CITROËN

REPAIR MANUAL

2CV

Manual supplied by Roger Wilkinson

Scanned July 2013 by Ray Potts

Images and pages reduced to A4

2CV Repair Manual (2nd Edition)

Errata

Page 336 - Operation 47 - paragraph 52

for " 14.1 to 15.6 P.S.I. " read " 41 to 45 P.S.I. "

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TEXT

No. of Illus.	DESCRIPTION	Service Methods No.	Reference of Tool on Sale.	REMARKS
	ENGINE			
4	Automatic advance checking fixture		1692-VA	
21	Sparking plug spanner		1601-T	
10	Valve retaining tool		1609-VA	
10	Valve spring compressor		1612-VA	
10	Spring compressor		1613-VA	
	Biconical grinding wheel for inlet seat		1631-T	
	Biconical grinding wheel for exhaust seat		1632-T	
	Grinding wheel for inlet seat		1661-T	
	Grinding wheel for exhaust seat		1663-T	
14	Small end bush extractor (Type AZ and AZU vehicles)	MR-3682-20		
21	Stud extractor		2410-T	
21	Torsion spanner		2470-T	
14	Gudgeon pin extractor	MR-3682-10		
15	Piston ring guide		1659-VA	
15	Piston ring guide		1654-VA	
14	Small end bush extractor	MR-3682-20		
16	Pressure gauge union	MR-3705		
79	Battery terminal extractor		2200-T	See Electrical Equipment.
17	Chain sling		1619-VA	
79	Armature extractor screw		2205-VA	See Electrical Equipment.
18	Engine stand for bench work	MR-3053-50		
21	Valve grinder		1615-T	
19	Spring calibrator		2420-T	
19	Calibrated spring		2421-T	
14A	Oil seal fitting tool	MR-3754-10		
24	Mandrel for centring clutch plate	MR-1620-40		See Clutch.
28	Spanner for coupling gearbox and engine		1790-VA	
28	Spanner for coupling gearbox and engine		1791-VA	
16	Closing punch for oil pressure valve	MR-3857-3		
15	Expander for rocker pushrod housing tubes		1605-VA	
15	Cylinder head sealing bush extractor	MR-3682-50		
24	Clutch adjustment gauge (Type A-AU-AZU vehicles)	MR-3834		
24	Clutch adjustment gauge (Type AZ car)	MR-3834-10		
	CLUTCH			
19	Spring calibrator		2420-T	See Engine.
19	Calibrated spring		2421-T	See Engine.
23	Clutch adjustment fixture		1701-T	
23	Finger, disc and clamps for 1701-T		1702-VA	
24	Mandrel for centring the clutch disc	MR-1620-40		See Engine.
17	Chain sling		1619-VA	See Engine.
28	Spanner for coupling gearbox and engine		1790-VA	See Engine.
28	Spanner for coupling gearbox and engine		1791-VA	See Engine.

No. of Illus.	DESCRIPTION	Service Methods No.	Reference of Tool on Sale.	REMARKS
24	Simplified fixture for clutch adjustment		1703-VA	
22B	Mandrel for grinding the clutch drum	MR-3700-100		
22C	Straight edge for positioning the clutch flywheel		1755-VA	
22C	Dial gauge		2437-T	
22B	Mandrel for grinding the engine flywheel	MR-3700-110		
	GEARBOX			
27	Stand for gearbox for bench work	MR-3053-40		
31	Extractor for reverse pinion spindle	MR-3682-30		
35	Extractor body		1750-T	
35	Shell and retainer for differential taper bearing		1736-T	
35	Pressure pad for 1736-T		1743-VA	
31	Ring for primary shaft bearing	MR - 3886		
36	Spanner for brake backplate ring nut		1925-VA	
36	Spanner for front brake steel backplate		1926-VA	
39	Mandrel for grinding front brake drum		2118-VA	
40	Retaining plate	MR - 3677		
40	Punch for location of rear bearing	MR - 3676		
67	Punch for locking front brake cams (steel backplates)	MR-3354-20		
67	Punch for rivetting front brake cams	MR-3354-2		
44	Dial gauge extension	MR-3365-10		
29A	Spanner for adjusting front brake cams		2126-VA	
41	Intermediate train retaining tool	MR-3139-10		
42	Fixture for adjusting the crown wheel and bevel pinion		2045-VA	
21	Bracket for dial gauge		1754-VA	
21	Torsion spanner		2470-T	See Engine.
21	Stud extractor		2410-T	See Engine.
21	Dial gauge with totalising needle		2437-T	
43	Adjustment shim for second speed fork		1786-VA	
43	Adjustment shim for overdrive fork		1787-VA	
42	Dial gauge support		2041-T	
46	Fixture for centring front brake linings		2112-VA	
17	Chain sling		1619-VA	See Engine.
28	Spanner for coupling gearbox and engine		1790-VA	See Engine.
28	Spanner for coupling gearbox and engine		1791-VA	See Engine.
44	Differential retaining clamps	MR-3644-10		
34A	Milling cutter for satellite bearing faces		1761-VA	
	FRONT AXLE - STEERING GEAR - REAR AXLE			
51	Spanner for fitting friction discs		1834-VA	
52	Support for lifting the vehicle	MR-3300-70		
54	Spanner for steering rod	MR-3691-1		
55	Tool for fitting and removing the swivel pin	MR-3742		
51	Spanner for axle arm		1833-VA	
54	Tube for positioning the Timken bearing	MR-3616-20		

No. of Illus.	DESCRIPTION	Service Methods No.	Reference of Tool on Sale.	REMARKS
56	Assembly for checking the front arms	MR-3745		
58A	Lever for removing the steering wheel		1951-VA	
59	Stand for axle after removal	MR-3301-60		
60	Steering ball joint extractor		1964-T	
60	Pressure pad for 1964-T		1965-VA	
60	Spanner for rack pinion nut		1980-VA	
60	Spanner for rack pinion nut (second type)		1981-VA	
54	Spanner for rack guide nut	MR-3691-2		
54	Spanner for ball pin socket nut	MR-3691-3		
61	Extractor for Timken bearing on crossmember		1829-VA	
62	Mandrel for removing hub pivot	MR-3436-40		
66	Spanner for hub ring nut		1811-VA	
68	Fixture for locking the wheel studs	MR-3445-20		
68	Punch for locking the wheel studs	MR-3445-24		
62	Punch for locating the oil seals	MR-3676-10		
66	Rear drum extractor		2003-VA	
71	Fixture for checking the rear arms	MR-3745		
67	Assembly for locking the rear brake cams	MR-3354-10		
69	Mandrel for grinding the rear brake drum		2119-VA	
70	Fixture for centring the rear brake linings		2113-VA	
	DRIVE SHAFT			
52	Stand for lifting the vehicle	MR-3300-70		See Axle.
46	Fixture for centring the front brake linings		2112-VA	See Gearbox.
29A	Spanner for adjustment of front brake cams		2126-VA	See Gearbox.
	BRAKES			
52	Stand for lifting the vehicle	MR-3300-70		See Axle.
46	Fixture for centring front brake linings		2112-VA	See Gearbox.
66	Spanner for hub ring nut		1811-VA	See Axle.
66	Rear drum extractor		2003-VA	See Axle.
69	Mandrel for grinding rear brake drums		2119-VA	See Axle.
70	Fixture for centring rear brake linings		2113-VA	See Axle.
36	Spanner for steel backplate ring nut		1925-VA	See Gearbox.
44	Dial gauge support bracket		1754-VA	See Gearbox.
44	Dial gauge with totalising needle		2437-T	See Gearbox.
39	Mandrel for grinding the front brake drum		2118-VA	See Gearbox.
29A	Spanner for adjustment of the front brake cams		2126-VA	See Gearbox.
	PEDAL GEAR			
24	Adjustment shim (Type A-AU-AZU cars)	MR-3834		
24	Adjustment shim (Type AZ cars)	MR-3834-10		

No. of Illus.	DESCRIPTION	Service Methods No.	Reference of Tools on Sale	REMARKS
	SUSPENSION			
52	Stand for lifting the vehicle	MR-3300-70		See Axle.
74	Spanner for holding adjustable end tubes		2185-VA	
74	Spanner for adjustment nut of end tubes		2186-VA	
51	Spanner for fitting the friction discs		1834-VA	See Axle.
50	Spring balance		2472-T	
74	Spanner for adjustment rod locknut		2187-VA	
74	Tool for locating seals	MR-3676-50		
	ELECTRICAL EQUIPMENT			
5B	Test bench for checking flexible insulator ignition coils		2209-T	
79	Cable end extractor		2200-T	
79	Dynamo armature extractor screw		2205-VA	
80	Screwdriver for removing the pole pieces	MR-1601-4		
80	Mandrel for locating the pole pieces in position (dynamo)	MR-1601-8		
80	Punch for putting the pole pieces in position (dynamo)	MR-1601-9		
81	Stand for testing the dynamo on the bench		2207-VA	
80	Mandrel for putting the pole pieces in position (starter)	MR-1601-11		
80	Punch for locating the pole pieces (starter)	MR-1601-10		
	ADJUSTMENTS			
89	Gauge for checking the toe-in of the rear wheels	MR-3756-20		
4	Automatic advance checking fixture		1692-VA	See Engine.
16	Pressure gauge union	MR-3705		See Engine.
52	Support for lifting the vehicle	MR-3300-70		See Axle.
29A	Spanner for adjusting the brake cams (with steel brake backplates)		2126-VA	
54	Spanner for steering rods	MR-3691-1		See Axle.
88	Camber checking tool		2315-VA	
74	Spanner for holding adjustable end tubes		2185-VA	See Suspension.
90	Height gauge		2300-T	
90	Attachment for 2300-T		2306-VA	
90	Gauge for 2300-T		2303-VA	
51	Spanner for fitting the friction discs		1834-VA	See Axle.
92	Fixture for balancing the wheels	MR-3396-10		
93	Fixture for adjusting the headlamps	MR-1572		
	CHASSIS			
95	Template for checking the sidemembers	MR-3747		

TOOLS

CHECKING THE STANDARD IGNITION TIMING

1 Connect an indicator lamp between earth .... Indicator lamp
and the "RUP" terminal on the metal cased coil,
or the negative terminal on the rubber cased coil.

Switch on the ignition.

2 Turn the engine in the running direction by rotating the flywheel. Stop at the precise moment the lamp lights.

1st Case - No hole drilled in flywheel (it bears a reference mark on the engine side in the form of a chisel mark under the starter ring).

A and AU engines

3 Make sure that the reference mark is in line with the joint of the two halves of the crankcase or has not gone past it.

4 Turn the engine; the light goes out. Stop the engine at the precise moment the lamp re-lights. The engine will then have made one revolution ....

5 Recheck to make sure that the mark is opposite the joint of the two halves of the crankcase or has not gone past it.

6 If, during one of the checking operations (paragraphs 3 and 5):
- the reference mark has gone past the joint of the two halves of the crankcase joint,
- or has failed to reach the level of the joint by more than the thickness of one tooth, the ignition advance must be re-adjusted (see paragraphs 12 and following this operation). ....

2nd Case - The flywheel has a hole for Adjustment purposes (See Pl. 2).

7 Introduce a 6 mm dia. rod :

a) A and AU engines:
in the hole on the right hand side of the clutch housing (see Fig. 1).

b) AZ and AZU engines:
in the hole on the left hand side of the clutch housing (see Fig. 2).
Make sure that the rod enters the hole in the flywheel or that the hole is not yet in line with the rod. Rod 6 mm dia. x 150 mm long.

		TOOLS
8	Turn the engine in the running direction. The lamp goes out. Stop the engine at the exact moment the lamp re-lights. The engine will have made one revolution	
9	Make sure that the rod is opposite the hole or has not passed it	
10	If, in one of the checking operations (paragraphs 7 and 9) : - the rod has gone past the hole, - or is more than 8 mm in front of the hole, the ignition must be retimed (see paragraphs 20 and following, this operation)	
11	Switch off and remove the indicator lamp	
	ADJUSTING THE IGNITION TIMING	
	<u>A and AU engines</u> (see Pl. 3).	
12	Remove the fan (see Op. 6, paragraphs 1 and following)	
13	To determine the point of ignition. a) The flywheel is not drilled : Turn the flywheel by hand in order to bring the reference mark on its rear face exactly opposite the line of the joint between the two halves of the crankcase. b) The flywheel has a hole for adjustment : Insert a 6 mm dia. rod in the hole provided in the right hand side of the clutch housing. Turn the engine by the flywheel until this rod enters the hole in the flywheel In this position the engine is at the point of ignition (6^{o} to 8^{o} advance).	Rod 6 mm dia. x 150 mm long.
14	Connect the lead of an indicator lamp to the terminal screw of the condenser, the lamp holder must be connected to earth. Switch on the ignition	Indicator lamp
15	Remove the contact breaker cover (10) by taking out the three screws (9). *Bring the weights of the centrifugal governor into the position of rest by hand.*	
	Undo the two contact breaker fixing nuts (5). Determine the point at which the contacts begin to open by rotating the housing (19). The lamp lights as the contact points begin to open. Tighten the nuts (5). Replace the cover (10). Tighten the three screws (9), inserting serrated washers under the heads	12 mm box spanner

		TOOLS
16	Turn the engine (by the flywheel) in the running direction; the light will go out. Stop rotating the engine at the very moment when the lamp relights (the engine has made one turn). Check the point of ignition again. a) The flywheel is not drilled: If the reference mark on the flywheel has not passed or is in line with the joint between the two halves of the crankcase, the ignition timing is correct. If the reference mark has gone past the line of the joint there is retardation on the second cylinder. The ignition point for this cylinder must be adjusted - in no circumstances must the advance be less than 6^o. In this case recommence the timing adjustment for this cylinder as described in paragraphs 13 to 15 above. b) The flywheel has a hole for adjustment : The rod must enter the hole in the engine flywheel. If it can be inserted the adjustment is correct. If the hole in the flywheel has gone past the rod there is retardation on the second cylinder. The ignition point for this cylinder must be adjusted and in no circumstances must the advance be less than 6^o. In this case recommence for this cylinder the operations described in paragraphs 13 - 15 above.	
17	Switch off and remove the indicator lamp	
18	Make sure that the cable harness is correctly positioned, pass the harness under the condenser, press it lightly against the crankcase and secure by means of the metal clip in order to prevent its being torn away by the fan	
19	Replace the fan (see Op. 6, paragraphs 5 and following).	
	<u>AZ and AZU engines</u> (see Pl. 2).	
20	Remove the fan (see Op. 6, paragraphs 1 and following)	
21	To determine the point of ignition : Introduce a 6 mm dia. rod in the hole provided on the right hand side of the crankcase. Turn the engine by the flywheel until this rod enters the hole in the flywheel. In the position the engine is at the point of ignition, 9^o to 11^o advance (for engines with flat topped pistons) or 10^o to 12^o advance (for engines with convex topped pistons)	Rod 6 mm dia. x 150 mm long.
22	Connect the lead of the indicator lamp to the terminal screw of the condenser and connect the lamp holder to earth. Switch on the ignition	Indicator lamp
23	Undo the two contact breaker fixing nuts (5). Then determine the exact point at which the contact breaker points begin to open by rotating the housing (19). The lamp lights at the precise moment the contacts open. Tighten the nuts (5).	12 mm box spanner
24	Remove the rod from the engine flywheel	

		TOOLS
25	Turn the engine in the running direction by means of the flywheel. The light will go out. Stop the rotation at the precise moment the lamp lights again (the engine has made one revolution). At this point the rod should be able to enter the hole in the flywheel. If it can be inserted, the adjustment is correct. If the hole has gone past the rod there is retardation on the second cylinder.	
	The point of ignition for this cylinder must be adjusted. In no circumstances must the advance be less than 9^{o} for flat topped pistons or 10^{o} for convex topped pistons. In this case recommence for this cylinder the operations described above in paragraphs 21, 23 and 24	
26	Switch off the ignition and remove the indicator lamp	
27	Make sure that the cable harness is correctly positioned; pass the harness under the condenser, press it gently against the crankcase and secure it with the metal clip to prevent it being torn away by the fan	
28	Replace the fan (see Op. 6, paragraphs 5 and following)	
	ADJUSTING THE CONTACTS (see Pl. 3)	
29	Remove the fan (see Op. 6, paragraphs 1 and following)	
30	Remove the cover (10) from the contact breaker housing by unscrewing the three fixing screws (9)	
31	Turn the engine until the lug on the cam (1) lifts the contact breaker arm (2) to its maximum height	
	At this point the gap between the contact points must be 0.4 mm. If not, undo the screw (3), and move the support of the fixed contact (4) in the required direction	
	Check the contact gap with the aid of a feeler gauge. Tighten the screw (3)	Set of feeler gauges.
32	Turn the engine so that the second lug on the cam (1) lifts the breaker arm (2) to its maximum height	
	Check the contact gap with the same feeler gauge. The gap must be 0.4 mm. If the difference is greater than 0.05 mm, rotate the cam (1) and remeasure. Removal of the cam entails removal and replacement of the contact breaker (see paragraphs 40 and following this operation). If there is still a difference it means that one of the lugs of the cam is worn or that the end of the camshaft is out of true. The defective part must be replaced (see paragraphs 40 and following this operation)..........	Set of feeler gauges.
	NOTE - After carrying out this operation check the ignition setting (see paragraphs 13 to 17 or 21 to 26, this operation).	

		TOOLS
33	Replace the cover (10) of the contact breaker housing, tighten the three screws (9), inserting a serrated washer under each head	
34	Refit the fan (see Op. 6 paragraphs 5 and following)	
	REPLACEMENT OF A CONDENSER (see Pl. 3)	
35	Remove the fan (see Op. 6, paragraph 1 and following)	
36	Disconnect the primary lead by undoing the screw (21)	
	Remove the condenser (11), remove the screw (16) and the nut (20) securing it to the contact breaker housing (19) and to the brass terminal (22). Fit the new condenser and secure it using a serrated washer under the nut and under the screw	8 mm box spanner.
37	Connect the condenser lead, tighten the screw (21) inserting a serrated washer under the head. Pass the cable harness under the condenser and press it lightly against the crankcase securing it with the metal clip to prevent it being torn away by the fan.	
38	Replace the fan (see Op. 6, paragraphs 5 and following)	
	REPLACEMENT OF A CONTACT BREAKER ARM	
39	This operation is facilitated by the removal and replacement of the contact breaker housing (see paragraphs 40 and following this operation)	
	NOTE - 1) *Although of standard appearance the contact braker arm is a special one.* The spring is calibrated with high precision by the factory. This calibration is essential in order to prevent excessive wear of the fibre block. The spring is supplied by our Spare Parts Division already rivetted on its bracket.	
	2) After replacement of a contact breaker arm, the ignition timing must always be adjusted (see paragraphs 13 to 17, this operation).	
	REPLACEMENT OF A DISTRIBUTOR (see Pl. 3)	
	<u>To remove</u>	
40	Remove the fan (see Op. 6, paragraphs 1 and following)	

		TOOLS
41	Disconnect the condenser lead	
42	Remove the contact breaker by undoing the two nuts (5) securing it to the engine	12 mm box spanner
43	Remove the protecting plate (6). Remove the circlip (7) from the cam (1) and the thrust washer (8) and lift off the cam and the weights (18)	
	<u>To refit</u>	
44	Place the cam (1) and its weights (18) in position (for position of the weights see fig. 3) on the end of the camshaft and fit the thrust washer (8) and the cam circlip (7)	
	NOTE - There are three ignition control weights available for A-AU engines, for AZ-AZU engines (flat topped pistons) and for AZ-AZU (convex topped pistons).	
45	Check the total movement of the centrifugal advance (see paragraphs 59 and following this operation) : it must be a) For A and AU engines between 16° and 19° b) For AZ and AZU engines (flat topped pistons): between 11° and 14° c) For AZ and AZU engines (convex topped pistons): between 6° and 8°	
46	Lightly grease the protecting plate (6) and place it on the two fixing studs. Fit the housing (19) and provisionally tighten the nuts (5) inserting a flat washer	12 mm box spanner
47	Connect the lead to the condenser making sure that the cable harness is in the correct position. Pass it under the condenser and press it gently against the crankcase, securing it with the metal clip to prevent its being torn away by the fan. Tighten the screw after inserting a serrated washer under the head	
48	Adjust the contact gap (see paragraphs 31 and following this operation)	
49	Adjust the ignition timing (see paragraphs 13 to 17 or 21 to 26 this operation)	
50	Fit the housing cover (10), tighten the three screws (9), inserting serrated washers under the heads	
51	Replace the fan (see Op. 6, paragraphs 5 and following)	
	OVERHAULING A CONTACT BREAKER (see Pl. 3)	
	<u>To remove</u>	
52	Remove the cover (10) from the contact breaker housing and take out the condenser (11) together with its brass terminal (22) by removing the screws (14 and 16). Lift out the movable breaker arm (2), together with its insulator (12). Remove the spring from the breaker arm	

		TOOLS
53	Remove the fixed contact support (4)	
	To refit	
54	Fit the support of the fixed contact in the contact breaker housing and provisionally tighten the screw (3) inserting a flat washer under the head	
55	Fit the movable contact breaker arm (2) complete with its spring and insulator (12), after first greasing the pivot pin of the contact breaker arm. Lightly grease the fibre block at "f" (special bearing grease). Place the insulating bush (13) in the hole provided for the brass fixing screw (14) of the brass condenser terminal (22). Place the condenser complete with its insulator (15) and its terminal (22) in position. Insert and tighten the screws (14 and 16) fitting a serrated washer under the heads.	
	NOTE - No bench test is required for this distributor. Checking the total automatic advance is sufficient (see paragraphs 59 and following this operation).	
	CHECKING AND ADJUSTING THE CENTRIFUGAL TIMING CONTROL (see Pl. 3 and 4)	
56	Remove the fan (see Op. 6, paragraphs 1 and following)	
57	Disconnect the condenser lead	
58	Remove the contact breaker by undoing the nuts (5) securing it to the engine. Remove the protecting plate (6)	12 mm box spanner
59	Fix the graduated quadrant of the indicating gauge 1692-VA on the distributor fixing stud	Indicating gauge 1692-VA 12 mm box spanner
	NOTE - For use on AZ and AZU models (flat and convex pistons) the indicating gauge 1692-VA must be modified in accordance with Fig. 2 of Plate 4.	
60	Mount the needle carrier (A) on the cam, pusing it down as far as it will go and gently tighten the holding screw (B)	
61	By turning the flywheel bring the needle of the gauge opposite the upper reference mark "c"	
62	Rotate the needle carrier from right to left without forcing it. At the end of its travel the needle should be between the reference marks: a) For A and AU models: between "d" and "e", corresponding to a displacement of the weights of between 16° and 19° b) For AZ and AZU models (engines fitted with flat topped pistons): between "f" and "g", corresponding to a displacement of the weights of between 11° and 14°	

		TOOLS
	c) For AZ and AZU models (engines with convex topped pistons): between "h" and "i", corresponding to a displacement of weights of between 6^o and 8^o	
	If the needle lies outside this area the travel of the weights must be adjusted by bending the stops (D) and (E). The weights must touch stops (D) and (E) simultaneously	
63	Remove the gauge 1692-VA	12 mm box spanner
64	Lightly grease the protecting plate (6) and refit. Fit the contact breaker and provisionally tighten the nuts (5) inserting flat washers	12 mm box spanner
65	Connect the condenser lead, and tighten the screw (21) placing a serrated washer under the head. Make sure that the cable harness is correctly positioned, press it lightly against the crankcase and secure by means of the metal clip in order to prevent its being torn away by the fan	
66	Adjust the ignition timing (see paragraphs 13 to 17 and 21 to 26, this operation)	
67	Fit the fan (see Op. 6, paragraphs 5 and following)..............................	

		TOOLS
	REPLACEMENT OF A SPARKING PLUG LEAD (see Pl. 5, Fig. 1).	
	METAL CASED COIL	
	VERY IMPORTANT NOTE - Inside each secondary terminal there is a spring to the ends of which two discs are soldered. These springs ensure permanent contact of the secondary teminals with the splayed ends of the sparking plug leads.	
	Removal	
1	Disconnect the lead to be replaced from the sparking plug	
2	Withdraw the rubber protector (12) from the terminal in the coil	
3	Unscrew the knurled nut (13) and pull the lead to release it. *Be careful not to lose the spring* (11)	
	Replacement	
4	On the new lead fit the protection rubber (12), the knurled nut (13) together with its rubber gland (14) and the washer (15). If necessary splay the end of the sparking plug lead	
5	Push the lead into the terminal as far as it will go (so as to compress the spring(14) and hold it there).	
6	Screw up the knurled nut (13) to compress the rubber gland (14) in order to secure the lead in this position	
7	Place the rubber protector (12) in position	
8	Connect the lead to the sparking plug	
	RUBBER CASED COIL	
	As the replacement of a sparking plug lead presents no difficulty it is not described here	
	REPLACEMENT OF A COIL	
	Removal	
9	Disconnect the sparking plug leads	
10	Disconnect the leads from the "BAT" and "RUP" terminals (metal cased coils) or from the positive and negative terminals (rubber cased coils)	

TOOLS

11 <u>To remove the coil</u>

a) Metal cased coil:
Remove the strap securing the coil to the headlamp bracket assembly ......

b) Rubber cased coil:
Remove the L. H. coil support from the headlamp bracket assembly. Detach the coil from the R. H. support ......

<u>Replacement</u>

12 a) Metal cased coil:
Place the coil in position and secure it with the fixing strap. Adjust the position so that the contact terminals are on the R. H. side of the vehicle ......

b) Rubber cased coil:
Place the coil in position on the R. H. support with the primary terminals on the R. H. side of the vehicle and fit the L. H. support ......

13 Connect the battery distributor leads to the "BAT" and "RUP" terminals (metal cased coil) or to the positive and negative terminals (rubber cased coil): fit a serrated washer under the heads of the screws ......

14 Connect the leads to the sparking plugs ......

REPLACEMENT OF A METAL CASED COIL BY A RUBBER CASED COIL (see Pl. 5A)

Our Spare Parts Division no longer sells metal cased coils. In order to fit a rubber cased coil in place of an old one, proceed as follows:

15 Remove the wiring passing into the headlamp bracket assembly. For this purpose:
Disconnect the wires from the left hand headlamp. Disconnect the yellow, red and green plugs from the wiring.
Withdraw the wiring from the headlamp bracket assembly from the right hand side ......

16 Drill two symmetrically disposed holes of 4.5 mm dia. in the flat part of the headlamp bracket assembly, the distance between centres being 123 $\pm$ 0.5 mm (See fig. 2).

17 Place the L. H. support (1) and R. H. support (2) on the coil ......

18 Place this assembly on the headlamp bracket assembly. Secure the supports (1) and (2) with the round headed screws fitting a serrated washer under the nuts ...... 7 mm flat spann

19 Fit a socket (3) on each plug of the primary circuit of the coil. On each plug fit a flat washer, the terminal lug of the lead corresponding to the reference mark on the coil (+ or -), a flat washer, a serrated washer and then tighten the nut 7 mm box spann

20 Connect the leads to the coil and to the sparking plugs (the longest lead (460 mm) to the L. H. sparking plug) ......

21 Insert the wiring into the headlamp bracket assembly. Connect the leads to the L. H. headlamp. Connect the yellow, red and green plugs to the corresponding lead plugs ......

	TOOLS
CHECKING THE COIL (See Pl. 5, fig. 2).	
22 Remove the coil (see paragraphs 9 - 11 this operation)	
23 Set up the coil on the test bench. *Earth the coil casing* (metal coil)	
24 Connect the "BAT" or the positive terminal of the coil to the positive terminal of a 6 volt battery and the "RUP" terminal or negative of the coil to a *4 cylinder engine distributor,* complete with its condenser	
25 Connect: 1. The secondary terminal "a" to the insulated terminal of a first spark-gap (D) which will be adjusted during the test	
2. The secondary terminal "b" to the insulated terminal of a second spark-gap (E) adjusted to 1 mm for the duration of the test	
26 Requirements for satisfactory operation:	
- At a distributor speed of 1,000 r.p.m. (4,000 r.p.m. engine) the minimum length of the spark (between the points of the spark-gap D) must be 6 mm	
- At a distributor speed of 125 r.p.m. (500 r.p.m. engine) this length must be 11 mm	
NOTE - Do not try to obtain a spark of greater length by increasing the distance between the terminals of the spark-gap (D), *since the spark will short circuit inside the coil causing its rapid deterioration.*	
27 Test the two terminals "a" and "b" of the coil in succession	
28 Remove the coil from the bench and refit it on the vehicle (See paragraphs 12 - 14 this operation)	
29 Rubber cased coil: The method outlined above can be adopted. It is however preferable to use the test bench designed by our Repair Methods Division and sold by Etablissements de Sarello, 7 *bis*, Villa Berthier (Paris XVII) (See Pl. 5B)	Test bench 2209-T
a) Checking the continuity of the primary.	
Connect up a 6 volt battery to the test bench	
Connect the primary leads to the primary terminals of the coil at A. Operate the general switch B (top left hand) and move the change-over switch C to supply current to the lamp D (directed downwards)	
Test: The filament of the lamp must glow without any fluctuation in intensity even when the primary terminals of the coil are shaken	

TOOLS

b) Checking for correct operation:

1. Secondary terminal No. 1.

Connect the secondary terminals E of the coil to the two spark-gaps. Start up the motor by operating the motor switch F (upper right hand) and by immediately pressing the starter switch button G (bottom right) ....

Move the change-over switch C to supply current to the distributor (upwards). There should be practically no failure of the sparks across the spark-gap set at 8 mm ....

Move the change-over switch into the neutral position ....

2. Secondary terminal No. 2.

Interchange the secondary leads to the spark-gaps ....

Move the change-over switch C to the position to supply current to the distributor (upwards). There should be practically no failure of the sparks across the spark-gap adjusted to 8 mm ....

Let the spark-gap operate for 15 minutes. After this time there should still be no failure of the spark ....

Move the change-over switch into the neutral position ....

3. Secondary terminal No. 1. (after warming for 15 minutes).

Interchange the secondary leads to the spark-gaps ....

Move the switch C into the distributor position (upwards) ....

Results must be identical with those mentioned above ....

Place the switch in the neutral position ....

Disconnect the leads, switch off the apparatus ....

		TOOLS
	REPLACEMENT OF THE PUMP (See Pl. 6).	
	<u>Removal</u>	
1	Disconnect the flexible pipes from the pump unions (17 and 18)	12 mm box spanner
2	Disconnect the pump from the crankcase. WARNING : Do not drop the nuts or the washers between the air duct and the crankcase	
	<u>Replacement</u>	
3	Connect the flexible petrol pipe leading to the carburettor to the union (18) (marked SORTIE on the pump body) and the petrol supply pipe from the tank to the union (17) (marked ENTREE on the pump body)	
	NOTE - *The flexible petrol pipes are fitted without clips.*	
4	Make sure that the pump control rod is at its lowest point by turning the engine. Also make sure that the surfaces of the insulating block are perfectly clean. Pack the housing of the operating lever (13) with grease (special bearing grease)..	
5	Place the pump in position.	
6	Place two flat washers and two spring washers on the studs. Screw on the nuts. When screwing on the front nut hold the priming lever (7) down. Tighten the two nuts with a box spanner. Prime the pump by operating the lever (7)	12 mm box spanner
	REPLACEMENT OF THE DIAPHRAGMS (See Pl. 6).	
	GUIOT PETROL PUMP	
	NOTE - For this operation it is necessary to remove the pump (see paragraphs 1 and following this operation).	
7	Separate the two halves of the pump	

		TOOLS
8	Remove the set of 3 diaphragms (3) by unscrewing the nut (4). Remove the washer (5) and the diaphragms	7 mm box spanner
9	Place the new set of 3 diaphragms (3) on the push-rod (10) and make sure that the screw holes are in line with the *tapped* holes in the pump body. Replace the washer (5) and tighten the nuts (4).If necessary hold the push-rod with flat-nosed pliers in order to prevent it from rotating	7 mm box spanner
10	Drop a bead of solder on the end of the push-rod (10) and on the surface of the nut (4) at "a" in order to prevent petrol from leaking past the thread	
11	Assemble the two halves of the pump *(the diaphragms must be assembled dry without jointing material or the like)* and tighten the screws.	
	NOTE - After this operation the pump must be tested for leaks (see paragraphs 40 and following this operation).	
	REPLACEMENT OF THE DIAPHRAGMS (See Pl. 6 A).	
	S. E. V. PETROL PUMP	
	NOTE - The pump must be removed for this operation (see paragraphs 1 and following this operation).	
12	Separate the two halves of the pump	
13	Remove the diaphragm (1) and push-rod (2) assembly from the operating lever (3). Remove the spring (4)..............	
14	Place the spring (4) in the pump body. Offer up diaphragm assembly (1) with the push-rod (2) in position. Engage the push-rod (2) under the operating lever (3). Bring the screw holes in the diaphragms in alignment with the tapped holes in the pump body	
15	Assemble the two halves of the pump (see fig. 2 for positioning) *(the diaphragms must be assembled dry without jointing material or the like)* Tighten the screws fitting a spring washer under the heads..	
	NOTE - After this operation the pump must be tested for leaks (see paragraphs 40 and following this operation).	

		TOOLS
	OVERHAULING THE PUMP (See Pl. 6).	
	GUIOT PETROL PUMP	
	Removal	
16	Unscrew and remove the inlet union (17) and the outlet union (18). Remove the plug (1)	17 mm and 18 mm spanners
17	Separate the two halves of the pump body	
18	Remove the set of three diaphragms (3) by unscrewing the nut (4). Remove the washer (5), the diaphragms and the pressure plate (6), unhooking the latter from the priming lever (7). Take off the spring (8) and the joint (9) from the push-rod (10). Remove the cup(11)	7 mm box spanner
19	Drive out the pin (12) and remove the operating lever (13) together with its return spring (14) and the push-rod (10)	
20	Take off the two rubber washers (15) from the push-rod (10) as well as the celoron washer (16) (this washer is split to facilitate its removal)	
21	Clean all the parts	
	Assembling	
	NOTE - *The inlet and outlet valves cannot be removed.* If they are defective the pump must be replaced.	
22	Put the celoron washer (16) on the push-rod (10) (this washer is split to facilitate fitting). Then fit the two rubber washers (15)	
23	Insert the push-rod (10) into the pump body as far as it will go. Put the return spring (14) on the locating boss on the pump body. Insert the operating lever (13) in its seating with the forked end of the lever in contact with the washer (16) which in turn bears on the collar of the push-rod. Fit the return spring (14) on the locating boss on the lever (13)	

		TOOLS
	Keep the spring compressed by pushing down on the lever (13). Using a pin punch bring the fulcrum pin holes in the pump body and in the lever into alignment, insert the fulcrum pin (12) locking it by lightly peening the ends	5.5 mm dia. pin
24	Place in position the cup (11), the spring (8), the joint (9) and the pressure plate (6) the latter being hooked on to the priming lever (7)	
25	Place the set of three diaphragms (3) in position on the push-rod, bring the screw holes into alignment with the *tapped* holes in the pump bodv. fit the washer (5) and tighten the nut (4). If necessary hold the push-rod with flat-nosed pliers to prevent it from rotating	7 mm box spanne
26	Drop a bead of solder on the end of the push-rod (10) and on the face of the nut (4) at "a" in order to prevent petrol from leaking past the thread	
27	Assemble the two halves of the pump *(the diaphragms must be assembled dry without jointing material or the like)* and tighten the screws.	
28	Tighten the plug (1) inserting a gasket. Screw on and tighten the unions (17 and 18) using fibre washers	17 and 18 mm sp
	NOTE - Every time that pump is reconditioned it must be checked for leaks (see paragraphs 40 and following this operation)	

OVERHAULING A PUMP (See Pl. 6a).

S. E. V. PETROL PUMP

<u>Dismantling</u>

29	Separate the two halves of the pump body	
30	Remove the diaphragm assembly (1) and push-rod (2) from the operating lever (3). Remove the spring(4)	

	TOOLS
31 Remove the fulcrum pin (5) from the operating lever (3). Remove the operating lever (3), the spring (6) remains secured by its rivet	
32 Remove the priming lever (7) by taking off the circlip	
33 Remove the valve body (9), remove the outlet valve (10) together with its spring	
NOTE - The inlet valve (11) cannot be removed, and if defective the pump must be replaced.	
34 Clean all the parts	
Assembly	
35 Fit the outlet valve (10) with its spring. Fit the valve body and insert two gaskets. Tighten the three screws, locking them by tapping down into the slot of each screw a little of the metal of the pump body	
36 Place the spring of the priming lever in position. Fit the priming lever (7) and secure it by the circlip	
37 Fit the operating lever (3), insert the fulcrum pin (5) and lock with a split pin.	
38 Insert the spring (4) in the pump body. Place the diaphragm assembly (1) and the push-rod (2) in position. Engage the push-rod (2) under the operating lever (3). Bring the screw holes in the diaphragms into alignment with the holes tapped in the pump body	
39 Assemble the two halves of the pump body (see Fig. 2 for positioning). Tighten the screws, inserting a spring washer under the heads	
The diaphragms must be assembled dry without jointing material or the like.	
NOTE - Whenever the pump is reconditioned it must be checked for leaks (see paragraphs 40 and following this operation).	

CHECKING FOR LEAKS (See Pl. 7).

40 Block the outlet orifice with a plug ....

41 Fit a flexible pipe to the inlet connection from the petrol tank ....

42 Immerse the pump completely in a receptacle containing clean petrol ....

43 Blow compressed air at a pressure of $1\frac{1}{2}$ to $4\frac{1}{2}$ lbs p.s.i. through the flexible petrol pipe ....

At first, bubbles may be produced as a result of movement of the diaphragms. Maintain the pressure for a short time...

44 If bubbles of air escape through the opening for the operating lever, the diaphragms are not tight and must be replaced.

If bubbles of air escape between the cover and the body or at the clamping screws, the mating surfaces are defective or the diaphragms are not tightened down sufficiently.

REPLACEMENT OF A CARBURETTOR

		TOOLS
	Removal	
1	Remove the air filter. In order to do so unscrew if necessary the lower clip holding the rubber pipe on the valve of the oil breather, unscrew the clip securing the filter to the carburettor and remove the filter. Remove the oil breather. Stop up the hole in the crankcase with a clean cloth.	12 mm spanner
2	Disconnect the flexible pipe leading from the carburettor to the pump. Uncouple the choke wire from the lever and the sheath from its support. Remove the throttle control lever (without uncoupling the control rod from the lever)	8 and 12 mm spanners
3	Remove the carburettor and take off the spacer	12 mm spanner
4	Block the inlet manifold opening with a piece of clean rag in order to prevent foreign bodies from falling into the manifold	
	Replacement	
5	Take out the rag inserted in the manifold opening when removing the carburettor. Fit the carburettor	
	Insert the spacer (smearing the two faces with sealing compound) between the carburettor and the manifold	
	Tighten the fixing nuts using serrated washers.	
	NOTE - If a Hugo-Reintz joint and a screen are fitted, it is unnecessary to refit them.	
6	Reconnect the throttle control lever. Make sure that the throttle opens and closes fully. Fit the choke wire and adjust it. Make sure that the choke opens and closes fully	
	On types AZ and AZU make sure that the return spring brings the lever into the middle position	
	Connect the flexible pipe to the float chambers Use only flexible pipe 14 mm o.d. x 5 mm i.d. sold by our Spare Parts Division. It is unnecessary to use a clip	8 - 12 - 14 mm spanners
7	Fit the oil breather inserting a gasket. Fit the air filter pushing the rubber union on to the opening of the valve of the oil breather (this joint must be perfectly tight). At the same time connect the warm air inlet pipe (on types A and AU only). Tighten the union clip if fitted. Tighten the clip holding the filter on the carburettor	12 mm spanner

		TOOLS
	OVERHAULING THE SOLEX 22 Z AC1 CARBURETTOR (See Pl. 8).	
	Dismantling	
8	Disconnect the float chamber cover (1) from the carburettor body. Remove the float (2)	8 mm spanner
9	Undo the screw retaining the choke tube. Remove the choke tube (3)	
10	Disconnect the "starter" (4) from the carburettor	
11	Remove the compensating jet (5), remove the emulsion tube (6), the slow running air jet (7) and the slow running fuel jet (8)	
12	Remove the main jet carrier (9) and take off the main jet (10) from the carrier (9). Remove the "starter" petrol jet (11).	12 - 14 mm box spanners
13	Remove the filter (12) and the needle (13). Remove the mixture control screw (14)................................	12 - 14 mm box spanners
	NOTE - This carburettor is not fitted with removable "starter" air jet. The part (15) is only a plug	
14	Clean all the parts. Blow compressed air through all the passages and the jets	
	NOTE- *Never use metal wire to unblock a jet.*	
	Assembly	
15	Screw in the mixture control screw (14) provisionally	
16	Replace the needle (13) and insert a fibre gasket. Fit the filter (12)	12 and 14 mm box spanners
17	Screw on the "starter" fuel jet (11) and insert a fibre gasket. Screw the main jet (10) into the carrier (9) and fit the carrier (9) using a fibre gasket	12 - 14 mm box spanners

		TOOLS
18	Screw in the slow running fuel jet (8) and the slow running air jet (7). Place the emulsion tube (6) in position and screw in the compensating jet (5)	
19	Connect the "starter" unit (4) to the carburettor	
20	Place the choke tube (3) in position and secure it with the pointed screw	
21	Replace the float (2). Place the paper gasket on the float chamber joint, fit the float chamber cover (1) and tighten the screws inserting a spring washer under the heads	8 mm spanner
	OVERHAULING A SOLEX 26 BC1 CARBURETTOR (See Pl. 8A).	
	<u>Dismantling</u>	
22	Remove the float chamber cover (1) from the carburettor body. Lift the float chamber cover vertically in order to avoid bending the starter plunger tube. Remove the float (2), do not mislay the spindle	
23	Disconnect the "starter" (3) from the carburettor (unhook the return spring from the lever in order to facilitate the insertion of a screwdriver)	
24	Remove the correction jet (4) together with its emulsion tube (5) and the main jet (6)	12 mm box spanner
25	Remove the slow running jet (7) and the "starter" fuel jet (8)	8 and 12 mm box spanners
26	Remove the filter gauze (9) and the needle valve (10) and do not mislay the gasket. Remove the mixture control screw (11) together with its spring	
	NOTE - 1. This carburettor has no separate choke tube nor has it a removable "starter" air jet or a removable slow running air jet. Clean the parts and blow compressed air through the passages and the jets.	
	2. *Never use metal wire to unblock a jet.*	

		TOOLS
	Assembly	
27	Screw the mixture control screw (11) together with its spring into position provisionally	
28	Fit the needle valve (10) inserting the copper washer or washers found on dismantling. Fit the filter (9) and its plug	12 mm and 14 mm box spanners
29	Fit the "starter" fuel jet (8). Fit a copper washer. Screw the main jet (6) into the bottom of the float chamber. Screw in the slow running fuel jet (7) and the air correction jet (4)	
30	Fit the spindle into the lug on the float (2) and place the float in position in the chamber. Place the paper gasket on the joint face of the float chamber. Fit the float chamber cover (1) and tighten the screws using spring washers under the heads	
	OVERHAULING A SOLEX 26 CB1 CARBURETTOR (See Pl. 8B).	
	Dismantling	
31	Remove the float chamber cover (1) from the carburettor body Lift the float chamber cover vertically in order to avoid bending the "starter" plunger tube. Remove the paper joint. Remove the float (2) and its spindle (3)	
32	Remove the piston rod (4) and its guide (5). Turn the carburettor over to remove the piston(6), the spring (7) and the thrust pad (8)	
33	Disconnect the starter cover (9) from the carburettor (unhook the return spring (20) from the lever in order to facilitate insertion of the screwdriver)	12 mm box spanner
34	Remove the correction jet (10) complete with its emulsion tube and the main jet (11)	
35	Remove the slow running jet (12) and the "starter" fuel jet (13)	
36	Remove the filter (14) and its plug (15) and the needle valve (16) together with its washer (17)	12 mm box spanner
37	Remove the mixture control screw (18) and its spring (19)	14 mm box spanner
	Clean the parts and blow compressed air through the passages and jets	
	Never use metal wire to unblock a jet.	
	NOTE - This carburettor has not a separate choke tube nor has it a removable "starter" air jet or a removable slow running air jet.	

		TOOLS
	Assembly	
38	Screw the mixture control screw (18) together with its spring (19) into position provisionally	
39	Fit the needle valve (16) inserting the new copper washer (17)	14 mm box spanner
	Fit the filter (14) and its plug (15)	12 mm box spanner
40	Fit the "starter" fuel jet (13). Screw the main jet carrier (11) into the bottom of the chamber. (This special jet of the so-called "inverse" type has a reference mark in the form of two grooves on the body). Screw on the slow running fuel jet (12) and the compensating jet (10)	8 and 12 mm box spanners
41	Connect the "starter" (9) to the carburettor and hook the spring (20) into position	
42	Place the piston (6) in the spring (7) and the thrust pad (8) in the piston (6). Insert this piston assembly into the body of the carburettor	
43	Insert the piston rod (4) and its guide (5) into the body of the carburettor	
44	Place the float (2) and its spindle (3) in position. Place the paper gasket on the joint face of the float chamber. Put the float chamber covered) in position lowering it vertically in order not to bend the plunger tube of the "starter". Tighten the screws using spring washers under the heads	
	REPLACEMENT OF AN AIR CLEANER (See Pl. 9 and 9A).	
	Removal	
45	Unscrew the clip, if fitted, securing the rubber pipe between breather and cleaner. Undo the screw of the clip (1). Remove the cleaner	
	Replacement	
46	Fit the cleaner on the carburettor fixing the rubber hose on the breather. At the same time fit the warm air intake pipe (on types A and AU only)	
47	Tighten the screw of the collar (1). Tighten the clip securing the hose on the breather. This joint must be perfectly tight.	

		TOOLS
	OVERHAULING AN AIR CLEANER (See Pl. 9 and 9 A).	
	<u>Removal</u>	
48	Remove the cover plate (2) by undoing the nut (3). Remove the filter element (4). Remove the rubber gasket (5)	10 mm box spanner
49	Clean the filter element in trichlorethylene or in diesel oil	
	<u>Replacement</u>	
50	Soak the fabric filter element (4) in medium grade engine oil and allow it to drain	
51	Insert the filter element (4) in the cleaner body. Fit the rubber gasket (5), fit the cover plate (2) and tighten the nut (3) using a serrated washer	
	OVERHAULING A DASH-POT (on 26 BC1 Carburettor) (See Pl. 8A, fig 3 and 4).	
	NOTE - Only the capsule, the spring or the gasket çan be replaced.	
	<u>Dismantling</u>	
52	Remove the dash-pot from the carburettor body	
53	Remove the plug (12) drain off the oil	
54	Remove the capsule (13), remove the gasket (14), the dash-pot bracket (15), and the gasket (16), withdraw the spring (17)	17 mm spanner
55	Remove the adjustment screw (18) and the valve body (19), withdraw the ball (20) and the seat (21)	
56	Clean all the parts. Check that the air holes "a" in the cover (12) and "b" in the capsule are not obstructed	

		TOOLS
	Replacement	
57	Place the seat (21) and the ball (20) in position and screw up the body of the valve (19) with the filter fitted. Temporarily screw up the adjustment screw (18)	
58	Place the spring (17) in position in the capsule and on the chamber fit a gasket (16), the bracket (15) (see Fig. 4 for position), a gasket (14) and fit the capsule (13). Make sure that the piston rod (23) slides smoothly	17 mm spanner
59	Fit the dash-pot to the carburettor. Tighten the screws and insert a spring washer under each head	
60	Fill up the dash-pot with brake fluid. The level must be 11 ± 1 mm from the top of the chamber	
61	Screw in the plug (12)	
	ADJUSTMENT OF THE DASH-POT AND THE SLOW RUNNING (on 26 BC1 carburettor) (See Pl. 8A).	
62	Warm up the engine. This adjustment can be made only when the engine is warm with the oil in the dash-pot at a temperature of about 30° C	
63	Remove the air cleaner	
64	Adjust the throttle adjustment screw acting on the piston rod (23) of the dash-pot so that the centrifugal clutch drum is at the point of engagement and then slacken the screw half a turn	
65	Screw up the mixture control screw (11) until the engine begins to "hunt". Slacken this screw one and half turns	
66	Fit the air filter	
67	Accelerate firmly, release the accelerator and measure the time taken between the moment the adjustment screw (22) makes contact with the push-rod and the moment the push-rod reaches its highest point. This should be 2 seconds at most. If it is more remove the plug (12) from the dash-pot and adjust the screw (18) (the time is reduced as the screw is screwed up). Refit the plug on the chamber	
	NOTE - If, after this adjustment, the engine still fails to run smoothly when idling, check the valve rocker clearances, the sparking plug gap adjustment and the adjustment of the contact breaker points and the ignition advance	

TOOLS

ADJUSTMENT OF THE DASH-POT AND THE SLOW RUNNING (26 CB1 carburettor) (See Pl. 8B).

68 Warm up the engine ....

69 Adjust the slow running adjustment screw (21) acting on the intermediate lever (22) so that centrifugal clutch drum is at the point of engagement and then slacken the screw half a turn ....

70 Screw up the mixture control screw (18) until the engine begins to "hunt". Unscrew this screw about one and a half turns so that the engine runs smoothly ....

71 Accelerate briskly, release the accelerator and measure the time taken between the moment the slow running adjustment screw makes contact with the piston lever and the moment when the lever reaches its highest position. This should be 2 seconds at most. If not, then shift the return spring securing clip on the accelerator control rod a sufficient number of notches until smooth running is obtained (the time is reduced as the spring is tightened and vice versa). Start the adjustment by inserting the hook in the centre notch ....

NOTE - Before adjusting the dash-pot all friction losses likely to affect its operation must be eliminated ....

For this purpose:

1) Make sure that the control rod is not touching the engine crankcase or the gearbox housing ....

2) Apply a few drops of special brake fluid to the control rod at the point where it passes through the body ....

3) Apply a few drops of special brake fluid to the ball joint of the accelerator pedal ....

		TOOLS
	REPLACEMENT OF A MANIFOLD GASKET	
1	Unscrew the clip, if fitted, securing the rubber connecting pipe to the breather valve	
2	Remove the split collars securing the exhaust pipe to the manifold	12 mm box spanner
3	Disconnect the manifold flanges from the cylinder heads and remove them together with the gaskets	12 mm box spanner
4	Place the combination gaskets in position on the cylinder head flanges. Place the manifold in position. Tighten the fixing nuts to $14\frac{1}{2}$ lbs/ft (2 m.kg) inserting one flat ond one spring washer under the centre nuts and one spring washer under each of the others	12 mm box spanner
5	Fit the split collars coupling the exhaust pipe. Tighten the two fixing screws	12 mm box spanner
6	Tighten the clip, if fitted, securing the rubber connecting pipe to the breather valve	
	REPLACEMENT OF A MANIFOLD	
	Removal	
7	Disconnect the negative lead from the battery	14 mm spanner
	Unscrew the clip securing the air cleaner to the carburettor	12 mm box spanner
8	Remove the split collars coupling the exhaust pipe to the manifold	12 mm box spanner
9	Remove the inlet-exhaust manifold and carburettor assembly	12 mm box spanner
10	Disconnect the carburettor from the manifolds (without disconnecting the choke wire, the accelerator control or the flexible petrol pipe). Take off the carburettor distance piece	12 mm box spanner

		TOOLS
	Replacement	
11	Using a surface plate make sure that the surfaces of the manifold flanges are flat. If the distortion is greater than 0.1 mm reface them (by milling or if no milling machine is available, by filing)	
12	Fit the new copper asbestos gaskets on the cylinder head flanges	
13	Fit the carburettor and insert the spacer (smear the two faces with sealing compound) between the carburettor and the manifold. Tighten the fixing nuts and fit serrated washers	12 mm spanner
	NOTE - 1. If a Hugo-Reintz joint and a screen are fitted there is no need to refit them. 2. Air leaking through the inlet flange gasket will result in bad induction and will adversely affect engine performance. *Whenever the manifolds are removed new gaskets must be fitted.*	
14	Place the manifolds in position. Tighten the fixing nuts to $14\frac{1}{2}$ lbs/ft (2 m.kg). Insert one flat and one spring washer under the nuts in the centre of each flange and one spring washer under the other nuts	12 mm box spanner
15	Fit the air cleaner on the carburettor. At the same time engage the rubber hose on the breather (on types A and AU also engage the hot air intake pipe). Tighten the clip securing the air cleaner to the carburettor	12 mm spanner

		TOOLS
	REPLACEMENT OF A FAN	
	<u>Removal</u>	
1	Remove the starting handle bracket and the protecting grille	
2	Lock the flywheel with a screwdriver. Remove the fan fixing screw	14 mm box spanner
3	With a chisel and hammer deliver a sharp tap on the ratchet for the starting handle catch. This will free the fan cone from the dynamo armature (this cone is not keyed)	
	NOTE No. 1:	
	If the armature cone comes away from the crankshaft without the fan being separated from the armature, inject a little petrol, or even better, trichlorethylene on the crankshaft taper by inserting the syringe through the screw hole in the armature	
	Rotate the armature on the crankshaft to remove the grease from the cones	
	Retighten the fixing screw. Repeat the procedure described above	
4	Remove the fan	
	NOTE No. 2: If the above operation is not successful, the brush holder cover must be removed. In order to gain access to the fixing screws proceed as follows:	
	Drill an 18 mm diameter hole in the fan 45 mm from the centre of the fan (the angular position of the hole is immaterial).	
	Insert a box spanner through this hole and remove the screws securing the brush holder cover.	
	Withdraw the assembly comprising the armature, brush holder cover, dynamo body and fan. (Take care not to damage the field magnet leads). Disconnect the dynamo and field magnet terminal leads and withdraw the dynamo body. Then remove the fan from the armature, holding the latter in a vice.	
	VERY IMPORTANT - A fan unbalanced by drilling a hole must be replaced by a new one.	
	<u>Replacement</u>	
5	Rotate the engine by the flywheel so that the pistons are at T. D. C. Fit the fan, positioning it so that the starting handle is horizontal when inserted	
6	Tighten the fan fixing screw firmly with a spring washer under the head. Use a screwdriver to lock the flywheel........	14 mm box spanner

		TOOLS
7	Fit the starting handle bracket and tighten the screws inserting a spring washer under the heads	12 mm box spanner
	REPLACEMENT OF AN AIR DUCT	
	<u>Removal</u>	
8	Remove the bonnet only if it is fitted with a stay secured to the wings	
9	Remove the front wings	Wheelbrace
10	Disconnect the heating ducts from the hot air intakes	
11	Remove the fan (see paragraphs 1 to 4, this operation)	
12	Remove the headlamp bracket assembly....................	
	a) Disconnect the leads from the "BAT" and "RUP" terminals (on the metal cased coils) or from the + and - terminals (on the rubber cased coils). Disconnect the leads from the sparking plugs but *do not disconnect the sparking plug leads from the coil.* Disconnect the headlamp feed cable connections....................	
	b) Remove the headlamp control knob	10 mm box spanner
	c) Disconnect the earth lead (between headlamp bracket and engine)	8 mm spanner
	d) Disconnect the two headlamp bracket flanges from the side members and withdraw the coil and headlamp bracket assembly and headlamp control	12 mm box spanner
13	Disconnect the exhaust pipe from the manifold. Undo the expansion chamber bracket fixing nut. Undo the clip securing the front pipe of the silencer to the rear pipe of the expansion chamber. Disconnect the silencer from the gearbox housing and withdraw it	12 mm box spanner 17 mm spanner
14	Disconnect the front engine flexible supports from the chassis and from the air duct	12 - 17 mm box spanners
15	Raise the engine by means of a workshop crane or lifting tackle (use the sling 1619 VA, see Pl. 17). Withdraw the expansion chamber (from the front) and the front engine supports. Disconnect the dynamo and contact breaker leads	7 mm spanner Sling 1619 VA
16	Remove the cable harness from the air duct	

		TOOLS
17	Remove the fixing screws on the cylinder head (3 on each side). Disconnect and withdraw the air duct. Remove the hot air intakes	12 mm spanner 12 mm box spanner
	Replacement First case - Cars fitted with engines having cylinders with machined fins. NOTE - Our Spare Parts Division no longer supplies cylinder heads and air ducts of the A and AU types. On these engines a cylinder head AZ-112-01 or AZ-112-01a and the air duct AZ-242-1 must be fitted. On the cylinder head currently sold, the upper fixing hole in the air duct has been modified. This hole which was previously inclined at an angle of 30° to the air duct is now perpendicular to the faces of the inlet and exhaust manifold flanges. On the air duct AZ-242-1 the bracket for fixing it to the cylinder head is now horizontal as shown in Pl. 13. Fig. 3. Fitting an old type air duct on to a new cylinder head (A and AU engines). The air duct must be modified for this purpose: a) Cut off the bracket for fixing it to the cylinder head (see Pl. 13. Fig. 2). b) Weld or rivet on to it, as shown in Fig. 3, the following parts sold by our Spare Parts Division: Part No. A-242-80 for the left hand side; Part No. A-242-80a for the right hand side .... Fitting an AZ and AZU type air duct on an old cylinder head (A and AU engines). Using universal pliers bend the bracket of the duct until the screw hole is in line with the tapped hole on the inclined boss on the cylinder head. If necessary use a hammer to shape the bracket satisfactorily .... Second case - Cars fitted with engines having cast cylinder fins. The cylinder head is identical with that for the previous engine. On this model an air duct AZ-242-1b must be fitted.	
18	Place the heater intakes in position and secure them temporarily to the cylinder head with the rear screw. Place the air duct in position and secure it on each cylinder head with the three fixing screws (with the engine raised). Insert one plain and one spring washer under the heads where there is no reinforcement and one spring washer where the air duct is reinforced	12 mm box spanner
19	Fit the expansion chamber (tighten the screws temporarily)	12 mm box spanner 17 mm spanner

		TOOLS
20	Fit the front flexible engine supports to the air duct but do not tighten the nuts. Lower the engine, tighten the supports on the cross member and on the air duct. Insert one plain washer and one spring washer under the head on the air duct and a lockwasher under the head on the cross member	12 and 17 mm box spanners
21	Place the cable harness in position in the air duct and secure it. Connect the cables to the dynamo and to the contact breaker, inserting one serrated washer under the screw head	12 mm box spanner 7 mm spanner
	NOTE - Make sure that the cable harness is correctly positioned: the leads must pass under the condenser. They must be pressed firmly against the crankcase and secured with a clip to prevent them from being torn away by the fan.	
22	Fit the fan (see paragraphs 5 - 7 this operation)	
23	Fit the exhaust silencer and tighten the clip securing the expansion chamber to the silencer. Tighten the 2 split collars securing the expansion chamber to the air duct	12 mm box spanner 17 mm spanner
24	To fit the headlamp bracket assembly: .... a) Connect the headlamp bracket assembly flanges to the side members inserting one spring washer under the heads of the fixing screws .... b) Fit the control knob .... c) Connect the cables to the coil (inserting a serrated washer under the heads of the fixing screws) (metal cased coils) and sparking plugs or connect the terminals (rubber cased coil). Connect the terminals feeding the headlamps .... d) Connect the earth lead to the headlamp bracket assembly cross-member	 12 mm box spanner 10 mm box spanner 8 mm spanner
25	Fit the heating ducts. Tighten the clips	Wheelbrace
26	Refit the wings	
27	Replace the bonnet. Replace the bonnet stay (if fitted)	

ADJUSTMENT OF VALVE ROCKER CLEARANCES
REPLACEMENT OF A ROCKER RETURN SPRING

		TOOLS
1	Remove the bonnet if it is fitted with a stay fixed to the wings	
2	Remove the wings	Wheelbrace
3	Remove the valve covers. Place a bowl under the covers to prevent the loss of oil	12 mm box spanner
4	Adjust the valve rocker clearances as follows: On cars manufactured prior to March 1954 (the engine must be cold for this adjustment): to .006" (0.15 mm) for the inlet valves .008" (0.20 mm) for the exhaust valves On cars manufactured after March 1954 (this adjustment must be made with the engine warm): to .008 (0.20 mm) for both inlet and exhaust valves (the .008" (0.20 mm) feeler gauge must slide freely, but it should be impossible to insert an .010 (0.25 mm) feeler gauge) In both cases adjust the inlet valve when the exhaust valve of the same cylinder is raised to the maximum height and vice versa	Set of feeler gauges 10 mm spanner
5	Fit the valve covers. Insert rubber gaskets. Make sure that the mating faces are perfectly flat. The faces in contact must be dry. The widest part of the gasket must be at the bottom NOTE - A badly fitted gasket or inadequate tightening of the valve cover fixing nut may result in the total loss of engine oil	12 mm box spanner
6	Top up the oil. Start up the engine. *Check the joints for tightness.*	
7	Refit the wings	Wheelbrace
8	Refit the bonnet. Replace the stay (if fitted)	

NOTE - The return spring is placed in position by hand. Make sure that the cup is properly located under the point of the rocker with the spring engaged on the boss or in the recess in the cylinder head (engines manufactured before October 1954).

		TOOLS
	REPLACEMENT OF THE VALVE SPRING REPLACEMENT OF A ROCKER SHAFT OR ROCKER	
	<u>Removal</u> (see Pl. 12)	
9	Remove the wing on the side on which the work is to be carried out. Remove the cylinder head cover. Place a bowl underneath to collect the oil. Rotate the engine until the rockers no longer bear on the valves	Wheelbrace 12 mm box spanner
10	Remove the spring (28) or the pin fixing the rocker shaft. Remove the return spring (15) and its cup (14) if fitted. Drive out the shaft (use a 5 mm pin punch to avoid damaging the cylinder head stud bush) and remove the rocker, the thrust spring and the two washers	5 mm pin punch
11	Remove the sparking plug (use spanner 1601-T, see Pl. 21, fig. 1). Place a valve retaining tool in position to hold the valve (use valve retaining tool 1609-VA, see Pl. 10 fig. 1)	Spanner 1601-T Retaining tool 1609-VA
	NOTE - Avoid the use of a screwdriver or of a punch which may cause damage to the thread in the sparking plug hole.	
12	<u>A and AU Engines</u> (manufactured before October 1954).	
	Withdraw the spring cup from the valve stem (use spring compressor 1612-VA, see Pl. 10, fig. 1). To do this compress the spring and move the cup sideways (in the direction of the slot in the cup) in order to release it from the valve stem. Withdraw the cup and the valve spring	Spring compressor 1612-VA
12 Z	<u>Engines manufactured since October 1954</u> (see Pl. 11 A).	
	Take a spare rocker shaft and rub it with emery paper until it slides freely in the bores in the support. Hold it in position by means of a pin placed in the hole in the shaft.	
	Withdraw the spring cup from the valve stem (use spring compressor 1613-VA, see Pl. 10, fig. 2). To do so compress the spring, remove the split collets, the cup, the springs and the spring locating cup.	Compressor 1613-VA
	<u>Replacement</u>	
13	Place the retaining tool in position to prevent the valve from dropping (use retaining tool 1605-VA, see Pl. 10, fig. 1), (inserting the screwdriver through the sparking plug hole is not to be recommended, see Note to para. 11, this operation)	Retaining tool 1609-VA

		TOOLS
14	<u>A and AU Motors</u> (manufactured before October 1954)	
	Make sure that the valve guide cap (exhaust) or the lower cup (inlet) is in position. Place the spring and the upper cup in position and compress the spring (use spring compressor 1612-VA, see Pl. 10, fig. 1). Move the cup sideways (in the direction of the slot) to lock it on the valve stem. Remove the retaining tool	Spring compressor 1612-VA
	NOTE - In the case of cylinder heads fitted with an exhaust guide having a spiral cooling groove, exhaust valve guide caps having a height of 13 mm only must be fitted. If necessary reduce the height of the existing caps (see Pl. 11, Fig. 1). In the case of cylinder heads fitted with a smooth exhaust guide, fit guide caps with a height of 13 mm.	
14 Z	<u>Engines manufactured since October 1954</u> (see Pl. 11 A).	
	Place the spring locating cap in position	
	NOTE - The locating cap for the inlet valve spring is the same as that for the exhaust valve (14.5 mm high).	
	Place the inner spring, the outer spring and the upper cup in position. Place in position the used shaft prepared as in paragraph 12 Z. Compress the springs (use spring compressor 1613-VA, see Pl. 10, fig. 2). Fit the split collets. Remove the retaining tool and the shaft	Spring compressor 1613-VA
15	Fit the sparking plug and tighten it inserting the copper asbestos washer (use spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
16	Place the rocker push-rod in position in its tappet after first oiling the ball end; make sure that it is properly seated in the tappet. The curvature of the rod must not exceed 0.2 mm. Check it by placing it on two Vee blocks. If necessary straighten the rod with a mallet	
	The ball should not be pitted nor scratched nor should it show signs of wear. If necessary polish the ball with emery paper (engines manufactured before October 1954)	
	On engines manufactured after October 1954 the diameter of the ball end of the rod in contact with the tappet has been increased. On these rods it is unnecessary to polish the ball ends	
17	<u>To fit the rockers</u> (See Pl. 12):	
	Place a washer (8), the thrust spring (7), the rocker (6) and another washer (8) between the bosses forming the supports for the rocker shaft. Insert the rocker shaft (5), previously oiled, and secure it by means of its spring. (If it is fixed by a pin replace the latter by a locking spring sold by our Spare Parts Division)	

		TOOLS
	Engines manufactured before October 1954:	
	Fit the return spring (15) and its cup (14). Make sure that the cup is properly located under the point of the rocker with the spring engaged on the boss or in the recess in the cylinder head	
18	Check the valve rocker clearance and adjust it (see para. 4, this operation)	
19	Fit the cylinder head cover and its gasket. Make sure that the mating faces make a perfect joint. The faces in contact must be dry. The widest part of the gasket must be at the bottom	12 mm box spanner
	NOTE - A badly fitting joint or insufficient tightening of the cylinder head cover fixing nut may lead to the total loss of engine oil.	
20	Top up the oil. Start up the engine. *Check the joints for tightness.* Fit the wing	Wheelbrace
	NOTE - This operation is only an emergency repair. If the motor has been running with a broken spring the seating of the valve must be checked.	
	REPLACEMENT OF THE ROCKER PUSH-ROD	
	Removal (See Pl. 12).	
21	Remove the wing on the side where the work is to be carried out	Wheelbrace
22	Remove the cylinder head cover and place a bowl underneath to collect the oil. Turn the engine until the rockers no longer bear on the valve	12 mm box spanner
23	Remove the spring (28) or the pin fixing the rocker shaft. Remove the return spring (15) and its cup (14) (if fitted); drive out the shaft (using a 5 mm pin punch to avoid damaging the cylinder head stud bush); withdraw the rocker the thrust spring and the two washers.	5 mm pin punch
24	Withdraw the rocker push-rod	

		TOOLS
	Replacement	
25	Place the rocker push-rod in position (see Para. 16, this operation)	
26	Fit the rockers (See para. 17, this operation)	
27	Adjust the rocker (See para. 4, this operation)	
28	Fit the cylinder head cover with its gasket. Make sure that the mating faces form a perfect joint. The faces in contact must be dry. The wider part of the gasket must be at the bottom	12 mm box spanner
	NOTE - A badly fitting gasket or inadequate tightening of the valve cover fixing nut may cause the total loss of engine oil.	
29	Top up the oil. Start up the engine. *Check the joints for tightness.* Fit the wing	Wheelbrace
	REPLACEMENT OF CYLINDER HEAD: OF A COPPER GASKET OR OF A TAPPET.	
	Removal	
30	Remove the bonnet (if fitted with a stay fixed to the wing)	
31	Remove the wing	Wheelbrace
32	Disconnect the inlet and exhaust manifolds from the front pipe from the expansion chamber and from the cylinder head and undo the clip securing the rubber hose to the breather valve (A and AU engine). Withdraw the manifold and carburettor assembly (without disconnecting the controls) and support the assembly on the rear of the engine	12 mm box spanner
33	Disconnect the lead from the sparking plug. Remove the sparking plug (use spanner 1601-T, see Pl. 2, fig. 1). Disconnect the heater duct from the heater intake	12 mm box spanner Spanner 1601-T

		TOOLS
34	Remove the fan (See operation 6, paras. 1 and following).	
35	Disconnect the air duct.	
	When the air duct is in one piece:	
	Undo the nuts fixing the flexible suspension blocks to the front cross member of the chassis and to the air duct. Carefully raise the engine by means of a jack (inserting a block of wood between the head of the jack and the engine sump)	
	Remove the three screws securing the air duct to the cylinder head. Pull the air duct forwards as far as possible	12 and 17 mm box spanners
	In the case of a three piece air duct: Remove the bracket securing the air duct to the cylinder head	
	NOTE - If the new cylinder head is not of the same type as the one to be replaced (see NOTE to para. 51, this operation) the air duct must be removed. To do this:	
	Undo the fixing nut of the expansion chamber bracket. Undo the clip securing the front pipe of the exhaust silencer to the rear pipe of the expansion chamber. Disconnect the silencer from the gearbox housing and withdraw it	17 mm spanner 12 mm box spanner
	Withdraw the expansion chamber (from the front) and the front engine supports. Disconnect the dynamo and contact breaker cables	7 mm spanner
	Disconnect the cable harness from the air duct	
	Withdraw the air duct	
36	Disconnect the oil pipe from the cylinder head	12 mm spanner
37	Remove the cylinder head cover. Place a bowl in position to collect the oil. Remove the sparking plug (use spanner 1601-T, See Pl. 21, fig. 1)	12 mm box spanner Spanner 1601-T
38	a) Remove the cylinder head (this will withdraw the rocker push-rods) and the copper gasket (if fitted) .... b) Withdraw the tappets with a piece of iron wire bent to form a hook, inserting it through one of the lubricating holes.	14 mm box spanner

		TOOLS
39	Remove the heater intake	12 mm box spanner
	<u>Replacement</u> (See Pl. 12)	
	NOTE - When removing the exhaust valves spring note the type of exhaust guide fitted on the cylinder head. If the guide has a spiral cooling groove *the union screw* of the cylinder head oil pipe *must have a 2 mm hole*. If the guide is smooth *the union screw must have two holes of 1 mm diameter.*	
40	Clean the top of the piston and the face of the joint on the cylinder. Lightly oil the bore of the cylinder (with an oil can since a brush will intruduce impurities or lose its hairs)	
41	Oil the tappets and place them in position in their housing	
	Make sure that the rocker push-rods are notbent. The curvature must not exceed 0.2 mm; check by resting them on two vee blocks. If necessary straighten the rods with a mallet. The ball end must not be pitted or scratched or show signs of wear. If necessary polish the ball end with emery cloth (this operation is necessary only for engines manufactured before October 1954)	
	On motors manufactured since October 1954 the diameter of the ball on the rod in contact with the tappet has been increased. On these rods it is unnecessary to polish the ball end	
42	Fit the heater intake. Secure it to the cylinder head by the upper screw only using a flat washer and a spring washer under the screw head	12 mm spanner 12 mm box spanner
43	<u>Preparation of the cylinder head.</u>	
	Fit the copper gasket, previously oiled, in the recess in the cylinder head if such a gasket is found on dismantling (old type cylinder head)	
	NOTE - Types A and AU Engines. - The new cylinder heads are fitted without a copper gasket. These cylinder heads are marked with a letter S engraved under the lower fin. It is immaterial whether a new type or an old type cylinder head is fitted.	
	Place the rocker push-rods in the housing tubes. Make sure that the cup washers (11), the springs (10) and the oil retaining caps (9) together with their joint (16) are properly positioned on the housing tubes enclosing the rocker push-rods. Make sure that the distance between the centres of the tubes at the top is 47 mm. If necessary obtain this condition by spacing the tubes	

		TOOLS
44	**Fitting the cylinder head.**	
	a) Undo completely the rocker adjustment screws. Bring the pistons to top dead centre	
	b) Place the cylinder head in position	
	c) Do up the lower nut until the cylinder head is bearing on the cylinder and the cylinder on the crankcase .... Guide the housing tubes so that the shoulder on the rubber seals engages in the bores in the crankcase. Do up the two upper nuts and tighten them to a maximum of $3\frac{1}{2}$ ft/lbs (0.5 m.kg)	10 mm spanner 14 mm box spanner
45	Fit the exhaust and inlet manifold assembly inserting a copper asbestos gasket between the flanges. Place one flat washer and one serrated washer under the nuts on the centre stud of the flanges and a serrated washer under the other nuts. Do up the nuts. Tighten the clip securing the rubber connection to the breather valve. (On the latest models fitted with a reed valve there is no clip on the lower part). *(This joint must be tight).* At the same time engage the rubber connection on the hot air intake pipe (on types A and AU engines only)	12 mm box spanner
46	Tighten the cylinder head nuts as follows:	
	1st tightening = 7.1 ft/lbs (1 m.kg)	
	2nd tightening = 18 ft/lbs (2.5 m.kg)	
	When tightening always begin with the lower nut............................	
	Tighten the nuts of the inlet and exhaust manifolds to $10\frac{1}{2}$ ft/lbs (1.5 m.kg)	Torque wrench 2470-T, 14 mm socket.
47	Adjust the valve rocker clearances (See Para. 4, this operation)	
48	Fit the cylinder head cover. Make sure that the mating faces form a perfect joint. Insert the rubber gasket. Tighten the nut. The faces in contact must be dry. The wider part of the gasket must be at the bottom	12 mm box spanner
	NOTE - A badly fitting gasket or inadequate tightening of the nut may cause the total loss of the engine oil.	
49	Fit the sparking plug. Insert a copper asbestos washer (use the spanner 1601-T, see Pl. 21, fig. 1). Connect the lead to the sparking plug	Spanner 1601-T
50	Couple the oil pipe to the cylinder head (see NOTE preceding Para. 40). Fit a double copper washer on the union and tighten the adjustable screw	12 mm box spanner

TOOLS

51 Fit the Air Duct.

1st Case - Cars fitted with engines having cylinders with machined fins.

NOTE - Our Spare Parts Division no longer sells cylinder heads and air ducts of the A and AU type. On thses cars the cylinder head AZ-112-01 or 112-01a and the air duct AZ-242-1 must be fitted.

On the cylinder head currectly available the upper fixing hole of the air duct has been modified.

This hole which was previously inclined at an angle of 30° to the air duct is now perpendicular to the face of the flanges of the inlet and exhaust manifolds.

On the air duct AZ-242-1 the bracket for securing it to the boss on the cylinder head is horizontal as shown in Pl. 13, fig. 3.

Fitting an old type air duct on a new type cylinder head (A and AU engines).

For this purpose the air duct must be modified as follows:
a) Cut off the bracket for fixing the duct on the cylinder head (see Pl. 13, fig. 2) ....
b) Weld or rivet on to it as shown in fig. 3, the following part sold by our Spare Parts Division:

Under No. A-242-80 for the left hand side ....

Under No. A-242-80a for the right hand side ....

Fitting an air duct on an old cylinder head.

With the aid of a pair of universal pliers bend the bracket of the air duct as required until the screw hole is in line with the tapped hole in the inclined boss on the cylinder head. If necessary use a hammer to tap the plate into the correct shape ....

Connect the air duct.

Where the air duct is in one piece.

Place the air duct in position. Lower the motor. Tighten the two screws securing the flexible mounting blocks to the front cross member of the chassis. Tighten the nuts fixing the air ducts on the flexible blocks. Secure the air duct to the cylinder head by means of three fixing screws and insert one plain and one spring washer under the screw heads ..

When the air duct is in 3 pieces:

Fit the air duct bracket. Tighten the screws with one plain and one spring washer under the heads .... 12 and 17 mm box spanners

2nd Case - Vehicles fitted with engines having cylinders with cast fins.

The cylinder head is the same as that for the preceding engine.
On this type an air duct AZ-242-1b must be fitted.

		TOOLS
52	Fit the fan (See Op. 6, 5 and following)	
53	Fill up with oil. Start up the engine and *check the cylinder head cover joint for tightness.*	
54	Fit the wing	Wheelbrace
55	Fit the bonnet and secure the support to the wings (if fitted)	
	GRINDING THE VALVES	
56	Remove the cylinder head (See Para. 30 to 39, this operation)	
57	Strip the cylinder head (See Pl. 11 and 12)	
	a) Remove the springs (28) fixing the rocker shaft (or the pins) and drive out the rocker shafts with a 5 mm punch in order to avoid impairing the tightness of the bush provided for the cylinder head stud. Remove the rockers (6), the springs (7) and the washers (8)	
	Remove the return springs (15) and their cups (14) (on engines manufactured before October 1954)	5 mm pin punch
	b) Remove the oil retaining cups (9), the springs (10) and the thrust cups (11) of the tubes housing the rocker push-rods .	
	c) Place the cylinder head in a vice and tighten gently using lead jaws. Screw the retaining rod in the sparking plug hole (use retaining tool 1609-VA, see Pl. 10, fig. 1) in order to prevent the valve from dropping out when the spring is removed	Retaining tool 1609-VA
	NOTE - If the retaining tool 1609-VA is not available fix a wooden block on a bench to prevent the valves from dropping and the cylinder head from shifting during the removal of the valve springs	Block of wood 31 mm long x 31 mm wide x 25 mm thick
	d) Remove the valves (on types A and AU engines manufactured before October 1954)	
	Remove the valve spring cups (use spring compressor 1612-VA, see Pl. 10, fig. 1). To do this compress the spring about 2 mm and then slide the cup sideways along the slot to disengage it. Remove the valve spring, the lower cup (12) on the inlet valve and the exhaust guide cap (13). Remove the retaing rod 1609-VA and remove the valves	Spring compressor 1612-VA
	e) To remove the valves on engines manufactured since October 1954 (see Pl. 11a)	

Place in position the rocker shaft modified as described Para. 12Z, this operation ....

Remove the valve spring cups (use spring compressor 1613-VA, see Pl. 10, fig. 2). Remove the collets with the aid of a piece of iron wire, the cup, the springs and the spring locating caps. Remove the retaining rod 1609-VA and withdraw the valves and shaft ....

58 To prepare the cylinder head and to grind the valves (see Pl. 10, fig. 3 and 4).

a) Grind the valves (use a valve refacer). Grind the valve seat faces, the seat angles of the exhaust valves being 90° and those of the inlet valves 120° ....

NOTE - The width "1" of the valve seating face must be between 0.9 and 1.5 mm. If the seating face is too wide remove the lower portion with a grinding wheel bevelled at 90° for the inlet seats (see fig. 4) and at 60° for the exhaust seats (see fig. 5) and the upper part with the grinding wheel bevelled at 150° ....

b) Lap the valves (using the suction valve lapper 1615-T, see Pl. 21, fig. 6). This lapper is driven by an electric grinder or by hand ....

c) Clean the cylinder head. Carry out this cleaning operation carefully to ensure that no trace of emery remains in the valve space or in the gas ducts ....

1st assembly: Make sure that the spiral groove round the exhaust guide is not blocked. For this purpose inject petrol by means of a syringe. If the groove is blocked change the cylinder head ....

NOTE - In certain cases the groove can be unblocked by soaking the cylinder head for at least one hour in a cellulose solvent.

2nd assembly: Make sure that the lubricating hole under the head of the exhaust valve cap is not blocked (see above note).

d) Calibrate the valve springs.

TYPE OF VEHICLE	Spring	Free Length	Length in mm.	Load in kg.	Length in mm.	Load in kg.
A and AU before October 1954.		38	24	38 to 40	31	18 to 20
A and AU from October 1954.	Outer	38	24	38 to 40	31	18 to 20
and AZ and AZU	Inner	28	14.5	7.4 to 8.3	21.5	3.6 to 4.4

TOOLS

Spring compressor 1613-VA

Valve refacer
36 mm dia. grinding wheel for inlet 1661-T
32 mm grinding wheel for exhaust 1663-T

Biconical grinding wheel 33 mm dia. inlet 1631-T
Biconical grinding wheel 30 mm dia. exhaust 1632-T

Valve lapper 1615-T
Electric grinder.

	TOOLS
To check these conditions special equipment is required (use calibrator 2420-T fitted with a reference spring 2421-T, see Pl. 19). To check the inner spring an 8 mm shim must be inserted between the end of the spring and one of the guides (2) (See Pl. 19)	Calibrator 2420-T Reference spring 2421-T
e) Fit the valves. To do this:	
Place the cylinder head in the vice and tighten moderately using lead jaws. Oil the valve stems and the seats (use an oil can since a brush will introduce impurities or lose its hairs). Place the valves in position. Screw in a retaining rod in the hole for the sparking plug (use the retaining rod 1609-VA, see Pl. 10). The use of a screwdriver or of a punch is not to be recommended since this may damage the thread of the sparking plug holes. If the tool 1609-VA is not available use the method described in the NOTE to para. 57 c)	Retaining rod 1609-VA
1. <u>Engines manufactured before October 1954</u> (see Pl. 11):	
Place the lower cup (12) of the inlet valve spring and the cap (13) of the exhaust valve spring in position. Fit the springs and the cups	
Compress each cup and move it sideways along the slot in order to lock it by the valve stem (use spring compressor 1612-VA, see Pl. 10, fig. 1). Remove the retaining rod 1609-VA	Spring Compressor 1612-VA
NOTE - In the case of cylinder heads fitted with an exhaust guide with a spiral cooling groove only exhaust guide caps having a height of 13 mm should be fitted. If necessary shorten the existing caps(See Pl. 11, fig. 1).	
On cylinder heads fitted with a smooth exhaust guide, guide caps with a height of 13 mm are to be fitted	
2. <u>Engines manufactured since October 1954</u> (see Pl. 11A):	
Place in position the locating caps of the inlet and exhaust valve spring (the caps measure 14.5 mm in height and they are indentical for the inlet and exhaust springs). Fit the springs and the upper cups. Place in position a rocker shaft, modified as indicated in paragraph 12A, this operation, in the bore and compress the springs (use the spring compressor 1613-VA, see Pl. 10, fig. 2). Fit the split collets. Remove the retaining rod 1609-VA and the shaft	Spring compressor 1613-VA
f) Oil the rocker shafts and between the bosses forming the rocker shaft supports place a washer (8), the spring (7), the rocker (6) and a washer (8) and insert the shaft (5). Fit the springs (28) securing the rocker shafts (see Pl. 12) ...	
NOTE - If the axes are fitted with fixing pins the latter must be replaced by springs	
g) On each rocker push-rod housing tube fit: the cup washer (11), the spring (10) and the oil retainer (9) fitted with its joint (16) (See Pl. 12)	
h) Remove the cylinder head from the vice	

		TOOLS
59	Replace the cylinder head (see paragraphs 40 to 55, this operation)	
	NOTE - We must emphasise once more that it is impossible to replace the valve guides and the valve seats without special tools. These parts are assembled in nitrogen. If they are no longer in good condition the cylinder head must be replaced.	
	REPLACEMENT OF A ROCKER PUSH-ROD HOUSING TUBE	
	Removal (see Pl. 15).	
	1st case (the tube is shouldered, the diameter of the part in the cylinder head being 15 mm).	
60	Release the housing tube by turning up the metal with universal pliers (if the housing tube is flanged)	
61	Engage a mandrel in the housing tube. Clamp the tube in a vice and withdraw it from the cylinder head by pulling on the latter	
	Withdraw the mandrel from the tube	Mandrel 12 mm dia. x x 100 mm long.
	2nd case (the part in the cylinder head is not shouldered, diameter = 16 mm).	
62	Saw off the tube flush with the lower face of the cylinder head	
63	Use a saw blade to cut lengthwise the part of the tube remaining in the cylinder head	
	Note:– Do not damage the bore in the cylinder head.	
64	Drive out the tube with a shouldered mandrel	Mandrel Small dia, 12.8 mm, length 20 mm. Large dia. 15.9 mm, length 100 mm.
	Replacement (see Pl. 15).	
	1st case.	
65	Smear sealing compound on the part of the housing tube to be inserted in the cylinder head	

		TOOLS
	Smear sealing compound in the bore in the cylinder head in which the housing tube is to be inserted and on the chamfered edge of the bore	
66	Place the housing tube in position on the cylinder head	
67	To expand the housing tube:	
	a) Insert a tube expander in the tube (use the tube expander 1605-VA, see Pl. 15, fig. 4). Insert rollers in the tube to a depth of 12 mm only	Tube expander 1605-VA
	b) Rotate the tapered pin clockwise at the same time pressing down on it. Stop the operation when the rollers are level with the upper part of the tube	
	c) Withdraw the expander by turning the pin in the opposite direction	
	NOTE - After expansion the inner diameter of the tube should be at least 13.4 mm over a length of about 12 mm measured from the upper end of the tube	
	d) If the bore for the housing tube in the cylinder head is chamfered, flare the end of the tube on this bevel with a 15 mm diameter ball. Do not hammer the tube too hard otherwise it may split	
	e) After fitting two tubes make sure that the distance between the centres of the upper part is 47 mm. Obtain this spacing by adjusting position of the tubes if necessary.	
	2nd case.	
68	Insert the tube into the cylinder head until it is level with the upper face	
69	Expand the housing tube:	
	1. At the top:	
	a) Insert the tube expander (use the expander 1605-VA, see Pl. 15, fig. 4) and insert the rollers in the tube to a depth of 12 mm only	Expander 1605-VA
	b) Rotate the tapered pin clockwise at the same time pressing down on it. Stop the operation when the end of the rollers is flush with the upper edge of the tube	
	c) Withdraw the expander by rotating the pin in the opposite direction	
	NOTE - After expansion the inner diameter of the tube should be at least 13.4 mm over a length of 12 mm measured from the top of the tube	

TOOLS

2. The lower part:

a) Insert the expander (to facilitate insertion press on the roller carrier with a 4 mm dia. rod) until the distance "a" (see fig. 3) is equal to 14 mm ....

b) Rotate the tapered pin clockwise at the same time pressing on it. Stop the operation when the squared end has moved downwards 22 mm ....

c) Remove the expander by rotating it in the opposite direction ....

d) After fitting two tubes make sure that the distance between centres is equal to 47 mm. If not adjust the spacing of the tubes to satisfy this condition ....

ELIMINATION OF AN OIL LEAK FROM THE HOUSING TUBE

NOTE - This operation can be effected without removing the cylinder head or replacing the tube.

70 Remove the cylinder head cover, the rockers and the push-rods ....

71 Expand the housing tubes (see paragraph 67 above) ....

72 Refit the rockers and push-rods. Replace the cylinder head cover (see paragraph 5, this operation) ....

NOTE - If after doing this there is still a leakage:

Replace the punched washer under the lower fixing nut of the cylinder head by a brass washer. Smear the nut with sealing compound.

ELIMINATION OF AN OIL LEAK THROUGH THE CYLINDER HEAD GUDGEON BUSHES

NOTE - 1. To find out whether there is a leak here, plug the bush (on the rocker side) with roof sealing compound. Pour petrol into the fixing stud hole. This petrol should not flow out through the hole provided for the rocker shaft.

		TOOLS
	2. The replacement of a stud bush can be effected without removing the cylinder head if the leak can be found. In this case use the extractor MR 3682-50	Extractor MR-3682-50
	<u>Removal</u> (see Pl. 12, fig, 1).	
73	Tap the bush (30) to be extracted for a length of about 10 mm using a 10 mm dia. x 150 pitch screw tap	
	Extract the bush. If the bush does not fit very tightly use a screw to withdraw it. Hold the head of the screw in a vice and pull on the cylinder head	
	If the bush fits tightly withdraw it by using an extractor (use the extractor MR-3682-50, see Pl. 15, fig. 5)	Extractor MR 3682-50
	NOTE - There are two types of stud bushes (30):	
	A 112-99 with an outer diameter of 11 mm	
	A 112-99a with an outer diameter of 11.2 mm	
	<u>Replacement</u>	
74	Smear the housing in the cylinder head for the bush with sealing compound	
	Place the bush in position using a clamp, or if not available, by hammering, using a shouldered mandrel	Mandrel Small dia. = 8.5 mm length = 15 mm Large dia. = 12 mm length = 100 mm.

REPLACEMENT OF A CYLINDER-PISTON ASSEMBLY

		TOOLS
	Removal	
1	Remove the bonnet if the latter is secured to the wing	
2	Remove the wing on the side on which the work is to be carried out	Wheelbrace
3	Disconnect the exhaust pipe from the manifold by removing the two half collars. Undo the clip (if fitted) securing the rubber union to the breather valve. Disengage the inlet and exhaust manifolds from the cylinder heads and withdraw them (without disconnecting the controls). Place the assembly on the rear of the engine	12 mm box spanner
4	Disconnect the lead from the sparking plug and remove the plug (use the spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
5	Disconnect the heater duct from the hot air intake	
6	Remove the fan (See Op. 6, paras. 1 and following).	
7	Remove the air duct.	
	Where the air duct is in one piece.	
	Undo the nuts fixing the flexible suspension blocks to the front cross member of the chassis and to the air duct. Raise the engine slightly by means of a jack (insert a wooden block between the head of the jack and the engine sump). Remove the three screws securing the air duct to the cylinder head. Pull the air duct forward as far as possible	12 mm spanner 17 mm box spanner
	Where the air duct is a three piece assembly.	
	Remove the bracket securing the air duct to the cylinder head	
8	Disconnect the oil pipe from the cylinder head	12 mm box spanner
9	Remove the cylinder head cover. Place a receptacle underneath to collect the oil. Remove the cylinder head and the copper gasket, if fitted, and take out the rocker push-rods. Mark the position of the cylinder relative to the crankcase, so that it can be replaced to give the same working conditions in the event of having worn oval (types A and AU engines). On types AZ and AZU engines this precaution is unnecessary. Because of the grooves in the fins the cylinders can be fitted in one position only. Remove the cylinder, which can be withdrawn by hand	12 and 14 mm box spanner

TOOLS

10 Remove the piston (See Pl. 11).

a) Remove the circlips (24) from the gudgeon pin ....

b) Remove the gudgeon pin (use the extractor MR-3682-10, See Pl. 14, fig. 1 and 3) .... Extractor MR-3682-10

11 Clean the parts ....

<u>Replacement.</u>

12 Fit the piston on the connecting rod ....

NOTE - The piston is paired with its own cylinder. This assembly is sold by our Spare Parts Division. In no circumstances should one of these parts be renewed without renewing the other. There are two types of piston which are interchangeable, but on one and the same engine *the two pistons must be of the same type.* The cylinder-piston assemblies bear the following numbers:

A 111-01 for pistons with 4 rings) bore 62 mm)
A 111-01a for pistons with 3 rings))
AZ 111-01 for pistons with 3 rings, bore 66 mm) Cylinders with machined ribs
AZ 111-01a for the L.H. convex piston and AZ 111-01b for the R.H. convex piston)

AZ 111-01c for the L.H. convex piston and AZ 111-01d for the R.H. convex piston (cylinders with cast fins).

Our Spare Parts Division supplies only pistons with three rings. (These pistons may or may not have a split skirt).

Important Note :– On one and the same engine it is possible to fit one cylinder with cast fins and one cylinder with machined fins but this is not to be recommended.

a) Bring the piston to a temperature of about 60° C by immersing it in an oil bath or by heating it in an oven so that the gudgeon pin can be inserted by hand. The gudgeon pin and piston have an index mark etched on them and after fitting these two marks must coincide ....

b) Place the piston on the connecting rod ....

Split skirt piston:

Bring the slot to the correct position: on the left hand piston the slot is at the bottom; on the right hand piston it is at the top ....

Pistons without a slot:

The position of the piston is given by the word "AVANT" and an arrow engraved on the top of the piston.

TOOLS

Oil the gudgeon pin and fit it by hand in the piston and the connecting rod ....

Convex piston:

There is a right hand piston and a left hand piston distinguished by the letters D or G. The letter must be situated at the front of the engine ....

NOTE - The compression rings are tapered. They have the index: HAUT, H or TOP engraved on the top face. When assembling the index mark must be located towards the top of the piston.

On the piston fitted with cylinders having cast fins, the first ring may be cylindrical or may taper inwards; an index mark shows the correct assembly position ....

The edges of these rings are rounded.

In the case of pistons sold by our Spare Parts Division make sure that the rings are correctly assembled. *Incorrectly fitted rings will cause excessive oil consumption.*

If a used piston is refitted with only the rings renewed make sure that they turn freely in their grooves, if not file lightly with a smooth file. If there is excessive play the piston cannot be re-used.

13 Fitting the cylinder.

a) Oil the piston with an oil-can (a brush will introduce dirt or lose its hairs). Arrange the rings so that the gaps in the 1st and 3rd rings are opposite the slot in the piston and the gaps of the 2nd and 4th rings at 180° in the case of pistons with four rings. On pistons with three rings locate the gaps at 120° ....

b) Fit a piston ring guide on the piston (use the guide 1659-VA for 62 mm dia. pistons or 1654-VA for 66 mm dia. pistons, see Pl. 15, figs. 1 and 2); fit the cylinder after first oiling but do not rotate it to avoid displacing the gaps in the rings, fitting it so that the marks made when removing coincide (engines types A and AU) or by correctly positioning the slots in the ribs of the cylinder (types AZ and AZU engines) .... — Piston ring guide 1654-VA or 1659-VA

14 Make sure that the rocker push-rods are not bent. The curvature must not exceed 0.2 mm; check by placing the rods on two Vee blocks. If the curvature is greater straighten the rods by using a mallet. The ball end must not be pitted, or scored or show traces of wear. If necessary polish the ball end with emery cloth. (This operation is necessary only on engines manufactured before October 1954) ....

Place the rocker push-rods in position first oiling the ball ends; make sure that they are properly seated in the tappets .

Fit the copper gasket, if one is found during removal, in the recess in the cylinder head, first oiling lightly ....

NOTE - 1. Types A and AU engines. - The new type of cylinder head is not fitted with a copper gasket. These cylinder heads are marked with a letter S punched under the lower fin. It does not matter whether an old type or new type cylinder head is fitted.

2. - Types AZ and AZU engines: the cylinder head of engines fitted with convex pistons are identical with those fitted with flat pistons ....

		TOOLS
15	Fitting the cylinder head.	
	a) Undo completely the rocker adjustment screw. Bring the pistons to top dead centre	
	b) Place the cylinder head in position	
	c) Screw up the lower nut until the cylinder head bears on the cylinder and the cylinder on the crankcase. Guide the housing tubes until the shoulder of the rubber sealing washers engages in the bores in the crankcase. Screw on the two other nuts and tighten them to a maximum of 3.5 lbs/ft (0.5 m.kg)	14 mm box spanner
16	Fit the inlet and exhaust manifolds together with the carburettor. Insert a copper asbestos gasket between the flanges. Place one plain washer and one serrated washer under the centre nuts and a serrated washer under the other nuts and tighten the nuts. Tighten the clips securing the rubber union to the breather valve. This joint must be tight. On the latest model (reed valve) there is no clip on the lower part.	
	Fit the coupling half-collars to the pipe on the expansion chamber	12 mm box spanner
17	Tighten the cylinder nuts:	
	1st. Tightening to 7 lbs/ft. (1 m.kg)	
	2nd. Tightening to 18 lbs/ft. (2.5 m.kg) (use the torque wrench 2470-T, see Pl. 21, fig. 5)	
	Always begin by tightening the nut at the bottom	
	Tighten the air duct nut to $10\frac{1}{2}$ lbs/ft. (1.5 m.kg)	Torque wrench 2470-T 14 mm socket.
18	Adjust the valve rocker clearances (engines manufactured before March 1954).	
	To .006" (0.15 mm) for the inlet valves;	
	To .008" (0.20 mm) for the exhaust valves.	
	Adjust the inlet valve when the exhaust valve of the same cylinder is at its highest point and vice versa. These adjustments are made *with the engine cold.*	10 mm spanner Set of feeler gauges.
18A	Make a temporary adjustment of the valve rocker clearances (engines manufactured since March 1954).	
	Under the same conditions as for the preceding paragraph adjust the inlet and exhaust valves to .008" (0.20 mm)	
19	Replace the cylinder head cover and insert a rubber gasket. Make sure that the mating faces are perfectly flat. The faces in contact must be dry. The wide part of the gasket must be at the bottom	12 mm box spanner
	NOTE - *A badly fitting gasket or inadequate tightening of the cylinder head cover fixing nut may result in the total loss of the engine oil.*	

		TOOLS
20	Fit the sparking plug (use the spanner 1601-T, see Pl. 21, fig. 1). Connect the lead to the sparking plug	Spanner 1601-T
21	Connect the oil pipe to the cylinder head and fit a double copper gasket on either side of the union. Tighten the union screw	12 mm spanner
22	Fit the air duct. Where the air duct is in one piece: Place the air duct in position. Lower the engine. Tighten the two screws fixing the flexible suspension blocks to the front cross member of the chassis. Tap down the lockwashers (replace them if they are in bad condition). Secure the air duct to the cylinder head by means of the three screws, inserting one plain and one spring washer under the screw heads. Tighten the nuts securing the air duct to the flexible blocks .... When the air duct is a three-piece assembly: Place the bracket securing the air duct to the cylinder head in position. Tighten the screws and insert one plain and one spring washer under the heads	12 mm box spanner
	IMPORTANT NOTE If one cylinder with cast fins and one cylinder with machined fins are fitted two cases are possible: 1. Fitting the air duct AZ-242-1. Bend the air duct as required on the side of the cylinder with cast fins. 2. Fitting the air duct AZ-242-1 b. The space existing round the cylinder with machined fins will not adversely affect proper cooling of the engine.	
23	Fit the fan (see Op. No. 6, para. 5 and following).	
24	Top up the engine oil. Start up the engine (check the cylinder head cover joint for tightness)	
25	Adjust the clearance of the valve rocker (engines manufactured since March 1954). With the engine warm remove the cylinder head cover, and collect the oil. Adjust the valve rocker clearances to .008" (0.20 mm) for the inlet and exhaust valves. The .008" (0.20 mm) feeler gauge must slide freely but it must be impossible to insert the .010" (0.25 mm) gauge. Adjust the exhaust valve when the inlet valve of the same cylinder is at its highest point and vice versa. Refit the cylinder head cover (check the joint for tightness)	12 mm spanner
26	Replace the wing. Refit the bonnet if necessary	Wheelbrace
	REPLACEMENT OF A SMALL END BEARING BUSH	
	Removal	
27	Remove the cylinder and the pistons (see paras. 1 to 10, this operation)	
28	Remove the bush from the connecting rod (use the extractor MR-3682-20, see Pl. 14, figs. 2 and 4)	
29	Clean the parts	Extractor MR-3682-20

		TOOLS
	Replacement (types A and AU engines).	
30	Fit the bearing bush bringing the oil holes in the connecting rod and in the bush into alignment. (Use the extractor MR-3682-20, see Pl. 14, figs. 2 and 4)	Extractor MR-3682-20
31	Ream the bush (use a 20 mm dia. expanding reamer). If no plug gauge is available use the new gudgeon pin to check the bore	
	NOTE - This delicate operation must be carried out with the greatest care; the dimensions of the bore when completed must be $20^{+0.020}_{+0.015}$ mm.	
32	Fit the piston and the cylinder (see paras. 12 to 26, this operation)	
	Replacement (types AZ and AZU engines).	
	NOTE - The bushes sold by our Spare Parts Division have a bore which is about 0.05 mm smaller than the finished bore.	
33	Fit the bush.	
	Block the hole in the bush with grease or with tallow. This grease plug must not overflow to the outside of the bush. Fit the bush prepared in this way (use the extractor 3682-20, see Pl. 14, fig. 4). After the bush is in position the oil hole in the bush must be in line with the oil inlet hole bored in the body of the connecting rod. Check the correct alignment of the oil holes; a 3/32" (2.4 mm) dia. wire should enter easily	Extractor MR-3682-20
34	Ream the bush (use a 20 mm dia. expanding reamer). If no plug gauge is available use the new gudgeon pin to check the bore	Expanding reamer 20 mm dia.
	NOTE - This delicate operation must be carried out with the greatest of care and the diameter of the finished bore must be $20.005^{+0.015}_{+0.010}$ mm.	
35	Drive out the grease plug (inserted according to paragraph 33) by compressed air. Blow compressed air through the hole "a" (see Pl. 14) in the big end of the connecting rod, the grease will be driven into the bore in the bush thus carrying away with it any foreign bodies. Carefully clean the bore in the bush	
36	Fit the piston and the cylinder (see paras. 12 to 26, this operation)	

		TOOLS
	REPLACEMENT OF THE PISTON RINGS	
	<u>Removal</u>	
37	Remove the piston and cylinder assembly (see paras. 1 to 9, this operation)	
38	Remove the piston rings (use piston ring pliers)	Piston ring pliers.
39	Clean the piston:	
	Remove the carbon from the grooves using a scraper. NOTE: do not damage the sides of the grooves. Emery cloth must not be used	
	Clean the piston with petrol or with trichlorethylene and blow it off with compressed air	
	<u>Replacement</u>	
	NOTE No. 1 - The compression rings are tapered.	
	They are marked with one of the following: HAUT, or H or TOP.	
	When the rings are fitted this mark must be towards the top of the piston.	
	Incorrectly fitted piston rings will cause abnormal oil consumption.	
	NOTE No. 2 - On engines fitted with cylinders having cast fins the first compression ring may be tapered and bears a mark which must be directed towards the top part of the piston. The edges of this ring are rounded	
40	Fit the rings:	
	Place each ring in its groove (use piston ring pliers) and make sure that they turn freely in their grooves; if not file them lightly with a smooth file. If there is excessive play the piston and cylinder assembly must be renewed	Piston ring pliers.
	NOTE - Never use a tool to tamper with the piston groove as this will weaken the sides which will become deformed rapidly and result in the seizure of the piston rings.	
41	Fit the cylinder and piston assembly (see paras. 12 to 26, this operation)	

CHECKING AND ADJUSTING THE OIL PRESSURE

		TOOLS
1	Warm up the engine (for about 15 minutes). Remove the R.H. front wing	Wheelbrace
2	When the temperature of the oil reaches 60° C, stop the engine	
	a) Remove the fan (see Op. 6, paras. 1 and following).	
	b) Retain the armature on the crankshaft by means of the fan fixing screw and insert the plain washer 10 x 30 x 2 mm thick	12 - 14 mm box spanners.
4	Remove the oil screw from the L.H. cylinder head. Fit the pressure gauge pipe with the aid of the union MR-3705 (see Pl. 16, fig. 2). Use a pressure gauge calibrated from 0 to 150 p.s.i. (0 to 10 kg/cm^2)	Union MR-3705
	NOTE - If the test is to be a relatively long one refit the fan in order to avoid overheating of the engine. In this case introduce the pressure gauge tube between the air duct and the cylinder on a level with the point where the cylinder enters in the cylinder head (dotted lines in Pl. 16, fig. 1)	12 mm box spanner or box spanner
5	Start up the engine. Let it run at 3,500 r.p.m. and read off the pressure which should be between 41 and 45 p.s.i. (2.9 and 3.2 kg/cm^2). Stop the engine . If the pressure is not correct change the number of the washers (27) (see Pl. 11)	
	NOTE - 1. On the old models the adjustment is made by means of the washers forming the joint and located between the the valve plug (2) and the crankcase (see Pl. 11)	
	2. The only plugs which must be refitted are those without the guide plates A-222-98 a, with ball 4104-S, (8.54 dia.) and spring A-222-5	
5 Z	On types AZ and AZU engines the pressure must be between 35 and 40 p.s.i. (2.5 and 2.8 kg/cm^2)	
6	Disconnect the pressure gauge. Replace the lubricating screw of the cylinder head, inserting the double copper joint	12 mm box spanner or plain spanner
7	Remove the screw fixing the armature. Fit the fan (see Op. 6, paras. 5 and following):	
	Top up the engine oil. Start up the engine (check the cylinder head cover joint for tightness)	
	Fit the wing	Wheelbrace

		TOOLS
	REPLACEMENT OF A RELIEF VALVE (see Pl. 11).	
	Removal.	
8	Remove the front R.H. wing	Wheelbrace
9	Undo the valve plug (2) and remove the spring (3) and the ball (4)	17 mm box spanner
10	Clean the parts and the inlet hole	
	Replacement.	
11	Place the ball (4) in position in the crankcase and in the valve plug (2), place the adjustment washers (27) and the spring (3). Screw up and tighten the plug (2) inserting a copper asbestos washer. Check the pressure (see paras. 2 - 6, this operation)	17 mm box spanner
	NOTE - Only plugs without guide plate A-222-98a must be refitted with ball 4104-S (8.54 mm dia.) and spring A-222-5.	
12	Replace the wing	Wheelbrace
	REPLACEMENT OF AN OIL COOLER	
	IMPORTANT NOTE - *Never run the engine without the oil cooler,* because a considerable part of the oil circulation system will be cut off. It is possible *in the case of a breakdown* to replace the cooler *temporarily* by a tube.	
	Removal.	
13	Remove the fan (see Op. 6, paras. 1 and following).	
14	Cut and remove the iron wires locking the union screws securing the tubes	
15	Remove the two union screws. Disconnect the cooler from the crankcase by removing the screw securing it to the crankcase. Remove the cooler	12 - 26 mm box spanners 12 mm flat spanner

		TOOLS
	Replacement.	
	NOTE - Before fitting the new cooler the tubes must be cleaned with trichlorethylene or with petrol. Blow them out with compressed air.	
	If a used oil cooler is fitted it must be cleaned. Wash it thoroughly with diesel oil. Blow it out with compressed air. Immerse it in a bath containing cellulose solvent for 30 minutes. Make the solvent circulate in the cooler in order to remove all impurities and then blow compressed air through it.	
16	Fit a copper asbestos washer between the union of the cylinder head oil tube and the crankcase (on the left and on the right)	
	NOTE - To keep this washer in place slightly bend the oil tube so that its union bears on the washer. Also make sure that the bore in the union is in line with the tapped hole in the crankcase.	
17	Insert the union screws in the cooler tube union using a combination washer on either side of the union	
18	Place the cooler in position and engage only a few threads of the union screws by hand. Check by inspection, that the washers have been inserted between the cylinder head and crankcase oil tube unions (there must be three washers on each union screw)	
19	Connect the cooler to the crankcase. Tighten the fixing screw and insert one plain washer under the nut	12 mm spanner 12 mm box spanner
20	Tighten the union screws. Lock them by means of a piece of wire to prevent them from working loose. Insert the iron wire in the hole provided in the head of the union screws and twist it round each of the cooler tubes	26 mm box spanner
21	Fit the fan (see Op. 6, paras. 5 and following).	
	REPLACEMENT OF AN OIL BREATHER (by a breather of the same type).	
	Removal.	
22	Remove the air cleaner by undoing the screw securing the clip. Undo the lower fixing clip on the rubber union (1st and 2nd models)	
	Undo the fixing nuts and remove the breather from the rubber union	12 mm box spanner

		TOOLS
	Replacement.	
23	Fit a gasket on the flange of the crankcase. Place the valve carrier tube in the rubber union. Tighten the two fixing nuts of the breather using serrated washers. Under one of the nuts tighten the earth lead of the headlamp bar. Fit the air cleaner and tighten the fixing clip screw. Place the rubber union in position. This connection must be tight. Tighten the clip (1st or 2nd model)	12 mm box spanner
	REPLACEMENT OF AN OIL BREATHER (1st or 2nd type by a breather of the 3rd type).	
	Removal.	
24	See para. 22, this operation.	
	Replacement	
25	Cut the bottom part of the tube A along a length of about 10 mm (see Pl. 9) so that the distance between the end of the tube and the bottom of the filter is 53 $\pm$ 1 mm	
26	Fit the breather (see para. 23, this operation). There is no clip on the lower part of the union	
	OVERHAULING AN OIL BREATHER (see Pl. 20, fig. 3). (1st or 2nd type).	
27	a) Remove the pin (81) and withdraw the cup (82), the spring (83), the plate (84), the distance piece (85) and the valve (86) (metal or rubber)	
	b) Clean the parts	
	c) Examine the valve, it should not be bent or show traces of splitting or corrosion (metal valve) or of deformation (rubber valve). If any of these defects are present, replace the parts dismantled above by an assembly sold by our Spare Parts Division.	

TOOLS

d) Place the valve (86) (metal or rubber) on the breather body, the distance piece (85), the plate (84), the spring (83) and its cup (82). Lock with a pin. Be careful not to distort the fixing pin when inserting the split pin (81) ....

NOTE - The metal plate valve A-132-02 and the rubber valves A-132-02a are not interchangeable. The old breather body is no longer sold. It has been superseded by the new one sold by our Spare Parts Division under the same number A-221-1 ....

OVERHAULING A BREATHER VALVE (see Pl. 20, fig. 4)
(3rd type)

28 Take out the rubber reed from the breather body. This part is simply put into the body of the breather ....

Clean with petrol ....

Place the reed in the breather (the position of the slot is immaterial) ....

		TOOLS
	REMOVAL	
1	Remove the bonnet. Disconnect the battery leads (use the terminal extractor 2200-T, see Pl. 79 fig. 1)	Extractor 2200-T
2	Remove the two front wings	Wheelbrace
3	<u>Remove the headlamp support and the headlamps.</u>	
	a) Disconnect the "BAT" and "RUP" leads from the coil (metal cased coil) or the positive and negative leads (rubber cased coil) and disconnect the leads from the sparking plugs. Pull out the plugs of the cables feeding the headlamps	
	b) Remove the headlamp control knob	10 mm box spanner
	c) Disconnect the headlamp support earth wire from the breather. Undo the two headlamp support flanges from the side members and withdraw the support, coil headlamp and control assembly	12 mm box spanner
4	<u>Remove the fan</u> (see Op. 6, paras. 1 and following)	
5	Disconnect the cables from the dynamo, the contact breaker and the horn. Disconnect the earth wire from the gear lever housing. Remove the cable harness from the air duct and from the clip on the horn bracket. Place it on the scuttle.....	12 mm box spanner
6	Disconnect the throttle control lever from the carburettor. Release the control and keep it in position against the scuttle panel by means of the cable harness. Disconnect the clutch cable from the lever. Press down the clutch pedal, withdraw the cable socket from the trunnion and remove the sheath stop from the bracket on the gearbox. Remove the screw locking the speedometer drive; withdraw the cable from the gearbox. Disconnect the flexible brake pipe from the union on the gearbox. Disconnect the flexible petrol pipe from the tube from the petrol tank and from the petrol pump	10 - 12 - 17 mm flat spanners
7	Disconnect the choke control and remove it. Disconnect the starter control from the switch. Disconnect the hand brake cables from the lever. Disconnect the fork shift lever from the gear lever	8 mm flat spanner
8	Undo the two collars fixing the heater tubes and remove the tubes from the hot air intakes	
9	Undo and remove the two nuts or the two screws securing the two front flexible engine suspension blocks to the cross member and undo the two nuts or the two screws fixing the rear flexible block. Remove the dust covers on the sliding coupling of the drive shaft. Undo the four nuts securing the front flexible engine suspension blocks to the air duct	17 mm box spanner 17 mm flat spanner 12 mm box spanner

		TOOLS
10	Put a chain sling into position (use the sling 1619-VA, see Pl. 17)	Sling 1619-VA
11	Raise the engine by means of lifting tackle or a workshop crane. If no lifting tackle is available the assembly can be removed by hand by two men	
12	Place the engine on the ground or on a workshop bench. Insert the wooden packing, 0.15 mm thick, under the gearbox in order to avoid damaging the exhaust silencer. Remove the chain sling	
	REPLACEMENT OF THE ASSEMBLY	
13	Put a chain sling in position (use the sling 1619-VA, see Pl. 17)	Sling 1619-VA
14	Lift the engine and suspend it above the car. Lower it, at the same time engaging the drive shafts in the sliding couplings (after first smearing the splines with an adhesive grease). *Place the hand brake cables in their duct* in the chassis cross member	
	NOTE - 1. In order to ensure correspondence of the movement when running in a straight line, it is essential that the forks of the sliding couplings and the splined drive shaft should be in the same plane.	
	2. Make sure that the rubber dust cover on the drive shaft is in position.	
	Continue to lower the engine, guiding the ends of the brake cables into the trunnions on the intermediate levers, insert the rear engine suspension fixing studs (or screws) in the bracket on the axle tube and support the engine/gearbox assembly on the chassis. Remove the chain sling.	
15	Insert the fixing screws of the front engine support without tightening them. Insert a lockwasher under each head. Tighten the fixing nuts or fixing screws of the rear engine suspension, inserting a lockwasher under each nut. Finally tighten the two screws securing the rear supports to the cross member, turning down the lockwashers, and tighten the nuts securing the front engine supports to the air duct	12 mm and 17 mm box spanner 17 mm flat spanner
16	Provisionally screw up the adjustment nuts on the ends of the brake cable. Fit the dust covers in position on the sliding couplings	
17	Put the trunnion in position in the clutch lever. Place the sheath end stop on the sheath and engage it in the bracket on the gearbox. Insert the end of the cable in the trunnion	

		TOOLS
18	Connect the flexible Lockheed pipe to the distributing union on the gearbox. Fit a copper gasket on either side of the union. Fit the speedometer drive in its socket on the gearbox, tighten the screw, inserting a spring washer under the head	12 - 17 - 19 mm spanners.
19	Fit the carburettor control lever and adjust the length of the rod (by bending the vee-shaped portion) in order to obtain the correct opening of the throttle. Make sure that the control operates normally	12 mm box spanner
20	Fit the choke control wire and adjust in order to obtain the correct opening and closing of the disc	8 mm spanner
21	Connect the control wire to the starter switch and adjust it so that it is neither too taut nor too slack	
22	Connect the gear control lever to the fork shift lever. The pin should fit into the rubber bush without play, otherwise the bush must be renewed	
23	Fit the flexible petrol intake pipe between the pipe from the tank and the petrol pump. *(This flexible pipe is fitted without clips).*	
24	Fit the earth wire, securing it under the left hand front nut fixing the gear lever bracket, using a serrated washer under the nut. Insert the cable harness in the clip on the horn bracket	
	Connect the cable to the horn. Place the cable harness in position in the air duct	
	Connect the cables to the dynamo and to the contact breaker, pass them under the condenser and press them against the front face of the crankcase and the dynamo body, securing them with the metal clip in order to prevent them being cut by the fan	7 mm flat spanner 12 mm box spanner
25	Place the headlamp bracket assembly on the chassis (passing the right hand bracket behind the flexible petrol pipe). Insert the headlamp control rod through the dashboard, tighten the fixing screws with a plain washer and a spring washer under each head. Fit the control knob and tighten the nut. Connect the earth wire from the headlamp bracket to one of the nuts securing the breather	8 mm flat spanner 10 and 12 mm box spanner
26	Connect the plugs of the cables feeding headlamps, connect the cables to the "BAT" and "RUP" terminals (metal cased coil) or to the positive and negative terminals (rubber cased coil). Connect the cables to the sparking plugs and to the battery.	

		TOOLS
27	**To check the initial ignition setting.**	
	a) Connect an indicator lamp between earth and the "RUP" terminal of the metal cased coil or the negative terminal of the rubber cased coil	Indicator lamp
	b) Turn the engine by means of the flywheel in the running direction. Stop the engine at the precise moment the lamp lights.	
	1st Case - The flywheel is not drilled (there is a reference mark on the engine side consisting of a chisel cut under the starter ring).	
	c) Make sure that the reference mark is opposite the joint between the two halves of the crankcase or has not passed it.	
	d) Rotate the engine, the lamp is extinguished. Stop at the very moment that the lamp lights again. The engine has completed one revolution	
	e) Re-check to make sure that the reference mark is opposite the joint or has not passed it.	
	f) If in either of the checks (paras. c and e):	
	- the reference mark has passed the joint between the halves of the crankcase;	
	- or is more than the thickness of one tooth in front of this joint,	
	the ignition advance must be re-set (see Op. 47, paras. 10 to 16).	
	2nd Case - The flywheel has a hole for adjustment purposes (see Pl. 2).	
	g) Insert a 6 mm diameter rod:	
	1. - For types A and AU engines: in the hole provided on the right hand side of the clutch housing (see Fig. 1).	
	2. - For types AZ and AZU engines: in the hole provided on the left hand side of the crankcase (see Fig. 2).	
	Make sure that the rod enters the hole in the flywheel or that this hole has not yet passed the rod	Rod 6 mm dia. x 100 mm long
	h) Rotate the engine in the normal running direction. The lamp is extinguished. Stop at the very moment that the lamp re-lights. The engine has completed one revolution.	
	i) Make sure that the hole is opposite the rod or has not passed it.	
	j) If in either of the above checks (paras. g and i):	
	- the hole has passed the rod;	
	- or is more than 8 mm in front of the rod,	
	the ignition advance must be re-set (see Op. 47, paras. 19 to 22).	

		TOOLS
	k) Switch off and remove the indicator lamp.	
28	Turn the engine by roating the flywheel in order to bring the pistons to T.D.C. Fit the fan. Locate it so that when in position the starting handle is horizontal. Hold the flywheel by means of a screwdriver. Tighten the fixing screw firmly and insert a spring washer under the head. Fit the starting handle bracket and its grill. Tighten the screws using a spring washer under each head. Move the gear lever into the neutral position	12 and 14 mm box spanner
29	Connect the two heater tubes to the hot air intakes. Tighten the clips	
30	Top up the engine oil - about 2 litres (S.A.E. 20 grade). Preferably use a detergent oil	
31	Top up the oil level in the gearbox; about 1 litre of extreme pressure oil (S.A.E. 80 EP). If the oil level is too high or if the oil is too thick, the gearbox may not operate properly (the synchronising cones may stick)	
32	Adjust the handbrake (see Op. 49, para. 16)...	
33	Bleed the brake pipes (see Op. 49, paras. 18 to 24)..	
34	Start up the engine	
	Engines delivered since March 1954: Adjust the valve clearances (see Op. 47, para. 4).	
35	Adjust the slow running(see Op. 47, para. 37)...	
36	Adjust the oil pressure (see Op. 47, paras. 44 to 50)	
37	Adjust the lost motion of the clutch pedal on types A, AU and AZU vehicles. (See Pl. 24).	
	a) Insert the split pin in one of the holes in the pedal rod so that the pad of the pedal is level with that of the brake pedal. Under these conditions the travel of the pedal should be between 85 mm and 95 mm. Shift the position of the pin if necessary	
	b) Insert the packing piece MR-3834 (see Fig. 4) between the split pin and the toe board	Packing piece MR-3834

		TOOLS
	c) Put the engine in gear and adjust the length of the cable so that when the vehicle is pushed along the engine does not turn	
	d) Remove the packing piece MR-3834. Put the gear lever into neutral	
	e) Start up the engine and make sure that the gears can be changed properly. If not, the clutch mechanism must be adjusted (see Ops. 15 and 16)	
37 Z	To adjust the lost motion of the clutch pedal (on type AZ vehicles) (see Pl. 24).	
	a) Insert the locking pin in one of the holes in the pedal rod so that the pad of the pedal is level with that of the brake pedal. Under these conditions the total travel of the clutch pedal should be between 85 mm and 95 mm. If necessary move the pin into another hole	
	b) Insert the packing piece MR-3834-10 (see Fig. 4)	Packing piece MR-3834-10
	c) Tighten the adjustment nut until there is no longer any play between the graphite bearing and the toggle thrust bearing. Check this by pressing down lightly on the clutch withdrawal fork (in order to bring the bearings into contact). Tighten the locknut	12 mm spanner 12 mm box spanner
	d) Remove the packing piece MR-3834-10	
	e) Start up the engine, accelerate and make sure that the gears engage properly when withdrawing the clutch. If not the mechanism must be adjusted (see Op. 15 AZ and 16)	
38	Fit the wings	Wheelbrace
39	Fit the bonnet	
	NOTE - The operations described in paragraphs 27, 30 and 31 are necessary only if the engine has been removed or replaced.	

		TOOLS
	This operation can be carried out only on types A-AU and AZU vehicles.	
	Removal.	
1	Remove the bonnet. Disconnect the positive lead from the battery (if necessary use the terminal extractor 2200-T, see Pl. 79, fig. 1)	Extractor 2200-T
2	Remove the two front wings	Wheelbrace
3	Remove the headlamp bracket assembly.	
	a) Disconnect the "BAT" and "RUP" cables (metal cased coil) or the positive and negative leads (rubber cased coil) from the coil and disconnect the cables from the sparking plugs. Disconnect the plugs of the cables feeding the headlamps and the earth wire from the nut on breather	12 mm spanner
	b) Remove the headlamp control knob	10 mm box spanner
	c) Disconnect the two head lamp bracket flanges from the side members and withdraw the bracket, coil, headlamp and and control assembly	12 mm box spanner
4	Remove the fan (see Op. 6, paras. 1 and following).	
5	Disconnect the cables from the dynamo and from the contact breaker. Disconnect the cable harness from the air duct. Remove the horn without disconnecting the wires. Place the cable harness and horn assembly on the scuttle panel of the vehicle	17 mm box spanner
6	Disconnect the throttle control lever from the carburettor and the control wire from the choke. Disconnect the petrol feed pipe from the pump and the two air tubes from the hot air intakes	12 mm spanner
7	Disconnect the expansion chamber from the exhaust manifold and from the silencer	12 mm flat spanner 12 mm box spanner

		TOOLS
8	Remove the two screws securing the two front engine flexible suspension blocks	17 mm box spanner
9	Place a chain sling in position (use the sling 1619-VA, see Pl. 17), and attach the chain to the exhaust manifold by the two front hooks without using the rear hook	Sling 1619-VA
10	Raise the engine and gearbox assembly and stop when the fork shift control lever bracket touches the toe board	
11	Remove the expansion chamber from the vehicle	
12	Under the clutch housing, near the point where it is secured to the engine, place a wood plank of about 1 metre in length and 60 mm thick. Rest the ends of the plank on the two side members of the chassis and support the engine and gearbox assembly on the plank	
13	Separate the engine from the gearbox (using the spanner 1790-VA, see Pl. 28, fig. 2, or the spanner 1791-VA, see Pl. 28, fig. 3). Remove the engine from the vehicle	Spanner 1790-VA or 1791-VA

Replacement

VERY IMPORTANT NOTE- Depending on the type of clutch housing or engine fitted, the locating dowels specified in the table below, must be used:

Depth of hole in the crankcase	Depth of hole in the clutch housing	Length and Part Number of dowels to be used.	
		Length	Part No.
3 mm	4.5 mm	6 mm	A 331-99
3 mm	15 mm	17.5 mm	A 331-99 a
5 mm	4.5 mm	8.7 mm	A 331-99 b
5 mm	15 mm	17.5 mm	A 331-99 a

		TOOLS
	If the engine and the gearbox are fitted with locating dowels having a length of 6 mm or 8.7 mm, it is absolutely essential to remove the gearbox in order to carry out the assembly of the engine and gearbox as described in Op. 12, para. 15.	
	If the locating dowels are 15 mm long, fit the engine as described below.	
14	Suspend the engine as described in paragraph 9 (use the sling 1619-VA, see Pl. 17). Put the engine in gear	
	Place the engine in position, engage the fixing studs in the clutch housing and turn the engine by hand by means of the flywheel so that the splines on the gearbox drive shaft can be engaged in the hub of the disc	
15	Place the brackets with the horn on the upper right hand stud. Tighten the fixing nuts of the gearbox (use the spanner 1790-VA, see Pl. 28 fig. 2 or the spanner 1791-VA, see Pl. 28, fig. 3)..	Spanner 1790-VA or 1791-VA
16	Remove the plank supporting the gearbox. Put the expansion chamber in position engaging the outlet pipe in the end of the silencer (make sure that the fixing collar is on the end of the silencer)	
17	Rest the engine on the front cross member of the chassis. Withdraw the chain sling. Screw up and tighten the two screws securing the two engine front suspension blocks to the cross member using a single lockwasher under the head of each screw. Lock the washers by turning one part down over the rear edge of the cross member and the other part over the flat face of the screw	17 mm box spanner
	NOTE - If necessary, undo the screws securing the flexible blocks to the air duct in order to facilitate the positioning of the fixing screws in the brackets.	
18	Fit and tighten the half-clips securing the expansion chamber to the manifold. Tighten the clip on the end of the silencer	12 mm flat spanner 12 mm box spanner
19	Place the cable harness in position in the air duct and in the clip near the contact breaker. Connect the cables to the dynamo and to the contact breaker	
20	Fit the choke control wire and adjust it so that the disc can be fully opened and closed. Fit the throttle control lever and make sure that the throttle fully opens and closes	

		TOOLS
	Connect the petrol feed pipe to the pump; this pipe is fitted without a clip	12 mm box spanner
21	Place the headlamp bracket assembly in position on the chassis, (passing the right hand bracket behind the flexible petrol pipe). Engage the headlamp control rod in the dashboard. Tighten the screws securing the bracket to the chassis using a spring washer under the heads. Fit the control knob and tighten the nut	8 mm flat spanner 10 mm and 12 mm box spanners
22	Connect the earth wire to the right hand fixing stud of the breather. Connect the cables to the "BAT" and "RUP" terminals (metal cased coil) or to the positive and negative terminals (rubber cased coil), connect the cables to the sparking plugs and the plugs of the cables feeding the headlamps. Connect the positive lead to the battery	
23	Connect the heater tubes to the hot air intakes and tighten the clips	
24	Check the ignition setting:	
	a) Connect an indicator lamp between earth and the "RUP" terminal of the metal cased coil or the negative terminal of the rubber cased coil. Switch on the ignition	Indicator lamp.
	b) Turn the engine by means of the flywheel in the running direction. Stop at the exact moment the lamp lights	
	1st Case - The flywheel is not drilled (there is a reference mark on the engine side consisting of a chisel cut under the starter ring).	
	c) Make sure that the reference mark is opposite the joint or has not passed it	
	d) Turn the engine, the lamp is extinguished. Stop at the precise moment the lamp re-lights. The engine has made one revolution	
	e) Re-check to make sure that the reference mark is opposite the joint or has not passed it	
	f) If in either of the above checks (paras. c and e):	
	- the reference mark has passed the joint between the two halves of the crankcase;	
	- or is still at a distance of more than the thickness of one tooth in front of it,	

		TOOLS
	the ignition advance must be adjusted (see Op. 47, paras. 10 to 14).	
	2nd Case - The flywheel has a hole for adjustment purposes (see Pl. 2). g) Insert a 6 mm diameter rod; 1 - For types A and AU engines: - in the hole provided on the right hand side of the clutch housing (see Fig. 1) .... 2 - For type AZU engines: - in the hole provided in the left hand side of the crankcase (see Fig. 2) .... Check to make sure that the rod enters the hole in the flywheel or that this hole is not yet opposite the rod	Rod 6 mm dia. x 150 mm long
	h) Turn the engine in the running direction. The lamp is extinguished. Stop at the exact moment the lamp re-lights. The engine will have made one revolution .... i) Make sure that the hole is opposite the rod or has not yet passed it .... j) If in either of the above checks (paras. g and i): - the hole has passed the rod; - or is still at a distance of more than 8 mm in front of the rod, the ignition must be adjust (see Op. 47, paras. 18 to 22). k) Switch off and remove the indicator lamp.	
25	Turn the engine by means of the flywheel in order to bring the pistons to T.D.C. Fit the fan. Locate it so that when in position the starting handle is horizontal. Hold the flywheel by means of a screwdriver. Tighten the fixing screw firmly and insert a spring washer under the head. Fit the starting handle bracket and its grill. Tighten the screws, inserting a spring washer under the heads. Put the gear lever into neutral	12 and 14 mm box spanner
26	Top up the engine oil level. About 2 litres (S.A.E 20)	
27	AZ and AZU engines: adjust the valve clearances (see Op. 47, paragraph 4)	

		TOOLS
28	Start up the engine. Adjust the slow running [see Op. 47, paragraphs 37 to 43 (26 BC1 carburettor) and 44 to 47 (26 CB1 carburettor)]	
29	Adjust the oil pressure (see Op. 47, paras. 48 to 55)	
30	Adjust the lost motion of the clutch pedal (see Op. 10, paragraph 37)	
31	Fit the wings and the bonnet	Wheelbrace

		TOOLS
	Vehicles A-AU-AZU	
	Removal	
1	Remove the engine (see Op. 10 A paragraphs 1 to 13)	
2	Put the engine on a work bench. Remove the chain sling	
3	Remove the clutch mechanism, disconnect the disc and remove the engine flywheel	12 mm box spanner
	Replacement	
4	Replace the starter ring:	
	a) Using a drift, drive off the starter ring	
	NOTE - Three successive types of starter rings have been fitted:	
	1st assembly - Flat starter ring 11 mm thick with one tooth having a reference mark in the form of a punch mark. On assembly this mark must be in the area shown in Pl. 2, fig. 4).	
	2nd assembly - Starter ring 11 mm thick with a shoulder.	
	3rd assembly - Flat starter ring 9 mm thick. *This ring will be the only one sold by our Spare Parts Department.*	
	b) Heat the starter ring with a blow torch having a nozzle with a capacity of 800 to 1,000 litres. Heat the bore only, turning the ring all the while in order to ensure uniform expansion. Stop the heating process as soon as the ring reaches a temperature of 200° to 250°C (390° to 480°F) (straw colour). Place the starter ring on the flywheel which should have been previously thoroughly cleaned, make sure that they are perfectly parallel and fit quickly.	
	1st Case - Fitting a starter ring of the 1st type	
	When fitting make sure that the reference mark is in the proper position and that the front faces of the starter ring and the flywheel meet	
	Lock the starter ring by means of the 4 grub screws fitted as shown in Pl. 22, fig. 4	
	Drill four holes of 3.25 mm at approximately 90° opposite one tooth.	
	Tap these holes 4 mm diameter 75 pitch and countersink them.	
	Insert the grub screws, hammer them down and file down until flush with the surface.	
	Check the run-out of the starter ring. It must not be more than 0.3 mm out of true	

		TOOLS
	2nd Case - Fitting a starter ring of the 2nd type (see fig. 2).	
	Fit the starter ring so that it seats properly on the shoulder of the flywheel	
	3rd case - Fitting a starter ring of the 3rd type (see fig. 3).	
	1. The flywheel has no shoulder: bring the front face of the starter ring (tooth entry side) in contact with face of the flywheel, clutch side	
	Lock the starter ring by means of the 4 grub screws (see 1st case above)	
	2. The flywheel has a shoulder; seat the starter ring on this shoulder	
	c) Check the run-out of the starter ring. It must not be more than 0.3 mm out of true	
5	Grind the engine flywheel (see Pl. 22) (if the flywheel has not been replaced).	
	Carry out this operation on a lathe using a grinding wheel. In an emergency this operation can be done with a turning tool provided that a perfectly polished surface is obtained	
	Each time the bearing "b" of the clutch disc on the flywheel is ground, remove the same amount of metal from the bearing surface "a" on which the toggle plate bears (see fig. 2). The two operations must be carried out without removing the flywheel from the lathe in order to ensure that the two ground faces are perfectly parallel	
6	Fit the flywheel	
	Tighten the screws to 27½ lb/ft (3.8 m.kg) (use torque wrench 2470-T, Pl. 21, fig. 5), and during the tightening process lock the flywheel by means of a rod inserted in one of the three holes drilled on the flywheel circumference or by means of a screwdriver	Torque wrench 2470-T 12 mm socket
	IMPORTANT NOTE - Use only the ground screws A121-92a which are 16.5 mm long under the head. *These screws are fitted without lockwashers.*	
7	Fit the clutch.	
	a) Check the run-out of the disc. In order to do so place a mandrel in the splined hub of the disc. The mandrel may be rested on two vee blocks or may be supported between the two centres of a lathe. The run out must not exceed 0.2 mm. The linings must be dry without any traces of grease and the rivets must be set below the surface of the lining. Make sure that the disc slides freely on the primary shaft of the gearbox	Mandrel 200 mm long x 18 mm dia.
	b) Make sure that the bearing faces of the clutch disc on the flywheel and on the clutch plate are clean and this applies also the the bearing faces of the carrier plate and the flywheel	
	c) Couple the clutch to the engine flywheel. Centre the disc by means of a mandrel, using mandrel MR-1620-40, See Pl. 24, fig. 3). When tightening the screws fixing the assembly to the flywheel make sure that the mandrel slides freely. Tighten the screws using a spring washer under the heads. Remove the mandrel	10 mm box spanner Mandrel MR-1620-40

TOOLS

VERY IMPORTANT NOTE - According to the clutch housing and the crackcase fitted, the locating dowels given in the table below must be used:

Depth of hole in the crankcase	Depth of hole in the clutch housing	Length and Part Number of dowels to be used.	
		Length	Part No.
3 mm	4.5 mm	6 mm	A 331-99
3 mm	15 mm	17.5 mm	A 331-99 a
5 mm	4.5 mm	8.7 mm	A 331-99 b
5 mm	15 mm	17.5 mm	A 331-99 a

If the engine and the gearbox are fitted with locating dowels having a length of 6 mm or 8.75 mm, it is absolutely essential to remove the gearbox in order to carry out the engine gearbox assembly as described in Op. 12, para. 15.

If the locating dowels are 15 mm long, fit the engine as indicated below.

8 Fit the engine (see Op. 10 A, paras. 14-24, 28, 30 and 31).

		TOOLS
	Type AZ Vehicle	
	Removal	
1	Remove the engine gearbox assembly (see Op. 10, paras. 1 to 11)	
2	Remove the expansion chamber and silencer assembly (without dismantling them)	12 and 17 mm box spanner 12 and 17 mm flat spanner
3	Put the engine gearbox assembly on a work bench . Remove the chain sling	
4	Disconnect the gearbox from the engine (use the spanner 1791-VA, see Pl. 28, fig. 3)	17 mm flat spanner
	NOTE - Type AZ engines: When disengaging the gearbox make sure that its whole weight does not bear on the drive shaft, The oil return grooves would be impressed in the housing	Spanner 1791-VA
5	Remove the balance weight carrier ring. Remove the engine flywheel	12 mm box spanner
	Replacement	
6	**Replace the starter ring**	
	a) Drive off the ring using a drift	
	b) Heat the ring with a blow torch fitted with a nozzle having a capacity of 800 to 1,000 litres. Heat only the bore turning the ring the whole time in order to ensure uniform expansion. Stop the heating process when the starter ring reaches a temperature of 200^{o} to 250^{o}C (straw colour). Offer up the starter ring so that it is perfectly parallel with the flywheel which should have previously been cleaned and fit quickly	
	Position the starter ring so that it is seated on the shoulder of the flywheel	
	c) Check the run-out of the starter ring. It must not be more than 0.3 mm out of true	

		TOOLS
7	Fit the flywheel Tighten the screws to $27\frac{1}{2}$ lbs/ft (3.8 m.kg) (use the torque wrench 2470-T, see Pl. 21, fig. 5) and during the tightening process lock the flywheel by means of a screwdriver. *These screws are fitted without lockwashers.*	Torque wrench 2470-T
8	Fit the weight carrier ring. Insert a serrated washer under the head of the screws	12 mm box spanner
9	Couple the gearbox to the engine (see Op. 12, para. 15)	
10	Fit the engine gearbox assembly (see Op. 10, paragraphs 13 to 26, 28 and 29, 32 to 34 and 37 Z)	

		TOOLS
	STRIPPING THE ENGINE	
1	Put a chain sling in position (use the sling 1619-VA, see Pl. 17). Raise the engine gearbox assembly	Sling 1619-VA
2	Drain the oil from the engine and from the cylinder head cover	21 mm flat spanner 12 mm box spanner
3	Remove the expansion chamber and silencer assembly (without dismantling them)	12 mm box spanner 17 mm flat spanner
4	Put the engine gearbox assembly on a work bench. Remove the chain sling	
5	Disconnect the gearbox from the engine and remove it (use the spanner 1790-VA or 1791-VA, see Pl. 28, fig. 2 or 3)	17 mm spanner Spanner 1790-VA or 1791-VA
	NOTE - Type AZ engines: When removing the gearbox make sure that the full weight does not bear on the drive shaft. The oil return threads would be impressed on the casing	
5 Z	Remove the balance weight carrier ring	12 mm box spanner
	Remove the clutch (Types A, AU, AZU engines)	
6	Remove the sparking plugs (use the spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
7	Remove the petrol pump, disconnect the control rod and the insulating distance piece. Remove the two flexible blocks. Remove the front engine supports	10 and 12 mm spanners 10 and 12 mm box spanners 17 mm spanner
	Remove the air duct and the oil breather	
8	Remove the air filter and the carburettor.	
	a) Undo the clip on the rubber union on the breather (if fitted) and the clip on the carburettor. Remove the filter	
	b) Remove the carburettor and take out the insulating gasket and the screen, if fitted	12 mm spanner
9	Remove the dynamo.	
	a) Remove the fixing screws. Withdraw the body of the dynamo from the bore in the crankcase. (Do not pull it out by the brush carrier plate, otherwise the wires will be damaged)	12 mm box spanner
	b) Withdraw the armature from the crankshaft (use the extractor screw 2205-VA, see Pl. 79, fig. 2)	Extractor screw 2205-VA

		TOOLS
	ASSEMBLING THE ENGINE	
10	Fit the dynamo.	
	a) Use alcohol to remove all grease from the taper bore in the armature and from the bearing on the crankshaft. Make sure that the bore provided in the crankcase for the dynamo body is perfectly clean	
	b) Put the armature on the crankshaft	
	c) Keep the brushes raised by means of their spring as shown in Pl. 78	
	1st case: Fitting a dynamo secured by 3 screws on a crankcase with 3 fixing screws.	
	d) Put the body of the dynamo in position (smear grease on the part which goes into the crankcase) fitted with 3 fixing screws and their insulators. Align the reference marks (a line on the body of the dynamo and on the face of the crankcase). Insert the body of the dynamo in the bore in the crankcase. (If necessary, tap the end lightly with a mallet). - Screw up a few threads of the fixing screws by hand in the tapped hole in the crankcase. - Complete the fitting of the dynamo by tightening the 3 screws progressively	12 mm box spanner
	2nd case: Fitting a dynamo secured by 2 screws to a crankcase with 2 fixing screws.	
	e) Insert the body of the dynamo (smeared with grease) in the bore in the crankcase. Fit the insulators on the two fixing screws. Start these screws by hand. Tighten them to 3.6 to 5.8 ft/lbs. (0.5 - 0.8 m.kg)..................	
	NOTE - *This torque must not be exceeded otherwise the bosses on the brush holder plate may be damaged.*	
	Bring the brushes into contact with the commutator.	
	3rd case: Fitting a dynamo (secured by 3 screws) to a crankcase with 2 fixing screws.	
	On the 2 undrilled bosses "a" and "b" (See Pl. 78 G, fig. 1).	
	f) Describe an arc with a radius of 78 mm and with centre at the middle point "c" of the tapped sleeve of the lower boss.	
	g) Describe an arc with a radius of 44 mm with centre at the middle point "d" of the tapped sleeve of the upper boss.	
	h) Where the two arcs intersect on the boss "a" and "b" make a punch mark and drill a hole of 8.5 mm diameter to a depth of 15 mm. (Be careful not to drill right through). Tap these holes 10 mm diameter x 100 pitch.	
	i) Smear sealing compound on the thread of the two sleeves A-532-99. Screw up the sleeves in the tapped holes by means of a 7 mm diameter screw fitted with a locknut. Tighten to $10\frac{1}{2}$ - 14 ft/lbs. (1.5 - 2 m.kg)................	
	j) Fit the dynamo bringing the reference marks (a line on the dynamo body and on the face of the crankcase) into alignment. Tighten the screws to 3.6 - 5.8 ft/lbs. (0.5 to 0.8 m.kg). Insert a shakeproof washer under the head.	

		TOOLS
	4th case: Fitting a dynamo (secured by 2 screws) on a crankcase with 3 fixing screws:	
	1. - The crankcase has only 3 bosses (see Pl. 78 G, fig. 2): On the crankcase at "a".	
	k) Describe an arc with a radius of 90 mm with centre at the centre point "d" of the threaded sleeve of the upper left hand boss (engine seen from the front)	
	l) Describe arcs with a radius of 44 mm and centres at the centre points "b" and "c" of each of the sleeves on the other two bosses	
	m) Where the three arcs intersect at the point "a" on the crankcase make a punch mark and drill a hole with a diameter of 8.5 mm. Drill right through the wall of the crankcase. Tap this hole to a diameter of 10 mm x 100 pitch	
	n) Smear sealing compound on the thread of the sleeve A-532-99. Screw this sleeve into the tapped hole in the crankcase by means of a screw, diameter 7 mm fitted with a locknut. Tighten to $10\frac{1}{2}$ - 14 ft/lbs. (1.5 - 2 m.kg)	
	o) When fitting the dynamo, position it so that the number engraved on it is at the bottom. Tighten the fixing screws to 3.6 - 5.8 ft/lbs. (0.5 - 0.8 m.kg.), inserting a serrated washer under the heads	
	2. - The crankcase has 4 bosses (one of which is not drilled) (See Pl. 78 G, fig. 3): On the undrilled boss "a".	
	p) Describe an arc with a radius of 90 mm with centre at the centre point "b" on the threaded sleeve of the lower boss ..	
	q) Describe arcs with a radius of 44 mm and centres at the centre points "c" and "d" of each of the two other bosses ...	
	r) Where the three arcs intersect on the boss "a" make a punch mark and drill a hole with a diameter of 8.5 mm to a depth of 15 mm. (Be careful not to drill right through). Tap this hole to a diameter of 10 mm x 100 pitch	
	s) Smear the thread of the sleeve A-532-99 with sealing compound. Screw this sleeve in the tapped hole with the aid of a 7 mm diameter screw fitted with a locknut. Tighten to $10\frac{1}{2}$ - 14 ft/lbs. (1.5 - 2 m.kg)	
	t) When fitting the dynamo locate the number engraved on the component towards the bottom. Tighten the fixing screws to 3.6 - 4.5 ft/lbs. (0.5 - 0.6 m.kg), inserting a serrated washer under the heads	
11	Fit the air duct. (See Op. 6)	
12	Fit the petrol pump.	
	a) Oil the control rod and put it in position in its bore. Check to make sure that it slides freely. Turn the engine by means of the flywheel in order to bring the rod to its lowest point. Make sure that the bearing faces of the insulating distance piece are clean and place it on the studs. Fill the lever housing in the petrol pump with grease (special bearing grease)	
	b) Fit the petrol pump (complete with the inlet and outlet flexible pipes). Tighten the fixing nuts, inserting one plain and one spring washer under each nut	12 mm box spanner
	NOTE - The flexible pipes are fitted without clips.	

TOOLS

13 <u>Fit the carburettor:</u>

Place the insulating gasket in position (smear the two faces with sealing compound) on the manifold. Fit the carburettor with the float chamber towards the front of the engine. Tighten the nuts, using serrated washers under the nuts. Connect the flexible pipe from the pump to the carburettor. This pipe is fitted without a clip .... 12 mm spanner

NOTE - If a Hugo-Reintz washer and a screen were fitted, they need not be replaced.

14 <u>Fit the breather valve.</u>

Fit the klingerite gasket between the flange and the crankcase, position the valve facing the rear of the engine. Tighten the fixing nuts using serrated washers under them .... 12 mm spanner

NOTE - If the breather of the latest type is fitted (breather valve with a rubber reed, see Pl. 20, fig. 4) check the length of the tube "A" and if necessary cut this tube in order to obtain the dimension 53 $\pm$ 1 mm (see Pl. 9).

15 <u>Fit the air filter.</u>

Place the rubber union corectly in position on the breather valve outlet and the rubber union on the hot air intake pipe. Tighten the clip (this joint must be tight). In the case of the latest type of breather valve (breather valve with a rubber reed) there is no clip on the lower part.

NOTE - There is no hot air intake on types AZ and AZU engines.

16 Types A, AU-AZU engines: Fit the clutch (see Op. 14, para. 55).

16 Z <u>Type AZ engines</u>: Fit the balance weight carrier ring with a serrated washer under the heads of the screws............ 12 mm box spanner

17 <u>Connect the gearbox to the engine.</u>

a) Put the engine on a workshop bench; stand it on the front end (the engine must not contain oil).

NOTE - Depending on the clutch housing or engine fitted, the locating dowels specified in the following table must be used:

Depth of hole in the crankcase	Depth of hole in the clutch housing	Length and Part Number of dowels to be used.	
		Length	Part No.
3 mm (A and AU)	4.5 mm	6 mm	A 331-99
3 mm (A and AU)	15 mm	17.5 mm	A 331-99 a
5 mm (A and AU)	4.5 mm	8.7 mm	A 331-99 b
5 mm (A and AU-AZU)	15 mm	17.5 mm	A 331-99 a
5 mm (AZ)	15 mm	27.5 mm	AZ 331-99

b) Make sure that the two locating dowels on the gearbox are in position in their seating in the crackcase. Also make sure that *the housing for these dowels in the clutch housing is not damaged.*

	TOOLS
IMPORTANT NOTE - If the dowel holes are damaged *the crankcase or the gearbox housing must be replaced since incorrect alignment of the gearbox and engine will cause rapid deterioration of the clutch.*	
bz) Type AZ engine. Place the distance pieces in position on the dowels and on the fixing studs on the gearbox.	
c) Types A-AU and AZU engines. Engage one of the gears. Position the gearbox on the engine, put it on the studs and lower it in order to bring the primary shaft in contact with the splined hub on the clutch disc. Operate the two sliding couplings in order to rotate the primary shaft so that the splines on the shaft can engage with those on the disc. The gearbox should fall into position under its own weight. Make sure that the clutch housing and the two halves of the crankcase are in *contact.* If not, the locating dowels will prevent correct positioning since the clutch disc *is not perfectly centered in relation to the primary shaft.* Release the disc by undoing the screws fixing the clutch mechanism to the flywheel. Centre the disc by moving the gearbox so that the dowels freely enter the locating holes.	
cz) Type AZ engine. Place the gearbox on the engine and engage the end of the driveshaft in the needle bearing.	
d) Place the two horn brackets on the upper right hand stud. Tighten the gearbox fixing screws (use the spanner 1790-VA or 1791-VA, see Pl. 28, fig. 2 or 3)	10 and 17 mm spanners Spanner 1790-VA
Tighten the screw fixing the clutch mechanism to the flywheel, if necessary (types A-AU-AZU engines).	
IMPORTANT - *To prevent leakages through the return oil threads on the primary shaft, this operation must be carried out quickly. Replace the engine gearbox assembly horizontally.*	
18 Fit the sparking plugs using copper asbestos washers (use the spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
Fit the front engine supports and the flexible blocks	12 mm spanner 12 mm and 17 mm spanners
19 Fit the expansion chamber and the exhaust silencer.	
a) Place a block of wood about 15 cm thick under the gearbox.	
b) Place the expansion chamber and silencer assembly in position. Screw up a few threads of the screws securing the silencer to the gearbox casing and use 1 plain washer and 1 spring washer under the screw heads.	
c) Fit the half-collars securing the silencer to the manifold. Tighten the screw	12 mm box spanner
d) Tighten the nut securing the expansion chamber bracket to the clutch housing; use 1 plain washer and 1 spring washer under the nut. Finally tighten the screws fixing the exhaust silencer to the gearbox	12 mm and 17 mm spanners
20 Place the engine on the floor after inserting a block of wood 15 cm thick under the gearbox in order to prevent damage to the silencer	

		TOOLS
	A-AU & AZU Vehicles	
	Stripping	
1	Drain the engine oil and the cylinder head cover	21 mm spanner 12 mm spanner (box)
2	Put the engine on a workshop bench	
3	Remove the sparking plugs (use the spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
	Remove the breather (if the engine is to be replaced)	
4	Remove the petrol pump, withdraw the push-rod and the insulating distance piece. Remove the engine supports and the flexible blocks	12 mm spanner 12 mm box spanner
5	**Remove the carburettor**	
	a) Undo the collar, securing the rubber union to the oil breather (if fitted) and the clip on the carburettor ; remove the filter	
	b) Remove the carburettor and take out the distance piece, and the screen if fitted	12 mm spanner
6	**Remove the dynamo**	
	a) Remove the screw securing the dynamo. Withdraw the dynamo body from the bore in the crankcase. (Do not pull on the brush holder plate, otherwise the wires will be damaged)	12 mm box spanner
	b) Remove the armature from the crankshaft (use the extractor screw 2205-VA, see Pl. 79, fig. 2)	Screw 2205-VA
7	Remove the air duct	10 mm and 12 mm box spanners
8	Remove the clutch	12 mm box spanner
	Re-assembly	
9	**Fit the dynamo**	
	a) Use alcohol to remove grease from the taper bore of the armature and from the bearing on the crankshaft. Make sure that the bore provided in the crankcase for the dynamo body is perfectly clean	
	b) Put the armature on the crankshaft	
	c) Keep the brushes raised by means of their spring, as shown in Pl. 78	

		TOOLS
	d) Place the dynamo body in position (smear the part going into the crankcase with grease) together with the fixing screws and their insulators. Bring the reference marks into alignment (line on the dynamo body and on the face of the crankcase). Insert the body of the dynamo in the bore in the crankcase	
	Start the screws by screwing up a few threads by hand in the tapped holes in the crankcase	
	Finish fitting the dynamo in position by tightening the three screws progressively	12 mm box spanner
	e) Bring the brushes into contact with the commutator	
10	<u>Fit the petrol pump</u>	
	a) Oil the push-rod and place it in its bore. Make sure that it slides freely. Turn the engine by means of the flywheel in order to bring the rod to its lowest point. Make sure that the bearing faces of the insulating distance piece are clean and then place it on the studs. Make sure that the end of the rod extends beyond the upper face of the distance piece by at least 3 mm, if not reduce the thickness of the distance piece. Pack the lever housing in the petrol pump with grease (special bearing grease)	
	b) Fit the petrol pump. Tighten the fixing nuts with one plain washer and one spring washer under each nut	12 mm box spanner
11	<u>Fit the carburettor</u>	
	Place the distance piece in position (smear the two faces with sealing compound) on the manifold. Fit the carburettor with the float chamber towards the front of the engine. Tighten the nuts, inserting a serrated washer under each. Connect the flexible pipe from the pump to the carburettor. The flexible pipe is fitted without a clip	12 mm spanner
	NOTE:- If a Hugo-Reintz washer or a screen were fitted, they need not be replaced	
12	<u>Fit the breather</u> *(use the new part delivered with the engine).*	
	Insert the klingerite gasket between the flange and the crankcase with the valve facing the rear of the engine. Tighten the fixing nuts using serrated washers	12 mm spanner
	NOTE:- If the breather delivered is of the latest type (breather valve with a rubber reed, see Pl. 20, fig. 4) check the length of the pipe "A" and if necessary cut it to obtain the dimension 53 ± 1 mm (see Pl. 9)	
13	<u>Fit the air filter</u>	
	Tighten the clip fixing it to the carburettor. Put the rubber union in its correct position on the breather valve outlet and tighten the clip. (This joint must be tight). On the latest type of the breather valve (breather valve with rubber reed) there is no clip on the lower part	

		TOOLS
14	Fit the sparking plugs (with copper asbestos washers) (use the spanner 1601-T, see Pl. 21, fig. 1)	Spanner 1601-T
15	Fit the air duct	
	Fit the front engine supports, tighten the screws and use serrated washers under the heads. Fit the flexible blocks and tighten the screws temporarily (the exact position of the blocks is determined when the engine is fitted on to the vehicle	12 mm and 17 mm box spanners
16	Fit the clutch (see Op. 14, para. 5)	
17	Put the engine on the floor	

In the case of important parts having to be renewed, we advise the use of an engine overhauled in our factory (exchange replacement).

DISMANTLING (see Pl. 12)

		TOOLS
1	Place the engine on a stand (use the stand MR-3053-50, see Pl. 18, fig. 2)	Stand MR-3053-50
1 Z	Type AZ engine. Use the stand, placing a distance piece on each stud for fixing the crankcase on the stand	Distance piece : interior dia. 10.5 mm exterior dia. 17 mm length . . . 35 mm
2	Remove the sparking plugs (use the spanner 1601-T, see Pl. 21, fig. 1). Remove the drain plug (25)	Spanner 1601-T
3	Undo the clip fixing the rubber union on the breather valve (if fitted), and disconnect the flexible petrol pipe from the carburettor; remove the inlet and exhaust manifolds together with the carburettor from the manifold	12 mm spanner 12 mm box spanner
4	Remove the heater ducts; remove the air duct	12 mm spanner 12 mm box spanner
5	Remove the oil cooler by unscrewing the two adjustable fixing screws and the screw fixing it to the crankcase	26 mm box spanner 12 mm spanner 12 mm box spanner
6	Remove the oil breather	12 mm box spanner
7	Remove the dipstick and its tube. Remove the two oil pipes from the cylinder heads	12 mm box spanner
8	Remove the dynamo	
	a) Remove the fixing screws. Withdraw the dynamo body from the bore in the crankcase (do not pull it out by the brush holder plate, otherwise the wires may be broken	12 mm box spanner
	b) Withdraw the armature from the crankshaft (use the screw 2205-VA, see Pl. 79, fig. 2)	Screw 2205-VA

		TOOLS
9	Remove the distributor (see Pl. 3).	
	Remove the two fixing nuts (5). Remove the casing (19) and the protector plate (6)	12 mm box spanner
10	Remove the front engine support	17 mm box spanner
11	Type A-AU & AZU Engines	
	Remove the clutch mechanism and remove the disc. Remove the engine flywheel	10 mm and 12 mm brace
11 Z	Type AZ engine (see Pl. 22A, fig. 2).	
	Remove the weight carrier ring (1). Extract the needle bush (8) for centring the drive shaft from the bore in the crankshaft (use the extractor 1671-VA, see Pl. 15A)	Extractor 1671-VA
12	Remove the valve covers. Remove the cylinder heads and disengage the rocker push rods and the cylinders (if these parts are to be re-used, mark them to ensure their replacement in the same position)	12 mm and 14 mm box spanners
13	Remove the cylinder head studs (use the stud extractor 2410-T, see Pl. 21, fig. 2). *Fit the extractor on the lower part of the studs, where the diameter is 10 mm,* in order to prevent distortion	Stud extractor 2410-T
14	Remove the screws fixing the oil pump cover. Take off the cover. Remove the screws securing the oil filter element	8 mm and 10 mm box spanners
15	Place the engine on a stand as described in paragraph 1 Z, this operation, (use the stand MR. 3053-50, see Pl. 18, fig. 1). If this stand is not available rest the engine on the right-hand half of the crankcase, placing a wooden block under it to prevent the piston from coming into contact with the bench	Stand MR. 3053-50
16	Disconnect the two crankcase halves, and with the pistons T.D.C. take off the left half crankcase and disengage the two tappets	12 mm and 17 mm box spanners 12 mm spanner
17	Remove the oil filter (1) and the two tappets. Disengage the camshaft with the oil pump, disengage the crankshaft with the connecting rods and pistons from the right-hand half crankcase (see Pl. 13)	
	Remove the crankcase from the stand	

		TOOLS
18	<u>Strip the two crankcase halves</u> (see Pl. 11 and 12).	
	a) Remove the plugs (26) and the valve (2), take out the spring (3) and the ball (4)	17 mm and 21 mm box spanners
	b) Drive out the locating dowels from the two halves of the crankcase (on the earlier types)	
19	<u>Remove the pistons from the connecting rods</u> (see Pl. 11).	
	a) Remove the circlips (24) from the gudgeon pins	
	b) Remove the gudgeon pins (use extractor MR. 3682-10, see Pl. 14, figs. 1 and 3)	Extractor MR. 3682-10
	NOTE:- If the pistons are to be used again, the following precautions must be taken : 1. Heat up the pistons to a temperature of about 140°F (60°C) by immersing them in an oil bath or by heating them in a furnace. 2. Remove the gudgeon pins. Do not mix them because they are weighed and paired with the pistons.	
	c) Remove the bushes from the connecting rods (use the extractor MR. 3682-20, see Pl. 14, fig. 2 and 4)	Extractor MR. 3682-20
20	<u>Strip the cylinder heads.</u> Types A & AU Engines before October 1954 (see Pl. 11 and 12).	
	a) Remove the springs (28) fixing the rocker shafts (or the pins) and drive out the rocker shafts (5) with a 5 mm pin punch in order not to damage the cylinder head stud bush. Remove the rockers (6), the springs (7), and washers (8), as well as the return spring (15), and its cup (14)	5 mm pin punch
	b) Remove the gaskets (16), the oil retaining caps (9), the springs (10) and the thrust washers (11) from the push-rod housing tubes.	
	c) Put the cylinder head in a vice and tighten it moderately, using lead jaws. Screw a valve retaining rod in the sparking plug hole (use retaining rod 1609-VA, see Pl. 10, fig. 1) in order to prevent valves from falling out during the removal of the spring	Retaining rod 1609-VA
	NOTE:- If the retaining rod 1609-VA is not available, fix a wooden block on a bench to prevent the valves from dropping and the cylinder head from moving during the removal of the valve springs	Wooden block : length-width = 31 mm thickness = 25 mm
	d) Remove the valve spring cups (use the spring compressor 1612-VA, see Pl. 10, fig. 1). To do this: compress the spring approximately 2 mm, then remove the cup sideways along the groove in order to withdraw it. Remove the valve spring, the lower cup (12) on the inlet valve and the guide cowl (13) on the exhaust valve. Remove the retaining rod 1609-VA. Remove the valves..	Spring compressor 1612-VA

		TOOLS
20 Z	Strip the cylinder heads. Types A & AU engines delivered since October 1954 and Types AZ & AZU engines (see Pl. 11A and 12).	
	a) Remove the springs (28) fixing the rocker-shafts and drive out the rocker-shafts (5) using a 5 mm pin punch in order to avoid damaging the cylinder head stud bush. Remove the rockers (6), the springs (7) and the washers (8)	5 mm pin punch
	b) Remove the gaskets, the cups (9), the springs (10) and the thrust washers (11) from the rocker push-rod housing tubes.	
	c) Place the cylinder head in the vice, and tighten moderately using lead jaws. Screw a retaining rod in the sparking plug hole (use the retaining rod 1609-VA, see Pl. 10, fig. 1), in order to prevent the valves from falling out during the removal of the spring	Retaining rod 1609-VA
	NOTE:- Failing the retaining rod 1609-VA, fix a wooden block on a bench in order to prevent the valves from dropping and the cylinder head from moving during the removal of the valve springs.	
	d) Place in position a rocker-shaft which has been previously rubbed down with emery cloth so that it slides freely in the brackets. Remove the valve spring cups (use the spring compressor 1613-VA, see Pl. 10, fig. 2). Remove the split cotters with a piece of wire, the cup, the springs and the guide cowl. Remove the retaining rod 1609-VA, and remove the valves and the shaft	Spring compressor 1613-VA
21	Strip the cam-shaft (see Pl. 3).	
	a) Disengage the body of the oil pump from the cam-shaft and withdraw the key from its keyway.	
	b) Remove the circlip (7), the thrust washer (8) and disengage the cam and automatic advance weight assembly without forcing the springs	
22	Disconnect the carburettor from the inlet manifold. Remove the air filter from the carburettor	12 mm spanner
23	Clean the parts	

TOOLS

ASSEMBLY

Prepare the cylinder heads.

24 Replacement of the rocker push-rod housing tube.

1st Case (the top end of the tube is turned down).

Straighten the end of the housing tube by bending it with a pair of universal pliers ....

Insert a mandrel in the housing tube. Clamp the tube in a vice and withdraw it from the cylinder head by pulling it ..

Remove the mandrel from the housing tube ....

Smear the part of the tube fitting in the cylinder head with sealing compound. (The tube is shouldered, the diameter of the part fitting in the cylinder head being 15 mm), it is sold by our Spare Parts Division under No. A-224-99.

Apply sealing compound to the hole in the cylinder head in which the housing tube fits and also to the chamfer on the hole ....

Place the housing tube in position in the cylinder head ....

Expand the housing tube:

a) Insert the expander in the housing tube (use the expander 1605-VA, see Pl. 15, fig. 3) so that the rollers penetrate only 12 mm into the housing tube .... Expander 1605-VA

b) Rotate the taper pin clockwise and at the same time press on it. Stop the operation when the ends of the rollers are level with the upper part of the tube ....

c) Withdraw the expander by rotating the pin in the opposite direction ....

NOTE:- After expanding, the inner diameter of the tube must be at least 13.4 mm over a distance of about 12 mm from the upper end of the tube.

d) After fitting two tubes make sure that the distance between centres at the lower end of the tubes is 47 mm. If necessary, obtain this dimension by adjusting the position of the tubes by setting them.

2nd Case (the tube is not turned over at the top).

Saw off the housing tube flush with the lower face of the cylinder head ....

Using a saw blade make a longitudinal cut through the part of the housing tube remaining in the cylinder head........

NOTE:- *Do not damage the bore in the cylinder head.*

Drive out the tube with the aid of a shouldered mandrel ....

Mandrel :
small dia. = 12.8 mm
length = 20 mm
large dia. = 15.9 mm
length = 100 mm

Apply sealing compound to the part of the tube fitting in the cylinder head. (This tube is not shouldered and has a diameter of 16 mm, it is sold under No. A-224-99a by our Spare Parts Division. It is not interchangeable with the first type) ....

Insert the tube in the cylinder head until it is flush with the upper face ....

Expand the housing tube:

1. At the top:

a) Insert the expander (use the expander 1605-VA, see Pl. 15, fig. 3). Introduce the rollers only 15 mm into the tube.

b) Rotate the tapered pin clockwise at the same time pressing on it. Stop this operation when the ends of the rollers are flush with the top of the housing tube ....

c) Withdraw the expander by rotating the pin in the opposite direction ....

NOTE:- After expansion, the inner diameter of the tube must be at least 13.4 mm over a length of about 12 mm measured from the upper end of the tube.

2. At the bottom:

a) Insert the expander (to put it in position press on the roller carrier with a scriber) until dimension "a" (see fig. 3) is equal to 14 mm ....

b) Rotate the tapered pin clockwise, at the same time pressing on it. Stop the operation when the driving nut has travelled 22 mm downwards ....

3. After two tubes have been put in position, make sure that the distance between centres at the bottom is 47 mm. If not, adjust the position of the tubes by setting them ....

25 <u>To replace a cylinder head stud sealing sleeve.</u>

a) Tap the sleeve to be extracted over a length of about 10 mm, using a 10 x 150 tap ....

<u>1st case</u>: The sleeve does not fit very tightly in its housing. Withdraw it by means of a screw. Hold the head of this screw in a vice and pull on the cylinder head *by hand*. ....

IMPORTANT:- Do not hammer the cylinder head.

<u>2nd case</u>: The sleeve sticks tightly in its housing.

In this case, remove it by means of an extractor (use extractor MR-3682-50, see Pl. 15, fig. 5).

NOTE:- Two types of sealing sleeves are in use:
A 112-99 outer diameter 11 mm.
A 112-99a outer diameter 11.2 mm.

b) Smear the sleeve housing in the cylinder head with sealing compound ....

Put the sleeve in position, using a press, or if not available, drive in with a shouldered mandrel ....

TOOLS

Expander 1605-VA

Extractor MR-3682-50

Mandrel:
Small dia. 8.5 x 15 mm long
Large dia. 12 x 100 mm long

TOOLS

26 Grind the valves (See Pl. 10, figs. 3 and 4).

Use a valve grinder.

a) The seats of the exhaust valve must be at 90°, those of the inlet valves at 120° ....

Valve grinder:
Grinding wheel 36 mm dia.
Inlet 1661-T
Grinding wheel 32 mm dia.
Exhaust 1663-T

NOTE - The width "1" of the valve seating face on the seat should be between 0.9 and 1.5 mm. If the seating face is too wide, reduce the lower part with a wheel tapered at 90° for the inlet valves (see fig. 3) and at 60° for the exhaust valves (see fig. 4) and the outer part by means of a wheel tapered at 150° ....

Grinding wheel 33 mm dia.
Inlet 1631-T
Grinding wheel 30 mm dia.
Exhaust 1632-T

b) Lap the valves (use the suction valve lapper 1615-T, see Pl. 21, fig. 6). This suction lapper can be driven by and electric valve grinder or by hand ....

Valve lapper 1615-T
Electric grinder.

c) Clean the cylinder heads. *Carry out this cleaning process with great care so that no traces of emery remain in the valve spaces or in the gas ducts,* otherwise the engine can be subjected to excessive wear ....

1st assembly: Make sure that the helical groove round the exhaust valve guide is not blocked up. Check by injecting petrol by means of a syringe. If the groove is blocked, change the cylinder head ....

NOTE - In some cases the groove can be cleared by keeping the cylinder head immersed in a cellulose solvent for at least one hour.

2nd assembly: Make sure that the lubricating holes under the cowl are not blocked up. (See above NOTE) ....

d) Test the valve springs.

VEHICLE TYPE	Spring	Free Length	Length under Load	Load in kg.	Length under Load	Load in kg.
A and AU before October 1954.		38	24	(84 to 88 lbs. (38 to 40 kgs)	31	40 to 44 lbs. (18 to 20 kgs)
A and AU since October 1954. }	Outer	38	24	84 to 88 lbs. (38 to 40 kgs)	31	40 to 44 lbs. (18 to 20 kgs)
and AZ and AZU }	Inner	28	14.5	$16\frac{1}{2}$ to $18\frac{1}{4}$ lbs. (7.4 to 8.3 kgs)	21.5	8 to $9\frac{3}{4}$ lbs. (3.6 to 4.4 kgs)

Check these conditions using a fixture (use spring calibrating fixture 2420-T fitted with the reference spring 2421-T, see Pl. 19).

		TOOLS
	In order to check the inner spring, a packing piece 8 mm thick must be inserted between the end of the spring and one of the guides (2) (see Pl. 19)	Calibrating fixture 2420-T Reference spring 2421-T
27	Fit the valves.	
	Put the cylinder head in a vice, tighten the vice moderately using lead jaws. Oil the valve stems and the valve seating faces (use an oil can; a brush introduces dirt or loses its hairs). Put the valves in position. Screw in a valve retaining rod in the hole for the sparking plug (use the retaining rod 1609-VA, see Pl. 10, fig. 1). Never use a screwdriver or a punch for this purpose as this would damage the thread of the sparking plug hole. If tool 1609-VA is not available, use the method described in the Note to para. 20 c)	
	a) Engines manufactured before October 1954 (see Pl. 11).	
	Put the lower valve spring cup (12) and the exhaust spring cap (13) in position. Fit the springs and the cups. Compress each spring and move the cup sideways along the groove in order to lock it by means of the valve stem (use spring compressor 1612-VA, see Pl. 10, fig. 1). Remove the retaining rod 1609-VA.	Retaining rod 1609-VA Spring compressor 1612-V
	NOTE: - On cylinder heads fitted with an exhaust guide with a spiral groove, the exhaust guide caps fitted must be 13 mm high. If necessary, cut down the existing caps (see Pl. 11, fig. 1).	
	On cylinder heads fitted with a smooth exhaust guide, guide caps of 13 mm height should also be fitted.	
	NOTE: - With exhaust guides having a spiral groove, *fit union screws drilled with a 2 mm dia. hole for the cylinder head oil tube.*	
	With smooth exhaust valve guides, *fit union screws drilled with two 1 mm dia. holes.*	
	b) Engines manufactured since October 1954.	
	Place the inlet and exhaust valve spring locating cap in position. In the bore in the brackets insert a modified rocker shaft (as described in para. 20 Zd) and compress the springs (use the spring compressor 1613-VA, see Pl. 10, fig. 2). Fit the collets.	
	Remove the retaining rod 1609-VA and shaft	Spring compressor 1613-V
28	Fit the rockers (see Pl. 12).	
	a) Oil the rocker shafts and between the bosses forming the shaft supports put a washer (8), the spring (7), the rocker (6), and a washer (8) and press in the rocker-shaft (5).	
	Fit the springs (28) securing the rocker-shafts.	

		TOOLS
	NOTE:- If the rocker shafts were secured by split pins, they must be replaced by springs.	
	a) On each rocker push-rod housing tube place: the thrust washer (11), the spring (10) and the cup (9) together with its washer (16).	
	c) Remove the cylinder head from the vice.	
	d) Fit the valves and the rockers on the 2nd cylinder head.	
29	<u>Fit the bushes on the connecting rods</u> - Types A and AU engines.	
	a) Put the bushes in position with a press making sure that the oil holes in the rod and in the bush are in alignment.	
	b) Ream the bushes (use a 20 mm expanding reamer). If no plug gauge is available, use a new gudgeon pin to check the bore. The gudgeon pin should be a tight fit.	20 mm expanding reamer
	NOTE:- This delicate operation should be carried out with great care and the diameter of the bore when finished must be between 20.015 and 20.020 mm.	
29 Z	<u>Fit the bushes on the connecting rods</u> - Types AZ and AZU engines.	
	NOTE:- The bushes sold by our Spare Parts Division are provided with a bore machined to a dimension which is about 0.05 mm less than the required bore.	
	a) Plug the bore in the bush with grease or tallow. This grease plug must not overflow on to the outside of the bush. Fit the bush prepared in this way (use the extractor MR-3682-20, see Pl. 14, fig. 4). After the bush is in position, the oil hole in the bush must be in alignment with the inlet duct drilled in the body of the connecting rod. Check to see whether the oil holes are aligned. A 2.4 dia. wire should slide through freely	Extractor MR-3682-20
	b) Ream the bush (use a 20 mm expanding reamer). If no plug gauge is available, use the new gudgeon pin to check the bore	20 mm dia. expanding reamer
	NOTE:- This delicate operation must be carried out with great care. The diameter of the finished bore must be $20.005 \begin{smallmatrix} +0.015 \\ +0.010 \end{smallmatrix}$ mm.	
	c) Drive out the grease plug (inserted as described in para. a)) by means of compressed air. Blow in compressed air through the hole "a" in the big end of the connecting rod; the grease is driven through the bore in the bush and thus carries away the shavings. Thoroughly clean the bore in the bush.	
30	<u>Fit the pistons on the connecting rod</u> (see Pl. 11).	

TOOLS

NOTE:- 1. Each piston is paired with its cylinder. This assembly is sold by our Spare Parts Division. Under no circumstances must either of these parts be interchanged with another.

2. Because of the taper of the bore in the pistons and of the gudgeon pins, care must be taken to fit the parts correctly. The gudgeon pin and the piston have an etched mark on them and these marks must be in alignment after assembly.

3. There are two types of pistons and they are interchangeable, but on any one engine *both pistons must be of the same type.* The piston/cylinder assemblies have the following numbers:

A 111-01 for pistons with 4 rings } 62 mm bore
A 111-01 a for pistons with 3 rings }
AZ 111-01 for flat bottomed pistons with 3 rings
AZ 111-01a for the left-hand convex piston and AZ 111-01b for the right-hand convex piston } Cylinders with machined fins.

AZ 111-01c for the left-hand convex piston and AZ 111-01d for the right-hand convex piston { Cylinders with cast fins.

Our Spares Parts Division supply pistons with three rings only. (These pistons are available with or without split skirts).

IMPORTANT: On any one engine it is possible to fit one cylinder with cast fins and one cylinder with machined fins. This practice is not to be recommended.

a) Heat the pistons to a temperature of about 140°F (60°C) by immersing them in an oil bath or in a furnace so that the gudgeon pins (already oiled) can be pushed in by hand. (Do not mix up the gudgeon pins; they are weighed and matched with the pistons).

b) Place the pistons in position on the connecting rods. Position the slits as follows:

Pistons with split skirt: on the left-hand piston, the slit is at the bottom and on the right-hand piston it is at the top.

Pistons without split skirt: the correct position is indicated by the word "AVANT" and an arrow engraved on the top of the piston. Put thegudgeon pins in place after first oiling and fit the circlips (24) on the pins; make sure that they are properly seated in their grooves ....

Convex pistons: there is a right-hand and a left-hand piston marked "D" and "G" respectively. The letter must be towards the front of the engine ....

NOTE No. 1 : The compression rings are conical. They are marked with one of the following: HAUT, H or TOP, engraved on the upper part of the piston.

In the case of pistons sold by our Spare Parts Division, make sure that the rings are properly fitted. *Incorrectly fitted piston rings will cause abnormal oil consumption.*

If a used piston is refitted and only the rings are renewed, make sure that they turn freely in their grooves; if not file them lightly with a smooth file. If there is excessive play, the piston cannot be re-used.

NOTE No. 2: On the engines fitted with the cylinder having cast fings, the first compression ring is tapered and is marked "TOP", and this must be directed towards the upper part of the piston. The edges of this ring are rounded.

31 Prepare the cam shaft and the oil pump (see Pl. 20).

NOTE: 1. Examine the camshaft between centres. Make sure that the end of the shaft (distributor side) runs true. If it does not, the contact breaker gap will not be identical on the two cams.

	TOOLS
2. The oil pump pinions should have a lateral clearance of 0.04 - 0.06 mm. Check with feeler gauges and a rule placed across the face of the pump body joint	Feeler gauges and ruler

a) Put the key (17) in the keyway on the camshaft.

b) Place the oil pump body (18) in position, after first oiling the bearing.

c) Fit the pinion (19) and insert the internally toothed wheel (20).

d) Put the centrifugal advance weights (18) and the cam (1) in position together with thrust washer (8) and the circlip (7) (see Pl. 3) ....

32 Prepare the oil breather (see Pl. 20) :

a) 1st and 2nd types:

Remove the pin (81) and withdraw the cup (82), the spring (83), the disc (84), the distance piece (85) and the valve (86) (metal or rubber). Clean the parts. Examine the valve,which should not show any cracks or traces of corrosion (metal valve) or deformation (rubber valve). If any of these defects are found, replace the parts dismantled above by an assembly sold by our Spare Parts Division. Put the valve (86) (metal or rubber) on the breather body, the distance piece (85) the disc (84), the spring (83) and its cup (82). Insert the split pin. Be careful not to twist the fixing pin when inserting the split pin (81).

NOTE:- The valves: metal foil A-132-02 and rubber A-132-02a are not interchangeable. The old type breather body is no longer sold. It has been replaced by the new one, sold by our Spare Parts Division, under the same part No. A-221-1.

b) 3rd type:

Withdraw the rubber reed from the breather body. This part is merely inserted into the breather body. Clean it. Fit the reed into the breather (the position of the slit is immaterial).

33 Replace the starter ring.

a) Using a drift, drive off the starter ring ....

NOTE:- Three successive types of starter ring have been fitted:

1st assembly - Flat starter ring 11 mm thick on which one tooth was marked by a punch mark. On assembly, this mark must be in the area shown in Pl. 2, fig. 4.

2nd assembly - Starter ring 11 mm thick with a shoulder.

3rd assembly - Flat starter ring 9 mm thick. *This ring will be the only one sold by our Spare Parts Division.*

TOOLS

b) Heat the starter ring with a blow torch having a nozzle capacity of 800 to 1,000 litres. Heat the bore only, turning the ring all the while to ensure uniform expansion. Stop the heating process when the ring reaches a temperature of 390 - 480 $^{\circ}$F (200 - 250 $^{\circ}$C) (straw coloured). After having first cleaned the flywheel thoroughly, hold the starter ring parallel to it and fit rapidly ....

1st case - Fitting a starter ring of the first type.

When fitting, note the position of the reference mark and bring the front faces of the starter ring and of the flywheel into alignment ....

Lock the starter ring by four grub screws fitted as shown in Pl. 22, fig. 4 ....

Drill four holes of 3.25 mm diameter at approximately 90° opposite one tooth ....

Tap these holes to a diameter of 4 mm x 75 pitch and countersink ....

Insert the grub screws, hammer them down and file off until flush with the surface ....

Check the trueness of the starter ring. It must not run out of true more than 0.3 mm ....

2nd case - Fitting a starter ring of the second type (see fig. 2).

Fit the starter ring so that it seats correctly on the shoulder of the flywheel.

3rd case - Fitting a starter ring of the third type (see fig. 3).

1. The flywheel has no shoulder : bring the front face of the starter ring (tooth entry side) in contact with the face of the flywheel, clutch side ....

Lock the starter ring by means of the four grub screws (see 1st case above) ....

2. The flywheel has a shoulder: seat the flywheel on this shoulder ....

c) Check the starter ring for trueness. It must not run out of true more than 0.3 mm.

34 Grind the flywheel (Types A-AU & AZU engines).

Carry out this operation on a lathe using a grinding wheel. In an emergency, a turning tool may be used for this purpose provided that a perfectly polished surface is obtained ....

Each time the bearing face "b" on the flywheel for the clutch disc is ground, remove the same amount of metal from the bearing surface "a" on which the toggle carrier plate bears on the flywheel (see Pl. 22, fig. 2). The two operations must be carried out without removing the flywheel from the lathe, in order to ensure that the two ground faces are perfectly parallel ....

35 Make sure that the locating dowels are in position ....

36 Prepare the crankcases: Using a scraper, chamfer on the two crankcase halves the outer edge of the bore provided for the oil seal (to facilitate the fitting of this seal later on)..........

TOOLS

Put the right-hand crankcase half on the stand MR-3053-50 (see Pl. 18, fig. 1) as described under para. 1 Z ...... Stand MR-3053-50

37 *Make sure that the mating faces of the two crankcase halves are free from dents or cracks and that they are perfectly clean.*

38 <u>To replace an oil thrower.</u>

NOTE:- The oil throwers fitted by us have two diameters:

the oil thrower diameter = $42^{-0.22}_{-0.27}$ mm

is fitted in a crankcase having a bore of $42^{+0.037}_{+0.062}$ mm

the oil thrower diameter = $42.5^{-0.22}_{-0.27}$ mm

is fitted in a crankcase with a bore of $42.5^{+0.037}_{+0.062}$ mm

These throwers are sold by our Spare Parts Division.

a) Place the oil thrower on a block with the crankshaft parallel to the block ....

b) Place a drift vertically on the oil thrower and parallel to the centre line of the crankshaft ....

Tap the drift once or twice with the hammer ....

Remove the oil thrower by hand .... Drift 20 mm wide

c) Clean the bearing face of the oil thrower on the crankshaft ....

d) Heat the oil thrower to a temperature of about 175°F (80°C) (in an oil bath or in a furnace)....................

e) Put the oil thrower on the crankshaft (position immaterial). Fit it with the aid of a tube, and stop when the oil thrower comes into contact with the crankshaft pinion ....

Tube:
internal dia. = 32 mm
external dia. = 38 mm
length = 80 mm

39 <u>Fit the crankshaft</u> (see Pl. 13 and 20) (Types A & AU engines manufactured up to December 1954).

a) Oil the bearings of the crankshaft (with an oil can, since a brush introduces dirt or loses its hairs). Place the rear bearing on the bearing of the crankshaft, if the crankshaft is not fitted with an oil deflector.

NOTE:- On the first type, the oil deflector should be left 'off' if it is loose.

b) Put the crankshaft in the right-hand half crankcase. *Make sure that the dowels are properly seated in the holes in the front and the rear bearings.*

		TOOLS
39 Z	<u>Fit the crankshaft</u> (Types A & AU engines manufactured since October 1954 and Types AZ & AZU engines).	
	Put the rear bearing only in the right-hand half crankcase, with the boss engaged in the hole in the bearing. Using a scriber or a pencil make a reference line level with the face of the crankcase joint.	
	NOTE:- The purpose of this operation is to facilitate the fitting of the crankshaft, fitted with its bearing, because the bearing is a push fit in the crankcase and cannot be turned to bring the hole in the line with the locking dowels.	
	Oil the bearings of the crankshaft (with an oil can).	
	Put the crankshaft in position and mark the position of the bearing. Make sure that the dowels are properly engaged in the holes in the front and rear bearings.	
40	<u>Fit the camshaft</u> (see Pl. 13 and 20).	
	a) Apply sealing compound to the surface of the crankcase on which the oil pump rests. Oil the bearing surfaces of the camshaft (with an oil can). Put the camshaft in the right-hand half of the crankcase, at the same time bringing the pinion reference marks into alignment.	
	<u>1st case</u> : Bring the line marked on the tooth on the crankshaft pinion opposite the line marked on a gap between two teeth on the camshaft pinion (see Pl. 2, fig. 2).	
	<u>2nd case</u> : Bring the tooth on the crankshaft pinion marked with a line between the teeth on the camshaft pinion marked with a punch mark.	
	Make sure that the front bearing engages correctly on the retaining dowel. Position the smooth holes in the pump body so that they are opposite the tapped holes in the half crankcase; bring the oil inlet holes in the crankcase and in the pump into alignment.	
	b) Fit the oil filter (1). Smear the clip fixing the filter lightly with sealing compound. Do up the screw	8 mm spanner
	c) Put the locating dowel for the two crankcase halves in position (on the new type, this dowel is no longer fitted. Location is ensured by two ground bolts. The first serves at the same time to fix the oil cooler. The second is fitted in the diametrically opposite hole)	
	d) *Apply boiled linseed oil or sealing compound* to the mating faces of the half crankcases.	
	NOTE:- Use very fluid sealing compound.	
	Apply the compound over only half of the width of the joint face (on the outside). The sealing compound must not be allowed to flow between the bearing and the crankcase halves.	
	e) Put the left-hand half crankcase on the right-hand half. Do up the nuts securing the bearing studs. Oil the pump pinions (with an oil can). Push the camshaft forward as far as it will go, tapping it lightly with the handle of a	

TOOLS

mallet. With a set of feeler gauges and a ruler placed on the face of the joint of the pump body, make sure that the lateral clearance of the pinions is still between 0.04 and 0.06 mm. Insert the second screw, fixing the oil filter element, but do not tighten it. Tighten the assembly nuts and screws of the crankcase halves. Tighten the two fixing screws of the oil filter element. Fit the oil pump cover (22). Progressively tighten the screws to a torque 7 ft./lbs. (1 m.kg) ....

Tools: 8 mm, 10 mm, 17 mm box spanners.
12 mm flat spanner
Torque wrench 2470-T
17 mm socket

NOTE:- Even if the paper gasket were fitted between the pump body and cover, it need not be replaced.

f) Lift the engine from the stand and place it in the position shown in Pl. 18, fig. 2.

g) Tighten the bearing stud nuts to $32\frac{1}{2}$ ft/lbs. (4.5 m.kg) (use torque wrench 2470-T, see Pl. 21, fig. 5).

41 Fit the oil seal - Use insertion tool MR-3754-10 (see Pl. 14 A).

a) Before fitting the oil seal smear the bore and the outer surface with grease (grease with a high melting point) and smear the cone "A" of the insertion tool with engine oil. Arrange the seal so that the rubber lip faces towards the interior of the engine ....

Tools: Tool MR-3754-10

IMPORTANT NOTES :- Fit only oil seals sold by our Spare Parts Division.

The oil seal must not be fitted until the two half crankcases have been assembled, in order to avoid nipping the rubber, which could result in an oil leakage.

Renew the oil seal each time the engine is overhauled.

42 a) Fit the flywheel, *tighten the screws to 27½ ft/lbs. (3.8 m.kg)* (use the torque wrench 2470-T, see Pl. 21, fig. 5). While tightening, lock the flywheel by means of a pin inserted through one of the 3 holes drilled on the periphery of the flywheel, or by means of a screwdriver ....

Tools: Torque wrench 2470-T
12 mm socket

b) Make sure that the crankshaft and the camshaft turn freely; during this check, guide the pistons to prevent the rings from being scratched or broken. Stiffness may be due to the pinion (19) rubbing against the oil pump cover (22) (see para. 40, section f and Pl. 20, fig. 1).

IMPORTANT NOTE:- You must use only the ground screws A-121-92 a, 16.5 mm long under the head. *These screws are fitted without lockwashers.*

42 Z Type AZ engines only (see Pl. 22 A) : Fit the weight carrier ring (1), tighten the screws, using serrated washers under the heads.

		TOOLS
43	Fit the cylinder head studs, the shorter stud in the lower tapped hole in the crankcase (use stud driver 2410-T, see Pl. 21, fig. 2). *Fit the stud driver on the lower part of the stud with a diameter of 10 mm*, in order to avoid distorting the studs. Fit the drain plug (25) and the plugs (26) using copper asbestos washers (see Pl. 12)	Stud driver 2410-T
44	Make sure that the seat for valve ball does not move in its recess. If it does replace it by proceeding as follows:	
	a) Extract the seating from the crankcase.	
	b) Put in position a valve seat of the new type with the aid of a mandrel. This seat is shouldered (see Pl. 16, fig. 4 for positioning.	
	c) Bead the seat (use the hollow punch MR-3857-3, see Pl. 16, fig. 3)	Hollow punch MR-3857-3
45	Fit the washers (27) in the plug (2) and fit the spring (3) and the ball (4). Tighten the plug (2) of the valve inserting a washer (see Pl. 11)	
	NOTE - Use only plugs with no guide plates A-222-98a with ball 4104-S, (dia. 8.54) and spring A-222-5.	
46	<u>Fit the tappets</u>.	
	a) Make sure that the ball ends of the rocker push-rods are not cracked or scratched and that they show no signs of wear. If necessary rub them with emery cloth and clean them thoroughly. (This operation is unnecessary in the case of engines delivered since October 1954).	
	b) Fit the tappets after first oiling them.	
47	<u>Fit the cylinders</u>.	
	a) Oil the pistons (with an oil can). Position the piston ring gaps so that the gaps of the 1st and 3rd rings are opposite the slit in the piston and the gaps in the 2nd and 4th rings are at 180° (pistons with 4 rings). On pistons with 3 rings arrange the gaps at 120°.	
	b) Put a piston ring guide on the pistons (use the piston ring guide 1659-VA for 62 mm dia. pistons and 1654-VA for 66 mm dia. pistons, see Pl. 15, fig. 2)	Piston ring guide 1659-VA or 1654-VA.
	c) Oil the cylinder of the corresponding piston; fit it on the piston, aligning the marks made when dismantling (types A and AU engines) or positioning the notches in the cylinder fins (on types AZ and AZU engines), remove the piston ring guide and bring the cylinder to bear on the crankcase. Do not rotate the cylinder otherwise the gap position of the piston rings will be altered.	
	d) Carry out the same operation for the other cylinder.	

		TOOLS
48	<u>Fit the cylinder heads and the inlet and exhaust manifolds</u> (see Pl. 12).	
	NOTE - Types A and AU engines. - The cylinder heads of the new type are fitted without a copper gasket. These cylinders are marked with the letter "S" punched on the lower fin. It is immaterial whether an old type or a new type cylinder head is fitted.	
	a) In the recess in the cylinder block insert a copper gasket 1 mm thick and lightly smeared with oil, if such a gasket was found when dismantling (types A and AU engine cylinder heads without the reference mark "S"). After oiling the ball ends insert the rocker push-rods in the housing tubes. The ball end must not be cracked or scratched or show signs of wear. If necessary, rub it lightly with emery cloth (this operation is unnecessary on engines delivered since October 1954)	
	b) Fit the cylinder heads:	
	Undo completely the valve rocker adjusting screws. Bring the piston to top dead centre.	
	Place the cylinder heads in position.	
	Do up the lower nut until the cylinder head bears on the cylinder and the cylinder on the crankcase. Guide the housing tubes so that the shoulder of the rubber seals fits correctly in the bore in the crankcase.	
	Do up the two upper nuts and tighten to a maximum torque of $3\frac{1}{2}$ ft/lbs (0.5 m.kg).	
	<u>Engines manufactured before October 1954</u>:	
	Fit the return springs (15). They are to be fitted by hand. Make sure that the cup (14) is correctly positioned under the point on the rocker and that the spring is seated on the boss or in the recess on the cylinder head	14 mm box spanner
	c) Use a surface plate to check the flatness of the inlet and exhaust manifold flanges. If the unevenness is greater than 0.1 mm level off (by filing or by milling).	
	d) Fit the manifolds using a copper asbestos gasket between the flanges and the cylinder heads. Fit a flat washer and a spring washer under the nuts in the centre and a spring washer under the other nuts. Do up the nuts	12 mm box spanner.
	e) Tighten the cylinder head nuts. First tightening 7.1 ft/lbs (1 m.kg). Second tightening: 18 ft/lbs (2.5 m.kg). Always begin by tightening the nut at the bottom. Tighten the manifold nuts to $10\frac{1}{2}$ ft/lbs (1.5 m.kg) (use the torque wrench 2470-T), see Pl. 21, fig. 5)	Torque wrench 2470-T 14 mm socket
	f) Adjust the valve clearances (engines manufactured before March 1954): to .006" (0.15 mm) for the inlet valves; to .008" (0.20 mm) for the exhaust valves.	
	The measurement must be made on one valve when the second valve of the same cylinder is fully raised, *the engine being cold.*	10 mm spanner

TOOLS

g) Provisionally adjust the valve clearances (engines manufactured since March 1954). Under the same conditions as described in section f) adjust the inlet and exhaust valves to .008" (0.20 mm).

The final adjustment is to be made with the engine warm after refitting it.

h) Fit the valve covers: use a rubber gasket. Make sure that the mating faces are perfectly flat. The faces in contact must be dry. The widest part of the gasket must be at the bottom .... 12 mm box spanner

NOTE - a badly fitting gasket or inadequate tightening of the terminal nut may result in the total loss of the engine oil.

49 Fit the contact breaker. Check and adjust the centrifugal advance. Adjust the ignition advance (see Pl. 3).

a) Put the protector plate (6) in position (smear the bearing face on the contact breaker lightly with grease) ....

NOTE - For use on types AZ and AZU vehicles (flat and convex pistons) the apparatus 1692-VA must be modified as shown in fig. 2, Pl.4.

b) Fit the graduated quadrant of the apparatus 1692-VA (see Pl. 4) on the contact breaker fixing stud. Mount the needle carrier (A) on the cam pushing it down as far as it will go and gently tighten the retaining screw(B). By turning the flywheel bring the needle of the apparatus opposite the upper reference mark "c". Swing the needle carrier from the left towards the right without forcing it. At the end of its travel, the needle should be:

1. - For types A and AU engines: between "d" and "e", which corresponds to a movement of the weights of between 16° and 19°

2. - For types AZ and AZU engines (flat pistons): between "f" and "g", which correspond to a deflection of the weights of between 11° and 14°.

3. - For types AZ and AZU engines (fitted with convex topped pistons): between "h" and "i", which corresponds to a deflection of the weights of between 6° and 8°.

If the needle is outside of these areas, the travel of the weights must be adjusted by bending the stop plates (D) and (E).

The weights must touch the plates (D) and (E) simultaneously.

Remove the apparatus 1692-VA .... Apparatus 1692-VA

c) Remove the cover (10) from the contact breaker housing(19). Fit the contact breaker housing. Do up the fixing nuts (5), fitting a flat washer under each nut. 12 mm box spanner

d) Turn the engine so that one of the bosses on the cam lifts the contact breaker arm (2) to its maximum height. At this point adjust the gap between the contacts to 0.4 mm (use a set of feeler gauges) by undoing the screw (3) and moving the contact breaker arm carrier (4) in the required direction ....

Turn the engine so that the second boss on the cam raises the contact breaker arm to its maximum height. Check the gap between the contacts by means of the same feeler gauge. This gap must also be equal to 0.4 mm.

		TOOLS
	If the difference is greater than 0.05 mm turn the cam again. If the difference persists it means that one of the cam bosses is worn. The cam must be replaced (see paragraphs 21 b and 31 d, this operation)	Set of feeler gauges.
	e) Adjust the ignition advance	
	(This operation is carried out after refitting the engine gear box assembly, see Op. 1, paragraphs 13 to 19 or 21 to 26).	
50	<u>Fit the dynamo.</u>	
	a) Use alcohol to remove all grease from the taper bore in the armature and from the bearing surface on the crankshaft. Make sure that the bore in crankcase in which the dynamo body fits is perfectly clean.	
	b) Put the armature on the crankshaft.	
	c) Keep the brushes raised by means of their springs so that the commutator can be fitted between them, as shown in Pl. 78.	
	<u>1st case</u>: Dynamo fixed by three screws.	
	a) Put the body of the dynamo in position (smear the part fitting in the crankcase with grease) fitted with the screws and their insulators. Align the reference marks (line on the dynamo body and on the face of the crankcase). Start engaging the dynamo body in the bore in the crankcase. If necessary tap the end lightly with a mallet). Tighten the fixing screws, fitting a serrated washer under each head.	
	b) Bring the brushes in contact with the commutator.	
	<u>2nd case</u>: Dynamo fixed by two screws.	
	a) Introduce the body of the dynamo, previously greased, into the bore in the crankcase, Fit the insulators on the two screws. Screw up a few threads by hand and then tighten them alternately	12 mm box spanner
	NOTE - *Do not exceed the torque of 5¾ ft/lbs. (0.8 m.kg), otherwise the bosses on the brush carrier cover plate may be damaged.*	
	b) Bring the brushes in contact with the commutator	
	<u>3rd case</u>: Fitting a dynamo (fixed by 3 screws) on a crankcase with two fixing screws.	
	On the two undrilled bosses "a" and "b" (see Pl. 78 G, fig. 1):	
	a) Describe an arc of 78 mm radius centred on the middle point "c" of the threaded sleeve of the lower boss	
	b) Describe an arc of 44 mm radius centred at the middle point "d" of the sleeve of the upper boss	
	c) Where these two arcs intersect on the studs "a" and "b" make a punch mark and drill a hole of 8.5 mm diameter to a depth of 15 mm. (Take care not to drill right through). Tap these holes to a diameter of 10 mm, pitch 100	

TOOLS

d) Smear the thread of two sleeves A 532-99 with sealing compound. Screw these sleeves into the tapped holes by means of a 7 mm dia. screw and a locknut. Tighten to $10\frac{1}{2}$-14 ft/lbs. (1.5 to 2 m.kg) ....

e) Fit the dynamo and align the reference marks (line on the dynamo body and on the face of the crankcase). Tighten the screws to $3\frac{1}{2}$-5.8 ft/lbs.(0.5 - 0.8 m.kg), fitting a serrated washer under each head ....

f) Bring the brushes into contact with the commutator.

4th case: Fitting a dynamo (fixed by two screws on a crankcase with three fixing screws:

1. - The crankcase has only three bosses (see Pl. 78 g, fig. 2).

On the boss "a":

a) Describe an arc of 90 mm radius centred at the middle point "d" of the threaded sleeve of the upper left hand boss (engine seen from the front) ....

b) Describe arcs of 44 mm radius centred at the middle points "c" and "d" of each of the sleeves of the other two bosses.

c) At the point where the three arcs intersect on the boss "a", make a punch mark and drill a hole of 8.5 mm diameter. Drill through the wall of the crankcase. Tap this hole to 10 mm diameter, pitch 100 ....

d) Smear the thread of a sleeve A 532-99 with sealing compound. Screw this sleeve into the tapped hole in the crankcase with a 7 mm diameter screw and a locknut. Tighten to $10\frac{1}{2}$ to 14 ft/lbs. (1.5 to 2 m.kg) ....

e) When fitting the dynamo make sure that the number engraved on the component is at the lower part. Tighten the fixing screws to $3\frac{1}{2}$ to $5\frac{3}{4}$ ft/lbs (0.5 to 0.8 m.kg), fitting a serrated washer under each head ....

f) Bring the brushes into contact with the commutator.

2. - The crankcase has four bosses (one of which is not drilled) (see Pl. 78 G, fig. 3).

On the undrilled "a":

a) Describe an arc of 90 mm radius centred at the middle point "b" of the threaded sleeve of the lower boss ....

b) Describe arcs of 44 mm radius centred at the middle points "c" and "d" of each of the sleeves of the other two bosses.

c) At the point where the three arcs intersect on the boss "a" make a punch mark and drill a hole of 8.5 mm diameter to a depth of 15 mm. (Be careful not to drill right through). Tap this hole to a diameter of 10 mm, pitch 100.

d) Smear the thread of a sleeve A 532-99 with sealing compound. Screw this sleeve in the tapped hole in the crankcase with a 7 mm diameter screw and a locknut. Tighten to $10\frac{1}{2}$ to 14 ft/lbs. (1.5 to 2 m.kg) ....

e) When fitting the dynamo make sure that the number engraved on the component is at the lower part. Tighten the fixing screws to $3\frac{1}{2}$ to $4\frac{1}{2}$ ft/lbs.(0.5 to 0.6 m. kg), fitting a serrated washer under each head ....

f) Bring the brushes into contact with the commutator.

		TOOLS
51	Fit the dipstick sealing tube and place the dipstick in position. Fit the cylinder head oil pipes. Fit the double copper gasket on the union and lock the tube fixing plates on the cylinder head studs	
	NOTE - In the case of exhaust valve guides with a spiral groove, *fit cylinder head oil pipe union screws drilled with one hole of 2 mm diameter.* In the case of smooth exhaust valve guides *fit union screws drilled with two 1 mm diameter holes.*	
	Fit the oil cooler, fitting a copper gasket between the cylinder head oil pipe union and the crankcase and a copper gasket as well on either side of the union for the oil cooler tube. Tighten the union screws. Lock them with a piece of iron wire passing through the holes drilled in the head of the screws and twisted round the oil pipe	
	Fix the oil cooler on the crankcase with a ground screw and tighten the nut fitting a serrated washer	8-12-26 mm box spanners 12 mm flat spanner.
52	Fit the crackcase drain plugs (25 and 26). Fit copper washers (see Pl. 12)	17 mm flat spanner.
53	<u>Fit the carburettor.</u>	
	On the inlet manifold put: the flange smeared on both faces with sealing compound and the carburettor complete with its filter, with it the float chamber towards the front of the engine. Tighten the nuts, fitting serrated washers. Tighten the nuts, fitting serrated washers. Fit the flexible petrol pipe between the carburettor and pump	12 mm spanner
	NOTE - If a Hugo-Reintz washer and a screen were fitted, it is unnecessary to refit them.	
54	<u>Fit the breather</u> *(position the valve to face the rear of the engine).* Fit the klingerite gasket between the flanges, tighten the nuts fitting serrated washers. Fit the air filter. Tighten the fixing screws of the clip on the carburettor	12 mm spanner
	Fit the rubber union on the breather (this joint must be tight). Tighten the clip (1st and 2nd types). On these models fit the union on the hot air intake tube at the same time.	
55	<u>Fit the clutch</u> (Types A-AU and AZU engines).	
	NOTE - (Types A and AU engines only). Our Spare Parts Division will supply only the progressive disc A-319-01a. In the case of old assemblies if the disc is replaced, it is essential that the clutch mechanism should be replaced,at the same time by a new type A-312-0a. The old clutch can be refitted but it must be adjusted as described in Op. 16, para. 7, 2nd type.	
	a) Check the run out of the disc. For that purpose place a mandrel in the splined hub of the disc; the mandrel can be supported on two Vee blocks or between the centres of a lathe. The run out must not exceed 0.2 mm. The linings must be dry without any trace of oil and the rivets must be set below the surface of the linings.	
	Make sure that the disc slides freely on the drive shaft of the gearbox	Mandrel 18 mm dia. x 200 mm long.

TOOLS

b) Make sure that the bearing faces for the disc on the flywheel and on the clutch plate are clean. The mating faces of the toggle carrier plate and of the flywheel must also be clean.

c) Couple the clutch to the engine flywheel. Centre the disc by means of a mandrel (use the mandrel MR-1620-40, see Pl. 24, fig. 3). When tightening the screws securing the assembly to the flywheel, make sure that the mandrel slides freely. Tighten the screws fitting a spring washer under each head. Remove the mandrel .... 10 mm box spanner, Mandrel MR-1620-40.

55 Z Fit the needle bearing (AZ engine) (see Pl. 22 A).

Smear the needle bearing (8) with grease (about 3 gram). Use only the silica grease "Silice penetration ASTM 160" sold by SPCA, 61 Rue du Dessous-des-Berges (Paris XIII^{e}).

Put the needle bearing (8) in position in the crank shaft using a mallet, but hold a smooth metal plate between the bearing and the mallet to avoid driving the bearing too far in.

It must be flush with the surface of the journal.

56 Fit the sparking plugs, using copper asbestos washers (use the spanner 1601-T, see Pl. 21, fig. 1) .... Sparking plug, Spanner 1601-T

57 Fit the hot air intakes on the cylinder heads .... 12 mm box spanner, 12 mm spanner

58 Fit the air duct.

1st case. - Vehicles fitted with engines having cylinders with machined fins.

NOTE - Our Spare Parts Division no longer sells cylinder heads and airducts of the A and AU type. On these engines the cylinder head AZ 112-01 or AZ 112-01 a and the air duct AZ 242-1 must be fitted.

On the cylinder head now sold, the upper fixing hole for the air duct has been modified.

This hole which was formerly inclined at about 30° towards the air duct is now perpendicular to the face of the flanges of the inlet and exhaust manifolds.

On the air duct AZ-242-1, the bracket on the cylinder head boss is horizontal as shown on Pl. 13, fig. 3.

Fitting an old type air duct on a new type of cylinder head. (Types A and AU engines).

The air duct must be modified for this purpose:

a) Cut off the bracket for fixing it to the cylinder head (see Pl. 13, fig. 2);

b) Weld or rivet on as shown in fig. 3 the following component sold by our Spare Parts Division:

Under the No. A-242-80 for the left hand side,
Under the No. A-242-80 a for the right hand side.

	TOOLS
Fitting an air duct on an old type cylinder head (Types A and AU engines).	
Using universal pliers bend the bracket of the air duct as required until the screw hole is in line with the tapped hole on the inclined boss on the cylinder head. If necessary use a hammer to shape the bracket satisfactorily.	
Fit the air duct. Place the air duct in position and secure it on each cylinder head by the three fixing screws. Fit one plain and one spring washer under the head where there is no reinforcement and one spring washer at the point where the duct is reinforced	12 mm box spanner
Put the flexible engine blocks in position without tightening them (their position is determined when the engine is fitted into the vehicle). Fit one plain and one spring washer under the head of the fixing screws of the air duct and under the fixing nuts of the supports	12 mm box spanner 12 mm flat spanner
2nd case. - Vehicles fitted with engines having cylinders with cast fins. An air collector model AZ 242-1 b must be fitted.	
IMPORTANT NOTE	
If one cylinder with cast fins and one cylinder with machined fins are mounted there are two possibilities:	
1. - Fitting the air duct AZ 242-1.	
Bend the air duct as is required on the side of the cylinder with cast fins.	
2. - Fitting the air duct AZ 242-1 b.	
The available space round the cylinder with machined fins does not adversely affect satisfactory cooling of the engine.	
59 Adjust the oil pressure. This operation will be arried out after the engine has been fitted (see Op. 47, paragraphs 47 to 49).	

		TOOLS
	ELIMINATION OF A LEAK IN THE REAR BEARING	
1	Check the vacuum obtaining in the crankcase. Use a water gauge (MR 3898), one end of which is to be connected to the rubber sealing tube of the oil dipstick (see Pl. 16 A).	Pressure gauge MR 3898
2	With the engine idling, accelerate gently in order to keep the levels steady.	
	NOTE - The liquid should rise in the leg of the gauge connected to the engine.	
	Read the difference in the height of the two levels. This difference must be at least 140 mm (70 mm on either side from 0).	
	a) If the vacuum is less than 140 mm water, check the breather valve (see Op. 9, para. 1 and following).	
	After making sure that the breather valve is working efficiently check the vacuum again. Carry out a road test with the engine thoroughly warm in order to check the tightness of the rear bearing	
	b) If the vacuum is normal:	
	1. - Remove the engine (see Op. 10 A, for types A, AU and AZU vehicles and Op. 10 for type AZ vehicles). On AZ vehicles disconnect the gearbox	
	2. - Remove the engine flywheel	12 mm box spanner
	3. - Remove the oil seal with the help of a screwdriver. *Make sure that no damage is done to the crankshaft.* Do not exert too much force with the screwdriver, as this may split the crankcase.	
	NOTE - If it is found impossible to extract the oil seal in this way, remove the engine (see Op. 14).	
	4. - Fit the oil seal. Make sure that there are no dents or longitudinal cracks on the crankshaft journal on which the seal is fitted.	
	Grease the outer surface of the seal. Put grease in the space between the lips of the seal. Grease the cone A of the tool. Locate the rubber edge of the seal so that it faces towards the interior of the engine	Tool MR-3754-10
5	Fit the flywheel, tighten the screws to 27 ft/lbs. (3.8 m.kg). (Use the torque wrench 2470-T, see Pl. 21, fig. 5). When tightening, hold the flywheel by means of a screwdriver inserted between two teeth of the starter ring gear	Torque wrench 2470-T

TOOLS

VERY IMPORTANT. - Use only the ground screws A 121-92 a, 16.5 mm long under the head. ***These screws are fitted without lockwashers.***

3 **Couple the engine to the gearbox (Type AZ vehicle).**

4 **Fit the engine (see Op. 10 for type AZ vehicles and Op. 10 A for type A, AU and AZU vehicles).**

ELIMINATION OF A LEAK IN THE FRONT BEARING

5 **Check the vacuum obtaining in the crankcase (see para. 1, this operation).**

6 **If the vacuum is correct, the fault is a mechanical one. Proceed as follows:**

a) Remove the dynamo.

1. - Remove the fan (see Op. 6, para 1 and following).

2. - Disconnect the cables from the dynamo. Remove the fixing screws. Withdraw the dynamo from the bore in the crankcase (do not pull it out by the brush holder cover in order to avoid damaging the wires) .... 7-8-12 mm box spanners

3. - Remove the armature from the crankshaft (use extractor 2205-VA, see Pl. 79, fig. 2).

b) Make sure that the side and radial play of the crankshaft, is not excessive ....

c) With the aid of a gauge 5 mm wide make sure that there is a clearance of 0.05 mm all round the oil thrower between the thrower and the bore in the crankcase. If not, remove the engine (see Op. 10, also uncouple the gearbox for type AZ vehicles and Op. 10 A for types A, AU and AZU vehicles) ....

d) Strip the engine (Op. 14).

e) Examine the crankcase: the crankshaft oil thrower should not leave an imprint in the bore in the crankcase. The two crankcase halves must be properly centred by the 2 ground screws; one also serves at the same time to fix the oil cooler, while the other one, which is diametrically opposed in the lower rear portion, fixes the half-crankcases. If there are any burrs in the bore, remove them carefully with a triangular scraper.

	TOOLS
f) Inspect the crankshaft by supporting it between centres. Do not exert too much pressure at the centres which will distort the crankshaft. If the crankshaft webs have not shifted, the oil thrower must run true. If it does not, renew the crankshaft. Check the play of the front bearing. If there is too much play the oil seal will rub against the crankcase, thus causing a leakage	
g) Assemble the engine (see Op. 14)	
h) Connect the engine to the gearbox (for type AZ vehicles). Fit the engine (see Op. 10 A for types AZ vehicles and Op. 10 for types A, AU and AZU vehicles)	

		TOOLS
	Removal	
1	Remove the engine without removing the gearbox (see Op. 10 A, paras. 1 to 13)	
2	Remove the clutch and withdraw the disc	10 mm box spanner
	Refitting	
3	**Examine the disc.**	
	Check the disc for run-out, by proceeding as follows: insert a mandrel in the grooved hub of the disc. Support the mandrel on two vee blocks or between the centres of a lathe. The run-out must not exceed 0.2 mm. The linings must be clean without any traces of oil and the rivets must be set below the surface of the linings. Make sure that the disc slides freely on the primary shaft of the gearbox	Mandrel 200 mm long x 18 mm diameter.
4	**Fit the clutch.**	
	a) Make sure that the bearing faces for the disc on the flywheel and on the clutch plate are clean: this applies also to the bearing faces of the toggle carrier plate and the engine flywheel	
	b) Couple the clutch to the flywheel, centring the disc with the aid of a mandrel (use the Mandrel MR. 1620-40, see Pl. 24, fig. 3)	
	When tightening the screws securing the assembly to the flywheel make sure that the mandrel slides freely	
	Tighten the screws, fitting a spring washer under each head	
	Remove the mandrel	10 mm box spanner Mandrel MR-1620-40.
	VERY IMPORTANT NOTES - Depending on the type of clutch and engine fitted, one of the locating dowels given in the table below must be used:	

Depth of the hole in the crankcase	Depth of the hole in the clutch housing	Length and part number of the dowels to be fitted	
		Length	Part No.
3 mm (A and AU)	4.5 mm	6 mm	A 331-99
3 mm (A and AU)	15 mm	17.5 mm	A 331-99 a
5 mm (A and AU)	4.5 mm	8.7 mm	A 331-99 b
5 mm (A-AU-AZU)	15 mm	17.5 mm	A 331-99 a

TOOLS

If the engine and the gearbox are fitted with locating dowels having a length of 6 mm or 8.7 mm, it is absolutely essential to remove the gearbox in order to couple the engine and gearbox as described in Operation 12, para. 15.

If the locating dowels are 15 mm long fit the engine as described below.

5 Fit the engine (see Op. 10 A, paras. 14 to 23, 30 and 31).

		TOOLS
	Removal (see Pl. 22 A)	
1	Remove the engine gearbox assembly (see Op. 10).	
2	Disconnect the engine from the gearbox (see Op. 11 A paras. 2 to 4).	
3	Remove the weight carrier ring (1)	12 mm box spanner
	NOTE - No work can be done on the clutch. The weights on the ring and their linings can neither be replaced nor re-surfaced (with a file or emery cloth). They cannot be re-shaped; the concentricity and the balance of the weights are adjusted after they have been fitted. The bearing surface in the drum (2) cannot be ground.	
	Replacement.	
4	Check the condition of the facings of the weights. The facings must be dry without any traces of oil. Fit the weight carrier ring (1). Fit serrated washers under the screw heads	12 mm box spanner
5	Connect the engine to the gearbox.	
6	Fit the engine and gearbox assembly (see Op. 10).	

		TOOLS
	<u>Removal</u> (see Pl. 22 A).	
1	Remove the engine and gearbox assembly (see Op. 10).	
2	Disconnect the engine from the gearbox (see Op. 11 A, paras. 2 to 4).	
3	<u>Remove the clutch drum</u>.	
	a) Remove the fork control lever. Engage 2 gears (1st and overdrive)	
	b) Undo the bearing locknut (3) (left hand thread). When undoing the nut support the spanner and do not let it rest on the driveshaft	
	c) Lift out the clutch drum (2) and clutch assembly	
	NOTE - Do not exert excessive pressure on the drum in order to release it; the clutch disc fabric is very fragile.	
4	<u>Stripping the clutch drum</u>.	
	a) Disconnect the clutch assembly and withdraw the disc (4) and the adjusting ring (5)	10 mm box spanner Mandrel 22 mm dia. 150 mm long
	b) 1st Assembly:	
	Drive off the bearing (6) using a mandrel in a press, the dust cover (7) comes away with the bearing.	
	2nd Assembly:	
	1. - Extract the deflector (7) by means of a screwdriver inserted between the deflector and the bearing (6).	
	NOTE - The deflector must be renewed each time it is removed.	
	2. - Remove the circlip (9) from the bearing (6). To do this insert a screwdriver with a blade 7 mm wide between the ends of the circlip.	
	3. - Turn the screwdriver so as to release *one end only* of the circlip from the groove.	
	4. - Finally finish freeing the circlip by inserting a 2nd screwdriver between the end of the circlip freed as described in para. c)and the bore in which the bearing is housed, keeping the ends of the circlip apart with the 1st screwdriver.	
	NOTE - A new circlip must be fitted every time the old one is removed.	

		TOOLS
	Replacement (see Pl. 22 A).	
	NOTE - On the clutch drum (2) the only surface that may be ground is the disc bearing face. Under no circumstances grind the surface on the drum on which the weights bear. If this surface has any defects, the clutch drum must be renewed.	
5	**Prepare the clutch drum.**	
	a) Reface the disc bearing surface on the clutch drum (use the mandrel MR-3700-100, see Pl. 22 B, fig. 1). Every time the disc bearing surface is ground, the same amount of metal must be removed from the bearing surface on the drum for the toggle carrier plate	Mandrel MR-3700-100
	b) Smear the bearing (6) with grease (ASTM 160 grease sold by SPCA, Rue du Dessous-des-Berges,(Paris XIII^{e}). The grease must not come into contact with the balls	
	c) Fit the bearing (6) in the clutch drum (2) with the aid of a mandrel and a clamp	Mandrel 39 mm dia. x 150 mm long.
	1st Assembly: Fit the dust cover (7) in position with the aid of a tube	
	2nd Assembly: Fit the circlip (9). Make sure that it is properly seated in the groove. After it has been fitted the distance between the two ends must be 4.2 mm. Fit the dust cover with the help of a tube	Tube: i.d. = 33 mm. o.d. = 37.5 mm. Length = 150 mm.
	d) Put the adjusting ring (5) against the bearing (6) (hold it in position with grease)	
	e) Put the clutch disc in position, centre it with the aid of a shouldered mandrel or a driveshaft engaged in the bearing (6). Fit the clutch mechanism, tighten the screws, using spring washers under the heads	Mandrel: small end 17 mm dia. x 40 mm long. Large end 25 mm dia . x 40 mm long.
6	**Fit the clutch drum.**	
	IMPORTANT - If the driveshaft or the gearbox housing have been replaced, an adjustment of the position of the flywheel must be made. This adjustment is of extreme importance, since it ensures correct seating of the weights in the drum. This adjustment is obtained by selecting an adjusting ring (5) of suitable thickness.	
	a) Adjust the postion of the clutch drum (use the straight edge 1755-VA with the dial gauge 2437-T, see Pl. 21 C fig. 1) .	Straight edge 1755-VA Dial gauge 2437-T
	1. - Standardise the dial gauge by placing the straight edge on a surface plate.	
	2. - Fit an adjusting ring (5) 3.1 mm thick.	
	3. - Measure the distance "a" (see Fig. 2) between the joint face of the gearbox housing and the face of the boss provided for the bearing in the clutch drum.	

TOOLS

Assume the dimension measured is 5.65 mm for example:

The distance "a" must be between 5.12 mm and 5.42 mm if the position of the flywheel is to be satisfactory.

In the example chosen the drum must be advanced:

5.65 mm - 5.42 mm = 0.23 mm.

A spacer ring (5) must be selected which is 0.23 mm thicker, or in our example:

3.1 mm + 0.23 mm = 3.33 mm.

In this particular example, fit a ring with a thickness of 3.4 mm: the spacer rings sold by our Spare Parts Division range from 2.5 mm to 4 mm in steps of 0.3 mm.

b) Place the clutch drum (2) in position and if necessary guide the spacer ring with the finger in order to allow the introduction of the driveshaft. Do up and tighten the nut (3) to a torque of $21\frac{1}{2}$ - $28\frac{1}{2}$ ft/lbs. (3 to 4 m.kg) ....

NOTE - *During the tightening operation, support the spanner so that it does not rest on the driveshaft.*

c) Turn down the metal of the nut into the slot in the driveshaft in order to lock it ....

NOTE - During this operation support the nut from underneath in order to prevent the threads of the oil return on the driveshaft from being impressed in the bore in the crankcase.

7 Connect the engine to the gearbox (see Op. 10).

8 Fit the engine and gearbox assembly (see Op. 10).

		TOOLS
	DISMANTLING (see Pl. 22).	
1	1st assembly (nut locked by rivetting).	
	Using a saw blade, remove the metal of the nuts (1) hammered into the slot in the screws (2). Hold the nut (1) with a flat spanner and *turn the adjusting screw* (2) with a screwdriver..	11 mm flat spanner
	2nd assembly (nuts locked by tack welding).	
	Drill a hole in the adjusting screw (nut side) with a 5 mm bit in order to destroy the part of the screw engaged in the nut. Tap the nut to break the screw and remove	
2	Remove the toggle carrier plate (3). Withdraw the thrust springs (4), the cups (5) and the adjustment screw springs (6)..	
3	Remove the toggle thrust ring. Remove the toggles and withdraw the toggles and the toggle retainer springs (7)	
4	Clean the parts..	
	ASSEMBLY (see Pl. 22).	
5	Grinding the pressure plate.	
	This operation is to be carried out on a lathe with a grinding wheel. In an emergency,the work can be done with a facing tool, provided that a perfectly polished surface is obtained	
	Each time the bearing surface on the plate for the clutch disc is ground, there will be a corresponding reduction in the pressure exerted by the mechanism on the disc. In order to compensate for this diminution in pressure, washers punched from sheet metal having a thickness approximately equal to the amount of metal removed by grinding should be placed under the springs when assembling the clutch	
6	Grinding the flywheel (types A-AU-AZU engines).	
	Each time the bearing surface "b" on the flywheel for the clutch disc is ground, the same amount of metal must be removed from the bearing surface "a" for the toggle carrier plate on the same flywheel (see fig. 2). The two operations must be carried out without removing the flywheel from the lathe, in order to ensure that the ground surfaces are perfectly parallel (use mandrel MR-3700-110, see Pl. 22 B, fig. 2)	Mandrel MR-3700-110

		TOOLS
6 Z	Grinding the clutch drum (type AZ engine). NOTE - Only the part of the disc actually in the drum can be ground. *Under no circumstances may the bearing surface on the drum for the weights be ground. If this surface is defective, the clutch drum must be replaced.* In order to grind the bearing surface on the drum for the disc, proceed as described in para. 6 above (use the mandrel MR-3700-100, see Pl. 22 B, fig. 1)	Mandrel MR-3700-100
7	Calibration of the thrust springs. NOTE - Two types of discs were fitted in succession. 1st type: rigid disc. This disc is fitted with a mechanism comprising 6 springs Part No. A 312-2. 2nd type: flexible disc. This disc is mounted with a mechanism comprising 3 springs Part No. A 312-2 and 3 springs Part No. A-312-2a. Our Spare Parts Division now supplies the flexible disc only. In order to fit a flexible disc in place of a rigid disc, three of the existing springs must be replaced by springs Part No. A 312-2a.	

Part No. of spring	Identification	Length under load	Load
A 312-2	pink	25 mm	25 ± 2.5 kg
A 312-2 a	orange	25 mm	$18 {}^{+2.5}_{0}$ kg

	Check these conditions with the aid of a calibrating fixture (use the calibrating fixture 2420-T with reference spring 2421-T, see Pl. 19)	Calibrating fixture 2420-T Spring 2421-T
	If the fixture is not available, the springs must be renewed each time the clutch is repaired	
8	Fit the mechanism. a) Put the pressure plate (8) complete with the 3 toggle adjusting screws (2) on an assembling and adjusting fixture (use the assembling and adjusting fixture 1701-T, see Pl. 23, fitted with the finger, the block and the clamps 1702-VA	Fixture 1701-T, Finger, block, clamps 1702-VA
	b) Put the thrust springs (4) on the plate: fit one pink and one orange spring alternately. If necessary, place in position the punched washers as described in para. 5 above. Fit the cups (5) on the spring. Put the adjusting screw springs (6) on the screws....................	

TOOLS

c) Put the toggle thrust springs (7) on the cover plate and put the toggle thrust ring in position.

d) Fit the toggle carrier plate (3) on the cups (5). Compress the assembly, fit the toggles (9), put the nuts (1) on the screws (2) *and rotate the screws* to bring the toggle thrust rings into contact with the under part of the central pivoting finger of the device.

e) Lock the nuts (1) of the adjusting screws (2) by hammering the metal of the nut into the slots in the screws.

9 Remove the assembly from the adjusting device. ....

IMPORTANT NOTE.

- On the new clutch mechanisms sold by our Spare Parts Division, the distance between the bearing surface of the toggle thrust plate and the pressure plate can vary between H = 32 mm and H = 33.5 mm, the distance between the thrust plate and the carrier plate being h = 12 mm.

  This adjustment must not be changed.

- The clutch must never be adjusted except under the same conditions of working as on the car. That is why the fixture is essential for obtaining the correct adjustment. If the adjusting fixture 1701-T is not available use the simplified fixture 1703-VA (see Pl. 24).

The dimensions given can be checked only under these conditions.

- When the clutch is released from the fixture, the pressure plate and the toggle thrust ring take up an indeterminate position relative to the carrier plate and it is therefore not possible to measure the height of the toggles except when assembled.

- No re-adjustment of the clutch should be made after it has been fitted on the engine .... Simplified fixture 1705-VA.

		TOOLS
	REPLACEMENT OF A LEVER (see Pl. 25).	
	<u>Removal.</u>	
1	Withdraw the cotter pin and remove the fulcrum pin from the gear change lever	
2	Disconnect the lever tower from the gearbox and disconnect the two earth wires	12 mm box spanner
3	Remove the lever and tower assembly from the gearbox, tilt the lever towards the left to release the end from the guide finger (56)	
	<u>Replacement.</u>	
4	Pack the housing cavity with grease (special bearing grease)	
5	Put the lever in position, tilting it towards the left in order to avoid catching it on the guide finger (56), and fit it on the fixing stud.	
6	Fit the regulator earth wire and the negative battery cable on the front left hand stud. Put a flat washer on the wire lugs, tighten the lever tower nuts with a spring washer under each nut	12 mm box spanner
7	Put the fulcrum pin of the gear change lever in position and lock with the cotter pin	
8	Make sure that the gear changes work smoothly.	
	OVERHAULING A LEVER	
	<u>Removal.</u>	
9	<u>Stripping down the gear change lever</u> (see Pl. 25).	
	a) Remove the fixing clip (57) and take off the lever dust cover (58) by passing it over the yoke which is not to be dismantled	
	b) Remove the 2 lever return plungers (59). In order to do so, compress the two return springs (60) by means of a screwdriver and extract the two rivets (61). Take off the springs from the plungers.	

TOOLS

c) Remove the lever thrust spring (62) from the support (by means of a screwdriver) and remove the socket (64) .....

d) Take the lever out of the tower (63). Remove the lever stop screw .... 12 mm box spanner

Assembly.

10 Prepare the gear change control lever (see Pl. 25).

a) Insert the stop screw in position and turn down the lockwasher. Insert the lever in the tower (63) after first oiling the ball end.

b) Fit the spring cup (64) in position, insert the spring (62) in the tower and place it under the retaining bosses with the aid of a screwdriver.

c) Fit the springs (60) in the plungers, oil the plungers (59) and place them in position in their housing, locating them so that the slit is opposite the holes provided for the rivets (61). Compress each spring with the aid of a screwdriver and put the rivets (61) in position. Make sure that the heads of the rivets do not project above the face of the joint of the tower. Check the clearance at "a" between the ball of the lever and the plungers. This clearance must be 0.6 mm. The correct clearance can be obtained by inserting washers (95) between the flanges of the plungers and the lever tower.

d) Fit the dust cover (58) on the tower. Fit the fixing clip (57). *Position the head of the cotter pin as shown in fig. 1.* Tighten the clip.

TOOLS

Removal.

1 Extract the cotter pin and remove the fulcrum pin from the gear change lever, the pin from the guide on the dash and the pin from the support on the scuttle panel ....

2 Remove the flange of the flexible control joint on the instrument panel ....

3 Undo and remove the gear lever knob ....

4 Remove the gear change control assembly from the front of the vehicle ....

Replacement.

5 Place the gear change control assembly in the opening in the dash, inserting it from the front of the vehicle..........

6 Fix the flange of the flexible joint on the dashboard, tighten the screws, using a serrated washer under each head....

7 Place the lever guide in position on the pin of the dashboard, insert the cotter in the fulcrum, using a flat washer. Put in position the fulcrum pins of the gear change lever and of the support on the scuttle panel. Secure the pins with cotters using a plain washer..

8 Screw on the gear change lever knob ....

NOTE - Never oil the sliding rubber bushes or the fulcrum pins. If it does not slide freely, sprinkle with talcum powder only.

		TOOLS
1	Remove the top cover from the gearbox	T - spanner 12 mm extension socket
2	<u>Adjust the selector forks</u> (see Pl.43).	
	a) Adjust the 2nd and 3rd change speed forks	
	NOTE - Two adjusting gauges of different thicknesses are available.	
	1. The gauge 1785-VA (see Pl. 43, fig. 3) 2.8 mm thick, is used with the 2nd and 3rd speed sliding gear (37) (length 65.4 ± 0.1 mm) with a reference groove "a" (see Pl. 33 B, fig. 1) and fitted without a washer 0.5 mm thick.	
	2. Gauge 1786-VA, 1.8 mm thick, is used for:	
	a) The 2nd and 3rd speed sliding gear (37) (length 65.4 ± 0.1 mm) with a circular reference groove "a" (see Pl. 33 B, fig. 1) and when there is a washer (99) 0.5 mm thick (501.068) between the bearing (31) and the shaft (75) on the one hand and another washer (113) 0.5 mm thick between the pinion (40) and bearing (18) on the other hand.	
	b) The 2nd and 3rd speed sliding gear (37) (length 66.4 ± 0.1 mm) without a reference groove (see Pl. 33 B, fig. 2).	
	NOTE - (see Pl. 33);	
	1. Put the gear selector fork shaft in the neutral position and undo the fixing screw of the 2nd and 3rd speed selector fork.	
	2. Put the adjustment gauge (see Fig. 3) on the synchronising ring (70) of the primary shaft dogs	Gauge 1785-VA or 1786-VA
	3. By means of the selector fork, bring the 2nd and 3rd speed sliding gear (37) into contact with adjusting gauge. In this position tighten the fork fixing screw, fitting a serrated washer under the head. Remove the gauge	12 mm spanner
	b) Adjust the fork of the 1st and reverse speed sliding gear.	
	Put the 2nd and 3rd speed sliding gear in neutral.	
	1. Put the shaft of the 1st and reverse fork in the neutral position, and undo the screws fixing the 1st and reverse speed selector fork..	12 mm spanner
	2. Locate the 1st and reverse speed sliding gear on the 2nd and 3rd speed sliding gear by using the fork to bring it to the middle of its travel between the idler of the 1st speed and the reverse gear pinion. For all practical purposes this condition is obtained when the rear face of the 1st and reverse sliding gear is level with the rear end of the ground portion of the 2nd and 3rd speed sliding gear (37) at "b" (see Pl. 33, fig. 2).	
	3. Tighten the two fork fixing screws, fitting a serrated washer under each head.	

	TOOLS
c) Adjust the overdrive fork.	
1. Move the selector fork shaft into the neutral position and undo the screw fixing the overdrive fork.	
2. Place the adjustment gauge 1787-VA (see Pl. 43, fig. 2) on the synchronising ring (35) of the reduction gear idler wheel.	
3. By means of the fork, bring the overdrive sliding gear (19) into contact with the adjustment gauge.	
4. Tighten the fork fixing screw, fitting a serrated washer under the head. Remove the adjustment gauge	Adjustment gauge 1787-VA 12 mm spanner
d) Check the engagement of the gears in succession.	
3 Fit the cover with its gasket; tighten the screws moderately (in order to avoid distortion of the cover plate), fitting a spring washer under the screw heads..	T - spanner 12 mm extension socket

		TOOLS
	Removal.	
1	This operation necessitates the removal of the engine gearbox assembly (see Op. 10, paras. 1 - 11).	
2	Disconnect the expansion chamber and silencer assembly from the gearbox without separating them................. (use the spanner 1791-VA, see Pl. 28, fig. 3)	12-17 mm spanners Spanner 1791-VA
3	Place the engine and gearbox assembly on a work bench.	
4	Remove the starter. Unhook the clutch fork return spring. Disconnect the connecting pipe from the wheel cylinders ..	12 mm flat spanner 12 mm box spanner
5	Uncouple the gearbox from the engine (use the spanner 1790-VA, see Pl. 28, fig. 2 or the spanner 1791-VA, see Pl. 28, fig. 3)	17 mm spanner Spanner 1790-VA or 1791-VA
5 Z	Disconnect the clutch drum together with the mechanism from the gearbox driving shaft (see Op. 15 AZ).	
6	Drain the gearbox. (If the same gearbox is to be replaced).	
	Replacement.	
7 Z	Fit the assembled drum and the clutch mechanism on the drive shaft of the gearbox (see Op. 15 AZ).	
8	Couple the gearbox to the engine. NOTE - Depending on the type of clutches or engines fitted, the locating dowels given in the following table should be used:	

Depth of the hole in the crankcase	Depth of the hole in the clutch housing	Length and Part No. of the locating dowels to be used.	
		Length	Part No.
3 mm (A-AU)	4.5 mm	6 mm	A 331-99
3 mm (A-AU)	15 mm	17.5 mm	A 331-99 a
5 mm (A-AU)	4.5 mm	8.7 mm	A 331-99 b
5 mm (A-AU-AZU)	15 mm	17.5 mm	A 331-99 a
5 mm (AZ)	15 mm	27.5 mm	AZ 331-99

TOOLS

a) Make sure that the 2 dowels for the clutch housing are in position on the studs and that *the dowel holes in the clutch housing have not been damaged.*

IMPORTANT NOTE - If the dowels holes are damaged, *the crankcase or the gearbox casing must be replaced, since faulty alignment of the gearbox and the engine will cause rapid deterioration of the clutch.*

a Z) Type AZ engine, fit the distance pieces on the locating dowels and on the gearbox fixing studs.

b) Put the engine on a work bench, resting it on its front face. (The engine must not contain oil).

c) Types A-AU-AZU engines.

Put the gearbox on the engine. (Engage one gear). Rotate the 2 sliding couplings on the driving shaft so that the primary shaft can be turned to enable the splines to be introduced into the splines in the disc.

At this point, the box should drop under its own weight.

Make sure that the clutch housing and the crankcase are *in contact*. If not, the locating dowels are preventing the correct positioning, because the clutch disc *is not perfectly centred with respect to the primary shaft.*

Release the disc by undoing the screws securing the clutch mechanism to the flywheel.

Centre the disc by moving the gearbox so that the locating dowels drop into their holes.

c Z) Type AZ engine. Put the gearbox on the engine. Engage the end of the driving shaft in the needle bearing.

d) Put the horn brackets on the upper left hand and right hand studs. Tighten the gearbox nuts (lower left hand nut temporarily) (use the spanner 1790-VA, see Pl. 28, fig. 2 or the spanner 1791-VA, see Pl. 28, fig. 3). Tighten the clutch fixing screws .... 10 - 17 mm spanners; Spanner 1790-VA or 1791-VA

9 Fit the starter, and hook the clutch fork return spring in position. Connect the connecting tube to the wheel cylinders. 12 mm box spanner

10 Put a chain sling in position (use the chain sling 1619-VA, see Pl. 17). Lift the engine .... Sling 1619-VA

11 Connect the silencer and expansion chamber assembly to the gearbox and to the exhaust manifold. Fit one flat and one spring washer under the heads of the screws securing the silencer to the gearbox casing (use the spanner 1791-VA, see Pl. 28, fig. 3) .... Spanner 1791-VA

12 Fit the engine and gearbox assembly (see Op. 10, paras. 14-26, 29, 32-34, 37-39) ....

13 Top up the oil level in the gearbox : about $1\frac{3}{4}$ pints (1 litre) of high pressure oil (SAE 80 EP). If the oil level is too high or the oil too thick, gearbox troubles may be experienced. (The synchronising cones may stick).

		TOOLS
	DISMANTLING (see Pl. 26).	
1	Drain the oil from the gearbox. Screw the plug in a few threads	21 mm spanner
2	Put the gearbox on a stand (use the stand MR-3053-40, see Pl. 27)	Stand MR-3053-40
3	To Remove the Brake Drums (see Pl. 28).	
	Unscrew the 4 nuts (1). Withdraw the drum, keeping the sliding coupling jaw (88) perpendicular to the drum	12 mm box spanner 12 mm spanner
4	To Remove the Brake Shoes (see Pl. 28 and 29).	
	a) Remove the guides (2) supporting the adjusting cams and remove the two nuts (3) on the anchorage pins. Do not mislay the 4 distance pieces. Remove the two eccentrics (4)	12 mm box spanner
	b) Unscrew the two securing screws of the wheel cylinder	12 mm spanner
	c) Disengage the cable sheath from the boss inserted into the brake backplate.	
	d) Release the brake shoe and wheel cylinder assembly from the brake backplate.	
	e) Unhook the brake cable from the handbrake control lever (5) and remove the brake shoe and wheel cylinder assembly.	
5	Remove the brake shoe and wheel cylinder assembly from the second brake backplate (proceed exactly as described in para. 4).	
6	To Remove the Brake Backplates.	
	Unscrew the securing nuts. Release the plates from the gearbox casing by tapping the back of each plate lightly with a mallet. Take out wheel cylinder securing screws..........	T-spanner, 12 mm socket
	IMPORTANT NOTE - If the gearbox is being dismantled for an overhaul without renewing the casing or the crown wheel and pinion or the differential bearings or the backplates, mark the adjustment shims (fitted between the differential bearings and the backplates) so that they can be refitted in the same position. This will make it unnecessary to carry out any re-adjustment of the crown wheel and bevel pinion.	
7	To Remove the Clutch Housing.	

		TOOLS
	a) Remove the graphite thrust ring from the clutch release fork. Unhook the return spring from the fork lever.	
	b) Remove the circlips from the fork shaft and withdraw the shaft	Circlip pliers
	c) Disconnect the clutch housing from the gearbox. While removing the housing, support the differential assembly to prevent it from falling. If necessary, ease off the clutch housing by tapping it with a mallet	12 mm box spanner 17 mm spanner
	d) Remove the differential assembly simultaneously with the clutch housing.	
8	<u>To Remove the Gear Change Control Lever.</u> Tilt the lever towards the left, in order to release it from the guide finger	12 mm box spanner
9	<u>To Remove the Cover Plates.</u> Remove the rear cover plate (6). Remove the adjusting shims (7) from the recess in the housing. (If the cover plate (6) and the bearing (18) are to be re-used, mark the shims (7) and the bearing (18) in order to avoid having to carry out the adjustment described in para. 48, this operation). Remove the top cover plate (8) from the gearbox and remove the gasket (9) .... NOTE : The bearings (18) and (24) may have shoulders of different thicknesses.	12 mm box spanner
10	<u>To Remove the Selector Forks</u> (see Pl. 30). Unscrew the screws securing the forks to their shafts. Withdraw the shafts by rotating them through half a turn. Place a finger over the openings in the locking ball housing, first at the front and then at the rear, in order to prevent the balls from jumping out. Disengage the first and reverse speed forks (10) and the 2nd and 3rd speed fork (11). The overdrive fork (12) can be withdrawn after the primary and main shafts have been removed. Remove the locking balls and springs from their housing using a hook made of iron wire	12 mm spanner
11	Put 2 gears in mesh. Remove the nut (13) from the primary shaft. Remove the pinion shaft nut (14). (NOTE: left-hand thread). Remove the speedometer worm (15) and the distance piece (16)	23 mm and 29 mm box spanners.
12	<u>To Remove the Main Shaft and the Primary Shaft.</u> a) Remove the two screws securing the flange (17). Drive off the main shaft assembly by tapping the rear end of the primary shaft (66) with a copper block	T-spanner, 12 mm socket.

		TOOLS
	b) Drive out the bearing (18) (towards the rear of the box) by tapping the constant mesh pinion with a copper rod. Withdraw the primary shaft and the pinions from inside the gearbox	12 mm box spanner
13	Take out the overdrive selector fork (12) from the sliding gear (19)	
14	<u>To Remove the Bevel Pinion Shaft</u>.	
	a) Remove the retaining plate (20) from the rear bearing of the bevel pinion shaft. Do not mislay the 4 distance pieces for the bearing retaining plate (20)	12 mm box spanner
	b) Push the overdrive sliding gear (19) so that it is engaged on the constant mesh pinion (21). Push the intermediate train towards this assembly and keep the three parts in contact. (*This operation is necessary in order to hold the idler thrust washer (22) and to prevent it from falling into the groove on the shaft and thus preventing the removal of the bevel pinion shaft.*) (see Pl. 32, fig. 1).	
	c) Drive out the bevel pinion shaft together with its front bearing (23). Withdraw it from the front of the gearbox by tapping the rear end with a copper rod. Remove the pinion assembly from the casing.	
	d) Take out the rear bearing (24) from the bore in the casing, holding the outer race either by means of two small bent levers or by means of a tube inserted into the gearbox	Tube: External dia. = 51.5 mm Length = 350 mm
15	<u>To Remove the Reverse Pinion</u> (see Pl. 32, fig. 5).	
	a) Remove the pointed screw locking the pinion shaft	12 mm box spanner
	b) Withdraw the shaft (97) (use the extractor MR-3682-30, see Pl. 31, figs. 1 and 3). Remove the reverse pinion (25).	Extractor MR-3682-30
16	Remove the three expanding washers (93) and the screw blocking the locking ball housing (where the casing is being replaced)..........	
17	Remove the gearbox from the stand MR-3053-40	
18	<u>To Strip Down the Differential</u> (see Pl. 34).	
	a) Remove the taper bearings from the housing and from the crown wheel (use the extractor 1750-T fitted with the shells 1736-T with pad 1743-VA, see Pl. 35)	Extractor 1750-T Shells 1736-T Pad 1743-VA
	b) Disconnect the crown wheel from the housing	17 mm articulated spanner
	c) Drive out the satellite pinion shaft (26) from the housing. Remove the two satellite pinions (27) and the plant wheels (28)..........	

		TOOLS
19	To Strip Down the Mainshaft (see Pl. 33, fig. 1). a) Withdraw the front bearing (29) with the aid of a press. b) With a chisel, drive out the metal of the nut (30) which is tapped into the slot in the shaft (75). Remove the nut. (NOTE : *left-hand thread*)........	32 mm spanner or ring spanner
	c) Remove the bearing (31) from the mainshaft in a press (use the bush MR-3686, see Pl. 31, fig. 2 and 4). (The distance piece fitted on certain types will come away with the bearing)	Bush MR-3686
	d) Remove the circlip (32) with circlip pliers. Remove the synchronising circlip (70) (this circlip must be replaced each time the box is overhauled).	
	e) Remove the circlip (33) from the needle bearing by means of a small pin inserted in the hole "a" located between the teeth. Remove the needle bearing (69), their thrust washers and the distance piece (34)	2 mm dia. pin.
20	<u>To Strip Down the Bevel Pinion Shaft</u> (see Pl. 32, fig. 1). a) Extract the front bearing (23) in a press if necessary, by resting the bearing on a tube	Tube: Internal dia. = 48 mm External dia. = 55 mm Length = 50 mm
	b) Remove the synchronising circlip (35) from the constant mesh pinion (21). (The circlip must be replaced after every overhaul). Remove the bushes (72 and 73) from the bore in the intermediate train	
21	<u>To Strip Down the Primary Shaft</u> (see Pl. 33, fig. 2). a) Remove the 1st speed and reverse speed sliding gear (36) and the 2nd and 3rd speed sliding gear (37) from the shaft. Remove the 2nd gear idler pinion (38), the 2nd speed idler distance piece (39) and the constant mesh pinion (40)........	
	b) Remove the synchronising circlip (41) from the 2nd speed idler pinion (this circlip must be replaced after every overhaul)	
22	<u>To Strip Down the Brake Backplates</u> (see Pl. 28 and 29). a) Disengage the brake cable from the backplate	
	b) Hold the shaft in a vice (clamp it by the fork). Using a chisel, drive out the metal of the nut tapped into the groove in the differential shaft. Unscrew the bearing locknut (42). (NOTE : *right-hand thread for the right-hand backplate and vice versa*).	32 mm box spanner
	c) Drive out the differential shaft (88) from the bearing in a press or with the aid of a mallet	
	d) Drive out the locking pin (43) from the ring nut (44) by means of a bent punch inserted through the hub bore. Remove the ring nut (44). (NOTE : *left-hand thread for the right-hand backplate and vice versa*) (use the spanner 1925-VA,	

		TOOLS
	see Pl. 36, fig. 1). Withdraw the bearing (65) with the aid of a copper rod	Spanner 1925-VA
	e) Drive out the oil seal (45)	
	f) Remove the oil deflector (46) from the hub of the backplate (if necessary) with the aid of a lever resting on the backplate	
	g) Drive out the rivets (47) locking the anchorage pins. If necessary, drive out the anchorage pins (48) from the plates	
23	To Strip Down the Sliding Couplings (see Pl. 37).	
	a) Remove the 4 circlips (49) from the bearings	
	b) If necessary, use a scraper to remove any burrs or paint liable to impede the removal of the bearings	
	c) Loosen the bearings (50) from their housings by tapping on the forks with a copper block. Remove the bearings with the aid of universal pliers or with flame	
	d) Drive off the metal cups (51) and the copper gaskets (52) from the crosshead trunnions	
	e) Drive out the studs for the brake drums from the differential shaft driving plate	
24	To Disconnect the Brake Shoes in order to Release the Wheel Cylinder (see Pl. 38).	
	a) Move the brake shoes into the position indicated in fig. 1. Remove the wheel cylinder	
	b) Unhook the return springs from the brake shoes	
25	To Strip Down the Wheel Cylinders (see Pl. 29).	
	a) Remove the pistons (53), the cups (54) and the springs (55) from the cylinder	
	b) Remove the bleed screw and the 2 plugs	8 and 12 mm spanners
26	To Strip Down the Rear Cover Plate (see Pl. 33 B).	
	a) Remove the speedometer drive socket (116) from the cover plate. Remove the pinion (117)	12 mm spanner
	b) Drive out the bearing bush (118) with the aid of a bent punch	Bent punch
	c) Remove the guide finger (56) (see Pl. 26)	12 mm box spanner

		TOOLS
27	<u>To Strip Down the Gear Shift Control Lever</u> (see Pl. 25).	
	a) Remove the securing clip (57), take off the dust cover (58) from the lever by passing it over the yoke which is not removable	
	b) Remove the two lever return plungers (59). To do so, compress the two return springs (60) with the aid of a screwdriver and extract the two rivets (61). Remove the springs from the plunger	
	c) Remove the spring (62) supporting the lever with the aid of a screwdriver and remove the cup (64)	
	d) Remove the lever from the bracket (63). Remove the lever retaining screw	12 mm box spanner
28	Clean the parts	
	ASSEMBLY	
29	<u>To Prepare the Gearshift Control Lever</u> (see Pl. 25).	
	a) Put the retaining screw in position and turn down the lockwasher. Engage the lever in the lever bracket (63) after first oiling the ball	12 mm box spanner
	b) Fit the spring cup (64), put the thrust spring (62) in the bracket and fit it into position under the retaining bosses by compressing it with a screwdriver	
	c) Put the springs (60) in the plungers (59) and insert them in their housing, locating them so that the groove is in line with the holes provided for the rivets (61). Compress each spring with a screwdriver and put the rivets (61) in position. Make sure that the heads of the rivets do not project above the face of the joint of the housing. Check the clearance at "a" between the lever ball and the plungers. There must be clearance of 0.5 mm. Obtain this clearance dimension by inserting the shims (95) between the shoulders of the plungers and the lever housing.	
	d) Put the dust cover (58) in position on the housing. Fit the clip (57) *Position the head of the split pin as shown in fig. 1.* Tighten the clip	
30	<u>To Prepare the Rear Cover Plate</u> (see Pl. 33 B, fig. 4).	
	a) Put the speedometer pinion bearing bush (118) in its housing	
	b) Oil the speedometer pinion (117) put it in position, fit the adaptor (116), put the flange (119) in position and tighten the screw, fitting a serrated washer under the head	12 mm spanner
	VERY IMPORTANT - The screw locking the end of the speedometer cable in the adaptor must be parallel to the centre line of the gearbox and positioned towards the bottom.	

		TOOLS
	c) Fit the guide finger (56) (see Pl. 25, fig. 2 for position) and tighten the screws, fitting a spring washer under each head	12 mm box spanner
31	To Prepare the Wheel Cylinders (see Pl. 29).	
	Use only alcohol or special brake fluid for cleaning the parts, any other substance will cause rapid deterioration of the rubber cups.	
	Smear the cylinder and the cups with special fluid.	
	In the cylinder fit : 1 cup (54), 1 piston (53), the spring (55), 1 cup (54) and the 2nd piston.	
	Screw up and tighten the two plugs, fitting a fibre washer. Temporarily screw in the bleed screw and fit the cap on the bleed screw	8 mm and 12 mm spanners
32	To Prepare the Brake Shoe and Wheel Cylinder Assemblies (see Pl. 38).	
	The shoe with a short lining is fitted at the rear	
	a) Hook the return springs on to the shoes (see fig. 1 or 2 for position)	
	b) Arrange the shoes as shown in fig. 1. Put the wheel cylinder in position.	
	NOTE : The two cylinders *are symmetrical.* The union for the connecting pipe must be on the side with the short lining.	
	c) Move the shoes into their working position (fig. 2)	
	NOTE : The brake linings must be quite dry without any traces of oil. The rivets must not project beyond the face of the lining. If they project beyond the lining, the shoe assembly must be replaced.	
33	To Prepare the Sliding Coupling (see Pl. 37).	
	a) Fit the wheel studs on the universal joint with a press. Lock them by tack welding..	
	b) Fit on each bearing of the trunnion the steel cups (51) by means of a tube. Fit a washer (52) in each cup	Tube: Internal dia. = 14 mm External dia. = 23 mm Length = 100 mm
	c) Pack grease (adhesive grease) into the holes provided in each trunnion bearing for this purpose	
	d) Pack the bearing (50) with grease (adhesive grease). Fit the 16 needles (90) in each bearing	
	e) Fit the trunnion (89) in the jaw of the driving coupling. Place one bearing (50) and the circlip (49) in position. Fit the second bearing (50) and its circlip (49). Make sure that the circlips are properly seated in their groove	

		TOOLS
	f) Place the fork of the splined sliding coupling on the trunnion. Fit the bearings and the circlips as described in para. e). Make sure that the circlips are fitted correctly	
34	<u>To Prepare the Brake Backplates</u> (see Pl. 28 and 29).	
	a) Fit the anchorage pins (48) on the backplates and insert the knurled rivets (47) to retain them	
	b) Put the oil baffle (46) in position. Force it into position with a press and the aid of a tube. (Hammering it into position will deform the metal). Bend the oil drain pipe near the bottom to facilitate the flow	Tube: Internal dia. = 60 mm External dia. = 72 mm Length = 60 mm
	c) Place the oil seal (45) in position after first oiling it (the rubber edge towards the interior). The seal must be fitted by hand. Make sure that the spring of the seal remains in position	
	d) Fit the bearing (65) after first oiling it (extreme pressure oil) (the bearing fits easily in the bore in the backplate). Screw up and tighten the ring nut (44) (use the spanner 1925-VA, see Pl. 36, fig. 1). (NOTE : *left-hand thread for the right-hand backplate and vice versa*)..	Spanner 1925-VA
	Tap in the cylindrical pin (43) to lock the ring nut. The pin must not project beyond the bearing surface of the backplate nor must it project beyond the inner face of the ring nut	
	NOTE - If the pin does not come opposite a slot it is not necessary to slacken off the ring nut (44) to bring them into line. If necessary, file down the face of the ring nut so that when it is *tightened* the slot can be brought opposite the pin.	
	e) Press the differential shaft fitted with the sliding coupling into the bearing or if necessary tap it home with a mallet. Support the bearing on a tube	
	The right-hand shaft can be identified since it has a right-hand thread. The left-hand shaft has a left-hand thread.	
	Screw up and tighten the locknut (42). With a chisel, knock down the metal of the nut into the groove in the shaft in order to lock it. Be careful not to damage the bearing collar for the Timken bearing on the brake backplate...	32 mm box spanner Tube: Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm
	f) Place the brake cable in the boss on the backplate which acts as the stop for the cable sheath. The cable should pass between the oil baffle tube and the backplate	
35	<u>To Prepare the Brake Drums.</u>	
	Grind the bearing surface for the shoes in the brake drum on a lathe (use the mandrel 2118-VA, see Pl. 39). The tolerance of eccentricity must not exceed 0.1 mm. Check the rectification with a dial gauge. (Do not increase the original diameter of 200 mm by more than 2 mm)	Mandrel 2118-VA

	TOOLS
36 **Prepare the Primary Shaft** (see Pl. 33).	
a) Put the synchronising circlip (41) on the second speed loose pinion (38).	
NOTE : *Do not distort the circlip by opening it too much when fitting it*	
REMARK : There are two types of circlips available, depending on the type of pinion used.	
1st Case : The pinion has no locking hole.	
Fit the circlip (short-nosed circlip A-335-90) as shown in fig. 3, Pl. 32. The nose of the circlip must be placed between two teeth of the pinion so that the end "b" of the circlip does not lie in the zone "c" where the teeth of the steel synchronising cone operate. *Replace the synchronising circlips every time the gearbox is overhauled.*	
2nd Case: The pinion has a circlip locking hole.	
Fit the circlip (long-nosed circlip A-335-90a) as shown in fig. 4. The nose must be placed in the hole "d" in the pinion.	
IMPORTANT : *The two circlips A-335-90 and A-335-90a are not interchangeable.*	
b) On the primary shaft (66) fit : the 2nd speed loose pinion (38), the distance piece (39), the constant mesh pinion (40). Hold the constant mesh pinion against the shoulder on the shaft	23 mm box spanner
c) Make sure that the 2nd speed loose pinion (38) turns freely with a side play of between 0.05 and 0.35 mm, if not, replace the distance piece (39)	
d) Put the 2nd and 3rd speed sliding gear (37) on the shaft (with the groove for the gear selector fork at the rear). Fit the 1st speed and reverse speed sliding gear pinion (36) on the 2nd and 3rd sliding pinion (37) (the teeth opposite the wide splines to facilitate fitting), with the teeth of the 1st speed sliding pinion located towards the rear of the gearbox	
NOTE : The sliding gears must be cleaned with great care in order to prevent the synchronising cones from seizing. Make sure that the cones rotate freely.	
IMPORTANT NOTE - There are two types of 2nd and 3rd speed sliding pinions, A-335-02. 1st type : total length = 65.4 ± 0.1 mm 2nd type : total length = 66.4 ± 0.1 mm	
The first type can be identified by the circular groove "a" (see Pl. 33 B, fig. 1).	
On the second type, there is no reference groove (see Pl. 33 B, fig. 2).	
In the case of the longer sliding gear, never under any circumstances replace the 0.5 mm thick washers fitted in certain gearboxes, one (113) being between the pinion (75) and the bearing (31) and the other (99) between the pinion (40) and the bearing (18)	
37 **To Prepare the Bevel Pinion** (see Pl. 32, fig. 1).	
a) Fit the synchronising circlip (35) on the constant mesh pinion (21) (see Note to para. 36a), this operation)	

		TOOLS
	b) Fit the front bearing (23) on the shaft, in a press (if necessary). Put the front fixed thrust washer (67) on the shaft. If the washer (67) has a chamfered portion, this must be located to face the bearing (23). Fix it in position with grease (adhesive grease). The flat on the washer and the flat on the shaft must coincide	
	c) Place on the shaft the intermediate train (68) together with its two bushes, the thrust washer (22) and the constant mesh pinion (21). Hold the constant mesh pinion against the shoulder on the shaft and make sure that the intermediate train rotates freely. The side play must be between 0.05 and 0.35 mm; if it is more, replace the washers (67 or 22). After checking, remove all the parts from the shaft with the exception of the bearing (23) ..	
	NOTE - 1. Our Spares Parts Division no longer sells the constant mesh pinion (21), Part No. A-333-4, 29.25 mm long. It has been superseded by the new constant mesh pinion Part No. A-333-4a, 31.25 mm long. With this new pinion, the tapered adjustment shims (74) are fitted between the shoulder of the bearing (24) and the housing (see Pl. 32, fig. 2). These shims are sold under Part No. A-334-93a, b, c or d.	
	2. The new type gearboxes are no longer fitted with the thrust washer (22) since the intermediate train (68), (see fig. 2) has been modified. The side play is controlled by the washer (67) only (see fig. 1).	
38	To Prepare the Main Shaft (see Pl. 33, fig. 1).	
	a) Put the distance piece (34) in position in the bore of the shaft	
	NOTE - The needles (69) are supplied by our Spare Parts Division in the form of a "cartridge", so that they can be fitted in the bore in the shaft.	
	The cartridge also contains the circlip (33). The metal cover has one turned down edge. At the other end the metal is turned down at three points only, and it is this end which must be located towards the distance piece (34) in order to fit the needles.	
	b) Put the needles in position in the bore of the pinion. Proceed as follows:	
	1. Hold the cartridge on the bore of the primary shaft	
	2. Push the assembly comprising the needles, washers and circlip into the pinion bore with the aid of a mandrel until it comes up against the distance piece (34)	**Mandrel:** External dia. = 19 mm Length = 100 mm
	3. Withdraw the metal case	
	4. Make sure that the circlip (33) is properly seated in its groove	
	5. Pack the bore in the pinion with grease (special bearing grease)	
	c) Fit the synchronising circlip (70) on the shaft pinion (see Note to para. 36a, this operation) and fit the bearing circlip (32)	

TOOLS

d) Fit the bearing (31) on the shaft with a press. Fit the distance piece if one was found when dismantling and if the shaft has not been renewed ....

e) Screw up and tighten the nut (30) firmly.

(NOTE : *left-hand thread*).

Tap the metal of the nut into the groove in the shaft in order to lock it ....

32 mm spanner or adjustable spanner

f) Make sure that the front bearing (29) fits freely and without play on its bearing on the shaft. If not, rub the bearing with emery cloth ....

39 To Prepare the Differential (see Pl. 34).

NOTE - The accurate machining of the differential housing, the planet wheel and the satellite wheels are machined, allows these parts to be fitted without any adjustment (clearance or alignment of the teeth). That is why no shims have been fitted.

a) In the differential housing place one planet wheel (28) after first oiling the bearing faces, and 2 satellite wheels (27). First oil and then fit the spindle (26). Make sure that the planet wheel and the satellite wheels rotate satisfactorily (if one of the pinions is stiff, at one or more points, replace it) ....

b) Place the second planet wheel (28) on the 2 satellites. Couple up the crown wheel (after oiling the bearing surface for the planet wheel) to the differential housing. Tighten the screws to 29 to 36 ft/lbs. (4 to 5 m.kg) (use the torsion spanner 2470-T, see Pl. 21, fig. 5). Make sure that the whole assembly rotates satisfactorily by turning the planet wheels. (If any stiffness is experienced at any point, replace the second planet wheel). The screw with a smooth section at the end must engage in the spindle of the satellite wheels. ....

Torsion spanner 2470-T
17 mm socket

IMPORTANT NOTE - On early type cars, the crown wheel securing screws had a diameter of 7 mm. Under no circumstances must these screws be refitted.

Replace the crown wheel and bevel pinion and the screws securing the crown wheel.

Drill and tap to a diameter of 10 mm x 150 pitch the holes existing in the differential housing.

c) Carefully tap down the lockwashers on a hexagonal flat of each screw. Make sure that they do not project beyond the heads of the screws ....

d) Fit the taper bearings (71) in a press with the aid of a tube ....

Tube:
Internal dia. = 36 mm
External dia. = 45 mm
Length = 40 mm

40 To Prepare the Reverse Gear Pinion (see Pl. 32, fig. 5).

NOTE - If the bushes are worn, it is preferable to renew the pinion. In an emergency, the bushes may be renewed but in that case it is essential to proceed as follows:

- Fit the pinion to be repaired on a mandrel *adjusted to the worn bearing.* (If the ovality is excessive, the pinion cannot be re-used) ....

		TOOLS
	Grind the periphery of the pinion teeth	
	Remove the mandrel and change the bushes. The bush having the oil groove with a left-hand thread is fitted on the entry side of the pinion teeth, that having a right-hand oil groove is fitted to the front of the pinion	
	Centre the pinion on a lathe, its position depending on the part which has just been ground, and bore the bushes with a boring tool. The required dimension is 12 $\pm$ 0.027 mm. Use the spindle as an inspection gauge	
41	Place the gearbox casing on a stand (use the stand MR-3053-40, see Pl. 27)	Stand MR-3053-40
42	If there was a dowel fitted for centring the clutch housing on the gearbox casing, it need not be refitted.	
43	<u>To Fit the Reverse Gear Pinion</u> (see Pl. 32, fig. 5). Oil the spindle (97) and engage it in the boss on the gearbox casing with the notch towards the aperture for the locking screw. Put the pinion (25) in position (the mesh side of the teeth towards the front of the gearbox) between the two bosses: complete the insertion of the shaft by tapping the end with a copper rod. Tighten the pointed locking screws fitting a spring washer under each head	12 mm box spanner
44	<u>To Fit the Bevel Pinion Shaft</u> (see Pl. 26). a) Oil the bushes (72 and 73) and fit them in the bore of the intermediate train .... b) Put the overdrive sliding gear (19) on the constant mesh pinion (21). For this purpose proceed as follows: place the teeth opposite the wide splines in the constant mesh pinion. NOTE : The sliding gear *must be thoroughly cleaned* to prevent the cones from sticking. Make sure that the cones rotate freely .... <u>1st case</u> : The gearbox is fitted with a thrust washer (22). a) *Push the overdrive sliding gear until it engages with the constant mesh pinion,in order to keep the rear thrust washer (22) in position and to allow the subsequent fitting of the bevel pinion shaft.* b) Place the rear thrust washer (22) against the constant mesh pinion (21) and engage the intermediate train in the splines of the overdrive sliding gear .... c) Put the assembly comprising the intermediate train, overdrive sliding gear and constant mesh pinion in position in the gearbox casing. To prevent the washer (22) from being displaced or from being deformed when fitting the bevel pinion, hold the three parts in contact. Insert the bevel pinion shaft in the pinion train by tapping on the end of the bevel pinion shaft with a mallet if necessary. (NOTE : The washer (67) has one flat, see that this is correctly located). If the washer (66) has a chamfer this part should be directed towards the bearing (23). Continue the assembly process as described in paragraphs c), d) and e).	

TOOLS

2nd case: The gearbox has no thrust washer (22) fitted.

a) Engage the intermediate train (68) in the splines of the overdrive sliding gear (19)............................

b) Place the assembly comprising the intermediate train, the overdrive sliding gear and the constant mesh pinion in the gearbox casing. Engage the bevel pinion shaft in the pinion train by tapping the end of the pinion shaft with a mallet if necessary ....

(NOTE : The washer (67) has a flat, see that this is correctly located).

c) Hold the bevel pinion shaft (using retaining plate MR-3677, see Pl. 40, fig. 1 and 2) ....

Retaining plate MR-3677

d) Fit the rear bearing (24) and put it in position by means of a punch bearing on the inner and outer races of this bearing (use the punch MR-3676, see Pl. 40, fig. 1 and 3). Put the four distance pieces in position. Make sure that the retaining flange (20) is perfectly flat and renew it if it is distorted. Fit this flange. Remove the retaining plate MR-3677. Tighten the securing nuts to 18 to $21\frac{1}{2}$ ft/lbs (2.5 to 3 m.kg), fitting spring washers ....

Punch MR-3676

e) Hold the constant mesh pinion (21) (use retaining device MR-3139-10, see Pl. 41). Tighten the bevel pinion shaft nut (14) to 72 ft/lbs. (10 m.kg)...

Retaining device MR-3139-10
29 mm box spanner

45 To Adjust the Conical Distance of the Pinion (see Pl. 26 and 42).

NOTE - *This adjustment is of extreme importance.* By providing the correct bearing of the teeth, it ensures the silent running and long life of the crown wheel and bevel pinion. A dimension expressed in millimetres and hundredths of millimetres is engraved on the ground face of the driving pinion. This dimension represents the distance "d" which must exist between the centre line of the differential and the ground face of the driving pinion after adjustment is completed.

This distance is different for each crown wheel and bevel pinion assembly.

The adjustment of the conical distance must be effected with the aid of the adjusting fixture 2045-VA fitted with a dial gauge 2437-T. This device is so designed that the distance between the centres of the ground bearing faces and the bearing pads is 48 mm. This number is engraved between the pads.

The measurement should not be made from the face of the casing joint since the machining tolerances for this face are such that there may be a difference of several tenths with respect to the centres of the bores of the differential bearing..

Dial gauge 2437-T

a) Thoroughly clean the bearing faces of the differential bearings and the ground bearing faces of the adjustment fixture 2045-VA. All the faces must be free from scratches or burrs ....

Adjustment fixture 2045-VA

b) Put the adjustment fixture on a surface plate, resting it on the two ground pads. (In this position, the pointer of the dial gauge is 48 mm. from the centre line of the ground bearing faces). Move the dial so that the figure 0 is 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 at 0.

c) Measure the actual conical distance of the bevel pinion.

TOOLS

1. Put the adjustment fixture in position in place of the differential.

Rotate the adjustment fixture by means of the knurled rod until the large needle of the dial gauge changes its direction of rotation.

Read off the positions of the needles of the dial gauge.

Example: totalising needle between 1 and 2; large needle on 82.

NOTE - The second type of the fixture 2045-VA is no longer fitted with fixing brackets since it is of a different design. It is sufficient to press the fixture into the recesses provided for the differential bearings. It is used in exactly the same way as the first type.

2. Move the needles back to the position which they occupied in paragraph b) (in the example chosen: totalising needle between 4 and 5 and large needle at 0) by pulling the dial gauge spindle.

3. Release the dial gauge spindle slowly and count the number of turns and fractions of turns made by the large needle, until the point again rests on the ground face of the bevel pinion.

Check to make sure that the needles of the dial gauge have resumed the position given under 1.

Example: The large needle has made 3.18 turns, that is to say that the difference between the positions when the apparatus 2045-VA was put on a surface plate (see paragraph b) and the position it now occupies is 3.18 mm.

The actual conical distance "d" is therefore : 48.00 + 3.18 = 51.18 mm.

The dimension inscribed on the ground face of the bevel pinion being for example : 49.65, the bevel pinion must be brought nearer to the centre line of the differential by 51.18 - 49.65 = 1.53 mm.

d) Remove the bearing retaining plate (20), unscrew the bevel pinion nut (14) at the same time holding the intermediate train in position (use the retaining fixture MR-3139-10, (see Pl. 41, fig. 2), securing it by two nuts and pressing on the finger of the fixture during the operation). Remove the retaining fixture MR-3139-10, and the lower stud. Remove the bearing by means of two small bent levers placed behind the bearing shoulder. NOTE : do not damage the face of the joint.

Fit the adjustment shims (74) (see Pl. 32, fig. 1) selected from those sold by our Spares Parts Division, between the constant mesh pinion (21) and the bearing (24), (if the constant mesh pinion is 29.25 mm long) or between the thrust collar of the bearing (24) and the gearbox casing (if the constant mesh pinion is 31.25 mm long), so that the dimension "d" becomes equal to the conical distance engraved on the pinion.

In the above example, fit shims with the total thickness of 1.55 mm. (The shims sold by our Spare Parts Division allow adjustments only within 0.05 mm approximately).. Fixture MR-3139-10
12 mm and 29 mm
box spanners

e) Refit the rear bearing (24) (use the punch MR-3676, see Pl. 40, fig. 3). (In order to do so, the adjustment fixture must be removed and stop plate MR-3677 must be fitted). Tighten the nut (14) firmly. Fit the bearing retaining plate (20) and tighten the nuts to a torque of 18 ft/lbs. (2.5 m.kg) (to avoid distorting the plate). Fit a spring washer under each nut. Remove the stop plate MR-3677.. Stop plate MR-3677
12 mm and 29 mm
box spanners
Punch MR-3676

	TOOLS
f) Check the distance "d" as previously indicated.	
g) Lock the nut (14) with a split pin. Remove the adjustment fixture 2045-VA and the retaining fixture MR-3139-10.	
46 To Fit the Main Shaft and the Primary Shaft (see Pl. 26).	
a) Place the overdrive selector fork (12) in the groove in the sliding gear (19) with the head of the securing screw on the left-hand side of the box	
b) Offer up the primary shaft and pinion assembly in the gearbox casing; fit the mainshaft. Make sure that the dogs on the main shaft are engaged in the 2nd and 3rd speed gear and put the shaft in position by means of a tube resting on the outer race of the bearing. Put the retaining plate (17) in position. Tighten the securing screws, fitting spring washers under the screw heads	T-spanner 12 mm socket
NOTE : If two distance pieces were found between the retaining plate (17) and the gearbox casing when dismantling, they must be re-fitted if the same casing is used. These distance pieces must never be re-fitted on gearbox casings sold by our Spare Parts Division.	
c) Fit the rear bearing (18) and put it in position with the aid of a mandrel bearing on the inner and outer races (use the punch MR-3676, see Pl. 40, fig. 3). Fix the flexible washer (96) (see NOTE), the distance piece (16), the speedometer worm (15) and tighten the nut (13)	Punch MR-3676
NOTE - If no flexible washer (96) is found - this washer is sold by our Spare Parts Division under No. A-381-97, it is *absolutely* essential to fit one and to replace the distance piece (16) by the distance piece A-381-99a.	
d) Put two gears in mesh, tighten the nut (13) to 72.5 ft/lbs. (10 m.kg) and lock with a pin (use the torsion spanner 2470-T, see Pl. 21, fig. 5)	Torsion spanner 2470-T 23 mm socket
47 To Fit the Fork Shafts (see Pl. 30).	
a) Fit the second and third speed forks (11) and the first and reverse selector fork (10) in the grooves in their sliding gears. The heads of the securing screws are all located towards the right-hand side of the box	
b) Put the springs (76) for the rear locking balls in their housing	
c) Place the overdrive selector fork shaft (77) (previously oiled and fitted with its circlip) in position, turning it through a quarter of a turn to prevent the ball from moving into the locking grooves. With a finger, block up the opening for the shaft on the box side. Grease the locking ball (78) and place it on the spring. Compress the spring and ball assembly by means of a 5 mm diameter rod and complete the insertion of the shaft in the forks and in the box until locked in the neutral position by the ball, by turning the selector shaft to bring it in to its normal position	5 mm diameter rod

		TOOLS
	d) Offer up the 1st and reverse speed fork shaft (80), previously oiled and fitted with its circlip, rotating it through a quarter of a turn to prevent the ball from falling into the locking grooves. Bring it into contact with the spring. With a finger, block the hole for the selector shaft on the box side. Grease the locking ball (81) and place it on the spring. Complete fitting the shaft as described in paragraph c)	
	e) Fit the 2nd and 3rd speed fork shaft (85) previously oiled, rotating it through half a turn to prevent the ball from entering the locking groove. With a finger, block the shaft hole on the box side. Grease the ball (92) and place it on the spring (76). Compress the spring and ball assembly with a 5 mm diameter rod and push the selector shaft until it engages in the selector fork. Turn the shaft in order to bring it into its normal position	5 mm diameter rod
	f) Fit the spring (83) and the balls (79 and 82) (lightly smeared with grease) (special bearing grease), in their housings. Place the ball (84) on the spring (83) of the shaft (85). Compress the spring and ball assembly with a 5 mm diameter rod and complete insertion of the 2nd and 3rd speed selector fork shaft in the casing until it reaches the neutral position	5 mm diameter rod
	g) Make sure that the balls are in the correct position by moving the selector shaft. NOTE : forks which are not locked may jam together on the selector shaft	
48	To Fit the Rear Cover Plate.	
	a) Make sure that the shoulder of the primary shaft bearing is in contact with the face of the gearbox casing. Measure the distance by which the bearing projects from the face of the casing (use the fixture 1754-VA fitted with the dial gauge 2437-T, see Pl. 21, fig. 3 and 4)	Fixture 1754-VA Dial gauge 2437-T
	b) Measure the depth of the bearing housing in the cover.	
	The difference between the two measurements is the thickness of the shims to be fitted between the bearing and the cover. In order to obtain satisfactory tightening, add an extra shim of 0.05 mm thickness	
	c) Fit the lower stud removed in accordance with paragraph 45 d) (use the stud driver 2410-T, see Pl. 21, fig. 2) .	Stud driver 2410-T
	d) Smear the gearbox casing and the cover plate joint faces with linseed oil or sealing compound (make sure that these faces are not scratched or scored). Using grease, fix in the bearing housing, the shims whose thickness was determined according to paragraph b). Locate them correctly if there is a flat on the outside. Fit the gearbox casing and tighten the nuts	12 mm and 17 mm box spanners
	e) Fit the expanding washers (93) (see Pl. 26) after first smearing them with hermetic, if the gearbox casing has been renewed. Fit the plug (on the front right-hand side of the gearbox)	
	f) Put into reverse gear. Make sure that there is a minimum clearance of 0.05 mm between the rear end of the selector fork shaft and the rear cover plate. If not, grind the end of the shaft in order to ensure a clearance of between 0.05 and 0.15 mm.	

	TOOLS
Proceed in the same way for the 2nd speed and the overdrive. If necessary, remove the guide finger	
49 <u>To Adjust the Selector Forks</u> (see Pl. 43).	
NOTE - If there are two adjusting shims of different thicknesses.	
1. The shim 1785-VA (see Pl. 43, fig. 3) 2.8 mm thick is used for the 2nd and 3rd speed sliding gear (37) (length 65.4 ± 0.1 mm) having a reference groove "a" (see Pl. 33 B, fig. 1) fitted without an 0.5 mm thick washer.	
2. The shim 1786-VA which is 1.8 mm thick is used with:	
a) The 2nd and 3rd speed sliding gear (37) (length 65.4 ± 0.1 mm) having a circular reference groove "a" (see Pl. 33 B, fig. 1) and when there is a washer (99) 0.5 mm thick (501.068) between the bearing (31) and the shaft (75) on the one hand, and a second washer (113) 0.5 mm thick between the pinion (40) and the bearing (18) on the other hand.	
b) The 2nd and 3rd speed sliding gear (37) (length 66.4 ± 0.1 mm) which has no reference groove (see Pl. 33 B, fig. 2).	
a) Adjust the 2nd and 3rd speed selector fork.	
1. Put the selector fork shaft in the "neutral" position	
2. Place the adjustment shim (see fig. 3) on the synchronising circlip (70) of the main shaft	Adjustment shim 1785-VA or 1786-VA
3. By means of the selector fork bring the 2nd and 3rd speed sliding gear (37) in contact with the adjustment shim. Tighten the selector fork securing screw in this position, fitting a serrated washer under the head. Remove the shim	12 mm spanner
b) Adjust the fork of the 1st speed and reverse speed sliding gear (with the 2nd and 3rd speed sliding gear in the "neutral" position)	
1. Place the 1st and reverse speed selector fork shaft in the "neutral" position	
2. Position the 1st and reverse speed sliding gear on the 2nd and 3rd speed sliding gear by using the selector fork to bring it to the centre of its travel between the 1st speed constant mesh pinion and the reverse pinion. For all practical purposes, this condition is satisfied when the rear face of the 1st and reverse speed sliding gear is level with the rear end of the ground portion of the 2nd and 3rd speed sliding gear (37) at "b" (see Pl. 33, fig. 2).	
3. Tighten the two screws securing the selector forks, fitting a serrated washer under each head	12 mm spanner
c) Adjust the overdrive selector fork (with the 2nd and 3rd speed and first and reverse speed sliding gears in the "neutral" position)	
1. Place the selector shaft in the "neutral" position	
2. Place the adjustment shim 1787-VA (see fig. 2) on the synchronising circlip (35) of the constant mesh pinion	Adjustment shim 1787-VA
3. By means of the selector fork, bring the overdrive sliding gear (19) into contact with the adjustment shim	

	TOOLS
4. Tighten the fork securing screw fitting a serrated washer under the head. Remove the adjustment shim...........	12 mm spanner
d) Check the engagement of the gears in succession	
50 **To Fit the Differential** (see Pl. 34).	
a) Oil the bearings. Put the outer races (98) of the bearing in position on the rollers. Put the differential assembly in position in the half bearings in the crankcase. (NOTE : do not reverse its position, the crown wheel passes over the centre line of the drain plug)	
b) Fit the bearing (29) in its housing in the clutch housing (see Pl. 26). Make sure that it is properly seated on the bottom of its housing	
NOTES - 1. If neither the casing, nor the crown wheel and pinion assembly, nor the differential bearings, nor the brake backplates have been changed, it is unnecessary to carry out the operations 50 b) to 52 k), provided that the washers found when dismantling are re-fitted in exactly the same positions.	
2. If there is a dowel for locating the clutch housing on the gearbox casing, it need not be re-fitted.	
c) Fit the clutch housing. Tighten the 4 securing screws after having first made sure that the bearing faces on the gearbox casing and on the clutch housing for the brake backplates are in alignment	17 mm spanner
d) Fit the left-hand brake backplate with its transmission. Tighten 4 nuts only	T-spanner 12 mm socket
51 **To Adjust the Bearing Clearance** (see Pl. 44).	
a) Place the gearbox in the position shown (Pl. 45)	
b) Make sure that the fitting of the differential against the left-hand backplate and the fitting of the outer bearing races on the rollers is correctly carried out by tapping lightly on the outer race of the right-hand bearing with a tube	Tube: External dia. = 71.5 mm Internal dia. = 58 mm Length = 50 mm
c) Place the fixture 1754-VA fitted with the dial gauge 2437-T on the shoulder of the backplate as shown in fig. 2. Bring the zero on the movable dial of the dial gauge opposite the large needle and note the positions taken up by the dial gauge needles. Example : totalising needle between 7 and 8; large needle at zero. Make this measurement at several points: tolerance 0.05, take the mean dimension.	
d) Without touching the dial gauge, place the fixture 1754-VA on the bearing face of the brake backplate on the gearbox casing, with the point of the dial gauge resting on the outer race of the bearing as shown in fig. 1. Make sure that the point of the dial gauge is not on the inscriptions engraved on the bearing race as this would give a false reading	

	TOOLS
Note the position taken up by the needles of the dial gauge and check to make sure that this position remains constant (to within 0.02) when the measurement is repeated at 3 points having an angular distance of 120° from one another. If the readings do not agree, the differential bearings are not properly seated on the left-hand backplate and they must be correctly positioned as described in paragraph b) and the measurement must be recommenced.	
Example : totalising needle between 5 and 6; large needle on 54.	
e) Bring the needles of the dial gauge back to the positions they occupied in paragraph c) by pulling on the dial gauge spindle	
Release this spindle slowly and count the number of complete and partial turns made by the large needle until the point of the dial gauge is again on the outer race of the bearing.	
Check to make sure that the needles of the dial gauge have returned to exactly the same position as in d).	
Example : the large needle has moved through 1.46 turns.	
From among the adjusting shims sold by our Spare Parts Division, select those which together will give this thickness. Check this thickness with a caliper gauge. Keep these shims for subsequent use.	
52 To Adjust the Play Between Teeth (see Pl. 42).	
a) Put the gearbox in the position shown (Pl. 27)	
b) Remove the left-hand brake backplate and the clutch housing. Fit the differential with the aid of the clamps sold with the adjustment fixture 2045-VA, 1st type or with the aid of clamps MR-3644-10 (see Pl. 44, fig. 3)	Clamps MR-3644-10 T-spanner 12 mm socket
c) Fit the left-hand brake backplate and secure it by the 3 nuts	T-spanner 12 mm socket
d) Place *all* the adjustment shims (86) (see Pl. 34) selected in accordance with paragraph 51 e) against the outer race of the right-hand bearing. Fit the right-hand backplate with its transmission and secure it by the 3 nuts	T-spanner 12 mm socket
e) Put the dial gauge 2437-T in position on the top right-hand stud for securing the clutch housing, using only the adjustable part of the dial gauge bracket 2041-T (see fig. 2)	Dial gauge 2437-T Dial gauge bracket 2041-T
Adjust the position of the dial gauge so that the point of the spindle is perpendicular to the flank of one tooth on the periphery of the crown wheel	
NOTE - The figure for the clearance between teeth is between 0.13 and 0.23 mm. This figure is no longer engraved on the ground end of the bevel pinion.	
f) Take the clearance between teeth on 4 teeth at an angular distance of 90° from each other (hold the bevel pinion stationary by hand) and take the average of the 4 dimensions (the difference between two dimension should not exceed 0.1 mm).	

TOOLS

If it does the crown wheel is running out and must be replaced, or there is some foreign body between the crown wheel and the differential housing

Example : movement measured = 0.76 mm.

g) Determine the thickness of the shims (86) to be taken away at "i" and fitted at "k" (see Pl. 34). The movement of an adjusting shim (86) of 0.1 mm will cause a difference in the meshing clearance of about 0.07 mm

Example : clearance between teeth as measured = 0.76
minimum play between teeth to be obtained = 0.13
Difference = 0.63

The thickness of the shims to be moved in this case is : $\frac{0.63 \times 0.1}{0.07}$ = 0.90 mm approximately.

h) Remove the right-hand backplate. At "i" take away the number of shims (86) required to obtain the thickness calculated in g), that is 0.90 mm in the preceding example. Refit the brake backplate, inserting the remaining shims

T-spanner
12 mm socket

i) Remove the left-hand backplate, fit at "k" the shims removed in paragraph h) and refit the backplate

T-spanner
12 mm socket

j) Recheck the play between teeth as described in f). Make any necessary adjustments by moving one or several shims from one side to the other

k) Remove the 2 brake backplates. NOTE : *Do not mix up the adjusting shims.*

Remove the 2 clamps securing the differential. Remove the dial gauge and its bracket

T-spanner
12 mm socket
17 mm spanner

l) Smear the mating faces of the clutch housing joint with boiled linseed oil or hermetic. Fit the housing and tighten the securing screws

17 mm spanner
12 mm box spanner

m) Fit the clutch withdrawal fork on the housing. Lock it by means of the circlip, fit the graphite thrust ring and secure it by two clips. Hook the return spring on to the lever

n) Using adhesive grease, stick the adjusting shims (86) against the outer races of the differential bearings

o) Smear the faces of the joints of the shoulders on the brake backplates with linseed oil or hermetic compound. Put the wheel cylinder securing screws in position (this cannot be done once the backplates are in position). Fit the brake backplates and tighten the nuts

T-spanner
12 mm socket

53 <u>To Fit the Gearbox Control Lever.</u>

Pack the inside of the casing with grease (special bearing grease). Offer up the lever in position, tilting it towards the left in order to avoid the guide finger and engage it on the securing studs. Tighten the securing nuts, fitting spring washers. Check the working of the lever

12 mm box spanner

TOOLS

54 To Fit the Top Cover (see Pl. 26).

Fit the cork gasket (9). Tighten the securing screws (moderately in order to avoid distorting the cover) and fit spring washers under the heads. The cork gasket will be secured by hermetic to the cover only ....

NOTE - If the gear change forks have been replaced by forks having an inclined fixing flange, the cover A-331-4a must be fitted.

55 To Fit the Brake Shoes (see Pl. 28 and 29).

a) Place the brake shoes and wheel cylinder assembly in position. (The short lining is placed at the rear). Hook the brake cable to the handbrake lever (5). Keep the end of the cable in position by holding it with a finger. Separate the shoes in order to place them behind the plate. Put the brake cable casing in position. Complete the location of the wheel cylinder and the brake shoes ....

b) Fix the wheel cylinder by tightening the two screws. Fit the two adjusting eccentrics (4) and the two flat washers (87) and tighten the nuts (3) provisionally .... 12 mm box spanner
12 mm spanner

c) Fit the two bridge supports (2) for the adjusting cams. Between the plate and the bridge insert the brake shoe distance pieces. Tighten the screws, fitting a spring washer under each head .... 12 mm box spanner

d) Make sure that the brake shoes pivot freely and that they are properly supported on the bridges. The maximum side play must not exceed 0.1 mm. Obtain this play by selecting distance pieces from among those sold by our Spare Parts Division. (Too much play may cause the brakes to judder)..

56 To Centre the Brake Shoes (use the fixture 2112-VA, see Pl. 46).

Tighten the nuts of the eccentric spindles and lock them with pins.. Tool 2112-VA

57 Fit the brake drums holding the jaw of the sliding coupling perpendicular to the drum. Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg) and fit serrated washers under the nuts (see Pl. 28).. 12 mm box spanner

58 To Adjust the Adjusting Cams.

a) Remove one of the plugs (94) from the brake drum with the aid of a screwdriver ....

b) Turn the adjusting cam spindle in the direction shown in Pl. 29, at the same time turning the brake drum by hand until the shoe comes into contact with the drum. Turn it slightly towards the rear again in order to release it and then bring it forward until the lining exerts a light pressure (never finish the adjustment operation by bringing the shoe back). The shoe must be as near the drum as possible so that the pedal should have only a short distance to travel. Proceed in the same way for the other shoe. Refit the plug (94) ....

59 Adjust the cams of the two other brake shoes (work in exactly the same way as described in paragraph (58) ....

		TOOLS
60	Fit the oil filler plug, with its copper asbestos joint. Remove the gearbox from the stand. Tighten the drain plug, fitting a copper asbestos washer	17 mm and 21 mm box spanners
	IMPORTANT NOTE - If the gearbox casing is replaced, the registration plate on the box must be refitted, or at least the rivet hole should be blocked up by means of a Parker rivet, in order to prevent any appreciable loss of oil.	
	REPLACEMENT OF THE PRIMARY SHAFT OR OF ITS PINIONS OR OF THE 2nd AND 3rd SPEED SYNCHRONISING CIRCLIPS.	
	<u>Removal</u>.	
61	Put the gearbox on a stand (use the stand MR-3053-40, see Pl. 27), if the gearbox has not been separated from the engine this operation cannot be performed	Stand MR-3053-40
62	<u>To Remove the Gearbox Control Lever</u>.	
	Tilt the lever to the left in order to release it from the guide finger	12 mm spanner
63	<u>To Remove the Cover</u> (see Pl. 26).	
	Remove the rear cover plate (6). Remove the adjusting shims (7) from the recess in the casing (do not mislay the shims (7)	
	Remove the top cover (8) from the gearbox. Remove the joint (9)	12 - 17 mm box spanners
64	<u>To Remove the Selector Forks</u> (see Pl. 30).	
	Unscrew the screws securing the selector forks on the selector shaft	
	Withdraw the shafts by turning them through half a turn. Place a finger on the hole of the locking ball housing, first at the front and then at the rear, in order to prevent the balls from jumping out	
	Remove the 1st speed and the reverse speed selector fork (10) and the 2nd and 3rd speed selector fork (11)	
	Take out the locking balls and the springs with the aid of a bent piece of wire	12 mm spanner
65	Put two gears in mesh. Remove the nut (13) from the primary shaft. Take out the speedometer drive worm (15), the distance piece (16) and the spring washer (96) (if fitted) (see Pl. 26)	
	Drive off the bearing (18) (towards the rear of the gearbox) by tapping on the constant mesh pinion with a copper rod.	

		TOOLS
	Remove the primary shaft and the pinions from inside the gearbox	12 mm and 23 mm box spanners
66	To Remove the Synchronising Circlips (see Pl. 33).	
	a) Remove the shaft (66), the 1st and reverse speed sliding gear (36) and the 2nd and 3rd speed gear (37). Remove the constant mesh pinion (40), the distance piece (39) and the 2nd speed loose pinion (38).....................	
	b) Remove the synchronising circlip (41) from the 2nd speed loose pinion (38)..............................	
67	Remove the synchronising circlip (70) from the pinion of the mainshaft (75)	
	Fitting.	
68	Put the synchronising circlip (70) on the pinion of the main shaft (75) (see Pl. 33, fig. 1)........................	
	NOTE - There are two types of circlips depending on the type of pinion used.	
	1st case : The pinion has no locking hole.	
	Put the circlip (short-nosed circlip A-335-90) in position as shown in fig. 3 of Pl. 32. The nose of the circlip must be located between two pinion teeth so that the end "b" does not lie in the zones "c" where the teeth of the steel synchronising cone engage.	
	2nd case: The pinion has a locking hole for the circlip.	
	Put the circlip (long-nosed circlip A-335 90a) in position as shown in fig. 4.	
	IMPORTANT - *The two circlips A-335-90 and A-335-90a are not interchangeable.*	
69	Fit the circlip (41) (see Pl. 33, fig. 2) on the 2nd speed loose pinion (38) (see Note, para. 68, this operation)	
70	On the primary shaft (66) put: the 2nd gear loose pinion (38), the distance piece (39) and the constant mesh pinion (40)	
	Place the 2nd and 3rd speed sliding gear (37) on the shaft (the groove in the fork directed towards the rear). Put the 1st and reverse sliding pinion (36) on the 2nd and 3rd speed sliding gear (37) (with teeth in line with wide splines to facilitate fitting and the teeth of the 1st speed sliding gear towards the rear of the gearbox)	
	IMPORTANT NOTE - There are two types of 2nd and 3rd speed sliding gear, A-335-02.	
	1st type : total length = 65.4 ± 0.1 mm	
	2nd type : total length = 66.4 ± 0.1 mm	

		TOOLS
	The 1st type can be identified by the circular groove "a" (see Pl. 33 B, fig. 1).	
	On the 2nd type, this groove is not provided (see Pl. 33 B, fig. 2).	
	In the case of the long sliding gear, under no circumstances is it permissible to refit the 0.5 mm thick washers found in certain gearboxes, one (99) being located between the pinion (75) and the bearing (31) and the other (113) between the pinion (40) and the bearing (18)	
71	Offer up the primary shaft and pinion assembly in position in the gearbox casing. Make sure that the teeth on the main shaft are engaged in the 2nd and 3rd speed sliding gear	
	Fit the rear bearing (18), putting it in place with the aid of a punch bearing on the inner and outer races (use the punch MR-3676, see Pl. 40, fig. 3). Fit the spring washer (96) (see NOTE), the distance piece (16) and the speedometer drive worm (15) and tighten the nut (13)	Punch MR-3676
	Put two gears in mesh, tighten the nut (13) to 72 ft/lbs (10 m.kg) and fit the split pin (use the torsion spanner 2470-T, see Pl. 21, fig. 5)	Torsion spanner 2470-T 23 mm socket
	NOTE - If no spring washers (96) are fitted - this washer is sold by our Spare Parts Division under No. A-331-97, it is *absolutely* essential to fit one and to replace the distance piece (16) by the distance piece A-381-99a.	
72	<u>To Fit the Selector Shafts</u> (see Pl. 30).	
	See para. 47, this operation.	
73	<u>To Fit the Rear Cover</u> (see Pl. 26).	
	Use grease to secure the adjusting shims (7) found, when dismantling, into the recess in the casing (if the adjusting shims have a flat make sure that it is correctly positioned)	
	Smear the casing joint faces with linseed oil or hermetic (make sure that the faces are neither scored or pitted). Fit the casing and tighten the nuts	12 mm and 17 mm box spanners
74	<u>To Adjust the Selector Forks</u> (see Pl. 43).	
	See Para. 49, this operation.	
75	<u>To Fit the Gearbox Control Levers</u>.	
	See para. 53, this operation.	
76	<u>To Fit the Top Cover</u>.	
	See para. 54, this operation.	
77	Remove the gearbox from the stand if one was used.	

		TOOLS
	Dismantling (see Pl. 26).	
1	Drain the oil from the gearbox. Screw the plug in a few threads	21 mm spanner
2	Put the gearbox on a stand (use the stand MR-3053-40, see Pl. 27)	Stand MR-3053-40
3	To Remove the Brake Drums (see Pl. 29 A). Unscrew the four nuts (1). Disengage the brake drum, holding the sliding coupling (88) perpendicular to the drum ...	12 mm box spanner
4	To Remove the Brake Shoes (see Pl. 29 A and 29 B). a) Remove the cup washers (101) retaining the thrust springs by rotating them through a quarter of a turn in order to release the guide rods. Remove the guide rods (114) and the springs (115)	
	b) Remove the nut (3) from the eccentric and take off the washers (87) and the adjusting eccentrics (4)	12 mm box spanner
	c) Remove the brake shoes by proceeding as follows : bring the bottom part of the brake shoes towards each other in order to release the top parts from the wheel cylinder, and unhook the return springs from the brake shoes and the brake cable from the lever (5)	
5	To Remove the Brake Backplates.	
	a) Remove the four securing screws or nuts	12 mm box spanner
	b) Take off the brake plate and shaft assembly by tapping the back of the driveshaft flange with a copper block	
	IMPORTANT NOTE - If the gearbox is dismantled for an overhaul without renewing the casing, the crown wheel and bevel pinion assembly, the differential bearings or the driveshaft bearings, mark the adjusting shims (located between the differential bearings and the hub) so that they can be fitted on the same hubs again. It will then be unnecessary to re-adjust the crown wheel and bevel pinion assembly.	
	In certain gearboxes there is a distance piece between the hub bearing and the gearbox casing. These distance pieces must also be marked for correct refitting.	
6	To Remove the Gearbox Control Lever.	
	Tilt the gear lever to the left in order to release it from the guide finger	12 mm box spanner

		TOOLS
6 Z	To Remove the Clutch Drum (Type AZ Gearbox) (see Pl. 22 A). a) Put two gears in mesh (1st and overdrive). b) Unscrew the locknut (3) of the bearings (6) (Note: left-hand thread). *While unscrewing the nut, support the spanner so that it should not rest on the drive shaft,* otherwise there is a risk that the threads of the oil return of the drive-shaft will be imprinted on the bore in the clutch housing. c) Remove the clutch drum and the clutch mechanism assembly.	
7	To Remove the Clutch Housing and the Differential. Remove the housing from the gearbox and hold the differential assembly to prevent it from dropping	12 mm and 17 mm box spanners
8	To Remove the Covers (see Pl. 26). a) Remove the rear cover plate (6) and take out the adjusting shims (7) from the recess in the casing	17 mm and 12 mm box spanners
	NOTE - If the same cover plate (6) and the same bearing (18) are to be refitted, mark the shims (7) so that there should be no need to make a re-adjustment after assembling. b) Remove the top cover plate (8) and take off the gasket (9)	T-spanner 12 mm socket
9	To Remove the Selector Forks (see Pl. 30). a) Unscrew the screws securing the forks to the selector shafts	12 mm spanner
	b) Place a finger on the opening of the locking ball housing, first at the front and then at the rear, in order to prevent the balls from jumping out. Remove the selector fork shafts .... c) Remove the 1st and reverse speed selector fork (10) and the 2nd and 3rd speed selector fork (11) (the overdrive selector fork (12) is to be removed only after the primary and main shafts have been taken out) .... d) Take out the balls. Remove the locking springs from their housing with the aid of a bent piece of iron wire	
10	To Remove the Main Shaft and the Primary Shaft. a) Put two gears in mesh. Remove the nut (13) from the primary shaft. Remove the bevel pinion nut (14) (NOTE: *left-hand thread*). Remove the speedometer worm (15) the distance piece (16) and the spring washer (96)	

		TOOLS
	b) Remove the retaining plate (17) holding the main shaft bearing, and take out the main shaft (75) from the casing. If there is any difficulty in withdrawing the shaft, tap the rear end of the primary shaft (66) with a copper block.	T-spanner 12 mm socket
	c) Drive out the bearing (18) towards the rear of the gearbox by tapping on the constant mesh pinion with a copper rod. Remove the primary shaft and the pinions from inside the gearbox	
	d) Remove the overdrive selector fork (12) from the sliding gear (19)	
11	<u>To Remove the Bevel Pinion Shaft.</u>	
	a) Remove the retaining plate (20) from the rear bearing of the bevel pinion. Do not mislay the four distance pieces for the bearing retaining plate (20)	12 mm box spanner
	b) Push the overdrive sliding gear (19) to ensure that it is in mesh with the constant mesh pinion (21). Push the intermediate train towards this assembly and hold the three parts in contact. (*This operation is necessary in order to hold the idler thrust washer (22) and to prevent it from falling into the groove on the shaft and thus preventing the removal of the bevel pinion shaft*) (see Pl. 32). On gearboxes of a later type, the washer (22) is no longer fitted	
	c) Drive out the bevel pinion shaft together with its front bearing (23). Remove it from the front of the casing by tapping the rear end with a copper rod. Remove the pinion assembly from the casing	
	d) Take out the rear bearing (24) from the bore in the casing, holding it by the rear race either with two small bent levers or with the aid of a tube passing inside the box	Tube: External dia. = 51.5 mm Length = 350 mm
12	<u>To Remove the Reverse Pinion</u> (see Pl. 32, fig. 5).	
	a) Remove the pointed screw locking the pinion shaft	12 mm box spanner
	b) Withdraw the shaft (97) (use the extractor MR-3682-30, see Pl. 31, fig. 1 and 3). Remove the pinion (25)	Extractor MR-3682-30
13	Remove the expanding washers (93) and the screw blocking the locking ball housing (this screw is not fitted on later types). Remove the oil filler plug and the drain plug	
	Remove the gearbox casing from the stand MR-3053-40	17 mm and 21 mm box spanners

		TOOLS
14	To Strip Down the Differential (see Pl. 34).	
	a) Remove the inner races (71) of the taper bearings from the differential housing and from the crown wheel. (Use the extractor 1750-T fitted with shells 1736-T and pressure pad 1743-VA, see Pl. 35)	Extractor 1750-T Shells 1736-T Pressure pad 1743-VA
	b) Disconnect the crown wheel from the differential housing	17 mm articulated spanner
	c) Drive out the satellite pinion spindle (26) from the casing. Remove the two satellite pinions (27), the washers (since October 1954) and the planet wheels (28)	
15	To Strip Down the Main Shaft (see Pl. 33, fig. 1).	
	a) With a chisel extract the metal of the nut (30) which is knocked into the slot in the shaft (75). Remove the nut. (NOTE : left-hand thread).	32 mm spanner or adjustable spanner
	b) Remove the bearing (31) from the main shaft with a press (use ring MR-3686, see Pl. 31, fig. 2 and 4). Remove the washer (99)	Ring MR-3686
	c) Remove the circlip (32) with circlip pliers. Remove the synchronising circlip (70) *(it must be renewed each time the box is repaired)*	
	d) Remove the circlip (33) holding the needles using a small pin inserted in the hole "a" located between the teeth. Remove the needle bearings (69), their thrust washers (100) and the distance piece (34)	2 mm diameter pin
16	To Strip Down the Bevel Pinion Shaft (see Pl. 32, fig. 1).	
	a) Extract the front bearing (23) in a press if necessary, resting the bearing on a tube	Tube: Internal dia. = 48 mm External dia. = 55 mm length = 50 mm
	b) Remove the synchronising circlip (35) from the constant mesh pinion (21). *(The circlip must be renewed after every repair).* Remove the bushes (72 and 73) from the bore of the intermediate train	
17	To Strip Down the Primary Shaft (see Pl. 33, fig. 2).	
	a) Remove from the shaft, the 1st and reverse speed sliding gear (36) and the 2nd and 3rd speed (37). Remove the 2nd speed loose pinion (38), the 2nd speed loose pinion distance piece (39) and the constant mesh pinion (40)	
	b) Remove the synchronising circlip (41) from the 2nd speed loose pinion. *(The circlip must be renewed after every repair).*	

		TOOLS
18	To Strip the Brake Backplate (see Pl. 29 A).	
	a) Remove the handbrake cable, the brake tube and the wheel cylinder	10 and 17 mm spanners 10 mm box spanner
	b) Clamp the differential shaft in a vice by the sliding coupling forks (remove the greaser if necessary)	
	c) With a chisel knock out the metal of the nut (42) driven into the slot in the shaft. Unscrew and remove this nut. (NOTE : *left-hand thread for the left-hand shaft and vice versa*)	32 mm box spanner
	d) Remove the differential shaft (88) from the bearing in a press, supporting the metal plate on two vee blocks. Remove the hub plate	
	e) With a chisel, knock out the metal of the ring nut (44). Unscrew and remove the ring nut (use the spanner 1926-VA, see Pl. 36, fig. 2)	Spanner 1926-VA
	f) Remove the bearing (65) with the aid of a bronze rod. Drive out the hub oil seal (45)	
	Remove the oil deflector (46) from the hub (if necessary)	
	g) Take out the rivets and drive out the adjusting cams (102) (see Pl. 29 B)	
19	To Strip Down the Sliding Couplings (see Pl. 37).	
	a) Remove the four circlips (49) from the bearings	
	b) If necessary, use a scraper to remove any burrs or paint liable to prevent extraction of the bearings	
	c) Ease the bearings (50) out of their housings by tapping the forks with a copper mallet. Remove the bearings with the aid of universal pliers or a flame	
	d) Drive out the metal cups (51) and the oil seal (52) from the trunnion bearings	
	e) Drive out the studs on the driving plates	
20	To Strip Down the Wheel Cylinders (see Pl. 29 B).	
	a) Remove the dust cover (103), the pistons (53), the cups (54) and the spring (55)	
	b) Unscrew the bleed screw (104) (see Pl. 29 A)	8 mm spanner

		TOOLS
21	To Strip Down the Rear Cover Plate (see Pl. 33 B).	
	a) Remove the speedometer bearing (116) from the cover plate. Remove the pinion (117)	12 mm spanner
	b) Drive out the thrust bearing (118) with a bent punch	Bent punch
	c) Remove the guide finger (56) (see Pl. 26)	12 mm spanner
22	To Strip Down the Gearbox Control Lever (see Pl. 25).	
	a) Remove the securing clip (57), remove the dust cover (58) from the lever by passing it over the yoke which cannot be dismantled	
	b) Remove the two lever return plungers (59). In order to do so, compress the two return springs (60) with a screwdriver and take out the two rivets (61). Remove the plunger springs	
	c) Remove the lever thrust spring (62) from the bracket with the aid of a screwdriver and remove the socket (64)	
	d) Remove the lever from the bracket (63). Remove the lever locking screw	12 mm box spanner
23	To Strip Down the Clutch Housing (see Pl. 34 B).	
	a) Remove the screw (105) securing the fork spindle. Drive out the spindle (106) with the aid of a punch (NOTE : do not lose the thrust washers (107) when withdrawing the punch). Remove the steel fork (108), the washers (107) and the return spring (109)	Punch dia. = 8.5 mm Length = 200 mm
	b) Remove the housing (110) and the graphite thrust ring (111) assembly from the fork	
	c) Unscrew the screw (112) securing the thrust housing (110). Remove the graphite thrust ring (111) from the housing.	12 mm spanner
	d) Drive out the bearing (29) from its housing (see Pl. 33) (types A-AU-AZU boxes)	
	dZ) Drive out the oil retaining cup (129) from its housing (see Pl. 33 A) (type AZ gearbox)	
24	Clean the parts	
	Assembly.	
25	To Prepare the Clutch Housing (see Pl. 34 B).	
	a) Put the graphite ring (111) in the housing (110), tighten the screw (112) and fit the flat washer under each head ...	

	TOOLS
b) Oil the fork spindle (106)	
c) Fit the return spring (109). Place the metal fork (108) in position and on either side fit the washers (107) and hold the assembly with a punch. Insert the spindle (106) by turning it with a screwdriver to facilitate its introduction into the various parts, at the same time compressing the return spring with the aid of a fork	Punch dia. = 8.5 mm Length = 200 mm
NOTE - The metal fork (108) fitted with a rivetted dowel (A) is assembled with a spring (109) No. A-314-9 b (7 coils). The metal fork with a locating dowel pressed into it is fitted with a spring No. A-314-9 a (8 coils).	
d) Screw up and tighten the spindle locking screw (105)	
e) Fit the bearing (29). Make sure that it is properly seated on the bottom of its housing (see Pl. 33) (Types A-AU-AZU gearboxes)	
eZ) Put the oil retainer (129) in position with a press, (see Pl. 33 A) (type AZ gearbox).	
26 <u>To Prepare the Gearbox Control Lever</u> (see Pl. 25).	
a) Put the stop screw in position and knock over the lockwasher. Insert the lever, after first oiling the ball into the bracket (63)	12 mm box spanner
b) Insert the spring thrust cup (64), place the thrust spring (62) in the bracket and fit it in position under the locking bosses by compressing it with a screwdriver	
c) Put the spring (60) in the plunger, oil the plungers (59) and put them into their housing, with the slots opposite the holes for the rivets (61). Compress each spring with a screwdriver and insert the rivets (61). Make sure that the heads of the rivets do not project beyond the face of the bracket joint. Check the clearance at "a" between the lever ball end and the plungers. This clearance must be 0.6 mm. Obtain this dimension by inserting washers (95) between the shoulders of the plungers and the lever bracket	
d) Fit the dust cover (58) on the bracket. Fit the clip (57). *Position the head of the split pin as shown in fig. 1.* Tighten the clip.	
27 <u>To Prepare the Rear Cover</u> (see Pl. 33 B, fig. 4).	
a) Put the bottom bush (118) for the speedometer pinion in its housing	
b) Oil the speedometer pinion (117), put it in position and fit the bearing (116). Fit the flange (119) and tighten the screw, fitting a serrated washer under the head	12 mm spanner

		TOOLS
	VERY IMPORTANT - The screw for locking the end of the speedometer cable on the speedometer adaptor must be parallel with the centre line of the gearbox and must be located towards the bottom.	
	c) Fit the guide finger (56) (see Pl. 25, fig. 2 for position), tighten the screws, fitting a spring washer under each head	12 mm spanner
28	<u>To Prepare the Wheel Cylinders</u> (see Pl. 29 B).	
	Use only alcohol or special brake fluid for cleaning the parts, since any other product will cause rapid deterioration of the rubber cups	
	Smear the cylinders and the cups with special brake fluid	
	In the cylinder fit one dust cover (103), one piston (53), one cup (54), the spring (55), one cup (54), the second piston (53) and the dust cover (103)	
	Screw up and tighten the bleed screw fitted with its rubber cap	8 mm spanner
29	<u>To Prepare the Sliding Couplings</u> (see Pl. 37).	
	a) Fit the drum studs in a press on the jaw of the universal joint. Lock them by a tack weld.	
	b) On each trunnion bearing, put the metal cups (51) with the aid of a tube. Fit a washer (52) in each cup	Tube: Internal dia. = 14 mm External dia. = 23 mm Length = 100 mm
	c) Pack grease (adhesive grease) into the holes provided for the purpose in each trunnion bearing	
	d) Pack the bearings (50) with grease (adhesive grease). Fit the 16 needles (90) in each bearing	
	e) Place the trunnion (89) in the coupling jaw. Put a bearing (50) and the circlip (49) in position. Fit the second bearing (50) and its circlip (49). Make sure that the circlips are properly seated in their grooves	
	f) Offer up the fork of the splined sliding coupling in position on the trunnion. Fit the bearings and circlips as described in para. "e". Make sure that the circlips are correctly fitted	
30	<u>To Prepare the Brake Backplates</u> (see Pl. 29 A and B).	
	a) Fit the adjusting cams (102). Lock the fulcrum pins. In order to obtain the stiffness of rotation required by the factory of 7 to 18½ ft/lbs (1 to 2.5 m.kg), it is essential to use a fixture (use the die MR-3354-20 and the punch MR-3354-2, see Pl. 67)	Die MR-3354-20 Punch MR-3354-2

	TOOLS
b) Fit the wheel cylinders, fitting a spring washer under the heads of the screws. Fit the brake tube with a copper washer on each side of the union	10 mm and 17 mm spanners
c) Put the brake backplate on the hub. Fit the oil deflector (46) on the hub (91). Locate the drain tube in the centre line of the boss of the oil return hole. Use a tube for fitting the deflector in position	Tube: Internal dia. = 60 mm External dia. = 72 mm Length = 60 mm
d) Fit the oil seal (45) after previously oiling it (the rubber edge on the inside). After assembly make sure that the spring of the oil seal is still in the correct position	
e) Fit the bearing (65) after first oiling it (extreme pressure oil). Screw up and tighten the ring nut (44) (use the spanner 1926-VA, see Pl. 36, fig. 2). With a hammer knock down the metal of the nut into the slot in the bearing in order to lock it	Spanner 1926-VA
f) Insert the differential shaft into the bearing (65), with a press, resting the bearing on a tube	Tube: Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm
NOTE - The right-hand shaft can be identified by its right-hand thread, and vice versa.	
g) Screw up and tighten the nut (42). With a hammer knock down the metal of the nut in the slot in the shaft in order to lock it	32 mm box spanner
h) Fit the brake cable, tighten the screw securing the cable sheath stop, fitting a spring washer under the nut ...	12 mm box spanner
31 <u>To Prepare the Brake Drums</u> (see Pl. 39).	
Grind the bearing face for the brake shoes on the drum on a lathe (use the mandrel 2118-VA). The eccentricity tolerance is 0.1 mm maximum. Check the ground surface with a dial gauge. Do not increase the original diameter of 200 mm by more than 2 mm	Mandrel 2118-VA
32 <u>To Prepare the Primary Shaft</u> (see Pl. 33).	
a) Put the synchronising circlip (41) on the 2nd speed loose pinion (38).	
(NOTE : *Do not distort the circlip by opening it too much when fitting it*)	
NOTE - There are two types of synchronising circlips, depending on the type of pinion fitted.	

TOOLS

<u>1st case</u> : The pinion has no locking hole : Put the circlip (short-nosed circlip A-335-90) in position as shown in fig. 3 on Pl. 32. The nose of the circlip must be located between two pinion teeth so that the end "b" of the circlip does not lie in the zone "c" where the teeth of the steel synchronising cone engage. *Replace the synchronising circlips every time the gearbox is overhauled.*

<u>2nd case</u> : The pinion has a locking hole for the circlip : Arrange the circlip (long-nosed circlip A-335-90a) as shown in fig. 4. The nose must be inserted in the hole "d" in the pinion.

IMPORTANT : *The two circlips A-335-90 and A-335-90a are not interchangeable.*

b) On the primary shaft (66) place: the 2nd speed loose pinion (38), the distance piece (39), the constant mesh pinion (40). Hold the constant mesh pinion against the shoulder on the shaft. . . . .

c) Make sure that the 2nd speed loose pinion (38) turns freely with a side play of 0.05 to 0.35 mm; if not, replace the distance piece (39) . . . .

d) Put the 2nd and 3rd speed sliding gear (37) on the shaft (the groove for the fork at the rear). Fit the 1st and reverse sliding pinion (36) on the 2nd and 3rd speed sliding gear (37) (the teeth in line with the wide splines in order to facilitate fitting), the teeth of the 1st speed sliding gear facing towards the rear of the box . . . .

NOTE - The sliding gears must be cleaned with extreme care, otherwise the synchronising cones will stick. Make sure that the cones rotate freely.

IMPORTANT NOTES - 1. There are two types of sliding gear for 2nd and 3rd speeds, A-335-02.

1st type : total length = 65.4 ± 0.1 mm

2nd type : total length = 66.4 ± 0.1 mm

The 1st type can be identified by the circular groove "a" (see Pl. 33 B, fig. 1).

On the 2nd type, there is no such reference groove (see Pl. 33 B, fig. 2).

In the case of the longer sliding gear, under no circumstances is it permissible to refit the 0.5 mm thick washers fitted in certain gearboxes, the one (99) being between the pinion on the main shaft (75) and the bearing (31) and the other (113) between the pinion (40) and the bearing (18) on the primary shaft.

2. The driving collar on the sliding pinion can be replaced. This part is sold under the No. A-335-96 by our Spare Parts Division. In order to replace the driving collar, proceed as described in para. 75, this operation.

33 <u>To Prepare the Bevel Pinion Shaft</u> (see Pl. 32).

a) Fit the synchronising circlip (35) on the constant mesh pinion (21) (see Note para. 32 a), this operation) . . . .

TOOLS

b) Fit the front bearing (23) on the shaft with a press if necessary. Fit the fixed front thrust washer (67) on the shaft. If this washer has a chamfer, it must be located towards the bearing (23). Affix it with grease (adhesive grease). Align the flats on the shaft and on the washer ....

c) On the shaft put: the intermediate train (68) together with its two bushes (72 and 73), the thrust washer (22) and the constant mesh pinion (21). Hold the constant mesh pinion against the shoulder on the shaft and make sure that the intermediate train turns freely. The side play is between 0.05 and 0.35 mm. If it is more, replace the washers (67 or 22). After this check, remove all the parts from the shaft except the bearing (23) ....

NOTE - 1. The Spare Parts Division no longer sells the constant mesh pinion (21) A-333-4, length 29.25 mm. It has been replaced by the new constant mesh pinion A-333-4a, length 31.25 mm. In the case of this new pinion, the shims (74) for adjusting the conical distance are fitted between the thrust washer of the bearing (24) and the casing (see Pl. 32, fig. 2). These shims are sold under the numbers A-334-93a, b, c, d.

2. If there is no thrust washer (22), the side play is controlled by means of the washers (67) only (see fig. 1).

34 <u>To Prepare the Main Shaft</u> (see Pl. 33 and 33 A).

a) Put the distance piece (34) in the bore of the shaft ....

NOTE - The needles (69) are supplied by our Spare Parts Division in the form of a cartridge in order to facilitate their insertion in the bore of the shaft. The cartridge also contains the circlip (33). The foil pack has one turned-down edge. The other end has the foil turned back at three points only and it is this end which must be held towards the distance piece (34) for insertion of the needles.

b) Put the needles in position in the bore of the pinion. To do so proceed as follows:

1. Put the cartridge in front of the bore of the primary shaft ....

2. Push the assembly comprising the needles, washers (100) and circlips into the bore of the pinion with the aid of a mandrel until it comes into contact with the distance piece (34) .... Mandrel : External dia. = 19 mm Length = 100 mm

3. Withdraw the foil packing of the cartridge ....

4. Make sure that the circlip (33) is properly seated in the groove ....

5. Pack the pinion bore with grease (special bearing grease) ....

c) Fit the synchronising circlip (70) on the shaft pinion (see Note, para. 32 a, this operation) and the bearing circlip (32).

	TOOLS
d) Fit the washer (99), 0.5 mm thick, on the shaft. (If the 2nd and 3rd speed sliding gear (37) has no reference groove (see Pl. 33 B, fig. 2). Fit the bearing (31) in a press	
e) Screw up and tighten firmly the nut (30). (NOTE: *left-hand thread*). Knock down the metal of the nut into the slot in the shaft to lock it	32 mm spanner or adjustable spanner
f) Types A-AZ-AZU vehicles : Check to make sure that the front bearing (29) engages freely but without play on the journal of the shaft. If not, rub the journal with emery cloth	
35 To Prepare the Differential (see Pl. 34).	
NOTE - There are two types of differential boxes :	
1st type (before October 1954) : the distance between the bearing faces of the satellites is 57 mm. The satellites are fitted without washers	
2nd type (since October 1954) : the distance between the bearing faces of the satellites is 61 mm. The satellites are fitted with thrust washers	
a) 1st Type Box (without thrust washers).	
1. In the box fit one planet wheel (28), after first oiling the journal, the two satellites (27) and fit the spindle (26) after oiling. Make sure that the planet wheel and the satellite rotate freely (if one of the pinions sticks at any point, replace it)..	
2. Put the 2nd planet wheel (28) on the two satellites. Connect the crown wheel (after first oiling the bearing face for the planet wheel) to the box. Tighten the screws to 29 to 36 ft/lbs (4 to 5 m.kg) (use the torsion spanner 2470-T, see Pl. 21, fig. 5). Make sure that the assembly rotates satisfactorily by turning the planet wheels. (If there is any stiffness change the 2nd planet wheel). The screw having a smooth portion at the end must be engaged in the satellite spindle	Torsion spanner 2470-T
b) 2nd Type Box (with satellite bearing washers).	
1. If necessary, grind the bearing faces for the satellite washers in the casing (use the milling cutter 1761-VA, see Pl. 34 A)	Milling cutter 1761-VA
2. In the differential box, put a planet wheel, one satellite thrust washer and the spindle. Determine the thickness of the satellite washer so that there should be no excessive side play when the planet wheel is turned.	
3. Carry out the same operation for the other satellite.	
4. Finally fit the planet wheel, the satellites and their thrust washers and the spindle, after first oiling the bearing faces.	

		TOOLS
	5. Put the 2nd planet wheel (28) on the two satellites. Connect the crown wheel (after first oiling the bearing faces for the planet wheels) to the differential housing. Tighten the screws to 29 to 36 ft/lbs (4 to 5 m.kg) (use the torsion spanner 2470-T, see Pl. 21, fig. 5). Make sure that the whole assembly rotates freely, by turning the planet wheel. (If there is stiffness at any point, change the 2nd planet wheel). The screw with the smooth portion at one end must be engaged in the satellite spindle	Torsion spanner 2470-T 17 mm socket
	c) Carefully turn down the locknuts over one of the flat faces of each screw. Make sure that they do not project above the head of the screws	
	d) Fit the taper bearing (71) in a press with the aid of a tube	Tube: Internal dia. = 36 mm External dia. = 45 mm Length = 40 mm
36	<u>To Prepare the Reverse Speed Pinion</u> (see Pl. 32, fig. 5).	
	NOTE - In order to ensure satisfactory repair *it is preferable, if the bushes are worn, to replace the whole pinion assembly.* In an emergency the bushes may be replaced, but this operation is laborious. In this case, it is essential to proceed exactly as follows :	
	Fit the pinion to be repaired on a mandrel *adjusted to the worn bush.* (In the event of excessive ovality, the pinion cannot be reclaimed)	
	Grind the external diameter of the pinion teeth	
	Remove the mandrel and change the bushes. The bush having a left-hand oil groove is fitted on the tooth entry side of the pinion, that having a right-hand groove is fitted in front of the pinion	
	Centre the pinion on the lathe in accordance with the part which has to be ground. Bore the bushes with a tool. The dimension to be obtained is 12 ± 0.027 mm. Use the shaft as an inspection gauge	
37	Put the gearbox casing on a stand (use the stand MR-3053-40, see Pl. 27).	Stand MR-3053-40
38	<u>To Fit the Reverse Pinion</u> (see Pl. 32).	
	Oil the shaft (97), engage it in the boss in the casing with the slot towards the hole for the locking screw. Put the pinion (25) between the two bosses (the entry side of the teeth facing the front of the gearbox); complete the insertion of the shaft by tapping the end with a copper rod. Tighten the pointed locking screw, fitting a spring washer under the head	12 mm box spanner

TOOLS

39 To Fit the Bevel Pinion Shaft (see Pl. 26).

a) Oil the bushes (72 and 73) and put them in the bore of the intermediate train ....

b) Fit the overdrive sliding gear (19) on the constant mesh pinion (21). In order to do so, put the teeth opposite the wide splines on the constant mesh pinion.

NOTE : *the sliding gear must be cleaned with extreme care,* in order that the cones should not stick; make sure that the cones turn freely ....

1st case : The gearbox has a thrust washer (22) (see Pl. 32, fig. 1).

c) *Push the overdrive sliding gear so that it meshes with the constant mesh pinion, in order to hold the rear thrust washer (22) and to allow subsequent fitting of the drive pinion.*

d) Fit the rear thrust washer (22) against the constant mesh pinion (21) and engage the intermediate train in the splines of the overdrive sliding gear ....

e) Place in position in the casing the assembly comprising: the intermediate train, the overdrive sliding gear and the constant mesh pinion. To prevent the washer (22) from being displaced and from being distorted when fitting the bevel pinion, hold the three parts in contact. Engage the bevel pinion in the pinion train by tapping the end of the bevel pinion with a mallet if necessary.

(NOTE : The washer (67) has a flat; make sure that this flat remains in position). If this washer has a chamfer, the latter must be directed towards the bearing (23).

Proceed with the assembly as described in paras. h), i), j) ....

2nd case : The gearbox has no thrust washer (22) (see Pl. 32, fig. 2) ....

f) Engage the intermediate train (68) on the splines of the overdrive sliding gear (19) ....

g) Place in position in the casing the assembly consisting of: the intermediate train, the overdrive sliding gear and the constant mesh pinion. Engage the bevel pinion in the pinion train by tapping the end of the drive pinion with a mallet if necessary ....

(NOTE : the washer (67) has a flat. Make sure that this remains in position).

h) Hold the bevel pinion shaft (use the retaining plate MR-3677, see Pl. 40, fig. 1 and 2) .... Retaining plate MR-3677

i) Fit the rear bearing (24), put it into position with the aid of a punch resting on the inner and outer races of the bearing (use the punch MR-3676, see Pl. 40, fig. 1 and 3). Fit the four distance pieces. Make sure that the retaining plate (20) is perfectly flat, if it is warped, renew it. Fit this plate. Remove the retaining plate MR-3677. Tighten the securing nuts to 18 to $21\frac{1}{2}$ ft/lbs (2.5 to 3 m.kg), fitting spring washers under the nuts. Punch MR-3676

j) Fit the constant mesh pinion (21) (use the retaining fixture MR-3139-10, see Pl. 41). Tighten the bevel pinion shaft nut (14) to a torque of 57 ft/lbs (8 m.kg) .... Retaining fixture MR-3139-10
29 mm box spanner

TOOLS

40 To Adjust the Conical Distance of the Bevel Pinion (see Pl. 26 and 42).

NOTE - *This adjustment is of extreme importance.* By giving the correct bearing to the teeth, it ensures silent running and long life of the crown and bevel pinion assembly. A dimension expressed in millimetres and hundredths of millimetres is engraved on the ground end of the bevel pinion. This dimension represents the distance "d" which must exist after adjustment is completed between the differential shaft and the ground end of the pinion.

This dimension varies for each crown wheel and pinion assembly.

The adjustment of the conical distance must be carried out by means of the adjustment fixture 2045-VA, fitted with dial gauge 2437-T. This device is so designed that the distance between the centre line of the ground bearing surfaces and the bearing pads is 48 mm. This figure is engraved between the pads.

The measurement must not be made from the face of the joint of the casing, since the machining tolerance for this face is measured in several tenths as compared with the centres of the bores of the differential bearings.

a) Carefully clean the bearing faces for the differential bearings and the ground bearing faces on the adjustment fixture 2045-VA. They must be free from burrs or scratches ....

b) Place the adjustment fixture on a surface plate, resting it on the two ground bearing pads. (In these conditions, the point of the dial gauge is 48 mm from the centre of the ground bearing surfaces). Bring the figure 0 on the movable dial opposite the large needle ....

Read the position of the needles on the dial gauge.

Example : totalising needle between 4 and 5; large needle on zero .... Fixture 2045-VA
Dial gauge 2437-T

c) Measure the actual conical distance of the bevel pinion.

1. Put the adjustment fixture in place of the differential..

Pivot the adjusting fixture by means of the threaded spindle until the large needle on the dial gauge changes its direction of rotation ....

Note the readings given by the needles on the dial gauge..

Example : totalising needle between 1 and 2; large needle on 82.

NOTE - The 2nd type of fixture 2045-VA is not provided with means for securing it. It is sufficient to put the fixture in the half bores for the differential bearings, otherwise its use is identical with the 1st type.

2. Bring the needles back to the position in which they were in paragraph b) (in the example chosen, totalising needle between 4 and 5 and the large needle on 0), by pulling on the dial gauge spindle ....

3. Slowly release the dial gauge spindle, counting the number of complete and partial turns made by the large needle until the point is again resting on the ground face of the bevel pinion ....

TOOLS

Check to make sure that the dial gauge needles have returned to exactly the same positions as in 1.

Example : the large needle has rotated through 3.18 turns, that is to say, that the spindle of the dial gauge has travelled 3.18 mm from the position it occupied when the adjusting fixture 2045-VA was placed on a surface plate (see para. b)).

The actual conical distance is therefore "d" : 48.00 + 3.18 = 51.18 mm.

Assuming that the dimension engraved on the ground end of the bevel pinion is for example : 49.65, the pinion must be brought nearer to the differential shaft by : 51.18 - 49.65 = 1.53 mm.

d) Remove the retaining plate (20) from the bearing, unscrew the nut (14) on the bevel pinion shaft, holding the intermediate train stationary, (use the fixture MR-3139-10 (see Pl. 41, fig. 1), secure it by two screws 7 mm dia. x 30 mm long. Press on the finger of the fixture during this operation). Remove the fixture MR-3139-10. Remove the bearing with the aid of two small bent levers placed behind the bearing shoulder. NOTE : Do not damage the joint face ....

Put the adjusting shims (74) (see Pl. 32, fig. 1) selected from among those sold by our Spare Parts Division, between the constant mesh pinion (21) and the bearing (24), (if the constant mesh is 29.25 mm long),or between the thrust collar of the bearing (24) (see fig. 2) and the casing if the constant mesh pinion is 31.25 mm long, so that the distance "d" should be equal to the conical distance engraved on the bevel pinion ....

In the above example, fit shims having a total thickness of 1.55 mm (the shims sold by our Spare Parts Division allow adjustments to only 0.05 mm approximately).. Fixture MR-3139-10, 12 mm and 29 mm box spanners

e) Refit the rear bearing (24)(use the punch MR-3676, see Pl. 40, fig. 1). (For this purpose, the adjusting fixture must be removed and the retaining plate MR-3677 fitted). Tighten the nut (14) firmly. Fit the bearing retaining plate (20), tighten the nuts to approximately 18½ ft/lbs (2.5 m.kg) (in order to prevent distortion of the plate). Fit a spring washer under each nut. Remove the retaining plate MR-3677 .... Retaining plate MR-3677, 12 mm and 19 mm box spanners, Punch MR-3676

f) Recheck the distance "d" as described above ....

g) <u>1st case</u> : The nut is locked by a split pin.

Insert the pin into the nut (14). Remove the adjusting fixture 2045-VA and the fixture MR-3139-10 ....

<u>2nd case</u> : The nut is locked by caulking.

Remove the adjustment fixture 2045-VA. Knock down the metal of the nut into the grooves in the shaft. (Never deliver blows perpendicular to the shaft, otherwise the bearing may be damaged).

TOOLS

41 To Fit the Main Shaft and the Primary Shaft (see Pl. 26).

a) Put the overdrive selector fork (12) into the groove in the sliding gear (19), with the head of the securing screw pointing towards the left-hand side of the box ....

b) Offer up the assembly comprising the primary shaft and pinions into the gearbox casing; fit the main shaft. Make sure that the teeth of the main shaft are engaged in the 2nd and 3rd speed sliding gear, and put the shaft into position with the aid of a tube bearing on the outer bearing race. Put the retaining plate (17) in position. Tighten the securing screws, fitting a spring washer under each head .... T-spanner, 12 mm socket

NOTE - If two distance pieces were found between the retaining plate (17) and the casing when dismantling, they must be refitted if the same casing is used. These distance pieces must never be used on the casings sold by our Spare Parts Division.

c) Fit the 0.5 mm thick washer (113) (if the 2nd and 3rd sliding gear (37) has no reference groove, see Pl. 33 B). Fit the rear bearing (18), putting it in position with the aid of a punch bearing on the inner and outer races (use the punch MR-3676, see Pl. 40, fig. 1 and 3). Fit the spring washer (96) on the shaft (see NOTE), with the concave face towards the bearing. Fit the distance piece (16) and the speedometer worm (15) and tighten the nut (13) .... Punch MR-3676

NOTE - If the spring washer (96), sold by our Spare Parts Division under the number A-381-97 was not fitted, it is *absolutely* essential to fit one and to replace the distance piece (16) by the distance piece A-381-99a.

d) Put two gears in mesh, tighten the nut (13) to 72 ft/lbs (10 m.kg) and lock with a pin (use the torsion spanner 2470-T, see Pl. 21, fig. 5) .... Torsion spanner 2470-T, 23 mm socket

42 To Fit the Selector Fork Shafts (see Pl. 30).

a) Put the 2nd and 3rd speed selector fork (11) and the 1st and reverse selector fork (10) in the grooves in their sliding gear. The heads of the securing screws must all be on the right-hand side of the box ....

b) Fit the springs (76) for the rear locking balls in their housing ....

c) Offer up the overdrive selector fork shaft (77) in position (previously oiled and fitted with its circlip), by turning it through a quarter of a turn in order to prevent the ball from entering the locking groove. Block the opening of the hole on the gearbox side with a finger. Oil the locking ball (78) and put it on the spring. Compress the spring and ball assembly with the aid of an iron rod 5mm in diameter and complete insertion of the shaft in the fork and in the casing until locked by the ball in the neutral position, turning the shaft to bring it into its normal position .... 5 mm dia. rod.

d) Offer up the 1st and reverse selector fork shaft (80) in position, previously oiling it and fitting a circlip on it, by turning it through a quarter of a rotation in order to prevent the ball from dropping into the locking groove, bring it into contact with the spring. With a finger block the opening of the hole on the box side. Oil the locking ball (81) and fit it on the spring. Proceed with the fitting operation as described in para. c) ....

TOOLS

e) Fit the 2nd and 3rd speed selector fork shaft (85), after first oiling it, turning it through half a turn in order to prevent the ball from dropping into the locking groove. With one finger, block the opening of the hole on the box side. Oil the ball (92) and place it on the spring (76). Compress the ball and spring assembly with the aid of a 5 mm diameter rod and push the shaft until it is engaged in the fork. Rotate the shaft to bring it into its normal position .... 5 mm dia. rod

f) Fit the spring (83) and the balls (79 and 82) (lightly smeared with special bearing grease) in their housings. Put the ball (84) on the spring (83) of the shaft (85). Compress the spring and ball assembly with a 5 mm diameter rod and complete engagement of the 2nd and 3rd speed selector fork shaft in the casing until it is in the neutral position .... 5 mm dia. rod

g) Make sure that the balls are in the correct position by moving the selector shaft.

NOTE : forks which are not locked may jam together on the selector shaft ....

43 <u>To Fit the Rear Cover Plate</u> (see Pl. 26).

a) Make sure that the shoulder of the bearing of the primary shaft bears against the face of the casing. Measure the projection of the bearing beyond the face of the casing (use the fixture 1754-VA, fitted with the dial gauge 2437-T, see Pl. 21, fig. 3 and 4) .... Fixture 1754-VA
Dial gauge 2437-T

b) Measure the depth of the bearing housing in the cover plate. The difference between the two measurements is the thickness of the shims (7) to be fitted between the bearing and the cover (6). In order to obtain satisfactory tightening, add an extra shim of 0.05 mm thickness ....

c) Smear the mating faces of the casing and of the cover plate with linseed oil or hermetic (make sure that the faces are neither scratched or scored). With grease, fix in the bearing housing, the shims whose thickness was determined in para. b), and position them properly if they have a flat on the outside. Fix the casing, tighten the nuts .... 12 - 17 mm box spanners

d) Fit the expanding washers (93) after first smearing them with hermetic if the casing has been changed. Fit the plug (on the front right-hand side of the gearbox). This plug does not exist on the later type gearboxes ....

44 <u>To Adjust the Selector Forks</u> (see Pl. 43).

NOTE - There are two adjusting shims of different thickness.

1. The shim 1785-VA (see Pl. 43, fig. 3) 2.8 mm thick, is used with the 2nd and 3rd speed sliding gear (37) (length 65.4 $\pm$ 0.1 mm) having a reference groove "a" (see Pl. 33 B, fig. 1) fitted without an 0.5 mm thick washer.

2. The shim 1786-VA 1.8 mm thick is used with :

a) The 2nd and 3rd sliding gear (37) (length 65.4 $\pm$ 0.1 mm) having a circular reference groove "a" (see Pl. 33 B, fig. 1) and when there is a washer (99) having a thickness of 0.5 mm (501.068) between the bearing (31) and the shaft (75) on the one hand and a second washer (113) 0.5 mm thick between the pinion (40) and the bearing (18) on the other hand.

b) The 2nd and 3rd speed sliding gear (37) (length 66.4 $\pm$ 0.1 mm) without a reference groove (see Pl. 33 B, fig. 2).

TOOLS

a) Adjust the 2nd and 3rd speed selector fork :

1. Put the fork shaft into the "neutral position" ....

2. Put the adjusting shim 1785-VA (see fig. 3) on the synchronising circlip (70) of the main shaft dogs ....

3. By means of the selector fork bring the 2nd and 3rd speed sliding gear (37) into contact with the adjustment shim. In this position, tighten the selector fork securing screw, fitting a serrated washer under the head. Remove the shim 1785-VA ....

Shim 1785-VA
12 mm spanner

b) Adjust the selector fork of the 1st and reverse speed sliding gear (the 2nd and 3rd speed sliding gear being in the neutral position) :

1. Put the 1st and reverse selector fork shaft in the "neutral position" ....

2. Position the 1st and reverse sliding gear on the 2nd and 3rd speed sliding gear by moving it by means of the selector fork into the centre of its travel between the constant mesh pinion and the reverse pinion. In practice, this condition is satisfied when the rear end of the 1st and reverse speed sliding gear is level with the rear end of the ground portion of the 2nd and 3rd sliding gear (37) at "b" (see Pl. 33, fig. 2) ....

3. Tighten the two selector fork securing screws, fitting a serrated washer under the heads ....

12 mm spanner

c) Adjust the overdrive fork (the 2nd and 3rd speed and the 1st and reverse speed sliding gear being in the neutral position):

1. Put the selector fork shaft in the "neutral position" ....

2. Put the adjusting shim 1787-VA (see fig. 3) on the synchronising circlip (35) of the constant mesh pinion ....

3. By means of the selector fork bring the overdrive sliding gear (19) into contact with the adjustment shim ....

4. Tighten the selector fork securing screw, fitting a serrated washer under the head. Remove the adjustment shim.

Adjustment shim
1787-VA
12 mm spanner

d) Check the working of the gears in succession ....

45 To Fit the Differential (see Pl. 34).

a) Oil the bearings. Place the outer races (98) of the bearings in position on the rollers. Put the differential assembly in the half bearings in the casing.

(NOTE : Do not reverse the position, the crown wheel passes over the centre line of the drain plug) ....

1st NOTE - In order to avoid oil losses between the shoulders of the bearings and the casing, a velumoid washer is fitted. Even if one was not found when dismantling, fit such a washer. If the box was fitted with a distance piece, two washers must be used, one on either side of the distance piece.

	TOOLS
2nd NOTE - If neither the casing, nor the crown wheel and pinion, nor the bearing, nor the hub have been changed and if no washers have been added to the initial number, it is unnecessary to carry out an adjustment of the bearing clearances, provided that the washers found when dismantling are used in exactly the same positions.	
b) Fit the clutch housing and when tightening, make sure that the bearing faces of the differential shaft hubs on the gearbox casing and on the clutch housing are correctly aligned	
c) Fit the left-hand hub and backplate assembly. Fit two joints between the hub and the casing. Do not forget the distance piece (if one was found when dismantling, see para. 5, this operation) to be fitted between the hub and the gearbox casing. In this case, fit four joints	
NOTE - 1. If the gearbox casing has been replaced, there is no need to fit the distance pieces since our Spare Parts Division sells only casings of the later type.	
2. If the hub and brake backplate assembly is secured by screws, the latter must be replaced by the studs 616.006 with nuts 2491-S. Before fitting, check the length of the tapped hole in the casing. It must be at least 17 mm. If it is less, the threaded portion must be lengthened (dia. = 7 mm, pitch 100). Fit the studs, screwing up the longer end into the casing. Tighten the backplate nuts to 10 to 13½ ft/lbs. (1.5 to 1.9 m.kg), fitting a serrated washer under each nut.	
46 <u>To Adjust the Bearing Clearance</u> (see Pl. 44).	
a) Put the gearbox in the position shown (Pl. 45)	
b) Make sure that the differential is properly positioned against the left-hand hub and that the outer bearing races are properly located on the rollers by tapping lightly on the outer race of the right-hand bearing with a tube ...	Tube: External dia. = 71.5 mm Internal dia. = 58 mm Length = 50 mm
c) Fit the distance piece (if one was found when dismantling, see para. 5, this operation) on the hub of the differential shaft and make sure that it is properly seated on the hub shoulder	
Place the device 1754-VA fitted with a dial gauge 2437-T with the extension MR-3365-10 on the hub shoulder as shown in fig. 2, the point of the dial gauge resting on the distance piece or on the hub	
Bring the zero on the movable dial of the gauge opposite the large needle and note the position occupied by the dial gauge needles	
Example : totalising needle between 7 and 8; large needle at zero	
Take this measurement at several points : tolerance 0.05, taking the mean dimension	Fixture 1754-VA Dial gauge 2437-T Extension MR-3365-10

	TOOLS
d) Without disturbing the dial gauge, put the fixture 1754-VA on the hub bearing face on the casing, the point of the dial gauge resting on the outer race of the bearing. Make sure that the point of the extension of the dial gauge does not rest on the inscriptions engraved on the bearing race, since this will give a false reading (see fig. 1).	
Note the position taken by the dial gauge needles and make sure that this remains identical (within about 0.02) when the measurement is made at three points at an angular distance of 120° from each other.	
If the reading is not the same, the bearings of the differential are not properly seated on the left-hand hub and their correct positioning must be re-checked as described in b), and the measurement must be retaken	
Example : totalising needle between 5 and 6; large needle on 54	
e) Bring the dial gauge needles back to the position they occupied in c) by pulling on the dial gauge spindle	
Slowly release this spindle and count the number of complete and partial turns made by the large needle until the point of the dial gauge is again on the outer race of the bearing...	
Check to see that the dial gauge needles have returned to the same position they occupied in d)	
Example : the large needle has made 1.46 turns.	
From among the adjusting shims sold by our Spare Parts Division, select those which together give this thickness. Check this thickness with a caliper gauge. Put these shims aside for subsequent fitting	
47 To Adjust the Play Between Teeth (see Pl. 42).	
a) Put the gearbox in the position shown (Pl. 27)...	
b) Remove the left-hand hub and the clutch housing. Secure the differential with the aid of the clamps MR-3644-10 (see Pl. 44, fig. 3) or with the clamp, sold with fixture 2045-VA, 1st type	Clamp MR-3644-10
c) Fit the left-hand hub securing it by the four screws	T-spanner 12 mm socket
d) Fit *all* the adjusting shims (86) (see Pl. 34) (determined in para. 46 e)), against the outer race of the right-hand bearing. Fit the right-hand hub with its transmission, fit a washer, and tighten it by the two nuts	T-spanner 12 mm socket
e) Put the dial gauge 2437-T on the upper right-hand securing the stud of the clutch housing, using only the adjustable component of the dial gauge (2041-T) (see fig. 2). Adjust the position of the dial gauge so that its point rests perpendicularly on the flank of one tooth on the periphery of the crown wheel	
NOTE - The figure for the play between teeth is between 0.13 mm and 0.23 mm. This figure is no longer engraved on the ground end of the bevel pinion.	

	TOOLS
f) Measure the play between teeth on four teeth at an angular distance of 90° from each other (keep the bevel pinion stationary by holding it by hand), take the average of the four measurements (the difference between two measurements must not exceed 0.1 mm). If it is more, the crown wheel is running out and must be replaced or there is a foreign body between the crown wheel and the differential box	Dial gauge 2437-T Dial gauge bracket 2041-T
Example : movement measured = 0.76 mm.	
g) Determine the thickness of the shims (86) to be taken away at "i" and placed at "k" (see Pl. 34). Moving one adjusting shim (86) having a thickness of 0.1 mm will cause a variation of about 0.07 mm in the meshing clearance	
Example : play between teeth measured = 0.76 mm Minimum play between teeth to be obtained = 0.13 mm Difference = 0.63 mm	
The thickness of the shims to be removed in this case is : $\frac{0.63 \times 0.1}{0.07} = 0.90$ mm	
h) Remove the right-hand hub. Take away from "i" the number of shims (86) required to obtain the thickness calculated in para. g), that is 0.90 mm in the preceding example. Fit the hub, inserting the remaining adjusting shims	T-spanner 12 mm socket
i) Remove the left-hand bearing, put at "k" the shims removed in para. h), and fit the hub	T-spanner 12 mm socket
j) Recheck the play between teeth as described in f). Make any necessary modification by changing one or several shims from one side to the other	
k) Remove the two hubs. NOTE : *Do not mix up the adjusting shims. Do not damage the joint.*	
Remove the two clamps securing the differentials. Remove the dial gauge and its bracket	T-spanner 12 mm socket 17 mm spanner
l) Smear the mating faces of the clutch housing with linseed oil or hermetic. Fit the housing and tighten the securing nuts	17 mm spanner 12 mm box spanner
m) Secure the adjusting shims (86) with grease against the outer races of the differential bearings	
Fit the hubs. Fit a gasket, tighten the securing screws, fitting a spring washer under the heads .... Position and tighten the connecting tubes of the wheel cylinders	T-spanner, 12 mm socket, 12 mm spanner

		TOOLS
48	To Fit the Gearbox Control Lever (Type A-AU-AZU Vehicles).	
	NOTE - On type AZ vehicles, the lever is fitted at the end of the operation.	
	Pack the inside of the casing with grease (special bearing grease). Put the lever in position tilting it to the left to avoid the guide finger and complete its engagement on the securing studs. Tighten the securing screw, fitting a spring washer. Check the working of the lever	12 mm box spanner
49	To Fit the Top Cover (see Pl. 26).	
	Fit the cork gasket (9). Tighten the securing screws (moderately to avoid distorting the cover), fitting a spring washer under each head. The cork gasket is to be secured to the cover only, with hermetic	Wheelbrace 12 mm socket
	NOTE - On gearboxes with forks having inclined securing flanges, a cover A-331-4a must be fitted	
50	To Fit the Brake Shoes (see Pl. 29 A and B).	
	a) Hook the return spring to the shoes, the spring must be placed behind the shoes and the longest portion must be hooked to the shoe carrying the handbrake lever	
	b) Put the brake shoes in position and connect the handbrake cable to the lever. (NOTE : Do not damage the dust cover of the wheel cylinder when putting the top ends of the brake shoes on the cylinder)	
	c) Lightly oil the adjusting eccentrics (4) and put them in position, fit the washers (87) on the pin and provisionally tighten the eccentric nuts (3)	
	d) Fit the guide rods (114), the pressure springs (115), the retaining caps (101) and lock them by turning them a quarter of a turn	
	Make sure that the brake shoes move freely	12 mm box spanner
51	To Centre the Brake Shoes.	
	Use the fixture 2112-VA (see Pl. 46), and a 14 mm spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2) for adjusting the cams	
	Carry out the adjustment of the cams as indicated in Pl. 29 B	Fixture 2112-VA Spanner 2126-VA
52	Fit the brake drums, holding the sliding coupling jaw perpendicular to the drum. Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg), fitting a serrated washer under the nuts (see Pl. 29 A)	12 mm box spanner

TOOLS

53 To Adjust the Adjustment Cams.

Turn the cam spindle with the aid of a 14 mm ring spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2) in the direction shown in Pl. 29 B, at the same time turning the drum by hand until the shoe comes into contact with the drum. Withdraw the shoe slightly to free it and bring it forward again until the lining exerts a light pressure (never complete the adjustment by withdrawing the shoe from the drum) ....

Shoes must be adjusted as near the drum as possible, so that the travel of the pedal is small ....

Proceed in the same way for the other shoe .... Spanner 2126-VA

54 To Adjust the Adjustment Cams for the Other Two Shoes..

55 To Fit the Clutch Drum (Type AZ Vehicle) (see Pl. 22 A).

a) Remove the oil deflector (7) with a screwdriver inserted between the bearing (6) and the deflector. (The deflector must be replaced each time it is removed). Smear the bearing (6) with grease (ASTM 160 grease, sold by SPCA, 61, rue du Dessous-des-Berges (Paris 13). The grease must not spill on to the balls ....

IMPORTANT - If either the main shaft or the gearbox casing have been replaced, the position of the clutch flywheel must be adjusted. This adjustment is extremely important because it ensures the correct bearing of the weights on the drum. This adjustment is obtained by selecting a spacer ring (5) of suitable thickness.

Proceed as described in para. b).

b) To Adjust the Position of the Clutch Drum.

In order to carry out this adjustment, the fixture 1755-VA with dial guage 2437-T,(see Pl. 22 C, fig. 1) must be used.

1. Set the dial gauge by placing the fixture on a surface plate.

2. Fit the spacer (5) having a thickness of 3.1 mm (see Pl. 22 A, fig. 2).

3. Measure the distance "a" (see Pl. 22 C, fig. 2) between the joint faces of the gearbox casing and the face of the boss taking the bearing in the clutch drum.

The dimension measured is for example : 5.65 mm.

The dimension "a" must lie between 5.12 and 5.42 mm, if the position of the flywheel is to be satisfactory.

TOOLS

In the example chosen, the drum must be moved forward :

5.65 - 5.42 = 0.23 mm.

Therefore a spacer (5) which is 0.23 mm thicker must be chosen, or in the example :

3.1 + 0.23 = 3.33 mm.

In this case, fit a spacer ring having a thickness of 3.4 mm. The spacer rings sold by our Spare Parts Division range from 2.5 to 4 mm, in steps of 0.3 mm .... Fixture 1755-VA, Dial gauge 2437-T

c) Fit the spacer ring (5) against the bearing (6) (secure it with grease).

d) Offer up the clutch disc in position, centre it with the aid of a shouldered mandrel or a main shaft engaged in the bearing (6). Fit the clutch mechanism and tighten the screws, fitting a spring washer under each head ....

Mandrel :
Small dia. = 17 mm
Length = 40 mm
Large dia. = 25 mm
Length = 100 mm

e) Offer up the clutch drum (2) on the main shaft; if necessary guide the spacer ring (5) with a finger to facilitate introduction of the main shaft. Screw up and tighten the nut (3) to 21 ft/lbs. (3 m.kg) ....

NOTE - *When tightening the nut, support the spanner so that it should not rest on the main shaft.*

f) Knock down the metal of the nut into the slot in the shaft in order to lock it ....

NOTE - *During this operation, have the nut supported, so that the oil return threads of the main shaft should not be imprinted in the bore in the casing.*

56 <u>To Fit the Gearbox Control Lever</u> (Type AZ Vehicle).

Pack the inside of the casing with grease (special bearing grease). Put the lever in position and tilt it towards the left to avoid the guide finger. Complete its engagement on the securing studs. Tighten the securing screws, fitting a spring washer under the heads. Check the working of the lever .... 12 mm box spanner

57 Fit the oil filler plug, fitting a copper asbestos washer. Remove the gearbox from the stand. Tighten the drain plug, fitting a copper asbestos washer .... 17 mm and 21 mm box spanners

IMPORTANT NOTE - If the gearbox casing has been replaced, the registration plate of the box must be refitted, or at least the hole for securing the rivet must be blocked by a Parker screw to prevent any appreciable oil losses.

		TOOLS
	REPLACEMENT OF THE PRIMARY SHAFT OR OF ITS PINIONS OR OF THE 2nd AND 3rd SPEED SYNCHRONISING CIRCLIPS	
	<u>Removal</u>.	
58	Place the gearbox on a stand (use the stand MR-3053-40, see Pl. 27). If the gearbox has not been disconnected from the engine, this operation is not essential	Stand MR-3053-40
59	<u>To Remove the Gearbox Control Lever</u>.	
	Tilt the lever to the left in order to release it from the guide finger	12 mm box spanner
60	<u>To Remove the Covers</u> (see Pl. 26).	
	Remove the rear cover (6). Take out the adjustment shims (7) from the recess in the casing (do not mislay the shims) (7)	
	Remove the top cover (8), from the gearbox. Take out the gasket (9)	12 mm and 17 mm box spanners
61	<u>To Remove the Selector Forks</u> (see Pl. 26 and 30).	
	Unscrew the screws securing the selector forks on the selector shafts. Remove the selector sh..fts by rotating them through half a turn. Place a finger on the locking ball housing hole, first at the front and then at the rear, in order to prevent the balls from jumping out	
	Remove the first and reverse selector fork (10) and the second and third speed selector fork (11)	
	Remove the locking balls and the springs with the aid of a bent piece of iron wire	12 mm spanner
62	Put two gears in mesh. Remove the nut (13) from the primary shaft. Remove the speedometer worm (15), the distance piece (16) and the spring washer (96)	
	Drive out the bearing (18) (towards the rear of the box) by tapping the constant mesh pinion with a copper rod	
	Remove the primary shaft and the pinions from the inside of the box	12 mm and 23 mm box spanners
63	<u>To Remove the Synchronising Circlips</u> (see Pl. 33).	
	a) Remove the shaft (66), the 1st and reverse speed sliding gear (36) and the 2nd and 3rd speed sliding gear (37). Remove the constant mesh pinion (40), the distance piece (39) and the 2nd speed loose pinion (38)	
	b) Remove the synchronising circlip (41) from the 2nd speed loose pinion (38)	

TOOLS

64 Remove the synchronising circlip (70) from the main shaft pinion (75) ....

Fitting.

65 Put the synchronising circlip (70) on the main shaft pinion (75) (see Pl. 33, fig. 1) ....

NOTE : Depending on the type of pinion, there are two types of synchronising circlips.

1st case : The pinion has no locking hole (see Pl. 32).

Position the circlip (short-nosed circlip A-335-90) as shown in fig. 3. The nose of the circlip must be placed between two pinion teeth so that the end "b" does not lie in the zones "c" where the teeth of the synchronising cone mesh ..

2nd case : The pinion has a circlip locking hole.

Position the circlip (long-nosed circlip A-335-90a) as shown in fig. 4. The nose must be put in the hole "b" provided in the pinion as shown in fig. 4 ....

IMPORTANT - *The two circlips A-335-90 and A-335-90a are not interchangeable.*

66 Put the synchronising circlip (41) in position (see Pl. 33, fig. 2) on the 2nd speed loose pinion (38) (see Note above).

67 On the primary shaft (66) : put the 2nd speed loose pinion (38), the distance piece (39) and the constant mesh pinion (40) ....

Put the 2nd and 3rd speed sliding gear (37) on the shaft (the groove for the fork towards the rear). Put the 1st speed and reverse speed sliding pinion (36) on the 2nd and 3rd speed sliding gear (37) (the teeth opposite the wide splines in order to facilitate fitting and the teeth of the 1st speed sliding gear towards the rear of the gearbox) (see Pl. 33, fig. 2) ....

IMPORTANT NOTE - There are two types of 2nd and 3rd speed sliding gear, A-335-01.

1st type : total length = 65.4 ± 0.1 mm.

2nd type : total length = 66.4 ± 0.1 mm.

The 1st type can be identified by the circular groove "a" (see Pl. 33 B, fig. 1).

On the 2nd type, this groove is not provided (see Pl. 33 B, fig. 2).

With the long sliding gear, under no circumstances should the washers of 0.5 mm found in certain gearboxes be refitted; one (99) is fitted between the pinion (75) and the bearing (31) and the other (113) between the pinion (40) and the bearing (18) (see Pl. 33).

		TOOLS
68	Offer up the primary shaft and pinion assembly in the gearbox casing. Make sure that the teeth on the main shaft are properly engaged in the 2nd and 3rd speed sliding gear	
	Fit the rear bearing (18), putting it into position with the aid of a punch bearing on the inner and outer races (use the punch MR-3676, see Pl. 40, fig. 1). Fit the spring washer (96), the distance piece (16) and the speedometer worm (15), screw up the nut (13). Put two gears in mesh, tighten the nut (13) to 72 ft/lbs. (10 m.kg) and lock it with a pin (use the torsion spanner 2470-T, see Pl. 21, fig. 5)	Punch MR-3676 Torsion spanner 2470-T 23 mm socket
	NOTE - If no spring washer (96) sold by our Spare Parts Division under the No. A-381-97 was fitted, it is *absolutely* essential to fit one and to replace the distance piece (16) by the distance piece A-381-99a.	
69	To Fit the Selector Fork Shafts. See para. 42, this operation.	
70	To Fit the Rear Cover (see Pl. 26).	
	Secure the adjustment shim (7), found when dismantling, in the recess in the casing, using grease for the purpose (position the shims correctly if they have a flat on the outside)	
	Smear the joint faces of the casing with linseed oil or hermetic (make sure that they are neither scratched or scored). Fit the casing and tighten the nuts	12 mm and 17 mm box spanners
71	To Adjust the Forks. See para. 44, this operation.	
72	To Fit the Gearshift Control Lever. See para. 48, this operation.	
73	To Fit the Top Cover. See para. 49, this operation.	
74	If the gearbox was on a stand, remove it.	

TOOLS

REPLACEMENT OF A SELECTOR COLLAR ON A 2nd AND 3rd SPEED SLIDING GEAR

NOTE - Carry out this operation only if the total length of the sliding gear is 66.4 mm (sliding gears fitted with a selector collar, without reference groove "a", see Pl. 33B, fig. 1).

Removal.

75 Cut the collar along its whole length opposite one of the points where the metal has been locked (at b). With a grinding wheel cut through the heat treated portion. Finish off the operation with a saw (see Pl. 33 B, fig. 3).............

Insert a chisel in the saw cut. Open up the cut so that the collar can be unscrewed by hand without damaging the thread on the gear ....

Refitting.

76 Screw up the replacement collar on the sliding gear.

In order to tighten the collar without distortion, hold the collar in a lathe chuck, put the primary shaft in the sliding gear, fit the driving dog on the shaft and tighten the collar ....

77 Lock the collar : to avoid any distortion of the bronze synchronising cones, tighten the steel cones on the bronze cones with the aid of a screw passing through the sliding gear, fitting 40 mm dia. washers under the head of the screw and under the nut ....

Lock the collar by knocking down the metal into the three grooves in the sliding gear ....

Remove the screw and the washers.

TOOLS

REPLACEMENT OF A FRICTION DISC (see Pl. 49).

Removal.

1 Remove the cover plate (1). Take out the friction disc (2) ....

12 mm spanner

Replacement.

NOTE - 1. If the friction plate is defective (broken spring, worn or broken linings, or friction disc does not work), the whole assembly must be replaced.

2. To identify the front friction disc, check that :

the diameter of the wire = 4.2 mm.

the diameter of the spring =32.5 mm.

2 Put the friction disc (2) in position, fitting a paper gasket between the disc and the arm hub. Fit it on the lugs on the axle tube (see Pl. 50) (use the spanner 1834-VA, see Pl. 51, fig. 2) ....

Spanner 1834-VA

3 Fit the cover plate (1). Fit a paper gasket between the cover plate and the friction disc, tighten the screws, fitting a serrated washer under each head ....

12 mm box spanner

REPLACEMENT OF A FRONT HUB OR OF A HUB BEARING

Removal.

4 Remove the wing on the side of the hub of the bearing to be replaced ....

Wheel brace

5 Lift the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Place packing pieces under the car to the height of the axle tube. Remove the wheel ....

Support MR-3300-70
Wheel brace

6 To Remove the Transmission (see Pl. 53).

a) Take out the split pin and remove the hub locking nut (29). Hold the hub (38) by means of a bar inserted in one of the holes in the hub ....

32 mm box spanner

The left-hand stub axle has a right-hand thread and vice versa.
Since September 1954 both stub axles have a right-hand thread.

		TOOLS
	b) Remove the transmission. In order to do so, push the drive shaft as far as it will go into the universal joint on the gearbox side in order to release the stub axle from the hub. Then take off the drive shaft from the gearbox end.	
7	To Remove the Hub.	
	a) Place chocks under the arm.	
	b) Drive out the hub (38) from the pivot with the aid of a mandrel (use the mandrel MR-3436-40, see Pl. 62, fig. 2 and 4)	Mandrel MR-3436-40
8	To Remove the Bearing.	
	a) Pass a 4 mm dia. drill through the punch marks locking the ring nut (39). Remove the ring nut (use the spanner 1811-VA without the external guide, see Pl. 66, fig. 2)	Spanner 1811-VA
	b) Drive out the bearing (40) from the bore of the pivot with the aid of a copper rod if necessary	
9	To Remove the Oil Seals.	
	Drive out the oil seal (41) from the pivot and also the oil seal (42) from the ring nut (39)	
10	Then clean the parts	
	Replacement.	
11	To Fit the Oil Seals.	
	Put the oil seal (42) in the ring nut (39). The metal cover on the oil seal must be located so that it is 0.1 to 0.5 mm below the bearing face of the ring nut, otherwise the case will rub against the bearing.	
	Put the oil seal (41) in the hub. This seal must also be set back between 0.1 and 0.5 mm with respect to the bearing flange (when fitting the two oil seals use the punch MR-3676-10, see Pl. 62, fig. 1 and 3)	Punch MR-3676-10
12	To Check the Bearing.	
	Tighten the two inner races against each other by means of a bolt and two washers. Check the play of the bearing . . .	

		TOOLS
13	To Fit the Bearing.	
	a) Smear the bearing (40) with grease (special bearing grease) and put it in position in the bore of the pivot with the aid of a tube bearing on the outer bearing race	Tube: External dia. = 70 mm Length = 100 mm
	b) Screw up and tighten the ring nuts (39) to a torsion of $85\frac{1}{2}$ ft/lbs. (12 m.kg) (use the spanner 1811-VA without the external guide, see Pl. 66, fig. 2). Lock the ring nut by means of three punch marks	Spanner 1811-VA
14	To Fit the Hub.	
	a) Put the hub (38) in position in the bearing (40) with a mallet	
	b) Take out the shim, put under the arm in para. 7 a)	
15	To Fit the Driveshaft (see Pl. 53).	
	NOTE - 1. In order to ensure constant velocity of the movement when the car is running in a straight line, it is absolutely essential that the forks of the sliding coupling and on the splined driveshaft are in alignment.	
	2. Make sure that the rubber dust cover is fitted on the driving shaft.	
	a) Grease the sliding coupling and the splines of the driveshaft (adhesive grease). Push the driveshaft into the sliding coupling as far as it will go. Insert the stub axle in the hub	
	b) Oil the face of the hub securing nut (29) and tighten to 144 ft/lbs (20 m.kg). Stop the hub from rotating by means of a bar inserted in one of the holes in the hub. Lock the nut with a pin	
	Put the rubber dust cover on the sliding coupling	32 mm box spanner
16	Fit the wheel and tighten the nuts	Wheel brace
17	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
18	Fit the wing	Wheel brace

		TOOLS
	REPLACING A PIVOT OR A PIVOT PIN	
	Removal.	
19	Remove the wing on the side of the pivot or pivot pin to be replaced	Wheel brace
20	Raise the vehicle (use the stand MR-3300-70 placed on a roller jack, see Pl. 52). Place packing under the chassis up to the level of the axle tube	Support MR-3300-70
21	Remove the wheel..	Wheel brace
22	To Remove the Driveshaft (see Pl. 53).	
	See para. 6, this operation	
23	Disconnect the steering rod from the pivot lever (use the spanner MR-3691-1, see Pl. 54, fig. 2)	Spanner MR-3691-1
24	To Remove the Pivot (see Pl. 53).	
	a) Unscrew the plate (30) carrying the greaser (see fig. 1), or unscrew the greaser carrier plug (70) (see fig. 2). In order to do so, remove the greaser, replace it by a screw dia. 7 mm, pitch 100, length 40 mm, fitted with a nut. Lock the screw on the plug by means of the nut. Unscrew the nut by turning the head of the screw	12 mm box spanner
	b) With a pin punch drive out the expanding disc (32). Extract the pin (31) (use the extractor MR-3742, see Pl. 55)...	Extractor MR-3742 Punch punch dia. = 8 mm Length = 200 mm
	NOTE - In certain instances, the pivot pin can be removed only with the aid of a press and for this it is necessary to remove the arm.	
	c) Remove the pivot with the friction washer (33), the thrust washers (34) and the dust cover (35)	
25	To Strip Down the Pivot.	
	a) See paras. 7 b) to 9, this operation	
	b) Remove the damper : take out the split pin and remove the securing nuts	17 mm spanner
26	Clean the parts	

TOOLS

Replacement.

27 To Assemble the Pivot.

See paras. 11 to 14 a), this operation ....

28 To Fit the Pivot (see Pl. 53).

a) Make up a slave pivot pin with a tapered end ....

Pivot pin dia. = 16.5 mm
Length = 150 mm

b) In the dust cover (35) put one washer (34), the friction washer (33), and another thrust washer (34) ....

c) Place the pivot in position on the arm, and at the lower end place between the pivot and the arm, the assembly comprising the dust cover and the washer. Position the whole assembly with the swivel pin prepared in para. a) ..

d) Measure the clearance between the pivot and the arm at "a" with the aid of feeler gauges. This clearance must be between 0.1 and 0.4 mm. Satisfy this condition by selecting thrust washers (34) from among those sold by our Spare Parts Division ....

e) Carefully clean the pin with trichlorethylene. Remove the inspection marks with a stone. Oil the bushes (44 and 45), and grease the swivel pin (31). Put the pin in position, start by using a copper rod and then use the fixture MR-3742 (see Pl. 55) ....

Fixture MR-3742

NOTE - *The swivel pins may have two or four oil holes. Position these holes as shown in Pl. 53. Fig. 1 shows how to fit a pin with two holes and fig. 2 shows the fitting of the pin with four holes. The lower part of the pin must be above the lower face of the pivot (b=1·25 to 1·75 mm).* If the pivot has a threaded plug carrying the greaser (70) (see fig. 2), the distance "b" between the bottom of the pin and the lower end of the pivot must be 5.75 to 6 mm.

f) Pack the pivot pin and the spaces between the pin and the expanding plug (32) and the lower plate (30) with grease (adhesive grease) ....

g) Fit the greaser plate (30) with the greaser towards the front of the axle. Fit a paper gasket between the plate and the pivot. Tighten the screws, fitting a spring washer under the head, or tighten the greaser carrier plug to $2\frac{1}{4}$ ft/lbs. (0.300 m.kg) by means of a 7 mm diameter screw fitted as for the removal, see para. 24 a), this operation. Lock the plug by two punch marks ....

12 mm box spanner

h) Put the expanding plug (32) in position. Flatten it with a hammer to lock it. Turn down the metal of the pivot at four points with the aid of a punch in order to lock the expanding plug (see fig. 3) ....

i) Fit the damper, tighten the nuts to 43 ft/lbs. (6 m.kg) and lock them with split pins ....

17 mm spanner

29 To Connect the Steering Rod to the Pivot Lever (see Pl. 53).

a) Pack the socket of the pivot lever ball with grease (adhesive grease). Grease the ball pin and the seats ....

		TOOLS
	b) Put the spring (56), the washers (57) (one 3 mm washer and two 1 mm washers), and a ball pin seat (58) in position. Engage the ball pin in the steering rod. Fit the second seat (58), the washers (59) (one 5 mm washer and one 2 mm washer). Screw up and tighten the nut (60) (use the spanner MR-3691-1 see Pl. 54, fig. 2) and then slacken off about 1/6 of a turn. Lock the nut with a pin. Put the dust cover in position	Spanner MR-3691-1
30	<u>To Fit the Drive Shafts</u>.	
	See para. 15, this operation	
31	Fit the wheel. Lower the vehicle to the ground	Wheel brace
32	Adjust the toe out of the front wheels (see Op. 48, paras. 7 to 21)........................	
33	Adjust the lock (see Op. 48, paras. 22 to 25)	
34	Fit the wing	Wheel brace
35	Grease the pivot (adhesive grease)	
	REPLACEMENT OF AN ARM	
	<u>Removal</u>.	
36	Remove the wing on the side of the arm to be replaced	Wheel brace
37	Raise the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Place chocks under the car up to the level of the front axle and the rear axle. Remove the wheel	Support MR-3300-70 Wheel brace
38	<u>To Remove the Transmission</u> (see Pl. 53).	
	See para. 6, this operation	
39	<u>Disconnect the Suspension Tie Rod</u> (see Pl. 73) (type with suspension casing).	

		TOOLS
	NOTE - *In order to avoid disturbing the height adjustment and the distribution of the weight, proceed as follows:*	
	a) Remove the dust cover (8) from the adjustable end tube (5)	
	b) Raise the arm as far as possible in order to compress the suspension spring (14) in the casing	
	c) *Fit a hand vice with lead or copper jaws (in order to avoid scratching the tie rod)* against the adjustable end tube and tighten it firmly on the tie rod to prevent the latter from slipping	
	d) Remove one of the spring clips (2) on the clevis pin (3). Hold the arm up, remove the clevis pin and lower the arm again	
	IMPORTANT - *Never turn the end of the tie rod (7), in order not to alter the adjustment.*	
39 Z	<u>To Disconnect the Suspension Tie Rod</u> (see Pl. 73 A) (Type with Visible Suspension Springs).	
	Remove the spring clips (2) on the clevis pin (3).	
	Hold up the arm, remove the clevis pin and lower the arm again.	
	IMPORTANT - *Never turn the end of the tie rod, in order not to alter the adjustment.*	
40	Disconnect the steering rod from the pivot lever (use the spanner (MR-3691-1, see Pl. 54, fig. 2)	Spanner MR-3691-1
41	<u>To Remove the Axle Arm</u> (see Pl. 49).	
	a) Remove the cover plate (1) and take off the friction disc (2)	12 mm box spanner
	b) Take out the cotter pin and remove the nuts (3) (use the spanner 1833-VA, see Pl. 51, fig. 1)	Spanner 1833-VA
	c) Remove the arm from the axle tube by tapping at the back of the arm with a mallet if necessary	
	<u>Dismantling</u>.	
42	<u>To Remove the Pivot</u>.	
	See para. 24, this operation	
43	<u>To Strip Down the Arm</u> (see Pl. 49).	
	Remove the outer races of the bearings (36 and 46) in the bore for the axle arms. Drive them out with the aid of a drift having a sharp edge. Remove the screw for adjusting the lock	12 mm box spanner 12 mm spanner

TOOLS

Assembly.

NOTE (see Pl. 49) - We have fitted in succession two types of arms on saloon cars and vans

at the front left A-412-1

at the front right A-412-1a

with a bearing housing 42.4 mm deep (on the inside) and 28.5 mm deep (on the outside)

and then the arms at the front left A-412-1b

at the front right A-412-1c

with a bearing housing 39.4 mm deep (towards the inside) and 25.5 mm deep (towards the outside).

The new arms are fitted with bearings :

S. K. F. No. 620.041; dimensions 63.5 x 95 x 17

or Timken No. 620.042; dimensions 63.5 x 95 x 17.

Our Spare Parts Division now supply only the new arms and the new bearings.

The new bearings (620.041 or 620.042) can be fitted on an old arm if a washer (71) sold under No. A-422-93, 3 mm thick, is placed between the bottom of the housing and the bearing.

On an old arm, one old bearing and one new bearing may also be fitted.

If an old arm is replaced by a new one, it is essential to replace the 2 bearings as well.

IMPORTANT-1.Never fit an S.K.F. roller assembly in a Timken bearing housing or vice versa since the taper of the rollers differs.

2. Two bearing assemblies of different makes can be fitted on one and the same arm.

44 To Prepare the Arm (see Pl. 49).

Fit the outer races of the bearings (36 and 46) in the bore for the arm with the aid of a drift with a sharp edge (if necessary, fit the washers (71), see fig. 2). Make sure that they are properly seated on their bearing faces ......

45 To Fit the Pivot.

See para. 28, this operation ....

Replacement.

46 To Fit the Arm (see Pl. 49).

a) Smear the inner and outer bearings with grease (adhesive grease) ....

		TOOLS
	b) Put the arm in position, and fit the outer bearing (46) with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	c) Screw up and tighten the nut (3) to 36 ft/lbs (5 m.kg), in order to ensure correct positioning of the bearings (use the spanner 1833-VA, see Pl. 51, fig. 1).	
	Then unscrew the nut (3) and retighten it to a torsion of $21\frac{1}{2}$ to 25 ft/lbs (3 to 3.5 m.kg)	
	The arm must turn freely without stiffness at any point.	
	Lock the nut with a split pin, bringing the slot nearest to a pin hole opposite that hole by tightening or untightening the nut	Spanner 1833-VA
	Open out the end of the split pin in the bore in the axle tube.	
	d) Put the friction disc (2) in position (see Pl. 50) for positioning. Fit a paper gasket between the friction disc and the arm. Put the friction disc on the lugs on the crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2). Fit the cover plate (1), fitting a paper gasket and tighten the screws with a serrated washer under each head	Spanner 1834-VA 12 mm box spanner
47	<u>To Connect the Steering Rod to the Pivot Lever</u> (see Pl. 53).	
	See para. 29, this operation	
48	<u>To Fit the Transmission</u> (see Pl. 53).	
	See para. 15, this operation	
49	<u>To Connect Up the Suspension Tie Rod</u> (see Pl. 73).	
	a) Raise the arm in order to bring the yoke opposite the end carrying the clevis pin. Put the clevis pin (3) in position and lock it by fitting the spring clip (2)	
	b) Remove (if used) the hand vice holding the tie rod during the preceding operations	
	c) Put the dust cover in position on the adjustment end tube (5)	
50	Fit the wheel and tighten the nuts	Wheel brace
51	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
52	Adjust the toe out (see Op. 48, paras. 7 to 21).	
53	Adjust the lock (in the case where the axle arm has been replaced, see Op. 48, paras. 22 to 25)	
54	Fit the wing	Wheel brace

		TOOLS
	CHECKING AN ARM	
55	Remove and strip down the arm (see paras. 36 to 43, this operation)	
56	To Check the Arm (see Pl. 56). Put the arm on a special fixture (use the fixture MR-3745) .... a) Place the pin "A" in the bore "b" of the pivot pin .... b) Put the mandrel "C" carrying the pin in the bore of the hub .... c) Rotate the mandrel "C" until the 2 pins are substantially parallel and are *just resting* on the surface plate .... d) Measure the distance "I_1" between the points at one end, and then the distance "I_2" at the other end. These 2 distances must be approximately equal to 10 mm; if not, the arm must be replaced	Fixture MR-3745
57	Assemble and fit the arm (see Note and paras. 44 and 54, this operation)	
	REPLACEMENT OF THE CLEARANCE STOPS (see Pl. 49).	
58	Remove the arm (see Note and paras. 36 to 41, this operation)..	
59	To Replace the Stop. a) Take out the outer race of the bearing (36) and the washer (71) if fitted .... b) File down and grind the welding fillets of the old stop .... c) Weld the new stop in position as shown in fig. 2, Pl. 56. Use the electric welding process and protect the arm with wet asbestos, in order to avoid any deformation of the bearing housing	
60	Fit the outer race of the bearing (36) and refit the washer (71) (if one was taken out when dismantling) (see Note 2 "Assembly" page 199)	
61	Fit the arms (see paras. 46 to 54, this operation)...	

		TOOLS
	REMOVAL OF THE ASSEMBLY	
1	Remove the screw of the collar securing the steering tube on the rack pinion	12 mm box spanner
2	Remove the steering tube from the rack pinion and from the stationary tube (use the lever 1951-VA, see Pl. 58 A) . .	Lever 1951-VA
3	Remove the lighting switch from the stationary tube. Unscrew the nuts on the steering bracket securing the tube to the instrument board and remove the stationary tube	12 mm spanner
	FITTING THE ASSEMBLY	
	NOTE : The rubber bushes are bored only after they are fitted in the stationary tube. It is therefore not possible to replace only one bush. The Spare Parts Division will only supply the tube and bush assembly ready for fitting	
4	Put the stationary tube in position and insert the flexible support between the tube and the instrument board, without tightening the nuts of the steering bracket	
5	<u>To Fit the Steering Wheel and Steering Tube Assembly</u>.	
	Dust talcum powder on the bearing faces of the steering tube rotating in the bushes of the stationary tube	
	a) Position the wheels for running in a straight line	
	b) Put the steering tube in the stationary tube. Place the arms of the steering wheels horizontally (tolerance 10°). Put the lower rubber oil retainer plate in position, put the locking collar on the steering tube and fit the tube on the rack pinion (it should slide in easily). Put the screw in the locking collar. Fit a lockwasher under the head of the screw and under the nut, tighten the nut to a maximum torsion of $13\frac{1}{2}$ ft/lbs. (1.9 m.kg), in order to avoid elongating the screw. Turn over the lockwashers	12 mm box spanner
	NOTE - If the collar is tapped, it must be modified : Drill out the tapped hole to a diameter of 7.5 mm. Replace the existing screw by the screw 89.330 and the nut 2503-S. Fit a lockwasher under the nut. Tighten the nut to $13\frac{1}{2}$ ft/lbs. (1.9 m.kg). Turn down the lockwasher. It is preferable to fit the new type of collar sold under No. A-441-86.	
	c) Adjust the thickness of the rubber steering support (by fitting a rubber packing chosen from among those sold by our Spare Parts Division, thicknesses 13.5 - 19.5 - 25.5 mm) so that the steering tube should under no circumstances jam in the stationary tube, which after a certain number of miles could cause the breakage of the steering tube	

		TOOLS
	d) Adjust the height of the stationary tube so that there should be a dimension of 8 ± 0.5 mm between the top of the tube and the arms of the steering wheel. Tighten the nuts of the steering bracket, fitting a flat washer under the nut	12 mm box spanner
	NOTE - Stop tightening when it becomes difficult to turn the fixed tube by hand (over tightening may cause crushing of the tube).	
6	Fit the lighting switch..	

		TOOLS
	REMOVAL	
1	Remove the front wings	Wheel brace
2	Raise the vehicle (use the stand MR-3300-70 placed on a roller jack, see Pl. 52). Put chocks under the chassis up to the level of the front and rear axles. Remove the two front wheels	Support MR-3300-70 Wheel brace
3	Place a block of wood between the gearbox and the chassis crossmember. Disconnect the gearbox from the bracket on the axle crossmember	Wood block 200 mm thick
4	Remove the screw from the collar securing the steering tube and the rack pinion. Remove the tube from the pinion (use the lever 1951-VA, see Pl. 58 A)	12 mm box spanner Lever 1951-VA
5	<u>To Disconnect the Suspension Tie Rods</u> (see Pl. 73) (Type with Suspension Casing).	
	NOTE - After removing and refitting the axle, it is always preferable to adjust the heights. Nevertheless, in order to disconnect the suspension tie rods without disturbing the height adjustment or the distribution of the weight of the vehicle, proceed as indicated below (for each arm).	
	a) Remove the dust cover (8) from the adjustment tube end (5)	
	b) Raise the axle arm as far as possible in order to compress the suspension spring in the casing	
	c) Put a hand vice, fitted with copper or lead jaws (in order to avoid scratching the tie rod) against the adjustable tube end and tighten it firmly on the suspension tie rod to prevent the latter from slipping	
	d) Remove one of the spring clips (2) from the clevis pin (3). Hold up the axle arm, remove the clevis pin (3) and lower the arm again	
	IMPORTANT - Do not turn the end of the tie rod (7) in order to avoid altering the adjustment.	
5 Z	<u>To Disconnect the Suspension Tie Rods</u> (see Pl. 73 A) (Type with Visible Suspension Springs).	
	Remove one of the spring clips (2) from the clevis pin (3).	
	Hold up the arm, remove the clevis pin and lower the arm again.	
	IMPORTANT - Do not turn the end of the tie rod (7), in order to avoid changing the adjustment.	

		TOOLS
6	Disconnect the right-hand steering rod from the pivot lever (use the spanner MR-3691-1, see Pl. 54, fig. 2).	Spanner MR-3691-1
7	<u>To Remove the Right-hand Axle Arm</u> (see Pl. 49).	
	a) Remove the cover plate (1). Remove the friction disc (2)........	12 mm box spanner
	b) Take out the split pin and remove the nut (3) (use the spanner 1833-VA, see Pl. 51, fig. 1)	Spanner 1833-VA
	c) Release the arm axle from the crossmember by tapping at the back of the arm with a mallet if necessary	
8	Disconnect the axle crossmember from the chassis. Remove the securing screws *unscrewing them by the head.* Remove the axle steering gear and left arm assembly from the left-hand side of the vehicle	17 mm box spanner 17 mm spanner
	REPLACEMENT	
	NOTE - If the front axle and steering gear assembly has been replaced, it is necessary first to remove the right-hand arm so that the axle can be fitted on the chassis without having to remove the engine or the body (see para. 7 for the removal of the axle arm).	
9	Put the front axle steering gear and left-hand arm assembly on the chassis, fitting it from the left-hand side of the vehicle	
10	NOTE - 1. In order to ensure constant velocity of the movement when the car is running in a straight line, it is essential that the forks of the sliding coupling and of the splined drive shaft should be in alignment;	
	2. Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the sliding coupling and the splines on the drive shaft (adhesive grease)........	
	b) Insert the drive shaft in the sliding coupling	
11	Make sure that the locating dowels of the axle crossmember are properly seated in the holes in the chassis. Fix the axle to the chassis with the heads of the screws under the chassis and fit a double lockwasher under the screw heads and a single lockwasher under the nuts (1st assembly only; the nuts were omitted later). Tighten the screws (by turning them by the heads) to a torsion of 29 ft/lbs. (4 m.kg). Turn down the lockwashers. Put the dust cover on the sliding coupling	17 mm box spanner

		TOOLS
12	To Fit the Right-hand Axle (see Pl. 49).	
	a) Grease (use special bearing grease) the inner and outer bearings (36 and 46)	
	b) Put the arm in position on the axle crossmember. Insert the drive shaft in the sliding coupling (see para. 10, this operation)	
	c) Put the outer bearing (46) in position with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	d) Screw up and tighten the nut (3) to 36 ft/lbs. (5 m.kg), in order to ensure the correct positioning of the bearings (use the spanner 1833-VA, see Pl. 51, fig. 1). Then unscrew the nut (3) and retighten it to 22 to 25 ft/lbs. (3 to 3.5 m.kg). The arm must turn freely without stiffness at any point. Bring the slot nearest to a pin hole opposite this hole by tightening or slackening the nut. Lock the nut with a split pin	
	Open the ends of the split pin in the bore in the crossmember..........	Spanner 1833-VA
	e) Fit the friction disc (2) (see Pl. 50 for positioning). Fit a paper gasket between the friction disc and the arm. Put the friction disc in position on the lugs on the crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2). Fit the cover plate (1) with a paper gasket, tighten the screws and fit a serrated washer under each head	Spanner 1834-VA 12 mm box spanner
13	To Connect the Steering Rod to the Pivot Lever (see Pl. 53).	
	a) Pack the pin socket of the ball end of the pivot lever with grease (adhesive grease). Grease the ball pin and its seats	
	b) Fit the spring (56), the washers (57) (one 3 mm thick washer and two washers 1 mm thick) and one ball socket (58). Engage the ball pin in the steering rod. Fit the second socket (58) and the washers (59) (one washer 5 mm and one washer 2 mm)..........	
	Screw up and tighten the thrust nut (60) (use the spanner MR-3691-1, see Pl. 54, fig. 2). Then unscrew it about 1/6th of a turn and lock it with a split pin	Spanner MR-3691-1
	c) Fit the dust cover on the ball pin housing	
	Put the dust cover in position on the sliding coupling	32 mm box spanner
14	Remove the wooden block placed under the gearbox. Connect the gearbox to the bracket on the axle and knock down the lockwasher	17 mm box spanner
15	To Connect the Suspension Tie Rods to the Arms (see Pl. 73).	
	a) Raise the arm to bring the yoke opposite the end carrying the clevis pin. Fit the clevis pin (3) and lock it by fitting a spring clip (2)	
	b) Remove the hand vice used to hold the tie rod during the preceding operations	
	c) Put the dust cover in position on the adjustment end tube (5)	

		TOOLS
16	Fit the two front wheels and tighten the nuts	Wheel brace
17	<u>To Connect Up the Steering Wheel and Steering Tube Assembly.</u>	
	a) Set the wheels as for running in a straight line	
	b) Arrange the arms of the steering wheel horizontally (tolerance 10°). Fit the rubber oil retaining plate and the locking collar on the steering tube, engage the tube on the rack pinion (it should slide in easily). If not, unscrew the screws on the steering bracket securing the tube to the instrument panel, so that the steering tube can engage easily on the rack pinion. Insert the screw of the locking collar fitting a lockwasher under the head and under the nut, tighten the nut $13\frac{3}{4}$ ft/lbs. (1.9 m.kg) in order to avoid elongating the screw. Turn over the lockwashers	12 mm box spanner
	NOTE - If the collar is tapped, it must be modified. Drill out the threaded hole to a dia. 7.5 mm. Replace the existing screw by the screw 89.330 and the nut 2.503-S. Fit a lockwasher under the nut. Tighten the nut to a maximum torsion of $13\frac{3}{4}$ ft/lbs. (1.9 m.kg). Turn down the lockwashers. It is preferable to fit the collar of the new type sold under the No. A-441-86.	
	c) Adjust the thickness of the rubber steering support (by adding, if necessary, a rubber packing piece chosen from among the three types sold by our Spare Parts Division, thicknesses 13.5 - 19.5 - 25.5 mm), to prevent the steering tube from jamming in the fixed tube, since this would after a certain number of miles, lead to a fracture of the steering tube	
	d) Adjust the height of the fixed tube in order to obtain a distance of 8 ± 0.5 mm between the top end of the tube and the arms of the steering wheel. Tighten the nuts of the steering bracket, fitting a flat washer under each nut	
	NOTE - Stop the tightening process when it becomes difficult to turn the fixed tube by hand (over-tightening may lead to the tube being crushed).	
18	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
19	Adjust the toe out (see Op. 48, paras. 7 to 21)	
20	Adjust the steering lock (see Op. 48, paras 22 to 25)	
21	Fit the wings	Wheel brace
22	Adjust the height if necessary (see Op. 50)	

		TOOLS
	NOTE - Since the steering gear is housed in the axle crossmember it cannot be dismantled on the car. If it is to be overhauled, the whole front axle and steering gear assembly must be removed (see Op. 23)	
	DISMANTLING (see Pl. 57 and 58).	
1	Put the front axle and steering gear assembly on a stand (use the stand MR-3301-60, see Pl. 59).................	Stand MR-3301-60
2	Disconnect the steering rod from the ball pins on the rack (use the extractor 1964-T fitted with the shield 1965-VA, see Pl. 60, fig. 1). Remove the springs (4) from the collars (8).......................................	17 mm box spanner Extractor 1964-T Shield 1965-VA
3	Unscrew and remove the nut (5) from the guide spring (use the spanner MR-3691-2, see Pl. 54, fig. 2). Remove the spring (6) and the guide (7)...	Spanner MR-3691-2
4	Remove the dust cover slide (9), remove the dust cover (10) and the ball pin guide collars (8).....................	12 mm box spanner
5	Remove the rack and tube assembly from the axle crossmember	
6	Remove the nut (11) retaining the rack pinion (use the spanner 1980-VA or 1981-VA, see Pl. 60, fig. 2). Remove the rack pinion (12) from the box	Spanner 1980-VA or Spanner 1981-VA
7	Drive out the rack pinion bearing (13) with a shouldered mandrel inserted into the box. The expanding plug (26) will come out together with the bearing	Mandrel : Small dia. = 13 mm Length = 20 mm Large dia. = 17 mm Length = 130 mm
8	Remove the split pin and unscrew the ball pin thrust nut (14) (use the spanner MR-3691-3, see Pl. 54, fig. 2)	Spanner MR-3691-3
9	Remove the ball pin socket (15), the ball pin (16), the second socket (17), the spring (18) and the distance piece (19), the ball pin socket (20) and the second ball pin (21)...	
	Remove the rack (24) from the ball pin guide (25). Remove the second ball socket (22) and the distance piece (23) from the rack tube	
10	Clean the parts	

		TOOLS
	ASSEMBLY (see Pl. 57 and 58).	
11	In the rack (24) fit the distance piece (23) retaining the ball pin socket and then the two ball pin sockets (22 and 20)	
	Fit the spring (18) in the distance piece (19). Pack the interior of the spring with grease (adhesive grease). Fit the assembly in the rack. Put the two sockets (15 and 17) in the rack	
12	Grease the inside of the rack tube (use adhesive grease) and engage it in the ball pin guide (25). Pack with grease the holes "a" provided in the four ball pin sockets. Also grease the balls (16 and 21) and put them in position between the sockets	
	The new ball pins have no flats on the ball or keyways on the taper	
13	Screw up and lock the thrust nut (14) (use the spanner MR-3691-3, see Pl. 54, fig. 2), and then slacken off 1/6th of a turn. Make sure that all pins move freely without stiffness or play	
	Lock the nut with a split pin inserted in the hole nearest the slot, with the head of the split pin located in the slot. Flatten the ends of the split pin on the rack sleeve to prevent the ends from rubbing on the ball pin guide	Spanner MR-3691-3
14	Put the rack pinion bearing bush (13) in the box with the aid of a shouldered mandrel. Fit the expanding plug (26) in the recess in the box and flatten it with a hammer in order to lock it. Pack the inside of the bearing bush with grease (adhesive grease)	Shouldered Mandrel: Small dia. = 13 mm Length = 20 mm Large dia. = 17 mm Length = 130 mm
15	Grease the outside of the rack and rack tube (use adhesive grease) and fit it in position in the axle crossmember	
	Grease the pinion bearing (27) and the pinion shaft (use adhesive grease). Put the pinion in position in the box	
	Screw up the nut (11) (with felt washer fitted) and tighten to 72 ft/lbs (10 m.kg) (use the spanner 1980-VA or 1981-VA), (see Pl. 60, fig. 2). Lock with two centre punch marks	Spanner 1980-VA or Spanner 1981-VA
16	Put the collar (8) on the ball pin stems. Grease the contact faces of the dust cover (10) and put it in position, with the shorter side on the left-hand side of the car	
	Fit the dust cover slide (9) and tighten the screws. Make sure that the rack moves freely in the axle crossmember. Turn over the lockwashers	12 mm box spanner
17	Grease the guide (7) and fit it in its housing. Fit the spring (6) and temporarily screw up the nut (5) (use the spanner MR-3691-2, see Pl. 54, fig. 2)	Spanner MR-3691-2

		TOOLS
18	Fit the steering wheel and steering tube assembly provisionally on the rack pinion	
19	Turn the steering wheel (about $2\frac{1}{2}$ turns) in order to move the rack along the whole length of its travel.	
	NOTE - At the extreme left-hand lock, the rack may become dis-engaged from the pinion. By progressively tightening the nut (5) find the stiffest point if there is one. Adjust the pressure of the guide at this point, by progressively slackening off the nut (5). The rack should move smoothly without the movement of the teeth being felt..........	
	NOTE - The nut (5) is not locked. The pressure of the guide spring is sufficient to prevent it from working loose. After adjustment is completed, remove the steering wheel.	
20	Put the keys (28) on the ball pin stems (position the ball pins as shown in Pl. 57). (The latest type of ball pins without flats on the balls, are fitted without keys and there is no need to position them), fit the collar springs (4), put the steering rods in position on the rack ball pins and tighten the ball pin nuts to 29 ft/lbs. (4 m.kg), locking them with split pins	17 mm box spanner
21	Remove the axle from the stand	
22	Paint the assembly	

		TOOLS
	DISMANTLING	
1	Put the axle on a stand (use the stand MR-3301-60, see Pl. 59)..	Stand MR-3301-60
2	Disconnect the steering rods from the rack ball pins (use the extractor 1964-T fitted with the sleeve 1965-VA, see Pl. 60, fig. 1) and from the pivot levers (use the spanner MR-3691-1, see Pl. 54, fig. 2). Take out the springs (4) from the collars (8) (see Pl. 57)	Sleeve 1965-VA Extractor 1964-T Spanner MR-3691-1 17 mm box spanner
3	Remove the dampers. Remove the rear engine support	12 mm box spanner 17 mm spanner
4	Disconnect the drive shafts from the hubs by unscrewing the nuts (29) (see Pl. 53). (If these drive shafts were not removed when taking off the axle)	32 mm box spanner
5	<u>To Remove the Left-hand Axle Arm</u> (see Pl. 49).	
	(The right-hand axle arm having been removed together with the axle)	
	a) Remove the cover plate (1), remove the friction disc (2)	12 mm box spanner
	b) Take out the split pin and remove the nut (3) for adjusting the bearings (use the spanner 1833-VA, see Pl.51, fig.1).	Spanner 1833-VA
	c) Remove the arm from the axle crossmember by tapping on the hub of the arm with a mallet if necessary	
6	<u>To Remove the Pivots</u> (see Pl. 53).	
	a) Remove the greaser plate (30) (see fig. 1) or unscrew the plug carrying the greaser (70) (see fig. 2). In order to do so, remove the greaser and replace it by a screw 7 mm dia. x 100 pitch x 40 long, fitted with a nut. Lock the screw on the plug with the aid of the nut. Unscrew the plug by turning the head of the screw	12 mm box spanner
	b) Drive out the expanding plug (32) with a pin punch. Drive out the pivot pin (31) with a press. (Release the pin with the aid of a short mandrel and complete the operation with a shouldered mandrel)	Short Mandrel : Dia. = 16 mm Length = 25 mm Shouldered Mandrel: Small dia. = 8 mm Length = 20 mm Large dia. = 16 mm Length = 150 mm Pin Punch : Dia. = 8 mm Length = 200 mm

		TOOLS
	c) Remove the pivot together with the friction washer (33), the thrust washers (34) and the dust cover (35)	
7	To Remove the Inner Bearings (see Pl. 49).	
	a) Take out the felt packing from the metal casing of the oil seal (37) with the aid of a screwdriver (so that the extractor can be fitted in the oil seal casing)........	
	b) Take out the bearing (36) (use the extractor 1829-VA, see Pl. 61)	Extractor 1829-VA
	c) Drive out the half casing of the oil seal still lodged in the axle crossmember........	
	NOTE - The oil seal must be renewed each time it is removed.	
8	To Strip Down the Pivots (see Pl. 53).	
	a) Drive out the hub (38) from the pivot with the aid of a mandrel and press (use the mandrel MR-3436-40, see Pl. 62, fig. 2 and 4)........	Mandrel MR-3436-40
	b) With a 4 mm dia. drill, drill the punch marks locking the ring nut (39). Remove the ring nut (use the spanner 1811-VA, see Pl. 66, fig. 3)	Spanner 1811-VA
	c) Drive out the bearing (40) from the bore of the pivot with the aid of a copper rod if necessary........	
	d) Drive out the oil seal (41) from the pivot and the oil seal (42) from the ring nut (39)	
	e) Remove the coupling lever (43) from the pivot	12 mm box spanner
	f) Drive out the bushes (44 and 45) from the pivot (use a shouldered mandrel)	Shouldered Mandrel: Small dia. = 13 mm Length = 30 mm Large dia. = 20 mm Length = 120 mm
	g) Drive out the wheel studs from the hub. In order to avoid deforming the hub, use the tool MR-3445-20 (see Pl. 68).	Tool MR-3445-20
9	To Strip Down the Arms (see Pl. 49).	
	Remove the outer races of the bearings (36 and 46), from the bore of the arm axle, by driving them out with a square edged pin punch and take out the washers (71) (if fitted). Remove the steering lock screw	12 mm spanner 12 mm box spanner
10	To Dismantle the Drive Shafts (see Pl. 63).	
	a) Remove the four circlips (47) from the bearings	
	b) If necessary, use a scraper to remove any burrs or paint liable to prevent the removal of the bearings	

TOOLS

c) Release the bearings (48) from their housing by tapping on the forks with a copper block. Remove the bearings with the aid of universal pliers or gas pliers. Release the drive shaft from the stub axle and remove the trunnion (50)...

d) Drive out the metal cups (49) (with their washer) from the bearings of the trunnion (50) ....

e) Remove the dust cover from the shaft ....

11 Clean the parts ....

ASSEMBLY

12 To Prepare the Pivots (see Pl. 53).

a) Fit the wheel studs on the hubs. Insert them with a press and lock them (use the tool MR-3445-20 and hollow punch MR-3445-24, see Pl. 68). Make sure that the flanged edges do not project beyond the face of the hub. Drill the housing for the dowel pin (some distance away from the old hole). Drive in the dowel and make sure that it does not project. Lock by punching .... Tool MR-3445-20 Hollow punch MR-3445-24

b) Fit the bushes (44 and 45) in the pivot with the aid of a shouldered mandrel and a press ....

Shouldered Mandrel:

Small dia.	=	13 mm
Length	=	30 mm
Large dia.	=	20 mm
Length	=	120 mm

NOTE - The bushes cannot be rebored after assembly.

c) Put the oil seal (42) in the ring nut (39). The metal casing of the oil seal must be 0.1 mm to 0.5 mm below the bearing face of the ring nut so that the casing does not rub against the bearing ....

Put the oil seal (41) in the hub. The seal must also be from 0.1 mm to 0.5 mm below the bearing shoulder of the bearing (use the punch MR-3676-10, for fitting the two bushes (see Pl. 62, fig. 1 and 3)........................ Punch MR-3676-10

d) Examine the bearing. Secure the inside two cages to each other by means of a bolt and two washers. Check the clearance of the bearing ....

e) Grease the bearing (40) (use special bearing grease) and fit it in position in the bore of the pivot with the aid of a punch bearing on the outer race of the bearing (use the punch MR-3676-10, see Pl. 62, fig. 1) .... Punch MR-3676 10

f) Screw up and tighten the ring nut (39) to a torsion of 87 ft/lbs. (12 m.kg) (use the spanner 1811-VA, without the guide) (see Pl. 66, fig. 3). Lock the ring nut with three punch marks .... Spanner 1811-VA

	TOOLS
g) Fit the coupling lever (43) on the pivot. Tighten the screw firmly and turn over the lockwashers on one flat face of the screw........	12 mm box spanner
h) Put the hub (38) in position in the pivot bearing with the aid of a press and a tube resting on the inner race of the bearing........	Tube : External dia. = 44 mm, Internal dia. = 36 mm, Length = 200 mm
13 **To Prepare the Drive Shafts** (see Pl. 63).	
a) Put the metal cups (49) on the bearing of the trunnion (50) with the aid of a tube. Fit the oil seals (51) in each cup (49)........	Tube : Internal dia. = 14 mm, External dia. = 23 mm, Length = 100 mm
b) Pack the holes provided for the purpose in each trunnion with grease (adhesive grease). Pack the bearing (48) with grease (adhesive grease) and fit 16 needles (52) in each bearing........	
c) Put the trunnion (50) in the yoke on the drive shaft. Fit one bearing (48) and its circlip (47). Fit the second bearing (48) and the circlip (47)........	
Make sure that the circlips are properly seated in their groove........	
d) Put the stub axle yoke (53) on the trunnion. Put the bearings and the circlips in position. (Make sure that the circlips are properly seated in their groove)........	
e) Fit the dust cover of the sliding coupling on the drive shaft near the shaft splines........	

14 **To Prepare the Arms** (see Pl. 49).

NOTE (see Pl. 49) - We have successively fitted two types of arms on Saloon cars and vans :

at the left-hand front A-412-1
at the right-hand front A-412-1a

with the bearing housing 42.4 mm deep (towards the inside) and 28.5 mm (towards the outside),

and the arms at the left-hand front A-412-1b
at the right-hand front A-412-1c

with the bearing housing 39.4 mm deep (towards the inside) and 25.5 mm deep (towards the outside).

The new arms are fitted with bearings :
S.K.F. No. 620.041, dimensions 63.5 x 95 x 17
or Timken No. 620.042, dimensions 63.5 x 95 x 17

Our Spare Parts Division will now only supply the new arms and the new bearings.

TOOLS

On an old type arm, the new bearings (620.041 or 620.042) can be fitted if a washer (71), sold under the No. A-422-93, 3 mm thick, is inserted between the bottom of the housing and the bearing.

One old type and one new type bearing can be fitted on a old arm.

If an old arm is replaced by a new one, both bearings must also be replaced.

IMPORTANT - 1. An S.K.F. roller assembly must never be fitted in a Timken bearing housing or vice versa since the taper of the rollers differs.

2. On one and the same arm, two bearings of different makes can be fitted.

a) Put the outer races of the bearings (46) and (36) in position in the bore of the arms with the aid of a square edged punch (if necessary fit the washers (71), see fig. 2). Make sure that the races are pressed right home ....

b) Provisionally fit the steering lock regulating screw..........

15 To Assemble the Pivots (see Pl. 53).

a) Prepare a slave pin with a tapered end .... — Pin dia. = 16.5 mm, Length = 150 mm

b) In the dust cover (35) put one thrust washer (34), the friction washer (33) and a second thrust washer (34) ....

c) Put the pivot on the arm and fit at the bottom between the pivot and the arm the dust cover and washer assembly. Locate the assembly by means of the pin prepared according to para. a) ....

d) Measure the clearance between the pivot and the arm at "a" by means of feeler gauges. This clearance must be between 0.1 mm and 0.4 mm. Satisfy this condition by selecting the correct number of washers (34) sold by our Spare Parts Division ....

e) Thoroughly clean the pin with trichlorethylene. Remove the inspection marks with a stone. Oil the bushes (44 and 45) and grease the pivot pin (31). Start fitting with the aid of a copper block.

NOTE : *Locate the lubrication holes in the pin as shown in Pl. 53, fig. 1, when the pin has two lubricating holes and as shown in fig. 2 when there are four holes.* Complete insertion with a press. The lower end of the pin must be below the lower end of the pivot ("b" equals 1.25 to 1.75 mm)..........

If the pivot is fitted with a threaded greaser carrying plug (70) (see fig. 2) the lower end of the pin must be below the end of the pivot so that the distance "b" equals 5.75 to 6 mm.

f) Pack the inside of the pin and the spaces between the pin and the expanding plug (32) and the plate (30) with grease (adhesive grease)..........

g) Fit the greaser plate (30) with the greaser towards the front of the axle. Fit a paper gasket between the plate and the pivot. Tighten the screws, fitting a spring washer under the heads or tighten the plug carrying the greaser (70) to

		TOOLS
	a torsion of $2\frac{1}{4}$ ft/lbs. (0.300 m.kg) by means of a 7 mm dia. screw fitted as for the removal, see para. 6 a), this operation	12 mm box spanner
	h) Put the expanding plug (32) in position. Flatten it with a hammer to lock it. Turn down the metal of the pivot at four points with the aid of a chisel in order to secure the expanding plug (see fig. 3)	
16	<u>To Assemble the Axle Arm</u> (see Pl. 49).	
	a) Fit the oil seal (37) on the bearing face of the axle arm (54), (use the tube MR-3616-20, see Pl. 54, fig. 1).	
	Put the inner bearing (36) on the bearing face of the axle crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	b) Grease the inner and outer bearings (adhesive grease)	
	c) Put the arm in position, bring the outer bearing (46) against the bearing face on the axle crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	d) Put the oil seal (55) on the bearing adjusting nut (3). The oil seal should be between 0.1 and 0.5 mm below the bearing surface of the nut	
	e) Screw up and tighten the nut (3) to 36 ft/lbs. (5 m.kg) to ensure the correct positioning of the bearing (use the spanner 1833-VA, see Pl. 51, fig. 1)	
	Then slacken off the nut and retighten it to 22 to 25 ft/lbs. (3 to $3\frac{1}{2}$ m.kg)	
	The arm must turn freely without any stiffness	
	Bring the slot which is nearest to a locking pin hole opposite this hole by tightening or slackening the nut. Insert the split pin in the nut. Open out the ends of the split pin in the bore of the crossmember	Spanner 1833-VA
	f) Put the friction disc (2) in position. (If the heights are not to be adjusted). Fit a paper gasket between the friction disc and the arm hub. Fit the friction disc on the lugs on the crossmember (see Pl. 50 for position) (use the spanner 1834-VA, see Pl. 51, fig. 2). Fit the cover plate (1) with a paper gasket between the plate and the friction disc, and tighten the screws, fitting serrated washers under each head	
	If the heights have to be adjusted, fit the friction disc and the cover plate only temporarily	Spanner 1834-VA 12 mm box spanner

NOTE - 1. In order to identify the front friction disc, check the diameter of the wire which is 4.2 mm and the diameter of the spring which is 32.5 mm.

2. If a friction disc is defective (broken spring, worn or broken lining, or the friction disc does not work), it must be renewed.

		TOOLS
17	To Assemble the Steering Rods (see Pl. 53 and 57).	
	a) Fit the keys (28) on the stems of the ball pins. (The ball pins of the latest type without flats on the balls are fitted without keys and their position need not be adjusted). Connect the steering rods to the rack ball pins and fit the springs (4) on the collars (8). Tighten the nuts to 29 ft/lbs. (4 m.kg) and lock with split pins..................	17 mm box spanner
	b) Pack the inner housing of the ball pin of the pivot lever with grease (adhesive grease). Grease the ball pin and the sockets	
	c) Fit the spring (56), the washers (57) (one washer of 3 mm and two washers of 1 mm) and a socket (58). Engage the ball pin in the steering rod. Fit the second socket (58), the washers (59) (one washer of 5 mm and one washer of 2 mm)..	
	Screw up and tighten the thrust nut (60) (use the spanner MR-3691-1, see Pl. 54, fig. 2). Unscrew it about 1/6th of a turn and lock the split pin....	Spanner MR-3691-1
	d) Fit the dust cover on the ball pin housings	
18	To Fit the Drive Shaft (see Pl. 53).	
	NOTE - The nut of the left-hand stub axle formerly had a left-hand thread and vice versa. Since September 1954, the nut for both stub axles has a right-hand thread.	
	a) Engage the stub axles on the splines on the hub. Oil the thread and the bearing surface of the nuts	
	b) Tighten the nuts to 144 ft/lbs. (20 m.kg). Prevent the hub from rotating by holding it with a rod inserted in one of the holes in the hub	32 mm box spanner
19	To Fit the Dampers.	
	Tighten the nuts to 43 ft/lbs. (6 m.kg) and lock with split pins	17 mm spanner
20	Fit the rear engine support and tighten the screws, fitting a serrated washer under each head	12 mm box spanner
21	Paint the axle	
22	Remove the axle from the stand MR-3301-60	

		TOOLS
	REPLACEMENT OF A FRICTION DISC (see Pl. 49).	
	<u>Removal</u>.	
1	Remove the cover plate (1). Remove the friction disc (2)	12 mm box spanner
	<u>Replacement</u>.	
	NOTE - 1. If a friction plate is defective (broken spring, worn or broken lining, the friction disc does not work), it must be renewed.	
	2. To identify the rear friction disc, measure the diameter of the wire which is 5.4 mm and the diameter of the spring which is 35 mm.	
2	Put the friction disc in position (see Pl. 50 for correct positioning). Fit a paper gasket between the friction disc and the hub of the arm. Fit the friction disc on the lugs on the axle crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2)	
	Fit the cover plate (1) with a paper gasket between the cover plate and the friction disc. Tighten the screws with a serrated washer under each head	Spanner 1834-VA 12 mm box spanner
	REPLACEMENT OF A HUB BRAKE DRUM OR OF A HUB BEARING	
	<u>Removal</u>.	
3	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack under the chassis up to the height of the axle	Support MR-3300-70
4	Remove the wheel	Wheel brace
5	<u>To Remove the Hub Brake Drum</u> (see Pl. 64 and 65).	
	a) With a 4 mm dia. drill, drill the punch marks locking the ring nut (4). Remove the ring nut (use the spanner 1811-VA, see Pl. 66, fig. 2). Keep the drum stationary by means of a lever supported on the wheel studs	Spanner 1811-VA

		TOOLS
	b) Remove the bearing retaining nut (5)........	44 mm box spanner
	c) Remove the drum (use the extractor 2003-VA, see Pl. 66, fig. 1)	Extractor 2003-VA
6	To Remove the Bearing (see Pl. 64).	
	a) Drive out the double bearing (11) from the hub using a tube and a press	Tube : Internal dia. = 35 mm External dia. = 44 mm Length = 150 mm
	b) Drive out the oil seal (12)	
	Replacement.	
7	To Prepare the Hub Brake Drum (see Pl. 64).	
	a) Put the oil seal (12) in position with the leather edge facing the bearing. The metal case of the oil seal must be between 0.1 and 0.5 mm below the face of the shoulder of the bearing, so that the latter should not rub against the oil seal. Satisfy this condition by fitting it with a punch and a press (use the punch MR-3676-10, see Pl. 62, fig. 1)........	Punch MR-3676-10
	b) Check the bearing. Tighten the two outer races to each other by means of a bolt and two washers. Check the clearance of the bearing	
	c) Fit the bearing. Grease the bearing (11) (use special bearing grease). Insert it in position in the bore of the hub in a press and with the aid of a tube resting on the outer race of the bearing	Tube : External dia. = 71.5 mm Internal dia. = 68 mm Length = 100 mm
8	To Fit the Hub Brake Drum (see Pl. 64).	
	a) Put the brake drum in position on the stub axle, using a tube and a mallet to facilitate fitting	Tube : External dia. = 44 mm Internal dia. = 36 mm Length = 200 mm
	b) Fit the lockwasher and tighten the nut (5) to 101 ft/lbs. (14 m.kg). Turn back the lockwasher on one flat of the nut.	44 mm box spanner
	c) Fill the plug of the ring nut (4) with grease (special bearing grease)	
	d) Tighten the ring nut (4) to 108 to 144 ft/lbs. (15 to 20 m.kg) (use the spanner 1811-VA, see Pl. 66, fig. 2). Hold the drum still with the aid of a lever resting on the wheel studs	Spanner 1811-VA
	e) Lock the ring nut by three centre punch marks	

		TOOLS
9	Fit the wheel and tighten the nuts	Wheel brace
10	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
	REPLACEMENT OF AN AXLE ARM	
	Removal.	
11	Jack up the vehicle (use the support MR-3300-70, placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front and rear axles	Support MR-3300-70
	Remove the wheel	Wheel brace
12	To Disconnect the Suspension Tie Rod from the Axle Arm (see Pl. 73).	
	a) Remove one spring clip (2) from the clevis pin (3)	
	b) Remove the clevis pin (3)	
	VERY IMPORTANT - Do not turn the end of the tie rod (7), otherwise the adjustment will be altered	
13	Disconnect the rear brake tube from the union on the flexible tube	17 mm box spanner
	Disconnect the flexible tube from the clip on the arm	12 mm spanner
14	To Remove the Axle Arm (see Pl. 49).	
	a) Remove the cover plate (1). Remove the friction disc (2)	12 mm box spanner 12 mm spanner
	b) Take out the split pin and remove the adjusting nut (3) (use the spanner 1833-VA, see Pl. 51, fig. 1)	Spanner 1833-VA
	c) Take out the arm from the axle crossmember by tapping the arm with the mallet if necessary	
15	To Strip Down the Arm.	
	a) Remove the damper	17 mm spanner
	b) Remove the drum and the brake shoes (see Pl. 64 and 65)	

	TOOLS
1. With a 4 mm dia. drill, drill the punch marks locking the ring nut (4). Remove the ring nut (use the spanner 1811-VA, see Pl. 66, fig. 2). Keep the drum still with a lever resting on the wheel studs	Spanner 1811-VA
2. Remove the nut (5) retaining the bearing	44 mm box spanner
3. Remove the drum (use the extractor 2003-VA, see Pl. 66, fig. 1)	Extractor 2003-VA
4. Remove the outer cups (6) of the springs by turning them through a quarter of a turn in order to release them from the guide rod. Remove the springs (7) and the rod (8)	
Unhook the return spring (9) from the brake shoes, using universal pliers	
Take out the split pin and remove the anchorage pin nuts (10); remove the flat washers (20)	
Remove the two brake shoes from the backplate. Remove the adjustment eccentrics from the shoes	12 mm box spanner
5. Remove the brake tube. Remove the wheel cylinder	10 mm box spanner 17 mm spanner
c) To strip down the axle arms and the brake backplates (see Pl. 49)	
1. Drive out the outer races of the bearings (46) and (36) from the arm hub using a pin punch with a square edge and remove the washers (71) (if fitted)	
2. Remove the rivets and drive out the adjusting cams (13) (see Pl. 65)	

16 To Assemble the Arm (see Pl. 49, 64 and 65).

NOTE - (See Pl. 49). - We have fitted two types of arms in succession :

on the Saloon type A:	on the Van type AU :
at the R.H. rear A-442-1b	at the L.H. rear AU-422-1
at the L.H. rear A-422-1c	at the R.H. rear AU-422-1a

with the bearing housing having a depth of 42.4 mm (towards the inside) and 28.5 mm (towards the outside), and then the new type arms on :

Type A and AZ Saloons :	Type AU and AZU Vans :
at the L.H. rear A-422-1d	at the L.H. rear AU-422-1b
at the R.H. rear A-422-1c	at the R.H. rear AU-422-1c

with bearing housings having a depth of 39.4 mm (towards the inside) and 25.5 mm (towards the outside).

The new arms are fitted with bearings :

S.K.F. No. 620.041, dimensions 63.5 x 95 x 17
or Timken No. 620.042, dimensions 63.5 x 95 x 17.

Our Spare Parts Division now supply only the new arms and the new bearings.

On an old arm, the new bearings 620.041 or 620.042 can be fitted if a washer (71) sold under the No. A-422-93, 3 mm thick, is fitted between the bottom of the housing and the bearing.

One new and one old bearing can be fitted on an old type arm.

If an old arm is replaced by a new one, the two bearings must be replaced also.

IMPORTANT - 1. An S.K.F. roller assembly must never be fitted in a Timken bearing housing or vice versa, since the taper of the rollers differs.

2. On one and the same arm, two bearings of different makes may be fitted.

a) Put the outer races of the bearings (36 and 46) in position in the bore of the arm, using a punch with a square edge. If necessary, fit the washers (71) see fig. 2. Make sure that the races are properly seated on their bearing faces..

b) Fit the adjustment cams (13). Lock the pins (use the tool MR-3354-10, see Pl. 67)............................

c) Fit the brake shoes and centre them...... ....

1. Lightly oil the adjustment eccentrics (19) and put them in position in the brake shoes ....

NOTE - The linings must be completely dry without any traces of oil and the rivets must be below the surface of the linings; if not, fit new brake shoes.

2. Put the brake shoes in position on the backplate: *the brake shoe with the offset lining at the top must be fitted at the front. The lining of the rear brake shoe is offset at the bottom.* Fit the flat washers (20) on the eccentric pins, tightening the nuts (10) provisionally. Fit the rods (8), the spring (7), the outer cup (6) and lock it on the rod (8) by turning it through a quarter of a turn ....

Make sure that the shoes move freely...

3. Fit the wheel cylinder, tighten the two screws and fit a spring washer under each head. Connect the brake tube. Tighten the screw, fitting a copper washer on each side of the union. Hook on the brake shoe return spring (9) with the aid of universal pliers..

4. Centre the brake shoes (use tool 2113-VA, see Pl. 70) ....

5. Tighten the nuts (10) moderately and lock them with split pins ....

d) Fit the brake drum on the stub axle and press home with the aid of a tube...... ....

TOOLS

Operation	Tools
b)	Tool MR-3354-10
2. Make sure that the shoes move freely	12 mm, 21 mm and 24 mm box spanners
3.	10 mm box spanner 17 mm spanner
4.	Tool 2113-VA 21 mm and 24 mm box spanners
5.	12 mm box spanner
d)	Tube : Internal dia. = 36 mm External dia. = 44 mm Length = 200 mm

		TOOLS
	e) Put the lockwasher in position, tighten the nut (5) to 101 ft/lbs. (14 m.kg). Turn over the lockwasher on one of the side faces of the nut. Pack the metal plug of the ring nut (4) with grease (special bearing grease). Keep the drum still by means of a lever resting on the wheel studs. Tighten the ring nut (4) to a torsion of 108 to 144 ft/lbs. (15 to 20 m.kg) (use the spanner 1811-VA, see Pl. 66, fig. 2). Lock it by three centre punch marks	44 mm box spanner Spanner 1811-VA
17	<u>To Fit the Arm</u> (see Pl. 49).	
	a) Grease the outer brearing (46) and the inner bearing (36) (special bearing grease)	
	b) Put the arm in position in the axle crossmember. Insert the outer bearing (46) in the axle crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	c) Screw up and tighten the nuts (3) to 36 ft/lbs. (5 m.kg) to ensure the correct positioning of the bearings (use the spanner 1833-VA, see Pl. 51, fig. 1)	
	Unscrew the nut (3) and retighten it to a torsion of 22 to 25 ft/lbs. (3 to 3.5 m.kg). The arm must turn freely without any stiff points. Bring the slot nearest a locking pin hole opposite the hole by tightening or slackening the nut. Lock the nut with a split pin. Open out the ends of the split pin in the bore of the crossmember	Spanner 1833-VA
	d) Fit the friction disc (see Pl. 50 for positioning). Fit a paper gasket between the friction disc and the hub of the arm. Put the friction disc in position on the lugs in the crossmember (use the spanner 1834-VA, see Pl. 51, fig.2). Fit the cover plate (1) with a paper gasket between the plate and the friction disc, tighten the screws with a serrated washer under each head	Spanner 1834-VA 12 mm box spanner 12 mm flat spanner
18	Fit the flexible brake tube. In order to facilitate this operation, lift the axle arm, tighten the nut securing the union on the clip and fit a serrated washer. Couple the connection tube to the wheel cylinder and to the flexible tube	12 mm and 17 mm spanners
	NOTE - The flexible tube must not touch either the chassis or the arm whatever the position of the arm.	
19	<u>To Connect the Suspension Tie Rod</u> (see Pl. 73).	
	Put the clevis pin (3) in position and secure it with the spring clip (2)	
20	<u>To Fit the Inertia Damper</u>.	
	Tighten the nuts to a torsion of 42 ft/lbs. (6 m.kg) and lock with split pins	17 mm spanner
21	Bleed the brake system (see Op. 49, paras. 14 and following)	
22	Fit the wheel	Wheel brace
23	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70

		TOOLS
	CHECKING AN ARM (see Pl. 71).	
24	To Remove the Arm (see paras. 11 to 14, this operation)	
25	To Strip Down the Arm (see para. 15, this operation)	
26	To Check the Arm.	
	Put the arm on a special fixture (use the fixture MR-3745)	
	a) Put the stub axle in the bore of the plate (E) and rest the plate on a surface plate	
	b) Put the mandrel (C) in the bore of the hub	
	c) Pack up to the height of the hub (F) so that the plate (E) is in perfect contact with the surface plate	
	d) To Check the Toe-in (see fig. 2).	
	1. Fit the inclined pin of the mandrel (C) so that it is in line with the welding seams on the arm	
	2. With a surface gauge measure the height (h1) of one point; rotate the mandrel through half a turn and measure the height (h2) *of the same point*	
	The difference between the two heights must be between 0 and 2.5 mm and the smaller of the two heights must always be the one farther away from the centre line of the stub axle; if not, the arm must be renewed	
	e) To Check the Camber (see fig. 3).	
	1. Place the pin of the mandrel (C) *perpendicular* to the welding line on the arm	
	2. With a surface gauge measure the height (h3) of one point. Rotate the mandrel through half a turn and measure the height (h4) *of the same point*	
	The difference in the measurements of the two heights must be between 7 and 10.5 mm for cars delivered before December 1950. On later types the difference must be between 0 and 3.5 mm. The smaller of the two heights must always be on the same side as the yoke carrying the clevis pin. If not, the arm must be replaced	Fixture MR-3745
27	To Assemble the Arm (see para. 16, this operation)	
28	To Fit the Arm (see para. 17, this operation)	
29	Fit the brake pipes (see para. 18, this operation)	

		TOOLS
30	Connect up the suspension tie rod (see para. 19, this operation)...	
31	Fit the damper (see para. 20, this operation)...	
32	Bleed the brake system (see Op. 49, paras. 18 and following)	
33	Fit the wheel	Wheel brace
34	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
	REPLACEMENT OF AN ARM STOP (see Pl. 49).	
35	Remove the arm (see paras. 11 to 14, this operation)...	
36	<u>To Replace the Stop</u>.	
	a) Take out the outer race of the bearing (36)	
	b) Chisel and grind off the welding fillet of the old stop	
	c) Weld on the new stop in the position shown in Pl. 56, fig. 2). Use an electric arc welder, protecting the arm with wet asbestos to prevent any distortion of the bearing housing...	
37	Fit the outer race of the bearing (36) (see Note to para. 16, this operation)	
38	Fit the arm (see paras. 17 to 19 and 21 to 23, this operation)...	

		TOOLS
	REMOVAL	
1	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle and at about 50 cm in front of the rear axle. Remove the two wheels	Support MR-3300-70 Wheel brace
2	Remove the inertia dampers	17 mm box spanner 17 mm spanner
3	<u>To Remove the Petrol Tank</u> (on Type A Saloons only).	
	a) Remove the filler cap and take out the dip stick	
	Unscrew the collar securing the flexible hose connecting the filler tube to the tank. Remove the filler tube by pulling it upwards	
	b) Take out the rear seat. Remove the inspection cover, disconnect the rubber hose from the outlet pipe on the tank.	
	c) Disconnect the petrol tank from the chassis and from the axle crossmember and remove it	12 mm box spanner
4	Disconnect the rear brake tubes from the unions on the flexible pipes. Disconnect the flexible pipes from the brackets on the arms	17 mm box spanner 12 mm spanner
5	<u>To Disconnect the Suspension Tie Rods from the Axle Arms</u> (see Pl. 73).	
	a) Remove one spring clip (2) from the clevis pin (3)	
	b) Remove the clevis pin (3)	
	NOTE - After removing or refitting an axle, it is always preferable to make a re-adjustment of the height. If this is not done, do not turn the end of the tie rod (7), otherwise the height adjustment will be altered.	
6	Disconnect the axle crossmember from the chassis. Remove the securing screws, unscrewing them by the heads ...	17 mm box spanner
7	<u>To Remove an Axle Arm</u> (see Pl. 49).	
	a) Remove the cover plate (1). Take out the friction disc (2)	12 mm spanner 12 mm box spanner
	b) Take out the split pin and remove the adjustment nut (3) (use the spanner 1833-VA, see Pl. 51, fig. 1)	Spanner 1833-VA
	c) Remove the arm from the axle crossmember by tapping the arm with a mallet if necessary	
8	<u>Remove the remainder of the axle and arm assembly</u> from the vehicle	

		TOOLS
	REPLACEMENT (see Pl. 49)	
	NOTE - If the rear axle assembly has been replaced, it is first necessary to remove an arm to enable the axle to be fitted on the chassis in order to avoid having to remove the body work (see para. 7, this operation).	
9	Put the axle in position on the chassis, introducing it from the side of the vehicle. Make sure that the dowels are properly seated in the holes in the chassis (on the AU type van, fit the 10 mm aluminium shim). Put the securing screws in position. Put the heads of the screws under the chassis. Fit a double lockwasher under the screw heads. Tighten the screws to 29 ft/lbs. (4 m.kg) (turning the screws by the head). Fit a lockwasher under the nuts (on earlier types the axle securing brackets are not tapped). Turn over the lockwashers	17 mm box spanner
	NOTE - On types AU and AZU vans, equipped with visible suspension springs, there is no aluminium shim.	
10	<u>To Fit the Axle Arm</u>.	
	a) Grease the inner and outer bearings (36 and 46) (special bearing grease)	
	b) Put the arm in position on the axle crossmember. Insert the outer bearing (46) in the housing on the crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	c) Screw up and tighten the nut (3) to 36 ft/lbs. (5 m.kg) in order to ensure the correct seating of the bearing (use the spanner 1833-VA, see Pl. 51, fig. 1)	
	Then unscrew the nut (3) and retighten it to a torsion of 22 to 25 ft/lbs. (3 to 3.5 m.kg). The arm must turn freely without stiffness at any point	
	Bring the slot nearest to a locking pin hole opposite that hole by tightening or slackening the nut. Insert the split pin in the nut (3). Open out the ends of the split pin in the bore of the crossmember	Spanner 1833-VA
	d) Fit the friction disc (see Pl. 50 for location). Fit a paper gasket between the friction disc and the arm hub. Put the friction disc on the lugs on the crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2). Fit the cover plate (1) with a paper gasket between the plate and the friction disc, tighten the screws, fitting a serrated washer under each head	Spanner 1834-VA 12 mm box spanner 12 mm spanner
11	Fit the flexible brake pipes : in order to facilitate their fitting, raise the arm of the axle, tighten the nuts securing the unions to the brackets, fitting a serrated washer. Couple the connecting tubes to the wheel cylinders and to the flexible pipes	12 mm and 17 mm spanners
	NOTE - The flexible pipes must never touch the chassis or the arm whatever the position of the arm	

		TOOLS
12	Fit the petrol tank (on types A and AZ Saloon cars only). Tighten the securing screws, fitting one flat and one serrated washer under each head	T-spanner 12 mm socket
	Fit the flexible connecting hose in position on the filler tube and tighten the clip	
	NOTE - The filler tube has a flat which must be located so that there is clearance for the wheel.	
	Put the rubber hose on the outlet pipe from the reservoir (without clip).	
	Fit the inspection cover with the felt gasket. Tighten the screws, fitting a klingerite washer under the heads	
	Put the dipstick in position and fit the filler cap.	
	Put the rear seat in position	T-spanner 12 mm socket
13	<u>To Connect the Suspension Tie Rods to the Arms</u> (see Pl. 73).	
	Put the clevis pin (3) in position and secure with the spring clip (2)	
14	Fit the dampers. Tighten the securing nuts to $43\frac{1}{2}$ ft/lbs. (6 m.kg) and lock with split pins	17 mm spanner 17 mm box spanner
15	Bleed the brake system (see Op. 49, paras. 18 and following)	
16	Fit the wheels	Wheel brace
17	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
18	Adjust the heights if necessary (see Op. 50)	

		TOOLS
	DISMANTLING	
1	Put the axle on a stand (use the stand MR-3301-60, see Pl. 59)	Stand MR-3301-60
2	<u>To Remove the Axle Arm</u> (see Pl. 49).	
	a) Remove the cover plate (1). Remove the friction disc (2)	12 mm box spanner
	b) Take out the split pin and remove the nut (3) (use the spanner 1833-VA, see Pl. 51, fig. 1). Remove the oil seal (55) from the nut	Spanner 1833-VA
	c) Remove the arm from the axle crossmember by tapping on the arm hub with a mallet if necessary	
3	<u>To Remove the Inner Bearings</u> (see Pl. 49).	
	a) Take out the felt from the metal case of the seal (37) with a screwdriver (in order to allow the extractor to be fitted in the oil seal casing)	
	b) Extract the bearing (36) (use the extractor 1829-VA, see Pl. 61)	Extractor 1829-VA
	c) Drive out the half casing of the oil seal (37) still in the crossmember	
	NOTE - The oil seal (37) must be renewed every time it is removed.	
4	<u>To Remove the Hub Brake Drums and the Brake Shoes</u> (see Pl. 64 and 65).	
	a) With a 4 mm dia. drill, drill the centre punch marks retaining the ring nut (4). Remove the ring nut (use the spanner 1811-VA, see Pl. 66, fig. 2). Hold the drum still by means of a lever resting on the wheel studs. It is sometimes necessary to scrape the nut in order to release it	Spanner 1811-VA
	b) Remove the bearing locknut (5)	44 mm box spanner
	c) Remove the drum (use the extractor 2003-VA see Pl. 66, fig. 1)	Extractor 2003-VA
	d) Remove the outer cups (6) of the springs by turning them through a quarter of a turn in order to release them from the rod. Remove the springs (7) and the rods (8)	
	Unhook the return spring (9) from the shoes with the aid of universal pliers	
	Take out the split pins and remove the nuts (10) on the anchorage pins, remove the flat washers (20). Remove the two brake shoes from the backplate. Remove the eccentrics from the shoes	12 mm box spanner
	e) Remove the brake tube. Remove the wheel cylinder	10 mm box spanner 12 mm spanner

		TOOLS
5	To Strip Down the Hub Brake Drums (see Pl. 64).	
	a) Drive out the double bearing (11) from the hub with the aid of a tube and press	Tube : Internal dia. = 35 mm External dia. = 44 mm Length = 150 mm
	b) Drive out the oil seal (12)	
6	To Strip Down the Axle Arms and the Brake Backplates (see Pl. 49).	
	a) Drive out the outer races of the bearings (46 and 36) from the arm hub with the aid of a punch with a square edge, and remove the washers (71), if fitted	
	b) Remove the rivets and drive out the adjustment cams (13) (see Pl. 65)	
7	To Strip Down the Wheel Cylinders (see Pl. 65).	
	a) Remove the dust cover (14) the pistons (15), the cups (16) and the spring (17)	
	b) Unscrew the bleed screw (18) (see Pl. 64)	8 mm spanner
	ASSEMBLY	
8	To Prepare the Wheel Cylinders (see Pl. 65).	
	NOTE - Use only alcohol or special brake fluid for cleaning the parts. Any other substance will cause rapid deterioration of the rubber cups. Smear the cylinder and the cups with special brake fluid.	
	a) In the cylinder place: one cup (16), one piston (15) together with its dust cover (14), the spring (17), one cup (16) and one piston (15) fitted with its dust cover (14)	
	b) Put the bleed screw (18) in position and tighten it provisionally (see Pl. 64). Fit the cap on the bleed screw	8 mm spanner
9	To Prepare the Axle Arm and Brake Backplates (see Pl. 49 and 65).	
	NOTE - (see Pl. 49) - We have successively fitted two types of arms :	

on Type A Saloon Cars :	On Type AU Vans :
L.H. rear A-422-1 b	L.H. rear AU-422-1
R.H. rear A-422-1 c	R.H. rear AU-422-1a

TOOLS

with bearing housing 42.4 mm deep (towards the inside) and 28.5 mm deep (towards the outside) and later the new type arms :

on Types A and AZ Saloons :	on Types AU and AZU Vans :
L.H. rear A-422-1 d	L.H. rear AU-422-1 b
R.H. rear A-422-1 e	R.H. rear AU-422-1 c

with bearing housing 39.4 mm deep (towards the inside) and 25.5 mm deep (towards the outside).

The new arms are fitted with bearings :

S.K.F. No. 620.041, dimensions 63.5 x 95 x 17

or Timken No. 620.042, dimensions 63.5 x 95 x 17

Our Spare Parts Division will now only supply the new arms and the new bearings.

On an old type arm, the new bearings (620.041 or 620.042) can be fitted by inserting a washer (71), sold under the No. A-422-93, 3 mm thick, between the bottom of the housing and the bearing.

On an old type arm, one old and one new bearing may be fitted.

If an old arm is replaced by a new one, both bearings must be replaced as well.

IMPORTANT - 1. An S.K.F. roller assembly must never be fitted in a Timken bearing housing or vice versa, since the taper of the rollers is different.

2. On one and the same arm, two bearings of different makes may be fitted.

a) Put the inner and outer races of the bearing (36 and 46) in the bore of the arm with the aid of a punch with a square edge. Make sure that the races are properly seated on their bearing faces..............................

b) Fit the adjustment cams (13). Lock the pins (use the tool MR-3354-10, see Pl. 67) .... Tool MR-3354-10

10 To Prepare the Hub Brake Drum (see Pl. 64 and 65).

NOTE - *When replacing wheel studs, never completely disconnect the drum from the hub:* replace one stud only at a time. The grinding of the drum is carried out at the Works, with the two components assembled, with great precision.

a) Drive out a wheel stud and tighten the replacement stud with the aid of a fixture (use the tool MR-3445, see Pl. 68). Drill the dowel hole (away from the old hole). Insert the dowel, make sure that it does not project and lock it with a centre punch.. Tool MR-3445

b) Put the oil seal (12) in position with the leather edge facing the bearing. The metal casing of the oil seal must be 0.1 to 0.5 mm below the bearing shoulder of the bearing so that the latter does not rub against the seal. Obtain this condition when fitting it by using a punch and a press (use the punch MR-3676-10, see Pl. 62, fig. 1) .... Punch MR-3676-10

		TOOLS
	c) Check the bearing. Secure the two inner races against each other by means of a bolt and two washers. Check the clearance of the bearing	
	d) Fit the bearing. Grease the bearing (11) (Mobilgrease No. 5). Insert it in the bore of the hub with a press and the aid of a tube resting on the outer race of the bearing	Tube : Internal dia. = 68 mm External dia. = 71.5 mm Length = 100 mm
	e) Grind the bearing faces of the brake shoes on a lathe (use the mandrel 2119-VA, see Pl. 69). The eccentricity tolerance is 0.1 mm maximum. Check the grinding with a dial gauge	
	Do not increase the original diameter of 180 mm by more than 2 mm	Mandrel 2119-VA
11	<u>To Fit the Brake Shoes and Centre Them</u> (see Pl. 64 and 65).	
	a) Lightly oil the adjustment eccentrics (19) and put them in position in the brake shoes	
	NOTE - The linings must be completely dry without any traces of oil and the rivets must be below the surface of the lining, if not, renew the brake shoes.	
	b) Put the shoes in position on the brake backplate: *at the front, fit the shoe with the unlined portion at the top.* Fit the flat washers (20) on the eccentric pins, tighten the nuts (10) provisionally	
	Fit the rods (8), the spring (7), the outer cup (6) and lock the latter on the rod (8) by turning it through a quarter of a turn	
	Make sure that the brake shoes move freely	12 mm, 21 mm and 24 mm box spanners
	c) Fit the wheel cylinder, tighten the two screws, fitting a spring washer under each head. Connect up the brake tube. Tighten the screw with a copper washer on each side of the union. Hook up the brake shoe return spring (9) with the aid of universal pliers	10 mm box spanner 17 mm spanner
	d) Centre the brake shoes (use the fixture 2113-VA, see Pl. 70)	Fixture 2113-VA 21 mm and 24 mm box spanners
	e) Tighten the nuts (10) moderately and lock them with split pins	12 mm box spanner
12	Fit the brake drum on the stub axle with the aid of a tube and a press	Tube: Internal dia. = 36 mm External dia. = 44 mm Length = 200 mm
13	Put the lockwasher in position, tighten the nut (5) to 101 ft/lbs. (14 m.kg). Turn over the lockwasher on one face of the nut. Pack the metal cap of the ring nut (4) with grease (special bearing grease). Hold the drum still by means of a lever resting on the wheel studs. Tighten the ring nut (4) to a torsion of 108 to 144 ft/lbs. (15 to 20 m.kg), (use the spanner 1811-VA, see Pl. 66, fig. 2), and lock by means of three centre punch marks	44 mm box spanner Spanner 1811-VA

		TOOLS
14	<u>To Fit the Inner Bearing on the Axle Crossmember</u> (see Pl. 49).	
	a) Fit the oil seals (37) on the bearing housing (54) (use the tube MR-3616-20, see Pl. 54, fig. 1)	Tube MR-3616-20
	b) Insert the inner right-hand and left-hand bearings (36) in the housing in the axle crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)..	Tube MR-3616-20
	c) Grease the inner and outer bearings (special bearing grease)..	
15	<u>To Fit One Arm</u> (see Pl. 49).	
	NOTE - If the body was not removed, only one arm must be fitted in order to allow the axle to be replaced on the chassis.	
	a) Put the arm in position, insert the outer bearing (46) in the housing in the axle crossmember with the aid of a tube (use the tube MR-3616-20, see Pl. 54, fig. 1)..	Tube MR-3616-20
	b) Put the oil seal (55) in position on the bearing adjustment nut (3). The oil seal must be 0.1 to 0.5 mm below the face of the nut	
	c) Screw up and tighten the nut (3) to 36 ft/lbs. (5 m.kg) in order to ensure that the bearings are correctly seated (use the spanner 1833-VA, see Pl. 51, fig. 1)	
	Then slacken off the nut and retighten it to a torsion of 22 to 25 ft/lbs. (3 to 3.5 m.kg). The arm must turn freely without stiffness at any point	
	Bring the slot nearest to a pin locking hole opposite that hole by slackening or tightening the nut. Insert the split pin in the nut (3). Open out the ends of the split pin in the bore of the crossmember	Spanner 1833-VA
	d) Put the friction disc in place (see Pl. 50 for position) (if the heights have not been adjusted). Fit a paper gasket between the friction disc and the arm hub. Fit the friction disc on to the lugs on the axle crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2)	
	Fit the cover plate (1) with a paper gasket between the cover plate and friction disc. Tighten the screws fitting a serrated washer under each head	
	If the heights have to be adjusted, fit the friction disc and the cover plate only provisionally	Spanner 1834-VA 12 mm box spanner
	NOTE - 1. If a friction disc is faulty (broken spring, worn or broken linings, or the friction disc does not work), it must be replaced.	
	2. The rear friction disc can be identified by measuring the diameter of the wire and of the spring which are 5.4 mm and 35 mm respectively.	
16	Paint the assembly	
17	Remove the axle from the stand MR-3301-60	

		TOOLS
	REPLACEMENT OF A DRIVE SHAFT (see Pl. 53).	
	Removal.	
1	Remove the wing on the side of the drive shaft to be replaced	Wheel brace
2	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack under the chassis to the height of the front axle. Remove the wheel	Support MR-3300-70 Wheel brace
3	Take out the split pin and remove the hub retaining nut (29). Hold the hub (38) by means of a rod inserted in one of the holes in the brake backplates	32 mm box spanner
	NOTE - The left-hand stub axle formerly had a right-hand thread and vice versa. Since September 1954, both stub axles have right-hand threads.	
4	Take out the drive shaft; in order to do so push the drive shaft as far as it will go in the universal joint, gearbox end, in order to free the stub axle from the hub. Then take out the drive shaft from the sliding coupling	
	Replacement.	
5	To Fit the Drive Shaft.	
	NOTE - 1. In order to ensure constant velocity of movement when the car is running in a straight line, it is absolutely essential that the forks on the sliding coupling and on the splined drive shaft should be in line.	
	2. Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the splines on the drive shaft (adhesive grease) and push it into the sliding coupling as far as it will go so that the stub axle can be fitted in the hub	
	b) Oil the face of the hub securing nut (29) and tighten it to 144 ft/lbs. (20 m.kg). Keep the hub from turning by means of a rod inserted in one of the holes in the hub (38). Lock the nut with a split pin	
	Put the rubber dust cover in position on the sliding coupling	32 mm box spanner
6	Fit the wheel	Wheel brace
7	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52)	Support MR-3300-70
8	Fit the wing	Wheel brace

TOOLS

OVERHAULING A DRIVE SHAFT

Dismantling.

9 To Dismantle the Drive Shaft (see Pl. 63).

a) Remove the four circlips (47) from the bearings

b) If necessary, use a scraper to remove any burrs or paint liable to prevent the removal of the bearings

c) Ease the bearings (48) out of their housing by tapping on the yokes with a copper mallet. Remove the bearings, using pliers or gas pliers

d) Drive out the metal cups (49) with their seals (51) from the trunnion bearings (50)

e) Take out the trunnion (50) and remove the dust cover from the shaft

10 Clean the parts

Assembly.

11 To Prepare the Drive Shaft (see Pl. 63).

a) Put the metal cups (49) on the bearings of the trunnion (50) with the aid of a tube. Fit the seals (51) in each cup (49)

Tube :
Internal dia. = 14 mm
External dia. = 23 mm
Length = 100 mm

b) Pack the holes provided in each bearing for the purpose with grease (adhesive grease). Pack the bearings (48) with grease (adhesive grease) and fit 16 needles (52) in each bearing

c) Fit the trunnion (50) in the yoke on the transmission shaft. Put one bearing (48) in position with its circlip (47). Fit the second bearing (48) and its circlip (47)

Make sure that the circlips are properly seated in their grooves

d) Fit the stub axle yoke (53) on the trunnion. Put the bearings and the circlips in position as described in para. c)

e) Fit the dust cover on the drive shaft near the shaft splines

		TOOLS
	OVERHAULING A UNIVERSAL JOINT IN POSITION	
	Dismantling.	
1	Remove the wing on the side where the work is to be carried out	Wheel brace
2	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Support MR-3300-70 Wheel brace
3	To Remove the Drive Shaft (see Pl. 53).	
	a) Take out the split pin and remove the hub retaining nut (29). Hold the hub (38) by means of a rod inserted in one of the holes in the hub	32 mm box spanner
	NOTE - The left-hand stub axle formerly had a right-hand thread and vice versa. Since September 1954 both stub axles have a right-hand thread.	
	b) Remove the drive shaft. In order to do so, push the drive shaft as far as it will go in the universal joint, gearbox side, in order to free the stub axle from the hub. Then take out the drive shaft from the universal joint, gearbox side	
4	Disconnect the heater tube from the hot air intake	
5	To Disconnect the Sliding Coupling from the Yoke on the Differential Shaft (see Pl. 37).	
	a) Remove the two circlips (49) from the bearings, differential shaft side	
	b) If necessary, use a scraper to remove any burrs or paint liable to prevent the extraction of the bearing	
	c) Ease the bearings (50) from their housing by tapping the sliding coupling yoke with a copper mallet. Remove the two bearings with the aid of universal pliers or gas pliers. Remove the sliding coupling and trunnion assembly from the yoke on the differential shaft (88)	
	d) Remove the trunnion (89) from the sliding coupling yoke (operation similar to that described in paras. a), b), c).	
	e) Drive off the metal cups (51) and the seals (52) from the trunnion pins	

		TOOLS
	<u>Assembly</u>.	
6	<u>To Prepare the Sliding Coupling</u> (see Pl. 37).	
	a) Put in position on each pin of the trunnion (89) the metal cups (51) with the aid of a tube. Fit a seal (52) in each cup	Tube : Internal dia. = 14 mm External dia. = 23 mm Length = 100 mm
	b) Pack the holes provided in each pin for the purpose with grease (adhesive grease)	
	c) Pack the bearings (50) with grease (adhesive grease). Fit 16 needles (90) in each bearing	
	d) Put the trunnion (89) in the sliding coupling. Fit a bearing (50) and its circlip (49). Fit the second bearing (50) and its circlip (49)	
	Make sure that the circlips are properly seated in their grooves	
7	<u>To Couple the Sliding Coupling Yoke to the Yoke on the Differential Shaft.</u>	
	Engage the pins of the trunnion (89) in the bores in the yoke of the shaft (88). Put the bearings (50) and their circlips (49) in position. Make sure that the circlips are correctly seated	
8	<u>To Fit the Drive Shaft</u> (wheel side) (see Pl. 53).	
	NOTE - In order to ensure constant velocity of movement when running in a straight line, it is essential that the yokes of the sliding coupling and of the splined drive shaft should be in a line.	
	Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the sliding coupling yoke and the drive shaft splines (use adhesive grease). Push the shaft into the sliding coupling as far as it will go. Introduce the stub axle in the hub	
	b) Oil the face of the hub securing nut (29) and tighten to 144 ft/lbs. (20 m.kg). Prevent the hub from turning by means of a rod inserted in one of the holes of the hub. Lock the nut with a split pin	
	Put the rubber dust cover in position on the sliding coupling	32 mm box spanner
9	Fit the wheel	Wheel brace
10	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
11	Connect the heater tube to the hot air intake. Fit the wing	Wheel brace

		TOOLS
	REPLACEMENT OF A COMPLETE UNIVERSAL JOINT	
	Removal.	
12	Remove the wing on the side of the universal joint to be replaced	Wheel brace
13	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Wheel brace Support MR-3300-70
14	Remove the drive shaft (see para. 3, this operation)	
15	Disconnect the heater tube from the hot air intake	
16	Remove the brake drum by unscrewing the four nuts (1) (see Pl. 28). Remove the drum, keeping the sliding coupling yoke perpendicular to the drum	12 mm box spanner
17	To Remove the Brake Shoes (see Pl. 28 and 29).	
	a) Remove the bridge supports (2) of the adjustment cams (do not mislay the four distance pieces) and remove the two nuts (3) from the anchorage pins. Remove the two eccentrics (4)	12 mm box spanner
	b) Unscrew the two screws securing the wheel cylinder	12 mm spanner
	c) Disengage the sheath from the boss, and pass it through the brake backplate	
	d) Disengage the brake shoe and wheel cylinder assembly from the backplate	
	e) Unhook the brake cable from the control lever (5) and remove the brake shoe and wheel cylinder assembly	
18	Disconnect the brake cable from the intermediate lever. Remove the screws securing the silencer to the gearbox casing. Unscrew the screws securing the expansion chamber clip on the silencer. Lower the silencer to allow the passage of the brake cable	12 mm box spanner
19	Remove the brake backplate. Unscrew the six securing nuts. Remove the securing screws of the wheel cylinder. Release the backplate from the gearbox casing by tapping the back of the plate lightly with a mallet.	12 mm box spanner
	NOTE : VERY IMPORTANT - *Do not disturb the adjusting shims (86) (see Pl. 34) of the crown wheel and pinion assembly, otherwise the gearbox will have to be dismantled in order to re-adjust the bearing and tooth clearances.*	

		TOOLS
20	<u>To Remove the Universal Joint from the Brake Backplate</u> (see Pl. 28).	
	a) Hold the shaft in a vice (clamp it by the yoke). With a chisel remove the metal of the nut (42) knocked into the groove in the shaft. Unscrew the bearing retaining nut (42)	32 mm box spanner
	NOTE - *Right-hand thread for the right-hand backplate and vice versa.*	
	b) Drive out the differential shaft (88) from the bearing in a press and with the aid of a mallet	
	<u>Replacement</u>.	
21	<u>To Fit the Universal Joint on the Brake Backplate</u> (see Pl. 28).	
	a) Fit the differential shaft (88) in the bearing (65) in a press, or if not available with a mallet. The right-hand shaft can be recognised by its right-hand thread. The left-hand shaft has a left-hand thread	
	b) Screw up and tighten the locking nut (42). With a caulking chisel knock down the metal of the nut into the groove on the shaft in order to lock it	32 mm box spanner
	NOTE - Do not damage the collar on the brake backplate against which the Timken bearing bears.	
22	<u>To Fit the Brake Backplate</u> (see Pl. 34).	
	IMPORTANT NOTE - *Before fitting the brake backplate in position, insert the two securing screws of the wheel cylinder.* They cannot be fitted after the backplate is in position.	
	a) Fix the adjusting shims (86) (kept safely after their removal in para. 19) against the outer race of the differential bearings with grease	
	b) Engage the end of the brake cable in the crossmember of the chassis. Make sure that the sheath stop is correctly in place in the crossmember and that the sheath is properly engaged in the stop. Insert the end of the cable in the trunnion on the lever and provisionally screw up the adjusting nut. Tighten the securing nuts of the brake backplate.	12 mm box spanner
23	<u>To Fit the Brake Shoes</u> (see Pl. 28 and 29).	
	a) Put the brake shoe and wheel cylinder assembly in position. (The short lining is placed at the rear). Hook up the brake cable to the control lever (5). Hold the end of the cable in position with a finger. Open out the shoes to insert them behind the drive plate. Put the sheath of the brake cable in position. Complete the fitting of the wheel cylinder and the brake shoes	
	b) Secure the wheel cylinder in position by tightening the two screws. Fit the two adjusting eccentrics (4) and the two flat washers (87); tighten the nuts (3) provisionally	12 mm box spanner 12 mm spanner

		TOOLS
	c) Fit the two support bridges (2) for the adjustment cams. Between the backplate and the bridge fit the shoe distance pieces. Tighten the screws, fitting a spring washer under each head	12 mm box spanner
	d) Make sure that the shoes move freely and that they are properly supported on the bridges. The lateral clearance must be between 0.05 mm and 0.1 mm. Obtain this condition by choosing the correct distance pieces from those sold by our Spare Parts Division. (Excessive clearance may cause the brakes to judder)	
24	<u>To Centre the Brake Shoes</u> (use the fixture 2112-VA see Pl. 46).	
	Tighten the nuts (3) finally and lock them with split pins (see Pl. 29)	12 mm and 21 mm box spanners Fixture 2112-VA
25	Fit the brake drums, keeping the sliding coupling yoke perpendicular to the drum. Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg), fitting a serrated washer under each nut (see Pl. 28)	12 mm box spanner
26	<u>To Adjust the Eccentrics</u> (see Pl. 28).	
	a) With a screwdriver, force out a plug (94) from the brake drum	
	b) Turn the pin of the adjustment cam in the direction shown in Pl. 29, at the same time turning the brake drum by hand, until the shoe makes contact with the drum. Bring the shoes slightly backwards to release them from the drum and bring them forward again until the lining exerts slight pressure. (Never finish the adjustment by bringing the shoes back). The shoe must be adjusted as near the drum as possible, in order to ensure short travel of the pedal. Adjust the second shoe in the same way. Fit the plug (94)	21 mm box spanner
27	<u>To Fit the Drive Shaft</u> (see Pl. 53).	
	(See para. 8, this operation).	
28	Connect the silencer to the gearbox, tighten the screws, fitting one flat washer and one spring washer under each head. Tighten the screw of the clip	12 mm box spanner 12 mm spanner
29	Fit the wheel	Wheel brace
30	Bleed the brake system (see Op. 49, paras. 18 and following)	
31	Adjust the handbrake (see Op. 49, para. 16)	
32	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52)	Support MR-3300-70

		TOOLS
33	Connect the heater tube to the hot air intake; tighten the clip	
34	Fit the wing	Wheel brace

OVERHAULING A UNIVERSAL JOINT

Dismantling.

35	See para. 5, this operation	

Assembly.

36	See paras. 6 and 7, this operation	

		TOOLS
	OVERHAULING A UNIVERSAL JOINT ON THE CAR	
	Dismantling.	
1	Remove the wing on the side where the work is to be carried out	Wheel brace
2	Jack up the car (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Support MR-3300-70 Wheel brace
3	To Remove the Drive Shaft (see Pl. 53).	
	a) Take out the split pin and remove the hub retaining nut (29). Hold the hub (38) by means of a rod inserted in one of the holes in the hub	32 mm box spanner
	NOTE - The left-hand stub axle formerly had a right-hand thread and vice versa. Since September 1954 both stub axles have right-hand threads.	
	b) Remove the drive shaft. In order to do so, push the drive shaft into the universal joint, the gearbox side, as far as it will go, in order to free the stub axle from the hub. Then take out the drive shaft from the universal joint, gearbox side	
4	Disconnect the heater tube from the hot air intake	
5	To Disconnect the Sliding Coupling Yoke from the Differential Shaft Yoke (see Pl. 37).	
	a) Remove the two circlips (49) from the bearings, on the differential shaft side	
	b) If necessary, use a scraper to remove any burrs or paint liable to prevent the removal of the bearings	
	c) Ease the bearings (50) from their housing by tapping on the sliding coupling yoke with a copper mallet. Remove the two bearings with a pair of universal pliers or gas pliers. Disengage the sliding coupling and trunnion from the yoke of the differential shaft (88)	
	d) Remove the trunnion (89) from the sliding coupling (operation identical with that described in paras. a), b), c).	
	e) Drive out the metal cups (51) and the seals (52) from the trunnion pins....................	
	Assembly.	
6	To Prepare the Sliding Coupling Yoke (see Pl. 37).	
	a) On each pin of the trunnion (89) fit the metal cups (51) with the aid of a tube. Put a seal (52) in each cup.	Tube: Internal dia. = 14 mm External dia. = 23 mm Length = 100 mm

No.	Operation	TOOLS
	b) Pack the holes provided for this purpose in each trunnion pin with grease (adhesive grease)	
	c) Pack the bearings (50) with grease (adhesive grease). Fit 16 needles (90) in each bearing	
	d) Place the trunnion (89) in the sliding coupling yoke. Put one bearing (50) and the circlip (49) in position. Fit the second bearing (50) and the circlip (49)	
	Make sure that the circlips are properly seated in their grooves.	
7	<u>To Connect the Sliding Coupling Yoke to the Yoke on the Differential Shaft.</u>	
	Insert the pins of the trunnion (89) in the bores in the fork of the shaft (88). Fit the bearings (50) and the circlips (49). Make sure that the circlips are properly seated in their grooves	
8	<u>To Fit the Drive Shaft</u> (wheel side) (see Pl. 53).	
	NOTE - In order to ensure constant velocity of movement when the car is running in a straight line, it is essential that the forks on the sliding coupling and on the splined drive shaft should be in line.	
	Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the sliding coupling and the splines on the drive shaft (adhesive grease). Push the drive shaft as far as it will go into the sliding coupling. Introduce the stub axle into the hub	
	b) Oil the face of the hub securing nut (29) and tighten to 144 ft/lbs. (20 m.kg). Stop the hub from turning by means of a rod inserted in one of the holes in the hub. Lock the nut with a split pin. Fit the rubber dust cover on the sliding coupling	32 mm box spanner
9	Fit the wheel	Wheel brace
10	Lower the vehicle to the ground (use the stand MR-3300-70 placed on a roller jack, see Pl. 52)	Stand MR-3300-70
11	Connect the heater tube to the hot air intake. Fit the wing	Wheel brace
	REPLACEMENT OF A COMPLETE UNIVERSAL SHAFT	
	<u>Removal.</u>	
12	Remove the wing	Wheel brace
13	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Wheel brace Support MR-3300-70

		TOOLS
14	<u>To Remove the Drive Shaft</u> (see Pl. 53). See para. 3, this operation.	
15	Disconnect the heater tube from the hot air intake	
16	<u>To Remove the Brake Drum</u>. Undo the four nuts (1) (see Pl. 29 A). Remove the drum, keeping the sliding coupling yoke perpendicular to the drum. (On the left-hand side, it is sometimes necessary to disconnect the expansion chamber from the gearbox).	12 mm box spanner
17	<u>To Remove the Brake Shoes</u> (see Pl. 29 A and 29 B). a) Remove the cup washers (101) retaining the springs, by turning them through a quarter of a turn in order to release them from the guide rod (114). Remove the guide rod and the springs. b) Remove the brake eccentric nuts (3), remove the washers (87) and the adjusting eccentrics (4) .... c) Remove the brake shoes. In order to do so, bring the bottom part of the brake shoes together in order to release the top part from the wheel cylinder. Unhook the return spring from the brake shoes and the brake cable from the lever	 12 mm box spanner
18	Disconnect the brake cable from the intermediate lever. Remove the screws securing the silencer to the gearbox casing. Unscrew the screw securing the expansion chamber clip to the silencer. Lower the silencer to allow the passage of the brake cable	12 mm box spanner
19	<u>To Remove the Brake Backplate and the Differential Shaft</u>. a) Remove the four securing nuts .... b) Remove the brake backplate and shaft assembly by tapping behind the driving plate with a copper mallet......... NOTE: VERY IMPORTANT - 1. Do not disturb the adjustment shims (86) (see Pl. 34) for the crown wheel and pinion assembly, otherwise it will be necessary to dismantle the gearbox in order to carry out re-adjustment of the bearing and tooth clearances. 2. If the backplate and bearing assembly are secured by screws, the latter must be replaced by studs 616.006 with nuts 2491-S. Before fitting, check the length of the tapped portion in the casing; this must be at least 17 mm. If it is not, extend the thread (diameter = 7 mm, pitch = 100 mm). Fit the studs, screwing the longer portion in the casing. Tighten the backplate nuts to a torsion of 10 to $15\frac{1}{2}$ ft/lbs. (1.4 to 1.9 m.kg), fitting a serrated washer under each head.	 12 mm box spanner

	TOOLS
20 To Remove the Universal Joint from the Hub (see Pl. 29 A).	
a) Hold the differential shaft in a vice, clamping it by the fork on the sliding coupling (remove the greaser if necessary).	
b) With a chisel, drive out the metal of the nut (42) knocked into the groove in the shaft. Unscrew and remove this nut. (NOTE : left-hand thread for the left-hand shaft and vice versa)	32 mm box spanner
c) Press out the differential shaft (88) from the bearing with a press and rest the plate on two vee blocks..........	
Remove the backplate from the hub	
Replacement.	
21 To Fit the Universal Joint in the Hub (see Pl. 29 A).	
a) Insert the differential shaft (88) in the bearing (65) with a press or if one is not available with a mallet. The right-hand shaft can be recognised by the fact that it has a right-hand thread. The left-hand shaft has a left-hand thread.	
b) Screw up and tighten the retaining nut (42). With a caulking hammer, knock down the metal of the nut into the groove in the shaft, in order to lock it	32 mm box spanner
22 To Fit the Hub and the Brake Backplate (see Pl. 34).	
a) Use grease to secure the adjustment shims (86) found during the dismantling operation against the outer race of the differential bearing	
b) Smear the mating faces of the hub and the differential shaft or of the distance piece (if one was fitted) with hermetic.	
c) Fit the hub, tighten the securing nuts with a serrated washer under the heads	
23 To Fit the Brake Shoes (see Pl. 29 A and 29 B).	
a) Hook the return spring on to the brake shoes, the spring must be put behind the shoes and the longest end must be hooked on to the shoe carrying the handbrake lever	
b) Fit the shoes in position, hooking the handbrake cable to the lever (5).	
(NOTE : Do not damage the wheel cylinder dust covers when fitting the upper ends of the brake shoes on the cylinder).	
c) Lightly oil the adjustment eccentrics (4) and put them in position. Fit the washers (87) on the pin and provisionally screw up the eccentric nuts (3)	
d) Fit the guide rods (114), the springs (115) and the retaining cup washers (101) and lock the latter by rotating them through a quarter of a turn	
Make sure that the brake shoes move freely	12 mm box spanner

		TOOLS
24	To Centre the Brake Shoes.	
	Use the fixture 2112-VA, see Pl. 46, and a 14 mm double-ended spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2) to adjust the cams........	
	Carry out the adjustment of the cams in the direction shown in Pl. 29 B........	Fixture 2112-VA Spanner 2126-VA
25	To Fit the Brake Drum (see Pl. 29 A).	
	Fit the brake drum, holding the sliding coupling fork perpendicular to the drum. Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg). Fit a serrated washer under the nuts	12 mm box spanner
26	To Adjust the Cams.	
	Turn the cam pin (using a 14 mm double-ended spanner) (use the spanner 2126-VA, see Pl. 29 A, fig. 2) in the direction indicated in Pl. 29 B, at the same time turning the drum by hand until the brake shoe just makes contact with the drum. Move the shoe slightly back in order to release it and bring it towards the drum again until the linings exert light pressure, (never finish the adjustment by moving the brake shoes away from the drum)........	
	The shoe must be adjusted as near the drum as possible in order to ensure that the pedal has only a short distance to travel	
	Proceed in the same way for the other shoe........	Spanner 2126-VA
27	To Fit the Drive Shaft (see Pl. 53).	
	See para. 8, this operation.	
28	Connect the silencer to the gearbox casing (if it was removed), tighten the screws and fit one flat washer and one spring washer under each head. Tighten the screw of the clip	12 mm spanner 12 mm box spanner
29	Fit the wheel	Wheel brace
30	Bleed the brake system (see Op. 49, para. 18 and following)........	
31	Adjust the handbrake (see Op. 49, para. 16)	
32	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52)	Support MR-3300-70
33	Connect the heater tube to the hot air intake, and tighten the clip	
34	Fit the wing........	Wheel brace

		TOOLS
	REPLACING A DRUM	
	<u>Removal</u>.	
1	Remove the wing on the side where the work is to be carried out	Wheel brace
2	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Support MR-3300-70 Wheel brace
3	<u>To Remove the Drive Shaft</u> (see Pl. 53).	
	a) Take out the split pin and remove the hub retaining nut (29). Hold the hub (38) by means of a rod inserted in one of the holes of the hub	32 mm box spanner
	NOTE - The left-hand stub axle formerly had a right-hand thread and vice versa. Since September 1954, both stub axles have right-hand threads.	
	b) Remove the drive shaft. In order to do so, push the drive shaft as far as it will go in the universal joint, gearbox side, in order to free the stub axle from the hub. Then take out the drive shaft from the universal joint on the gearbox side	
4	Disconnect the heater tube from the hot air intake	
5	Remove the brake drum by unscrewing the four nuts (1) (see Pl. 28). Release the drum at the same time holding the sliding coupling yoke perpendicular to the drum	12 mm box spanner
	<u>Replacement</u>.	
6	<u>Centre the Brake Shoes</u> (use the fixture 2112-VA, see Pl. 46).	
	Tighten the nuts (3) finally and lock them with split pins, (see Pl. 28)	Fixture 2112-VA 12 mm and 21 mm box spanners
7	Fit the brake drum, holding the sliding coupling yoke perpendicular to the drum.	
	Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg), fitting a serrated washer (see Pl. 28)	12 mm box spanner
8	<u>To Adjust the Eccentrics</u> (see Pl. 28).	
	a) Using a screwdriver drive out one plug (94) from the brake drum	

		TOOLS
	b) Turn the pin of the adjustment cam in the direction shown in Pl. 29, at the same time turning the hub by hand until the brake shoe makes contact with the drum. Move the brake shoe slightly back in order to release it and then bring it forward again until the lining exerts a light pressure (never complete the adjustment by moving the brake shoe away from the drum). The brake shoe must be adjusted as near the drum as possible to ensure the pedal has only a short distance to travel. Adjust the second brake shoe in the same way. Fit the plug (94)	21 mm box spanner
9	<u>To Fit the Drive Shaft</u> (see Pl. 53).	
	NOTE - 1. In order to ensure constant velocity of movement when the car is running in a straight line, it is essential that the forks of the sliding coupling and of the splined drive shaft should be in the same line.	
	2. Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the sliding coupling and the splines on the drive shaft. Push the drive shaft as far as it will go in the sliding coupling. Introduce the stub axle into the hub	
	b) Oil the face of the hub securing nut (29) and tighten to 144 ft/lbs. (20 m.kg). Stop the hub from turning by means of a rod inserted in one of the holes of the hub. Lock the nut with a split pin	
	Fit the rubber dust cover on the sliding coupling	32 mm box spanner
10	Fit the wheel	Wheel brace
11	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
12	Connect the heater tube to the not air intake, tighten the clip	
13	Fit the wing	Wheel brace
	REPLACING THE BRAKE SHOES OR A WHEEL CYLINDER	
	<u>Removal</u>.	
14	Remove the wing on the side where the work is to be carried out	Wheel brace
15	Disconnect the heater tube from the hot air intake	

		TOOLS
16	Jack up the vehicle (see Para. 2, this operation)	
17	Remove the drive shaft (see para. 3, this operation)	
18	Remove the brake drum (see para. 5, this operation)	
19	<u>To Remove the Brake Shoes</u> (see Pl. 28 and 29).	
	a) Remove the bridge supports (2) of the adjusting cams and the two anchorage nuts (3). Do not mislay the four distance pieces. Remove the two eccentrics (4)	12 mm box spanner
	b) Disconnect the connecting brake pipe from the wheel cylinder without disconnecting it from the flexible pipe	12 mm spanner
	c) Unscrew the two securing nuts on the wheel cylinder	
	d) Free the cable casing from the boss and insert it as far as possible in the brake backplate	
	e) Release the brake shoe and wheel cylinder assembly from the backplate	
	f) Unhook the brake cable from the control lever (5) and remove the brake shoe and wheel cylinder assembly	
20	<u>To Remove the Wheel Cylinder</u> (see Pl. 38).	
	a) Move the brake shoes into the position shown in fig. 1. Disconnect the wheel cylinder	
	b) Unhook the return springs from the brake shoes	
	<u>Replacement.</u>	
21	<u>To Prepare the Brake Shoe and Wheel Cylinder Assembly</u> (see Pl. 38).	
	The brake shoe with the short lining is to be fitted at the rear	
	a) Hook the return spring to the brake shoes (see fig. 1 or fig. 2 for position)	
	b) Fit the brake shoes as shown in fig. 1. Put the wheel cylinder in position. NOTE : the two cylinders are symmetrical and the union for the connecting pipe must be on the same side as the short lining	
	Move the brake shoes into their working position, (fig. 2)	
	NOTE - The brake shoe lining must be perfectly dry and without any traces of oil. The rivets must not project above the surface of the lining, otherwise the brake shoe assembly must be replaced	

		TOOLS
22	<u>To Fit the Brake Shoes</u> (see Pl. 28 and 29).	
	a) Put the brake shoe and wheel cylinder assembly in position. (The short lining is placed at the rear). Hook the brake cable on to the control lever (5). Hold the end of the cable in position with a finger. Open out the brake shoes in order to place them behind the driving flange	
	Put the brake cable casing in position. Complete the fitting of the wheel cylinder and the brake shoes	
	b) Secure the wheel cylinder by tightening the two screws. Put the two eccentrics (4), and the two washers (87) in position and tighten the nuts (3) provisionally	12 mm spanner 12 mm box spanner
	c) Fit the two support bridges (2) for the adjusting cams. Insert the brake shoe distance pieces between the backplate and the bridge. Tighten the screws, fitting a spring washer under each head	12 mm box spanner
	d) Make sure that the brake shoes move freely and that they are properly supported by the bridges. The side play must be between 0.05 and 0.01 mm. Obtain this clearance by selecting the correct distance pieces from among those sold by our Spare Parts Division. (Too much play can cause brake judder)	
	f) Connect the connecting brake pipe to the wheel cylinder	12 mm spanner
23	<u>To Prepare the Brake Drums</u> (see Pl. 39).	
	Grind the brake shoe bearing faces in the drum on a lathe (use the mandrel 2118-VA). The eccentricity tolerance is 0.1 mm maximum. Check the grinding with a dial gauge. Do not increase the original diameter of 200 mm by more than 2 mm	Mandrel 2118-VA
24	Centre the brake shoes (see para. 6, this operation).	
25	Fit the brake drum (see para. 7, this operation)	
26	Adjust the eccentrics (see para. 8, this operation)	
27	Fit the drive shaft (see para. 9, this operation)	
28	Fit the wheel	Wheel brace
29	Bleed the brake system (see Op. 49, paras. 18 and following)	
30	Adjust the handbrake (see Op. 49, para. 16)	
31	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52)	Support MR-3300-70
32	Connect the heater tube to the hot air inlet. Tighten the clip	
33	Fit the wing	Wheel brace

		TOOLS
	REPLACEMENT OF A HANDBRAKE CABLE	
	<u>Removal.</u>	
34	Remove the brake shoes (see paras. 1 to 5 and 19, this operation) without, however, disconnecting the wheel cylinder from the brake shoes	
35	Disconnect the brake cable from the intermediate cross-shaft. Remove the screws securing the exhaust silencer to the gearbox casing. Unscrew the screw securing the collar of the expansion chamber to the silencer. Lower the silencer in order to allow the passage of the brake cable	12 mm spanner 12 mm box spanner
36	<u>To Remove the Brake Backplate.</u> Unscrew the securing nuts. Release the backplate from the gearbox casing by tapping the back of the plate lightly with a mallet. Remove the securing screws from the wheel cylinder	
	NOTE : VERY IMPORTANT - *Do not displace the shims (86) (see Pl. 34) for adjusting the clearance between teeth of the crown wheel and bevel pinion, otherwise the gearbox must be dismantled in order to carry out re-adjustment of the crown wheel and pinion (see Op. 20).*	12 mm box spanner
37	Release the brake cable from the backplate	
	<u>Replacement.</u>	
38	Put the brake cable in position on the backplate. Use grease to fit the adjustment shims (86), found during the dismantling process, into the recess in the gearbox casing and against the outer bearing race	
39	*Put the two master cylinder securing screws in position* (this cannot be done once the backplate has been fitted).	
	Fit the backplate on the gearbox casing, at the same time inserting the end of the cable in the chassis crossmember. Make sure that the cable casing stop is correctly positioned in the crossmember and that the casing is correctly engaged in the stop. Insert the end of the cable into the trunnion on the lever and provisionally screw up the adjustment nut. Tighten the brake backplate securing nuts	12 mm box spanner
40	Fit the brake shoe and wheel cylinder assembly (see para. 22, this operation)	
41	Centre the brake shoes (see para. 6, this operation)	
42	Fit the brake drum (see para. 7, this operation)	

		TOOLS
43	Adjust the eccentrics (see para. 8, this operation)	
44	Fit the drive shaft (see para. 9, this operation)	
45	Connect the silencer to the gearbox and tighten the nuts, fitting one flat and one spring washer under the heads. Tighten the collar securing screw	12 mm spanner 12 mm box spanner
46	Fit the wheel	Wheel brace
47	Bleed the brake system (see Op. 49, paras. 18 and following).	
48	Adjust the handbrake (see Op. 49, para. 16)	
49	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52). Top up the oil level in the gearbox (extreme pressure oil) (SAE 80 EP). If the oil level is too high or the oil too thick, the operation of the gearbox may be adversely affected. (The synchronising cones may stick)	Support MR-3300-70
50	Connect the heater tube to the hot air intake, and tighten the clip	
51	Fit the wing	Wheel brace
	REPLACING A BRAKE BACKPLATE	
	<u>Removal</u>.	
52	Remove the brake shoes (see paras. 1 to 5 and 19, this operation) without, however, disconnecting the wheel cylinder from the brake shoes	
53	Remove the brake backplate (see para. 36, this operation).	
54	<u>To Strip Down the Brake Backplate</u> (see Pl. 28 and 29).	
	a) Disconnect the brake cable from the backplate	
	b) Hold the shaft in a vice (clamp it by the fork). With a chisel drive out the metal of the nut knocked down into the groove in the differential shaft. Unscrew the bearing retaining nut (42)	
	NOTE : right-hand thread for the right-hand drive shaft and vice versa	32 mm box spanner
	c) Drive out the differential shaft (88) from the bearing, in a press or by means of a mallet.	

	TOOLS
d) Remove the locking pin (43) from the ring nut (44) by driving it outwards with a bent punch inserted through the hub bore. Remove the ring nut (44) (use the spanner 1925-VA, see Pl. 36). Remove the bearing (65) using a copper rod	Spanner 1925-VA
e) Drive out the oil seal (45)	
f) Remove the oil deflector (46) from the backplate hub (if necessary) with a lever supported on the backplate......	
Replacement.	
55 To Assemble the Brake Backplate.	
a) Put the oil deflector (46) in position. Insert it in a press with the aid of a tube. (Hammering it into position may distort the metal). Bend the oil drain tube downwards in order to help the flow	Tube : Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm
b) Oil and fit the oil seal (45) (the rubber edge facing inwards). The oil seal can be fitted by hand. Make sure that the spring in the oil seal is in the correct position	
c) Oil (extreme pressure oil) and fit the bearing (65) which should engage easily in the bore in the plate. Screw up and tighten the ring nut (44) (use the spanner 1925-VA, see Pl. 36)	Spanner 1925-VA
Press in the cylindrical pin (43) to lock the ring nut. The pin must not project above the bearing face of the backplate or project beyond the inner face of the ring nut	
NOTE - If the pin is not opposite the slot, the ring nut (44) must not be slackened off for this purpose. If necessary, file down the bearing face of the ring nut so that it can be *tightened* to bring the slot opposite the pin.	
d) Insert the differential shaft, fitted with its universal joint into the bearing in a press or if no press is available, by tapping it with a mallet. Support the bearing on a tube	
The right-hand shaft can be recognised by its right-hand thread. The left-hand shaft has a left-hand thread........	
Screw up and tighten the locking nut (42). With a caulking chisel, knock down the metal of the nut into the bore in the shaft in order to lock it	32 mm box spanner Tube: Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm
Take care not to damage the bearing shoulder on the backplate for the Timken bearing.	
e) Put the brake cable in the backplate boss acting as the cable sheath stop. The brake cable must pass between the tube of the oil deflector and the backplate	

		TOOLS
56	To Fit the Brake Backplate. NOTE - If the backplate has been renewed, it may be necessary to change the thickness of the adjusting shims (86) so that the same clearance can be kept for the Timken bearing .... a) Place the gauge 1754-VA fitted with a dial gauge 2437-T in position on the shoulder of the backplate to be replaced (as shown in Pl. 44, fig. 2). Take measurements at three points and bring the zero on the movable dial of the dial gauge opposite the mean position of the large needle. Note the position occupied by the totalising needle ..... b) Put the gauge 1754-VA fitted with the dial gauge 2437-T on the shoulder of the new backplate (as shown in Pl. 44, fig. 2) .... Take measurements at three points and position the gauge so that the large needle gives the average of the two extreme measurements .... c) Bring the needles of the dial gauge (totalizing and large needles) back to the position they occupied in para. a), by pulling on the dial gauge spindle. Slowly release the spindle and count how many hundredths of a millimetre the large needle moves until the point of the dial gauge is again resting on the backplate. .... Example : the large needle moves to fifteen hundredths. In this case the adjustment shims (86) found when dismantling must be *reduced* by a number of shims equivalent to a thickness of 0.15 mm. NOTE - If the shoulder on the new backplate is lower than that on the old backplate, the procedure described above cannot be carried out. In that case, carry out operation a) on the new backplate and operation b) on the old backplate. The measurement c) will give the thickness of the shims to be *added* to those found when dismantling	Gauge 1754-VA Dial gauge 2437-T
57	Fit the brake backplate (see para. 39, this operation)	
58	Fit the brake shoe and wheel cylinder assembly (see para. 22, this operation)	
59	Centre the brake shoes (see para. 6, this operation)	
60	Fit the brake drum (see para. 7, this operation)	
61	Adjust the eccentrics (see para. 8, this operation)	
62	Fit the drive shaft (see para. 9, this operation)	
63	Connect the silencer to the gearbox. Tighten the screws with one flat and one spring washer under each head. Tighten the screws securing the expansion chamber clip to the silencer	12 mm spanner 12 mm box spanner

		TOOLS
64	Fit the wheels	Wheel brace
65	Bleed the brake system (see Op. 49, paras. 18 and following)	
66	Adjust the handbrake (see Op. 49, para. 16)	
67	Lower the vehicle to the ground. Top up the oil level in the gearbox (see para. 49, this operation)	Support MR-3300-70
68	Connect the heater tube to the hot air intake. Tighten the clip	
69	Fit the wing	Wheel brace
	REPLACING A BEARING OIL SEAL	
	Removal.	
70	Remove the brake shoes (see paras. 1 to 5 and 19, this operation) without, however, disconnecting the wheel cylinder from the brake shoes	
71	Remove the brake backplate (see para. 36, this operation)	
72	To Partially Strip Down the Brake Backplate (see Pl. 28 and 29).	
	a) Hold the shaft in a vice (clamp it by the fork). With a chisel, drive out the metal of the nut knocked down into the groove in the differential shaft. Unscrew the bearing retaining nut (42)	32 mm box spanner
	NOTE : *Right-hand thread for the right-hand shaft and vice versa.*	
	b) Drive out the differential shaft (88) from the bearing in a press or using a mallet	
	c) Drive out the oil seal (45)	
	Replacement.	
73	To Assemble the Brake Backplate (see Pl. 28 and 29).	
	a) Oil and put the oil seal (45) in position (with the rubber edge facing the inside). The ring can be fitted by hand. Make sure that the spring of the oil seal is in position	
	b) Insert the differential shaft together with its universal joint in the bearing in a press or if one is not available, with the aid of a mallet. Rest the bearing on a tube	

		TOOLS
	The right-hand shaft can be identified by its right-hand thread. The left-hand shaft has a left-hand thread	
	Screw up the retaining nut (42). With a caulking hammer, knock down the metal of the nut into the groove in the shaft in order to lock it	
	Take care not to damage the shoulder on the backplate for the Timken bearing	32 mm box spanner Tube : Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm
74	Fit the backplate (see para. 39, this operation), the brake cable has not been moved	
75	Fit the brake shoes and the wheel cylinder (see paras. 21 and 22, this operation)	
76	Centre the brake shoes (see para. 6, this operation)	
77	Fit the brake drum (see para. 7, this operation)	
78	Adjust the eccentrics (see para. 8, this operation)	
79	Fit the drive shaft (see para. 9, this operation)	
80	Connect the exhaust silencer (see para. 63, this operation)	
81	Fit the wheel	Wheel brace
82	Bleed the brake system (see Op. 49, paras. 18 and following)	
83	Adjust the handbrake (see Op. 49, para. 16)	
84	Lower the vehicle to the ground (see para. 11, this operation)	
85	Connect the heater tube and tighten the clip	
86	Fit the wing	Wheel brace

		TOOLS
	REPLACING A BRAKE DRUM	
	Removal.	
1	Raise the bonnet and remove the wing on the side on which the work is to be carried out	Wheel brace
2	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front axle. Remove the wheel	Support MR-3300-70 Wheel brace
3	To Remove the Drive Shaft (see Pl. 53).	
	a) Take out the split pin and remove the hub retaining nut (29). Hold the hub (38) by means of a rod inserted in one of the holes of the hub	32 mm box spanner
	NOTE - The left-hand stub axle formerly had a right-hand thread and vice versa. Since September 1954, both stub axles have a right-hand thread.	
	b) Remove the drive shaft. In order to do so, push the drive shaft as far as it will go in the universal joint, gearbox side, in order to free the stub axle from the hub. Then take out the drive shaft from the universal joint on the gearbox side	
4	Disconnect the heater tube from the hot air intake	
5	Remove the brake drum by unscrewing the four nuts (1) (see Pl. 29 A). Remove the drum, keeping the sliding coupling yoke perpendicular to the drum	12 mm box spanner
	Replacement.	
6	To Centre the Brake Shoes.	
	Use the fixture 2112-VA, see Pl. 46 and a 14 mm double-ended spanner (spanner 2126-VA, see Pl. 29 A, fig. 2) for the adjustment of the cams	
	Carry out the adjustment of the cams in the direction shown in Pl. 29 B	Fixture 2112-VA Spanner 2126-VA
7	Fit the brake drum, holding the sliding coupling jaw perpendicular to the drum. Tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg) fitting serrated washers (see Pl. 29 A)	12 mm box spanner

		TOOLS
8	<u>To Adjust the Cams.</u>	
	Turn the adjusting cam pin with a 14 mm adjustable spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2) in the direction shown in Pl. 29 B, at the same time turning the drum by hand until the shoe makes contact with the drum. Move the shoe slightly backwards to release it and then bring it forwards towards the drum until the lining exerts a slight pressure, (never finish the adjustment by moving the shoe away from the drum)	
	The shoe must be adjusted as near the drum as possible, so that the pedal has only a short distance to travel	
	Proceed in the same way for the other brake shoe	Spanner 2126-VA
9	<u>To Fit the Drive Shaft</u> (see Pl. 53).	
	NOTE - 1. In order to ensure constant velocity of movement when driving in a straight line, it is essential that the forks on the sliding coupling and on the splined drive shaft should be in the same plane.	
	2. Make sure that the rubber dust cover is fitted on the drive shaft.	
	a) Grease the sliding coupling and the splines on the drive shaft (use adhesive grease). Push the drive shaft into the sliding coupling as far as it will go. Introduce the stub axle into the hub	
	b) Oil the face of the hub securing nut (29) and tighten it to 144 ft/lbs. (20 m.kg). Prevent the hub from rotating by inserting a rod in one of the holes of the hub. Lock the nut with a pin	
	Fit the rubber dust cover on the sliding coupling	32 mm spanner
10	Fit the wheel	Wheel brace
11	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
12	Connect the heater duct to the hot air intake, and tighten the clip	
13	Fit the wing	Wheel brace

		TOOLS
	REPLACING THE BRAKE SHOES	
	Removal.	
14	Remove the drive shaft and the drum (see paras. 1 to 5, this operation)	
15	To Remove the Brake Shoes (see Pl. 29 B).	
	a) Remove the cup washers (101) from the springs, by rotating them through a quarter of a turn in order to release them from the guide rods. Remove the guide rods (114) and the springs (115)	
	b) Remove the brake eccentric nuts (3) and take out the washers (87) and the adjusting eccentrics (4)	12 mm box spanner
	c) Remove the brake shoes; in order to do so, bring the bottom part of the brake shoes together in order to release the upper part from the wheel cylinder, unhook the return springs from the brake shoes and the brake cable from the lever	
	Replacement.	
	NOTE - If the bearing and brake backplate assembly is secured by screws, the latter must be replaced by studs 616.006 with nuts 2491-S. Before fitting, check the length of the tapped portion in the casing. It must be at least 17 mm. If not, extend the thread (7 mm dia. x 100 mm pitch). Fit the studs, screwing up the longer portion in the casing. Tighten the nuts of the brake backplate to a torsion of 10 to 16 ft/lbs. (1.4 to 1.9 m.kg) inserting a serrated washer under each head.	
16	To Fit the Brake Shoes (see Pl. 29 A and 29 B).	
	a) Hook the return spring on to the brake shoes; the spring should be placed behind the shoes and the longest end hooked on to the brake shoe carrying the handbrake lever	
	b) Put the brake shoes in position and hook the brake cable to the handbrake lever (NOTE: do not damage the dust cover on the wheel cylinder when fitting the upper ends of the brake shoe on the cylinder)	
	c) Lightly oil the adjustment eccentrics (4) and put them into position. Put the nuts (87) on the pin and tighten the eccentric nuts (3) temporarily	
	d) Fit the guide rods (114), the pressure springs (115) and the cup washers (101) and lock the latter by rotating through a quarter of a turn	12 mm box spanner
	Make sure that the brake shoes move freely	

		TOOLS
17	<u>To Centre the Brake Shoes</u>.	
	Use the fixture 2112-VA, and a 14 mm double-ended spanner (spanner 2126-VA, see Pl. 29 A, fig. 2) for adjusting the cams	
	Adjust the cams in the direction indicated in Pl. 29 B	Fixture 2112-VA Spanner 2126-VA
18	Fit the brake drum, keeping the sliding coupling jaw perpendicular to the drum. Tighten the nut (1) to 29 ft/lbs. (4 m.kg) fitting a serrated washer (see Pl. 29 A)	12 mm box spanner
19	<u>To Adjust the Cams</u>.	
	Turn the pin of the cam, with a double-ended 14 mm spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2) in the direction shown in Pl. 29 B, at the same time rotating the drum by hand until the shoe makes contact with the drum. Move the shoe slightly away from the drum in order to release it, bring it towards the drum again until the lining exerts a slight pressure (never complete the adjustment by moving the shoe away from the drum) ...	
	The shoe must be adjusted as near to the drum as possible so that the pedal should have only a short distance to travel	
	Proceed in the same way for the other brake shoe	Spanner 2126-VA
20	To Fit the Drive Shaft.	
	See paras. 9 to 13, this operation.	
	REPLACING A WHEEL CYLINDER	
	<u>Removal</u>.	
21	Remove the wing on the side where the work is to be carried out	Wheel brace
22	Remove the drum by unscrewing the nuts (1) (see Pl. 29 A). Remove the drum, keeping the sliding coupling jaw perpendicular to the drum	
23	Slacken off the union screw of the brake pipe as far as possible. Remove the two screws securing the wheel cylinder to the brake backplate	
24	Open out the brake shoes by means of a lever and remove the wheel cylinder, at the same time finish unscrewing the union screw on the brake pipe	12 mm ring spanner with 10 mm flat 17 mm spanner

		TOOLS
	Replacement.	
25	Put the wheel cylinder in position on the brake backplate, open out the brake shoes with the aid of a lever. As the wheel cylinder is being fitted, screw up the union screw of the brake pipe, fitting a copper washer on each side of the union	
	Screw up and tighten the two screws securing the wheel cylinder to the brake backplate, fitting a spring washer under each screw head	
	Tighten the brake union screw	
	Make sure that the brake shoes are properly seated on the backplate	
26	Fit the drum, tighten the nuts (1) to 18 ft/lbs. (2.5 m.kg) fitting a serrated washer under each nut	12 mm box spanner
27	Bleed the brake system (see Op. 49, paras. 18 and following)	
28	Fit the wing	Wheel brace
	REPLACING A BRAKE CABLE	
	Removal.	
29	Remove the drive shaft and the drum. See paras. 1 to 5, this operation.	
30	Remove the brake shoes. See para. 15, this operation.	
31	Disconnect the exhaust from the gearbox casing. Disconnect the brake cable from the pedal gear. Remove the brake casing stop from the metal plate. Disconnect the cable from the plate by pulling it towards the front	12 mm box spanner 10 mm spanner

		TOOLS
	Replacement.	
32	Put the cable in the backplate, inserting the threaded end from the outside of the plate. Fit the cable casing stop in the chassis crossmember	
	Insert the cable through the stop and the crossmember and engage the threaded end in the trunnion on the pedal gear. Secure the casing stop on the brake backplate	10 mm spanner
	Tighten the wing nut for adjusting the cable temporarily	12 mm box spanner
	Connect the silencer to the gearbox	
33	To Fit the Brake Shoes.	
	See para. 16, this operation.	
34	To Centre the Brake Shoes.	
	See para. 17, this operation.	
35	Fit the brake drum, keeping the sliding coupling jaw perpendicular to the drum. Tighten the nuts (1) to 29 ft/lbs. (4 m.kg) fitting a serrated washer (see Pl. 29 A)	12 mm box spanner
36	To Adjust the Cams.	
	See para. 19, this operation.	
37	To Fit the Drive Shaft.	
	See para. 9, this operation.	
38	To Adjust the Handbrake.	
	See Op. 49, para. 16.	
39	Fit the wheel	Wheel brace
40	Lower the vehicle to the ground (use the support MR-3300-70, placed on a roller jack, see Pl. 52)	Support MR-3300-70
41	Connect the heater duct to the hot air intake and tighten the clip	
42	Fit the wing	Wheel brace

		TOOLS
	REPLACING A BEARING OIL SEAL	
	Removal.	
43	Remove the drive shaft and the drum. See paras. 1 to 5, this operation.	
44	Remove the brake shoes. See para. 15, this operation.	
45	To Remove the Brake Backplate and the Differential Shaft.	
	a) Remove the four securing screws	12 mm box spanner
	b) Release the backplate and shaft assembly by tapping the back of the drive shaft driving plate	
46	To Remove the Oil Seal (see Pl. 29 A).	
	a) Remove the greaser from the sliding coupling. Clamp the shaft in a vice by the fork	10 mm spanner
	b) Drive out with a chisel, the metal of the nut (42) knocked into the groove in the shaft. Undo and remove this nut. (NOTE : Left-hand thread for the left-hand shaft and vice versa)	32 mm box spanner
	c) Drive out the shaft from the bearing in a press, resting the metal plate on two vee blocks	
	d) Take out the oil seal (45) from the hub with a screwdriver. (Do not damage the hub during this operation)	
	Replacement.	
47	To Fit the Oil Seal (see Pl. 29 A).	
	a) Oil the seal (45) and put it in position in the hub (with the rubber edge facing the inside). The oil seal fits easily. Make sure that the spring in the oil seal is correctly in position	
	b) Insert the differential shaft in the hub bearing in a press or with a mallet, and support the bearing on a tube while the shaft is being fitted	Tube : Internal dia. = 26 mm External dia. = 32 mm Length = 200 mm

		TOOLS
	c) Screw up and tighten the retaining nut (42). With a caulking hammer, knock down the metal of the nut into the groove in the shaft. Screw up the greaser on the sliding coupling. (The right-hand shaft has a right-hand thread and vice versa)	10 mm spanner 32 mm box spanner
48	<u>To Fit the Brake Backplate and the Differential Shaft</u> (see Pl. 34).	
	a) Use grease to secure the adjustment shims (86) found on dismantling aginst the outer race of the differential bearings	
	b) Smear the mating faces of the differential shaft hub or of the distance piece (if one was fitted) with hermetic	
	c) Fit the hub, and tighten the securing screws, fitting a spring washer under each head	
49	To fit the brake shoes. See para. 16, this operation.	
50	To centre the brake shoes. See para. 17, this operation.	
51	Fit the brake drum, keeping the sliding coupling jaw perpendicular to the drum. Tighten the nuts (1) to 29 ft/lbs. (4 m.kg) fitting a serrated washer (see Pl. 29 A)	
52	To adjust the brake cams. See para. 19, this operation.	
53	To fit the drive shaft. See para. 9, this operation.	
54	To bleed the brake system. See Op. 49, paras. 18 and following.	
55	To adjust the handbrake. See Op. 49, para. 16.	
56	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
57	Connect the heater duct to the hot air intake, and tighten the clip	
58	Fit the wing	Wheel brace

		TOOLS
	REPLACING A HUB BRAKE DRUM	
	<u>Removal</u>.	
1	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the rear axle	Support MR-3300-70
2	Remove the wheel	Wheel brace
3	<u>To Remove the Hub Brake Drum</u> (see Pl. 64 and 65).	
	a) With a 4 mm dia. drill, drill the punch marks locking the ring nut (4). Remove the ring nut (use the spanner 1811-VA, see Pl. 66, fig. 2), keeping the drum still by means of a lever resting on the wheel studs. It is sometimes necessary to loosen the nut with a hammer	Spanner 1811-VA
	b) Remove the bearing retaining nut (5)	44 mm box spanner
	c) Remove the drum (use the extractor 2003-VA, see Pl. 66, fig. 1)	Extractor 2003-VA
	<u>Replacement</u>.	
4	<u>To Fit the Hub Brake Drum</u> (see Pl. 64).	
	a) Centre the brake shoes (use the fixture 2113-VA, see Pl. 70). After adjustment is completed, tighten the nuts (10) of the eccentric pins and lock with split pins	Fixture 2113-VA 12 mm, 21 mm and 24 mm box spanners
	b) Put the drum in position on the stub axle, using a mallet and a tube	Tube : External dia. = 44 mm Interior dia. = 36 mm Length = 200 mm
	c) Fit the lockwasher. Tighten the nut (5) to 101 ft/lbs (14 m.kg). Turn over the lockwasher on one face of the nut..	44 mm box spanner
	d) Pack the metal plug of the ring nut (4) with grease (special bearing grease)	
	e) Hold the brake drum still as described in para. 3. Tighten the ring nut (4) to a torsion of 108 to 144 ft/lbs. (15 to 20 m.kg) (use the spanner 1811-VA, see Pl. 66, fig. 2)	Spanner 1811-VA
	f) Lock the ring nut with three punch marks	
5	Fit the wheel	Wheel brace
6	Lower the vehicle to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70

		TOOLS
	REPLACEMENT OF A WHEEL CYLINDER	
	Removal.	
7	Jack up the vehicle (see para. 1, this operation).	
8	Remove the drum (see para. 3, this operation).	
9	To Remove the Wheel Cylinder (see Pl. 65).	
	a) Disconnect the brake pipe from the wheel cylinder	17 mm spanner
	b) Remove the return spring (9) and open out the shoes	
	c) Unscrew the two securing nuts, and remove the cylinder from the brake backplate	12 mm box spanner
	Replacement.	
10	To Fit the Wheel Cylinder (see Pl. 65).	
	a) Put the cylinder in position, secure it by the two screws and fit a spring washer under each head	12 mm box spanner
	b) Connect the brake pipe and tighten the screw, fitting a copper washer on each side of the union	17 mm spanner
	c) Hook on the return spring (9)	
11	Fit the drum (see para. 4, this operation).	
12	Bleed the brake system (see Op. 49, paras. 18 and following).	
13	Fit the wheel	Wheel brace
14	Lower the vehicle to the ground (see para. 6, this operation).	

TOOLS

REPLACEMENT OF THE BRAKE SHOES

Removal.

15 Jack up the vehicle (see para. 1, this operation).

16 Remove the drum (see para. 3, this operation).

17 To Remove the Brake Shoes (see Pl. 64 and 65).

a) Remove the outer retaining cups (6) from the springs, by turning them through a quarter of a turn to release them from the guide rod. Remove the springs (7) and the rods (8) ....

b) Unhook the return spring (9) from the brake shoes, using universal pliers ....

c) Take out the split pin and remove the nut (10) from the anchorage pins and remove the flat washers (20). Disconnect the two brake shoes from the backplate. Take off the two eccentrics (19) from the brake shoes .... — 12 mm box spanner

18 Clean the parts..........

Replacement.

19 Grind the bearing faces in the drum for the brake shoes on a lathe (use the mandrel 2119-VA, see Pl. 69). The tolerance of eccentricity is 0.1 mm maximum. Check the grinding with a dial gauge ....

Do not increase the original diameter of the drum, which is 180 mm, by more than 2 mm .... — Mandrel 2119-VA

20 To Fit the Brake Shoes and Centre Them (see Pl. 64 and 65).

a) Lightly oil the adjusting eccentrics (19) and put them in position in the brake shoes ....

NOTE - The linings must be completely dry, without any traces of oil and the rivets must lie below the surface of the lining. If not, replace the brake shoes.

b) Put the brake shoes in position on the backplate; *at the front fit the brake shoe where the unlined portion is at the top.* Fit the flat washers (20) on the eccentric pins and tighten the nuts (10) temporarily..........

Fit the rods (8) the springs (7) and the outer retaining cups (6), locking the latter on the rod (8) by turning them through a quarter of a turn..........

Make sure that the brake shoes move freely .... — 12 mm, 21 mm, and 24 mm box spanners

		TOOLS
	c) Hook the return spring (9) to the brake shoes, using universal pliers	
	d) Centre the brake shoes (use the fixture 2113-VA, see Pl. 70). After making the adjustment, tighten the nuts (10) on the eccentric pins and lock with split pins	12 mm, 21 mm and 24 mm box spanners Fixture 2113-VA
21	Fit the drum (see para. 4, this operation).	
22	Adjust the brake cams (see Op. 49, para. 4). Rotate the cams in the direction shown in Pl. 65	
23	Bleed the brake system (see Op. 49, paras. 18 and following).	
24	Fit the wheel..	Wheel brace
25	Lower the vehicle to the ground (see para. 6, this operation).	

		TOOLS
	REPLACEMENT OF A MASTER CYLINDER	
	<u>Removal.</u>	
	Aluminium backplates :	
1	Disconnect the flexible brake pipe from the connection tube to the wheel cylinder. Disconnect the flexible tube from the master cylinder	17 mm and 19 mm spanners
	Steel backplates :	
1 A	Disconnect the connection tube from the distribution union. Unscrew the distribution union from the flexible pipe between the master cylinder and the union. Unscrew the flexible pipe from the master cylinder	17 mm and 19 mm spanners
2	Disconnect the master cylinder push-rod from the control lever	
3	Disconnect the master cylinder from the bracket, without removing the fluid reservoir	12 mm spanner
	<u>Replacement.</u>	
4	Put the master cylinder (together with the fluid reservoir) on the bracket. Tighten the screws, fitting a spring washer under each head	12 mm spanner
5	Connect the push-rod of the master cylinder to the control lever. Lock with a split pin	
6	Screw up and tighten the flexible brake pipe on the master cylinder and place a copper washer on either side of the union of the feed pipe for the rear wheel cylinders	19 mm spanner
	Aluminium backplates :	
7	Connect the flexible pipe to the connection pipe of the front wheel cylinders, and tighten the screw, fitting a copper washer on either side of the union	17 mm and 19 mm spanners
	Steel backplates:	
7 A	Screw the flexible pipe on to the master cylinder. Engage the other end in the union of the left-hand wheel cylinder. Fit a copper washer. Tighten the distribution union, fitting copper washers. Connect the connecting tube to the distribution union.	17 mm and 19 mm spanners
8	Adjust the brake pedal by moving the locking pin so that there should be a pedal movement of about 10 mm before it comes into contact with the push-rod on the master cylinder plunger (in practice the pin is in the fourth hole from the pedal pad)	
9	Bleed the brake system (see Op. 49, paras. 18 and following)	

		TOOLS
	OVERHAULING A MASTER CYLINDER (see Pl. 72).	
	Dismantling.	
10	Drain the fluid reservoir. Remove the reservoir, by removing the union screw with a spanner inserted inside the reservoir	17 mm box spanner
11	Remove the dust cover and the push-rod from the master cylinders	
12	Remove the circlip (1) at the same time holding the thrust washer (2) by hand in order to prevent the parts from being ejected by the pressure of the spring (3)	
13	Remove the thrust washers (2), the piston (4) the cup (5) the spring (3), the valve (6), and its seal (7). Remove the cup (8) from the piston. Remove the valve diaphragm (9)	
	Cleaning the Parts.	
14	Clean all the parts with alcohol. If no alcohol is available, use very clean special brake fluid. Do not use any other product....................................	
	The master cylinder must be free from all the traces of rust or scratches. If it is not, replace it. Make sure that the ducts "a", "b", "c" are not blocked	
	Immerse all the parts in brake fluid before refitting	
	Assembly.	
15	Put the diaphragm (9) in the valve body (6). Fit the secondary cup (8) on the piston (4)	
16	In the body of the master cylinder insert the valve joint (7). the valve (6), the spring (3), the main cup (5), and the piston (4). Put the thrust washer (2) in position, compress the spring and fit the circlip (1)	
17	Fit the fluid reservoir on the master cylinder. Fit a copper gasket between the reservoir and the master cylinder and another copper gasket between the union screw and the reservoir. Tighten the union screws	17 mm box spanner
18	Fit the push-rod in the piston and the dust cover on the master cylinder body	

REPLACMENT OF THE PEDAL GEAR

		TOOLS
	<u>Removal</u>.	
1	Unhook the pedal return springs, and remove the spindle	
	Disconnect the clevis pin from the push-rod of the master cylinder. Disconnect the clutch cable from the control lever.	
2	Disengage the dust cover and the push-rod from the master cylinder	
3	Disconnect the master cylinder from the pedal bracket (to obtain access to the screw securing the pedal bracket to the chassis)	12 mm spanner
4	Disengage the pedal bracket from the chassis and remove it	T-spanner 12 mm extension socket
5	Disconnect the clutch cable from the intermediate pedal lever	
	<u>Replacement</u>.	
6	Connect the clutch cable to the intermediate pedal lever, fit the split pin to the clevis pin	
7	Place the pedal gear in position on the chassis, tighten the screws, fitting one flat and one serrated washer under each head	T-spanner 12 mm extension socket
8	Put the cable sheath stops in position in the bracket on the gearbox casing and on the pedal gear bracket. Connect the cable to the lever and tighten the nut temporarily	
9	Fit the master cylinder on the pedal gear bracket and tighten the screws, fitting a spring washer under each head	12 mm spanner
10	Put the master cylinder push-rod in position and fit the dust cover on the master cylinder body. Connect the lever to the push-rod and lock the pin with a cotter	

		TOOLS
11	Connect the pedals to the levers; *hook on the return springs between the head of the pin and the lever.*	
	Fit the split pins..	
12	To Adjust the Clearance of the Clutch Pedal (see Pl. 24) (Types A-AU-AZU Vehicles).	
	a) Place the split pin in one hole on the pedal rod so that the pedal pad of this pedal is at the same level as that of the brake pedal. In these conditions, the total travel of the clutch pedal must be between 85 mm and 95 mm. Put the split pin in another hole if necessary	
	b) Fit the packing piece MR-3834-10 (see fig. 4) between the split pin and the toe board	
	c) Engage one gear and adjust the length of the cable so that when the car is pushed along, the engine is not turned...	
	d) Remove the packing piece MR-3834-10 (see fig. 4). Put the gear lever in the neutral position	Packing piece MR-3834-10
	e) Start up the engine and make sure that the gears can be changed normally; if not, the clutch mechanism must be adjusted (see Op. 15 and 16)..	
	NOTE - The pedal gear forms one assembly sold by our Spare Parts Division. It cannot be dismantled.	
12 Z	To Adjust the Clearance of the Clutch Pedal (Type AZ Vehicles).	
	a) Place the locking pin in one of the holes in the pedal rod so that the pedal pad of this pedal is at the same level as that of the brake pedal. In these conditions, the total travel of the clutch pedal must be between 85 mm and 95 mm. Move the position of the split pin if necessary..	
	b) Put the packing piece MR-3834-10 in position (see Pl. 24, fig. 4)	Packing piece MR-3834-10
	c) Tighten the adjusting nut until the play between the thrust collar and the toggle stops is eliminated. Test this by pressing lightly on the clutch fork (to bring the stops in contact). Tighten the locknut	12 mm spanner 12 mm box spanner
	d) Remove the packing piece MR-3834-10.	
	e) Start up the engine, accelerate and make sure that the gears can be engaged normally on releasing the clutch. If not, the clutch mechanism must be adjusted (see Op. 15 AZ and 16).	

		TOOLS
	REPLACEMENT OF A BRAKE CROSS SHAFT	
	Removal.	
1	Remove the bonnet and the two front wings. If the bonnet is fitted with a central stay, it need not be renewed	Wheel brace
2	Disconnect the handbrake control rod from the intermediate lever	
3	Remove the adjusting nuts from the ends of the brake cable. Unhook the return spring from the intermediate lever	
4	Cut the tubular rivets with a chisel to free the bearings and remove them from their brackets on the chassis	
5	Take out the cross shaft assembly from the vehicle by lifting it out from the top	
	Replacement.	
	NOTE - If there is any play of the levers in the bearings, the cross shaft assembly must be renewed: this assembly cannot be dismantled and is sold by our Spare Parts Division.	
6	Put the trunnions in position in the levers, and the cross shaft in the brackets, at the same time inserting the threaded ends of the cables in the trunnions	
	Secure the cross shaft by means of two screws 5 mm dia. x 15 mm long and tighten the nuts, fitting a spring washer	8 mm box spanner
7	Temporarily screw up the cable adjustment nuts. Connect the handbrake control to the intermediate lever and secure with a split pin. Hook on the return spring	
8	Adjust the handbrake (see Op. 49, para. 16)	
9	Fit the two front wings and bonnet (if necessary)	Wheel brace

TOOLS

REPLACEMENT OF A HANDBRAKE CONTROL

Removal.

10 Disconnect the handbrake control from the intermediate handbrake lever ....

11 Remove the handbrake control assembly from the bracket by bringing the bent end of the rod into the vertical position in order to pass it through the control bracket ....

Replacement.

12 Lightly oil the handbrake control. Insert the bent end of the rod vertically through the bracket and push the handbrake control assembly as far as possible into the support ....

13 Connect the rod to the intermediate lever and secure with a split pin ....

REPLACEMENT OF A RATCHET SPRING IN THE HANDBRAKE CONTROL

Removal.

14 Remove the split pin retaining the ratchet spring. Remove the spring ....

Replacement.

15 Put the spring on the handbrake control support, insert the split pin and open out the ends ....

16 Make sure that the ratchet spring engages correctly in the notches in the handbrake control ....

		TOOLS
	REPLACEMENT OF A CONTROL RATCHET SPRING (Since September 1954).	
	Removal.	
14 Z	Remove the split pin. Remove the spring and the ratchet..	
	Replacement.	
15 Z	Put the ratchet in the control support, fit the spring on the support and insert the split pin, opening up the ends	
16 Z	Make sure that the ratchet works properly. The ratchet must pivot freely on the pin............................	

TOOLS

REPLACING THE LEVER

See Op. 17 A, page 135.

OVERHAULING THE LEVER

Removal.

1 Disconnect the control rod from the lever ....

2 With a saw or grinding wheel remove the beading holding the tube ....

3 Disconnect the rubber bushes or the Rilsan bearings from the support tube ....

4 Clean the support tube and the lever with alcohol ....

Refitting.

5 Sprinkle talcum powder inside the tube and on the lever ....

6 Put the bearings or the bushes in position in the tube ....

7 Turn down the metal of the tube at four points in order to secure each bearing or bush ....

8 Fit the control rod with the flexible bush, fitting a flat washer and lock with a split pin ....

		TOOLS
	REPLACEMENT OF A SUSPENSION UNIT (with anti-pitching springs)	
	Removal (see Pl. 73).	
1	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front and rear axles on the side of the suspension unit to be removed	Support MR-3300-70
2	Disconnect the suspension tie rod (17) from the rear axle arm	
	a) Remove one spring clip (2) from the clevis pin (3)..	
	b) Remove the clevis pin (3)..	
3	Remove the dust covers (8) from the adjustable end tubes (5 and 19)	
4	Hold each adjustable end tube (use the spanner 2185-VA, see Pl. 74). Unscrew the inside nuts (4 and 20) from the adjustable end tubes (5 and 19) (use the spanner 2186-VA, see Pl. 74). Remove the end tubes (5 and 19) from the supports on the sidemember	Spanner 2185-VA Spanner 2186-VA
5	Disconnect the suspension tie rod (1) from the front axle arm	
	a) Remove one spring clip (2) from the clevis pin (3)..	
	b) Remove the clevis pin (3)..	
6	Remove the suspension unit assembly from the supports	
7	If a new suspension unit must be fitted : Unscrew the trunnion eyes (7 and 10), remove the dust covers (8), the adjustable end tubes (5 and 19) and the inside nuts (4 and 20)..	
	Replacement (see Pl. 73).	
	NOTE - The suspension unit for type A vehicles can be recognised by the two flats provided on the rear tie rod for adjustment purposes. The suspension unit on the type AU vehicle can be recognised by the four flats on the rear tie rod provided for adjustment purposes.	

		TOOLS
8	If the suspension unit has been renewed : On the tie rods, fit the nuts (4 and 20), the adjustable end tubes (5 and 19), fitted with the nuts (18 and 21) and the dust covers (8); screw on the trunnion eyes (7 and 10) in order to obtain the dimensions "d" and "e" (see Op. 50, para. 2). NOTE - The front of the suspension unit has the letters AV engraved on the metal casing.	
9	Fit the two inside nuts (4 and 20) against the volute springs (6 and 12). Put the suspension unit in position, engaging the rods in the supports on the chassis. Engage the adjustable end tubes (5 and 19) in the supports on the chassis, and screw up the nuts (4 and 20) temporarily (use the spanner 2185-VA and the spanner 2186-VA, see Pl. 74)	Spanner 2185-VA Spanner 2186-VA
10	Insert the trunnion eyes (7 and 10) in the yokes on the axle arms. Put the clevis pins (3) in position and fit the spring clips (2) to retain them	
11	Lower the vehicle to the ground (use the support MR-3300-70, placed on a roller jack, see Pl. 52)	Support MR-3300-70
12	Adjust the heights (see Op. 50)..	
13	Grease the outside of the volute springs	
14	Fit the dust cover (8) on the adjustable end tubes	
	REPLACEMENT OF A SUSPENSION UNIT (with visible springs) Removal (see Pl. 73 A).	
15	Jack up the vehicle (use the support MR-3300-70, placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front and rear axles on the side where the springs are to be removed	Support MR-3300-70
16	Disconnect the suspension tie rods (17) from the axle arms. a) Remove one spring clip (2) from the clevis pin (3).. b) Remove the clevis pin (3)..	

		TOOLS
17	To Remove the Adjustable Rods.	
	a) Unscrew the locknuts (25) (left-hand thread) (use the spanner 2187-VA, see Pl. 74, fig. 2)	Spanner 2187-VA
	NOTE - 1. Since March 1955, the ends (26) have been mounted freely in the springs and locked by a spot weld. The calibration of the springs depends on the position of the ends. It is therefore essential to prevent the ends from rotating when unscrewing the locknut of the tie rod in order to retain the initial suspension characteristics.	
	2. In no circumstances, must springs be refitted unless their ends (26) are secured by two welding spots.	
	b) Remove the adjustment rods (NOTE: left-hand thread)..	
18	To Remove the Springs.	
	a) Unscrew by hand the rear spring (27) and the connection tube (31) welded on to this spring (left-hand thread). Hold the front spring (28) during this operation	
	b) Remove the rear spring and the rear rubber buffers (29)	
19	Drive out the bushes (30) from the spring support (A) using a pin punch. Clean the parts. Use water only for cleaning the rubber buffers..	
	Replacement (see Pl. 73 A).	
20	To Fit the Bushes.	
	Before fitting these bushes, they must be immersed for 48 hours in engine oil.	
	a) Insert the bushes (30) in the support. Put them in position (use tool MR-3676-50, see Pl. 74, fig. 3)	Tool MR-3676-50
21	To Fit the Springs.	
	a) Put a little grease (adhesive grease) between the two bushes (30). *It is preferable to use a mixture of grease and oil.*	
	NOTE - Too much grease may attack the rubber buffers.	

TOOLS

b) Put the two rubber buffers (29) on the tube (31) connecting the springs. Insert the tube in the bushes (30). Fit the front rubber buffer (32)..

c) Put the front spring (28) in position. Screw up the connecting tube (31) in the end of the front spring (left-hand thread) ....

Adjust the tension of the rubber buffers.

	Type AZ Saloons	Type AZU Vans
h, left-hand side = ...	154	159
h, right-hand side = ...	156	162

22 To Fit the Adjustment Rods.

Screw up the adjustment rods (17) fitted with their locknut (25) and their socket end (7). Hold the end (26) of the spring. Adjust the length of the adjustment rods :

	Type AZ Saloons	Type AZU Vans
front tie rod f = ...	350 $\pm$ 0.5 mm	354 $\pm$ 0.5 mm
rear tie rod g = ...	993 $\pm$ 0.5 mm	962 $\pm$ 0.5 mm

Make sure that at least 10 threads are engaged in the sockets and in the ends of the springs. (Right-hand thread in the sockets and left-hand thread in the spring ends).

To ensure that this condition is satisfied, measure before and after fitting, the distance "e" between a reference mark (for example the end of a flat) on the rods and the end of the rod (see fig. 2).

23 Connect the adjustment rods to the axle arms. Fit the clevis pins (3), fit the spring clips (2) in order to lock them..

		TOOLS
24	Lower the vehicle to the ground (use the support MR-3300-70, placed on a roller jack, see Pl. 52).................	Support MR-3300-70
25	Adjust the heights (see Op. 50, paras. 8 and following).................................	
	REPLACING A SUSPENSION UNIT (flexible stops).	
	Removal (see Pl. 73 B).	
26	Jack up the vehicle (use the support MR-3300-70, placed on a roller jack, see Pl. 62). Pack up under the chassis to the height of the front and rear axles on the side where the suspension unit is to be removed	Support MR-3300-70
27	Disconnect the suspension tie rod (17) from the rear axle arm :	
	a) Remove one spring clip from the clevis pin	
	b) Remove the clevis pin..	
28	Remove the dust cover (8) from the adjustable end tubes (5 and 19)	
29	Hold each adjustable end tube with a spanner (use the spanner 2185-VA, see Pl. 74)	
	Unscrew the inside nuts (4 and 20) from the adjustable end tubes (5 and 19) (use the spanner 2186-VA, see Pl. 74) from the supports on the sidemember. Remove the tube ends (5 and 19) from the supports on the sidemember	Spanner 2185-VA Spanner 2186-VA
30	Disconnect the suspension tie rod (1) from the front axle arm.	
	a) Remove one spring clip from the clevis pin	
	b) Remove the clevis pin..	
31	Remove the suspension unit from the brackets..	
	Replacement (see Pl. 73 B).	
	NOTE - Suspension units (with flexible stops) are delivered complete by our Spare Parts Division. They vary according to whether they are for Type AZ or Type AZU vehicles. The suspension unit for the Type AZU vehicle can be identified by the 4 adjustment flats on the rear tie rod. The front of the suspension unit has the letters AV stamped on the metal casing..	

		TOOLS
32	Fit the two inside nuts (4 and 20) against the flexible stops (22 and 12)..	
	Put the suspension unit in position, engaging the rods (1 and 17) in the supports on the chassis. Engage the adjustable end tubes (5 and 19) in the supports on the chassis. Temporarily screw up the nuts (4 and 20). (Use the spanner 2185-VA and the spanner 2186-VA, see Pl. 74)..	Spanner 2185-VA Spanner 2186-VA
33	Fit the eyes carrying the clevis pins in the metal yokes on the axle arms..	
	Fit the clevis pins and lock them with the spring clips..	
34	Lower the vehicle to the ground (use the support MR-3300-70, placed on a roller jack, see Pl. 52)	Support MR-3300-70
35	Adjust the heights (see Op. 50)..	
36	Fit the dust cover (8) on the adjustable end tubes	

		TOOLS
	DISASSEMBLING THE SUSPENSION UNIT (see Pl. 73).	
1	Unscrew the trunnion eyes (7 and 10) carrying the clevis pin. Remove the dust cover (8), the adjustable end tubes (5 and 19) and the nuts (4 and 20).	
2	Clamp the front volute spring (6) in a vice and remove the suspension unit	
3	Clamp the rear volute spring (12) in a vice, and remove the suspension unit	
4	Remove the weld "a" securing the end of the casing to the suspension unit casing, preferably with a grinding wheel (if no grinding wheel is available, clamp the suspension unit in a vice, tightening only moderately and file off the weld)	
	Remove the assembly comprising the tie rod (1), the end of the casing (13), the suspension spring (14) and the compression cup (15) from the suspension casing	
5	Remove the assembly comprising the tie rod (17), the compression cup (16) and the suspension spring (11) from the casing through the front end.	
6	Clean the parts.	
	ASSEMBLING THE SUSPENSION UNIT (see Pl. 73).	
	NOTE - 1. The suspension and volute springs have the following characteristics : Front suspension spring : diameter of wire = 14.4 ± 0.05 mm left-hand spiral. Rear suspension spring : diameter of wire = 15.2 ± 0.05 mm right-hand spiral. Front volute spring : free height = 62 mm max. Rear volute spring : free height = 36 mm max. The direction of winding of the volute springs is immaterial The springs can be identified by these specifications	

		TOOLS
	2. The front part of the suspension unit casing has the letters AV stamped on the outer cover	
7	<u>To examine the springs</u> : the test loads are very high and complicated apparatus is required to check the springs. Simply measure the free heights as given above	
8	Grease the inner walls of the suspension casing (adhesive grease, about $5\frac{1}{4}$ ozs (1.50 gr)	
9	Fit the rear suspension spring (11) in the casing. Fit the compression cup (16), and the rear tie rod (17) (length 659 to 662 mm for type A and AZ vehicles and 639 to 642 mm for type AU and AZU vehicles)......................	
10	Fit the front tie rod (1) (length 618 to 621 mm for type A and AU vehicles), the compression cup (15), the suspension spring (14) and the casing end plate (13). Fit the assembly in the suspension casing	
11	Position the casing end plate (13) so that it is 417 $\pm$ 1 mm from the rear end (type A and AU vehicles) and 418 $\pm$ 1 mm (type AZ and AZU vehicles) (see fig. 1 for measuring points)..	
12	Secure the front end on the casing by means of an arc weld (if no arc is available use a welding torch)	
13	Fit the volute springs (6 and 12). Compress them in a vice to put them in position (see preceding NOTE for identification of the springs)	
14	On the front tie rod (1) put the nut (4), the adjustable end tube (5) fitted with the nut (18) and the dust cover (8) and temporarily screw on the tie rod eye (7)	
15	On the rear tie rod (17) put the nut (20), the adjustable end tube (19) with its nut (21) and the dust cover (8), and temporarily screw on the tie rod eye (10)	
16	Adjust the position of the tie rod eyes (see fig. 1)	
17	Paint the assembly..	

REPLACEMENT OF A FRICTION DISC

Removal (see Pl. 49).

No.	Operation	TOOLS
1	Remove the wing (for front friction disc)	
2	Remove the cover plate (1)	12 mm box spanner 12 mm spanner
3	Take the friction disc (2) off the lugs on the crossmember, removing it with a mallet if necessary	

Replacement (see Pl. 49).

NOTE - 1. If a friction disc is defective (broken spring, worn or broken lining, or friction disc does not work) it must be renewed.

2. The front and rear friction discs are not identical. They can be identified by the pressure springs ....

Front friction disc pressure spring :
(until October 1956)
external dia. = 32.5 mm max.
wire dia. = 4.2 mm min.

Rear friction disc pressure spring :
(until October 1956)
external dia. = 35 mm max.
wire dia. = 5.5 mm min.

Front friction disc pressure spring :
(since November 1956)
external dia. = 30.1 mm max.
wire dia. = 3.3 mm min.

Rear friction disc pressure spring :
(since November 1956)
external dia. = 31.9 mm max.
wire dia. = 4.2 mm min.

No.	Operation	TOOLS
4	Put the friction disc (2) in position, fitting a paper gasket between the friction disc and the arm hub. Fit it on the lugs on the axle crossmember (see Pl. 50 for position) (use the spanner 1834-VA, see Pl. 51, fig. 2)	Spanner 1834-VA
5	Fit the cover plate (1). Fit a paper gasket between the friction disc and the cover plate. Tighten the securing screws with a serrated washer under each head	12 mm spanner 12 mm box spanner
6	Fit the wing (for front friction disc)	

TOOLS

CHECKING A FRICTION DISC

7 Remove the friction disc (see paras. 1 to 3, this operation) ....

8 To Check the Friction Disc.

Put the friction disc on an axle tube (clamped in a vice or fitted on the car). If this cannot be done, hold it by means of two pins clamped in a vice and inserted in the holes for the lugs ....

Measure the load required for the initial movement and continued movement (use the spring balance 2472-T, see Pl. 50)..............................

The hook on the balance must be inserted in one of the 3 securing holes on the friction disc. Pull the spring balance in a direction perpendicular to the radius of the friction disc (see Pl. 50, fig. 3) .... Spring balance 2472-T

The loads are as follows :-

		FRONT FRICTION DISC	REAR FRICTION DISC
Initial movement	Load	0.8 m.kg max. ($5\frac{1}{2}$ ft/lbs)	1.3 m.kg max. ($9\frac{1}{4}$ ft/lbs)
	Spring balance reading ..	13.3 kgs.	21.6 kgs.
Continued movement..........	Load	0.6 m.kg min. ($4\frac{1}{4}$ ft/lbs)	1.1 m.kg min. (8 ft/lbs)
	Spring balance reading ..	10 kgs.	18.3 kgs.

		TOOLS
	REPLACEMENT OF AN INERTIA DAMPER	
	Removal.	
1	Jack up the vehicle (use the support MR-3300-70 placed on a roller jack, see Pl. 52). Pack up under the chassis to the height of the front or rear axle	Support MR-3300-70
2	Remove the wheel	Wheel brace
3	Take out the split pins, remove the two securing nuts and take the damper off its bracket	17 mm spanner 17 mm box spanner
	Replacement (see Pl. 75).	
4	Put the damper on its bracket with the plug (1) at the top.	
	Tighten the securing nuts to a torsion of 43 ft/lbs. (6 m.kg) and insert the split pins	17 mm box spanner
5	Fit the wheel........	Wheel brace
6	Lower the vehicle to the ground (use the support MR-3300-70, see Pl. 52)	Support MR-3300-70
	NOTE - The rear dampers are no longer fitted with a rubber protection sleeve.	
	Our Spare Parts Division now sells only the lightweight damper (see fig. 2), a heavy damper (fig. 1) can be replaced by a lightweight damper (fig. 2)........	
	CHECKING AN INERTIA DAMPER (see Pl. 75).	
7	Shake the damper, holding it so that the plug (1) is at the top. The damper is in good condition if the movement of the weight inside can be felt but no noise can be heard	
8	To replace the oil :	
	Unscrew the plug (1) fitted at the top. Drain out the oil contained in the inertia damper	
	For dampers made prior to October 1957	
	Refill with 80 ccs. oil through the plug (1) (engine oil)	
	For dampers issued since October 1957 (lightweight dampers)	
	Refill with 70 ccs. oil through the plug (1) (engine oil)	

		TOOLS
	REPLACING A SILENCER	
	Removal.	
1	Disconnect the heater tube from the tubes on the scuttle	
2	Disconnect the silencer securing clips from the gearbox casing	12 mm box spanner
3	Unscrew the screw securing the expansion chamber collar to the silencer. Unscrew the nut securing the expansion chamber bracket to the casing	12 mm spanner 17 mm ring spanner
4	Remove the silencer from the vehicle	
	Replacement.	
5	Put the silencer underneath the gearbox casing, engage the end of the silencer on the expansion chamber tube and fit the clip without tightening the screw	
6	Connect the silencer securing brackets to the gearbox casing. Tighten the screws fitting a spring washer under each head	12 mm box spanner
7	Put the expansion chamber in position, placing its securing bracket on the stud. Fit one flat and one spring washer and tighten the nut	
	Tighten the screw of the clip securing the silencer to the expansion chamber tube	12 mm spanner 17 mm ring spanner
8	Connect the heater tubes to the tubes on the cowl, and tighten the clips	

		TOOLS
	REPLACING AN EXPANSION CHAMBER	
	Removal.	
9	Remove the front left-hand wing	Wheel brace
10	Remove the silencer (see paras. 1 to 4, this operation)	
11	Remove the split collars securing the expansion chamber tube to the exhaust manifold	12 mm spanner 12 mm box spanner
12	Disconnect the two front engine supports from the chassis	17 mm box spanner
13	Turn the wheels fully to the left	
14	Move the engine over to the right-hand side by means of a lever. Release the expansion chamber and push it towards the front. Pass the outlet pipe of the expansion chamber under the drive shaft so that about one-third of the length of the expansion chamber is under the air duct........	
15	Tilt the expansion chamber until the inlet tube is horizontal and remove the expansion chamber by turning it round the headlamp bracket	
	Replacement.	
16	Keeping the wheel still turned fully to the left, bring the inlet tube of the expansion chamber into a horizontal position and fit it under the engine; turn it round the headlamp bracket	
17	Push the expansion chamber towards the front until about one-third of its length is under the air duct. Tilt the expansion chamber until the inlet tube is vertical. Finish putting it in position by passing the chamber under the engine, the outlet tube being passed under the drive shaft	
18	Fit the silencer (see paras. 5 to 8, this operation)	
19	Tighten the split collars securing the expansion chamber tube to the exhaust manifold. Tighten the bracket securing the chamber to the gearbox casing. Tighten the collar on the outlet tube of the expansion chamber	12 mm and 17 mm spanners 12 mm box spanner
20	Connect the engine supports to the chassis	17 mm box spanner
21	Fit the wing	Wheel brace

		TOOLS
	REPLACING A PETROL TANK (A and AZ Saloons).	
	Removal.	
1	Remove the filler cap and take out the dipstick. Undo the clip securing the flexible connection pipe of the filler tube to the tank. Disconnect the filler tube by pulling it upwards	
2	Take out the rear seat. Remove the inspection cover, and remove the flexible hose from the outlet pipe on the petrol tank	
3	Disconnect the tank from the chassis and from the axle crossmember and remove it	T-spanner 12 mm socket
4	Remove the outlet pipe from the tank	
5	Clean and flush out the tank if necessary	
	Replacement.	
6	Fit the outlet pipe. Fit a gasket between the outlet pipe and tank, and tighten the screws, fitting a fibre washer under each head	
7	Fit the petrol tank. Tighten the securing screws with one flat and one spring washer under each head	T-spanner 12 mm socket
8	Fit the flexible hose connecting the filler tube to the petrol tank. Tighten the clip .... NOTE - The filler tube has one flat which must be positioned to allow clearance for the wheel Put the petrol dipstick in position and fit the filler cap	

		TOOLS
9	Fit the flexible hose on the tube of the outlet pipe	
	NOTE - The hose is fitted without a clip.	
	Fit the inspection cover with a felt joint, tighten the screws, fitting a klingerite washer under each head	
10	Fit the rear seat	
	REPLACING A PETROL TANK (Type AU and AZU Vans).	
	Removal.	
11	Remove the filler cap and take off the rubber collar on the tube	
12	Remove the panel giving access to the petrol tank	12 mm box spanner
13	Disconnect the flexible petrol pipe from the outlet tube	
14	Disconnect the tank and remove it	12 mm box spanner
15	Remove the petrol outlet pipe	8 mm box spanner
16	Clean and flush out the tank if necessary	
	Replacement.	
17	Fit the petrol outlet pipe, fitting a rubber washer. Tighten the securing screws with a fibre washer under each head.	8 mm box spanner
18	Put the tank in position with a flat washer under the head of the top securing screw	12 mm box spanner
19	Put the flexible petrol pipe on the outlet tube (this pipe is fitted without a clip)	

		TOOLS
20	Put the rubber collar for the filler cap in position in the opening in the panel giving access to the petrol tank. Fit the panel, and tighten the securing nuts with a flat washer under each head. Fit the filler cap	12 mm box spanner
	CLEANING THE FILTER (Type A and AZ Saloons).	
21	Take out the rear seat. Remove the inspection cover. Take off the flexible petrol pipe from the outlet pipe. This pipe is not to be disconnected from the pipe to the pump	
22	Remove the outlet pipe from the tank	
23	Remove the filter block by unscrewing the lower cup. Remove the filter washer assembly	
24	Clean the washers and the outlet pipe in petrol	
25	Put the washer assembly on the outlet pipe, screw up the lower cup and tighten firmly	
26	Put the outlet pipe in position. Fit a washer between the outlet pipe and the tank, tighten the three screws with a fibre washer under each head	
27	Fit the petrol pipe on the outlet pipe	
	NOTE - The petrol pipe is fitted without a clip.	
28	Fit the inspection cover. Fit a felt joint. Tighten the screws with a spring washer under each head	
29	Replace the rear seat	

		TOOLS
	CLEANING A FILTER (Type AU and AZU Vans).	
30	Remove the filler cap, take off the rubber collar on the tube. Remove the panel giving access to the petrol tank	12 mm box spanner
31	Take off the petrol hose from the outlet pipe	
	Remove the outlet pipe from the tank	8 mm box spanner
32	Remove the filter block by unscrewing the lower cup. Remove the filter washer assembly	
33	Clean the washers and the outlet pipe in petrol	
34	Put the washer assembly on the outlet pipe, screw up the lower cup and tighten firmly	
35	Fit the outlet pipe with a rubber washer, tighten the securing screws, fitting a fibre washer under each head	8 mm box spanner
36	Put the petrol hose on the outlet pipe (this hose is fitted without a clip)	
37	Put the rubber collar of the filler tube in position in the opening, giving access to the petrol tank. Fit the access panel with a plain washer under the nuts	

		TOOLS
	LUBRICATING THE BLADE SPINDLES (see Pl. 76).	
	NOTE - The efficiency of the windscreen wiper depends to a great extent on the lubrication of the wiper blade spindles.	
1	Pull the wiper blade (1) away from the windscreen in order to expose the securing screw. Unscrew this screw. Remove the wiper blade. Remove the protective rubber seal	
2	Take off the circlip (2)	
3	Remove the spindle bush (3) by unscrewing it. Hold the nut (9) by means of a flat spanner	17 mm spanner 17 mm box spanner
4	Grease the wiper spindle (4) and the spindle bush (3) (adhesive grease)	
5	Fit the spindle bush (3)	17 mm spanner 17 mm box spanner
6	Fit the circlip (2). Fit the protective rubber seal	
7	Fit the wiper blade (1) and tighten the securing screw	
8	Switch on the windscreen wiper and let it run for a few minutes	
	REPLACEMENT OF A WINDSCREEN WIPER (see Pl. 76).	
	Removal.	
9	Disconnect the speedometer drive from the windscreen wiper control box (17)	
10	Remove the air deflector securing screws. Remove the air deflector from the body. Disconnect the lighting cable from the speedometer, if necessary	

		TOOLS
11	Disconnect the windscreen wiper control box from the instrument panel. Disconnect the control link (7) from the windscreen wiper spindle (8)	8 mm box spanner
12	Take off the windscreen wiper control box and speedometer assembly	
13	Remove the two windscreen wiper arms (1). Remove the rubber protectors (24). Remove the circlips (2) from the wiper blade spindles (4). Disconnect the control link (7) and the central link (13) from the wiper spindles (4). Remove the spindle bushes (3)	17 mm spanner 17 mm box spanner
	Replacement.	
14	Fit the spindle bushes (3) on the scuttle panel, tighten the nuts (9), fitting serrated washers	17 mm spanner 17 mm box spanner
15	On the crank pin (14) put the distance washer (10), the control link (7), and the friction washer (11) and lock with a split pin	
16	Put the control box and speedometer assembly in the deflector. Engage the wiper spindles (4) in the spindle bushes. On the left-hand wiper spindle fit the control link (7), the centre link (13) and fit the friction washer (15). Lock with a split pin	
17	Fix the control box on the panel, tighten the nuts, fitting a serrated washer. On the right-hand wiper spindle, fit the central link (13), the distance washer and the friction washer and lock with a split pin	8 mm box spanner
18	Put the circlips (2) in position on the wiper spindles. Fit the rubber protectors (24). Fit the wiper arms (1).......	
19	Fix the air deflector in position, and tighten the screws. Fit a cup washer under each of the two Parker screws ...	
20	Fit the speedometer drive; tighten the locking screw (1st type) or screw up the nut of the cable casing...........	
	Connect up the lighting cable to the speedometer (if necessary)	
	NOTE - The speedometer drive casing should not be twisted, as this may cause it to break. It is therefore essential that the screw securing the end of the speedometer cable to the speedometer connection on the gearbox should be parallel to the centre line of the gearbox, with the boss for the screw situated towards the bottom.	
21	Check the centring of the speedometer (see para. 27, this operation) while testing the car	
	(In the case of speedometers with two securing studs).	

		TOOLS
	OVERHAULING A WINDSCREEN WIPER (see Pl. 76).	
	<u>Dismantling.</u>	
22	Remove the speedometer (6) from the windscreen wiper control box (17)	7 mm spanner
23	Remove the control knob (18) and the cap (23). Remove the locking spring (19) and take out the spindle and driving wheel (8)	10 mm box spanner
24	Remove the tube (20) retaining the lower bush for the worm, and remove the bush (21) and the worm (22)	
	<u>Assembly.</u>	
25	Grease the bearings for the worm (22) (adhesive grease) and put it in position in the windscreen wiper control box. Fit the lower bush (21) and put the retaining tube (20) in position	
26	Grease the driving wheel spindle (8) (along its whole length) and insert it in the box. Fit the locking spring (19). Fit the cap (23). Put the control knob (18) in position and tighten the nut. Pack the body of the control box with grease (adhesive grease)	10 mm box spanner
27	To fit the speedometer (6)	

1st assembly : Tighten the securing nuts, fitting spring washers. Before locking the nuts make sure that faulty centring of the speedometer is not causing binding in the driving dog. If, after it has been refitted on the car, tests show that the speedometer is noisy, slacken off the securing nuts and centre the speedometer.

2nd assembly : Screw the speedometer into the control box (17). Tighten the locknut (16) moderately.

NOTES - 1. The above operations apply to windscreen wipers with clutch control.

2. Our Spare Parts Division now sells only windscreen wiper control box A-563-03c. This box is not fitted with a clamp for securing the speedometer. The various successive speedometer types supplied can be fitted on this control box by cutting the two speedometer securing studs.

3. It is possible to fit a Jaeger speedometer with oil bath (A-521-4b) in place of a Jaeger speedometer A-521-4.

Fit washers having a thickness of 3.6 to 4 mm between the speedometer and the control box.

The square section on the worm must make a satisfactory engagement in the speedometer.

		TOOLS
	REPLACING A BRUSH (see Pl. 78).	
1	Disconnect the positive cable from the battery (use the terminal extractor 2200-T, see Pl. 79, fig. 1)	Terminal extractor 2200-T 10 mm spanner
2	To Remove the Fan.	
	a) Lock the engine flywheel by means of a screwdriver. Remove the fan securing screw	14 mm box spanner
	b) Put the starting handle in position. Give it a sharp turn as for starting up the engine; this will release the fan taper from the dynamo armature (this taper is not keyed)	
	c) Remove the starting handle bracket and the protection grille	12 mm box spanner
	d) Remove the fan	
	If the armature taper comes away from the crankshaft without the fan being freed from the armature, the brush gear cover must be removed. In order to obtain access to the securing screws, proceed as follows :- Drill an 18 mm dia. hole in the fan with its centre on a circle of 45 mm radius with centre at the centre of the fan (the angular position of the hole is immaterial). Insert a box spanner through this hole and remove the screws securing the brush gear cover plate. Remove the assembly comprising the armature, the brush gear cover plate, the dynamo body and the fan. Be careful not to tear away the field magnet wires. Disconnect the leads from the field magnet and dynamo terminal and take out the dynamo body. Then remove the fan from the armature by clamping the latter in a vice. VERY IMPORTANT - A fan unbalanced by the drilling of a hole must be renewed.	
3	Renew the defective brush (1 or 2). Hold up the spring (3 or 4) by means of a screwdriver	
4	To Refit the Fan.	
	a) Turn the engine by means of the flywheel to bring the pistons to T.D.C. Fit the fan and position it so that when the starting handle is in position, the latter should be horizontal	
	b) Lock the engine flywheel by means of a screwdriver. Tighten the fan securing screws firmly, fitting a spring washer under each head	14 mm box spanner
	c) Fit the starting handle bracket, tighten the screws, fitting a spring washer under each head.................	12 mm box spanner
5	Connect the positive cable to the battery	10 mm spanner

		TOOLS
	REPLACING A DYNAMO (see Pl. 78 and 78 B).	
	Removal.	
6	Disconnect the positive cable from the battery (use the terminal extractor 2200-T, see Pl. 79, fig. 1)	Terminal extractor 2200-T 10 mm spanner
7	Remove the fan (see para. 2, this operation)	
8	Disconnect the leads from the dynamo	7 mm and 8 mm spanners
9	Remove the dynamo securing screws (5 or 24)	12 mm box spanner
10	Remove the dynamo from the bore in the crankcase, but do not pull on the brush gear cover plate otherwise the wires may be torn away	
11	Remove the armature from the crankshaft (use the screw 2205-VA, see Pl. 79, fig. 2)	Screw 2205-VA
	Replacement.	
12	Use alcohol to remove any grease in the taper bore in the armature and on the bearing faces on the crankshaft. Make sure that the bore in the crankcase for the dynamo is perfectly clean	
13	Fit the armature on the crankshaft	
14	Keep the brushes raised by means of their springs as shown in Pl. 78	
15	Lightly grease the bearing in the crankcase (special bearing grease)	
	1st case : dynamo secured by 3 screws (see Pl. 78).	
	Fit the dynamo body together with the 3 securing screws (5) and their insulators. Align the reference marks on the body of the dynamo and on the face of the crankcase. Engage the body of the dynamo in the bore in the crankcase (its insertion can be aided by tapping the end lightly with a mallet if necessary). Screw in a few threads of the screws by hand. Then tighten them progressively	12 mm box spanner

TOOLS

2nd case : dynamo secured by 2 screws (see Pl. 78 B).

Insert the body of the dynamo in the bore in the crankcase. Fit the insulators on the 2 screws (24). Screw in a few threads of these screws by hand. Tighten them to a torsion of $3\frac{1}{2}$ to $5\frac{1}{2}$ ft/lbs. (0.5 to 0.8 m.kg) ....

NOTE - *Do not exceed the above torsion otherwise the bosses on the brush gear cover plate may be damaged.*

16 Bring the brushes into contact with the armature...

17 Connect the leads to the terminals (6 and 7). Tighten the nuts, fitting serrated washers. Make sure that the leads are securely held by the metal clip and lie flat against the front face of the crankcase and against the dynamo body .... — 7 mm and 8 mm spanners

18 Fit the fan (see para. 4, this operation) ....

19 Connect the positive lead to the battery .... — 10 mm spanner

OVERHAULING A CITROEN DYNAMO (see Pl. 77, 78, 78 A, and 78 B).

Dismantling.

20 1st case : dynamo secured by 3 screws (see Pl. 77 and 78).

Remove the terminals (6 and 7). Disconnect the wires from the brush holders. Disconnect the brushes. Remove the brush gear carrier plate (8) from the dynamo body (9) .... — 7 mm and 8 mm box spanners

2nd case : dynamo secured by 2 screws (see Pl. 78 A and 78 B).

Disconnect the lead from the EXC terminal (25). Disconnect the brush wires from the brush holder. Remove the brush gear carrier plate (26) ....

21 To Strip Down the Brush Gear Carrier Plate (8).

1st case : dynamo secured by 3 screws (see Pl. 77 and 78).

a) Drive out the rivets (10) of the positive brush holder (11) and remove the insulator plate (12) and the insulator bushes (13) from the rivets. Remove the springs (3)...

b) Drive out the rivets (14) from the negative brush holder (15) and remove the brush. Remove the spring (4)......

		TOOLS
	2nd case : dynamo secured by 2 screws (see Pl. 78 A and 78 B).	
	a) Remove the brushes (1 and 2) and take out the springs (29 and 34)	8 mm box spanner
	b) Take out the rivets from the negative brush holder (27) and remove the steel shim (28)	
	c) Remove the EXC terminal (27), take off the flat washers (35 and 39), the insulating washers (36 and 38) and the bush (37)	8 mm box spanner
	d) Remove the rivet of the positive brush (30). Take off the insulating plate (31), the bush (32) and the insulating washers (33)	
	NOTE - It is preferable to renew the cover complete. This part is sold by our Spare Parts Division.	
22	Remove the Pole Pieces and the Windings.	
	NOTE :	
	1. This delicate operation is not to be recommended. It is preferable to change the assembly comprising the body, the coils and the pole pieces.	
	2. *Under no circumstances may the pole pieces be renewed. Mark their position when dismantling.*	
	a) Drill the two punch marks retaining the screws (use a 2 mm drill)	2 mm drill
	b) Put the mandrel MR-1601-8 (see Pl. 80) in position in order to avoid damaging the dynamo body. Remove the pole piece securing screws with a screwdriver (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80, fig. 2)	Mandrel MR-1601-8 Screwdriver MR-1601-4
	c) Remove the pole pieces and the coils	
23	Clean the parts	
	Assembly.	
24	Check the armature on an inspection fixture	
25	Grind the commutator, removing as little metal as possible. Do not reduce the diameter to less than 50 mm. If less, fit a new armature	
	NOTE - This delicate operation can be carried out between lathe centres or on a mandrel especially machined for this purpose. The commutator and the inner cone on the engine side must be perfectly concentric.	

		TOOLS
26	Make sure that the laminations of the armature are clear of each other by means of a suitable scraper or a saw blade of the same width as the insulators, in order to ensure that the sections are not in contact	
27	<u>To Fit the Induction Coils and the Pole Pieces</u> (see Pl. 78 and 80).	
	NOTE - *This delicate operation is not recommended. It is preferable to renew the body, coil and pole piece assembly.*	
	a) Check the coils by means of a test lamp	
	NOTE - In order to make sure that the coils and the pole pieces are properly fitted in the dynamo body and that there should be a maximum clearance of 0.5 mm, a mandrel must be used (use the mandrel MR-1601-8 and the stand MR-1601-9, see Pl. 80).	
	b) Put the coils (16) and the pole pieces (17) in position in the dynamo body. Position the pole pieces in accordance with the reference marks made when dismantling. Tighten the pole pieces securing screws temporarily	
	c) Engage the mandrel MR-1601-8 in the press, between the pole shoes	Mandrel MR-1601-8 Stand MR-1601-9
	d) Lock the pole piece securing screws (18) (use the screwdriver MR-1601-4 fitted on a bench press, see fig. 2) ...	Screwdriver MR-1601-4
	e) Remove the mandrel from the end opposite the one where it was inserted	
	f) Lock the pole piece securing screws (18) by two centre punch marks	
28	<u>To Assemble the Brush Gear End Plate</u> (see Pl. 77 and 78) (dynamo secured by 3 screws).	
	a) Put the spring (4) in position on the negative brush holder (15). Rivet the brush holder. Fit the brushes (1 and 2).	8 mm box spanner
	b) Put the spring (3) on the positive brush holder (11). Rivet this brush holder inserting the insulating plate (12), the bushes (13) and the insulating washers for these rivets (use flat headed rivets sold by our Spare Parts Division).	
28 A	<u>To Assemble the Brush Gear End Plate</u> (see Pl. 78 A and 78 B) (dynamo secured by 2 screws).	
	a) Rivet the negative brush holder (27), fit the steel shim (28). Put the spring (29) in position on the negative brush holder	

TOOLS

b) Rivet the positive brush holder (30), fitting the insulating plate (31), the bush (32) and the insulating washers (33). Put the spring (34) in position on the positive brush holder ....

c) Fit the EXC terminal (25). Under the head put one flat washer (35), one insulating washer (36), the bush (37), one insulating washer (38), one flat washer (39) and one serrated washer and tighten the nut .... 8 mm box spanner

29 1st case : dynamo secured by 3 screws (see Pl. 78).

a) Put the brush gear end plate on the dynamo body (it is located by a dowel). Fit the terminals (6 and 7) with their insulating bushes (19 and 20) and insulating washers (21 and 22). Fit the brushes (1 and 2), and connect the leads.

Make sure that the terminals are not earthed (use a test lamp) ....

2nd case : dynamo secured by 2 screws (see Pl. 78 A).

b) Put the brush gear end plate on the dynamo body (it is located by a dowel). Connect the red lead to the DYN terminal of the positive brush and the yellow lead to the EXC terminal (25) ....

30 To Test the Dynamo on a Test Bench.

This test requires a special stand (use the stand 2207-VA, see Pl. 81) ....

Voltage tests (without load) : Connect the EXC terminal to earth and the DYN terminal to a volt meter ....

When cold, the dynamo should give a voltage of 6.5 volts at a maximum speed of 1,100 r.p.m. ....

Output tests (when warm) : Connect the EXC terminal to earth and the DYN terminal to the positive terminal of a battery (charged to about 6.5 volts) ....

At a speed of 2,200 r.p.m. the dynamo must supply at least 16.5 amps .... Stand 2207-VA

OVERHAULING A PARIS-RHONE G 11 R 60 DYNAMO

Dismantling (see Pl. 78 C and 78 D).

31 Disconnect the positive brush (1) and the lead (2) from the positive terminal (3) .... 8 mm box spanner

32 Disconnect the lead (4) from the field terminal (5) and remove the terminal with its washers and insulators .... 7 mm box spanner

		TOOLS
33	Remove the brush gear end plate (6) from the dynamo body (7).	
34	To Strip Down the Brush Gear End Plate.	
	a) Remove the negative brush (8) and the positive brush (1) as well as the springs (9)	8 mm box spanner
	b) Take out the rivets of the negative brush holder (10) and remove the terminal (11) of the negative brush (8). Remove the metal shim (12)	8 mm box spanner
	c) Remove the rivets of the positive brush holder (13) and remove the terminal (3) of the positive brush (1). Remove the insulating shim (14), the insulating washers (15) and the steel washer..................................	8 mm box spanner
35	To Remove the Pole Pieces and the Induction Coils.	
	NOTE - *Under no circumstances may the pole pieces be renewed. Mark their position when dismantling.* This delicate operation is not to be advised, it is preferable to renew the whole assembly comprising the body, coils and pole pieces.	
	a) Put the mandrel MR-1601-8 in position (see Pl. 80) to avoid damaging the dynamo body. Remove the pole shoe securing screws by means of a screwdriver (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 80).	Mandrel MR-1601-8 Screwdriver MR-1601-4
	b) Remove the pole pieces (16) and the coils (17)	
36	Clean the parts.	
	Assembly (see Pl. 78 C and 78 D).	
37	Check the armature with an inspection fixture.	
38	Grind the commutator, removing as little material as possible. Do not reduce the original diameter of 56 mm by more than 2 mm. If more than 2 mm has to be removed, renew the armature.	
	NOTE - This delicate operation can be carried out between the centres of a lathe or on a mandrel especially machined for this purpose. The commutator and the inner cone must be perfectly concentric.	
39	After grinding, separate the laminations of the commutator with a suitable scraper or a saw blade cut down to the thickness of the insulators, so that the sections should not be in contact with each other.	

		TOOLS
40	<u>To Fit the Induction Coils and the Pole Pieces</u> (see Pl. 80).	
	a) Check the coils by means of a test lamp.	
	NOTE - In order to ensure the correct positioning of the coils and of the pole pieces in the body of the dynamo, and to obtain maximum clearance of 0.5 mm, a mandrel must be used (use the mandrel MR-1601-8 and the support MR-1601-9, see Pl. 80)	Mandrel MR-1601-8 Support MR-1601-9
	b) Put the coils (17) and the pole pieces (16) in the dynamo body (7). Position the pole pieces in accordance with the reference marks made when dismantling. Tighten the pole pieces securing screws temporarily.	
	c) With a press engage the mandrel MR-1601-8 fully between the pole pieces.	
	d) Lock the securing screws (18) of the pole pieces (use the screwdriver MR-1601-4 fitted on the bench press, see Pl. 80)	Screwdriver MR-1601-4
	e) Remove the mandrel from the end opposite the one where it was inserted.	
	f) Lock the pole pieces securing screws (18) by turning down a little of the metal of the dynamo body into the slot in the screws.	
41	<u>To Assemble the Brush Gear Cover Plate</u>.	
	a) Rivet the negative brush holder (10) with the steel plate (12), fitting a flat washer under the rivet head. Fit the terminal (11) of the negative brush (8). Tighten the nuts	8 mm box spanner
	b) Rivet the positive brush holder (13) with the insulating plate (14), fitting an insulating washer (15) under the head of the rivet and an insulating bush on the rivet. Fit the positive terminal with a flat washer and fit an insulating washer under the head and the insulating bush on the terminal. Tighten the nut	8 mm box spanner
	c) Put the springs (9) in position. Fit the positive brush (1) and the negative brush (8), holding them up by means of the springs (see Pl. 78 D).	
	d) Connect up the negative brush. Tighten the nut, fitting a serrated washer	8 mm box spanner
42	Put the brush gear cover plate in position on the dynamo body (its position is determined by a dowel).	
	a) Fit the field terminal. On the terminal (5) place one flat washer, one insulating washer (19) and the insulating bush (20). Put the terminal in position in the brush gear cover plate (6) and fit an insulating washer (19), a flat washer, the field cable end (4) and a serrated washer. Tighten the nut	7 mm box spanner

		TOOLS
	b) Connect up the second field cable end (2) to the brush (1) on the terminal (3), fitting a serrated washer under the nut	8 mm box spanner
43	Test the dynamo on the test bench (see para. 30, this operation).	

OVERHAULING A DUCELLIER 7060 A DYNAMO

Dismantling. (see Pl. 78 E and 78 F).

44	Disconnect the lead (1) from the EXC terminal (2). Remove the terminal (2) together with its washers and insulator.	7 mm box spanner
45	Disconnect the lead (3) from the positive brush holder (4).	
46	Disconnect the brush gear cover plate (5) from the dynamo body (6).	
47	To Strip Down the Brush Gear Cover Plate (5). a) Remove the negative brush (7) and the positive brush (8). b) Unrivet the negative brush holder (9) and remove the steel washers (10) and the rivets (11). c) Unrivet the positive brush holder (4) and remove the insulating washers (12), the rivets (13), the insulating washers (14) and the insulating bushes (15).	
48	To Remove the Pole Pieces and the Induction Coils. NOTE - *Under no circumstances may the pole pieces be renewed. Mark their position when dismantling.* This delicate operation is not to be advised. It is preferable to renew the whole assembly comprising the body, coils and pole pieces. a) With a small chisel remove the metal tapped down into the slot in the heads of the screws. b) Put the mandrel MR-1601-8 (see Pl. 80) in position in order to avoid damaging the dynamo body. Remove the pole piece securing screws (use the screwdriver MR-1601-4, fitted on a bench press, see Pl. 80)	Mandrel MR-1601-8 Screwdriver MR-1601-4
	c) Remove the pole pieces (16) and the coils (17).	

		TOOLS
49	Clean the parts.	
	Assembly.	
50	Check the armature on an inspection fixture.	
51	Grind the commutator, taking off as little material as possible. Do not reduce the original diameter of 54 mm by more than 2 mm. If the diameter has to be reduced still further renew the armature.	
	NOTE - This delicate operation can be carried out between the centres of a lathe or on a shouldered mandrel especially machined for this purpose. The commutator and the inner cone on the engine side must be perfectly concentric.	
52	Free the laminations of the commutator after grinding, by means of a suitable scraper or a saw blade cut down to the width of the insulators, in order to ensure that the sections are not in contact with one another.	
53	To Fit the Coils and the Pole Pieces (see Pl. 78 E and 78 F).	
	a) Check the coils by means of a test lamp.	
	NOTE - In order to ensure that the correct fitting of the coils and of the pole pieces in the body of the dynamo and to provide a maximum clearance of 0.5 mm, a mandrel must be used (use the mandrel MR-1601-8 and the support MR-1601-9, see Pl. 80)	Mandrel MR-1601-8 Support MR-1601-9
	b) Put the coils (17) and the pole pieces (16) in the dynamo body (6). Position the pole pieces in accordance with the reference marks made when dismantling. Tighten the pole piece securing screws temporarily.	
	c) By means of a press, engage the mandrel MR-1601-8 fully between the pole pieces.	
	d) Lock the pole piece securing screws (18) (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80).	Screwdriver MR-1601-4
	e) Remove the mandrel from the side opposite the end where it was inserted.	
	f) Lock the pole piece securing screws (18) by two centre punch marks.	

		TOOLS
54	To Assemble the Brush Gear Cover Plate (see Pl. 78 F).	
	a) Rivet the negative brush holder (9) after fitting the steel washers (10).	
	b) Rivet the positive brush holder (4) fitting the insulating washers (12), the insulating bushes (15), and the insulating washers (14).	
55	Put the brush gear cover plate in position on the dynamo body (its location is determined by a dowel).	
	a) Fit the field terminal (2). On the terminal fit a flat washer, an insulating washer (19) and the insulating bush (20). Put the terminal in position in the brush gear cover plate (5) and place on it an insulating washer (19), a flat washer, the cable end (1) and a spring washer. Tighten the nut (21)	7 mm box spanner
	b) Connect the second cable end (3) of 5 mm dia. to the positive brush holder (4). Tighten the screw temporarily.	
56	Fit the positive brush (8) and the negative brush (7). Tighten the screws.	
57	Test the dynamo on the test bench (see para. 30, this operation).	

TOOLS

REPLACING A REGULATOR (see Pl. 82).

The terminals on the regulator are marked : BAT - DYN - EXC ....

Removal.

1 Disconnect the positive cable from the battery (use the cable end extractor 2200-T, see Pl. 79, fig. 1). Disconnect the leads from the regulator and remove the regulator...

Cable end extractor 2200-T

Replacement.

2 Fit the regulator, connect the leads to the regulator with a shakeproof washer under each screw head (see wiring diagram, Pl. 84).

red end to DYN terminal

yellow end to EXC terminal

blue end to BAT terminal

NOTE - Do not change over the leads, especially those to the BAT and EXC terminals. The polarity of the dynamo would be reversed and it would no longer charge.

7, 8 10 mm box spanners

CHECKING A REGULATOR

3 Checking on the Car.

If the battery, the dynamo and the wiring are in good condition and the electri cal equipment comprises only the standard equipment fitted in the Works :

a) The regulator should come into operation between 650 and 800 r.p.m. that is to say at a speed slightly higher than slow running ....

b) After operating for 15 minutes at normal speed *with headlamps full on,* the ammeter should show a slight discharge.

c) On a long run, a progressive reduction in the current should be noticed if the charging current is high at the beginning ....

d) When the engine is stopped by switching off, the ammeter should not show any discharge at all (obvious since all the electric equipment is switched off) ....

TOOLS

4 Testing on the test Bench (see Pl. 83).

a) Checking the "cutting-in".

The following results should be obtained :

1. Cutting-in voltage : 6.5 to 7.7 volts.

2. Breaking voltage : less than 6 volts.

The difference between the cutting-in and breaking voltages should be equal to or greater than 1 volt.

NOTE - The cutting-in and breaking voltages are measured in the following way :

1. Cutting-in: by means of a rheostat on the motor (commencing from stationary), progressively increase the speed of the dynamo and check the voltage indicated by the voltmeter, when the ammeter needle begins to move ......

2. Breaking : by means of the engine rheostat (commencing at a speed of 3000 to 4000 r.p.m.); reduce the speed of the dynamo progressively and check the voltage indicated by the voltmeter when the needle of the ammeter suddenly returns to zero ....

b) Inspection of the "regulation".

After the dynamo has been running for 30 minutes at a speed of between 2000 and 4000 r.p.m. the following readings should be obtained :

Raise the voltage to 6.75 volts (starting with a slightly lower voltage and *never reducing*), read the voltage shown on the voltmeter. Obtain the voltage variation by varying the battery circuit.

The ammeter must give a reading of 10.8 to 14.4 amperes, viz: I.

Raise the voltage to 7.25 volts (*never reducing*), the output must be greater than half of the figure 1, or between 5.4 and 7.2 amperes.

Continue to raise the voltage steadily; the output must then be *less* than half of the figure I, or 5.4 to 7.2 amps, before the voltmeter reading reaches 8 volts.

Reduce the voltage to 7.15 volts (*without ever increasing it*), and the output must be greater than $\frac{1}{2}$.

		TOOLS
	REPLACING A STARTER SWITCH	
	Removal (see Pl. 85).	
1	Disconnect the positive cable from the battery (use the terminal extractor 2200-T, see Pl. 79, fig. 1) and from the starter	Terminal extractor 2200-T. 10, 12 and 14 mm spanners
2	Remove the starter switch (4)	
3	Remove the contact blade (1) and its insulators without pushing in the terminal (2)	12 mm spanner
	Replacement.	
4	Fit the contact blade (1) and its insulators on the terminal (2) without pushing in the latter, and fit the washer acting as a locking washer, tighten the nut, and turn down one edge of the washer over one side of the nut	12 mm spanner
5	Fit the starter switch, tighten the screws with a spring washer under each head	
6	To Adjust the Starter Switch. a) By means of the lever (3) bring the terminals (35 and 36) into contact .... b) In this position measure the distance "a" between the front end of the driving pinion and the bearing face on the bearing bracket .... This dimension must be "a" = 31.7 $\pm$ 0.5 mm .... c) If not, tighten or slacken off the stop screw (18) of the lever (3). In order to do so, the spring (19) must be compressed so as to disengage the slot in the stop (18) from the lever (3) .... d) Recheck the dimension "a" .... NOTE - This dimension is essential in order to obtain correct meshing of the teeth on the starter pinion and on the starter ring.	
7	Adjust the control fork cable, if necessary, so that it should not exert any tension on the control	
8	Connect the positive cable to the starter switch terminal, tighten the nut, fitting a serrated washer. Connect the cable to the battery	10 mm, 12 mm and 14 mm spanners

		TOOLS
	REPLACING A STARTER SWITCH CONTACT	
9	The work is the same as for the replacement of the starter switch (see paras. 1 to 8, this operation)	
	REPLACEMENT OF A STARTER MOTOR	
	Removal.	
10	Disconnect the negative cable from the battery (use the terminal extractor 2200-T, see Pl. 79, fig. 1) and the cable from the starter	Terminal extractor 2200-T, 10 mm, 12 mm and 14 mm spanners
11	Disconnect the control cable from the starter motor switch	
12	Remove the two starter motor securing screws and remove the starter	12 mm box spanner
	Replacement.	
13	Put the starter motor in position, tighten the two securing screws, fitting a spring washer under each head	12 mm box spanner
14	Connect the cable to the control fork, adjusted so that no tension is exerted on this fork	
15	Connect the positive cable to the starter switch terminal, tighten the nuts, fitting a serrated washer. Connect the negative cable to the battery	10 mm, 12 mm and 14 mm spanners
	OVERHAULING A DUCELLIER 6 VOLT 161-B-15 STARTER	
	Dismantling (see Pl. 85 and 85 A).	
16	Remove the starter switch (4)	

		TOOLS
17	Remove the brush cover (5)	7 mm spanner
18	Remove the bearing bracket (6) by undoing the two nuts. Remove the circlip (7). Take out the armature from the starter. Disconnect the lead from the positive brush. Remove the brush gear cover plate (8)	
19	Remove the contact blade (1) and its insulators	12 mm spanner
20	Remove the two distance pieces (9 and 10) from the armature shaft. Remove the thrust washer (11) and the circlip (12) with circlip pliers	Circlip pliers.
21	Take out the starter pinion from the fork. Remove the fork (3) from the bracket by taking out the pivot pin (13). Unscrew the securing studs from the bracket (use universal pliers)	
22	Remove the positive and negative brushes (14 and 15). Unhook the springs from the brushes and remove the brush holders (16) and the spring (17)	
23	<u>To Strip Down the Starter Switch.</u> a) Remove the terminal (2) and take off the insulators .... b) Unscrew the lever stop (18) and remove the spring (19) and the plunger (20)	14 mm spanner
24	<u>To Remove the Coils.</u> a) Remove the four securing screws from the pole pieces (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80, fig. 2) .... b) Remove the solder holding the connections to the terminal (2). Remove the pole pieces and the coils	Screwdriver MR-1601
25	<u>To Remove the Starter Pinion.</u> Remove the circlip (21) and take out the grooved pulley (22) and the spring (23)	
26	<u>To Remove the Free Wheel of the Pinion Assembly.</u> Because of the conditions in which the parts of the free wheel are manufactured, they cannot be renewed. Replace the free wheel complete by an assembly sold by our Spare Parts Division.	

		TOOLS
27	Clean the parts	
	<u>Assembly</u> (see Pl. 85 and 85 A).	
28	Check the armature shaft between centres	
29	Check the armature on an armature tester	Armature tester
30	Grind the commutator. Do not reduce the original commutator diameter of 33 mm by more than 2 mm	
31	Separate the laminations of the commutator after grinding by means of a scraper or a saw blade reduced to the width of the insulators, so that the sections should not be in contact with each other	
32	<u>To Fit the Induction Coils</u>.	
	a) Check the coils with a test lamp	
	NOTE - To ensure the correct positioning of the pole pieces and the coils in the starter motor body and to obtain a maximum clearance of 0.5 mm, a mandrel should be used (use the mandrel MR-1601-11, see Pl. 80)	Mandrel MR-1601-11
	b) Fit the coils and the pole pieces in the starter motor body and tighten the screws temporarily	
	c) Tin the connections to the coils and temporarily fit the terminal (2) with its insulators	
	d) Insert a mandrel between the pole pieces in a press (use the mandrel MR-1601-11, with the stand MR-1601-10, see Pl. 80)	Mandrel MR-1601-11 Stand MR-1601-10
	e) Tighten the pole pieces securing screws (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80, fig. 2)	Screwdriver MR-1601-4
	f) Remove the mandrel from the end opposite the one where it was inserted	
33	<u>To Prepare the Starter Switch.</u>	
	a) Lightly oil the plunger (20) and fit it in its bore in the casing. Fit the spring (19) temporarily screw up the stop (18) on the threaded rod of the plunger	
	b) Fit the terminal (2) and its insulators	14 mm spanner

		TOOLS
34	To Prepare the Brush Holder.	
	a) Fit the brushes on their bracket, fitting one flat and one spring washer under the heads of the screws. Do not tighten the screw of the positive brush	
	b) Fit the brush holder (16) with the brush springs (17) on their pins and position the end of the springs against the stop pins (32)........	
35	To Prepare the Starter Pinion.	
	Fit the spring (23), put the pulley (22) in position and compress the assembly in a vice in order to fit the circlip (21).	
36	To Prepare the Bearing Bracket (6).	
	a) Fit the fork (3) on the bearing bracket. Put the pin (13) (lightly oiled) in position and lock with a split pin. Fit a flat washer between the split pin and the boss	
	b) Screw up the two securing studs	
37	To Prepare the Armature, and Adjust the Side Clearance.	
	a) Fit the two distance pieces (9 and 10) on the armature shaft	
	b) Fit the circlip (12) on the shaft on the commutator side and fit the bronze washer (11). Fit the brush holder bracket on the shaft, fit the adjustment washer (34) and the circlip (7)	
	c) Make sure that the side clearance is between 0.2 and 0.5 mm; if not, fit an adjustment washer between the washer (34) and the circlip (7)	
38	Fit the contact blade (1) with its insulators on the terminal (2), fit the washer acting as a lock washer, tighten the nut and turn over one edge of the washer on one face of the nut	
	Fit the switch (4) and tighten the screws with a spring washer under each head	12 mm spanner
39	Insert the armature in the starter motor body, connect up the positive lead to the brush, and tighten the screw. Make sure that the dowel on the body engages in the groove cut in the end plate	

		TOOLS
40	a) Put the starter motor pulley in the fork (3). Oil the splines on the armature shaft. Fit the bearing bracket (6), at the same time engaging the shaft in the hub of the starter pinion. Make sure that the locating dowel is correctly seated in the groove in the bearing bracket. Tighten the bearing bracket nuts, fitting a spring washer	7 mm spanner
	b) By means of the lever (3) bring the body of the starter pinion in contact with the distance piece (10)	
	c) With the assembly in this position, measure the distance "b" between the front end of the drive pinion (27) and the spigot face of the bearing bracket (6). This dimension must be "b" = 21.07 mm maximum......................	
	d) If it is not, satisfy this condition by choosing a distance piece (10) of suitable length from those sold by our Spare Parts Division	
	e) Recheck the distance "b"	
	NOTE - It is essential that this distance be correct, otherwise the pinion will not engage correctly with the starter gear ring.	
41	Adjust the switch (see para. 6, this operation)..	
42	Fit the band (5)	8 mm spanner
43	<u>To Test the Starter Motor on a Test Bench</u>. The working curve at 6 volts is as follows : from 60 to 380 r.p.m. = 300 A for a load of 3.9 to 4.35 ft/lbs (0.54 to 0.60 m.kg). from 480 to 800 r.p.m. = 250 A for a load of 2.9 to 3.3 ft/lbs (0.40 to 0.46 m.kg). from 950 to 1,200 r.p.m. = 200 A for a load of 1.85 to 2.2 ft/lbs (0.26 to 0.32 m.kg). from 1,620 to 2,500 r.p.m. = 150 A for a load of 1.1 to 1.35 ft/lbs (0.14 to 0.19 m.kg). at 6,100 r.p.m. = 32 A without load.	
44	Paint the unit	

OVERHAULING A PARIS-RHONE 6 VOLTS D8 L6 STARTER MOTOR

		TOOLS
	Dismantling (see Pl. 86 and 86 A).	
45	Remove the starter switch (1)	8 mm spanner
46	Remove the brush cover (2) together with its joint	
47	To Remove the Brush Gear Plate.	
	a) Lift up the brush springs (3) and remove the brushes from the holder	
	b) Take out the split pin (4), remove the adjustment washer (5), the steel washer (6) and the fibre washer (7)	
	c) Remove the nuts from the end plate securing rods. Remove the brush gear cover plate (9). Remove the fibre washer (10) and the metal washer (11) from the armature shaft	8 mm box spanner
48	Remove the bearing bracket (12), drive end, from the starter body. Remove the armature (13) from the starter pinion. Remove the metal washer (14) from the armature shaft	
49	Remove the fork pivot pin (15). Remove the fork (16) and the pinion (17)	
50	Remove the earthing brush (18)	
51	To Remove the Switch Terminal (19).	
	a) With the aid of a soldering iron, heat the connection between the switch terminal (19) and the end pieces of the coils	
	b) Release the coil ends from the terminal by sliding a screwdriver between the coil ends and the dynamo body	
	c) Remove the terminal (19)	
52	To Remove the Coils.	
	a) Remove the four securing screws from the pole pieces (use the screwdriver MR-1601-4, see Pl. 80, fig. 2, fitted on a bench press)	Screwdriver MR-1601-
	b) Remove the pole pieces and the coils with their insulators	

		TOOLS
53	To Remove the Pinion Assembly.	
	Remove the circlip (20) (use circlip pliers), remove the Bendix pulley (21) and the spring (22)	
	NOTE - If the free wheel assembly is defective, a new assembly must be fitted. The conditions of machining the different parts are such that they cannot be changed.	
54	Remove the bush from the bearing (12), drive end, and the bush from the brush gear plate (9) (use a shouldered mandrel)	Shouldered mandrel: Small dia. = 12 mm Length = 15 mm Large dia. = 14 mm Length = 135 mm
55	Clean the parts	
	Assembly (see Pl. 86).	
56	Check the armature shaft between lathe centres	
57	Check the armature on an armature tester	
58	Grind the commutator. Do not reduce the original commutator diameter of 36 mm by more than 2 mm	
59	Separate the laminations of the commutator after grinding by means of a scraper or of a saw blade reduced to the width of the insulator, so that the sections should not be in contact	
60	Check the coils by means of a test lamp	
61	To Fit the Coils.	
	a) Tin the ends of the coil connections and the part of the terminal (19) receiving these connections	
	b) Put the coil assembly in the starter motor body. Fit the coil insulators	
	c) Put the insulating bush on the terminal (19) and the two insulating strips (8) on the bush	

		TOOLS
	d) Offer up the terminal (19) (for position of the insulator (8) see Pl. 86). Insert the ends of the terminal end pieces in the slot in the terminal and solder the connections. NOTE : *do not burn the coil insulating strip.*	
	e) Fit the pole pieces and tighten the screws temporarily	
	NOTE - In order to ensure correct positioning of the pole pieces and coils in the starter body and to provide a clearance of 0.5 mm maximum, a mandrel must be used.	
	f) Insert a mandrel between the pole pieces in a press (use the mandrel MR-1601-11 with the support MR-1601-10, see Pl. 80). Tighten the pole piece securing screws (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80, fig. 2). Take out the mandrel from the opposite end to where it was inserted	Mandrel MR-1601-11 Support MR-1601-10 Screwdriver MR-1601-4
62	To Prepare the Bearings.	
	Put the bush in position in the bearing (12) and the bush in the brush gear end plate (9) (use a shouldered mandrel) ..	Shouldered mandrel: Small dia. = 12 mm Length = 15 mm Large dia. = 14 mm Length = 135 mm
63	To Prepare the Pinion Assembly.	
	Fit the spring (22) on the pinion, put the pulley (21) in position, compress the assembly in a vice and fit the circlip (20)	
64	Fit the fork (16) on the bearing (12). Put the pivot pin (15) in position and lock with a split pin	
	Fit the two securing rods fitted with their insulators, screw up the two nuts, fitting a spring washer	8 mm spanner
65	To Fit the Bearing, Drive End on the Armature Shaft.	
	a) Put the stop washer (14) on the armature shaft	
	b) Fit the starter pinion in the bearing and engage the pulley (21) in the fork (16)	
	c) Lightly oil the splines on the armature shaft and fit in the starter pinion (17)	
66	Fit the earthing brush (18) and tighten the nut, fitting a spring washer	

		TOOLS
67	To Fit the Armature and the Brush Gear End Plate (9). Adjust the Side Clearance.	
	a) Insert the armature (prepared as in para. 21) in the starter body	
	b) Fit the metal washer (11) and the fibre washer (10) on the armature shaft	
	c) Fit the brush gear end plate (9) fitted with the brush thrust springs. Make sure that the dowel on the body on the starter is properly seated in the groove in the cover plate. Tighten the two securing nuts, fitting a spring washer.	8 mm box spanner
	d) Fit the fibre washer (7) the steel washer (6) and an adjustment washer (5) (1 mm thick) on the end of the shaft. Insert the split pin (4) (without opening out the ends)	
	With the aid of a feeler gauge, measure the side clearance which must be between 0.2 and 0.5 mm. Obtain this clearance by changing the adjustment washer (5), if necessary	
	e) Open out the ends of the split pin and tap them round the shaft	
	f) Fit the earthing and field brushes in their holders and make sure that the brush springs (3) are properly seated on their supports	
68	Fit the switch (1) and tighten the securing screws, fitting a spring washer under each head	
69	To Adjust the Starter Switch.	
	a) By means of the fork lever (16) bring the pinion body and a stop washer (14) into contact	
	b) With the assembly in this position, measure the distance "b" between the front face of the starter pinion and the spigot face on the bearing bracket (12)	
	This dimension must be such that b = 21.07 mm maximum.	
	c) If it is not so, satisfy this condition by choosing a stop washer (14) of suitable thickness	
	d) Recheck the dimension "b"	
	NOTE - This dimension is essential, otherwise the pinion will not engage with the teeth on the starter ring.	
	e) By means of the fork lever (16) bring the contact blade (24) in contact with the terminal (23)	

		TOOLS
	d) Offer up the terminal (19) (for position of the insulator (8) see Pl. 86). Insert the ends of the terminal end pieces in the slot in the terminal and solder the connections. NOTE : *do not burn the coil insulating strip.*	
	e) Fit the pole pieces and tighten the screws temporarily	
	NOTE - In order to ensure correct positioning of the pole pieces and coils in the starter body and to provide a clearance of 0.5 mm maximum, a mandrel must be used.	
	f) Insert a mandrel between the pole pieces in a press (use the mandrel MR-1601-11 with the support MR-1601-10, see Pl. 80). Tighten the pole piece securing screws (use the screwdriver MR-1601-4 fitted on a bench press, see Pl. 80, fig. 2). Take out the mandrel from the opposite end to where it was inserted	Mandrel MR-1601-11 Support MR-1601-10 Screwdriver MR-1601-4
62	<u>To Prepare the Bearings.</u>	
	Put the bush in position in the bearing (12) and the bush in the brush gear end plate (9) (use a shouldered mandrel) . .	Shouldered mandrel: Small dia. = 12 mm Length = 15 mm Large dia. = 14 mm Length = 135 mm
63	<u>To Prepare the Pinion Assembly.</u>	
	Fit the spring (22) on the pinion, put the pulley (21) in position, compress the assembly in a vice and fit the circlip (20)	
64	Fit the fork (16) on the bearing (12). Put the pivot pin (15) in position and lock with a split pin	
	Fit the two securing rods fitted with their insulators, screw up the two nuts, fitting a spring washer	8 mm spanner
65	<u>To Fit the Bearing, Drive End on the Armature Shaft.</u>	
	a) Put the stop washer (14) on the armature shaft	
	b) Fit the starter pinion in the bearing and engage the pulley (21) in the fork (16)	
	c) Lightly oil the splines on the armature shaft and fit in the starter pinion (17)	
66	Fit the earthing brush (18) and tighten the nut, fitting a spring washer	

		TOOLS
	REPLACING A SCINTEX CTXMC 2 TIME SWITCH	
	Removal.	
1	Remove the switch from the instrument panel	23 mm spanner
2	Disconnect the cables.	
3	Remove the bulb.	
	Replacement.	
4	Connect the cables, fitting a serrated washer under the nuts : - Red end to the positive terminal, - Green end to the negative terminal, - White end to the right-hand terminal, - Black end to the left-hand terminal.	
5	Fit the bulb between the contacts of the switch.	
6	Secure the switch to the instrument panel	23 mm spanner
	REPLACING A SWITCH LAMP.	
	Removal.	
7	Remove the switch from the instrument panel	23 mm spanner
8	Remove the bulb without bending the contact blades.	

		TOOLS
	<u>Replacement</u>.	
9	Fit the lamp between the contacts.	
10	Secure the switch on the instrument panel	23 mm spanner
	REPLACING THE PARKING LIGHT SWITCH	
	<u>Removal</u>.	
11	Remove the switch from the instrument panel	15 mm spanner
12	Disconnect the leads.	
	<u>Replacement</u>.	
13	Connect the leads, fitting a serrated washer under the heads of the screws :- - Violet end to the left-hand terminal, - Yellow end to the right-hand terminal, - Green end to the centre terminal.	
14	Fit the switch on the instrument panel	15 mm spanner
	REPLACING A DIRECTION INDICATOR BULB	
	<u>Removal</u>.	
15	Remove the cover of the Labinal lamp by taking out the screws on the bottom part.	
16	Remove the spherical lamp.	

	TOOLS
<u>Replacement</u>.	
17 Put the bulb in the socket and lock it by rotating through a quarter of a turn.	
18 Fit the cover and tighten the securing screws.	
REPLACING A PARKING LIGHT BULB	
<u>Removal</u>.	
19 Remove the cover by unscrewing the screw at the bottom.	
20 Remove the spherical bulb.	
<u>Replacement</u>.	
21 Put the bulb in position in the socket and lock it by turning it through a quarter of a turn.	
22 Fit the cover and tighten the securing screw.	
REPLACING A LABINAL FLASHING LAMP	
<u>Removal</u>.	
23 Remove the cover by unscrewing the screw at the bottom.	
24 Remove the bulbs. Disconnect the leads.	
25 Undo the material from the side panel at the position of the light to be removed.	
26 Remove the light, the holder and the rubber pad	7 mm box spanner

		TOOLS
	Replacement.	
27	Fit the rubber pad and the lamp holder. Tighten the nuts, fitting serrated washers	7 mm box spanner
28	Connect the leads : - The lead with the largest diameter to the terminal of the flashing lamp. - The lead with the smaller diameter to the terminal of the parking light.	
29	Put the bulbs in their sockets and lock them by rotating them through a quarter of a turn.	
30	Fit the cover and tighten the securing screw.	
31	Stick down the trimming.	
	REPLACEMENT OF A REAR LIGHT TWO PIN BULB, L. H. OR R. H.	
	Removal.	
32	Remove the cover from the lamp by unscrewing the screw.	
33	Remove the bulb.	
	Replacement.	
34	Insert the two pins of the bulb in the holes in the contact blades. Make sure that there is no play of the bulb between the blades; if so, slightly bend them at the base.	
35	Fit the cover and tighten the securing screw.	

		TOOLS
	REPLACING A BULB IN THE REAR STOP LIGHT	
	Removal.	
36	Remove the cover from the rear light by unscrewing the securing screw.	
37	Remove the bulb.	
	Replacement.	
38	Insert the lamp in the socket and tighten it by rotating it through a quarter of a turn.	
39	Fit the cover. Tighten the securing screw.	
	REPLACING A REAR LAMP	
	Removal.	
40	Remove the cover from the lamp by unscrewing the securing screw.	
41	Remove the bulbs.	
42	Disconnect the leads	7 mm spanner
43	Remove the lamp bracket	8 mm box spanner
	Replacement.	
44	Fit the bracket and secure it, fitting serrated washers under the nuts	8 mm box spanner

TOOLS

45 Connect the leads :

- Red end to the stop lamp terminal,
- Blue end to the reversing lamp terminal.

46 Fit the bulbs :

- Engage the two pins of the lamp in the holes in the contact blades. Make sure that there is no play of the lamp between the blades, if so, bend them slightly at the base.
- Insert the spherical bulb in its socket and lock it by rotating it through a quarter of a turn.

47 Fit the cover. Tighten the securing screw.

REPLACING A SPEEDOMETER BULB

Removal.

48 With the aid of a screwdriver, remove the socket from the speedometer housing.

49 Remove the bulb from the socket.

Replacement.

50 Insert the lamp in the socket and lock it by turning it towards the right after pushing it home.

51 Insert the socket in the speedometer casing as far as the collar in order to lock it correctly.

		TOOLS
	REPLACING A STOP LIGHT SWITCH	
	<u>Removal</u>.	
52	Disconnect the two leads from the terminals	7 mm box spanner
53	Remove the stop lamp switch.	
	<u>Replacement</u>.	
54	The collar forming the stop for the switch on the pedal rod must be at the bottom. Secure the contact by means of screws, fitting a serrated washer under each head.	
55	Connect the leads to the terminals, and tighten the nuts, fitting serrated washers	7 mm box spanner

		TOOLS
	ADJUSTING THE VALVE ROCKERS	
1	Remove the wings. Remove the bonnet if fitted with a bracket secured to the wings	Wheel brace
2	Place a receptacle under the cylinder head cover to collect the oil.	
3	Remove the cylinder head cover	12 mm box spanner
4	<u>To Adjust the Rocker Clearances</u> : On vehicles prior to March 1954 (adjustment to be made with engine cold) : .006'' (0.15 mm) for the inlet valves, .008'' (0.20 mm) for the exhaust valves. On cars delivered after March 1954 (adjustment to be made with the engine warm): .008'' (0.20 mm) for the inlet and exhaust valves (a .008'' (0.20 mm) feeler gauge must slide in easily and a .010'' (0.25 mm) gauge cannot be inserted). In both cases adjust the inlet valves when the exhaust valve of the same cylinder is at the very top	12 mm spanner Set of feeler gauges
5	Fit the cylinder head cover with a rubber gasket NOTE - A badly fitted gasket or insufficient tightening of the securing nut of the cylinder head cover may lead to the total loss of the engine oil. The faces of the gasket must be dry. The wider part of the gasket is to be fitted at the bottom.	12 mm box spanner
6	Start up the engine. *Check the cylinder head cover joint for leakage*	
7	Top up the engine oil to the correct level	
8	Fit the wing if only one side had been adjusted or fit both wings and the bonnet	Wheel brace

		TOOLS
	ADJUSTMENT OF IGNITION INITIAL ADVANCE (see Pl. 3).	
	Types A and AU Vehicles.	
9	Remove the fan (see Op. 6, paras. 1 and following).	
10	To Determine the Point of Ignition. a) The flywheel is not drilled : Turn the flywheel by hand to bring the reference mark engraved on the rear face of the flywheel exactly opposite the line of the joint between the two crankcase halves. b) The flywheel has a hole for adjustment purposes : Insert a 6 mm dia. rod in the hole provided on the right-hand side of the clutch housing. Turn the engine by means of the flywheel until the rod enters the hole in the flywheel. In this position, the engine is at the point of ignition (6 to 8° advance)	Rod 6 mm dia. Length = 150 mm
11	Connect the lead of an indicator lamp to the terminal screw of the condenser; the lamp holder must be earthed. Switch on the ignition	Indicator lamp
12	Unscrew the two distributor securing nuts (5). Determine the exact point at which the contacts begin to open by rotating the distributor. The lamp lights at the moment the contact points begin to open. Tighten the nuts (5)	12 mm box spanner
13	Turn the engine (by the flywheel) in the running direction and the light is extinguished. Stop rotating the engine at the very moment the lamp relights (the engine has made one complete revolution). Recheck the ignition point .... a) The flywheel is not drilled : If the reference mark on the flywheel has not passed or is in line with the joint between the two halves of the crankcase, the ignition timing is correct. If the reference mark has gone past the line of the joint, there is retardation on the second cylinder. The point of ignition on this cylinder must be adjusted and in no circumstances must the advance be less than 6°. If it is necessary, the timing adjustment for this cylinder is as described in paras. 11 and 12 above. b) The flywheel has a hole for adjustment : It must be possible to introduce the rod in the hole in the flywheel. If it can be inserted, the adjustment is correct. If the hole in the flywheel has gone beyond the rod, there is retardation on the second cylinder. The ignition point for this cylinder must be adjusted and in no circumstances must the advance be less than 6°. If it is necessary, the timing adjustment for this cylinder is described in paras. 11 and 12 above.	
14	Switch off and take out the indicator lamp	
15	Make sure that the cable harness is correctly positioned, pass the harness under the condenser and press it carefully against the face of the crankcase and secure it by means of the metal clip in order to prevent it being torn away by the fan	
16	To Refit the Fan (see Op. 6, paras. 5 and following).	

		TOOLS
	Types AZ and AZU Engines (see Pl. 2).	
17	Remove the fan (see Op. 6, paras. 1 and following)	
18	To Determine the Point of Ignition :	
	Introduce a 6 mm dia. rod in the hole provided on the left-hand side of the crankcase. Turn the engine by the flywheel until the rod enters the hole in the flywheel (see fig. 2)	
	In this position the engine is at the point of ignition (9 to 11° advance, engines with flat topped pistons; or 10 to 12° advance for engines with convex topped pistons)	Rod dia. = 6 mm Length = 100 mm
19	Connect the lead of the indicator lamp to the terminal screw of the condenser and connect the lamp holder to earth. Switch on the ignition	Indicator lamp
20	Unscrew the two distributor securing nuts (5) (see Pl. 3). Then find the exact point at which the contacts begin to open, by rotating the distributor housing (19). The lamp lights at the precise moment the contacts open. Tighten the nuts (5)	12 mm box spanner
21	Remove the rod from the engine flywheel	
22	Turn the engine by the flywheel in the running direction, the lamp being extinguished. Stop the rotation at the exact moment the lamp lights again (the engine has made one revolution). At this point it should be possible to introduce the rod in the hole in the flywheel. If the rod can be inserted, the adjustment is correct. If the hole in the flywheel has gone beyond the rod there is retardation on the second cylinder. *The point of ignition of this cylinder must be adjusted*, and in no circumstances may the advance be less than 9°. If it is necessary, the timing adjustment for this cylinder is described in paras. 18, 20 and 21	
	Switch off the ignition and remove the indicator lamp	
23	Make sure that the cable harness is correctly positioned, pass the harness under the condenser, press it carefully against the crankcase and secure it with the metal clip to prevent it being damaged by the fan	
24	Refit the fan (see Op. 6, paras. 5 and following)	

		TOOLS
	CHECKING AND ADJUSTING THE CENTRIFUGAL ADVANCE (see Pl. 3 and 4).	
25	Remove the fan (see Op. 6, paras. 1 and following)	
26	Disconnect the lead from the condenser	
27	Remove the distributor by unscrewing the nuts (5) securing it to the crankcase. Remove the protection plate (6)	12 mm box spanner
28	Fix the graduated plate of the checking tool 1692-VA on the distributor securing stud	Checking tool 1692-VA 12 mm box spanner
	NOTE - In order to use the checking tool 1692-VA on types AZ and AZU cars, it must be modified as indicated in fig. 2 of Pl. 4.	
29	Fit the needle carrier (A) on the cam, pushing it down as far as it will go, and lightly tighten the retaining screw (B).	
30	By turning the flywheel, bring the needle of the checking tool opposite the upper reference "c"	
31	Swing the needle carrier from right to left without forcing it. At the end of its travel, the needle should be opposite the reference marks :-	
	a) For types A and AU cars between "d" and "e", which corresponds to a displacement of the weights of between 16 and 19°	
	b) For types AZ and AZU cars with flat topped pistons : between "f" and "g", which corresponds to a displacement of the weights of between 11 and 14°	
	c) For types AZ and AZU cars with convex topped pistons : between "h" and "i", which corresponds to a displacement of the weights of between 6 and 8°	
	If the needle lies outside this range, the travel of the weights must be adjusted by bending the stop plates (D) and (E).	
	The weights must touch both plates (D) and (E) simultaneously	
32	Remove the checking tool 1692-VA	12 mm box spanner
33	Lightly grease and fit the protection plate (6). Fit the distributor and temporarily tighten the nuts (5), fitting flat washers	12 mm box spanner
34	Connect the lead to the condenser, tighten the screw, fitting a shakeproof washer under the head. Make sure that the cable harness is correctly fitted, pass the harness under the condenser, press it carefully against the face of the crankcase and secure it by the metal clip in order to prevent it being damaged by the fan	
35	Adjust the ignition advance (see paras. 10 to 14, or 18 to 23, this operation)	
36	Fit the fan (see Op. 6, paras. 5 and following)	

TOOLS

ADJUSTMENT OF THE CARBURETTOR

37 The setting for the Solex down-draught carburettor type 22-ZACI (type A and AU cars) and type 26 BCI and 26 CBI (type AZ and AZU cars) are as follows :-

Type	Choke	Main Jet	Emulsion Tube	Correction Jet	Starter Jet	Slow Running		Needle Valve	Float
						Air Jet	Petrol Jet		
22 ZACI	16.5	65	No. 15	210	125	200	40	1.2	11 g
26 BCI	17	95		155 with emulsion	100	240	40 three holes	1.2	5.7 g
26 BCI	15.5	100		195 M			42	1.2	5.7 g
26 CBI	15.5	100 down-draught		195 M			42	1.2	5.7 g

Any alteration of these settings *is most undesirable* since the settings was determined after numerous tests.

We remind you that on down-draught Solex carburettors a slow running is adjusted by regulating the petrol flow. Some information is given below as a guide regarding the method of adjusting the slow running.

Slow Running Adjustment (Type A and AU cars) (see Pl. 8).

The adjustment of the slow running is effected as follows with the engine warm :

1. By turning the throttle stop screw (16) by means of which the speed of the engine can be varied (set at 500 r.p.m.).
2. By turning the volume control screw (14) which controls the amount of petrol supplied by the slow running jet.

Since this screw is very sensitive, it should be turned very slowly and with great care. If the engine tends to hunt, the mixture is too rich, therefore the screw must be screwed in. If, on the other hand, the engine tends to stall and stops easily, the mixture must be made richer by unscrewing the screw. The volume control screw (14) must never be screwed right home.

Adjustment of the Slow Running and of the Dashpot (Type AZ and AZU cars, 26 BCI carburettor) (see Pl. 8 A).

38 Warm up the engine. This adjustment can be made only when the engine is warm and the oil in the dashpot is at a temperature of about 30° C.

39 Remove the air cleaner.

TOOLS

40 Adjust the throttle stop screw (22) acting on the piston rod (23) of the dashpot so that the clutch drum is at its limiting point and then slacken off the screw half a turn.

41 Screw up the mixture control screw (11) until the engine is running irregularly. Slacken this screw one and a half turns.

42 Fit the air filter.

43 Accelerate firmly, release the accelerator and measure the time taken between the moment the adjustment screw (22) comes into contact with the pushrod and the moment the pushrod reaches its highest point. This should be 2 to 2.5 seconds; if not, remove the cap (12) from the dashpot and adjust the screw (18) (the time is reduced when the screw is screwed up). Refit the cap on the chamber.

NOTE - If, after this adjustment, the engine still does not run smoothly when idling, check the valve rocker clearance, the sparking plug electrode adjustment and the adjustment of the platinum screws and of the ignition advance.

Faulty Running.

The following are some of the faults due to incorrect adjustment.

1. The sparking plugs are white in colour. There is spitting back through the carburettor. The engine knocks, overheats, has no power and the valves are distorted.

   Mixture too lean;

2. The sparking plugs are blackish in colour. Black smoke from the exhaust. The engine hunts, overheats, and loses power.

   Mixture too rich;

3. Difficulty in starting when the engine is warm, back firing in the exhaust.

   Slow running jet too small; engine turns too slowly at idling speed; mixture too lean;

4. Poor acceleration.

   Inadequate correction, jets too small, engine turns too slowly when idling;

5. Low maximum speed.

   Choke too small, inadequate jets, excessive compensation, needle valve too small, engine speed too low when idling;

6. Insufficient power on hills.

   Choke too small or too large, jets too small, excessive compensation, engine speed too low when idling.

Eliminate these faults by using the proper settings (see table above).

TOOLS

Adjust the Dashpot and the Slow Running (Type AZ and AZU cars) (26 CBI Carburettor)
(see Pl. 8 B)

44 Warm up the engine ....

45 Adjust the throttle stop screw (21) acting on the lever (22) so that the clutch drum should be at its limiting point and then slacken off the screw half a turn ....

46 Screw in the mixture control screw (18) until the engine is running irregularly. Slacken off this screw one and a half turns so that the engine runs smoothly ....

47 Accelerate sharply and then release the accelerator. Measure the time taken between the moment the control screw (21) comes into contact with the lever and the moment the lever reaches its highest position. This time should be between 1.4 and 2.5 seconds; if not, shift the return spring retaining clip as many notches along the rod as is necessary to obtain smooth running of the engine. (The time is reduced as the spring is tightened and vice versa). Commence the adjustment by putting the clip in the centre notch ....

NOTE - Before making an adjustment of the dashpot, all friction losses likely to affect operation must be eliminated.

In order to do so :

1. Make sure that the control rod is not touching either the engine crankcase or the gearbox casing.
2. Apply a few drops of special brake fluid to the control rod at the point where it passes through the body.
3. Put a few drops of special brake fluid on the ball joint of the accelerator pedal.

CHECKING AND ADJUSTING THE OIL PRESSURE

48 Warm up the engine (for about 15 minutes). Remove the R.H. front wing .... Wheel brace

49 When the oil reaches a temperature of 60° C (140° F), stop the engine.

Errata

Page 336 - Operation 47 - paragraph 52

for " 14.1 to 15.6 P.S.I. " read " 41 to 45 P.S.I. "

50 Remove the fan (see Op. 6, paras. 1 and following).

Hold the armature by means of the fan securing screw, fitting a flat washer of 10 x 30 x 2 mm thick under the head of the screw .... — 12 mm and 14 mm box spanners

51 Remove the lubricator screw from the left-hand cylinder head. Fit the connection tube of the pressure gauge by means of the union MR-3705 (see Pl. 16, fig. 1 and 2). Use a pressure gauge graduated from 0 to 142 p.s.i. (0 to 10 kg/cm^2) .... — Union MR-3705

NOTE - If the test is to be of relatively long duration, refit the fan in order to prevent the engine from overheating. In this case, introduce the pressure gauge connection tube between the air duct and the cylinder on a level with the point where the cylinder is set in the cylinder head (dotted line in Pl. 16)........ — 12 mm spanner or box spanner

52 Start up the engine. Let it run at 3,500 r.p.m. and read the pressure which should be between 14.1 to 15.6 p.s.i. (2.9 and 3.2 kg/cm^2). Stop the engine. If the pressure is not correct, change the number of washers (27) (see Pl. 11).

NOTE - 1. On earlier types, the adjustment was made by means of the washers forming the joint and located between the valve plug (2) and the crankcase (see Pl. 11).

2. The only plugs which must be refitted are those without the guide plates A-222-98a, with ball 4104-S, 8.54 dia. and spring A-222-5.

53 Disconnect the pressure gauge. Replace the cylinder head lubricator screw, fitting a double copper washer .... — 12 mm spanner or box spanner

54 Remove the screw securing the armature. Fit the fan :

a) Turn the engine by means of the flywheel to bring the pistons to T.D.C. Fit the fan and position it so that the starting handle is horizontal when in position.

b) Lock the flywheel by means of a screwdriver. Tighten the fan securing screw, fitting a spring washer under the head .... — 14 mm box spanner

		TOOLS
	c) Fit the starting handle bracket and tighten the screws, fitting a spring washer under each head	12 mm box spanner
	d) Fill up with engine oil. Start up the engine (check the valve cover plate joint for leakage).	
55	Fit the wing	Wheel brace
	CHECKING THE IGNITION SETTING	
56	Remove the L.H. front wing	Wheel brace
57	Collect the oil in a receptacle. Remove the cylinder head cover.	
58	Adjust the exhaust valve rocker clearance (with the inlet valve at its highest point and the engine cold) : - .040" (1.15 mm) for engines before March 1954. - .060" (1.55 mm) for engines after March 1954.	
59	Introduce a 6 mm dia. rod in the hole provided for checking the ignition timing.	
60	Turn the engine in the opposite direction to the running direction until the rod enters the hole in the flywheel (see Pl. 2, fig. 1 and 2).	
61	Measure the exhaust rocker valve clearance. If the ignition setting is correct, this clearance must be : - .002" to .006" (0.05 to 0.15 mm) for engines before March 1954. - .002" to .008" (0.05 to 0.20 mm) for engines after March 1954.	
62	Adjust the rockers (see para. 1 and following, this operation)	
63	Fit the cylinder head cover and top up the oil level	
64	Fit the wing	Wheel brace

		TOOLS
	CHECKING A SWIVEL PIN ANGLE (see Pl. 87 and 88).	
	NOTE - This inspection is to be carried out to check the arms after an accident. Nevertheless, if there is excessive play in the swivel pin, no measurement is possible.	
1	Check to make sure that the front wheel (on the side of the swivel pin to be checked) is not twisted	
2	Place the car on a flat horizontal surface. Adjust the height gauge 2300-T fitted with the extension 2306-VA (see Pl. 90) to 300 mm. Place it under the hub of the arm to be checked and behind the friction disc. If necessary, load the car lightly at the front so that the hub of the arm should rest on the gauge	Gauge 2300-T Extension 2306-VA
3	Align the front wheel (on the side of the swivel pin to be checked) with the rear wheel	
	a) Hold the wire level with the centre of the wheels and in contact with them as shown in Pl. 87. To prevent the wire fouling the mudflap, lift the flap and wedge it in the door (1st case) or remove it (2nd case, rigid mudflap)...	
	b) Bring the front wheel parallel to the wire by turning the steering so that the dimensions "a1" and "a2" are equal ..	
4	Measure the wheel camber in these conditions (use the gauge 2315-VA, see Pl. 88, fig. 1). (The wire must be in the region "1" of the gauge. If not, remove the arms (see Op. 21, paras. 36 to 41) and check them (see Op. 21, paras. 57 to 59)	Gauge 2315-VA
5	Turn the wheel (if working on the right-hand wheel turn to the right and vice versa)	
	a) Mark the position of the steering wheel. On the speedometer secure a wire so that its end, which acts as a pointer, is level with the steering wheel. Opposite the pointer, make a chalk mark on the steering wheel	
	b) Turn the steering wheel through a full circle to bring the reference mark *exactly* opposite the pointer	
6	Measure the wheel camber in these conditions (use the gauge 2315-VA, see Pl. 88, fig. 2). The wire must be in the region "2" of the gauge. If not, remove the arm (see Op. 21, paras. 36 to 41) and check it (see Op. 21, paras. 57 to 59)	Gauge 2315-VA

ADJUSTING THE TOE-OUT OF THE FRONT WHEELS

NOTE - *The wheels must diverge at the front. The difference between the front and the rear of the wheel must be between 1 and 3 mm.*

To Carry out this operation, it is necessary for the front and rear heights to be adjusted (see Op. 50, paras. 1 and following).

		TOOLS
7	Use one of the gauges obtainable in the trade	Toe in / Toe out gauge
8	Set the steering so that the wheels point straight ahead	
9	Measure the distance between the outer edges of the rims at the front on a level with the wheel centres. With chalk, mark the points between which the measurement was taken. Move the car forward so that the wheels make half a rotation and measure at the rear the distance between the marks (taken at the same height). If this measurement shows a difference of between 1 mm and 3 mm, the adjustment is correct. If not, remove from the steering arms the adjustment washers situated on either side of the ball sockets. To do this, proceed as follows :	
10	Remove the bonnet if fitted with a hinged support	
11	Remove the wings	Wheel brace
12	Jack up the vehicle (use the support MR-3300-70, placed on a roller jack, see Pl. 52)	Support MR-3300-70
13	Remove the wheels	Wheel brace
14	Disconnect the steering rods from the steering arms (see Pl. 53)	
	a) Remove the dust covers	
	b) Take out the split pins and remove the nuts (60) (use the spanner MR-3691-1, see Pl. 54, fig. 2)	Spanner MR-3691-1
15	Make the required changes to the adjustment washers (57 or 59)	
16	Screw up and tighten the nuts (60) (use the spanner MR-3691-1, see Pl. 54, fig. 2). Tighten the nuts fully and then slacken them off one sixth of a turn. Put the split pins in the nearest hole	Spanner MR-3691-1
17	Fit the dust covers	
18	Fit the wheels	Wheel brace
19	Lower the vehicle to the ground. Fit the wings	Wheel brace
20	Fit the bonnet, if removed	
21	Carry out a new check as described in paras. 7, 8 and 9	

		TOOLS
	ADJUSTING THE STEERING LOCK	
	NOTE - For this operation, it is necessary to adjust the front and rear heights (see Op. 50, paras. 1 and following).	
22	Put the car on a flat, horizontal surface	
23	Turn the wheels to full lock. Check to make sure that there is a clearance of at least 10 mm between the tyre and the arm, and a clearance of at least 1 mm between the inertia damper and the arm on the opposite side	
24	If there is not, adjust the stop screw located on the arm	12 mm spanner 12 mm box spanner
25	Check the steering lock for the other wheel	
	CHECKING A REAR ARM	
	This inspection is to be carried out to check the arms after an accident. It comprises two operations : checking the toe-in and checking the camber	
26	<u>To Check the Toe-in of the Rear Wheels</u>.	
	The wheels should converge towards the front. The toe-in must be between 0 mm and 8 mm. In order to carry out this operation, it is essential that the front and rear heights be correctly adjusted (see Op. 50, paras. 1 and following).	
	However, on cars of the first type (delivered before September 1950) the toe-in is between 8 and 16 mm	
	Proceed as described in para. 9, this operation. If the toe-in does not lie within the prescribed limits, one arm or both arms are bent. In that case :	
	Remove the arms (see Op. 26, paras. 11 and following)	
	Check the arms (see Op. 26, para. 26)	
	If the toe-in is within the tolerance limits, check the camber	

		TOOLS
27	<u>To Check the Camber on the Rear Wheels.</u>	
	Place the car on a flat, horizontal surface. Adjust the height gauge 2300-T, fitted with the extension 2306-VA (see Pl. 90) to 388 mm. Place it under the hub of the arm to be checked, behind the friction damper. If necessary, load the car at the rear so that the hub of the arm should rest on the gauge	Gauge 2300-T Extension 2306-VA
28	Remove the rear wing on the side to be checked	12 mm spanner 12 mm box spanner
29	Use the gauge 2315-VA, (see Pl. 88, fig. 1). The wire must be in the region "1" of the gauge (on cars delivered before December 1950) and in the region "3" on later types. If it is not, remove the arm (see Op. 26, paras. 11 and following) and check it (see Op. 26, para. 26)	Gauge 2315-VA
	CHECKING THE POSITION OF THE REAR ARM (see Pl. 89).	
	NOTE - *If there is excessive tyre wear, it may be necessary to check the toe-in of each rear wheel.*	
30	Put the car on a flat, horizontal surface. The front and rear heights must be correctly adjusted (see Op. 50, paras. 1 and following)	
31	Put the gauge MR-3756-20 as shown in Pl. 89	Gauge 3756-20
32	Unscrew the movable rod F and move it away from the rim. Bring the pointer A in contact with the rim at the height of the centre of the stub axle by sliding the fork B in the socket C. Lock the fork by screwing up the screw D	
33	Proceed in the same way for the other wheel with the other side of the gauge	
34	On both sides, bring the movable pointer F into contact with the rim. On either side of the vernier scale, read the number opposite the reference mark. Example : 2 mm on the right and 1 mm on the left.	
35	Remove the forks B, move the car forward so that the wheels make exactly half a turn	

TOOLS

36 Carry out the operations described in paras. 32, 33 and 34 again . . . .

The numbers read on the vernier scales are for example :

3 mm on the right and 6 mm on the left.

37 Take the average of the two readings. In the example chosen :

$$\text{On the right : } \frac{2 + 3}{2} = 2.5 \text{ mm and on the left : } \frac{1 + 6}{2} = 3.5 \text{ mm.}$$

This average must be between 0 and 4 mm; if not, the arm is bent.

ADJUSTMENT OF THE BUMP STOPS

38 For this operation, it is essential that the front and rear heights under the chassis should be correctly set (see Op. 50) (paras. 1 and following). Make sure that there is a distance of 12 to 15 mm between the rubber buffers and the stop on the arm. If not, obtain this distance by using the adjusting shims sold by our Spare Parts Division under the No. A-437-85 . . . .

		TOOLS
	ADJUSTMENT OF THE CAMS	
	Adjustment of the Front Brake Cams (aluminium backplate).	
1	Jack up the front of the car (use the support MR-3300-70, placed on a roller jack, see Pl. 52)	Support MR-3300-70
2	Remove the wings and the heater ducts	Wheel brace
3	With a screwdriver take out the plug (94) from the brake drum (see Pl. 28)	
4	Turn the pin on the adjusting cam in the direction shown in Pl. 29, using a spanner, until the shoe comes into contact with the drum. Make sure of this by turning the wheel by hand. Move it back slightly to release it and then bring it forward again until the lining exerts a slight pressure (*never finish the adjustment by moving the shoe away from the drum*). The shoe must be adjusted as near the drum as possible to ensure short pedal travel. Proceed in the same way for the other shoe	21 mm spanner
5	Put the plug (94) in position on the brake drum	
6	Proceed in the same way for the other front wheel	
7	Fit the wings and the heater ducts	Wheel brace
8	Lower the car to the ground	
	Adjustment of the Front Brake Cams (steel brake backplate).	
9	Jack up the front of the car (use the support MR-3300-70 placed on a roller jack, see Pl. 52)....................	Support MR-3300-70

		TOOLS
10	To Adjust the Cams.	
	Turn the pin of the cam with the aid of a 14 mm double ended spanner (use the spanner 2126-VA, see Pl. 29 A, fig. 2), in the direction shown in Pl. 29 B, at the same time turning the drum by hand until the shoe comes into contact with the drum. Move it slightly back in order to free it, and bring it forward again until the lining exerts a slight pressure (*never finish the adjustment by moving the shoe back*).	
	The shoe must be adjusted as near the drum as possible to ensure short pedal travel	
	Proceed in the same way for the other shoe	Spanner 2126-VA
11	Carry out the same operation for the other wheel	
12	Lower the car to the ground (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
	To Adjust the Rear Brake Cams.	
13	Jack up the rear of the car (use the support MR-3300-70 placed on a roller jack, see Pl. 52)	Support MR-3300-70
14	Proceed in the same way as described in para. 4, this operation	
	Turn the cams in the direction shown in Pl. 65	21 mm spanner
15	Lower the vehicle to the ground	
	ADJUSTMENT OF THE HANDBRAKE	
	NOTE - The handbrake acts only on the front brake drums.	
16	Jack up the front of the car (use the support MR-3300-70, placed on a roller jack, see Pl. 52). Adjust successively the tension of the two brake cables so that when the handbrake control is moved into the 4th notch, application of the brakes is started and when moved into the 5th notch, the wheels are locked	Support MR-3300-70

		TOOLS
	ADJUSTMENT OF THE BRAKE PEDAL	
	NOTE - The clearance between the pushrod and the piston of the master cylinder required to enable the piston to move back and clear the fluid feed hole, is obtained by adjustment of the pedal.	
17	Place the stop pin in the hole in the pedal rod which will give a lost motion of about 10 mm before the pushrod acts on the master cylinder piston. In practice, the pin is placed in the 4th hole from the pedal end of the rod	
	BLEEDING THE BRAKE SYSTEM	
	NOTE - If the brakes are to act efficiently, it is essential that there should be no air bubbles in the system.	
18	Fill up the fluid reservoir and check from time to time and top up as required, (use only special brake fluid)........	
19	Jack up the car (use the support MR-3300-70 placed on a roller jack, see Pl. 52)...........................	Support MR-3300-70
20	Remove the rubber protection cap from the bleed screw on the R.H. rear wheel cylinder. Fit a flexible tube on the bleed screw. Insert the end of the tube in a receptacle, preferably a transparent one (glass, bottle etc.) containing a little brake fluid	Rubber tube : Internal dia. = 6 mm Length = 300 mm
21	Unscrew the bleed screw about half a turn	8 mm spanner
22	*Have the brake pedal operated by an assistant*	
	With each movement of the pedal, a certain amount of liquid will flow out of the tube bringing with it any bubbles of air which may be in the system. The air will bubble up in the liquid contained in the receptacle. Continue to operate the pedal until air no longer escapes through the tube. Then *keeping the pedal pressed down and the tube still immersed in the liquid,* screw up the bleed screw	
	Remove the rubber tube. Refit the rubber protection cap	

TOOLS

23 Carry out the same operation for each of the other wheels in the following order : L. H. rear wheel, R. H. front wheel, L. H. front wheel.

Do not forget to top up the reservoir (use only special brake fluid).

24 To Check for Leakage.

In order to do so, press on the pedal as hard as possible for about 30 seconds to 1 minute. If the pedal exerts resistance, there is no leakage; on the other hand, if it moves down more or less quickly, there is a leak at one of the unions or in one of the tubes ....

Check the reservoir as well; if the level is falling, it means that the cup on the master cylinder is not tight. *This unit must immediately be overhauled* (see Op. 33) ....

25 Lower the car to the ground ....

NOTE - On the market, there are pressure apparatus which enable the system to be bled continuously and which give good results. *Their use is highly recommended.*

TOOLS

ADJUSTMENT OF THE HEIGHTS (cars with suspension units and anti-pitching springs) (see Pl. 73).

If the heights are adjusted in accordance with one or other of the methods described below, the distribution of the weights is correct.

Saloon Type A : Pilote tyres 125 x 400, the heights must be :

- at the front = 298^{+5}_{0} mm measured from the ground to the underside of the arm hub behind the friction damper.
- at the rear = 385^{+6}_{0} mm measured from the ground to the underside of the arm hub behind the friction damper.

Van Type AU : Pilote tyres 135 x 400, the heights must be :

- at the front = 298^{+5}_{0} mm measured from the ground to the underside of the arm hub behind the friction damper.
- at the rear = 435^{+6}_{0} mm measured from the ground to the underside of the arm hub behind the friction damper.

1 Prepare the vehicle for the road, i.e. with spare wheel and tools in position and 1.1 gallons (5 litres) petrol in the tank, without any other load; the tyre pressure being :

- Saloon cars : 14 lbs.(1.00 kg/cm^2) at the front, 16 lbs.(1.10 kg/cm^2) at the rear;
- Vans : 16 lbs. (1.10 kg/cm^2) at the front, 17 lbs. (1.20 kg/cm^2) at the rear.

2 Pre-adjustment of the Suspension Tie-rods (see fig. 1).

NOTE - This work is carried out only if one or both suspension units have been removed. Adjust the length of the suspension tie-rods as follows :-

Saloon cars :

- dimension "d" = 440 mm for the front tie-rods;
- dimension "e" = 535 mm for the rear tie-rods.

Vans :

- dimension "d" = 445 mm for the front tie-rods;
- dimension "e" = 500 mm for the rear tie-rods.

		TOOLS
3	<u>Adjustment of the Heights</u> (see fig. 2).	
	1st METHOD	
	NOTE - This 1st method which is slightly longer than the 2nd one, since it is more accurate, should be the one used for preference.	
	a) Place the vehicle on a *flat, horizontal* surface. Set the wheels as for running in a straight line	
	b) Remove the cover plates from the friction dampers and remove the front and rear friction dampers	12 mm ring spanner
	c) Saloon.	
	Put a weight of about 110 lbs. (50 kgs) in the luggage boot on the *centre line of the vehicle*	
	d) Van.	
	Put a weight of about 133 lbs. (60 kgs) on the *centre line of the vehicle* on the floor between the rear axle tube and the doors	
	e) Position the adjustable tubular ends (5) and (9). In order to do so, move the nuts (4) and (20) so that they are at a distance "c" = 2 mm from the shoulder of the end tube and are in contact with support brackets (use the spanners 2185-VA and 2186-VA, see Pl. 74)	Spanners 2185-VA and 2186-VA
	f) <u>Adjust the Front Heights</u>.	
	Saloon : to 325 mm;	
	Van : to 320 mm (the vehicle remaining loaded at the rear).	
	Distances to be measured from the ground to the underside of the arm hub.	
	NOTE - The anti-pitching springs (6 and 12) must not rest on the adjustable end tube shoulder; if necessary, move the suspension unit by adjusting the suspension tie-rods. In order to move the suspension unit towards the front, screw up the front tie-rod and unscrew the rear tie-rod the same number of turns and vice versa.	
	Adjust the heights to the dimensions given above according to the type of vehicle (use the height gauge rod 2300-T fitted with attachment 2303-VA, see Pl. 90) by screwing up or unscrewing the front tie-rods (1). Use a flat spanner or an adjustable spanner to the exclusion of all other tools and *especially pipe wrenches, which may produce grooves leading to subsequent breaking*	
	When working, avoid rotating the suspension unit as this would alter the adjustment of the rear tie-rods. Hold the suspension unit by hand or hold the rear tie-rod	Height gauge 2300-T Attachment 2303-VA 8 mm spanner
	g) Bring the adjustable tubular ends at the front in contact with the anti-pitching springs. Lock them in this position. (Use the spanners 2185-VA and 2186-VA, see Pl. 74)	Spanners 2185-VA and 2186-VA
	h) Remove the load placed in the back of the vehicle	

		TOOLS
4	Adjust the Rear Heights. a) Turn the tie-rods (17) to obtain the rear height measurement given at the beginning of the operation, according to the type of vehicle. (Avoid rotating the suspension unit). Measure the height with the utmost accuracy (use the height gauge 2300-T fitted with the attachment 2303-VA, see Pl. 90)...... After this adjustment, the front heights must lie within the tolerance limits given at the beginning of the operation. Check them. If they are not correct, rotate each front tie-rod the same number of turns in order to obtain the required dimension	8 mm spanner Height gauge 2300-T Attachment 2303-VA
	b) Bring the rear end pieces (19) towards each other to obtain a distance "b" = 6 mm from the end of the rear anti-pitching spring (12) to the shoulder of the end piece (see fig. 2). Lock them in this position (use the spanners 2185-VA and 2186-VA, see Pl. 74)	Spanners 2185-VA and 2186-VA
5	To Fit the Friction Discs (see Pl. 50). a) Fit a paper gasket between the friction disc and the axle arm. Fit the friction disc on the lugs on the axle crossmember (use the spanner 1834-VA, see Pl. 51, fig. 2)	Spanner 1834-VA
	b) Fit the cover plates (with a paper gasket), tighten the screws, fitting a spring washer under each head	12 mm ring spanner
	NOTE - *If the chassis platform is strained or bent, the heights cannot be adjusted to within the tolerances.* Nevertheless, in order to obtain favourable distribution of the loads, uniformity of the front heights must be obtained at the expense of the rear heights. In order to do so, proceed as described in para. 3, (sub-paras. "a" to "h"). Then adjust the defective front height by screwing the corresponding rear tie-rod. (Screwing in the rear tie-rod, holding the suspension unit still, will increase both the front and the rear heights). *If the arms are bent, the distribution of the loads will be unfavourable in spite of the correct heights.* After an accident, the arms must be checked either in position (by checking the swivel pin angle at the front and the camber and the toe-in at the rear (see Op. 48), or by stripping down (see Op. 21 and 26).	
	2nd METHOD	
6	Put the car on a *flat, horizontal* surface. Set the wheels for running in a straight line (vehicle in running order with spare wheel, tool kit and 1.1 gallons (5 litres) petrol in the tank)......	
	a) Remove the friction disc cover plates and the front and rear friction discs	12 mm ring spanner
	b) Set the front adjustable tubular ends (5). In order to do so, move the nuts (4 and 20) so that they are at a distance "c" = 2 mm from the shoulder on each end tube and are resting on the support brackets (use the spanner 2185-VA and 2186-VA, see Pl. 74)	Spanners 2185-VA and 2186-VA
	c) Adjust the two front heights by rotating the front tie-rods (1)	8 mm spanner

	TOOLS
d) Adjust the two rear heights by screwing the rear tie-rods (17); if the correction to be made is a substantial one, the front heights will be outside the limit tolerances. Re-adjust the front tie-rods (1) to complete the adjustment (use the height gauge 2300-T fitted with the attachment 2303-VA, see Pl. 90)	8 mm spanner Height gauge 2300-T Attachment 2303-VA
e) Move the rear ends (19) towards each other in order to obtain a dimension "b" = 6 mm from the end of the rear vibration damper spring (12) to the shoulder on the end tube (see fig. 2). Lock them in this position (use the spanner 2185-VA and 2186-VA, see Pl. 74)	Spanners 2185-VA and 2186-VA

7 Fit the friction disc (see para. 5, this operation) ....

NOTE - If the platform of the chassis is strained or bent, it is not possible to adjust the heights within tolerances. In this case, use the 1st method.

ADJUSTMENT OF THE HEIGHTS (cars with visible suspension springs) (see Pl. 73).

If the heights are adjusted by one of the following methods, the distribution of the weights is correct.

Saloon - Pilote tyres, 125 x 400, the heights must be :

- at the front : 293 $\pm$ 2.5 mm, measured from the ground to the underside of the arm hub behind the friction disc;
- at the rear : 393 $\pm$ 2.5 mm, measured from the ground to the underside of the arm hub behind the friction disc.

Van - Type AZU - Pilote tyres, 135 x 400, the heights must be :

- at the front : 293 $\pm$ 2.5 mm, measured from the ground to the underside of the arm hub behind the friction disc;
- at the rear : 418 $\pm$ 2.5 mm, measured from the ground to the underside of the arm hub behind the friction disc.

8 Put the vehicle into running order, i.e. with the spare wheel fitted, with the tool kit and with 1.1 gallons (5 litres) of petrol in the tank, without any other loads, the pressure of the tyre being :

for saloons :	at the front = 14 lbs. (1 kg/cm^2)
	at the rear = 16 lbs. (1.1 kg/cm^2)
for vans :	at the front = 16 lbs. (1.10 kg/cm^2)
	at the rear = 17 lbs. (1.20 kg/cm^2)

9 Pre-adjust the Suspension.

NOTE - This work is to be carried out only if one or both suspension springs have been removed.

TOOLS

Adjust the tension of the rubber buffers by screwing up or unscrewing the rear spring (note: left-hand thread).

	Saloon	Van
L.H. side h = ...	154	159
R.H. side h = ...	156	162

Adjust the length of the suspension tie-rods in order to obtain a dimension of :

	Saloon	Van
Front tie-rod f = ...	350 ± 0.5 mm	354 ± 0.5 mm
Rear tie-rod g = ...	993 ± 0.5 mm	962 ± 0.5 mm

Make sure that at least 10 threads are engaged in each socket and in the end pieces of the spring (right-hand thread in the sockets and left-hand thread in the spring end pieces).

10 <u>To Adjust the Heights.</u>

a) Put the vehicle on a flat, horizontal surface. Set the front wheels as for running in a straight line.

b) Remove the friction damper cover plates and the front and rear friction dampers.

c) Adjust the front heights (17).

Hold the adjustment rod, unscrew the locknut (25) (use the spanner 2187-VA, see Pl. 74, fig. 2). Set for the heights given above (use the height gauge 2300-T fitted with the attachment 2306-VA, see Pl. 90), by screwing up or unscrewing the adjustment rod (use a spanner to the *exclusion of all other tools, in particular pipe wrenches which will form grooves in the rod leading to breakage.* While carrying out the work, avoid rotating the suspension spring (28) by holding it by hand ....

8 mm spanner
Height gauge 2300-T,
Attachment 2306-VA,
Spanner 2187-VA

d) Adjust the rear heights.

Turn the adjustment rods (17) in order to obtain the rear height dimension given at the beginning of the operation, according to the type of car (avoid rotating the suspension spring). Measure this dimension with great accuracy (use the height gauge 2300-T fitted with the attachment 2306-VA, see Pl. 90). After this adjustment, the front heights must be within the tolerances given at the beginning of the operation. Check them. If they are not, turn each of the front rods the same number of turns in order to obtain the required dimensions ....

8 mm spanner
Height gauge 2300-T
Attachment 2306-VA

TOOLS

e) After the heights have been adjusted, there must be a clearance "a" = 0 to 2 mm between the front vibration damper (32) and the front face of the support "A". Screw up or unscrew the rear spring (27) (left-hand thread) to obtain this condition. Re-check the heights. Tighten the locknuts (25) on the adjustment springs (left-hand thread) (use the spanner 2187-VA, see Pl. 74, fig. 2) .... Spanner 2187-VA

f) Fit the friction dampers (see para. 5, this operation).

NOTE - 1. When fitting, do not apply too much grease to the bushes (30) as this will cause rapid deterioration of the rubber stops (29).

2. In no circumstances, must the springs be refitted if the ends are not secured by two spot welds.

ADJUSTMENT OF THE HEIGHTS (car with suspension unit and rubber stops).

If the heights are adjusted in accordance with the following method, the weight distribution will be correct :

Type AZ Saloon : Pilote tyres 125 x 400, the heights must be :

- at the front = $298 {}^{+2}_{\ 0}$ mm measured from the ground to the underside of the arm hub behind the friction disc.
- at the rear = $385 {}^{+6}_{\ 0}$ mm measured from the ground to the underside of the arm hub behind the friction disc.

Type AZU Van : Pilote tyres 135 x 400, the heights must be :

- at the front = $298 {}^{+2}_{\ 0}$ mm measured from the ground to the underside of the arm hub behind the friction disc.
- at the rear = $438 {}^{+2}_{\ 0}$ mm measured from the ground to the underside of the arm hub behind the friction disc.

11 Put the vehicle into running order, i.e. with spare wheel fitted, tool kit 1.1 gallons (5 litres) petrol in the tank, to the exclusion of all other loads, the pressure of the tyres being :

Type AZ Saloon : at the front = 14 lbs. (1.00 kg/cm^2)
at the rear = 16 lbs. (1.10 kg/cm^2)
Type AZU Van : at the front = 16 lbs. (1.10 kg/cm^2)
at the rear = 17 lbs. (1.20 kg/cm^2)

12 To Adjust the Heights.

a) Put the car on a flat, horizontal surface. Set the front wheels as for running in a straight line.

b) Remove the front and rear friction damper cover plates.

c) Adjust the front heights by screwing up or unscrewing the front tie-rods. Use an adjustable spanner or a flat spanner to the exclusion of all other tools and especially pipe wrenches which will make grooves in the tie-rod leading to breakage. When working, avoid rotating the suspension unit as this would upset the height adjustment of the rear tie-rods.
Hold the suspension unit or hold the rear tie-rods.

	TOOLS
d) <u>Adjust the rear heights</u> by screwing up or unscrewing the rear tie-rods. If the correction is a substantial one, <u>the front heights will</u> be outside the limit tolerances. Reset the front tie-rods in order to complete the adjustment. (Use the height gauge 2300-T fitted with the attachment 2303-VA, see Pl. 90)	Height gauge 2300-T Attachment 2303-VA
e) Adjust the rear end tubes in order to obtain a clearance of 0 to 2 mm between the end tube and the flexible stop. (Use the spanners 2185-VA and 2186-VA, see Pl. 74). 1 to 2 threads of the front end piece must extend beyond the nut	Spanner 2185-VA Spanner 2186-VA
f) Fit the friction discs (see para. 5, this operation).	
CHECK THE WHEELS (see Pl. 91 and 92).	
13 <u>Running-out and Eccentricity</u>. - With the aid of a surface gauge check :	
a) The eccentricity on the outer periphery of the rim,	
b) The running-out of the inside face of the rim; this must not exceed 4 mm.	
Eccentricity or exaggerated running-out can cause shimmy in the same way as an unbalanced wheel.	
14 <u>Balancing the Wheels</u> (Static).	
We describe the method for determining the correcting any out-of-balance. This operation requires very sensitive equipment (use the arrangement MR-3196-10)	
A wheel should be balanced only when normally inflated and after it has run for several miles. This is to allow the tube and cover to settle into position	
Carefully clean the wheel and the tyre	
Fit the wheel on the balancing device MR-3396-10	
After several revolutions, the assembly will come to rest with the heavy point at the bottom "a" (see fig. 1)	
At the diametrically opposite point, put sufficient roofing putty in order to balance the wheel	
Mark the centre line of the piece of putty "b" (see fig. 1)	
Weigh the putty	
At the point where the wheel was marked, place on both sides of the rim two weights whose total weight is equal to that of the putty (see fig. 3). These weights are sold by our Spare Parts Division.	Balacing Device 3396-1
15 <u>Dynamic Balancing of the Wheels</u>.	
Machines are available on the market for dynamic balancing of the wheels.	

TOOLS

Equipment MR-1572
21 mm box spanner

The inclination of the headlamps can be controlled from inside the car, but nevertheless, the beams must be adjusted. In order to do so, use the equipment MR-1572, (see Pl. 93) ....

1 Adjust the movement of the manual control. Turn the control knob from left to right as far as it will go ....

Turn the knob $2\frac{1}{2}$ turns from right to left. Move the castellated stop nut so that it is 0.5 mm from the pivot of the headlamp support ....

2 Put the car on a flat, horizontal surface in running order with tools, spare wheel and 1.1 gallons (5 litres) of petrol in the tank ....

3 Put the screen in position. Hook the steel cables of the screen on the front towing eyes of the vehicle ....

4 Adjust the position of the adjustment wires on the screen (see Pl. 93) :

the vertical wires are to be in the centres of the headlamps;

the horizontal wires to be on a level with the headlamp centres, minus 50 mm.

Example : Height of headlamps = 850 mm; height of the wire = 850 - 50 = 800 mm.

5 The control remains in the position determined in para. 1.

Adjust the position of the beam : with the headlamps dipped, the top line of the beam must be level with the horizontal wire and the centres of the beams must be at the point of intersection of the vertical and horizontal wires.

NOTE - If there is a black patch in the beam, the bulb must be renewed.

SCHEDULE OF PARTS

1	Headlamp, R.H. front.
2	Headlamp, L.H. front.
3	Horn.
12	Dynamo.
13	Starter Motor.
15	Regulator.
17	Battery.
22	Coil.
24	Ignition switch.
29	Ammeter.
36	Lighting and horn switch.
46	Rear lamp, centre.
61	Contact-breaker.

CONNECTORS : A, B, C, D.

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
1	Front	*Feed terminal of light switch (36)...... to output terminal of the ammeter (29).*	Blue
2		*Headlamp terminal of light switch (36)...... to connector C.*	Yellow
3		*Dipping terminal of light switch (36)...... to connector B.*	Green
4		*Front light terminal of light switch (36)...... to connector A.*	Red
5		*Horn terminal of light switch (36)...... to horn terminal (3).*	White
6		*Rear light terminal of light switch (36)...... to connector D.*	Blue
7		*Output terminal of ammeter (29)...... to BAT terminal on the regulator (15).*	Blue
8		*Output terminal on the ammeter (29)...... to the lower terminal on the ignition switch (24).*	Blue
9		*Feed terminal on the ammeter (29)...... to the starter motor terminal (13).*	Green

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
10	Front	*Upper terminal on ignition switch (24)* .... *to positive terminal on coil (22).*	Red
11		*Negative terminal of coil (22)* .... *to terminal on distributor (61).*	Blue
12	Dynamo and regulator	*DYN terminal of the dynamo (12)* .... *to DYN terminal on the regulator (15).*	Yellow
13		*EXC terminal on the dynamo (12)* .... *to EXC terminal on the regulator (15)*	Red
14		*Earth of the regulator (15)* .... *to earth on the gearbox.*	Black
15	Headlamps	*Headlamp terminal on R.H. front headlamp (1)* .... *to connector C.*	Yellow
16		*Dipping terminal of the R.H. front headlamp (1)* .... *to connector B.*	Green
17		*Front light terminal of R.H. front headlamp (1)* .... *to connector A.*	Red
18		*Headlamp terminal of R.H. front headlamp (1)* .... *to the headlamp terminal of the L.H. front headlamp (2).*	Yellow
19		*Dipping terminal of R.H. front headlamp (1)* .... *to dipping terminal of L.H. front headlamp (2).*	Green
20		*Front light terminal of R.H. front headlamp (1)* .... *to front light terminal of L.H. front headlamp (2).*	Red
21	Rear	*Connector D* .... *to rear light terminal (46).*	Blue

SCHEDULE OF PARTS

1	Headlamp, R. H. front.
2	Headlamp, L. H. front.
3	Horn.
9	Direction indicator and parking light, R. H.
10	Direction indicator and parking light, L. H.
12	Dynamo.
13	Starter.
15	Regulator.
17	Battery.
19	Stop light switch.
22	Coil.
24	Ignition switch.
29	Ammeter.
33	Parking light switch.
35	Time switch for direction indicator lights.
36	Lighting and horn switch.
45	Red rear and stop light, L. H.
46	Rear light, centre.
55	Red rear light, R. H.
60	Speedometer light.
61	Contact-breaker.

CONNECTORS : A, B, C, D, E, F, G, H, J, K.

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
1	Front	*Feed terminal of lighting switch* (36)........ *to output terminal on ammeter* (29).	Blue
2		*Headlamp terminal of lighting switch* (36)........ *to connector* G.	Yellow
3		*Dipping terminal of the lighting switch* (36)........ *to connector* H.	Green
4		*Front light terminal of the lighting switch* (36)........ *to connector* J.	Red
5		*Horn terminal of the lighting switch* (36)........ *to horn* (3).	White
6		*Rear light terminal of the lighting switch* (36)........ *to connector* E.	Blue
7		*Rear light terminal of the lighting switch* (36)........ *to connector* K.	Blue

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
8	Front	*Feed terminal of the ammeter (29)* .... *to starter terminal (13).*	Green
9		*Feed terminal of the ammeter (29)* .... *to connector B.*	Green
10		*Output terminal of the ammeter (29)* .... *to BAT terminal of the regulator (15).*	Blue
11		*Output terminal of the ammeter (29)* .... *to the lower terminal of the ignition switch (24).*	Blue
12		*Upper terminal of the ignition switch (24)* .... *to connector D.*	Red
13		*Upper terminal of the ignition switch (24)* .... *to positive terminal of the coil (22).*	Red
14		*Upper terminal of the ignition switch (24)* .... *to the stop light switch (19).*	Red
15		*Stop light switch (19)* .... *to connector F.*	Red
16		*EXC terminal on the regulator (15)* .... *to EXC terminal on the dynamo (12).*	Yellow
17		*DYN terminal on the regulator (15)* .... *to DYN terminal on the dynamo (12).*	Red
18		*Earth terminal on the regulator (15)* .... *to earth on the gearbox.*	Black
19		*Negative coil (22)* .... *to distributor (61).*	Blue
25	Flashing light R. H.	*Centre terminal of parking light switch (33)* .... *to connector B.*	Green
26		*R.H. terminal of parking light switch (33)* .... *to connector A.*	Yellow
27		*L.H. terminal of parking light switch (33)* .... *to R.H. parking light (9).*	Violet
28		*Connector C* .... *to flashing terminal of R.H. light (9).*	Blue
30	Flashing light L. H.	*R.H. terminal of parking light switch (35)* .... *to connector C.*	Blue
31		*L.H. terminal of parking light switch (35)* .... *to L.H. light (10) (flash terminal).*	Green

No. of wire	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
32	Flashing light L. H.	*Negative terminal of direction indicator light switch (35)* .... *to earth on battery case.*	Black
33		*Positive terminal of direction indicator light switch (35)* .... *to connector D.*	Red
34		*Connector A* .... *to L.H. parking light (10).*	Yellow
40	Headlamps	*Connector G* .... *to headlight terminal, R.H. (1).*	Yellow
41		*Connector H* .... *to dip terminal of R.H. headlamp (1).*	Green
42		*Connector J* .... *to lamp terminal of R.H. headlamp (1).*	Red
43		*Headlamp terminal of R.H. headlamp (1)* .... *to headlamp terminal of L.H. headlamp (2).*	Yellow
44		*Dip terminal of R.H. headlamp (1)* .... *to dip terminal of L.H. headlamp (2).*	Green
45		*Lamp terminal of R.H. headlamp (1)* .... *to lamp terminal of L.H. headlamp (2).*	Red
50	Rear	*Connector E* .... *to L.H. red rear light (45) lamp terminal.*	Blue
51		*Connector F* .... *to L.H. red rear light (45) stop terminal.*	Red
52		*Lamp terminal of L.H. rear light (45)* .... *to centre rear light (46).*	Blue
53		*Centre right-hand lamp (46)* .... *to lamp terminal of R.H. rear red light (55).*	Blue
60	Separate lead	*Speedometer lamp (60)* .... *to connector K.*	Blue

LOW TENSION CABLES	
Positive terminal of the battery (17) to positive terminal of starter (13).	
Negative terminal of the battery (17) to earth on the gearbox.	

SCHEDULE OF PARTS

1	Headlamp, R.H. front.	24	Ignition switch.
2	Headlamp, L.H. front.	29	Ammeter.
3	Horn.	33	Parking light switch.
9	Direction indicator and parking light, R.H.	35	Time switch for direction indicator lights.
10	Direction indicator and parking light, L.H.	36	Lighting and horn switch.
12	Dynamo.	46	Rear lamp, centre.
13	Starter.	55	Red rear light, R.H.
15	Regulator.	56	Red rear light, L.H.
17	Battery.	58	Stop light.
19	Stop light switch.	60	Speedometer light.
22	Coil.	61	Contact-breaker.

CONNECTORS : A, B, C, D, E, F, H, J, K.

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
1	Front	*Feed terminal of the lighting switch (36)*........ *to output terminal of the ammeter (29).*	Blue
2		*Headlamp terminal of the lighting switch (36)*........ *to connector G.*	Yellow
3		*Dip terminal of the lighting switch (36)*........ *to connector H.*	Green
4		*Front lamp terminal of the lighting switch (36)*........ *to connector J.*	Red
5		*Horn terminal of the lighting switch (36)*........ *to horn (3).*	White
6		*Rear light terminal of the lighting switch (36)*........ *to connector E.*	Blue
7		*Rear light terminal of the lighting switch (36)*........ *to connector K.*	Blue

No. of wire	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
8	Front	*Feed terminal of ammeter (29)* *to starter terminal (13).*	Green
9		*Feed terminal of ammeter (29)* *to connector B.*	Green
10		*Output terminal of ammeter (29)* *to BAT terminal of regulator (15).*	Blue
11		*Output terminal of ammeter (29)* *to lower terminal on ignition switch (24).*	Blue
12		*Upper terminal of ignition switch (24)* *to connector D.*	Red
13		*Upper terminal of ignition switch (24)* *to positive terminal of coil (22).*	Red
14		*Upper terminal of ignition switch (24)* *to stop light switch (19).*	Red
15		*Stop light switch (19)* *to connector F.*	Red
16		*EXC terminal on the regulator (15)* *to EXC terminal on the dynamo (12).*	Yellow
17		*DYN terminal on regulator (15)* *to DYN terminal on dynamo (12).*	Red
18		*Earth terminal on regulator (15)* *to earth on gearbox.*	Black
19		*Coil terminal (22)* *to contact breaker terminal (61).*	Blue
25	Flashing light R. H.	*Centre terminal of parking light switch (33)* *to connector B.*	Green
26		*R.H. terminal of parking light switch (33)* *to connector A.*	Yellow
27		*L.H. terminal of parking light switch (33)* *to R.H. parking light (9).*	Violet
28		*Connector C* *to flash terminal of R.H. light (9).*	Blue
30	Flashing light L. H.	*R.H. terminal of direction indicator switch (35)* *to connector C.*	Blue
31		*L.H. terminal of direction indicator switch (35)* *to L.H. light (10), flash terminal.*	Green

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
32	Flashing light L. H.	*Negative terminal of direction indicator light switch (35)* .... *to earth on battery case.*	Black
33		*Positive terminal of direction indicator light switch (35)* .... *to connector D.*	Red
34		*Connector A* .... *to L.H. parking light (10).*	Black
40	Headlamps	*Connector G* .... *to headlight terminal, R.H. (1).*	Yellow
41		*Connector H* .... *to dipping terminal on R.H. headlamp (1).*	Green
42		*Connector J* .... *to lamp terminal of R.H. headlamp (1).*	Red
43		*Headlamp terminal of R.H. headlamp (1)* .... *to headlamp terminal of L.H. headlamp (2).*	Yellow
44		*Dip terminal of the R.H. headlamp (1)* .... *to dip terminal of L.H. headlamp (2).*	Green
45		*Lamp terminal of R.H. headlamp (1)* .... *to lamp terminal of L.H. headlamp (2).*	Red
50	Rear	*Connector E* .... *to L.H. red rear light (56).*	Blue
51		*Connector F* .... *to stop light (58).*	Red
52		*L.H. red rear light (56)* .... *to rear light (46).*	Blue
53		*Rear light (46)* .... *to R.H. rear red light (55).*	Blue
60	Separate lead	*Speedometer bulb (60)* .... *to connector K.*	Blue

LOW TENSION CABLES	
Positive terminal of the battery (17) to positive terminal of starter (13).	
Negative terminal of the battery (17) to earth on the gearbox.	

When fitting the electrical cables and leads, adhere to the diagram.

SCHEDULE OF PARTS

1	Headlamp, R.H. front.
2	Headlamp, L.H. front.
3	Horn, town.
4	Horn, country.
9	Direction indicator and parking light, R.H.
10	Direction indicator and parking light, L.H.
12	Dynamo.
13	Starter.
15	Regulator.
17	Battery.
19	Stop light switch.
22	Coil.
24	Ignition switch.
29	Ammeter.
33	Parking light switch.
35	Time switch for direction indicator lights.
36	Lighting and horn switch.
46	Registration plate lighting switch.
55	Red rear light, R.H.
56	Red rear light, L.H.
58	Stop light,
60	Speedometer bulb.
61	Contact-breaker.

CONNECTORS : A, B, C, D, E, F, G, H, J, K.

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
1	Front	*Feed terminal of lighting switch (36)* .... *to output terminal of ammeter (29).*	Blue
2		*Headlamp terminal of lighting switch (36)* .... *to connector G.*	Yellow
3		*Dip terminal of lighting switch (36)* .... *to connector H.*	Green
4		*Front light terminal of lighting switch (36)* .... *to connector J.*	Red
5		*Horn terminal on lighting switch (36)* .... *to horn (3).*	White
5 bis		*Country horn terminal on lighting and horn switch (36)* .... *to country horn (4).*	Black

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
6	Front	*Rear lamp terminal of lighting switch* (36) to connector E.	Blue
7		*Rear lamp terminal on lighting switch* (36) to connector K.	Blue
8		*Feed terminal of ammeter* (29) to starter terminal (13).	Green
9		*Feed terminal of ammeter* (29) to connector B.	Green
10		*Output terminal of ammeter* (29) to BAT terminal of regulator (15).	Blue
11		*Output terminal of ammeter* (29) to lower terminal on ignition switch (24).	Blue
12		*Upper terminal of ignition switch* (24) to connector D.	Red
13		*Upper terminal of ignition switch* (24) to positive terminal of coil (22).	Red
14		*Upper terminal of ignition switch* (24) to stop light switch (19).	Red
15		*Stop light switch* (19) to connector F.	Red
16		*EXC terminal of regulator* (15) to EXC terminal on the dynamo (12).	Yellow
17		*DYN terminal of regulator* (15) to DYN terminal on dynamo (12).	Red
18		*Earth terminal on regulator* (15) to earth on gearbox.	Black
19		*Coil terminal* (22) to contact breaker terminal (61).	Blue
25	Flashing light R. H.	*Centre terminal of parking light switch* (33) to connector B.	Green
26		*R.H. terminal of parking light switch* (33) to connector A.	Yellow
27		*L.H. terminal of parking light switch* (33) to R.H. parking light (9).	Violet
28		*Connector C* to flash terminal of R.H. light (9).	Blue

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour o Ends
30	Flashing light L. H.	*R.H. terminal of direction indicator switch (35) to connector C.*	Blue
31		*L.H. terminal of direction indicator switch (35) to L.H. light (10), flash terminal.*	Green
32		*Negative terminal of direction indicator light switch (35) to earth on battery case.*	Black
33		*Positive terminal of direction indicator light switch (35) to connector D.*	Red
34		*Connector A to L.H. parking light (10).*	Black
40	Headlamps	*Connector G to headlight terminal, R.H. (1).*	Yellow
41		*Connector H to dip terminal of the R.H. headlamp (1).*	Green
42		*Connector J to lamp terminal of R.H. headlamp (1).*	Red
43		*Headlamp terminal of R.H. headlamp (1) to headlamp terminal of L.H. headlamp (2).*	Yellow
44		*Dipping terminal of R.H. headlamp (1) to dipping terminal of L.H. headlamp (2).*	Green
45		*Lamp terminal of R.H. headlamp (1) to lamp terminal of L.H. headlamp (2).*	Red
50	Rear	*Connector E to L.H. red rear light (56).*	Blue
51		*Connector F to stop light (58).*	Red
52		*L.H. red rear light (56) to rear light (46).*	Blue
53		*Rear light (46) to R.H. rear red light (55).*	Blue
60	Separate wire	*Speedometer bulb (60) to connector K.*	Blue

LOW TENSION CABLES
Positive terminal of the battery (17) to positive terminal of starter (13).
Negative terminal of the battery (17) to earth on the gearbox.

When fitting the electrical cables and leads, adhere to the diagram.

SCHEDULE OF PARTS

1	Headlamp, R.H. front.
2	Headlamp, L.H. front.
3	Horn, town.
4	Horn, country.
9	Direction indicator and parking light, R.H.
10	Direction indicator and parking light, L.H.
12	Dynamo.
13	Starter.
15	Regulator.
17	Battery.
19	Stop light switch.
22	Coil.
24	Ignition switch.
29	Ammeter.
33	Parking light switch.
35	Time switch for direction indicator light.
36	Lighting and horn switch.
45	Rear lamp and stop light, L.H.
46	Number plate light.
55	Rear lamp, R.H.
60	Speedometer light.
61	Contact-breaker.

CONNECTORS : A, B, C, D, E, F, G, H, J, K, L.

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
1	Front	*Feed terminal of lighting switch (36)* .... *to output terminal of ammeter (29).*	Blue
2		*Headlamp terminal of lighting switch (36)* .... *to connector G.*	Yellow
3		*Dip terminal of lighting switch (36)* .... *to connector H.*	Green
4		*Front light terminal of lighting switch (36)* .... *to connector J.*	Red
5		*Horn terminal on lighting switch (36)* .... *to horn (3).*	White
5 bis		*Country horn terminal on lighting and horn switch (36)* .... *to country horn (4).*	Black

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
6	Front	*Rear lamp terminal of lighting switch (36)* .... *to connector E.*	Blue
7		*Rear lamp terminal on lighting switch (36)* .... *to connector K.*	Blue
8		*Feed terminal of ammeter (29)* .... *to starter terminal (13).*	Green
9		*Feed terminal of ammeter (29)* .... *to centre terminal of parking light switch*	Green
10		*Output terminal of ammeter (29)* .... *to BAT terminal of regulator (15).*	Blue
11		*Output terminal of ammeter (29)* .... *to lower terminal on ignition switch (24).*	Blue
12		*Upper terminal of ignition switch (24)* .... *to connector D.*	Red
13		*Upper terminal of ignition switch (24)* .... *to positive terminal of coil (22).*	Red
14		*Upper terminal of ignition switch (24)* .... *to stop light switch (19).*	Red
15		*Stop light switch (19)* .... *to connector F.*	Red
16		*EXC terminal of regulator (15)* .... *EXC terminal on the dynamo (12)*	Yellow
17		*DYN terminal of regulator (15)* .... *to DYN terminal on dynamo (12).*	Red
18		*Earth terminal on regulator (15)* .... *to earth on gearbox.*	Black
19		*Coil terminal (22)* .... *to contact breaker terminal (61).*	Blue
26	Flashing light R. H.	*Terminal D on time switch for direction lights (35)* .... *to connector C.*	Blue
27		*L.H. terminal of parking light switch (33)* .... *to connector B.*	Violet
28		*Connector C* .... *to flash terminal of R.H. direction indicator light (9).*	Blue
29		*Connection B* .... *to R.H. parking light (9).*	Violet

No. of Lead	Wire Harness	SCHEDULE OF WIRING	Colour of Ends
30	Flashing light L. H.	*R.H. terminal of parking light switch (33)* *to connector A.*	Yellow
31		*Terminal G of the time switch for the direction lights (35)* *to connector L.*	Black
32		*Terminal of time switch for the direction lights (35)* *to earth.*	Green
33		*Positive terminal of direction light time switch (35)* *to connector D.*	Red
34		*Connector A* *to L.H. parking light (10).*	Yellow
35		*Connector L* *to flash terminal of L.H. direction indicator light.*	Black
40	Headlamps	*Connector G* *to R.H. headlamp terminal (1) connector H.*	Yellow
41		*Connector H* *to dip terminal of R.H. headlamp (1) plug J.*	Green
42		*Connector J* *to lamp terminal of R.H. headlamp (1).*	Red
43		*Headlamp terminal of R.H. headlamp (1)* *to headlamp terminal of L.H. headlamp (2).*	Yellow
44		*Dip terminal of R.H. headlamp (1)* *to dip terminal of L.H. headlamp (2).*	Green
45		*Lamp terminal of R.H. headlamp (1)* *to lamp terminal of L.H. headlamp (2).*	Red
50	Rear	*Connector E* *to L.H. rear light, light terminal (45).*	Blue
51		*Connector F* *to stop terminal of L.H. rear light (45).*	Red
52		*Light terminal of L.H. rear light (45)* *to number plate light (46).*	Blue
53		*Number plate light (46)* *to light terminal of R.H. rear light (55).*	Blue
60	Separate lead	*Speedometer bulb (60)* *to connector K.*	Blue

LOW TENSION CABLES	
Positive terminal of the battery (17) to positive terminal of starter (13). Negative terminal of the battery (17) to earth on the gearbox.	

		TOOLS
	NOTE - The essential chassis dimensions are given in Pl. 94.	
1	<u>Check to Make Sure That the Platform is Flat</u>.	
	Use two straight edges of about 40 inches (1 metre) in length placed across the platform at each end	
	By sighting, check whether the 2 straight edges are in the same plane	
2	<u>Check the Chassis for Squareness</u>.	
	a) Platform : the diagonals AB and CD must be equal to each other within 1/16 inches (1.6 mm)	
	b) Front sidemembers : the diagonals AG and CE must be equal and between 908.3 and 909.8 mm long.	
3	<u>Check the Sidemembers</u>.	
	Use the template MR-3747 (see Pl. 95)	Template MR-3747

ILLUSTRATIONS

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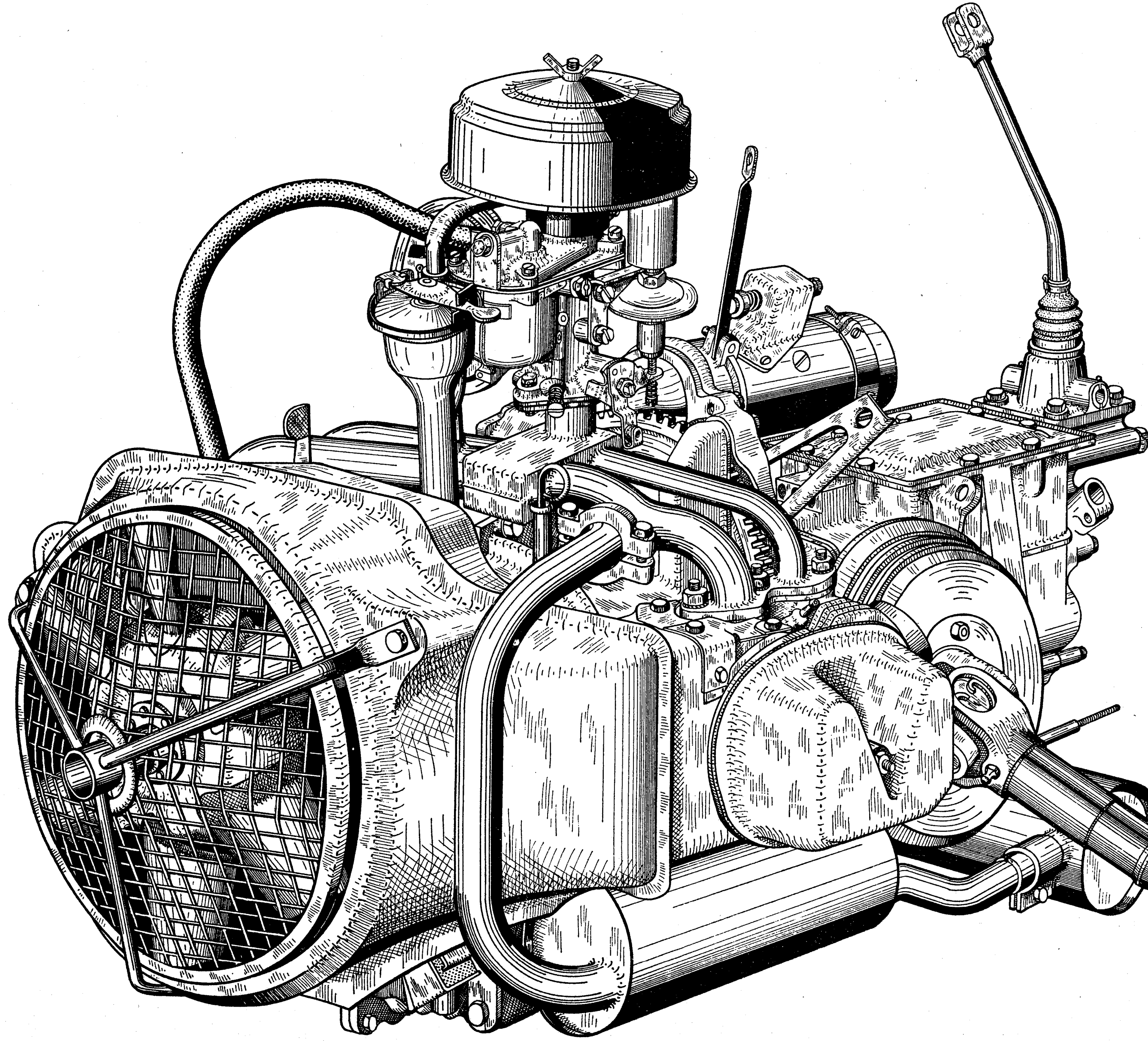
ENGINE—GEARBOX ASSEMBLY



ADJUSTMENTS

SETTING OF INITIAL ADVANCE

Fig. 1

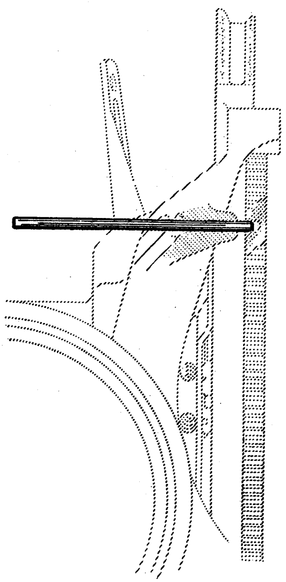


Fig. 2

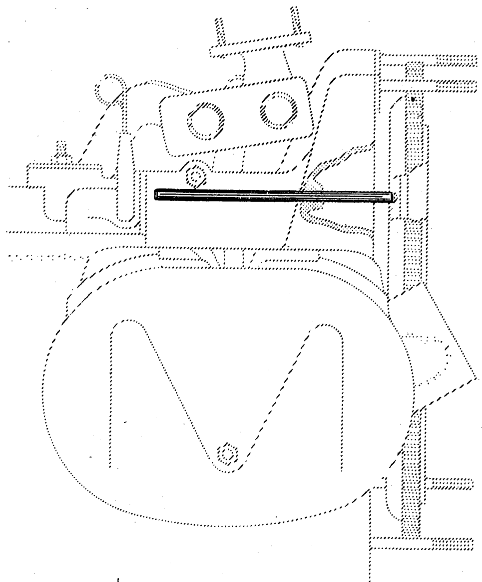


Fig. 3 FITTING THE TIMING WHEELS

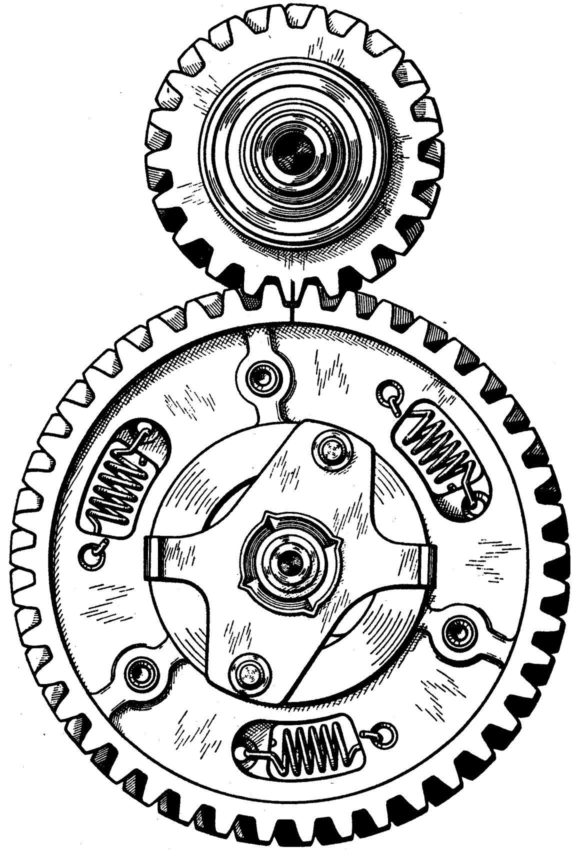


Fig. 4

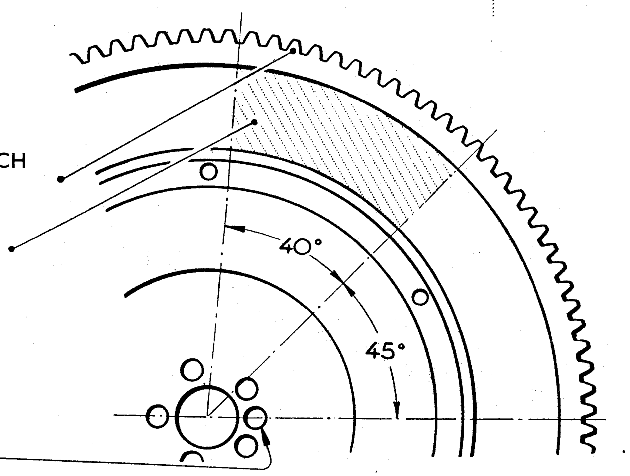


Fig. 5 DETAILS OF TEETH

CONTACT-BREAKER

Fig. I SECTION

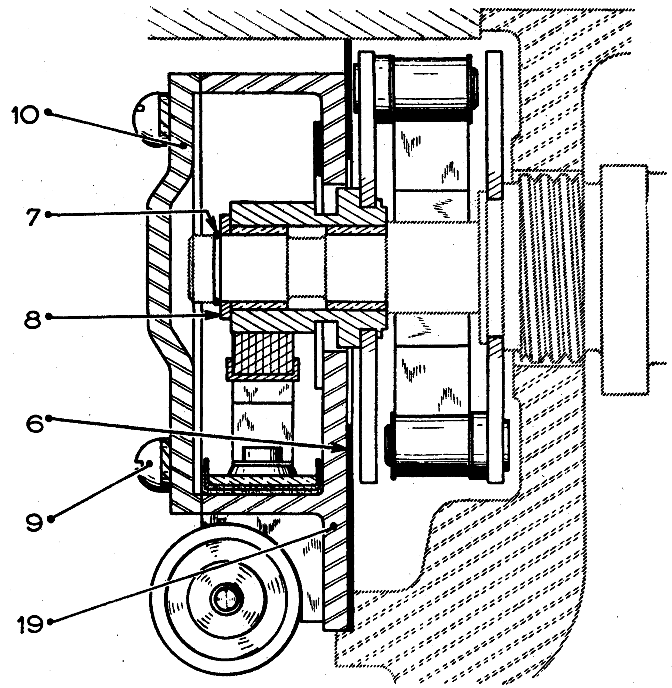


Fig. 2 FRONT VIEW

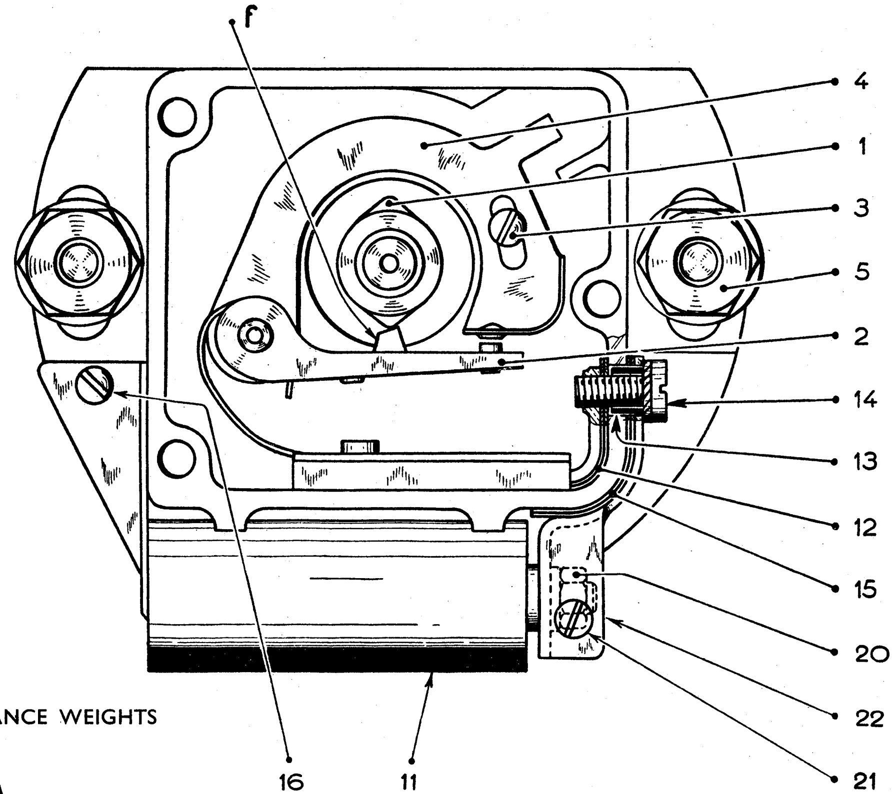
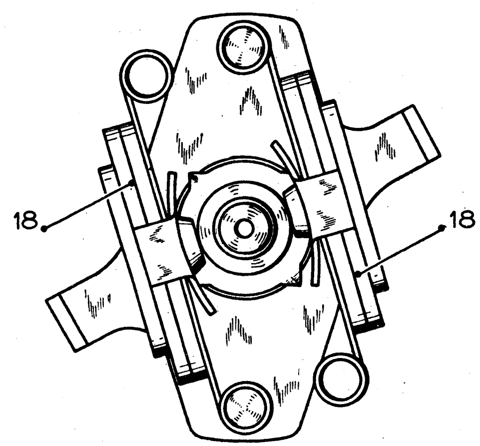


Fig. 3 CENTRIFUGAL ADVANCE WEIGHTS



CHECKING THE CENTRIFUGAL ADVANCE

Fig. 1

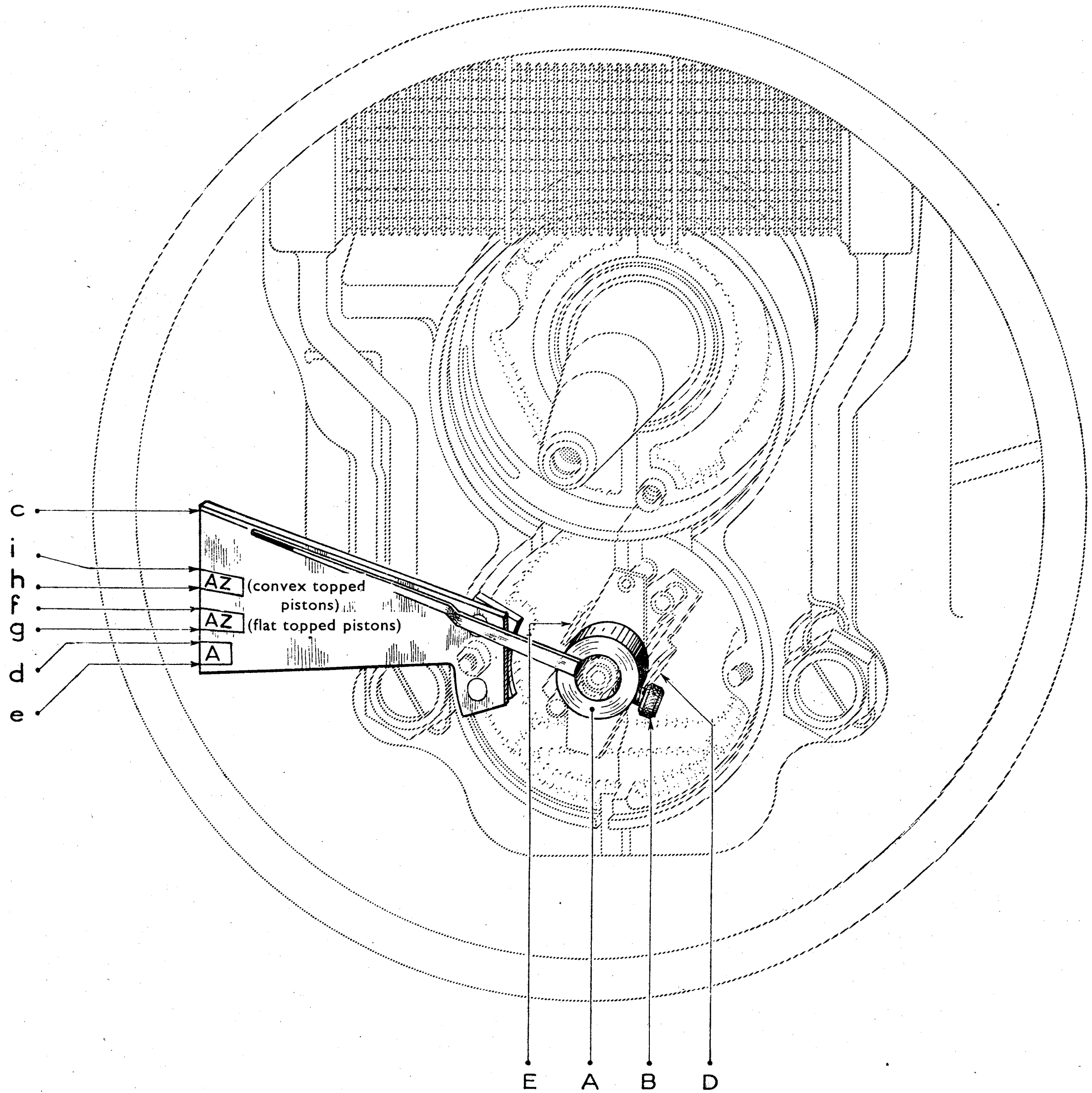
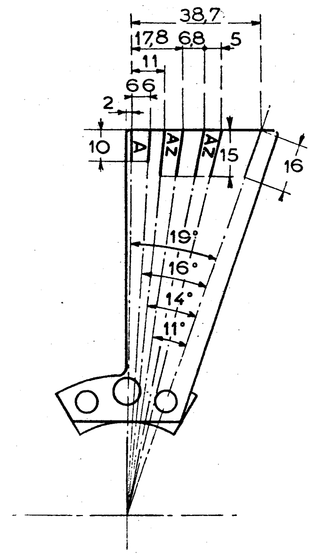


Fig. 2 CHECKING FIXTURE

sold under No. 1692–VA



ENGINE

IGNITION COIL

Fig. 1 FITTING A SECONDARY TERMINAL

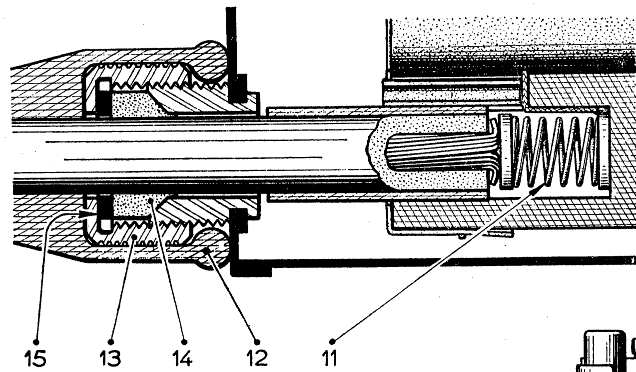
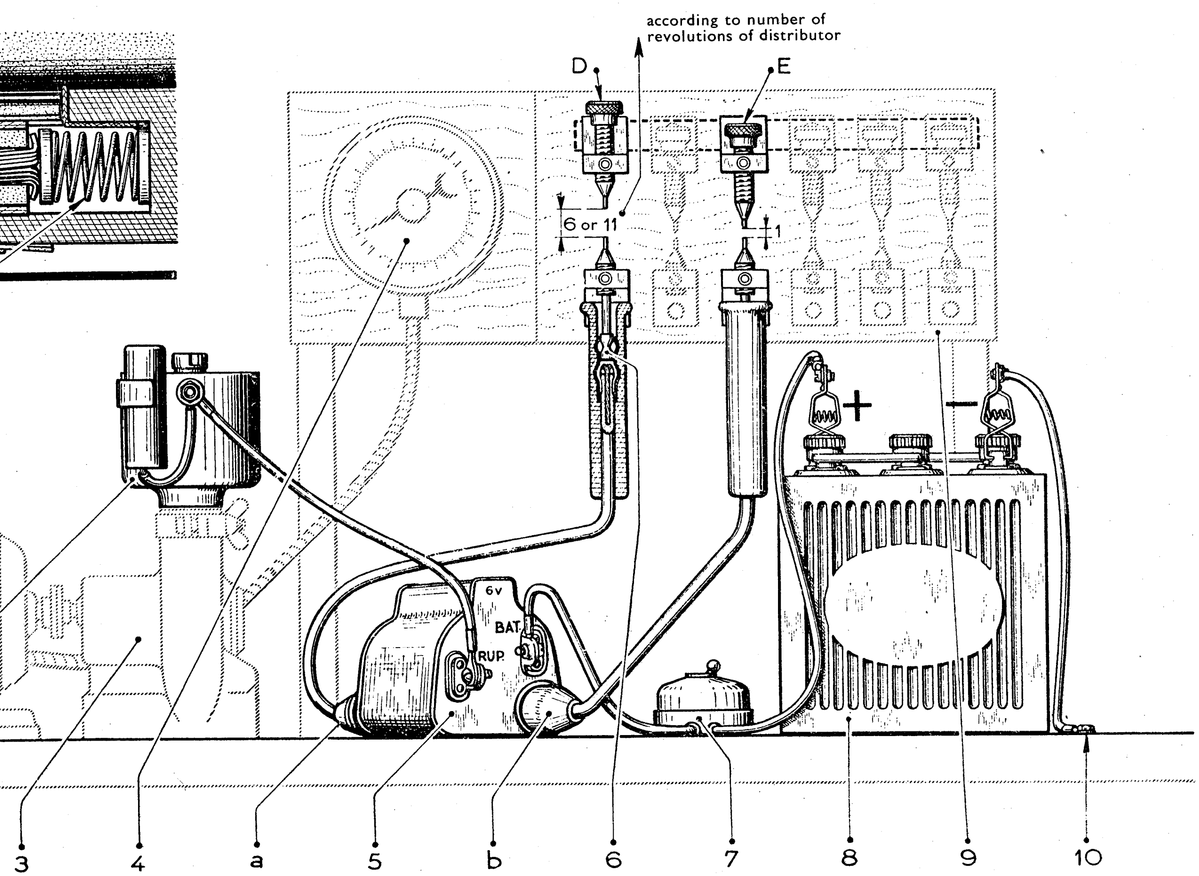


Fig. 2 CHECKING THE COIL



1 DRIVING MOTOR
2 4 CYLINDER DISTRIBUTOR WITH CONDENSER
3 RIGHT ANGLE DRIVE FOR DISTRIBUTOR
4 TACHOMETER
5 COIL
6 SPARKING PLUG TERMINAL CONNECTED TO SPARK GAP
7 SWITCH ON PRIMARY CIRCUIT
8 BATTERY, 6 volts
9 TEST BOARD
10 EARTH CONNECTION FROM BATTERY

FITTING A COIL WITH RUBBER CASING

Fig. 1

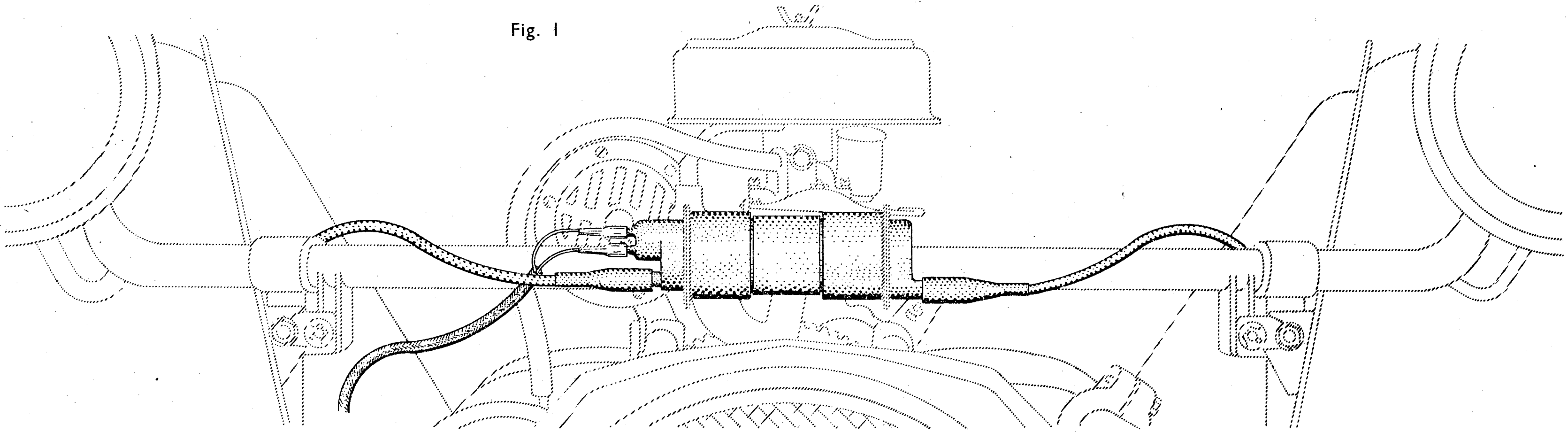


Fig. 2

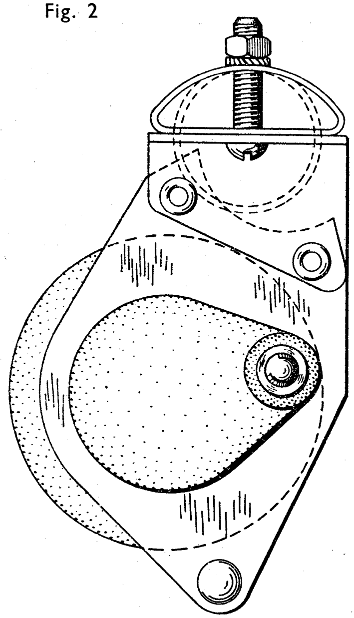
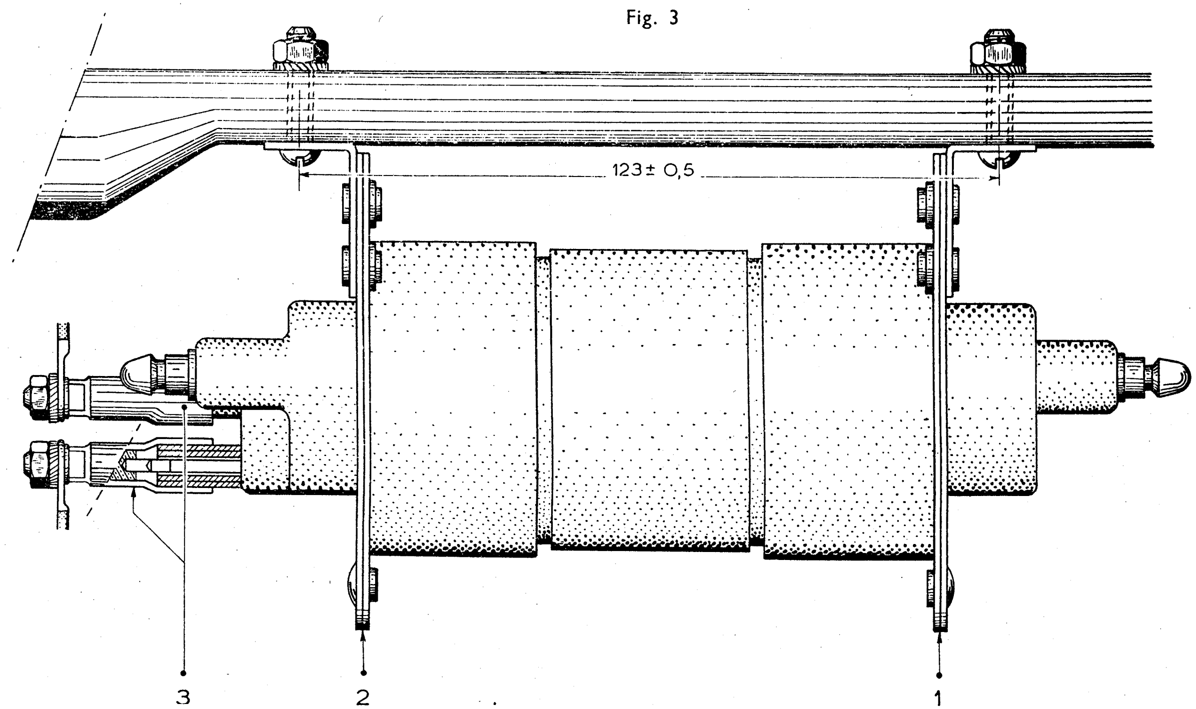
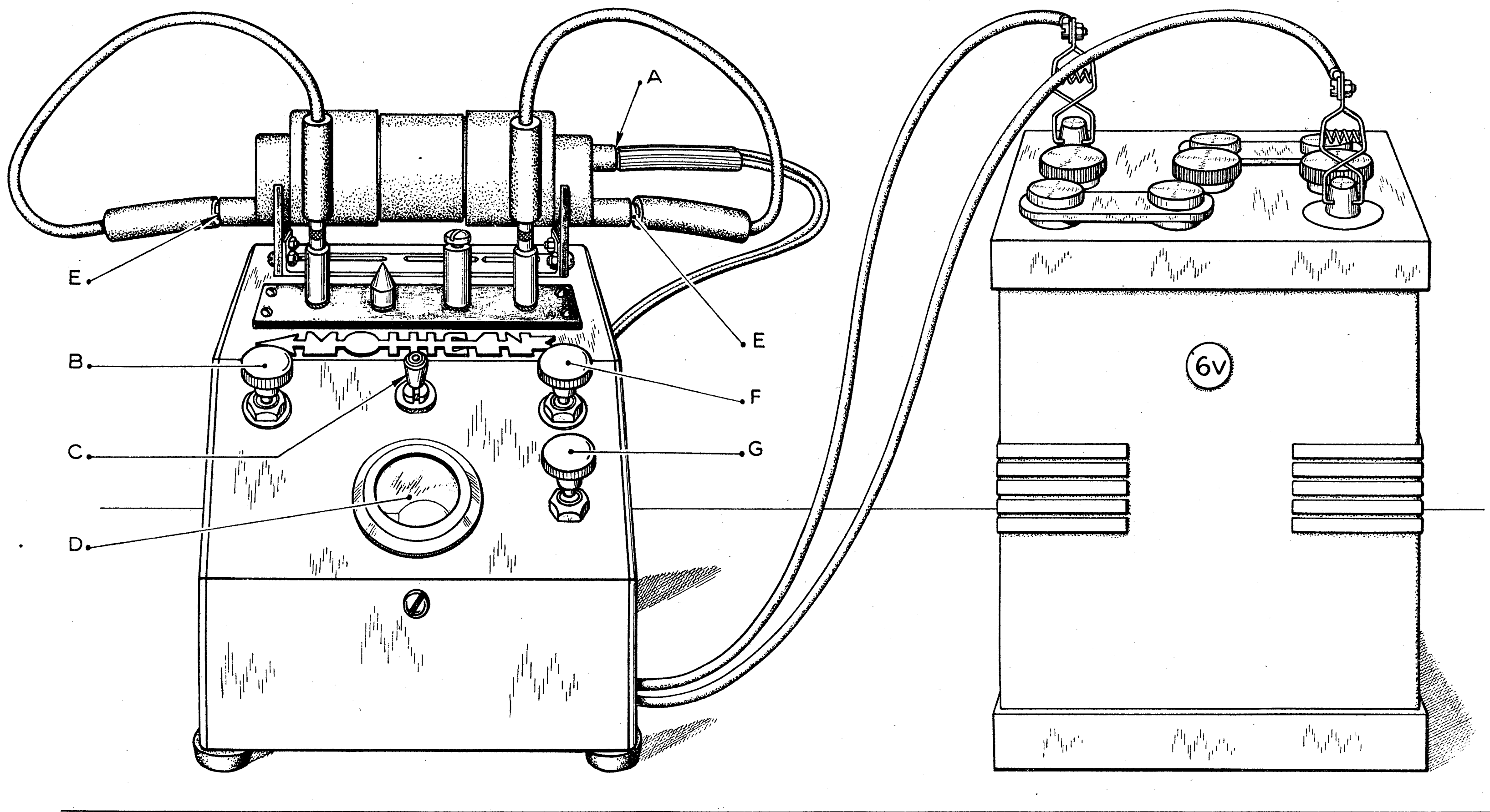


Fig. 3



CHECKING A COIL WITH RUBBER CASING



TEST BENCH SOLD UNDER No. 2209–T

PETROL PUMP, SEV.

Fig. 1

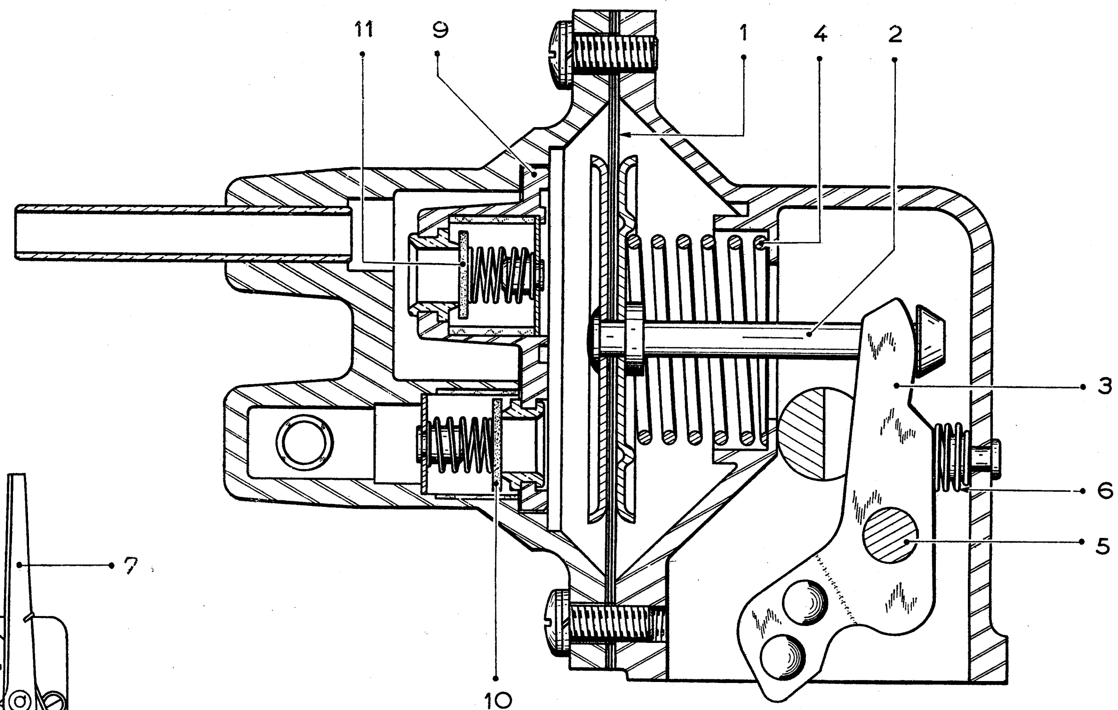
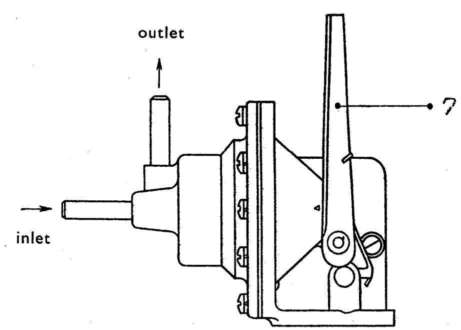
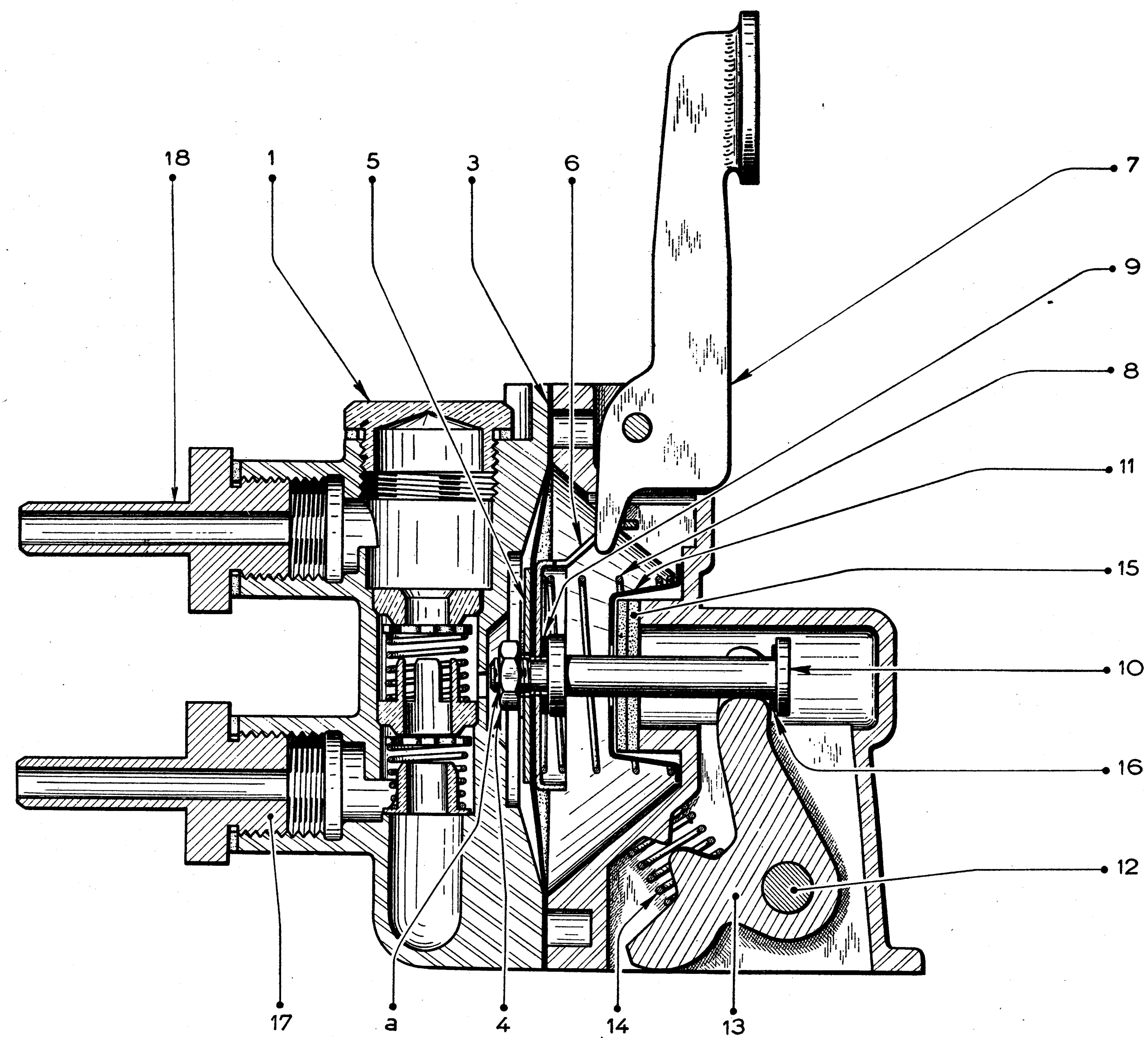


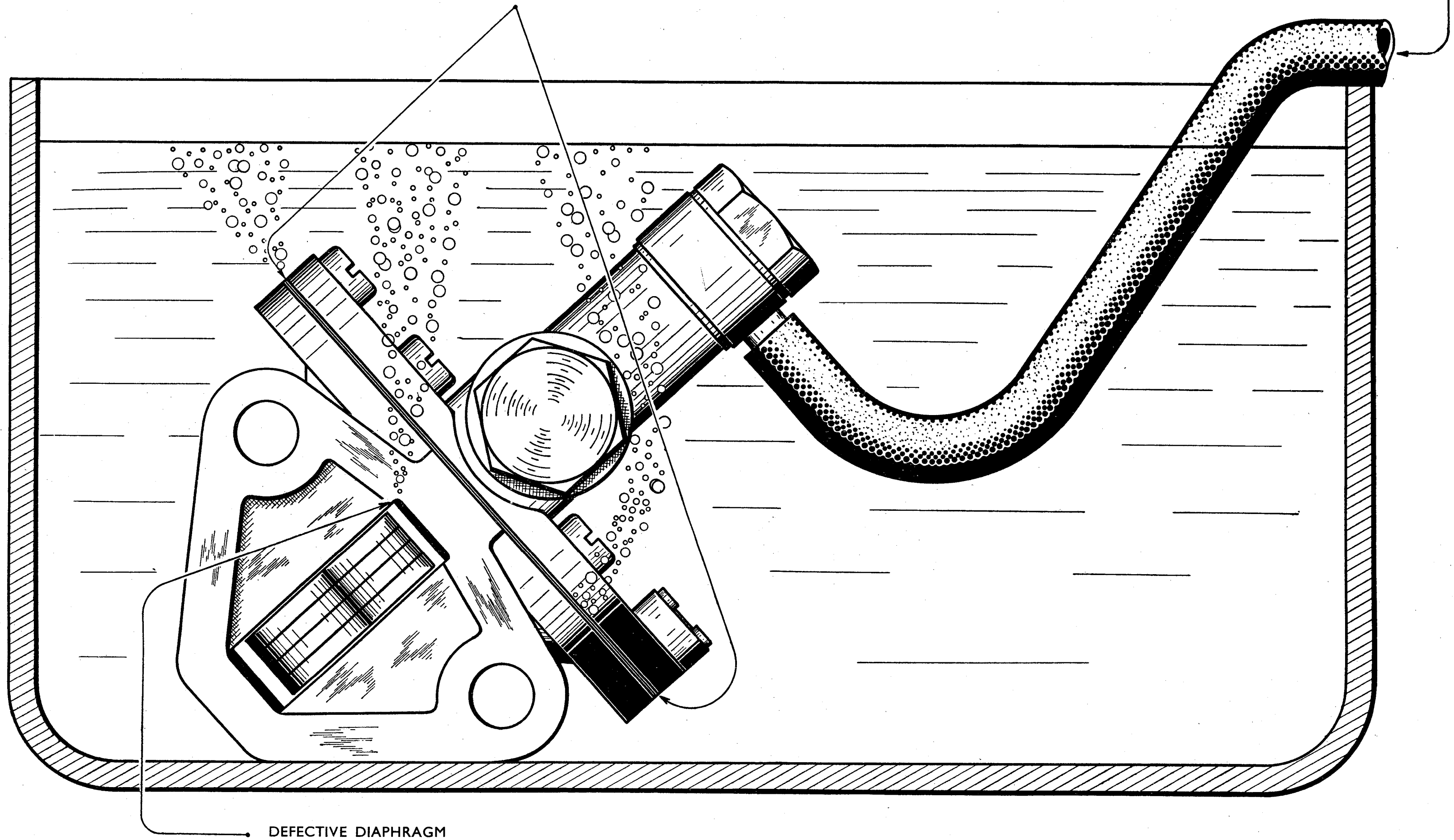
Fig. 2



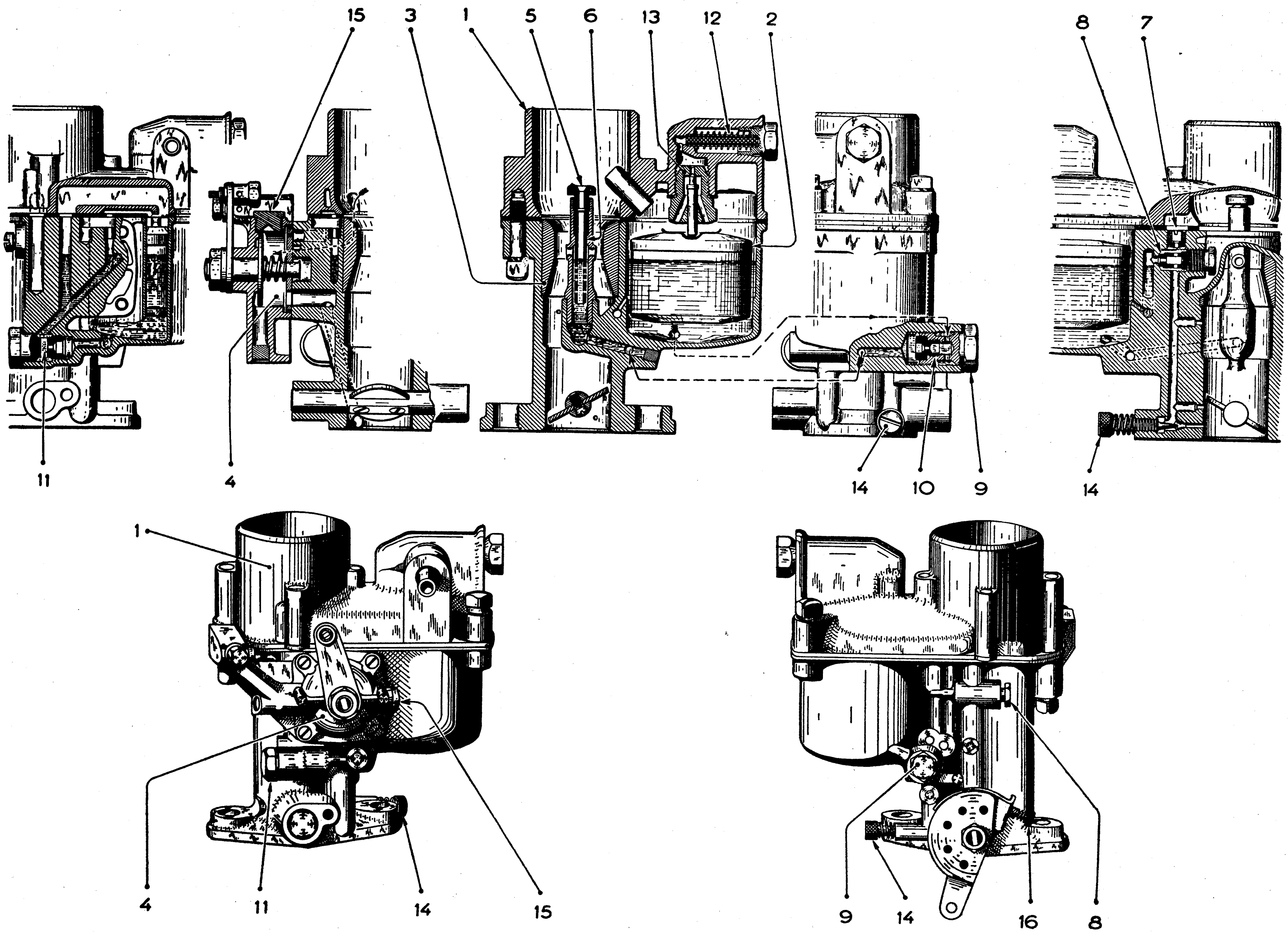
PETROL PUMP, GUIOT



CHECKING A PETROL PUMP FOR TIGHTNESS



CARBURETTOR, SOLEX 22 ZACI



CARBURETTOR, SOLEX 26 BCI

Fig. 1

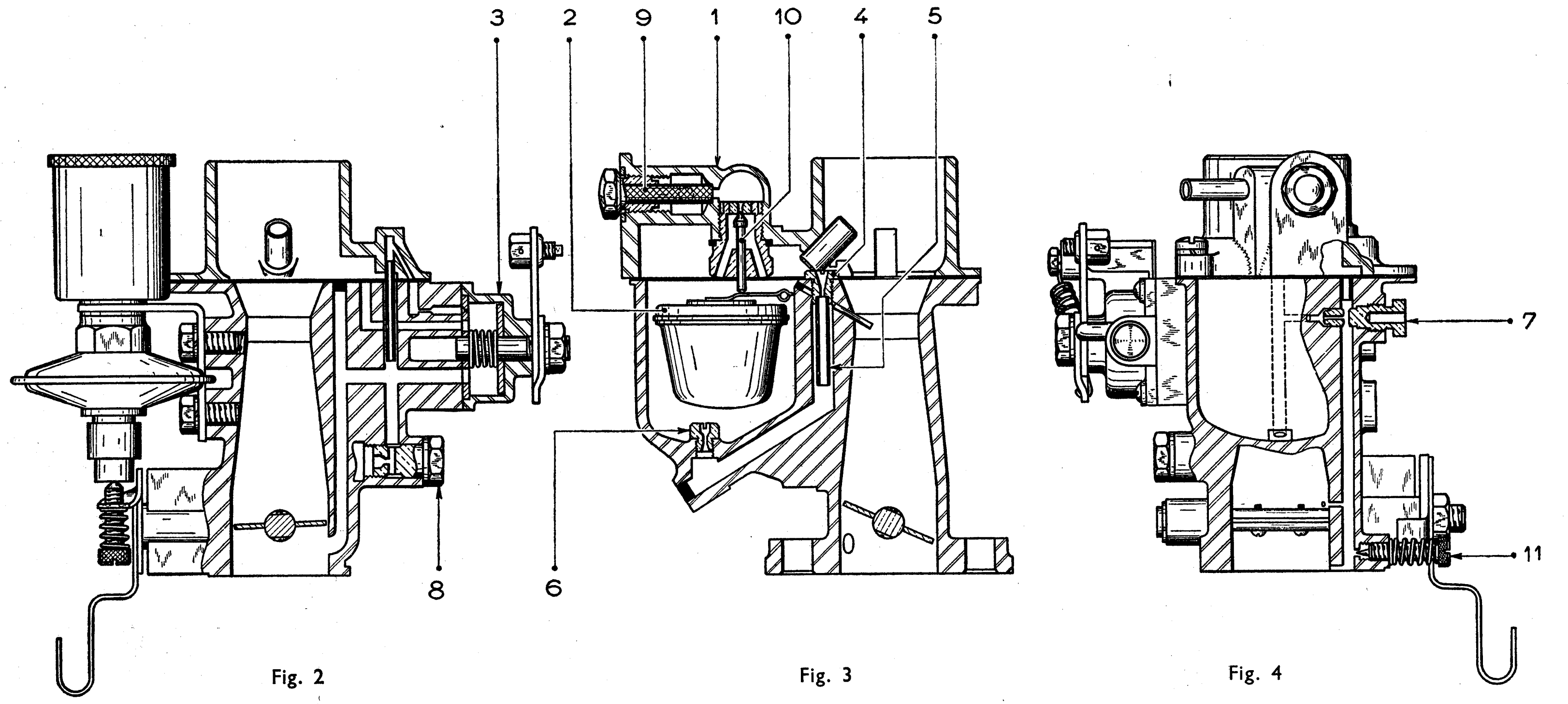


Fig. 2

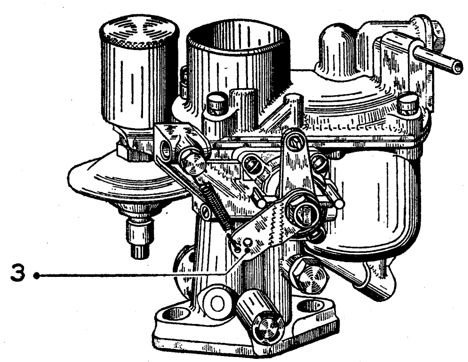


Fig. 3

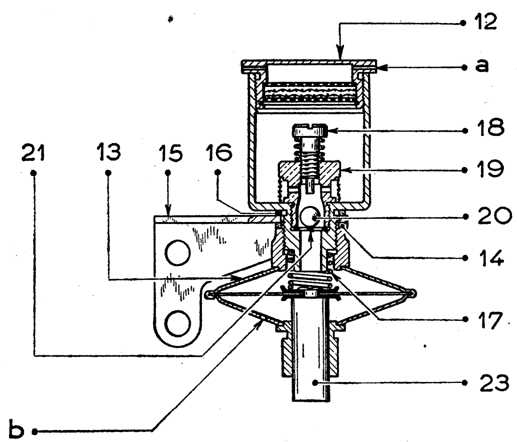
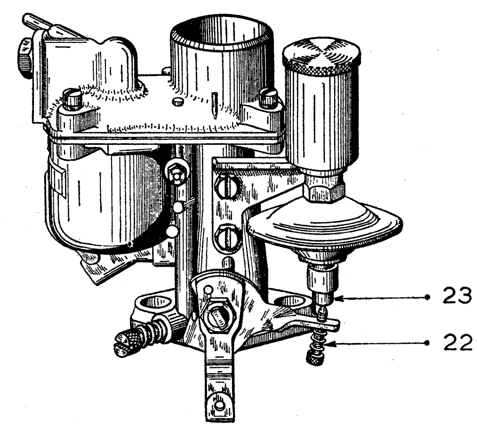
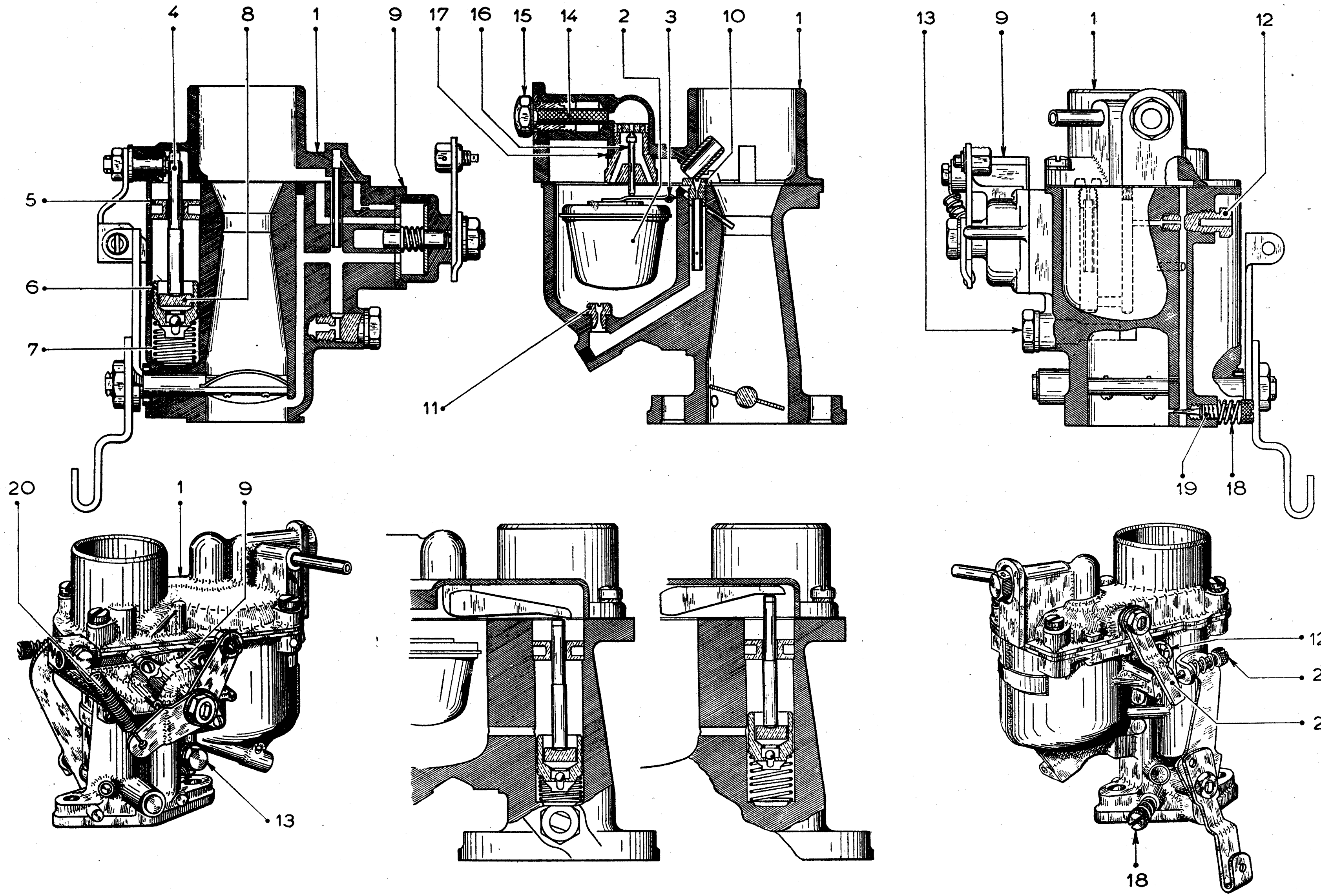


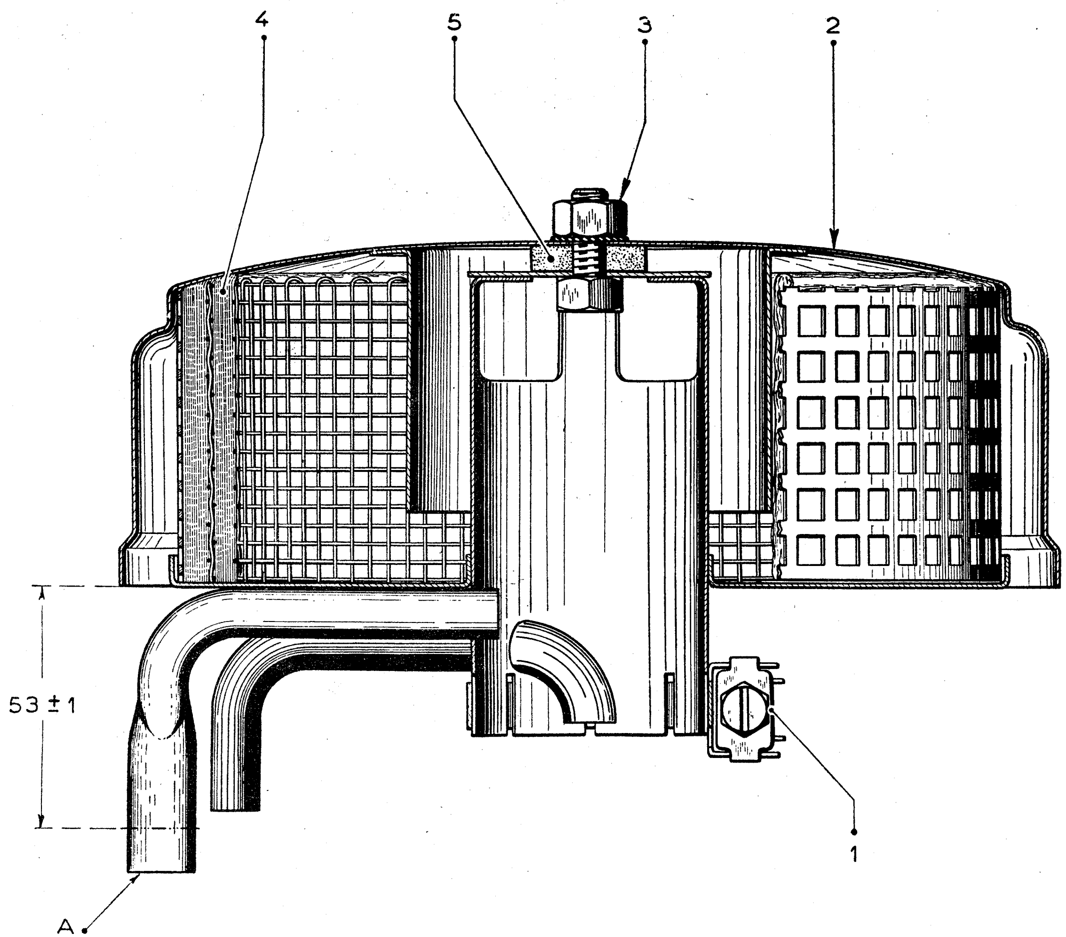
Fig. 4



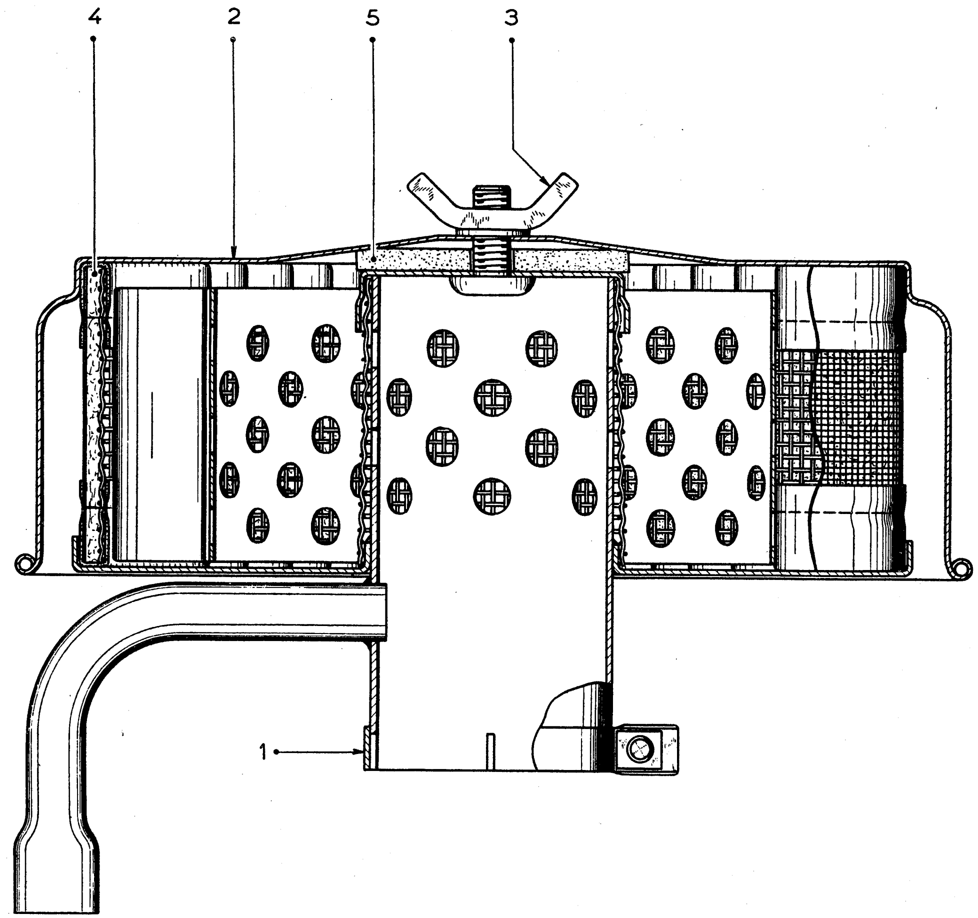
CARBURETTOR, SOLEX 26 CBI



AIR CLEANER AND SILENCER, TECALEMIT



AIR CLEANER AND SILENCER



REMOVAL AND REFITTING OF VALVES

Fig. 1

SPRING COMPRESSOR

sold under No. 1612–VA

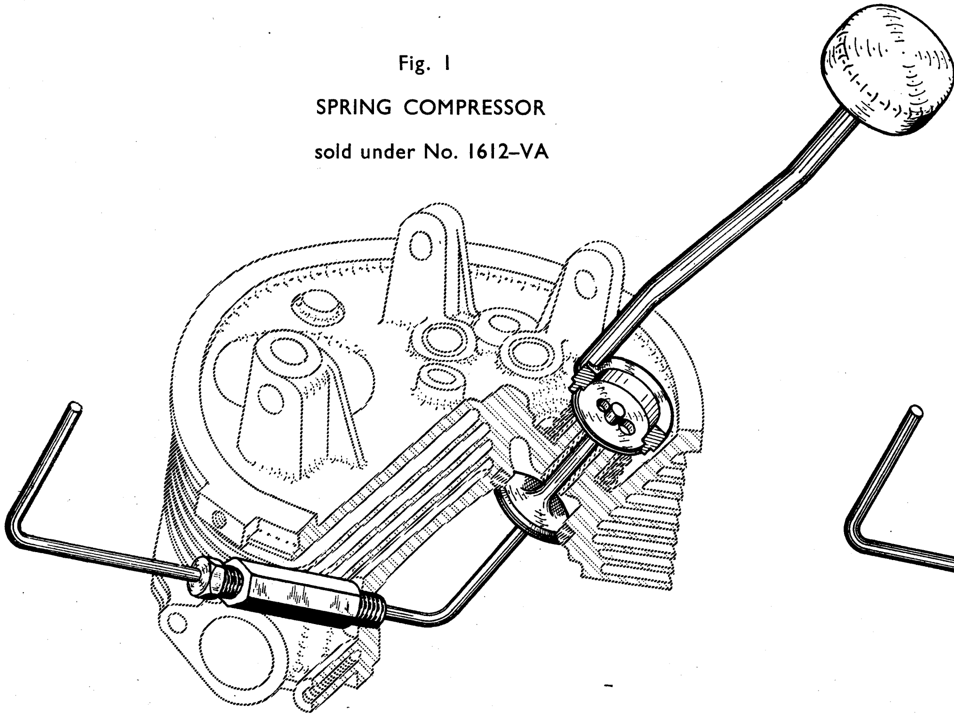
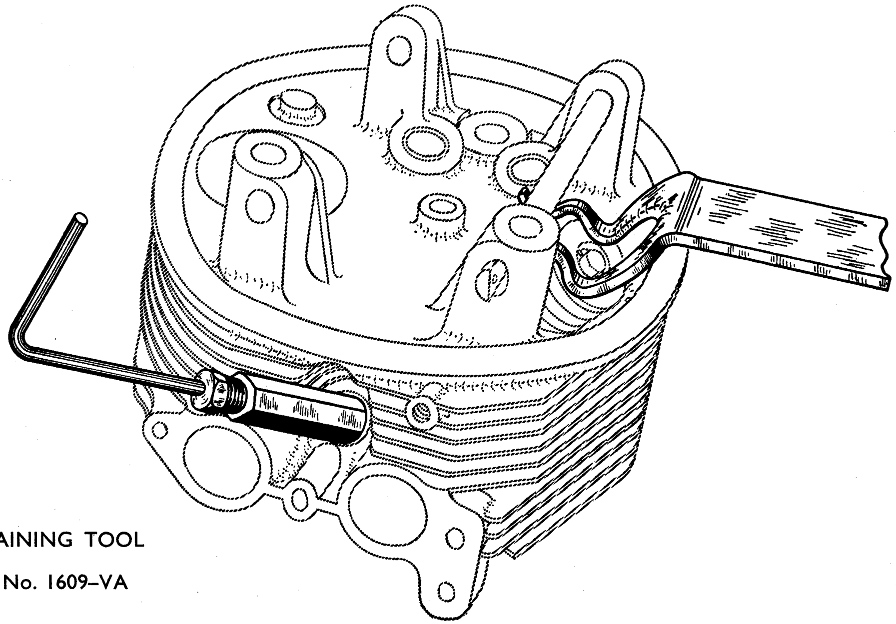


Fig. 2

SPRING COMPRESSOR

sold under No. 1613–VA



VALVE RETAINING TOOL

sold under No. 1609–VA

Fig. 3 INLET VALVE SEAT

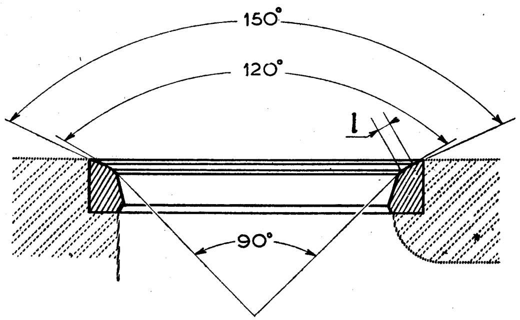
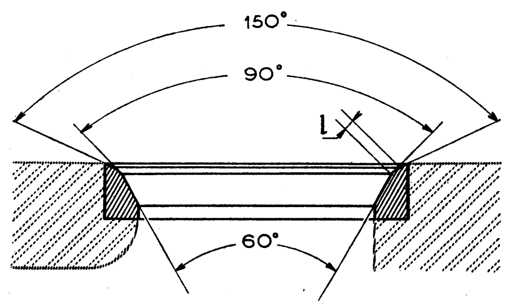


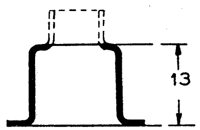
Fig. 4 EXHAUST VALVE SEAT

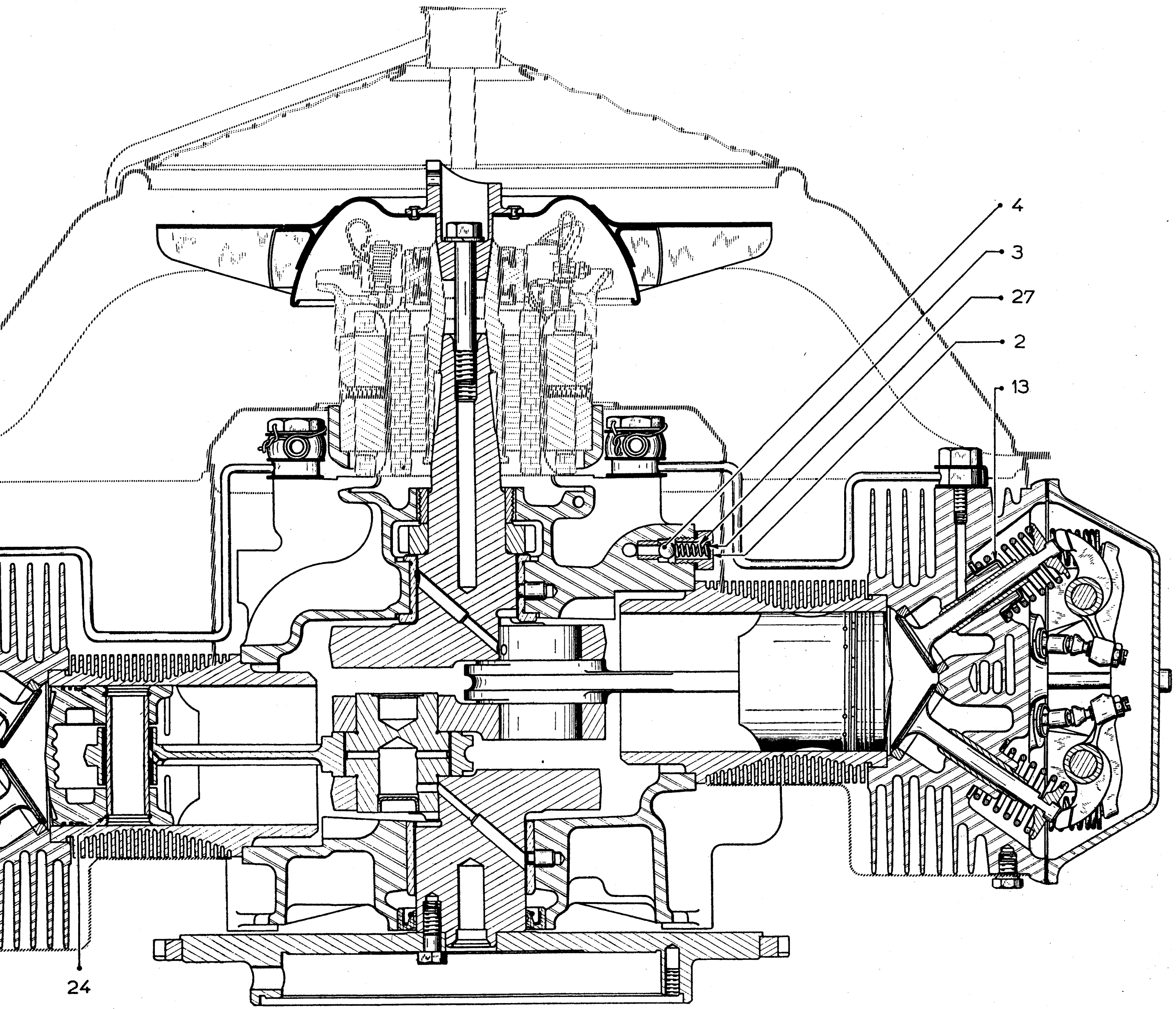


ENGINE, TYPES A AND AU

HORIZONTAL SECTION

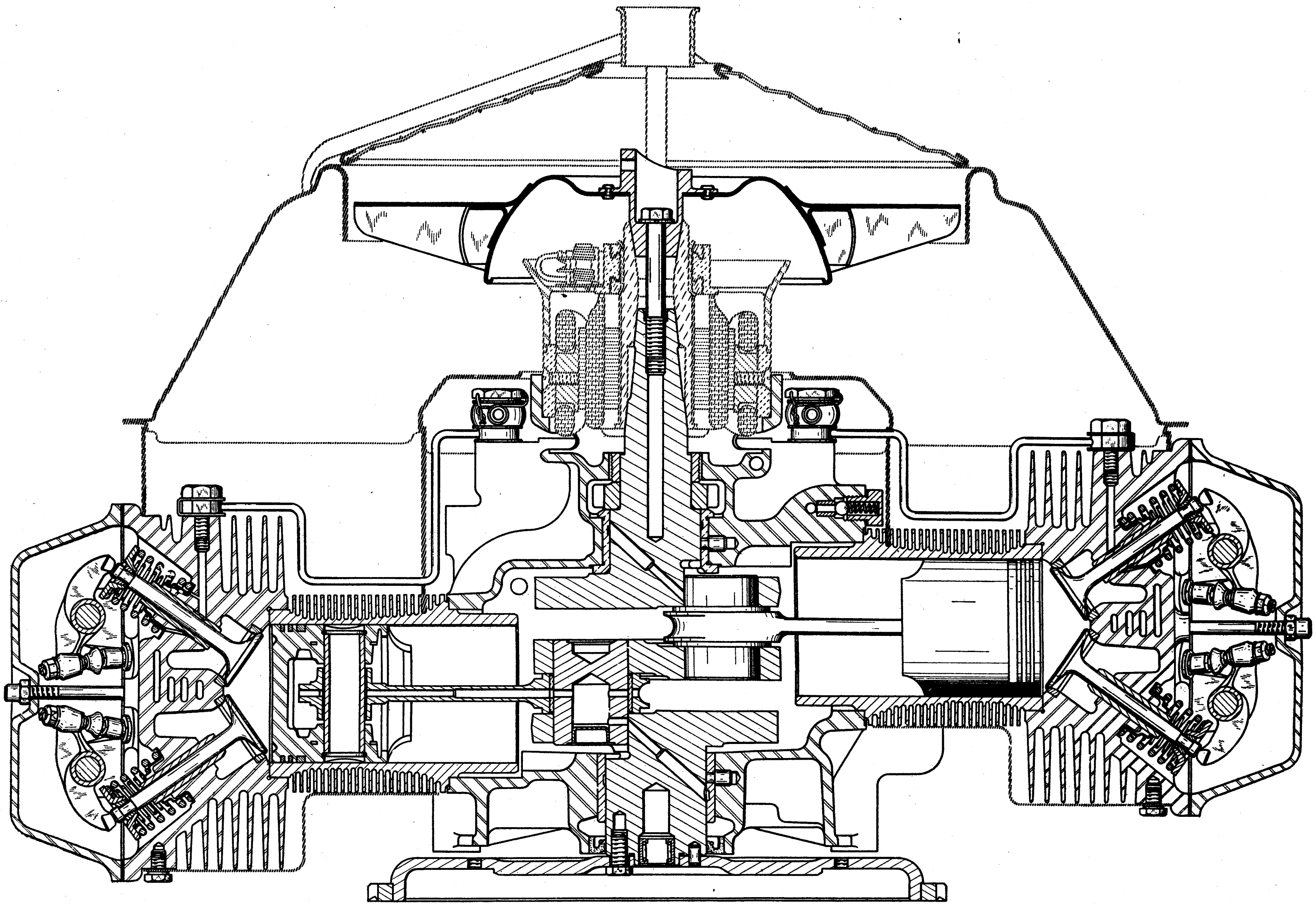
Fig. I





ENGINE, TYPES AZ AND AZU

HORIZONTAL SECTION



ENGINE

VERTICAL SECTION

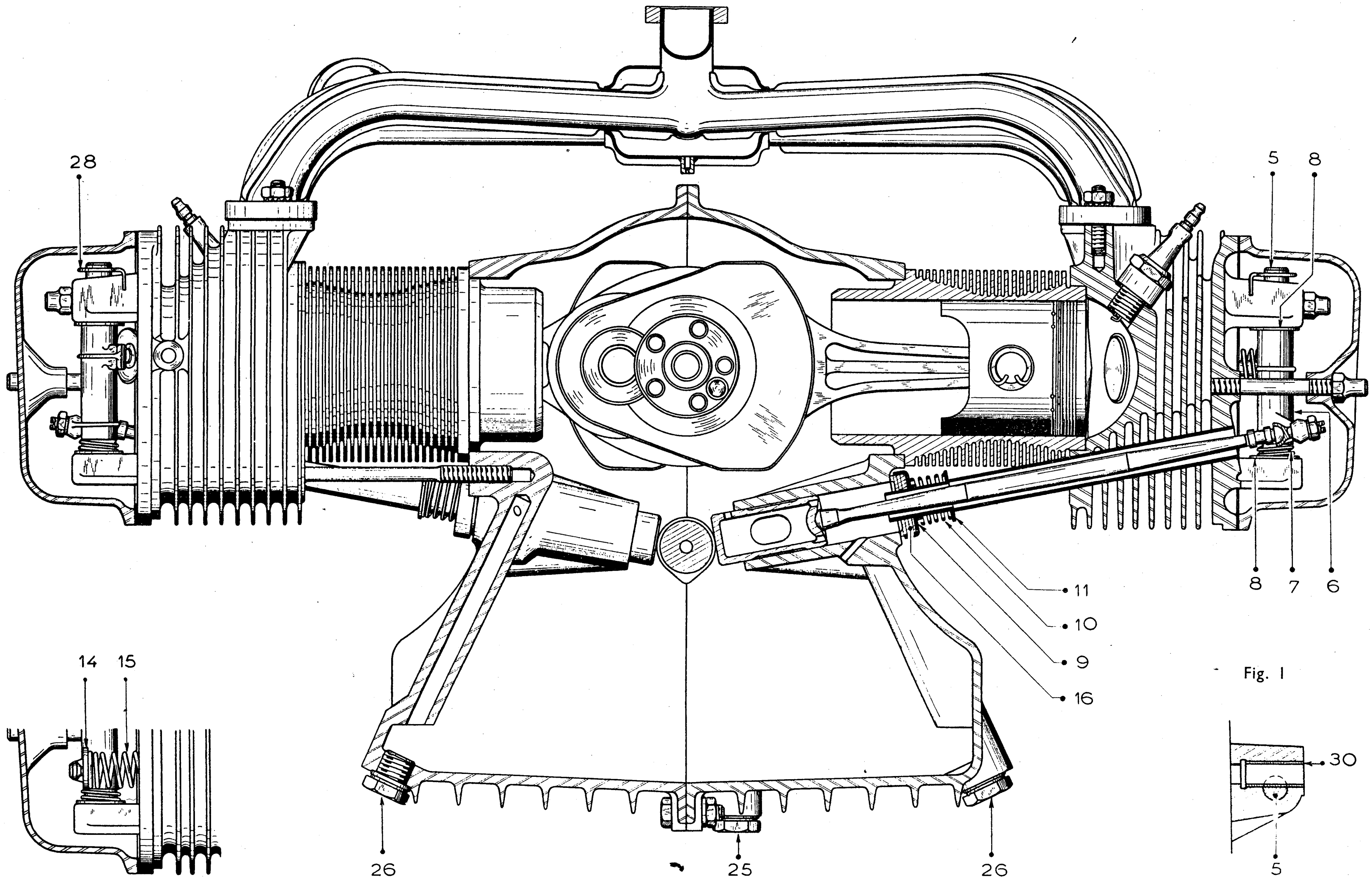


Fig. 1

LONGITUDINAL SECTION

Fig. 1

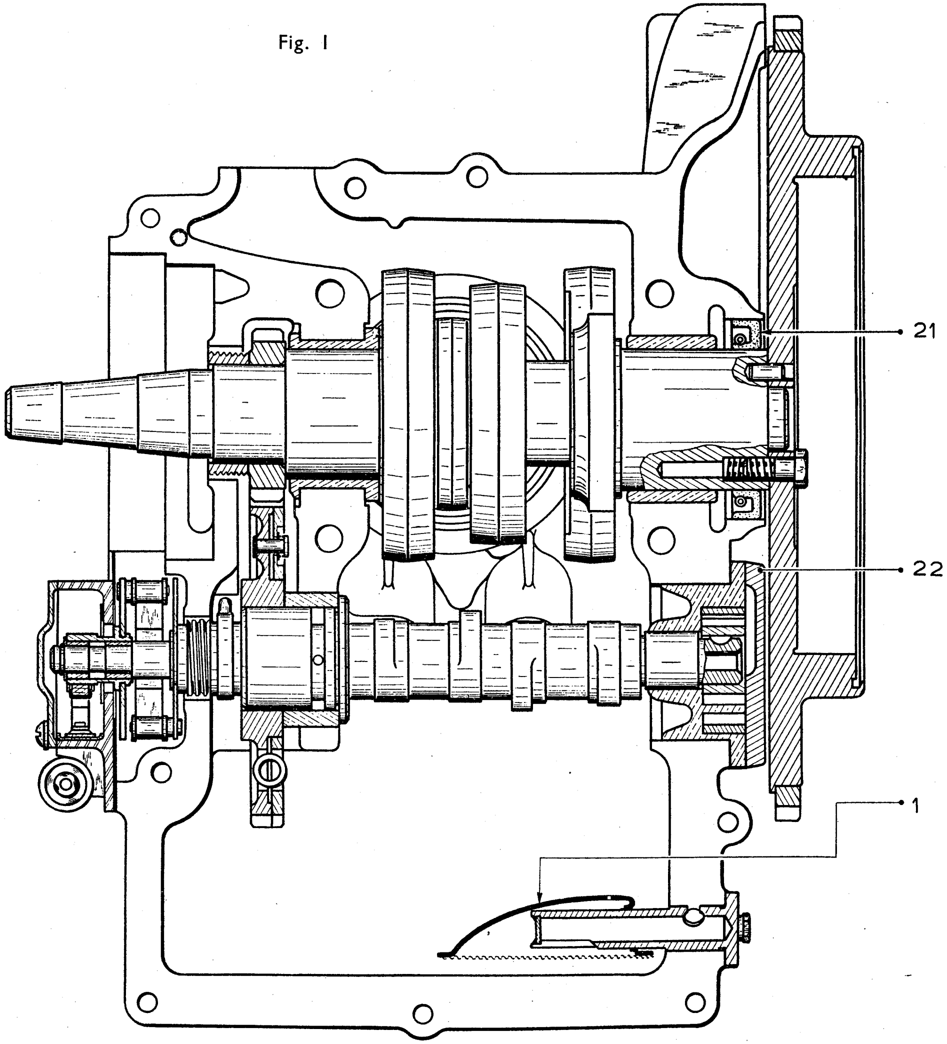


Fig. 2

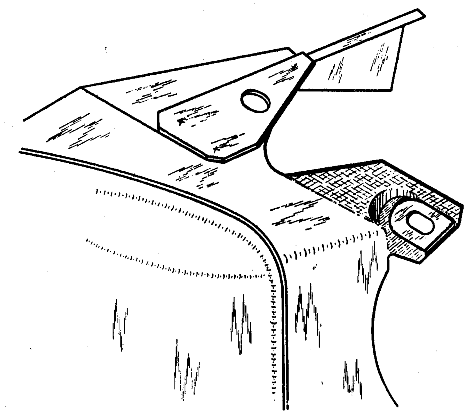
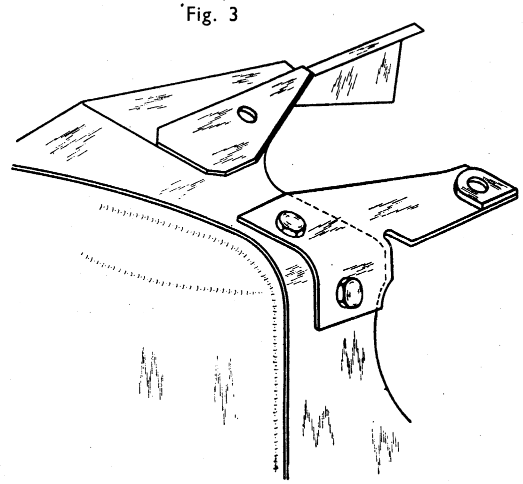


Fig. 3



ENGINE

DISASSEMBLY OF A PISTON

Fig. 1 REMOVAL OF A GUDGEON PIN

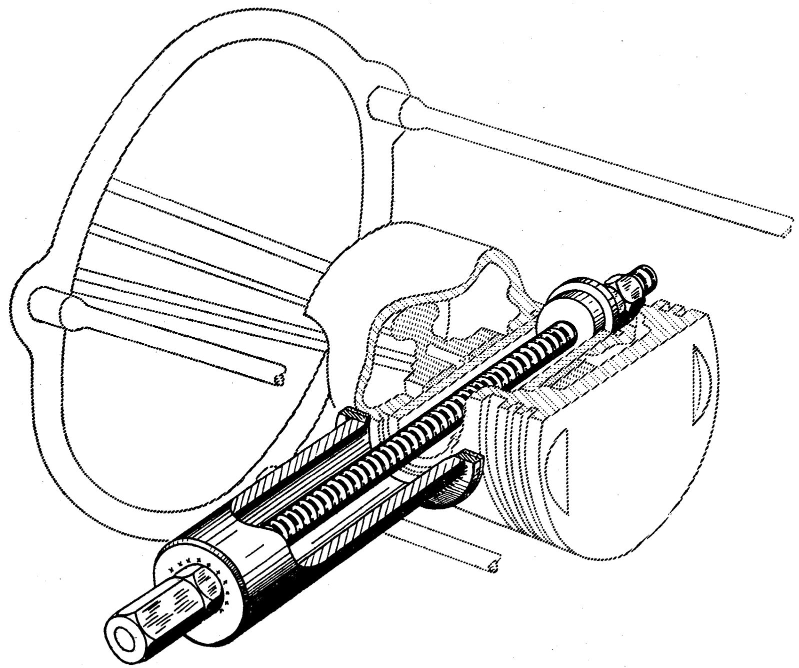


Fig. 2 REMOVAL OF THE CONNECTING ROD SMALL END BUSH

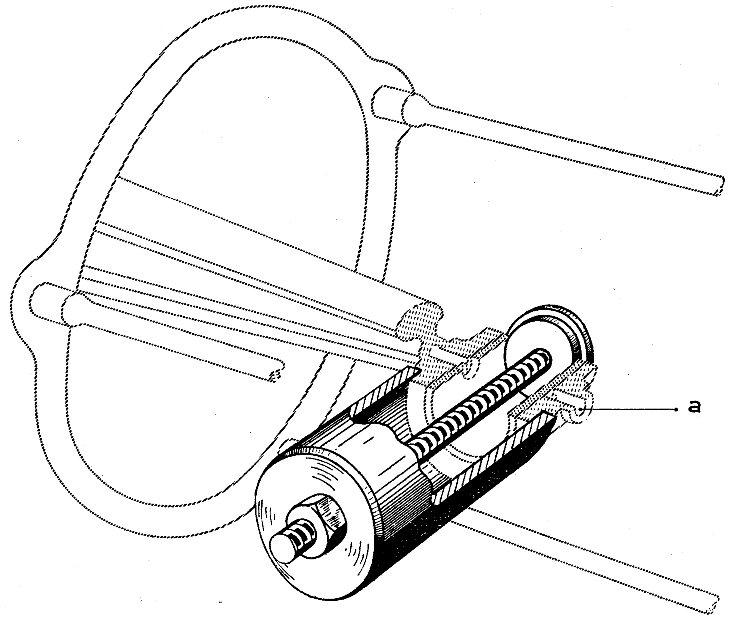


Fig. 3 GUDGEON PIN EXTRACTOR MR–3682–10

not sold

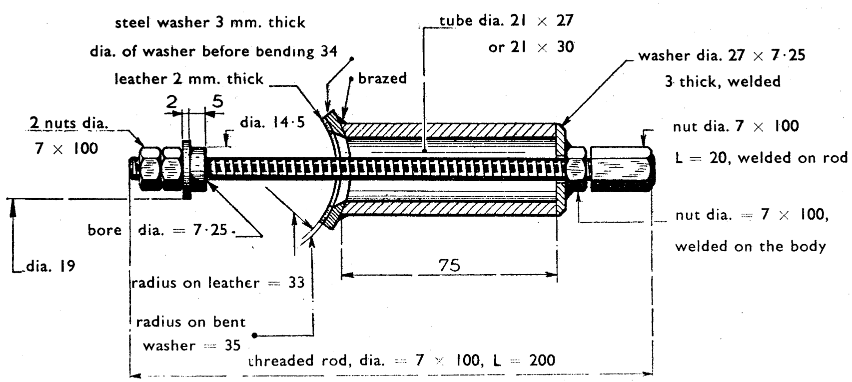
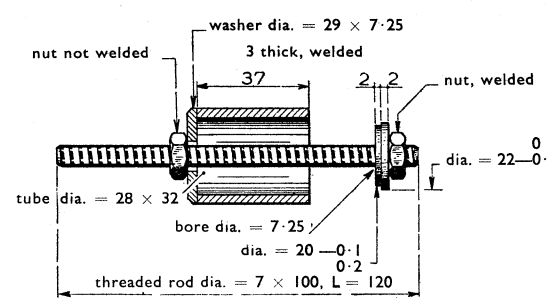


Fig. 4 SMALL END BUSH EXTRACTOR MR–3682–20

not sold



FITTING THE OIL SEAL

Fig. 1 METHOD OF USE

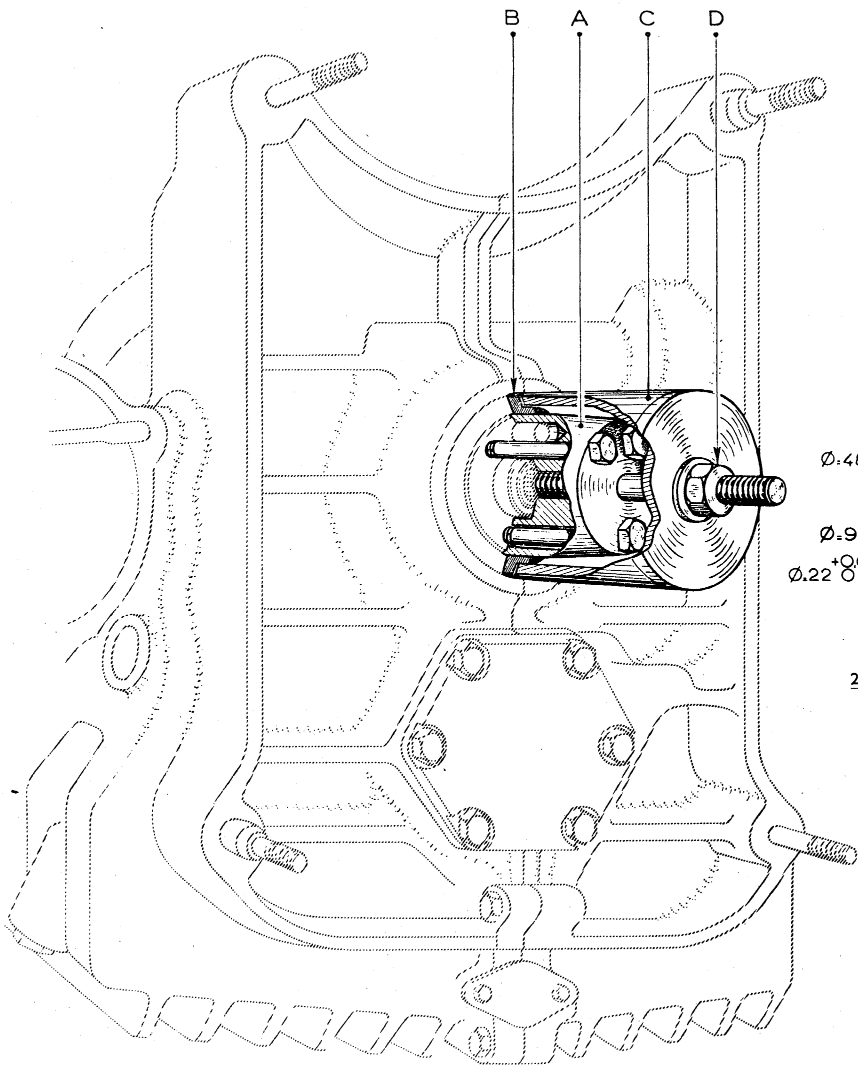
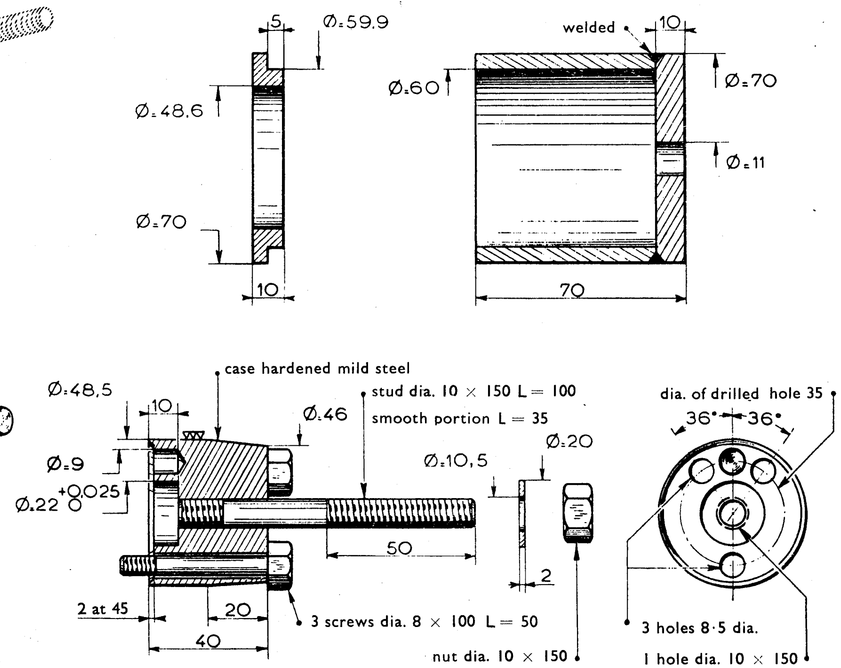


Fig. 2 TOOL MR 3754-10

not sold



1 FIX THE CONE A ON THE CRANKSHAFT
2 FIT THE BUSH B AGAINST THE JOINT TO BE ASSEMBLED
3 FIT THE BODY C
4 TIGHTEN THE NUT D UNTIL THE SEAL IS BEARING AGAINST THE CRANKCASE

FITTING A CYLINDER

EXPANDING A HOUSING TUBE

Fig. 1 USING THE GUIDE RING

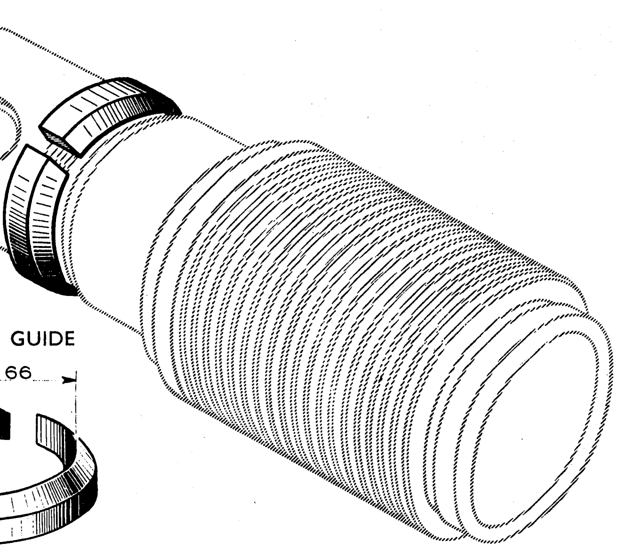
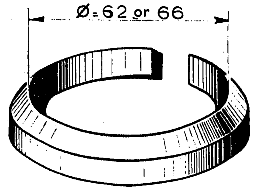


Fig. 2 PISTON RING GUIDE



dia. 62 sold under No. 1659–VA

dia. 66 sold under No. 1654–VA

Fig. 3 EXPANDING

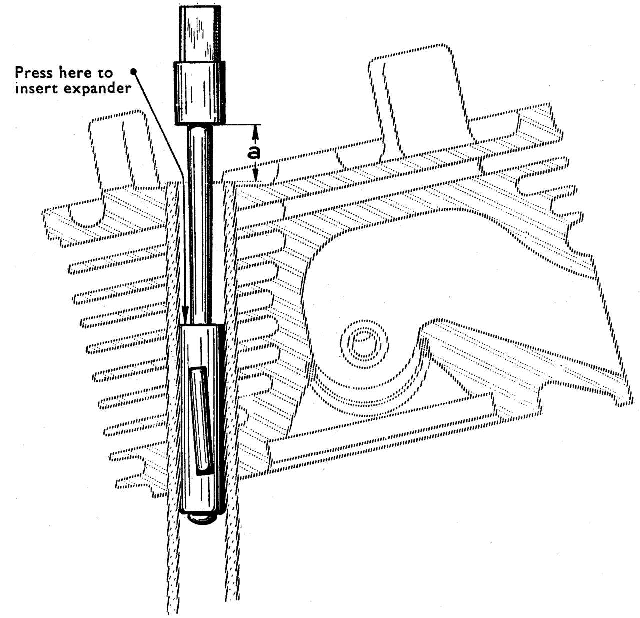


Fig. 4 EXPANDER

sold under No. 1605–VA

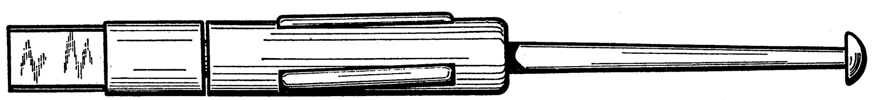
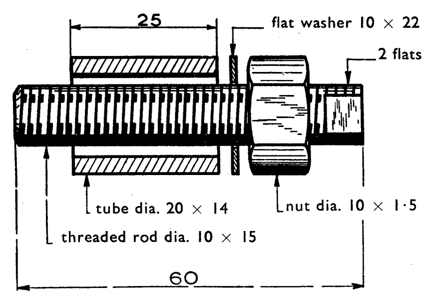


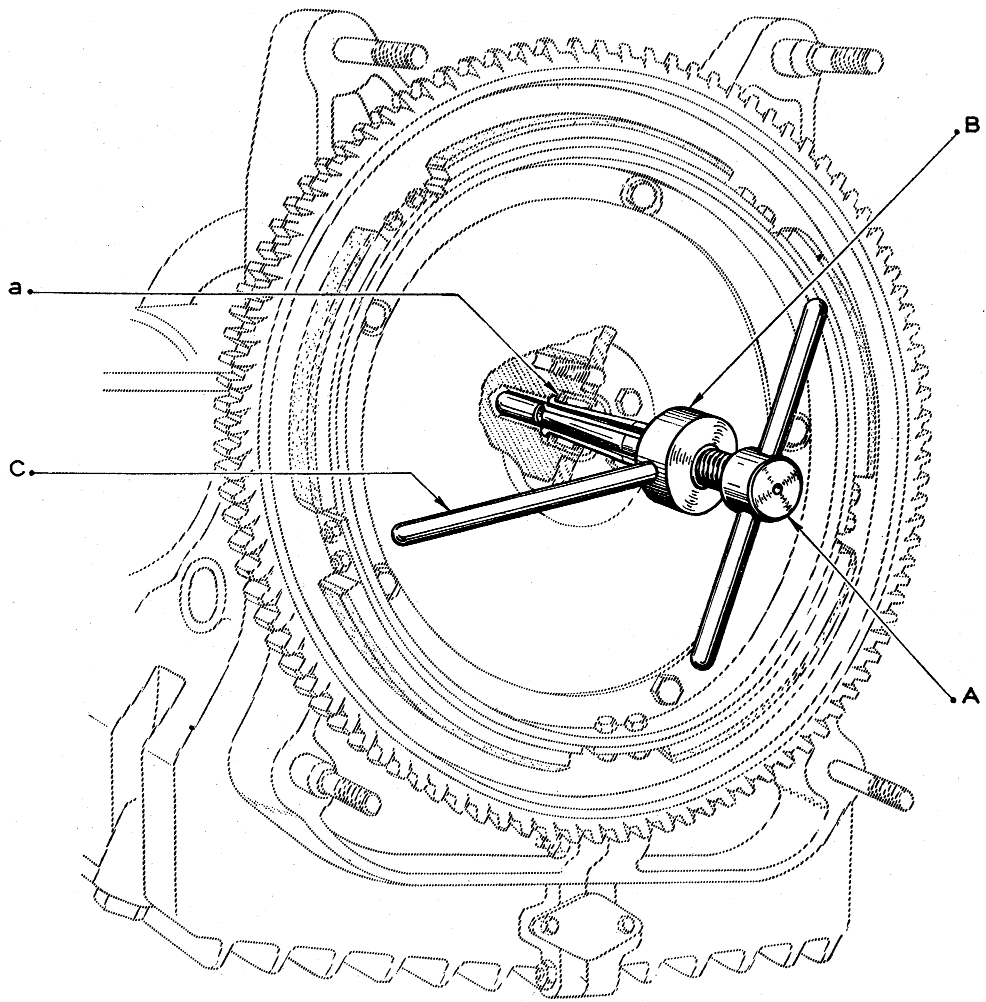
Fig. 5 EXTRACTOR MR–3682–50

not sold



ENGINE

EXTRACTION OF THE CRANKSHAFT NEEDLE BEARING



1 UNSCREW AND REMOVE THE PIN A FROM THE BODY OF THE EXTRACTOR B

2 ENGAGE THE CLAWS OF THE EXTRACTOR BODY IN THE BORE OF THE BUSH

3 ENGAGE THE PIN A IN THE EXTRACTOR BODY AT THE SAME TIME PULLING ON THE LATTER SLOWLY IN ORDER TO LOCK THE CLAWS BEHIND THE BUSH AT "a"

4 CONTINUE SCREWING UP THE PIN A. AT THE SAME TIME HOLDING THE EXTRACTOR STEADY BY THE ROD C UNTIL THE BUSH HAS BEEN COMPLETELY EXTRACTED.

EXTRACTOR

sold under No. 1671–VA

CHECKING THE OIL PRESSURE

Fig. 1 METHOD OF USING THE UNION

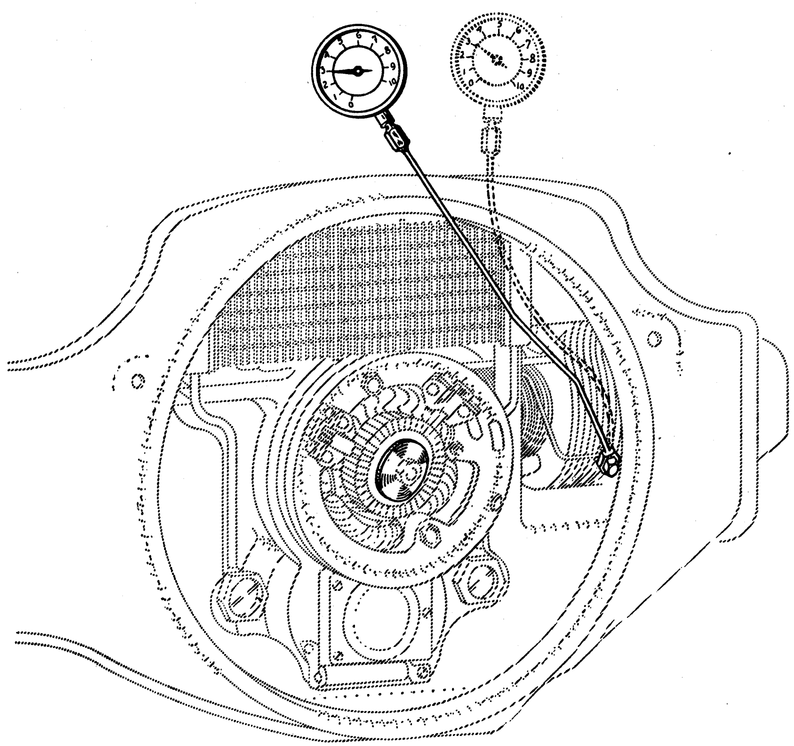
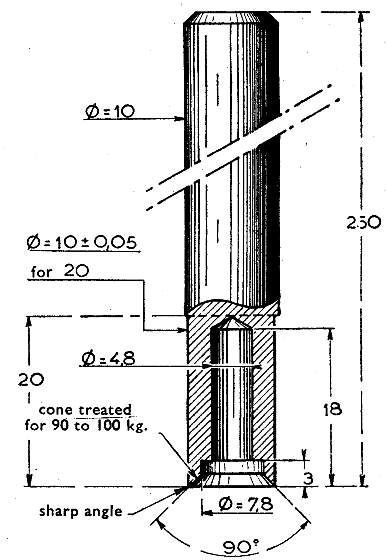


Fig. 3 CLOSING PUNCH MR-3857-3

not sold



DOWEL FOR CLOSING PUNCH

not sold

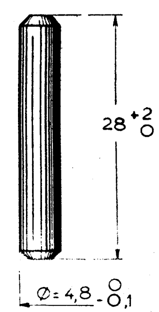


Fig. 2 UNION MR 3705

not sold

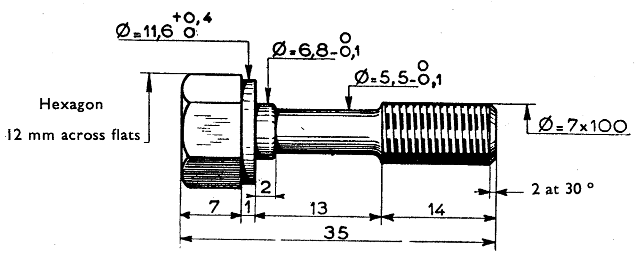
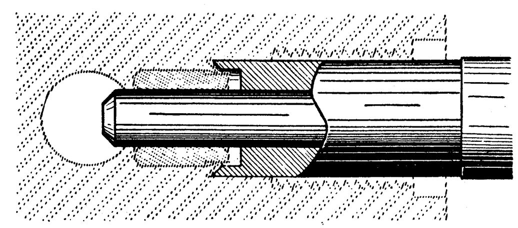


Fig. 4



CHECKING THE VACUUM IN THE CRANKCASE

Fig. 1

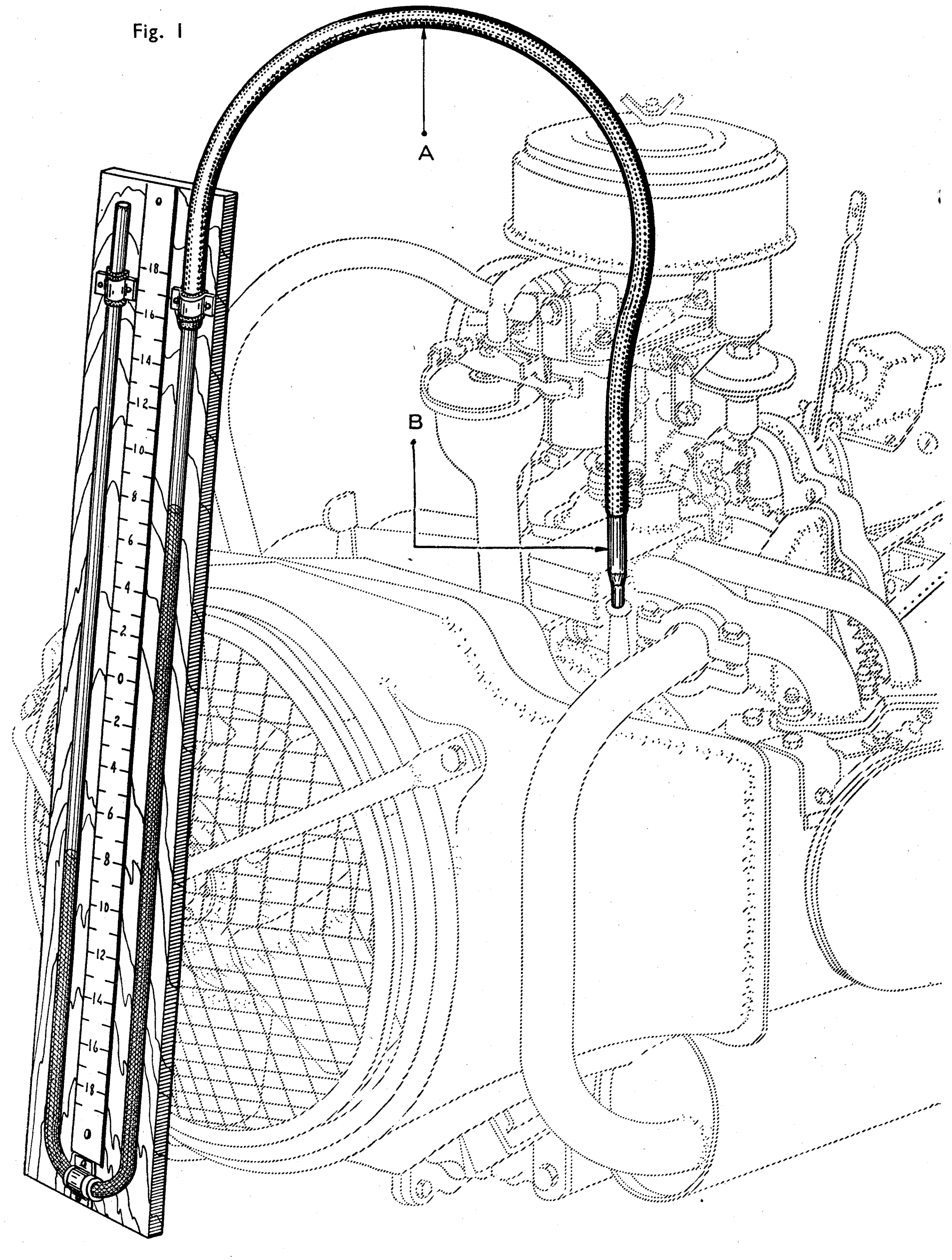
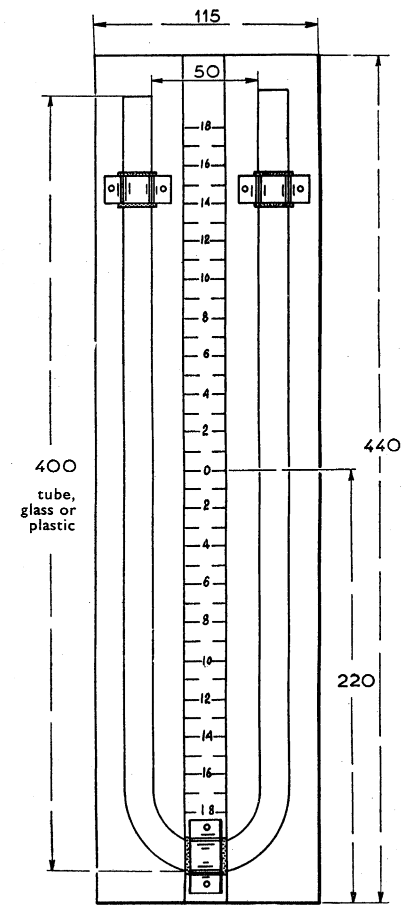
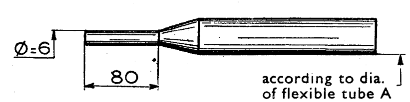


Fig. 2 PRESSURE GAUGE MR-3898

not sold



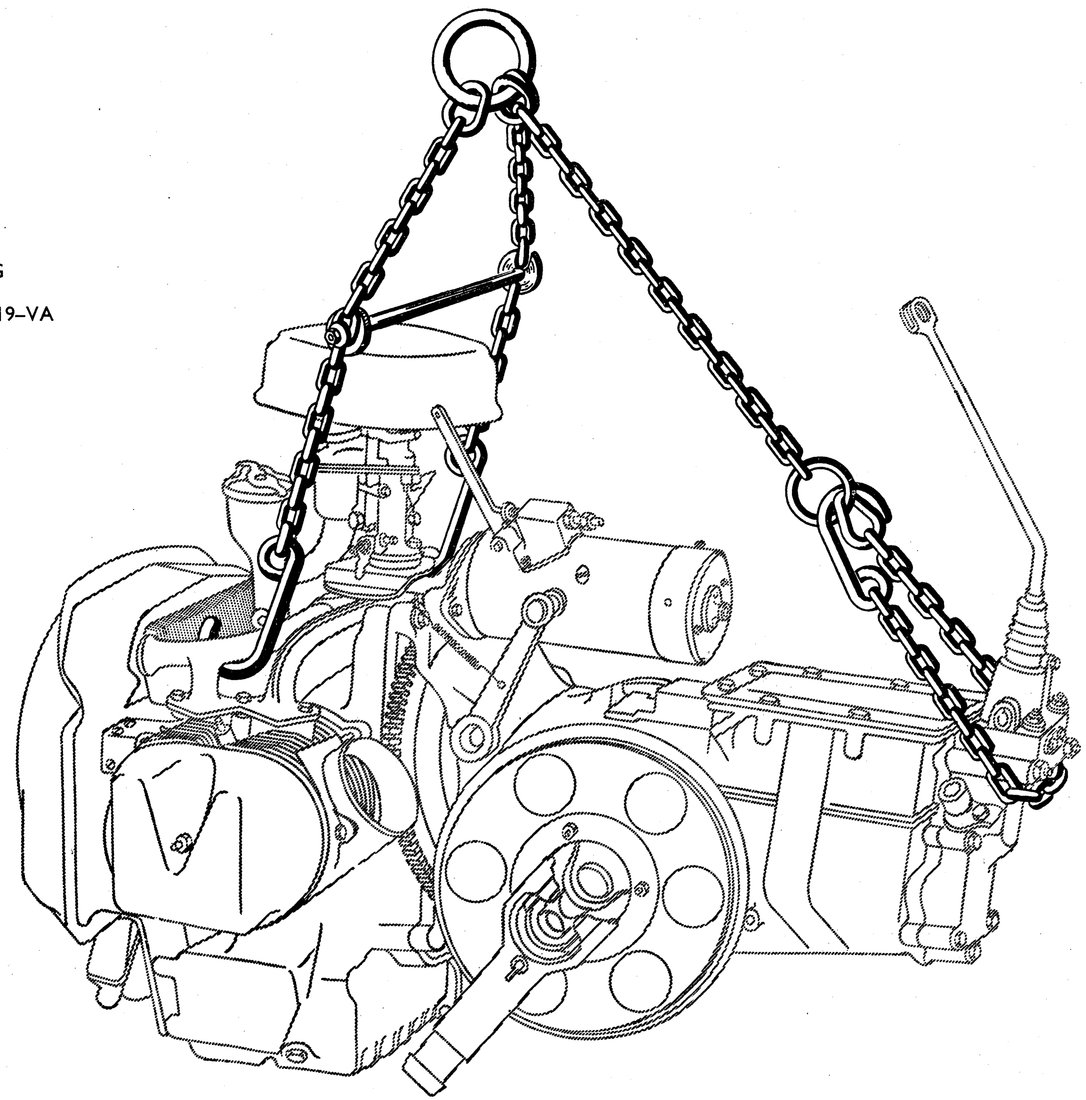
SOCKET B



LIFTING THE ENGINE

CHAIN SLING

sold under No. 1619–VA



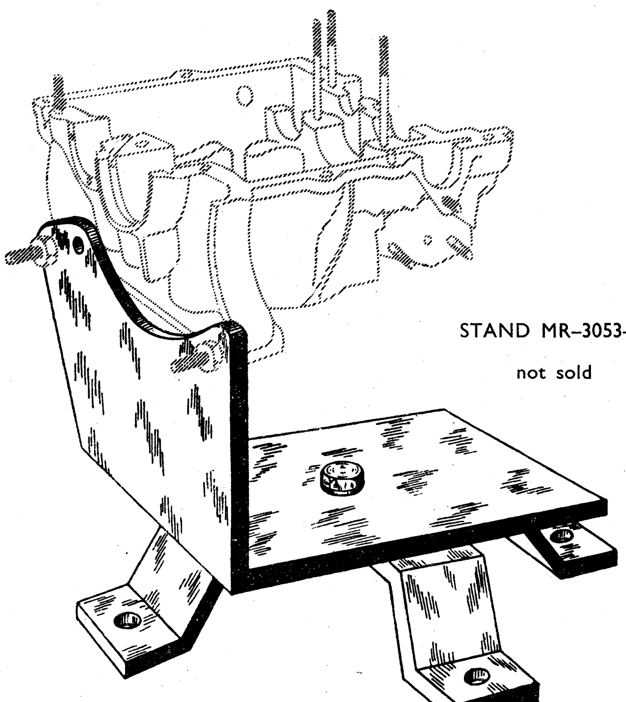
ENGINE

ENGINE STAND

USING THE STAND

FOR DIMENSIONS CONSULT OUR SERVICE DEPARTMENT

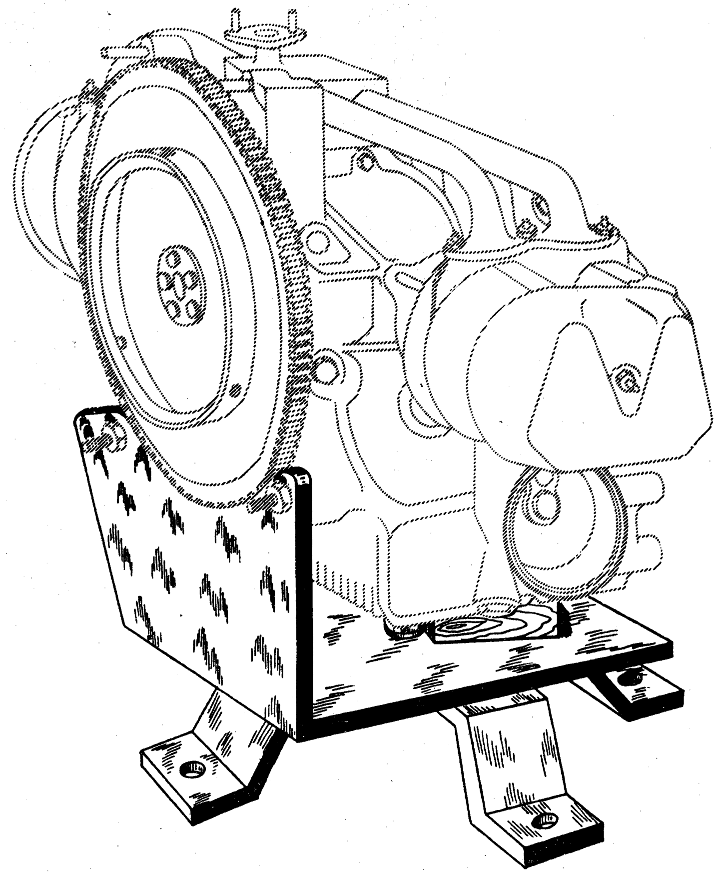
Fig. 1



STAND MR–3053–50

not sold

Fig. 2



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 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 (7) AND BRING THE SLIDE (8) INTO CONTACT WITH IT BY MEANS OF THE HAND-WHEEL (9)

(b) BY MEANS OF 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 }

Fig. 1 FIXTURE FOR CALIBRATING SPRINGS

sold under No. 2420–T

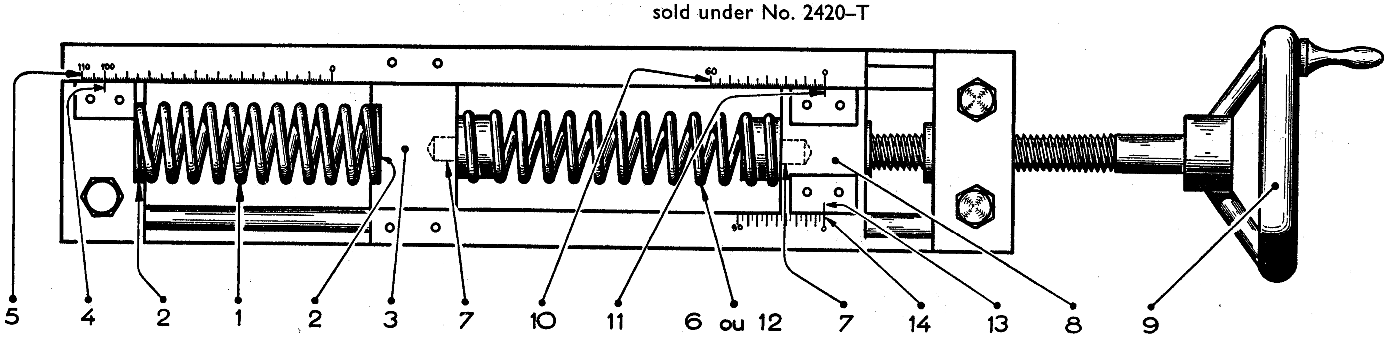
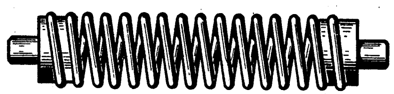


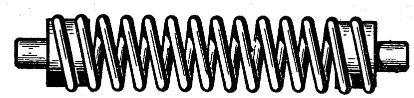
Fig. 2 CALIBRATED SPRINGS



SPRING DEFLECTING 1 mm per kg.

sold under No. 2421–T

This spring is painted yellow



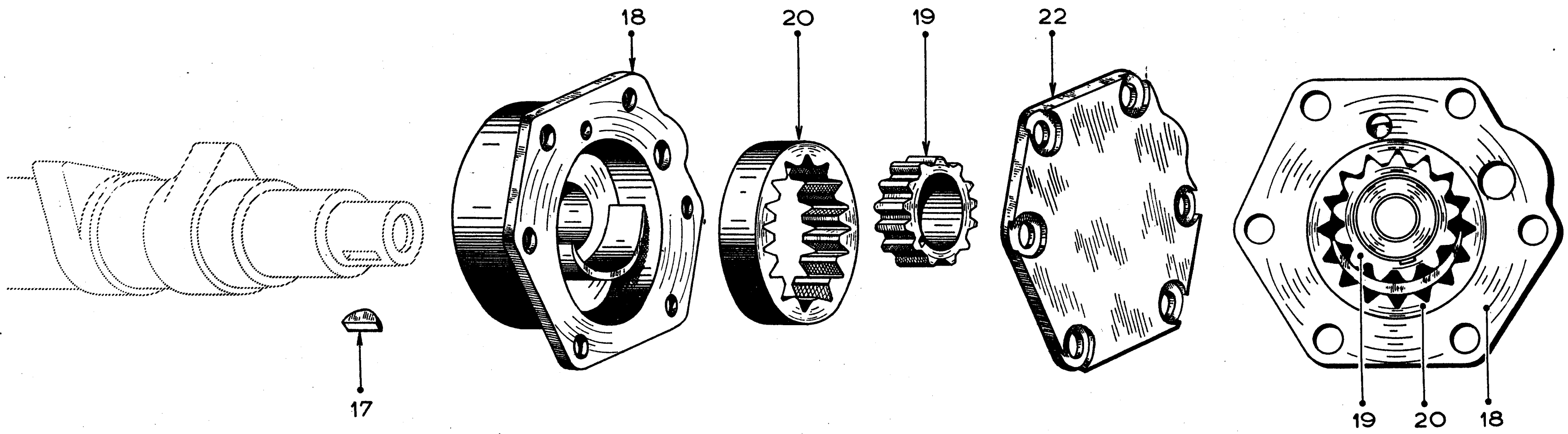
SPRING DEFLECTING 1 mm. per 2 kg.

sold under No. 2422–T

This spring is painted red

OIL CIRCULATION

Fig. 1 OIL PUMP



SECTIONAL VIEWS OF BREATHER VALVE

Fig. 2

METAL FOIL VALVE

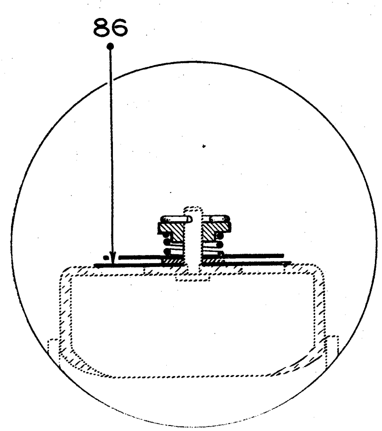
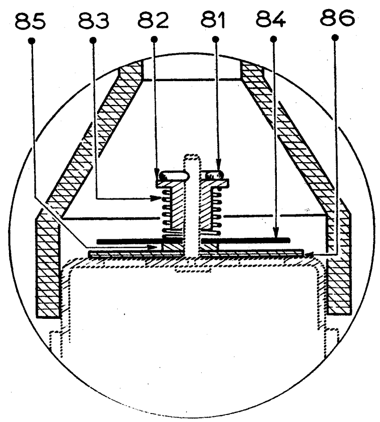
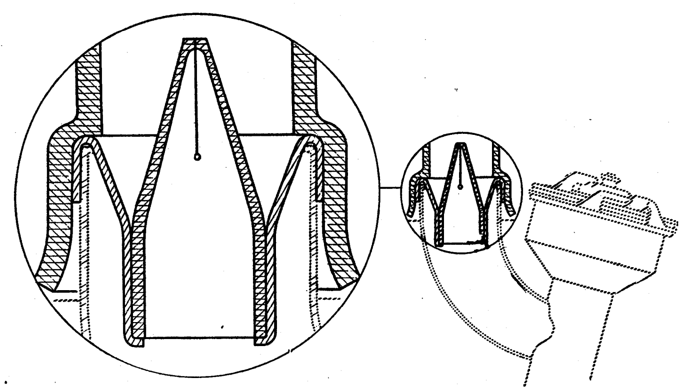


Fig. 3

Fig. 4

RUBBER VALVES





VARIOUS TOOLS

Fig. 1 SPARKING PLUG SPANNER

sold under No. 1601–T

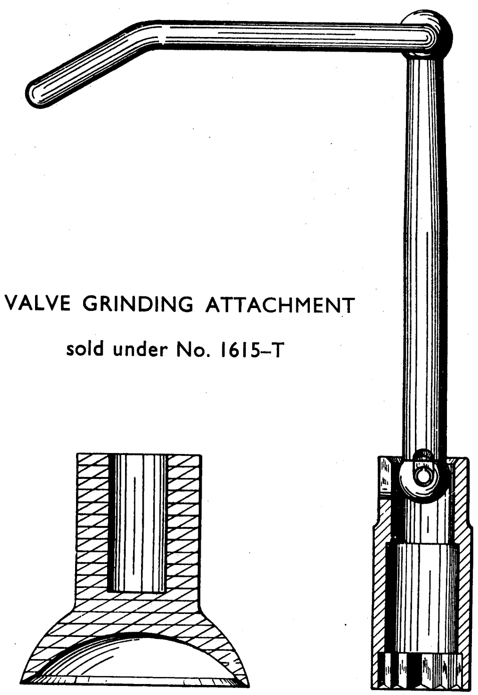


Fig. 2 STUD DRIVER AND EXTRACTOR

sold under No. 2410–T

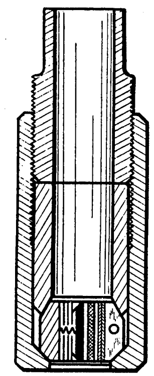


Fig. 3 DIAL GAUGE

sold under No. 2437–T

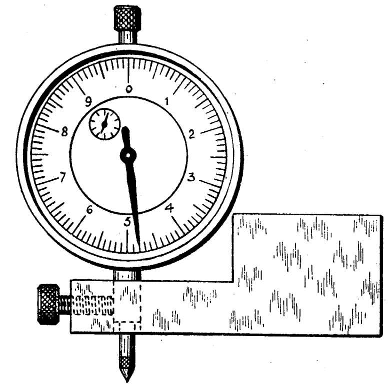
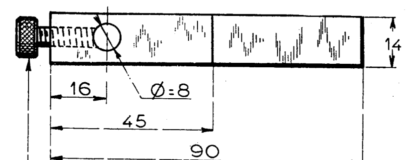


Fig. 6 VALVE GRINDING ATTACHMENT

sold under No. 1615–T

Fig. 4 DIAL GAUGE BRACKET

sold under No. 1754–VA

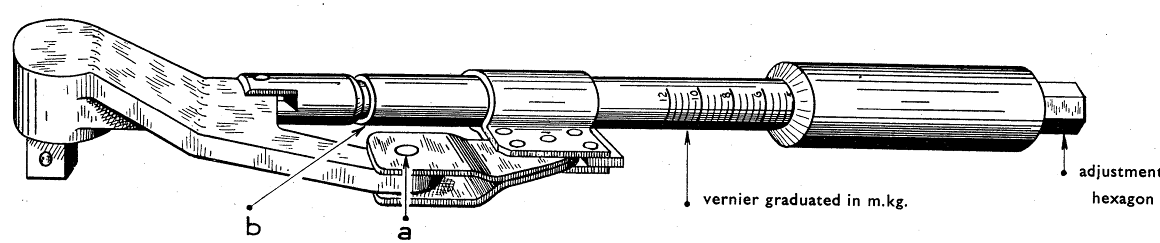


screws 5 × 0·90 – length under head 16
dia. of knurled head 12

Fig. 5 TORSION SPANNER

sold under No. 2470–T

THIS WRENCH IS GRADUATED IN m.kg. AND USES SOCKETS WITH A SQUARE OF 12·7 mm. (sold under No. 2465–T). WHEN THE TORSION LOAD REACHES THE TIGHTENING FIGURE SHOWN ON THE SCALE THE LINKAGE "a" BENDS, INDICATING THAT THE TIGHTENING MUST STOP. THE LINKAGE "a" MUST NEVER BEAR AGAINST THE BODY OF THE WRENCH AT "b".



CLUTCH, A–AU–AZU

VARIOUS VIEWS

Fig. I EXTERNAL VIEW

Fig. 2

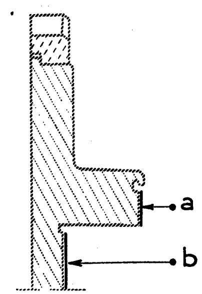


Fig. 3 SECTION

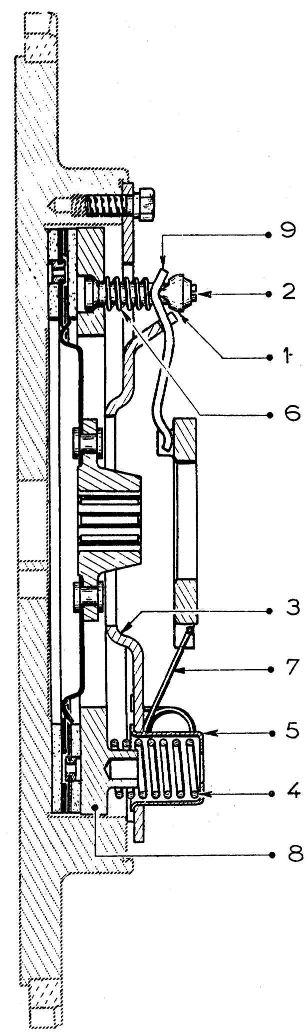
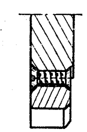


Fig. 4



CLUTCH AZ

VARIOUS VIEWS

Fig. 1

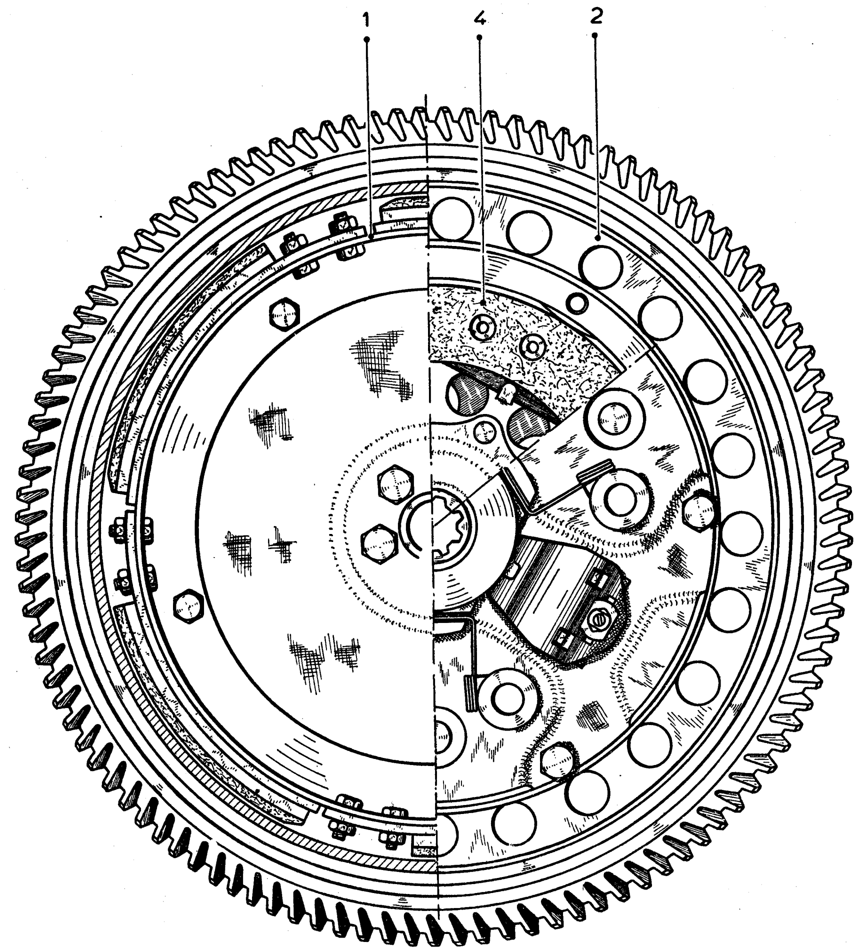
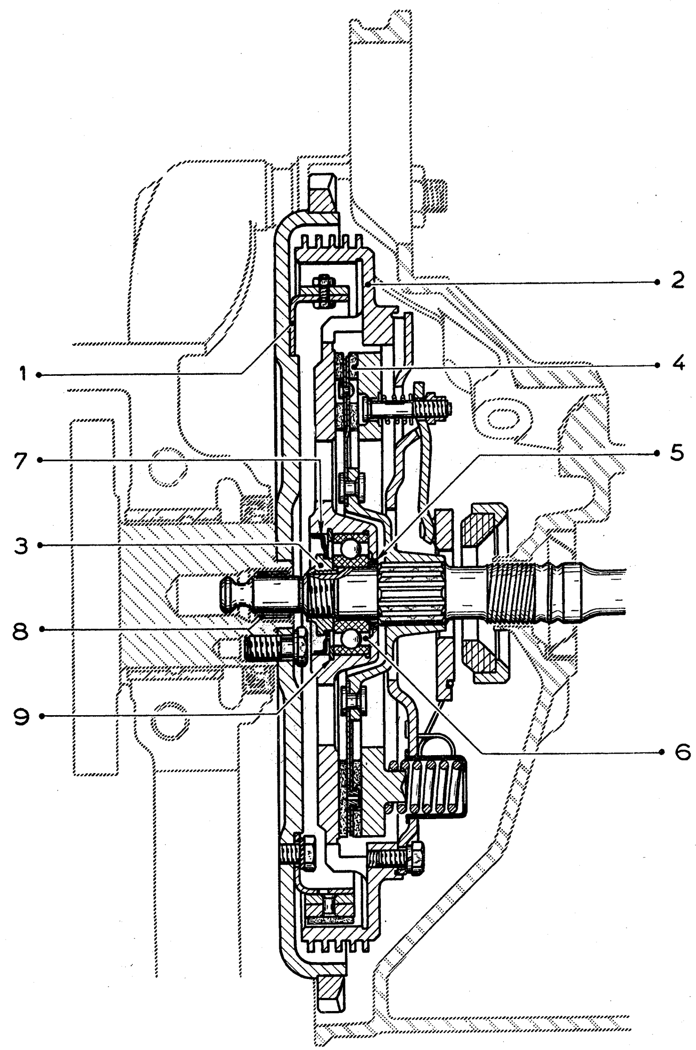


Fig. 2



GRINDING THE CLUTCH DRUM AND THE ENGINE FLYWHEEL

Fig. 1 USING THE MANDREL

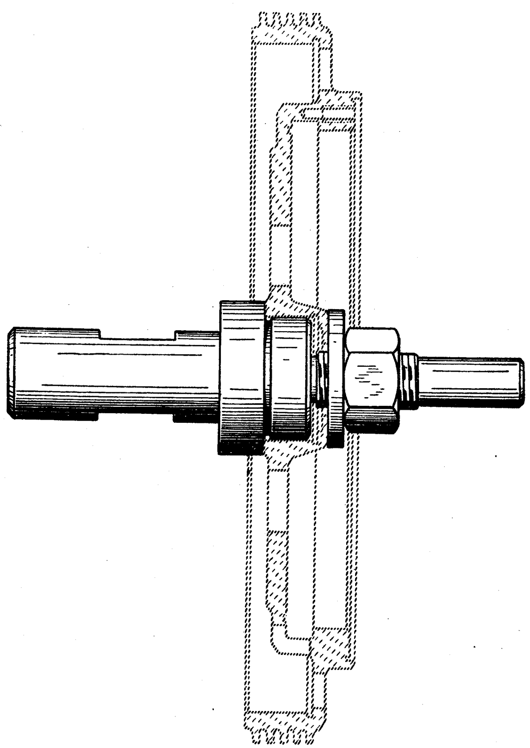


Fig. 3 USING THE MANDREL

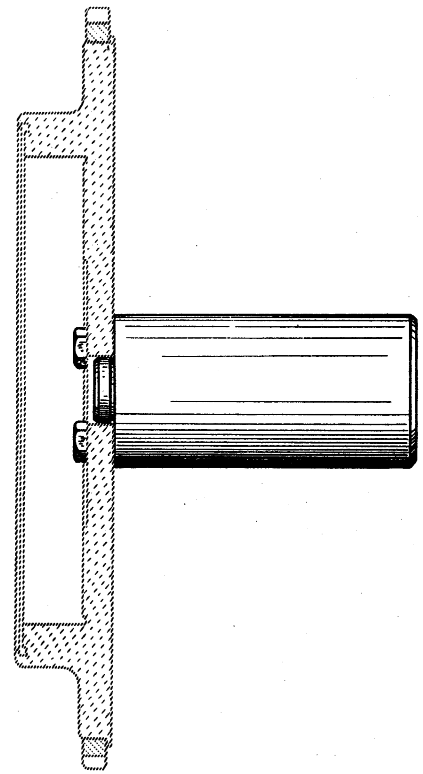


Fig. 2 MANDREL MR 3700–100

not sold

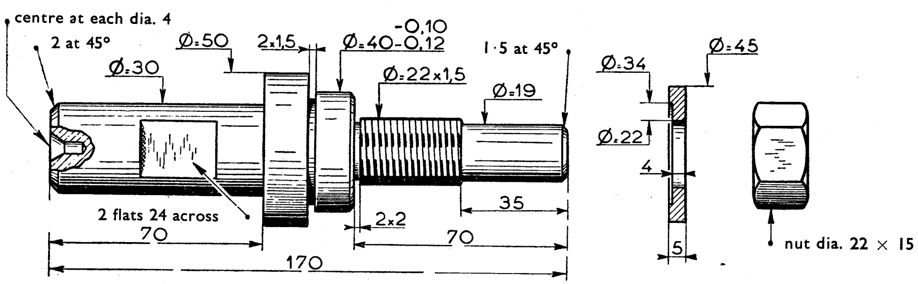
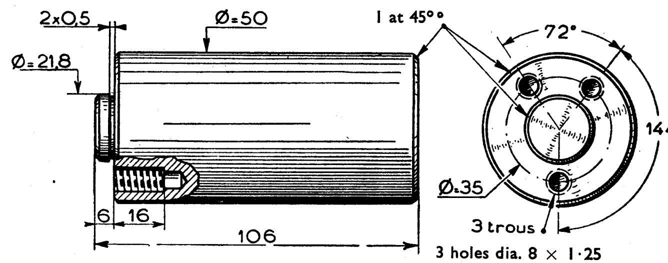


Fig. 4 MANDREL MR 3700–110

not sold



ADJUSTING THE POSITION OF THE CLUTCH DRUM

Fig. 2

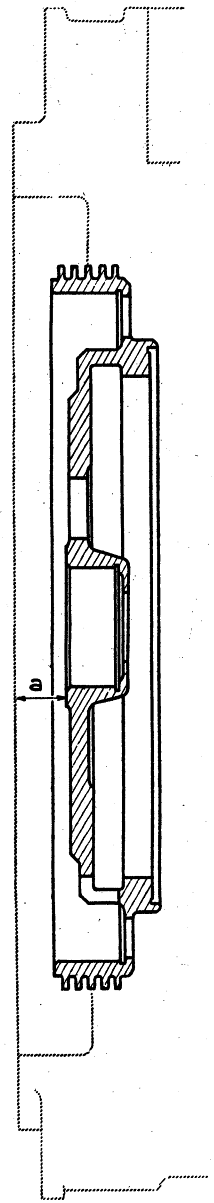
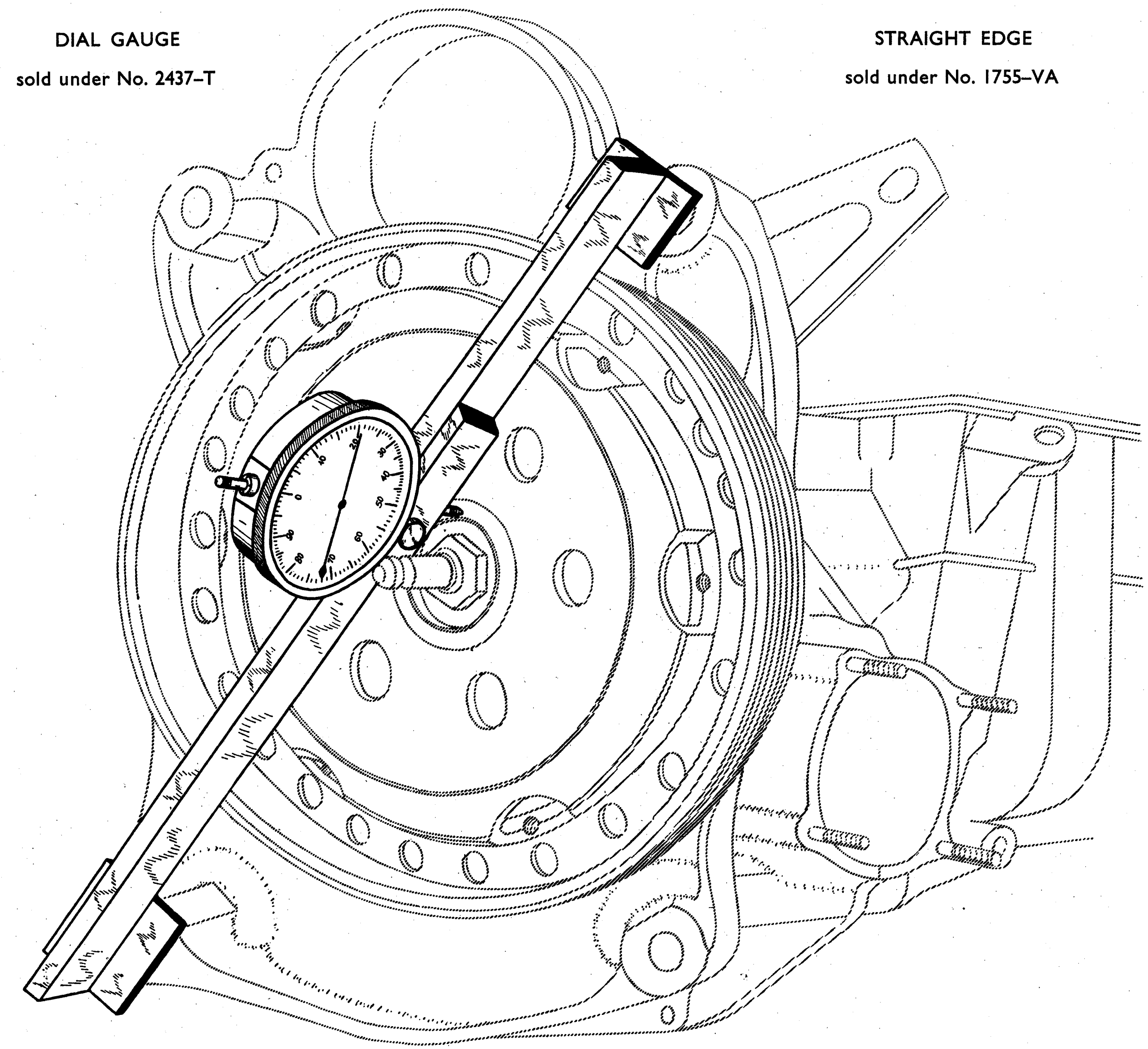
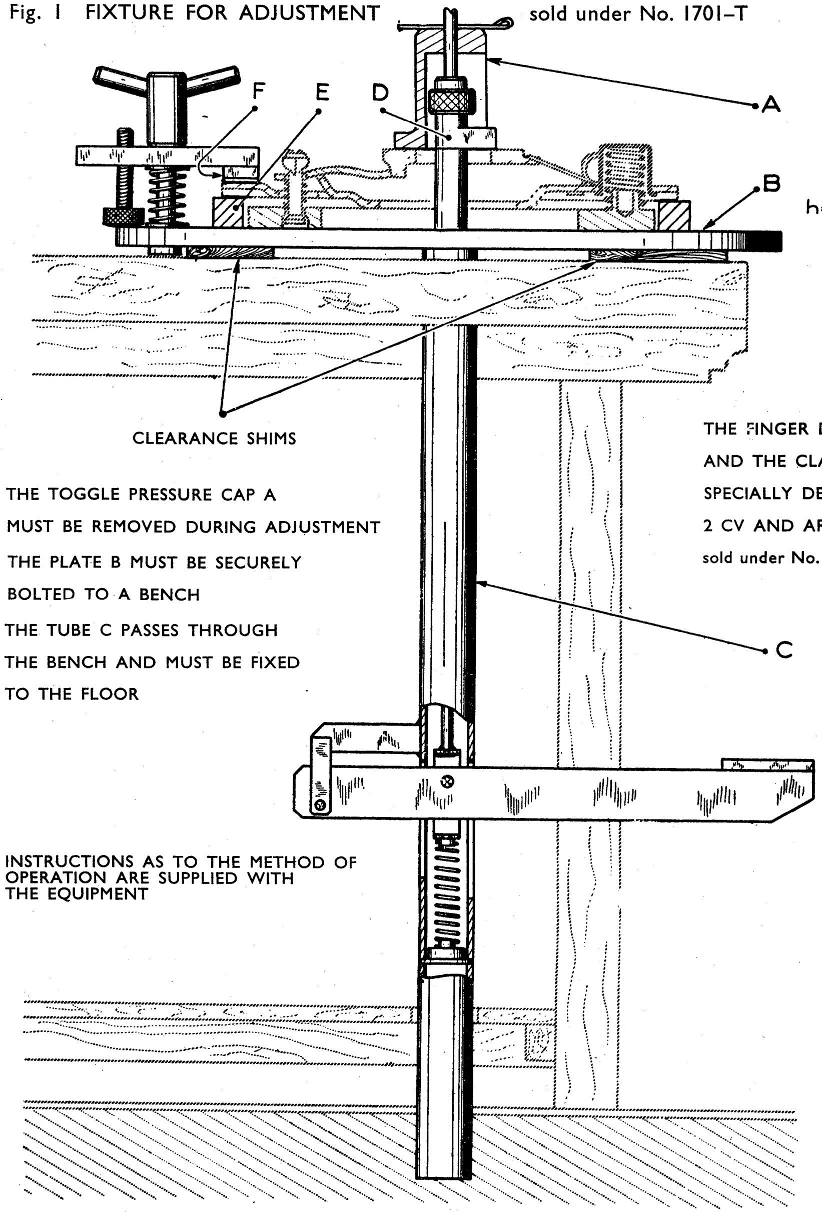


Fig. 1



ADJUSTMENT OF THE CLUTCH

Fig. I FIXTURE FOR ADJUSTMENT sold under No. 1701–T



THE TOGGLE PRESSURE CAP A MUST BE REMOVED DURING ADJUSTMENT

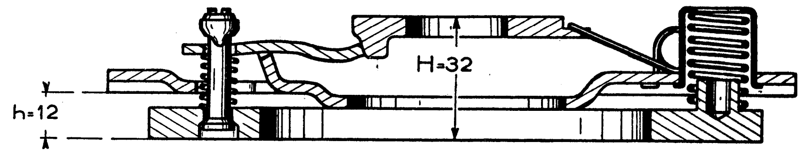
THE PLATE B MUST BE SECURELY BOLTED TO A BENCH

THE TUBE C PASSES THROUGH THE BENCH AND MUST BE FIXED TO THE FLOOR

INSTRUCTIONS AS TO THE METHOD OF OPERATION ARE SUPPLIED WITH THE EQUIPMENT

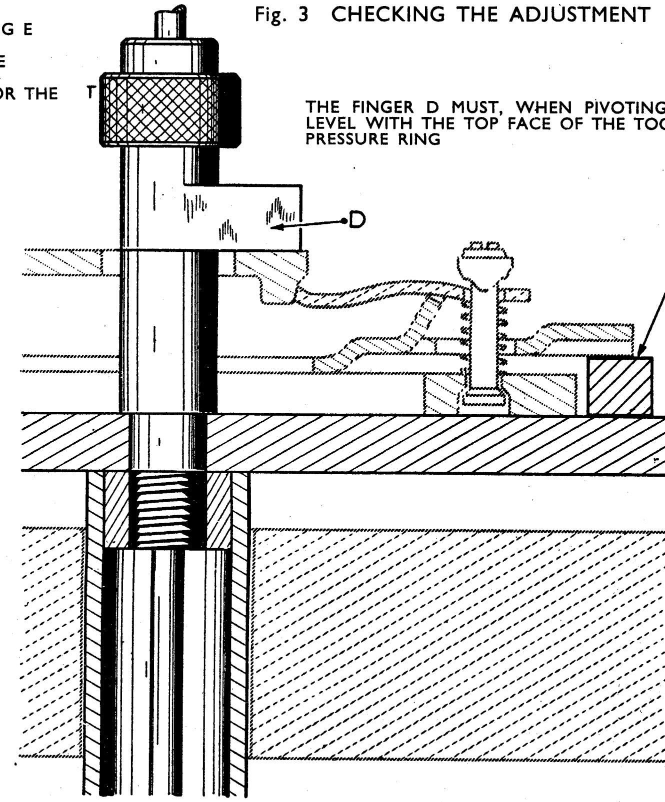
THE FINGER D, THE RING E AND THE CLAMPS F ARE SPECIALLY DESIGNED FOR THE 2 CV AND ARE sold under No. 1702–VA

Fig. 2 CLUTCH MECHANISM IN THE ENGAGED POSITION



THESE DIMENSIONS MAY BE MEASURED ONLY ON A FIXTURE

Fig. 3 CHECKING THE ADJUSTMENT

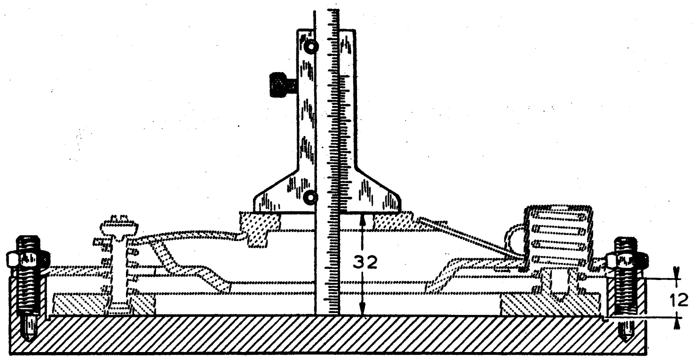


THE FINGER D MUST, WHEN PIVOTING, BE LEVEL WITH THE TOP FACE OF THE TOGGLE PRESSURE RING

CLUTCH

ADJUSTMENT OF THE CLUTCH

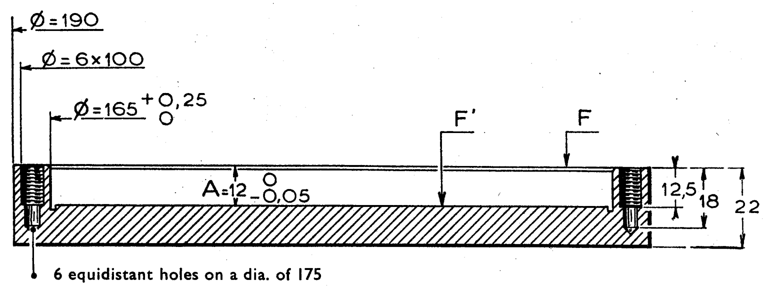
Fig. 1 METHOD OF USE



THE DIMENSION 12 mm IS OBTAINED BY THE FIXTURE TO
ADJUST THE MECHANISM
AFTER HAVING WORKED THE TOGGLES BY MEANS OF A PRESS
OR A DRILLING MACHINE, CHECK THE DIMENSION 32
WITH A DEPTH GAUGE
LOCK THE NUTS

Fig. 2 SIMPLIFIED FIXTURE

sold under No. 1703–VA



THE CLUTCH IS FIXED ON THE FIXTURE BY 6 STUDS
OF 6 mm. dia. × 100 pitch, LENGTH 45 mm. and 6 NUTS
THE FACES F AND F' ARE GROUND. THE DIMENSION 'A' BEING VERY IMPORTANT

Fig. 4 PACKING MR 3834—length 50
PACKING MR 3834–10—length 20
not sold

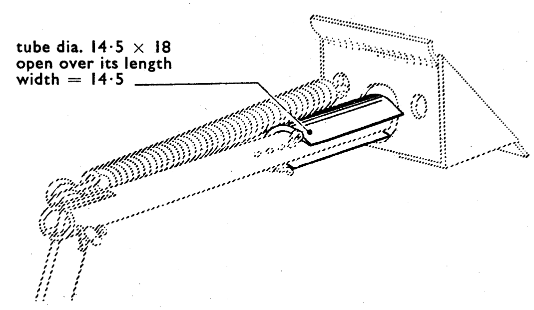
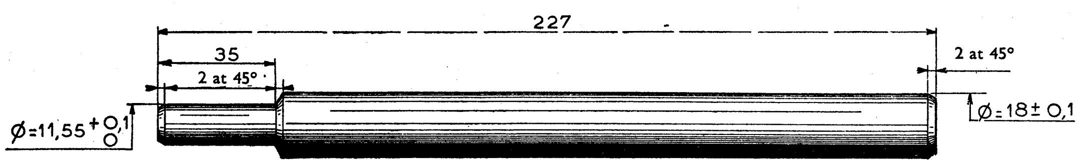


Fig. 3 MANDREL MR 1620–40 FOR CENTRING THE CLUTCH DISC

not sold



CHANGE SPEED LEVER

Fig. 1 SECTION

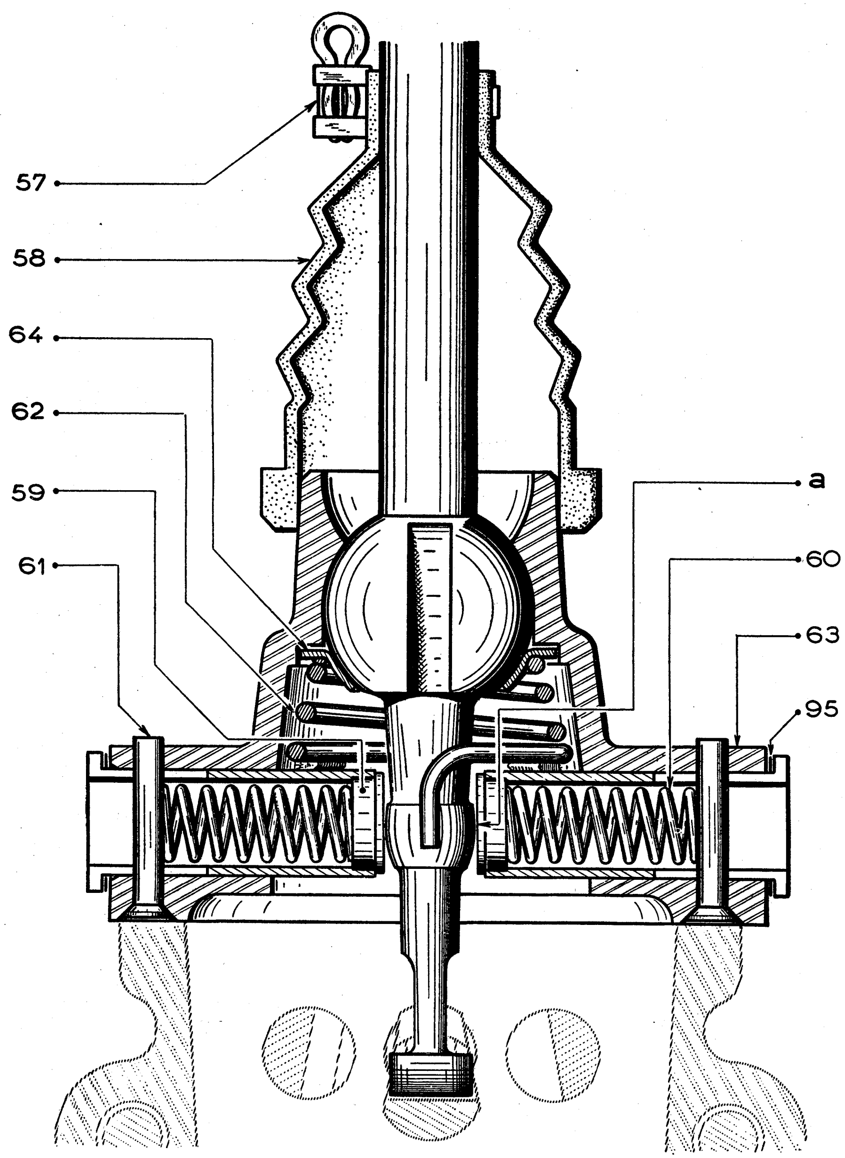
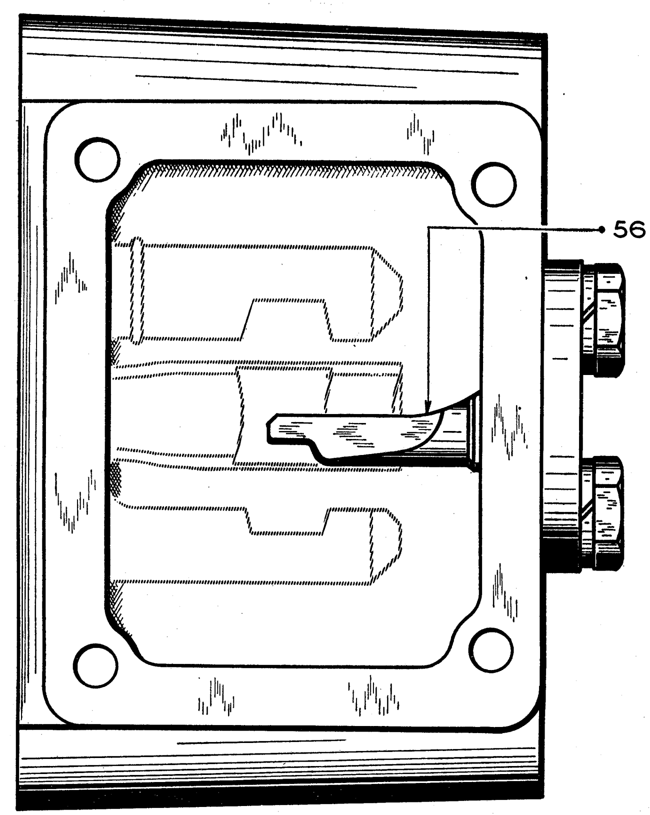
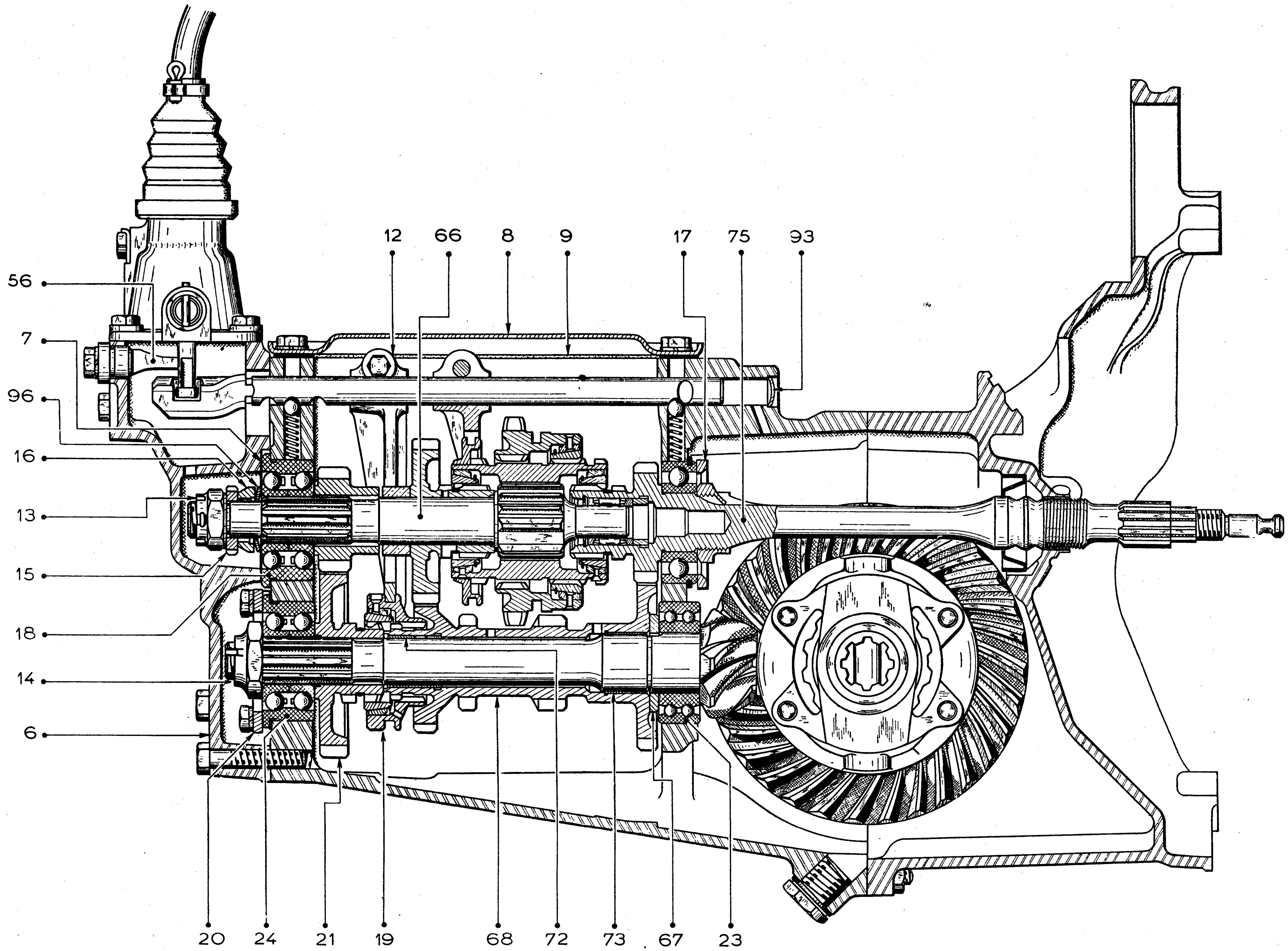


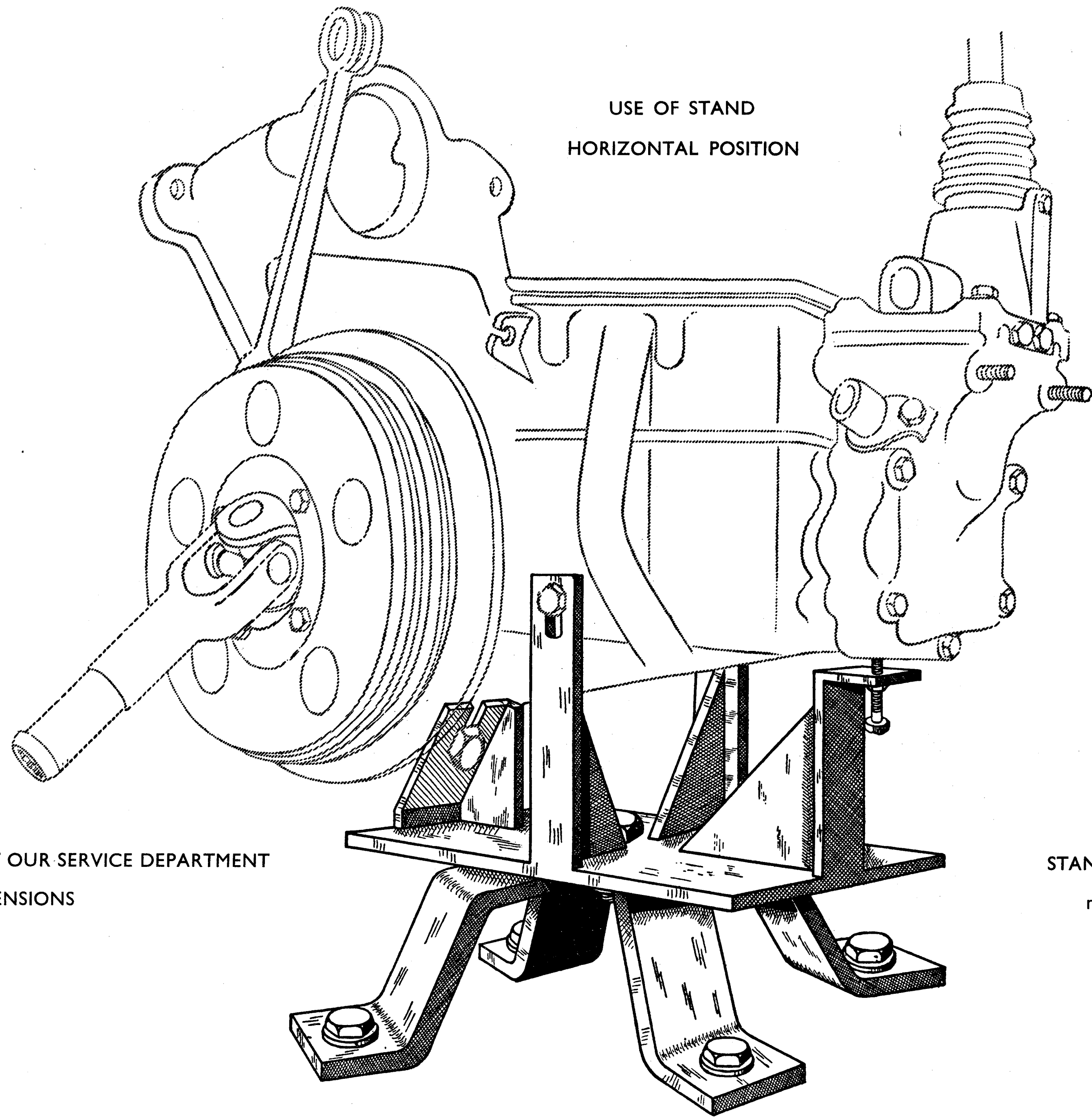
Fig. 2 POSITION OF GUIDE FINGER



LONGITUDINAL SECTION



GEARBOX
STAND



CONSULT OUR SERVICE DEPARTMENT
FOR DIMENSIONS

STAND MR–3053–40
not sold

SECTION THROUGH THE BRAKE BACKPLATE

ALUMINIUM BACKPLATE

Fig. 1

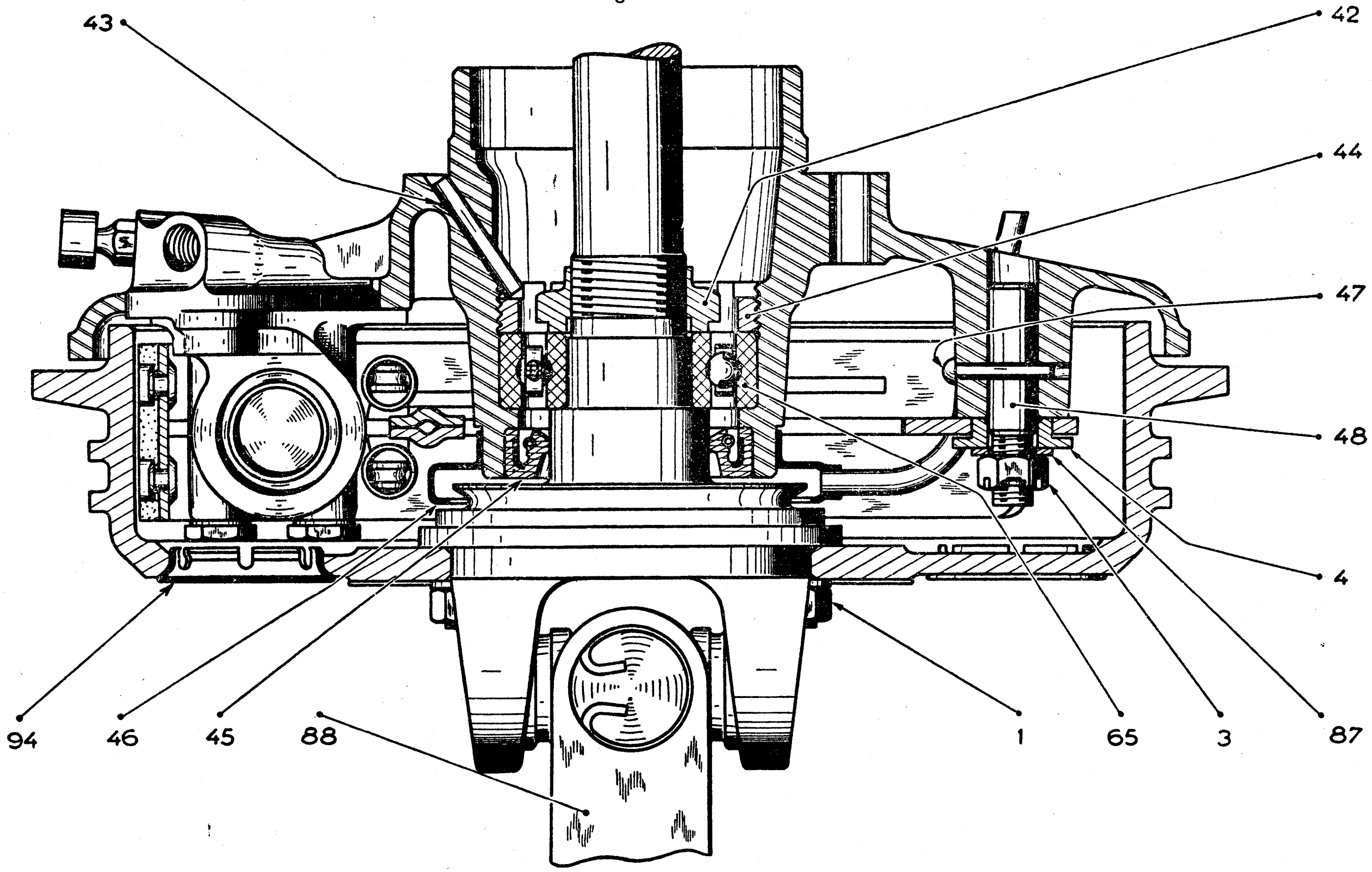


Fig. 2 SPANNER

sold under No. 1790–VA

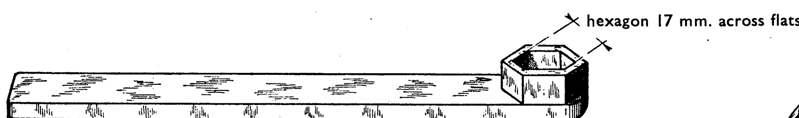
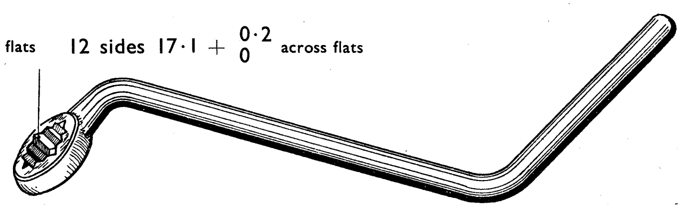


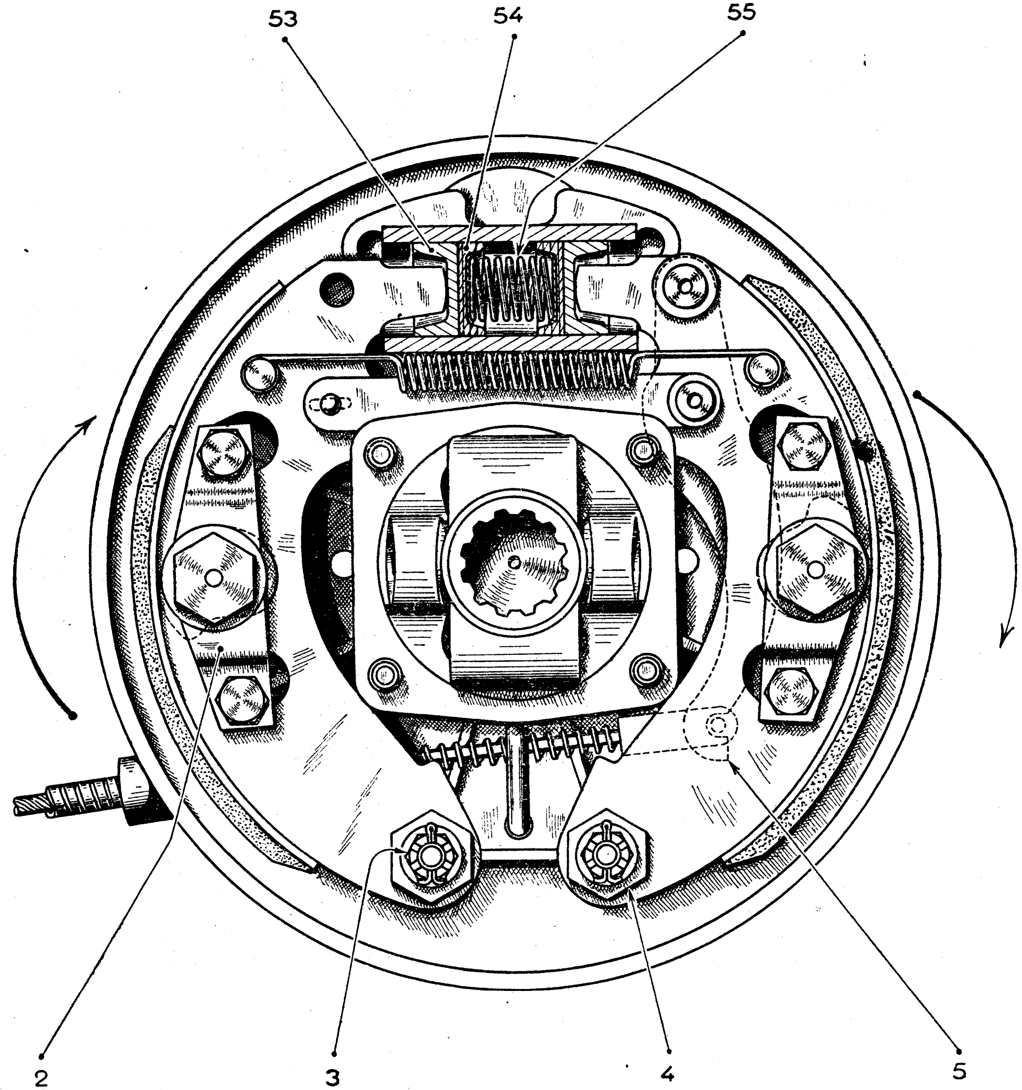
Fig. 3 SPANNER

sold under No. 1791–VA



BRAKE BACKPLATE

ALUMINIUM



SECTION THROUGH THE BRAKE BACKPLATE

STEEL BACKPLATE

Fig. 1

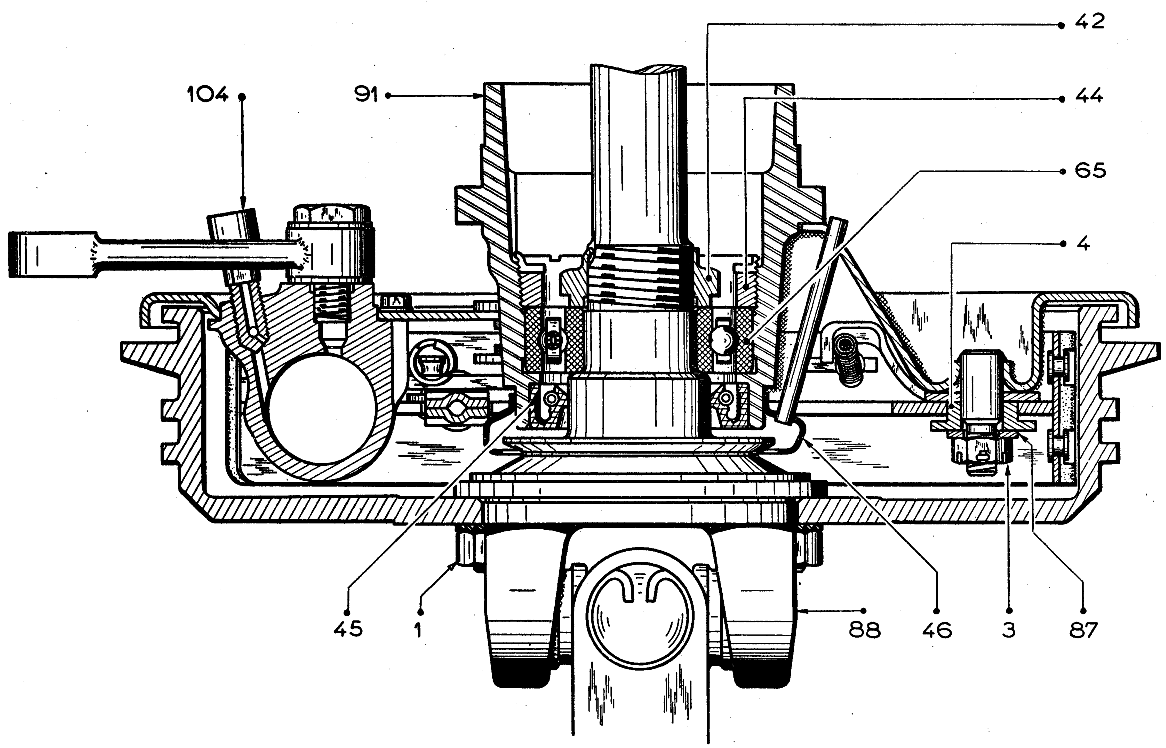
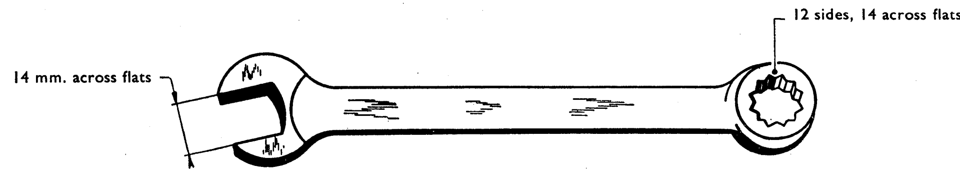


Fig. 2 SPANNER

sold under No. 2126–VA

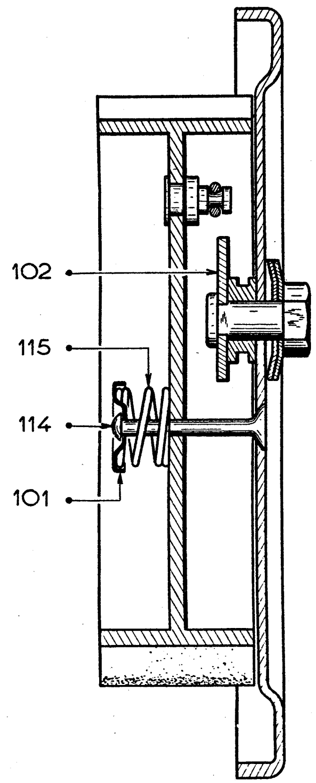


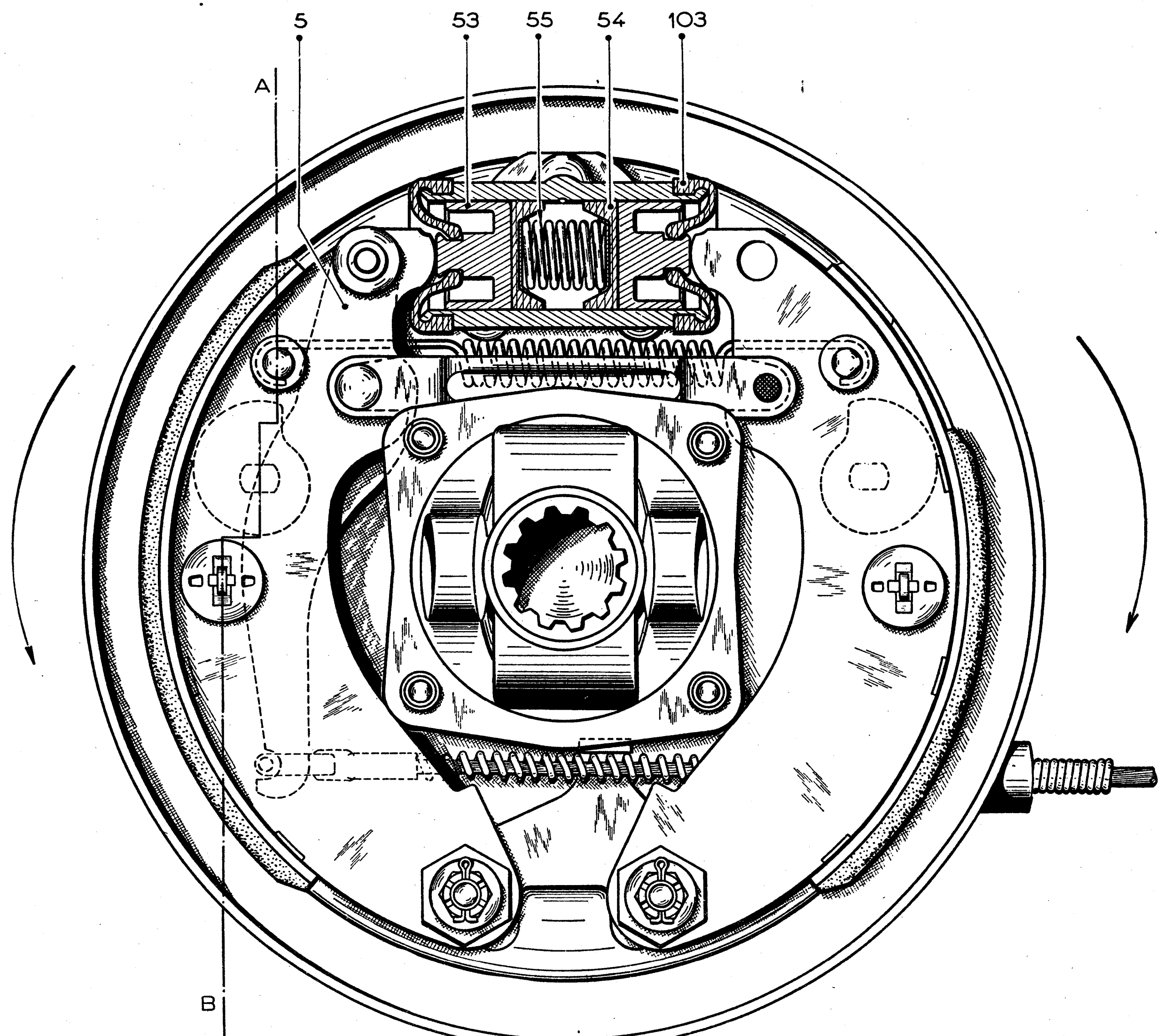
GEARBOX

BRAKE BACKPLATE

STEEL BACKPLATE

SECTION ON AB





GEARBOX

SELECTOR SHAFTS AND FORKS

Fig. 1—POSITION OF SELECTOR FORKS

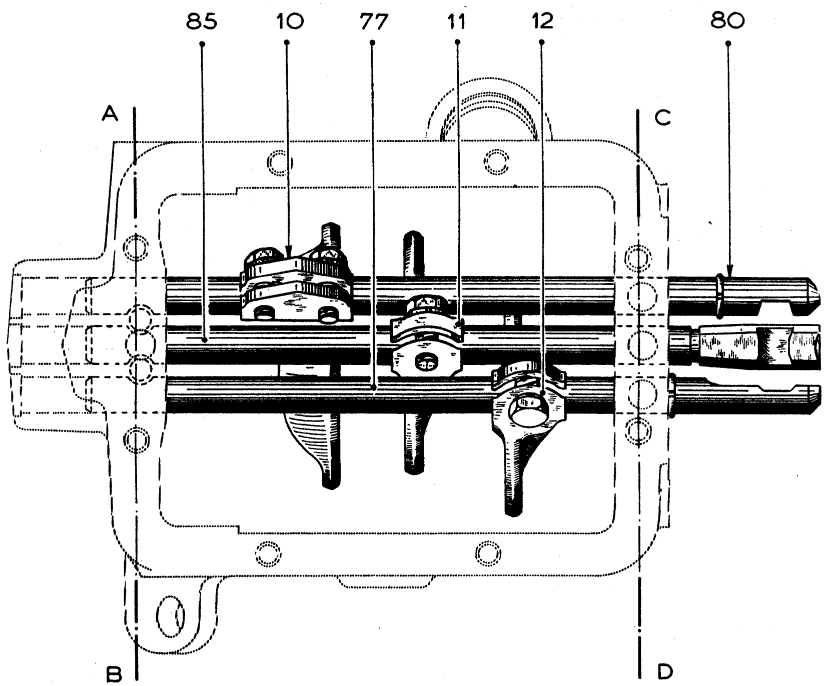
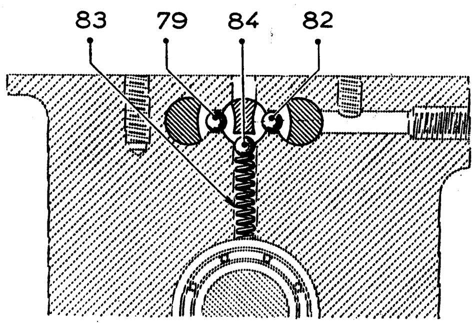
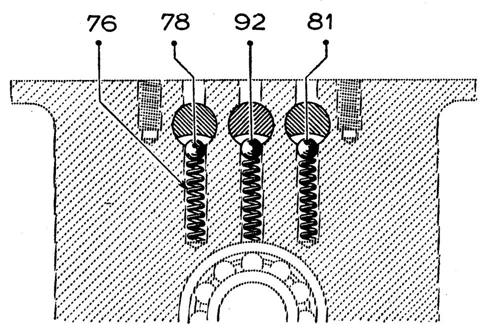


Fig. 2 LOCKING MECHANISM, FRONT



SECTION ON AB

Fig. 3 LOCKING MECHANISM, REAR



SECTION ON CD

DISASSEMBLY

Fig. 1 EXTRACTOR FOR REVERSE PINION SHAFT

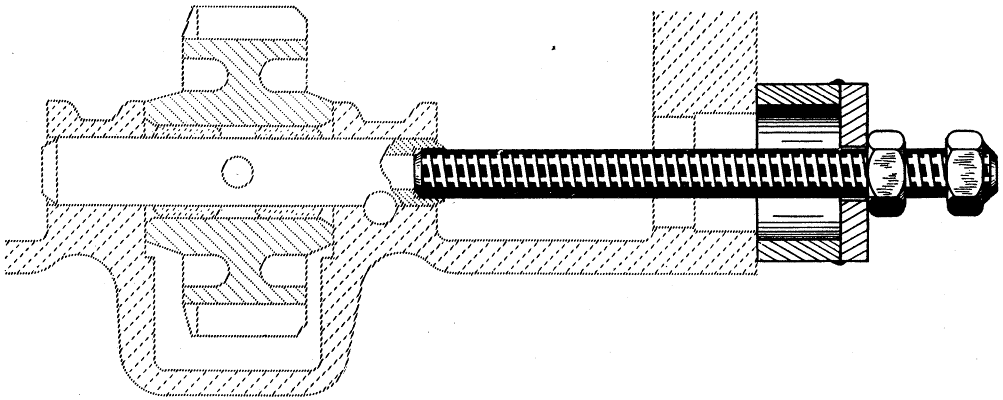


Fig. 3 EXTRACTOR MR-3682-30

not sold

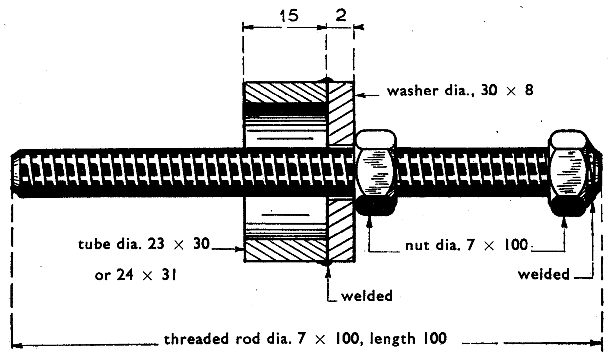


Fig. 2 REMOVAL OF THE BEARING

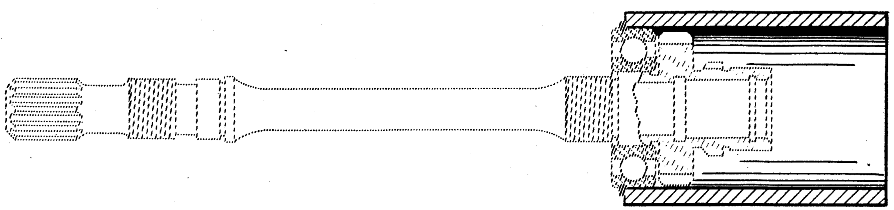
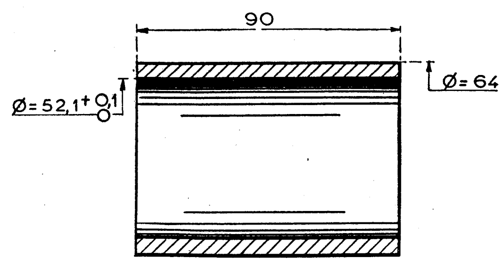


Fig. 4 RING MR-3686

not sold



GEARBOX

SECTIONS

Fig. 1 BEVEL PINION SHAFT

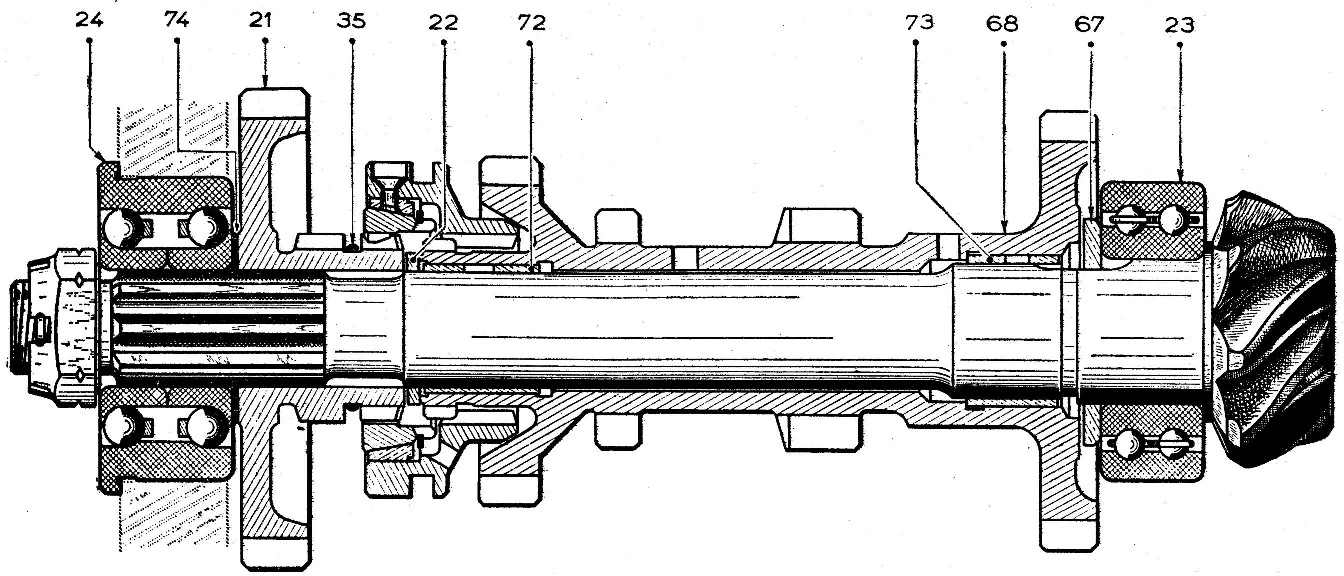


Fig. 2

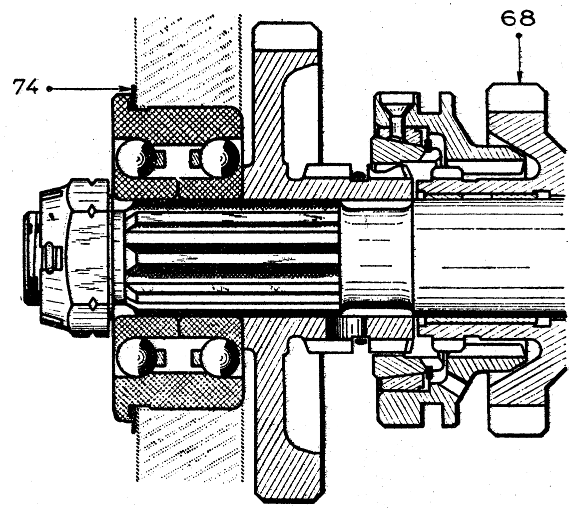


Fig. 3

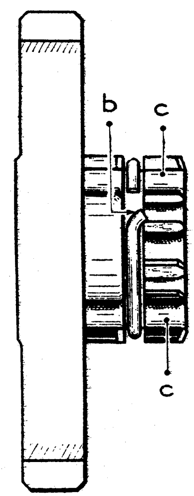
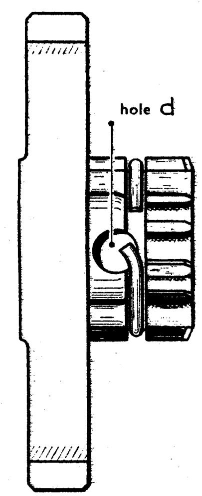
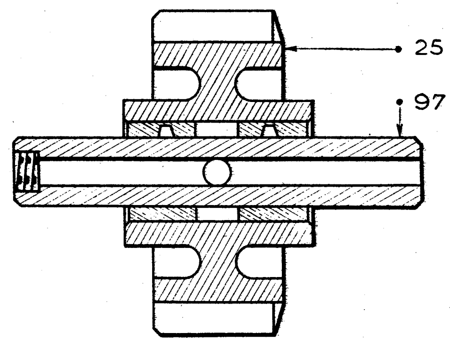


Fig. 4



POSITION OF THE SYNCHRONISING CIRCLIP

Fig. 5 REVERSE SPEED PINION



GEARBOX

SECTIONS

Fig. I MAIN SHAFT

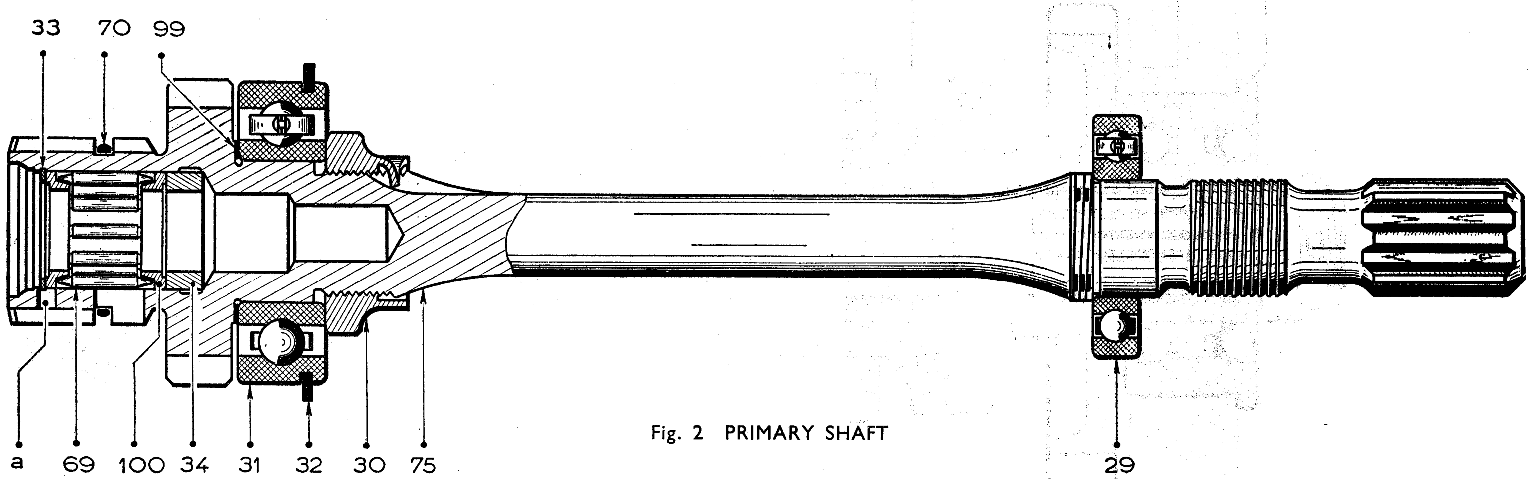
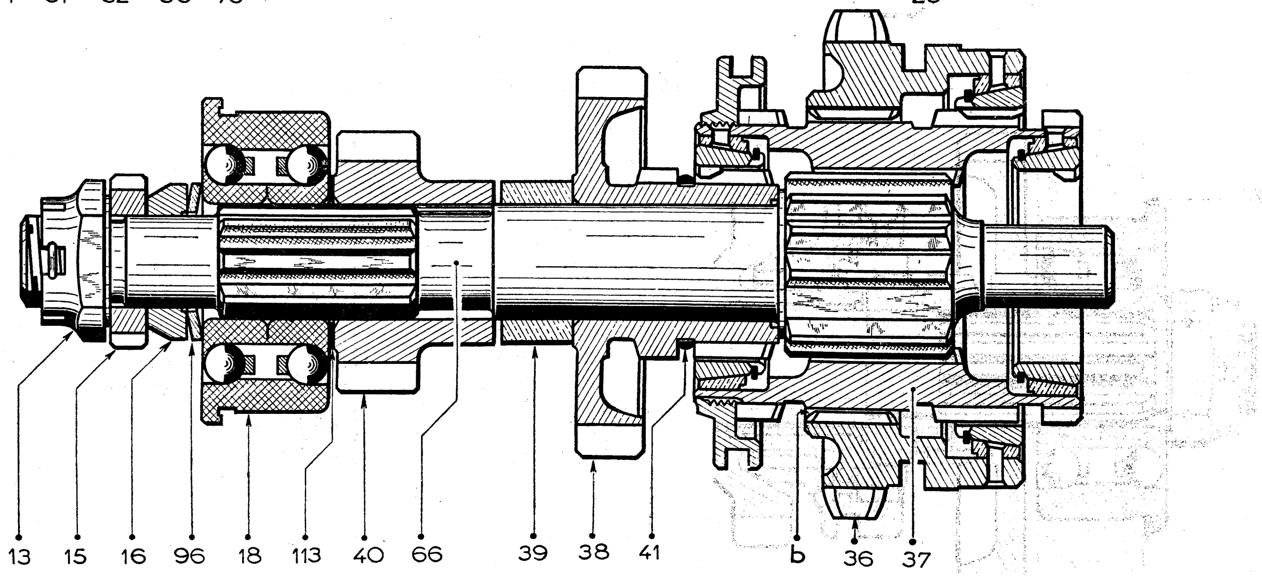
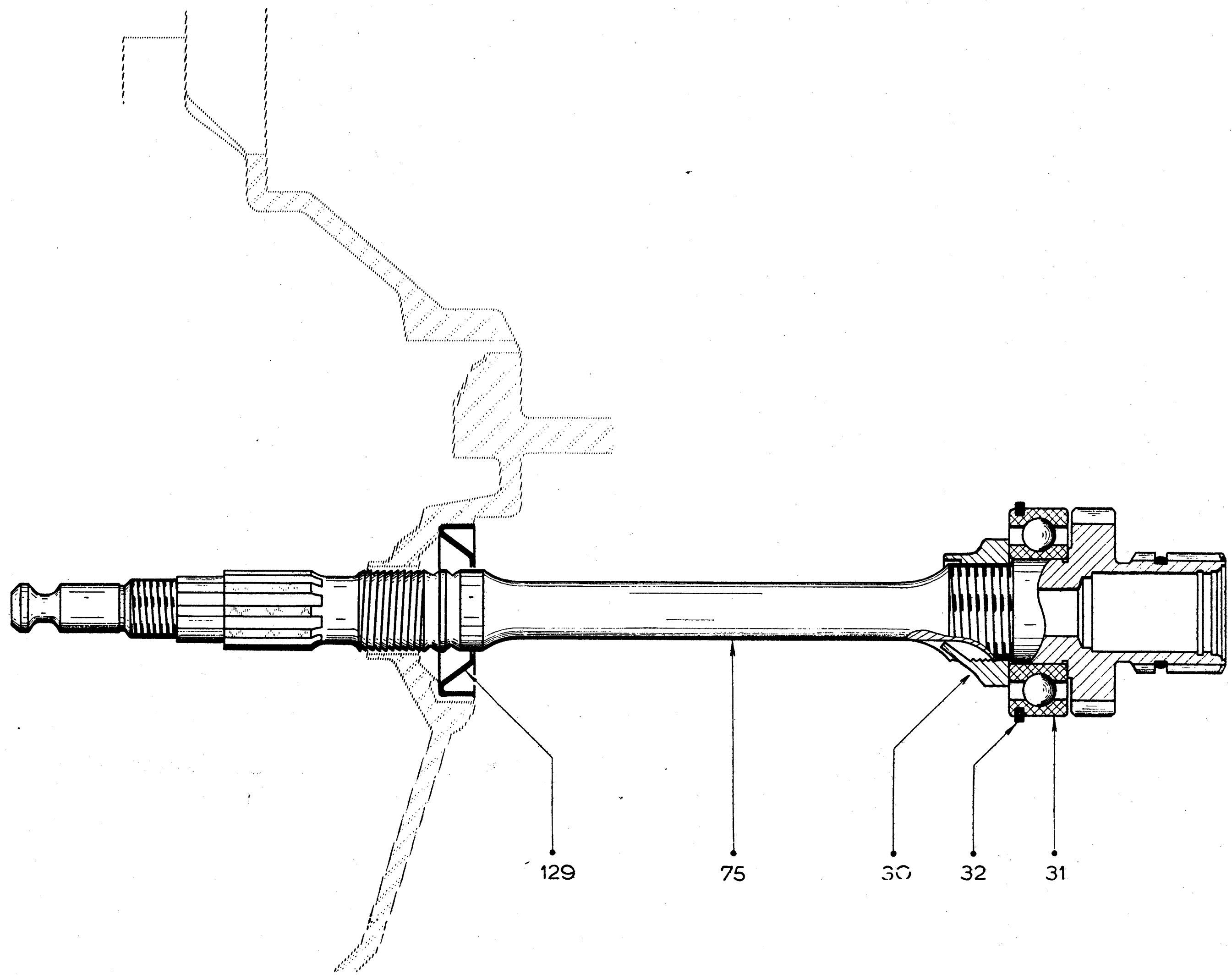


Fig. 2 PRIMARY SHAFT



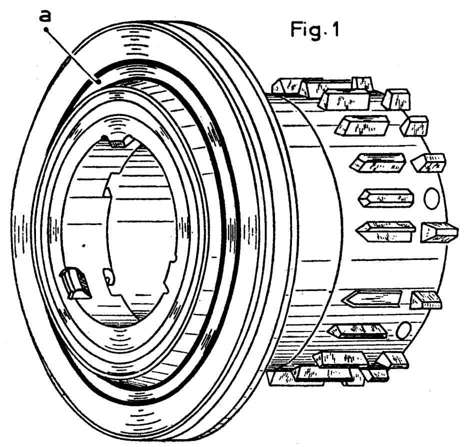
GEARBOX AZ

MAIN SHAFT



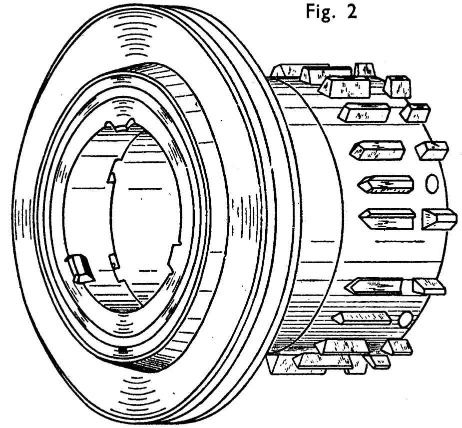
2nd AND 3rd SPEED SLIDING GEAR AND SPEEDOMETER DRIVE PINION

Fig. 1



ON THE 1st TYPE SLIDING GEAR THERE IS A GROOVE AT "a"

Fig. 2



•ON THE 2nd TYPE SLIDING GEAR THERE IS NO GROOVE

Fig. 3

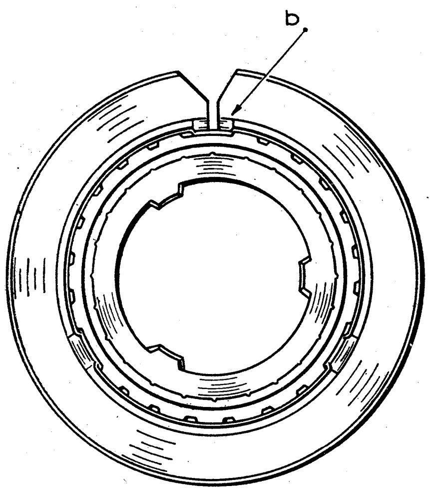
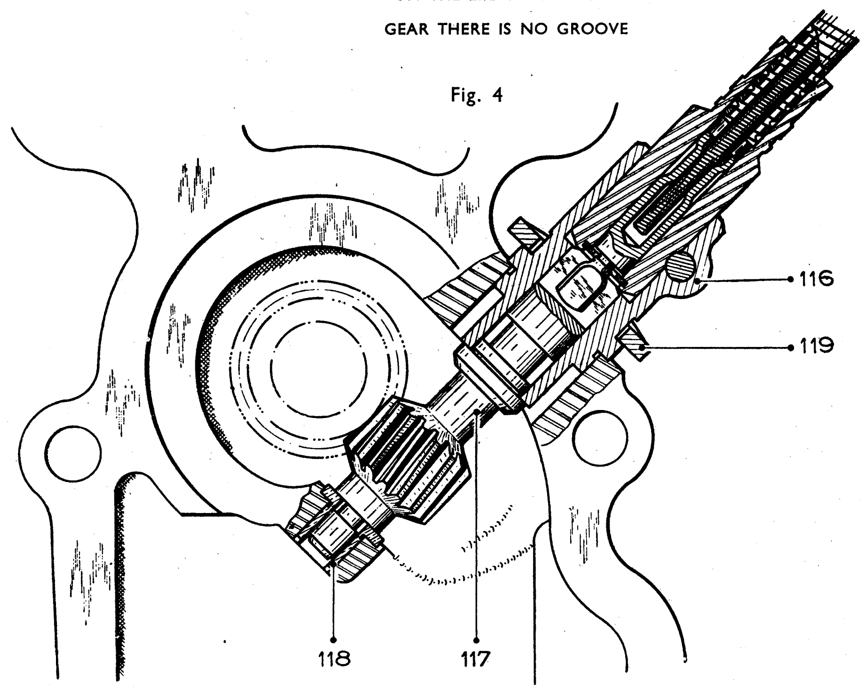


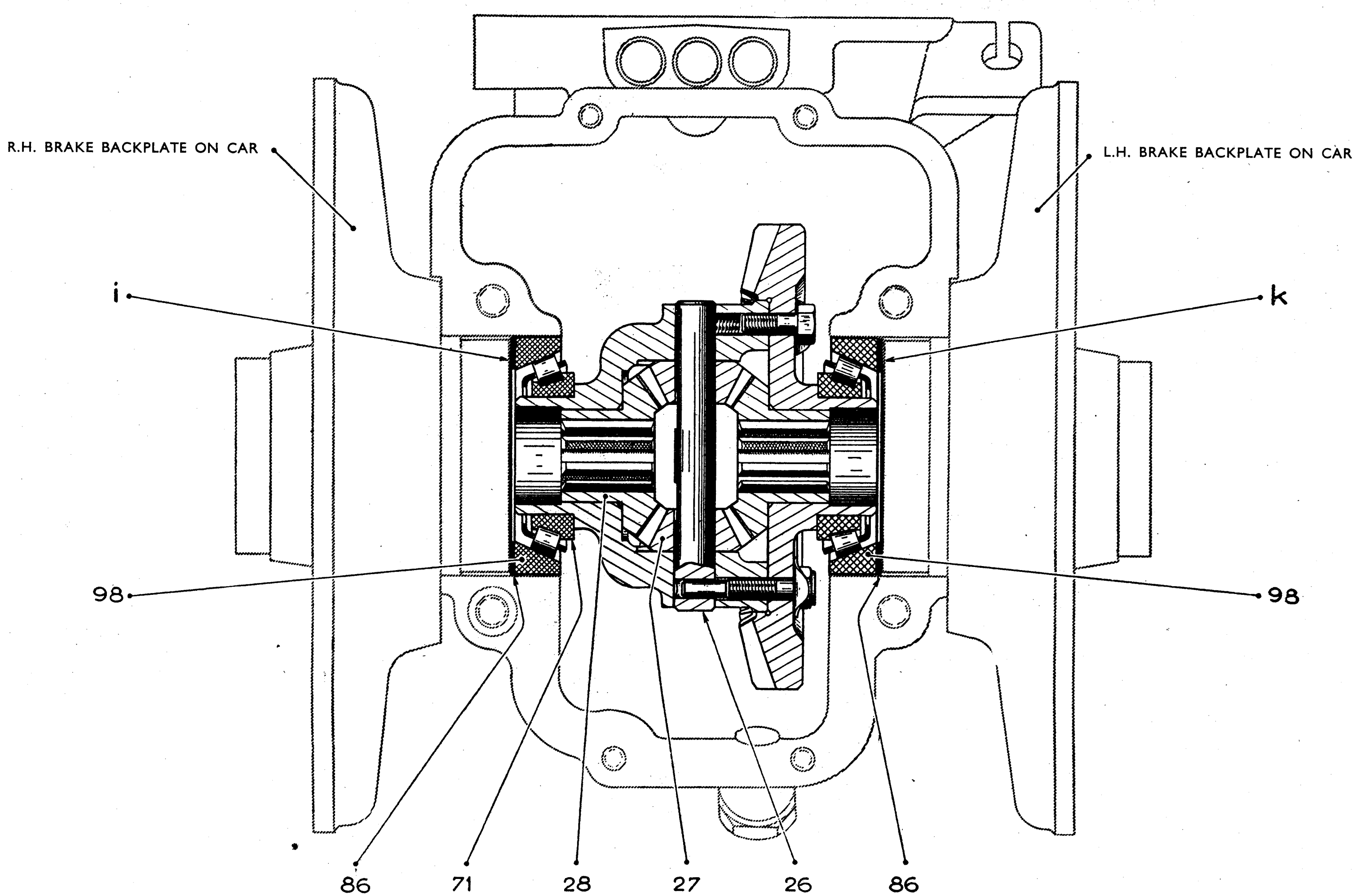
Fig. 4



GEARBOX

SECTION THROUGH DIFFERENTIAL

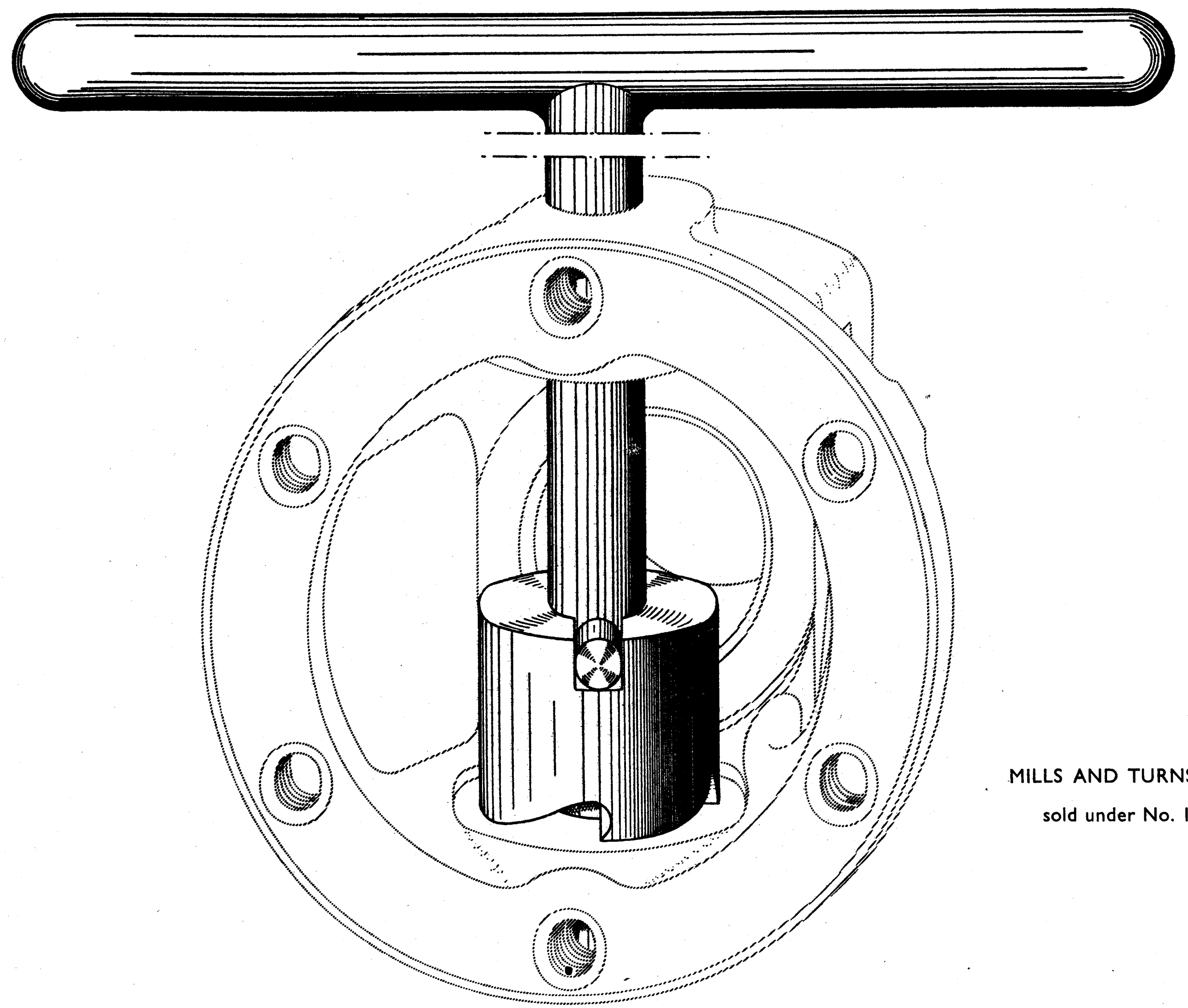
Fig. 1 VIEW FROM FRONT OF VEHICLE



GEARBOX

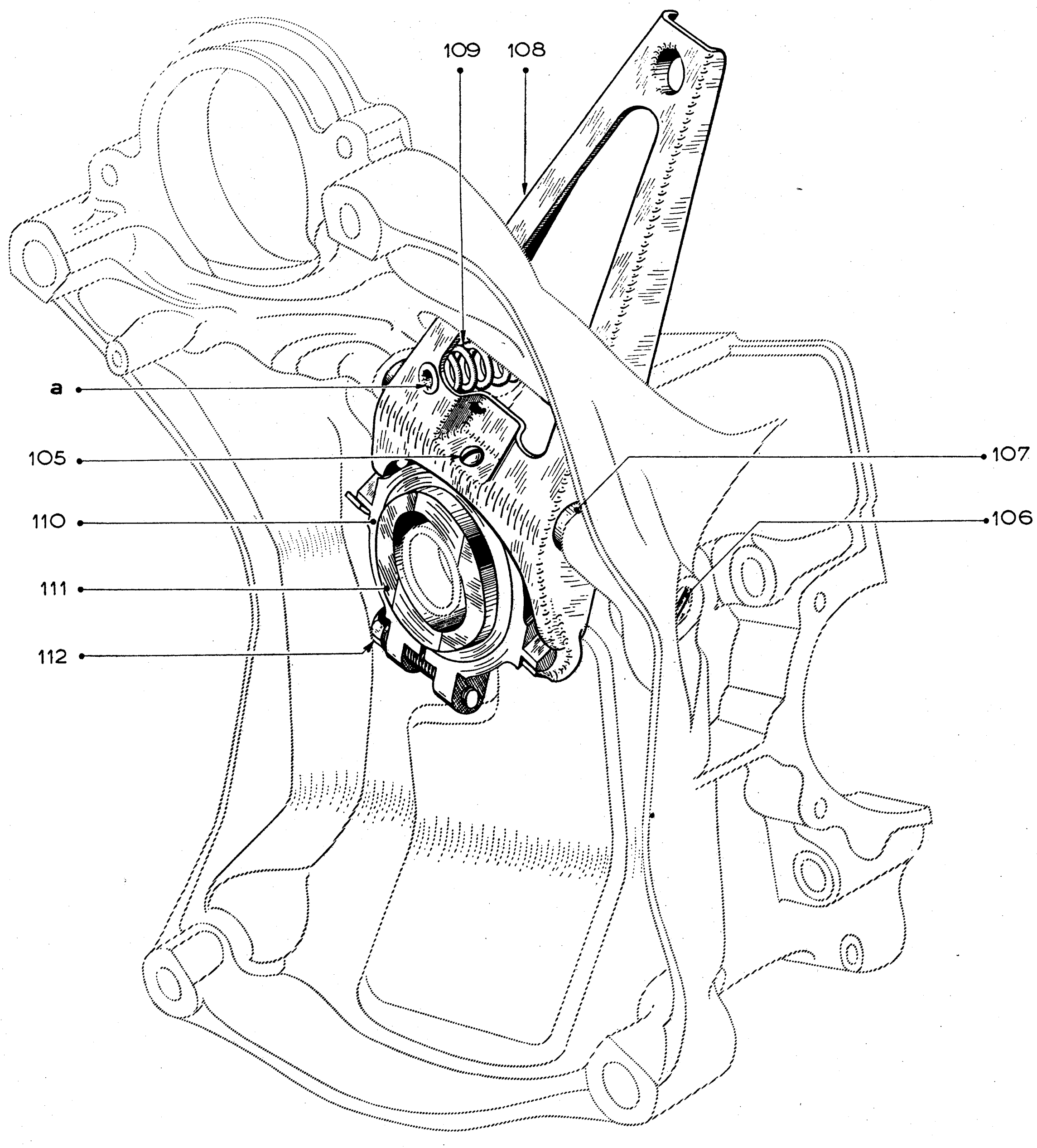
DIFFERENTIAL

GRINDING THE SATELLITE WASHER THRUST FACES



MILLS AND TURNS TO LEFT
sold under No. 1761–VA

CLUTCH HOUSING



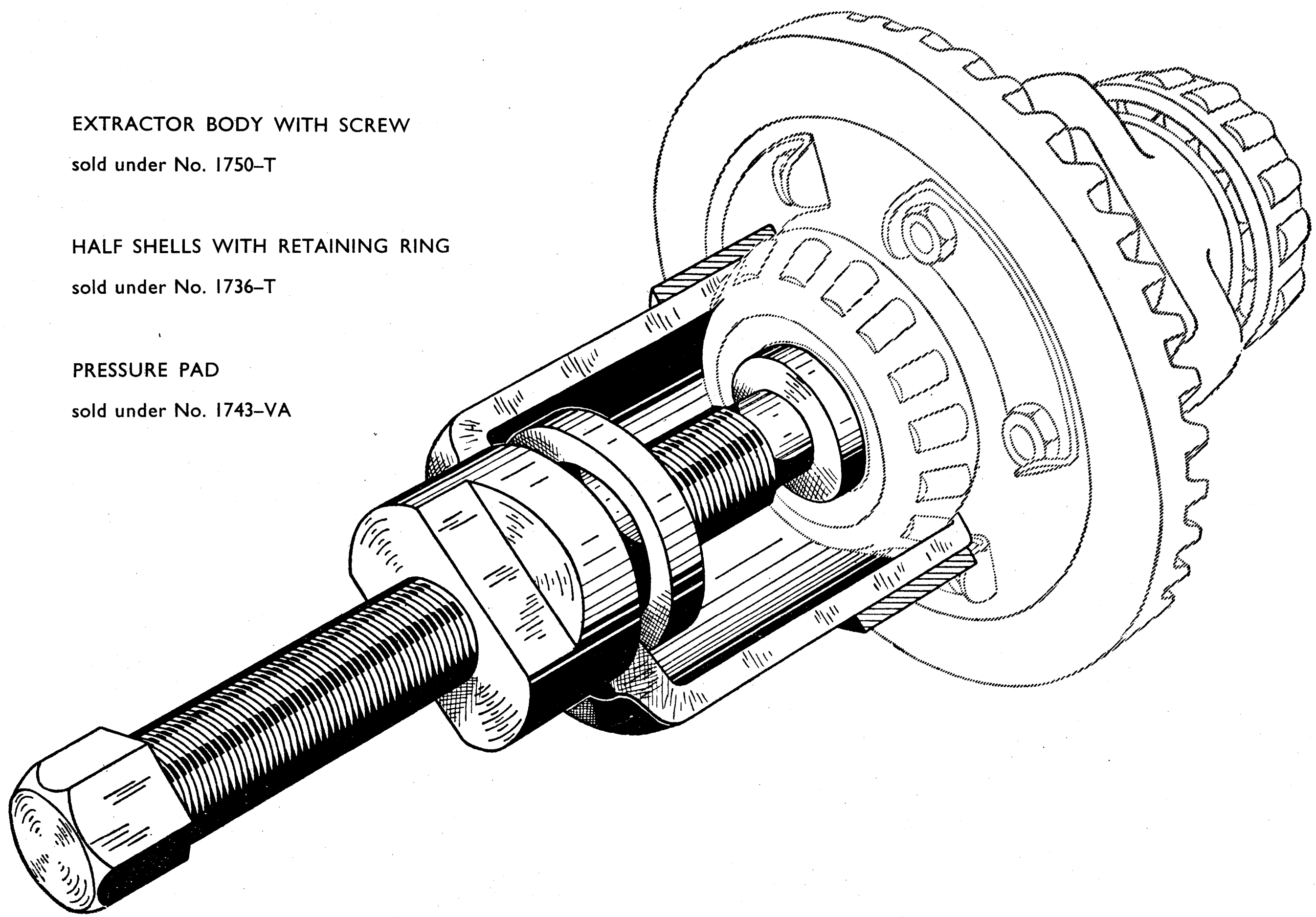
EXTRACTION OF DIFFERENTIAL BEARING

METHOD OF USING THE EXTRACTOR

EXTRACTOR BODY WITH SCREW
sold under No. 1750–T

HALF SHELLS WITH RETAINING RING
sold under No. 1736–T

PRESSURE PAD
sold under No. 1743–VA



TIGHTENING THE RINGNUT ON THE BRAKE BACKPLATE

Fig. I SPANNER FOR RINGNUT ON THE FRONT BRAKE BACKPLATE (aluminium)

sold under No. 1925–VA

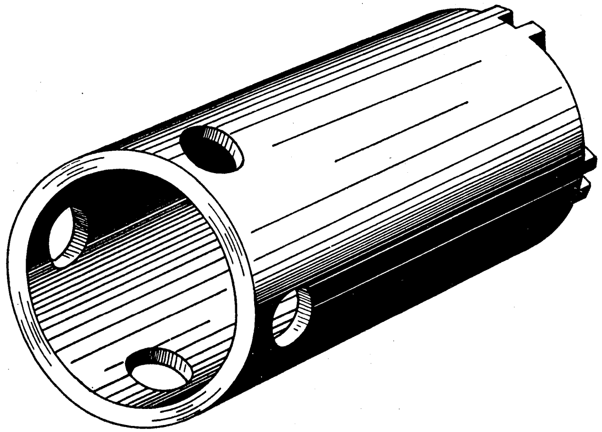
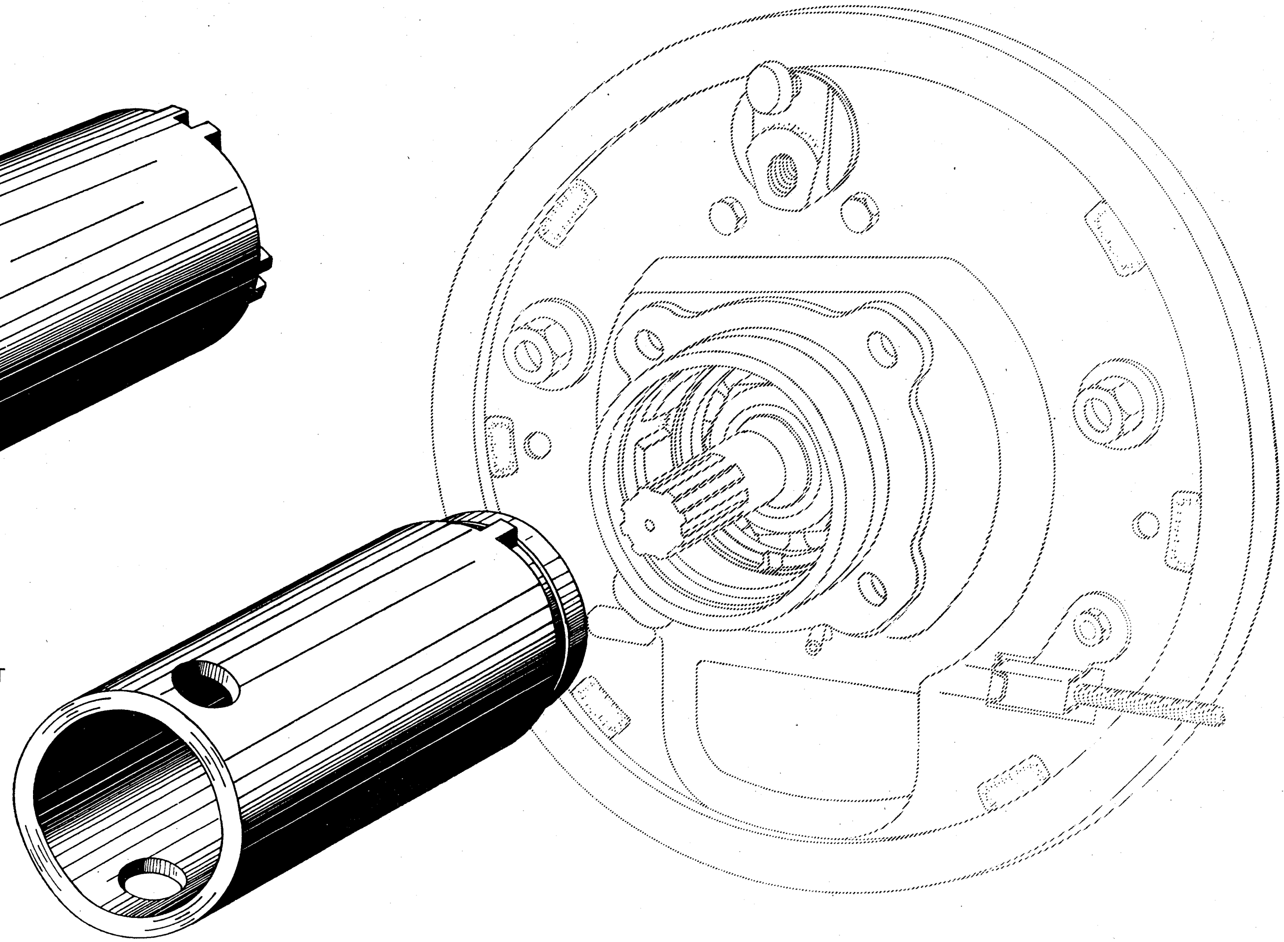


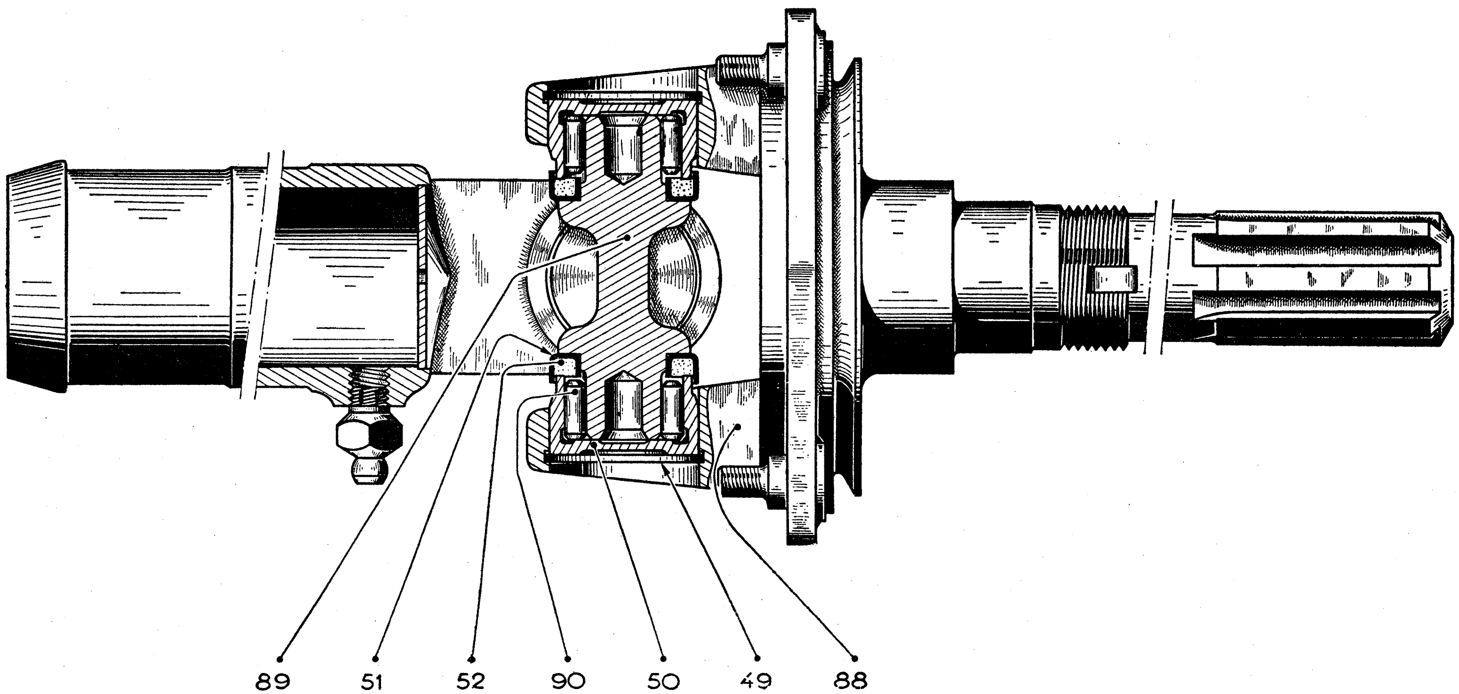
Fig. 2 SPANNER FOR RINGNUT ON THE FRONT BRAKE BACKPLATE (steel)

sold under No. 1926–VA



UNIVERSAL JOINT, GEARBOX END

Fig. I SECTION



ASSEMBLY OF THE BRAKE SHOES

Fig. 1

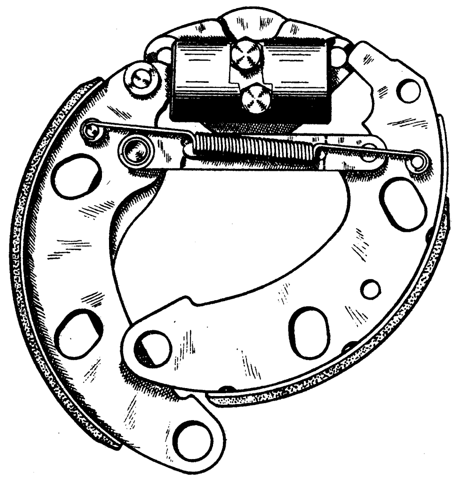
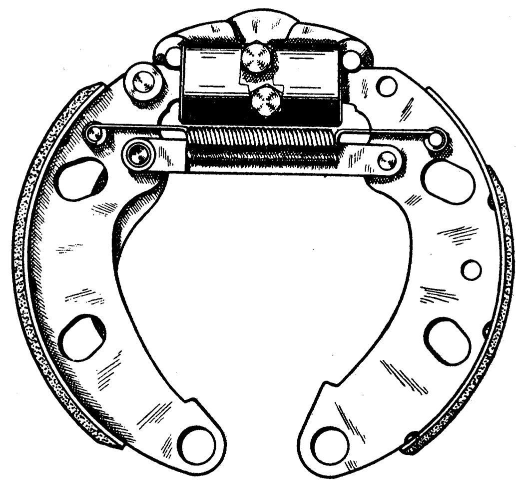


Fig. 2



GEARBOX

GRINDING THE BRAKE DRUMS

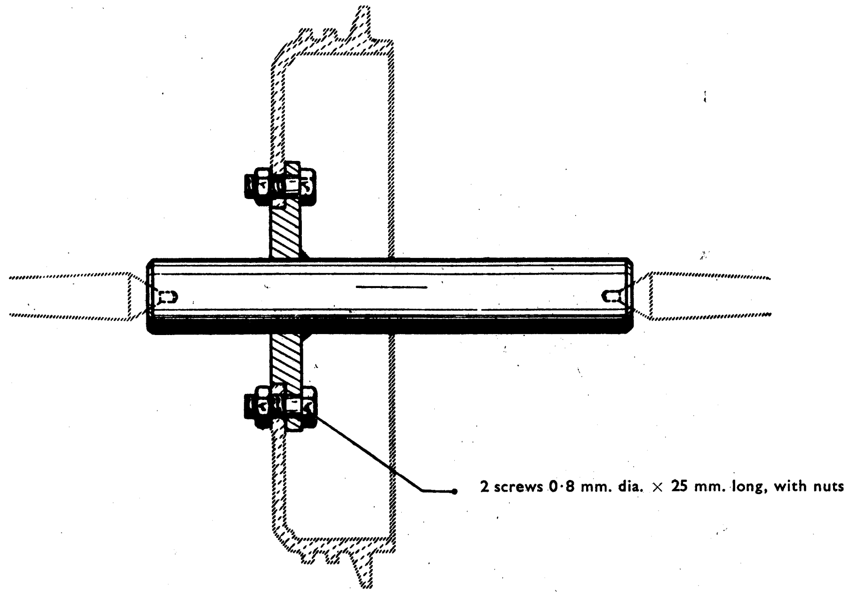
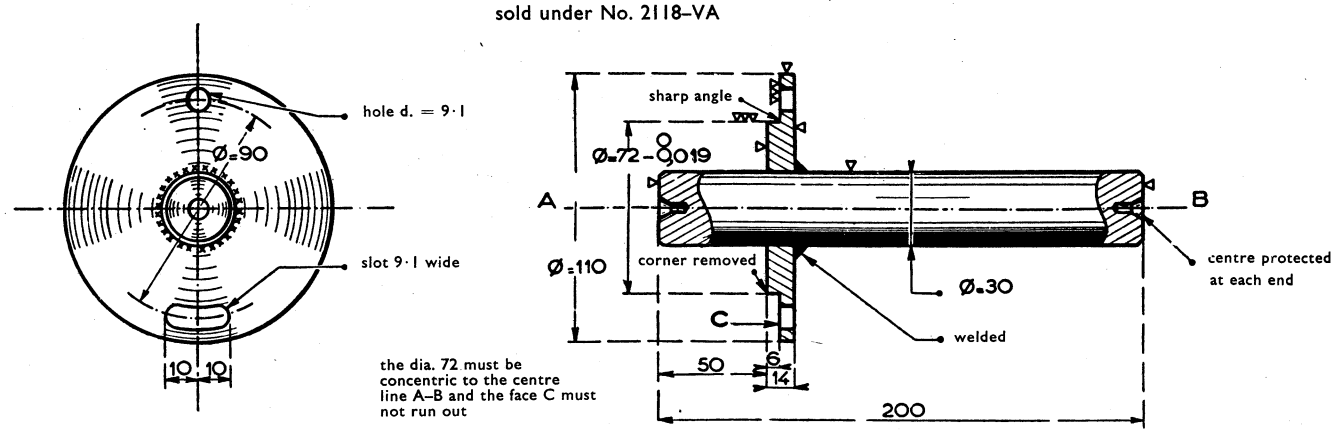


Fig. 1 GRINDING THE BRAKE DRUM

Fig. 2 MANDREL FOR GRINDING THE DRUM

sold under No. 2118–VA



the dia. 72 must be concentric to the centre line A–B and the face C must not run out

GEARBOX

FITTING THE BEARING

Fig. 1 USE OF THE TOOLS

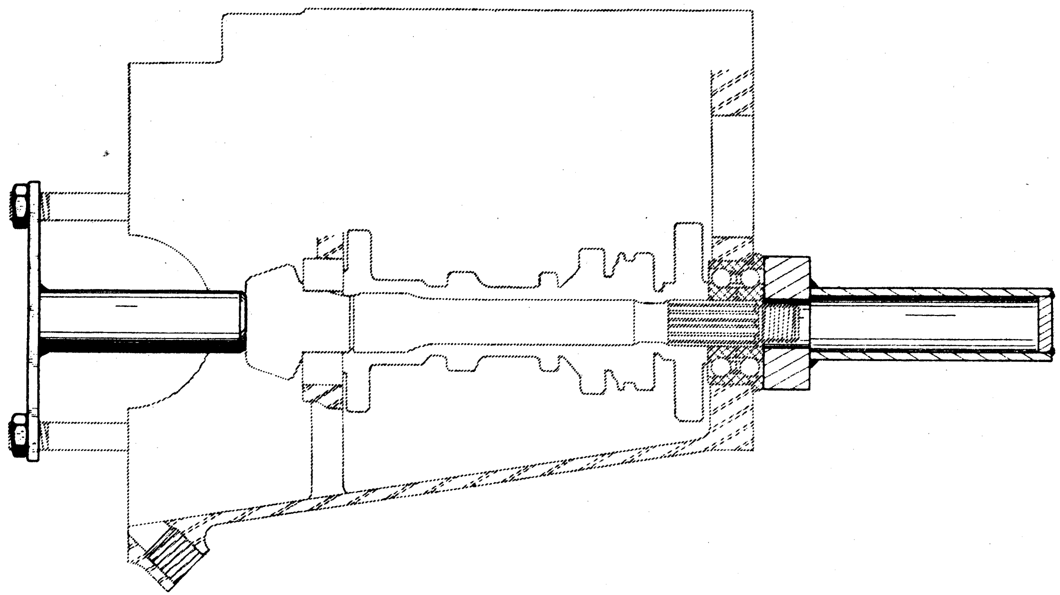


Fig. 2 RETAINING PLATE MR–3677, not sold

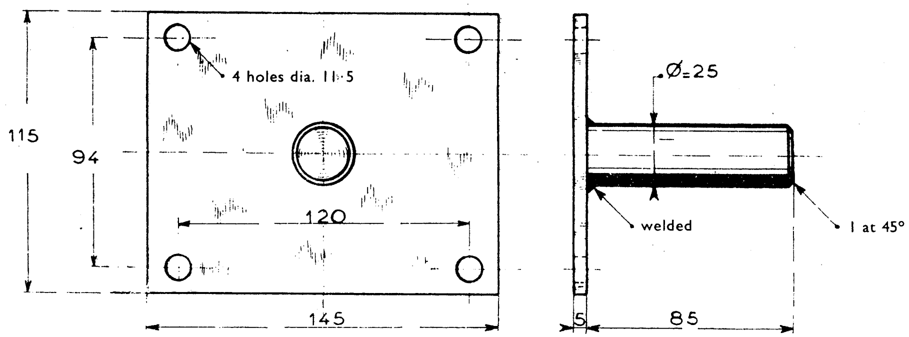
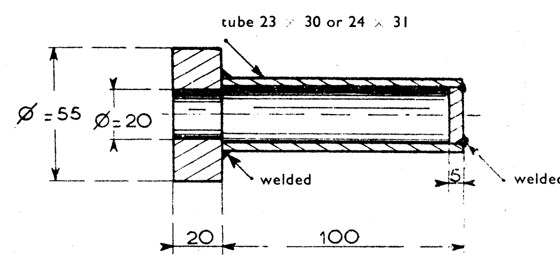


Fig. 3 PUNCH MR–3676
not sold



HOLDING THE INTERMEDIATE SHAFT

Fig. 1 USING THE EQUIPMENT

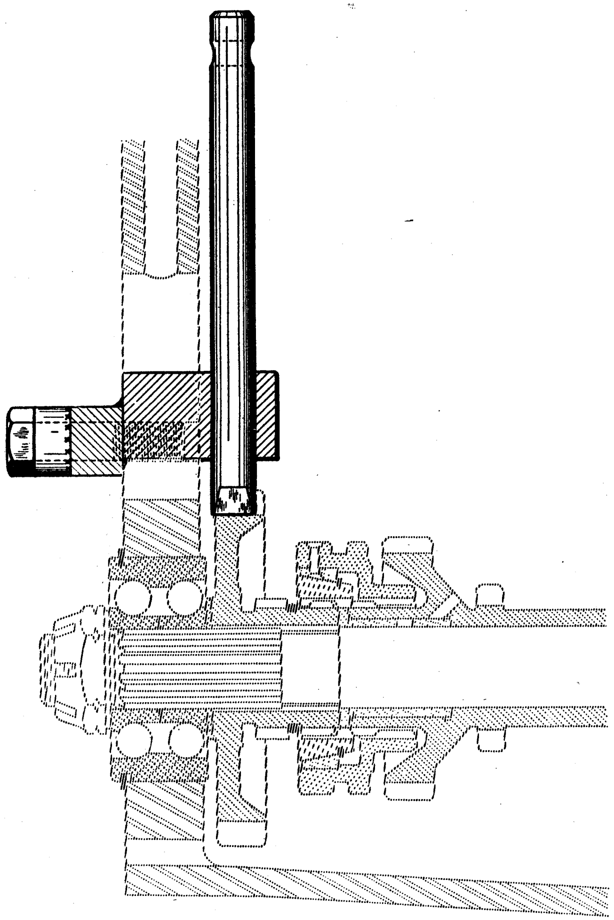
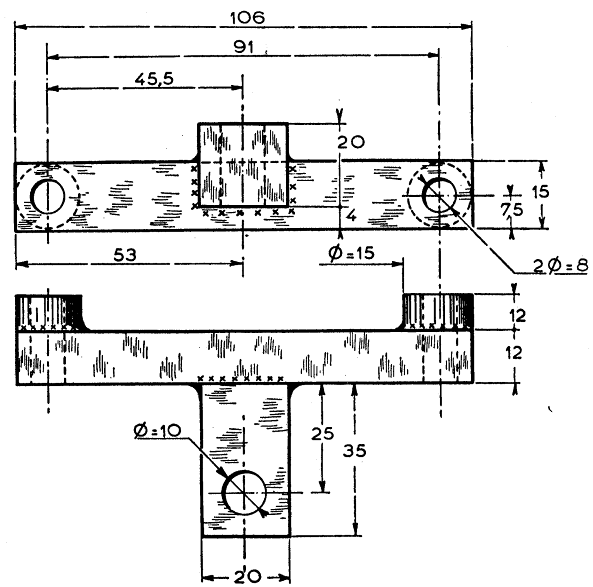
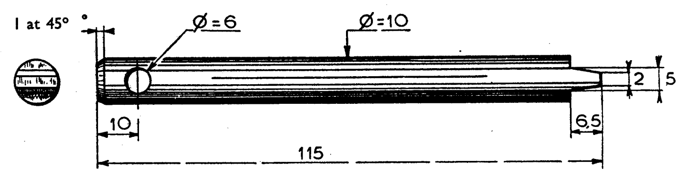


Fig. 2 TOOL MR-3139-10

not sold

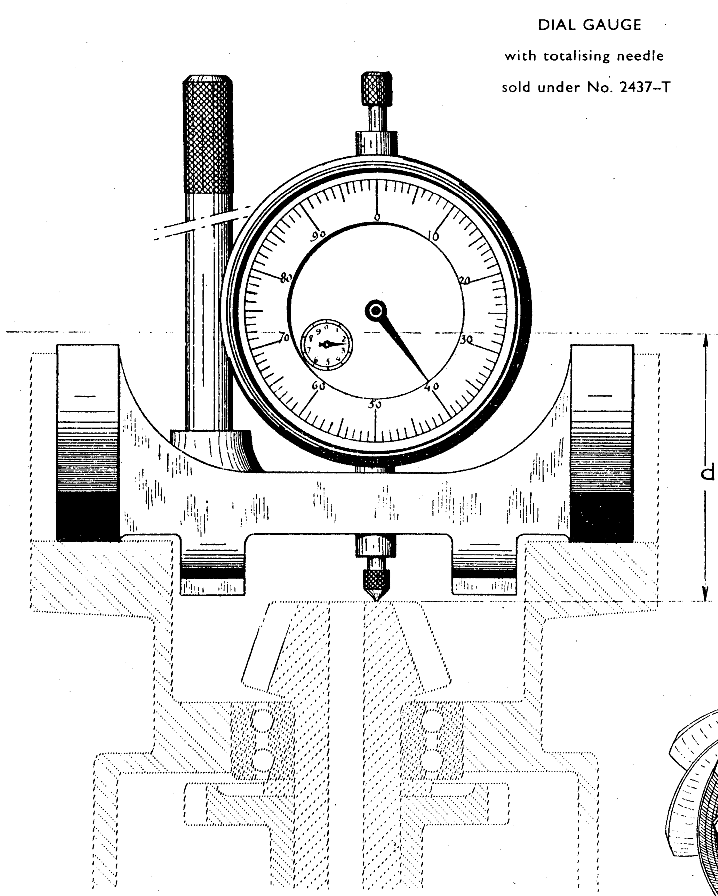


LOCKING ROD



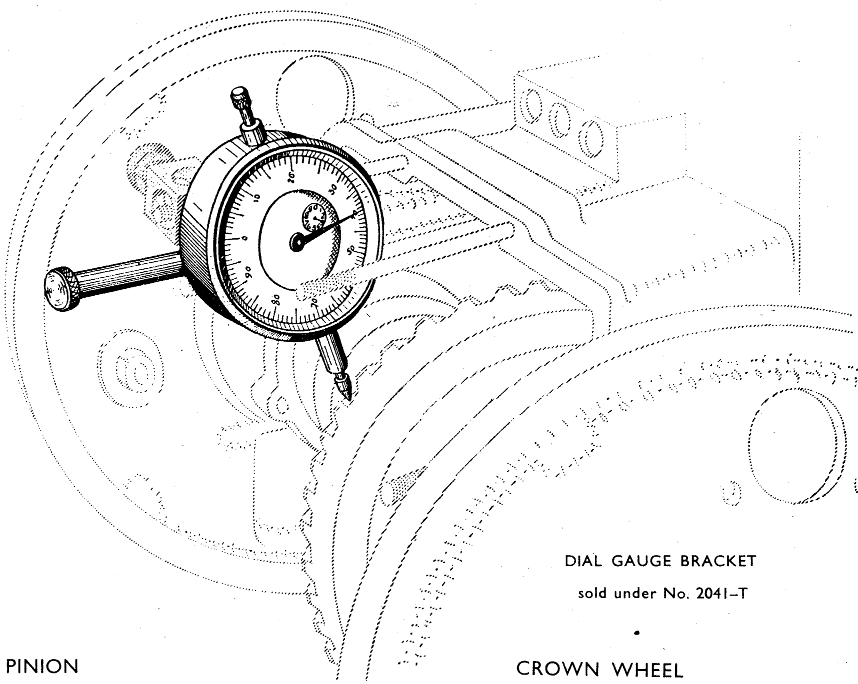
ADJUSTMENT OF THE CROWN WHEEL AND BEVEL PINION

Fig. 1 ADJUSTING THE CONICAL DISTANCE



EQUIPMENT FOR ADJUSTMENT
sold under No. 2045–VA

Fig. 2 ADJUSTMENT OF THE TOOTH CLEARANCE



DIAL GAUGE BRACKET
sold under No. 2041–T

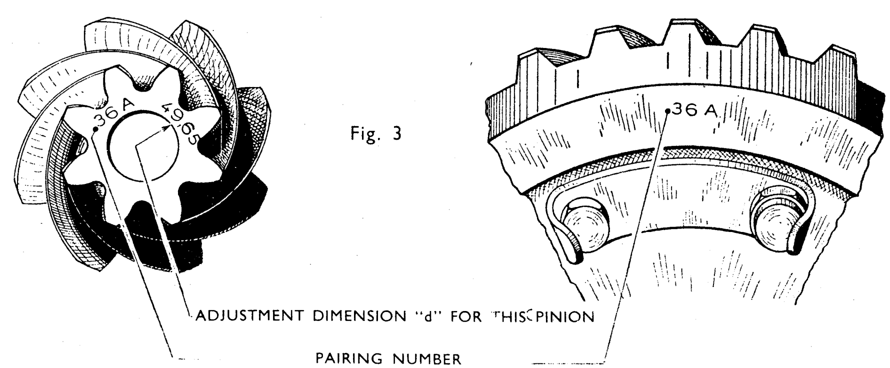


Fig. 3

ADJUSTMENT OF THE SELECTOR FORKS

Fig. 1 POSITION OF THE ADJUSTING SHIMS

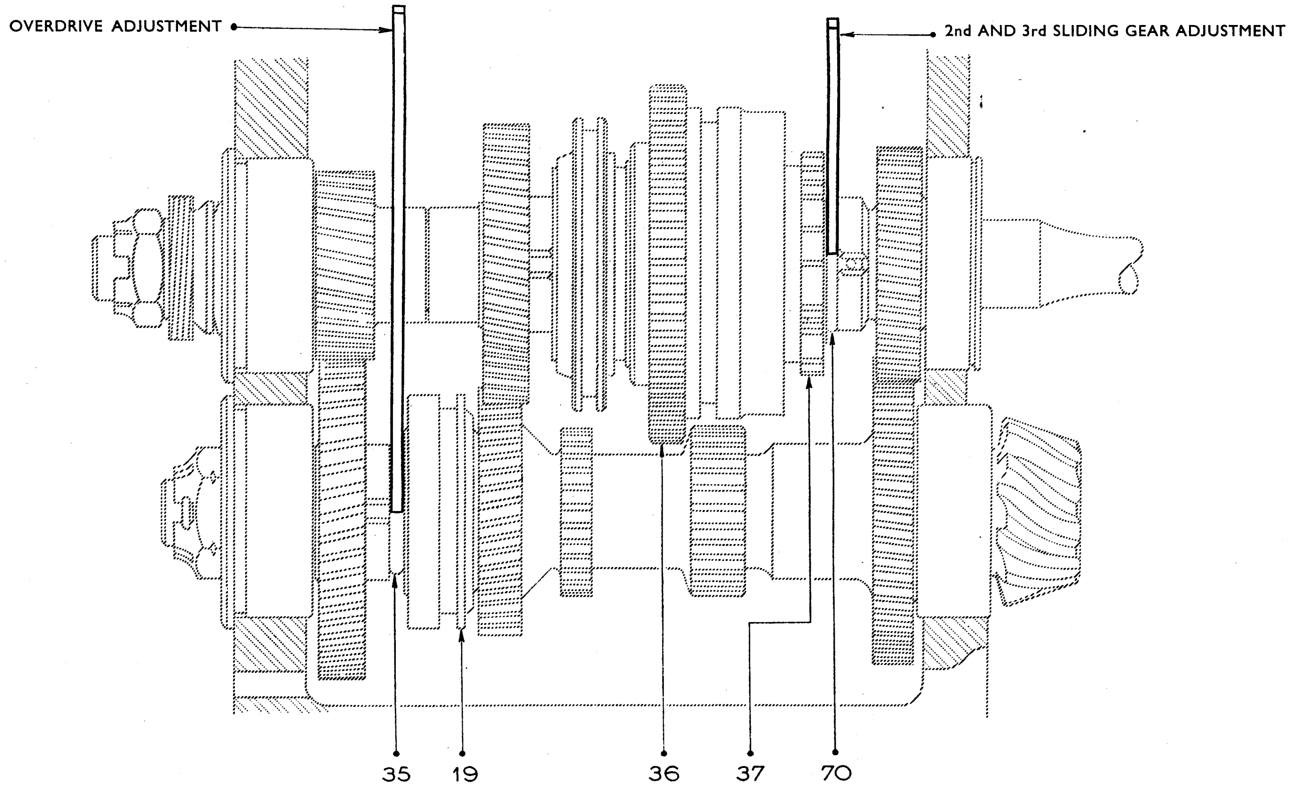


Fig. 2 ADJUSTING SHIM FOR OVERDRIVE

sold under No. 1787–VA

1 mm. THICK

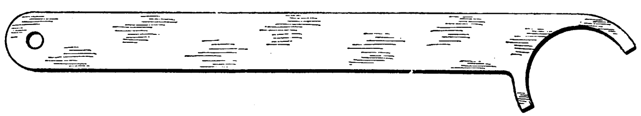
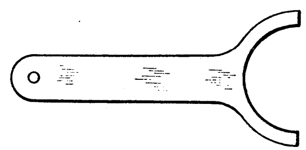


Fig. 3 ADJUSTING SHIM FOR 2nd AND 3rd SPEEDS

sold under No. 1786–VA

1·8 mm. THICK



ADJUSTMENT OF THE DIFFERENTIAL BEARINGS

Fig. 1 MEASURE THE DEPTH OF THE HOUSING

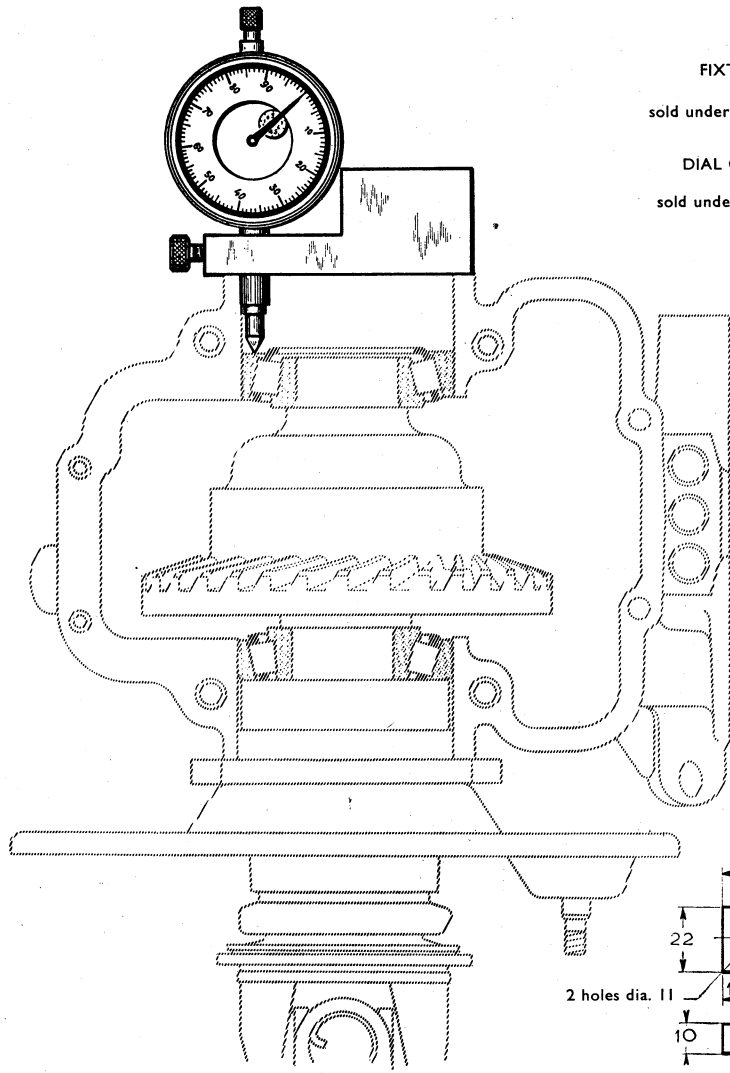


Fig. 2 MEASURE THE HEIGHT OF THE SHOULDER OF THE HUB

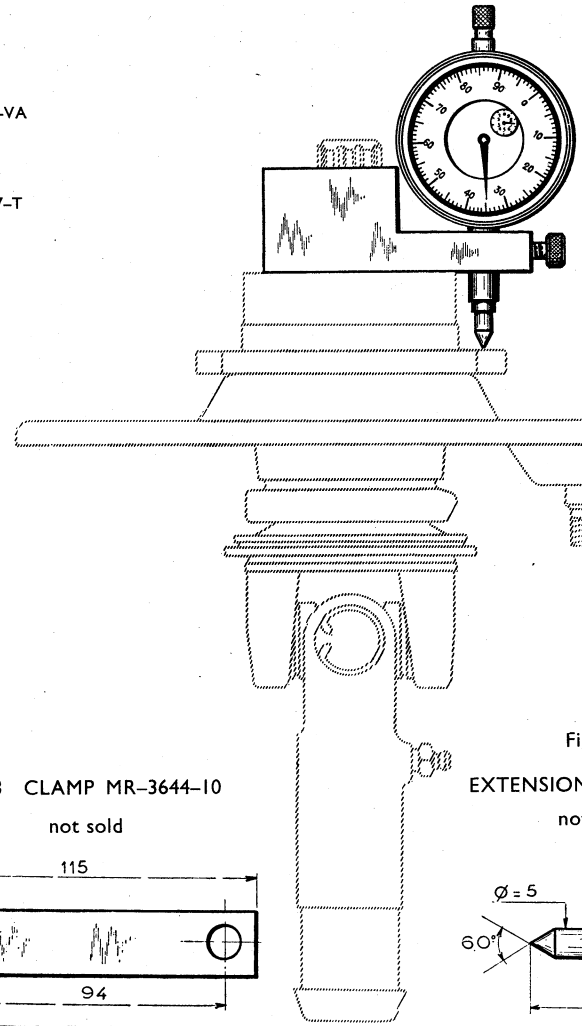


Fig. 3 CLAMP MR–3644–10

not sold

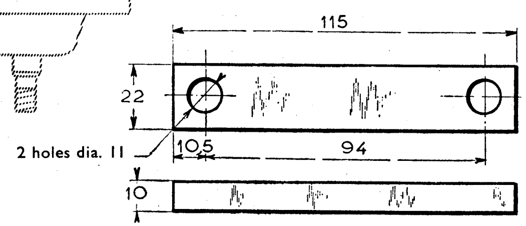
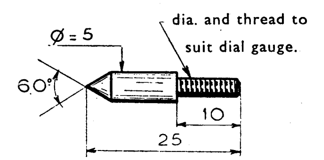


Fig. 4

EXTENSION MR–3365–10

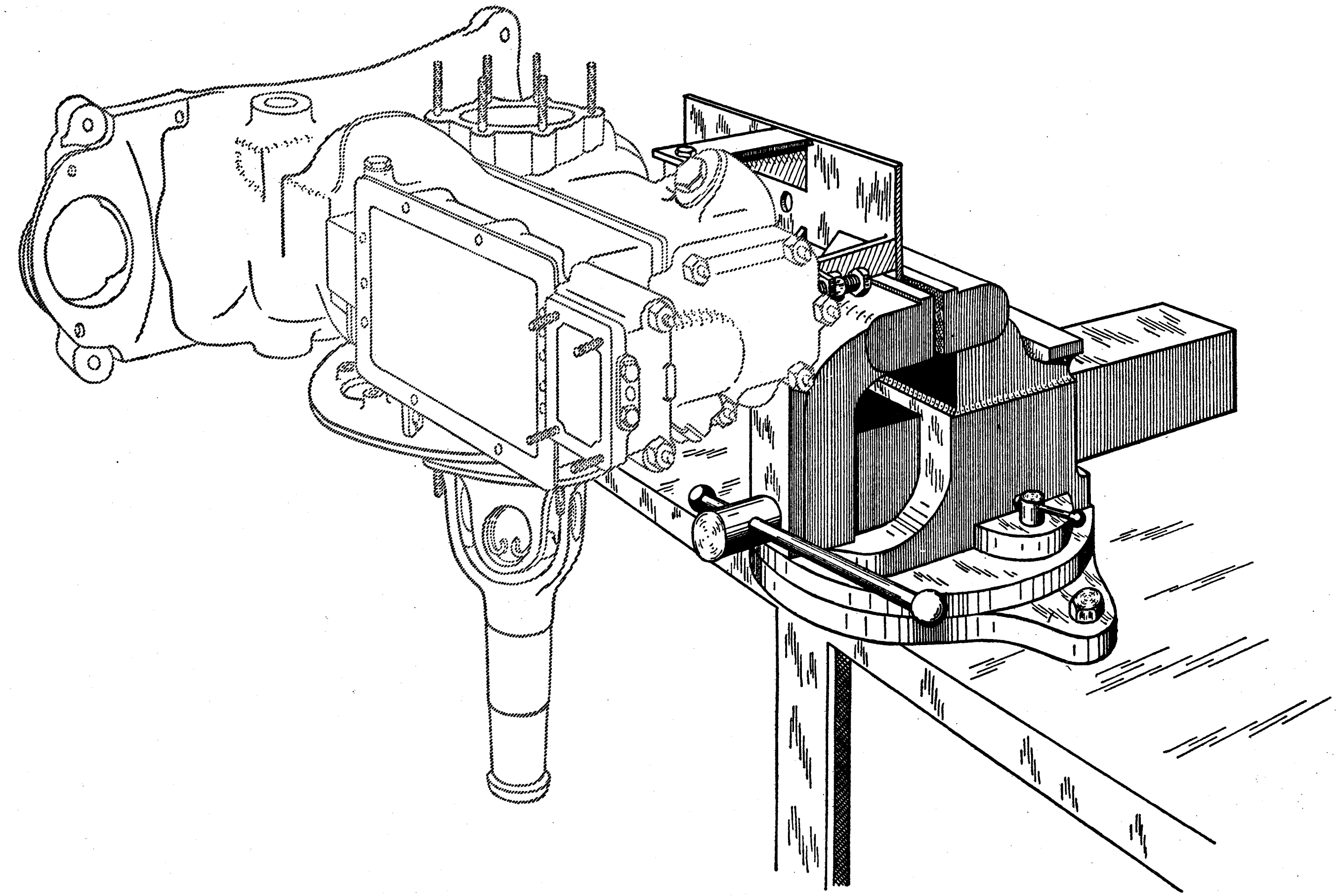
not sold



GEARBOX

ADJUSTMENT OF THE DIFFERENTIAL BEARINGS

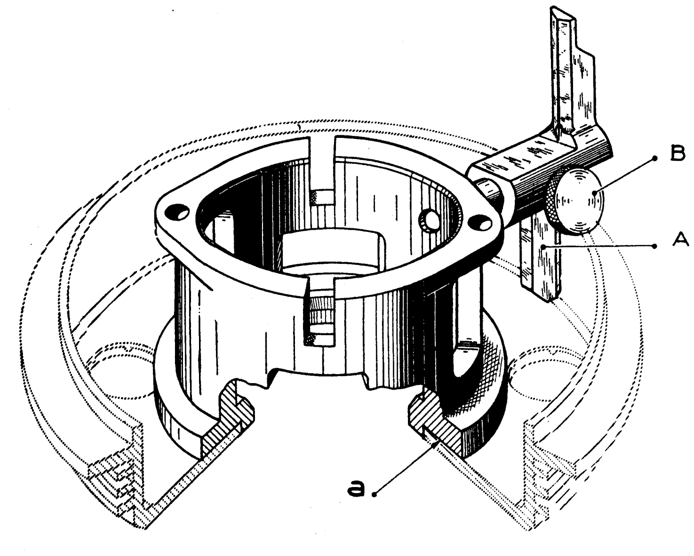
POSITION OF THE BOX FOR THE
ADJUSTMENT



GEARBOX

CENTRING THE BRAKE LININGS

Fig. 1 CHECKING THE DRUM DIAMETER

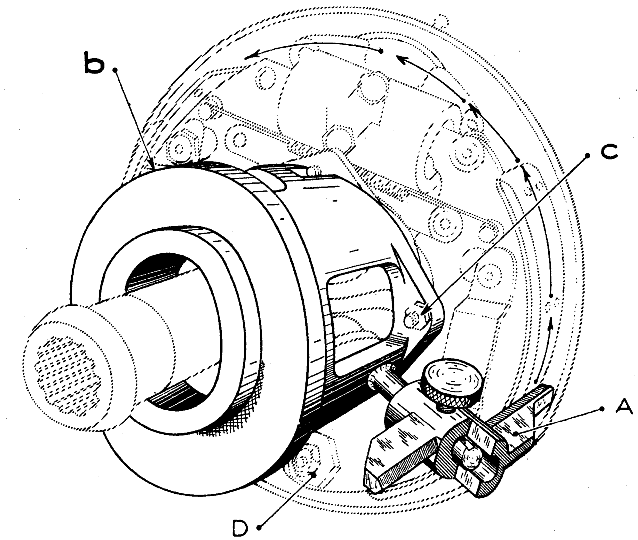


PUT THE FIXTURE IN POSITION IN THE DRUM. BRING THE INDEX A INTO CONTACT WITH THE DRUM AND ROTATE IT THROUGH ONE COMPLETE REVOLUTION. LOCK THE INDEX IN THIS POSITION BY MEANS OF THE KNURLED SCREW B.

NOTE: LIGHTLY OIL AT "a" TO FACILITATE ROTATION OF THE FIXTURE.

Fig. 2 INSPECTION OF CENTRING

FIXTURE sold under No. 2112–VA



REMOVE THE GREASER FROM THE SLIDING COUPLING. OFFER UP THE FIXTURE AGAINST THE DRIVING PLATE AND SECURE IT BY THE 2 SCREWS "b" AND "c".

OFFER UP THE INDEX "A", LOCKED IN THE PREVIOUS OPERATION, ON THE LININGS. THE INDEX SHOULD BE LEVEL WITH THE LININGS THROUGHOUT THEIR CIRCUMFERENCE. (IF NECESSARY MOVE THE LININGS IN THE REQUIRED DIRECTION BY ADJUSTING THE ECCENTRIC D AND THE ADJUSTING CAM NOT SHOWN IN THE DRAWING). REMOVE ANY HIGH SPOTS WITH A RASP.

REMOVE THE FIXTURE AND REPLACE THE GREASER.

AFTER CHECKING, LOOSEN THE CAMS SO THAT THE DRUM CAN BE FITTED.

POSITION OF THE GEARS FOR EACH SPEED

Fig. 1 FIRST SPEED

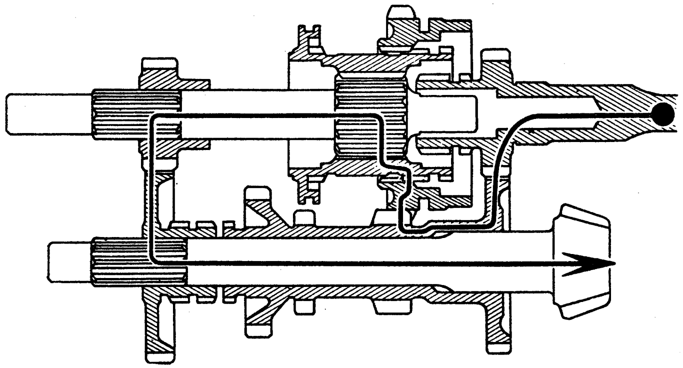
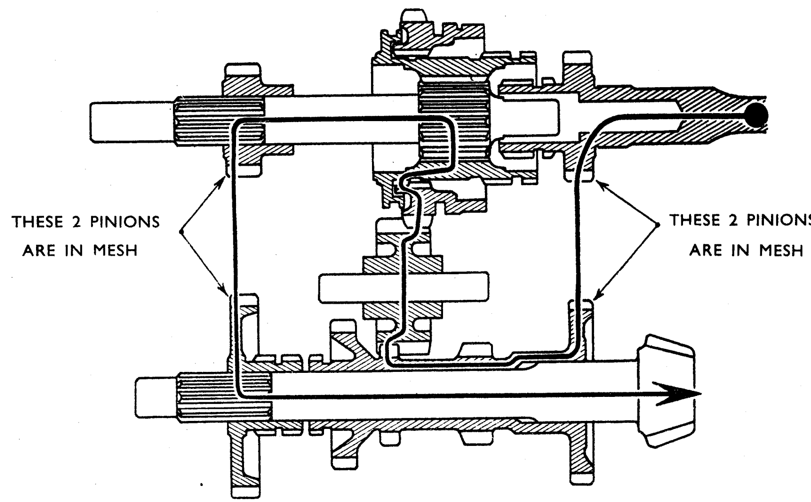


Fig. 2 REVERSE



GEARBOX

POSITION OF THE GEARS FOR EACH SPEED

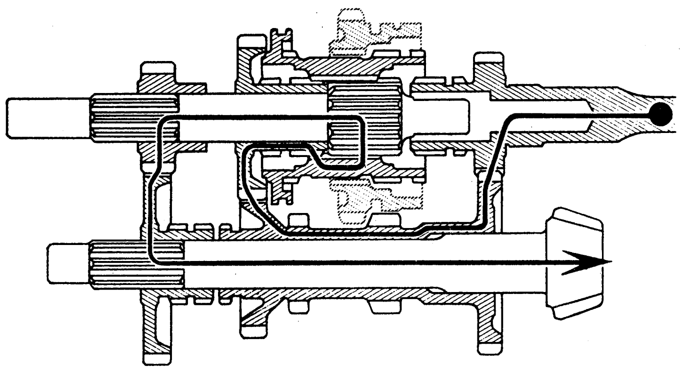


Fig. I SECOND SPEED

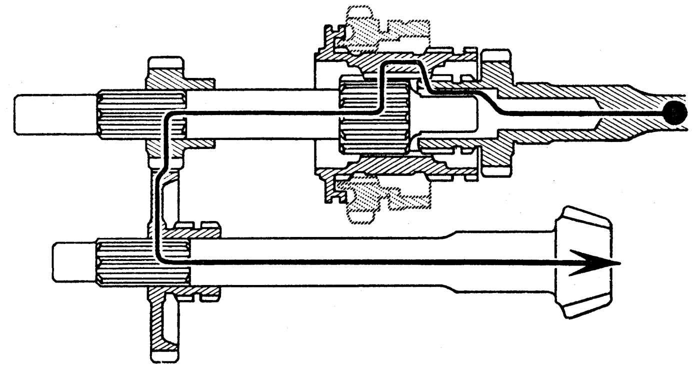


Fig. 2 THIRD SPEED

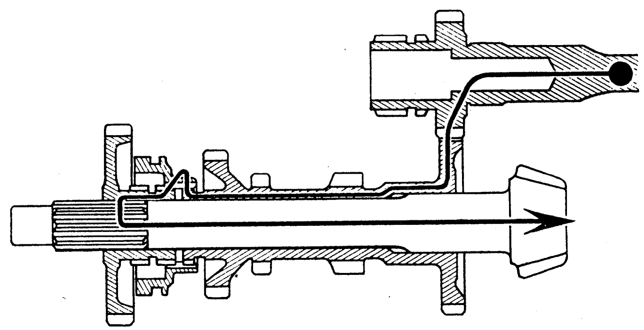
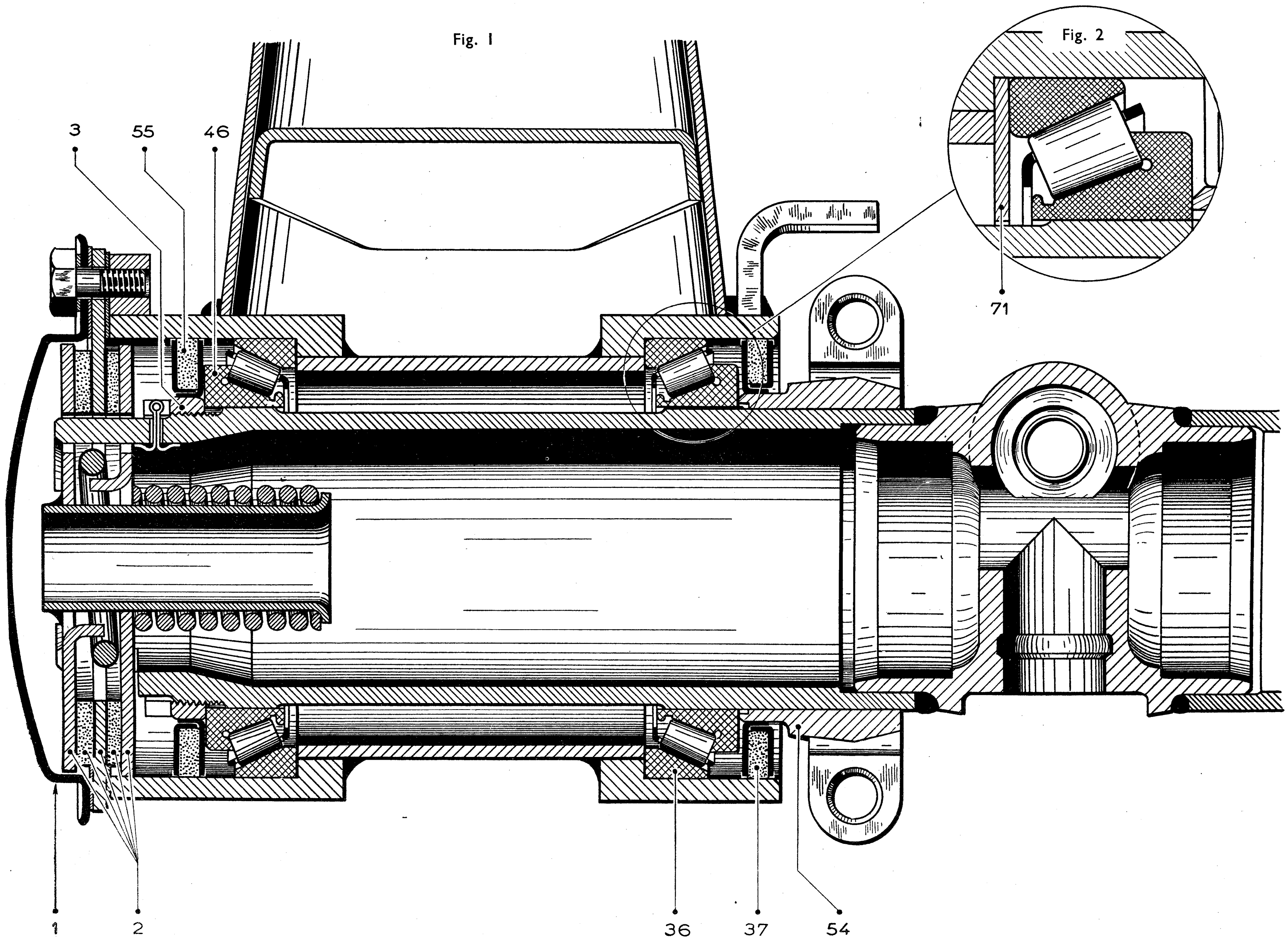


Fig. 3 OVERDRIVE

FRONT AND REAR AXLES

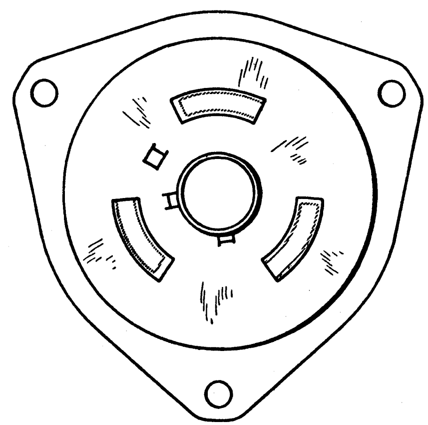
SECTION OF HUB OF ARM



FRONT AND REAR AXLES

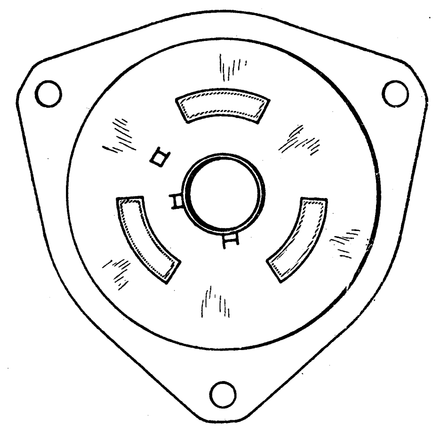
ASSEMBLY OF THE FRICTION DISCS

Fig. 1



FIT THE INNER DISC OF THE FRICTION DISC ON THE THREE TENONS ON THE AXLE CROSS MEMBER.

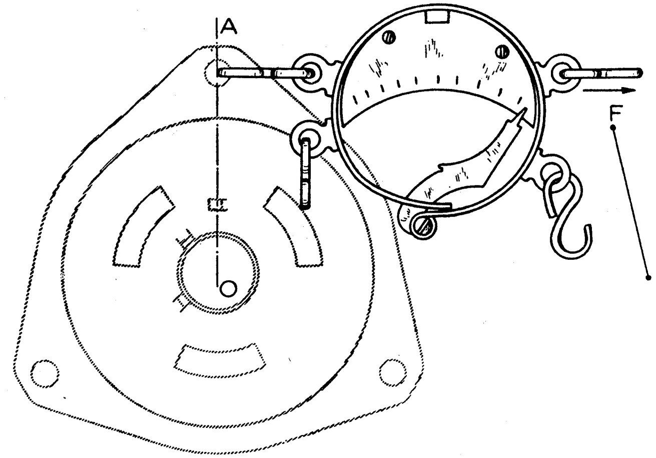
Fig. 2



TURN THE OUTER DISC WITH THE SPANNER 1834–VA UNTIL THE THREE SLOTS ARE OPPOSITE THE TENONS ON THE AXLE CROSS MEMBER. PUSH THE ASSEMBLY AS FAR AS POSSIBLE ON TO THE TENONS.

Fig. 3 SPRING BALANCE

sold under No. 2472–T

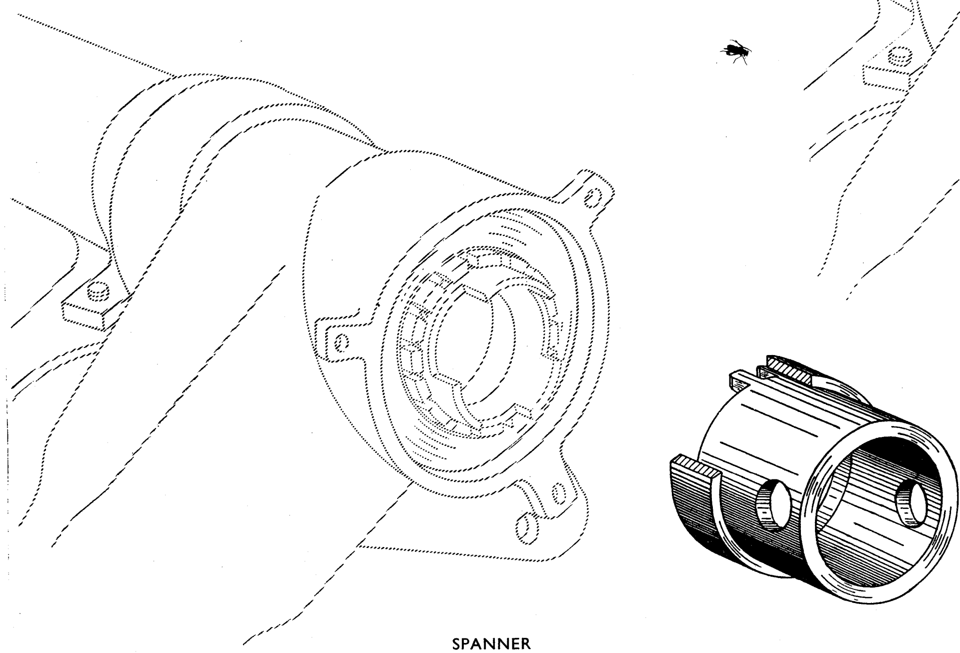


THE PULL F SHOULD BE AT RIGHT ANGLES TO THE RADIUS OA.

FRONT AND REAR AXLES

ASSEMBLY OF ARMS AND FRICTION DISCS

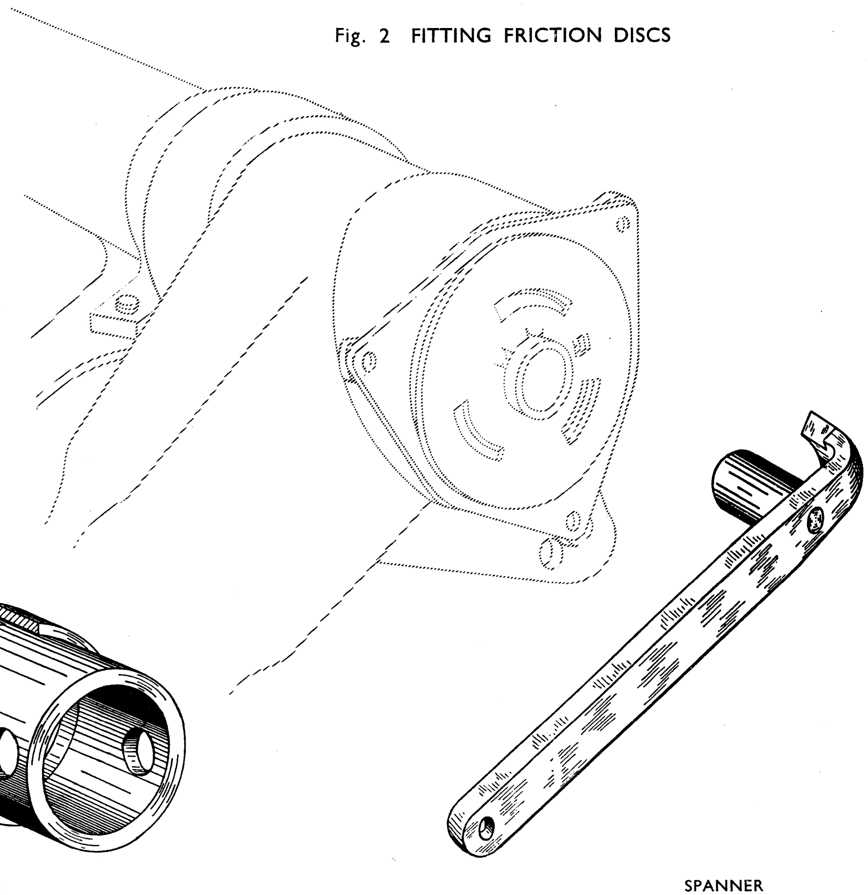
Fig. 1 DISMANTLING – ASSEMBLING AND ADJUSTING OF ARMS



SPANNER

sold under No. 1833–VA

Fig. 2 FITTING FRICTION DISCS

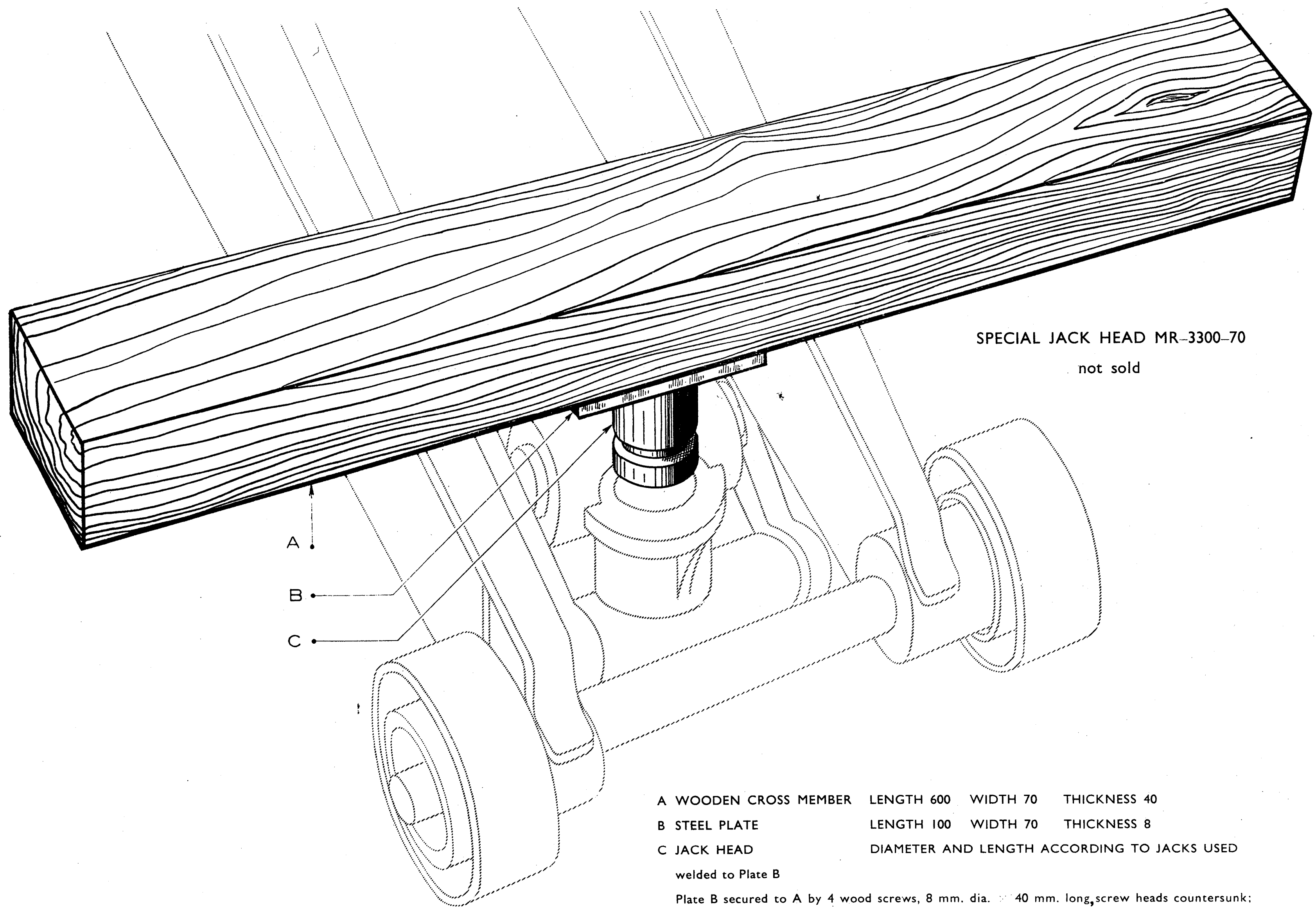


SPANNER

sold under No. 1834–VA

FRONT AND REAR AXLES

LIFTING THE VEHICLE



SPECIAL JACK HEAD MR-3300-70
not sold

A	WOODEN CROSS MEMBER	LENGTH 600	WIDTH 70	THICKNESS 40
B	STEEL PLATE	LENGTH 100	WIDTH 70	THICKNESS 8
C	JACK HEAD	DIAMETER AND LENGTH ACCORDING TO JACKS USED		

welded to Plate B

Plate B secured to A by 4 wood screws, 8 mm. dia. 40 mm. long, screw heads countersunk; spacing of screw heads: length 70, width 40.

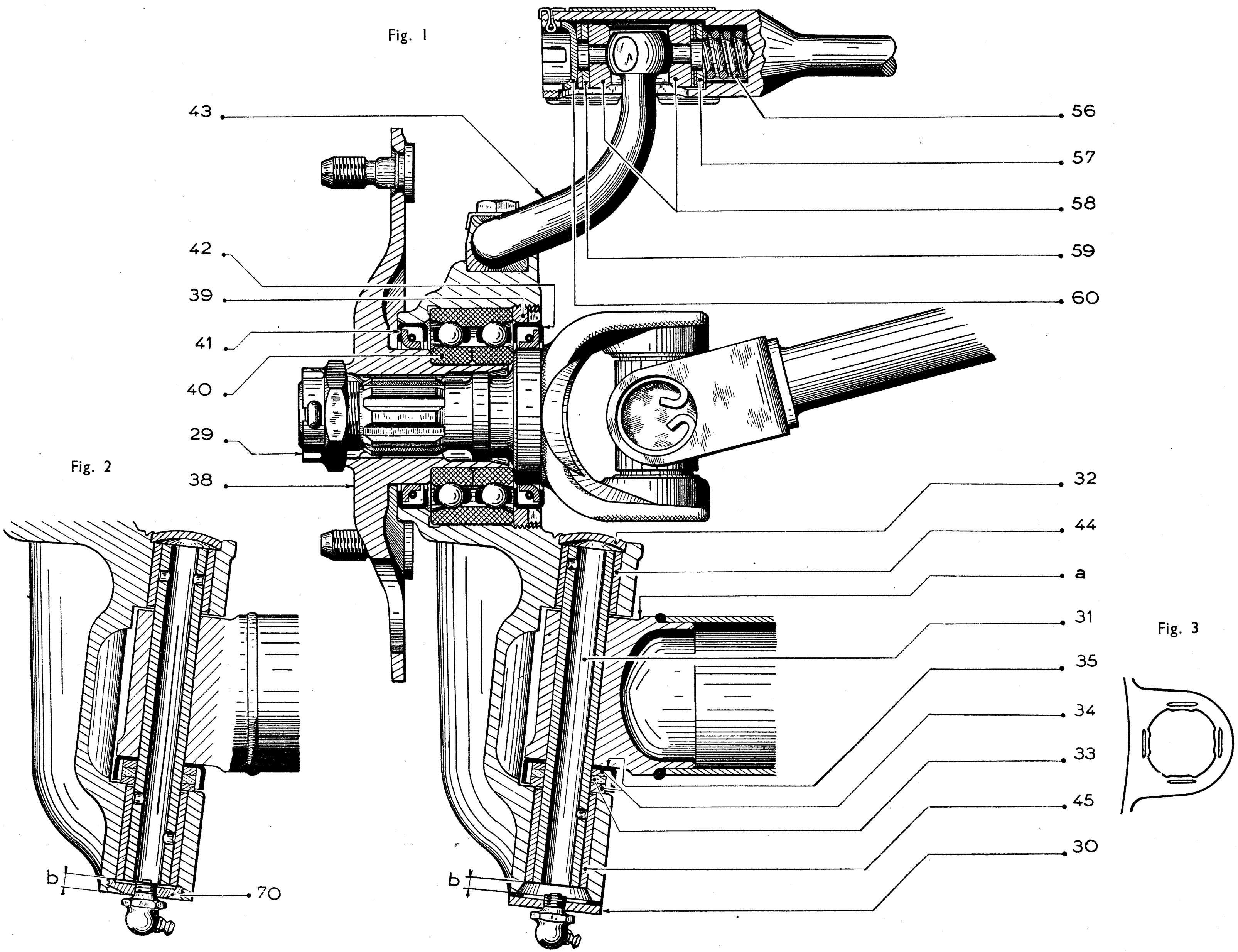
FRONT AXLE—STEERING

SECTION OF HUB AND SWIVEL

Fig. 1

Fig. 2

Fig. 3



VARIOUS TOOLS

Fig. 1 ASSEMBLY OF BALLRACE

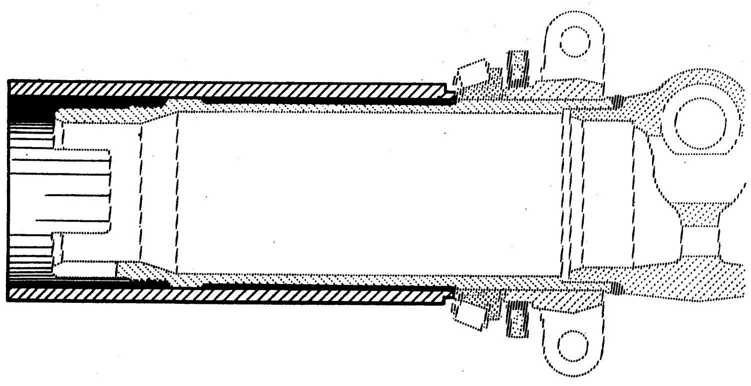


Fig. 2 ADJUSTMENT OF BALL UNIT

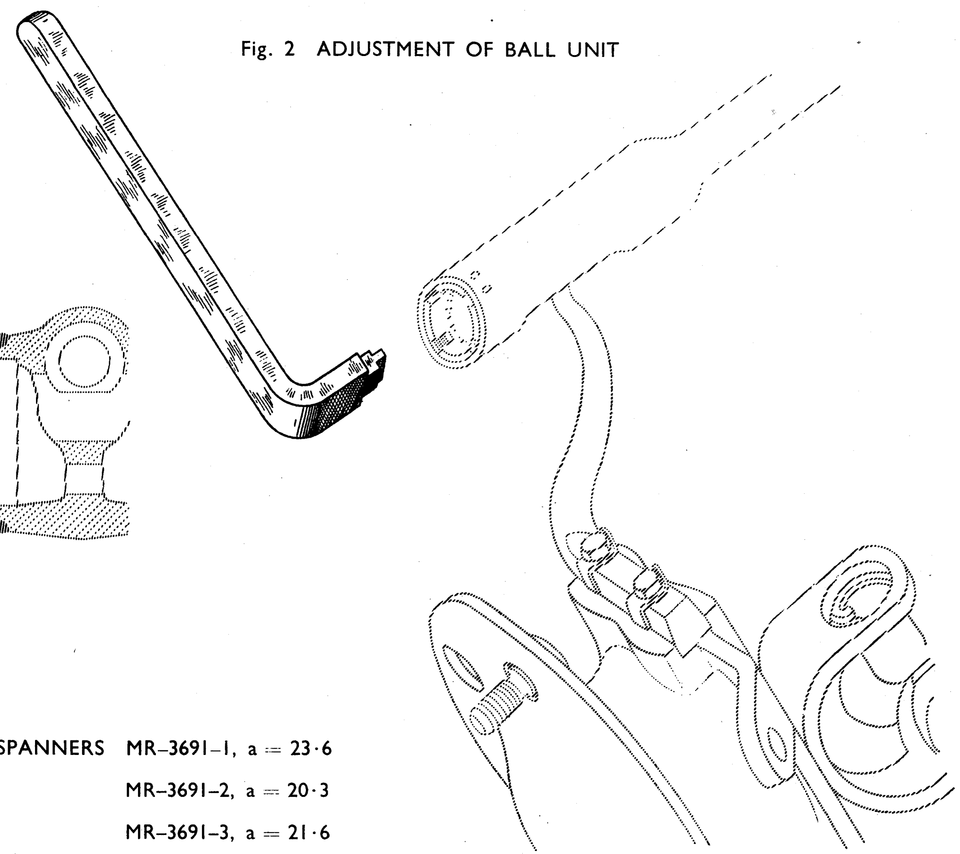
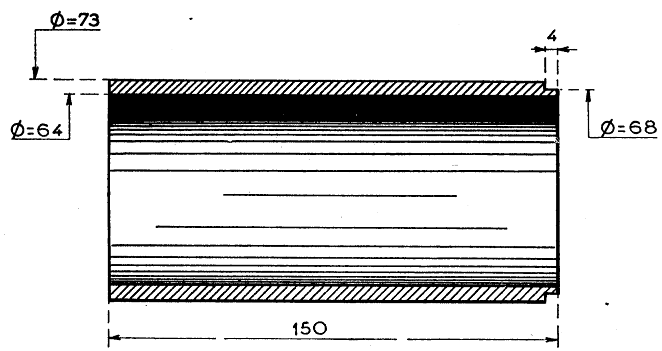


Fig. 3 TUBE MR–3616–20

not sold.



SPANNERS MR–3691–1, a = 23·6

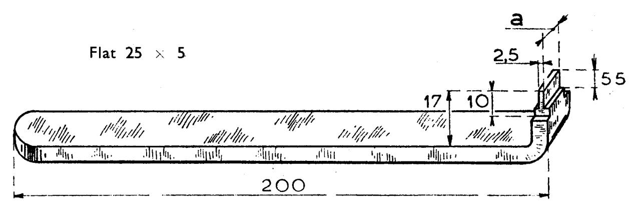
MR–3691–2, a = 20·3

MR–3691–3, a = 21·6

not sold.

THESE THREE SPANNERS ARE ALL USED IN THE SAME WAY.

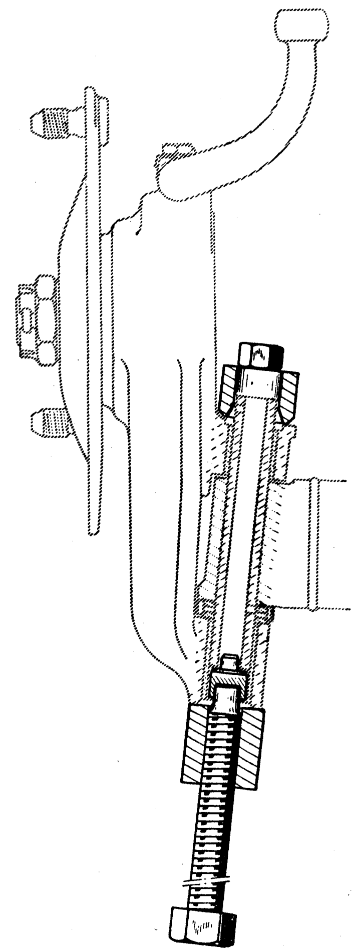
Flat 25 × 5

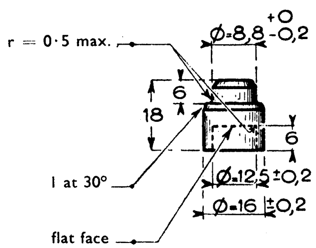


FRONT AXLE—STEERING

REMOVING AND FITTING THE KING PIN

Fig. 1 METHOD OF USING THE EQUIPMENT

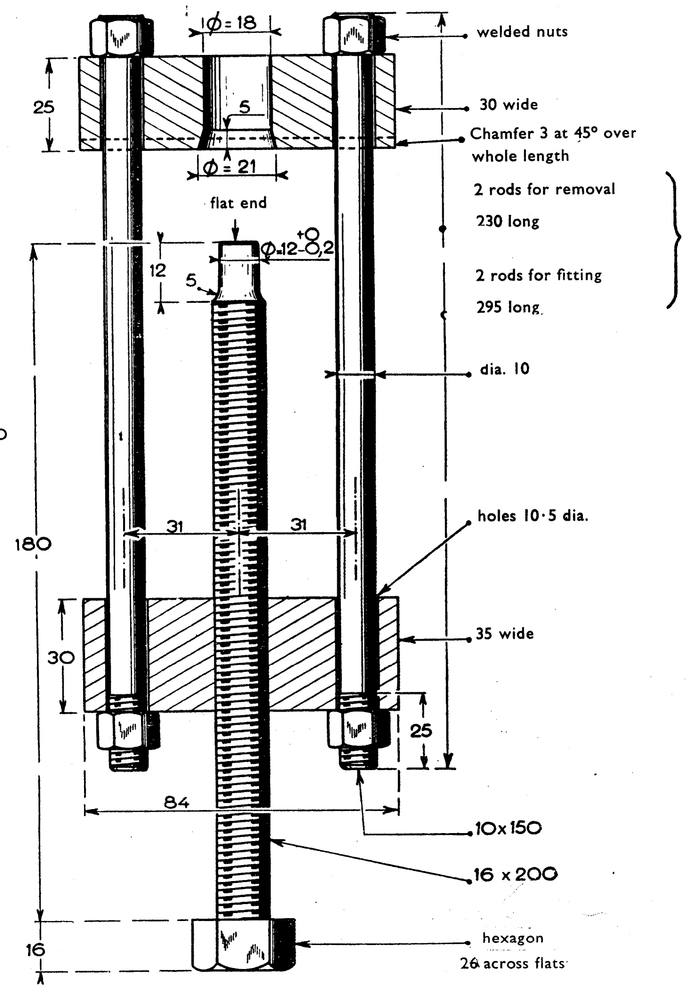




SCREW AND PAD HEAT TREATED TO GIVE TENSILE STRENGTH OF 100 kg./mm2.

Fig. 2 EQUIPMENT FOR THE KING PIN MR–3742

not sold.



FRONT AXLE

CHECKING AN ARM

Fig. 2 POSITION OF STOP

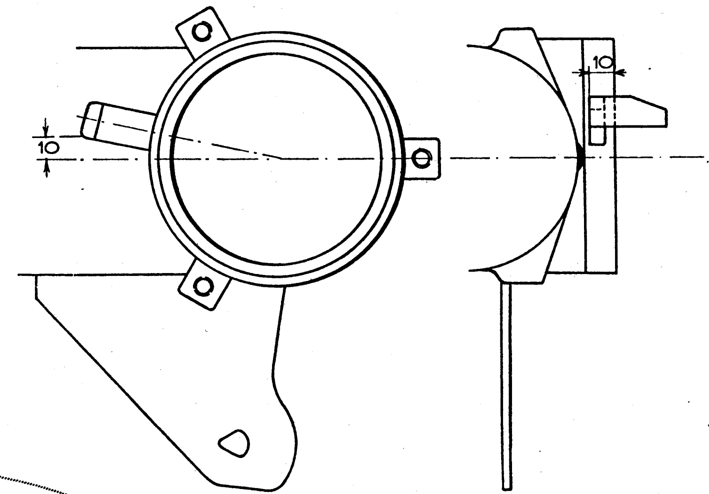
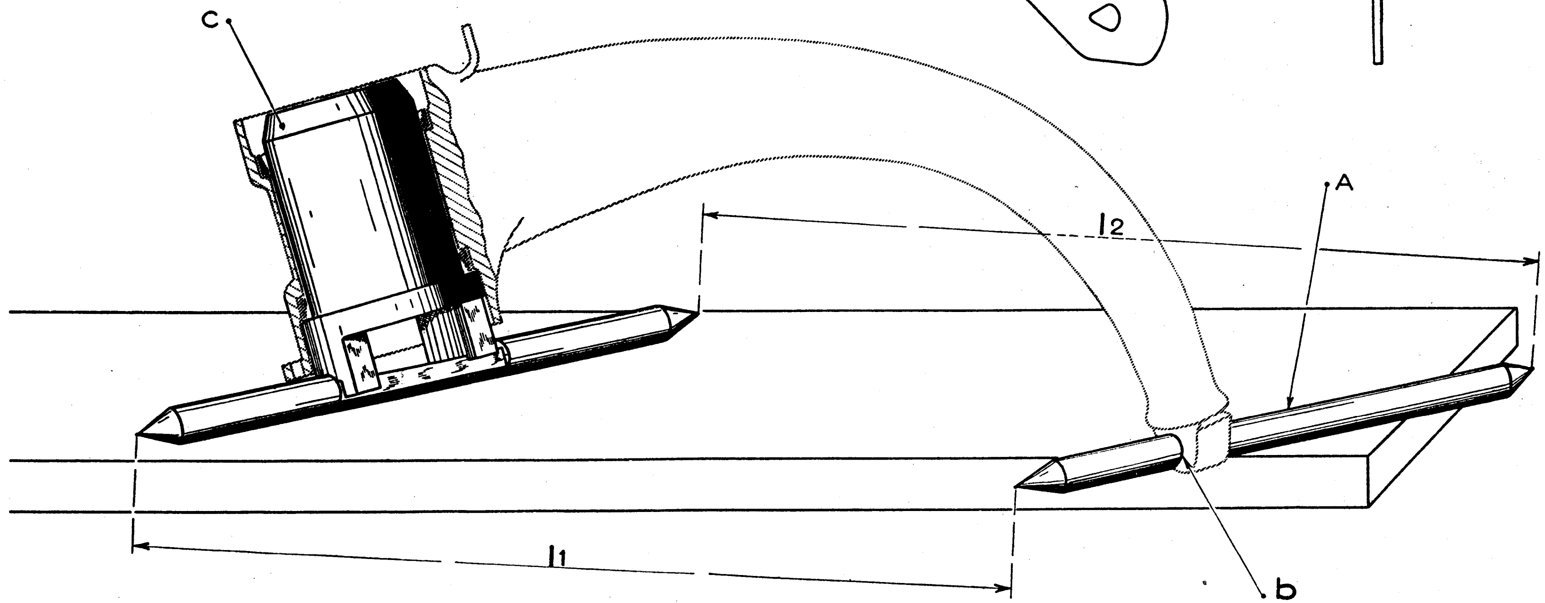


Fig. I USE OF THE ASSEMBLY

ASSEMBLY MR-3745

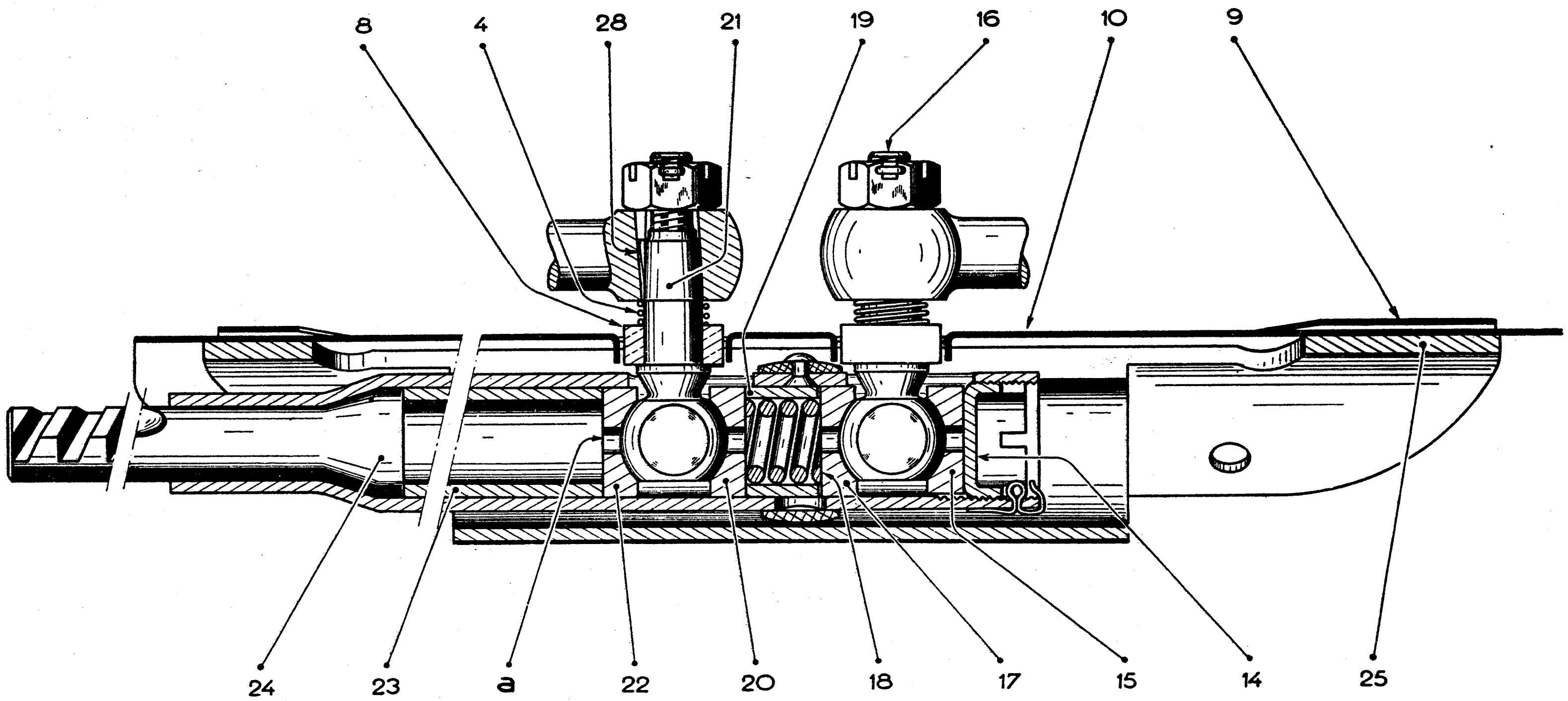
not sold



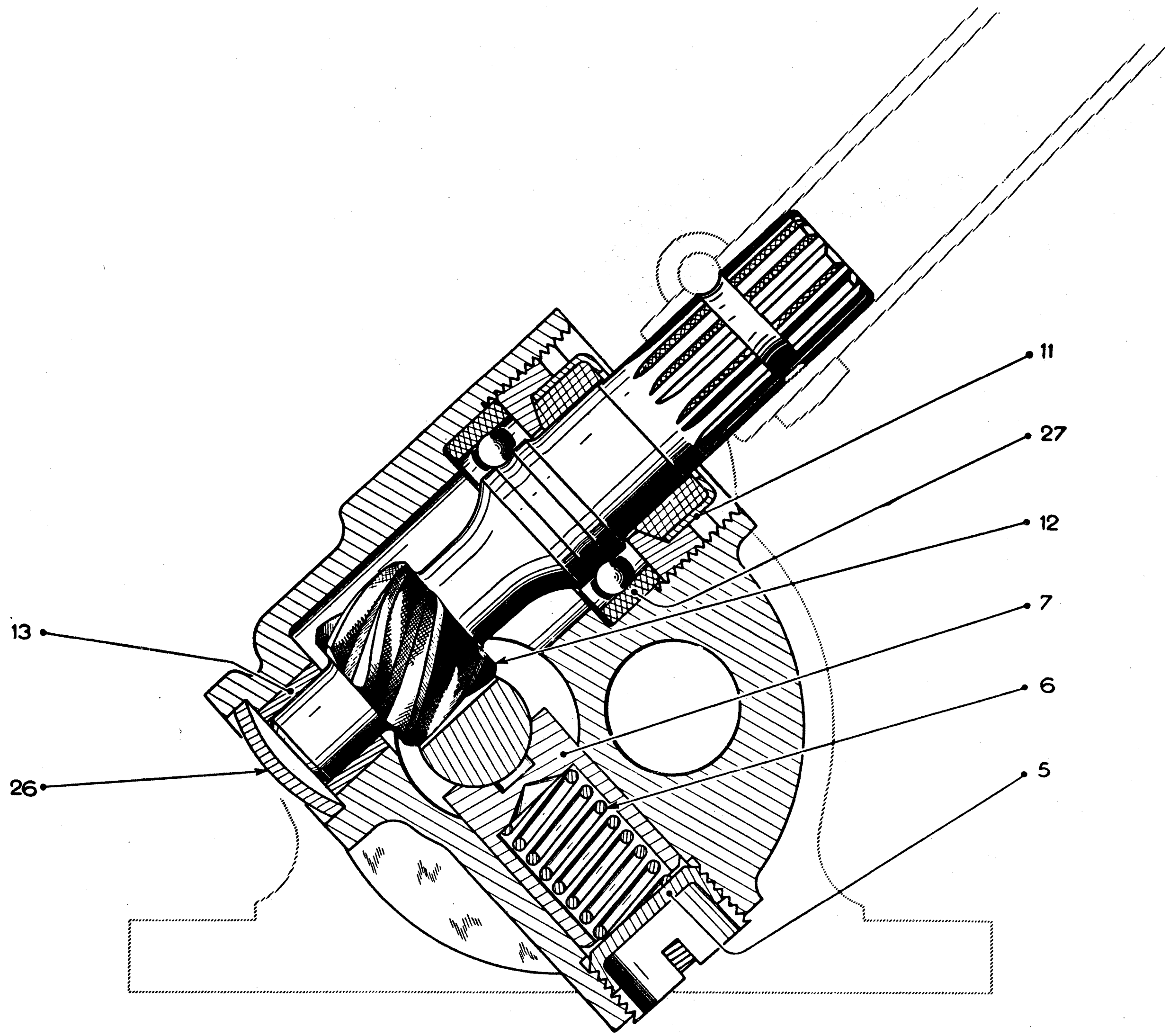
CONSULT OUR SERVICE DEPARTMENT FOR DIMENSIONS

FRONT AXLE—STEERING

SECTION OF THE STEERING GEAR



SECTION OF THE STEERING GEAR



REMOVAL OF THE STEERING WHEEL

Fig. 1 METHOD OF USE

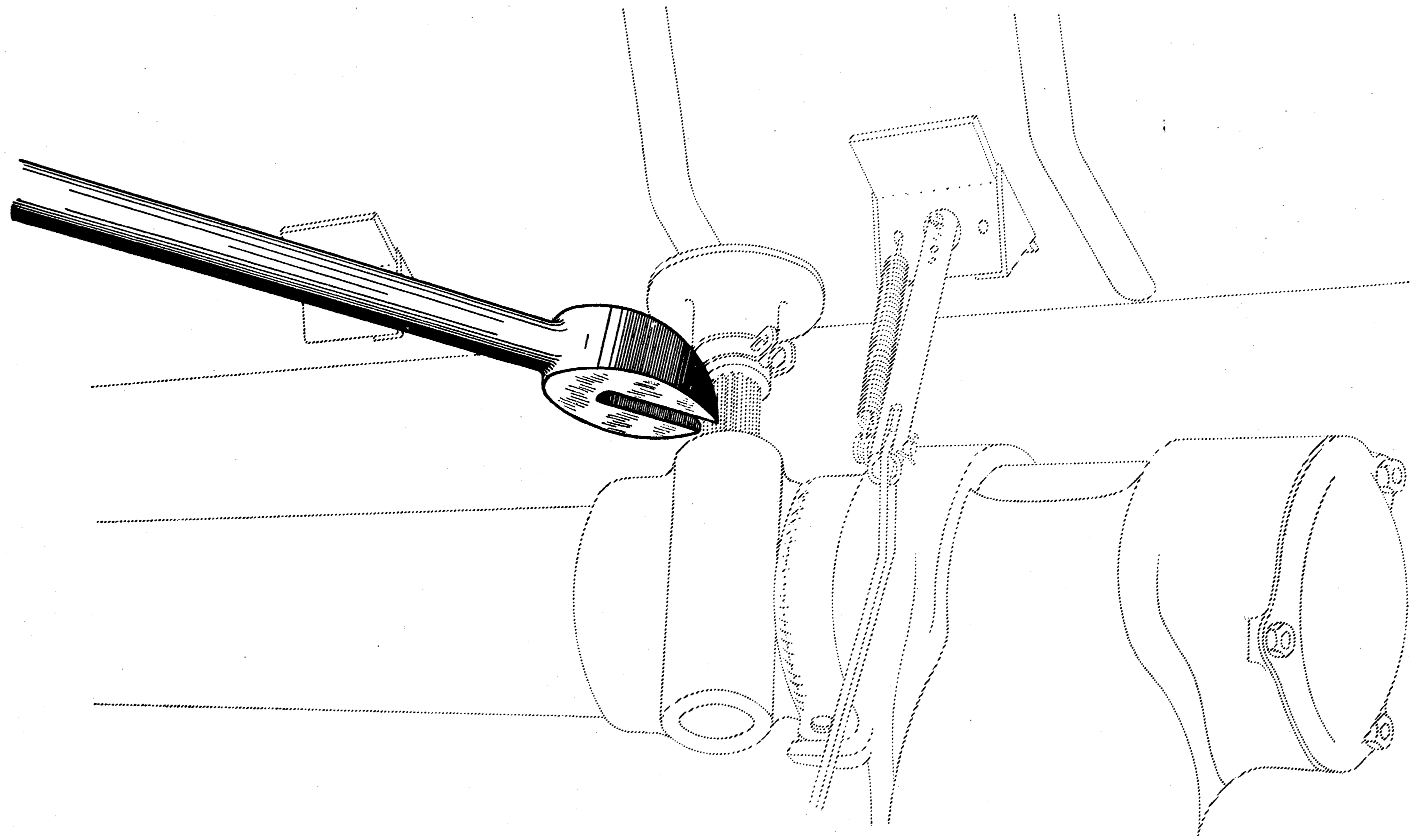
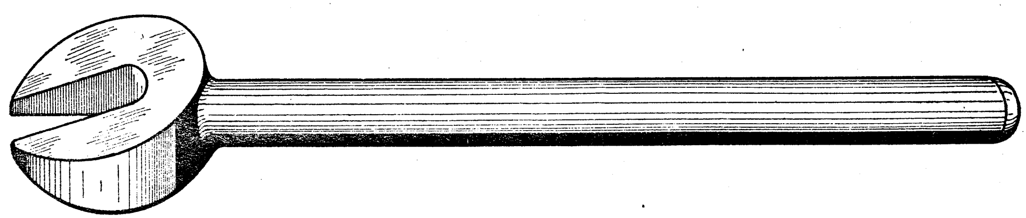
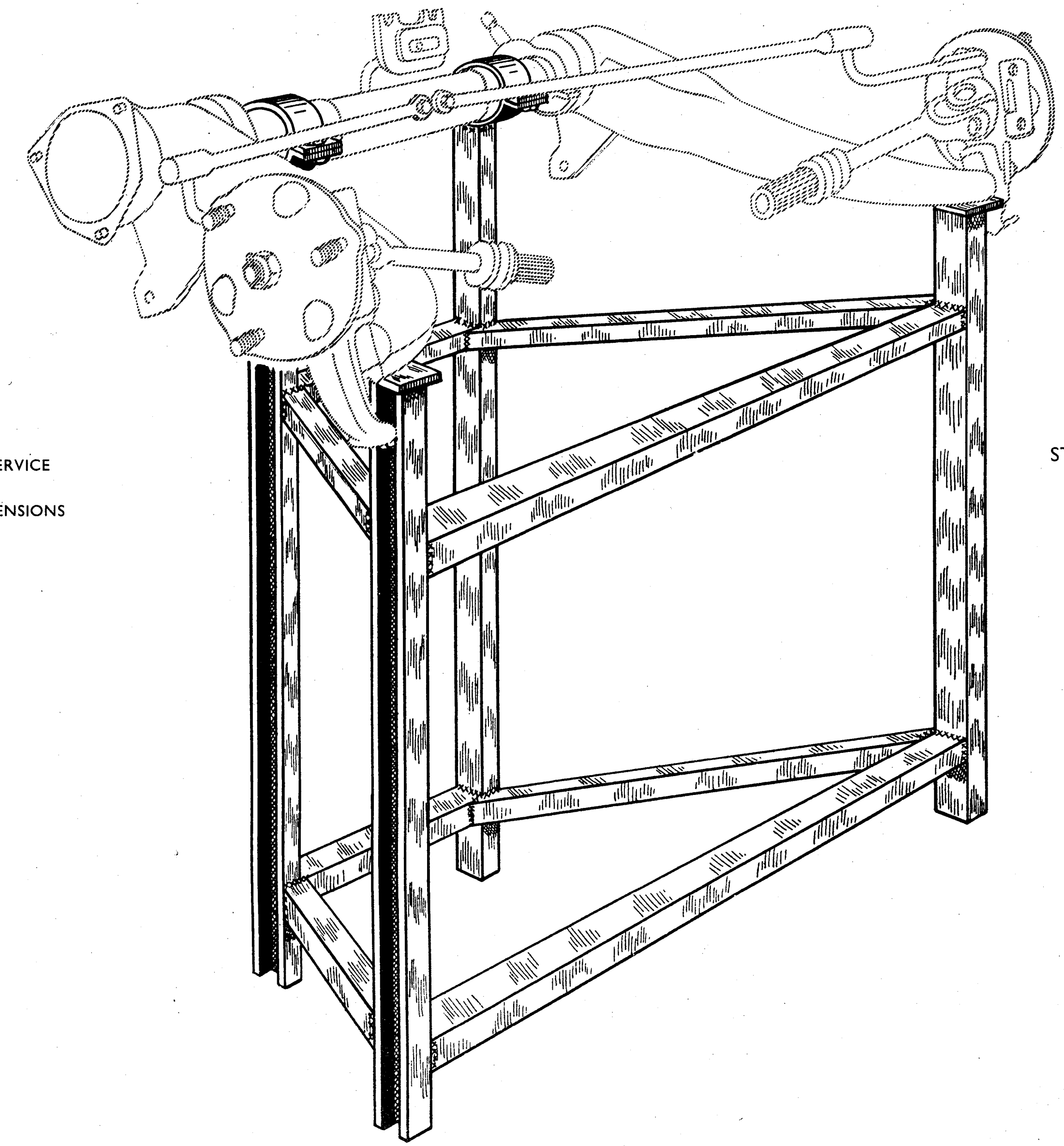


Fig. 2 FORK LEVER FOR REMOVAL OF STEERING WHEEL

sold under No. 1951–VA



STAND FOR AXLE ASSEMBLY



CONSULT OUR SERVICE

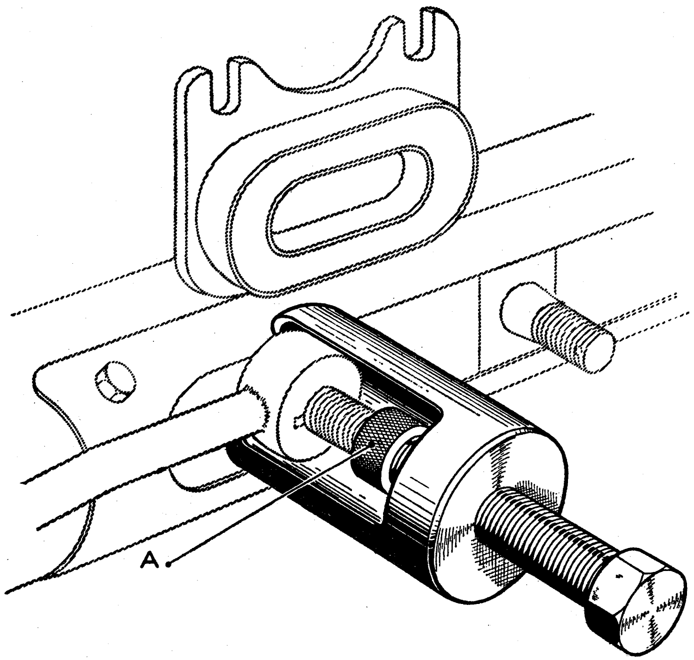
DEPARTMENT FOR DIMENSIONS

STAND NO. MR-3301-60

not sold.

VARIOUS TOOLS

Fig. 1 REMOVAL OF STEERING TIE RODS



BALL PIN EXTRACTOR

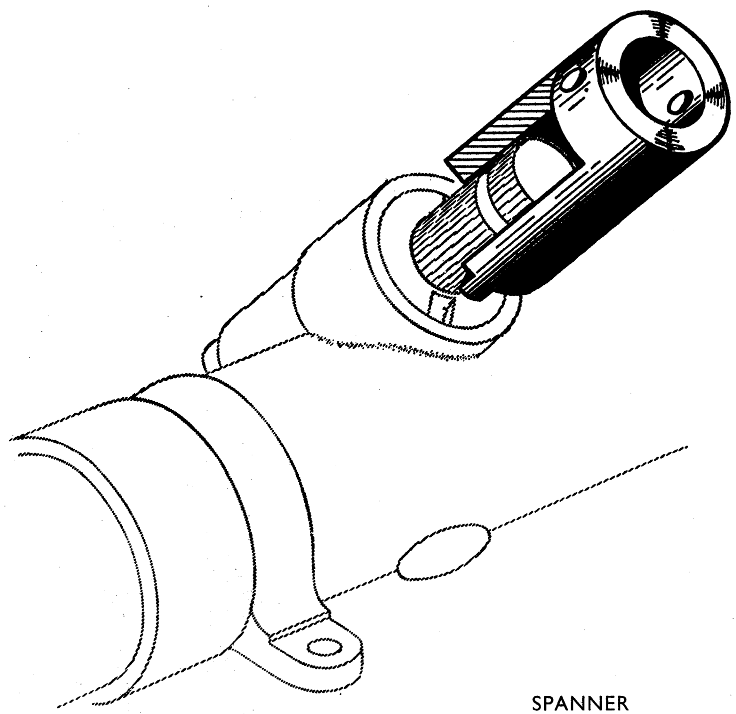
sold under No. 1964–T

CAP

sold under No. 1965–VA

SCREW THE CAP A ON THE BALL PIN IN ORDER TO AVOID DAMAGING THE THREAD AND THEN PUT THE EXTRACTOR IN POSITION.

Fig. 2 TIGHTENING THE RACK PINION NUT



SPANNER

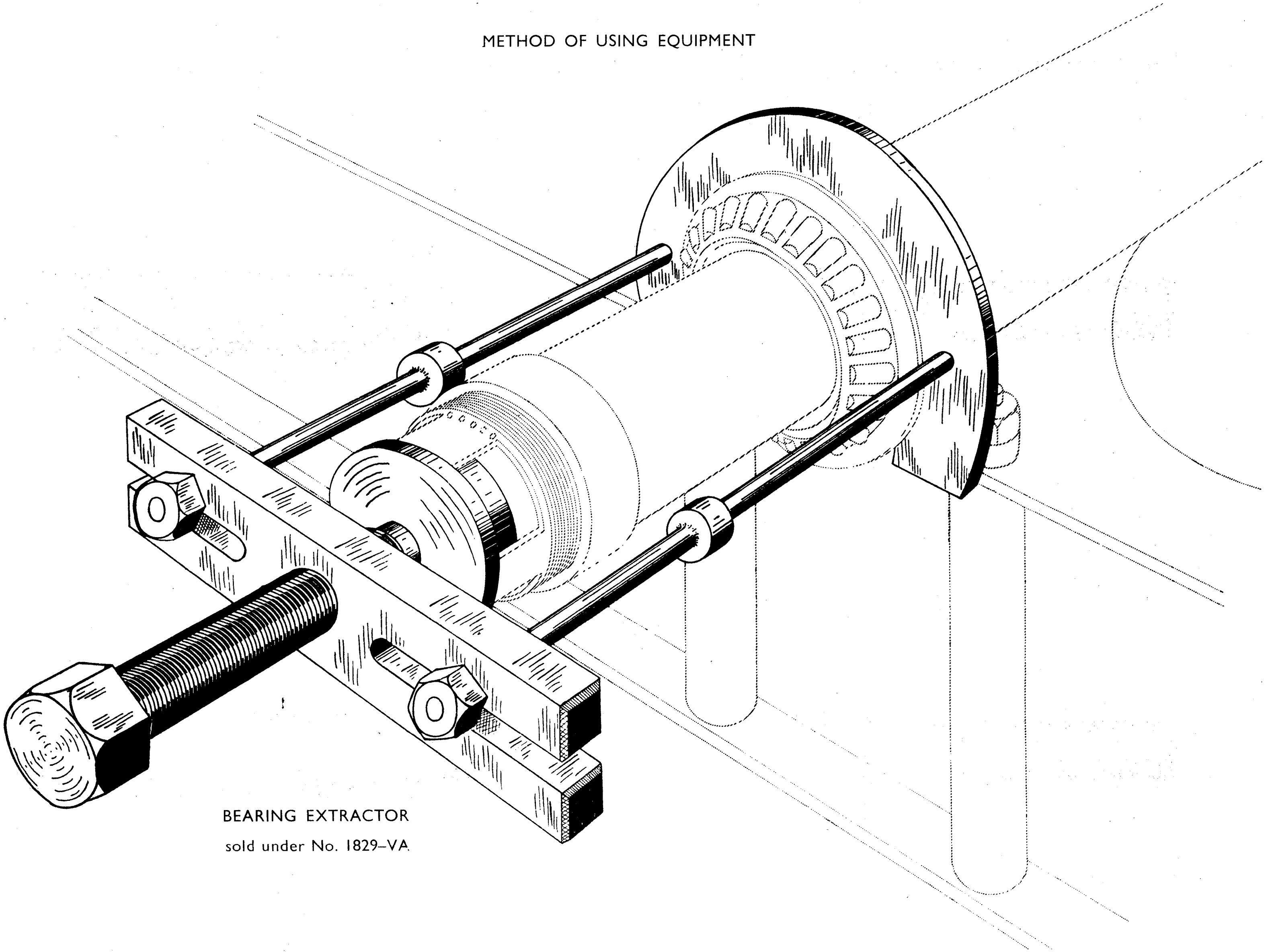
1st type sold under No. 1980–VA

2nd type sold under No. 1981–VA

FRONT AND REAR AXLES

REMOVAL OF THE INTERIOR BEARING

METHOD OF USING EQUIPMENT



BEARING EXTRACTOR
sold under No. 1829–VA

FRONT AND REAR AXLES

VARIOUS TOOLS

Fig. 1 FITTING THE FRONT HUB OIL SEAL

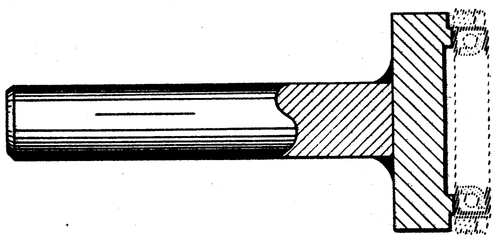


Fig. 2 REMOVAL OF THE FRONT HUB

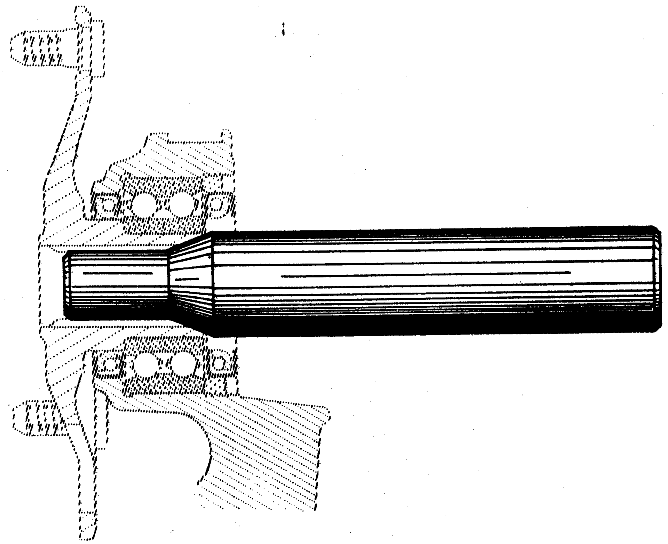


Fig. 3 PUNCH MR 3676-10

not sold

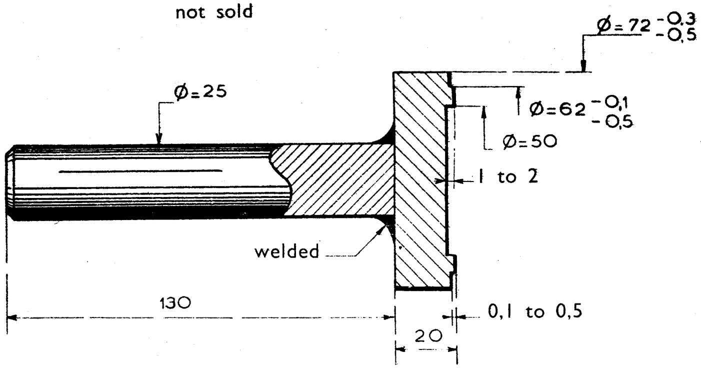
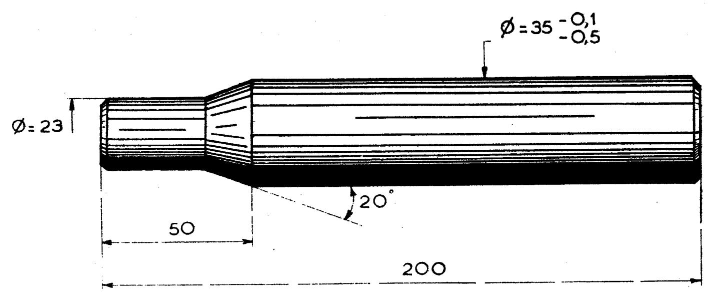


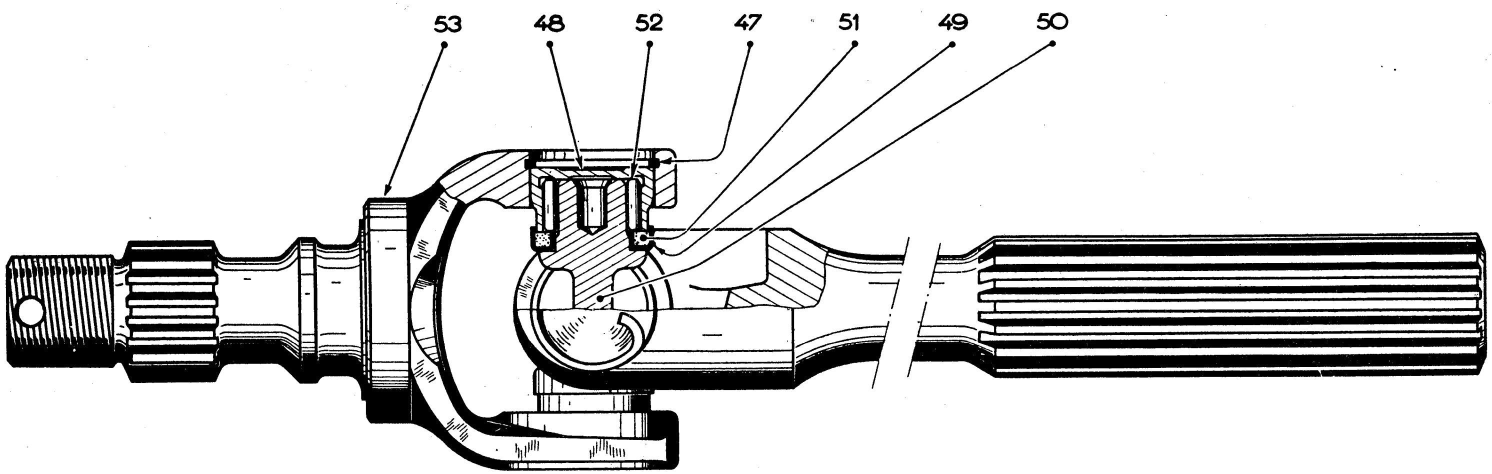
Fig. 4 MANDREL MR-3436-40

not sold



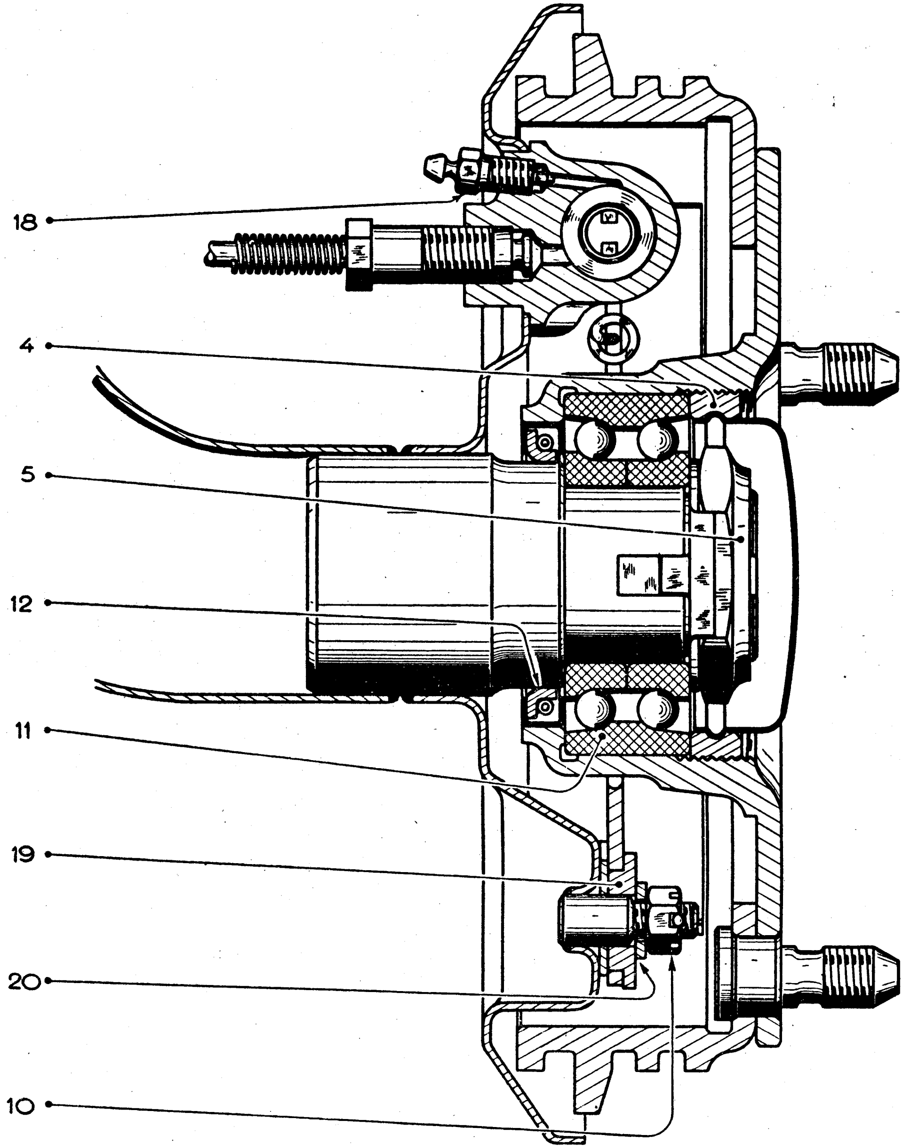
UNIVERSAL JOINT, WHEEL END

SECTION



REAR AXLE

SECTION OF HUB AND BRAKE DRUM



REAR AXLE

BRAKE BACKPLATE

Fig. 1 LEFT SIDE – FRONT VIEW

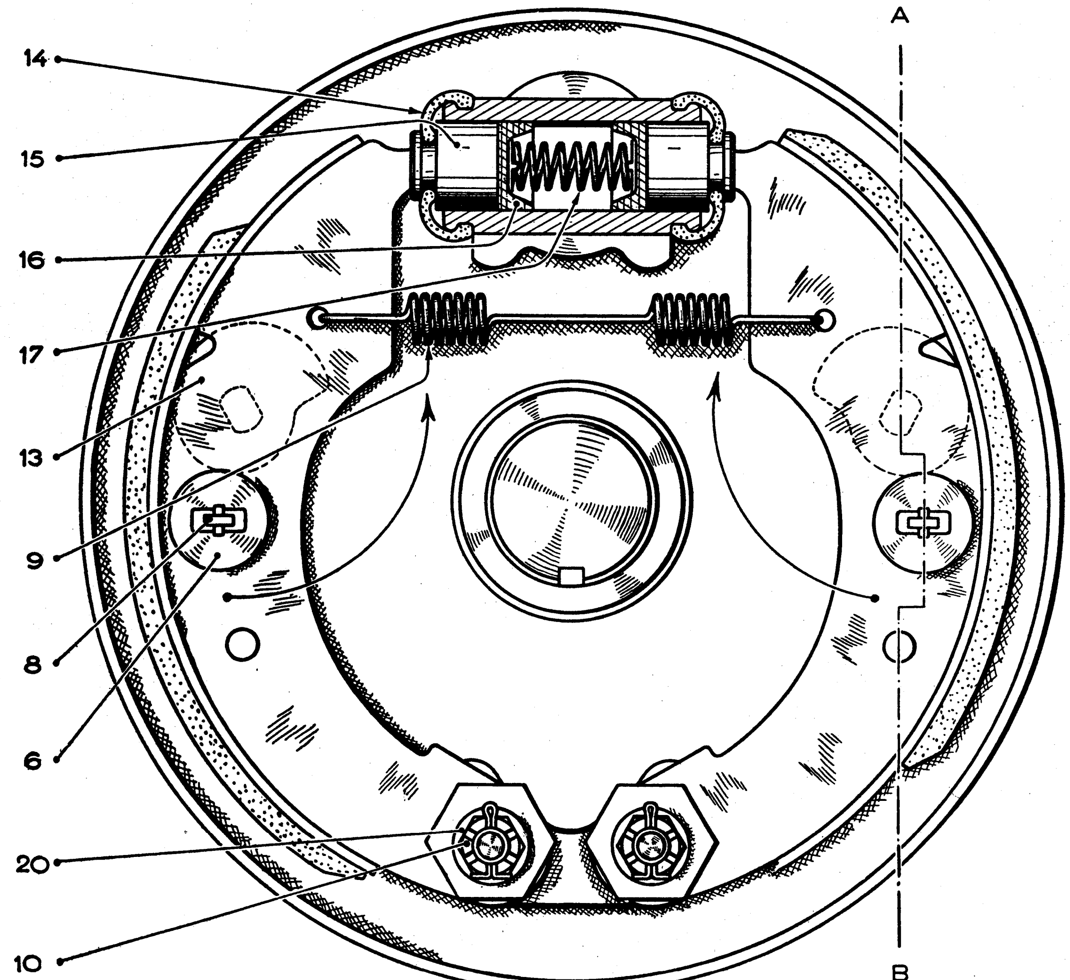
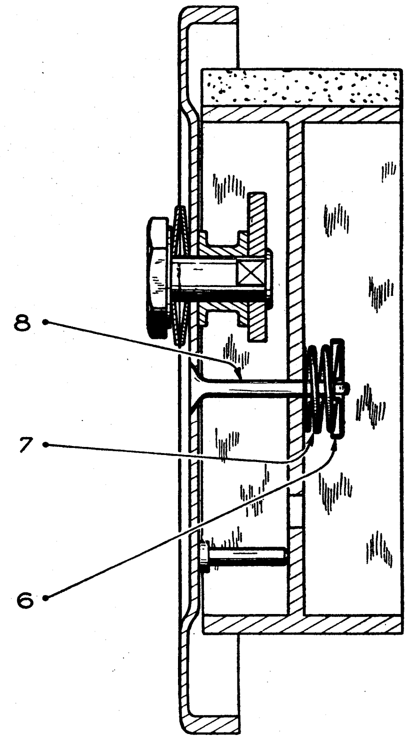
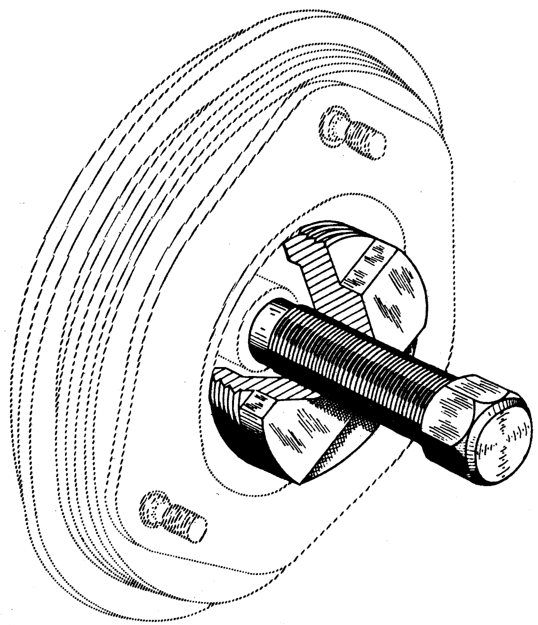


Fig. 2 SECTION A – B



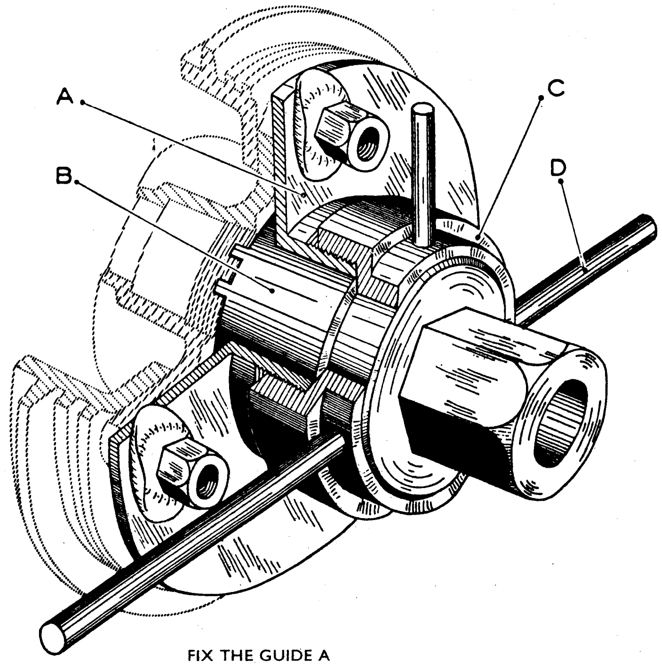
FRONT AND REAR AXLES
VARIOUS TOOLS

Fig. 1 UTILIZATION OF THE EXTRACTOR



EXTRACTOR sold under No. 2003–VA

Fig. 2 UTILIZATION OF THE SPANNER ON THE REAR HUB



FIX THE GUIDE A
WITH THE 3 WHEEL NUTS
PLACE THE SPANNER B
SCREW UP THE NUT C WITHOUT TIGHTENING
LOCK THE SPANNER B AND THE NUT C BY MEANS
OF THE BAR D
UNSCREW THE HUB NUT COLLAR

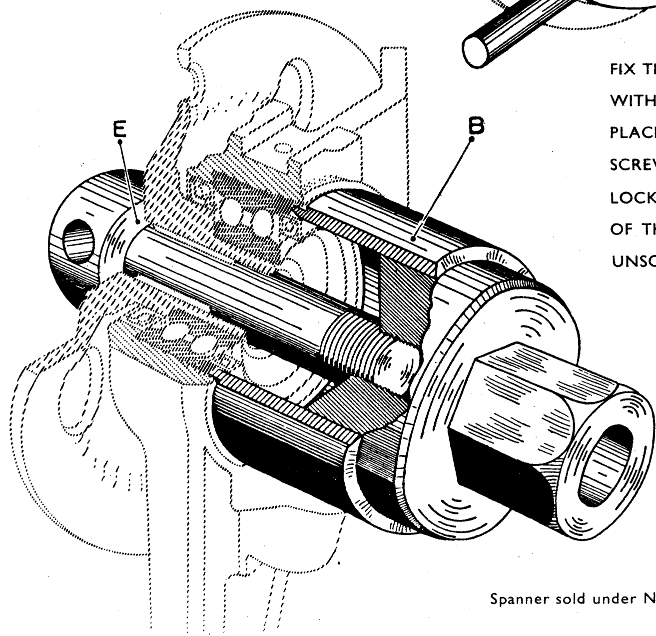


Fig. 3 UTILIZATION OF THE SPANNER ON THE FRONT HUB

PLACE THE SPANNER B
FIT THE SCREW E WITHOUT TIGHTENING
UNSCREW HUB NUT COLLAR AT THE SAME TIME
HOLDING THE SCREW E

Spanner sold under No. 1811–VA

FRONT AXLE

RIVETING THE BRAKE SHOE ADJUSTING CAMS

Fig. 1 UTILIZATION

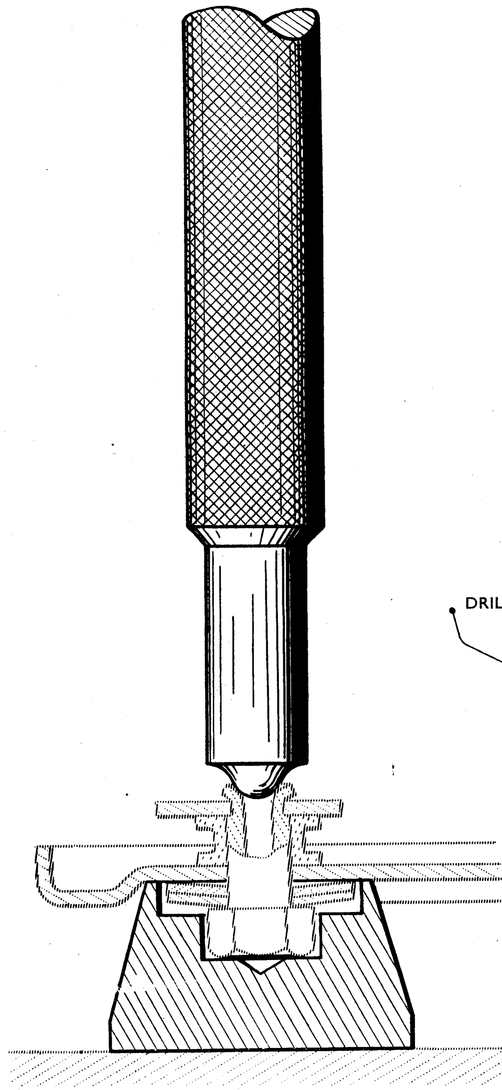


Fig. 2 PUNCH MR-3354-2
not sold

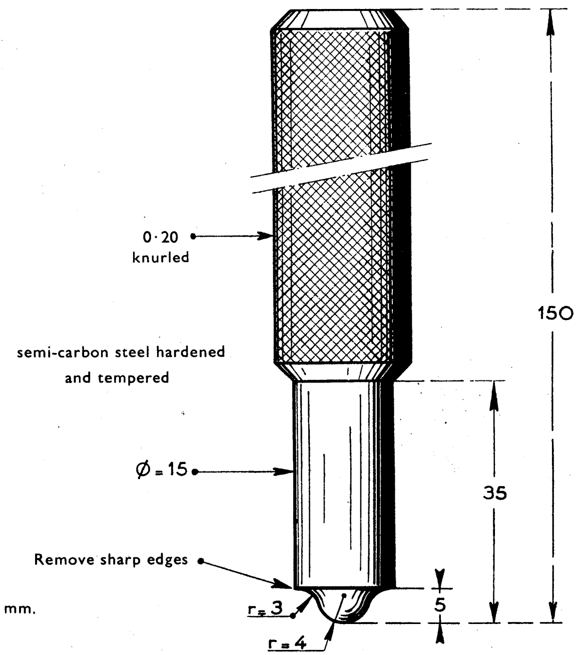
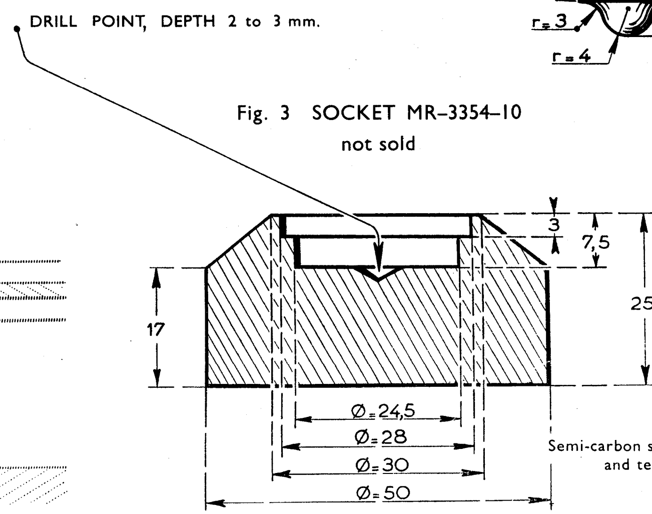
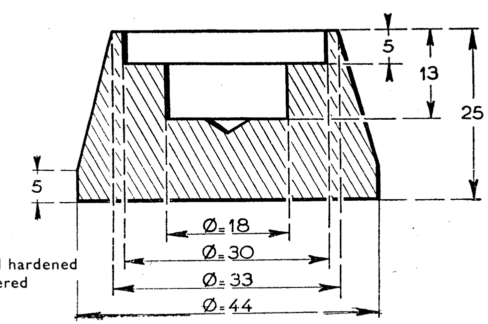


Fig. 3 SOCKET MR-3354-10
not sold



Semi-carbon steel hardened
and tempered

Fig. 4 SOCKET MR-3354-20
not sold



FRONT AND REAR AXLES

LOCKING THE WHEEL STUDS

Fig. 1 METHOD OF USING THE TOOLS
SECTION ON XOY

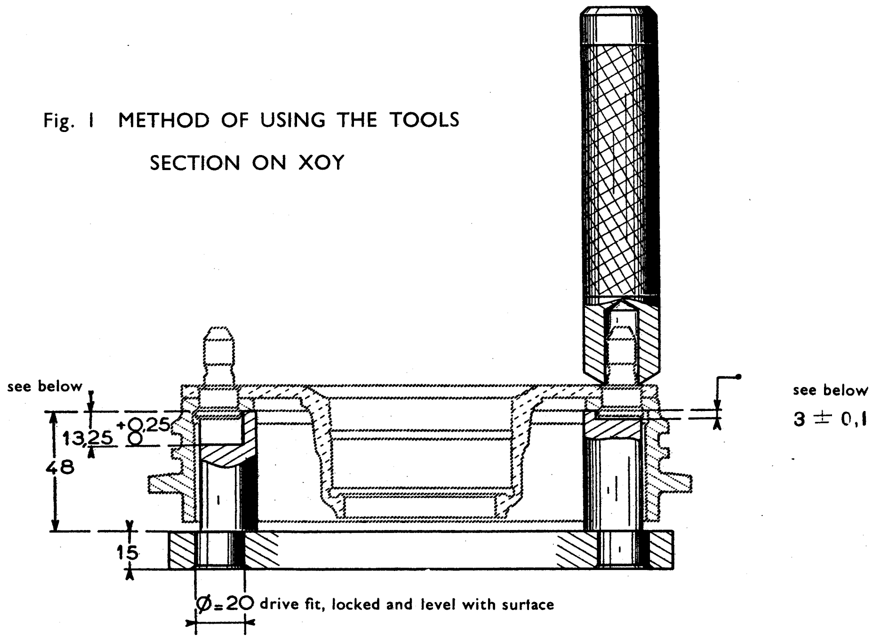


Fig. 2 HOLLOW PUNCH MR-3445-24
not sold

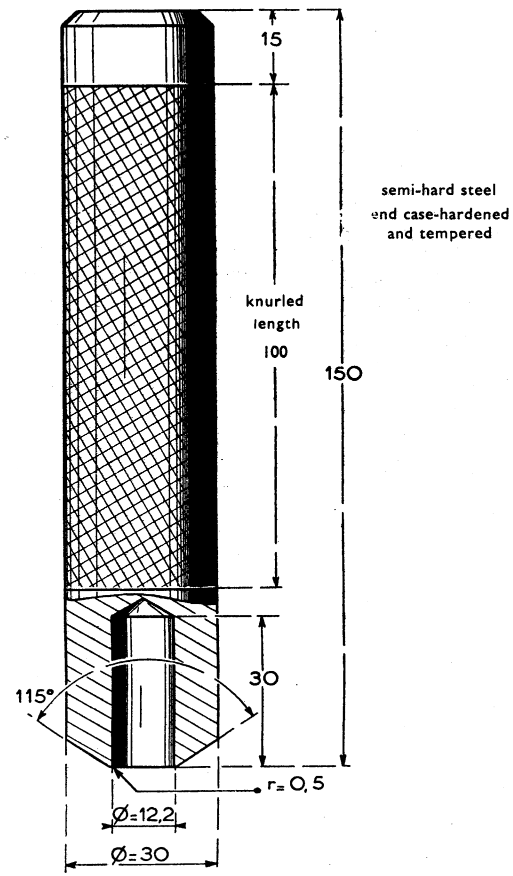
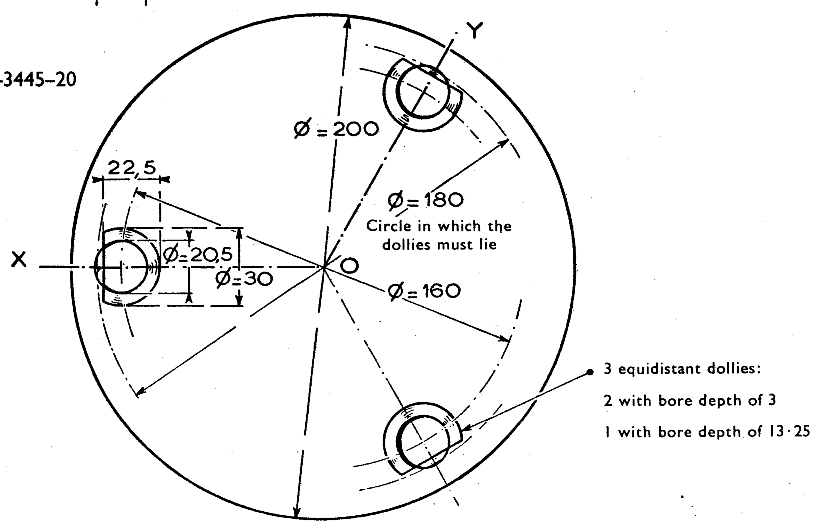


Fig. 3 PLATE MR-3445-20
not sold



REAR AXLE

GRINDING THE BRAKE DRUM

Fig. 1 METHOD OF USE

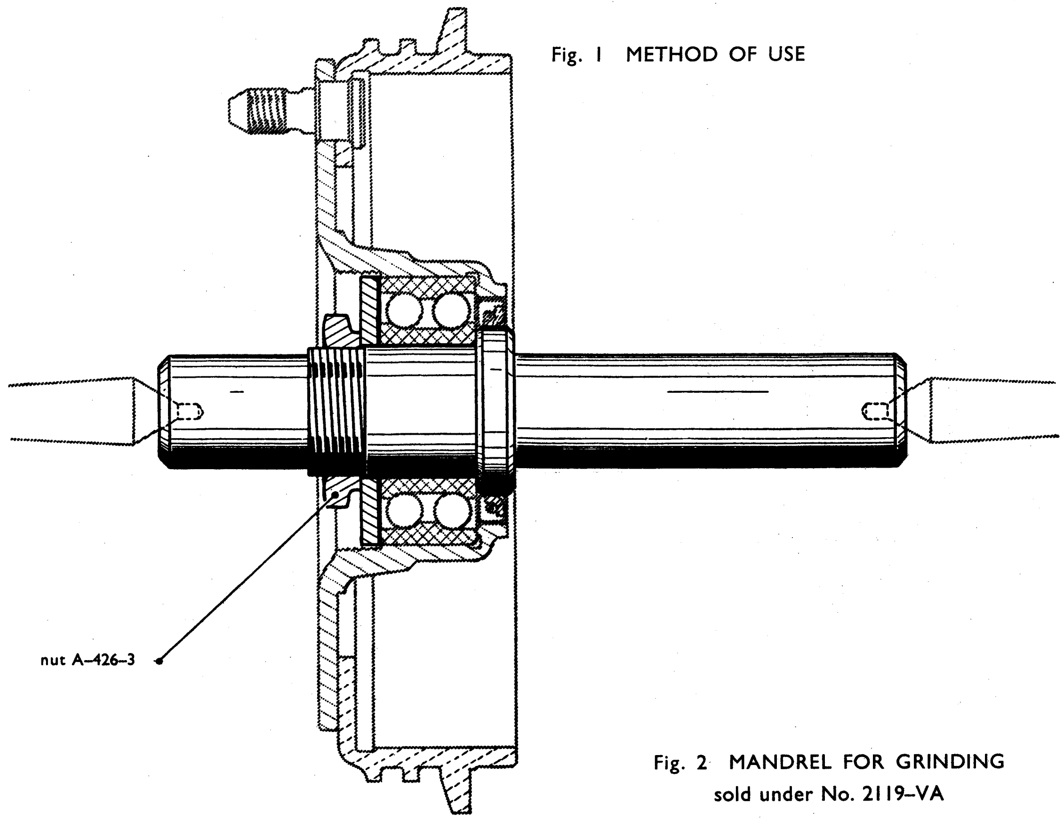
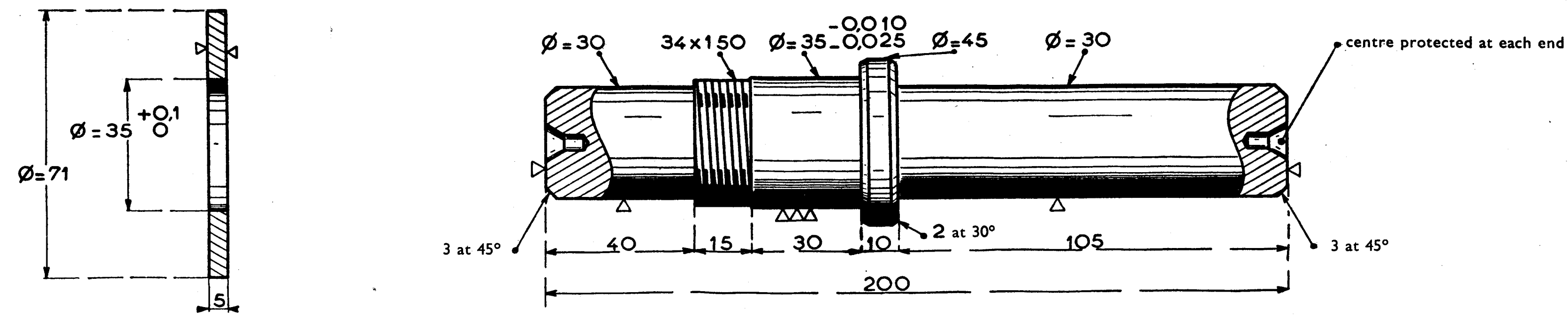
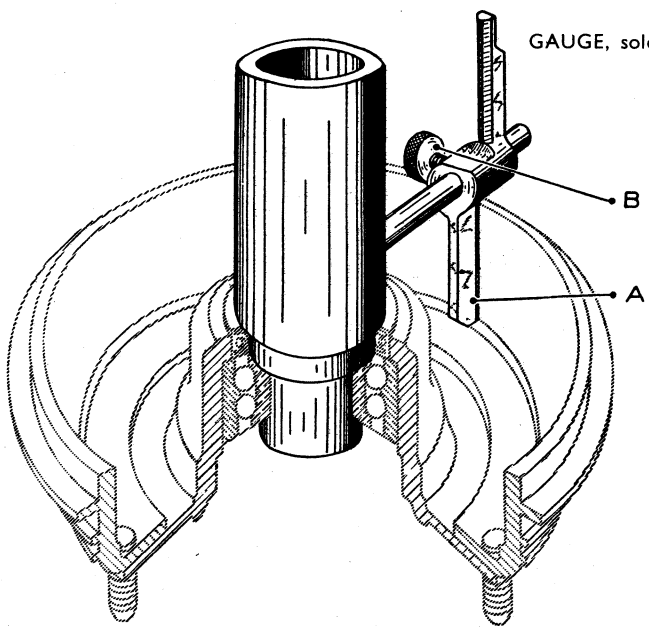


Fig. 2 MANDREL FOR GRINDING
sold under No. 2119-VA



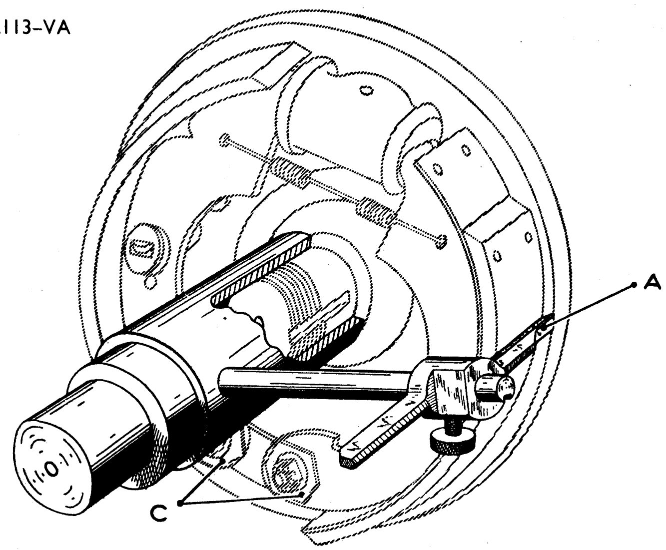
CHECKING CONCENTRICITY OF BRAKE LININGS

REGISTERING DIAMETER OF DRUM



PUT THE DEVICE IN POSITION IN THE BEARING. BRING THE INDEX A INTO CONTACT WITH THE INNER FACE OF THE DRUM AND TURN THROUGH ONE COMPLETE REVOLUTION. POSITION BY MEANS OF THE SCREW B.

Fig. 2 CHECKING CONCENTRICITY OF LININGS



FIT THE DEVICE ON THE STUB AXLE.

PUT THE POINTER A LOCKED IN PREVIOUS OPERATION IN POSITION ON THE LININGS. THE FINGER MUST BE IN CONTACT WITH THE LININGS ALL THE WAY ROUND (TO ENSURE THIS, MOVE THE LININGS IN THE REQUIRED DIRECTION BY OPERATING THE ADJUSTMENT ECCENTRICS C AND THE CAMS NOT SHOWN IN THE DRAWING).

IF ANY BUMPS ARE FOUND FILE DOWN WITH A RASP.

AFTER CHECKING UNDO THE CAMS SO THAT THE DRUM CAN BE FITTED.

FOR FINAL ADJUSTMENT OF THE CAMS SEE OPERATION 49, PARAGRAPHS 9 to 11.

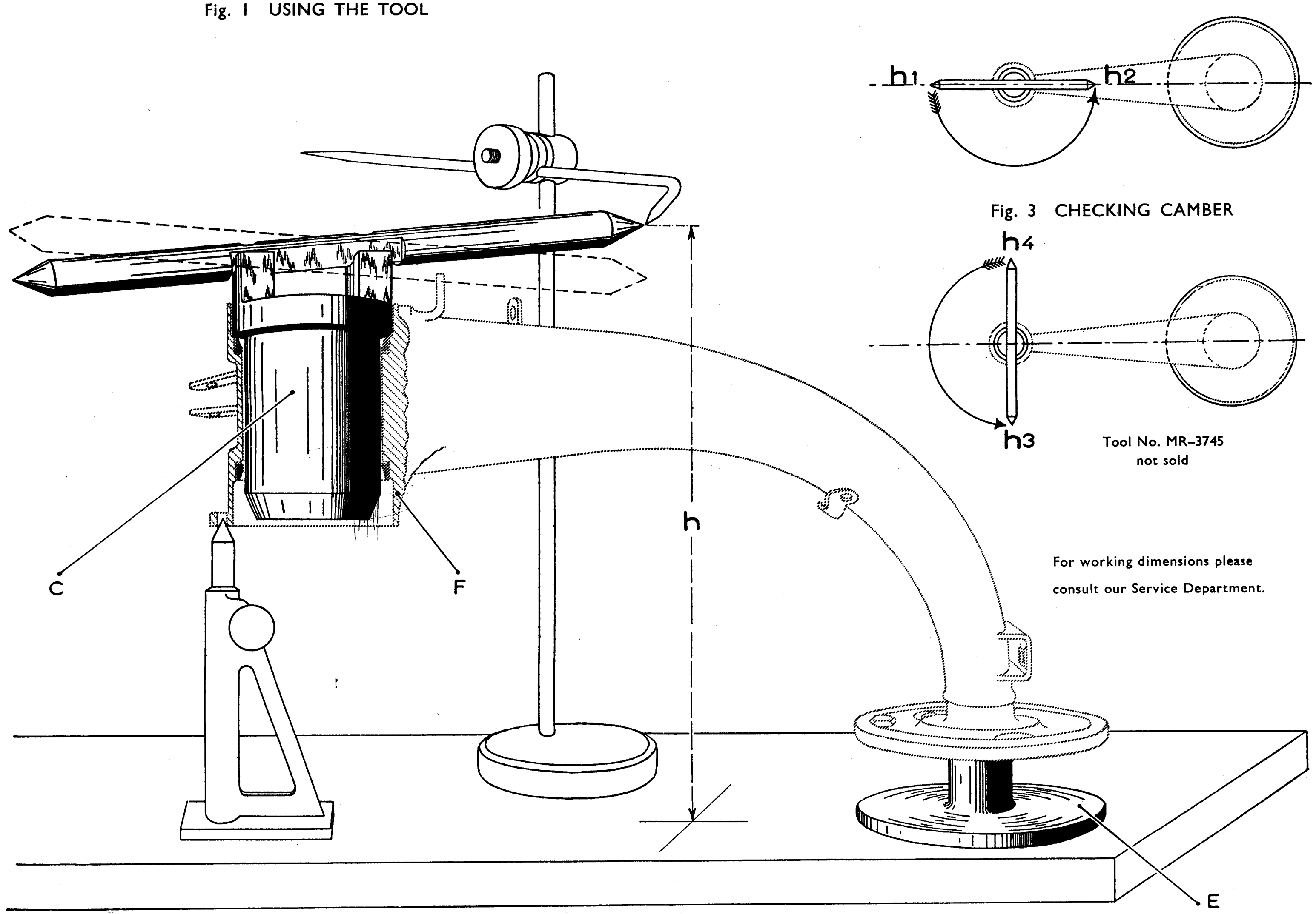
AXLE, REAR

CHECKING AN ARM

Fig. 1 USING THE TOOL

Fig. 2 CHECKING ALIGNMENT

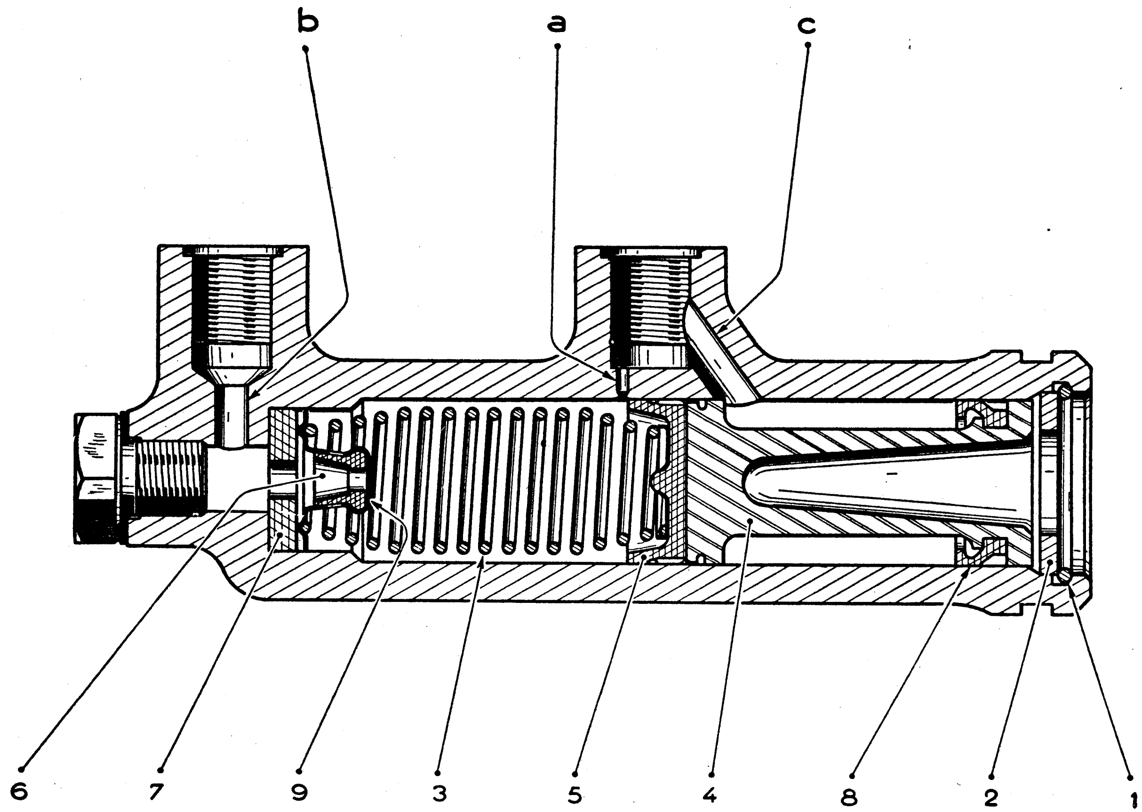
Fig. 3 CHECKING CAMBER



Tool No. MR-3745
not sold

For working dimensions please consult our Service Department.

SECTION OF MASTER CYLINDER



SUSPENSION

SECTION OF SUSPENSION UNIT

FRONT

Fig. I ASSEMBLY

REAR

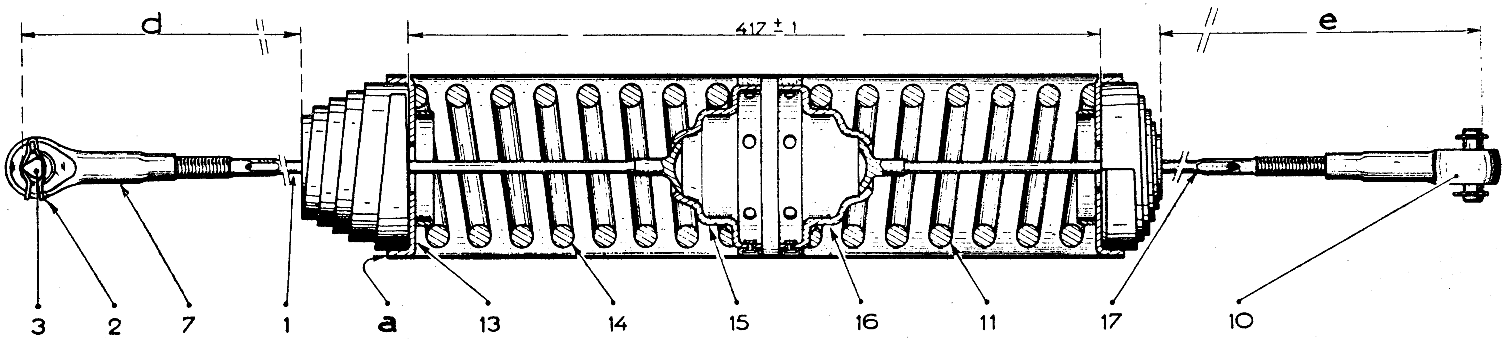


Fig. 2 DETAIL OF END PIECES

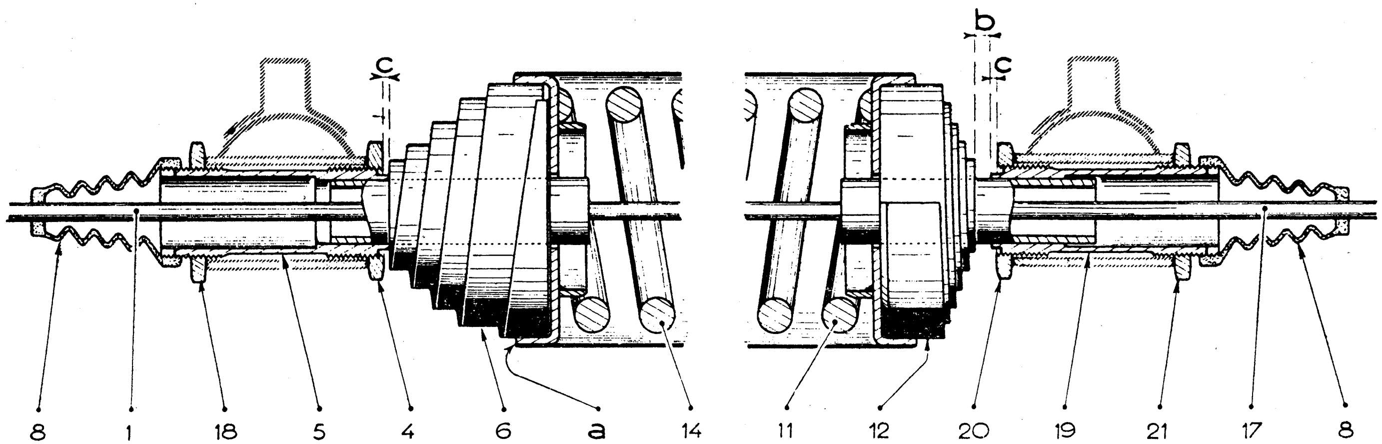


Fig. 1

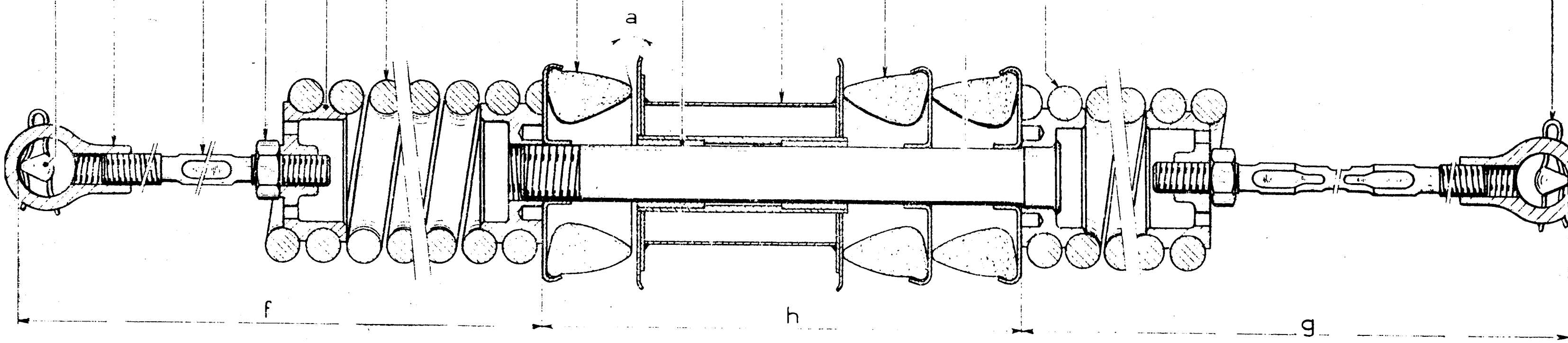


Fig. 2

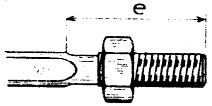
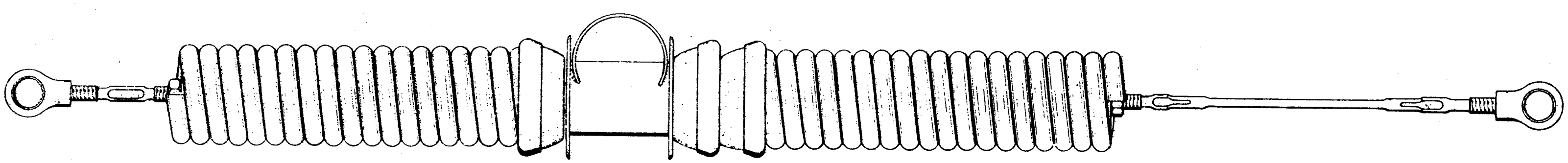


Fig. 3



SUSPENSION

FLEXIBLE BUFFER SUSPENSION

Fig. 1

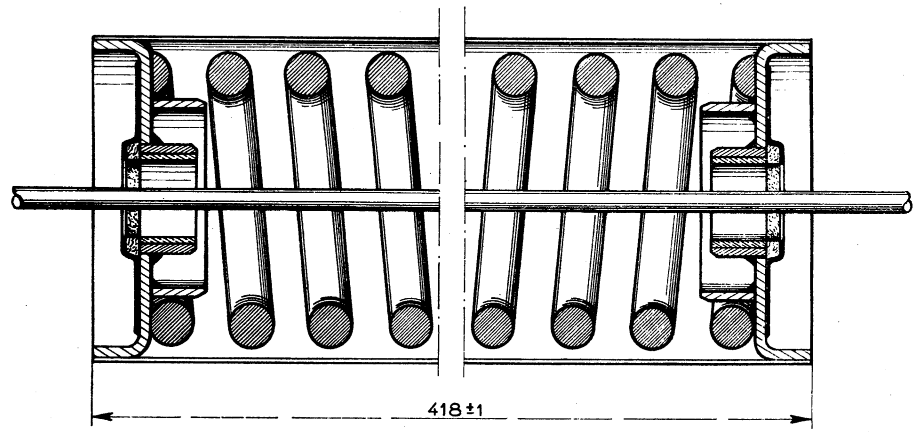


Fig. 2

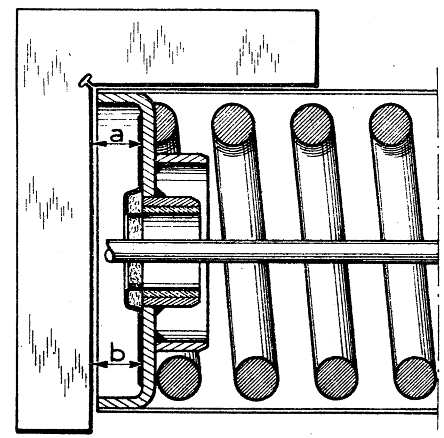
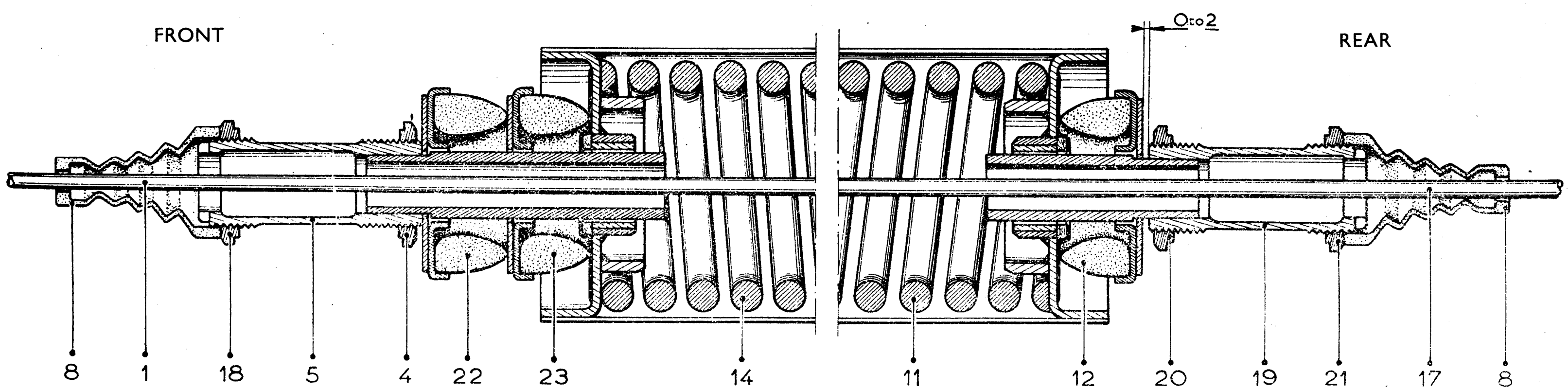


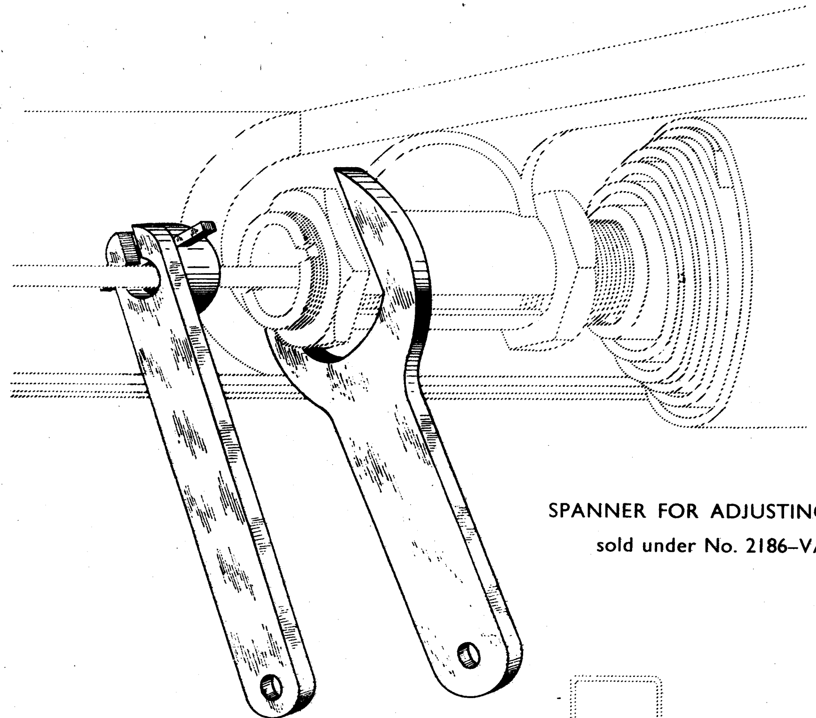
Fig. 3



SUSPENSION

ADJUSTING POSITION OF SUSPENSION UNIT

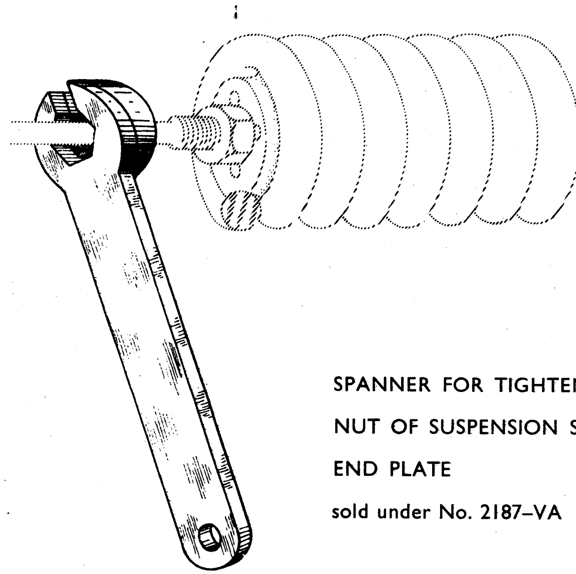
Fig. 1



SPANNER FOR ADJUSTING NUT
sold under No. 2186–VA

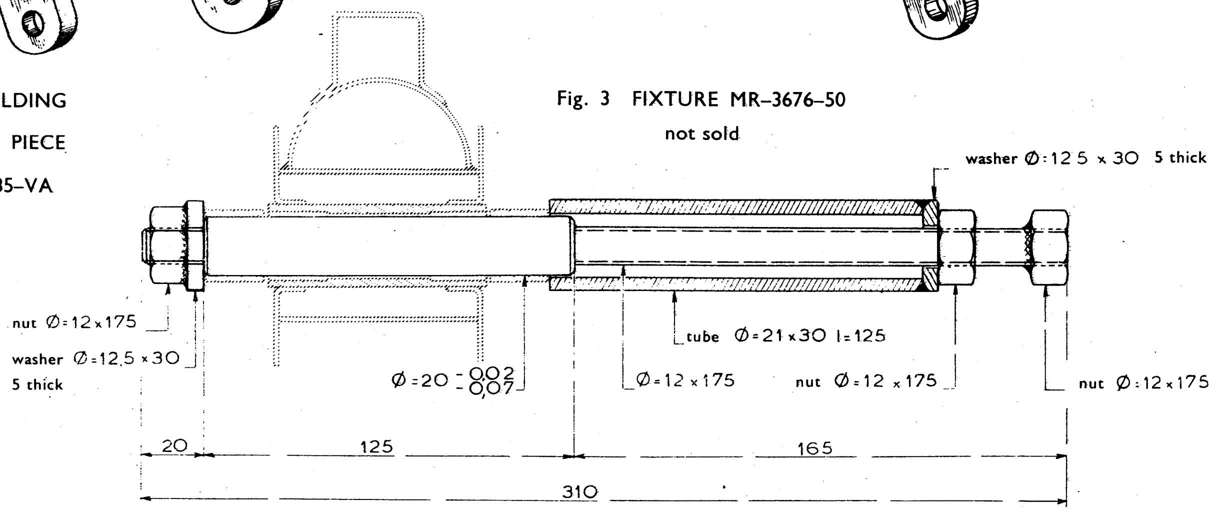
SPANNER FOR HOLDING
ADJUSTMENT END PIECE
sold under No. 2185–VA

Fig. 2



SPANNER FOR TIGHTENING
NUT OF SUSPENSION SPRING
END PLATE
sold under No. 2187–VA

Fig. 3 FIXTURE MR–3676–50
not sold



SUSPENSION

INERTIA DAMPERS

Fig. 1

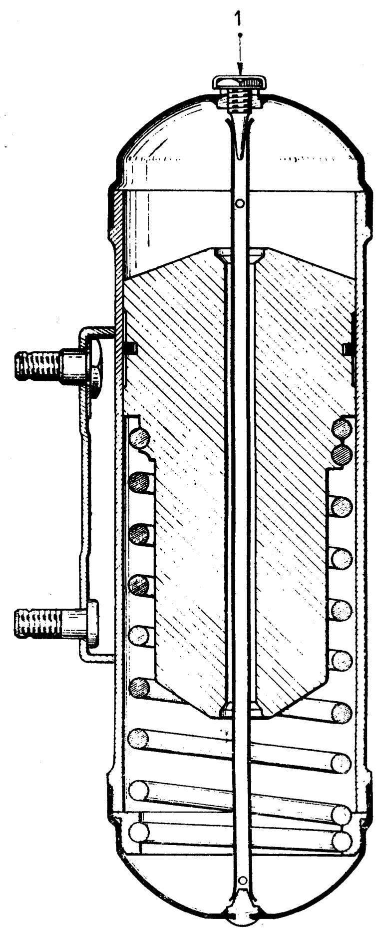
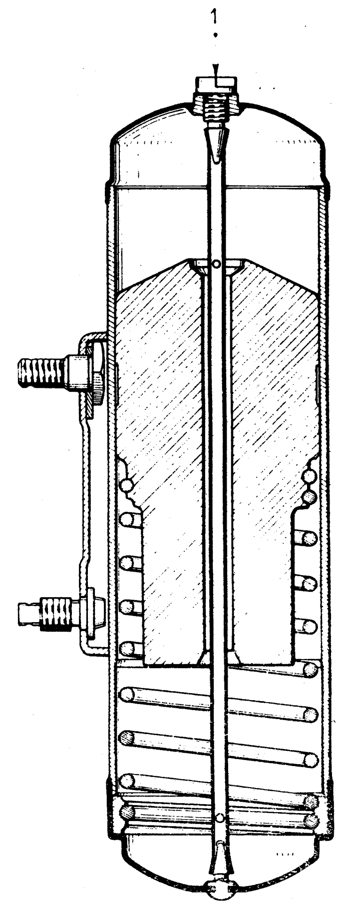
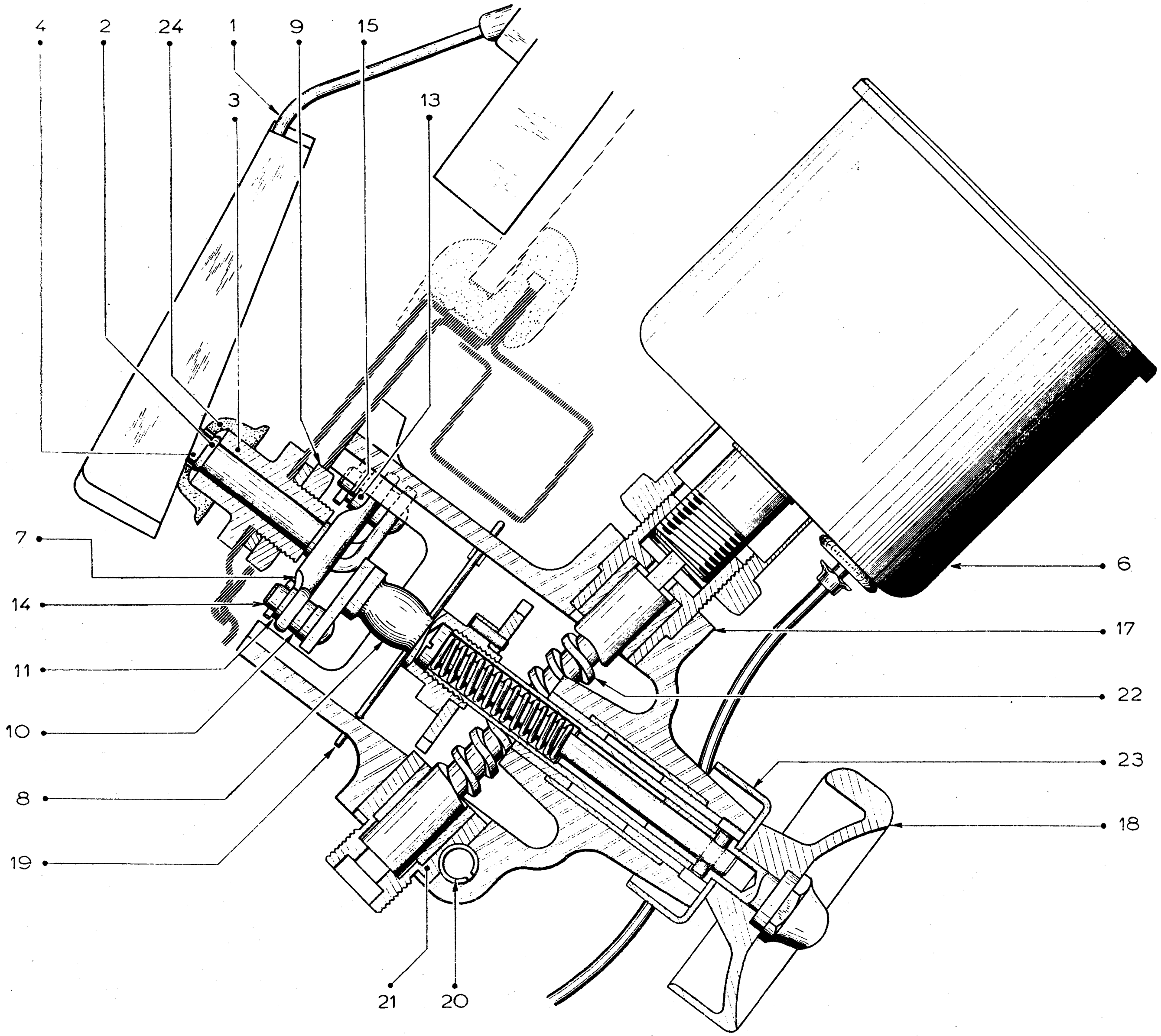


Fig. 2



WINDSCREEN WIPER

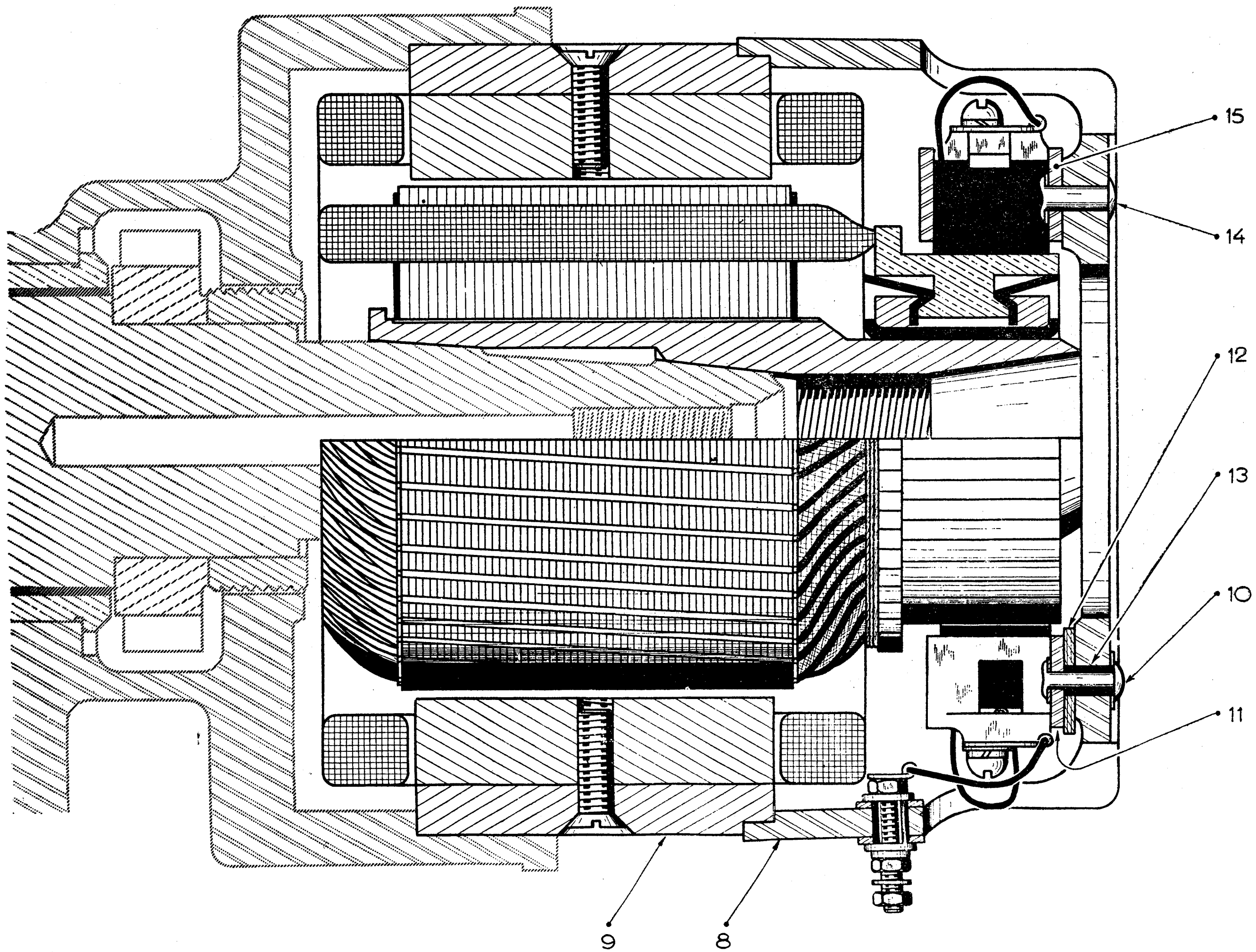


ELECTRICAL

DYNAMO, CITROEN

FIXING BY 3 SCREWS

LONGITUDINAL SECTION

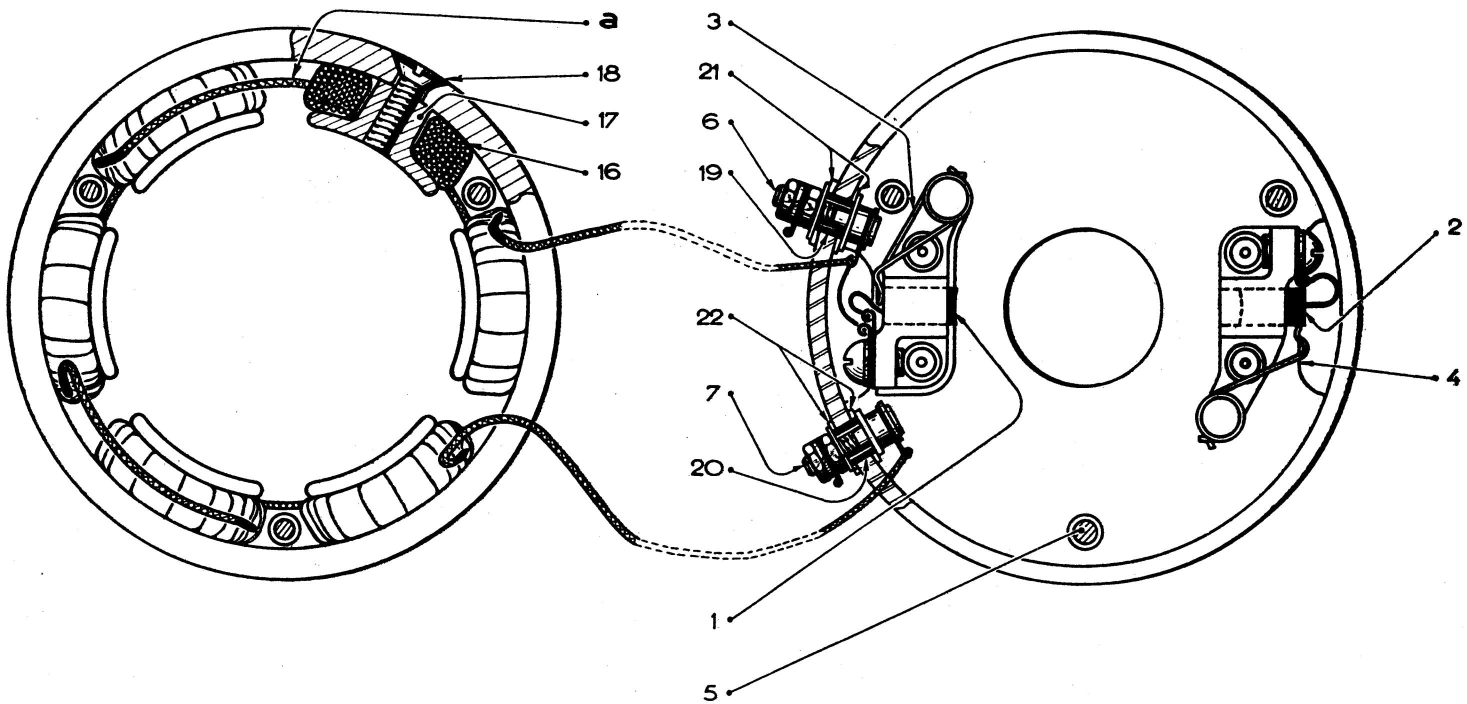


ELECTRICAL

DYNAMO, CITROEN

FIXING BY 3 SCREWS

END VIEWS

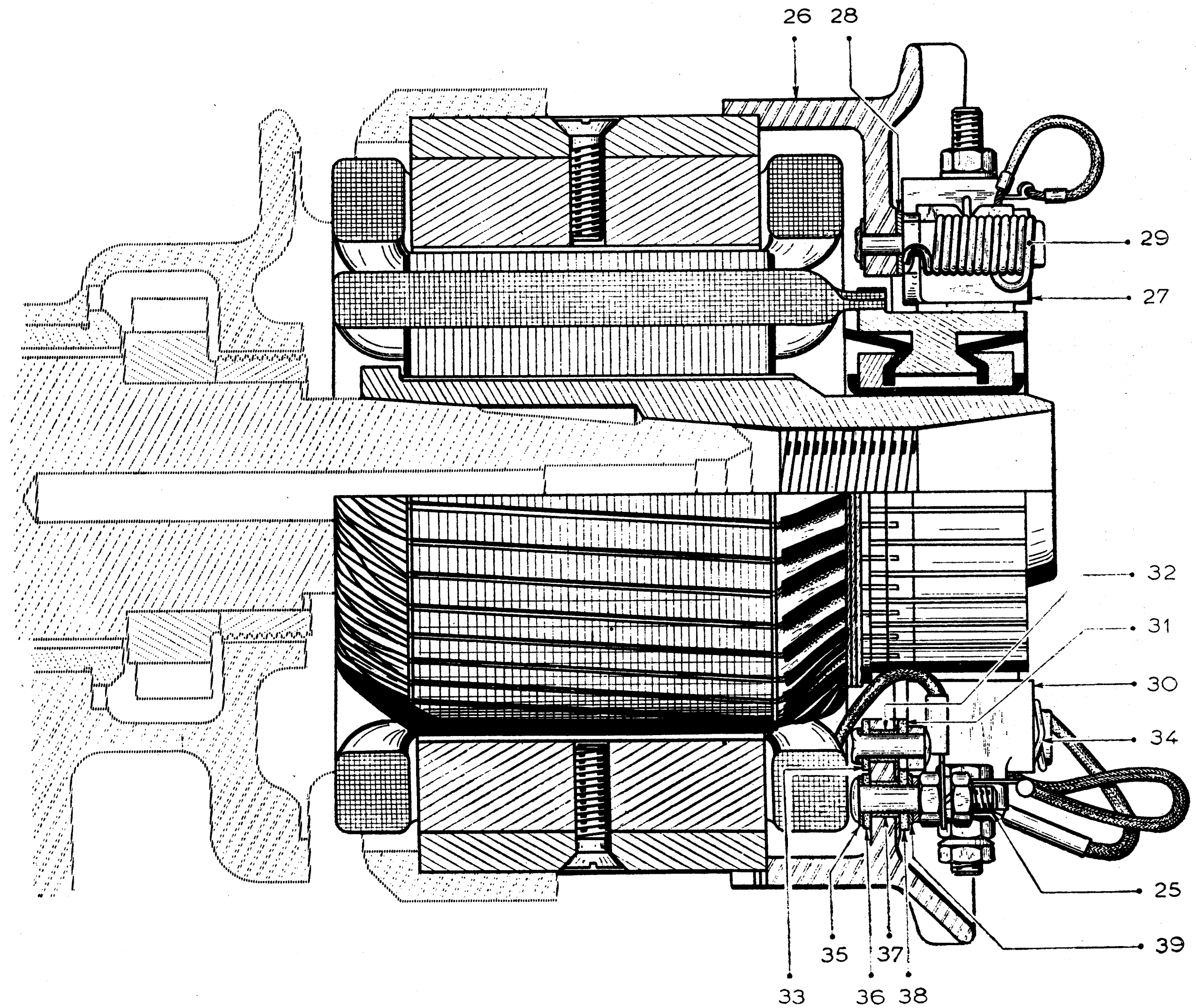


ELECTRICAL

DYNAMO, CITROEN

FIXING BY 2 SCREWS

LONGITUDINAL SECTION

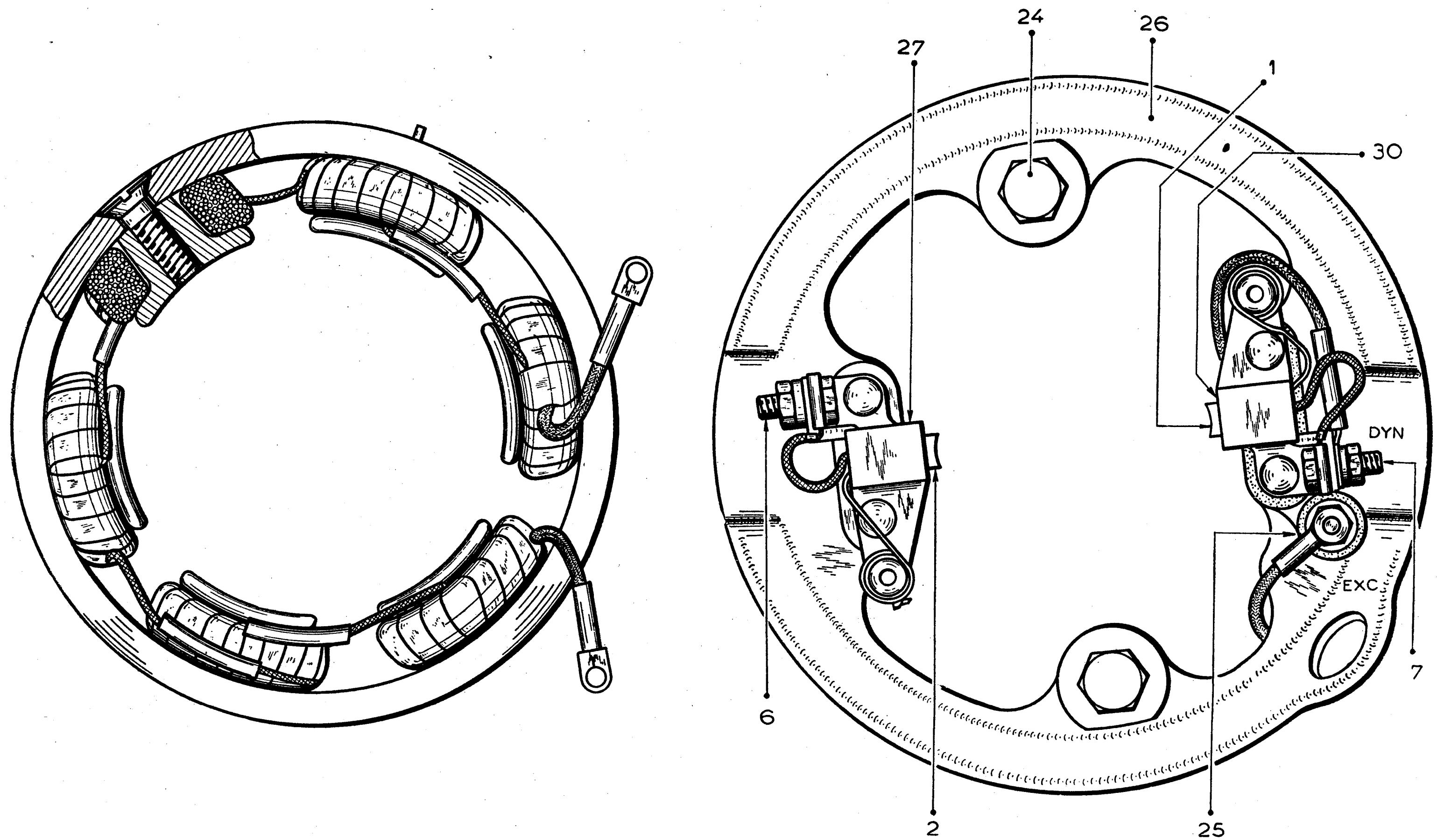


ELECTRICAL

DYNAMO, CITROEN

FIXING BY 2 SCREWS

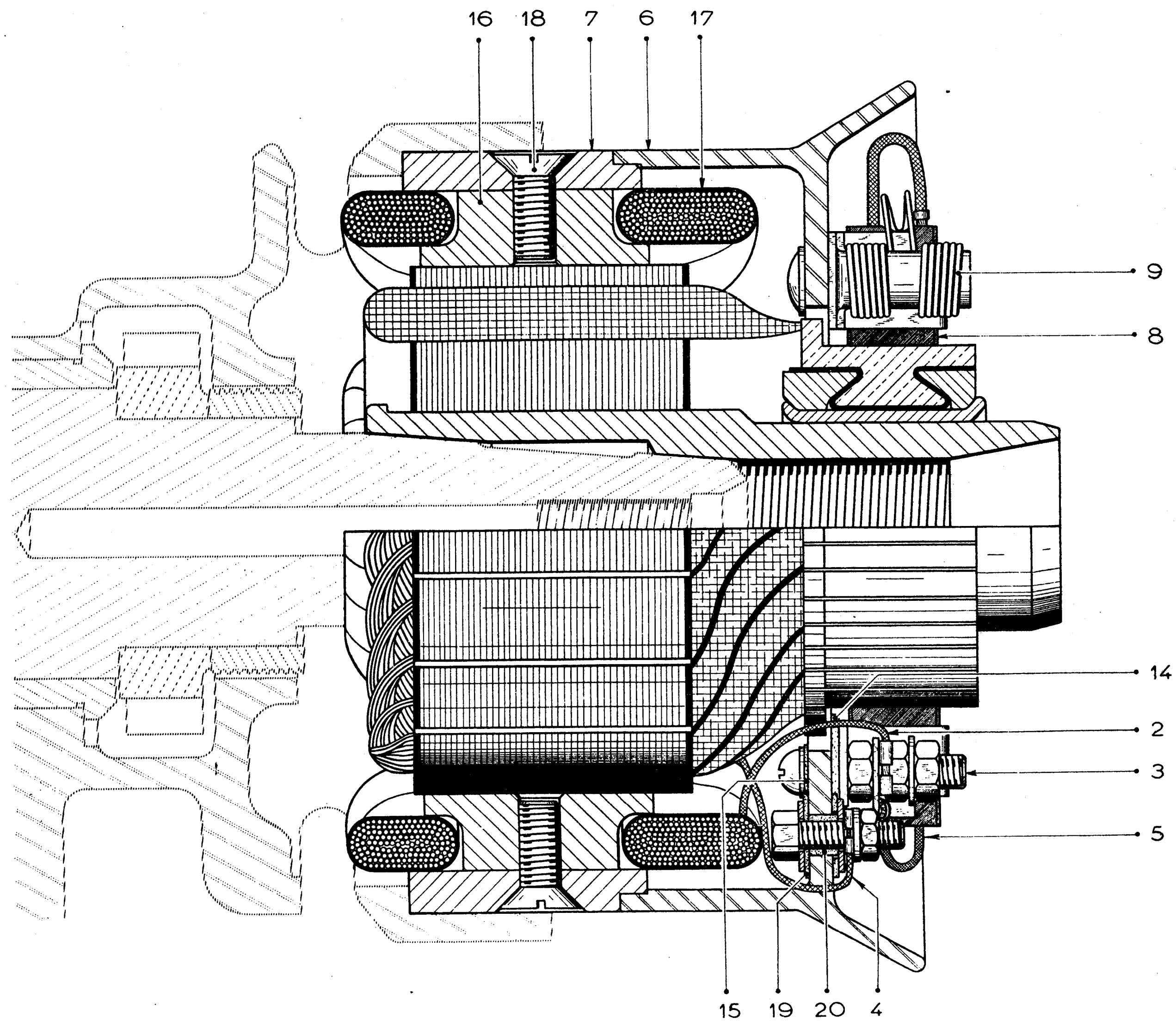
END VIEWS



ELECTRICAL

DYNAMO; PARIS RHONE G 11 R 60

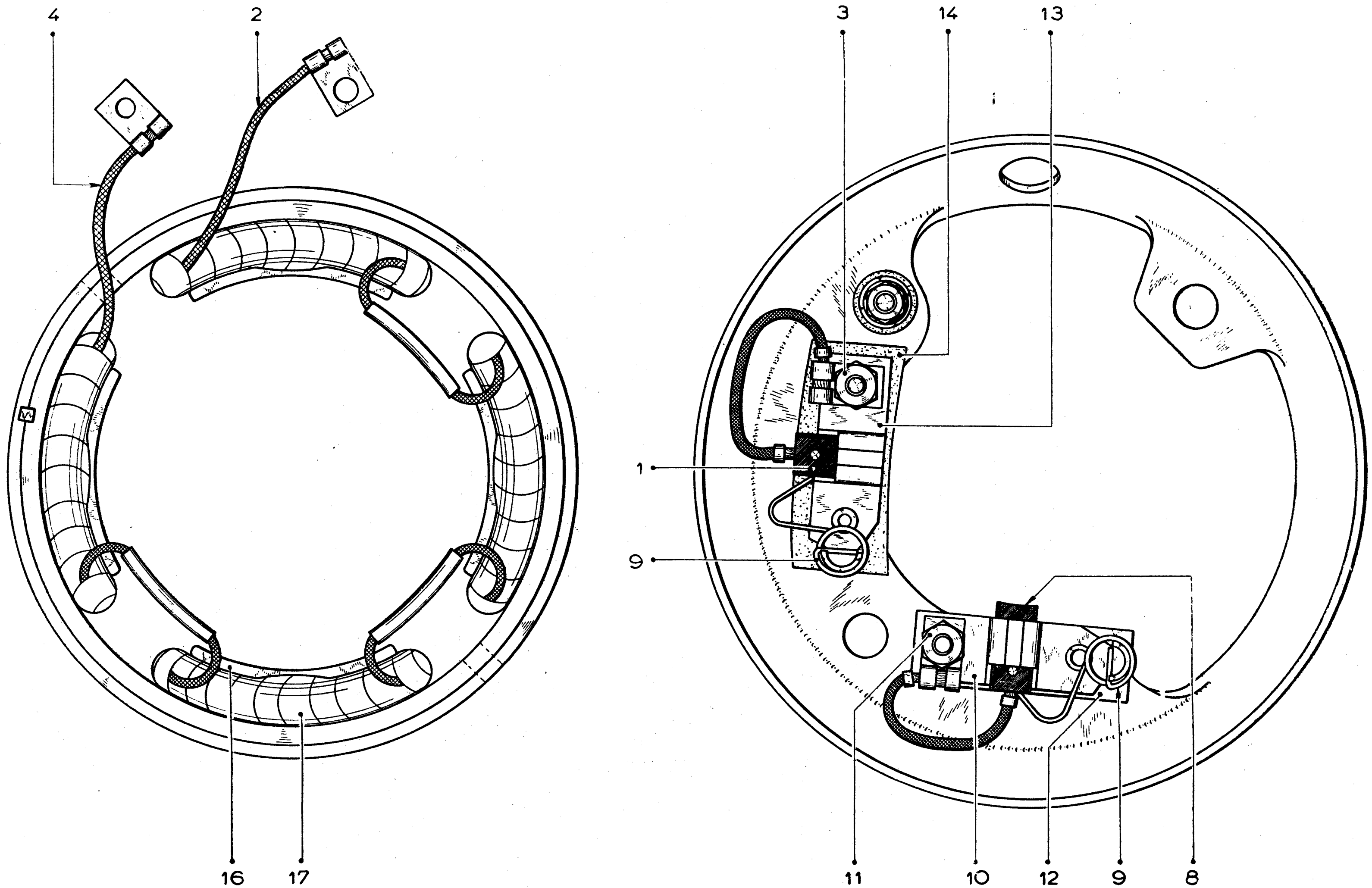
LONGITUDINAL SECTION



ELECTRICAL

DYNAMO, PARIS RHONE G 11 R 60

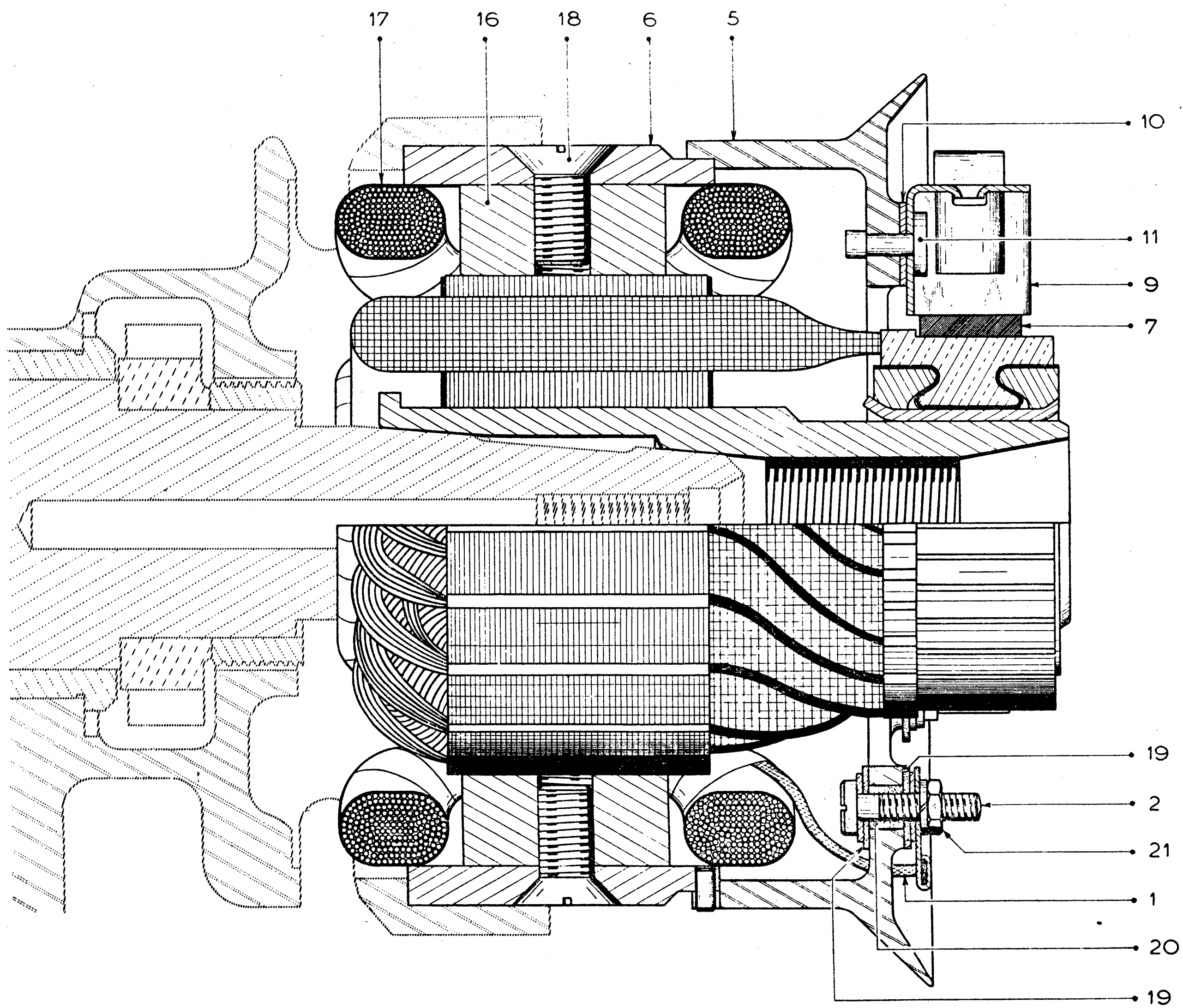
END VIEWS



ELECTRICAL

DYNAMO, DUCELLIER 7060 A

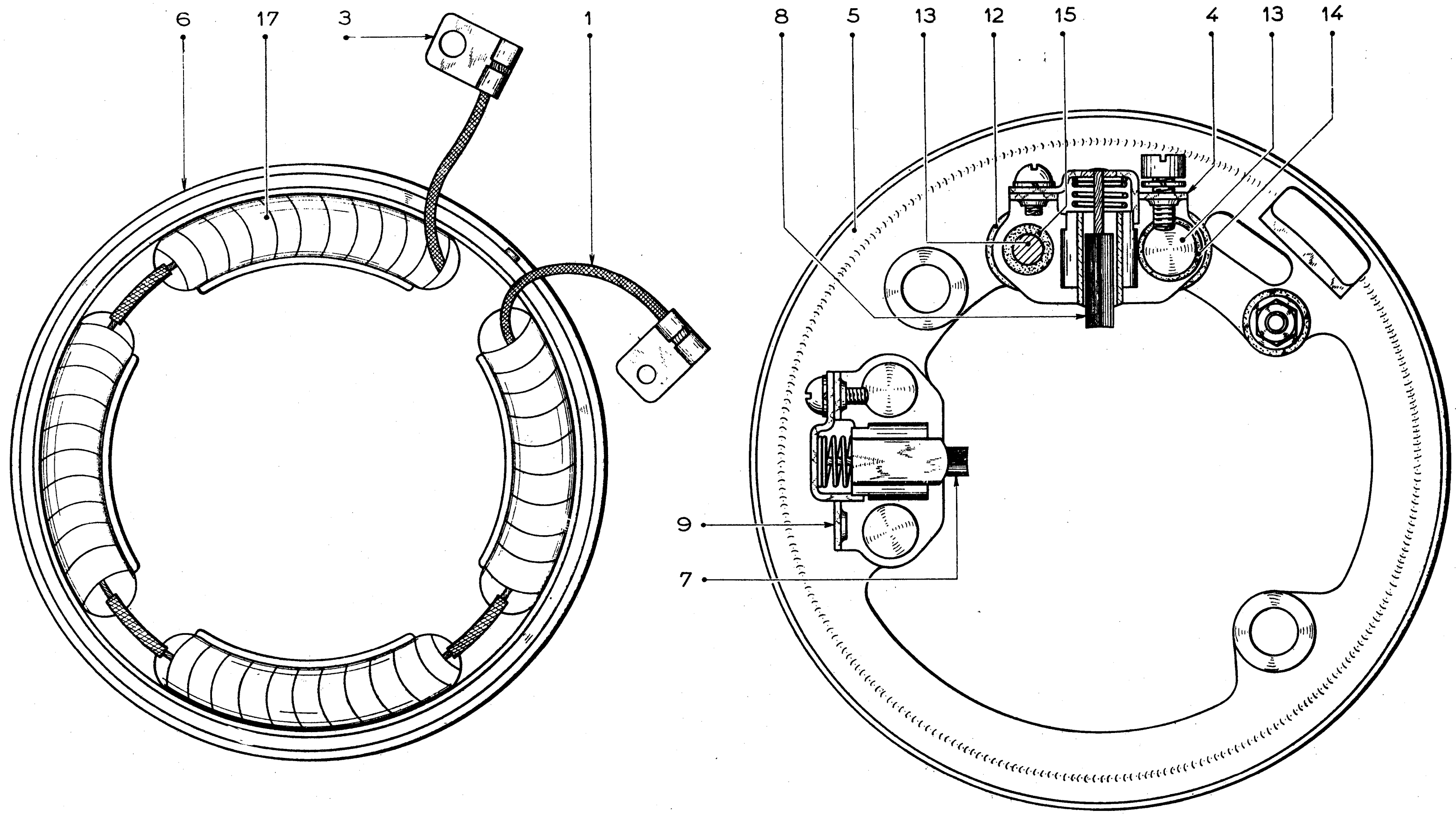
LONGITUDINAL SECTION



ELECTRICAL

DYNAMO, DUCELLIER 7060 A

END VIEWS



ELECTRICAL

DRILLING THE CRANKCASE FOR FITTING THE VARIOUS DYNAMOS

Fig. 1

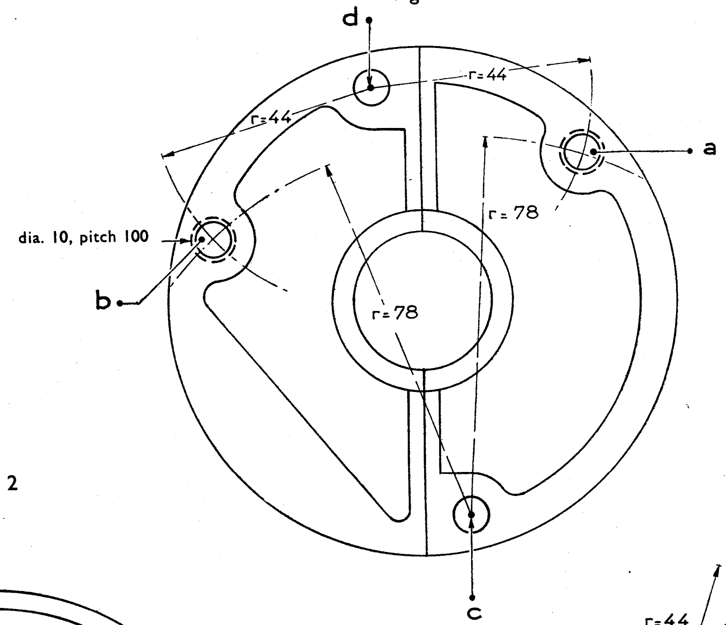


Fig. 2

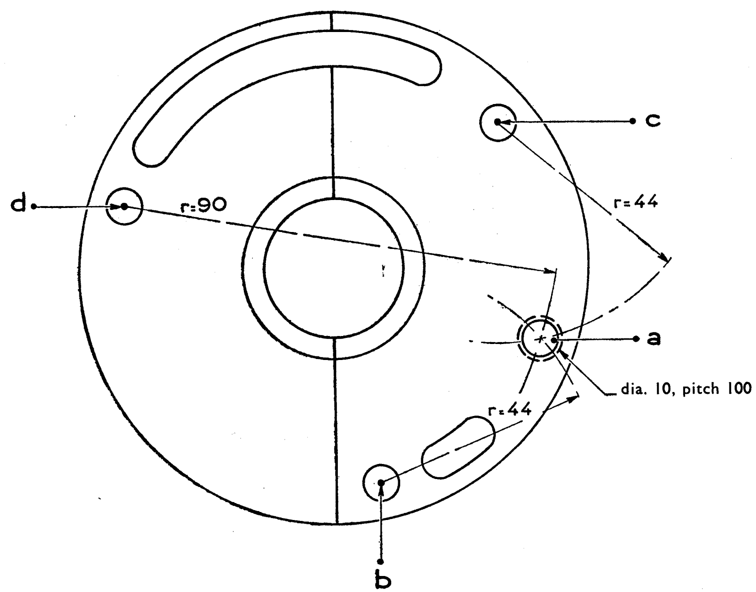
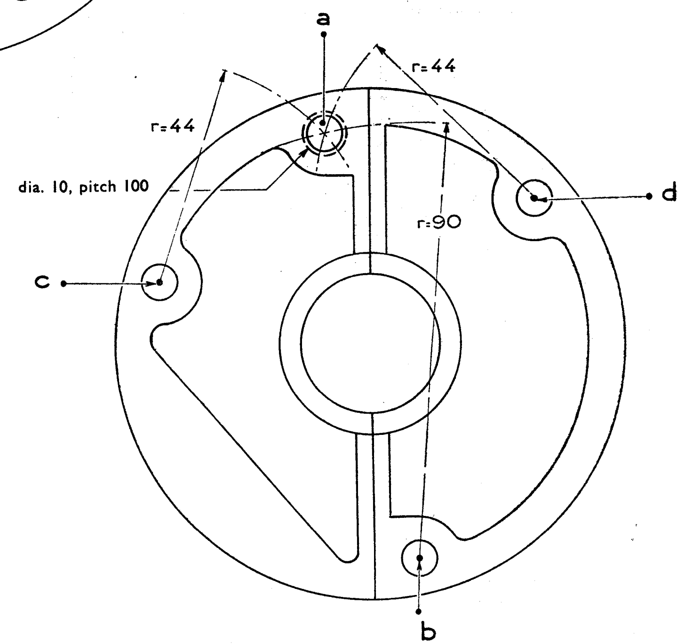


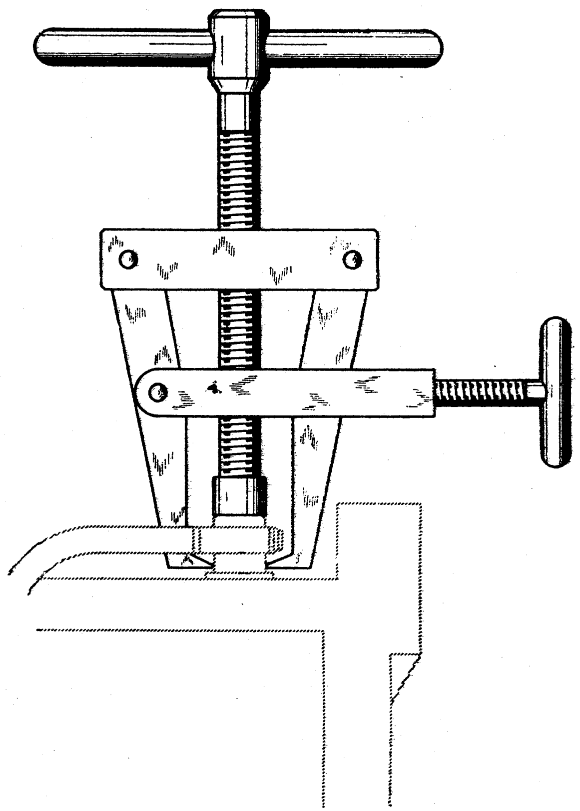
Fig. 3



ELECTRICAL

VARIOUS TOOLS

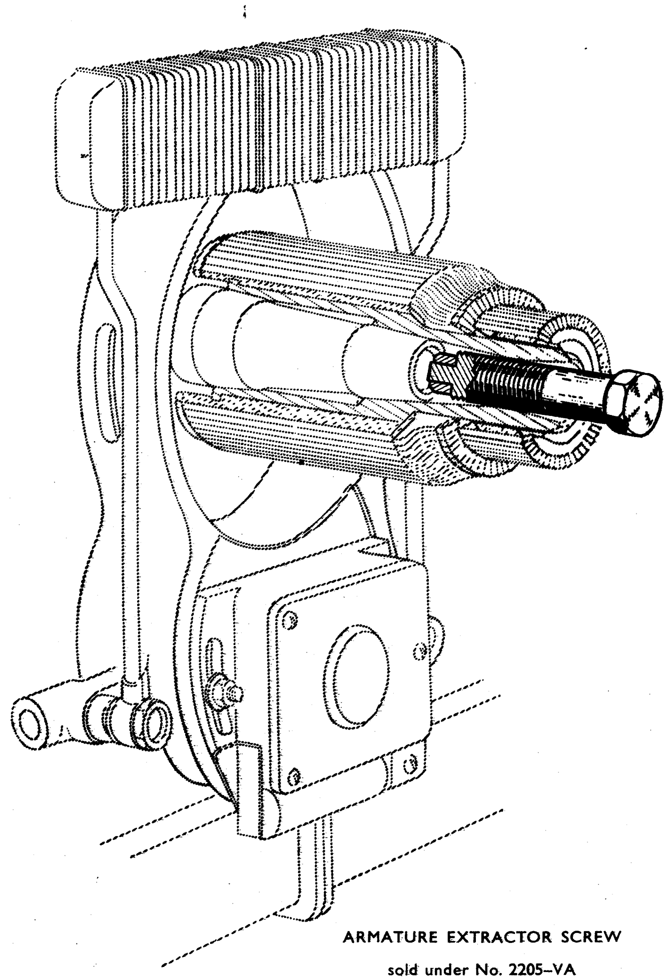
Fig. 1 BATTERY TERMINAL EXTRACTOR



EXTRACTOR

sold under No. 2200–T

Fig. 2 REMOVAL OF THE ARMATURE



ARMATURE EXTRACTOR SCREW

sold under No. 2205–VA

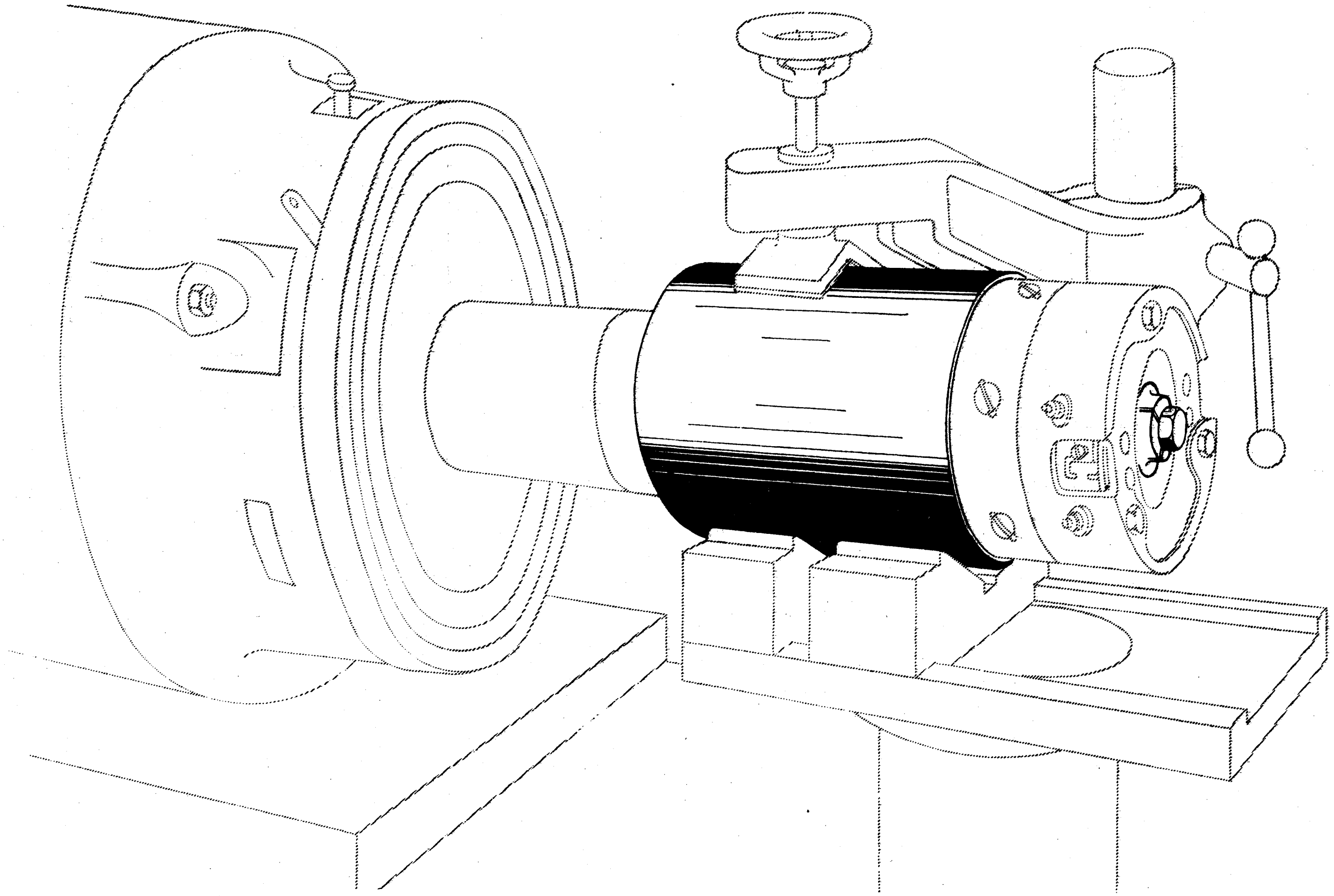
ELECTRICAL

BENCH TEST

SUPPORT FOR DYNAMO ON TEST

sold under No. 2207–VA

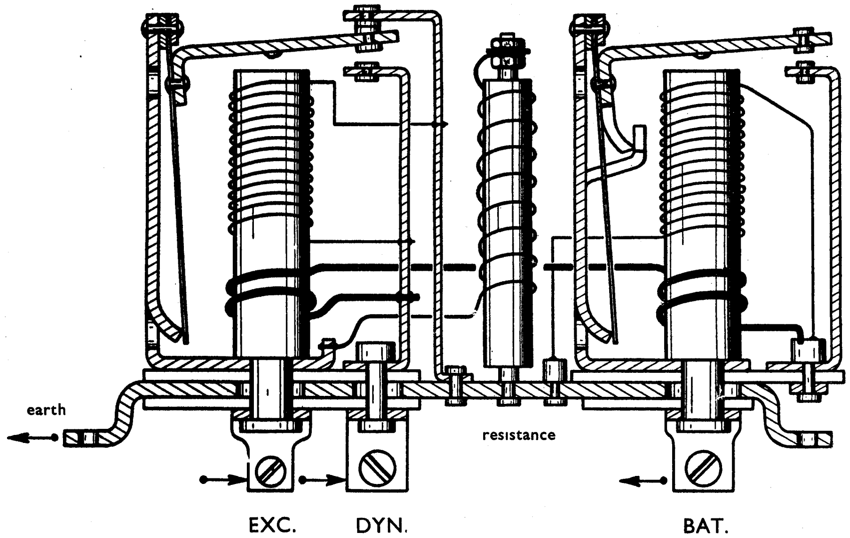
THIS SUPPORT HOLDS AND POSITIONS THE BODY AND THE ARMATURE OF THE DYNAMO TO BE TESTED. THE BRUSH HOLDER COVER PLATE IS HELD BY THE 3 SCREWS SECURING THE DYNAMO TO THE ENGINE.
THE SUPPORT IS FOR USE ON STANDARD TEST BENCHES AS USED BY ELECTRICAL REPAIRERS



ELECTRICAL

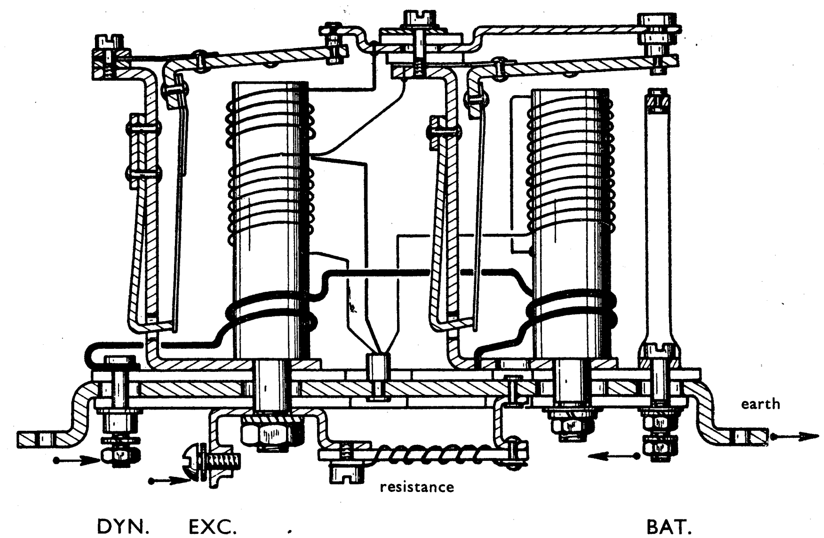
REGULATORS — DIAGRAMS

Fig. 1 DUCELLIER REGULATOR



TWO STAGE REGULATION

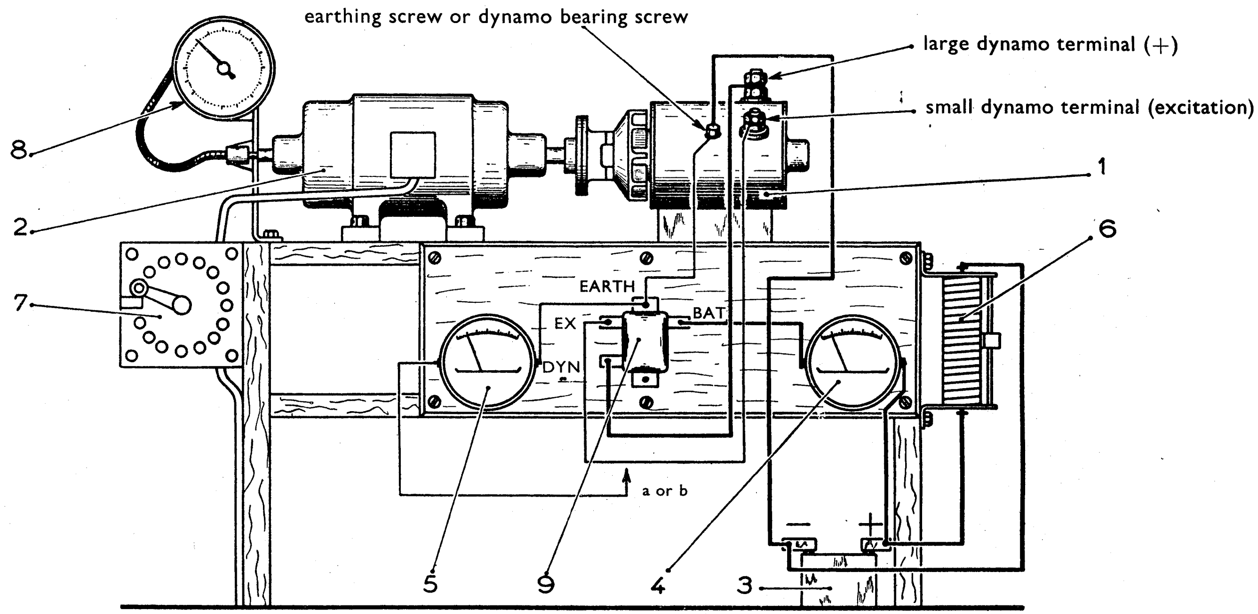
Fig. 2 S.N.A. REGULATOR



SINGLE STAGE REGULATION

ELECTRICAL

REGULATOR TEST



1 CITROEN 6 V DYNAMO WITH VOLTAGE REGULATION FOR DUCELLIER REGULATOR (FLAT BASE) SP 39.

2 2 CV CITROEN ENGINE DRIVING THE DYANMO AT SPEEDS VARYING FROM 0 to 4,000 r.p.m.

3 6 V BATTERY (PREFERABLY MOTO 15 to 24 A/HR TO PROVIDE RAPID VOLTAGE VARIATION AT THE TERMINALS).

4 AMMETER IN CHARGING CIRCUIT.

5 VOLTMETER (a) CONNECTED BETWEEN THE DYN TERMINAL ON THE REGULATOR AND EARTH TO RECORD MAKE AND BREAK VOLTAGES.
(b) CONNECTED BETWEEN BAT TERMINAL ON REGULATOR AND EARTH TO CHECK THE REGULATION.

6 VARIABLE RESISTANCE 0·2 to 8 OHMS.

7 MOTOR RHEOSTAT.

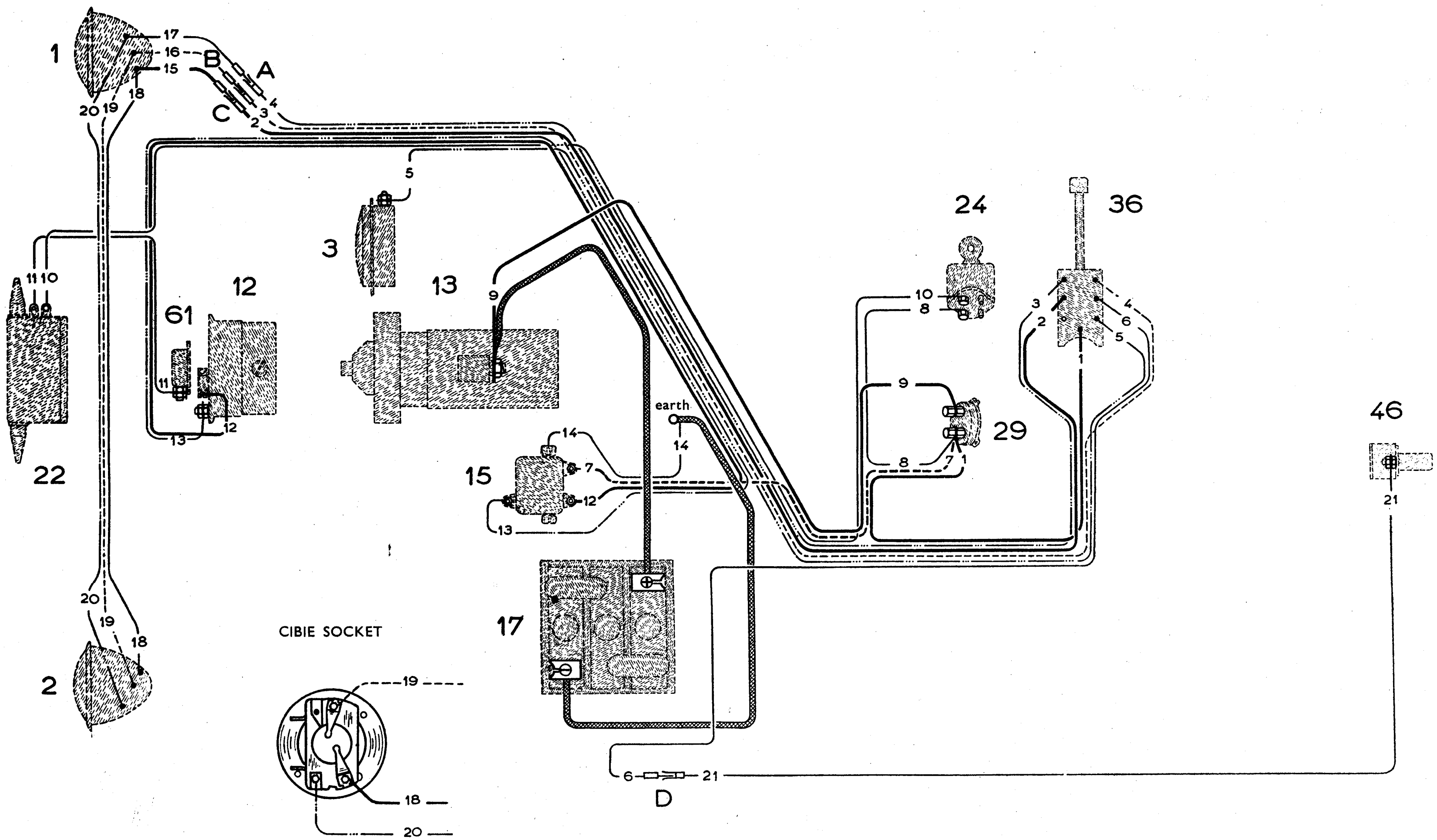
8 TACHOMETER.

9 REGULATOR TO BE TESTED (EARTHING TO BE PROVIDED BY A CABLE BETWEEN DYNAMO AND REGULATOR).
VERY IMPORTANT – THE CABLES MUST BE OF THE SAME CROSS SECTION AND LENGTH AS THOSE ON THE CAR AND IN PARTICULAR THE RESISTANCE OF THE REGULATOR TO BATTERY LINE MUST BE 0·03 OHMS.

ELECTRICAL

WIRING DIAGRAM A

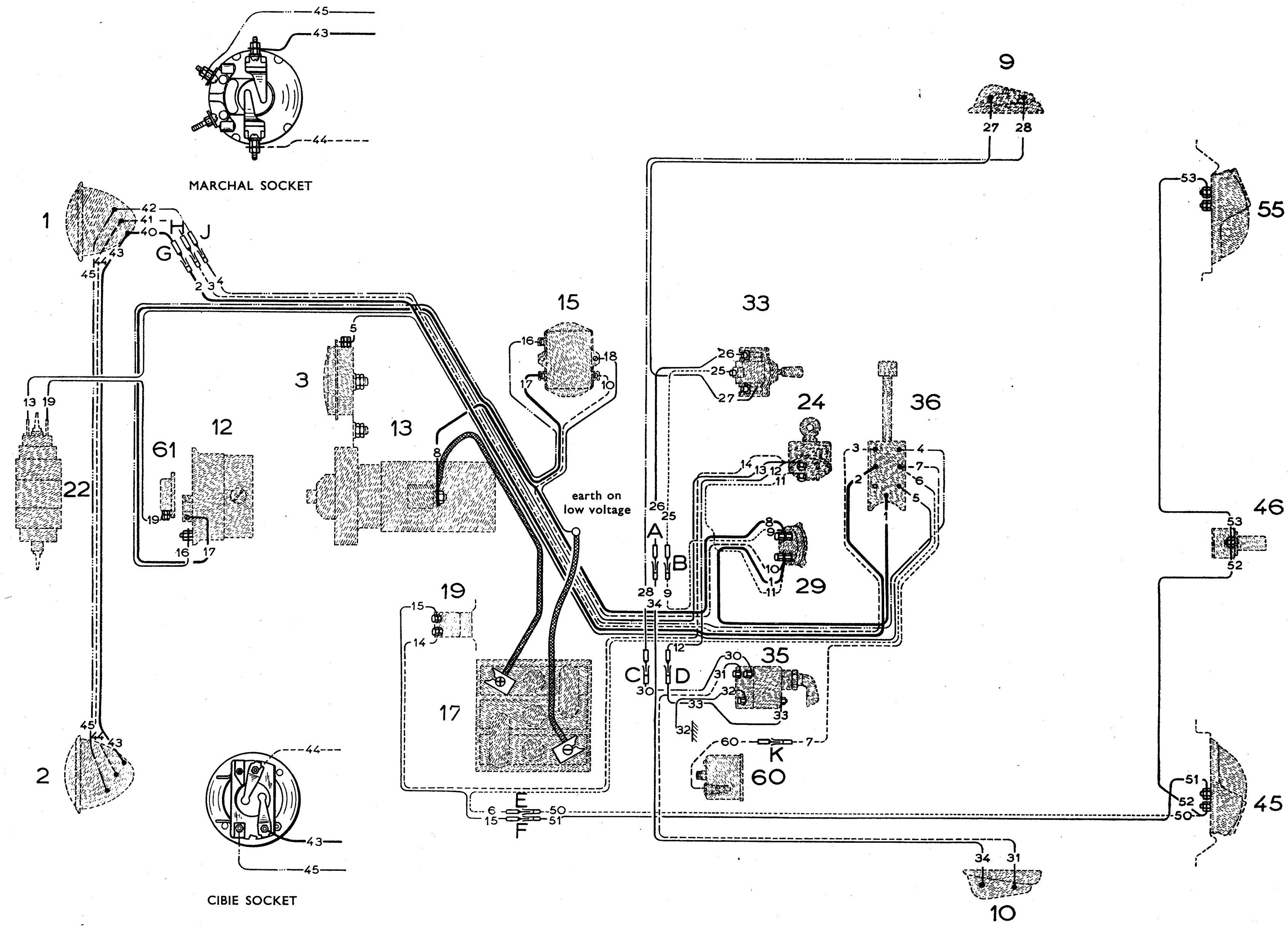
PRIOR TO JANUARY 1955



ELECTRICAL

WIRING DIAGRAM AZ

SINCE JANUARY 1955



ELECTRICAL

FITTING THE COILS AND POLE PIECES

Fig. 1 POSITIONING THE COILS

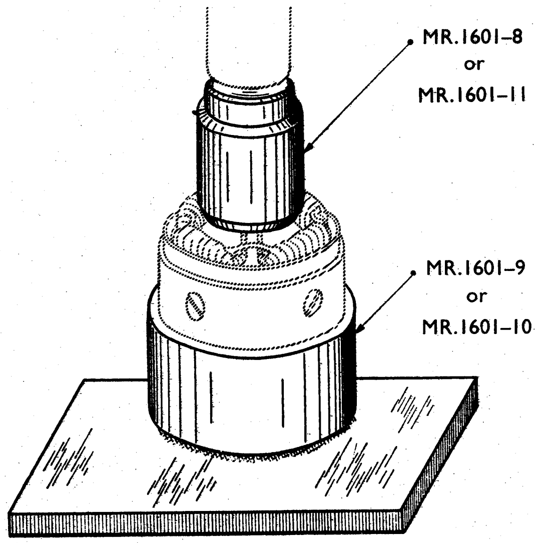
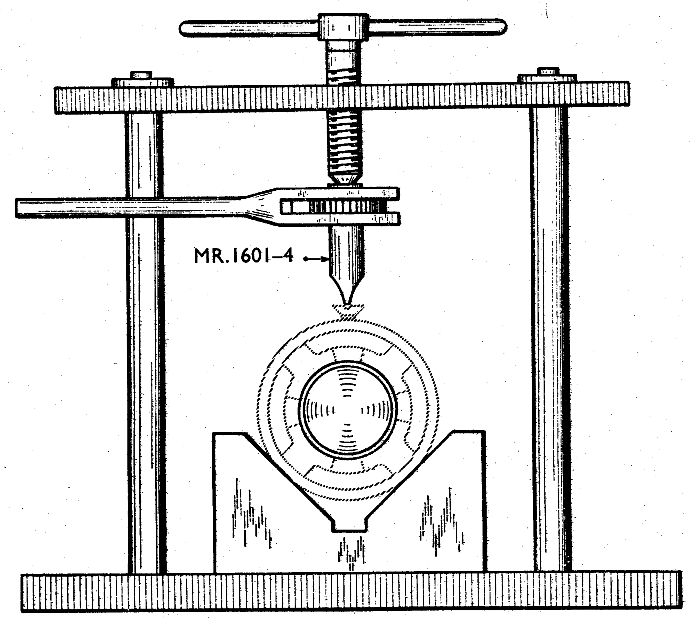


Fig. 2 FITTING THE POLE PIECES



STARTER	A	B	C
DUCELLIER	Ø=45	Ø=50	Ø=54,25 ± 0,05
PARIS RHONE	Ø=45	Ø=53	Ø=56,60±0,05

DYNAMO	A	B	C
CITROEN	Ø=60	Ø=65	Ø=71,75 ± 0,05
DUCELLIER	Ø=61	Ø=66	Ø=73 ± 0,05
PARIS RHONE	Ø=65	Ø=70	Ø=76,7 ± 0,05

FOR STARTERS

MR.1601-11
case hardened and tempered mild steel

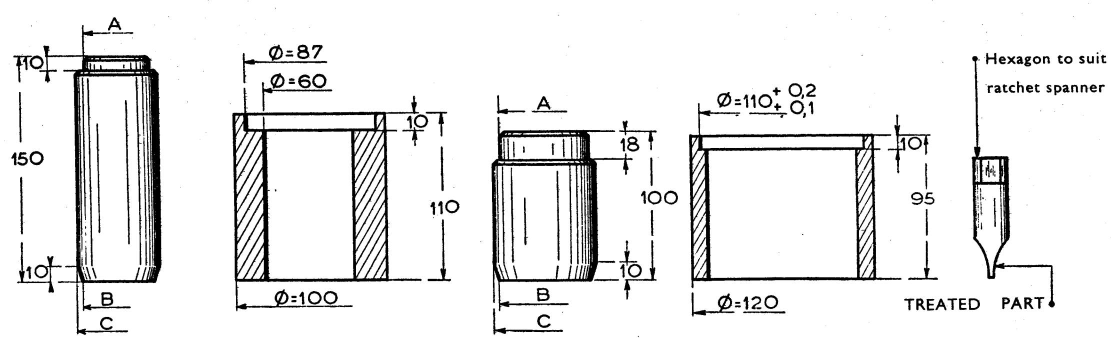
MR.1601-10
mild steel or cast iron

FOR DYNAMOS

MR.1601-8
case hardened and tempered mild steel

MR.1601-9
mild steel or cast iron

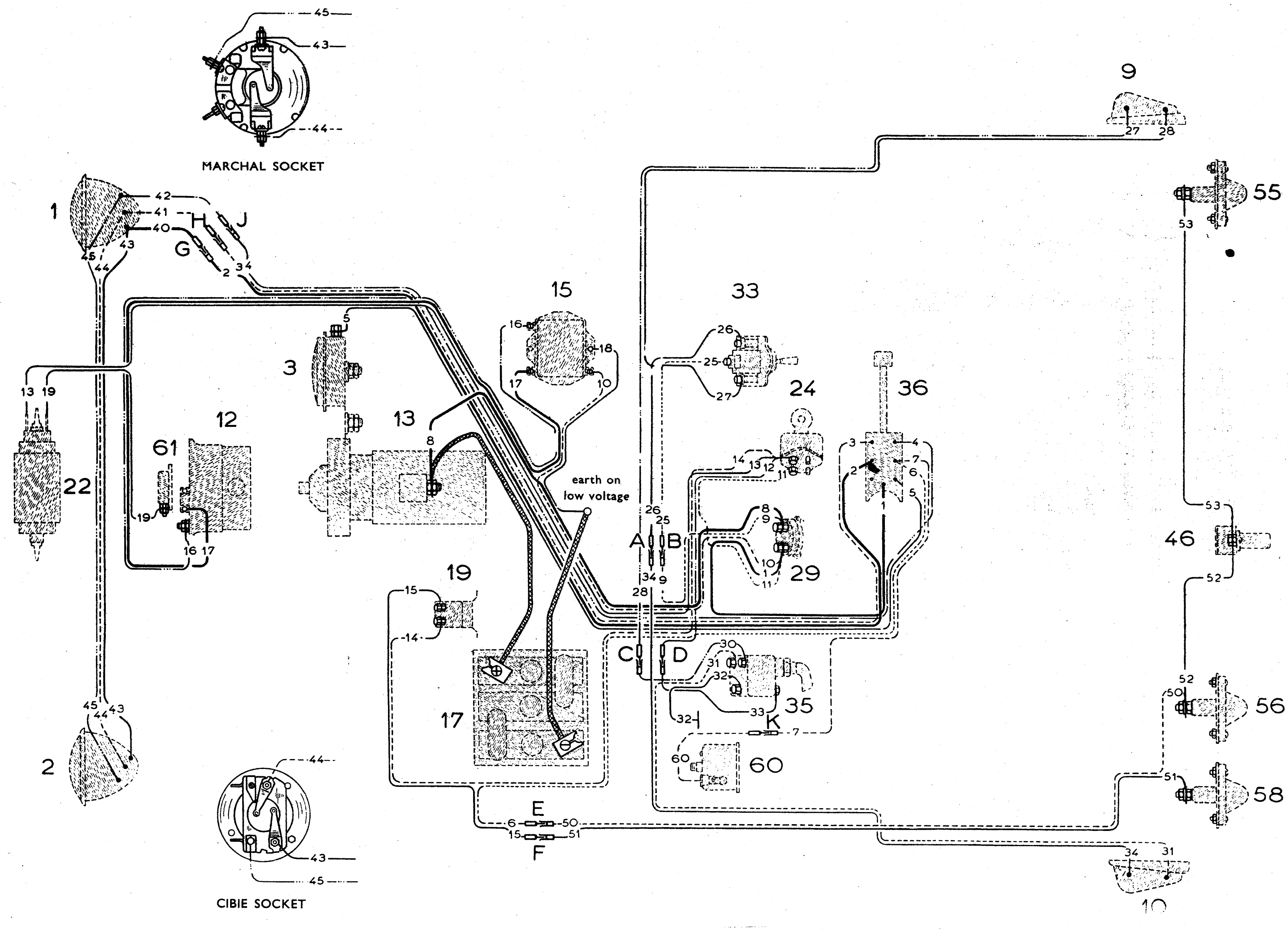
MR.1601-4



ELECTRICAL

WIRING DIAGRAM AZU

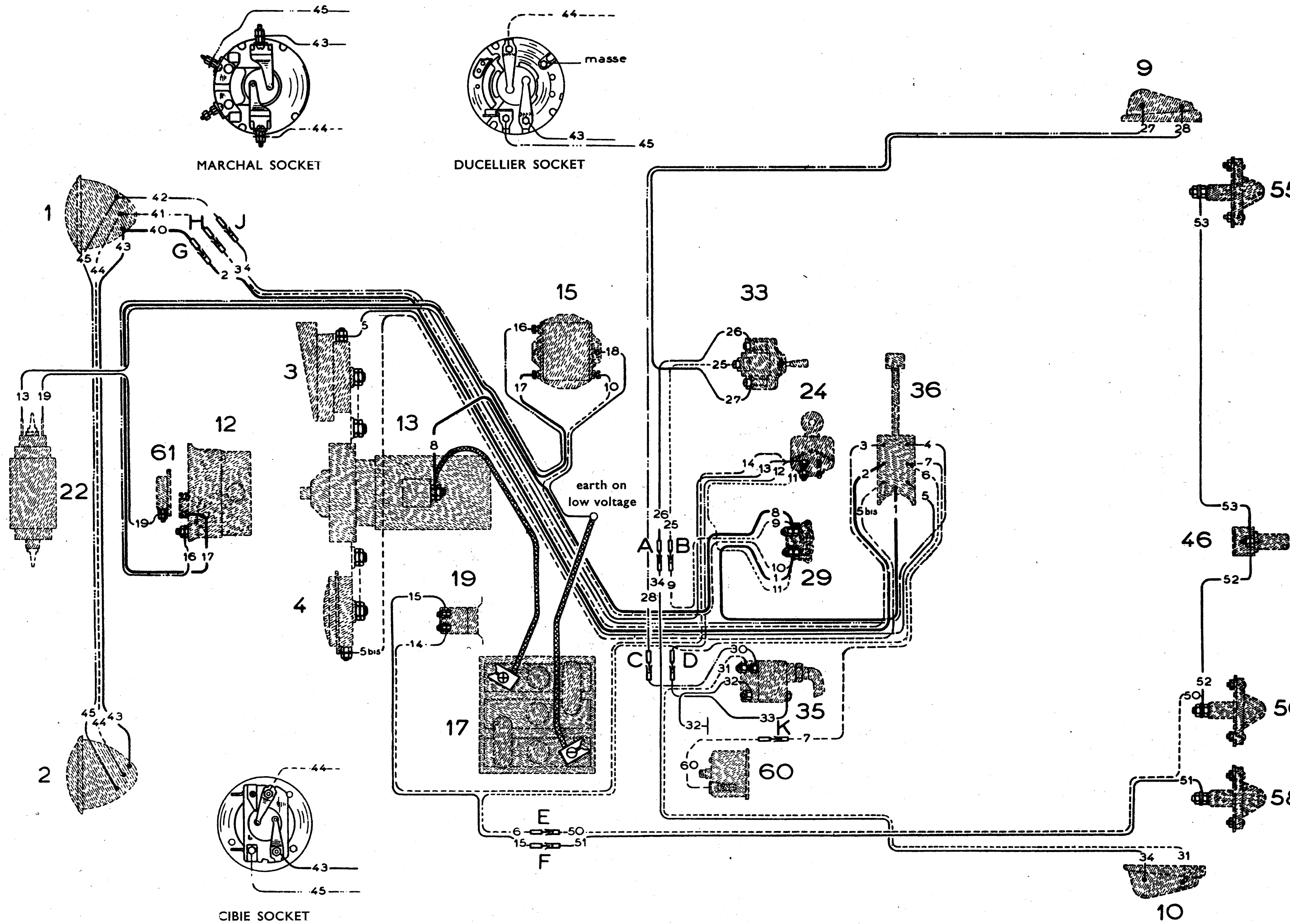
SINCE JANUARY 1955



ELECTRICAL

WIRING DIAGRAM AZU

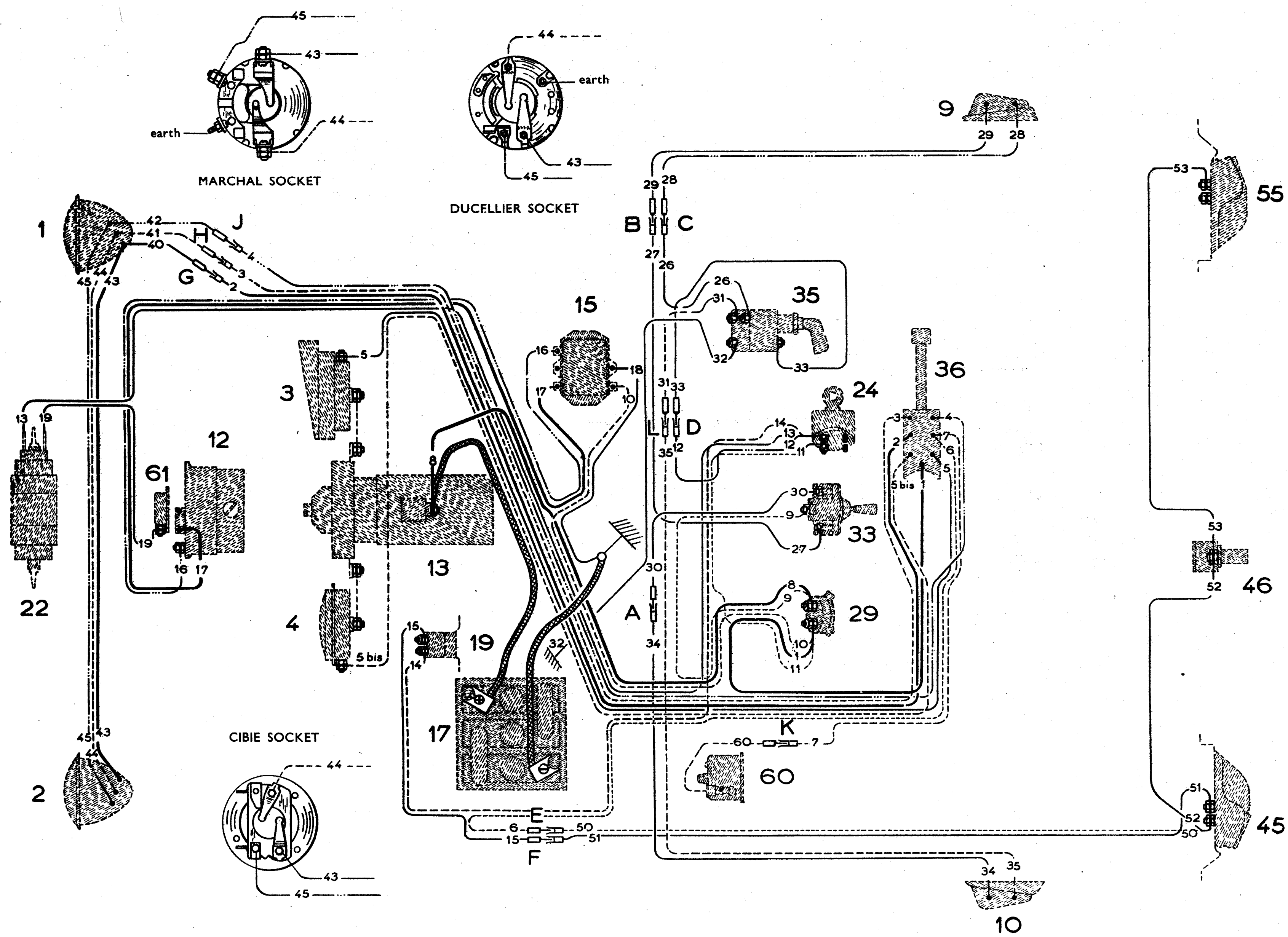
SINCE JANUARY 1957



ELECTRICAL

WIRING DIAGRAM AZL

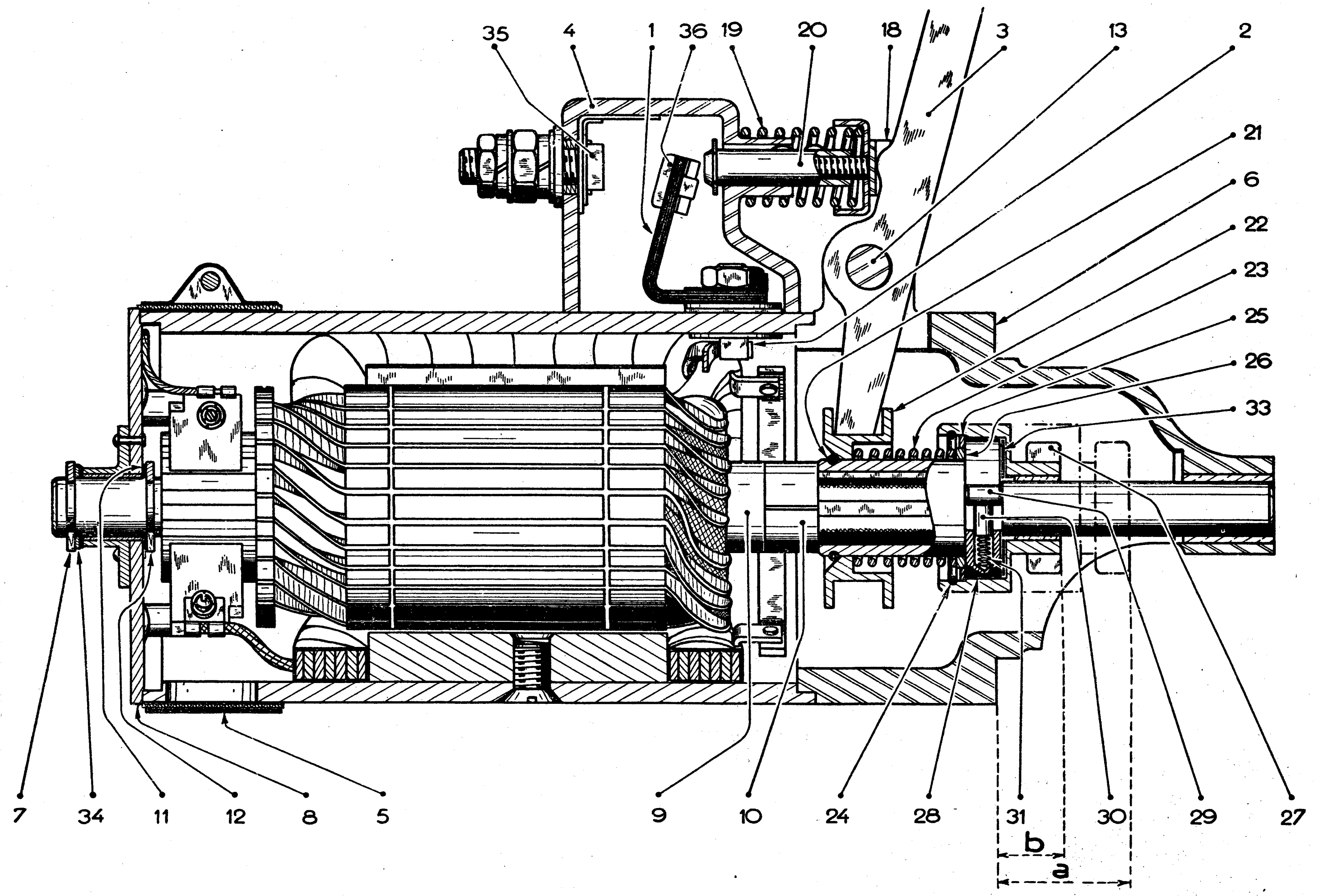
SINCE JANUARY 1957



ELECTRICAL EQUIPMENT

DUCELLIER STARTER

LONGITUDINAL SECTION



ELECTRICAL EQUIPMENT

DUCELLIER STARTER

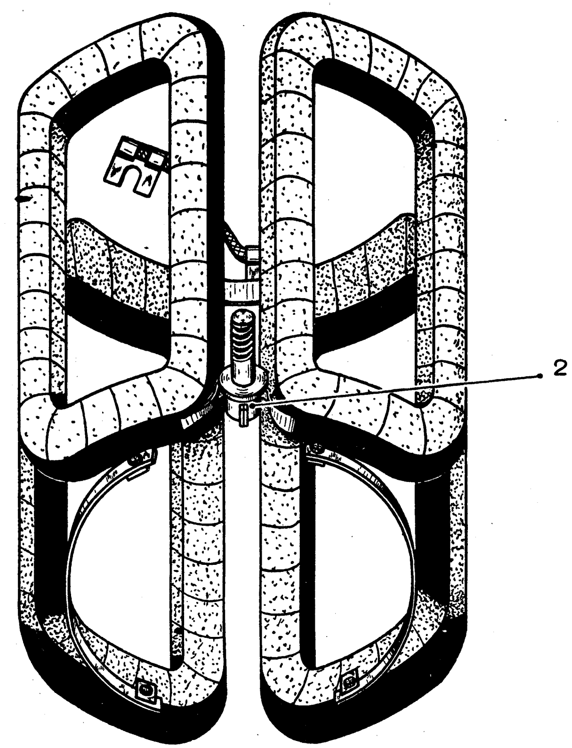


Fig. 1 INDUCTION COIL ASSEMBLY

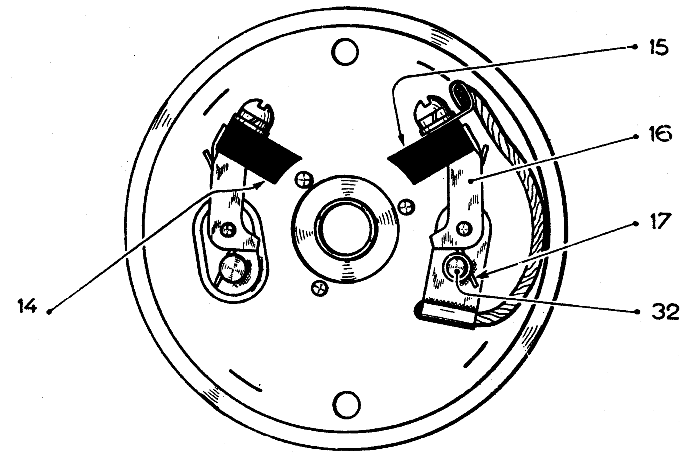
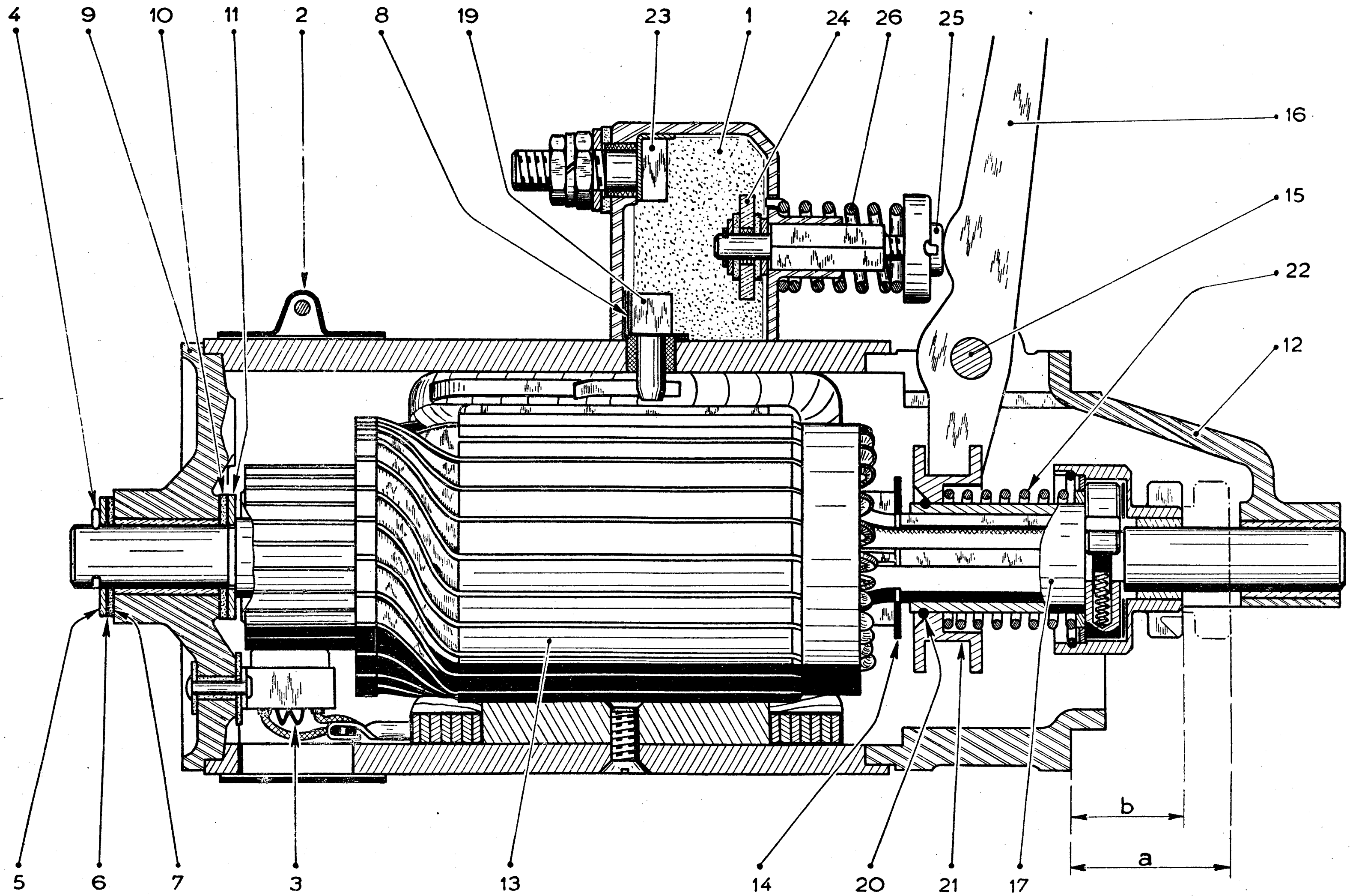


Fig. 2 BRUSH ASSEMBLY

ELECTRICAL

PARIS-RHONE STARTER

LONGITUDINAL SECTION



ELECTRICAL

PARIS-RHONE STARTER

Fig. 1 INDUCTION COIL ASSEMBLY

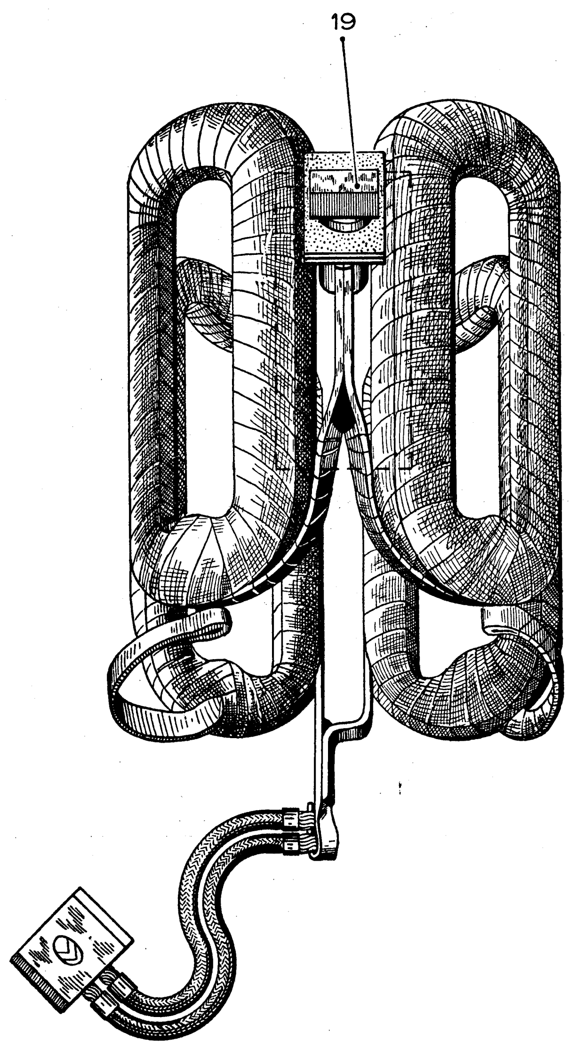
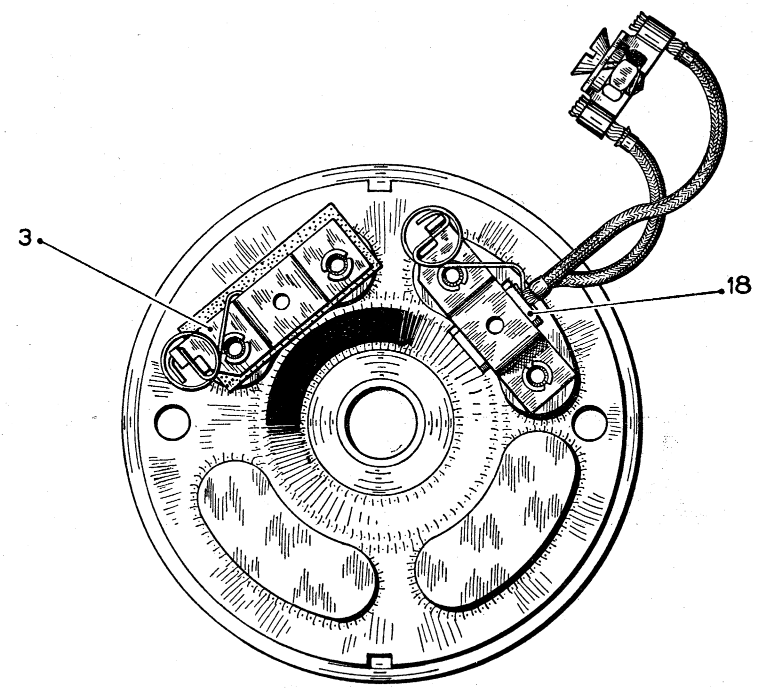
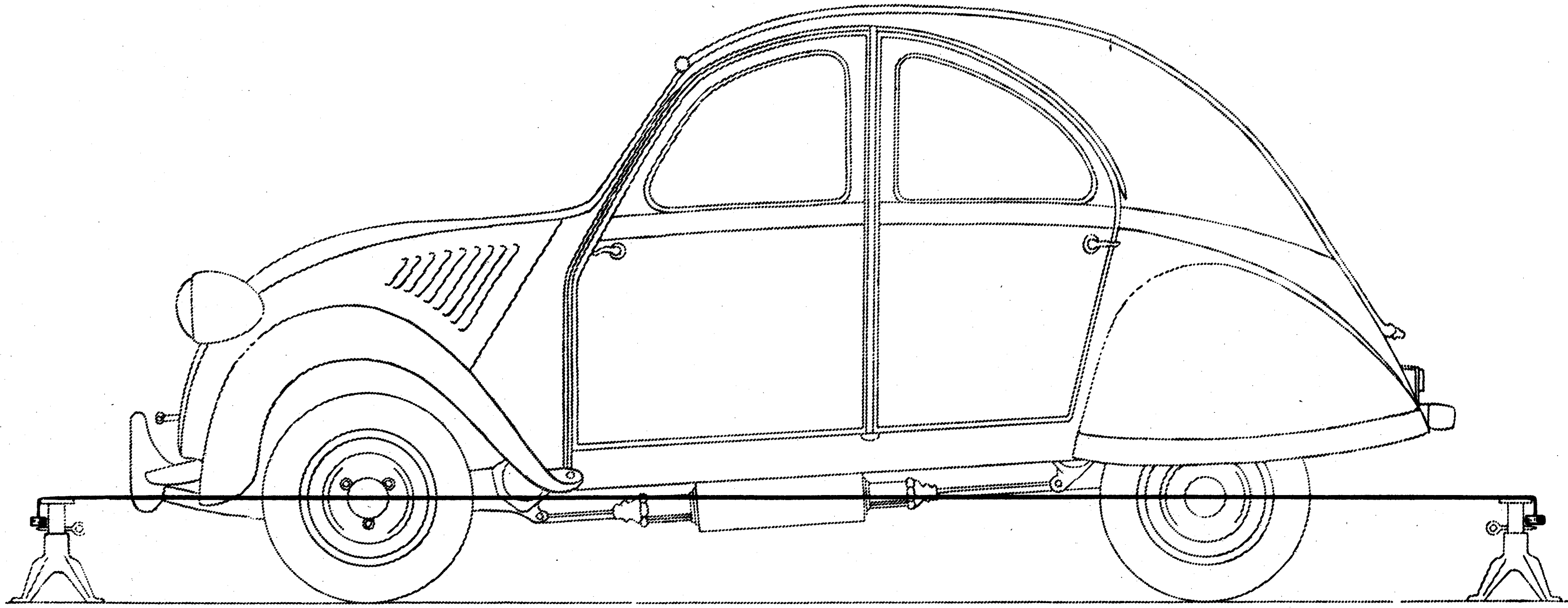


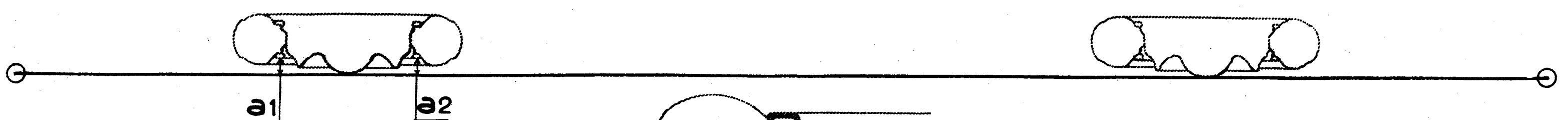
Fig. 2 BRUSH ASSEMBLY

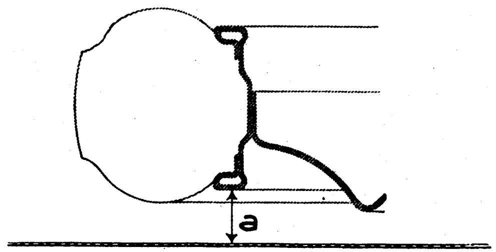


CHECKING CASTER AND CAMBER ANGLE OF PIVOTS

ALIGNMENT OF FRONT AND REAR WHEELS



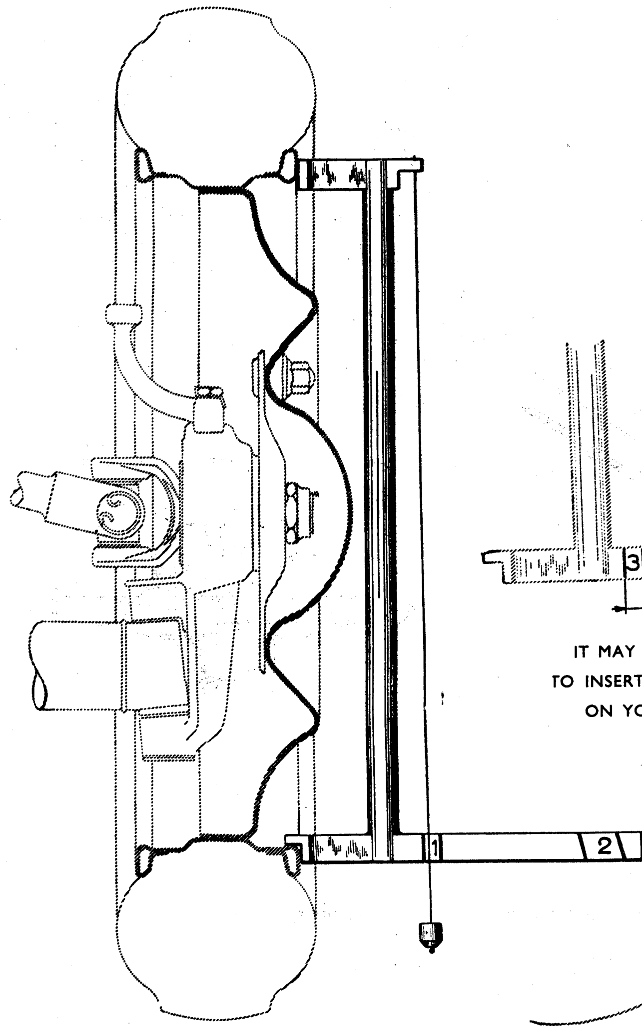




ADJUSTMENTS

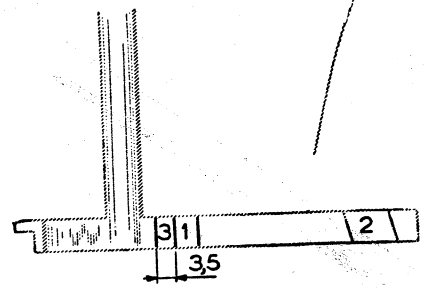
CHECKING CASTER AND CAMBER ANGLE OF PIVOT

Fig. 1 FIRST CHECK



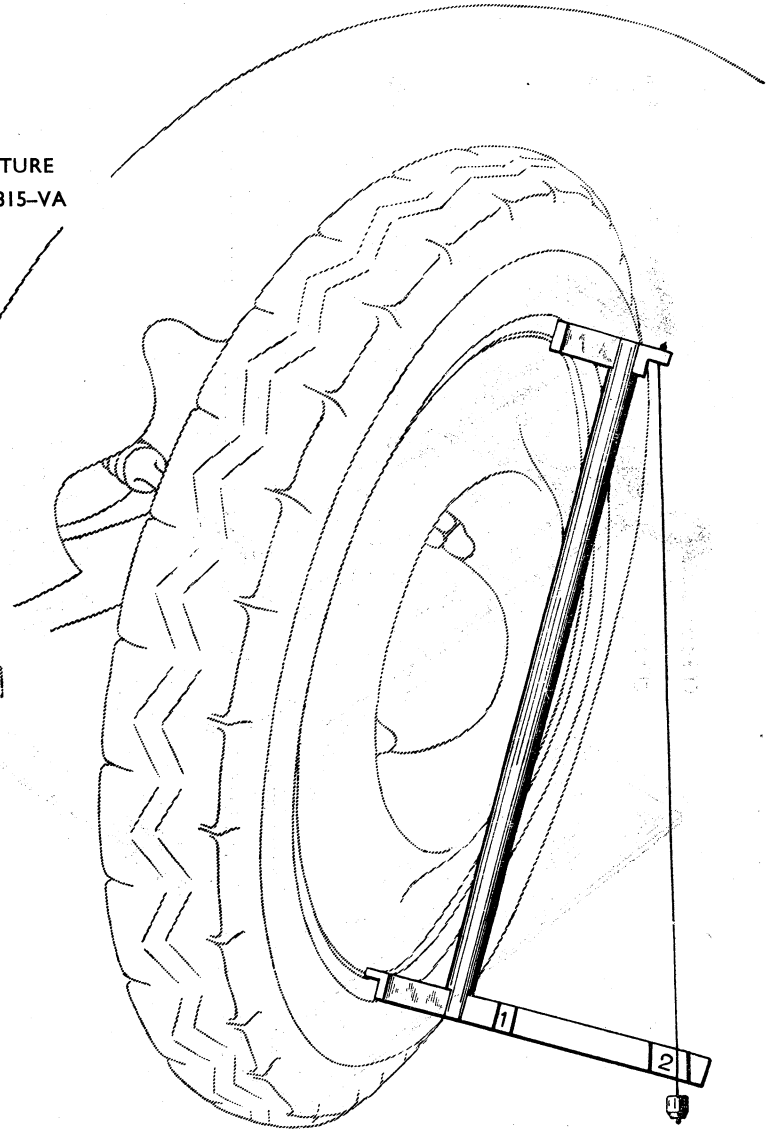
CHECKING FIXTURE
sold under No. 2315–VA

Fig. 3



IT MAY BE NECESSARY
TO INSERT GRADUATION 3
ON YOUR FIXTURE.

Fig. 2 SECOND CHECK



ADJUSTMENTS

CHECKING THE POSITION OF THE ARMS

Fig. 1 METHOD OF USE

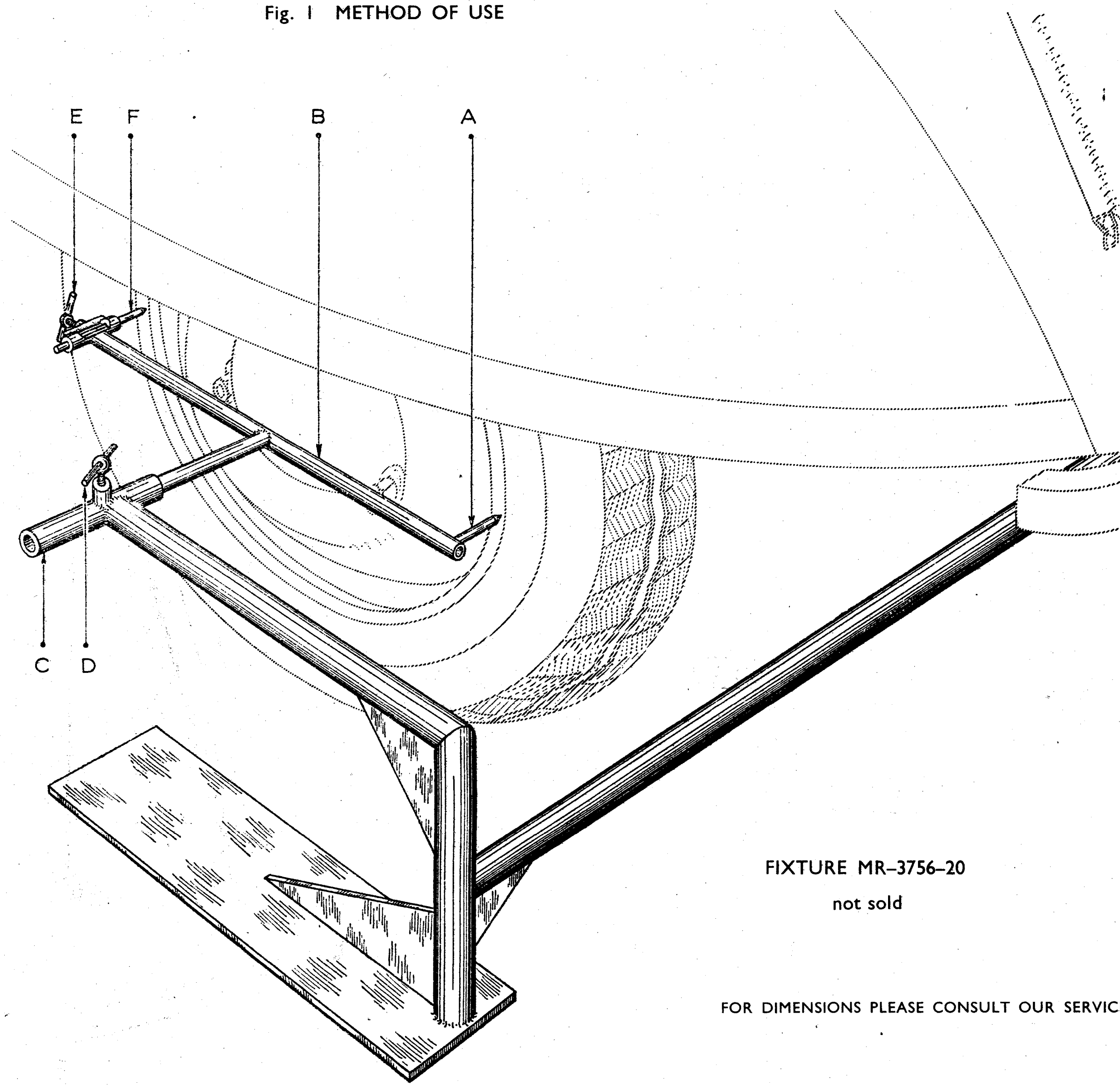
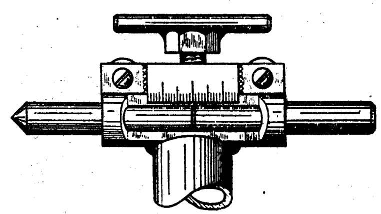


Fig. 2 DETAIL OF THE SCALE



FIXTURE MR-3756-20
not sold

FOR DIMENSIONS PLEASE CONSULT OUR SERVICE DEPARTMENT.

ADJUSTMENTS

CHECKING THE HEIGHTS

Fig. 1 USE OF GAUGE ROD

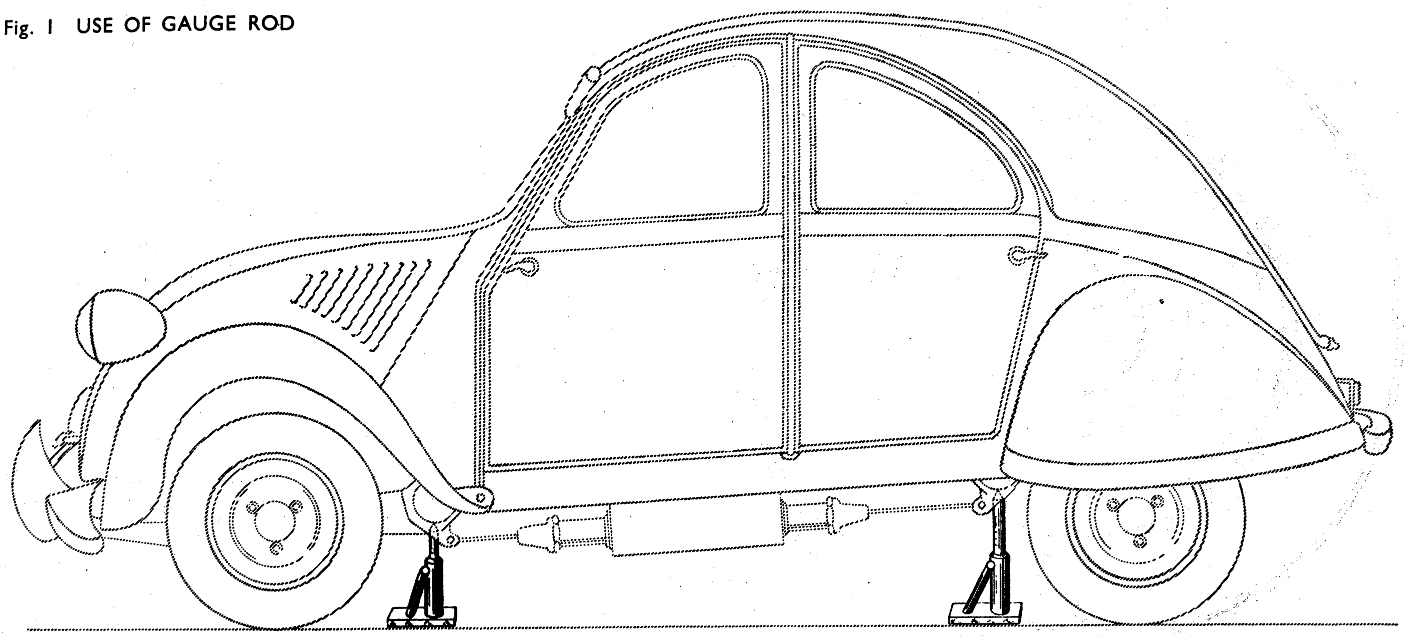
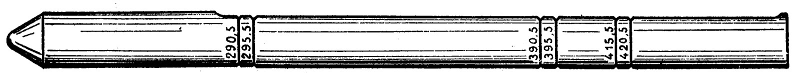


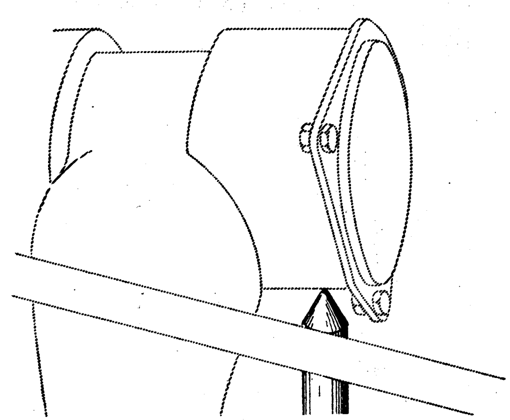
Fig. 3 GAUGE ROD sold under No. 2303–VA

Fig. 4 GAUGE ROD sold under No. 2306–VA



THESE TWO RODS ARE USED TOGETHER WITH ROD 2300–T

Fig. 2 POSITION OF THE GAUGE ROD



ADJUSTMENTS

CHECKING THE WHEELS

Fig. 1 POSITION OF BALANCING COMPOUND

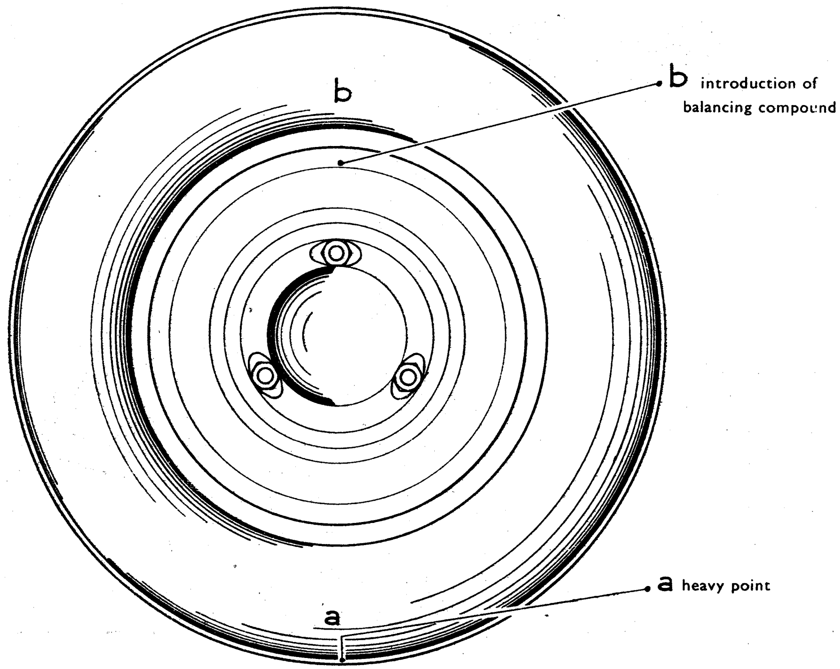


Fig. 2 USE OF FIXTURE MR-3396-10

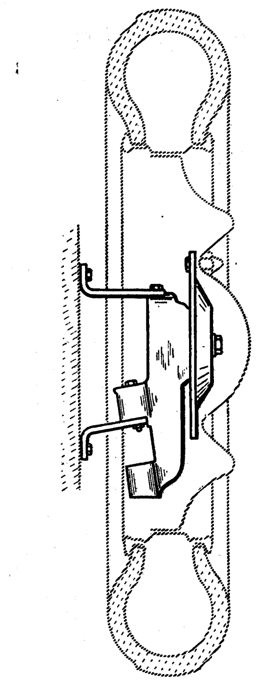


Fig. 3 POSITION OF BALANCE WEIGHTS

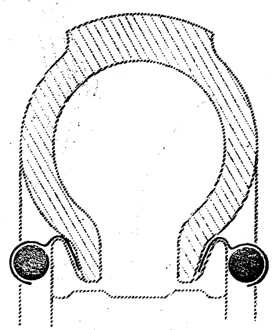
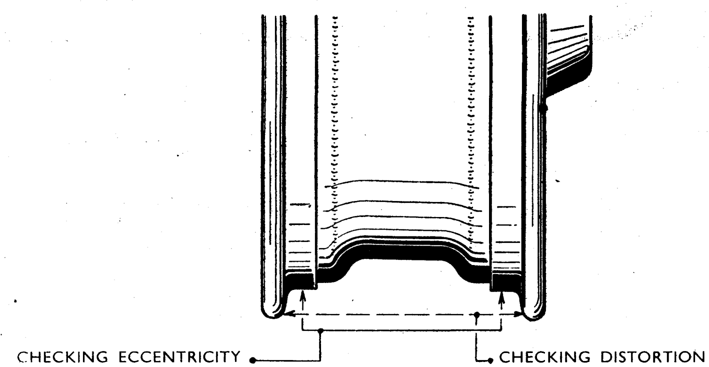


Fig. 4 CHECKING DISTORTION OF RIM



ADJUSTMENTS

CHECKING THE BALANCE OF WHEELS

IMPORTANT NOTE: IN ORDER TO GIVE THE FIXTURE MAXIMUM SENSITIVITY THE BALLRACES SHOULD BE LUBRICATED WITH THIN VASELINE ONLY.
THE FIXTURE MUST BE PERFECTLY BALANCED.

Fig. 1 FIXTURE MR-3396-10
not sold

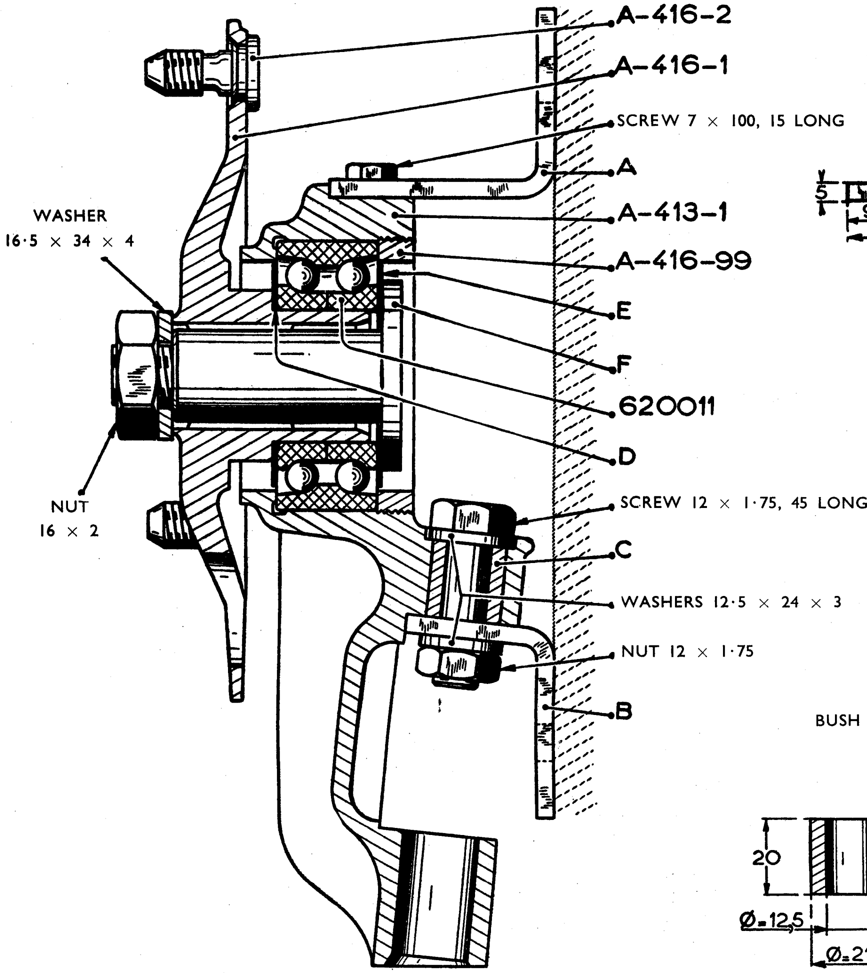


Fig. 2 FIXING BRACKETS

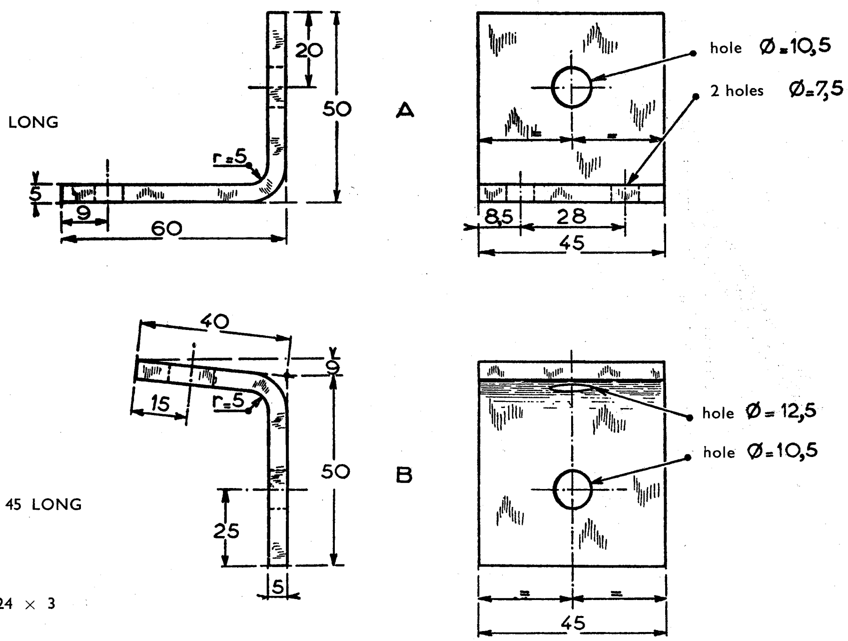
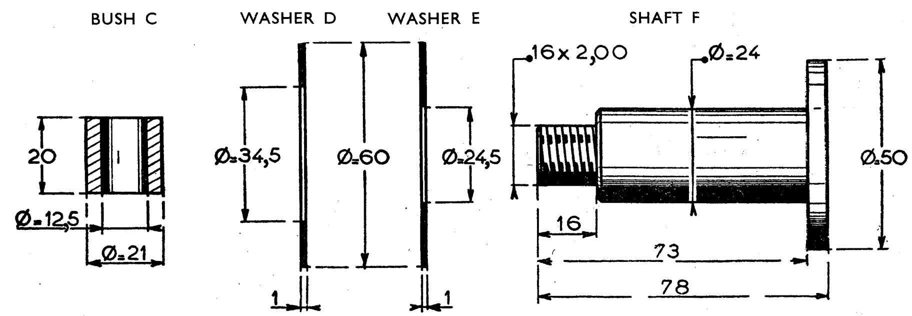


Fig. 3 ASSEMBLY DETAILS



ADJUSTMENTS

ADJUSTING THE HEADLAMPS

Fig. 1 PANEL MR–1572 not sold

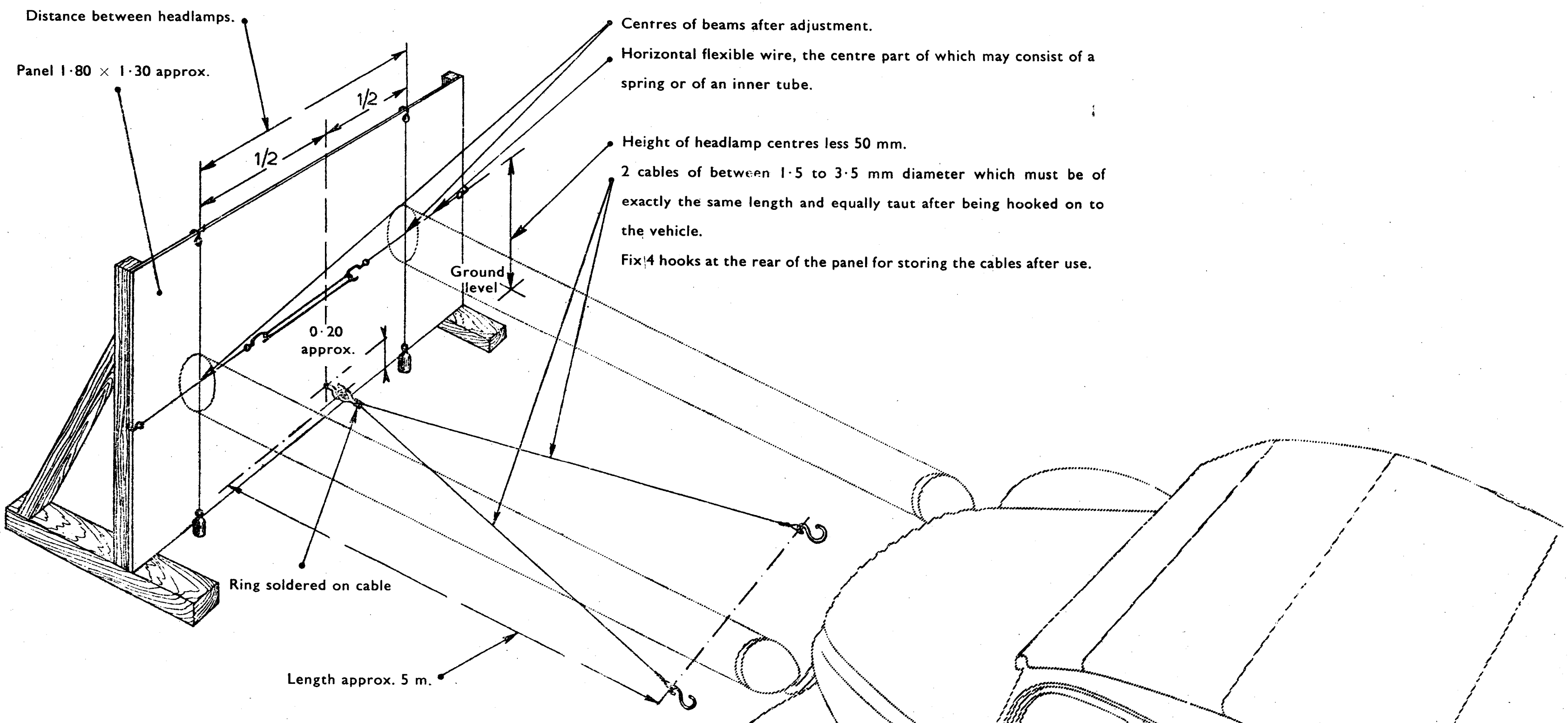
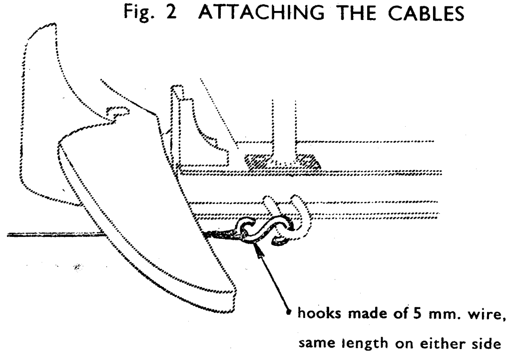
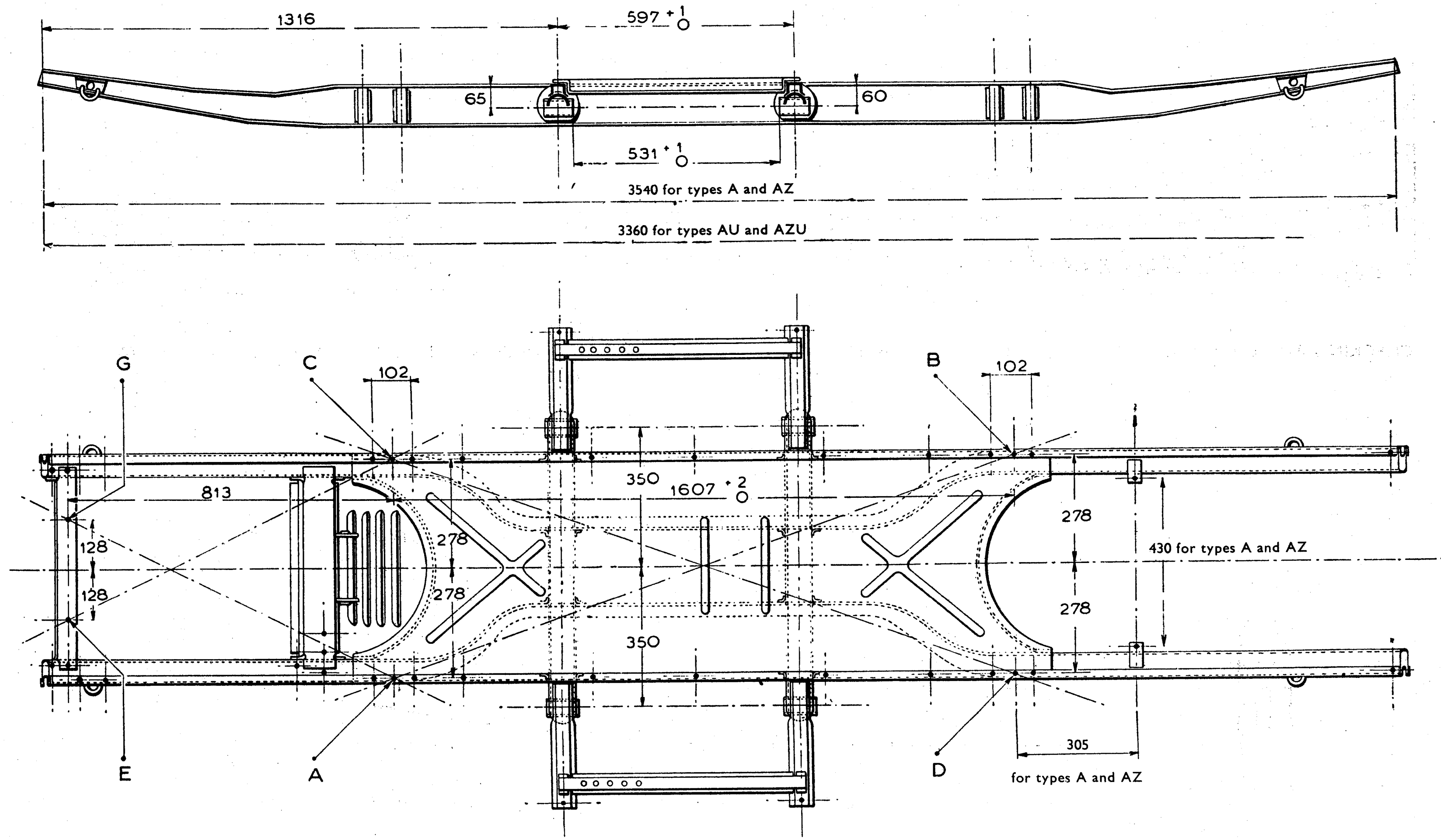


Fig. 2 ATTACHING THE CABLES



CHASSIS

PRINCIPAL DIMENSIONS



CHASSIS

CHECKING THE SIDE MEMBERS

Fig. 1 USE OF TEMPLATE

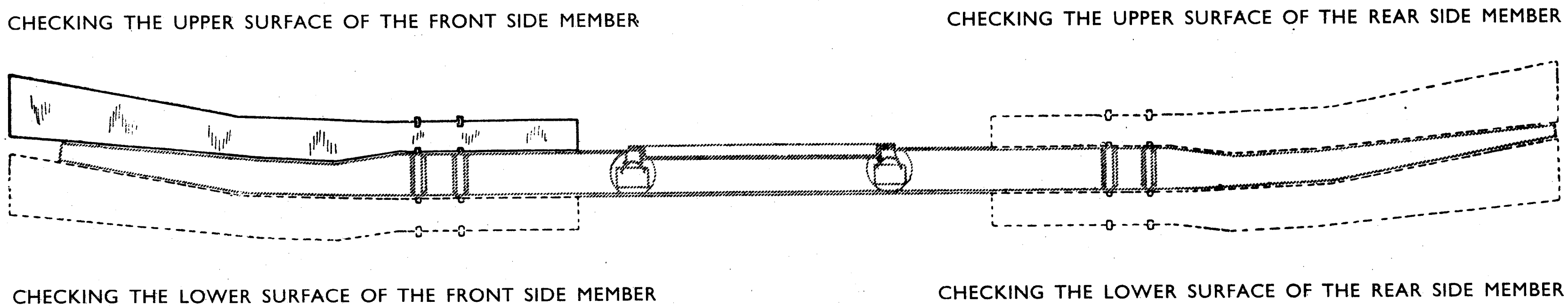
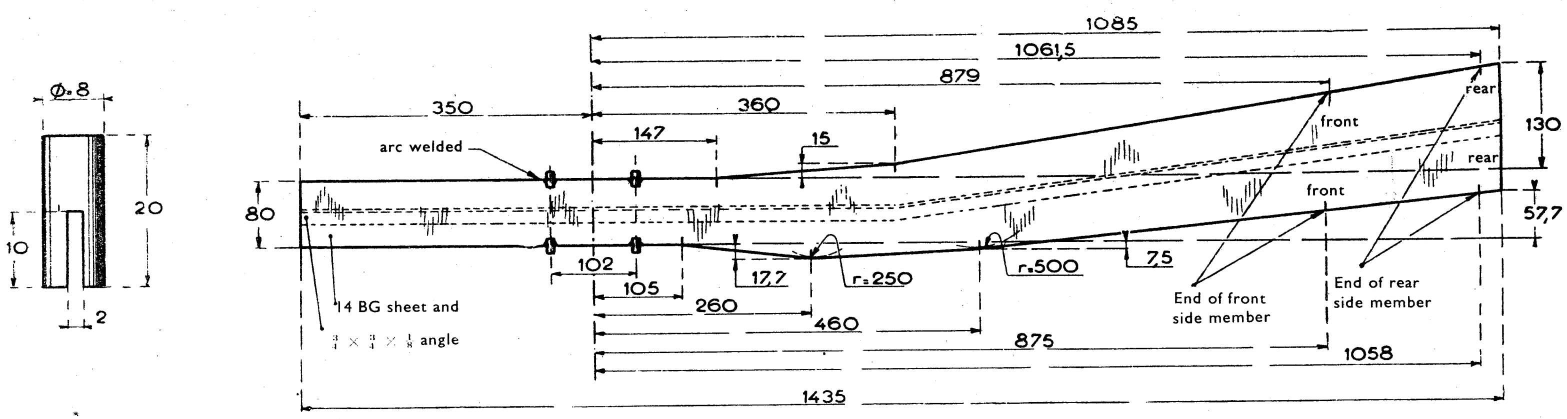


Fig. 2 TEMPLATE MR-3747
not sold



LUBRICATION

LUBRICATION POINTS