AUSTIN TEN

SALOON AND VAN SERIES G.S.I. & G.V.I.

SERVICE MANUAL

THE AUSTIN MOTOR CO. LTD., LONGBRIDGE, BIRMINGHAM, ENGLAND

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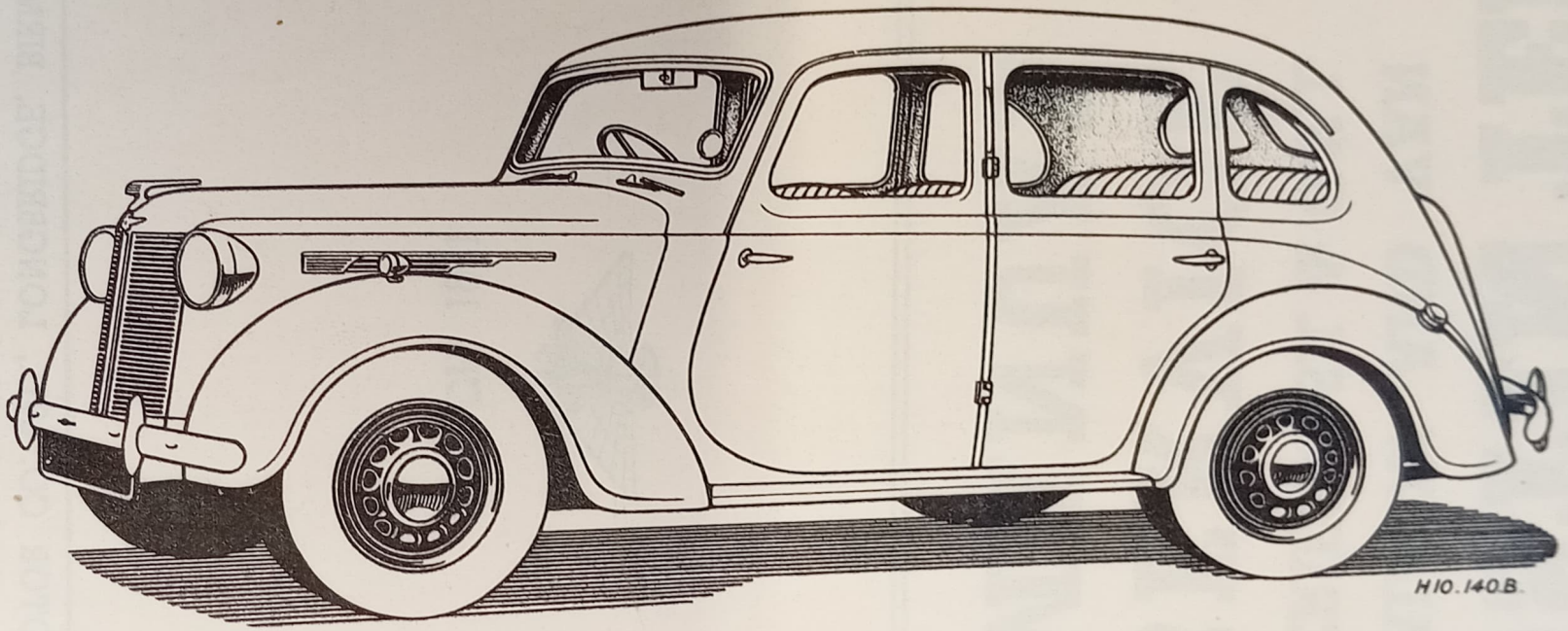
THE AUSTIN TEN SALOON



This model was introduced in May 1939 and remained in production until 1941, from which date all private car production ceased for the duration of the war. Production was resumed in October 1944 with various improvements in general specification, including sound insulation, redesigned steering, new transmission and improved engine details, including lubrication and timing chain silencer.

GENERAL INDEX

CHASSIS SPECIFICATION

AND GENERAL DATA

ENGINE

Type. Four cylinders, water cooled with detachable head. Side valves and three-bearing counterbalanced crankshaft.

Dimensions

Car. Bore 2.4995 in. (63.5 mm.); Stroke 3.5 in. (89 mm.); Cubic Capacity 68.7 cu. in. (1,125 c.c.); R.A.C. Rating 9.996 h.p.; Oil Sump Capacity 7 pints.

Van. Bore 2.620 in. (66.65 mm.); Stroke 3.5 in. (89 mm.); Cubic Capacity 75.48 cu. in. (1,237 c.c.); R.A.C. Rating 10.98 h.p.; Oil Sump Capacity 7 pints.

PISTONS

Of special low expansion aluminium alloy, with scraper ring groove drilled for oil return, and with an anodised surface to maintain efficient lubrication.

LUBRICATION

Pressure gear pump forces oil to all main, big-end, and camshaft bearings. Each main bearing oil feed is supplied from a circular channel cut in the bearing housing, which provides a uniform feed of oil between the bearing surfaces. Big-end bearing lubrication is improved by an additional oil feed in the crankshaft. An increased flow of oil from the camshaft front bearing on to the timing chain is guided by deflectors fitted to the camshaft gear. Readily accessible engine oil filler and dipper rod.

TIMING CHAIN

Duplex roller. Quiet operation ensured by a patented tensioner ring of synthetic rubber fitted to the camshaft chain sprocket.

VALVES

Exhaust valves made of X.B. steel. Shrouded guides protect the exhaust valve stems from excessive heat.

MOUNTINGS

Flexible engine mountings designed to permit smooth top gear running down to lowest speeds.

COOLING

Thermo-syphon water circulation. Radiator incorporates expansion chamber to obviate overflow while running. Capacity of system 20 pints.

FUEL SYSTEM

Rear petrol tank, with electric gauge on instrument panel. Tank capacity 6 gallons. An A.C. petrol pump delivers the fuel from the tank to the Zenith carburetter, fitted with air cleaner and intake silencer on car.

CLUTCH

A flexible single-plate Borg and Beck clutch is employed, giving smooth power take-up, with a light pedal action.

GEARBOX

Four speeds forward and one reverse. Synchromesh engagement for 2nd, 3rd and top gears. Oil capacity $1\frac{7}{8}$ pints. Overall gear ratios :—

Car : 5.43, 8.31, 13.22, and 21.82 to 1. Reverse 28.1.

Van : 6.143, 9.4, 14.95 and 24.7 to 1. Reverse 31.7.

TRANSMISSION

By open propeller shaft and Hardy-Spicer needle-roller-bearing universals with lubrication nipples to each joint and sliding splines.

REAR AXLE

The rear axle is of the spiral bevel three-quarter floating type, and of "banjo" construction, with splined detachable axle shafts. The pinion is carried in taper roller bearings. Oil capacity $2\frac{3}{4}$ pints.

SUSPENSION

Semi-elliptic springs all round, with long and wide spring leaves underslung at rear. There are double acting piston-type pressure recuperation hydraulic shock absorbers front and rear. All road springs are almost flat under load, giving maximum stability; they are anchored with silentbloc bushes, and are shackled on adjustable hardened steel pins with lubricating nipples.

STEERING

Variable ratio Cam gear steering giving 10 to 1 ratio in the straight ahead position, and 14 to 1 ratio for easy manoeuvrability on full lock. The steering box is mounted well forward and gives a comfortable angle for driving.

There are patent adjustable steering connections.

ELECTRICAL

12-volt Battery Fitted under bonnet forward of bulkhead. Separate side- and head-lamps with combined stop- and tail-lamp. Fan ventilated dynamo with compensated voltage control. Coil ignition with automatic advance and retard, and vacuum assisted control.

BRAKES

The Girling roller and wedge brakes are light in application, but smooth, progressive and powerful. There is individual adjustment at each wheel. Both foot- and hand-brake controls operate on all four wheels.

WHEELS AND TYRES

Pressed steel easy-clean wheels with 5.00-16 tyres on the car and 5.00-17 tyres on the van. Spare wheel with tyre carried in compartment at rear.

FRAME.

The special chassis and floor is a complete welded unit, and the body sill is bolted to the frame at numerous points, forming a box section. The front portion of the frame and the cross members are completely boxed and diagonally braced. The floor is heavily sprayed for weather protection and sound-proofing.

CAR FEATURES

Wide doors; full range of instruments; barrel type ignition lock; battery under bonnet; safety glass to all windows, with winding windows in all doors and wide opening front screen; foot-controlled dipper switch for headlamps; combined stop- and tail-lamp; roof lamp; driver-controlled rear blind; rear luggage compartment; all car body panels are sound insulated.

DIMENSIONS

	Car. ft.	Car. in.	Van. ft.	Van. in.
Length overall	13	2	13	2
Width overall	4	$10\frac{1}{2}$	5	4
Height overall	5	4	6	1
Wheelbase	7	$9\frac{3}{4}$	7	$9\frac{3}{4}$
Track, Front	3	11	4	$2\frac{1}{4}$
Track, Rear	4	0	4	$2\frac{1}{4}$
Ground Clearance at Silencer ...		$6\frac{1}{8}$		$6\frac{3}{4}$
Turning Circle	38	0	38	0

Weight : less petrol, plus oil, water, batteries, tools, spare wheel and tyre :—Car 18 cwts. 2 qrs. 14 lbs. Van 17 cwts. 3 qrs. 0 lbs.

Car luggage carrier capacity is 112 lbs. Van goods load is 10 cwt.

IDENTIFICATION NUMBER LOCATIONS

Engine Number on right-hand side of cylinder block—stamped.

Chassis Number on right-hand side of frame, under bonnet—stamped.

Vehicle Number on left-hand side of body, under bonnet—on plate.

REGULAR ATTENTIONS

THE following is a convenient list of regular attentions which the car or van should receive to keep it in good mechanical condition. These instructions should be closely followed.

The attentions under the daily and weekly headings are based on the assumption that the maximum mileage per week does not exceed 500. Under more arduous conditions, as for instance, very dusty or very muddy roads, long distances at high speeds or with heavy loads, it will be advisable to attend to chassis lubrication more frequently.

DAILY

Engine Check the level of oil in the sump and top up if necessary to the full mark on the dipstick. The oil filler and dipstick are on the right-hand side of the engine.

Radiator Check the level of water in the radiator and top up if necessary.

Fill to just below the top of the filler plug thread, when the engine is cold.

Fuel Tank Check the quantity of fuel in the tank. Add upper cylinder lubricant as necessary.

WEEKLY

Shackle Pins These are on the rear ends of all road springs and should be given a charge of oil once a week. There are eight nipples, the bottom nipple on each shackle being positioned on the inside on some models.

Swivel Axles Apply the oil gun to the two nipples on each swivel. This is best done when the car is partly jacked up, since the oil is then able to penetrate to the thrust side of the bearing.

Steering Connections Apply the oil gun to the steering cross tube nipples and the steering side rod nipples (one at each end).

Brakes and Controls Oil the handbrake joints, footbrake connections, and the carburetter engine control joints.

Wheels and Tyres Check the tightness of the wheel nuts and check tyre pressures, including the spare, using a tyre gauge, and inflate if necessary. See that all valves are fitted with valve caps, and inspect the tyres for injury. Remove any flints or nails from the treads and ensure that there is no oil or grease on the tyre, since these substances are harmful to rubber.

The recommended pressures are :—

	Tyre size	Front	Rear
Car ...	5.00-16 ...	24 ...	25 lbs. per sq. in.
Van ...	5.00-17 ...	24 ...	36 lbs. per sq. in.

A tyre that loses more than three to four pounds per square inch in a week should be suspected of puncture, but ensure that the valve is not leaking.

500 and 2,000 MILES

Engine On new and reconditioned engines the sump should be drained and refilled with new oil after the first 500 and 2,000 miles. With a new engine, at the same time as these changes are made, the cylinder head nuts should be tested and tightened if necessary.

After the first 500 miles it is advisable to have the valves ground in and tappets re-set to .012.

Gearbox and Rear Axle Also at 2,000 miles drain and refill the gearbox and rear axle on new vehicles. Always drain the oil after a run, since it will then flow more easily.

EVERY 2,000 MILES OR MONTHLY

Engine Drain the sump, refill with new oil.

Gearbox Check the oil level and top up if necessary. For access, lift the floor carpet and remove the rubber plug on the side of the gearbox covering. The filler plug is then accessible.

Remove the plug and fill up to the bottom of the plug hole. This is the correct level.

Rear Axle Check the oil level and replenish if necessary. A special oil is used and injected into the axle casing from the right-hand side, using the special adapter on the oil gun.

First remove the plug, then apply the end of the adapter to the oil hole, and push the barrel of the gun.

The plug also serves as an oil level indicator. Therefore, do not replace the plug at once, but give time for the superfluous oil to run out if too much lubricant has been injected. This is most important, because if the rear axle is overfilled the lubricant may leak through on to the brakes and render them ineffective.

Brakes Examine the brakes and adjust if necessary (see page N/1). Lubricate the brake balance levers on the front and rear axles, and the brake and clutch pedal levers.

Steering Column Lubricate the felt washer at the top of the steering column by adding a few drops of light machine oil through the oil hole in the steering wheel hub, close to the steering column.

Distributor Cam and Drive Shaft Bearings Lubricate the distributor cam shaft bearings by withdrawing the moulded rotating arm from the top of the distributor spindle and carefully adding a few drops of thin machine oil round the screw exposed to view. Take care to refit the arm correctly by pushing it on to the shaft as far as it will go.

A lubricator is provided for the drive shaft bearings, through which a few drops of thin machine oil should be added.

Battery Check that the electrolyte in the cells is just level with the top of the separators. If necessary add a few drops of distilled water. Never use tap water as it contains impurities detrimental to the battery.

Never leave the battery in a discharged condition. If the car is to be out of use for any length of time, have the battery charged about once a fortnight.

EVERY 3,000 MILES

Sparking Plugs Remove the plugs and clean off all carbon deposit from the electrodes, insulators, and plug threads with a stiff brush dipped in paraffin. Alternatively the plugs may be cleaned in a special machine.

Clean and dress the plug points and reset to the correct gap of .017-in. to .018-in.

Before replacing the plug, check that the copper washer is in a sound condition. Never overtighten a plug in the cylinder head, but ensure that a good joint is made between the plug body, the copper washer, and the head.

EVERY 5,000 MILES

Distributor Cam Apply a trace of grease to the distributor cam and to the contact breaker pivot. The contact breaker arm should be lifted off its spindle for this latter attention. Be careful not to let any grease or dirt reach the contact breaker points.

Distributor Automatic Advance Add a few drops of engine oil to the automatic advance mechanism in the distributor.

Access is gained by removing the distributor moulding, lifting off the rotating arm and then removing the contact breaker base by withdrawing its two securing screws. When refitting the contact breaker base make quite certain that it is returned to its original position.

Air Cleaner The air cleaner should be removed, cleaned and "wetted" with fresh oil.

Note. In countries where dust is constantly experienced it is advisable to attend to the air cleaner more frequently.

Fuel System Check the flow of the fuel at the carburetter inlet union, and if necessary clean the petrol filters in the pump and in the carburetter inlet union. Also clean the jets.

Radiator Flush out the cooling system by opening the drain tap at the bottom of the radiator and allowing water to run through until it comes out clear.

In winter, when flushing the radiator take care to preserve the cooling mixture if anti-freeze has been added.

Fan Belt The fan belt must be sufficiently tight to prevent slip, yet it should be possible to move the centre of the belt about one inch each way.

To make any necessary adjustment slacken the three bolts and raise or lower the dynamo until the desired tension of the belt is obtained. Then securely lock the dynamo in position again. (See Cooling Section).

Speedometer Drive The inner member of the speedometer drive should be lubricated by dipping in fairly thick oil, after disconnecting the cable from the speedometer end and pulling the inner member out of the casing.

Rear Axle Drain when the oil is warm (after a run) and refill to the level of the filler plug with new oil.

Gearbox Drain, when the oil is warm (after a run), and refill to the level of the filler plug with new oil.

Front Road Wheel Hubs Apply the oil gun charged with grease to the nipple on each hub, accessible on removing the wheel disc. It is important that the hubs are not given too much grease, otherwise it may penetrate to the brakes.

Rear Road Wheel Hubs These are packed with grease upon assembly and do not require greasing attention except after dismantling.

Steering Gear The steering box should be topped up with oil, with the special adapter on the oil gun. Take out the hexagon plug on the side of the steering box to inject the oil.

Some models have the filler orifice in the steering outer column. This filler is reached by opening the bonnet and sliding aside the spring clip covering the filler orifice.

Also apply the oil gun to the cross shaft nipple, where this is fitted, using the pressure end.

Decarbonising, Valve Grinding and Tappet Adjustment This attention may not be needed so frequently on cars used for long journeys. As a general guide, a falling off in engine power with pinking indicates when decarbonising is due. The correct tappet clearance is .012-in.

EVERY 10,000 MILES

Contact Breaker Points Clean and reset to .010-in to .012-in. gap.

Dynamo and Starter Commutators Clean; also check freedom of brushes in holders.

Track Adjustment Check front wheel alignment.

Steering Box Check for wear.

Clutch Pedal Clearance Check, and adjust if necessary.

Oil Sump Remove and clean sump and oil pump strainer gauze.

Front and Rear Hub Bearings Check for signs of wear.

Propeller Shaft and Universal Joints Lubricate the splined end of the propeller shaft (behind the gearbox) and the universal joints. Move the car to expose the three nipples.

Also test the flange bolts, and tighten if these have worked loose; the nuts are secured with tab washers.

Clutch Operating Shaft Lubricate the two nipples sparingly, as any excess oil may find its way into the clutch.

Sparking Plugs Renew the sparking plugs.

Dynamo Bearings Unscrew the wick-type lubricator with slotted end, and if the wick is dry refill the cup with lubricant.

EVERY 20,000 MILES

Shock Absorbers Remove to check fluid level, and top up if necessary.

General Check Examine and, if necessary, tighten all bolts and nuts such as road spring clips, and cylinder head nuts.

Examine other parts, such as steering connections and brake rods, neglect of which might be followed by an expensive repair and inability to use the car for a lengthy period.

CONTROLS AND INSTRUMENTS

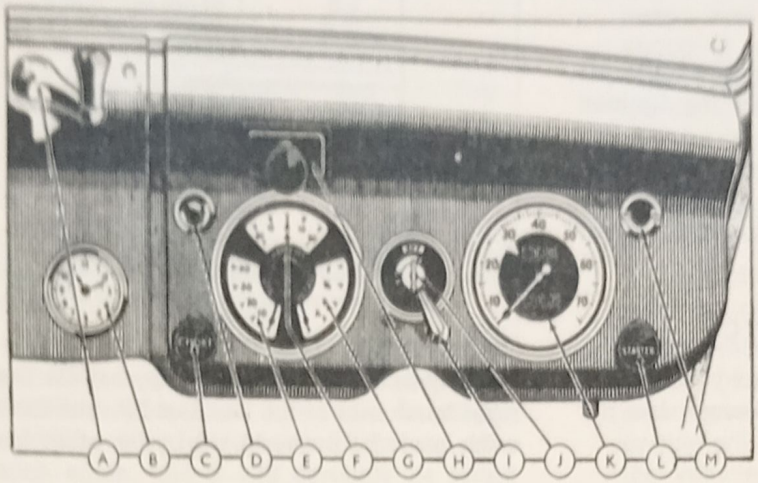


Fig. 1.

The Instrument Panel

A Windscreen Winder.
B Electric Clock (car only).
C Carburetter Air Choke.
D Panel Light Switch.
E Oil Pressure Gauge.
F Ammeter.
G Petrol Gauge.
H Windscreen wiper Control.
I Lighting Switch.
J Ignition Switch.
K Speedometer.
L Starter Switch.
M Ignition Warning Lamp.

FOOT CONTROLS

(a) **Accelerator** The right-hand pedal which operates the carburetter throttle.

(b) **Brake** The centre pedal which operates brakes on all four wheels.

(c) **Clutch** The left-hand pedal.

(d) **Headlamp Dipper Control** The small press switch in the centre of the scuttle, operated with the left foot.

HAND CONTROLS

(a) **Brake** Operates on all four wheels.

(b) **Gear Lever** It should always be in neutral when starting the engine. Lift the lever to engage reverse gear.

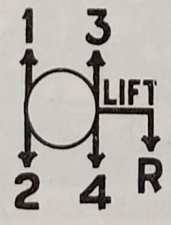


Fig. 2. The Gear Positions.

c) **Carburetter air choke control** For starting from cold, pull out air choke to limit until engine fires. As soon as the engine is running, push knob about half way back.

(d) **Ignition Switch** Centre of Instrument Panel. Turn clockwise to switch on.

e) **Lighting Switch** Centre of panel, on same mounting as ignition switch. There are three positions:

(1) "Off."
(2) "Side." Side lamps and tail lamp.
(3) "Head." All lamps.

(f) **Direction Indicators** The Direction Indicators are controlled from the steering wheel. Normally after the car has turned a corner they automatically return, but when only a slight turn has been made it may be necessary to centre the control by hand.

(g) **Windscreen Wipers** The windscreen wiper on the driver's side is started by pushing in the knob and turning it to the left. After this blade is in operation, the second blade may be started by pushing in its knob and turning to the right. The second blade should be stopped first by pushing in the knob and turning to the left; to stop the first blade, push in the knob and turn to the right. The wipers operate only when the ignition switch is "On."

INSTRUMENTS

(a) **Speedometer** Registers vehicle speed, and total and trip mileage.

(b) **Oil Pressure Gauge** Indicates the oil pressure in the engine. It does not show the quantity of oil in the sump.

(c) **Ammeter** Indicates the flow of current into or out of the battery. With the automatic voltage control system, little or no change is shown when the battery is in a well-charged condition.

(d) **Ignition Warning Light** On the instrument panel. Glows red when the ignition is switched on and fades out when the dynamo is charging the battery.

(e) **Petrol Gauge** The petrol gauge indicates the contents of the tank when the ignition control is switched on.

When the tank is being filled, switch off to stop the engine, then switch on again, and the needle will record the amount of fuel entering the tank.

BONNET SAFETY CATCH

This safety catch is designed to hold the bonnet down while driving even if the bonnet has not been properly locked.

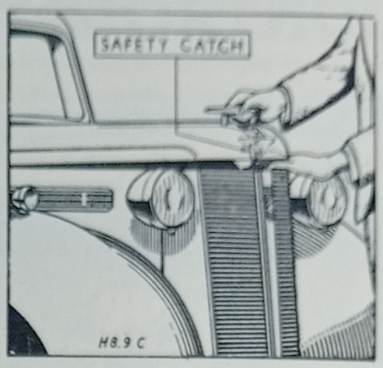


Fig. 3. Releasing the safety catch to raise the bonnet.

To open the bonnet, turn the handle towards right-hand side of the car and lift, but the safety catch has to be pushed back by the other hand.

STARTING

Before starting the engine check the oil level in the sump and the water level in the radiator.

(a) Make sure there is sufficient petrol in the tank.

(b) See that the gear lever is in neutral position. If the engine is cold pull out the air choke (see "Controls"). Turn the ignition switch to "on". Also push down the clutch pedal, which takes the gearbox load off the engine.

(c) Pull starter knob firmly (**in cold weather** the engine should first be rotated several times with the starting handle, and the radiator should be completely blanked off by fastening the muff flap in position). Never pull out the starter knob unless the engine is stationary.

(d) As soon as the engine starts, release the knob, depress the accelerator slightly and slowly push in the air choke.

(e) When the vehicle has been parked for some time the petrol in the carburetter may have evaporated. Before attempting to start the engine, refill the carburetter by operating the priming lever on the petrol pump, which is on the left-hand side of crankcase.

(f) The pumping action should be distinctly felt until the carburetter bowl is full. If this pumping action cannot be felt, turn the engine with the starting handle about one full turn, when the priming lever should be free to pump.

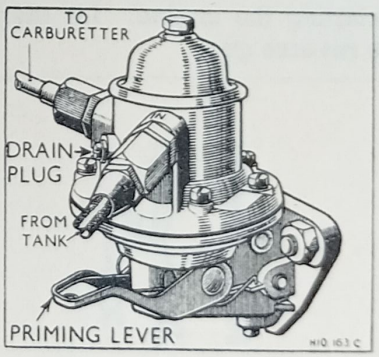


Fig. 4. The A.C. petrol pump showing the priming lever and unions. Pull up lever to prime.

(g) Do not allow the engine to race when first starting up, as time must be allowed for oil to circulate and lubricate the engine bearings. Let the engine idle fairly fast for a few minutes before moving off, or get into top gear as soon as possible after having started. Blanking off the radiator will assist the engine to warm up quickly.

DRIVING

The following speeds should not be exceeded during the first 500 miles.

	Miles per hour.			
	1st	2nd	3rd	Top
New Engine	6-7	11-12	17-18	30

The gearbox has four forward speeds and a reverse.

(a) To engage first gear, press down the clutch pedal (i.e., declutch) and move the gear lever into the first speed position.

(b) It may happen that when the clutch is let in, there is no apparent drive from the engine. That is because there has been no proper engagement of the gear. Therefore, declutch again, and it will certainly be found that the lever can then be moved so as to give the proper gear engagement. Do not use force, but always move the gear lever as far as it will go.

(c) Start on first speed, accelerate to about 7 m.p.h. release the accelerator, declutch, move the lever to neutral, and continue the movement of the lever steadily to the second speed position and gently let in the clutch.

(d) In moving from second to third speed, a similar action takes place. Accelerate to about 12 m.p.h., release the accelerator, declutch, move the lever to neutral and continue the movement of the lever steadily into the third speed.

(e) To move from third to top, declutch, and move the lever steadily into the position desired. It assists the change down from top to third, and third to second if the accelerator is kept slightly depressed while the change is made.

(f) Gear changing may be slightly stiff in a new vehicle until the moving parts have eased in use. Changing should be done deliberately, but not hurriedly.

(g) Always change gear early on a hill. Never allow the engine to labour in any gear and expect it to pick up speed on changing into a lower one when the vehicle has nearly stopped. Do not persist in attempting to drive the vehicle uphill in top gear when the speed falls below 20 m.p.h.—change down early.

(h) If the vehicle has been driven back in reverse gear, wait until it is stationary before engaging a forward speed, and do not engage the reverse gear when the vehicle is travelling forward, or serious damage to the gears will result.

(i) Keep the foot off the clutch pedal, except in heavy traffic. Even then do not allow the weight of the foot to be taken by the pedal. The slipping of the clutch caused by this practice heats and wears it badly.

(j) When descending a long hill, or before commencing a steep descent, engage one of the lower gears, and do not accelerate. The engine will then help to retard the speed of the vehicle. When using the brake, keep the clutch in, disengaging it at the last moment if stopping.

(k) **What Not to do**

Please do not make the following mistakes :—

Do not forget the ignition switch when starting up.

Do not forget to release the air choke control after starting the engine.

Do not make a fast run with the radiator covered.

Do not continue pulling out the starter knob if the engine will not fire.

Do not pull the starter knob while a gear is engaged.

Do not leave the vehicle in gear with handbrake off.

Do not coast with a gear engaged and the clutch held out.

Do not fill the radiator with cold water when the engine is hot.

Do not leave the ignition switched on when the engine is not running.

Do not allow the engine to run at high speeds for the first 500 miles.

On no account run the engine in a closed garage. The exhaust gases are highly toxic and a very small amount in a restricted atmosphere can produce grave, if not fatal, results.

THE COOLING SYSTEM

Description

The cooling of the engine is maintained by a radiator incorporating a patent Austin expansion chamber, which prevents the loss of cooling water through expansion. When the cooling water expands, it rises and fills the radiator expansion chamber while the displaced air escapes from a small overflow pipe connecting the top of the expansion chamber with the bottom of the filler plug well. Should any further expansion take place, water flows along the overflow pipe to the filler plug well, and when the engine cools, the water is drawn back into the radiator through the overflow pipe.

Topping up is only necessary very occasionally to replace water lost through evaporation.

Overheating

Overheating may be caused by a slack fan belt, excessive carbon deposit in the cylinders, running with the ignition too far retarded, incorrect carburetter adjustment, failure of the water to circulate, or loss of water due to leakage or evaporation.

Belt Adjustment

The belt should be just sufficiently tight to prevent slip, yet it should be possible to move the belt laterally about one inch each way. To make the adjustment, slacken the bolts (A) indicated in Fig. 3, which hold the dynamo in position, and raise or lower the dynamo until the desired tension of the belt is obtained. Then securely lock the dynamo in position again.

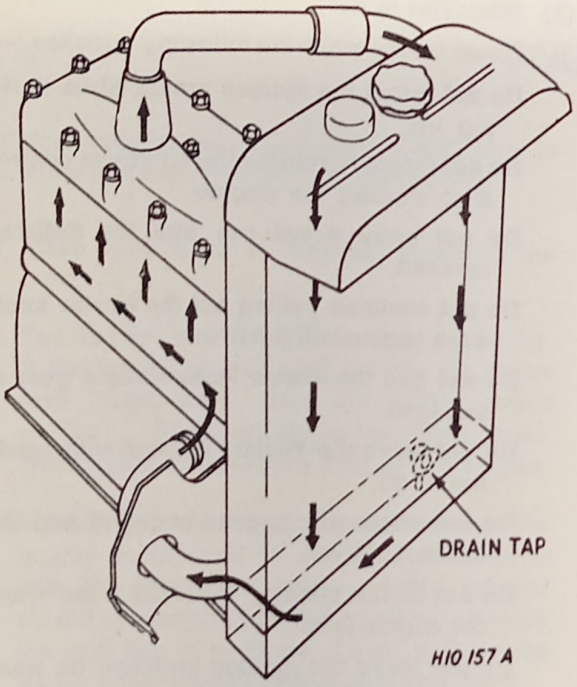


Fig. 1. Thermo-syphon cooling circuit. The drain tap is closed when the lever is down.

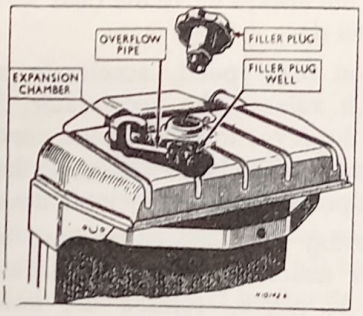


Fig. 2. The radiator top tank expansion chamber.

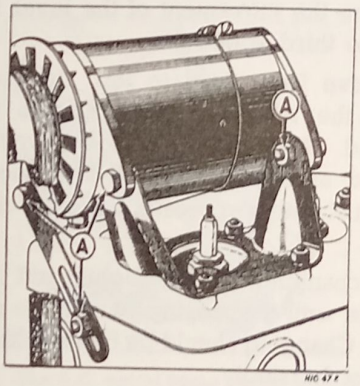


Fig. 3. The bolts "A" are for dynamo and fan belt adjustment.

Circulation is by thermo-syphon. When the engine is cold, the radiator should be filled with rain water, if available, or clean soft water, to just below the top of the filler plug thread.

Capacity

The capacity of the radiator, pipes and cylinder jackets is about 19 pints.

Frost Precautions

Care should be taken to see that the water is drained off completely, for in case of freezing it will do harm by lodging in small places, and fracture of the cylinder block may result. There is a drain tap in the base of the radiator block. See that the car is on level ground while draining.

Freezing may occur first at the bottom of the radiator or in the lower hose connection. Ice in the hose will stop water circulation and may cause boiling.

A muff can be used to advantage, but care must be taken not to run with the muff fully closed, or boiling will result.

Protection by use of Anti-freeze Mixture

1. When frost is expected or when the car is to be used in very low temperatures, make sure that the strength of the solution is, in fact up to the strength ordered by its manufacturers.
2. The strength of the solution must be maintained by topping up with anti-freeze solution as necessary. Excessive topping with water reduces the degree of protection afforded. The solution must be made up in accordance with instructions supplied with the container.
3. TOP UP WHEN THE SYSTEM IS HOT.
4. If the cooling system has to be emptied, run the mixture into a clean container and use again.

Protection by Draining

On vehicles where anti-freeze is not used, the following precautions should be taken during frosty weather to obviate any damage due to the freezing of the cooling system.

1. The cooling system must be completely drained. It is not sufficient merely to cover the radiator with muffs.
2. The cooling system is fitted with one drain cock, which must be opened to drain the system completely. Remember that the car must stand on level ground while draining.
3. The drain tap is positioned at the bottom of the radiator.
4. The drain tap should be tested at frequent intervals by inserting a piece of wire to ensure that it is clear. This should be done immediately the drain tap is opened, so that any obstructions freed by the wire may be flushed out by the water.
5. When draining in very cold weather do so when the engine is hot and do not leave the car until the water is properly drained.
6. Place a reminder on the radiator to the effect that it is empty.

Flushing

If there is anti-freeze in the cooling system obtain a receptacle large enough to hold the contents of radiator and engine, and place it under the drain tap.

Remove the radiator filler cap and open the drain tap at the bottom of the radiator. (Turn the tap lever UP to open and DOWN to close).

As soon as the tap is opened, and again when water has stopped running, insert a few inches of wire into the tap outlet to ensure there is no clogging before the system is empty.

Remove the receptacle into which the anti-freeze was run and proceed to flush the radiator from a hose or other supply of clean water.

Fitting Fan Blades

It is not generally understood that there is a right and a wrong way round for the fitting of fan blades.

The blades are not flat, but shaped, and the concave or hollow side should be the leading one, thus, when fitting to the dynamo pulley the convex or arched side must always face the radiator. This convex side is further easily identified as stiffeners are pressed into the blades; they project on this convex face.

In cases of overheating, the position of the fan blades should be at once examined; make sure after dismantling, the fan is assembled the right way round.

Radiator Removal

Take off the radiator tank filler cap.

Drain the radiator and remove the dynamo from its bracket on the cylinder head. (See page B/1). The dynamo wiring is sufficiently long to allow the unit to rest on the mudwing and flitch plate.

Disconnect the water hose at the top and bottom connections to the radiator. Remove the nuts from the two mounting bolts which extend from the bottom of the radiator, and which pass through the rubber mounting blocks. (See illustration on following page for order of assembly of this mounting).

Remove the nut and rubber washer from the stud which forms the securing point of the radiator and cowl at the top.

The radiator block may now be lifted from behind the cowl, taking care not to damage the fins as it clears the engine. (It is to give more access here that the dynamo and fan removal is suggested).

Re-fitting the Radiator

Carefully place the radiator in position and see that the support assemblies (Fig. 5) are properly in position before attempting to secure with the nuts at the bottom. When securing at the top do not finally tighten till the dynamo and fan are in position and adjusted, in order to ensure proper fan blade clearance of the radiator.

The Cowl Removal

It is advisable to remove the bonnet, while the bonnet side plates must also be taken away. Illustration shows bolts to be removed. While working on such jobs it is usual to dispense with the bonnet prop rod, using a length of wood to raise the bonnet a few inches higher to obtain better access. In this case the bonnet will need to be firmly held by an assistant while the bolts are taken from the hinge arms. The bonnet sides are held by one bolt though the scuttle and one through the top of the cowl. On the left-hand side the bolt through the cowl also secures the bonnet prop rod bracket.

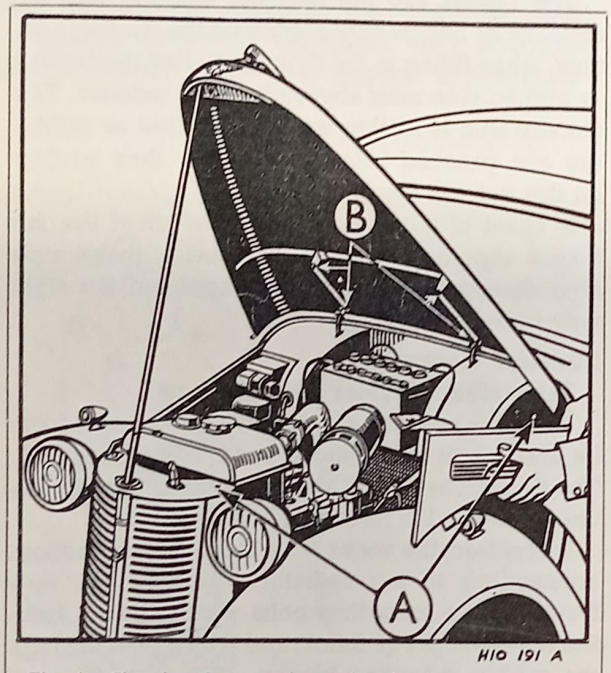


Fig. 4. Showing the securing points for the bonnet and side panels. A, bonnet side bolt positions; B, bonnet hinge arm bolts; and a wooden support prop in place of the fitted prop to give more working room.

To remove the cowl, first disconnect the headlamp wiring at the snap connection at each side.

There are three bolts through each side of the cowl and into the mudwing and bodywork. Upon removal of these the cowl is free to be lifted from the vehicle. Leather packing will be found between the cowl and the mudwing; see that this is replaced when rebuilding the radiator unit. Replacement is a reversal of these instructions, taking care to line up the cowl to ensure register of bonnet lock.

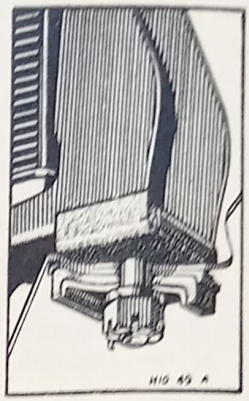


Fig. 5. This illustration shows the assembly of one of the two radiator supporting points.

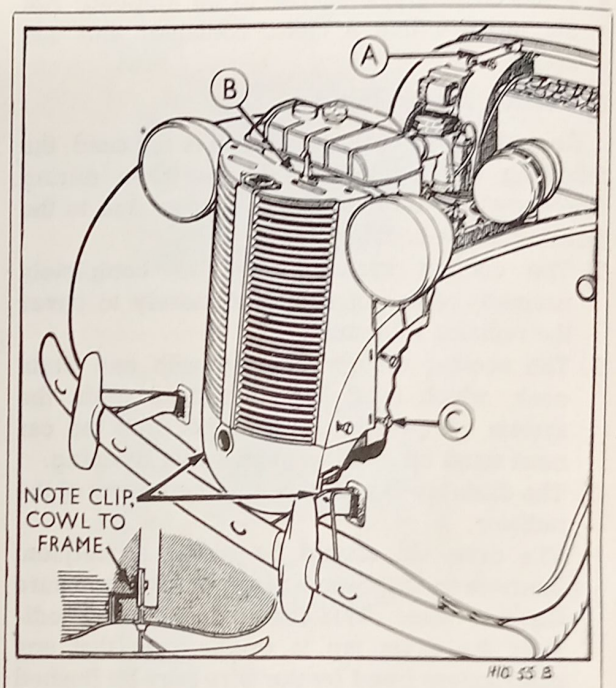


Fig. 6. Points of attachment of the bonnet and radiator cowl, showing A, bonnet hinge; B, bolt securing cowl to radiator tank; C, bolts through mudwing.

THE FUEL SYSTEM

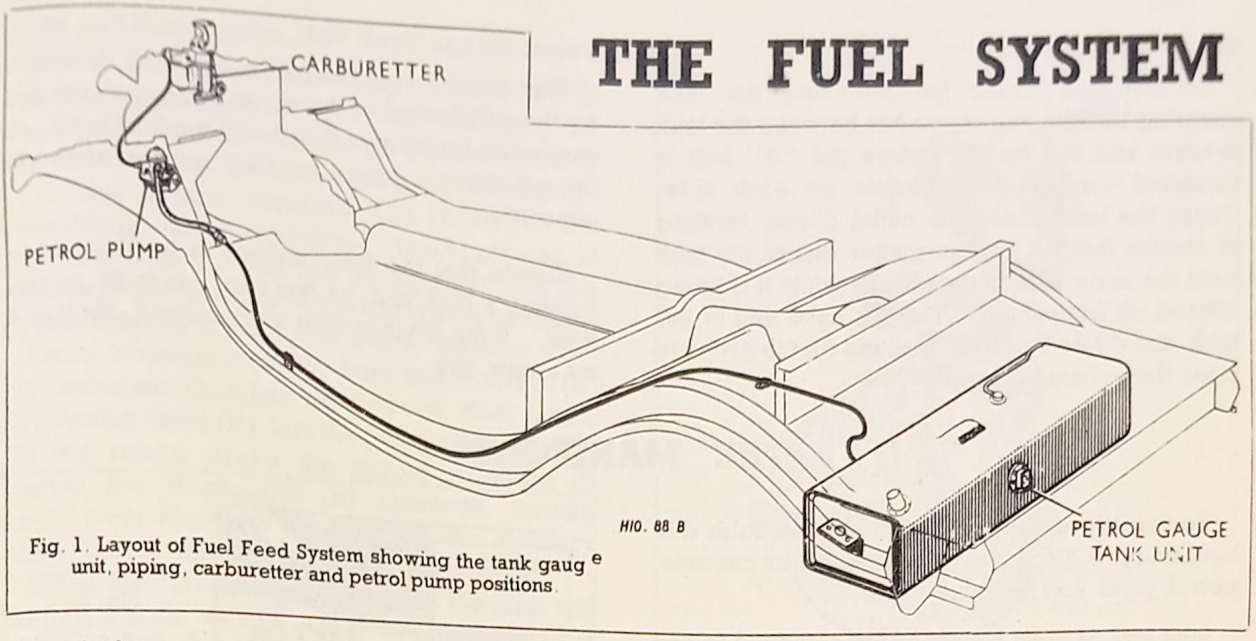


Fig. 1. Layout of Fuel Feed System showing the tank gauge unit, piping, carburetter and petrol pump positions.

Description.

The petrol tank has a capacity of 6 gallons and it is fitted with a bayonet-type of cap, ventilation being provided for by a vent pipe. The tank has an electrically operated petrol gauge unit, and is supported directly on the chassis side members at the rear of the chassis. The tank incorporates an overflow and vent pipe as shown in Fig. 1.

An A.C. petrol pump, operated by the engine camshaft, draws petrol from the tank and lifts it at low pressure to the Zenith Carburetter. An Air Cleaner is fitted.

THE PETROL TANK

To Drain

The drain plug is positioned centrally in the bottom of the tank and is removed for draining.

To Remove (See Fig. 2)

1. Drain as above.

2. Disconnect the petrol delivery pipe from the union in front of the tank, as shown in illustration.

3. Disconnect the insulated lead from the electrical unit terminal at the rear of the tank.

4. Remove the filler hose clips accessible from inside the car on the left-hand side, and cover the filler pipe opening.

5. Release the nuts on the "U" bolt which secures the tank to the frame at each side (See Fig. 2), and gently lower the tank. Manoeuvre it past the springs and shackles, lowering the right-hand end first so that the filler tube at the other end can be more easily lowered through the floor.

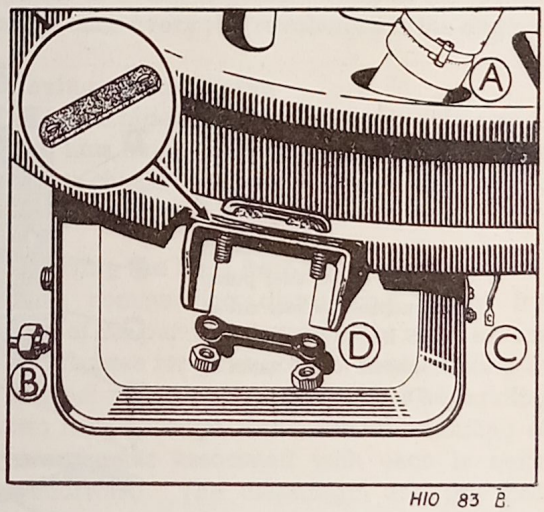


Fig. 2. The tank mounting, with (inset) the rubber pad. A is the petrol filler connection; B, the petrol pipe union; C is cable to electric fuel gauge unit in tank; D shows assembly of nuts and washers for securing the tank to frame. The rubber pad must be fitted between the tank bracket and the frame.

To Replace

Reverse the order for removing the tank ensuring that the rubber pad is between the tank bracket and the frame, before the "U" bolt is threaded through the bracket on each side. Cover the tank filler tube outlet during refitting to ensure that no foreign matter enters the tank from the underside of the chassis while it is being offered up in position. The left-hand end of the tank should be raised in position first in order to clear the exhaust tail pipe.

Petrol Gauge Tank Unit

This can be removed from the tank complete by the withdrawal of the six securing screws, but care must be taken not to bend the float lever, or the subsequent gauge reading may be seriously affected.

Ensure that the joint washer is in place when refitting a tank unit, as this joint has to be petrol-tight. If the washer is at all damaged, replace it by a new one.

THE MANIFOLDS

To remove the inlet and exhaust manifolds it is necessary to disconnect the carburetter controls, petrol pipe and exhaust pipe.

Inlet and exhaust manifolds are removed as one unit after releasing the nuts at five points, two of these bearing on steel clamps, the remaining three on studs which pass through the flange, one on each end of the manifold and one in the centre.

Detach the manifold joint washer. Make sure that the joint washer is in good condition before replacing it.

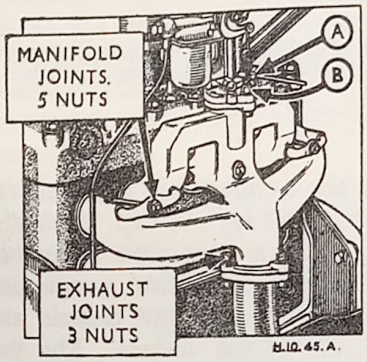


Fig. 3.
A. Suction Timing Union.
B. Carburetter Flange Joint.

THE FUEL PUMP

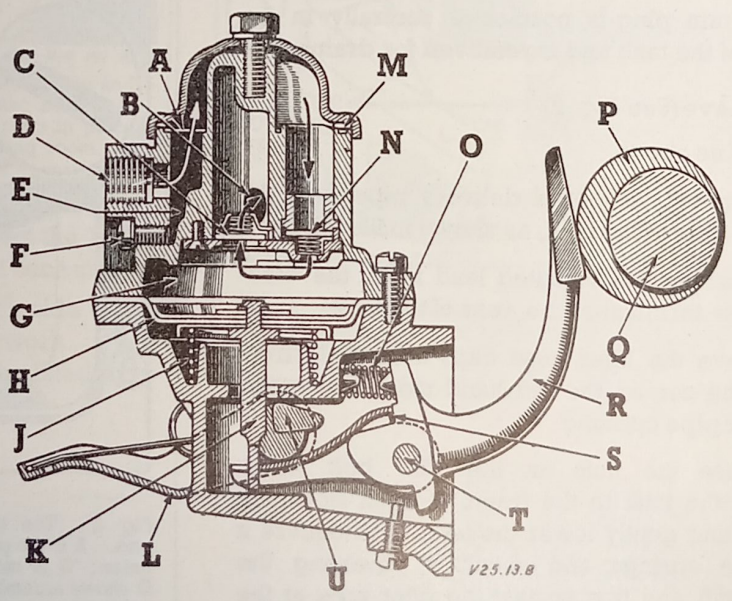


Fig. 4. This sectional view of the fuel pump enables the fuel circuit to be traced from the inlet D to the outlet B The hand priming lever is shown at L.

Type and Description.

The A.C.-Sphinx Fuel Pump, Type "T" is operated mechanically from an eccentric on the engine camshaft. Figure (4) gives a sectional view of the pump, the method of operation being:

As the engine camshaft (Q) revolves, the eccentric (P) lifts pump rocker arm (R) pivoted at (T) which pulls the pull rod (K) together with the diaphragm (H) downward against spring pressure (J) thus creating a vacuum in pump chamber (G).

Petrol is drawn from the tank and enters at (D) into sediment chamber (E) through filter gauze (A), suction valve (N) into the pump chamber (G). On the return stroke the spring pressure (J) pushes the diaphragm (H) upwards, forcing petrol from chamber (G) through the delivery valve (C) and opening (B) to the carburetter.

When the carburetter bowl is full the float will shut the needle valve, thus preventing any flow of petrol from the pump chamber (G). This will hold diaphragm (H) downward against spring pressure (J) and it will remain in this position until the carburetter requires further petrol and the needle valve opens. The rocker arm (R) operates the connecting link by making contact at (S) and this construction allows idling movement of the rocker arm when there is no movement of the fuel pump diaphragm.

Spring (O) keeps the rocker arm (R) in constant contact with eccentric (P) to eliminate noise. The hand priming lever is indicated at "L" and sediment drain plug at "F".

Cleaning the Filter

The filter should be examined every 1,000 miles and cleaned if necessary. Under extreme 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 washer under the filter cover should be renewed if broken or if it has hardened.

When refitting the cover, make certain that the fibre washer is 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 the pump to crankcase mounting bolts for tightness; also check the petrol pipe unions.

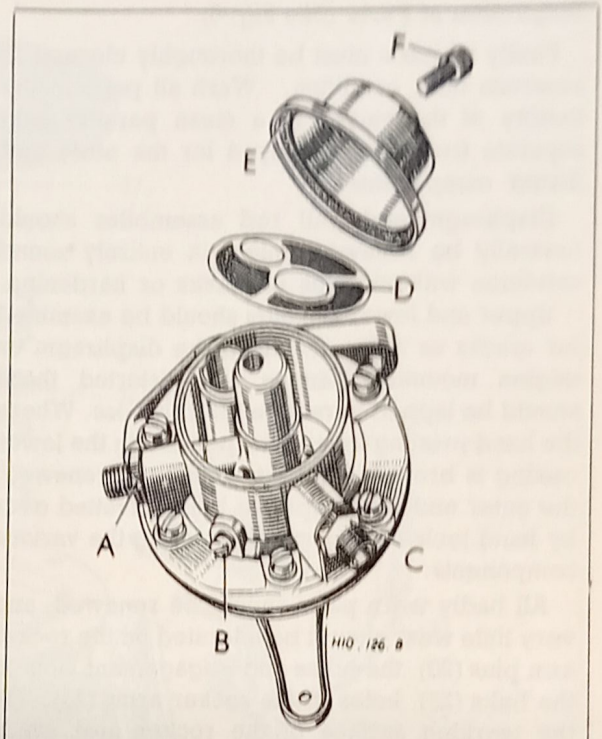


Fig. 8. A, outlet union; B, drain plug; C, inlet union; D, filter gauze; E, cork washer; F, cover screw and washer.

Testing while on Engine

With the engine stopped and switched off, the pipe to the carburetter should be disconnected at the carburetter 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 disconnected; the two nuts fixing the fuel pump to the engine crankcase should then be unscrewed, after which the fuel pump will readily come away.

Dismantling the Fuel 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 degrees. See Fig. 7. No attempt should be made to separate the four diaphragm layers from their protector washers and pull rod, as this is at all times serviced as a complete assembly, being permanently rivetted together.

Inspection of Parts (See Fig. 6).

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 renewed unless in entirely sound condition without signs of cracks or hardening.

Upper and lower castings should be examined for cracks or damage, and if the diaphragm or engine mounting flanges are distorted these should be lapped to restore their flatness. Where the hand priming lever incorporated in the lower casting is broken, the parts should be renewed, the outer end of the spindle being rivetted over by hand tools after correctly locating the various components.

All badly worn parts should be renewed, and very little wear should be tolerated on the rocker arm pins (20), the holes and engagement slots in the links (25), holes in the rocker arms (23). On the working surface of the rocker arm which engages with the engine eccentric, slight wear is permissible but not exceeding .010-in. depth. The valve seat incorporated in the valve plate (14) should be examined and if at all roughened should be carefully lapped flat on a smooth carborundum stone; similarly, the corresponding outlet valve seat incorporated in the upper casting (6) should be examined and if worn unevenly to the slightest degree, both the upper casting and valve seat assembly must be renewed. It is not practicable to refit new valve seats into the castings as this calls for special equipment.

Fuel pump valves (12) should be renewed if at all worn, although in an emergency they can be turned over to provide a fresh surface to the valve seat. Valve springs (11) should preferably be renewed, 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 (26) 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. Rocker arm springs (24) are occasionally found to be broken after service. All joint washers should be renewed.

To Reassemble the Fuel Pump

The following procedure should be adopted dealing with the upper portion of the pump first:

Place the outlet valve spring retainer (10) in the pump upper casting (this retainer is the small three-legged pressing which retains the outlet valve spring), taking care not to distort the legs.

Place the valve plate washer (13) 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.

Place the outlet valve (12) on the spring.

Place the inlet valve (12) on the valve seat located in the upper casting.

Place the valve spring (11) on the centre of the inlet valve.

Place the valve plate (14) in position and secure with the three screws (15). (The inlet valve spring must be centred properly in the spring seat formed in the valve plate).

Place the filter gauze (5) in position on top of the casting, making certain that it fits snugly.

Fit the cork washer, cover, fibre washer, and retaining screw as previously detailed under "Cleaning Filter" and detailed on page C/3.

To assemble the lower half of the pump, proceed as follows:—

Assemble link (25), packing washers (21), rocker arm (23) and rocker arm spring (24) in the body (17).

Insert the rocker arm pin (20) through the hole in the body, at the same time engaging the packing washers, link, and the rocker arm, then spring the retaining clips 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-in. 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 in from the opposite side, removing the temporary rod as the pin takes up its proper position

To fit the diaphragm assembly to the pump body:—

Place the diaphragm spring (26) in position in the pump body.

Place the diaphragm assembly (27) over the spring, the pull rod being downwards, and centre the upper end of the spring in the lower protector washer.

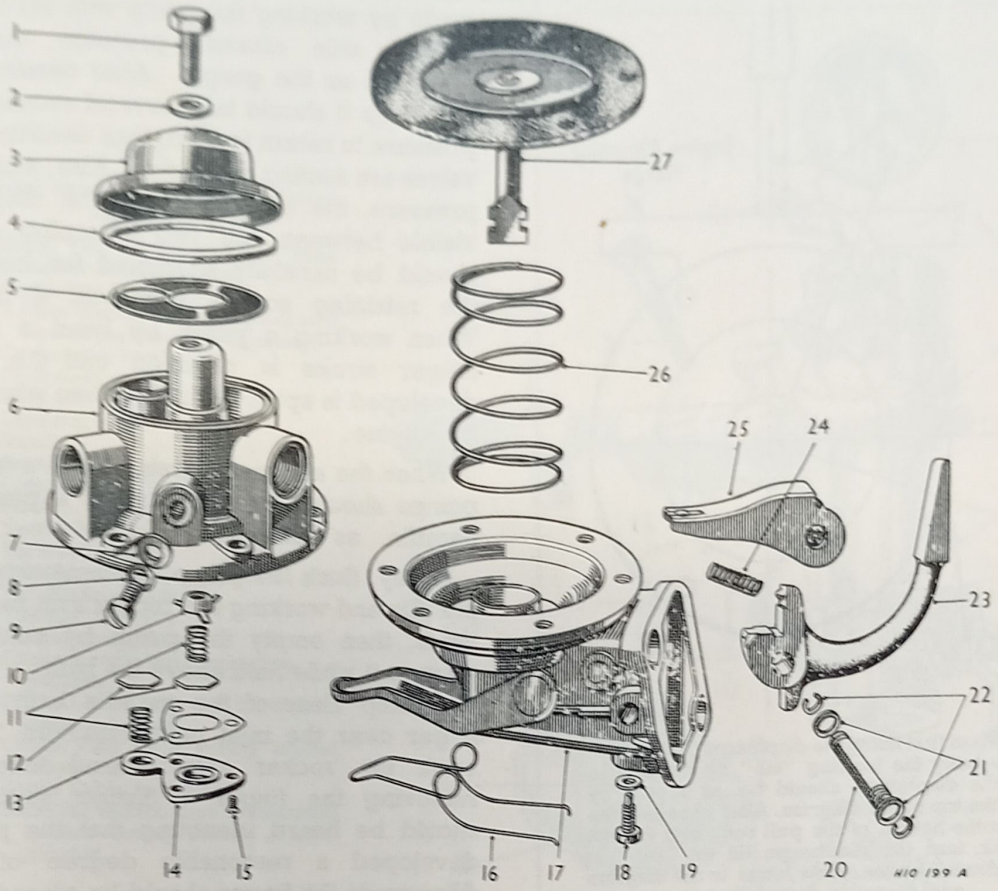


Fig. 6. An exploded view of the Fuel Pump, showing :—

1 Top cover screw.
2 Cover screw washer.
3 Pump top cover.
4 Cover cork washer.
5 Filter gauze.
6 Upper chamber.
7 Drain plug joint washer.
8 Drain plug washer.
9 Drain plug.
10 Spring retainer.
11 Valve spring.
12 Valves.
13 Valve plate washer.
14 Valve retainer plate.
15 Valve plate screw.
16 Priming lever spring.
17 Lower casting.
18 Rocker arm stop screw.
19 Stop screw washer.
20 Rocker arm pin.
21 Rocker pin washers.
22 Rocker arm pin clips.
23 Rocker arm.
24 Rocker lever spring.
25 Rocker link.
26 Diaphragm spring.
27 Diaphragm and pull rod.

On the latest type units the Priming Lever is designed for "pull-up" action instead of the "press-down" type on earlier models.

Press downwards on the diaphragm at the same time turning the assembly to the left in such a manner that the slots on the pull rod will engage the fork in the link, ultimately turning the assembly a complete quarter turn to the left. This will place the pull rod in the proper working position in the link, and at the same time permit the matching up of the holes in the diaphragm with those on the pump body flanges.

When first inserting the diaphragm assembly into the pump body, the locating "tab" on the outside of the diaphragm should be at the 11 o'clock position. After turning the diaphragm assembly a quarter turn to the left the "tab" should be at the 8 o'clock position. These positions are shown in Fig. 7.

The two sub-assemblies of the pump are now ready for fitting together, and this is carried out as follows :—

Push the rocker arm (23) towards the pump 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.

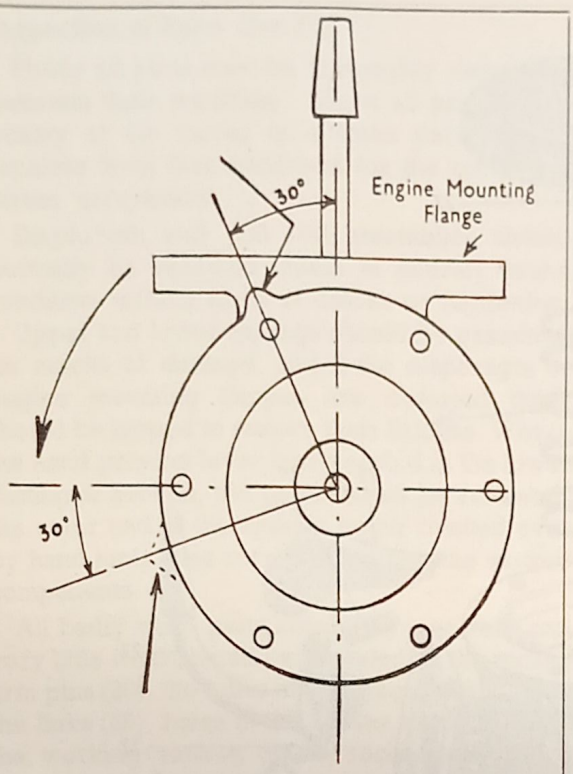


Fig. 7. When first fitting the diaphragm assembly to the pump body the locating "tab" on the outside edge of the diaphragm should be as shown by arrow at the top of the diagram. After engaging the notches in the bottom of the pull rod, with the slot in the link, turn the diaphragm till the "tab" is where indicated by the arrow lower in the diagram and shown in dotted line.

Release and push the rocker arm away from the pump so as to hold the diaphragm at the top of the stroke, and while so held tighten the cover screws diagonally and securely. On pumps fitted with rocker arm stop screws (18) and washer (19) these should be removed for the operation and afterwards refitted.

Testing the Pump

The best method is by using an A.C.-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 the 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 working a 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 pumps 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 has 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 diaphragm watched for any signs of air leakages.

Refitting to the Engine

Reverse the procedure outlined for removal from the engine. Ensure that the rocker arm is correctly positioned against the eccentric on the camshaft, as there is a possibility of inadvertently getting the rocker arm under the eccentric or to one side, when damage will result after the pump bolts are tightened. The joint washer between the pump and the crankcase should be renewed if unsound.

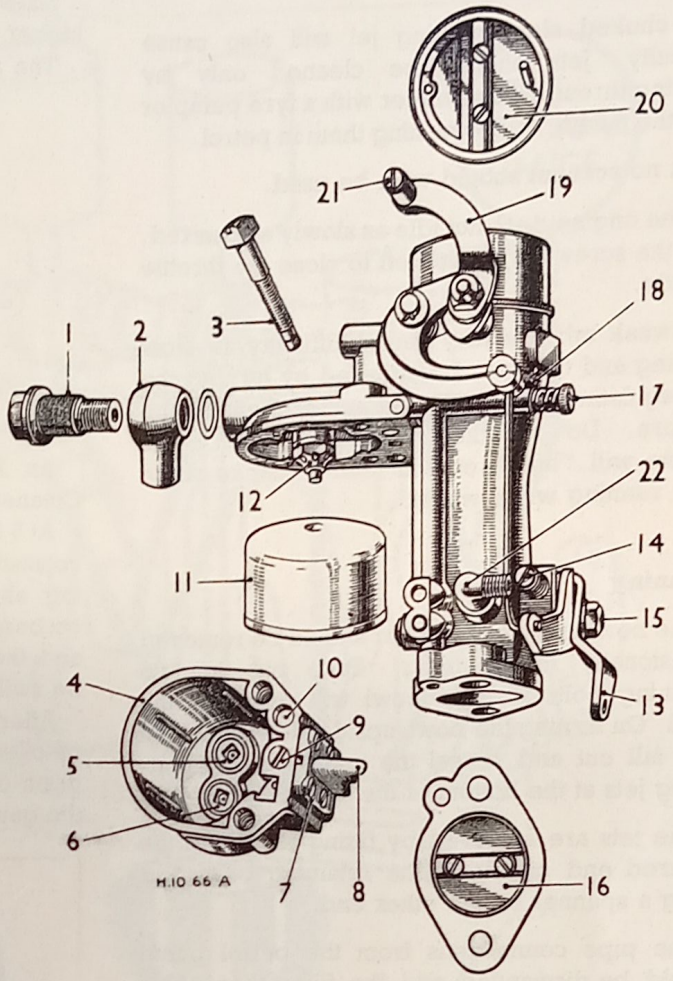
After refitting to the engine, the pump should be run for a short time, and pipe unions and pump examined for the possibility of fuel leakage.

THE CARBURETTER

Fig. 8.

General assembly of the Carburetter, showing :—

1. Union Nut carrying loose fibre washer and filter gauze.
2. Petrol Pipe Union.
3. A Float-chamber Retaining Bolt with squared end for use as jet key.
4. Carburetter bowl.
5. Compensating Jet.
6. Main Jet.
7. Emulsion Block.
8. Nozzle
9. Slow Running Jet.
10. Compensating Well.
11. Float.
12. Needle Seating.
13. Throttle Lever.
14. Slow Running Adjuster Screw.
15. Throttle Spindle Nut.
16. Throttle "Butterfly."
17. Air Regulating Screw.
18. Choke-throttle Interconnecting Adjuster.
19. Choke Lever, with cam for throttle interconnection.
20. Choke Flap (with spring loaded release valve flap).
21. Choke Cable Anchorage.
22. Union for vacuum pipe to automatic ignition timing control at distributor.



Description

THE carburetter fitted is the Zenith down-draught type, 30-V.M.4., embodying the well known principles of main and compensating jets. Fuel from the pump passes through the union, the filter and the needle seating into the float chamber. As the float rises it closes the needle on its seating, thus regulating the flow of the fuel.

The float chamber contains the main jet, the compensating jet, the capacity well, and the slow running jet. Fuel flows through the main and compensating jets and also rises in the capacity well. From the jets it flows along two separate channels into a common channel in the emulsion block attached to the float chamber.

This main channel has its outlet in a nozzle which projects into the choke tube.

The capacity well is in direct communication with the atmosphere and the compensating channel in the emulsion block.

Cold Starting

To obtain an easy start from cold, the air choke control on the dashboard should be pulled to its fullest extent and the engine should be given, by hand, a few turns to free the moving parts. Then pull the self-starter knob When the engine is running, gradually release the choke control.

In cold weather it may be necessary to hold the choke control out for a few minutes while the engine warms up and to run the car for the first few minutes with the choke partly open. As soon as the engine is warm, however, the control knob should be pushed right in, otherwise the mixture will be too rich.

Air Choke Setting

If difficulty in starting the engine is experienced, ascertain that the air choke flap is closing properly and if necessary adjust the wire.

Make sure also that the choke flap opens fully, for if this sticks in a partially closed position

it will restrict the speed of the car and increase fuel consumption.

A choked slow running jet will also cause difficulty. Jets should be cleaned only by blowing through them, either with a tyre pump or with the mouth, or by washing them in petrol.

On no account should wire be used.

If the engine does not idle as slowly as desired, turn the screw (14) to the left to close the throttle slightly.

A weak mixture may cause difficulty in slow running and this may be adjusted by turning the air regulating screw (17) clockwise to enrich the mixture. Do not make the mixture too rich or the engine will "hunt" or will tend to choke when slow running while warm.

Cleaning

The bowl of the carburetter should be removed occasionally for cleaning. Take out the two retaining bolts and the bowl will drop into the hand. On turning the bowl upside down the float will fall out and reveal the main and compensating jets at the bottom of the bowl.

The jets are removed by fitting into them the squared end of one of the retaining bolts and using a spanner on the other end.

The pipe connections from the petrol pump should be dismantled and the filter thoroughly cleaned in petrol. When reassembling take care thta the fibre washers on both sides of the union are correctly replaced and that the washer against which the bowl fits is not damaged.

Do not alter the jets unless you are quite sure that other parts of the engine, including sparking plugs, ignition and valves are in order, and that the compression is good. There are no adjustable parts in the Zenith carburetter, except for the slow running control, so nothing can get out of adjustment when once set.

Standard Settings

Sizes of Zenith jets normally run in 5's—the higher the number the larger the jet.

The standard settings are :—

Choke Tube ...	23
Main Jet	107
Compensating Jet ...	60
Slow Running Jet ...	50
Progression Jet ...	100
Capacity Tube ...	2
Needle Seating ...	1.5

Oil-Wetted Air Cleaner

An A.C. oil-wetted Intake Silencer and Air Cleaner is fitted to the carburetter.

At 5,000 mile intervals or weekly where dust is constantly experienced, the silencer needs cleaning and re-oiling. It is removed from the carburetter after slackening the retaining clips, and the front end containing the gauge should be swilled in a shallow pan of petrol.

After drying, the metal gauze mesh should be re-oiled with engine oil, allowing the surplus to drain off before refitting the cleaner. Refit with the gauze end facing forward.

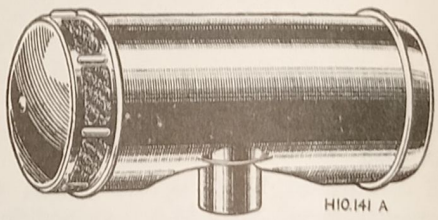


Fig. 9, showing the air cleaner detached from carburetter.

If the air cleaner is neglected it becomes choked with dirt, so that the cleaning efficiency of the device and its valuable protection against engine wear are not maintained.

ENGINE LUBRICATION

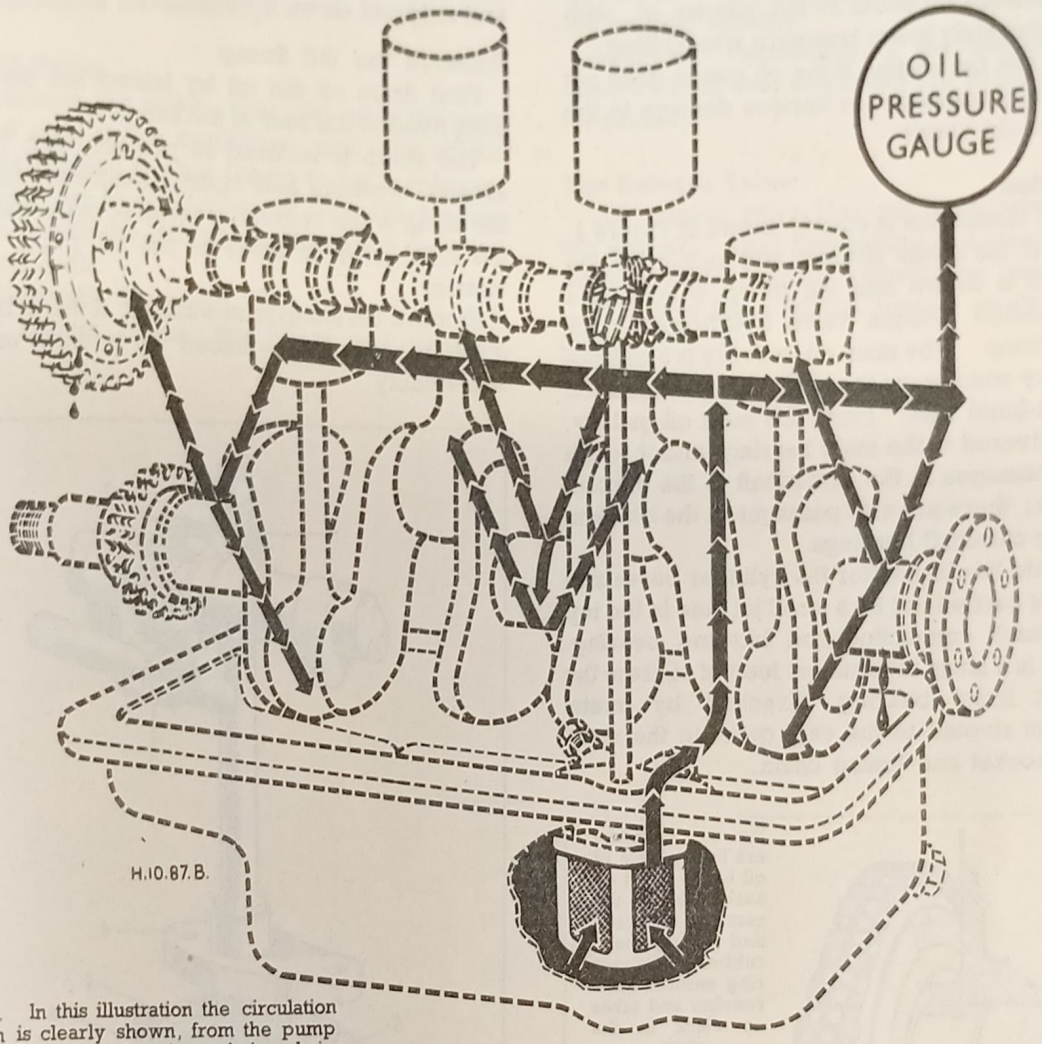


Fig. 1. In this illustration the circulation system is clearly shown, from the pump to the gallery and bearings, timing chain and back to the sump.

Capacity

THERE is full pressure lubrication throughout the unit. The sump oil capacity is approximately 7 pints. The oil filler is on the right-hand side and the oil level is checked by dipstick, also in the right-hand side of the crankcase.

Draining

Every 2,000 miles the sump should be drained, and refilled with new oil (on new or reconditioned engines this should be done after the first 500 miles).

Refilling

Under no circumstances should petrol or paraffin be poured through the oil filler to clean the engine.

After filling with fresh oil to the correct level, run the engine for a few moments to check that the oil is circulating and that the oil pressure gauge reading is correct. The oil level should not be allowed to go below 1 inch on the bottom of the dipper rod. Wipe the rod before taking the reading of the level, which should only be taken after the engine has been standing and the car is on level ground.

Pressure Gauge

The oil pressure gauge provides an indication that the oiling system is working correctly and it should be observed at frequent intervals while the engine is running at normal speed. Should the gauge fail to register a normal pressure, it may be due to lack of oil in the crankcase. If no pressure is recorded although oil is present, stop the engine immediately and look for a broken pipe or other cause. The gauge can be detached from the instrument panel for testing purposes.

When the engine is started in cold weather the oil pressure may rise to a high figure.

The normal oil pressure during ordinary running should be about 30 lbs. per sq. in., with a proportionately lower pressure when idling.

Never run the engine if the oil gauge does not register any pressure, or serious damage to the engine might result.

Circulation

The oil circulation is clearly shown in Figure 1. Starting at the gauze strainer and pick-up in the sump, oil is drawn into the pump, which has a spring-loaded release valve overflowing back into the sump. The main oil delivery is along the oil gallery which runs the length of the engine on the right-hand side. From this main oil gallery, oil is delivered to the main bearings and through drilled passages in the crankshaft to the big end bearings; there are also passages in the block to the three camshaft bearings.

Separate lubrication for the cylinder bores and tappets is carried out by a small jet hole in the top half of each connecting rod big-end bearing.

There is a large intermittent feed of oil from the camshaft front bearing directed, by metal pressings riveted to the cam gear, to the camshaft sprocket and timing chain.

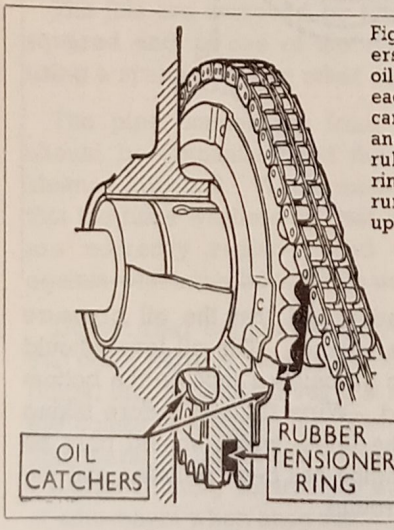


Fig. 2. Oil catchers feed a flow of oil to the chain on each side of the camshaft sprocket, and a synthetic rubber tensioner ring ensures quiet running and takes up slack in the chain.

Check for Pressure Loss

First check the oil level in the sump using the dipstick. If the oil level is well up, check the oil gauge pipe from the crankcase to the instrument panel for fracture or leak.

If the pipe is in order, remove the sump and examine the gauze filter; this may be clogged. Also remove the release valve and the spring, inspecting for foreign matter.

If these tests fail to show the cause of the loss of pressure or oil circulation, the crankshaft and other bearings will have to be closely examined and stripped down if necessary.

Remove the Oil Sump

First drain off the oil by taking out the drain plug fitted to the rear of the sump.

The sump is secured in position with 18 set-screws, washers and spring washers. Support the sump while removing these screws, and then carefully lower it clear of the oil pump gauze strainer.

Remove the sump joint washer; if this is broken it will have to be replaced by a new one on reassembly.

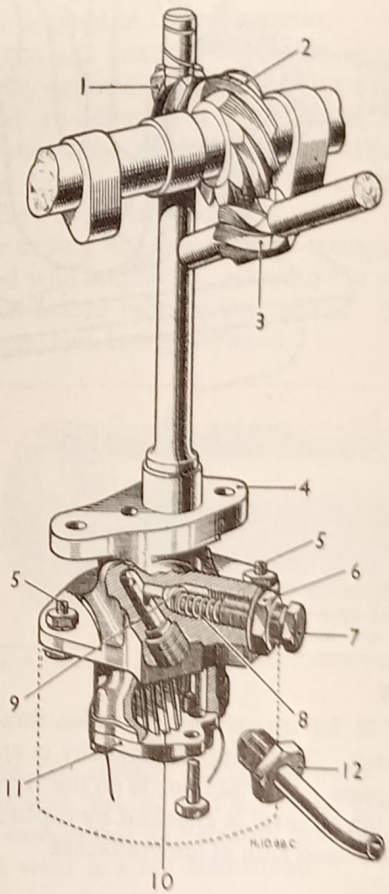


Fig. 3. A general arrangement of the oil pump and drive, showing :—
1 Pump spindle driving gear.
2 Camshaft gear.
3 Ignition distributor gear.
4 Oil pump body.
5 Gauze strainer retaining screws.
6 Release valve locknut and lock washer.
7 Release valve retaining bolt.
8 Release valve spring.
9 Release valve.
10 Pump gears.
11 Bottom cover.
12 Gland nut and delivery pipe.

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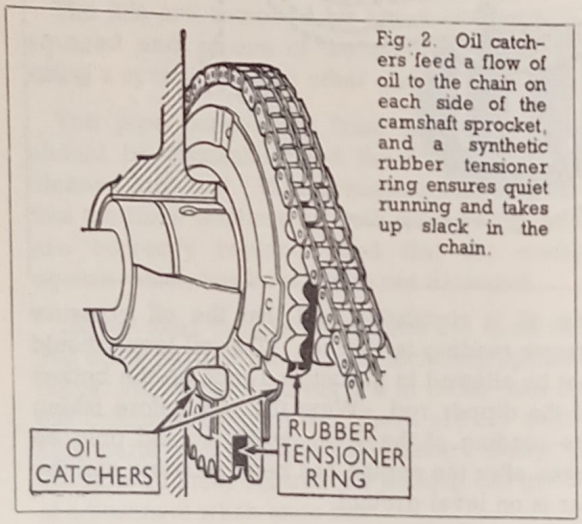

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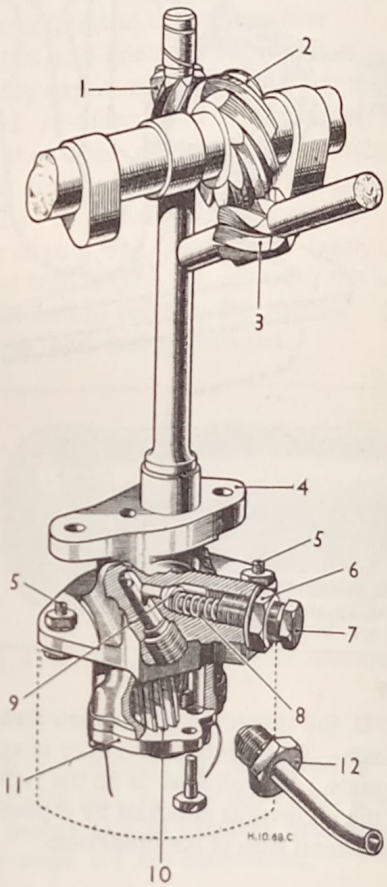

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11 Bottom cover.
12 Gland nut and delivery pipe.

The Gauze Strainer and Pickup

The oil strainer is attached to the pump body by two bolts through the flange. The filter has to be detached for cleaning.

The Oil Pump

To remove the pump, first take away the main oil feed pipe to the crankcase, and take off the two nuts holding the top flange to the crankcase. The pump can then be lowered from the engine, complete with the driving shaft and the camshaft meshing gear.

To dismantle the pump, remove the four bolts in the bottom cover; the gears will then be accessible. The driving gear is keyed to the driving shaft, but it will slide out. Tap out the driving shaft after extracting the gear and inspect the key and keyway.

After the reassembly of the bottom cover, ensure that all four setscrews are wired together for security.

The Release Valve

The release valve lock-nut is secured with a tab washer. After dismantling and cleaning, the valve should be finally adjusted on test.

The valve has a conical seating on its spring-loaded plunger.

ENGINE ASSEMBLY

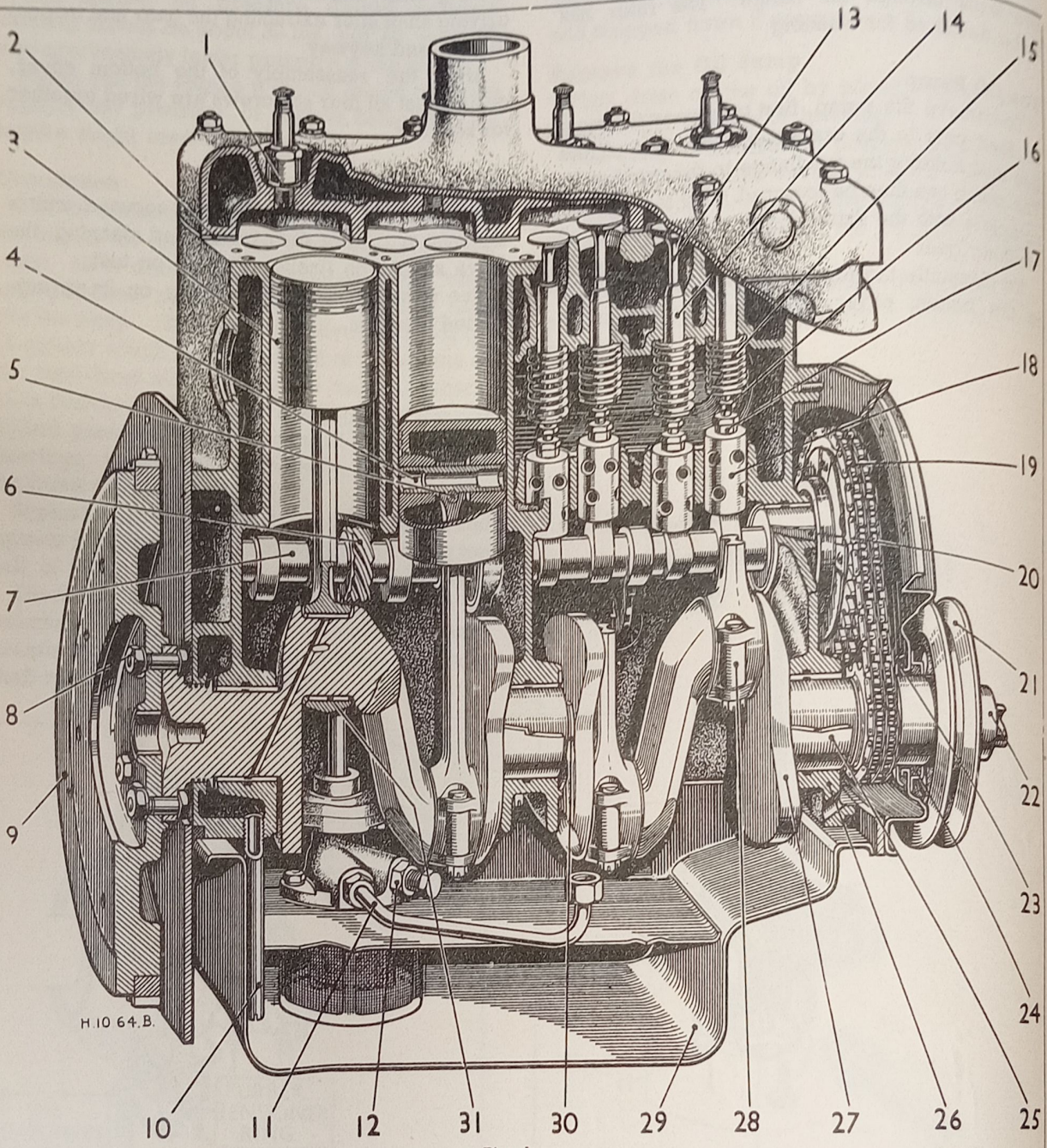


Fig. 1.

1. Sparking Plug Washer.
2. Cylinder Head Joint Washer.
3. Piston.
4. Gudgeon Pin.
5. Gudgeon Pin Clamping Bolt.
6. Drive Gear for oil pump and ignition timing.
7. Camshaft.
8. Flywheel Flange Bolt.
9. Flywheel.
10. Oil Return Pipe to sump.
11. Oil Pump Delivery Pipe.
12. Oil Pressure Valve Lock Nut.
13. Valve Stem.
14. Valve Guide.
15. Valve Spring.
16. Tappet Adjustment Screw.
17. Flat to accommodate locking plate.
18. Barrel Tappet.
19. Camshaft Timing Chain.
20. Camshaft Front Bearing.
21. Crankshaft Pulley.
22. Starting Handle Dog and Nut.
23. Oil Thrower.
24. Felt Oil Retainer.
25. Crankshaft Front Bearing.
26. Bearing Cap.
27. Crankshaft.
28. Connecting Rod Big End.
29. Oil Sump.
30. Crankshaft Thrust Washers.
31. Big End Bearing.

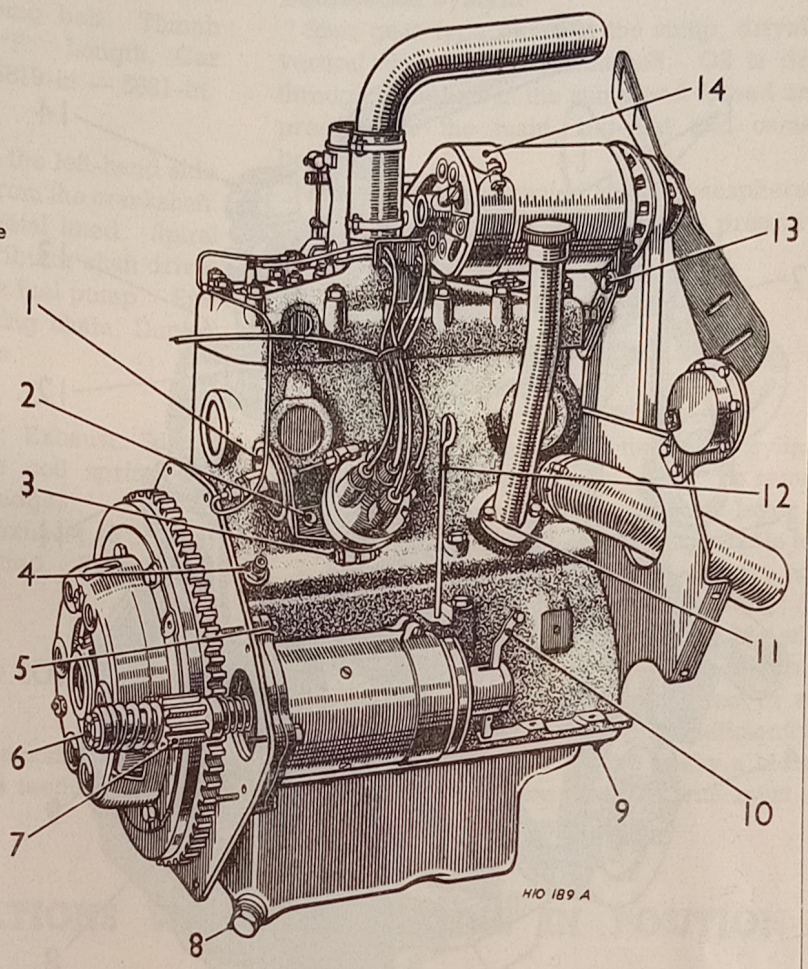


Fig. 2. The right-hand side of the power unit showing :—

1 Vacuum timing control.
2 Distributor clip securing screw.
3 Distributor clamp bolt.
4 Oil gauge pipe union.
5 Starter motor bolts.
6 Starter motor shaft nut.
7 Starter pinion and sleeve.
8 Oil sump drain plug.
9 Oil sump studs.
10 Starter motor switch lever
11 Oil filler tube flange screws.
12 Oil level dipstick.
13 Dynamo adjusting bolt.
14 Dynamo commutator cover.

ENGINE RECOMMENDED CLEARANCES AND GENERAL DATA

Main Journal Clearance	.000¾—.002
Crankpin and Big End Clearance	.000¼—.001½-in.
Gudgeon Pin to Piston Clearance	Thumb fit at 70°F.
Camshaft and Bearing Clearance	.001—.002-in.
Crankshaft End Clearance or Float	.002—.003-in.
Thrust	Taken by washers on centre main bearing.
Side Clearance, Connecting Rod and Crankshaft ...	.008—.012-in.
Diameter of Crankshaft Journals	1.875—1.875½-in.
Diameter of Crankpins	1.750—1.750½-in.
Valve Tappet Clearance	.012-in. with engine cold.
Piston Fit	.009-in. at top land; .0032 to .0038-in. at skirt.
Piston Ring Gap	.006-in. to .010-in.

Re-grinding Sizes

Undersize Bearings	Crankpins.		Journals.	
	Minimum.	Maximum.	Minimum.	Maximum.
.020-in.	1.730-in.	1.730½-in.	1.855-in.	1.855½-in.
.040-in.	1.710-in.	1.710½-in.	1.835-in.	1.835½-in.

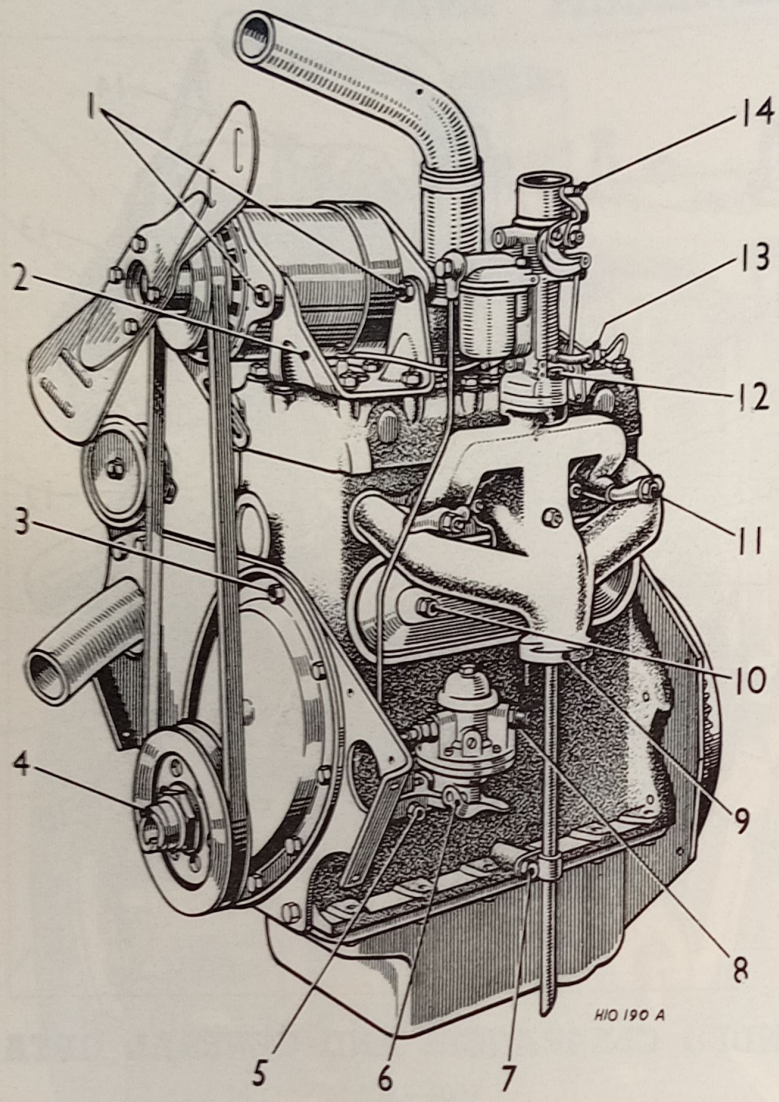


Fig. 3.

The left-hand side of the power unit showing :—

1 Dynamo mounting bolts.
2 Dynamo bracket mounting.
3 Front cover screws.
4 Starting handle dog.
5 Petrol pump mounting stud.
6 Petrol pump priming lever.
7 Breather pipe clip.
8 Petrol pump inlet union.
9 Exhaust pipe flange.
10 Valve cover screws.
11 Manifold studs.
12 Carburetter flange nuts.
13 Vacuum control pipe union.
14 Carburetter choke lever.

Cylinders and Crankcase

Cast Iron Monobloc, crankcase integral with cylinder block. Pressed steel sump. Cylinder bore diameter, **Car** 2.4995-in. +.001-in. or — .0005-in.; **Van** 2.620-in. Max. permissible re-bore, diameter + $\frac{1}{16}$-in.

Cylinder Head

Cast iron, secured by 17 H.T. $\frac{3}{8}$-in. steel studs. Copper and Hard Clay Board joint washer.

Crankshaft

Steel stamping, 3 bearings.

Main Bearings

Steel shells, white metal lined. Retained by feathered projections.

Thrust washers each side of centre bearing, for end thrust.

Connecting Rods

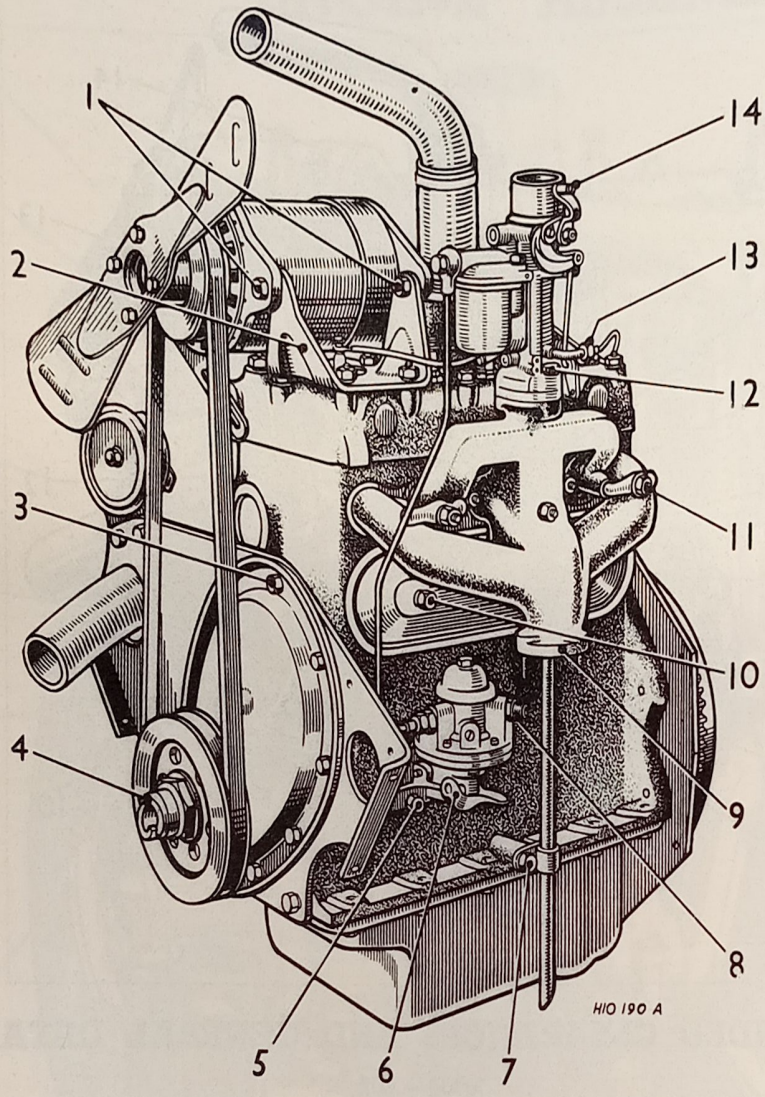
Steel stamping "H" section, Detachable bearings. Caps secured by two H.T. steel bolts, with heads recessed for locating dowel pin. Small end fitted with clamping bolt securing the gudgeon pin.

Pistons

Pistons, aluminium alloy, solid skirt. Lower ring groove drilled for oil return. Also supplied in oversizes of + $\frac{1}{32}$-in. and + $\frac{1}{16}$-in.

Rings

Two compression, one oil control, all above gudgeon pin. Groove widths : Compression, .0950-.0955-in. Oil Control, .1577-.1582-ins. Groove clearance : Compression, .0012-in.-.0027-in.; Oil, .0015-in.-.0030-in.



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Gudgeon Pin

Tubular grooved for clamping bolt. Thumb push fit in piston boss at 70°F. Length, **Car** 2 5/16-in.; **Van** 2 11/16in., diameter .5619-in.—.5621-in.

Camshaft

One piece stamping fitted in the left-hand side of the crankcase, chain driven from the crankshaft. Three bearings, steel white metal lined. Spiral gear for the oil pump and distributor shaft drive. Eccentric cam for operating the fuel pump. End float, .002-in. to .008-in. Timing chain, Duplex roller, .375-in. pitch, 54 pitches.

Valves

Inlet, Silicon Chrome Steel; Exhaust, Silicon Chrome or X.B. Steel; Single coil spring retained by cup and split cone wedges.

Valve seat angle, inlet and exhaust 45°. Seat width, .06-in. Valve guides fitted. Stem clearance, .002½—.003¾-in.

Valve Timing

Inlet—Opens 10° before T.D.C.

Flywheel

11 5/16-in. dia., bolted to the crankshaft flange.

Starter ring, A.S. 17 steel, 94 teeth, shrunk on the flywheel.

Lubrication System

Spur gear type pump in the sump, driven by vertical shaft from the camshaft. Oil is drawn through a strainer in the sump and forced under pressure to the main, big-end and camshaft bearings.

The crankcase is vented to the atmosphere via the tappet side cover. The normal pressure is 30/40 lbs. per sq. in.

Oil Pressure Gauge

Smith's pressure gauge, type X.53483.

Expansion Plugs (or Welch Plugs)

Four expansion plugs are fitted in the cylinder block and four in the cylinder head. To remove a plug, drill a hole in the centre and lever out the plug with a screwdriver or other suitable tool.

It is usual in fitting a new plug to coat the edge with a jointing compound before inserting; (the "bulge" must of course be on the outside when a plug is put in position). A carefully aimed blow at the centre with a small hammer direct or with a blunt punch will expand the plug sufficiently to make a water-tight joint. If too heavy a blow is used the plug will be useless and must be replaced by another new one.

SERVICE OPERATIONS WITH THE ENGINE IN POSITION

To Remove the Cylinder Head

First drain the radiator.

Detach the air cleaner by releasing the clip at the carburetter intake.

Remove the dynamo leads from the two terminals at the rear, and then remove the dynamo complete by releasing the adjusting bolts illustrated on page B/1.

Remove the carburetter after releasing the throttle link, petrol pipe, vacuum ignition pipe union and the choke cable.

Disconnect the H.T. leads from the sparking plugs, and detach the top water connection.

Remove the cylinder head nuts, take away the dynamo bracket, and then lift off the head.

The head joint washer should then be examined for damage, such as burning between the cylinder bores or other defects. If faulty it will need to be replaced by a new one when reassembling.

Decarbonizing

Carbon deposit should be removed by carefully scraping with a suitable tool, care being taken not to damage the piston crowns and cylinder head, and not to allow dirt to enter the cylinder bores, water passages, or the valve chambers.

When cleaning the top of a piston, do not scrape right to the edge, as a little carbon left on the chamfered edge assists in keeping down oil consumption; with the pistons cleaned right to the edge, or with new pistons, oil consumption is often slightly, though temporarily, increased.

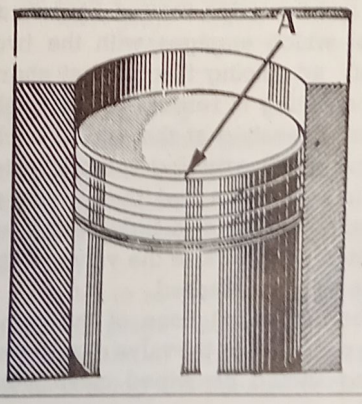


Fig. 4.
"A" shows the chamfered edge of a piston on which a ring of carbon may be left.

Bonnet Side

In order to gain access to the valves (on left-hand side of the engine) it is necessary first to remove the bonnet side, which is held by one bolt at the radiator cowl and one into the scuttle.

Manifold

The exhaust and inlet manifold will need to be removed. This casting is held in position by five nuts; remove these, together with three nuts on the exhaust pipe flange.

Carefully remove the manifold joint washer, which may be in a condition to be used again. When refitting the manifolds ensure that good joints are made.

Valve Cover

The valve cover is held in position by two set-screws, and the breather pipe attached is secured by a clip to the crankcase. This pipe must be detached at the same time as the valve cover.

Valve Grinding

Before grinding-in the valves each valve spring must be compressed to allow the split cotters and the cotter cup to be removed. Also slacken back the tappet adjustment to ensure there is sufficient clearance for grinding. The valve is then free to be rotated on its seat.

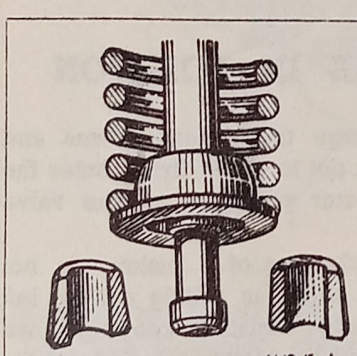
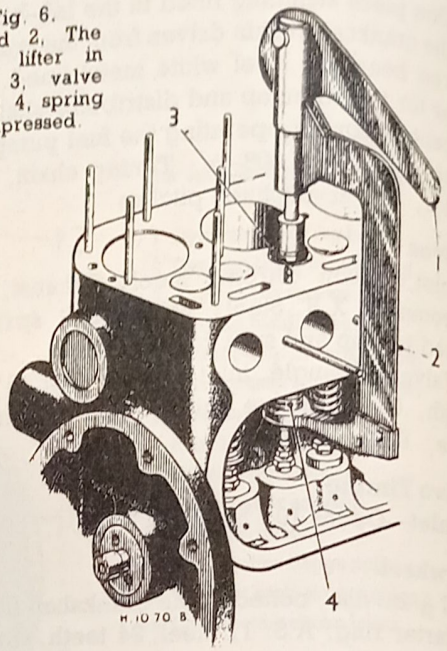


Fig. 5.
The split cotters.

After the valve has been cleaned, a little grinding compound should be smeared evenly on the valve face and the valve rotated by means of a pegged tool which engages with the two holes in the head, advancing it a step at short intervals, until the pitting is removed. Lift each valve a little from its seating at the end of each step to allow some of the grinding compound to enter between the two faces and thus facilitate the cutting action. The use of a light spring as illustrated will automatically raise the valve off its seat when the pressure is released.

Care should be taken that none of the compound enters the cylinders or the valve chambers. The valve seating should be wiped clean after this operation. It is essential for each valve to be ground-in and refitted on its own seating as indicated by the number on the valve head. The valves are numbered from 1 to 8 starting from the front.

Fig. 6.
1 and 2, The valve lifter in use; 3, valve head; 4, spring compressed.



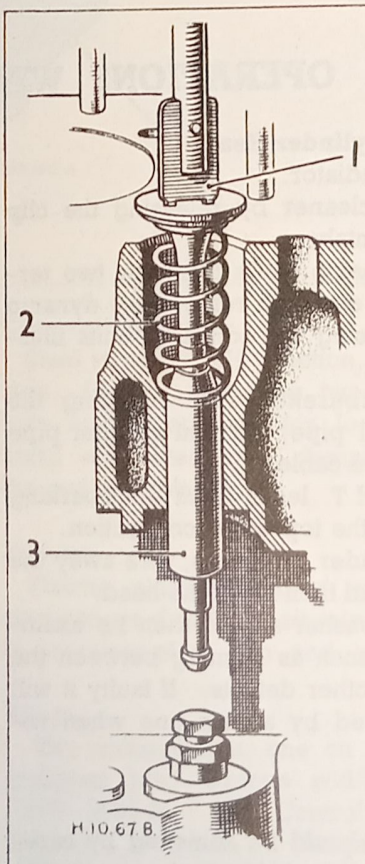


Fig. 7.

The pegged tool (1) is supplied in the tool kit.

2, Light spring to lift valve off seat (for use during valve grinding operation only.

3, Valve guide. It will be noted that the tappet has been screwed well down to clear valve during the grinding operation.

It is also desirable to clean the valve guides. This can be done by dipping the valve stem in petrol or paraffin and moving it up and down and round in the guide until it is free. The valve should be wiped, the stem smeared with graphite grease and then reinserted in the guide, the valve spring, cup and cotters being fitted round it.

Adjust the tappets to .012-in. with the engine cold, and replace the valve cover and the breather pipe.

The Cylinder Head Joint Washer

The joint washer should be replaced with the beaded edge facing down, a little grease being smeared over each side to make a good joint and to prevent sticking when the head is next lifted.

Cylinder Head Nuts

When replacing the head take care to tighten the nuts evenly, commencing at the centre and working to the outside. Do not tighten any nut right home while others are loose, and make sure that the centre nuts are tight first.

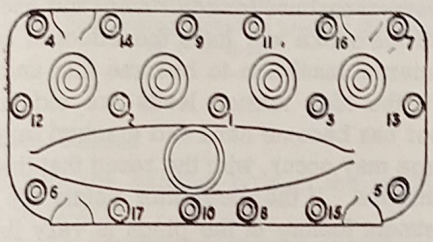


Fig. 8. Tighten cylinder head nuts from the centre and work outwards.

Cylinder head nuts need to be checked again when the engine has been run to ensure that the joint washer is properly bedded down.

Reassembly

Replace the dynamo and the flex leads (the terminals are of special size to ensure correct replacement). Adjust the fan belt and refit the manifold, air cleaner and plug leads.

Connect up the top water hose and refill the radiator.

Tappet Adjustment

The adjustment must be made or checked with the engine cold. To make this adjustment, remove the valve cover and have the engine slowly turned with the starting handle. Watch each valve open in turn and note the point at which it closes again.

From that point until the valve begins to lift again there should be between the valve stem and the tappet a clearance of .012-in. If the clearance is other than this it can be adjusted by loosening the locknut and raising or lowering the adjusting screw. Care must be taken to tighten the locknut when this adjustment is completed.

On replacing the valve cover take care in fitting the joint washer; renew washer if it is damaged.

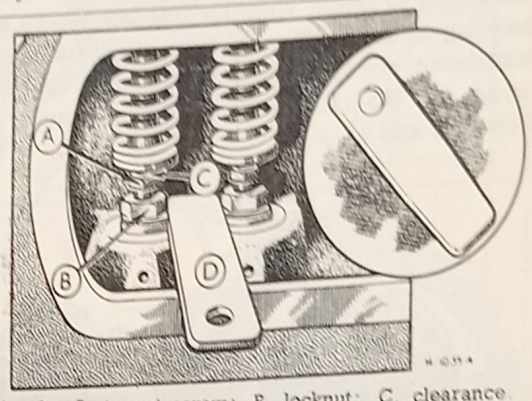


Fig. 9. A, tappet screw; B locknut; C, clearance. D, locking plate to keep tappet from turning while adjusting.

Check the tappet adjustment again after the vehicle has run about 100 miles as the valves have a tendency to "bed down"

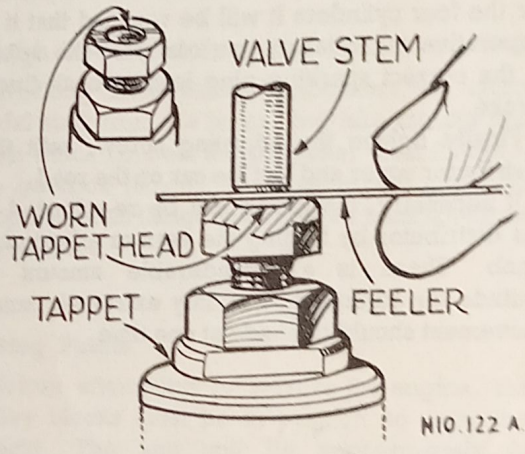


Fig. 10. This illustration shows how a worn tappet head can allow a greater clearance than is shown by the use of a feeler gauge. Always check the tappet head for wear and renew if necessary.

Ignition Timing

As it is essential that a spark should occur at the plug points as each piston reaches the top of its compression stroke, re-timing after dismantling needs care but should present no difficulty.

In order to re-set the ignition timing remove all sparking plugs except No. 1 and, using the starting handle, turn the crankshaft until No. 1 piston is at top dead centre before a firing stroke.

The compression felt at the handle will denote the correct stroke. Top dead centre of No. 1 piston is marked on the flywheel (1/4), which can be seen after removing the clutch inspection cover. Remove the distributor cover, slacken the screw in the clip of the distributor casing and turn the casing until the contact breaker points just begin to open, with the rotating centre arm pointing to the position of No. 1 electrode in the distributor cover. The spark is then correctly timed for No. 1 cylinder, and of course for Nos. 2, 3 and 4.

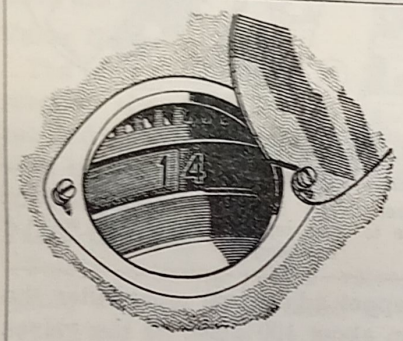


Fig. 11. The flywheel timing mark can be seen on removing the inspection plate on the clutch casing

As the distributor cover carries the electrodes for the four cylinders it will be realised that it is imperative the rotating arm can pass the spark to the correct sparking plug lead at each firing stroke.

Finally tighten the adjusting screw, refit the distributor cover and test the car on the road.

If necessary, the timing can be re-adjusted at the distributor by turning the vernier adjustment knob. There is a considerable amount of latitude for adjustment but only extremely small movement should be made at one time.

If the leads from the distributor to the sparking plugs have been disconnected they must be replaced in the firing sequence 1, 3, 4, 2.

Sparking Plugs

The sparking plugs fitted are the Lodge C.N. Champion L.10, or alternatively, K.L.G. F50X.

The gaps of these plugs should be maintained between .017-in. and .018-in. If the gap is allowed to become too wide, misfiring at high speeds is liable to occur, and if too small, bad slow running and idling will be the results.

The removal or fitting of the plugs is effected with the box spanner provided.

When replacing a sparking plug after cleaning, make sure that the sparking plug washer is not defective in any way, and if it looks flat and worn, fit a new one to be sure of obtaining a gas-tight joint.

When fitting be careful not to damage the top insulation of the plug, for a heavy blow might damage the insulation, and misfiring will occur.

Incorrect carburetter adjustment and excessive use of the choke will have the effect of causing the internal insulation to become foul and dirty, and if the high tension leads are old and the rubber has become hard and cracked, electrical leakage may occur, with the result that the plugs will misfire. If the distributor points are out of adjustment fouling of the plugs is very liable to take place.

It is recommended that plugs be renewed every 10,000 miles, for old plugs are wasteful and give bad and sluggish running.

When replacing the lead on a plug, see that it is securely attached.

TO REMOVE AND REFIT THE ENGINE

For subsequent operations it is advisable to remove the engine and the gearbox unit from the frame. First drain all the oil from the engine and gearbox; also drain the water from the cooling system.

Bonnet

Disconnect the bonnet top hinge and the bonnet sides. (See illustration in Cooling Section, page B/3).

Battery

Disconnect the earth lead from the battery and from the flywheel housing; also the battery lead at the starter motor.

Radiator Block

Remove the water hose connection at the top and the bottom of radiator and then remove the radiator block itself. (See page B/3). This is secured at two points at the bottom and one point at the top. Split pins are used on all nuts. The dynamo must be removed before the radiator can be lifted free. (See page B/1).

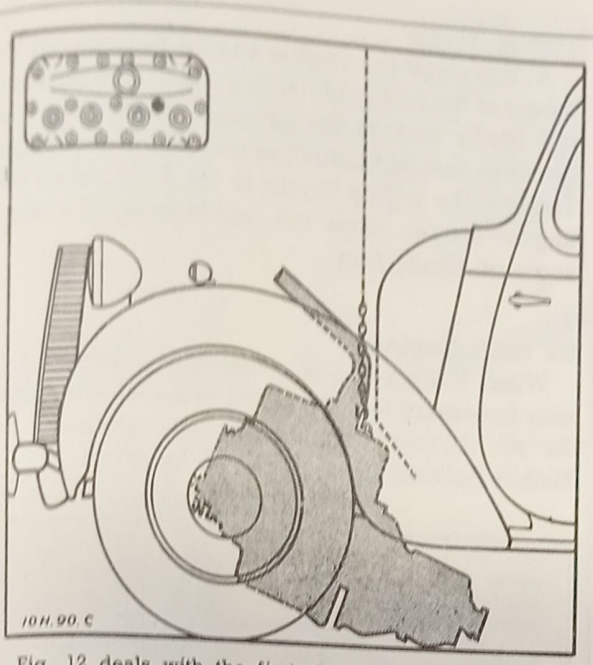


Fig. 12 deals with the first stage of engine removal. First take the weight of the engine, using a clip under the cylinder head nut (indicated solid in the diagram) while the front and rear mountings are disconnected. The unit can then be lowered to the ground behind the front axle. Soft packing should be used for the gearbox to rest upon.

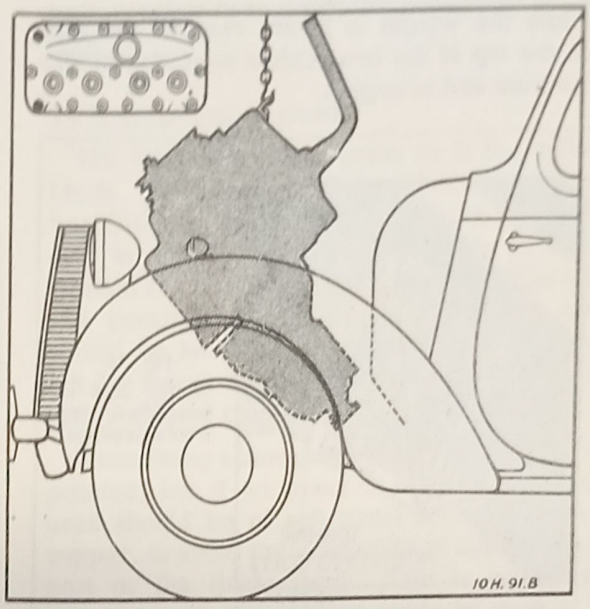


Fig. 13 represents the second stage. The lifting tackle has to be transferred to two clips under cylinder head nuts (indicated solid in the diagram) in order that the unit can be raised at the correct angle to clear the radiator cowl and the scuttle. It will be seen that the gearbox top cover and the gear lever are removed for these operations.

Pipes and Cables

Disconnect the exhaust pipe at the manifold. (See page C/2).

Remove the accelerator linkage at carburetter end together with the choke wire connection. Also disconnect, at the fuel pump end, the delivery pipe from the petrol tank. (See page C/1).

Pull out the starter lever from the front end bracket of the starter motor and then remove the motor itself. It is held to the flywheel housing by three bolts. Also take away the packing plate for the starter, noting the position of the locating dowels for guidance when refitting.

Disconnect the flexible oil pipe from the union at the side of the crankcase.

Disconnect the H.T. lead from the centre of the distributor, and take away the L.T. lead connected to the side of the distributor housing. The two leads to the electric horn should also be released.

Gearbox Top Cover

Remove the rubber cover from the gearbox top, and then take away the gearbox top cover and lever completely, by withdrawing the six small bolts in the top face. Cover the open box with rag to keep out any foreign matter.

Clutch Pedal and Propeller Shaft

Working from below, disconnect the clutch pedal stalk from the lever, and take out the four bolts which connect the propeller shaft flange to the gearbox flange; the splines will allow the propeller shaft flange to be moved back free from the gearbox.

Lifting Points

Before attempting to remove the engine, the pulley blocks must be in position to take the weight. The unit will be approximately in balance if the weight is taken from a bracket mounted on the cylinder head where shown in Fig. 12. (If the head is not in position it should be temporarily replaced without the joint washer and secured by the nuts).

Figs. 12 and 13 include diagrams of the cylinder head. The best nut under which to fit the bracket for correct balance during the lowering operation, and the nuts to use for actual lifting, are shown.

Close reference should be made to these details in order that the removal of the engine may be carried out in the most convenient way and in a manner least likely to cause damage.

Front Engine Mountings

While the weight is taken, remove the nuts from the top of the two rubber mounting blocks at the front end of engine.

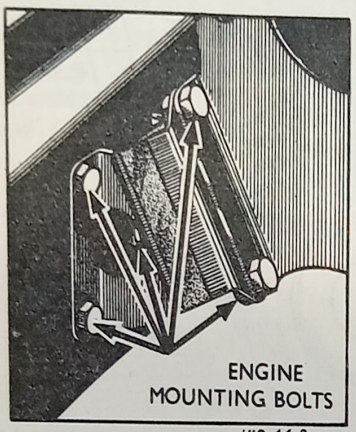


Fig. 14. Shown here is one of the engine front mountings.

There is a live rubber mounting at each side of the engine. The rubber is held between two plates which are bolted to the frame and the engine front plate.

Rear Engine Mountings

To disconnect the rear mounting point (below the gearbox), take out the bolts through each end of the gearbox mounting cross member. When this member is free, disconnect it from the gearbox itself by removing the two nuts to the central rubber mounting block. Unless this cross member is removed there will be difficulty in bringing the unit through the front of the frame.

Lifting Angle

At this stage the engine should be lowered by means of the pulley block and chain; the gearbox will finally rest on the ground. Bring it to rest gently or the rear mounting may receive damage. Transfer the pulley blocks to the front, when the engine can be lifted out, maintaining the same angle till finally free.

To Refit Engine

When the engine is eventually refitted, it is only necessary to reverse the removal sequence. As no difficulty should be experienced, no further detailed description will be given.

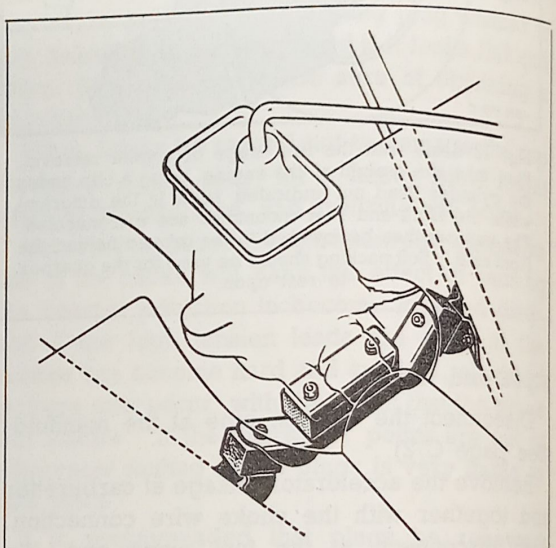


Fig. 15. The rear mounting, showing engine unit flexibly supported on a floating cross-member.

OPERATIONS WITH THE ENGINE REMOVED

The following operations should be carried out with the engine removed, although in some cases it is possible to perform them with the engine in position.

Before removing or replacing any component it is important to ensure that all surrounding surfaces are perfectly clean to prevent the entry of foreign matter into any vital parts. This can best be accomplished by the use of a paraffin bath and a brush, and it is also important to note that fluffy rags should never be used as there is a danger of causing obstruction to small oil ways.

Valve Guides

The inlet and exhaust valve guides are each of a different design. While the inlet guide is of orthodox construction, the exhaust is longer and the top portion is of greater internal diameter than the lower portion. This has been introduced to alleviate the corrosive effects of leaded fuels on the valve stem. In effect this extension forms a shroud for the upper portion of the exhaust valve stem protecting it from excessive heat and carbon deposit.

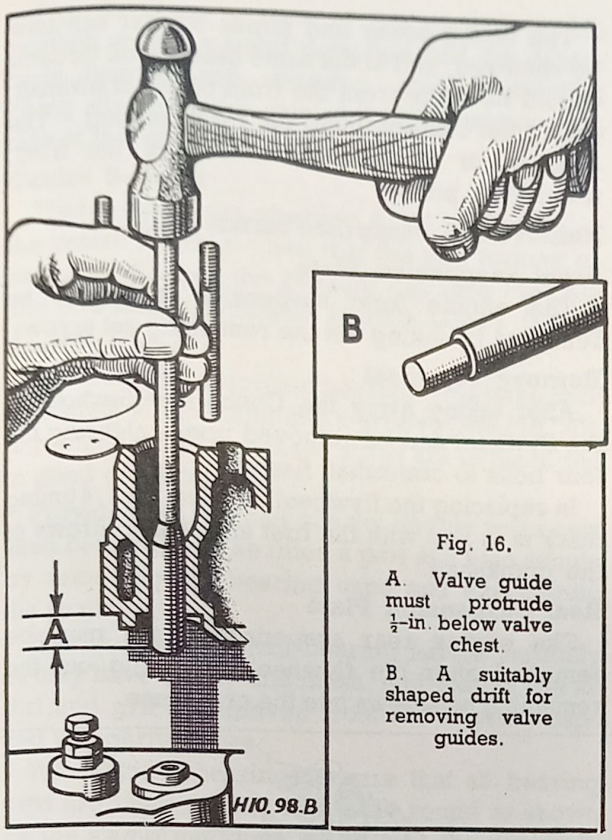


Fig. 16.

A. Valve guide must protrude ½-in. below valve chest.

B. A suitably shaped drift for removing valve guides.

Valve guides should be tested for wear whenever valves are removed, and if excessive side play is present, a close check should be made of the valve stem and the guide. In the event of wear being noticeable, the defective component should be renewed. If a valve is at fault the wear will usually be evident on the stem, but it should be borne in mind that the valve and stem should be a running fit to avoid the possibility of an air leak.

To Renew Valve Guide

The valve guide is a press fit in the cylinder block. After removal of the valve the guide may be driven out with a drift as shown in Fig. 16; the drift is shown "stepped" in order to ensure location and obviate the drift slipping off the guide and possibly damaging the port. The guide should be knocked out in the direction shown, but the tappet screw must first be withdrawn to give sufficient clearance.

When fitting a new guide it may be pressed into position, but if no press is available, the drift used should be of soft metal such as brass or copper, to avoid the possibility of damage to the port or the guide itself. This is particularly important with the exhaust guide in view of the shrouded design, which is more liable to damage if not carefully handled.

A new guide should be inserted in the same direction—that is, through the valve seating. The final correct position of the guide is as shown in Fig. 16, the guide should stand ½-in. clear.

Renewing Valve Spring

It is always advisable to remove the cylinder head to renew a valve spring. It takes less time than attempting to hold a valve through a plug aperture while a spring is placed in position.

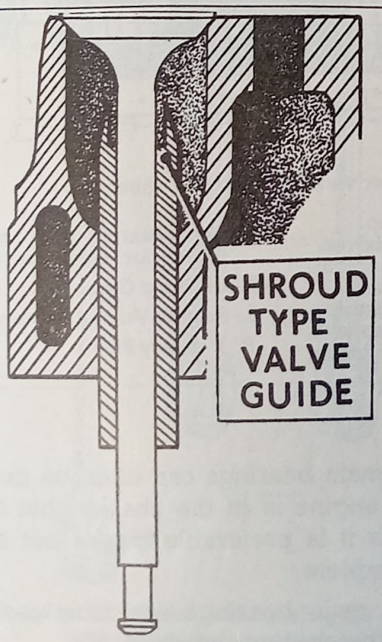
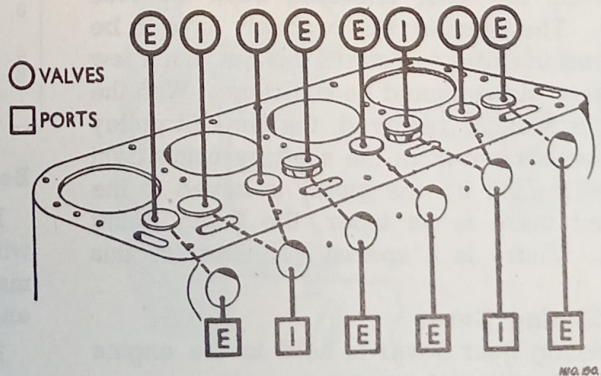


Fig. 17. The illustration on the left shows an exhaust valve guide with shrouded extension to protect the valve stem from extreme heat. Care is required when fitting a guide of this type as it is easily damaged by the drift.

Fig. 18. Below is a diagram showing the relative position of exhaust and inlet valves together with their connecting ports.



To Remove a Tappet

A tappet may be withdrawn after removal of the valve, valve spring and cotters, as already described for valve grinding. It is also necessary to remove the tappet adjusting screw and locknut in order to clear the guide. The tappet can normally be withdrawn with the fingers, but should there be any tightness, a piece of rod screwed to take the place of the adjusting screw, can be inserted as shown in Fig. 19, enabling the tappet to be more readily handled.

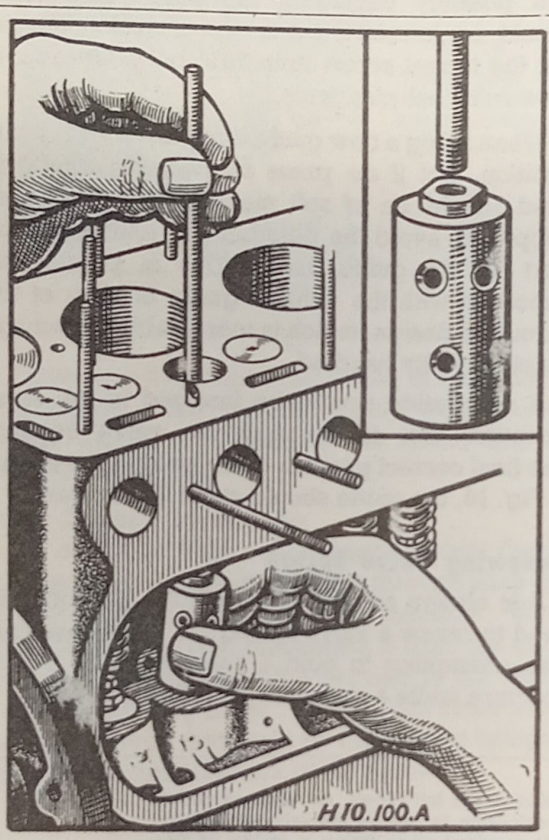


Fig. 19. Showing a tappet being lifted out with the aid of a length of screwed rod.

Starting Nut and Fan Driving Pulley

For access to the valve timing gear, unscrew the starting nut after knocking back the lock washer. The spanner will probably have to be hammered in order to "start" this nut, but a few fairly sharp blows should be sufficient. With the nut and its washer removed, the fan belt pulley can be withdrawn from the shaft by using light leverage behind it; the pulley is keyed to the shaft, but there is no taper, the fitting being parallel. There is a special extractor for this pulley.

Valve Timing Cover

The timing gear cover is held to the engine front plate by nine set-screws.

The timing cover and paper washer can now be removed, and at the same time the oil thrower should be taken from the front of the crankshaft, noting the correct fitting for reassembling. The concave or hollow side must face the front, toward the pulley.

Remove Oil Sump (See Section D/2).

Front Suspension Plate

The engine front suspension plate can be removed by taking out the remaining set screws.

Remove Flywheel

After taking away the Clutch (see Section G), the flywheel can be removed upon releasing the four bolts to crankshaft flange.

In replacing the flywheel, see that the 1/4 timing mark is in line with the first and fourth throws of the crankshaft.

Rear Suspension Plate

The engine rear suspension plate may be removed after the flywheel by taking out the remaining setscrews into the crankcase.

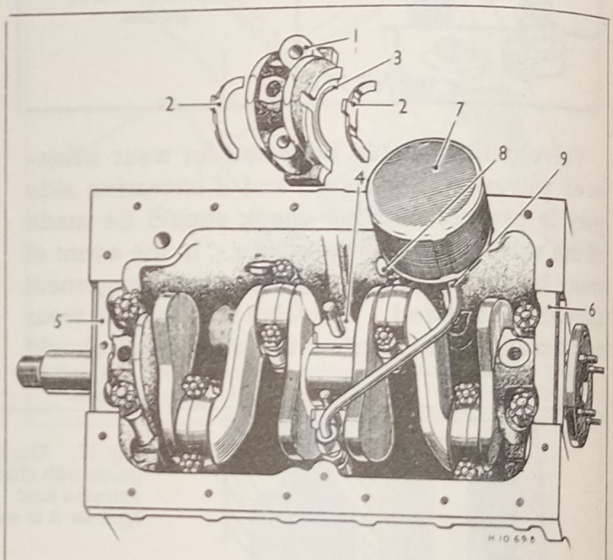


Fig. 20. An under view of the engine, showing :—

1. Main Bearing Cap.
2. Thrust Washer Halves.
3. Groove in cap to accommodate washer.
4. Centre Bearing Housing.
5. Front Bearing Cap with recess for cork insert.
6. Rear Bearing Cap with recess for cork insert.
7. Oil Pump Gauze.
8. Release Valve Assembly.
9. Delivery Pipe.

Bearings

Big end and main bearings can often be dealt with while the engine is in the chassis, but for major overhauls it is preferable to take out the engine unit complete.

Big end and main bearings are most easily serviced with the engine inverted.

Fig. 20 gives a view of the engine in this position with the sump detached and the centre main bearing cap removed, special attention being drawn to the pair of thrust washers each side of this cap.

Centre Bearing

There are thrust washers fitted each side of the centre bearing. See that the peg formed on each pair fits into the bearing cap (see Fig. 20). The end float permissible is from .002 to .003-in.

Bearing Caps

The front and rear main bearing caps have cork oil sealing strips fitting into a groove (see Fig. 20). In rebuilding see that these strips are in place and in good condition.

Provided the journals are not unduly worn new shell bearings can be fitted a pair at a time simply by removing the bearing caps and exchanging the shells.

Handle the new shell bearing halves carefully as they have a very fine finish, and ensure that all dirt and grit is removed from the bearing caps and the journal faces.

When fitting bearings ensure that all bearing caps are replaced the right way round as shown by the stamp markings which face the camshaft. See that connecting rod caps are retained for the same connecting rods, and that they are refitted the same way round as found.

The crankshaft is counterbalanced.

Connecting Rods

There is an oil hole in the top half of the big end bearings, and it should be noted that these face **away from** the camshaft side of the engine.

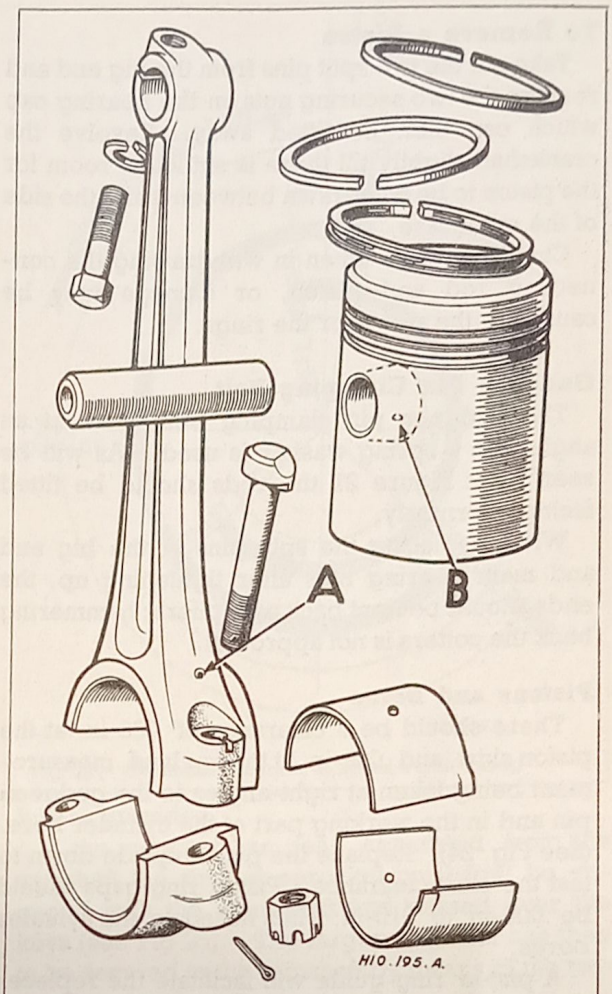


Fig. 23. The main bearings, like those of the big ends, are of the detachable type. See page E/2 for undersize bearings available.

A, big end oil hole; B, gudgeon oil hole.

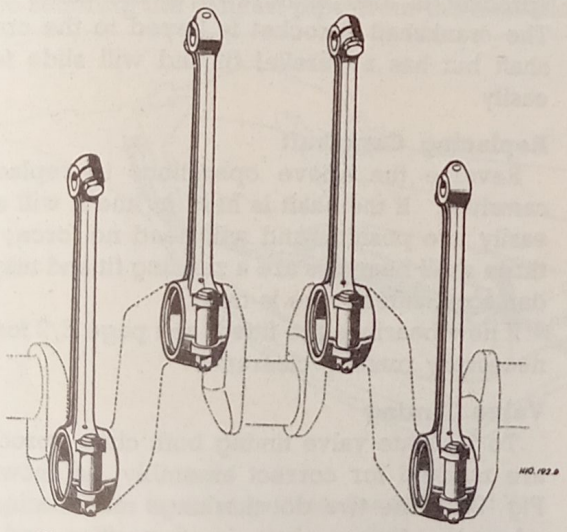


Fig. 21. Order of assembling the connecting rods. Note the alternate positioning of the small ends.

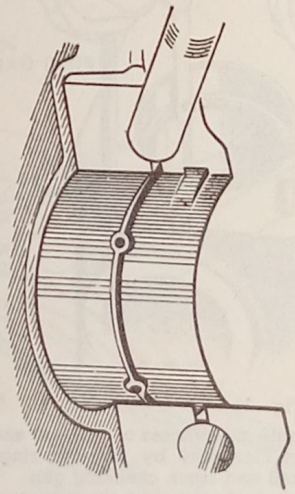


Fig. 22.

A view of the main bearing with the top bearing cap and crankshaft removed to show the oil recess.

To Remove a Piston

Take out the two split pins from the big end and remove the two securing nuts on the bearing cap which can then be lifted away. Revolve the crankshaft slightly till there is sufficient room for the piston to be withdrawn between it and the side of the crankcase.

Care should be taken in withdrawing the connecting rod and piston, or damage may be caused to the piston or the rings.

Gudgeon Pin Clamping Bolt

The gudgeon pin clamping bolt is set at an angle and a spring washer is used. As will be seen from Figure 21 the rods should be fitted facing alternately.

When replacing the split pins in the big end and main bearing nuts after tightening up, the ends should be bent back with pliers; hammering back the cotters is not approved.

Pistons and Bores

There should be a clearance of .003-in. at the piston skirt, and .009-in. at the top land, measurement being taken at right-angles to the gudgeon pin and in the working part of the cylinder bore. (See Fig. 24). Replace the piston upside down to test the skirt clearance. Piston ring gaps should be .006-in. to .010-in. when tested in the cylinder bores.

A piston ring guide will facilitate the replacement of the piston assembly (see Tools List).

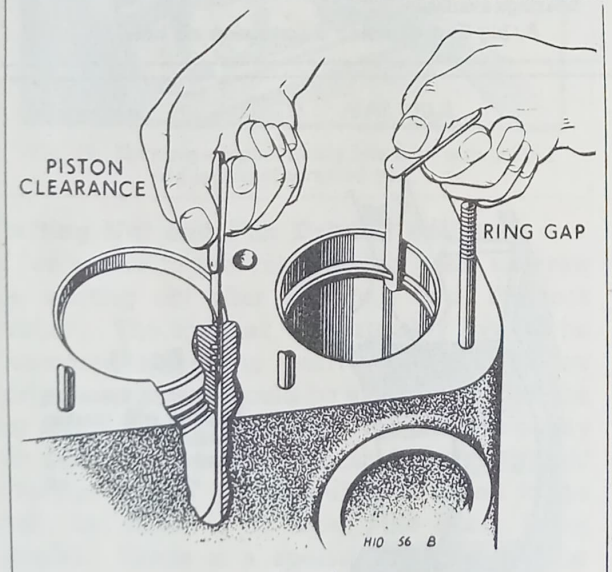


Fig. 24.

Piston and Rings are available in oversizes of + $\frac{1}{32}$-in. and + $\frac{1}{16}$-in. Test for loss of Flexibility by pressing rings outward on to cylinder wall and again checking gap. Replace piston upside down to test skirt clearance.

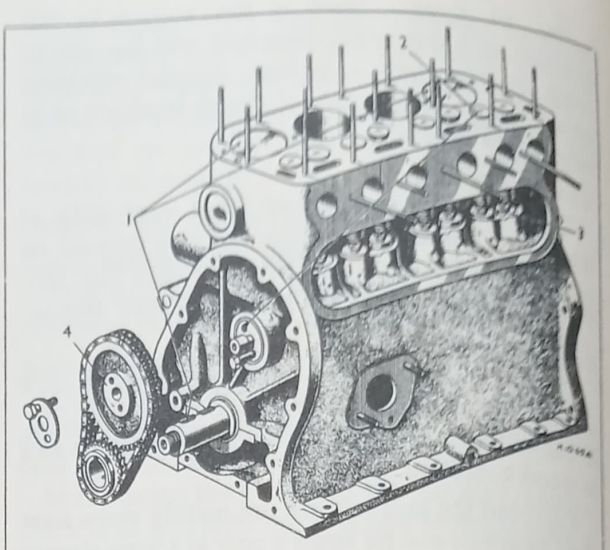


Fig. 23.

1. Pistons 1 and 4 at T.D.C., also showing position of crankshaft keys.
2. Inlet valve about to open, also showing position for camshaft gear bolts.
3. Tappet clearance.
4. Camshaft and crankshaft sprocket correctly in position in chain.

Timing Chain Tensioner

The rubber tensioner ring fitted to the camshaft gear sprocket ensures quiet running by constantly taking up the slack in the timing chain. This ring should not be interfered with in any way.

Withdrawing Camshaft

Remove the tappets as described in page E/11, together with the distributor and fuel pump if these are still in position.

The camshaft, complete with sprocket and chain, can then be withdrawn, providing the crankshaft sprocket is also withdrawn at the same time. The crankshaft sprocket is keyed to the crankshaft but has a parallel fit and will slide fairly easily.

Replacing Camshaft

Reverse the above operations to replace a camshaft. If the shaft is held in line it will slide easily into position and will need no force; the three shell bearings are a running fit and may be damaged unless care is used.

If new bearings are fitted, see page E/2 for the necessary running clearance.

Valve Timing

To facilitate valve timing both chain sprockets are marked for correct assembly, as shown in Fig. 26. The two dot markings must be in line when the timing chain is in position and the sprockets are finally mounted.

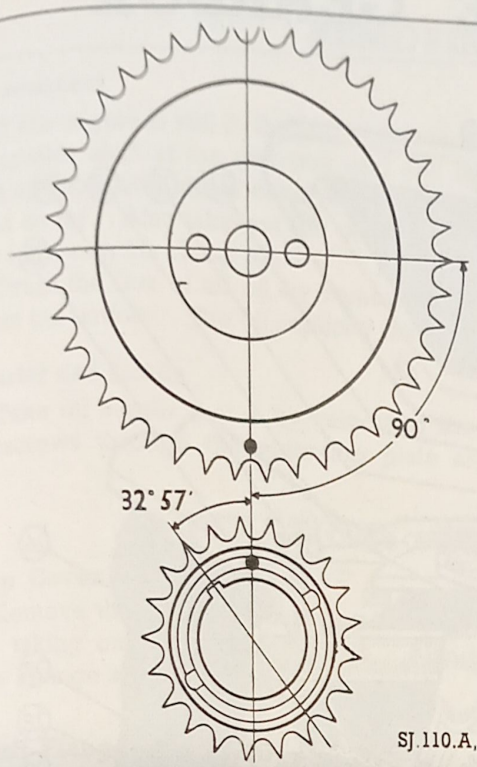


Fig. 26. Valve timing diagram and marks on sprockets.

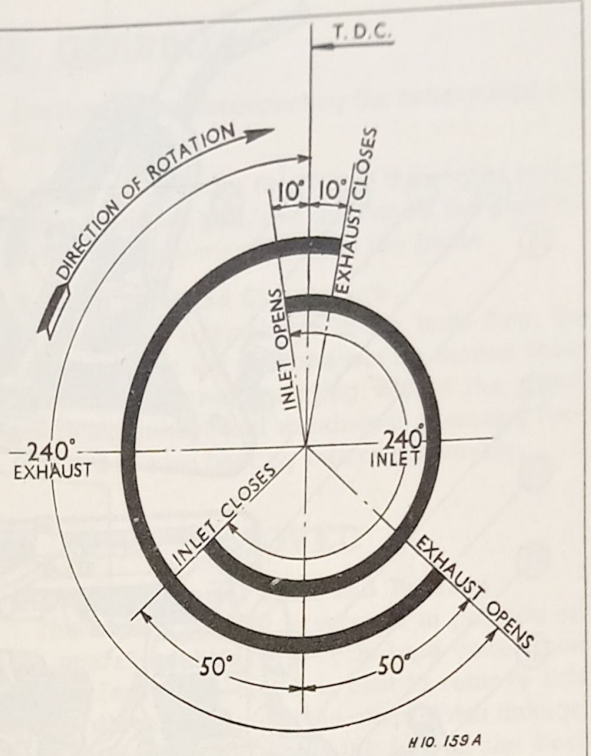


Fig. 27. Technical diagram of actual valve timing

If the camshaft and sprocket have not been separated, the chain can be fitted with the camshaft partly withdrawn from the engine provided no valves or tappets are in position.

Fitting a Timing Chain

The chain must be fitted while both the sprockets are away from the engine as no spring link is provided.

If the sprocket has been separated from the camshaft the smaller sprocket must first be engaged with the crankshaft and passed over the keys (see Fig 25). The larger sprocket has then to be secured to the camshaft by means of the two setscrews and washers

THE EXHAUST SYSTEM

The tail pipe is welded to the silencer. Two clips to the frame carry the silencer, the front clip also securing the exhaust pipe from the manifold on the engine. Check the pipes for obstruction, serious dents or fracture of the silencer as caused by continuous back-firing.

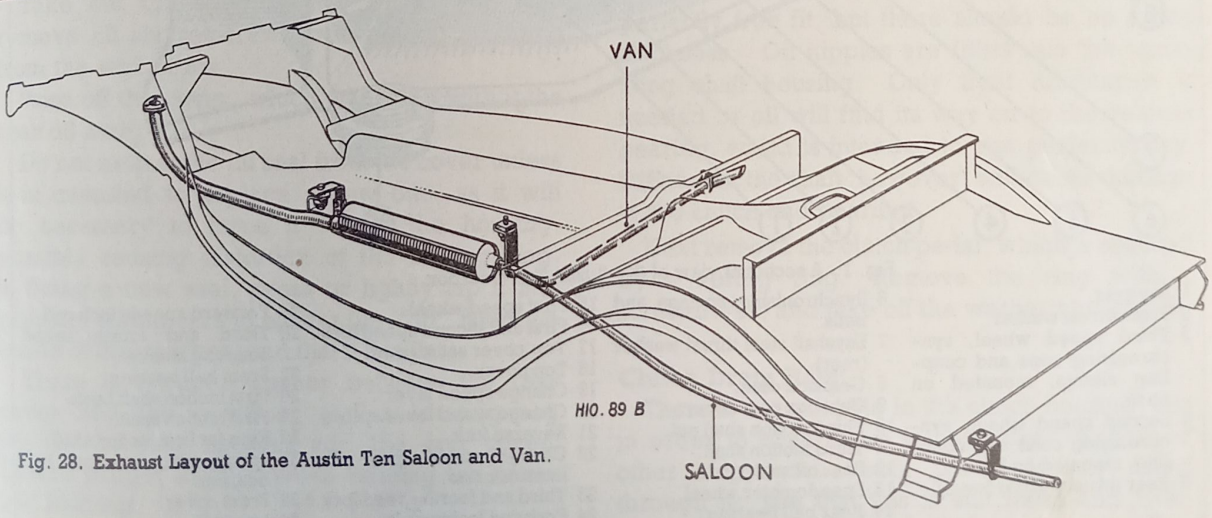


Fig. 28. Exhaust Layout of the Austin Ten Saloon and Van.

THE GEARBOX

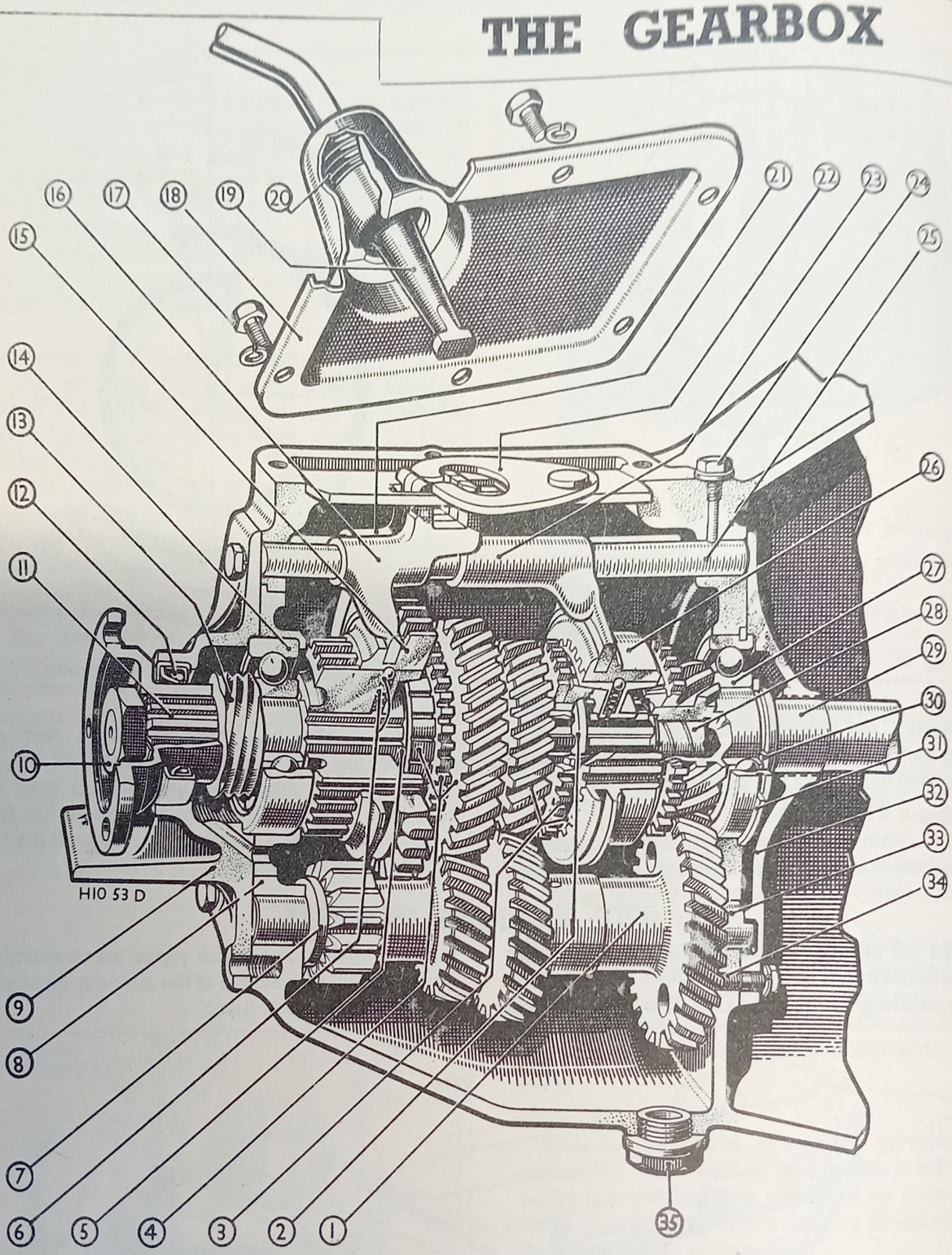


Fig. 1. A sectional view of the Austin Ten Gearbox.

1 Laygear.
2 Front thrust washer.
3 Third speed wheel, synchronising cone and coupling sleeve, mounted on bush.
4 Second speed wheel, synchronising cone and coupling, mounted on bush.
5 Rear thrust washer (steel).
6 Synchronising springs and balls.
7 Layshaft steel thrust washer (rear).
8 Gearbox case.
9 Gearbox rear cover.
10 Third motion shaft nut.
11 Third motion shaft.
12 Rear oil seal.
13 Speedometer wheel.
14 Rear ball bearing.
15 First speed wheel.
16 First and second speed fork.
17 Top cover set screws.
18 Top cover.
19 Change speed lever.
20 Change speed lever spring.
21 Reverse fork.
22 Change speed gate with interlock arm.
23 Third and fourth speed fork.
24 Fork rod locking pin.
25 Forward speeds fork rod.
26 Third and fourth speed coupling sleeve.
27 Front ball bearing.
28 First motion shaft bush.
29 First motion shaft.
30 Ring for first motion shaft.
31 Spring ring for front ball bearing.
32 Front cover.
33 Layshaft.
34 Front cover screw.

REMOVING THE GEARBOX

Disconnect

If the engine is still in the frame disconnect the propeller shaft at the gearbox end and take off the speedometer drive cable at the union in the end cover. Also take out the clutch pedal stalk by removing the clamp pin.

Drain the box of all oil by removing the plug from the bottom. The oil capacity is 1 $\frac{7}{8}$ pints.

Starter and Leads

Take off starter motor by removing the three setscrews through the mounting plate and the gearbox, after disconnecting the battery lead and the starter cable.

Place a jack under the rear of the engine sump, using a wooden pad, and disconnect the gearbox mounting cross-member from the frame.

Housing Bolts and Clutch Fork

Take out the remainder of the bolts from the housing, when the gearbox can be moved rearward and lowered, carrying with it the clutch operating linkage and withdrawal operating rod, fork and release bearing with cup assembly.

OPERATIONS WITH THE BOX REMOVED

Top Cover and Gate Lock

Remove the top cover carrying the gear lever, by taking out the six setscrews. Also lift out the change speed gate lock.

Shaft Flange

To withdraw the propeller shaft flange, knock back the lockwasher and remove the nut. Reverse gear and a forward gear should be engaged together to lock the gears and facilitate the removal of the nut. The flange may need an extractor tool, but as it fits on splines it should be possible to tap it off without necessitating such heavy blows as to cause damage.

Rear End Cover and Oil Seal

Remove the flexible rear mounting block by taking the nuts from the two studs through the rear cover; this will provide better accessibility to the lower setscrews in the cover.

Take out the speedometer pinion and then remove all six setscrews (with spring washers) from the end cover.

Prise off the cover, which will bring with it the rear oil seal.

Do not extract the oil seal from the cover unless it is intended to replace a new one, as it will be necessary to force it out of the housing, possibly causing distortion of the sealing ring. In fitting a new seal, press or lightly tap it into position, taking care to ensure the "lip" faces the inside of the gearbox, and that it lies flat.

There is a paper washer between the rear cover and the gearbox, and a locating peg for the bearing housing and the end cover. Ensure proper location when refitting the cover and bearing.

Clutch Withdrawal Fork and Bearing

The withdrawal fork is secured in position on the operating shaft by a cycle-type cotter (see Fig. 1, Section G), and it is best to remove this before dismantling any of the other clutch linkage as the operating rod holds the fork in the best position.

Remove the cotter nut and washer, and lightly tap the cotter upward. The release bearing can be detached from the fork, at the same time taking care not to scratch or chip it when bringing it over the splined end of the first motion shaft.

Disconnect the clutch rod from the pedal and take the lever from the operating shaft by removing the pinch bolt from the top. (See Fig. 6, Section G). Remove the pedal return spring. The operating shaft may now be tapped out of the clutch housing, leaving the withdrawal fork behind.

Examine the two bushes in the housing and renew if these are worn. The shaft should be a perfectly free fit, but there should be no actual slackness. Oil nipples are fitted into the operating shaft housing. Only light lubrication is needed or oil will find its way on to the release bearing, which is intended to run perfectly dry. Stiffness in the shaft, however, will cause damage to the clutch and bearing.

Next remove the clutch pedal, which is secured by a spring ring. Remove the ring with a screwdriver, and take off the washer and pedal.

Clutch Drain Hole

There is a drain hole in the clutch housing, but in order to ensure this is kept clear of mud or other stoppage, a split pin is loosely fitted through it; see that this is still loose and free.

Front Cover

There are six studs through the front end cover; remove the nuts and spring washers and lift the cover, with paper joint washer. There is no oil seal washer here, but an oil-return thread is included in the cover bearing. Use a new joint washer when replacing the cover.

Change Speed Fork Rods

With both end covers detached, remove the fork rod locating set screw, then tap out each of the fork rods, taking care to retrieve each of the spring-loaded steel balls as the rods pass through each rod housing. The small springs may remain in the fork.

Lift out each fork, making a note of its actual position to assist in reassembling.

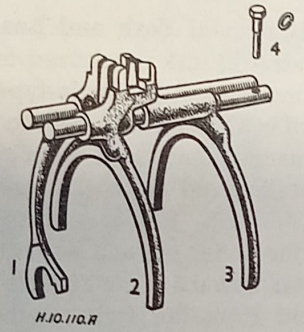


Fig. 3. The correct order of assembly for the change speed forks.
1. Reverse gear fork.
2. 1st and 2nd speed fork.
3. 3rd and 4th speed fork.
4. Fork rod locating set screw.

Spring Loaded Forks

A pilot rod facilitates the refitting of the change speed rods through the gear selecting forks.

The spring and ball are placed in the housing and held down in position by the insertion of the pilot rod. The fork is then pushed in and the ball remains trapped in position as the fork rod replaces the pilot.

The fork rod on early models had grooves for 3rd and 4th speed location, but this type of rod has been replaced by one with slots instead of grooves.

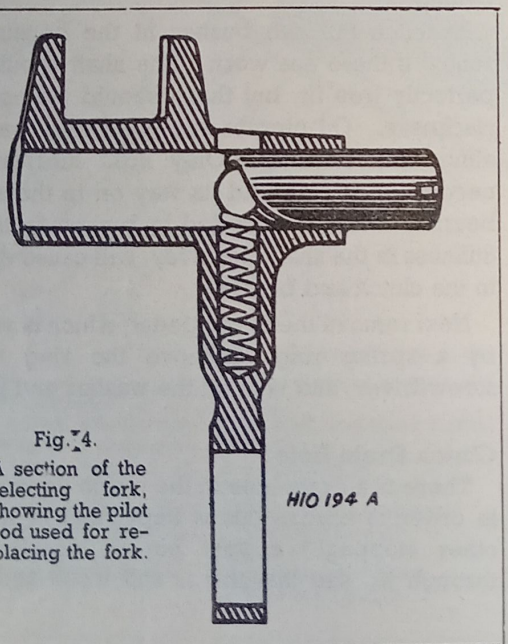


Fig. 4. A section of the selecting fork, showing the pilot rod used for replacing the fork.

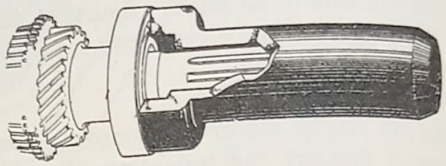


Fig. 5. Using a First Motion Shaft Drift to place bearing in position on shaft. The bearing has also to be tapped into the box housing.

FIRST MOTION SHAFT

The First Motion Shaft can be withdrawn from the front after the laygear has been lowered (See Fig. 7) and the front cover removed. If the bearing is tight in the housing it will need to be tapped out with a hammer and soft punch from inside the box.

In replacing a First Motion Shaft, the bearing must be tapped into position to ensure that it is flush with the case before the front cover is replaced.

There is a spring ring in a groove on the outer race of the bearing, provided for location purposes in the box. The bearing must be tapped into the box till the spring ring is properly home.

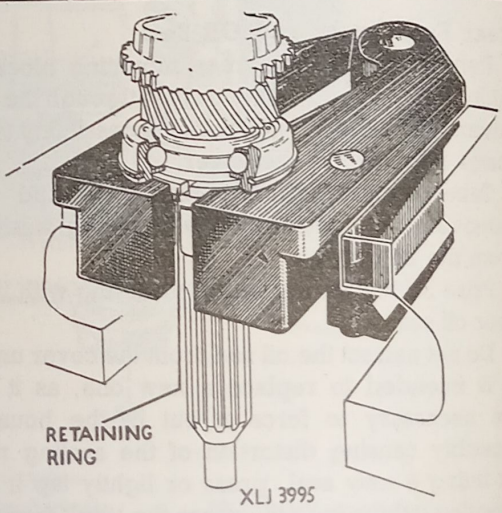


Fig. 6. The special jaws mounted in an ordinary vice for closing the first motion shaft ring.

Securing First Motion Shaft Retaining Ring

Fig. 6 shows the special vice jaws for closing the First Motion Shaft bearing retaining ring. This is not a spring ring and such a tool is essential to ensure that the ring is properly closed up in the groove.

THIRD MOTION SHAFT AND LAYGEAR

To remove the Third Motion Shaft it will first be necessary to free it from the Laygear. (Fig. 7).

The laygear must be lowered in the box for this operation, and in order not to displace the thrust washers fitted to each end, a wire or thin rod should follow as the layshaft is driven out through the box.

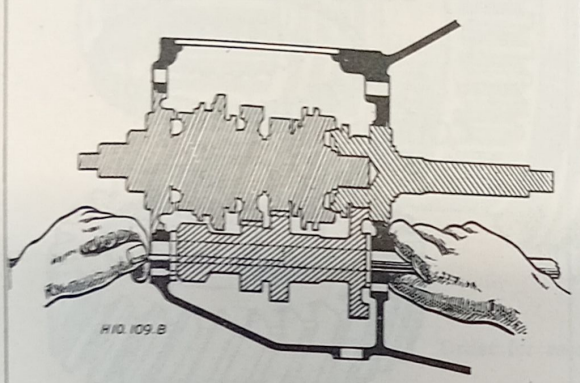


Fig. 7. Lowering laygear to free the third motion shaft.

The laygear will then drop sufficiently for the gears to come out of mesh, and the Third Motion Shaft Assembly complete can be moved rearward and lifted from the box. (See Fig. 13 and 14 and accompanying text for detail of assembly of gears and shaft).

The assembly of the laygear and the thrust washers will then be clearly seen. The purpose of the thin rod is to enable the gear to be readily re-assembled if it is not desired to take it out of the box. (See Fig. 8).

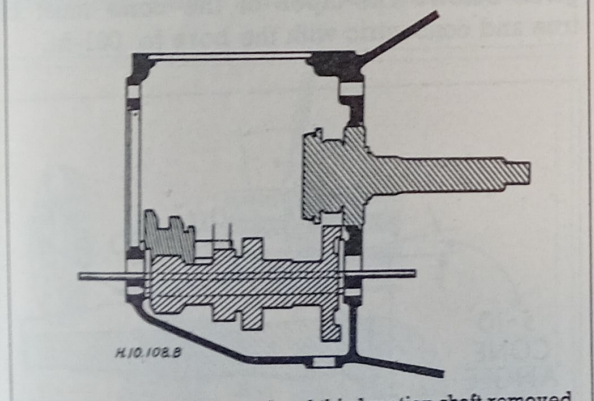


Fig. 8. Laygear lowered and third motion shaft removed.

By removing the rod, however, the gear and thrust washers can be lifted out of the box separately (although the reverse gear will need to be manipulated by hand to clear).

Re-bushing the Laygear

If the laygear needs new bushes, the old ones can be tapped out and the new ones fitted without special tools, but it is essential that the bushes are driven in till they are slightly below the end surface. The bushes must be jig drilled and reamed to final diameter.

Reverse Gear

Note that the short reverse gear shaft is located in position by a setscrew from the outside of the box (left-hand side, towards the rear). Remove the setscrew and tap out the shaft to remove the gear.

Examine the gear bush for wear. If a new bush is fitted, ensure that it is reamed if necessary, to provide a sliding fit on the shaft.

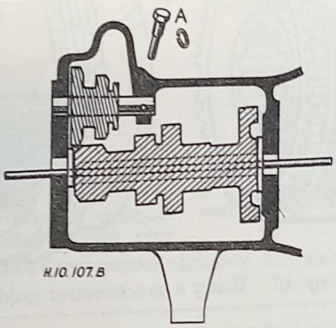


Fig. 9. A, reverse shaft locating screw showing laygear moved out of positioned line to enable the reverse gear to be positioned.

Laygear Thrust Washers

There is a hardened floating steel washer at each end of the laygear. The accompanying illustrations make this assembly clear, and will show how the thin rod keeps the gear and thrust washers in place while building or dismantling the box.

Synchromesh Sub-assembly Guide

It should be noted that during manufacture both the 1st speed wheel and the 3rd and 4th speed coupling sleeve are each paired with their respective synchronisers. Therefore, only mated pairs of these parts should be refitted.

Special guides are available to facilitate re-assembling the six balls and springs into the speed synchroniser and speed gear coupling sleeve. The guide is a sleeve the same width as the coupling sleeve. (See Fig. 10).

It will be seen that the machined portion of the guide bore is slipped over the synchroniser and turned until the hole coincides with one of the six sockets in the synchroniser. A spring and ball are then placed in position, the ball depressed and the guide rotated to hold it in this position.

This procedure is repeated for each spring and ball in turn until they are all held in a depressed position.

The guide is then pushed further along the synchroniser splines, and followed up by the gear coupling sleeve.

The splined portion of the guide fully depresses the balls against their springs and then, as the coupling sleeve replaces the guide, the balls find their location in the coupling sleeve groove.

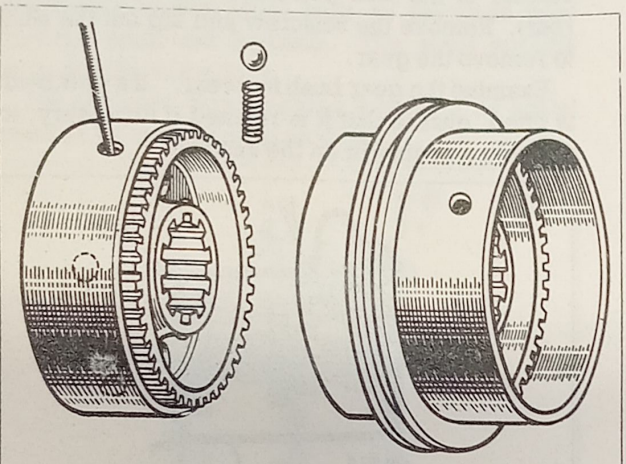


Fig. 10. Using a synchroniser guide.

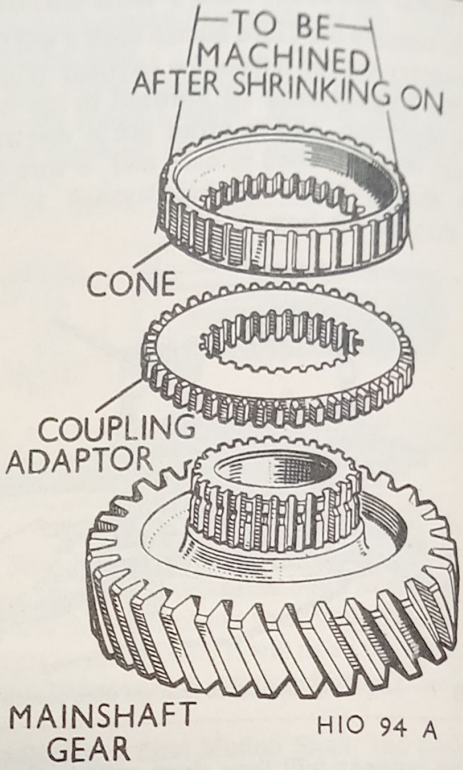


Fig. 11. Order for assembling mainshaft gear and synchroniser.

FITTING THE GEAR SYNCHRONISING CONES

The Synchronising Cones on the second, third and fourth speed gears are "shrunk on" to the gear itself, which is normally supplied as a complete assembly for spares purposes. Where facilities exist for shrinking on and final machining, however, cones can be supplied separately, but care must be exercised in fitting if the gear is to operate satisfactorily. The internal broaching of the cone is calculated to allow for a shrinkage fit on to the gear serrations, and the cone must be heat-expanded before it can be fitted. When heated to approximately 250 degrees Fahrenheit, expansion will be sufficient to allow the cone to be pressed home on to the gear without damaging the broaching, and will be sufficiently close fitting to resist displacement in gear changing.

This can best be done by immersion in oil heated to 250 degrees Fahrenheit and then fitting by means of a hand-operated press. After shrinking on, the unit should be immediately quenched in water to prevent the heat softening the gear itself.

On each gear the appropriate speed coupling adaptor must be fitted before the cone, but there is no need to pre-heat this adaptor—it can be pressed home cold. There is a shoulder on one side of the adaptor, and this must face the gear and not the cone.

When the cone is in position the final machining can be done in accordance with the dimensions given below. The taper of the cone must be true and concentric with the bore to .001-in.

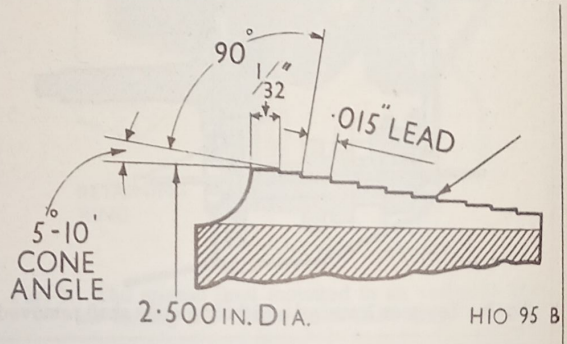


Fig. 12. Cone course turned either right- or left-hand. The arrow, top right, indicates a section of the cone showing machining details, but with the course turning drawn to larger scale.

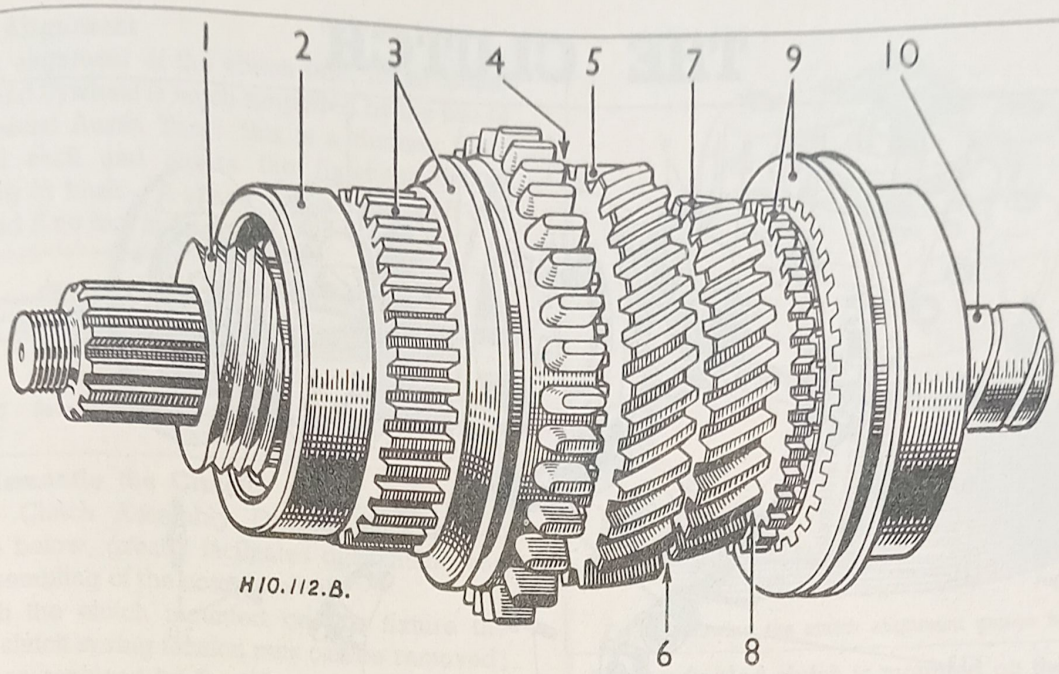


Fig. 13. Order for assembling the third motion shaft.

1. Speedometer Wheel.
2. Ball Bearing.
3. 2nd Speed Synchroniser complete with 1st Speed Wheel.
4. Steel Thrust Washer.
5. 2nd Speed Wheel complete.
6. Bronze Thrust Collar.
7. 3rd Speed Wheel complete.
8. Steel Thrust Washer complete with spring loaded locking peg.
9. 3rd and 4th Speed Synchroniser complete with sleeve.
10. Bronze bush.

THE THIRD MOTION SHAFT

Fig. 13 shows the correct running assembly of the Third Motion Shaft, but actually the speedometer wheel (1) and the ball bearing (2) are not assembled till the shaft and gears are positioned in the box. The rear ball bearing is then pressed into the bearing housing, the speedometer wheel follows, and the rear cover and its joint washer complete the assembly at this end of the box.

If the bronze thrust collar (6), Part No. I.G.3210, is excessively worn it should be replaced with a new collar, Part No. I.G.3285, which is .010-in. oversize.

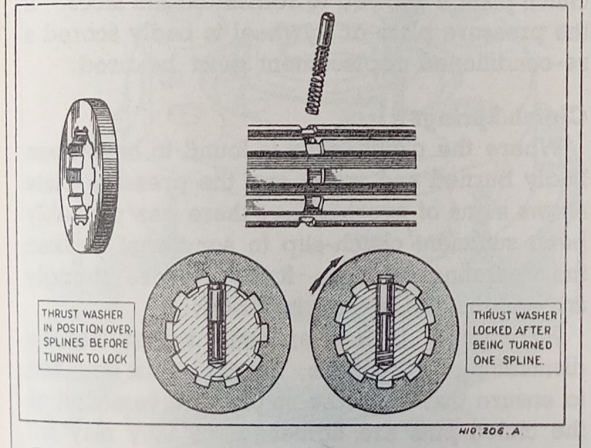


Fig. 14. The third motion shaft thrust washer. The assembly of this washer is clearly shown in this illustration.

THIRD MOTION SHAFT THRUST WASHER

This thrust washer is locked by a spring loaded peg situated in a blind hole drilled in the shaft and is positioned between the 3rd speed wheel and the synchroniser which operates for both 3rd and 4th speeds. (See Fig. 14).

When assembling, the peg is held down level with the bottom of the groove and the washer slid along the shaft until it comes into position over it. The washer is then turned one spline when the peg will spring up into one of the slots in the washer and thus lock it in position.

When dismantling, the peg is held down by a tool having a flat end such as a small screwdriver, and the thrust washer turned one spline when it can be slid along the shaft and removed. Care must be taken so that as the peg is uncovered, it does not fly out and become lost.

THE CLUTCH

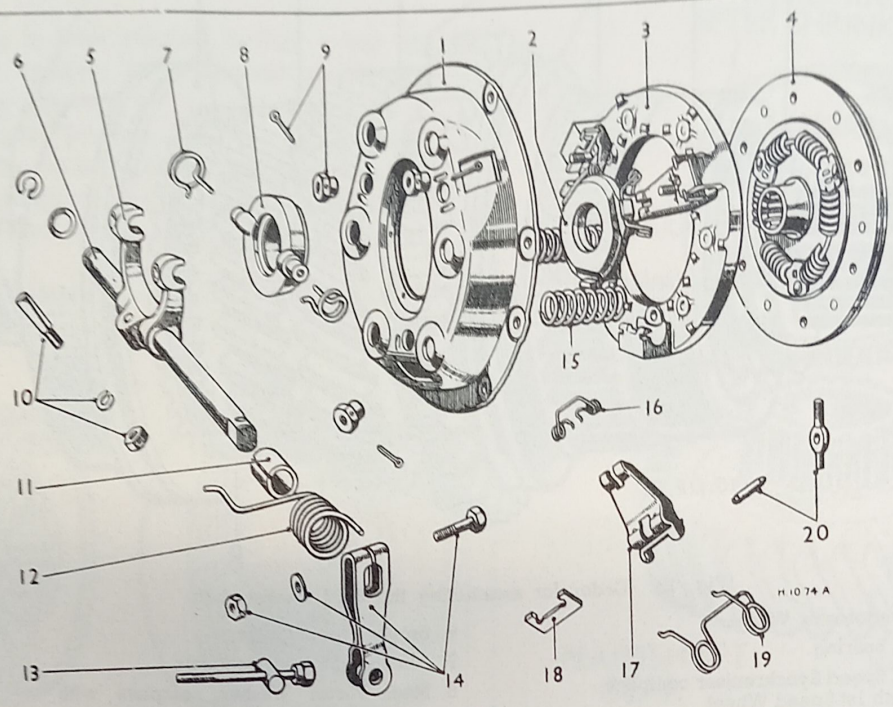


Fig. 1.

1. Cover for clutch.
2. Release Lever Plate.
3. Pressure Plate.
4. Clutch Plate and Linings.
5. Withdrawal Fork.
6. Clutch Operating Shaft.
7. Release Bearing Retaining Springs.
8. Release Bearing.
9. Nuts and Cotters for eyebolts.
10. Withdrawal Fork Cotter.
11. Clutch Shaft Bushes.
12. Pedal Return Spring.
13. Trunnion for lever.
14. Shaft Lever and Clamp Bolt.
15. Thrust Springs.
16. Spring Retainers.
17. Release Levers.
18. Struts for release levers.
19. Anti-Rattle Springs.
20. Eyebolts and Release Lever Pins.

Removing Clutch Unit

To remove the clutch, six set pins have to be withdrawn from the flywheel. Three staples should be placed in position as shown in Fig. 2. When the set pins have been released a turn or two the staples will be tightly held between the case and the levers.

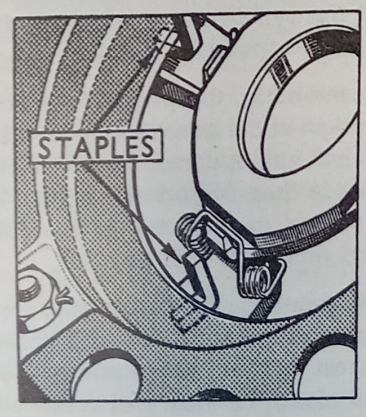


Fig. 2. Showing two of the metal staples in position.

Clean Faces

Before a new clutch plate is fitted it is essential that the flywheel face and the face of the clutch pressure plate be thoroughly cleaned with petrol and polished dry, and an examination made for any scoring which might damage the new clutch plate if allowed to remain on the faces. If the pressure plate or flywheel is badly scored a re-conditioned replacement must be used.

Clutch Springs

Where the clutch plate is found to have been badly burned and worn, and the pressure plate shows signs of overheating, there has probably been sufficient clutch-slip to somewhat weaken the operating springs. It is therefore strongly advised that the springs be renewed.

Reassembly is now an exact reversal of the dismantling instructions, but care must be taken to ensure that the three staples are removed as the clutch pins are tightened, or they may fall into the clutch, necessitating complete dismantling to retrieve them.

Plate Alignment

The alignment of the clutch unit, loose clutch plate and flywheel is much simplified by the use of the special Austin Tool; this is a dummy first-motion shaft and enters the flywheel centre bearing or bush. A spare first-motion shaft can be used if no tool is available.

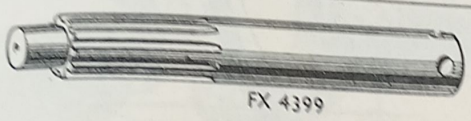


Fig. 3. Service first motion shaft for aligning clutch with flywheel.

To Dismantle the Clutch

The Clutch Assembly Fixture illustrated in Fig. 4 below, greatly facilitates dismantling and re-assembling of the complete unit.

With the clutch mounted on this fixture the three clutch spring tension nuts can be removed; they are replaced by the adapters, with the nuts lightly screwed down. As the clutch is released from the base, the adaptors take the spring pressure and can afterwards be slackened off in turn till the springs are released.

To reassemble the Clutch

The fixture is used in reverse for reassembling the clutch.

Clutch Setting

The fixture also enables the clutch plate to be accurately aligned, obviating clutch drag which will otherwise be present when the unit is in use.

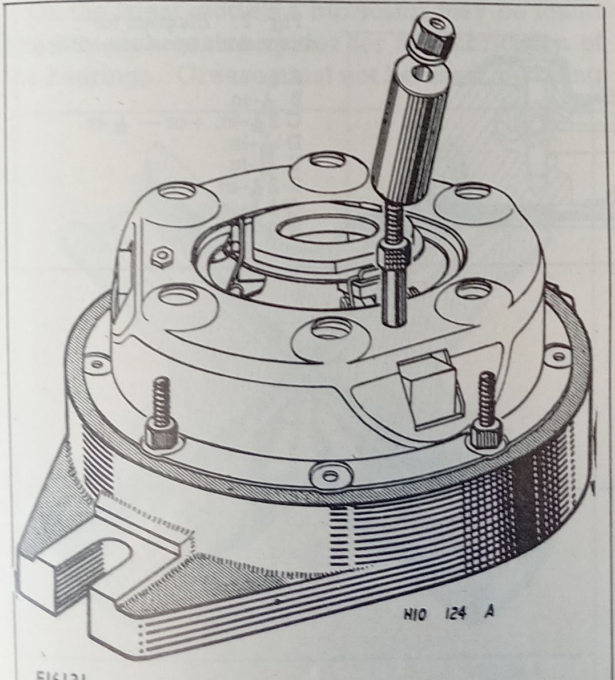


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Fig. 4. Depicting the clutch assembly fixture in use.

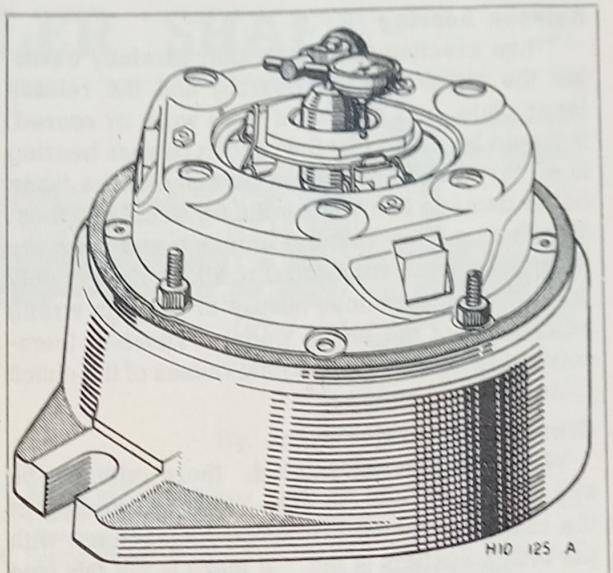


Fig. 5. Showing the clutch alignment gauge in use.

The assembled clutch is mounted on the base, complete with clutch plate and dummy first motion shaft.

A dial gauge is mounted on the dummy first motion shaft, and when moved round the clutch release ring will immediately show which of the three tension nuts requires adjusting to make the clutch run true. There should be $\frac{3}{16}$-in. space between the levers and the clutch case.

Improvised Jig

Where special tools are not available, the flywheel can be detached and, using three extra long studs screwed the whole length in place of set pins, this will make a useful jig. With the clutch mounted tightly on the flywheel the three clutch case nuts can be removed. The clutch springs are slowly expanded as the three holding-down nuts are screwed back up the long studs.

Make Identity Marks

At the outset it is advisable to mark the three clutch nuts and the studs to which they belong. The nuts are drilled and cottered on their studs and if replaced in their original position the setting will be more easily accomplished.

Correct Tension

Replace with new springs and then re-assemble. With everything in position—including the clutch plate—press down the cover till sufficient thread shows on the three studs to start the nuts. Using the correct nut for each stud, screw down till it is possible to push the split-pin through the nut and stud; incorrect assembly will cause the clutch plate to spin and make the gears difficult to engage.

Release Bearing

When erecting the clutch unit, carefully examine the clutch release bearing and the release lever plate, and replace if at all worn or scored. It should be noted that the carbon release bearing is of very brittle material; care should be taken not to damage this when refitting to the gearbox. (See Section F). This bearing ring and plate are designed to run without lubrication and will only fail through continuous misuse or through wrong adjustment of the clutch pedal. These in themselves are usually the original causes of the clutch plate needing renewal.

Clutch Pedal Adjustment

When finally assembled, there should be approximately ½-in. to 1-in. "free" movement of the clutch pedal before actual engagement with the clutch springs is felt. If there is not this free movement the clutch may not engage fully and will accordingly create clutch slip. The pedal position is easily adjusted by altering the effective length of the rod between the pedal and the clutch operating lever on the shaft end. (Fig. 6).

The adjustment must be such as to allow this free movement of the clutch pedal with one finger. After depressing the pedal to this extent the stronger resistance of the clutch springs will be obvious, so that it is easy to ascertain the amount of movement.

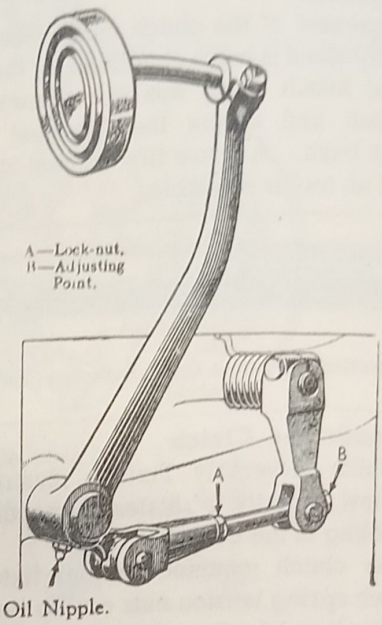


Fig. 6, Indicating the clutch pedal adjustment points.

The pedal should be tested from time to time, otherwise damage may be done to the clutch owing to the slipping of the plates.

The adjustment is obtained by first slackening the locking nut A and screwing back the adjusting nut B until the pedal has sufficient free movement.

Finally, tighten the locking nut.

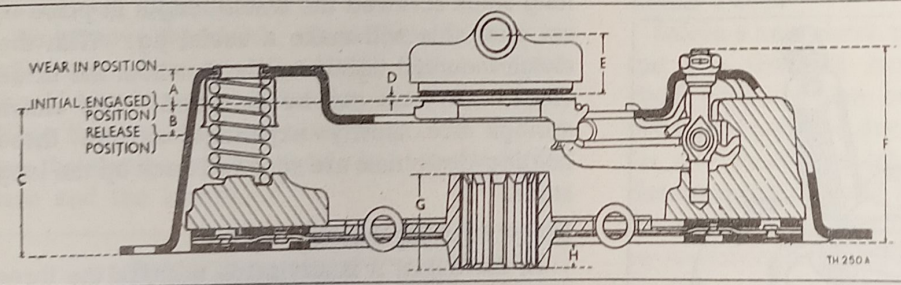


Fig. 7. Diagram for dimensions upon assembling.

A $\frac{3}{8}$
B $\frac{1}{16}$-in.
C $2\frac{3}{16}$-in. + or — $\frac{1}{32}$-in.
D $\frac{1}{16}$-in.
E $\frac{21}{32}$-in.
F $2\frac{7}{16}$-in.
G $1\frac{9}{32}$-in.
H $\frac{1}{4}$-in.

THE PROPELLER SHAFT

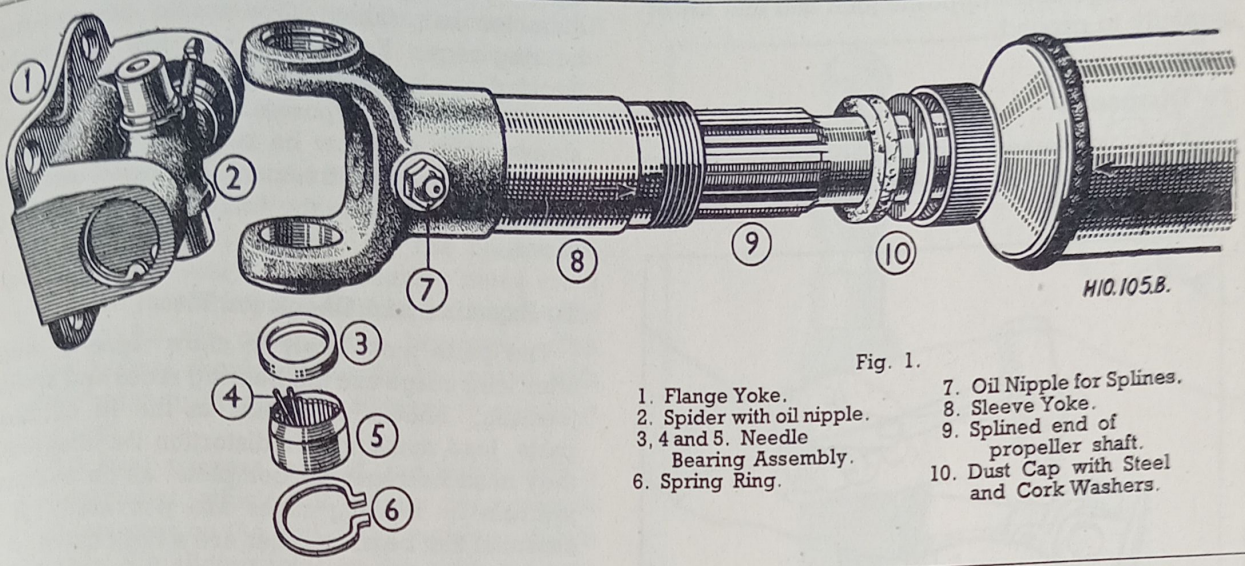


Fig. 1.

1. Flange Yoke.
2. Spider with oil nipple.
3, 4 and 5. Needle Bearing Assembly.
6. Spring Ring.
7. Oil Nipple for Splines.
8. Sleeve Yoke.
9. Splined end of propeller shaft.
10. Dust Cap with Steel and Cork Washers.

Type and Description

The Propeller Shaft and Universal Joints are of Hardy Spicer make (Fig. 1).

To accommodate fore and aft movement of the axles and other components, the forward end of each shaft is provided with a splined sliding joint. Each joint consists of a centre spider, four needle roller bearings and two yokes. Reference to the Lubrication Chart shows the location of the joints.

Lubrication

On the latest models a lubricator may be found fitted to each centre spider for the lubrication of the bearings. Grease must not be used, oil being the correct lubricant. Reference to Fig. 2 shows that the central oil chamber is connected to the four oil reservoirs and to the needle roller bearing assemblies.

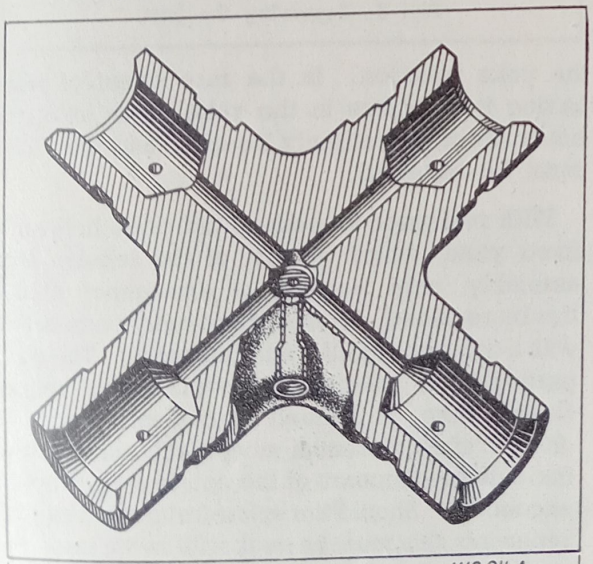


Fig. 2, showing the oil channels in a joint spider.

The needle roller bearings are packed with oil on assembly. Where no lubricator is fitted, the Universal Joints should be completely dismantled every 10,000 miles and repacked with lubricant. A lubricator is provided on the sleeve yoke of the sliding spline joint on all types.

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

After dismantling, and before reassembly, the inside splines of the sleeve yoke should be liberally smeared with grease.

Tests for Wear

Wear on the thrust faces is located by testing the lift in the joint, either by hand, or by using a length of wood suitably supported.

Any circumferential movement of the shaft relative to the flange yokes, indicates wear in the needle roller bearings, or the sliding spline.

Removal of Complete Assembly

Support the propeller shaft near the sliding joint by wood blocks or a sling from the chassis.

Remove all the nuts and bolts from the companion flange at the sliding spline joint end.

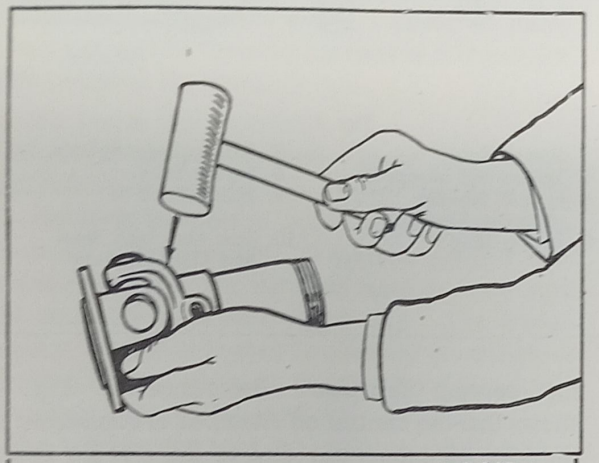
Unscrew by hand, the dust cap at the rear of sliding joint. Slide the splined sleeve yoke about half an inch towards the propeller shaft.

This disengages the pilot flanges.

Remove all the nuts and bolts from the companion flange at the opposite joint end and lower carefully to ground.

To Dismantle

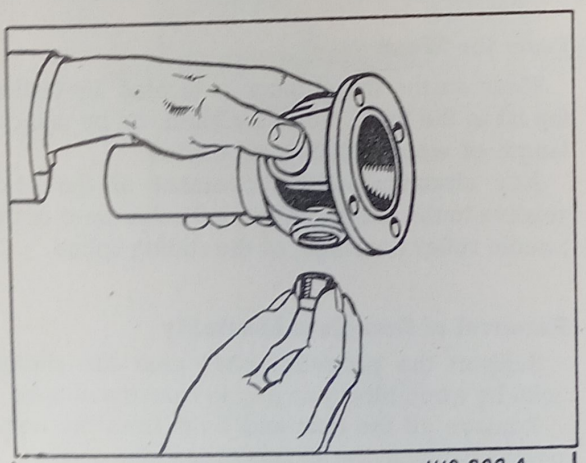
Having unscrewed the dust cap, pull the sliding joint off the shaft. Clean the enamel from the



H10.207.A.

Fig. 3. Tapping the joint to extract bearing.

snap rings and top of bearing races. Remove all snap rings by pinching the ears together with a pair of pliers, and prising with a screwdriver. If the ring does not snap out of the groove readily, tap the end of the bearing race lightly to relieve the pressure against the ring. Holding the joint in the left hand with the splined sleeve yoke lug on top, tap the radius of the yoke lightly with a copper hammer (see Fig. 3). The top bearing should



H10.208.A.

Fig. 4. Removing a bearing cup complete with needle rollers.

begin to emerge ; turn the joint over and finally remove with the fingers (see Fig. 4). If necessary tap the bearing race from the inside with a small diameter bar, taking care not to damage the bearing race. Keep the joint in this position to avoid dropping the needle rollers. Repeat this operation for the opposite bearing. The splined sleeve yoke can now be removed (see Fig. 5). Rest the exposed trunnions on wood or lead blocks, and remove the two remaining bearing races.

To Examine and Check for Wear

The parts most likely to show signs of wear after long usage are the bearing races and spider journals. Should looseness in the fit of these parts, load markings or distortion be observed, they must be renewed complete, as no oversize journals or bearing races are provided. It is essential that bearing races are a light drive fit in

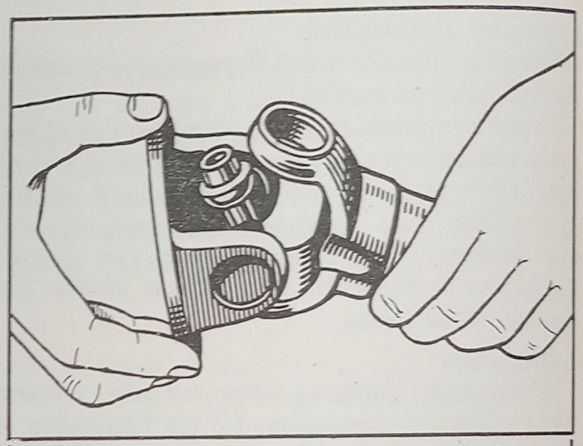


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Fig. 5 Separating the joint.

the yoke trunnion. In the rare event of wear having taken place in the yoke cross hole, the holes will most certainly be oval, and the yokes must be renewed.

With reference to wear of the cross holes in a fixed yoke, which is part of the tubular shaft assembly, only in cases of emergency should this be replaced. It should normally be renewed with a complete tubular shaft assembly The other parts likely to show signs of wear are the splined sleeve yoke, or splined stub shaft. A total of .004-in. circumferential movement measured on the outside diameter of the spline should not be exceeded. Should the splined stub shaft require renewing, this must be dealt with in the same way as the fixed yoke, i.e., a replacement tubular shaft assembly fitted.

To Reassemble

See that all drilled holes in the journals are cleaned out and filled with oil (Fig. 2). Assemble the needle rollers in the bearing races and fill with oil. Should difficulty be experienced in assembly, smear the walls of the races with petroleum jelly to retain the needle rollers in place.

Insert the spider in the flange yoke. Using a soft nosed drift about $\frac{1}{32}$-in. smaller in diameter than the hole in the yoke, tap the bearing in position. It is essential that bearing races are a light drive fit in the yoke trunnions. Repeat this operation for the other three bearings. The spider journal shoulders should be coated with shellac prior to fitting the retainers to ensure a good seal.

If the joint appears to bind, tap lightly with a wooden mallet, which will relieve any pressure of the bearings on the end of the journals. When replacing the sliding joint on the shaft, be sure that the trunnions in the sliding and fixed yoke are in line. This can be checked by observing that arrows marked on the splined sleeve yoke and the splined stub shaft are in line. It is advisable to renew cork washers and washer retainers on spider journals, using the tubular drift shown in Fig. 6.

To Replace Shaft Assembly

Wipe the companion flange and flange yoke faces clean, to ensure that the pilot flange registers properly and the joint faces bed evenly all round. Insert the bolts, and see that the nuts are evenly tightened all round and are securely locked.

The dust cap must be screwed up by hand as far as possible. The sliding joint is always placed towards the front of the vehicle.

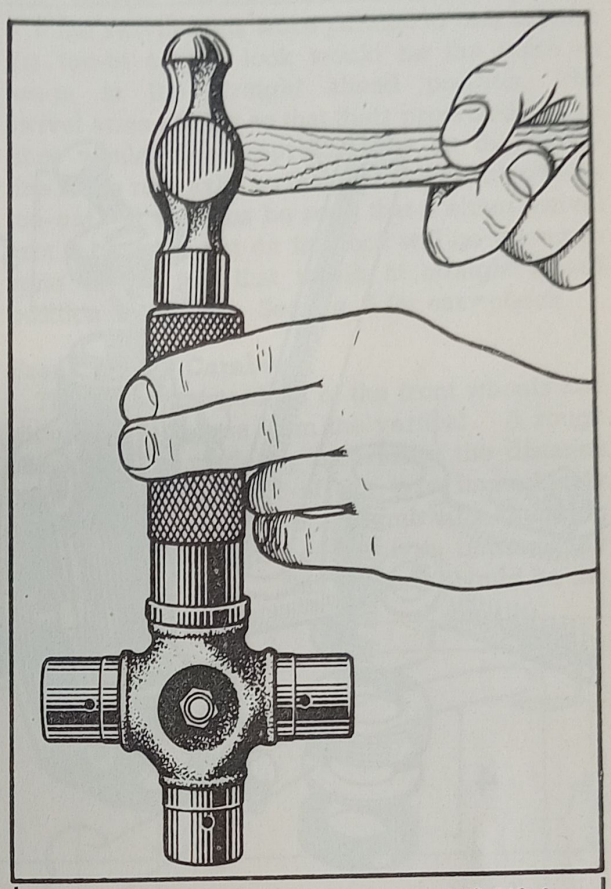

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Fig. 6. Tapping an oil seal into position. Care must be used to see it is well home and not damaged. A tubular drift must be used.

THE FRONT AXLE

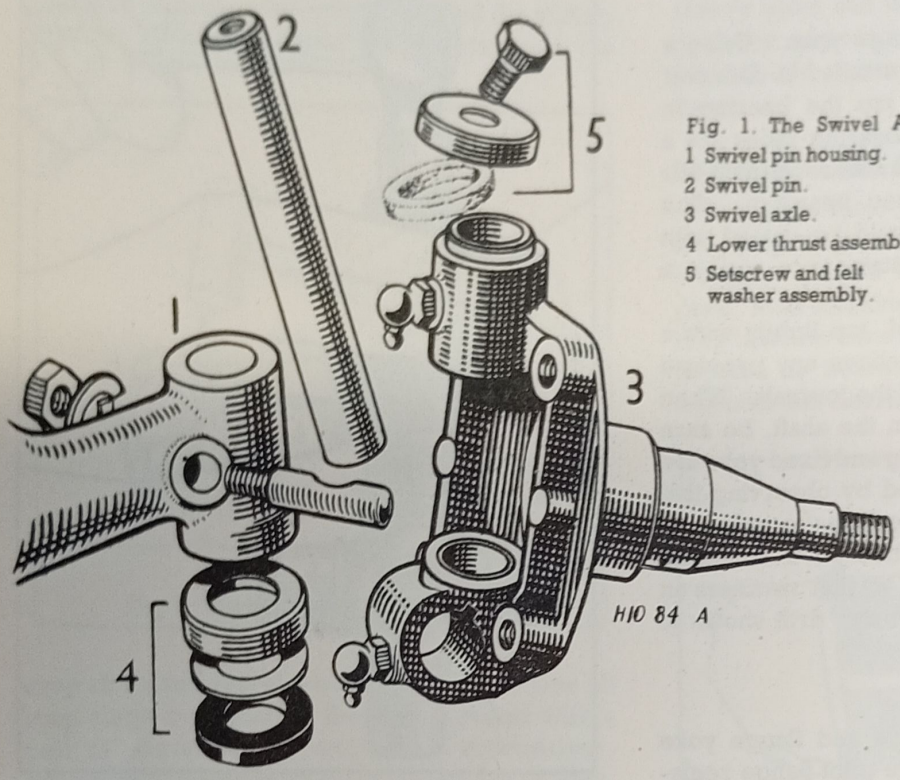


Fig. 1. The Swivel Axle
1 Swivel pin housing.
2 Swivel pin.
3 Swivel axle.
4 Lower thrust assembly.
5 Setscrew and felt washer assembly.

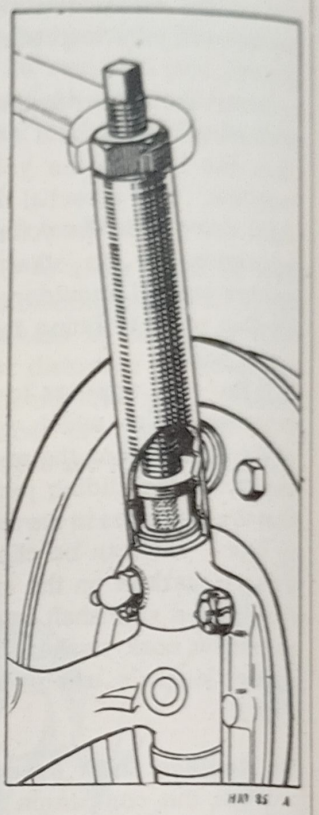


Fig. 2. Using a swivel pin extractor. If brakes are still in position, remove brake drum and screw in adjuster to clear swivel pin.

The above illustration shows an exploded view of the swivel axle, and it should be noted that the design of the cotter securing the swivel axle pin is such that it cannot be driven out till the pin itself is withdrawn—it must only be slackened.

Withdrawing the Swivel Pin

Jack up the car and remove the wheel.

Take out the setscrew from the top of the swivel housing and remove the cover and felt ring

Slacken the nut of the cotter securing the swivel pin and lightly tap to slacken the cotter.

With an extractor which will screw into the internally threaded end of the swivel pin (as shown in Fig. 2), screw up and withdraw the pin.

Retrieve the lower thrust washer, felt pad and cover.

Reassembling

If new bushes are to be fitted the welch plug must be driven out of the bottom of the swivel axle, when the bottom bush can be tapped out. When new bushes are fitted they must be reamed in line by means of a special reamer. Use a new welch plug and see that it is expanded into the groove in the housing. It is essential to ensure that the swivel pin cotter through the axle is locked up tightly, otherwise the pin may turn in the axle beam when on the road, thus creating wear and consequent slackness in the axle. This may necessitate renewing the axle beam.

Front Wheel Track

When the steering rod and cross tube are connected up, test for front wheel alignment.

With the wheels in the straight ahead position, take measurements at the edge of the rim at axle height. The rims should be up to $\frac{1}{8}$-in. closer in front than at the rear. Any deviation from this can be corrected by slackening the lock-nut at each end of the cross tube and rotating the tube; the ends are threaded right- and left-hand respectively, and by this means the wheels are re-set to the required position.

It should be understood, however, that should the wheels require more than slight adjustment it is possible that damage to the swivel arms has been sustained. In this event, re-adjustment at the cross tube is not a cure, as the steering geometry will be upset, causing heavy tyre wear and inaccurate steering. Make a quick check as shown in Fig. 5, and if necessary remove the arm and make a fine check with dimensions as shown in Fig. 4. Damaged arms must be renewed and not corrected by bending. The steering arm should also be checked (Fig. 3).

The Swivel Arms

The accompanying drawing shows the swivel arms and dimensions which will enable them to be checked up for damage

Swivel Arms and Toe-in

Before attempting to cure faulty toe-in, a check should be made to find the cause

If the length of the cross tube has not been altered, incorrect wheel alignment indicates that damage has occurred to some component.

If the swivel arms were parallel to one another the toe-in on full lock would be the same as toe-in in the straight ahead position. The swivel arms are set so that their projected centre lines would meet approximately on the centre line of the rear axle, so that on full lock the wheels toe-out. It will thus be seen that if either swivel arm is bent toe-out on full lock will be wrong in spite of the fact that toe-in at straight ahead position is correct. See Fig. 5 for easy check.

Front Wheel Camber

This is the outward tilt of the front wheels and should be 1 degree from the vertical. A rough check can be made by measuring the distance from the outside wall of the tyre immediately below the stub axle, to a plumb line, hanging from the outside wall of the tyre immediately above the stub axle. This distance should be the

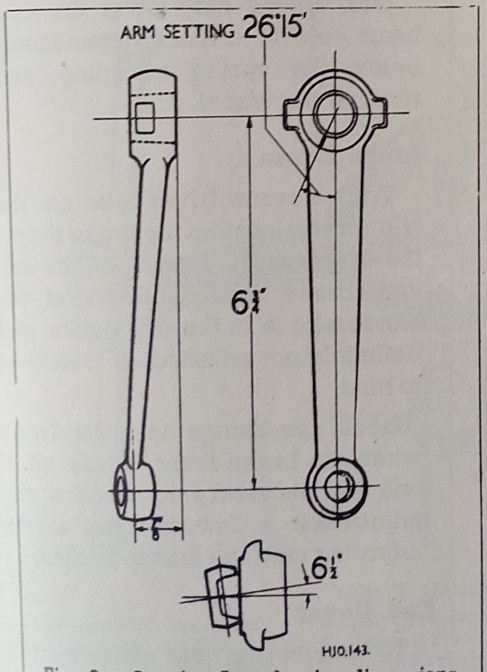


Fig. 3. Steering Arm showing dimensions and the mark on the face for correct arm setting on the splined cross shaft.

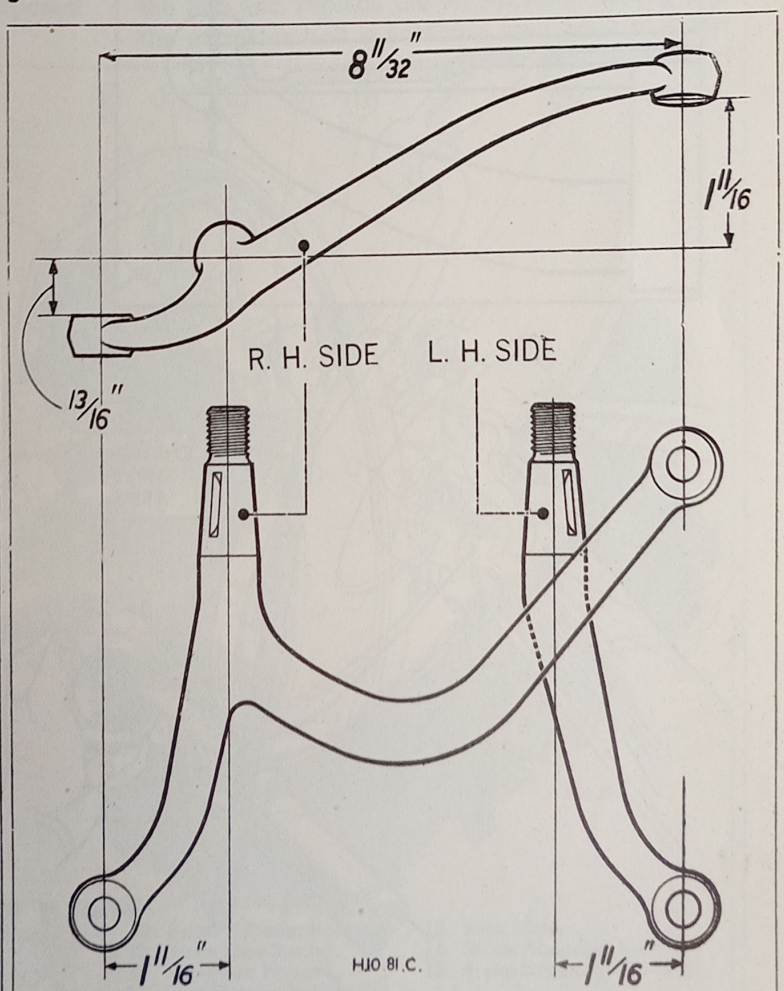


Fig. 4. Swivel arms, showing dimensions for checking actual setting of each for correct steering geometry.

same on both wheels. The correct method of checking is, of course, with a camber gauge. If this measurement is incorrect, either the stub axle or axle beam is bent. If subsequent inspection of the axle beam against the dimensions given in Fig. 6 show that it is in order, then the stub axle is bent or there is serious wear in the steering swivel pins.

Swivel Pin Inclination

This can only be checked with a special gauge, or after the axle has been removed. The inclination is shown in Fig. 6 and is 6½ degrees.

Castor

This is the tilt backwards of the axle beam and is "set" during manufacture to be correct when the axle is mounted on the springs. Castor is 3 degrees from the vertical.

Quick Check for Swivel Arms

To check the swivel arm for damage, without dismantling, place a straight-edge across the backplate in such a position that a direct reading can be taken with a rule between the centre of the swivel arm eye and the straight-edge, representing the inside face of the backplate.

If the reading is other than that shown in the diagram the affected arm must be removed. A fine check can then be made with dimensions given in Fig. 3.

The illustration on the next page (Fig. 6) shows the essential details of the axle beam and will enable this unit to be checked for possible damage.

The right-hand side half of the front axle is shown, and it will be seen that the axle is not straight, but has a "set" which brings each swivel-end 13/16th of an inch forward.

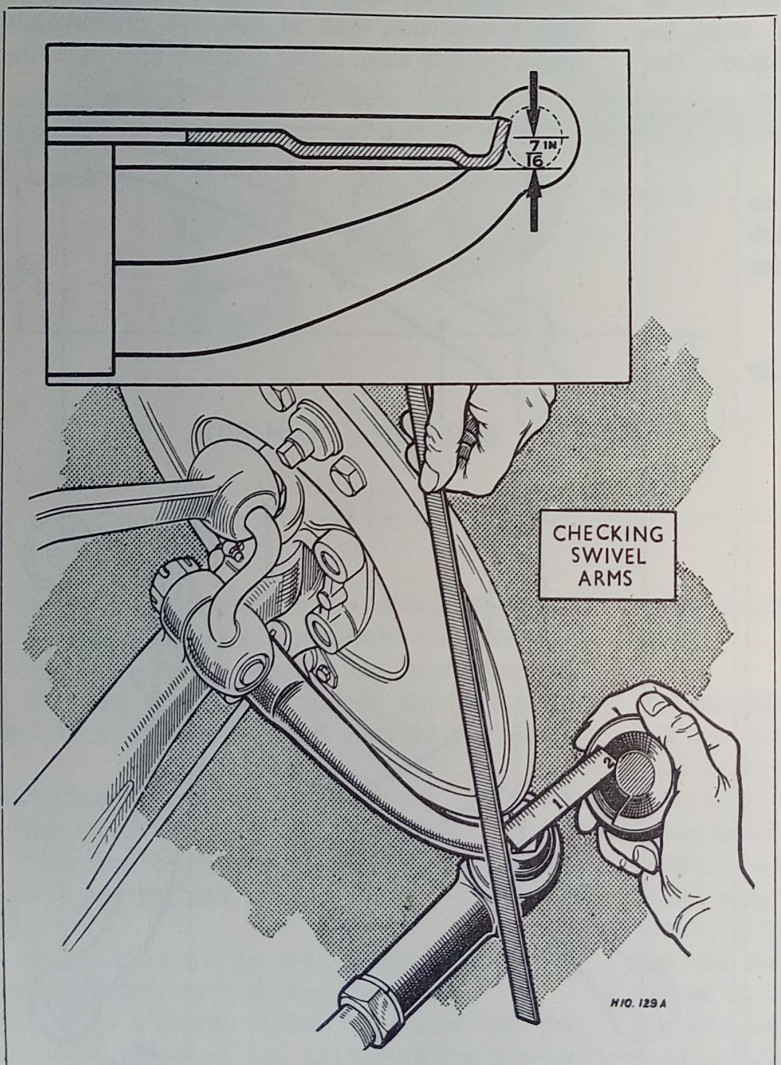


Fig. 5.
Checking the position of the swivel arm relative to the back plate.

The lug for the brake balance lever and its securing cotter (which is on the right-hand side only) is also indicated on the drawing.

FRONT HUB WITHDRAWAL

Jacking

Chock all wheels not being operated upon.

Jack up the car, lower the axle beam on to blocks immediately below the spring mounting, and remove the wheel.

Brake Drum

With a screwdriver take out the two screws locating the brake drum; the drum can be tapped off the hub and brake linings, provided the handbrake is in the off position and definitely not adjusted so closely as to bind.

Should the linings hold the drums when the brake lever is fully off, it will be necessary to slacken the adjustment a few notches at the adjusting unit (See Brakes Section).

End Cover

To remove the hub end cover, it will be necessary to force a screwdriver between its joint with the hub.

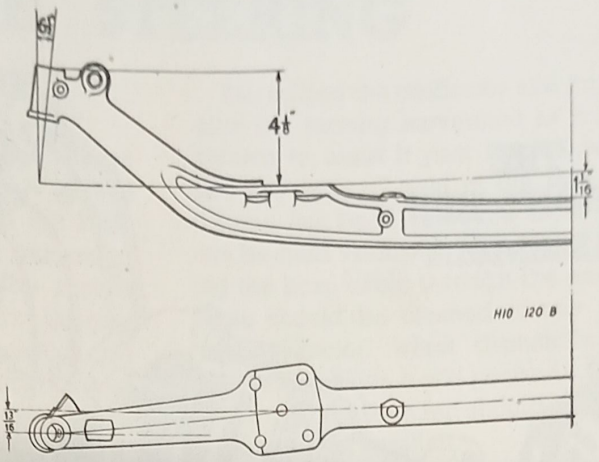


Fig. 6.
The axle beam and swivel angle, showing essential dimensions to enable the beam to be checked for any suspected damage.

There is a paper washer here, and when reassembling it will be necessary to use a new washer.

The hub cover should be prised off a little at a time from each side.

Remove the split pin from the hub nut exposed and then remove the nut.

Using the Extractor

The extractor is supplied complete with a loose adaptor; the adaptor is not required for the front hub.

Fit the hub extractor over the wheel studs of the hub and replace the wheel nuts, seeing that the extractor bolt is screwed well back to allow

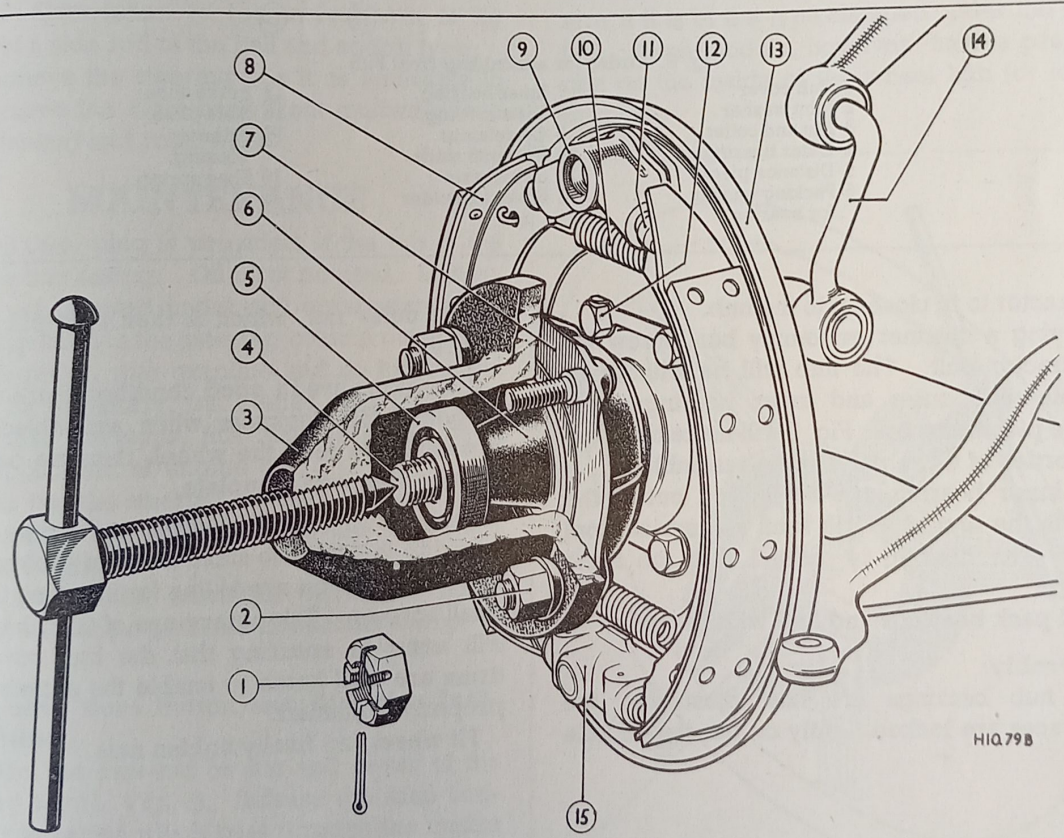


Fig. 7, showing the extractor in position.

1. Securing Nut and Cotter.
2. Wheel Stud and Nut.
3. Hub Extractor in position.
4. Swivel Axle.
5. Hub Outer Bearing.
6. Distance Piece.
7. Hub with studs.
8. Brake Shoe.
9. Brake Adjuster Housing.
10. Brake Shoe Spring.
11. Expander Plunger.
12. Back Plate Setscrews.
13. Back Plate.
14. Shock Absorber Link.
15. Brake Expander Housing.

THE FRONT HUB ASSEMBLY

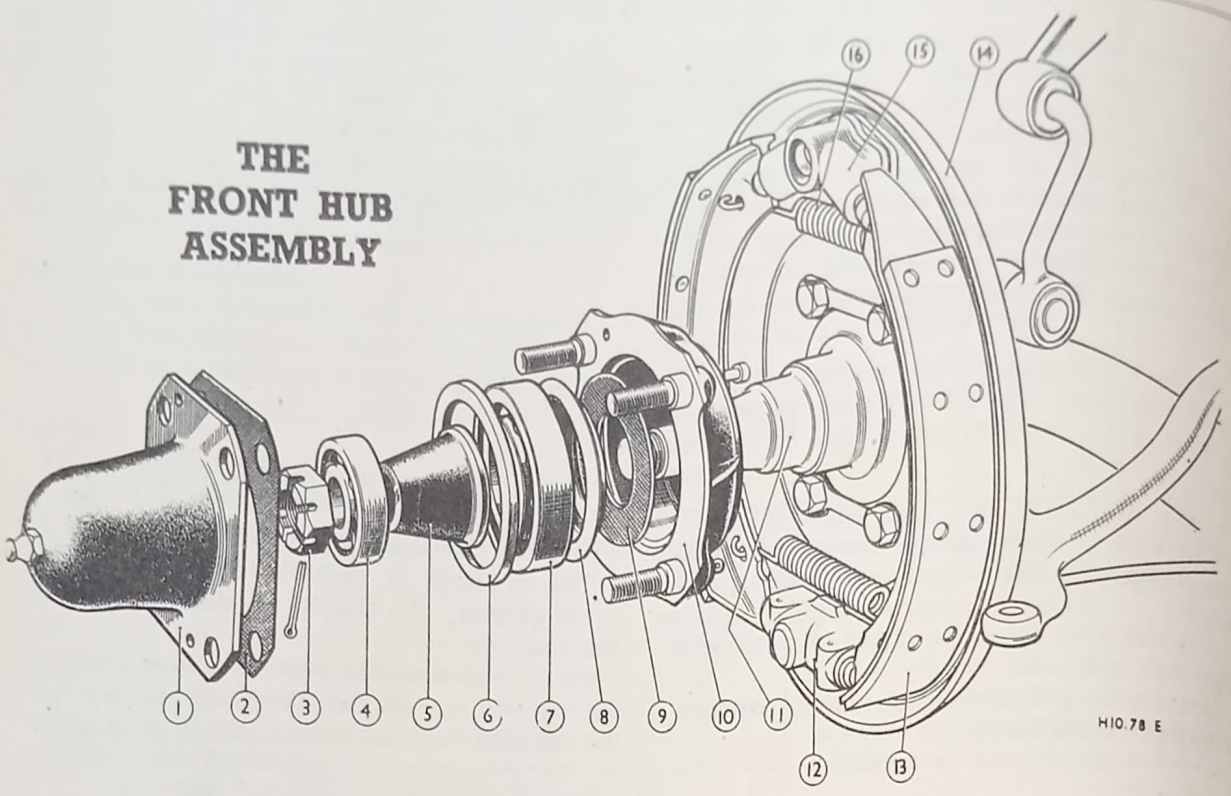


Fig. 8. Order for assembling front hub.

1 Hub cover.
2 Joint washer.
3 Nut and cotter.
4 Outer bearing.
5 Distance piece.
6 Packing washer for bearing.
7 Inner bearing.
8 Distance ring.
9 Oil retainer.
10 Hub with studs.
11 Swivel axle.
12 Brake expander unit.
13 Brake shoe.
14 Back plate.
15 Adjuster housing.
16 Shoe spring.

the extractor to fit close up to the hub.

Applying a spanner or tommy bar, screw up the extractor bolt. The hub will be withdrawn complete with outer and inner bearings, and distance piece washers. Fig. 8 will make clear the actual order of these parts when assembled.

The inner bearing can be tapped out of the hub with the end of a drift such as Service Tool FJ5434. The bearing is refitted with the same tool.

Hand pack bearings and hub with grease.

Reassembly

The hub bearings are not adjustable; the inner races are locked tightly on the swivel axle by the outer nut, which is then split-pinned for security.

If bearings are in good condition there will be no noticeable slackness when assembled. If it is possible to rock the wheel, then the bearings must be renewed complete.

Replace washer, hub cover and brake drum, ensuring that the two small holes in each of these three components are in line for inserting the two small screws. Temporary use of the wheel nuts will assist in ensuring that the hub cover and drum are well home to enable the screws to be properly tightened.

Fit wheel and finally tighten nuts.

THE STEERING

COLUMN AND BOX

Steering Type

The steering gear is the Cam and Lever Model "T" having a ratio of 10 to 1 in the straight ahead position and 14 to 1 on full lock. The cam portion takes the form of a generated worm and runs in ball bearings. The rocker shaft runs in a plain bearing and an arm integral with the shaft carries a peg which is conical at one end, to engage the cam. 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 removing shims which are fitted under the side cover or by adjusting the thrust screw in the side cover on latest models.

All working parts are immersed in oil. A felt bush is fitted in the top of the steering column outer tube and serves as a third steady bearing for the inner column. The steering arm is attached to the rocker shaft by fine tapered splines. Connection to the swivel arm is by means of a side rod of the ball and socket type.

To remove the steering box it is advisable to first remove the right-hand front mudwing (see Body Section) and road wheel.

MAINTENANCE

An oil filler plug is provided at the top of the steering box casing. Oil must be used. Grease should not be used under any circumstances.

The top bush in the steering column outer tube 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 engine oil.

Check that the steering arm and ball ends are fight, and that the bolts securing the box to the frame are tight.

The cross shaft lubricator (fitted to some models) should be given an occasional charge of oil.

To Remove Horn Button and Direction Indicator Switch

Slacken the lock-nut on the end cover of the steering box (L, Fig. 2). Release the snap connectors to cables which pass through the centre of steering column.

The horn button can be pulled away from the steering wheel centre and the full length tube can be removed.

To replace the trafficator and horn button tube, give it a turning movement as it goes down the column to assist it past the felt pad near the top and the cork oil seal in the end cover. If the column has been removed from the vehicle, it can be held vertically which will help in threading the horn cable through the end cover. This cable should be cleaned of any oil which may have collected when dismantling. When the tube is in position it will protrude through the end cover, and the lock nut should then be tightened to secure it in position.

With electric traffic indicators, the locating plate under the steering wheel nut must be adjusted for cancelling operation at each lock.

To Remove and Refit the Steering Wheel

After removal of the central tube and direction indicator switch, the steering wheel nut is accessible. Remove the nut with a box spanner and take out the direction indicator operating arm, if it is of the type clamped under the central nut. Some models, however, have a projection cast on the inside of the wheel hub for locating purposes.

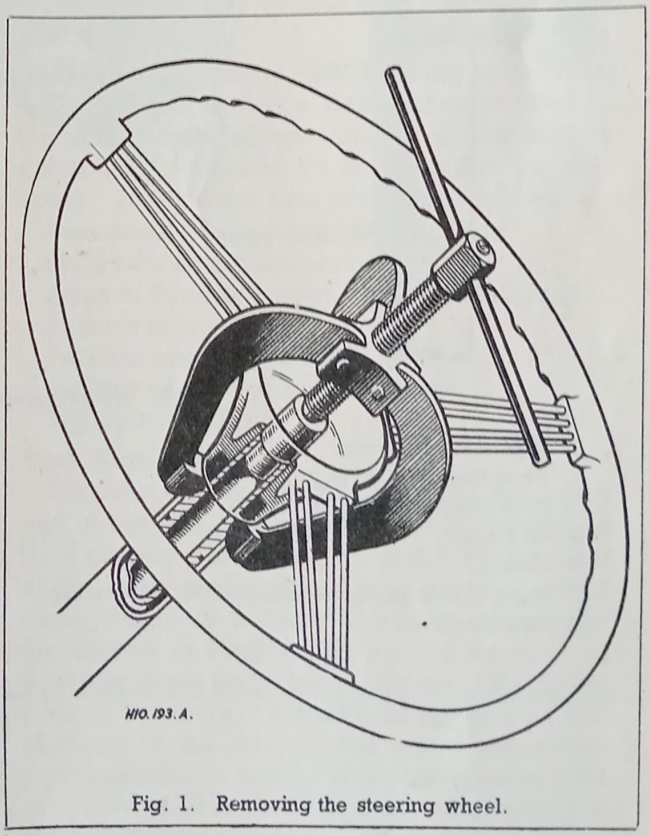


Fig. 1. Removing the steering wheel.

THE STEERING ASSEMBLY

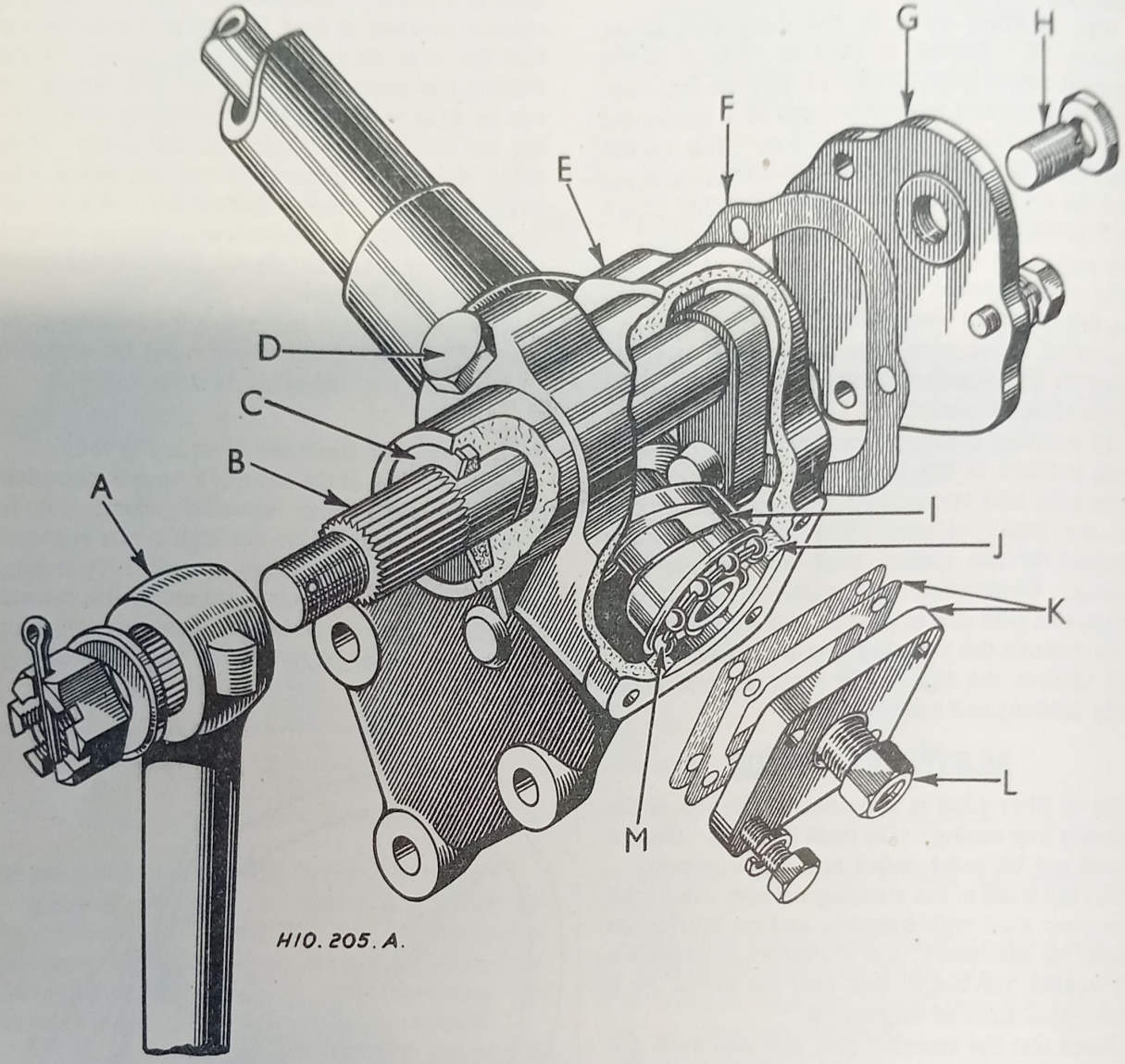


Fig. 2. A sectional view of the steering box.

A. Splined Steering Arm.
B. Cross Shaft and Cam Lever.
C. Cork Gland and Steel Washer.
D. Oil Filler.
E. Casing.
F. Paper Washer (shims for adjustment on older models).
G. Side Cover.
H. Adjusting Screw and Locknut (not fitted on older models).
I. Inner Column and Cam.
J. Ball Race.
K. End Cover and Shims.
L. Locknut for traffic indicator and horn cable tube.
M. Ball Bearings.

Remove the steering wheel by using an extractor similar to that shown in Fig. 1.

Replacement is a reversal of the procedure for removal, tapping the centre of the wheel on to the splines and securing with the nut.

To Remove and Refit Outer Tube Top Bush.

Remove the steering wheel.

Pick out the old felt bush.

Insert a new felt by rolling it to form a bush, and inserting one corner of the felt into 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 shaft.

Refit the steering wheel.

To Remove Steering Arm

Remove the split pin from the steering arm securing nut and then unscrew the nut.

Withdraw the steering arm with an extractor as illustrated.

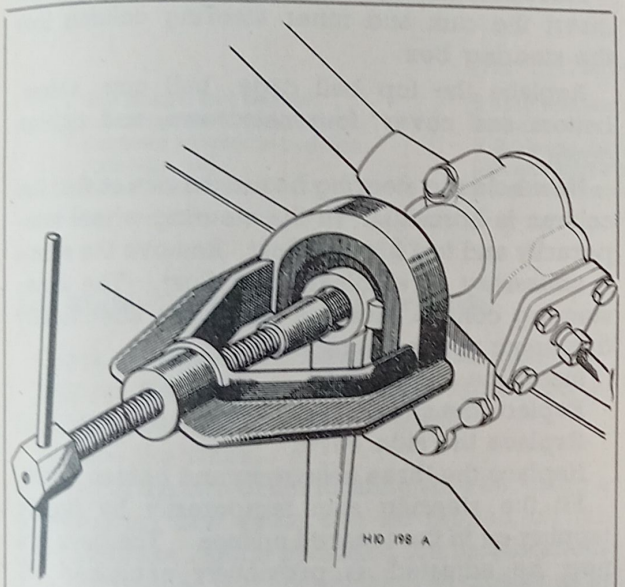


Fig. 3. A typical extractor in use. The steering arm may be withdrawn without disturbing the box mounting.

To Replace Steering Arm

When replacing the steering arm on the steering cross shaft it is essential that it is fitted to the correct spline in order to secure full steering lock to both left and right. The arm and the shaft end are marked and the arm must be fitted so that the marks are in line. (Fig. 4).

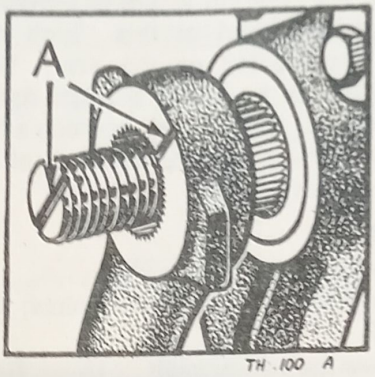


Fig. 4. Lining up arm and shaft.

Removal of Box and Column

Remove the steering wheel.

Remove the steering column clip under the instrument panel and the two draught excluder plates where the column passes through scuttle.

Take away the right-hand bonnet panel.

Remove the front right-hand road wheel.

Disconnect the steering side rod from the bottom of the steering arm.

Disconnect the horn and the direction indicator snap connectors at the lower end of the steering column.

Remove the three bolts which hold the box to the chassis side member, when the box and column complete can be lifted from the chassis and withdrawn forward.

Refitting

Refit the box and column before replacing the steering wheel.

Backlash Adjustment with Steering in position

On the latest models a thrust screw is fitted to the side plate for adjustment. On earlier models adjustment is effected by shims under the side cover. In the latter case proceed as follows :—

Disconnect side rod from steering arm.

Place oil tray under steering box.

Remove three setscrews holding side cover.

Remove side cover.

Take out one of the shims.

Replace side cover and setscrews.

Top up box with oil.

Test Adjustment

With the thumb and forefinger on the lower end of the arm, test for slackness by exerting a light pressure alternately in each direction and at the same time turning the steering wheel slowly from lock to lock. It will be noticed that the amount of slackness is not the same in all positions, there being less slackness in the centre than on the locks. If slackness appears at ALL positions of the arm, further screw adjustment must be made, or further shims taken out and the side cover replaced. After each adjustment, test again in the same manner. When the necessary

adjustment has been made a "high spot" will be noticed as the steering wheel is moved past the central position, and at this "high spot" no backlash can be felt on the arm. When this "high spot" can be felt as a slight drag on the steering wheel, the gear is correctly adjusted.

Replace the side rod on the end of the arm. Refill the box with oil.

Dismantling

Remove the steering complete.

Remove the side cover and shims, and drain off the oil.

Withdraw the rocker shaft.

With the gear mounted vertically in a vice and the steering box uppermost, take off the four set screws, and remove the end cover.

Remove the shims, ball cup and ball cage.

Withdraw the inner shaft by pulling upwards.

Take out the ball cage from inside the steering box.

Examining for Wear

Examine the rocker shaft for wear on the shank. Renew if badly worn. If the splines are twisted the rocker shaft should not be used again. The back of the rocker shaft arm must be inspected for any wear due to lack of lubrication, and the smooth surfaces restored or the rocker shaft renewed. At the end of the rocker shaft arm is a conical peg; this is replaceable and can be pressed out and a new peg fitted.

Examine the cam for excessive wear in the grooves, and the ball tracks formed at each end of the cam for any signs of pitting. If the cam is defective for either of these reasons, the cam and steering tube must be renewed.

Examine the ball cups for wear in the ball tracks. If pitting has occurred the ball cups should be renewed. One of these ball cups is housed inside the steering box and may be examined without removal. If replacement is necessary the ball cup can usually be dislodged from its housing by tapping the steering box on to a large block of wood. If this is not effective, the ball cup can be broken and the pieces removed. To break the ball cup a small brass chisel can be inserted through the side cover facing and then engaged behind the ball cup : a few light taps will drive the brass chisel between the back of the ball cup and the steering box. With the brass chisel still in this position a cold chisel can be inserted through the other flanges on to the ball cup which will now break up very easily with a few hammer blows. Remove any burrs with a scraper, and fit the new ball cup by lightly tapping into position.

Examine the inner machined face on the side cover of the earlier type, where shims are used. This should be flat and reasonably free from scoring. If there are slight score marks, the cover is still serviceable but the surface should be polished with emery cloth to remove any sharp edges.

Reassembling

See that all parts are clean and dry.

Hold the box in a vice so that the outer column is pointing downwards.

Place the ball cage inside the lower ball cup and insert the cam and inner steering column into the steering box.

Replace the top ball cage, ball cup, shims, bottom end cover, four setscrews, and tighten down.

Now hold the steering box in the vice so that the column is horizontal, fit the steering wheel temporarily and test for end float. Remove the shims if necessary to eliminate end float. The inner steering column must be quite free after finally tightening up the flange bolts.

Insert the rocker shaft.

Replace the shims.

Replace the side cover.

Replace the three setscrews and tighten down.

Fit the steering arm temporarily by lightly tapping on to the tapered splines. The gear can now be adjusted as previously explained for adjustment with gear fitted to chassis.

Fit the felt bush in the top of the column as previously explained. If the shaft is excessively slack, the bush should be renewed.

Refit steering gear to chassis as previously explained.

THE REAR AXLE

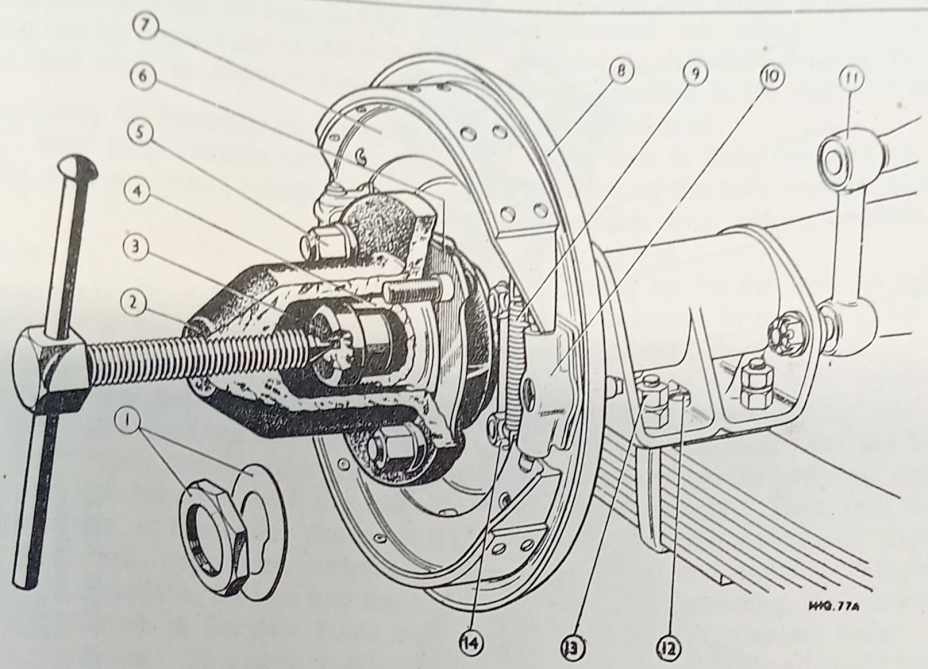


Fig. 1. The hub extractor in position.

1 Hub locknut and washer.
2 Hub extractor in position.
3 Extractor adaptor in position.
4 Axle tube end.
5 Wheel stud and nut.
6 Hub with studs.
7 Brake shoe.
8 Brake back plate.
9 Brake shoe spring.
10 Brake adjuster housing.
11 Shock absorber link.
12 Hole to take spring centre bolt.
13 Spring clip lock nut.
14 Back plate setscrews.

Axle Shaft—To Remove and Replace

Chock all wheels not being operated upon.

Jack up the car and lower the spring on to blocks as close as possible to the axle.

Remove the wheel.

Take out the two drum locating screws, using a screwdriver. The drum can be tapped off the hub and brake linings provided the handbrake is in the off position and not adjusted so closely as to bind.

Should the linings hold the drum when the brake lever is fully off, it will be necessary to slacken the adjustment a few notches at the adjusting unit.

Draw out the axle shaft by gripping the flange outside the hub; it should slide out easily, but if it is tight on the studs it may need gently prising with a screwdriver inserted between the flange and the hub. Should the paper washer be damaged it will need to be replaced with a new one when re-assembling.

Replacement is a reversal of the above operations.

Note :—A van axle shaft is longer than a saloon shaft, and they are accordingly not interchangeable.

Hubs—To Withdraw and Replace

Remove the wheel and axle shaft as described.

With the shaft removed the hub retaining nut is accessible. This nut is locked in position by a keyed washer which is hammered down on to one of the flats of the nut. Knock back the washer and remove the nut with a well-fitting spanner such as Service Tool No. CX.670/2.

The lockwasher can be removed by hand by tilting it so that the key disengages with the slot in the threaded portion of the axle case.

To use the extractor on the rear hub, the adapter will be needed. It will be seen that this piece fits into the end of the axle tube and provides a stop for the extractor bolt when this is screwed up.

The extractor is fitted over the wheel studs, and the nuts should be screwed well down. By screwing up the central bolt of the extractor,

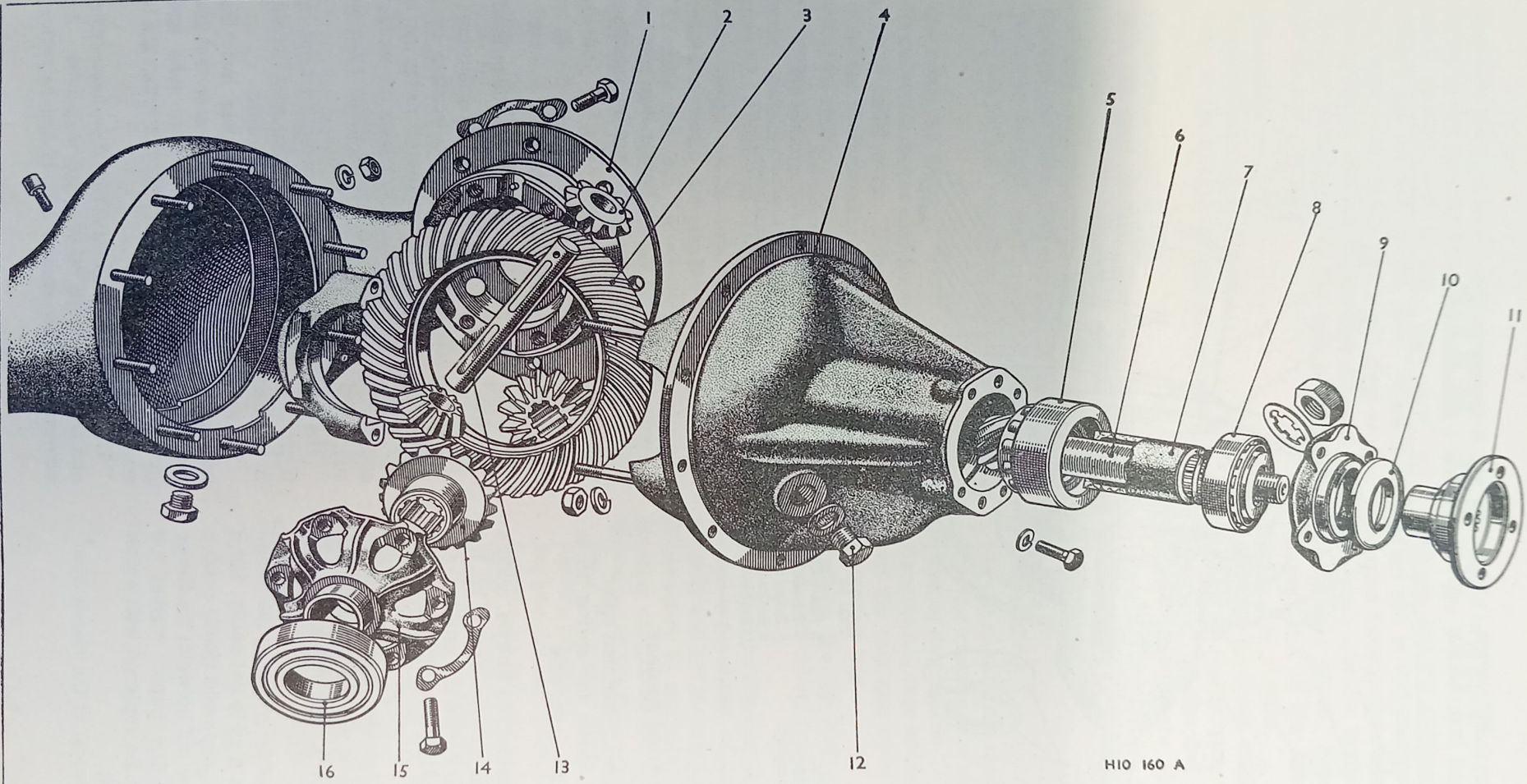


Fig. 2. **GENERAL ASSEMBLY OF THE REAR AXLE**

1. Differential Cover (Left-Hand).
2. Differential Pinion.
3. Crown Wheel.
4. Gear Carrier.
5. Pinion Taper Roller Bearing.
6. Bevel Pinion.
7. Pinion Sleeve.
8. Pinion Taper Roller Bearing.
9. Oil Seal Housing and Bearing Cover.
10. Dust Cover.
11. Propeller Shaft Flange.
12. Oil Filler Plug.
13. Differential Pinion Centre Spindle.
14. Differential Wheel.
15. Differential Case (Right-Hand).
16. Double Purpose Ball Bearing.

It should be noted that the pinion must be driven out towards the differential casing; it cannot be withdrawn forward
Shims for pre-load adjustment used between items 7 and 8.

using either a spanner or a tommy bar, the hub and double-row ball bearing, together with washers and oil seal, will be withdrawn. The actual order of assembly will be seen in Fig. 3.

The bearing can be tapped out of the hub with the aid of a drift such as Service Tool FJ5434.

When assembling, the bearings must be packed with grease. Rear hubs receive some lubricant from the axle during normal running.

Reassembling

The hub bearing is not adjustable.

In latest models a standard double row ball journal bearing supersedes the special double row double purpose ball bearing with split outer race. These bearings are interchangeable.

With the early type, the loose race is first pressed into the hub together with the distance ring and oil retainer, in the order shown in the illustration. The ball cage and second half of the outer race complete, follows into the hub, the special drift listed in Service Tools being useful for this operation. The later type bearing is replaced in one operation.

It is essential that the face of the outer race protrudes .001-in. to .004-in. beyond the face of the hub plus paper washer, when the bearing is pressed into place. This ensures that the bearing is definitely gripped between the abutment shoulder in the hub and the flange of the differential shaft.

The hub is then mounted on the axle tube, followed by the lock washer (which has a tongue to register with groove or hole) and finally the securing nut.

Tighten up the nut until the hub is fully home, and then secure by tapping down the lock washer on one of the flats of the nut.

Replace the axle shaft, carefully finding the spline fitting and ensuring that the flange and washer are threaded over the hub studs in the position in which the two small holes of the flange and hub coincide. Then refit the brake drum, taking the same precaution regarding the two small holes, and ensuring that the drum is well home when inserting the screws. Temporary use of the wheel nuts will assist.

Replace the wheel and finally tighten the nuts.

During reassembly the hubs should be packed with fresh grease.

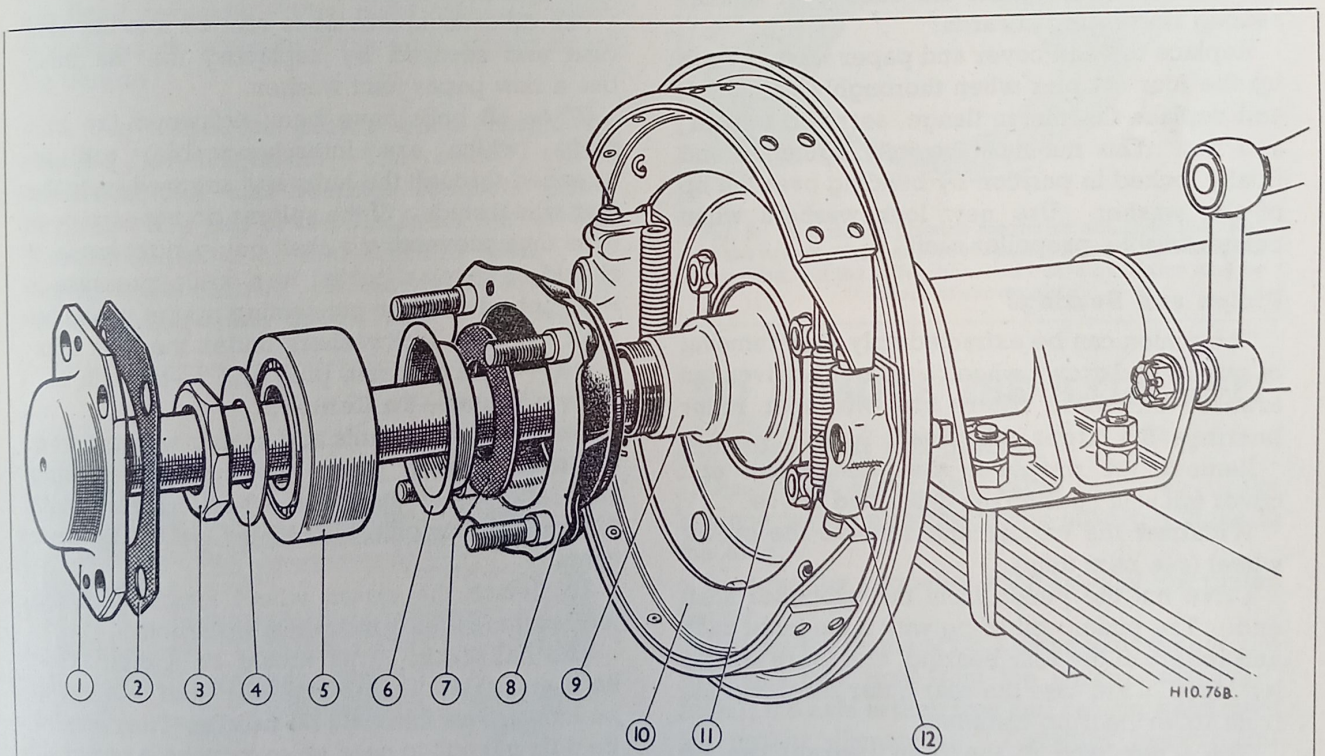


Fig. 3. Order of assembly of rear hub.

1 Axle shaft flange.
2 Joint washer.
3 Hub lock nut.
4 Lock washer.
5 Double ball bearing.
6 Distance ring.
7 Oil retainer.
8 Hub with studs.
9 Axle tube.
10 Brake shoe.
11 Brake shoe spring.
12 Brake adjuster housing.

Bevel Pinion—To Renew Oil Seal

This oil seal can be renewed with the axle in position.

Jack up the vehicle under the chassis side members in front of the spring mountings, and not under springs or axle. Raise the vehicle till the wheels are clear of the road.

Take out the four bolts of the propeller shaft flange to axle pinion flange.

Remove the large nut in the centre of the pinion flange after knocking back the lock washer, and then withdraw the flange itself. A flange extractor should be used, but it may be possible to tap the flange off the splined pinion shaft.

Remove the four set pins from the pinion end cover after knocking back the tab washers; the end cover can now be withdrawn.

The oil seal is pressed into this end cover, but can be removed with a punch. The end cover is of aluminium, and care must be used to prevent damage. Never remove an oil seal from the end cover unless it is intended to replace a new one, as it is invariably distorted in removal.

The new oil seal must be carefully pressed home, with the edge of the rubber or leather sealing ring facing inwards.

Replace the end cover and paper washer, lock up the four set pins when thoroughly tightened, and replace the pinion flange, serrated washer, and nut. This nut must be fully tightened and finally locked in position by bending over the lip of the washer. Use new lock washers when connecting the propeller shaft.

Pinion and Bearings

The pinion can be extracted only after removal of carrier and crown wheel; it must be driven out towards the rear. There are two taper roller bearings, the larger in the rear.

Remove the propeller shaft flange and end cover (oil seal housing) as described above.

Withdraw the carrier and remove the crown wheel (see next item).

Drive out the pinion from the propeller shaft end. The pinion will bring with it the inner race and rollers of the rear bearing, and there will be left loose in the case the rear outer race, and the front roller bearing complete.

The inner race of the front bearing can be removed with the fingers. The outer races can be tapped out with a soft drift or suitable extractor. Replacement of races must be carefully carried out to ensure that they are fully home against the shoulder in each case and perfectly square with the housing. To replace, fit the outer races to the housing. Fit the inner race and rollers of the rear bearing to the pinion, slide on the pinion sleeve and shim or shims as found on dismantling, and push into position from the rear. Fit the inner race and rollers of the front bearing over the splined end of the pinion and tap into position. Replace oil seal housing and paper washer, dust cover, propeller shaft flange, serrated washer and nut. Tighten the nut well home.

The taper roller bearing assembly is designed for pre-loading to the extent of 6 to 8 inch lbs., adjusted by means of the shims.

To Withdraw the Carrier

The bevel gear carrier unit can be withdrawn with the axle in position. Withdrawing the bevel gear however first entails removing the propeller shaft and then the axle shafts for which latter operation the road wheels and brake drums must also be removed.

Also remove the drain plug and run the oil into a suitable receptacle.

To withdraw the bevel gear unit, remove the ten nuts which hold the gear carrier to the axle case, and lift out the carrier complete.

To Replace Carrier

The differential carrier is refitted into the axle case and secured by replacing the ten nuts. Use a new paper joint washer.

When all bolts have been tightened the axle shafts (which are interchangeable) can be threaded through the hubs and secured on to the four wheel studs. If the splines do not engage at once thus preventing a shaft going right home, it should be given a partial turn while pressure is still applied. When connecting up the propeller shaft use new lockwashers under the four nuts. Replace the axle drain plug and re-fill with oil.

Crown Wheel—To Remove

Remove the four nuts and spring washers from the main bearing caps. Ease off the bearing caps, after which the crown wheel complete with differential carrier can be lifted out of the gear carrier.

To detach the crown wheel, knock back the lockwashers and remove the eight bolts.

The ball thrust races should be a tight fit on each end of the differential case, and if found to be loose a new case will be needed. They should be tight enough to need an extractor for removal.

Shaft Pinions—To Remove

Knock back the lockwashers and remove the eight set pins to part the differential case and give access to the differential wheel and axle shaft pinions.

The left-hand half of the differential case (to which the crown wheel is bolted) houses the pin upon which the two differential pinions revolve. This pin is located in position at one end by a dowel pin protruding from the case. Prise off the pin to detach the pinions.

The unit is now fully dismantled and all parts should be checked for scoring and signs of wear.

Wash all parts in paraffin after removal and ensure that they are quite clean and free from grit when they are reassembled.

RE-BUILDING THE UNIT

Shaft Pinions and Crown Wheel

Replace the differential wheels on the centre spindle and assemble the differential pinions. Use new lock-washers when bolting up. To be sure the casing is bolted up in the position in which it was originally machined, see that the identification marks are in line. Bolt the crown wheel to the differential case (but see next paragraph before using lockwashers). If new races are necessary take particular care to ensure they are fitted correctly. The word "thrust" which is stamped on one side of the race, should be on the outside.

At this stage the crown wheel should be checked for alignment. The crown wheel, differential case and bearings complete should be placed on a pair of vee blocks for this test and a sensitive meter or dial indicator used. The crown wheel should be slowly rotated and measurements taken on the face of the wheel.

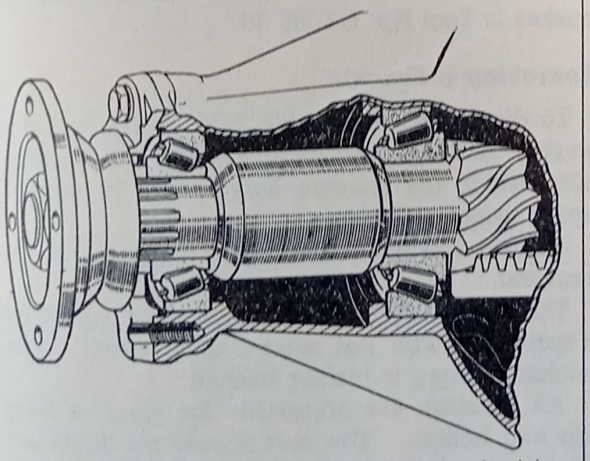


Fig. 4. Taper roller bearings support the rear axle pinion.

The crown wheel must not be more than .002-in. out of true. Any greater irregularity must be corrected. First detach the crown wheel and examine for any slight particles of grit on the flange. When the parts are thoroughly cleaned it is rare to find they do not run true. The pinion mesh will be automatically correct for depth.

The Pinion Assembly

Build up the pinion assembly as described on previous page and refit to the gear carrier.

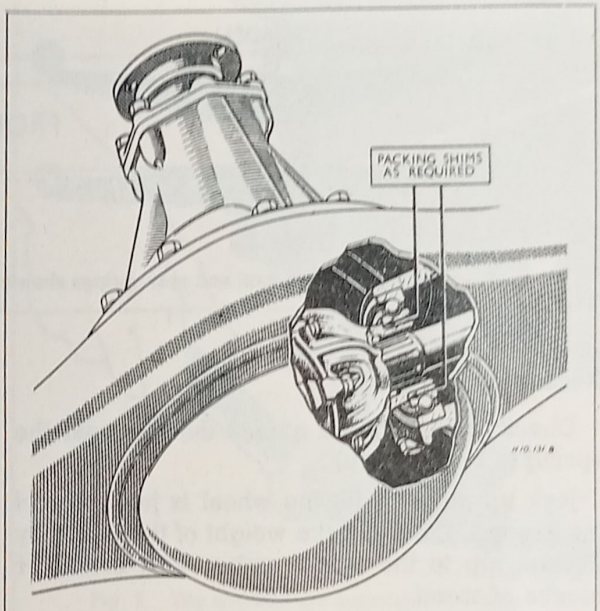


Fig. 5. In order to provide means for adjusting the mesh of the crown wheel and bevel pinion and for adjusting the pre-load and the differential ball bearings, shims may be fitted as shown above.

TO REMOVE THE AXLE UNIT

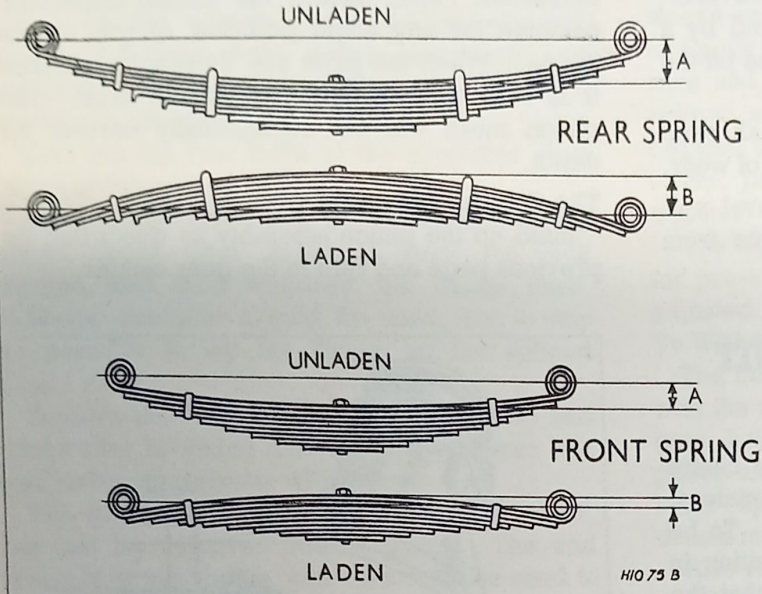
Propeller Shaft and Springs

Disconnect the brake cable from the brake balance lever, also the shock absorber links to the axle.

Remove the propeller shaft bolts at the pinion flange.

Jack up the frame at both sides and remove the nuts and lock nuts from the spring clips ("U" bolts); the axle is then free and can be withdrawn for further dismantling. Carefully remove the pad from between the spring and axle spring bracket. It has a hole for location over the spring centre bolt. In reassembling, make sure this pad is properly located, in order that the spring pin can fit into the centre hole.

ROAD SPRINGS



Spring Detail (Rear)	Early Models	Latest Models
Total Length ...	48-in.	43-in.
Free Camber, A ...	3¾-in.	3¾-in.
Camber, laden (reverse), B ...	2-in.	2-in.

Spring Detail (Front)	Early Models	Latest Models
Total Length	31-in.	31-in.
Free Camber, A ...	1 3/16-in.	1½-in.
Camber, laden (reverse) B ...	1-in.	1-in.

Fig. 1. The front and rear springs showing the free camber and camber when laden.

Removing a Spring

Chock all the wheels except the one near the spring to be dealt with.

Jack up the axle till the wheel is just clear of the ground, then take the weight of the frame by packing up to the side member with bricks or blocks of wood.

Remove the wheel, then slightly lower the jack to take the body weight from the spring.

Remove the shock absorber arm.

Using a box spanner release the locknuts from the spring clips ("U" bolts), then remove the spring washers and holding-down nuts. The spring clips may now be taken away, also the clip pads which are fitted between spring and axle. (See Fig. 1, page L/1). Front springs are mounted above the axle, and rear springs are underslung.

To Dismantle and Reassemble Road Springs

Grip the spring in a vice, with the vice jaws against the top and bottom leaves.

Free the leaf clips by tapping them with a hammer. Remove the nut on the spring centre bolt.

Carefully open the vice, when the spring leaves will separate.

Clean the leaves and examine for signs of failure, such as cracks. Replace any defective leaves, thoroughly grease, and reassemble by clamping in the vice; replace the clamping bolt and nut.

While the spring is still held in the vice, refit leaf clips.

To Renew Spring Eye Bushes

Bushes must be punched out of the spring leaf eyes, and new bushes pressed home. New bushes must be reamed out in position with Service Tool FX4277.

The special drift for removal and fitting of bushes is Tool No. CX585/30.

Removing a Shackle

To dismantle the shackle, take off the locknut, washer and adjusting nut at the top and bottom, after which the shackle halves can be tapped apart, using a suitable punch.

Shackle bushes can also be tapped out for renewal.

The front anchor end of each spring is held by a spring pin with nut, washer and locknut. The anchor bearing is rubber bushed.

All shackles are adjustable for wear at both top and bottom. The nuts should be tightened till all perceptible side play is eliminated, and then secured by the lock nuts.

It will be noticed that each pin is integral with one of the side plates, and therefore both sets of nuts must be removed before the shackle can be removed from the spring or the frame.

The accompanying diagram shows the correct order of assembly for each of the four shackles, which is important, as this provides the most convenient position for carrying out adjustment and lubrication.

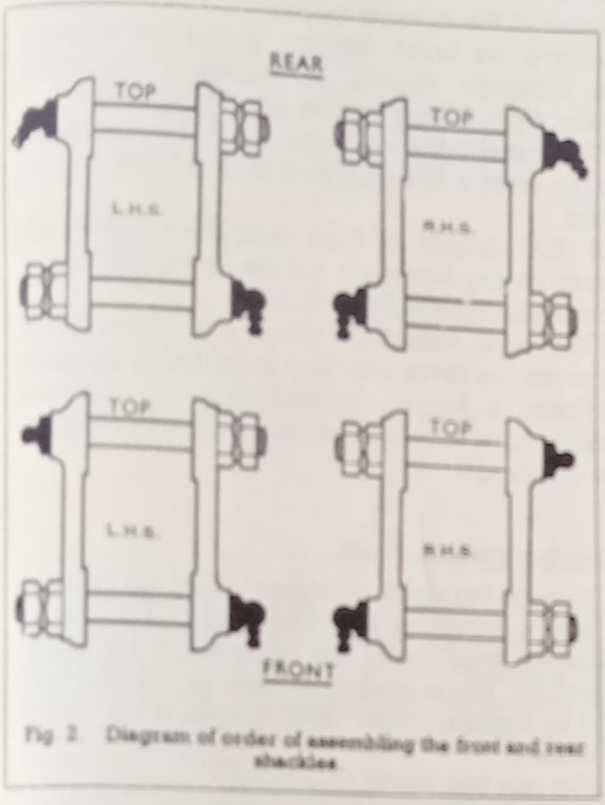


Fig. 2. Diagram of order of assembling the front and rear shackles.

To Renew Shackle Bush.

Bushes must be pressed out of housing. Service Tool CX585/30 is a special drift for fitting new bushes. These must be reamed out in position with Tool No. FX4277.

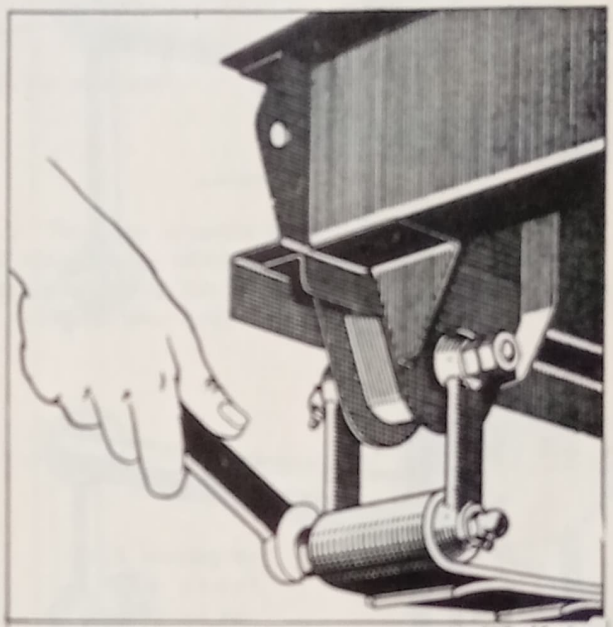


Fig. 3. The shackles are adjustable for wear.

THE BRAKING SYSTEM

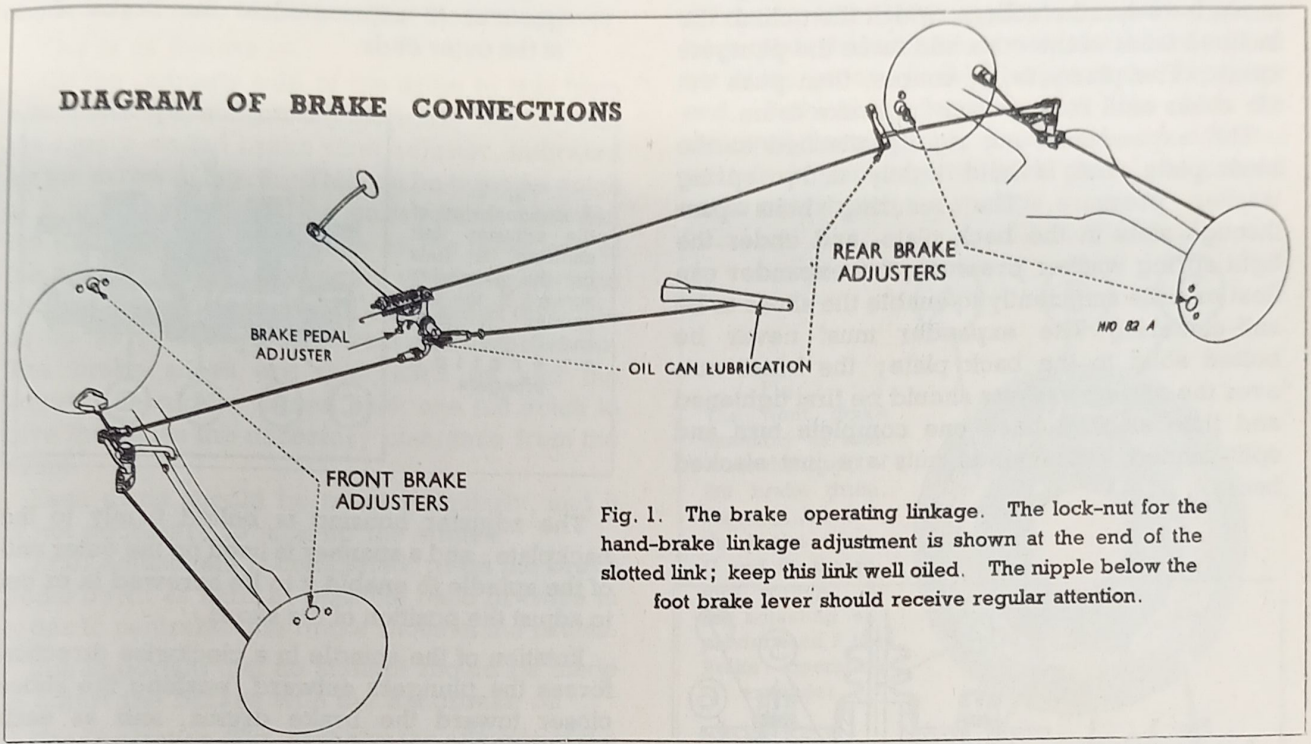


Fig. 1. The brake operating linkage. The lock-nut for the hand-brake linkage adjustment is shown at the end of the slotted link; keep this link well oiled. The nipple below the foot brake lever should receive regular attention.

It is of the utmost importance that the brakes are adjusted or serviced to give an equal distribution of braking on all wheels, so that maximum tyre life is obtained. Remember that adjustment may not always effect a cure; oil may have reached the brake linings.

Brakes are automatically compensated, and any tendency to pull to one side can only be due either to seized joints through lack of lubrication or to oil from the hubs reaching some of the brake linings.

Badly worn or distorted drums may also cause uneven braking and efficient compensation can only be effected after the renewal of the drums concerned.

Description

Girling wedge and roller type automatically compensated, and adjusted direct from each brake backplate.

Each brake consists of:

The backplate.
A pair of fabric faced shoes.
The shoe expander.
The shoe adjuster.
A pair of "pull-off" springs.

The load is applied either by foot or hand controls directly coupled to all wheels, through a front-rear compensating spring and balance levers.

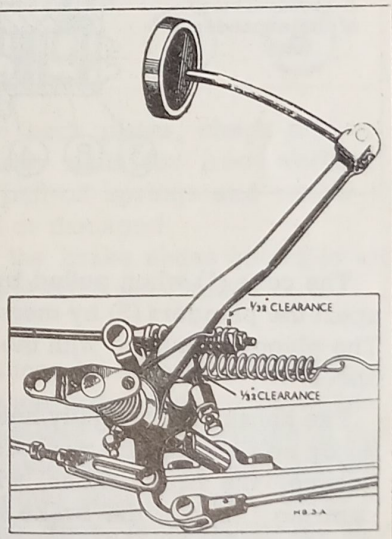


Fig.2, showing the brake pedal mounting and adjustment points, together with two important 1/32-in. clearance points.

The Expander Unit

The expander consists of:—

A die-cast housing in which are two studs (cast in and not removable).
A hardened and ground steel cone.
Two hardened and ground steel plungers.
Two hardened and ground steel rollers.
Two steel stop pins.
A pull rod or draw link.
Two double coil spring washers.
Two brass slotted nuts and two split pins (or on late models two Simmonds nuts).

It will be seen that any load applied to the draw-link is transmitted to the cone causing it to move between the rollers, which then climb the inclined faces of the cone and force the plungers apart. The plungers, of course, then push out the shoes until they contact the brake drum.

The expander is not rigidly attached to the back plate, but is held lightly under spring washer pressure. The securing bolts pass through slots in the back plate, and under the light spring washer pressure, the expander can float or slide sufficiently to enable the shoes to be self-centering. The expander must never be bolted solid to the back plate; the brass nuts over the spring washers should be first tightened and then slacked back one complete turn and split-pinned. (Simmonds nuts are just slacked back).

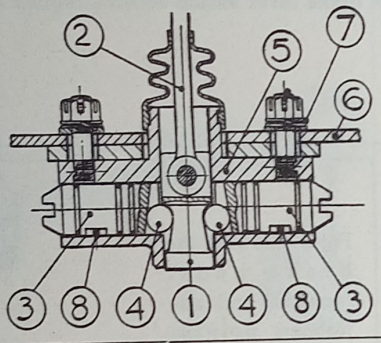


Fig. 3.
A sectional view of the expander unit.

The cone (1) when pulled by the rod (2) forces apart the plungers (3) by means of the rollers (4). The plungers engage with the webs of the brake shoes.

The housing (5) is lightly held on the back plate (6) by nuts and spring washers (7) so that it floats between the brake shoes, which are thus self-centring. When the brake shoes are removed the pins (8) hold the plungers (3) in the housing.

The Adjuster Unit

The adjuster unit, (Fig. 4) which is held firmly on the back plate by its housing (B) has two somewhat similar plungers (C) held apart by the adjuster (A), a conical ended screw, which provides adjustment to the shoes.

The adjuster consists of:—

A steel housing.

A screwed steel spindle having a cone at one end, with machined flats.

Two hardened and ground plungers having inclined faces to engage with the cone, and grooves to accommodate the brake shoes at the outer ends.

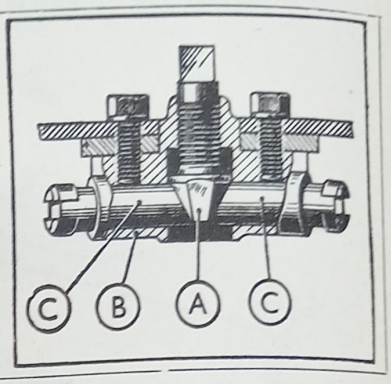


Fig. 4.
A sectional view of the adjuster unit showing, A, flats on the expander screw; B, the expander housing, and C, the brake operating plungers.

The adjuster housing is bolted firmly to the backplate, and a spanner is used on the outer end of the spindle to enable it to be screwed in or out to adjust the position of the shoes.

Rotation of the spindle in a clockwise direction forces the plungers outward, pushing the shoes closer toward the brake drums, and as each "flat" is reached a "click" will be heard, due to the plungers dropping from the cone surface under the pressure of the shoe "pull-off" springs. All adjustments must be completed on one of these "clicks".

It is an essential part of the design of the Girling Braking System that adjustment for brake lining wear is **always** made at each brake drum, and

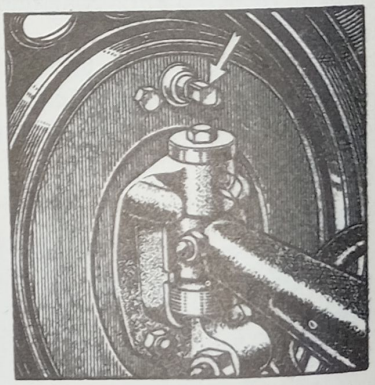


Fig. 5.
The adjustment screw for the front brake.

never by means of altering the length of brake rods. The two brakes on each axle are automatically compensated and hand or foot pressure brings all four brakes into operation.

In making adjustment to take up the wear of the brake linings there is only one operation necessary at each wheel to adjust the brake shoes.

This is as follows :—

On the opposite side of the drum to that from which the operating rod protrudes, will be seen the square-ended brake shoe adjuster, indicated by the arrow in Fig. 5. This can be turned a notch at a time, and effects the engagement between the four flat sides of the cone on the inner end of the adjuster, and the plungers which support the shoes. Turn the adjuster in a clockwise direction as far as it will go with reasonable pressure. The brake shoes are then hard on and the adjuster should be turned back one full notch to give the shoes the necessary clearance from the drum.

Each drum should be treated similarly, and it is not necessary to jack up the wheels.

After adjustment is completed, press the brake pedal down as hard as possible once or twice in order to centralise the brake shoes in the drums.

It is important that no attempt should be made to adjust the brakes with the handbrake on.

The illustration (Fig. 5) shows the adjuster of the front brake; on the rear brakes the adjuster will be found immediately in front of the axle.

Dismantling the Brakes

First jack up the car and remove the road wheels. Turn back the adjuster in an anti-clockwise direction as far as it will go. The adjuster should turn quite freely in the housing.

The brake drum is mounted on the hub and held by two small countersunk screws. Mark the position of the drum on the hub, take out the screws and remove the drum.

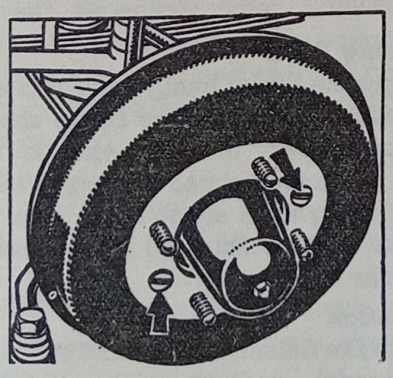


Fig. 6.
The brake drum is secured to the hub by two countersunk screws.

To Remove Shoes

To remove the shoes, place a large screwdriver, or other lever, against one of the studs on back plate behind the shoes and lift one shoe out of the groove in the plunger at the expander end. Both shoes and springs can now be removed leaving the expander and adjuster units in position on the back plate. Be careful not to overstretch the springs.

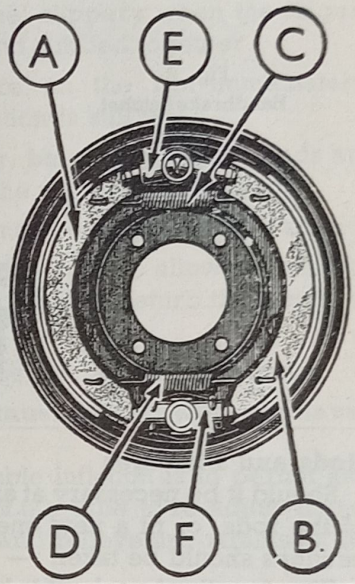


Fig. 7.
The front brake assembly as seen from the back of the brake drum, showing, A and B, the brake shoes; C and D, the return springs; E, the adjusting expander; and F, the brake operating expander.

Clean down the back plates, check the expander and adjuster units for free working. Inspect the shoe pull-off springs and renew if they are stretched or damaged.

When re-lining the brake shoes attend to all four shoes of one axle at the same time.

Refitting Shoes

In refitting the shoes be sure that the springs are between the shoe webs and the backplate. Hook the shoes together with one spring at the adjuster end, and assemble on the adjuster unit first, crossing the other ends of the two shoes to do so. Place one shoe in position on the expander unit, replace the second spring, and lever the other shoe into position. Refit the brake drum.

Brake Backplate

The brake backplate is secured to the axle by four nuts and bolts, and can be removed after taking off the hubs (see page L/1). The bolts can be taken out after knocking back the tabs of the lockwashers and removing the nuts. Each brake rod from the expander unit must, of course, be disconnected from the balance lever on the rear of the axle casing.

There is no adjustment possible for these rods, but it will be noted that the right-hand rod is shorter than that on the left-hand side.

Reassembling is a reversal of the removal sequence.

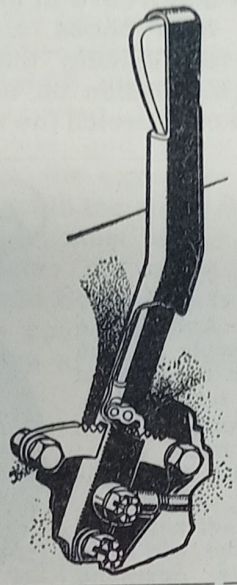


Fig. 8. Handbrake Ratchet Mounting. Use an oil can for lubricating the working parts.

Rods and Linkages

Should it be necessary at any time to adjust one of the rods, or fit a new one, the following precautions should be taken :—

The handbrake should have a little "free" movement and is adjusted by means of the connecting rod from the bottom of the lever to the cross shaft. In tightening the lock-nut be careful not to distort the slotted link.

Free Movement and Clearances

When the brake pedal has from ¼-in. to ½-in. free movement there should be a 1/32-in. clearance between the face of the forward adjusting screw and the lever on the pedal shaft. The front and rear brake rods should be adjusted to suit this position. (See illustration of pedal mounting, page N/1).

The front brakes are operated by direct pull and the rear brakes are operated through a special spring. There should be 1/32-in. clearance between this spring and the locking nut.

Fitting New Rods

Should it be necessary to fit new transverse rods on either axle, remove the shoes as previously described. Next remove the expander unit by undoing the two nuts holding it to the backplate, drawing the attached rod through the rubber cover.

To remove the rod, the expander plungers must be withdrawn by removing the split pins which retain them. The rod and the expander cone can now be drawn out, taking care that the two small rollers are not lost. Push out the pin attaching the short rod to the expander cone, and fit the new rod. Reassemble the expander unit, making sure the rollers are properly in place.

If there is any difficulty in reassembling the rollers, a little grease smeared on them and the slots in which they work will hold them in place while being assembled.

Now push the rod through the dust cover, and tighten up fully the two nuts holding the unit to the backplate, not forgetting the double spring washer underneath them. Slack back the nuts one complete turn, thus allowing the unit to float on the backplate in the manner it is intended. Reassemble shoes and brake drum or hub assembly.

It is very important that the adjustable fork ends on the rear brake rod, and on the front and rear longitudinal rod, are never screwed off the rods further than the inspection holes provided.

This can be checked with the aid of a thin piece of wire. The fit of the pins in the fork ends must always be free, as adequate clearance has been provided purposely at these points.

Always fully tighten the lock-nut after adjustment.

Shoe Centralising

To centralise the shoes and ensure correct clearance between the shoes and the drums, slack off the nuts that hold the expander unit to the backplate, and, by turning the adjuster screw in a clockwise direction as far as it will go, put the brake shoes hard on. When all drums have been treated in this manner press the brake pedal down as hard as possible once or twice, to ensure that the shoes are centralised. Slack back adjusters one notch to give the brake drums clearance, and finally check that the expander unit nuts are a half-turn slack.

The shoes should now be quite free of the drums.

The unit will then float on the backplate and be self-centring.

Equalising Wear

To equalise brake lining wear it is a good plan occasionally to reverse the brake shoes on each hub. In respect of rear wheels, this means putting the lower shoes on top ; and for front wheels, using front shoes at the rear of the hub, and vice versa. Thus, all linings share leading-shoe wear.

Lubrication

The brake balance levers and the nipple on the brake pedal, and all joints should be oiled regularly.

Inattention to lubrication of the brake balance levers may cause the brakes to "stick on."

TYRES AND JACKING

Inflation Pressures

The most important feature of tyre maintenance is regular attention to pressures—to a great extent the life of a tyre depends upon it. The recommended pressures are :—

	Tyre size.	Front.	Rear.
Car ...	5.00–16	24	25 lbs. per sq. in.
Van ...	5.00–17	24	36 lbs. per sq. in.

Failure to maintain correct pressures affects adversely both casing and tread.

Pressures should be tested frequently and any loss restored.

Maintenance

Oil (particularly paraffin) **and grease,** are injurious to rubber and should not be allowed to remain on tyres. To remove, petrol may be applied sparingly.

Cuts should receive attention; major ones by vulcanisation and minor by the application of special compound. If this is done promptly an extension of the injury will be prevented.

It is important that the tyre should be removed immediately any serious damage is sustained.

Synthetic Tyres

Synthetic tyres can be identified by a red medallion on covers and a red or blue disc on tubes close to the valve. Synthetic rubber is more susceptible to failure from abuse than natural rubber, and tyres therefore require more careful treatment in service and more regular maintenance. Tyre pressures should be checked and corrected at least weekly.

Avoid high speed, which is more detrimental to synthetic than natural rubber tyres. Synthetic tyres generate heat more quickly and have less resistance to cuts and tears than natural rubber tyres, especially when the rubber is hot, and for this reason synthetics require frequent inspection for cuts and tears in order that repairs can be made before serious damage is done to the casing.

Care in Fitting

Special care in fitting synthetic tubes is essential to obtain maximum life and avoid premature failure. Recommendations when fitting on Well Base rims are as follows :—

1. Dust the inside of the cover evenly with French chalk.

2. Inflate the tube until it begins to round out; then insert in cover.

3. Apply a frothy solution of soap and water generously around the entire base of the tube, extending upwards between the tyre beads and the tube itself for at least 2 inches on both sides. Also apply the mixture to the bottom and outside of the tyre beads. Do not allow the solution to run into the crown of the tyre. Mixture must be strong enough to feel slippery when the fingers are wetted with it and rubbed together.

4. Mount the tyre on the rim immediately, whilst the soap solution is still wet.

5. Before inflating, **be sure** the tyre beads are clear of the well of the rim all the way round.

6. Inflate slowly until the beads are fully seated.

7. Remove the valve core to allow the tube to **deflate completely.** Do not disturb the beads of the cover.

8. Re-inflate to correct working pressure.

This procedure must be followed whenever a tube is refitted.

The object of double inflation is to permit any stretched portions of the tube to re-adjust themselves in the cover and relieve any strains in the tube.

In an emergency, French chalk may be used as a substitute for soap solution, provided it is evenly and generously applied. This practice, however, is not recommended.

Repairing Tubes

Have punctures or injuries vulcanised. Ordinary patches should be used only for emergencies.

Road Wheels

Hub discs are sprung in position and can be removed with a coin or screwdriver used at the rim.

Misalignment plays havoc with front tyres and an occasional check with an alignment gauge is recommended.

Front wheels should be set between parallel and $\frac{1}{8}$-in. toe-in; rear wheels should be parallel.

Wheel Nuts should be tightened frequently particularly when the vehicle is new or the wheels have been removed and refitted.

Changing a Wheel

Before removing a wheel see that the handbrake is on firmly, and if on a hill, scotch one or two of the wheels. Check the spare tyre for

correct pressure. Adjust the jack nearly to the height required, before locating it in the frame, or placing it under the axle or spring, according to type.

The Car Jack

The "Stevenson" telescopic jack is provided with some models. This jack operates from a central cross member of the chassis frame. There are two positions for the jack, enabling either the right-hand side or left-hand side of the car to be raised.

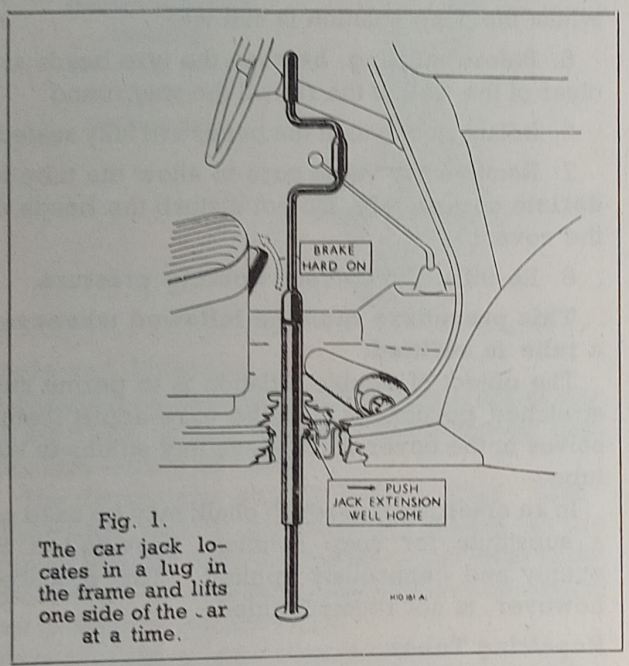


Fig. 1. The car jack locates in a lug in the frame and lifts one side of the car at a time.

To jack up the car, apply the hand-brake and lower the jack into position through a panel in the car floor immediately ahead of the front seat.

Ensure that the boss on the side of jack fully engages with the lug on the chassis frame cross-member, and then fit the wheel brace on the adjuster at the top of the jack. Turn the wheel-brace to lift the car, and as the car is raised check that the jack location is correct and secure. See that the jack is used on a hard and firm surface.

On fitting the spare wheel, tighten the nuts alternately and securely before removing the jack, and test the nuts again when the wheel is on the ground.

The Van Jack

When changing a front wheel place the jack under the axle beam immediately below the spring mounting. For a rear wheel, place the jack under the spring in front of the axle and operate from the side. There are two special locations on the spring to accommodate the jack head.

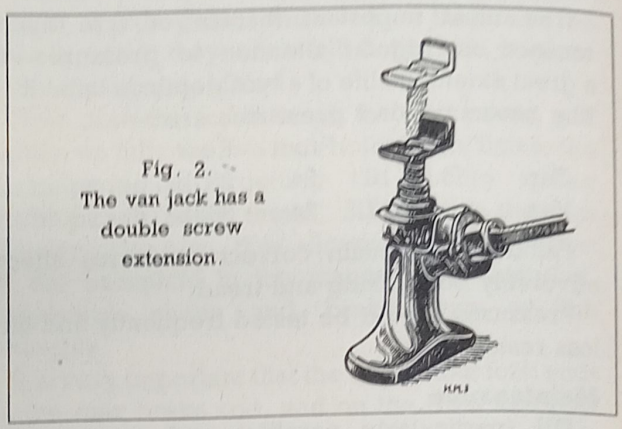


Fig. 2. The van jack has a double screw extension.

On fitting the spare wheel, tighten the nuts alternately and securely before removing the jack and test the nuts again when the wheel is on the ground.

Uneven Wear

Because the front wheels are slightly "cambered" or lean outwards, the outer side of the tyre tread wears more than the inner. To minimise the effect of such wear, change round the tyres periodically, so that the more worn sides are next to the car.

Change the near and offside tyres so that unequal weight distribution and consequent wear caused by road camber are shared. The spare tyre should be used in turn with the others.

Tyre Balance

The tyres are checked for balance in manufacture. This is denoted by the application of a white spot or spots near the bead, at the **lightest** point, on the cover. It has been the practice, that the tyres should be so fitted to the rims, that these white spots are located immediately opposite to the tube valve.

This has been further improved by the tubes receiving a balance check during manufacture and a group of coloured spots being marked on the base indicating the **heavy** point.

In such cases it is important that the white spots on the cover should coincide with the coloured spots on the tube.

In addition to the above, some covers may also have a special balancing disc fixed to the inside of the cover casing. This disc does not indicate a repair and must not be interfered with in any way.

ELECTRICAL EQUIPMENT

THE electrical equipment is designed and manufactured to give long periods of service without need for adjustment or cleaning. The small amount of attention which is required is described in Section 1, and this procedure should be followed to ensure that the best service is obtained.

Section 2 gives information on the operation of the various items of the equipment and describes the method of setting the lamp beams and fitting replacements, such as bulbs, high tension cables, etc., which may become necessary from time to time.

LUBRICATION AND GENERAL MAINTENANCE

AFTER THE FIRST 500 MILES RUNNING

Distributor

Remove the moulded distributor cap and turn over the engine by hand until the contacts in the distributor are fully opened. Check the gap with the gauge on the screwdriver supplied in the tool kit. This gauge has a thickness of .012in. and if the setting is correct the gauge should be a sliding fit. If the gap varies appreciably from the gauge the contact breaker should be adjusted. To adjust, keep the engine in the position to give maximum opening of the contacts and slacken the two screws which secure the contact plate. Move the plate until the gap is set to the thickness of the gauge and then fully tighten the locking screws.

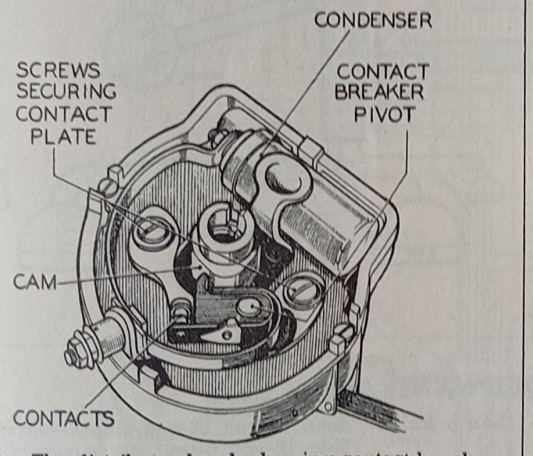


Fig. 1. The distributor head, showing contact breaker adjustment details.

MONTHLY OR EVERY 1,000 MILES

Battery

Remove the filler plug from each of the cells of the battery and examine the level of the electrolyte in each cell. If necessary, add sufficient distilled water to bring the electrolyte level with the top of the separators. A syringe will be found useful for topping up as it prevents the distilled water from being spilled on the top of the battery. Do not use tap water and do not use a naked light when examining the condition of the cells. Examine the terminals and if they are corroded, scrape them clean and coat with petroleum jelly.

Wipe away all dirt and moisture from the top of the battery and make sure that the connections and fixing bolts are clean and tight.

EVERY 3,000 MILES

Carry out the procedure for every 1,000 miles together with the following :

Distributor—Lubrication

Distributor Shaft

Add a few drops of thin machine oil through the lubricator fitted on the distributor shank.

Cam

Lightly smear the cam with a very small amount of Mobilgrease No. 2 or if this is not available, clean engine oil can be used.

Cam Bearing

Lift the rotor 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 which is exposed to view as there is a clearance between the screw and the inner face of the spindle through which the oil passes.

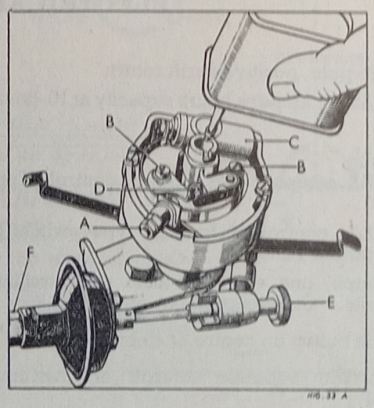


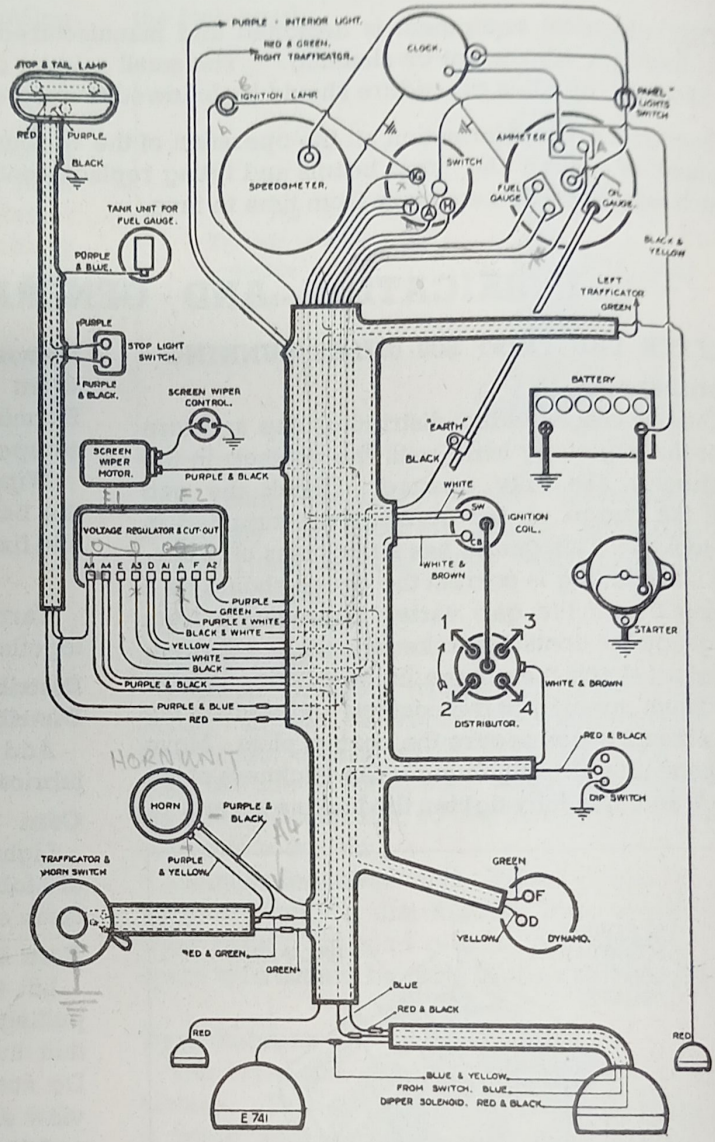
Fig. 2. Oiling the distributor after removing the rotor. A, connection from coil to contact breaker; B, points adjuster screws; C, condenser; D, contact points; E, vacuum timing control; F, vacuum pipe union.

F1 Aux Ign SW ON
F2 Aux

AUSTIN TEN WIRING DIAGRAM

FOR CARS AND VANS

Fig. 3. The Austin Ten wiring diagram. The voltage regulator and cut-out unit contains two fuses and one spare. One fuse protects the accessories which are operative only when the ignition is switched on (e.g., stoplamp, fuel gauge, horn and direction indicators). The other fuse protects those accessories which can be operated independently of the ignition. If a new fuse blows, the cause of the trouble must be found.



ELECTRICAL EQUIPMENT DATA

Voltage – 12

Wiring – – Single pole, positive earth return.

Battery – – LUCAS, 51 ampere hours capacity at 10-hour rate.

Dynamo – LUCAS.

Regulator – LUCAS compensated voltage control, Type RF.91.

Starter Motor LUCAS, controlled by pull-type switch on Instrument Panel.

Fuses – 25 amps, one each for main and auxiliary circuits. One spare in cut-out.

Horn – – Switch button on centre of steering wheel.

Windscreen Wipers Dual, with separate controls on Instrument Panel.

Lamp Bulbs Head, 12-volt, 36 watt, single contact.
Side, 12-volt, 6-watt, single contact.
Tail, 12-volt, 6-watt, single contact.
Roof, 12-volt, 6-watt, festoon.
Traffic Indicators, 12-volt, 3-watt, festoon.
Ignition Warning, 2.5-volt, .5-watt, single contact screw cap.
Panel, 12-volt, 2.5-watt, single contact screw cap.
There is a foot-controlled dip-switch.

Instruments Fuel Gauge, Centre-Zero Ammeter, Electric Clock.

Direction Indicators Controlled from centre of steering wheel, self-cancelling type and wired in ignition circuit.

AUSTIN TEN WIRING DIAGRAM
FOR RIGHT-HAND STEERING CARS AND VANS—EXPORT

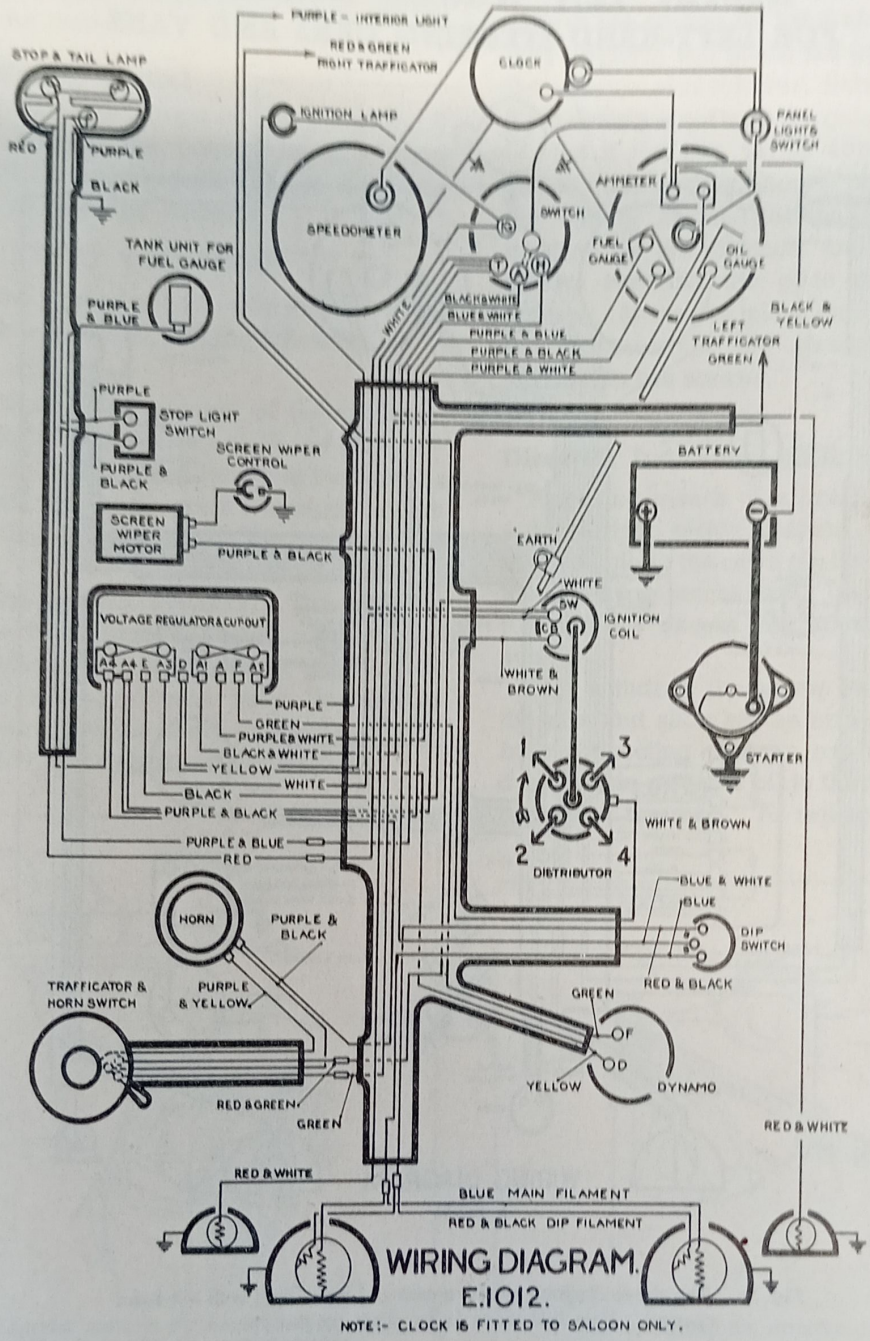


Fig. 3a. The wiring diagram applies to right-hand steering cars for export, fitted with double filament type headlamps.

AUSTIN TEN WIRING DIAGRAM
FOR LEFT-HAND STEERING CARS AND VANS

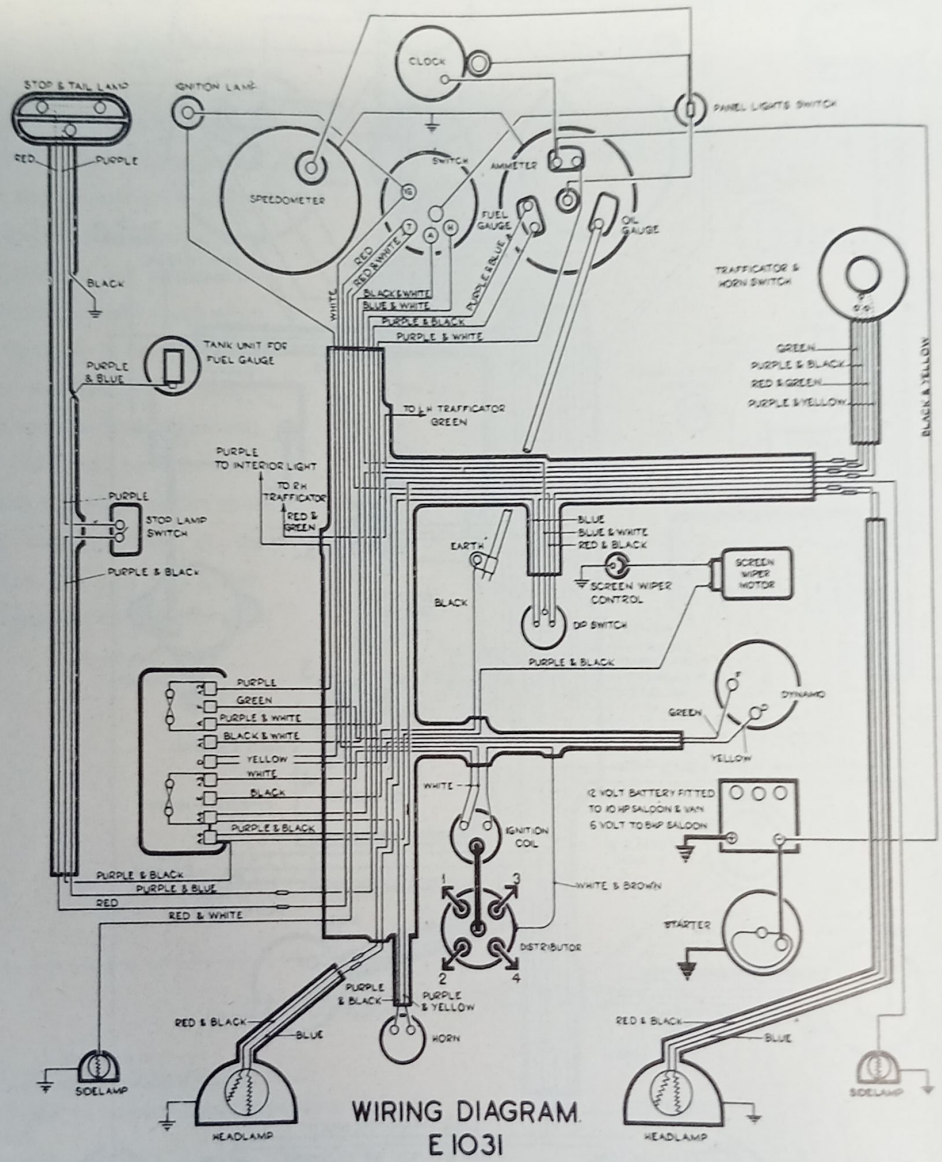


Fig. 3b. The above diagram refers to cars and vans fitted with left-hand steering. Note that there is no clock on the van.

Replace the rotor correctly and push it on to the shaft as far as it will go, otherwise there is a risk of the moulded cap becoming burned or tracked.

Contact Breaker Pivot

Place a small amount of Mobilgrease No. 2 or clean engine oil on the pivot on which the contact breaker lever works. Do not allow oil or grease to get on to the contacts.

Automatic Timing Control

Carefully add a few drops of thin machine oil through the hole in the contact breaker base through which the cam passes. Do not allow any oil to get on or near the contacts.

EVERY 6,000 MILES

Carry out the procedure for every 1,000 miles and 3,000 miles together with the following :

Distributor—Cleaning

Wipe the inside and outside of the moulded distributor cap with a soft dry cloth, paying particular attention to the space between the terminals. See that the small spring-loaded carbon brush on the inside of the moulding works 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 with very fine emery cloth. Afterwards wipe away any trace of dirt or metal dust with a petrol moistened cloth.

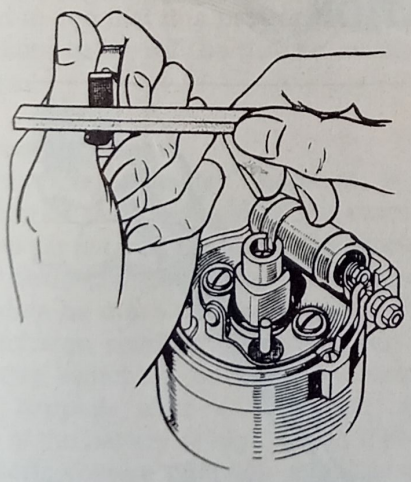


Fig. 4. Cleaning the contacts, showing the points being carefully trued with fine carborundum.

Cleaning the contacts is made easier if the contact breaker lever carrying the moving contact is removed. To do this unscrew the nut securing the end of the spring. Remove the spring washer and flat washer, and lift off the lever complete with spring.

After cleaning check the contact breaker setting.

Contact Breaker—Checking and Adjustment

Turn the engine by hand until the contacts are fully opened, and insert the gauge, provided on the ignition screwdriver, between the contacts. If the setting is correct, the gauge will be a sliding fit, but if the gap varies appreciably from the gauge, the setting should be adjusted. Keep the engine in the position to give maximum opening of the contacts and slacken the two screws securing the plate carrying the fixed contact. Move the plate until the gap is set to the thickness of the gauge and afterwards tighten the two screws.

Direction Indicators—Lubrication

Apply by means of a brush or other suitable article 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 adversely affect operation.

Also withdraw the screw on the underside of the arm and slide off the arm cover. Place the bulb connecting wire on one side and apply a drop of thin machine oil to the lubricating pad at the top of the arm. To replace the arm cover,

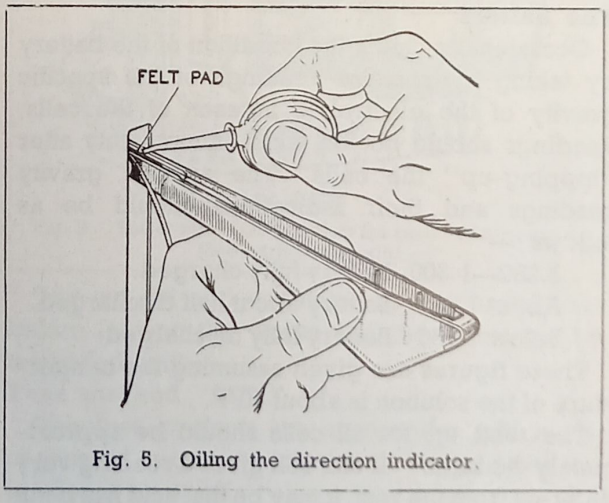


Fig. 5. Oiling the direction indicator.

slide it in an upward direction so that the side plates engage with the slots on the underside of the spindle bearing, and secure with the screw.

EVERY 12,000 MILES

Carry out the procedure for every 1,000 miles, 3,000 miles, and 6,000 miles together with the following :

Dynamo—Lubrication

Unscrew the lubricator fitted at the commutator end, lift out the felt pad and spring, and about half fill the lubricator with petroleum jelly. Replace the spring and felt pad and screw the lubricator in position on the commutator end bracket.

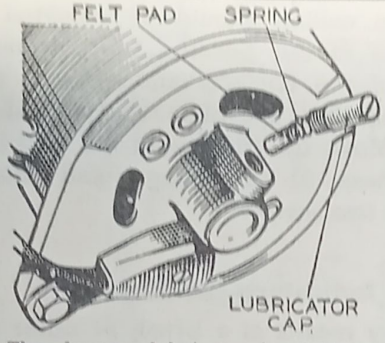


Fig. 6. The dynamo lubricator is of the spring and plunger type.

Dynamo and Starter—Brushes and Commutator

Remove the cover band and check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol-moistened rag. Be careful to replace brushes in their original positions, to retain the "bedding". Brushes which have worn so that they will not bear correctly on the commutator must be replaced and properly "bedded" by a Lucas Service Depot, or Agent.

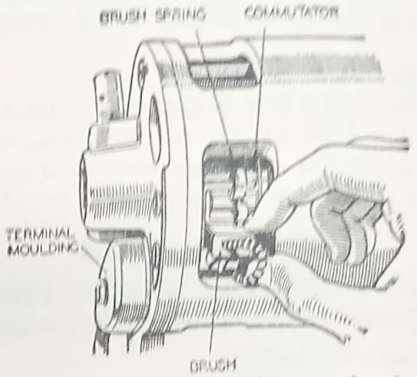


Fig. 7. Removing a dynamo brush for cleaning.

The commutator should be clean, free from oil or dirt and should have a polished appearance. If it is dirty, clean it by pressing a fine dry duster against it while the armature is slowly rotated—in respect of the dynamo this can be done by turning the engine over by hand, while with the starter the armature can be rotated by a spanner fitted on the square shaft extension at the commutator end. If the commutator is very dirty, moisten the cloth with petrol.

GENERAL INFORMATION

The Battery

Occasionally check the condition of the battery by taking hydrometer readings of the specific gravity of the electrolyte in each of the cells. Readings should not be taken immediately after "topping-up" the cells. The specific gravity readings and their indications should be as follows :—

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 the temperature of the solution is about 60°F.

The readings for all cells should be approximately the same. If one cell gives a reading very different from the rest, it may be that acid has been spilled or has leaked from this particular cell or there may be a short circuit between the plates. In this event the battery should be examined by a Lucas Service Depot or Agent.

Fig. 8. Taking hydrometer readings to test the strength of the solution.

Never leave the battery in a discharged condition for any length of time. If the car is out of commission have the battery fully charged, and every fortnight give it a short refreshing charge to prevent any tendency for the plates to become permanently sulphated.

The Dynamo

The dynamo is of the compensated voltage control type and operates in conjunction with the regulator unit which is housed together with the cut-out in the control box.

The regulator causes the dynamo to give an output which varies according to the load on the battery and its state of charge. When the battery is discharged, the dynamo gives a high output so that the battery receives a quick recharge which brings it back to its normal state in the minimum possible time.

On the other hand, if the battery is fully charged the dynamo will give only a trickle charge which is sufficient to keep it in good condition without any possibility of causing damage to the battery by overcharging.

The regulator also causes the dynamo to give a controlled boosting charge at the beginning of a run which quickly restores to the battery the energy taken from it when starting. After about 10 minutes running, the output of the dynamo falls to a steady rate, best suited to the particular state of charge of the battery.

Occasionally inspect the dynamo driving belt and adjust if necessary to take up any slackness. Care should be taken to avoid overtightening the belt and to see that it is properly aligned, otherwise undue strain will be thrown on the dynamo bearings.

Ammeter Readings

When noting ammeter readings, it must be remembered that during daytime running when the battery is in good condition, the dynamo gives only a trickle charge so that the charge reading will seldom be more than a few amperes.

A discharge reading may be given immediately after switching on the headlamps. This usually happens after a long run, when the voltage of the battery is high. After a short time, the battery voltage will fall, and the regulator will respond, causing the dynamo output to balance the load.

When starting from cold, the charging current will rise until it reaches a steady maximum at a speed of say, 20 m.p.h., after which it will remain fairly high for about 10 minutes and then fall to a steady charge which is most suitable for the particular state of charge of the battery.

It will be noticed from the ammeter readings that the dynamo does not charge at very low engine speeds. This is because it is not rotating fast enough to generate sufficient energy to charge the battery. The cut-out, which is an automatic switch and allows the flow of current from the dynamo to the battery only, is connected between the dynamo and the battery. It closes when the dynamo is running fast enough to charge the battery and opens when the speed is low or the engine is stationary, thus preventing current flowing from the battery through the dynamo windings.

Control Box

This unit is usually mounted on the engine side of the dash and houses the cut-out, dynamo voltage regulator and two fuses, which protect the circuits of the auxiliary accessories (i.e., the horn, windscreen wiper, etc.).

The cut-out, regulator and fuses are protected by a moulded cover which can be withdrawn when the spring clip is moved aside. Take care to avoid closing the cut-out contacts when removing or replacing the cover, as this may cause damage to the equipment. Should they become inadvertently closed when the engine is stationary, carefully pull them apart.

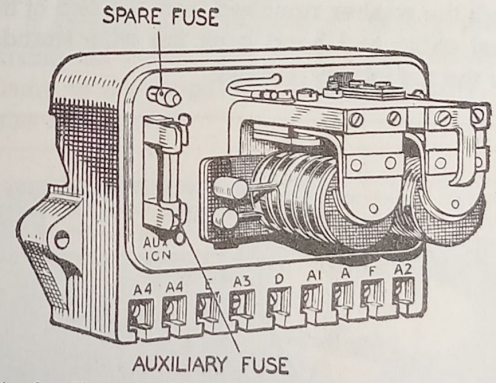


Fig. 9. The control box showing the order of terminals. (See wiring diagram).

The cut-out and regulator are accurately set before leaving the works and they must not be tampered with.

Fuse marked "AUX"

This fuse protects the accessories which are connected to operate irrespective of whether the ignition is on or off.

Fuse marked "AUX IGN"

This fuse protects the accessories which are connected to operate only when the ignition is switched on.

The units which are protected by the fuses can readily be identified by referring to the wiring diagram.

A blown fuse is indicated by the failure of all the units protected by it, and is confirmed by examination of the fuse, which can easily be withdrawn from the spring clips in which it fits. If it has blown, the broken ends of the wire will be visible inside the glass tube. Before renewing a blown fuse, inspect the wiring of the units that have failed, for evidence of a short circuit or other fault which may have caused the fuse to blow, and remedy the cause of the trouble.

Spare fuses are provided and it is important to use only the correct replacement fuse. The fusing value is marked on a coloured paper slip inside the glass tube of the fuse.

If the new fuse blows immediately and the cause of the trouble cannot be found, have the equipment examined at a Lucas Service Depot.

High Tension Cables

The high tension cables are those connecting the coil to the distributor and the distributor to the sparking plugs. When these cables show signs of perishing or cracking they must be replaced by 7 mm. rubber-covered ignition cable.

The method of connecting is to thread the knurled moulded nut over the cable, bare the end of the cable for about $\frac{1}{4}$-in., thread the wire through the washer removed from the end of the original cable and bend back the wire strands. Screw the nut into its terminal.

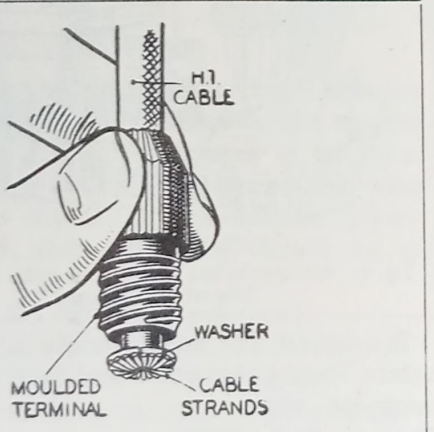


Fig.10. Fitting a high tension cable terminal.

The Coil

The coil requires no attention beyond keeping its exterior clean, particularly between the terminals and occasionally checking that the terminal connections are quite tight.

The Ignition Switch and Warning Light

The ignition switch, besides forming a means of stopping the engine, is provided for the purpose of preventing the battery being discharged by the current flowing through the coil windings when the engine is stopped. A warning lamp is provided in the instrument panel which gives a red light when the ignition is switched on and the engine is running very slowly or is stationary, thus reminding you to switch off.

Should the warning lamp bulb burn out, this will not in any way affect the ignition system, but you should renew it as soon as possible in order to safeguard your battery.

The replacement bulb is a Lucas C252A.

Timing Adjustment

In order to obtain very fine timing of the ignition to the engine and to allow for altered engine conditions, e.g., state of carbonisation of engine, change of fuel, etc., a micrometer adjustment is provided which allows fine adjustment to be made simply by the movement of a knurled knob.

With a clean engine, and using first grade fuel, the micrometer scale should be set at 0.

If the firing is found to be slightly too early or too late, adjust the knurled knob until the best engine performance is obtained. The adjustment should not be altered by more than half a division on the scale at a time.

Electric Horn

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 the horn 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 some outside source, e.g., a discharged battery, or loose connection or short circuit in the wiring of the horn: a short circuit in the horn wiring will cause the fuse to blow. If the fuse has blown, examine the wiring for the fault, remedy and renew the fuse.

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 should be returned to a Lucas Service Depot or Service Agent for examination.

The Starter

When starting, observe the following points :—

1. See that the controls are properly set.
2. Operate the starter switch firmly and release it as soon as the engine fires.
3. Do not operate the starter when the engine is running. If the engine will not fire at once, allow it to come to rest before operating the switch again.
4. Do not run down the battery by keeping the starter on when the engine will not start.

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 small cap which is secured by two screws.

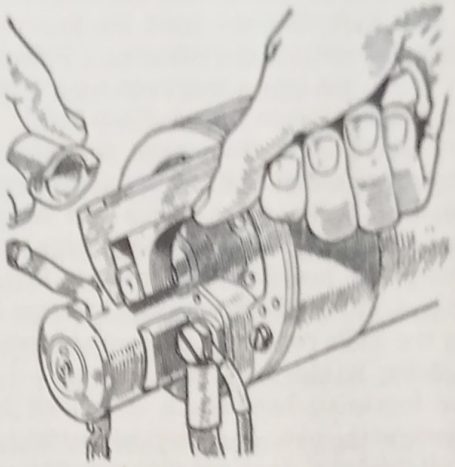


Fig. 11. Freeing the starter pinion with a spanner.

LIGHTING

Setting the Headlamps

The Ministry of Transport Lighting Regulations state that a lighting system must be set so that it can give a light which is "incapable of dazzling any person standing on the same horizontal plane as the vehicle at a greater distance than 25 feet from the lamp, whose eye-level is not less than 3-ft. 6-in. above that plane."

To comply with the regulations, the lamps must be set as shown. Check the setting by placing the car in front of a blank wall at the greatest possible distance, taking care of course, that the surface on which the car is standing is not sloping relative to the wall.

The headlamps must be set so that the beams of light are parallel with the road and with each other. This will ensure that when the "Dip and Switch" reflectors are operated, the lamps will give a non-dazzling light.

If adjustment is necessary, slacken the single fixing nut at the base of the lamp and move the lamp to the required position. Finally, tighten the locking nut.

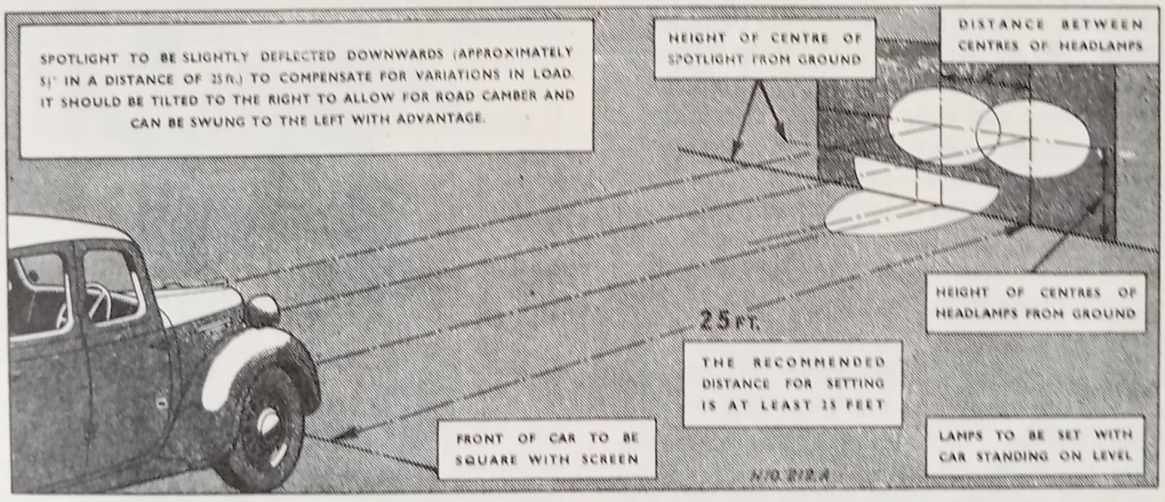


Fig. 12. This diagram shows the procedure for correct setting of headlamps, including the setting of a spotlight on vehicles so fitted.

Focussing

In order that the lamps shall give the best results, the bulb filament must be as near as possible to the focus of the reflector. If the bulb is out of focus, the lamps will have a poor range and will inconvenience approaching traffic.

Before lamps leave the works, the bulbs are focussed to give the best results and provided that genuine Lucas spare bulbs are fitted as replacements, it should not be necessary to alter the setting. If, however, an ordinary bulb has to be fitted, it may be necessary to focus it by moving the bulb backward or forward until the best lighting is obtained.

When focussing headlamps, it will be found an advantage to cover one lamp while testing the other. If the lamp does not give a uniform long

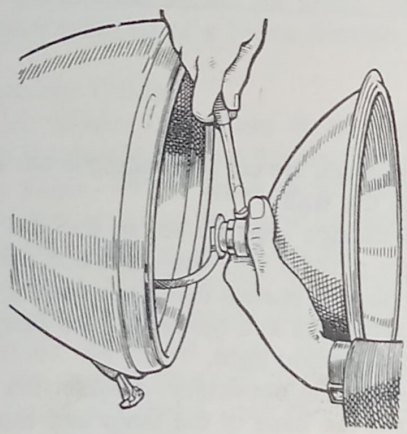


Fig. 13. Focussing a bulb by means of the adjustable holder.

range beam, or has a dark centre, the bulb needs adjusting. To do this remove the lamp front and reflector, slacken the clamping clip at the back of the reflector and slide the bulb holder backward or forward. After each adjustment note the effect with the front and reflector refitted. When the best position for the bulb has been found, the clamping screw must be finally tightened.

Removing Lamp Front and Reflector

Pull forward the fixing clip at the bottom of the front rim and swing it downwards. Remove the front from the bottom of the lamp first. When replacing the front, locate the top first, then press on at the bottom and secure by springing the clip into its location in the front rim.

The reflector is secured in the lamp body by a rubber bead and can be withdrawn when the rubber bead is removed. When replacing the reflector, the projection on the rim must fit into the left hand location at the top of the lamp body, and the rubber bead must be positioned over the reflector rim and the edge of the lamp body so that the thinner lip of the bead fits in the groove in the lamp body.

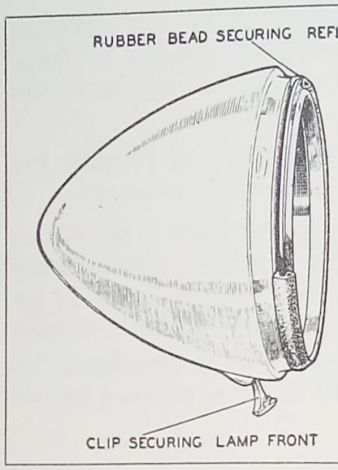


Fig. 14 The reflector is secured by a rubber bead.

Dipping Reflectors

The headlamps are fitted with the electrically operated dip and switch scheme in which the left-hand reflector is arranged to dip to the left while, at the same time, the right-hand headlamp is switched off. On some export models the dipper is on the opposite side, and sometimes twin filament bulbs are fitted in place of the dipping reflector scheme. The dipping reflector calls for no attention—there is nothing to adjust and no lubrication is required.

The dipping reflector is protected by a fuse which is fitted at the back of the reflector, together with a spare fuse. The indication of this fuse

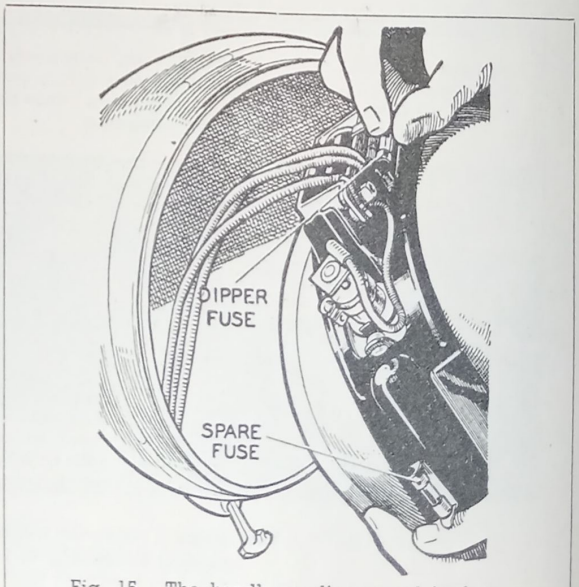


Fig. 15. The headlamp dipper and its fuse.

blowing will be the failure of the dipping reflector to function. The cause of the trouble may be a faulty connection inside the lamp, or the cables may be fouling the reflector and restricting its movement. Check the movement of the reflector by carefully rocking it with the fingers (finger marks can be removed by wiping with a clean, dry, soft cloth). If it seems stiff, first see that this is not due to the cables fouling it, and then apply the lightest smear of thin machine oil to the moving plunger of the dipper unit and to the reflector bearings.

Side Lamps

The front together with the reflector can be withdrawn when the fixing screw at the top of the lamp is slackened. The bulb holder is clipped on the back of the reflector and can be withdrawn by twisting to the left and pulling off. When replacing the bulb holder, position it so that the slots in the rim will engage with the springs in the back of the reflector and press it home. When replacing the front and reflectors, locate the bottom first and then press on at the top and secure by the screw.

Stop-Tail Lamp

The lamp cover can be removed when the two fixing screws are slackened.

Roof Lamp

The lamp cover can be removed to provide access to the bulb, when the two screws are removed.

Cleaning the Lamps

Care must be taken when handling reflectors to prevent them from becoming finger marked. If they do become marked, however, a transparent and colourless protective covering enables any finger marks to be removed by polishing with a chamois leather or a soft dry cloth. DO NOT USE METAL POLISH ON REFLECTORS.

Metal polish must not be used for cleaning chromium plated lamp bodies. They must be washed with plenty of water and when the dirt is completely removed, the lamp bodies must be polished with a chamois leather or a soft dry cloth. Black or coloured lamp bodies can be cleaned with a good car polish.

Renewing Lamp Bulbs

Genuine Lucas spare bulbs are sold by any reputable garage and are specially tested to ensure that the filament is in the correct position to give the best results with Lucas Lamps. To assist in identification, Lucas bulbs are marked on the metal cap with a number. When fitting a replacement see that it bears the same number as the original bulb. It is advisable to renew bulbs after long service before they actually burn out as in time the filament may sag.

Replacement Bulbs

Headlamp Lucas No. 54, 12-volt, 36-watt single pole.

Sidelamp Lucas No. 207, 12-volt, 6-watt single pole.

Stop-Tail Lamp Lucas No. 207, 12-volt, 6-watt single pole.

Panel Lights Lucas No. 1224M, 12-volt, 2.5 watt.

Ignition Warning Lamp Lucas No. C.252A, 2.5-volt, .5 watt.

Direction Indicators Lucas No. 256, 12-volt, 3-watt festoon type.

Roof Lamp 12-volt, 6-watt festoon type.

STOP/TAIL LIGHT 6/21 WATT @ 12V.

Replacing a Direction Indicator Bulb

Withdraw the screw on the underside of the arm and slide off the metal plate; the burnt-out bulb may then be renewed. To replace the metal plate, 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 plate by means of its fixing screw.

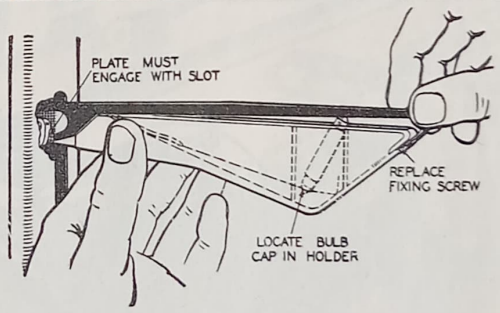


Fig. 16. Renewing a direction iudicator bulb.

Windscreen Wiper

The switch is combined with the knob on the driver's side. To start, push in the knob and turn it to disengage from the parking position. Release the knob and then rotate it until the driving dogs engage. Engage the drive to the arm on the passenger's side in a similar manner.

To switch off, push in the knob and turn it until the arm lies on the scuttle.

No adjustment or lubrication is necessary as the gears are fully lubricated when assembled.

BODY REMOVAL

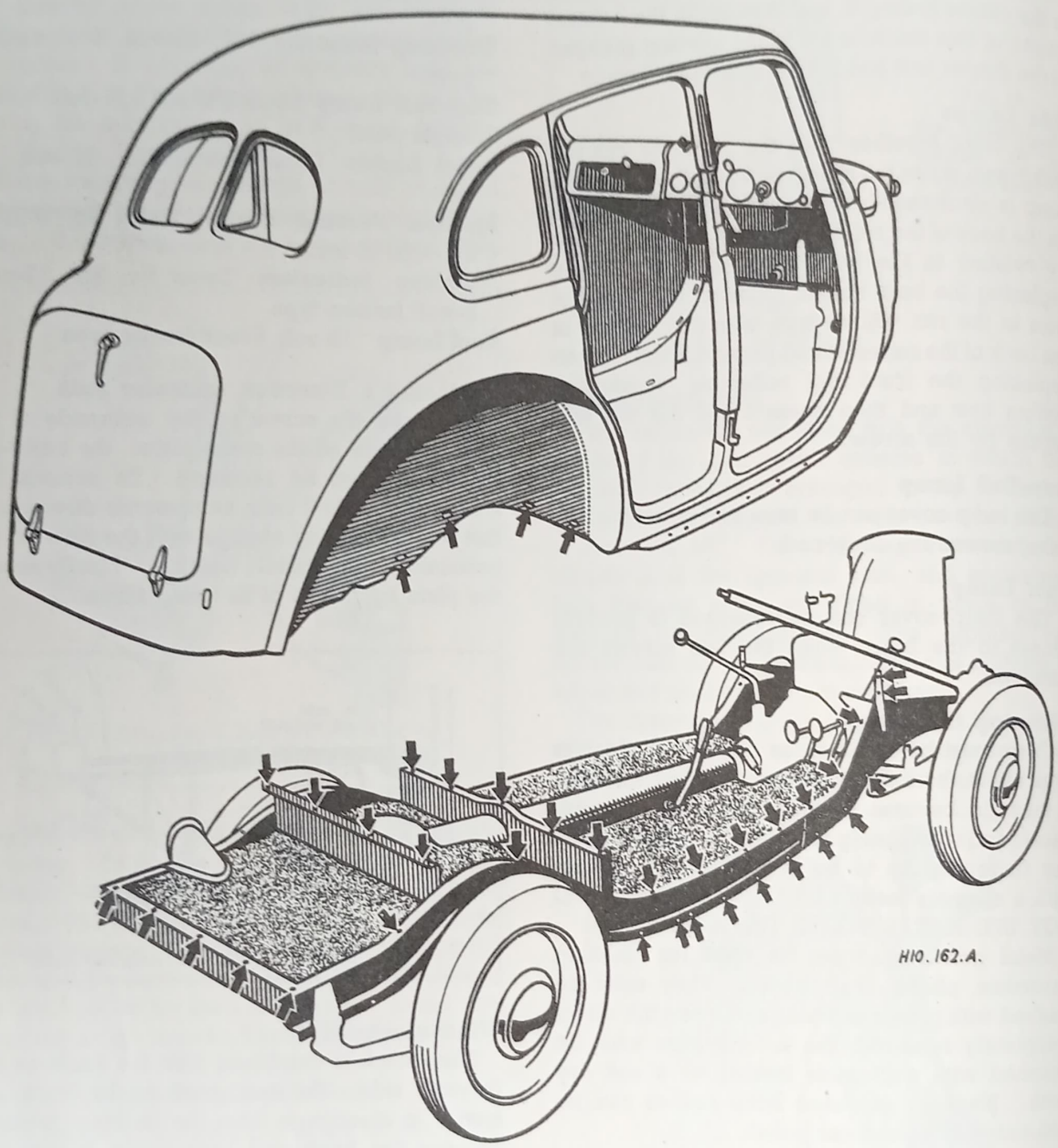


Fig. 1. The body attachment points are indicated by the arrows. Setscrews are used throughout to either tapped holes or caged nuts. When refitting, the body sill must be eased over the frame side members with which it forms a box section.

Removing the Body

Remove the battery, separate all snap connections to lamps and horn and disconnect the leads from the ignition coil, dynamo, starter motor and throttle, and choke levers on the carburetter.

Place an oil receptacle under the steering box to catch the lubricant, then slacken the steering end cover pinch bolt and withdraw the horn switch and tube.

Withdraw the steering wheel (see Steering Section).

Remove the moulded cover over the gearbox.

Disconnect the speedometer cable from the drive at the rear of the gearbox.

Release the steering column from the clip under the instrument panel.

Take out the toe plates in the floor-board near the clutch and brake pedals.

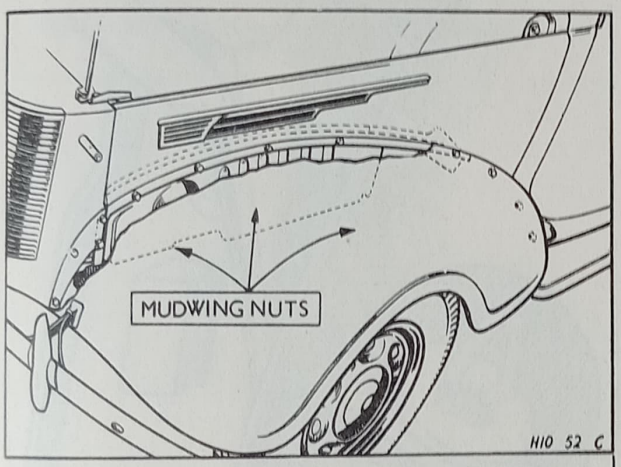


Fig. 3. The front wing and flitch plate fixing points.

Remove the bonnet and side panels held by a bolt at the radiator cowl and a bolt into the scuttle.

Remove the rear bumper bar and brackets: If it is intended to remove the front wings complete, the front bumper bar will also have to be detached. It is held each side by two bolts through the frame. The mudwing bolts to body and flitch plates will be seen in Fig. 3.

At this stage proceed to remove the body set-screws at positions indicated in Fig. 1. Care should be taken to detach the petrol filler hose from the tank inlet.

The front seats, carpet and rear seat are also removed from the car.

The body is then free to be lifted. If windows are wound down a sling can be passed through the front of the car and further support used near the tail.

The body should be drawn backwards as it is raised in order that the scuttle can follow the "rake" of the steering column.

It will be found that the body is mounted with a felt strip between it and the frame; a similar strip should always be used in mounting.

Replacing the body is exactly a reversal of the above procedure, care being taken to "thread" the dash over the steering column.

Removing the Windscreen

First disconnect the winder chain from the bottom of the screen frame, as shown in the accompanying illustration. (Fig. 4).

While the weight of the screen is supported by an assistant, remove the bolt from each of the two hinge plates at the top of the screen as shown inset.

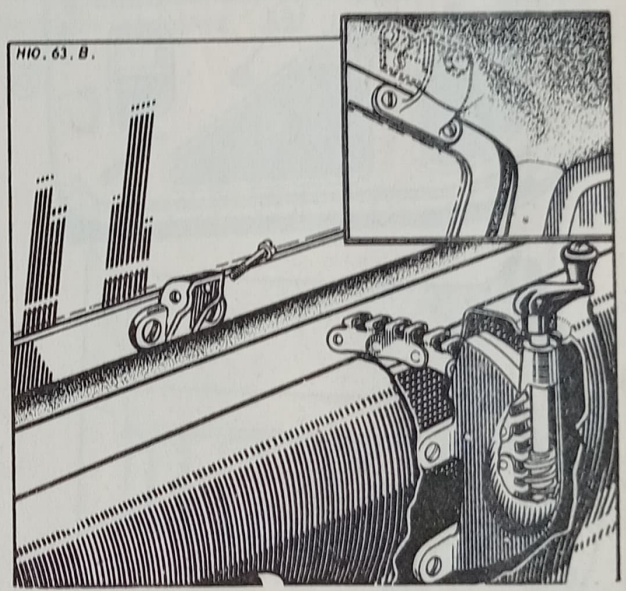


Fig. 4. Details of the front screen winding mechanism showing the link to detach to free the screw. A top hinge is also illustrated.

Replacing the Windscreen

When replacing the windscreen winder chain after refitting the windscreen frame, the chain bolt and clip are more easily located if the chain is wound out for a few inches and the windscreen kept partly open.

The illustration also shows the method of mounting the winder mechanism, which can be removed complete for renewal in the event of damage.

DOORS AND WINDOWS

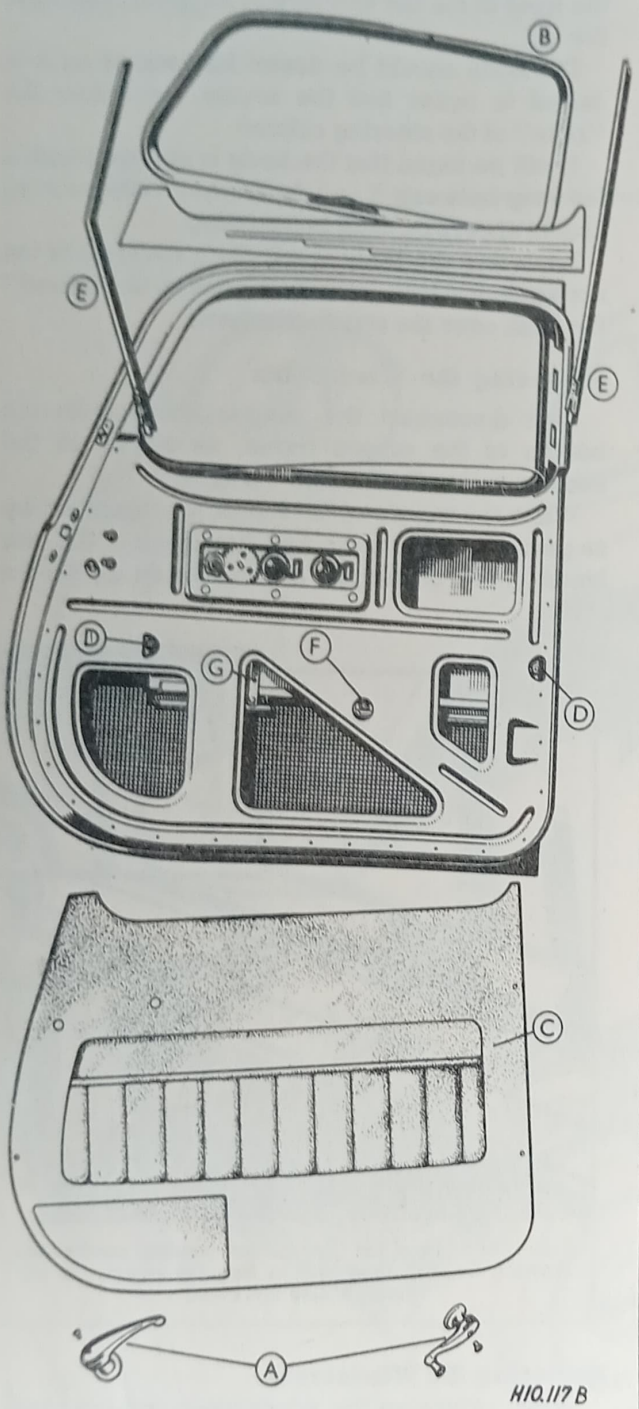


Fig. 5.
The door casing and fittings showing :
A. Door and winder handles.
B. Window fillet with garnish rail.
C. Door casing.
D. Locking nuts for glass channels.
E. Channels.
F. Stop screw for lifting arm.
G. One of the lifting arms.

Remove Glass

Remove the door check and take out the hinge pins.

Take off the interior handles—winder and lock handles—by taking out the central screw from each.

Take out the window fillet by removing the screws to the door frame; also remove the garnish rail.

Next remove the door casing. It is usually held by three screws into the door frame as well as by the spring clips (illustrated in Fig. 6 below).

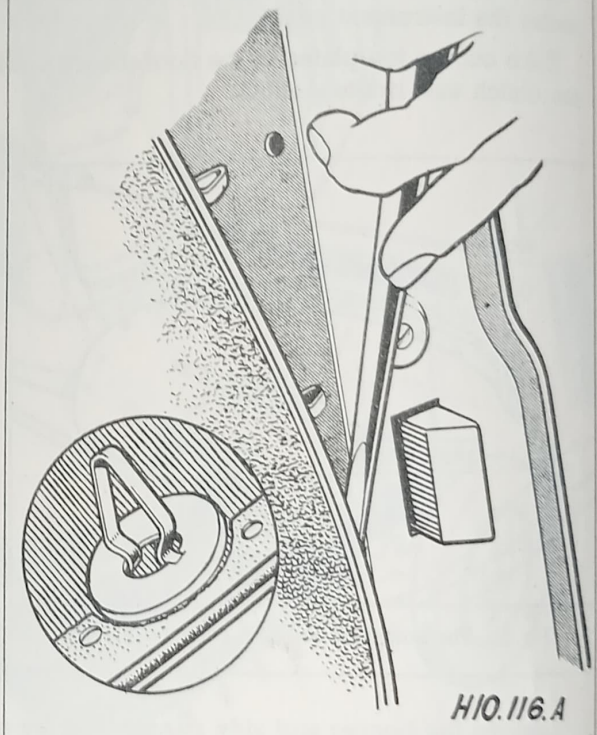


Fig. 6. Removing a door casing by easing it away with a screwdriver.

Temporarily refit the window winding handle and wind the glass to its lowest position.

Take out the small screws in the upper half of the glass channels, and then slacken the two nuts

Through the aperture in the door panel the two lifting arms can be seen up against the two stop screws in the slide. Take out these stop screws and draw the lifting arms towards the centre, when they will slide out of the bottom channel.

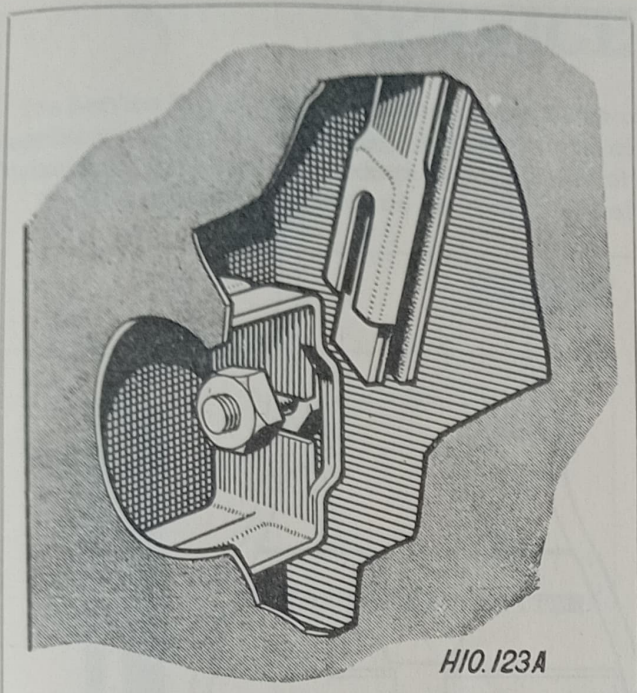


Fig. 7. Withdrawing a window channel, showing access to the securing nut.

Channel Fitting

With the loose glass channels leaning inward the glass complete may be withdrawn upward from the door by hand.

In the illustration the glass channels are shown withdrawn, but there is no need to detach them. If they are detached, however, Fig. 7 will show how they should be replaced in order to register with the locking plate and bolts.

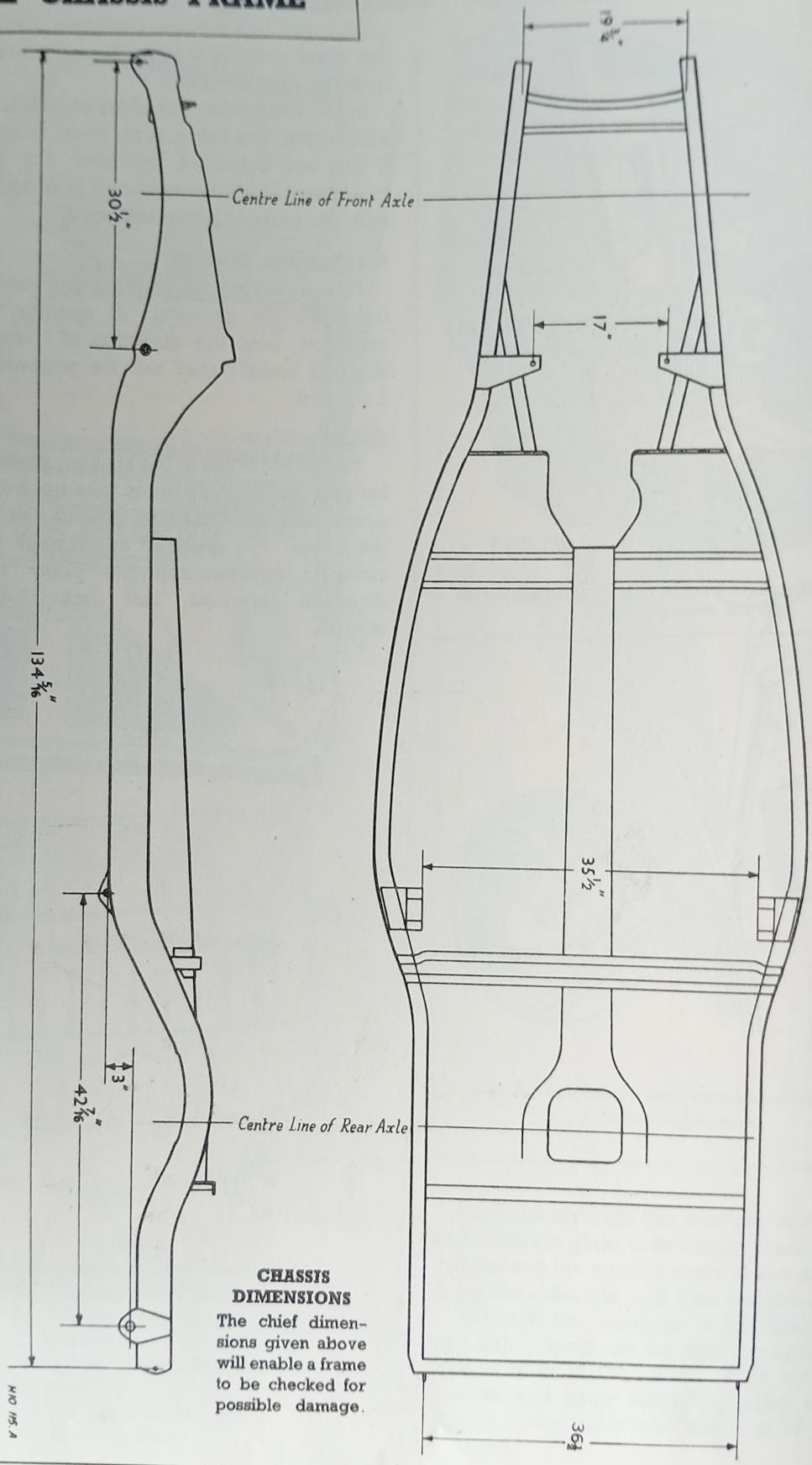
Mechanical Winder

This is bolted in position but can easily be detached for renewal. If springs are to be renewed, note the direction of "wind", or the window weight may not be properly counter-balanced.

Striking Plate

The screw holes in the striking plate are slotted for adjustment in order to take up wear that may occur with the continual opening and closing of the doors. To make an adjustment, slacken the securing screws, tap the plate toward the direction required, and then re-tighten the screws.

THE CHASSIS FRAME



CHASSIS DIMENSIONS

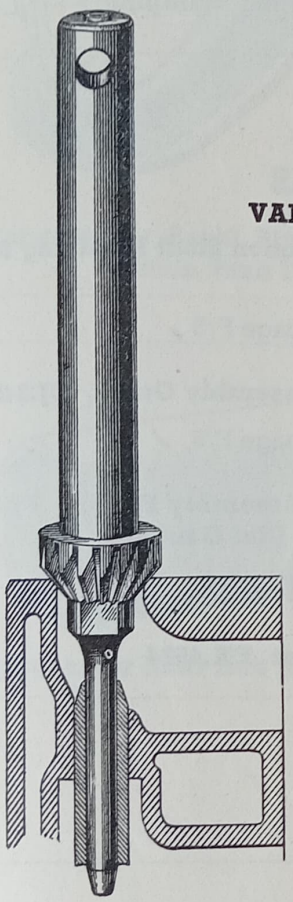
The chief dimensions given above will enable a frame to be checked for possible damage.

SERVICE TOOLS

The Service Tools listed in this section are those referred to in the text of the Manual. While it is not possible to supply all the tools listed, suitable tools of similar design can usually be obtained from factors. Dimensional drawings can be supplied, on application to the Service Department.

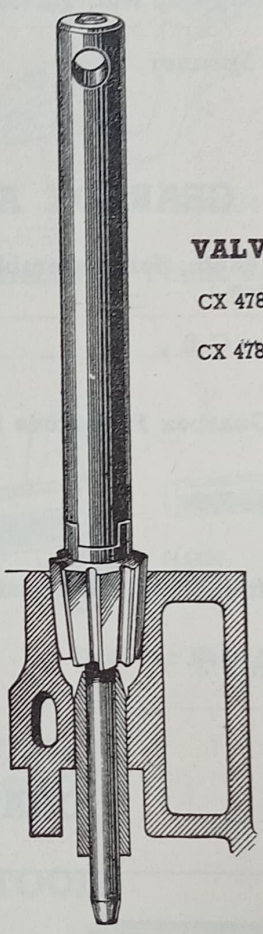
Service efficiency depends on the correct use of the correct type of tool.

ENGINE TOOLS



VALVE SEAT CUTTER

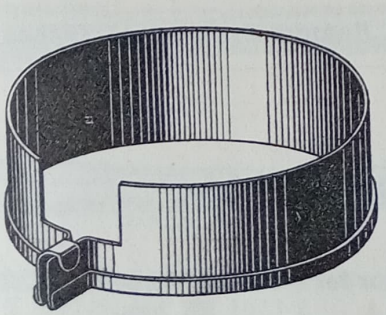
CX 365/2
CX 364/1
CX 364/5



VALVE PORT REAMER

CX 478/2–CX 479/9 } (Inlet)
CX 364/1 }

CX 478/2 CX 479/2 } (Exhaust)
CX 364/1 }



PISTON RING GUIDE

FJ2200/1 (Saloon)

FJ5531/1 (Van).

Valve Spring Lifter, FJ.5793.
Tool illustrated on page E/4.5

Valve Grinding Tool, CX.1706
Tool illustrated on page E/4.5

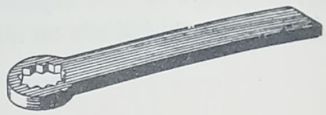
Tappet Wedge, FJ.5404
Tool illustrated on page E/4.6

Fan Driving Pulley Extractor, CJ.1535

Spanner for Main Bearing Cap Nut, FX4398

Gudgeon Pin Setscrew Spanner

Connecting Rod Clamping Bolt Spanner, 2H3127



For use with early type connecting rod, XLX.763 (horizontal clamping)

GEARBOX AND CLUTCH TOOLS

Service 1st Motion Shaft (for assembling clutch plate) FX.4399

Tool illustrated on page G/2

Drift for Assembling Gearbox Fork Rods and Springs. FX.924

Tool illustrated on page F/3.

Drift for 1st Motion Shaft Bearing (into Housing) CX.500/13

Tool illustrated on page F/3

Vice Jaws for 1st Motion Shaft Retaining Ring XLJ.3995

Tool illustrated on page F/3

Synchromesh Sub-assembly Guide. CJ.345/1

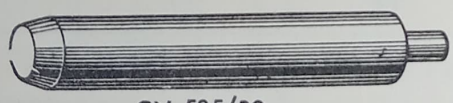
Tool illustrated on page F/5.

Clutch Setting and Assembly Fixture FJ.6131 (with or without Dial Gauge)

Tool illustrated on page G/2.

Clutch Brace Spanner FX.4524

CHASSIS TOOLS



CX 585/30

Drift for Shackle Bushes

FX 4277

Reamer for Shackle Bushes

STEERING TOOLS

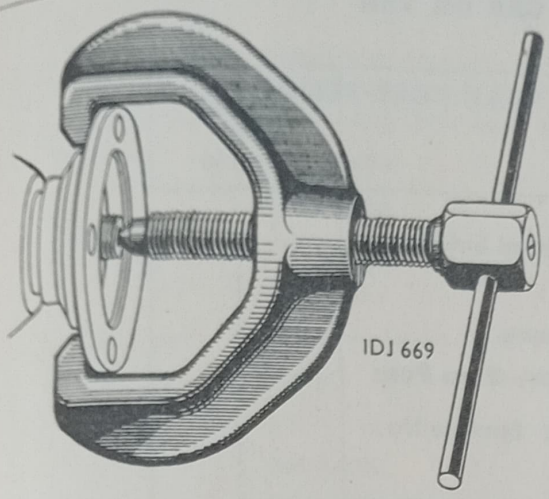
Extractor for Steering Arm CJ.207

Tool illustrated on page K/3.

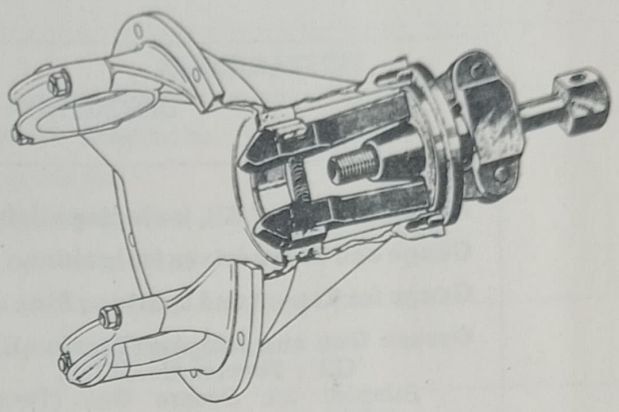
Extractor for Steering Wheel. CJ.211

Tool illustrated on page K/4.1

REAR AXLE TOOLS

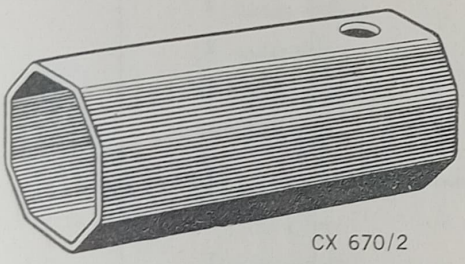


Extractor for Bevel Pinion and Third Motion Shaft Flanges



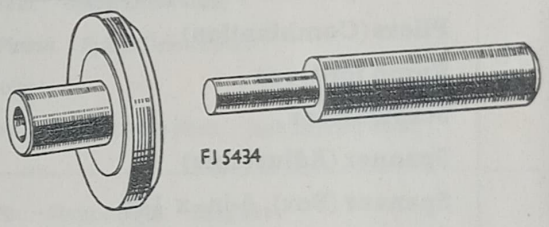
FX5834

Extractor for Pinion Bearing Outer Race



CX 670/2

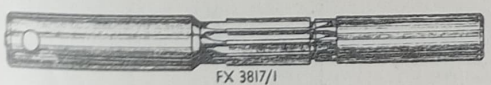
Spanner for Rear Hub Retaining Nut

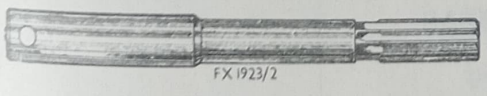


Drift for Hub Assembly

Rear Hub Extractor FJ.5441
Tool illustrated on page L/1.

FRONT AXLE TOOLS





Reamers for Swivel Axle Bushes FX.3817/1 and FX.1923/2

Extractor for Front Hub FJ.5441
Tool illustrated on page J/4.

Extractor for Swivel Pins CJ.720
Tool illustrated on page J/1.

THE TOOL KIT

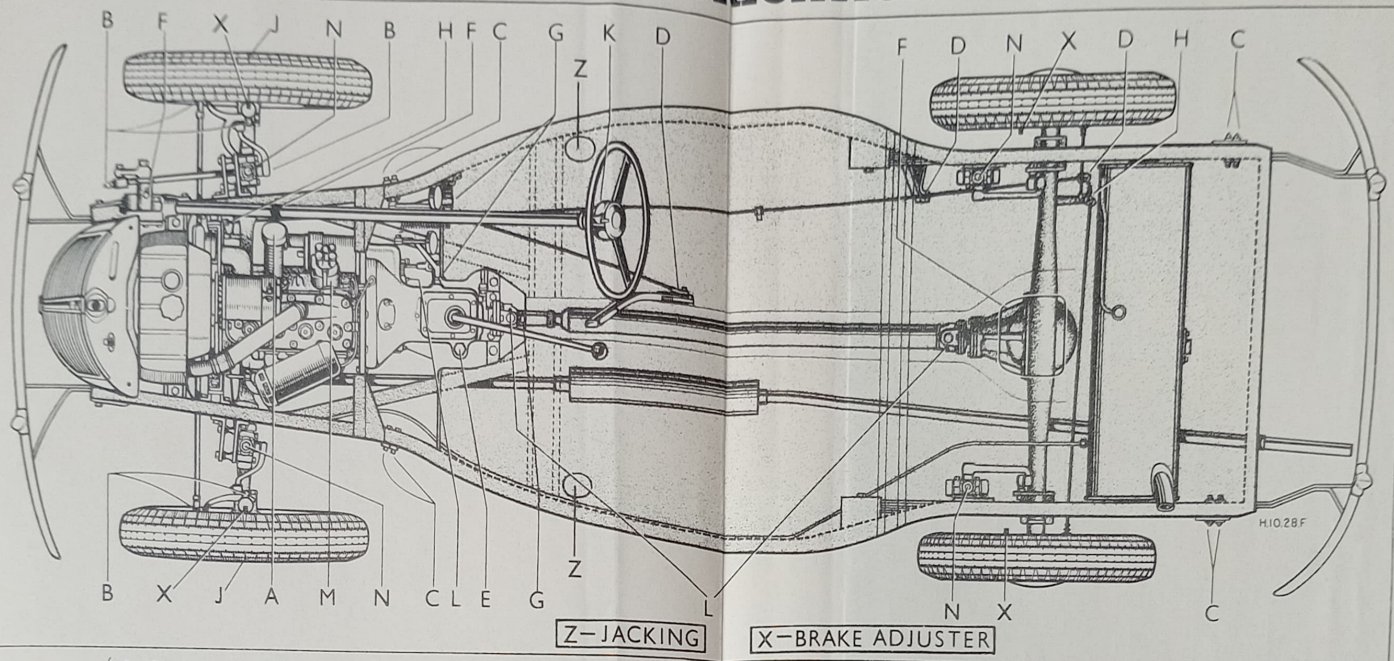
AS SUPPLIED WITH THE CAR OR VAN

DESCRIPTION	Number per vehicle
Assembly of Tool Kit, including all items listed below ...	1
Gauge and Screwdriver for ignition	1
Gauge for Tappet and Sparking Plug clearance	1
Grease Gun and Adapter (Tecalemit; Type—Pom Pom 'CH'; Service No. 25732)	1
Adaptor for Grease Gun (Tecalemit; Service No. 25732, 1)	1
Lifting Jack with Shaft and Handle ... Necessary prior	1
Lifting Jack, less Shaft and Handle ... to Chassis 230056	1
Shaft and Handle ... September, 1945	1
Lifting Jack "Stevenson" Type—From Chassis 230056 ...	1
Locking Plate for Tappet Adjustment	1
Pliers (Combination)	1
Pump for tyres	1
Screwdriver	1
Spanner (Adjustable)	1
Spanner (Box), $\frac{3}{4}$-in. x $\frac{1}{4}$-in.	1
Spanner (Box) for Sparking Plug	1
Spanner (Double-ended Flat), $\frac{3}{4}$-in. x $\frac{1}{4}$-in.	1
Spanner (Double-ended Flat), $\frac{5}{16}$-in. x $\frac{3}{8}$-in.	1
Spanner (Double-ended Flat), $\frac{7}{16}$-in. x $\frac{1}{2}$-in.	1
Spanner for Tappet Screw	1
Tommy Bar	1
Tool Wrap	1
Tyre Valve Tool	1
Tyre Levers	2
Valve Grinding-in Tool	1
Wheel Brace	1
Starting Handle	1
JOINT WASHER SETS AVAILABLE	
Set of Joint Washers for Engine—decarbonizing ...	
Set of Joint Washers for Engine—complete overhaul ...	

PART NAME ALTERNATIVES

	AUSTIN PART NAME	ALTERNATIVES
ENGINE ...	Gudgeon Pin	Piston Pin. Small End Pin. Wrist Pin
	Scraper Ring	Oil Control Ring
	Welch Plug	Expansion Plug. Core Plug. Sealing Disc.
	Oil Sump	Oil Pan. Oil Reservoir.
CONTROLS ...	Choke	Strangler. Easy Starting Device.
GEARBOX ...	Gear Lever	Shift Lever
	Change Speed Fork ...	Shift Fork. Selector Fork
	First Motion Shaft	Clutch Shaft. First Reduction Pinion. Main Drive Pinion
	Layshaft	Counter Shaft
AXLE ...	Crown Wheel	Ring Gear. Spiral Drive Gear
	Bevel Pinion	Small Pinion. Spiral Drive Pinion
	Spring Clips	"U" Bolts
	Axle Shaft	Half Shaft. Hub Driving Shaft. Jack Driving Shaft
STEERING ...	Swivel Pin	Pivot Pin. Steering Pin. King Pin
	Swivel Axle	Stub Axle
	Cross Tube	Tie Rod. Track Rod
	Side Tube	Drag Link. Steering Connecting Rod
	Steering Arm	Drop Arm
ELECTRICAL ...	Dynamo	Generator
	Voltage Regulator	Control Board. Cut Out. Voltage Controller
EXHAUST ...	Silencer	Muffler
BODY	Bonnet	Hood
	Mudguard	Fender

AUSTIN TEN LUBRICATION CHART



Weekly

A. Crankcase—Replenish to full mark on dipstick **Weekly.**

B. Steering Cross Rod (2), Steering Side Rod (2), Swivel Axles (4).

C. Road Spring Shackles (8) — **Oil Weekly.**

D. Brake, Clutch and all Throttle Control Joints—**Oil Weekly.**

Monthly

E. Gearbox — Replenish **Monthly.**

F. Rear Axle and Steering Box—Replenish **Monthly.**

G. Brake and Clutch Pedal Levers, Propeller Shaft, splined end—**Oil Monthly.**

K. Top of Steering Column —**Oil Monthly.**

J. Front Hubs — **Grease Monthly.**

H. Brake Balance Levers (2) —**Oil Monthly.**

Other Periods

(See text)

M. Distributor — **Oil** (sparingly) **every 1,000 miles.**

N. Shock Absorbers — Test for fluid level.

L. Clutch operating shaft, also propeller shaft universals. **Oil sparingly.**

RECOMMENDED LUBRICANTS

		Vacuum	Shell	Wakefield	Essolube	Price's	Duckham's
Engine	Summer	Mobiloil A	Shell X-100 30	Castrol XL	Essolube 30	Energol S.A.E.30	Duckham's N.O.L. 'THIRTY'
	Winter	Mobiloil Arctic	Shell X-100 20	Castrol-ite	Essolube 20	Energol S.A.E.20	Duckham's N.O.L. 'TWENTY'
Gearbox		Mobiloil BB	Shell X-100 40	Castrol XXL	Essolube 40	Energol S.A.E.40	Duckham's N.O.L. 'FORTY'
Front Wheel Hubs		Mobil Hub Grease	Shell Retinax A	Castrol-ease Heavy	Esso Grease	Ener-grease C3	Duckham's H.B.B. Grease
Oil Nipples Steering Box and Rear Axle		Mobilube G.X.140	Shell Spirax 140 E.P.	Castrol Hi-Press	Esso Expee Com-pound 140	Energol E.P. S.A.E.140	Duckham's N.O.L. E.P.T.140

	Vacuum	Shell	Wakefield	Essolube	Price's	Duckham's
Distributor Dynamo and Oil Can	Mobil Handy Oil	Shell X-100 20	Wakefield Oilit	Esso Handy Oil	Energol S.A.E. 20	Duckham's N.P. 'TWENTY'
Upper Cylinder Lubrication	Mobil Upper-lube	Shell Donax U.	Wakefield Castrollo	Essomix	Energol U.C.L.	Duckham's Adcoids
Springs, Rusted Parts or Squeaks	Mobil Spring Oil	Shell Donax P	Castrol Pene-trating Oil	Esso Pene-trating Oil	Energol Pene-trating Oil	Duckham's Laminoid Liquid

Note—Shock Absorbers must be removed to top up. Use Girling Piston-type Thin Oil or Armstrong Super (Thin) Shock Absorber Oil, according to type of unit fitted.