The

SINGER

9 h.p.

Roadster

Instruction Book and Repair Manual

SINGER MOTORS LTD
COVENTRY & BIRMINGHAM

SINGER MOTORS LIMITED

Works :

COVENTRY and BIRMINGHAM.

Below is a reproduction of Name and Number Plate, fixed to each Singer Car on bulkhead under offside bonnet.

CAR NUMBER must be quoted on all communications.

SINGER MOTORS LTD.
BIRMINGHAM WORKS
CAR NUMBER
RECOMMENDED LUBRICANTS

ENGINE	WAKEFIELD	ANGLO	VACUUM	PRIDE'S	SHELL
SUMMER	CASTROL XL	ESSOLUBE 30	MOBILOIL A	MOTORINE M	DOUBLE SHELL
WINTER	CASTROLITE	ESSOLUBE 20	MOBILOIL ARCTIC	MOTORINE E	SINGLE SHELL
GEARBOX	CASTROL XXL	ESSOLUBE 40	MOBILOIL BB	MOTORINE B (DE LUXE)	TRIPLE SHELL
BACK AXLE	CASTROLO	ESSOLUBE GEAR OIL HEAVY	MOBILOIL G	MOTORINE BATTERSEA "A"	SHELL SPIRAX GEAR OIL

Address for all correspondence (including service matters)

SINGER MOTORS LIMITED
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BIRMINGHAM, 10

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Owner's Name .....

Address .....

.....

.....

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 described, and photographs have been made of points which it is desirable to stress.

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

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

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

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

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

In addition to this arrangements have been made with Singer Dealers in London and the provincial cities and towns to look after all local service. Most garages are now equipped for rapid and economical servicing operations and all Dealers carry adequate stocks of parts that may normally be required.

The Factory Service Depot is also available for major overhauls and the supply of spare parts. This Depot has been specially created for the benefit of all Singer owners and whatever the age of your car, you are at liberty to call and our staff is at your disposal to carry out a test and give you a report on its condition. You are under no obligation to have 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.

THE SINGER WARRANTY

The Company warrants that in the manufacture of new vehicles it has taken all precautions which are usual and reasonable to secure excellence of materials and workmanship and undertakes that if any defect is disclosed in any part of a new vehicle within six months of the date of delivery of such vehicle to the retail customer it will (provided such defective part is returned to the Works carriage paid) examine the part alleged to be defective and if on such examination the fault is found to be due to defective materials or workmanship for which it is responsible it will repair or replace the defective part free of charge.

This Warranty is given only in respect of a vehicle purchased by the retail customer as a new vehicle, for which the Company's full retail List Price has been paid.

The foregoing Warranty is limited to a new vehicle manufactured by the Company and is in lieu of any Warranty (or Condition) whether expressed or implied by Common Law Statute or otherwise as to the description, quality or fitness for their purpose of any goods manufactured, replaced or repaired by the Company every such Warranty (or Condition) whether expressed or implied being in all cases excluded and the liability of the Company 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. The Company shall not be responsible for any other liability, expenses, damages or loss which may occur consequent upon any misdescription 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) whether expressed or implied by Common Law Statute or otherwise are also expressly excluded.

This Warranty shall not apply to defects caused or arising under the following conditions:—

(a) During or caused by motor racing.
(b) Wear and tear, accident, misuse or neglect.
(c) Defects in any vehicle which has been altered in any manner whatsoever or upon which the identification numbers have been altered or removed.
(d) Defects in any vehicle which has been or is let out on hire.

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

(a) New vehicles or goods manufactured by the Company and which are bought direct from the Company or from one of its duly authorised Distributors, Dealers or Retail Dealers.
(b) Repairs done or replacements supplied by the Company direct,

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

The Company gives no Warranty of any description in respect of any Secondhand Vehicles or goods sold by it or by its authorised Dealers or by any other person nor is any Warranty (or Condition) expressed or implied, whether arising by Common Law Statute or otherwise in respect of such vehicles or goods.

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

The Company does not warrant the Specialities of other manufacturers fitted to its vehicles such as tyres, electrical fittings, lamps and horns. It endeavours to secure the best quality in these articles and the Makers whose names usually appear thereon are generally willing to replace any defective part. The Company will 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 the Company's Works 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 at the same time :—

(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 the Company's 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 the Company will be at the risk of the Sender and this Warranty shall not be enforceable.

The Company shall not be responsible for the cost of any labour involved in connection with the removal or replacement of any defective parts 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 the Company in respect of all repairs to vehicles or parts of vehicles executed by it or replacements supplied by it direct but for three months only and subject nevertheless to the reservations limitations and conditions therein contained and all other conditions or warranties whether expressed or implied by Common Law Statute or otherwise are excluded. The Company shall not be responsible for any other liability expenses damages or loss which may occur consequent upon any misdescription defective material or workmanship of any description in connection with any replacements supplied or repairs executed by it.

The Company accepts no responsibility whatsoever for any replacements or parts which are not fitted by it to a vehicle even if such replacements or parts are supplied by it.

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

The Company accepts no responsibility for damage by fire or otherwise to customers' cars or parts thereof whilst on the Company's premises.

SINGER MOTORS LTD., BIRMINGHAM.

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GENERAL ATTENTIONS.

GENERAL DESCRIPTION

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

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

CARBURETTER. S.U. downdraught of the latest type giving high power with petrol economy. Easy starting control operated from the dash. The inlet and exhaust manifold is specially designed to combine a heating device for rapid warming up. Choke control on the facia panel. An air intake silencer and cleaner is fitted direct to the carburetter.

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

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

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

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

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

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

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

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

SUSPENSION. Long, wide, semi-elliptic springs front and rear, carried on rubber bearings requiring no lubrication. New type dual piston, hydraulic shock absorbers with progressive damping action.

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

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

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

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

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

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

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

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

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

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

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

OTHER EQUIPMENT. Dual bladed windscreen wiper, exterior driving mirror, cubby hole in nearside of instrument panel, pockets in each door, flush fitting trafficators with control on steering wheel. Rear number plate embossed in rear panel, stop tail light.

DATA

ENGINE.

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

TYRES.

Size	5.00″ × 16″
Pressures	Front wheels—20 lbs. per sq. in. Rear wheels—22 lbs. per sq. in. with two passengers 25 lbs. per sq. in. with four passengers

BRAKE HORSE POWER.

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

Maximum safe r.p.m. : 5,200.

GEAR RATIOS.

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

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

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

GENERAL DIMENSIONS.

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

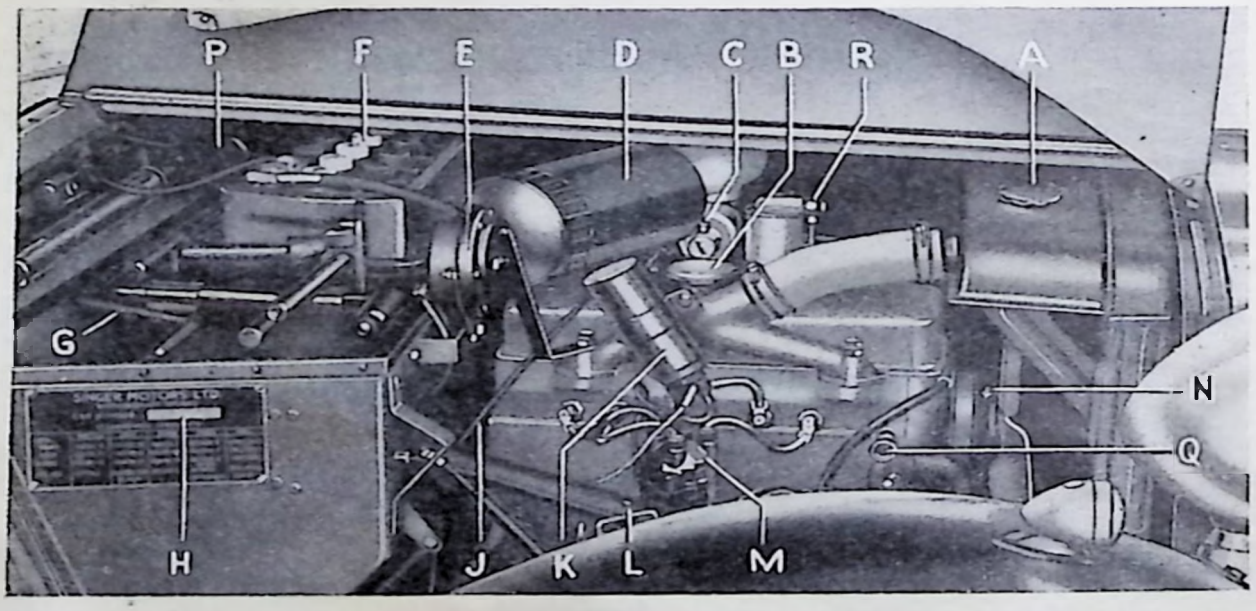
ON TAKING DELIVERY

IT is as well to be assured that everything is in order, and that any special equipment has been satisfactorily fitted. The supply of oil, petrol and water should also be checked, and an examination of the coachwork and chassis generally is well worth while. The tool kit should be checked and packed away as detailed hereunder.

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

Screwdriver	Tommy bar	Grease gun
Adjustable spanner	Tyre valve remover	Tyre levers
Distributor spanner	Tappet spanner	Hammer
Box spanners (1 set)	Open ended spanner	Toolbag

The tyre valve remover is for safety wired on to the Distributor spanner.



a. Radiator filler cap.
b. Engine oil filler cap.
c. Carburetter oiler.
d. Air cleaner.
e. Horn.
f. Battery.
g. Tool deck.
h. Car number.
j. Throttle control.
k. Coil.
l. Steering column oil hole.
m. Distributor.
n. Fan grease nipple.
p. Fuse box.
q. Camshaft chain adjuster.
r. Petrol filter union.

DRIVING AND CONTROL OF THE CAR.

AS pointed out in the preface to this book, some knowledge of the care and operation of a motor car has been presupposed, but for the benefit of new owners and those who have been driving other types of car, the following hints are given, which, if observed, will not only prolong the life of the car and cut down running costs, but will make motoring much more pleasant and comfortable.

The car is, as previously indicated, fitted with a three speed gearbox with synchromesh on second and top, making gear change a very simple and easy operation. In starting away from a standstill, do not over-rev and only change up at the speeds indicated on the speedometer dial. Over-revving is not only bad practice but is very harmful to the engine and transmission generally and in addition causes wheelspin, especially on the rear, which in turn promotes rapid tyre wear. Get into top gear as quickly as possible, there is no necessity to drive long distances in bottom before changing into second and in second before going on into top. The car attains its maximum efficiency in top gear and the intermediate gears are only a means of getting there.

Unless in traffic or hilly country, the use of second and first gears should be avoided as much as possible. Top gear performance is exceptionally good and there is no necessity for frequent gear changes and using, say, second gear for inclines and small hills which the car is perfectly capable of taking on top. Do not change down until the engine begins to drag and then change up into top again as early as possible. A little practice will soon make this changing down question almost automatic but the great thing to remember is that the car will normally take anything but severe gradients easily in top gear.

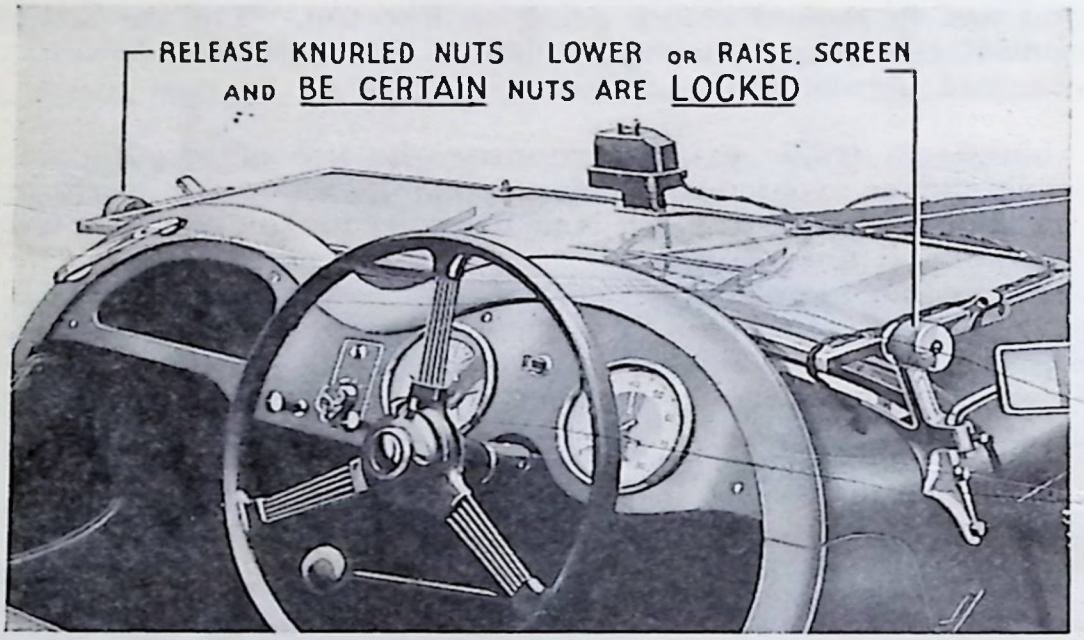
The habit of changing down and then violently accelerating to pass another vehicle should most definitely be discouraged, as also should the common fault of changing down from high speeds in order to slow up the car. Bends and corners are either known or are plainly indicated by road signs and traffic in front can always be seen, and it is therefore a simple matter to slow up in plenty of time by first removing the foot from the accelerator pedal and using the engine as a brake. If it is then desirable to slow up the car still further, a touch on the brake pedal will be all that is necessary. Apart from the fact that these habits are a sign of bad driving, they have very detrimental effects on the engine, transmission, brakes, tyres and fuel consumption and very soon lead to perhaps heavy repair bills.

One point in connection with the gearbox. This has been designed for easy operation and no difficulty should be experienced in making a smooth change. Owners who have had experience in changing gear on a car fitted with a freewheel will find that gear changing on the synchromesh box is exactly similar, but owners who

are used to the ordinary gearbox must realise that changing gear on a synchromesh box is a slow and deliberate movement and there is no necessity to double declutch. Two engagements can usually be felt, first the cone and then the gear, so always see that the gear lever is pushed right home otherwise the car will be driving on the cones instead of the gears with the ultimate risk of seizure.

"Practice makes perfect" and the intelligent use of both gearbox and brakes will soon become second nature making driving a pleasure instead of a strain and generally adding very much to the comfort of motoring, particularly from the passengers' point of view.

There are several adjustments provided for the personal comfort of both driver and passenger; the front seats can be adjusted by releasing the locking lever which will be found underneath each seat and sliding the seat backwards and forwards on its runners. The windscreen wiper is brought into action by unlocking the curved handle, swinging the wiper arm into position and switching on.



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

It is in your own interest to run this car carefully for the first 500 miles. DO NOT EXCEED FORTY MILES AN HOUR ON TOP GEAR. Even when the car is run in the engine must not be overdriven, especially on first and second gears. The maximum permissible speed on these gears are clearly indicated by the marks 1 and 2 shown on the face of the speedometer. See illustration page 14.

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.

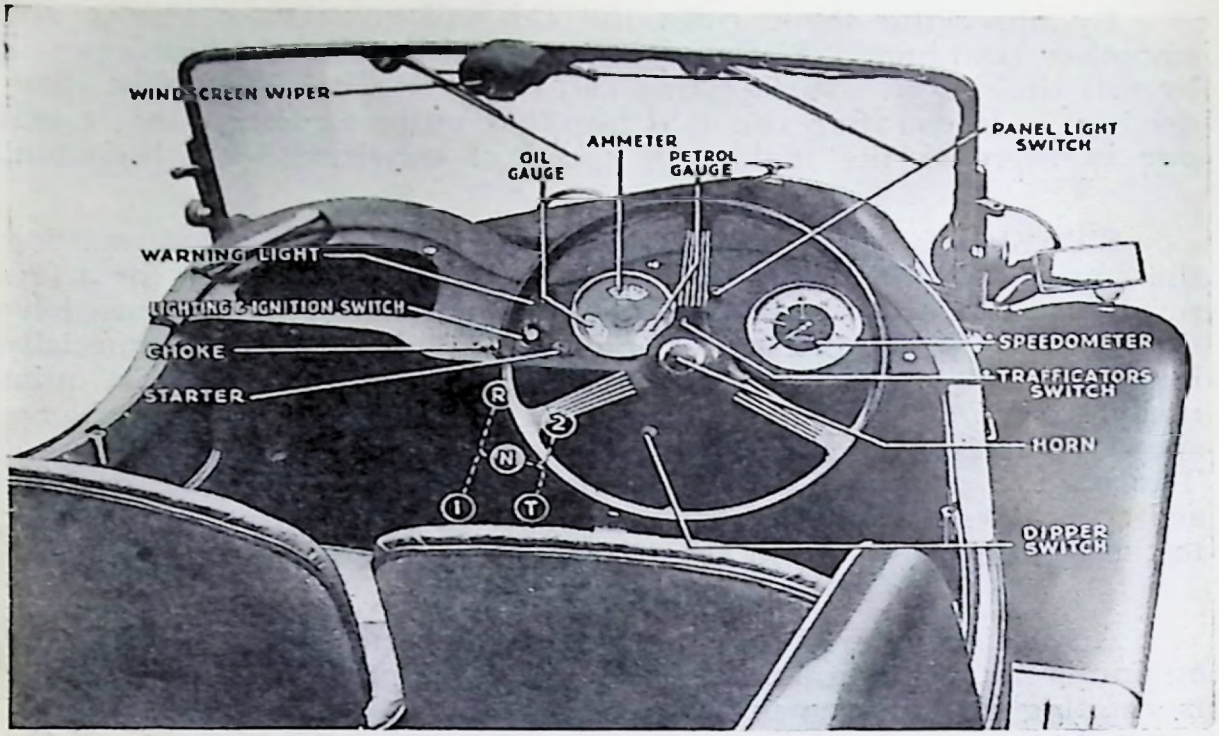
STARTING THE ENGINE. It is advisable before starting the engine to make a practice of using the starting handle for a few revolutions in order to ease the load on the starter motor caused by the natural "gumminess" of the engine oil. This is especially important in winter time. After this, the engine should start quite easily. When starting an engine be quite certain that the change speed lever is in the neutral position and the handbrake lever on. The engine should then be switched on by means of the ignition switch and key which control the supply of current from the battery to the ignition coil. Two keys are supplied.

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

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

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

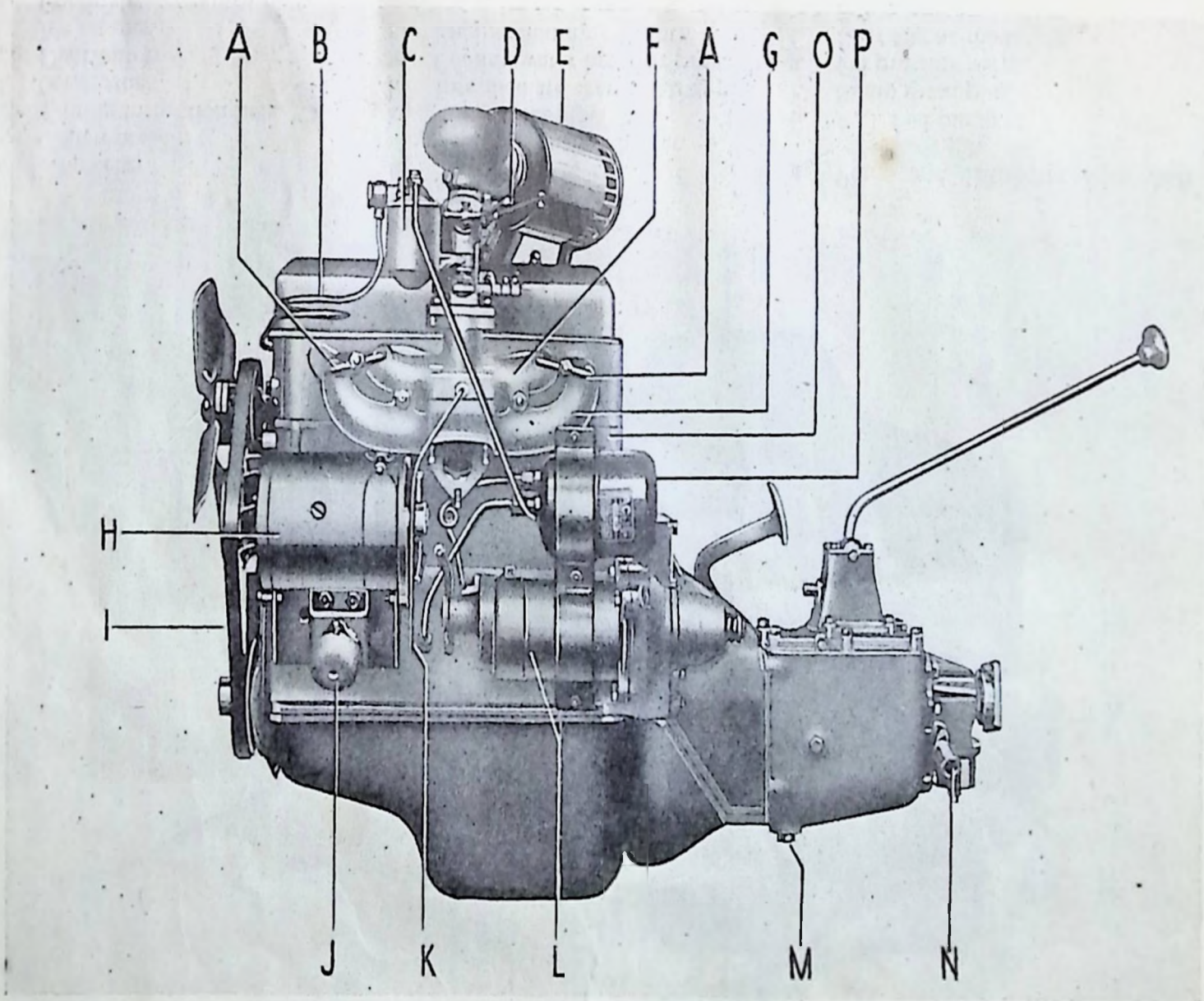
The remaining controls and the change speed lever positions are fully illustrated on page 14.



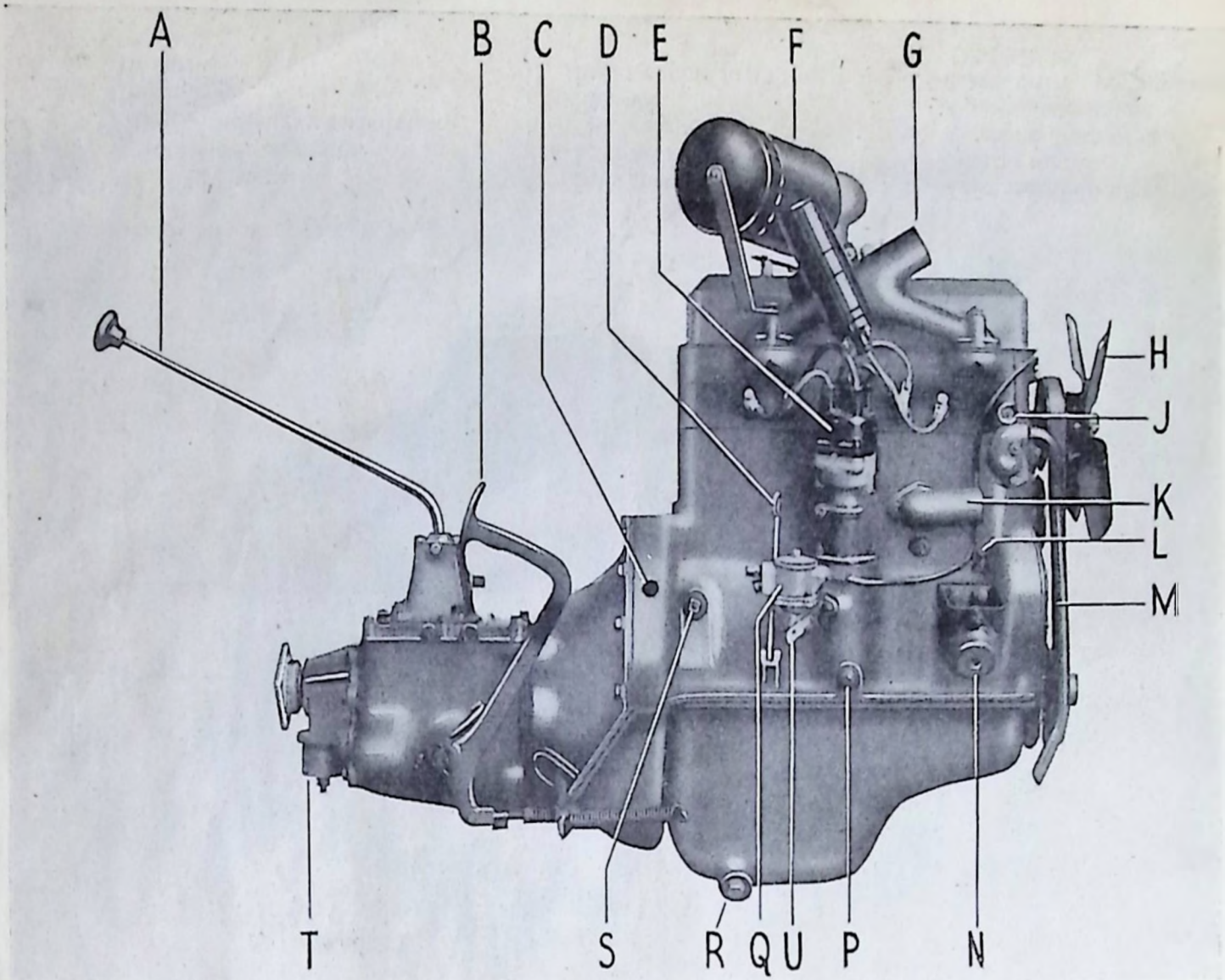
Having described briefly the general details of the car, it is proposed now to deal in detail with the engine lubrication, general lubrication and maintenance adjustments which should be carried out periodically.

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

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



a. Manifold clamps.
b. Petrol pipe from pump.
c. S.U. downdraught carburetter.
d. Choke lever.
e. Air silencer.
f. Inlet manifold.
g. Exhaust manifold.
h. Dynamo.
i. Fan belt.
j. Front engine mounting.
k. Inlet manifold bleed pipe.
l. Starter motor.
m. Gearbox drain plug.
n. Speedometer guide.
o. Carburetter overflow pipe.
p. Oil filter.



a. Gear lever.
b. Clutch pedal.
c. Timing inspection hole.
d. Oil dipstick.
e. Distributor.
f. Air cleaner.
g. Cooling water return pipe.
h. Fan.
j. Camshaft chain adjuster.
k. Water inlet pipe.
l. Intermediate shaft locating pin.
m. Cooling water breather pipe.
n. Engine mounting (front).
p. Pump and distributor drive shaft locating pin.
q. A.C. fuel pump.
r. Sump drain plug.
s. Oil pressure valve.
t. Rear engine mounting.
u. Pump primer.

DAILY ATTENTIONS.

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

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

We recommend all users to the higher grade petrol as and when it becomes available. In the meantime, engines have been set to give the best results possible with present day fuel but a certain amount of incipient detonation or "pinking" may be noticed when pulling hard which better class fuels will eliminate besides providing smoother running and lower consumption.

2. ENGINE OIL. The engine oil filler will be found on the engine top cover and is stamped with the word "Oil". It is airtight in order to prevent fumes escaping. Full details of the various recommended brands of oil are to be found on the engraved plate fixed to the bulkhead under the offside bonnet.

An oil breather is fitted to the offside of the engine case which conveys fumes below the body level. We also fit a by-pass type filter, served from the main oil circuit, the filtered oil being returned via the crank chamber to the oil sump. It is fitted on the nearside above the starter motor. (Note.—The first hundred and twenty-five cars are not equipped with this filter).

When the filter has been in use for some 10,000 miles it may require renewal due to clogging. This may be checked by uncoupling the union between the filter body and the return pipe to crankcase and observing whether the oil flow is scanty or absent.

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

With the filter mentioned above, it should not be necessary to check the oil pressure or flow, but if for some reason this is required, the best way is, with the engine running slowly, to disconnect the

union between the oil gauge pipe and the flexible connection from the engine and if oil pressure is present at this point then either the oil lead to the gauge is choked or the gauge itself is at fault. Make sure that the pipe is clear and if the trouble still persists have the gauge attended to by your local dealer.

If no oil pressure is present at the union, then the fault must be in the lubricating system. It is unlikely to be in the pump itself and the cause will most probably be due to (a) a choked filter, (b) foreign matter of some description in the pressure release valve. To clean the filter it will be necessary to lower the sump, and instructions for this operation are given on page 22.

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

To increase the oil pressure, slack back the lock nut two or three turns, screw in the centre plug and tighten the lock nut. To decrease the oil pressure, release the lock nut, screw the centre plug back two or three turns and relock the nut. **The correct pressure is 35/40 lbs. at 25 m.p.h. in top gear.**

In some cases low oil pressure is due to the engine oil becoming very thin owing to dilution with petrol due to misuse of the carburetter choke control. This can easily be checked by draining a little of the oil from the sump through the drain plug, and if the condition of the oil verifies the suspicion of dilution the remedy is to drain the sump and refill with fresh oil of the correct grade.

Clean engine oil is essential, and after the first 750 to 1,000 miles the oil should be drained from the sump and fresh oil put in. After this, the oil should be changed about every 5,000 miles.

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

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

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

If the garage is not heated, the water may be drained, but it is usually more convenient to use an anti-freezing mixture in the cooling system. Any of the high class, nationally advertised brands are suitable and full directions are given on the containers. If obtainable, ordinary commercial glycerine is a cheap and reliable form of anti-freeze and 25% (by volume) of glycerine in the cooling system will give adequate protection. The total cooling system capacity is eighteen pints, therefore sufficient water may be drawn away and replaced by five pints of glycerine.

In the event of a sudden frost with no anti-freeze in the radiator and no means of keeping the car warm, drain off all water from the system by means of the tap at the base of the radiator and remove the small plug in the offside of the cylinder block under the water inlet branch near the distributor.

WEEKLY ATTENTIONS.
(Or every 250 miles).

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

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

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

3. It is also advisable at this period to put two or three spots of oil from a hand oil can on the ball joints of the carburetter controls and the brackets holding the accelerator pedal cross shaft. A little attention given to points of this description is always time well spent.

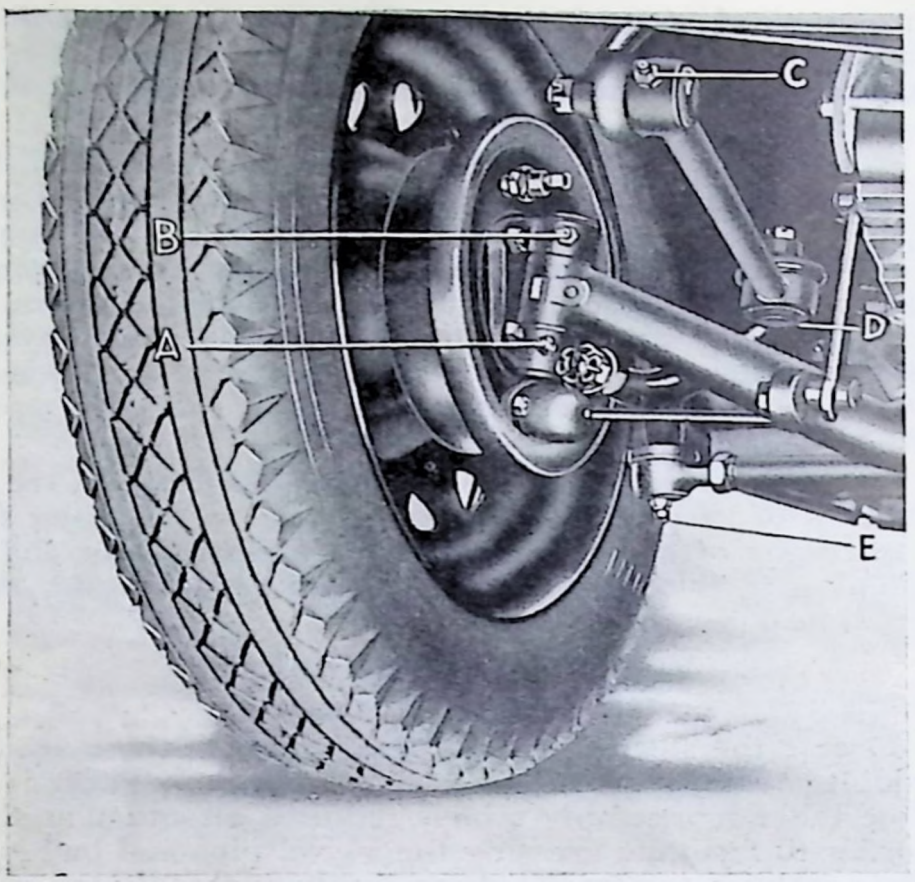
4. IMPORTANT. It is a good point to make a practice of checking the tyre pressures weekly, and these should be as follows :

Size .. .. 5.00 in. × 16 in.

Pressure .. Front wheels—20 lbs. per sq. in.
Rear wheels—22 lbs. per sq. in. with two passengers
25 lbs. per sq. in. with four passengers

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

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



A, bottom swivel pin bush ; B, top swivel pin bush ; C, drag link greaser ; D, steering rod greaser ; E, track rod greaser.

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

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

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

MONTHLY ATTENTIONS.

(Or every 1,000 miles).

GREASERS. There are three greasers to which the grease gun should be applied every 1,000 miles, one is on the clutch pedal and the others on the propeller shaft, one at the rear and two at the forward end.

If the latter are not visible when the gearbox rubber is removed it will be necessary to release the handbrake and push the car backwards or forwards a little way until the greasers are accessible.

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

the following points may receive attention.

1. Check level of oil in the gearbox and rear axle. The filler plug for the gearbox is situated at the rear of the gearbox top cover and the oil level plug on the nearside of the box.

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

3. Spray all road springs with penetrating oil (spring leaves only).

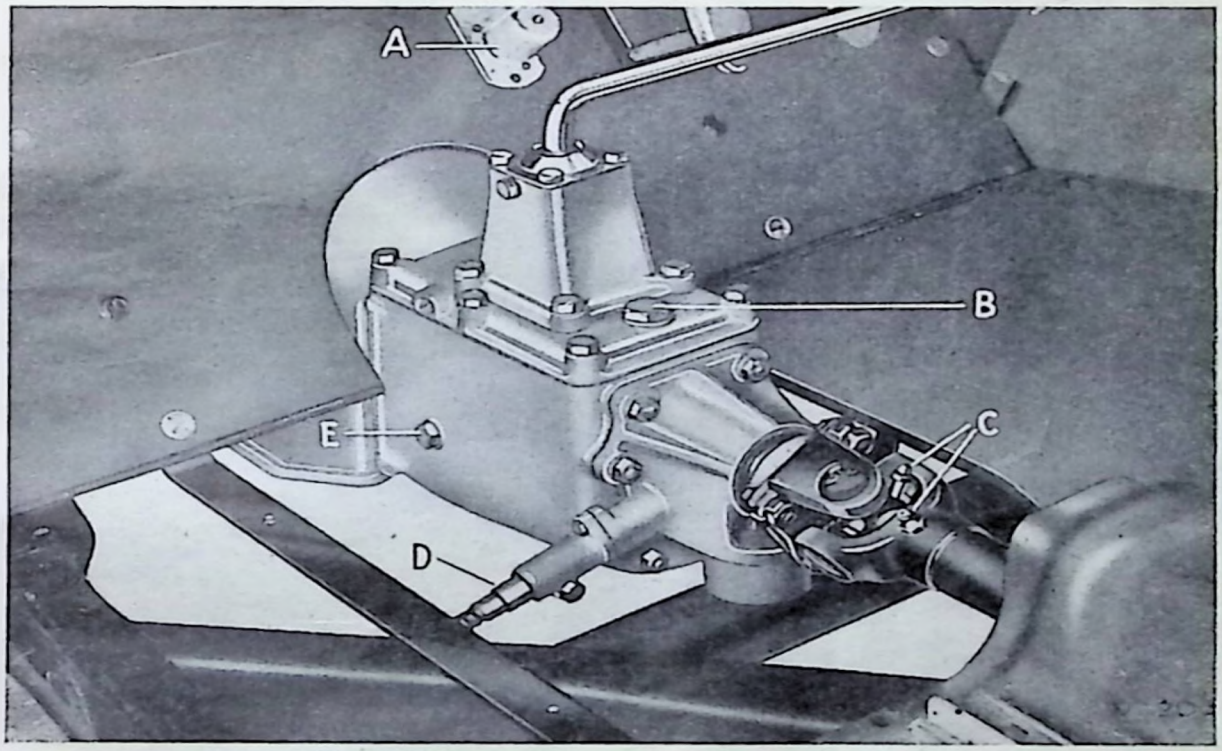
NOTE.—All spring shackles are mounted on rubber bushes which do not require lubrication.

4. Top up the battery (see page 76).

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

6. Lubricate the door catches and striking plates.

7. Steering box: The steering box will not normally use any appreciable amount of oil but it is advisable to put in a small quantity each time the 1,000 mile service is carried out. An oil hole will be observed situated about half way down the steering column and oil in accordance with the grade specified in the Lubrication Chart can be inserted at this point.



A, headlamp dipper; B, gearbox filler plug; C, propeller shaft greaser; D, speedometer drive; E, oil level drive.

EVERY 2,000 MILES.

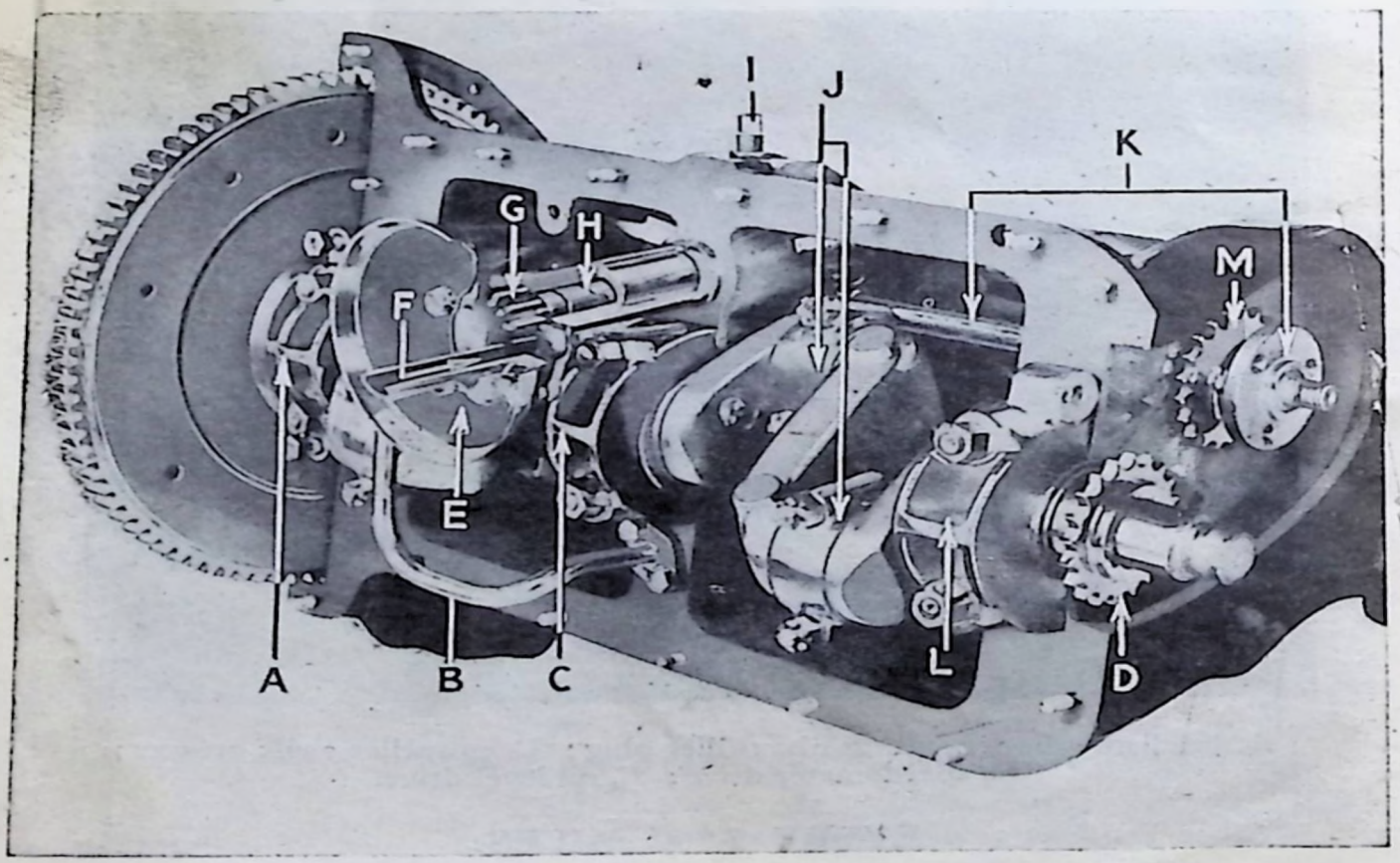
TRAFFICATORS. It is advisable about every 2,000 miles to raise the trafficator arm and apply one or two drops of thin machine oil by means of a feather or match stick, between the brass knob or profile and the small copper spring and copper spindle.

EVERY 5,000 MILES.

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

Then drain away, replace the drain plug, and refill with the correct grade of oil to the level mark on the dip stick. Cleaning the oil filter becomes necessary on any sign of low oil pressure, and in any case every 5,000 miles it is advisable. Proceed as follows :—

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



a. Rear main bearing cap.
b. Oil pump delivery pipe.
c. Centre main bearing cap.
d. Crankshaft sprocket.
e. Oil pump filter plate.
f. Oil pump suction pipe.
g. Oil pump gears.
h. Oil pump drive shaft.
i. Pump and distributor shaft locating pin.
j. Connecting rod bearings.
k. Intermediate shaft assembly.
l. Front main bearing cap.
m. Intermediate shaft sprocket.

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

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

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

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

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

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

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

5. Add a few drops of thin machine oil to the distributor cam bearing. To do this withdraw the moulded rotating arm from the top of the spindle by pulling it off. Do not remove the screw exposed as there is a clearance between the screws and the inner face of the spindle, through which the oil will pass.

The distributor automatic timing control needs lubricating at this period with a good grade engine oil. The control is rendered accessible by removing the distributor moulding, lifting off the rotating distributor arm and then removing the contact breaker base by removing its two securing screws. Take care to refit contact breaker base in its original position. Two drops of thin machine oil should also be inserted into the lubricator on the distributor shank.

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

7. SPARKING PLUGS. After exhaustive tests it was found that the Champion L10S, 14 mm. sparking plug was most suitable for the Roadster model, and it is advised that replacements be of the same type.

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

After the first few hundred miles remove the plugs, clean, and check the gaps, re-setting if necessary to .025 in.

These attentions will normally be required every 5,000 miles.

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

INLET VALVES	.005"
EXHAUST VALVES	.007"

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

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

9. The Armstrong hydraulic shock absorbers should be examined at this period and if necessary a little oil added. For full instructions concerning the adjustment and maintenance of the shock absorbers, see page 64.

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

11. CAMSHAFT CHAIN ADJUSTMENT. In order to adjust the camshaft chain it will be necessary to release the locking nut on the knurled screw which passes through the offside of the cylinder head close to the water outlet pipe. Tighten the knurled screw until the tension of the camshaft chain is felt. Then turn the knurled screw back half-a-turn and lock into position by means of the lock nut. The camshaft chain adjustment will then be correct. Every precaution must be taken against over-tightening as this will cause excessive wear of the camshaft chain.

12. Wash off mud, etc., from brake rod linkage and grease all pins and levers (see brake section—page 59).

ANNUALLY.

(Or every 12,000 miles).

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

METHOD OF REMOVING DUST CAP FROM ROAD WHEEL

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

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

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

2. Dynamo and Starter Motor. These components should be removed from the car and sent to the makers or the nearest Lucas Service Agent for cleaning and lubricating. For other information see pages 70-75 of the electrical equipment section.

PETROL SUPPLY

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

PETROL TANK.

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

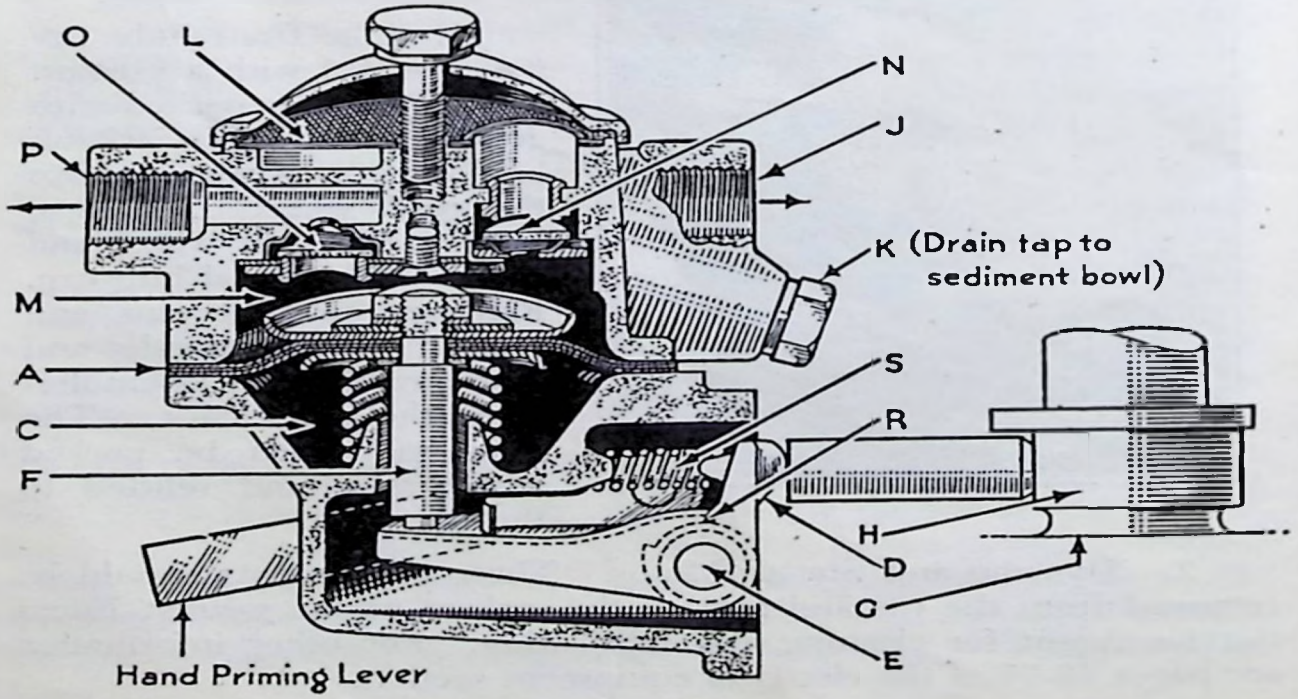
Should it at any time be necessary to remove the petrol tank, disconnect the petrol gauge and pipe, remove the four nuts and bolts securing the petrol tank straps to the chassis frame, and withdraw the petrol tank from beneath the chassis.

THE A.C. FUEL PUMP.

SERIES "Y"

WORKING PRINCIPLES.

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



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

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

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

SERVICE HINTS.

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

LACK OF FUEL AT THE CARBURETTER.

Check as follows :

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

LEAKAGE OF FUEL AT THE DIAPHRAGM.

Check as follows :

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

FLOODING OF CARBURETTER.

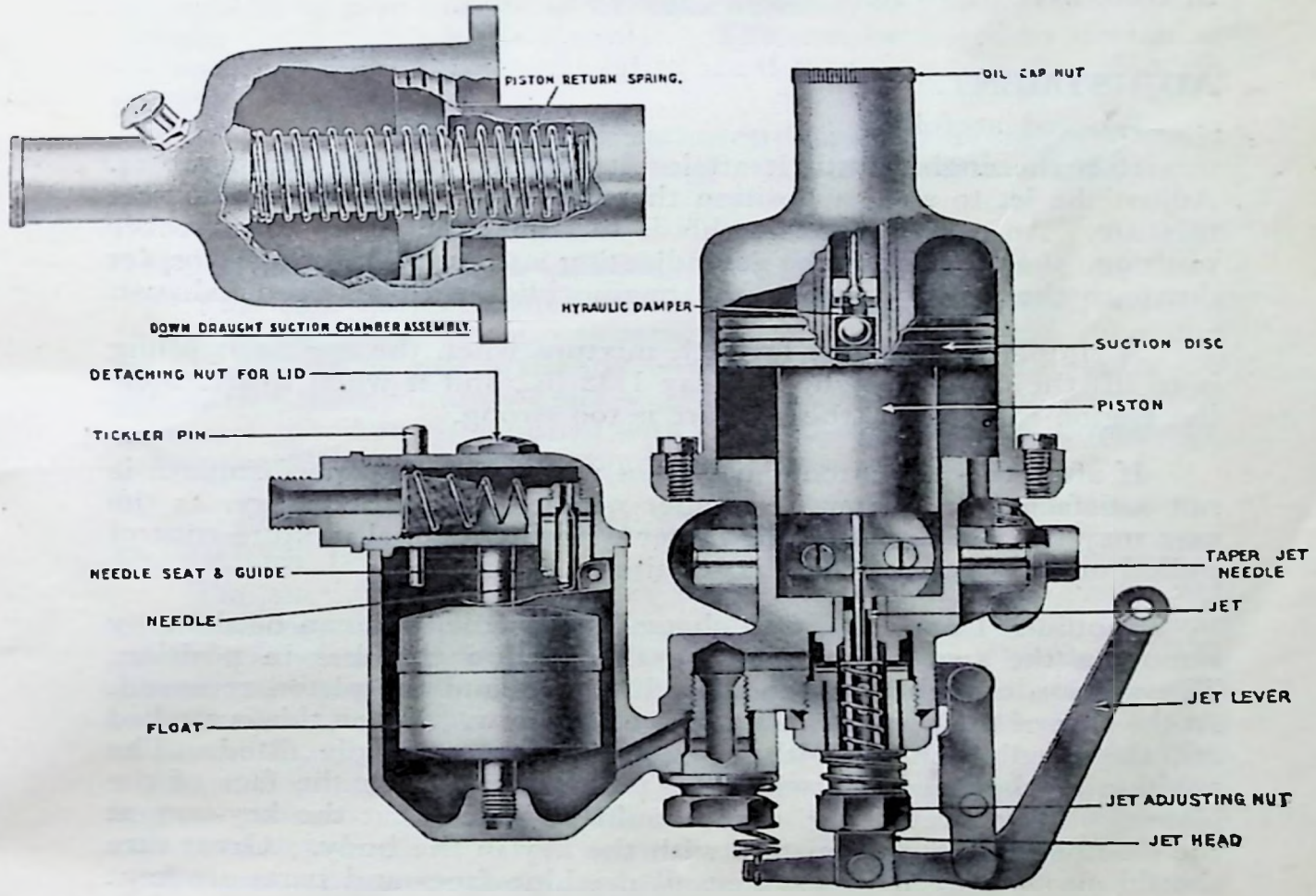
Check as follows :

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

CARBURETTER

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

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



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

It is of the utmost importance that the carburetter should be adjusted by means of the jet and jet adjusting nut in such a way that the correct mixture is obtained when the engine is idling—that is to say, it should be made to fire as evenly as possible. This can be noted by listening to the exhaust. If the engine has a constant uneven beat (known as "hunting"), this is due to rich mixture. If the exhaust note is irregular and splashy, the mixture is too weak.

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

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

ADJUSTMENT.

Proceed as follows :—

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

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

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

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

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

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

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

LOSS OF COMPRESSION on one or more cylinders.

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

OILY PLUGS causing misfiring.

FAULTY IGNITION, bad starting and misfiring.

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

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

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

THE HYDRAULIC SUCTION PISTON DAMPER.

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

PISTON STICKING.

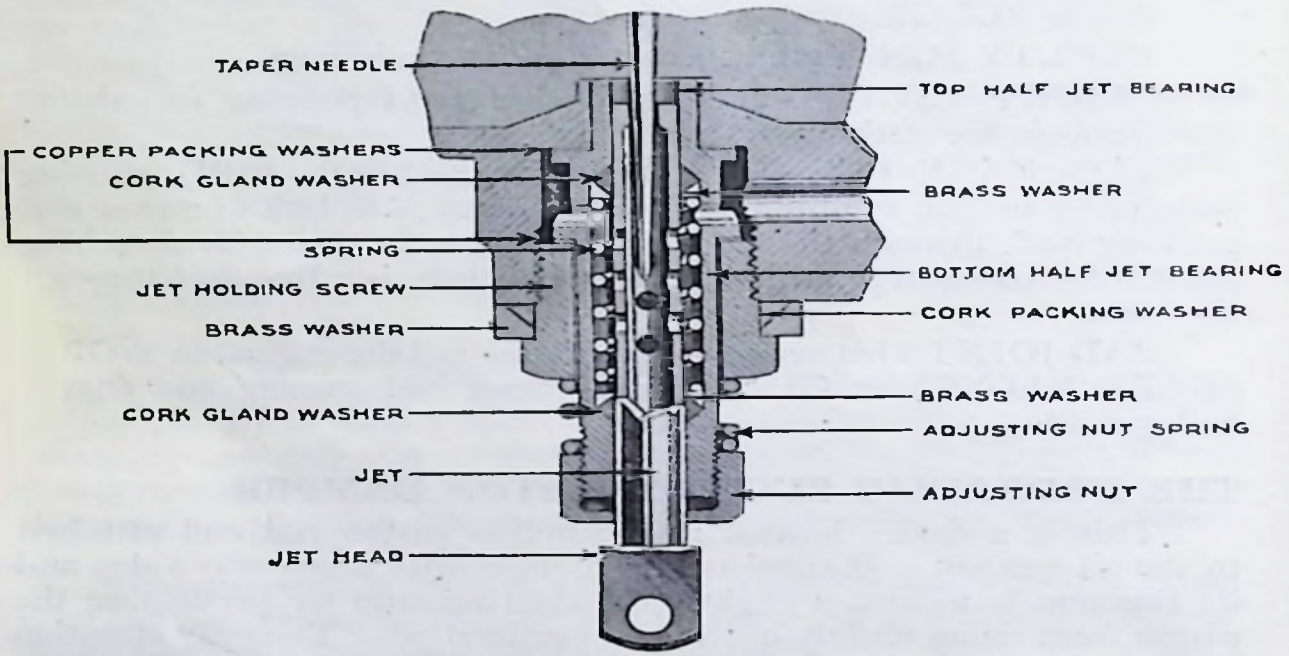
Paragraph 1.

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

WATER OR DIRT IN CARBURETTER.

Paragraph 2.

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



CENTRING OF JET.

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

First screw the jet adjusting nut to its top position and move the jet right up 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.

FLOAT-CHAMBER FLOODING.

Paragraph 3.

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

FLOAT NEEDLE STICKING.

Paragraph 4.

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

JET STICKING.

Paragraph 5.

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

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

There is very little that is likely to go wrong with the S.U. carburetter, and when this does happen it is a perfectly simple matter to rectify the fault. A lot of trouble has been, and can be caused by unnecessary interference due to lack of knowledge. As previously pointed out, the only possible adjustment is by fitting the correct needle adjusted for idling by means of the jet adjusting nut, consequently there is normally no need whatever for the jet to be touched.

In the past the chief trouble has been the jet being removed without knowledge as to re-centring it ; therefore on no account allow anyone to remove or tamper with this part unless you are personally certain that it is blocked, which after all, is a very unlikely occurrence.

STARTING.

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

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

DECARBONISING ENGINE

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

It is not possible to state definitely over what mileage a car should be run before decarbonising becomes necessary, but signs of excessive carbon deposit are noticeable owing to the sluggishness of the engine and a tendency to "pink" under load. Therefore, we suggest that a new engine should be decarbonised for the first time after 10,000 miles, and thereafter every 20,000 miles will be a fair average period.

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

1. Remove bonnet.

2. Drain the water system by means of the drain tap at the base of the radiator at the nearside, and by means of the drain plug underneath the water inlet pipe on the offside of the cylinder block. IT IS ESSENTIAL THAT THIS PLUG IS REMOVED TO COMPLETELY DRAIN THE WATER COOLING SYSTEM.

3. Disconnect air silencer and the filter union from the carburetter, exercising care to avoid damaging the filter inside the union. When reconnecting the union be quite certain that the fibre washer is in position.

4. Disconnect the carburetter throttle and choke controls. It will be noticed that the carburetter throttle control is secured to the top cover by means of one of the dome nuts and care must be taken when refitting the bracket to be quite certain that it is in such a position that the carburetter throttle can be fully closed.

5. Disconnect the exhaust lead pipe, and remove the drain pipe from the induction manifold. Be careful to avoid damage to the gasket fitted between the lead pipe and the manifold.

6. Remove carburetter.

7. Remove five nuts securing the inlet and exhaust manifolds, and withdraw the manifolds from the studs. Special gaskets are fitted between the manifolds and cylinder head, and these should be carefully removed and stored for safety.

8. Remove top valve cover which is secured by two dome nuts. A cork washer is fitted between the valve cover and the cylinder head.

9. Disconnect and remove the sparking plugs.

10. Disconnect the clips securing the radiator top hose pipe and remove the hose pipe.

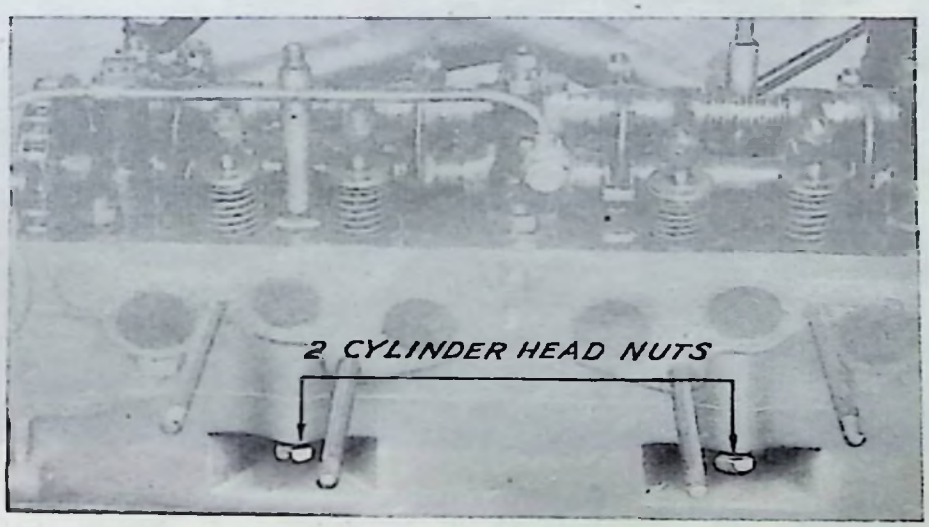
11. Disconnect the camshaft oil feed pipe by unscrewing the union at the timing case end, removing the nut and releasing the clip securing the pipe to the first camshaft bearing and removing the gallery stud, which connects the camshaft feed pipe to the camshaft centre bearing.

12. Remove water outlet pipe.

13. Remove two bolts and washers securing the cover at the front of the cylinder head and open out the small metal clip which secures the oil feed pipe of the overhead camshaft assembly. (See illustration, page 36).

14. Set the engine position by turning the starting handle until the inlet valve on number four cylinder is about to open.

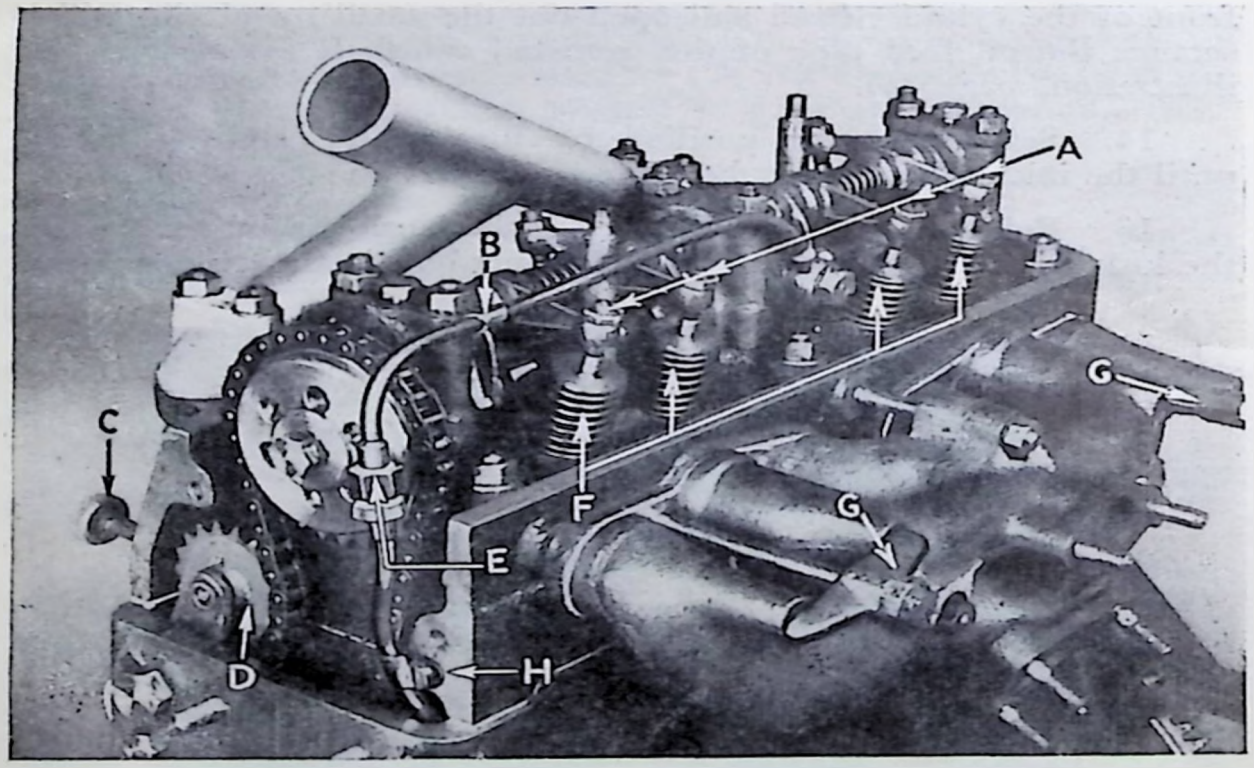
15. Release the camshaft drive chain tensioner by unscrewing the lock nut and turning back the adjusting bolt in the cylinder head.



16. Remove the camshaft chain sprocket by releasing the tab washer and removing the bolt and plain washer which secure the chain wheel to the camshaft flange. DO NOT UNDER ANY CIRCUMSTANCES REMOVE CHAIN FROM CHAIN WHEEL.

17. Remove two bolts and washers from timing case to cylinder head, one of which carries the petrol pipe clip. Remove eight nuts and plain washers from the cylinder head holding down bolts, and remove two nuts and washers from two studs which penetrate the cylinder block immediately behind the manifolds on the nearside of the engine. These nuts and washers will only be disclosed when the exhaust and inlet manifolds are removed (see illustration below).

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



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

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

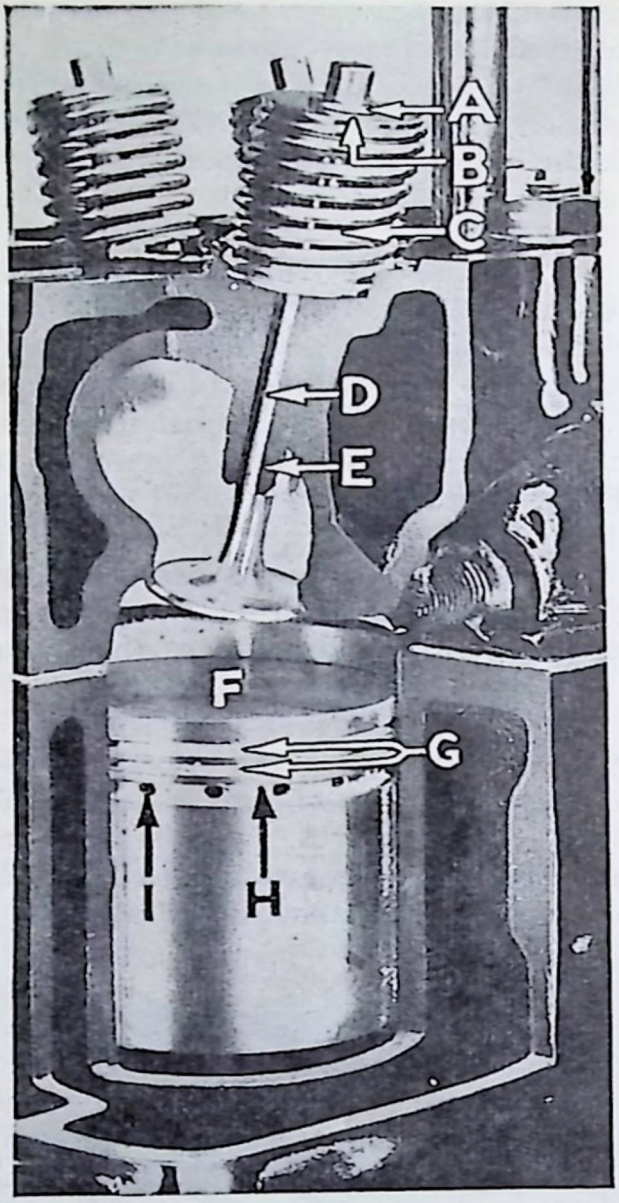
Remove all carbon deposit from the combustion chambers, the face of the cylinder head and the valve heads. Do not in any way interfere with the position of the camshaft in order that the cylinder head can be returned to the cylinder block without interfering with the valve timing. Again, hold the camshaft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

GRINDING IN VALVES. It is not always necessary to carry out this operation every time an engine is decarbonised, therefore the above instructions concerning decarbonising have not taken into consideration the method of dismantling the cylinder head and camshaft assembly for the purpose of valve grinding.

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

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

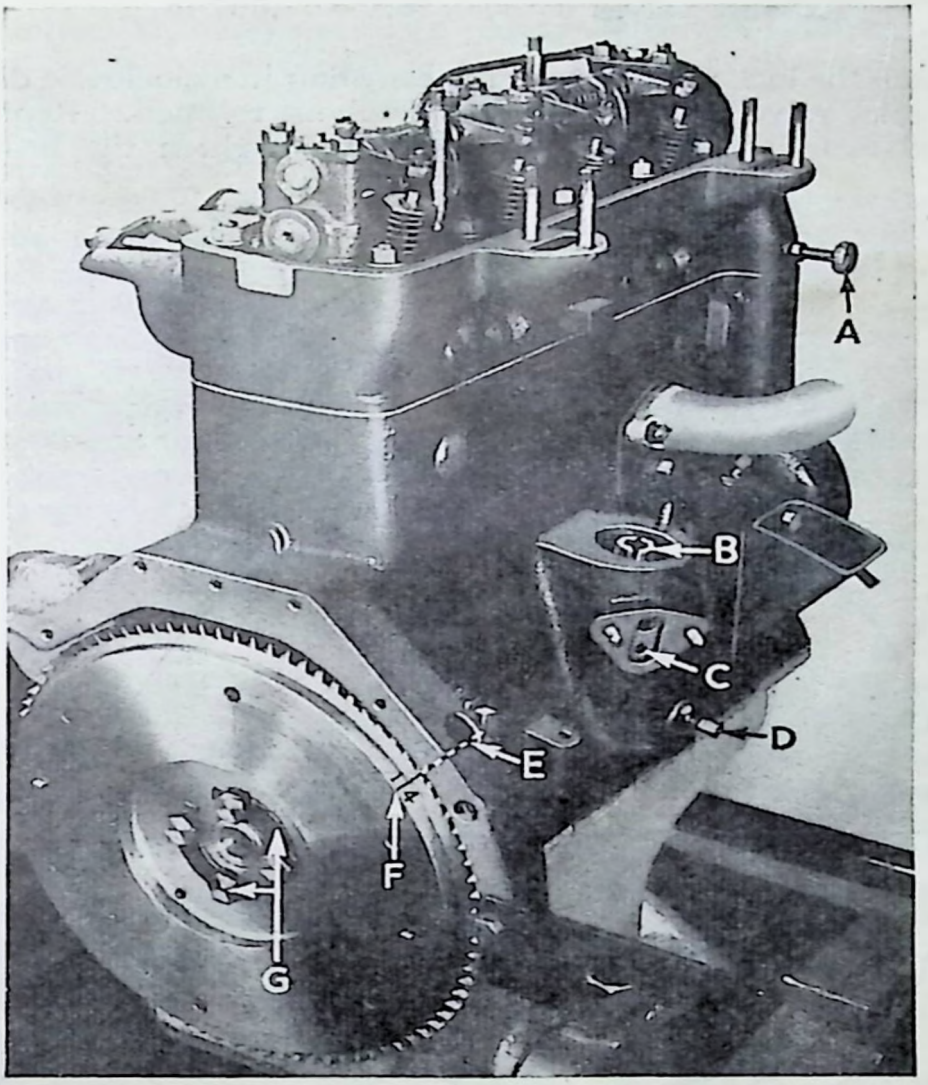
Inlet valves . .	. .	Nos. 2, 4, 6, 8
Exhaust valves	. .	Nos. 1, 3, 5, 7



a. Valve split cotter.
b. Valve spring collar.
c. Valve spring.
d. Valve.
e. Valve guide.
f. Piston.
g. Compression rings.
h. Scraper rings.
i. Scraper ring oil return holes.

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

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

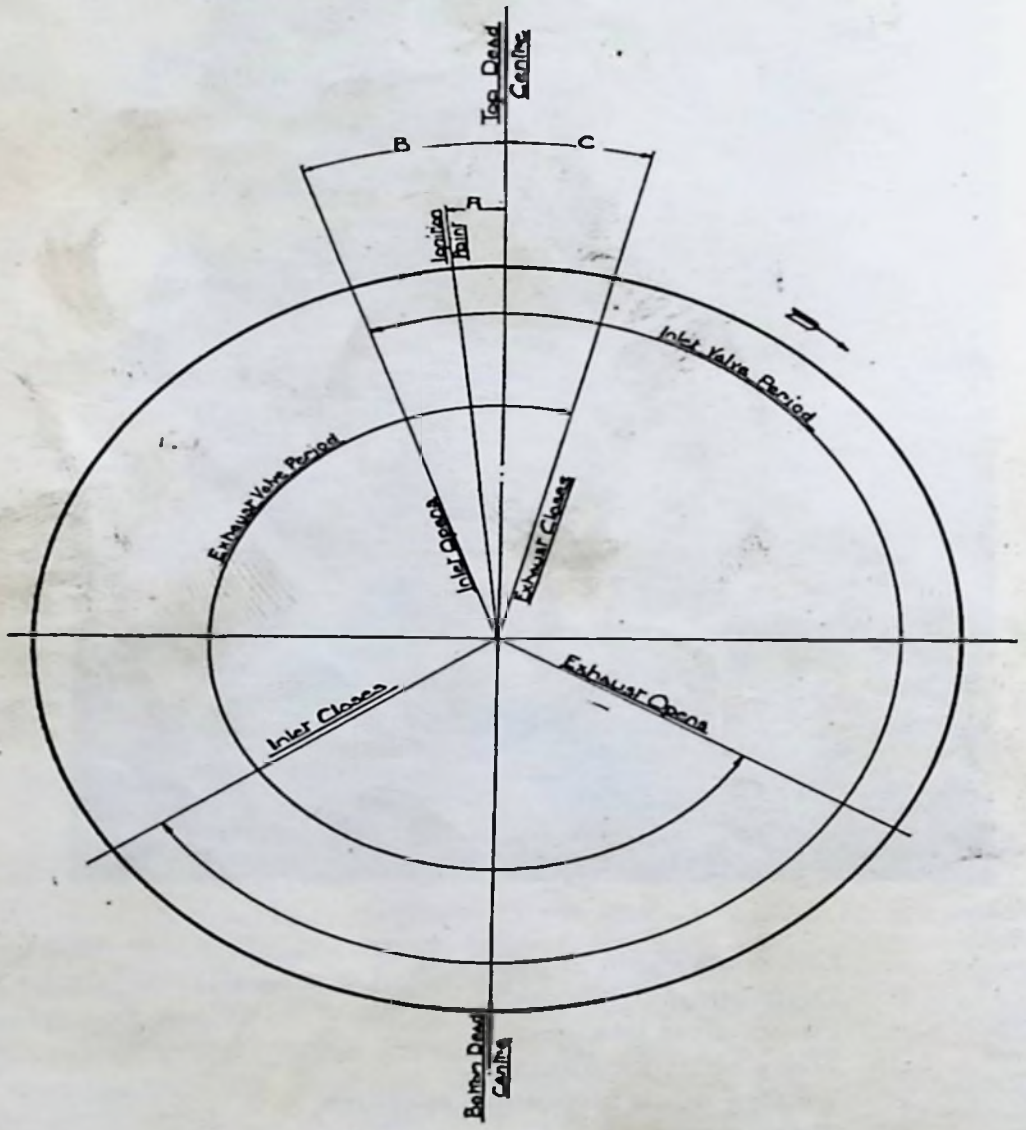


a. Camshaft chain adjustment.
b. Distributor drive shaft.
c. Pump drive plunger.
d. Drive shaft locating pin.
e. Timing mark inspection aperture.
f. Timing mark.
g. Flywheel anchorage bolts and locking plates.

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

Inlet valves	.005 in.
Exhaust valves	.007 in.

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



	A	B	C
FLYWHEEL	$\frac{1}{16}$"—$\frac{7}{8}$" B.T.D.C.	$1\frac{23}{32}$" B.T.D.C.	$1\frac{11}{32}$" A.T.D.C.

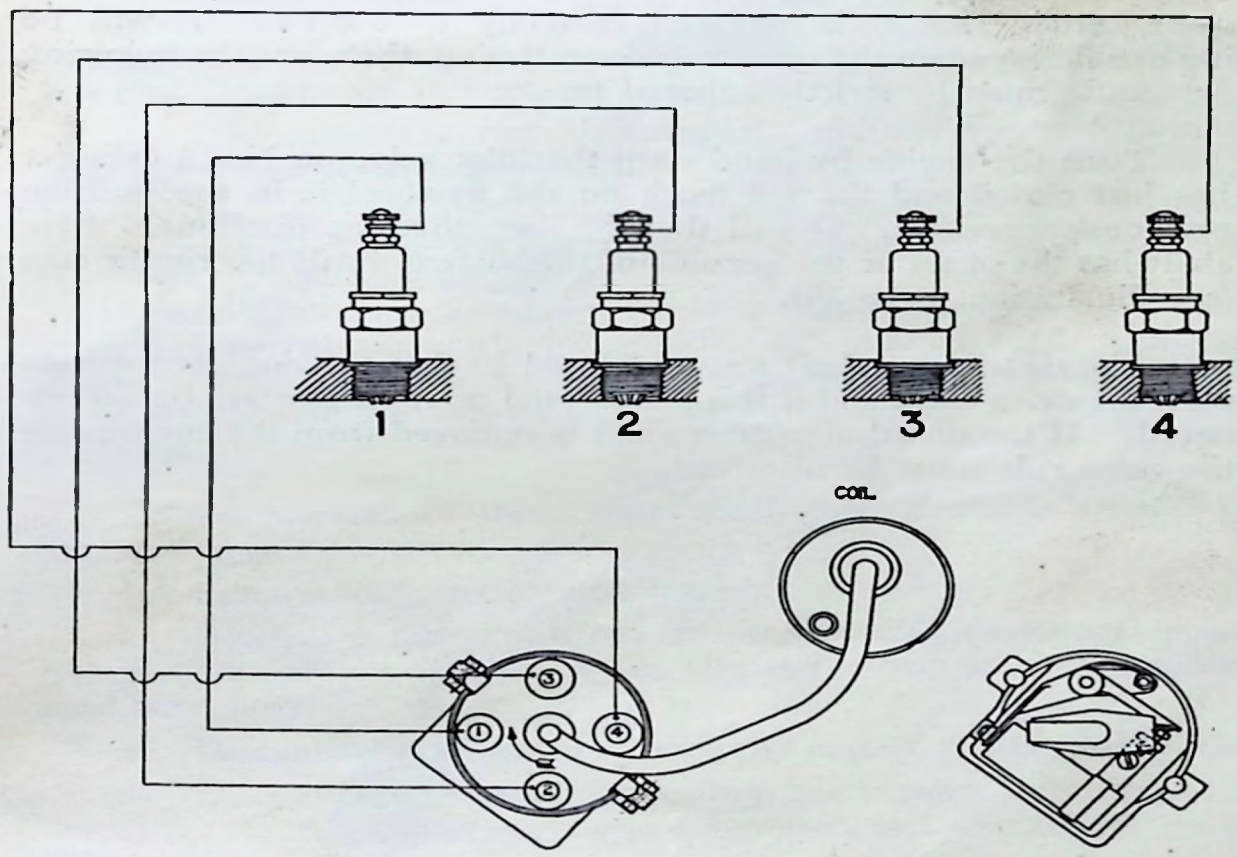
evenly half a turn at a time, working from the centre outwards. Reassemble the oil feed pipe to the camshaft assembly. Remount the camshaft chain wheel and lock into position, not overlooking the correct location of the tab washer with the chain wheel stud.

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

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

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

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



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

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

Test the engine after this setting, and any slight variation which may seem necessary can be made by slackening the distributor clip nut and slightly rotating the distributor. Turning clockwise will retard the ignition and anti-clockwise will advance it.

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

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

Turn the engine by hand until the inlet valve on No. 4 cylinder has just closed and the 1/4 mark on the flywheel is in the position previously specified. It will then be seen that the distributor drive shaft has the offset or thicker side of the shaft towards the engine case (see illustration, page 39).

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

OVERHAULING INSTRUCTIONS

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

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

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

CAUTION.

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

REMOVING ENGINE FROM CHASSIS.

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

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

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

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

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

1. Remove carburetter air silencer.

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

3. Disconnect carburetter controls and remove carburetter.

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

5. Disconnect the oil gauge pipe at the flexible connection.

6. Remove three bolts which secure the starter motor and which also carry the earth return cable. The starter motor may then be removed.

7. Remove three nuts from exhaust pipe flange and disconnect pipe from manifold.

On the offside of the engine it will be necessary to

8. Disconnect the petrol pipe from the tank to the pump.

9. Disconnect the lead from the coil to the distributor and the low tension and earth lead from the distributor.

10. At this stage it will be advisable to fix the pulley block and tackle in position to take the weight of the engine.

REMOVING GEARBOX.

1. Remove the front seats and carpets disclosing twelve wood screws securing the gearbox rubber cover.

2. Remove the propeller shaft guard.

3. Extract the wood screws securing the metal pedal cover to the offside of the front toe-board.

4. Remove bolts from toe-board and floor-boards and remove boards.

5. Remove the floor-board supporting straps. These are secured by four nuts and bolts and two screws.

6. Disconnect the front end of the propeller shaft and the speedometer drive.

7. Remove bolts from the unit rear mounting and lift clear of the cross member.

8. Remove the six bolts securing the clutch housing to the engine case and withdraw the gearbox from the chassis.

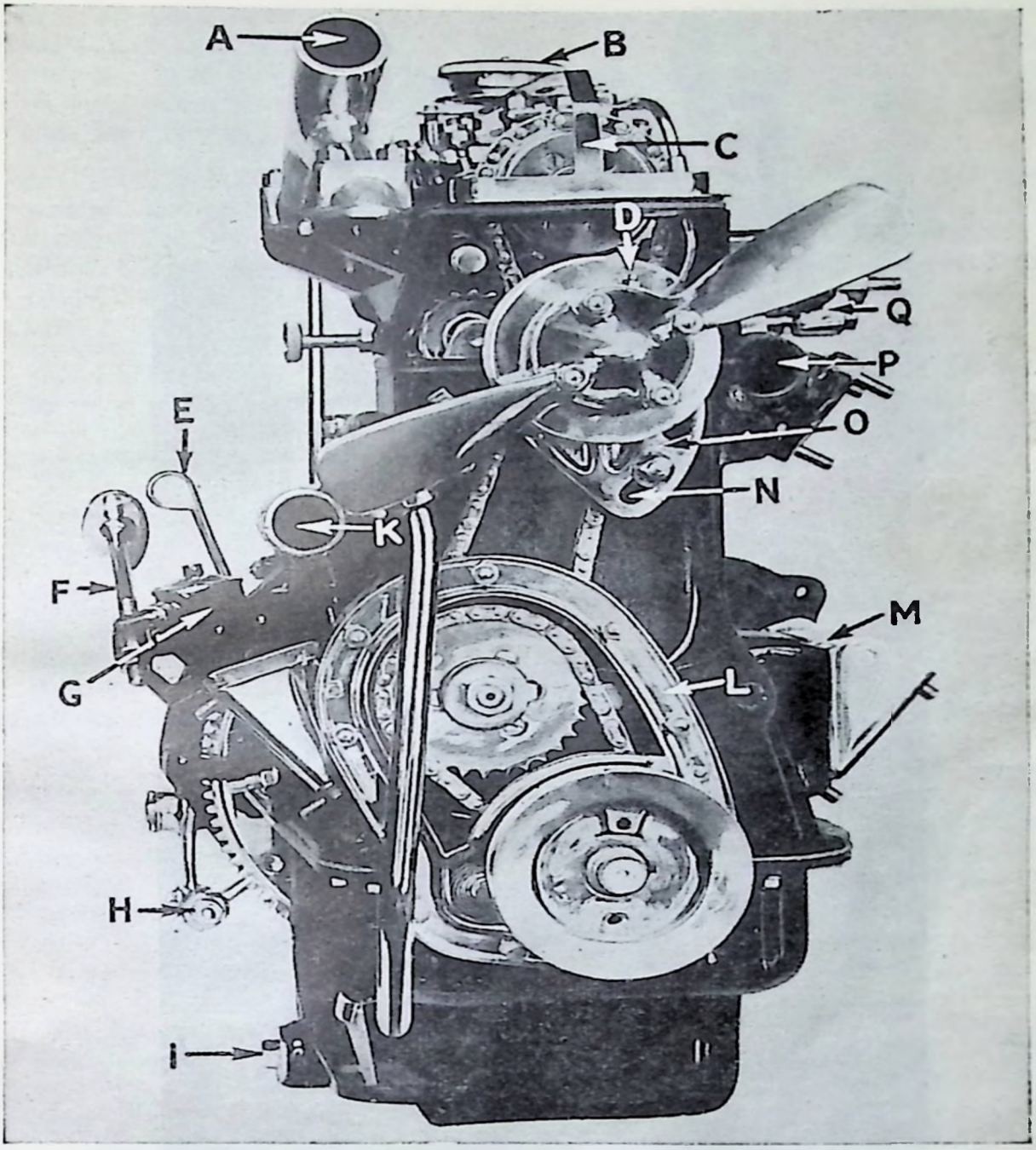
9. Remove the centre bolts, one each side of the engine front mounting brackets and lift the engine from the chassis, tilting slightly to the nearside in order to clear the steering box.

DISMANTLING ENGINE.
REMOVING TIMING CASE, INTERMEDIATE SHAFT ASSEMBLY, ETC.

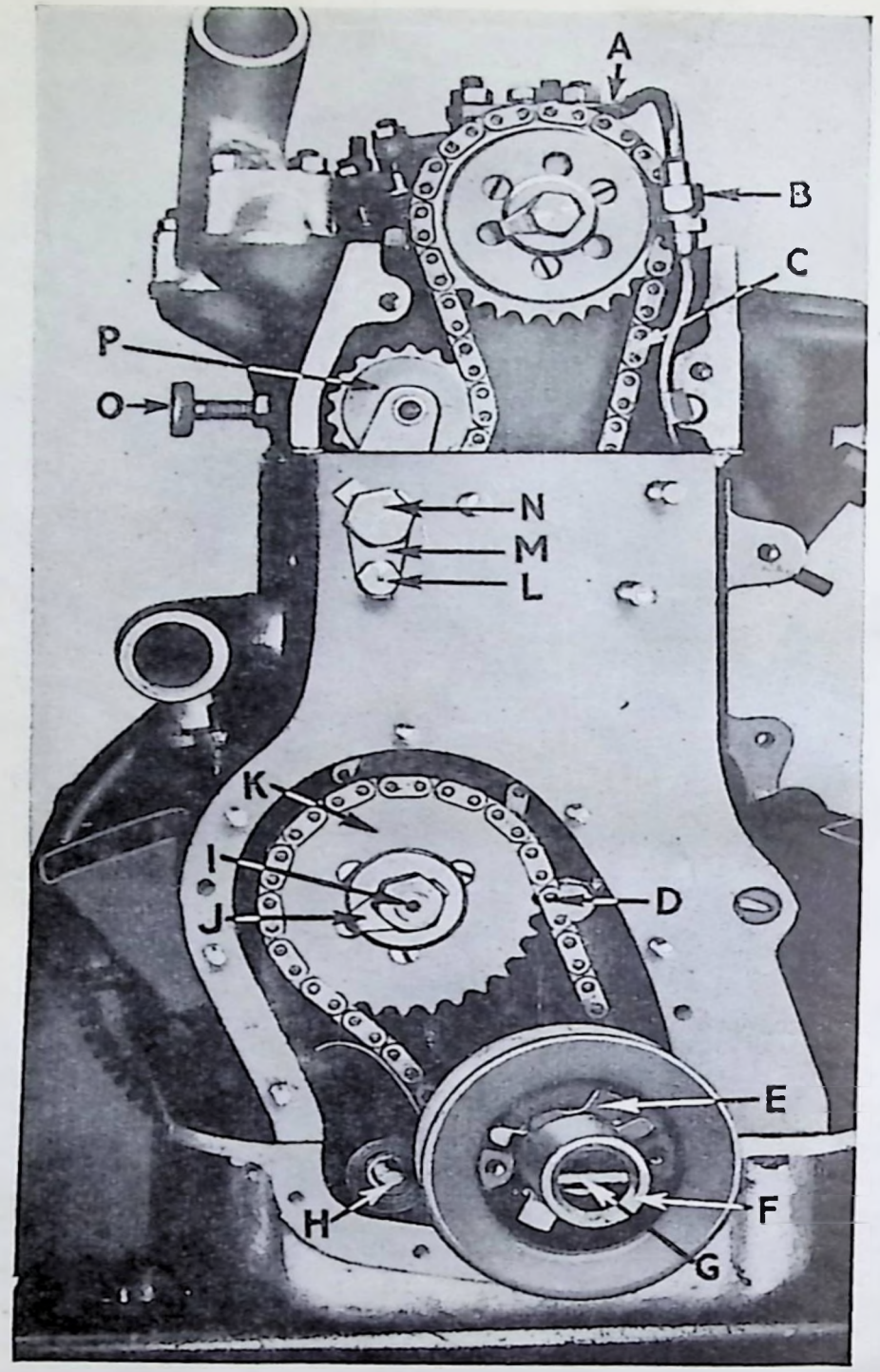
Slacken off the fan pulley and dynamo adjustment and remove the fan belt.

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

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



a. Water outlet pipe.
b. Engine oil filler.
c. Top cover (sectional).
d. Fan bearing greaser.
e. Oil dip stick.
f. Clutch pedal and adjustment.
g. Petrol pump.
h. Clutch lever adjustment.
i. Oil sump drain plug.
k. Water inlet pipe.
l. Timing cover (sectional).
m. Engine bearer bracket.
n. Fan adjustment.
o. Fan bracket.
p. Exhaust manifold.
q. Induction manifold.



a. Camshaft oil feed pipe.
b. Feed pipe union nut.
c. Camshaft chain.
d. Intermediate shaft driving chain.
e. Fan pulley locking plate.
f. Starting handle dog.
g. Dog pin.
h. Inter chain tensioner.
i. Inter sprocket locking nut.
j. Inter shaft nut locking plate.
k. Inter shaft sprocket.
l. Camshaft chain tensioner sprocket pin.
m. Locking plate.
n. Chain tensioner fulcrum pin.
o. Chain tensioner adjusting bolt.
p. Chain tensioner sprocket.

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

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

Please note, when refitting the bottom fan pulley it will be best to turn the engine on to top dead centre and be careful when the starting handle dog is locked into position that the peg from the dog is at 90 degrees to top dead centre.

REMOVING INTERMEDIATE SHAFT ASSEMBLY.

First remove the intermediate chain tensioner which is secured to the engine case by a central bolt. Remove one nut, tab washer and plate from the intermediate shaft, remove three driving pins and the intermediate shaft sprocket. The intermediate chain (48 pitches) may then be removed. Remove the set pin and nut locating the intermediate shaft to the engine case and withdraw the shaft from the case.

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

DISMANTLING DISTRIBUTOR DRIVE ASSEMBLY.

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

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

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

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

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

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

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

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

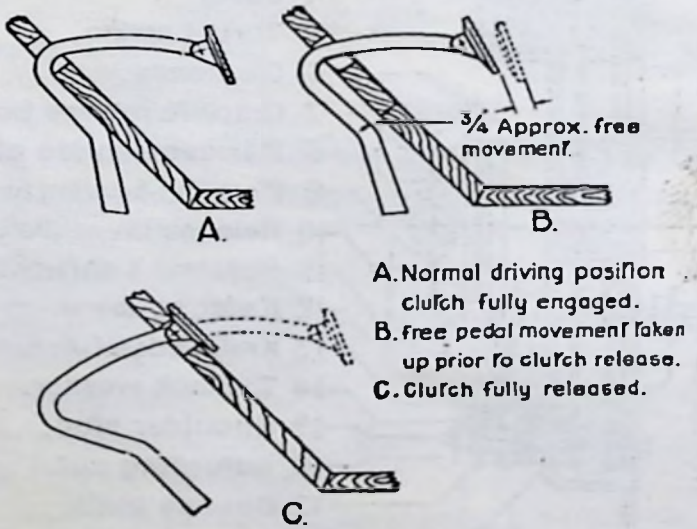


Fig 2

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

REMOVING CLUTCH FROM FLYWHEEL.

To remove clutch from flywheel (1) (Fig. 1) it is necessary to remove the holding screws (2) (Fig. 1). Loosen each of holding screws a turn or two at a time until the spring pressure is relieved (this should be carefully done to prevent springing the flanged edge of cover). The screws can then be removed and the complete clutch lifted off the flywheel, all parts except driven plate (3) (Fig. 1) being assembled to the cover.

CAUTION.

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

Do not drive with foot on clutch pedal.

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

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

PROPELLER SHAFT.

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

3-SPEED SYNCHROMESH GEARBOX

DISMANTLING INSTRUCTIONS.

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

1. Remove six bolts securing the gearbox lid and control tower to the box.

2. Select two gears to hold the mainshaft assembly stationary and remove the nut and split pin from the rear end of the mainshaft in order to allow the front universal joint flange to be withdrawn.

3. Take out one bolt and withdraw the speedometer drive bracket complete.

4. Remove six nuts securing the gearbox rear end cover and take away the cover.

5. Slide the speedometer drive gear from the mainshaft.

6. Remove the four bolts securing the gearbox clutch housing and withdraw the housing.

7. Again select two gears to hold the mainshaft assembly stationary and take away the constant pinion nut which is machined with a left-hand thread. Withdraw the tab washer, oil scroll, and chip shield from the front of the constant pinion bearing.

8. Tap out the constant pinion bearing from the inside of the box and remove the inner chip shield.

9. Tap out the rear end mainshaft bearing from the inside of the box and remove the steel oil flinger.

10. By holding the constant pinion with the left hand and tilting the pinion shaft downwards it will enable the mainshaft spigot to be withdrawn from the bush of the constant pinion, and the mainshaft assembly can now be passed through the top of the gearbox. Withdraw the constant pinion backwards through the top of the gearbox.

11. Remove the set pin and shakeproof washer which secures the lock plate for the reverse shaft and layshaft.

12. Tap out the layshaft from the front through the rear of the gearbox.

13. Remove the layshaft gear cluster from the top of the box taking special care of the one bronze thrust washer at the front end of the assembly. The slotted steel washer registers in the reverse gear.

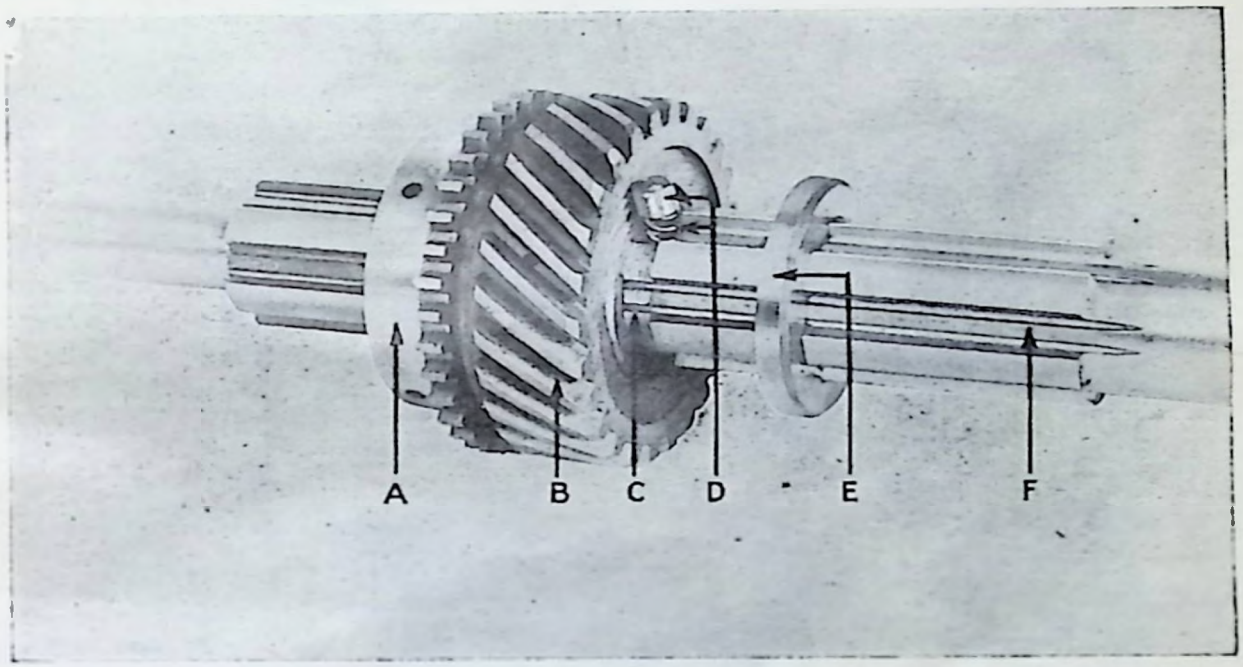
14. Tap out the reverse shaft and remove the reverse gear.

15. DISMANTLING MAINSHAFT ASSEMBLY.

(a) Slide first speed gear from mainshaft.

(b) Remove synchro assembly complete from mainshaft.

(c) To remove the second mainshaft gear, depress one small spring loaded plunger which secures the splined locking washer at the rear of the second gear. Turn the washer in order to clear the splines and slide this off the shaft. It is then possible to withdraw the second speed gear, leaving the bush on the mainshaft, but great care must be taken to avoid loosing the plunger and spring (see illustration). It will be noted that there is a similar spring loaded plunger and washer at the front end of the second speed gear bush.

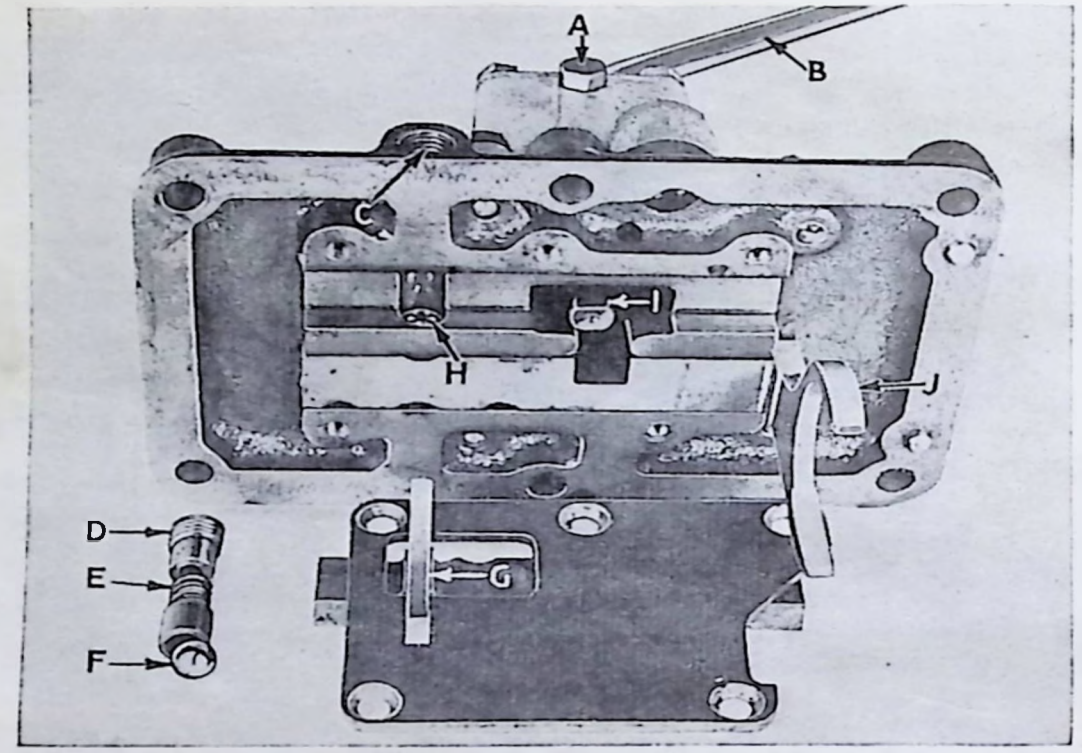


A, synchronising cone; B, gear; C, groove (mainshaft); D, locking ring plunger and spring; E, locking ring; F, mainshaft.

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

16. DISMANTLING GEARBOX LID AND SELECTOR MECHANISM.

Hold gearbox lid and control tower in vice and remove four bolts which secure change speed lever tower to gearbox lid. The tower complete with lever may then be withdrawn from lid. Withdraw two plugs followed by springs, plungers and balls from offside of lid and one of each from nearside of lid. This will release tension from the selector shaft and forks, which are in one piece. Remove five set screws which secure the selector fork clamping plate, the latter can then be removed and will bring away with it the 2nd and top selector shaft and fork. Care should be taken not to lose the safety locking ball concealed in the guide boss which separates the two selector shafts (see illustration).



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

REAR AXLE

REMOVING REAR AXLE FROM CHASSIS.

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

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

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

4. Disconnect brake rod.

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

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

7. Disconnect petrol pipe line from the tank.

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

DISMANTLING REAR AXLE, HUBS AND BRAKES.

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

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

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

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

5. Release the tab washer and lock nut securing the bearing housing and bearing to the rear hub and withdraw the bearing housing and bearing together. Remove the bearing and washer from the bearing housing. The rubber moulded oil seal can remain in position, but care must be taken when withdrawing and replacing axle shafts by guiding them in or out of the seal, without allowing the shafts to fall and distort the rubber sealing surface.

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

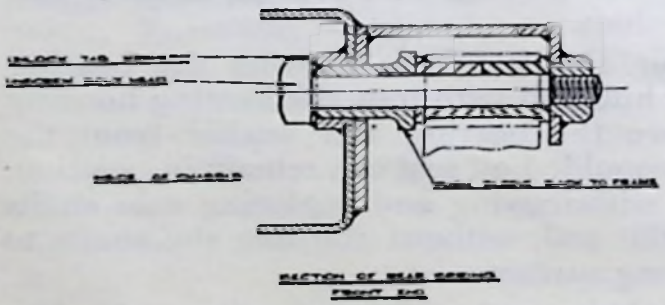
7. Extract bevel pinion and universal joint coupling by releasing the four set pins and spring washers securing the bevel pinion bearing sleeve to the axle bearing case. Withdraw the sleeve, bevel pinion and universal joint coupling. Remove the split pin and lock nut securing the universal joint coupling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

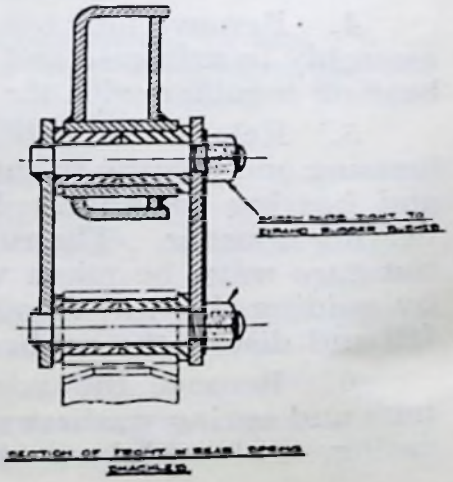
8. Remove the differential case and bevel wheel from the axle bearing case by releasing the two set screws in the bearing case which secure the differential bearing adjusting ring. Release the two tab washers and remove the four nuts securing the bearing case caps, remove the caps and mark them, to be 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.

9. 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. This operation is most easily carried out by supporting the differential case on the splined end of an axle shaft which has been secured in the vice, as the shoulders of the differential pins prevent their being driven out by merely supporting the differential case on the vice.

MOUNTING OF SUSPENSION SPRINGS.

All road springs are mounted on rubber bushes of a special type, they do not require lubrication and MUST be kept free from oil or grease.





When removing the shackle bolts it will be noticed that these bushes will become slack enough to be easily removed, and when refitting it is important to see that all nuts are fully tightened up to the shoulder of the bolts, which will impose the necessary pressure for expanding the rubber, see illustrations on page 56.

STEERING & FRONT AXLE ASSEMBLY

THE only attention the steering box requires is the periodic replenishment of the oil level as described in the paragraph under "Monthly Attentions". No adjustment is provided in the steering box itself, but slackness or backlash in the steering column can be corrected by adjustment at the top of the column.

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

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

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

TRACK ROD AND COUPLING TUBE.

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

The ball sockets on the track rod and coupling tube are spring loaded and are unlikely to require adjustment until a very considerable mileage has been covered (providing, of course, they are adequately lubricated). If necessary, the spring pressure of the ball joints can be increased by removing the grease nipple and the tab washer in the top of the socket and tightening the adjusting screw. Turn the screw half-a-turn or more in increments of half-a-turn at a time, two complete turns being about the maximum that should be required.

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

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

DISMANTLING FRONT AXLE ASSEMBLY.

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

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

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

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

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

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

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

GIRLING BRAKES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

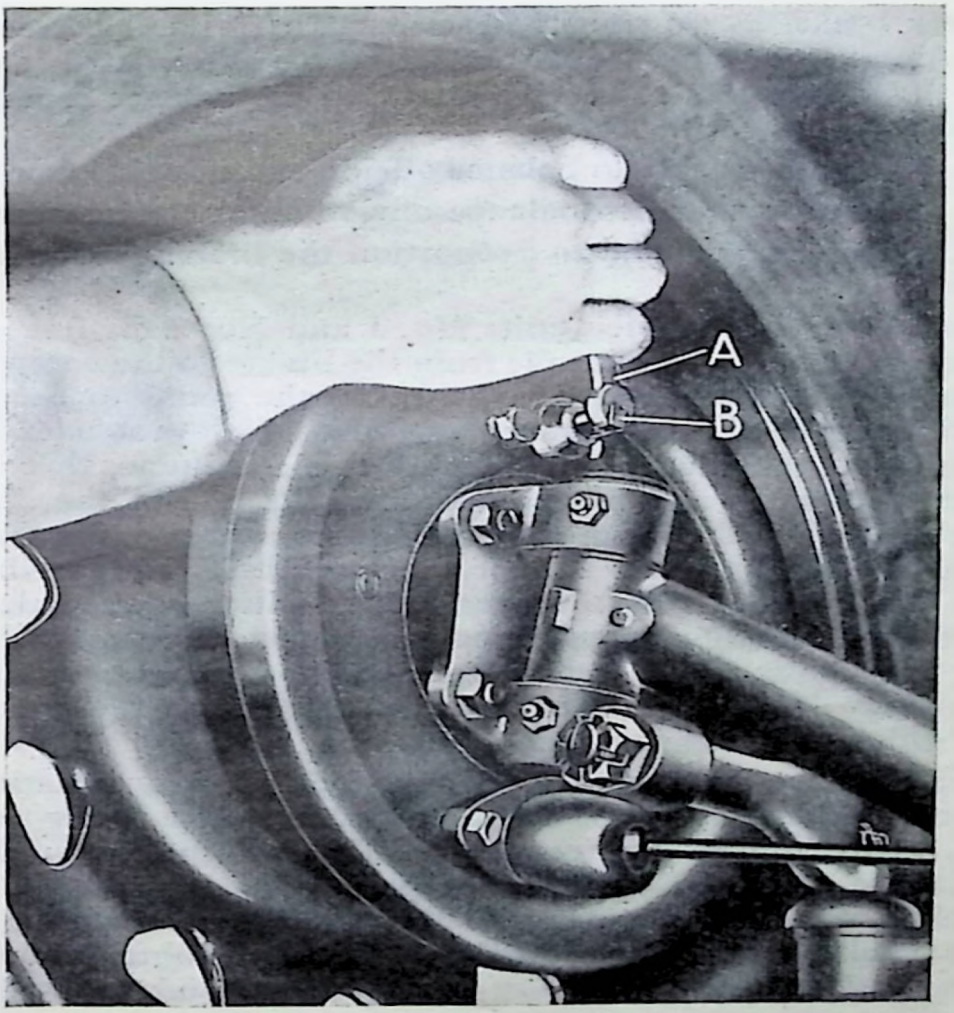
THE RELINING OF GIRLING BRAKES.

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

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

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

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



a. Adjusting spanner. b. Adjusting nut.

then insert other end of one shoe in the expander plunger. Place the screwdriver under the webs of the remaining shoe and against the stud on the backplate. Ease the shoes in the plunger groove.

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

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

8. Refit road wheels and jack down.

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

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

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

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

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

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

Having checked balance units No. 1 and No. 2 for free working, connect up the transverse rods (4) from the brakes to the compensators, beginning this operation by first screwing the rod into the screwed socket (5) on the end of the brake draw link which protrudes from the expander unit. Be sure when screwing this rod home, that it screws right into the socket and butts up against the end of the draw link. Now tighten firmly the locknut (6) using two spanners for this operation. At the compensator end of the transverse rod will be found screwed fork ends (7). By this means the position of the balance unit is set ; the main body of the fulcrum type must be vertical to the axle and the long lever which carries the longitudinal rod (8) should be approximately $\frac{3}{4}$" before a line parallel to the centre line of front axle and $\frac{3}{4}$" behind a similar line to the rear axle.

By setting the long lever in this position first, it automatically sets the position of the two small bottom levers, these being machined integral. Now connect the transverse rods (4) to the two small levers, taking care to retain the long lever in position as described. There is a flat link (9) type of balance unit. The flat link connected to the axle must be parallel to the longitudinal rod, a position obtained by adjustment on the screwed fork ends of the transverse rods, but still maintaining the position of the long lever as described above. Do not make any adjustment whatever at the coupling on the rear transverse

rods close to the brake expander. The next operation is to connect the longitudinal rod (8) to the long lever of each balance unit on front and rear axle. Where there are any connecting or swinging links see that these are lying approximately $\frac{3}{4}$" towards whichever axle they belong. Now to arrive at the pedal (10). First see that the pedal is in its highest position, keeping this position by either tying back or supporting it in some way. Carry forward the work of connecting the longitudinal rods (8) to the pedal rocker. Situated on the pedal are two small rocker arms, and the pedal boss is drilled to take a small spring plunger. When correctly adjusted there is a 1/16" gap between these rocker arms and the pedal boss. The spring plunger is the means of obviating rod rattle, Fig. 4.

Adjust the front longitudinal rod until the required 1/16" gap is at the front rocker arm. Adjust rear longitudinal rod until there is 1/16" gap at rear rocker arm, Fig. 4. Now adjust the control spring through which the rear longitudinal rod passes. This should be adjusted to a given length, $1\frac{11}{16}$", Fig. 4. The adjustment is now completed and car should be quite satisfactory to drive away for all conditions.

PLEASE NOTE. Duckham's Keenol K.G.20 grease can be supplied by any Singer dealer, or direct from our Service Department.

SHOCK ABSORBERS

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

CONSTRUCTION.

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

HOW IT WORKS.

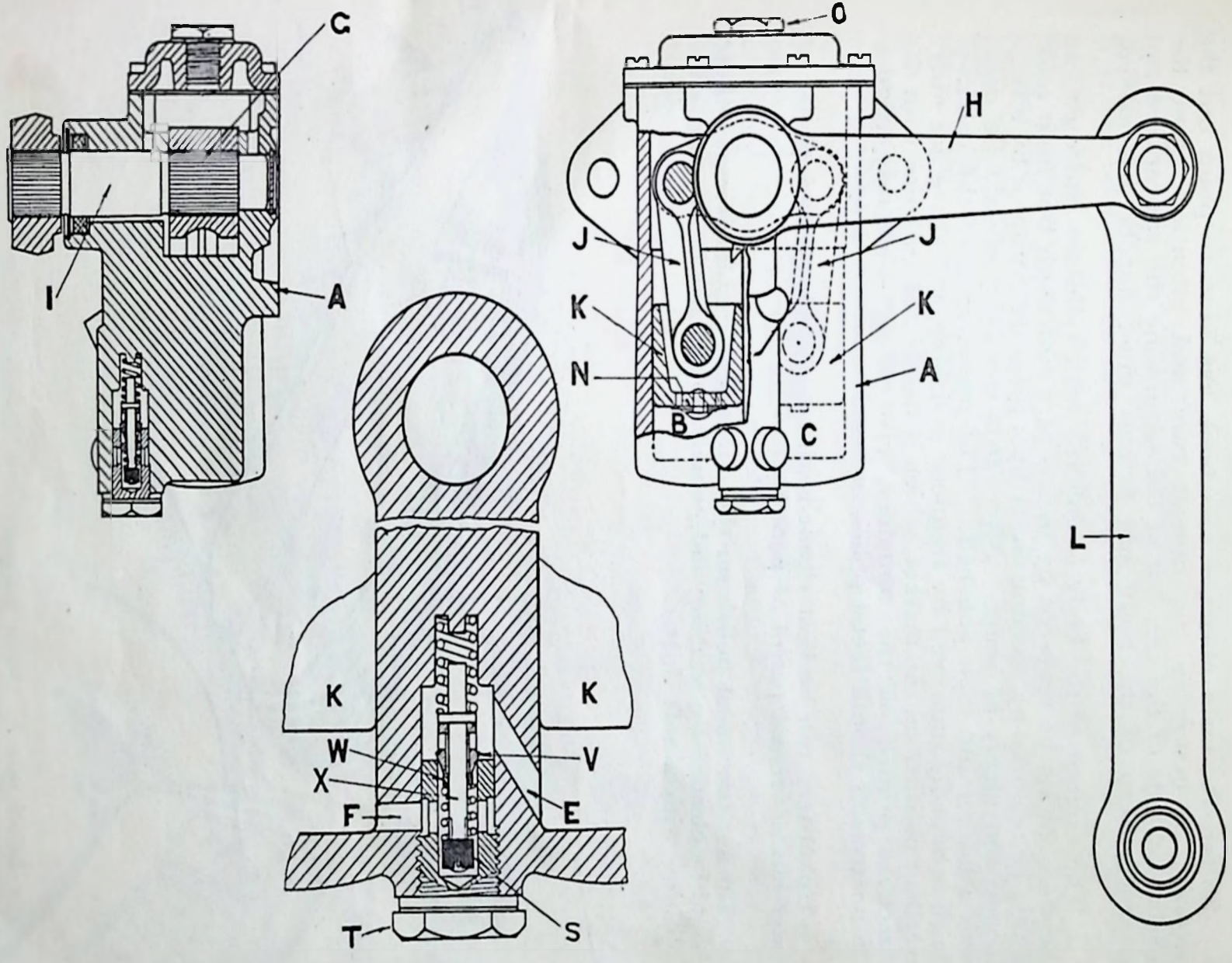
As the axle moves to and from the car frame so the pistons move in and out of their respective cylinders pumping oil from one to the other. The interior of the body is filled with oil to within $\frac{3}{8}$" from top of cover, any shortage of oil beneath the pistons is instantly made good through recuperating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

The flow of oil, however, is governed by the

ORIFICE RELIEF VALVE.

As the axle moves towards the car frame oil is pumped from cylinder B to cylinder C passing through an orifice between the disc W and the valve V, which has been set to offer a pre-determined resistance. When this leak resistance is exceeded the excess pressure opens the spring-loaded valve V and the oil passes to cylinder C at a decided constant pressure. On the return or rebound stroke oil is pumped from cylinder C to cylinder B, and as valve V only operates in one direction the oil must find its way to cylinder B through the holes in valve V and through the orifice as previously described. The disc W held up to the face of valve V by means of a spring located on the stem X provides the spring-loaded valve which operates in the manner described above but in the opposite direction. This arrangement of valve provides for separate and independent adjustment in each direction, so that the compression and rebound resistance may be equal or unequal as desired, or single acting in either direction, all depending on the strength of the springs.

For the correct functioning of these shock absorbers it is essential that "ARMSTRONG" Super Shock Absorber Oil only is used. This may be purchased direct from our Service Depot, or from any Singer Dealer.



ORIFICE RELIEF VALVE

BODY, HOOD & SIDE CURTAINS

So far, the main object of this book has been to point out the necessity of bestowing the utmost care and attention upon the mechanical side of the car, but at the same time the appearance and general upkeep of the body and fittings must not be overlooked.

The exterior of the body is finished with cellulose and dust can therefore always be removed by means of a soft cloth but mud must always be removed by washing either by a pressure pump or by a large sponge and plenty of water. Afterwards the body should be dried with a leather and then polished. The appearance of the cellulose finish is actually improved by frequent polishing and there are many excellent polishes on the market, which if used in accordance with the directions printed on the container, give very satisfactory results. On no account should metal polish be used.

Upholstery can be best cleaned with a good soap and plenty of water but never use petrol or paraffin for this purpose.

Do not use metal polish on the chromium plated fittings—these should be cleaned by washing and, when the dirt has been removed—polishing with a soft duster.

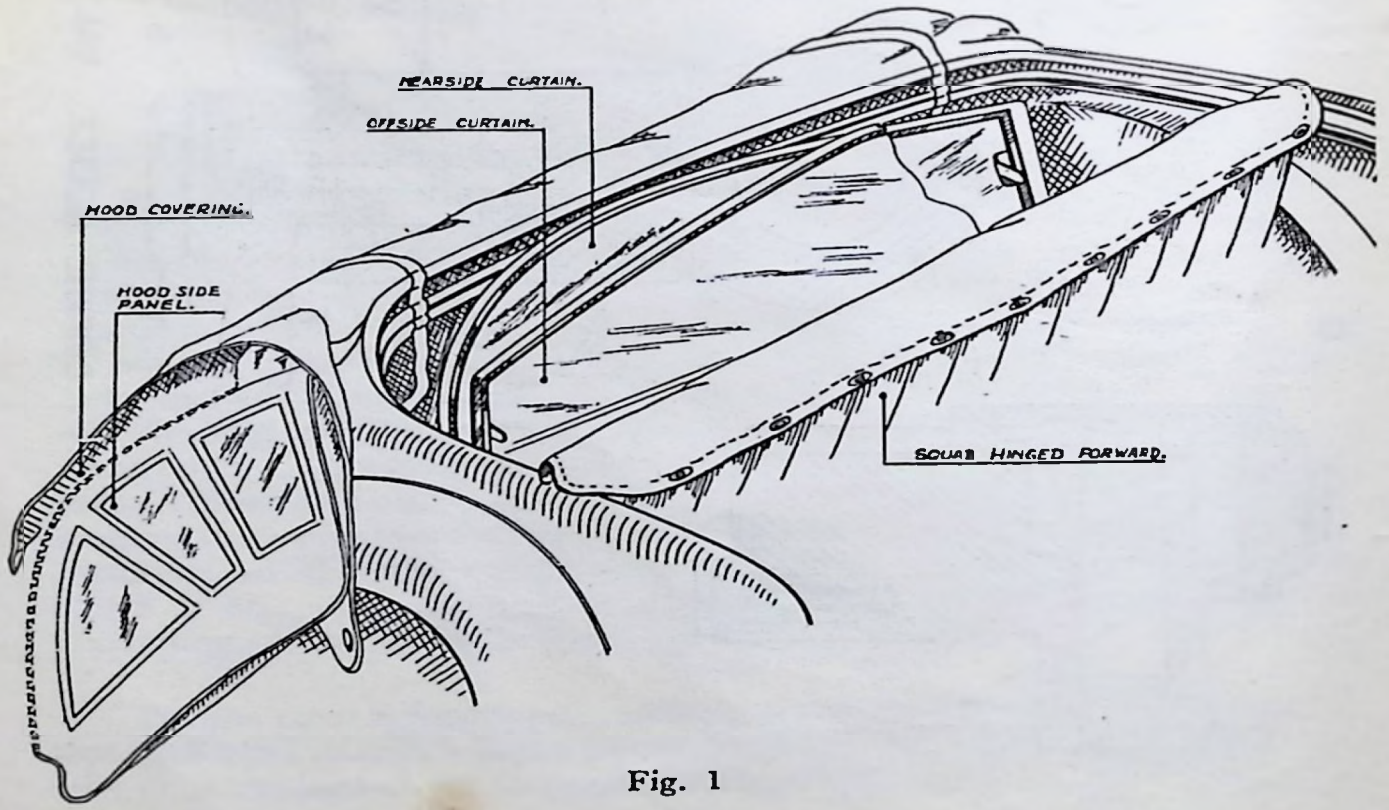


Fig. 1

Thoroughly brush out the floor carpets at least once a week and the instrument panel can be kept in good appearance by the occasional use of a very small amount of ordinary household wax polish.

Inspect the door hinges periodically as instructed in the summary of attentions and apply a little oil to ensure they are working easily. It is also advisable to smear the door catches and striking plates with a little grease at the same time as the hinges receive attention. Do not put too much grease on the catches and striking plates otherwise clothes may suffer on entering or leaving the car. Check over body bolts occasionally and keep the floor and pedal boards tight—the latter are a frequent cause of rattles and a little care will always prevent them from working loose.

See that the spare wheel is kept tight in the rear locker and that tools are always replaced and kept tight in their containers.

The best and correct way of washing road wheels is to remove them from the car. They can be washed in position if water is applied by means of a brush or large sponge but if water is forced on to the wheels at high pressure there is a very big chance of it entering the drums and causing a certain amount of inconvenience, so far as braking is concerned.

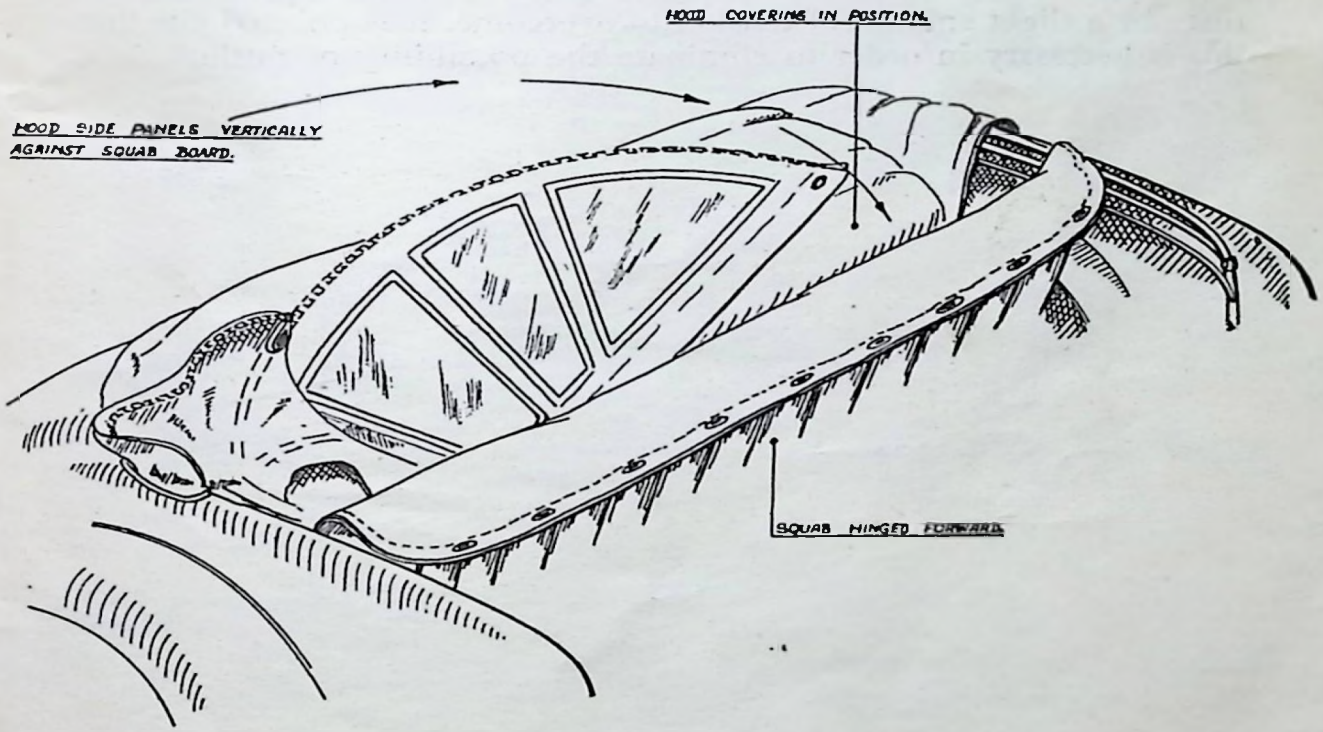


Fig. 2.

The erection, lowering and stowing away of the hood and side curtains is quite a straightforward matter, but the following hints are given which will probably be found useful when doing this for the

first time. Assuming that the hood and curtains are erected, the correct procedure for lowering and stowing is as indicated below :—

1. Release press studs of side panel of hood.
2. Release zip fasteners in side panel of hood.
3. Release lift-the-dot fasteners from windscreen and throw hood top back over hoop sticks.
4. Unscrew knurled knobs on hoop stick lock.
5. Lower hoop sticks and fold, pulling material from between hoop sticks to prevent creasing.
6. Release press studs of back squab and pull forward.
7. Place nearside sidescreen in back of recess at the back of the rear seat squab with the pegs pointing downwards with inside of inside curtain facing forward. Ensure that this side curtain is as far in the recess as it can possibly go (see Fig. 1).
8. Place offside curtain in recess with outside of curtain facing rear squab board. Fold hood material of front canopy over the top of the side curtains together with side panels of hood (Fig. 2).
9. Refix back squab in position with lift-the-dot fasteners.

Providing the hood material has been folded over evenly, the rear squab will go back into position quite satisfactorily but should there be a slight amount of tension to overcome, it is pointed out that this is necessary in order to eliminate the possibility of rattle.

ELECTRICAL EQUIPMENT

The Electrical Equipment.

The 3-brush system, entailing the use of a 2-stage charging switch, is now changed to the Voltage Control system, which is entirely automatic in action and caters for all conditions, subject to these instructions being properly observed. The wiring is the earth return system, where a single wire is used to convey the current which returns through the metal parts of the chassis. It is, therefore, important to see that all earth connections such as battery to frame, lamps to frame, etc., are clean and that a metal to metal connection is made. It is advisable to disconnect one of the battery terminals before removing any unit from the chassis, so preventing short circuiting which may result in burnt out wiring and equipment.

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

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

When starting from cold the driver will notice the rise of the charging current until it reaches a steady maximum at a speed of say, 20 m.p.h. The output then falls until after about thirty minutes' running it reaches a steady charge which is most suitable for the particular condition of the battery.

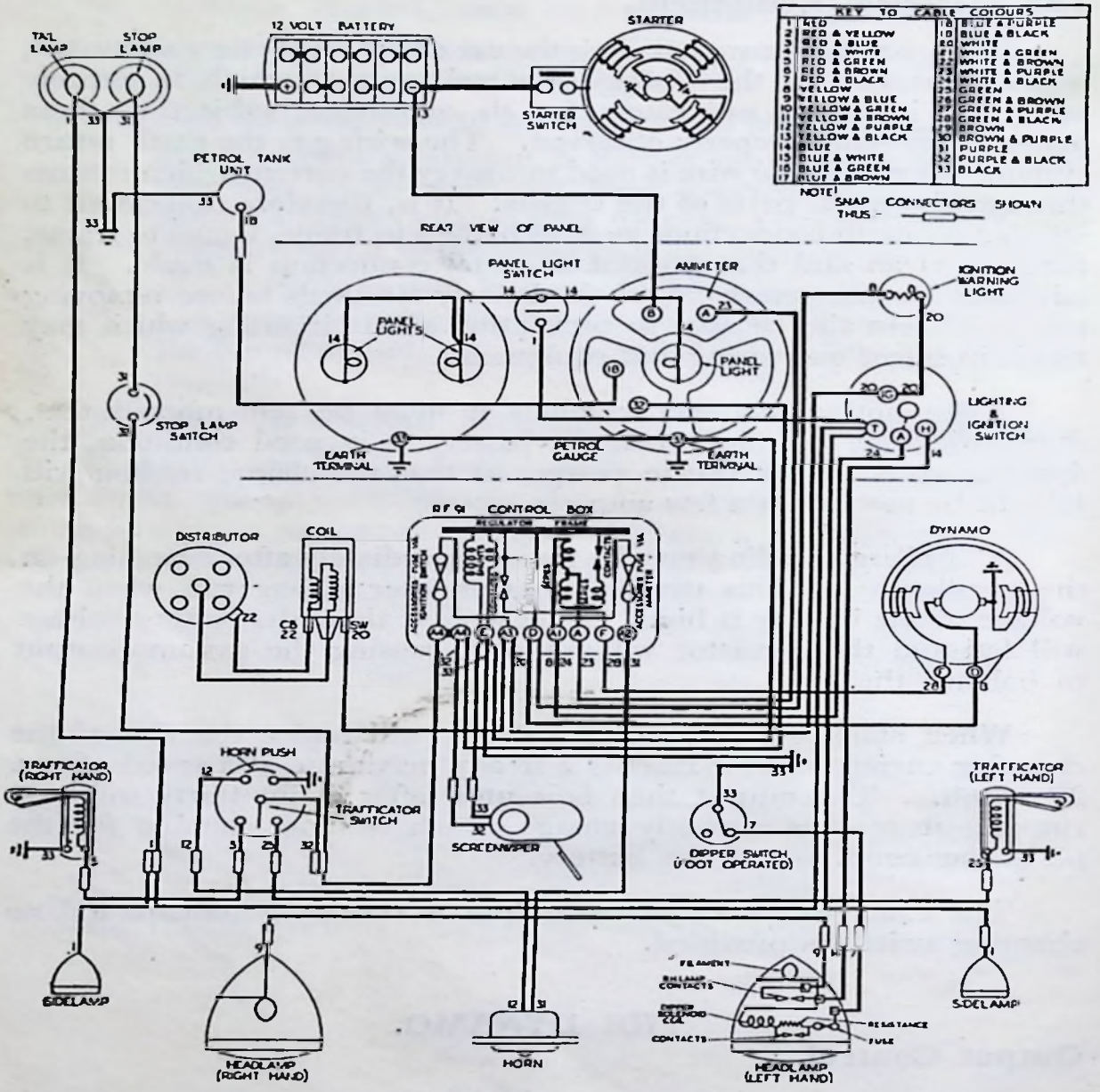
The control of the dynamo output is entirely automatic and no charging switch is provided.

THE DYNAMO.

Output Control.

The dynamo is of the compensated voltage control type and works in conjunction with a regulator housed along with cutout.

The regulator causes the dynamo to give an output which varies according to the lamp load and the state of charge of the battery. When the battery is discharged the dynamo gives a high output so that the battery receives a quick re-charge which brings it back to its normal state of charge in the minimum possible time.


KEY TO CABLE COLOURS
1 RED
2 RED & YELLOW
3 RED & BLUE
4 RED & WHITE
5 RED & GREEN
6 RED & BROWN
7 RED & BLACK
8 YELLOW
9 YELLOW & BLUE
10 YELLOW & GREEN
11 YELLOW & BROWN
12 YELLOW & PURPLE
13 YELLOW & BLACK
14 BLUE
15 BLUE & WHITE
16 BLUE & GREEN
17 BLUE & BROWN
18 BLUE & PURPLE
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25 GREEN
26 GREEN & BROWN
27 GREEN & PURPLE
28 GREEN & BLACK
29 BROWN
30 BROWN & PURPLE
31 PURPLE
32 PURPLE & BLACK
33 BLACK
NOTE! SNAP CONNECTORS SHOWN THUS -
TAIL LAMP
STOP LAMP
12 VOLT BATTERY
STARTER
STARTER SWITCH
PETROL TANK UNIT
REAR VIEW OF PANEL
PANEL LIGHT SWITCH
AMMETER
IGNITION WARNING LIGHT
PANEL LIGHTS
PANEL LIGHT
STOP LAMP SWITCH
EARTH TERMINAL
PETROL GAUGE
EARTH TERMINAL
LIGHTING & IGNITION SWITCH
RF 9I CONTROL BOX
DISTRIBUTOR
COIL
CB 22
SW 20
DYNAMO
TRAFFICATOR (RIGHT HAND)
HORN PUSH
TRAFFICATOR SWITCH
SCREENWIPER
DIPPER SWITCH (FOOT OPERATED)
TRAFFICATOR (LEFT HAND)
SIDELAMP
HEADLAMP (RIGHT HAND)
HORN
FILAMENT
CONTACTS
RESISTANCE
FUSE
HEADLAMP (LEFT HAND)
SIDELAMP

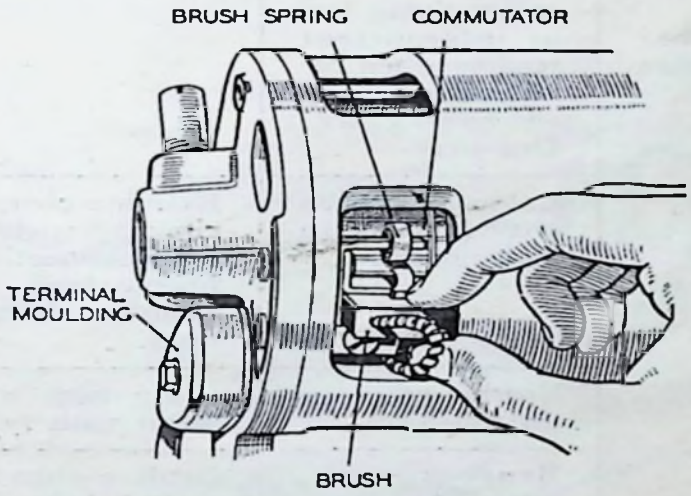
On the other hand, if the battery is fully charged the dynamo is arranged to give only a trickle charge which is sufficient to keep it in good condition without any possibility of causing damage to the battery by overcharging.

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

The regulator incorporates a temperature compensation which causes the dynamo to give an increased output in cold weather when the load on the battery is greater and it also provides an increased charge at the beginning of a run so quickly replacing the energy used for starting.

Maintenance.

The dynamo bearings are supplied, during manufacture, with lubricant sufficient to last under normal conditions until the engine is taken down for a major overhaul. When this occurs the dynamo should be taken to a Lucas Service Depot for cleaning, adjustment and replenishment of bearing lubricant.



About every 10,000 miles, or once a year, remove the cover band to inspect the brushes and commutator. Check that the brushes move freely in their holders by holding back the brush springs and pulling gently on the flexible connectors. If a brush is inclined to stick, remove it from its holder and clean its sides with a petrol-moistened cloth. Be careful to replace brushes in their original positions in order to retain the "bedding". Brushes which have worn so that they will not bear correctly on the commutator must be replaced and properly bedded at a Lucas Agent or Service Depot.

The commutator should be clean, free from oil or dirt and should have a polished appearance. If it is dirty, clean it by pressing against it a fine dry duster while the engine is slowly turned over by hand. If the commutator is very dirty, moisten the cloth with petrol.

HOW TO LOCATE AND REMEDY DYNAMO TROUBLE.

Symptoms	Possible Causes	Remedy
Battery in low state of charge, shown by lack of power when starting. (Hydrometer readings less than 1.200).	Dynamo not charging indicated by ammeter not showing charge reading when running at about 20 m.p.h. with no lights in use. Due to :—	
	Broken or loose connection in dynamo circuit, or regulator not functioning correctly.	Examine charging and field circuit wiring. Tighten loose connection or replace broken lead. Particularly examine battery connections. Return regulator to Lucas Service Depot for attention.
	Commutator greasy or dirty.	Clean with soft rag moistened in petrol.
	Dynamo giving low or intermittent output, indicated by ammeter giving low or intermittent reading when car is running steadily in top gear. Due to :—	
	Loose or broken connections in dynamo circuit.	Examine charging and field circuits wiring. Tighten loose connections or replace broken lead. Particularly examine battery connections.
	Brushes greasy or dirty.	Clean with soft rag moistened with petrol.
	Brushes worn, not fitted correctly, or wrong type	Replace worn brushes. See that brushes "bed" correctly. Fit correct type brushes.
	Regulator not functioning correctly.	Have equipment examined by a Lucas Service Depot.
Battery overcharged, shown by burnt-out bulbs and very frequent need for "topping-up" (Hydrometer readings high ; see page 77).	Dynamo giving high output, indicated by ammeter giving high charge reading. Due to :—	
	Regulator not functioning correctly.	Return regulator to Lucas Service Depot for attention.

If, after following the above table, the trouble is not rectified, have the dynamo regulator and battery examined by a Lucas Service Depot.

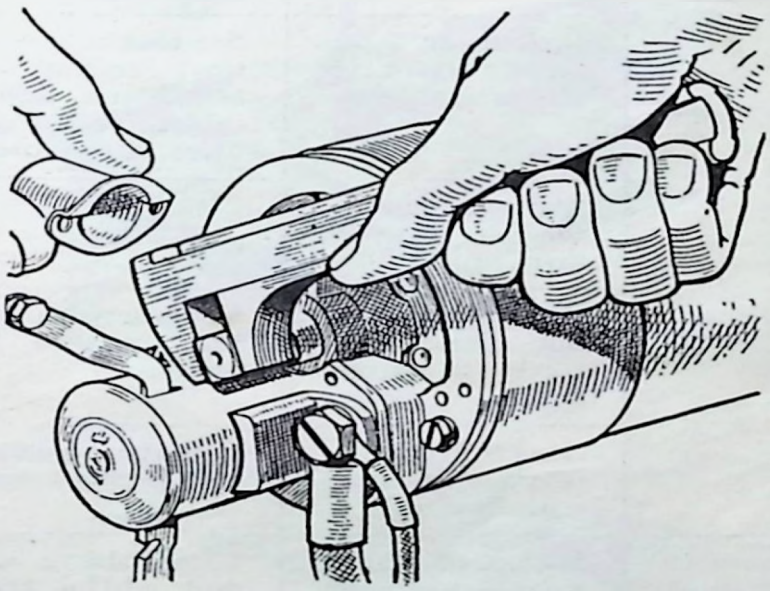
THE STARTER.

To obtain the longest life from the starter and battery the following points should be observed when starting :—

1. See that the controls are properly set—petrol turned on, etc.
2. Operate the starter switch firmly and, of course, release it as soon as the engine fires. In cold seasons it is advisable to turn engine with the starting handle for a few revolutions.
3. Never operate the starter while the engine is still running. If the engine will not fire at once, allow it to come to rest before operating the switch again.
4. Do not run the battery down by keeping the starter on when the engine will not start, it is better to find the cause.

About once a year remove the starter cover band in order to examine the brushes and commutator, as for Dynamo.

Check that the brushes move freely in their holders by holding back the brush springs and gently pulling the flexible connectors. If the movement is sluggish, remove the brush from its holder and clean its sides with a petrol moistened cloth. Replace brushes in their original positions in order to retain the correct "bedding". If the brushes are worn so that they do not bear properly on the commutator, they must be replaced by a Lucas Agent or Service Depot, and correctly "bedded" to the commutator.



The commutator should be clean and dirt-free and should have a polished appearance. If it is dirty, clean it by pressing a soft dry cloth against it while the starter is turned by hand. The square shaft extension at the commutator end can be used to rotate the starter. If the commutator is very dirty the cloth should be moistened with petrol.

If the starter drive is exposed, examine it to make sure that the pinion moves easily on the screwed sleeve. If necessary, wash the sleeve with paraffin and afterwards give it the merest trace of thin machine oil.

Starters with extended shafts having square ends, as shown, can be rotated by means of a spanner in the remote possibility of the pinion becoming jammed in mesh with the flywheel for any reason. Access to the squared end is obtained by pulling off the metal cap which is secured by two screws.

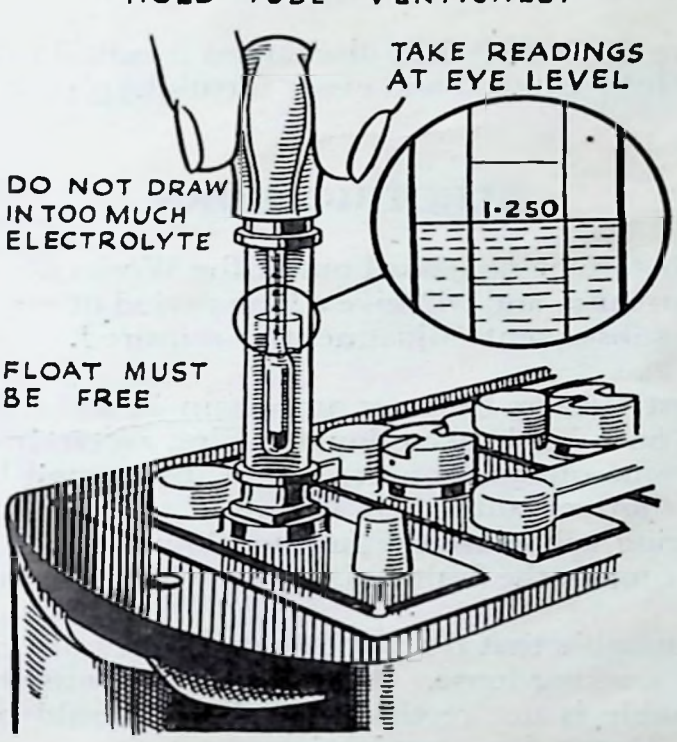
HOW TO LOCATE AND REMEDY STARTER MOTOR TROUBLE.

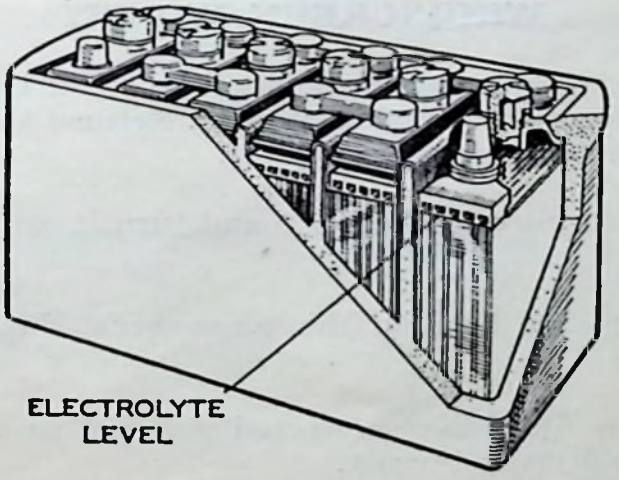
Condition	Probable Fault	Remedy
Motor sluggish or fails to move engine.	If engine cannot be turned by hand, then fault is due to a stiff engine.	Locate and remedy cause of stiffness.
	If engine can be turned by hand, then trouble may be due to :—	
	Battery discharged.	Start by hand. Charge battery either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

THE BATTERY.

About once every month, top up each cell with distilled water to bring the acid solution (electrolyte) level with the tops of the separators. Do not use tap water and do not use a naked light when examining the condition of the cells.

Keep the terminals clean. If they are corroded, scrape them clean and coat them with vaseline. Wipe away all dirt and moisture from the top of the battery and make sure that the connections and fixing bolts are clean and tight.





Occasionally check the battery's condition by taking hydrometer readings of the specific gravity of the electrolyte in each of the cells. Specific gravity readings and their indications are as follows :—

1.280—1.300	.. ..	Battery fully charged.
About 1.210	.. ..	Battery about half discharged.
Below 1.150	.. ..	Battery fully discharged.

The readings of all cells should be approximately the same. If one cell gives a very different reading from the rest it may be that acid has been spilled or has leaked from this particular cell or there may be a short circuit between the plates. In this case the battery should be examined by a Lucas Service Agent or Depot.

Never leave the battery in a discharged condition for any length of time. Have it fully charged and every fortnight give it a short refreshing charge.

ELECTRIC HORN.

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

If the horn fails or becomes uncertain in its action, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, *e.g.*, a discharged battery, or loose connection or short circuit in the wiring of the horn ; a short circuit in the horn wiring will cause the fuse to blow. If the fuse has blown, examine the wiring for the fault and replace with the spare fuse provided.

It is also possible that the performance of a horn may be upset by the fixing bolt working loose. If after carrying out the above examination, the trouble is not rectified, the horn should be returned to a Lucas Service Depot for examination.

WINDSCREEN WIPER.

To start the wiper, push in the knob on the driver's side and turn it to release it from the parking stop. Release the knob and then rotate it until the driving dogs engage.

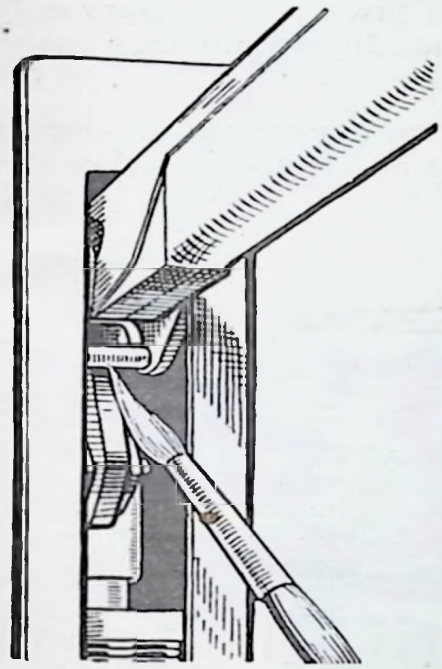
To switch off, push in the knob and turn it until the arm lies on the scuttle.

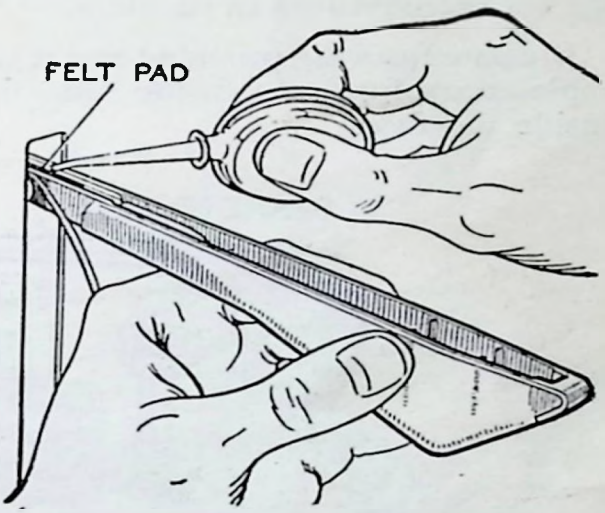
The drive to the arm on the passenger's side is engaged in a similar manner.

The motor is fitted in a protected position in a recess on top of the bulkhead, under the bonnet.

TRAFFICATORS.

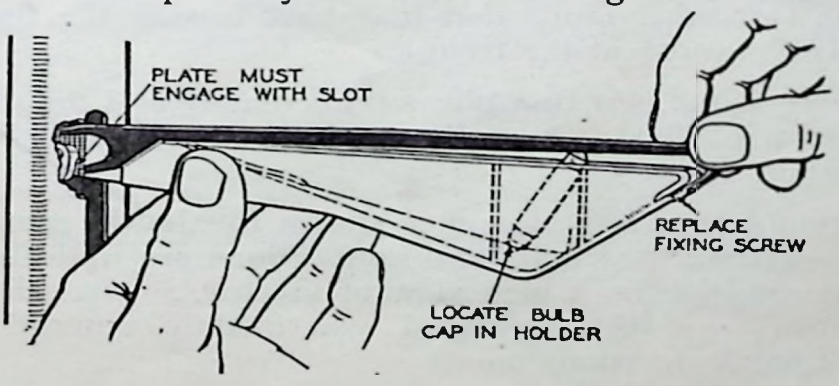
If the movement of the arms becomes stiff, raise each arm and apply by means of a brush or other suitable article, a drop of thin machine oil, such as sewing machine oil, to the catch pin between the arm and the operating mechanism. Use only the merest trace of oil as any excess may affect the operating mechanism. Also remove the cover from the arm and add one or two drops of thin oil to the lubricating pad at the top of the arm.





If any difficulty is experienced in raising the arms by hand, switch the "Trafficator" on and then supporting the arm in the raised position, move the switch to the off position. Failure of the arm to light up usually indicates a blown bulb. The bulb can be replaced as follows :—

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



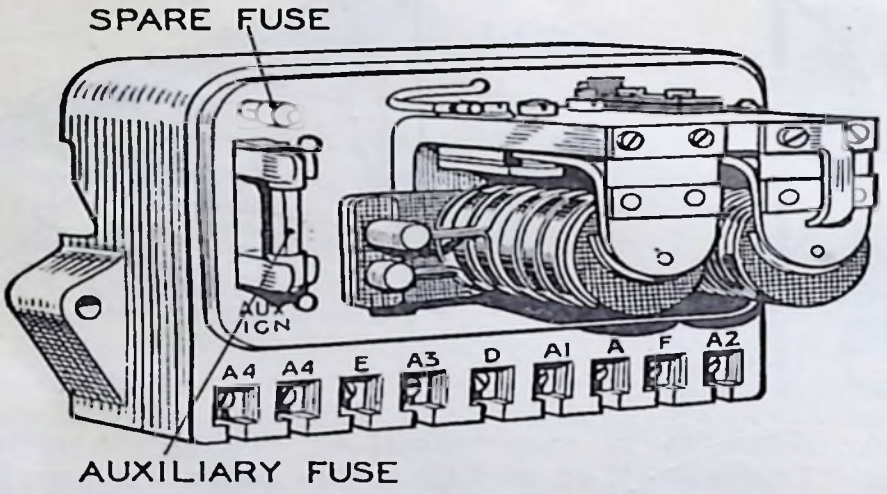
CONTROL BOX.

The control box is mounted on the engine side of the dash and houses the cutout, voltage regulator and fuses.

The cutout and regulator units are carefully and accurately set before leaving the Works and must not be tampered with.

The fuses are of the cartridge type, consisting of a length of very fine wire enclosed in a glass tube with brass end caps to which are soldered the ends of the wire. To replace a fuse it is necessary only to withdraw it from the spring clips in which it fits and then insert the replacement fuse in its place.

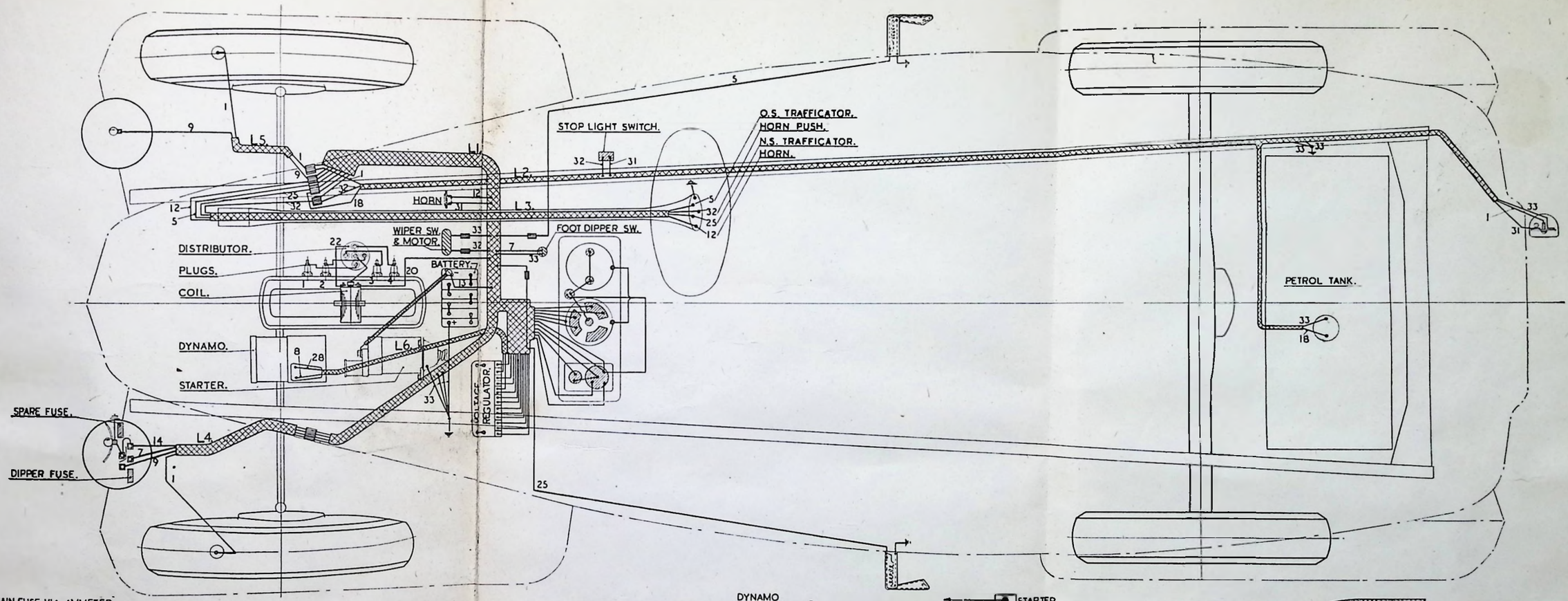
Spare fuses are provided and it is important to use only the correct replacement fuse—the fusing value is marked on a coloured paper slip inside the fuse.

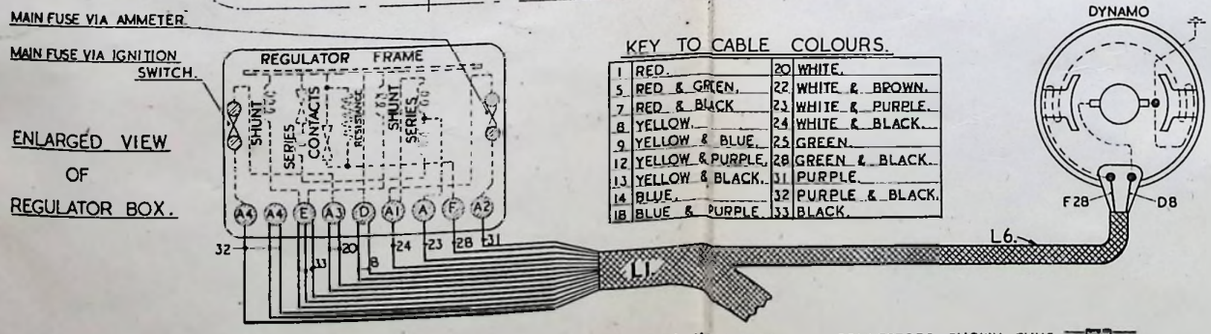


The fuses protect the accessories such as the horn, windscreen wiper, etc. The particular units protected by the different fuses can be identified by referring to the wiring diagram. A blown fuse will be indicated by the failure of all the units protected by it, and is confirmed by examination of the fuse. If it has blown, the broken ends of the wire will be visible inside the glass tube. Before replacing a blown 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 the cause of the trouble.

However, if the new fuse blows immediately and the cause of the trouble cannot be found, have the equipment examined by a Lucas Service Depot.

The complete wiring system is shown by the diagram following this page. The various units and connections are indicated in their approximate position on a plan view of the car, so that all wires and junctions can be easily identified where they emerge from the 3 Braided Looms at various points.

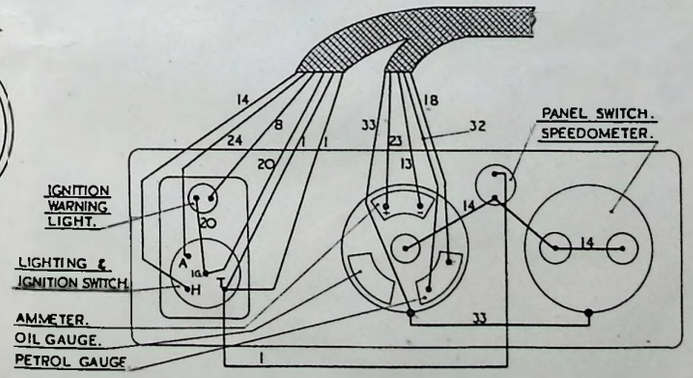




ENLARGED VIEW OF REGULATOR BOX.

KEY TO CABLE COLOURS.

1	RED.	20	WHITE.
5	RED & GREEN.	22	WHITE & BROWN.
7	RED & BLACK.	23	WHITE & PURPLE.
8	YELLOW.	24	WHITE & BLACK.
9	YELLOW & BLUE.	25	GREEN.
12	YELLOW & PURPLE.	28	GREEN & BLACK.
13	YELLOW & BLACK.	31	PURPLE.
14	BLUE.	32	PURPLE & BLACK.
18	BLUE & PURPLE.	33	BLACK.



ENLARGED VIEW OF INSTRUMENT PANEL.

BRAIDED LOOMS.

L1. MAIN FROM REGULATOR TO SWITCHES, CONNECTORS AND LAMPS. CONNECTORS SHOWN THUS

L2. STOP TAIL LAMP AND PETROL GAUGE. PASSES THROUGH CHASSIS FRAME.

L3. HORN AND TRAFFICATORS, PASSES DOWN INSIDE OF STEERING COLUMN.

L4. N/S. HEADLAMP AND SIDELAMP.

L5. O/S. HEADLAMP AND SIDELAMP.

L6. DYNAMO.

Numbers connect each wire to a Colour Chart, to assist in tracing faults. An electrician's diagram is also included, as it shows the wires separate and independent of grouping in the three looms, so that analysis can be taken from point to point individually, see page 71.

HEAD LAMPS.

Setting.

Check the setting of the headlamps by placing the car in front of a blank wall at the greatest possible distance, taking care that the surface on which the car is standing is not sloping relative to the wall.

The headlamps must be set so that the beams of light are parallel with the road and with each other. If adjustment is necessary slacken the single fixing nut at the base of the lamp and move the lamp on its adjustable mounting to the required position. Finally, tighten the locking nut.

Focusing.

To enable the best light to be obtained from the lamps, the bulb filament must be as near as possible to the focus of the reflectors. If a bulb is out of focus, the lamps will have a poor range and will cause dazzle to approaching traffic.

Before lamps leave the Works, the bulbs are focused to give the best results and provided that Genuine Lucas spare bulbs are fitted as replacements, it should not be necessary to alter the setting. If, however, an ordinary bulb has to be fitted, it may be necessary to re-focus by moving the bulb backwards or forwards until the best lighting is obtained.

The bulb and its holder can be adjusted when the lamp front and reflector are removed and the clamping clip on the bulb holder is slackened.

It is an advantage to cover one lamp while testing the other. If the lamp does not give a uniform long range beam without a dark centre, the bulb needs adjusting.

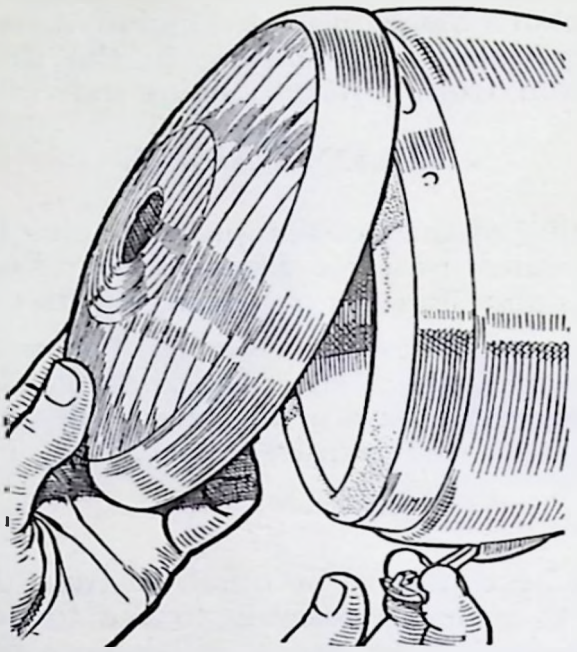
Tighten the clamping screw after the best position for the bulb has been found.

REMOVING LAMP FRONTS AND REFLECTORS.

Headlamps.

Pull forward the fixing clip at the bottom of the lamp and swing it downwards. Remove the front from the bottom of the lamp first. When replacing the front, locate the top of the rim first, then press on at the bottom and secure by springing the clip into its location.

The reflector is secured to the lamp body by a rubber bead or washer and can be withdrawn when the rubber bead is removed. When replacing the reflector the projection on the rim must fit into the left hand location at the top of the lamp body. When refitting the rubber bead locate its thinner lip between the reflector rim and the edge of the lamp body.



Sidelamps.

The front and reflector can be removed when the securing screw at the top of the rim is slackened. Withdraw the bulb holder from the back of the reflector by twisting in an anti-clockwise direction and pulling it off. Replace the bulb holder by lining up the slots in the holder with the spring clips at the back of the reflector and press it into position. When refitting the front, engage it at the bottom first, then press on at the top and secure with the fixing screw.

CLEANING.

Care must be taken when handling reflectors to prevent them from becoming finger-marked. If they do become marked, however, a transparent and colourless protective covering enables any finger-marks to be removed by polishing with a chamois leather or a very soft cloth. DO NOT USE METAL POLISH ON REFLECTORS. The lamp bodies can be cleaned with any good car polish.

HOW TO LOCATE AND REMEDY LIGHTING TROUBLE.

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

REPLACEMENT OF BULBS.

When replacing a bulb it is important not only that the same size bulb is fitted, but also that the bulb has a high efficiency and will focus in the reflector. Cheap and inferior bulbs often have the filament of such a shape that it is impossible to focus properly. This will cause dazzle and will result in loss of range and light efficiency.

Lucas Genuine Spare Bulbs are sold by most garages and are specially tested to ensure that the filament is in the correct position to give the best results with Lucas lamps. Lucas bulbs have a number marked on the metal cap ; when fitting a replacement see that it is of the same number as the original bulb.

It is advisable to replace bulbs after long service before they actually burn out, as often the filaments sag, making it impossible for them to be focused properly.

REPLACEMENT BULBS.

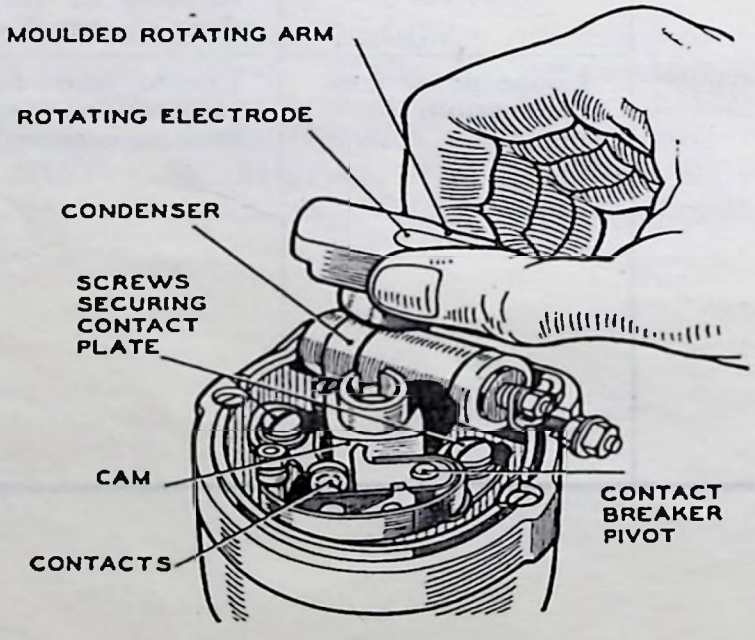
Headlamps	Lucas No. 54	12 volt	36 watt
Side and Tail Lamps ..	,, No. 207	12 ,,	6 ,,
Trafficators	,, No. 256	12 ,,	3 ,, (festoon type)
Ignition Warning Lamp	,, No. C252A	2.5 volt	.2 amp.
Roof Lamp	,, No. 251	12 ,,	6 watt (festoon type)

COIL IGNITION EQUIPMENT.

Lubrication. To be carried out every 2,500 miles.

Cam and Contact Breaker Pivot.

Give the cam and the pivot on which the contact breaker rocker arm works a light smear of clean engine oil.



Cam Bearing.

Withdraw the moulded rotating arm from the top of the spindle by pulling 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 the oil passes to lubricate the cam bearing. Take care to refit the arm correctly and to push it on to the shaft as far as possible, otherwise there is a risk of tracking and burning of the moulding.

Automatic Timing Control.

Add a few drops of thin machine oil to the timing control through the hole in the contact breaker base through which the cam passes. Do not allow any oil to get on to the contacts.

Distributor Shaft.

Add a few drops of thin machine oil to lubricator which is fitted on the distributor shank.

Cleaning.

Keep the outside of the distributor clean, particularly the spaces between the high tension terminals. Very occasionally remove the moulding by springing aside its two securing spring clips and wipe the inside with a dry cloth. See that the carbon brush is quite free in its holder. Clean the metal electrodes inside the moulding and also the rotating electrode on the distributor arm ; if necessary use a cloth moistened with a drop of petrol for this.

Examine the contact breaker ; keep the contacts free from any grease or oil. If they are burned or blackened, clean them with fine carborundum stone, or, if this is not available, use very fine emery cloth. Finish off with a cloth moistened with petrol, and remove all traces of dirt and metal dust. Misfiring is sometimes caused by dirty contacts.

Cleaning and adjusting the Contacts.

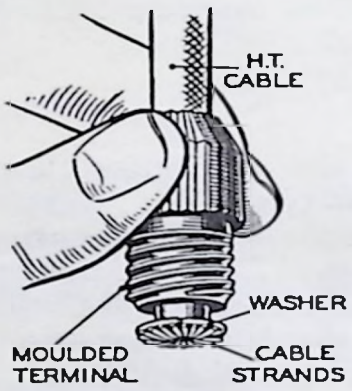
The chief cause of variation in the gap is wear of the heel of the contact rocker arm which bears upon the actuating cam. Provided the cam is smeared with lubricant, however (see lubrication instructions), the wear on the heel will be negligible and the contact gap setting should only require adjustment at infrequent intervals.

To check the setting, turn the engine by hand until the contacts are fully open. Insert the gauge provided on the ignition screwdriver between the contacts ; the gauge has a thickness of about 12 thousandths of an inch and it should be a sliding fit between the contacts when the gap is correct. We do not advise altering the setting unless there is quite an appreciable variation from the gauge. To make the

adjustment keep the engine in the position to give maximum opening of the contacts and slacken the two screws securing the contact plate. Then move the plate until the gap is set to the thickness of the gauge. After making the adjustment, care must be taken to tighten the locking screws.

Renewing the High Tension Cable.

The high tension cables are those connecting the coil to the distributor and the distributor to the sparking plugs. When these cables show signs of perishing or cracking they must be replaced by 7 mm. rubber-covered ignition cable. The method of connecting the cable to the terminals is to thread the knurled moulded nut over the cable, bare the end of the cable for about $\frac{1}{4}$", thread the wire through the brass washer removed from the end of the original cable and bend back the strands. Finally screw the nut into its terminal.



The Coil.

The coil requires no attention whatever beyond keeping its exterior clean, particularly between the terminals, and occasionally checking that terminal connections are quite tight.

Ignition Switch and Warning Light.

The ignition switch, besides forming a means of stopping the engine, is provided for the purpose of preventing the batteries being discharged by the current flowing through the coil windings when the engine is stopped. A warning lamp is provided in the instrument panel which gives a red light when the ignition is switched on and the vehicle is running very slowly or is stationary, thus reminding you to switch off.

Should the warning lamp bulb burn out, this will not in any way affect the ignition system, but it should be replaced as soon as possible in order to safeguard the battery.

HOW TO LOCATE AND REMEDY COIL IGNITION TROUBLE.

Condition	Method of Detection of Possible Causes	Remedy
Engine will not fire.	Starter will not turn engine and lamps do not give good light. Battery discharged.	Start engine by hand. Battery should be recharged by running car for a long period during day time. Alternatively recharge from an independent electrical supply.
	Controls not set correctly for starting.	See that ignition is switched on, petrol turned on, and everything is in order for starting.
	Remove lead from centre distributor terminal and hold it about ¼in. away from some metal part of the chassis, while engine is turned over. If sparks jump gap regularly, the coil and distributor are functioning correctly. If the coil does not spark, the trouble may be due to any of the following causes :—	Examine the sparking plugs, and if these are clean and the gaps correct, the trouble is due to carburetter, petrol supply, etc.
	Fault in low tension wiring. Indicated by (1) No ammeter reading when engine is slowly turned and ignition switch is on, or (2) No spark occurs between the contacts when quickly separated by the fingers when the ignition switch is on.	Examine all cables in ignition circuit and see that all connections are tight. See that battery terminals are secure.
	Dirty or pitted contacts.	Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol.
	Contacts out of adjustment. Turn engine until contacts are fully opened and test gap with gauge.	Adjust gap to gauge.
Engine misfires.	Dirty or pitted contacts.	Clean with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol.
	Contacts out of adjustment. Turn engine until contacts are fully opened and test gap with gauge on screwdriver.	Adjust gap to gauge.
	Remove each sparking plug in turn, rest it on the cylinder head, and observe whether a spark occurs at the points when the engine is turned. Irregular sparking may be due to dirty plugs or defective high tension cables. If sparking is regular at all plugs the trouble is probably due to engine defects.	Clean plugs and adjust the gaps to about 20 thousandths of an inch. Replace any lead if the insulation shows signs of deterioration or cracking. Examine carburetter, petrol supply, etc.

LUCAS—C.A.V.—ROTAX SERVICE DEPOTS

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

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

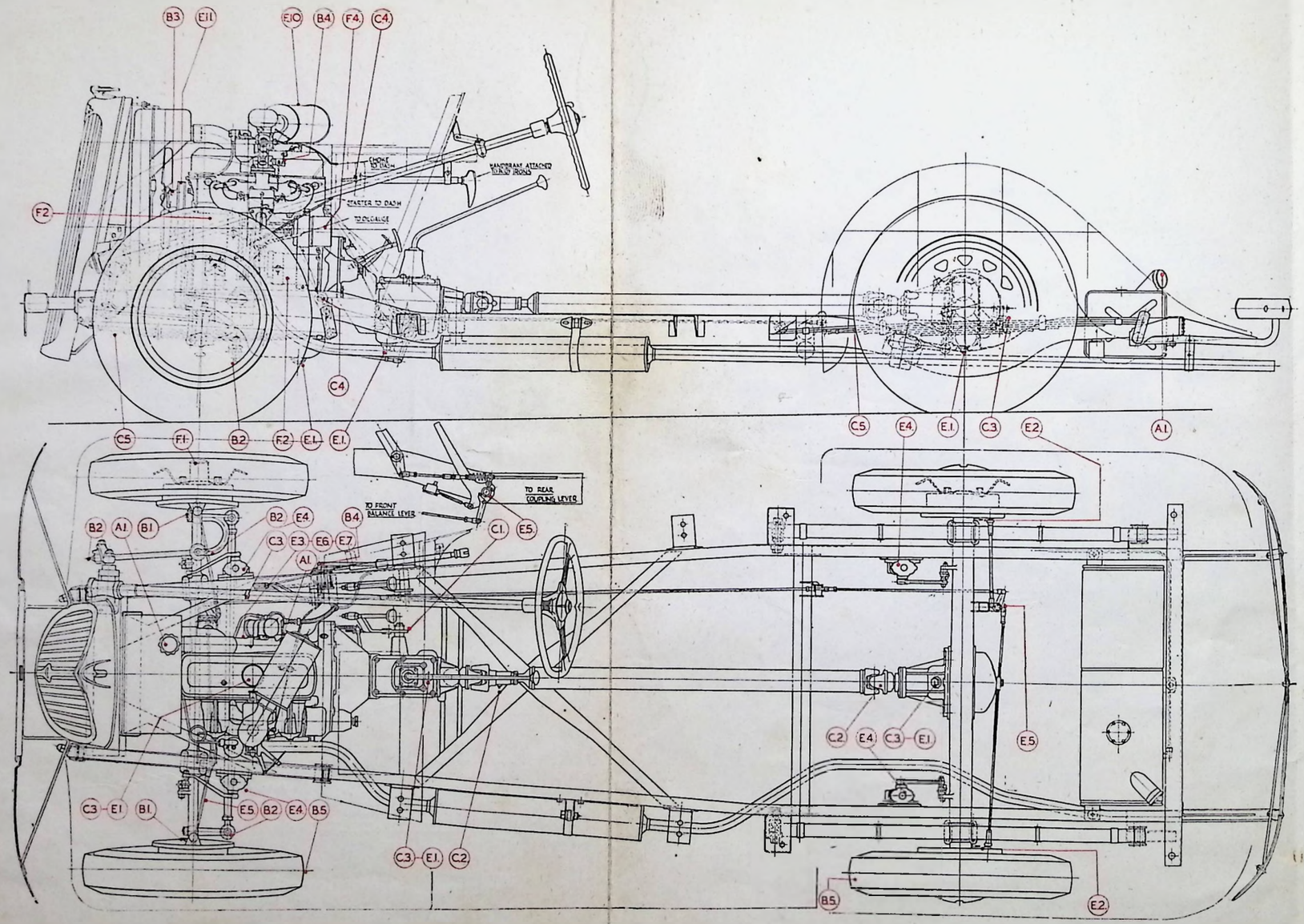
If it is necessary to replace any part order Genuine Lucas-C.A.V.-Rotax Spares. It is obvious that only the designers and manufacturers of the equipment are in a position to make replacement parts which will give satisfactory and lasting service.

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

BELFAST	51/55 Upper Library Street	*Telephone:* Belfast 25617 — *Telegrams:* "Servdep, Belfast"
BIRMINGHAM, 18	Great Hampton Street	*Telephone:* Central 8401 — *Telegrams:* "Lucas, Telex, Birmingham"
BRIGHTON, 4	85 Old Shoreham Road, Hove	*Telephone:* Hove 1146 — *Telegrams:* "Luserv, Brighton"
BRISTOL, 4	345 Bath Road	*Telephone:* Bristol 76001 — *Telegrams:* "Kingly, Bristol"
CARDIFF	54a Penarth Road	*Telephone:* Cardiff 4603 — *Telegrams:* "Lucas, Cardiff"
DUBLIN	Portland Street North, North Circular Road	*Telephone:* Dublin 72601 — *Telegrams:* "Luserv, Dublin"
EDINBURGH, 11	60 Stevenson Road, Gorgie	*Telephone:* Edinburgh 62921 — *Telegrams:* "Luserv, Edinburgh"
GLASGOW, C.3	4/24 Grant Street (St. George's Road)	*Telephone:* Douglas 3075 — *Telegrams:* "Lucas, Glasgow"
LEEDS, 8	64 Roseville Road	*Telephone:* Leeds 28591 — *Telegrams:* "Luserdep, Leeds"
LIVERPOOL, 13	450/456 Edge Lane	*Telephone:* Stoneycroft 4721 — *Telegrams:* "Luserv, Liverpool"
LONDON	Dordrecht Road, Acton Vale, W.3	*Telephone:* Shepherd's Bush 3160 — *Telegrams:* "Dynomagna, Ealux, London"
LONDON	757/759 High Road, Leyton, E.10	*Telephone:* Leytonstone 3361 — *Telegrams:* "Luserdep, Leystone, London"
MANCHESTER	Talbot Road, Stretford	*Telephone:* Longford 1101 — *Telegrams:* "Lucas, Stretford"
NEWCASTLE-ON-TYNE, 2	64/68 St. Mary's Place	*Telephone:* Newcastle 25571 — *Telegrams:* "Motolite, Newcastle-on-Tyne"

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

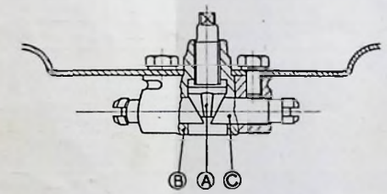
EDWARDS THE PRINTERS LTD. COVENTRY.



PERIODIC LUBRICATION INSTRUCTIONS

DAILY	A1	CHECK PETROL, ENGINE OIL AND WATER		SEE PAGE
WEEKLY OR EVERY 250 MILES	B1	SWIVEL PINS	GREASE	
	B2	STEERING BALL JOINTS	GREASE	
	B3	FAN BEARING	GREASE	
	B4	CARBURETTER CONTROL JOINTS AND ACCELERATOR PEDAL SHAFT AND BRACKET	OIL	SEE PAGE
	B5	CHECK TYRE PRESSURES	—	SEE PAGE
MONTHLY OR EVERY 1000 MILES	C1	CLUTCH SHAFT	GREASE	
	C2	PROPELLER SHAFT	GREASE	
	C3	CHECK LEVELS ENGINE, GEARBOX, REAR AXLE AND STEERING BOX	OIL	SEE PAGE NAME UNDER B
	C4	HANDBRAKE LEVER PAWL AND RATCHET	OIL	SEE PAGE
	C5	ROAD SPRINGS—SPRAY	PENETRATING OIL	SEE PAGE
	C6	DOOR HINGES AND LOCKS	OIL	SEE PAGE
	C7	BATTERY—TOP UP	DISTILLED WATER	SEE PAGE
EVERY 2000 MILES	D1	TRAFFICATORS	OIL	SEE PAGE
EVERY 5000 MILES	E1	DRAIN AND REFILL ENGINE, GEARBOX AND REAR AXLE	OIL	SEE NAME P UNDER BON
	E2	REAR HUBS	GREASE	SEE PAGE
	E3	CONTACT BREAKER PIVOT	OIL	SEE PAGE
	E4	SHOCK ABSORBER—CHECK	ARMSTRONG OIL	SEE PAGE
	E5	BRAKE LINKAGE—CLEAN	GREASE	SEE PAGE
	E6	CAM BEARING AND AUTOMATIC TIMING CONTROL ...	MACHINE OIL	SEE PAGE
	E7	DISTRIBUTOR SHAFT	MACHINE OIL	SEE PAGE
	E8	CHECK SPARKING PLUG GAPS	—	SEE PAGE
	E9	CHECK VALVE CLEARANCES	—	SEE PAGE
	E10	CARBURETTER AIR SILENCER—CLEAN	—	
	E11	FAN BELT ADJUSTMENT	—	SEE PAGE
ANNUALLY	F1	FRONT HUBS—DISMANTLE AND REPACK	GREASE	SEE PAGE
	F2	DYNAMO AND STARTER MOTOR	OVERHAUL	SEE PAGE
	F3	BODY AND CHASSIS BOLTS—CHECK	—	
	F4	OIL FILTER ELEMENT—REPLACE	—	

FULL DETAILS OF RECOMMENDED BRANDS OF ALL LUBRICANTS WILL BE SEEN ON THE CAR NAME PLATE UNDER OFFSIDE OF BONNET.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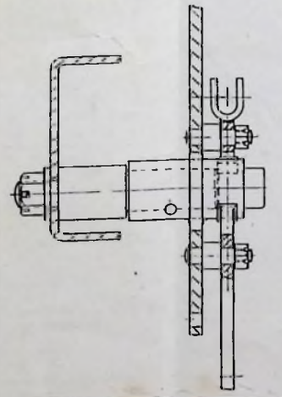

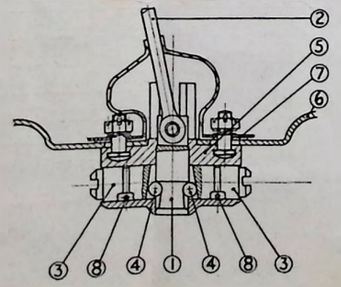
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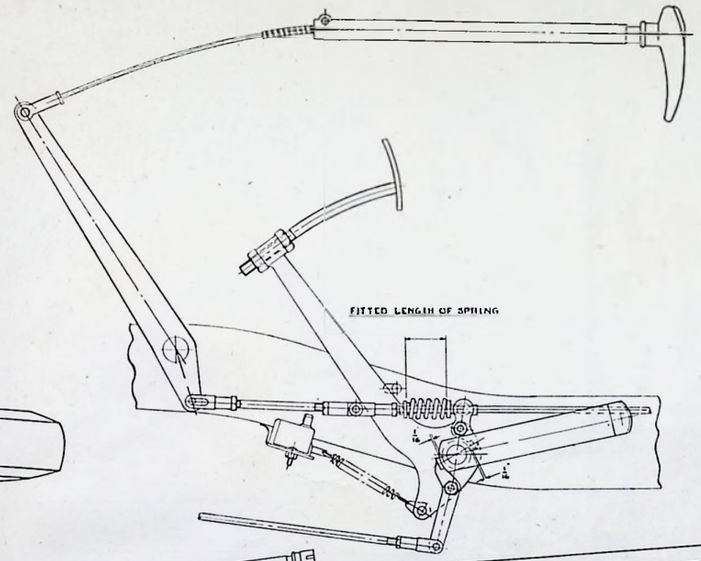
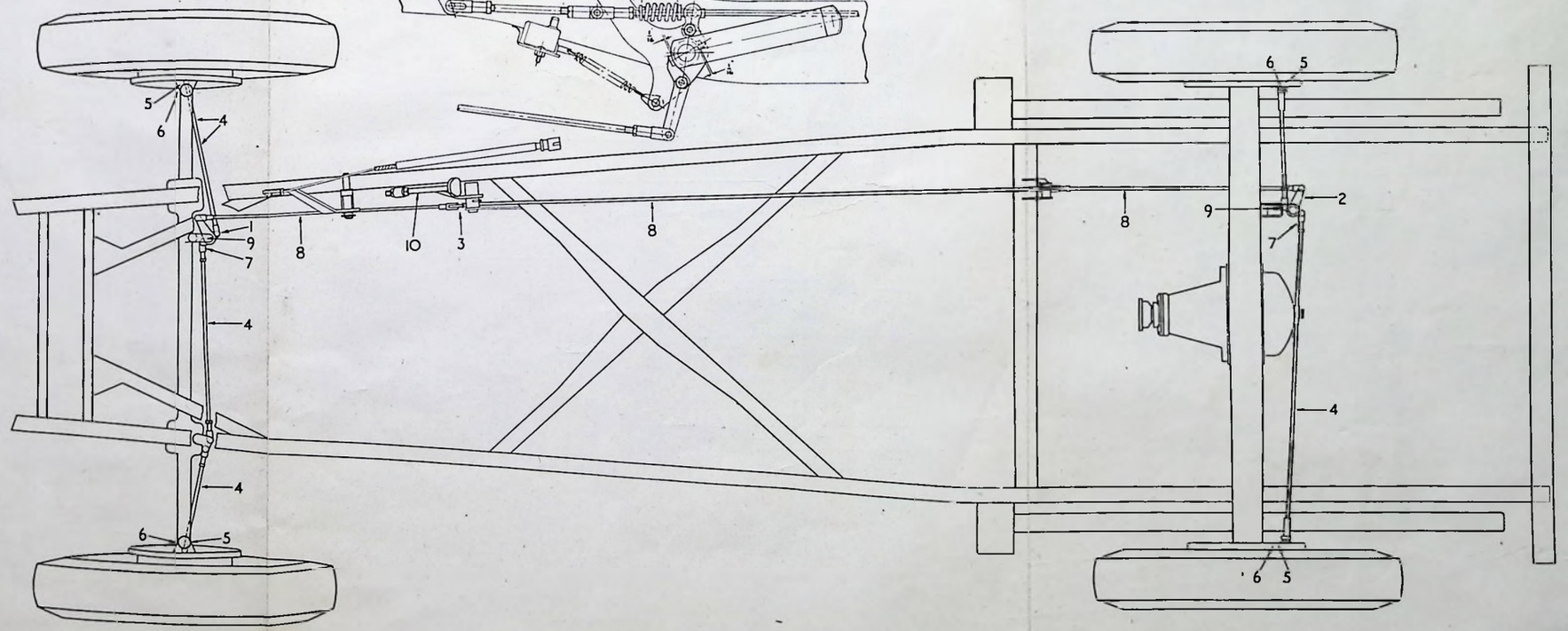

FITTED LENGTH OF SPRING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