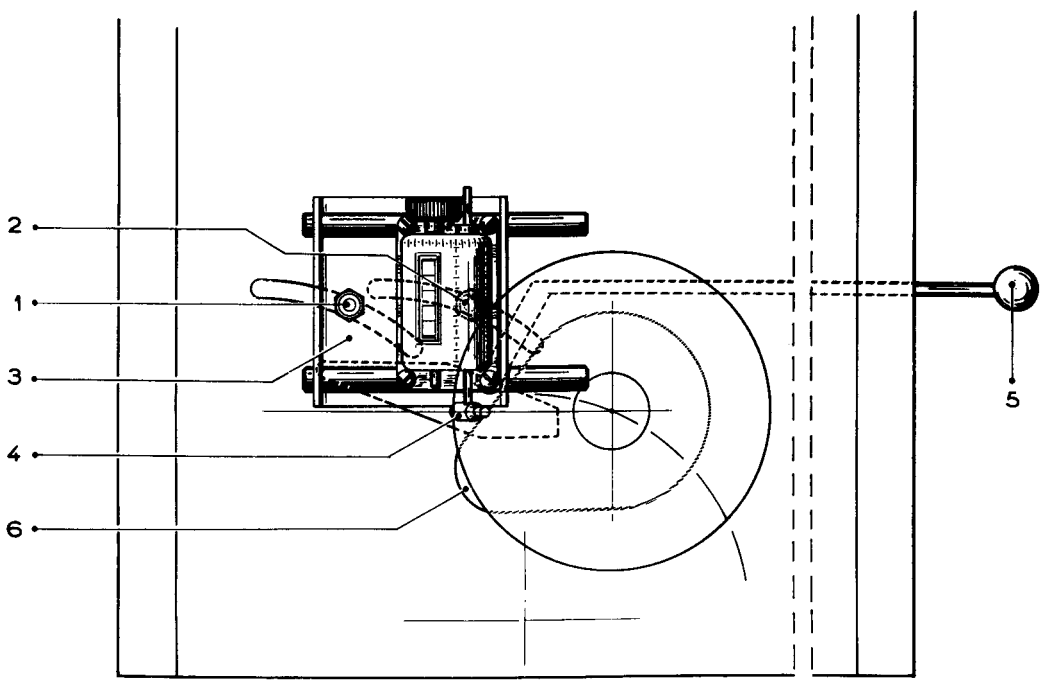
CHECKING THE FEED



HIGH PRESSURE PUMP

CHECKING THE FEED

Fig. 1 REVOLUTION COUNTER



RELATIONSHIP BETWEEN VOLUME
AND THE NUMBER OF TURNS OF THE PUMP
TO DELIVER 1,000 CC.

volume in ccs. per rev. of pumps	number of pump revolutions
3,00	333
2,95	338
2,90	344
2,85	350
2,80	356
2,75	362
2,70	370
2,65	377
2,60	384
2,55	392
2,50	400
2,45	408
2,40	417
2,35	425
2,30	435
2,25	445
2,20	455
2,15	465
2,10	476
2,05	487
2,00	500
1,95	514
1,90	526
1,80	555

ACCUMULATORS—PRESSURE DISTRIBUTION BLOCK—SUSPENSION SPHERES

CHECKING FOR LEAKAGE AND PRESSURE

Fig. 3

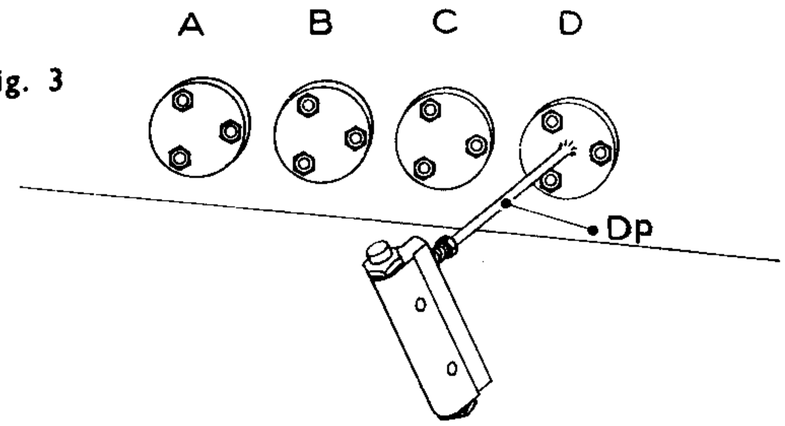


Fig. 2

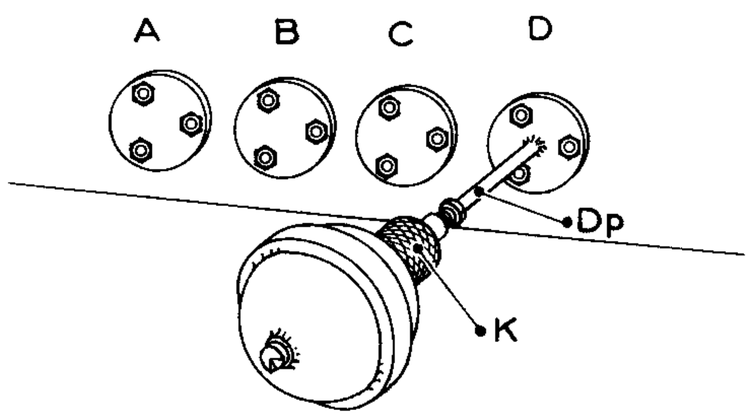
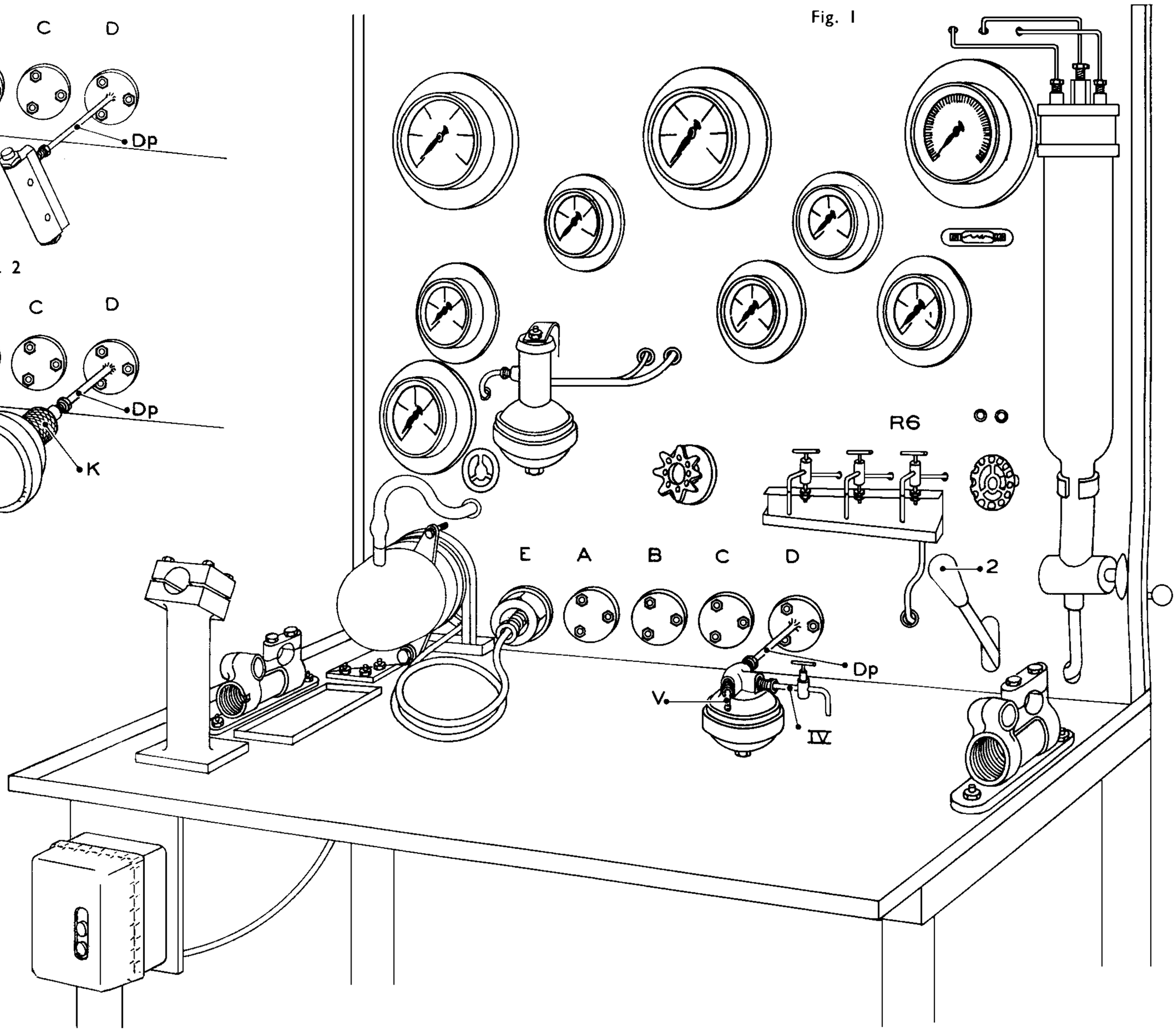
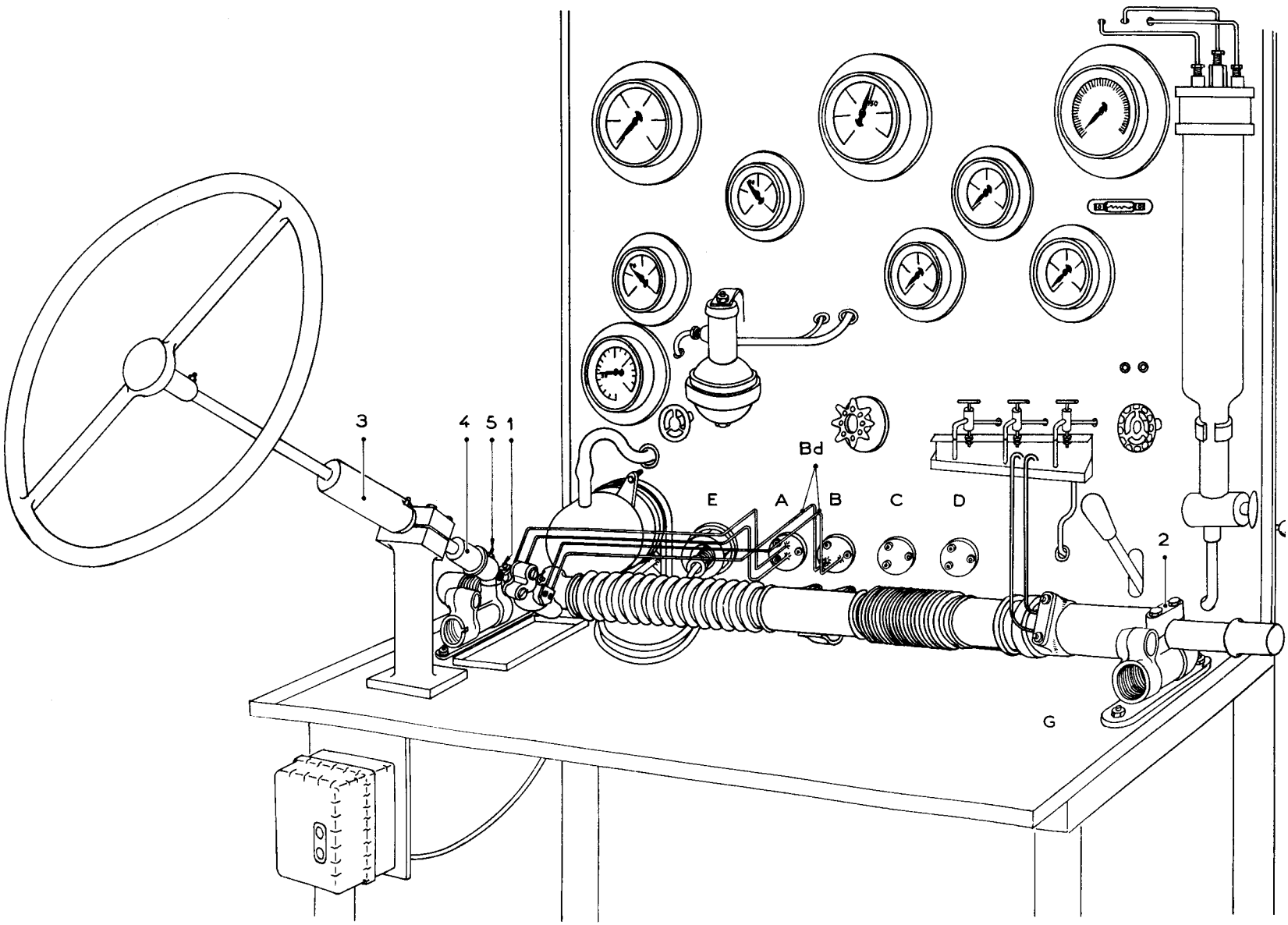


Fig. 1



STEERING

ADJUSTMENT OF PRESSURES



STEERING

CHECKING FOR LEAKAGE

Fig. 1

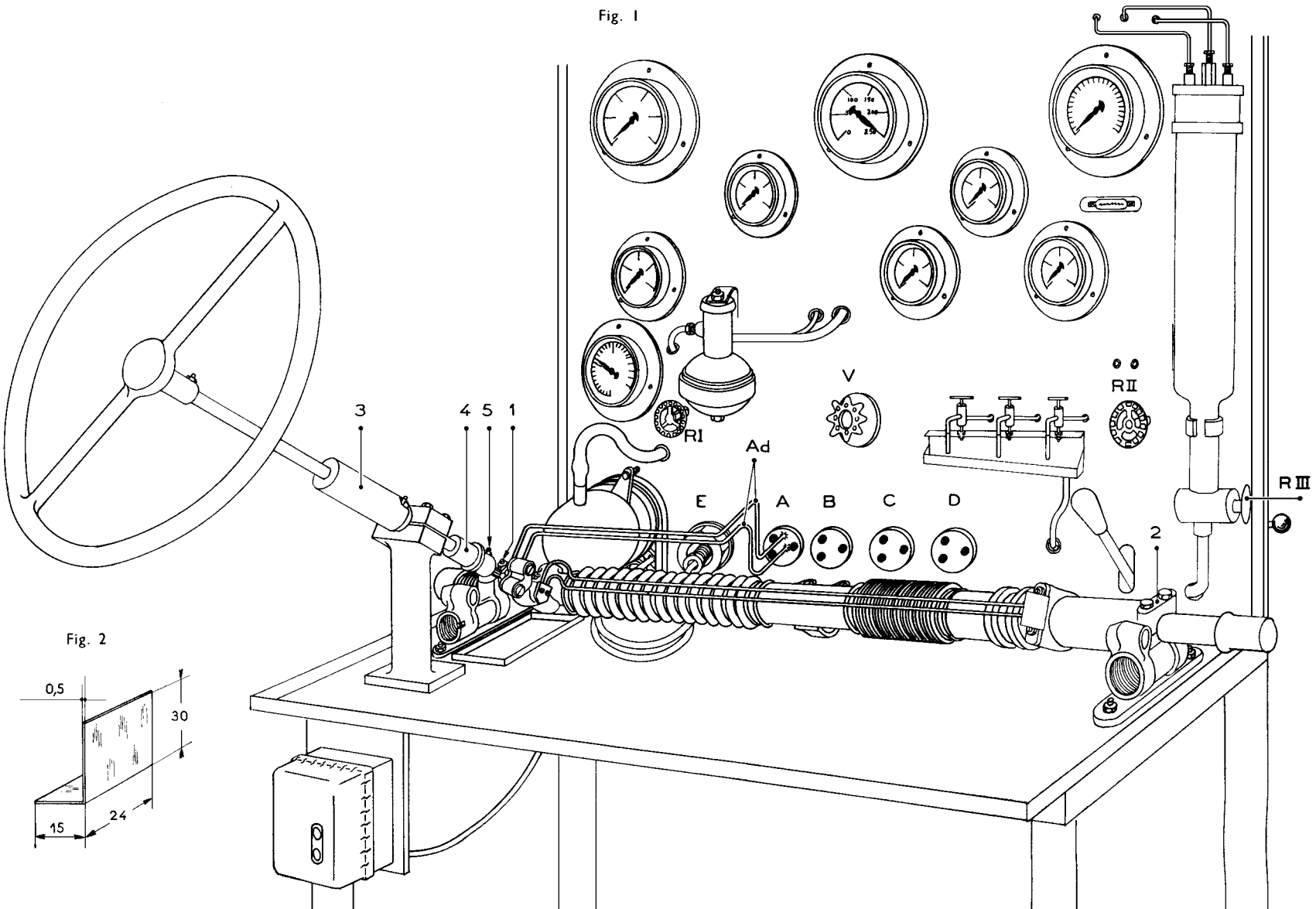
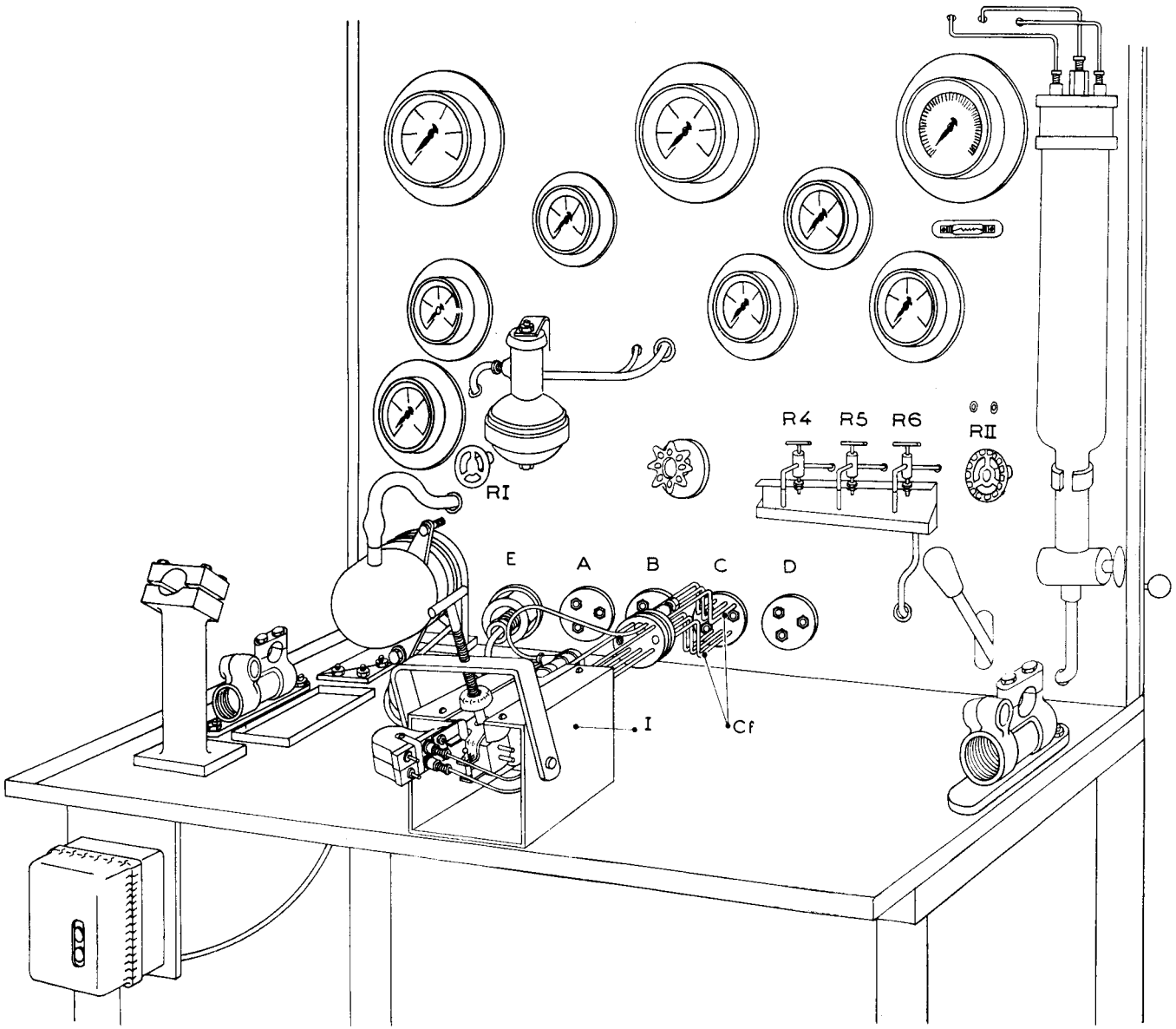


Fig. 2

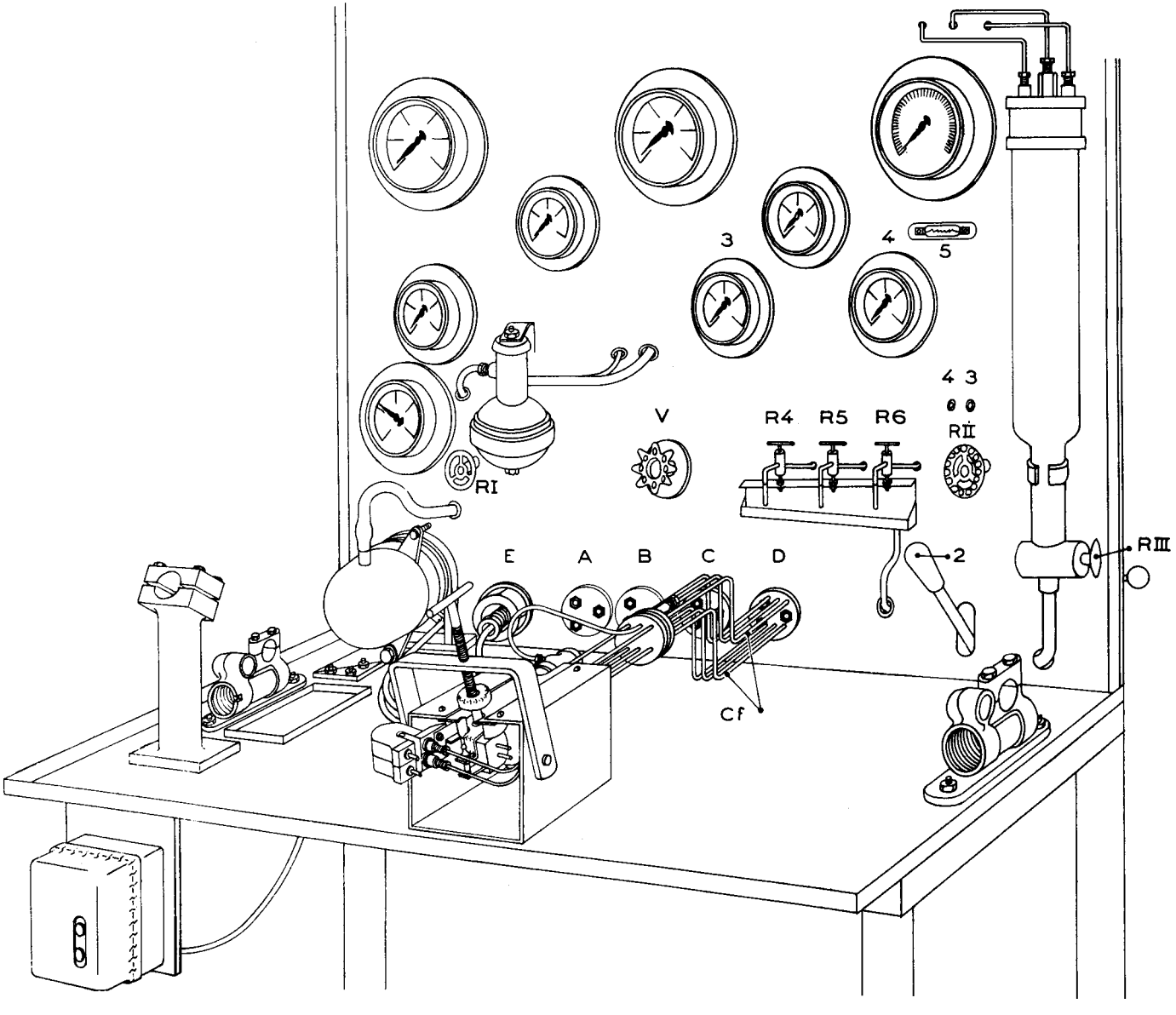
HYDRAULIC BRAKE CONTROL

CHECKING FOR LEAKAGE



STEERING

CHECKING BRAKE PRESSURE DISTRIBUTION



LIFTING FOR TOWING

POINTS OF ANCHORAGE

Fig. 1 LIFTING AT THE FRONT

INSERT AT A BETWEEN THE CHASSIS AND WOODEN PLANKS A THICKNESS OF SACKING

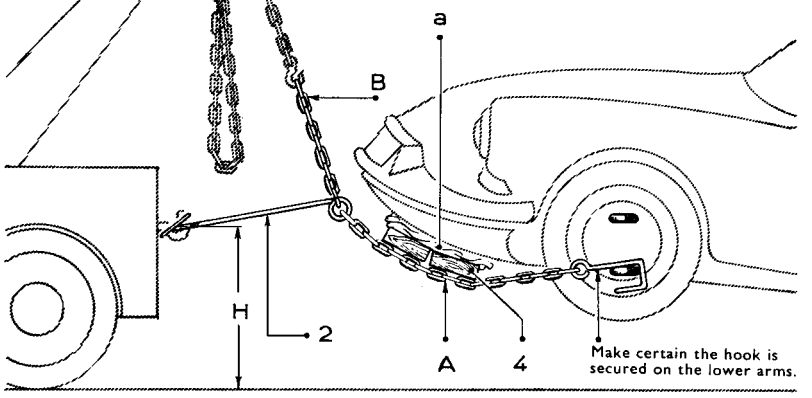
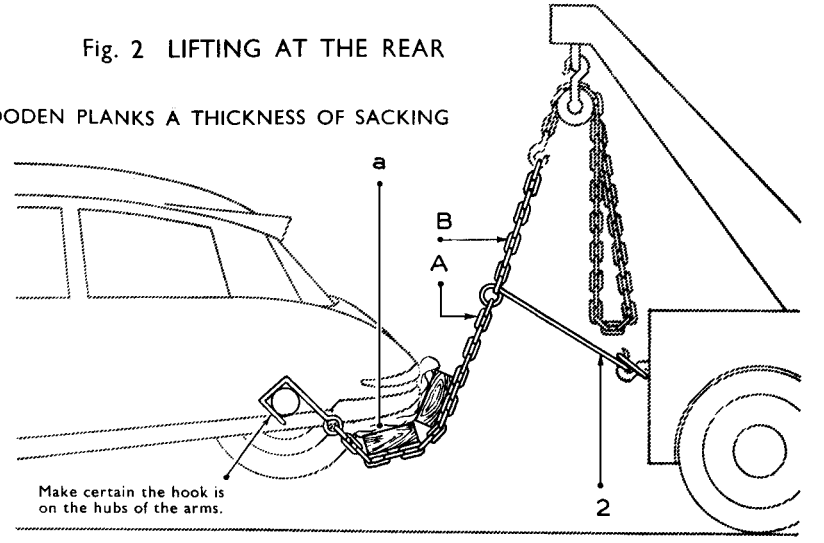
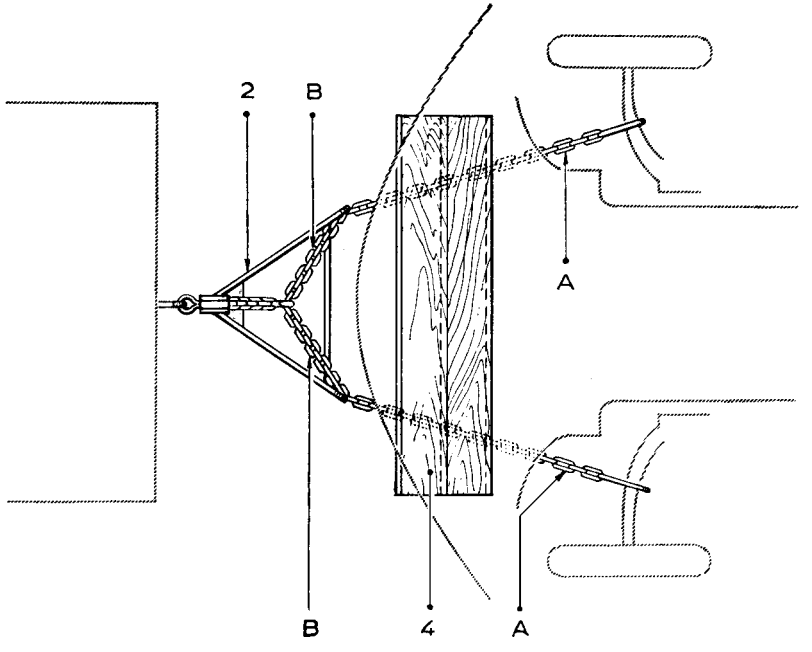
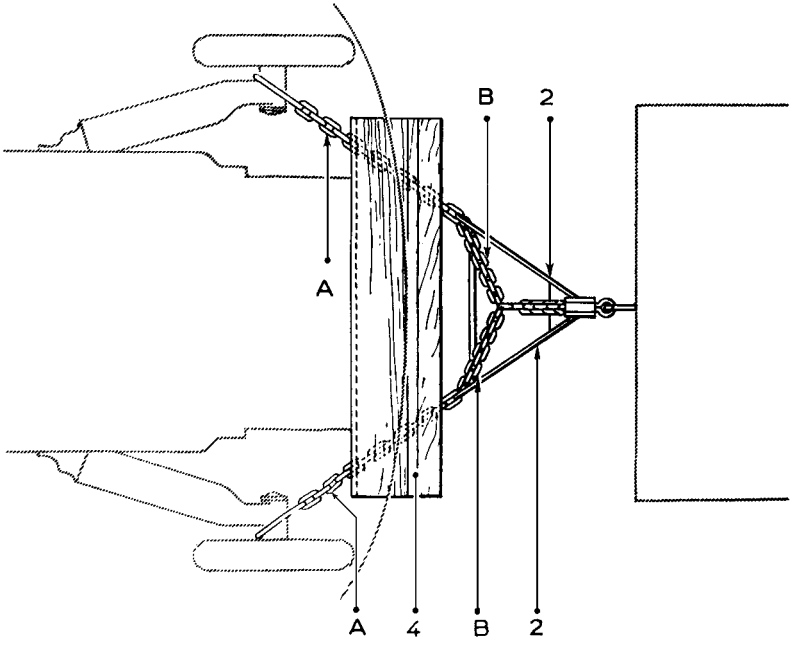


Fig. 2 LIFTING AT THE REAR

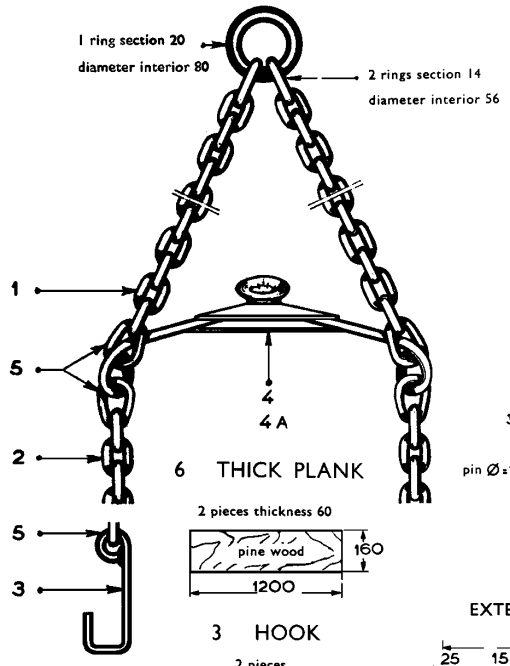






LIFTING THE CAR FOR TOWING

ASSEMBLY OF THE CHAIN

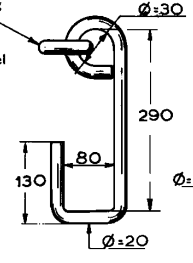


6 THICK PLANK

3 HOOK

2 pieces

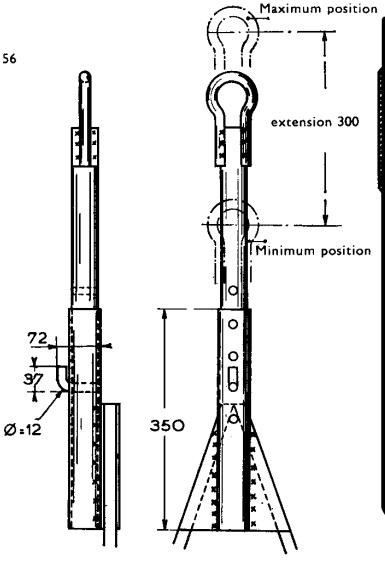
assemble the ring 5 before welding



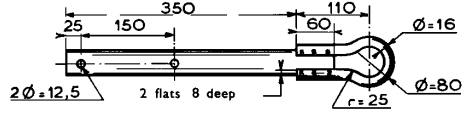
Second quality Martin steel
UTS 35–40 Kg./mm²
elongation 28% min.
underload 275 Kg.

approx. length of chains { chains 1 = 792 mm. between connecting links — 12 CNM 601 22 links
chains 2 = 900 mm. between connecting links — 12 CNM 601 25 links

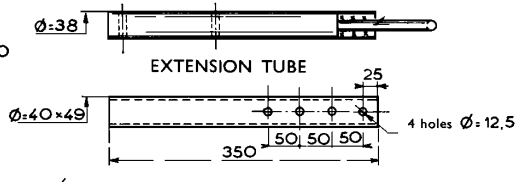
4a EXTENSION FOR TOWING TRIANGLE



EXTENSION RING (drawn steel)

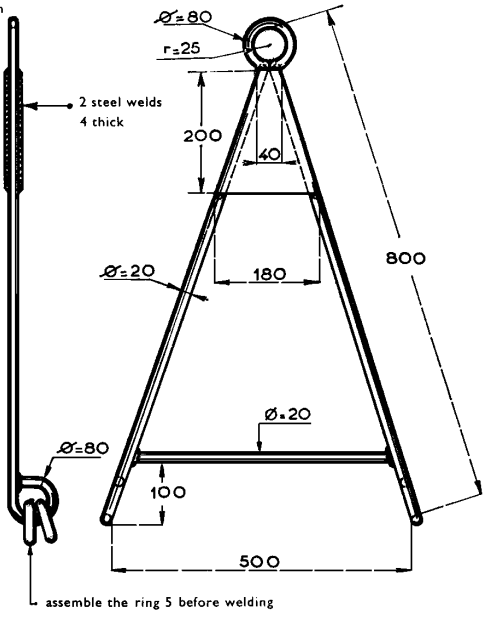


EXTENSION TUBE



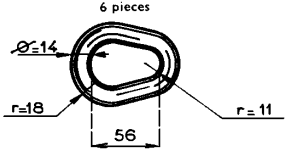
4 TOWING TRIANGLE

Second quality Martin steel



5 CONNECTING LINK

6 pieces



Second quality Martin steel
UTS 35–40 Kg./mm²
elongation 28% min.
underload 275 Kg.