Service Instruction Manual

TRIUMPH

Mayflower

1600 ENGINE

SECTION B

ENGINE

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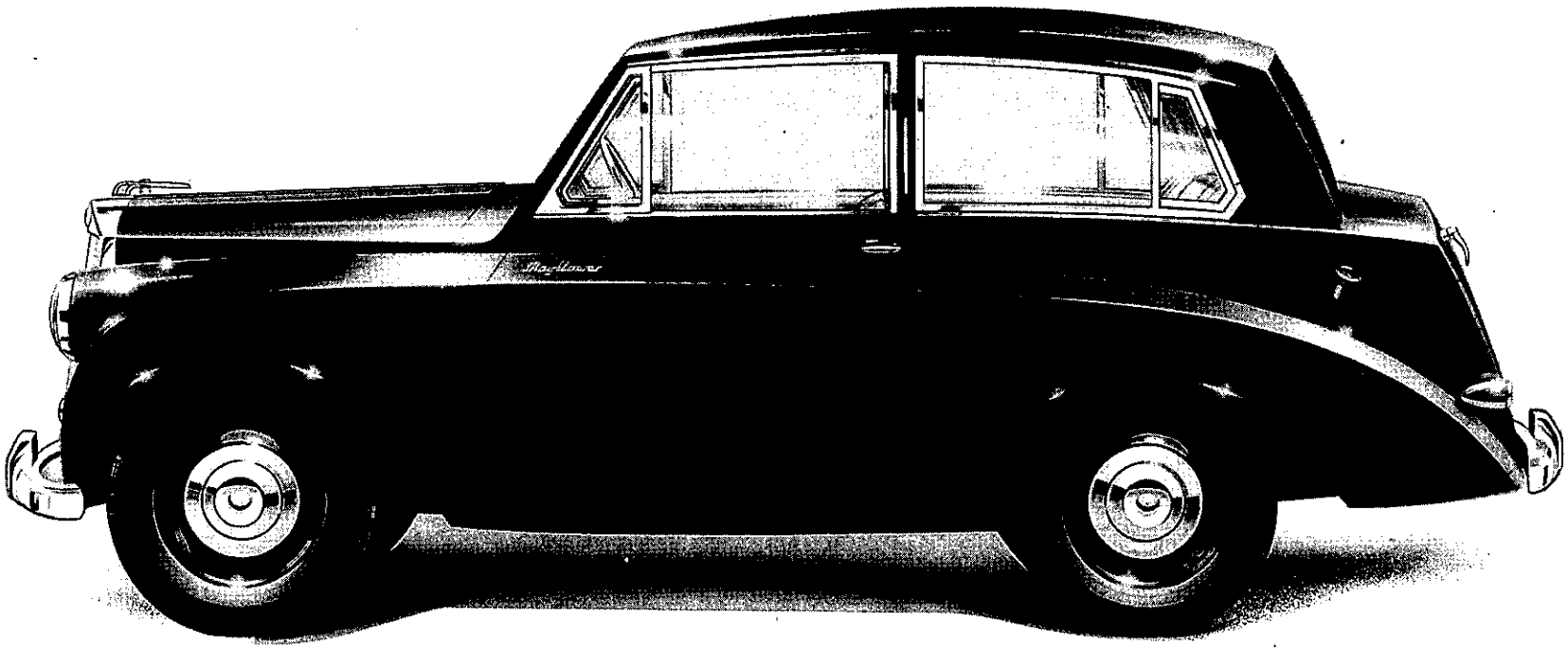
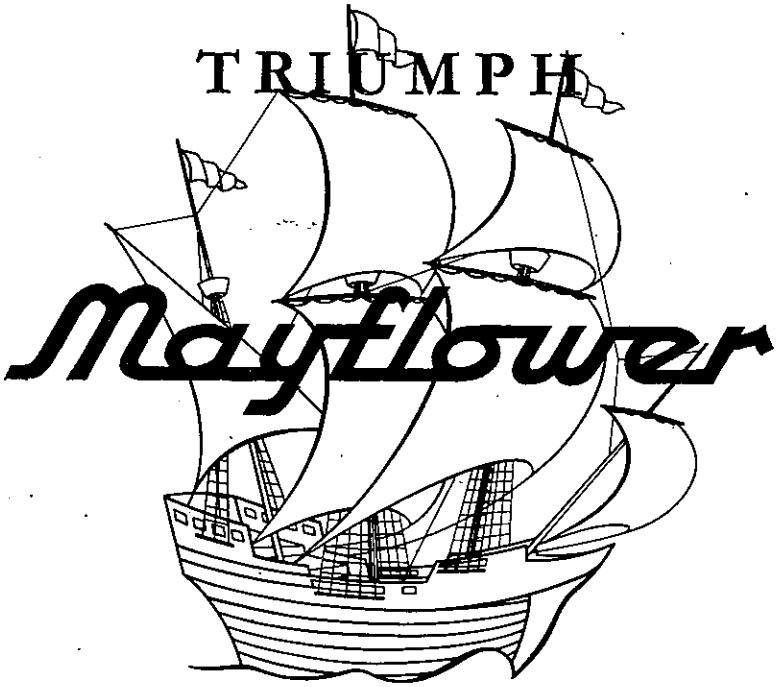


1951 TRIUMPH MAYFLOWER

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

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THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
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FOREWORD

This Manual has been compiled with a view to assisting our Agents and other Repairers throughout the World in dealing with the various servicing operations that are likely to be encountered in connection with the " Mayflower " car.

This publication has been divided into Sections which comprise, in the main, the various component assemblies ; an index being given for each. The pages of each Section are numbered individually.

In preparing the instructions, we have given the procedure for dismantling and reassembling the various components, illustrating the use of approved tools and fixtures and covering, as far as possible, any difficulties which are likely to be experienced by Repairers. Service Bulletins are issued to our Agents from time to time to cover service difficulties which arise and these instructions should, as a general rule, be considered as supplementary to the information given in this Manual.

Lists of useful dimensions and tolerances are shown at the front of various of the Sections and a summary of Nut Tightening Torque figures are given in the General Data Section.

A list of specialised tools, manufactured on this Company's behalf by Messrs. V. L. Churchill and Co. Ltd., 27/34, Walnut Tree Walk, Kennington, London, S.E.11, is given. It will be seen from the summary of special tools that a number of those designed for the Standard " Vanguard " are also applicable to the " Mayflower."

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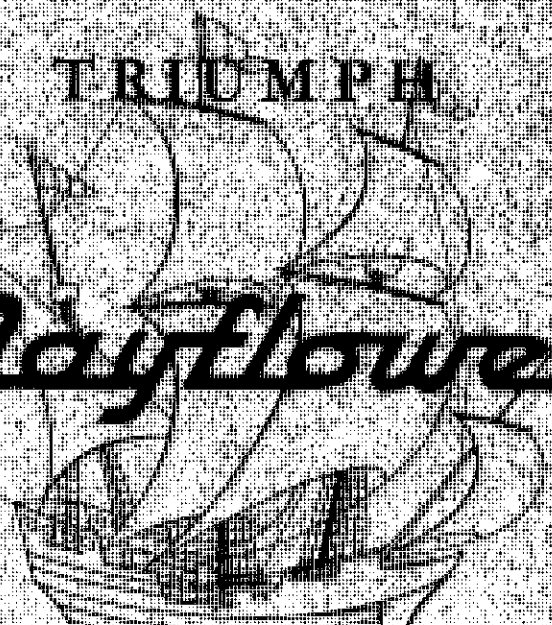


GENERAL DATA

SECTION A

GENERAL DATA

Summaries of useful dimensions and tolerances relative to various components appear at the commencement of the respective sections to which they refer. The data set out in this section, in some instances, appears elsewhere in the body of the Manual, but in such instances the summarized repetition is considered to be justified on the score of the recurring usefulness of such details.

CHASSIS SPECIFICATION

Engine dimensions and details.

Number of cylinders	Four
Bore of cylinders	2.48 in. (63 mm.)
Stroke of crank	3.94 in. (100 mm.)
Cubic capacity of engine	76.1 cu. in. (1,247 cu. cms.)
Compression ratio	6 : 8
Firing order	1-3-4-2
Brake horse power	38 at 4,200 r.p.m.
Sparking plug make and type	Champion Type NA.8 ¾ in. reach
Sparking plug gap	.025 in.
Distributor make and break	.010—.012 in.
Ignition timing setting (fully retard) 2° before	T.D.C.
Inlet valve tappet clearance (working)	.015 in.
Exhaust valve tapper clearance (working)	.015 in.
Tappet clearance (timing)	.020 in.

Valve timing with tappet clearances set at .020 in.

Inlet valve opens	10° B.T.D.C.
Inlet valve closes	50° A.B.D.C.
Exhaust valve opens	50° B.B.D.C.
Exhaust valve closes	10° A.T.D.C.

Oil pressure.

Oil pressure gauge reading for normal speed with the engine hot	40—60 lbs. per sq. in. (2.8—4.2 Kg. per sq. cm.)

Fuel system.

Carburettor make and type :	Solex Type 30 F.A.I.O.

Carburettor settings.

Choke	21
Main jet	105
Correction jet	220
Pilot jet	45
Air bleed	2.0
Needle valve	2.0
Starter air jet	4.5
Starter petrol jet	120.
Fuel pump make and type	AC Type Y No. 1524712
Fuel pump pressure	1½—2½ lbs. per sq. in.

Cooling system.

Radiator water temperature	
Water capacity for cooling system	12 pints without heater 13 pints with heater
Thermostat opens	167—176°F (Normal use) 185—195°F (Sub-Zero weather)

Frost precautions with Bluecol anti-freeze mixture.
(Other brands as recommended by the manufacturer)

% *Bluecol by Volume*	*Freezing Point Degrees F*	*Safe Limit Degrees F*	*Bluecol Pints "Mayflower"*
20	16	—3	2½ pints
25	10	—15	3 pints
30	4	—28	3¾ pints
35	—3	—40	4¼ pints
40	—10	—58	5 pints

PERFORMANCE FIGURES

Engine.

R.P.M.	*B.H.P.*	*Torque (lbs. inch)*
1,000	10	630
2,000	22	693
3,000	32	673
4,200 (Peak)	38	570

Maximum torque 700 lbs. inch at 2,500 r.p.m. equivalent to 116 lbs. per sq. in. B.M.E.P.

Car.

	M.P.H.	*Km.P.H.*
Top gear	65	105
Second gear	40	64
First gear	18	29

Engine R.P.M.

	At 10 M.P.H.	*At 10 Km.P.H.*
Top gear	690	420
Second gear	1,170	730
First gear	2,460	1,530
Reverse gear	2,850	1,780

Speed at 1,000 R.P.M.

Top gear	14.4 m.p.h.
Second gear	8.6 m.p.h.
First gear	4.1 m.p.h.
Reverse gear	3.5 m.p.h.

Acceleration (two up).

	Speed	*Time*
Top gear	10—30 m.p.h. (16—48 Km.p.h.)	12 seconds
Top gear	30—50 m.p.h. (48—80 Km.p.h.)	16.50 seconds
Through gears	0—50 m.p.h. (0—80 K.m.p.h)	23 seconds

Fuel and oil consumption.

Petrol	35 m.p.g
Oil	2,000 m.p.g

Brakes.

From 30 m.p.h. (48 Km.p.h.) :
Stopping distance 30 feet (9 metres)
From 40 m.p.h. (64 Km.p.h.) :
Stopping distance 60 feet (18 metres)

CAR DIMENSIONS

Wheel base	7 ft. 0 in.
Track : Front	3 ft. 10 in. after TT. 5553
Rear	4 ft. 1 in. after TT. 5553

Note : The front and rear track was originally 1" less than that given above.

Ground clearance (under axle)	7 in.
Turning circle (between kerbs)	34 ft. 0 in.
Overall length	13 ft. 0 in.
Overall width	5 ft. 2 in.
Height unladen	5 ft. 2 in.

GENERAL DATA

CAR WEIGHT

Complete with tools, fuel, oil and water .. .. 19 cwt. 0 qr. 14 lb.
Shipping weight (dry) excluding extra equipment .. .. 18 cwt. 1 qr. 14 lb.

TYRE SIZES AND PRESSURES

Tyre size .. .. 5.50—15 in.
Tyre pressures (fully laden condition):
Front .. 20 lb. per sq. in. (1.4 kg. per sq. cm.)
Rear .. 25 lb. per sq. in. (1.76 kg. per sq. cm.)

CLUTCH ADJUSTMENT

Clutch toggle clearance measured at pedal pad .. .. $\frac{1}{2}$ in. appro:
Clearance between toggle levers and release bearing .. .. $\frac{1}{16}$ in. appro:

OIL AND PETROL CAPACITY

Engine oil capacity .. .. 6 pints
Gearbox .. .. $1\frac{1}{4}$ pints
Rear axle .. .. $1\frac{1}{2}$ pints
Petrol capacity .. .. 9 gallons

STANDARD MEASURE AND METRIC EQUIVALENTS

English to Metric (linear).

1 inch = 2.54 centimetres
1 foot = 30.4799 centimetres
1 yard = 0.914399 metres
1 mile = 1.6093 kilometres

Metric to English (linear).

1 centimetre = .3937 inches
1 metre = 39.3702 inches
= 1.0936 yards
1 kilometre .62137 miles

English to Metric (square measure).

1 square inch = 6.4516 square centimetres
1 square foot = 9.203 square decimetres
1 square yard = .836126 square metres

Metric to English (square measure).

1 square centimetre = .15500 square inch
1 square metre = 1550.01 square inches / 10.7639 square feet / 1.196 square yards

English to Metric (cubic measure).

1 cubic inch = 16.387 cubic centimetres
1 cubic foot = 28.317 litres
1 gall. (0.1605 cu. ft.) = 4.546 litres

Metric to English (cubic measure).

1 litre (1,000 cu.cms.) = .22 gallons = 1.7598 pints
1 cu. cm. = 0.61 cubic inches

English to Metric (weight).

1 pound (Avoirdupois) = .45359 kilogrammes
1 cwt. (112 pounds) = 50.8 kilogrammes
1 ton (2,240 pounds) = 1,016 kilogrammes

Metric to English (weight).

1 kilogramme = 2.20462 pounds
100 kilogrammes = 1.968 cwt.
1,000 kilogrammes = .9842 tons

RELATIVE VALUES OF MILLIMETRES AND INCHES

mm.	*Inches*	*mm.*	*Inches*	*mm.*	*Inches*	*mm.*	*Inches*
1	0.0394	26	1.0236	51	2.0079	76	2.9922
2	0.0787	27	1.0630	52	2.0473	77	3.0315
3	0.1181	28	1.1024	53	2.0866	78	3.0709
4	0.1575	29	1.1417	54	2.1260	79	3.1103
5	0.1968	30	1.1811	55	2.1654	80	3.1496
6	0.2362	31	1.2205	56	2.2047	81	3.1890
7	0.2756	32	1.2598	57	2.2441	82	3.2284
8	0.3150	33	1.2992	58	2.2835	83	3.2677
9	0.3543	34	1.3386	59	2.3228	84	3.3071
10	0.3937	35	1.3780	60	2.3622	85	3.3465
11	0.4331	36	1.4173	61	2.4016	86	3.3859
12	0.4724	37	1.4567	62	2.4410	87	3.4252
13	0.5118	38	1.4961	63	2.4803	88	3.4646
14	0.5512	39	1.5354	64	2.5197	89	3.5040
15	0.5906	40	1.5748	65	2.5591	90	3.5433
16	0.6299	41	1.6142	66	2.5984	91	3.5827
17	0.6693	42	1.6536	67	2.6378	92	3.6221
18	0.7087	43	1.6929	68	2.6772	93	3.6614
19	0.7480	44	1.7323	69	2.7166	94	3.7008
20	0.7874	45	1.7717	70	2.7559	95	3.7402
21	0.8268	46	1.8100	71	2.7953	96	3.7796
22	0.8661	47	1.8504	72	2.8347	97	3.8189
23	0.9055	48	1.8898	73	2.8740	98	3.8583
24	0.9449	49	1.9291	74	2.9134	99	3.8977
25	0.9843	50	1.9685	75	2.9528	100	3.9370

GENERAL DATA

RELATIVE VALUES OF INCHES AND MILLIMETRES

Inches	0	1/16	1/8	3/16	1/4	5/16	3/8	7/16
0	0.0	1.6	3.2	4.8	6.4	7.9	9.5	11.1
1	25.4	27.0	28.6	30.2	31.7	33.3	39.9	36.5
2	50.8	52.4	54.0	55.6	57.1	58.7	60.3	61.9
3	76.2	77.8	79.4	81.0	82.5	84.1	85.7	87.3
4	101.6	103.2	104.8	106.4	108.0	109.5	111.1	112.7
5	127.0	128.6	130.2	131.8	133.4	134.9	136.5	138.1
6	152.4	154.0	155.6	157.2	158.8	160.3	161.9	163.5
Inches	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16
0	12.7	14.3	15.9	17.5	19.1	20.6	22.2	23.8
1	38.1	39.7	41.3	42.9	44.4	46.0	47.6	49.2
2	63.5	65.1	66.7	68.3	69.8	71.4	73.0	74.6
3	88.9	90.5	92.1	93.7	95.2	96.8	98.4	100.0
4	114.3	115.9	117.5	119.1	120.7	122.2	123.8	125.4
5	139.7	141.3	142.9	144.5	146.1	147.6	149.2	150.8
6	165.1	166.7	168.3	169.9	171.5	173.0	174.6	176.2

CONVERSION OF MILES INTO KILOMETRES

Kilo	*Miles*	*Kilo*	*Miles*	*Kilo*	*Miles*	*Kilo*	*Miles*	*Kilo*	*Miles*
1	$\frac{5}{8}$	16	10	31	$19\frac{1}{4}$	46	$28\frac{5}{8}$	60	$37\frac{1}{4}$
2	$1\frac{1}{4}$	17	$10\frac{5}{8}$	32	$19\frac{7}{8}$	47	$29\frac{1}{4}$	70	$43\frac{1}{2}$
3	$1\frac{7}{8}$	18	$11\frac{1}{4}$	33	$20\frac{1}{2}$	48	$29\frac{7}{8}$	80	$49\frac{3}{4}$
4	$2\frac{1}{2}$	19	$11\frac{3}{4}$	34	$21\frac{1}{8}$	49	$30\frac{1}{2}$	90	$55\frac{7}{8}$
5	$3\frac{1}{8}$	20	$12\frac{3}{8}$	35	$21\frac{3}{4}$	50	$31\frac{1}{8}$	100	$62\frac{1}{2}$
6	$3\frac{3}{4}$	21	13	36	$22\frac{3}{8}$	51	$31\frac{3}{4}$	200	$124\frac{1}{4}$
7	$4\frac{3}{8}$	22	$13\frac{5}{8}$	37	23	52	$32\frac{1}{4}$	300	$186\frac{3}{8}$
8	5	23	$14\frac{1}{4}$	38	$23\frac{5}{8}$	53	$32\frac{7}{8}$	400	$248\frac{1}{2}$
9	$5\frac{5}{8}$	24	$14\frac{7}{8}$	39	$24\frac{1}{4}$	54	$33\frac{1}{2}$	500	$310\frac{3}{4}$
10	$6\frac{1}{4}$	25	$15\frac{1}{2}$	40	$24\frac{7}{8}$	55	$34\frac{1}{8}$	600	$372\frac{7}{8}$
11	$6\frac{7}{8}$	26	$16\frac{1}{2}$	41	$25\frac{1}{2}$	56	$34\frac{3}{4}$	700	435
12	$7\frac{1}{2}$	27	$16\frac{3}{4}$	42	$26\frac{1}{8}$	57	$35\frac{3}{8}$	800	$497\frac{1}{8}$
13	$8\frac{1}{8}$	28	$17\frac{3}{8}$	43	$26\frac{3}{4}$	58	36	900	$559\frac{1}{4}$
14	$8\frac{3}{4}$	29	18	44	$27\frac{3}{8}$	59	$36\frac{5}{8}$	1,000	$621\frac{3}{8}$
15	$9\frac{3}{8}$	30	$18\frac{5}{8}$	45	28				

FRACTIONS OF INCHES WITH DECIMAL AND METRIC EQUIVALENTS

Fractions of Inches	*Decimals*	*Millimetres*	*Fractions of Inches*	*Decimals*	*Millimetres*
1	1.0	25.4	1/26	0.038462	0.976923
1/2	0.5	12.7	1/27	0.037037	0 940741
1/3	0.333333	8.466667	1/28	0.035714	0.907142
1/4	0.25	6.35	1/29	0.034483	0.875862
1/5	0.2	5.08	1/30	0.033333	0.846667
1/6	0:166666	4.233333	1/31	0.032258	0.819355
1/7	0.142857	3.628571	1/32	0.03125	0.79325
1/8	0.125	3.175	1/33	0.030303	0.769697
1/9	0.111111	2.822222	1/34	0.029411	0.747058
1/10	0.1	2.54	1/35	0.028571	0.725714
1/11	0.090909	2.309091	1/36	0.027777	0.705556
1/12	0.083333	2.116667	1/37	0.027027	0.686476
1/13	0.076923	1.953846	1/38	0.026316	0.667631
1/14	0.071429	1.814286	1/39	0.025641	0.651282
1/15	0.066666	1.693333	1/40	0.025	0.635
1/16	0.0625	1.5875	1/41	0.02439	0.619512
1/17	0.058824	1.494118	1/42	0.023809	0.604761
1/18	0.055555	1.411111	1/43	0.023256	0.590598
1/19	0.052632	1.336842	1/44	0.022727	0.577272
1/20	0.05	1.27	1/45	0.022222	0.564444
1/21	0.047619	1.209524	1/46	0.021739	0.552174
1/22	0.045455	1.154545	1/47	0.021277	0.540426
1/23	0.043478	1.104348	1/48	0.020833	0.529166
1/24	0.041666	1.058333	1/49	0.020408	0.518367
1/25	0.04	1.016	1/50	0.02	0.508

TRIUMPH MAYFLOWER

RECOMMENDED LUBRICANTS

BRITISH ISLES

Component	*Vacuum*	*Shell*	*Esso*	*Price's*	*Wakefield*	*Duckham's*
ENGINE Summer	Mobiloil A	Double Shell	Essolube 30	Energol S.A.E. 30	Castrol XL	Duckham's N.O.L. "Thirty"
Winter	Mobiloil Arctic	Single Sbell	Essolube 20	Energol S.A.E. 20	Castrolite	Duckham's N.O.L. "Twenty"
Upper Cylinder Lubricant	Mobil Upperlube	Shell Donax U	Essomix	Energol U.C.L.	Castrollo	Duckham's Adcoids
Flushing Oils	Mobil Engine Flusbing Oil	Shell Flushing Oil	Esso Flushing Oil	Price's Flusbing Oil	Wakefield Flushing Oil	Duckham's N.O.L. "Ten"
GEARBOX	Mobiloil A	Double Shell	Essolube 30	Energol SAE 30	Castrol XL	Duckham's N.O.L. "Tbirty"
REAR AXLE	Mobilube GX 90	Shell Spirax 90 EP	Esso Expee Compound 90	Energol E.P. S.A.E. 90	Castrol Hypoy	Duckham's Hypoid 90
STEERING BOX and PROPELLOR SHAFT	Mobilube GX 140	Shell Spirax 140 EP	Esso Expee Compound 140	Energol E.P. S.A.E. 140	Castro Hi-Pressl	Duckham's N.O.L. E.P. 140
WATER PUMP and WHEEL HUBS .. (*Hand gun*)	Mobil Hub Grease	Shell Retinax RB	Esso Grease	Belmoline C	Castrolease Heavy	Duckham's H.B.B.
CHASSIS Grease Nipples .. (*Hand or pressure gun*)	Mobilgrease No. 4	Shell Retinax C	Esso Grease	Belmoline C	Castrolease CL	Duckham's Laminoid Soft
Oil Points (*Oil can*) Body and Chassis ..	Mobil Handy Oil	Single Sbell	Essolube 20	Energol SAE 20	Oilit	Duckham's N.O.L. "Twenty"
REAR ROAD SPRINGS	Mobil Spring Oil	Shell Donax P	Esso Penetrating Oil	Price's Penetrating Oil	Castrol Penetrating Oil	Duckham's Laminoid Liquid
	ALTERNATIVELY USE REAR AXLE OR ENGINE OIL					
BRAKE CABLES ..	Mobil Graphited Grease	Shell Retinax C	Esso Graphite Grease	Belmoline C.G.	Castrolease Brake Cable Grease	Duckham's Keenol KG 16
BRAKE RESERVOIR	LOCKHEED ORANGE BRAKE FLUID					

GENERAL DATA

OVERSEAS COUNTRIES

Component	*Vacuum*	*Shell*	*Esso*	*Energol*	*Wakefield*	*Duckham's*
ENGINE Air Temp. °F Over 70°	Mobiloil "AF"	Shell X-100 SAE 40 or Double Extra	Essolube 40	Energol Auto 200	Castrol XXL	Duckham's N.O.L. "Forty"
40° to 70°	Mobiloil "A"	Shell X-100 SAE 30 or Double Shell	Essolube 30	Energol Auto 150	Castrol XL	Duckham's N.O.L "Thirty"
10° to 40°	Mobiloil Arctic	Shell X-100 SAE 20 or Single Shell	Essolube 20	Energol Auro 125	Castrolite	Duckham's N.O.L. "Twenty"
—10° to 10° ..	Mobiloil Arctic Special	Shell X-100 SAE 10 or Silver Shell	Essolube 10	Energol Auto 80	Castrol Z	Duckham's N.O.L. "Ten"
Upper Cylinder Lubricant	Mobil Upperlube	Shell Donax U	Esso Upper Motor Lubricant	Energol Upper Cylinder Lubricant	Castrollo	Duckham's Adcoids
Flushing Oils	Mobiloil Arctic Special	Shell Donax F	Esso Flushing Oil	Energol Flushing Oil	Wakefield Flushing Oil	Duckham's N.O.L. "Ten"
GEARBOX Over 10° ..	Mobiloil "A"	Shell X-100 SAE 30 or Double Shell	Essolube 30	Energol Auto 150	Castrol XL	Duckham's N.O.L. "Thirty"
Below 10° ..	Mobiloil Arctic	Shell X-100 SAE 20 or Single Shell	Essolube 20	Energol Auto 125	Castrolite	Duckham's N.O.L. "Twenty"
REAR AXLE Over 10° ..	Mobilube GX90	Sbell Spirax 90 EP	Esso XP Compound 90	Energol Transmission 300/EP	Castrol Hypoy	Duckham's Hypoid 90
Below 10° ..	Mobilube GX 80	Shell Spirax 80 EP	Esso XP Compound 80	Energol Transmission 200/EP	Castrol Hypoy 80	Duckham's Hypoid 80
STEERING BOX and PROPELLOR SHAFT	Mobilube GX 140	Shell Spirax 140 EP	Esso XP Compound 140	Energol Transmission 700/EP	Castrol Hi-Press	Duckham's N.O.L. E.P. 140
WATER PUMP and WHEEL HUBS .. (*Hand gun*)	Mobilgrease No. 5	Shell Retinax RB	Esso Bearing Grease	Energrease Wheel Hub	Castrolease Heavy	Duckham's H.B.B.
CHASSIS Grease Nipples .. (*Hand or pressure gun*)	Mobilgrease No. 4	Shell Retinax C	Esso Chassis Grease	Energrease Chassis Pressure No. 2	Castrolease CL	Duckham's Laminoid Soft
Oil Points (*Oil can*) Body and Chassis ..	Mobiloil Arctic	Shell X-100 SAE 20 or Single Shell	Esso Handy Oil	Energol Auto 125	Oilit	Duckham's N.O.L. "Twenty"
REAR ROAD SPRINGS	Mobilgrease No. 2	Shell Donax P	Esso Penetrating Oil	Energol Penetrating Oil	Castrol Penetrating Oil	Duckham's Laminoid Liquid
	ALTERNATIVELY USE REAR AXLE OR ENGINE OIL					
BRAKE CABLES ..	Mobilgrease No. 4	Shell Retinax C	Esso Graphite Grease	Energrease Graphited No. 1	Castrolease Brake Cable Grease	Duckham's Keenol KG 16
BRAKE RESERVOIR Over 0°	LOCKHEED ORANGE BRAKE FLUID *or* LOCKHEED No. 5 BRAKE FLUID					
Below 0°	LOCKHEED AMERICAN BRAKE FLUID No. 21					

TIGHTENING TORQUE FOR BOLTS, NUTS AND SHACKLES ON TRIUMPH "MAYFLOWER" CHASSIS

OPERATION	DESCRIPTION	MATERIAL	TORQUE RECOMMENDED (*lb./ft.*)	REMARKS
ACCELERATOR BRACKET ATTACHMENT.	$\frac{1}{4}$" NC setscrews.	Medium tensile UTS 45T/sq. in. minimum.	2—3	
BONNET AND SPARE WHEEL COVER, ETC. ATTACHMENT.	$\frac{1}{4}$" NF screws.	Medium tensile UTS 45T/sq. in. minimum.	4—6	
ENGINE MOUNTINGS.	$\frac{3}{8}$" NF bolts. $\frac{3}{8}$" NF studs and nuts.	Medium tensile UTS 45T/sq. in. minimum. Mild steel UTS 30T/sq. in. minimum.	26—28 20—22	
FRONT SUSPENSION: Fulcrum to chassis. Tie rod levers.	$\frac{3}{8}$" NF bolts, nuts and setscrews.	Medium tensile UTS 45T/sq. in. minimum.	26—28	
Top inner fulcrum assembly.	$\frac{7}{16}$" NF nut.	—	26—32	Within this range to suit split pin hole.
Bottom outer fulcrum assembly.	$\frac{7}{16}$" NF nut.	—	—	Tighten to nip 0.006" feeler gauge between collar and washer and give 0.004"—0.008" end float of wishbone bosses.
Upper ball joints to wishbone arms.	$\frac{9}{16}$" NF nut.	—	55—70	To suit split pin holes. Ensure that ball joints serrations have fully cut into wishbone arms.
Upper ball joint to vertical link.	$\frac{1}{2}$" NF nut.	—	55—65	To suit split pin hole.
Stub axle to vertical link.	$\frac{1}{2}$" NF slotted nut.	—	55—65	Within this range to suit split pin holes.
Brake backing plates, Spring pan to lower wishbones, etc.	$\frac{3}{8}$" NF bolts and nuts.	Medium tensile UTS 45T/sq. in. minimum.	26—28	
Front hub attachment.	$\frac{1}{2}$" NF slotted nut.	—	—	0.004"—0.006" end float.
PETROL TANK ATTACHMENT.	$\frac{1}{4}$" NF screw.	Medium tensile UTS 45T/sq. in. minimum.	2—4	Tightening onto seal.
RADIATOR ATTACHMENT.	$\frac{5}{16}$" NF setscrew.	Ditto.	16—18	
ROAD WHEELS.	$\frac{7}{16}$" NF wheel stud and nut.	High tensile UTS 55T/sq. in. minimum.	45—55	
REAR AXLE UNIT: Bearing caps.	$\frac{3}{8}$" NF setscrews.	Ditto.	42—46	
Hypoid pinion flange attachment.	$\frac{9}{16}$" NF slotted nut.	High tensile.	65—80 with $\frac{9}{16}$" pinion shank	Within this range to suit split pin hole. Torque with $\frac{5}{8}$" shank to be 80—100 lbs./feet.
Case cover.	$\frac{5}{16}$" NF setscrew.	Medium tensile 45T/sq. in. minimum.	16—18	
Rear hub to axle shaft.	$\frac{3}{8}$" slotted nut.	—	125	Within this range to suit split pin hole.
REAR ROAD SPRINGS: Rear spring to axle.	"U" clip threaded $\frac{3}{8}$" NF with Simmonds nut.	High tensile UTS 55T/sq. in. minimum.	28—30	Pulled up to spring clamp plate.
Spring front eye.	Pin $\frac{7}{16}$" NF and nut.	High tensile UTS 55T/sq. in. minimum.	28—30	
Shackle to spring and frame.	Shackle pin $\frac{3}{8}$" NF and nut.	—	26—28	
STEERING UNIT AND IDLER BRACKET ATTACHMENT.	$\frac{7}{16}$" NF bolt and nut.	Medium tensile UTS 45T/sq. in. minimum.	37—40	

TIGHTENING TORQUE FOR BOLTS, NUTS AND SETSCREWS ON TRIUMPH "MAYFLOWER" ENGINE AND GEARBOX

OPERATION	DESCRIPTION	MATERIAL	TORQUE RECOMMENDED (*lb./ft.*)	REMARKS
MAIN BEARING CAPS.	½" NF setscrew.	High tensile UTS 55T/sq. in. minimum.	90—100	
CYLINDER HEAD.	⅜" NF studs and nuts.	Ditto.	35—38	
FLYWHEEL ATTACHMENT TO CRANKSHAFT.	⅜" NF setscrew.	Ditto.	42—46	
CONNECTING ROD BOLTS.	Con. rod bolt and nut.	Ditto.	35—38	
TIMING CHAIN WHEEL ATTACHMENT TO CAMSHAFT.	5/16" NF setscrew.	Ditto.	24—26	
MANIFOLD ATTACHMENT.	⅜" NF studs, bolts and nuts.	Mild steel UTS 30T/sq. in. minimum.	18—20	
ATTACHMENT OF TAPPET BLOCKS, STARTER MOTOR CLUTCH HOUSING DOWEL BOLT, ETC.	⅜" NF bolts, nuts and setscrews.	Medium tensile UTS 45T/sq. in. minimum.	26—28	
OIL PUMP ATTACHMENT, WATER PUMP/HOUSING, PETROL PUMP, ETC.	5/16" NF studs and nuts.	Mild steel UTS 30T/sq. in. minimum.	12—14	
ATTACHMENT OF END PLATES, CLUTCH HOUSING TO ENGINE BLOCK, WATER PUMP AND HOUSING TO BLOCK, ETC.	5/16" NF setscrews, nuts and bolts.	Medium tensile UTS 45T/sq. in. minimum.	18—20	Mild steel stud in clutch housing to block tighten 12-14 lb./ft.
ATTACHMENT OF TIMING COVER, SUMP, REAR OIL SEAL, ETC.	5/16" NF setscrews, bolts and nuts.	Ditto.	16—18	Tapped holes in aluminium block.
CLUTCH TO FLYWHEEL.	5/16" NF setscrew.	Ditto.	20—22	
DYNAMO PULLEY ATTACHMENT.	7/16" NF nut.	—	30—35	
OIL GALLERY PLUGS.	5/16" NF setscrew.	Medium tensile UTS 45T/sq. in. minimum.	13—15	Tighten onto copper washer.
ATTACHMENT OF GEARBOX REAR EXTENSION, FRONT AND TOP COVER.	5/16" NC setscrew.	Ditto.	14—16	Tapped holes in aluminium case.
ATTACHMENT OF GEARBOX BUSH AND INTERLOCK.	¼" NC setscrews.	Ditto.	6—8	Ditto.

NOTE: 1. All nuts are mild steel UTS 30T/sq. in. minimum except Simmonds nuts which are medium tensile.

2. NC—American National Coarse Thread.

3. NF—American National Fine Thread.

4. UTS—Ultimate Tensile Strength of Material.

5. To convert lb./ft. to lb./in. multiply by 12.

GENERAL DATA

IDENTIFICATION OF COMMISSION AND MAIN COMPONENTS

Details of Commission Numbers used with the various "Mayflower" Models are given below.

The location of the number for the various components are indicated in Fig. 1.

Car and Body No. Engine
Gearbox Axle

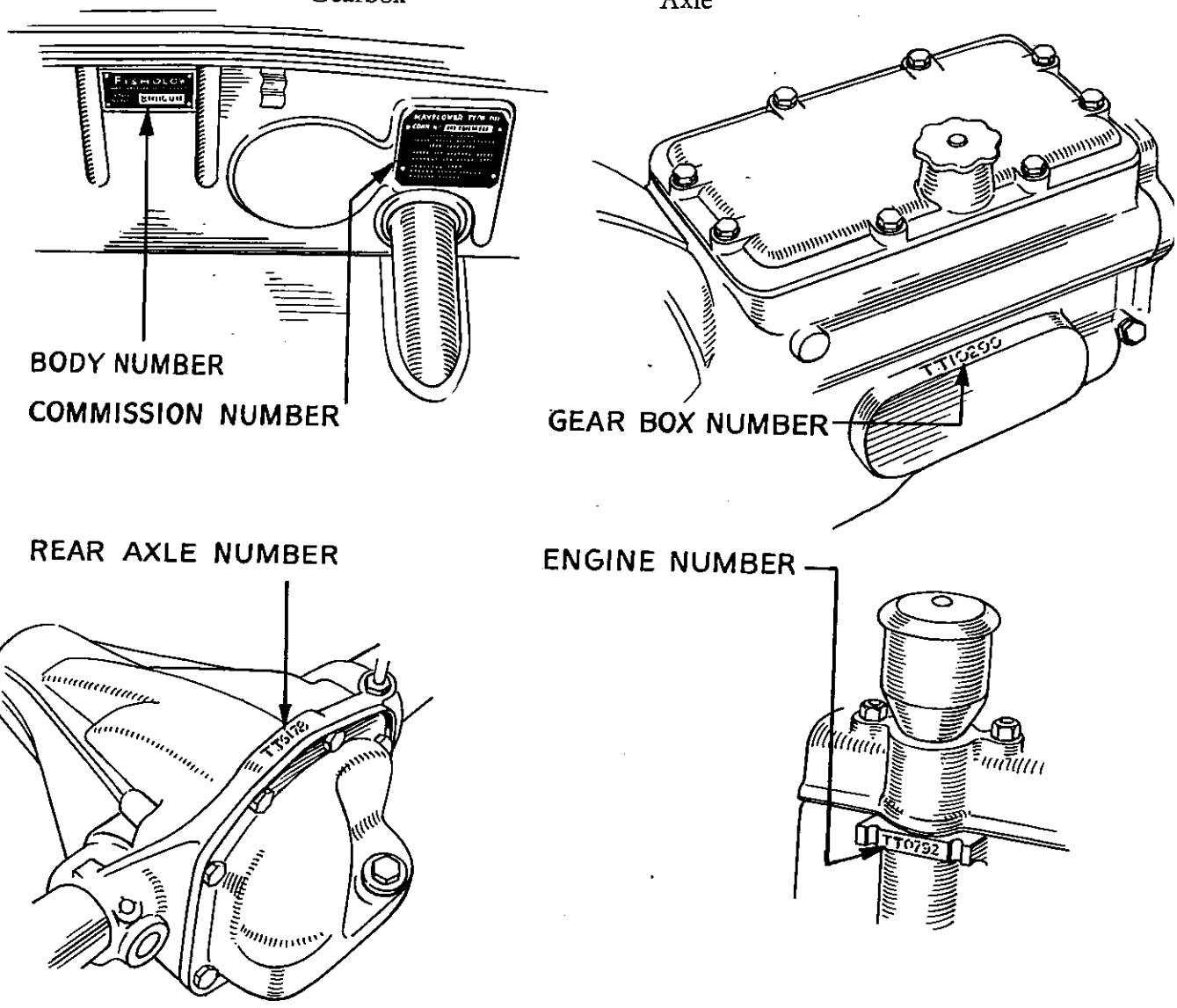


Fig. 1. Location of main component numbers.

COMMISSION NUMBERS

Car/Type	Commission No. Suffix	Commission No. Prefix
R.H.S. Saloon De Luxe	DL	TT.1—TT.30,000
R.H.S. Saloon Standard	—	
L.H.S. Saloon De Luxe	LDL	
L.H.S. Saloon Standard	L	

BODY DIMENSIONS.

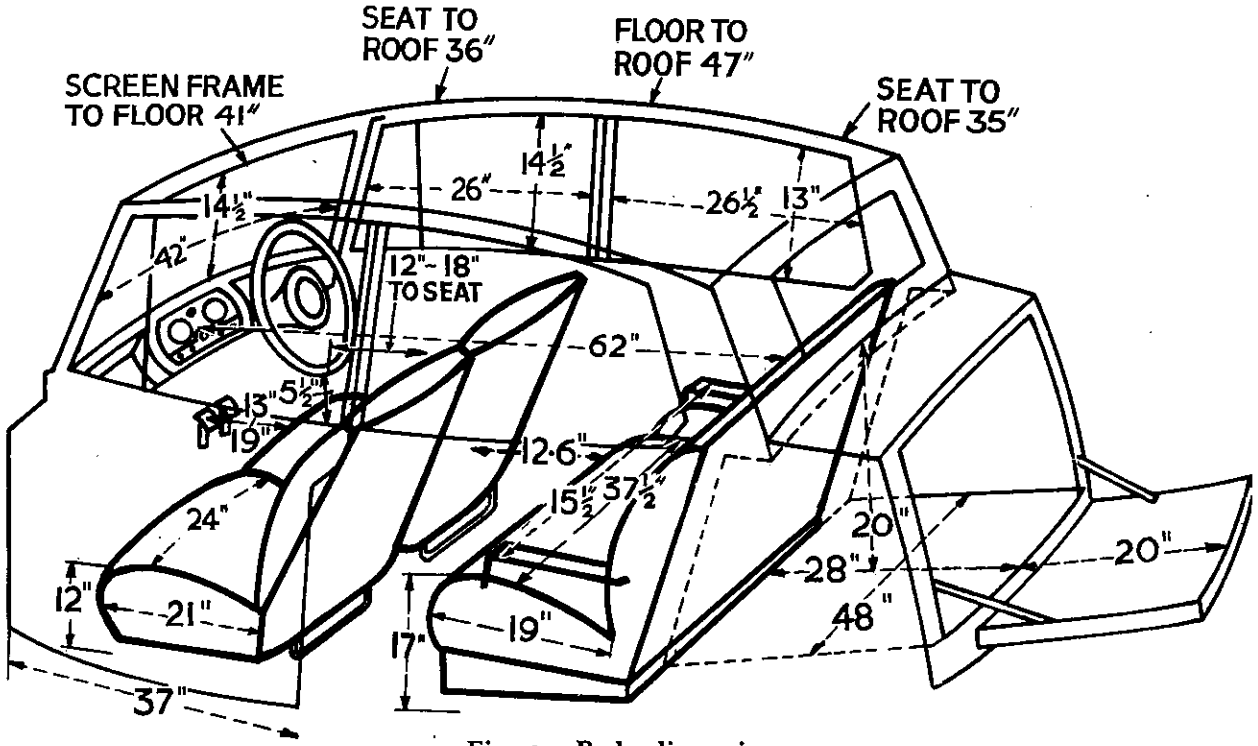


Fig. 2. Body dimensions.

POWER CURVES.

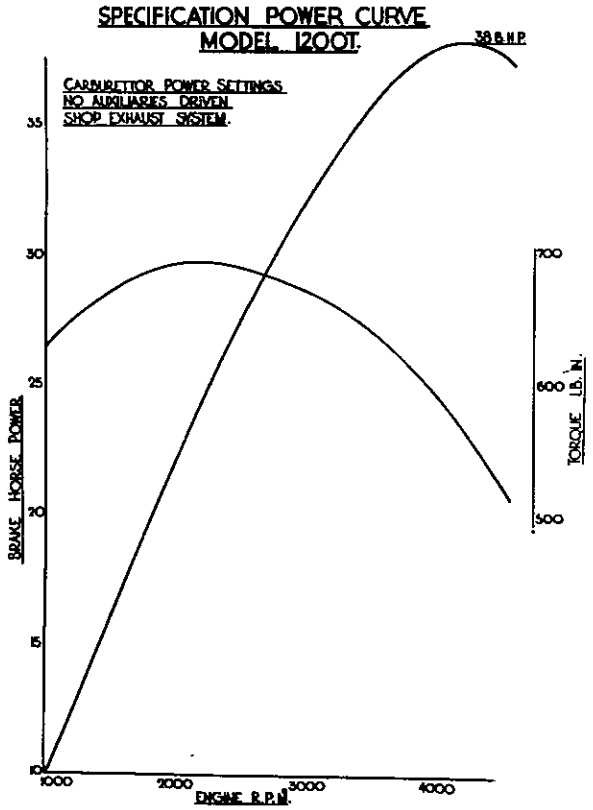


Fig. 3. Specification power curves.

DIMENSIONS AND TOLERANCES

Parts and Description	Dimensions new	Clearance new	Permissible worn Dimensions	Permissible worn Clearance	Remarks
Crankshaft.	2.0000				
Journal Diameter	1.9995	.0015" to .0025"	1.9975	.005" Dry	
Bearing Internal Diameter	2.0015 2.0020		2.003		
Internal Diameter of Bearing Housing	2.1460 2.1465				
	Undersize Bearings Available —.020" —.030" or —.040"				
Crankshaft End Float.					
Rear Journal length	1.59475 1.59375				
Rear Bearing Cap Width, plus thickness of two thrust washers	1.584 1.590	.004 to .006"			
Main Bearing Width	1.380 1.370				
Big End.					
Crank Pin Diameter	1.750" 1.7495"	.001" to .002"	1.748"	.006"	
Bearing Internal Diameter	1.7510" 1.7515"		1.753"	Dry	
Internal Diameter of Bearing Housing	1.856" 1.855"				
Bearing Width	.939" .929"				
	Undersize Bearings available —.020" —.030" or —.040"				
Big End Float.					
Crank Pin Width	1.1257" 1.1348"	.008" to .010"	1.127"		
Con. Rod. Width	1.117" 1.115"		1.113"		

ENGINE—Dimensions and Tolerances

Parts and Description	Dimensions new	Clearance new	Permissible worn Dimensions	Permissible worn Clearance	Remarks
Ovality and Taper.					
Journals and Crank Pins			.002″		
Small End.					
Bore for Bush	.8755″ .8745″				Press Fit in Rod
Bush External Diameter	.8780″ Go. .877″ No Go.				
Internal Diameter of Bush	.7498″ .7502″	.0002″ at 68° Fahr.	.750″	.002″	
Gudgeon Pin Diameter	.75010″ .74985″		.749″		
Piston Rings.					
Compression Ring Width	.0787 .0777	.001″ to .003″	.075″	.005″	Top Ring Chromium Plated
Groove Width	.0797 .0807		.081″		
Scraper Ring Width	.156″ .155″	.001″ to .003″	.154″		
Groove Width	.157″ .158″		.159″		
Ring Gap in Cylinders	.004″ to .008″				

Pistons and Cylinders	Dimensions New			Clearance New
	F	G	H	
Bore Diameter	2.4799″ Min. 2.4802″	2.4803″ Min. 2.4806″	2.4807″ 2.4810″	.002″ — .003″
Top Diameter of Piston	2.4774″ over 2.4777″ to	2.4777″ over 2.4781″ to	2.4781″ 2.4785″	
Bottom Diameter of Piston	2.47865″ over 2.47895″ to	2.47895″ over 2.47935″ to	2.47935″ 2.47975″	.001″ — .001½″

Parts and Description	Dimensions new	Clearance new	Permissible worn Dimensions	Permissible worn Clearance	Remarks
Camshaft.					
First Journal	1.6845″		1.681″		
Diameter	1.684″	.003″ to .004″		.010″	
Bore in Block	1.6882″				
	1.6873″		1.691″		
Intermediate and	1.497″		1.494″		
Rear Journal Dia.	1.4965″	.002½″ to .004½″		.010	
Bore in Block	1.5010″				
	1.4995″		1.504″		
End Float	.003 — .006½″			.012″	
Max. Valve Lift	.025″				
Valve Tappet Clearances (Running)	.015″ (cold)				
Valve Tappet Clearances (Timing)	.020″ (cold)				
Valves and Valve Guides.					
Inlet Valve	.2475				
Stem Diameter	.2465	.002″ to .004″			
Guide Diameter	.2495				
	.2505				
Exhaust Valve	.2475	.002″			
Stem Diameter	.2465	to .004″			
Guide Diameter	.2495				
	.2505				
Included Angle of Valve Faces	90°				
Dimension from Top of Valve Guide To Cylinder Block Upper Face	.97″				
Guide External	.4385″				
Diameter	.4395″				
Oil Pump (Outer Rotor)					
Outside	1.598″				
Diameter	1.599″	.002″ to .003″			
Housing	1.601″				
Internal Diameter	1.600″				

ENGINE—Dimensions and Tolerances

Parts and Description	Dimensions new	Clearance new	Permissible worn Dimensions	Permissible worn Clearance	Remarks
Oil Pump (Outer Rotor contd.)					
Depth of Rotor	.9995″ 9985″	.0005″ to .0025″			A combined worn clearance of .004″ indicates the necessity for cover and housing face lapping.
Housing Depth	1.001″ 1.000″				
Oil Pump (Inner Rotor).					
Major Diameter	1.171″ 1.172″				
Minor Diameter	.729″ .731″				
Clearance on Rotors	Maximum Clearance New .001″ to .004″ Minimum Clearance New .0005″ to .0025″				Where clearance in excess of .010″ exists new parts should be fitted.
Valve Springs.					
Fitted Length	1. $\frac{9}{32}$″				
Fitted load at Fitted Length	22 lbs.	+ 2 lbs. — 1 lb.			
Valve Lift (nominal)	$\frac{1}{4}$″ + .010″				
Load at Full Lift	37 lbs.				
No. of free Coils	7				

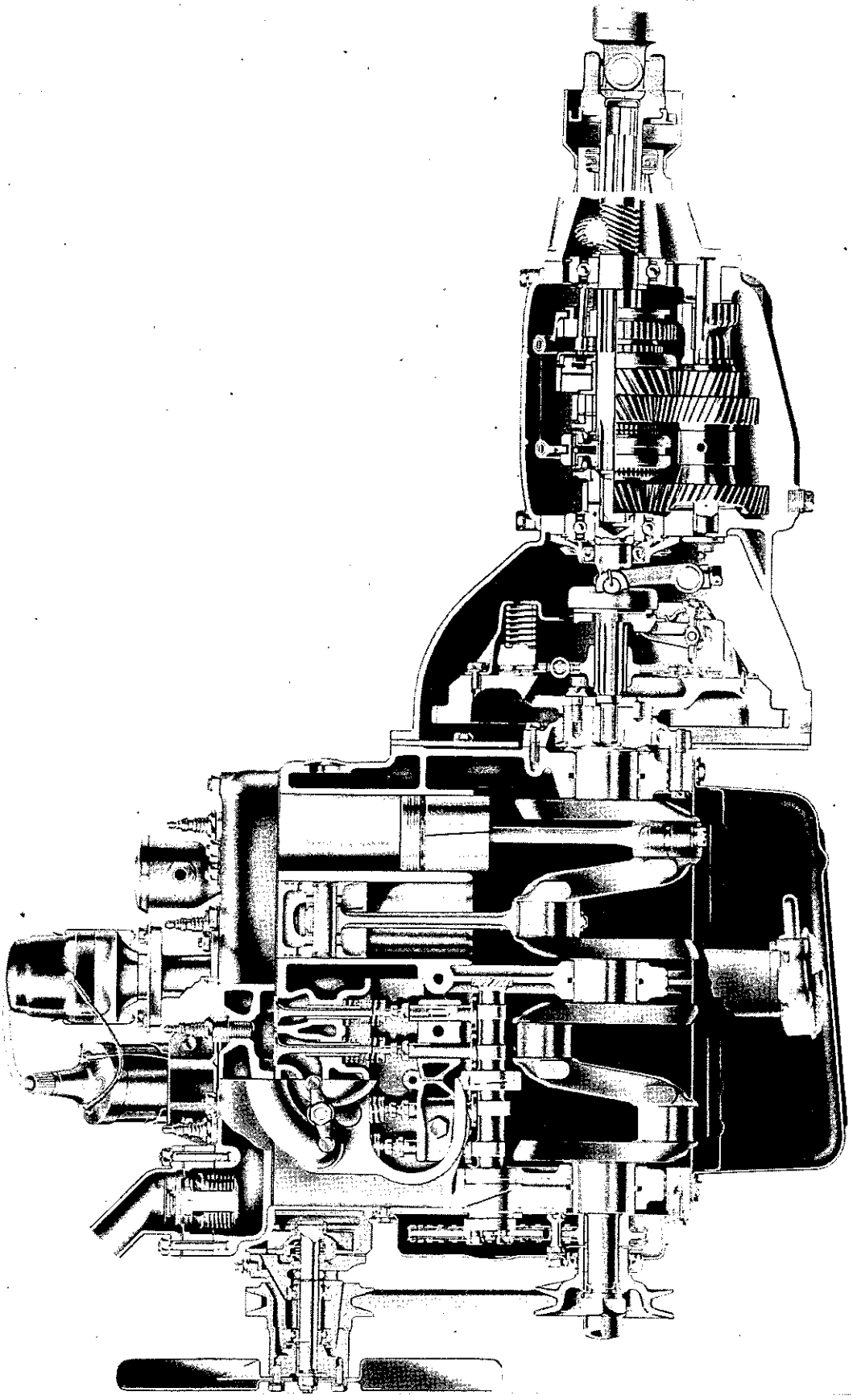


Fig. 1. Side view of engine.

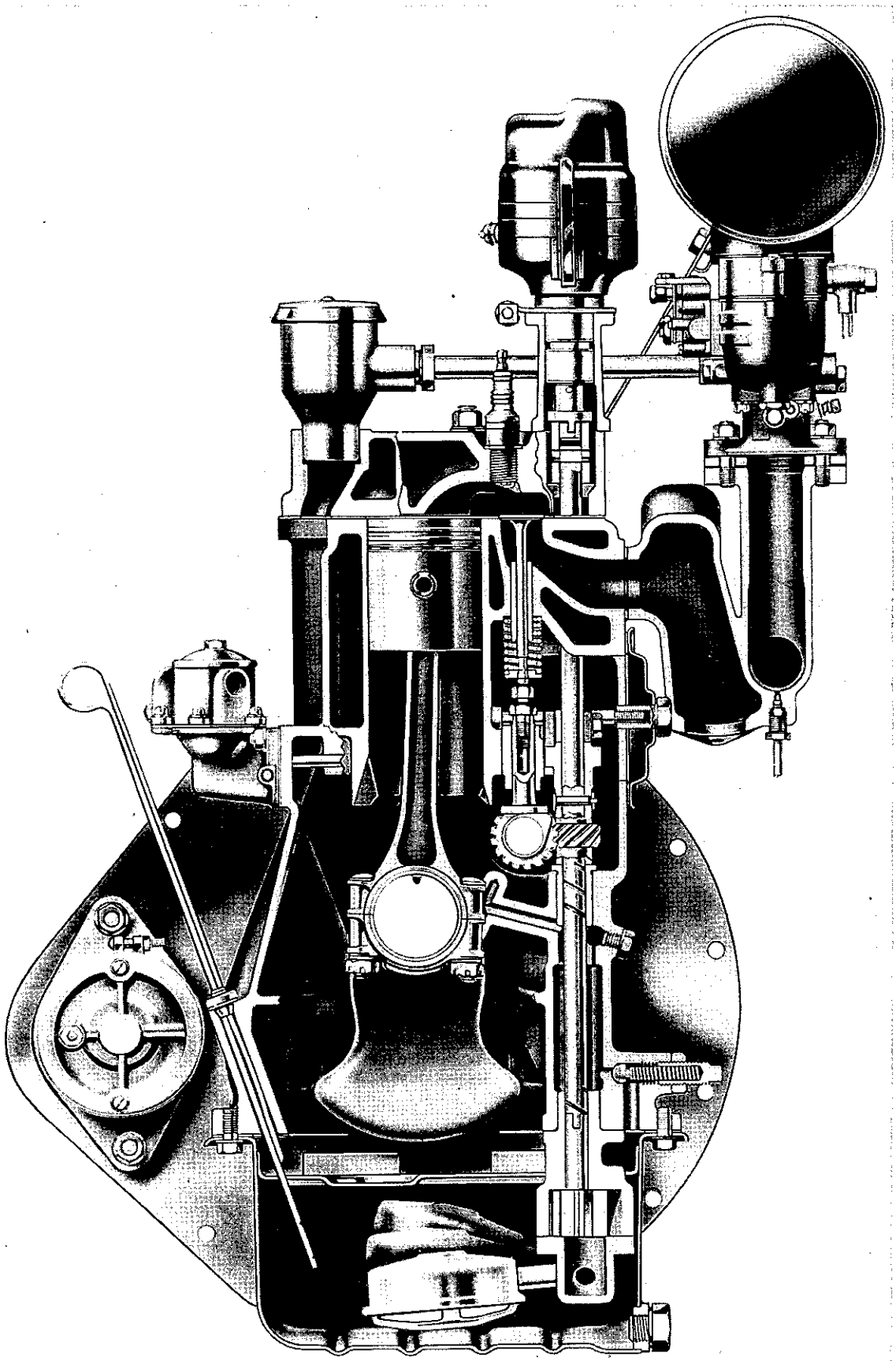


Fig. 2. Cross sectional view of engine and gearbox.

GENERAL DESCRIPTION (Figs. 1 & 2)

The engine has four cylinders of 63 m/m and a stroke of 100 m/m, providing a cubic capacity of 1247 cu. centimetres.

The compression ratio is 6.8.

The cylinder block is manufactured of Chromium Cast Iron, which material has particularly good anti-corrosive properties which are required if long bore life is to be obtained.

The connecting rods are manufactured from high quality carbon steel forgings. Each connecting rod is offset in relation to its crank pin with a view to decreasing the length of the crankshaft and thereby adding to its rigidity.

The cylinder bores are offset (Desaxe) laterally from the centre of the crankshaft journals, thus reducing the width of the engine which otherwise would be required.

A split skirt type of Aluminium Alloy Piston is fitted, these being tin coated in manufacture, with a view to preventing surface damage during the running in period. The split portion of the piston faces towards the camshaft, or opposite to the side of maximum thrust.

The crankshaft is forged from Molybdenum Manganese Steel, the throws adjacent to each of the three main bearings being suitably shaped to counter balance the load on these bearings.

The crankshaft is accommodated in three precision type, white metal lined, steel backed bearings, each pair of bearings being mounted in the cylinder block and secured thereto by a cap and two $\frac{1}{2}$" N.F. setscrews and lock washers.

Crankshaft thrust is taken by two steel backed white metal covered half washers, which fit into a recess machined on each side of the rear bearing cap. The thrust pieces are located circumferentially by the engagement of the extremities of each half washer on the abutting portion of the bearing housing in the cylinder block.

Side by side valves are used, these being operated by flat based chilled cast iron tappets which, in turn, bear directly upon the camshaft.

With early batches of engines, the camshaft was manufactured from a special cast iron alloy, but after a few hundred units a change over was made to a case hardened steel camshaft. The camshaft is provided with four journals which are mounted directly in the cylinder block. The camshaft is located endwise by a case hardened steel plate which plate also takes the end thrust.

The camshaft is driven by an endless silent roller chain which engages a gear on this shaft and on the crankshaft. The tension of the timing chain, which has 56 pitches of $\frac{3}{8}$" is automatically maintained by a tensioning device. The tensioning device consists of a spring steel, bow shaped, double blade attachment which bears on the timing chain, being anchored at its lower extremity by a pin on the timing cover, its other end bearing against the inside of the cover.

The chilled cast iron tappets are accommodated in cast iron guide blocks which are secured by four bolts to the cylinder block. The centre pair of setscrews also secure the distributor and oil pump drive shaft abutment and for this reason are longer than the outer ones.

The oil pump, which is of the submerged double rotor type, is driven by a vertical shaft on which is pegged a helical gear, an integral portion of which embodies the petrol pump operating eccentric. The helical gear on the drive shaft engages with a similar gear cut on the camshaft.

Upward thrust of the gear is taken on a composite abutment bracket which is secured to the cylinder block by two of the four tappet guide attachment bolts.

The petrol pump is mounted on the side of the engine remote from the camshaft and is operated by a cast-iron bushed, horizontally disposed push rod, bearing on an eccentric, which is an integral portion of the pump and distributor drive shaft helical.

An aluminium alloy combustion head is employed, this being secured to the cylinder block by sixteen $\frac{3}{8}$" N.F. studs and nuts. A copper and asbestos gasket is employed. The cylinder head is anodised during manufacture to eliminate the risk of corrosion on the holding studs in service.

The cooling system is thermostatically controlled and a combined water pump and fan assembly is used to circulate the water and to provide extenal cooling for the engine.

The water pump is driven in tandem with the dynamo by an endless rubber composition belt passing round a pulley mounted on its stainless steel spindle, which spindle is mounted on two ball bearings and carries on its inner extremity an impellor and seal assembly; provision is made for external lubrication of the two bearings and adjustments of the driving belt is arranged by movements of the dynamo in its cradle.

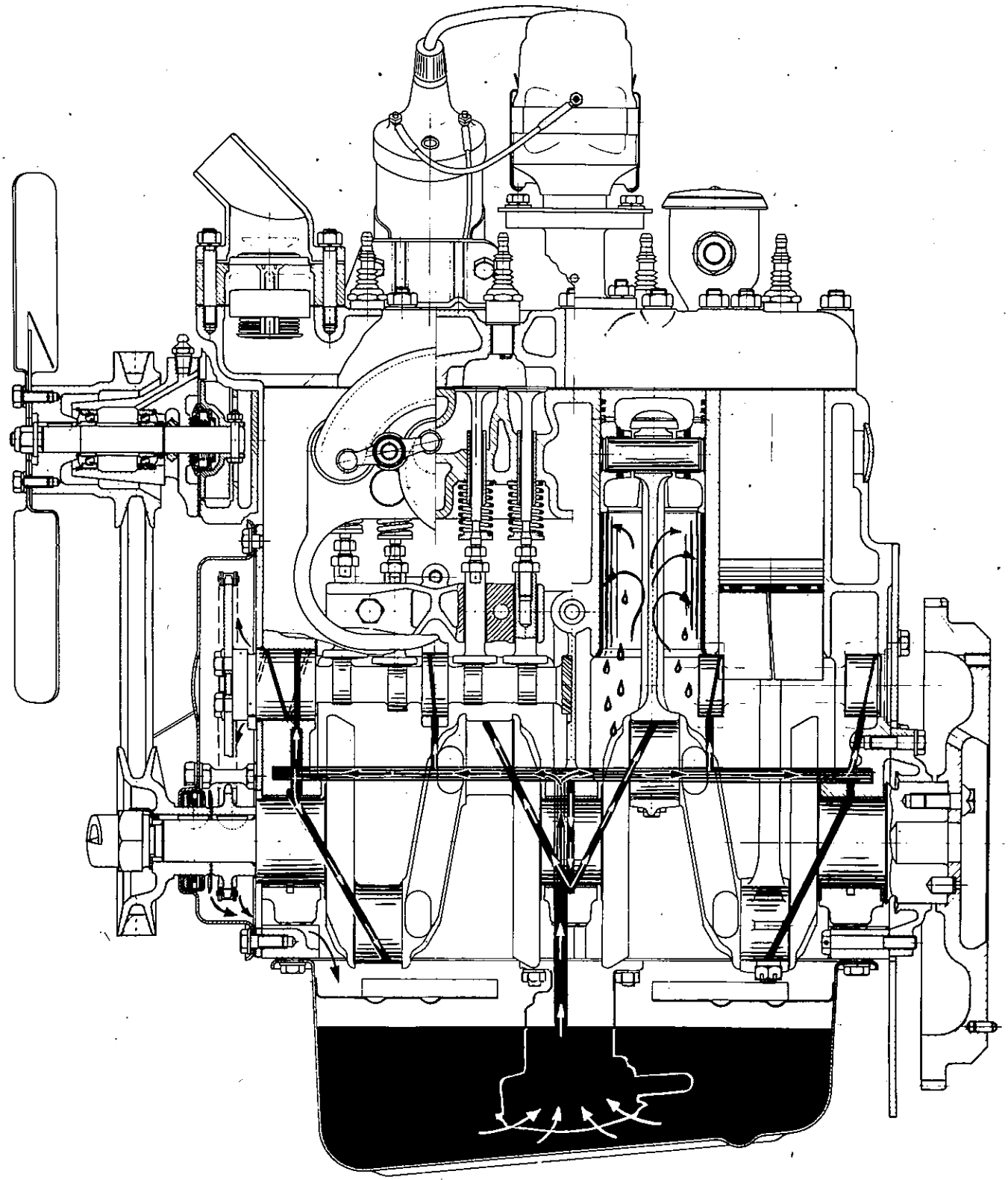


Fig. 3. Longitudinal section of engine showing oil circulation.

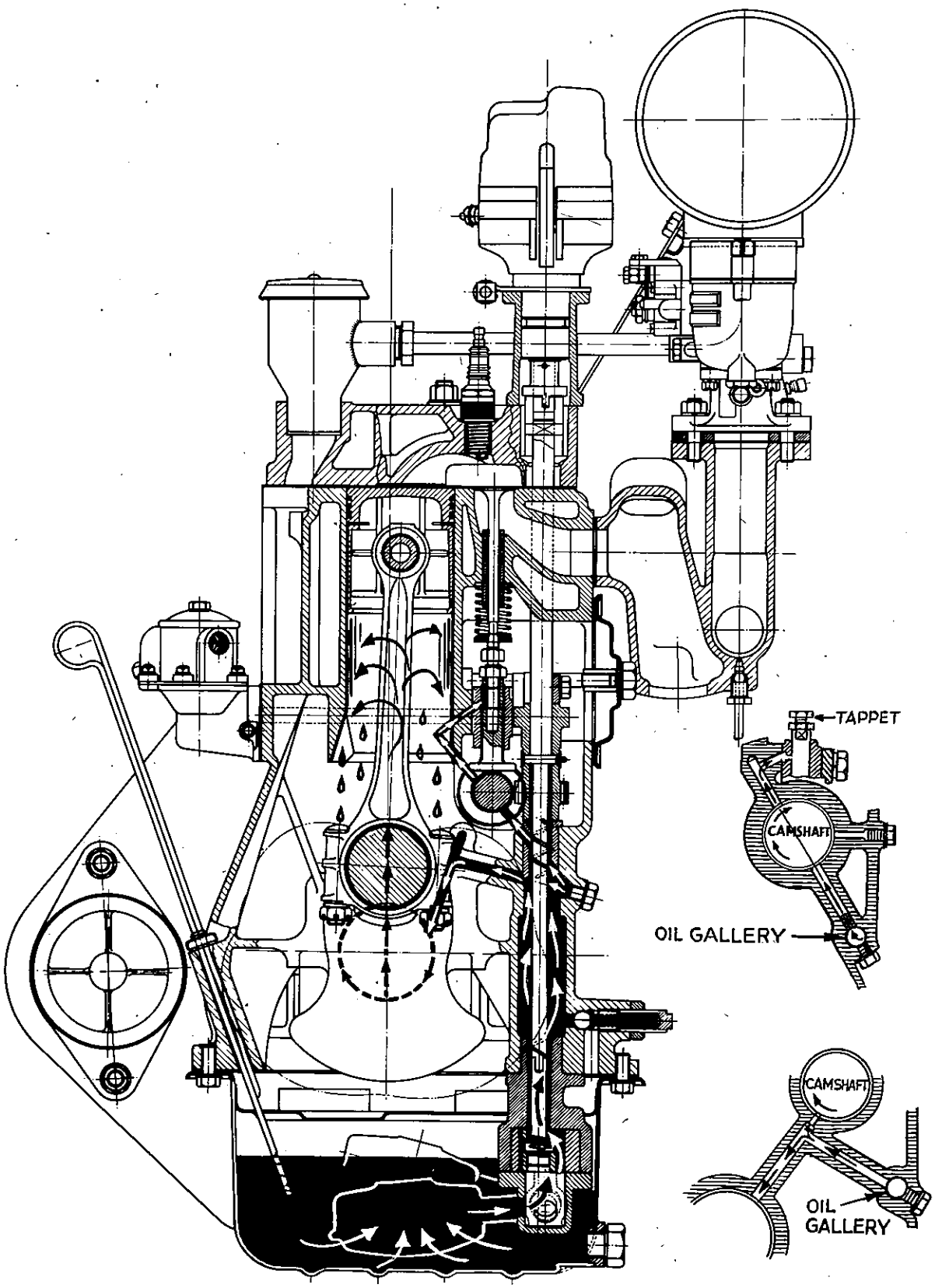


Fig. 4. Cross sectional view of engine showing oil circulation.

OVERHAULS AND ADJUSTMENTS

ENGINE LUBRICATION

(See Figs. 3 & 4).

Description.

Engine lubrication is by a double rotor pump which is described in detail later in this Section.

Oil is picked up from the sump by a floating intake, which is hinged at its attachment to the pump and rises and falls with the oil level, hence ensuring that the oil picked up is always the cleanest available.

The oil pump is driven by a short shaft, which is pegged to the inner rotor at its lower extremity and slotted at its upper end to receive the projection on the lower end of a vertical shaft, on which is mounted a helical gear which engages a similar gear on the camshaft to provide the drive for the oil pump and distributor gear. A cam on the driven gear operates the fuel pump.

Oil drawn through the floating intake passes through a passage to the rotor chamber, whence it is forced by the relative motion of the two rotors up a passage in the pump passing into the annular space which surrounds the vertical driving shaft. The oil in its passage up the annular space, mentioned above, passes over an adjustable pressure release ball (a plunger has recently been introduced) and into a longitudinal oil gallery, being sealed off from further upward travel by the driving shaft bush.

The oil having entered the gallery passes directly to the three main bearings and through restrictors pressed into the cylinder block, to the two intermediate camshaft journals.

The front and rear camshaft bearings are fed through restricted by-passes from the oil channels supplying the front and rear main bearings.

By-passes from the intermediate camshaft journals supply oil to a channel cast in each tappet guide block, each tappet being lubricated by a hole drilled from the channel into the respective tappet bores.

Surplus oil from the front camshaft journal, which passes into the timing case, is caught on an oil deflector and from thence conveyed onto the timing chain and gears.

The oil supplied to the main bearings is fed through drillings in the crankshaft to the adjacent big end bearings—one each in the case of the front and rear main bearings and two in the case of the middle one.

The pistons, cylinder walls, gudgeon pins and bushes depend upon the oil thrown out of the big end for their lubrication.

OIL PUMP.

Description.

The oil pump is of the double rotor type and is shown in exploded form in Fig 5.

The smaller or centre rotor is driven by a shaft on which it is pressed into position and pegged. The two rotors are contained in a white metal housing, which is an integral portion of the pump casting, and provided with a cover assembly which has a ground face and embodies an elbow into which the floating oil intake pipe

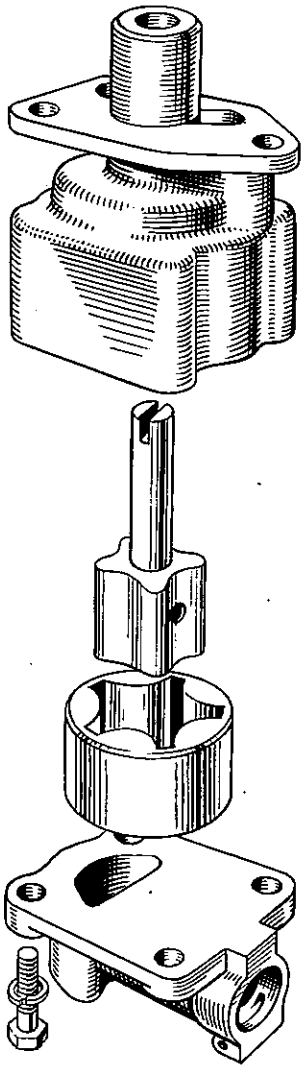


Fig. 5. Exploded view of oil pump.

fits. The clearance between the ground face of the cover assembly and the rotors is just sufficient to provide for the necessary end lubrication of the two rotors. The centres of the two rotors are offset, the inner rotor shaft is provided with a slot which engages a projection on the lower extremity of a vertical driving shaft which is geared helically to the camshaft.

The smaller rotor, by its engagement with the outer rotor, drives the latter round at a slightly slower speed owing to the difference in sizes.

Owing to the relative movement of the centre rotor around the outer rotor, and the close fit of the cover plate, and of the outer rotor in the casing, oil is forced out of the rotor casing and upward through a passage cast in the pump body to the annular space around the driving shaft, as shown in Fig.26 From the annular space around the driving shaft, oil is circulated around the engine as described under "Engine Lurication."

To Remove Oil Pump.

If it is necessary at any time to remove the oil pump, the sump should be drained of oil and removed. The sump's removal clears the way for the withdrawal of the pump which is secured to the cylinder block by three studs, nuts and lock washers. ($\frac{1}{2}$" A/F Spanner).

To Dismantle Oil Pump.

Remove the $\frac{1}{8}$" split pin which locates the floating oil intake pipe in the pump cover assembly, and withdraw the intake assembly.

Remove the four setscrews which secure the cover assembly to the pump casting and detach the cover assembly thus providing access for the withdrawal of the two rotors.

Servicing the Oil Pump.

As the pump provides a heavy surplus of oil to that which is required for the engine's lubrication and as, owing to the design of the unit, little wear is likely to occur in service, few maintenance attentions need be expected to be required during the Car's normal lifetime.

From the experience with this type of pump on the Two Litre Models, no adjustments are likely to be required until upwards of 200,000 miles running and will then probably be limited to the elimination of rotor end float and can be satisfactorily met by lapping the joint faces on the rotor casing and cover assembly. The clearance new between the ground portion of the cover assembly and the upper side of the rotor is .0005-.0025" and where a serious drop in oil delivery from the pump is associated with the development of excessive rotor end float steps should be taken to lap the cover plate and body.

CRANKSHAFT AND MAIN BEARING

Crankshaft and Main Bearing.

The Crankshaft is a Manganese Molybdenum forging with ground journals and crank pins Counterbalance weights are an integral part of the crankshaft throws adjacent to the three main bearings.

The main and big end bearings are of the precision type, being steel backed and white metal lined. *No hand fitting is required and under no circumstances should the bearing caps be filed with a view to taking up wear.*

When big end bearing caps have been filed it becomes necessary to ream or machine the housings to the size given on Page 1. In the case of main bearing caps which have been let down by filing, it will be necessary to have the three main bearings line bored or reamed to the size given on Page 1 before fitting new bearings.

When excessive bearing wear has occurred the only satisfactory cure is to replace the bearing so worn, ensuring first that the crankshaft journals are in good order and there is no question of a regrind being required.

Bearings can be replaced without removing the engine from the frame. Where a crankshaft journal, or crank pin, is worn, scored or tapered in excess of .002", regrinding is necessary (for dimensions of journals see Page 1).

Where a regrind is found to be necessary, a decision will have to be made as to the suitable undersize bearings, which will meet the particular case. The reduced diameter of journal or crank pin to suit the various undersize bearings may be calculated by subtracting—.020" —.030 or —.040"—the undersized bearings available from the Spares Department—from the original dimensions on Page 1 for these items.

Main Bearing Clearances.

The crankshaft journal diameter, and the internal dimensions of the bearings for these is given on Page 1. The clearance new for these bearings is .001" to .002", if the wear clearance exceeds .006" or if the journals have become scored, the crankshaft will require

regrinding and undersized bearings will have to be fitted.

The crankshaft should be measured with a micrometer gauge and if the reading is less than 1.9975″ for the journals (for a crankshaft which has not previously been reground) then the shaft is due for regrinding to suit available undersize bearings to deal with the journal wear, or damage which has occurred.

With regard to the bearings themselves, when the worn internal dimensions exceed 2.003″ (for standard sized bearings), replacements should be fitted sufficiently undersized to suit the amount by which the crankshaft has to be reduced having regard to the undersizes available —.020″, —.030″ and —.040″.

Crankshaft End Float.

The end float specified for this crankshaft new, should be .004″ — .006″ and can either be measured with a dial gauge conveniently mounted on the cylinder block as shown in Figs. 6 & 7 or, alternatively, a set of feelers may be used.

Where end float is found to be excessive, the thrust washer accommodated on each side of the rear main bearing cap should be replaced by new ones and the end float again checked. If the end float is then found to be inadequate, the thickness of the steel backs of the two thrust washers should be suitably reduced on a piece of emery cloth placed on a surface plate as shown in Fig. 8. Thrust washers of oversize thickness + .005″ are to be available from our Spares Department.

Big End Bearing Clearances.

The clearance between the crank pin and the big end bearing, when new, should fall

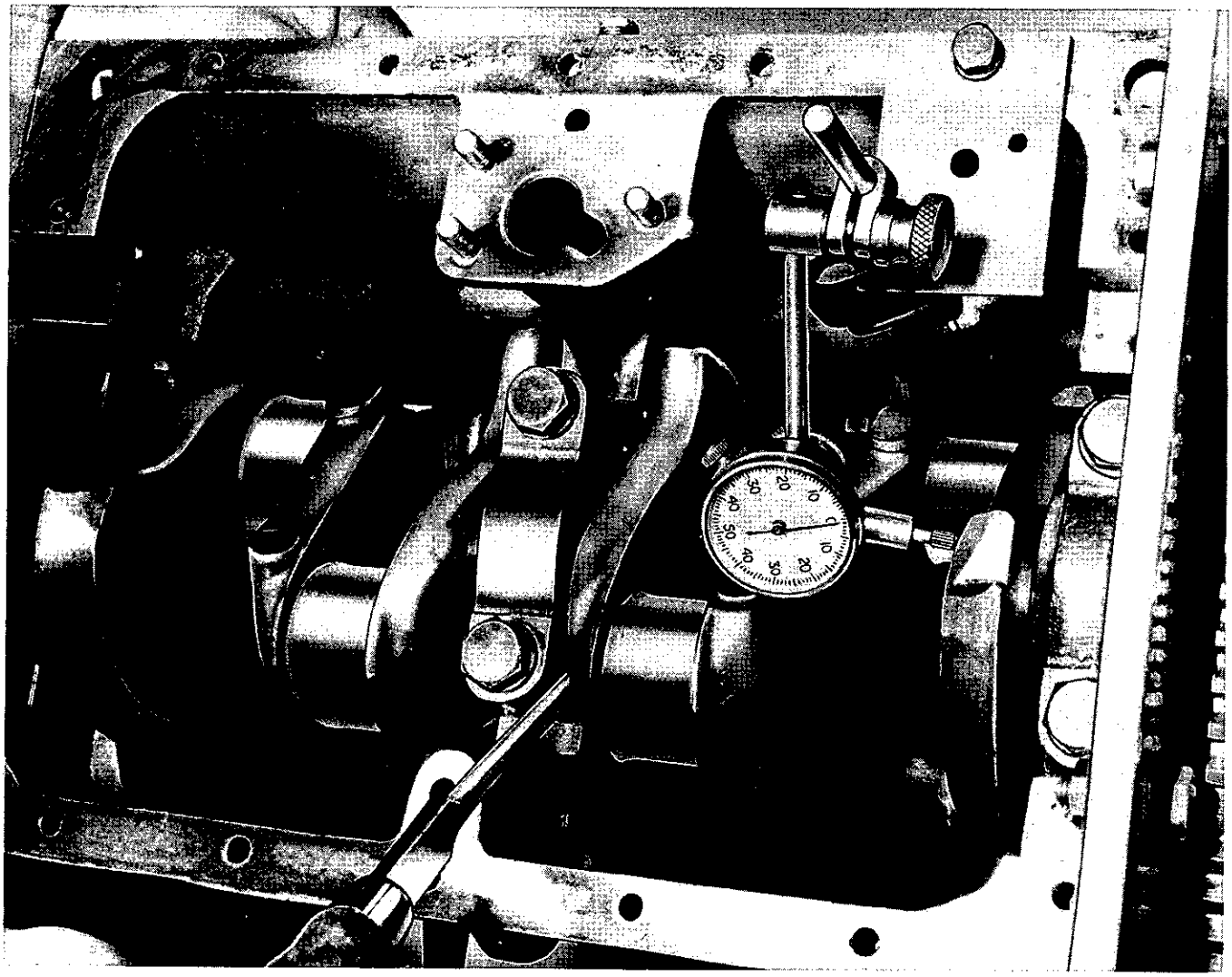


Fig. 6. Checking crankshaft float—" zeroing " indicator.

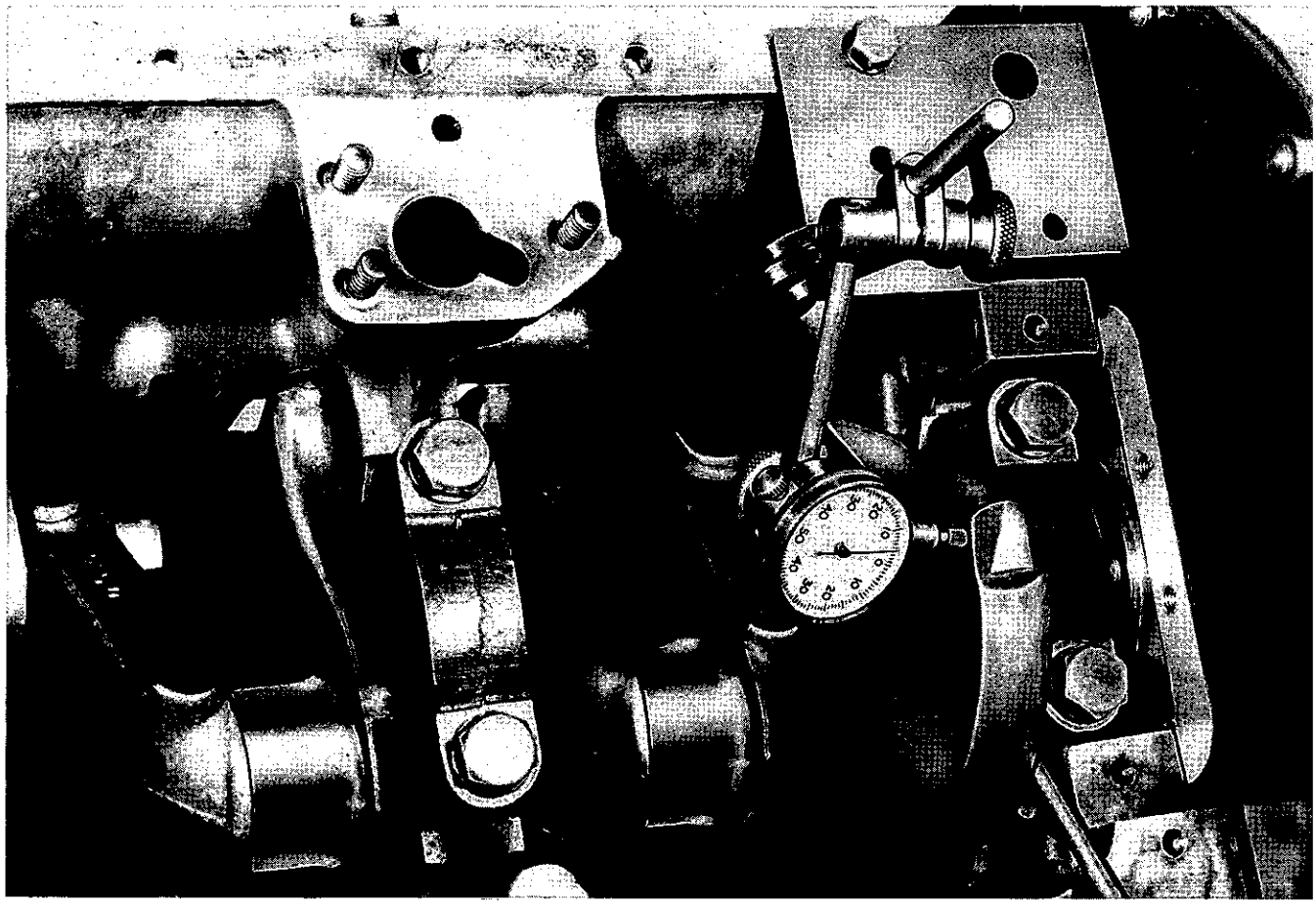


Fig. 7. Checking crankshaft float—measuring float.

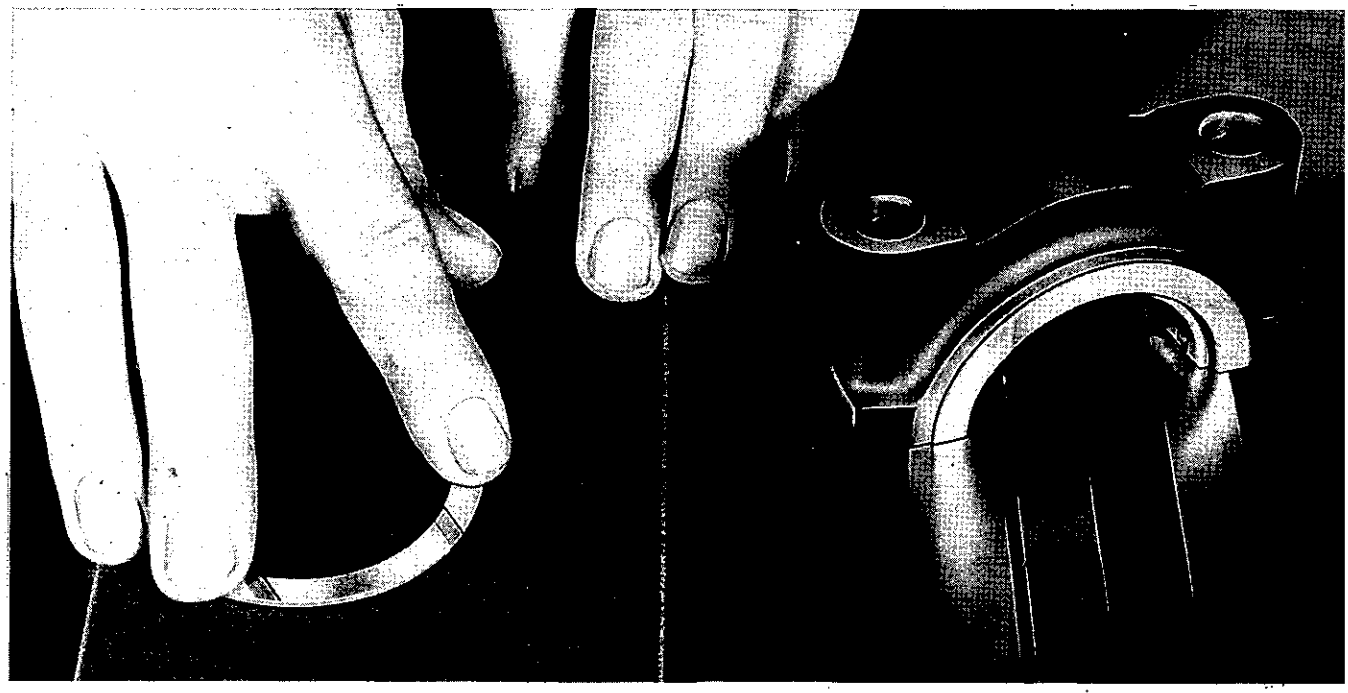


Fig. 8. Reducing steel back of thrust washer.

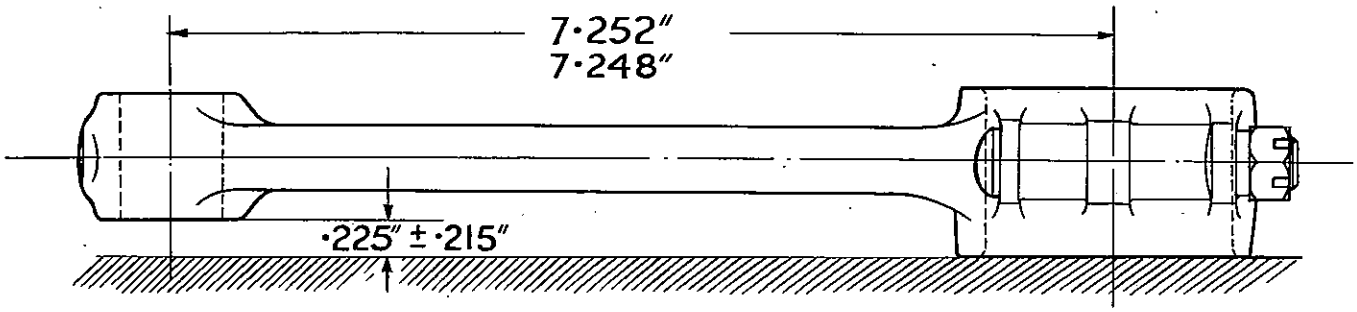


Fig. 9. Checking connecting rod offset on a surface plate.

between .001″ — .002″ and the side clearance be between .008″ and .010″.

Where the crank pin dimension is found on measurement with a micrometer to be less than 1.748″, crankshaft pins will require regrinding, to meet the wear which has occurred, and to accommodate an available undersize set of big end bearings (—.020″, —.030″ or —.040″).

Under no circumstances should the bearing caps be filed with a view to taking up wear as such a procedure will render the connecting rods unfit for further use.

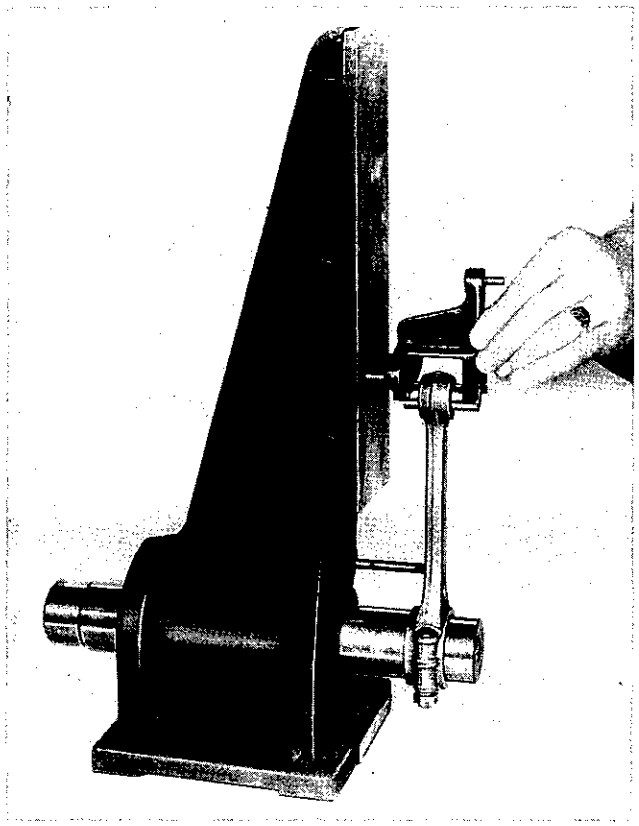


Fig. 10. Checking connecting rod for bend with Churchill Alignment Tester—Tool No. VLC 335.

Small End Bearings.

The small end bushes, the dimensions for which are given on Page 2 should be pressed into the rod and subsequently reamed to $\frac{3}{4}$″ ± .0002″, and the gudgeon pin selected to leave a clearance of .0002″ at 68° Fahr. This clearance will be represented by a light finger push fit, after the piston has been immersed in hot water.

Connecting Rod Centres and Offset.

The connecting rod centres are $7\frac{1}{4}$″ ± .002″ and the centre line of each of the front and rear pairs of rods are offset from one another. The object of this offsetting is to reduce the overall length of the engine and also the length of the crankshaft giving increased rigidity. The offset can be checked as shown in Fig. 9.

Before installing a connecting rod it should be checked for alignment after first removing the bearing shell.

The rod should be checked for bend as shown in Fig. 10 and for twist as shown in Fig. 11. If the rod is bent from the vertical plane the piston will be cocked sideways, whereas if the rod is twisted the gudgeon pin will be operating in a different plane to the crankpin. Appropriate action should be taken with a suitable bending iron to correct the alignment.

The connecting rod and piston aligning fixture, which is shown may be obtained from Messrs. V. L. Churchill and Co. Ltd., 27/34, Walnut Tree Walk, Kennington, S.E.11. Where this fixture has already been in use for the "Vanguard" Models, it may be necessary to provide an additional journal size of 1.855″ on the mandrel to fit the connecting rod bearing housing. Later mandrels with this fixture are suitably equipped.

Piston Assembly.

An aluminium alloy split skirt piston is used. The piston is coated with a thin deposit

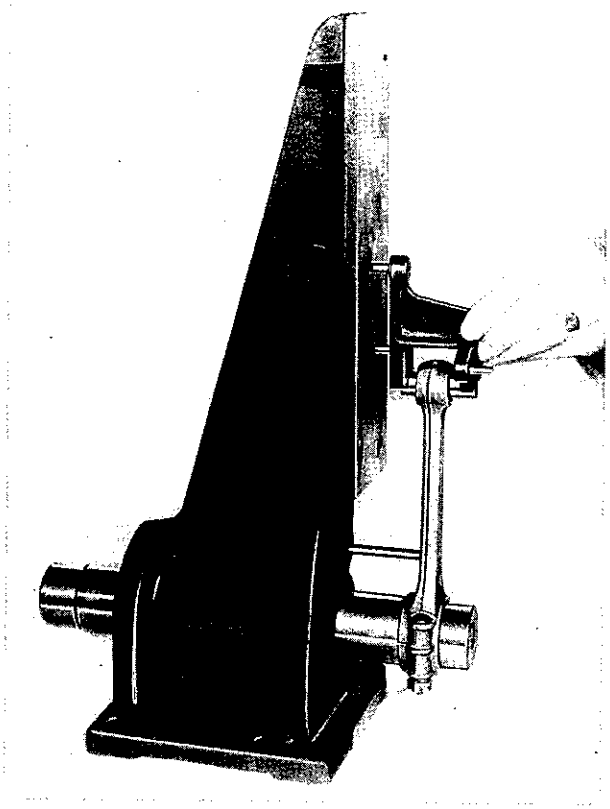


Fig. 11. Checking connecting rod for twist with Churchill Fixture—Tool No. VLC.335.

of tin with a view to minimising the possibili of damage during the initial "running in period.

Selective assembly is used when assemblir the engine in the factory and three sizes pistons are used and can be indentified by th letters "F", "G" or "H", the appropriat code letter being stamped on the crown of eac piston. The appropriate size of piston (dimen sions of which are given on Page 2) is selecte to suit the bore size, this is measured durin manufacture and is indicated, as with the piston by suitable lettering on the right hand side c the cylinder block just below the combustio head as shown in Fig. 12.

Where piston replacement is required t deal with slight wear or damage, which doe not neccesitate a rebore, during the initial lif of an engine, the larger size of piston marke "H" in practically every case, will be required

The periphery of the top compression rin is coated with chrome to reduce bore wear, bu the second ring is not so treated. The bottor or oil scraper ring is slotted and wider than th other two.

After the first few hundred "Mayflower' engines were built, a change in the two botton rings was made. A tapered second compressior

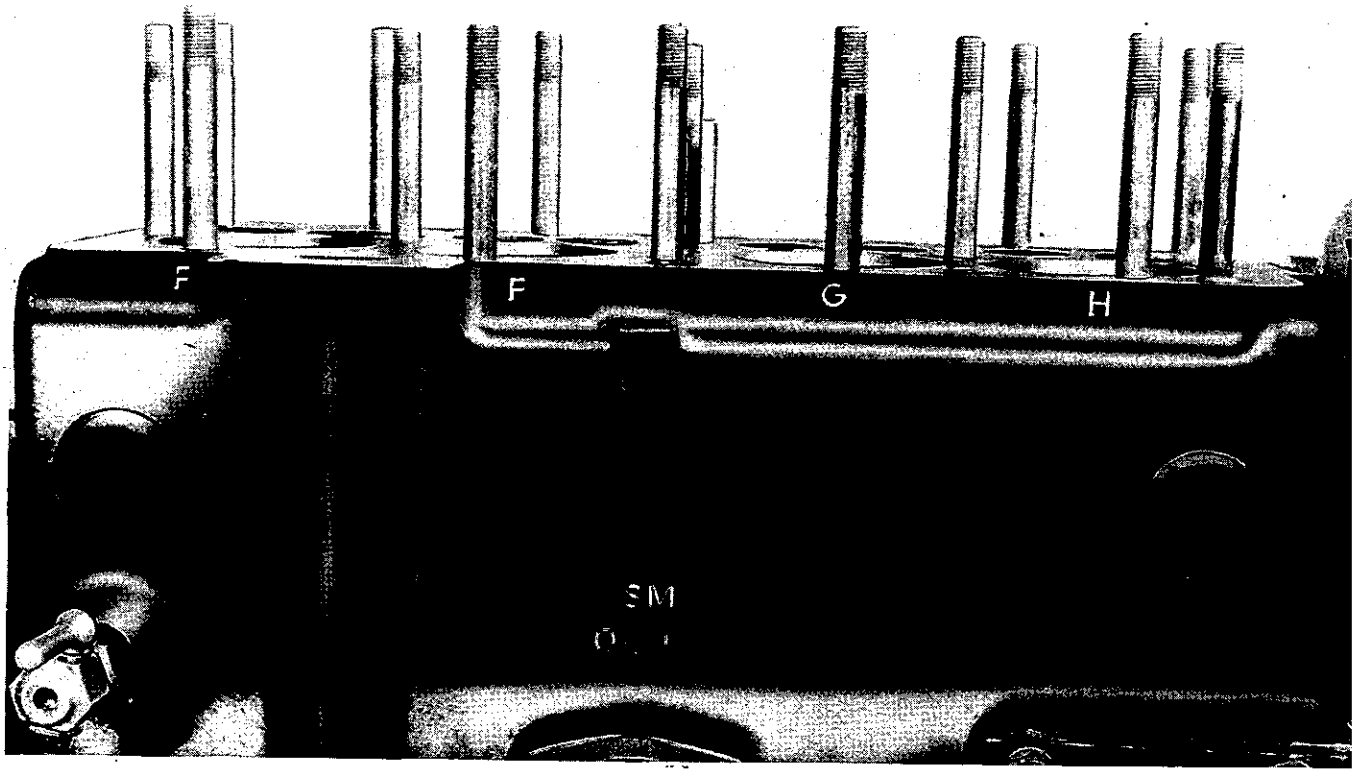


Fig. 12. Cylinder block selective markings to correspond with bore sizes.

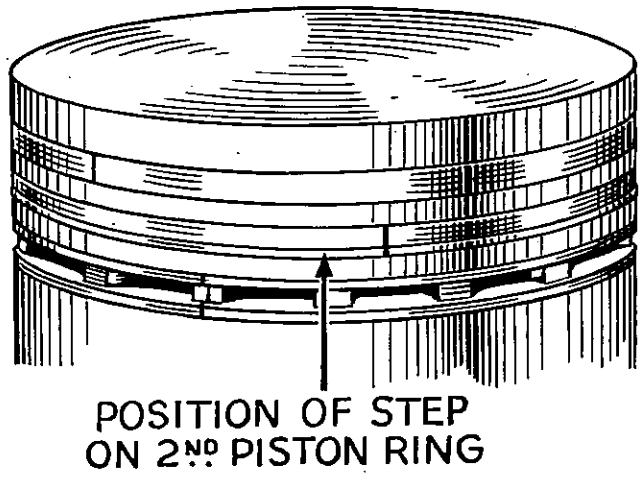


Fig. 13. Showing the correct positioning of tapered compression ring. This ring is marked " T " on its upper face.

ring replaced the ring of uniform section which was first fitted and a butt ended, high radial pressure ring replaced the scarf ended ring used initially. No change to the piston itself was made, but it is of vital importance that the larger diameter of the stepped piston ring is fitted towards the bottom of its groove in the piston as shown in Fig. 13.

This alteration was made with a view to improving oil control.

Piston ring dimensions and clearances are given on Page 2. Where the cylinder bore wear exceeds .007" at the top and .005" at the bottom of the bores reboring of the block becomes necessary, if a satisfactory repair is to be made.

The connecting rod should be fitted to the piston so that the slot in this is towards the camshaft side of the engine in its assembled position, or away from the point of maximum cylinder wall thrust. The slot in the piston, when assembled on the connecting rod will face away from the side on which the big end bearing housing is numbered, or towards the Camshaft.

VALVES — DETAILS AND TIMING.

Exhaust Valve.

The exhaust valves are stampings made of special valve steel (EN. 59). The head is 1" in diameter and the stem $\frac{1}{4}$". The included angle of the valve face is 90 degrees. The stem diameter is $\frac{1}{4}$".

The valve is mounted in a Cast Iron guide, which is pressed into the cylinder block. The dimensions of the valve guide are given on Page 3.

Inlet Valve.

The inlet valves are a stamping made from Silichrome Steel (EN. 52). The head diameter being 1.$\frac{3}{16}$" and that of the stem $\frac{1}{4}$". The face angle as for the exhaust is 45 degrees.

Details for the valve guides are identical to those for the exhaust valve given on Page 3.

Valve Seatings.

Where valves and seatings are found to be be pitted and unlikely to respond to ordinary valve grinding, the seating will have to be recut with a cutter having an included angle of 89 degrees as shown in Fig. 14 and the valve replaced on a suitable facing machine.

After a considerable mileage it is possible that the seating may have become embedded in the cylinder head and to deal with such wear the employment of the cutter, mentioned earlier, should be preceded by one of 15 degrees, to

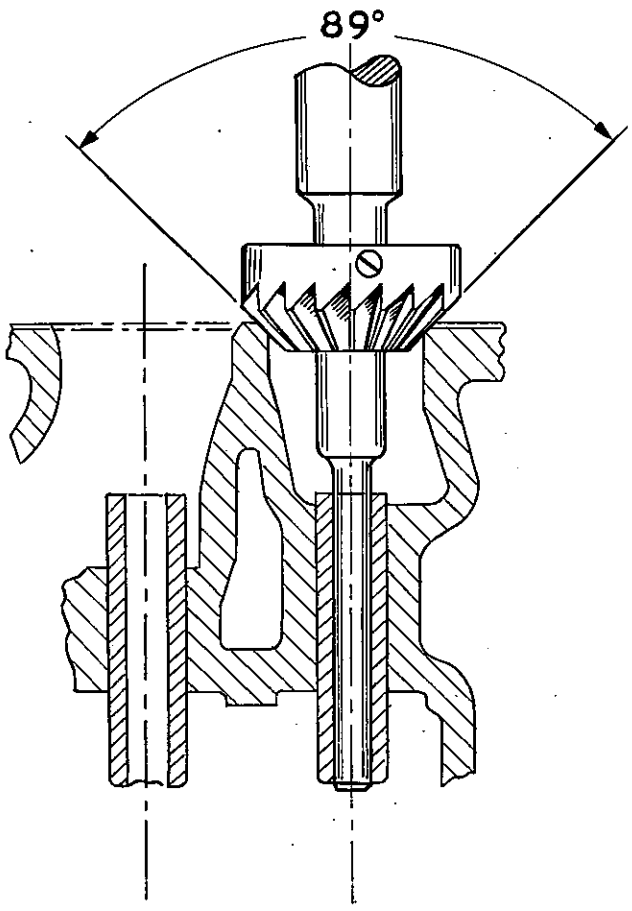


Fig. 14. Showing use of valve seating cutter for normal refacing.

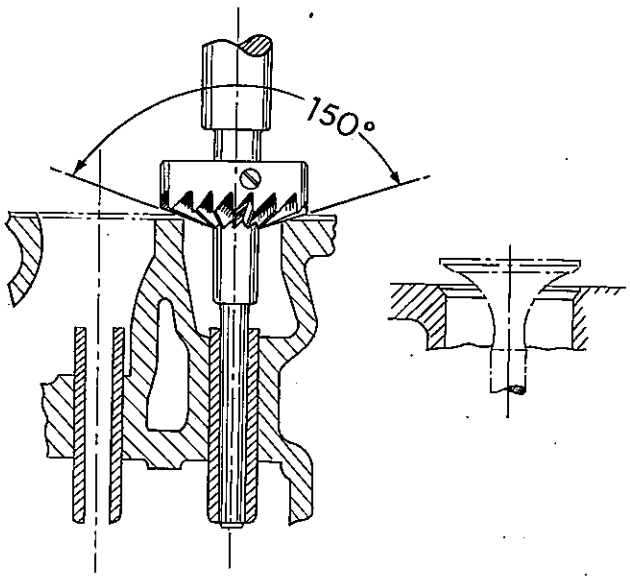


Fig. 15. Showing the use of a cutter to deal with a sunken valve.

provide clearance for the incoming and outgoing gases as shown in Fig. 15.

It is important before using a valve seating cutter, to ensure that the guides are in good order and if doubt exists as to their concentricity with the seatings, they should be replaced by new ones.

Springs and Collars.

The valve springs are located endwise c the valve stem and against the cylinder block b a collar having an elongated slot as shown Fig. 16.

In order to assemble the spring and coll on to a valve in the engine, utilize pieces of ra to prevent collars and springs entering the sum Next offer up the spring and collar to the valv stem with the larger hole facing towards th cylinder block, as shown in Fig. 16.

Having registered the larger hole in th collar on the bottom of the valve stem by hanc a valve spring compressor, such as that show in Fig. 17 can be used to compress the spring until the collar is aligned with the recess in th valve stem, after which the base of the sprin compressor should be pushed inwards towarc the cylinder block sufficiently to move the sprin and collar until the smaller hole is aligned wit the valve stem. The release of the valve sprin compressor now should leave the collar locke to the valve stem.

When removing the valve spring and colla the collar and spring should be turned, so tha the slot is at right angles to the axis of the engin and the larger hole is towards the cylinder block The spring and collar should now be raised wit a suitable compressor sufficiently to free th

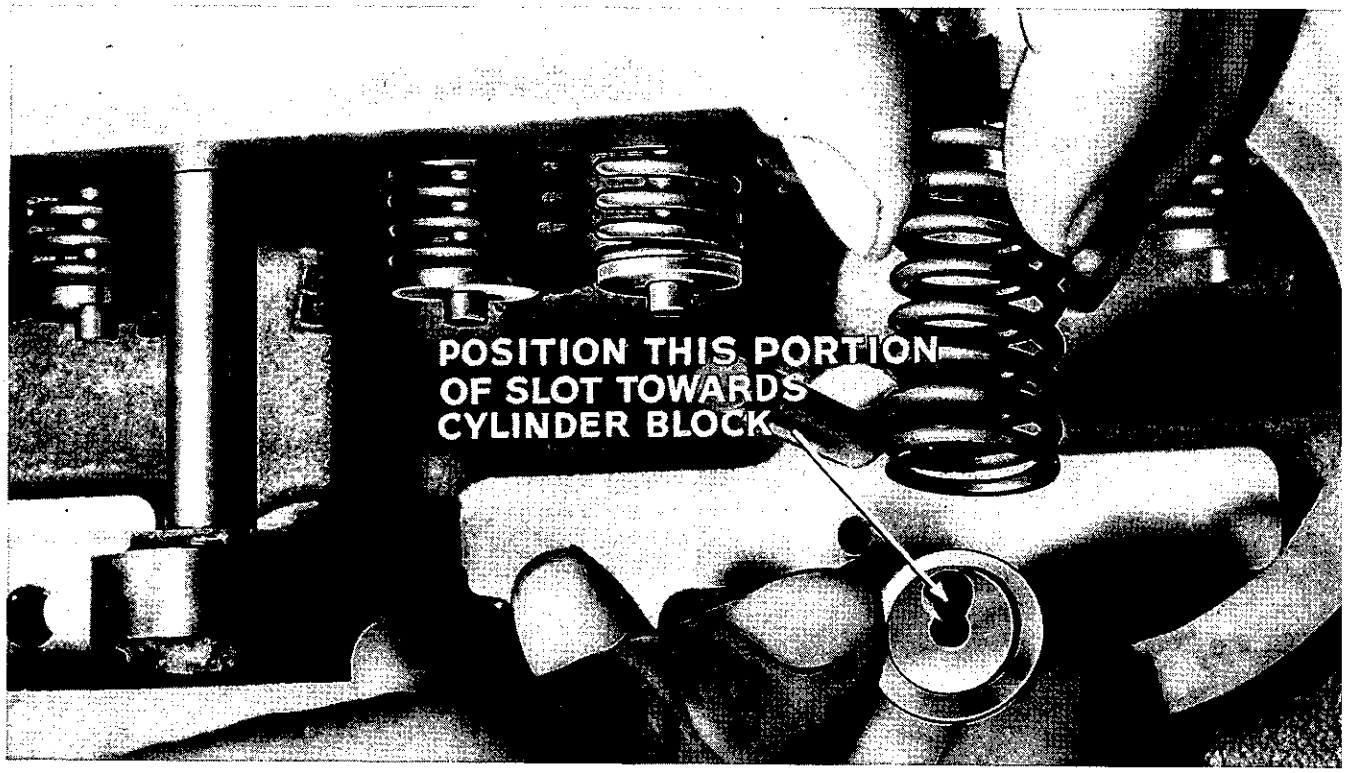


Fig. 16. Showing alignment of slot on spring collar to facilitate assembly on valve stem.

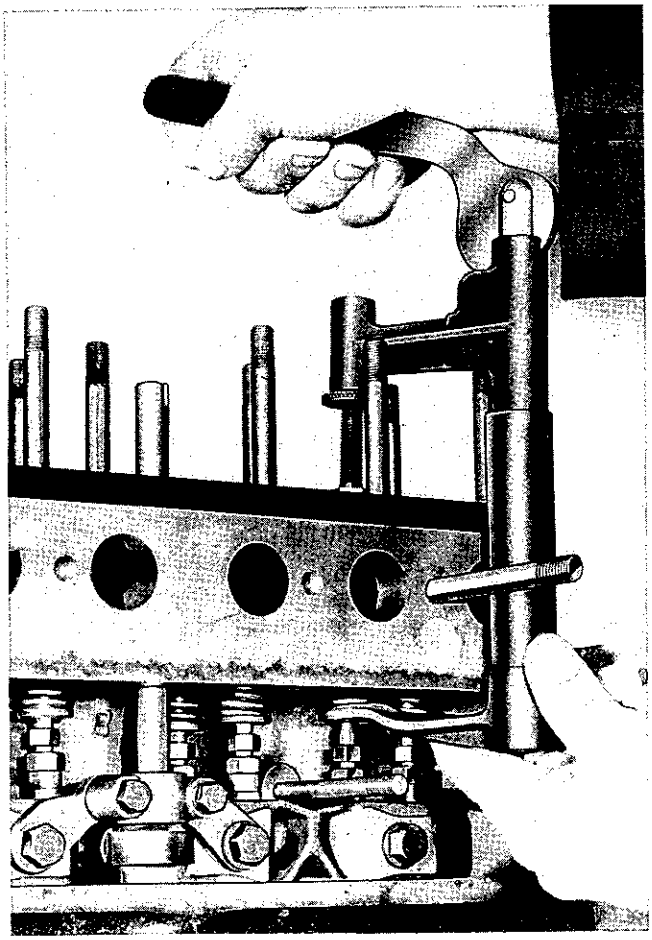


Fig. 17. Using valve spring compressor to fit collar —Churchill Tool No. S.52.

collar from the recess in the valve stem. The bottom of the compressor should then be moved outwards, thus engaging the larger hole on the valve stem, after which, by releasing the spring pressure on the compressor, the collar and spring can be drawn off the valve stems and removed.

It is possible to ultilize direct pressure, instead of the valve spring compressor, and with such a lever as is shown in Fig. 18, to fit or remove these collars, using a bar across the tops of the valve heads to hold these down, as shown in Fig. 19. This is a method which is better employed, however, with the engine on the bench, as with the unit in the car it will prove a little more difficult to exercise sufficient leverage on the valve collar and spring.

To adjust tappets.

1. Turn the engine with the starting handle until No. 1 cylinder is at T.D.C. of the compression stroke *i.e.* with the valve tappets resting on the concentric portion of the cam, as shown in Fig. 20.
2. Slacken off the lock nut on the tappet which is being adjusted with a suitable spanner ($\frac{1}{2}$" A/F) whilst preventing the tappet from rotating by either the engagement of a spanner on its two flats ($\frac{13}{32}$" A/F) or the employment of suitable wedge pieces inserted between the two tappets as shown in Fig. 21. Having slackened off the locknut another spanner should be used to rotate the lock nut, ($\frac{7}{16}$" A/F) until a clearance of .015" is provided. Having obtained the correct clearance the lock nut should be secured, whilst preventing any movement of the tappet and adjuster screw. After tightening the locknut recheck the clearance with a .015" clearance gauge and ensure that this gauge is a push fit between the valve stem and adjuster

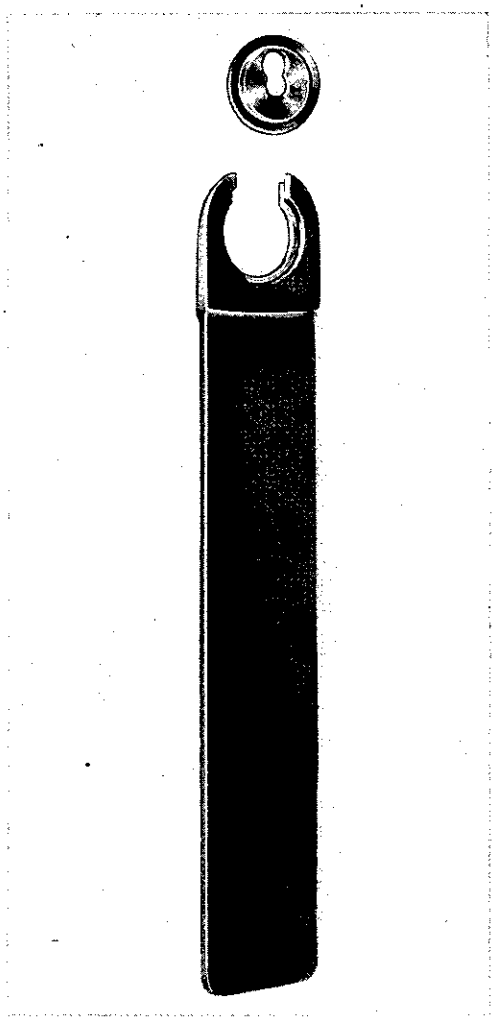


Fig. 18. Showing a suitable lever for direct compression of valve spring.

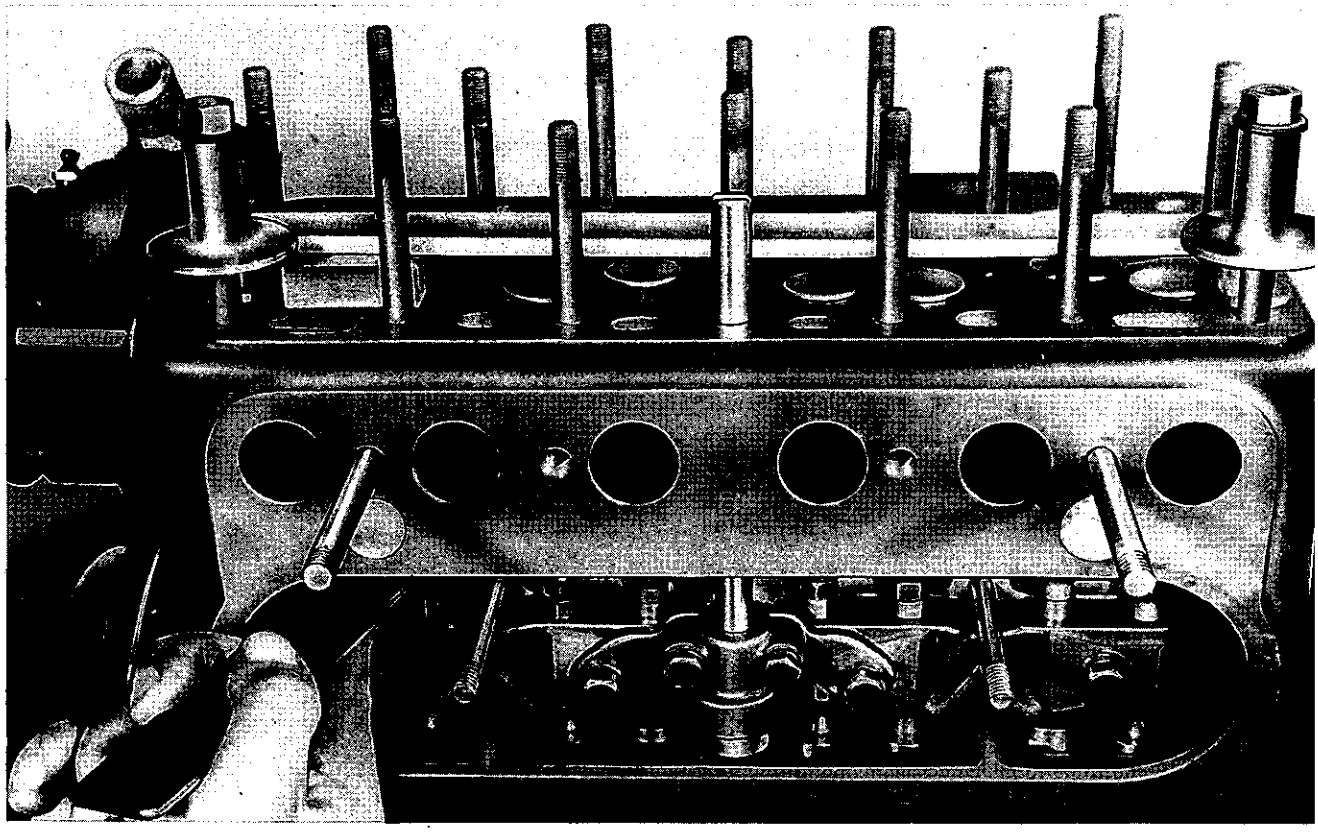


Fig. 19. Showing hand lever being used in conjunction with valve locating bar and packing.

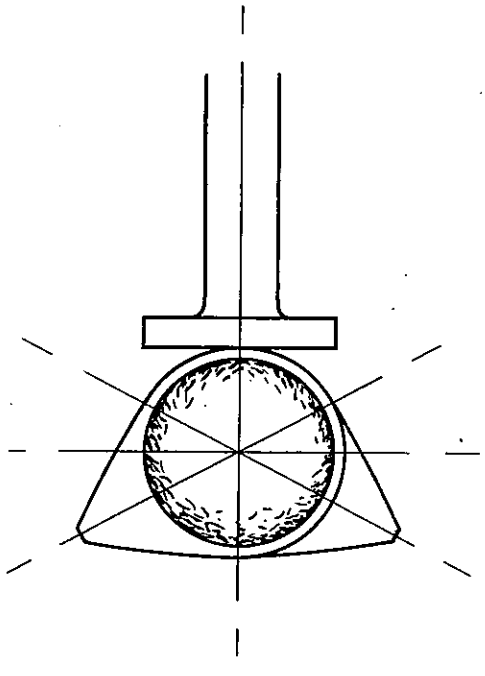


Fig. 20. Showing valve tappets on concentric portion of cams.

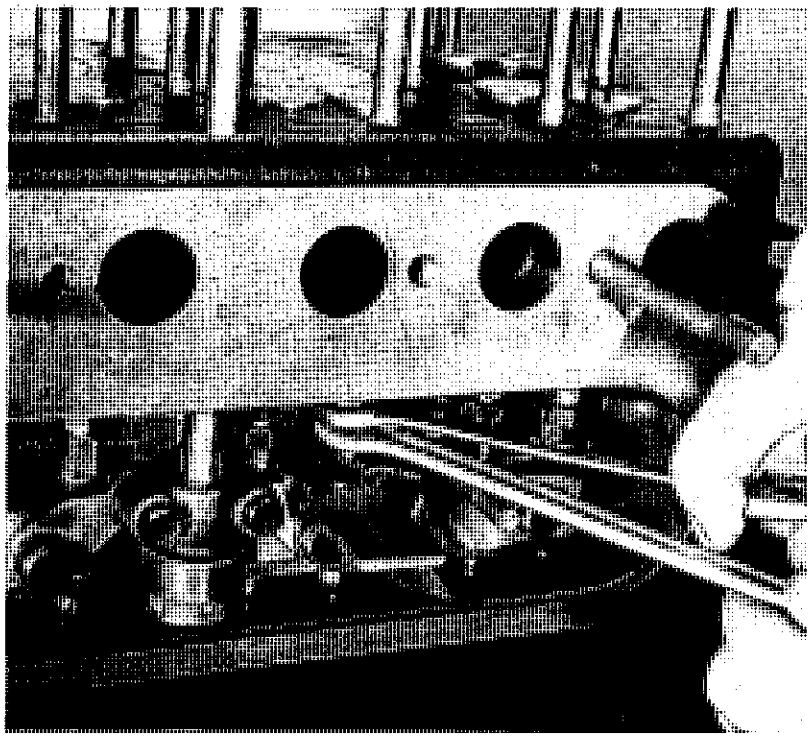


Fig. 21. Adjusting valve tappets with two spanners and tappet locl

screw. Make any further adjustment which may be necessary.

3. Turn the starting handle through 180 degrees and repeat the procedure indicated above for No. 3 cylinder, subsequently carrying out the same adjustment after a further 180 degree rotations of the crankshaft for Nos. 4 and 2 cylinders respectively thus following the order of firing 1-3-4-2.

TO SET VALVE TIMING.

(a) Where Timing Gears are Marked.

For the purpose of this instruction it will be assumed that the camshaft timing wheel and gear have already been removed.

The following procedure should be used :—

1. Turn crankshaft until Nos. 1 and 4 pistons are on T.D.C. and fit crankshaft gear.
2. Fit camshaft timing gear and chain on to the camshaft spigot matching up the centre punch and scribed markings on the camshaft and timing gear faces as shown in Fig. 22. The alternative pair of setscrew holes in the camshaft gear provide a $\frac{1}{2}$" tooth variation in timing.
3. Having suitably matched the timing markings, with the driving side of the timing chain tight, the two securing setscrews and locking plate are fitted, the setscrews tightened and their heads locked by turning up the corners of the locking plate.

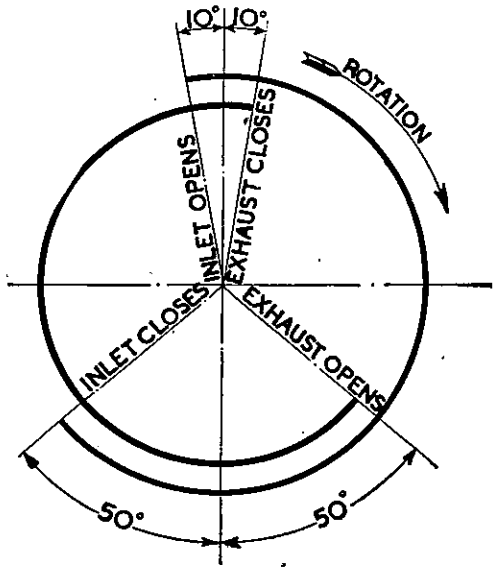


Fig. 22a. Valve timing diagram.

(b). Where Timing Gears are not Marked.

1. Place Nos. 1 and 4 pistons on T.D.C. in

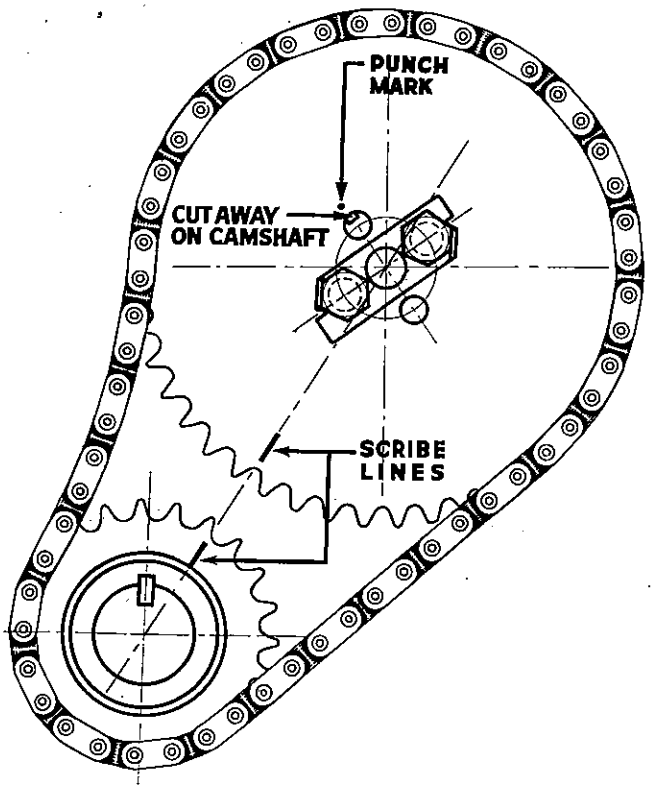


Fig. 22. Showing valve timing gear markings.

Fig. 23. Top dead centre indicator.

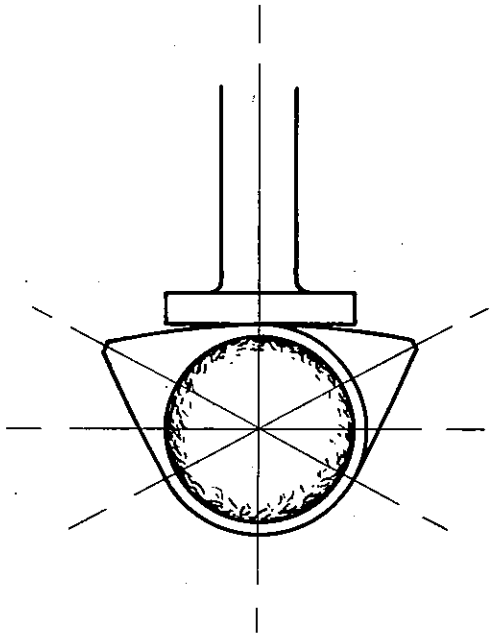


Fig. 24. Showing valve tappets at the point of balance or "rock."

this position the keyway on the forward end of the crankshaft will be pointing vertically upwards, as shown in Fig. 22. (See also Fig. 23 for assembled engine).

2. Rotate camshaft until tappets for No. 4 cylinder are on the concentric portions of their respective cams. Set the two tappets for this cylinder to the working clearanc of .015". (See Note re checking valv opening positions). Similarly set the tappe clearances for No. 1 cylinder.
3. Turn the camshaft until the exhaust an inlet valves for No. 4 cylinder are equidis tant from their respective seatings or at th point of balance and the tappets, as shown in Fig. 24. (A feeler gauge may be use to check this clearance).
4. Engage the timing chain with the crank shaft wheel and fit the Camshaft Gear i such a way that when this is spigotted o to the end of the camshaft, the setscrev holes in the camshaft wheel are exactl aligned with those in the camshaft wit the driving side of the chain tight. Th employment of the alternative pairs o setscrew holes in the camshaft wheel pro vides a $\frac{1}{2}$" tooth variation in timing, and b turning the wheel back to front $\frac{1}{4}$" and $\frac{3}{4}$ tooth alterations are available.
5. Apply timing wheel setscrews and locking plate. Tighten setscrews and locate wit locking plate.
6. Having set the timing as directed above the faces of the gears should be marked, a shown in Fig. 22, with a scriber, and th face of the timing gear also marked with centre punch, as illustrated.

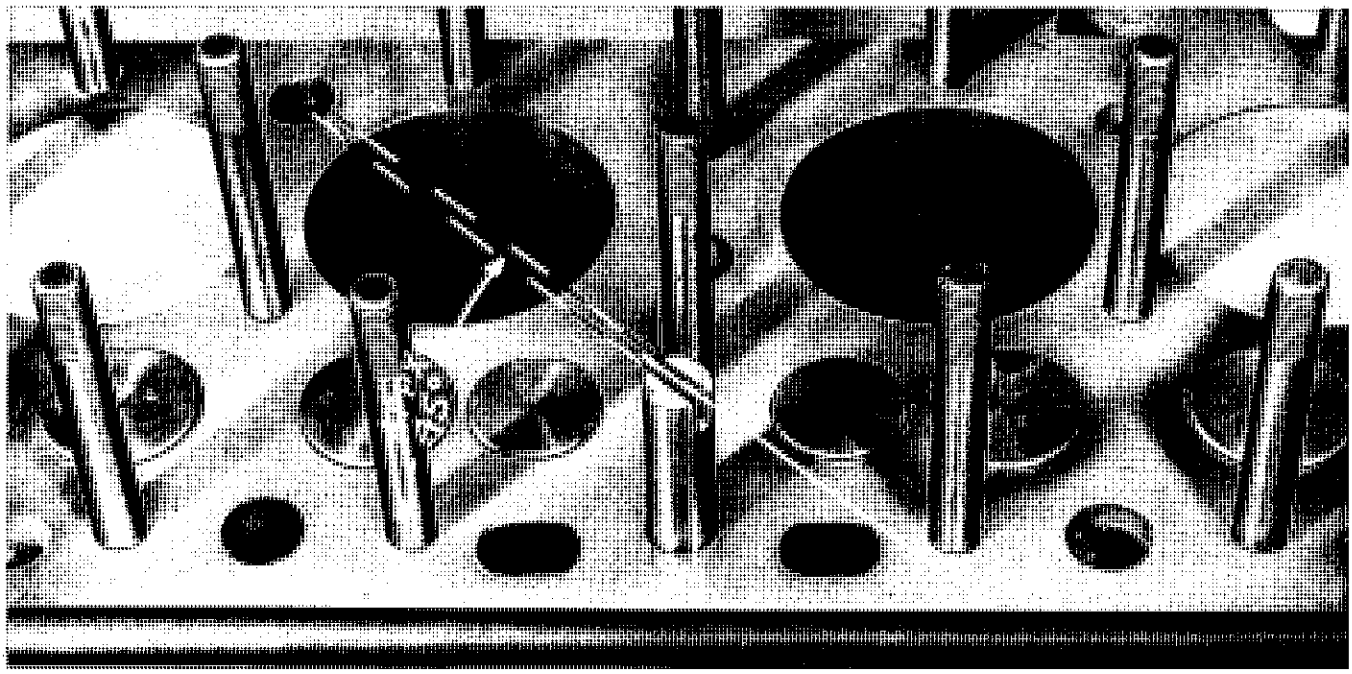


Fig. 25. Position of offset and slot in distributor and oil pump shaft with No. 1 cylinder at firing point.

NOTE. When checking valve timing against the Timing Diagram shown in Fig. 22a the tappet clearances must be set to .020". The cam timing clearance is .005" greater than the normal running clearance. The reason for setting the clearance at .020" for timing checks is that at this clearance the tappet makes contact with the effective opening and closing points of the cam. The running clearance of .015" allows .005" take up for quiet operation.

Setting Ignition Timing.

The dogs on the vertical drive shaft and on the distributor are offset.

The object of this offsetting is to assist in the maintenance of Ignition Timing, when once this has been set, and providing the clamping bolt is kept tightened after initial timing, the removal and re-installation of the Distributor is fool-proof.

Where the clamping bolt is slackened, for any reason, the following procedure is necessary :

1. Place number one cylinder on T.D.C. of the compression stroke (*i.e.* with both valves closed).
2. Ensure that the slot and offset in the upper end of the drive shaft is as indicated in Fig.25. Re-engaging helicals as necessary to obtain this position.

DISTRIBUTOR AND OIL PUMP DRIVE.

Distributor and oil Pump Drive (Fig. 26).

Description.

The oil pump and distributor is driven by a vertical shaft which is mounted at the middle and on the right hand, or camshaft, side of the engine cylinder block. The shaft runs in a flanged phosphor bronze bush, which is pressed into the cylinder block at the bottom of the tappet chamber.

Immediately above the driving shaft bush an integral spiral gear and eccentric is mounted on the shaft, this being secured by means of a driving pin, which is retained in position by a clip. Upward thrust of the driving shaft is taken by a bridged abutment assembly, which comprises an inner and outer member. The inner or main portion of this assembly is bolted, with the inner ends of the tappet guides, to the cylinder block and the outer portion embraces the driving shaft and is secured to its composite member by two setscrews.

The lower extremity of the driving shaft is provided with a projecting tongue which engages in the recess in the pump driving spindle. The

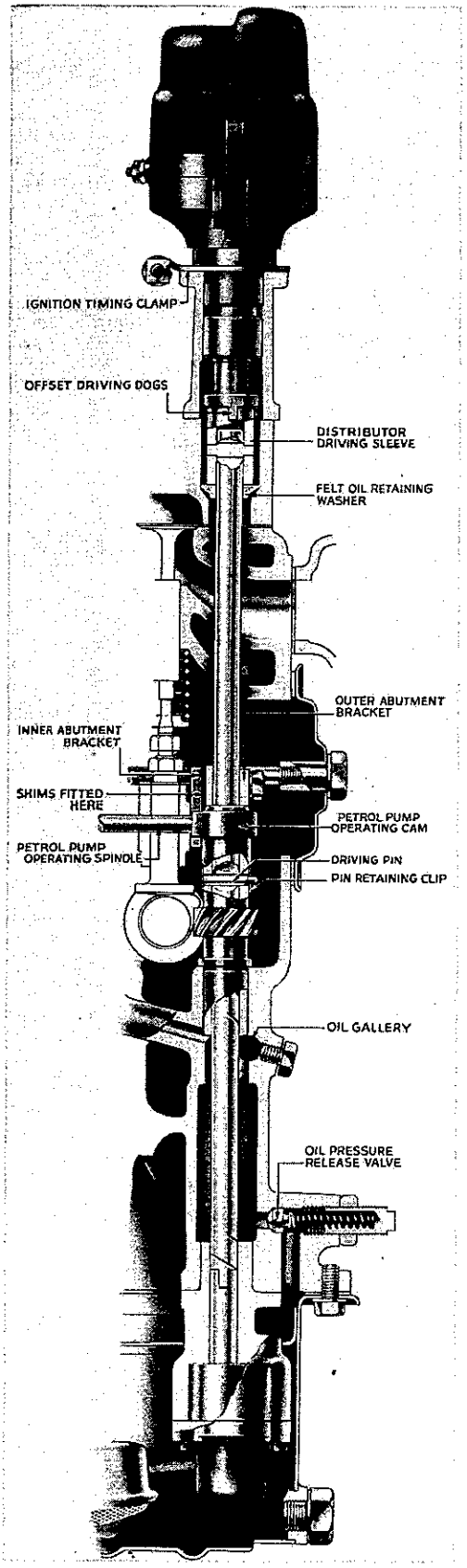


Fig. 26. Distributor and oil pump driving shaft.

upper end of the driving shaft is provided with an offset slot which engages a pin in the distributor driving sleeve, this sleeve in turn being provided at its upper end, with an offset slot which engages the distributor driving piece. The correct engagement of the Distributor Driving Sleeve in relation to the offset slot at the top of the main driving shaft is described under " Ignition Timing," later in this Section.

Maintenance of Distributor and Oil Pump Drive.

This assembly is very unlikely to require any maintenance attention, during the normal life of the Car, and only after a considerable mileage may the possibility arise of a replacement bush and/or shaft being required. The necessity for such a replacement will affect the oil pressure owing to excessive leakage past the worn bush and/or shaft.

The possibility of it ever being necessary to replace the helical driving gear and/or the camshaft, by reason of normal wear between the helicals, is a remote one.

Replacement of the spiral gear on the driving shaft, to cover normal wear or damage, would almost certainly be associated with the necessity to replace the camshaft, the driving gear being an integral portion of this.

To Remove Distributor Driving Shaft.

1. Withdraw Distributor Assembly after disconnecting the H.T. leads from the coil and sparking plugs and the L.T. leads from the coil and removing the two securing nuts and spring washers ($\frac{1}{2}$" A/F Spanner
2. Remove tappet Cover and packing aft loosening the two domed securing sleeve ($\frac{3}{4}$" A/F Spanner).
3. Withdraw the two setscrews, which secu the outer abutment bracket to the inn one and remove the latter bracket, takin care not to drop the packing shims, show in Fig. 27, into the sump ($\frac{7}{16}$" A/F Spanne
4. Remove the two bolts, which secure th main abutment bracket and inner ends c the two guide blocks to the cylinder bloc and withdraw this bracket ($\frac{9}{16}$" A/F Spanne
5. Remove petrol pump and withdraw oper ting spindle, this operation is best carrie out at this juncture and is necessary befo refitting distributor shaft, to allow the ca to pass over its operating spindle, whic is loaded by pump spring pressure, and th also to permit the vertical driving shaft t go properly home. ($\frac{1}{2}$" A/F Spanner.).
6. Remove the driving pin retaining clip an withdraw the pin (See Fig. 26).
7. The Driving shaft can now be withdraw

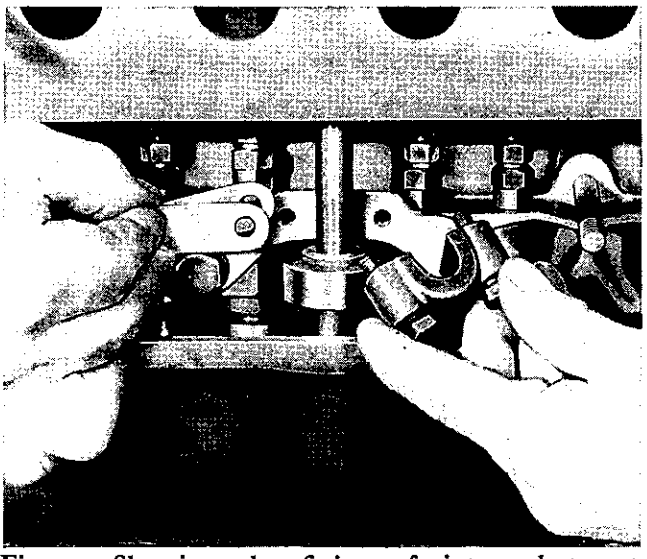


Fig. 27. Showing the fitting of inter abutment bracket and shims to distributor and oil pump drive.

Refitting Distributor and Oil Pump Drivin Shaft.

Refitting this shaft involves the opposit procedure to that given above for i removal.

When re-engaging the spiral gear, th should be carried out as described und " Ignition Timing."

CAMSHAFT AND TIMING GEARS.

Description.

The Camshaft is driven by a single roll chain having 56 pitches of $\frac{3}{8}$", which is automatic ally tensioned by means of a spring blade attach ment.

The silent chain engages with a sprocke which is keyed to the forward end of the crank shaft, and to a timing wheel which is spigotte on to the end of the camshaft, being secure thereto by two setscrews and a locking plate.

The Camshaft Timing Wheel is provide with four holes, which are equally spaced, bu offset from tooth centre. When the timing gea is fitted at 90 Degrees to its initial position, half tooth alteration in timing is obtained. I on the other hand the wheel is turned " Bac to Front " from its initial position, a quarte tooth alteration in timing is provided, wherea

the employment of the other pair of holes, in the reversed position, a three quarter tooth variation to the original timing is obtained.

When the valve timing has been correctly set during manufacture, as indicated under "Valve Timing," the faces of the two gears are marked with a scribed line drawn radially, in such a manner that if the lines are produced outwards on the respective gears, they will form a common centre line for the two gears. In addition to avoid the possibility of the camshaft being fitted incorrectly, a centre punch mark is made on the face of the camshaft wheel adjacent to the occupied setscrew hole through which the cut-away portion on the camshaft can be seen as shown in Fig. 22.

The Camshaft for engines up to and including Engine No. TT. 1407E is made of a special alloy cast iron, which has chilled faces for the eight cams and four journals. No bearings are provided for the camshaft, the four journals being accommodated in housings machined in the cylinder block.

From Engine No. TT. 1408E a change in material was made to a case hardened steel camshaft, which is bonderised after finished grinding and whilst still warm from the latter process immersed in a solution of colloidal graphite to promote good bearing surfaces and wearing qualities. *With this change of camshaft material, which naturally affects the helical driving gear, a similar change in materials was made for the driven gear and it is important to pair equivalent specifications when changing the camshaft for any reason.*

The helical gear for the distributor and oil pump drive is integral with the camshaft. The petrol pump, with this Model, being driven by a cam which is an integral portion of the driven helical gear on the vertical shaft. (See Distributor and Oil Pump Drive Shaft.)

End thrust of the camshaft is taken by a keep plate which is bolted to the front engine plate and cylinder block.

To Remove the Camshaft.

The Camshaft can be removed from the engine in the following manner :—

1. Drain water and remove radiator film block and grille as indicated under "Removal of Engine."
2. Remove manifold assembly as directed in "Dismantling Engine."
3. Remove tappet cover as explained in "Dismantling Engine."
4. Withdraw petrol pump after removal of the two securing nuts, the removal of the petrol pump is necessary to free the operating spindle from its cam on the Vertical Shaft. ($\frac{1}{2}$" A"F Spanner).
5. Withdraw the Distributor Head after detachment of the H.T. and L.T. connections and the removal of the two securing nuts ($\frac{1}{2}$" A/F Spanner).
6. Remove distributor and oil pump driving gear abutment and tappet guide block as explained in operations 26 and 27 of "Dismantling Engine."
7. Remove Starter Dog Nut after releasing tabwasher (1.$\frac{5}{16}$" A/F Spanner), also withdraw tabwasher with any shims which are fitted.
8. Take the weight off the front of the engine, on a lifting jack, and remove the four bolts (2 on each side) which secure the front engine flexible mountings to the chassis side member, subsequently raising the engine sufficiently to enable the removal of the fan pulley with the extractor shown in Fig 28.
9. Remove timing cover and packing, after withdrawal of six setscrews and three bolts $\frac{1}{2}$" A/F Spanner).
10. Withdraw Oil Thrower.
11. Remove timing wheel and chain after withdrawal of two securing setscrews and locking plate ($\frac{1}{2}$" A/F Spanner).
12. Withdraw Camshaft keep plate after removal of two securing setscrews ($\frac{1}{2}$" A/F Spanner).
13. Raise Distributor Driving Shaft sufficiently to disengage the helical gears and draw out camshaft.

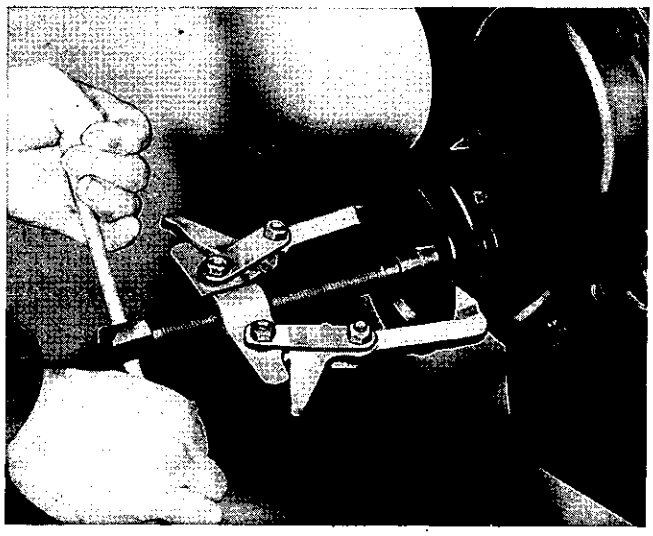


Fig. 28. Extracting fan pulley.

Maintenance of Camshaft.

Wear between the Camshaft Journals and Cylinder Block, apart from damage due to seizure is never likely to be sufficient to necessitate replacements being fitted.

The dimensions of the Camshaft Journals and their respective bore sizes in the block are given on Page 3.

MAYFLOWER ENGINE UNIT.

Removal of Engine Unit.

1. Remove Bonnet by detachment of four bolts which are screwed into captive nuts ($\frac{1}{2}$" A/F Spanner).
2. Remove Battery lead.
3. Drain Radiator and disconnect top and bottom hoses.
4. Detach radiator from grille by removal of two $\frac{3}{16}$" screws and nuts from hinged bracket. Remove lifting jack from its bracket.
5. Radiator film block can now be withdrawn after removal of six bolts (3 on each side), which are screwed into cage nuts on either side of the body valances ($\frac{1}{2}$" A/F Spanner).
6. Remove the eight self-tapping screws (4 on each side) which secure the radiator grille to the wing valances.
7. Withdraw the two bolts which secure the radiator grille to the cross member and remove grille ($\frac{7}{16}$" A/F Spanner).
8. Remove cross member bracket, which is secured at each end by two bolts to the wing valances. The two upper bolts have loose nuts and have $\frac{1}{2}$" A/F hexagon heads and nuts. The lower pair of bolts have $\frac{7}{16}$" A/F hexagon heads and captive nuts. The cross member must now be lowered down the channelled extremities of the wing valances and withdrawn from the front.
9. Detach electrical connections from the dynamo and starter motor.
10. Disconnect and remove flexible hose connection to petrol pump.
11. Detach exhaust downtake pipe from manifold by removal of the two brass securing nuts ($\frac{9}{16}$" A/F Spanner.)
12. Detach Thermometer lead from cylinder head by removal of gland nut ($\frac{5}{8}$" A/F Spanner).
13. Where a heater is fitted disconnect inlet and outlet hose connections.
14. Detach oil pressure gauge flexible hose connection.
15. Detach throttle wire on throttle leve trunnion piece and withdraw.
16. Jack up rear of Car and apply support under rear jacking brackets.
17. Remove Propellor Shaft which is secure by four bolts with $\frac{9}{16}$" A/F Simmonds Nut at the rear end.
18. Disconnect clutch coupling rods by remova of the nut, which secures the trunnio piece to the clutch operating lever and th split pin which attaches the other rod to th its flexible coupling bracket.
19. Disconnect the two gear operating cros shafts from their attachment to the respec tive levers by the removal of two bolts an Simmonds Nuts which secure each shaft i its flexible coupling.
20. Apply lifting bracket to cylinder head, a shown in Fig. 29, and take weight of engine
21. Remove the two $\frac{5}{8}$" Simmonds Nuts whic secure the gearbox extension bracket to th cross member.
22. Having taken the weight off the cros member with a lifting jack and detaching th petrol pipe holding clip from the member remove the two bolts from cross membe and withdraw this member ($\frac{9}{16}$" A/F Spanner).
23. Remove the four (2 on each side of th engine) $\frac{9}{16}$" A/F headed bolts which ar screwed into captive nuts, which secur the front engine flexible mountings to th chassis side member. The earthing wir will come away with one of these bolts.

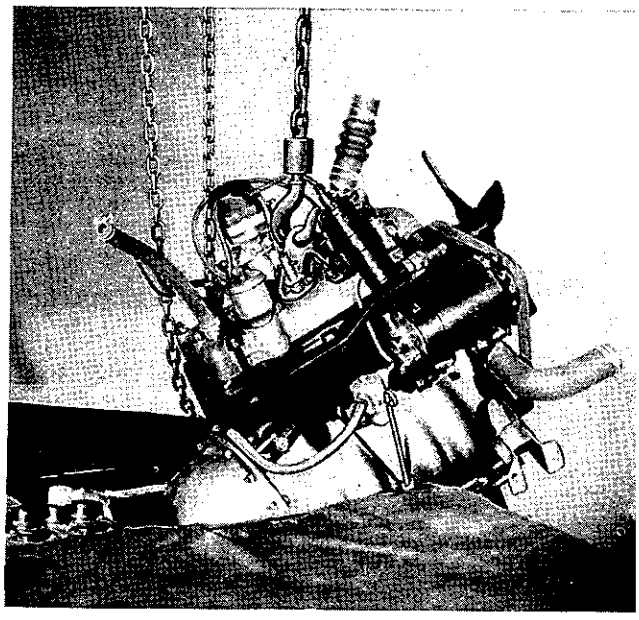


Fig. 29. Lifting engine out of chassis.

24. If the rear supports for the Car are high enough, the lifting out of the engine unit should now be a straight-forward operation. Care should be taken not to damage the steering centre tie rod when removing the engine. Obvious precautions for the protection of the front wings will also be taken whilst carrying out this operation.

DISMANTLING ENGINE UNIT.

Having removed the engine and gearbox as a unit, the following procedure for dismantling should be adopted :—

1. Remove Starter Motor, by withdrawal of two bolts ($\frac{9}{16}$" A/F Spanner.)
2. Detach gearbox and clutch housing, after removal of securing nuts and bolts ($\frac{1}{2}$" A/F Spanner).
3. Remove clutch assembly, after withdrawal of six holding setscrews ($\frac{1}{2}$" A/F Spanner).
4. Detach Air Cleaner after removal of crankcase ventilation hose connection and one cylinder head nut and one manifold nut ($\frac{9}{16}$" A/F Spanner now $\frac{5}{8}$" A/F).
5. Remove Distributor from cylinder head, after first detaching the high and low tension connections to the coil and removing the sparking plug leads at the terminals. Release distributor by removal of two $\frac{1}{2}$" A/F Nuts. Do not interfere with the clamping bracket as this will upset the ignition timing.
6. Remove inlet and outlet water hose.
7. Detach thermostat and housing, after removal of two securing nuts and hose ($\frac{1}{2}$" A/F Spanner.)
8. Remove dynamo and Fan Belt.
9. Detach petrol pump, after removal of two securing nuts ($\frac{1}{2}$" A/F Spanner and pipe union. (When reassembling engine, leave the fittings of petrol pump and operating spindle until distributor shaft and gear have been installed).
10. Detach carburettor, after removal of two securing nuts ($\frac{1}{2}$" A/F Spanner) and petrol pipe union.
11. Remove Crankcase Ventilation Pipe from manifold and adaptor on tappet cover ($\frac{11}{16}$" A/F Spanner).
12. Remove manifold, after releasing securing nuts and bolts ($\frac{9}{16}$" A/F Spanner).
13. Withdraw tappet cover and packing, after removal of two domed nuts ($\frac{3}{4}$" A/F Spanner).
14. Remove coil with bracket, by withdrawing two cylinder head nuts ($\frac{9}{16}$" A/F Spanner).
15. Detach crankcase ventilation pipe from adaptor in oil filler and cylinder head nut ($\frac{9}{16}$" A/F or $\frac{5}{8}$" A/F and $\frac{13}{16}$" A/F Spanner).
16. Remove cylinder head, gasket, petrol pipe and throttle abutment bracket by withdrawal of remaining head securing nuts ($\frac{9}{16}$" A/F or $\frac{5}{8}$" A/F Spanner).
17. Detach water pump, after withdrawal of three holding bolts ($\frac{1}{2}$" A/F Spanner).
18. Release Tabwasher from Starter Dog Nut and unscrew this nut whilst holding the flywheel (1. $\frac{5}{16}$" A/F Spanner). Remove tabwasher and packing shim(s), lay aside shims for refitting thus ensuring appropriate position of dogs in relation to respective cylinder compressions.
19. Extract Fan Pulley and Woodruffe Key from Crankshaft.
20. Detach Timing Cover and Packings after removal of six setscrews, three nuts and bolts ($\frac{1}{2}$" A/F Spanner).
21. Withdraw oil thrower.
22. Remove timing wheel and chain, after withdrawing two securing setscrews and locking plate ($\frac{1}{2}$" A/F Spanner).
23. Remove crankshaft timing wheel and packing shims. Note shim thickness to align two gear wheels for re-assembly.
24. Remove camshaft keep plate, after withdrawal of two securing setscrews. ($\frac{1}{2}$" A/F Spanner).
25. Remove front engine bearer plate, after withdrawal of three securing setscrews (2 only for 1st 25 engines) ($\frac{1}{2}$" A/F Spanner).
26. Remove Distributor Shaft abutment outer bracket with packing shims, after withdrawal of two securing bolts. Note packing shims for reassembly and position of machined portion of bracket towards skew gear with .003 gap. *Shims should be just sufficient to provide a clearance between shaft and* bracket. ($\frac{7}{16}$" A/F Spanner). (See Fig. 27.)
27. Remove valve tappet guide blocks and inner portion of distributor shaft abutment, after withdrawal of four securing setscrews. *Note the position of the longer pair of setscrews, through the inner ends of the two guide blocks and abutment bridge piece for reassembly.* ($\frac{9}{16}$" A/F Spanner).
28. Remove Spring Clip from Distributor Shaft.
29. Withdraw Locking Pin.
30. Remove distributor shaft and driving gear.
31. Withdraw camshaft.
32. Withdraw fuel pump spindle.

33. Remove valve spring collars, springs and valves with valve spring compressor shown in Figs. 17 or 19. Note numbering of valves from front of the engine 1-8.
34. Withdraw oil sump, after removal of 18 setscrews and spring washers ($\frac{1}{2}$" A/F Spanner).
35. Remove flywheel, after withdrawal of four securing setscrews and locking plate ($\frac{5}{8}$" A/F Spanner).
36. Remove oil pump and floating filter with packing, after withdrawal of four securing bolts ($\frac{7}{16}$" A/F Spanner).
37. Remove locking wire from heads of sealing block securing screws and withdraw screws and tap out sealing block (Screwdriver required to remove securing screws.)
38. Remove aluminium oil retaining cover after withdrawal of 5 securing setscrews ($\frac{1}{2}$" A/ Spanner) and withdrawal of locking wir from inside bolts.
39. Remove connecting rod caps, after with drawal of bolts and split pins. ($\frac{5}{8}$" A/ Spanner). Note positon of markings o connecting rods in relation to those on th cylinder block, an example of which i shown in Fig. 30).
40. Remove main bearing caps, after withdraw of securing setscrews and spring washer $\frac{3}{4}$" A/F Spanner). Note markings on bea ing caps in relation to those on the cylinde block flange.
41. Remove crankshaft and oilite bush fo constant pinion shaft spigot.
42. Remove connecting rods and piston assem blies, noting the lettering on the piston top

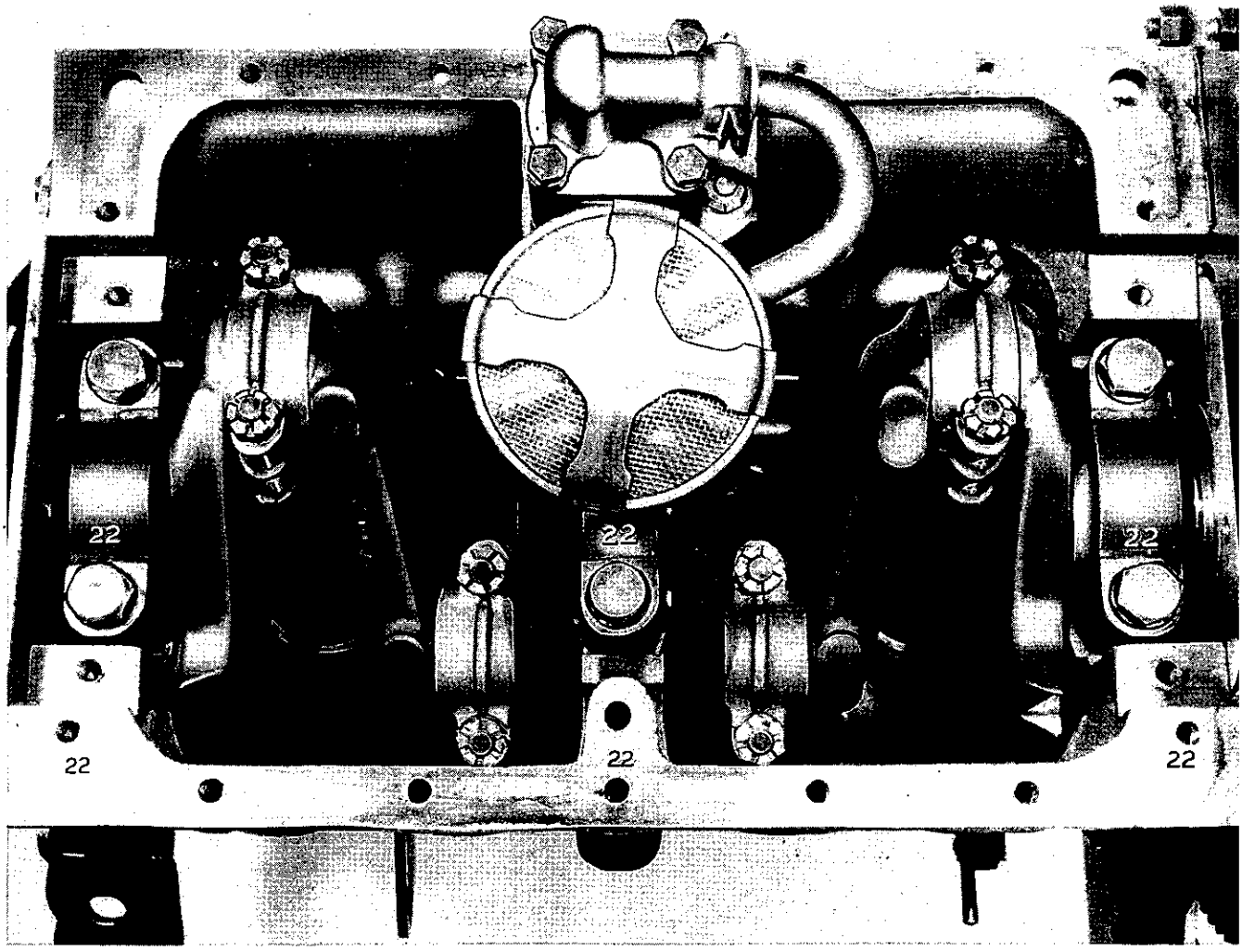


Fig. 30. Showing relation of connecting rod and bearing cup markings with those on the cylinder bloc The actual numeral used on the main bearing caps and crankcase will vary with the particular uni

and cylinder block (See Fig. 12) also the offsetting of the big end housings on the front and rear pair of assemblies towards each other for re-assembly. Remove gudgeon pin circlips, push out pins and release piston assemblies.

REASSEMBLY OF ENGINE.

Reassembly of the engine involves approximately the reverse procedure to that employed for its dismantling. When reassembling apart from the normal replacement of defective or worn parts, attention is drawn to the following points :

1. Carefully clean cylinder block, ensuring that core plugs are in order and blow out oil ways with compressed air. Examine the cylinder bores for excessive wear and where this exceeds .007" at the tops of bores regrinding the cylinder block will be required. Where wear is appreciably less than this figure, the replacement of worn pistons and rings should satisfactorily meet the case.
   Three sizes of pistons are used "F" slightly below nominal size, "G" mean size and "H" slightly oversize, the piston tops are marked with the appropriate letter and the right hand upper side of the cylinder block, adjacent to the piston, is similarly identified when the engine is erected in the Factory as shown in Fig. 12. Replace "F" or "G" marked pistons by ones having an "H" marking, where it is considered replacements are required and a rebore is not justified.
2. Examine crankshaft bearings for wear or damage. Where the clearance exceeds that given on Page 1 new bearings should be fitted to replace worn ones and where the crankshaft wear exceeds that given on Page 1 or where the journals are scored the crankshaft should be reground to suit the undersize bearings available *i.e.* —.020", —.030" or —.040". NO ATTEMPT SHOULD BE MADE TO TAKE UP WEAR BY FILING BEARING CAPS. WHERE SUCH FILING HAS OCCURRED THE MAIN BEARING HOUSINGS WILL HAVE TO BE LINE BORED AND THE BIG END BEARING HOUSINGS SIMILARLY RESTORED TO THEIR ORIGINAL DIMENSIONS.
3. When refitting the timing wheels and chain, where the timing wheels are marked as shown in Fig. 22 the markings should be matched up with the driving side of the chain held tight. Varying degrees of adjustment any be arranged by employing the two alternate pairs of holes in the camshaft. (Still further degrees of adjustments are provided in the absence of markings by turning the timing wheel on the Camshaft back to front). In the absence of timing markings re-time as directed under "Valves and Timing."
4. The Distributor Shaft should be fitted before the petrol pump, otherwise some difficulty will be met in engaging the cam for the petrol pump with the operating spindle and thus preventing the engagement of the helical gears. Before engaging the distributor shaft, the engine should be turned until No. 1 Cylinder is on T.D.C. of the compression stroke.
5. When refitting the distributor outer abutment bracket and shims as shown in Fig 27, sufficient shims should be used to ensure a working clearance between the shaft and bracket. (Smearing shims with grease will assist in their location whilst fitting bracket). The machined portion of the bracket should be fitted towards the driving gear, with a clearance of .003" thereon. It is important to note the difference in the length of the two pairs of tappet guide bolts. The longer pair are fitted through the inner ends of the guide block and the inner abutment bracket.
6. When fitting the cylinder head and tightening down the holding nuts, these should be tightened progressively and in the order indicated in Fig. 31.
7. If the distributor assembly was removed from the engine without slackening the

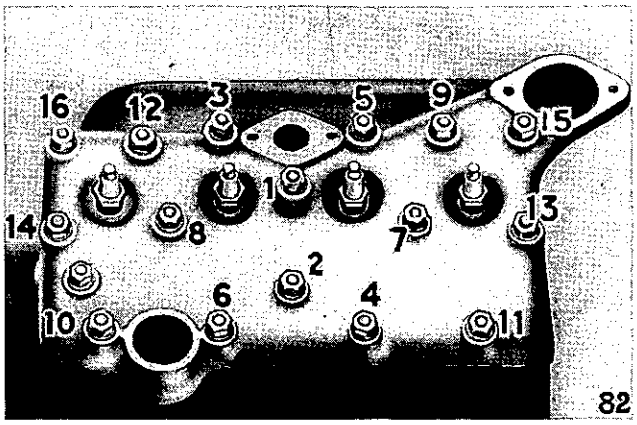


Fig. 31. Showing order for tightening cylinder head nuts.

clamping bolt, its reassembly is perfectly straightforward. If a new distributor is being fitted, or the clamping bolt has been released, the timing should be re-set as indicated under " Setting Ignition Timing."

8. The plug leads should be connected to the sparking plugs as indicated in Fig. 32 thus following the order of firing 1-3-4-2, the Distributor having an anti-clockwise rotation, as indicated on its cover.

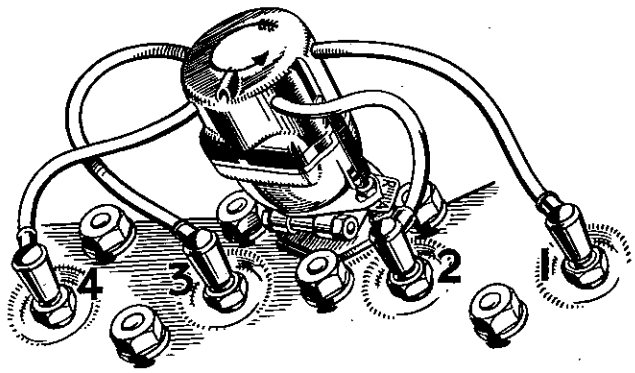


Fig. 32. Showing order for firing and ignition timing adjustment.

9. When fitting rear crankshaft oil retainer, centralize this with relation to the shaft and ensure that a .002" feeler can be entered in any position between the retainer and the crankshaft. To obtain this centralization tap the retainer into position with the securing bolts partially slackened.
10. When refitting the crankshaft bearing caps and two half thrust washers, check the end float of the shaft with a set of feeler gauges or dial gauge as shown in Figs. 6 and 7. End float should be between .004"—.006", and where this is exceeded, new washers should be used. Where this is inadequate the steel faces of the thrust washers should be rubbed down on a piece of emery cloth placed on a surface plate as shown in Fig. 8.
11. When refitting the sealing block at each end of the cylinder block, fit new packing pieces at either end of each block, after coating these with jointing compound.
12. Before refitting the water pump, the condition of the spindle bearings and of the water seal should be ensured and replaced where this is justified by their condition. (See Water Pump in " Cooling System.")

Decarbonising and Valve Grinding.

Under normal circumstances the attentio is not likely to be required until approximatel 5,000 miles have been covered, but instance may occur where, in spite of all reasonabl precautions during manufacture casting stresse may cause valve seating distortion which wi naturally necessitate earlier valve grinding tha that suggested aboye.

It is suggested that providing there is n obvious falling off in power and correspondin deterioration in petrol consumption, that th attention should be carried out initially afte 5,000 miles running and that subsequent atten tions be delayed until there is a falling off i power associated with lack of compression.

When carrying out this attention, the follow ing procedure is suggested :—

1. Remove one terminal from the accumulato to prevent any possibility of a " short."
2. Drain the cooling system preserving anti freeze mixture, for further use.
use.
3. Disconnect top water hose and bye-pas hose from thermostat housing.
4. Detach air cleaner after removal of crankcas ventilation hose and removal of manifol and cylinder head nuts. ($\frac{9}{16}$" A/F Spanner. ($\frac{5}{8}$" A/F cylinder head nut now in use.)
5. Remove distributor from cylinder hea after first detaching high and low tensio connection to the coil and removin sparking plug leads at the terminals and the removing the two securing nuts ($\frac{1}{2}$" A/F) a the base of the unit. Do not slacken th clamping bolt as this will upset the ignitio timing.
6. Detach throttle and choke connections fron carburettor also fuel pipe to pump.
7. Detach exhaust downtake pipe from man ifold flange by removal of the two bras securing nuts ($\frac{9}{16}$" A/F Spanner).
8. Remove crankcase ventilation pipe fron manifold and adaptor on tappet cove ($\frac{11}{16}$" A/F Spanner).
9. Withdraw manifold assembly with car burettor and drain pipe after removal o two bolts and nuts ($\frac{9}{16}$" A/F Spanner).
10. Detach tappet cover and packing afte removal of two domed nuts ($\frac{3}{4}$" A/F Spanner
11. Disconnect Heater (where fitted), hos connections and detach return pipe fron water pump, after removal of gland nu ($\frac{13}{16}$" A/F Spanner) and from combustio head after removal of support bracket fron

cylinder head stud. ($\frac{9}{16}$" or $\frac{5}{8}$" A/F Spanner.)

12. Disconnect thermometer gauge capillary tube from conbustion head by unscrewing union nut. ($\frac{5}{8}$" A/F.)
13. Remove crankcase ventillation pipe from oil filler ($\frac{13}{16}$" A/F Spanner) and from its attachment to combustion head stud ($\frac{9}{16}$" or $\frac{5}{8}$" A/F Spanner).
14. Remove cylinder head and gasket after withdrawal of throttle abutment brackets, coil bracket support and the removal of the remaining securing nuts ($\frac{9}{16}$" or $\frac{5}{8}$" A/F Spanner).
15. Remove distributor and oil pump driving shaft abutment brackets, after withdrawal of the two inner tappet guide bolts ($\frac{9}{16}$" A/F Spanner). Be careful not to drop the shims for the outer abutment bracket shown in Fig. 27 into the sump. Do not lift drive shaft thereby disengaging helical gears.

Fig. 33. Showing the use of Champion sparking plug cleaner and tester.

16. Remove the outer tappet guide securing bolts ($\frac{9}{16}$" A/F Spanner) and withdraw guide blocks. It is possible to carry out this operation with the guide valves fitted.
17. Fill space left above the camshaft with pieces of clean rag to catch any valve springs, collars etc. which might be inadvertently dropped and would otherwise enter the sump.
18. Remove valve springs and collars, as shown in Fig. 17 and withdraw valves. Note the nubering of these valves from front to rear, 1-8 and retain this order for " grinding in " and reassembly purposes.
19. Before scraping the carbon off the piston tops, which will be done in pairs on T.D.C., fill the other cylinder bores with clean rag and similarly seal off adjacent water passage, into which particles of carbon can enter. Take care to avoid damaging the valve seatings.
20. Leave a ring of carbon around the top of each piston against the cylinder bores, approximately $\frac{1}{8}$" in depth. Removal of this ring of carbon on the tops of the pistons may affect the oil consumption adversely.
21. Remove the sparking plugs and clean these thoroughly preferably in a proper cleaner as shown in Fig. 33 and after setting the points to .025" test the plugs and fit new copper and asbestos washers where necessary.
22. Remove all carbon from the conbustion head spaces.
23. Examine and clean carbon from valves. Reface or replace badly fitted valves. When refacing valves, remove the least amount necessary to give a clean face and reject these valves where head thickness above seat edge is less than $\frac{1}{32}$". Valve seatings which are badly fitted or sunken should be treated as indicated on Page 16. Having recut the valve seatings the respective valve must be ground in to ensure, perfect seating.

Re-assembly.

Reassembly is approximately the reverse procedure to that given above for dismantling but the following points are indicated for special attention :—

1. Before refitting the valves, lubricate these with clean oil.
2. When refitting valve springs and collars,

place slots in collars at right angles to the cylinder block, with the large hole inwards and use valve spring compressor, as indicated in Fig. 17, or alternative method shown in Fig. 19.

3. Set tappet clearances as directed on Page 18.
4. When refitting combustion head securing nuts, regard sequence indicated in Fig. 31. tightening these progressively. Failure to tighten holding nuts symmetrically may cause distortion of the cylinder head.
5. If the instruction for distributor's removal has been regarded, as also the necessity for maintaining the engagement of the driving gears, its re-installation should present no difficulty, If, however, the gears have been disengaged, these should be engaged as indicated on Page 22 and where the distributor clamping bolt has been slackened, the ignition should be reset as indicated on Page 22 for " Setting Ignition Timing." Before refitting dis-

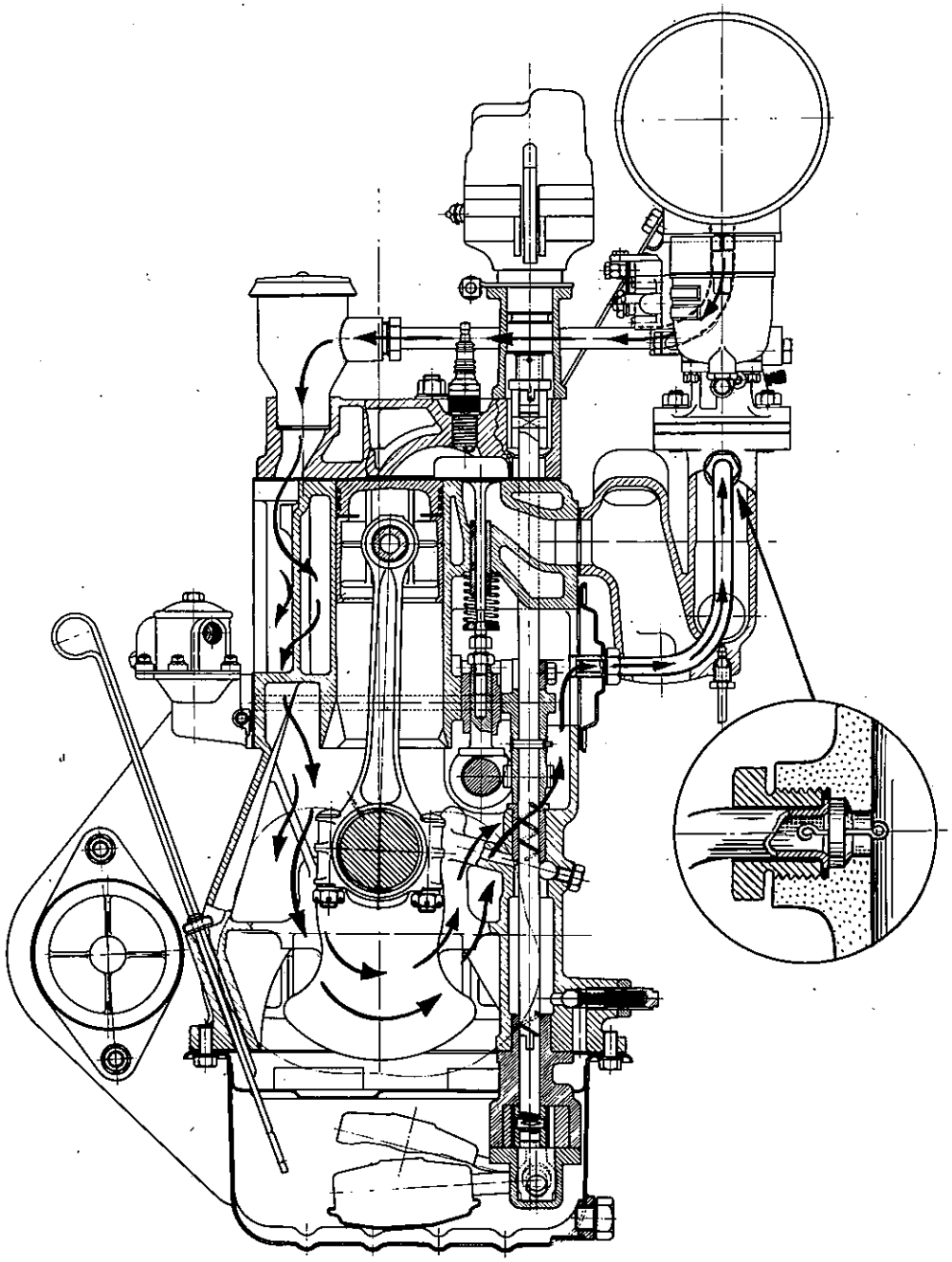


Fig. 34. Showing the arrangement of crankcase ventilation.

tributor, ensure that the felt washer in the cylinder head recess, through which the driving shaft protrudes, is fitted and in good order.

6. Check contact breaker points for gap and condition, setting gap and squaring up as directed in the Electrical Section.

CRANKCASE VENTILATION (Fig. 34).

Description.

Crankcase ventilation is used in conjunction with a sealed engine. The ventilation of the Crankcase is of considerable importance if the maximum possible life is to be obtained from an engine. Crankcase ventilation is desirable to expel " blow-by " gases which contaminate and dilute the oil, create varnish deposits, give rise to corrosion, contribute to exhaust fumes in the Car's body and eject particles of carbon and other foreign matter into the crankcase.

The depression in the induction manifold is employed to operate the system, the proper operation of the system depending on the maintenance of a sealed engine, which is provided by careful attention to oil sealing.

With this system a depression is created in the crankcase by suction from the induction Manifold. A pipe connects an adaptor on the induction manifold with a similar adaptor on the tappet cover. A metering valve containing a stainless steel pin (see inset in illustration) is fitted at the manifold end of this connector pipe.

As a depression is created in the crankcase, it is relieved by filtered air, which is drawn into the crankcase through a pipe connecting the carburettor air silencer and oil filler neck as shown in Fig. 34.

The calibration of the metering valve is of importance and should, under no circumstances be altered after a Car leaves the Works. The small stainless steel pin is provided to keep the orifice clear of carbon, this being achieved by the vibrations of the pin which occur as a result of the pulsations in the manifold.

Maintenance.

As stated above, this system's proper operation will depend upon the engine remaining sealed, it being equally important that the orifice in the metering valve should be kept clear of carbon. If the valve is allowed to become restricted, back pressure will be created in the sump and oil leakage past one of the oil seals may well occur. From this point of view the hole in the valve should be examined occasionally when other normal maintenance attentions are performed.

SPARKING PLUGS

The sparking plug is of great importance in satisfactory engine performance, and every care should be taken to fit the correct type when replacements are necessary.

There is little to be gained by expermenting with different plugs as the make and type fitted by us as official factory equipment is best suited to the requirements of the motor.

THIS IS CHAMPION TYPE No. NA-8

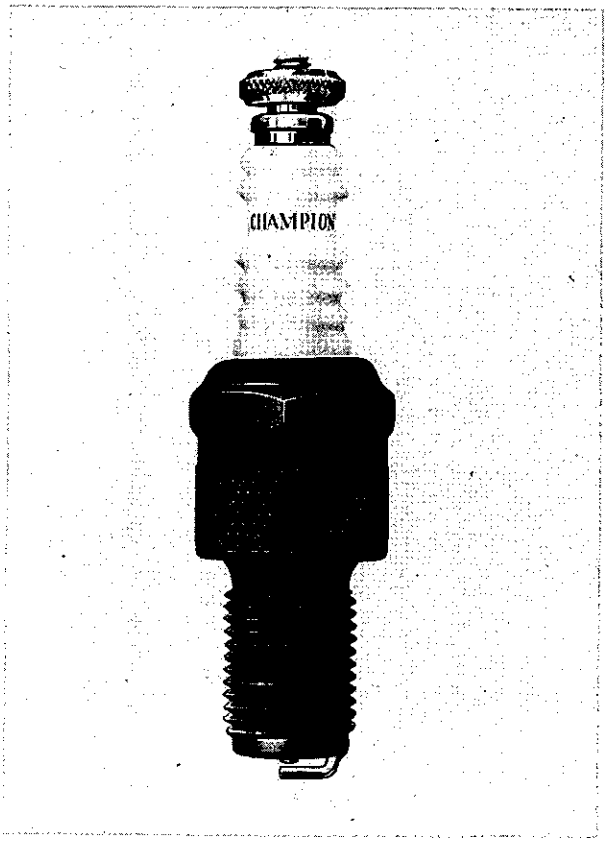


Fig. 35. Champion Type NA-8 Plug.

The correct gap setting of sparking plugs (*i.e.*, the width between the firing point of the centre electrode and the earth electrode) is essential to good engine performance, and the recommended gap setting is

Do not guess this distance, but use a feeler gauge similar to the one illustrated which is supplied by the Champion Company (Price 2/-). When resetting, bend the side electrode only. Never bend the centre electrode as this may split the insulator tip.

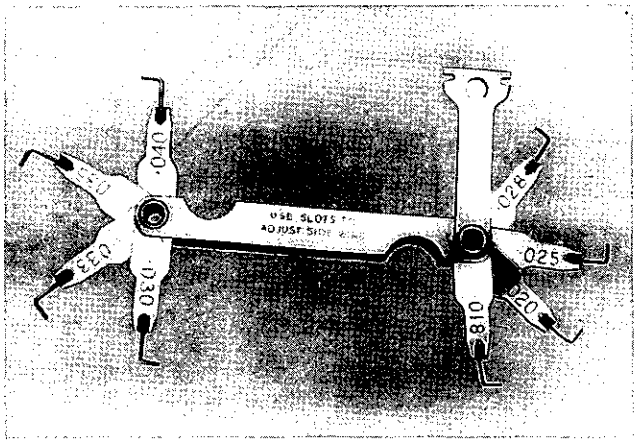


Fig. 36. Champion gap gauge and adjuster with feeler gauges for .018, .020, .025, .028, .030, .033, .035, .040 in.

When refitting the plugs, make sure that the copper washers are not defective in any way. If they have become worn and flattened, fit new ones to ensure obtaining a gastight joint.

When installing plugs, first screw the plug down by hand as far as possible, then use spanner for tightening only. Always use a tubular box spanner to avoid possible fracture of the insulator, and do not in any circumstances use a moveable wrench.

Paint splashes, accumulation of grime and dust, etc., on the top half of the insulator are often responsible for poor plug performance Plugs should be wiped frequently with a clea rag.

To save petrol and eliminate hard starting plugs should be cleaned and tested at regula intervals, and it is suggested that this servic be performed at your garage on a special " Ai Blast " service unit. Plugs which are allowe to remain oily and dirty with corroded electrode will seriously impair the efficient running of th motor and waste precious petrol.

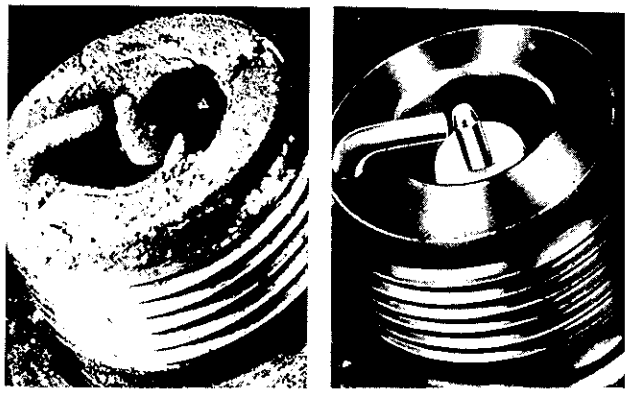


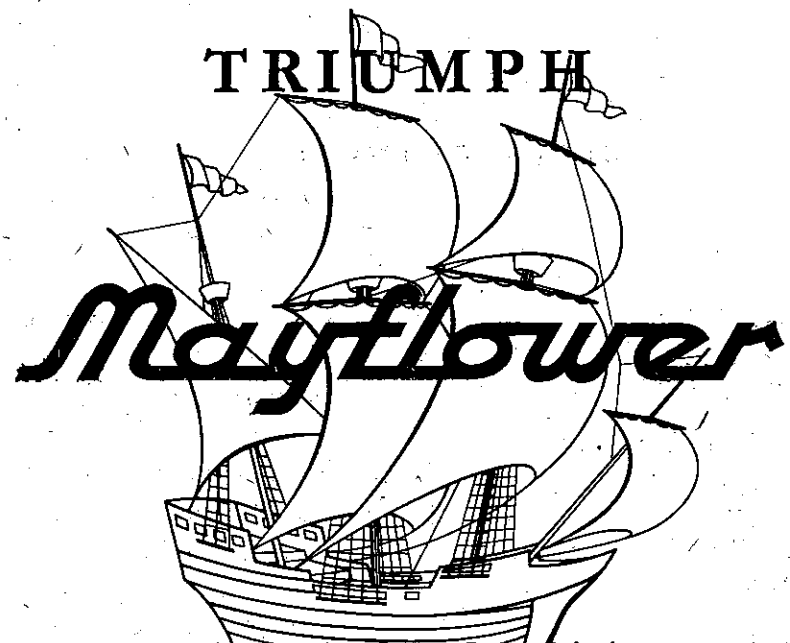
Fig. 37. An unretouched photograph of a Champio sparking plug after 25,000 miles of service compared with a new plug. The weal spark given by the former can readily b imagined and amply justifies our recom mendation that to save petrol, plugs shoul be changed before such a stage of wear a that shown in the photograph is reached

To obtain maximum efficiency from th engine, and also to maintain good petrol con sumption which the car has when new, plug should be changed at regular intervals as ol plugs are wasteful and cause poor and sluggis running. We recommend inspection, cleanin and testing every 3,000 miles, and it will b found economical to fit a new set of dependabl Champions approximately every 10,000 miles o running.

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

COOLING SYSTEM

SECTION C

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

COOLING SYSTEM

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COOLING SYSTEM — "MAYFLOWER"

Description

The Cooling System is thermostatically controlled, a water pump circulating the water round an adequately jacketted cylinder block, external cooling being provided by a four bladed attachment, which is bolted to the water pump assembly.

A finned radiator block is used, the combined water capacity of the cooling system being 12 Gallons (13 Gallons when a Heater is fitted).

The Water Pump with fan blades are driven in tandem with the dynamo by an endless composition belt, which passes round a pulley, keyed to the crankshaft and similar pulleys mounted on the dynamo armature spindle and water pump. Adjustment of the belt tension is effected by moving the dynamo on its cradl as shown in Fig. 1.

The driving pulley on the water pump is a integral part of an extension bracket, which i keyed to the water pump spindle. The fa blades are secured to this extension bracket b means of four setscrews and spring washers.

A thermostat is accommodated in an alumin ium alloy housing, which is bolted to th combustion head. The thermostat, which i described in detail later in this Section prevent the circulation of the water through the radiato until water in the engine water jacketting ha been suitably raised in temperature.

WATER PUMP AND FAN ASSEMBLY

Description. (Fig. 2.)

The water pump assembly consists of th

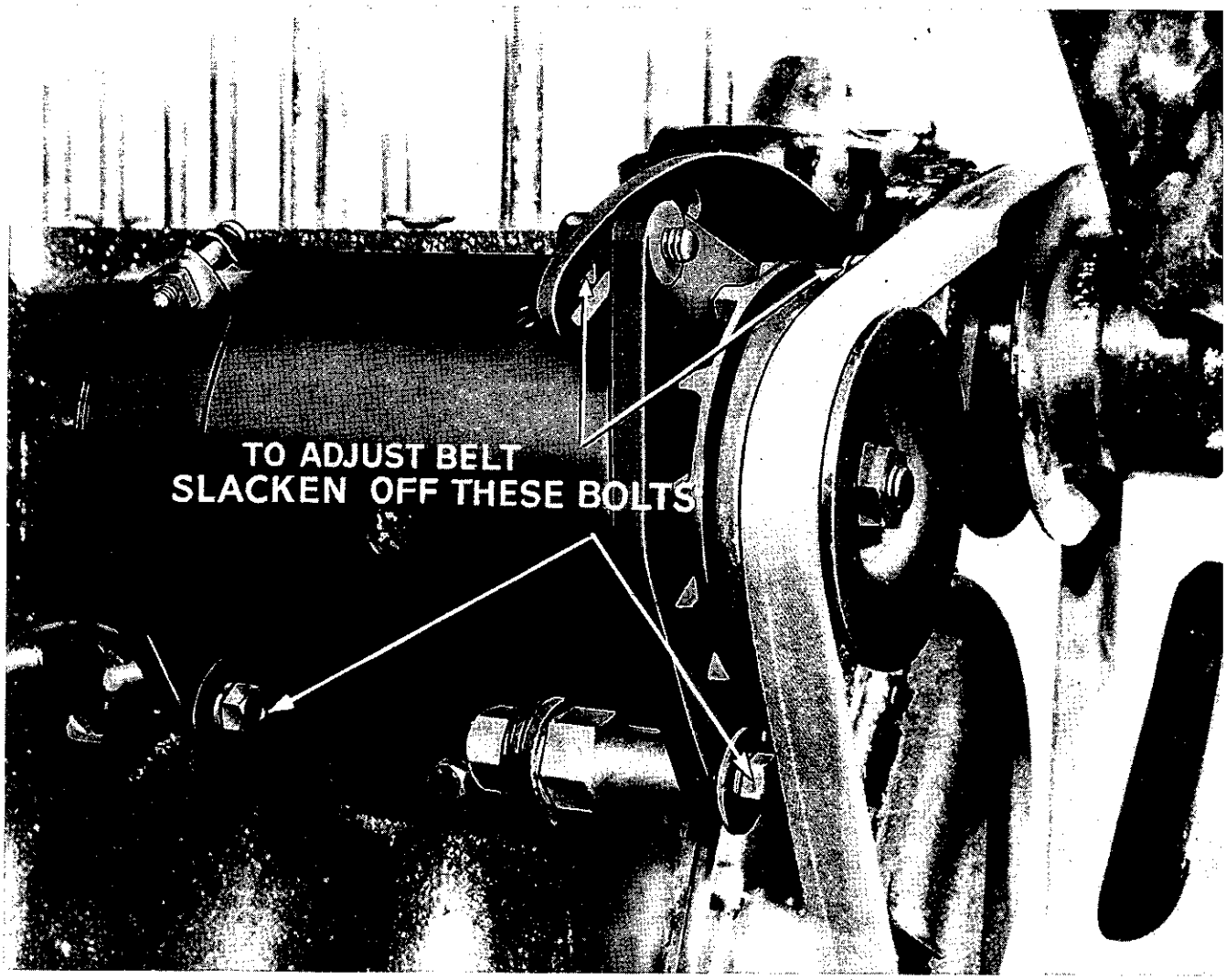


Fig. 1. Adjustment of dynamo and fan belt.

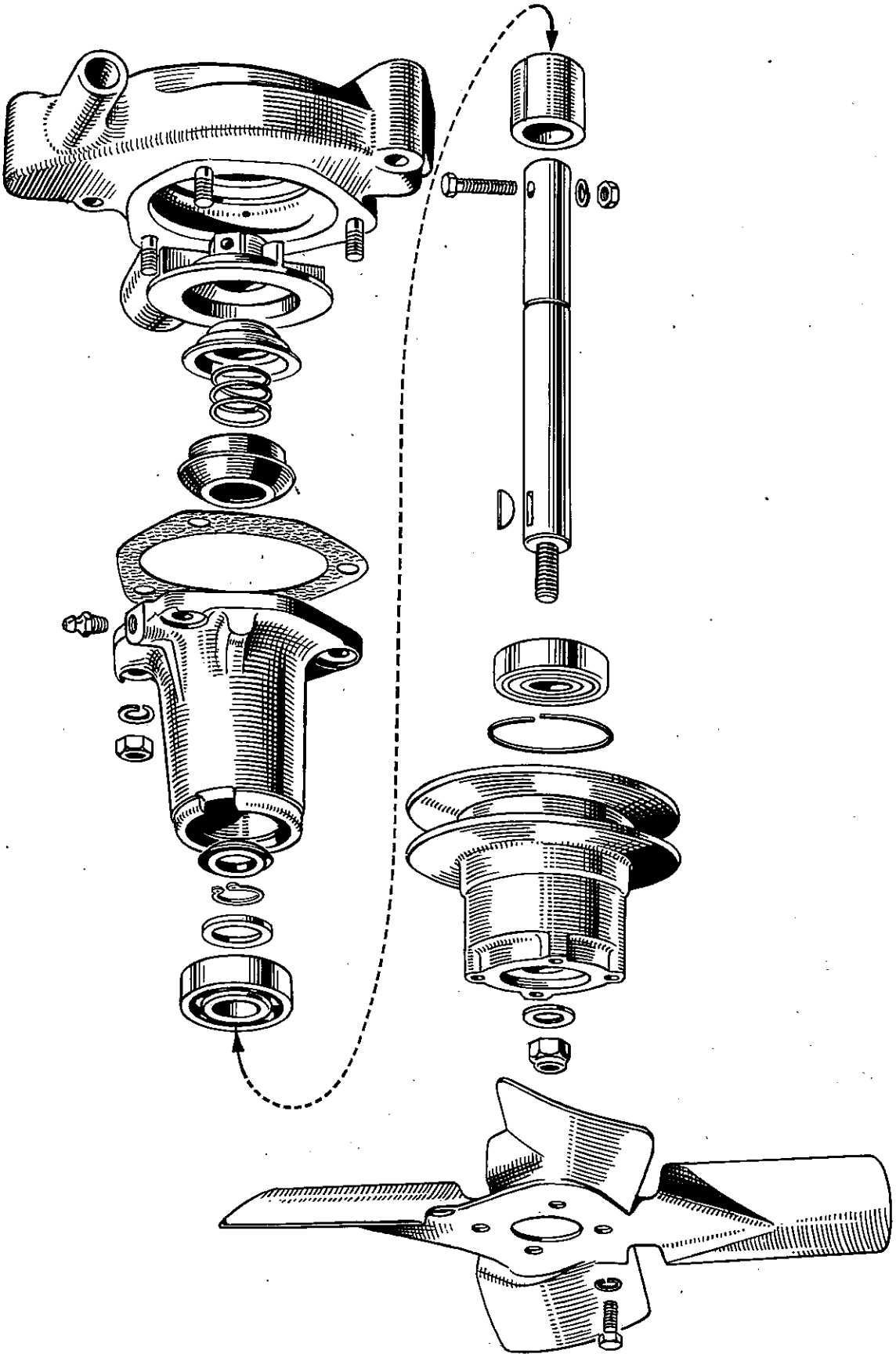


Fig. 2. Exploded view of water pump.

two main assemblies, the water housing and the bearing housing assembly.

The water Housing is bolted to the cylinder block, a paper composition packing washer being used to provide a water-tight joint. This housing is provided with a main inlet elbow through which the water enters from the radiator. Water entering the housing is forced in to the engine water channels through matched orifices in the housing and cylinder block. The water housing has another smaller elbow, through which the water is by-passed from the engine by way of the thermostat housing, this forming the only outlet for the circulating water, until the main outlet to the radiator at the top of the thermostat becomes availlable, with the opening of the regulating valve due to necessary rise in coolant temperature. The by-pass, which is somewhat restricted by the size of the outlet hole in the thermostat housing, continues to pass a small amount of water even after the main outlet passage comes into operation. (See Figs. 3 & 4)

The Bearing Housing Assembly comprises the housing itself, the stainless steel operating spindle, the two bearings and spacer sleeve, the special synthetic rubber spanner, the rotor and the special rubber water seal.

The two bearings, which are a sliding fit on the stainless steel spindle, and which incor porate on their outer faces a special sealing device, are separated from each other by mean of a short sleeve. The front and rear bearing are located endwise on the operating spindle b means of the inner machined face of the extensio bracket which is keyed to the forward end of th spindle and in the case of the rear bearing by circlip and hardened steel washer. The fa extension bracket is secured endwise on th operating spindle by means of a Simmonds Nu and plain washer. The bearings are located i the bearing housing between a flange an circlip.

The water is circulated by means of a fou bladed rotor which is bolted to the inner end o the spindle and into which is pressed the cu shaped moulded rubber water seal which em bodies a carbon ring and contains a coil spring and brass sleeve. The carbon face is hel against a machined face on the bearing housing around the aperture through which the spindl projects, by the pressure to which the coil spring is constantly subjected.

Water which passes the water seal is pre vented from entering the bearings by a rubbe spinner, which is mounted on the spindle betwee the water seal and the bearings, which collect the water and rejects it harmlessly through a slo

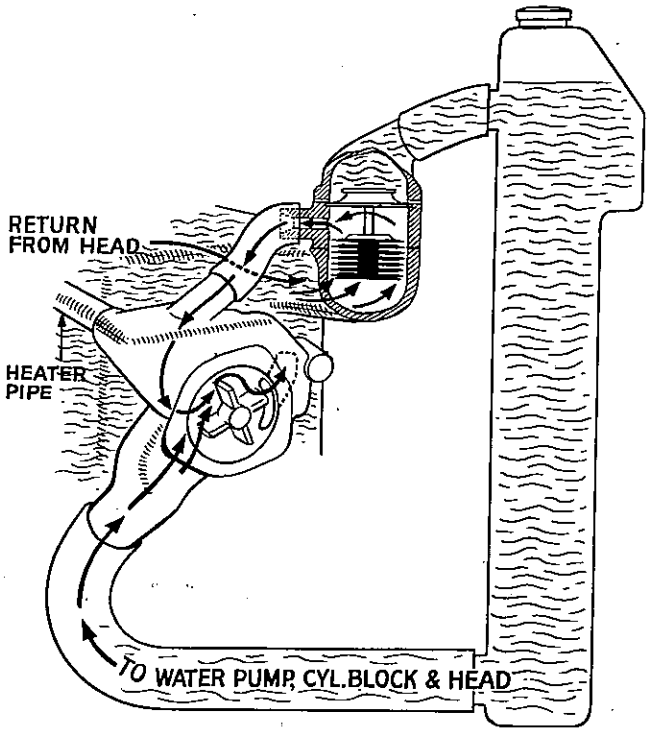


Fig. 3. Diagram of water circulation with thermostat valve closed.

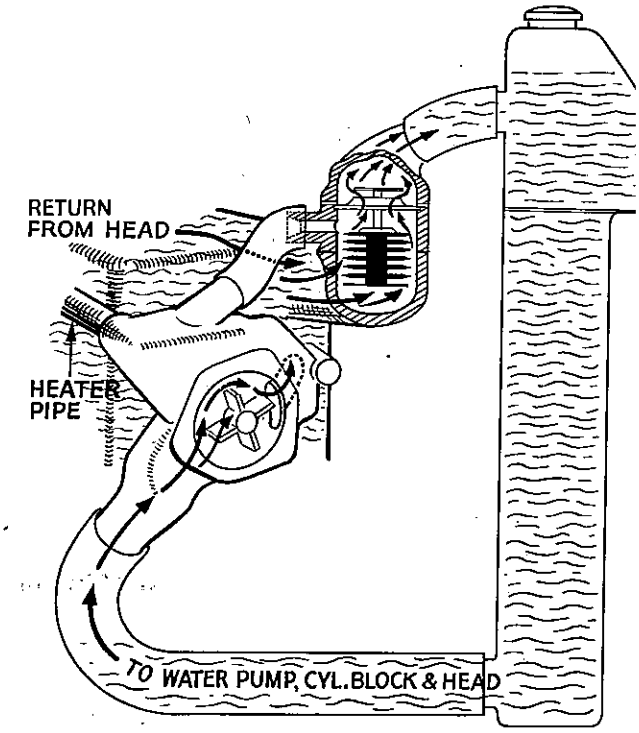


Fig. 4. Diagram of water circulation with thermosta valve open.

in the housing and thence to the ground.

To Remove Water Pump.

When it is desired to service the water pump it is rarely necessary to remove more than the bearing housing assembly, which will naturally include the fan extension bracket and blade assembly. The water housing normally need not be removed and the following is the procedure we suggest :—

1. Drain Radiator of water, naturally preserving any anti-freeze mixture which may be in use. (See Fig. 5).
2. Remove radiator block as described on Page 7.
3. Slacken driving belt as directed on Page 1 and free this from dynamo and crankshaft pulleys.
4. Slacken one bolt and remove two nuts and spring washers. ($\frac{1}{2}$" A/F Spanner.)
5. The Bearing Housing Assembly with fan blades can now be withdrawn with the bolt and spring washer remaining in the fixing flange. The bolt cannot be removed until the extension bracket has been removed.

If it is desired to remove the Pump with Water Housing for any reason, the two nuts indicated in operation 4 need not be removed but the bolt mentioned which passes through the water housing will have to be screwed out of the block and two further bolts removed. In addition, the water by-pass hose and heater (where fitted) connection will have to be detached.

Refitting the Water Pump as a complete assembly or the bearing housing unit, involves the reversal of the procedure for removal.

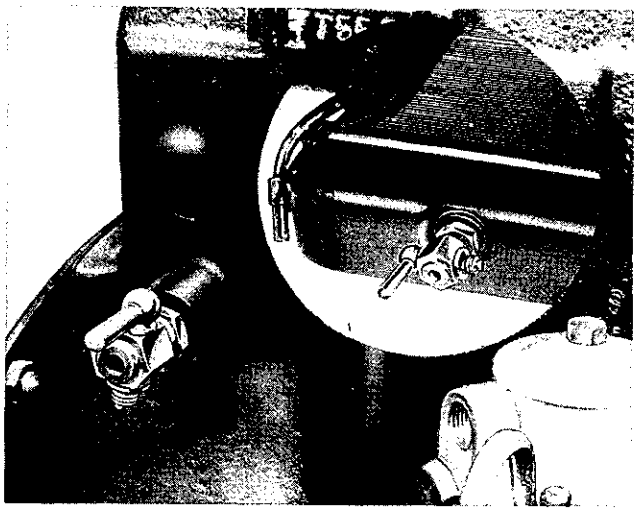


Fig. 5. Draining points in cooling system.

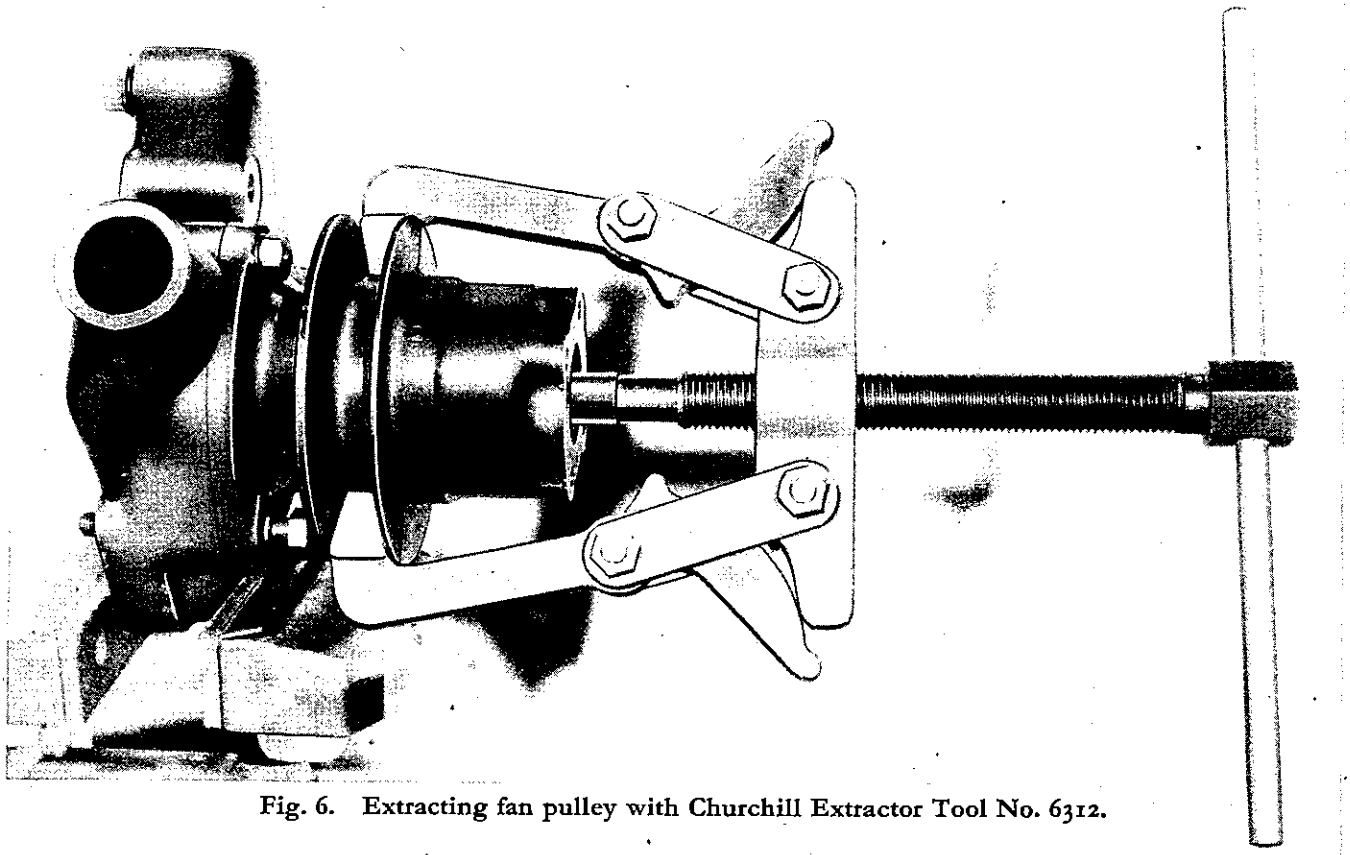


Fig. 6. Extracting fan pulley with Churchill Extractor Tool No. 6312.

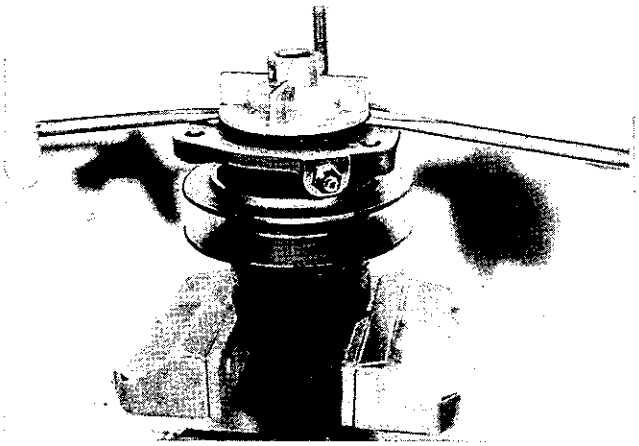


Fig. 7. Levering rotor off spindle.

To Dismantle Water Pump Bearing Housing Assembly.

1. Remove Fan Blades by withdrawal of four setscrews and spring washers together with any balancing pieces which may be in use. Note the drilled hole in such balancing pieces for re-assembly.
2. Remove Simmonds Nut and Washer from pump spidnle and extract fan extension bracket as shown in Fig. 6.
3. Withdraw Rotor securing pin and lever this off the pump spindle. (See Fig. 7.)
4. Remove bearing locating circlip from housing bore.
5. Tap pump spindle out, from the rear of the bearing housing, with bearings, spacer etc.
6. Remove bearings, spacer circlip, thrust washer and synthetic rubber spinner from pump spindle.

Re-assembly procedure is approximately the reverse of the foregoing. When refitting the rotor on to the spindle, a flexible type of jointing compound should be applied to the spindle and around the hole through which it fits and the bolt securing the rotor to the spindle should be similarly treated. This employment of jointing compound is essential, if water is to be prevented from finding its way down the spindle, or past the bolt, and thence through the centre of the water seal on to the spinner and through the waste slot to the ground.

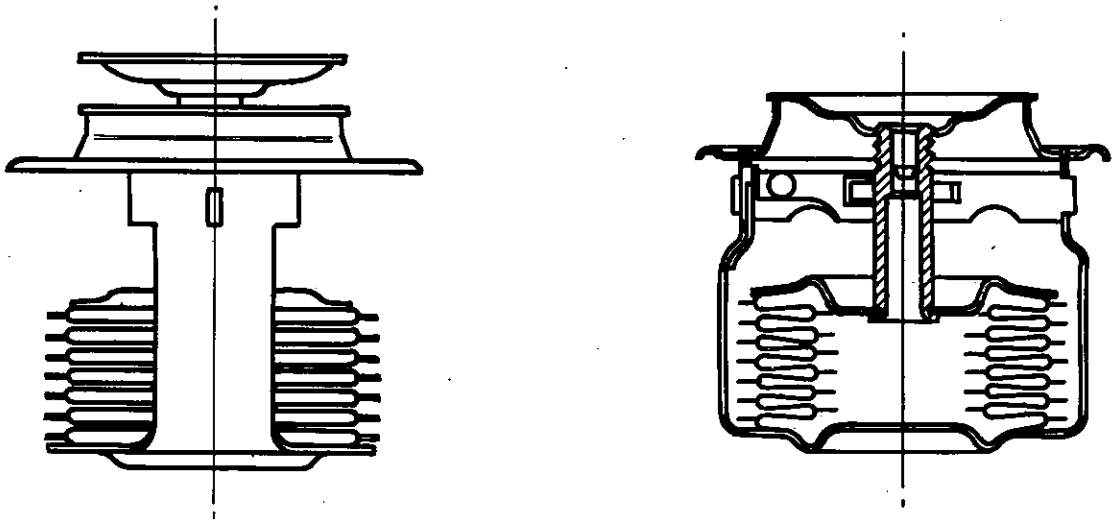
THERMOSTAT (Fig. 8).

Description.

The function of the thermostat is to control the flow of water until the engine reaches its normal working temperature.

When the engine is first started up from cold, the water is forced into the cylinder block water ways by the pump, through matched apertures in the pump housing and the cylinder block. The water circulation round the cylinder block and combustion head passing from the latter through a hole, approximately $\frac{1}{4}''$ in diameter in the thermostat housing. (See Fig. 3.)

The thermostat valve remains closed until the coolant reaches a certain specified tempera-



(*a*). Valve open. (*b*). Valve closed.

Fig. 8. Thermostat.

ture, after which it starts to open gradually, thus permitting a gradually increasing amount of water to be circulated to the radiator, via the main outlet until the prescribed temperature is reached for full opening of the valve and normal passage of water to the radiator. A limited amount of water continues to circulate through the by-pass even after the thermostat valve is fully open, but this is insufficient to interfere with cooling efficiency. (See Fig. 4.)

The thermostat consists essentially of a valve which is attached by a hollow spindle to a concertina type of cylinder, which is joined at its base to a brass housing, but free to expand or contract, relative to the housing which is held, as the water temperature varies. The hollow cylinder is filled with an alcohol mixture which quickly reacts to changes in temperature.

To Remove and test Thermostat Valve.

The standard setting of the thermostat valve should permit the valve to commence to open at 149° to 158° Fahrenheit and to be fully open at 176° Fahrenheit. During winter in very cold areas a 190° Fahrenheit Thermostat is recommended.

If doubt exists as to the correct operation of the thermostat valve, it can be quite easily tested after removal from its housing.

To gain access to the thermostat, it is merely necessary to detach the main outlet hose after first suitably lowering the water level in the circulation system, and to remove the thermostat housing top flange after withdrawal of the two holding nuts and spring washers ($\frac{1}{2}$" A/F Spanner)

The "plant in" type thermostat can then be lifted out of its housing.

Having removed the thermostat from its housing, it should be tested in a bowl of water at the appropriate temperature using an accurate thermometer to ensure that the valve does commence to open at the correct temperature.

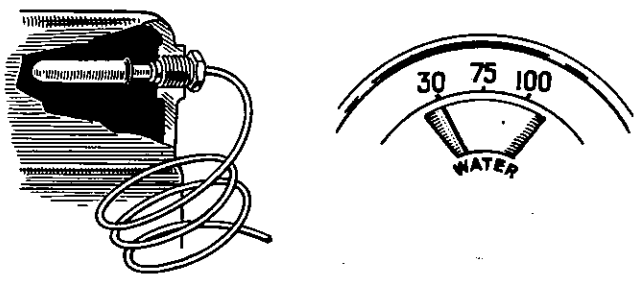


Fig. 9. Diagram showing thermometer gauge capillary tube attachment with cylinder lead and gauge.

There is no necessity to check the valve for fully opening, as providing the temperature at which the valve commences to open falls within the specified limits given above, the rest should follow.

Thermometer Gauge.

This is illustrated in Fig. 9 the capillary tube being attached to the rear end of the Combustion Head.

Where doubt exists as to the correctness of the readings, the instrument can be checked by inserting the element in a container of hot water, and the reading on the gauge to be compared with that of a reliable thermometer.

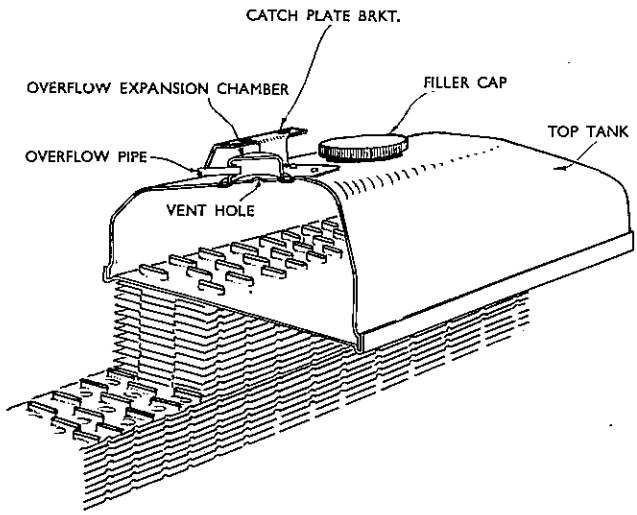


Fig. 10. Partially sectioned diagram of radiator.

RADIATOR.

Description. (Fig. 10).

A finned tube type of radiator is used with the "Mayflower." Three rows deep of elongated brass tubes of .006" thickness are mounted in .004" thick steel gills. These three rows of tubes extend the width of the film block.

The steel fins are provided with a system of symmetrically arranged corrugations on the forward and rear edges with a view to deflecting the incoming air streams round the rows of tubes.

A combined steam valve and overflow outlet is embodied in the header tank. Rejected water passes through this valve and down a pipe, clipped to the side of the film block, overflowing

on to the ground at the bottom and in front of the block.

To Remove Radiator.

1. Drain radiator block preserving anti-freeze mixture for further use.
2. Detach Outlet and Inlet hose connections from radiator.
3. Detach hinged bracket, the fulcrum of which is attached to the grille, by withdrawal of two cheese headed bolts with a screwdriver.
4. The radiator can now be removed after withdrawal of three bolts, which secure each side bracket to captive nuts in their respective adjacent body side members.

Anti-Freeze Precautions.

During frosty weather precautionary action must be taken to protect the engine from damage.

The draining of the water system from the points shown in Fig. 5 although protecting the engine from damage in the garage does not afford any immunity from freezing whilst the Car is in use, which can quite easily occur during severe weather, either when starting with the thermostat valve closed, or with this valve open under normal driving conditions.

In view of the possibilities mentioned in th previous paragraph, we strongly recommend th use of some anti-freeze mixture in Countrie where severe weather conditions are likely to b experienced.

The freezing compound which we recom mend for use in this Country is " Bluecol " which is manufactured by Messrs. Smiths Moto Accessories Ltd., Cricklewood Works, Londor N.W.2, but there will naturally be instance where this compound may not be readily avail able, or another approved brand be preferrec We are giving details of the quantities o " Bluecol " required to give immunity to varyin degrees of frost, but where other brands ar employed the makers recommendations wil naturally be followed, with the known capacit of the cooling system, (12 pints without heate or 13 pints with).

Recommended " Bluecol " proportions t meet all normal weather conditions, which ar likely to be experienced in this Country or o the Continent of Europe, are given below. I Countries where abnormally cold conditions ar

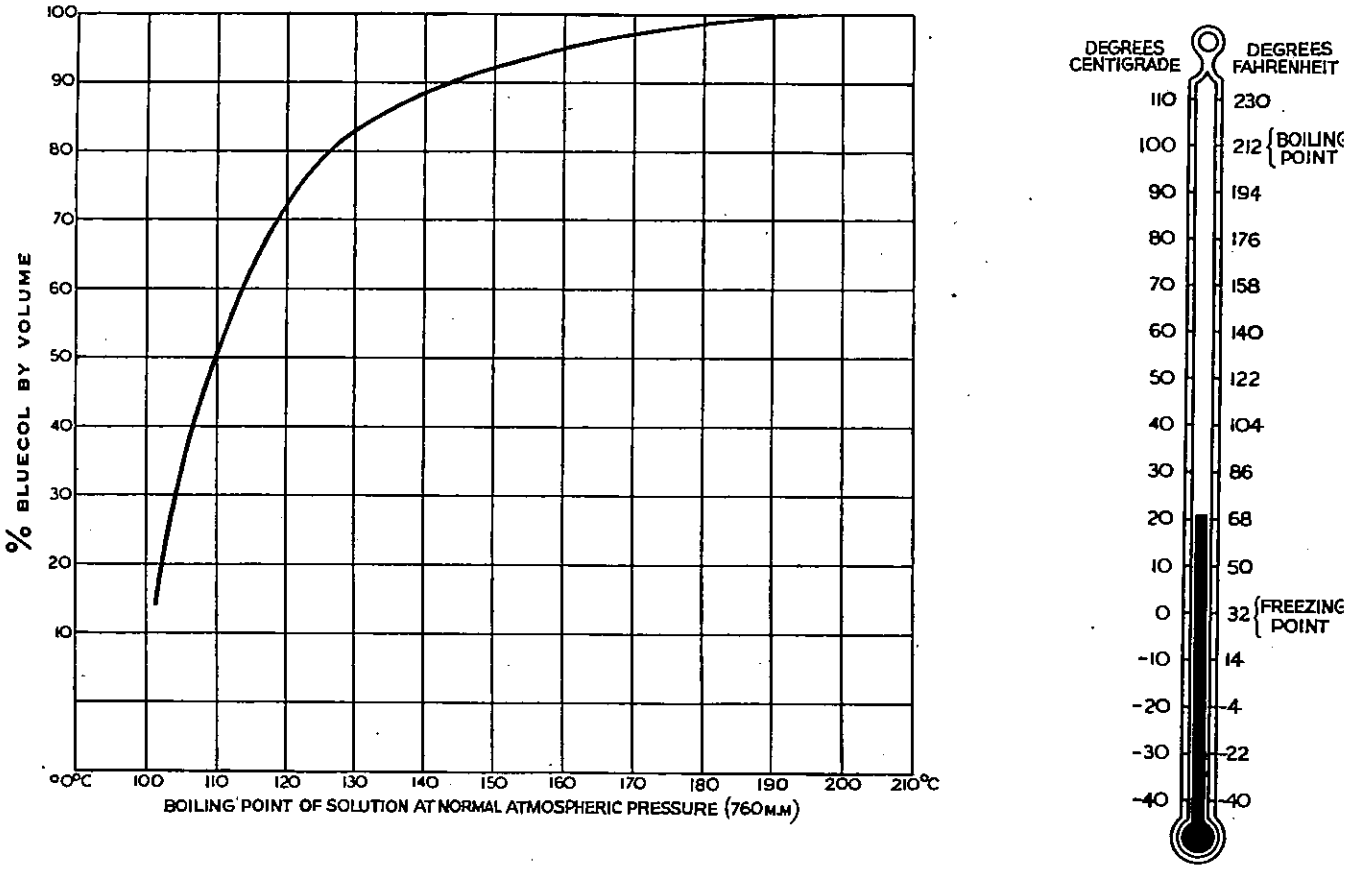


Fig. 11. Graph showing effect of " Bluecol " on boiling point.

experienced and where, in most instances, other brands of anti-freeze will be used, repairers will naturally rely on the recommendations of the manufacturer concerned.

The following details for Bluecol are submitted for the guidance of Repairers :—

Percentage BLUECOL by Volume	Freezing Point Degrees Fahrenheit	Safe Limits Degrees Fahrenheit	BLUECOL Pints on "Mayflower"
20	16	—3	2½
25	10	—15	3
30	4	—28	3¾
35	—3	—40	4¼
40	—10	—58	5

Water Cooling Capacity of "Mayflower."

Without Heater ... ... 12 pints
With Heater ... ... 13 pints

Effect of "Bluecol" on Boiling Point of Water in Cooling System.

The graph shown in Fig. 11 illustrates the effect of the introduction of "Bluecol" into the Cooling System, on the Boiling Point of the Coolant. (This curve was prepared from data supplied by Imperial Chemical Industries).

The comparison between Degrees Centigrade and Fahrenheit is given for the benefit of those who are not thoroughly conversant with the ordinary thermometer.

USEFUL DATA.

1 Imperial Gallon ... ... 8 pints.
4 Quarts ... ... 1 Imperial Gallon.
1 U.S.A. Gallon ... 0.833 Imperial Gallons.
1 U.S.A. Gallon ... ... 6.66 pints.
1 Litre ... ... 1.76 pints.
1 Gallon of water weighs ... ... 10 lbs.
1 Gallon of Bluecol weighs ... 11.14 lbs.
20% by vol. 1 part of Bluecol & 4 parts of water.

Before adding anti-freeze compound ensure that all water hose clips and cylinder head nuts are tight also that there is no leakage from the water pump. These precautions are desirable to eliminate the possibility of wastage and, as far as the cylinder head gasket is concerned to prevent leakage into the bores which may be burnt into a tacky substance and cause damage to the engine.

This anti-freeze compound will not of itself evaporate, thus apart from the possibility of loss due to leakage, it is only necessary to top up with water as evaporation takes place.

It is a wise precaution, when using anti-freeze mixture to employ some means of indicating the fact for the enlightenment of other repairers. It is manifestly even more important to remove such indications, when the compound is discarded, to avoid the suggestion that suitable precautions have alreay been taken when the winter conditions return which might otherwise arise.

DEFECTS IN COOLING SYSTEM.

Engine Overheating.

This difficulty may arise through a variety of causes, amongst which are the following :—

1. Ignition Timing late or automatic advance and retard not working properly.
2. Fan Belt slipping or incorrectly adjusted.
3. Insufficient water in the cooling system due to loss or improper filling.
4. Radiator and/or cylinder block restricted by accumulations of sludge, dirt or other matter. The cooling system should as a matter of routine be properly flushed out once every year and some approved type of defurring compound employed where serious fouling has occurred. A solution of common washing soda can be used satisfactorily.
5. Defect in radiator outlet valve.
6. Thermostat not operating properly.
7. Pre-ignition which may arise due to a variety of reasons.
8. Weak carburettor mixture caused by incorrect carburettor jet setting or air leaks to the induction system.
9. Cylinder head gasket not fitted properly.
10. High internal resistance in engine caused by:
    (a) Initial tightness after an overhaul or insufficient clearances.
    (b) Use of an incorrect grade of lubricant.
    (c) Inadequate oil level or improper circulation.
11. Dragging brakes or tight wheel bearings.
12. Slipping Clutch.
13. Use of certain brands of anti-freeze, which have a lowering effect upon the boiling point of the cooling system, during summer months. "Bluecol" actually slightly raises the boiling point of water.

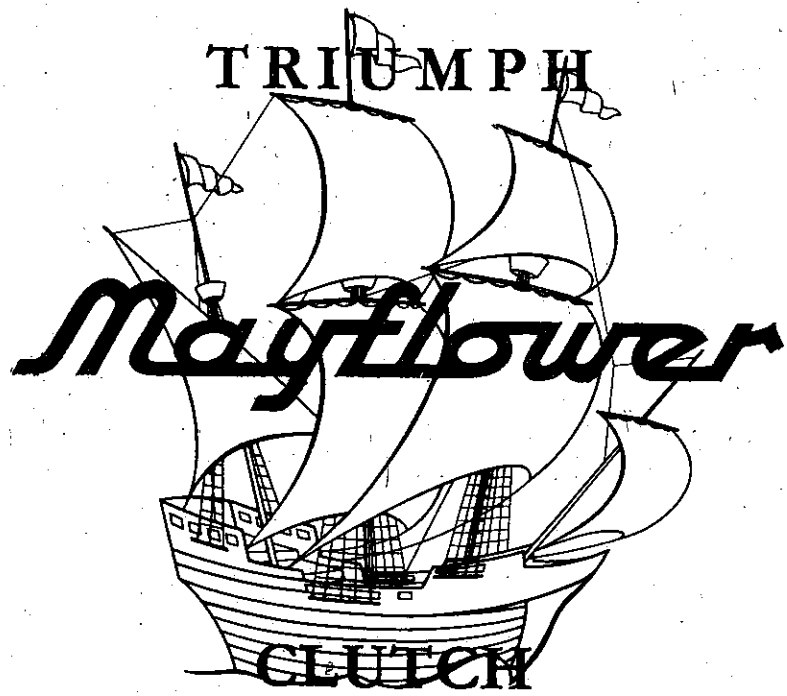
Loss of Water from Cooling System

1. Radiator leaking.
2. Loss of water due to badly made hose connections.
3. Leakage due to defective water pump seal or packings.
4. Leakage due to badly made thermostat housing packings.
5. Internal or external leakage, due to defective combustion head gasket, loose securing nuts or distorted cylinder head.
6. Loss of water due to boiling caused by one or more of the causes given for "Engine Overheating."

Service Instruction Manual

First Issue

TRIUMPH



CLUTCH

SECTION D

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

CLUTCH

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Pedal adjustment	2	Adjusting release levers	3 & 4
Removal of clutch	2	Refacing driven plate	4
Dismantling clutch	2	Condition of clutch facings	4 & 5
Assembling clutch	2 & 3	Faults and remedies	6 & 7

CLUTCH

MAYFLOWER 7¼A6-G MODEL

GENERAL DESCRIPTION (See Fig. 1)

The clutch is of the single dry plate type consisting of a driven plate assembly, a cover assembly and a release bearing assembly.

DRIVEN PLATE ASSEMBLY

This is of the Borglite spring type having a splined hub (15) and a disc adaptor (16) fitted with nine cushion segments (14) which carry two facings (17) attached by rivets (18). The hub flange and the disc adaptor are slotted to carry three drive and three over-drive springs positioned by a retaining plate which is secured to the disc adaptor by stop pins.

RELEASE BEARING ASSEMBLY

The release bearing consists of a graphite bearing (5) shrunk into a bearing cup (6), the cup being located by the operating forks an release bearing retainer springs.

COVER ASSEMBLY

The cover assembly consists of a presse steel cover (1) and a cast-iron pressure plate (2 loaded by six thrust springs (six yellow 115-12 lbs). Mounted on the pressure plate are thre release levers (8) which pivot on floating pins (9 retained by eyebolts (10). Adjustment nuts (12 are screwed on to the eyebolts, which pass throug the clutch cover, and are secured by staking Struts (13) are interposed between lugs on th pressure plate and the outer ends of the releas levers. Anti-rattle springs (11) are fitted betwee the release levers and the cover and retaine springs (7) connecting the release lever plate (4 to the release levers.

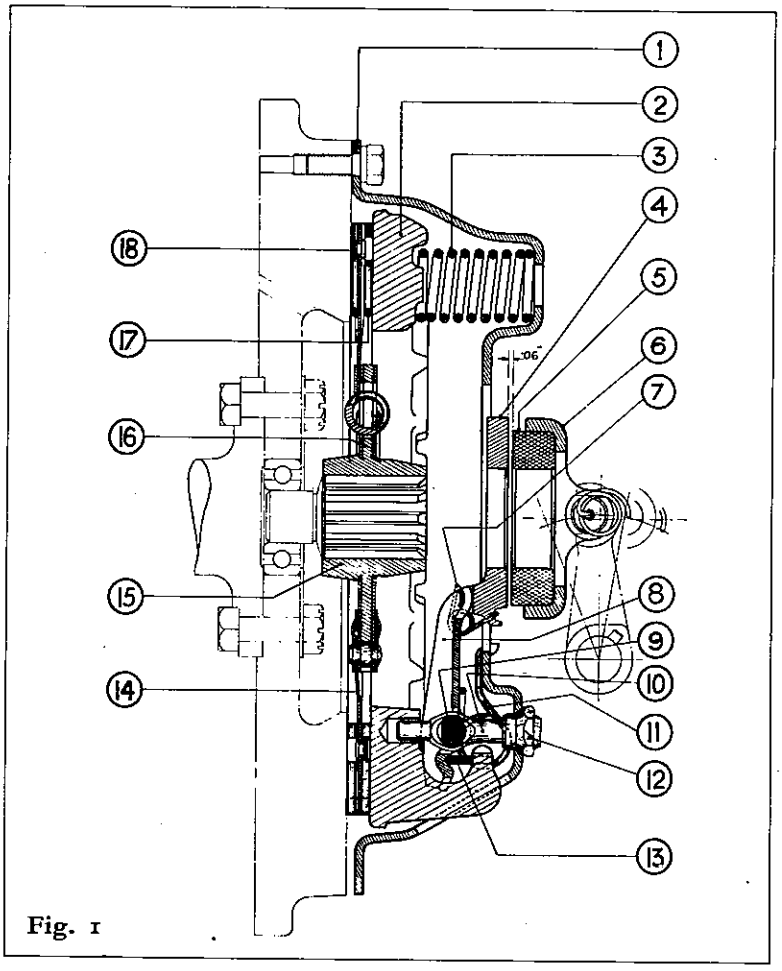


Fig. 1

PEDAL ADJUSTMENT

The only adjustment necessary throughout the life of the driven plate facings is to restore periodically the free movement of the clutch pedal, *i.e.*, movement of the pedal before the release bearing comes in contact with the release levers and commences to withdraw the clutch. To ensure this free movement, a clearance of not less than $\frac{1}{16}$" must be provided. As the driven plate facings wear, the pressure plate moves closer to the flywheel and the outer ends of the release levers follow.

This causes the inner ends of the release levers to travel further towards the gearbox and decreases the release bearing clearance or free pedal movement.

Adjust the clutch pedal stop until free movement is approximately 1". Press the pedal down and note the distance the release bearing travels after the release bearing clearance has been taken up. To obtain a clean release, the inner ends of the release levers should be pushed towards the flywheel .50". When the inner ends of the release levers have travelled this amount and no more, the clutch pedal should be in contact with the pedal stop. If such is not the case, the stop must be adjusted.

Should excessive pedal movement be made to release the clutch, this leads to close coiling of the thrust springs, after which any pedal pressure exerted only tends to overstress the release gear and internal parts of the clutch.

REMOVAL OF CLUTCH FROM CHASSIS

1. To remove the clutch from the flywheel of an engine, it is merely necessary to withdraw the gearbox, which can be done quite easily owing to the detachable rear cross member which is fitted. This operation is described in the " Gearbox Section " on Page 7.

2. Slacken the holding screws (2), Fig. 3, a turn at a time by diagonal selection until the thrust spring pressure is relieved. Remove the screws and lift the complete clutch away from the flywheel. Remove the driven plate assembly.

Note: The adjustment nuts (12), Fig. 1, are correctly set and locked when the clutch is assembled and should not be altered unless the clutch has been dismantled and new parts fitted. Interference with this adjustment will throw the pressure plate out of position and cause the clutch to judder.

DISMANTLING (see Fig. 1)

To dismantle the clutch proceed as follows:—

1. Suitably mark the following parts in such a manner that they can be reassembled in the same relative positions to each other in order to preserve the balance and adjustment: cover (1), pressure plate lugs (2) and the release levers (8).
2. Remove the release lever plate (4) by unhooking it from the retainer springs (7), place the cover assembly under a press with the pressure plate resting on wooden blocks, so arranged that the cover can move downwards when pressure is applied. Place a block of wood across the top of the cover resting on the spring bosses.
3. Compress the cover by means of the ram and, while holding it under compression, remove the adjusting nuts (12) and slowly release the pressure to prevent the thrust springs (3) from flying out. Lift off the cover to expose all parts for inspection.
4. Remove each release lever (8) by holding the lever and eyebolt (10) between fingers and thumb so that the inner end of the lever and the threaded end of the eyebolt are as near together as possible, keeping the release lever pin (9) in position in the lever. Lift the strut (13) over the ridge on the lever and remove the eyebolt from the pressure plate.

ASSEMBLING (see Fig. 1)

Before assembly, thoroughly clean all parts and renew those which show appreciable wear. A very slight smear of grease, such as Duckhams' H.P.2295 or Keenol, should be applied to the following parts during assembly :—

Release lever pins (9), contact faces of struts (13), eyebolt seats in cover (1), drive lugs sides on the pressure plate (2) and the plain end of the eyebolts (10).

1. Assemble the release lever (8), eyebolt (10) and release lever pin (9), holding the threaded end of the eyebolt and the inner end of the lever as close together as possible. With the other hand insert the strut (13) in the slots in the pressure plate lug sufficiently to allow the plain end of the eyebolt to be inserted in the hole in the pressure plate (see

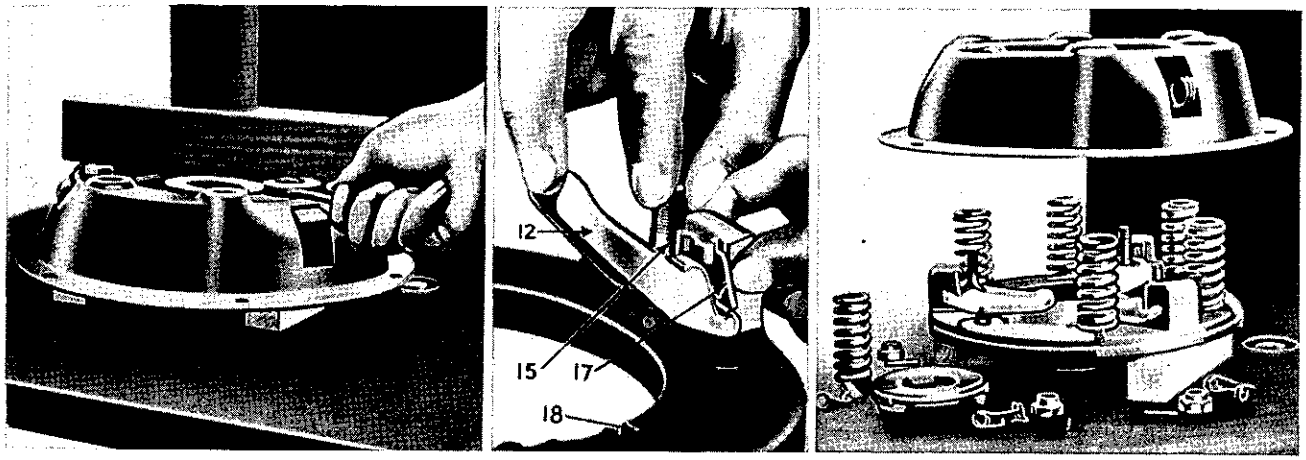


Fig. 2

Fig. 2). Move the strut upwards into the slots in the pressure plate lug and over the ridge on the short end of the lever and drop it into the groove formed in the latter. Fit the remaining release levers in a similar manner.

2. Place the pressure plate on the blocks under the press and arrange the thrust springs (3) in a vertical position on the plate, seating them on the bosses provided (Figs. 1 and 2).

3. Lay the cover over the assembled parts, ensuring that the anti-rattle springs (11) are in position and that the tops of the springs are directly under the seats in the cover; also that the machined portions of the pressure plate lugs are under the slots in the cover through which they have to pass. Care should be taken that the parts marked before dismantling are in their correct relative positions.

4. Place the block of wood across the cover, resting it on the spring bosses, and compress the cover by means of the ram, guiding the eyebolts and pressure plate lugs through the holes in the cover.

5. Screw the adjusting nuts (12) on to the eyebolts (10) and secure by staking. Operate the clutch a few times by means of the ram to ensure that the working parts have settled into their correct positions. Connect the release lever plate (4) to the release levers (8) by means of the retainer springs (7).

Note: If new parts have been fitted, which would affect the adjustment, the release levers should be set by using the Borg and Beck Gauge Plate, Part No. CG.12916.

REFITTING THE CLUTCH

To reassemble the clutch on the flywheel proceed as follows :—

1. Assemble the driven plate in the flywheel, taking care to place the larger chamfered spline end of the driven plate hub towards the gearbox or rear of the vehicle. Centralize the driven plate by means of a dummy shaft which fits the splined bore of the driven plate hub and the pilot bearing in the flywheel.
2. Fit the cover assembly to the flywheel by means of the holding screws (2), Fig. 3, tightening them a turn at a time by diagonal selection. Do not remove the dummy shaft until all the screws are securely tightened. Remove the dummy shaft.

ADJUSTING THE RELEASE LEVERS

(See Fig. 3)

Satisfactory operation of the clutch is dependent on accurate adjustment of the release levers (5). This must be carried out before the clutch has been assembled to the flywheel and should only be necessary if new parts have been fitted. The maximum difference allowed in the height of the release levers is .015". To obtain this accuracy use the special gauge plate in conjunction with the flywheel which may be mounted on the engine or lying on the bench, whichever is the more convenient.

1. Place the gauge plate (4) centrally in the flywheel in place of the driven plate assembly.
2. Fit the cover assembly to the flywheel by tightening the holding screws (2) a turn at a time by diagonal selection, until fully secured.

3. Place a straight edge across the gauge plate boss and the top of one release lever (5) and adjust the release lever, if necessary, by turning the eyebolt nut (6) until the top of the lever is exactly level with the top of the gauge plate boss. Adjust the remaining levers in a similar manner.

   The setting should be within .005" if carefully carried out.

4. Slacken the holding screws (2) a turn at a time by diagonal selection, then remove the holding screws and the clutch from the flywheel. Remove the gauge plate.

REFACING THE DRIVEN PLATE

When removing old worn facings, the rivets must be drilled, not punched out. Each rivet attached one facing only. Using a $\frac{5}{32}$" dia. drill, inserted through the clearance hole in the opposite facing, drill out the rivets. After removing the facings, thoroughly examine the segments for cracks; if cracks are found a new driven plate assembly should be used.

1. Place one facing in position with the countersunk holes coinciding with the ones located on the crown or longer side of each segment.
2. Insert the rivets with their heads in the countersunk holes of the facing, and roll the shanks over securely against the segments. If a rolling tool is not available a blunt ended punch will prove satisfactory.
3. Secure the opposite facing in a similar manner, matching the countersunk holes with the remaining holes in the segments. Rivet heads should always face outwards.
4. Place the assembly on a mandrel between lathe centres and spin for run-out; if more than .015", prise over as necessary.

The possibility of further use of the friction facings of the Borg and Beck clutches is sometimes raised, because they have a polished appearance after considerable service. It is natural to assume that a rough surface will give a higher frictional value against slipping, but this is not correct.

Since the introduction of non-metallic facings of the moulded asbestos type, in service, a polished surface is a common experience, but it must not be confused with a glazed surface which is sometimes encountered due to conditions discussed below.

CONDITION OF CLUTCH FACINGS

The ideal smooth or polished condition will provide a normal contact, but a glazed surface may be due to a film or a condition introduced, which entirely alters the frictional value of the facings. These two conditions might be simply illustrated by the comparison between a polished wood, and a varnished surface. In the former the contact is still made by the original material, whereas in the latter instance, a film of dried varnish is interposed between the contact surfaces.

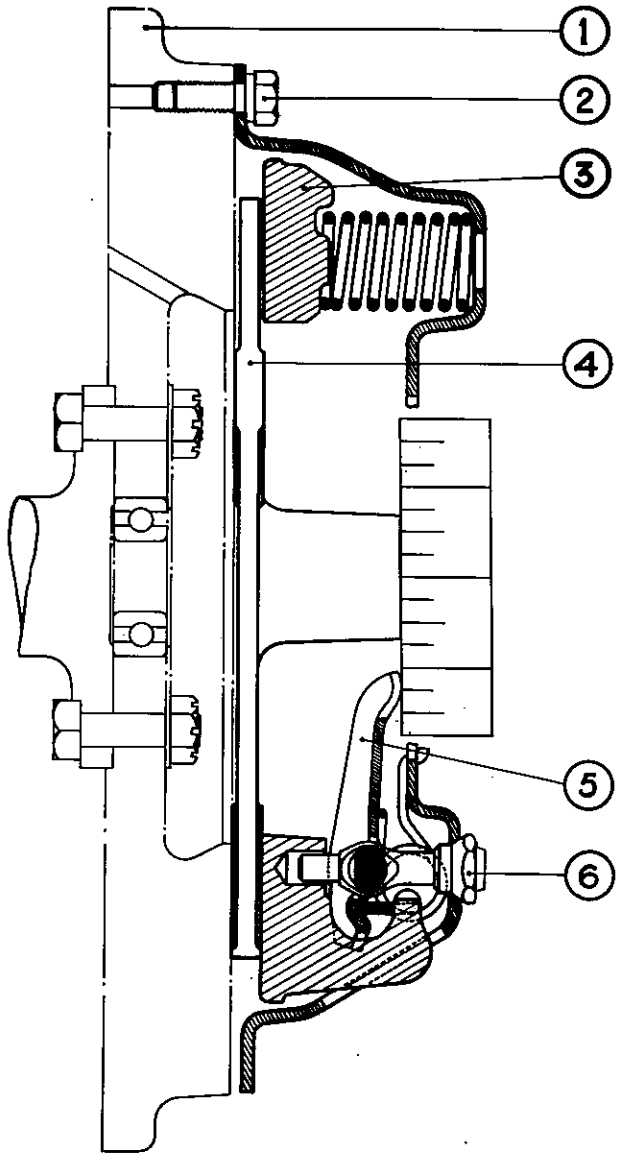


Fig. 3

The following notes are issued with a view to giving useful information on this subject :—

1. After the clutch has been in use for some little time, under perfect conditions (*i.e.*, with the clutch facings working on true and polished or ground surfaces of correct material, without the presence of oil, and with only that amount of slip which the clutch provides for under normal conditions) then the surface of the facing assumes a high polish, through which the grain of the material can be clearly seen. This polished facing is of a mid-brown colour and is then in a perfect condition, the coefficient of friction and the capacity for transmitting power being up to Borg and Beck standard.

   Note : The appearance of wound or woven type facings is slightly different but similar in character.

2. Should oil in small quantities gain access to the clutch in such a manner as to come in contact with the facings it will burn off, due to the heat generated by slip which occurs under normal starting conditions. The burning off of this small amount of lubricant has the effect of gradually darkening the facings, but, provided the polish on the facings remains such that the grain of the material can be clearly distinguished, it has very little effect on clutch performance.

3. Should increased quantities of oil or greas obtain access to the facings, one or tw conditions, or a combination of the twc may arise, depending upon the nature o oil, etc.

   (a) The oil may burn off and leave on th surface facings a carbon deposit whic assumes a high glaze and causes slip This is a very definite, though very thi deposit, and in general it hides the grai of the material.

   (b) The oil may partially burn and leave resinous deposit on the facings, whic frequently produce a fierce clutch, an may also cause a " spinning " clutch du to a tendency of the facings to adhere t the flywheel or pressure plate face.

   (c) There may be a combination of (a) an (b) conditions, which is likely to produc a judder during clutch engagement.

4. Still greater quantities of oil produce a blac soaked appearance of the facings, and th effect may be slip, fierceness, or judder i engagement, etc., according to the condi tions.

If the conditions under (3) or (4) are ex perienced, the clutch driven plate should b replaced by one fitted with new facings, th cause of the presence of the oil removed and th clutch and flywheel face thoroughly cleaned.

FAULTS AND THEIR REMEDY

SYMPTOM	CAUSE	REMEDY
1. Drag or Spin.	(a) Oil or grease on the driven plate facings.	Fit new facings.
	(b) Misalignment between the engine and splined clutch shaft.	Check over and correct the alignment.
	(c) Improper pedal adjustment not allowing full movement to release bearing.	Correct pedal adjustment.
	(d) Warped or damaged pressure plate or clutch cover.	Renew defective part.
	(e) Driven plate hub binding on splined shaft.	Clean up splines and lubricate with small quantity of high melting point grease such as Duckham's Keenol.
	(f) Pilot bearing or bushing of clutch shaft binding.	Renew or lubricate pilot bearing.
	(g) Distorted driven plate due to the weight of the gearbox being allowed to hang in clutch plate during erection.	Fit new driven plate assembly using a jack to take the overhanging weight of the gearbox.
	(h) Broken facings of driven plate.	Fit new facings.
	(j) Dirt or foreign matter in the clutch.	Dismantle clutch from flywheel and clean the unit, see that all working parts are free. **Caution**—Never use petrol or paraffin for cleaning out clutch.
2. Fierceness or Snatch.	(a) Oil or grease on driven plate facings.	Fit new facings and ensure isolation of clutch from possible ingress of oil or grease.
	(b) Misalignment.	Check over and correct the alignment.
	(c) Binding of clutch pedal mechanism.	Free and lubricate journals.
	(d) Worn out driven plate facings.	New facings required.
3. Slip.	(a) Oil or grease on the driven plate facings.	Fit new facings and eliminate cause of foreign presence.
	(b) Binding of clutch pedal mechanism.	Free and lubricate journals.
	(c) Improper pedal adjustment indicated by lack of the requisite 1" free or unloaded foot pedal movement. Incorrectly replaced floorboards preventing complete rearward movement of the pedal.	Correct pedal adjustment and/or clearances.

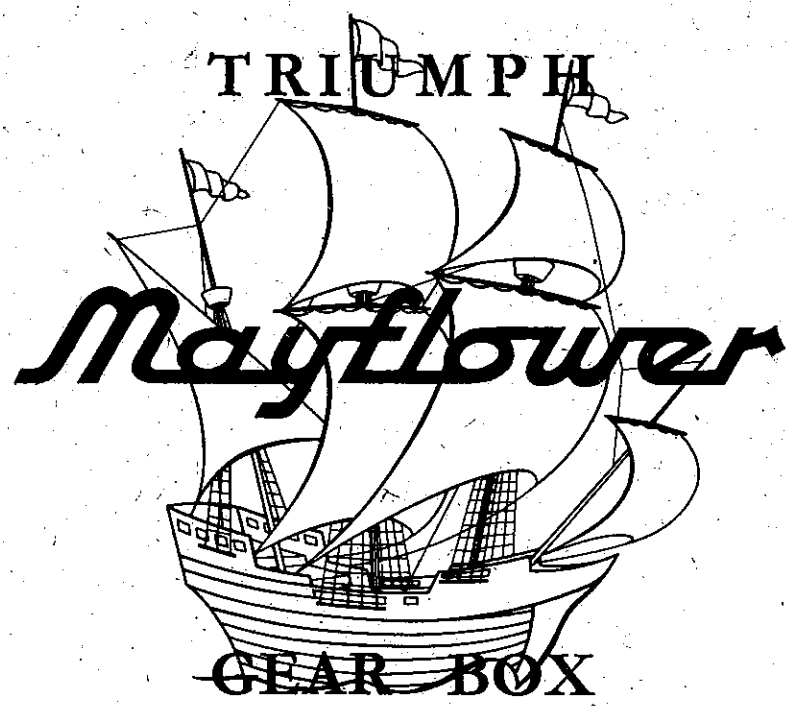
FAULTS AND THEIR REMEDY—Continued

SYMPTON	CAUSE	REMEDY
4. Judder.	(a) Oil, grease or foreign matter on the driven plate facings.	Fit new facings and eliminate cause o: foreign presence.
	(b) Misalignment.	Check over and correct alignment.
	(c) Pressure plate out of parallel with flywheel face in excess of the permissible tolerance.	Re-adjust levers in plane and, if necessary, fit new eyebolts.
	(d) Contact area of friction facings not evenly distributed. Note that friction facing surface will not show 100% contact until the clutch has been in use for some time, but the contact area actually showing should be evenly distributed round the friction facings.	This may be due to distortion, if so fi new driven plate assembly.
	(e) Bent splined shaft or buckled driven plate.	Fit new shaft or driven plate assembly.
	(f) Unstable or ineffective rubber engine mountings.	Replace and ensure elimination of endwise movement of power unit.
	(g) Chassis to engine tie bar out of adjustment.	Correct to ensure that power unit is held against endwise travel.
5. Rattle.	(a) Damaged driven plate, *i.e.*, broken springs, etc.	
	(b) Worn parts in release mechanism.	
	(c) Excessive back lash in transmission.	Fit new parts as necessary.
	(d) Wear in transmission bearings.	
	(e) Bent or worn splined shaft.	
	(f) Graphite release bearing loose on throw-out fork.	
6. Tick or Knock.	(a) Hub splines badly worn due to misalignment.	Check and correct alignment, then fit new driven plate.
	(b) Worn pilot bearing.	Pilot bearing should be renewed.
7. Fracture of Driven Plate.	(a) Misalignment distorts the plate and causes it to break or tear round the hub or at segment necks in the case of Borglite type.	Check and correct alignment and introduce new driven plate.
	(b) If the gearbox during assembly be allowed to hang with the shaft in the hub, the driven plate may be distorted, leading to drag, metal fatigue and breakage.	Fit new driven plate assembly and ensure satisfactory reassembly.
8. Abnormal Facing Wear.	Usually produced by overloading and by the excessive slip starting associated with overloading.	In the hands of the operator.

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

GEAR BOX

SECTION E

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

GEARBOX

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GEARBOX—Dimensions and Tolerances

Parts and Description	Dimensions new	Permissible worn Dimensions	Clearance new	Permissible worn Clearance	Remarks
Selector Mechanism.					
Selector Rod Dia.	$\frac{9}{16}$″ $\frac{-.001″}{-.002″}$				
			.000$\frac{1}{2}$″		
Bore for Selector Rod in Casing and Bush Spring Fitted	$\frac{9}{16}$″ ±.0005″		to .002$\frac{1}{2}$″		
Plunger Spring, Fitted Load	10 lbs.				
Width of Grooves in "Second" & "Top" Synchro sleeve and "Reverse" gear for Change Speed Forks	$\frac{9}{32}$″ $\frac{+.004″}{+.006″}$		.010″ to .016″		
Width of Selector Fork Sides	$\frac{9}{32}$″ $\frac{-.006″}{-.010″}$				
Main Line.					
Constant Pinion Shaft Bore	.9245″ .9250″		.000$\frac{1}{2}$″ to .001$\frac{1}{2}$″		
Constant Pinion Bush Outside Dia.	.9240″ .9235″				
Constant Pinion Bush Bore	.6887″ .6880″		.000$\frac{1}{2}$″ to .001$\frac{3}{4}$″		
Mainshaft Spigot	.6875″ .6870″				
"Second" & "Top" Bush External Dia.	1$\frac{1}{2}$″ $\frac{-.0017″}{-.0029″}$		.001$\frac{1}{4}$″ to .002$\frac{3}{4}$″		
"Second" & "Top" Bush Bore	1$\frac{1}{2}$″ ±.0005″				
"First" Gear Bush External Dia.	1.5675″ $\frac{-.001″}{-.0017″}$		.000$\frac{1}{2}$″ to .002$\frac{1}{4}$″		
"First" Gear Bush Bore	1.5675″ ±.0005″				
Speedometer Bearing Internal Dia.	$\frac{15}{32}$″ ±.0005″		.000$\frac{1}{4}$″ to .002$\frac{1}{4}$″		
Speedometer Driven Gear Shaft Dia.	$\frac{15}{32}$″ $\frac{-.0007″}{-.0017″}$				

GEARBOX—Dimensions and Tolerances

Parts and Description	Dimensions new	Permissible worn Dimensions	Clearance new	Permissible worn Clearance	Remarks
Countershaft Line.					
Shaft Dia.	.7913″ $^{+.000''}_{-.0005}$				
Bore in Casing for Shaft	.7923″ .7915″		.000$\frac{1}{4}$″ to .001$\frac{3}{4}$″		
Bore of Countershaft Gear for Needle Rollers	1.0284″ 1.0289″				24 rollers at each end of shaft.
Thickness of Front Thrust Washer	.066″ .068″				
Thickness of Rear Thrust Washer	.105″ .107″				
Overall Width of Countershaft Gear	6.5837″ 6.5817″				
Overall Width of Thrust Washers and Countershaft Gear	6.7587″ 6.7527″				
Internal Width of Gearbox Casing for Countershaft Gear	6.758″ $^{+.011''}_{+.013''}$				
Countershaft Gear End Float			.006″ to .010″		

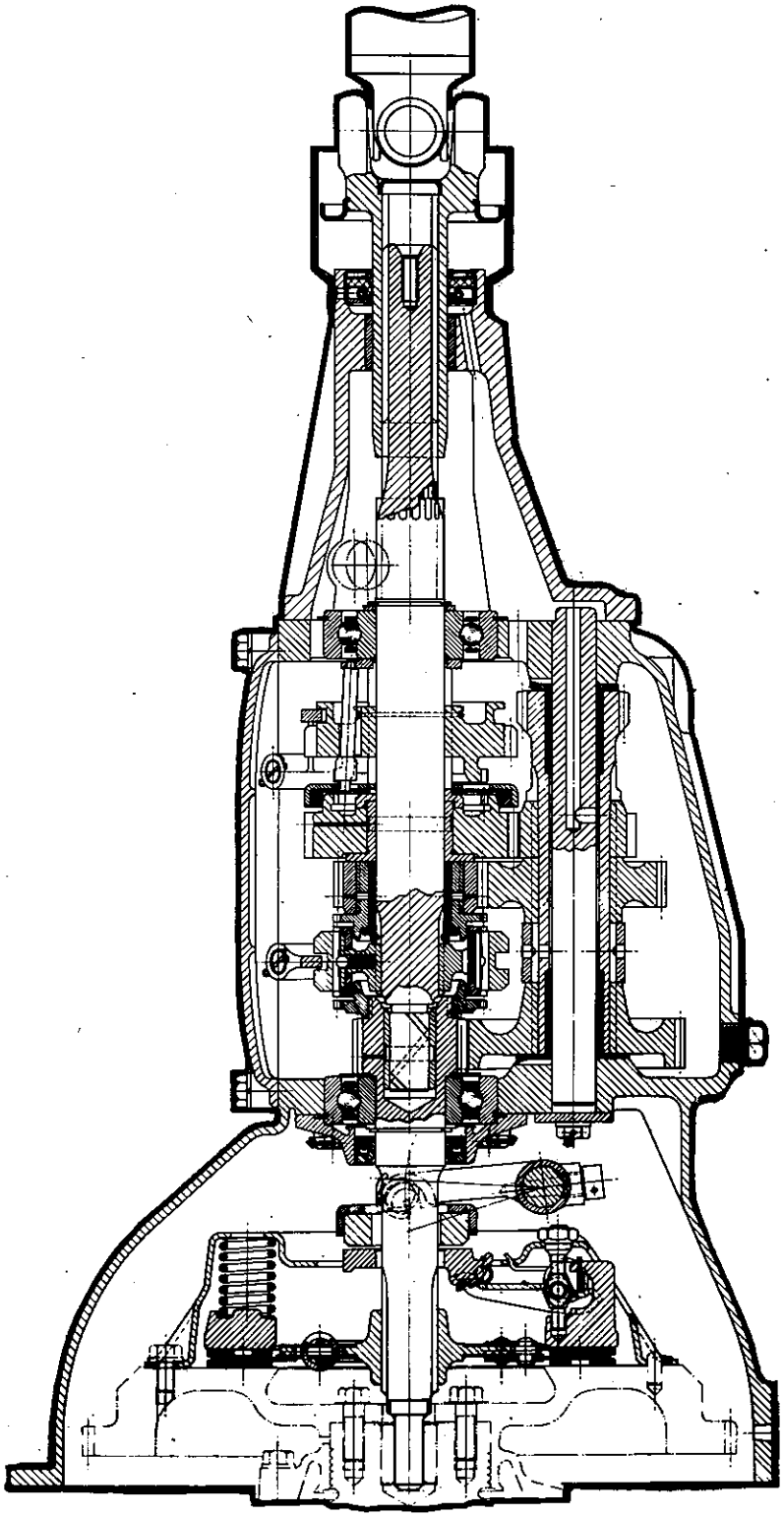


Fig. 1. General arrangement of gearbox

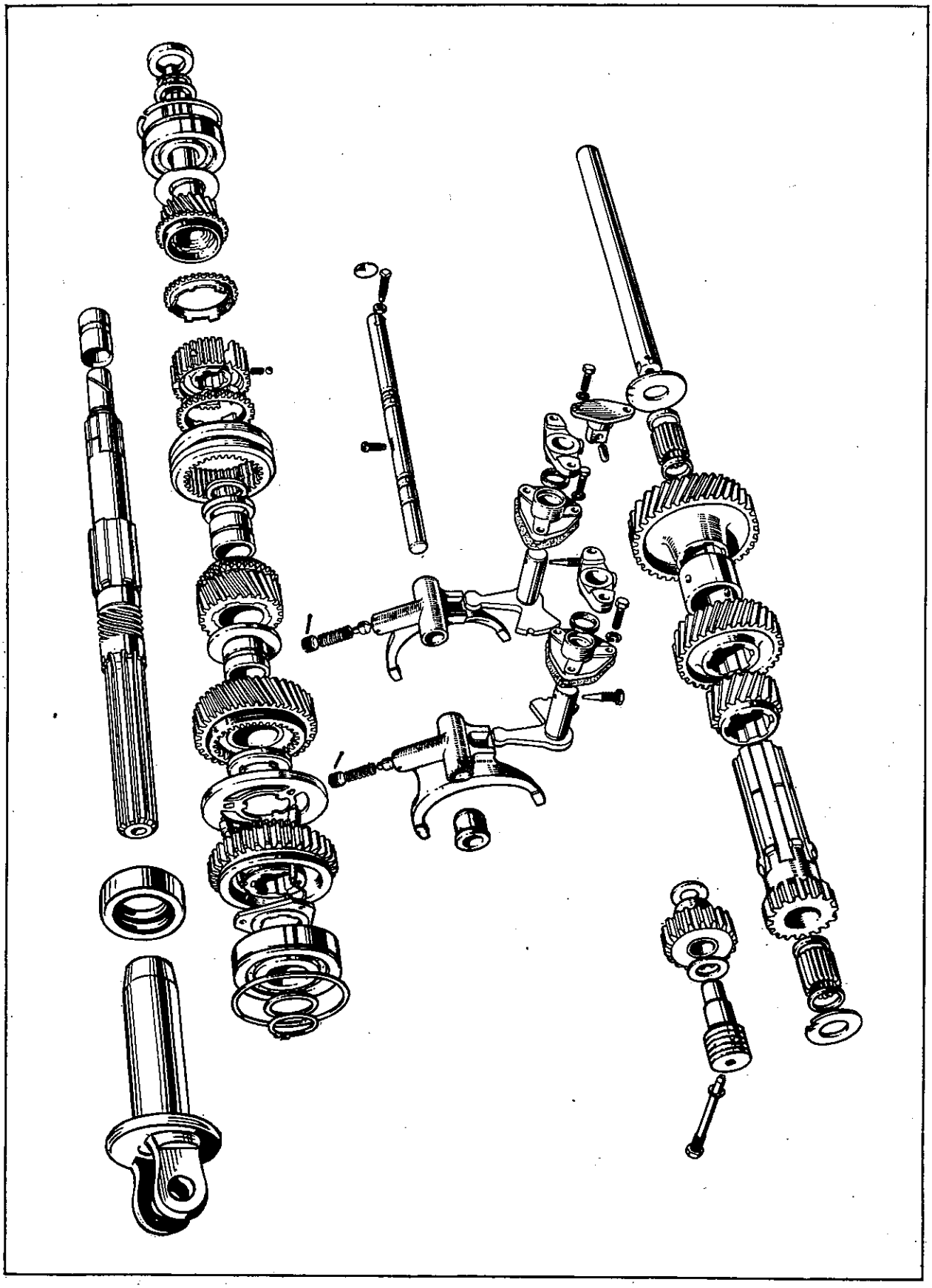


Fig. 2. Exploded details of gearbox

GEARBOX

(See Figs. 1 and 2)

DESCRIPTION

The gearbox details used with this model are largely interchangeable with those used on the Two Litre models.

The following items used on the "Mayflower" are not interchangeable with the Two Litre model :—

Gearbox and clutch housing.
Mainshaft.
Constant pinion assembly.
Gearbox extension and outer sleeve assembly.
Extension oil seal.
Oilite bush in extension.
Clutch operating fork.
Clutch operating shaft.
Clutch operating lever.

The gearbox casing and clutch housing is an integral casting of aluminium alloy. The clutch housing being flanged and bolted to form a point of attachment with the engine unit.

Three forward speeds and reverse are provided. There are three trains of single helical constant mesh gears.

Straight spur teeth are used for the "reverse" gear, the idler wheel being in constant mesh with the countershaft gear and reversal of motion being obtained by sliding mainshaft "reverse" gear into engagement with the idler wheel. The mainshaft "reverse" gear wheel is provided with a segmented projecting toothed ring which engages in a manner described later with an internal toothed ring on the adjacent side of the third mainshaft constant mesh helical gear, to provide the silent "first" gear.

Synchro-mesh is obtained with all three forward gears.

Synchro-mesh is provided on "top" and "second" by means of a double-ended synchro unit, which consists of an outer or operating sleeve, splined on to an inner synchronizing sleeve, which is in turn also splined to the gearbox mainshaft.

The synchronizing sleeve is provided with three longitudinal slots which are let into the outer diameter of the sleeve radially, 120° apart. These three slots accommodate the three projecting lugs on each of two phosphor bronze toothed rings, one of which is fitted on each side of the sleeve. These toothed rings are exactly similar, in tooth form, to the internal splining of the operating sleeve and to the dogs on the driving members, and are permitted by clearance in their accommodating slots to make small arcuate movements relative to the operating sleeve.

The toothed rings, or, as they are commonly called, baulk rings, are provided with internally female coned surfaces which are designed to engage with similarly shaped male coned surfaces on the driving members. The internal conec faces of the baulk rings are scrolled to shear any oil film which may form on the male cones and militate against proper synchronization.

An elastic connection is formed between the operating and synchro sleeves by means of spring loaded balls fitted in three radial drillings in the centre of the synchro sleeve, spaced at 120° and running 60° out of phase with the slots for the baulk ring lugs. The synchro balls are located by a circumferential recess inside the operating sleeve. Synchro-mesh in the case of "top" and "second" is provided as follows :—

When the operating sleeve of the synchro unit is moved towards the gear, which is to be engaged, by the driver operating the gear lever, the spring pressure on the three balls is sufficient to keep these balls in their annular recess in the operating sleeve. The inner and outer members of the unit, accordingly, move together towards the selected gear and, as they approach, the coned surface on the interior of the bronze baulk ring begins to bear upon the surface of the coned face, on the driving member. The contact between these two faces is controlled by the spring loading of the three synchro balls and the position of the baulk ring, as is later explained. This contact between the coned faces, tends to carry the baulk ring round at the speed of the faster moving member and, owing to the small amount of permissible relative movement permitted between the ring and its accommodating sleeve, out of line with the internally cut splines in the operating sleeve. Continued pressure between the coned surfaces tends to synchronize the relative speeds of the driven and driving members. When exact synchronization of speed is reached, the dogs on the driving member align themselves with the toothed ring and the internally cut splines on the operating sleeve. When this position of synchronization is reached, the operating sleeve moves into engagement with the baulk ring and driving dogs, whilst the spring loaded synchro

balls leave their recess in the operating sleeve, releasing the pressure on the cone and permitting full engagement between the driving dogs on the splines and those in the operating sleeve.

It will be seen that with the employment of these baulk rings, less reliance for control of synchronization is placed upon the pressure exercised by the spring loading of the synchro balls. Such being the case, it is possible to reduce the axial load necessary to release the synchro balls, and correspondingly to reduce the number of balls required.

Synchro-mesh in the case of the "first" gear is provided by means of a large diameter coned cup splined to the mainshaft, so arranged that a small amount of circumferential movement relative to the shaft is possible, and three baulk pins. The three baulk pins have their outer extremities spigotted into a triangular plate, which plate is splined to the mainshaft, and pass through three equally spaced $\frac{3}{8}$" holes drilled through the mainshaft reverse gear. The inner extremities of these three pins, adjacent to the coned cup, are of increased diameter to provide a measure of centrifugal action and a means of "baulking" until synchronization of speed is attained. They are finally reduced in size for spigotting into the three specially shaped elongated holes in the three arms of the cone and cup assembly. A light coil spring, fitting into a recess on the "reverse" gear, aids synchronization at extremely low car speeds.

The mainshaft constant mesh helical gear in the third train of these gears has an internally cut toothed ring on its rear face, and this ring is surmounted by a projecting circular male faced cone over which the coned cup mentioned above fits.

These aids towards synchronization operate in the following manner :—

When it is required to engage " first " gear from the " second " position, the mainshaft " reverse " gear is moved towards the first speed constant mesh wheel by the driver's operation of the change speed lever. As this gear is moved towards the constant wheel and bears on the three baulk pins, it carries with it the cup and cone assembly by virtue of the baulk pin heads being displaced radially outwards due to light spring load and centrifugal action. The coned surfaces on the cup and on the constant wheel thus come into contact. As the "reverse" gear and cup assembly are rotating at mainshaft speed, which is greater than that at which the constant wheel is being driven by its mating gear on the countershaft, the cup and cone assembly, together with the " reverse " gear, will tend to overrun the constant wheel, consequently, when the cup contacts the cone, the cup is displaced a small amount circumferentially carrying the pin heads with it. The continued travel of the " reverse " gear and consequent pressure on baulk pins increases the load on the cup assembly until the speed of the driven member is synchronized with that of the gear which is to be engaged. When synchronization is reached, not only are the respective dogs on the two gears aligned, but in addition the baulk pins are restored to their normal relation with the accommodating gear, and as a result the radiused portion of each baulk pin adjacent to the increased diameter allows the pins to freely enter their respective holes. Further movement of the " reverse " gear allows the engagement of the toothed ring on the constant wheel by the passage of the segmented ring through the slots provided for this purpose in the cone and cup assembly. With the engagement of " first " gear from rest the constant wheel will naturally overrun the stationary cup and mainshaft " Reverse " gear and relative speeds will be synchronised when engagement takes place.

The countershaft gear is mounted on two sets of needle bearings, one at either end, and is in constant engagement with the reverse pinion. The reverse pinion is bushed and carried by a spindle which is supported on the one side by a boss in the gearbox casing, and on the other by an enlarged portion of the spindle fitting into the gearbox end casing, there being a phosphor bronze faced thrust washer on each side of the pinion.

The spindle is secured endwise by a locking pin which also carries out the same function for the countershaft spindle.

The countershaft gear is of the sleeved type, the sleeved portion being splined externally to drive the three trains of constant mesh helical gears and internally bored to accommodate the two sets of needle rollers (there being 24 at each end) and the countershaft spindle. The first and second constant wheel are separated by means of a sleeve loosely fitted on the countershaft gear splines.

A thrust washer is fitted at either end of the countershaft and these located by tabs which register with slots on the gear casing.

The boring for the countershaft spindle in the front end of the gearbox casing is sealed by a small plate and paper packing which is secured to the casing by two setscrews and plain washers, lead wire being used under the washers.

The selector mechanism consists of two bell cranked levers at the inner end of two spindles which are mounted in cast-iron bearings, each of which are secured by three setscrews to the gearbox casing. The outer extremity of each spindle has attached to it " T " shaped brackets, secured by a taper setscrew joined by a metallic coupling to the operating shafts, which are interconnected by a system of cranked levers to the steering column change speed shaft and control.

The cranked selector arms have upper extremities suitably shaped to fit in the selector fork recesses and quadrant shaped lower ends which are separated from one another by the spigotted cylindrical housing which accommodates the interlocking plunger. The quadrant shaped ends of the selector arms are each supplied with a semi-circular slot, shaped to accommodate the rounded end of the interlocking plunger. The operation of one selector arm, forces the plunger into the semi-circular recess in the other, thus rendering this immovable.

The two selector forks are mounted on a single rod, the front end of which being accommodated direct in the casing, whilst at the other end a steel collar spigotted into the casting carries the shaft. The rod is secured to the gearbox casing, at the front end, by means of a taper setscrew. At the front end the selector rod hole is sealed by a welch plug. The front fork operates " top " and " second " gears, whilst the other fork provides " first " and " reverse." The " first " and " reverse " fork is handed for left or right hand steering as also is the selector rod, but the fork for " top " and " second " is interchangeable for either system.

The speedometer driving gear is cut on the mainshaft itself and the driven helical gear is carried in a bronze housing, which is setscrewed to the gearbox extension and provided with an oil seal below the screwed adaptor to prevent oil escape up the speedometer drive.

The constant pinion shaft is mounted on a ball bearing, in the front end of the gearbox. The bearing is located endwise :—

(a) From moving into the box, by a circlip fitting in an annular recess on the outside of the outer ring.

(b) From moving outwards by the front end cover. The inner ring is secured by means of a smaller circlip fitting into an annular recess in the mainshaft.

The outer extremity of the constant pinion shaft is splined to accommodate the hub of the clutch driven plate. An oil seal is fitted in the gearbox end cover and this surrounds a ground portion of the constant pinion shaft, in addition, an oil thrower is fitted between the ball bearing, already mentioned, and the constant pinion.

The mainshaft is spigotted into a floating bush in the constant pinion shaft and at the other end of the casing this shaft is mounted on a ball bearing. This ball bearing is located in exactly the same way as for the constant pinion shaft with the exception that the gearbox extension takes the place of the end cover. **The hardened washer abutting against the smaller circlip for the bearing, although of the same diameter as that for the front of the box, is thicker and should not, therefore, be interchanged.**

The gearbox extension, towards the rear, on its underside, is provided with a flanged bracket, which forms a point of attachment to the rubber mounting on the chassis cross member.

The rear end of the mainshaft is splined to receive the internally splined sleeve, which is universally jointed to the forward end of the propellor shaft. This splined attachment permits the necessary fore and aft movement of the propellor shaft, which necessarily accompany rear road spring deflections. The outside of this splined sleeve is mounted in an oilite bush which is pressed into the extension and an oil seal is fitted at the rear of this extension, to which bracket is also attached a sleeved dust cover.

TO REMOVE GEARBOX AS A SEPARATE UNIT

1. Disconnect battery lead.
2. Disconnect clutch coupling rods from housing by removal of the split pinned nut which secures the trunnion piece to the operating lever, and withdrawal of the split pin which secures the other rod to the fixed bracket on the housing ($\frac{9}{16}$" A/F spanner).
3. Disconnect the two gear operating cross shafts, from their attachment to the respective

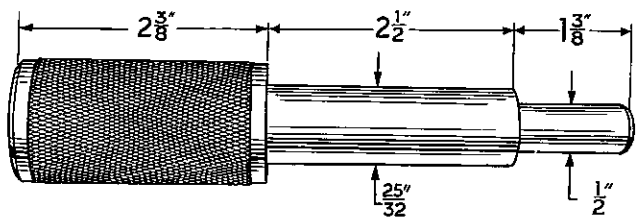


Fig. 3. Mandrel for centralizing clutch centre plate Tool No. M-72.

levers, by removal of the two bolts and Simmonds nuts, which secure each coupling to the selector shafts ($\frac{7}{16}$" A/F spanner).

4. Remove propellor shaft, after withdrawal of four bolts and Simmonds nuts ($\frac{9}{16}$" A/F spanner).
5. Remove steering centre tie rod after slackening off the locknuts ($\frac{7}{8}$" A/F spanner) and screwing rod out of end assemblies.
6. Detach exhaust downtake pipe from manifold flange, by removal of two brass securing nuts ($\frac{9}{16}$" A/F spanner).
7. Place lifting jack under engine sump and take weight of engine off rear mounting.
8. Remove nuts and bolts, which secure the clutch housing to the engine.
9. Detach petrol pipe clip from the detachable cross member, to which the gearbox is secured.
10. Remove the two Simmonds nuts which secure the rear engine mounting to the cross member ($\frac{5}{8}$" A/F spanner).
11. Having ensured that the jack is taking the weight off the rear cross member, remove the two bolts which secure this member to the chassis frame ($\frac{9}{16}$" A/F spanner).
12. Lower the engine on the jack just sufficiently to enable the clutch housing to clear the toe board pressing as it is drawn back to withdraw the constant pinion shaft from the clutch assembly.

Reassembly involves approximately the reverse procedure to the foregoing, but where it is found necessary to remove the clutch for any reason, the clutch centre plate should be centralized with a suitable mandrel after refitting the assembly to enable the splines on the constant pinion to register with the hub of this plate. A suitable mandrel can be turned from a 7-8 inch piece of 1" steel bar as shown in Fig. 3.

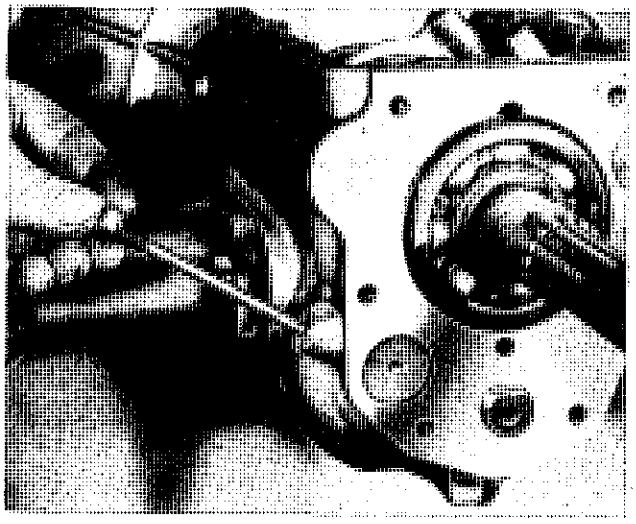


Fig. 4. Showing the removal of the countershaft and reverse pinion locating setscrew

TO DISMANTLE GEARBOX

Having removed the gearbox from the chassis as just described, proceed to dismantle as follows :—

1. Detach the gearbox top cover and dipstick after removal of the eight $\frac{5}{16}$" setscrews ($\frac{1}{2}$" A/F spanner).
2. Withdraw the clutch operating shaft after removal of locating bolts and operating fork.
3. Remove the taper setscrew which is screwed into the side of the gearbox casing and secures the selector rod.

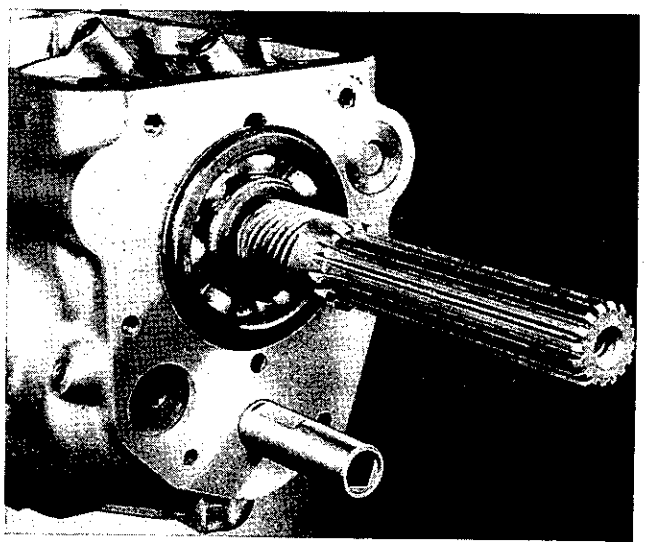


Fig. 5. Needle roller retainer tube—Churchill Tool No. 20SM-77

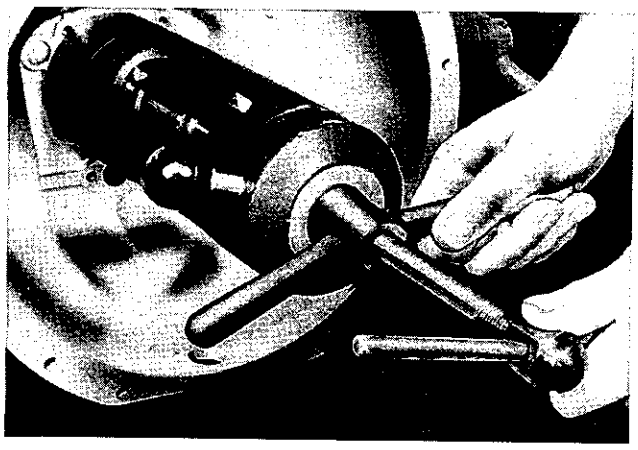


Fig. 6. Extracting constant pinion shaft with Churchill Tool No. 20SM-66

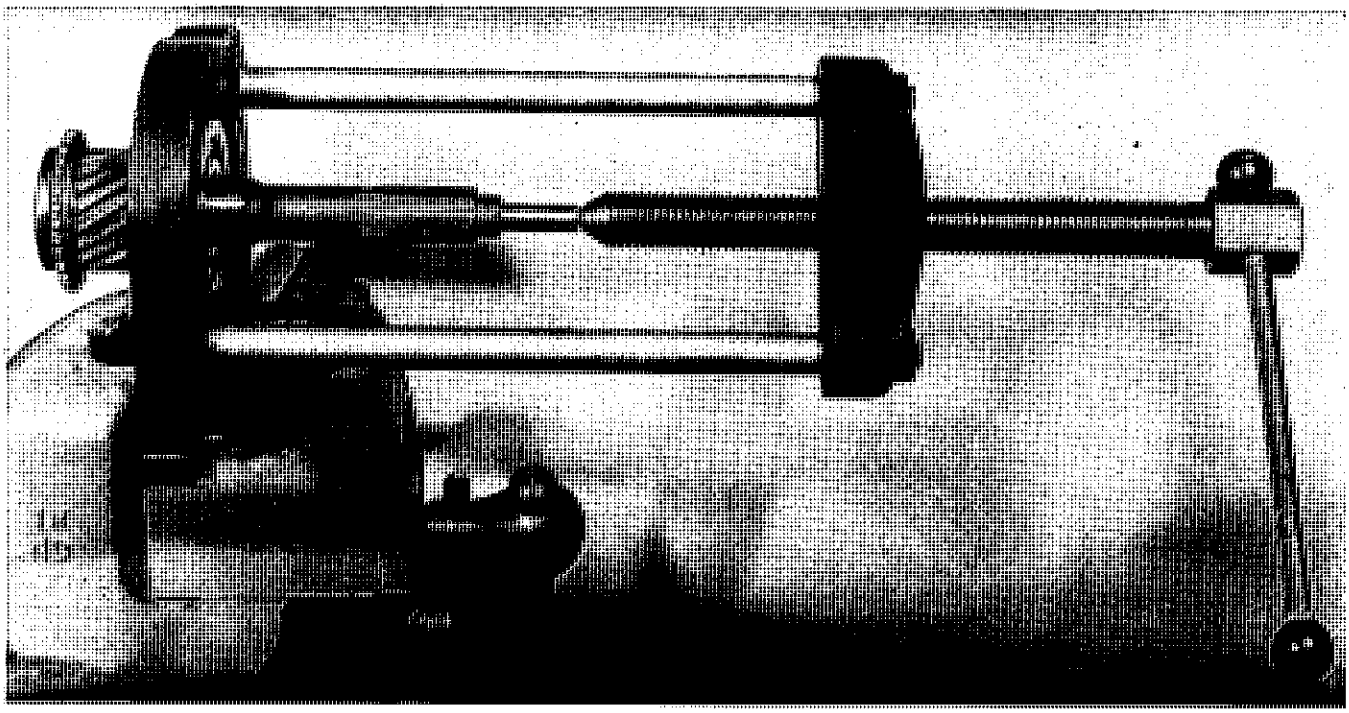


Fig. 7. Extracting constant pinion ball race—Tool No. 20SM-4615

4. Withdraw the selector locking plungers and springs after removing the securing screws, which are split pin located.
5. Withdraw the speedometer drive after removal of the special securing setscrew ($\frac{1}{2}$" A/F spanner).
6. Remove gearbox extension and packing after withdrawal of six securing bolts and spring washers ($\frac{1}{2}$" A/F spanner).
7. Tap out selector from the rear of the casing after removal of the stop screw.
8. Withdraw the countershaft locating setscrew ($\frac{1}{2}$" A/F spanner) as shown in Fig. 4.
9. After removal of the countershaft front cover plate which is secured by two wired setscrews and spring washers ($\frac{7}{16}$" A/F spanner) drive out the countershaft, with a suitable tube, as shown in Fig. 5 to retain the 48 needle rollers in position, maintaining contact throughout between the tube and countershaft.
10. Remove the gearbox front end cover after cutting the wire in the setscrew heads and withdrawing these setscrews, noting the spring and plain washers and lead wire used on each of the bolts ($\frac{1}{2}$" A/F spanner).
11. Extract the constant pinion shaft assembly as shown in Fig. 6. The further dismantling of this assembly necessitates the removal of the smaller circlip and thrust washers which fit against the inner ring of the ball race. After extraction of ball race in the fixture shown in Fig. 7 the oil thrower may be withdrawn, but owing to probable damage to this thrower during the extraction of the oil thrower, a new one may be required when reassembling the unit.
12. Tap the mainshaft towards the rear with a soft metal drift as shown in Fig. 8 sufficiently to clear the bearing of its housing and then tilt the shaft sufficiently to enable the Second and Top Synchro Unit to be withdrawn as shown in Fig. 9. Note position of the

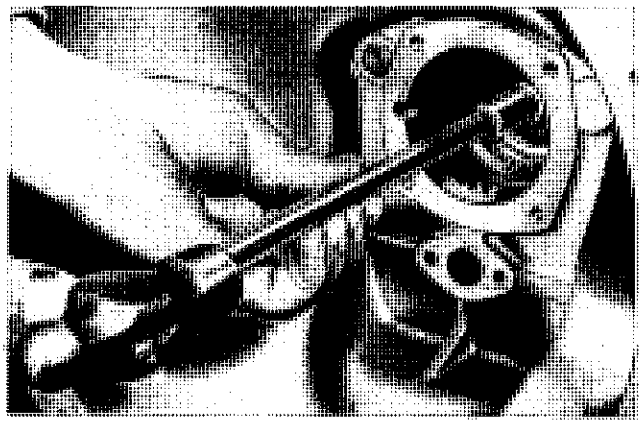


Fig. 8 Releasing mainshaft assembly and bearing from casing with Special Drift—Tool No. 20SM-1

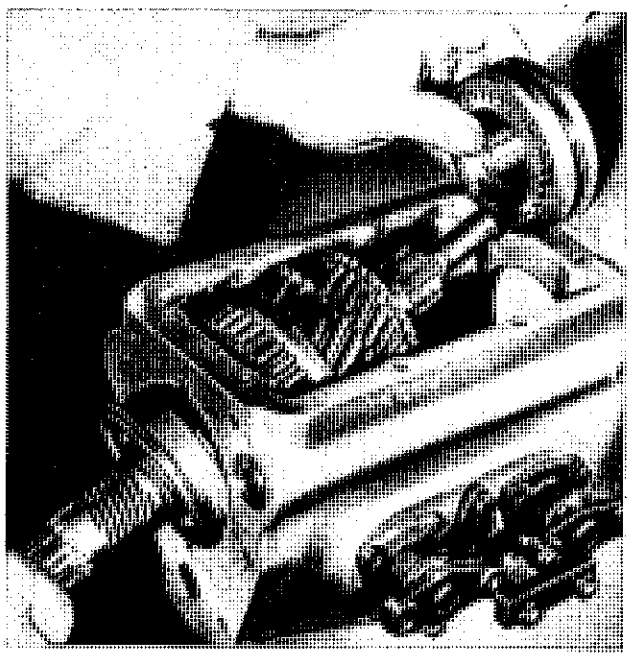


Fig. 9. Fitting or removing second and top gear assembly

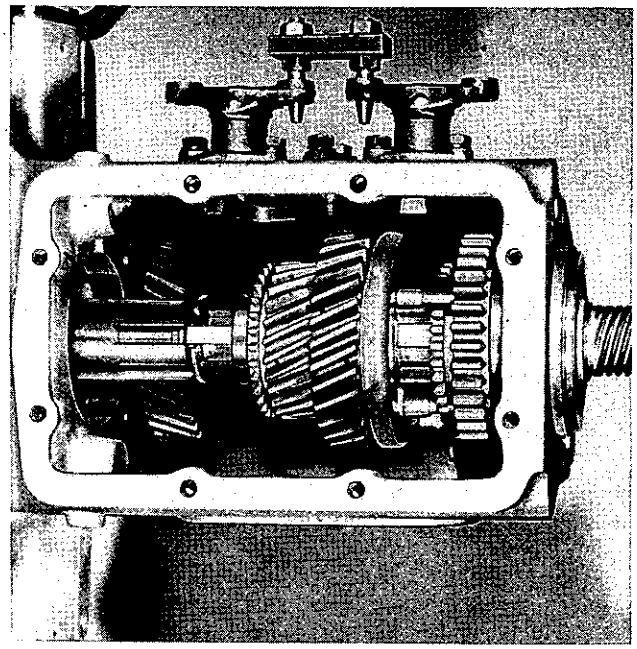


Fig. 10. Extracting mainshaft circlip with Churchill Tool No. 20SM-69

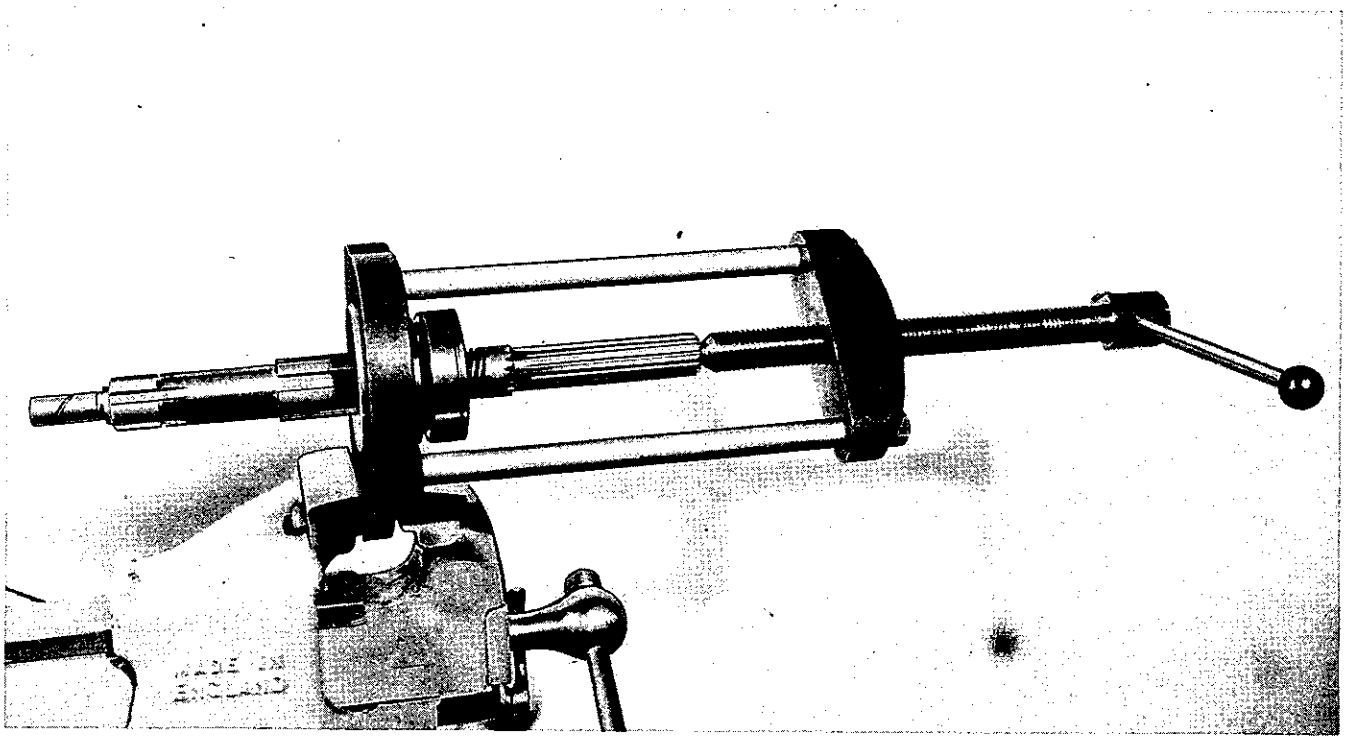


Fig. 11. Extracting mainshaft race.—Tool No. 20SM-4615

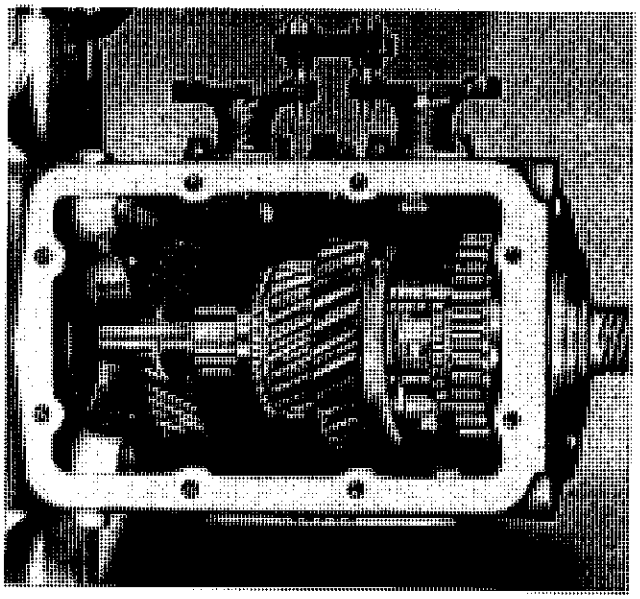


Fig. 12. Showing use of adaptor sleeve for installing circlip with special sleeve (Churchill Tool No. 20SM-46). Note selector locking bracket (Tool No. 20SM-67)

short boss on synchro hub towards the mainshaft circlip for reassembly.

13. Remove mainshaft circlip with the special extractor shown in Fig. 10. The extraction of this circlip is made somewhat difficult by the adjacent thrust washer, which has three lugs, equally spaced, and engaging alternate splines on the mainshaft. Quite apart from the necessity to engage the three available splines with the full length prongs, in some cases it may be necessary to tap the circlip round on these prongs, to free it from its recess, before it can be withdrawn. A new circlip should always be used when reassembling.
14. Remove thrust washer, second mainshaft, constant gear and bush, first mainshaft constant gear, thrust washer with three lugs to fit splines, the first speed synchro cup assembly, reverse gear and three baulk pins with retainer spring.
15. Extract mainshaft race, as shown in Fig. 11, after the withdrawal of the small seeger circlip and thrust washer which locates the ball race on the shaft.
16. The countershaft assembly can now be lifted out of the casing with the roller retaining tube still holding the 24 rollers at each end of the countershaft in their respective recesses.
17. The countershaft gears and distance sleeve can now be removed from the splined portion of the countershaft gear, noting their position for reassembly.
18. If it is desired to examine the needle rollers, they can be removed by withdrawing the retaining tube. Note the correct number of 48 for reassembly (24 at each end).
19. Remove reverse pinion by tapping out its spindle through the rear of the casing, its retaining setscrew having been removed in a previous operation, lay aside the two phosphor bronze thrust washers for reassembly.
20. If it is desired to remove the selectors and interlock device, withdraw the taper setscrew from each selector spindle and withdraw brackets and remove from inside the casing.
21. The interlock spigot can now be withdrawn as can the selector housings with their oil seals, by removal of the securing setscrews—two in the case of the interlock housing and three for each selector housing.

REASSEMBLY OF GEARBOX

The procedure for reassembly, which will be approximately the reverse of that employed for dismantling, is as follows :—

1. Thoroughly clean out the casing and examine for cracks, race housings for wear and any other damage.
2. Fit reverse pinion, with reduced end towards front of box, having first ensured that there is no question of tooth damage or wear on either of the two thrust washers or in the bush, leave over the fitting of the locating setscrew until the countershaft has been assembled in its normal fitted position.
3. Refit selectors and bracket on each spindle, taking care to position the synthetic rubber oil seals, at the same time ensuring the condition of these parts.
4. Reassemble spigotted interlocking device and subsequently fit bracket, as shown in Fig. 12 to fix selectors and thus prevent any possibility of the interlocking plunger falling into the gearbox casing.
5. Assemble countershaft noting the position for these gears, observed in operation 17 above for assembly. Note position of gear and boss offsets in Fig. 13.

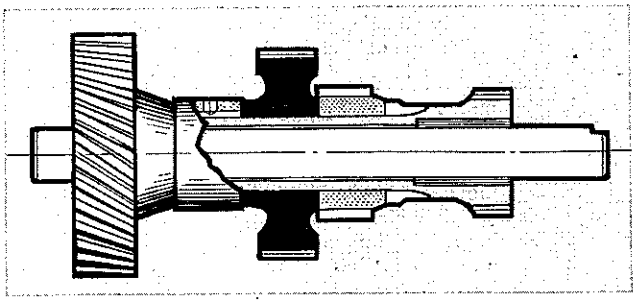


Fig. 13. Showing correct positioning for gears on countershaft viewed from right

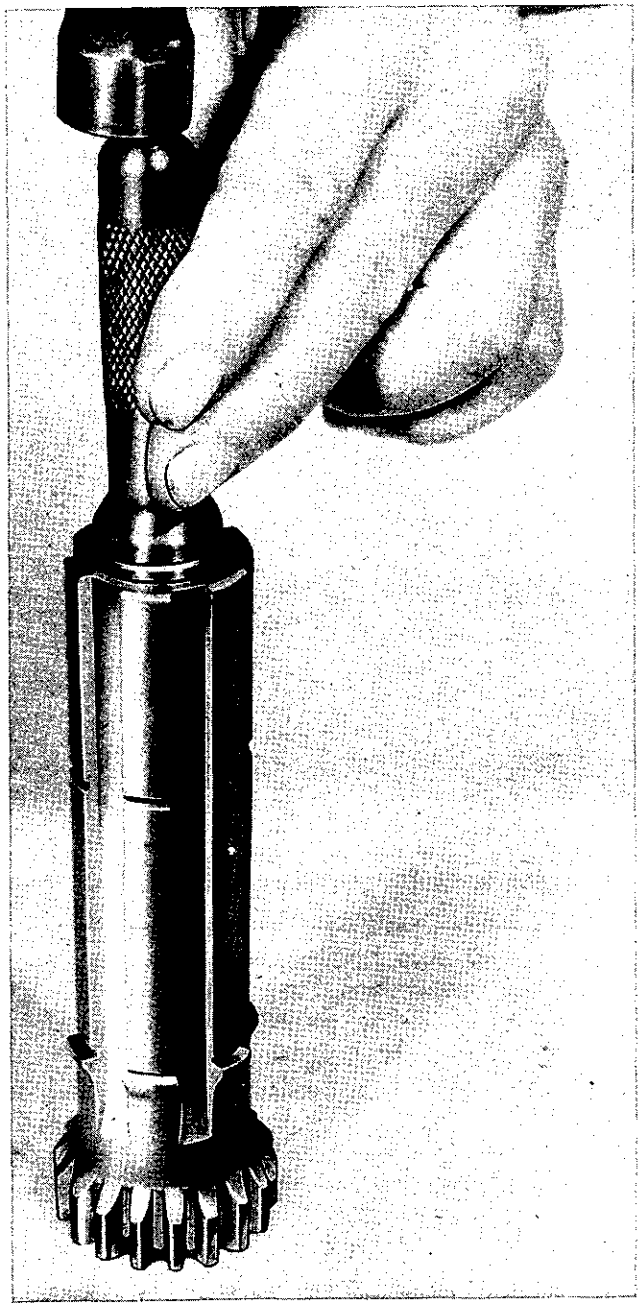


Fig. 14. Fitting needle roller retainer rings to sleeved countershaft gear—Tool No. 20SM-68.

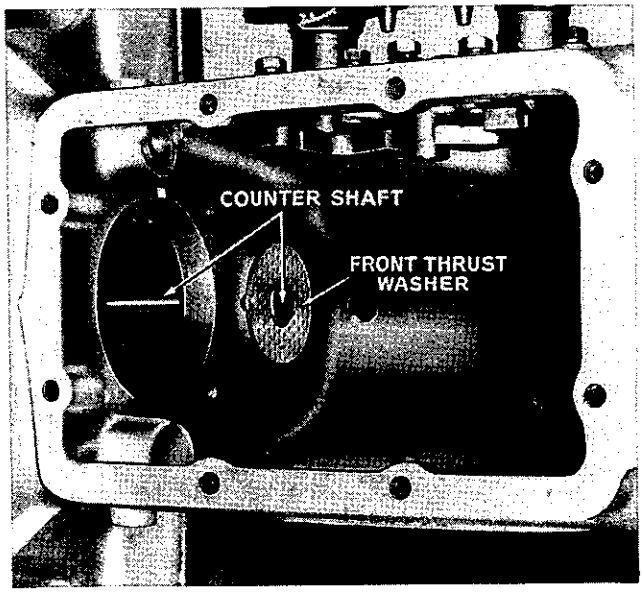


Fig. 15. Positioning front thrust washer with countershaft

6. Fit 24 needle rollers at each end of countershaft gear ensuring first that the locating rings are in position or alternatively they should have been fitted in position before the previous operation as shown in Fig. 14 with the drift shown. The chamfer on each retainer ring should be placed towards the bottom of the bore in the case of the inner ones and outwards for the outer ones. The rollers should be retained in grease and counted after installation to ensure that they have not become displaced, before fitting retainer tube mentioned in next operation.
7. Having fitted rollers, apply retainer, as shown in Fig. 5 and after locating the front thrust washers with the countershaft (Fig. 15) and the smaller one with grease—position the assembly in the casing. Before fitting new thrust washers gauge these as shown in Fig. 16. The correct end float for the countershaft gears should be between .006"—.010". If there is insufficient end float, the distance collar should be reduced as necessary by rubbing this down on a piece of emery cloth placed on a surface plate. Where too much end float exists new thrust washers and/or distance piece should be fitted.
8. (a) Install the baulk pin washer on its splines on the mainshaft.
   (b) Press ball race on to mainshaft with Churchill fixture as shown in Fig. 17.
   (c) Fit the three baulk pins and semi-

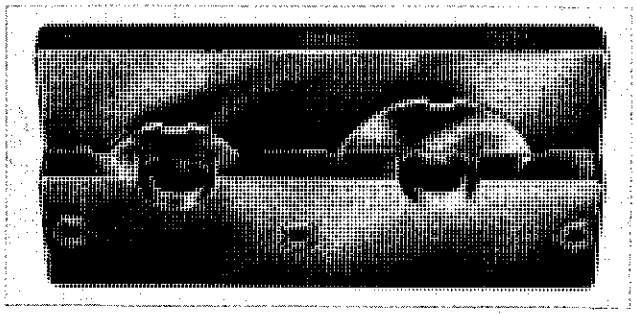


Fig. 16. Gauging countershaft thrust washers with Churchill Fixture No. 20SM-82

elliptical coil spring to the reverse gear as shown in Fig. 18. Install this assembly on the mainshaft, afterwards fitting the first speed cup, noting the splines engaged by its three lugs.

(d) Apply the first mainshaft gear thrust washer, ensuring that its three lugs engage alternate splines to those occupied by the synchrocup mentioned in previous operation, as shown in Fig. 19.

(e) Fit first mainshaft gear and bush following this with the second mainshaft gear and bush. Where new gears are being used, the appropriate end float on bushes should be checked as directed below. Fit hardened thrust washers.

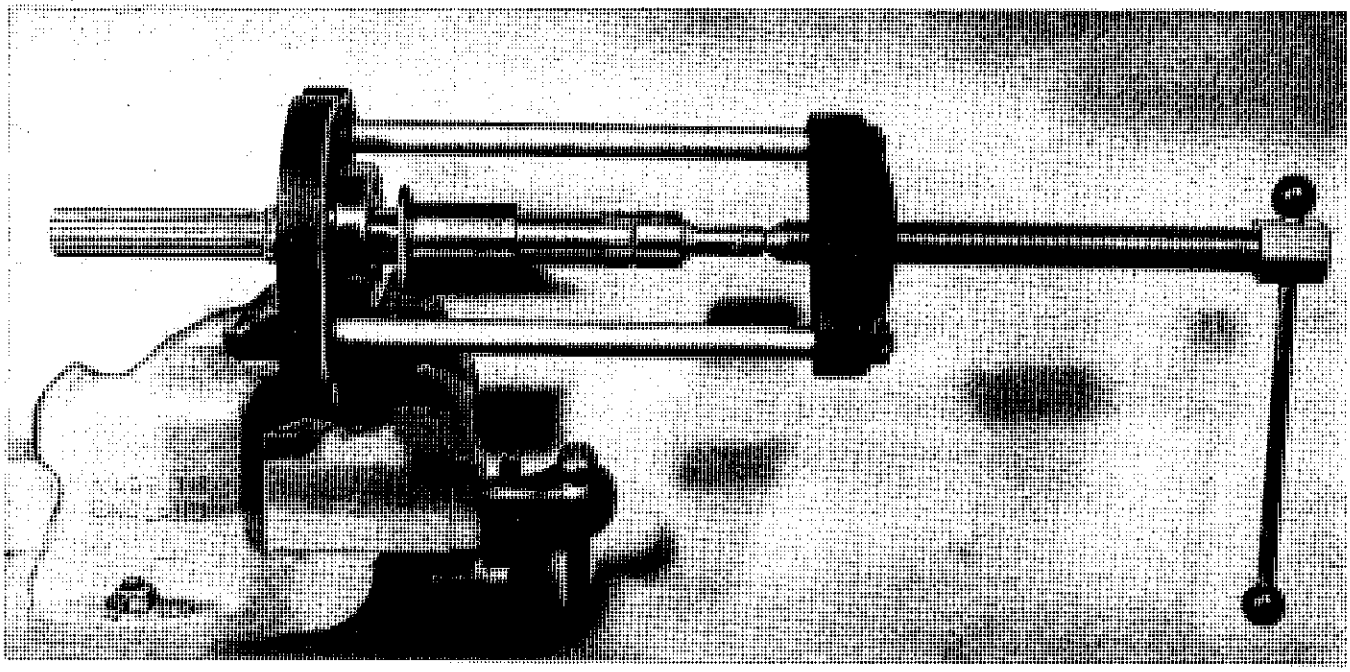


Fig. 17. Fitting ball race on mainshaft with Fixture No. 20SM-4615

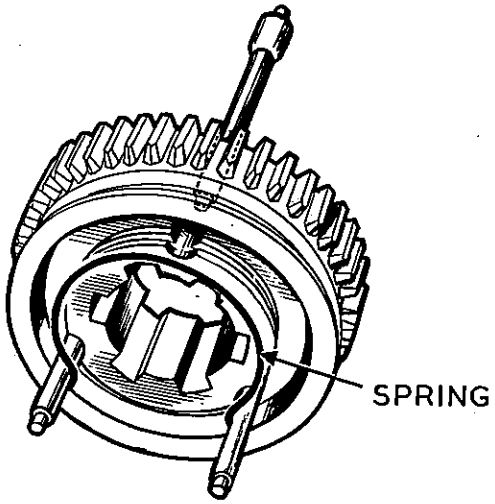


Fig. 18. Fitting baulk pins and semi-elliptical coil spring to "first" gear

(f) Fit new circlip employing tool shown in Fig. 12. It is important to ensure that the thrust washer which abutts against the second mainshaft gear, where new parts have been fitted, permits the circlip to go properly home in its recess and if it is necessary the thickness of the thrust washer should be suitably adjusted to just provide the necessary clearance to allow the circlip to be rotated freely in its recess and be tested with a half circlip as shown in Fig. 20.

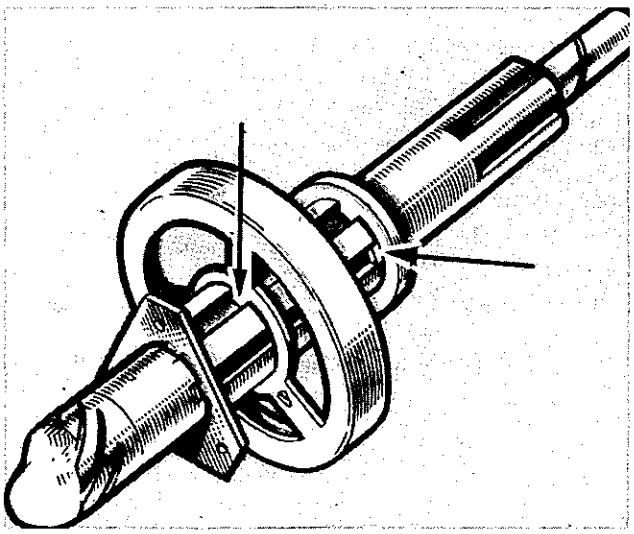


Fig. 19. Showing correct engagement with mainshaft splines for " first " speed synchro cup and thrust washer

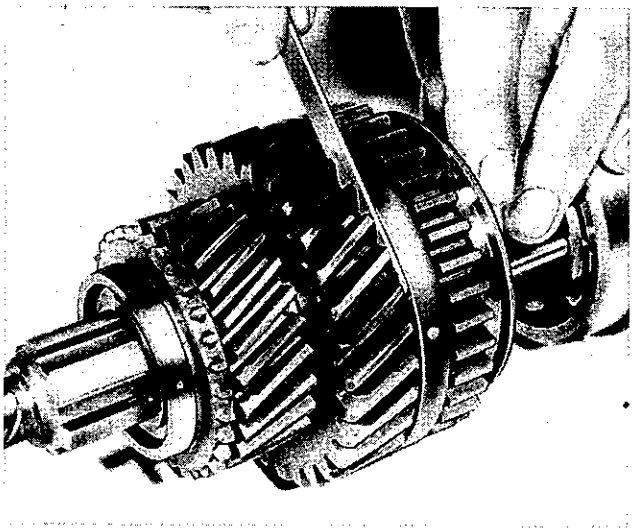


Fig. 21. Checking clearance between " first " speed sliding gear and its synchro cup

(g) When reassembling new gears and bushes on to the mainshaft, there should be a clearance, measured as shown in Fig. 21 between the " first gear " synchro cup and the " first gear " itself of .065"—.070", with the gear synchro cup and cone in contact.

(h) When reassembling new gears and bushes on to the mainshaft, the bushes should stand " proud " of the gears sufficiently to permit an end float of .004"—.006" in the first and second constant gears and can be measured as shown in Fig. 22 and 23 respectively. Overall float on these gears can be measured as shown in Fig. 20 and should be from .007" to .012".

9. The mainshaft may now be installed in the gearbox casing. Assemble mainshaft gears in sequence indicated under operation 8. Fit mainshaft circlip as shown in Fig. 12.

10. Where the " second " and " top " synchro

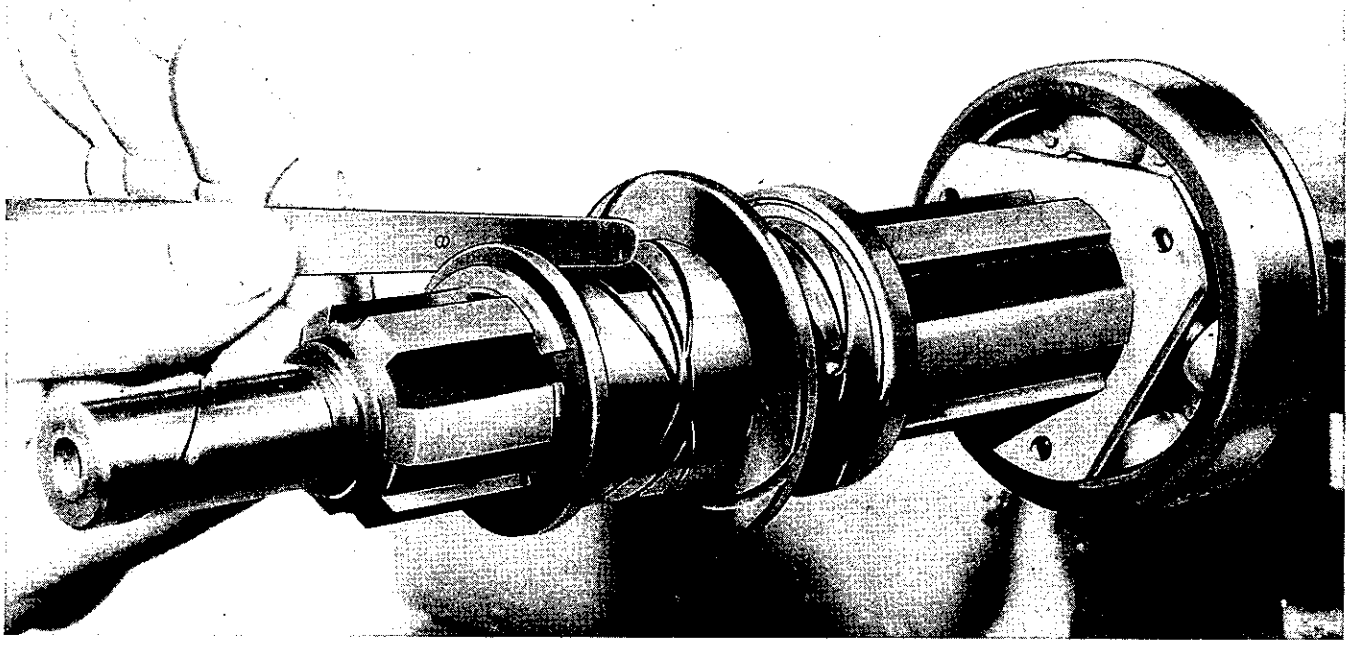


Fig. 20. Checking end float in mainshaft bearing bushes with half circlip and feeler gauge

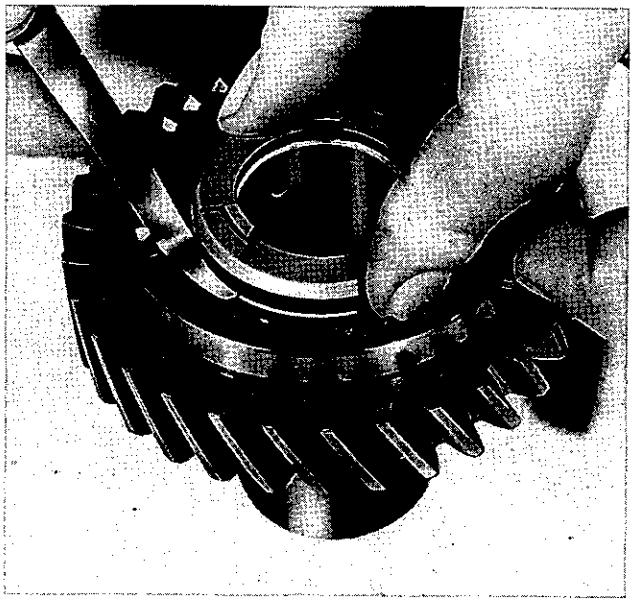


Fig. 22. Checking end float of "first" constant wheel on bush

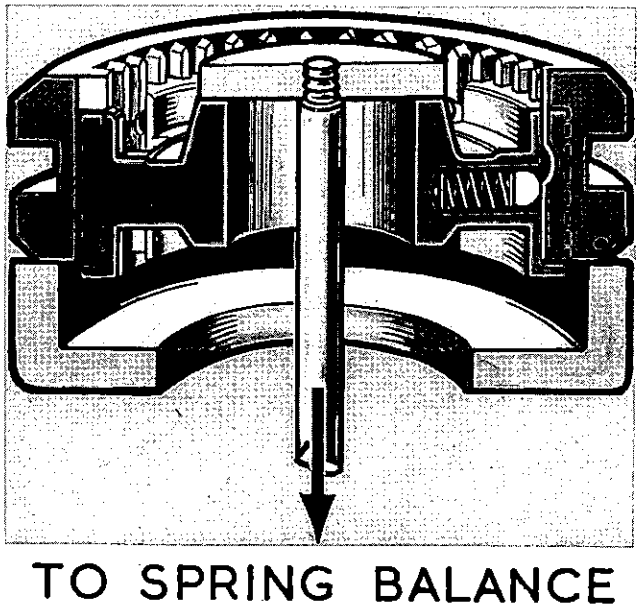


Fig. 24. Fixture for checking axial loading of synchro sleeve

sleeve has been dismantled it will be necessary to fit up the three synchro balls and springs and, whilst it is possible to estimate approximately by manual means the axial load required for release which is specified as 19-21 lbs., a more precise means of measuring this figure involves the use of some such fixture as is shown in Fig. 24. The application of, or withdrawal of, shims must be carried out to increase or decrease loading respectively. The method employed for checking this loading in the factory is illustrated in Fig. 25.

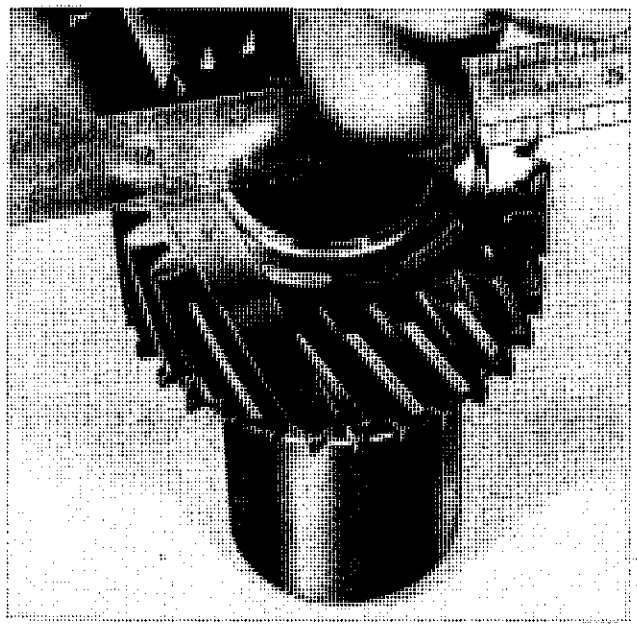


Fig. 23. Checking end float of "second" constant wheel on bush

11. In order to assemble the Second and Top Synchro Unit on the mainshaft proceed as shown in Fig. 9. The position of the outer or operating sleeve in relation to the synchro hub cannot be at fault, but it is necessary to fit the short boss of the synchro hub towards the circlip or front of the gearbox.
12. Assemble oil thrower on to constant pinion shaft and press ball race on to the shaft as shown in Fig. 26 ensuring that this goes right home and that in this position with the correct thrust washer fitted, the small seeger circlip fits properly into its recess. When passing this circlip along the ground portion of the constant pinion shaft, take care not to score the shaft as such damage may cause subsequent leakage of oil. Fit larger circlip into its recess in the ball race extension.
13. Fit Oilite spigot bush into constant pinion, placing the internally bevelled portion of this towards the mainshaft as shown in Fig. 27.
14. Drive the constant pinion shaft and bearing into the gearbox casing.
15. Fit selector forks on respective gears and thread the selector rod into position and then securing in position by locating taper set-

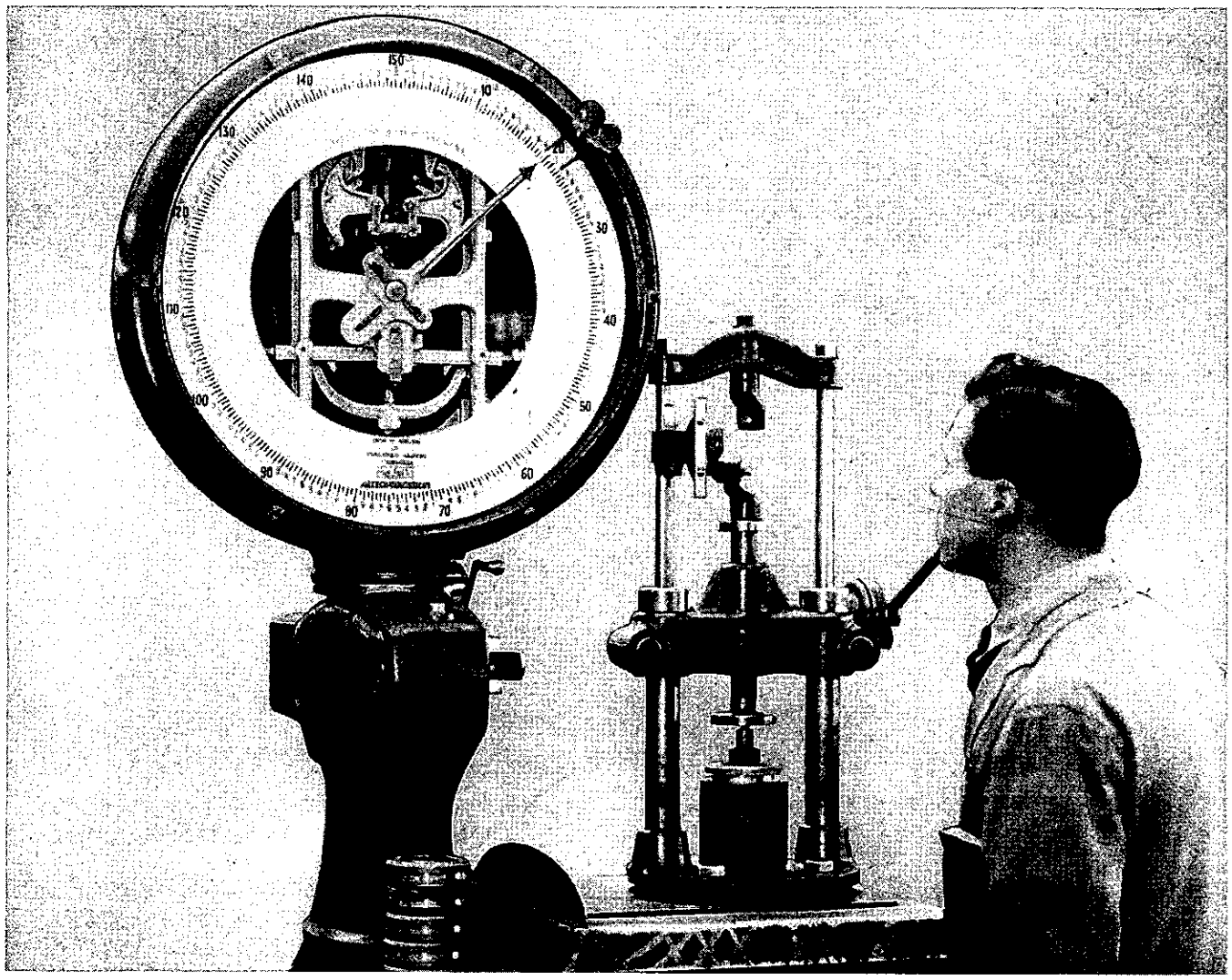


Fig. 25. Testing axial load for synchro release with a spring testing machine

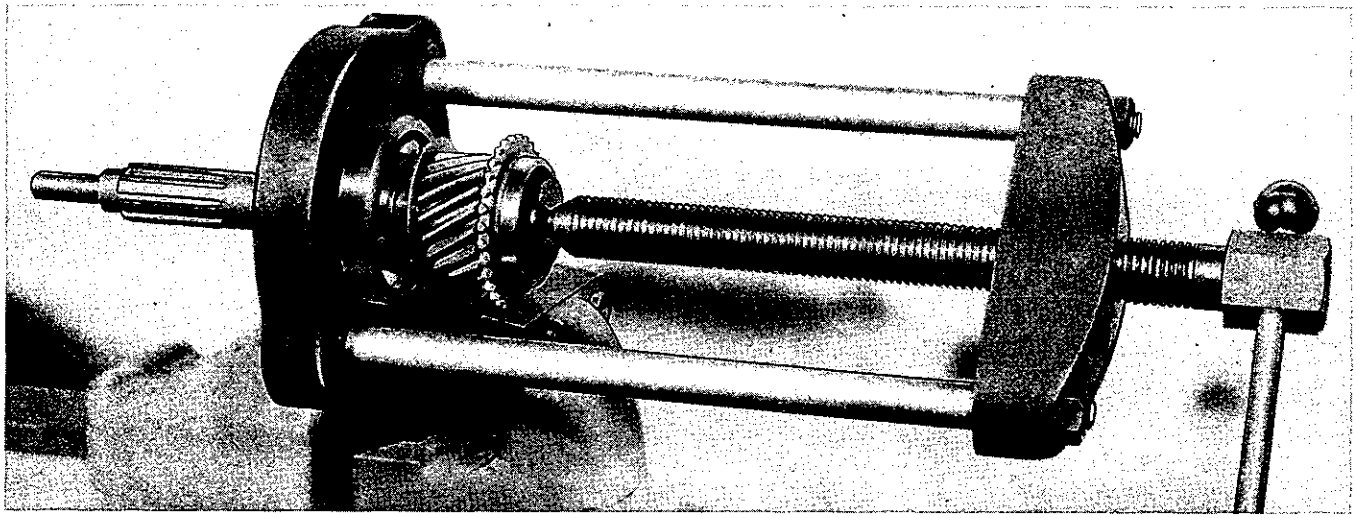


Fig. 26. Fitting constant pinion race with Churchill Fixture 20SM-4615

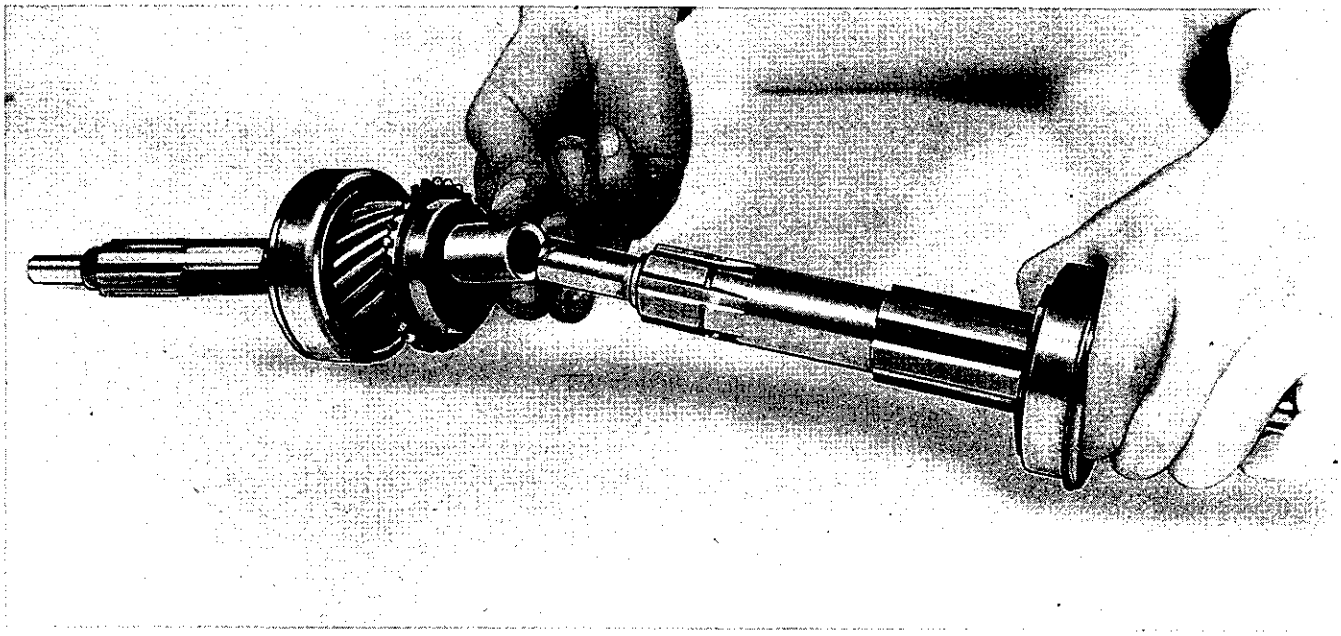


Fig. 27. Position for assembling " oilite " bush into constant pinion and on mainshaft spigot

screw and locknut. The selector rod is " handed " for left or right hand drive by the drilling of the rod for the locating setscrew. The " top " and " second " selector fork is interchangeable to " left " or " right " hand drive, but the " first " and " reverse " fork is " handed " by its offset construction and is not interchangeable for use with either system.

16. Fit selector locking plungers, springs and adjuster screws. Adjust the screws so that the upper faces of these are approximately flush with the upper face of their respective selector fork. The correct axial load for release should be 22-26 lbs. measured with a spring balance on the selector fork.
17. Fit selector rod stop screw, wiring this carefully so that the free travel of the fork is unrestricted.
18. Having fitted front cover oil seal, as shown in Fig. 28, apply cover and packing, utilizing a fitting tool to protect the oil seal as shown in Fig. 29. Fit four setscrews and plain washers with lead wire, after positioning the

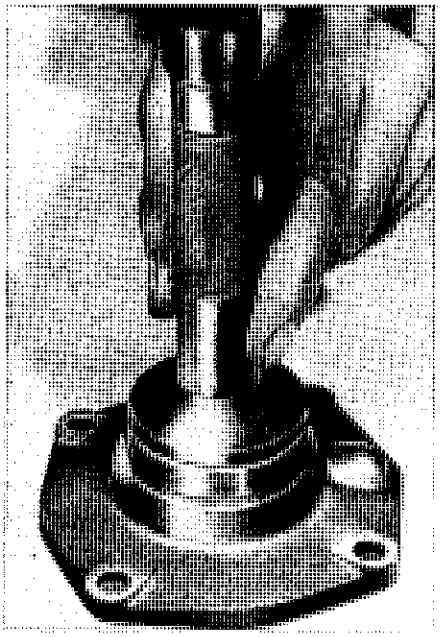


Fig. 28. Fitting front cover oil seal with Churchill Tool No. 20SM-73

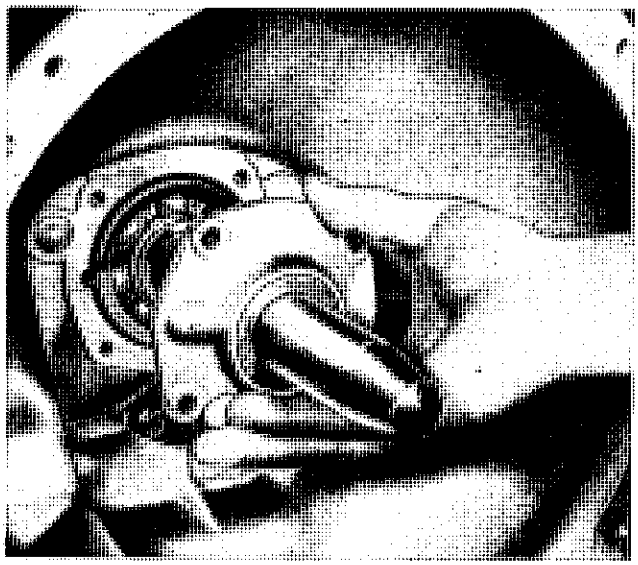


Fig. 29. Fitting front cover and oil seal with special adaptor, Churchill Tool No. 20SM-47

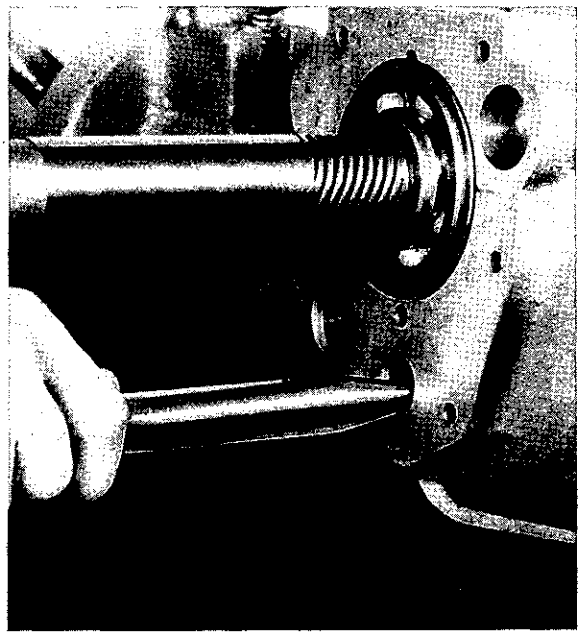


Fig. 30. Showing pilot tool for aligning countershaft gears and rear thrust washer—Tool No. 20SM-76

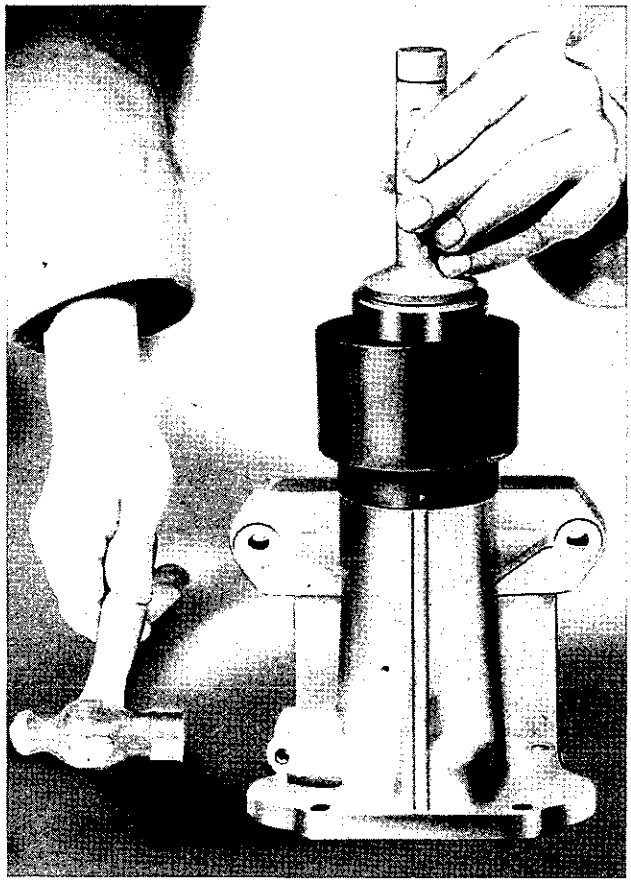


Fig. 31. Fitting extension oil seal withTool No.

slot in the face of the front cover at 9 o'clock and wire setscrew heads.

19. Fit core plug at front end of selector rod if this has been removed for any reason.
20. Utilize a pilot to align thrust washer and countershaft gear, as shown in Fig. 30, driving out needle roller retaining tube and countershaft, which was fitted to position forward thrust washer, with pilot, subsequently ejecting the pilot tool with the actual countershaft. It is important, when carrying out this operation, that the pilot spindle should maintain contact with the retaining tube or countershaft, as appropriate, throughout the operation, alternatively there is danger that the needle rollers may leave their recess.
21. Fit taper locating setscrew through countershaft and that relating to the reverse spindle, first checking the alignment of the hole in the reverse gear spindle and that in the countershaft as shown in Fig. 4. Tighten up locating setscrew.
22. Fit oil seal into rear of gearbox extension with the special tool shown in Fig. 31.
23. Fit speedometer driving gear and housing, locking this in position with its locating setscrew.
24. Fit top cover, securing with eight setscrews and spring washers. Install dipstick.
25. Fit clutch operating shaft and withdrawal fork together with return spring and abutment bracket.

DEFECTS AND CAUSES

Poor synchronization of gears.

Owing to the special baulking arrangements provided to assist in gear synchronization in this gearbox there should be little difficulty of this description.

In such cases, where difficulty in synchronization is encountered, the trouble in the case of the " second " and " top " gear will probably be explained by incorrect synchro sleeve spring loading, or, alternatively, may very rarely arise as a result of the condition of the contacting coned faces.

Where the synchronization of the " first " gear is unsatisfactory, the trouble may be caused either by the condition of the surfaces on the cone and/or cup or, if experienced at slow speeds alone, be explained by a misplaced, weak or broken semi-elliptical baulk pin spring.

To deal with poor synchronization with the "first" gear, it will become necessary to dismantle the mainshaft as previously described. Having dismantled the mainshaft gears, the condition of the coned faces should be ascertained as should that of the baulk pin semi-elliptical spring.

If doubt exists as to the condition of the coned faces, they should be lapped in together, employing burnishing paste and holding the cup on the special spiggotted fixture shown in Fig. 00. All traces of paste should subsequently be removed with a petrol-moistened rag. Carburundum paste should NEVER BE EMPLOYED for this lapping-in process. If the baulk pin spring has become damaged it should be replaced. Where difficulty arises with synchronization of the "second" and "top" gears, the usual explanation, as previously stated, will be the incorrect spring loading of the operating sleeve and for this reason should first receive attention. The correct axial loading for this operating sleeve should be between 19 and 21 lbs. and can be checked on a spring testing machine, employing a suitable ring fixture to support the unit such as shown in Fig. 26, or, alternatively, more simply as indicated in Fig. 25

It will be very rarely found necessary to lap in the cones and cups with the "top" and "second" synchro unit, but where it does become necessary, burnishing paste should be employed and NEVER carburundum, all traces of the paste being removed upon completion of the grinding in process with a petrol-moistened rag.

Oil leakage from gearbox.

Where loss of oil from the gearbox is experienced, the following possible sources of trouble should be investigated :—

1. Faulty joints between the gearbox casing and the cover plate, the extension or the front cover. To deal with all but the cover plate, it will be necessary to remove the gearbox unless such trouble is merely due to loose setscrews which are externally accessible.
2. Defective front and/or rear oil seal. To replace the front seal it will be necessary to remove the gearbox.

The replacement of rear oil seal will necessitate the removal of the detachable cross member which supports the rear of the gearbox, the removal of the propellor shaft and speedometer drive and then the detachment of the extension and the exchange of the oil seal, fitting the replacement with special tool shown in Fig. 32.

When replacing the front seal it will naturally

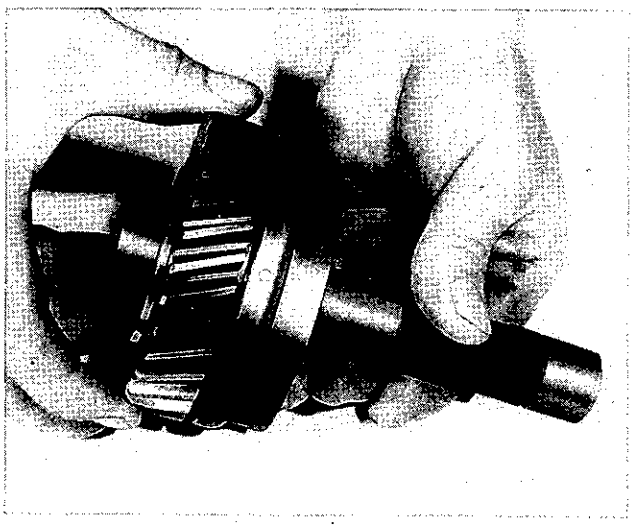


Fig. 32. Lapping in "first" gear and synchro cup with Churchill Tool No. 20SM-83

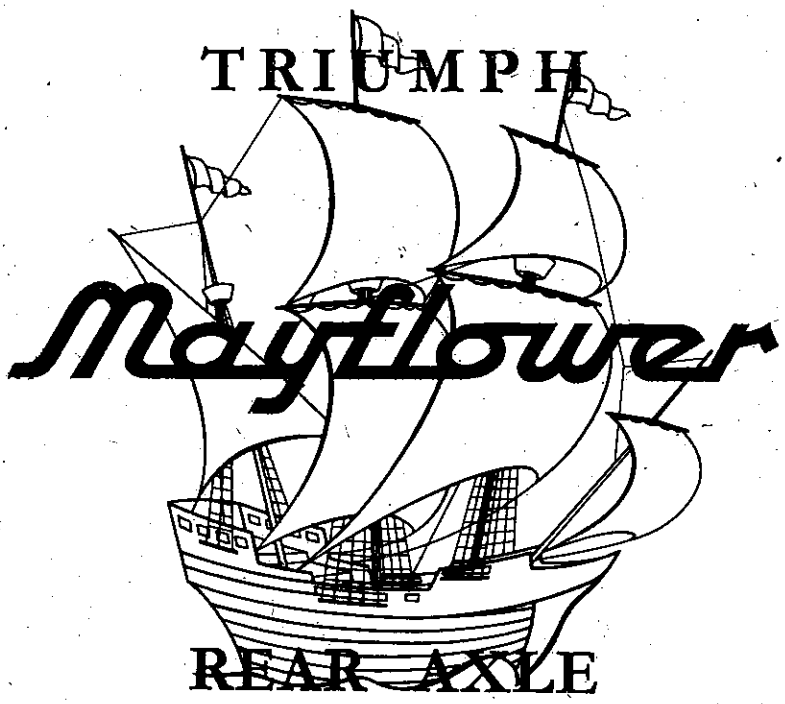
be necessary to remove the gearbox and withdraw the front cover and to fit a new oil seal with the tool shown in Fig. 29 and to use protective sleeve, shown in Fig. 30, when replacing cover.

Care should always be taken when fitting an oil seal to place the lipped portion inwards towards the inside of the gearbox and to avoid damaging the fabric face when threading it over a shaft or spindle into position.

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

REAR AXLE

SECTION F

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

REAR AXLE

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REAR AXLE

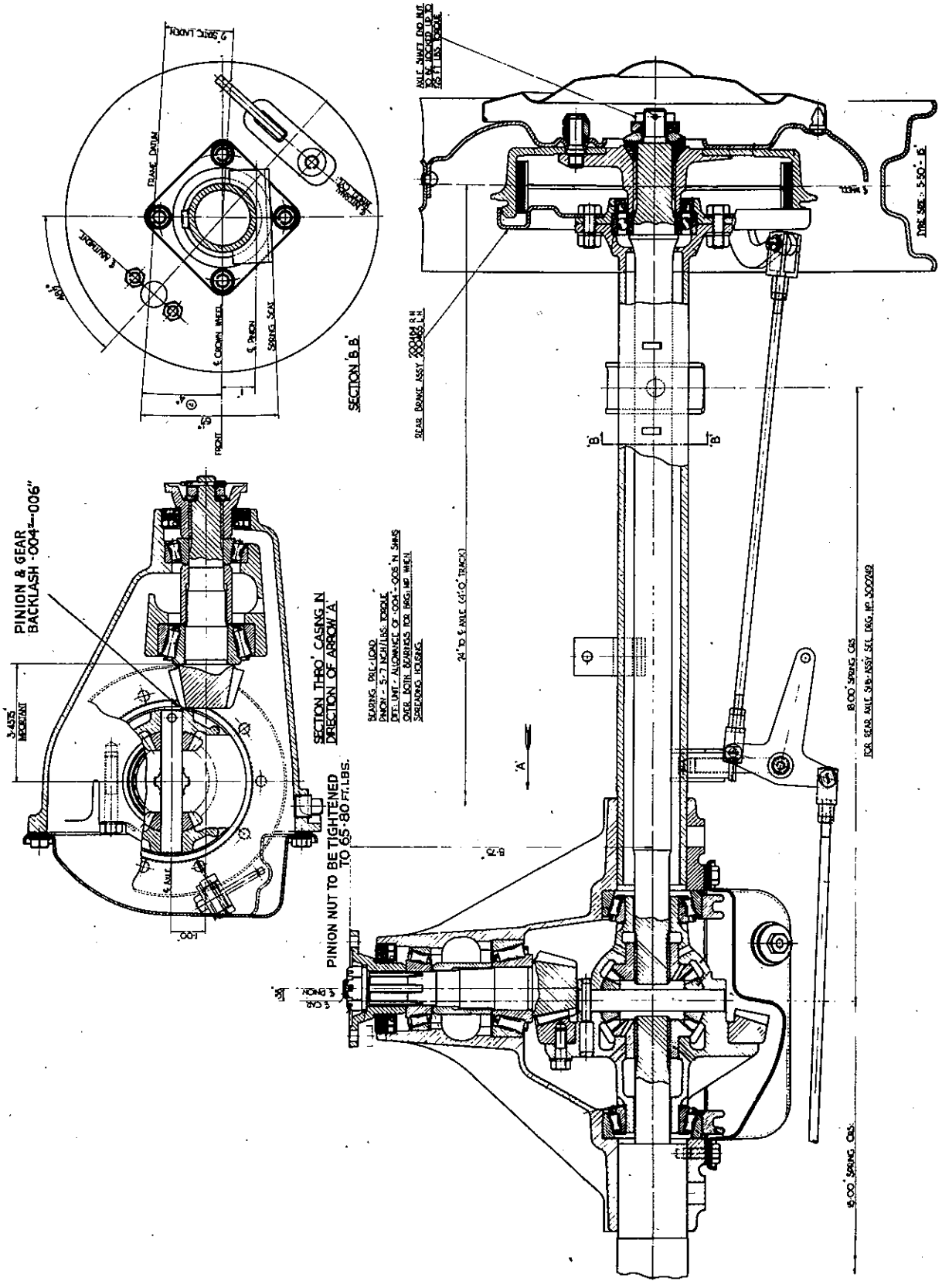


Fig. 1. General Arrangement

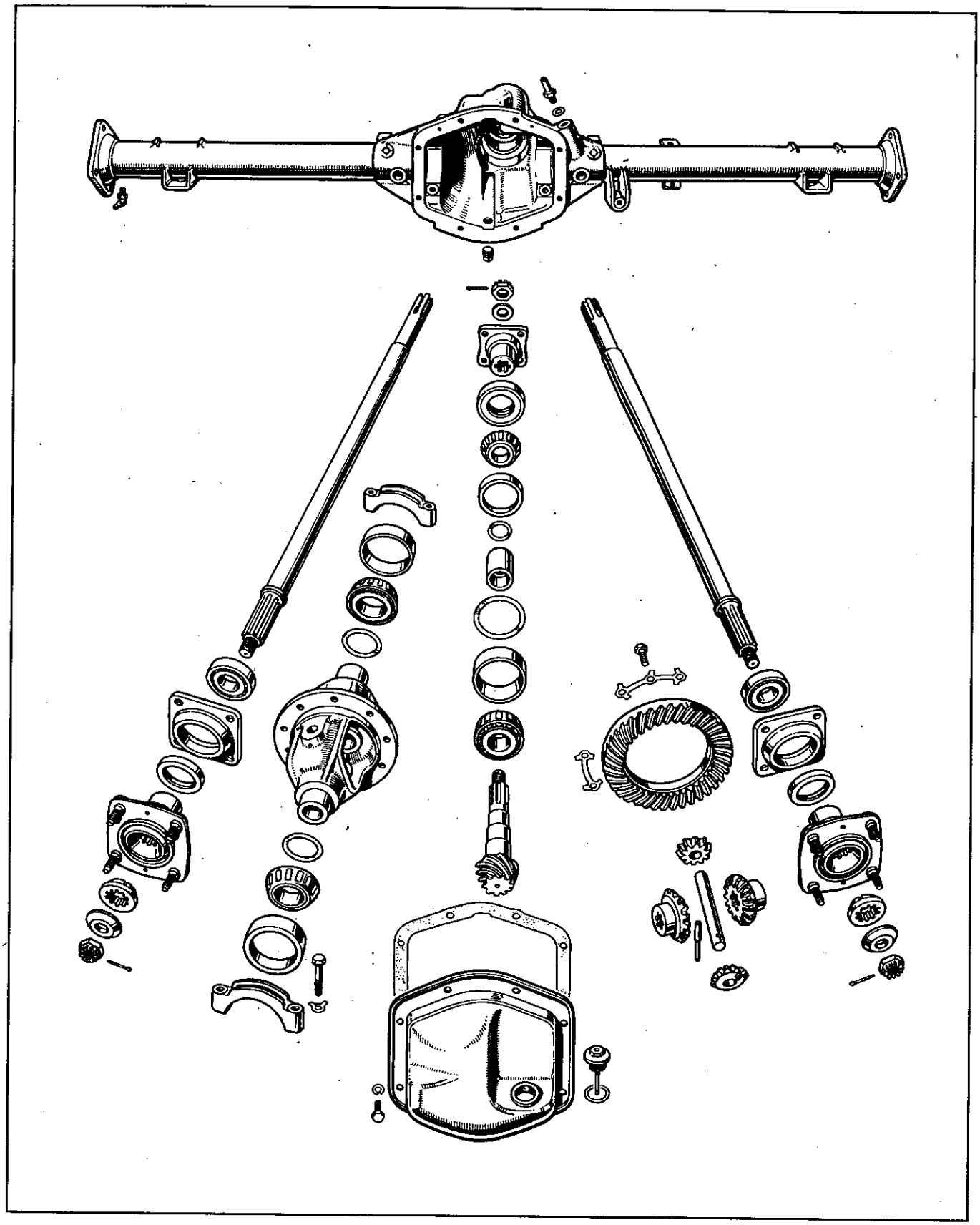


Fig. 2. Exploded view of rear axle details.

DATA

Axle shaft end float	None
Crown wheel run out ...	Not more than .003"
Backlash between crown wheel and pinion	.004" — .006"
Distance from ground thrust face on pinion to centre of crown wheel	3.4375 ± .000"
Differential bearing	5-7 inch/lbs.
Pre-load	(Allowance of .004" — .005") shims spread over both bearings.
Axle shaft end nut tightening torque	125 feet/lbs.
Pinion nut tightening torque	65-80 feet/lbs.
Diameter of differential bearing	2.8446"/2.8440"
Dimension from centre of crown wheel bearings to machined face of casing ...	1.489"/1.491"

General Description. (See Figs. 1 & 2).

The rear axle is of the hypoid semi-floating type with shim adjustment for the differential bearings and for the endwise location of the pinion in relation to the crown wheel.

The axle sleeves are pressed into the centre casing and each sleeve is located by four pegs.

The centre casing is a casting which accommodates the differential cage and the attached crown wheel, together with the hypoid pinion. A detachable pressed steel cover, at the rear of the centre casing, allows access to the differential unit and crown wheel, the removal of this cover clears the way for the dismantling of the axle.

The hypoid pinion is mounted on two taper roller bearings which are separated from one another by a tubular spacer. The pinion's endwise relation with the crown wheel is adjusted by means of shims inserted between the "head" bearing outer ring and the casing. Preloading of bearings is adjusted by means of shims between the spacer and tail bearing.

The differential casing contains the two sun and planet wheels and also carries the crown wheel, which is bolted in position by ten bolts passing through the casing and into tapped holes in the back of the wheel itself. The ten securing bolts are located in their tightened positions by means of locking plates.

The two planet wheels are mounted on a cross spindle, this spindle being provided with a hole at one end and located by a pin passin through the hole and the differential casing.

The axle shafts are splined at both ends The inner end fitting into the sun wheels and th outer extremities accommodating the whee bearing and hub. The hub is secured to the axl shaft by means of a split taper collar, a shape washer and a castellated nut.

The wheel bearing is accommodated in th axle sleeve and a housing which is bolted to th flanged end of each axle tube. The inner portio of the wheel bearing is gripped between the hul and a flange on the axle shaft.

The differential casing is mounted on tw taper roller bearings, the position of these bein adjustable by means of shims interposed betwee them and the casing itself. The disposition o these shims decides the crown wheel and pinio depth of engagement and the thickness of thes the amount of preloading.

To remove and dismantle axle shafts, whee bearings etc.

1. Jack up rear of car and remove rear wheels
2. Remove brake drums after the withdrawal o the two countersunk grub screws by whic each of these drums is secured to its res pective hub.
3. Disconnect brake hydraulic connection a each brake backing plate and uncouple hand brake lever cables from operating levers
4. Remove the four bolts and nuts, whic secure each backing plate and bearing housing to the flanged portion of each axle sleeve

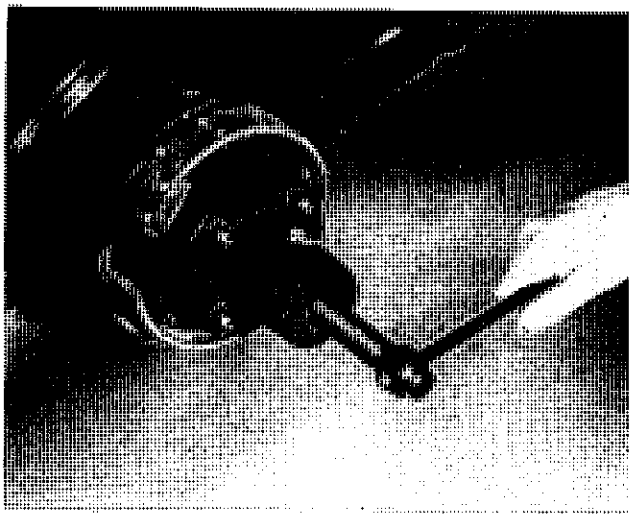


Fig. 3. Extracting Rear Hub with Tool No. M.86.

5. Withdraw each axle shaft assembly, together with the brake shoes and backing plate assembly.
6. The hub can now be extracted from each axle shaft after removal of the castellated nut, washer and taper collar. Alternatively the hub can be extracted with the puller shown in Fig. 3, before removing the axle shaft.
7. The extraction of each hub will release the respective bearing housing and oil seal.
8. The oil seals can now be driven out of their respective housings and be replaced as shown in Fig. 4, if the necessity for the renewal arises.
9. The wheel bearing is next extracted as shown in Fig. 5.

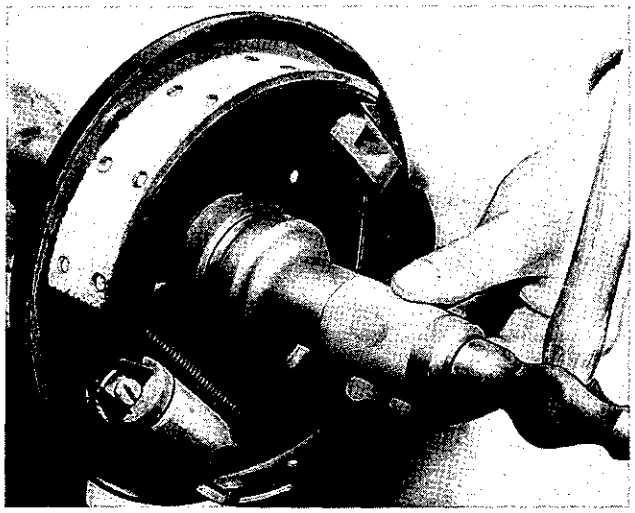


Fig. 4. Fitting new Oil Seal in Axle Casing, Tool No. M.29.

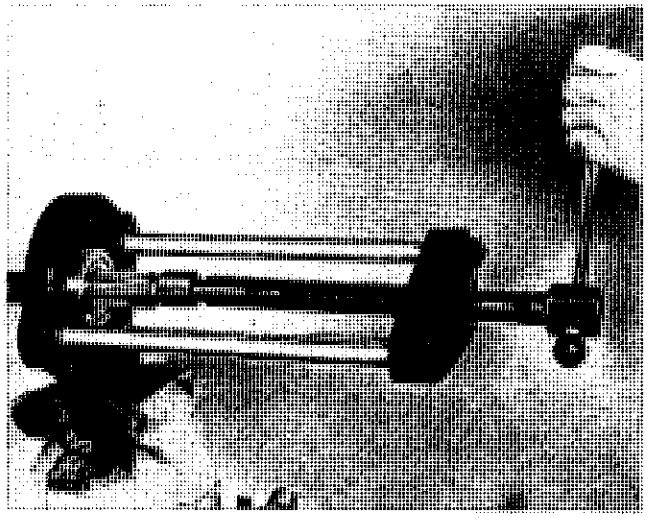


Fig. 5. Extracting Wheel Bearing with special Fixture, Tool No. M.20 S.M.4615.

10. Reassembly of these parts is approximately the reverse of the procedure given above with the necessity to drive or press the bearings on to the shafts. In the absence of a press, the special sleeved tool may be used with a hammer to drive on the bearings as shown in Fig. 6.
11. " Bleed " brakes.

To remove rear axle from chassis.

1. Jack up chassis frame and remove rear road wheels. Fit supports under each rear jack bracket.
2. Take weight of axle on lifting jack and remove $\frac{3}{4}$" A/F Simmonds nut from bottom eye of each shock absorber, subsequently remove two half rubber bushings from the respective eyes and force these clear of their mountings. (It is important that the weight is taken off the shock absorbers when carrying out this operation).
3. Detach propellor shaft from pinion flange by removal of four $\frac{9}{16}$" A/F headed bolts and push propellor shaft forward out of the way.
4. Disconnect handbrake lever from its attachment to compensator and free cable from abutment by removing pinch bolt. ($\frac{7}{16}$" A/F spanner).
5. Disconnect hydraulic brake line from its attachment to rear axle. This is probably best done by detaching the two pipes from the " T " shaped adaptor union on the axle and freeing this adaptor from the axle bracket by removal of the $\frac{7}{16}$" A/F headed

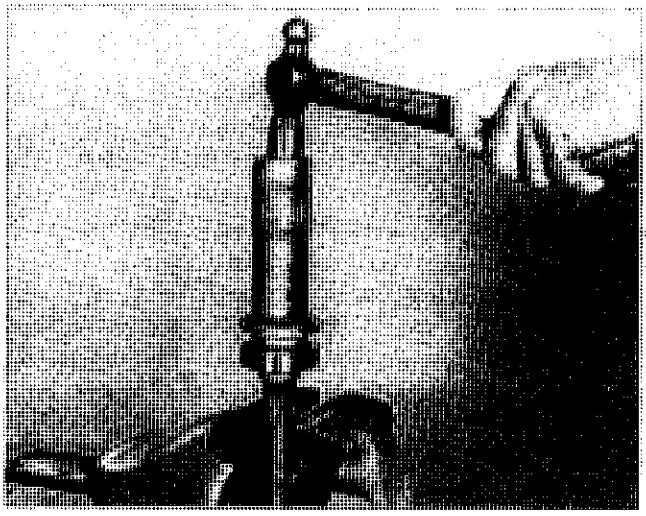


Fig. 6. Fitting Wheel Bearing with Tool No. M.92.

securing bolt. This will leave the adaptor attached to the flexible lead.

6. The four $\frac{5}{8}$" A/F simmonds nuts securing the " U " bolts to the shock absorber spring plates are next removed and the axle lifted out of the chassis. Replacing rear axle is the opposite of above.

To dismantle rear axle.

1. Remove brake drums, after release of the two grub screws which secure each of these.
2. Remove hydraulic brake pipes and connection and remove from rear axle. Remove handbrake operating rods and compensator gear.
3. Remove four $\frac{9}{16}$" A/F headed bolts which secure the bearing housings and brake backing plate assemblies to the axle casing. (If preferred, rear hubs may be extracted with the puller shown in Fig. 3, before removal of the bearing housings).
4. The axle shaft, hubs, bearing housings, oil seals and backing plates can now be removed from the rear axle.
5. Remove rear hubs from axle shafts. Thi may or may not be possible without a extractor or press. Under certain associa tions of hub and axle shaft machining limit an interference fit is possible.. The furthe resistance offered by the special hub locking collar will necessitate additional force.

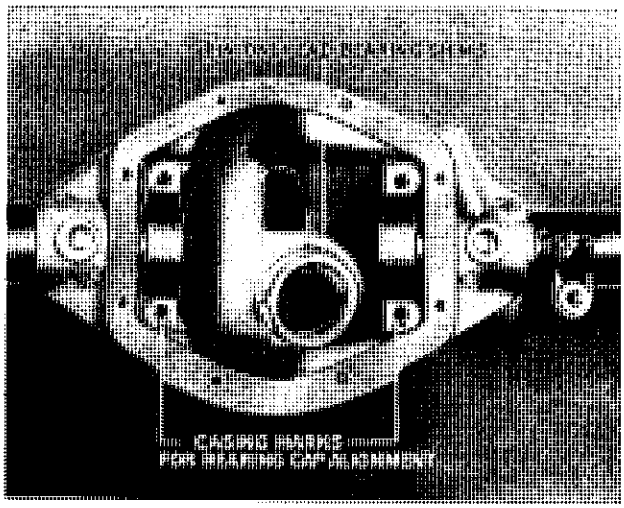


Fig. 7. Showing Axle Casing Markings.

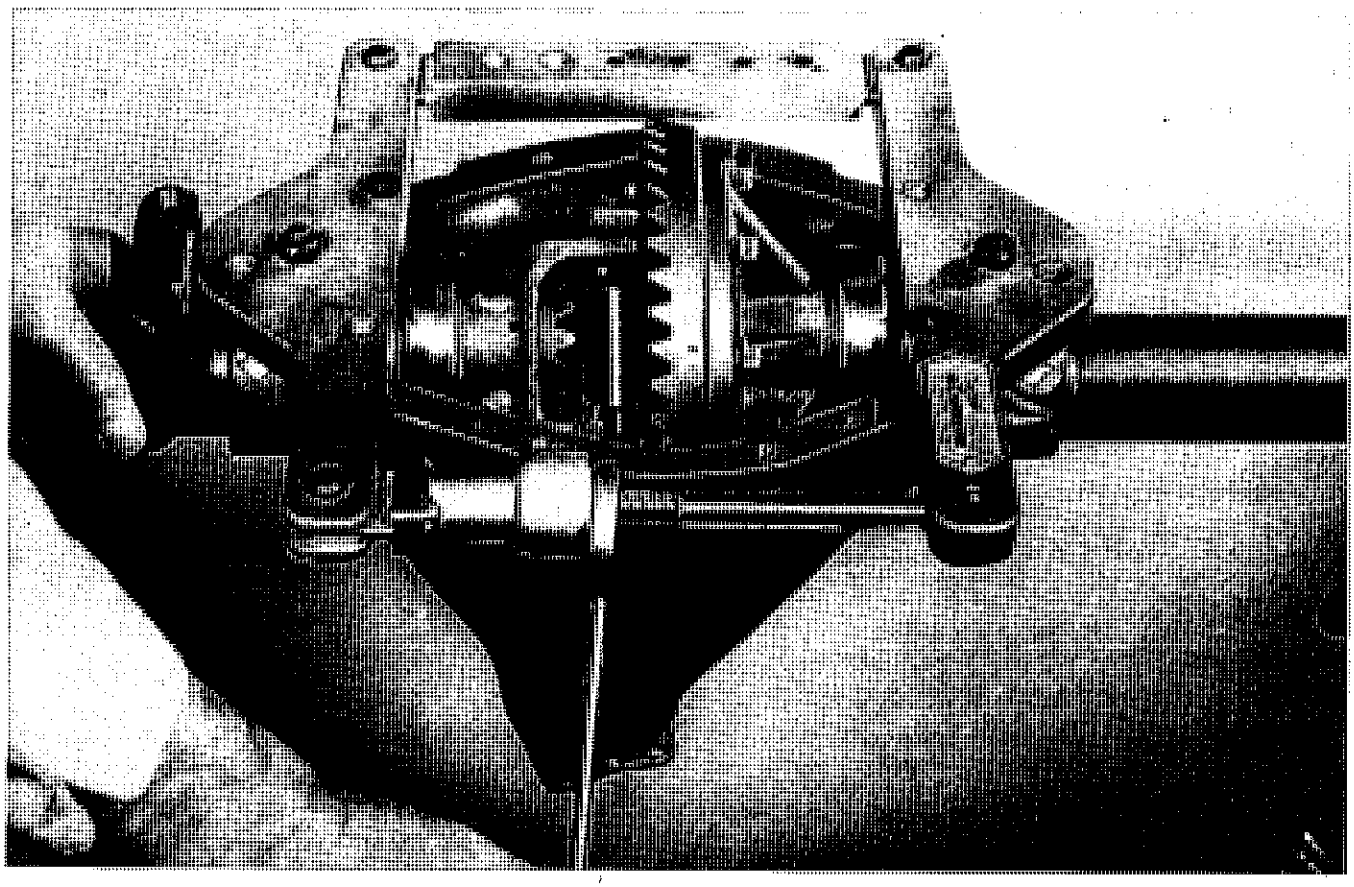


Fig. 8. Casing Spreader in Use, Tool No. SK/.S939.

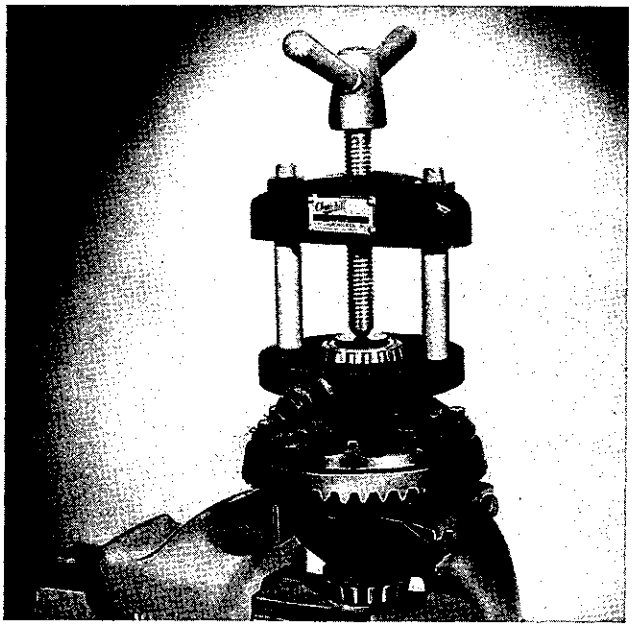


Fig. 9. Extracting Differential Bearing Inner Cone—Tool No. 20S.85 with special extractor finger.

6. The bearing housing oil seals are next removed.
7. Remove axle casing cover and packing after withdrawal of eight $\frac{5}{16}$" N.F. setscrews. ($\frac{1}{2}$" A/F spanner required).
8. Remove the differential bearing caps, noting the markings stamped on the face of these and the correspondingly abutting portions of the casing. The existing relation between the caps and casing must be retained when re-assembling. Fig. 7 shows example of markings.
9. Apply axle casing spreader as shown in Fig. 8 and prize differential assembly out of axle, taking steps to protect the machined face against which the cover fits. "Spreading" should be limited to that required to just free the assembly in the casing.
10. Suitably identify the respective outer portions of the differential bearings with their inner races. The inter-relation of the component parts of these races must be retained when reassembling the rear axle.

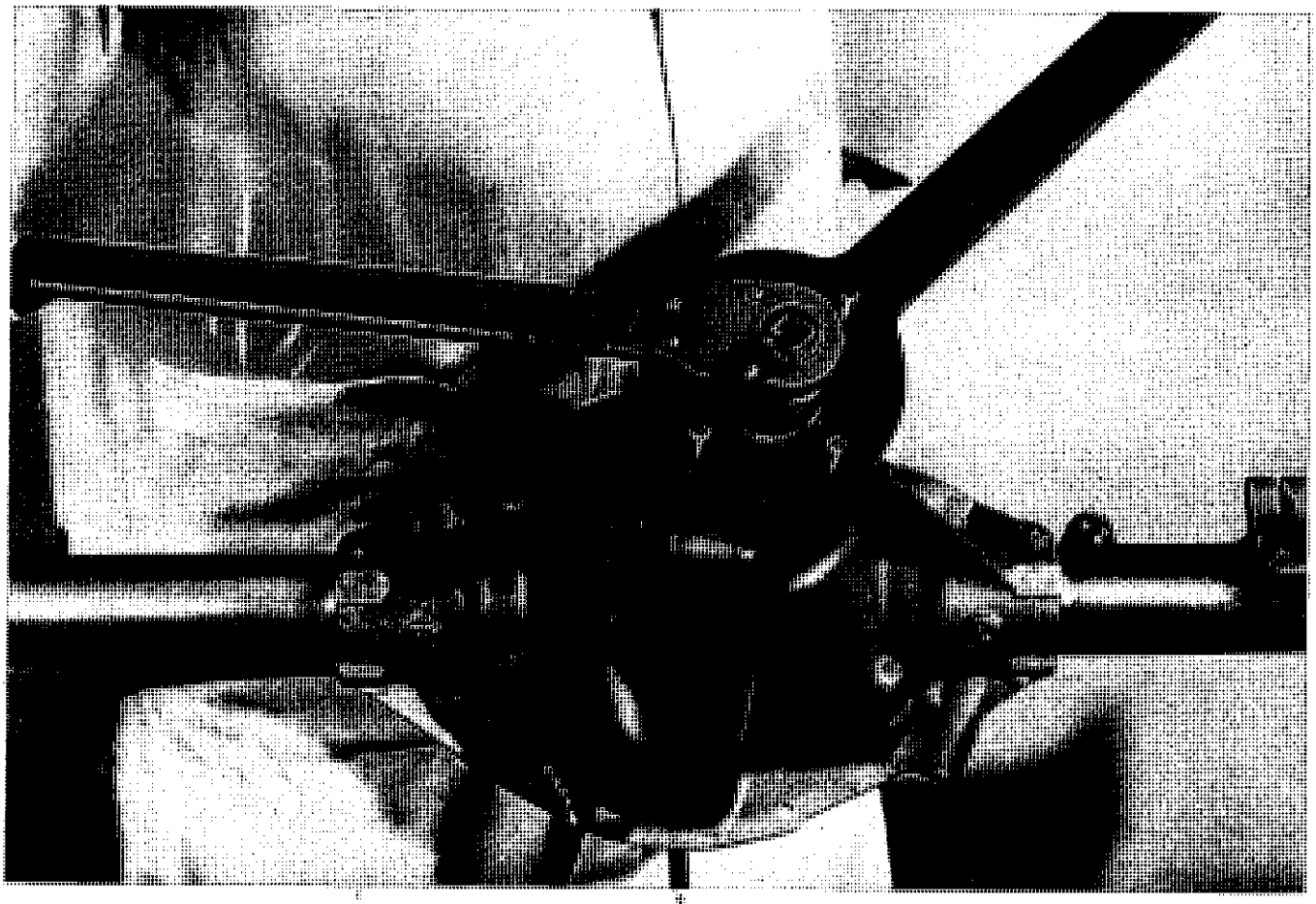


Fig. 10. Removing Pinion Driving Flange Nut—Tool No. SK/S.965.

11. Extract the differential bearing inner races as shown in Fig. 9. (The extractor shown is specially manufactured for this purpose by Messrs. V. L. Churchill and Co. Ltd. and is the same as that used for "Vanguard" Models with longer fingers). The outer races should be paired with their respective inner portions and laid aside for reassembly or replacement if necessitated by damage or wear. The shims removed with each race should also be laid aside with the respective races as a guide when estimating the shims for reassembly. The differential may be dismantled if necessary, as directed later in this section.
12. Remove pinion flange nut as shown in Fig. 10 and having removed the flange, drive the pinion out through the casing with a hide faced hammer, lay aside the shims which are fitted between the spacer and the tail race for possible use when reassembling. Remove pinion head bearing inner cone as shown in Fig. 11.
13. Drive out the pinion outer races as shown i Fig. 12. The removal of the ring for th tail bearing will also eject the oil seal and ta bearing inner cone. The ejection of the hea bearing outer ring will uncover the shim fitted between this and the casing and thes shims should be laid aside with the com ponent parts of this race as a guide whe reassembling.
14. All that remains now is to dismantle th differential unit, instructions for which are a follows.
15. Withdraw the ten crown wheel securin bolts after first flattening tabwashers. ($\frac{1}{2}$ A/F spanner).
16. Drive out cross pin locating pin and tap ou cross pin, thus releasing the sun and plane wheels and completing the dismantling o the rear axle.

THE CROSS PIN CANNOT BE DRIVEN OUT UNTIL AFTER THE CROWN WHEEL HAS BEEN REMOVED.

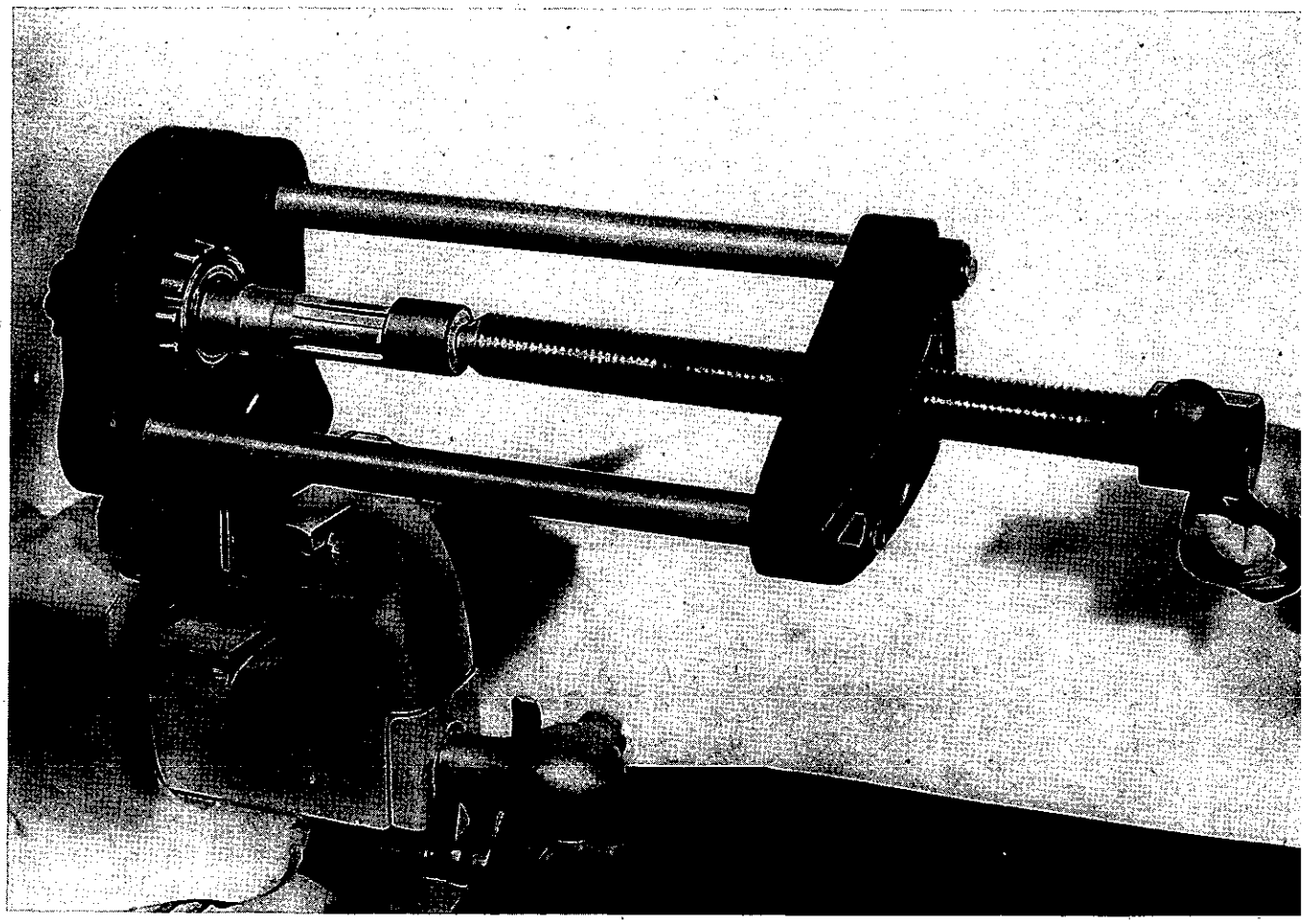


Fig. 11. Extracting Pinion Head Bearing—Tool No. 20S. M.4615.

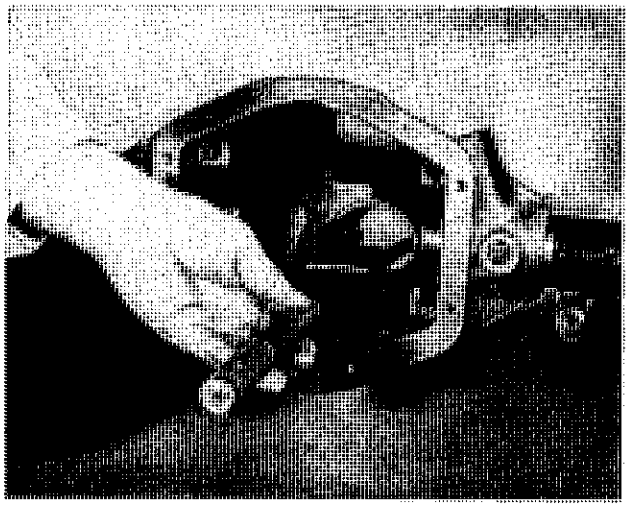


Fig. 12. Removing Pinion Outer Race—Tool No. 20S.71.

To reassemble rear axle.

All parts should be examined carefully and a decision must be made as to which items require renewal. Where it is found necessary to replace the crown wheel or pinion for any reason, the gears must be replaced as a pair, as they are "lapped" together in manufacture.

The first consideration, after replacing damaged or worn parts must be the correct interrelation between the crown wheel and pinion. The assembled relation of these two gears must very closely approximate that used when the gears were lapped together, after heat treatment, during manufacture.

The datum position of the pinion with relation to the crown wheel is specified as 3.4375" from the ground thrust face on the back of the pinion to the centre line of the differential bearings. It is also important that not only should this datum position be achieved, but that sufficient bearing pre-load should be arranged to ensure the maintenance of the specified relation in service.

Having cleaned the abutment faces and bearing housings, thoroughly, and removed any excrescences from these surfaces, the following procedure for re-assembly is recommended.

1. The fixture shown in Fig. 13 is inserted as shown in Fig. 14 in the axle casing and used to assess the shim thickness, which is required under the pinion head bearing, to bring the pinion into its correct datum position mentioned earlier.
2. Although the packing shims are supplied in nominal thicknesses, the dimensions specified cannot be depended upon and for this reason the shims must be measured with a micrometer gauge. It is important that no damaged shims are used and that they are thoroughly cleaned before measurement.
3. Having inserted the measured pack of shims, the thickness of which was assessed with the fixture shown in Fig. 13 the pack of shims is inserted on the head bearing abutment face

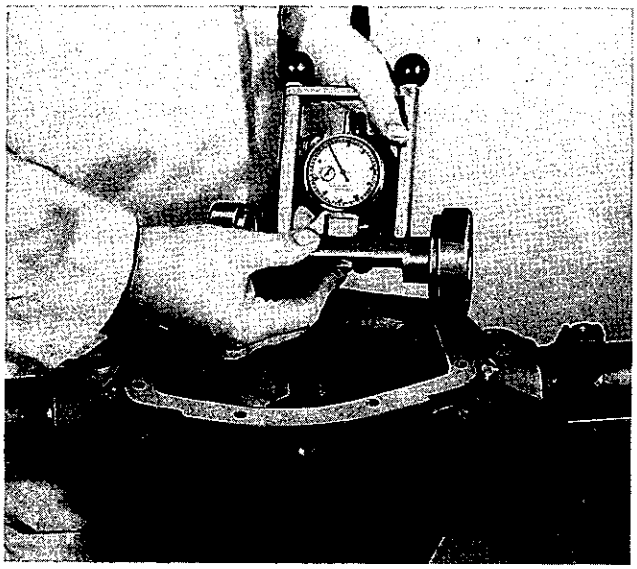


Fig. 13. "Zeroing" the fixture for estimating Pinion Bearing Shims—Tool No. M.84.

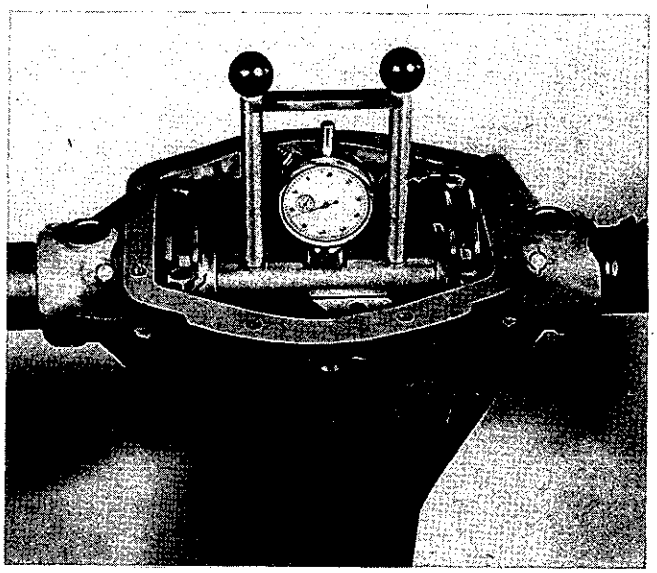


Fig. 14. Pinion Shimming Fixture in Position—Tool No. M.84.

and the outer portions of the pinion's two bearings are pulled into place with the special tool shown in Fig. 15.

4. The sun and planet gears are now assembled into the differential casing, the cross pin being used to locate the two planet gears temporarily in the position shown in Fig. 16. Subsequently the planet gears are rotated around the sun wheels through 90 degrees, the cross pin being withdrawn to allow the gears to assume their normal fitted position, and the cross pin is finally fitted and secured by its locking pin, this pin being located by " centre popping."
5. Where the crown wheel and pinion are to be replaced the new crown wheel is fitted to the differential casing, the ten fixing bolts are thoroughly tightened and secured with their respective locking plates. The crown wheel is checked for flush fitting against the flanged face on the casing with a feeler gauge, thus ensuring that the crown wheel goes right home and also that there can be no question of casting distortion.
6. The differential assembly bearings are now fitted without, as yet, installing any packing shims. A suitable driver such as that which is shown in Fig. 17 should be used for driving the bearings on to the casing.
7. The bearing housings in the centre casing are carefully cleaned and any excresences removed and the differential assembly is dropped into the position in the casing. A dial indicator gauge is mounted on the centre casing with the plunger resting on the back of a crown wheel bolt, as shown in Fig. 18. The assembly is forced away from the dial gauge as far as possible and then the indicator set to zero. The assembly should then be levered in the opposite direction without tilting until the taper rollers go hard home in the dial gauge, .062" for example, indicates the total side float in the differential assembly. This latter reading is noted for reference later in the sequence of operation.
8. The differential assembly is again removed

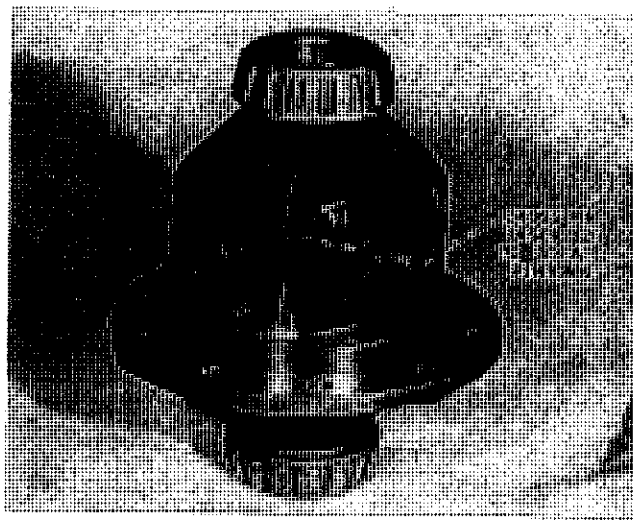


Fig. 16. Location of Differential Gears for Assembly in differential housing.

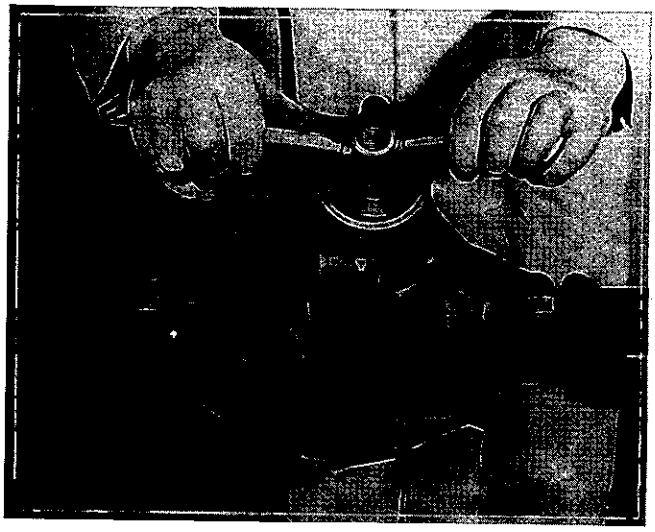


Fig. 15. Fitting Pinion Bearing Outer Races—Tool No. M.70.

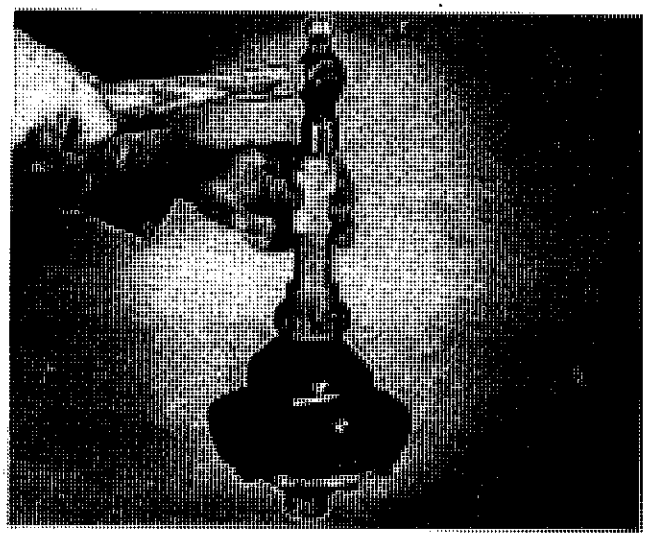


Fig. 17. Fitting Differential Bearing Inner Cone with Sleeved Tool—Tool No. M.89.

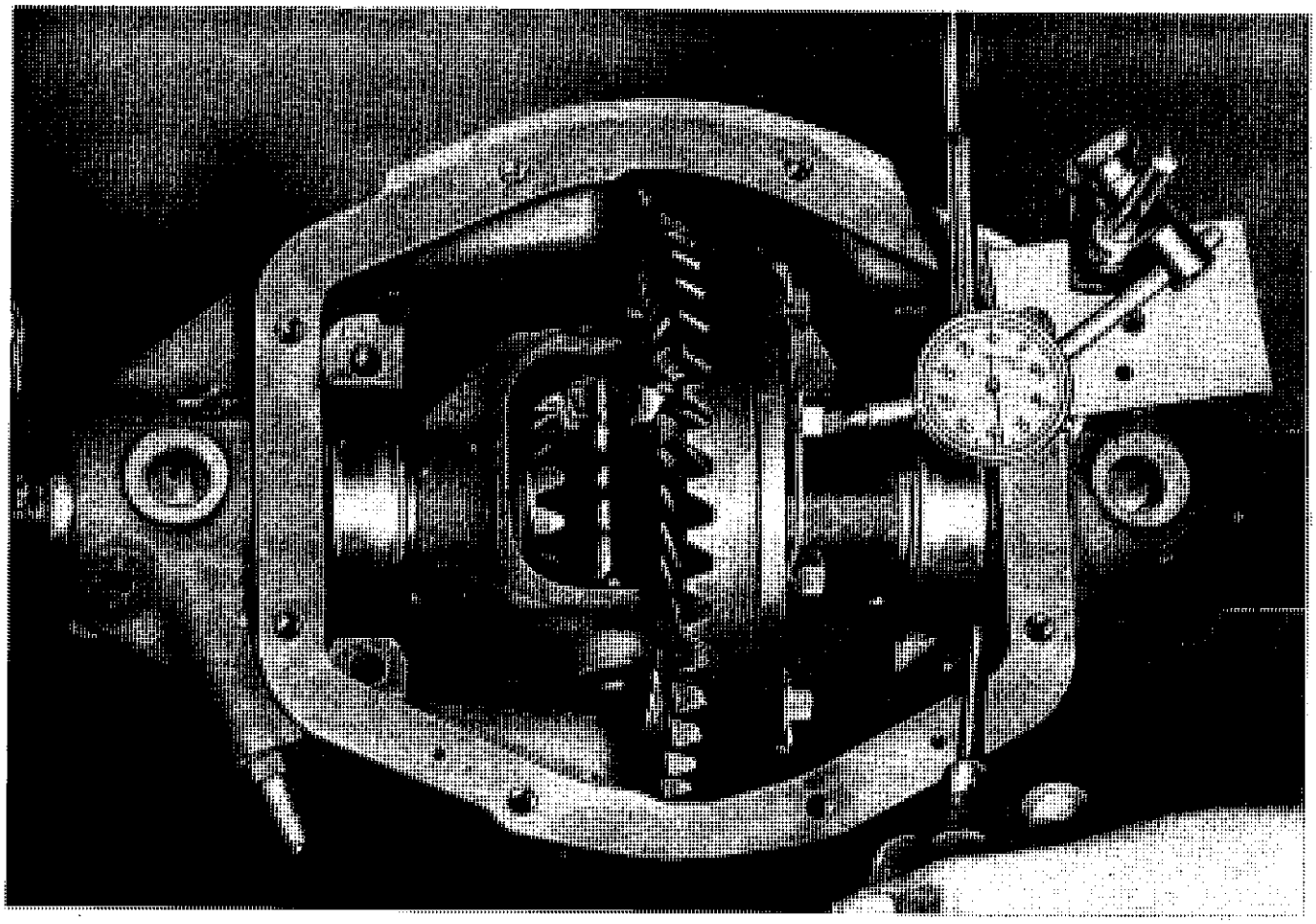


Fig. 18. Checking Differential Assembly for lateral movement in axle casing.

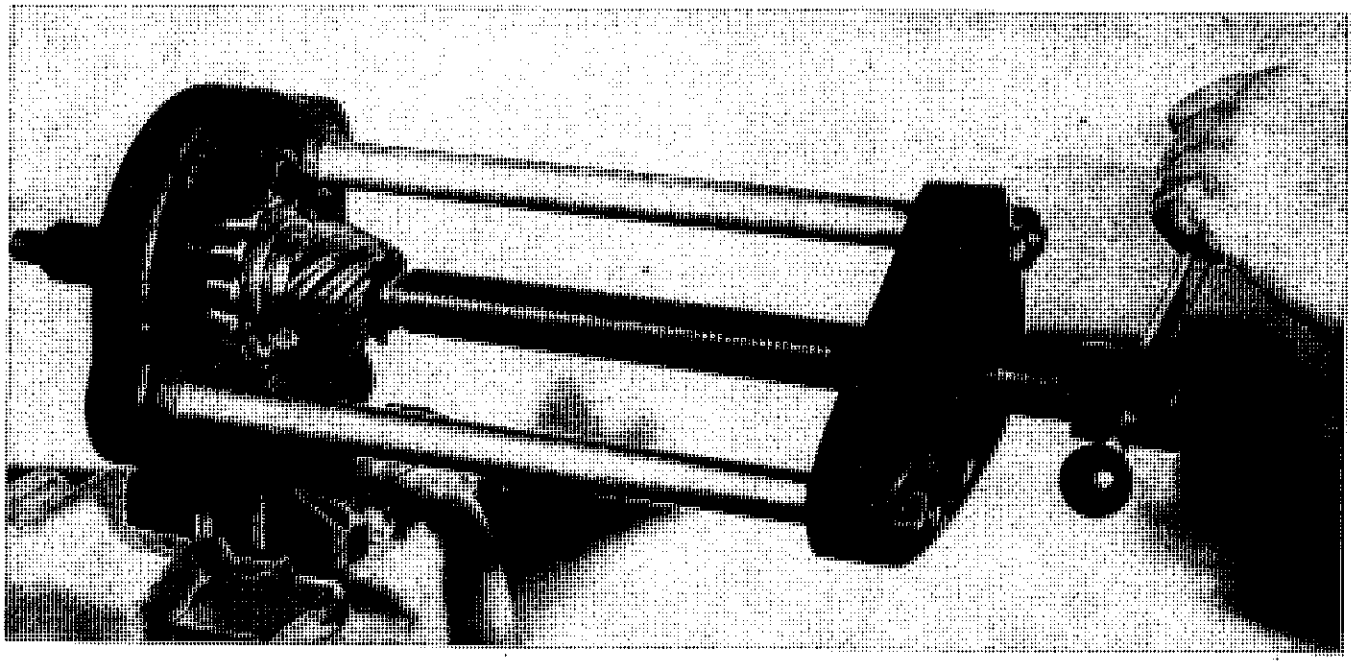


Fig. 19. Fitting Pinion Bearing Inner Cone—Tool No. 20S. M.4615.

from the centre casing and laid aside temporarily.

9. The inner portion of the pinion head bearing is pressed into position on the pinion with the special fixture shown in Fig. 19.

10. The bearing spacer is threaded on to the pinion shaft with the chamfer outwards as shown in Fig. 20 and the shims, previously removed when dismantling the axle, are placed in position on the pinion and the assembly fitted into the axle casing. The thickness of shims fitted will probably have to be adjusted to provide the correct preload figure.

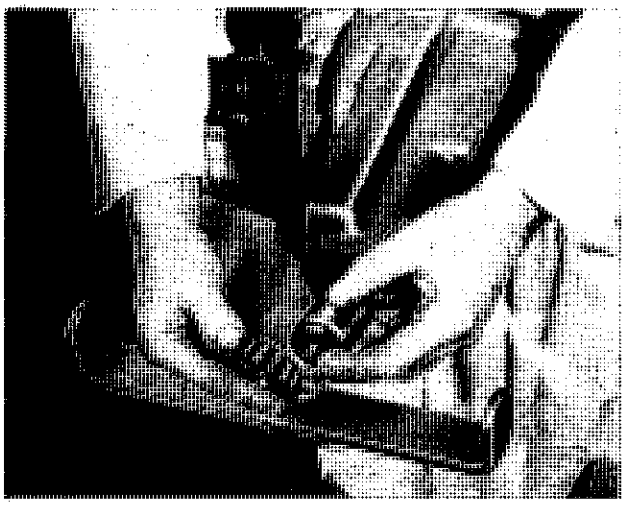


Fig. 20. Correct Position for assembly Bearing Spacer, Shims and Tail Bearing Inner Cone.

11. The inner ring of the pinion tail bearing i tapped into position on the pinion and u against the shims on the distance collar.

12. The driving flange is fitted on the end o the pinion shaft and firmly secured wit the castellated nut and plain washer. (tightening torque of 65-80 lbs. feet i specified). **The oil seal is not fitted unti the bearing preload has been checked a described in the next operation.**

13. The fixture shown in Fig. 21 is now applie and the preload of the bearings checked The correct preload should fall between fiv and seven inch lbs. If the preload is inade quate, shims must be withdrawn whereas i an excessive figure is obtained additiona shims must be fitted.

14. The differential assembly is again installed i the axle casing and a dial gauge fitted on thi casing so that the plunger of the dial gaug bears against the back of a crown wheel bol as shown in Fig. 18.

15. The assembly is now forced away from th dial gauge until the teeth on the crown whee go fully home with those on the pinion. Th dial gauge is now set to zero and the assembl levered towards the dial gauge. Let thi dimension be .045".

16. The side float of the assembly measured i the last operation, less the crown wheel an pinion backlash specified will indicate th

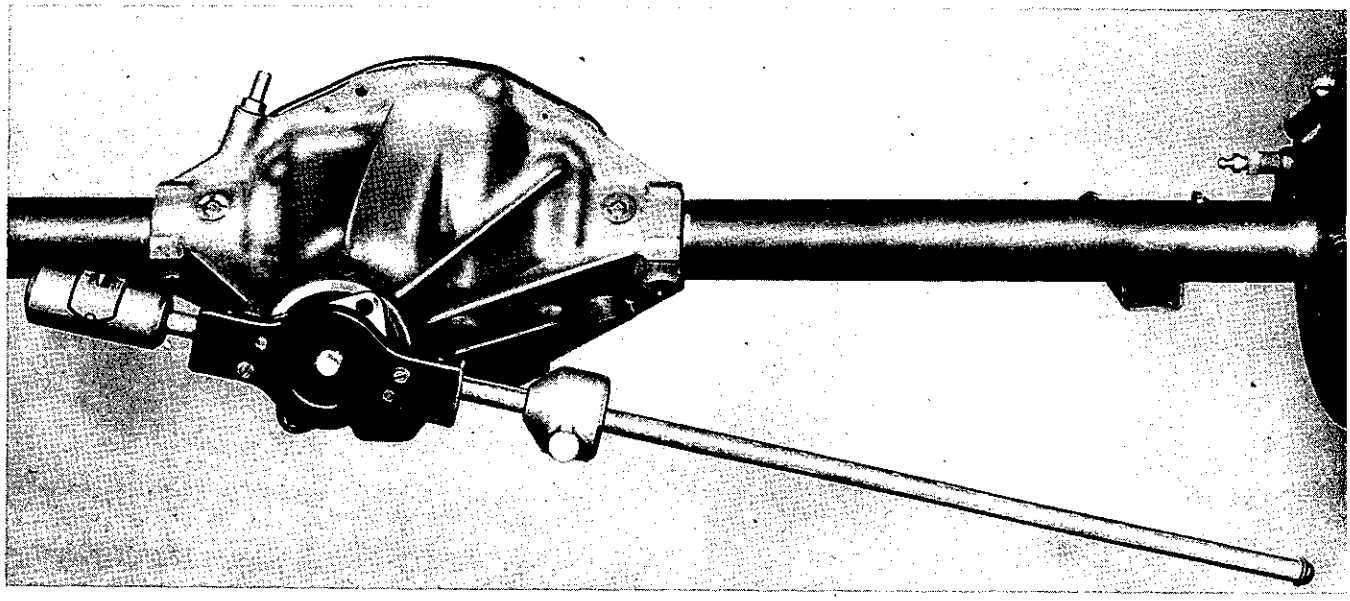


Fig. 21. Checking Pinion Bearing pre-load with Churchill Fixture—Tool No. 20S.M.98.

shim thickness required on the crown wheel side. The backlash is specified as between .004″ and .006″ and an average figure of .005″ should be used for this calculation giving .040″.

17. To obtain the thickness of shims required between the other differential bearing and casing the figure arrived at in the previous operation, .040″, should be subtracted from the side float measured in operation 7 plus an allowance of .005″ to provide the necessary degree of bearing preload. This gives a total shim thickness of .067″ and thus shims on two bearings will be .040″ already estimated and .067″ — .040″ = .027″ on the other side.
18. Having decided the thickness of shims required behind each differential bearing these bearings are extracted with the special tool shown in Fig. 9. The respective shim packs are measured with a micrometer gauge after ensuring that the shims are clean and undamaged and allocated to their respective sides of the differential casing.
19. As each bearing is extracted, the two portions of each must be laid aside for refitting in the same relation and position, as that used during initial assembly. Failure to fit these bearings in their original positions will upset the measurements made in operation 15.
20. Having fitted the two packs of shims in their respective positions, the bearing inner cones are driven on to the casing with a suitable sleeve tool as shown in Fig. 17 and the outer rings applied.

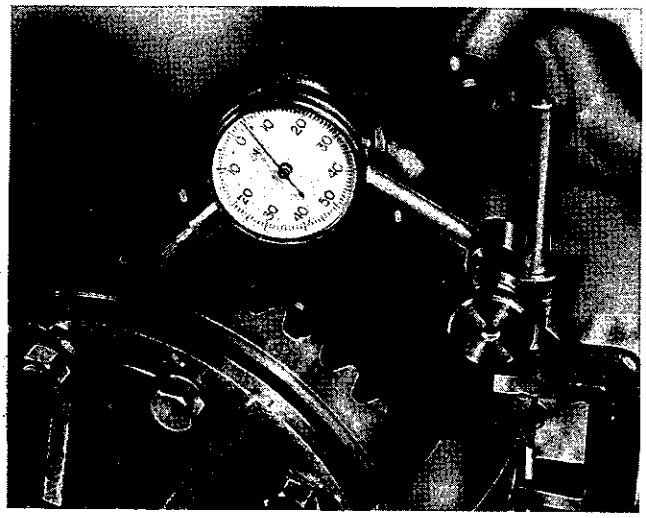


Fig. 22. Checking Crown Wheel and Pinion Backlash with a dial gauge.

21. The differential assembly is now fitted into the axle casing and, owing to the preloading of the bearings, a certain amount of casing spreading is desirable to complete this operation. **The casing spreader shown in Fig. 8 should be used and the spreading of the case should not be overdone and limited to that required to just enable the entry of the differential into the casing.**
22. The bearing caps are now fitted, having regard to the markings indicated on the abutting face. The letters and figures used for these markings will vary. The pinion and crown wheel backlash is checked with a dial gauge as shown in Fig. 22. An average should be taken of several teeth.
23. A tooth marking test should now be carried out and to enable this to be done, a few teeth should be painted with a suitable marking compound. The pinion should be rotated backwards and forwards by the driving flange, over the marked teeth on the crown wheel and the markings compared with the diagram on page 14 and the instructions on this diagram regarded.
24. The oil seal is fitted in its respective housing and then each housing is pressed on to its wheel bearing.
25. The wheel bearings and housings are driven on to their respective axle shaft as shown in Fig. 6, and the housings and axle shaft assemblies fitted.
26. The brake backing plate and shoe assembly is placed in position on each axle sleeve.
27. The four $\frac{3}{8}$″ bolts are fitted through each bearing housing and brake backing plate, ensuring that both these items assume their appropriate relation with the axle sleeve, and after applying the locking plates the nuts are screwed into position and firmly tightened with a $\frac{9}{16}$″ A/F spanner finally engaging the flats on the nuts with the ears of the locking washers.
28. The hubs are next fitted and tightened on to their splines by means of the taper collar washer and slotted nut. A substantial $1\frac{1}{8}$″ A/F socket spanner will be required to tighten the slotted securing nut. (A tightening torque of 125 lbs./ft. is specified). Having thoroughly tightened up this nut the hole in the axle shaft is lined up with one of the slots and the cotter pin fitted.

29. The brake drum is next fitted to each hub and secured thereto by means of the two countersunk grub screws.
30. A new axle cover packing is fitted together with the cover itself and the latter secured with the eight setscrews. A $\frac{1}{2}$" A/F spanner is required to tighten these setscrews.

REPAIRS AND ADJUSTMENTS.

Oil leakages.

Where loss of oil from the rear axle unit is experienced, the following points of possible leakage should be investigated.

1. Poorly fitting axle cover plate due to a loosely bolted or distorted cover plate, faulty packing or a damaged casing face.
2. Pinion oil seal damaged or worn. Where this difficulty arises a new seal should be installed, care being taken to protect its fabric face and a proper installing tool as shown in Fig. 23 should be employed.
3. Loss of oil past wheel bearing oil seal, this leakage will also affect the brake linings. To deal with this difficulty a new oil seal should be installed, after the removal of the rear hub with the special sleeved tool shown in Fig. 4 Obvious precautions not to overfill the axl should be taken.
4. In rare cases, usually associated with a ca which has covered a considerable mileage leakage may occur around one or more o the four pegs which locate each axle sleev in relation to the centre casing, into whic these sleeves are pressed. To deal with suc a difficulty, the offending pegs should b welded into the casing.

Loose rear hubs.

Where a rear hub is found to be loose on its respective shaft, immediate steps should be taken to tighten up the axle shaft nut. If this hub has been allowed to run for any length of time, in a loose condition, damage will most likely have occurred to the splines of the hub and shaft and replacements for both these items be required.

Providing proper attention is given to the tightening of the axle shaft nut (a tightening torque of 125 lbs./ft. is specified) and the condition of the splines is satisfactory as also that of the special split collar, this difficulty should not arise.

Fig. 23. Fitting Pinion Oil Seal—Tool No. M.100.

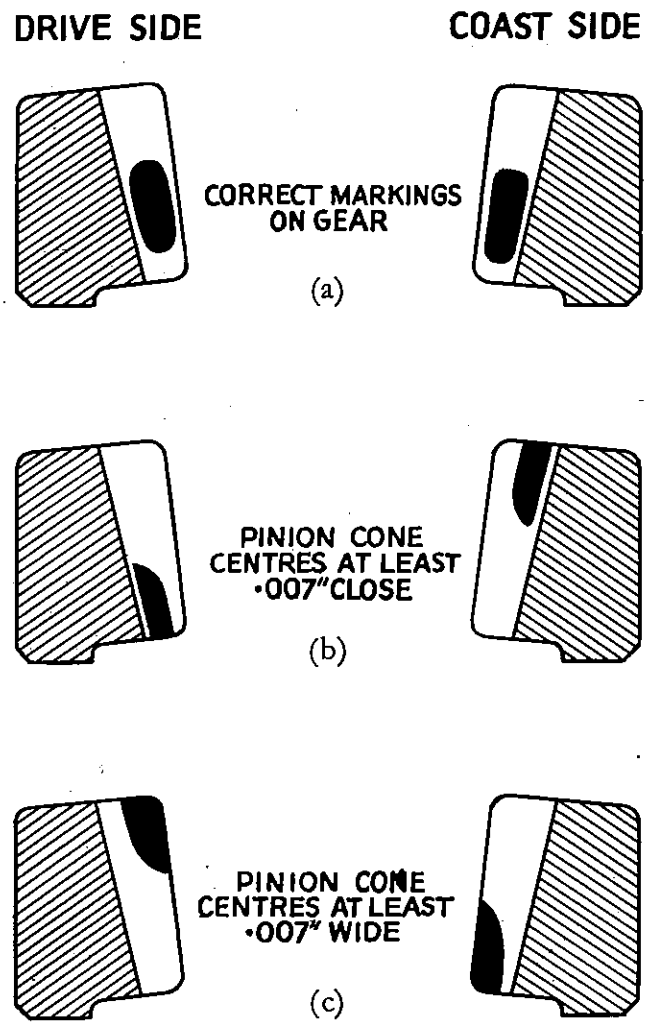


Fig. 24. Crown wheel tooth markings.

Ring gear tooth markings.

When assembling one of these axles it is particularly important that the correct cone centres and crown wheel and pinion backlash are employed. Owing to the fact that, after the crown wheel and pinion have been lapped together at the correct centres (3.4375" ± .000"), these gears are subjected to a proprietary process known as " Parco-lubrizing " which briefly consists in depositing lubricating media on the tooth faces, tooth markings are apt to be somewhat misleading and should be treated as of secondary importance to the correct cone centres and backlash.

The mounting distance from the centre line of the ring gear to the ground back face of the pinion, which is maintained during lapping (3.4375") must be respected during assembly, and all units adjusted to give a backlash of between .004"—.006" and the bearings preloaded to the specified degree to give the necessary rigidity and to minimize deflection. Providing these precautions are observed during assembly, the markings shown in Fig. 24 will be produced within very close limits.

Correct markings [Fig. 24(a)].

The marking on the gear should approximate very closely to that shown in the illustration, with a slight clear band between top and bottom of each tooth. The marking for the coast side being similar in shape but slightly closer to the " toe."

Pinion too close to ring gear [Fig. 24(b)].

The drive side marking on the gear will be a heavy band in the root of the tooth at the " toe " end and on the coast side a heavy band at the root of the tooth, but at the " heel " end.

Pinion too far from ring gear [Fig. 24(c)].

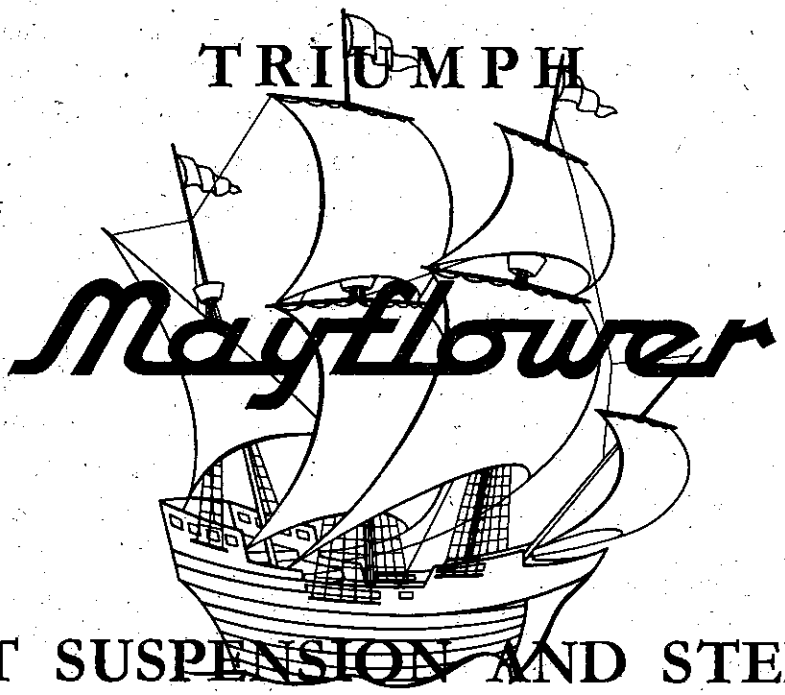
The drive side markings on the gear will be a heavy band at the top of the tooth at the heel end and on the coast side at the bottom of the " toe " end.

NOTE: *All the markings shown are those obtained, under a light running load, using powdered red lead or yellow ochre mixed with oil.*

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

FRONT SUSPENSION AND STEERING

SECTION G

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

FRONT SUSPENSION AND STEERING

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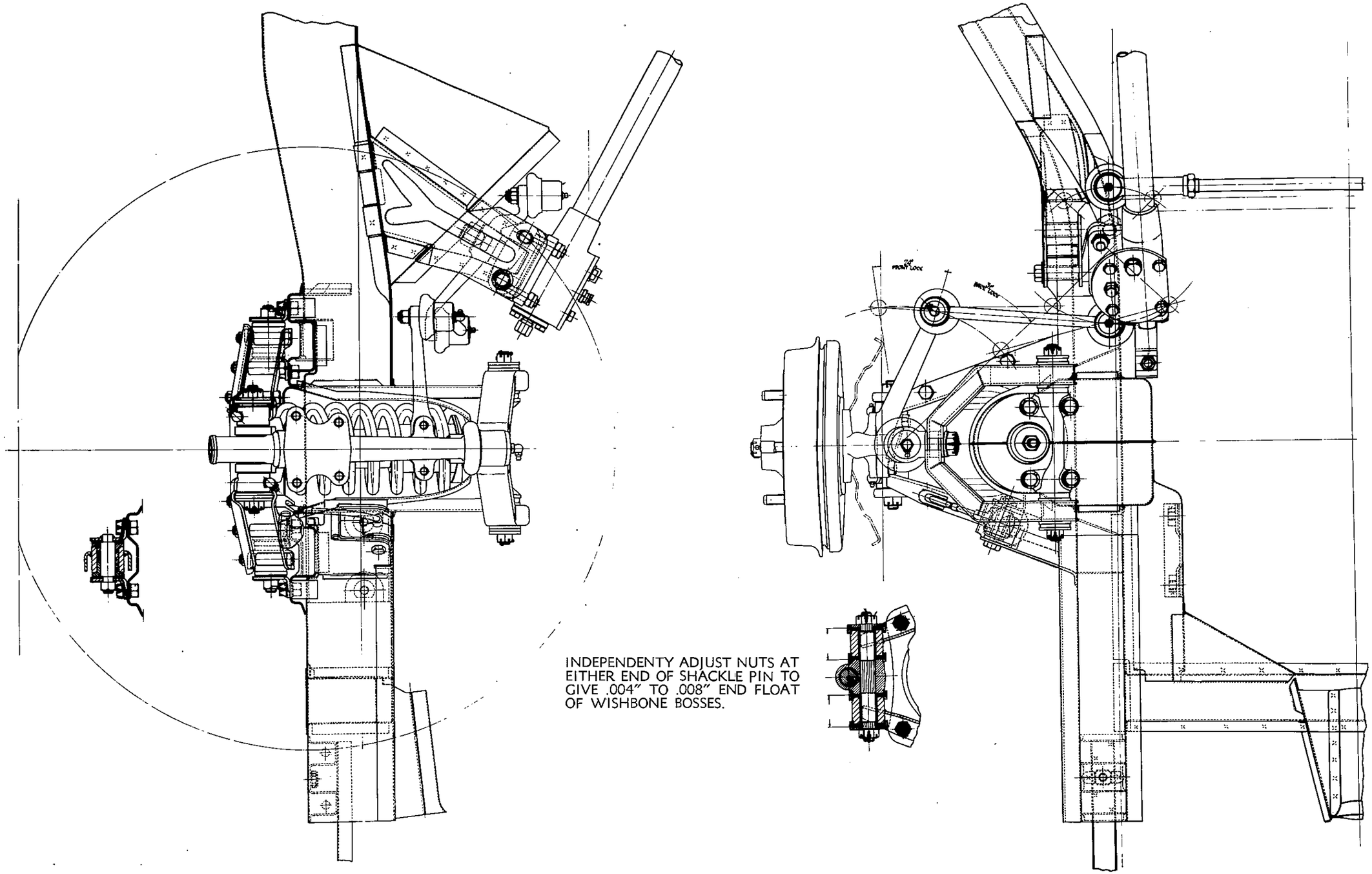


Fig. 1. Longitudinal plan and side elevation of front suspension unit

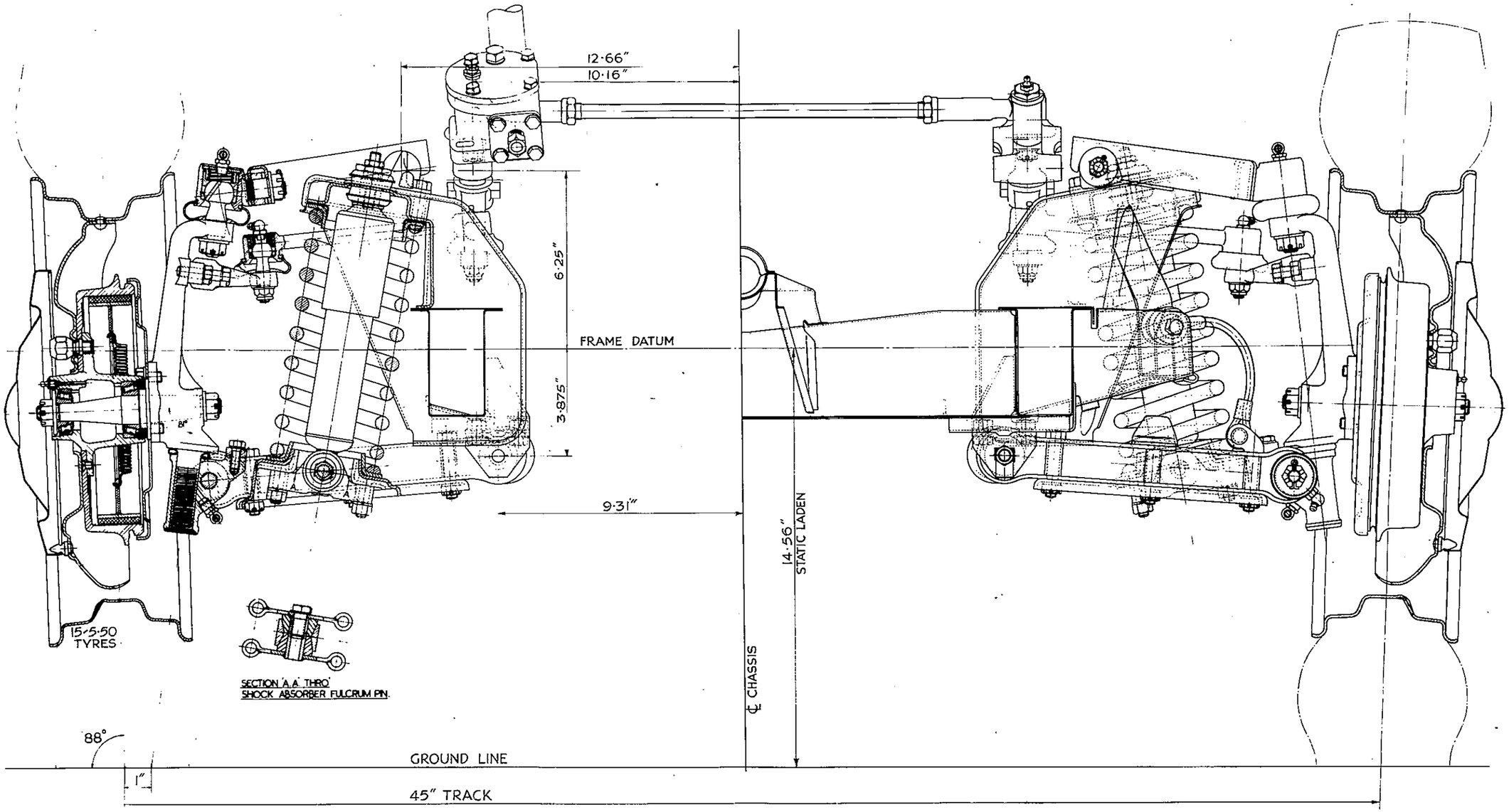


Fig. 2. Front elevation of front suspension units

FRONT SUSPENSION AND STEERING

General Data.

Turning Circle	34′ 7″
Front Lock	24°
Back Lock	31°
Steering Box Ratio	11 : 1
Overall Ratio	14.7 : 1
Drop Arm Travel	76°
Maximum Angular Travel in Box ...	80°
Number of Turns of Steering Wheel (Lock to Lock)	2.32
*Vertical Range of Front Wheel Movement	5.25″

3″ Bump. 2.25″ Rebound from datum laden position.

FOR FURTHER DATA SEE PAGE NO. 11.

**Datum Laden Position is that provided when four Adult Persons occupy the Car.*

FRONT SUSPENSION UNIT.

Description. (See Figs. 1 and 2).

The two front suspension units are of wishbone construction. Road shocks are absorbed by low periodicity coil springs, each of the two coil springs having a double acting telescopic damper fitted inside, to assist in controlling their action. Steel cables also limit rebound.

The wishbones are built up of pressed channel section steel girders.

The upper wishbones of each suspension unit are rubber bushed at their inner ends to an abutment bracket, which is bolted to the top of each spring housing. The outer ends of the two sides of the upper wishbones are bolted together by the screwed shank of a cupped housing, which, with a ball headed extension fitted to the vertical link, provides for axial movement of the upper end of this link.

The outer ends of the lower wishbone are bushed and mounted on either end of a spindle which is splined centrally to fit transversely into an internally threaded manganese bronze trunnion, which trunnion accommodates the screwed lower end of the vertical link. The respective bushed ends of the wishbone are located sideways on the cross shaft by means of a white metal covered steel thrust washer on each side, bearing on the screwed trunnion on the inside and on the outer side, against a specially designed steel washer which is secured by a castellated nut. Grit and dirt are excluded from the grease lubricated bearing surfaces by special oil resisting rubber sleeves.

The screwed trunnion, with the ball and socket union at the upper end of the vertical link completes arrangements for the pivotting of the road wheels. This trunnion is lubricated by a grease nipple and a special oil resisting rubber dust excluder is fitted between the upper end of the threaded barrel and the shoulder on the vertical link, whilst the bottom end is sealed off by a disc let into the trunnion and located by spinning over the end of the barrel.

The steering lock stop consists of an eccentric roller, bolted to the upper side of the trunnion, and operating against a machined portion of the vertical link.

The inner ends of the lower wishbone are rubber bushed on each side and mounted on brackets, which are themselves attached to brackets welded on the underside of the chassis side member.

The vertical link is a carbon steel stamping which couples the outer extremities of the upper and lower wishbones and also carries the stub axle shaft and steering lever.

The stub axle, which is mounted on the vertical link is a stamping of manganese molybdenum steel. The shaft is a pressed taper fit in the vertical link, being secured thereto by a castellated nut and plain washer.

The brake backing plate, which carries the brake shoes and hydraulic operating mechanism is secured to a machined flange on the vertical link by four setscrews and spring washers.

The front hub is mounted on a pair of opposed taper roller bearings, carried on the stub axle shaft. The inner portion of the inner race abuts against a projecting shoulder on the vertical link and the outer ring against a flange machined in the hub. The outer portion of the outside race bears against a flange in the hub and the inner portion of this race abuts against a "D" washer, which is secured to the stub axle by means of a castellated nut, by which the bearings are adjusted. Provision against the loss of grease is made by the fitting of a felt washer, which surrounds the projecting portion of the vertical link and fits into a retainer in the hub against the outer portion of the adjacent taper roller bearing.

To remove front suspension unit.

The following procedure is recommended :—

1. Jack up the front of the Car, remove road wheel and place support under jacking bracket, afterwards withdrawing the jack.
2. Disconnect steering outer tie rod from the steering lever.
3. Compress front spring by applying a lifting jack under brake drum.

4. Remove locking nut ($\frac{5}{8}$" A/F spanner) on the upper end of the shock absorber, whilst holding the larger nut on this spindle with a suitably thin spanner ($1\frac{1}{4}$" A/F).
5. Remove the four plain nuts ($\frac{9}{16}$" A/F) on the studs, which secure the shock absorber, these should not be confused with the six castellated nuts which secure the spring pan.
6. The shock absorber can now be driven down through the spring pan with a hide faced hammer.

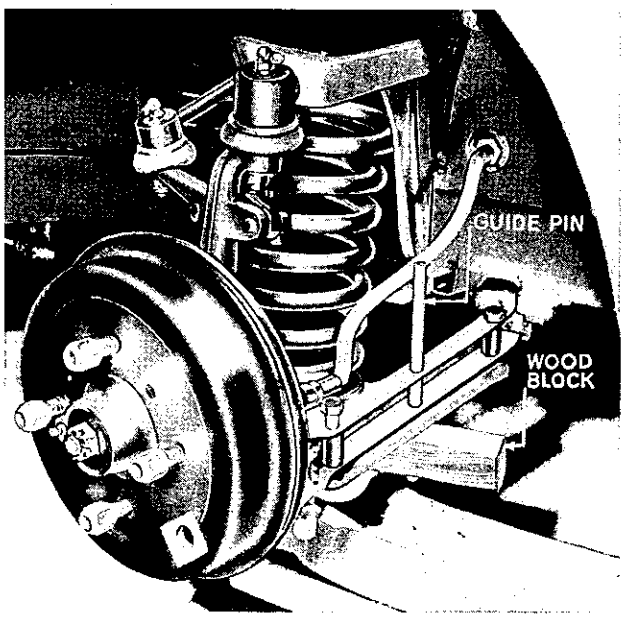


Fig. 3. Method of supporting spring pan whilst removing four outer securing bolts

7. Remove the split pins which secure the six spring pan securing nuts and REMOVE THE CENTRE BOLT ON EACH SIDE AND REPLACE WITH GUIDE PINS, leaving the other four for removal as, directed in next operation ($\frac{5}{8}$" nut and $\frac{9}{16}$" A/F bolt head.)
8. Remove jack and place under centre of spring pan with a suitable packing as shown in Fig. 3 to provide clearance on the four shock absorber mounting studs. NOTE: One or two guide pins used.
9. Remove the four spring pan securing bolts not so far withdrawn and lower jack thus releasing spring pan. With all but early models a rebound cable is attached to a special bolt which is substituted for the front outer spring pan securing bolt and this bolt will then be left attached to the cable. *NOTE. It is most important that the inner end of the cable shall be free to rotate on the attachment bolt. Failure to allow for such movement will ultimately lead to collapse of the cable.*
10. Disconnect the brake hose from the body valance. This detachment necessitates the removal, in the case of the right hand side of the Car, of the two lower hydraulic unions and barrel nut to allow access to the nut which secures the hose to the valance, as shown in Fig. 4. The banjo union on the left of the car has only one union to remove in addition to the barrel nut. **No attempt**

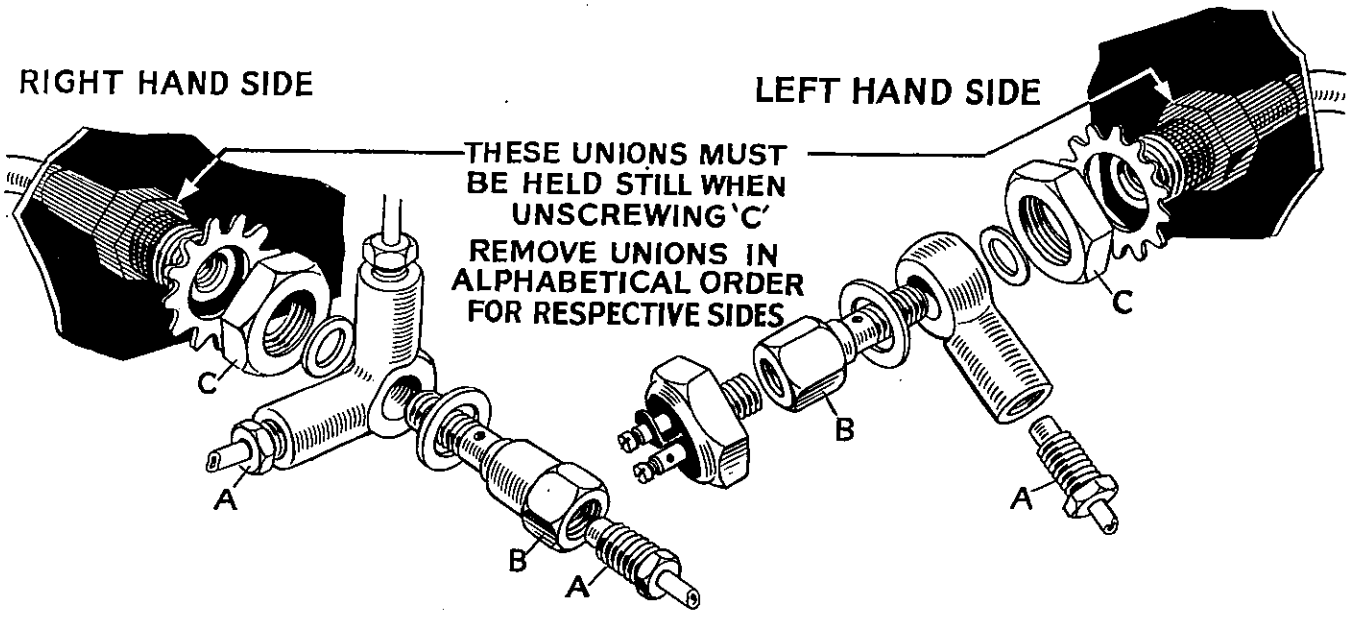


Fig. 4. Front brake hydraulic pipe connections

should be made to turn the hose by its hexagonal extremities as such a procedure will destroy the hoses. The hexagon sizes on these items are of Whitworth specification—the union nuts being approximately $\frac{7}{16}$" A/F, the barrel nut $\frac{5}{8}$" A/F and the lock nut $\frac{15}{16}$" A/F.

11. Release the locking plates which lock the four bolts on each side of the bottom inner fulcrum bracket and remove these bolts, thus releasing the bottom wish bones from the chassis side member ($\frac{9}{16}$" A/F spanner required).
12. To complete the removal of the assembly, withdraw the four bolts which secure the top inner fulcrum bracket to the spring abutment bracket. The two rear bolts are provided with loose nuts, but the outer pair screw into captive nuts ($\frac{9}{16}$" A/F spanner required).
13. Reassembly of the front suspension assembly is the reverse procedure to the foregoing *with the additional necessity for "bleeding" the brakes upon completion of reassembly*, and the employment of guide pins as shown in Fig. 3 when fitting the spring and pan.

To remove front shock absorber.

Proceed as directed in operation 1-6 inclusive in "Removal of Front Suspension Unit."

Refitting is the opposite to that given for its removal.

To remove front spring.

Proceed as directed in operations 1-9 inclusive in "Removal of Front Suspension Unit."

STEERING

Type and Description (Fig. 5).

The Steering Gear is the Bishop Cam and Lever Model "T" having a ratio of 11 to 1. The cam portion takes the form of a generated worm and runs in ball bearings. The rocker shaft runs in a plain bearing and a lever integral with the shaft carries a peg which is conical at one end to engage the cam, and as the conical part of the peg does not touch the bottom of the cam groove, adjustment for wear is effected by varying the depth of engagement. This is done by means of the set-screw 13556 (Fig. 5) in the top cover of the steering gear.

The gear is illustrated in Fig. 5, from which it will be observed that it is a self contained unit of extreme simplicity consisting essentially of a cam 14489 mounted on the bottom of steering tube 14516, which engages with the rocker shaft 14306 through a spiral groove cut in the periphery of the cam and a fixed peg mounted in the top of the integral lever of the rocker shaft.

The whole unit is enclosed in an oil tight casing 14479 which carries two ball bearings 17612 on which the cam rotates, and which have been designed to carry both radial and thrust loads. The lever 14355 is fitted to the lower end of the vertical rocker shaft and the stator tube for the trafficator control is locked by the gland nut 10805 attached to the end cover plate 14481. When the cam is rotated the peg moves over a predetermined arc and thus imparts the

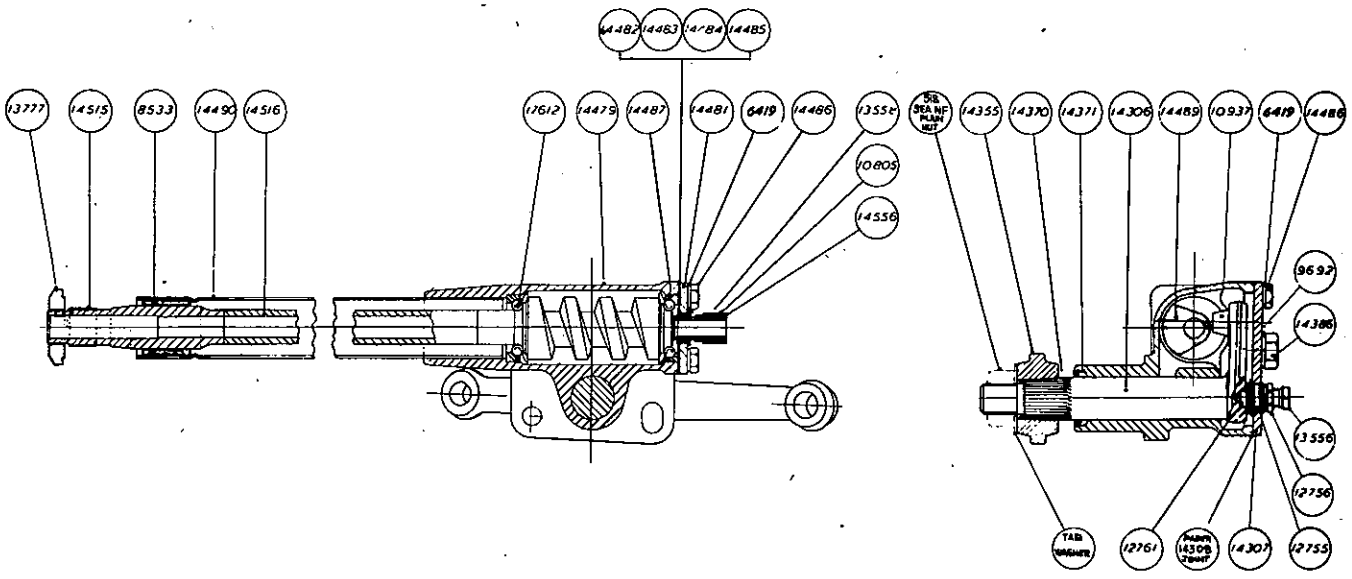


Fig. 5. Sectional view of Bishop's cam and lever. Model "T" steering gear

desired motion to the rocker shaft.

Maintenance.

An oil filler plug 14386 is provided in the steering box casting 14479. A high pressure oil should be used. Grease should *not* be used under any circumstances.

The top bush 8533 in the steering column outer tube 14490 is impregnated with graphite and no lubrication should be necessary but if after long periods a dry squeak develops, this may be cured by a small application of oil.

Check that the steering drop arm and ball joints are tight and that the bolts securing the steering box bracket to the frame are tight.

To Remove and Refit Steering Wheel.

1. Disconnect the wires which pass through the steering column from any electrical equipment taking careful note of the terminals to which each wire was connected.
2. Slacken off nut 10805 on olive 14556 clamping the stator tube at the bottom of the steering box 14479. Have a receptacle ready to catch the escaping oil.
3. Loosen the three grub screws in the steering wheel and withdraw stator tube and trafficator control. It is advisable to mark the position on the multiple splines before the wheel is right off the splines so that the self cancelling slots will be in the correct position when reassembling. Unscrew nut on the steering boss and withdraw steering wheel with wheel puller as shown in Fig. 6.

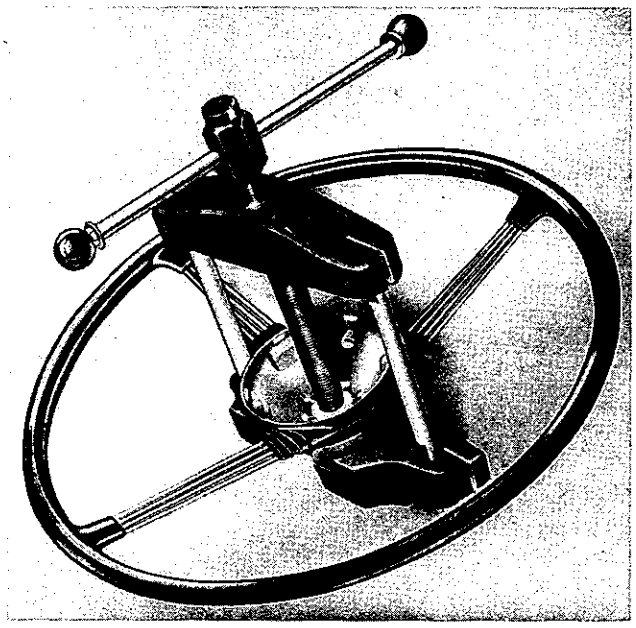


Fig. 6. Removing steering wheel with special puller —Tool No. 20S-M3600

To Remove and Refit Outer Tube Top Bush.

1. Pick out old felt bush with sharp end of a file.
2. Insert new bush by rolling to form a bush and inserting the corner of the felt between the shaft and outer tube. The remainder of the bush can then be inserted gradually with the aid of a screwdriver. Graphite should be applied to the side of the felt strip which makes contact with the steering tube.
3. Refit steering wheel and stator tube.

Adjustment on Car.

Means for adjustment to take up wear are provided and the following points should be noted as important :—

1. There should be no end play of the steering tube and cam in any position.
2. Correct rocker shaft adjustment is only practicable when there is no end play in the column and cam. There should be no end play of the rocker shaft in the straight ahead position.
3. Lost movement in either of these two points mentioned above will result in unsteady steering, knocks and backlash on the steering wheel.
4. The cam is designed to allow a little play in the rocker shaft at all positions of its travel except the straight ahead position, the amount of play reaching its maximum at either full lock. The geometry of the steering mechanism should always cause the pressure on the cam to be towards the centre of the box and therefore this play cannot be felt at the wheel, and the pressure on the cam in either direction tends to return the steering to the straight ahead position.

The notes given below apply to the steering unit alone and separate provisions must be made to deal with any looseness in the ball pin joints and other connections, which may in themselves cause " wandering " or a knock which will be felt on the steering wheel.

To adjust the steering gear, deal with it alone by disconnecting the drop arm lever 14355 and ball joints.

It should be carefully noted that under no

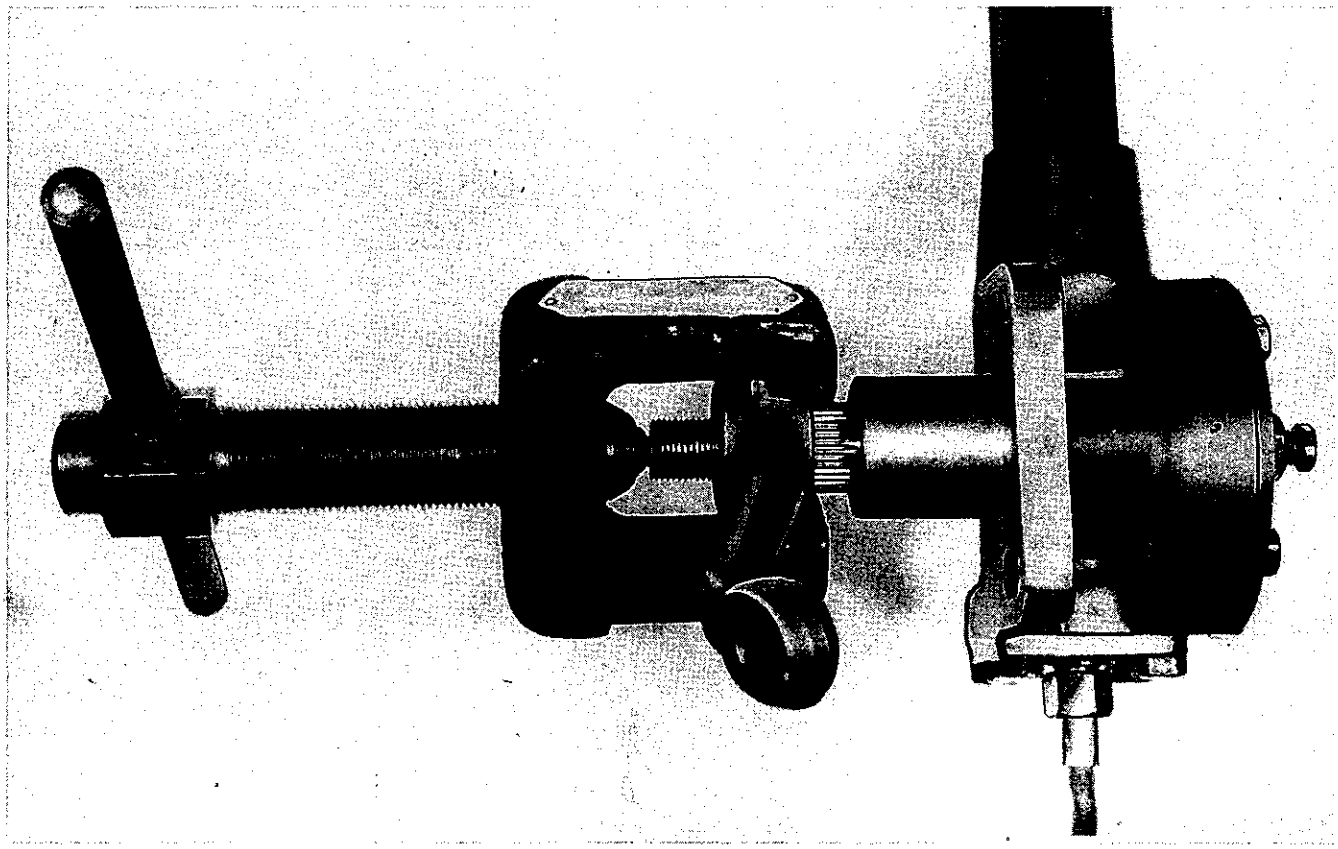


Fig. 7. Showing Churchill drop arm puller in use—Tool No. SK998

circumstances must the lever be removed from the rocker shaft by hammer blows. A proper extractor tool must be used as shown in Fig. 7 to remove this lever, as hammer blows may cause the taper peg to indent the cam track and cause serious damage.

If no extractor tool is available, remove top cover and the nut on the end of the rocker shaft which will then allow the drop arm to be removed by hammering with a lead hammer the end of the threaded portion of the rocker shaft so pushing the drop arm off with the side of the steering box casting. The fixed pin on the rocker shaft must always be knocked OUT of the cam not into the cam. Note the markings on drop arm and rocker shaft shown in Fig. 8 for refitting.

If the steering is stiff in the centre position only, the adjusting screw 13556 (see Fig. 5) is probably tightened up too much. Screw up "finger tight" only, but lock up the lock nut really tight. This adjustment *must* be made with the gear in the centre position only.

Knock or Backlash in the straight ahead position.

It is quite possible for even a stiffly operating gear to have a knock or backlash in the straight ahead position. This is due to play of the taper pin in the cam groove, and is eliminated by re-adjusting the screw (13556 Fig. 5) until a slight binding can be felt when turning the steering wheel to and fro with the gear in the *straight ahead position.*

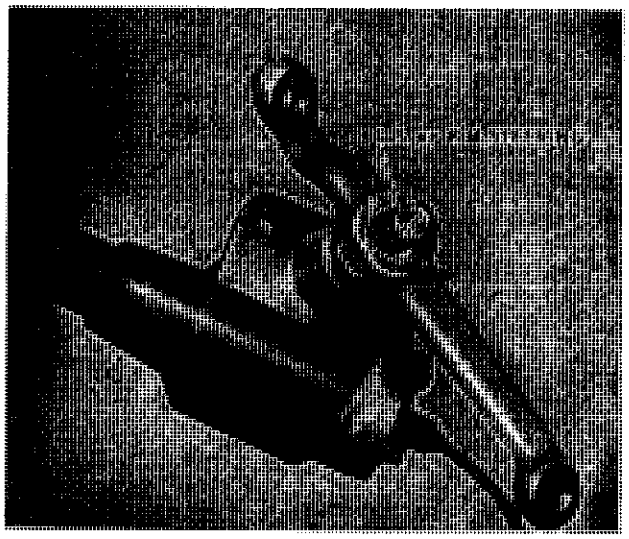


Fig. 8. Showing position for correct engagement of drop arm with rocker shaft

Lost motion can be easily detected by lightly shaking the drop arm (14355, Fig. 5) in a forward and rearward direction and moving the steering wheel to and fro near the straight ahead position until the least amount of play is found (this fixing the deepest point of engagement between the rocker shaft lever and cam). Keep the gear in this position and then adjust the setting of the screw (13556, Fig. 5). Be careful not to adjust this screw too far in so that the feel in the straight ahead postion is too heavy; just a slight touch is all that is required, otherwise the top cover plate 14307 will be damaged and oil lost quite apart from the fact that the steering will be rendered stiff in the straight ahead position

OVERHAUL OF GEAR

Stiff Steering Gear.

If the steering gear is stiff in all positions it is most probable that the steering column is pulled out of line with the frame bracket. Loosen the top support clip for the outer column (under the instrument board) and let the column find its own unrestricted position. If it is out of line horizontally, the box bracket bolts must be re-adjusted, but if it is out of line vertically, the bracket must be " packed out " to correct the fault. If still in all positions, the explanation may be one or more of the following, *and the unit should be removed from the car for examination.*

(a) Tight felt bush at the top of the steering column.
(b) Rocker shaft too tight on its bearing.
(c) The cam too tight in its bearing.
(d) Bent steering tube.
(e) Stator fouling the inside of the steering column.
(f) Trafficator head binding.

If the steering assembly is properly fitted and there is no question therefore of the steering column being pulled out of line, one of the other points enumerated must be to blame.

To investigate the possibility of point (e) and (f) being responsible, loosen off the brass gland nut 10805 holding the trafficator tube at the bottom end of the steering and the three grub screws in the steering wheel, and partly withdraw the tube.

If the steering is still stiff when the stator tube is free, investigate the possibility of point (c) above being responsible by slightly loosening the four setscrews (about half to three-quarter of a turn is sufficient) which holds the bottom end plate 14481 in position. This eases the ball bearings.

If the procedure indicated in the previous paragraph fails to ease the steering, retighten the four setscrews and remove the steering wheel and trafficator and ascertain whether the felt bush 8533 at the top of column is tight and if so ease.

If the felt bush is not responsible for the trouble and the gear is still found to be stiff, the next step is to investigate the possibility of a bent steering tube. To explore this possibility, withdraw the felt bush and see if the inner column pulls heavily to one side of the outer column.

REMEDIES

Easy gears with backlash or knock.

1. Disconnect the rods from the drop arm (14355, Fig. 5). Set the steering partly towards right- or left-hand lock. (Full lock position should not be used). Grip the lever firmly and try to move it forwards and backwards (holding the wheel from turning) and see if the steering wheel shows any lift. If such play exists, this is due to end play of the cam in the ball bearings. The remedy for this lift is to remove one or more shims adopting a similar procedure to that described further on for the addition of shims when dealing with a tight bearing. A very slight pre-loading of balls is permissible.

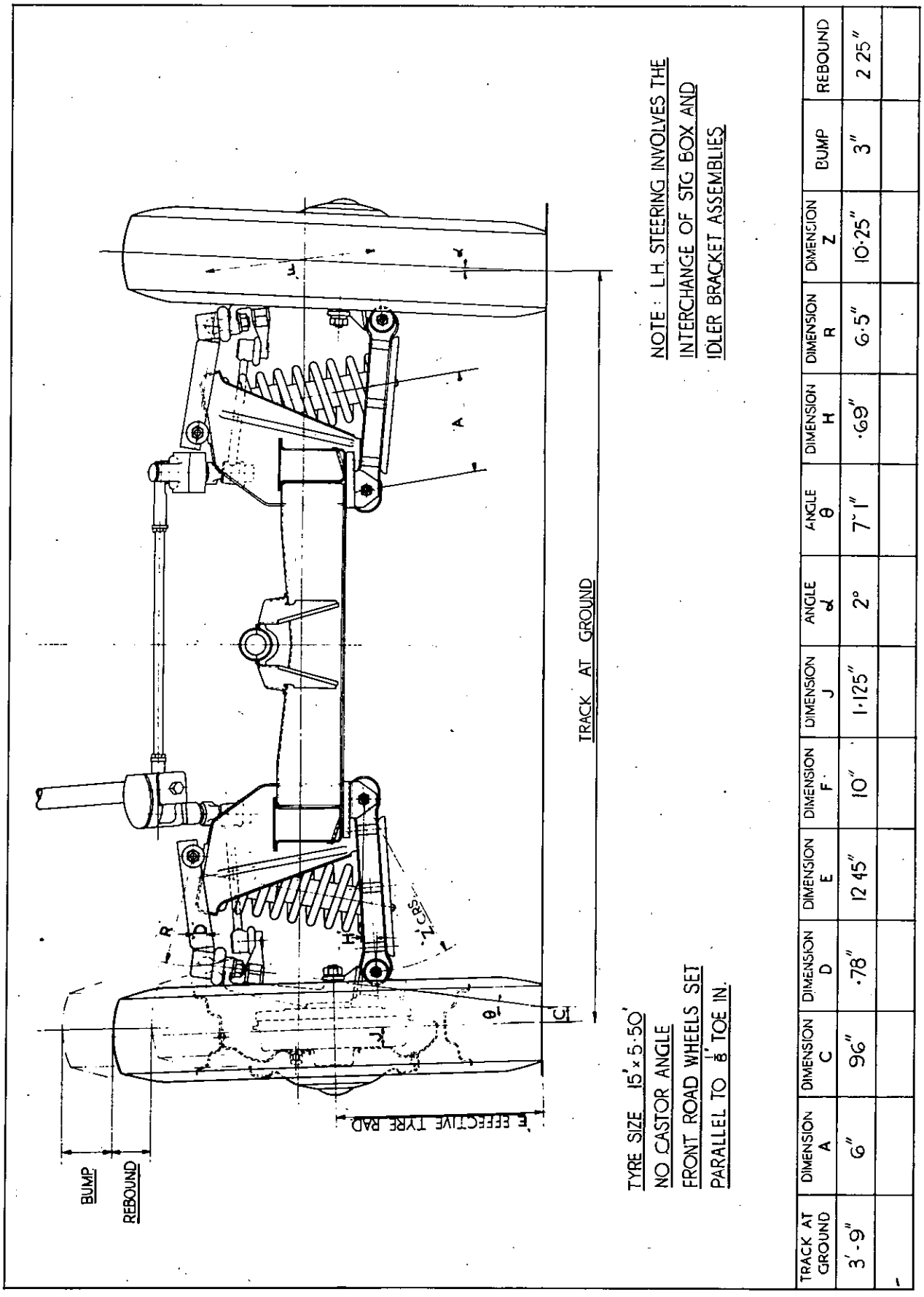
Bent Steering Inner Column.

The inner column is fairly flexible and *slightly* pulling to one side has little or no effect on the feel of thegear, but a badly bent column which is causing stiffness should either be rectified or replaced.

Tight Cam Bearings.

Remove top cover plate and rocker shaft. If by turning the steering the ball bearing can be felt grinding, the cam bearings (17612, Fig. 5) are too tight.

Remove the four setscrews (14486) which secure the base plate (14481) and *insert* an *additional* shim or shims of sufficient thickness to give an easy fit for the bearings. End play must not exceed .0015". Be careful if, when removing the base plate, the ball cup and the ball cage come away, that they are properly replaced when refitting the end cover. Take care also to renew the paper washer if it is damaged and to keep the shims scrupulously clean, otherwise oil leakage may develop.



TRACK AT GROUND	DIMENSION A	DIMENSION C	DIMENSION D	DIMENSION E	DIMENSION F	DIMENSION J	ANGLE α	ANGLE θ	DIMENSION H	DIMENSION R	DIMENSION Z	BUMP	REBOUND
3'-9"	6"	96"	·78"	12 45"	10"	1·125"	2°	7°1"	·69"	6·5"	10·25"	3"	2 25"

Fig. 9. Steering geometry details

To Replace the TOP Bearing Race 17612.

Remove the steering as stated in this manual. Unscrew the four setscrews 14486 on top cover plate 14307. Remove top cover plate 14307 and shims. Withdraw rocker shaft 14306. Unscrew the four setscrews 14486 on the end cover plate 14481 and remove cover plate. Take out the shims and remove the cup 14487 and BOTTOM ball race 17612. Withdraw cam 14489 and column 14490 and owing to the diameter of the top of the column being slightly greater than the internal diameter of the TOP ball cage 17612, the top ball cage 17612 will come out as well with the column. Cut off the cage of the TOP ball race 17612 and destroy both cage and balls. Hold gear vertically with box uppermost and pack recess of the cup where the TOP ball cage is housed with grease and place 14-$\frac{7}{32}$" diameter balls in the housing without any cage. Still with gear vertical, reassemble steering making sure that no balls drop into the box when the column and cam are replaced in the steering box, and that the previous faults are not overlooked.

Replacement of Cork Gland, 14371 at Rocker Shaft.

Gear to be taken out of car as described on Page 12.

Drain oil out of steering box 14479, Obtain a small tube slightly larger than the diameter of the rocker shaft. Place tube over splined end of rocker shaft and tap steel washer 14370 holding cork washer 14371, with the aid of the tube. This will make the washer cup shaped and so enable it to be taken out. With a sharp point remove cork washer. Replace new cork washer. Place steel washer in back to front and tap gently with small tube mentioned above. This will have the effect of springing washer into position. Peen over round the edge of the washer to hold it in place. Refill box with oil.

Refitment of Steering Gear.

When steering assembly has been refitted after overhaul before connecting any other part to the drop arm make sure the steering is easy and free. By this means it is possible to determine whether tightness of steering is due to the steering gear or any other assembly.

Refitment of the steering drop arm lever.

If, for any reason, the lever has been removed from the gear, it is essential that it goes back on the correct spline. A line is scribed on the bottom of the rocker shaft and one on the drop arm, as shown in Fig. 8.

On refitment of the drop arm care should be taken that one of the tabs of the lock washer has been turned down to prevent nut unscrewing and one turned up against main boss of drop arm.

LUBRICANTS

The oil recommended for this steering gear is of the extreme pressure type and the necessary recommendations are included in the summary given in the General Data Section.

N.B. Care should be taken that on refitment of oil filler plug 14386 to side cover plate that the washer 9692 is not omitted.

STEERING GEOMETRY

Neither Castor Angle nor wheel camber is adjustable these being built into the design of the Front Suspension Unit.

Where one of these Cars have been involved in an accident, the castor angle and/or camber may be upset by damage to the front suspension linkage or frame side members. Where measurement of camber and/or castor disclose appreciable deviations from the details specified on Fig. 9 a careful examination should be made of the front suspension linkage etc. should be made.

MEASUREMENT OF CASTOR ANGLE, WHEEL CAMBER AND KING PIN INCLINATION

There are available a number of different pieces of equipment for carrying out these measurements.

The choice of the equipment used for this purpose will obviously depend on the one available and the instructions for the particular fixture will naturally be used.

REMOVAL OF STEERING ASSEMBLY

1. Detach lead from accumulator.
2. Remove radiator block and grille as explained in the " Cooling System " section. The grille need only be removed when dealing with a left hand steering model.
3. Disconnect steering column electrical leads at junction.
4. Release lock nut at each end of steering centre tie rod ($\frac{3}{4}$" A/F spanner) and screw tie rod out of ball pins.
5. For right hand steering models remove dynamo and disconnect battery lead to starter motor.

6. For right hand steering models, disconnect petrol pump hose to prevent this being damaged. With left hand steering models the manifold assembly must be removed to provide the necessary clearance for the steering unit's removal.
7. Disconnect the two gear change operating rods from the levers on the steering columns. This should be done by removal of the castellated trunnion nut on each rod ($\frac{9}{16}$" A/F spanner).
8. Partially remove the Simmonds nut which secures the outer tie rod end to drop arm., ($\frac{5}{8}$" A/F spanner).
9. Having partially removed the tie rod end nut, a pinch bar suitably supported on the chassis may be used to prize the tapered end of ball pin out of the drop arm as shown in Fig. 10.
10. Remove stator tube assembly from steering column after removal of three grub screws, from under the steering wheel, and withdrawing the union which secures the olive at the base of the steering column.
11. Remove the draught excluder rubber and keep plate which surrounds the steering column and is secured to the dash by four self-tapping screws.
12. Remove the nut which secures the steering wheel to the inner column ($1\frac{5}{16}$" A/F spanner) and remove steering wheel with the extractor as shown in Fig. 6.
13. Remove millboard steering column cover from cubby hole by removal of securing screws. This uncovers column bracke and steady bar.
14. Free the bolt which secures the steady ba to the support bracket and remove the " U " bolt nuts which secure the two halves of th bracket to the cubby hole see Fig. 11.
15. Remove pinch bolt ($\frac{1}{2}$" A/F spanner) fron the upper steering column change spee bracket, after first marking each side of th bracket with a scriber for reassembly When a new steering unit is to be fitted th method of fitting these controls given late in this section should be adopted.
16. Remove the steering box trunnion bolt This unit is secured to the body valance by means of a $\frac{5}{8}$" A/F headed $\frac{7}{16}$" bolt and a $\frac{3}{4}$" A/F simmonds nut.
17. Remove the two bolts which secure th lower change speed mechanism brackets to the steering column ($\frac{7}{16}$" A/F spanners) after first marking the position of the assembly on the steering column to assist in reassembly, and fold back upper half of this bracket, thus freeing it from the steering column. Movements of the steering unit will facilitate this operation, which, under any circumstances is rather an awkward one.
18. The steering assembly can now be manoeuvred out of the car as shown in Fig. 12. The right hand steering model, shown does not actually require the removal of the grille as well as the radiator film block.
19. Reassembly is approximately the reverse, but the front wheel alignment will neces-

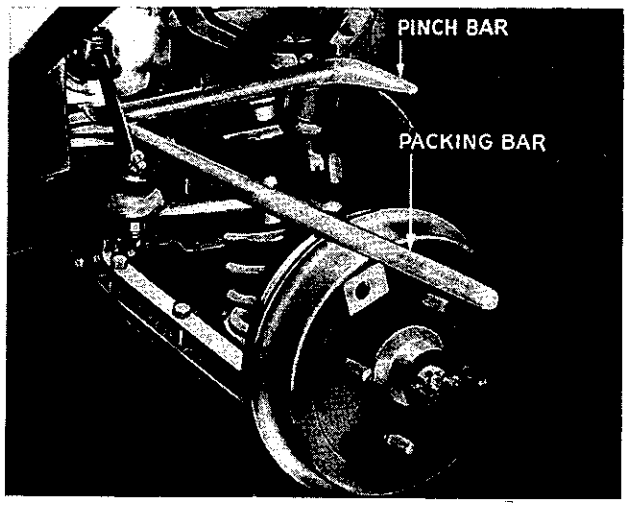


Fig. 10. Showing method of releasing bell pin from steering box drop arm

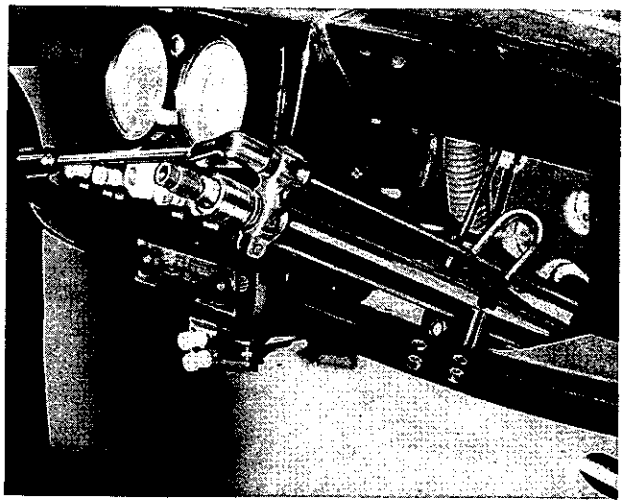


Fig. 11. Showing steering wheel and upper portion of column support removed

sarily have to be re-set after the centre tie rod has been refitted. The length of this tie rod should be so adjusted as to provide an alignment of " Parallel to $\frac{1}{8}$" Toe-in."

Dismantling and reassembly of steering unit.

Having removed steering unit as described above, proceed to dismantle as follows :—

1. Remove drop arm nut and locking plate ($\frac{15}{16}$" A/F spanner).
2. Extract drop arm with extractor as shown in Fig. 7. Note the relation of scribed line on drop arm and rocker shaft, as shown in Fig. 8 for refitting.
3. Remove steering box cover plate by withdrawal of four setscrews and spring washers ($\frac{7}{16}$" A/F spanner required). Note paper packing for replacement.
4. Drive out rocker shaft with a hide faced hammer.
5. Remove bottom cover with shims by withdrawal of four setscrews ($\frac{7}{16}$" A/F spanner) noting the shims for replacement. The brass shims are .003" and the steel ones are .010". New paper packing will be required on reassembly.
6. The bottom bearing cup and race can now be removed and the centre shaft withdrawn. The upper race will remain on the centre shaft. Where it is found necessary to replace the upper race, it should be forced off the shaft being replaced on re-assembly by fourteen $\frac{7}{32}$" loose balls.
7. The felt bush washer can now be withdrawn from the top of the steering column tube if it is necessary to replace this.

Setting Steering Lock Stops.

The steering lock stop consists of an eccentric roller (See Fig. 2) secured to each of the Front Suspension Vertical Link Trunnions by means of a setscrew.

IT IS MOST IMPORTANT THAT THE LOCK STOPS COME INTO ACTION BEFORE THE ROCKER SHAFT FOLLOWER REACHES END OF ITS CAM PATH.

The correct adjustment of the lock stops should allow a " Back Lock " of 31 degrees and a " Forward Lock " of 24 degrees.

The best way of checking and setting this lock is to place the road wheels on a wheel movement measure, as shown in Fig. 13 and to measure the wheel movement from the " Straight Ahead " position making any necessary correction to the Lock Stops. In the absence of such equipment, a protractor and straight edge should be used.

If it is impossible to obtain the appropriate lock positions in spite of attention to the lock stops, this indicates either a damaged drop arm or steering lever or, in rare cases, a fault in the Steering Unit itself. Where such a difficulty does arise, the appropriate steps to fit the necessary replacements should be taken.

Damaged Steering Levers etc.

In view of the serious possible consequences of a failure of a Steering Lever or vertical link and the fact that the heat treatment of these parts require the attention of a specialist, no attempt should be made to re-set damaged items.

Where accidental damage is suspected, the steering levers should be set up on a surface plate and checked against the dimensions which are given in the various illustrations. Where discrepancies are found replacement parts should be fitted.

Details are given below for the steering items requiring specialised heat treatment which are particularly susceptible to accidental damage :—

Detail No.	Description of Part	Illustration No.
300148	Vertical Link	14
200132	Tie Rod Lever L.H. ...	15
200131	Tie Rod Lever R.H. ...	16
200133/4	Idler Lever or Drop Arm (Early Batches of Cars)	17
200649/50	Idler Lever or Drop Arm (Later Batches of Cars)	18

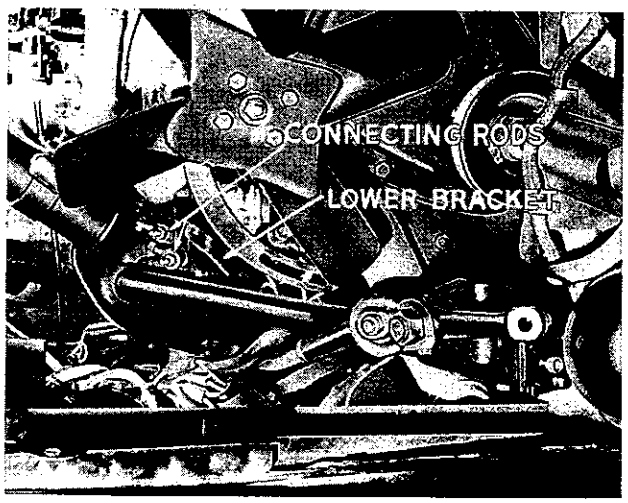


Fig. 12. Showing position for withdrawal of steering unit (R.H. steering)

Fitting Steering Column Controls. (See Fig. 19).

Generally speaking, when removing these controls for any reason, the best procedure to adopt, where no change of steering unit or change speed details is involved, will be the precaution of marking the position of the brackets on the column and only slight adjustments should then be required after refitting.

When new controls, or a steering unit, are required the following procedure should be adopted :—

1. Offer up the controls to the steering column and with the upper bracket and control shaft assembly in the same vertical plane as the Drop Arm Pivot, adjust the position of this bracket on the steering column until, with the knob on the hand lever forced upwards, as far as it will go, the upper side of this knob is approximately $1\frac{3}{8}$" from the underside of the steering wheel as shown in Fig. 19. Secure the bracket in this position by tightening up the pinch bolt.
2. The positioning of the bracket, as indicated in the previous operation automatically fixes the distance of the lower bracket up the steering column, it merely being necessary to align it in the same vertical plane as the upper bracket and hence with the drop arm pivot and to secure the two clamping bolts ($\frac{7}{16}$" A/F Spanners required).
3. Having placed the gearbox in "Neutral" and with the connecting rods attached to the two operating cross shafts place the hand operating lever at the top of the steering column in a horizontal position and connect the upper ends of the two connecting rods in their respective levers on the steering column. The position of the nut on each side of the trunnion attachment on the respective levers will have to be adjusted, as necessary, to maintain the horizontal position of the hand lever, the Neutral position of the gearbox and complete freedom of up and down movement of the control shaft in this position.
4. The foregoing procedure should ensure proper operation of the gears, but a road test will disclose any further necessity for adjustment.

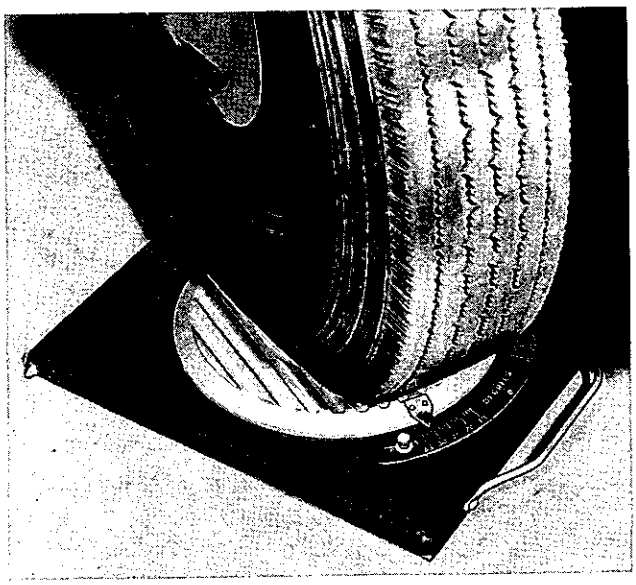


Fig. 13. Showing use of wheel turning measure for setting steering clock—V. L. Churchill Turning Measure

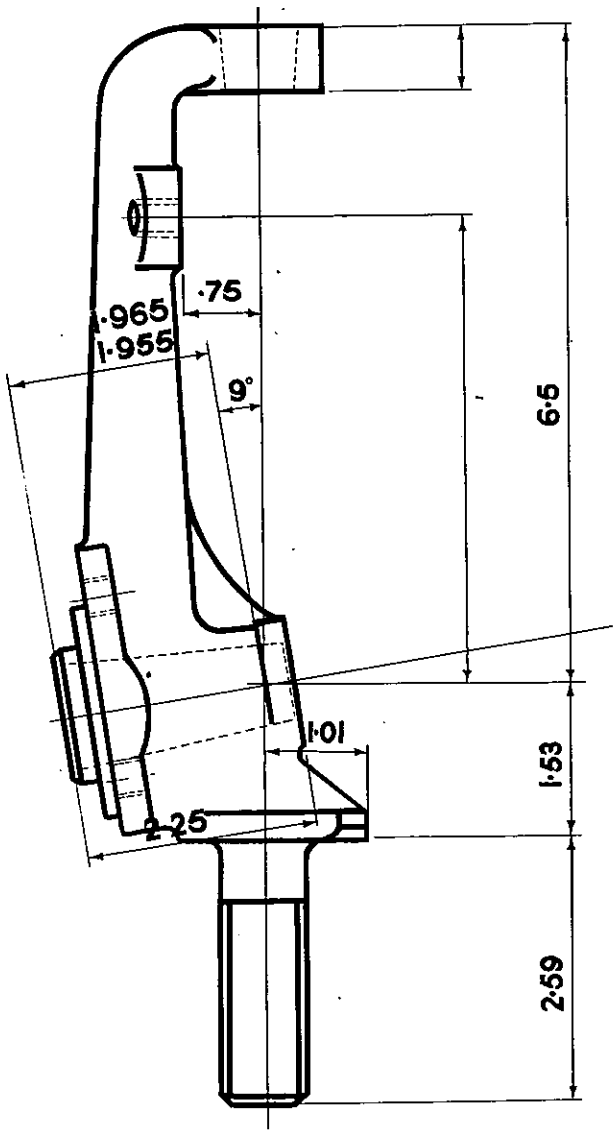


Fig. 14. Vertical link

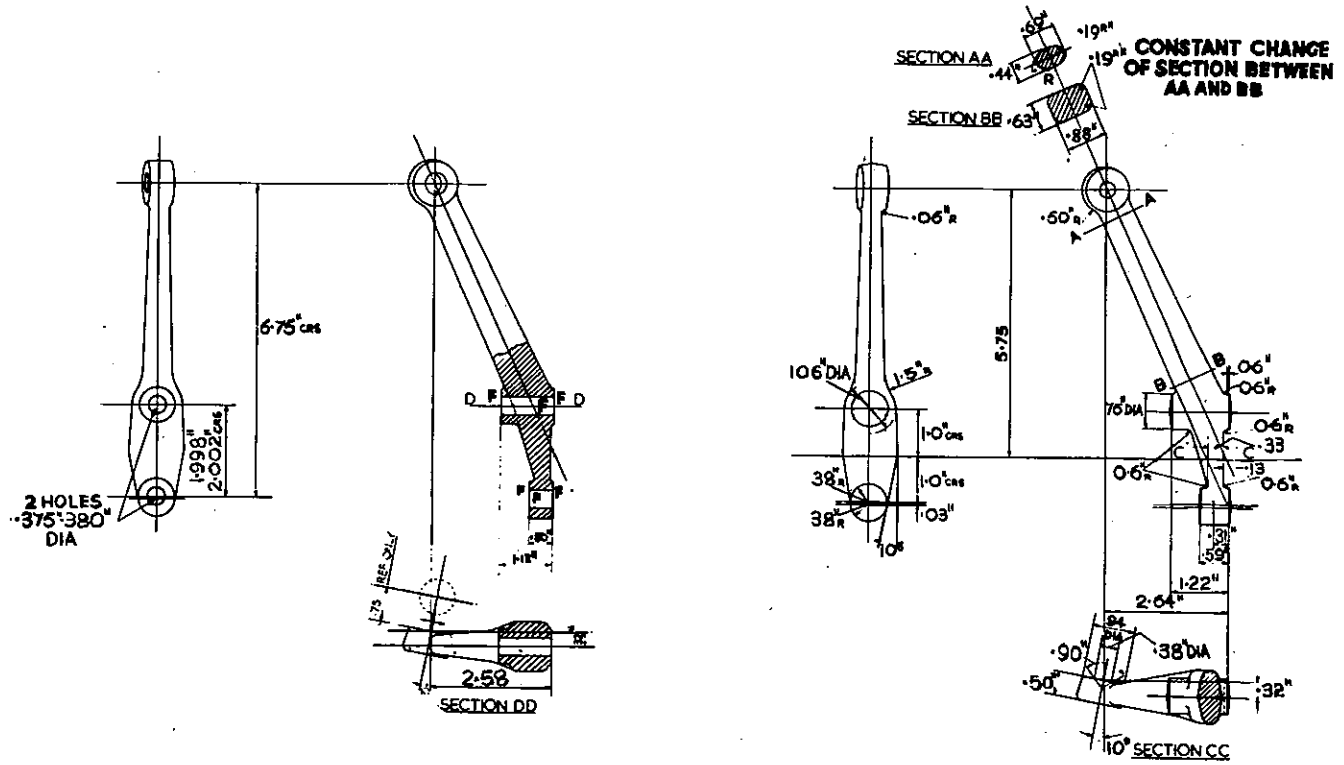


Fig. 15. Tie rod lever L.H.—Detail 200132

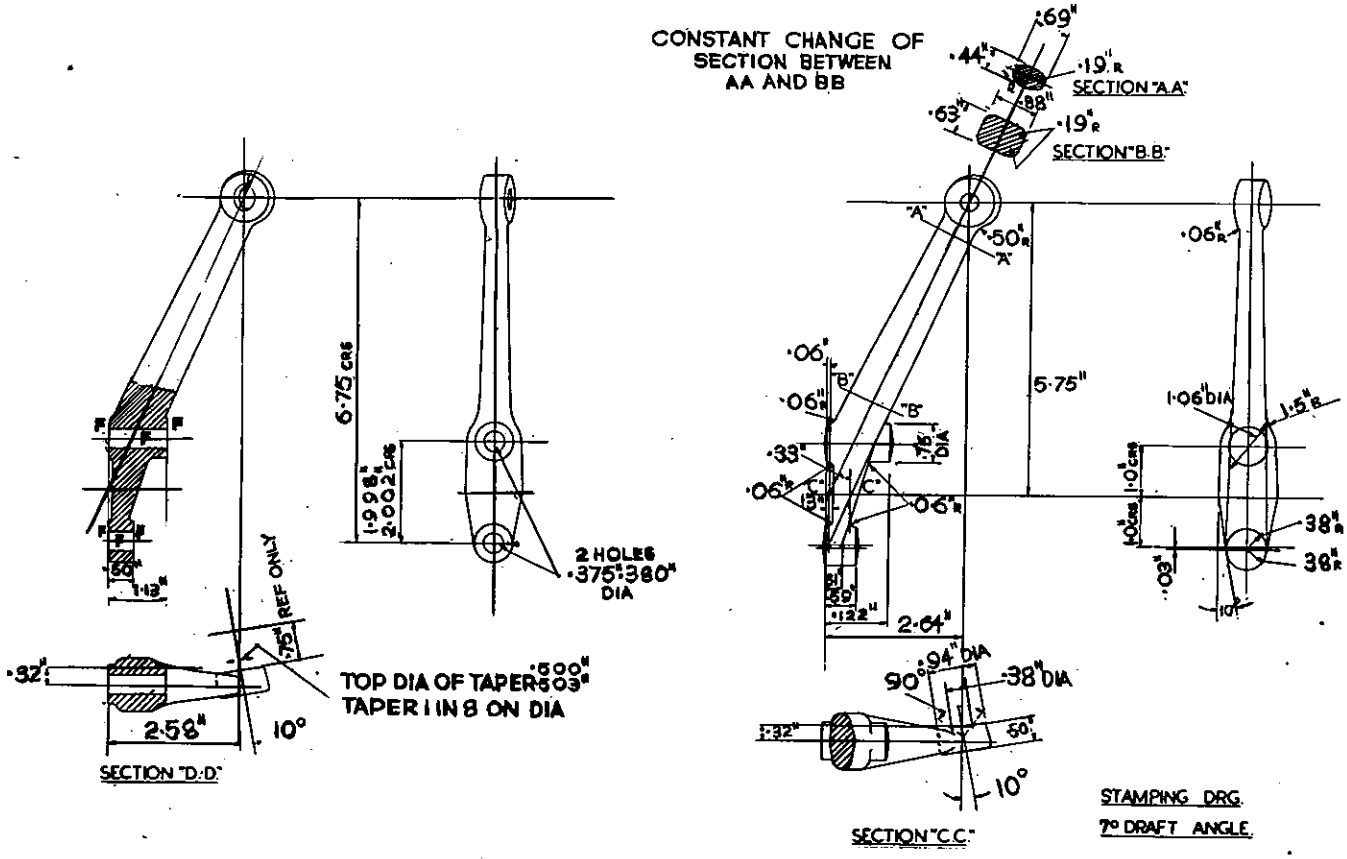


Fig. 16. Steering tie rod lever R.H.—Detail 200131

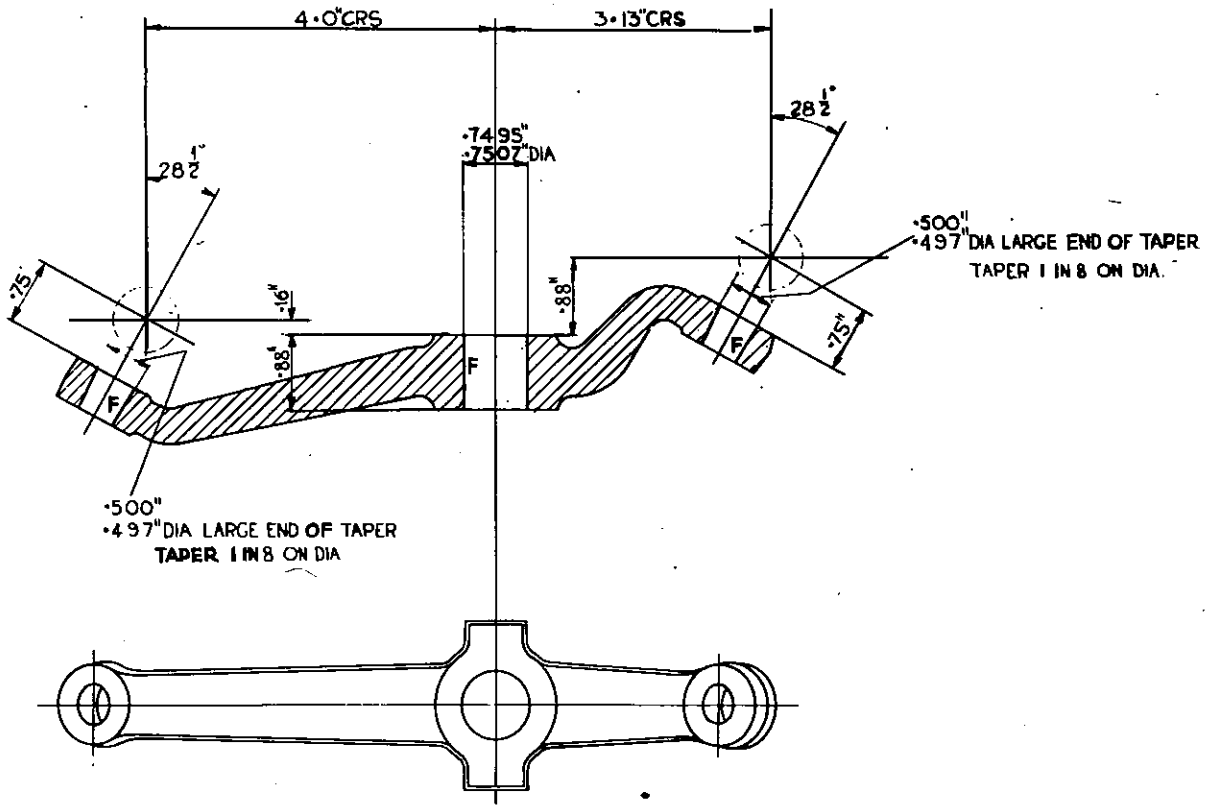


Fig. 17. Idler lever—Detail 200134 (Identical apart from central hole to drop arm—Detail 200133)

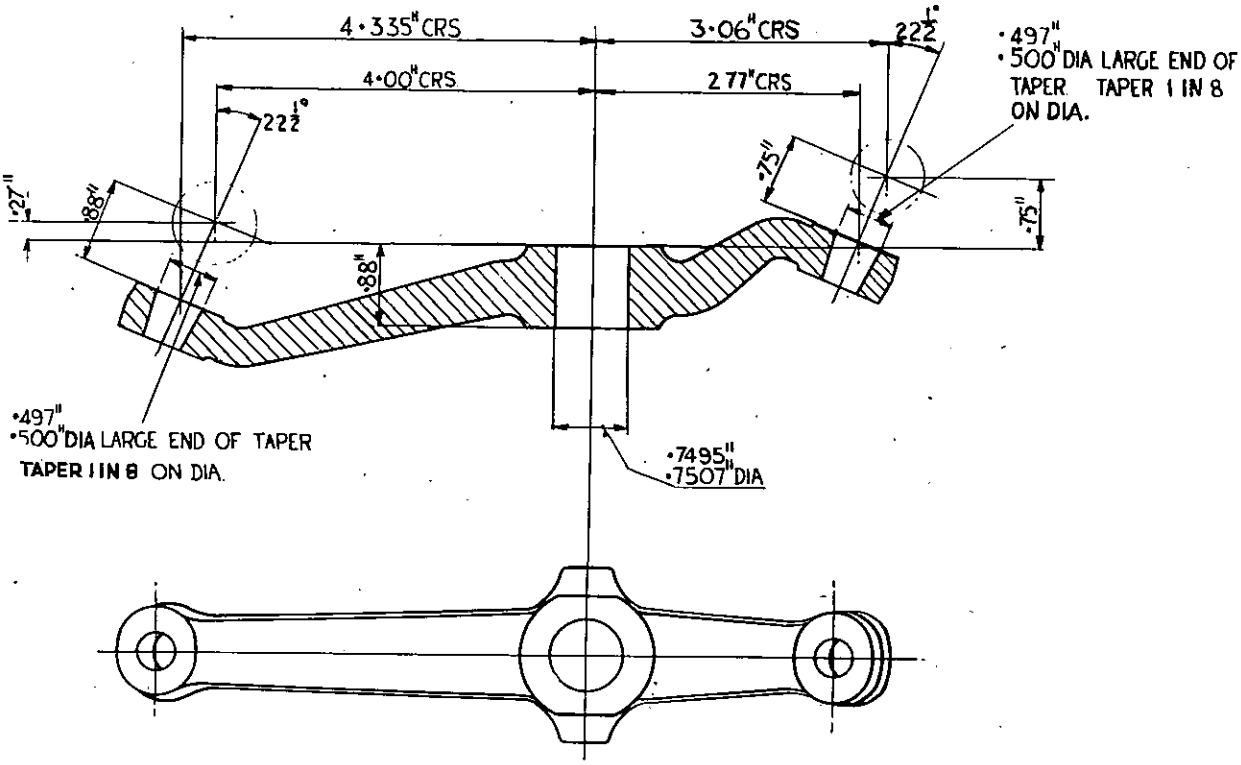


Fig. 18. Idler lever—Detail 200650 (Identical apart from central hole to drop arm—Detail 200649)

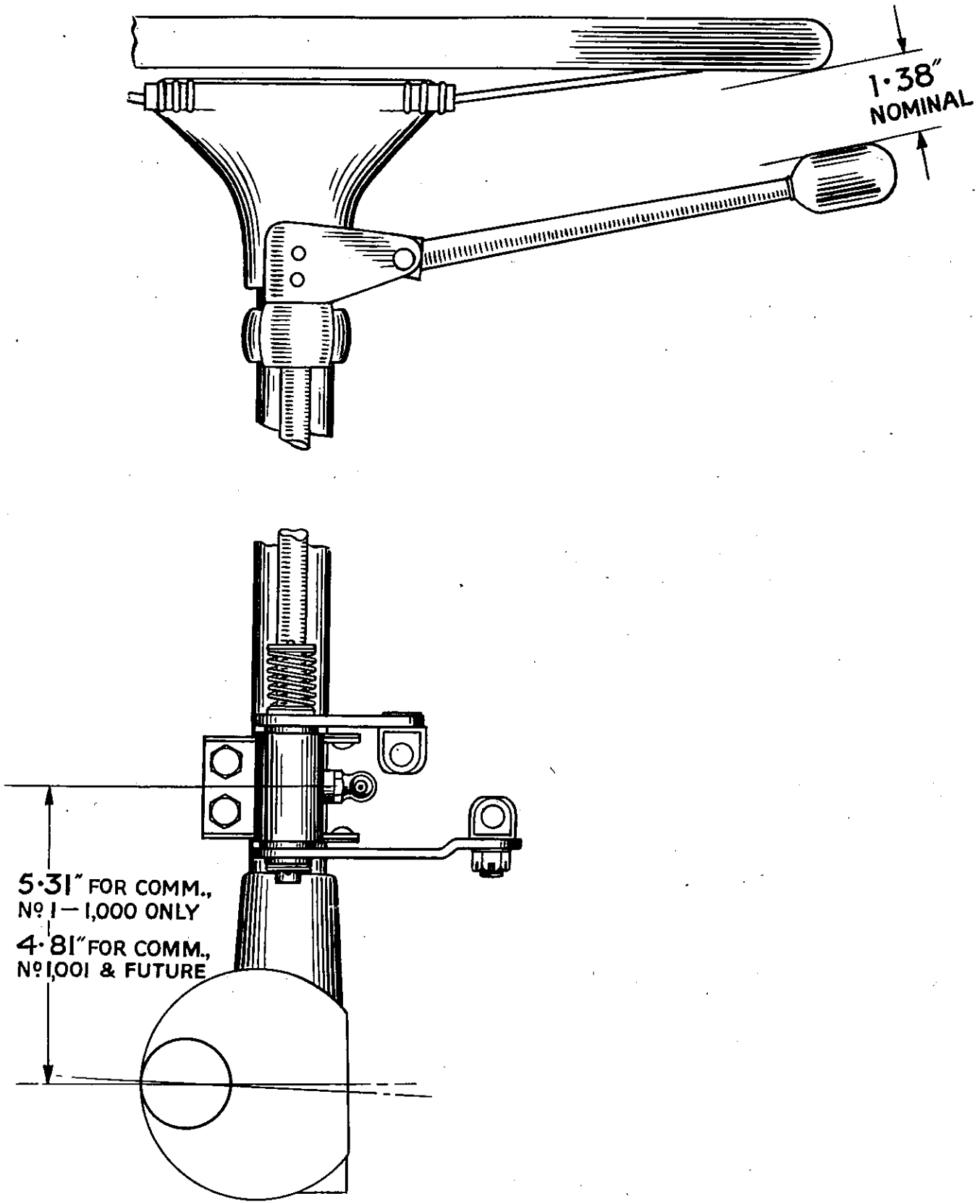


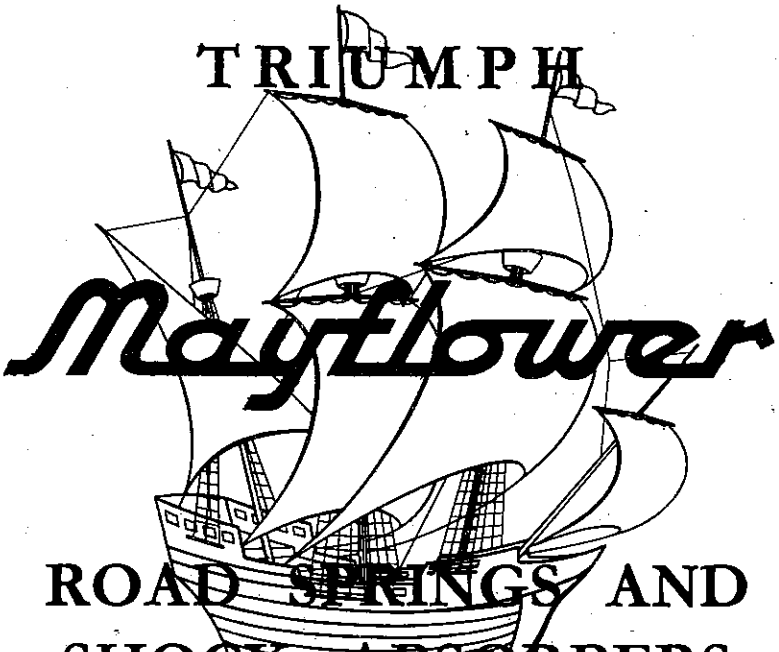
Fig. 19. Guide when fitting steering column change speed controls

Service Instruction Manual

First Issue

TRIUMPH

Mayflower



ROAD SPRINGS AND SHOCK ABSORBERS

SECTION H

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

ROAD SPRINGS AND SHOCK ABSORBERS

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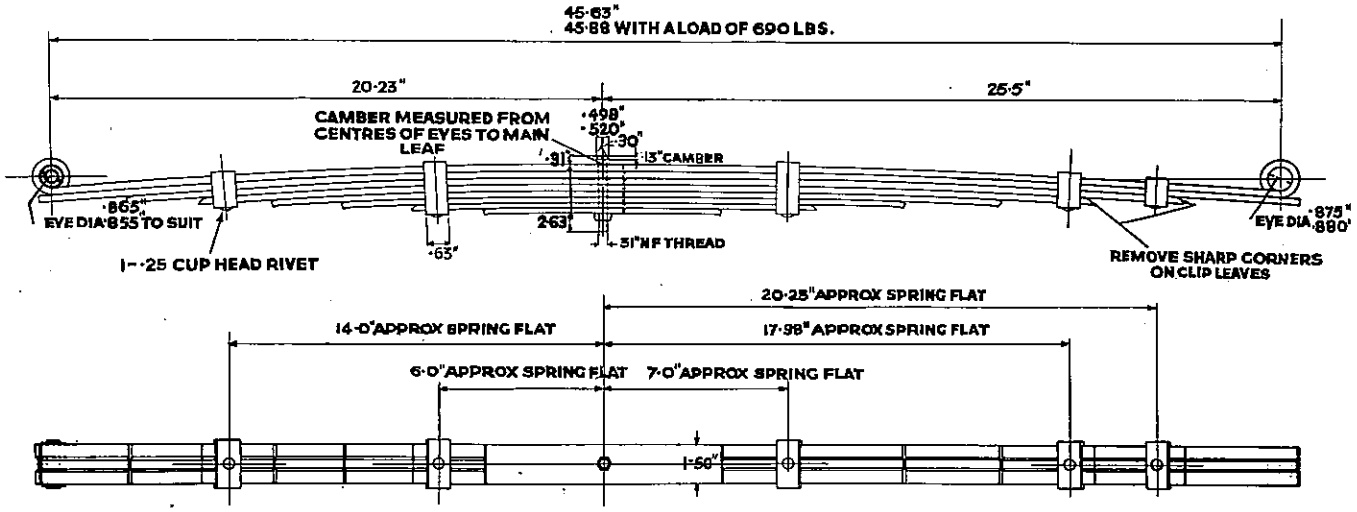

LEAF No	LEAF LENGTH	SHORT END	LONG END	THICKNES
1		20·25"	25·5"	·231"
2	46·75	20·75"	26"	·231"
3	39·38	17·63"	21·75"	·231"
4	33·38"	15"	18·38"	·231"
5	27·50"	12·50"	15"	·208"
6	21"	9·63"	11·38"	·208"
7	15"	7"	8"	·208"
8	9·06"	4·50"	4·56"	·188"

TOTAL THICKNESS 1·736"
ALL LEAVES 1·50" WIDE

CAMBER(FREE)	NOT SPECIFIED	CAMBER LADEN	ZERO ± ·25"
DEFLECTION(STATIC) BASED ON SPECIFIED RATE	6·65"	STATIC LOAD	690 LBS.
PERIODICITY(LADEN)	73·0"	·231" LEAVES STRESS(STATIC)LBS/□"	86,200
RATE(LBS/INS ± 5%	104"	·208" LEAVES STRESS(STATIC)LBS/□"	92,700

Fig. 1. Rear road spring detail 300549.

FRONT SPRINGS

Description

Low periodicity coil springs are used with the " Mayflower." The action of the spring is controlled by a telescopic type shock absorber which is dealt with later in this Section.

Maintenance

The springs are not likely to require replacing during the Cars normal lifetime. It is most important, however, to ensure that the shock absorbers are in good order, as this is a composite part of the front suspension unit.

These springs requre no lubrication. Indeed although the rubber cup washer at either end of each spring is splash resistant, persistent lubrication of these washers will lead to their eventual destruction.

In view of the integrated construction of the body and chassis used with the " Mayflower " the front springs can be quite easily compressed with an ordinary lifting jack—the weight of the chassis and body providing the necessary reaction, whenever it is found necessary to remove the road spring prior to dismantling the front front suspension.

FRONT SPRING (DETAIL 101181) DATA.

Item	*Dimension*	*Unit*
Section of Coils	0.50" ± .005"	Inch.
No. of free Coils	$8\frac{3}{4}$	—
Mean Dia. of Coils	3.50" ± .010"	Inch.
Rate	238	Pounds/Inch.
Free Length	12.25" (Approx.)	Inch.
Fitted Length	8.5" ± $\frac{3}{32}$"	Inch.
Static Deflection	3.74"	Inch.
Fitted Load	890	Pound.
Solid Length	5.25" Max.	Inch.
Weight	5.85	Pound.
Stress Solid	Mean. 119,000	Pound per sq. in.
	Wahl. 143500	
Hand of Helix	Unimportant	

ROAD SPRINGS AND SHOCK ABSORBERS

REAR SPRINGS (Fig. 1.)

Description

Semi-elliptical laminated springs are used, which have their fulcrum points offset from centre. The long end of each spring is fitted towards the rear of the Car.

Each spring is provided with a silent block bush at the front end and is shackled at the other end to a bracket on each side member, the pins being mounted in split rubber bushings, which are mounted in the bracket and spring eye respectively for the top and bottom of each shackle.

Note: In view of several alterations made to the rear springs and attachment details for early batches of these Cars, it is more than usually important to state the Commission Number of the car concerned when ordering replacements.

Lubrication.

The only lubrication required is that for the spring leaves and under no circumstances should oil be applied to the silent bloc and rubber bushings.

Over lubrication of spring leaves should be avoided it merely being necessary, after the springs have been cleaned, to brush the leaves at the edge with engine oil, when sufficient of this oil will penetrate between the leaves, to provide inter leaf lubrication. Lubrication of spring blades is chiefly required at the ends of the leaves where one presses upon the next, and where the maximum relative motion occurs.

To remove front road springs.

This operation is described on Page 7 under "Front Suspension and Steering."

To remove rear road springs.

1. Jack up rear of car and fit chocks under front wheels.
2. Remove road wheels.
3. Detach nuts from "U" bolts securing springs to rear axle casing. Leave shock absorber arm attached to bottom spring plate.
4. Whilst supporting the rear axle on a jack, withdraw the plate from each shackle after removal of the two castellated nuts. The yoke of the shackle can then be tapped sideways out of the rubber bushings in the spring eye and chassis bracket and the rear end of the spring lowered onto the ground.
5. To complete the removal of the springs, it is merely necessary to remove the castellated nut which secures the front end of each spring to the fixed shackle and to drive the spring off with the silent block bushing.

To dismantle springs.

In general, the best procedure to adopt when dealing with a spring which has settled badly, or where blades are broken, is to fit a replacement.

In some cases, however, it may be impossible to obtain a replacement without considerable delay and a repair of the existing spring may then be necessary.

We do not recommend the resetting of road springs, as such repairs are rarely satisfactory, but where such resetting is unavoidable it should be carried out by a competent spring maker after reference to the data given in this section.

Where, in spite of the remarks made in the previous paragraphs, it is found necessary to dismantle a road spring, proceed as follows:—

1. Remove the four spring clips.
2. Remove the centre bolt and dismantle spring.
3. Clean and examine blades for cracks or breakages. Cracks or breakages will most likely occur towards the bolt hole in each blade where the maximum stress occurs. Replace bent or worn centre bolts.

Note: When ordering replacement springs always state Commission No. of Car for which these are required.

SPRING DATA FOR "MAYFLOWER" CARS. (SEE FIG. 1).
REAR SPRINGS.

Part. No.	Camber (Laden)	Total Thickness	Width	No. of Blades	Spring Centres (Load of 690 lbs.)	Comm. No.
300351	$\frac{1}{2}" \pm \frac{1}{4}"$ NEG.	1.932"	$1\frac{1}{2}"$	10	$48\frac{3}{8}" \pm \frac{1}{8}"$	TT.1—TT.450
300409	$1\frac{1}{8}" \pm \frac{1}{8}"$ NEG.	1.932"	$1\frac{1}{2}"$	10	45.63" 45.38"	TT.451—TT.927
300548	$1\frac{1}{2}" \pm \frac{1}{4}"$ NEG.	1.952"	$1\frac{1}{2}"$	10	45.63" 45.38"	TT.928—TT.3070
300549	ZERO $\pm$ .25"	1.736"	$1\frac{1}{2}"$	8	45.63" 45.88"	TT.3071 & future

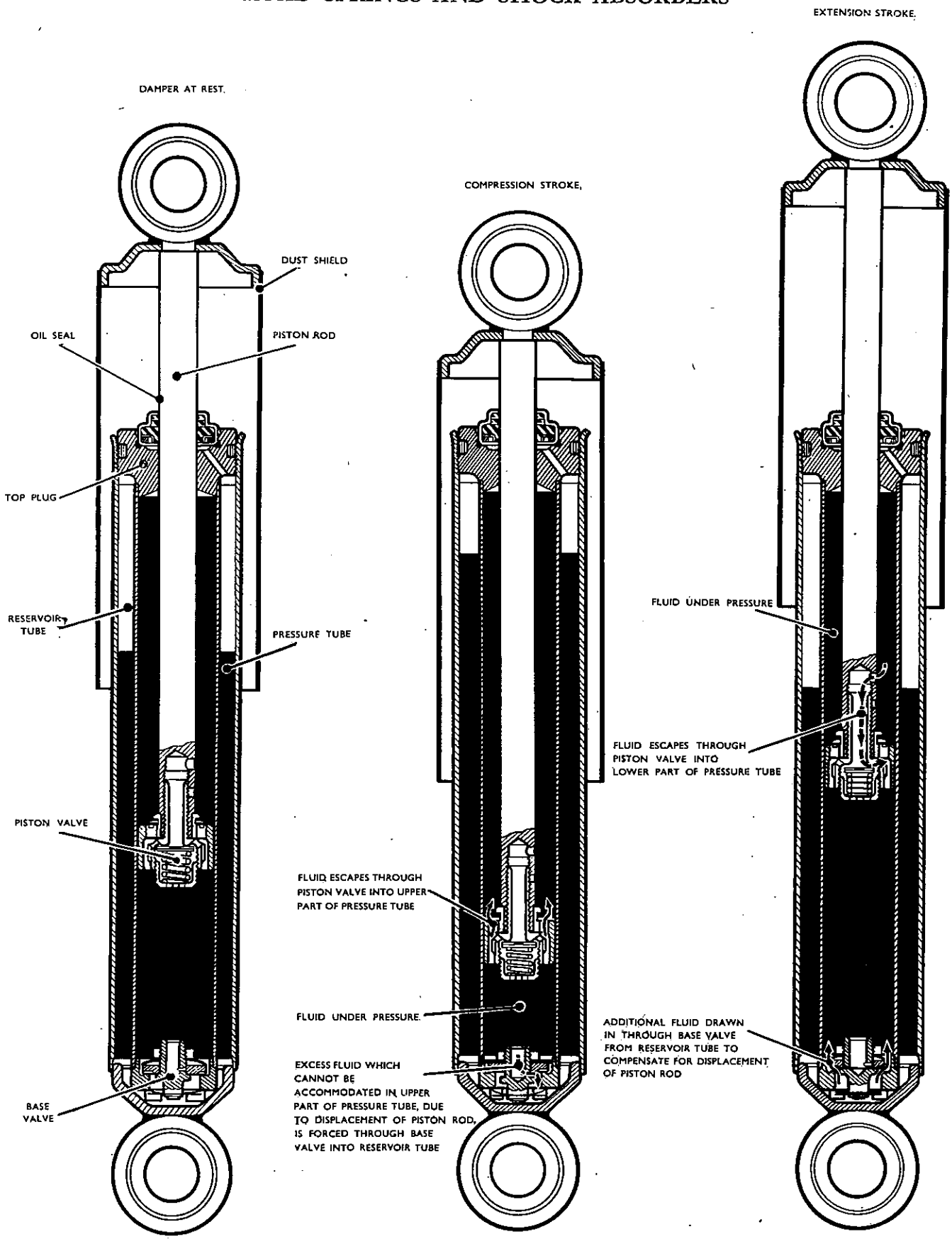

Fig. 2. D.A. type damper.

SHOCK ABSORBERS

Description (Fig. 2.)

The body of the damper is telescopic and forms a strut between the axle assemblies and the frame of the car. Broadly speaking it consists of a cylinder of small bore and long stroke, attached at its lower and closed end to an eye in which there are rubber bushes for the pin securing it to the axle assembly. Thrusting downwards into this cylinder is a piston carried on a long rod. This has a rubber bushed eye, for the rear dampers and a screwed stem for the front suspension, at its upper extremity where it is attached to the chassis frame. Outside the working cylinder and attached to it is a larger diameter tube which forms a reservoir for the fluid. Attached to the top of the piston rod is a still larger diameter inverted tube which forms a shroud and dirt excluder. The cylinder and tubes can be safely manufactured from light gauge steel and the total weight of the damper consequently kept down to a minimum.

The question of weight is of some importance with this type of shock absorber, as they differ from the radial arm type inasmuch as a portion of their weight is " sprung " the remainder being " unsprung."

The D.A. Type Damper can be divided into two parts, the upper one consisting of the piston rod with piston and the outer tubular shroud. The lower assembly consists of an outer reservoir tube which terminates in a base cup welded to an eye, its upper extremity being internally screw threaded to take a special form of plug. A spigot on the lower face of this plug enters the top of the internal cylinder and clamps it down upon a valve assembly which rests upon the base cup of the fluid reservoir. Besides locating and clamping the inner cylinder, this special plug has other functions to perform.

The plug at the top of the internal cylinder acts as a guide for the sliding piston rod and also carries an oil seal and dirt excluding gland. This oil seal consists of a synthetic rubber cup which has its lower lip pressed against the piston rod by the serrated fingers of an annular spring washer. The upper portion of this seal's cage contains a composition ring. Any fluid which exudes past the guide bearing is prevented from escaping further by the seal and is returned by way of an escape port into the reservoir tube. The cylinder is normally completely full of fluid and the reservoir to within about $1\frac{1}{2}$" from its top.

OPERATION OF THE D.A. TYPE DAMPER

Assume that the damper is in its mid-position, and that the car, travelling slowly, passes over a considerable bump in the road. The road springs are compressed and the damper is compressed and shortened. The piston in effect, therefore, moves downwards in the cylinder.

It should be appreciated that, for any given length of stroke, the fluid displacement above the piston is always less then the displacement below the piston, by reason that the swept volume above the piston is less than below, by the volume of the piston rod.

ALTERNATIVE FLUID PATHS

When the piston moves downwards, pressure is applied to the fluid below it. If the movement is slow the fluid passes through the metering restriction in the Rebound valve disc, See Fig. 3 and enters the upper part of the working cylinder above. If the movement is fast the fluid passes through the spring-controlled compression valve which is quite lightly loaded. The ported sleeve in the piston remains closed.

Downward movement of the piston displaces a greater volume of fluid than the lesser

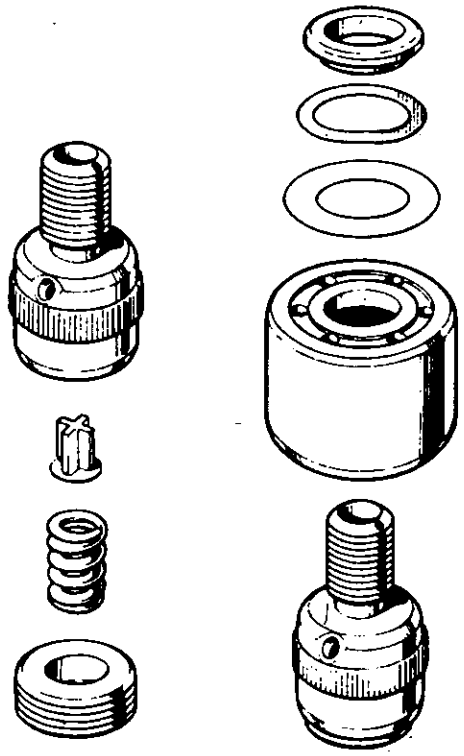

Fig. 3. Rebound valve

volume above the piston. Hence during a slow movement the excess can find a restricted way out to the reservoir through a groove machined in the valve disc of the compression valve at the base of the cylinder (see Fig. 4). If, however, the downward movement of the piston is a fast one, the slotted sleeve valve, controlled by the strong laminated spring washer, will be opened.

When a wheel has passed over a bump the road spring commences to return to its neutral position. The damper then is in the state where the piston is moving away from the bottom of the cylinder, instead of towards it as described in the previous paragraph, hence the fluid above the piston is put into compression. The fluid can now squeeze through the restriction provided by a calibrated slot in the bleed shim (see Fig. 4) if the movement is slow, but where the movement is fast the spring controlled disc valve will open and allow the fluid to pass. This passage of fluid as the piston and rod rises will, owing to the volume previously occupied by the rod and piston, require more fluid than is available, in the cylinder below the piston. To supply the defficient fluid the large diameter disc valve in the base of the cylinder opens against its comparatively light spring and allows fluid to pass from the reservoir tube.

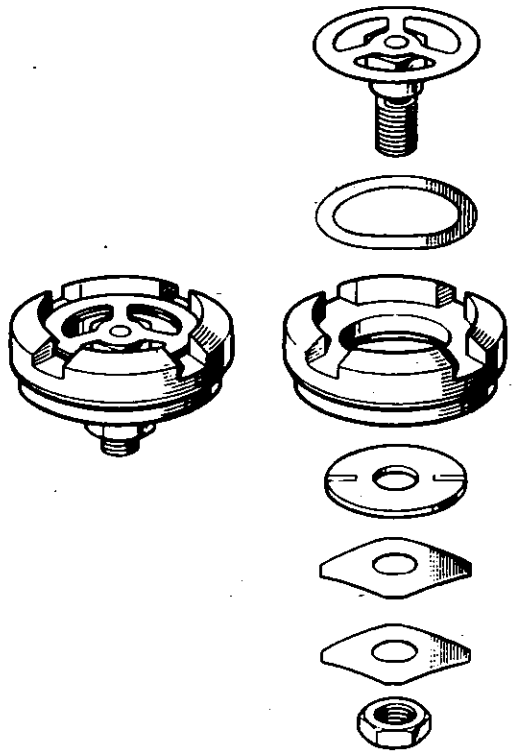

Fig. 4. Compression valve

Action of Damper when meeting a Road Depression.

Under level road conditions the damper will be in its mid-position. On meeting a depression in the road, the damper will be rapidly extended and the piston in effect moves upwards in the cylinder. The fluid above the piston is heavily compressed, and, in addition to escaping through the restriction slot in the bleed shim, will have sufficient pressure to open the spring controlled disc valve against its relatively strong coil spring, and so pass into the base of the cylinder. At the same time fluid displaced from above the piston will not be sufficient to fill the growing volume below the piston. Hence the lower portion will require more fluid which enters through the large diameter lightly loaded disc valve in the base.

When the wheel leaves the road depression, the damper is forced back towards the midway position. The piston, which may perhaps have travelled almost to the top of the cylinder, now moves inwards again. Fluid is then compressed below the piston and a depression is caused above it. This results in a flow through the slot in the bleed shim (see Fig. 3) and through the piston upper spring disc valve, the condition becoming practically the same as described for damper compression caused by a wheel passing over a bump.

After reading the notes above which describe the various cycles of operation, it will be realized that the working cylinder above and below the piston is always maintained full of fluid, which is provided from the reservoir tube. It will also be appreciated that the damper is double acting.

There is a wide range of initial setting available, but the setting used is that which is considered to be most suitable for all normal conditions. Where a car is to be driven under abnormal conditions and a modification in damping is thought to be necessary reference should be made to Messrs. Girling Ltd., Service Department, Tyseley or to their local agent.

Maximum damping is obtained when the damper is extending, as during the recoil of a spring, or the fall of a wheel below static position. When the damper is shortening, as during the compression of a road spring, or the rise of a wheel, damping up to a high percentage of the rebound setting is obtainable. Alternatively, this compression damping can be very low, as with the dampers fitted to the Mayflower.

The setting for the dampers fitted to the Mayflower provide the following resistances :—

FRONT SUSPENSION DAMPERS

High speed :

Rebound ...	...	375 lbs. ins. ± 10%
Bump ...	...	15 lbs. ins. ± 10%

Low speed bleed :

Rebound ...	...	30 lbs. ins. ± 25%
Bump ...	...	25 lbs. ins. ± 25%

REAR AXLE DAMPERS

High speed :

Rebound ...	...	375 lbs. ins. ± 10%
Bump ...	...	55 lbs. ins. ± 10%

Low speed bleed : ...

Rebound ...	...	30 lbs. ins. ± 25%
Bump ...	...	20 lbs. ins. ± 25%

SHOCK ABSORBERS

Maintenance.

Under normal circumstances, no attempt should be made to adjust these dampers, the appropriate procedure, where defects in the dampers arise, being to fit a replacement unit obtained from Messrs. Girling's local agent or direct from that manufacturer.

In countries overseas it may not always be possible to obtain replacements without considerable delay and to meet such cases alone, dismantling and reassembly instructions are given below.

It must be quite clearly understood that if an unauthorised attempt is made to adjust, or overhaul, these dampers on the home market, or indeed in countries overseas where replacements are readily available, the future service of such units must remain the responsibility of the repairer concerned.

Dismantling for servicing (see Fig. 2).

Extend the dampers until the screwed guide assembly is visible. Insert a special spanner (Girling Part No. 9010/4742) into the two keyways, (with the dampers fitted at the front of the car, this plug is protected by a dust cover which can be tapped off the reserve tube) securing the bottom eye in a vice, and turn the tool anti-clockwise until the plug is separated from the reserve tube after which the pressure cylinder can be lifted out.

At the bottom of the pressure cylinder is the compression valve, which can be easily removed by lightly tapping on its edge, with a copper drift, not forgetting that the cylinder still contains fluid. After the fluid has been poured away, the cylinder, which is a pressed fit on the rod guide assembly, can be removed. The withdrawal of the pressure cylinder reveals the extension valve fitted on the piston rod, which can be removed with a special tool (Girling Part No. 9010/4563).

The reservoir tube, which was held in the vice whilst the plug was being unscrewed, contains a certain amount of fluid which can now be discarded.

All damper parts, excepting the rod guide assembly, should now be washed with petrol or trichlorethylene, taking particular care of the valves. No attempt should be made to dismantle the valves as this will alter the setting of the dampers—the valves having been set on a special rig for the particular type of vehicle.

Wherever possible the removal of the extension valve should be avoided, as its removal will upset the concentric relation between the piston's periphery and that of its rod and thus tend to cause " binding " in the working cylinder. Re-centralization of the position in relation to the rod will necessitate the removal of the top shroud to enable the rod to be mounted on vee blocks. Whenever possible, when the extension valve or

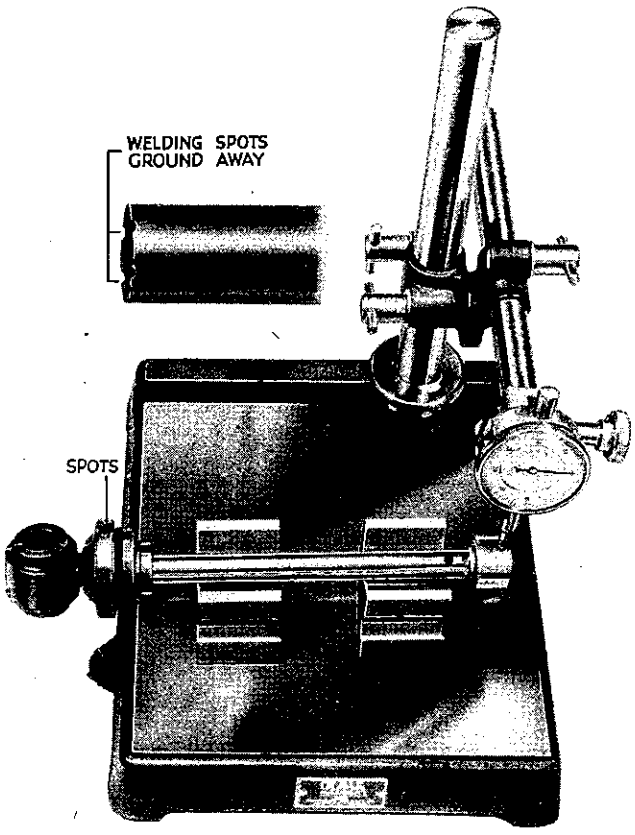

Fig. 5. Centralizing piston in relation to rod.

guide assembly is at fault, a complete top assembly should be obtained from the local agent and be fitted in place of the defective one rather than attempt to fit replacements to the existing rod.

Procedure for centralizing piston in relation to rod after valve or guide assembly replacements.

If, for any reason, it has been found necessary to exchange either the guide assembly or extension valve, owing to the fact that it has been found impossible to fit a complete assembly, suitable steps will then have to be taken to centralize the piston with rod on which it is mounted. To centralize this piston, it will become necessary to remove the shround tube by grinding out the four spot weldings (see Fig. 5) by which this shroud is attached to the upper eye, thus enabling the rod to be placed on two vee blocks. Having placed the rod on the vee blocks a dial gauge can be mounted on the piston wall and, with the valve partially secured only, by light taps on the piston periphery to make this concentric to the rod within .001"—.0015".

The valve is then tightened fully home with the special Girling spanner. The upper end of the shroud will then have to be ground square and re-attached to the eye by welding.

Refilling with fluid after servicing and reassembly.

Having overhauled the pressure cylinder as described above, the pressure cylinder is next tapped gently home on to the spigot of the rod guide assembly with a copper or lead hammer. Whilst still holding the pressure cylinder and piston rod assembly inverted in the vice, and until the extension valve up against the guide assembly, take a measured quantity of genuine Girling fluid; .16 pints for the front damper and .29 pints for those at the rear, pour this into the pressure cylinder until this cylinder is full, the balance of the fluid will be retained for filling the reservoir as explained below.

Next tap the compression valve into the pressure cylinder this can be exchanged if necessary without difficulty, taking care meanwhile not to damage this valve.

Remove the pressure tube assembly from the vice, without compressing the piston and secure the reserve chamber in the vice by means of its eye and then pour the balance of the measured quantity of fluid into the reservoir.

Before screwing the plug into the reserve for reassembly, ensure the rubber gasket is in position. Having screwed the plug securely home with a special Girling spanner 9010/4742, the damper is ready for attachment to the vehicle.

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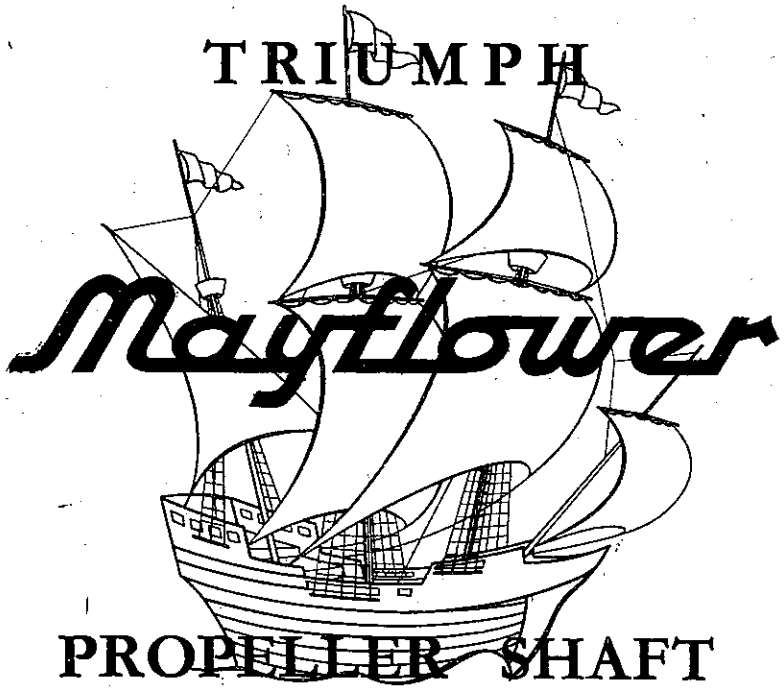

PROPELLER SHAFT

SECTION J

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

PROPELLER SHAFT

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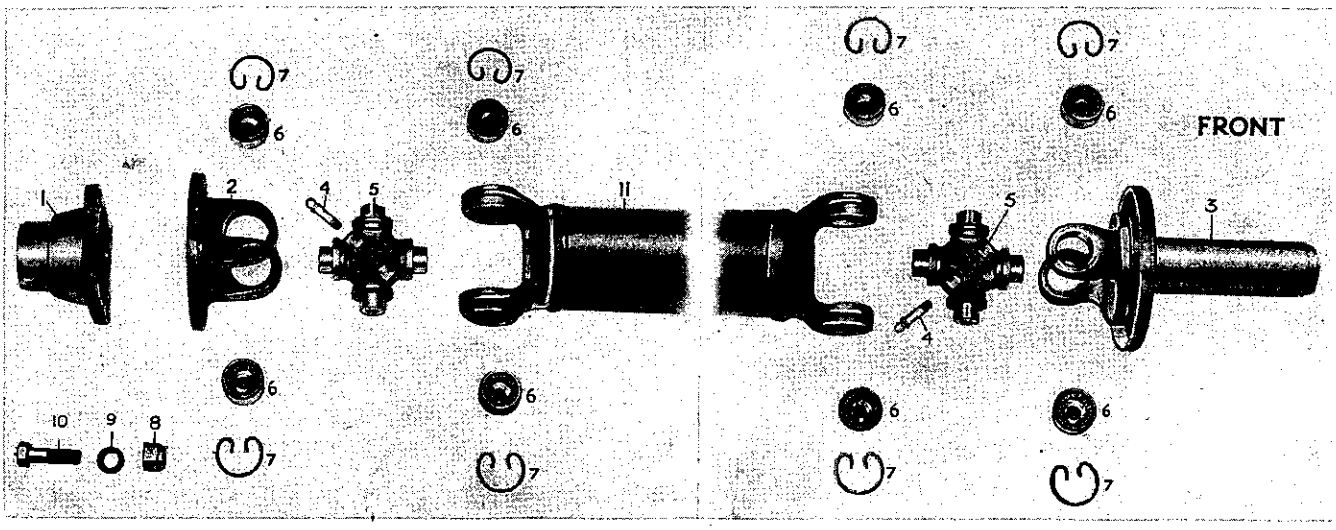

Fig. 1. Propeller shaft details

NOTATION FOR FIG. 1

Figure No.	*Item*
1	Companion flange.
2	Flange yoke.
3	Splined sleeve.
4	Greaser for universal joint.
5	Universal joint.
6	Bearing race assembly.
7	Snap ring.
8	Simmonds nut.
9	Steel washer.
10	Bolt.
11	Propeller shaft.

DESCRIPTION

The propeller shaft and universal joints fitted to the "Mayflower" are Hardy Spicer, Reversed Spline Type Series K.R. 1110, the tube being 2" in diameter and the face to end length being $47\frac{1}{8}$".

The details of this propeller shaft are shown in exploded form in Fig. 1.

When the rear axle rises and falls with the flexing of the springs, the arc of the axle's travel necessitates variations in the length of the propeller shaft, which is provided for by the fitting of a sliding sleeve at the front end of the assembly. The splined sleeve of the propeller shaft is shown under Notation 3 in Fig. 1.

A universal joint is supplied at each end, consisting of a central spider having four trunnions, four needle roller bearings and two yokes, as can be appreciated by a study of Fig. 1.

LUBRICATION

Each spider is provided with an oil nipple for lubrication of the needle bearings, which should be lubricated each 5,000 miles with the oil recommended in the summary in "General Data" section.

If a large amount of oil exudes from the oil seals, the joint should be dismantled and new oil seals fitted.

MAINTENANCE INSTRUCTIONS

To test for wear.

Wear on the thrust faces is located by testing the lift in the joint by hand.

Any circumferential movement of the shaft relative to the flange yoke or splined yoke indicates wear in the needle roller bearings or the yokes.

REMOVAL OF PROPELLER SHAFT

1. Jack up one rear wheel clear of the ground to enable the propeller shaft to be rotated.
2. Remove nuts from bolts fixing flange yoke to rear companion flange engaging first gear, as necessary to hold the shaft from turning when slackening nuts.
3. Tap out bolts and by sliding the complete shaft rearwards disengage the splined sleeve from the gearbox spline.

TO DISMANTLE PROPELLER SHAFT

Clean enamel from snap rings and top of bearing races. Remove all snap rings by pinching ears together with a suitable pair of circlip

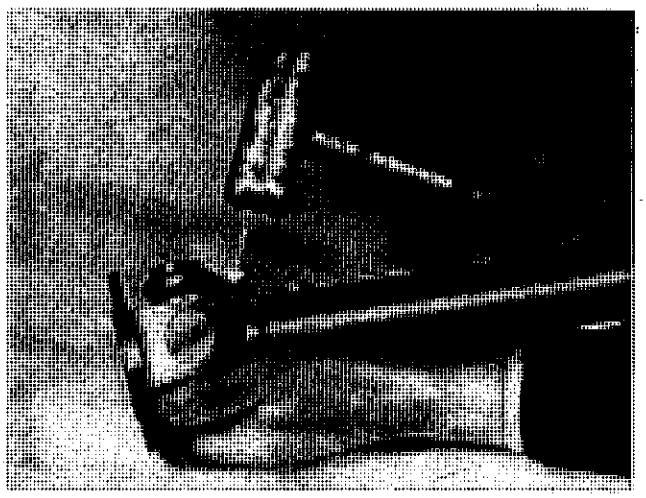

Fig. 2. Tapping sleeve yoke to release bearing race

pliers and subsequently prising out these with a screwdriver. If ring does not snap out of the groove readily, tap end of bearing race lightly inwards to relieve the pressure against ring.

Support the rear of the shaft with the yoke lug on top, tap yoke arms lightly with soft hammer, as shown in Fig. 2.

Top bearing should begin to emerge, turn shaft over and finally remove with fingers as shown in Fig. 3, but if it is necessary, tap bearing race from inside bearing with a small diameter bar as Fig. 4. taking care not to damage the bearing race. This operation may destroy the oil seal and necessitate fitting replacement parts

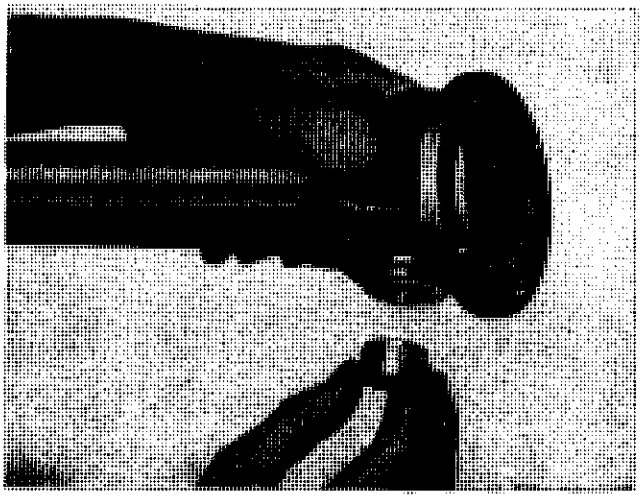

Fig. 3. Removing bearing

when reassembling, keep joint in this position whilst removing bearing race, so as to avoid dropping the needle rollers.

Repeat the operation described in previous paragraph for the opposite bearing. The flange yoke can now be removed as shown in Fig. 5.

Rest the two exposed trunnions on wood or lead blocks, then tap yoke with soft hammer to remove the two remaining bearing races.

Fig. 4. Removing bearing race with special punch

TO EXAMINE AND CHECK FOR WEAR

The parts most likely to show signs of wear after long usage are the bearing races and spider trunnions. Should looseness in the fit of these parts, load markings or distortion be observed, they must be renewed complete, as no oversize journal races are provided. It is essential that bearing races are a light drive fit in the yoke. In the rare event of wear having taken place in the yoke cross hole, the holes will most certainly be oval, and such yokes must be replaced.

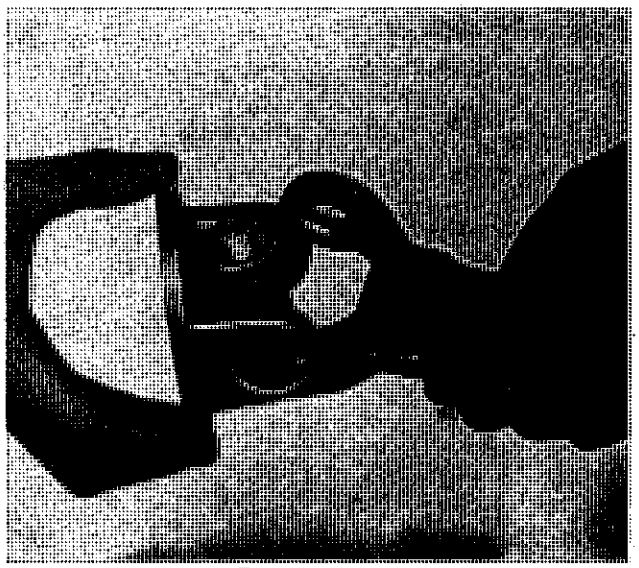

Fig. 5. Removing the yoke

In the case of wear of the cross holes in a fixed yoke, which is part of the tubular shaft assembly, only in cases of absolute emergency should this be replaced by welding in a new yoke. The normal procedure is to replace by a complete shaft assembly. The other parts likely to show signs of wear are the splines of the sleeve yoke. A total of .004" circumferential movement, measured on the outside diameter of the spline, should not be exceeded.

TO ASSEMBLE

See that trunnion assemblies are well lubricated with one of the lubricants recommended. Assemble needle rollers in bearing recess, smearing the walls of the races with vaseline or grease to retain the rollers in place.

It is advisable to replace cork gaskets and gasket retainers (oil seals) on the trunnions using a tubular drift as shown in Fig. 6. The spider journal shoulders should be shellacked prior to fitting retainers to ensure a good oil seal. Ensure that the trunnions are clean and free from shellac before fitting needle rollers.

Insert spider in yoke. Then using a soft-nosed drift about $\frac{1}{32}$" smaller in diameter than the hole in the yoke, tap the bearing into position. It is essential that bearing races are a light drive fit in the yoke holes. Repeat this operation for the other three bearings.

Refit snap rings with a suitable pair of circlip pliers, ensuring that rings engage properly with their respective grooves. If joint appears to bind after assembly, tap lightly with a soft hammer, this relieving any pressure of the bearings on the ends of the trunnions.

TO REFIT PROPELLER SHAFT

Wipe companion flange and flange yoke faces clean, to ensure the pilot flange registering properly, and joint face bedding evenly all round.

Slide the front splined sleeve on to the gearbox splined shaft and insert bolts at rear end, and see that all nuts are evenly tightened all round and are securely locked.

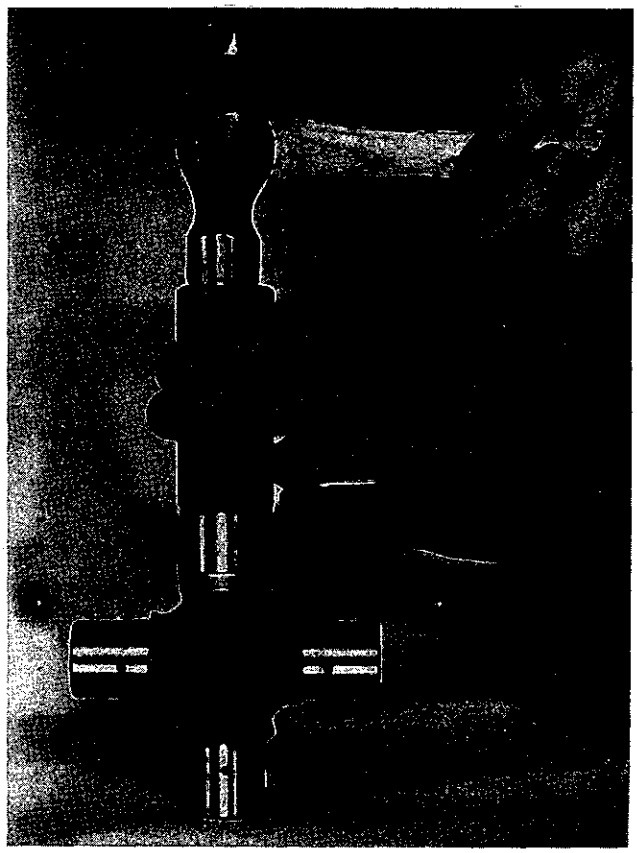

Fig. 6. Fitting new oil seals

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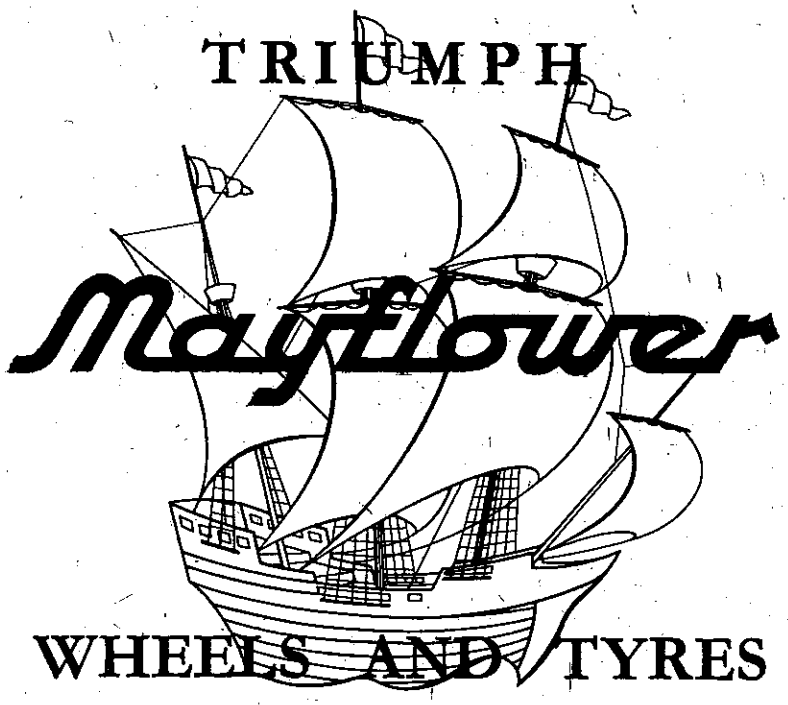

Mayflower

WHEELS AND TYRES

SECTION K

PRINTED IN ENGLAND

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WHEELS AND TYRES

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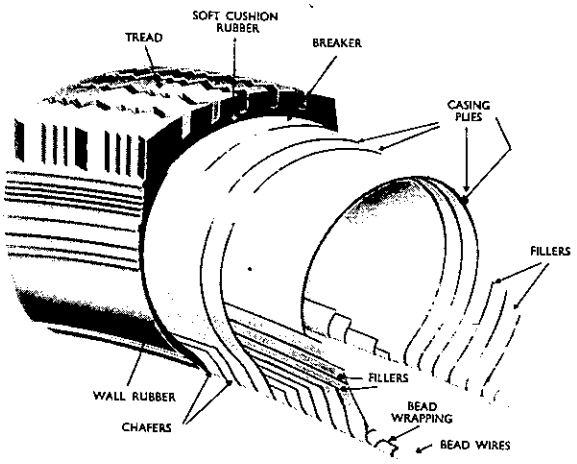


Fig. 1. Construction of tyre

One of the principal functions of the tyres fitted to a car is to eliminate high frequency vibrations. They do this by virtue of the fact that the unsprung mass of each tyre—the part of the tyre in contact with the ground—is very small.

Tyres must be flexible and responsive. They must also be strong and tough to contain the air pressure, resist damage, give long mileage, transmit driving and braking forces, and at the same time provide road grip, stability, and good steering properties.

Strength and resistance to wear are achieved by building the casing from several plies of cord fabric, secured at the rim position by wire bead cores, and adding a tough rubber tread (Fig. 1).

Part of the work done in deflecting the tyres on a moving car is converted into heat within the tyres. Rubber and fabric are poor conductors and internal heat is not easily dissipated. Excessive temperature weakens the tyre structure and reduces the resistance of the tread to abrasion by the road surface.

Heat generation, comfort, stability, power consumption, rate of tread wear, steering properties and other factors affecting the performance of the tyres and car are associated with the degree of tyre deflection. All tyres are designed to run at predetermined deflections, depending upon their size and purpose.

Load and pressure schedules are published by all tyre makers and are based on the correct relationship between tyre deflection, tyre size, load carried and inflation pressure. By following the recommendations the owner will obtain the best results both from the tyres and the car.

Inflation pressures.

Correct tyre pressures for are :—

Front	*Rear*
20 lb./sq. in.	25 lb./sq. in.
(1.4 Kg./sq. cm.)	(1.76 Kg./sq. cm.)

Note.—Pressures should be checked when the tyres are cold, such as after standing overnight and not when they have attained normal running temperatures.

Tyres lose pressure, even when in good condition, due to a chemical diffusion of the compressed air through the tube walls. The rate of loss in a sound car tyre is usually between 1 lb. and 3 lb. per week, which may average 10% of the total initial pressure.

For this reason, and with the additional purpose of detecting slow punctures, *pressures should be checked with a tyre gauge applied to the valve not less often than once per week.*

Any unusual pressure loss should be investigated. After making sure that the valve is not leaking the tube should be removed for a water test.

Do not overinflate, and do not reduce pressures which have increased owing to increased temperature. (See Section "Factors Affecting Tyre Life and Performance.")

Valve cores and caps. (Fig. 2)

Valve cores are inexpensive and it is a wise precaution to renew them periodically.

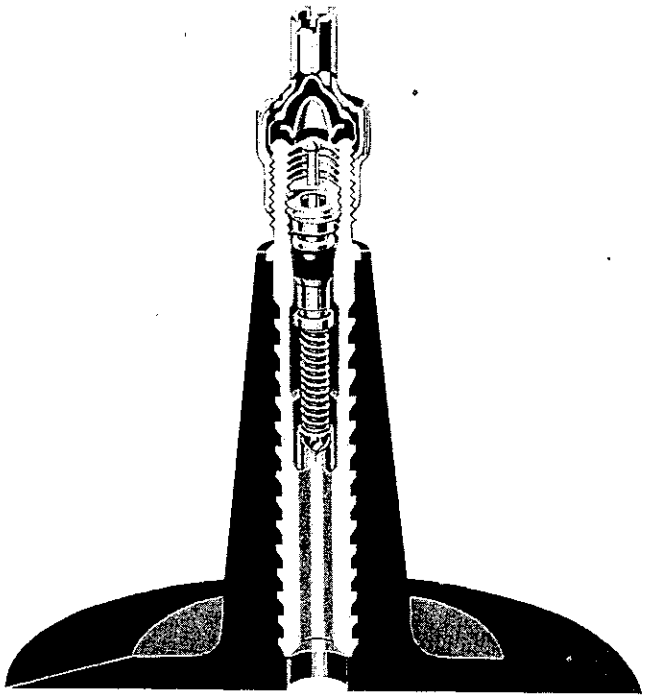


Fig. 2. Valve and cap in section

Valve caps should always be fitted, and renewed when the rubber seatings have become damaged after constant use.

Tyre examination.

Tyres on cars submitted for servicing should be examined for :—

Inflation pressures.
Degree and regularity of tread wear.
Misalignment.
Cuts and penetrations.
Small objects embedded in the treads, such as flints and nails.
Impact bruises.
Kerb damage on walls and shoulders.
Oil and grease.
Contact with the car.

Oil and grease should be removed by using petrol sparingly. Paraffin is not sufficiently volatile and is not recommended.

If oil or grease on the tyres results from over-lubrication or defective oil seals suitable correction should be made.

Repair of injuries.

Minor injuries confined to the tread rubber, such as from small pieces of glass or road dressing material, require no attention other than the removal of the objects. Cold filling compound or " stopping " is unnecessary in such cases.

More severe tread cuts and wall rubber damage, particularly if they penetrate to the outer ply of the fabric casing, require vulcanized repairs. The Dunlop Spot Vulcanizing Unit is sold for this purpose and it is also suitable for all types of tube repairs.

Injuries which extend into or through the casing, except clean nail holes, seriously weaken the tyre. Satisfactory repair necessitates new fabric being built in and vulcanized. This requires expensive plant and should be undertaken by a tyre repair specialist or by the tyre maker.

Loose gaiters and " stick-in " fabric repair patches are not satisfactory substitutes for vulcanized repairs and should be used only as a temporary " get-you-home " measure if the tyre has any appreciable tread remaining. They can often be used successfully in tyres which are nearly worn out and which are not worth the cost of vulcanized repairs.

Clean nail holes do not necessitate cover repairs. If a nail has penetrated the cover the hole should be sealed by a tube patch attached to the inside of the casing. This will protect the tube from possible chafing at that point.

Fig. 3. The effect of persistent under-inflation on tyre tread

If nail holes are not clean, and particularly if frayed or fractured cords are visible inside the tyre, expert advice should be sought.

FACTORS AFFECTING TYRE LIFE AND PERFORMANCE

Inflation pressures.

Other things being equal there is an average loss of 13% tread mileage for every 10% reduction in inflation pressure below the recommended figure.

The tyre is designed so that there is minimum pattern shuffle on the road surface and a suitable distribution of load over the tyre's contact area when deflection is correct.

Fig. 4. Internal view showing the partial destruction of the ply body due to under-inflation

Moderate underinflation causes an increased rate of tread wear although the tyre's appearance may remain normal. Severe and persistent underinflation produces unmistakable evidence on the tread (Fig. 3). It also causes structural failure due to excessive friction and temperature within the casing (Figs. 4 and 5).

Pressures which are higher than those recommended for the car reduce comfort. They may also reduce tread life due to a concentration of the load and wear on a smaller area of tread, aggravated by increased wheel bounce on uneven road surfaces. In any event cold tyres should not be inflated to pressures higher than the maximum figure shown on standard Load and Pressure Schedules for the size of tyre involved. Excessive pressures overstrain the casing cords, in addition to causing rapid wear, and the tyres are more susceptible to impact fractures and cuts.

Effect of temperature.

Air expands with heating and tyre pressures increase as the tyres warm up. Pressures increase more in hot weather than in cold weather and as the result of high speed. These factors are taken into account when designing the tyre and in preparing Load and Pressure Schedules.

Pressures in warm tyres should not be reduced to standard pressures for cold tyres. " Bleeding " the tyres increases their deflections and causes their temperatures to climb still higher. The tyres will also be underinflated when they have cooled.

Speed.

High speed is expensive and the rate of tread wear may be twice as fast at 50 m.p.h. as at 30 m.p.h.

High speed involves—

1. Increased tyre temperatures due to more deflections per minute and a faster rate of deflection and recovery. The resistance of the tread to abrasion decreases with increase in temperature.
2. Fierce acceleration and braking.
3. More tyre distortion and slip when negotiating bends and corners.
4. More " thrash " and " scuffing " from road surface irregularities.

Braking.

" Driving on the brakes " increases the rate of tyre wear, apart from being generally undesirable. It is not necessary for wheels to be locked for an abnormal amount of tread rubber to be worn away.

Other braking factors not directly connected with the method of driving can affect tyre wear. Correct balance and lining clearances, and freedom from binding, are very important. Braking may vary between one wheel position and another due to oil, or foreign matter, on the shoes even when the brake mechanism is free and correctly balanced.

Brakes should be relined and drums reconditioned in complete sets. Tyre wear may be affected, if shoes are relined with non-standard material having unsuitable characteristics or dimensions, especially if the linings differ between one wheel position and another in such a way as to upset the brake balance. Front tyres, and particularly near front tyres, are very sensitive to any condition which adds to the severity of front braking in relation to the rear.

" Picking up " of shoe lining leading edges can cause grab and reduce tyre life. Local " pulling up " or flats on the tread pattern can often be traced to brake drum eccentricity (Fig. 6). The braking varies during each wheel revolution as the minor and major axes of the eccentric drum pass alternately over the shoes. Drums should be free from excessive scoring and be true when mounted on their hubs with the road wheels attached.

Climatic conditions.

The rate of tread wear, during a reasonably dry and warm summer, can be twice as great as during an average winter.

Water is a rubber lubricant and tread abrasion is much less on wet roads than on dry roads. Also the resistance of the tread to abrasion decreases with increase in temperature. Increased abrasion on dry roads, plus increased temperatures of tyres and roads cause faster tyre

Fig. 5. Showing the result of running on a deflated tube. The tube in question was completely destroyed

wear during summer periods. For the same reasons tyre wear is faster during dry years, with comparatively little rainfall, than during wet years.

When a tyre is new its thickness and pattern depth are at their greatest. It follows that heat generation and pattern distortion due to flexing, cornering, driving and braking are greater than when the tyre is part worn. Higher tread mileages will usually be obtained if new tyres are fitted in the Autumn or Winter rather than in the Spring or Summer. This practice also tends to reduce the risk of road delays, because tyres are more easily cut and penetrated when they are wet than when they are dry. It is therefore advantageous to have maximum tread thickness during wet seasons of the year.

Road surface.

The extent to which road surfaces affect tyre mileage is not always realized.

Present-day roads generally have better non-skid surfaces than formerly. This factor, combined with improved car performance, has tended to cause faster tyre wear, although developments in tread compounds and patterns have done much to offset the full effects.

Road surfaces vary widely between one part of the country and another, often due to surfacing with local material. In some areas the surface dressing is coarser or of larger " mesh " than in others. The material may be comparatively harmless, rounded gravel, or more abrasive, crushed granite or knife-edged flint. Examples of surfaces producing very slow tyre wear are smooth stone setts and wood blocks but their non-skid properties are poor.

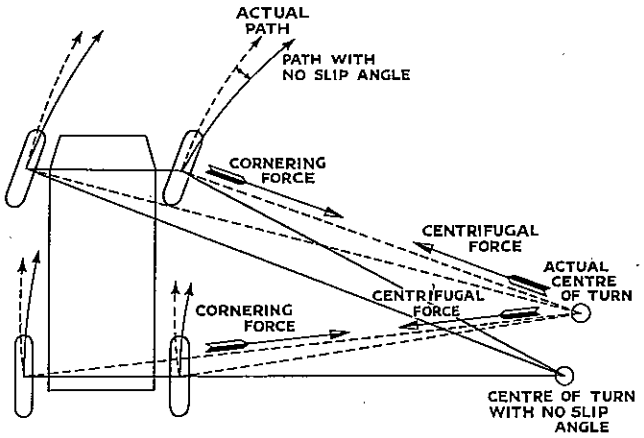


Fig. 7. Diagrammatical illustration of slip angles

Bends and corners are severe on tyres because a car can be steered only by misaligning its wheels relative to the direction of the car. This condition applies to the rear tyres as well as to the front tyres. The resulting tyre slip and distortion increase the rate of wear according to speed, load, road camber and other factors (Fig. 7).

The effect of hills, causing increased driving and braking torques with which the tyres must cope, needs no elaboration.

Road camber is a serious factor in tyre wear and the subject is discussed on page 7.

An analysis of tyre performance *must* include road conditions.

Impact fractures.

In order to provide adequate strength, resistance to wear, stability, road grip and other necessary qualities, a tyre has a certain thickness

Fig. 6. Local excessive wear due to brake drum eccentricity

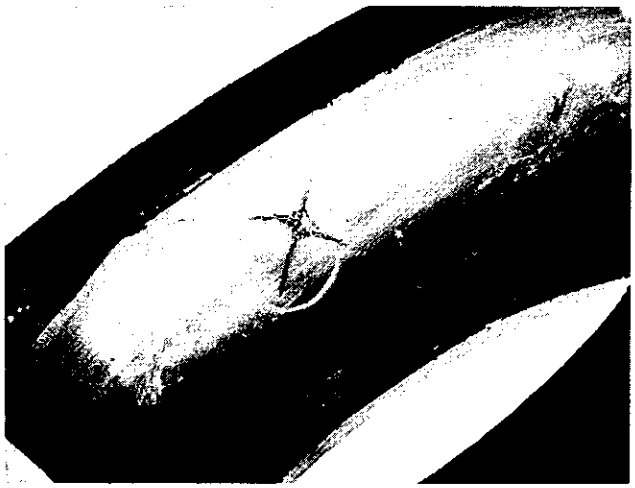


Fig. 8. Impact fracture caused by striking a sharp object such as a brick-end or pavement kerb

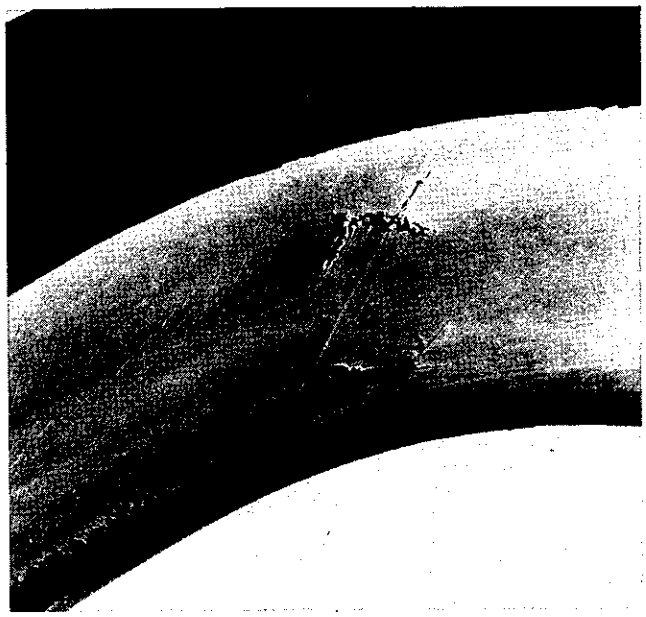


Fig. 9. Typical double fracture

and stiffness. Excessive and sudden local distortion such as might result from striking a kerb, a large stone or brick, an upstanding manhole cover, or a deep pothole may fracture the casing cords (Figs. 8 and 9).

Impact fractures often puzzle the car owner because the tyre and road spring may have absorbed the impact without his being aware of anything unusual; only one or two casing cords may be fractured by the blow and the weakened tyre fails some time later; there is usually no clear evidence on the outside of the tyre unless the object has been sufficiently sharp to cut it.

This damage is not associated solely with speed and care should be exercised at all times, particularly when drawing up to a kerb or parking against one.

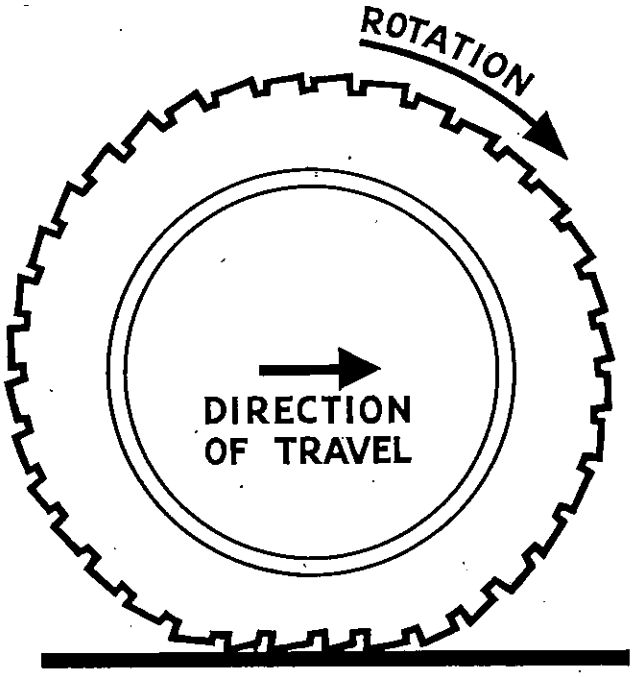


Fig. 10. " Heel and toe " wear

SPECIAL TYPES OF IRREGULAR TREAD WEAR

" Heel and toe " or " saw tooth " wear.

This is the condition where one end of each pattern segment or stud is more worn than the other (Fig. 10). To some extent it is latent in any non-skid pattern design and severe service conditions may cause it to develop.

When each successive portion of a running tyre comes under load the tread is flattened and there is limited pattern distortion and shuffle on the road surface. Additional movement is caused by braking, driving and the tyre's own rolling resistance, which acts as a constant retarding force.

On rear wheels the effects of braking and rolling resistance are offset by the effects of driving. Rear tyres usually wear evenly if they are properly maintained. Front tyres are at a disadvantage in this respect and their pattern displacement tends to be always in the same direction.

Fig. 11 illustrates the basic cause of " heel and toe " wear. If the tyre is assumed to be on a locked wheel and sliding forward, the abrasive road surface may be likened to a file passing across the tread. The manner in which the flexible rubber studs will be worn is clear. There is a similar but less marked effect when the tyre is revolving but trying to " hang back " under the forces of braking and rolling resistance.

Modern tyre patterns designed for use on

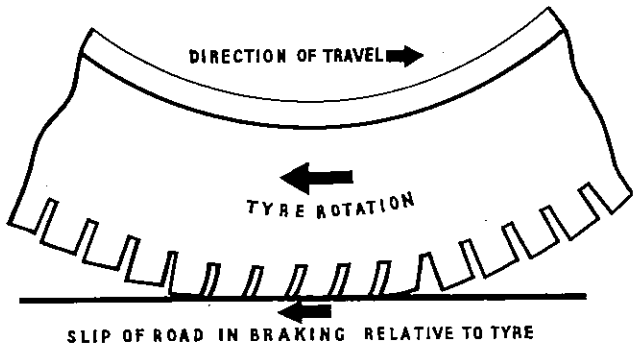


Fig. 11. Showing the effect of braking and rolling resistance on tyre tread

hard road surfaces are very stable. They do not consist of separate unsupported studs or blocks such as are shown in the diagram. In normal conditions " heel and toe " wear should be absent or barely noticeable but any localized forces such as from eccentric brake drums, fierce or binding brakes, incorrect brake balance and severe front braking will usually cause this type of wear to appear amongst other evidence of these troubles. An unsuitable tyre contact area and distribution of load, resulting from road camber, wheel camber, or excessive deflection, will also produce " heel and toe " wear.

Regular interchanging of tyres will prevent or reduce irregular wear (see Fig. 12).

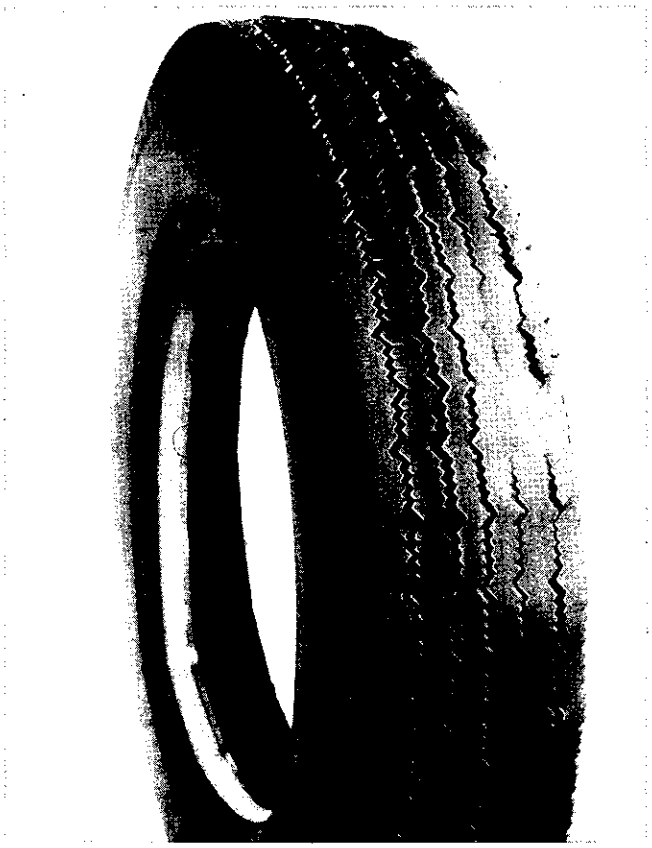


Fig. 12. Irregular spotty wear due to a variety of causes

" Spotty " wear.

Fig. 12 shows a type of irregular wear which sometimes develops on front tyres and particularly on near front tyres. The causes are difficult to diagnose although evidence of camber wear, misalignment, underinflation, or braking troubles may be present.

It has been explained that front tyres are at a disadvantage due to their fore and aft slip and distortion being in one direction. Front tyres are connected to the car through swivelling stub axles and jointed steering linkage and they are subjected to complicated movements resulting from steering, spring deflection, braking, and camber. Load transference during braking causes increased loading and pattern displacement on front tyres, and adds to the severity of front tyre operation.

Unbalance of the rotating assembly may also contribute to a special form of irregular wear with one half of the tyre's circumference more worn than the other half. Unbalance alone does not cause the type of " spotty " wear illustrated but the unbalance usually becomes progressively worse as the irregular or unequal wear develops.

The nature of " spotty " wear—the pattern being much worn and little worn at irregular spacing round the circumference—indicates an alternating " slip-grip " phenomenon but it is seldom possible to associate its origin and development with any single cause.

It is preferable to check all points which may be contributory factors. The front tyre and wheel assemblies may then be interchanged, which will also reverse their direction of rotation, or better still the front tyres may be interchanged with the rear tyres.

Points for checking are :—

(a) Inflation pressures and the consistency with which the pressures are maintained.
(b) Brake freedom and balance, shoe settings, lining condition, drum condition and truth.
(c) Wheel alignment.
(d) Camber of both front wheels.
(e) Play in hub bearings, king pin bearings, suspension bearings, and steering joints.
(f) Wheel concentricity at the tyre bead seats. S.M.M. & T. tolerances provide for a radial throw not exceeding 0.1".
(g) Balance of the wheel and tyre assemblies.

Corrections which may follow a check of these points will not always effect a complete cure, and it may be necessary to continue to interchange wheel positions and reverse directions of rotation at suitable intervals.

Irregular wear may be inherent in the local road conditions such as from a combination of steep camber, abrasive surfaces, and frequent hills and bends. Driving methods may also be involved. Irregular wear is likely to be more prevalent in summer than in winter, particularly on new, or little worn, tyres.

WHEEL ALIGNMENT AND ITS ASSOCIATION WITH ROAD CAMBER

It is very important that correct wheel alignment should be maintained. Misalignment causes a tyre tread to be scrubbed off laterally, because the natural direction of the wheel differs from that of the car.

An upstanding sharp " fin " on the edge of each pattern rib is a sure sign of misalignment and it is possible to determine from the position of the " fins," whether the wheels are toed in or toed out (Fig. 13).

" Fins " on the inside edges of the pattern ribs—nearest to the car—and particularly on the near-side tyre indicate " toe in." " Fins " on the outside edges, particularly on the offside tyre, indicate " toe out."

With minor misalignment the evidence is less noticeable and sharp pattern edges may be caused by road camber even when wheel alignment is correct. In such cases it is better to make sure by checking with an alignment gauge.

Road camber affects the direction of the car, by imposing a side thrust, and if left to follow its natural course the car will drift towards the near side. This is instinctively corrected by steering towards the road centre.

As a result the car runs crab-wise, diagrammatically illustrated in an exaggerated form in Fig. 14. The diagram shows why near-side tyres are very sensitive to too much toe in and offside tyres to toe out. It also shows why sharp " fins " may appear on one tyre, but not on the other, and

Fig. 13. Fin or feathers caused by severe misalignment. This condition is usually associated with " heel and toe " wear across the tread pattern

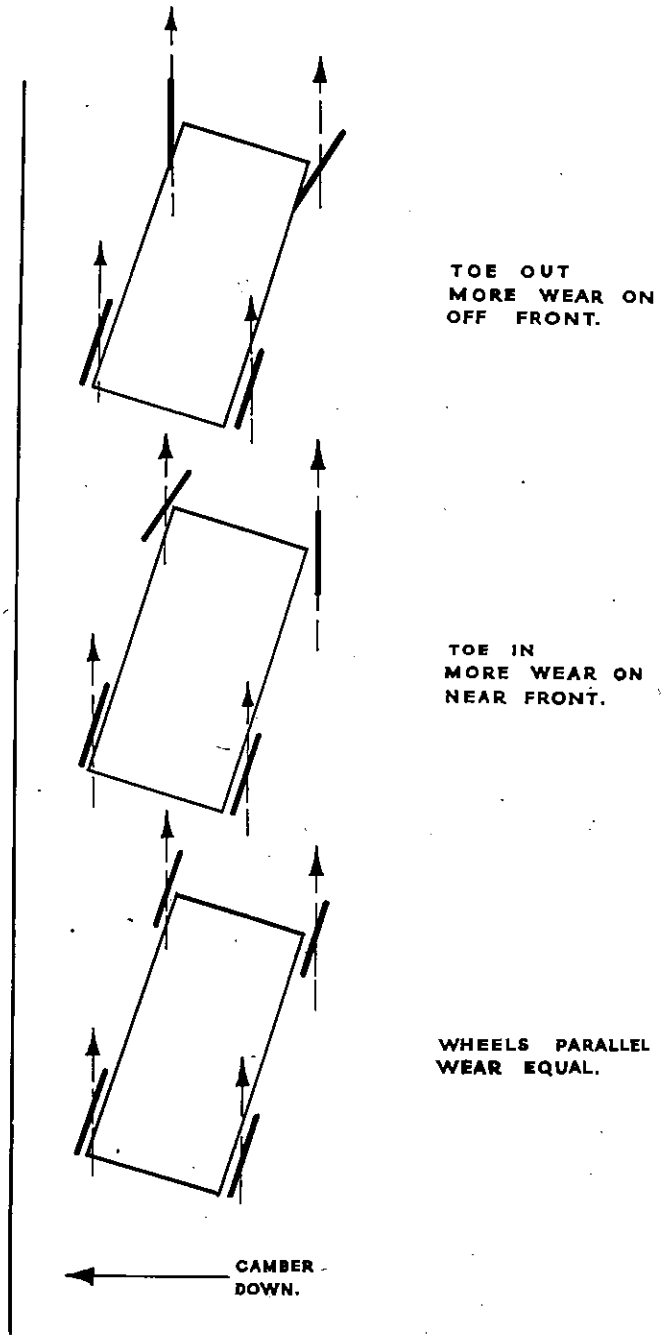


Fig. 14. Exaggerated diagram showing effect of road camber on a car's progress

why the direction of misalignment can be determined by noting the position of the "fins." Severe misalignment produces clear evidence on both tyres.

The front wheels on a moving car should be parallel. Tyre wear can be affected noticeably by quite small variations from this condition. It will be noted from the diagram that even with parallel wheels the car is still out of line with its direction of movement, but there is less tendency for the wear to be concentrated on any one tyre.

The near front tyre sometimes persists in wearing faster and more unevenly than the other tyres even when the mechanical condition of the car and tyre maintenance are satisfactory. The more severe the average road camber the more marked will this tendency be. This is an additional reason for the regular interchanging of tyres.

Precautions when measuring wheel alignment.

1. The car should have come to rest from a forward movement. This ensures as far as possible that the wheels are in their natural running positions.
2. It is preferable for alignment to be checked with the car laden. (The driver and one passenger.)
3. With conventional base-bar type alignment gauges measurements in front of and behind the wheel centres should be taken at the same points on the tyres or rim flanges. This is achieved by marking the tyres where the first reading is taken and moving the car forwards approximately half a road wheel revolution before taking the second reading at the same points. With the Dunlop Optical Gauge two or three readings should be taken with the car moved forwards to different positions—180° road wheel turn for two readings and 120° for three readings. An average figure should then be calculated. Wheels and tyres vary laterally within their manufacturing tolerances, or as the result of service, and alignment figures obtained without moving the car are unreliable.

CAMBER, CASTOR, AND KING PIN INCLINATION

These angles normally require no attention unless they have been disturbed by a severe impact or abnormal wear of front end bearings. It is always advisable to check them if steering irregularities develop.

Wheel camber, usually combined with road camber, causes a wheel to try to turn in the direction of lean, due to one side of the tread attempting to make more revolutions per mile than the other side. The resulting increased tread shuffle on the road and the off-centre tyre loading tend to cause rapid and one-sided wear. If wheel camber is excessive for any reason the rapid and one-sided tyre wear will be correspondingly greater. Unequal cambers introduce unbalanced forces which try to steer the car one way or the other. This must be countered by steering in the opposite direction which results in still faster tread wear.

When tyre wear associated with camber results from road conditions and not from car condition little can be done except to interchange or reverse the tyres. This will prevent one-sided wear, irregular wear, and fast wear from developing to a maximum degree on any one tyre, usually the near front tyre.

Castor and king pin inclination by themselves have no direct bearing on tyre wear but their measurement is often useful for providing a general indication of the condition of the front end geometry and suspension.

TYRE AND WHEEL BALANCE

Static balance.

In the interests of smooth riding, precise steering, and the avoidance of high speed "tramp" or "wheel hop" all Dunlop tyres are balance checked to predetermined limits.

To ensure the best degree of tyre balance the covers are marked with white spots on one bead, and these indicate the lightest part of the cover. Tubes are marked on the base with black spots at the heaviest point. By fitting the tyre so that the marks on the cover bead exactly coincide with the marks on the tube a high degree of tyre balance is achieved (Fig. 15). When using tubes which do not have the coloured spots it is usually advantageous to fit the covers so that the white spots are at the valve position.

Some tyres are slightly outside standard balance limits and are corrected before issue by attaching special loaded patches to the inside of the covers at the crown. These patches contain no fabric, they do not affect the local stiffness of the tyre and should not be mistaken for repair patches. They are embossed "Balance Adjustment Rubber."

The original degree of balance is not necessarily maintained and it may be affected by uneven tread wear, by cover and tube repairs, by

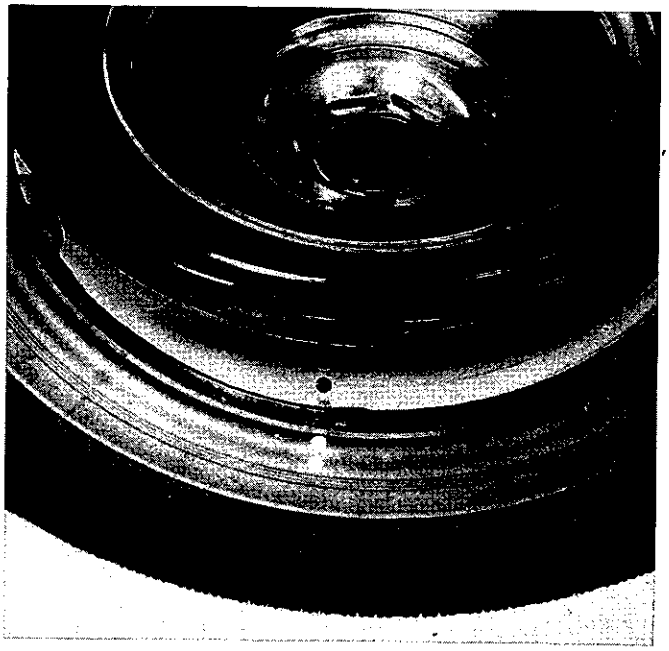


Fig. 15. Showing the correct relation of tyre and cover

tyre removal and refitting or by wheel damage and eccentricity. The car may also become more sensitive to unbalance due to normal wear of moving parts.

If roughness or high-speed steering troubles develop, and mechanical investigation fails to disclose a possible cause, wheel and tyre balance should be suspected.

A Tyre Balancing Machine is marketed by the Dunlop Company to enable Service Stations to deal with such cases. This is shown in Fig. 16.

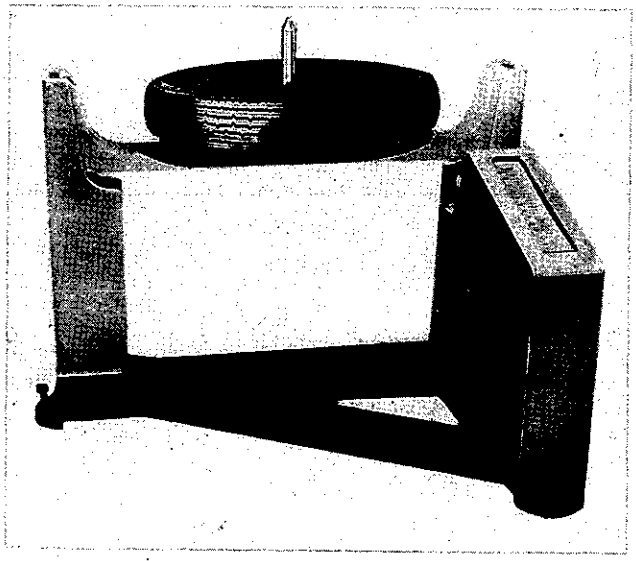


Fig. 16. Dunlop tyre balancing machine

Dynamic balance.

Static unbalance can be measured when th tyre and wheel assembly is stationary. There i another form known as dynamic unbalance whicl can be detected only when the assembly i revolving.

There may be no heavy spot—that is, ther may be no natural tendency for the assembly t rotate about its centre due to gravity—but th weight may be unevenly distributed each side o the tyre centre line (Fig. 17). Laterally eccentri

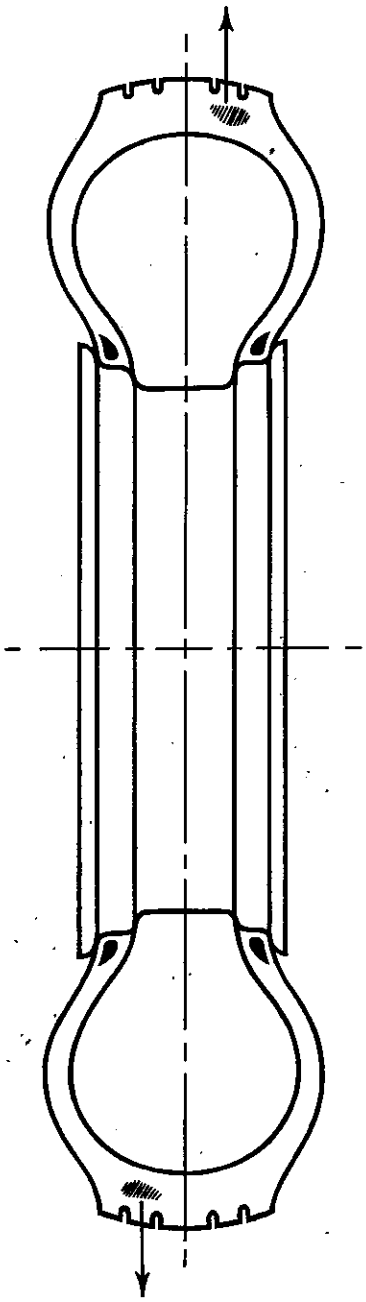


Fig. 17. Dynamic or couple unbalance

wheels give the same effect. During rotation the offset weight distribution sets up a rotating couple which tends to steer the wheel to right and left alternately.

Dynamic unbalance of tyre and wheel assemblies can be measured on the Dunlop Tyre Balancing Machine and suitable corrections made when cars show sensitivity to this form of unbalance. Where it is clear that a damaged wheel is the primary cause of severe unbalance it is advisable for the wheel to be replaced.

CHANGING POSITION OF TYRES

There have been references to irregular tread wear and different rates of wear between one tyre and another. It has also been stated that irregular wear is confined almost entirely to front tyres and that near front tyres are likely to be more affected than off front tyres.

The causes may lie in road conditions, traffic conditions, driving methods and certain features of design which are essential to the control, steering, and driving of a car. Close attention to inflation pressures and the mechanical condition of the car will not always prevent irregular wear.

It is therefore recommended that front tyres be interchanged with rear tyres at least every 2,000 miles. Diagonal interchanging between near front and off rear and between off front and near rear provides the most satisfactory first change because it reverses the directions of rotation.

Subsequent interchanging of front and rear tyres should be as indicated by the appearance of the tyres, with the object of keeping the wear of all tyres even and uniform.

When the car owner undertakes his own interchanging he can avoid moving the whole set at one time by carrying out a series of single exchanges at suitable intervals between the spare wheel and the various running wheels.

WHEELS

S.M.M. & T. standard tolerances are—

Wobble.

The lateral variation measured on the vertical inside face of a flange shall not exceed 0.10".

Lift.

On a truly mounted and revolving wheel the difference between the high and low points, measured at any location on either tyre seat, shall not exceed 0.10".

Radial and lateral eccentricity outside these limits contribute to static and dynamic unbalance respectively. Severe radial eccentricity also imposes intermittent loading on the tyre. Static balancing does not correct this condition which can be an aggravating factor in the development of irregular wear.

A wheel which is eccentric laterally will cause the tyre to " snake " on the road but this in itself has no effect on the rate of tread wear.

At the same time undue lateral eccentricity is undesirable and it affects dynamic balance.

There is no effective method of truing eccentric pressed steel wheels economically and they should be replaced.

Wheel nuts should be free on their studs. When fitting a wheel all the nuts should be screwed up very lightly, making sure that their seatings register with the seatings in the wheel.

Final tightening should be done progressively and alternately by short turns of opposite nuts to ensure correct seating and to avoid distortion.

Wheels with damaged or elongated stud holes, resulting from slack nuts, should be replaced.

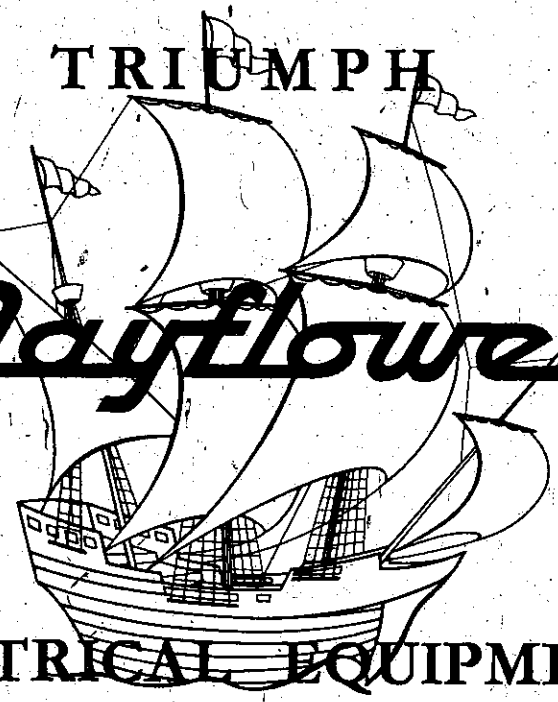
Rim seatings and flanges in contact with the tyre beads should be free from rust and dirt.

Service Instruction Manual

First Issue

TRIUMPH

Mayflower



ELECTRICAL EQUIPMENT

SECTION L

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

ELECTRICAL EQUIPMENT

for

"MAYFLOWER" and "RENOWN"

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"MAYFLOWER"

EQUIPMENT SPECIFICATION

Unit	*Model or Type*
Battery	GTW7A
Dynamo	C39PV
Starting motor	M35G (with "SB" pattern drive)
Starter switch	ST19/1
Distributor	DKYH4A
Headlamps	F700
Sidelamps	489
Stop-tail lamp	488
Number-plate illumination lamp	467/2
Horns	WT614 (high note and low note)
Control box	RF96/2
Windscreen wiper	CR5
Trafficators	SF34N

Note: The illustrations listed in the text are used with both "Mayflower" and "Renown" scripts, *except* those marked "M," which are used only with "Mayflower" script.

BATTERY

Capacity at 10-hour rate: 38 ampere hours.
Capacity at 20-hour rate: 43 ampere hours.

Routine maintenance.

In order to keep the battery in good condition, a periodical inspection of the battery should be made and the following carried out :—

(a) *Topping up.*

About once a month, or more often in warmer climates, remove the vent plugs from the top of each of the cells and examine the level of the electrolyte. If necessary, add distilled water until the top edge of the separators are just covered. Do not fill above this level, otherwise the excess electrolyte will be thrown out from the cell. A hydrometer will be found useful for topping up, as it prevents distilled water being spilled on the top of the battery.

Note: In very cold weather it is essential that the car be used immediately after topping up the battery to ensure that the distilled water is thoroughly mixed with the electrolyte. Neglect of this precaution may result in the distilled water freezing, causing damage to the battery.
When examining the cells, do not hold naked lights near the vent holes, as there is a danger of igniting the gas coming from the plates.

(b) *Testing the condition of the battery.*

Occasionally examine the condition of the battery by taking hydrometer readings. There is no better way of ascertaining the state of charge of the battery. The hydrometer contains a graduated float which indicates the specific gravity of the acid in the cell from which the sample is taken. The specific gravity readings and their indications are as follows :—

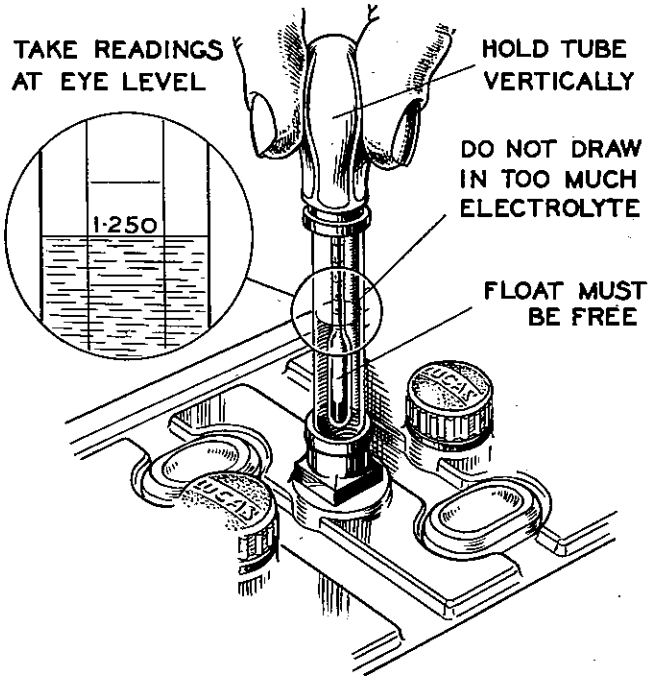


Fig. 1. Taking hydrometer reading

1.280—1.300 Battery fully charged.
About 1.210 Battery about half discharged.
Below 1.150 Battery fully discharged.

These figures are given assuming an electrolyte temperature of 60°F. If the electrolyte temperature exceeds this, .002 must be added to hydrometer readings for each 5°F. rise to give the true specific gravity at 60°F. Similarly, .002 must be subtracted from hydrometer readings for every 5°F. below 60°F.

The readings for each of the cells should be approximately the same. If one cell gives a reading very different from the rest it may be that the electrolyte has been spilled or has leaked from one of the cells, or there may be an internal fault. In this case it is advisable to have the battery examined by a battery specialist. Should the battery be in a low state of charge, it should

be recharged by taking the car for a long daytime run or by charging from an external source of D.C. supply at 4 amperes, until the cells are gassing freely. After examining the battery, check the vent plugs, making sure that the air passages are clear, and screw the plugs into position. Wipe the top of the battery to remove all dirt and moisture.

Storage.

If a battery is to be out of use for any length of time, it should first be fully charged and then given a freshening charge about every fortnight.

A battery must never be allowed to remain in a discharged condition, as this will cause the plates to become sulphated.

Initial filling and charging.

Usually the battery will have been filled and initially charged. If, however, it should be found necessary to prepare a new battery, supplied dry, for service, proceed as follows :—

(a) *Preparation of electrolyte.*

The specific gravity of the electrolyte necessary to fill the new battery, and the specific gravity at the end of the charge, are as follows :—

Climate	*S.G. of Filling Acid* (corrected to 60°F.)	*S.G. at End of Charge* (corrected to 60°F.)
Ordinarily below 80°F. (27°C.)	1.350	1.280—1.300
Between 80°—100°F. (27°—38°C.)	1.320	1.250—1.270
Over 100°F. (38°C.)	1.300	1.220—1.240

The electrolyte is prepared by mixing distilled water and concentrated sulphuric acid of 1.835 S.G. The mixing must be carried out in a lead-lined tank or a suitable glass or earthenware vessel. Steel or iron containers must NOT be used. The acid must be added slowly to the water, while the mixture is stirred with a glass rod. NEVER ADD THE WATER TO THE ACID as the resulting chemical reaction may have dangerous consequences. To produce electrolyte of the correct specific gravity as stated above, use proportions of acid and distilled water as below :—

To obtain Specific Gravity (corrected to 60°F.)	*Add 1 part by volume of 1.835 S.G. acid to distilled water by volume as below*
1.350	1.8 parts
1.320	2.2 parts
1.300	2.5 parts

Heat is produced by the mixture of acid and water, and it should, therefore, be allowed to cool before pouring it into the battery, otherwise the plates, separators and moulded container may become damaged.

(b) *Filling-in and soaking.*

The temperature of the filling-in acid, battery and charging room should be above 32°F.

Carefully break the seals in the filling holes and half fill each cell in the battery with dilute sulphuric acid solution of the appropriate specific gravity (according to temperature), see table on previous page. The quantity of electrolyte to half fill a two-volt cell is $\frac{3}{8}$ pint.

The mixing of the electrolyte with the water contained in the separators, and the chemical action of the acid on the plates, result in the generation of heat. The battery should, therefore, be allowed to stand for at least six hours before further electrolyte is added, thereby allowing the heat generated by the first filling to be mainly dissipated and avoiding an excessive temperature rise which might cause damage to plates and container.

After the lapse of this period add enough dilute acid to fill each cell to the top edge of the separators and allow to stand for a further two hours before commencing the charge.

(c) *Duration and rate of initial charges.*

Charge at a constant current of 2.5 amperes until voltage and temperature-corrected specific gravity readings show no increase over five successive hourly readings. This period is dependent upon the length of time the battery has been stored since manufacture, and will be from 40 to 80 hours, but usually not more than 60 hours.

Throughout the charge, the acid must be kept level with the tops of the separators in each cell by the addition of acid solution of the same specific gravity as the original filling-in acid.

If, during charge, the temperature of the acid in any cell of the battery reaches the maximum permissible temperature of 120°F., the charge must be interrupted and the battery temperature allowed to fall at least 10°F., before charging is resumed.

At the end of the first charge, *i.e.*, when specific gravity and voltage measurements remain substantially constant, carefully check the specific gravity in each cell to ensure that it lies within the limits specified. If any cell requires adjustment, some electrolyte must be syphoned off and replaced with either acid of the strength used for the original filling-in, or distilled water according to whether the specific gravity is too low or too high.

After such adjustment, the gassing charge should be continued for one or two hours to ensure adequate mixing of the electrolyte. Recheck, if necessary repeating the procedure until the desired result is obtained.

DYNAMO

Testing in position.

Disconnect the cables from the dynamo terminals "D" and "F" and then connect the two terminals with a short length of wire. Connect a voltmeter between the dynamo terminals and the dynamo frame. Increase the engine speed gradually and note the voltmeter reading, this should reach 12 volts at a comparatively low speed. Do not run the engine at a speed above 1,500 r.p.m. If no reading is given, or if it is low or erratic, the dynamo must be removed for examination.

Dismantling.

Take off the driving pulley.

Remove the cover band, hold back the brush springs and remove the brushes from their holders.

Unscrew the locking nuts on the through bolts.

Withdraw the two through bolts from the driving end.

Remove the nut, spring washer and flat washer from the smaller terminal (*i.e.*, field terminal) on the commutator end bracket and remove the bracket from the dynamo yoke. The driving end bracket together with the armature can now be lifted out of the frame. If it is necessary to remove the armature from the driving end bracket, it can be done by means of a hand press. It should be noted that there are no connections to be uncoupled between the dynamo frame and the commutator end bracket.

Armature.

Examine the commutator and if burned or blackened, clean with a petrol-moistened rag, or in bad cases by carefully polishing with very fine glass-paper. If necessary, undercut the insulation to a depth of $\frac{1}{32}$" with a hacksaw blade ground down to the thickness of the insulation.

Check the armature by means of a growler test or volt-drop test, and test the insulation by connecting a test lamp at mains voltage between the commutator segments and the shaft.

Brushgear.

Examine the brushes. If they are worn so that they do not make good contact on the commutator, or if the brush flexible is exposed on the running face, take out the screw securing the eyelet on the end of the brush flexible and remove the brushes.

Fit new brushes into holders and secure eyelets on the ends of the brush lead in the original positions. Brushes are pre-formed and do not require bedding.

Field coils.

Test the resistance of the field coils by means of an ohmmeter. If this is not available, connect a 12-volt D.C. supply, with an ammeter in series, between the field terminal and the dynamo frame. The ammeter reading should be approximately 2 amps. If there is no reading, the field

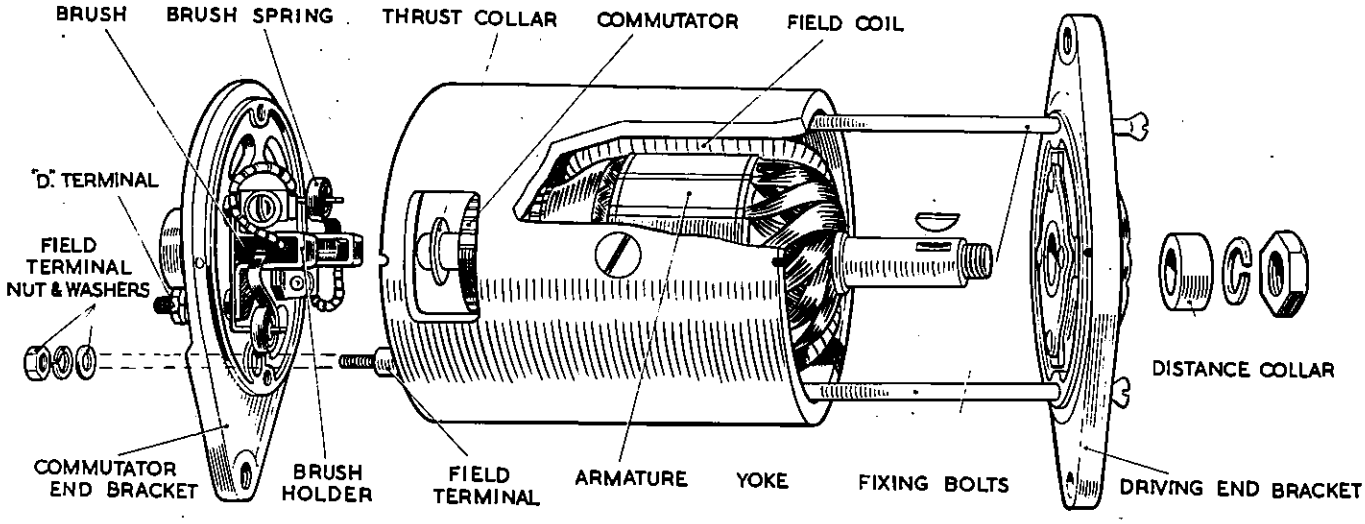


Fig. 2. Exploded view of dynamo

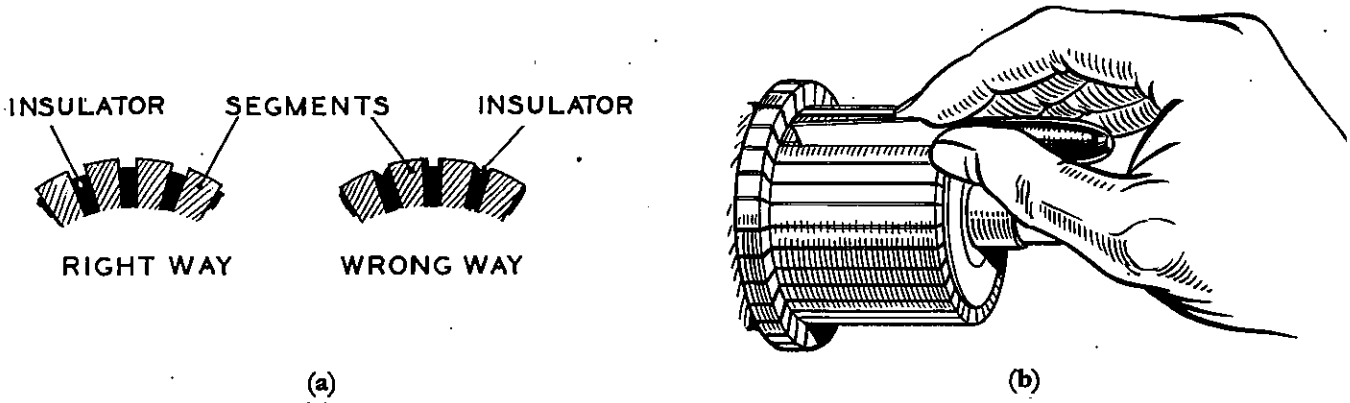


Fig. 3. Undercutting commutator insulation

coils are open-circuited and must be replaced.

To test for earthed field coils, unsolder the end of the field winding from the earth terminal of the dynamo frame and with a test lamp connected from supply mains, check between field terminal and earth. If lamp lights, field coils are earthed and must be replaced.

When replacing field coils, an expander should be used to press the pole shoes into position. A few taps on the outside of the dynamo frame with a copper-faced mallet will assist the expander to seat the pole shoes. When pole shoes are finally home, fully tighten up fixing screws and caulk to lock them in position.

Bearings.

Bearings which are worn to such an extent that they will allow excessive side movement of the armature shaft must be replaced.

Commutator end.

To remove and replace the bearing bush at the commutator end, proceed as follows :—

(a) Press the bearing bush out of the bracket by means of a hand press or bench drill.

(b) Press the new bearing bush into the end bracket using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

Note: Before fitting a new porous bronze bearing bush, it should be immersed for 24 hours in clean thin engine oil. In an emergency this period may be shortened to 2 hours by heating the oil to 100°C.

Driving end.

The ball-bearing at the driving end is replaced as follows :—

1. Knock out the three rivets which secure the bearing retaining plate to the end bracket and remove the plate.
2. Press the bearing out of the end bracket and remove the corrugated washer, felt washer and oil retaining washer.
3. Before fitting the replacement bearing see that it is clean and lightly pack it with high melting-point grease.
4. Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.
5. Locate the bearing in the housing and press it home by means of a hand press.
6. Fit the bearing retaining plate. Insert three new rivets from the outside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

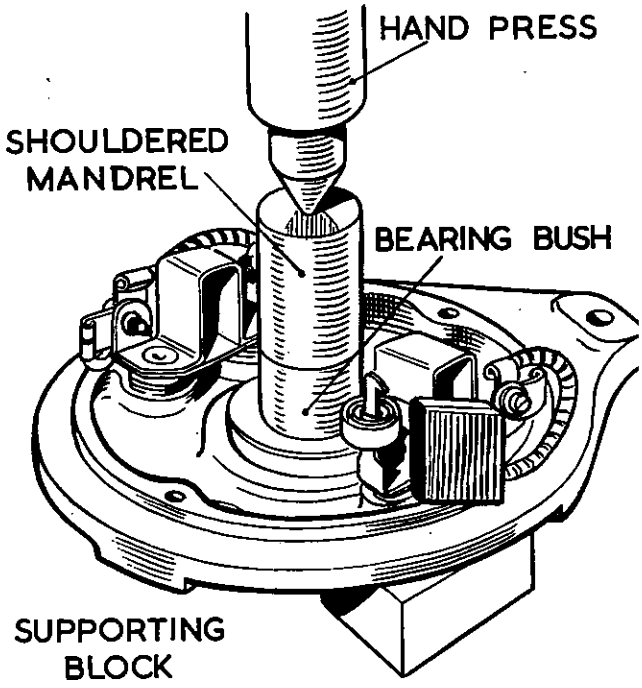


Fig. 4. Fitting new bearing bush

Reassembly.

In the main the reassembly of the dynamo is a reversal of the operations described above for dismantling.

Before refitting the dynamo to the vehicle, unscrew the lubricator on the end of the dynamo, lift out the felt pad and spring, and about half fill the lubricator with HMP grease. Replace the spring and felt pad, and screw the lubricator in position.

STARTER

If difficulty is experienced with the starter not meshing correctly with the flywheel, it may be that the starter drive requires cleaning. The pinion should move freely on the screwed sleeve; if there is any dirt or other foreign matter on the sleeve it must be washed with paraffin. To do this it will be necessary to remove the driving end bracket from starter frame (see dismantling instructions below).

In the event of the starter pinion becoming jammed in mesh with the flywheel, it can usually be freed by turning the starter armature by means of a spanner applied to the shaft extension at the commutator end. This is accessible by removing the cap. If the starter does not rotate when the starter switch is operated, the switch and wiring should be tested as described on page o.

Before removing the starter from the engine, disconnect the earthing cable (positive) from the battery terminal to avoid any damage of causing short circuits and remove cables from starter switch.

Dismantling starter motor.

Take off the cover band at the commutator end, hold back the brush springs and take out the brushes from their holders. Unscrew and withdraw the two through-bolts.

Remove the terminal nuts and washers from the terminal post on the CE bracket and then remove the commutator and driving end brackets.

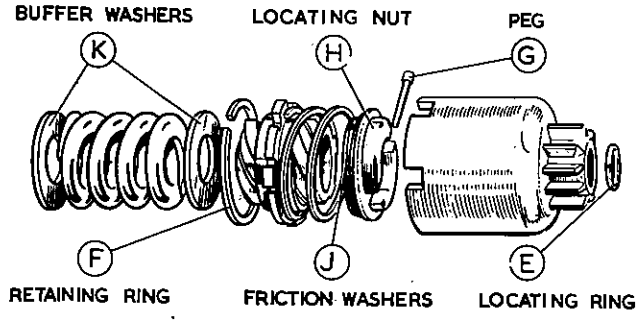


Fig. 5 Starter drive, dismantled

Starter drive.

Secure the armature by gripping the shaft extension in a vice and remove the locating ring "E" from the end of the shaft. Remove the retaining ring "F" and withdraw the barrel and pinion assembly.

Take out the peg "G" securing the locating nut.

Remove the locating nut "H" friction washers "J" and restraining spring.

Slide the sleeve and control nut off the splined shaft. Remove the buffer washers "K" and the main spring. Should either the control nut or screwed sleeve be damaged, then a replacement assembly of screwed sleeve and control nut must be fitted. These components must not be renewed individually. Reassemble by reversing the above procedure.

Note: On some models the locating nut is secured by caulking the nut into the keyway provided in the shaft, therefore no peg "G" is fitted. When reassembling it will be necessary to fit a new locating nut.

Commutator.

Examine the commutator and if burned or blackened, clean with a petrol-moistened rag, or in bad cases by carefully polishing with very fine glass-paper.

Note: The insulation on the starter commutator *must not* be undercut.

Brushes.

Examine the brushes. If they are worn so that they do not make good contact on the commutator, or if the brush flexibles are exposed on the running face, they must be replaced. Two of the brushes are connected to terminal eyelets on the brush boxes, and the other two are connected to a tapping on the field coils.

The flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their places by soldering. The brushes are pre-formed so that bedding to the commutator is unnecessary.

Field coils.

The field coils can be tested for open circuit by connecting a 12-volt battery and test lamp between the tapping point on the field coils at which the brushes are connected and the terminal post. If the lamp does not light there is an open circuit in the wiring of the field coils.

Lighting of the lamp does not necessarily mean that the field coils are in order, as it is

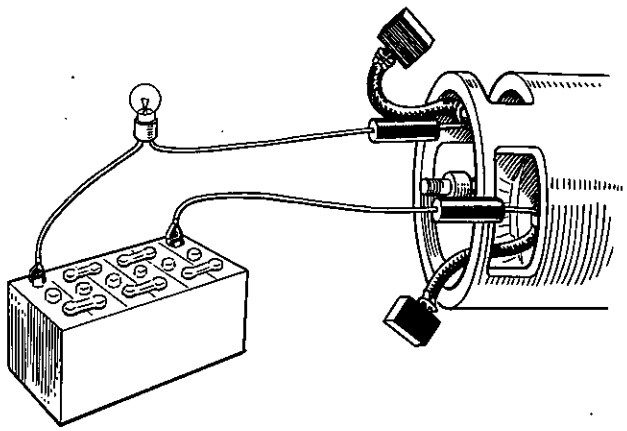


Fig. 6 Testing field coils for open circuit

possible that one of them may be earthed to a pole shoe or to the starter frame. This may be checked by removing the test lead from the brush connector and holding it against a clean part of the starter frame.

Should the lamp light it indicates that the field coils are earthed and must be replaced.

When replacing field coils the procedure as detailed in the dynamo section should be followed.

Bearings.

Bearings which are worn to such an extent that they will allow excessive side play of the armature shaft must be replaced. To replace the bearing bushes proceed as follows :—

1. Press the bearing bush out of the end bracket.
2. Press the new bearing bush into the end bracket using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearings.

Note : Before fitting a new porous bronze bearing bush it should be immersed for 24 hours in clean, thin engine oil.

Reassembly.

The reassembly of the starter is a reversal of the dismantling procedure.

Starter switch.

The starter switch is not adjustable and must be replaced if faulty.

To test the switch and wiring, connect a voltmeter or a 12-volt bulb between earth and the following points with the battery connected :

(a) Supply terminal of starter switch. No reading indicates faulty cable or connections.
(b) Second terminal of starter switch. Operate the switch and see that a steady reading is obtained. An intermittent reading, or no reading at all means that the switch is faulty and a new unit must be fitted.
(c) Terminal of starting motor, with switch operated.

DISTRIBUTOR

Routine maintenance.

Lubrication.

Every 3,000 miles

Lightly smear the cam with a very small amount of Mobilgrease No. 2 or clean engine oil. Apply a spot of clean engine oil to the top of the pivot on which the contact breaker works.

Lift the rotor arm from the top of the spindle by pulling it off vertically and add a few drops of thin machine oil to lubricate the cam bearing and distributor shaft. Do not remove the screw exposed to view as the screw is drilled to enable the oil to pass through. Take care to refit the rotor arm correctly, pushing it on to the shaft as far as it will go.

Add a few drops of thin machine oil through the hole in the contact breaker base through which the cam passes, to lubricate the automatic timing control. Do not allow any oil to get on or near the contacts.

Every 6,000 miles

Cleaning.

Wipe the inside and outside of the moulding with a soft dry cloth, paying particular attention

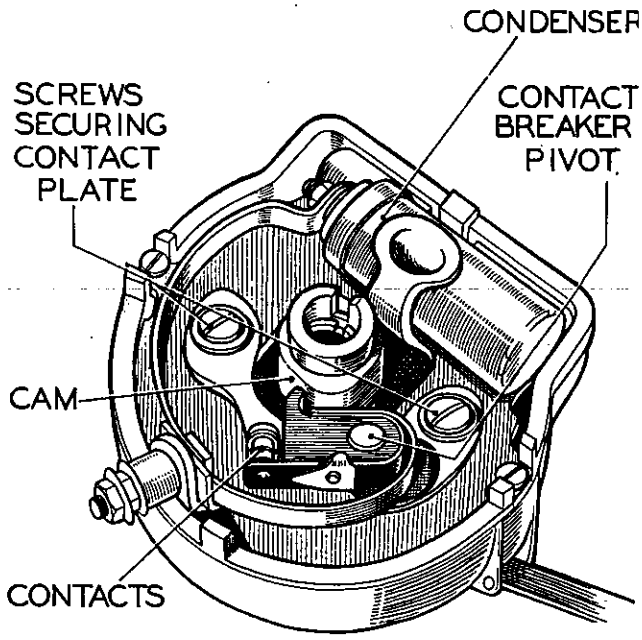


Fig. 7 Distributor with cap and rotor arm removed

to the spaces between the metal electrodes. See that the small carbon brush on the inside of the moulding moves freely in its holder.

Examine the contact breaker. The contacts must be free from grease or oil. If they are burned or blackened, clean them with a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this slacken the nut(s) on the terminal block and lift off the spring, which is slotted to facilitate removal.

After cleaning, check the contact breaker setting.

Contact breaker adjustment.

Turn the engine by hand until the contacts are seen to be fully opened, and check the gap with a gauge having a thickness of .010"—.012" 0.25—0.3 mm.). If the gap is correct, the gauge should be a sliding fit, but if the gap varies from the gauge, the setting must be adjusted. To do this, keep the engine in the position giving maximum contact opening and slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is set to the thickness of the gauge and tighten the two locking screws. Recheck the gap for other positions of the engine giving maximum contact opening.

High tension cables.

Examine the high tension cables. Any which have the insulation cracked or perished, or show signs of damage in any other way, must be replaced by 7-mm. rubber-covered ignition cable.

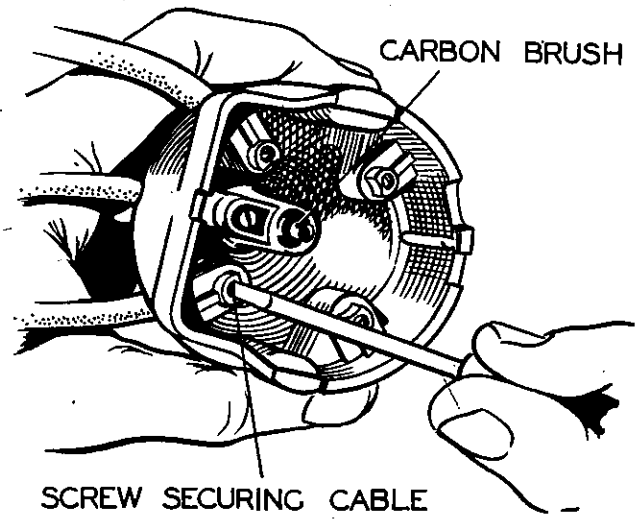


Fig. 8 High tension cable connections

Dismantling.

1. Spring back the securing clips and remove the moulded cap.
2. Lift the rotor off the top of the spindle. If it is a tight fit, it should be carefully levered off with a screwdriver.
3. Slacken the nut on the terminal post and lift off the end of the contact breaker spring. The contact breaker lever can now be lifted off its pivot. Take out the two screws, complete with spring washers and flat steel washers, which secure the plate carrying the fixed contact, and remove the plate.
4. Take out the two screws and spring washers fitted at the edge of the contact breaker base, which can then be removed from the body of the distributor.
5. Remove the driving dog from the shaft.
6. Lift the cam, automatic timing control and shaft assembly from the distributor. Take out the screw from inside the top of the cam spindle. (Before dismantling, carefully note the positions in which the various components are fitted so that they can be replaced correctly.) Lift off the cam, when the automatic timing control will be accessible.

Condenser.

The best method of testing the condenser is by substitution. Disconnect the original condenser and connect a new one between the L.T. terminal of the distributor and earth.

Should a new condenser be necessary, it is advisable to fit a complete condenser and contact breaker plate assembly, but should a condenser only be available, care must be taken not to overheat the condenser when soldering in position.

Replacement of bearing bushes.

1. In order to ensure easy running of the distributor shaft, when the shank has been rebushed, the new porous bronze bushes must be fitted so that they are in correct alignment. The bushes must be fitted by means of a vertical drilling machine or hand press, using a mandrel of the same diameter as the distributor shaft, and a packing block of the type shown.
2. Fit the mandrel in the drilling machine or hand press and place the distributor body in an inverted position on the table below it.
3. To remove the bushes, a sleeve must be fitted over the mandrel to build it up to the

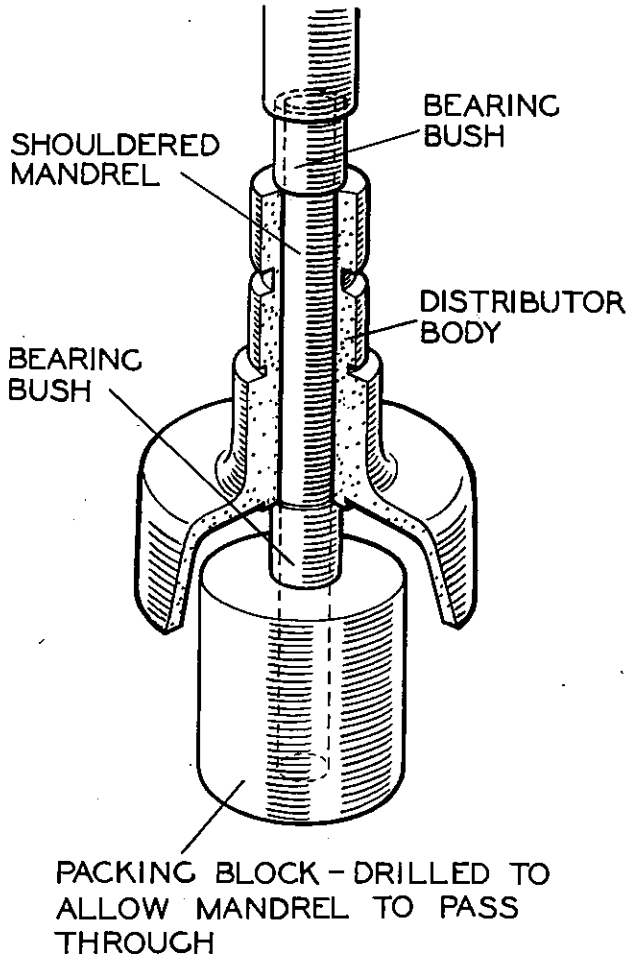


Fig. 9 Replacing distributor bearing bushes

required size. With this sleeve fitted in position, force the old bushes out of the shank by applying a steady pressure.

4. Before new bushes are fitted, they should be allowed to stand for 24 hours immersed in thin engine oil.
5. Take the sleeve off the mandrel. Place the long bush on the mandrel, then the distributor body in an inverted position and finally the short bush.
6. Locate the end of the mandrel through the packing piece and press the mandrel downwards, taking care that both bushes enter the distributor shank squarely. Continue forcing the bushes into the shank until the mandrel reaches the end of its travel.
7. *The bushes must not be opened out after fitting, as this impairs the porosity of the bushes and so prevents effective lubrication.*

Reassembly.

Note: Before reassembly, the distributor shaft, automatic advance mechanism and the portion of the shaft on which the cam fits must be lubricated with thin engine oil.

1. Assemble the automatic timing control, taking care that the parts are fitted in their original positions, and that the control springs are not stretched. Two holes are provided in each toggle; the springs must be fitted to the inner hole in each case. Place the cam on its spindle and secure by tightening the fixing screw.
2. Fit the shaft assembly in position in the body and replace the driving member.
3. Place the contact breaker base in position on the distributor body and secure by replacing the two fixing screws. A spring washer must be fitted under each of the screw heads and the screws must be fully tightened.
4. Position the plate carrying the fixed contact on the contact breaker base and secure it in position by means of the two screws, first placing a spring washer and flat steel washer under the head of each screw.
5. Place the insulating washer over the contact breaker pivot pin and position the contact breaker lever on the pin. Locate the slotted end of the contact breaker spring under the head of the terminal screw and tighten the nut to lock the spring in position. Adjust the contact breaker, setting to give a gap of .010"—.012" (0.25—0.3 mm.) when fully opened.

Note: If it becomes necessary to renew the contacts, a replacement set comprising fixed and moving contacts must be fitted.

6. Place the rotor on top of the spindle, locating the register correctly and pushing the rotor fully home.
7. Fit the distributor cover moulding and secure by means of the spring clips.

CONTROL BOX

Regulator

Adjustment.

The regulator is carefully set before leaving the works to suit the normal requirements of the standard equipment and in general it should not be necessary to alter it. If, however, the battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, it may be advisable to check the setting and if necessary to re-adjust.

It is important, before altering the regulator setting, when the battery is in a low state of charge, to check that its condition is not due to

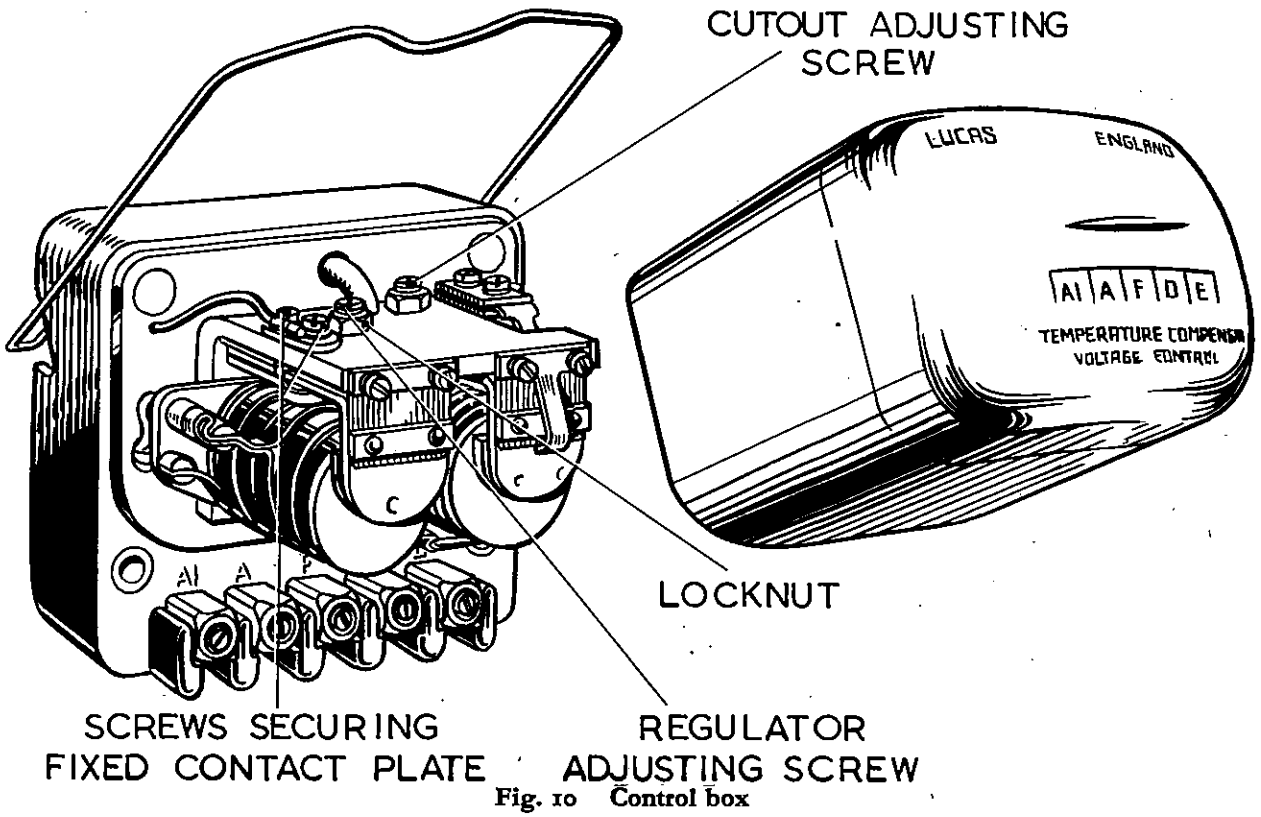


Fig. 10 Control box

a battery defect or to the dynamo belt slipping.

How to check and adjust electrical setting.

The regulator setting can be checked without removing the cover of the control box.

Withdraw the cables from the terminals marked " A " and " A1 " at the control box and join the ends of the cables together. Connect the negative lead of a moving coil voltmeter (20 volts full scale reading) to the " D " terminal on the dynamo and connect the other lead from the meter to a convenient chassis earth.

Slowly increase the speed of the engine until the voltmeter needle " flicks " and then steadies ; this should occur at a voltmeter reading between the limits given below for the appropriate temperature of the regulator :—

Setting at 10°C. (50°F.)	16.1—16.7 volts.
Setting at 20°C. (68°F.)	15.8—16.4 volts.
Setting at 30°C. (86°F.)	15.6—16.2 volts.
Setting at 40°C. (104°F.)	15.3—15.9 volts.

If the voltage at which the reading becomes steady occurs outside these limits, the regulator must be adjusted.

Shut off the engine, remove the control box cover, release the locknut (A) holding the adjusting screw (B) and turn the screw in a clockwise direction to raise the setting, or in an anti-clockwise direction to lower the setting. Turn the adjustment screw a fraction of a turn and then tighten the locknut.

When adjusting, do not run the engine up to more than half throttle, as while the dynamo is on open circuit it will build up to a high voltage if run at high speed, and so a false voltmeter reading would be obtained.

Mechanical setting.

The mechanical setting of the regulator is accurately adjusted before leaving the works and provided the armature carrying the moving contact is not removed, the regulator will not require mechanical adjustment. If, however, the armature has been removed from the regulator for any reason, the contacts will have to be reset.

To do this, proceed as follows :—

1. Slacken the two armature fixing screws " E." Insert a .018" feeler gauge between the back of the armature " A " and the regulator frame.
2. Press back the armature against the regulator frame and down on the top of the bobbin core with gauge in position and lock the armature by tightening the two fixing screws.
3. Check the gap between the underside of the arm and the top of the bobbin core. This should be .012"—.020". If the gap is outside these limits correct by adding or

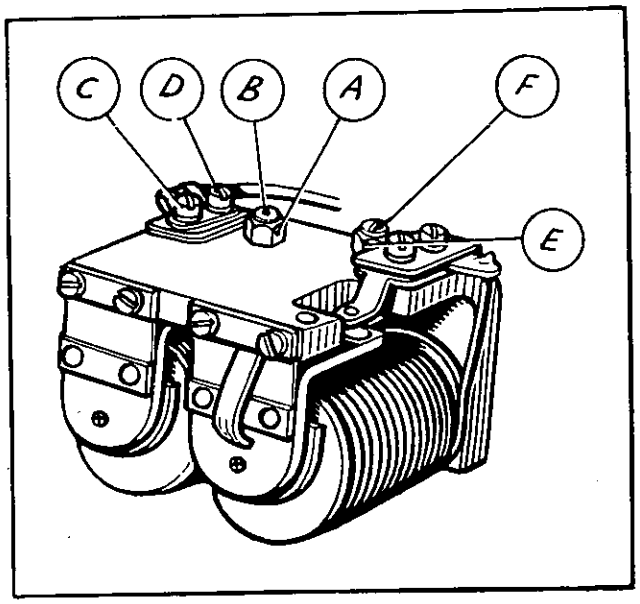


Fig. 11. Cut-out and regulator assembly

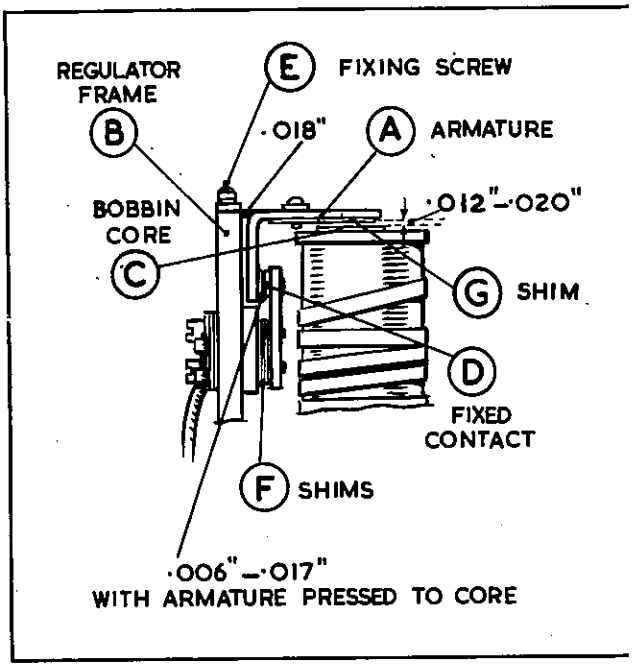


Fig. 12. Mechanical setting of regulator

removing shims "F" at the back of the fixed contactor.

Note: On some regulators a stop rivet is fitted on the underside of the arm instead of a shim. When checking on this type the gap should be .022"—.030" between the underside of the arm and bobbin core. DO NOT CHECK GAP BETWEEN STOP RIVET AND BOBBIN CORE.

4. Remove gauge and press the armature down when the gap between the contacts should be .006"—.017".

Cleaning contacts.

To render the regulator contacts accessible for cleaning, slacken the screws securing the plate carrying the fixed contact. It will be necessary to slacken the upper screw (C) a little more than the lower (D) so that the contact plate can be swung outwards. Clean the contacts by means of fine carborundum stone or fine emery cloth. Carefully wipe away all traces of dirt or other foreign matter. Finally tighten the securing screws.

Cut-out

Adjustment.

If it is suspected that the cutting-in speed of the dynamo is too high, connect a voltmeter between the terminals marked "D" and "E" at the control box and slowly raise the engine speed. When the voltmeter reading rises to about 12.7—13.3 the cut-out contacts should close.

If the cut-out has become out of adjustmen and operates at a voltage outside these limits, i must be reset.

To make the adjustment, slacken the locknu (E), turn the adjusting screw (F) a fraction of turn in a clockwise direction to raise the operatin voltage or in an anti-clockwise direction to lowe the voltage. Tighten the locknut after makin the adjustment.

Cleaning.

To clean the contacts, remove the cove place a strip of fine glass-paper between th contacts and then, closing the contacts by hanc draw the paper through. This should be don two or three times, with the rough side towarc each contact.

LAMPS

Headlamps.

Bulb replacement.

To remove the light unit for bulb replac ment, unscrew the screw securing the front ri and lift off the rim. Next remove the dus excluding rubber when three spring-loaded a justment screws will be visible. Press the lig unit in against the tension of the adjustme screw springs and turn it in an anti-clockwi direction until the heads of the screws can b disengaged through the slotted holes in the lig unit rim. Do not disturb the screws as this w alter the lamp setting.

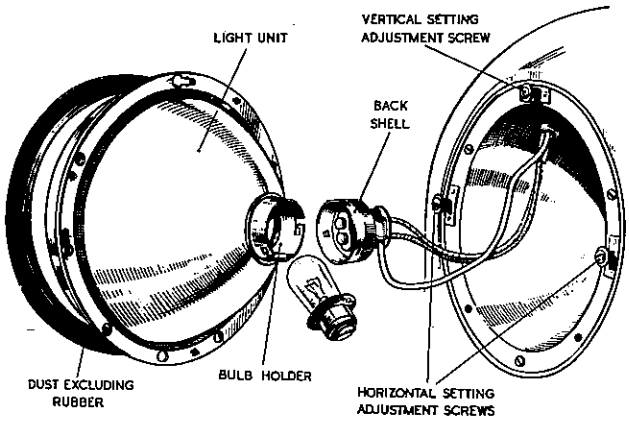


Fig. 13 Headlamp

Twist the back shell in an anti-clockwise direction and pull it off. The bulb can then be removed.

Place the replacement bulb in the holder taking care to locate it correctly. Engage the projections on the inside of the back shell with the slots in the holder, press on and secure by twisting it to the right.

Position the light unit so that the heads of the adjusting screws protrude through the slotted holes in the flange, press the unit in and turn in a clockwise direction. Replace the dust-excluding rubber and refit the front rim.

Setting.

If adjustment to the setting is required, first remove the front rim and rubber, as described above.

Vertical adjustment is made by turning the screw at the top of the lamp. Horizontal adjustment can be altered by the adjustment screws on each side of the light unit.

Replacement of light unit.

In the event of damage to either the front lens or reflector, a replacement light unit must be fitted as follows :—

Remove the light unit assembly as described above.

Withdraw the three screws from the light unit rim and remove the seating rim and unit from light unit.

Position the replacement light unit between the unit rim and seating rim, taking care to see that the die-cast projection at the edge of the light unit fits into the slot in the seating rim and also see that the seating ring is correctly positioned.

Finally secure in position by means of the three fixing screws.

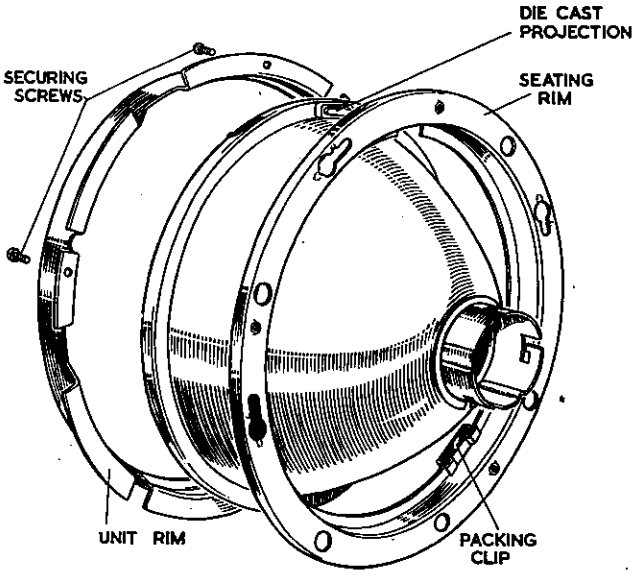


Fig. 14. Light unit assembly

Sidelamps.

To gain access to the bulb, remove the rim and glass assembly as follows :—

Move aside the rubber ring and lever off the rim and glass assembly from the bottom of the lamp.

When refitting, move aside rubber ring, locate rim at top of lamp, press on and finally position rubber ring so that it fits around rim.

Stop tail, reverse and number-plate illumination lamps

To gain access to the bulbs, remove or swing open the front covers of the lamps. The front covers in all cases are secured by means of fixing screws.

TRAFFICATORS

If the action of a trafficator becomes sluggish, it must be lubricated as described below.

In order to raise the arm of the trafficator for lubrication purposes or bulb replacement, switch on the trafficator and then, supporting the arm in a horizontal position, move the switch to the "OFF" position.

Lubricating catch pin.

Apply, by means of a small brush, a drop of thin machine oil, such as sewing machine oil, to the catch pin between the arm and the operating mechanism. Use only the slightest trace as any excess may affect the operating mechanism.

Arm pivot bearing.

Withdraw screw on underside of arm and slide off the cover. Place the connecting wire

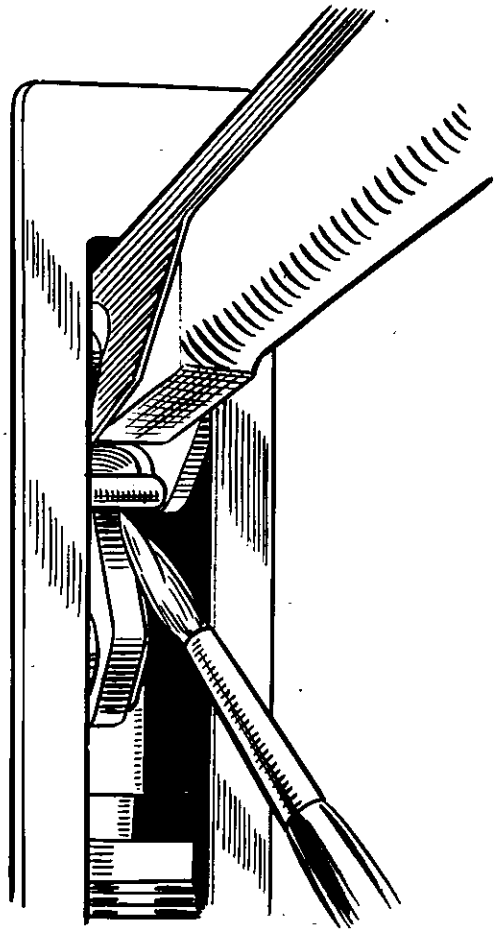


Fig. 15. Lubricating trafficator catch pin

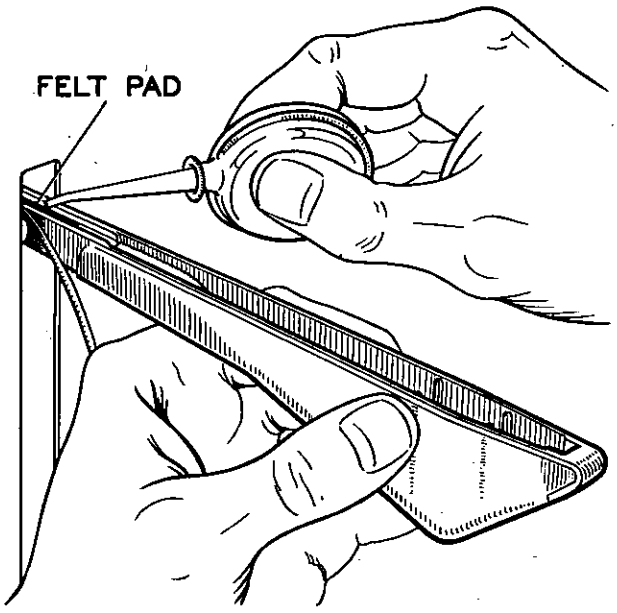


Fig. 16. Lubricating pivot bearing

to the bulb on one side and apply two or three drops of thin machine oil to the lubricating pad at the top of the arm.

Bulb replacement.

Withdraw the screw on the underside of the arm and slide off the metal arm cover; the burnt-out bulb may then be replaced. To replace the arm cover, slide it on in an upwards direction so that the side plates engage with the slots on the underside of the spindle bearing. Finally secure the cover by means of its fixing screws.

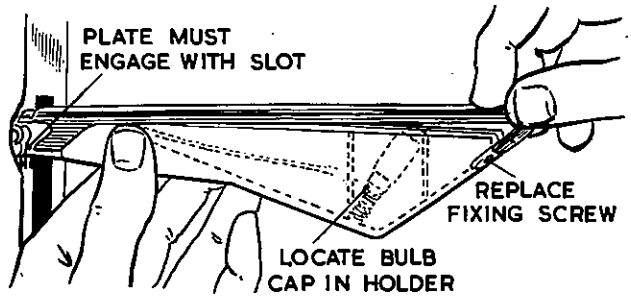


Fig. 17. Replacing trafficator bulb

WINDSCREEN WIPER

Normally the windscreen wiper will not require any servicing apart from the occasional renewal of the rubber blades.

Should any trouble be experienced, first check for loose connections, worn insulation, etc., before dismantling the motor.

1. **To detach the cable rack from the motor and gearbox.**

   Remove gearbox cover.
   Remove split pin and washer from crankpin and final gear-wheel. Lift off the connecting link.

2. **Commutator dirty.**

   Removing the connecting leads to the terminals, withdraw the three screws securing the cover at the commutator end. Lift off the cover. Clean the commutator with a cloth moistened with petrol and carefully remove any carbon dust from between the commutator segments.

3. **Brush lever stiff or brushes not bearing on commutator.**

   Check that the brushes bear freely on the commutator. If they are loose, and do not make contact, a replacement tension spring

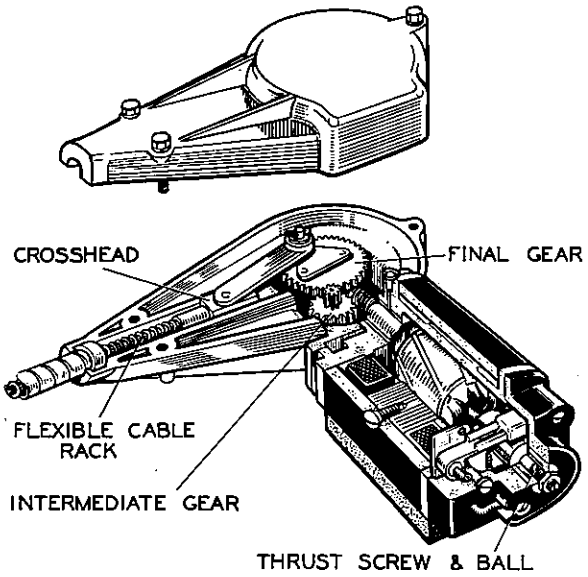


Fig. 18. Windscreen wiper motor and gearbox

is necessary. The brush levers must be free on their pivots. If they are stiff, they should be freed by working them backwards or forwards by hand and by applying a trace of thin machine oil. Packing shims are fitted beneath the legs of the brush levers to ensure that the brushes are central and that there is no possibility of the brush boxes fouling the commutator. If the brushes are considerably worn, they must be replaced.

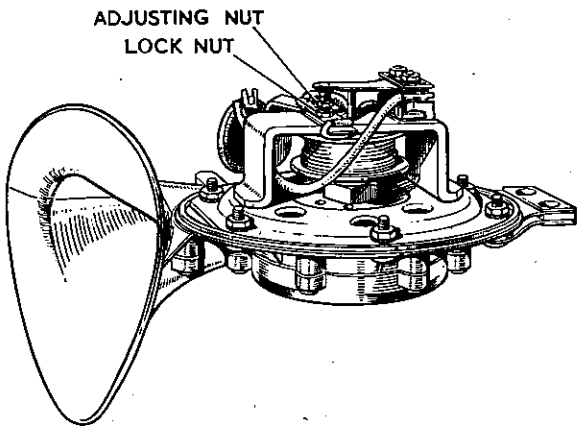
4. **Motor operates but does not transmit motion to spindles.**

Remove the cover of the gearbox. A push-pull motion should be transmitted to the inner cable of the flexible rack. If the crosshead moves sluggishly between the guides, lightly smear a small amount of medium-grade engine oil in the groove formed in the die-cast housing. When overhauling, the gear must be lubricated by lightly packing the gearbox with a grease of the zinc-oxide type.

ELECTRIC HORNS

All horns before being passed out of the works are adjusted to give their best performance and will give a long period of service without any attention; no subsequent adjustment is required.

If one of the horns fails or becomes uncertain in its action, it does not follow that the horn has broken down. First ascertain that the trouble is not due to a loose or broken connection in the wiring of the horn. If both horns fail or become uncertain in action, the trouble is probably due to a blown fuse or discharged battery. If the fuse has blown, examine the wiring for the fault and replace with the spare fuse provided.



WIND TONE HORN, MODEL WT614, WITH COVER REMOVED

Fig. 19. Horn with cover removed

It is also possible that the performance of a horn may be upset by the fixing bolt working loose, or by some component near the horn being loose. If, after carrying out the above examination, the trouble is not rectified, the horn may need adjustment, but this should not be necessary until the horns have been in service for a long period.

Adjustment does not alter the pitch of the note, it merely takes up wear in moving parts. When adjusting the horns, short circuit the fuse, otherwise it is liable to blow. Again if the horns do not sound on adjustment, release the push instantly.

When making adjustments to a horn, always disconnect the supply lead of the other horn, taking care to ensure that it does not come into contact with any part of the chassis and so cause a short circuit.

Adjustment.

Remove the fixing screw from the top of the horn and take off the cover. Detach the cover securing bracket by springing it out of its location.

Slacken the locknut on the fixed contact and rotate the adjusting nut until the contacts are just separated (indicated by the horn failing to sound). Turn the adjusting nut half a turn in the opposite direction and secure it in this position by tightening the locknut.

"RENOWN"

EQUIPMENT SPECIFICATION

Unit	*Model or Type*
Battery	GTW9A
Dynamo	C39PV
Control box	RF95/2
Starting motor	M418G
(with " rubber coupling " drive)	
Starter switch	ST950
Distributor	DVX4A
Headlamps	MBPL147
Sidelamps	1142
Number-plate box	288/3
Horns	WT614
(high note and low note)	
Windscreen wiper	CR4
Trafficators	SF34N

(All illustrations not listed in text are as " Mayflower " copy. The seven illustrations listed *replace* illustrations of same number in " Mayflower " copy.)

BATTERY

(As copy for GTW7A battery fitted to " Mayflower " with the substitution of the following data.)

Capacity at 10-hour rate : 51 ampere hours.
Capacity at 20-hour rate : 59 ampere hours.
Normal recharge current : 5 amperes.
Initial charge current : 3.5 amperes.
Quantity of electrolyte to half fill one cell : ½ pint.

DYNAMO

(As copy for " Mayflower " dynamo.)

STARTING MOTOR

(As copy for " Mayflower " starter : but note that as the M418G is a series-parallel wound machine, the field coil continuity test must be made by connecting the battery and test lamp " between the tapping points on the field coils to which the brushes are connected.")

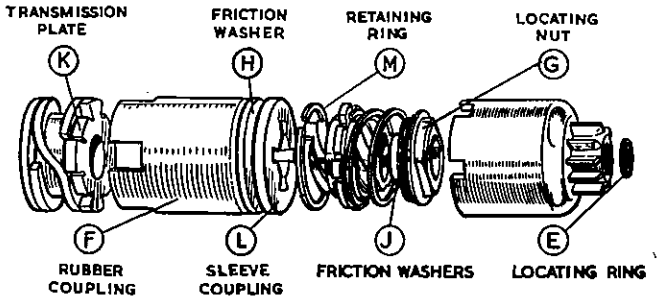


Fig. 1. Starter drive dismantled

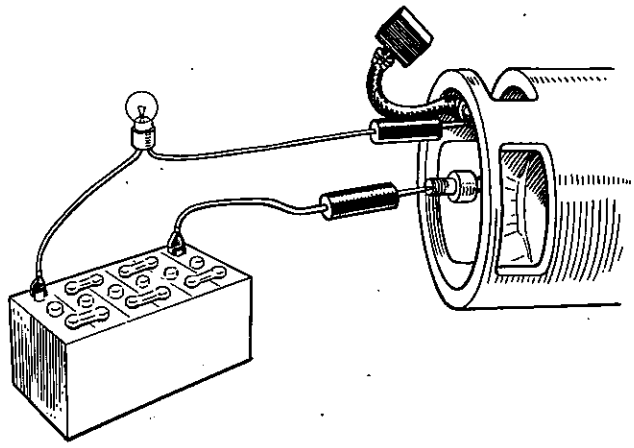


Fig. 2. Testing field coils for open circuit

Starter drive.

Secure the armature by gripping the shaft extension in a vice and remove the locating ring " E " from the end of the shaft.

Remove the retaining ring " M " and withdraw the barrel and pinion assembly. Uncaulk and remove locating nut " G," friction washers " J " and restraining spring. Slide the sleeve and control nut off the armature shaft.

Finally remove sleeve coupling " L," friction washer " H " and rubber coupling " F."

Should either the control nut or screwed sleeve be damaged, then a replacement assembly of screwed sleeve and control nut must be fitted. These components must not be renewed individually.

Note : When reassembling, it will be necessary to fit a new locating nut.

Starter switch.

A solenoid-operated switch mounted on the engine bulkhead ; this switch cannot be adjusted and must be replaced if faulty. Test as described for the " Mayflower " starter switch. Listen for the sound of the closing contacts when the push is pressed by an assistant. Check the push and the wiring before condemning the switch as faulty.

DISTRIBUTOR

Routine maintenance.

Lubrication.

Every 3,000 miles

Lightly smear the cam with a very small amount of Mobilgrease No. 2 or clean engine oil.

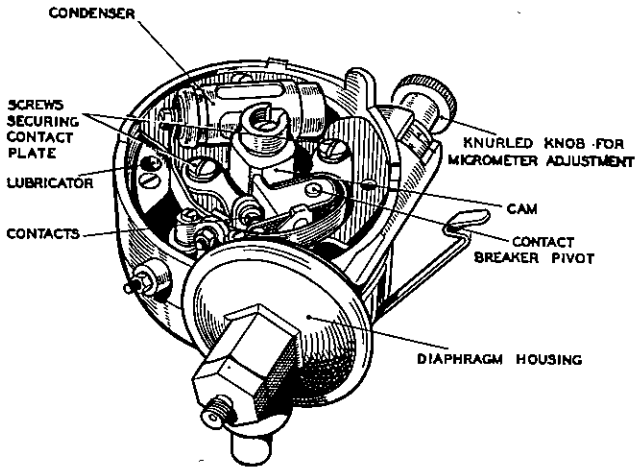


Fig. 3. Distributor with cover and rotor arm removed

Apply a spot of clean engine oil to the top of the pivot on which the contact breaker works.

Lift the rotor arm from the top of the spindle by pulling it off vertically and add a few drops of thin machine oil to lubricate the cam bearing. Do not remove the screw exposed to view as there is a clearance through which the oil passes. Take care to refit the rotor arm correctly, pushing it on to the shaft as far as it will go.

Add a few drops of thin machine oil through the hole in the contact breaker base marked " Oil Here " in order to lubricate the automatic timing control.

Every 6,000 miles

Cleaning.

Wipe the inside and outside of the moulding with a soft dry cloth, paying particular attention to the spaces between the metal electrodes. See that the small carbon brush on the inside of the moulding moves freely in its holder.

Examine the contact breaker. The contacts must be free from grease or oil. If they are burned or blackened, clean them with a fine carborundum stone or very fine emery cloth, afterwards wiping away any trace of dirt or metal dust with a petrol-moistened cloth. Cleaning of the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this, slacken the nut(s) on the terminal block and lift off the spring, which is slotted to facilitate removal.

After cleaning, check the contact breaker setting.

Contact breaker adjustment.

Turn the engine by hand until the contacts are seen to be fully opened, and check the gap with a gauge having a thickness of .010"—.012" (0.25—0.3 mm.). If the gap is correct, the gauge should be a sliding fit, but if the gap varies from the gauge, the setting must be adjusted. To do this, keep the engine in the position giving maximum contact opening and slacken the two screws securing the fixed contact plate. Adjust the position of the plate until the gap is set to the thickness of the gauge and tighten the two locking screws. Recheck the gap for other positions of the engine giving maximum contact opening.

High tension cables.

Examine the high tension cables. Any which have the insulation cracked or perished, or show signs of damage in any other way, must be replaced by 7-mm. rubber-covered ignition cable.

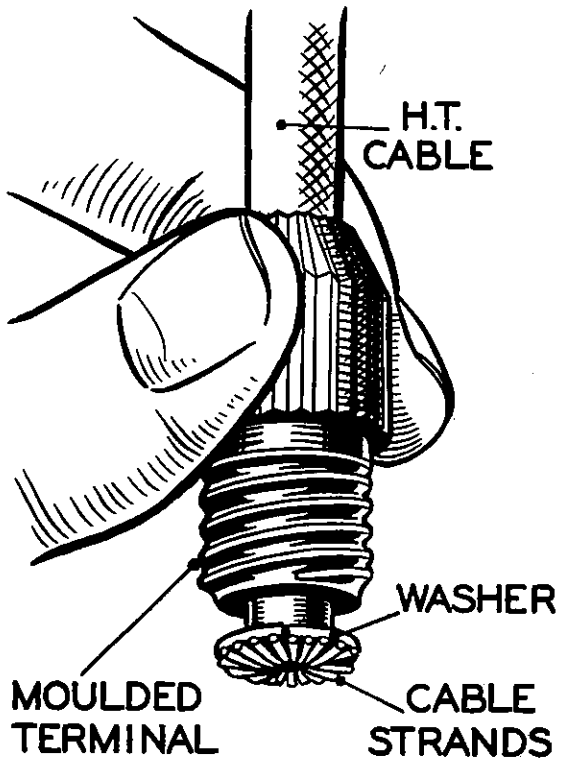


Fig. 4. High tension cable connections

Dismantling.

Spring back the securing clips and remove the distributor moulding.

Lift the rotor arm off the top of the spindle. If it is a tight fit, it should be carefully levered off with a screwdriver.

To remove the moving contact, unscrew the

nut from the moulded junction block, lift off the washer and cable eyelet and take out the bolt, the contact breaker spring can then be lifted off the pivot pin and then remove insulating washer from the pivot pin. Take out the two screws complete with spring washers and flat steel washers, from the plate carrying the fixed contact and remove the plate.

Unscrew the screw from the condenser band clip. Unscrew the terminal nut, lift off the spring washer and remove the condenser and connecting strip.

Undo the three screws fitted at the edge of the contact breaker base casting and lift them out. The screws are accessible through the apertures cut in the contact breaker plate. The contact breaker base can then be removed from the body of the distributor when the eyelet securing the earthing cable is withdrawn from the base casting.

Remove the jump ring from the underside of the contact breaker base, lift off the star-shaped spring and slide the contact breaker plate out of the base.

Undo the two nuts from the studs securing the vacuum unit to its bracket, pull the unit off its seating so that the studs are clear of the fixing bracket and rotate the vacuum unit to unscrew the connecting rod from the control barrel.

Remove the driving gear or dog from the shaft.

Take out the screw from inside the top of the cam spindle and lift off the cam. The automatic timing control is then accessible. Before dismantling, carefully note the position in which the various components are fitted in order that they can be replaced correctly. To remove the automatic timing control and shaft assembly from the distributor, it must be pressed out of its bearing. The bearings must not be disturbed unless they are worn and need replacing. The bearing bush fitted at the lower end of the shank can be removed by driving it out with a suitable punch ; while the ball bearing at the top can be removed by means of a shouldered mandrel locating on the inner journal of the bearing.

If the bearings have been removed, the distributor should be assembled with new bearings fitted. Press the ball bearing into its housing at the top of the shank using a shouldered mandrel which locates on the inner and outer journals of the bearing. The bearing bush at the lower end of the shank must also be fitted using a shouldered mandrel.

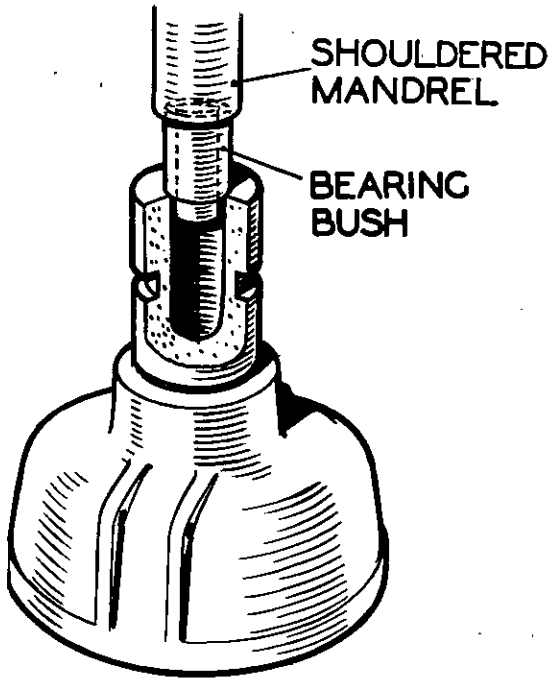


Fig. 5. Replacing distributor bearing bushes

Before fitting the bearing bush it should be allowed to stand completely immersed in this oil for at least 24 hours.

Place the distance collar over the shank, fit the shank in its bearings and replace the driving member.

Assemble the automatic timing control, taking care that the parts are fitted in their original positions and that the control springs are not stretched. Place the cam on its spindle and tighten the locking screw.

Screw the vacuum unit connecting rod into the control barrel and position the vacuum unit on its fixing plate so that the two studs fit through the holes provided. Place a spring washer over each stud and secure by tightening the locking nut.

See that the two cables are connected to the terminal and to the earthing screw in the base casting. Position the contact breaker plate in the base casting so that the peg fitted in the control barrel locates in the hole provided in the contact breaker plate. Place the star-shaped spring over the bearing sleeve on the under side of the base casting and secure by springing the jump ring into its location.

Place the contact breaker base on the

distributor body and secure by means of the three bolts.

Insert the terminal post on the condenser through the hole in the connector strip. Replace the spring washer and tighten the terminal nut. Secure the band clip by replacing and tightening the fixing screw.

Position the plate carrying the fixed contact on the contact breaker base and secure it by replacing and lightly tightening the two screws, first placing a spring washer and flat steel washer under the heads of each of the screws.

The eyelet on the end of the cable connected to the earthing screw must be fitted under the head of one of the screws. Place the insulating washer over the contact breaker pivot pin and position the contact breaker lever on its pivot pin. Insert the square-headed bolt through the condenser connecting strip and the hole in the end of the contact breaker spring. Fit the bolt in the moulded junction block, place the eyelet on the end of the connector from the low tension terminal over the bolt, followed by a spring washer and secure by tightening the nut. Adjust the contact breaker setting to give a maximum opening of .010"—.012" (0.25—0.3 mm.).

Note: If it becomes necessary to renew the contacts, a replacement set comprising fixed and moving contacts must be fitted.

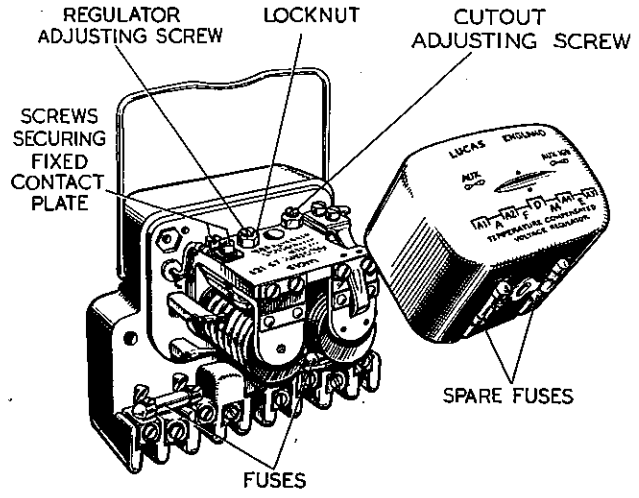


Fig. 6. Control box

Place the rotor arm on the top of the spindle, locating the register correctly and push it fully home.

Fit the distributor moulding and secure by means of the spring clips.

CONTROL BOX

(As copy for " Mayflower.")

HEADLAMPS

These lamps are of the stem fitting variety. They incorporate a Lucas light unit with pre-focus bulb so that no focusing of the bulb is required. The method of bulb replacement is exactly the same as Model F.700 (fitted to " Mayflower ") except for the removal of the front rim which is as follows :—

Pull forward the fixing clip and swing it downwards. The front together with the light unit can then be withdrawn from the lamp body.

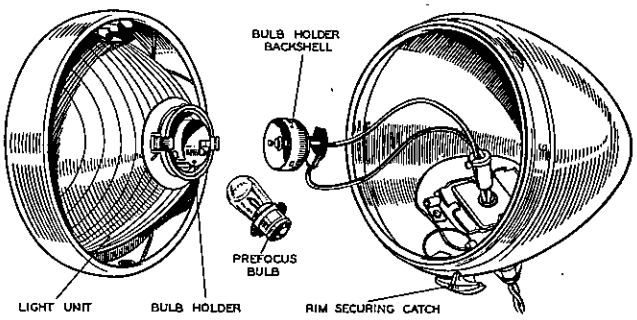


Fig. 7. Headlamp

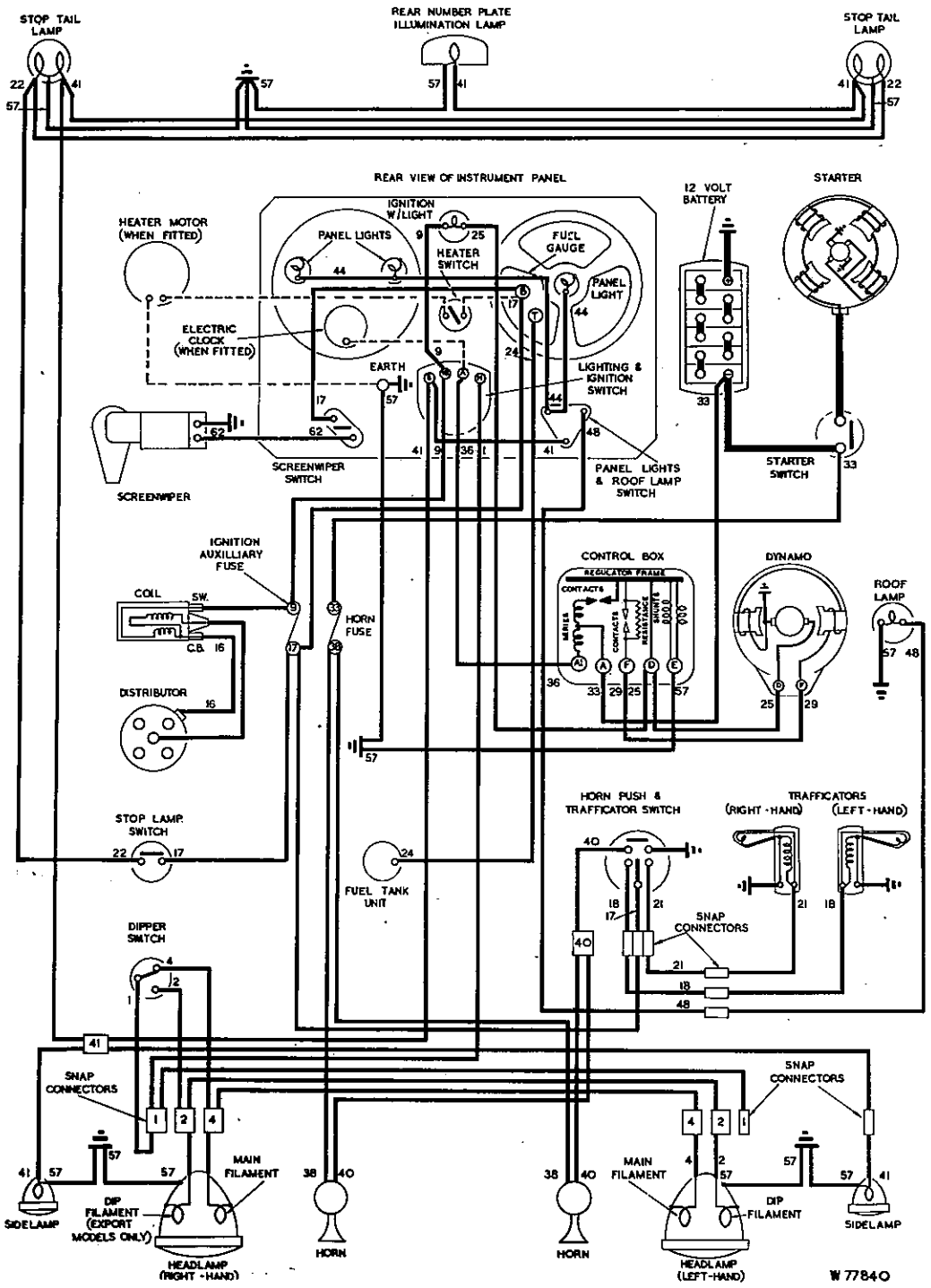
Setting.

If adjustment to the setting is required, slacken the single fixing nut at the base of the lamp and move the lamp on its adjustable mounting to the required position. Finally tighten the fixing nut.

SIDELAMPS

To gain access to the bulb, remove the screw at the rear of the lamp body and pull off the front rim assembly.

(For trafficators, windscreen wiper and horns, see " Mayflower " copy.)



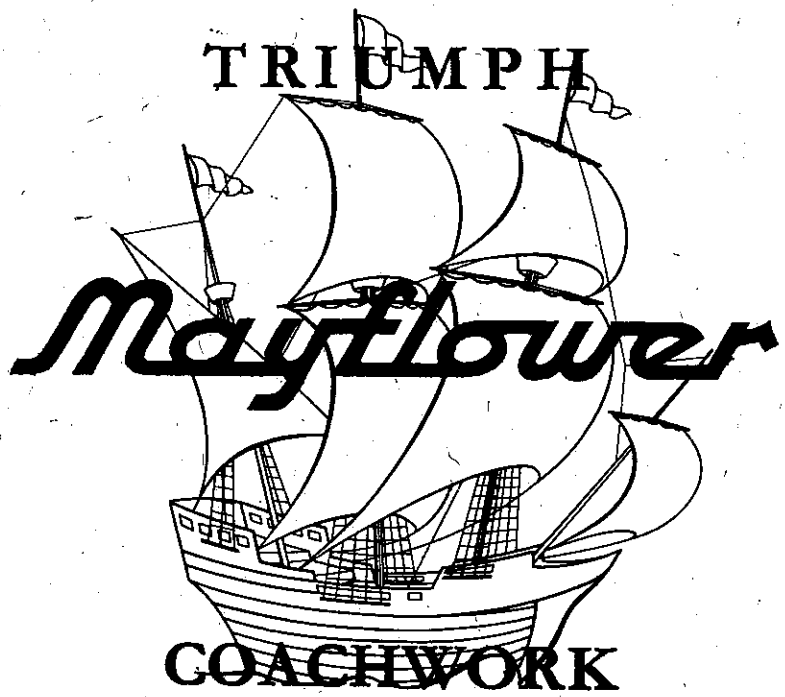
KEY TO CABLE COLOURS

1 BLUE	14 WHITE with PURPLE	27 YELLOW with BLUE	40 BROWN with BLACK	53 PURPLE with WHITE
2 BLUE with RED	15 WHITE with BROWN	28 YELLOW with WHITE	41 RED	54 PURPLE with GREEN
3 BLUE with YELLOW	16 WHITE with BLACK	29 YELLOW with GREEN	42 RED with YELLOW	55 PURPLE with BROWN
4 BLUE with WHITE	17 GREEN	30 YELLOW with PURPLE	43 RED with BLUE	56 PURPLE with BLACK
5 BLUE with GREEN	18 GREEN with RED	31 YELLOW with BROWN	44 RED with WHITE	57 BLACK
6 BLUE with PURPLE	19 GREEN with YELLOW	32 YELLOW with BLACK	45 RED with GREEN	58 BLACK with RED
7 BLUE with BROWN	20 GREEN with BLUE	33 BROWN	46 RED with PURPLE	59 BLACK with YELLOW
8 BLUE with BLACK	21 GREEN with WHITE	34 BROWN with RED	47 RED with BROWN	60 BLACK with BLUE
9 WHITE	22 GREEN with PURPLE	35 BROWN with YELLOW	48 RED with BLACK	61 BLACK with WHITE
10 WHITE with RED	23 GREEN with BROWN	36 BROWN with BLUE	49 PURPLE	62 BLACK with GREEN
11 WHITE with YELLOW	24 GREEN with BLACK	37 BROWN with WHITE	50 PURPLE with RED	63 BLACK with PURPLE
12 WHITE with BLUE	25 YELLOW	38 BROWN with GREEN	51 PURPLE with YELLOW	64 BLACK with BROWN
13 WHITE with GREEN	26 YELLOW with RED	39 BROWN with PURPLE	52 PURPLE with BLUE	

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

COACHWORK

SECTION M

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

COACHWORK

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4	Showing hot water valve and volume control levers	4
5	Showing position of demister control lever, inlet water connection and aperture for blower connection	4
6	Showing metal return pipe to adaptor on water pump and hot water inlet pipe	4

BODY AND UNDERFRAME REPAIRS

A separate manual has been prepared to cover body repairs and adjustments and is available from our Spares Department at 10/- subject to the normal trading discount.

In view of the existence of instructions to cover body repairs, it is proposed to confine this Section to the installation of heating equipment and an outline of our policy with regard to the incorporation of radio.

TO FIT SMITH 2 K.W. CAR HEATER

Provision has been made in the design of the "Mayflower" for the incorporation of this type of heater and its installation is, therefore, considerably simplified.

The procedure recommended for the installation of this equipment is as follows :—

To dismantle.

1. Disconnect battery lead to protect circuit.
2. Remove interior trim from the inner sid of each cubby hole thus exposing the bac of the facia panel and dashboard.
3. Withdraw cover plate from below dasl board. This plate is secured by six meta thread screws.
4. Withdraw facia panel after removal of fou wing nuts.
5. Partially withdraw dashboard after remova of six metal screws and—after disconnecting speedometer cable and trip, choke cable and starter wire from engine end and oil pressure gauge pipe union—allow dash board to hang on its electric cables and controls, as shown in Fig. 1.

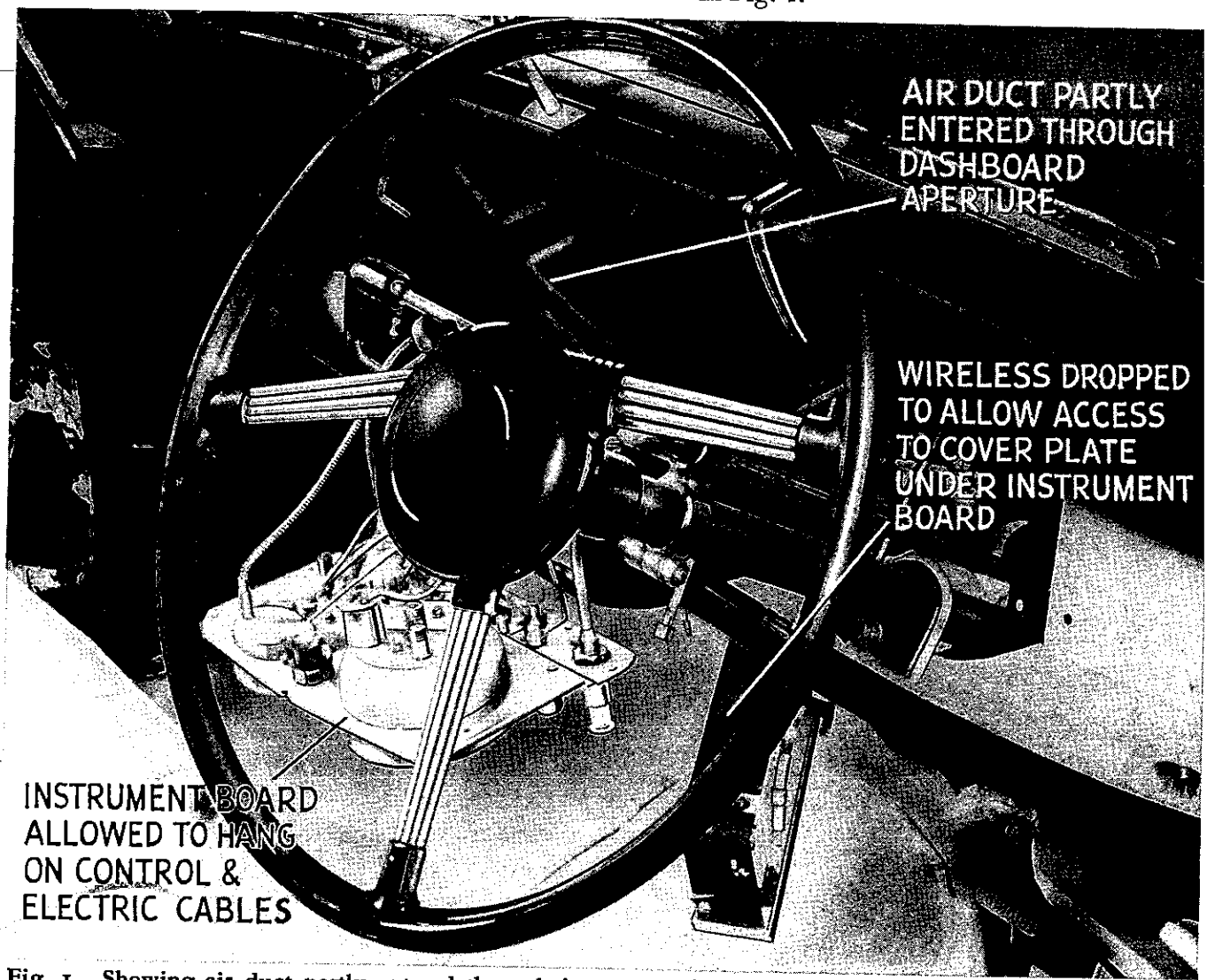


Fig. 1. Showing air duct partly entered through instrument board aperture. Where wireless is fitted unit must be removed to allow access to cover plate under dash.

6. Withdraw air vent control rod and duct after removing two metal screws.
7. Remove circular cover from dash after withdrawal of six metal screws.
8. Remove rectangular cover plate from top of bulkhead after withdrawing the two securing setscrews.
9. Remove blanking grommets from scuttle as shown in Fig. 2.

To assemble.

1. Check equipment supplied against details shown in Fig. 3.
2. Fit demister grommets to scuttle in the apertures shown in Fig. 2.
3. Assemble demister pipes under scuttle entering elbows through grommets.
4. Fit control cable grommets to dash as indicated in Fig. 2.
5. Fit special air duct behind dashboard and secure the top of this to scuttle dash with two metal screws. (Fig. 1 shows new duct partially entered into position through instrument aperture.)
6. Position bottom of duct opposite circular hole in dash, fit rubber packing ring and secure with six metal screws.
7. Bostick rubber washer to base of heater unit.
8. Position heater unit on scuttle fitting demister elbows on to adaptors at the back of this unit.
9. Partially secure heater unit to bulkhead, fully tightening the front two setscrews and leaving the other two loosely screwed in position.
10. Fit heater switch and cable to dash. Fit short cable to green wire (live) connection

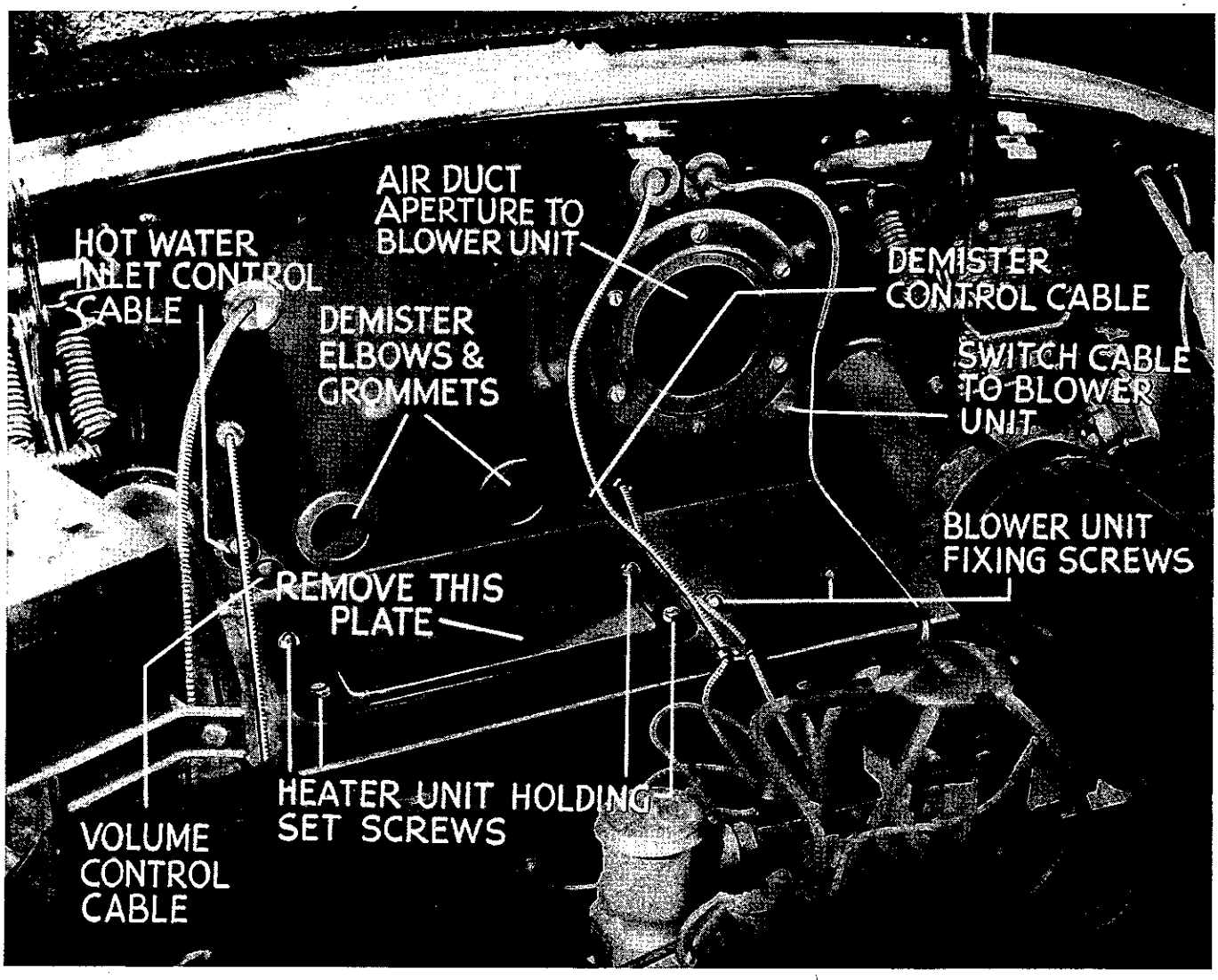


Fig. 2. Showing the position for various heater details and controls.

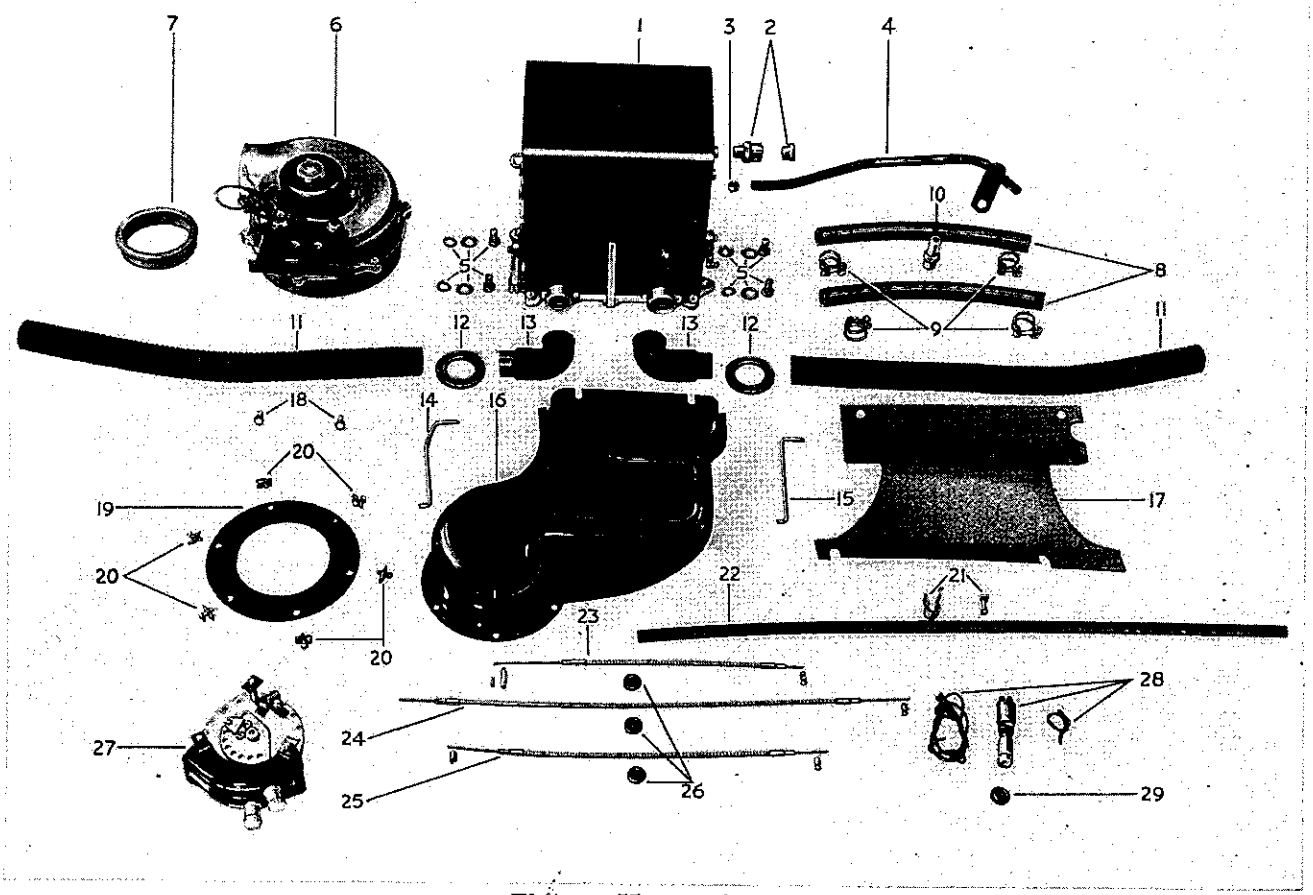


Fig. 3. Heater details.

NOTATION FOR FIG. 3

1. Heater.
2. Adaptor for metal water return pipe.
3. Acorn for metal water return pipe.
4. Metal return pipe.
5. Heater mounting setscrews and washers.
6. Blower.
7. Grommet for blower.
8. Water hoses.
9. Clips for water hoses.
10. Adaptor for water inlet pipe.
11. Demister hoses.
12. Grommets for demister elbows.
13. Demister elbows.
14. Dash ventilator rod (external).
15. Dash ventilator rod (inside air duct).
16. Air duct.
17. Trim cover.
18. Blower mounting screws.
19. Air duct rubber packing.
20. Air duct fixing screws.
21. Clip for air duct drain pipe.
22. Air duct drain pipe.
23. Demister control cable.
24. Volume control cable.
25. Hot water control cable.
26. Grommets for control cables.
27. Control assembly bracket.
28. Heater switch and electrical leads.
29. Grommet for lead from switch to blower.

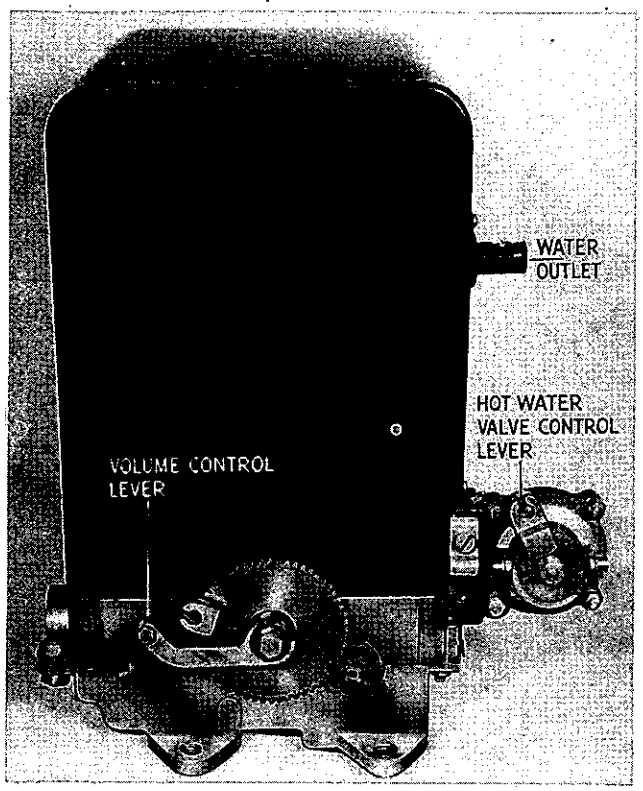


Fig. 4. Showing hot water valve and volume control levers.

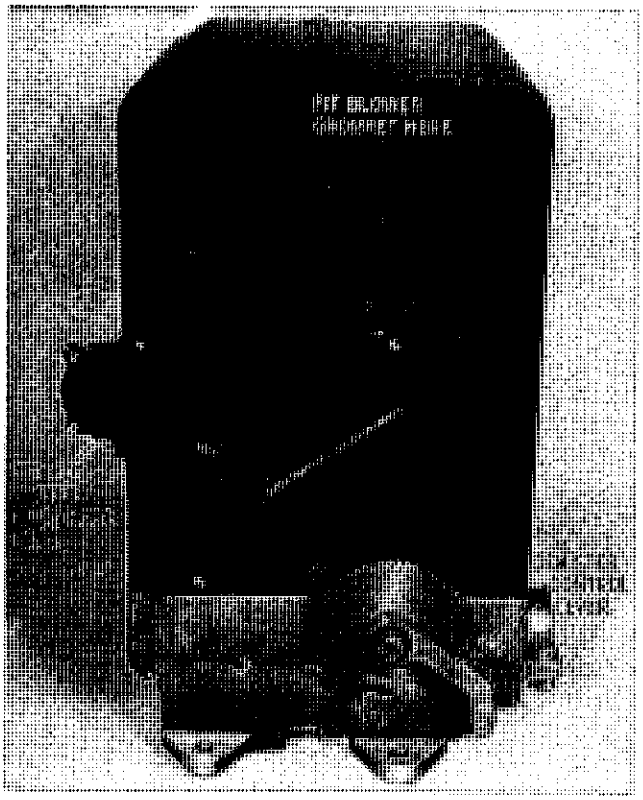


Fig. 5. Showing position of demister control lever inlet water connection and aperture for blower connection.

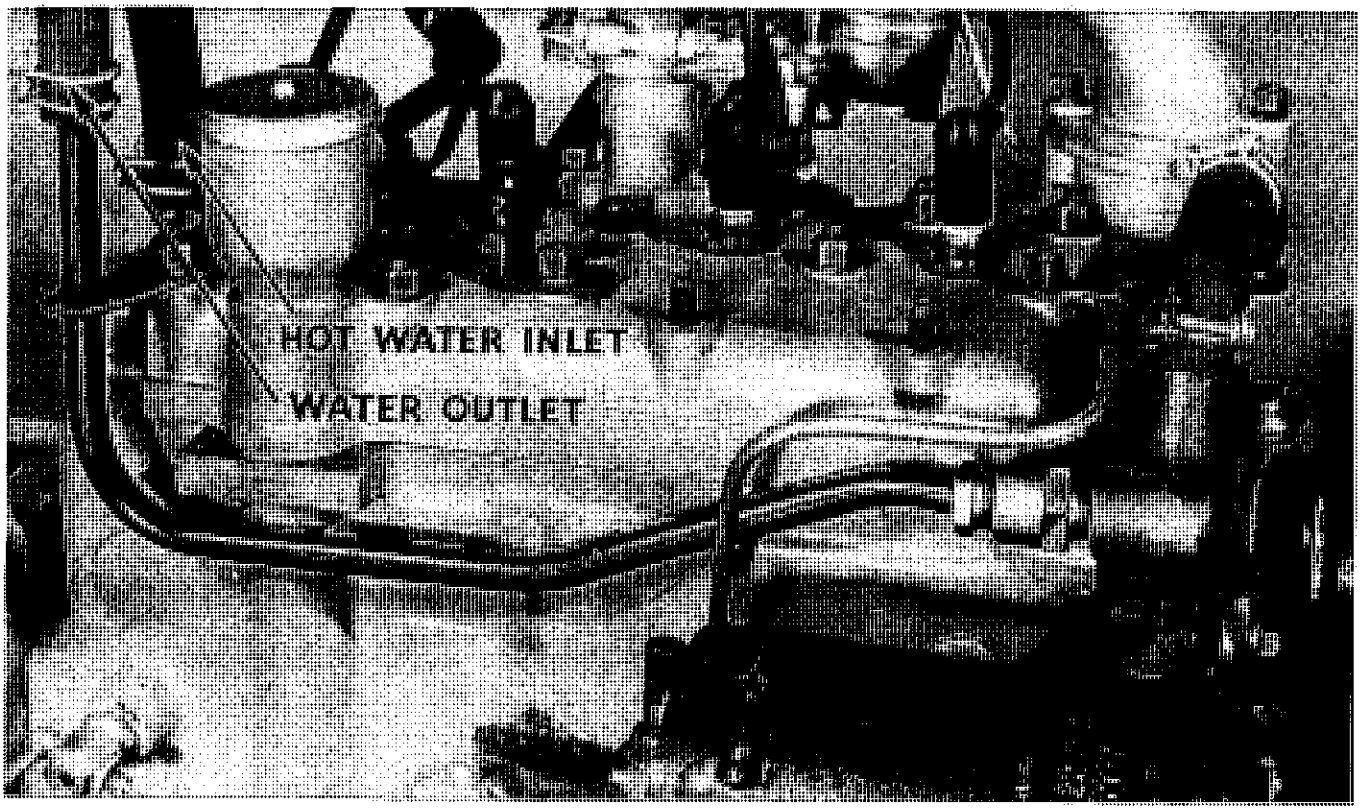


Fig. 6. Showing metal return pipe to adaptor on water pump and hot water inlet pipe. (The ignition coil has been removed from the cylinder head to show the adaptor with water pump).

on windscreen wiper switch, the long cable will be connected to blower unit.

11. Refit dash panel after reconnecting controls and oil pressure gauge pipe.
12. Refit cover under dash, securing with six metal thread screws.
13. Connect control cables to levers on control assembly bracket and secure this bracket to three of the under dash cover plate securing screws, fitted in the last operation.
14. Pass control cables through their grommets and connect to their respective levers on the heater unit (see Figs. 4 and 5).
15. Fit millboard covering to the toeboard and scuttle dash using respectively two carpet turn buttons and the two loose heater unit securing setscrews.
16. Fit blower grommet to side of heater unit (see Fig. 5).
17. Fit blower unit to scuttle securing with two metal thread screws, earthing unit to one of these fixing screws. Connect switch cable to snap connector.
18. Fit water pipe adaptor to water pump.
19. Fit brass acorn on forward end of metal connector pipe and assemble this into adaptor on water pump, securing metal pipe by its bracket to a cylinder head stud (see Fig. 6).
20. Remove plug from right-hand rear corner of combustion head and replace this by $\frac{3}{8}$" gas brass adaptor supplied.
21. Assemble outlet and inlet rubber hoses securing these with Jubilee Clips.
22. Having completed assembly, check heater control for maximum opening.

CAR RADIO

The Radiomobile Models 4100 and 4200 are specified for use with this car and provision for the incorporation of these units has been made in the design of the car.

This equipment is manufactured by Messrs. S. Smith and Sons (Radiomobile) Ltd., 179/185, Great Portland Street, London, W.1.

Whilst the installation of this equipment is a reasonably straightforward operation, to get proper quality of sound reception, technical knowledge in regard to such matters is necessary.

In fairness to the purchasers of these sets and to the manufacturers of the equipment, it is proposed to refer all enquiries as to such installations to the nearest Radiomobile Agent. A list of Radiomobile Home and Overseas Agents is given below and where such an installation is contemplated, reference should be made to the appropriate Agent or, where such assistance is not readily available, to Messrs. S. Smith and Sons (Radiomobile) Ltd., 179/185, Great Portland Street, London, W.1.

RADIOMOBILE ACCREDITED DEALERS

HOME

The following is a complete list of Radiomobile Accredited Dealers. Every one of them is fully equipped to demonstrate, install and service "His Master's Voice" Automobile Radio equipment. Wherever you live there is a Radiomobile Accredited Dealer in the district.

LONDON E.
Zenith Motor & Eng. Works, Ltd., 591 Commercial Road, E.1.
R. P. Powell Motors, Ltd., 321 Romford Road, Forest Gate, E.7.
Leytonia Radio, 828 High Road, Leyton, E.10.
G. E. Matthews, Ltd., 305 High Road, Leytonstone, E.11.
Browning Francis, Ltd., 152 Hoe Street, Walthamstow, E.17.
George Matthews Esq., 339 High Road, Leytonstone, E.11.

LONDON N.
Glanfield Lawrence (London), Ltd., Glanfield's Corner, 407 High Road, Finchley, N.12.
Lindsay Bros., Ltd., 923-925 High Road, North Finchley, N.12.
Barclay Motors, 644-648 Holloway Road, N.19.

LONDON N.W.
Car Mart, Ltd., Austin House, 287-289 Euston Road, N.W.1.
Henlys, Ltd., Hawley Crescent, Camden Town, N.W.1.
Longman's Garages, Ltd., Taunton Place, Marylebone, N.W.1.
L. A. Hills (Hendon), Ltd., Electric Service Garage, The Quadrant, Finchley Lane, Hendon, N.W.4.
Standard & Triumph Sales, Ltd., 98a Boundary Road, St. John's Wood, N.W.8.
Warwick Wright, Ltd., Lord's Court, St. John's Wood Road, N.W.8.
Blackbird Hill Garage, Ltd., Kingsbury Lane, N.W.9.

LONDON S.E.
Clifton's Service Station, Ltd., 59 Sidcup Road, Lee, S.E.12.
Furlong's, Ltd., 160 Powis Street, Woolwich, S.E.18.
S. G. Smith (Motors), Ltd., 13-19 East Dulwich Road, S.E.22.

LONDON S.W.
Godfrey Davis, Ltd., 7 Eccleston Street, Victoria, S.W.1.
Gramophone Shop, Ltd., 130 Sloane Street, S.W.1.
Prynn & Stevens, Ltd., 57 Acre Lane, S.W.2.
Eustace Watkins, Ltd., Chelsea Manor Street, S.W.3.
A. Owen, Ltd., 72 Park Hill, Clapham, S.W.4.
Boon & Porter, Ltd., Castelnau, Barnes, S.W.13.
South London Motors, Ltd., 512-522 Streatham High Road, S.W.16.
Allan Taylor (Motors), Ltd., High Street, Wandsworth, S.W.18.
Gurney Nutting, Ltd., Lombard Road, Morden Road, S.W.19.
Modern Service (Wimbledon), Ltd., The Modern Service Garage, High Street, Wimbledon Common, S.W.19.
Wimbledon Motor Works, Ltd., 29 High Street, Wimbledon, S.W.19.

LONDON W.
Gramophone Co., Ltd., 363 Oxford Street, W.1.
Lex Garages, Ltd., 2 Lexington Street, Piccadilly Circus, W.1.
Jack Olding & Co., Ltd., 8-10 North Audley Street, W.1.

COACHWORK

Smiths Motor Accessories Ltd., 179-185 Great Portland Street, W.1.
University Motors, Ltd., 7 Hertford Street, Piccadilly, W.1.
Hamilton Motors (London), Ltd., 466-490 Edgware Road, W.2.
Stewart & Ardern, Ltd., Morris House, The Vale, Acton, W.3.
Chain Garages, Ltd., Hanger Lane, Ealing, W.5.
Normand, Ltd., 405-409 King Street, Hammersmith, W.6.
Geer's Car Radio, Rear 3, Broadway Buildings, Hanwell, W.7.
Rootes, Ltd., Ladbroke Hall, Barlby Road, North Kensington, W.10.
J. Davey Esq., Logan Place, Kensington, W.8.
Atkinson Battery Service, 1 Princedale Road, W.11.

BEDFORDSHIRE
George Langley, Ltd., Morris House, Bromham Road, BEDFORD.
Murkett Bros., 3 High Street, BEDFORD.
Dickinson & Adams (Luton), Ltd., Bridge Street, LUTON.

BERKSHIRE
S. Evans & Sons, Ltd., Electric House, 16a & 18 King Street. MAIDENHEAD.
Hewens Garages, Ltd., MAIDENHEAD.
Marchant's Garages, Ltd., Greenham Road, NEWBURY.
Barnes & Avis, Ltd., 140-141 Friar Street, READING.
Hewens Garages, Ltd., 87 Castle Street, READING.
Hickie & Hickie, Ltd., 153 Friar Street, READING.
Quartermains Quick Service, Ltd., 346-348 Oxford Road, READING.
Reading Garage Co., Ltd., Cork Street, READING.
Vincents of Reading, Ltd., Station Square, READING.
Surplices Ltd., 37-39 Sheet Street, WINDSOR.

BUCKINGHAMSHIRE
Station Garages, Ltd., AMERSHAM.
E. D. Hasberry, Temple Street, AYLESBURY.
Weatherhead's, 73 Bletchley Road, BLETCHLEY.
Davenport Vernon & Co., Ltd., 31-34 High Street, HIGH WYCOMBE.
Messrs. Currall's Garages, High Street, MARLOW.

CAMBRIDGESHIRE
King & Harper, Ltd., Hilton Road, CAMBRIDGE.
Marshalls (Cambridge), Ltd., Jesus Lane, CAMBRIDGE.
Herbert Robinson, Ltd., Regent Street, CAMBRIDGE.
Pack & Packer (March), Ltd., Dartford Road, MARCH.
King & Harper, Ltd., Bridge Street, CAMBRIDGE.

CHESHIRE
James McKenzie, Ltd., Oxton Road, BIRKENHEAD.
Harry E. Madders, Park Garage, CHEADLE HULME.
North Cheshire Electric Co., Ltd., 48 Station Road, CHEADLE HULME.
Anchor Motor Co., Ltd., The Newgate, CHESTER.
Cestrian Electrical Co., Northgate, CHESTER.
More & Gamon, Ltd., 110 Foregate Street, CHESTER.
Tristams, Ltd., 14 City Road, CHESTER.
Breedon & Middleton, 42 High Street, CREWE.
Morris Store, 163 Edleston Road, CREWE.
Offley Bros., Ltd., Whitby, ELLESMERE PORT.
Samways of Cheshire Ltd., 181-183 London Road, HAZEL GROVE.
W. S. Whiston, Chester Road, MIDDLEWICH.
Chesters (New Brighton), Ltd., 139 Victoria Road, NEW BRIGHTON.
Hollingdrake Automobile Co., Ltd., Town Hall Square, STOCKPORT.
Smiths of Stockport, Ltd., Wellington Road South, STOCKPORT.
Douglas Williams & Co., 153 High Street, WINSFORD.

CORNWALL
Melody House, Basset Road, CAMBORNE.
G. R. Ennor, The Moor, FALMOUTH.
Blewett's Garage, HAYLE.
Taylor's Garage, Green Market, PENZANCE.
Wheel Garage, Praa Sands, Nr. PENZANCE.
Hill & Phillips (1939), Ltd., Gover Road, ST. AUSTELL.
H.T.P. Motors, Ltd., Princes Garage, TRURO.

CUMBERLAND
Dias & Co., Ltd., 53 Lowther Street, CARLISLE.
Graham & Roberts, Ltd., Botchergate, CARLISLE.
Harrisons (Motor Engineers), Ltd., Warwick Road, CARLISLE.
E. T. Roberts & Co., Ltd., 1 The Crescent, CARLISLE.
S.M.T. Sales & Service, Ltd., Viaduct Garage, CARLISLE.
J. W. Kieser & Son, Victoria Road, PENRITH.
Gillitt & Co., St. Nicholas Chambers, Lowther Street, WHITEHAVEN.

DERBYSHIRE
Corner House (Ashbourne), Ltd., 2 Church Street, ASHBOURNE.
Brocklehurst Motors, Ltd., Sheffield Road, CHESTERFIELD.
Kennings, Ltd., The Motor Depot, CLAY CROSS.
Andrews Garage (Derby), Ltd., Becket Street, DERBY.
Dalton & Sons, Ltd., 11 London Road, DERBY.
E. H. Pickford & Co., Ltd., 39 Duffield Road, DERBY.
Sanderson & Holmes, Ltd., London Road, DERBY.

DEVONSHIRE
Barnstaple Motor Co., The Square, BARNSTAPLE.
County Garage, Boutport Street, BARNSTAPLE.
West Regional Autos, Ltd., Newport Road, BARNSTAPLE.
Herbert H. Burrow, 4 Bridge Street, BIDEFORD.
Heard Bros., Broad Quay, BIDEFORD.
G. C. Chichester, Exeter Road, BRAUNTON.
City Garages (Exeter), Ltd., City Garage, New North Road, EXETER.
Motor Macs (Exeter), Ltd., 167-169 Sidwell Street, EXETER.
P. Pike & Co., Ltd., Alphington Street, EXETER.
Standfield & White, Ltd., 8 Sidwell Street, EXETER.
Presslers of Kingsbridge, 42 Fore Street, KINGSBRIDGE.
Perry's, Preston, PAIGNTON.
Car Sales (Plymouth), Ltd., Summerland Place, PLYMOUTH.
Barton Motor Co., Ltd., Hyde Park Corner, PLYMOUTH.
Luckes & Sons, Ltd., Crownhill, PLYMOUTH.
W. Mumford, Ltd., Abbey Garage, St. Andrew's Street, PLYMOUTH.
M. Thomas (Motors), Ltd., Embankment Road, PLYMOUTH.
Messrs. Eric Perry, Ltd., Torwood Street, TORQUAY.
P. Pinch, High Street, TOTNES.

DORSET
Merchants Garage, High West Street, DORCHESTER.
Wilfrid Snook, South Street, DORCHESTER.
Tilleys, 45 South Street, DORCHESTER.
Parkstone Motor Co., Ltd., Station Road, PARKSTONE.
Walters & Co. (Parkstone), Ltd., PARKSTONE.
Westminster Garages, Ltd., Commercial Road, PARKSTONE.
F. W. B. Saunders, Ltd., Dighy Road, SHERBORNE.
Rodway's Garage, WIMBORNE.

DURHAM
Cleveland Car Co., Ltd., Grange Road, DARLINGTON.
F. W. Keighley, Ltd., 7 Houndgate, DARLINGTON.
Minories Garage, Ltd., Northgate, DARLINGTON.
C. Sharp, 7 Prebend Row, DARLINGTON.
Wheatley Motors, Ltd., Tower Garage, Yarm Lane, STOCKTON-ON-TEES.
Binns, Ltd., Union Street, SUNDERLAND.
Dunns Garages (Sunderland), Ltd., Wheatsheaf Corner, SUNDERLAND.
Gales Motor & Engineering Co., Ltd., York Road, WEST HARTLEPOOL.
Robert Robinson (West Hartlepool), Ltd., Grand Garage, Avenue Road, WEST HARTLEPOOL.

ESSEX
Eastern Automobiles, Ltd., London Road, CHELMSFORD.
F. G. Smith (Motors), Ltd., High Road, Goodmayes, ILFORD.
Malcolm Motors, Ltd., The Broadway, LEIGH-ON-SEA.
Romford Commercial Cars, 20-28 London Road, ROMFORD.
F. B. Motors, Ltd., Bull's Corner, STANSTED.
Eastern Automobiles (Southend), Ltd., 1163-7 London Road, Leigh, SOUTHEND-ON-SEA.
Holmes & Smith, Ltd., Essex House, 459 London Road, WESTCLIFF-ON-SEA.
Lamb's Ltd., Standard House, Southend Road, WOODFORD GREEN.
P. G. Page Esq., 38 Crouch Street, COLCHESTER.

GLOUCESTERSHIRE
C. Allen & Sons, Ltd., Berkeley Square, BRISTOL 8.
F. W. Allen (Bristol), Ltd., Lower Arcade, BRISTOL 1.
Bristol Motors, Ltd., Ashton Gate, BRISTOL 7.
Cater Motor Co., Ltd., Crofton House, Cheltenham Road, BRISTOL 6.
Cathedral Garage, Ltd., College Green, BRISTOL 1.
College Motors, Rupert Street Garage, BRISTOL 1.
Coventry & Jeffs, Ltd., 22-32 St. George's Road, BRISTOL 1.
Victoria Motor Co. (Bristol), Ltd., Temple Gate, BRISTOL 1.
Western Motors (Bristol), Ltd., Park Row, BRISTOL 1.
Windmill & Lewis, Ltd., Clifton, BRISTOL 8.
Regent Motors, Regent Street, CHELTENHAM.
Steels Garages, Ltd., High Street, CHELTENHAM.

Walker & Ward, Ltd., Warwick Place, CHELTENHAM.
Hickie & Hickie, Ltd., 52 & 54 Southgate Street, GLOUCESTER.
Taylor's Crypt House Motors, Ltd., London Road, GLOUCESTER.
Westgate Motor House Co. (Gloucester), Ltd., Westgate Street, GLOUCESTER.
Wicliffe Motor Co., Ltd., Russell Street, STROUD.

HAMPSHIRE

Phillips Bros. (Aldershot), Ltd., Birchett Road, ALDERSHOT.
Edwards & Co. (Bournemouth), Ltd., 189 Old Christchurch Road, BOURNEMOUTH.
George Hartwell, Ltd., 35-41 Holdenhurst Road, BOURNEMOUTH.
Hughes of Bournemouth, 34 Poole Hill, BOURNEMOUTH.
Knott Bros., Ltd., 382-386 Charminster Road, BOURNEMOUTH.
Tice & Sons, 723 Wimborne Road, BOURNEMOUTH.
Bennett & Righton (Fareham), Ltd., 2-4 West Street, FAREHAM.
Cedar Service Station, Ltd., FAREHAM.
Righton & Bennett, Ltd., Motor Corner, Stoke Road, GOSPORT.
Coopers (New Milton) Garages, Ltd., NEW MILTON.
Wall & Martin, Ltd., Barton-on-Sea, NEW MILTON.
Weston Hart, 84 London Road, North End, PORTSMOUTH.
E. Wyatt, 10 Queens Road, PORTSMOUTH.
Alec Bennett, Ltd., Portswood, SOUTHAMPTON.
Carey & Lambert, Ltd., Austin House, The Avenue, SOUTHAMPTON.
Perrins, Ltd., March Lane, SOUTHAMPTON.
Wadham Bros., Morris House, The Avenue, SOUTHAMPTON.
E.M.A., Ltd., Tudor House, Grove Road South, SOUTHSEA.
Haig's Motor Co., Ltd., Austin House, Granada Road, SOUTHSEA.
Seals of Southsea, Ltd., 51-55 Highland Road, SOUTHSEA.
Wadham Bros., SOUTHSEA.
Wadham Bros., London Road, WATERLOOVILLE.
Will Short, Ltd., 2-4 St. Cross Road, WINCHESTER.

HEREFORDSHIRE

Brook Bros. (Hereford), Ltd., Blue School Street, HEREFORD.
H. A. Saunders, Ltd., Commercial Road, HEREFORD.
Geo. Hopkins & Sons, New Street, LEDBURY.

HERTFORDSHIRE

Odeon Motors, Ltd., Great North Road, BARNET.
Ralph E. Sanders & Sons, Ltd., Walsworth Road, HITCHIN.
Hoddesdon Motor Company, High Street, HODDESDON.
W. N. Couper, Ltd., Catherine Street, ST. ALBANS.
Stevenage Motor Co., Ltd., Morris House, STEVENAGE.
Russell's Auto-Electrical Co., 18 Queens Road, WATFORD.

HUNTINGDONSHIRE

Murkett Bros., Market Square, HUNTINGDON.

KENT

C. Hayward & Son, 18-46 New Street, ASHFORD.
W. T. Richards, 74-78 The Broadway, BEXLEYHEATH.
Broadstairs Car Electrical Services, Ltd., 140 High Street, BROADSTAIRS.
Barrets of Canterbury, Ltd., 26 St. Peter's Street, CANTERBURY.
Caffyns, Ltd., New Dover Road, CANTERBURY.
Rootes, Ltd., The Pavilion, CANTERBURY.
Martin Walter, Ltd., 41 St. George's Place, CANTERBURY.
Russell's Garages, Ltd., Medway Street, CHATHAM.
John C. Beadle, Ltd., Spital Street, DARTFORD.
Martin Walter, Ltd., Castle Street, DOVER.
E. Barden & Sons, 257 Bexley Road, Northumberland Heath, ERITH.
Martin Walter, Ltd., 145-147 Sandgate Road, FOLKESTONE.
Manington's Ltd., 426 Canterbury Street, GILLINGHAM.
W. H. Gatward, Ltd., 14-17 Sandling Road, MAIDSTONE.
Miles (Maidstone), Ltd., King Street, MAIDSTONE.
Rootes, Ltd., MAIDSTONE.
Northdown Motor Co., Northdown Road, Cliftonville, MARGATE.
Cyril Nicolls & Co., 28 Station Square, PETTS WOOD.
Gentry & Bayley, Ltd., 334 High Street, ROCHESTER.
Rootes, Ltd., Star Hill, ROCHESTER.
Sheppey Motor Co., Ltd., 21 Broadway, SHEERNESS.
George Fitt Motors, Ltd., Tankerton Garage, TANKERTON.
Caffyns, Ltd., 150 High Street, TONBRIDGE.
H. Featherstone, Ltd., 22 London Road, TUNBRIDGE WELLS.

LANCASHIRE

Auto Services (Accrington), Ltd., Clock Garage, Whalley Road, ACCRINGTON.
Lawton Bros., 284 Stamford Street, ASHTON-UNDER-LYNE.
Parkinson's, The Music Shop, 61 Market Street, ATHERTON.
William Kelly, Ltd., 70 Dalton Road, BARROW-IN-FURNESS.
Loxhams Morriservices, Ltd., Premier Service Station, BLACKBURN.
Brown & Mallalieu, Ltd., Metropole Garage, General Street, BLACKPOOL.
North Promenade Garage & Engineering Co., Ltd., 176 Promenade, BLACKPOOL.
Radio & Electrical Equipment Co., Ltd., 37-39 Waterloo Road, BLACKPOOL.
Edward Bullough, 29-31 Knowsley Street, BOLTON.
Parkers (Manchester & Bolton), Ltd., Bradshawgate, BOLTON.
Hebden Bros., Ltd., 221-223 Accrington Road, BURNLEY.
G. W. Rushworth, Ltd., Savoy Garage, Bull Street, BURNLEY.
R. Waring, Ltd., 4 The Crescent, CLEVELEYS.
J. P. Hey, 30 Albert Road, COLNE.
Edward Bullough, 45-47 Albert Road, FARNWORTH.
Edward Bullough, 1a Bolton Road, KEARSLEY.
Pye Motors, Ltd., Parliament Street, LANCASTER.
Barton Townley, Ltd., Penny Street, LANCASTER.
John Shinn & Sons, 99 Bradshawgate, LEIGH.
J. Blake & Co., Ltd., Bold Street, LIVERPOOL 1.
Johnson's Radio & Music Stores, 172 Allerton Road, LIVERPOOL 18.
Kirby's, Ltd., 45-61 Duke Street, LIVERPOOL 1
James Smith & Son, Ltd., Williamson Street, LIVERPOOL 1
W. Watson & Co. (Liverpool), Ltd., Oldham Street, LIVERPOOL 1.
Brindle & Kirby, Ltd., 470-472 Bury New Road, Prestwich, MANCHESTER.
Joseph Cockshoot & Co., Ltd., Great Ducie Street, MANCHESTER 3.
Fred Dawes, Ltd., 90-92 London Road, MANCHESTER 1.
Electric House (Denton), Ltd., Ashton Road, Denton, MANCHESTER.
Green & Zonis, Ltd., 246-252 Deansgate, MANCHESTER 3.
Henlys, Ltd., 234 Cheetham Hill Road, MANCHESTER 8.
Kennings, Ltd., 232 Cheetham Hill Road, MANCHESTER 8.
Cyril Lawton, Ltd., 65 & 67 Moston Lane, Blackley, MANCHESTER.
Frank Lewis, Ltd., Market Street, Stretford, MANCHESTER.
Lookers, Ltd., Chester Road, Stretford, MANCHESTER.
Rootes, Ltd., Olympia, Chester Road, MANCHESTER.
B. A. Fox, 36 Albert Road, MORECAMBE.
Ratcliffe & Thornton Bros., Ltd., Manchester Road, NELSON.
Cuerden Motors, Ltd., Grimshaw Street, PRESTON.
Loxhams Morriservices, Ltd., Corporation Street, PRESTON.
Edward Bullough, 11 Stand Lane, RADCLIFFE.
L. C. Hillier, Ltd., Oldham Road, ROCHDALE.
King's Road Garage Co., Ltd., King's Road, ST. ANNES-ON-SEA.
Automotors (Southport), Ltd., 5 Albert Road, SOUTHPORT.
R. Bamber & Co., Ltd., Scarisbrick, SOUTHPORT.
Edward Bullough, 52-54 Manchester Road, WALKDEN.
Dawsons, Ltd., 59 Sankey Street, WARRINGTON.
H. H. Timberlake, Ltd., Library Street, WIGAN.
Messrs. Kirby's, Ltd., Clifford Road, BLACKPOOL.
Liverpool Radio Supplies, Ltd., 74-76 Renshaw Street, LIVERPOOL 1.

LEICESTERSHIRE

H. A. Browett & Co., Ltd., 64-66 Granby Street, LEICESTER.
Castle's Motor Co. (Leicester), Ltd., Church Gate, LEICESTER
Colmore Depot, Ltd., 178 Belgrave Gate, LEICESTER.
H. A. Hamshaw, Ltd., Humberstone Gate, LEICESTER.
T. H. Wathes & Co., Ltd., 86 & 88 High Street, LEICESTER.
Garner & Sons (Melton), Ltd., High Street, MELTON MOWBRAY.

LINCOLNSHIRE

Holland Bros., Ltd., Wide Bargate, BOSTON.
Shipley & Co., Ltd., Market Place, GAINSBOROUGH.
Whipples, Ltd., The County Garage, Watergate, GRANTHAM.
Roland C. Bellamy, Ltd., St. Mary's Gate, GRIMSBY.
Fred W. Wood, Ltd., 24a Bull Ring, GRIMSBY.
E. W. Campion & Sons, Ltd., High Street, LINCOLN.
Gilbert & Son, Ltd., Pelham Street, LINCOLN.
C. R. Spouge, Ltd., 12 Cornhill, LINCOLN.
Parker & Co. (Scunthorpe), Ltd., Doncaster Road, SCUNTHORPE.
Kenneth T. Green, Drummond Road, SKEGNESS.
H. V. Skinner, Ltd., 86-90 Southgate, SLEAFORD.
H. Leverton & Co., Ltd., Broad Street, SPALDING.
C. E. Denning & Son, Broad Street, STAMFORD.

COACHWORK

MIDDLESEX
Henlys, Ltd., Great West Road, BRENTFORD.
G. E. Lloyd, 119 Station Road, HAMPTON-ON-THAMES.
Automobile & Aircraft Services, Ltd., Marlborough Garage, 609 Kenton Road, Kenton, HARROW.
J. R. Inwards, Ltd., High Street, RUISLIP.
Grand Garages, 383 Richmond Road, TWICKENHAM.
Spikins (Twickenham), Ltd., Heath Road, TWICKENHAM.
Norman Reeves (Motors), Ltd., High Street, UXBRIDGE.
Campbell Symonds & Co., Ltd., Wembley Park Drive, WEMBLEY PARK.

NORFOLK
W. H. Johnson & Sons, Ltd., 24 St. James Street, KING'S LYNN.
Mann Egerton & Co., Ltd., Prince of Wales Road, NORWICH.
Maudes of Norwich, Ltd., 106-119 Prince of Wales Road, NORWICH.
John L. Pointer, The Garage, Aylsham Road, NORWICH.
Willmott's Stores, Ltd., 45-51 Prince of Wales Road, NORWICH.
J. J. Wright & Sons, Ltd., DERENHAM.

NORTHANTS
Blanchflowers' (Kettering), Ltd., Northampton Road, KETTERING.
The Central Motor Co. (1919) Kettering, Ltd., Dalkeith Place, KETTERING.
Douglas Garage, Ltd., 50 Sheep Street, NORTHAMPTON.
Grose, Ltd., Marefair, NORTHAMPTON.
Arthur Mulliner, Ltd., Bridge Street, NORTHAMPTON.
Boroughbury Garages, 14 Lincoln Road, PETERBOROUGH.
Marshalls (Cambridge), Ltd., Bishops Road, PETERBOROUGH.
Murkett Bros., Bridge Street, PETERBOROUGH.
Reed's Garages, Ltd., PETERBOROUGH.

NORTHUMBERLAND
J. W. Parsons (Motor Engineers), Ltd., The Drive, GOSFORTH.
Dex Automobiles, Ltd., New Bridge Street, NEWCASTLE-ON-TYNE.
Minories Garage, Ltd., Jesmond Road, NEWCASTLE-ON-TYNE 2.
Rossleigh, Ltd., Olympia Garage, Northumberland Road, NEWCASTLE-ON-TYNE 2.
St. Andrew's Motors, Ltd., St. Andrew's Buildings, Gallowgate. NEWCASTLE-ON-TYNE 1.
A. Smart (Newcastle), Ltd., College Avenue, NEWCASTLE-ON-TYNE.
Auto Garages (Northern), Ltd., Gallowgate, NEWCASTLE-ON-TYNE.

NOTTINGHAMSHIRE.
G. E. Neville & Son, Ltd., Forest Road, MANSFIELD.
Portland Motors Co., Ltd., 47-49 West Gate, MANSFIELD.
A. R. Atkey & Co., Ltd., Lower Parliament St., NOTTINGHAM.
Bennetts (Nottingham), Ltd., 24-30 Shakespeare St., NOTTINGHAM.
R. Cripps & Co., Ltd., Parliament St., NOTTINGHAM.
T. Shipside, Ltd., Lower Parliament St., NOTTINGHAM.
Charlie Clark & Son (Retford), Ltd., 46-48 Bridgegate BETFORD.

OXFORDSHIRE
Hartwells of Oxford, Ltd., Banbury Road, OXFORD.
Laytons of Oxford (Motors), Ltd., New Road, OXFORD.
Morris Garages, Ltd., St. Aldates, OXFORD.

SHROPSHIRE
Bridgnorth Garage, Ltd., 52 West Castle Street, BRIDGNORTH.
Vincent Greenhous, Greyfriars Motor Works, SHREWSBURY.
Wales & Edwards, Ltd., Morris House, Wyle Cop, SHREWSBURY.
E. W. Jones (Electrical), Ltd., 19 New Street, WELLINGTON.
Wem Motor Co., Ltd., New Street, WEM.

SOMERSET
Bath Garages, Ltd., James Street West, BATH.
Ware's Motors, Ltd., Broad Street, BATH.
Gumbrell's Motors, Ltd., Monmouth Street, BRIDGWATER.
Frome Auto Electric Service, 18 Market Place, FROME.
Bradbeer's Garage, Friday Street, MINEHEAD.
Somerset Motors (1927), Ltd., Corporation Street, TAUNTON.
Richardson's Garage, High Street, WELLINGTON.
Gunning's Garages, Ltd., WELLS.
Passey & Porter, Ltd., Locking Road, WESTON-SUPER-MARE.
Bradbeer's Garage, WILLITON.

STAFFORDSHIRE
Chester Bros., Branstone Road, BURTON-ON-TRENT.
Tom Byatt, Ltd., Victoria Road, FENTON.
John Pepper (Hanley), Ltd., 63 Piccadilly, HANLEY.
J. C. Sherwin & Sons, Ltd., Market Square, HANLEY.
Newcastle (Staffs) Motor Company, Ltd., Brunswick Street, NEWCASTLE.
Peppers Garages, Ltd., Grosvenor Garage, London Road, NEWCASTLE.
E. E. Brown & Co. (Smethwick), Ltd., Empire Garage, St. Paul's Road, SMETHWICK.
Hadley Bros., 587-589 Bearwood Road, SMETHWICK.
Attwood's Garage, Ltd., Lichfield Road, STAFFORD.
Electrical Service Co., 148 Lichfield Street, WALSALL.
John Allen & Son, 32 New Street, WEST BROMWICH.
Charles Attwood & Son, Ltd., Stafford Street, WOLVERHAMPTON.
Bernard P. Littleford, Albany Road, WOLVERHAMPTON.
Wolverhampton Motor Services, Ltd., Clevedon Road, WOLVERHAMPTON.

SUFFOLK
Lawson's (Bury St. Edmunds), Ltd., 36 Cornhill, BURY ST. EDMUNDS.
T. H. Nice & Co., Ltd., 21 Abbeygate Street, BURY ST. EDMUNDS.
Howes & Sons, Ltd., St. George's Street, IPSWICH.
Lock & Stagg, Ltd., Friars Road, IPSWICH.
Mann Egerton & Co., Ltd., 37 Princes Street, IPSWICH.
Mann Egerton & Co., Ltd., 95-99 London Road South, LOWESTOFT.
O. G. Barnard & Sons, Ltd., STOWMARKET.

SURREY
Morris Bros. of Camberley, Ltd., 30 High Street, CAMBERLEY.
Bannisters (Croydon), Ltd., Cherry Orchard Road, CROYDON.
F. W. Mays & Co., Ltd., South Street, DORKING.
Page Motors, Ltd., High Street, EPSOM.
E. D. Abbott, Ltd., FARNHAM.
Jordan's Garage, Ltd., 11-13 Ockford Road, GODALMING.
Coombs Service Station (Guildford), Ltd., By-Pass Road, GUILDFORD.
Haslemere Motor Co., Ltd., Morris House, Woodbridge Road, GUILDFORD.
Kingston Hill Motors, Ltd., KINGSTON HILL.
H. Beart & Co., Ltd., London Road, KINGSTON-ON-THAMES.
Bentalls, Ltd., (Motor Department), KINGSTON-ON-THAMES.
Wray Park Garages, Ltd., Broadway, London Road, REIGATE.
Messrs. Phoenix Motor Co. (Surrey), Ltd., 315-323 High Street, SUTTON.
E. Rogers & Sons, Ltd., 51 High Street, WALTON-ON-THAMES
G. Roberts & Co., 143 North End, WEST CROYDON.
E. W. Farrow, High Street, WEYBRIDGE.

SUSSEX
Brittains Garage, Ltd., 233 Preston Road, BRIGHTON.
Caffyns, Ltd., 140-141 Dyke Road, BRIGHTON.
Adcock's Garages, Ltd., East Street, CHICHESTER.
Caffyns, Ltd., Meads Road, EASTBOURNE.
Langney Motors, Ltd., Devonshire House, Langney Road, EASTBOURNE.
Thomas Harrington, Ltd., Sackville Works, Old Shoreham Road, HOVE.
A. S. Tilley (Garage), Ltd., 36 Davigdor Road, HOVE 2.
George Newman & Co. (Brighton), Ltd., Cromwell Road, HOVE.
H. E. Griffin, Mill Green Road, HAYWARDS HEATH.
Ringmer Motor Works, Ltd., Ringmer, Nr. LEWES.
Caffyns, Ltd., 58 Chapel Road, WORTHING.

WARWICKSHIRE
Archer's (Shirley), Ltd., Stratford Road, Shirley, BIRMINGHAM.
Chester Bros., 870 Stratford Road, Sparkhill, BIRMINGHAM 11.
R. H. Collier & Co., Ltd., South Yardley, BIRMINGHAM.
Colmore Depot, Ltd., 77-85 Station Street, BIRMINGHAM 5.
Cutler's of Streetly, Ltd., Chester Road, Streetly, Nr. BIRMINGHAM.
Dale, Forty & Co., Ltd., 80-84 New Street, BIRMINGHAM 2.
P. J. Evans, Ltd., John Bright Street, BIRMINGHAM 1.
R. J. Evans & Kitchen, Ltd., 88-93 Hurst Street, BIRMINGHAM 5.
Harold Goodwin (1944), Ltd., Wolverhampton Road, BIRMINGHAM 32.
Cecil Kay, Ltd., 10-20 Essex Street, BIRMINGHAM 5.
Mist's Garage, Hamstead Road and Soho Hill, Handsworth, BIRMINGHAM 19.
Frank Moseley (Auto Sales & Service), Ltd., The Depot, Steward Street, Spring Hill, BIRMINGHAM 18.
Rootes, Ltd., 90-94 Charlotte Street, BIRMINGHAM 3.

J. W. Stocks, Ltd., Broad Street, BIRMINGHAM 1.
Walker Bros. (Elec. Eng.), Ltd., Quality House, Temple Row, BIRMINGHAM 2.
Coventry Garage, Ltd., Holyhead Road, COVENTRY.
H. Crane, 127 Far Gosford Street, COVENTRY.
Guyvers (Coventry), Ltd., Greyfriars Lane, COVENTRY.
Parkside Garage, Ltd., Warwick Road, COVENTRY.
H. Payne (Coventry), Ltd., 11 Ford Street, COVENTRY.
Dale, Forty & Co., Ltd., 118 The Parade, LEAMINGTON SPA.
Parkside Garage, Ltd., Newdegate Street, NUNEATON.
Geo. T. Hilton & Co., Ltd., North Street, RUGBY.
Sam Robbins, Ltd., Bilton Road, RUGBY.
F. Guyver & Sons, Ltd., Rother Street, STRATFORD-ON-AVON.
J. H. Thorp, Eversley Garage, Alderminster, Nr. STRATFORD.
P. Bryant & Sons, Birmingham Road, SUTTON COLDFIELD.

WESTMORLAND
H. J. Croft, Ltd., 84-92 Highgate, KENDAL.

WILTSHIRE
Corner Garage (Amesbury), Ltd., High Street, AMESBURY.
Bulson Bros., Marshfield Road, CHIPPENHAM.
Avon Motors (Salisbury), Ltd., Rampart Road, SALISBURY.
Radio Services, 5 Winchester Street, SALISBURY.
Quantock Motors, Devizes Road, SWINDON.
Skurrays, Ltd., SWINDON.
Swindon Motor Co., 34 Wood Street, SWINDON.
Victoria Garage (Swindon), Ltd., Victoria Road, SWINDON.
Fore Street Garages, Ltd., 33-34 Fore Street, TROWBRIDGE.

WORCESTERSHIRE
John Bryant & Sons, Ltd., 120-123 High Street, BROMSGROVE.
Keith Lowe, Ltd., Market Place, DUDLEY.
Whittingham & Co., Ltd., The Broadway Garage, DUDLEY.
F. H. Alcock (Evesham), Ltd., London House, EVESHAM.
Laughton Goodwin & Co., Ltd., Castle Motor Works, George Street, KIDDERMINSTER.
Tenbury Baths Co., Ltd., Oxford Street, KIDDERMINSTER.
Rothwell & Milbourne, Central Garage, MALVERN.
C. Bradley & Son, Mount Pleasant Garage, REDDITCH.
E. D. Gallie, Stourbridge Road Garage, Lye, Nr. STOURBRIDGE
"Wise" Radio & Television, Ltd., 135 High Street, STOURBRIDGE.
W. L. Cotton, Ltd., 41 Foregate Street, WORCESTER.
H. A. Saunders, Ltd., Austin House, WORCESTER.
Eric Williams, Ltd., Pierpoint Street, WORCESTER.

YORKSHIRE
Rodwell's Motors, Ltd., Woodside Garage, Wombwell, Nr. BARNSLEY.
J. C. Snell, Ltd., Central Garage, Stairfoot, BARNSLEY.
Hepworth & England, Ltd., 217 Bradford Road, BATLEY.
Central Garage, Ltd., Randall Well Street, BRADFORD.
Albert Farnell, Ltd., 75 Manningham Lane, BRADFORD.
Eric S. Myers, Ltd., Drill Parade, BRADFORD.
C. Surrahs of Bankfoot, Ltd., 2-12 Rooley Lane, Bankfoot, BRADFORD.
Thornton Engineering Co., Ltd., Belle Vue Works, 150 Manningham Lane, BRADFORD.
Paragon (Hull) Motor Co., Ltd., Prospect Street, BRIDLINGTON.
Walter Robinson, 40 Bradford Road, BRIGHOUSE.
Francis W. Birkett & Sons, Ltd., Northgate, CLECKHEATON.
James W. Thornes, Ltd., 6-8 Westgate, DEWSBURY.
Field's Radio, Ltd., 52 Hallgate, DONCASTER.
Hoffmann's Garage, Ltd., Huddersfield Road, HALIFAX.
Park Motors, Portland Place, HALIFAX.
Trinity Garage Co., Ltd., Skircoat Road, HALIFAX.
Glovers of Ripon, 91 Leeds Road, HARROGATE.
G. Mackay & Sons, Ltd., West Park, HARROGATE.
The Spa Garage, Ltd., Station Parade, HARROGATE.
G. W. Castle, Ltd., Castle Garage, Huddersfield Road, Holmfirth, HUDDERSFIELD.
H. G. Heaton, 21 Westgate, Honley, HUDDERSFIELD.
C. H. Mitchell & Sons (Motor Engineers), Ltd., East Parade, HUDDERSFIELD.
Rippon Bros., Ltd., Viaduct Street, HUDDERSFIELD.
Gordon Armstrong (Hull), Ltd., Anlaby Road, HULL.
Paragon (Hull) Motor Co., Ltd., Boothferry Road, HULL.
Sydney Scarborough, Ltd., Under the City Hall, HULL.
W. L. Thompson, Ltd., 70-76 Anlaby Road, HULL.
Triangle Motor Co., Ltd., Anlaby Road, HULL.
Ross Bros. (Ben Rhydding), Ltd., Riverside, Ben Rhydding, ILKLEY.
Appleyards of Leeds, Ltd., North Street, LEEDS 7.
Cox & Co. (Leeds), Ltd., Regent Street, LEEDS 2.
John Kaye (Leeds), Ltd., 18-22 New York Road, LEEDS 2.
Leeds Autocars, Ltd., Ritz Garage, Templar Street, Vicar Lane, LEEDS 2.
Paragon (Hull) Motor Co., Ltd., 5 New York Road, LEEDS 2.
Arnold G. Wilson, Ltd., 232 Harrogate Road, LEEDS 7.
Robert B. Massey & Co., Ltd., High Street, MARKET WEIGHTON.
C. McAdams, Ltd., Linthorpe Road, MIDDLESBROUGH.
Pallister, Yare & Cobb, Ltd., 134 Marton Road, MIDDLESBROUGH.
R. F. Parkinson, 29 Bottomley Street, MIDDLESBROUGH.
E. Upton & Sons, Ltd., 175-181 Linthorpe Road, MIDDLESBROUGH.
Appleton & Arundale, Ltd., Northway, SCARBOROUGH.
W. Rowntree & Sons, Ltd., York Place, SCARBOROUGH.
Tesseymans of Scarborough, Vernon Road Garage, SCARBOROUGH.
Crabtree & Nicol, Ltd., City Garage, Pinstone Street, SHEFFIELD 1.
Ernest W. Hatfield, Ltd., 147-151 Norfolk Street, SHEFFIELD 1
Kennings, Ltd., Leadmill Road, SHEFFIELD 1.
E. H. Pickford & Co., Ltd., Crescent Works, Ecclesall Road, SHEFFIELD 11.
Allan Urquhart, 297 Ecclesall Road, SHEFFIELD 1.
Westfield Motors (Sheffield), Ltd., West Street, SHEFFIELD 1.
Wakefield Garages, Ltd., Market Street, WAKEFIELD.
Messrs. Sandbeck Motors, Ltd., Deighton Road, WETHERBY.
House & Son, Ltd., Blake Street, YORK.
Lister & Edmond, Ltd., Holgate Road, YORK.
Myers & Burnell, Ltd., Davygate, YORK.

WALES

CAERNARVONSHIRE
Braid Bros., Ltd., Station Road, DEGANWY.
Browns (Llandudno), Mostyn Street, LLANDUDNO.
John Hughes, The Garage, LLANDUDNO JUNCTION.

CARMARTHENSHIRE
Evans Motors, Ltd., Priory Street, CARMARTHEN.
Lowndes Garages, Ltd., The House of Service, CARMARTHEN.
Thomas Bros., 13 Thomas Street, LLANELLY.

DENBIGHSHIRE
Slater & Wheeler, Ltd., Market Street, ABERGELE.
Braid Bros., Ltd., Abergele Road, COLWYN BAY.
F. Wellum, Ltd., 18 Queen Street, WREXHAM.

FLINTSHIRE
Slater & Wheeler, Ltd., Bodfor Street, RHYL.

GLAMORGAN
City Motor Co. (Cardiff), Ltd., Morris House, 99-101 City Road, CARDIFF.
Glanfield Lawrence Motors (Cardiff), Ltd., 2-10 City Road, CARDIFF.
James Howell & Co., Ltd., Bakers Row, Wharton Street, CARDIFF.
Moorwell Motors, Ltd., Westgate Street, CARDIFF.
Victoria Radio Services (Cardiff), Ltd., 229 Cowbridge Road, CARDIFF.
D. J. Davies, 16 Glebeland Street, MERTHYR TYDFIL.
C. K. Andrews, Ltd., Uplands Garage, SWANSEA.
Arthur Bassett, Ltd., Greenfield Street, SWANSEA.
Oscar Chess, Ltd., The Motor House, King Edward Road, SWANSEA.

MERIONETHSHIRE
Jones Bros., Henblas & West End Garages, BALA.

MONMOUTHSHIRE
F. A. Stibbs, 49 Somerset Street, ABERTILLERY.
Alfred Chaston, Ltd., BLACKWOOD.
H. Ellis Williams, Ltd., Newbridge Garage, NEWBRIDGE.
A. E. Hughes & Sons, 28 Clarence Place, NEWPORT.
F. N. Morgan & Co., Ltd., 57 Chepstow Road, NEWPORT.

PEMBROKESHIRE
Greens Motors, Ltd., HAVERFORDWEST.

SCOTLAND

ABERDEENSHIRE
Aberdeen Motors, Ltd., Union Row, ABERDEEN.

COACHWORK

Claud Hamilton (Aberdeen), Ltd., 254 Union Street, ABERDEEN.
Rossleigh, Ltd., Union Street, ABERDEEN.
P. N. Shinnie, Ltd., Morris House, 70 College Street, ABERDEEN.
S.M.T. Sales & Service, Ltd., Bon-Accord Street, ABERDEEN.
Walter D. Allan, 15 Marischal Street, PETERHEAD.

ANGUS
Angus Garage Co., Ltd., City Underground Garage, Crichton Street, DUNDEE.
Lamb's Garage, Ltd., Trades Street, DUNDEE.
Rossleigh, Ltd., Yeamon Shore Lane, DUNDEE.
St. Roque's Automobile Co., Ltd., 64 Ward Road, DUNDEE.
S.M.T. Sales & Service, Ltd., Lochee Road, DUNDEE.
Duthie & Son, Ltd., New Wynd, MONTROSE.

ARGYLL
A. P. MacGrory & Co., 16-18 Main Street, CAMPBELTOWN.

AYRSHIRE
McQuiston's Garage, Ltd., 18 Beresford Terrace, AYR.
Frazer Bros., Ltd., 2 Aitken Street, LARGS.
John Paton, Ltd., 1 Boyd Street, PRESTWICK.

BERWICKSHIRE
Coldstream Garage, High Street, COLDSTREAM.
Electrical Services (Duns), Ltd., 23-25 Newtown Street, DUNS.

DUMBARTONSHIRE
McLay's Garage, Ltd., KIRKINTILLOCH.

DUMFRIES-SHIRE
A. Baird & Sons, Ltd., High Street, ANNAN.
Thomas Corrie, Ltd., Morris House, DUMFRIES.
S.M.T. Sales & Service, Ltd., York Place, DUMFRIES.
Sutherland Motors (Dumfries), Ltd., English Street, DUMFRIES.

FIFESHIRE
Fife Motor Co., Ltd., Halbeath Road, DUNFERMLINE.
James Scott & Co., 57-59 Queen Anne Street, DUNFERMLINE.
Fidelity Motor Services, Ltd., Wemyssfield, KIRKCALDY.

INVERNESS-SHIRE
Macrae & Dick, Ltd., 36 Academy Street, INVERNESS.

LANARKSHIRE
Watson Bros., 28-36 High Street, AIRDRIE.
Callender's Garages, Ltd., Hughenden Road, GLASGOW.
Cameron & Campbell, Ltd., 171-181 Bothwell Street, GLASGOW C.2.
Clyde Automobile Co., Ltd., 96 Renfrew Street, GLASGOW.
James H. Galt, Ltd., 52 Woodlands Road, GLASGOW.
A. & D. Frazer, Ltd., Maxwell Park Garage, GLASGOW S.1.
James Gibbon (Motors), Ltd., 385 Parliamentary Road, GLASGOW C.4.
Frank Hopper, Ltd., 202-222 Bothwell Street, GLASGOW C.2.
Macharg, Rennie & Lindsay, Ltd., 2-28 Berkeley Street, Charing Cross, GLASGOW C.3.
Melvin Motors, Ltd., 43 Allison Street, GLASGOW S.2.
Millburn Motors, Ltd., 51 Millburn Street, GLASGOW N.
H. Prosser & Sons, Ltd., 113 St. George's Road, GLASGOW C.3.
Ritchies, Ltd., 333 Scotland Street, GLASGOW.
Rossleigh, Ltd., 147 Bothwell Street, GLASGOW C.2.
S.M.T. Sales & Service, Ltd., 39 West Campbell Street, GLASGOW C.2.
Taggart & Wilson, Ltd., Knowetop, MOTHERWELL.

MIDLOTHIAN
John Croall & Sons, Ltd., Castle Terrace, EDINBURGH 1.
Eastern Motor Co., Ltd., 52 George Street, EDINBURGH 2.
H. C. Hutchison, Ardmillan Motor Works, EDINBURGH.
Gordon C. Macandrew & Co., Lauriston Gardens, EDINBURGH 3.
James Ross & Sons (Motors), Ltd., Lochrin, EDINBURGH 3.
Rossleigh, Ltd., 6 Queensferry Street, EDINBURGH.
J. M. Sloan & Co., Ltd., Belford Road, EDINBURGH 4.
S.M.T. Sales & Service, Ltd., 39 Fountainbridge, EDINBURGH 3.
Westfield Autocar Co., Ltd., Westfield Avenue, EDINBURGH 11.

MORAYSHIRE
Barr Cochrane & Son, 142 High Street, ELGIN.

PERTHSHIRE
Angus Garage Co., Ltd., 5-7 Victoria Street, PERTH.
Perth Garages, Ltd., 10-12 York Place, PERTH.
S.M.T. Sales & Service, Ltd., St. Catherine's Garage, PERTH.

RENFREWSHIRE
William Gillespie & Son, Ltd., 53 Love Street, PAISLEY.
David Blane & Son, Weir Street Ridge, PAISLEY.
James Tennant, 60-62 West Blackhall Street, GREENOCK.
Anderson's (Newton Mearns), Ltd., Kilmarnock Road, NEWTON MEARNS.
Hamiltons (Paisley), Ltd., Marshall's Lane, PAISLEY.

ROSS & CROMARTY
Mackay Garage & Agricultural Co., Ltd., Central Garage, DINGWALL.
William Munro, The Royal Garage, INVERGORDON.

ROXBURGHSHIRE
Croall, Bryson & Co., Ltd., Tower Garage, HAWICK.
George Reid Radio, 10 Bridge Street, HAWICK.

SELKIRKSHIRE
Adam Purves & Son, Ltd., Market Street, GALASHIELS.

STIRLINGSHIRE
Graham Robertson, Fountain Road, BRIDGE OF ALLAN.
Thomas Laurie & Co., Ltd., West End, FALKIRK.
Rossleigh, Ltd., Allan Park, STIRLING.
Sterlini Radio Service, 73-75 Barnton Street, STIRLING.

WIGTOWNSHIRE
James McHarrie (Stranraer), Ltd., County Garage, STRANRAER.
Paterson Sons & Co., Ltd., 49 Hanover Street, STRANRAER.

NORTHERN IRELAND
Radio & Electrical, 3 English Street, ARMAGH, Co. Armagh.
R. J. Hooke, 110-112 Main Street, BANGOR, Co. Down.
Angew & Graham, Ltd., Oxford Street, BELFAST.
W. H. Alexander, Ltd., Holmes Street, BELFAST.
A. S. Baird, 26-30 Ormeau Avenue, BELFAST.
Clarence Engineering Co., Ltd., 24 Ormeau Avenue, BELFAST.
A. & F. Corner, 37 Shaftesbury Square, BELFAST.
Eirco Services, Ltd., 19 Ormeau Avenue, BELFAST.
Harry Ferguson (Motors), Ltd., 14-16 Donegall Square East, BELFAST.
Stanley Harvey & Co., Ltd., 4 Clarence Street West, BELFAST.
Charles Hurst, Ltd., Montgomery Street, BELFAST.
Ernest Kane, The Square, COMBER, Co. Down.
T. Wylie & Son, Market Street, DOWNPATRICK, Co. Down.
W. R. Montgomery, Main Street, LARNE, Co. Antrim.
Stevenson Bros. (Lisburn), Ltd., Seymour Street, LISBURN, Co. Antrim.
Thompson Edwards Motor Co., Ltd., 78 Strand Road, LONDONDERRY.
Jos. McGrath, Market Street, OMAGH, Co. Tyrone.
Walter Gracey, 12 Thomas Street, PORTADOWN, Co. Armagh.
R. J. Moore & Sons, Main Street, RANDALSTOWN, Co. Antrim.
Byrne Bros., Newry Street, WARRENPOINT, Co. Down.
Edward L. Smyd Esq., 164-168 Lisburn Road, BELFAST.

ISLE OF MAN
S. Hinton, Ridgeway Street, DOUGLAS.

ISLE OF WIGHT
C. Clark & Sons, 103-5 High Street, SANDOWN.

CHANNEL ISLANDS
St. Peter Port Garage, Rue du Pre, GUERNSEY.
Bel Royal Radio, 30 Burrard Street, St. Helier, JERSEY.
St. Helier Garages, 87 Bath Street, JERSEY.

OVERSEAS

ADEN
Pallonjee Dinshaw & Co., Steamer Point, Aden.

ALGERIA

ANGOLA

ARGENTINE
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

AUSTRALIA
The Gramophone Co. Ltd., 2 Parramatta Road, Home Bush, Sydney, N.S.W.
Cables : Jabberment Sydney.

AUSTRIA
Oesterr Columbia Gramophone G.m.b.H., Fuhrichgasse 2, Vienna.

AZORES

COACHWORK

BAHAMAS

BAHREIN (see Iraq and Persian Gulf)

BARBADOS
Da Costa & Co. Ltd., P.O. Box 103, Barbados, British West Indies.
Cables : Dacosta Barbados.

BELGIUM
S.A. Gramophone N.V., Bd. Maurice Lemonnier 171, Brussels.
Cables : Gramophone Brussels.

BELGIAN CONGO
Maison Horbijad, Avenue de Kambove, B.P.253, Jadotville.

BERMUDA
Bermuda Motor & Cycle Accessories Co., The Lucas House, Hamilton.
Cables : Accessories Bermuda.

BOLIVIA
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

BRAZIL
Industrias Electricas e Musicais Fabrica Odeon S.A., Avenida Rio Branco, 99, Rio de Janeiro.
Cables : Turntable Rio de Janeiro.
Also at : Rua da Liberdade, 865, Sao Paulo.

BRITISH GUIANA
The Modern Radio Co. Ltd., P.O. Box 178, Georgetown, Demerara.
Cables : Victrola Georgetown.

BRITISH HONDURAS

BRITISH NORTH BORNEO, SARAWAK & BRUNEI

BURMA
M. L. Shaw (Burma) Ltd., 389 Dalhousie Street, Rangoon.
Cables : Goldey Rangoon.

CANADA & NEWFOUNDLAND
Pryal & Nye, 24-28 Wellesley Street West, Toronto 5, Ontario.

CANARY ISLANDS
Casimiro Escala Roca, Fortuny 2, Las Palmas de Gran Canaria.

CEYLON
Cargills Ltd., P.O. Box 23, Colombo.

CHILE
Industrias Electricas y Musicales Odeon, Casilla 2651, Santiago.
Cables : Turntable Chile

CHINA

COLOMBIA
Industrias Electricas y Musicais Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

COSTA RICA

CUBA

CURACAO
Industrias Electricas y Musicais Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

CYPRUS
D. J. Demades, P.O. Box 104, Nicosia.
Cables : Didemades Nicosia

CYRENAICA
A. Thomas, 17 Sharia El Istiklal, P.O. Box 80, Benghazi.

CZECHOSLOVAKIA

DENMARK
Vilh. Nellemann A/S., Vodroffsvej 55-57, Copenhagen.
Cables : Nellemann Parts Copenhagen.

DOMINICAN REPUBLIC

ECUADOR
Industrias Electricas y Musicais Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

EGYPT
Soliman Osman Brougham & Co., 75-77a Sh. Malika Nazli, Cairo.
Cables : Broumco Cairo.

ETHOPIA
Pallonjee Dinshaw & Co., Steamer Point, Aden.

FIJI ISLANDS

FINLAND
Oy Radioteolisuus, Loon Rotinkatu 20, Helsinki.

FRANCE
Les Industries Musicales et Electriques, Pathe Marconi, 251/3 Rue du Faubourg Saint Martin, Paris, Xe.
Cables : Gramophone Paris.

FRENCH EQUATORIAL AFRICA

FRENCH WEST AFRICA

GERMANY
Hopfmann & Schwarz, Humboldstrasse 101, Hamburg 21.
Cables : Lucasservice Hamburg.

GIBRALTAR
S. Teuma & Co. Ltd., 79 Main Street, Gibraltar.

GOLD COAST

GREECE
Lambropoulos Bros. Ltd., 4 Churchill Street, Athens.

GUATEMALA
Industrias Electricas y Musicais Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires

HONDURAS
Industrias Electricas y Musicais Odeon, Av. Corrientes 485, Buenos Aires.
Cables : Turntable Baires.

HONG KONG

HUNGARY

ICELAND
Fridrik Bertelsen & Co. Ltd., Hafnarhvoll, Reykjavik.
Cables : Fridrik Reykjavik.

INDIA
The Gramophone Co. Ltd., P.O. Box 118, Bombay 1.
The Gramophone Co. Ltd., P.O. Box 48, Calcutta.
Cables : Jabberment Calcutta.

INDO-CHINA

INDONESIA
Manufacturers & Traders Inc., 62 Parapattan Gambir, Djakarta.
Cables : Manufacturer Djakarta.

IRAQ
Stephen Lynch & Co. Ltd., Beir Lynch, Baghdad.

IRISH REPUBLIC
Buckleys Accessories Ltd., 191 Pearse Street, Dublin.
Cables : Dublin 70881.

ISRAEL

ITALY
Ruggeri & Nizzi, Via Andrea Doria 32, Milan.

JAMAICA
Times Stores Ltd., King Street, Kingston.

JAPAN

JORDAN

KENYA
East Africa Music Stores, Government Road, Nairobi.
Cables : Music Nairobi.

KUWAIT
Stephen Lynch & Co., Beit Lynch, Baghdad.

LEBANON
S. Audi Freres, 10-14 Avenue des Francais, Beirut.
Cables : Saudi Beirut.

MADAGASCAR

MADEIRA

MALAYA
Far East Motors Ltd., 54 Orchard Road, Singapore.
Cables : Ignition Singapore.

MALTA
Mizzi Bros., 283 Kingsway, Valletta.
Cables : Framizzi Malta.

MAURITIUS
S. Manuel, 11 St. George Street, Port Louis.

MEXICO
Industrias Electricas y Musicales Odéon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

MOROCCO (SPANISH)
Centrale Automobile Marocaine S.A., Rue Duę Mexique, Place du France, Tangier.
Cables: Camsa Tangier.

NETHERLANDS
N. V. Imrex I. O., lc. Middellandstraat 19, Rotterdam.

NEW ZEALAND
His Master's Voice (N.Z.) Ltd., 118-120 Wakefield Street, Wellington, C.I.
Cables: Gramophone Wellington.

NICARAGUA
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

NIGERIA

NORWAY
Brodrene Johnsen A/S., Postboks 251, Medre Slottsgate 11, Oslo.
Cables: Broderjohn Oslo.

NYASALAND
Stansfield Ratcliffe & Co. Ltd., 101 Main Street, P.O. Box 254, Bulawayo, Southern Rhodesia.
Cables: Stancliffe Bulawayo.

PAKISTAN EAST
James Finlay & Co. Ltd., Chittagong, East Pakistan.

PAKISTAN WEST & NORTH, including adjacent States of Hyderabad, Khairpur, Bahawalpur and Kashmir
Almukhtar Ltd., P.O. Box 655, 140 Bunder Road, Karachi 2 (Pakistan).
Cables: Amcosales Karachi. Telephone: 3690.

PANAMA
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

PARAGUAY
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

PERSIA (IRAN)

PERU
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

POLAND

PORTUGAL
Valentim de Carvalho Lda., Rua Nova do Almada, 95-97, Lishon.
Cables: Tim Lisbon.

PORTUGUESE EAST AFRICA
Stansfield Ratcliffe & Co. Ltd., 29/31 Simmonds Street Extn., P.O. Box 3223, Johannesburg.
Cables: Stancliffe Johannesburg.

RHODESIA NORTH
Stansfield Ratcliffe & Co. Ltd., 101 Main Street, P.O. Box 254, Bulawayo, Southern Rhodesia.
Cables: Stancliffe Bulawayo.

RHODESIA SOUTH
Stansfield Ratcliffe & Co. Ltd., 101 Main Street, P.O. Box 254, Bulawayo, Southern Rhodesia.
Cables: Stancliffe Salisbury.
Branch also at: Box 1263, 42-44 Pioneer Street, Salisbury.

SALVADOR
Industrias Electricas y Musicales Odeon, Av. Corrientes 485, Buenos Aires.
Cables: Turntable Baires.

SAUDI ARABIA

SIERRA LEONE

SOMALILAND
Pallonjee Dinshaw & Co., Steamer Point, Aden.

SOUTH AFRICA, Union of
(Head Office), Stansfield Ratcliffe & Co. Ltd., 105-107 Strand Street, P.O. Box 797, Capetown.
Cables: Stancliffe Capetown.
Stansfield Ratcliffe & Co. Ltd., 48a Henry Street, P.O. Box 177, Bloemfontein.
Cables: Stancliffe Bloemfontein.
Stansfield Ratcliffe & Co. Ltd., 101-5 Pine Street, P.O. Box 72, Durban.
Cables: Stancliffe Durban.
Stansfield Ratcliffe & Co. Ltd., 179 Oxford Street, P.O. Box 386, East London.
Cables: Stancliffe East London.
Stansfield Ratcliffe & Co. Ltd., 29-31 Simmonds Street Extn., P.O. Box 3223, Johannesburg.
Cables: Stancliffe Johannesburg.
Stansfield Ratcliffe & Co. Ltd., 97 Dutoitspan Road, P.O. Box 487, Kimberley.
Cables: Stancliffe Kimberley.
Stansfield Ratcliffe & Co. Ltd., 212 Commercial Road, Pietermaritzburg.
Cables: Stancliffe Pietermaritzburg.
Stansfield Ratcliffe & Co. Ltd., 115 Queen Street, P.O. Box 798, Port Elizabeth.
Cables: Stancliffe Port Elizabeth.

SOUTH WEST AFRICA

SPAIN
Soc. Anonima Olabour, Gerona 55, Barcelona.
Cables: Olabour Barcelona.

SUDAN
Gellatly Hankey & Co. (Eng.) Ltd., P.O. Box 215, Khartoum.

SWEDEN
Skandinaviska Grammophon A-B, Sandhamnsgaten 39, Stockholm.
Cables: Grammophon Stockholm.

SWITZERLAND
Imex S. A., Rue Ph. Plantamour 8, Geneva.
Cables: Imex Geneva.

SYRIA
S. Andi & Freres, Damascus.

TANGANYIKA
International Motor Marr Ltd., P.O. Box 409, Dar-Es-Salaam.
Cables: Garager dar es Salaam.

TANGIER
Centrale Automobile Marocaine S.A., Rue Du Mexique, Place du France, Tangier.
Cables: Camsa Tangier.

THAILAND

TRINIDAD
Sports & Games Ltd., 19 & 28 Henry Str., Port of Spain, Trinidad, B.W.I.
Cables: General Trinidad.

TRIPOLITANIA
Fili, V. & C. Hannuna, Casella Postale 221, Tripoli.
Cables: Fratelli Hannuna Tripoli.

TUNISIA

TURKEY
Suat Karaosman ve Seriki Dizel, Ceylan Han Taksim No. 25, Istanbul.
Cables: Dizel Istanbul.

UGANDA
East Africa Music Store, Government Road, Nairobi, Kenya.
Cables: Music Nairobi.

URUGUAY
Automotive Accessories S.A., Neuva York 1175, Montevideo.
Cables: Socra Montevideo.

UNITED STATES OF AMERICA
Nisonger Sales Co., 146 East 74th Street, New York City 21, N.Y.
Cables: Nisongersa New York.

VENEZUELA
Oficina Tecnica Captriles, Caracas, P.O. Box 265, Caracas.
Cables: Otacca Caracas.

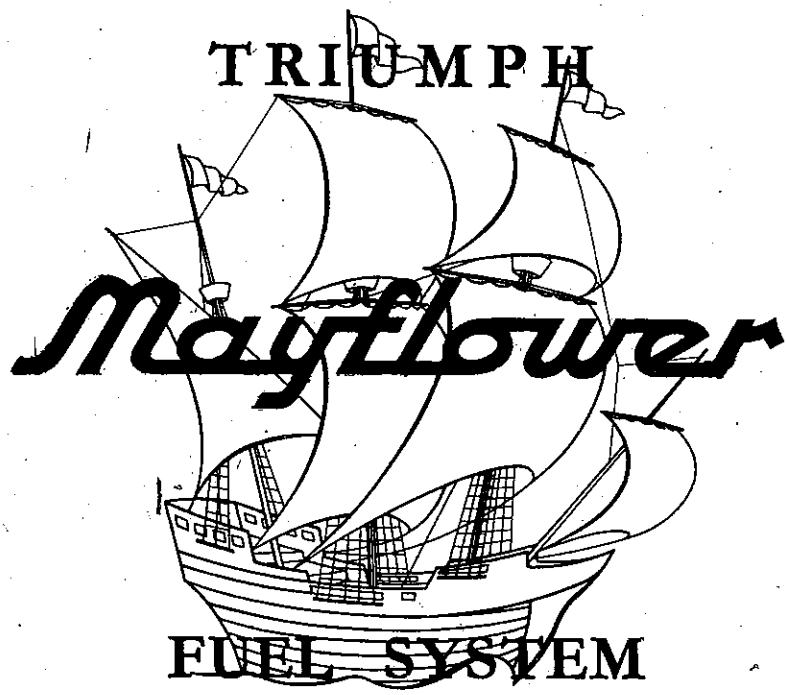
YUGOSLAVIA

Note—In countries where no agents have yet been appointed, reference should be made to the manufacturers of this equipment.

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

FUEL SYSTEM

SECTION N

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

FUEL SYSTEM

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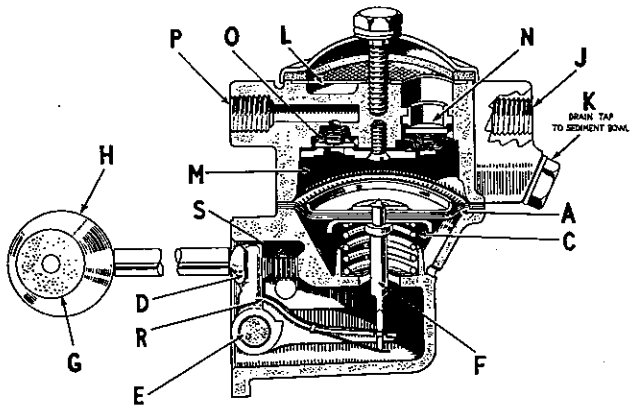

Fig. 1. Petrol pump in section

TYPE "Y" A.C. PETROL PUMP

Details of operation (Fig. 1).

As the engine camshaft (G) revolves, the eccentric (H) lifts, through the push rod, the pump rocker arm (D) pivoted at (E) which pulls the pull rod (F) together with the diaphragm (A) downward against spring pressure (C) thus creating a vacuum in the pump chamber (M). Petrol is drawn from the tank and enters at (J) into sediment chamber (K) through filter gauze (L), suction valve (N) into the pump chamber (M). On the return stroke the spring pressure (C) pushes the diaphragm (A) upwards, forcing petrol from chamber (M) through the delivery valve (O) and opening (P) into the carburettor.

When the carburettor bowl is full the float will shut the needle valve, thus preventing any flow of petrol from the pump chamber (M). This will hold diaphragm (A) downward against spring pressure (C).

It will remain in this position until the carburettor requires further petrol and the needle valve opens. The rocker arm (D) operates the connecting link by making contact at (R) and this construction allows idling movement of the rocker arm when there is no movement of the fuel pump diaphragm.

Spring (S) keeps the rocker arm (D) in constant contact with the push rod and the eccentric (H) to eliminate noise.

Cleaning filter (Fig. 2).

The filter should be examined every 2,000 miles and cleaned if necessary. Under conditions of dust-laden atmosphere this mileage interval should be reduced as conditions dictate. Access to the filter is gained by removing the dome cover, after unscrewing the retaining screw, when the filter gauze itself may be lifted off its seating. Remove the drain plug and clean out the sediment chamber. Clean filter gauze in air jet or petrol. The cork gasket under the filter cover should be replaced if broken or if it has hardened.

When refitting the cover, make certain that the fibre and cork washers are replaced under the head of the screw. Tighten the filter cover retaining screw just sufficiently to make a petrol-tight joint. Over-tightening will either destroy the cork washer, crack the cover, or fracture the main casting.

Check pump engine mounting setscrews for tightness, and petrol pipe unions.

Testing while on engine.

With the engine stopped and switched off, the pipe to the carburettor should be disconnected at the carburettor end, leaving a free outlet from the pump. The engine can then be turned over by hand, when there should be a well-defined spurt of petrol at every working stroke of the pump, namely, once every two revolutions of the engine.

Removing from engine.

Firstly, the pipe unions should be dis-

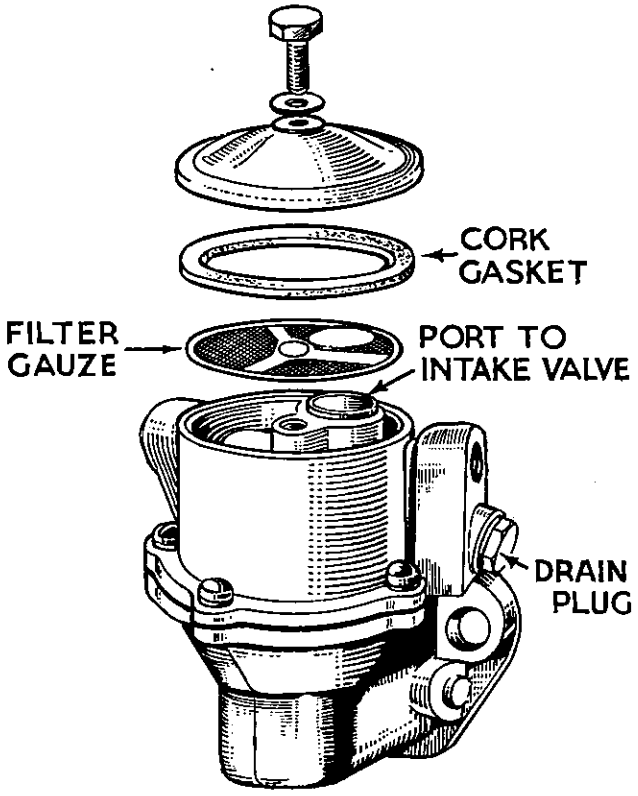

Fig. 2. Petrol pump with domed cover removed

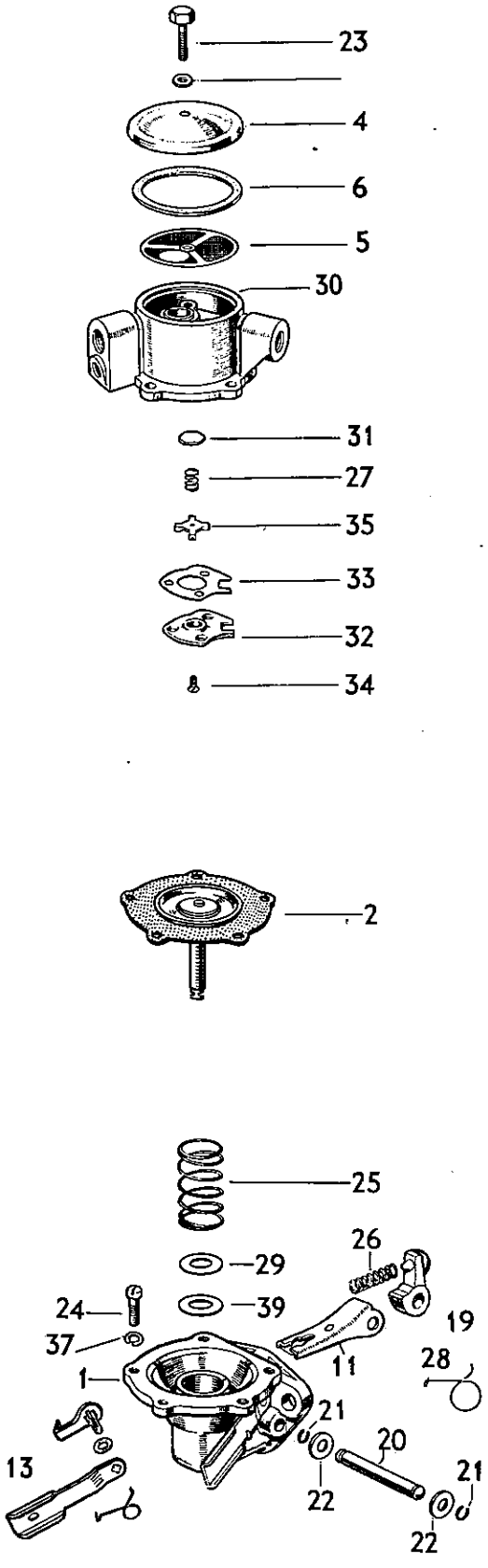

Fig. 3. Exploded view of pump details

connected, the two setscrews fixing the fuel pump at the engine crankcase should then be unscrewed, after which the fuel pump will come away readily.

Dismantling petrol pump.

Before commencing dismantling, clean the exterior of the pump and make a file mark across the two flanges for guidance in reassembling in the correct relative positions. After separating the two main castings, the further dismantling of the components associated with each is quite straightforward. The diaphragm and pull rod assembly can be withdrawn by first of all turning it through 90°. No attempt should be made to separate the four diaphragm layers from their protective washers and pull rod, as this is at all times serviced as a complete assembly, being permanently riveted together.

Inspection of parts (Fig. 3).

Firstly, all parts must be thoroughly cleaned to ascertain their condition. Wash all parts in the locality of the valves in a clean paraffin bath, separate from that employed for the other and dirtier components.

Diaphragm and pull rod assemblies should normally be replaced unless in entirely sound condition without any signs of cracks or hardening.

Upper and lower castings should be examined for cracks or damage, and if diaphragm or engine mounting flanges are distorted these should be lapped to restore their flatness. All badly worn parts should be replaced, and very little wear should be tolerated on rocker arm pins (20), the holes and engagement slot in link (11), holes in rocker arm (19). On the working surface of the rocker arm which engages with the push rod and engine eccentric, slight wear is permissible, but not exceeding .010" in depth. The valve seat incorporated in valve plate (32) should be examined and if at all roughened should be carefully lapped first on a smooth carborundum stone ; similarly, the corresponding outlet valve seat incorporated in the upper casting (30) should be examined and if worn unevenly to the slightest degree, both the upper casting and valve seat assembly must be replaced. It is not practicable to refit new valve seats into the castings as this calls for special equipment. Fuel pump valves (31) should be replaced if at all worn, although in an emergency they can be turned over to provide a fresh surface to the valve seat. Valve spring (27) should preferably be replaced,

although they can be refitted providing they do not bear undue evidence of rubbing away on the outside diameter. In no circumstances should valve springs be stretched in an endeavour to increase their strength. Diaphragm springs (25) seldom call for replacement but, where necessary, ensure that the replacement spring has the same identification colour and consequently the same strength as the original. All gaskets and joint washers should be replaced as a matter of routine.

To reassemble petrol pump

The following procedure should be adopted : dealing with the upper portion of the pump first :—

Place valve plate gasket (33) in position.

Valves should be swilled in clean paraffin before reassembly. Apart from the cleaning effect this improves the sealing between the valve and seat.

Fit outlet valve spring in the centre of the four cast webs.

Place outlet valve (31) on spring.

Place inlet valve (31) on valve seat located in the upper casting.

Place valve spring (27) on centre of inlet valve.

Place retainer (35) on top of inlet valve spring.

Place valve plate (32) in position and secure with the three screws (34). (At this stage use a piece of wire to make sure that valves work freely.)

Place filter screen (5) in position on top of casting, making certain that it fits snugly.

Fit cork gasket, cover, fibre washer, and retaining screw as previously detailed under " Cleaning Filter."

To assemble the lower half, proceed as follows :—

Assemble link (11), packing washers (22), rocker arm (19) and rocker arm spring (26) in the body. Insert rocker arm pin (20) through hole in the body, at the same time engaging the packing washers, link, and the rocker arm, then spring the retaining clips (21) into the grooves on each end of the rocker arm pin. The rocker arm pin should be a tap fit in the body, and if due to wear it is freer than this, the ends of the holes in the body should be burred over slightly.

Note : The fitting of the rocker arm pin can be simplified by first inserting a piece of .240" diameter rod through the pin hole in one side of the body far enough to engage the rocker arm washers and link and then pushing the rocker arm pin i from the opposite side, removing th temporary rod as the pin takes up it proper position.

To fit the diaphragm assembly to the pum body :—

Place the diaphragm spring (25) in positio in the pump body.

Place the diaphragm assembly (2) over th spring, the pull rod being downwards, an centre the upper end of the spring in th lower protector washer.

Press downwards on the diaphragm at th same time turning the assembly to the lef in such a manner that the slots on the pul rod will engage the fork in the link, ultimate ly turning the assembly a complete quarte turn to the left, which will place the pull ro in the proper working position in the link and at the same time permit the matching u of the holes in the diaphragm with those o the pump body flanges. When first insert ing the diaphragm assembly into the pum body, the locating " tab " on the outside o the diaphragm should be at the 11 o'cloc position. After turning the diaphragm as sembly a quarter turn to the left the " tab should be at the 8 o'clock position (See Fig. 4)

The two sub-assemblies of the pump ar now ready for fitting together, and this is carrie out as follows :—

Push the rocker arm (19) towards the pum

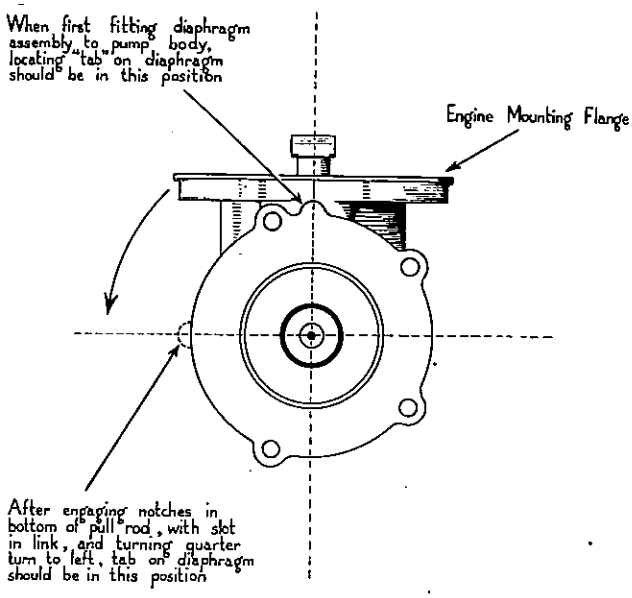

Fig. 4. Method of refitting diaphragm assembly

until the diaphragm is level with the body flanges.

Place the upper half of the pump into the proper position as shown by the mark made on the flanges before dismantling.

Install the cover screws and lock washers and tighten only until the heads of the screws just engage the washers.

Use a screwdriver to hold the rocker arm at its outward position, and while so held tighten the cover screws diagonally and securely.

Testing of petrol pump after assembly.

The best method is by using an AC-Sphinx bench test stand, on which the suction side of the pump is piped to a tin of paraffin at floor level and the outlet side of the pump connected to a stop tap and pressure gauge.

First, flush the pump through to wet the valves and seats, and then completely empty it again by continuing to operate the rocker arm by hand with the suction pipe clear of the paraffin. Again operate pump. Not more than 20 strokes should be necessary to secure delivery of paraffin from the pump outlet.

With the same apparatus a second test can be made by working the pump with the tap on the delivery side closed, pressure then being recorded on the gauge. After ceasing to work the pump it should take several seconds for this pressure to return to zero, thus denoting that the valves are seating properly. Also, while there is pressure, the outer edge of the diaphragm—visible between the two clamping flanges—should be carefully examined for leakage and the retaining screws tightened if necessary. When

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SERVICE PARTS FOR AC-SPHINX FUEL PUMP

Part No. 1524712

S. M. Co.'s Part No.	*Maker's Part No.*	*Notation No.*	*Description*	*No. per set*
200141	1524712 (200141)		Fuel Pump—Series " Y "	
500291	856812	1	Body	1
500292	1524631	2	Diaphragm Assembly	1
52467	856820	4	Filter Cover	1
52469	856850	5	Filter Gauze	1
52473	856821	6	Gasket, Filter Cover	1
52472	851297	7	Gasket, Filter Screw, Fibre	1
	856817	11	Link	1
500294	1524214	19	Rocker Arm	1
52483	856035	20	Rocker Arm Pin	1
52484	1524112	21	Rocker Pin Clip	2
52485	856828	22	Rocker Pin Washer	2
52487	856824	23	Screw, Filter Cover	1
52489	132117	24	Screw, Upper Casting	5
52491	1524078	25	Spring, Diaphragm	1
52493	856830	26	Spring, Rocker Arm	1
52495	856832	27	Spring, Valve	2
500295	856856	30	Upper Casting and Valve Seat Assembly	1
57351	855003	31	Valve	2
57353	1524569	32	Valve Plate	1
57355	856826	33	Valve Plate Gasket	1
57357	856374	34	Valve Plate Screw	3
57358	1524344	35	Valve Spring Retainer	1
57361	114648	37	Washer, Lock	5
	1524573	39	Washer, Oil Seal, Fabric	1
	1524575	29	Washer, Oil Seal, Metal	1

The above illustration numbers tie up with AC-Sphinx exploded view.

working the pump by hand a somewhat longer stroke is obtained and the pressure developed is apt to be higher than when fitted to the engine.

When the above apparatus is not available the petrol pump should be tested, using a pan of clean paraffin, as follows :—

Firstly flush the pump by immersing it in the paraffin and working the rocker arm half a dozen times, then empty the pump by continuing to operate it while held above the bath. Then with the pump clear of the paraffin bath place the finger over the inlet union (marked " in ") and work the rocker arm several times. Upon removing the finger a distinct suction noise should be heard, denoting that the pump had developed a reasonable degree of suction. Afterwards the finger should be placed over the outlet union and after pressing the rocker arm inwards the air drawn into the pump chamber should be held under compression for two or three seconds ; this should also be done with the pump immersed in paraffin and the clamping flanges of the diaphragr watched for any signs of air leakage.

Refitting to engine.

Reverse the procedure outlined for remova from engine. Ensure that the rocker arm i correctly positioned against the push rod to th camshaft. After refitting to the engine, th pump should be run for a short time and pip unions and pump examined for the possibility o fuel leakage.

CARBURETTOR

Solex Type 30FAIO (see Fig. 5).

It is not possible to show all the carburetto in one diagram, so the float chamber is partiall suppressed together with the fuel ducts, leadin therefrom to the main and starter box jet.

This model incorporates the bi-starter prin ciple which is a well-known feature of the Sole carburettor. With this carburettor, the zer starter unit is incorporated and makes th instrument particularly suitable for use in coun

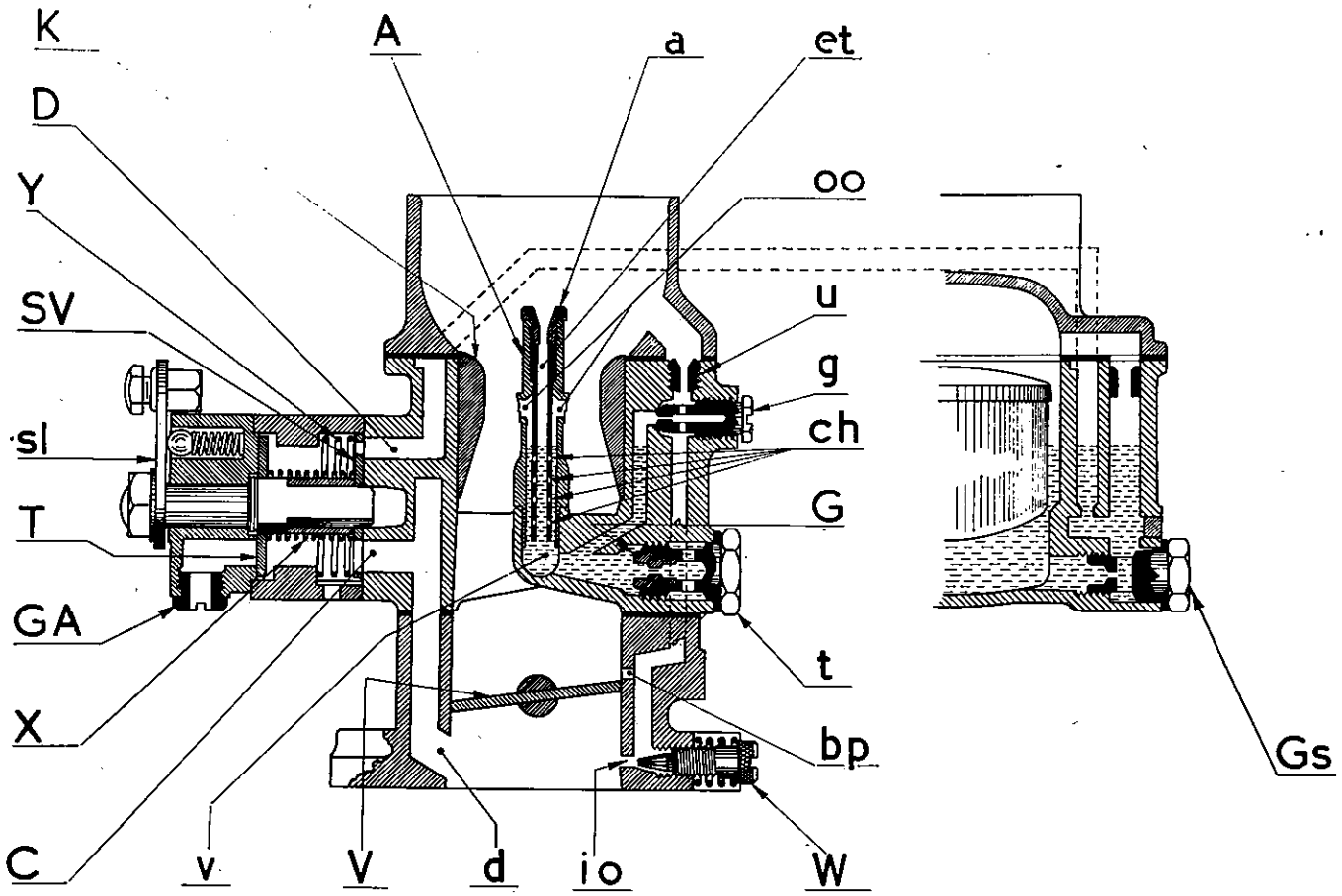


Fig. 5. Solex type 30FAIO carburettor

tries where specially low temperatures are experienced. This unit is described in detail later in these instructions.

Describing the main carburettor first of all, reference to the diagram will reveal the following :—

" t " is the main jet carrier, screwed in the rear of which is the main jet itself (G). This meters petrol from the float chamber into the horizontally disposed channel leading from the jet, to the well (A) of the spraying assembly.

Down the middle of this well will be observed an emulsion tube (et.) which is located on a conical seating near its upper part, and held thereon by the correction jet (a) which surmounts the whole and locks the emulsion tube immovably.

Main jet operation.

Observe now the functioning. The metered petrol from the main jet (G) passes into the well (A), where it meets air drawn downwards via the calibrated air correction jet (a). This passes out through the small holes into the annulus, where an emulsion is formed with the petrol, and the resulting mixture rises to the four large spraying orifices, of which two are shown (oo) in the waist of the choke tube. Here the emulsion is caught up in the main air current and passes down to the manifold via the throttle (V).

Pilot jet operation.

The idling is effected by petrol drawn from the main jet well via a small channel which will be seen emerging therefrom immediately above the larger horizontal lead from the main jet. This, it will be noted, turns upwards and eventually passes through the pilot jet (g) into the downwardly disposed channel communicating with the idling orifice (io) controlled by the spring-loaded and knurled-headed taper screw (W).

It will be noted that this orifice is on the engine, and therefore suctional, side of the throttle. A branch lead communicates with another orifice (bp) which enters the airway slightly on the atmospheric side of the almost-closed throttle.

When the throttle is in the idling position, the duct in question, which we term the " by-pass," acts as an air bleed upon the idling petrol supply, and therefore prevents over-richness when actually idling. Directly the throttle opens, however, the vane passes to the atmospheric side of the orifice in question, so that both " bp " and " io " function as delivery orifices, thereby proportionately enriching the output at the transfer position between the pilot and main supplies and preventing a lean flat spot which might otherwise take place.

Adjustment.

The adjustment of the 30 FAIO type carburettor follows the general lines of all the other Solex models, and consists in the selection of a choke tube (K) of suitable diameter, a main jet (G) of suitable size to correspond with the choke tube characteristic, and a pilot jet (g) to handle the idling end of the mixture curve, which is in turn assisted in effecting a perfect transfer by the air bleed (u) and eventually by the volume screw (W) which determines the idling mixture strength at all points below the actual output value of the jet itself (g).

The bi-starter.

Reference to the diagram will show the bi-starter as a disc valve controlled chamber, fed via the petrol jet (Gs) and the air jet (Ga), and put into operation by the lever (sl) which rotates the spring-loaded discs until the dtillings in the right-hand disc register with the ducts by which the petrol enters and (c) by which the eventual mixture passes into the airway below the throttle at (d).

It differs, however, from the original Solex starter in that, instead of having two positions, " shut " and " open," there is now an intermediate one, so that it is possible, when the lever is operated along the full length of its travel, to have a very rich mixture which will ensure easy starting under the coldest conditions, and then, by pushing it back a short distance, another very much smaller drilling in the inner disc comes into operation, its effective position being located by a spring-ball which makes contact with a corresponding notch in the outermost disc. This cuts down considerably the mixture strength and permits either of prolonged " semi-idling " for warming-up purposes or of the engine being driven straight away under load without any fear of fuel over-dosing.

When the temperature has reached the point where the assistance of the intermediate starting mixture is no longer necessary, the actuating knob is pushed fully home and the holes in the right-hand disc fail any longer to correspond with the channels.

As in the case of the main setting, the bi-starter is adjusted to suit the needs of the engine

by a suitable selection of the air jet (Ga) and the petrol jet (Gs).

DISMANTLING THE CARBURETTOR

In evolving model 30 FAIO, the principles of Solex simplicity and accessibility have been faithfully followed.

It will be seen that in either model, the pilot jet (g), the main jet (G), the starter air jet (Ga), and the starter petrol jet (Gs) are all accessible from the exterior without dismantling the carburettor.

Access to the interior is quite easy and obvious. In both cases the air cleaner, if fitted, should be removed.

Two slotted square-headed bolts will be found securing the top casting to the remainder of the carburettor.

Removal of these will allow the top to be removed, exposing the float chamber, air correction jet (a) and pilot jet air bleed (u).

It will be seen that the float can be lifted out quite easily, and only a small well-fitting screwdriver is required to withdraw (a) and (u) should it be necessary to remove them for cleaning.

ADJUSTMENT OF THE CARBURETTOR

The starting device.

The air jet (Ga) and the petrol jet (Gs) are determined by experiment to suit the engine for which the carburettor is issued, and it is very seldom that an alteration is required.

Should adjustment be needed, however, due perhaps to change of climate or altitude, never alter the air jet without consulting us or one of our service stations, for this is determined once and for all on a cylinder capacity basis.

Use a larger or smaller Gs as indicated by the symptoms.

1. If starting from cold is not practically instantaneous, or the engine stalls immediately after starting, a size larger Gs is required.
2. If black exhaust fumes occur, or there are other signs of over-richness such as " hunting " immediately after the engine is started, particularly when the dashboard knob is pushed half-way in, a smaller Gs is required.

MAIN CARBURETTOR

Slow running adjustment.

The idling or pilot jet (g) provides the necessary output for idling.

The slow-running screw mounted on the abutment plate of the throttle lever, limits the closing of the throttle, and thus fixes the idling speed of the engine. By screwing in this part the engine speed will rise, and vice versa.

The mixture adjustment screw (W) permits the richness of the idling mixture to be varied. By turning it in an *anti-clockwise* direction, enrichment takes place, up to the limit of the pilot jet output and conversely, by clockwise rotation the mixture is weakened.

Poverty of mixture is recognized by the irregular behaviour of the engine and the tendency to stall. Over-richness will cause the engine to " hunt " and tend to stall when the " hunt " becomes excessive.

Normal adjustment is carried out as follows :—

1. Wait until the engine is hot.
2. Set the slow-running screw until the idling is on the high side.
3. Slacken the volume screw (W) until the engine begins to hunt.
4. Screw it in very gradually until the hunting just disappears.
5. If the engine speed is too high, reset the slow-running screw to slow it down to idling speed of about 500 r.p.m.
6. This may cause a resumption of slight hunting. If so, then turn the volume control screw gently in a clockwise direction until the idling is perfect.

These adjustments must never be made with a cold engine.

Modern engines with substantial valve overlap and mounted on rubber frame-blocks, do not permit the clock-like tickover of earlier days to be obtained. About 400 to 500 r.p.m. is the normal idling speed of today.

ADJUSTMENT FOR GENERAL RUNNING

Generally speaking, the choke tube fitted to the carburettor is correct, and should not require altering unless a special performance is required.

The main jet is determined by " tuning in " to the choke tube size and corrected by selection of a suitable " air correction " jet as described in previous paragraphs of this booklet.

Any engine on which the Solex is fitted as " standard " by the motor-car manufacturer may be taken to be adequately catered for in carburation, for careful tests are made on bench and road by the car manufacturer before the setting is finalized.

To determine what change from " standard " is necessary, it must be understood exactly how

correction of main jet output is effected.

The following details will be more easily grasped by reference to the diagram.

When the engine is at rest, the spraying assembly is filled with petrol to a position closely approaching the spraying orifices (oo) but directly the throttle opens and creates a draught in the choke tube (K) two things happen :—

The petrol output from below increases in virtue of the rising depression in the choke tube waist, and if not corrected would do so by a gradually rising curve. In other words, it would become automatically richer as the speed rose. It is, therefore, the function of the emulsion tube (et) to adjust this mixture to the needs of the engine, and it is done by varying the size of the correction jet (a).

The bigger the correction jet, the greater is the volume and velocity of correctional air which passes vertically downwards and out into the annulus or reserve well (v).

Here it meets with the petrol, which it emulsifies, and reduces the mixture strength by a curve which runs in direct opposition to the rising curve of an uncorrected output, in virtue partly of its relieving progressively, the air depression, and partly on account of the mechanically obstructive effects which it exercises on the petrol flow.

The main virtue, however, of this layout is that, whereas by ordinary correctional means the whole of the curve is affected, the opposite directions which the fuel and air respectively follow in " Assembly 21 " have the effect of making each member—*i.e.*, the main jet and the correction jet, more or less independent within its own particular sphere of operation.

Thus, if we want a rich area at the lower part of the curve, we increase the main jet size without touching the correction jet.

If, on the other hand, we wish only to cut down, or increase the mixture strength at the top of the curve, without interfering with the bottom end, we increase or decrease the size of the correction jet, which gives us the required results without altering the low speed mixture.

By this means, therefore, a particularly flexible method of control is obtained and facilities are thereby given for adjusting correctly the carburation for engines having unusual characteristics which are apt to be outside of the range of ordinary methods of carburation correction.

To give a practical illustration, let us assume we are carburetting an engine which normally takes a standard combination of

25	120	240
(choke tube)	(main jet)	(correction jet)

It may be found in a particular instance that all round results are good, but for bottom end performance, main jet 120 is unnecessarily large, for fitment of size 115 gives equally good results from the point of view of acceleration and flexibility.

With main jet 115, however, we note that there is a falling off in power and speed at major throttle openings, indicating, of course, an insufficiently rich mixture.

In such a case, reduction of the correction jet to size 220 or 200 will almost certainly give the desired results, with obviously greater economy, since a smaller main jet is now in use.

To take an opposite example :—

Suppose we are catering for an engine normally requiring a setting of

25	115	240
(choke tube)	(main jet)	(correction jet)

It is found in this instance that acceleration is poor—there may even be a definite " flat spot," but all-round performance apart from this defect is satisfactory.

We require obviously therefore a richer " bottom end " mixture, so we substitute main jet size 120. Results are now satisfactory, but we find petrol consumption has suffered, particularly at high speed running. This means that the " top end " mixture is now too rich.

Raise the size of the correction jet to 260 or 280 and satisfactory results will be immediately forthcoming.

It will be seen from these examples that " Assembly 20 " is easily handled, and that refined carburation is speedily obtained with a minimum of trouble and time.

All adjustments to the idling and main mixtures must be carried out when the engine is at normal working temperature.

We particularly warn users against ever attempting to ream jets.

GENERAL NOTES

During cold weather, when the engine has remained at rest for a lengthy period, it is advisable to give it a few turns by hand to break the oil film **before switching on the ignition and before pulling out the dashboard knob of the Solex starting device.**

The majority of motors are fitted with a petrol pump. In that case, after a long period of disuse the following may occur :—

For the first few revolutions of the engine

there may be no sign of starting. Then a few late explosions, and prolonged action of the starter motor will be required before normal firing takes place.

This is occasioned by the inability of the pump to supply the required amount of petrol to the carburettor.

It is well, therefore, under such conditions, to make use of the priming device fitted to the pump to fill the carburettor float chamber before attempting to start the engine.

Similarly, if the car has been standing for some time, say two or three days, the petrol in the float chamber may have become stale. Difficult starting may result during cold weather, and it is well, therefore, to pump in a fresh supply before attempting to start the engine.

SOME NOTES ON THE STARTING DEVICE

The Zero Starter unit for Solex carburettors is designed for incorporation with certain Solex carburettors, fitted to vehicles which have a market in countries where very low temperatures prevail during the winter months and is embodied in the carburettor fitted to the "Mayflower."

Its function is similar to that of the well-known Solex "Self-Starter," and it is operated in exactly the same way, *i.e.*, as follows :—

To start the engine from cold, prior to closing the electric starting circuit.

1. Pull out fully the dashboard control. Then start the engine, and
2. Push the control half-way in (a marked resistance will be felt in this position) immediately the engine has "got a grip."
3. Push fully home when the engine is warm enough to idle and accelerate without the aid of the "starter" unit.

NOTE: If at extremely low temperatures the dashboard control must be kept in the No. 1 position for more than a few seconds to avoid stalling, the foot throttle should be gently depressed to admit more air to dilute the rich mixture and assist in warming up the engine in order that No. 2 position of the dashboard control can be achieved as quickly as possible.

In normal and warm climates, the engine can generally be started with the dashboard control in No. 2 (half-way) position.

It can easily be understood how the Zero Starter functions by studying Fig. 5, which exemplifies this unit applied to the Solex down-draught carburettor.

The central shaft to which the lever (Sl) is affixed has pinioned to it, at the inner end, a disc valve (SV). At the other end is another disc valve (T), fitted so that it can slide along the shaft within the limit of its housing in the casting body.

When the dashboard control, which is linked up with the lever (Sl), is pulled out fully the shaft rotates, and the disc (SV), having suitably located holes drilled through, takes up a position where these holes register with the channels (D) and (C), the spring (Y) holding the disc firmly in this position.

The disc (T), though suitably drilled, presents a blank outer face to atmosphere, the spring (X) holding it in position against the outer face of its housing.

All is now in readiness to start the engine. On closing the electrical circuit, *and with the throttle butterfly closed*, as shown in the diagram, engine depression, or suction, takes effect at the outlet channel (d), and is transmitted to the starter mixing chamber in which are located the two springs (X) and (Y). The suction further takes effect via the hole in the valve disc (SV) or the channel (D) being finally transmitted to the float chamber well supplied by the petrol jet (GS). Thus petrol is drawn into the mixing chamber.

Meantime, the suction acting on the surface of the disc (T), draws it inwards against the predetermined strength of the spring (X), thus admitting air via the jet (GA), restricted, however, by the space forming a clearance between the disc and its original seating.

By this means it will be seen that a very rich mixture (in the neighbourhood of 1 : 1 air/petrol) is provided for cold starting.

In consequence, the dashboard control must be pushed into the No. 2, *i.e.*, bi-starter position as soon as possible.

With this procedure, a hole in the disc (T) registers with the outer exit of the channel (C), thus allowing free passage of air to the full capacity of the air jet (GA). At the same time, the disc (SV) has, in its new position, presented a smaller hole to the channel (D), thus reducing the quantity of petrol entering the mixing chamber.

A much weaker mixture is therefore inspired by the engine, which may be left to warm up if desired, though it is preferable to drive off, thus putting the fuel consumption to good use.

After a few minutes running, the engine will be warm enough to function satisfactorily without the aid of the starter unit, when the dashboard control must be pushed right home, thus putting the starter unit out of action.

Points to note.

1. Use the bi-starter (half-way) position to start the engine unless the temperature is *very* low, and keep the throttle closed to the minimum idling position.
2. If the full rich mixture must be used to start, return the dashboard control to the bi-starter position as quickly as possible.

DIAGNOSIS OF FAULTS

There is never any question of definite failure with the Solex carburettor. It is simply a matter of finding the mistake either of fitting or adjustment.

It is well always to approach the diagnosis systematically and avoid doing more than one thing at a time for in that case it is impossible to ascertain from the eventual results, which was the successful factor.

FLOODING

Loose joints.

It is easy to see whether any of the exterior joints are loose.

The first thing to do therefore when a carburettor floods is to verify these various joints.

Grit on the needle seating.

This does not as a rule occur in the case of carburettors provided with a filter and generally only within the first few miles after fitting in which case it is usually due either to stray particles of packing material or to particles of oxide or solder which are apt to get loose inside the petrol pipe. Remove the needle valve and clean same by carefully blowing it out and noting by suction test that it is hermetic, after which replace it and be sure that the washer is perfect and the tightening adequate.

N.B.—Never attempt to " grind in " a needle valve. In cases where damage to seating is only small, a new seating can be made by removing the complete needle valve assembly from the carburettor placing it on a hard surface, and lightly tapping the needle " home," rotating it between every two or three taps.

Punctured float.

If any petrol gets into the float, its weight is of course increased, with the consequence that the level is raised and flooding occurs via the jets. In such a case one must either change the float, or locate, if possible, the point of leakage and solder same. To do this, immerse the float under boiling water, when the emergence of bubbles will disclose the puncture, and cause the petrol to evaporate. This is an emergency measure only, for the solder will unbalance and overweight the float. A new float should be obtained as soon as possible.

Too much fuel pressure.

26 and 30 mm. carburettors are normally fitted with needle valves of which the diameter of the seating is 1.5 mm.

With the advent of mechanical and electrical fuel pumps, it sometimes happens that the pressure developed in them is in excess of normal, and flooding or excessive petrol consumption results.

In such cases, the correct procedure of course is to have the fuel pump tested, and adjusted if delivering at above the prescribed pressure, but the difficulty can sometimes more easily be overcome by fitting a needle valve one size smaller than standard, if a size larger than 1.5 mm. is fitted, as may occasionally be found.

It will be realized, however, that this is merely a compromise, and that to be certain of freedom from trouble, the fuel pump should be checked.

Pressure should not exceed approximately 2 lb. per sq. inch. Normal needle valve-size for 35 and 40 mm. carburettors is 2.5 mm.

Stoppage in petrol supply.

It is advisable at the commencement to assure oneself that the petrol tap is turned on, and that there is petrol in the tank, and by unscrewing the petrol pipe at its union, that the pipework is clear of obstruction.

It often happens, especially after first fitting, that an air lock occurs in the pipe. This is cured in the ordinary way either by removing and priming same or by the temporary application of air pressure to the filler cap.

Vapour locks can also be produced by a petrol pipe too near the exhaust manifold.

A frequent cause of difficult starting is leakage at the pipe unions connecting the fuel pump with the petrol tank. Do not overlook this possibility when endeavouring to diagnose the cause of difficult starting.

Faulty slow running.

Ascertain that the adjustment is correct. If, even then, good slow running is not obtained air leakage is indicated at some point of the induction system, probably via worn inlet valve

stems in their guides. In this case try a slightly larger auxiliary jet, but not too large, for then the engine will " hunt " when idling. Where there is any choice between two jets which give approximately the same results, always use the smaller one.

Before making any jet alterations it is well to assure oneself in every case that the jet is clear of obstruction.

If, in spite of trying various auxiliary jets, regular slow running is not possible, excessive induction leakage is certainly indicated, assuming the ignition to be in order and valve timing normal. The engine in this case will not idle regularly and when one attempts to reduce the idling speed, it will generally stall.

One must realize that slow running is in such a case impossible, for the engine is actually inspiring via various sources of leakage, a greater quantity of air than that entering via legitimate means, so that the correct slow running mixture becomes unobtainable.

BAD ACCELERATION

Incorrect adjustment.

Assure oneself by reference to special directions for that particular engine, that the carburettor is adjusted in an average manner.

If the performance is still bad in spite of this, a larger main jet than is normally necessary may, in some cases, be required, owing to the individual " characteristic " of the engine, but the choke tube as a rule should not be changed.

Defective ignition.

In the case of battery ignition, note that the accumulators are in good order, but where ignition is by magneto one must recollect that the spark intensity diminishes with diminishing speed and as a rule is aggravated by retarding.

When a little weaker than normal owing to slight defects, it is well to set the plug points a little closer so as to offer slightly less electrical resistance to the passage of a weak spark.

Complete impossibility of acceleration.

Assuming that starting and idling are possible, this can only be caused by obstruction of the main jet, weak ignition, or other engine irregularities.

LACK OF MAXIMUM SPEED

Butterfly not opening fully.

Note that when the accelerator is depressed fully, the butterfly opens to its greatest extent. This can be checked by observing the position of the limit screw which should be in contact with the boss cast on the outside of the throttle chamber.

Insufficient ignition advance.

This is a prevalent cause both of heavy petrol consumption and insufficient top speed and can usually be recognized by inability to make the engine knock on a hill when slowing up with fully advanced spark. In such a case, advance the ignition by adjusting the auxiliary advance and retard attachment connected to the distributor or, if not fitted, slacken distributor clamping bolt and turn the whole unit in the opposite direction to which the rotor revolves; to achieve the required results, up to 10-15 degrees advance may be necessary; otherwise refer to the maker of the car or the nearest service station.

Defective petrol supply.

This can always be recognized by standard acceleration up to a certain speed at which periodic hesitations and back-firing occur, curable always by a slight throttle reduction. For confirmation, make a special test with an independent test tank placed as high as possible on the car so as to ensure a good head.

Silencer choked.

In certain designs of silencers this trouble can easily occur after the car has covered a fair distance. It is generally easy to recognize it by the absence of a clearly marked exhaust note at the tail pipe and instead a steady rush of hot gas. To confirm, obtain the aid of an assistant to listen at tail pipe—" rev up " engine to full throttle and switch ignition off, continued exhausting of gas will indicate a choked silencer.

OVERHEATING

It is seldom that the carburettor is the cause of this even in air-cooled engines, and it is definitely impossible, strictly speaking, where water-cooling is concerned.

An excessively weak mixture, can certainly raise the temperature a little, but in no case should it nearly approach the margin of cooling that should be provided by the water-cooling under normal conditions.

A retarded spark will always raise appreciably the engine temperature.

A most frequent and unsuspected cause of

overheating is furred radiators and water jackets.

When overheating insistently develops from no external cause that can be located, ascertain water capacity of cooling system and make a solution comprising 1 lb. *common* soda to two gallons of water. Fill radiator and operate vehicle for one day. Drain and flush out with fresh water for the subsequent two days; this method will usually disperse most of the deposits responsible for overheating.

KNOCKING

Knocking is similarly the result of various causes which as a rule have nothing to do with carburation, such as pre-ignition due to defective plugs, excessive carbonisation, excessive ignition advance or to mechanical noises which can easily be confused therewith, such as loose bearings, worn pistons, etc.

When knocking is actually caused by carburation it can only be due to weak mixture and if not curable by one size bigger main jet, other causes must be sought.

EXCESSIVE CONSUMPTION

Note first that there is no leakage either at the carburettor, the pipework or the petrol tank. *Be sure than that the estimation of fuel consumption is correct.*

To confirm this, it is always advisable, if possible, to make a definite test over a known mileage in average country with a measured quantity of petrol, either in the main tank if it is of the type from which all the petrol can be drained or by the use of an externally placed auxiliary test tank. The longer the test, of course, the more accurate will be the reading, assuming a non-stop run.

Never estimate petrol consumption either from the speedometer readings or from supposedly accurate quantities delivered from petrol pumps, either of which are subject to appreciable errors.

Insufficient advancement.

This is a most frequent cause of heavy consumption as mentioned above and it is always well to run with the spark as far forward as is consistent with the avoidance of knocking.

It is well, of course, to note that there is no sign of misfiring and that the carburettor is not flooding, or petrol being lost through other sources of leakage.

Poor condition of the engine.

The state of the motor has, of course, a very considerable effect upon economy.

It is easy to realise that if compression is lost via worn piston rings or pitted valves, quite an abnormal amount of fuel can in some cases be used to obtain a normal performance. An increase of as much as 100 per cent in consumption can easily result from this cause.

It is, however, as a rule, readily detectable owing to the general lack of power exhibited and in such a case it is useless to attempt to remedy matters at the carburettor.

MECHANICAL FUEL PUMPS

These are fitted as standard on most cars, and fuel waste can result if for any reason too much pressure is being developed. This trouble can generally be presumed when flooding occurs while descending a hill against the engine and causes fresh petrol to be smelt from the front seats.

If ordinary tests fail to disclose any leakage, a short run with a pint or quart test tank and the pump out of action will confirm if the latter is the cause.

There is also a possibility of air leaks between the rear tank and the pump, which will delay the delivery of petrol to the carburettor.

In such cases it is always preferable to apply to a qualified pump service station.

TROUBLES CAUSED BY AIR FILTERS

An air filter with too small a section of filtering medium will frequently raise the consumption owing to the increased vacuum imposed upon the jet thereby. If this is suspected, make a comparative test with the air filter removed. Should the cause be located here, first clean carefully the filtering medium and try again, but if the consumption is still bad it is probably the result of the filter itself being too small.

A FINAL WORD

Statistics show that 80 per cent of breakdowns and engine troubles are due to ignition faults. Apart from stoppage in the petrol supply, which may be due to a choked jet, it is extremely unlikely that a sudden loss of efficiency is attributable to carburation. Let the carburettor be the last item for examination, therefore, and much time will be saved.

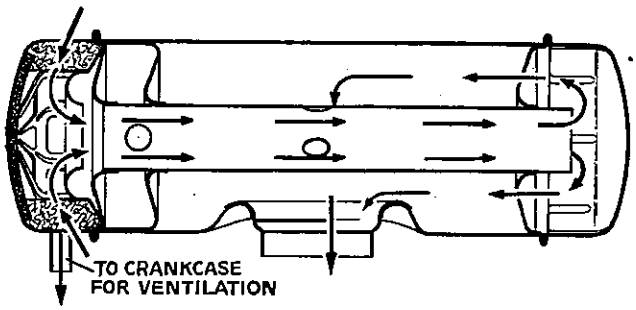


Fig. 6. Home model air cleaner and silencer

AIR CLEANERS—SERVICING INSTRUCTIONS

Home model (Fig. 6).

As a general guide the A.C. air cleaner and silencer fitted to the Home model will, in the Home Market, require servicing at approximately each 5,000 miles, although in any districts where roads are poor and considerable dust is present, servicing should then be carried out more frequently, say at about half the quoted mileage —the procedure being as follows :—

Disconnect breather pipe from end of cleaner, detach from steady bracket, undo clip holding cleaner to carburettor and remove cleaner assembly as a unit.

The lower louvred end of the cleaner should then be rinsed in a bowl of paraffin, taking care that as far as possible the paraffin only swills the woven metallic mesh and take care not to submerge the hole end of the cleaner in paraffin, otherwise the internal sound absorption pads will become saturated.

After thoroughly rinsing the metallic mesh in this way, all surplus paraffin should be shaken off or dried away, and the mesh then be lightly lubricated with engine oil, again allowing any surplus to drain away.

Finally the cleaner assembly should be refitted to the engine, the procedure being the reverse of that used for its removal.

Export model (Fig. 7).

On this model an A.C. oil bath combined air cleaner and silencer is fitted, which gives high cleaning efficiency, combined with good air intake silencing.

As regards frequency for cleaning and re-oiling, each 2,500 miles can be taken as a general guide, although where cars are operating under extremely dusty conditions, the frequency for servicing will need to be correspondingly increased.

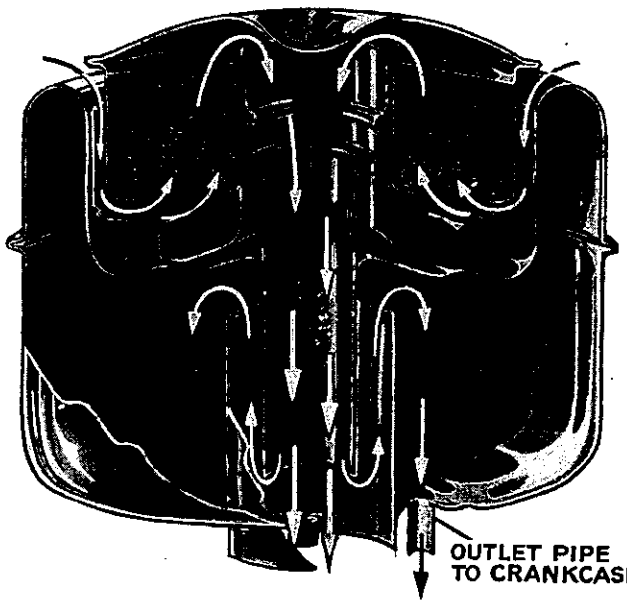


Fig. 7. Export model air cleaner for use in dusty countries

The procedure for servicing this air cleaner is as follows :—

Undo centre wing nut and remove filter cover, filter element containing the woven metallic mesh—and the oil container. There is no need to remove the outer silencer assembly, which remains in position on the engine.

All dirty oil and sludge should be thoroughly cleaned out of the oil container, which should then be filled with clean engine oil to the indicated level, and the oil container then replaced in position inside the silencing chamber.

The filter element should be cleaned by being thoroughly rinsed in a bath of paraffin—all surplus being afterwards shaken or dried off. The filter element can then be refitted inside the oil container, making sure that the cork sealing gasket located in the central tube of the element is in position and in good condition.

Finally, the cover needs to be replaced on the top of the filter element, again making sure that the corresponding sealing gasket is in position and intact, and then the wing nut is fitted and tightened in order to hold the various units together.

TO REMOVE PETROL TANK

The petrol tank forms the floor of the luggage boot and can be easily removed as follows :—

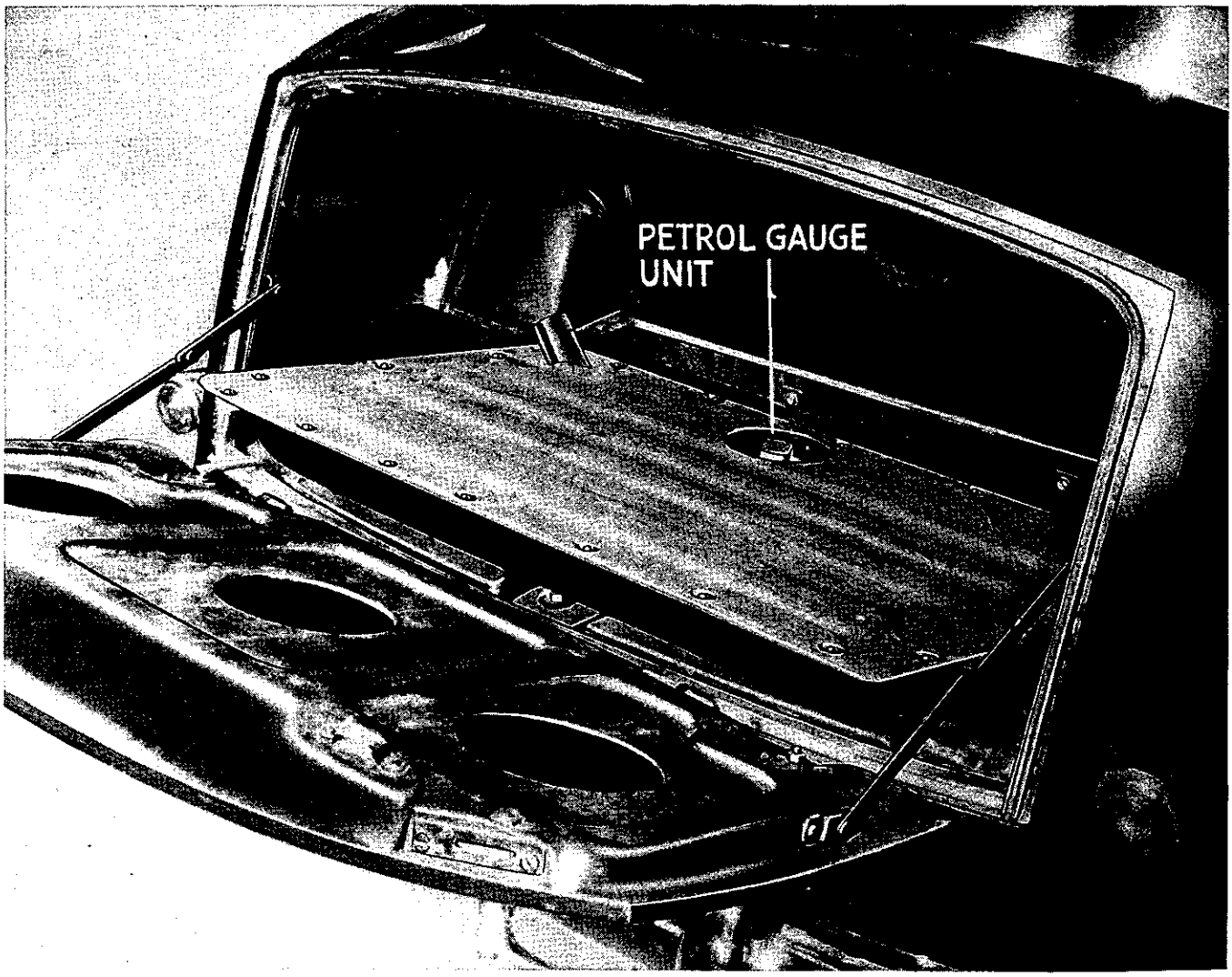


Fig. 8. Showing petrol tank partially removed

1. Detach lead from battery.
2. Drain petrol tank and disconnect pipe at union.
3. Remove spare wheel.
4. Remove rubber mat.
5. Disconnect electric lead from petrol gauge tank unit.
6. Disconnect petrol filler pipe from tank.
7. Remove eighteen $\frac{7}{16}$" A/F headed setscrews which secure tank to body and raise rear of tank, as shown in Fig. 8, and remove over the boot lid.

PETROL GAUGE

Description.

A Jaeger petrol gauge is used and the instrument comprises two components :—

1. Dashboard meter.
2. Tank Unit.

Dashboard meter.

This component is incorporated in the three in one unit and consists of a metal case with a dial calibrated to indicate the contents of the petrol tank.

Two coils, wound on bakelite bobbins with soft iron cores and shaped pole-pieces, exert a magnetic force on a pivotted soft iron armature, to which is attached the pointer. The magnetic effect of the two coils causes the armature (and, therefore, the pointer) to be deflected in accordance with the amount of petrol in the tank. The connections of these coils and a resistance mounted below the armature are shown in the wiring diagram Fig. 9. The voltage across each

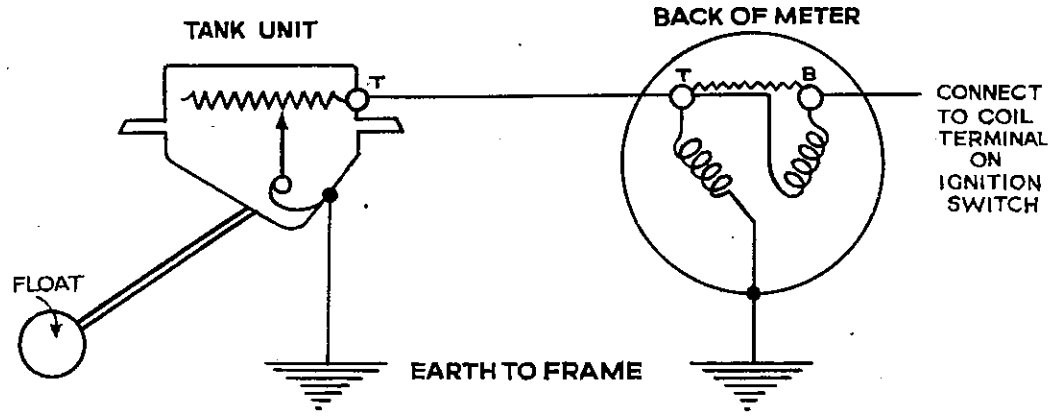


Fig. 9. Wiring diagram of petrol gauge

coil is varied according to the position of the tank unit float arm.

The instrument is practically independent of normal variation of battery voltage.

Tank unit.

This consists of a float and float arm mounted in a zinc-base die casting. The float arm carries a contact arm, which travels over a resistance wound on a bakelite former.

The contact arm takes up a position according to the quantity of petrol in the tank and consequently varies the current through the meter.

Tracing faults.

Symptom	*Cause*	*Remedy*
No reading	1. Meter supply interrupted	Reconnect
	2. Meter case not "earthed"	Connect case or fixing to "earth"
Meter reads "Full"	Tank unit cable broken or disconnected	Reconnect or replace cable

N.B.—The causes of faults, other than the above, may be traced by replacement of each unit in turn.

To test meter.

1. Disconnect wire from terminal "T" switch on ignition. Meter should read "Full" or over.
2. Check that the float arm is working freely
3. Connect terminal on tank unit to termina "T" on meter.
4. Connect body casting to frame of car (*i.e.* "Earth).
5. Switch on ignition. Meter should then indicate according to position of float arm
6. If the meter indicated "Full" irrespective of position of the float arm, the tank unit is faulty.

Important when testing tank unit.

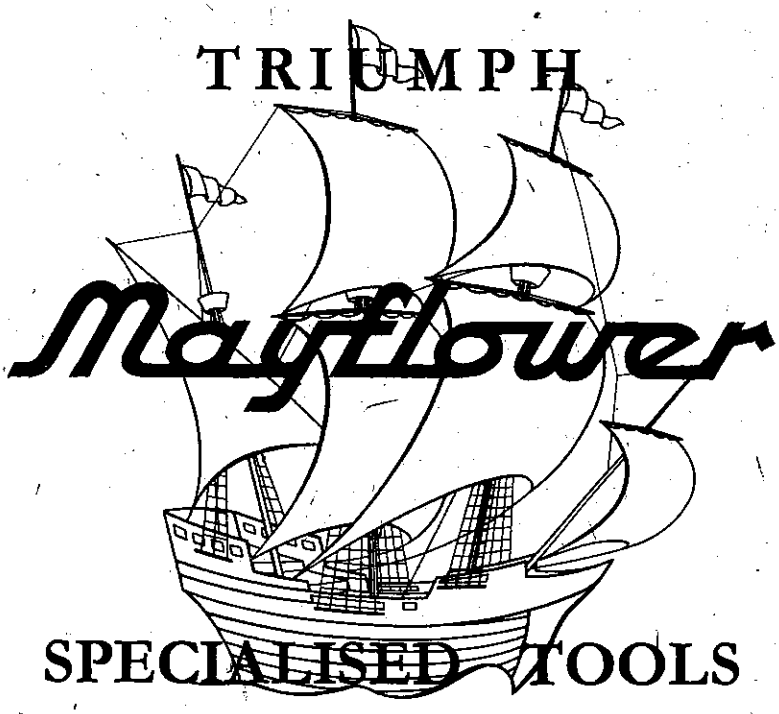
Under no circumstances should the battery supply be connected directly to the terminal o the tank unit.

On no account should the float arm be ben from its original shape. The float arm is provided with top and bottom stops which prevent the contact arm over-running the resistance.

Service Instruction Manual

First Issue

TRIUMPH



Mayflower

SPECIALISED TOOLS

SECTION O

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

TOOLS

POLICY

In the preparation of specialised tools for the "Mayflower," every endeavour has been made to adapt equipment, designed and prepared for the "Vanguard" models, for use with the smaller car.

In view of the importance of proper tools being available for the various repair operations, it is hoped that all our Agents will order complete sets of these tools. In the opinion of this Company, the employment of this equipment is essential to efficient servicing of the "Mayflower" models.

The list of tools, so far approved for use with the "Mayflower" is not yet complete and will be added to, as the necessity for further equipment becomes apparent, and prototype tools, at present on trial, are agreed.

The tools, listed below, should be ordered direct from Messrs. V. L. Churchill and Co. Ltd., 27/34, Walnut Tree Walk, Lambeth North, London, S.E.11.

PARTICULARS OF TOOLS

The list of tools, given below, is provisional and will be added to, as and when, the necessity arises.

Tools suitable for Mayflower only bear the prefix—M.

Tools suitable for Mayflower and Vanguard bear the prefix—20S.M.

Tools suitable for Mayflower, Vanguard and Ferguson bear the prefix—20S.FT.M.

Tools suitable for Mayflower and early Standard models bear the prefix—S.M.

Tool No.	*Description*
M.29	Rear hub oil seal and housing replacer.
S.M.52A	Valve spring compressor.
20S.M.69	Mainshaft circlip remover.
M.70	Pinion bearing outer cup and oil seal replacer.
M.84	Pinion bearing gauge. (This tool is used for estimating the shims required under the pinion head bearing outer ring.)
20S.M.66	Constant pinion remover.
20S.M.85	This tool is 20S.85 (Vanguard) to which has been added adaptors and is now suitable for both Mayflower and Vanguard. Agents who have 20S.85 should order Parts 15 and 16 to render the tool suitable for use on both models.
M.87	Gearbox extension oil seal replacer
M.86	Front and rear hub remover.
M.89	Differential bearing replacer.
M.92	Half shaft bearing replacer.
M.96	Engine lifting bracket.
20S.M.98	Pre-load gauge.
M.100	Drive pinion oil seal replacer.
M.854A.B.C.	Tappet Wrenches (set of three).
	M.854A. $\frac{1}{2}$" A/F straight × $\frac{7}{16}$" A/F cranked.
	M.854B. $\frac{7}{16}$" A/F straight × $\frac{1}{2}$" A/F cranked.
	M.854C. $\frac{13}{32}$" A/F straight × $\frac{13}{32}$" A/F cranked.
SM.853B	Tappet holding wedge. Suitable for Mayflower and Standard side valve engines.
20SM.3600	Steering wheel remover. (This tool supersedes 20S.3600 which is not suitable for the Mayflower nor for the latest Vanguard models with left-hand gear shift.
M.4210	Backlash gauge. (This tool is an expensive fixture which will only be made to special order.)
20S.M.4220	Differential case spreader which supersedes 20S.81.
20S.M.4615	Constant pinion bearing, halfshaft bearing, and Mayflower gearbox mainshaft bearing remover and replacer. Supplied with adaptors to suit the various operations. Where an Agent already has 20S.4615, it is only necessary for him to order the additional adaptors.
M.102	Shock absorber nut wrench.

The following list gives details of Vanguard tools, which are suitable for use without alteration on the "Mayflower," and the prefix has accordingly been altered from 20S to SM.

TOOLS

Tool No.	*Description*
20S.M.46	Circlip installer.
20S.M.47	Gearbox front cover and oil seal assembly installer.
20S.M.90	Propeller shaft flange holder.
20S.M.65	Mainshaft assembly tool.
20S.M.67	Selector locking bar.
20S.M.68	Countershaft needle bearing, retainer ring driver.
20S.M.F.T.71	Pinion bearing outer cup removing driver.
20S.M.73	Gearbox front cover and rear axle oil seal driver.
20S.M.76	Pilot for assembly of gearbox countershaft.
20S.M.77	Countershaft needle bearing retainer.
20S.M.82	Countershaft thrust washer gauge.
20S.M.83	Lapping fixture for 1st speed cone and cup.
20S.M.F.T.60	Valve guide remover and replacer.
20S.M.99	Sparking plug wrench.
6312	Universal puller.
335 & 335S	Connecting rod jig and arbor.

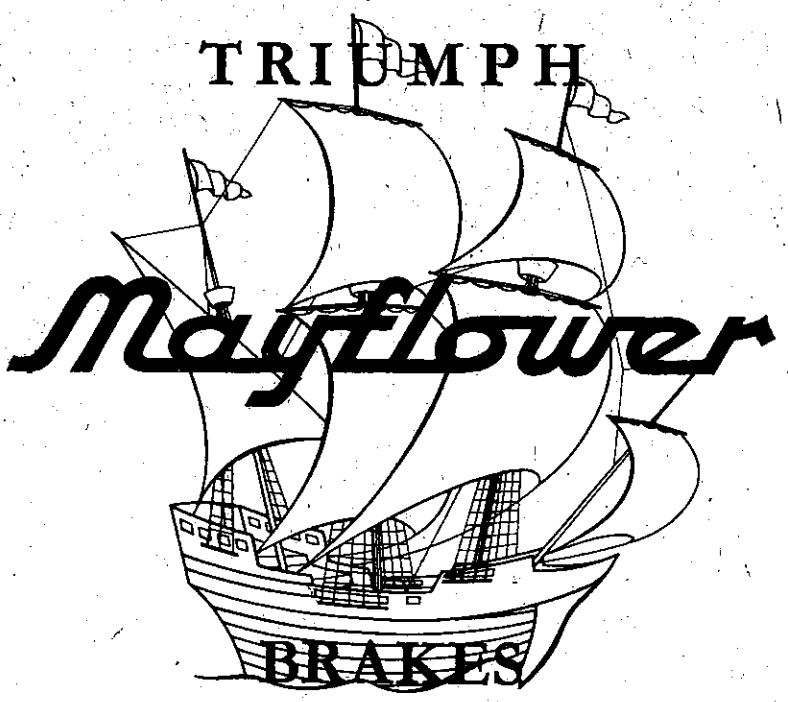
The following tools are under development, at the time of going to press :—

SK/S.998	Drop arm remover (M.91).
SK/S.1057	Clutch plate centralizer (M.72).
SK/S.1040	Door hinge screwdriver for Mayflower.
—	Front road spring compressor (M.50).
SK/S	Small end reaming equipment.
SK/S	Taper roller bearing width checking fixture.
316X	Valve seat cutter handle.
317-22	Valve seat cutter.
316-8	Valve seat cutter pilot.

Service Instruction Manual

First Issue

TRIUMPH



BRAKES

SECTION P

PRINTED IN ENGLAND

THE TRIUMPH MOTOR COMPANY (1945) LTD.,—A SUBSIDIARY OF
THE STANDARD MOTOR COMPANY LTD., COVENTRY

BRAKES

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BRAKES

GENERAL DESCRIPTION

The Lockheed hydraulic brake equipment consists of an integral barrel type master cylinder, containing the reserve supply of fluid, in which the hydraulic pressure is generated; single ended internal wheel cylinders which operate the two leading shoe front brakes; single ended internal wheel cylinders, incorporating hand brake operating levers, which operate the leading and trailing rear brakes, and the necessary pipe lines and hoses connecting the units.

ROUTINE MAINTENANCE

Examine the fluid level in the master cylinder periodically, and replenish if necessary to keep the level $\frac{1}{2}$" below the filler cap. Do not fill completely. The addition of fluid should only be necessary at extremely long intervals, and a considerable fall in fluid level would indicate a leak at some point in the system which should be traced and rectified immediately.

Ensure that the air vent in the filler cap is not choked; blockage at this point would cause the brakes to drag.

Adjust the brakes when the pedal travels to within 1" of the floor board before solid resistance is felt; if it is desired, adjustment may be carried out before the brake linings have worn to this extent.

BRAKE SHOE ADJUSTMENT

Front wheels.

1. Remove the wheel dust cap and jack up one wheel until it is free to rotate.
2. Turn the wheel so that the hole in the brake drum is opposite the slotted head of one of the micram adjusters.
3. Using a screwdriver, turn the adjuster in a clockwise direction until the brake shoe is in contact with the brake drum, then turn the adjuster back one notch; this should provide the correct clearance between the shoe and the drum. If closer adjustment is required, spin the drum and apply the brake hard; this will correctly position the shoe, after which a further adjustment check should be carried out.
4. Repeat operations 1 to 3 on the second adjuster.
5. Repeat operations 1 to 4 on the opposite front wheel.

Rear wheels.

1. Place chocks under one of the front wheels and release the hand brake.
2. Remove the wheel dust cap and jack up one wheel until it is free to rotate.
3. Turn the wheel so that the hole in the brake drum is opposite the slotted head of the micram adjuster.
4. Using a screwdriver, turn the adjuster in a clockwise direction until the brake shoes are in contact with the brake drum.
5. Apply the hand or foot brake hard, to ensure that the wheel cylinder is centralized, and release the brakes. If after doing this the wheel is still locked, turn back the adjuster one notch to provide the correct clearance between the shoes and the drum; if, however, the wheel is free to rotate after centralizing, turn the adjuster until the shoes contact the drum and then turn the adjuster back one notch.
6. Repeat operations 2 to 5 on the opposite rear wheel.

HANDBRAKE ADJUSTMENT

Adjustment of the brake shoes automatically re-adjusts the handbrake mechanism.

The brake rods on the back axle are correctly set at the works and, under normal conditions, these should not require any adjustment, as also is the case with the handbrake cables.

Where for any reason it is necessary to replace the brake rods or cables, or if it is necessary to remove these, the following procedure should be adopted :—

1. The approximate centres for the brake rods should be ensured and these should be 28.69" and 14.88" respectively for the long and short links.
2. The handbrake lever should be adjusted by altering the position of the nuts on yoke piece attached to the end of the longer of the two cables at the handbrake lever end. The normal cable adjustment should allow the handbrake lever to be fully on at 3 to 4 notches.

Brake pedal adjustment.

The correct amount of free play between the push rod (G) and the piston (L), Fig. 1, is set when the vehicle is assembled and should not be altered. If the adjustment has been disturbed, reset the length of the rod connecting the push rod to the pedal so that the pedal can be depressed approximately $\frac{1}{2}$" before the piston (L) commences to move; this free play can readily be determined if the pedal pad is depressed by hand.

Note: An incorrectly positioned floor mat or floor board may foul the pedal preventing its complete return of the " off " position, and may take up this free play when the adjustment is actually correct.

BRAKES
MASTER CYLINDER

(See Fig. 1)

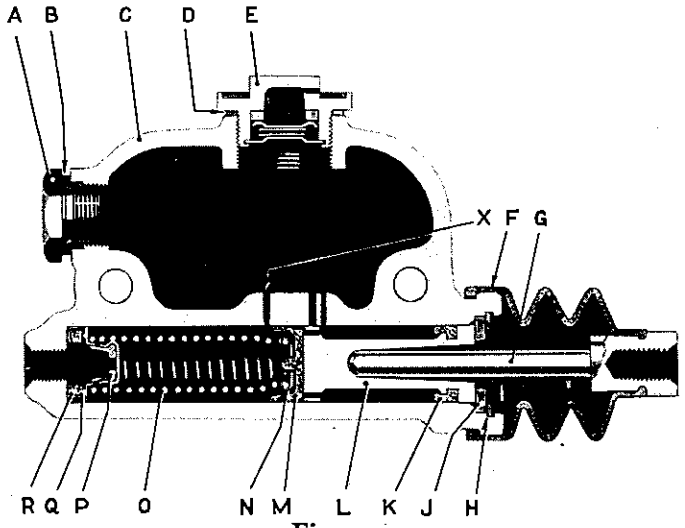

Fig. 1.

General Description

The master cylinder is of the integral barrel type incorporating a fluid reservoir and a master cylinder. In the head of the cylinder is an inlet and outlet valve consisting of a metal body (Q) containing a rubber cup (P), and a rubber washer (R) on which the metal body is urged by the return spring (O). The function of the valve is to prevent the return, to the master cylinder, of fluid pumped into the line during the bleeding operation, thereby ensuring a charge of fresh fluid being delivered at each stroke of the foot pedal and a complete purge of air from the system. During normal operation, fluid returning under pressure and assisted by the effort of the brake shoe pull-off springs, lifts the valve off its seat thereby permitting fluid to return to the master cylinder and the brake shoes to the " off " position.

Directly in front of the main rubber cup (M), when the system is at rest, is a by-pass port (X) which ensures that the system is maintained full of fluid at all times, and allows full compensation for expansion or contraction of the fluid due to change of temperature. It also serves to release additional fluid drawn into the cylinder from the annular space formed by the reduced skirt of the piston (L), through the small holes in the piston head, as a result of the vacuum created by the rapid return of the piston after each brake application. If this additional fluid is not released to the fluid reservoir through the by-pass port due, either to the hole being covered by the main cup as a result of incorrect pedal adjustment, or to the hole being choked by foreign matter, pressure will build up in the system and all brakes will drag.

Removing the master cylinder.

Disconnect the pressure pipe from the cylinder barrel, remove the fixing bolts and detach the rubber boot (F) from the cylinder (C), leaving the boot and push rod attached to the brake pedal. Unscrew the filler cap (E) and drain the fluid into a clean container.

Dismantling.

Push the piston (L) down the bore of the cylinder to release the pressure on the piston stop (J), remove the circlip (H) and the piston stop. Withdraw the piston, rubber cup (M), return spring (O), valve body (Q) complete with rubber cup (P) and the rubber washer (R. Using the fingers only, to prevent damage, remove the secondary rubber cup (K) by stretching it over the end flange of the piston.

Assembling.

Thoroughly clean all parts, using Lockheed brake fluid only for the rubber parts. All traces of petrol, paraffin or trichlorethylene, used for cleaning metal parts, must be removed before assembly. Examine all rubber parts for damage or distortion; it is usually advisable to renew all rubbers when rebuilding a master cylinder.

1. Ensure that the by-pass port (X) in the cylinder barrel is clear by probing with a piece of wire of 23 S.W.G. or smaller; access to the port is through the filler cap orifice.

2. Immerse all parts in brake fluid and assemble wet.

3. Fit the secondary cup (K) on the piston (L) so that the lip of the cup faces the piston head. Work the cup gently round the groove with the fingers to ensure that it is properly seated.

4. Place the rubber washer (R) in position in the bottom of the cylinder bore. Fit the rubber cup (P) in the metal body (Q) and assemble the body on the larger end of the return spring (O). Assemble the retainer (N) on the smaller end of the return spring and insert the assembly in the cylinder so that the valve body is in contact with the rubber washer.

5. Insert the main cup (M) in the cylinder, lip foremost, taking care not to damage or turn back the lip.

6. Press the piston (L) into the cylinder taking care not to damage or turn back the lip of the secondary cup (K). Insert the piston stop (J) and fit the circlip (H) ensuring that it beds evenly in its groove.

7. Fill the reservoir with clean Lockheed brake fluid and test the master cylinder by pushing the piston inwards and allowing it to return unassisted; after a few applications, fluid should flow from the outlet connection in the cylinder head.

Refitting the master cylinder

1. Insert the push rod (G) in the piston (L) and fit the boot (F) on the cylinder (C) so that the vent hole in the boot will be at the bottom when the cylinder is mounted on the vehicle. If the boot is damaged or perished, a new boot should be fitted.

2. Attach the cylinder to the mounting bracket taking care to pick up the adjustable push rod attached to the pedal.

3. Check the pedal adjustment (see "Brake Pedal Adjustment") and bleed the system (see "Bleeding the System").

4. Check the system for leakage by applying a firm pressure to the foot pedal and inspecting the line and connections.

Front wheel cylinders (see Fig. 2).

The front wheel cylinders are mounted rigidly to the shoe backplates inside the brake drum and between the ends of the brake shoes. One cylinder is mounted at the top and the other cylinder at the bottom of each backplate, and each cylinder operates one shoe only. A single piston in each cylinder acts on the leading tip of its respective shoe, whilst the trailing tip of the shoe finds a floating anchor by utilizing the closed end of the actuating cylinder of the other shoe as

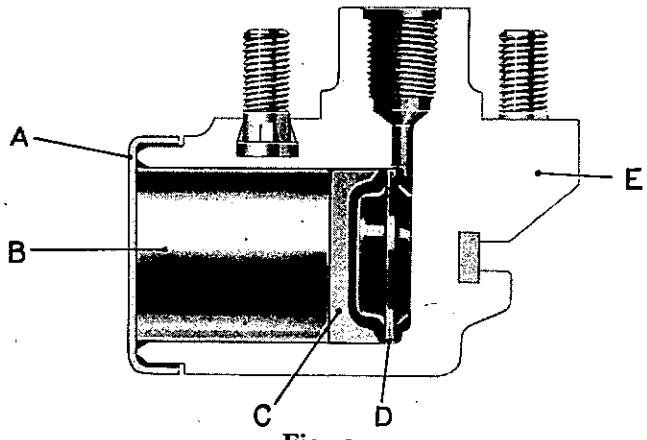

Fig. 2

its abutment. Between the piston and the leading tip of each shoe is a "MICRAM" adjuster which is located in a slot in the shoe.

Each front wheel cylinder consists of a casting (E) containing a piston (B) fitted with a cover (A) and backed by a rubber cup (C). The space in front of the rubber cup is partially occupied by a cup filler (D).

Removing the front wheel cylinders.

1. Jack up the vehicle, remove the wheel, back off all the available adjustment and remove the brake drums.
2. Pull one of the brake shoes, against the load of the pull-off springs away from its abutment on the closed end of the adjacent cylinder and slide the "MICRAM" mask off the piston cover of the operating cylinder; on releasing the tension of the pull-off springs, the opposite brake shoe will fall away.
3. Remove the flexible hose (see "Removing of Flexible Hose" below) also "Front Suspension."
4. Unscrew the banjo bolts on both cylinders and remove the banjo adaptors complete with the bridge pipe.
5. Unscrew the nuts and withdraw the wheel cylinders from the backplate.

Dismantling. (See Fig. 2)

Withdraw the piston (B) complete with the piston cover from the cylinder (E) and apply a gentle air pressure to the fluid connection to blow out the rubber cup (C) and the cup filler (D).

Assembling.

The earlier remarks concerning cleaning, etc., apply equally to the front and rear wheel cylinders.

1. Immerse all parts in brake fluid and assemble wet.
2. Insert the cup filler (D), recessed face foremost, in the cylinder (E) followed by the rubber cup (C), lip foremost; taking care not to damage or turn back the lip.
3. Insert the piston (B) complete with the piston cover.

Refitting the front wheel cylinders.

1. Mount the wheel cylinder on the backplate and secure by means of the spring washers and nuts.
2. Assemble the bridge pipe and banjo connections on the wheel cylinders and fit the banjo bolts with new copper gaskets to ensure pressure tight joints.
3. Screw the flexible hose, with a new copper gasket, into the banjo connection and tighten securely. Mount the opposite end of the hose in the frame of bracket, secure by means of the shakeproof washer and nut, and screw the tube nut, attached to the pipe, into the hose end.
4. Assemble the brake shoes, taking care to locate the " MICRAM " adjusters in the slots in the leading tip of each shoe, with the masks in position.
5. Fit the brake drum, bleed the system (as indicated) and adjust the brake shoes (see " Brake Shoe Adjustment ").
6. Check the system for fluid leakage by applying a firm pressure to the pedal and inspecting the line and connections. Fit the wheel.

REAR WHEEL CYLINDER
(See Fig. 3)

Description.

The rear wheel cylinder, which is fitted in an elongated slot in the rear backplate, is free to slide in the slot between the tips of the brake

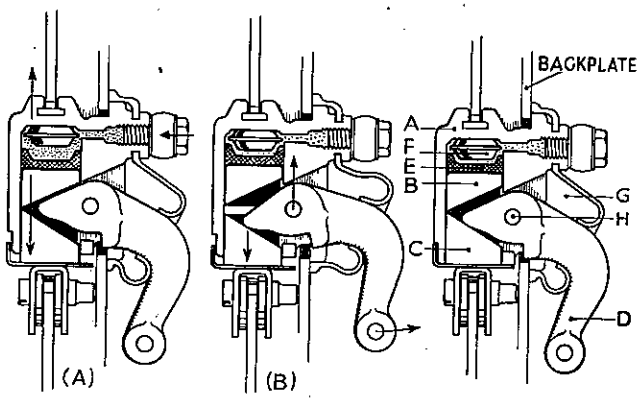

Fig. 3

shoes which are of the leading and trailing shoe type. The cylinder has a single piston operating on the tip of the leading shoe and this shoe butts against a fixed anchor block at the bottom of the backplate, the web of the shoe being free to slide in a slot in the block. The trailing shoe is located in a similar manner between the anchor block and the closed end of the cylinder, and is free to slide and therefore self-centring. The trailing shoe is operated by movement of the cylinder assembly as a result of the reaction of the leading shoe against the brake drum. A " MICRAM " adjuster is located in a slot in the top of the leading shoe.

The wheel cylinder (A) contains a single piston split in two, the inner piston (B) being hydraulically operated while the outer piston (C) is manually operated by the hand brake lever (D). The inner piston is backed by a rubber cup (E) and the space in front of the cup is partially occupied by a cup filler (F). When operated hydraulically, as in (a) of Fig. 3 the inner piston butts against the outer piston, leaving the hand brake lever (D) undisturbed, and applies a thrust to the tip of the leading shoe through the dust cover, " MICRAM " adjuster and mask. When operated manually, as in (b) of Fig. 3, an inward movement of the hand brake lever brings the heel of the lever into contact with the outer piston (C), thrusting it outwards against the leading shoe without disturbing the inner piston. A rubber boot (G) is fitted to exclude foreign matter.

Removing the rear wheel cylinder.

1. Jack up the vehicle, remove the wheel, back off all the available adjustment, disconnect the rod from the handbrake lever, then remove the brake drum.

2. Pull the trailing shoe, against the load of the pull-off springs, away from its abutment at either end; on releasing the tension of the pull-off springs the leading shoe will fall away, collect the " MICRAM " adjuster and the mask.
3. Unscrew the banjo bolt securing the banjo adaptor to the wheel cylinder, disconnect the rod from the hand brake lever (D) and remove the rubber boot (G).
4. Swing the hand brake lever until the shoulder is clear of the backplate and slide the cylinder casting forward. Pivot the cylinder about its forward end and withdraw the rear end from the slot in the backplate, a rearward movement of the cylinder will not bring its forward end clear of the backplate.

Dismantling.

Withdraw the piston (C) complete with cover from the cylinder (A). Withdraw the hand brake lever pivot pin (H) and remove the lever (D). Apply a gentle air pressure to the fluid connection and blow out the hydraulic piston (B), rubber cup (E) and the cup filler (F).

Assembling.

1. Insert the cup filler (F), recessed face foremost, in the cylinder (A) followed by the rubber cup (E), lip foremost, taking care not to damage or turn back the lip of the cup.
2. Insert the hydraulic piston (B), ensuring that the slot in the piston coincides with the lever slot in the cylinder casting.
3. Place the hand brake lever (D) in position and fit the pivot pin.
4. Insert the hand brake piston (C) complete with dust cover, ensuring that the lever is engaged in the slot in the piston.

Refitting the rear wheel cylinder.

1. Offer up the cylinder to the backplate with the hand brake lever through the slot. Engage the forward end of the cylinder in the slot and slide it well forward, taking care to position the lever so that its shoulder clears the backplate. Engage the rear end of the cylinder in the slot and slide it back to hold it in position. Fit the rubber boot.
2. Mount the banjo connection on the cylinder and fit the banjo bolt with a new copper gasket.
3. Assemble the brake shoes, ensuring that the " MICRAM " adjuster is in the slot in the leading shoe with the mask in position.
4. Fit the brake drum, bleed the system (see " Bleeding the System " below) and adjust the brake shoes (see " Brake Shoe Adjustment " above).
5. Offer up the hand brake rod to the lever and fit the pin.
6. Check the system for fluid leakage by applying a firm pressure to the foot pedal and inspecting the line and connections. Fit the wheel.

Removing a flexible hose.

No attempt should be made to remove a flexible hose by turning either of the hose unions with a spanner.

1. Unscrew the tube nut from the hose union where it is attached to the frame or bracket.
2. Remove the nut and shakeproof washer securing the hose union to the frame or bracket and withdraw the hose assembly.
3. Unscrew the hose from the wheel cylinder, or unscrew the banjo bolt leaving the hose on the banjo connection.

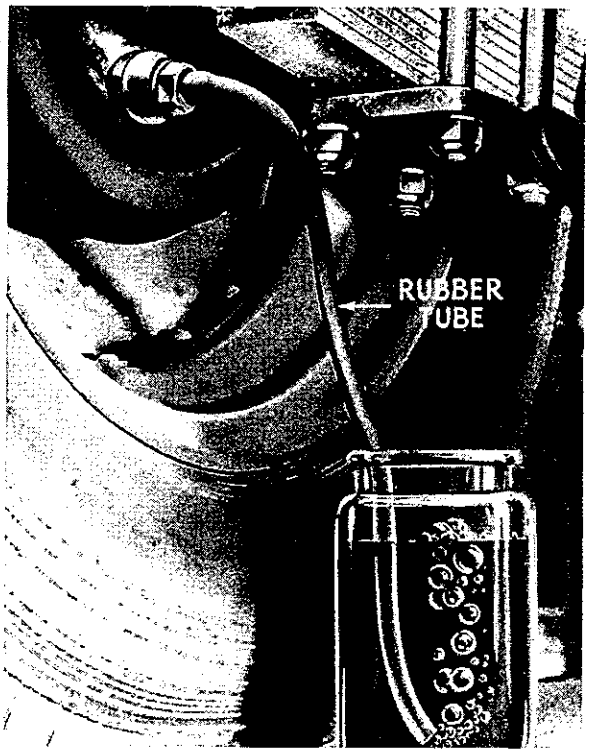

Fig. 4

Bleeding the system. (Fig. 4)

Bleeding the system, to expel all air, is not a routine maintenance operation and should only be necessary when some portion of the equipment has been disconnected or fluid drained off, thereby allowing air to enter.

1. Fill the fluid reservoir of the master cylinder with Lockheed brake fluid and keep a quarter full throughout the whole of the bleeding operation, otherwise air will be drawn into the system defeating the object of the operation.
2. Attach a rubber tube to the bleeder screw on the banjo connection attached to one wheel cylinder and allow the free end of the tube to be submerged in a little fluid in a clean glass jar.
3. Unscrew the bleeder screw one complete turn.
4. Depress the brake pedal quickly and allow it to return without assistance; repeat this pumping operation, with a slight pause between each depression of the pedal. Observe the flow of fluid being discharged into the glass jar and, when all air bubbles cease to appear, hold the pedal firmly down and securely tighten the bleeder screw.
5. Repeat on all wheel cylinders.

Note: Clean fluid discharged from the system should be allowed to stand, protected from dust, for several hours until it is quite clear of air bubbles, before being used again. Dirty fluid should be discarded.