
SINGER
½ LTR & 9 H.P.
SPORTS
INSTRUCTION
BOOK AND
REPAIR
MANUAL
PRICE 5/-

# SINGER & COMPANY LTD.
## COVENTRY

*Telegrams: "Singer, Coventry"*
*Telephone: Coventry* 5071
*(Private Branch Exchange)*

## SERVICE DEPOTS

### COVENTRY SERVICE DEPOT
Far Gosford Street, Coventry

*Telegrams: "Singer, Coventry"*
*Telephone:* 5071

### BIRMINGHAM SERVICE DEPOT
Coventry Road, Birmingham

*Telegrams: "Singer, Coventry Road, Birmingham"*
*Telephone: Victoria* 2271 *Birmingham*

### LONDON SERVICE DEPOT
Lancelot Road, Wembley, Middlesex

*Telegrams: "Singerpyr, Wembley"*
*Telephone: Wembley* 3031

# TOOL KIT

A kit containing the necessary tools for all reasonable adjustments is located in the dash and reached by lifting the nearside bonnet. It contains the following items :—

Lifting Jack.
Tool Bag.
Large Adjustable Spanner.
Small Adjustable Spanner.
Screwdriver.
Pliers.
Three Box Spanners.
Tommy Bar.
Pin Punch.
Box Spanner for Pivot Pin Nuts.
Tyre Pump.
Oil can.
Grease Gun.
Wheel Brace.
Distributor Spanner.
Tappet Spanner.
Tyre Lever.
Hammer.
Lockheed Bleeder Wrench.

## SPARES

For general running the following spares may be carried and should be sufficient for all emergencies :—

Sparking Plugs.
Lamp Bulbs.
Carburetter Washers.
Funnel (Steering Box Filler).

# PREFACE

IN 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 shown by sectional diagrams of all units, 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 CHASSIS NUMBER WHICH WILL BE FOUND STAMPED ON A METAL PLATE FIXED TO THE DASH BOARD UNDER THE BONNET.

The interest of Singer & Company in their productions does not end with 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 organization 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.

In addition to this, Singer & Company maintain a fleet of fully equipped Service Vans, manned by highly skilled mechanics who are experts in repairing Singer Cars.

These vans are continually touring the country, and are at the service of any owner who is experiencing difficulty. It is merely necessary to communicate with one of our Service Depots, giving a rough idea of the nature of the trouble which is being experienced; instructions will then be given to the travelling Service Representative nearest to your district, who will call upon you at the first opportunity.

The Service Depots of this Company were created specially for the benefit of all owners of Singer Cars. Whatever the age of your car, you are at liberty to call at any of the Company's Depots at any time you may be passing through the district where these are situated, namely, Coventry, Birmingham and Wembley. Our staff is at your disposal to test your car and give you a report as to its condition. You are under no obligation to have the repairs carried out—if you only call for advice, this will be given.

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 4.

# GUARANTEE

WE 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 & CO. LTD
COVENTRY.

# IMPORTANT

WE draw your attention to the notice regarding speed that is affixed to the inside of the driver's compartment. 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 Wakefield's "Castrollo" 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.

# CAUTION

So much trouble has been experienced by the owners of Singer Cars through the fitting of spurious spare parts, that this Company feel that it is incumbent upon them 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.

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# GENERAL DESCRIPTION

## 1½ LITRE LE MANS "SPECIAL" SPEED MODEL

ENGINE. The six cylinder engine has monobloc cylinders and a detachable, super-efficient cylinder head which carries the overhead valves, camshaft and rocker assembly.

Ample provision is made for water cooling purposes, both the block and head being carefully proportioned to avoid distortion. Cooling is by centrifugal water pump and fan.

The cylinder block casting is extended well below the centre line of the engine and carries a fully counter-balanced disc type four bearing crankshaft with a vibration damper mounted at the front end. The main bearings are in the form of split white metal lined bushes, located by dowels in the crankcase and main bearing caps. An extra large capacity sump, filter and baffle are bolted to the underside of the crankcase. The sump is of cast aluminium alloy with cooling fins and adaptor for oil sump thermometer.

The connecting rods are of H section high tensile steel with run-in white metal bearings, and the two halves of the white metal bearings completely encircle the connecting rod and cap, dispensing with the use of shims.

The pistons are of high tensile aluminium alloy with a special design of scraper ring for conserving oil. The gudgeon pins are fully floating and fitted with end pads.

The overhead camshaft is carried in four large area bearings fitted to the cylinder head and operates the inclined valves through harmonic cams and rockers. The camshaft is driven by a 'duplex' roller chain from the intermediate assembly which in turn is driven from the crankshaft.

The spur gear type oil pump is also driven from the shaft of the intermediate assembly and forces oil under pressure to all main and big end bearings and the overhead camshaft assembly. A pressure release valve is situated on the offside of the cylinder block and a pipe from the nearside of the cylinder block is taken to the oil gauge on the facia board.

The dynamo and magneto drive is carried on the offside of the engine and provision is made for adjustment of both the camshaft and dynamo chains. The magneto drive is taken from the dynamo driving sleeve by skew gears, one on the driving sleeve and one on the magneto shaft.

A high tension vertical type magneto is fitted, which is especially suitable for efficient working at high speeds. Automatic and manual controls are provided.

The starter motor is carried on the offside rear of the engine and is of the pinion type meshing with a geared ring on the flywheel.

The three horizontal S.U. Carburetters and exhaust manifold are on the opposite sides of the cylinder head for the purpose of obtaining a direct streamlined exhaust manifold and to enable the carburetters to be mounted direct to carefully designed inlet ports.

A balance pipe is fitted to the carburetters between each pair of

cylinders. The carburetters are of the controllable jst type and are fully dealt with elsewhere in this book. Petrol is fed to the carburetters through the medium of an electric fuel pump mounted on the nearside of the dash under the bonnet. The pump incorporates an easily detachable filter and is connected to the ignition circuit.

CLUTCH of the heavy duty single dry plate type to give rapid take up of drive. The withdrawal mechanism is in the form of a trunnion block and fork carried on a serrated shaft through the clutch extension, and adjustment is provided for the clutch pedal clearance and is effected both by means of the serrations on the shaft and the toggle link from the shaft to the clutch foot pedal.

GEARBOX of the helical perm-mesh type giving four forward speeds and reverse, three forward speeds being silent. A remote control of the change speed mechanism is effected by means of a cast extension fitted to the gearbox, and lubrication to all gears is provided by splash from the oil reservoir in the base of the box, and an oil mist sufficiently lubricates the working parts of the selector mechanism.

PROPELLER SHAFT. An open type tubular propeller shaft of large dimensions to provide against "whirling" and consequent vibration. Fitted with Hardy-Spicer mechanical universal joints.

REAR AXLE. Of the semi-floating type with silent spiral bevel crown wheel and pinion, nickel - chrome - molybdenum axle shafts, bevel gear differential and steel banjo casing.

BRAKES. These are Lockheed hydraulically operated brakes on large diameter drums. They are fully balanced and compensated, the foot brake operating on all four drums and the special type racing handbrake operating independently on the rear wheels. The brakes are extremely efficient, progressive in action with equal force on all wheels. Entirely free from fierceness in action.

SUSPENSION. Wide, long semi-elliptic springs fited with silentbloc shackle bushes and acting in conjunction with Hartford heavy duty friction type shock absorbers.

STEERING. Of the transverse worm and nut type specially designed for sports purposes and rigidly anchored to the chassis frame. It is finger light with just sufficient self-return action on corners while being free from road reaction and 'kick'.

ROAD WHEELS AND TYRES. Six racing type knock-on wheels with self locking hubs and special wing nuts. Six 4.75 x 18in tyres.

CHASSIS FRAME. Double dropped down swept pressed steel, with specially designed cross members giving a low centre of gravity.

ELECTRICAL EQUIPMENT. 12 volt 51 ampere hour battery located under the driver's seat; Starter motor with solenoid starter switch, dash-board control, large output dynamo, vertical magneto, long range high powered biflex head lamps with special lenses and electric dip and switch mechanism, sports side lamps, stop, tail and reverse lamps, two dash lamps, ammeter, high frequency twin tuned horns, high intensity flat beam fog lamp.

PETROL SUPPLY. 15 gallon tank at rear with two level tap giving 1½ gallon reserve. Quick-action self-locking lever filler cap; electric pressure pump with filter.

CHASSIS LUBRICATION. A large number of oiling points has been eliminated by fitting Silentbloc bushes. Lubrication to other parts of the chassis by Tecalemit high-pressure grease gun to nipples in accessible positions.

CHASSIS EQUIPMENT. Large dial trip speedometer, large dial revolution counter and clock combined, dash reading radiator thermometer, dash reading oil sump thermometer and oil pressure gauge, tandem electric windscreen wiper, full kit of tools, number plates.

# DATA

## ENGINE

| | |
|---|---|
| Bore | 59 m/m. |
| Stroke | 91 m/m. |
| Capacity | 1493 cc. |
| R.A.C. Rating | 12.95. |
| Tax | £13 (£9 15s. from 1/1/35). |
| Water cooling capacity | 20 pints. |
| Anti-freeze solution | 5 pints. |
| Oil sump capacity | 20 pints. |
| Petrol tank capacity | 15 gallons. |
| Gearbox capacity | 3 pints. |
| Rear axle capacity | 5 pints. |
| Firing order | 1, 5, 3, 6, 2, 4. |

## TYRE PRESSURES

| | |
|---|---|
| Front | 29 lbs. per sq. in. |
| Rear | 29 lbs. per sq. in. |

## BRAKE HORSE POWER

| | |
|---|---|
| 1,000 r.p.m. | 13.1 b.h.p. |
| 2,000 r.p.m. | 30 b.h.p. |
| 3,000 r.p.m. | 44 b.h.p. |
| 4,800 r.p.m. (Peak) | 63 b.h.p. |

## TOP GEAR ACCELERATION

(Driver and Passenger).

| 10-30 m.p.h. | 30-40 m.p.h. |
|---|---|
| Top: 7.8 sec. | 5.8 sec. |
| Maximum speed in top gear | 80 m.p.h. |

## GEAR RATIOS

| | |
|---|---|
| Top | 4.44 : 1 |
| 3rd | 5.64 : 1 |
| 2nd | 9.08 : 1 |
| 1st | 17.7 : 1 |
| Reverse | 24.0 : 1 |

# GENERAL DESCRIPTION

## 9 H.P. SPECIAL SPEED MODEL
## and
## 9 H.P. LE MANS FOUR SEATER

THE two 9 h.p. Sports models are very similar in construction to the 1½ Litre previously described but the engines are four cylinder models of the overhead camshaft type. Actually the three models are specially prepared for sports purposes, the 1½ Litre and 9 h.p. speed models being designed for the more serious competitions and the 9 h.p. Sports four seater for fast touring.

ENGINE. The four cylinder engine has monobloc cylinders and a detachable super-efficient cylinder head which carries the overhead valves, camshaft and rocker assembly. Ample provision is made for water cooling purposes, cooling being thermo-syphonic assisted by a fan. The pistons are of a special aluminium alloy, drilled for oil economy in conjunction with a patented design scraper ring. The gudgeon pins are fully floating and fitted with end pads. The connecting rods are of H section high tensile steel with run in white metal bearings, and the two halves of the white metal bearings completely encircle the connecting rod and cap, dispensing with the use of shims.

Vertical type high tension magneto and controllable jet S.U. carburetters are fitted to the speed model while high tension coil and distributor ignition and Solex down-draught carburetters are fitted to the Le Mans four seater.

Engine lubrication is full forced feed from a spur gear pump through a filter in the sump. The oil filler cap is air tight and a breather conveys oil fumes below the level of the body.

CLUTCH. Single dry plate, solid centre heavy duty clutch to give rapid take up of drive.

GEARBOX. "Perm-mesh" mounted as a unit with the engine, and provided with remote control of gear change.

PROPELLER SHAFT. Open type with Hardy Spicer mechanical universal joints.

REAR AXLE. Semi-floating type with spiral bevel drive and spur gear differential.

FRONT AXLE. High tensile steel stamping. Steering connections of ball and socket type.

STEERING. Patented type worm and nut, rigidly anchored to chassis frame. Self-centring action. Spring steering wheel.

BRAKES. Lockheed hydraulic operating in large diameter drums, the foot brake operating on all four wheels. Special racing type handbrake operates independently on rear wheels.

CHASSIS FRAME. Down swept pressed steel with specially designed cross members giving low centre of gravity.

SUSPENSION. Wide, long semi-elliptic springs, Silentbloc bushes and Hartford heavy duty friction shock absorbers.

WHEELS AND TYRES. Six racing knock-on wheels with self locking hubs and six 4.5 x 18in. low pressure tyres (five only on four seater).

ELECTRIC EQUIPMENT. 12 volt 51 ampere hour battery located under driver's seat. Starter motor with solenoid starter switch, large output dynamo, electric dip and switch head lamps, sports side lamps, stop tail lamp, dash lamps, ignition warning light and high frequency horns.

PETROL SUPPLY. Rear petrol tank for safety. Fuel fed by electric pressure pump incorporating a filter.

CHASSIS LUBRICATION. A large number of oiling points has been eliminated by fitting Silentbloc bushes. Lubrication to other parts of the chassis by Tecalemit high pressure grease gun to nipples in accessible positions.

CHASSIS EQUIPMENT. Dash reading electric fuel gauge, large dial speedometer driven direct from gearbox, large dial combined clock and revolution counter, oil pressure gauge, dip and switch head lights, side and rear lamps by finger-tip control, stone guard to radiator, Sports silencing system, full kit of tools.

# DATA

## ENGINE: 9 H.P. LE MANS SPEED 2 SEATER

| | |
|---|---|
| Bore | 60 m/m. |
| Stroke | 86 m/m. |
| Capacity | 972 c.c. |
| R.A.C. rating | 8.9 h.p. |
| Water cooling capacity | 16 pints. |
| Anti-freeze solution | 4 pints. |
| Oil sump capacity | 1½ gallons. |
| Petrol tank capacity | 13½ gallons. |
| Gearbox capacity | 2½ pints. |
| Rear axle capacity | 3 pints. |
| Firing order | 1, 3, 4, 2. |

## TYRE PRESSURES

| | |
|---|---|
| Front | 32 lbs. per sq. in. |
| Rear | 32 lbs. per sq. in. |

## BRAKE HORSE POWER

| | |
|---|---|
| 1,000 r.p.m. | 7.4 b.h.p. |
| 2,000 r.p.m. | 15.8 b.h.p. |
| 3,000 r.p.m. | 24 b.h.p. |
| 5,000 r.p.m. (Peak) | 38 b.h.p. |

## TOP GEAR ACCELERATION

(Driver and Passenger).

| 10-30 m.p.h. | 30-40 m.p.h. |
|---|---|
| Top: 9.0 sec. | 6.0 sec. |

Maximum speed in top gear - - 70 m.p.h.

20 at 1445
30 at 2168
40 at 2891
50 at 3613
60 at 4336.

## GEAR RATIOS

| | |
|---|---|
| Top - - - - - | 5.57 : 1 |
| 3rd - - - - - | 7.5 : 1 |
| 2nd - - - - - | 12.4 : 1 |
| 1st - - - - - | 24.4 : 1 |
| Reverse - - - - | 33.6 : 1 |

# DATA

## ENGINE: 9 H.P. SPORTS

| | |
|---|---|
| Bore - - - - - | 60 m/m. |
| Stroke - - - - - | 86 m/m. |
| Capacity - - - - | 972 c.c. |
| R.A.C. rating - - - - | 8.9 h.p. |
| Water cooling capacity - - | 16 pints. |
| Anti-freeze solution - - - | 4 pints. |
| Oil sump capacity - - - | 1 gallon. |
| Petrol tank capacity - - - | 7 gallons. |
| Gearbox capacity - - - | 2 pints. |
| Rear axle capacity - - - | 3 pints. |
| Firing order - - - - | 1, 3, 4, 2, |

## TYRE PRESSURES

| | |
|---|---|
| Front - - - - | 32 lbs. per sq. in. |
| Rear - - - - | 32 lbs. per sq. in. |

## BRAKE HORSE POWER

| | |
|---|---|
| 1,000 r.p.m. - - - - | 6.4 b.h.p. |
| 2,000 r.p.m. - - - - | 15 b.h.p. |
| 3,000 r.p.m. - - - - | 23.7 b.h.p. |
| 4,800 r.p.m. (Peak) - - | 31 b.h.p. |

## TOP GEAR ACCELERATION

(Driver and Passenger)

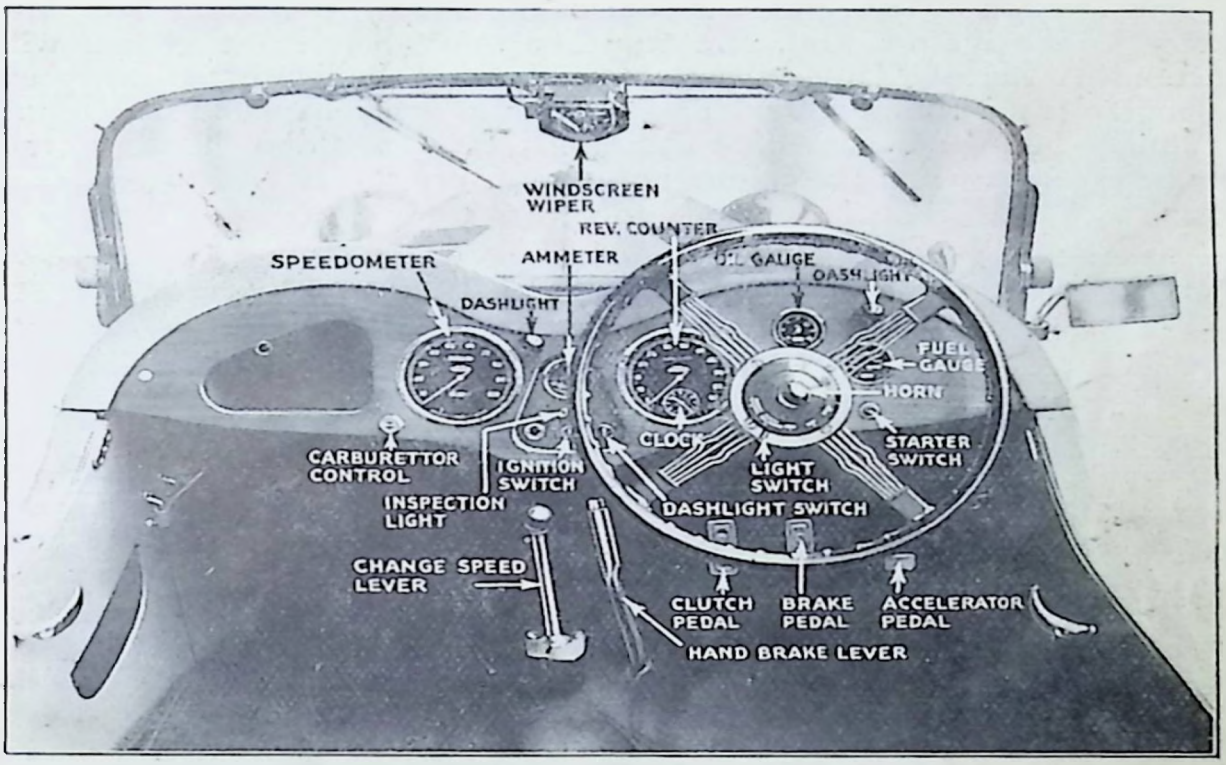
| 10-30 m.p.h. | 30-40 m.p.h. |
|---|---|
| Top: 11 sec. | 8 sec. |

Maximum speed in top gear - 66 m.p.h.

## GEAR RATIOS

| | |
|---|---|
| Top - - - - - | 5.57 : 1 |
| 3rd - - - - - | 7.5 : 1 |
| 2nd - - - - - | 12.4 : 1 |
| 1st - - - - - | 24.4 : 1 |
| Reverse - - - - | 33.6 : 1 |

# CONTROL OF THE CAR




AS indicated in the preface of this book, we have assumed that the owner of one of these Sports cars has a fair knowledge of mechanics, and is, therefore, in a position to superintend or carry out the ordinary care and maintenance adjustments. Therefore, we do not propose to deal at length with the method of driving the car.

On taking delivery of a new car 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 on the deck under the bonnet and the supply of oil, petrol, and water checked over.

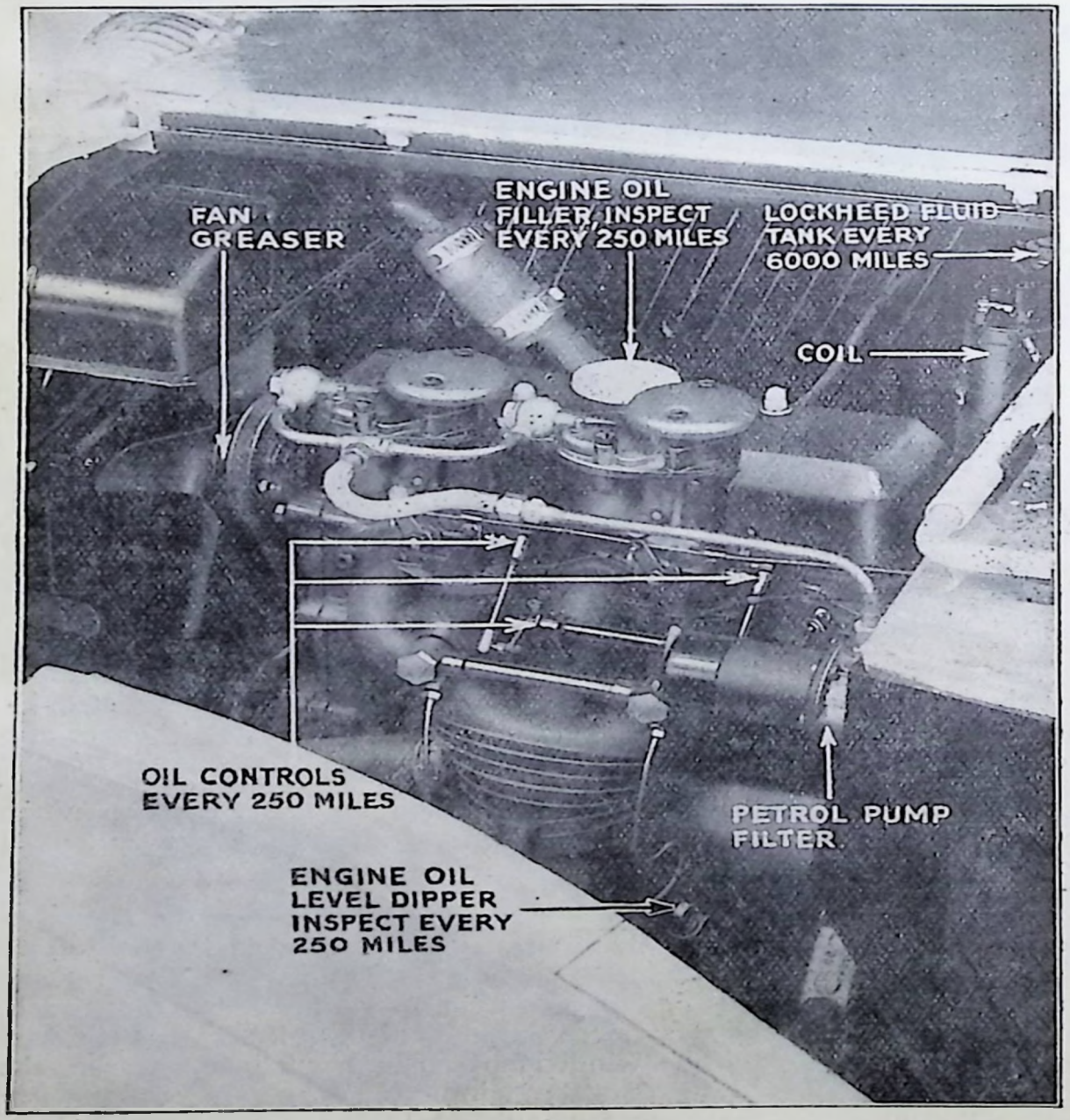
No doubt the supplier will have attended to matters of this description but a cursory examination of the coachwork and chassis generally is well worth while.

There are several adjustments provided for the personal comfort of the driver and passenger. 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 or forwards upon its runners. The foot pedals, too, are adjustable at the stem for reach and this adjustment is dealt with more fully on page 53. The windscreen can be opened by releasing the screws on the side swivels and the windscreen wiper is brought into action by unlocking the curved handle, swinging the wiper arm into

position and pulling out the switch knob. Stop the wiper by switching off and locking the arm out of the line of vision.

The controls are conveniently grouped about the driving position and in the majority of cases their purpose is self-explanatory. Some, however, are worthy of note and reference to the illustration will no doubt be of service.

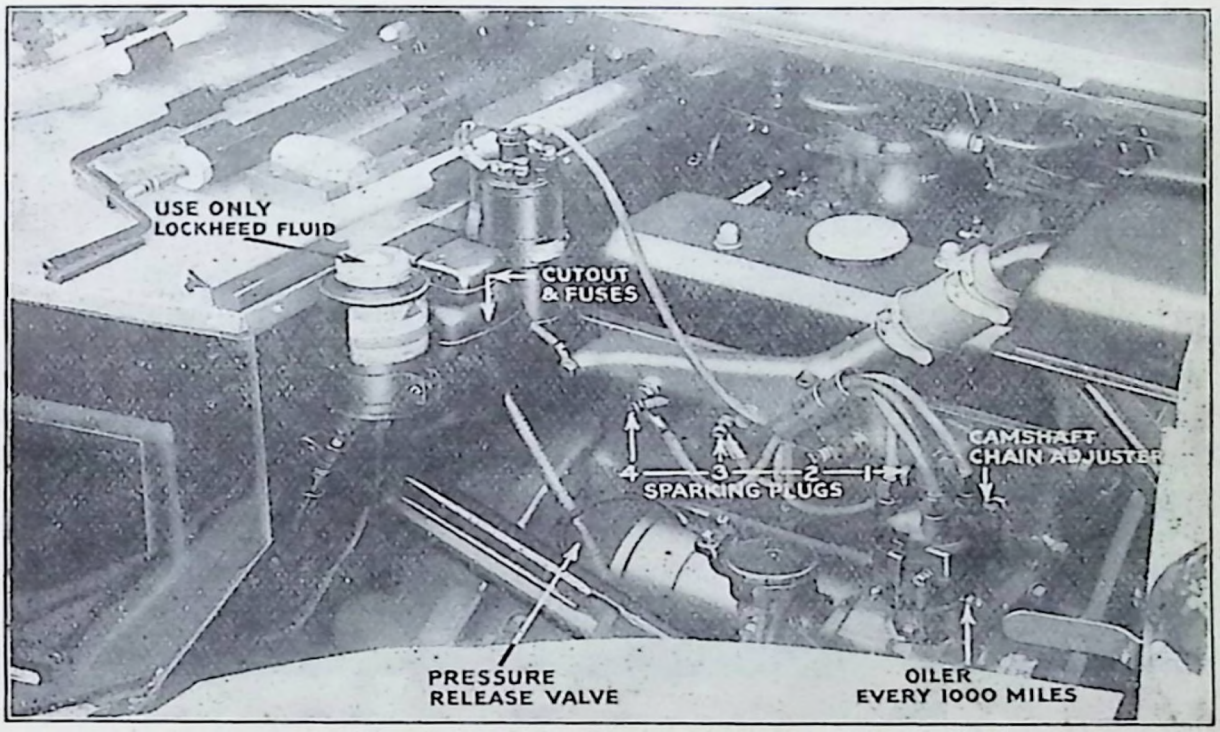
The ignition switch and key control the supply of current from the battery to the ignition coil, and must be "on" before the engine will function. A warning lamp gives a red light if the switch is left on when the engine is not running, and the light is also apparent while the engine is running but the 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**. (This does not apply to magneto ignition).

All controls and the change speed lever positions are fully illustrated in the photographs on page 13.

When preparing the car for the road there are three items which must receive attention : petrol, oil and water. As explained in the specification, 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. No fuel gauge is fitted to the "Speed" Models, but a two-way tap is situated on top of the petrol tank which provides a reserve supply of




9 H.P. Model

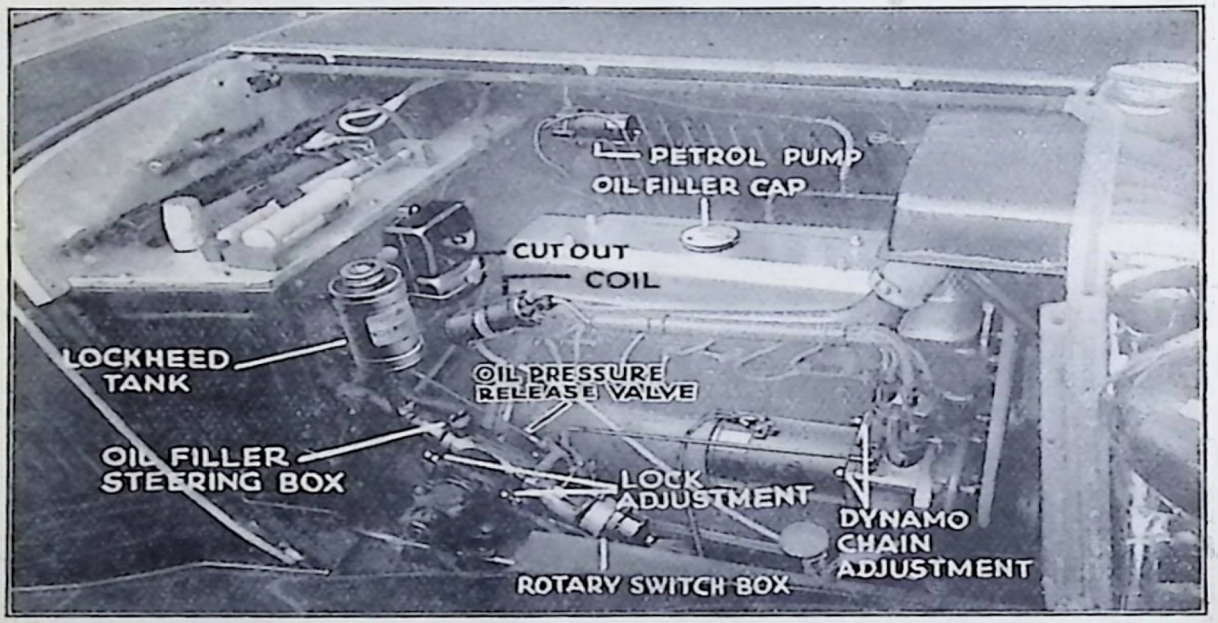
approximately one and a half gallons. The knurled nut on the petrol tap is pulled out for the "main" position and pushed in to run on the reserve supply.

It is essential that the level of oil in the engine be maintained near the full mark on the dip stick, which will be found on the nearside of the engine. 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 to its full extent and withdraw again. The level of oil will then be accurately indicated. The oil filler will be found on the engine top cover, and is air-tight in order to prevent fumes from escaping. An oil breather is, of course, fitted to the rear of the engine block which conveys fumes below the body level.

The radiator should be filled with water to a level not higher than one inch below the filler cap, and it is preferable 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 refill the cooling system with a strong solution of common soda and water. Run the engine 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

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 cold engine oil. This is especially important in winter time. After this, the engine should start quite easily when switched on, and the carburetter starter control knob




1½ Litre Model

situated on the left of the facia board, pulled out to bring the carburetter starter appliance into action. This applies only when the car is fitted with Solex down draught carburetters. In the case of the car provided with S.U. carburetters it is merely necessary, to start the engine from cold, to 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 will then immediately start, then bring the jet up to such a position that the engine will fire evenly. The car can then be driven away, but the jet should be brought up, weakening the mixture as the engine warms up. The jet control lever is fitted to the remote control extension on the gearbox.

To start when the engine is hot it is unnecessary to enrich the mixture, and the jet should be right up or in the position which gives the weakest or normal mixture.

Should the carburetters be set to give a very slow idling speed with a warm engine, it will help starting if the throttle be opened slightly by depressing the accelerator pedal. Release the starter switch immediately the engine fires and when the engine has been running for about two minutes, push back the carburetter starter control or jet control lever. **It should not be necessary to use the "Solex" carburetter starter appliance when re-starting a warm engine.**

It should 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.

A few words concerning the gearbox will perhaps be of assistance to the newcomer to the Singer range of Sports Models.

The Singer gearbox has been specially designed for easy operation, and with a little practice, no difficulty should be experienced in making a smooth change. When changing up, release the accelerator pedal, depress the clutch pedal and move the gear lever into the position selecting the desired gear, then let the clutch pedal gradually in to pick up the drive. Do not at any time force the gear lever but repeat the operation until the gear is easily engaged. With a little practice gear changing becomes a subconscious action and an easy change will be general.

Gear changing down is a similar procedure, excepting that pressure on the accelerator pedal is maintained while the clutch pedal is depressed and the gear lever moved to the next position. This, too, requires a little practice before the driver is able to effect a good change.

Having briefly described in the specification the general details of the cars, it is proposed now to deal in detail with the lubrication, maintenance adjustments and instructions for overhauling the various units.

# ENGINE

To the new car owner we cannot give greater service than to impress upon him the importance of regular attention to lubrication. A summary of essential attentions is given on page 49, and we have no doubt this will be found of valuable assistance in obtaining trouble free running. A list of recommended lubricants is also given on page 50 and we strongly advise owners to use only the oils specified. **On no account must cheap oils be used.**

Lubrication of the engine is automatic providing the correct oil level is maintained in the engine sump, but it is always advisable to check the correct functioning of the lubricating system by the gauge mounted on the facia board. When the engine is running, the oil gauge should indicate a steady pressure of between 20/25 lbs. per sq. inch when the engine oil is warm and the car running at about twenty miles an hour in top gear. It is, of course, understood that a higher pressure reading will be obtained when the engine oil is cold.

Should the gauge give a low reading or the needle oscillate rapidly, this indicates that the lubricating system is not functioning correctly and teps must be taken to trace the fault and correct it.

1½ LITRE MODEL. An engine lubrication diagram is introduced here which, if consulted with the following description, will be of considerable assistance to the owner in understanding the engine lubricating system.

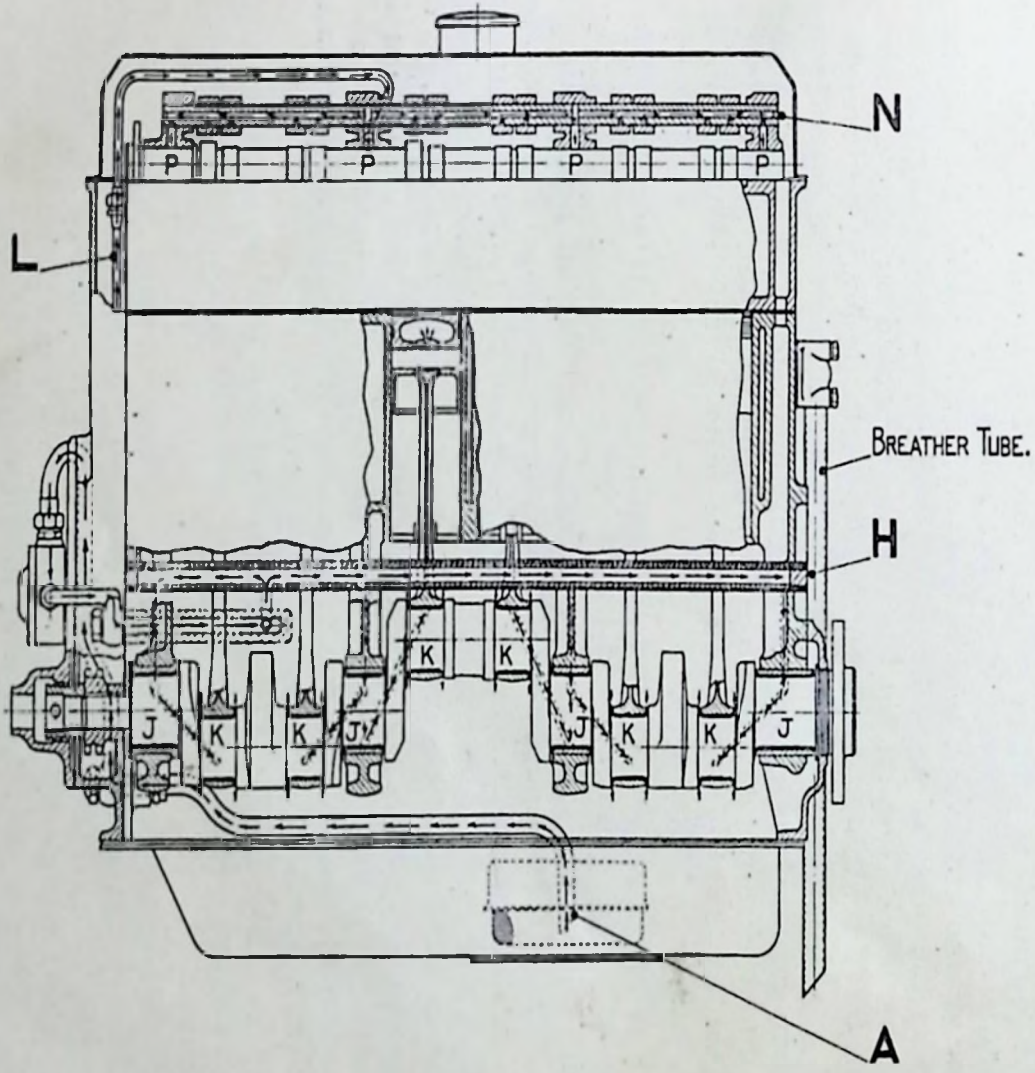
When oil is poured through the filler cap on the engine top cover it makes its way down passages through the cylinder head and block castings into the sump. Oil is drawn from the sump through a large area wire gauze filter up pipe (A) into union (B), and through pipe (C) to the pump (D).

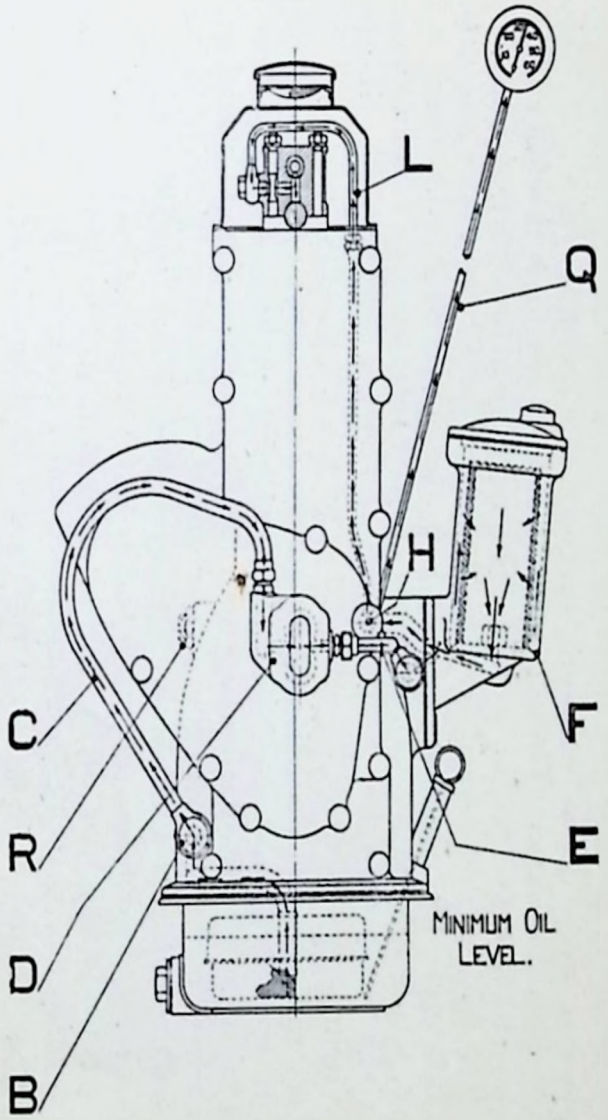
It is then discharged through pipe (E) into the filter housing (F), where it is forced through a fabric filter element into the main oil gallery (H). From here the oil passes through leads to the three main bearings (J), and through the crankshaft to the big-end bearings (K), surplus oil from the big-end bearings being thrown on to the cylinder walls.

An upward lead (L) is taken from the gallery (H) to the rocker shaft (N) for the purpose of lubricating the valve rockers and camshaft bearings (P). Here again, surplus oil from the valve rockers and camshaft bearings drains back into the sump and is, of course, filtered before again passing into circulation.

A lead (Q) is taken from the gallery (H) to the pressure gauge and an oil release valve (R) is incorporated in the system for oil pressure adjustment.

NINE H.P. MODEL. The lubricating system of this engine is very similar to that of the 1½ Litre. The difference will be shown by referring to the sectional diagram on page 21 in conjunction with the following description.




1½ Litre Model.

When oil is poured through the filler cap on the engine top cover, it makes it way down passages through the cylinder head and block castings, into the sump. The oil pump draws oil through the filter (A) and up pipes (B) and (C) to the pump. The oil is then discharged into a "T" piece (D) with a downward lead to the oil gallery pipe under the engine main bearing. Here a branch is taken through (E) to the front main bearing, while the main supply travels on past release valve (G) and branch (F) to the rear main bearing. Branch (F) is the lead to the oil gauge on the instrument panel.

The crankshaft is drilled, and from the front main bearing oil travels through the crankshaft to No. 1 connecting rod big end and then on to No. 2 big end. Similarly the rear bearing lead feeds Nos. 3 and 4 big end bearings. The oil which exudes from these bearings is thrown up to lubricate the cylinder walls and the excess drains back into the sump.

The upper lead from the pump takes oil through union (H) and pipes (J) and (K) to the centre of the rocker shaft (L), and leads from this shaft feed the three camshaft bearings and each valve rocker. Here again, as oil is exuded form the bearings and rockers, it is drained back into a sump and is filtered before being drawn into circulation again. A branch is taken from union (H) to supply a few drops of oil to the timing chain.

The quantity of engine oil in the sump should be maintained by checking the oil level about every 250 miles. A dip stick is fitted to the nearside of the crankcase, and is marked in two places, the highest mark ndicating the maximum level and the lower mark indicating the minimum ermissible level. The oil level is read as indicated on page 21, and if the il is below the highest mark on the dip stick, it should be brought to the correct level by pouring fresh oil through the filler on the engine top cover.

When adding engine oil, a few moments must be allowed for it to drain into the sump, before finally checking the level, and do not under any circumstances fill the sump above level as this is likely to lead to various minor troubles.

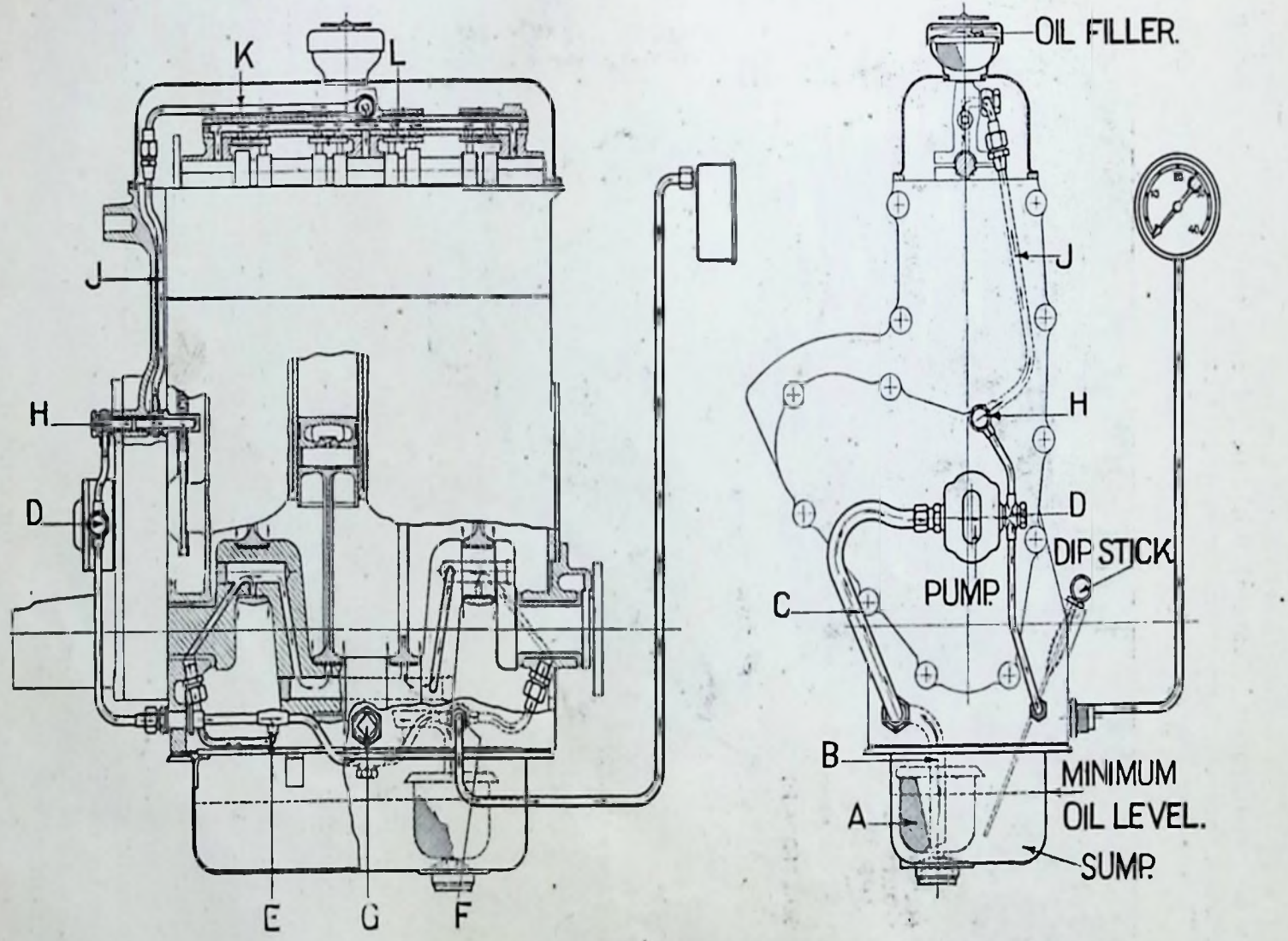
To prove that the engine lubricating system is working correctly, the following procedure should be adopted :—

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 first that the pipe is quite 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.

As previously indicated, there are two filters in the engine of the 1½ Litre lubricating system. The pressure filter (F) and the wire gauze filter in the sump.

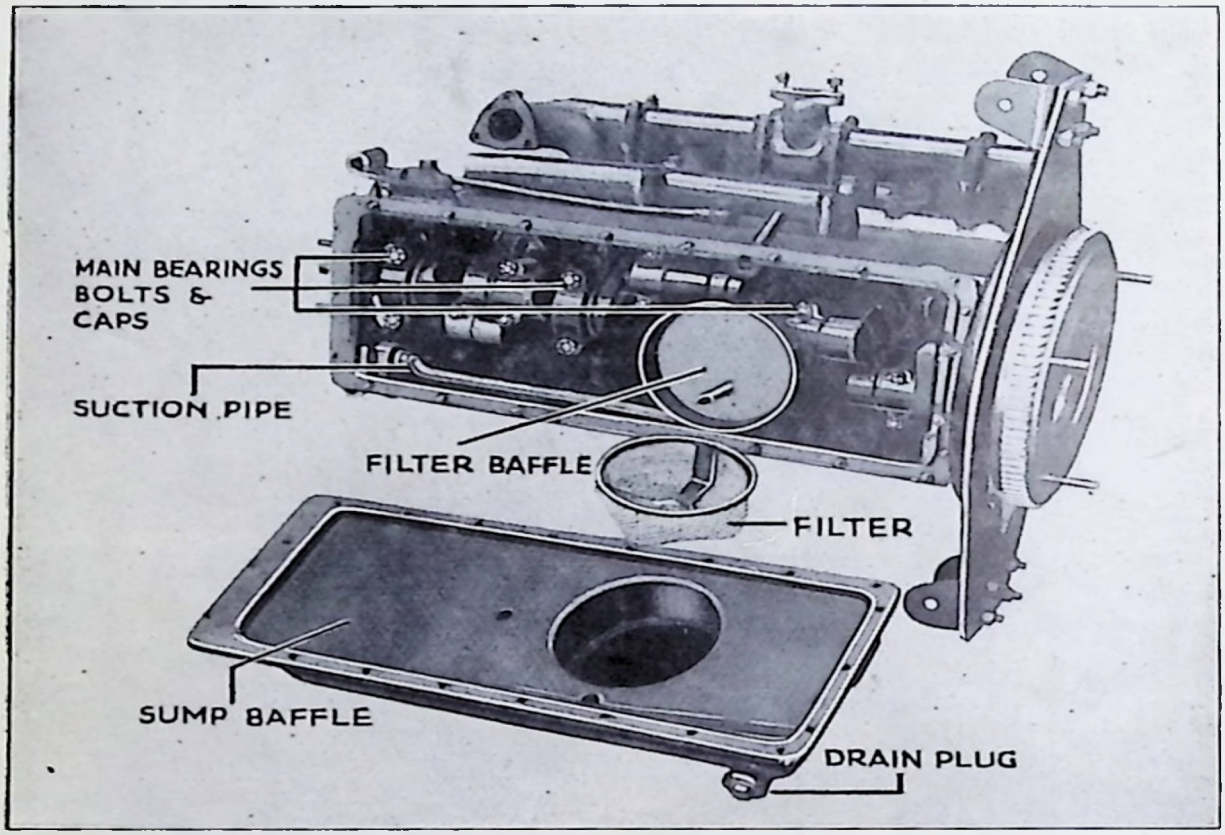
The pressure filter (F) contains a fabric element which should be cleansed every 2,000 miles when the engine oil is changed, and the method of procedure is to remove the six studs securing the filter cap to the housing, take out the filter element, clean carefully with petrol, and replace in the housing. There is no necessity to interfere with the by-pass valve in the cover of the filter body.


K
L
J
H
D
E
G
F
OIL FILLER.
J
H
D
DIP STICK.
PUMP.
C
B
MINIMUM
OIL LEVEL.
A
SUMP.

9H.P. MODEL.

On both models it is advisable to cleanse the sump filter on any sign of low oil pressure, and in any case every 5-6,000 miles, and this is effected by draining the engine oil through the drain plug on the offside of the sump and releasing the nuts round the base of the sump. The filter may then be withdrawn, cleansed with petrol and replaced, care being taken to ensure that the sump washer is unbroken.

To remove foreign matter from the pressure release valve, slacken the




lock nut sufficiently to allow the centre pin to be withdrawn—the position of the lock nut will be an indication of how far to screw in the centre pin when re-assembling—then withdraw the pin and remove the spring and ball and clean with petrol. When replacing, first insert the ball, then the spring, screw in the centre pin up to the lock nut and tighten the lock nut.

To increase the oil pressure, slacken the lock nut and screw back two or three turns, screw in the centre pin and tighten the lock nut. To decrease the oil pressure, release the lock nut, screw the centre pin back two or three turns and relock the nut.

In some cases, low oil pressure is due to the engine oil becoming very thin owing to dilution with petrol (due possibly to misuse of the carburetter starter control, worn pistons and rings or misfiring of the sparking plugs) but dilution 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 engine oil should be drained, the sump cleansed and fresh oil put in. After this, the engine oil should be changed every 2,000 miles.

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 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, turn 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 marked on the dip stick.

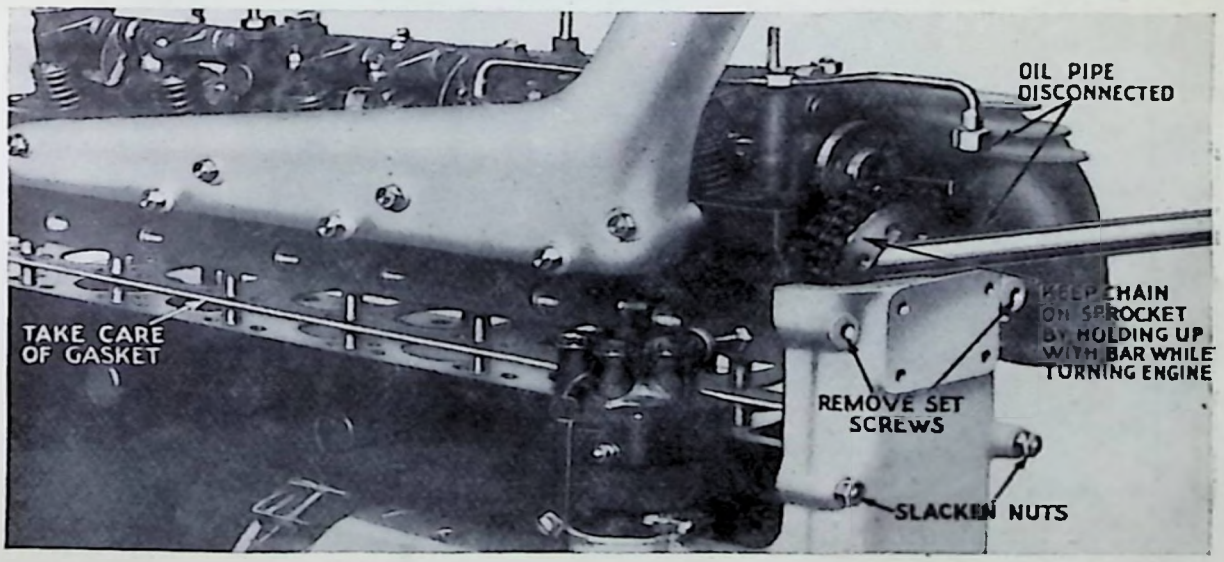
If the lubrication is carefully attended to, very little is likely to be necessary beyond the small adjustments required to balance wear and tear, and the periodical cleaning of the engine interior which includes decarbonising, grinding in the valves and cleansing of the oil sump and filter.

## RUNNING ADJUSTMENTS

Decarbonising is one of the periodic 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. In the case of an ordinary touring car a new engine should be decarbonised after 5,000 miles and thereafter every 10,000 miles will be a fair average period.

A Sports car, however, is different. In this case a clean engine is essential and it is recommended that a Sports engine be decarbonised for the first time between 3-4,000 miles and thereafter about every 5,000 miles.

The operation of decarbonising consists of cleaning the inside of the combustion chambers and the tops of the pistons, necessitating removing




the cylinder head.- In view of the similarity of the engine of the 1½ Litre and 9 h.p. Model it is not necessary to detail the decarbonising instructions separately for each model. Making due allowance for the differences between any 6-cylinder and 4-cylinder engines, the method of procedure to be adopted is briefly as follows :—

First remove the bonnet and drain the water system by means of the

drain tap at the nearside base of the radiator.

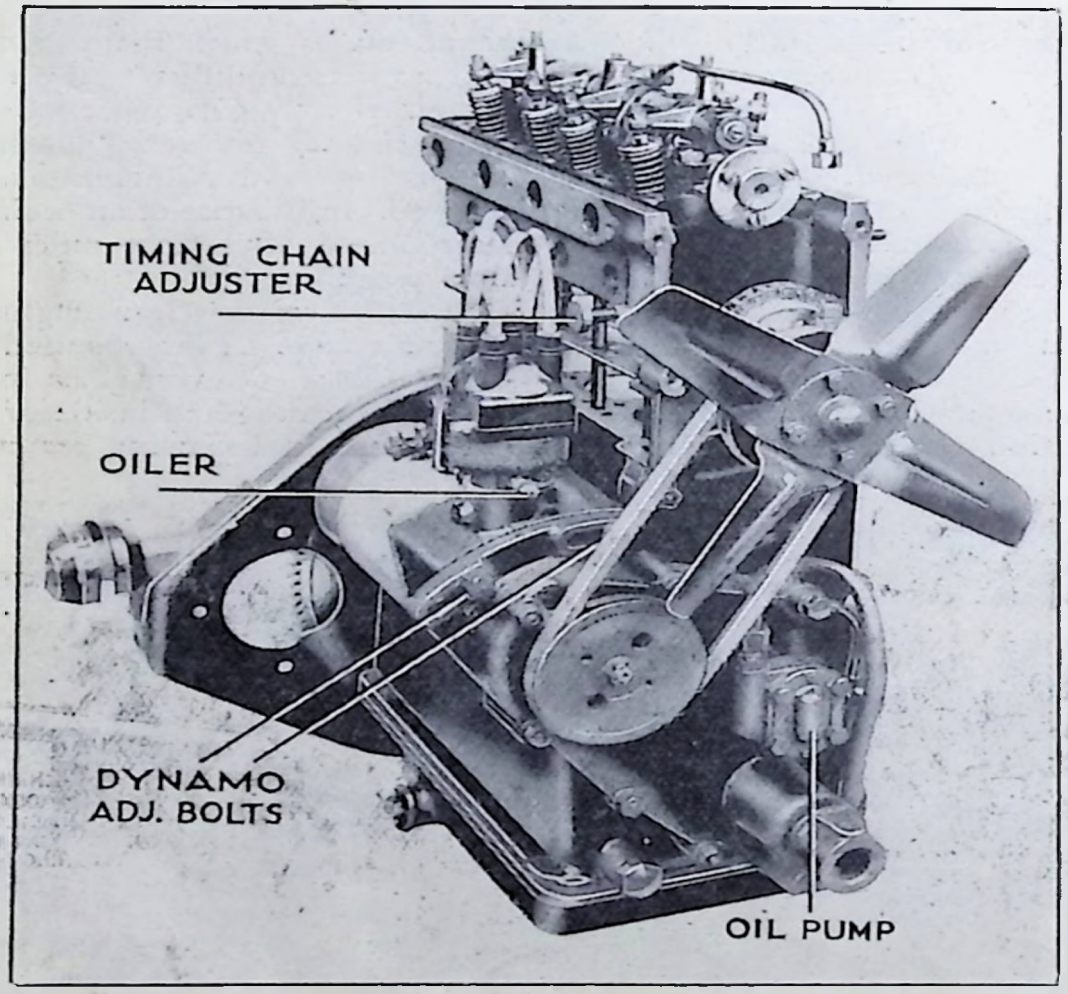
Disconnect all carburetter controls and the pipe from the petrol pump to the carburetters, then remove the carburetters from the cylinder head.

Remove the top valve cover, exhaust manifold and water outlet pipe. Disconnect the radiator hose pipe.

Disconnect the camshaft oil feed pipe and remove the fan assembly.

Set the engine position by turning slowly with the starting handle until the mark 1/6 (1½ Litre) or 1/4 (9 h.p.) appears on the flywheel and the inlet valve of No. 6 or No. 4 cylinder is about to open.

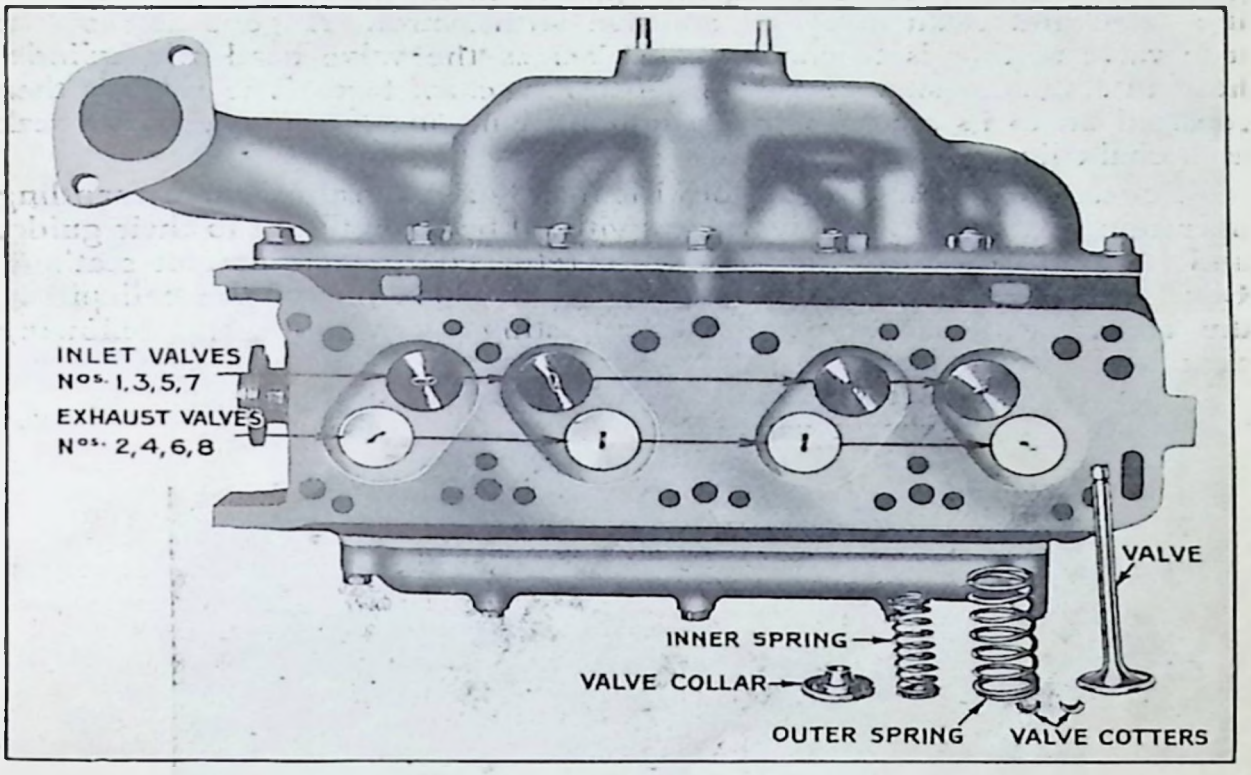
Disconnect the camshaft chain sprocket by first releasing the timing chain tensioner, i.e., unscrew lock nut and turn back adjusting bolt in the cylinder head, then remove the set screw, tab washer and plain washer which secure the chain wheel to the camshaft flange. **Do not under any circumstances remove chain from chain wheel.**




Remove the cylinder head and in breaking the joint between the gasket and the cylinder head do not use any lever between the faces. Rock the cylinder head to break the joint then remove the gasket and store for safety.

The camshaft assembly can be dismantled by releasing the nuts and washers which secure the camshaft bearings and withdrawing the upper halves of the bearings complete with valve rockers and shafts. The top halves of the bearings and rockers, etc., may be dismantled from the rocker shaft but should be marked to ensure their return to their correct position.

The valve ferrules should be removed from each valve stem and the valve extracting tool placed in position for compressing the valve springs and removing the split collar. The valves may then be withdrawn through their guides from the combustion head. The valves are marked and should be returned to their correct seating.




CLEANING THE ENGINE. Having removed the cylinder head, the pistons will now be visible, the first and last pistons being at the top of their strokes. Fill the exposed bores and water ports with rag and remove the carbon from the top piston, using for this purpose a blunt intrument 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 the remaining pistons, hold the camshaft sprocket up and in alignment with its lower sprocket by means of a steel bar or tommy bar, while turning the engine clockwise to bring these pistons to the top of their strokes. Afterwards remove any carbon deposit from the face of the cylinder block and cleanse the cylinder head gasket ready for refitting.

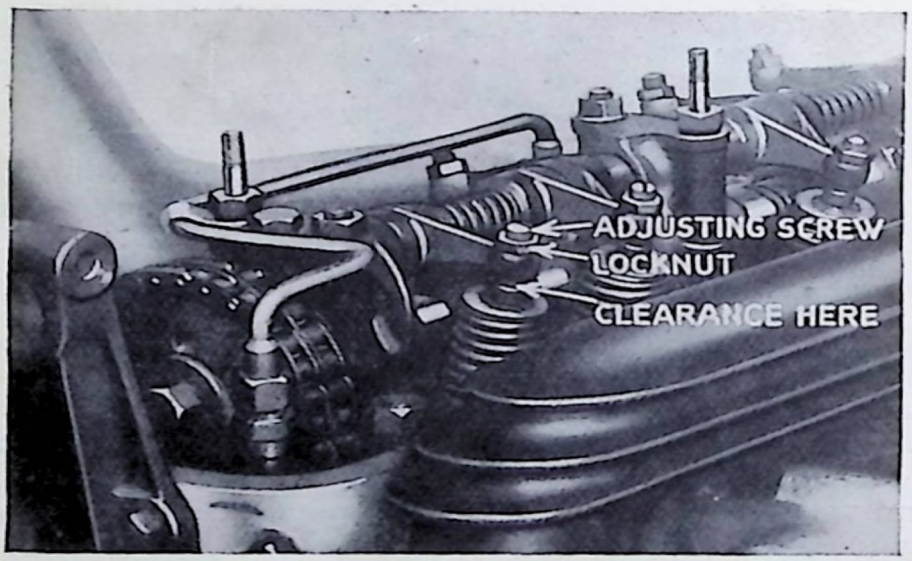
Again hold the camshaft chain wheel up and turn the engine forward until the first and last pistons are again at the top of their strokes and the distributor or magneto rotor arm is in the same position as it was prior to removing the cylinder head, i.e., opposite the segment for No. 1 high tension lead. Inject a small amount of oil into each cylinder bore to provide lubrication for the first few revolutions of the engine when reassembled.

Although it is not always necessary to grind in the valves every time the engine is decarbonised, it is policy to give the valves a thorough cleansing to ensure good compression after decarbonising. Remove all carbon deposit from the combustion chambers and the face of the cylinder head, also from the valve heads, stems, and valve seatings. Smear a little

valve grinding compound over the seating of the valve and cylinder head and grind in the valve by rotating backwards and forward upon its seat. Do not allow the valve to make a full revolution of the seating, but lift the valve 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 the valve seating, withdraw the valve and clean away all abrasive with petrol. A good test of the true valve seating is to chalk strokes across the valve head and cylinder head in similar positions to the figures on a clock face. The valve is then replaced on to its seating and a slight turn in one direction should break each chalk line.

Re-assembling the cylinder head is merely a reversal of the dismantling operation, but smear the valve stems with oil before refitting to their guides and be quite sure that the valves are returned to their 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 | ... | ... | 004in. |
| Exhaust valves | ... | ... | .006in. |




Tighten the lock nut and turn the camshaft in a clockwise direction until the inlet valve of the last cylinder is just commencing to open. Replace the cylinder head and gasket and tighten the cylinder head nuts evenly, half a turn at a time, working from the centre outwards. Reassemble the oil feed pipe with the camshaft assembly, remount the camshaft chain sprocket, and lock into position, not overlooking the correct location of the tab washer with the chain sprocket stud.

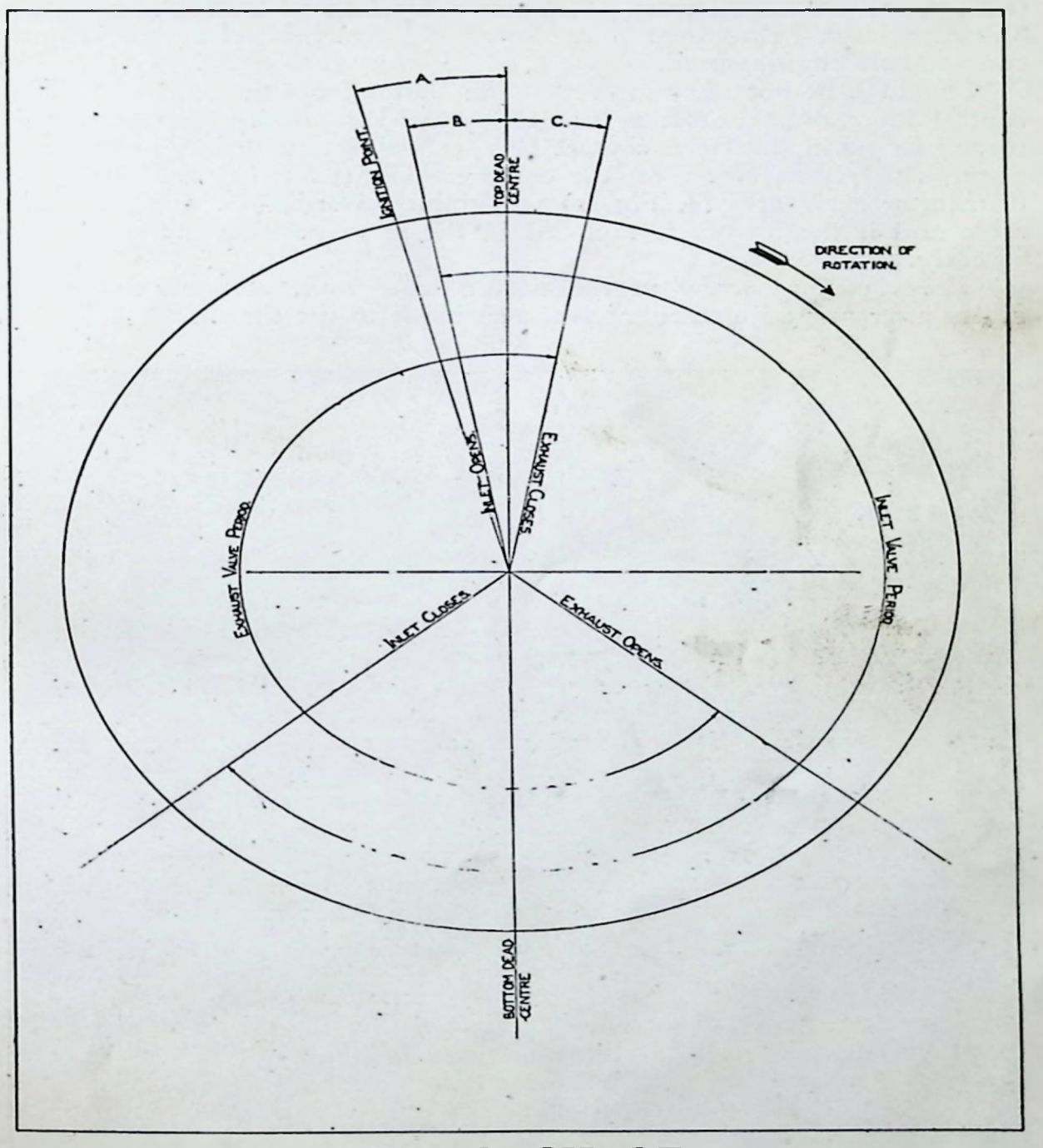
If the previous instructions have been closely followed the engine valve timing will be correct (see Chart, page 27).

After any operation that has necessitated the removal of the distributor or magneto unit it will be necessary to retime the engine. It will be seen from the engine timing chart (page 27) that the ignition is timed to fire when fully retarded a certain distance before top dead centre, this measurement and the valve timing measurements being taken from the 1/6 or 1/4 mark on the flywheel.

The firing order of the 1½ Litre engine is: 1, 5, 3, 6, 2, 4.
The firing order of the 9 h.p. engine is: 1, 3, 4, 2.

**Always time on No. 1 cylinder,** i.e., the cylinder nearest the radiator.

Remove the engine top cover and the flywheel inspection cover, and turn the engine until the inlet valve of No. 1 cylinder closes. Continue to turn the engine until the mark 1/6 or 1/4 on the flywheel is the stated distance before its vertical position.




## TIMING CHART

| MODEL | A IGNITION POINT (Fully retarded) | B INLET VALVE OPENS | C EXHAUST VALVE CLOSES |
|---|---|---|---|
| 1½ Litre "Speed" | ½" B.T.D.C. | 15/8" B.T.D.C. | 1¼" A.T.D.C. |
| 9 h.p. "Speed" | ½" B.T.D.C. | 15/8" B.T.D.C: | 1¼" A.T.D.C. |
| 9 h.p. Sports | 1" B.T.D.C. | 17/8" B.T.D.C. | 13/8" A.T.D.C. |

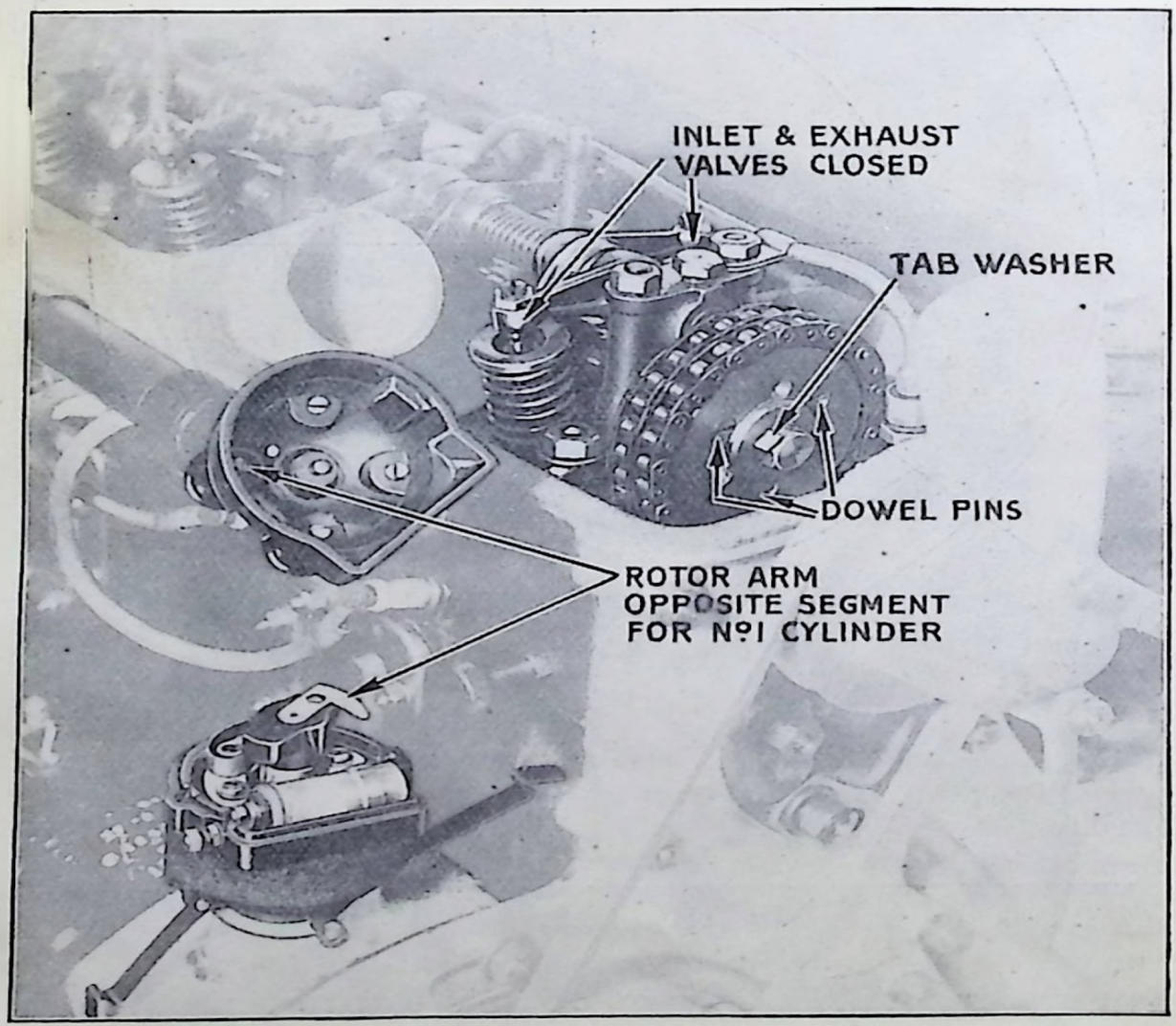
## TIMING ADJUSTMENT (Scintilla Vertex Magneto)

Slacken the clamping screw in the timing lever and turn the body of the Vertex in the direction shown by the arrow on top of the distributor head in order to RETARD the timing. To ADVANCE the timing, the Vertex body must be turned in direction opposite from that shown by the arrow.

A distance of ⅛in. measured on the perimeter of the magneto body (i.e., where the diameter is 3½in.) is equivalent to 4 deg. alteration of Vertex timing, i.e., 8 deg. if measured on the flywheel as the magneto runs at half engine speed.

Should it be necessary to remove the Vertex from the engine, the hand control lever must be set at the fully retarded position and the engine turned by hand until the contact breaker points are *just commencing* to open, with piston No. 1 on the compression stroke. In this position the distributor rotor arm (4, Fig. 1) will point towards No. 1 high tension cable and if the Vertex is replaced in the same position the timing will be correct.

The clamping screw in the timing lever must always be tightened firmly after any adjustments have been made to the timing.



## TIMING ADJUSTMENT (Coil Ignition)

Remove engine top cover and the flywheel inspection cover and turn the engine until the inlet valve of No. 1 cylinder closes. Continue to turn the engine until the 1/4 mark on the flywheel is in the position specified on the timing chart (see page 27). Remove the distributor cover and the contact breaker point 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 to this segment. Proceeding in a clockwise direction, place the lead to 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 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.

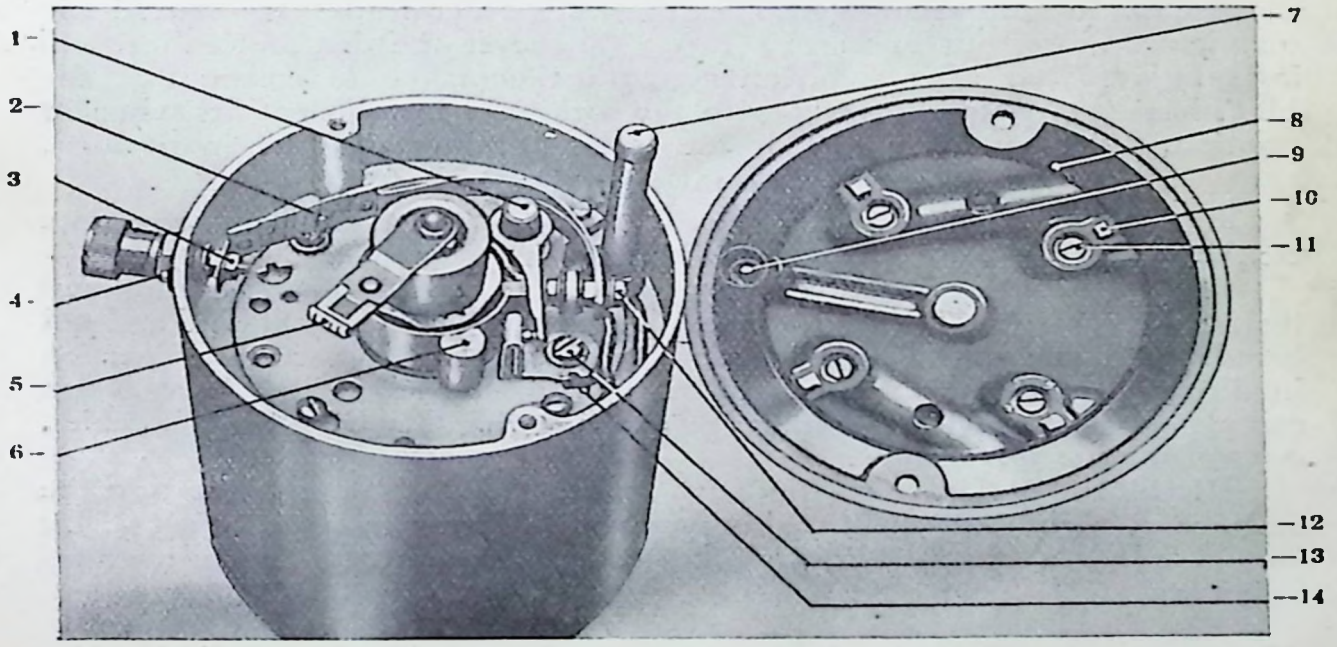



Fig. 1.

## "VERTEX" MAGNETO MAINTENANCE INSTRUCTIONS

### CONTACT BREAKER

CLEANING. It is essential that the contact points should be perfectly clean and free from grease or other foreign matter, otherwise misfiring will occur and life of contacts greatly shortened. Use only a thin, smooth file for cleaning purposes and take care that contact faces are flat and square after cleaning.

ADJUSTING. Turn engine by hand until contact points are fully open. The gap between points should be 0.012in. to 0.016in. (0.3 to 0.4 m/m). Adjust if necessary by slackening screw (13); inserting screwdriver

blade in slot (14) and turning in order to move fixed contact until correct gap is obtained. It is impossible to disturb the correct bedding of the contact faces when adjusting or even replacing.

FITTING NEW CONTACT POINTS. Remove nut and washers (3) and screw (13). Withdraw complete contact breaker assembly. Remove screw asembly (12) and fit to new contact breaker, assembling in exactly the same order as before removal. Slip new contact breaker assembly into position and refix nut and washers (3) and screw (13). Adjust gap in line with above instructions.

The usual cause of dirty contact points is over-lubrication of the cam felt (6) and rocker arm felt (1). (See "LUBRICATION").

## LUBRICATION

It is important that the following instructions should be followed carefully. Both over and under lubrication must be avoided. Screw greaser at base of Vertex must be used every 6,000 miles by filling three times and screwing right home. The correct grease is supplied by the makers of the "VERTEX" magneto—SCINTILLA LIMITED, or from any Singer Service Depot (see page 1).

Cam felt (6) and rocker arm felt (1). Every 12,000 miles apply slight smear only of grease of consistency of vaseline. Excess grease is thrown on to contact points, causing burning. Oil must not be used.

## HIGH TENSION LEAD (7)

A unique feature of Vertex is that the H.T. lead (7) is inside the magneto carcase, out of harm's way. Whenever the distributor head (8) is being replaced after removal, care must be taken to ensure that the H.T. lead (7) locates correctly with the socket (9) in which it fits when in position. The contact spring inside socket (9) must also be in position.

## HIGH TENSION (PLUG) CABLES

Imperfect H.T. leads cause trouble. Signs of perishing and cracking, etc., indicate the necessity of replacement.

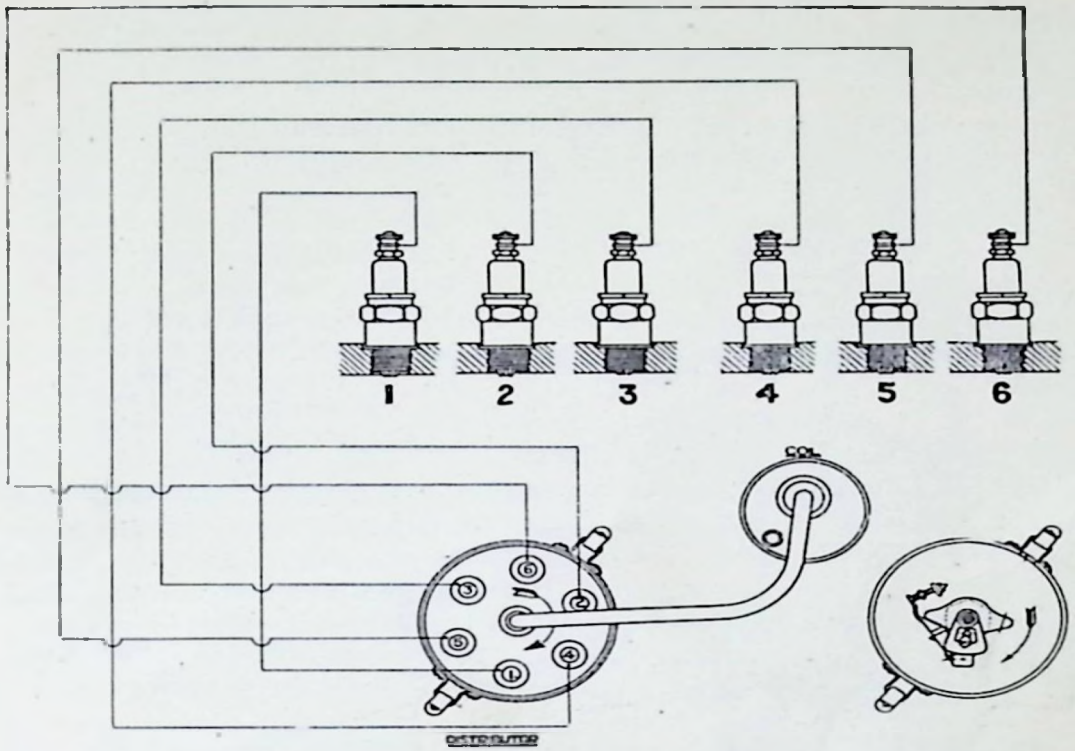
To fit new cables remove cable screws (11), withdraw old leads and insert replacements. The ends of new cables must be cut off square and not bared. The diameter should be 7 m/m exactly and to facilitate insertion in distributor head, the ends may be slightly smeared with tallow. Push completely home and refix screw (11) so that their points pierce the cables, *but do not use force.*

FIRING ORDER. On the 4-cyl. engine this is 1, 3, 4, 2, and on the 6-cyl. is 1, 5, 3, 6, 2, 4. Sparking order of Vertex is 1, 2, 3, 4 (4-cyl.), and 1, 2, 3, 4, 5, 6 (6-cyl.). Therefore, cables must be connected as follows :—

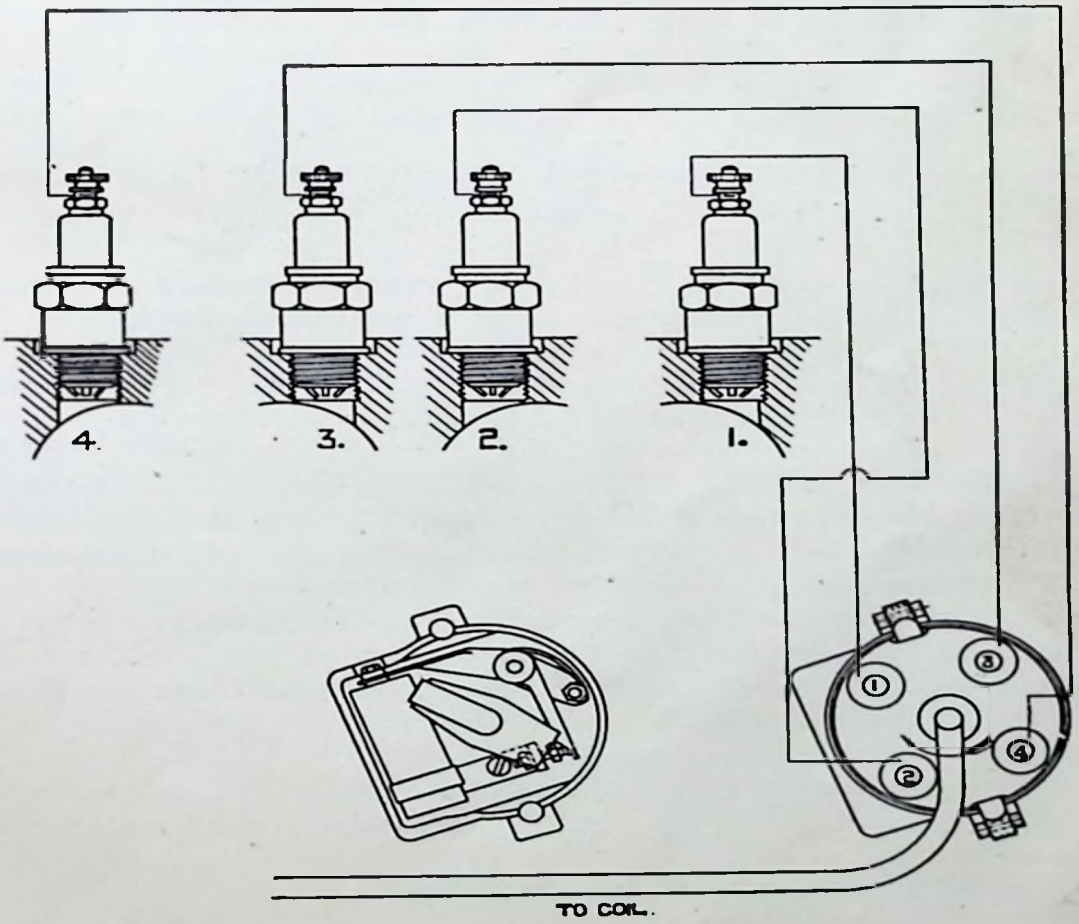
| 4-cylinder | | 6-cylinder | |
|---|---|---|---|
| Vertex No. | Cylinder No. | Vertex No. | Cylinder No. |
| 1 | 1 | 1 | 1 |
| 2 | 3 | 2 | 5 |
| 3 | 4 | 3 | 3 |
| 4 | 2 | 4 | 6 |
| | | 5 | 2 |
| | | 6 | 4 |

## ELECTRODES (10)

Do not remove carbonised material from the surfaces of electrodes (10) and distributor rotor arm (5) as this is a good conductor and removal makes the gap too wide.




1½ Litre.

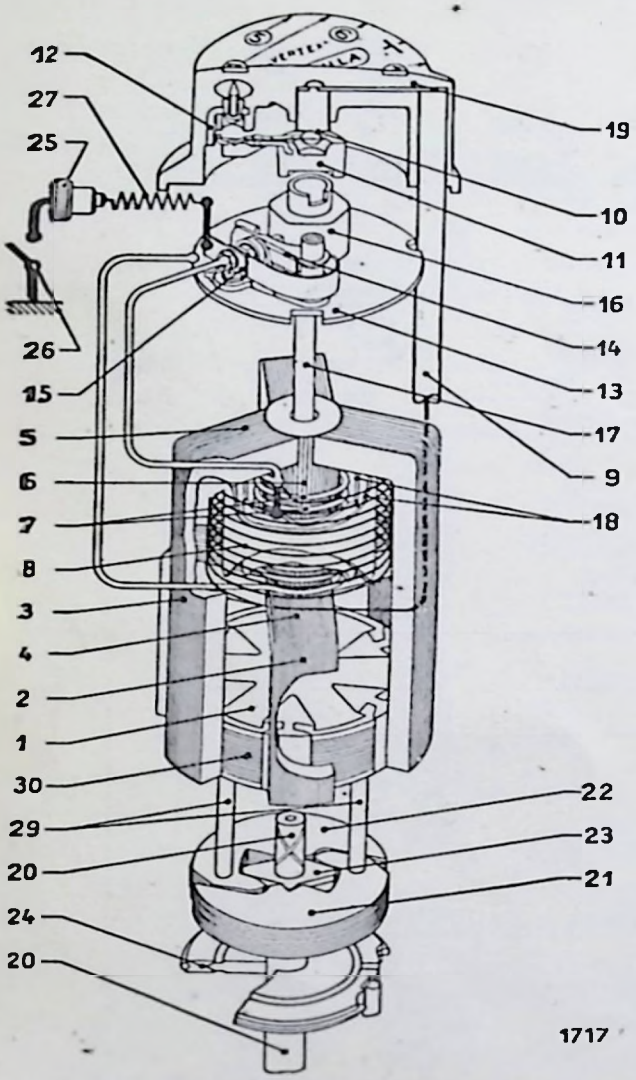



9 H.P.

## TERMINAL (4) AND RESISTANCE (2)

The primary terminal (4) is connected to the ignition switch on the dash panel, which short circuits the magneto windings in order to stop the engine.

The resistance (2) prevents weakening of the magnet by battery current which might accidentally be passed to the magneto armature.




1. Rotating Permanent Magnet
2. Short pole shoe.
3. Long pole shoe.
4. Core connecting piece.
5. Core connecting piece.
6. Armature core.
7. Primary winding.
8. Secondary winding.
9. High tension distributor lead.
10. Central contact in distributor head.
11. Distributor rotor.
12. Electrodes in distributor head.
13. Contact breaker base plate
14. Contact breaker rocker arm
15. Fixed contact point carrier.
16. Cam.
17. Rotor spindle.
18. Condenser.
19. Distributor head.
20. Driving spindle with brake.
21. } Centrifugal weights for the automatic
22 } advance mechanism.
23. Cam for the automatic advance mechanism.
24. Friction brake.
25. Primary terminal "P".
26. Ignition Switch.
27. Resistance.
29. Guide pins for centrifugal weights.
30. Laminated rotor.

FIG. 2.
DIAGRAM OF "VERTEX" MAGNETO.

BAD IDLING SPEED AND LOSS OF POWER. Test spark by disconnecting High Tension cable from sparking plug No. 1 and holding at distance of ¼in. from cylinder block. Regular and normal spark indicates Vertex is in order. Further procedure is :—

(*a*) Remove plugs. Clean thoroughly and adjust gaps to 0.015in.—0.018in. (0.4—0.5 m/m). Connect plugs to H.T. cables and lay on engine. Turn engine by self starter and check that spark jumps gap on each plug. Any plug showing no spark is faulty and must be replaced by a new plug.

(*b*) Check ignition timing. Adjust if necessary by advancing (see page 27) and give road test. If no better retard beyond original position and re-test.

(*c*) Check carburetter and filter carefully.

(*d*) Check valve clearances.

If no spark or weak spark proceed as below (test spark at each stage).

(*e*) Disconnect primary cable from terminal (4) on Vertex and start engine. Good spark indicates faulty primary cable or ignition switch.

(*f*) Remove distributor head (8), clean contact breaker points and adjust gap. If oily deposit present on or near contact breaker, clean thoroughly and remove excess lubricant by squeezing lubricating felts (1) and (6).

(*g*) Remove distributor head (8) and check tightness of screw in contact breaker base plate — beneath resistance (2) — and screw assembly (12) which secure the two primary leads. TAKE CARE to replace distributor head (8) correctly.

(*h*) Confirm that H.T. cables are in good condition.

DIFFICULT STARTING OR REFUSAL TO START. Test spark with all plugs removed so that self starter turns engine easily. Regular and normal spark indicates Vertex and H.T. cables in order. Further procedure is as paragraph a, b and c.

If no spark or weak spark, proceed as in paragraph e, f, g and h.

High Resistance Suppressors or plugs, used to prevent interference with radio, may cause bad starting, as they adversely affect any form of ignition by reducing spark energy at plug points. Plugs frequently oil up due to reduced running temperature and it is essential that values of resistances are lowest possible. SCINTILLA Limited request all users of Vertex magnetos or refer to them in cases of doubt and difficulty.

ENGINE OVERHEATS AND ACCELERATION POOR. Advance ignition.

ENGINE PINKS OR KNOCKS. Retard ignition.

DYNAMO CHAIN ADJUSTMENT. To compensate for stretch of the dynamo chain may be necessary after considerable running and will be noticeable by the chain becoming noisy. To adjust, it is first necessary to slacken off the fan belt to its fullest extent; this is done by releasing the three bolts securing the fan assembly.

The dynamo chain can now be adjusted by slackening the three nuts which secure the dynamo to its housing and the two nuts holding the dynamo shaft cover to the timing cover. The whole assembly can then be swung over, pivotting on the bottom dynamo stud. Do not overtighten or excessive wear will result, and carefully tighten all nuts after adjustment. Readjust the fan belt to the correct tension.

CAMSHAFT CHAIN ADJUSTMENT. On signs of undue noise from the camshaft chain, adjustment can be effected by means of the tensioner screw situated on the offside front of the cylinder head, i.e., behind the distributor or magneto. Release the lock nut and turn the screw until the resistance of the chain is felt, and then slack off half a turn to allow the correct running clearance. Tighten the lock nut. Great care should be taken to ensure that the tensioner screw is not too tight or undue strain will be thrown upon the chain.

WATER PUMP CHAIN ADJUSTMENT (1½ Litre only). Method of adjustment of the water pump driving chain is exactly the same as for the camshaft driving chain.

FAN BELT ADJUSTMENT. This has been dealt with under the heading of dynamo chain adjustment, but it is perhaps advisable to point out that precautions must be taken to ensure that the fan belt is not too tight, otherwise it might be damaged.

# PETROL SUPPLY AND CARBURETTERS

Three components directly concern the supply of petrol to the engine. First the petrol tank from which petrol is drawn by means of the S.U. pressure pump to the carburetter, secondly the S.U. petrol pump, and lastly the carburetter.

## PETROL TANK

This is situated at the rear of the chassis and has a capacity of fifteen gallons (1½ Litre) and twelve gallons (9 h.p. Special). The capacity of the Sports 4-seater Model is seven gallons. The speed models are provided with a two-way petrol tap, providing a reserve supply of approximately 1½ gallons of petrol, the knurled knob of the petrol tap should be pulled out to run on the reserve supply.

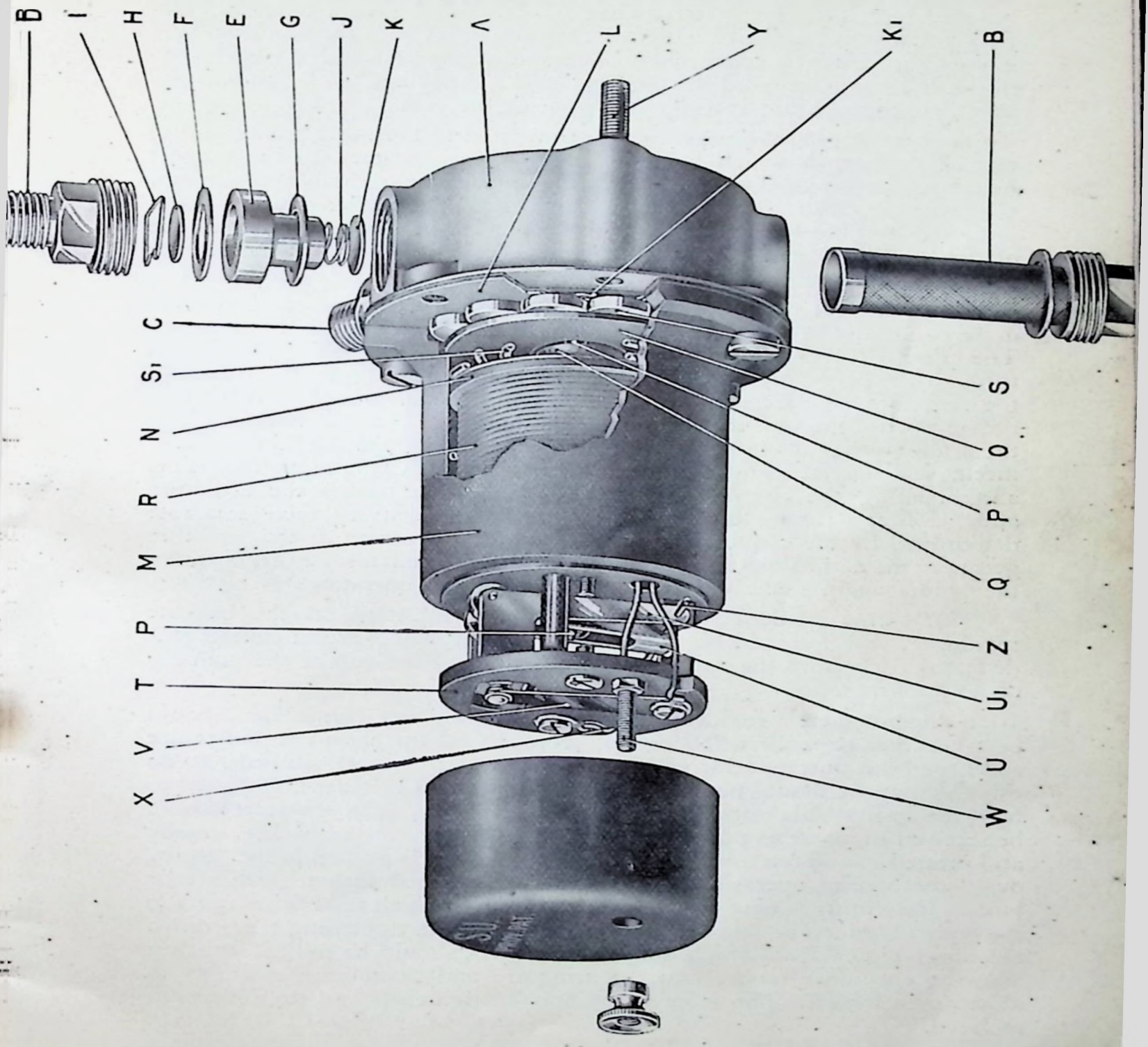
The Sports 4-seater petrol tank is fitted with an electric petrol gauge and a recording dial on the facia board. This dial records the amount of petrol in the tank the whole time the ignition switch is in the 'on' position.

## S.U. PRESSURE PUMP

This instrument is capable of delivering eight gallons of petrol per hour through a suction lift of four feet continuously.

The pump consists of three main assemblies, the body, the magnet assembly and the contact breaker. The body is composed of a hollow brass stamping "A", into the bottom of which the filter "B" is screwed. The inlet union "C" is screwed in at an angle on one side. The outlet union "D" which is screwed into the top tightens down on to the delivery valve cage "E", which is clamped between two fibre washers "F" and "G". In the top of the cage is the delivery valve, a thin brass disc "H" held in position by a spring clip "I". Inserted in the bottom of the cage is a light spring "J", which rests on the suction valve "K", the latter being a similar disc resting on a seating machined in the body. Holes connect the space between the valves to the pumping chamber, which is a shallow depression on the forward face of the body. This space is closed by a diaphragm assembly "L", which is clamped at the outside between the magnet housing "M" and the body, and in the centre between a brass plate "K1" and the steel armature "O". A bronze rod "P" is screwed through the centre of this and passes through the magnet core to the contact breaker which is located at the far end.

The magnet consists of a cast iron pot having an iron core "Q" on which is wound a coil of copper wire which energises the magnet. Between the magnet housing and the armature are fitted eleven spherical edged brass rollers "S". These locate the armature centrally within the magnet at all times and allow absolute freedom of movement in a longitudinal direction.


B
I
H
F
E
G
J
K
A
L
Y
K1
B
C
S1
N
R
M
P
T
V
X
S
O
P1
Q
Z
U1
U
W

The contact breaker consists of a small bakelite moulding carrying two rockers "U" and "U1", which are both hinged to the moulding at one end and are connected together at the top end by two small springs arranged to give a "throw over" action. A trunnion is fitted into the centre of the inner rocker and the bronze rod "P" connected to the armature is screwed into this. The outer rocker "U1" is fitted with a tungsten point which makes contact with a further tungsten point on a spring blade "V". This spring blade is connected to one end of the coil and the other end of the coil is connected to the terminal "W". A spring, "S1", is interposed between the armature and the end plate of the coil.

A short length of flexible wire is connected to the outer rocker and to one of the screws which hold the bakelite moulding on to the magnet housing, in order to ensure a good earth. In the case of double pole pumps this wire is taken to a further terminal and the rocker mechanism is insulated by fibre bushes. Two fibre bushes are in any case fitted to one of the spindles of the "throw over" mechanism of all pumps in order to silence the operation of the contact breaker.

The action of the pump is as follows. When the pump is at rest the outer rocker lies in the outer position and the tungsten points are in contact. The current passes from the terminal, through the coil, back to the blade, through the points and to earth, thus energising the magnet and attracting the armature. This comes forward, bringing the diaphragm with it and sucking petrol through the suction valve into the pumping chamber. When the armature has advanced nearly to the end of its stroke the "throw over" mechanism operates, and the outer rocker flies back, separating the points and breaking the circuit. The spring "S1" then pushes the armature and diaphragm back, forcing petrol through the delivery valve at a rate determined by the requirements of the engine. As soon as the armature gets near the end of this stroke the "throw over" mechanism again operates, the points again make contact, and the cycle of operations is repeated.

The spring blade rests against a small projection on the bakelite moulding, and it should be so set that when the points are in contact it is deflected back from the moulding. The width of the gap at the points is of no importance.

If the magnet is removed from the body for any reason care should be taken that the rollers "S" do not drop out. If the armature and centre rod have been unscrewed it will be necessary to reset these. In order to do this the magnet should be held in the left hand and the first finger used to hold the spring bade out of contact with the rocker. The armature should be screwed in as far as possible and should then be screwed back gradually and pressed in and out until it is found that when it is pushed in the "throw over" mechanism operates. It should then be turned back a further four holes. The setting is now correct. The six screws which hold the magnet to the body may then be screwed into place, but before tightening these down the hinge pin "Z" on which both rockers pivot should be pulled out, thus allowing the inner rocker and the armature and diaphragm assembly to move further back. The screws may now be tightened and the hinge pin replaced.

In the unlikely event of trouble, disconnect the lead from the terminal and strike against the body of the pump to see if it sparks and therefore if any current is available in the wire. If there is no current the trouble

must be looked for elsewhere. If the current is there remove the bakelite cover and touch the terminal with the lead. If nothing happens and the points are intact and a spark cannot be struck off the terminal it is probable that there is some dirt on the points. If on the other hand the points are not in contact look to see if the tips of the inner rocker "U" are in contact with the magnet housing. If they are not it indicates that the armature has not gone right back. To cure this loosen the six screws which hold the magnet housing to the body, make sure that the diaphragm is not sticking to the magnet housing by passing a penknife down the side of it and remove the hinge pin "Z". The six screws may then be tightened up again, when it will probably be found that the tips of the inner rocker are making contact with the magnet housing. If they are not it will be necessary to remove the whole magnet assembly, dismantle it and see if any foreign matter has caused a jam.

If the pump becomes noisy, look for an air leak on the suction side. To do this, first of all make sure that the filter and inlet union are tight, and also see that there is sufficient petrol in the tank. If this does not cure it, it is probable that the leak is somewhere in the pipe line, and the simplest way to test for this is to replace the suction pipe with a short length of piping and let the pump suck petrol out of a can. If the pump functions satisfactorily under these conditions the fault must be elsewhere. If the pump goes on beating without delivering any petrol it is probable that a piece of dirt has lodged under one of the valves. This may be removed by unscrewing the top union from the body and lifting the valve cage out. If the pump struggles to pump and gets very hot, it is probable that there is an obstruction somewhere in the pipe line or the filter may require cleaning.

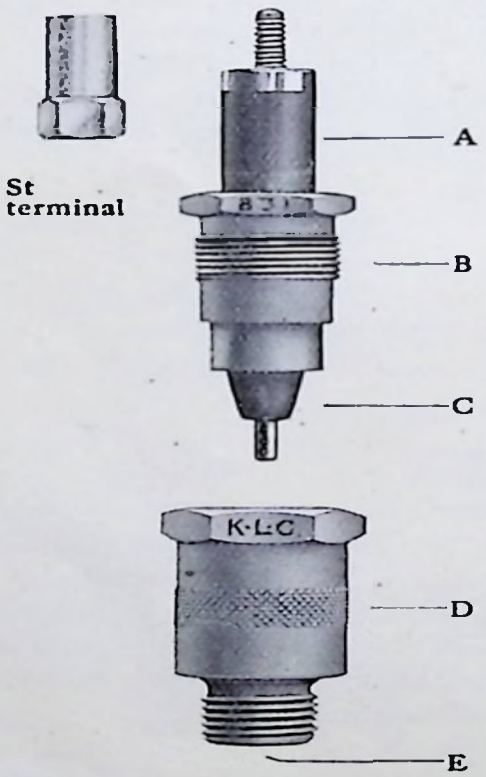
# SPARKING PLUGS

The sparking plugs fitted to Singer Sports Cars have been subjected to exhaustive tests, and it is advised that replacements be of the same type, i.e., KLG.831 14mm.

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 1,000 miles including the running-in period, it may be necessary to clean the sparking plugs because when an excess of oil is used, it causes a deposit of carbon to form on the interior insulation of the plug.

After the initial cleaning of the plug and re-adjustment of the gap setting, it should only be necessary for period inspection and cleaning to be carried out. This, we would suggest, about every 2,000 miles




K.L.G. type 831 in pieces, after dismantling.

The KLG.831 is a sparking plug of two-piece construction, and the gland nut is integral with the centre electrode, and **on no account must any attempt be made to separate this gland nut from the insulation.** The insulated centre (A) must be removed from the plug body (C) by

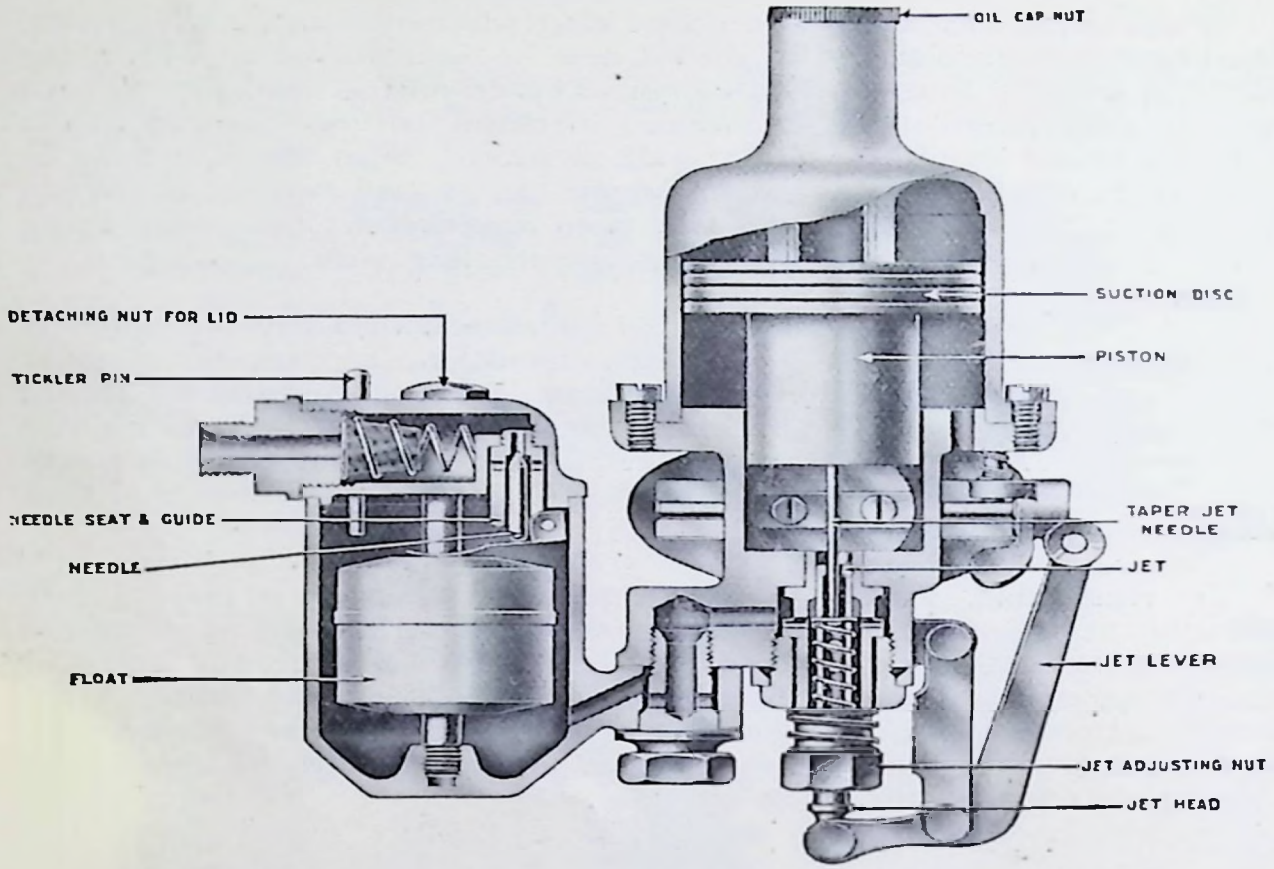
unscrewing the gland nut (B). The plug should be inverted and held in a vice by the gland nut hexagon (B). This will permit a box spanner of a suitable size to be used on the hexagon of the plug body (C).

When (B) is unscrewed, the centre electrode may then be withdrawn. The lower mica insulation (D) should now be carefully wiped with a rag soaked in petrol. If any carbon deposit is caked on the insulation so hard that the application of the rag soaked in petrol will not remove it, the centre electrode should be left steeped in petrol, when after an hour or so it will be found that the carbon deposit can be easily dispersed. When the mica insulation is perfectly free from any deposit, the actual firing point of the electrode should then be scraped clean with a penknife.

The mica insulation should then be polished with a dry rag until the mica attains a high polish, in which condition it offers the greatest resistance to any accumulation of soot, oil or carbon. The body (C) should now receive attention. The inside of the body should be well scraped out with either a penknife or small file and the earth points cleaned with a wire brush. The body should finally be washed out in petrol and then dried.

To reassemble, verify that the internal washer is in place before inserting the electrode. Having tightened the gland nut (B) to secure gas tightness, the earth points should then be re-set to .015/.018in. This will possibly necessitate bending each earth point to the firing point of the central electrode. The central electrode **must not be levered towards the earth points.** If the external washer has been completely flattened it is advisable to replace with a new one.

# CARBURETTERS




## THE CONTROLLABLE JET S.U. CARBURETTER

AS previously mentioned, the carburetters are of the S.U. H.V. controllable jet type, and the following description of the method of adjustment is given in order that the owner will be fully conversant with these carburetters.

The tuning of the S.U. Carburetter is simplicity itself if it is thoroughly understood that as all jets are of standard size the only adjustment possible is fitting the right size of needle with the jet adjusting nut set at the correct position to act as a stop for the weak position of the jet when 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 running slowly, 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 strong 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, look to this adjustment, and in ninety-nine cases out of a hundred it will put the matter right.

If, when this adjustment has been made correctly, carburation is still bad either as regards consumption or performance, an unsuitable needle is being used, and will have to be changed for one correcting the mixture as required. A larger needle, of course, will give a weaker, and a smaller needle a stronger mixture over the whole range of speeds.

## DETAILED DESCRIPTION FOR TUNING THE H.V. TYPE S.U. CARBURETTER

All jets being standard in size it will follow that the supply of fuel is governed by the size of the taper needle, consequently, to weaken the mixture fit a larger needle and to strengthen it fit a smaller one, the normal position of the taper needle being with the shoulder flush with the face of the piston.

It will be seen by the diagrams that the jet has an up and down movement, weakening and strengthening the mixture. The normal position is regulated by the jet head coming up against the jet adjusting nut when jet control is at the weak position, therefore, it is by means of the jet adjusting nut that the correct adjustment is obtained.

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 screw the jet adjusting nut up higher than its normal position and then adjust the jet correctly; as the jet adjusting nut actually only acts as a stop to prevent the jet from coming beyond its correct position, it can then be screwed down until it butts against the jet head. This will be the normal running position, with the mixture control set at weak.

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

If the road performance is not satisfactory, a larger or smaller needle will be necessary as the case may be. The jet control will be found helpful in determining whether more or less petrol is required.

These are the only possible adjustments that can be made to the carburetter, and it is of no use whatever trying to adjust the carburetter in any other manner.

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 slackened off, the needle can be withdrawn and the new needle replaced. 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 machined 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 points.

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

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 exhaust and through the carburetter.

Blockage or air leak in petrol pipe, causing carburetter to give symptoms of weak mixture, i.e., lack of power and popping back through 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. If air bubbles come through an air lock is the trouble. This trouble is generally due to shortage of petrol in the tank.

Bad joint between the carburetter and the engine, or worn inlet valves or guides will cause bad starting and engine will not idle.

## 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 do not cause sticking. If this does occur, the trouble must be looked for in the piston rod and its bearing. 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 with a click when released; if it does not, it will probably be found that the piston rod is sticky or dry.

To free this, remove the oil cap nut from the top of the suction chamber, pour in a few drops of paraffin, and work the piston up and down with the finger until free. A few drops of thin oil such as bicycle or sewing machine oil should then be dropped in, but under no circumstances should a heavy-bodied lubricant such as engine oil be used. No oil must be used on any other part of the suction chamber.

## WATER OR DIRT IN CARBURETTER

PARAGRAPH 2.

When this is suspected lift the piston with something small, such as 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 th rottle 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, but 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.

ENLARGED SECTION OF JET MOUNTING

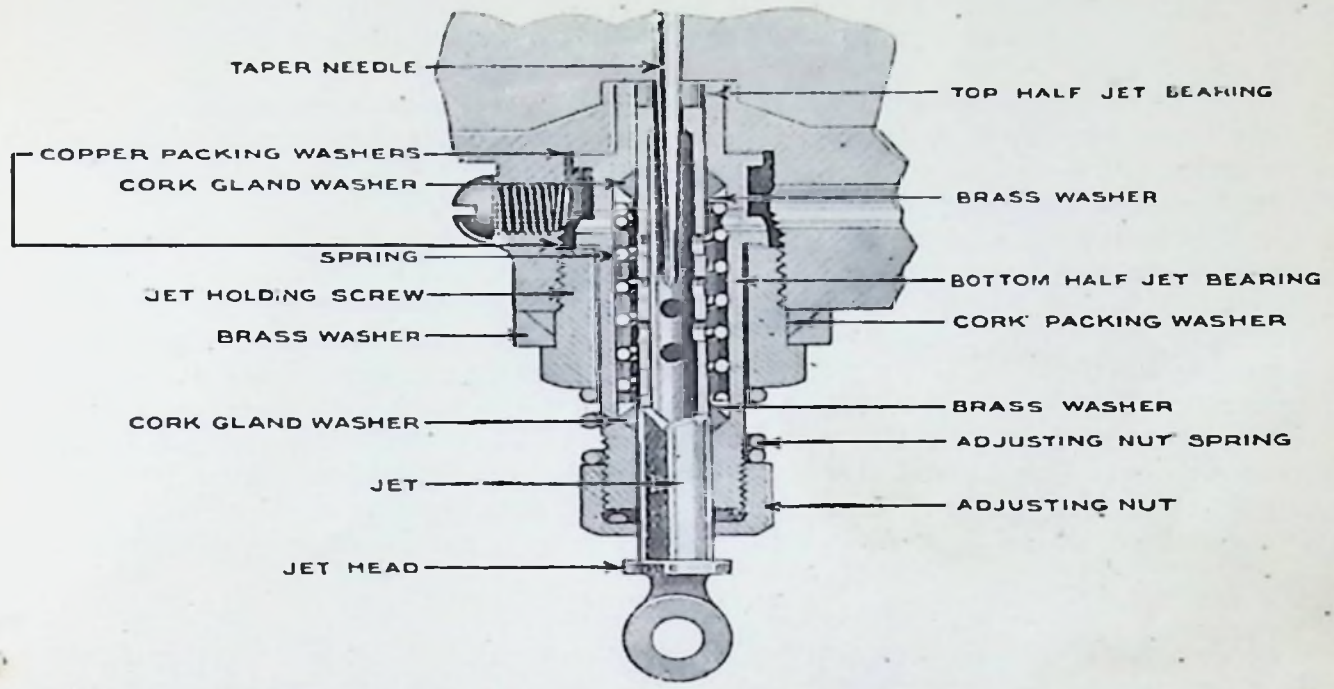



**Fig. 2.**

Should it be essential to remove the jet, this can be done by unscrewing the jet holding screw—this is the large hexagon screw which fits into the body at the back of the jet (see sectional drawing). 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 until 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. The test for a bent needle (providing the jet is not out of centre) is to remove it from the piston and refit the suction chamber into the body of the carburetter and see if the piston falls freely.

## 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 guides; this can be removed by depressing tickler pin, which allows the incoming petrol to wash the grit through the guide into float chamber.

If the above instructions are carefully read it will be realised that the S.U. Carburetter is very simple when thoroughly understood, but if it is not, it promptly appears to become an extremely complicated piece of mechanism.

It should be emphasised that the three troubles mentioned are the only ones that can be caused by the carburetter, and if these three 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 adjusting nut, consequently, there is 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 will then immediately start, then bring the jet up to such a position that the engine will fire evenly. It can then be driven away, but the jet should be brought up, weakening the mixture as the engine warms up.

To start when the engine is hot it is unnecessary to enrich the mixture, and the jet should be right up or in the position which gives the weakest or normal mixture.

N.B.—In cases where the carburetters are sealed under guarantee there will be no necessity to change the needle, and the seal must not be broken.

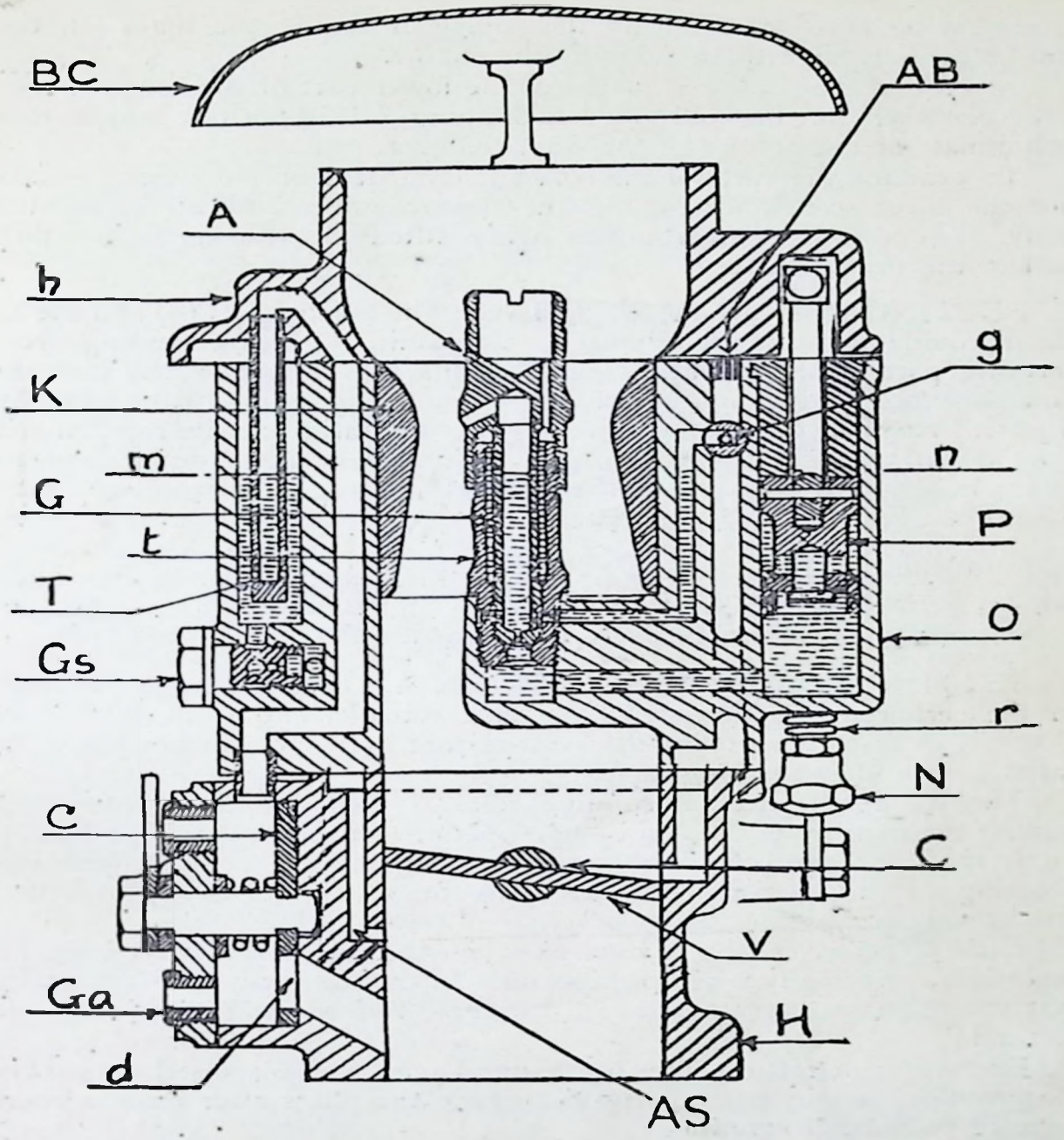
## SOLEX SELF-STARTING DOWNDRAUGHT CARBURETTER (TYPE I.F.) 9 H.P. SPORTS 4-SEATER MODEL.

The engines fitted to the Sports cars have a high compression ratio, and we therefore advise that in order to avoid pinking and engine knock, a high quality anti-knock fuel such as Ethyl or Benzole Mixture is used.

The I.F. type Solex is composed, apart from the constant level, of a self-starting unit similar to the standard type carburetter, a slow running device and a main carburetter.

Reference to the sectional diagram will help considerably in making quite clear the functioning of the carburetter.

SLOW RUNNING. The auxiliary jet and its air bleed provide for the engine when running light at low speeds. The idling rate is controlled by the regulating screw which is connected with the throttle screw, and the richness of the slow running mixture depends upon the slow running air regulating screw situated near the offtake flange of the carburetter.




MAIN CARBURETTER. The main carburetter is made up by a choke tube which fixes the maximum passage of air; at the centre of this choke tube there appears the assembly: jet stand, main jet and jet cap. The jets are of similar shape to those employed in the standard model.

DISMOUNTING THE CARBURETTER. The I.F. type carburetter in its layout follows closely the usual principles of simplicity and accessibility of the various parts. Thus, in order to obtain a setting, the slow running jet (g), starter petrol jet (Gs) and starter air jet (Ga) are accessible from the outside without dismantling any part.

In order to obtain access to the main jet (G), take off the air bell (BC), and upon unscrewing the main jet cap (A) the main jet (G) is available.

It should be noted that during the course of setting the main jet, this can be carried out without stopping the engine.

A screwed drain plug is placed at the lower part of the constant level float chamber for the purpose of draining off impurities which may accumulate at the bottom of the float chamber.

To examine the parts of the constant level, it is only necessary to take out the three screws which join the float chamber and the carburetter body. The top of the carburetter when lifted gives access to the float and to the needle valve.

SETTING FOR SLOW RUNNING. The auxiliary jet (g) and the air bleed provide the necessary mixture for slow running. A slow running screw, forming part of the throttle control, limits the closing of the butterfly and determines the minimum idling speed. Clockwise rotation of this part will result in the engine speeding up, and anti-clockwise rotation will slow down the engine speed. Apart from this, a slow running control screw is provided to regulate the idling mixture. This is situated near the offtake flange of the carburetter.

An anti-clockwise rotation of this part will over-enrich the mixture and cause the engine to hunt. To correct this, rotate gradually in a clockwise direction until the engine speeds up and steadies, then slacken the slow running screw progressively to obtain the desired idling speed.

SETTING FOR NORMAL RUNNING. The choke tube (K) fitted n the carburetter is that which is most suitable, and it should not be hanged in order to modify the performance of the car except in special ases.

The setting for normal running resolves itself, therefore, into determining the number of the main jet (G). Here again, one should endeavour to decrease the size of this jet as much as possible without, however, choosing a setting which will be too lean and which will have a bad effect on the valves.

Lack of petrol can be recognised when the engine gives off irregular explosions, principally when picking up. In this way it will be recognised that the main jet gives too lean a mixture, and a size larger jet should be used.

Excess of petrol on the other hand can be recognised by heavy consumption and by a tendency to soot up the plugs after quite a short distance of normal running.

The colour of the porcelains when the carburetter is correct should be approximately chestnut.

When the mixture is correct for summer work it is generally a little poor during the winter weather. In this case it is usually advisable to fit a main jet one or perhaps two sizes bigger.

MAIN JET. The main jet (G) is designed by one or two numbers stamped on the tube or on the top collar of the jet. The first number, i.e., 80, is the diameter of the lower orifice expressed in hundredths of millimetres; the second number, i.e., 54, characterises the diameter and disposition of the lateral holes.

It is essential, when proceeding with new tests, to use main jets of smaller and larger diameter showing the same type as that stamped on the original jet.

The sizes of the choke tubes and jets fitted to these carburetters are determined before the cars leave the works, and should be as follows :—

CHOKE TUBE, 23. PILOT JET, 050. MAIN JET, 90 x 58.

## DIAGNOSIS OF CARBURETTER FAULTS

There are so many slight engine irregularities that may affect the perfect functioning of this "Starter", and for that matter of the main carburetter, that we will proceed to enumerate hereunder the most common.

DIFFICULT STARTING. Petrol pipe obstruction. Dirt or water in the petrol tank will find its way eventually to the petrol pipe and a definite obstruction may result. Shortage of petrol has frequently been traced to pieces of packing material or other foreign matter having become lodged in the petrol pipe. Also air leaks may occur. A stopped up vent pipe in the petrol tank filler cap or a petrol pipe too close to the exhaust manifold, are often the causes. In the latter case, partial vaporisation of the petrol pipe takes place in the pipe and a vapour lock is formed.

The same thing may happen in the carburetter if fed by a petrol pump mounted too close to the exhaust system.

Fortunately, these short notes deal with the conditions that seldom arise, but it is hoped that readers of this booklet may find a solution when, as sometimes happens, there seems to be no obvious explanation of starting failure.

FUEL. It is advisable to run on the higher grade fuels such as Ethyl, Benzol, "Cleveland Discol" Koolmotor, or Regent Benzol. The lower grades of fuel are satisfactory, but the petrol consumption is not so good and there is a slight detonation at low speeds.

FLOODING. LOOSE JOINTS. The self-starting Solex carburetter has only six joints :—

The joint of the main jet carried.

The joint of the needle valve.

The joint of the petrol union.

The joints in the petrol pipe exterior to the carburetter.

The joints in the base plug connecting the starter to the float chamber.

It is easy to see whether any of the exterior joints are loose. The first thing to do, therefore, when a carburetter floods, is to verify these various joints.

GRIT ON THE NEEDLE SEATING. This does not as a rule occur in the case of carburetters provided with a filter, and generally only within the first few miles after fitting, in which case it is usually due either to stray particles of material or to particles of oxide or solder which are apt to get loose inside the petrol pipe. Remove the needle valve and clean same by carefully blowing it out and noting by suction test that it is hermetic, after which replace it and be sure that the washer is perfect and the tightening adequate.

PUNCTURED FLOAT. If any petrol gets into the float its weight is, of course, increased, with the consequence that the level is raised and

flooding occurs via the jets. In such a case, one must either change the float, or locate if possible the point of leakage, and solder it. To do this, immerse the float under boiling water when the emergence of bubbles will disclose the puncture.

EXCESSIVE CONSUMPTION. Note first that there is no leakage either at the carburetter, in the pipe-work or the petrol tank. Be sure then that the estimation of fuel consumption is correct. To confirm this, it is always advisable, if possible, to make a definite test over a known mileage in average country with a measured quantity of petrol, either in the main tank if it is of the type from which all petrol can be drained or by the use of an externally placed auxiliary test tank. The longer the test, of course, the more accurate will be the reading, assuming a non-stop run. Never estimate petrol consumption either from the speedometer readings or from supposedly accurate quantities delivered from petrol pumps, either of which are subject to appreciable errors.

LOOSE MAIN JET CAP. If the heating is sufficient and the jets as small as possible, consistent with maximum speed and correct idling, the wastage can seldom come directly from the carburetter excepting through the main jet cap being loose or the jet for some reason not seating correctly in its carrier.

UNEVEN SLOW RUNNING. Ascertain that the adjustment is correct. If even then good slow running is not obtained, air leakage is indicated at some point of the induction system, probably via worn inlet valve stems or their guides. In this case try a slightly larger auxiliary jet, but not too large, for then the engine will "hunt" when idling. Where there is any choice between two jets which give approximately the same results, always use a large one. Before making any jet alterations it is well to assure oneself in every case that the jet is clear of obstruction. If, in spite of trying various auxiliary jets, regular slow running is not possible, excessive induction leakage is certainly indicated—assuming the ignition to be in order and valve timing normal. The engine in this case will not idle regularly and when one attempts to reduce the idling speed it will generally stall. Air leakage in such a case is confirmed by a depression of the "tickler" at this moment, which will cause a temporary pick-up. One must realise that slow running is in such a case impossible, for the engine is actually obtaining, via various sources of leakage, a greater quantity of air than that entering via legitimate means, so that the correct slow running mixture becomes unobtainable.

POOR ACCELERATION. Incorrect Adjustment. Assure oneself by reference to that particular engine that the carburetter is adjusted in an average manner. If the performance is still bad in spite of this, a larger jet than is normally necessary may in some cases be required, owing to the individual characteristics of the engine, but the choke tube as a rule should not be changed.

Complete Impossibility of Acceleration. Assuming that starting and idling are possible, this can only be caused by obstruction of the main jet, weak ignition or other engine irregularities.

# SUMMARY OF LUBRICATION

In order that the points for lubrication will be quite clear, please refer to the chassis diagram overleaf.

## All points marked (A) should be lubricated every 250 miles (or weekly).

| | | |
|---|---|---|
| GREASE : | Swivel pins ... ... ... ... | 2 grease nipples |
| | Track rod ... ... ... ... | 2 ,, ,, |
| | Coupling tube ... ... ... ... | 2 ,, ,, |
| | Fan spindle ... ... ... ... | 1 ,, ,, |
| OIL : | Carburetter controls ... ... ... | Oil can |

## All points marked (B) should be lubricated every 1,000 miles (or monthly).

| | | |
|---|---|---|
| GREASE : | Clutch pedal shaft ... ... ... | 2 grease nipples |
| | Rear hubs ... ... ... ... | 2 ,, ,, |
| | Brake pedal ... ... ... ... | 1 ,, ,, |
| | Remote control extension ... ... | 1 ,, ,, |
| | Propeller shaft ... ... ... ... | 1 ,, ,, |
| | Distributor (not magneto) ... ... | 1 greaser |
| OIL : | Hand brake adjustment ... ... | Oil can |
| | Clutch pedal adjustment ... ... | ,, ,, |
| | Hand brake cable guides ... ... | ,, ,, |
| | Accelerator pedal ... ... ... | ,, ,, |
| | Road springs ... ... ... ... | Penetrating oil |

REPLENISH : Gearbox
Rear axle
Steering box (Special funnel in tool kit)

## All points marked (C) should be attended to every 2,000 miles.

Drain engine oil and refill.
Clean pressure filter element.
Adjust sparking plugs.

## All points marked (D) should be attended to every 6,000 miles (or half yearly).

Drain gearbox oil and refill.
Drain rear axle oil and refill.
Check shock absorber adjustment.

GREASE : Scintilla Vertex Magneto ... ... 1 greaser

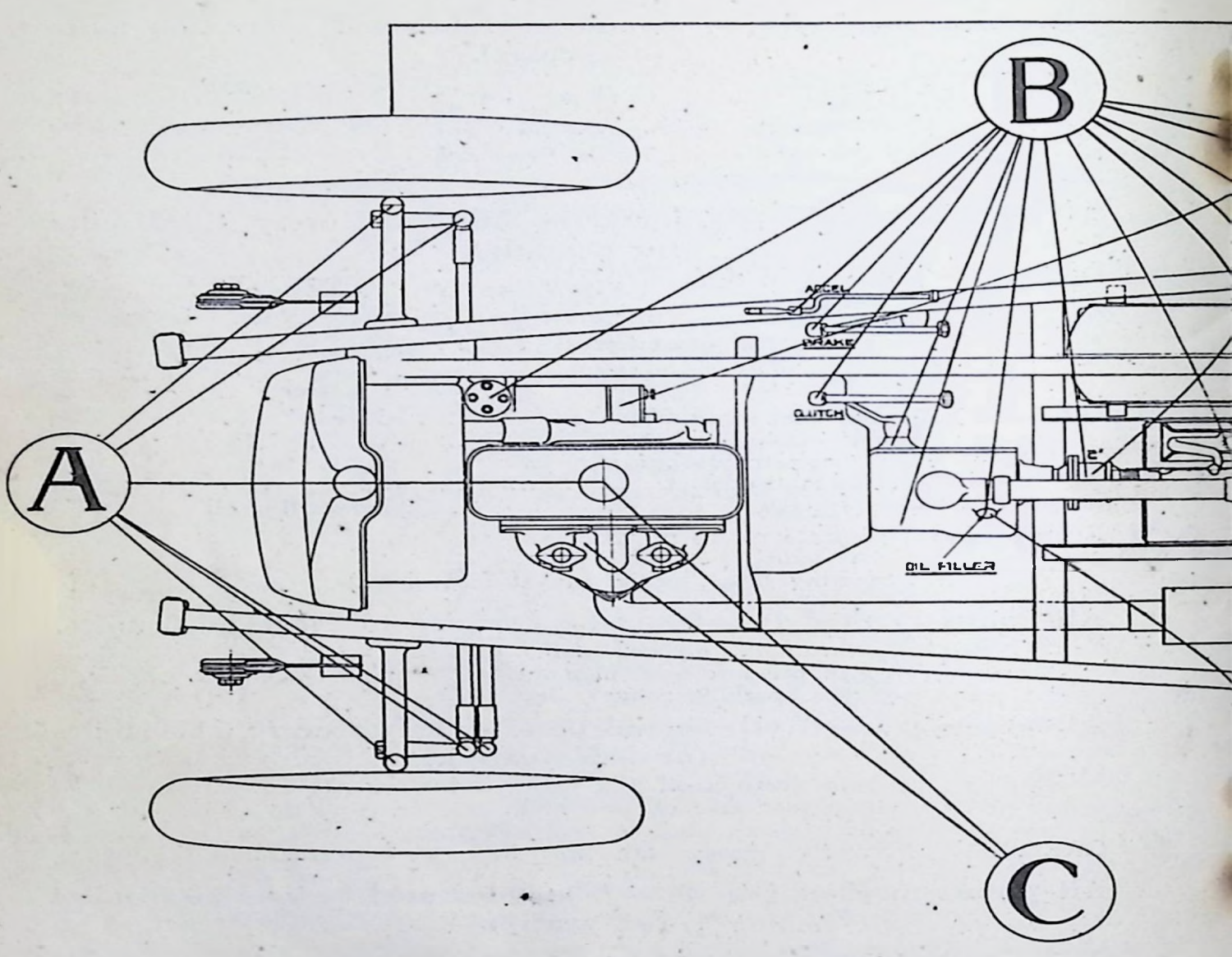
## All points marked (E) should be lubricated every 12,000 miles (or yearly).

GREASE : Front hub bearings.
Dynamo bearings.
Starter motor bearings.
Universal joints.
Magneto cam felt.
Magneto rocker arm.

This summary 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 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 practicable 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 the summary, even though the mileage covered by the car is comparatively low.

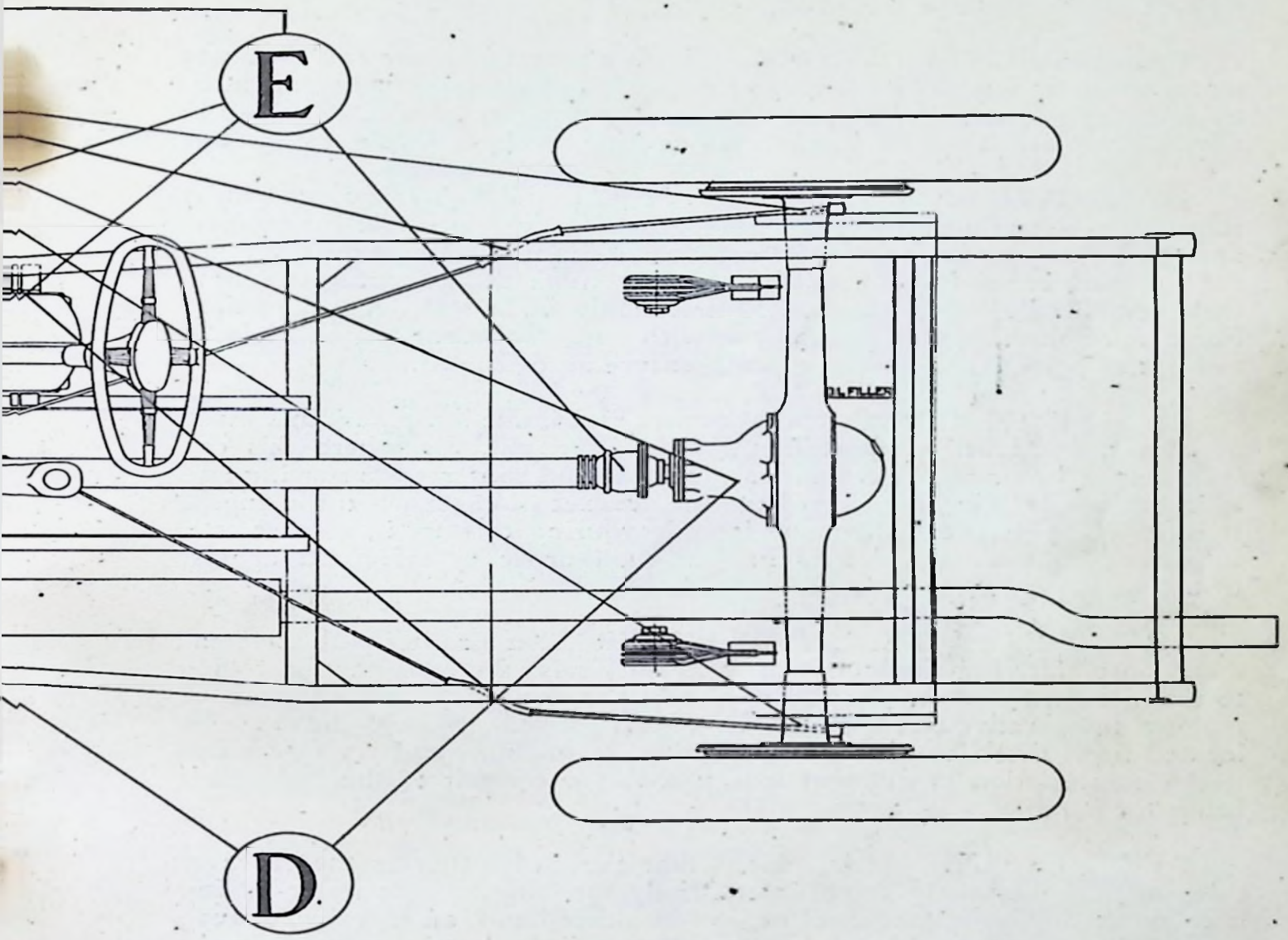
# CHASSIS LUBRIC




## RECOMMENDE

| Model and Component | | | Wakef |
|---|---|---|---|
| Engine and Gearbox. 9 h.p. and 1½ litre Le Mans. | SUMMER ... | | Castrol |
| | WINTER ... | | Castrol |
| All other Models ... .. | SUMMER ... | | Castrol |
| | WINTER ... | | Castrol |
| Upper Cylinder Lubrication .. ... ... ... ... .. ... | | | Wakefield |
| Rear Axle, Steering Box, and Independent Suspension Joints ... | | | Castrol Ge |
| Wheel Hubs : propeller shaft splines and chassis greasers (other than independent suspension) ... ... ... ... ... ... ... | | | Castrolease |
| Road Springs ... ... ... ... ... ... ... .. ... | | | Castrol Pene |

## ATION DIAGRAM




## LUBRICANTS

| ”s | Price's | Vacuum | Shell-Mex & B.P. |
|---|---|---|---|
| X.L | Motorine B de Luxe | Mobiloil D | Triple Shell |
| L | Motorine C de Luxe | Mobiloil AF | Double Shell |
| IL | Motorine C | Mobiloil BB | Triple Shell |
| A | Motorine M | Mobiloil A | Double Shell |
| sttrollo | Motorine U.C.L. | Gargoyle Upper Cylinder Lubricant | Shell Upper Cylinder Lubricant |
| Oil D | Motorine Amber B | Mobiloil C | Shell Spirax |
| edium | Belmoline C | Mobilgrease No. 4 | Shell R.B. Grease |
| tiing Oil | —— | Voco Penetrating Oil | Shell Penetrating Oil |

LACK OF POWER OR MAXIMUM SPEED. Butterfly not opening fully. Note that when the accelerator is depressed fully, the butterfly opens to its greatest extent. This can be checked by observing the position of the limit screw which should be in contact with the boss cast on the outside of the throttle chamber.

INSUFFICIENT ADVANCE. This is a prevalent cause of both heavy petrol consumption and insufficient top speed, and can be usually recognised by inability to make the engine knock when pulling up a hill with fully advanced spark. This, of course, has nothing to do with the carburetter

DEFECTIVE PETROL SUPPLY. This can always be recognised by standard acceleration after a certain speed at which "periodic hesitations" and backfiring occur, curable always by a slight throttle reduction. In such a case, remove the float chamber and note the rate of petrol flow from the needle valve which will frequently be a sufficient indication. For confirmation, make a special test with an independent test tank placed as high as possible on the car so as to ensure a good head.

ENGINE EFFICIENCY. Carburetter and induction pipe joints must, of course, be tight. Compression should be tested, for where this can leak outwards, air can of course leak inwards and so upset the starting and idling mixture. All these items have the greatest ill effect when the engine is turning slowly, i.e., when one is endeavouring to start it, so that it is important to maintain the engine in good order to safeguard against troubles.

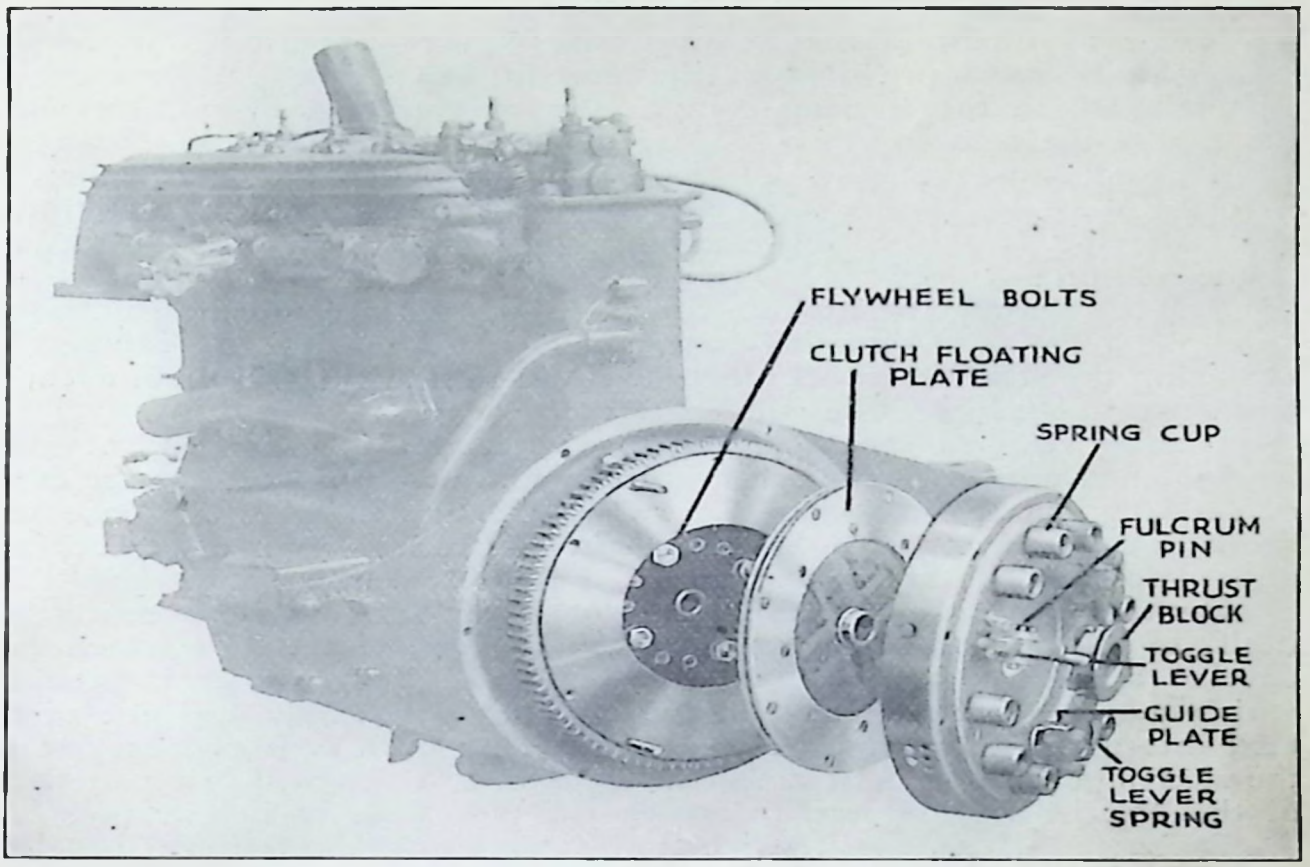
TROUBLES CAUSED BY AIR FILTERS. An air filter with too small a section of filtering medium will frequently raise the consumption owing to the increased vacuum thereby imposed upon the jet. If this is suspected, make a comparative test with the air filter removed. Should the cause be located here, first clean carefully the filtering medium and try again, but if the consumption is still bad it is probably the result of the filter itself being too small.

OVERHEATING. It is seldom that the carburetter is the cause of this and it is definitely impossible, strictly speaking, where water-cooling is concerned. Too much petrol or, on the other hand, an excessively weak mixture can certainly raise the temperature a little, but in no case should it nearly approach the margin of cooling that should be provided by the water cooling system under normal conditions.

Apart from a major examination, the most likely directions in which to work are reducing the mixture, but not to an unduly weak condition, and advancing the ignition as far as possible consistent with the avoidance of knocking.

In passing, a retarded spark will always raise appreciably the engine temperature, hence these brief notes concerning the ignition timing.

# CLUTCH




VERY little need be said about this unit as the operation of the clutch is entirely automatic, adjustment only being provided to alter the clearance to the foot pedal.

No provision is made for lubrication other than the oil port which is drilled in the constant pinion for the purpose of allowing a small quantity of oil from the gearbox to reach the splines of the clutch floating plate. It is, however, policy to make a practice of oiling the clutch withdrawal mechanism with a hand oil-can when the routine chassis lubrication is carried out.

In course of time wear of the clutch friction plates will make adjustment necessary. This is most readily observed by a lack of free play in the foot pedal—it should be possible to depress the pedal at least one and a half inches before the pressure of the clutch springs is felt.

The adjustment is arranged on the coupling rod which connects the clutch pedal to the clutch operating lever and when adjustment is necessary slacken the lock nuts, turn the coupling rod until the desired amount of free play is obtained and re-tighten the lock nuts.

Too much free movement in the pedal is inclined to prevent the clutch from fully disengaging and will make gear changing difficult. Too little movement will definitely prevent the clutch engaging and will result in slipping and will cause damage to the friction plates.

Both the clutch and the brake pedals are adjustable at the stem for pedal reach and to effect this adjustment, merely release the lock nuts holding the stem to the pedal, set the pedal to the required position and re-tighten the lock nuts.

# STEERING AND FRONT AXLE ASSEMBLY

THE only attention the steering box requires is periodic lubrication. 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 shall 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.

On the 1½ Litre model adjustment is provided on the steering box itself, to take up the slackness between the worm and nut which may develop after a considerable mileage. A small key spanner is provided which may be inserted through a small plug hole in the top side of the box, into a special locking bolt in the steering nut. It is necessary to set the steering wheel straight ahead in a position which will bring the head of the bolt in the nut into line with the plug hole in the steering box.

Excessive tightening of the bolt will tend to make the steering stiff : therefore, this adjustment should be handled with discretion.

## 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" ⅛in. 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.

# BRAKES

## GENERAL DESCRIPTION

THE brakes fitted to the Singer Sports Models are of the Lockheed Hydraulic type. The foot brake operates on all four drums, the hand brake on the rear drums only.

In the Lockheed fluid brake, the effort from the foot pedal is conveyed to the brake shoe by means of a column of fluid, which is incompressible. This special fluid has been developed as a result of many years of research, and for Lockheed fluid brakes to function satisfactorily and remain efficient GENUINE LOCKHEED BRAKE FLUID MUST BE USED EXCLUSIVELY.

The Lockheed fluid brake consists of a master cylinder in which hydraulic pressure is generated; wheel cylinders operating the brake shoes; a supply or reserve tank by which the system is maintained full of fluid; and the "line" consisting of copper tubing, flexible hoses and unions interposed between the master cylinder and the wheel cylinders.

The master cylinder is fitted with a piston and the wheel cylinders are each fitted with opposed pistons, all of which are provided with cup washers which act as a seal to maintain pressure and prevent any loss of fluid. When pressure is applied to the foot pedal, the piston within the master cylinder is forced forward and causes the fluid to flow through the copper tubing and flexible hose connections into the wheel cylinders (Fig. 1).

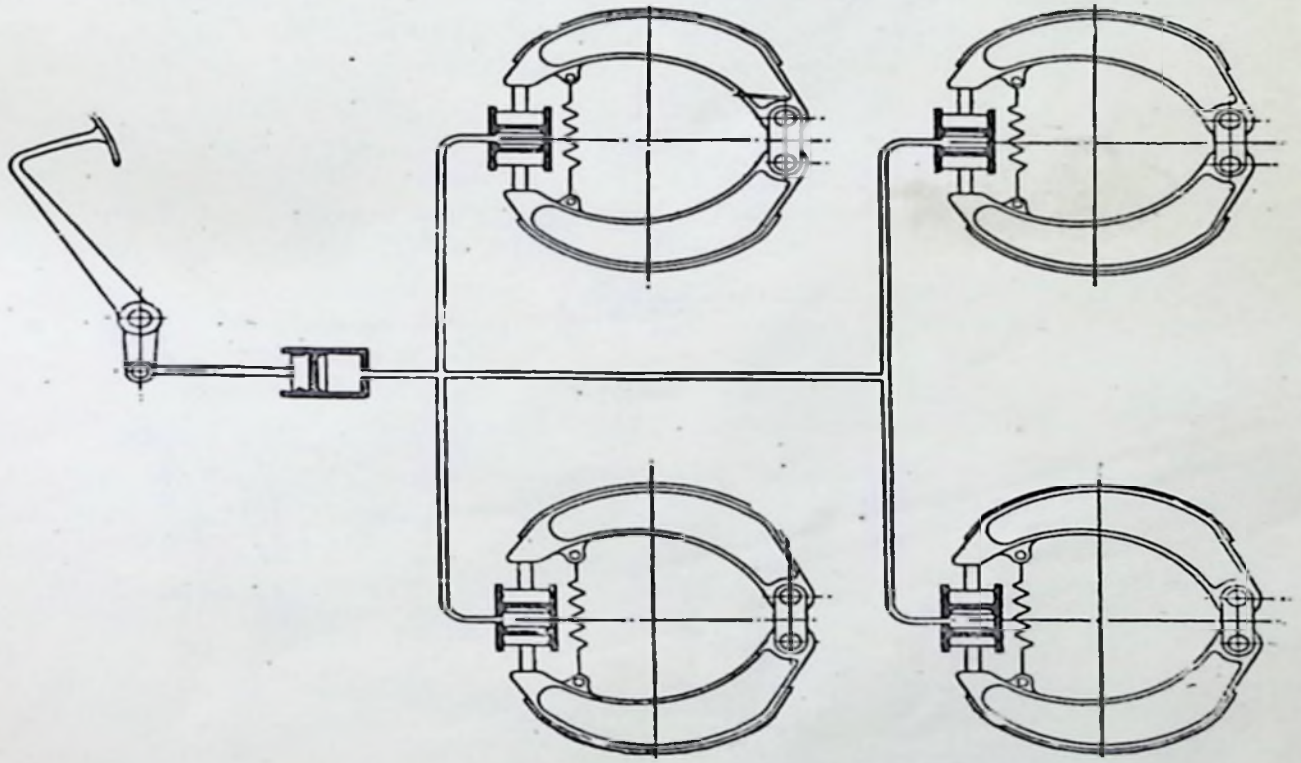


Fig. 1.

The brake fluid enters into each of the wheel cylinders between their opposed pistons, causing the latter to move outwardly against the brake shoes, thus bringing the shoes into contact with the drums.

The pressure generated in the master cylinder is transmitted to each wheel cylinder "with equal and undiminished force", and the efforts supplied to all shoe tips are identical, providing perfect equalisation with the maximum of efficiency thus obtaining infinitely longer wear of the shoe linings.

When the pressure on the foot pedal is released, the brake shoe return springs force the wheel cylinder pistons to their normal "off" position, and the fluid is forced back through the pipe line into the master cylinder.

THE MASTER CYLINDER. The single outlet barrel type compensating master cylinder is designed to maintain automatically in the system when at rest, a constant volume of fluid at a uniform pressure of 8 lbs. per square inch, this pressure acting as a liquid expander on all rubber cups ensuring a complete and efficient sealing of the system.

Automatic compensation for expansion or contraction of the fluid due to temperature changes is provided by inlet and outlet valves. The special Lockheed brake fluid used in the system is immune from freezing and unaffected by high temperatures.

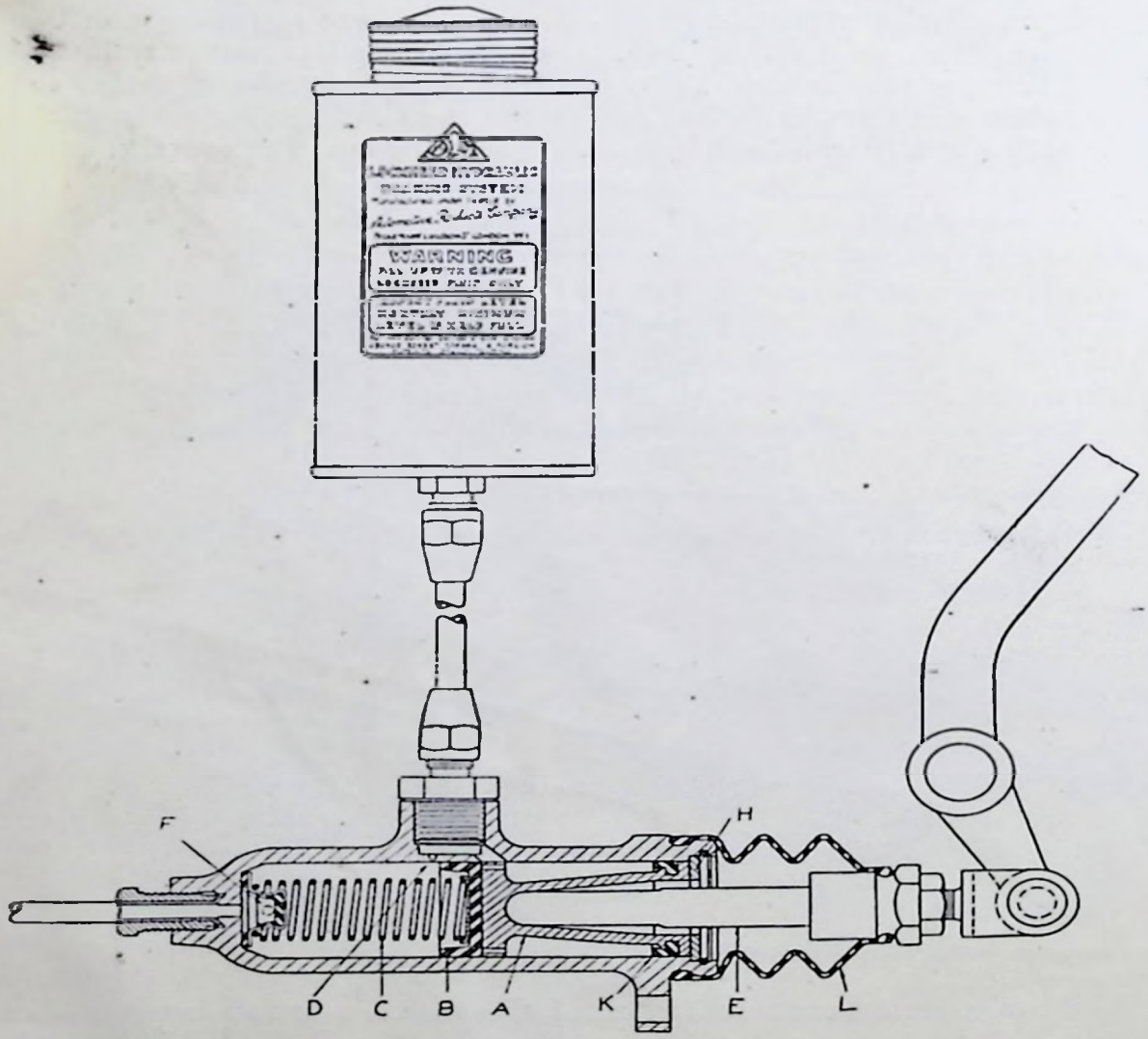



Fig. 2.

Within the master cylinder, Fig. 2, is a piston (A) and a cup washer (B), normally held in the "off" position by a coiled spring (C). Immediately in front of the cup washer, with the piston in the "off" position is a small port hole (D), connecting the cylinder interior with the hollow boss above it, which is connected by a length of copper tube to the fluid supply tank. With any rise in temperature, causing the fluid to expand in the system, the fluid is allowed to pass through the port into the supply tank. With any drop in temperature causing the fluid to contract, the fluid flows back through the port, thus a constant volume of fluid is maintained in the system.

Pressure is applied to the piston (A) by means of a push rod (E), which is attached directly to the brake pedal and is adjustable.

In the head of the master cylinder, held in place by the return spring (C) is a combination inlet and outlet check valve (F). The function of this valve is to cut off the return to the master cylinder of fluid pumped into the pipe line during the bleeding operation, thus ensuring a fresh charge of fluid being delivered at the next stroke of the pedal.

When the brakes are applied, the master cylinder piston is pushed forward and fluid is forced through holes in the metal valve body deflecting the walls of the rubber cup and so passing into the system. When the pedal is released, the master cylinder return spring forces the piston back to its "off" position against its stop (H, Fig. 2), at the same time the pistons in the wheel cylinders are forcing fluid back and so lifting the whole valve assembly off its seat by the action of the brake shoe return springs until the fluid pressure balances with the effort of the master cylinder return spring, and the inlet valve closes.

Leading from the interior of the hollow boss above the cylinder to the annular space formed by the reduced skirt of the piston (A), is a large diagonal port. Through this port the annular space is at all times kept full of fluid from the supply tank, leakage at the rear of the piston being prevented by the secondary cup K.

If for any reason the return of fluid is insufficient to equal the displacement caused by the return of the master piston, a vacuum is created in the master cylinder sufficient to cause the master cup (B) to turn in at the lip and allow the fluid to bypass from the annular space, through the small holes in the master piston head into the master cylinder.

Any excess fluid thus introduced into the system will pass freely into the supply tank to the port (D) when the master piston returns to its "off" position.

The open end of the master cylinder is fitted with a rubber boot (L) to prevent the ingress of dirt.

THE SUPPLY TANK. Is attached to the dash board, where it is accessible, and is connected to the master cylinder by a copper pipe. The tank should be kept three-quarters full of GENUINE LOCKHEED BRAKE FLUID.

THE PROPER ADJUSTMENT OF THE BRAKE PEDAL. It is important that the push rod (E) should have a slight clearance where it seats in piston (A) when in "off" position. Should the push rod be

adjusted tightly against the piston the port hole (D) will be covered by the cup washer (B), thus preventing the compensating action of the master cylinder.

It is essential that the cup washer (B) should be clear of the port hole (D). To be absolutely sure of this allow the brake pedal a slight amount of free movement before the master cylinder piston starts to move. The adjustment is made at the forked end of the push rod.

TO REMOVE THE MASTER CYLINDER FROM THE CHASSIS. Drain the supply tank. To do this conveniently, disconnect the pipe at the cylinder head, depress the brake pedal slowly by hand, allowing the fluid expelled to flow into a clean container. Repeat the performance until the tank is drained. Detach the push rod from the foot pedal and, having removed the three bolts holding the cylinder to the chassis, withdraw the cylinder.

TO DISMANTLE MASTER CYLINDER. Remove the rubber boot and the piston retaining spring clip and washer, and then draw the piston from the barrel. The cup, spring and valve are then removable.

CLEANING AFTER DISMANTLING. ANY NECESSARY CLEANING MUST BE CARRIED OUT WITH LOCKHEED BRAKE FLUID. NEVER USE PETROL, PARAFFIN OR OIL.

TO REASSEMBLE THE MASTER CYLINDER. Dip all parts in .OCKHEED BRAKE FLUID.

Hold the cylinder vertically and drop in the rubber washer, making ure that it seats concentrically in the cylinder head. Insert valve body and cup assembly in end of spring and drop into cylinder. Insert master cylinder cup, pressing it firmly on to end of spring. Replace the piston and secondary cup assembly, preferably using a special tool obtainable for the purpose.

THE PIPE LINE. The pipe line is composed of special copper tubing, tested to withstand high pressures, and internally clean and free from any scale or dirt. Inspect periodically for loose or misplaced pipe clips, to prevent vibration of the tubing and possible fracture.

THE PATENT FLEXIBLE HOSE. The patent flexible hose is specially manufactured by Messrs. Lockheed and is tested to withstand six times the highest pressure ever applied when braking.

THE WHEEL CYLINDER. The wheel cylinder, Fig. 3, is mounted rigidly to the brake shoe back plate, and the opposed pistons act through push rods directly on the tips of the brake shoes. The ends of the wheel cylinder are fitted with rubber boots to protect the cylinder from dust or dirt. At the uppermost position and between the opposed pistons is a bleeder screw required for expelling all air when filling the system.

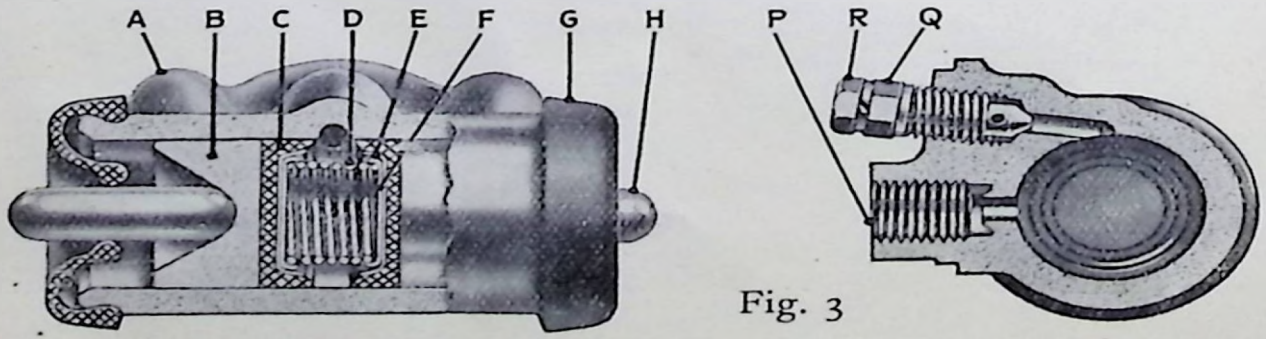



Fig. 3

## DISMANTLING INSTRUCTIONS

REMOVAL OF THE FRONT WHEEL CYLINDER. It is advisable not to unscrew the flexible hose at either end. Proceed, therefore, as follows : Disconnect copper tubing from the hose union (A, Fig. 4) at the frame, then remove the nut and lock washer B, when the hose union may be removed from the bracket. Unhook the brake shoe return spring. Removal of the two set screws holding the cylinder to the back plate allows the cylinder to be withdrawn with the hose in place.

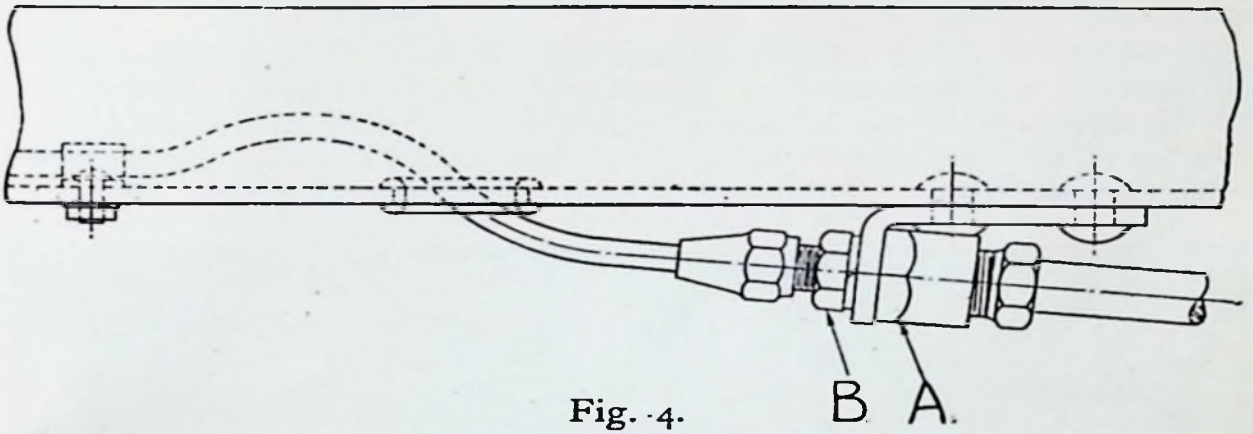



Fig. 4.

REMOVAL OF THE REAR WHEEL CYLINDER. Follow the above instructions except that the copper tubing must be disconnected at the cylinder inlet.

REMOVAL OF BRAKE SHOES. Unhook the brake shoe return spring and release the brake shoe anchor pin, after which the shoes may be pulled off. In assembling these operations are reversed.

TO RE-LINE BRAKES. When re-lining brake shoes, it is important that the same make and quality of lining be used on all four wheels, otherwise the braking on the wheels will be unequal.

TO ADJUST BRAKES. When lining wear has reached a point where the foot pedal goes almost to the floor board, it becomes necessary to adjust the brake shoes into closer relation to the drums. Raise the

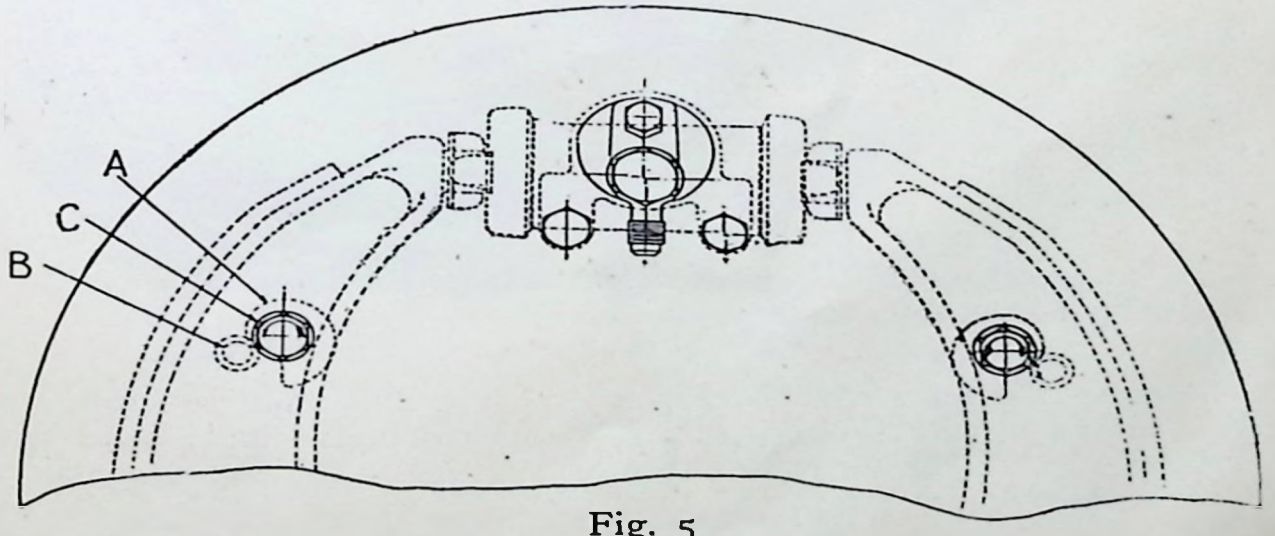



Fig. 5

car on a jack until the wheel is free. Adjustment is made by rotating the adjustment cam (A, Fig. 5) against a stop pin (B) on the shoe. Rotate the adjustment nut (C) with a wrench, until brake shoe comes into contact with drum. Then back off adjustment slightly, until the wheel rotates freely without any appreciable drag.

SPECIAL NOTE. One complete turn of the adjustment nut (C) is sufficient to take up ALL lining wear. When adjusting, the adjustment nut will only require a PARTIAL TURN before shoes are brought in contact with drum.

BLEEDING THE LINE. Whenever any part of the system has been disconnected, it is necessary to bleed the system in order to expel all air. Fill the supply tank with genuine Lockheed brake fluid before starting this operation, and keep the tank at least half full of fluid during the whole period of bleeding.

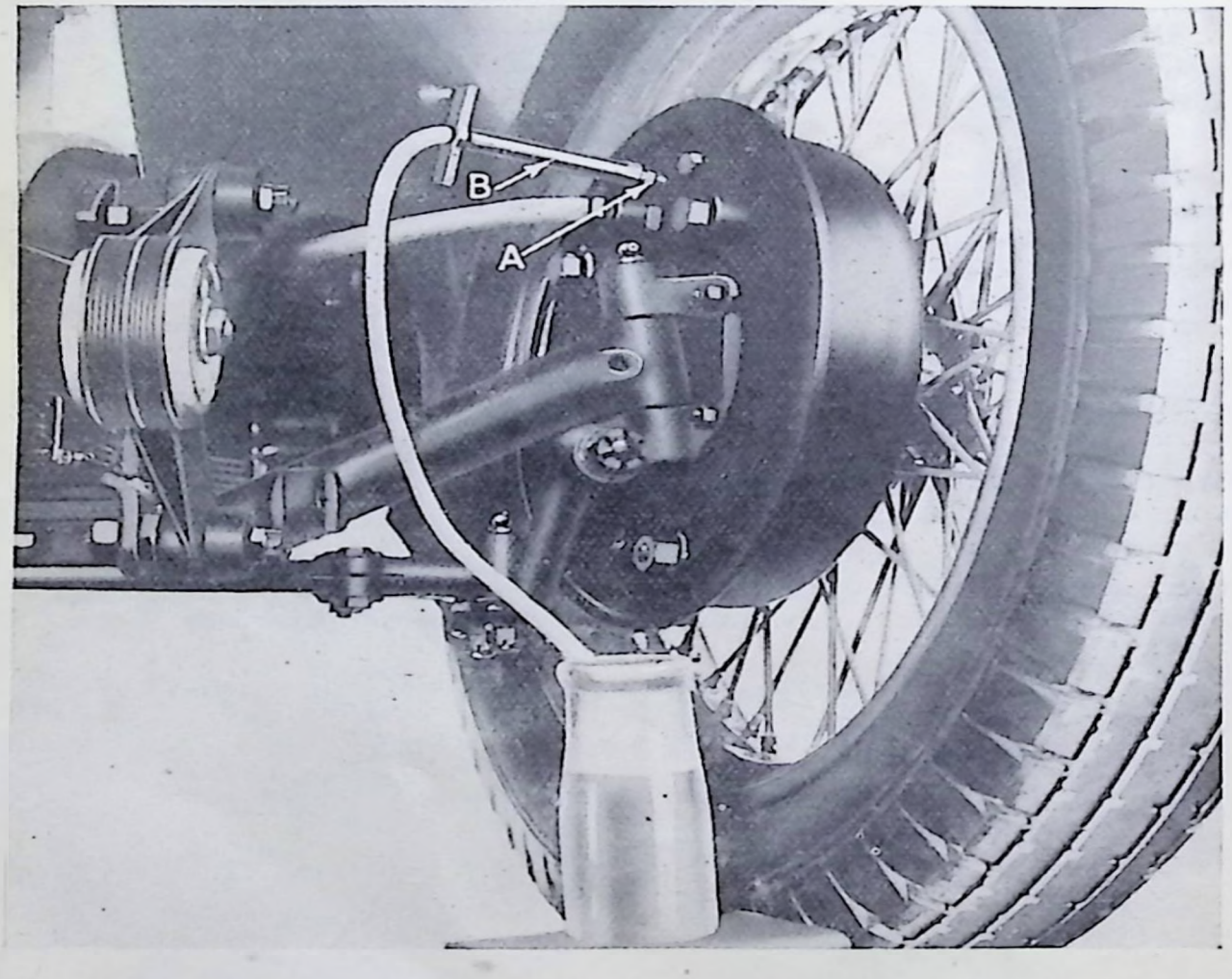



Fig. 6.

Remove the set screw (A, Fig 6) from end of bleeder screw, and screw in the bleeder drain which is a screwed brass nipple fitted with a rubber tube. Allow the rubber tube to hang into a clean glass container, unscrew the bleeder screw one turn with the wrench (B, Fig. 6), and depress the foot pedal quickly, allowing it to return fully without assistance.

This gives a pumping action which forces fluid out at the wheel cylinder carrying with it any air that may be present. No less than ten strokes of the foot pedal will be necessary to bleed each wheel cylinder. Watch the flow of fluid from the bleeder drain, the end of which should be kept below the surface of the fluid, and when all air bubbles cease to appear close the bleeder screw. The bleeding operation must be repeated on each wheel cylinder, and the supply tank replenished each time. Should the supply tank be drained during the bleeding operation, air will be drawn into the system at this point, necessitating rebleeding.

EQUALIZATION OF BRAKES. No adjustment is required for equalisation. Adjustment is only necessary to compensate for wear of the brake lining. While the pressure delivered to the brake shoes will always be equal, yet paint, grease, oil or any foreign substance on the brake lining will so change the co-efficient of friction of the lining, that the brakes will be unequal. This unequality can only be remedied by first thoroughly cleaning the linings with petrol or methylated spirit and then scraping them. Should the linings be thoroughly saturated, it will be necessary to reline the brake shoes affected.

## HOW TO LOCATE BRAKE TROUBLES

EXCESSIVE PEDAL TRAVEL. (Requires pumping).

(a) Brake shoes require closer adjustment to the drums.

(b) A leakage in the system—tighten line unions.

PEDAL FEELS SPRINGY.

(a) The system requires bleeding, see page 60.

(b) No fluid in supply tank—replenish.

INEQUALITIES IN BRAKING.

(a) Shoe linings not bedded in—of different makes or grades—rectify or reline.

(b) Protruding rivets or scored drums—rectify.

(c) Grease on shoe linings—carefully clean or scrape.

POOR BRAKING.

(a) Brake shoe linings worn, or greasy—reline.

BRAKES STAY "ON".

(a) Brake shoes too closely adjusted—readjust.

(b) Brake shoe seized on anchor pins—rectify.

(c) Brake shoe return springs weak or broken—renew.

(d) No initial clearance on pedal—it is essential to have free pedal play of about half an inch at the pedal tip to allow the piston in the master cylinder to go right back in the "off" position, to release excess fluid pumped into the system when the brake is applied. If there is no pedal slack when in the "off" position, it prevents the release of the fluid thereby keeping the brake shoes on. A floor board fouling the pedal may cut out this required pedal slack, or incorrect adjustment of the pedal gear may also be the cause—see page 59.

(e) The master cylinder cup and/or wheel cylinder cups sticking in the cylinder bores due to the use of spurious fluid—thoroughly flush out the system with genuine Lockheed brake fluid and fit new rubber parts.

BRAKE DRAG.

(a) The shoes adjusted too closely to drums—readjust.

(b) Hand brake operating mechanism seized or is fouling some portion of the chassis, etc.—release.

(c) Brake shoes are tight or seized on their anchor pins or brake shoe return springs weak or broken—remedy.

(d) No initial clearance on foot pedal—remedy.

(e) Oil or spurious fluid in system—cleanse and replenish.

(f) Wheel bearings loose—remedy.

BRAKES GRAB OR THE CAR PULLS TO ONE SIDE.

(a) Brake linings incorrectly bedded—re-bed linings to drums and chamfer ends.

(b) Brake linings have varying co-efficients of friction due to grease, etc.—cleanse or reline.

(c) Incorrect inflation of tyres—check and rectify.

(d) Back plate loose on axle or front spring loose at anchorage—check and rectify.

DO NOT under any circumstances use any substitute for genuine Lockheed brake fluid. The use of other than genuine Lockheed brake fluid will NULLIFY ALL GUARANTEES given by both the Car Manufacturer and the Lockheed Hydraulic Brake Co. Ltd.

If any difficulties are experienced, consult a Lockheed Service Station for advice.

## HAND BRAKES

These are normally adjusted by a wing nut mounted on the hand brake lever, and accessible without in any way interfering with the front seats or removing the floor boards. The hand brake should be so adjusted that the lever is pulled "on" four notches to give full braking effect.

To adjust, jack up the rear wheels until both are clear of the ground, pull the hand brake lever "on" about two notches, then adjust by means of the wing nut until the brakes are just rubbing when the road wheels are turned by hand. Release the brake lever and spin both wheels to ensure they are perfectly free.

It is important that the brakes are perfectly free when the lever is in the "off" position, as rubbing brakes cause excessive petrol consumption and lack of power, besides causing undue wear of the brake shoes and linings. **Always be quite certain when driving the car that the hand brake lever is in the "off" position.**

# HARTFORD SHOCK ABSORBERS

ON the 1½ Litre and 9 h.p. Models, Andre Hartford type shock absorbers are fitted, and each shock absorber is set to a certain initial tension when it is fitted to the car, and no change in this adjustment should be made until the car has been driven about a hundred miles over all conditions of road surfaces.

Carefully note the riding qualities of the car. If the spring action seems too free, increase the frictional resistance of each shock absorber by turning the centre adjusting nut to the right or clockwise, but not more than one graduation at a time.

If the spring action seems too retarded and feels stiff, reduce the frictional resistance again by turning the adjusting nut to the left or anti-clockwise. Careful adjustment in this manner will produce an ideal condition. The springs will still have the required amount of flexibility for easy riding, but spring vibration will be reduced to a minimum and violent rebound effectively eliminated.

Re-adjustment may only become necessary after several thousand miles of car travel, and should be made only when the spring movement seems too free and then the indicator should be moved not more than one half of a graduation at a time.

It should be noted that the full benefit of the shock absorbers will not be felt when the car is travelling at low speeds, as under these conditions the spring movement is very limited, but as the speed increases their effect becomes more pronounced, especially over bad roads when the spring action is most severe.

Testing should, therefore, be carried out at comparatively high average touring speeds, and adjustments made to suit these conditions.

The frictional resistance required to effectively control the action of the springs is comparatively small, and care should be taken not to increase the pressure when adjusting more than is absolutely necessary to obtain the desired results. The initial setting of the shock obsorbers is approximately correct under normal conditions, but fast sporting cars and for road and track racing, a considerable increase in pressure may be required.

# OVERHAULING INSTRUCTIONS

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

The car should be returned to one of our Service Depots so that the work may be properly carried out. 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.

The methods of dismantling the various parts of the chassis are described for the benefit of mechanics who will have the work to do, but may be unfamiliar with the construction of the Singer Sports Models.

## REMOVING ENGINE FROM CHASSIS (1½ LITRE MODEL)

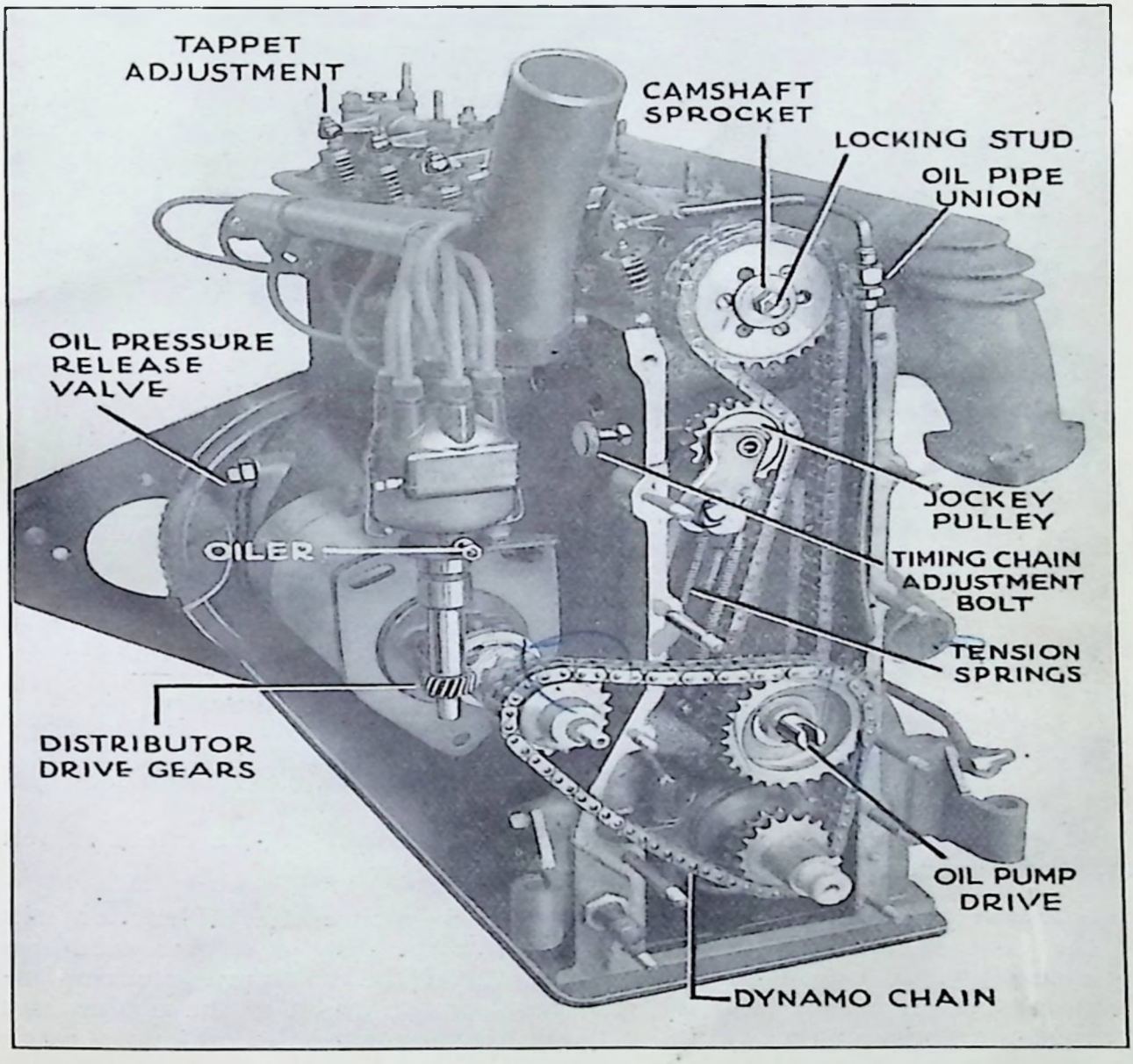
Remove bonnet as for decarbonising.
Drain water cooling system.
Remove front seats and seat boards, toe boards, etc.
Disconnect battery.
Disconnect head lamps and remove lamps and brackets from front wings and radiator cowl.
Remove bonnet support channel, disconnecting two clips securing the thermometer pipe.
Disconnect thermometer tube from radiator top tank.
Remove flexible hose pipes from radiator and water pump.
Remove radiator anchorage bolts and take radiator from chassis.
Disconnect speedometer cable at gearbox end.
Disconnect accelerator pedal.
Remove cover over propeller shaft.
Remove body battens running parallel with propeller shaft.
Disconnect front end of propeller shaft.
Remove Bowden cable attachment from remote control extension.
Remove six studs securing gearbox lid and remote control mechanism.
Remove clutch inspection cover.
Disconnect clutch pedal link at pedal and remove pedal stop plate.
Remove nuts and bolts round perimeter of clutch extension case.
Withdraw gearbox from chassis.
Disconnect carburetter controls and remove carburetters.
Disconnect oil gauge pipe.
Disconnect starter motor lead and remove starter motor.
Disconnect sump temperature gauge.
Remove junction boxes and bracket from engine case
Disconnect magneto control.
Disconnect exhaust pipe.
Disconnect dynamo lead.
Remove engine from chassis frame by first taking the weight of the engine with pulley block and tackle.
Remove two bolts from each front engine bearer.
Remove four bolts from offside rear bearer.
Remove four bolts from nearside rear bearer and clutch pedal stop bolt.
Swing engine to nearside to clear steering box and lift from chassis.

## REMOVE TIMING CASE AND TIMING GEAR ASSEMBLY

Remove fan by taking away three nuts and washers securing fan bracket to timing case.

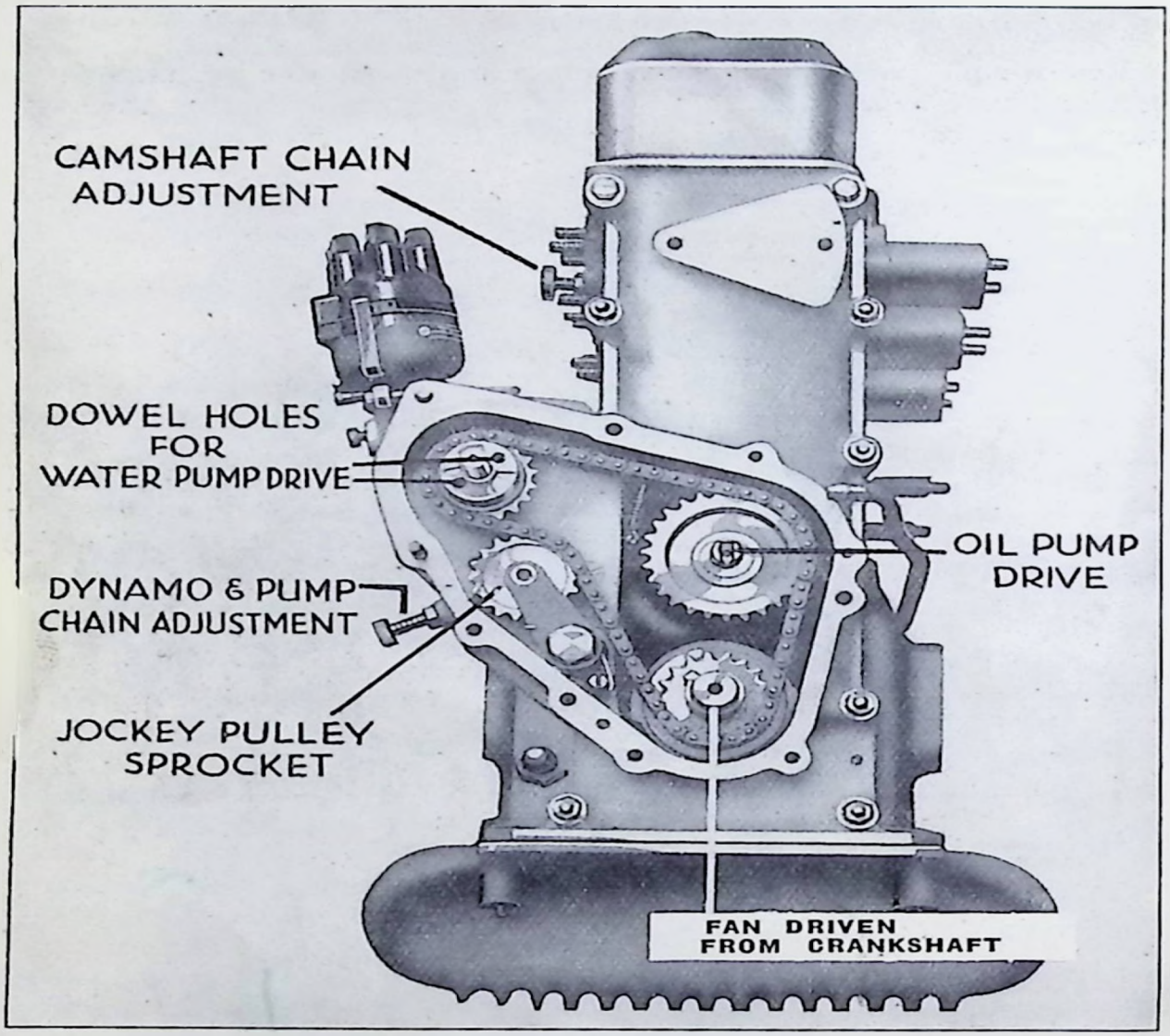
Remove fan pulley by releasing the nut and split pin which secure the fan pulley to the dynamo and magneto driving sleeve. The fan pulley is keyed on to the sleeve.

Remove the water pump by disconnecting the hose clips, remove the hoses and take away three nuts and spring washers anchoring the water pump to the case. The water pump may then be taken away.




It will be noted that the water pump drive is in the form of two dowels locating in dowel holes on the boss of the distributor drive sprocket, and that the method of anchoring the sprocket to the distributor drive shaft is by means of two set screws and a locking washer in place of a nut.

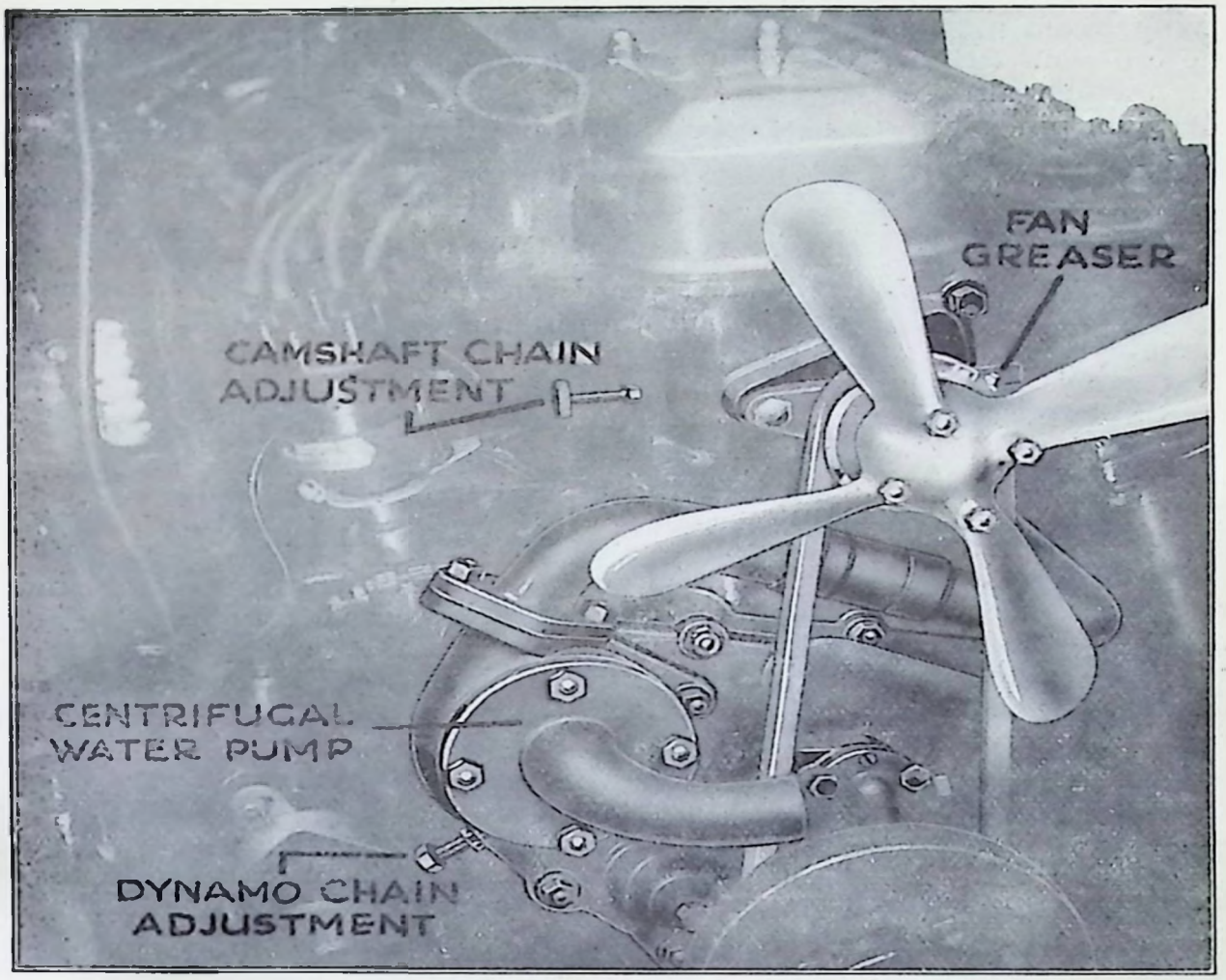
There is also on this model, a separate chain tensioner fitted to the dynamo chain. The construction of the tensioner is exactly the same as that fitted to the camshaft chain, but the bolt has a $\frac{5}{16}$in. square head instead of a knurled nut.




To adjust, screw in the bolt until the tension of the chain is felt, then screw back half a turn and tighten the lock nut.

Release the union and banjo nut which secure the oil suction pipe to the oil pipe and the oil pump. Remove the camshaft main feed pipe by releasing the union in the oil sump and the set screw securing the union to the oil pump, also the set screw for the union to the timing case. Release the four set screws and tab washers securing the oil pump to the timing case, and withdraw the pump.

Remove the vibration damper by unscrewing the dog which secures the damper to the crankshaft. The dog is machined with a right-hand thread, and it will be necessary to manufacture a slotted tubular spanner to fit the pin through the dog.




Remove the timing cover by taking away the eight nuts and washers and withdrawing the cover from its dowels.

Remove the magneto by releasing the bolt which secures the advance and retard lever, and the two studs which secure the magneto to its housing. This unit may then be withdrawn.

Remove the dynamo and magneto driving chain by taking away the fan pulley key from the dynamo driving sleeve, withdrawing the oil flinger and extracting the dynamo driving sprocket which is also keyed on to the sleeve. The dynamo and magneto drive housing may then be withdrawn and the driving sleeve pushed out of its bearing. The dynamo chain wheel and chain may then be removed.

Remove two studs at the top of the timing case, seven nuts and washers and three studs from the front of the sump. The timing case may then be withdrawn.

Remove the camshaft chain wheel in the manner previously indicated under the heading of decarbonising, and to take away the camshaft driving chain it is merely necessary to remove the intermediate timing shaft thrust washer and to take away the intermediate gear assembly complete.

To dismantle the timing chain tensioner, remove the front tension springs from the chain tensioner sprocket arm by releasing the spring from the top pin. Remove the set screw from the spring anchor in the engine case, which also secures the rear tension spring at the bottom. Release the pivot pin, plain washer, spring and fibre washer securing the tensioner sprocket arm to the engine case, and withdraw the tensioner.

## REMOVING BIG END BEARINGS, ETC.

Remove the cylinder head as for decarbonising.

Remove the dip stick, drain the engine oil and remove the sump assembly.

Remove the main suction pipe (inside the engine case) by extracting the oil sump stud which acts as a set screw on the oil pump union nut, and tap out the union which is a taper fit in the engine case.

Extract split pins and release the nuts from the connecting rod bolts.

Remove the connecting rod caps and push the connecting rods and pistons up the cylinder bores.

Push out the gudgeon pins, remove pistons and rings from connecting rod and by revolving the crankshaft to clear each cylinder bore the connecting rods may be withdrawn from beneath.

Remove the outer studs securing the clutch cover plate assembly to the flywheel and withdraw the clutch. Next release the tab washers and remove the four bolts securing the flywheel to the flange of the crankshaft, and withdraw the flywheel.

Remove eight nuts securing the engine rear bearer plate to the cylinder casting and withdraw bearer plate from dowels on which it is located.

Remove split pins and nuts from the four main bearings, remove the four main bearing caps and withdraw the crankshaft from the cylinder case.

## REMOVING ENGINE FROM CHASSIS (9 H.P. MODEL)

Remove bonnet and bonnet support channel as for decarbonising.

Release one union nut and two screws and nuts securing thermometer pipe line.

Remove positive battery lead.

Remove head lamp rims, bulbs and reflectors, release small clamp pin at base of head lamp rim, and lift rim and glass away. Remove bulb, release grub screw at top of head lamp shell securing reflector into position, twist reflector clockwise until free from bayonet fixing. Disconnect wires from screw and clip at rear of reflector.

Disconnect head lamp tie bar by removing two bolts securing tie bars to front wings. Tie bar fixing to radiator need not be detached.

Disconnect wing stays at base of radiator by removing three set screws from each side.

Drain water cooling system as for decarbonising, disconnect top and bottom hose connections, remove two radiator anchorage bolts securing base of radiator to chassis front cross member and lift radiator away.

Remove fan assembly.

Release ignition control wire, disconnect starter motor cable, remove earth wire from rear stud on engine top water pipe, disconnect dynamo cable.

Release ball joint and nut securing carburetter control rod to cross shaft lever, disconnect carburetter control wire by releasing one nut on carburetter lever and one bolt and nut securing wire bracket to engine bearer.

Unscrew oil gauge pipe union at engine case end.

Release pipe union nuts on balance pipe and pump and remove pipe.

Remove junction box by releasing nut securing junction box bracket to timing cover.

Release revolution counter drive by removing two studs securing drive to dynamo and magneto housing.

Remove three bolts from exhaust manifold flange and remove the lead pipe from the silencer.

Remove front seats and seat boards from chassis.

Remove cowl over gearbox and cardan shaft.

Release accelerator pedal drive on toe board.

Remove carburetter starter control from remote control extension.

Remove gearbox lid and withdraw cardan shaft cover.

Disconnect the propeller shaft by removing the four bolts securing the Hardy-Spicer coupling to the gearbox mainshaft.

Disconnect speedometer drive from gearbox.

Remove gearbox by first taking away two bolts and nuts (two nuts to each bolt) which secure the steady plate to the nearside of the engine rear bearer arm, also two further bolts and nuts on the nearside engine bearer arm. Each bolt passes through the engine arm locking the clutch extension casing with one nut, the other nut locking the steady plate. Remove seven nuts and bolts securing the clutch extension casing to the engine (two at the top, two at the bottom, one of which holds the anchorage for the clutch pedal pull-off spring, and three on the offside which serve the purpose of anchoring the starter motor).

Draw the gearbox towards the rear of the chassis frame, until the splines of the constant mesh pinion are clear of the clutch floating plate centre. The gearbox may then be lifted to the chassis frame.

Remove dynamo by releasing the three anchorage nuts securing the dynamo to its housing. The dynamo will then withdraw leaving the driving gear in position.

Remove engine from chassis frame by first taking the weight of the engine with pulley block and tackle, then release four nuts securing the front "U" bolts of the vibro damper suspension, leaving the two leaf spring and rubbers in position. Release the tension of the rear vibro damper suspension by removing the split pin from the main carrier bolt, slacking off the nut, and taking away the cover. Release the four nuts which secure the "U" bolts under the frame side members, and withdraw the "U" bolts. On the nearside bearer a frame earth connection is attached to one of the "U" bolts. Next tip the engine sightly to the offside by lifting the nearside rear bearer arm. This will allow the offside rear bearer arm to clear the steering column and box.

## REMOVE TIMING CASE AND TIMING GEAR ASSEMBLY

Remove fan pulley by releasing the nut and split pin which secure the fan pulley to the dynamo driving sleeve. The fan pulley is keyed on to the sleeve.

Release the union and banjo nut which secure the oil suction pipe to the oil sump and the oil pump. Remove the camshaft main feed pipe by

releasing the union in the oil sump and the set screw securing the union to the oil pump, also the set screw for the union to the timing case. Release the four set screws and tab washers securing the oil pipe to the timing case and withdraw the pump.

Remove the distributor by releasing the bolt which secures the advance and retard lever, and remove the one stud which secures the distributor to its housing. This unit may then be withdrawn.

Remove dynamo and distributor driving sleeve, taking away the oil flinger and extracting the dynamo driving sprocket which is also keyed on to the sleeve. The dynamo and distributor drive housing may then be withdrawn, and the driving sleeve pushed out of its bearing. The dynamo chain wheel and chain may then be removed.

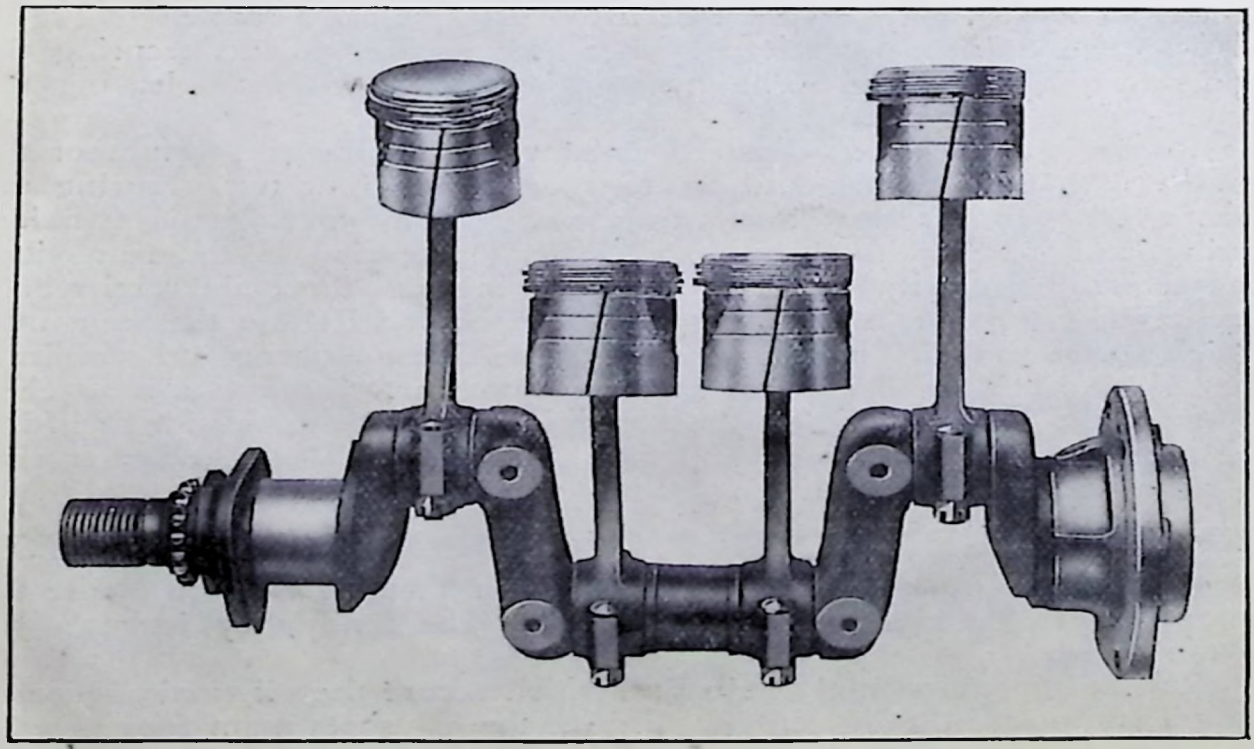
Release three outside nuts and plain washers, two inside nuts and spring washers, and withdraw the timing case from its dowels.

The camshaft chain wheel has already been removed, and to take away the camshaft driving chain it is merely necessary to take away the intermediate timing shaft thrust washer and to take away the intermediate gear assembly complete.

To dismantle the timing chain tensioner, remove the front tension spring from the chain tensioner sprocket arm by releasing from the top pin. Remove the set screw from the spring anchor in the engine case, and which also secures the rear tension spring at the bottom. Release the pivot pin, plain washer, spring and fibre washer securing the tensioner sprocket arm to the engine case, and withdraw the tensioner.

## REMOVING BIG END BEARINGS, ETC.

Remove dip stick and drain engine oil by taking away the drain plug on the offside of the sump. Remove sixteen nuts and washers which secure the oil sump and baffle to the base of the engine case, allowing the oil



sump, tray and filter to be lowered. Care must be taken to avoid damaging the cork washer between the sump and the bottom face of the cylinder case.

Remove the main suction pipe (inside the engine case) by extracting the oil sump stud which acts as a set screw on the oil pump union nut, and tap out the union which is a taper fit in the engine case.

Remove the cylinder head as for decarbonising.

Extract split pins and releasing the nuts from the connecting rod bolts. Remove the connecting rod caps and push the connecting rods and pistons up the cylinder bores.

Push out the gudgeon pins, remove pistons and rings from connecting rods, and by revolving the crankshaft to clear each cylinder bore the connecting rods may be withdrawn from beneath.

As mentioned in the general description the connecting rod bearings are of the full ring type and 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 true 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 remetalling. A nominal charge being made for the replacement rods procured.

## DISMANTLING MAIN BEARINGS, ETC.

When sump, connecting rods, etc., have been removed, proceed as follows :—

Remove six hexagon headed nuts securing clutch cover plate assembly to flywheel.

Remove four nuts and locking plates securing flywheel to crankshaft.

Dismantle timing case, intermediate gear assembly, etc., as previously detailed.

Remove six set studs and locking washers from rear main bearing housing, and withdraw crankshaft and rear main bearing from engine case.

The front main bearing is in the form of a white metal lined bush located in the engine case by one set pin.

## DISMANTLING CLUTCH ASSEMBLY
### (1½ Litre and 9 h.p. Models)

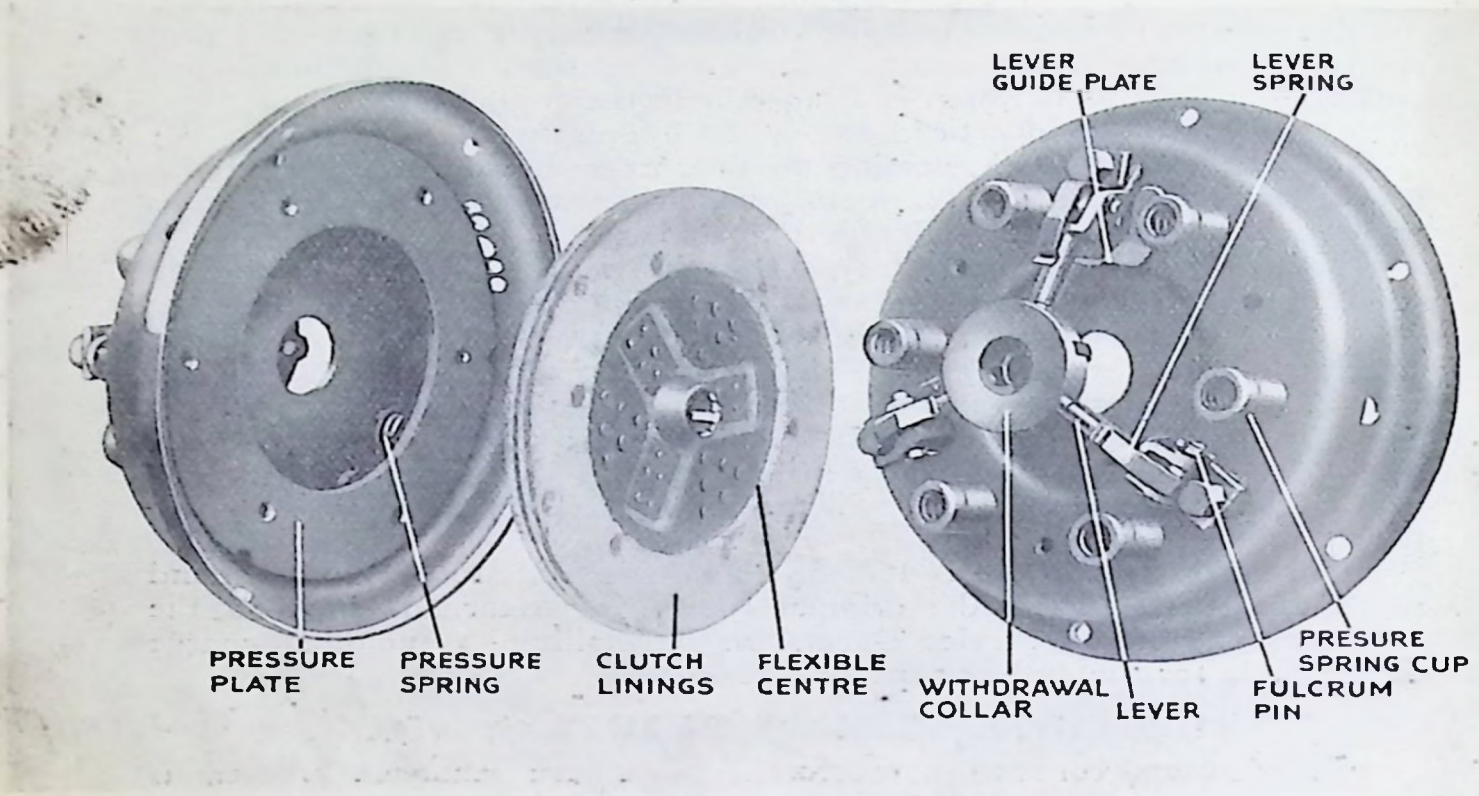
Remove clutch assembly as in engine overhauling instructions.

The clutch floating plate was released when the clutch assembly was removed from the flywheel, and to dismantle the clutch cover plate assembly it is necessary to remove the three toggle lever adjustment bolts and guide plates. This releases the clutch pressure plate and the three toggle lever adjustment springs. Remove the spring cups and clutch springs from the cover plate. There are nine springs and cups on the 1½ Litre model and six on the 9 h.p. model.

Remove the split pins and fulcrum pins which secure the toggle levers to the eye bolts in the clutch cover plate. The toggle levers and thrust collar are then free to be taken away.

Release the three set pins and tab washers which secure the circular plate of spring steel to the thrust collar, this releases the three toggle levers.

Take away the three nuts which secure the eye bolts to the clutch cover plate.




## GEARBOX

A brief description of the gearbox was given in the specification and the method of operating the change speed mechanism was dealt with in the section of this book referring to the control of the car.

Practically the only attention the gearbox needs is the periodic replenishing of the oil level 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. When the car is in motion the movement of the gears throws oil on to all the gears and bearings, and an oil mist is thrown up into the change speed lever control tower to lubricate the selector mechanism.

The filler plug is situated by the change speed lever bracket and the oil level plug is on the offside of the gearbox, access to both being attained by removing the floorboards.

## DISMANTLING GEARBOX (1½ LITRE MODEL)

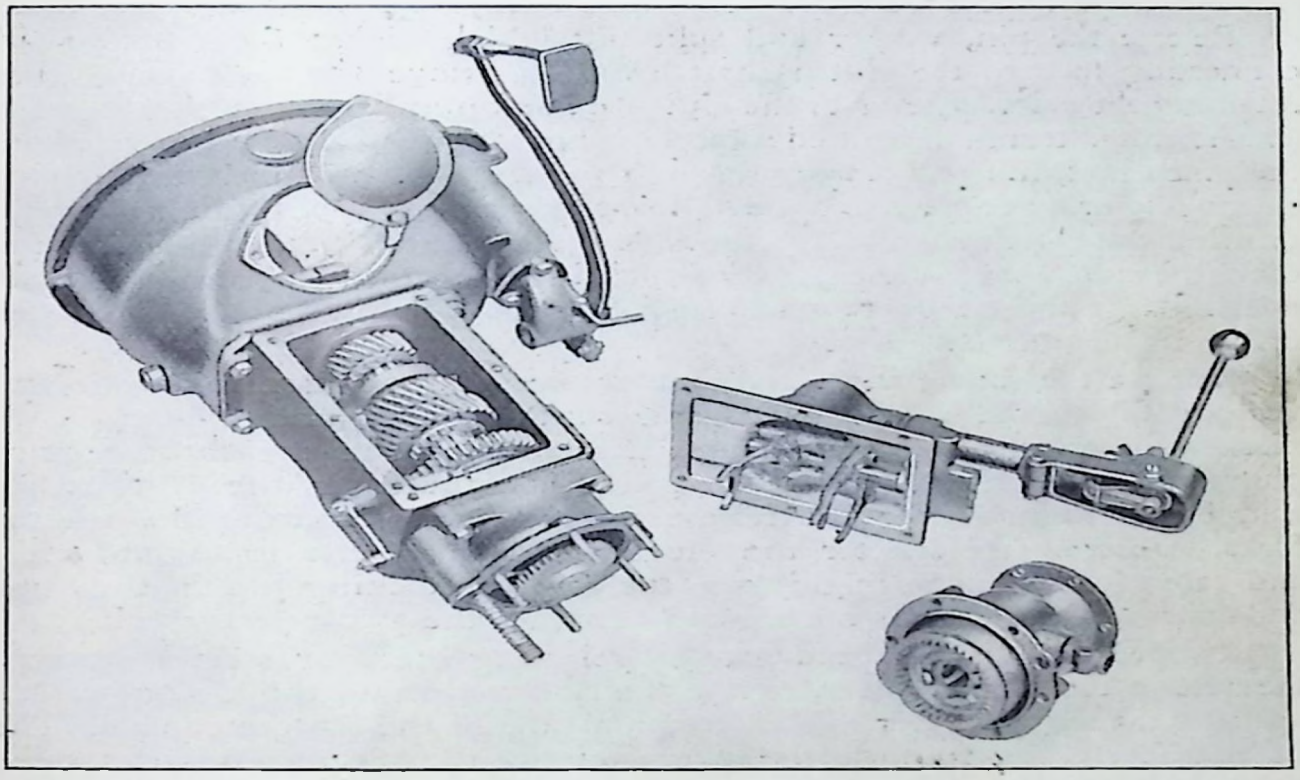
Remove gearbox from chassis as indicated on page 64 (Removing engine from chassis).

After having drained the oil from the gearbox, hold this unit in a vice by means of the drain plug.

Release the pin, washer and split pin which secure the clutch pedal connecting fork to the clutch shaft lever. Remove the two spring clips retaining the shifting lever to the clutch trunnion and remove the trunnion (in the clutch trunnion is fitted a carbon ring which is removed by releasing the pinch bolt, nut and washer through the trunnion). Release the clutch shifting lever, set screw and spring washer, remove split pin and collar

securing the clutch shaft to the nearside of the clutch housing, then withdraw the clutch shaft and the lever which is keyed on to the shaft. The clutch housing is removed by releasing the five nuts which secure it to the front of the gearbox.

Remove six studs and washers which secure the gearbox lid and control tower in position. This will allow the change speed mechanism complete with remote control extension to be withdrawn. Select neutral gear, and release the three selector plunger plugs, springs and selector balls situated in the gearbox lid. Extract the locking wire and release the set screws securing the selector forks. Unscrew the selector rod plugs and remove the forks and rods, and care must be taken that the locking pin in the third and fourth selector rod is not mislaid. Extract the two selector balls.



Remove the change speed gate by releasing the four screws securing the gate to the control tower, release the clamp pin and the spring washer securing the striking lever to the actuating tube of the remote control. The striking lever is keyed on to the tube. Remove the set pin and release the clamp bolt, washer and nut securing the change speed lever bracket to the remote control tube.

The change speed lever bracket and actuating tube can now be withdrawn through the remote control extension tube. Release the clamp bolt, washer and nut securing the remote control tube clip to the control tower and remove the clip.

Release the lock nut and tab washer at the rear end of the gearbox mainshaft, and remove the constant mesh pinion by rotating the pinion until the milled section of the gear will clear the layshaft gear.

Drive out the constant mesh pinion, ball race, etc., and remove spigot bush.

Drive out the mainshaft and rear ball race from the gearbox casing, and remove the mainshaft assembly through the top of the gearbox. Dismantle the mainshaft assembly by sliding off third and top dog, remove nut and tab washer from front end, remove splined dog sleeve, third speed thrust washer and slide off the third gear. Then remove second gear and bush from mainshaft, and withdraw second gear thrust washer.

Remove the layshaft split pin, nut and washer and drive out the layshaft and front ball race, afterwards removing the layshaft gears from the gearbox, extract the layshaft rear ball race.

Release the reverse gear bush retainer pin and extract reverse gear and shaft.

## DISMANTLING GEARBOX (9 H.P. MODEL)

Release the pin, washer and split pin which secure the clutch pedal connecting fork to the clutch shaft lever. Remove the two spring clips retaining the shifting lever to the clutch trunnion and remove the trunnion (in the clutch trunnion is fitted a carbon ring which is removed by releasing the pinch bolt, nut and washer through the trunnion). Release the clutch shifting lever, set screw and spring washer, remove split pin and collar securing the clutch shaft to the nearside of the clutch housing, then withdraw the clutch shaft and the lever which is keyed to the shaft. The clutch housing is removed by releasing the four nuts which secure it to the front of the gearbox.

Remove the six set studs and washers securing the control tower and gearbox lid to the gearbox. Remove control tower and change speed mechanism complete. Select neutral gear and release the three selector plunger plugs, springs and selector rod balls situated in the gearbox lid. Extract the locking wire and release the set screws securing the selector forks. Unscrew the selector rod plugs and remove the forks and rods, and care must be taken in this case too that the locking pin in the third and fourth selector rod is not mislaid. Extract the two selector balls.

Remove the change speed gate by releasing the four screws securing the gate to the control tower, release the clamp pin and the spring washer securing the striking lever to the actuation tube of the remote control. The striking lever is keyed on to the tube. Remove the set pin and release the clamp bolt, washer and nut securing the change speed lever bracket to the remote control tube.

The change speed lever bracket and actuating tube can now be withdrawn through the remote control extension tube. Release the clamp bolt, washer and nut securing the remote control tube clip to the control tower and remove the clip.

Release the split pin and nut securing the universal joint coupling to the rear end of the mainshaft and withdraw the coupling from the mainshaft splines.

Remove the speedometer spindle drive by releasing the screw which secures the guide to the gearbox rear end cover.

Release the four nuts and washers which secure the gearbox rear end cover and remove the cover.

Remove speedometer driving wheel and distance washer.

Remove layshaft split pin, nut and washer. Release the clutch pedal pin and remove the pedal from the shaft.

Remove the constant mesh pinion by rotating the pinion until the milled section of the gear clears the layshaft gear, then withdraw the constant mesh pinion complete with ball race, bush and thrust washers.

Drive the mainshaft and rear ball race out of the gearbox casing by means of a brass drift. Extract ball race and remove the mainshaft assembly through the top of the gearbox.

Drive out the layshaft and front ball race in a similar manner to the mainshaft assembly and remove the layshaft gears from the gearbox. Extract the layshaft rear ball race, release reverse gear bush retainer pin and extract gear and shaft.

## REAR AXLE

A brief description of the rear axle has already been given, and as this unit is hardly likely to need any attention other than that required to ensure sufficient lubrication, it is merely necessary to add that the rear axle should be treated generally in the same way as the gearbox.

The oil level should be replenished about every 1,000 miles and the axle case should be drained, flushed out and refilled with fresh oil about every 6,000 miles. The capacity of the rear axle is approximately five pints (1½ Litre), and three pints (9 h.p.), and care must be taken not to overfill the axle case to prevent any possibility of oil finding its way on to the rear brakes.

In this unit, as in the gearbox, lubrication is provided by the movement of the gears throwing oil to all essential parts of the axle and bearings.

## REMOVING REAR AXLE (Both Models)

To remove the propeller shaft, remove the nuts, bolts and washers securing the rear universal joint flange. The front end of the propeller shaft has been dealt with under the heading of "GEAR BOX". The propeller shaft may then be removed entirely.

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.

Remove the road wheels, release and remove the lifting jacks.

Remove the road spring U bolts by releasing the nuts and eye bolts and pulling the cable through the eye bolts.

Drain the Lockheed brake system and release the unions connecting the nearside and offside cylinder feed pipes to the hose brackets.

Remove the rear axle rubber buffers by releasing the bolts and nuts securing the buffers and retainers to the chassis frame.

Disconnect the shock absorber arms at the shock absorbers, and lift the shock absorbers to the top of their stroke. Disconnect the petrol pipe from the petrol tank.

Remove the rear spring rear shackle pins, release the rear ends of the springs, and withdraw the rear axle from the chassis frame.

## DISMANTLING HUBS AND BRAKES (Both Models)

Remove rear axle drain plug and drain out the oil.

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).

Remove two split pins, nuts and washers from the brake shoe steady bolts.

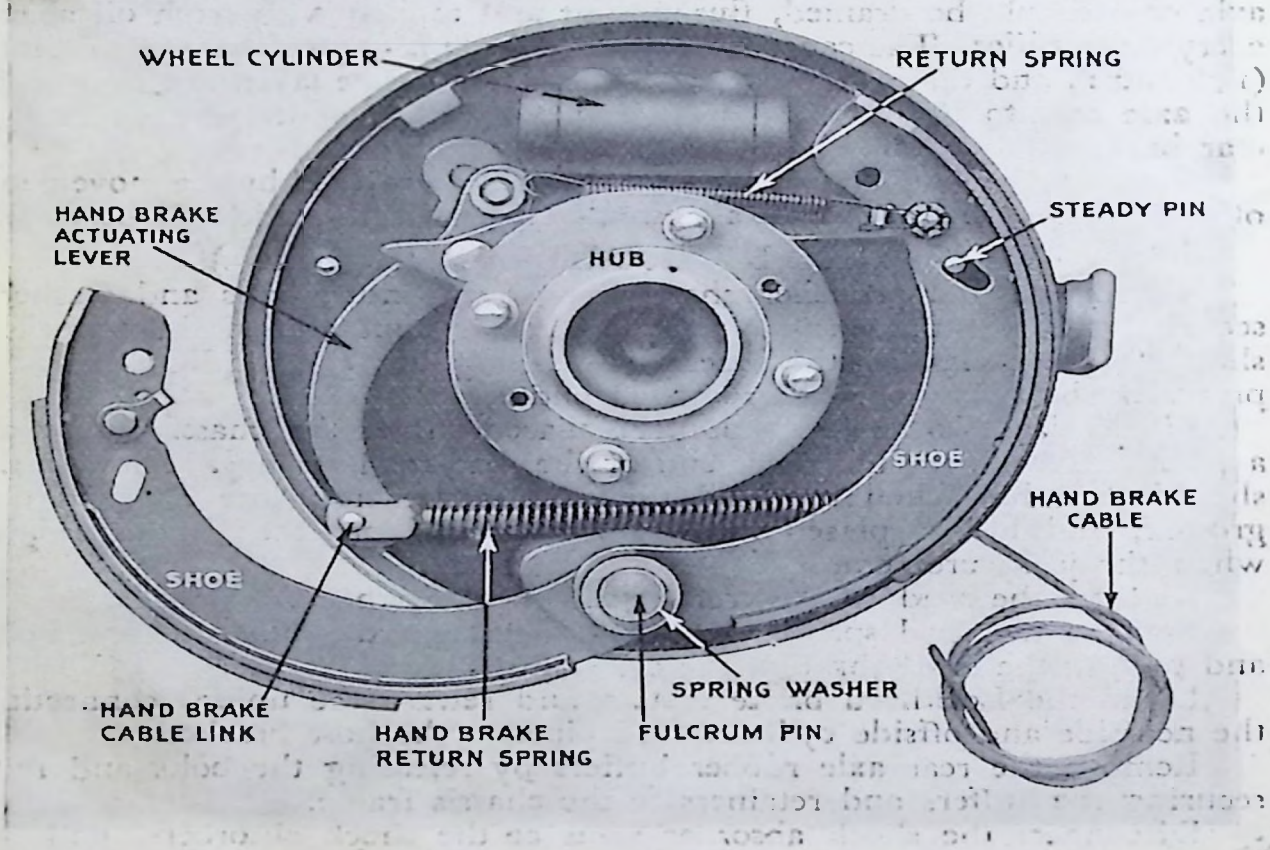
Remove the brake return spring at the top of the shoes.

Remove two split pins and nuts from the top bolts in the shoes securing the hand brake link. Remove split pin and spring washer from brake shoes fulcrum pin.

Remove brake shoes and disconnect the handbrake link from the cable.

Remove four nuts and shakeproof washers securing rear hub assembly to axle case and withdraw the rear hub, bearing housing and bearing together with the axleshaft.

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.




## DISMANTLING REAR AXLE (1½ LITRE MODEL)

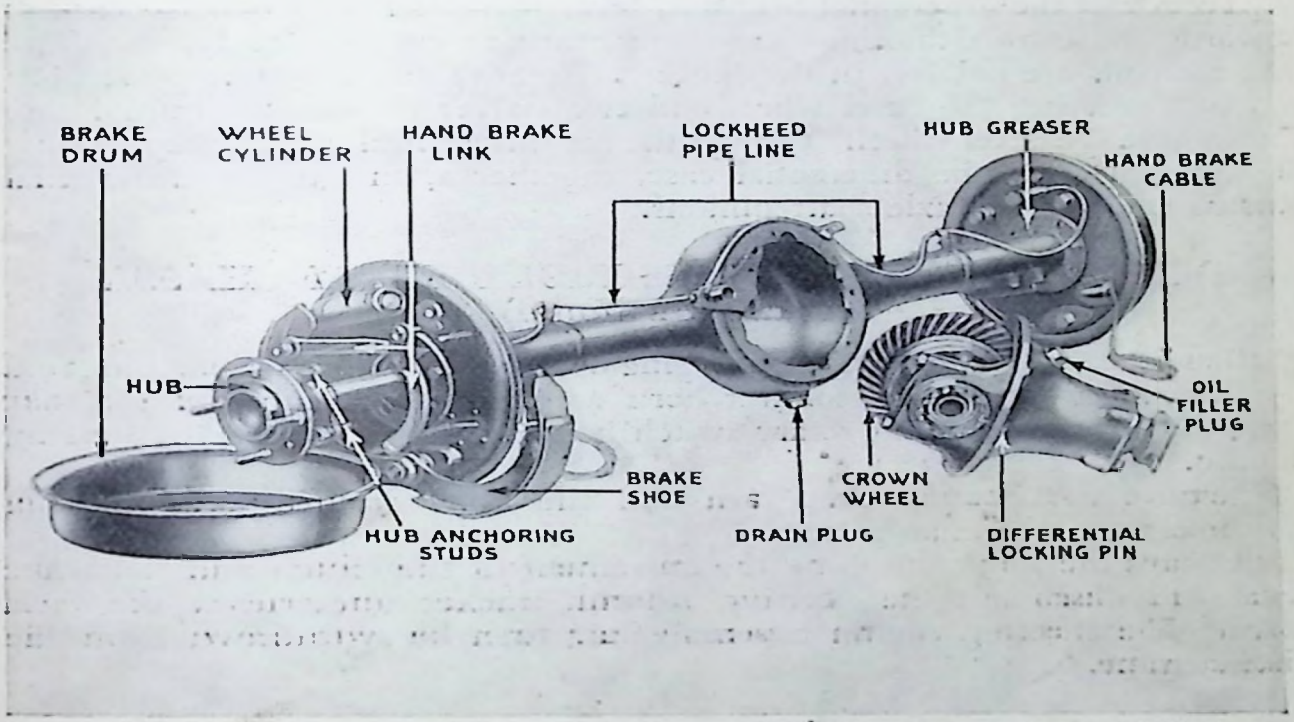
Remove six nuts, spring washers and four studs securing differential assembly to axle case (the two offside studs secure the Lockheed Brake feed pipe bracket), release the nut and bolt securing this bracket to the pipe and lift the differential assembly from the rear axle. It is not necessary to remove the axle case rear cover when withdrawing the differential assembly.

Hold the differential assembly in a vice and remove the split pin and nuts securing the universal joint flange to the shaft of the bevel pinion, withdraw flange.

Remove the locking wire from the four studs and spring washers of the bevel pinion housing (mark the housing and the axle case to ensure the housing being returned to the correct position). Withdraw the bevel pinion housing, and carefully remove the shims which are fitted between the housing and the case. Remove the two distance collars from the bevel pinion.

Remove split pins securing the locking tabs to the axle bearing case caps and remove the four nuts and locking strips which secure the axle bearing case caps into position.

Remove the caps and the serrated adjusting lock rings, care being taken to keep the outer rings of the roller bearings in position, as these are not interchangeable and they are likely to fall away when removing the crown wheel and differential assembly.




Tap out the bevel pinion and bearing towards the rear of the case.

Dismantle the bevel pinion housing by removing the spring ring and unscrewing the lock ring. Then remove the distance washer and press out the double row thrust race. Remove cap from bevel pinion housing, and withdraw felt washer and circular coil spring.

Remove locking wire and eight set studs securing the crown wheel to the flange of the differential case, and remove the crown wheel. Extract the roller bearings, remove set pin locking the centre pin for the differential pinions, tap out the pin and remove differential pinion and axle shaft pinions.

## DISMANTLING REAR AXLE (9 H.P. MODEL)

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.

Extract bevel pinion and universal joint coupling by releasing the four set pins and spring washers securing the bevel pinion 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.

Remove the differential case and bevel wheel 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.

To extract the differential bearings, 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.

## REMOVING STEERING ASSEMBLY FROM CHASSIS (1½ Litre Model)

Remove seats and boards as in engine overhauling instructions, page 64.

Disconnect battery. Disconnect horn wire from junction box and take away the set pins securing rotary switch box to bracket at base of steering column.

Remove the steering drop arm and the bolts securing the steering box bracket to the chassis frame.

Remove the stop controlling the movement of the clutch and footbrake pedal and disconnect the steering column bracket underneath the facia board. The steering column assembly may then be withdrawn from the chassis frame.

## REMOVING STEERING ASSEMBLY FROM CHASSIS (9 h.p. Model)

Disconnect the battery positive lead and remove the junction box cover.

Release the black horn wire from the junction box and remove switch box from steering box assembly. The horn wire will still remain attached to the horn push in the control quadrant.

Remove the cable cover which clips to the steering column, release the bolt, nut and spring washer securing the steering box to the bracket attached to the chassis frame side member. Release the three nuts and spring washers securing the steering box bracket to the front cross member, release the bolt and nut securing the steering box steady bracket to the frame side member. Remove the ball joint nut securing the steering drop arm to the steering coupling tube.

Release one screw securing hand control levers to column.

Release the bolt and nut securing the steering column to the dash bracket and withdraw steering column assembly towards rear of the car.

## DISMANTLING FRONT AXLE ASSEMBLY

The road wheels and hubs on both models are removed by releasing the knock-on type wing nuts securing the road wheels to the splined hub barrel. A lead hammer is provided in the tool kit for this purpose, and it should be noted that the wing nuts are marked right hand and left hand; therefore attention should be paid to the direction in which they are to be released. Withdraw road wheels from hub splines, release the two screws, four nuts and spring washers securing the brake drums to the hubs, and remove the brake drums, afterwards withdrawing the hub assembly. Dismantle the hubs by releasing the two screws securing the bearing housing to the hubs, extracting the two bearings, distance piece and oil retaining washer.

1½ LITRE MODEL. Remove stub axles, track rod and coupling tube by first releasing the four bolts, nuts and spring washers securing the brake back plate to the axle swivel, and remove the plate and brake shoes complete. It is not necessary to detach the Lockheed feed pipe from the wheel cylinder except when the brakes require attention. Release the nuts securing the track rod and coupling tube ball joints to the swivel levers, and remove both rods. 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.

9 H.P. MODEL. 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. It is not necessary to detach the Lockheed feed pipe from the wheel cylinder except when the brakes require attention. Release the nuts securing the track rod and coupling tube ball joints to the swivel levers, and remove both rods. 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.

# THE IGNITION EQUIPMENT

THE ignition equipment on the 1½ Litre Le Mans Speed Model and the 9 h.p. Le Mans Speed Model consists of a camshaft speed magneto (six cylinder type for 1½ litre models and four cylinder type for 9 h.p. models). The magneto ,which incorporates an automatic advance mechanism, is arranged for mounting in the same way as a distributor.

On the 9 h.p. Le Mans Sports Model, the ignition equipment comprises a coil and a combined distributor and contact breaker.

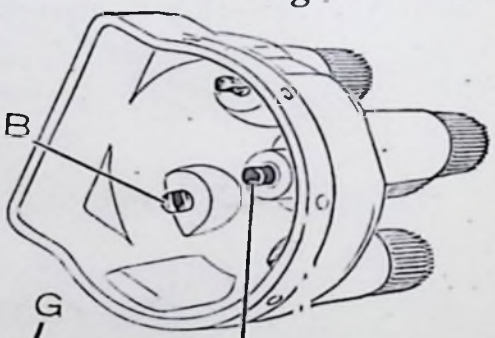
Very little attention is needed to keep the ignition equipment in proper condition. Occasional inspection of the system is advised, however, when any parts needing adjustment or cleaning can be attended to.

## CLEANING

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 in 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.

## ADJUSTMENT

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 contact points; 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: Turn the engine round slowly by hand until the points are seen to be fully opened, then, using the ignition screwdriver slacken the two screws securing the contact plate and move 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.



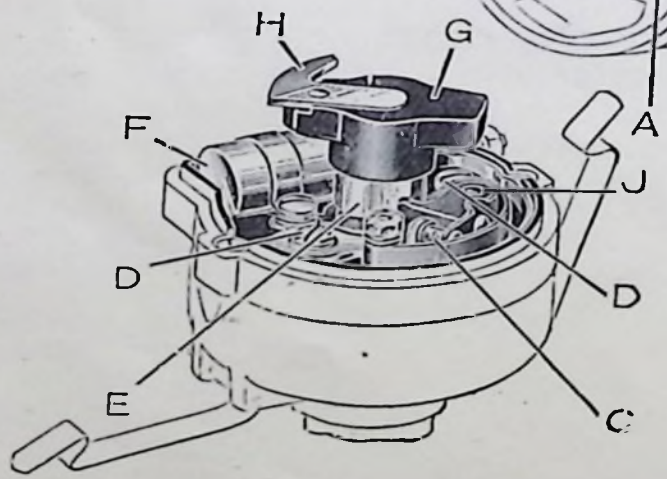




Fig. 1.

A—Carbon brush
B—Electrode
C—Contacts
D—Locking Screws
E—Rotating cam
F—Condenser
G—Rotating distributor arm
H—Metal Electrode
J—Contact breaker pivot

The contact breaker mechanism on the camshaft magneto is similar to that of the distributor shown in the above illustration.

## LUBRICATION

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

The cam should be given a smear of vaseline about every 3,000 miles or whenever it appears to be dry. After every 5,000 miles, place a single drop of oil on the pivot on which the contact breaker rocker arm works.

About every 3,000 miles withdraw the moulded rotating arm 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 automatic timing control.

MAGNETO. Add one or two drops of thin machine oil to the lubricator every 1,000 miles. This procedure lubricates the magneto shaft and the automatic timing control.

About every 3,000 miles, or whenever it appears dry, give the cam a smear of vaseline.

Every 5,000 miles, place a single spot of thin machine oil on the pivot on which the contact breaker lever works.

## 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 the high-tension cables show signs of perishing or cracking, they should be replaced. Use only 7 m/m. rubber-covered ignition cable for all high-tension leads.

## COIL 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 by means of the small tab provided. The bulb is a 2.5 volt .2 amp. screw cap type No. 252 M.E.S.

## THE DETECTION AND REMEDY OF IGNITION FAULTS

If failure of the ignition or misfiring occurs and the cause is not obvious, the owner 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-C.A.V.-Rotax 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, with charging switch in full charge position. 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 ¼in. away from some metal part of the chassis, while engine is turned over.<br>If sparks jump gap regularly, the coil and distributor are functioning correctly.<br>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 contact points 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 contact points. | Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol. |
| | Contact breaker points out of adjustment.<br>Turn engine until contacts are fully opened and test gap with gauge on screwdriver. | Adjust gap to gauge. |
| Engine misfires. | Dirty or pitted contact points. | Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol. |
| | Contact breaker points out of adjustment.<br>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.<br>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.<br>Replace any lead if the insulation shows signs of deterioration or cracking.<br>Examine carburetter, petrol supply, etc. |

# LIGHTING AND STARTING EQUIPMENT

## DYNAMO

THE dynamo output on the 1½ Litre Model is automatically varied according to the state of charge of the battery, by the compensated voltage control system. The dynamo is of special design and is automatically controlled by a regulator which is housed along with the cut-out on the engine side of the dash.

When the battery is discharged the dynamo gives a high output so that the battery receives a quick recharge which brings it back to its normal state in the minimum possible time. On the other hand, if the battery is fully charged, the dynamo is arranged to give only a trickle charge, which is sufficient to keep it in good condition, without any possibility of causing damage to the battery by overcharging.

In addition to controlling the dynamo output according to the state of charge of the battery the regulator provides for an increase of output to balance the current taken by lamps or other accessories whenever they are switched on.

When starting the car, the dynamo output will rise to a value which is most suitable for the particular condition of the battery at a speed of about 20 m.p.h. on top gear and it will remain constant at all speeds higher than this.

The dynamo on the 9 h.p. model is a simple self-regulating third brush machine which is arranged to give its full or a reduced output according to the position of the charging switch.

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

BRUSHGEAR AND COMMUTATOR. Inspect the brushes and see that they move freely in their holders. 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.

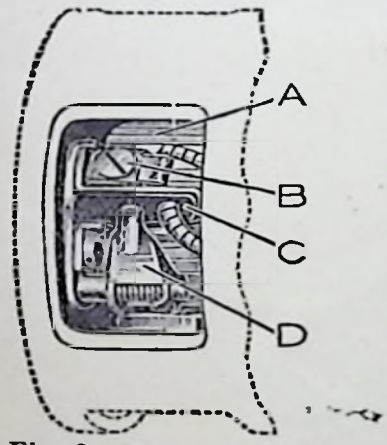



Fig. 2. Dynamo with cover removed.
A—Commutator.
B—Screw.
C—Brush.
D—Spring lever.

After long service, when the brushes have become worn so that they will not bear properly on the commutator, they should 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-C.A.V.-Rotax 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.

LUBRICATION. As the bearings are packed with grease before leaving the works, very little attention is needed. A few drops of oil may be added through the lubricator at the drive end of the dynamo about every 1,000 miles. Periodically, say, when the engine is being decarbonised move aside the flap marked "grease" at the commutator end of the machine, and add a very small quantity of high-melting-point grease.

When the car is taken down for a general overhaul, the dynamo should be dismantled for cleaning, adjustment and repacking the bearings with grease. This should be done preferably by the nearest Lucas-C.A.V.-Rotax Service Depot.

DYNAMO FUSES. On the 9 h.p. Model 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. On the 1½ Litre Model two fuses are provided, one connected in the dynamo field circuit and one in the main circuit. The fuses are of the cartridge type and are housed in the cut-out and fuse box on the engine side of the dash. If the dynamo fails to charge the battery at any time (indicated by a discharge reading being given on the ammeter during daytime running) check the wiring and then inspect the fuses. Replace a blown fuse with one of the spare fuses 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 or the nearest Lucas-C.A.V.-Rotax Depot. Never fit any fuse other than the Rotax standard fuse as originally fitted. The size of the fuse is marked on a coloured paper slip, which can be seen inside the fuse.

## STARTER MOTOR

In order to facilitate starting in cold weather, it is advisable to make use of the carburetter control, and before using the electric starter crank the engine over slowly by the starting handle for two or three revolutions, as this will considerably diminish the load for starting.

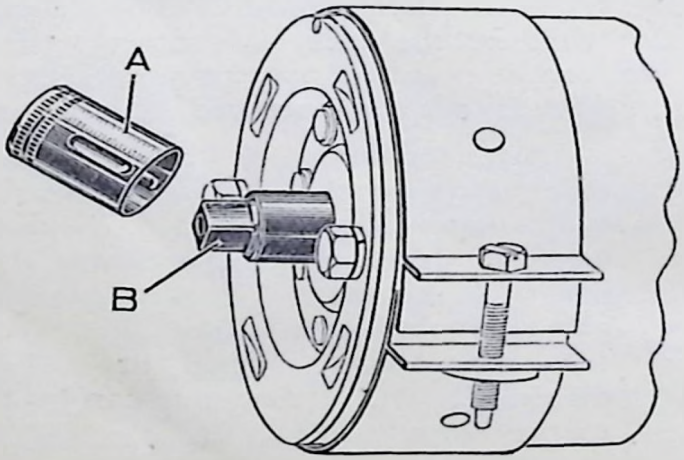



**Fig. 3. Squared end of shaft with cover removed.**
**A - Metal cover. B—Squared end of shaft.**

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 of the shaft by withdrawing a small metal cap.

As in the case of the dynamo, the surface of the commutator must be kept clean and free from oil, brush dust, etc.

## STARTER SWITCH

This switch must be operated firmly and without hesitation. Should the engine not fire at once, allow it to come to rest before again pressing the switch.

## CUT-OUT, REGULATOR AND FUSE BOX (1½ Litre Model)

This unit houses the cut-out, dynamo regulator and six fuses which protect the equipment against the possibility of damage from short circuits. The function of the regulator has already been described, while the function of the cut-out is described below.

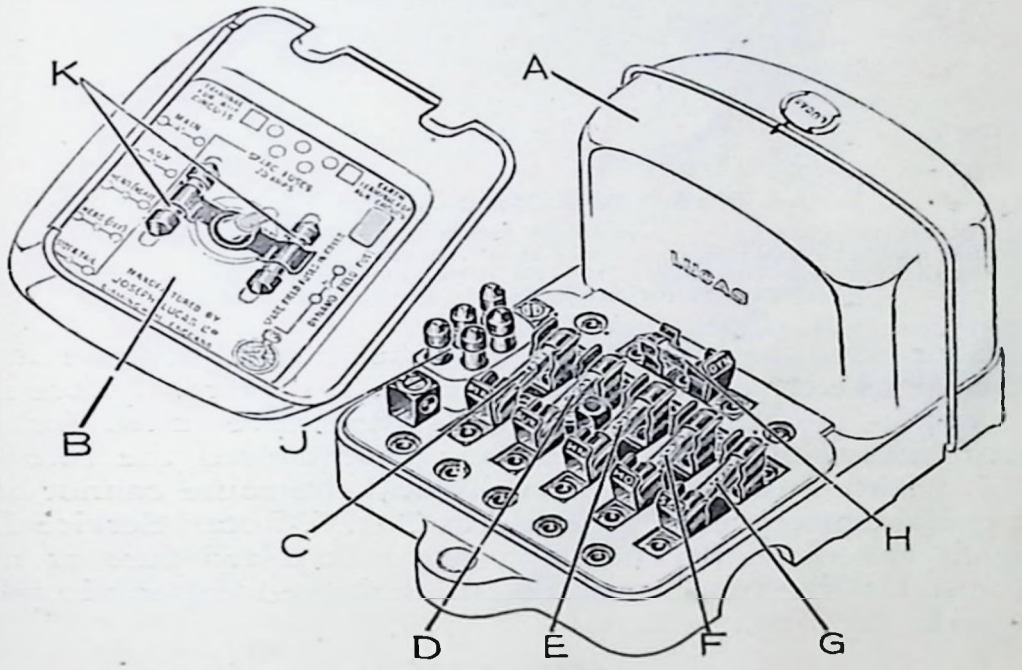



**Fig. 4. Cut-out, Regulator and Fuse Box.**

A—Cut-out and regulator cover.
B—Fuse cover.
C—Dynamo main fuse.
D—Auxiliary accessories fuse.
E—Horn fuse.
F—Headlamp Fuse.
G—Side and tail lamps fuse.
H—Dynamo field fuse.
J—Spare fuses for C, D, E and F.
K—Spare dynamo field fuses.

The circuits protected by each of the fuses can readily be seen by reference to the illustration.

## CUT-OUT AND FUSE BOX (9 h.p. Model)

This unit houses the cut-out and two fuses, one marked "AUX" protecting the accessories circuit while the second fuse marked "DYN" is connected in the dynamo field circuit. The function of this fuse has been described already.

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 opens and thereby prevents the battery discharging itself through the dynamo.

The cut-out and regulator are accurately set before leaving the Works, and do not need any adjustment; the cover protecting them therefore, is sealed.

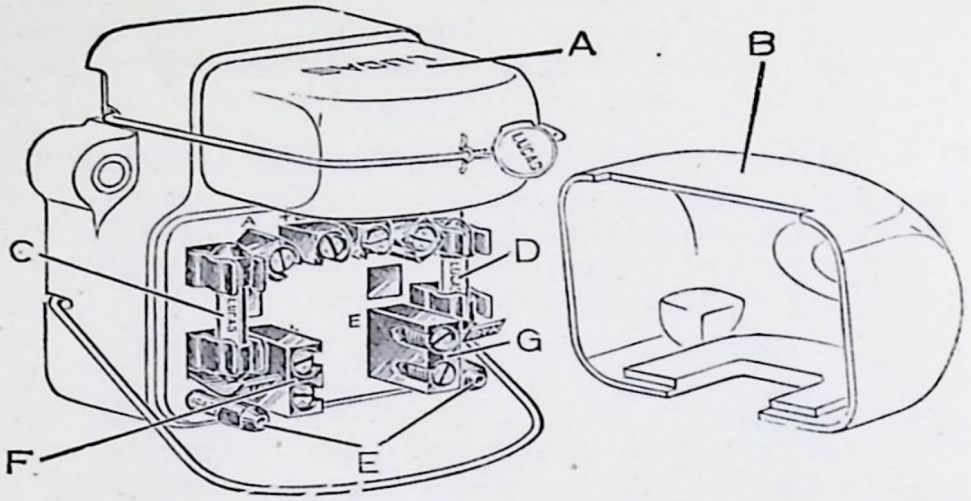



Fig 5. Cut-out and Fuse Box.

A—Cut-out cover.
B—Fuse and terminal cover.
C—Auxiliary accessories fuse.
D—Fuse in dynamo field circuit.
E—Spare fuses.
F—Positive supply terminal for accessories.
G—Negative (or earthed) terminal for accessories.

If it is suspected that one of the fuses has blown, remove it from its holder and see whether there is a break in the fuse wire. Before replacing the fuse, inspect the wiring of the units that have failed for evidence of short circuits or other faults that may have caused the fuse to blow, and remedy. If the fuse blows repeatedly and the cause cannot be traced, have the equipment examined by a Lucas-C.A.V.-Rotax Service Depot.

Never fit any fuse other than the Rotax standard fuse as originally fitted. The size of the fuse is marked on a coloured paper slip which can be seen inside the fuse.

## AMMETER

The ammeter indicates the current passing into or out of the battery. For instance, suppose the dynamo is generating 6 amperes and that the side and tail lamps are in use, the lamps and ignition coil will take approximately 2½ amperes, leaving 3½ amperes for charging the battery. Therefore, this is the figure shown on the ammeter.

On the 1½ Litre Model it must be remembered, when noting ammeter readings, that normally, during daytime running, when the battery is in good condition, the dynamo gives only a trickle charge so that the charge reading will seldom be more than a few amperes.

A discharge reading may be shown sometimes immediately after switching on the lamps. This usually happens after a long run when the voltage of the battery is high. After a short time, the voltage of the battery will fall and the regulator will respond, causing the dynamo output to balance the load.

When starting from cold, the driver will notice the rise of charging current until it reaches a steady maximum at a speed of, say, 20 miles per hour, after which it will remain fairly high for perhaps 10 minutes or so, then fall to a steady charge which is most suitable for the particular condition of the battery.

## 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. Never leave the battery 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 1.320 specific gravity. 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.

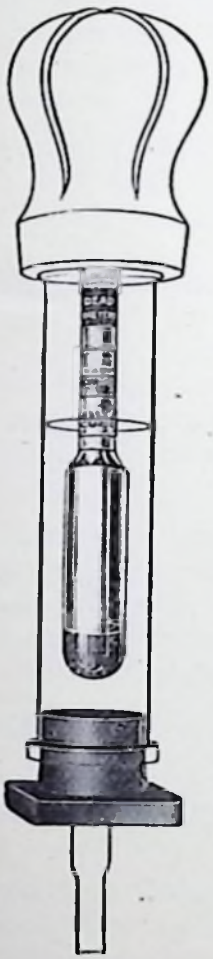


Fig. 6. Hydrometer.

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 in a fortnight, in order to obviate 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 charge of the battery. An instrument known as a hydrometer is employed for this purpose (Fig. 6).

Specific gravity readings and their indications are as follows : 1.285-1.300—battery fully charged; about 1.200—battery half discharged; about 1.150—battery fully discharged.

USE OF BATTERY CHARGING SWITCH (9 h.p. Model only). The combined lighting and charging switch at the centre of the steering wheel should, during daytime running, be kept in the appropriate position according to the season. For cars running under average conditions, this will ensure that the battery is kept in a fully charged state.

In exceptional cases, however, it may be advisable to use the switch out of season. For instance, if in Winter the car is run regularly during the day with practically no night running, and the hydrometer readings are always found to be about 1.285, and if the acid level gets unusually low,

then it is probable that the battery is being overcharged. In these circumstances, move the charging switch to the half charge position. On the other hand, if exceptional use is made of the lamps and starter in the Summer, causing the battery to be in a low state of charge (hydrometer readings of 1.200 or under), then run with the charging switch in the full charge position.

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

## LAMPS

HEADLAMPS. The headlamps are provided with an electrically-operated anti-dazzle device. By operating the steering column switch, the nearside headlamp beam is dipped and turned to the nearside of the road while at the same time the offside headlamp is switched off, thus causing no discomfort to approaching traffic.

REMOVING THE LAMP FRONT AND REFLECTOR. To remove the front, slacken the fixing screw at the bottom of the lamp and move aside from the slot in which it fits. The front can then be removed.

To remove the reflector, turn back the two ends of the cork washer at the top of the rim. The screw securing the reflector can then be removed, enabling the reflector to be withdrawn by turning it to the left. When replacing the dipping reflector, it will be noticed that there are two alternative holes at the top of the lamp for the fixing screw. The left-hand one is provided for use in the United Kingdom or where the rule of the road is left-hand, and the right-hand hole for use where the rule of the road is right-hand.

DIPPER FUSE. A fuse is provided with the dipping mechanism in the nearside lamp to protect the equipment in the event of the reflector failing to function properly. The fuse is of the cartridge type and is carried in spring clips alongside the dipping mechanism. If the reflector fails to function when the switch is manipulated, remove the fuse from its holder and see if there is a break in the fuse wire. The spare fuse which is clipped to the reflector bracket should be inserted in place of the damaged one, and should restore the action of the reflector.

Should the fuse blow repeatedly and the cause of the trouble cannot be found, have the reflector examined at the nearest Service Depot.

ADJUSTING AND FOCUSSING. The lamps are provided with a patented universal mounting which allows the beams of light to be adjusted on the road to the best advantage. This adjustment is obtained by slackening the fixing, turning the lamp to the desired position and then locking by tightening the fixing.

To enable the correct focus to be obtained, the bulb holder is arranged so that it can be moved backwards or forwards when the clamping clip at the back of the reflector is slackened. Care should be taken to tighten the screw after the adjustment.

The best method of adjusting and focussing the lamps is to take the car on a straight, level road and then adjust the lamps and focus the bulbs as described above, until the best road illumination is obtained.

SIDE LAMPS. The front of the side lamp can be removed when the fixing screw is withdrawn.

STOP TAIL LAMP (9 h.p. Model). The front of this lamp can be removed when the fixing screw is withdrawn.

STOP TAIL AND REVERSE LAMP (1½ Litre Model). To remove the front of this lamp for bulb replacement, withdraw the fixing screw at the centre.

CLEANING. The reflectors are protected by a transparent and colourless covering, which enables 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.**

Ebony black lamps can be cleaned with a good car polish. Chromium plated lamps will not tarnish and only need wiping over with a damp cloth to remove dust and dirt.

REPLACEMENT OF 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 .. .. .. | 1236 SVCD | 12 | 36 |
| Side, tail, stop, and panel lamps | B.A.S. No. 10S | 12 | 6 |
| Reverse lamp (1½ Litre Model) | B.A.S. No. 10S | 12 | 6 |
| Ignition warning lamp .. .. | No. 252 M.E.S. | 2.5 | .5 |

## ELECTRIC HORNS

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

If one of the horns 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 loose connection or short circuit in the wiring of the horn. If both horns fail, or become uncertain in their action, the trouble is probably due to a discharged battery, or in some cases a blown fuse.

It is also possible that the performance of a horn may be upset by the fixing bolt working loose.

In the case of horns mounted on cross bars in front of the radiator, the note may be impaired by the bar itself vibrating, or by any rattling or drumming of mudwings or headlamps which may be attached to the cross bar. This can be ascertained by removing the horn from its mounting, holding it firmly in the hand by the bracket and pressing the push. If the note is still unsatisfactory, **do not attempt to dismantle any part of the horn,** but return it to a Lucas Service Depot for examination.

## ELECTRIC WINDSCREEN WIPER

The wiper motor requires absolutely no attention; all moving parts are packed with grease during assembly, and no lubrication is necessary.

When the wiper is not in use, see that the end of the metal handle is located in the top of the switch knob. This ensures that the current is switched off.

# HOW TO LOCATE AND REMEDY DYNAMO TROUBLE

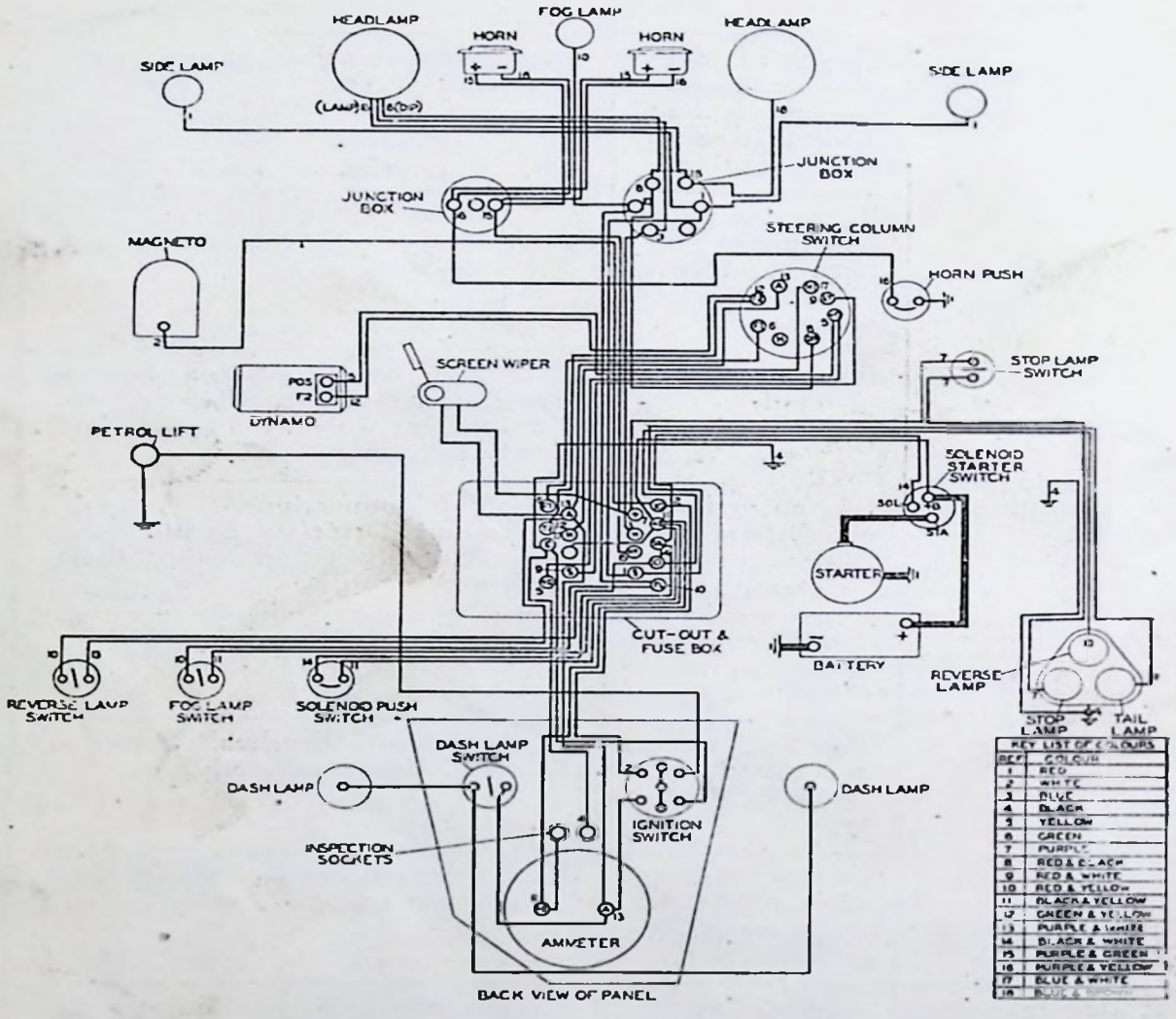
## ALL 9 H.P. MODELS

| 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 or broken 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. |
| 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. |

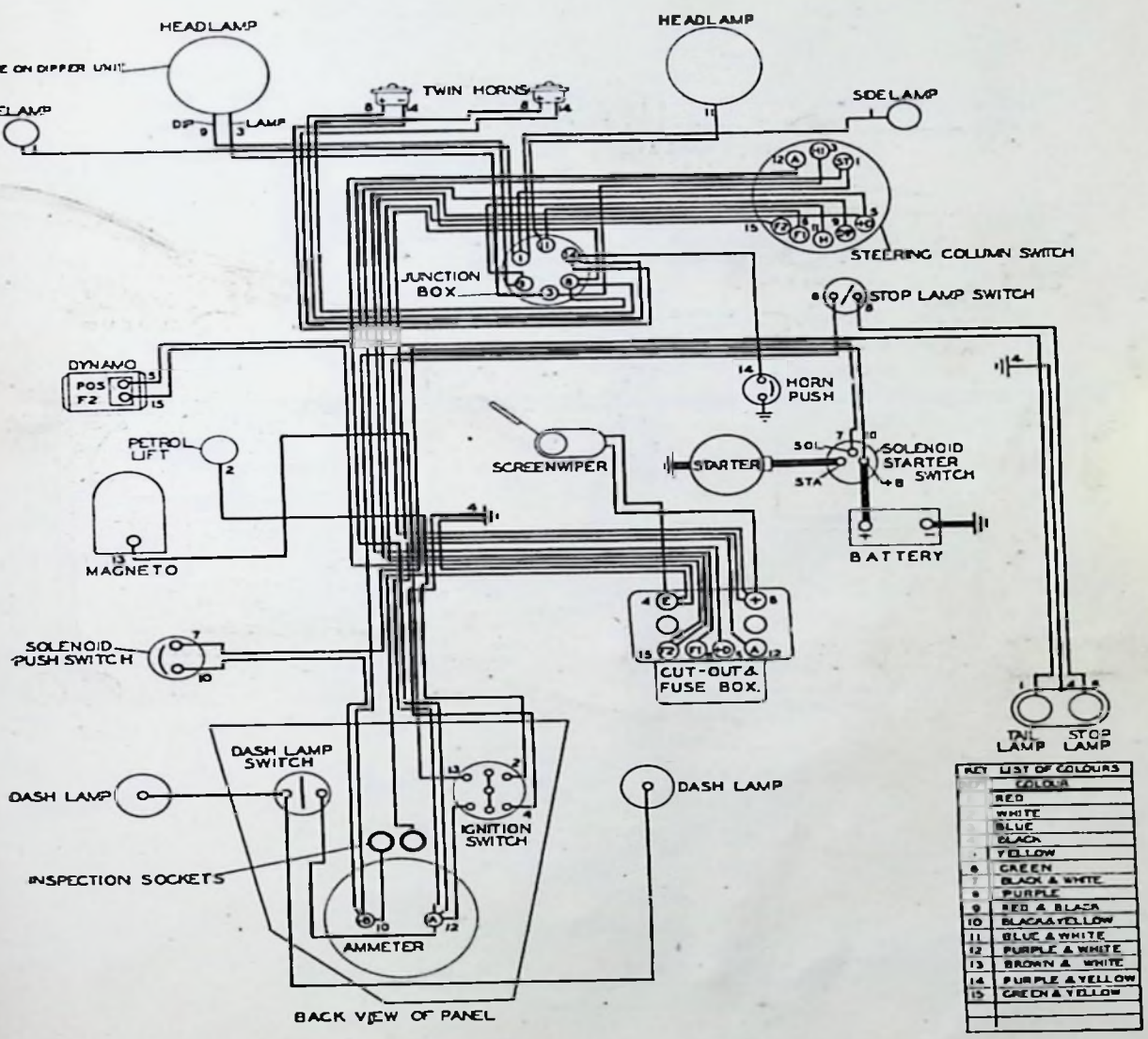
# HOW TO LOCATE AND REMEDY STARTER MOTOR TROUBLE

## 9 H.P. AND 1½ LITRE MODELS

| 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. |




**Wiring Diagram of Rotax Lighting, Starting and Ignition Equipment fitted to Singer 1½-Litre Le Mans "Special" Speed Model.**




**Wiring Diagram for Rotax Lighting, Starting and Magneto Ignition Equipment fitted to Singer 9 h.p. Le Mans Speed Special Model.**

# 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 our equipment, we 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 us; we shall be only too pleased to be of assistance. The best course to adopt is to call at our 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 equpment 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 ... ... ... 3/5, CALVIN STREET, MOUNT POTTINGER
Telegrams: "Servdep, Belfast" Telephone: Belfast 8811 (3 lines)

BIRMINGHAM, 18 ... ... ... ... GREAT HAMPTON STREET
Telegrams: "Lucas, Birmingham" Telephone: Central 8401 (10 lines)

BRIGHTON, 4 ... ... ... ... 85, OLD SHOREHAM ROAD, HOVE
Telegrams: "Luserv, Brighton" Telephone: Hove 1146 (4 lines)

BRISTOL ... ... ... ... ... ... ... 345, BATH ROAD
Telegrams: "Kingly, Bristol" Telephone: Bristol 76001 (4 lines)

CARDIFF ... ... ... ... ... ... ... 54a, PENARTH ROAD
Telegrams: "Lucas, Cardiff" Telephone: Cardiff 4603 (4 lines)

COVENTRY ... ... ... ... ... ... ... PRIORY STREET
Telegrams: "Lucas, Coventry" Telephone: Coventry 3068

DUBLIN PORTLAND STREET NORTH, NORTH CIRCULAR ROAD
Telegrams: "Luserv, Dublin" Telephone: Drumcondra 434 (6 lines)

EDINBURGH, 11 ... ... ... ... 60, STEVENSON ROAD, GORGIE
Telegrams: "Luserv, Edinburgh" Telephone Edinburgh 62921 (4 lines)

GLASGOW ... ... ... ... ... 227/229, ST. GEORGE'S ROAD
Telegrams: "Lucas, Glasgow" Telephone: Douglas 3075 (5 lines)

LEEDS ... ... ... ... ... ... ... ... 64, ROSEVILLE ROAD
Telegrams: "Luserdep, Leeds" Telephone: Leeds 28591 (5 lines)

LIVERPOOL, 13 ... ... ... ... ... ... 450/456, EDGE LANE
Telegrams: "Luserv, Liverpool" Telephone: Old Swan 1408 (4 lines)

LONDON ... ... ... DORDRECHT ROAD, ACTON VALE, W.3
Telegrams: "Dynomagna, Ealux, London" Telephone: Shepherd's Bush 3160 (10 lines)

LONDON ... ... ... ... 757/759, HIGH ROAD, LEYTON, E.10
Telegrams: "Luserdep, Leystone, London" Telephone: Leytonstone 3361 (4 lines)

LONDON ... ... 155, MERTON ROAD. WANDSWORTH, S.W.18
Telegrams: "Luserv, Put, London" Telephone: Putney 5131 (6 lines) & 5501

MANCHESTER ... ... ... ... TALBOT ROAD, STRETFORD
Telegrams: "Lucas, Stretford" Telephone: Longford 1101 (5 lines)

NEWCASTLE-ON-TYNE, 2 ... ... ... 64/66, ST. MARY'S PLACE
Telegrams: "Motolite, Newcastle-on-Tyne" Telephone: Central 25571 (3 lines)

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

# GENERAL

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.

It is therefore advisable to give the following hints for the care of the coachwork.

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

The appearance of 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 are stove enamelled, and should only be cleansed 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 soiled appearance.

Chromium plating should on no account be cleansed 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 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 lubrication, 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 often 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 upon the tyres.

Take care to keep the two 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 tyre, with a little petrol, drying the tyre with a duster after the cleaning process.

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

## ERECTION OF THE ALL-WEATHER EQUIPMENT

The all-weather equipment has been so designed to give perfect protection to the occupants of the car, and it is quite a simple matter to raise the hood and fit the side-curtains.

The two-seater 1½ Litre model is also provided with a tonneau cover which is composed of two parts joined in the centre by means of a zip-fastening device.

So far as the all-weather equipment on the four-seater Model is concerned, no mention need be made of the raising of the hood and fitting

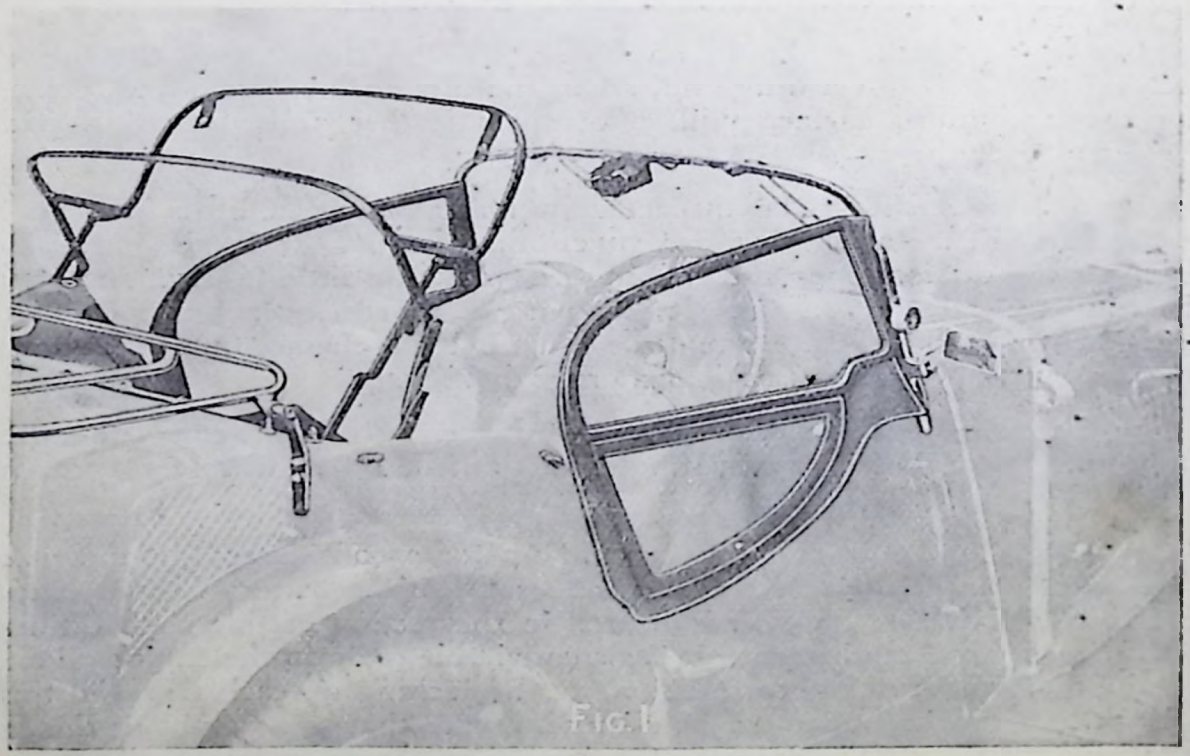


FIG. 1

the side-curtains—the raising and lowering of the hood is quite a straightforward matter.

The all-weather equipment fitted to the 1½ Litre and 9 h.p. 2-seater is of a different type from that fitted to the 4-seater Model. Nevertheless, the erecting of the concealed hood is quite simple if the following procedure is adopted :—

The hood frame is fitted on two pivots, one at each side of the body, and in the folded position lies flat at the back of the boot, but is secured into position by two straps—one at each side. The hood cover is separate from the hood frame and is packed in three folds in the boot.

To erect the all-weather equipment it is first necessary to raise the boot cover which is secured at the bottom by two press studs, withdraw the hood cover, undo the straps securing the hood frame and unfold the hood frame, securing it by means of the side arms to the knurled thumb screws—one at each side of the body. There are two fabric straps fitted to the hood frame which must next be secured to the back of the body by the two turn buttons.

The erection of the hood frame is now completed, and it is then necessary to place the hood cover in position over the frame and fasten it to the tonneau by means of the turn buttons provided.

IT IS IMPORTANT THAT THE HOOD COVER IS FIRST FASTENED TO THE TONNEAU AND AFTERWARDS TO THE WINDSCREEN.

The side-curtains are carried under the facia board, and these are merely pressed into the sockets at the side of the doors and fastened into position by means of the knurled thumb screws.

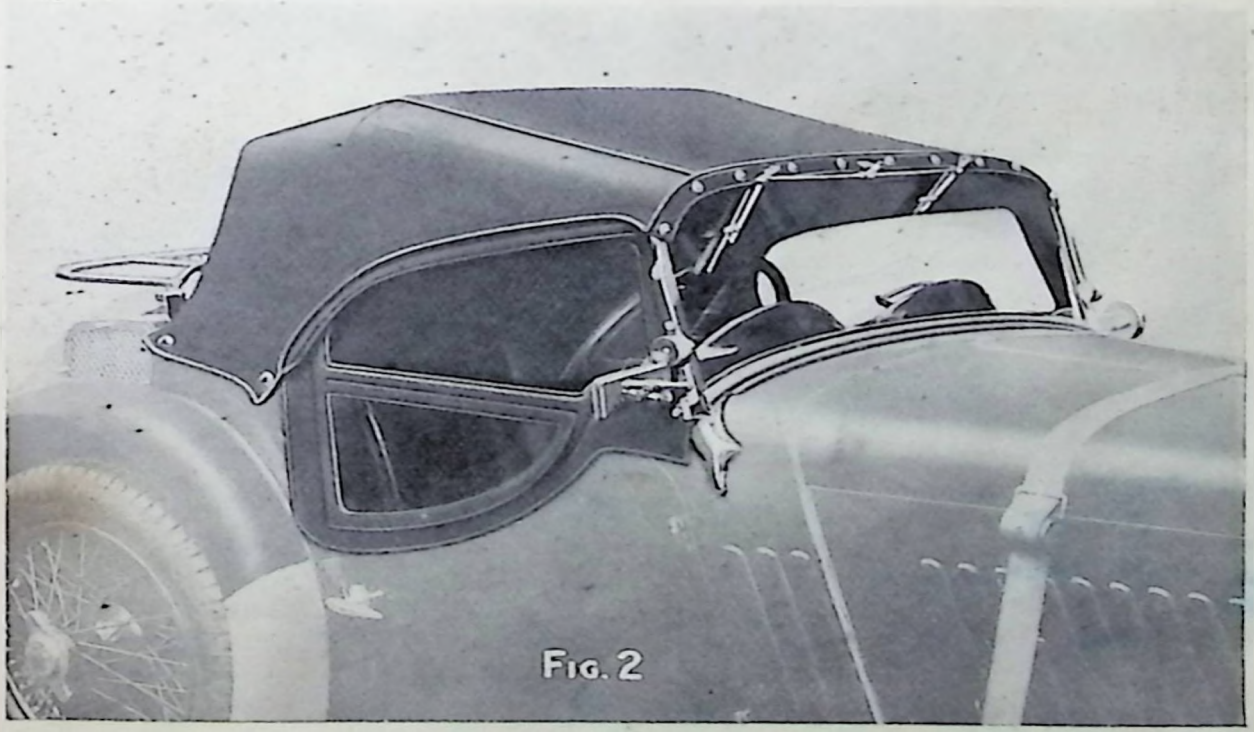


FIG. 2

When removing the cover, first release the cover from the windscreen, afterwards releasing the turn buttons on the tonneau. Refold the hood cover, and fold the hood frame back into position in the boot. The hood frame straps should then be fastened and the hood cover packed into position, afterwards closing the boot and fastening the cover to the press studs at the base of the boot.

Reference to the illustrations will no doubt be of assistance, Fig. 3 showing the assembly of the tonneau cover for the 1½ Litre Model.

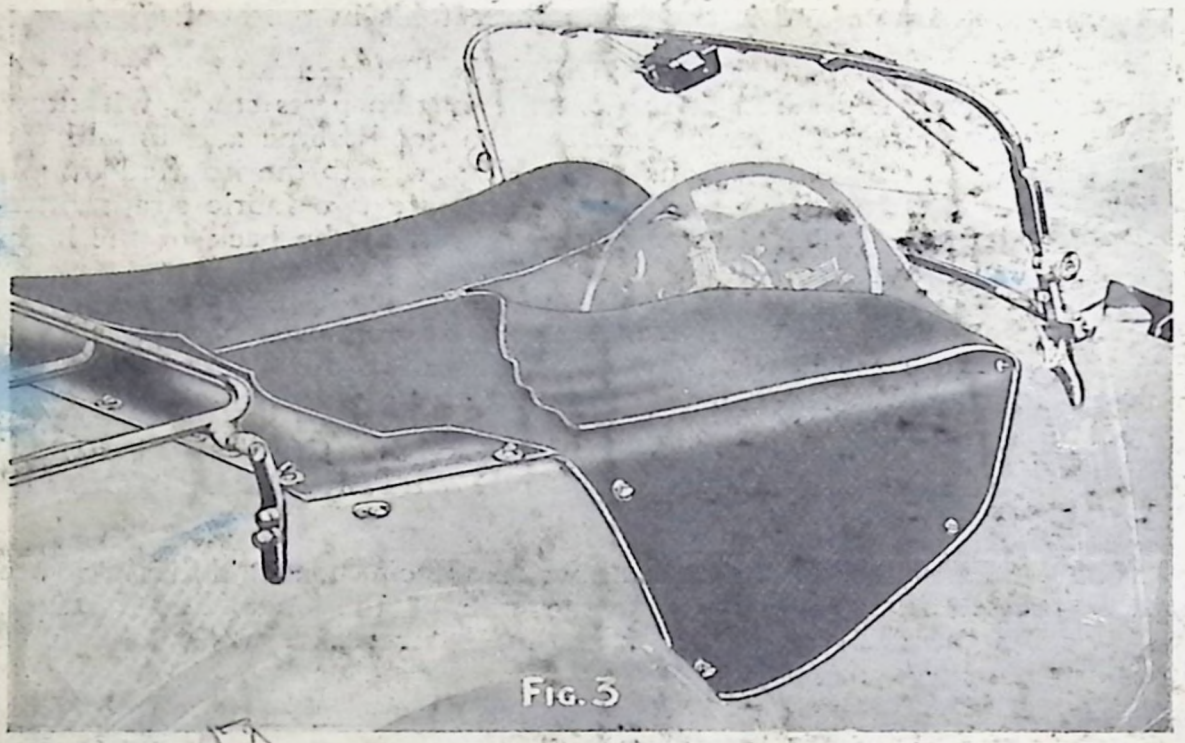


FIG. 3