Index

MG 1¼ LITRE

GENERAL DATA, DIMENSIONS AND SPECIFICATIONS

NOTE.—All dimensions are in inches unless otherwise stated.

Make	M.G.
Model	1¼ litre series Y and Y/T*.
(*The essential differences between the Y and the Y/T are listed at the end of this section.)	
Turning circle	35′ 0″.
Track, front	3′ 11⅜″.
Track, rear	4′ 2″.
Wheelbase	8′ 3″.
Ground clearance, unladen	6.00.
Height, unladen	4′ 9″.
Width	4′ 10¼″.
Length	13′ 5″.
Weight	19cwt. 2qrs.
Weight, front/rear distribution	9 cwt. 2 qrs./10 cwt.
Location of serial number	Side of the battery box.
Average fuel consumption	29 m.p.g. at 50 m.p.h.
Brake retardation at 30 m.p.h. (1 up)	31 feet.
Brake retardation at 50 m.p.h. (1 up)	92 feet.
Brake retardation at 70 m.p.h. (1 up)	227 feet.
Chassis type	Boxed section side and cross members.

Capacities

LUBRICANTS	QUANTITY	SAE No.
Crankcase and oil filter	9 pints	Down to 32°F. SAE 30.
Air cleaner	Oil wetted. With oil bath type, fill to mark.	Between 32°F. and 0°F. SAE 20. Under 0°F. SAE 10.
Gear box	1¼ pints	Down to 10°F. SAE 140.
Rear axle	1½ pints	Under 10°F. SAE 80.
Fuel tank	8 gallons.	
Radiator	7½ pints.	
Total cooling system	13½ pints.	

Engine

Type	XPAG/SC.
Bore	2.618 (69.5 m.m.).
Stroke	3.543 (90 m.m.).
Number of cylinders	4.
Firing order	1, 3, 4, 2.
Nominal H.P.	11.
Capacity	76 cu. ins. (1250 c.c.).
Compression ratio	7.2/7.4 to 1.
B.H.P.	46 at 4,800 r.p.m.
Maximum torque	702 lbs. ins. at 2,400 r.p.m.
Cylinder head gasket:	
Type	Copper asbestos.
Normal thickness	.045.
Location of engine number	On flywheel housing.
Engine suspension	Rubber blocks.

Torque Poundage, Bolts and Studs

Cylinder head	600 lbs. ins.
Connecting rod	320 lbs. ins.
Main bearings	750 lbs. ins.
Gudgeon pin clamp	400 lbs. ins.

Cylinder Block

Material	Cast iron.
Bore diameters:	
Standard	2.618.
Bore for oversizes:	
First	2.6378 (+.0197).
Second	2.6476 (+.0295).
Third	2.6575 (+.0394).
Fourth	2.6673 (+.0492).
Number of main bearings	3.
Cylinders:	
Location of number one	Front.

Cylinder Head

Material	Cast iron.
Type	Overhead valve.
Combustion space volume	45.5 c.c.
Depth of head	3.0216.
Valve seats:	
Angle, inlet	30°.
Angle, exhaust	30°.

Crankshaft

Material	Steel.
Type	Forging.
Thrust taken at	Centre bearing.
Number of journals	3.
Main bearing journals, diameter	2.047.
There are five undersizes	—.012, —.020, —.030, —.040, —.050.

Main bearing journal, length:	
Front	1.4961.
Centre	1.4961 (+.0008 —.0004).
Rear	1.5748.
Radius of fillet	.098.
Method of sealing oil:	
Front end of shaft	Asbestos washer.
Rear end of shaft	Scroll and drain.
Crankpin bearing journals:	
Length	1.1024.
Diameter	1.7716.
There are five undersizes	—.012, —.020, —.030, —.040, —.050.
Radius of fillet	.098.

Main Bearings

Type	Shimless, steel backed.
Material	White metal lined.
Number of main bearings	3.
Length:	
Front	1.3827 to 1.3732.
Centre	1.4943.
Rear	1.3827 to 1.3732.
Clearance on crankshaft	.0008 to .003.
End float between centre bearing and shaft	.0014 to .0037.
Diameter:	
Front	2.0479 to 2.0474.
Centre	2.0479 to 2.0474.
Rear	2.0479 to 2.0474.

Connecting Rods

Type	H Section.
Material	Steel.
Length, centre to centre	7.008.
Small end lubrication	Splash.
Small end:	
Type	Clamped.
Bore size	.7087.
Width	.748.
Big end bearings:	
Type	Thinwall, white metal lined.
Diameter	1.7716.
Width	.8842.
Radial clearance	.0005 to .002.
End float on crankpin:	
Nominal	.004 to .006.
Big end:	
Bore size, (forging)	1.9157 to 1.9162.
Width, (forging)	1.097 to 1.098.
Type of nut-locking device	Split pin.

Gudgeon Pin

Type	Clamped.
Material	Steel.
Method of securing	Pinch bolt.
Diameter	.7087 (—.0006 —.0004).
Length	2.3425.
Fit in connecting rod	Clamped.
Fit in piston	Double thumb (cold).

Pistons

Type	"Aerolite".
Material	Aluminium alloy.
Surface finish	Tin coated.
Removal	Downwards.
Oversizes available	+.020, +.030, +.040, +.050.
Skirt top clearance in bore	.0022 to .0028.
Skirt bottom clearance in bore	.0017 to .0023.
Gudgeon pin hole diameter	.7087 (—.0001 —.0003).

Piston Rings

Type	Rectangular section compression. Slotted oil control.
Number of compression	2.
Number of oil control	1.

DIMENSIONS	TOP RING	2ND RING	OIL CONTROL
Nominal diameter	2.618	2.618	2.618
Width	.0885	.0885	.1575
Groove clearance	.001 to .002	.001 to .002	.001 to .002
Thickness	.109 to .101	.109 to .101	.105 to .097
Ring gap (fitted):			
Minimum	.006	.006	.006
Maximum	.010	.010	.010

Valves

Type	Poppet.
Position	In head.
Operation	Push rod.
Timing:	
Inlet opens	11° B.T.D.C.
Inlet closes	57° A.B.D.C.
Exhaust opens	52° B.B.D.C.
Exhaust closes	24° A.T.D.C.
Marking (location of)	Marks on chain wheels and bright links on timing chain.

DIMENSIONS	INLET	EXHAUST
Amount of lift	.2559	.2559
Head diameter	1.2992	1.2205
Stem diameter	.315	.315
Clearance at tappets	Hot .019	Hot .019
Clearance for setting valve timing	.037	
Angle of face	30°	30°

Valve Guides

DIMENSIONS	INLET	EXHAUST
Overall length	2.3228	2.126
Outside diameter	.5512 (+.0008 +.0016)	.5512 (+.0008 +.0016)
Inside diameter	.3173 to .3181	.3173 to .3181

Tappets

Type	Hollow cylindrical.
Material	Cast iron.
Type of adjustment	Ball screw and locknut.

Camshaft

Type	Side.
Material	Steel.
Method of taking thrust	Front end plate.
Maximum end float	.005 to .013.
Amount of lift	.1705.
Number of bearing journals	3.
Diameter of bearing journals:	
Front	1.6142 (+.0004 —.0008).
Centre and rear	.9055 (—.002 —.003).

Camshaft Bearings

Type:	
Front	White metal.
Centre and rear	Zinc alloy.
Diameter of bearings:	
Front (reamed in position)	1.6142 (—.002 —.003).
Centre and rear	.9055 (+.0006 —.0002).
Diameter of bearings (outside):	
Front	1.7169.
Centre and rear	1.7126 —.0008.

Camshaft Drive

Type	Chain.
Fit of gear on camshaft	Slide.
How secured	Woodruff key and set bolt.
Fit of gear on crankshaft	Slide.
How secured	Woodruff key and set bolt.

Chain Drive

Pitch	$\frac{3}{8}$ duplex.
Number of pitches	60.

Lubrication System

Type	Forced feed.
Type of pump	Gear.
Type of pump drive	Gear from camshaft .
Normal pressure	70 lbs. per sq. inch to 40 lbs. per sq. in.
Idler gear:	
Overall diameter	1.2678 +.001.
Overall length	1.378 (—.0016 —.0024).
Driving gear:	
Overall diameter	1.2678 +.001.
Overall length	1.378 (—.0016 —.0024).
Clearance between gears and cover not to exceed	.0016 to .0035.
Filter:	
Type	Throw away.
Location	Crankcase side.
Capacity	Full flow.
By-pass valve opens at	60 lbs. per sq. in.
Pressure lubrication to	Big ends, mains, camshaft and rockers.
Leak lubrication to	Timing chest.
Splash feed to	Pistons and cylinders.
Oil pressure relief springs:	
Number of free coils	$13\frac{1}{2}$.
Pressure at fitted length	7 lbs.
Fitted length	1.063.
Free length	1.476.
External diameter	.500.
Diameter of wire	.056.
Relief valve opens at	50 to 70 lbs. per sq. in.

Cooling System

Type	Pump, fan and thermo-siphon.
Bottom hose, internal diameter	$1\frac{1}{8}$.
Top hose, internal diameter	$2\frac{3}{16}$.
Water pump type	Centrifugal.
Water pump drive	V-belt.
Water pump type of bearings	Ball.
Number of fan blades	4.

Sparking Plugs

Make	Champion.
Model	L10S.
Size	14 m.m.
Gap at electrodes	.020 to .022.

Coil

Make	Lucas.
Model	Q12-8.
Type	L-O.

Distributor

Make	Lucas.
Model	DKYH4A.
Type	DA.36.
Service number	40089B.
Direction of rotation	Counter clockwise at top.
Contact point gap	.010 to .012.

Condenser	.2 mfd.
Automatic advance:	
Type	Centrifugal with micro-adjustment.
Commences at	250 to 400 r.p.m. (distributor).
Maximum advance	14° to 16° at 1,300 r.p.m. (distributor).
Cam angle	Closed and open 45° ±4°.

Carburettor

Make	S.U.
Choke size	1¼.
Type	Semi-downdraught H2.
Number of fuel filters	1.
Location of fuel filter	At float chamber.
Jet	.090.
Needles	F1, standard; DK, rich; EF, weak.

Fuel Pump

Make	S.U.
Type	Electric type "L"
Contact point gap	.030.

Flywheel

Maximum runout	.002.
Type of ring gear	Shrunk on.
Type of pilot bearing	Oilite bush.
Method of locating flywheel	Bolts and dowels.

Clutch

Make	Borg and Beck.
Type	Single dry plate.
Type of hub	Sprung.
Clutch pedal free travel	¾.
Type of release bearing	Carbon.
Type of facing	Fabric.
Outside diameter of clutch facing	7¼.

Gearbox

Type	Synchromesh.
Mounting	Bolted to engine.
Ratios:	
Top	1 to 1.
Third	1.385 to 1.
Second	2.07 to 1.
First	3.5 to 1.
Reverse	3.5 to 1.

Propellor Shaft

Type	Hardy Spicer.
Material	Steel.
Number of universal joints	2.
Outside diameter of propellor shaft	2½.
Length, face to face	46¾.
Type of joints	Needle roller.

Rear Axle

Type	Three-quarter floating.
Final drive	Spiral bevel.
Side bearings	Taper roller.
Number	2.
Pinion bearings:	
Front	Taper roller.
Rear	Taper roller.
Crown wheel and pinion:	
Method of adjustment	Pinion fixed. Crownwheel by screwed nuts.
Normal backlash	.006 to .008.

Steering

Type of box	Rack and pinion.
Steering wheel:	
Total play at rim	Nil.
Number of turns from lock to lock	2.625.
End float, inner column	Nil.
Angles taken at unladen weight, tyre pressures as specified:	
Toe-in	Nil.
Caster	1° ±½°.
Camber	Nil.
King pin inclination	10°.

Front Suspension

Type	Independent.
Type of springing	Coil.
SPRING	
Mean diameter	3.238.
Wire diameter	.538.
Free height	9.82 ±1/16.
Number of effective coils	7.34.
Spring rate	435 lbs./ins.
Static laden height	6.63 ±1/32 for 1,390 lbs.
Static laden height	7.47 ±1/32 for 1,023 lbs.
Solid height	5.025.

Rear Suspension

Type of springing	Semi-elliptic.
LEAF	
Number of leaves	7.
Width of leaves	1½.

Gauge	$\frac{1}{4}$.
Diameter of spring eyes	.825.
Distance between eyes:	
Laden	$42\frac{1}{2}$ —$\frac{1}{8}$.
Average load rate	216.6 lbs./ins.
Working load	650 lbs.
Free camber	4.00.
Maximum deflection	$6\frac{1}{4}$.

Brakes

Type:	
Foot brake	Lockheed Hydraulic.
Hand brake	Cable.
Drums:	
Material	Cast iron.
Diameter (front)	9.00 (+.005 —.000).
Diameter (rear)	9.00 (+.005 —.000).
Drum to lining clearance	Minimum.
Brake pedal clearance	$\frac{1}{2}$.
Lining:	
Material	Ferodo MR19.
Width	$1\frac{1}{2}$.
Thickness	$\frac{3}{16}$.
Length per shoe	$8\frac{1}{2}$.
Total braking area	102 sq. ins.

Wheels and Tyres

Type of wheel	Ventilated disc, CDM 317.
Make	Dunlop.
Wheel size	3.00 x 16.

TYRES

Make	Dunlop.
Size	5.25 — 16.

PRESSURE

	FRONT	REAR
Normal	23 lbs.	25 lbs.

ELECTRICAL SYSTEM

Fuses

Number used	2.
Rating	35 amps.
Circuit	Aux. and aux. ign.

Bulbs

	VOLTS	WATTS
Headlamps	12	36
	12	36/36
Sidelamps	12	6
Stop, tail	12	6
Reverse light	12	24
Number plate lamp	12	6
Fog lamps	12	60

Starter

Make	Lucas.
Service number	255378.
Model number	M418G.
Voltage	12.
Lock torque	15.5 ft. lbs.
Lock voltage	7.0 to 7.5.
Lock current draw	450 to 500 amps.
Brush spring tension	30 to 40 ounces.
Number of pinion teeth	10.
Direction of rotation, commutator end	Counter clockwise.

Dynamo

Make	Lucas.
Model number	C45YV.
Service number	228139.
Voltage	12.
Maximum output	13.0 amps. at 13.0 volts.
"Cut-in" speed	900 to 1,100 r.p.m. at 13.0 volts.
Field resistance	6.3 to 6.5 ohms.
Brush spring tension	15 to 25 ozs. at moment of lift.
Direction of rotation, commutator end	Counter clockwise.

Battery

Make	Lucas.
Voltage	12.
Capacity	51 ampere hours at 10 hour rate.
Earth terminal	Positive.
Number of plates per cell	9.
Height	$9\frac{1}{4}$.
Width	$6\frac{7}{8}$.
Length	$13\frac{1}{4}$.

Horn

Make	Lucas.
Model	HF1235.
Service number	70036A.
Current consumption	2 amps.

Windscreen Wiper

Make	Lucas.
Model	CR2.
Service number	75075.
Current consumption	2.5 amps.

SERIES Y/T TOURER

The Series Y/T tourer is basically similar to the Series Y Saloon with the following exceptions:—

DIMENSIONS

Overall length	13ft. 8ins.
Overall width	4ft. 11ins.
Overall height	4ft. 10½ins.

WEIGHT

Complete car	18 cwt. 3 qr.

PERFORMANCE

Brake horse-power	54.4 at 5,200 r.p.m.
Maximum torque	765 lb. ins. at 2,600 r.p.m.

CAMSHAFT

Cam lift	5.785 m.m. = 8 m.m. at valve.

CARBURETTOR NEEDLES

Standard	E.S.
Richer	E.M.
Weaker	AP.

REAR SPRINGS

Type	Half-elliptical, inter-leaved with rubber.
Number of leaves	8.
Leaf size	¼ x 1½.
Load rate	248 lb/ins.
Free camber	294.
Flat load	729 lbs.
Maximum deflection	4.4.
Length	42½—⅛.

Removal and Replacement of the Sump.

Raise the car and remove the exhaust system.

Take out the drain plug and drain the oil from the sump.

Remove the dipstick and release the clutch pedal pull-off spring from the return spring bracket.

Remove the split pin and clevis pin securing the intermediate clutch operating lever to the clutch operating rod.

Remove the two set bolts and spring washers securing the clutch cable abutment bracket to the sump, remove the split pin and washer and slide off the intermediate clutch operating lever.

Remove the bolts and spring washers securing the sump to the cylinder block and flywheel housing and lower the sump to the ground. (In breaking the sump joint avoid damaging the composition cork washer).

Replacement of the sump is carried out in the reverse manner to that detailed for removal.

Note.—If it is necessary to fit a new sump gasket refer to Fig. 4 as to the method of cutting a replacement gasket. Take care that the portion is left on, which goes between the rear main bearing cap cork seal and crankcase.

Examine the cork composition packing ring in the groove of the rear main bearing cap, and if damaged, fit a new one.

See figure 5 for the correct fitting of this seal in conjunction with the sump gasket.

Examine the "Karmal" asbestos seal fitted into the recess at the front of the sump. If replacement is necessary, care should be taken that the ends of the new one are flush or a little above the face of the sump. The sump gasket must go between the ends of the seals.

Should the engine be turned while the sump is removed or drained, thus emptying the suction passages, the pump will have to be primed with oil by disconnecting the delivery pipe. The main feed oil gallery may also be primed through the special plug provided for this purpose in the cylinder block above the pump.

Removal of the Oil Pump.

Drain the radiator and slack off the top and bottom water hoses.

Remove the front engine mounting bolts holding the engine bracket to the rubber block. Slightly jack up the engine at the front. This allows the pump to clear the frame member.

Remove the oil pipe from the oil filter to the oil pump.

Remove the eight bolts securing the pump to the cylinder block.

Remove the pump by gently tapping the side of the pump body and withdrawing downwards.

Dismantling, Reassembling and Replacing Oil Pump.

Remove the cover from the pump body. This will release the driven gear which can easily be withdrawn.

Remove the circlip securing the driving gear to the oil pump shaft and gear.

Using a drift, tap the oil pump shaft and gear partly through the driving gear. Extract the key and gear before completely removing the shaft, otherwise the key will damage the bush.

Clean off all parts, examine and check for wear.

Renew parts as necessary. (The pump housing and driven pinion are fitted with renewable bushes.) The oil pump is assembled and replaced on the engine in the reverse manner to that detailed for dismantling and removal.

Top Dead Centre Mark.

An indication arrow is fitted on the timing chain case and a hole is drilled or a groove made in the outer face of the crankshaft fan pulley. Turn the engine until the hole in the pulley is in line with the arrow on the cover for top dead centre nos. 1 and 4 cylinders.

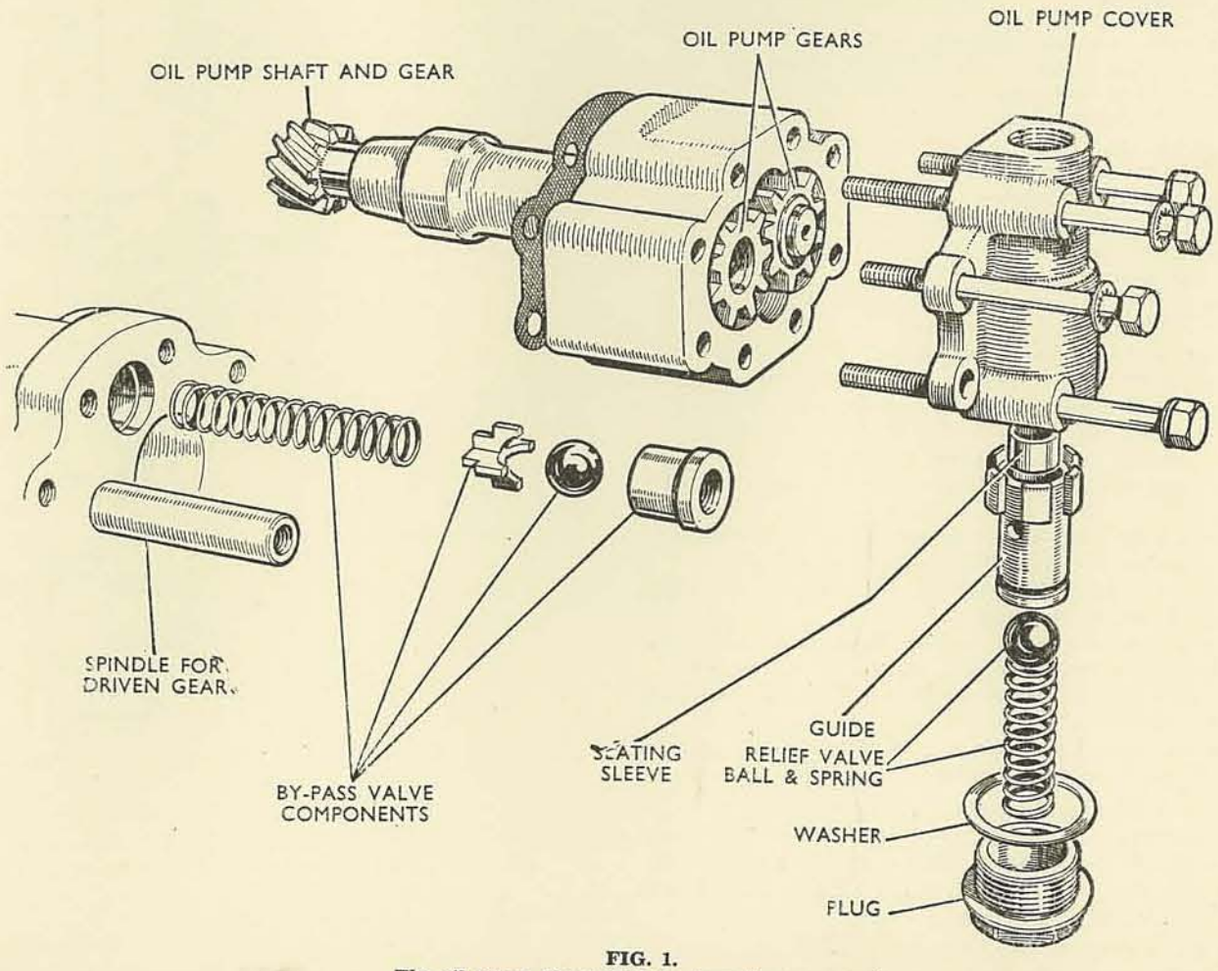


FIG. 1.
The oil pump dismantled to show its components.

Reassembling the Valves.

When the valves are reassembled, care should be taken to see that they are in their correct ports. First oil the valve stem with a little engine oil. After inserting the valve in its guide and resting its head on a wood packing block, the valve spring may be placed in position with the valve spring cap resting on it. Engage a tool on the top of the cap and depress the spring to expose almost the whole of the groove in the upper end of the valve stem. The synthetic rubber oil seal ring must then be fitted to the bottom of the cotter groove, and then insert the two conical cotters (small ends downwards) and gradually release the spring. Make sure that the cotters are properly engaging in their grooves.

Removal and Replacement of Engine (with Gearbox).

Drain the cooling system.
Remove the bonnet and radiator tie-rods.
Remove the battery lead terminals.
Take off the radiator complete.
Remove the front seats and carpets, gearbox cover, front floorboards, foot ramp, gear lever and gearbox extension cover.
Remove the exhaust system complete.
Uncouple the front end of the propellor shaft from the gearbox driving flange.
Disconnect the reverse light switch and speedometer cable from the gearbox.
Remove the engine fume pipe.
Disconnect the throttle control, mixture control and the fuel hose at the fuel pump end.
Disconnect the starter and dynamo cables.
Disconnect the oil gauge pipe and remove the distributor cover and high tension leads to the plugs.
Disconnect the high-tension lead from the coil and remove the steering column complete.
Unscrew the bolt securing the earth cable clip to the flywheel housing.
Disconnect the front end of the clutch cable and remove cable from its stop bolted to the sump.
Remove the engine control link from the bracket on the chassis.
Disconnect all controls and remove the air cleaner, branch pipe, carburettor and fuel pipe.

Place a lifting sling round the engine.
Remove the two bolts, nuts and washers securing the engine to the front engine mounting, and the split pin, nut, washer and rubber bush underneath the rear engine mounting.

Lift the rear of the gearbox slightly and remove the clevis pin in the forked bolt.

The engine can now be lifted up and forward clear of the chassis.

Replacement of the engine is carried out in the reverse manner to that detailed for removal.

Removal of the Timing Chain Case.

Remove the fan belt and the engine control link.

Note.—Mark or measure the position of the adjuster, so that this may be refitted at the same setting.

Take off the water pump and unscrew the starting handle dog nut.

Then extract the crankshaft fan pulley and remove the nine set screws securing the timing cover to the crankcase.

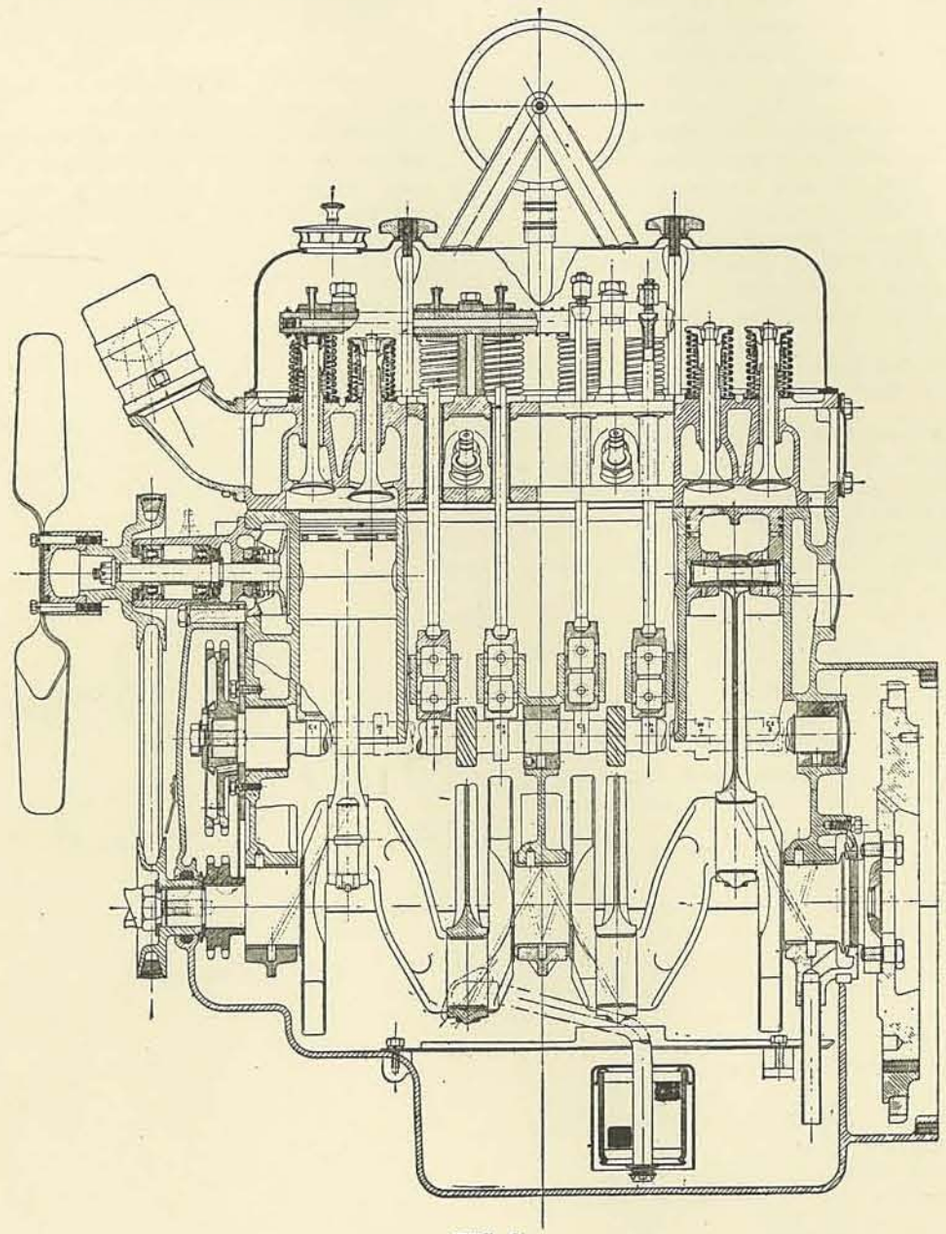


FIG. 2.
Sectional view of the engine (side).

To carry out this operation with the engine in the frame it is necessary to remove the radiator.

Replacement of the Timing Chain Case.

To ensure an oil-tight joint it is essential that the cork washer between the cover and the front plate is in good condition. Renew if necessary.

Check that the oil thrower is in position on the crankshaft.

Check the asbestos oil seal for the crankshaft pulley. The ends of the seal must not be below the mating faces of the chain cover. Coat the mating faces with jointing compound. Assembly is then a reversal of the dismounting process.

Removal of the Timing Chain.

Remove the timing chain case and unscrew the bolt securing the camshaft sprocket to the camshaft.

Remove the chain tensioner.

Lever off the crankshaft and camshaft sprockets, complete with the chain, by means of short flat levers, or Tool No. T123, taking care not to damage the crankshaft and camshaft front bearings.

The Timing Chain Tensioner.

The chain tensioner consists of an hydraulically damped, spring-loaded plunger and combined slipper block, encased in a housing which is bolted to the cylinder block. The slipper is held initially against the chain by the tension of a spring at a pressure of approximately 1.25 lbs.

The spring, which is of 22-gauge wire, has a free length of 71 m.m., an outside diameter of 7.5 m.m. and has 35 working coils. It gives a load of 1.25 lb. when compressed at 48 m.m.

The plunger is fed with oil from the crankshaft front main bearing via an oilway drilled through the cylinder block, mating with an oilway in the tensioner housing or feed block. This oilway is then reduced in diameter to 1 m.m. and the oil feeds through the stem of the plunger, which is 11 m.m. in diameter, and then through the bleed hole in the plunger, which is 2.5 in diameter. This causes an increased pressure and cushioning effect between the chain and the slipper. Oil passing through the bleed hole passes onto the chain and slipper.

Removal of the Chain Tensioner.

Break the lockwire at the two set screws securing the feed block to the cylinder block and unbolt, taking care to hold the assembly to overcome the tension of the spring.

Before replacing, examine the bore of the feed block for wear, this should be 11 m.m. ±.01 m.m.

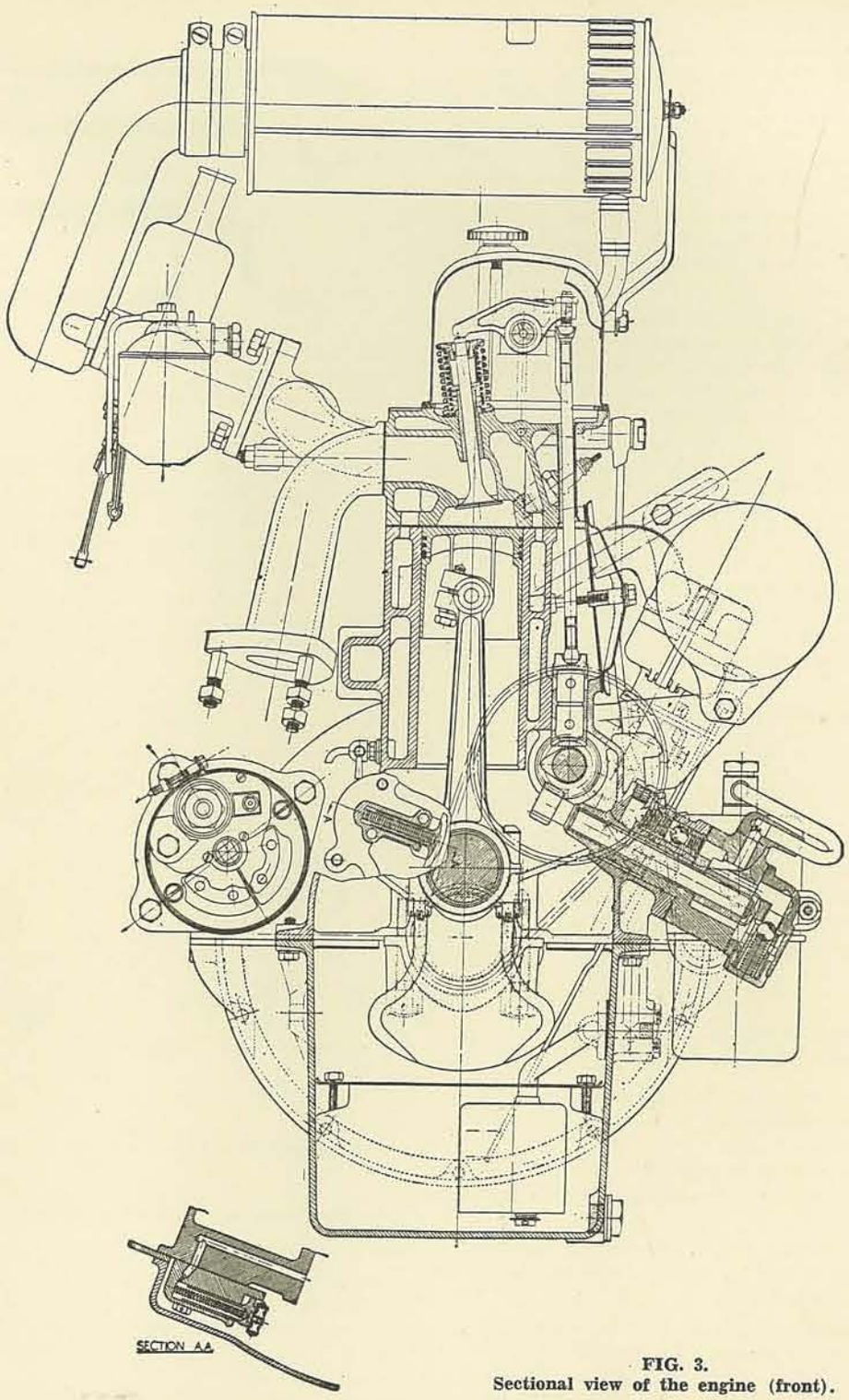


FIG. 3.
Sectional view of the engine (front).

and make sure that the oilway is clear. Look for any wear on the chain tensioner — the outside diameter of the stem should be 11 m.m. —.01 m.m./—.03 m.m. Finally check the tensioner spring, details of which are quoted previously.

Replacement of the Timing Chain.

The two timing sprockets are secured to the crankshaft and camshaft respectively by single keys, there is, therefore, only one position in which the sprockets can be fitted to the shafts.

It will be noticed that the timing chain has two bright links, and each of the sprockets has a tooth marked "T". Between the bright links are thirteen black ones on one side of the chain and fifteen black links on the other. The thirteen black and two bright links are clearly shown in Fig. 8, which shows one bright link of the chain engaged with the "T"-marked tooth of the camshaft sprocket, while the "T"-marked tooth of the camshaft sprocket, is opposite the other bright link, thirteen black links behind the first one.

With the shorter portion of the chain to the left (the bright links forward) engage the camshaft sprocket tooth marked "T" with the top bright link and the crankshaft sprocket tooth marked "T" with the other bright link.

Place the keyways of the crankshaft and camshaft in a suitable position and push home the sprockets complete with chain.

Replace the chain tensioner, checking the paper gasket.

Replace the bolt securing the camshaft sprocket to the camshaft, and knock over the lock washer.

Fit the timing chain case.

Note.—The engine must be turned twenty times before the links and marked teeth come back to this position again.

Removal and Replacement of a Piston and Connecting Rod.

Drain the engine oil from the sump and remove the exhaust system complete.

Take off the engine sump.

Remove the nuts and split pins from the big-end bolts, and withdraw the connecting rod bearing caps.

Remove the connecting rod from the crankshaft.

Draw out the piston and connecting rod down the right-hand side of the engine.

Replacement of the pistons and connecting rods is carried out in the reverse manner to that detailed for removal.

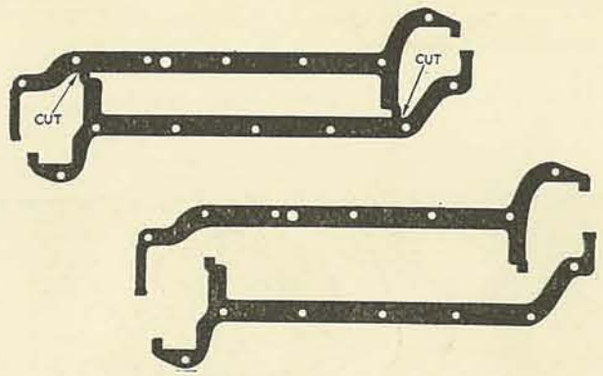


FIG. 4.
Showing the correct method of cutting a replacement sump gasket.

Important.—It is essential when replacing the pistons that they are fitted in the same bores and in the same way round as when removed, that is to say, with the gudgeon pin pinch bolt towards the right-hand side of the engine.

Also the same connecting rod and cap, complete with bearings, must be fitted to the same crank journal from which it was removed.

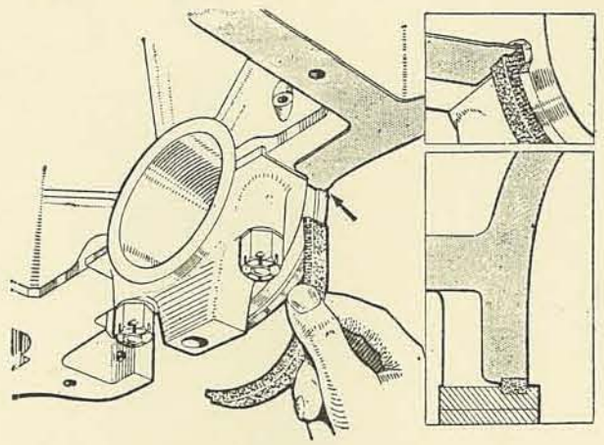


FIG. 5.
Showing correct fitting of the rear bearing seal and the sump gasket.

Piston Sizes and Cylinder Bores.

When fitting new pistons, selective assembly is necessary and the pistons are stamped with distinguishing figures on their crowns. These figures should correspond with those stamped to indicate bore sizes on the top front left-hand side of the cylinder block.

The symbols used for the cylinder bores are:—

A . . . OK, indicating the nominal size and having the actual measurement of 2.6181. A+2, indicating an oversize of .0008 on the nominal size, and having the actual measurements of 2.619 and so on through the range.

The pistons supplied are graded as above, and those marked A . . . OK should be fitted to bores marked A . . . OK, and so on throughout the range.

The Rear Main Bearing Oil Seal Cover.

This half-cover is dowelled and bolted to the cylinder block, and to prevent oil leaks it is important that the extreme ends of the cover mate with the top face of the rear main bearing block. Jointing should be put between these faces when assembling. Renew gasket if damaged.

Removal and Replacement of the Crankshaft (Engine out of the Chassis).

Remove the sump, flywheel, the fan driving pulley and the timing chain case.

Take off the timing chain and extract the pistons and connecting rods.

Remove the two securing nuts from each main bearing cap and remove the caps and bearings.

Note.—It is advisable to mark each bearing cap and bearing to ensure the correct position for replacement.

Lift out the crankshaft.

Replacement of the crankshaft is carried out in the reverse manner to that detailed for removal.

Removal and Replacement of the Rocker-shaft and Rockers.

Remove the air cleaner and the cylinder cover.

Knock down the ends of the lock plates and remove the eight bolts securing the rocker shaft.

Remove the shaft complete with the rockers.

Take off the circlip, washer and spring from the end of the rocker-shaft.

Slide the rockers, springs and brackets from the shaft.

Replacement is carried out in the reverse manner to that detailed for removal.

Note.—Fit the rocker-shaft with the rocker oil feed holes uppermost, and with the single oil feed hole at the bottom in No. 4 bracket. Make sure that the "D" washers are fitted to Nos. 1 and 4 brackets and the plain circular washers to Nos. 2 and 3 brackets, so that they engage with the keyways in the shaft. Fit new lock plates to the bolts.

Adjust valve clearances.

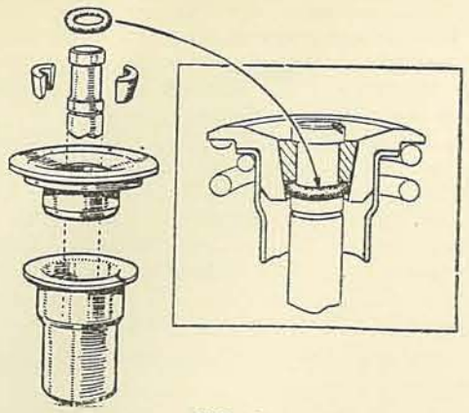


FIG. 6
Exploded view of the valve, oil seal and retainers.

Removal and Replacement of the Camshaft Tappets.

Remove the air cleaner and the cylinder head cover, then unbolt the fume pipe and remove the engine side cover.

Remove the rocker gear from the cylinder head and withdraw the push-rods. Lift out the tappets.

Replacement is carried out in the reverse manner to that detailed for removal.

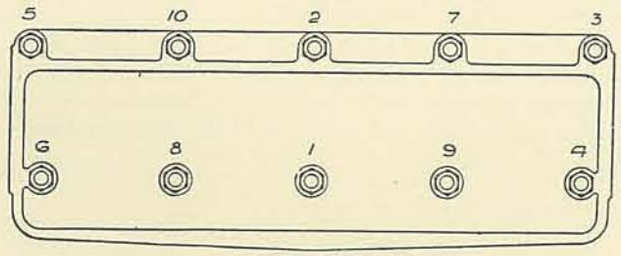


FIG. 7
Showing order of tightening cylinder head nuts.

Removal and Replacement of the Camshaft.

Remove the tappets as detailed above, otherwise fouling between the cams and tappets is likely to cause damage to the running surfaces.

Remove the sump, take out the distributor and extract the oil pump.

Remove the timing chain and unscrew the dowels which secure the intermediate and rear bearings to the cylinder block.

Remove the front thrust plate.

Pull the camshaft forward from its rear bearing through the front bearing, carrying the centre bearing with it. This should be removed from the camshaft when the camshaft has been withdrawn far enough to bring the centre bearing free from its housing.

Replacement is carried out in the reverse manner to that detailed for removal, not forgetting to re-wire the two bearing dowel screws.

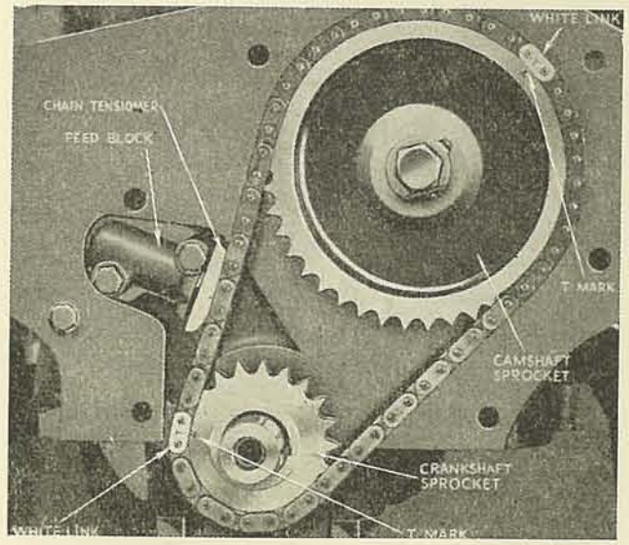


FIG. 8.
Timing chain.

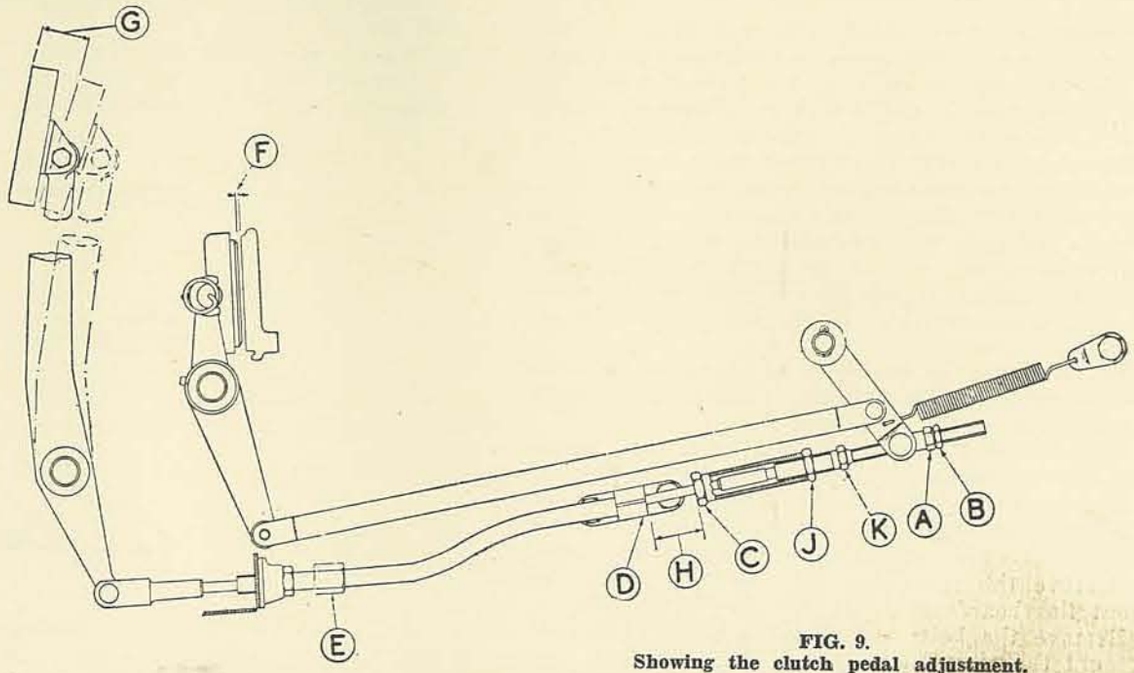


FIG. 9.
Showing the clutch pedal adjustment.

Camshaft Bearings.

When fitting new camshaft bearings it will be found that the centre and rear bearings can be simply fitted as straight replacements, but when the front bearing is pressed into the housing, this will need reaming in line with the centre and rear bearings with Tool T111. The bearing must also have the locking nick knocked into the crankcase slot.

THE CLUTCH

Running Adjustments.

The only adjustments 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 into contact with the release lever plate and commences to withdraw the clutch). As the driven plate facings wear, the free movement of the pedal will gradually decrease, having a tendency to prevent the clutch fully engaging and permitting too great a movement on withdrawal.

The minimum clearance between the withdrawal lever plate and the face of the thrust bearings is $\frac{1}{16}$, which gives a free pedal movement of $\frac{3}{4}$ at the clutch pedal.

When the clutch pedal free movement becomes less than this, it is essential to make use of the adjustment provided (see Fig. 9). This consists of an adjusting nut "A" and locknut "B" at the forward end of the clutch operating cable. Care should be taken to tighten up the locknut "B" carefully after adjustment.

In addition, care must be taken to see that the pedal travel is not excessive, as this will throw unnecessary strain on the carbon thrust block, leading to early failure. There should be approximately $\frac{7}{8}$ clearance at "H" between the stop nut "C" and its stop "D" when the pedal is lightly held with the carbon block in contact with the thrust ring.

To obtain adjustment, grip nut "C" and slack off the locknut "J"; grip nut "K" and adjust the stop nut "C" to the required position. Re-tighten the locknut "J" after adjustment. Need for this adjustment will be indicated when there is a tendency for the clutch not to free when the pedal is fully depressed.

Adjuster "E" is only for the initial adjusting of the outer cable length to give the correct flexibility between the pedal box and floating engine, and should require no resetting.

THE GEARBOX

Removal and Replacement of the Gearbox.

Important.—Two stops are provided in the gearbox for the third speed selector shaft; the first of the ball and socket type, the second a boss on the inside face of the gear lever housing. Should this housing be removed extreme care must be taken to ensure that the selector shaft is not withdrawn past the first stop, otherwise the synchromesh mechanism will slide apart, releasing the operating springs and balls and necessitating the dismantling and reassembling of the complete gearbox. Commencing gearbox No. SG.485 a modified shifter shaft with a circlip provides a positive stop under all conditions.

Remove the stop screws in the front of the seat slide runners, release the catches and slide the seats forward out of their runners.

Unfasten at the front and roll back the carpets and remove the carpet over the gearbox cover.

Remove the four bolts securing the cover to the ramp plate and the nine set bolts securing the cover to the floorboards, and withdraw the gearbox cover.

Remove the remaining set screws securing the front floorboards and lift out the floorboards.

Remove the bolts securing the ramp plate and lift out the ramp plate.

Uncouple the speedometer cable by unscrewing the union attaching the casing to the right-hand side of the gearbox.

Disconnect the reverse light switch from the gearbox.

Remove the two set bolts securing the exhaust bracket to the gearbox.

Slacken off the nuts securing the front exhaust pipe at the manifold flange.

Remove the split pin, nut, washer and rubber bush underneath the rear engine mounting.

Lift the rear of the gearbox slightly and remove the clevis pin in the forked bolt.

Remove the split pin and clevis pins securing the clutch operating rod to the clutch operating lever.

Uncouple the front end of the propellor shaft from the gearbox flange.

Jack up the rear of the engine, just taking the weight, remove the ten set screws securing the gearbox to the flywheel housing, remove the two bolts securing the clutch inspection cover and lift out the gearbox.

Replacement is carried out in the reverse manner to that detailed for removal.

Note.—The clutch inspection cover must be replaced with the air vent to the right-hand side of the chassis.

To Dismantle the Gearbox.

Remove the dipstick from the gearbox and drain off the oil.

Release the clutch housing from the gearbox.

Remove the six nuts securing the top cover assembly to the gearbox and the four bolts and spring washers securing the gear lever cover assembly to the gearbox extension.

Take out the three selector springs.

Using the extractor, Tool T.108 withdraw the propellor shaft driving flange.

Detach the speedometer drive housing and extract the lock wire from the eight square-headed screws locking the gear shifters and stops to the selector shafts and remove the screws.

Slacken the nuts and set bolts securing the gearbox extension to the gearbox and withdraw it sufficiently to allow the gear shifters to be removed from the ends of the selector shafts.

Now withdraw the gearbox extension from the gearbox.

Withdraw the selector shafts one at a time, taking care not to lose the selector lock balls in the process. Now lift out the selector forks. Reference to Fig. 10 will show the interlocking mechanism of the shifter balls. Observe the correct position of the gear shifters and stops on the selector spindles as shown in the plan view of the shifters and shafts.

Remove the layshaft spindle locating screw from the rear of the gearbox.

Extract the layshaft spindle by tapping it at the forward end with a copper or brass drift.

Remove the drive gear with its journal bearing by tapping the mainshaft towards the front of the gearbox, using a copper drift.

Before the mainshaft can be removed it is necessary to extract the journal bearing from its housing, using a drift for this purpose.

The mainshaft assemby can then be withdrawn from the gearbox.

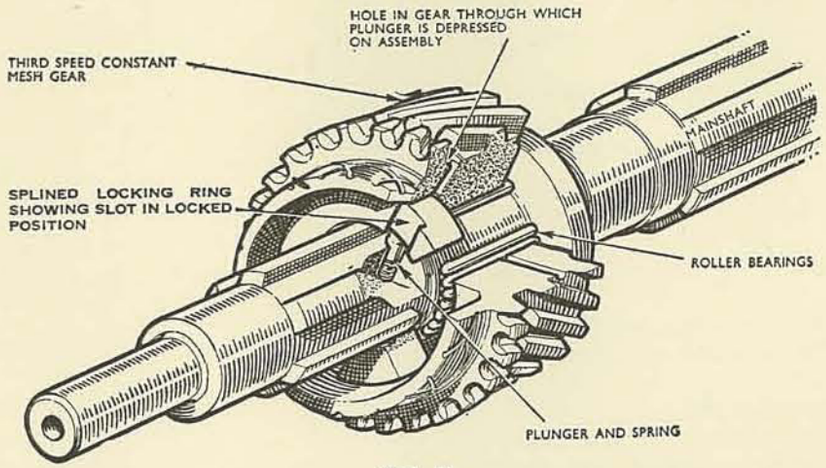
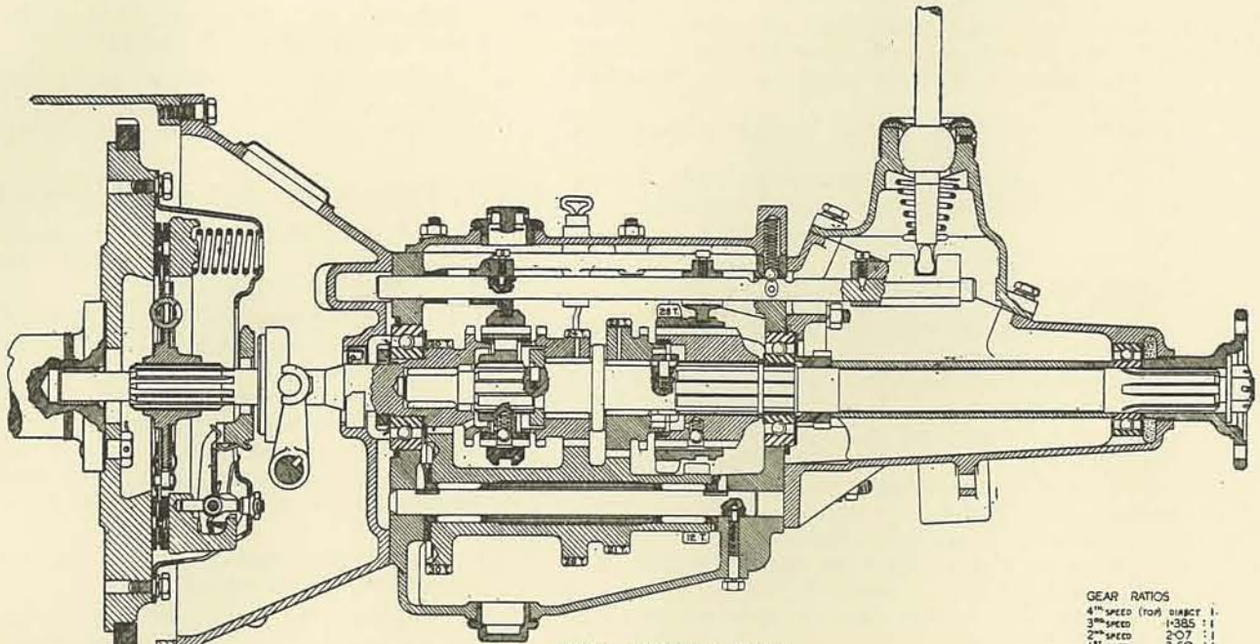


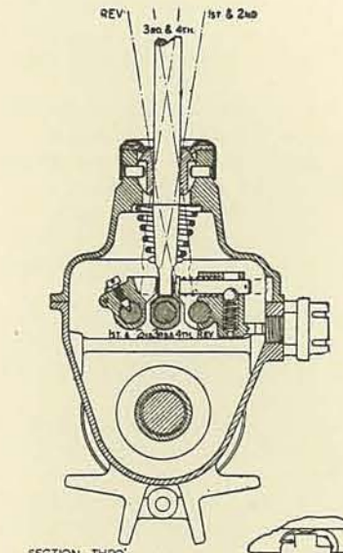
FIG. 11.
Showing method of securing third speed constant mesh wheel to the mainshaft.



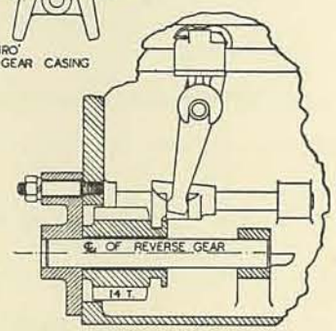
GENERAL LONGITUDINAL SECTION

GEAR RATIOS

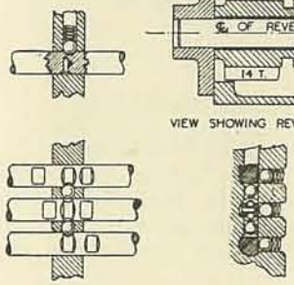
4TH SPEED (TOP) DIRECT	1 : 1
3RD SPEED	1·385 : 1
2ND SPEED	2·07 : 1
1ST SPEED	3·50 : 1
REVERSE	3·50 : 1



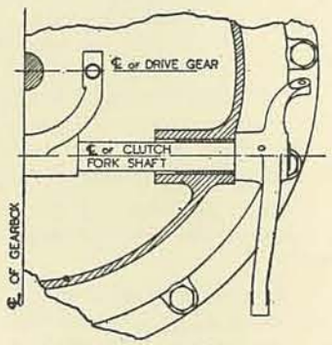
SECTION THRO' SPEEDOMETER GEAR CASING



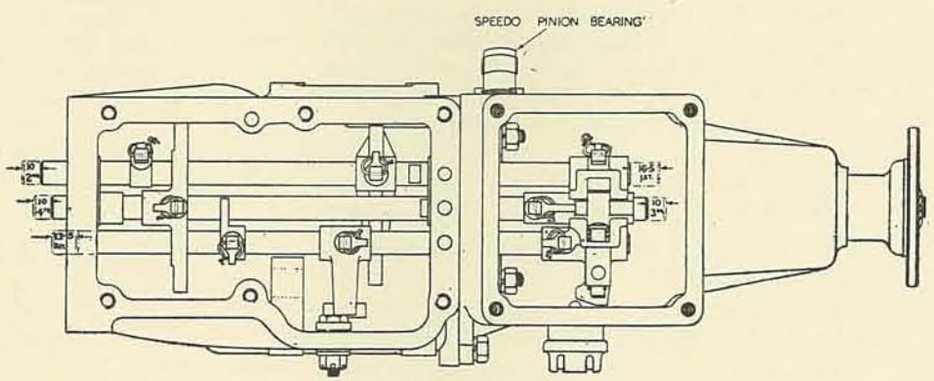
VIEW SHOWING REVERSE GEAR



SECTION SHOWING INTERLOCKING MECHANISM OF SHIFTER SHAFTS



PART SECTION SHOWING POSITION OF CLUTCH LEVER (OFFSIDE)



PLAN VIEW OF SHIFTERS & SHAFTS

FIG. 10.
Sectional view of the gearbox.

Extract the layshaft gear unit, observing that the tabs on the thrust pads line up with the slots cut at the front and rear walls of the gearbox.

To Dismantle the Mainshaft.

Withdraw the top and third gear synchromesh hub from the forward end of the shaft, observing that the plain side of the hub goes to the rear of the gearbox.

Remove the third speed gear collar by pressing down the spring-loaded locking plunger and rotating the collar until the female splines register with the male splines on the mainshaft.

The third gear can now be withdrawn.

Care must be exercised to prevent the loss of the plunger and spring or the 32 needle bearings on which the third gear is mounted.

Extract the circlip from the rear end of the mainshaft and remove the first and second gear synchromesh hub; the plain side of the hub faces to the front of the gearbox.

The withdrawal of the second gear from the mainshaft is executed in a similar manner to that for the third gear. Next to the second gear collar is a thrust washer which has two halves. Again care must be exercised not to lose the spring and plunger or the 28 needle bearings.

To Dismantle the Synchromesh Mechanism.

The striking dogs for top, third and second gears are retained on sliding hubs by balls and springs which are housed in their sliding hubs. Each sliding hub, therefore, can be pushed out from its striking dog when sufficient effort is applied to overcome the springs.

Reassembly of the Synchromesh Mechanism.

The six balls and springs must be fitted into the sliding hub and compressed by a special tool, T.109.

The sliding hubs can now be pushed into the striking dog and the tool withdrawn, when the balls will spring into an indentation ground in the centre of the teeth.

The reassembly of the gearbox, mainshaft, etc., is carried out in the reverse manner to that detailed for dismantling.

Note.—For easy assembly of the layshaft with its bearings, it is recommended that a dummy shaft $\frac{5}{16}$ diameter by $6\frac{11}{32}$ long be used.

THE REAR AXLE

Removal of the Rear Hub.

Jack up the rear axle and remove the hub cover and road wheel. Remove the three set screws securing the brake-drum to the hub. Turn the two adjustment nuts inwards to release the brake-shoe adjustment.

Withdraw the brake-drum.

Each axle drive shaft flange is provided with two threaded holes. By screwing into these holes two of the countersunk headed screws which secure the brake-drums and using them as extractors the shafts can be parted from their bearing housings and be readily withdrawn, exposing the large hub retaining nut.

Tap back the tabs of the locking washer and remove the nut.

The hub, complete with its bearing and oil seal, can now be withdrawn. Use special extractor tool, T.119.

Replacement of the Rear Hub.

Check the hub oil seal for damage or wear and replace if necessary.

See that the ball bearing is still serviceable. The ball bearing fitted is a Ransome & Marles L.J.40. The bore of the housing is 3.147 +.002/—.000.

The lip of the sealing edge of the seal should face towards the bearing. Replace the hub complete with bearings and oil seal.

The bearing is a tight sliding fit on the axle extension, so that it must be tapped gently into position by means of a piece of tube.

Place the lock washer and nut into position and tighten the nut.

Finally tap over the lock washer tabs into the slots in the nut.

Note.—The hub retaining nuts have right-hand and left-hand threads; right-hand is right-hand thread and left-hand side is left-hand thread.

Replace the driving shaft and brake-drum.

Reset the brake-shoe adjusters.

Removal and Replacement of Brake Back Plate Assembly.

Remove the wheel, brake drum, driving shaft and hub as described.

Disconnect the brake pipe from the wheel cylinder by removing the set bolt securing the banjo union.

Remove the two set bolts securing the hand brake cable dust cover to the back plate. The hand brake cable can then be withdrawn from the back plate.

Remove the four nuts and bolts securing the brake back plate to the rear axle tube flange.

The brake back plate can now be withdrawn complete with the brake assembly.

Replacement is carried out in the reverse manner to that detailed for removal.

To Remove the Differential, Crown Wheel and Pinion Assembly.

Drain the oil.

Jack up the axle until the wheels are free of the ground and remove the wheels, brake-drums and driving shafts as detailed.

Uncouple the propellor shaft at the rear axle flange and tie up out of the way.

Remove the eight nuts securing the differential carrier to the axle housing and withdraw the assembly complete in a forward direction.

To Dismantle the Axle Centre Assembly.

Hold the differential carrier assembly securely in a vice and remove the lock plates for the differential adjusting nuts.

Remove the two differential bearing caps. These caps are machined with the carrier, and it is most important that they should be fitted in their original positions when reassembling. These caps are marked to show their correct assembly. It is to be noted that these caps are only supplied with the pinion carrier for replacement purposes and cannot be obtained separately. They are definitely not interchangeable.

Remove the crown wheel assembly and the two differential adjusting nuts.

Withdraw the cotter pin securing the slotted nut on the flanged end of the pinion shaft. Remove the nut and flat washer. Press out the pinion shaft towards the crown wheel end of the shaft, placing a brass drift between it and the ram of the press. The drift should be of a size to pass through the flange bore, so that the flange may be pressed off at the same time. The inner race of the large bearing will come away with the pinion. The outer race of this bearing will remain in the carrier, together with the complete smaller bearing and the oil seal.

From the crown wheel end of the carrier press out the inner race of the smaller bearing, together with the oil seal.

Drive out, with a mild steel drift, $\frac{3}{8}$ in diameter, the outer races of both large and small bearings. Slots for this purpose are machined in the carrier.

To Dismantle the Crown Wheel Assembly.

The differential case which carries the crown wheel is in two pieces, the complete assembly being held together by eight bolts and nuts. The two portions of the differential case are marked to ensure correct assembly. Note these markings and their location before dismantling, and ensure that they correspond with reassembling.

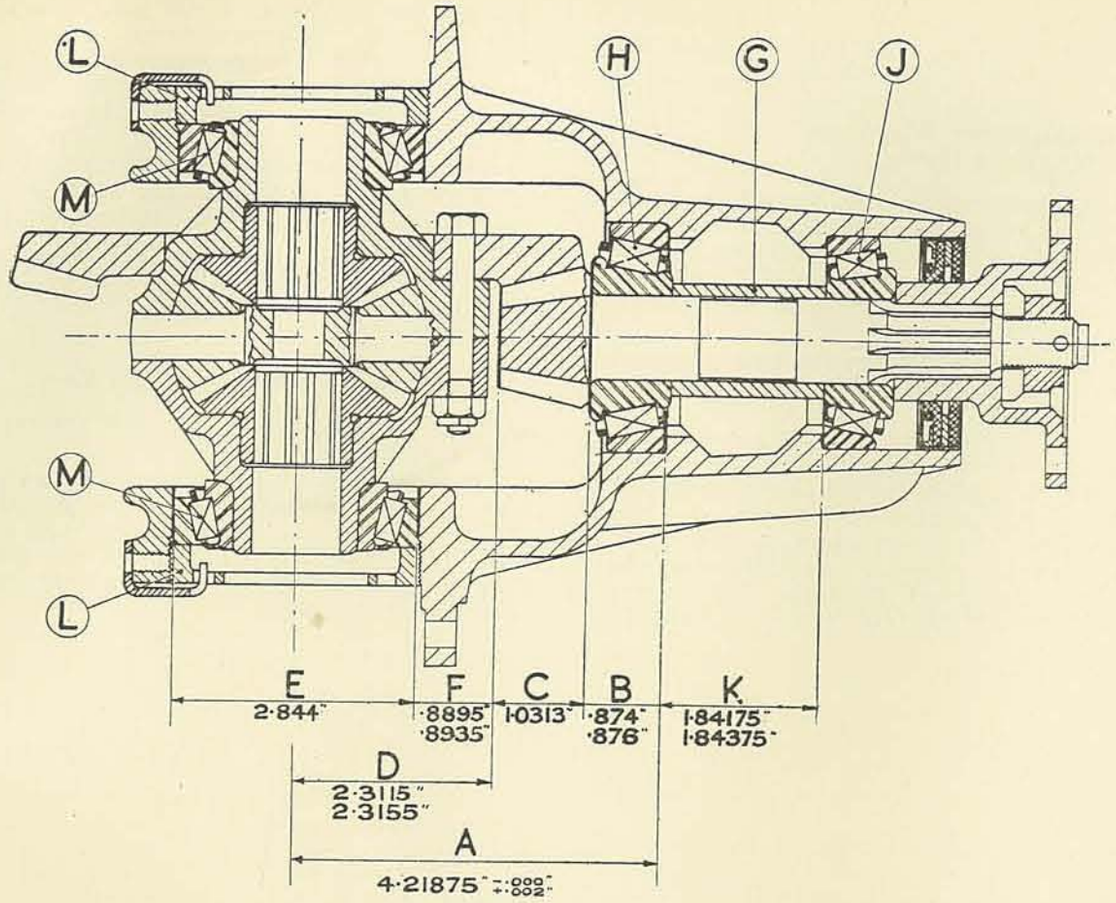


FIG. 12.
Sectional view of the drive gear, showing dimensions controlling the pinion position.

Extract the cotters securing the slotted nuts of the eight bolts holding the crown wheel to the differential case. Remove the nut and drive out the bolts with a soft brass drift. The crown wheel can now be removed from its register on the case and the case parted.

The two differential gears with their four differential pinions and differential spiders can now be withdrawn.

Assembly of the Crown Wheel and Pinion.

Note.—The bearings of both crown wheel and pinion are pre-loaded. It is part of the assembly process to subject the bearings to the pre-determined load, and it is, therefore, very important that each operation of assembly is carried out carefully and as described.

Assembly of the Pinion to the Carrier.

Note.—Pinion bearings are supplied in pre-selected sets consisting of the large and small bearings "H" and "J" and distance-piece "G". They are manufactured to special limits and must only be used in the complete sets. These sets should assemble into any axle and give the correct amount of pre-loading. We set out below the method of checking the correctness of the assembly.

If replacement pinion bearings are to be fitted, remove with a smooth file any burrs or abrasions on the shoulders machined in the carrier and against which the races bear. Any condition which will prevent the bearings fitting flush against the shoulders will make it impossible to obtain the correct pre-loading of the bearings and also give incorrect engagement of the crown wheel and pinion.

Press the outer races of the pinion shaft bearings into the carrier, the larger race from the crown wheel side of the carrier and the smaller race from the driving flange end.

Press on to the pinion shaft the inner race of the large taper bearing complete with rollers. Make sure it goes tight home against the shoulder on the pinion. Place the distance-piece on the pinion shaft and place the shaft in position in the carrier. Place the inner race complete with the rollers of the smaller bearing on the pinion shaft and press the assembly together.

Fit the driving flange, the washer and nut to the threaded end of the pinion, and tighten the nut securely. To enable this nut to be tightened, bolt a suitable bar across the driving flange.

Note.—The oil seal is not fitted at this stage.

Check the pre-load which should be 5 to 6 lb. ins.

If the pre-load is correct, remove the nut, washer and driving flange. Press the oil seal into the bore machined on the forward end of the carrier, with the knife edge of the central leather portion towards the bearing. Replace the driving flange, washer and nut. Tighten the nut securely and lock with the cotter pin.

Check the distance between the end face of the pinion—now in the carrier—and the centre line of the differential bearings. Do this by means of a mandrel 2.844 in diameter fitted in place of the differential assembly. Its distance from the pinion, measured with slip gauges, should be within the limits .8895 and .8935 as at "F". Should it not be so, the end faces of the races are not home against the shoulders on the pinion and carrier. Remove the pinion shaft and repeat the operations above.

Setting of the Pre-loaded Bearings.

Each pair of pinion shaft roller bearings "H" and "J" are fitted into a master carrier at the factory, and by the selection of a suitable distance-piece "G" the correct pre-loading of 5 to 6 lb. ins. is obtained. The distance-pieces are made in lengths which vary in increments of .001 between the dimensions 1.770 to 1.790; these bearings and distance-pieces are then boxed in sets for replacement use.

Assembly of the Differential Case and Crown Wheel.

Remove with a smooth file any burrs or abrasions on the joint faces of the halves of the differential case, and also any on the register for the crown wheel.

Smear the shafts of the differential gears with a small quantity of oil, and insert a gear into each half of the case.

Thread onto the differential pinion spider, also lightly lubricated, the four differential pinions with their teeth facing inwards.

Insert the spider assembly into that half of the case to which is attached the crown wheel and with the pinions engaging the gears correctly.

Place the two halves of the case together with their identification marks corresponding, and engage the crown wheel with the register machined on the case to take it. When doing so, see that there is no dirt, burrs or foreign matter between the faces of the wheel and case, as any dirt or foreign matter will throw the wheel out of truth.

Bolt together the crown wheel and both halves of the case, and make sure that the differential assembly rotates freely, then lock the slotted nuts with the cotter pins.

Mount the Timken roller bearings on the spigots of the case, with the smaller diameter of the inner ring facing outwards from the case. Mount the crown wheel and case assembly temporarily in the carrier. Check with the aid of a dial gauge the crown wheel for true running, both laterally and diametrically. The permissible error is ±.003. Should the wheel fail to run true within this margin of error, dismantle the case, repeat the foregoing assembly instructions and check again.

Assembly of the Crown Wheel and Case Assembly to the Carrier.

Place the crown wheel assembly in position in the carrier with a considerable amount of backlash between the teeth. Fit the differential bearing cap bolts in position, the caps according to marks, and tighten down fully with the bolts and spring washers.

Measure the distance between the flats machined on the bearing caps with a 5 to 6 micrometer. Using the spanner T.115 tighten the differential adjusting nuts until the caps are loaded so that this distance is increased by .006. This increase ensures a preload of 5 lb. ins. on the differential bearings.

Mark the relative positions of each adjusting nut and its cap. Draw the crown wheel closer in mesh with the pinion by releasing and tightening the adjusting nuts by equal amounts. The correct backlash is from .006 to .008. This is checked by placing the pointer of a dial gauge on the teeth and oscillating the crown wheel.

Confirm that the measurement between the machined flats on the differential bearing caps has not varied from that taken when the adjusting nuts were tight.

Place the differential adjusting nut lock plates in position and secure with the bolts and spring washers. Make sure that all the bolts are tight and cotter pinned.

Make sure that the prongs of the lock plates are in proper engagement with the differential adjusting nuts.

To Complete the Assembly of the Axle.

Clean the joint faces of the axle housing and the differential carrier.

Check that the bolts in the housing which secure the carrier are firmly screwed down onto their spring washers. Also check that the nuts will screw onto the bolts readily. These two points are important, as attention to them at this stage will avoid difficulty later.

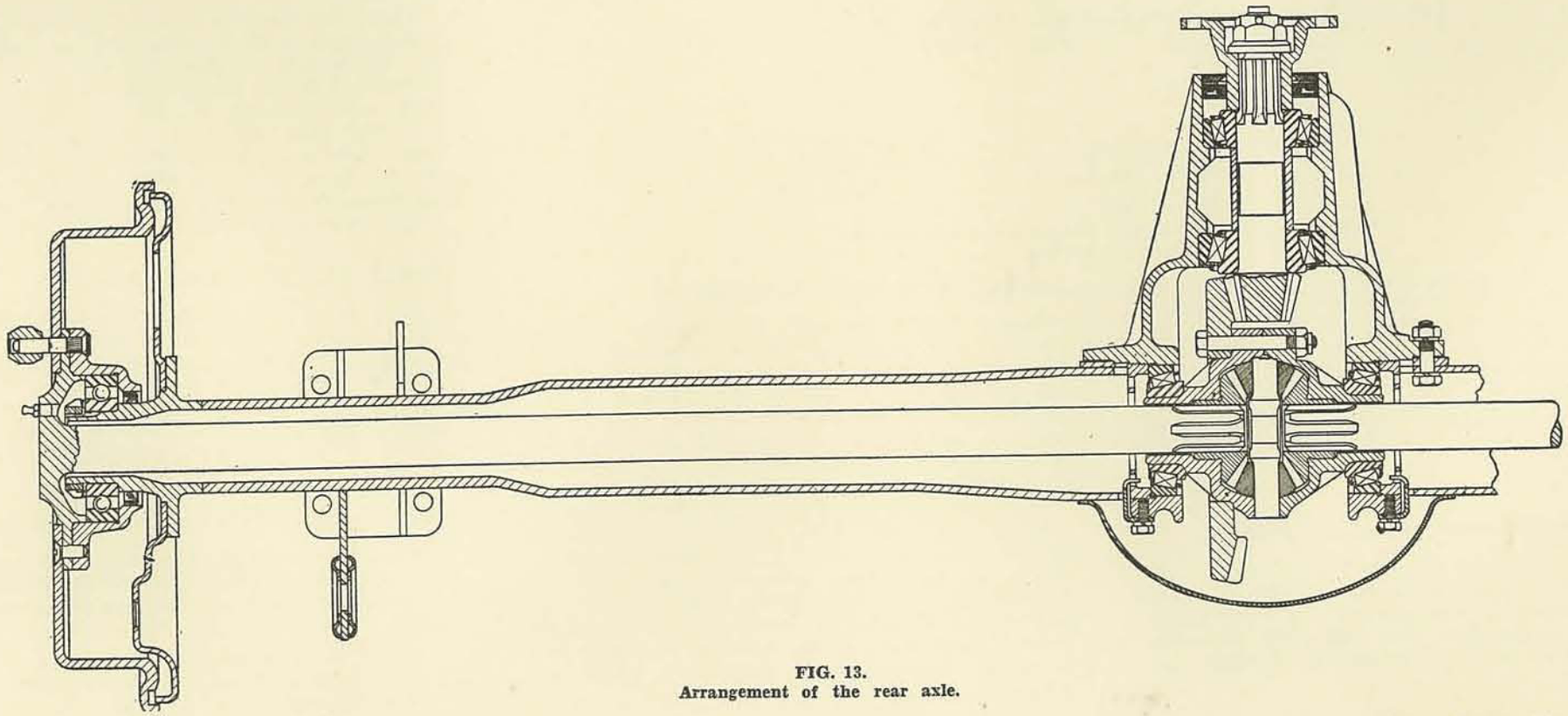


FIG. 13.
Arrangement of the rear axle.

Fit a new gasket between the axle casing and the differential carrier. When placing the differential assembly into the axle housing, avoid damaging the threads of the securing bolts. Use a spring washer under each securing nut.

Clean the joint faces of the axle drive shaft flanges and bearing housings. Use a new gasket for each shaft, and assemble the brake drums, securing each to its hub with the three countersunk-headed screws.

Reset the brake shoe adjustment.

Couple up the propellor shaft yoke flange with that on the pinion shaft and make sure that the marks made when dismantling correspond.

Check that all nuts are securely tightened and cotter pinned.

Fill the axle with the recommended oil to the correct level.

Removal and Replacement of the Axle.

Most of the necessary repairs can be carried out with the rear axle in position in the vehicle, but if its removal from the vehicle is required, proceed as follows:—

Lift the rear of the car with a hoist and remove the wheels.

Remove the right hand side brake drum and rear axle drive shaft as detailed.

Drain the oil from the rear axle.

Disconnect the propellor shaft from the rear axle driving flange.

Release the rubber Lockheed brake hose from its bracket on the right hand side of the chassis.

Release the rubber Jackall hose from its bracket on the left hand side of the chassis.

Remove the two nuts securing the hydraulic damper links to the spring brackets and release the links.

Take out the two bolts securing each axle check strap to the chassis.

Remove the bolt, nut and spring washer securing the right hand and left hand brake cable clips to their brackets on the chassis.

Unscrew the two hand brake adjuster nuts, springs and washers (inside the car).

Remove the two bolts securing the twin hand brake cable abutment bracket to the propellor shaft tunnel from underneath the car.

Bend back the tab washer locking the bearing on the right hand side hub.

Undo the bearing nut and withdraw the bearing housing complete with bearing.

Disconnect the brake pipe from the back of the wheel cylinder by removing the set bolt securing the banjo union on the right hand side back plate only.

Remove the four bolts securing the back plate to the rear axle flange and withdraw the back plate complete.

Remove the bolts securing the lateral control link to its bracket on the right hand side of the chassis.

Remove the eight nuts and locknuts of the spring "U" clips.

Withdraw the spring "U" clips from the axle.

Tilt the axle to allow the hydraulic jacks to clear the road springs and chassis and withdraw the rear axle through the left hand side wheel arch.

Replacement is carried out in the reverse manner to that detailed for removal.

THE COOLING SYSTEM

Removal and Replacement of the Radiator.

Drain the radiator.

Remove the bonnet by detaching the clip at the rear.

Take off both headlamps and pull the wiring through the bracket and disconnect the left hand lamp bracket from the wing.

Undo the pinch bolt and slide the bracket over the tube.

Remove the right hand pinch bolt and pull the tube out of the right hand lamp bracket.

Disconnect the stay-rods to the radiator.

Slacken off the clips on the top and bottom water hoses.

Remove, from under the chassis front cross-member, the four nuts (two locking) which secure the radiator on its mounting.

The radiator is now clear of all its attachments and can be lifted clear of the car.

Replacement of the radiator is carried out in the reverse manner to that detailed for removal.

Important.—Do not invert the radiator or lay it flat on the ground, as this will cause any accumulated sediment in the bottom tank to pass into the cooling spaces.

THE WATER PUMP

To Dismantle and Reassemble.

Remove the fan blades and the fan belt.

Remove the pump unit by breaking the joint between the impellor housing flange and the cylinder block, after removing the set bolts.

Dismantle by removing the pump impellor from the shaft, tapping out the taper pin attaching it to the shaft.

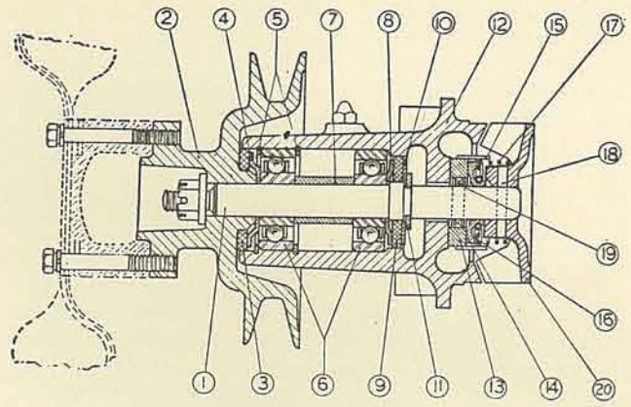


FIG. 14.
Sectional view of the water pump.

Withdraw the pressure spring and washer, which gives access to the carbon seal and gland washer assembly. Care should be taken not to damage the carbon ring, which is relatively brittle. The driving pin for the carbon gland is loose in the shaft.

The pump spindle is carried on two ball races, which should give no trouble unless they have been neglected. Access to the races is obtained by releasing the impellor and gland as described above, removing the drive pin for the gland, removing the attachment nut in the centre of the drive pulley, withdrawing the pulley, pulley key, felt sealing ring and retainer. Remove the outer bearing circlip with a pair of long-nosed pliers.

Pour a little kerosene or petrol into the impellor body around the outer bearing and tap the inner end of the spindle on a piece of wood until the outer bearing can be withdrawn. This will release the distance-piece between the bearings, which can be withdrawn, giving access to the inner face.

Remove the inner circlip, contracting the ring and inserting a screwdriver behind it to ease it out of its groove. After removal of the circlip the remaining bearing and the impellor spindle can be withdrawn.

If the felt oil sealing rings are badly worn or the bearings unduly slack, they should be renewed. Carefully examine the carbon sealing rings for cracks or undue wear and renew if necessary. The face of the brass sealing washer should be examined for flatness and all edges should be freed from burrs as this may damage the synthetic rubber seal. Fit a new seal if damaged.

Reassembly is carried out in the reverse manner to that detailed for removal, taking care that the flange jointing washer is in good condition.

The space between the two races should be partially filled with grease and the felt washers liberally soaked in engine oil or grease before replacement. The slotted nut retaining the pulley should not be over-tightened; as long as it is just firm it will be satisfactory.

HYDRAULIC BRAKING SYSTEM

Adjustment of the Brake Pedal.

The correct amount of free movement between the push-rod and the piston is set during erection of the vehicle and should not be altered. In the event of the adjustment having been disturbed, adjust the length of rod connecting the cylinder to the pedal until the pedal pad can be depressed approximately ½ before the piston commences to move. The clearance can be felt if the pedal is depressed by hand.

Removal of the Master Cylinder.

Put the car on a "High Lift" jack or over a pit. If this is not possible, remove the driver's seat and front floorboard.

Remove the side cover from the brake pedal chassis box and uncouple the pipe from the master cylinder.

Remove the cotter pin securing the push-rod to the brake pedal and then detach the cylinder from its mounting by removing the securing bolts, nuts and spring washers.

Withdraw the unit and drain the master cylinder supply tank by removing the filler plug "L".

Replacement of the Master Cylinder.

Replace the master cylinder on its mounting bracket on the frame, refit the securing bolts, spring washers and nuts and tighten.

Replace the pin securing the push-rod to the pedal and fit the cotter pin.

Check adjustment of the push-rod as described above and connect the fluid pipes and bleed the system.

Check the system for leaks with the brakes fully applied.

Refit the side cover on the pedal box and replace the floorboard and seat.

Hand Brake Adjustment.

Jack up the rear axle until both wheels are clear of the ground. The hydraulic jacks should be used for this purpose.

Set the hand brake lever to the "off" position and see that the two wheels rotate quite freely.

Note.—A slight resistance will be felt from the differential mechanism when turning the wheels by hand.

Apply the hand brake until the pawl engages with the second notch on the ratchet, and adjust each cable until it is possible to rotate each wheel by hand under heavy pressure. Both wheels must offer equal resistance to get the full power of the brake.

Do not take up the adjustment too tightly or the rear brake-shoes may be held in contact with the drums continuously when the lever is in the "off" position. There should be clearance at least equal to one tooth on the ratchet before the brake-shoes make contact with the drums.

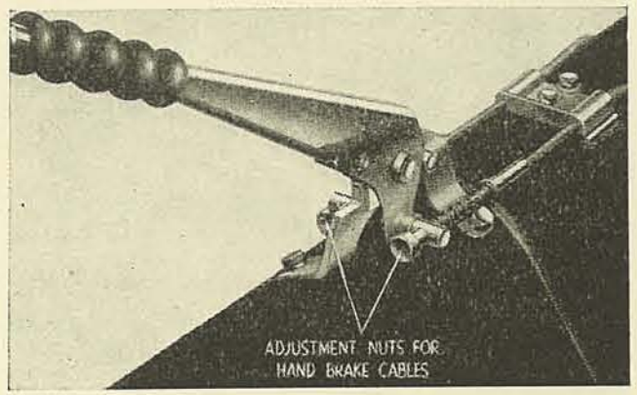


FIG. 15
Showing the hand brake adjustment.

THE CHASSIS

Removal and Replacement of the Steering Wheel.

Lift out the central control complete by removing the screw in the side of the steering wheel hub.

Disconnect the four terminals underneath the control.

Then undo the steering wheel nut and take off the steering wheel.

Replacement is carried out in the reverse manner to that detailed for removal.

Removal and Replacement of the Steering Column.

Remove the steering wheel central control as detailed.

Remove the adjuster clamp bolt and slide back the clamp. Shake out the key and the steering wheel and adjustment assembly can be drawn away.

Disconnect the four (slip-out) wiring connectors to the steering column slip-ring unit.

Remove the coupling bolts.

Note.—On early cars these are screwed into the lower coupling.

Take out the three bolts holding the plate and slide back the draught excluder.

Remove the column clamp bolt, open the clip and take out the distance-piece. Slide the clip and draught excluder over the top end of the steering column.

The steering column assembly can now be lifted up at the coupling end and brought out through the front.

Replacement of the steering column assembly is carried out in the reverse manner to that detailed for removal, except for points to watch, as below.

Note.—Do not forget to replace the earth spring between the couplings, or on later cars the earth wire between the coupling bolt and the column clip.

The rubber-bushed coupling allows for only a small amount of universal action and it is important that when tightening the coupling bolts the column be held in line with the gearbox pinion shaft, and bolts and rubbers tightened evenly. This can be seen by the rubber being displaced evenly on each side of the coupling and equally at each bolt. Also see that the column is in line when tightening the clamp.

When bolting up the column at the clamp it will be noticed that the outer tube can be moved a small amount up and down. This must be fixed at the correct position to ensure that the slip-rings are in line with the contact points in the slip-ring assembly. When the distance is ⅛ the clearance between the end of the inner ring and the felt retainer plate will be $\frac{1}{16}$, and the contacts will be in the centre of the clip-rings. On cars fitted with the later type slip-ring assembly the measurement should be $\frac{11}{16}$.

Dismantling and Re-assembly of the Steering Column Assembly.

Remove the steering column from the car and take out the slip-ring fixing screws.

Withdraw the centre mast downwards out of the column tube working out the felt bush.

Slide off the slip-ring.

Remove the circlips, and lift away the contact half-rings. These inner rings are driven by a key slot on the early type and by a dowel pin on the later type.

The trafficator horn wires are permanently fixed to the top half-ring; draw these out from the centre mast.

Reassembly of the steering column assembly is carried out in the reverse manner to that detailed for dismantling.

Removal and Replacement of the Steering Gearbox.

Disconnect the engine control link.

Remove the control link bracket from the frame.

Remove the coupling bolts.

Unlock the steering tie-rod nuts, right-hand and left-hand, and unscrew the tie-rods out of the steering ball joints by means of the flats on the rods.

Disconnect the wiring clips along the steering box and remove the electric horn.

Detach the four bolts bolting the steering gearbox to the front cross-member.

Now rotate the pinion shaft, pushing the rack over to the extreme left.

Take hold of the pinion shaft coupling flange, lift upwards and work the gearbox over to the left, the pinion shaft going between the front of the engine and the radiator. The right-hand steering tie-rod will now be clear of the hole in the right-hand chassis extension. Now lower the gearbox down on the right-hand side and withdraw the tie-rod from the hole in the left-hand chassis front extension.

Replacement is carried out in the reverse manner to that detailed for removal.

Note.—When replacing, re-track the steering and adjust the engine control link.

Dismantling and Reassembling the Steering Gearbox.

Undo the clips and remove the rubber dust excluders.

Unscrew the rack damper pad. The damper spring and the pressure pad can then be lifted away. A number of shims will be found under the cap.

Remove the pinion shaft tail bearing cap bolts and the tail bearing.

Undo the coupling nut and slide off the coupling.

Take off the circlip against which the coupling locates.

Next. withdraw the pinion, holding the gear with the pinion upwards and leaving behind the thrust washer. This thrust washer is trapped behind the rack teeth.

Hold the rack bar in suitable clamps in a vice, knock back the lock washers and undo the ball joint caps with the spanner tool No. T.114. The ball seat and shims should drop out.

Screw out the ball seat housing with a special peg spanner, tool T.113.

Note.—Should the ball joint caps come away complete with the ball seat housing it will be necessary to dismantle them with the use of tool T.122.

Remove the rack damper and shims and withdraw the rack bar from the housing.

Fractures in the teeth, hollows or any roughness on the surfaces of the teeth will render the parts unserviceable.

Check the rack bar and pinion shaft in the housing for wear or scoring.

The diameter of the rack bar is 1.121 to 1.120 and the bore of the housing 1.124 to 1.126.

The pinion shaft is .748 to .7485 diameter at the top and .624 to .6235 at the bottom. The bore of the housing is .7505 to .750 and the bore of the cap .6255 to .626. If a new cap is fitted this will be found to be supplied with an undersize bore and will need reaming in line with the housing with reamer tool T.112. Make sure that the oil groove is fitted to the top when reaming.

Check the felt washer and the rubber bellows and renew if necessary.

Examine the steering rod ball ends and caps for wear and renew as necessary or readjust as detailed later.

Note.—Replacement is carried out in the reverse manner to that detailed for removal.

When replacing the pinion shaft see that the thrust washers have their chamfered sides towards the pinion; adjust for end-float of .002 to .005 by means of the shims.

There is only one way for the cap, the oilway should be at the top.

Adjust the rack damper pad as detailed later.

Engage the pinion when the arrow is uppermost with the rack in the central position.

Refit the coupling with a coupling bolt in line with the arrow on the shaft. This will ensure that the steering wheel spokes are in the correct position for best vision.

Oil all parts before reassembling and refill the box with $\frac{3}{4}$ pint of lubricant.

Adjustment of the Inner Steering Ball Joint.

Fit the lock plate and screw home the ball seat housing in the rack bar.

Insert the shims and the ball seat.

Screw home against its shoulder the ball cap, first inserting the ball-ended tie-rod. The ball should have no play, but must be a free rolling fit. Adjustment can be altered by varying the shims which are supplied in thicknesses of .003 and .005.

Adjustment of the Rack Damper.

Check if necessary, the damper spring. It should have a free length of approximately 1.024, $\frac{7}{16}$ diameter (outside), 8.6 coils of square wire .08 square, and should give a load of 80 lb. when compressed to $\frac{3}{4}$.

When the steering gearbox is completely assembled, fit the cap, spring and plunger but omit the shims. Screw down the cap until the plunger bottoms. While screwing down the plunger rotate the pinion shaft. When it is felt to just lock the rack bar in the housing the plunger has bottomed. Take a measurement with feeler gauges of the gap between the plunger and add to this measurement .051.

Select shims to this total amount and insert under the cap. This gives the standard pre-load. If, when checked on the road, this is found to be too slack or too tight, it is permissible to decrease the added measurement of .051 to .030 or increase to .070.

Steering Arm Ball Joints.

If it is found necessary, through slackness, to renew the ball joints, the complete assembly must be changed, as no adjustment is provided. The dirt excluders may, however, be renewed separately.

Removing the Front Suspension.

Jack up the front of the car until the front tyres are just clear of the ground.

Remove the front wheels.

Place two additional jacks under the spring pans.

Jack these up, taking some of the weight, until the hydraulic damper levers are clear of the rebound rubbers.

Disconnect the hydraulic brake hoses.

Next, slacken the steering tie-rods and screw the tie-rods out of the steering ball joints by means of the flats on the rods.

Remove the cotters and nuts from the two outer fulcrum bolts. Draw out the bolts and take away the front hub units complete.

Release the jacks from under the spring pans.

Press down the lower wishbone assemblies and remove the coil springs.

Remove the four bolts holding the spring pan to the levers.

Remove the cotters, nuts and washers from the ends of the inner lower fulcrum pin, and slide off the levers and the rubber bushes.

Remove the bolts holding the lower fulcrum pins to the chassis cross-member.

Remove the bolts holding the hydraulic dampers to the top of the chassis cross-member. (The inner bolts are threaded into the cross-member and the outer bolts have their heads located inside the cross-member).

Inside the outer ends of the front cross-member will be found coil spring locating spigot plates.

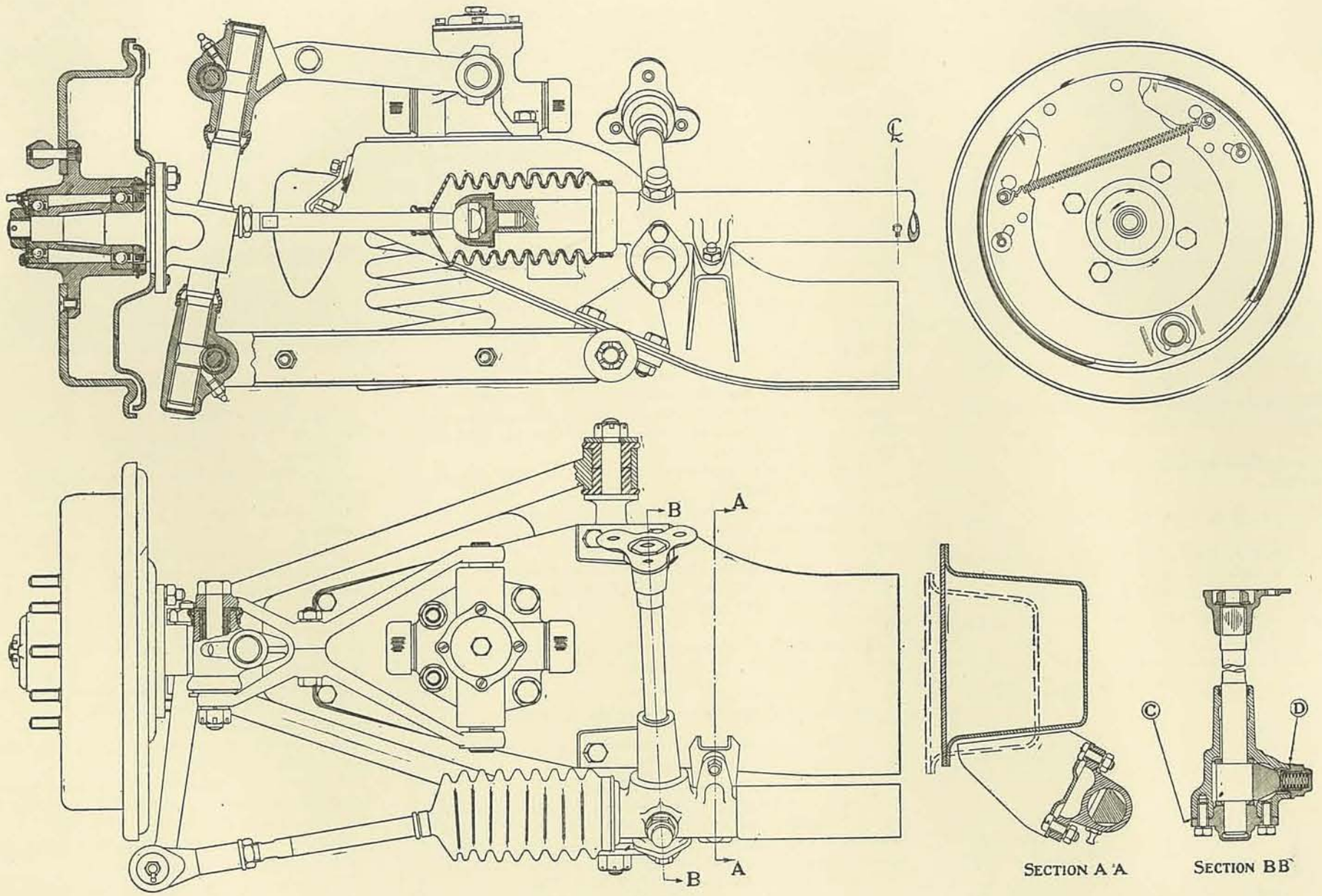


FIG. 16.
Sectional view of the front suspension.

These are each attached by one small bolt and the outer damper bolts also pass through them.

Replacing the Front Suspension.

Bolt up the coil spring top locating plates inside the front cross-member.

Bolt on the hydraulic dampers, with the heads of the outer bolts inside the spring locating plate.

The dampers are interchangeable from side to side.

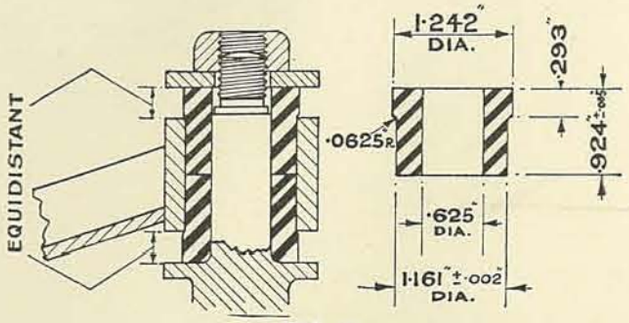


FIG. 17.
Correct method of clamping the rubber bushes.

Note.—The two long outer bolts each have a long flat on one side of the head. This flat locates against the flange of the spring locating spigot plate and prevents the bolt from turning.

Bolt up the lower fulcrum pivot pins. The two rear inner bolts have their nuts uppermost and the six other bolts have their nuts below.

Fit the rubber bushes into the lower levers. These bushes will be found to be quite a loose fit in the lever, but when clamped up by the nut and washer, will expand into their housings. These bushes do not rotate on their surfaces, the angular movement being taken up by torsional deflection of the rubber.

Special care should be taken when assembling these bushes to maintain a central location, so that the expansion of each half of the bush is equal.

To attain this, insert each bush so that it protrudes equally each side of the housing, and then clamp up with the washer and nut and fit the cotter pins. When central, the outer flanges of the bushes should all be of equal proportions.

Although not essential, it is advisable to clamp up the bushes when the suspension levers are set parallel with the ground.

Fit the spring pans between the levers, but with the heads of the bolts inside the spring pan.

Do not tighten up the spring pan bolts solid, but leave them half a turn slack.

Press down the lower wishbone assemblies.

Smear each end of the coil springs with grease.

Push the coil springs up into the cross-member and over the locating plates.

Jack up the lower wishbone assemblies until they are approximately parallel to the ground.

Assemble the hub units and king-pins.

Note.—The stub axle and nut is right hand thread for the right hand side and left hand thread for the left hand side.

The king pin bearing threads are also right hand thread for the right hand side and left hand thread for the left hand side.

Fit the front hub units to the suspension levers with the bolts.

Ensure that the thrust washers, rubber seals, and retainers are assembled in the right order.

Lubricate these parts and the fulcrum distance tube "E" during the assembly and again afterwards with the grease gun.

Do not tighten up the top or the bottom slotted nuts solid, but leave them half a turn slack.

Connect up the hydraulic brake hoses.

Screw the steering tie-rods into the outer steering ball joints. Screw the rods right in and then slack off five complete turns. This will give a rough wheel alignment and render subsequent accurate alignment easier.

Bleed and adjust the front brakes.

Fit the front wheels.

Lower all jacks.

Bounce the front end of the car up and down a few times. This allows the suspension fulcrums to assume the most free position.

Now tighten the spring pan bolts and then tighten and cotter up the outer fulcrum bolts.

Check and adjust the front wheel alignment.

Dismantling and Assembling the Front Hub Units.

Turn back the brake adjusters so that the brake-shoes are well clear of the drums.

Remove the set screws fixing the brake-drums to the front hubs and take away the drums.

Remove the cotters and nuts from the stub axles. The nut is right hand thread for the right hand side of the car and left hand thread for the left hand side.

Remove the grease retainer plate and felt washer.

Pull off the front hubs with the hub drawer, tool, T.119.

Note.—The front hubs each have two ball races which take the journal or car load, but these are arranged so that the thrust or side load is taken in both directions on the large inner bearing "C" only. Consequently, there is no need for any adjustment of the relative positions of the two bearings.

Remove the wire circlip and the locking ring.

This will unscrew complete with the oil seal, which is pressed inside. The ring is left hand thread for the left hand side of the car and right hand thread for the right hand side.

With a bar, tap or press out the small outer ball bearing and distance-piece, driving from the inside through the large bearing.

Press out the large bearing.

Remove the fixing bolts and draw off the brake back plates. These are each attached with three bolts and nuts and one screw, threaded into the stub axle flange. This screw is fitted adjacent to the steering arm.

Dismantle the hydraulic cylinders and brake-shoes.

Screw off the top and bottom swivel links from the king-pins.

Remove the steering arm nuts and press out the arms from the stub axles. These are a taper fit with a Woodruff key.

Remove the steering ball joints from the steering arms.

Press out the king-pins.

Assembling.

Press the king-pins into the stub axles (these should be a light press fit).

Note.—The stub axle and nut are right hand thread for the right hand side of the car and left hand thread for the left hand side of the car. The king-pin bearing threads are also right hand thread for the right hand side of the car and left hand thread for the left hand side of the car.

Fit the steering arms and the ball joints.

Oil the king-pin threaded bearings and screw on the swivel links complete with their rubber oil seals, so that the bores of the bushes are exactly central with the grooves in the king-pin. Locate the lower one in the correct assembly position as it cannot be turned once the brake back plate is fitted.

Assemble the brake components to the back plates.

Bolt on the brake back plate very tightly. The brake back plate assembly is interchangeable from the right hand side to the left hand side of the car, with the exception that the bolts holding the master cylinder are interchanged to bring the brake hose elbow in the correct position for the appropriate side.

Assemble the bearings in the front hubs.

Press in the large bearings and screw in the lock-rings.

Now fit the wire locking circlip. The locating hole should come in the same place if the old ring and bearings are used, but if it does not, or new

parts are fitted, drill through the hole in the hub a new hole 7/64 diameter x ⅛ deep into the locking ring. If this is done before the oil seal is fitted, the hole may be drilled right through the locking ring.

Pack the hubs with grease, fit the distance-pieces and press in the outer bearings.

Fit the distance washers to the stub axles, the chamfered side against the stub axle radius.

Fit the hubs to the stub axles, fit the felt washers and the grease retainer plates; tighten the stub axle nuts firmly and cotter up.

Note.—The hub with the left hand threaded ring must be fitted to the stub axle and the king-pin with the left hand threads. This is then fitted to the left hand side of the car.

Fit the brake-drums to the hubs.

Assemble the fulcrum pin distance tube, thrust washers, seals, and retainers. It is important to lubricate these parts well before assembly. The hub units are now complete.

LATERAL CONTROL LINK

The rear of the car should be sufficiently weighted to bring the lateral control link parallel with the surface on which the car is standing.

Grip the adjuster nut and slack off the locknuts.

Grip the fixing bolt and slacken off the adjuster nut.

Slacken off the control link tube from the fixing bolt.

Set the adjuster nut until the dimension of $1\frac{7}{8}$ between the outer faces of the control link cups is obtained, being equally disposed $\frac{15}{16}$ each side of the bracket.

Screw up the control link tube tightly to the adjuster nut and its spring washer.

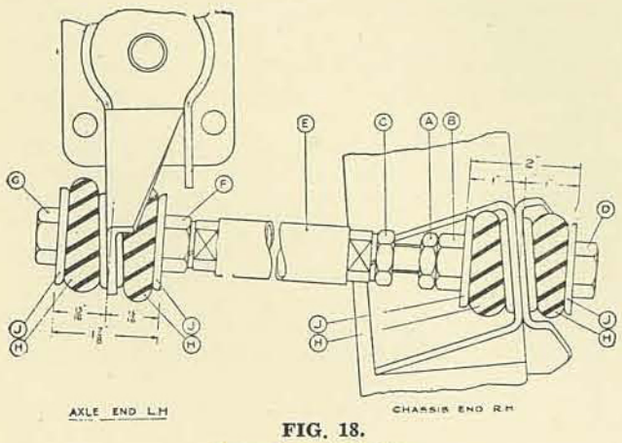


FIG. 18.
Lateral control link.

Grip the fixing bolt and tighten until the dimension of 1.00 is obtained between the outer face of the control link cup and the centre of the bracket.

Grip the control link tube and tighten up locknut.

Adjust the adjuster nut until the required dimension of 2.00 is obtained between the faces of the link cups, and securely tighten the locknut.

ENGINE CONTROL LINK

Fit the inner adjusting rod with its rubbers, cups, flat washer, and slotted nut. The slotted nut should be tightened only sufficient to allow the split pin to enter.

Fit the outer adjusting rod, complete with the adjuster locknuts and the inner rubber and its cup. Do not fit the outer rubber and cup at this stage.

Leave the adjuster shortened and the inner rubber clear of the face of the frame bracket.

Rock the engine until it assumes a natural poise on its mounting rubbers.

To ensure that the engine is quite free on its mountings, it is advisable to disconnect the exhaust system at the manifold and the gearbox bracket clip, and when the control link adjustment is set, to refit the exhaust system.

If, when only slightly rocking the engine, a knock is heard, this should be located and cleared.

Lengthen the adjuster until the inner rubber comes firmly against the frame bracket face, taking care to do this without disturbing the position of the engine.

Fit the outer rubber, cup, washer and slotted nut. Tighten the nut only sufficiently to allow the split pin to enter.

Note.—The engine control link is only to control engine movement and must not support the weight of the engine. It is most important that the control link is adjusted as explained, as this will ensure the minimum engine vibration.

ELECTRICAL EQUIPMENT

Trafficator Switch.

The steering column control which is fitted in the hub of the steering wheel incorporates a horn push and a trafficator switch.

The trafficator switch is operated by a moulded ring which is moved to either the right or the left. The action of switching on the trafficator brings into operation a clockwork timing mechanism which holds the trafficator in the "on" position for a period long enough for the driver to turn a corner or overtake. After this the trafficator is automatically switched off and the switch ring returned to its original position.

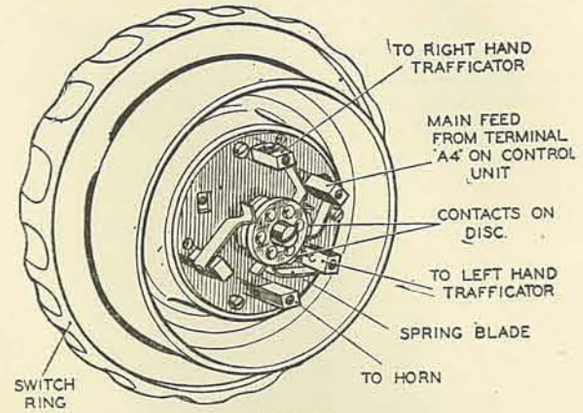


FIG. 19.
The trafficator switch.

Operation of the Timing Mechanism.

The moulded operating ring of the trafficator switch is carried on three spokes, at the centre of which is a boss. The boss has a hexagon-shaped recess which fits over the spindle of the timing control mechanism, being secured to it by means of a screw.

At the bottom of the switch is the contactor mechanism which completes the circuit to the trafficator by which the switch ring is moved to the appropriate position. This consists essentially of three spring contact blades, each secured at one end to a terminal post, the free end bearing on the

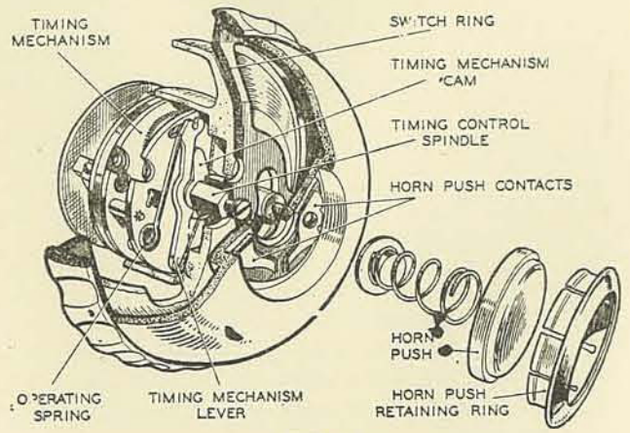


FIG. 20.
Exploded view of the trafficator switch and horn push.

edge of the disc attached to the switch spindle. This disc is provided with metal contacts through which the circuit to the trafficators can be completed.

Attached to the spindle and fitted just below the boss on the switch ring is a cam which is arranged so that when the switch ring is turned to the left or right it moves a lever against the tension of the operating spring, thereby setting the timing mechanism in motion.

When the switch ring is released, the tension on the operating spring is relieved and the lever caused to return to its original position, the rate of return being controlled by means of a train of gears. The movement also returns the spindle and hence the switch ring to the "off" position.

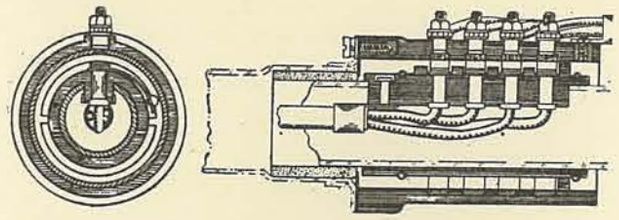


FIG. 21.

Sectional view of the steering column slip-ring unit.

Steering Column Slip-ring Unit.

As there is no outlet at the bottom of the steering gearbox for the cables from the trafficator switch and horn push, a slip-ring unit is incorporated and fitted near the base of the steering column.

The cables are taken down the centre of the steering column and are connected to four spring contacts in a moulded ring clamped around the inner sleeve of the steering column by means of jump rings.

Another moulding, which is secured by means of three screws to a bracket on the outer sleeve, fits over these contacts. This moulding is fitted with four slip-rings and terminals for connecting cables to the appropriate accessories.