

*The*  
SINGER  
ROADSTER

INSTRUCTION BOOK  
AND REPAIR  
MANUAL

SINGER MOTORS LIMITED  
COVENTRY & BIRMINGHAM

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WEALDSTONE

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# SINGER MOTORS LIMITED

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SINGER MOTORS LIMITED.

COVENTRY SERVICE DEPOT.

Coventry

Telephone: 5071.

Telegrams: "Singer, Coventry."

*Owner's Name*.....

*Address*.....

.....

## PREFACE

**I**N compiling this book, some knowledge of the operation and care of a motor car has been presupposed, and the instructions contained herein will, if followed with reasonable care, enable the owner to keep the car in excellent mechanical order.

The book is fully illustrated with diagrams which have been carefully prepared to give useful information in the simplest form, instead of making long technical descriptions. The arrangement of all mechanical parts is described, and photographs have been made of points which it is desirable to stress.

Advice is given to enable the owner to trace a fault, and the information given will be found sufficient in the majority of cases.

If at any time difficulties arise, first act in accordance with the information given in this manual, and if further information is required, advice will be given upon application to the Technical Department of our Service Depot, Coventry, **BUT IN ANY COMMUNICATION REGARDING YOUR CAR, IT IS ESSENTIAL THAT YOU QUOTE THE CAR NUMBER WHICH WILL BE FOUND STAMPED ON A METAL PLATE FIXED TO THE DASH BOARD UNDER THE BONNET. (SEE FLYLEAF.)**

The interest of Singer Motors Ltd. in their productions does not end with the delivery of the car—it continues directly in a one thousand miles' free of charge after sales service, which is available to every owner through the Singer Dealer from whom the car was purchased.

This service forms an extension of the Factory Inspection organisation and serves to ensure that each car during its preliminary running-in is maintained in good order.

The service comprises, among other things, general inspection and, if necessary, the tuning and adjustment of the carburetter and ignition system, adjustment of tappets and exchanging the lubricant in the engine, gearbox and rear axle, the lubricant used for replenishing purposes being, of course, a chargeable item.

The recommendations in this Book should not be construed as extending or modifying in any way the liability of this Company, as determined by the Singer Guarantee reproduced on page 5.



# THE SINGER WARRANTY

**W**E warrant that in the manufacture of new Vehicles we have taken all precautions which are usual and reasonable to secure excellence of materials and workmanship and we undertake that if any defect is disclosed in any part of a new vehicle within six months of the date of delivery of such vehicle we will (provided such defective part is returned to our Works carriage paid) examine the part alleged to be defective and if on such examination the fault is due to defective materials or workmanship for which we are responsible we will repair or replace the defective part free of charge.

It must be clearly understood that this Guarantee is given only on the understanding that the vehicle has been purchased by the owner as a new vehicle, for which the Company's List price has been paid.

The foregoing Warranty is limited to new vehicles manufactured by us and is in lieu of any Warranty (or Condition) implied by Common Law Statute or otherwise as to the quality or fitness for their purpose of any goods manufactured replaced or repaired by us every such implied Warranty (or Condition) being in all cases excluded and our liability under the terms of this Warranty is strictly limited to the replacement or repair and despatch to the sender carriage forward of the part replaced or repaired. We shall not be responsible for any other liability expenses damages or loss which may occur consequent upon any defective material or workmanship of any description.

The Warranty shall not apply to any defects caused by or arising in the following circumstances and in which instances all other warranties (or conditions) implied by Common Law Statute or otherwise are also expressly excluded:—

- (a) Defects caused by wear and tear accident misuse or neglect.
- (b) Defects in any Vehicle which has been altered in any manner whatsoever or upon which the identification numbers have been altered or removed.

This Warranty shall be construed as including and shall be limited in its application to:—

- (a) New Vehicles or Goods manufactured by us and which are bought direct from us or from one of our duly authorised Dealers.
- (b) Replacements supplied by us direct.

and all other Warranties (or Conditions) implied by Common Law Statute or otherwise are excluded.

We give no Warranty of any description in respect of any Secondhand Vehicles or goods sold by us or by our authorised Dealers or by any other person nor shall any warranty (or Condition) be implied whether arising by Common Law Statute or otherwise.

All Agreements and quotations by us to supply goods execute repairs or make replacements shall be deemed to include the above Warranty and the exclusion of all implied Warranties and/or Conditions.

We do not warrant the specialities of other manufacturers fitted to our vehicles such as tyres electrical fittings lamps and horns. We endeavour to secure the best quality in these articles and the makers whose names usually appear thereon are generally willing to replace any defective part. We shall be pleased at all times to furnish the maker's name and address.

## CONDITIONS OF WARRANTY

If a defective part be found in any vehicle or goods it must be sent to us carriage paid and accompanied by an intimation from the sender in writing that he desires to have it repaired or replaced free of charge under this Warranty. The Sender must also furnish us at the same time with:—

- (a) The number of the Car.
- (b) The name of the Dealer if any from whom the car was purchased.
- (c) The date of the purchase of the car or the date when the repairs were executed or replacements made as the case may be.

The Sender shall accept our decision as final and conclusive on all claims for replacement of or repairs to defective material and/or workmanship and to the exchange of defective parts. If these Conditions are not strictly complied with the goods received by us will lie at the risk of the Sender and this Warranty shall not be enforceable.

We shall not be responsible for the cost of any labour involved in connection with the removal or replacement of any defective part from or to the vehicle.

## REPAIRS AND REPLACEMENTS

All parts sent for repair or replacement must be forwarded carriage paid and bear the sender's name and address; the car number and year of manufacture should also be given. The foregoing Warranty is given by us in respect of all repairs to Vehicles or parts of Vehicles executed by us or replacements supplied by us direct but for three months only and subject nevertheless to the reservations limitations and conditions therein contained and all other conditions or warranties implied by Common Law Statute or otherwise are excluded. We shall not be responsible for any other liability expenses damages or loss which may occur consequent upon any defective material or workmanship of any description in connection with any replacements supplied or repairs executed by us.

We accept no responsibility whatsoever for any replacements or parts which are not fitted by us to a Vehicle even if such replacements or parts are supplied by us.

Cars which are sent for repair will only be driven by our employees at the risk and responsibility of the owners and repairs of Cars are undertaken only on the assumption that the owners give us authority to drive the cars on their behalf.

SINGER MOTORS LIMITED  
COVENTRY.

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## GENERAL DESCRIPTION

**ENGINE.** Four-cylinders cast integral with top half of crankcase. Overhead valves, overhead camshaft driven by heavy duty roller chain. The crankshaft is a high tensile steel drop forging, dynamically balanced and carried in three extra large bearings. Engine unit mounted on rubber at front and rear.

**ENGINE LUBRICATION.** By forced feed from a submerged gear type pump to main and connecting rod bearings, camshaft bearings and camshaft chain. Large oil filter in the sump ensures that only clean oil is circulated. Dip stick oil level gauge is fitted.

**CARBURETTOR.** S.U. downdraught of the latest type giving high power with petrol economy. Easy starting control operated from the dash. The new inlet and exhaust manifold is specially designed to combine a heating device for rapid warming up. Self-start control on the facia panel.

**PETROL SUPPLY.** Petrol is drawn from a seven gallon rear tank by a mechanical pump driven from the engine intermediate shaft. A primer is fitted to the pump.

**IGNITION.** By coil and distributor from 12-volt battery. Automatic timing control incorporated in the distributor.

**COOLING.** By thermo-syphon through the large radiator assisted by a fan. A steam valve is incorporated in the radiator to prevent loss of water. Water capacity 18 pints.

**CLUTCH.** Single flexible dry plate of increased area with spring cushion centre. Light and easy to operate.

**GEARBOX.** New type with larger gears and shafts, 3-speeds and reverse with synchromesh on top and second gears. Gears, shafts and bearings of large size, rigidly mounted and specially cut for silence at all speeds.

**REAR AXLE.** Semi-floating with spiral bevel drive, spur gear differential and pressed steel axle case.

**PROPELLOR SHAFT.** Hardy-Spicer balanced tubular shaft with the latest needle roller bearing.

**CHASSIS FRAME.** Deep section pressed steel channel, under-slung at the rear to give safety with maximum headroom. Two tubular and three pressed steel cross-members ensure rigidity and strength.

**SUSPENSION.** Long, wide, semi-elliptic springs front and rear, carried on oilite bearings requiring only a minimum of attention. New type dual piston, hydraulic shock absorbers with progressive damping action.

**STEERING.** Worm and nut type, of patented design, finger light, yet positive. Seventeen inch diameter spring steering wheel with three spokes of multiple stainless steel wires.

**WHEELS AND TYRES.** Five detachable pressed steel "Easy Clean" wheels with five low pressure 5.00 by 16in. tyres.

**BRAKES.** Girling fully compensated brakes on all four wheels, giving extraordinary high efficiency and provided with a rapid and positive adjustment without need of jacking up the car. The hand brake operates on the rear wheels only.

**ELECTRICAL EQUIPMENT:** Includes 12-volt 51 amp. hour battery mounted in a most accessible position under the bonnet, *latest type high duty belt driven ventilated dynamo*, coil distributor, dip and switch headlamps, sidelamps, electric horn, starter motor with pull switch on panel. The instrument panel carries a large dial speedometer and large dial combined oil gauge, ammeter and petrol gauge, both having translucent lighting; ignition and lighting switch, panel light switch, ignition warning light, starter motor and carburetter, self-start controls. The trafficator switch and horn push button are conveniently placed within easy reach of the steering wheel. A special foot operated dipping headlight switch is mounted on the floorboard to the left of the clutch pedal.

**BODY CONSTRUCTION.** The graceful coachbuilt body gives ample accommodation for four persons, and is fitted with two doors, hinged at the front.

**SEATING.** Two neat, independent, adjustable bucket seats in front with hinged back rests that fold forward to give easy access to rear seat. The rear seat has ample width for two, and the back hinges forward to give access to the hood and sidescreen locker. All seats are upholstered in real leather.

**LUGGAGE ACCOMMODATION.** There is a large luggage locker concealed in the flowing lines of the tail, and this also contains the spare wheel which is strapped securely in position. The lid opens outwards and is permanently fitted with luggage straps, providing generous adjustment.

**WINDSCREEN.** A single panel full width screen is fitted, arranged to fold flat if required. It can be securely locked in any position. Chromium plated with safety glass.

**HOOD AND SIDESCREENS.** This model is fitted with a particularly neat hood of fully proofed material. When "up" it gives ample headroom for both front and rear seat passengers, and remains neat and taut at all times. The hood folds down out of sight into the body behind the rear squab when not required. Fully detachable, rigid, celluloid sidescreens are fitted. They are metal framed of a special design to open integral with the doors. The offside screen also has a single flap closed by zip fastener.

**VENTILATION.** Two adjustable air scoops are provided in the scuttle.

**TOOLS.** A complete set of tools and jack are mounted on a special deck under bonnet.

**OTHER EQUIPMENT.** Chromium plated tubular badge bar fitted to front dumb irons, dual bladed windscreen wiper, exterior driving mirror, cubby hole in nearside of instrument panel, pockets in each door, flush fitting trafficators with control on dash. Rear number plate embossed in rear panel, stop tail light.

## DATA

### ENGINE.

Bore	...	...	...	...	...	...	60 mm.
Stroke	...	...	...	...	...	...	95 mm.
Capacity	...	...	...	...	...	...	1074 c.c.
R.A.C. Rating	...	...	...	...	...	...	8.93 h.p.
Tax	...	...	...	...	...	...	£11-5-0
Water cooling capacity	...	...	...	...	...	...	18 pints
Anti-freeze solution	...	...	...	...	...	...	5 pints
Oil sump capacity	...	...	...	...	...	...	7 pints
Petrol tank capacity	...	...	...	...	...	...	7 gallons
Gearbox capacity	...	...	...	...	...	...	2 pints
Rear axle capacity	...	...	...	...	...	...	3 pints
Firing order	...	...	...	...	...	...	1, 3, 4, 2

### TYRES.

Size	...	...	...	...	...	...	5.00" × 16"
Pressures	...	...	...	...	...	...	20 lbs. per sq. in.—Front wheels 26 lbs. per sq. in.—Rear wheels

### BRAKE HORSE POWER.

							Peak
1,000 r.p.m.	2,000 r.p.m.	3,000 r.p.m.	4,000 r.p.m.	5,000 r.p.m.			
8.0 B.H.P.	18.5 B.H.P.	28 B.H.P.	33.0 B.H.P.	36.0 B.H.P.			
Maximum safe r.p.m.: 5,200.							

### GEAR RATIOS.

Top	...	...	...	...	...	...	5.43 : 1
Second	...	...	...	...	...	...	10.0 : 1
First	...	...	...	...	...	...	18.08 : 1
Reverse	...	...	...	...	...	...	22.26 : 1

### ROAD SPEEDS AT 1,000 R.P.M.

Top: 13.4 m.p.h.	2nd: 7.25 m.p.h.	1st: 4.0 m.p.h.
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### GENERAL DIMENSIONS.

Wheelbase	...	...	...	...	...	7' 7"
Track	...	...	...	...	...	3' 9"
Ground clearance	...	...	...	...	...	5½"
Overall length (lid closed)	...	...	...	...	...	12' 1"
Overall width	...	...	...	...	...	4' 9"
Height	...	...	...	...	...	4' 10½"
Turning Circle	...	...	...	...	...	35' 0"
Unladen weight	...	...	...	...	...	14¾ cwts.
Stopping distance from 30 m.p.h. (dry concrete surface)	...	...	...	...	...	30' 0"

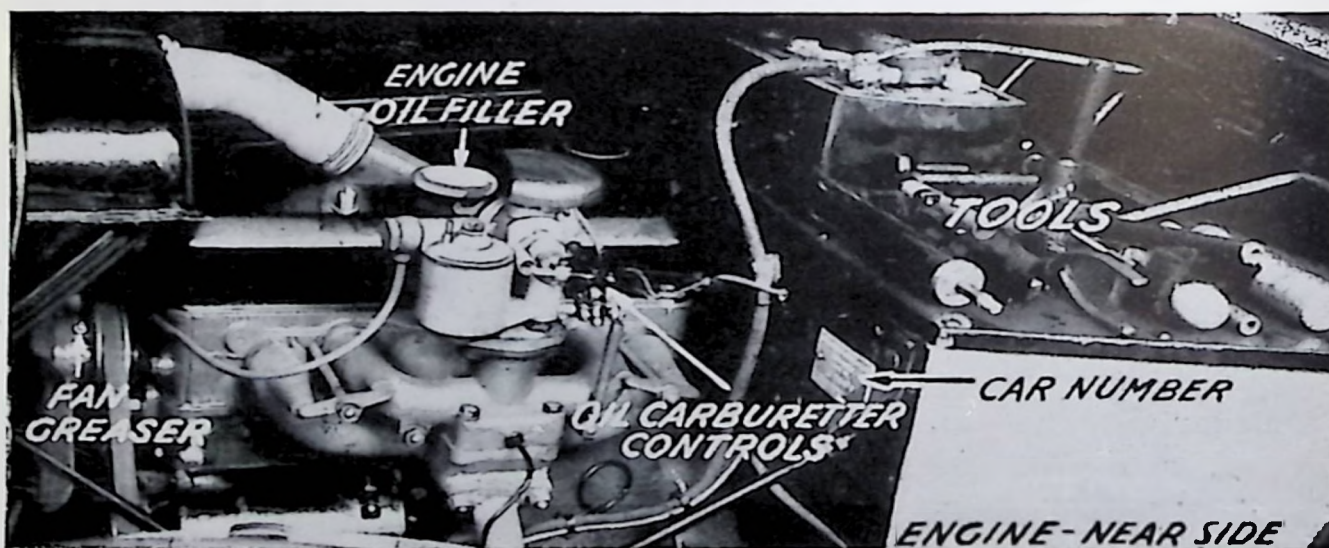
## ON TAKING DELIVERY

**I**T is as well to be assured that everything is in order, and that any special equipment has been satisfactorily fitted. The tool kit should be checked and packed away as detailed hereunder.

The portable jack and handle, together with the tyre inflator and handle, starting handle, pliers, and wheel brace, etc., are carried in clips on the deck of the scuttle under the nearside of the bonnet. The tool roll is carried on the deck of the scuttle under the offside of the bonnet, and contains the following items:—

Screwdriver	Tappet spanner	Funnel oiling
Toolbag	Open ended spanner	steering column
Large adjustable spanner	Oil can	Box spanners
Small adjustable spanner	Grease gun	(one set)
Pin punch	Tyre Lever	Tommy bar
Distributor spanner	Hammer	

The supply of oil, petrol and water should also be checked over, and an examination of the coachwork and chassis generally is well worth while.



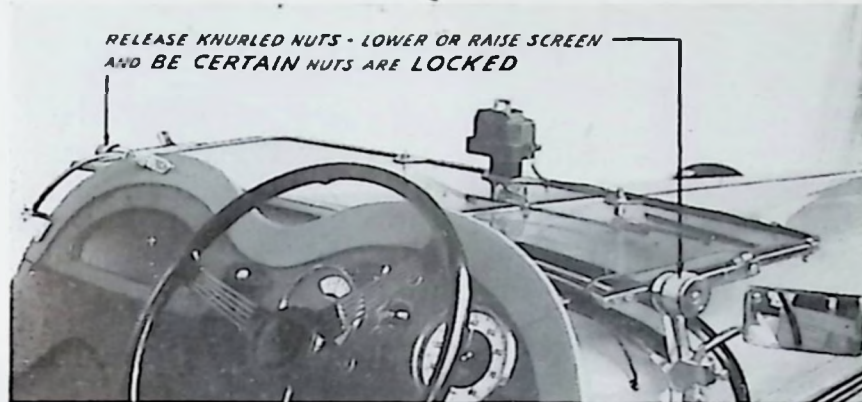
### DRIVING AND CONTROL OF THE CAR.

As pointed out in the preface of this book, some knowledge of the care and operation of a motor car has been presupposed, and therefore we do not propose to deal at length with the method of driving the car. It should, however, be understood that no two cars, even from the same maker, are exactly alike in performance, and as a consequence any instructions regarding the setting of controls, instruments, etc., should be taken as general remarks that are variable within narrow limits.

There are several adjustments provided for the personal comfort of the driver and passengers; the front seats can be adjusted for

comfort by releasing the locking lever, which will be found underneath the seat, and sliding the seat backwards and forwards on its runners.

The windscreen wiper is brought into action by unlocking the curved handle, swinging the wiper arm into position and switching on.



The windscreen may be opened by unscrewing the large knurled screws on the windscreen pillars. The windscreen may then be pushed forward until it lies parallel with scuttle and bonnet top. Care must be taken to ensure that the knurled nuts on the windscreen pillars are securely locked after opening or closing the screen.

It is to your own interest to run this car carefully for the first 500 miles. **DO NOT EXCEED FORTY MILES AN HOUR ON TOP GEAR.** Even when the car is run in the engine must not be overdriven, especially on first and second gears. The maximum permissible speeds on these gears are clearly indicated by the marks 1 and 2 shown on the face of the speedometer. See illustration page 13.

By observing these rules the car will give better service and smoother running. Pistons, rings, cylinder walls and bearings will by this time have a surface that can never be obtained by fast, hard driving. Even after the five hundred miles recommended it will pay to increase the maximum speed of travelling with discretion.

When cars are sent out from our Works a small quantity of upper-cylinder lubricant is included with the petrol at the rate of half-an-ounce to two gallons. The object of this is to provide an oily mixture which serves to lubricate slightly the upper part of the cylinder walls and piston rings. The continuance of this is strongly recommended as it is extremely valuable when the engine is started up, especially after the car has been garaged for a few days.

**STARTING THE ENGINE.** It is advisable before starting the engine to make a practice of using the starting handle for a few revolutions in order to ease the load on the starter motor caused by the natural "gumminess" of the engine oil. This is especially important in winter time. After this, the engine should start quite

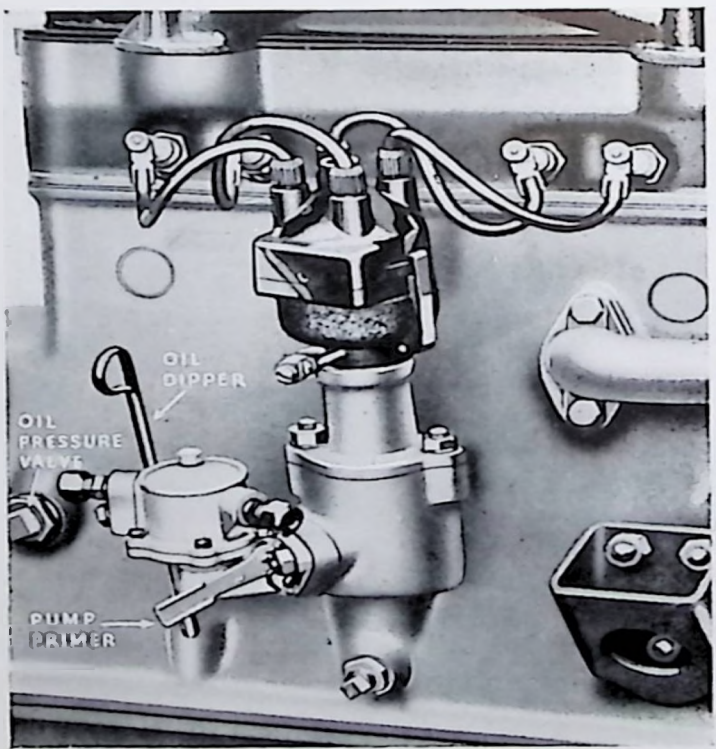
easily. It is always advisable when starting an engine to be quite certain that the change speed lever is in the neutral position and the handbrake lever on. The engine should then be switched on by means of the ignition switch and key which control the supply of current from the battery to the ignition coil. Two keys are supplied.

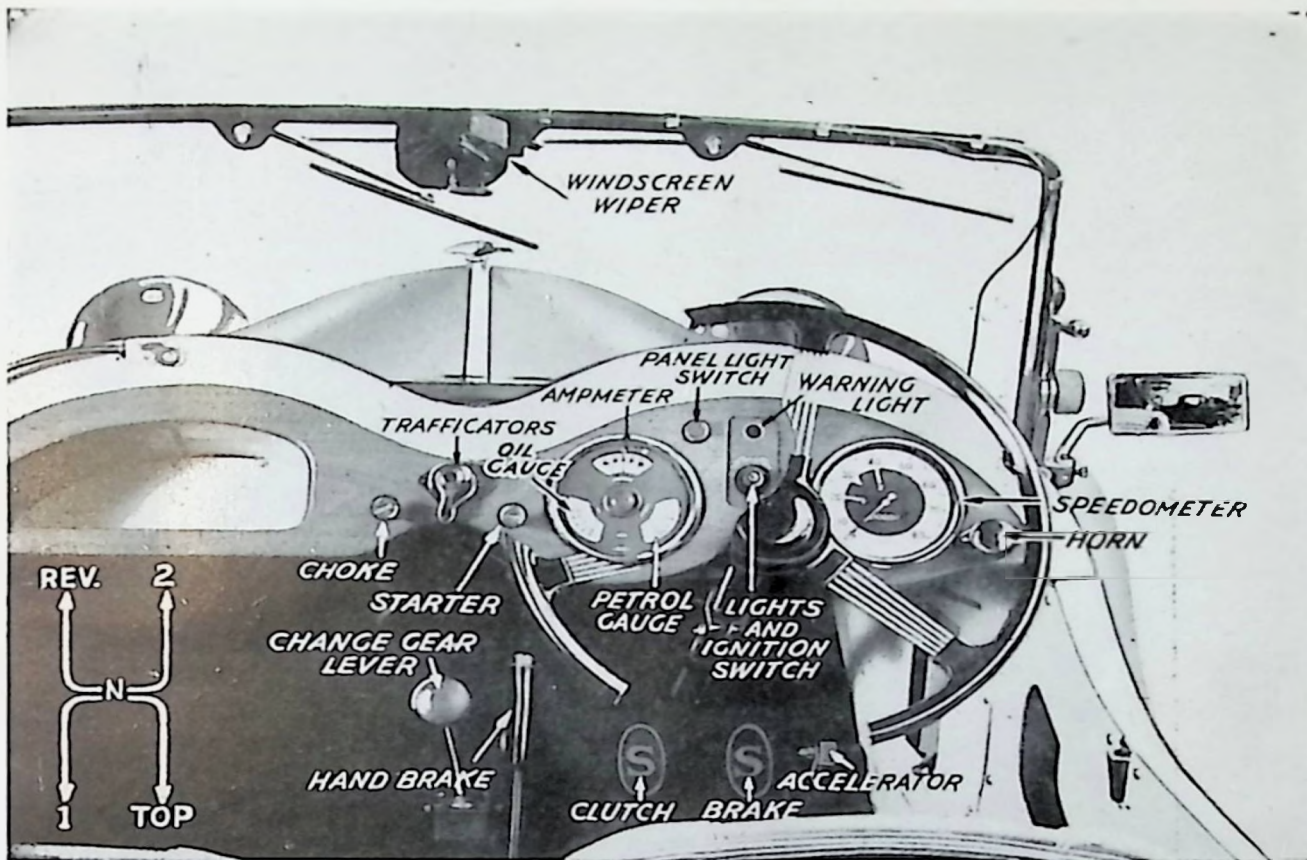
A warning lamp gives a red light if the switch is left on when the engine is not running, and this light is also apparent when the engine is running but the dynamo not charging. This condition, however, can only be expected when the engine is running very slowly and the dynamo charging rate insufficient to balance the drain on the battery from the coil ignition. **ALWAYS REMOVE THE SWITCH KEY WHEN LEAVING THE CAR STANDING.** Having switched the engine on, pull out the carburetter choke control which is on the left of the instrument panel, and which can be locked in position by turning the control knob. Then operate the starter switch by pulling the control on the right of the instrument panel. Release the starter switch immediately the engine fires, and when the engine has been running for one or two minutes turn the knob of the carburetter choke control, and push the control back to its original position.

**IT SHOULD NOT BE NECESSARY TO USE THE CARBURETTER CHOKE CONTROL WHEN RESTARTING A WARM ENGINE,** neither is it advisable to run the engine for any length of time with the choke control out.

If the car has been standing for some considerable time, such as when it has been laid up for the winter months or after the engine has been overhauled, the owner may find it beneficial to prime the A.C. fuel pump before attempting to start the engine. If reference is made to the illustration here the hand priming lever on the pump will be clearly seen and it is merely necessary to prime the pump by pumping the lever three or four times. **WE DO NOT RECOMMEND THAT THE PUMP PRIMING LEVER IS USED UNDER NORMAL CIRCUMSTANCES.**

The remaining controls and the change speed lever positions are fully illustrated overleaf, but perhaps a few words concerning the gearbox and the method of changing gear will be of assistance to the novice.





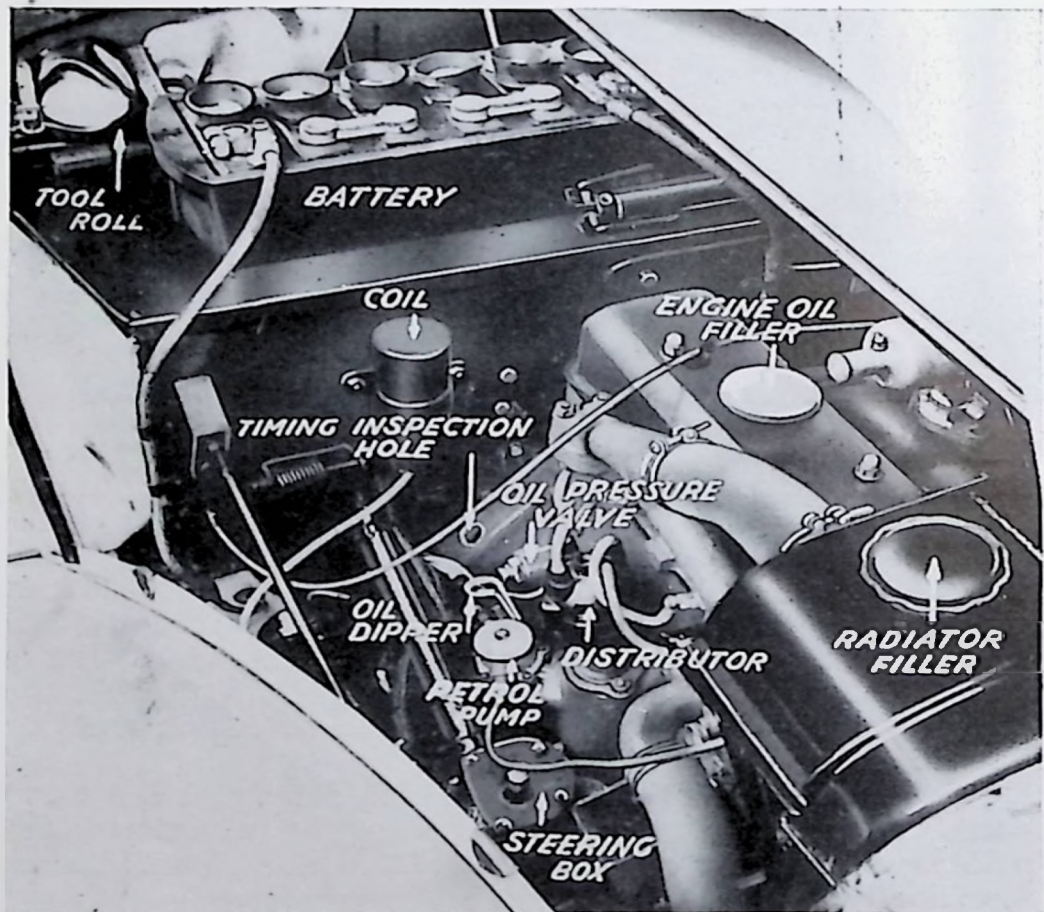
The gearbox has been specially designed for easy operation and no difficulty should be experienced in making a smooth change. Those owners who have had experience in changing gear on a car fitted with a freewheel will find that the gear changing on the synchromesh box is exactly similar, but owners who are used to changing gear on an ordinary gearbox fitted with neither freewheel nor synchronising device must realise that changing gear on a synchromesh box must be carried out very slowly. With a little practice gear changing becomes a subconscious action and an easy change will be general.

Having described briefly the general details of the car, it is proposed now to deal in detail with the engine lubrication, general lubrication and maintenance adjustments which should be carried out periodically.

To a new car owner we cannot give greater service than to impress upon him the importance of regular attention to lubrication. Therefore, this summary of "regular attentions" has been compiled on the assumption that the car will cover about 12,000 miles per year, but consideration must be given to the fact that whereas one owner will cover considerably more than 250 miles in a week or 12,000 miles in a year, another owner might only cover about 5,000 miles in a year. While it will be quite in order for the first owner to adhere strictly to the mileage covered so far as the chassis lubrication is concerned, this procedure will not be practic-

able in the case of the second owner. Lubricants deteriorate to a certain extent even though the car is not in use, and it is policy for the owner to carry out the routine chassis lubrication regularly at the periods quoted in this summary even though the mileage covered by the car is comparatively low.

A lubrication chart is provided showing quite clearly the parts of the car which require regular attention, together with the periods of time and mileages at which these parts should be attended to. We have no doubt this will be found of valuable assistance in obtaining trouble-free running. A list of recommended lubricants is also shown on the chart and we strongly advise owners to use only the oils specified. **ON NO ACCOUNT MUST CHEAP OILS BE USED.**



### DAILY ATTENTIONS.

When preparing the car for the road there are three items which must receive attention: PETROL, OIL and WATER.

1. PETROL is carried in a tank at the rear of the car and an electrically operated gauge with the dial situated on the instrument panel indicates the amount of petrol in the tank the whole time the engine switch is in the "on" position.

We recommend using the higher grade petrols such as Ethyl Discol, etc., or No. 1 grades.



2. ENGINE OIL. The engine oil filler will be found on the engine top cover and is air-tight in order to prevent fumes from escaping. This filler has the name of a brand of oil engraved on it and this is the oil with which the engine was filled at our Works and on which it has been carried through its tests. We recommend that the owner continues to use this oil whilst the car is in his possession.

An oil breather is of course fitted to the offside of the engine case, which conveys fumes below the body level.

The oil sump holds seven pints of oil and this quantity should be maintained by checking the oil level daily. A dipper is fitted on the offside of the crankcase and is marked with the correct oil level. To obtain a correct reading of the level of oil in the sump by means of the dip stick, run the engine for a short time until the oil is warm, then with the engine stopped, withdraw the dip stick, wipe it, replace it to its full extent and withdraw again. The level of the oil will then be accurately indicated, and if the oil is below the mark on the dip stick bring it to the correct level by pouring fresh oil through the filler in the engine top cover. A few moments must be allowed when adding oil for it to drain into the sump before finally checking the level, but do not under any circumstances fill the sump above the level as this is likely to lead to various minor troubles.

To prove that the engine lubricating system is working correctly the following procedure should be adopted.

With the engine running slowly, disconnect the oil pipe leading from the crankcase to the gauge (at the crankcase end) and if oil pressure is present at this union, then either the oil lead to the gauge is obstructed or the gauge is at fault. Make sure that the pipe is clear, and if the trouble persists have the gauge attended to by your local dealer.

If no oil pressure is present at the union, then the fault must be in the lubricating system. It is unlikely to be in the pump itself and the cause will most probably be due to (a) a choked filter, (b) foreign matter of some description in the pressure release valve. To clean the filter it will be necessary to lower the sump, and instructions for this operation are given on page 18.

To remove foreign matter from the pressure release valve, slack off the nut sufficiently to allow the centre plug to be withdrawn—the position of the lock nut will be an indication of how far to screw in the centre plug when reassembling—then withdraw the plug and remove the spring and ball for cleaning in petrol. When replacing, first insert the ball, then the spring, screw in the centre plug up to the lock nut and tighten the lock nut.

To increase the oil pressure, slack back the lock nut two or three turns, screw in the centre plug and tighten the lock nut. To decrease the oil pressure, release the lock nut, screw the centre plug back two or three turns and relock the nut. **The correct pressure is 40/45 lbs. at 25 m.p.h. in top gear.**

In some cases low oil pressure is due to the engine oil becoming very thin owing to dilution with petrol due to misuse of the

carburettor choke control. This can easily be checked by draining a little of the oil from the sump through the drain plug, and if the condition of the oil verifies the suspicion of dilution the remedy is to drain the sump and refill with fresh oil of the correct grade.

Clean engine oil is essential, and after the first 750 to 1,000 miles the oil should be drained from the sump and fresh oil put in. After this, the oil should be changed about every 2,000 miles.

3. WATER. The radiator should be filled with water to a level not higher than one inch below the filler cap. The filler cap is fitted to the offside of the radiator header tank under the bonnet, and it is advisable to use soft water for the cooling system in order to avoid an accumulation of lime deposits, which will eventually impede the water circulation.

If at any time it is considered advisable to flush out the cooling system, then drain the water from the radiator by means of the drain tap at the nearside bottom corner of the radiator, and the drain plug under the water inlet pipe on the offside of the cylinder block. **THIS PLUG MUST BE REMOVED** to completely drain the water cooling system. Refill the cooling system with a strong solution of common soda and water. Run the engines until the water becomes hot, drain the solution and afterwards flush out the cooling system with running water from a hose-pipe inserted in the radiator filler.

In frosty weather some steps must be taken to prevent the cooling water freezing, as water when frozen expands and causes a great bursting pressure with a considerable risk of cracked cylinders or radiator and consequent leaks.

If the garage is not heated, the water may be drained, but it is usually more convenient to use an anti-freezing mixture in the cooling system. Glycerine is a cheap and reliable form, and 25 per cent., by volume, of glycerine in the water cooling system will give effective protection. Glycerine does not evaporate and will last the winter through. The total cooling system capacity is eighteen pints, therefore sufficient water may be drawn away and replaced by five pints of radiator glycerine.

### **WEEKLY ATTENTIONS.**

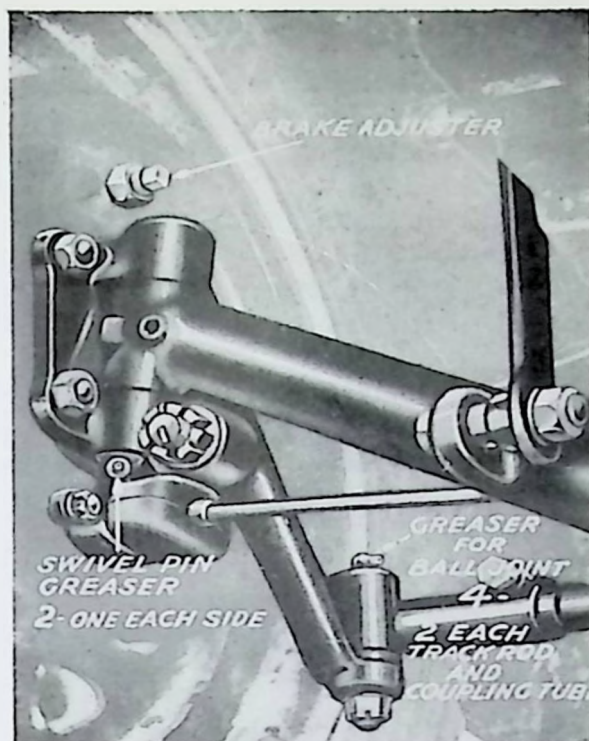
**(Or every 250 miles.)**

1. Grease the steering swivel pins, of which there are two, and the ball joints of the track rod and coupling tube. There is also one greaser on the fan assembly which requires attention at this time.

In order to facilitate greasing the swivel pins and ball joints it is advisable to jack up the front axle assembly and apply the grease gun to the swivel pin greasers, forcing the grease until some exudes from the top and bottom swivel pin bushes.

2. The same applies to the ball joints of the track rod and coupling tube, and the steering should be turned occasionally during the greasing operation to be quite certain that the lubricant is reaching its objective.

3. It is also advisable at this period to put two or three spots of oil from a hand oil can on the ball joints of the carburettor



controls and the brackets holding the accelerator pedal cross shaft. A little attention given to points of this description is always time well spent.

4. **IMPORTANT.** It is a good point to make a practice of checking the tyre pressures weekly, and these should be as follows:

Size	...	...	...	...	5.00" x 16"
Pressure	...	20 lbs. per sq. in.—	Front wheels		
		26 lbs. per sq. in.—	Rear Wheels		

Take care to keep the tyres on one axle at the same pressure. Unsteadiness of the steering is often due to under-inflation or unequal inflation of the front tyres and this also results in a tendency for the steering to pull to either side.

Examine the tyres periodically and remove flints or other road matter which may have become embedded in the tread, and any large cuts should be vulcanised.

Clean off oil or grease which may appear on the tyres with a little petrol, drying the tyres with a duster after the cleaning process.

At all times avoid violent acceleration and fierce braking, and always reduce speed over bad surfaces.

Tyre wear is balanced, and life considerably increased by a periodical change over, that is, the nearsides to the offside, and fronts to rears. This change over is recommended every 2,000 miles.

#### **MONTHLY ATTENTIONS.**

(Or every 1,000 miles.)

**GREASERS.** There are two greasers (one to the clutch pedal and one to the footbrake pedal) to which the grease gun should be applied every 1,000 miles and another greaser at the forward end

of the propeller shaft, but if this is not visible when the gearbox rubber cover is removed it will be necessary to release the hand-brake and push the car backwards or forwards a little way until the greaser is accessible (See illustration, below.)

It now becomes necessary to remove the front carpets and underfelts and the rubber covering over the change speed lever assembly. The rear seat cushion too must be removed from the car in order that the following points may receive attention.

1. Check level of oil in the gearbox, steering box and rear axle, and replenish if necessary. The filler plug for the gearbox is on the left-hand side of the change speed lever and the level plug about half-way down the gearbox on the same side (see illustration).

2. Oil the hand brake lever, pawl and ratchet.

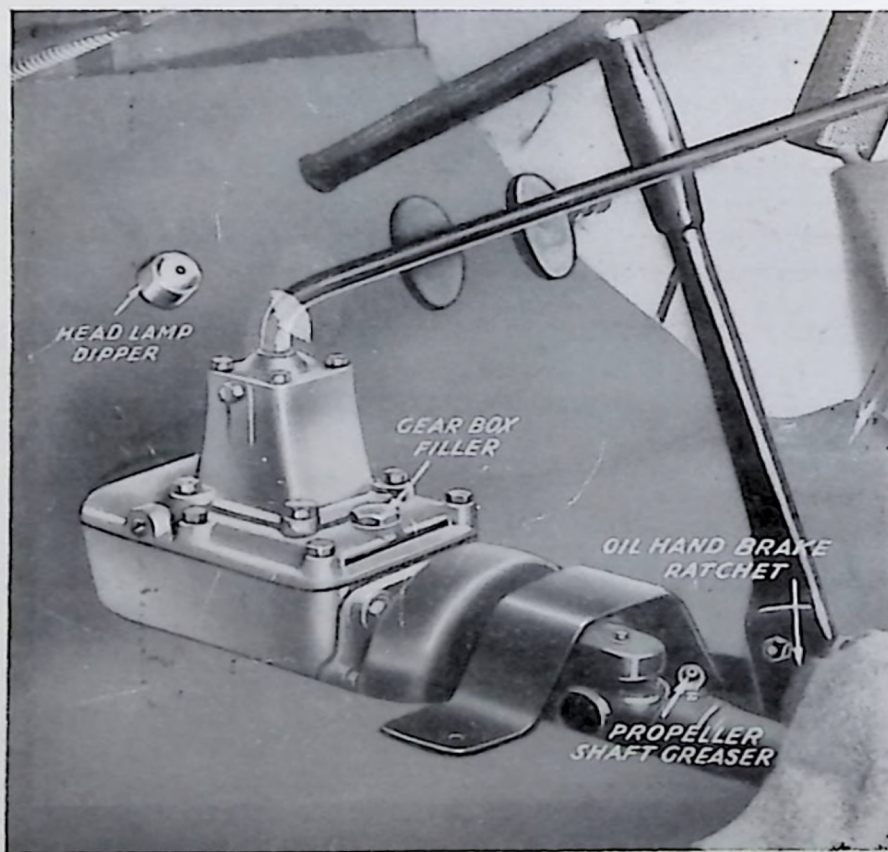
3. Spray all road springs with penetrating oil.

4. Distributor: Two drops of thin machine oil to lubricator on distributor shank.

5. Top up the battery (see page 72).

6. Inspect door hinges and apply a few spots of oil to ensure that they are functioning easily.

7. Lubricate the door catches and striking plates.



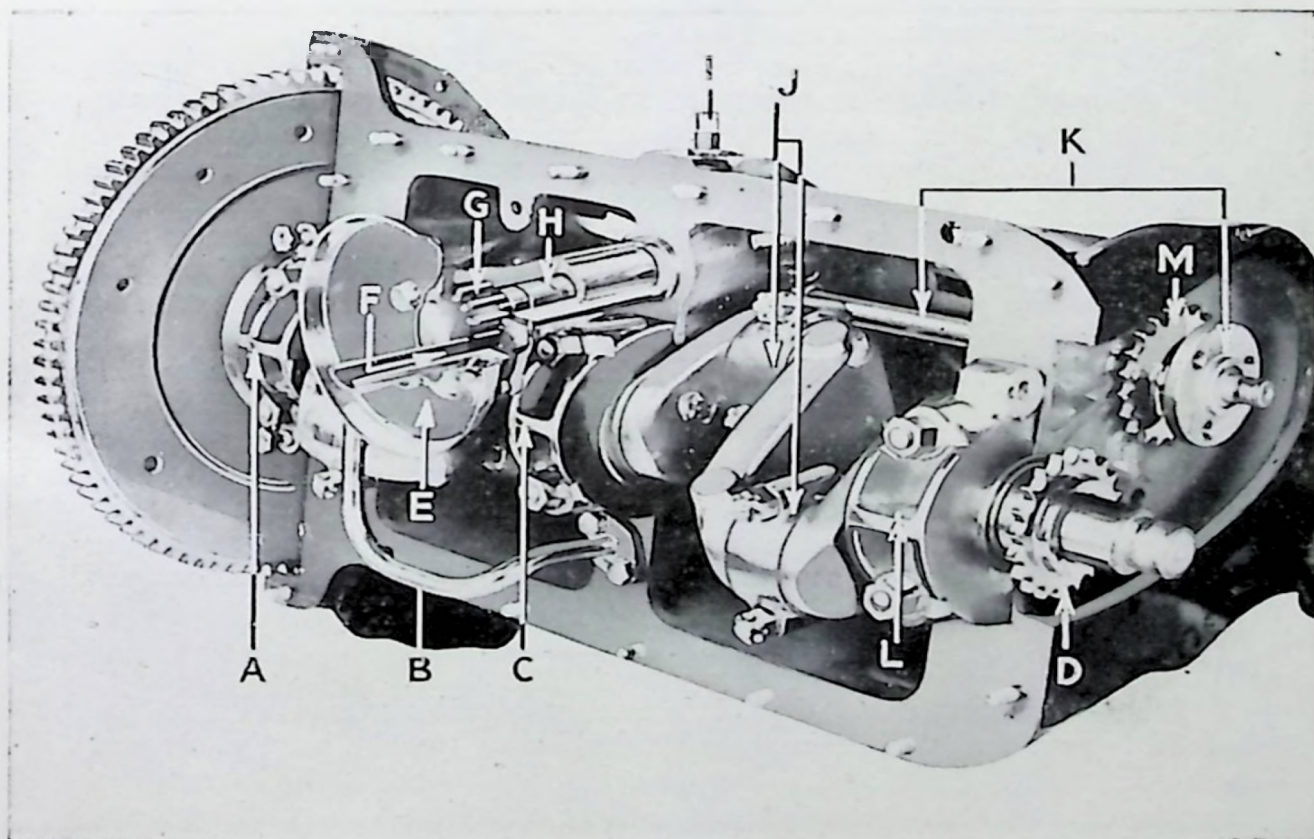
### EVERY 2,000 MILES.

1. Drain the engine oil and refill with fresh oil. Draining the sump can best be carried out while the engine oil is warm, and

should the oil appear to be very dirty, swill out the engine case with a thin "flushing" oil. ON NO ACCOUNT SHOULD PETROL OR PARAFFIN BE USED. If a "flushing" oil is used it will be necessary after draining the sump to replace the drain plug and pour about a quart of "flushing" oil into the engine through the filler, turning the engine over for a number of revolutions by hand to circulate the cleansing oil.

Then drain away, replace the drain plug, and refill with the correct grade of oil to the level mark on the dip stick. Cleaning the oil filter becomes necessary on any sign of low oil pressure, and in any case every 2,000 miles it is advisable. Proceed as follows:—

1. Drain the oil from the engine sump by removing the drain plug, and also remove the dip stick. Remove the sixteen nuts and washers which secure the oil sump to the base of the engine case and take away the oil sump, tray and oil filter. It is policy to remove the cork washers from the sump studs to prevent them from being damaged. The filter must be withdrawn from the pump and cleaned with petrol, and all traces of carbon, etc., must be removed from the sump.



A, rear main bearing cap; B, oil pump delivery pipe; C, centre main bearing cap; D, crankshaft sprocket; E, oil pump filter plate; F, oil pump suction pipe; G, oil pump gears; H, oil pump drive shaft; I, pump and distributor shaft locating pin; J, connecting rod bearings; K, intermediate shaft assembly; L, front main bearing cap; M, intermediate shaft sprocket.

When refitting the sump, be quite certain that the joint washer is in good condition, and tighten the anchorage nuts evenly and in alternatively opposite positions.

**SPARKING PLUGS.** After exhaustive tests it was found that the Champion L.10, 14mm. sparking plug was most suitable for the Roadster model, and it is advised that replacements be of the same type.

The sparking plug has an important part to play in the running of the engine and has an influence on such items as smooth running, speed, slow running and petrol consumption. Therefore, it fully merits the small attentions that are advised below.

After the first few hundred miles remove the plugs, clean, and check the gaps, re-setting if necessary to .020 in.

These attentions will normally be required every 2,000 miles.

**VALVE CLEARANCES.** Clearance between the valve stem and the tappet screw is necessary to ensure correct closing of the valves and efficient running of the engine. These clearances should be as follows:—

INLET VALVES           ...       ...       ...       .004"

EXHAUST VALVES       ...       ...       ...       .006"

and "feeler" strips of these thicknesses can be procured cheaply from most garages or tool dealers. The manner of checking the tappet adjustment is as follows:—

First run the engine for a few minutes until it becomes warm, then remove the two dome nuts and the top valve cover of the cylinder head, care being taken when removing the top valve cover, to avoid damaging the cork joint which is fitted. Turn the engine with the starting handle for a half revolution after the closing of the valve which is to be adjusted. Slacken the lock nut and adjust the tappet screw until the gauge is a loose sliding fit between the valve stem and the tappet screw. Now tighten the lock nut and recheck with the gauge, as tightening the lock nut will occasionally alter the clearance. **DO NOT SET THE VALVE CLEARANCES TOO SMALL, OR DIFFICULTY WILL BE EXPERIENCED OWING TO THE ENGINE MISFIRING.**

5. **TRAFFICATORS.** It is advisable about every 2,000 miles to raise the trafficator arm and apply one or two drops of thin machine oil by means of a feather or match stick, between the brass knob or profile and the small copper spring and copper spindle.

### **EVERY 3,000 MILES.**

Remove the rear road wheels and apply the grease gun to the rear hub greaser, which is situated half-way up the axle casing at each side immediately behind the brake brackets. Grease the threads of the road wheel studs before refitting the road wheels. This also applies to the threads of the front road wheel studs when the front wheels are removed at any time.

Add a few drops of thin machine oil to the distributor cam bearing. To do this withdraw the moulded rotating arm from the top of the spindle by pulling it off. Do not remove the screw

exposed as there is a clearance between the screws and the inner face of the spindle, through which the oil will pass.

The distributor automatic timing control needs lubricating at this period with a good grade engine oil. The control is rendered accessible by removing the distributor moulding, lifting off the rotating distributor arm and then removing the contact breaker base by removing its two securing screws. Take care to refit contact breaker base in its original position.

### HALF YEARLY ATTENTIONS.

(Or every 6,000 miles.)

1. Drain and refill the gearbox with fresh oil. Practically the only attention the gearbox needs is the periodical replenishing of the oil, and occasionally draining off the old oil, flushing out and refilling with new oil.

Lubrication is entirely automatic, the oil level being sufficient to cover the layshaft gears.

Draining and refilling the gearbox necessitates removing the rubber cover over the gearbox assembly. This is secured into position by twelve wood screws. The filler plug is situated at the rear of the gearbox cover, and the oil level plug on the nearside of the gearbox. The capacity of this unit is two pints.

2. Drain and refill rear axle with fresh oil. This operation can best be carried out by lifting the rear seat cushion, exposing the cover in the rear seat pan.

The filler plug is located on the top and in the centre of the differential case, the drain plug at the bottom and in the centre of the axle case, and the level plug just below the centre of the axle case rear cover. The capacity of the axle is three pints, and care must be taken not to over-fill this unit to prevent any possibility of oil finding its way on to the rear brakes.

3. Give the cam and the pivot on which the contact breaker works a smear of Mobilgrease No. 2.

4. The Armstrong hydraulic shock absorbers should be examined at this period and if necessary a little oil added. For full instructions concerning the adjustment and maintenance of the shock absorbers, see page 65.

**DYNAMO AND FAN BELT ADJUSTMENT.** This is effected by slackening the three nuts securing the fan bracket to the engine case, and swivelling the bracket in the desired direction. After adjustment be quite certain that all nuts are tight, and it should be possible to depress the fan belt at least half an inch. This will ensure that the fan belt is not over-tightened and will thus prevent excessive wear.

6. **CAMSHAFT CHAIN ADJUSTMENT.** In order to adjust the camshaft chain it will be necessary to release the locking nut on the knurled screw which passes through the offside of the cylinder head close to the water outlet pipe. Tighten the knurled screw until the tension of the camshaft chain is felt. Then turn the knurled screw back half-a-turn and lock into position by means of the lock nut. The camshaft chain adjustment will then be correct.

Every precaution must be taken against over-tightening as this will cause excessive wear of the camshaft chain.

7. Wash off mud, etc., from brake rod linkage and grease all pins and levers (see brake section—page 58).

**ANNUALLY.**

**(Or every 12,000 miles.)**

As explained in the commencement of this summary, it becomes necessary annually to give the car a cursory overhaul, but in any case there are several points which should receive attention, and these will be detailed below.

The period of time for which a car will run before it becomes necessary to overhaul it depends entirely upon the way in which the car has been driven and the attention given to lubrication, etc.

There are, however, three points which must receive attention about this time.

1. The front hubs are not provided with a greaser, and it becomes necessary at this time to jack up both the front wheels, remove the road wheel dust caps, remove the road wheel and prise out the metal hub cap. Remove the split pins and nuts from the stub axles and withdraw the hub assemblies from the stub axles. The hubs may then be packed with grease and refitted to the car.

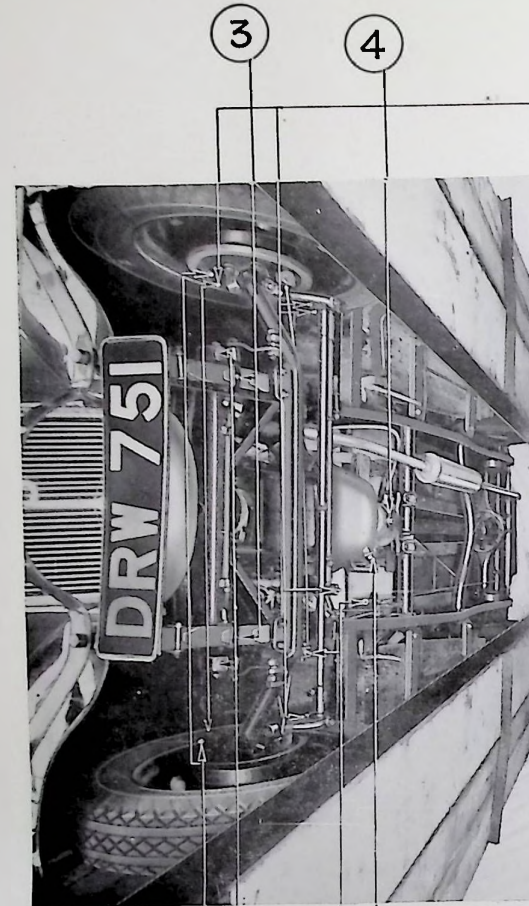
2. Dynamo and Starter Motor. These components should be removed from the car and sent to the makers or the nearest Lucas Service Agents for cleaning and lubricating. For other information see page 69 of the electrical equipment section.



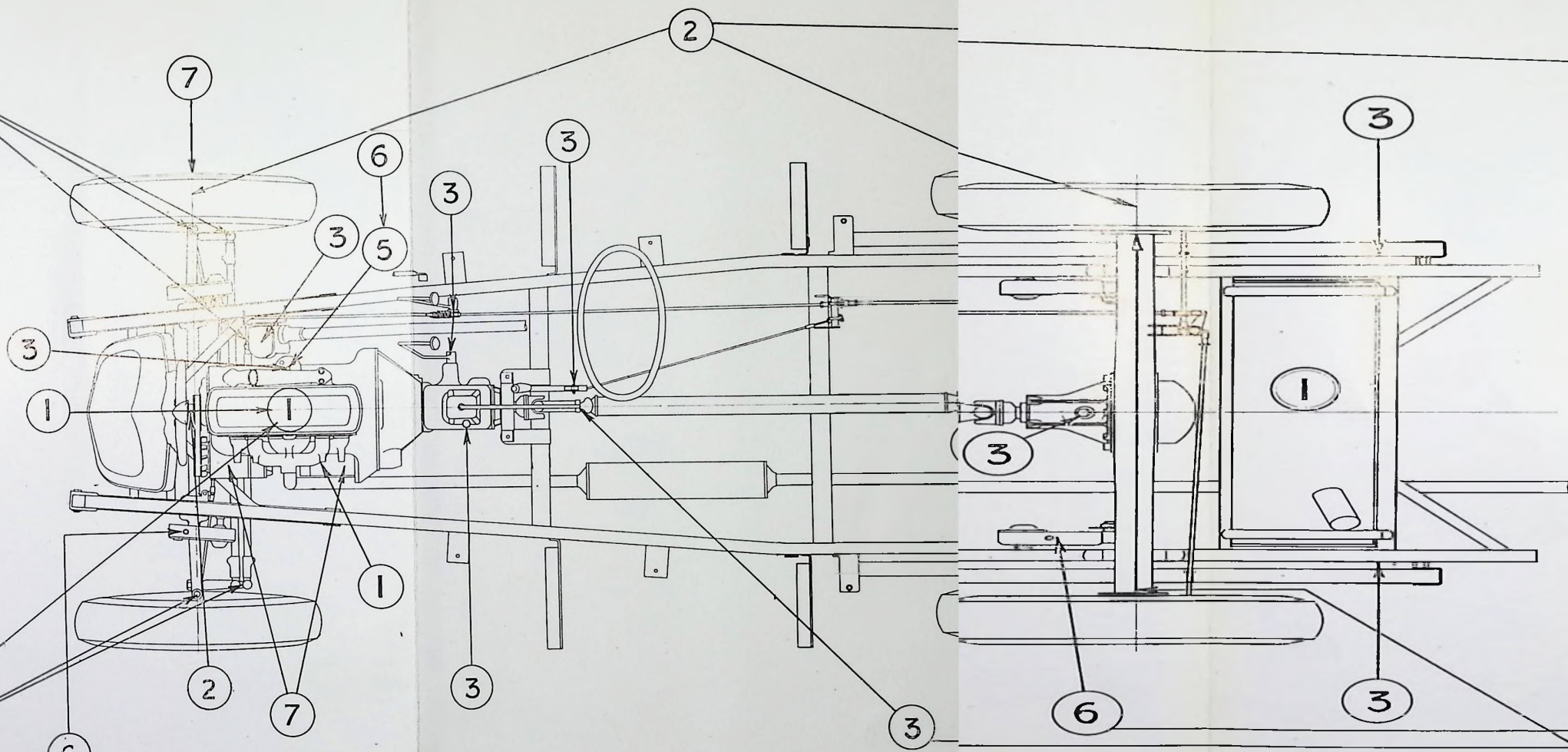
**METHOD OF REMOVING  
DUST CAP FROM ROAD  
WHEEL**



# LUBRICATION CHART

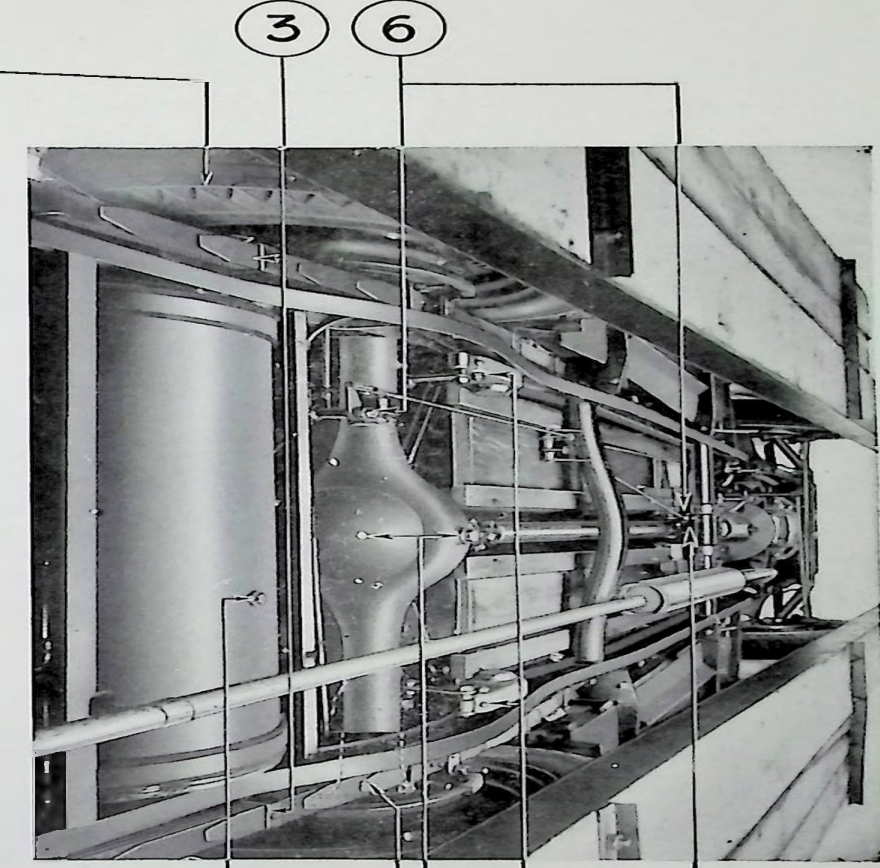


- SUMMARY OF REGULAR ATTENTIONS.**
- DAILY.**
- 1 Check petrol, engine oil and water.
- WEEKLY, OR EVERY 250 MILES.**
- 2 Grease swivel pins, ball joints, fan. Hand oil can, carburetter, controls and cross shaft. Check tyres and pressures, 20lbs. front, 26lbs. rear.
- MONTHLY, OR EVERY 1,000 MILES.**
- 3 Grease propellor shaft greaser and foot pedals. Check gearbox, steering box, rear axle, hand-brake pawl, and ratchet, luggage grid nuts. Spray road springs. Oil distributor shaft. Top up battery. Lubricate door hinges, striking plates and locks.



**SUMMARY OF REGULAR ATTENTIONS.**

- AT 2,000 MILES.**
- 4 Drain engine and refill with fresh oil. Check sparking plugs. Check tappet clearances. Lubricate trafficators.
- AT 3,000 MILES.**
- 5 Grease rear hubs and wheel nuts and studs. Lubricate the cam bearing and automatic timing control.
- BI-ANNUALLY, OR EVERY 6,000 MILES.**
- 6 Drain and refill gearbox and rear axle. Check over shock absorbers. Check camshaft chain adjustment and fan belt. Smear the cam and contact breaker pivot with Mobil grease No. 2. Wash off and grease Girling brake linkage.
- ANNUALLY, OR EVERY 12,000 MILES.**
- 7 Grease front hubs. Dismantle and repack. Overhaul dynamo and starter motor. Check over body anchorage bolts and chassis nuts and bolts generally.



**RECOMMENDED LUBRICANTS.**

Model and Component	Price's	Anglo-American	Vacuum	Shell-Mex & B.P.	Wakefield's
Engine and Gearbox	SUMMER WINTER	Essolube 50	Mobiloil BB	Triple Shell	Castrol XL
Upper Cylinder Lubrication	Motorine C Motorine M Motorine U.C.L.	Essolube 30	Mobiloil A Gargoyle Upper Cylinder Lubricant	Double Shell Shell Upper Cylinder Lubricant	Castrolite Castrollo Upper Cylinder Lubricant
Rear Axle and Steering Box	Motorine Battersea A	Essolube Gear Oil Heavy	Mobiloil G.X.H.	Shell Spirax Gear Oil	Castrol Gear Oil D
Wheels Hubs: propellor shaft splines and chassis greasers	Belmoline C	Esso Grease	Mobilgrease No. 4	Shell R.B. (Front Hub) Shell Retinax Grease	Castrol Gear Oil D
Road Springs	—	—	Voco Penetrating Oil	Shell Penetrating Oil	Castrol Penetrating Oil

# GIRLING BRAKE ASSEMBLY

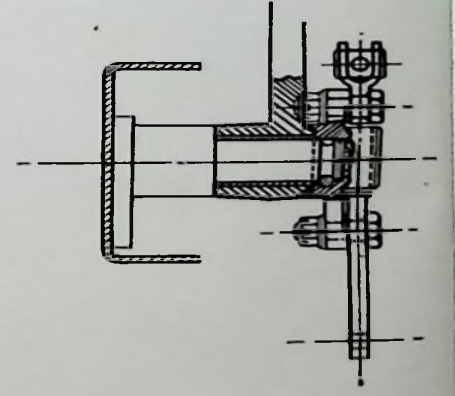
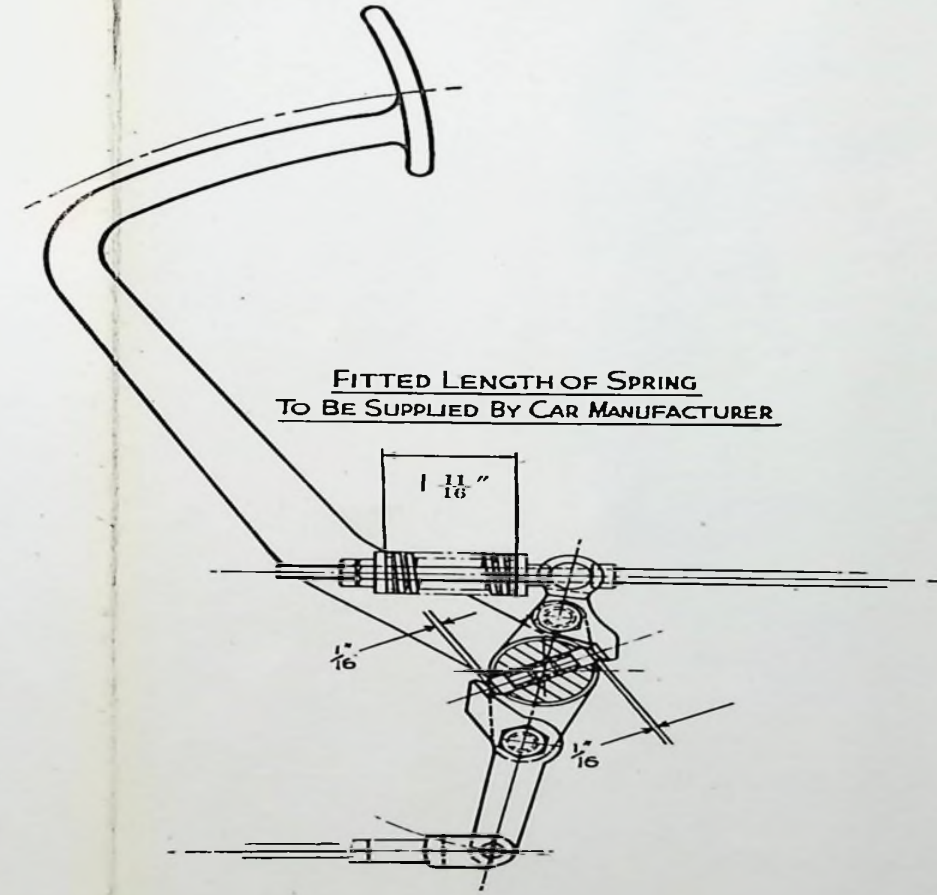
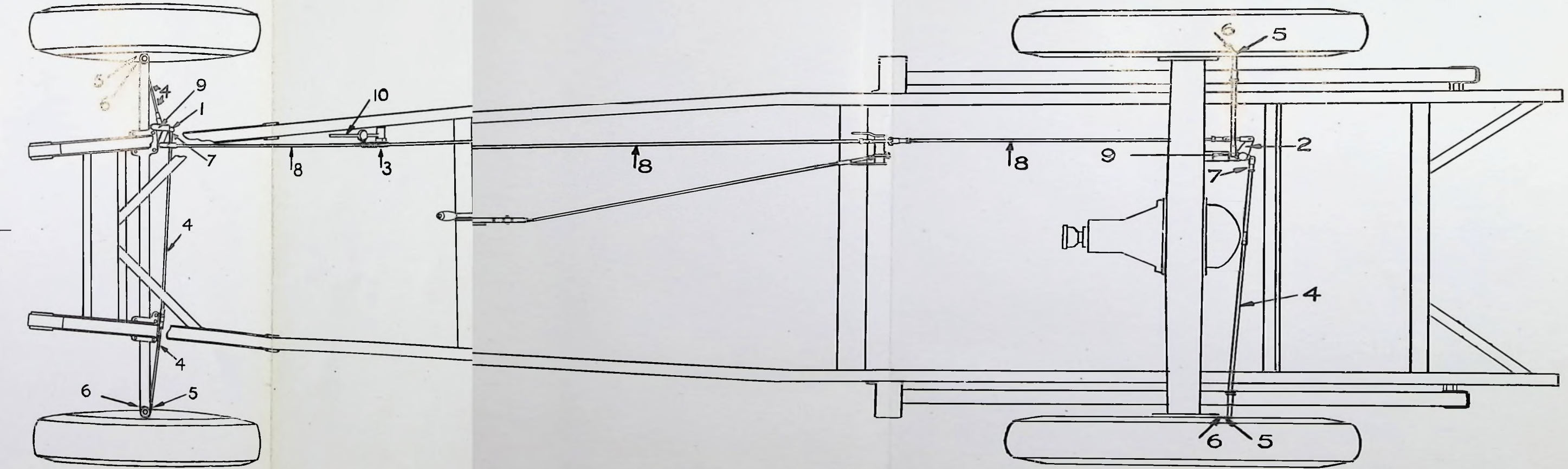
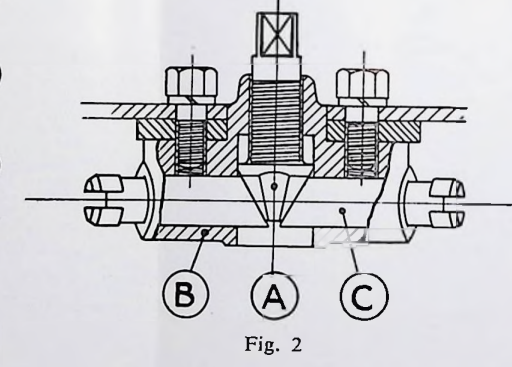
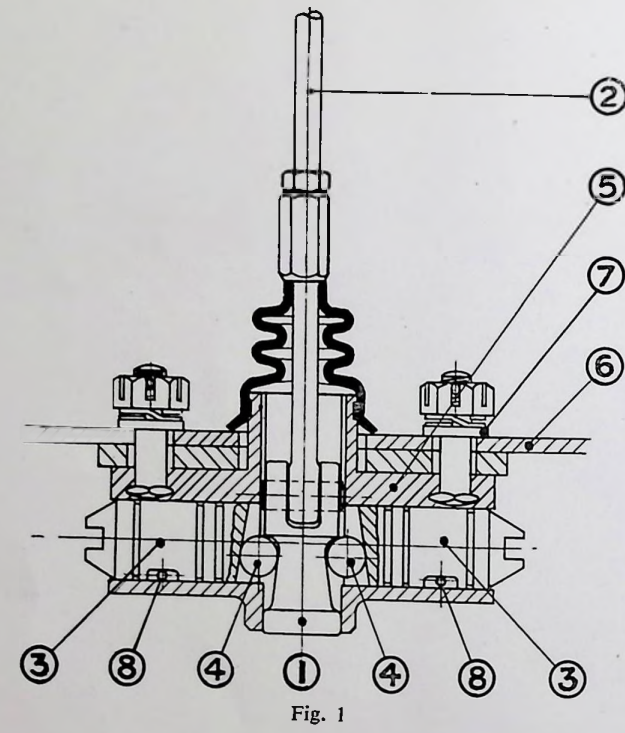


Fig. 3

Fig. 4

## PETROL SUPPLY

**T**HREE components directly concern the supply of petrol to the engine. First, the petrol tank, from which the petrol is drawn by means of the pump to the carburetter, secondly the A.C. petrol pump, and lastly, the carburetter.

### PETROL TANK.

This is situated at the rear of the chassis and has a capacity of seven gallons. The tank is also fitted with an electric petrol gauge and a recording dial on the facia board. This dial records the amount of petrol in the tank the whole time the ignition switch is in the "on" position.

Should it at any time be necessary to remove the petrol tank, disconnect the petrol gauge and pipe, remove the four nuts and bolts securing the petrol tank straps to the chassis frame, and withdraw the petrol tank from beneath the chassis.

## THE A.C. FUEL PUMP SERIES "Y"

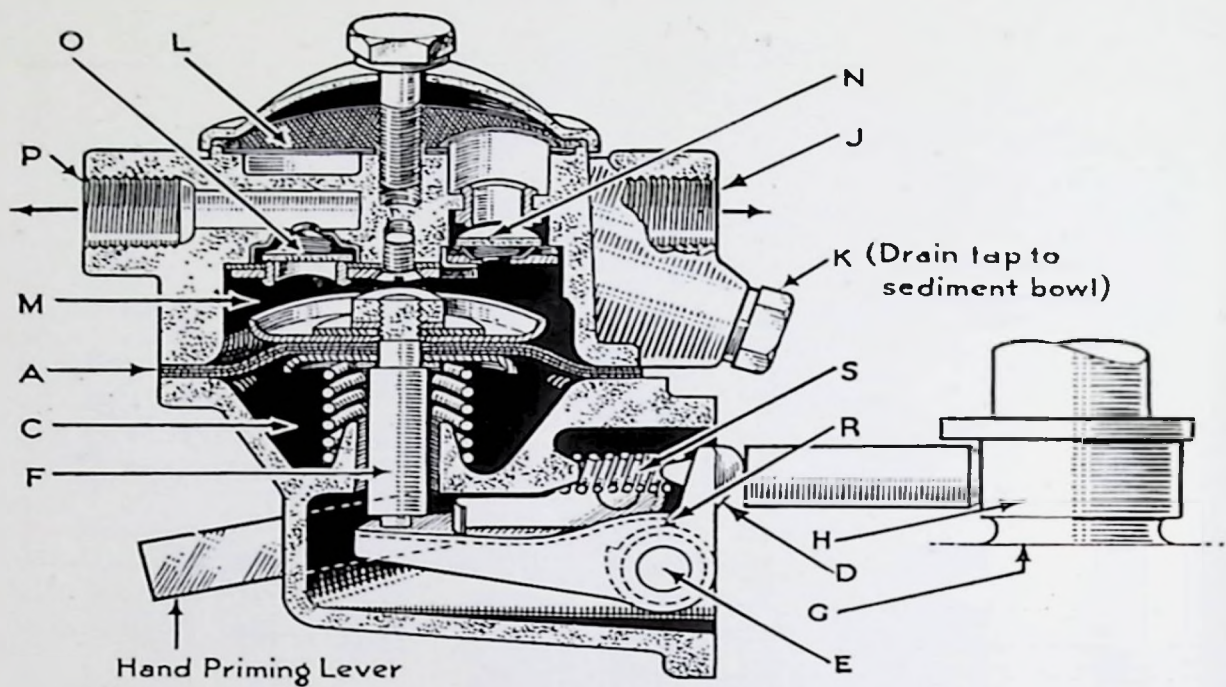
### WORKING PRINCIPLES.

By revolving shaft (G) the eccentric (H) will lift rocker arm (D), which is pivoted at (E) and which pulls the pull rod (F), together with diaphragm (A) downward against spring pressure (C), thus creating a vacuum in pump chamber (M).

Fuel from the rear tank will enter at (J) into sediment bowl (K) and through strainer (L) and suction valve (N) into pump chamber (M). On the return stroke, spring pressure (C) pushes diaphragm (A) upward forcing fuel from chamber (M) through pressure valve (O) and opening (P) into the carburetter.

When the carburetter bowl is filled the float in the float chamber will shut off the inlet needle valve, thus creating a pressure in pump against chamber (M). This pressure will hold diaphragm (A) downward against the spring pressure (C) and it will remain in this position until the carburetter requires further fuel and the needle valve opens. The rocker arm (D) is in two pieces, the outer operating the inner one through (R) and the movement of the eccentric (H) is absorbed by this "break" when fuel is not required.

Spring (S) is merely for the purpose of keeping the rocker arm (D) in constant contact with eccentric (H) to eliminate noise.



### SERVICE HINTS.

Service on the AC Fuel Pump is available through Authorised AC Service Stations, who are prepared with parts and fixtures for repairing all types of pumps. There are some service operations on this fuel pump that can, if necessary, be done without referring to the service station and these are tabulated below. In some instances trouble is attributed to the fuel pump which in reality is caused by some other condition. These should be carefully checked to avoid needless attention to the pump.

#### LACK OF FUEL AT THE CARBURETTER.

Check as follows:—

Cause.	Remedy.
Leaky tubing or connections.	Replace tubing and tighten all pipe connections at the fuel pump and petrol tank.
Bent or kinked tubing.	Replace tubing.
Filter cover loose.	Tighten nut after making certain that cork gasket lies flat in its seat and makes an airtight joint.
Dirty filter screen.	Remove nut and filter cover and clean the screen. Make certain that cork gasket is properly seated when reassembling.

## LEAKAGE OF FUEL AT THE DIAPHRAGM.

Check as follows:—

Cause.	Remedy.
Loose cover screws.	Tighten cover screws alternately and securely. NOTE: Sometimes there appears to be a leak at the diaphragm, whereas the leak actually exists at one of the pipe fittings and the fuel has run down the pump to the diaphragm flange, appearing to originate there.

## FLOODING OF CARBURETTER.

Check as follows:—

Cause.	Remedy.
Carburetter needle valve not seating.	Check carburetter for proper adjustment.

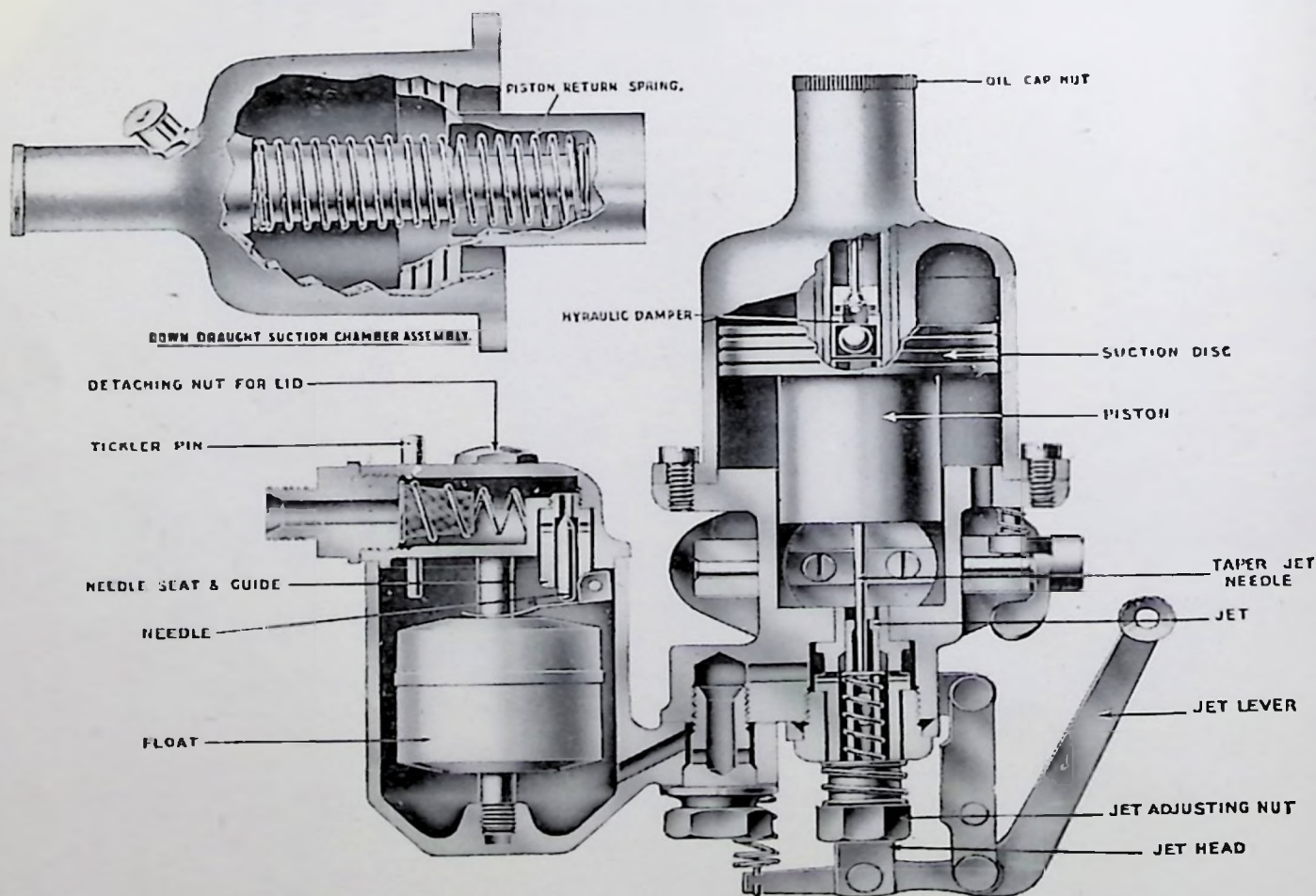
# CARBURETTER

**O**N this model the carburetter fitted is of the S.U. Downdraught type. There are only two types of S.U. carburetter, the horizontal and downdraught. The construction of these is, in the main the same, the only difference between them being that the suction piston of the former falls by its own weight, whereas that of the latter is depressed by a spring. The horizontal carburetter only is fitted with the hydraulic suction piston damper.

The tuning of the S.U. carburetter is **SIMPLICITY ITSELF** if it is thoroughly understood that all jets are of standard size. The **ONLY** adjustment possible is fitting the right size of needle with the jet adjusting nut set correctly for idling. It cannot be emphasised too strongly that it is of no use whatever trying to adjust the carburetter in any other manner.

Should the engine run badly, after having previously given good results, do not change the needle, for this cannot be the cause of the trouble.

It is of the utmost importance that the carburetter should be adjusted by means of the jet and jet adjusting nut in such a way that the correct mixture is obtained when the engine is idling—



that is to say, it should be made to fire as evenly as possible. This can be noted by listening to the exhaust. If the engine has a constant uneven beat (known as "hunting"), this is due to rich mixture. If the exhaust note is irregular and splashy, the mixture is too weak.

This adjustment not only adjusts the carburetter for idling but for the whole range of speeds.

If this adjustment is not made, consumption will be bad and probably the performance poor. Should your car, therefore, not be satisfactory in respect to consumption or performance, look to this adjustment, and if the correct size of needle is fitted it will put the matter right. If it does not, an incorrect size of needle is fitted and it will have to be changed for one correcting the mixture as required. A larger needle will give a weaker, and a smaller needle a stronger mixture over the whole range of speeds.

## ADJUSTMENT.

Proceed as follows:—

Run the engine until it attains its normal running temperature. Adjust the jet to such a position that the engine idles on the correct mixture. An easy way to do this is to adjust the jet up to a weaker position, then unscrew the jet adjusting nut until it brings the jet down to the position where the engine idles with an even exhaust.

A simple way to test for rich mixture when the engine is idling is to lift the piston up slightly, say  $1/32$ in., and if when this is done the engine runs faster, the mixture is too strong.

If after this adjustment has been made, the road performance is not satisfactory, a larger or smaller needle will be necessary, as the case may be. If the car pulls better with the manual mixture control pulled out, a smaller needle is required.

Should it be necessary to change the needle, this can be done by removing the two screws holding the suction chamber in position. The suction chamber can then be lifted off and the piston removed. At the side of the piston will be seen a set screw. When this is slacked off, the needle can be withdrawn and the new needle fitted. The position of the needle is with its shoulder flush with the face of the piston. When replacing, care should be taken that the keyway at the side of the piston registers with the key in the body. Great care should also be taken to see that all machine faces and parts are kept scrupulously clean.

There are a number of faults that will cause an engine to run badly, but if the trouble is due to the carburetter it can only be one of the following:—

1. Piston sticking (see paragraph 1).
2. Dirt or water in the carburetter (see paragraph 2).
3. Float-chamber flooding (see paragraph 3).
4. Float needle sticking (see paragraph 4).
5. Jet sticking (see paragraph 5).

The trouble will, however, more often be found to be due to one of the following causes:—

LOSS OF COMPRESSION on one or more cylinders.

PLUG POINTS too far apart, causing misfiring and popping in the carburetter when the engine is on full throttle pulling hard on hills, also difficult starting from cold.

OILY PLUGS causing misfiring.

FAULTY IGNITION, bad starting and misfiring.

STICKY VALVES, causing misfiring and popping in exhaust and through the carburetter.

BLOCKAGE OR AIR LOCK IN PETROL PIPE, causing carburetter to give symptoms of weak mixture, i.e., lack of power and popping back through the air inlet. This can be tested by detaching petrol pipe connection at float lid to see if there is a free flow through the pipe.

BAD JOINTS between the carburetter and the engine, or WORN INLET VALVES or GUIDES will cause bad starting and engine will not idle.

### THE HYDRAULIC SUCTION PISTON DAMPER.

This is a device located in the hollow piston rod and attached to the oil cap nut. It consists of a plunger with a one-way valve and its function is to give a slightly enriched mixture by preventing the piston from rising unduly quickly on acceleration. The only attention necessary is to keep it supplied with thin oil. It should not, however, require attention more than about once a month.

### PISTON STICKING.

#### Paragraph 1.

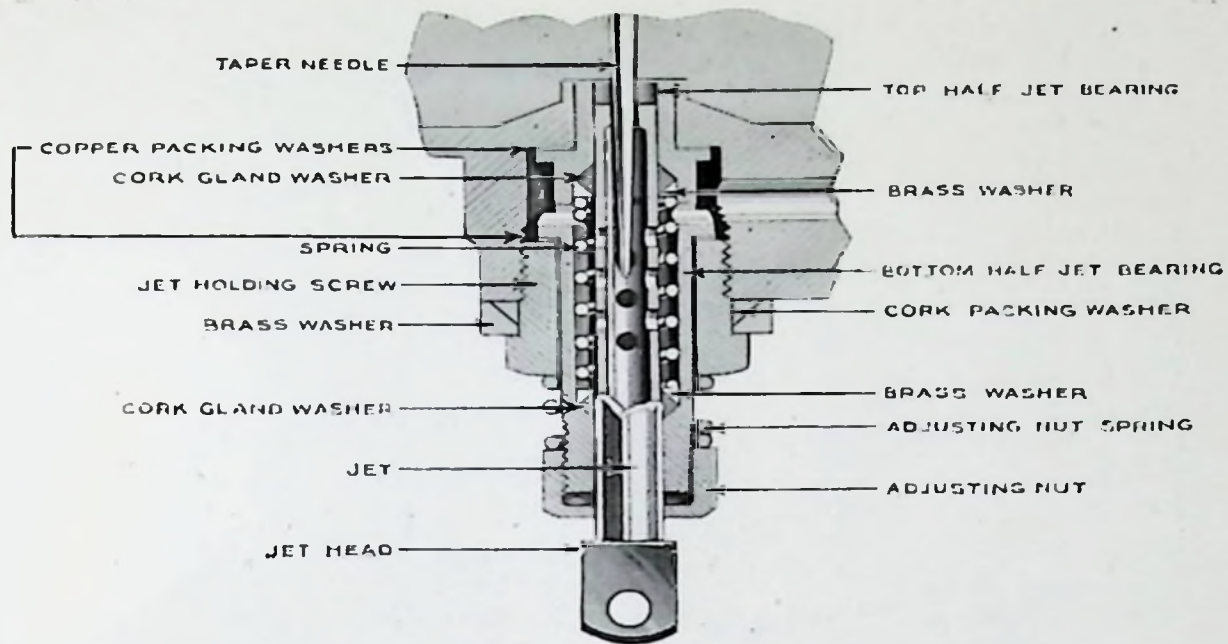
The suction piston comprises the piston, forming the choke, the needle and suction disc; into this is inserted the hardened and ground piston rod which works in the bearing of the suction chamber. The piston rod running in the bearing is the only part which is in actual contact with any other part—the suction piston and needle having clearance fit, and consequently should not cause sticking. If this does occur, the whole assembly should be carefully cleaned and the piston rod only should be lubricated with a spot of thin oil. A sticking piston can be ascertained in a few seconds by inserting a finger in the air intake and lifting the piston, which should come up quite freely and fall right on to its seat when released.

### WATER OR DIRT IN CARBURETTER.

#### Paragraph 2.

When this is suspected lift the piston with a pencil. The jet can then be seen. Flood the carburetter by depressing tickler pin and watch the jet; if the petrol does not flow through freely there is a blockage. To remedy this start the engine, open the throttle, block up the air inlet momentarily without shutting the throttle; keep throttle open until the engine starts to race. This trouble seldom arises with the S.U. carburetter owing to the size of the jet and the petrol ways. When it does happen, the above method will nearly always clear it. Should it not do so, the only alternative is to remove the jet. This, however, should on no account be done unless it is absolutely necessary, as when refitting it has to be





carefully centred to the needle, and it is practically impossible to assemble this part correctly unless it is first thoroughly understood how this is carried out.

### CENTRING OF JET.

Should it be essential to remove the jet, this can be done by unscrewing the jet holding screw. It must be understood that the needle is very nearly as large as the jet, and yet must not touch it. When assembling it is therefore necessary to carefully centre the jet to the needle, which is done as follows:—

First screw the jet adjusting nut to its top position and move the jet right up till the jet head is up against this, then refit the jet, taking care that the jet parts are assembled in the correct position (see diagram). When this is done, feel if the piston is perfectly free by lifting it up with the finger. If it is not, slacken the jet screw and try again. It may be necessary to slacken the screw several times before the piston falls perfectly freely. When this has been done bring the jet adjusting nut back to its original position. Experience shows that a very large percentage of carburetters that are returned for correction have had the jet removed and not centred correctly to the needle. It is quite easy when removing the piston to bend the needle, in which case it will bind on the jet and thus cause the piston to stick.

### FLOAT-CHAMBER FLOODING.

#### Paragraph 3.

This can be seen by the petrol flowing over the float-chamber and dripping from the air inlet, and is generally caused by grit between the float-chamber needle and its guide; this can usually be removed by depressing tickler pin, which allows the incoming petrol to wash the grit through the guide and into the float-chamber.

#### Paragraph 4.      **FLOAT NEEDLE STICKING.**

If the engine stops, apparently through lack of fuel when there is plenty in the tank, the probable cause of this is a sticking float needle. If the car is fitted with an electric petrol pump an easy test for this is to disconnect the pipe from the pump to the carburetter, switch on the ignition and see if fuel is delivered. If it is, starvation has almost certainly been caused by the float needle sticking to its seating, and the float-chamber lid should therefore be removed, the needle and seating cleaned and refitted. At the same time it will be advisable to clean out the entire fuel feed system, as this complaint is caused by foreign matter in the petrol, and unless this is done it is likely to recur. It is of no use whatever replacing any of the component parts of the carburetter, and the only cure is to make sure that the petrol tank and pipe lines, etc., are entirely free from any kind of sticky substance capable of causing this trouble.

#### Paragraph 5.      **JET STICKING.**

This complaint is less likely to be experienced with horizontal than with downdraught carburetters. It will probably be found that the cause is stiffness in the manual control or in the jet mechanism itself. The most simple cure is to withdraw the jet to its fullest extent, oil the operating wire and/or linkages, and grease the jets with vaseline or similar lubricant. The control should then be operated two or three times to ensure that the whole system is well lubricated.

It should be emphasised that the five troubles previously mentioned are the only ones that can be caused by the carburetter, and if these five points are in order on no account take the carburetter to pieces or alter it in any way, but look for the troubles elsewhere.

There is very little that is likely to go wrong with the S.U. carburetter, and when this does happen it is a perfectly simple matter to rectify the fault. A lot of trouble has been, and can be caused, by unnecessary interference due to lack of knowledge. As previously pointed out, the only possible adjustment is by fitting the correct needle adjusted for idling by means of the jet adjusting nut, consequently there is normally no need whatever for the jet to be touched. In the past, the chief trouble has been the jet being removed without knowledge as to re-centring it; therefore on no account allow anyone to remove or tamper with this part unless you are personally certain that it is blocked, which after all, is a very unlikely occurrence.

#### **STARTING.**

To start the engine from cold, bring the jet down to its lowest position by means of the jet control; open the throttle slightly more than the normal position when the engine is hot, the engine should then start immediately. The mixture control should not be kept at this strong position longer than is necessary.

To start when the engine is hot it is not necessary to use the mixture control.

N.B.—Some cars have the manual jet and throttle controls inter-connected. With these vehicles, therefore, it is only necessary to operate a single control for starting from cold.

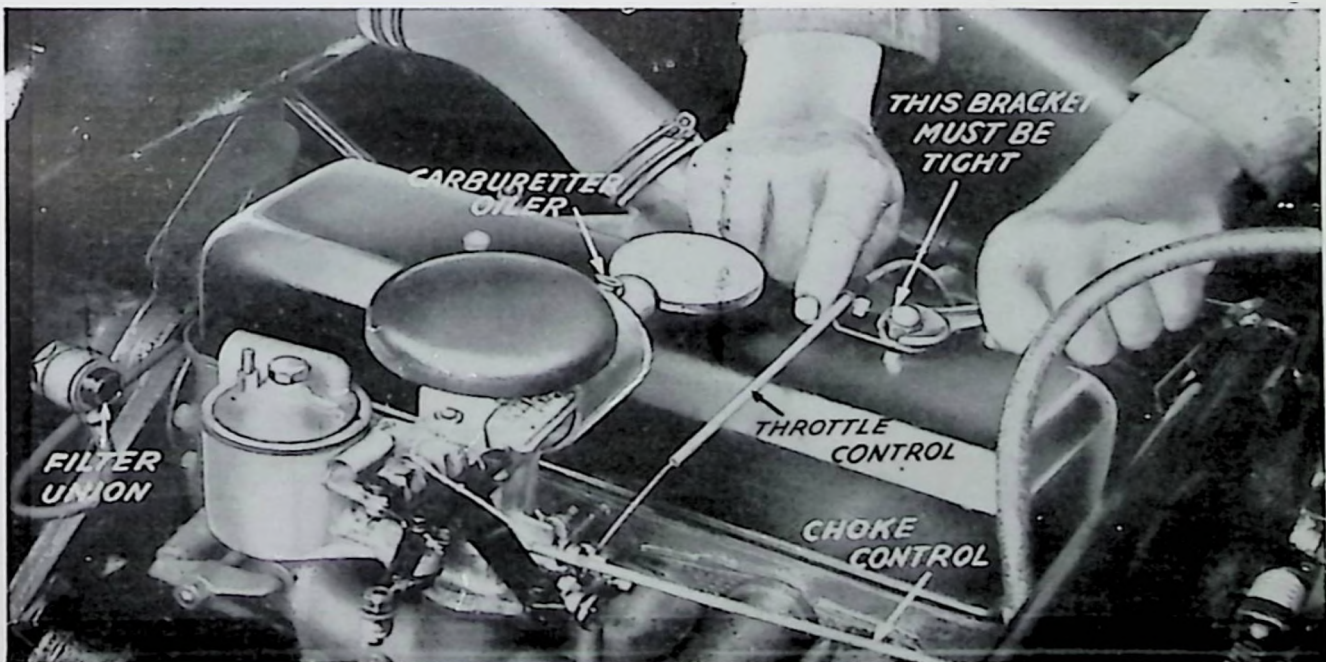
## DECARBONISING ENGINE

Decarbonising is one of the periodical attentions which many owners prefer to carry out themselves, and one which offers no difficulty if carried out methodically.

It is not possible to state definitely over what mileage a car should be run before decarbonising becomes necessary, but signs of excessive carbon deposit are noticeable owing to the sluggishness of the engine and a tendency to "pink" under load. Therefore, we suggest that a new engine should be decarbonised for the first time after 6,000 miles, and thereafter every 10,000 miles will be a fair average period.

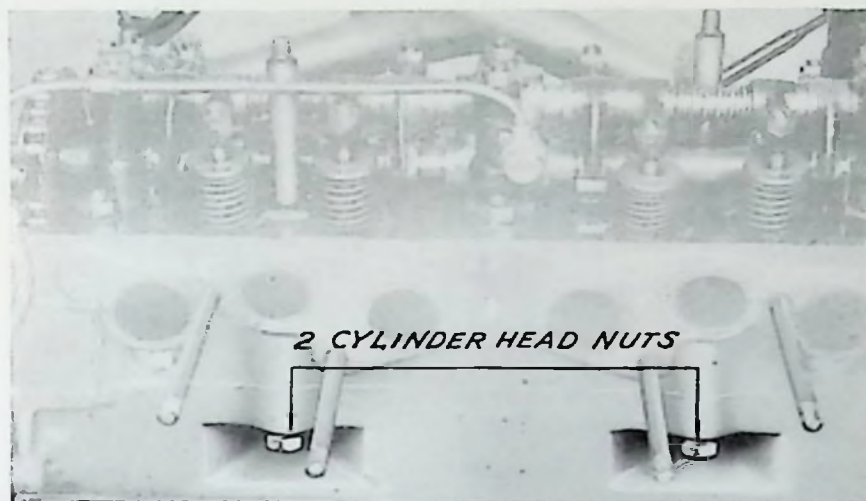
The operation of decarbonising consists of cleaning the inside of the combustion chambers and the tops of the pistons, and of course necessitates disturbing the valve timing when removing the cylinder head. The method of procedure is as follows:—

1. Remove bonnet.
2. Drain the water system by means of the drain tap at the base of the radiator at the nearside, and by means of the drain plug underneath the water inlet pipe on the offside of the cylinder block. **IT IS ESSENTIAL THAT THIS PLUG IS REMOVED TO COMPLETELY DRAIN THE WATER COOLING SYSTEM.**
3. Disconnect the filter union from the carburetter, exercising care to avoid damaging the filter inside the union. When reconnecting the union be quite certain that the fibre washer is in position.



4. Disconnect the carburetter throttle and choke controls. It will be noticed that the carburetter throttle control is secured to the top cover by means of one of the dome nuts. In some cases the throttle control bracket is fixed to the top cover, but if it should happen that the bracket is loose and secured only by means of the nut, care must be taken when refitting the bracket to be quite certain that it is in such a position that the carburetter throttle can be fully closed.
5. Disconnect the exhaust lead pipe, and remove the drain pipe from the induction manifold. Be careful to avoid damage to the gasket fitted between the lead pipe and the manifold.
6. Remove carburetter.
7. Remove five nuts securing the inlet and exhaust manifolds, and withdraw the manifolds from the studs. Special gaskets are fitted between the manifolds and cylinder head, and these should be carefully removed and stored for safety.
8. Remove top valve cover which is secured by two dome nuts. A cork washer is fitted between the valve cover and the cylinder head.
9. Disconnect and remove the sparking plugs.
10. Disconnect the clips securing the radiator top hose pipe and remove the hose pipe.
11. Disconnect the camshaft oil feed pipe by unscrewing the union at the timing case end, removing the nut and releasing the clip securing the pipe to the first camshaft bearing and removing the gallery stud, which connects the camshaft feed pipe to the camshaft centre bearing.
12. Remove water outlet pipe.
13. Remove two bolts and washers securing the cover at the front of the cylinder head and open out the small metal clip which secures the oil feed pipe of the overhead camshaft assembly. (See illustration, page 34.)
14. Set the engine position by turning the starting handle until the inlet valve on number four cylinder is about to open.
15. Release the camshaft drive chain tensioner by unscrewing the lock nut and turning back the adjusting bolt in the cylinder head.
16. Remove the camshaft chain sprocket by releasing the tab washer and removing the bolt and plain washer which secure the chain wheel to the camshaft flange. **DO NOT UNDER ANY CIRCUMSTANCES REMOVE CHAIN FROM CHAIN WHEEL**
17. Remove two bolts and washers from timing case to cylinder head, one of which carries the petrol pipe clip. Remove eight nuts and plain washers from the cylinder head holding down bolts, and remove two nuts and washers from two studs which penetrate the cylinder block immediately behind the manifolds on the

nearside of the engine. These nuts and washers will only be disclosed when the exhaust and inlet manifolds are removed (see illustration below).



**CLEANING THE ENGINE.** Having removed the cylinder head, the pistons will now be visible, Nos. 1 and 4 at the top of their stroke, Nos. 2 and 3 at the bottom. Fill the exposed bores and water ports with rag and remove the carbon from the top pistons using for this purpose a blunt instrument such as a screwdriver. **DO NOT USE EMERY UNLESS THE PISTONS ARE COMPLETELY REMOVED FROM THE CYLINDERS, AS SOME ABRASIVE MAY FIND ITS WAY INTO THE ENGINE CAUSING CONSIDERABLE DAMAGE.**

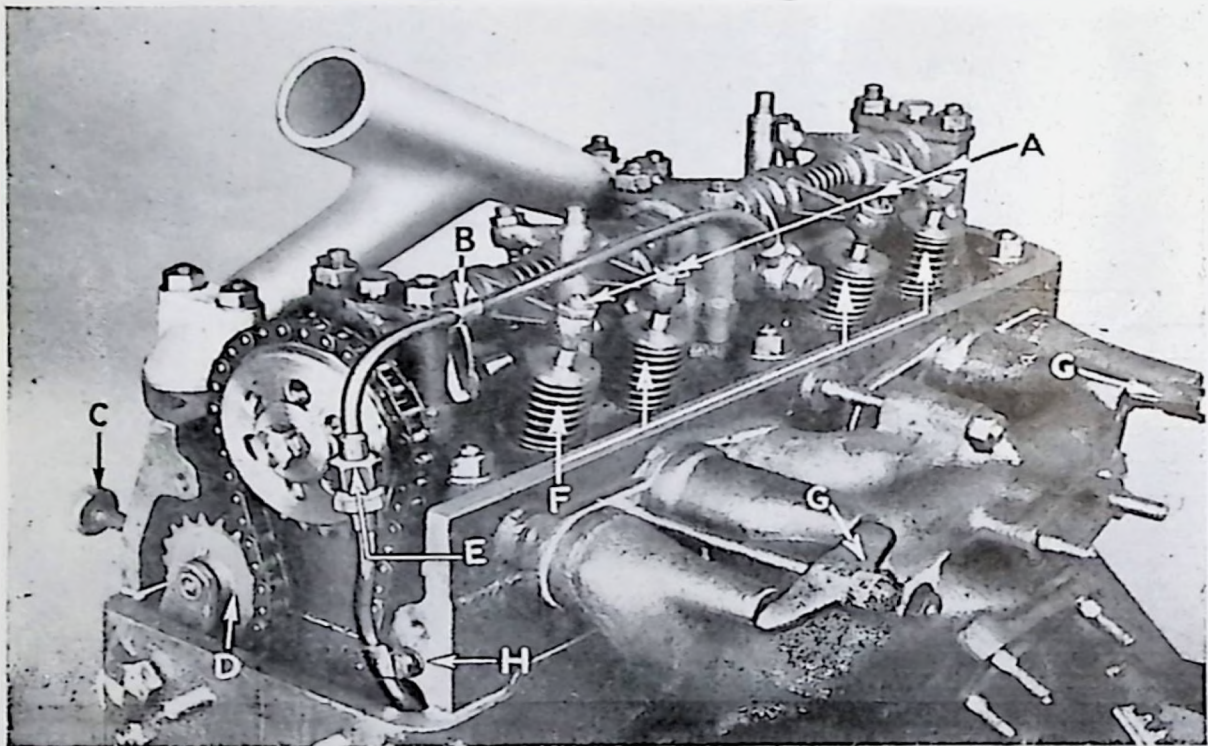
To clean pistons Nos. 2 and 3, hold the camshaft chain wheel up and in alignment with its lower sprocket while turning the engine half a turn clockwise to bring these pistons to the top of their stroke. Afterwards remove any carbon deposit from the face of the cylinder block and cleanse the cylinder head gasket ready for refitting.

Remove all carbon deposit from the combustion chambers, the face of the cylinder head and the valve heads. Do not in any way interfere with the position of the camshaft in order that the cylinder head can be returned to the cylinder block without interfering with the valve timing. Again, hold the camshaft chain wheel up and in alignment with its lower sprocket and procure assistance to turn the engine backwards by means of the flywheel until pistons Nos. 1 and 4 are again at the top of their stroke. Inject a small amount of oil into each cylinder bore to provide lubrication for the first few revolutions of the engine and refit the cylinder head. The reassembling of the cylinder head, etc., is merely a reversal of the dismantling operation.

**GRINDING IN VALVES.** It is not always necessary to carry out this operation every time an engine is decarbonised, therefore the above instructions concerning decarbonising have not taken into

consideration the method of dismantling the cylinder head and camshaft assembly for the purpose of valve grinding.

**REMOVE CAMSHAFT ASSEMBLY.** Release six nuts and washers which secure three camshaft bearings and withdraw upper halves of bearings complete with valve rockers and shaft. Release upper halves of camshaft bearings from rocker shaft, withdraw and mark to ensure returning them to the correct position. It is advisable at this stage to remove the camshaft bearing bases from the cylinder head studs and pair with the upper halves. Each valve rocker should be marked to facilitate its return to the correct position.

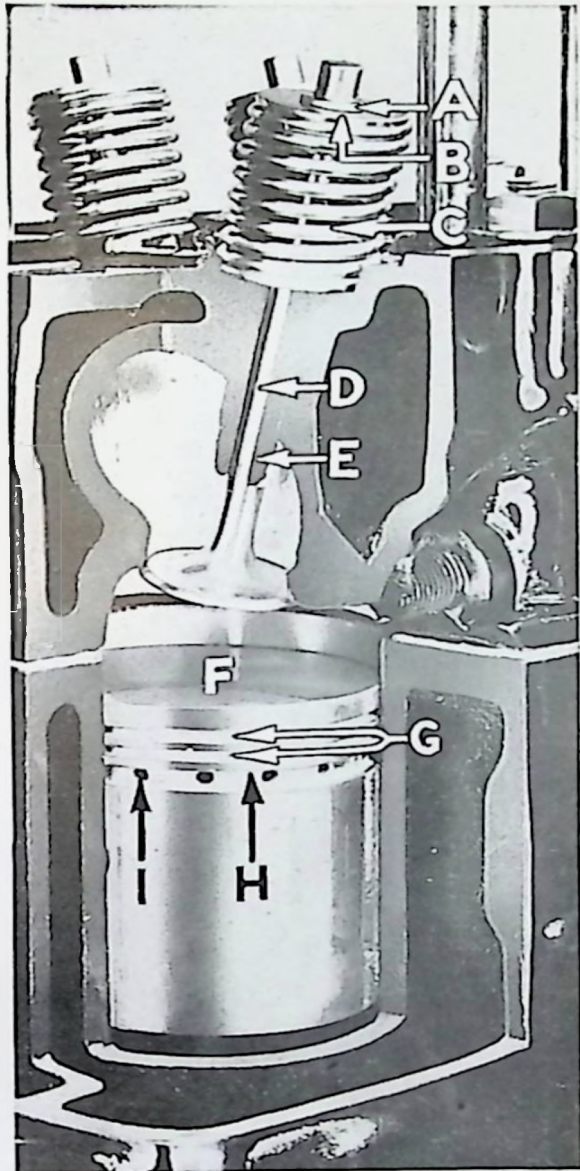


A, tappet adjusting screw; B, clip (mainshaft oil feed pipe); C, camshaft chain adjustment; D, camshaft chain tensioner; E, union (camshaft oil feed pipe); F, inlet valves; G, manifold clamps; H, feed pipe clip.

Place valve extracting tool in position for compressing valve spring and removing split collar. Release the valve extractor and remove valve spring and collar. The valves may then be withdrawn through their guides from the combustion head. The valves are marked and should be returned to the correct seatings. Counting from the front of the cylinder head, the valves are marked as follows:—

Inlet valves	...	...	Nos. 1, 3, 5, 7
Exhaust valves	...	...	Nos. 2, 4, 6, 8

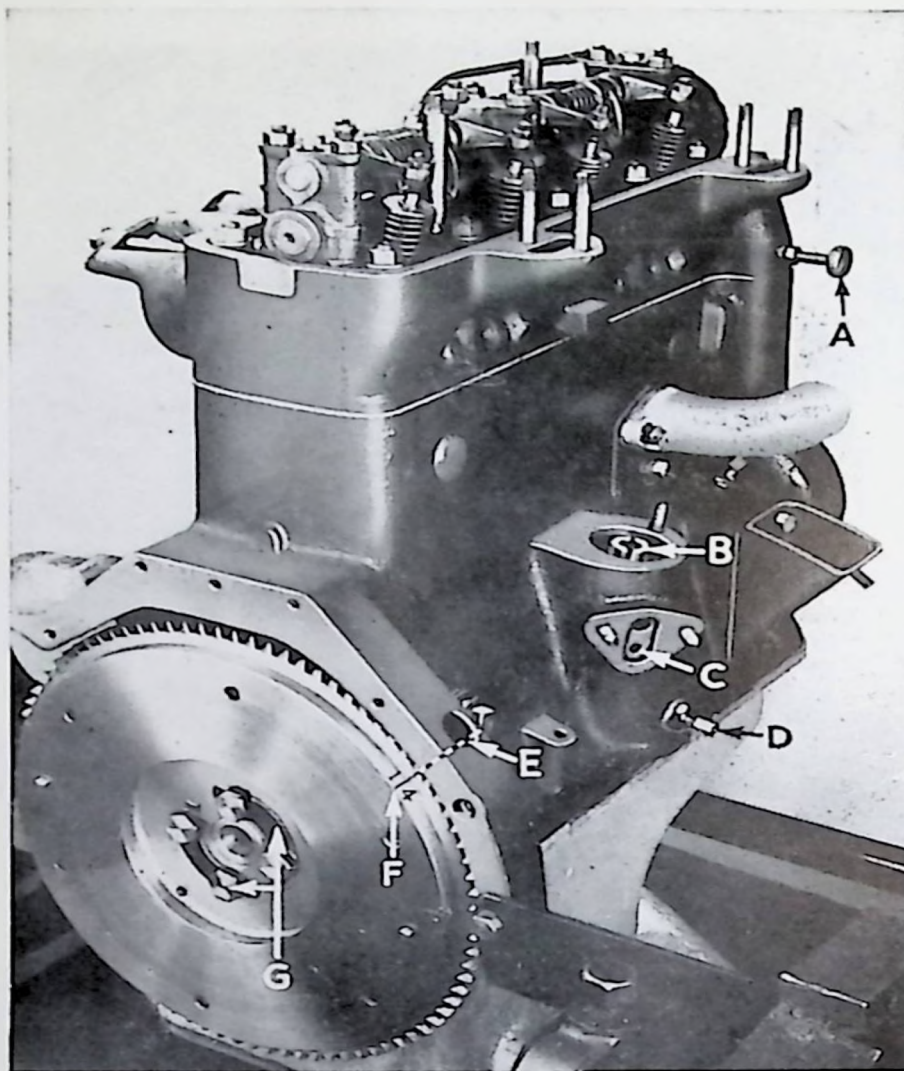
Remove all carbon deposit from the combustion chambers and the face of the cylinder head, also from the valve heads, stems, and



A, valve split cotter; B, valve spring collar; C, valve spring; D, valve; E, valve guide; F, piston; G, compression rings; H, scraper rings; I, scraper ring oil return holes.

valve seatings. Smear a little valve grinding compound over seating on valve and cylinder head, and grind in the valve by rotating backwards and forwards upon its seat. Do not allow the valve to make a full revolution of the seating, but lift the valve from its seating at the end of each stroke. A light coil spring placed between the head of the valve and the guide will considerably facilitate this method of grinding.

When a true contact ring appears on valve seating, withdraw the valve and clean away all abrasive with petrol. A good test of a true valve seating is to chalk strokes across the seating of the valve head and cylinder head in similar positions to the figures on a clock face. The valve is then replaced on its seating and a slight turn in one direction should break each chalk line.



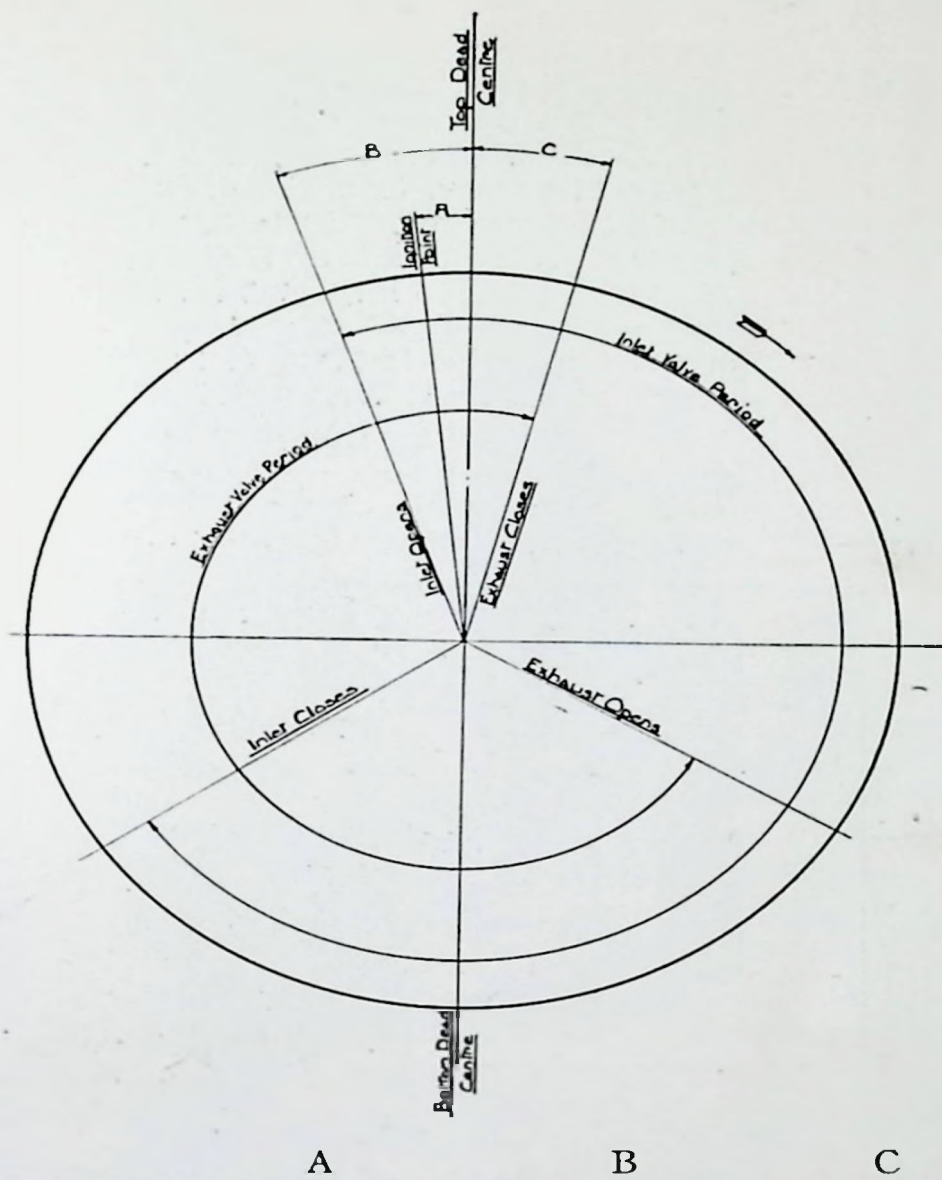
A, camshaft chain adjustment; B, distributor drive shaft; C, pump drive plunger; D, drive shaft locating pin; E, timing mark inspection aperture; F, timing mark; G, flywheel anchorage bolts and locking plates

REASSEMBLING THE CYLINDER HEAD, etc., is merely reversal of the dismantling operation, BUT DO NOT OVERLOOK RESETTING THE CLIP SECURING THE OIL FEED PIPE TO THE NEARSIDE OF THE CYLINDER HEAD. Smear the valve stems with oil before refitting to their guides and be quite sure that the valves are returned to the correct seatings. Check the valve clearances by slackening the lock nut of the ball pin in the rocker arm, and turning the adjusting screw until the following clearances are given:—

Inlet valves	...	...	...	.004 in.
Exhaust valves	...	...	...	.006 in.

Tighten the lock nut and turn the camshaft in a clockwise direction until the inlet valve of No. 4 cylinder is about to open. Replace the gasket and cylinder head to the engine and tighten





FLYWHEEL  $\frac{7}{16}$ " —  $\frac{7}{8}$ " BTDC.  $1 \frac{25}{32}$ " BTDC  $1 \frac{11}{32}$ " ATDC

the head nuts evenly half a turn at a time, working from the centre outwards. Reassemble the oil feed pipe to the camshaft assembly. Remount the camshaft chain wheel and lock into position, not overlooking the correct location of the tab washer with the chain wheel stud.

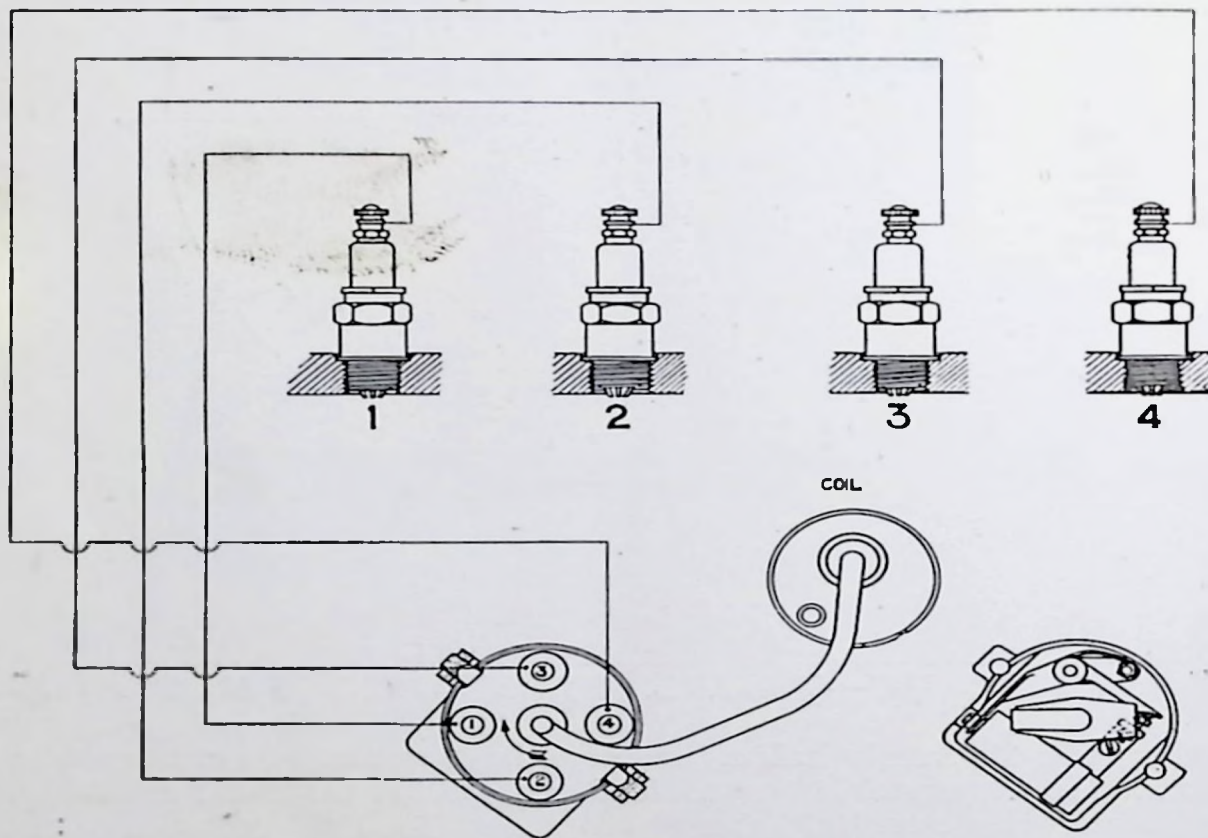
If the previous instructions have been closely followed, the engine valve timing will be correct, i.e., inlet valve on No. 4 cylinder about to open  $20^\circ$  ( $1.25/32$  in.) before the mark  $1/4$  on the flywheel is in the centre of the inspection aperture on the offside of the clutch casing (see illustration, page 36), and the distributor rotor arm opposite the segment for No. 1 cylinder high tension lead. It will be noted that when pistons Nos. 1 and 4 are on top dead centre the  $1/4$  mark denoting this is not on the top of the flywheel but is in a position approximately at two o'clock on the clock face,

so that the mark is visible through the inspection hole previously mentioned. The illustration will make this point quite clear.

**IGNITION TIMING.** After any operation which has necessitated the removal of the distributor unit it will be necessary to re-time the ignition. It will be seen from the timing diagram that the ignition is firing when fully retarded  $5^{\circ}$  to  $10^{\circ}$  ( $7/16$  in. to  $7/8$  in.) before top dead centre. Continue to turn the engine until the  $1/4$  mark on the flywheel is  $7/16$  in. to  $7/8$  in. before top dead centre.

The firing order of the engine is 1, 3, 4, 2; No. 1 cylinder being nearest to the radiator. **ALWAYS TIME ON No. 1 CYLINDER.**

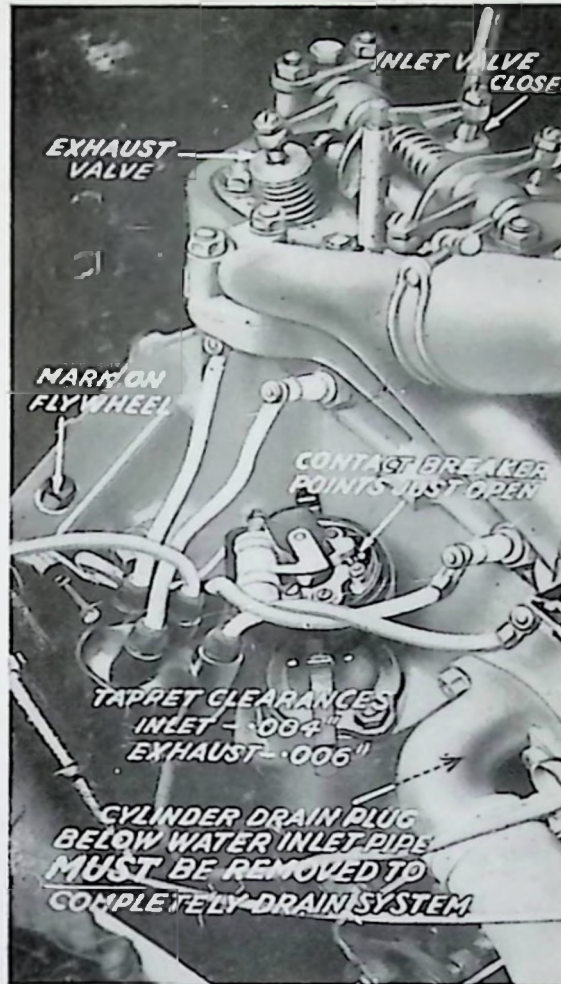
Remove engine top cover and turn the engine until the inlet valve on No. 1 cylinder closes.



Remove the distributor cover and the contact breaker points at this position should be about to open. Should this not be the case, release the distributor clip nut and turn the distributor body anti-clockwise until the contact breaker points just begin to open, then tighten the clip nut.

Replace the distributor cover after noting which segment makes contact with the rotating arm. The lead to No. 1 sparking plug must be plugged in opposite this segment. Proceeding in a clockwise direction, place the lead of No. 3 sparking plug opposite the next segment, then that for No. 4 plug and finally the lead for No. 2 plug in the last position.

Test the engine after this setting, and any slight variation which



Ignition Timing

may seem necessary can be made by slackening the distributor clip nut and slightly rotating the distributor. Turning clockwise will retard the ignition and anti-clockwise will advance it.

If the ignition is too early, the engine will be inclined to knock when pulling at low engine speeds. Late ignition causes overheating and lack of power.

It will be noted when the distributor is removed from the distributor drive shaft that the dog of the distributor shaft is offset, i.e., out of centre. It is very important when replacing the distributor to be quite certain that it is replaced correctly or otherwise it will be impossible to obtain the correct ignition timing, therefore the following procedure must be strictly adhered to.

Turn the engine by hand until the inlet valve on No. 4 cylinder has just closed and the 1/4 mark on the flywheel is in the position previously specified. It will then be seen that the distributor drive shaft has the offset or thicker side of the shaft towards the engine case (see illustration, page 36).

The distributor shaft must be fitted so that the dog corresponds with the drive shaft and if this is observed no difficulty will be experienced. If the distributor drive shaft is removed from the engine case the same rule must be observed.

## OVERHAULING INSTRUCTIONS

When the time comes for the overhaul to be carried out, the car should be returned to one of our Service Depots so that the work may receive careful attention by mechanics who are experts in overhauling Singer Cars.

If, however, this is not possible, the next best thing is to be quite certain that the car goes to a repairer of repute; many cars are ruined by slipshod overhauling.

In this section of the book the methods of dismantling the various parts of the chassis are described for the benefit of the mechanics who have the work to do.

### CAUTION.

So much trouble has been experienced by the owners of Singer Cars through the fitting of spurious spare parts, that this Company feels it necessary to issue a warning and to advise the many owners of Singer Cars when purchasing spare parts to insist that they are genuine Singer parts, such spares being fully guaranteed by the Company.

### REMOVING ENGINE FROM CHASSIS.

(1) Remove bonnet and drain water system (as in paragraphs 1 and 2 of Decarbonising Section).

(2) Disconnect the clips securing the radiator top and bottom hose pipes, and remove the hoses.

(3) Remove the four nuts and lock nuts from the radiator anchorage studs. The radiator may now be removed from the chassis.

It is perhaps as well to point out here that the holes in the chassis front member, through which the radiator anchorage studs pass, are slotted. This is to allow for correctly positioning the radiator so that no difficulty will be experienced when the bonnet is refitted into position.

At the nearside of the engine the following details should be attended to in their order.

1. Remove petrol pipe from carburetter and mechanical petrol pump. The pipe is secured by one clip at the offside of the cylinder head front cover.

2. Disconnect carburetter controls and remove carburetter.

3. Disconnect the starter cable from the battery, also disconnect the cables to the starter motor and dynamo and the starter motor switch controls.

4. Disconnect the oil gauge pipe at the crankcase end.
5. Remove three bolts which secure the starter motor and which also carry the earth return cable. The starter motor may then be removed.

On the offside of the engine it will be necessary to disconnect the petrol pipe from the tank to the pump.

6. Disconnect the lead from the coil to the distributor and the low tension and earth lead from the distributor.
7. At this stage it will be advisable to fix the pulley block and tackle in position to take the weight of the engine.

### REMOVING GEARBOX.

1. Remove the front seats and carpets disclosing twelve wood screws securing the gearbox rubber cover.
2. Remove the propellor shaft guard.
3. Extract the wood screws securing the metal pedal cover to the offside of the front toe-board.
4. Remove bolts from toe-board and floor-boards and remove boards.
5. Remove the floor-board supporting straps. These are secured by four nuts and bolts and two screws.
6. Disconnect the front end of the propellor shaft and the speedometer drive.
7. Remove bolts from the unit rear mounting and take away the mounting strap and pad.
8. Remove the six bolts securing the clutch housing to the engine case and withdraw the gearbox from the chassis.
9. Remove the centre bolts, one each side of the engine front mounting brackets and lift the engine from the chassis, tilting slightly to the nearside in order to clear the steering box.

### DISMANTLING ENGINE.

#### REMOVING TIMING CASE, INTERMEDIATE SHAFT ASSEMBLY, ETC.

Slacken off the fan pulley and dynamo adjustment and remove the fan belt.

Remove three nuts securing the fan assembly to the cylinder block casting and remove the fan assembly complete.

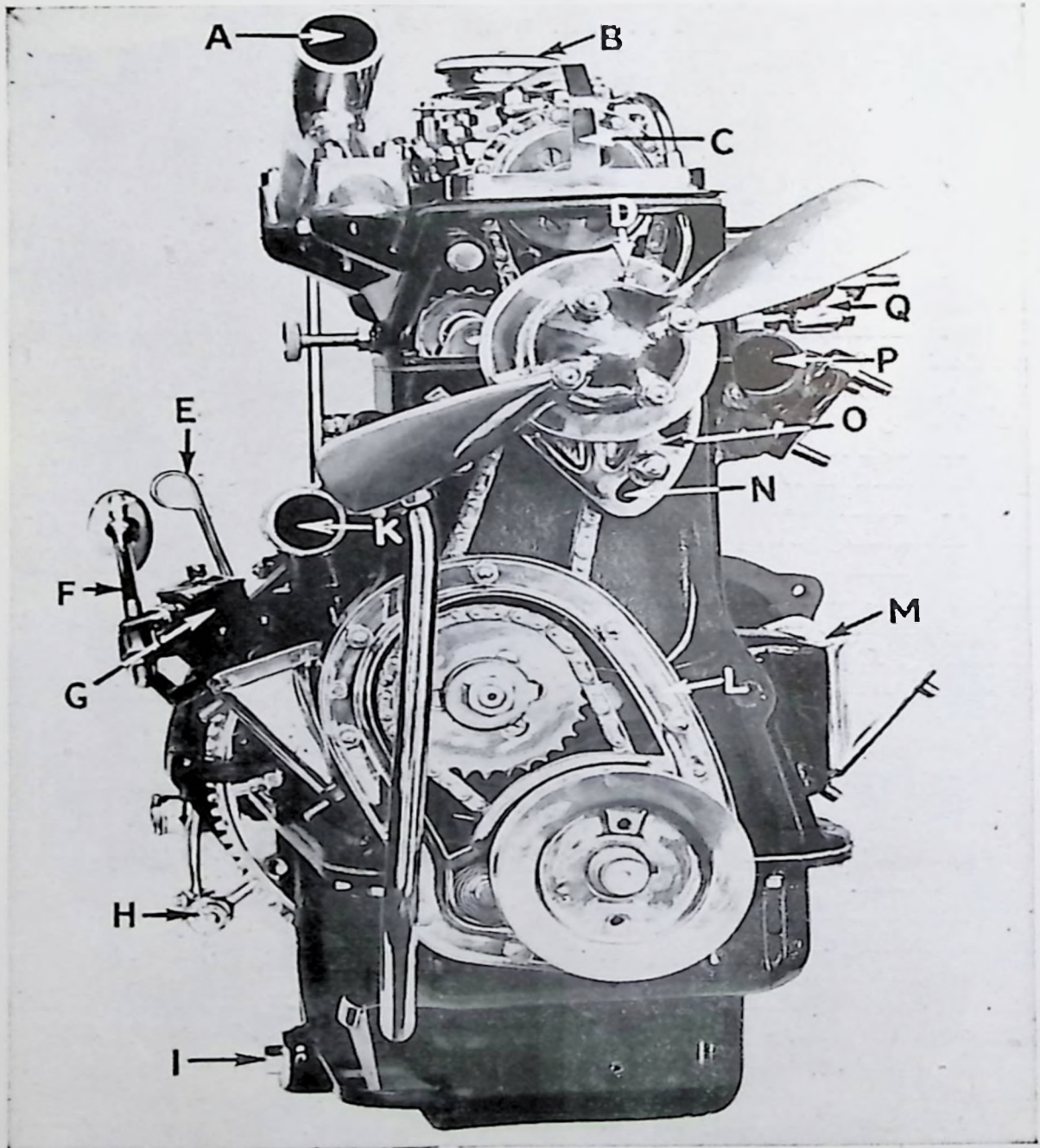
Remove two nuts and bolts securing the dynamo to engine case and remove dynamo. It now becomes necessary to remove the bottom fan pulley and this is secured to the crankshaft by means of the starting handle dog which is screwed on to the crankshaft and machined with a right hand thread.

The dog assembly is locked into position by two tabs from the locking washer which also register with two bosses cast on the fan pulley. It will be necessary to improvise a tool similar in construction to the starting handle but cut in the opposite direction so that the dog may be unscrewed from the crankshaft.

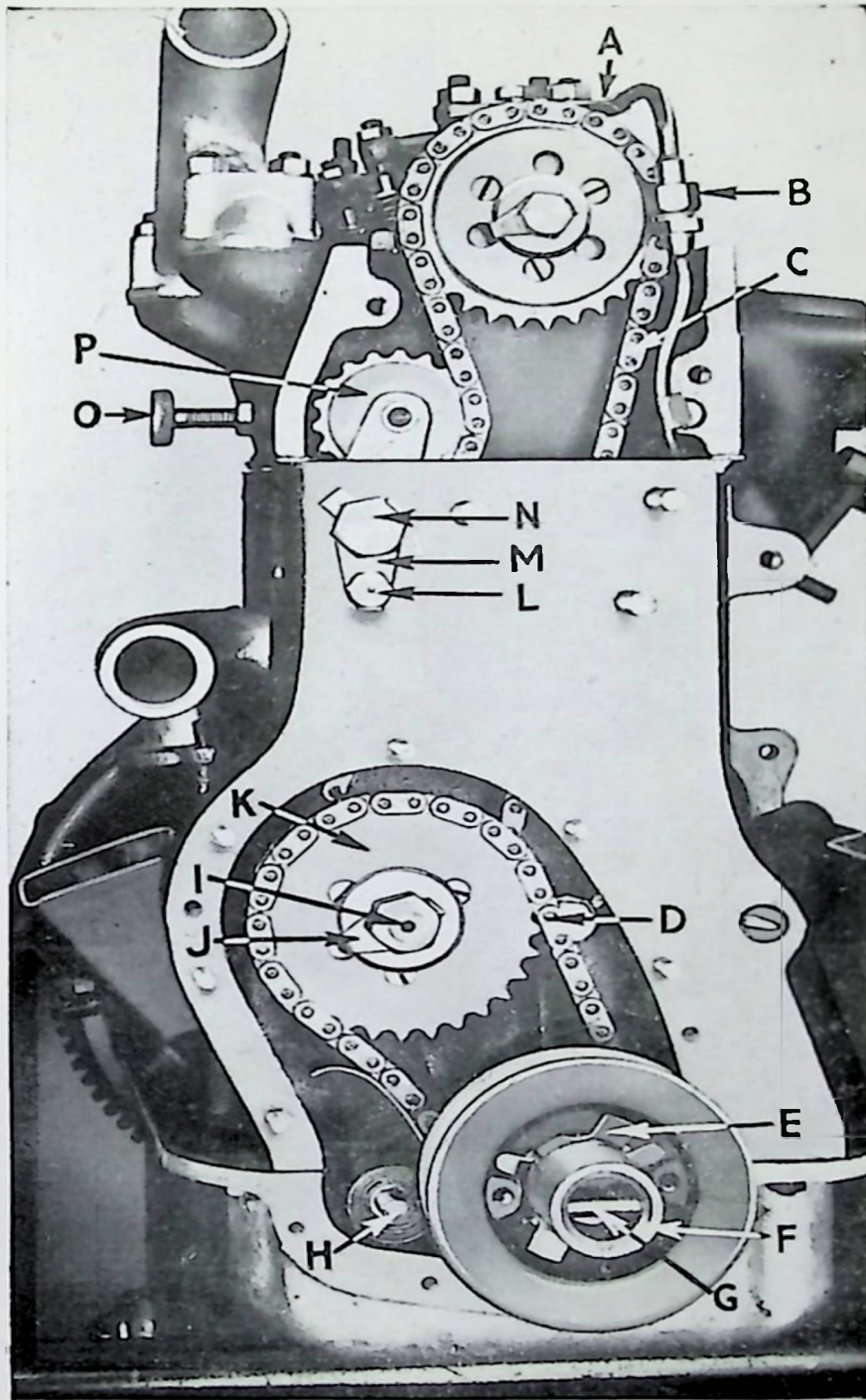
The fan pulley is keyed on to the crankshaft and when removing will disclose the oil flinger and camshaft sprocket assembly. The

camshaft sprocket too, is keyed on to the crankshaft. The oil flinger is fitted with the bevel of the flinger towards the cover. The timing cover is secured to the engine case by four bolts at the base and seven nuts round the edge of the cover. A cork washer is fitted.

Please note, when refitting the bottom fan pulley it will be best to turn the engine on to top dead centre and be careful when the



A, water outlet pipe; B, engine oil filler; C, top cover (sectioned); D, fan bearing greaser; E, oil dip stick; F, clutch pedal and adjustment; G, petrol pump; H, clutch lever adjustment; I, oil sump drain plug; K, water inlet pipe; L, timing cover (sectioned); M, engine bearer bracket; N, fan adjustment; O, fan bracket; P, exhaust manifold; Q, induction manifold

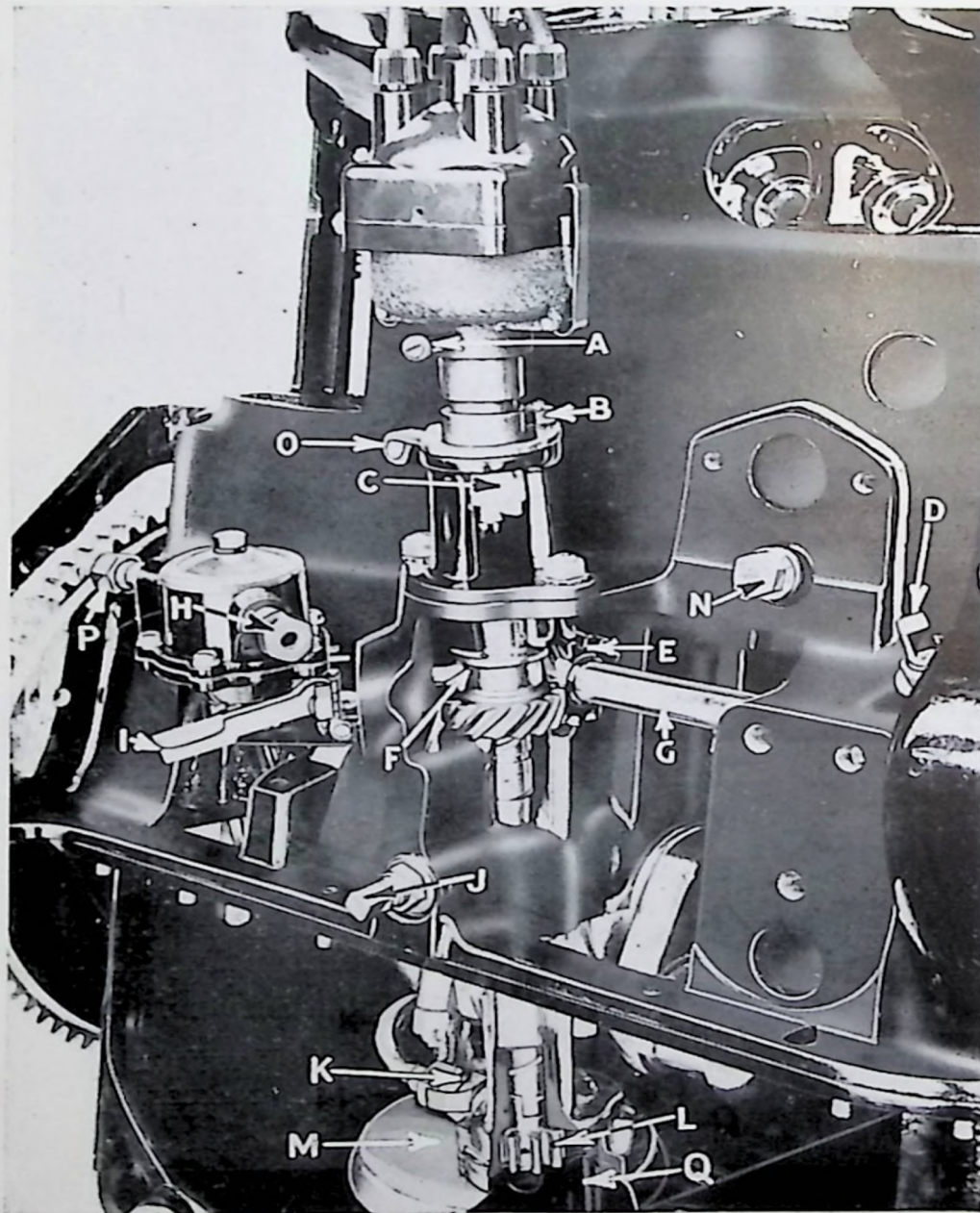


A, camshaft oil feed pipe; B, feed pipe union nut; C, camshaft chain; D, intermediate shaft driving chain; E, fan pulley locking plate; F, starting handle dog; G, dog pin; H, inter chain tensioner; I, inter sprocket locking nut; J, inter shaft sprocket; K, inter shaft sprocket; L, camshaft chain; tensioner sprocket pin; M, locking plate; N, chain tensioner fulcrum pin; O, chain tensioner adjusting bolt; P, chain tensioner sprocket.

starting handle dog is locked into position that the peg from the dog is at 90 degrees to top dead centre.

### REMOVING INTERMEDIATE SHAFT ASSEMBLY.

First remove the intermediate chain tensioner which is secured to the engine case by a central bolt. Remove one nut, tab washer and



A, distributor lubricator; B, distributor locating pin; C, distributor drive shaft; D, intermediate shaft locating pin; E, distributor drive gear; F Petrol pump plunger and cam; G, intermediate shaft; H, petrol pump delivery pipe; I, petrol pump primer; J, pump and distributor drive shaft locating pin; K, oil pump delivery tube; L, oil pump gear; M, filter plate; O, distributor clip nut; P, petrol pump suction pipe; Q, oil pump suction pipe.



plate from the intermediate shaft, remove three driving pins and the intermediate shaft sprocket. The intermediate chain (48 pitches) may then be removed. Remove the set pin and nut locating the intermediate shaft to the engine case and withdraw the shaft from the case.

**CAMSHAFT DRIVE CHAIN TENSIONER.** This is secured by two bolts from the front of the case. The bolts are locked with tab washers, one bolt acting as a pivot for the jockey sprocket assembly, the other carries the spring which provides tension for the jockey pulley. After removing the bolts the sprocket assembly may be withdrawn from the engine case.

### **DISMANTLING DISTRIBUTOR DRIVE ASSEMBLY.**

First remove two nuts securing the petrol pump to the engine case. Remove the petrol pump and extract the plunger. Next remove one bolt securing the distributor and locking plate to the drive housing and remove the distributor.

In order to remove the distributor drive housing take away two nuts securing the housing to the engine case. This will disclose the distributor drive shaft which is driven from the intermediate shaft by means of a skew gear. The pump drive is taken from the lower part of the shaft and the removal of the petrol pump plunger, distributor and drive housing will leave the shaft free to be extracted from the engine case.

Particular notice must be taken here that the slot in the distributor drive shaft and the dog on the distributor shaft are offset and if at any time it has been necessary to remove the drive shaft it must be refitted in the following manner.

First, turn the engine until the inlet valve on No. 4 cylinder is just commencing to open. The distributor drive shaft may then be inserted into the engine case until it engages with the dog on the oil pump shaft, but the offset or thicker side on the distributor drive shaft must be towards the engine case, or otherwise it will be impossible to obtain the correct ignition timing. (See illustration, page 36).

### **REMOVING PISTONS, CONNECTING RODS, ETC.**

Remove dip stick and drain engine oil by taking away the drain plug on the offside of the sump. Remove sump studs and nuts and take away sump, care being taken to avoid damaging the three cork washers which are fitted, one at each side and one to the rear main bearing housing. Care must be taken when refitting the sump to ensure these washers are in the correct position.

Extract split pins and release the nuts from the connecting rod bolts. Remove the connecting rod caps, and push the connecting rods and pistons a little way up the cylinder bores, care being taken to avoid the top piston ring passing over the top face of the cylinder block. The crankshaft may then be revolved to clear each cylinder bore and to allow each connecting rod and piston to be withdrawn from beneath.

The connecting rod bearings are of the full ring type and therefore, if at any time it should be necessary for the connecting rods to receive attention, under no circumstances should the faces of the connecting rod cap be filed, as this will result in altering the circle of the bearing and will render the connecting rods useless for future replacement purposes.

The correct procedure is for the connecting rods to be removed and replacement rods fitted, the original rods being returned either to the Dealer or one of our Service Depots for re-metalling.

A nominal charge is made for replacement connecting rods procured from one of our Depots or your Dealer, but when ordering connecting rods please quote the car number and the diameter of the crank pin journal.

### **DISMANTLING MAIN BEARINGS, CRANKSHAFT, ETC.**

When sump, connecting rods and pistons have been removed proceed as follows:—

To remove clutch from flywheel see page 48.

Remove four nuts and two locking plates securing flywheel to crankshaft.

Dismantle timing case, etc., as indicated on page 41.

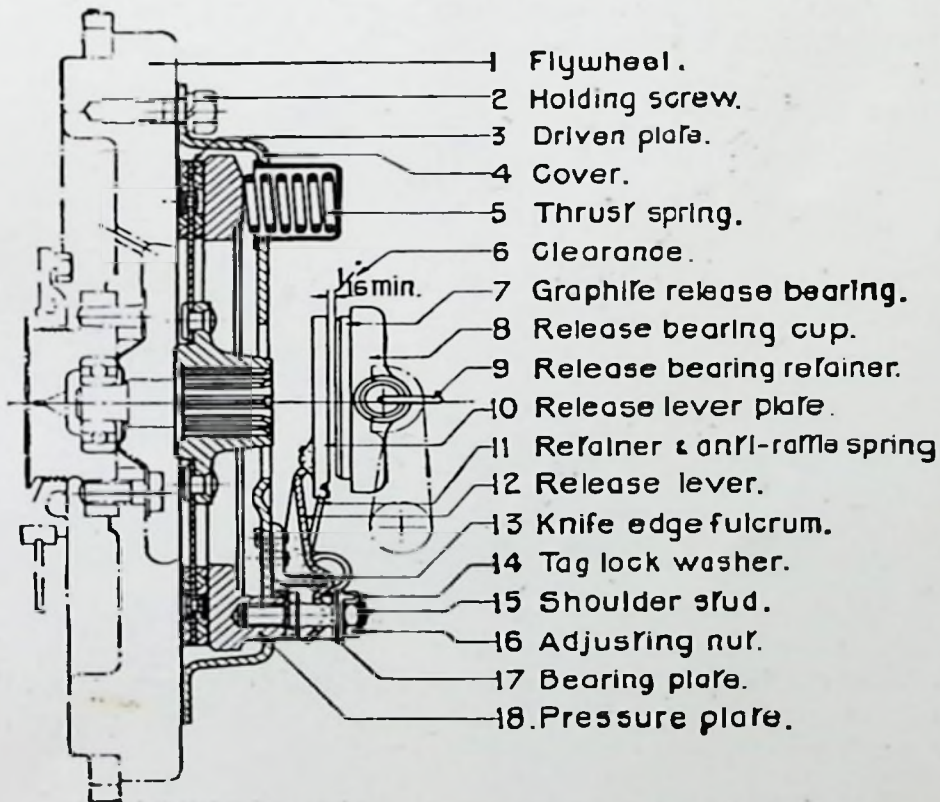
Remove tab washers and nuts from main bearing caps and withdraw crankshaft from engine case.

It will be noted that each bearing cap is located by two dowels. The front and centre main bearings are secured by two nuts and tab washers each, but the rear main bearing cap has four nuts and tab washers. No packing shims are fitted between the main bearing caps and the engine case.

## CLUTCH

**T**HE clutch is of the single plate dry disc type, no adjustment for wear being provided in the clutch itself. An individual adjustment is provided for locating each lever in manufacturing but the adjusting nut is locked in place by means of special tab lock washer, and should never be disturbed, unless the clutch is dismantled for replacement of parts.

A graphite release bearing (7) is used, mounted in a cup (8) attached to throw-out fork, and a release plate (10) is attached to inner ends of release levers (12) by means of retainer springs (11). Release is accomplished by moving release bearing forward against the release plate (1). The release levers are pivoted on knife edge fulcrums (13) mounted upon clutch cover (4) and at their outer ends shoulder studs (15) extend through holes and are fitted with adjusting nuts (16) by which each lever is located in correct position. The outer or shorter ends of the release levers engage the bearing plate (17) carried upon the shoulder studs (15) attached to pressure plate lugs, and thus the pressure plate (18) is pulled away from the driven plate (3) compressing the several small coil springs (5) which are assembled between the pressure plate and the clutch cover (4).



When the foot pressure is removed from clutch pedal the clutch springs force the pressure plate forward against the driven plate, gradually and smoothly applying the power of the engine to the rear wheels.

As the clutch facings wear the pressure plate moves closer to the flywheel face and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther towards the gearbox and decreases the clearance between the release lever plate and the release bearing. The effect on clutch pedal is to decrease the clearance or free travel under toe board, which is the distance clutch pedal moves down away from the underside of toe board before release bearing comes in contact with release lever plate. Some free movement must always be maintained to prevent clutch pedal riding against underside of the toe board and causing clutch to slip. This free movement is restored by adjusting the clutch pedal.

Adjust the pedal away from the stop until clearance or free movement is approximately three-quarters of an inch. The pedal should come in contact with the other stop when pedal is pressed down. If it does not move that far, further adjustment is necessary.

When this adjustment has been made a minimum clearance of one-sixteenth of an inch (6) (Fig. 1) between Graphite Release Bearing and Release Lever Plate should be obtained.

Press pedal down and note distance release bearing travels after it comes in contact with release plate. To obtain a clean release the lever plate should be pushed towards the flywheel a quarter of an inch. If it does not travel that distance move pedal up, bearing in mind that pedal pad must touch stop as above when pressed down for full clutch release.

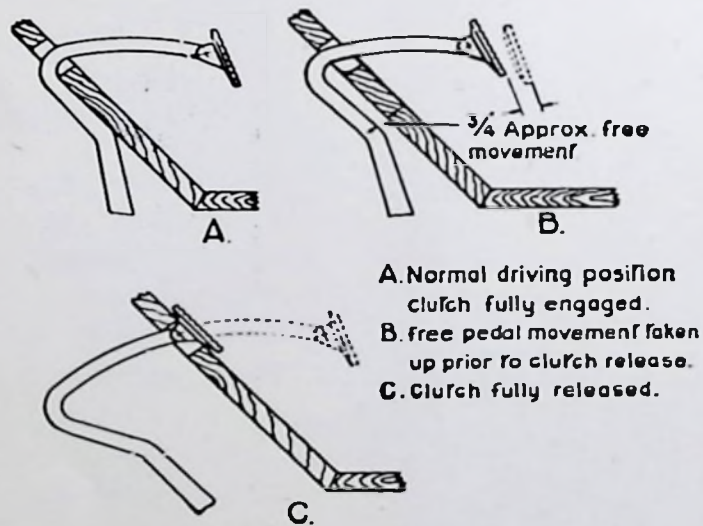


FIG 2

No other adjustment is necessary. DO NOT turn the adjusting nuts (16) because that will throw pressure plate out of position and cause clutch to chatter.

### REMOVING CLUTCH FROM FLYWHEEL.

To remove clutch from flywheel (1) it is necessary to remove the holding screws (2) (Fig. 1). Loosen each of holding screws a turn or two at a time until the spring pressure is relieved (this

should be carefully done to prevent springing the flanged edge of cover). The screws can then be removed and the complete clutch lifted off the flywheel, all parts except driven plate (3) (Fig. 1) being assembled to the cover.

### CAUTION.

Do not under any circumstances let gearbox hang in clutch assembly during removing or refitting of gearbox to engine.

Do not drive with foot on clutch pedal.

Do not slip clutch excessively instead of changing gears, as this causes rapid wear of clutch facings.

Do not put oil, grease, or paraffin in the clutch. Keep facings dry and free from oil.

### PROPELLER SHAFT.

The Hardy Spicer Needle Bearing Type Universal Joints are so designed that correct assembly is a very simple matter. No hand fitting or special tools being required.

The journal and needle bearing assemblies are the only parts subject to wear, and when it becomes necessary to replace these for any reason, the work (in the case of the larger sizes) can be done without removing the propeller shaft from the vehicle.

### TO DISASSEMBLE SNAP RING TYPE JOINT.

1. Remove snap rings by pinching ends together with a pair of pliers. If a ring does not readily snap out of the groove, remove enamel from the yoke holes and tap the end of the bearing lightly, which will relieve pressure against the ring.

2. Holding the joint in one hand, tap gently with a piece of copper or copper hammer on the radius of the ear of the yoke as shown in Fig. 1. The needle bearing will gradually emerge, and can finally be removed with the fingers. Be sure to hold the bearing in a vertical position, and when free remove race from the bottom side so as to avoid dropping the needle rollers (see Fig. 2).

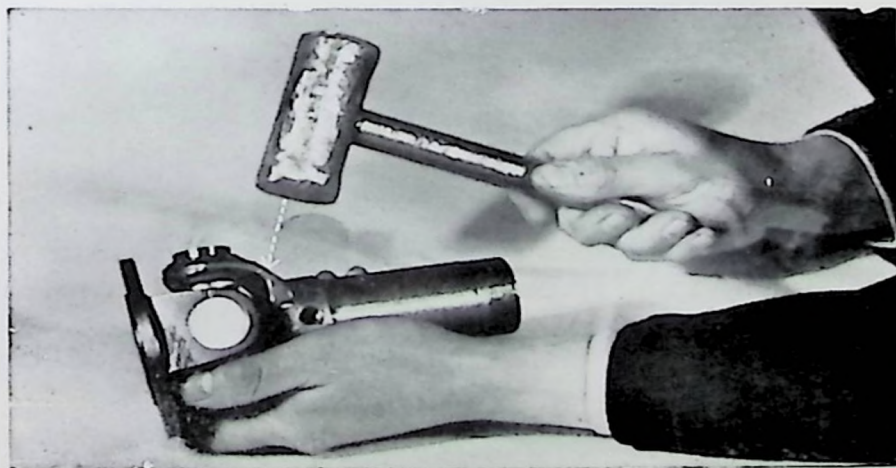


Fig. 1

3. Repeat this operation for the opposite bearing.
4. Support the two exposed journal pegs on lead blocks (to protect ground surface) and tap the ears of the flange yoke (2) to remove the race.
5. Reverse assembly and repeat the operation.
6. Wash all parts in petrol.
7. If parts are not worn, repack with a good grade of semi-fluid lubricant (160 S.A.E.). Make sure that the journal oil channels are filled with lubricant. With the rollers in position fill the race about one-third full.

Should any difficulty be encountered when assembling rollers in housing, smear the wall of the race with vaseline. It is advisable to install new gaskets, and gasket retainers on the journal assembly. The journal shoulders should be shellaced prior to fitting retainers so as to ensure a good seal. It is also useful to have snap rings available as replacements in the event of damaging a ring in disassembling the joint.

#### TO REASSEMBLE SNAP RING TYPE.

1. Insert journal in flange yoke holes.
2. Using soft round drift with flat face about  $1/32$  in. smaller in diameter than the hole in the yoke, tap the bearing into position.

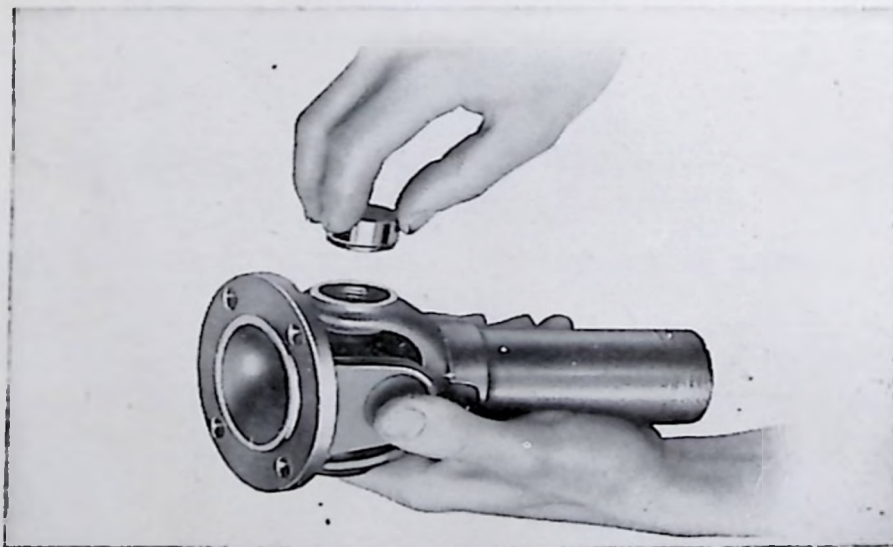


Fig. 2

3. Repeat this operation for the other three bearings.
4. Replace snap rings and be sure that these are firmly located in the grooves.

When assembled, if joint appears to bind, tap the lugs lightly with a wooden mallet, which will relieve any pressure of the bearing on the end of the journal.

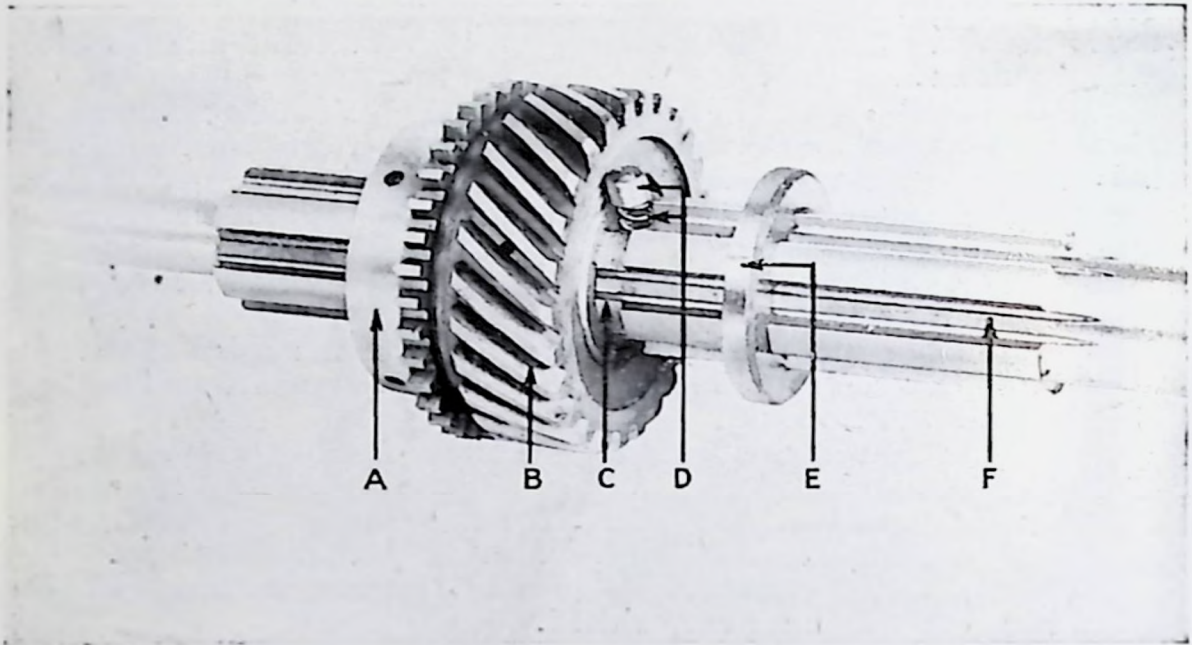
# BANTAM SYNCHROMESH GEARBOX

## DISMANTLING INSTRUCTIONS.

**R**EMOVE gearbox from chassis as detailed on page 41 and after having drained the oil from the gearbox, hold this unit in a vice by means of the drain plug. To dismantle the gearbox proceed as follows:—

1. Remove six bolts securing the gearbox lid and control tower to the box.
2. Select two gears to hold the mainshaft assembly stationary and remove the nut and split pin from the rear end of the mainshaft in order to allow the front universal joint flange to be withdrawn.
3. Take out one bolt and withdraw the speedometer drive bracket complete.
4. Remove six nuts securing the gearbox rear end cover and take away the cover.
5. Slide the speedometer drive gear from the main shaft.
6. Remove the four bolts securing the gearbox clutch housing and withdraw the housing.
7. Again select two gears to hold the mainshaft assembly stationary and take away the constant pinion nut which is machined with a left-hand thread. Withdraw the tab washer, oil scroll, and chip shield from the front of the constant pinion bearing.
8. Tap out the constant pinion bearing from the inside of the box and remove the inner chip shield.
9. Tap out the rear end mainshaft bearing from the inside of the box and remove the steel oil flinger.
10. By holding the constant pinion with the left hand and tilting the pinion shaft downwards it will enable the mainshaft spigot to be withdrawn from the bush of the constant pinion, and the mainshaft assembly can now be passed through the top of the gearbox. Withdraw the constant pinion backwards through the top of the gearbox.
11. Remove the set pin and shakeproof washer which secures the lock plate for the reverse shaft and layshaft.
12. Tap out the layshaft from the front through the rear of the gearbox.
13. Remove the layshaft gear cluster from the top of the box taking special care of the one bronze thrust washer at the front end of the assembly. The slotted steel washer registers in the reverse gear.
14. Tap out the reverse shaft and remove the reverse gear.
15. **DISMANTLING MAINSHAFT ASSEMBLY.**
  - (a) Slide first speed gear from mainshaft.
  - (b) Remove synchro assembly complete from mainshaft.
  - (c) To remove the second mainshaft gear, depress one small spring loaded plunger which secures the splined locking washer at the rear of the second gear. Turn the washer in order to clear the splines and slide this off the shaft.

It is then possible to withdraw the second speed gear, leaving the bush on the mainshaft, but great care must be taken to avoid losing the plunger and spring (see illustration). It will be noted that there is a similar spring loaded plunger and washer at the front end of the second speed gear bush.



A, synchronising cone; B, gear; C, groove (mainshaft); D, locking ring plunger and spring; E, locking ring; F, mainshaft.

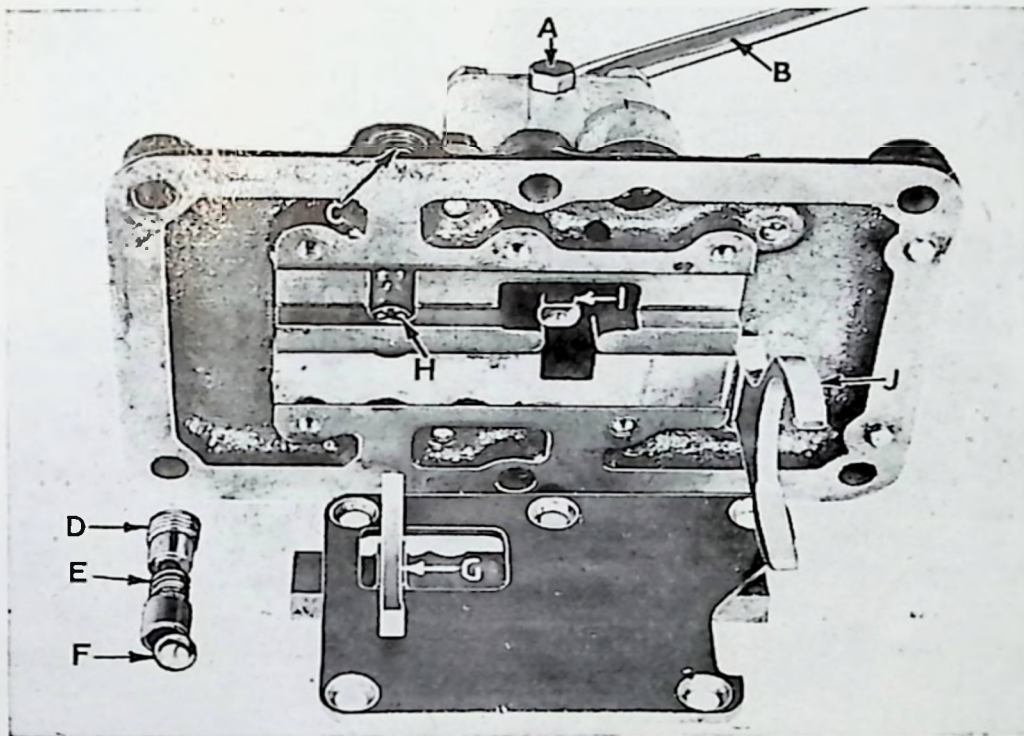
- (d) The synchro assembly comprises the third and second sliding dog, inside which slides the synchro sleeve carrying two serrated synchro cones of brass, and also contains six balls and springs which in effect lock the top and second sliding dog in the selected position. To dismantle the synchro assembly slide the assembly back on to the mainshaft until it butts against the second speed gear bush. Then depress the third and second sliding dog to its limit, great care being taken to avoid the six synchro balls and springs being lost. Then withdraw the synchro sleeve from the mainshaft. No further dismantling is necessary.

#### 16. DISMANTLING GEARBOX LID AND SELECTOR MECHANISM.

Hold gearbox lid and control tower in vice and remove four bolts which secure change speed lever tower to gearbox lid. The tower complete with lever may then be withdrawn from lid. Withdraw two plugs followed by springs, plungers, and balls from offside of lid and one of



each from nearside of lid. This will release tension from the selector shafts and forks, which are in one piece. Remove five set screws which secure the selector fork clamping plate, the latter can then be removed and will bring away with it the 2nd and top selector shaft and fork. Care should be taken not to lose the safety locking ball concealed in the guide boss which separates the two selector shafts (see illustration).



A, change speed lever locating pin; B, change speed lever; C, aperture for plunger assembly; D, selector plunger adjusting cap; E, selector plunger spring; F, selector spring ball; G, striker fork; H, selector safety locking ball; I, striker lever; J, selector fork.

## REAR AXLE

### REMOVING REAR AXLE FROM CHASSIS.

(1) To remove the propellor shaft, remove the four nuts, bolts and washers securing the rear universal joint flange. The front end of the propellor shaft has been dealt with (see page 41, paragraph 6). The propellor shaft may then be removed entirely.

(2) Lifting jacks or blocks should be placed under the chassis frame at a position level with the front end of the rear road springs. The chassis should then be jacked up until the rear road wheels are clear of the ground, and blocks placed into position to support the chassis weight when the jacks are removed.

(3) Remove the road wheels, release and remove the lifting jacks.

(4) Disconnect brake rod.

(5) Remove four nuts and bolts securing buffer carriers to chassis frame and remove the buffer carriers complete.

(6) Disconnect the top end of the shock absorber links.

(7) Disconnect petrol pipe line from the tank.

(8) Withdraw the rear axle from the chassis frame by lifting the axle unit towards one side of the chassis, passing one brake drum assembly through the aperture of the wheel arch and the chassis frame. This end of the axle unit will be drawn towards the centre of the chassis to allow the other end of the axle unit to be drawn through the aperture of the wheel arch and the chassis frame. The rear axle unit may then be withdrawn end ways from beneath the chassis.

### DISMANTLING REAR AXLE, HUBS AND BRAKES.

(1) Remove rear axle drain plug and drain out the oil.

(2) Release the two countersunk screws securing the brake drums to the rear hubs and remove the brake drums (two extractor holes are provided in the brake drums).

(3) Remove brake shoes (see page 60, paragraph 3).

(4) Remove four nuts and shake-proof washers securing rear hub assembly to axle case and withdraw the rear hub, bearing housing and bearing together with the axleshaft.

(5) Release the tab washer and lock nut securing the bearing housing and bearing to the rear hub and withdraw the bearing housing and bearing together. Remove the bearing, washer and oil retaining washer from the bearing housing.

(6) Remove the axle case bolts and nuts, and release the four nuts and spring washers securing the rear axle bearing case to the axle casing, and withdraw the bearing case and differential assembly.

(7) Extract bevel pinion and universal joint coupling by releasing the four set pins and spring washers securing the bevel pinion bearing sleeve to the axle bearing case. Withdraw the sleeve, bevel pinion and universal joint coupling. Remove the split pin and lock nut securing the universal joint coupling to the bevel pinion; remove the coupling and withdraw the bevel pinion. Extract the distance piece and bearings from the bevel pinion sleeve.

(8) Remove the differential case and bevel wheels from the axle bearing case by releasing the two set screws in the bearing case which secure the differential bearing adjusting ring. Release the two tab washers and remove the four nuts securing the bearing case caps, remove the caps and mark them, to be quite sure when re-assembling that they are returned to their correct positions. The two adjusting rings and the differential and bevel wheel assembly can now be removed from the axle bearing case.

(9) To extract the differential bearing, lever the outer ring of the bearings upwards and extract the inner cage and bearings very carefully, to ensure that the balls are not lost in the process. Remove the six split pins, bolts and nuts securing the bevel wheel and two halves of the differential case, and remove the bevel wheel. Tap out the six differential pins, thus releasing the two halves of the differential case, together with the six differential pinions and the two axle shaft pinions. This operation is most easily carried out by supporting the differential case on the splined end of an axle shaft which has been secured in the vice, as the shoulders of the differential pins prevent their being driven out by merely supporting the differential case on the vice.

## STEERING AND FRONT AXLE ASSEMBLY

**T**HE only attention the steering box requires is periodic replenishing of the lubricant. No adjustment is provided in the steering box itself, but slackness or backlash in the steering column can be corrected by adjustment at the top of the column.

This adjustment should only be carried out by a skilled mechanic; but in order that the owner should be fully conversant with the adjustment, the following is a brief description of the bearing assembly at the top of the column:—

The top bearing consists of a cup and cone ball race and the adjustment takes the form of a threaded cone and lock nut. These are exposed by removing the steering wheel pinch bolt and raising the wheel sufficient to allow a thin spanner to be applied to the lock nut.

Having released the lock nut the lower hexagon headed cone can be tightened until the backlash is eliminated, but great care must be taken in carrying out this adjustment, as excessive tightening of the cone will result in stiff steering and damage to the ball race. Tighten the lock nut and re-position the hand wheel, after the adjustment has been made.

### REMOVING STEERING ASSEMBLY FROM CHASSIS.

1. Disconnect the ball joint connecting the drop arm to the coupling tube.
2. Remove harness cable clips securing harness cable to column, and clear harness cable from steering assembly.
3. Remove the nuts and bolts securing the split link which anchors the steering column assembly under the fascia board.
4. Remove two nuts and one bolt securing steering box to chassis frame. The steering may then be withdrawn from the chassis frame through the floorboards into the interior of the car.

It is, of course, assumed that floorboards, etc., have already been removed.

### TRACK ROD AND COUPLING TUBE.

This assembly should require very little attention other than applying the grease gun to the grease nipples fitted to the ball joints every 250 miles, or weekly.

The ball sockets on the track rod and coupling tube are spring loaded and are unlikely to require adjustment until a very considerable mileage has been covered (providing, of course, they are adequately lubricated). If necessary, the spring pressure of the ball joints can be increased by removing the grease nipple and the tab washer in the top of the socket and tightening the adjusting

screw. Turn the screw half-a-turn or more in increments of half-a-turn at a time, two complete turns being about the maximum that should be required.

If front tyre wear appears excessive or the steering feels unsteady it is advisable to check the alignment of the front wheels. When correctly adjusted these should "toe in" one-eighth inch at the front—this measurement being taken from the inside of one rim to the inside of the other rim at a height of approximately one foot from the ground. If this toe-in is not correct, proceed as follows:—

Release the clamp nuts on each end of the steering track rod, then with a spanner on the hexagon section in the centre of the tube turn the tube until the toe-in is correct. Turning the spanner downwards and towards the back will lengthen the track rod and increase the toe-in; upwards and towards the back shortens the track rod and decreases the toe-in. After making this adjustment, lock the clamp nuts.

#### DISMANTLING FRONT AXLE ASSEMBLY.

(1) Remove road wheels and hubs by removing the cover plate, and removing the four wheel nuts, afterwards taking away the road wheels.

(2) Release the two screws securing the brake drums to the hubs and remove the brake drum.

(3) Remove the split pin and nut and withdraw the hub assembly from the stub axle.

(4) Dismantle the hub by releasing the two screws securing the bearing housing to the hub, and extract the two bearings, distance piece and oil retaining washers.

(5) Remove stub axles, track rod and coupling tube. First release the four bolts, nuts and spring washers securing the brake back plate to the axle swivel, and remove the plate and brake shoes complete.

(6) Release the nuts securing the track rod and coupling tube ball joints to the swivel levers, and remove both rods.

(7) Remove the nut and washer from the cotter pin which secures the swivel pin through the axle beam, knock out the cotter pin and withdraw the swivel pin, thereby releasing the stub axle.

## GIRLING BRAKES

THE brake shoes are pressed from solid drawn "T" section steel, and are operated by the expander shown in Fig. 1. The hardened steel cone (1) which is actuated by the pull rod (2) causes the plunger (3) to move outwards. Hardened steel rollers (4) are interposed between the cone and the plungers to reduce friction to a minimum. The plungers engage directly with the brake shoe webs. The whole expander mechanism is enclosed in a die cast housing (5) which contains a supply of lubricant (Duckham's Keenol Grease K.G.20) and protects the moving parts from mud, etc. This housing is slidably attached to the backplate (6) by studs and spring washers (7) which provide a slight frictional contact. The housing does not withstand any of the stresses set up by braking as it virtually floats between the brake shoes. In view of this fact it will be realised that the brake shoes are self-centering under the influence of the brake shoe pull-off springs. It will be noticed that the rollers (4) are freely mounted and roll up grooves in the plunger and down the inclined face of the cone. When shoes are removed for relining, pin (8) retains the plungers in position in the housing. This type of shoe expander provides a high step-up ratio and multiplies the low input effort of the pull rods very considerably (6.3 to 1).

Adjustment for brake lining wear is made by the brake shoe adjuster (Fig. 2). One of these is found on each backplate. This is the only adjustment required, and provided in the whole system.

Reference to Fig. 2 shows the method by which lining wear is taken up. A hardened steel cone (A), the spindle of which is screwed with a fine thread, is carried in a steel housing (B) which is spigotted and bolted firmly to the backplate. On the outside end of the cone spindle are machined flats which enable a spanner to be used, and on its inner face four flats of a pre-determined depth are cut.

The cone engages two plungers (C) also with a bearing in the housings (B) which have inclined faces. On the outer end of these plungers, arcuate grooves are formed in which the brake shoes are carried. The housing and cone are both cadmium plated to prevent rust, and the thread of the cone spindle remains inside the housing at all times, thus preventing damage.

For adjustment, the rotation of the cone in a clockwise direction causes it to move inwards, forcing apart the plungers and expanding the fulcrum ends of the brake shoes. All cones operate in a clockwise direction.

When adjustment is made, rotate cones with a spanner until a resistance is felt (this is the shoe coming into contact with the drum), then slack back the cone one full notch or two clicks, which can be felt and heard quite plainly. All drums should be treated in a similar manner. Adjustment for lining wear should take place with the car in its running position, which is on the ground. Jacking up is not recommended, and is also unnecessary for this operation.

The car should stand on a flat and level surface and the hand brake should be released before any attention is given. THIS IS MOST IMPORTANT. After adjustment is completed, it is advisable to give the brake pedal a firm application before test in order to ensure that the expander is centred and the shoes quite free in the drums. THIS IS THE ONLY ADJUSTMENT REQUIRED. DO NOT TIGHTEN UP THE BRASS EXPANDER NUTS ON THE OUTSIDE OF THE BACKPLATE. THESE SHOULD BE ONE TURN SLACK. THE ALUMINIUM HOUSING MUST BE FREE TO FLOAT.

Do not forget the double coil spring under these brass nuts.

Do not forget to check all plungers in the adjuster and expander units for easy working.

Do not forget the adjuster plungers in the inclined type are right and left hand. If wrongly fitted, four clicks for one full turn will not be heard.

Do not handle linings with greasy hands. Keep as clean as possible.

Do not overstretch shoe pull-off springs when removing or re-fitting shoes.

Do not forget when relining or checking Girling brakes that to ensure a correct clearance between the shoes and the drum it is a good policy to always reset the adjuster housing. The holes in the backplate for the two  $\frac{3}{8}$ " fixing bolts are clearance to allow a slight radial movement of this housing and this will counteract any slight variation of the shoes which may accrue during manufacture.

Do not forget that Duckham's Keenol Grease K.G.20 is recommended for all brake lubrication when necessary, i.e. when re-assembling.

Do not forget that a small and often made adjustment is much cheaper than a lengthy overhaul through neglect.

Do not forget to obtain genuine relined replacement shoes, available from the sole makers or any Singer dealer.

The Girling Brake requires very little lubrication or attention of any sort whatever. The adjuster and expander housings retain an adequate supply of lubricant and the balance levers work on a fixed fulcrum with the interposition of self-lubricating bushes. All holes in brake jaws are appreciably larger than the pins which fit them, but no rattle is present as the entire linkage is loaded by a light spring in the pedal assembly. This type of joint is also very efficient.

It will thus be seen that a brake of extreme power and which requires no great physical effort to operate, is attained by due attention to simple mechanical principles. The use of a high leverage between pedal and shoe tip, coupled with an almost complete elimination of friction and lost motion, gives all the power that can be safely utilised.

#### THE RELINING OF GIRLING BRAKES.

1. Jack up car and remove road wheels.
2. Remove drums. The general method of mounting the drum is on a spigot with small countersunk screws. Take out these screws and the drum can be withdrawn, disclosing the brake shoes, etc.

3. To dismantle the brake all that is required is a large screwdriver. Rest the screwdriver against one of the backplate fixing bolts, and it will be found quite easy to prise one shoe out of the groove in the plunger at expander end. Both shoes and springs can now be removed, leaving expander and adjuster units in position on the backplate. Do not detach these units from backplate. Do not overstretch shoe springs when removing shoes.

4. Clean down backplate, check expander unit for free float. **THIS IS IMPORTANT.** Check adjuster unit for easy working, and slack back (anti-clockwise) to the full "off" position. Lubricate where necessary with Duckham's Keenol Grease K.G.20. Inspect shoe pull-off springs and replace if stretched or damaged.

5. To refit new shoes, detach springs from old shoes and refit to new shoes. Be sure that the springs are between shoe webs and backplate, otherwise shoes will not be flat on backplate. Keep all grease off linings and do not handle linings any more than necessary. Place shoes with spring attached against backplate. Shoes have half-round slots at one end. Fit these slots to the adjuster plungers then insert other end of one shoe in the expander plunger. Place the screwdriver under the webs of the remaining shoe and against the stud on the backplate. Ease the shoes in the plunger groove.

6. Refit drums; be sure these are clean and free from grease, etc.

7. To ensure correct clearance between shoes and drums, slack off set pins that hold adjuster unit to backplate (not more than one complete turn) and lock up the brake shoes in the drum by turning the adjuster cone spindle in a clockwise direction. Screw up adjuster set pins tightly and slack off the adjuster cone spindle one full notch or two clicks, which can be felt and heard. Give the brake pedal a firm application to ensure the shoes have centralised at the expander end. Drums should now be quite free.

8. Refit road wheels and jack down.

The operation of relining a Girling Brake is now completed—nothing further is required, and car is now ready for the road.

Always fit Girling replacement shoes. These are correctly riveted, and ground to correct periphery, which ensures a fast and easy bed-in to drums.

Check brakes as previously described for full and correct adjustment. Assuming the brakes have received the above attention and are correct, the first points to receive attention are balance units situated as follows (see Fig. 3):—

1. On the front axle to balance offside and nearside front wheels.

2. On the rear axle to balance offside and nearside rear wheels.

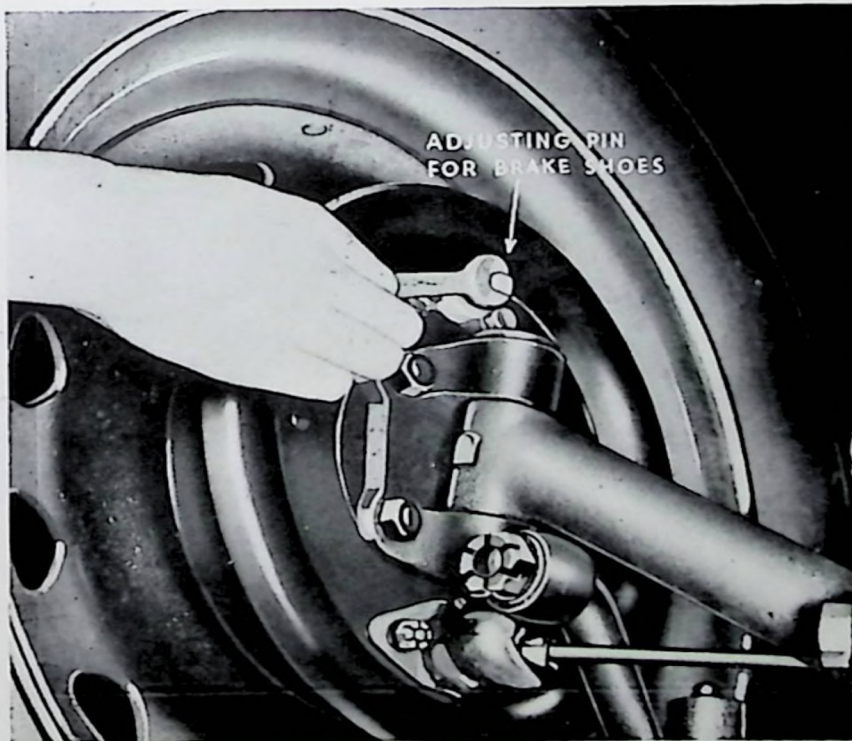
3. On the brake pedal to proportion the braking of front wheels to rear wheels.

Having checked balance units No. 1 and No. 2 for free working, connect up the transverse rods (4) from the brakes to the compensators, beginning this operation by first screwing the rod into the screwed socket (5) on the end of the brake draw link which pro-



trudes from the expander unit. Be sure when screwing this rod home that it screws right into the socket and butts up against the end of the draw link. Now tighten firmly the locknut (6) using two spanners for this operation. At the compensator end of the transverse rod will be found screwed fork ends (7). By this means the position of the balance unit is set; the main body of the fulcrum type must be vertical to the axle and the long lever which carries the longitudinal rod (8) should be approximately  $\frac{3}{4}$ " before a line parallel to the centre line of front axle and  $\frac{3}{4}$ " behind a similar line to the rear axle.

By setting the long lever in this position first, it automatically sets the position of the two small bottom levers, these being machined integral. Now connect the transverse rods (4) to the two small levers, taking care to retain the long lever in position as described. There is a flat link (9) type of balance unit. The flat link connected to the axle must be parallel to the longitudinal rod, a position obtained by adjustment on the screwed fork ends of the transverse rods, but still maintaining the position of the long lever as described above. Do not make any adjustment whatever at the coupling on the rear transverse rods close to the brake expander. The next operation is to connect the longitudinal rod (8) to the long lever of each balance unit on front and rear axle. Where there are any connecting or swinging links see that these are lying approximately  $\frac{3}{4}$ " towards whichever axle they belong. Now to arrive at the pedal (10). First see that the pedal is in its highest position, keeping this position by either tying back or supporting it in some way. Carry forward the work of connecting the longitudinal rods (8) to the pedal rocker. Situated on the pedal are two small rocker



3. To dismantle the brake all that is required is a large screwdriver. Rest the screwdriver against one of the backplate fixing bolts, and it will be found quite easy to prise one shoe out of the groove in the plunger at expander end. Both shoes and springs can now be removed, leaving expander and adjuster units in position on the backplate. Do not detach these units from backplate. Do not overstretch shoe springs when removing shoes.

4. Clean down backplate, check expander unit for free float. **THIS IS IMPORTANT.** Check adjuster unit for easy working, and slack back (anti-clockwise) to the full "off" position. Lubricate where necessary with Duckham's Keenol Grease K.G.20. Inspect shoe pull-off springs and replace if stretched or damaged.

5. To refit new shoes, detach springs from old shoes and refit to new shoes. Be sure that the springs are between shoe webs and backplate, otherwise shoes will not be flat on backplate. Keep all grease off linings and do not handle linings any more than necessary. Place shoes with spring attached against backplate. Shoes have half-round slots at one end. Fit these slots to the adjuster plungers then insert other end of one shoe in the expander plunger. Place the screwdriver under the webs of the remaining shoe and against the stud on the backplate. Ease the shoes in the plunger groove.

6. Refit drums; be sure these are clean and free from grease, etc.

7. To ensure correct clearance between shoes and drums, slack off set pins that hold adjuster unit to backplate (not more than one complete turn) and lock up the brake shoes in the drum by turning the adjuster cone spindle in a clockwise direction. Screw up adjuster set pins tightly and slack off the adjuster cone spindle one full notch or two clicks, which can be felt and heard. Give the brake pedal a firm application to ensure the shoes have centralised at the expander end. Drums should now be quite free.

8. Refit road wheels and jack down.

The operation of relining a Girling Brake is now completed—nothing further is required, and car is now ready for the road.

Always fit Girling replacement shoes. These are correctly riveted, and ground to correct periphery, which ensures a fast and easy bed-in to drums.

Check brakes as previously described for full and correct adjustment. Assuming the brakes have received the above attention and are correct, the first points to receive attention are balance units situated as follows (see Fig. 3):—

1. On the front axle to balance offside and nearside front wheels.

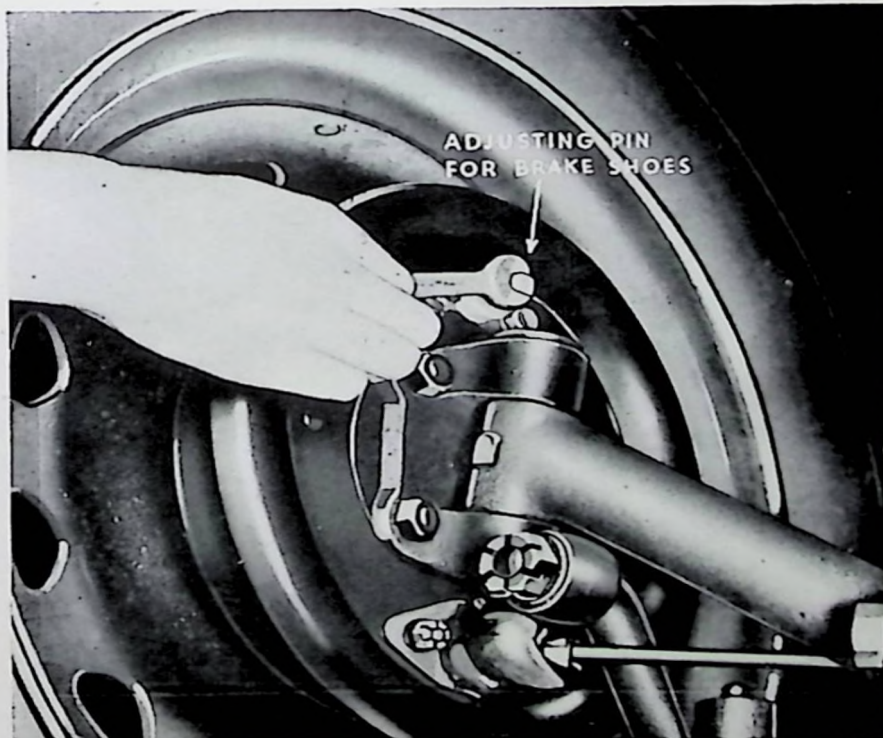
2. On the rear axle to balance offside and nearside rear wheels.

3. On the brake pedal to proportion the braking of front wheels to rear wheels.

Having checked balance units No. 1 and No. 2 for free working, connect up the transverse rods (4) from the brakes to the compensators, beginning this operation by first screwing the rod into the screwed socket (5) on the end of the brake draw link which pro-

trudes from the expander unit. Be sure when screwing this rod home that it screws right into the socket and butts up against the end of the draw link. Now tighten firmly the locknut (6) using two spanners for this operation. At the compensator end of the transverse rod will be found screwed fork ends (7). By this means the position of the balance unit is set; the main body of the fulcrum type must be vertical to the axle and the long lever which carries the longitudinal rod (8) should be approximately  $\frac{3}{4}$ " before a line parallel to the centre line of front axle and  $\frac{3}{4}$ " behind a similar line to the rear axle.

By setting the long lever in this position first, it automatically sets the position of the two small bottom levers, these being machined integral. Now connect the transverse rods (4) to the two small levers, taking care to retain the long lever in position as described. There is a flat link (9) type of balance unit. The flat link connected to the axle must be parallel to the longitudinal rod, a position obtained by adjustment on the screwed fork ends of the transverse rods, but still maintaining the position of the long lever as described above. Do not make any adjustment whatever at the coupling on the rear transverse rods close to the brake expander. The next operation is to connect the longitudinal rod (8) to the long lever of each balance unit on front and rear axle. Where there are any connecting or swinging links see that these are lying approximately  $\frac{3}{4}$ " towards whichever axle they belong. Now to arrive at the pedal (10). First see that the pedal is in its highest position, keeping this position by either tying back or supporting it in some way. Carry forward the work of connecting the longitudinal rods (8) to the pedal rocker. Situated on the pedal are two small rocker



arms, and the pedal boss is drilled to take a small spring plunger. When correctly adjusted there is a  $1/16''$  gap between these rocker arms and the pedal boss. The spring plunger is the means of obviating rod rattle, Fig. 4.

Adjust the front longitudinal rod until the required  $1/16''$  gap is at the front rocker arm. Adjust rear longitudinal rod until there is  $1/16''$  gap at rear rocker arm, Fig. 4. Now adjust the control spring through which the rear longitudinal rod passes. This should be adjusted to a given length,  $1.11/16''$ , Fig. 4. The adjustment is now completed and car should be quite satisfactory to drive away for all conditions.

PLEASE NOTE. Duckham's Keenol K.G.20 grease can be supplied by any Singer dealer, or direct from our Service Department, in compact tubes price  $1/3d.$  each, plus postage.

## SHOCK ABSORBERS

**T**HE Armstrong New Super Double-Acting Self-Regulating Hydraulic Shock Absorber is of the Vertical Cylinder Type. All working parts are submerged in oil.

### CONSTRUCTION.

The body A is a zinc alloy die casting and bolts directly on to the frame of the car, the two cylinders B and C being connected by passages E and F. The double crank G and arm H are a force fit on serrated portions of spindle I, which rotates in the body A on generous double bearings. Connecting rods J connect the crank G to pistons K to which non-return recuperating valves N are fitted. The arm H is connected to the axle of the car by link L.

### HOW IT WORKS.

As the axle moves to and from the car frame, so the pistons move in and out of their respective cylinders pumping oil from one to the other. The interior of the body is filled with oil to within  $\frac{3}{8}$ " from top of cover, any shortage of oil beneath the pistons is instantly made good through recuperating valves N.

The flow of oil, however, is governed by the valve gear placed in the passage M as follows.

### CAM VALVE (SELF REGULATING).

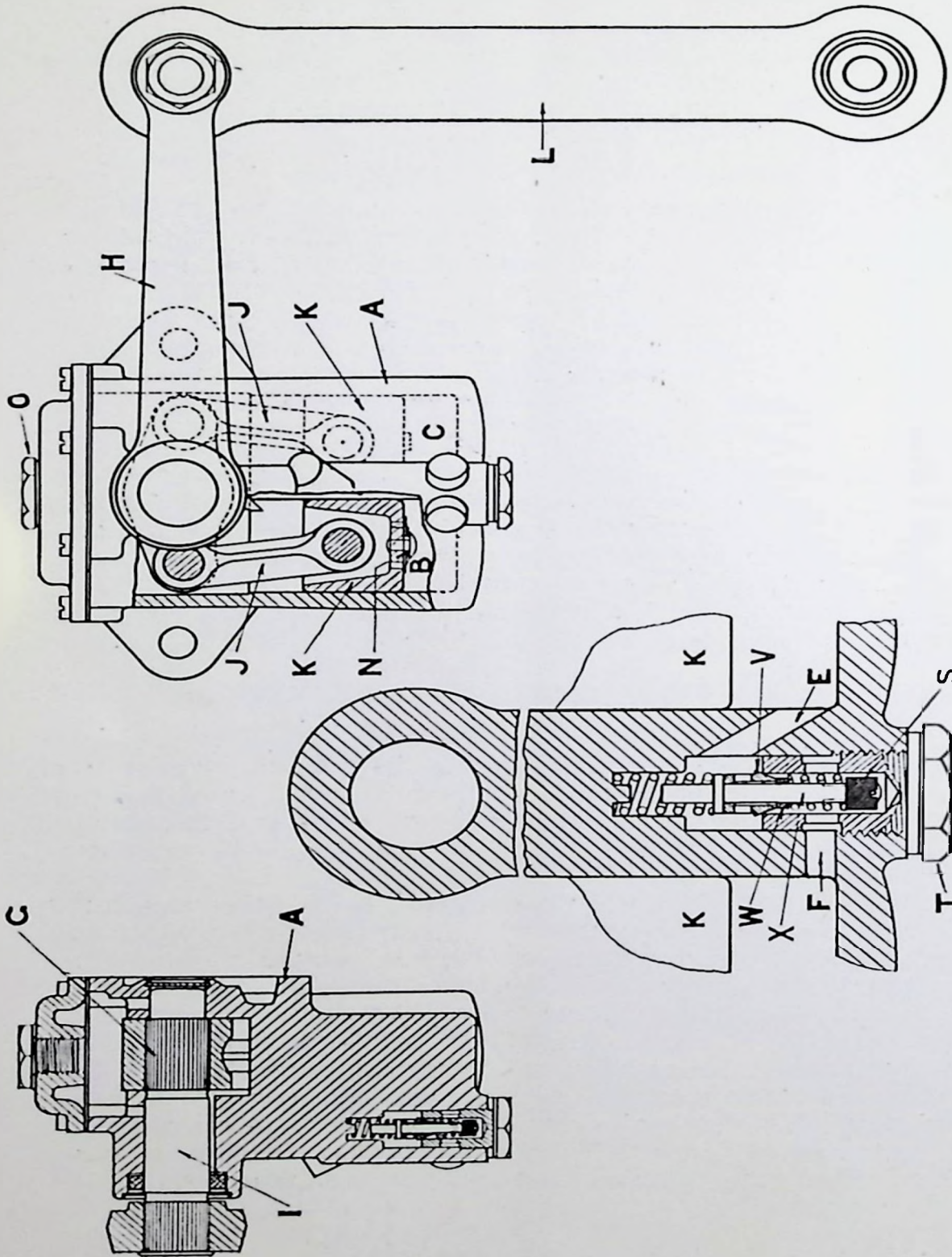
As the car axle moves to and from the car frame the oil is pumped from compression cylinder B to rebound cylinder C or cylinders C to B, and has to pass between the taper ended valve P and screw Q, which is adjustable to offer any desired resistance to the action of the axle.

As will be seen from the drawing the upper end of the valve P is held in contact with the cam on spindle I, which means that on fairly good roads the valve P is in its lightest setting and the shock absorber gives a normal resistance—just enough—yet not too much to produce harshness, but when bad roads are encountered the spindle I oscillates and the contour of the cam depresses the tapered end of valve P further into the central port of screw Q and thereby increases the resistance of the shock absorber.

The automatic, variable resistance obtained from the cam movement makes this shock absorber entirely self-regulating, the resistance automatically increasing as required thus enabling the car to pass over bad roads with comfort equal to good roads.

### SCREW TAPER VALVE.

As the axle moves toward; the frame the oil is pumped from the cylinder B to cylinder C, but as it has to pass the spring loaded



ORIFICE RELIEF VALVE

valve R a resistance governed by the tension on the spring is offered to the movement of the axle.

On the return or rebound stroke the oil is pumped from cylinder C to cylinder B, and as the ball valve only opens in one direction the oil must now find its way to cylinder B past the taper screw S, which is adjustable to offer any desired resistance to the rebound of the car spring.

### ADJUSTMENT OF CAM VALVE.

Both rebound and compression are controlled by screw Q.

To tighten rebound and compression slack nut T, taking care that the screw Q does not turn. Turn screw Q half a turn inwards and lock up the nut, taking care that the screw Q does not turn.

To reduce the resistance follow the above instructions, but turn screw outwards.

### SCREW TAPER VALVE ADJUSTMENT.

Both rebound and compression are controlled by screw S.

The same instructions apply as for cam valve, but refer to screw S and nut U.

**Note.**—Shock absorbers adjusted too tightly make your car feel harsh and hard; we recommend slacking off first in case of doubt.

These shock absorbers will only work satisfactorily on Armstrong Super Shock Absorber Oil. Examine your shock absorber oil level regularly. The correct level is  $\frac{3}{8}$ " from top of cover.

## ELECTRICAL EQUIPMENT

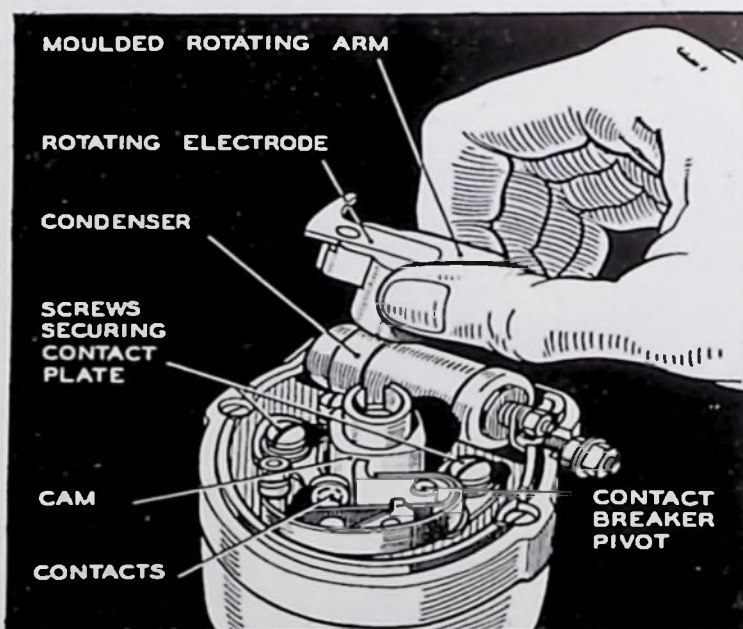
### THE COIL IGNITION EQUIPMENT.

**T**HE coil ignition equipment comprises a coil and a combined distributor and contact breaker, which is driven from the engine.

Very little attention is needed to keep the ignition equipment in proper condition. Occasional inspection of the system is advised, however, when any parts needing adjustment or cleaning can be attended to.

#### COMBINED DISTRIBUTOR AND CONTACT BREAKER.

Occasionally remove the distributor moulding by pushing aside its two securing springs. Wipe out the distributor with a dry duster, and clean the electrodes with a cloth moistened with petrol. See that the carbon brush inside the moulding is clean and moves freely on its housing. Next examine the contact breaker. The contacts must be kept free from any grease or oil. If burned or blackened they should be rubbed down with fine carborundum stone, or if this is not available, very fine emery cloth should be used. Afterwards polish with a cloth moistened with petrol. Care must be taken that all particles of dirt and metal dust are wiped away. Misfiring may be caused if the contacts are not kept clean.



To test the contact breaker gap, slowly turn the engine by hand until the contacts are seen to be fully opened. Now insert the gauge on the ignition screwdriver in the gap between the contacts; if it is correct, the gauge should be a sliding fit. It is not advisable to



alter the setting unless the gap varies considerably from the gauge. If adjustment is necessary, proceed as follows:—

Keep the engine in position to give maximum opening of the contacts, then using the ignition screwdriver, slacken the locking screws on the contact plate and move the plate until the gap is set to the thickness of the gauge. After making the adjustment care must be taken to tighten the locking screws.

#### **LUBRICATION.**

The distributor main bearing is lubricated from an oiler through which one or two drops of thin machine oil should be added about every 1,000 miles.

The cam and the pivot on which the contact breaker works should be given the slightest smear of Mobilgrease No. 2 every 6,000 miles or whenever they appear to be dry.

About every 3,000 miles, withdraw the moulded rotating arms from the top of the spindle by lifting it off, and add a few drops of thin machine oil. Do not remove the screw exposed to view, as there is a clearance between the screw and the inner face of the spindle through which oil passes to lubricate the cam bearing.

About every 3,000 miles, the moving parts of the automatic timing control must be lubricated with a good grade engine oil. To render the control accessible, remove the distributor moulding and lift off the rotating distributor arm, then remove the contact breaker base moulding by withdrawing its two securing screws. Take care to refit contact breaker base moulding in its original position.

#### **COIL.**

The coil unit is not adjustable in any way and requires no attention beyond seeing that the terminal connections are kept tight and the moulded coil top is kept clean.

#### **RENEWING HIGH TENSION CABLES.**

When high tension cables show signs of perishing or cracking they should be replaced. Use only 7 mm. rubber-covered ignition cable for all high tension leads.

#### **IGNITION SWITCH AND WARNING LAMP.**

In addition to merely stopping the engine, the ignition switch serves the purpose of preventing the battery being discharged by current flowing through the coil windings when the engine is stopped. A warning lamp is provided on the instrument panel, which gives a red light when the ignition is "on" and the engine is stationary or running very slowly, thus reminding the driver to switch off.

After long service the warning lamp bulb may burn out. However, this will not affect the ignition, but it should be replaced as soon as possible so as to act as a safeguard for the battery. To replace the bulb unscrew the front. The bulb can then be withdrawn. The bulb is a 2.5 volt, .2 amp. screw cap type (Lucas No. C252A).

#### **THE DETECTION AND REMEDY OF IGNITION FAULTS.**

If failure of the ignition or misfiring occurs and the cause is not obvious, the operator is strongly recommended to proceed in

accordance with the routine tabulated below, which should enable him to locate the trouble without difficulty.

If, after carrying out the examinations suggested, the cause of the trouble cannot be found, the equipment should be examined by the nearest Lucas Service Depot.

## HOW TO LOCATE AND REMEDY COIL IGNITION TROUBLE.

Condition	Method of Detection of Possible Causes.	Remedy.
Engine will not fire.	Starter will not turn engine and lamps do not give good light. Battery discharged.	Start engine by hand. Battery should be recharged by running car for a long period during day-time. Alternatively recharge from an independent electrical supply.
	Controls not set correctly for starting.	See that ignition is switched on, petrol turned on, and everything is in order for starting.
	Remove lead from centre distributor terminal and hold it about $\frac{1}{4}$ -in. away from some metal part of the chassis, while engine is turned over. If sparks jump gap regularly, the coil and distributor are functioning correctly. If the coil does not spark, the trouble may be due to any of the following causes :—	Examine the sparking plugs, and if these are clean and the gaps correct, the trouble is due to carburetter, petrol supply, etc.
	Fault in low tension wiring. Indicated by (1) No ammeter reading when engine is slowly turned and ignition switch is on, or (2) No spark occurs between the contacts when quickly separated by the fingers when the ignition switch is on.	Examine all cables in ignition circuit and see that all connections are tight. See that battery terminals are secure.
	Dirty or pitted contacts.	Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol.
	Contacts out of adjustment. Turn engine until contacts are fully opened and test gap with gauge.	Adjust gap to gauge.
Engine misfires.	Dirty or pitted contacts.	Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol.
	Contacts out of adjustment. Turn engine until contacts are fully opened and test gap with gauge on screwdriver.	Adjust gap to gauge.
	Remove each sparking plug in turn, rest it on the cylinder head, and observe whether a spark occurs at the points when the engine is turned. Irregular sparking may be due to dirty plugs or defective high tension cables. If sparking is regular at all plugs the trouble is probably due to engine defects.	Clean plugs and adjust the gaps to about 20 thousandths of an inch.  Replace any lead if the insulation shows signs of deterioration or cracking.  Examine carburetter, petrol supply, etc.

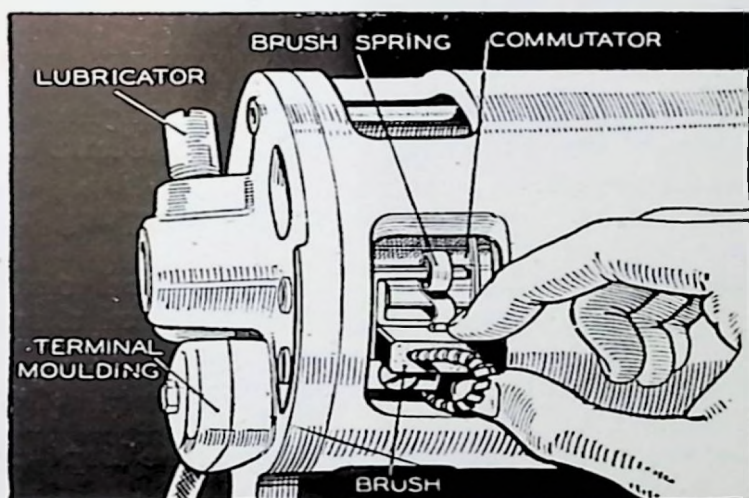
# LIGHTING AND STARTING EQUIPMENT

## DYNAMO.

The only parts of the dynamo requiring occasional inspection are the brushes and commutator, which are readily accessible when the cover is removed.

**BRUSHGEAR AND COMMUTATOR.** Inspect the three brushes and see that they press firmly on to the commutator. They should "bed" evenly on the commutator; that is, the face in contact with the commutator should present a uniformly polished appearance. Dirty brushes may be cleaned with a cloth moistened with petrol.

After long service, when the brushes have become worn, so that they will not bear properly on the commutator, they must be replaced. It is recommended that none but genuine Lucas brushes are fitted, as these are specially made and will give the best results



and the longest life. We advise owners to have the brushes fitted at a Lucas Service Depot so that they can be properly "bedded" to the commutator.

The surface of the commutator must be kept clean and free from oil and brush dust, etc. The best way to clean the commutator is to insert a fine duster, held by means of a suitably shaped piece of wood, against the commutator surface, slowly rotating the armature at the same time.

Before dynamos are sent out from the works sufficient lubricant is applied to the bearing to last for a considerable time. When the car is taken down for general overhaul, it is advisable to have the machine dismantled, preferably by a Lucas Service Depot for cleaning and adjustment, and refilling the bearings with lubricant.

The dynamo is fitted with porous phosphor bronze bearing bushes at the commutator end of the machine. The lubricant is fed by means of a wick to the outer surface of the bush, and it then

passes through the pores of the bush to the inner bearing surface. About every 10,000 miles unscrew the cap of the lubricator, and if the wick is dry refill the cap with vaseline.

**DYNAMO FIELD FUSE.** A fuse is provided in the dynamo field circuit to protect the machine in the event of anything being wrong in the charging circuit, e.g., a loose or broken battery connection. The fuse is of the cartridge type and is housed in the cut-out and fuse box on the engine side of the dash. If the dynamo fails to charge at any time (indicated by a discharge reading being given on the ammeter during daytime running), check the wiring and then inspect the fuse. If it has blown replace it with the spare fuse provided. If the new fuse blows after starting up, the cause of the trouble must be found, and we advise that the equipment is examined by one of our Service Depots. Never fit any other fuse than the Lucas standard fuse as originally fitted. The size of the fuse is marked on the coloured paper slip which can be seen inside the fuse.

### **STARTER MOTOR.**

Observe the following points when starting the engine:—

1. See that the controls are properly set.
2. Operate the starter switch firmly and release it as soon as the engine fires.
3. Never 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 the battery down by keeping the starter on when the engine will not start.

The starter is provided with an extended shaft, having a squared end, which can be rotated by means of a spanner in the remote possibility of the pinion becoming jammed in mesh with the flywheel. Access is obtained to the squared end by removing the metal cap which is secured by two screws. As in the case of the dynamo the surface of the commutator must be kept clean and free from oil, brush dust, etc.

### **CUT-OUT AND FUSE BOX.**

The function of the cut-out is to close the charging circuit, as the increasing engine speed when the car is starting causes the dynamo voltage to rise above that of the battery. When the engine slows down, the dynamo voltage falls below that of the battery and the reverse action takes place, i.e. the cut-out contacts open and thereby prevent the battery discharging itself through the dynamo.

The cut-out is accurately set before leaving the works, and does not need any adjustment.

Take care not to close 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.

This unit incorporates two fuses, one connected in the dynamo field circuit (see page 71) while the other protects the circuits of the auxiliary accessories (e.g. electric horn, screenwiper, etc.).

## INSTRUMENT PANEL.

The instrument panel houses the combined lighting, charging and ignition switch, ammeter, ignition warning lamp, together with the speedometer, clock, etc.

**AMMETER READINGS.** The ammeter indicates the current passing into or out of the battery. For instance, suppose the dynamo is generating six amperes, and that the side and tail lamps are in use, the lamps and ignition coil will take, say,  $2\frac{1}{2}$  amperes, leaving  $3\frac{1}{2}$  amperes for charging the battery; this is the figure shown on the ammeter.

**LIGHTING, CHARGING AND IGNITION SWITCH.** This switch which is incorporated in the instrument panel, controls the ignition, the lamps and the charging of the battery.

The ignition switch takes the form of a small key which fits in a slot in the centre of the lighting and charging switch. When the ignition is switched off the key can be withdrawn, thus ensuring the safety of the car in the absence of the owner.

The switch positions are:—

“Low.”—Dynamo giving about half its normal output.

“High.”—Dynamo giving full daytime output.

“Side.”—Side and tail lamps on.

“Head.”—Head, side and tail lamps on.

The dynamo automatically gives its maximum output when the lamps are switched on.

To switch on the ignition, depress the key and turn to the right; to switch off, turn to the left.

## USE OF THE CHARGING SWITCH.

The dynamo is arranged to give alternative outputs according to the position of the charging switch. In summer, when the lamps are little used, the charging switch should be kept in the “Low” position causing the dynamo to give about half its normal output. During the winter, when the lighting and starting loads are heavier, it is intended that the charging switch should be kept in the “High” position, which allows the dynamo to give its full daytime output. When any of the lamps are switched on the dynamo automatically gives its maximum output. For the majority of the cars this arrangement ensures that the battery is kept in a fully charged state without the possibility of excessive overcharging, always providing the charging switch is kept in the appropriate position according to the season.

In exceptional cases, however, it may be advisable to modify the use of the switches. For instance, if in winter the car is run regularly during the day with practically no night running, thus causing the battery always to be in a fully charged condition (Hydrometer reading of 1.285 or over, see page 71), the charging switch should then be in the “Low” position. On the other hand, if exceptional use is made of the lamps and starter in the summer, thus causing the battery continually to be in a low state of charge (Hydrometer readings of 1.200 or under) then the car should be run with the charging switch in the “High” position.

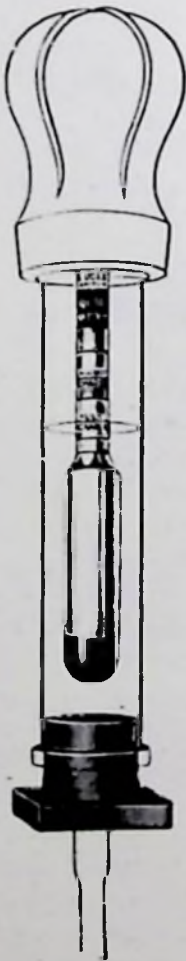
On a new car, during the running-in period, it is advisable to keep the switch in the "High" position all the time in order to compensate for the heavy starter motor load due to the initial stiffness of the engine.

### BATTERY.

The following are the most important battery maintenance points:—

1. Keep the acid level with the top of the separators.
2. Add only distilled water, never tap water.
3. Test the condition of the battery by taking readings of the specific gravity of the acid with a hydrometer.
4. The battery must never be left in a discharged condition.
5. Keep the terminals spanner tight, and smeared with vaseline.

At least once a month, the vent plugs in the top of the battery should be removed and the level of the acid solution examined. If necessary, distilled water, which can be obtained at all chemists and most garages, should be added to bring the level to the top of the separators. If, however, acid solution has been spilled, it should be replaced by a diluted sulphuric acid solution of the same specific gravity as that in the cell to which it is to be added. It is important when examining the cells that naked lights should not be held near the vents, owing to the possible danger of igniting the gas coming from the plates.



Keep the battery terminals tight and smeared with vaseline to prevent corrosion and keep the top of the battery clean and dry.

If the equipment is laid by for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate the permanent sulphation of plates. In no circumstances must the electrolyte be removed from the battery and the plates allowed to dry, as certain chemical changes take place which result in loss of efficiency.

It is advisable to complete the inspection by measuring the specific gravity of the acid in each of the cells as this gives a very good indication of the state of the charge of the battery. An instrument known as a hydrometer is employed for this purpose.

Specific gravity readings are as follows: 1.285-1.300, battery fully charged; 1.210 about half discharged; 1.150, fully discharged. These figures are given assuming the temperature of the solution is about 60 deg. F.

### LAMPS.

**HEADLAMPS.** The headlamps are provided with an electrically operated anti-dazzle device for operation by a foot controlled switch.

Operation of the switch causes the nearside headlamp beam to be dipped and turned to the nearside of the road, while at the same time the offside headlamp is switched off. Further operation of the switch restores the normal driving light.

The dipping of the headlamp beam is effected by a movement of the reflector. This is made in two parts: the centre portion is pivoted in a fixed rim which is in turn secured to the body. Movement of the reflector is controlled by means of a solenoid and plunger which, when the current is switched on, tilts the reflector to give the dipped beam. To remove the lamp front, pull forward the fixing clip at the bottom of the lamp and swing it downwards. The front can then be withdrawn. When replacing, press the front on to the lamp body, locating the top of the rim first. Finally secure by the fixing clip.

The reflector is secured to the lamp body by means of a rubber bead. The reflector 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. When refitting the rubber bead, locate its thinner lip between the reflector rim and the edge of the lamp body.

#### **ALIGNING LAMPS.**

To obtain the best results, it is essential that they are in good alignment.

The lamps should be aligned so that the normal driving beams are projected straight ahead; that is to say, parallel with the road surface and with each other.

The alignment of the lamps is very easily carried out, as they are fixed on a universal mounting, which is locked by a single nut.

**FOCUSSING.** In order for the lamps to give a parallel beam the filament of the bulbs must be as near as possible to the focus of the reflector. If the filament of the bulbs is behind the focal point of the reflector the beam will be divergent, while on the other hand, if the filament is in front of the focal point, the beam will be convergent, with a dark area in the centre of the beam. Focussing involves moving the bulb backwards or forwards along the axis of the reflector until the best lighting is obtained.

To do this remove the lamp front and reflector and slacken the clamping clip at the back of the reflector and slide the bulb holder backwards or forwards. After each adjustment, note the effect with reflector and front refitted. When the best position for the bulb holder has been found the clamping screw must be tightened.

**SIDE LAMPS.** Slacken the screw at the top of the lamp, and the front together with reflector can be withdrawn. The bulb holder is clipped on the back of the reflector and should be withdrawn by pulling it out. If it is a tight fit it can be carefully levered off with a small screw driver.

**STOP TAIL LAMP.** To replace a bulb, the front can be swung open when the fixing cup is pressed back.

**CLEANING.** The reflectors are protected by a transparent and colourless covering, enabling any accidental finger marks to be removed with chamois leather or a soft cloth without affecting the surface of the reflector. **DO NOT USE METAL POLISHES ON REFLECTORS.**

The chromium lamp bodies 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.

**REPLACEMENT OF THE BULBS.** When the replacement of any bulb is necessary, we strongly advise that the bulbs supplied by Messrs. Lucas are used as these are arranged to be in focus and give the best results, with the Lucas reflectors.

Particulars of replacement bulbs are given below:—

Lamps	Bulb Types	Volts	Watts
Headlamps .. ...	Lucas No. 54 ...	12	36
Side and stop tail lamps ...	Lucas No. 207 ...	12	6
Ignition warning lamp ...	Lucas No. C252A ...	2.5	.5
Trafficators ... ..	Lucas No. 256 ...	12	3
Panel lamps ... ..	Lucas No. 1224M ...	12	2.4

### **ELECTRIC HORN.**

The horn, before being passed out of the Works, is adjusted to give its best performance, and will give a long period of service without any attention; no subsequent adjustment is required.

If the horn becomes uncertain in its action, giving only a choking sound, or does not vibrate, 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 a loose connection or a short circuit in the wiring of the horn or a blown fuse.

If the note is still unsatisfactory, do not attempt to dismantle the horn but return it to a Lucas Service Depot for examination.

### **TRAFFICATORS.**

Every two or three months raise the "trafficator" arm and, by means of a brush or other suitable article, apply a drop of thin machine oil, such as sewing machine or typewriter oil, to the catch pin between the arm and the operating mechanism.

To replace a bulb, switch the trafficator on and then supporting the arm, move the switch to the off position.

Withdraw the screw on the under side of the arm and slide off the metal plate, the burnt out bulb can then be replaced. To replace the metal plate, slide it on in an upwards direction, so that the side plates engage with the slots on the under side of the spindle bearing. Finally, secure the plate by means of its fixing screw.

### **ELECTRIC WINDSCREEN WIPER.**

To start the wiper, pull out the handle and swing it aside so as to move the cleaning arm into position on the screen. Then move the switch to the "on" position.

To stop the wiper move the switch to "off" position and pull out the handle and insert the end of it into the top of the switch. The wiper requires no lubrication or attention.

### **PANEL LAMPS.**

The panel lamps incorporated in the instrument panel are accessible from the back of the panel.

The bulb holders can be released from the back of the panel for bulb replacement by pulling them out.



## HOW TO LOCATE AND REMEDY DYNAMO TROUBLE.

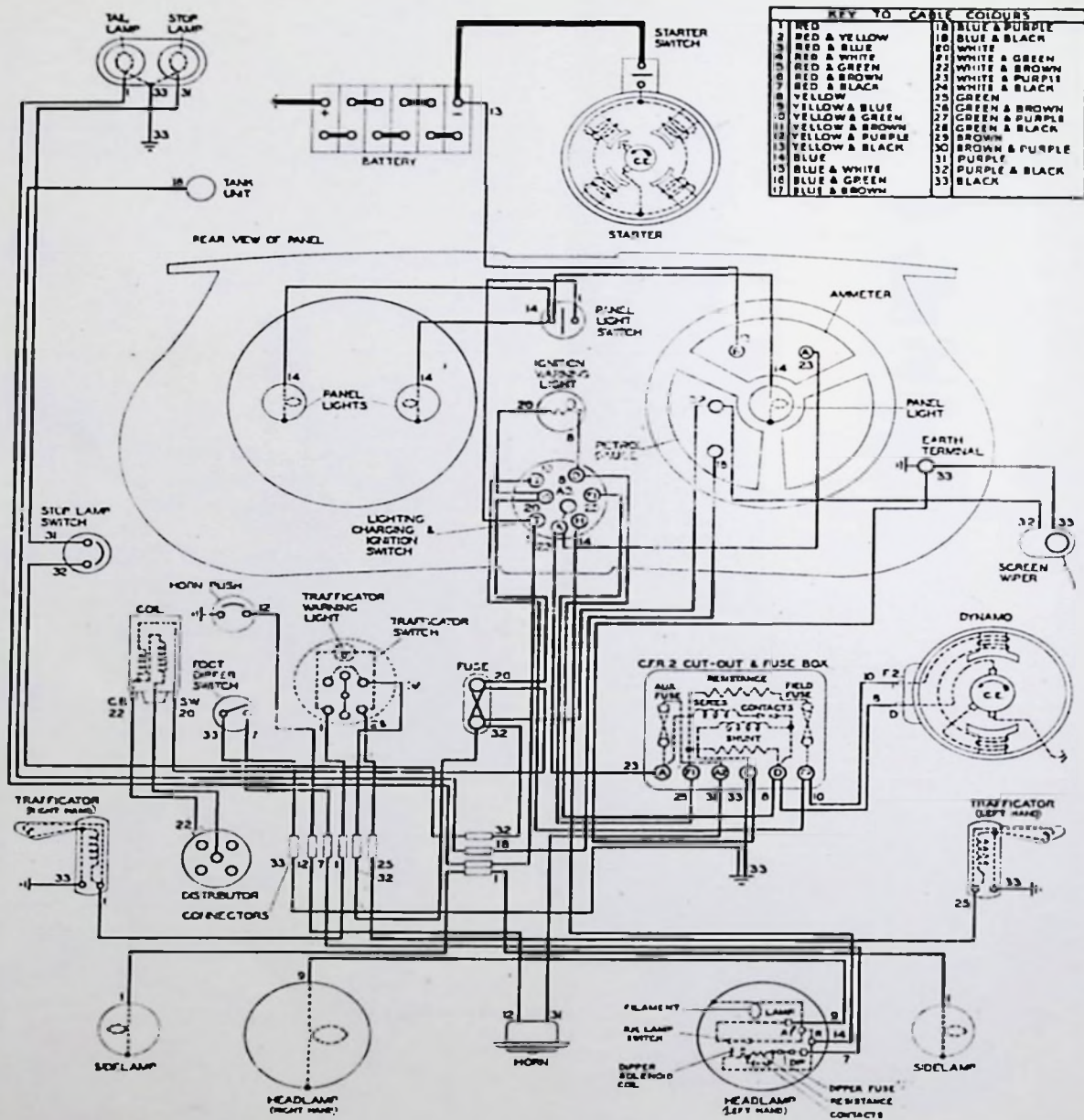
Symptoms.	Probable Fault.	Remedy.
Ammeter fails to indicate charge when running with no lights in use, or gives heavy discharge with Lights on.	Dynamo not charging due to: Broken or loose connection in charging circuit causing field fuse to blow.	Examine charging circuit wiring. Tighten loose connection or replace broken lead. Particularly examine battery connections. Fit replacement fuse.
	Commutator greasy or dirty.	Clean with soft rag moistened in petrol.
Ammeter gives low or intermittent charge reading.	Dynamo giving low or intermittent output, due to:—	
	Loose connections in dynamo circuit.	Examine charging circuit wiring. Tighten loose connections or replace broken lead. Particularly examine battery connections
	Commutator or brushes greasy.	Clean.
	Brushes worn, not fitted correctly, or wrong type.	Replace worn brushes. See that brushes "bed" correctly.
	Control brush position altered.	Have control brush adjustment re-set at nearest Lucas Service Depot.
Ammeter gives high charge reading.	Dynamo giving high output due to:—	
	Loose connections in dynamo charging circuit.	Examine charging circuit wiring, particularly battery connections.
	Battery acid level low.	"Top up" cells with distilled water.
	Brushes not fitted correctly.	See that brushes "bed" correctly.
	Control brush position altered.	Have control brush adjustment re-set at nearest Lucas Service Depot.

## HOW TO LOCATE AND REMEDY STARTER MOTOR TROUBLE.

Condition.	Probable Fault.	Remedy.
Motor sluggish or fails to move engine.	If engine cannot be turned by hand, then fault is due to a stiff engine.	Locate and remedy cause of stiffness.
	If engine can be turned by hand, then trouble may be due to :—	
	Battery discharged.	Start by hand. Charge battery either by a long period of daytime running or from independent electrical supply.
	Broken or loose connection in starter circuit.	See that connections to battery, starter and starter switch are tight, and that cables connecting these units are in order.
	Starter commutator or brushes dirty.	Clean.
	Brushes worn, not fitted correctly or wrong type.	Replace worn brushes. See that brushes "bed" correctly.
	Starter pinion jammed in mesh with flywheel.	Rotate squared end of starter shaft with spanner.
Starter operates but does not crank engine.	Pinion of starter drive does not engage with flywheel, due to dirt on screwed sleeve	Clean sleeve with paraffin and add a few drops of machine oil.
Starter pinion will not disengage from flywheel when engine is running.	Starter pinion jammed in mesh with flywheel.	Rotate squared end of starter shaft with spanner.

## HOW TO LOCATE AND REMEDY LIGHTING TROUBLE.

Symptoms.	Probable Fault.	Remedy.
Lamps give insufficient illumination.	Battery discharged.	Charge battery either by a long period of daytime running or from independent electrical supply.
	Lamps out of alignment, or bulbs out of focus.	Align lamps and focus bulbs.
	Bulbs discoloured through use, or reflectors dirty.	Fit new bulbs or clean reflectors.
Lamps light when switched on but gradually fade out.	Battery discharged.	Charge battery either by a long period of daytime running or from independent electrical supply.
Brilliance varies with speed of car.	Battery discharged.	Charge battery either by a long period of daytime running or from independent electrical supply.
	Battery connection loose or broken.	Tighten connections, or replace faulty cables.
Lights flicker.	Loose connection.	Locate loose connection and tighten.
Failure of lights.	Battery discharged.	Charge battery either by a long period of daytime running or from independent electrical supply.
	Loose or broken connection.	Locate and tighten loose connection, or re-make broken connection.



# LUCAS—C.A.V.—ROTAX SERVICE DEPOTS

All owners are urged to take advantage of the facilities offered by Lucas-C.A.V. Rotax Service.

For the benefit of the users of this equipment, Lucas have established Service Depots in all large towns, which are not only at your disposal for repairs, overhauls and adjustments, but to give free advice. If you experience any difficulty with any part of the equipment, do not hesitate to consult them; they will be only too pleased to be of assistance. The best course to adopt is to call at their nearest Service Depot, the addresses of which are given below, when the equipment can be examined as a whole.

If it is necessary to replace any part order Genuine Lucas-C.A.V.-Rotax Spares. It is obvious that only the designers and manufacturers of the equipment are in a position to make replacement parts which will give satisfactory and lasting service.

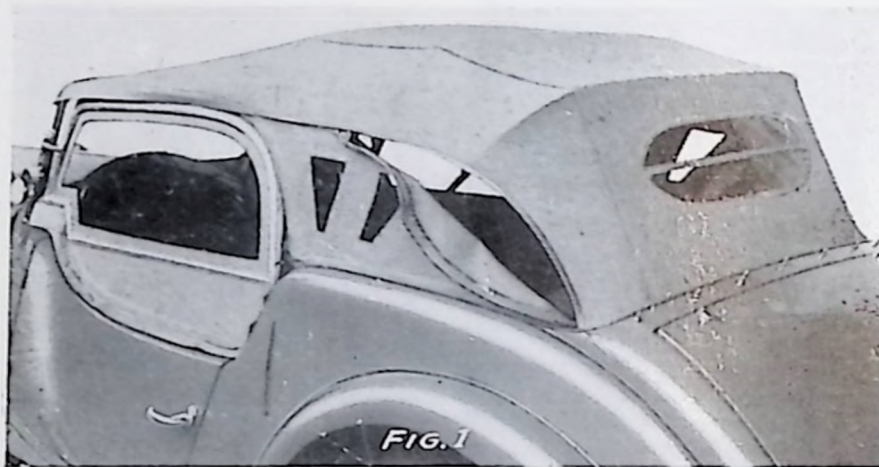
When corresponding with Depots, or when ordering spare parts, give the name, model and year of the engine; the unit of equipment; and particular part in question. Units of equipment are identified by letters and numbers stamped or moulded on some part of the article. It is essential to quote this marking to ensure that correct replacements are sent. Illustrated spare parts lists are available on application. State year, make and model of engine.

BELFAST	- - - - -	51/55 Upper Library Street
Telephone: Belfast 25617		Telegrams: "Servdep. Belfast"
BIRMINGHAM, 18	- - - - -	Great Hampton Street
Telephone: Central 8401 (10 lines)		Telegrams: "Lucas, Birmingham"
BRIGHTON, 4	- - - - -	85 Old Shoreham Road, Hove
Telephone: Hove 1146/1149		Telegrams: "Luserv. Brighton"
BRISTOL	- - - - -	345 Bath Road
Telephone: Bristol 76001 (4 lines)		Telegrams: "Kingly, Bristol"
CARDIFF	- - - - -	54a Penarth Road
Telephone: Cardiff 4603 (4 lines)		Telegrams: "Lucas, Cardiff"
COVENTRY	- - - - -	Priory Street
Telephone: Coventry 3068		Telegrams: "Lucas, Coventry"
DUBLIN	- - - - -	Portland Street North, North Circular Road
Telephone: Dublin 72601 (4 lines)		Telegrams: "Luserv. Dublin"
EDINBURGH, 11	- - - - -	60 Stevenson Road, Gorgie
Telephone: Edinburgh 62921 (4 lines)		Telegrams: "Luserv. Edinburgh"
GLASGOW	- - - - -	Corner of Grant Street and St. George's Road
Telephone: Douglas 3075 (5 lines)		Telegrams: "Lucas, Glasgow"
LEEDS	- - - - -	64 Roseville Road
Telephone: Leeds 28591 (5 lines)		Telegrams: "Luserdep. Leeds"
LIVERPOOL, 13	- - - - -	450/456 Edge Lane
Telephone: Old Swan 1408 (6 lines)		Telegrams: "Luserv. Liverpool"
LONDON	- - - - -	Dordrecht Road, Acton Vale, W.3.
Telephone: Shepherd's Bush 3160 (10 lines)		Telegrams: "Dynomagna, Ealux, London"
LONDON	- - - - -	757/759 High Road, Leyton, E.10
Telephone: Leytonstone 3361 (5 lines)		Telegrams: "Luserdep. Levstone, London"
LONDON	- - - - -	155 Merton Road, Wandsworth, S.W.18
Telephone: Putney 5131 (4 lines)		Telegrams: "Luserv. Put. London"
MANCHESTER	- - - - -	Talbot Road, Stretford
Telephone: Longford 1101 (5 lines)		Telegrams: "Lucas, Stretford"
NEWCASTLE-ON-TYNE, 2	- - - - -	64/68 St. Mary's Place
Telephone: Newcastle 25571 (3 lines)		Telegrams: "Motolite, Newcastle-on-Tyne"

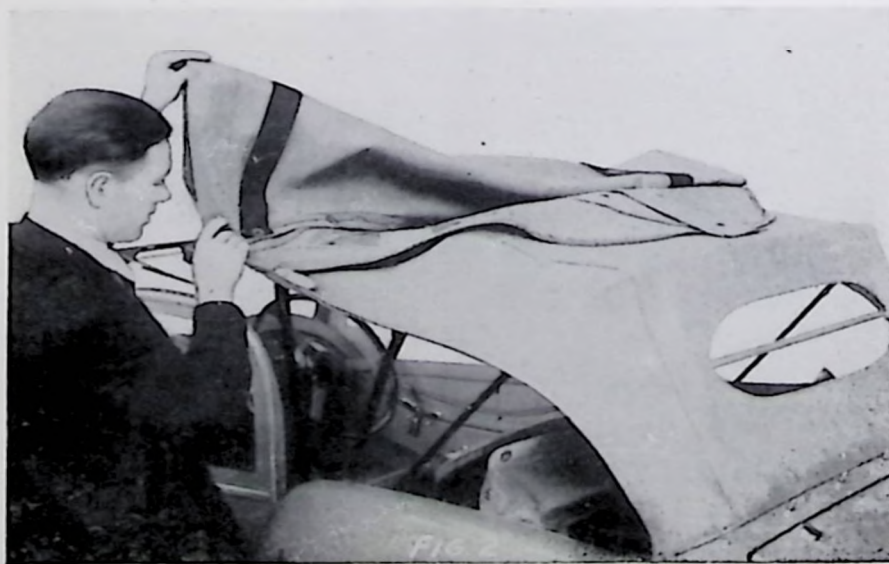
IN ADDITION THERE ARE LUCAS-C.A.V.-ROTAX OFFICIAL,  
BATTERY SERVICE AGENTS IN IMPORTANT CENTRES  
THROUGHOUT THE COUNTRY. LIST ON APPLICATION.

## HOOD, SIDE CURTAINS AND GENERAL INFORMATION

**A**LTHOUGH the erection, lowering and storage of the hood and side curtains is quite a simple matter, it would perhaps be advisable to give a brief outline of the correct procedure for storing the hood and side curtains on this particular model.



We will therefore assume that the hood and side curtains are erected in accordance with the illustrations which follow, and in order to stow them away it will first be necessary to release the rear quarter zip fastener (Fig. 1), and throw the rear curtains over on to the top of the hood, special care being taken to ensure that the celluloid windows lie between the hood sticks (Fig. 2). Whilst the



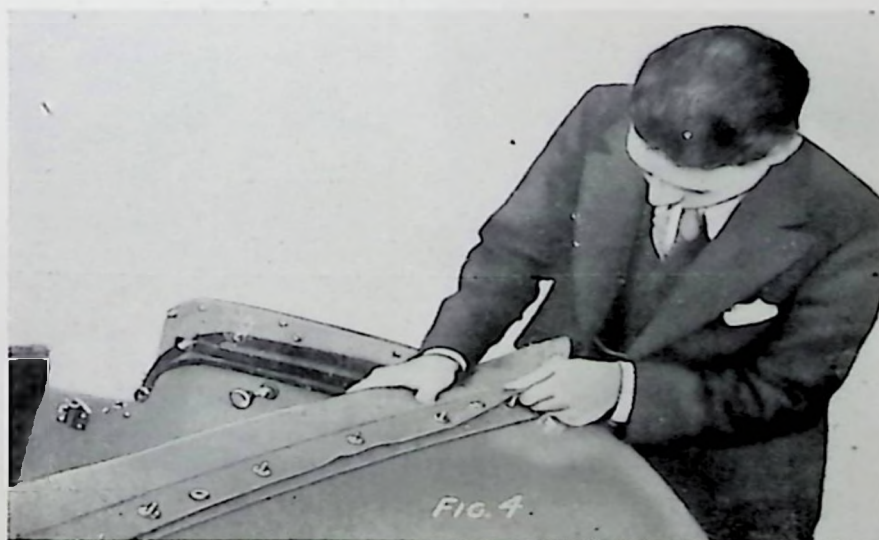
hood sticks are still erected, release the De Ville portion of the hood from the windscreen, and double fold back over the top of the rear curtains (also Fig. 2).

It will then be necessary to release the rear squab and bring it forward toward the back of the passenger's seat. Next release the knurled screws which secure the hood props and lower the hood into the recess at the back of the rear squab.



In view of the construction of the hood it will fold naturally, particularly at the back light, which is split horizontally for this purpose.

Whilst the rear squab is still forward, care must be taken to ensure that the hood is fitted into the recess, free from creases (Fig. 3). The side curtains are arranged to stow immediately in front of the hood, and at the back of the rear squab, and should be placed into the recess with the two inside faces of the side curtains together, and the pegs pointing downwards.



If these instructions are followed there will be no difficulty in storing both hood and side curtains, and in closing up the squab, but there should be a certain amount of tension to overcome when securing the squab studs, and it would perhaps be as well to point out that this tension is to avoid any possibility of rattles (Fig. 4).

If however, the car is fitted with safety glass side screens, the following is the best method of procedure:—

1. Fold the hood down, leaving the rear portion of the hood and the rear side curtains outside.
2. Take the two screens and place them together, top to top, bottom to bottom, with the catch in both cases pointing forward. Place them in the compartment with the pegs downward.
3. Drop the rest of the hood in over the front of the two curtains.

Providing no undue folds are left in the hood, the rear squab will go back into position satisfactorily.

It is of great importance to bestow care and attention upon the engine and chassis of the car, but the appearance of the car too, must not be neglected.

In general, coachwork can be treated successfully by the ordinary methods of washing, but Singer coachwork is finished with cellulose; dust, therefore, can be removed with a soft duster. Mud should be removed by washing the coachwork with a large sponge and water and the body should then be dried with a chamois leather and afterwards polished.

The appearance of the cellulose finish is actually improved by frequent polishing, and there are many well-known polishes on the market which may be used if desired, but on no account should metal polish be used.

Roof fabrics are best cleaned with a good soap and plenty of water—do not use petrol or paraffin.

Wings and valances should be cleaned with a sponge and plenty of water, a chamois leather being used for drying purposes.

The leather upholstery should also be cleaned periodically with a damp cloth, but petrol must not on any account be used on the leather work. It is advisable to give the upholstery regular and frequent attention to prevent the leather assuming a solid appearance.

Chromium plating should on no account be cleaned by the use of metal polish, but by washing and, when the dirt has been removed, polishing the chromium surface with a chamois leather and afterwards with a clean dry cloth.

Door hinges should be inspected periodically as instructed in the summary of attentions and a little lubrication applied to ensure that they are functioning easily. It is also advisable to smear the door catches and striking plates with a little lubricant when the hinges receive attention. It is advisable to run over the body bolts occasionally and at the same time examine all chassis nuts and bolts, shackle pins, spring clips and anchorage bolts, etc.



The floor boards and pedal boards are a frequent cause of rattles and squeaks, and the screws should be tightened occasionally to prevent these.

If at any time the car is to be laid up for a considerable period it is advisable to drain the water system and remove the battery so that it can receive the periodic attention indicated in the section of this book dealing with the electrical equipment. It is also advisable to drain the engine oil and to take the weight of the car off the tyres by jacking up each wheel in turn and placing blocks under the axles, taking care that the weight of the car is taken directly on the axles and not upon the track rod or brake levers.

Attention to the tyres is always time well spent, comfortable riding, easy steering, safe braking and long tyre life all depend to a considerable degree upon the care bestowed on the tyres.

### **SPARES.**

For general running the following spares should be carried and will no doubt be sufficient to meet any emergency.

- Sparking plugs.
- Lamp bulbs.
- Carburettor washers.





