

The

SINGER BANTAM

AND NINE COUPE

**INSTRUCTION BOOK
& REPAIR MANUAL**

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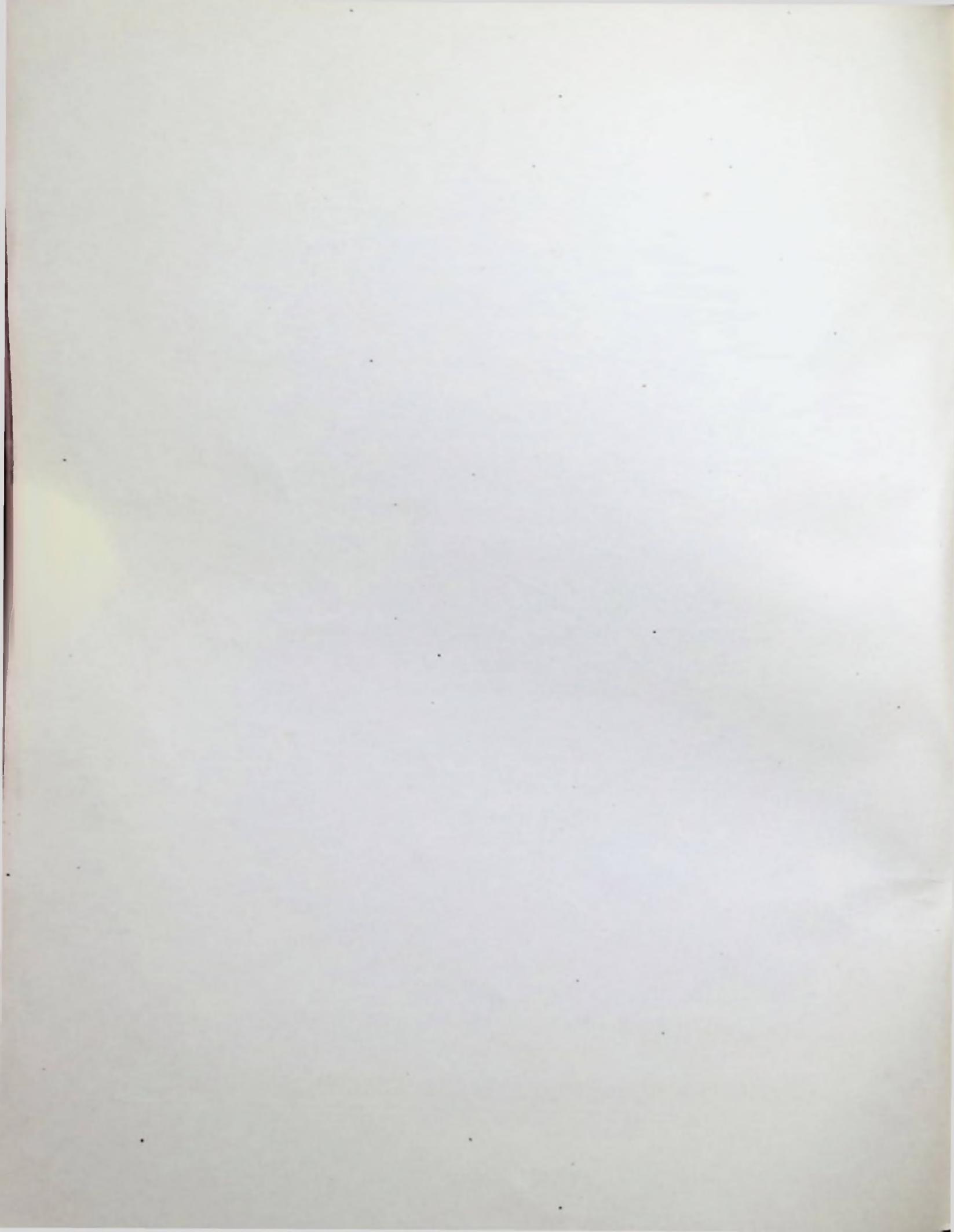
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PREFACE

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

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

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

If at any time difficulties arise, first act in accordance with the information given in this manual, and if further information is required, advice will be given upon application to the Technical Department of our Service Depot, Coventry, **BUT IN ANY COMMUNICATION REGARDING YOUR CAR, IT IS ESSENTIAL THAT YOU QUOTE THE CHASSIS NUMBER WHICH WILL BE FOUND STAMPED ON A METAL PLATE FIXED TO THE DASH BOARD UNDER THE BONNET.** (See illustration, page 18).

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, Singer Motors Ltd. maintain a fleet of fully equipped Service Vans, manned by highly skilled mechanics who are experts in repairing Singer Cars.

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

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

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

GUARANTEE

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

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

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

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

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

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

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

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

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

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

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

CONDITIONS OF WARRANTY

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

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

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

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

REPAIRS AND REPLACEMENTS

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

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

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

SINGER MOTORS LIMITED
COVENTRY.

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GENERAL DESCRIPTION

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

Ample provision is made for water cooling purposes, both the block and head being carefully proportioned to avoid distortion. Cooling is thermo-syphonic, and the radiator block is provided with a large extended header tank. The radiator filler is fitted in the nearside of the header tank, under the bonnet. (See page 17).

The cylinder block casting is extended well below the centre line of the engine and carries a crankshaft of unusually robust dimensions. The crankshaft is of heat treated steel, carefully balanced, and the rear main bearing has been specially designed to facilitate dismantling. A large sump, filter and baffle are bolted to the underside of the crankcase.

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

The self-adjusting pistons are of special aluminium alloy with two compression rings and one oil control ring. The gudgeon pins are fully floating and fitted with end pads.

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

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

The dynamo and distributor drive is carried on the offside of the engine and provision is made for adjustment of the chain which drives the dynamo driving sleeve. The distributor drive is taken from the dynamo driving sleeve by skew gears, one on the driving sleeve and one on the distributor shaft.

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

The carburettor is of the self-starting type, the starting appliance being operated from the dashboard by means of a control cable. Petrol is fed to the carburettor by an electric fuel pump mounted on the nearside of the dashboard under the bonnet. The pump incorporates an easily detachable filter, and is connected to the ignition circuit. The pump is therefore "in" or "out" of action when the ignition is switched "on" or "off". An electric recording petrol

gauge is fitted on the instrument panel and registers the amount of petrol contained in the tank the whole of the time the ignition switch is in the "on" position. Petrol is carried in a seven gallon tank at the rear of the car.

CLUTCH. A single dry-plate, cushion type clutch, and an open type tubular propeller shaft of large diameter to provide against "whirling" and consequent vibration, and fitted with Hardy Spicer enclosed roller bearing universal joints.

GEARBOX. Three forward speeds and reverse, with Synchronesh on top and second gears. The gears are specially cut for silence at all speeds, and lubrication to all gears is provided by splash from the oil reservoir in the base of the box. An oil mist sufficiently lubricates the working parts of the selector mechanism.

ENGINE MOUNTING. The engine and gearbox unit suspension is on three absorbent rubber mountings at the front and mid-way on the torque arms.

REAR AXLE. Of the semi-floating type with silent spiral bevel drive, spur gear differential, and pressed steel axle case.

BRAKES. Lockheed hydraulically operated brakes on large diameter drums. They are fully balanced and compensated, the foot brake operating on all four drums, and independent mechanical operation of the rear shoes is effected by a central hand brake lever. The brakes are extremely efficient and progressive in action, with equal force on all four wheels.

SUSPENSION. Long, wide, semi-elliptic front and rear springs carried on oilite bearings. Armstrong double-action hydraulic shock absorbers are fitted with each spring.

STEERING. Patented and improved worm and nut type rigidly anchored to the frame. It is finger light at all speeds with just sufficient self-return action on corners, while being free from road re-action and "kick". A 15" diameter steering wheel is fitted.

WHEELS AND TYRES. Five detachable wire wheels fitted with 17 in. \times 4.5 in. tyres. As an alternative, five easy-clean wheels with 16 in. \times 5 in. tyres.

CHASSIS FRAME. Deep section pressed steel channel, overslung at the front, underslung at the rear, and having two tubular and three pressed steel cross members, ensuring rigidity and great strength.

ELECTRICAL EQUIPMENT. Lucas electrical equipment comprising 12 volt, 51 ampere hour battery mounted on the dash under the bonnet, large dynamo, coil, distributor, dimming headlamps, sidelamps, tail lamp, electric horn, starter motor, with dash operated control. The switch mounted on the steering column extension incorporates the horn push, headlamp dimming switch and trafficator switch.

The neat centrally grouped instrument panel carries the ammeter, ignition switch, oil pressure gauge, electric petrol gauge, speedometer, panel illumination, carburettor, and starter motor controls.

DATA

ENGINE.

Bore	60 mm.
Stroke	86 mm.
Capacity	972 c.c.
R.A.C. Rating	8.93 h.p.
Tax	£6 15s. 0d.
Water cooling capacity	16 pints
Anti-freeze solution	4 pints
Oil sump capacity	7 pints
Petrol tank capacity	7 gallons
Gearbox capacity	1½ pints
Rear axle capacity	3 pints
Firing order	1, 3, 4, 2

TYRE PRESSURES.

Front and rear (wire wheels)	28 lbs. per sq. in.
Front and rear (easy-clean wheels)	24 lbs. per sq. in.

BRAKE HORSE POWER.

1,000 r.p.m.	2,000 r.p.m.	3,000 r.p.m.	Peak 4000/4200 r.p.m.
7.1 B.H.P.	14.8 B.H.P.	22.1 B.H.P.	25.75 B.H.P.

GEAR RATIOS.

Top	5.57 : 1
Second	10.08 : 1
First	17.75 : 1
Reverse	23.65 : 1

GENERAL DIMENSIONS.

Wheelbase	7' 7"
Track	3' 9"
Ground clearance	7½"
Overall length	11' 10½"
Overall width	4' 7¾"
Height	5' 2¾"
Turning circle (left lock)	35' 0"
Turning circle (right lock)	35' 6"
Unladen weight	15 cwt. 3 qrs.

IMPORTANT.

We draw your attention to the notice regarding speed that is affixed to the inside of the driver's compartment. By observing these rules the car will give better service and smoother running. Pistons, rings, cylinder walls and bearings will by this time have a surface that can never be obtained by fast, hard driving. Even after the five hundred miles recommended, it will pay to increase the maximum speed of travelling with discretion.

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

CONTROL OF THE CAR

ON taking delivery of a new car, be assured that everything is in order and that any special equipment has been satisfactorily fitted. The tool kit should be checked and packed away in the box under the bonnet and the supply of oil, petrol and water checked over.

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

There are several adjustments provided for the personal comfort of the driver and passengers. The front seats can be adjusted for comfort by releasing the locking lever which will be found underneath the seat and sliding the seat backwards or forwards on its runners. The windscreen can be opened by releasing the two thumb screws on the side swivels, and pulling the quadrant arms down. The quadrant arms may then be locked in the desired position by tightening the thumb screws.

The windscreen wiper is brought into action by unlocking the curved handle, swinging the wiper arm into position and pulling out the switch knob. Stop the wiper by switching off and locking the arm out of the line of vision.

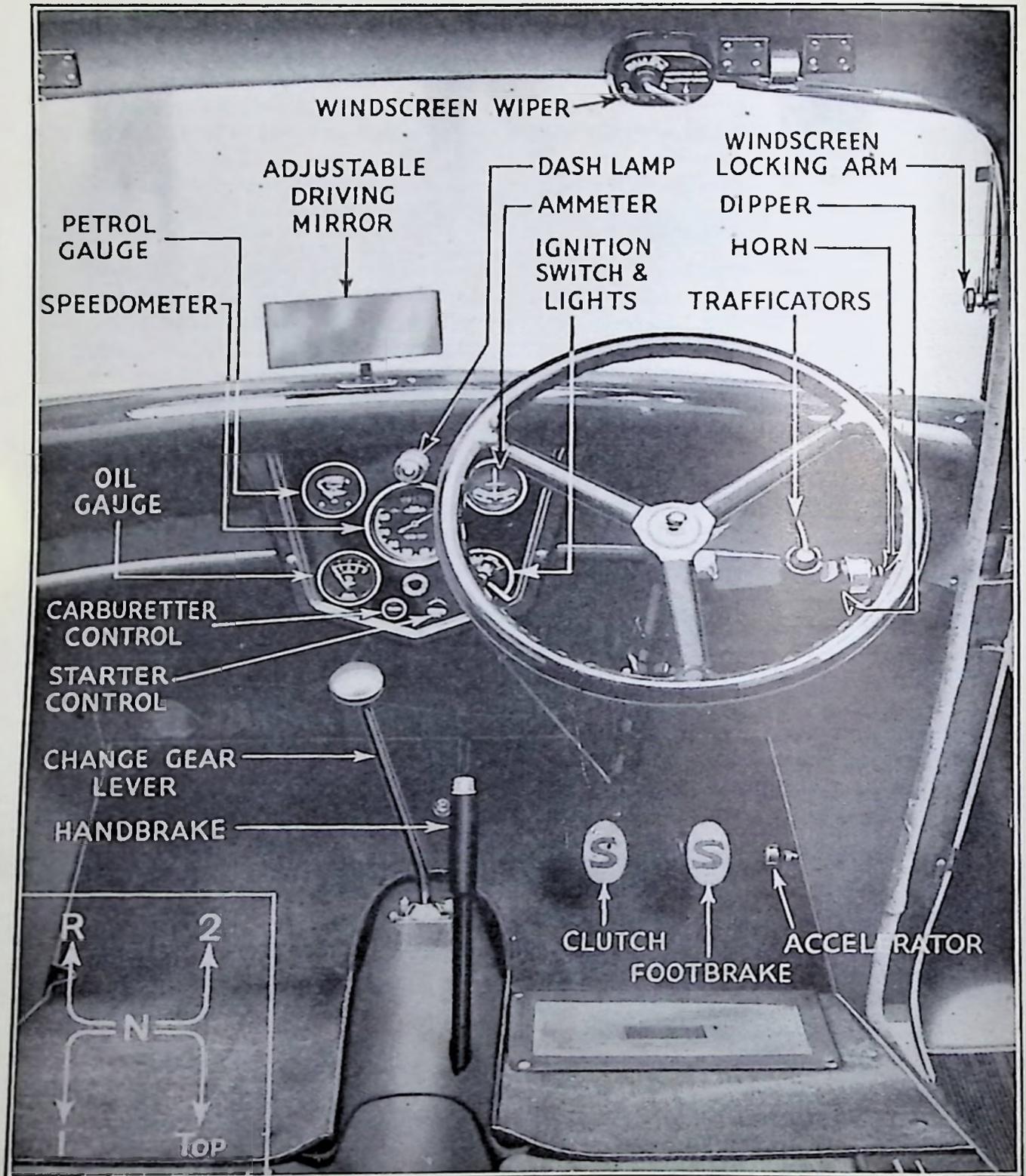
The controls are conveniently grouped about the driving position, and in the majority of cases their purpose is self-explanatory. Some, however, are worthy of note and reference to the illustration will no doubt be of service.

The ignition switch and key control the supply of current from the battery to the ignition coil, and must be "on" before the engine will function. A warning lamp gives a red light if the switch is left on when the engine is not running, and the light is also apparent while the engine is running but the dynamo not charging. This condition, however, can only be expected when the engine is running very slowly and the dynamo charging rate insufficient to balance the drain on the battery from the coil ignition. **ALWAYS REMOVE THE SWITCH KEY WHEN LEAVING THE CAR STANDING.**

All controls and the change speed lever positions are fully illustrated in the photograph on page 12.

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

Perhaps a few words concerning the gearbox and the method of changing gear will be of assistance to the novice.



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

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

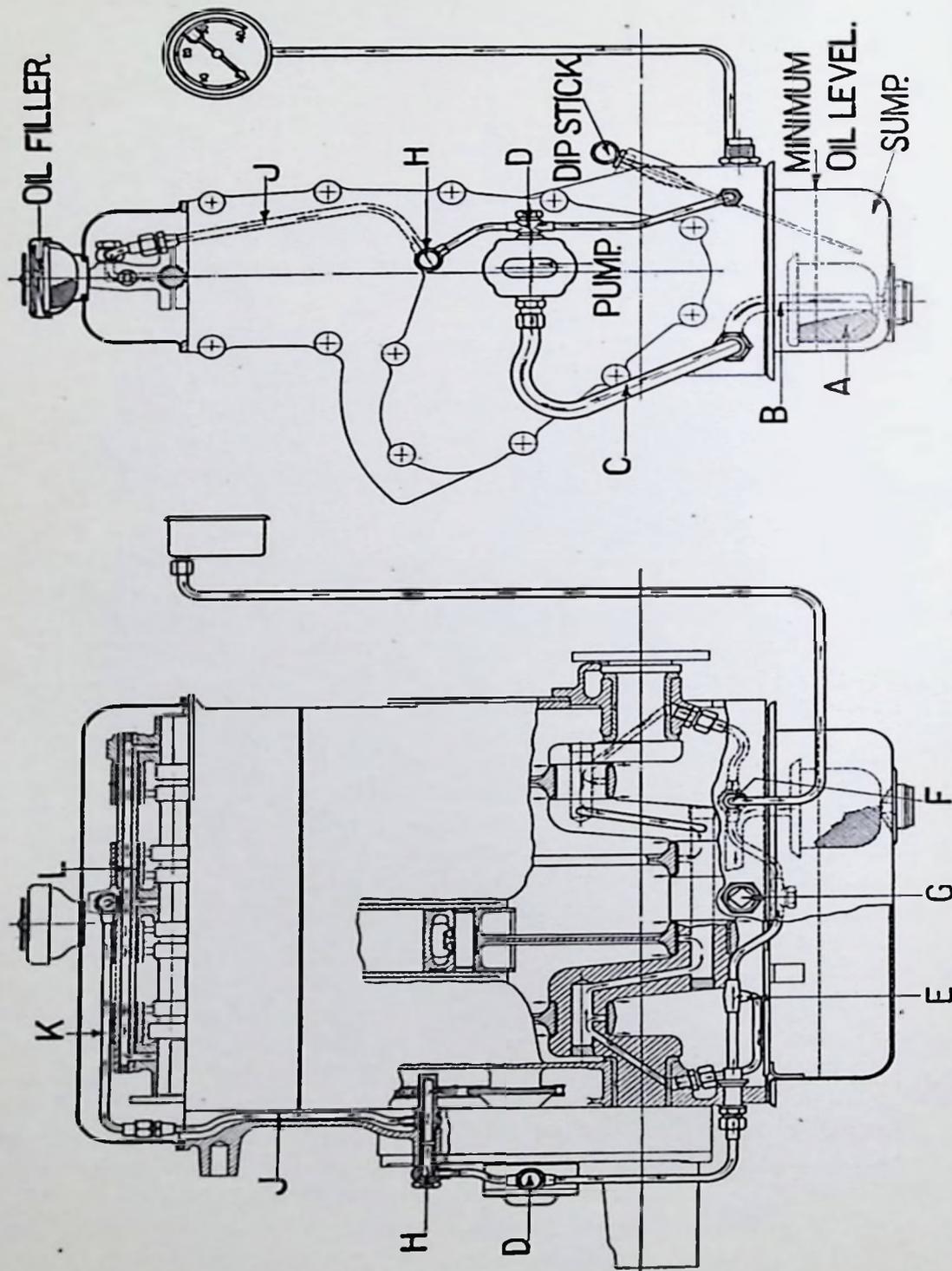
To a new car owner we cannot give greater service than to impress upon him the importance of regular attention to lubrication. Therefore, this summary of "regular attentions" has been compiled on the assumption that the car will cover about 12,000 miles per year, but consideration must be given to the 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 also shown on the chart and we strongly advise owners to use only the oils specified. **ON NO ACCOUNT MUST CHEAP OILS BE USED.**

DESCRIPTION OF ENGINE LUBRICATION.

The lubrication of the engine is automatic providing the correct oil level is maintained in the engine sump, but it is always advisable to check the correct functioning of the lubricating system by the gauge mounted on the instrument panel.

When the engine is running, the oil gauge should indicate a steady pressure of between 20/25 lbs. per square inch when the engine oil is warm and the car running at about twenty miles per hour in top gear. It is, of course, understood that a higher pressure reading will be obtained when the engine oil is cold.



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

Sectional diagrams are shown on page 14 which, if consulted with the following description, will be of considerable assistance to the owner in understanding the engine lubricating system.

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

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

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

DAILY ATTENTIONS.

When preparing the car for the road there are three items which must receive attention : petrol, oil and water.

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

2. **ENGINE OIL.** The engine oil filler will be found on the engine top cover, and is air tight in order to prevent fumes from escaping. An oil breather is of course fitted to the nearside of the engine case, which conveys fumes below the body level. The engine oil sump holds seven pints of oil and this quantity should be maintained by checking the oil level daily or at least every 150 miles. When refilling the engine oil level through the cap in the top cover the oil must be poured in very slowly to avoid any possibility of the oil finding its way down the intake pipe into the carburettor. A dip stick is fitted on the nearside of the crank case 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

oil will then be accurately indicated, and if the oil is below the mark on the dip stick, bring it to the correct level by pouring fresh oil through the filler in the engine top cover. A few moments must be allowed when adding oil for it to drain into the sump before finally checking the level, but do not under any circumstances fill the sump above the level as this is likely to lead to various minor troubles.

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

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

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

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

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

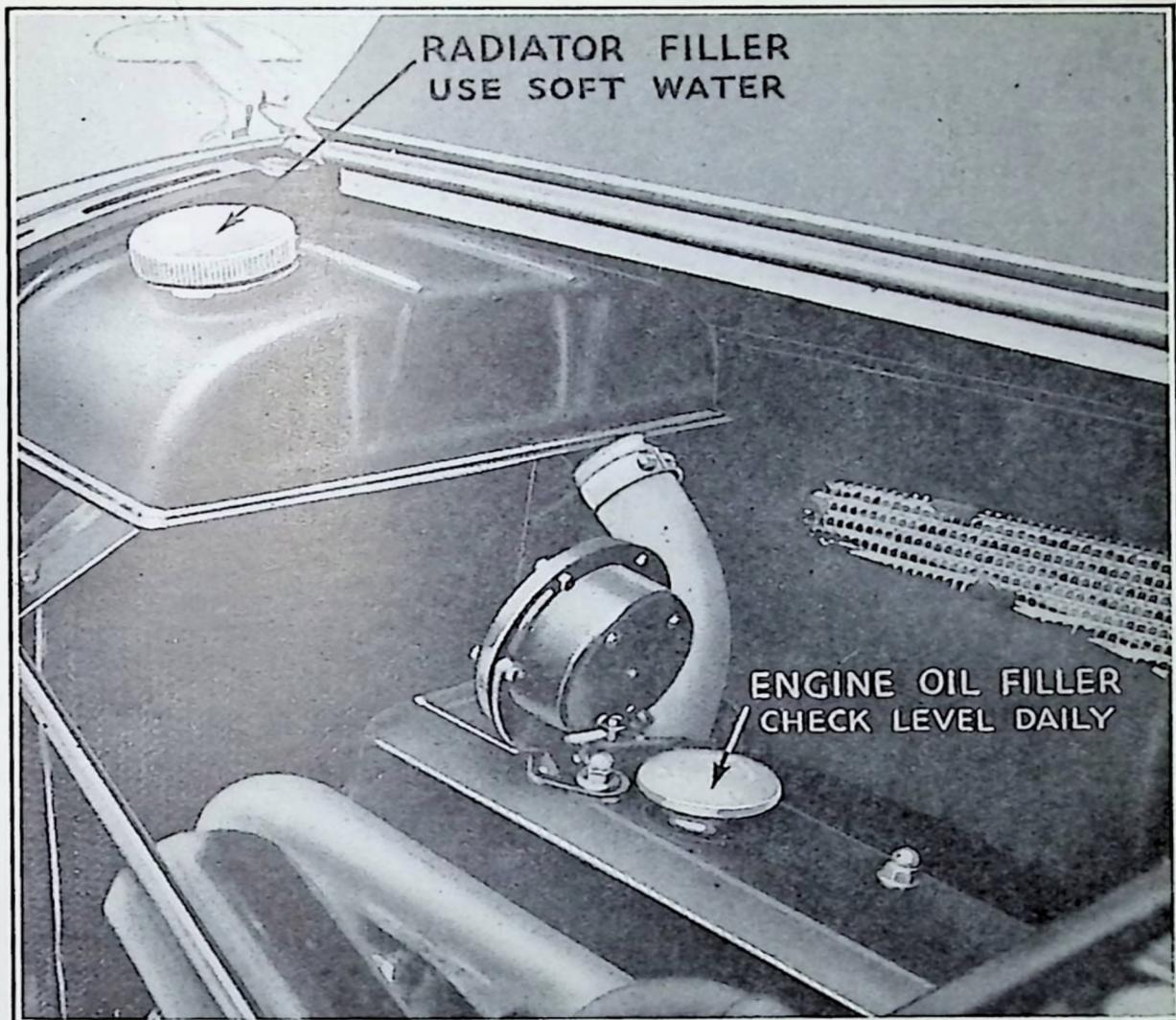
In some cases low oil pressure is due to the engine oil becoming very thin owing to dilution with petrol (due to misuse of the carburetter self-starter or worn pistons and rings). This can easily be checked by draining a little of the oil from the sump through the drain plug, and if the condition of 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 750/1,000 miles the oil should be drained from the sump and fresh oil put in. After this, the oil should be changed about every 2,000 miles.

3. WATER. The radiator should be filled with water to a level not higher than one inch below the filler cap. The filler cap is fitted to the nearside 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 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.

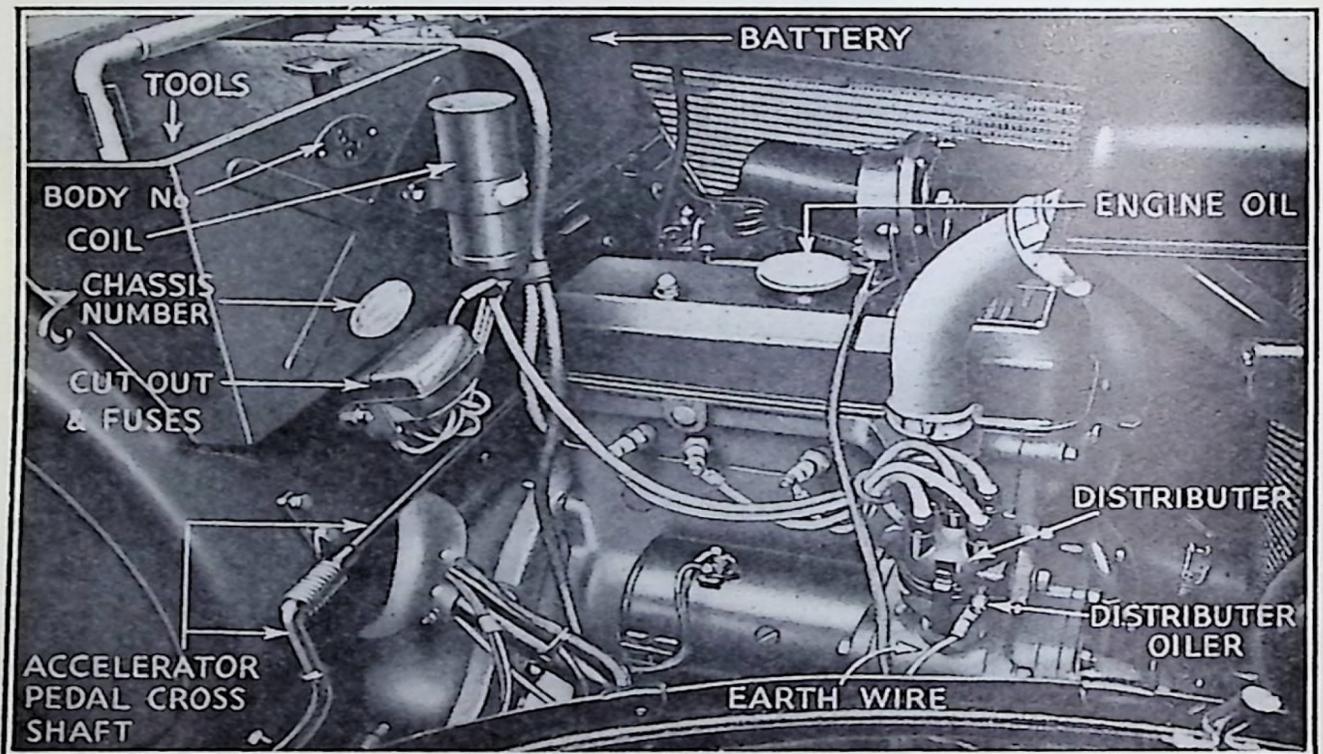


In frosty weather some steps must be taken to prevent the cooling water freezing, as water when frozen expands and causes a great bursting pressure with a considerable risk of cracked cylinders or radiator and consequent leaks.

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.

Glycerine is a cheap and reliable form, and 25% by volume of glycerine in the cooling water system will give effective protection. Glycerine does not evaporate and will last the winter through. The total cooling system capacity is sixteen pints, therefore sufficient water may be drawn away and replaced by four pints of radiator glycerine.

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 cold engine oil. This is especially important in winter time. After this, the engine should start quite easily when switched on, and the carburetter starter control knob, situated on the facia board, pulled out to bring the carburetter starter appliance into action. Release the starter switch immediately the engine fires, and when the engine has been running for about two minutes push back the carburetter starter control knob. **IT SHOULD NOT BE NECESSARY TO USE THE CARBURETTER STARTER APPLIANCE WHEN RESTARTING A WARM ENGINE.**



WEEKLY ATTENTIONS.
(Or every 250 miles).

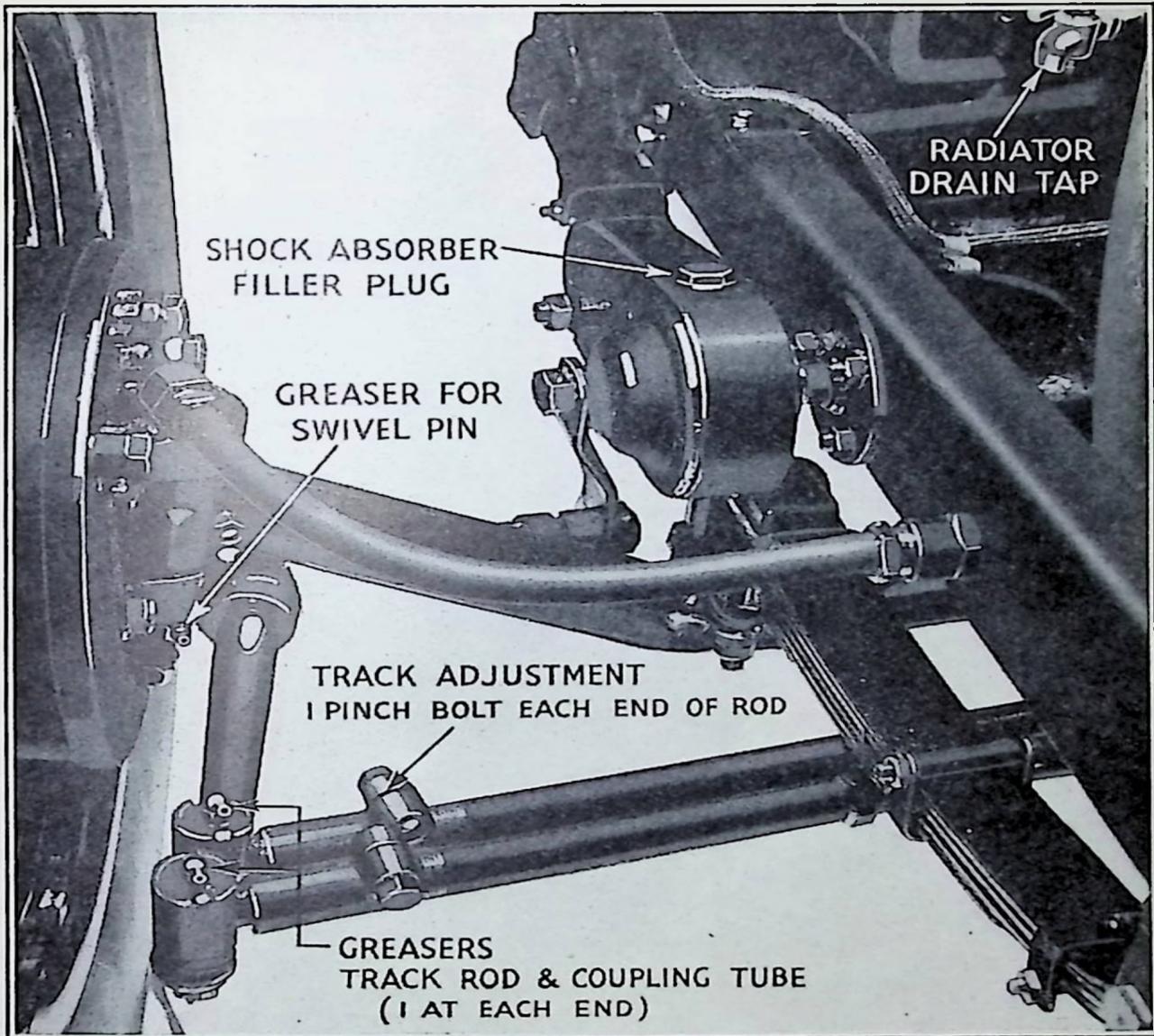
1. Grease the steering swivel pins, of which there are two, and the ball joints of the track rod and coupling tube.

In order to facilitate this operation 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 :—

Front and rear (wire wheels)	..	..	..	28 lbs. per sq. in.
Front and rear (easy-clean wheels)	..	..	..	24 lbs. per sq. in.

Take care to keep the tyres on one axle at the same pressure. Unsteadiness of the steering is often due to under-inflation or unequal

inflation of the front tyres and this also results in a tendency for the steering to pull to either side.

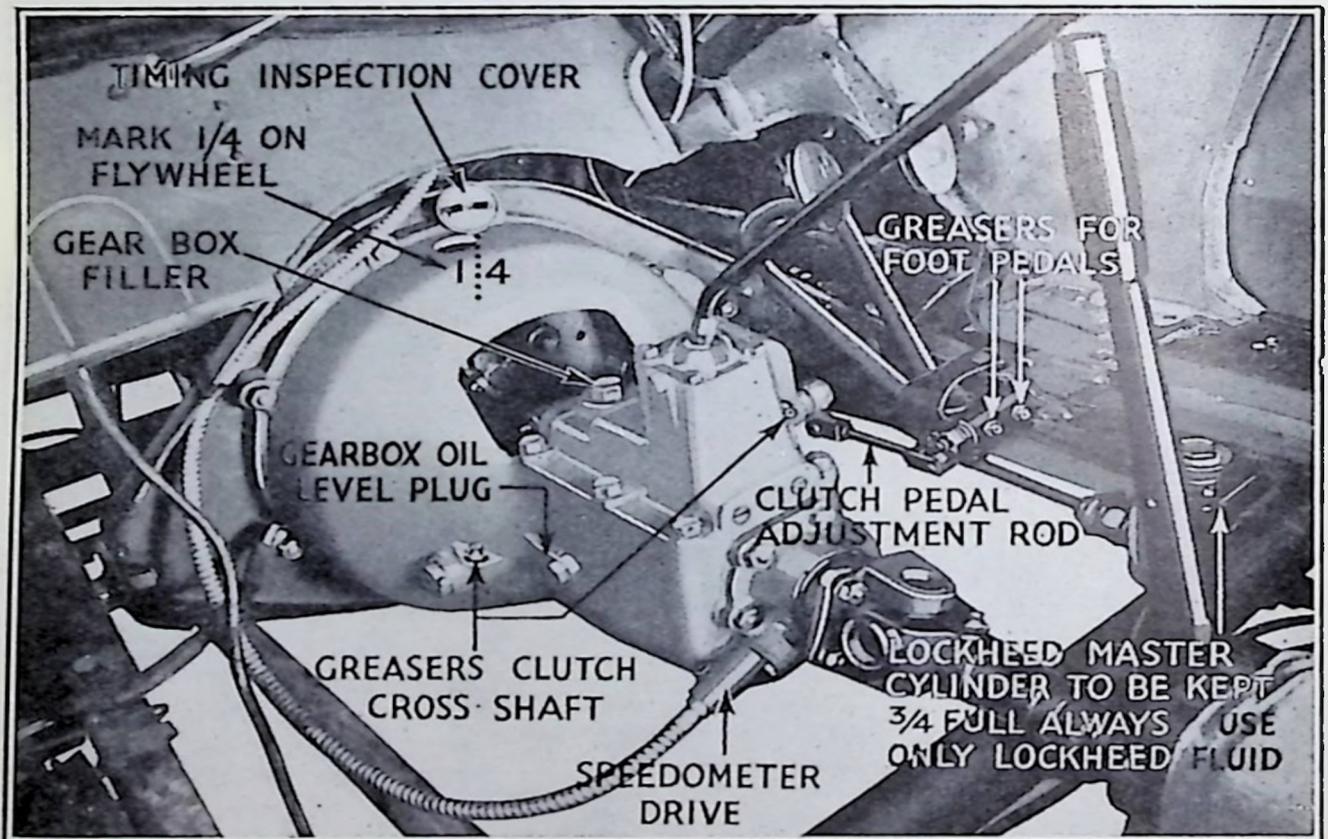
Examine the tyres periodically and remove flints or other road matter which may have become embedded in the tread, and any large cuts should be vulcanised.

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

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

MONTHLY ATTENTIONS. (Or every 1,000 miles).

It now becomes necessary to remove the front seats and floorboards and the rear seat in order that the following points may receive attention. (See page 34, paragraphs 14-18).



Greasers.

1. Clutch cross shaft; two greasers, one each side of clutch extension case (up to Car No. 10501).

1a. Clutch cross shaft; one greaser on clutch pedal boss.

2. Propeller shaft: one greaser at forward end.

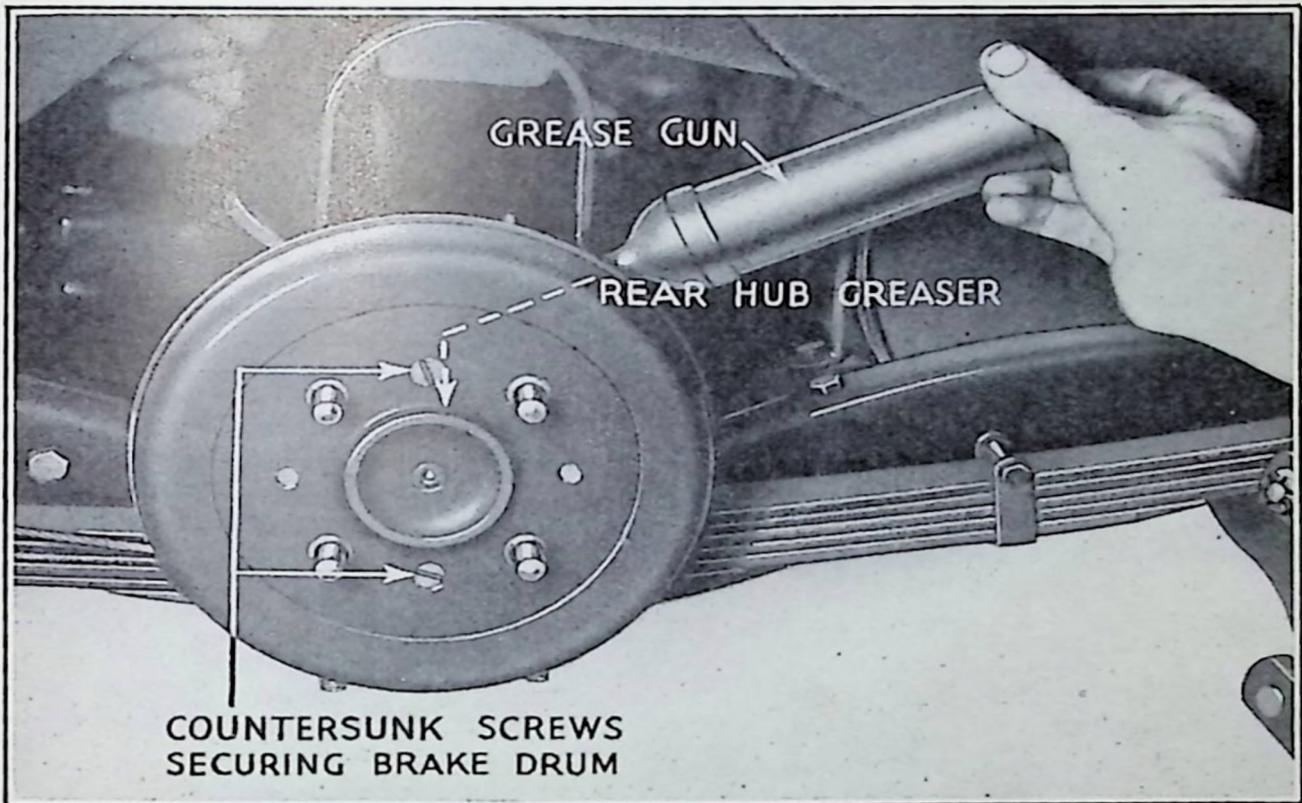
3. Foot pedals: two greasers, one to each pedal.

4. Check level of oil in the gearbox, steering box and rear axle, and replenish if necessary.

5. Check level of fluid in the Lockheed brake supply tank which is on the offside chassis frame member near the foot brake pedals. This tank should never be less than three-quarters full of fluid, AND GENUINE LOCKHEED FLUID ONLY MUST BE USED.

6. Oil the hand brake lever, pawl and ratchet, and the link rod between the foot brake pedal and the Lockheed supply tank.

7. Put a smear of grease on the hand brake cables where they penetrate the guides in the chassis frame, and also where they pass through the brake back plate on the rear axle case.



8. Remove the rear road wheels and apply the grease gun to the rear hub greaser which is situated at the top of each side of the axle immediately behind the brake brackets. (See illustration).

9. Grease the threads of the road wheel studs before refitting the road wheels, and this also applies to the front road wheels which should be removed and dealt with in the same way.

10. Spray all road springs with penetrating oil.

11. Distributor : two drops of thin machine oil.

12. Dynamo : two drops of thin machine oil.

13. Luggage grid wing nuts : a smear of grease on the thread.

14. Top up the battery (see page 73).

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

16. Lubricate the door catches and striking plates.

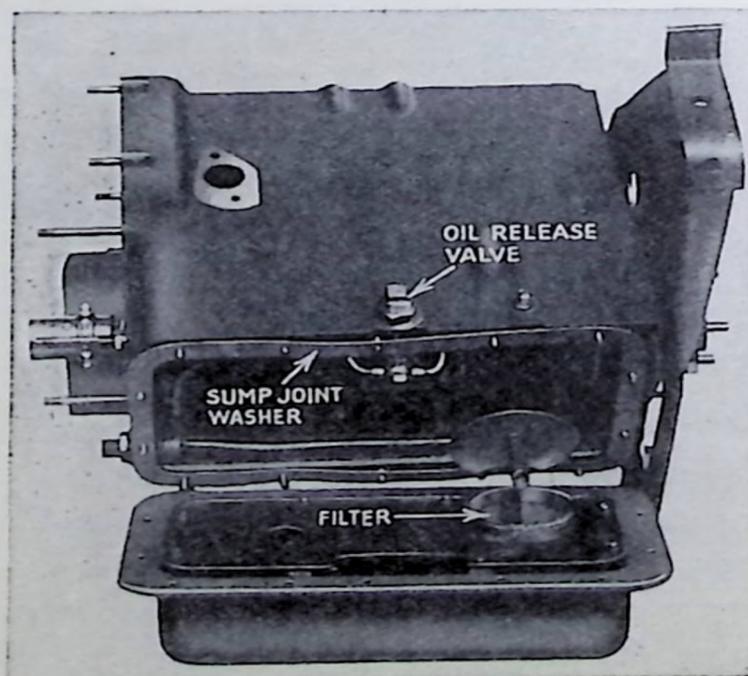
When replacing the floorboards and pedal boards, etc., remember that these are often the frequent causes of rattles and squeaks, and precautions should be taken to ensure that the screws are tight in order to prevent noises of this description.

EVERY 2,000 MILES.

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

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

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 tray to the base of the engine case and take away the oil sump, tray and oil filter. It is not necessary to remove the cork washer from the studs unless it is broken. The oil baffle



tray may be lifted from the sump, the filter withdrawn and cleaned with petrol. All traces of carbon, etc., must be removed from the sump.

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. The cam of the distributor and the distributor spindle should at this time receive a slight smear of vaseline.

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

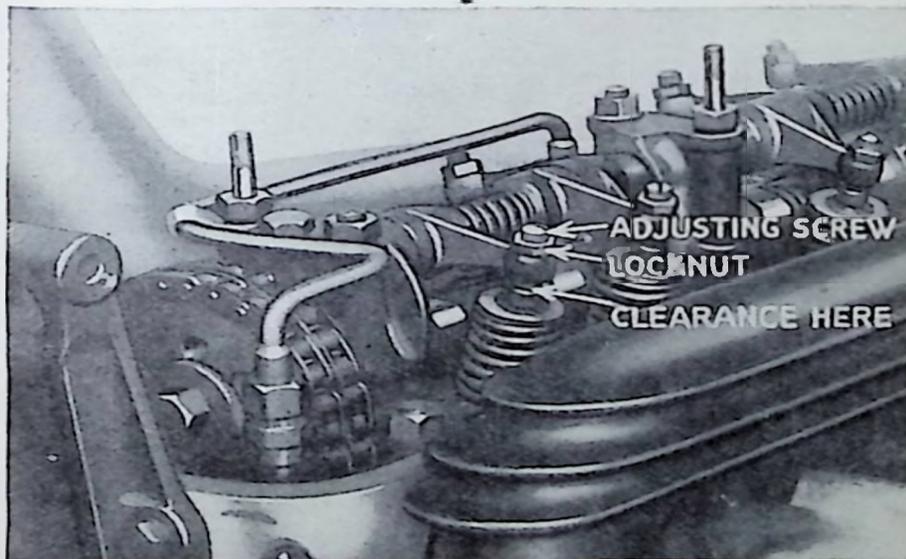
The sparking plug has an important part to play in the running of the engine and has an influence on such items as smooth running, speed, slow running and petrol consumption. Therefore, it fully merits the small attentions that are advised below.

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

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

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

INLET VALVES .. .. .	.004"
EXHAUST VALVES .. .. .	.006"



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

First run the engine for a few minutes until it becomes warm, then remove the two dome nuts securing the electric horn and the top valve cover to the cylinder head, care being taken when removing the top valve cover, to avoid damaging the cork joint which is fitted. Turn

the engine with the starting handle for a half revolution after the closing of the valve which is to be adjusted. Slacken the lock nut and adjust the tappet screw until the gauge is a loose sliding fit between the valve stem and the tappet screw. Now tighten the lock nut and recheck with the gauge, as tightening the lock nut will occasionally alter the clearance. **DO NOT SET THE VALVE CLEARANCES TOO SMALL, OR DIFFICULTY WILL BE EXPERIENCED OWING TO THE ENGINE MISFIRING.**

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

HALF YEARLY ATTENTIONS. (Or every 6,000 miles).

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

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

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

2. Drain and refill rear axle with fresh oil. This operation can best be carried out by lifting the rear seat cushion. The seat cushion is secured by means of a rod passing through the bottom edge of the cushion and which registers in two clips on the heel board.

It is merely necessary to depress the front of the cushion until the rod is clear of the clips, the cushion may then be lifted, exposing the cover in the rear seat pan.

The filler plug is located on the top and in the centre of the differential case, the drain plug at the bottom and in the centre of the axle case, and the level plug just below the centre of the axle case rear cover. The capacity of the axle is three pints, and care must be taken not to over-fill this unit to prevent any possibility of oil finding its way on to the rear brakes, see illustration on page 25.

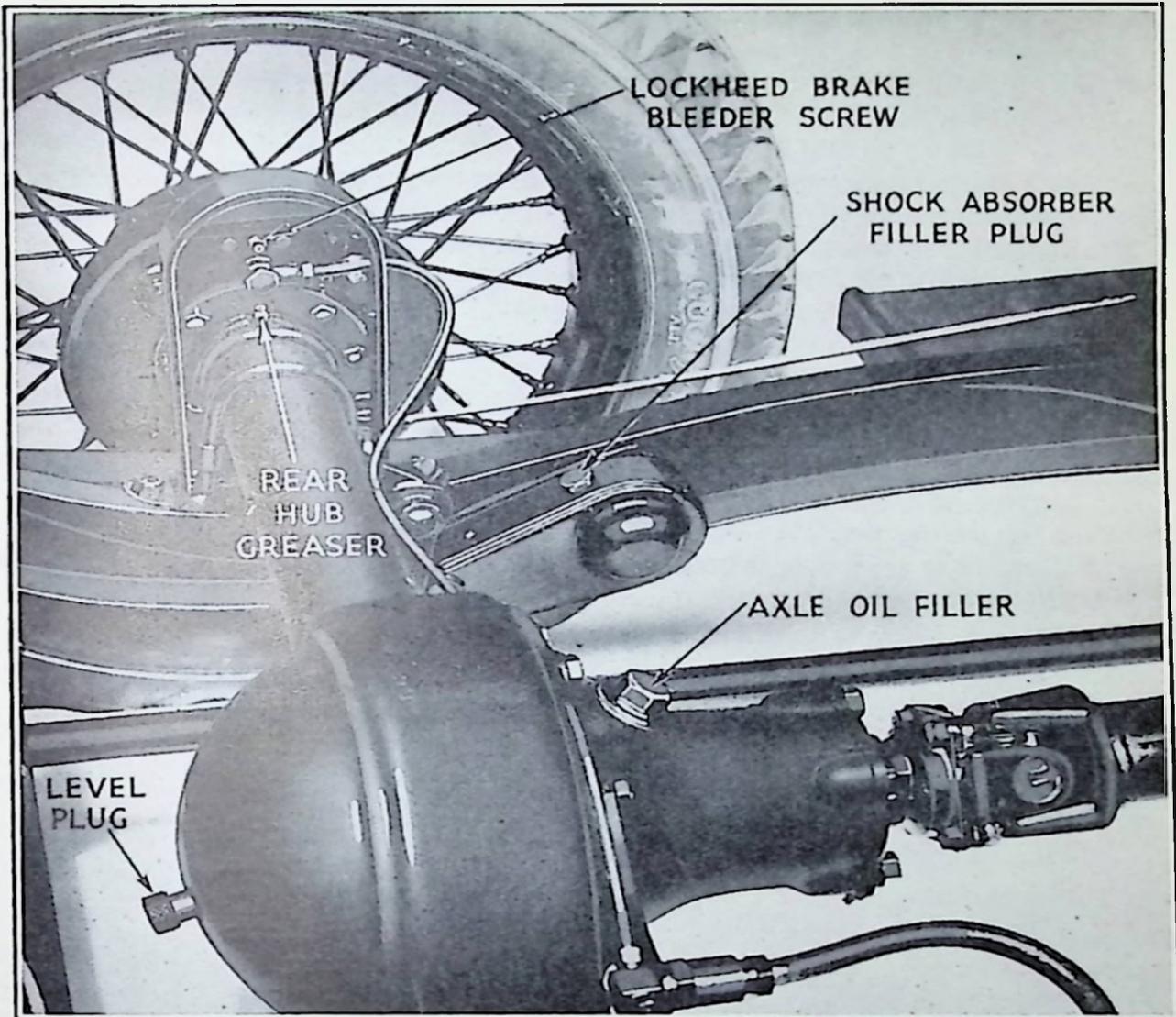
3. To the contact breaker pivot must be applied one single drop of thin machine oil.

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

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

It is not possible to state definitely over what mileage a car should be run before decarbonising becomes necessary, but signs of excessive carbon deposit are noticeable owing to the sluggishness of the engine

and a tendency to "pink" under load. Therefore, we suggest that a new engine should be decarbonised for the first time after 6,000 miles, and thereafter every 10,000 miles will be a fair average period.



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

(a) Remove bonnet by taking away two set pins from the front bonnet hinge clip, and two set pins and nuts from the rear bonnet hinge clip.

(b) Drain the water system by means of the drain tap at the base of the radiator on the nearside.

(c) Disconnect the petrol pipe from carburetter.

(d) Disconnect the carburetter throttle and choke controls.

(e) Disconnect the exhaust pipe which is secured to the manifold by three nuts and bolts and a copper-asbestos washer.

(f) On the earlier Bantam models, in order to remove the carburettor, it is only necessary to take away the two nuts securing the carburettor to the flange, care being taken not to destroy the Hallite washer.

The top valve cover can be removed by releasing the two dome nuts, one of which secures the electric horn. A cork washer is fitted between the top valve cover and the cylinder head.

(g) On the later Bantam models, the top valve cover is fitted with a device for hot spotting the carburettor, therefore the method of removing the top cover is as hereunder: Take away the two dome nuts securing the cover and release the two small studs which secure the bottom of the intake pipe bracket to the carburettor. This will allow the complete assembly to be removed.

If it is not thought necessary to remove the intake pipe, merely disconnect the clip securing the rubber hose to the intake pipe at the top cover end. Care must be taken to avoid damage to the valve cover cork washer when the cover is withdrawn.

When refilling the engine oil level through the cap in the top cover the oil must be poured in very slowly to avoid any possibility of the oil finding its way down the intake pipe into the carburettor.

The carburettor on this model is removed in exactly the same way as indicated above, when the top cover is taken away.

(h) Disconnect and remove the sparking plugs.

(i) Disconnect the clips securing the radiator top hose and remove the hose pipe.

(j) Disconnect the camshaft oil feed pipe by releasing the nut and set screw securing the feed pipe to the timing case pipe and cam shaft bearing. There is also one clip securing the pipe to the first camshaft bearing.

(k) Set the engine position by turning with starting handle until mark $1/4$ appears on the flywheel, and the inlet valve of No. 4 cylinder is about to open.

(l) Disconnect the camshaft chain sprocket. Release the timing chain tensioner by unscrewing the lock nut and turning back adjusting bolt in cylinder head. Remove the set screws, tab washer and plain washer which secure the chain wheel to the camshaft flange. **DO NOT UNDER ANY CIRCUMSTANCES REMOVE CHAIN FROM CHAIN WHEEL.**

(m) To remove the cylinder head, take off nine nuts and washers, securing the cylinder head to engine case. Remove two top bolts securing timing case to cylinder head, and slack off the two nuts immediately below these bolts. Rock cylinder head to break joint, but do not use any lever between faces of cylinder head or cylinder block, as this will damage the gasket. Remove gasket and store for safety.

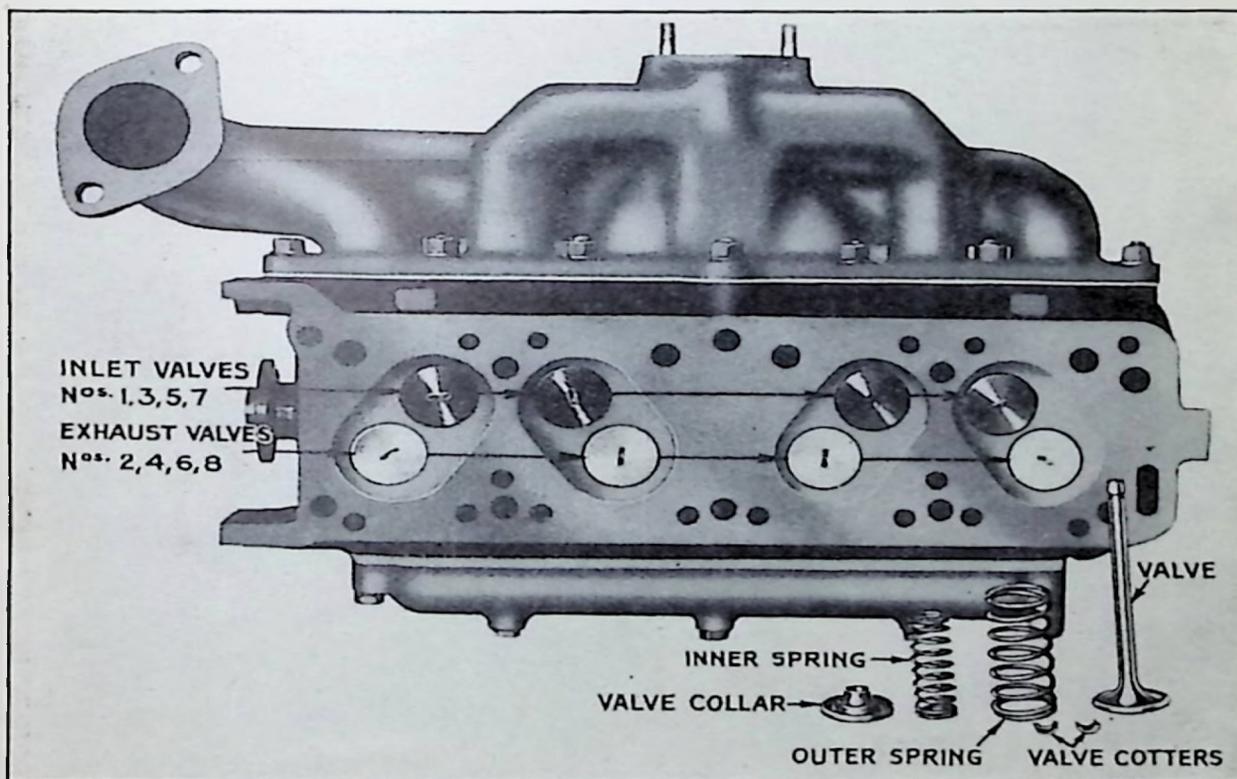
(n) Remove the camshaft assembly by releasing six nuts and washers which secure three camshaft bearings and withdraw upper halves of bearings complete with valve rockers and shaft. Release upper halves of camshaft bearings from rocker shaft and withdraw and mark to ensure return to correct position. It is policy at this

stage to remove camshaft bearing bases from cylinder head studs and pair with 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 remove split collar. Release 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 their correct seatings; counting from the front of the cylinder head the valves are marked as follows:—

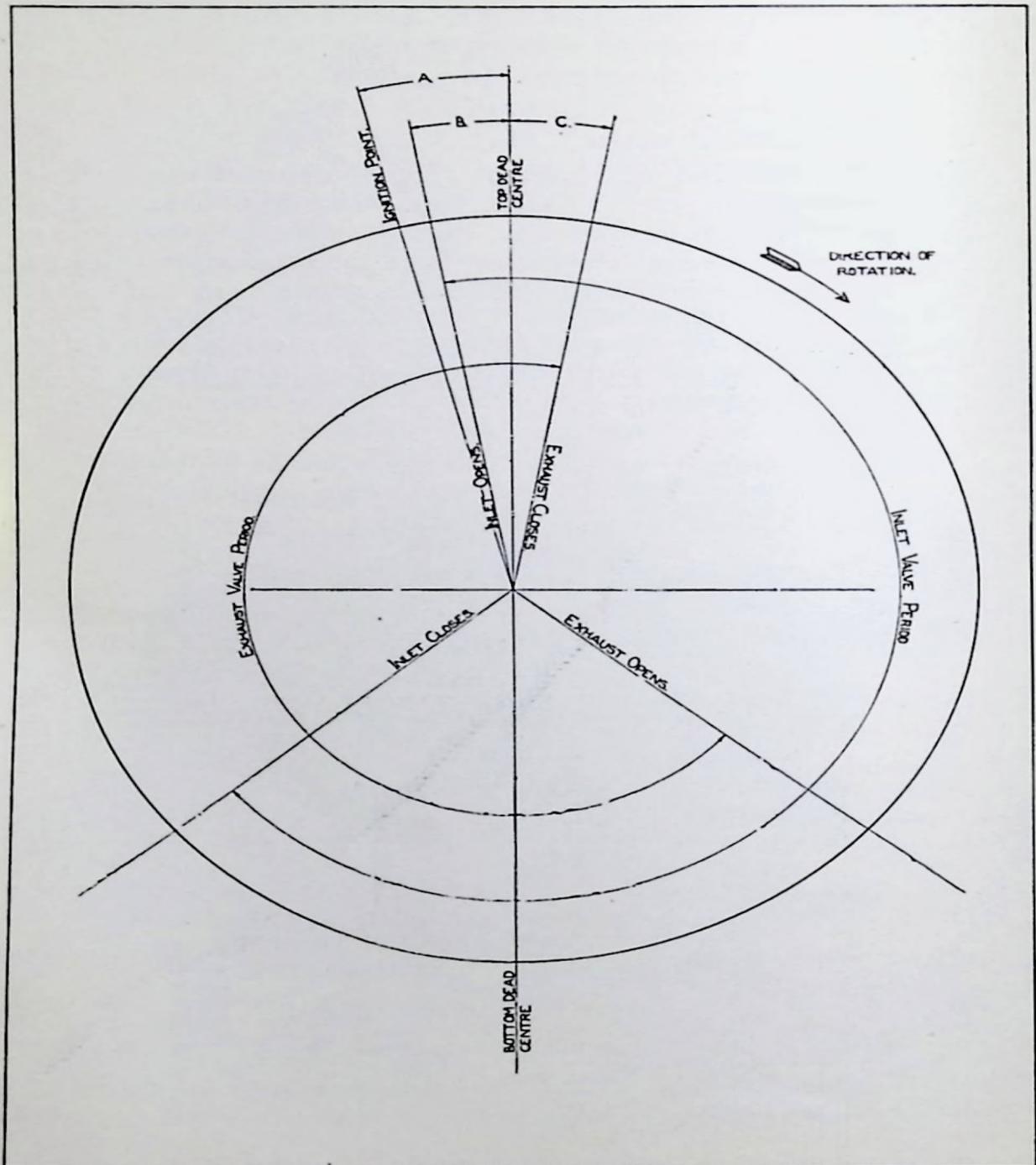
Inlet valves	1-3-5-7
Exhaust valves	2-4-6-8

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



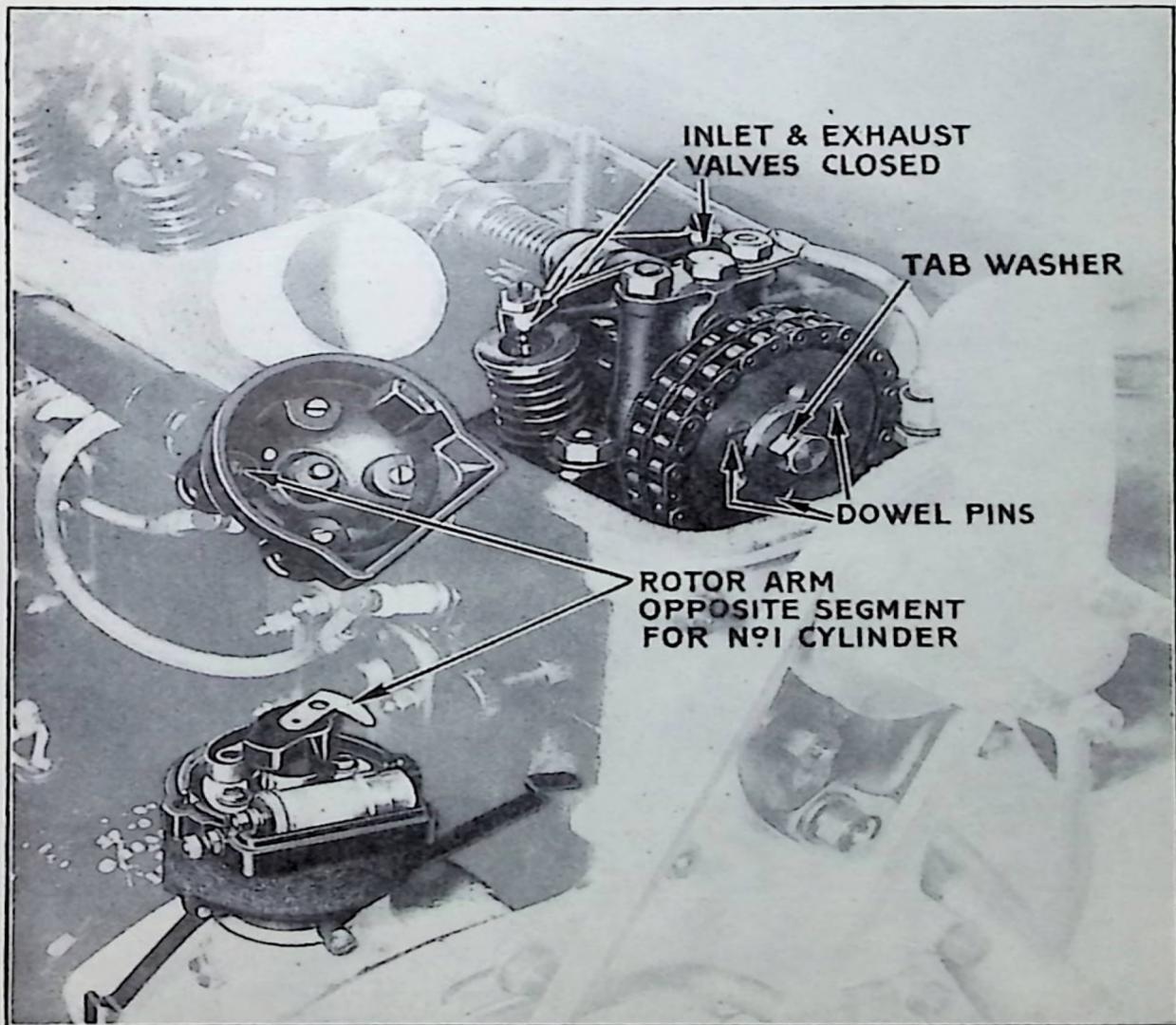
To clean pistons Nos. 2 and 3, hold the camshaft chain wheel up and in alignment with its lower sprocket, while turning the engine half a turn clockwise to bring these pistons to the top of their stroke. Afterwards remove any carbon deposit from the face of the cylinder block and cleanse the cylinder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

Again hold the camshaft chain wheel up and turn the engine clockwise one-and-a-half complete turns, again bringing pistons Nos. 1 and 4 to 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 when reassembled.



	A	B	C
FLYWHEEL	$\frac{1}{2}$ " B.T.D.C.	$\frac{15}{16}$ " B.T.D.C.	$\frac{15}{16}$ " A.T.D.C.

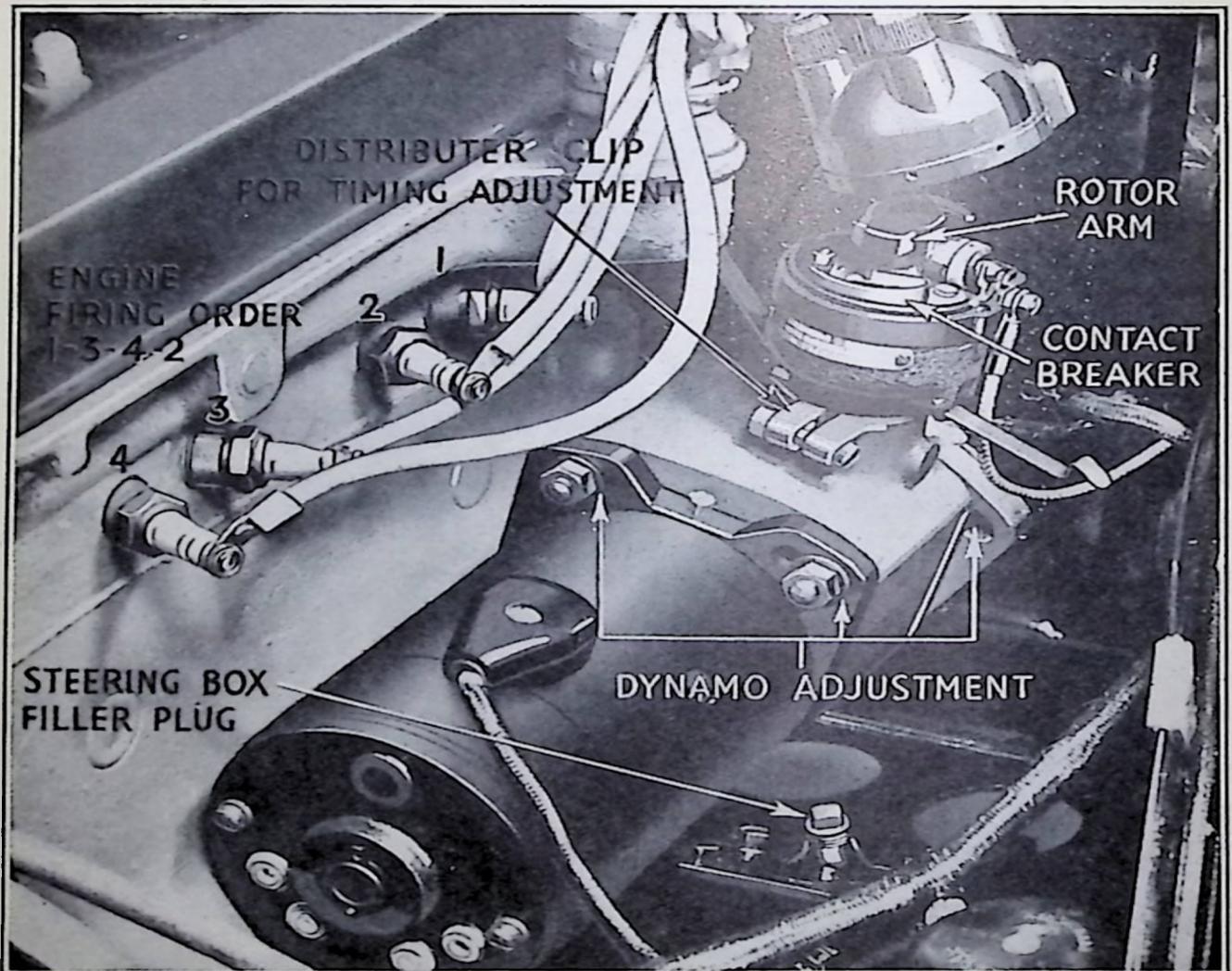
GRINDING IN VALVES. Although it is not always necessary to carry out this operation every time the engine is decarbonised, it is, perhaps, policy to give the valves a thorough cleansing to ensure good compression after decarbonising. Remove all carbon deposit from the combustion chambers and the face of the cylinder head, also from the valve heads, stems and valve seatings. Smear a little valve grinding compound over the seating 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 the valve seating, withdraw the valve and clean away all abrasive with petrol. A good test of a true valve seating is to chalk strokes across the seating of the valve head and cylinder head in similar positions to the figures on a clock face. The valve is then replaced on its seating and a slight turn in one direction should break each chalk line.



Re-assembling the cylinder head is merely a reversal of the dismantling operation, but smear the valve stems with oil before re-fitting to their guides and be quite sure that the valves are returned to their correct seatings. Check the valve clearances by slackening the lock nut of the ball pin in the rocker arm and turning the adjusting screw until the following clearances are given :—

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

Tighten the lock nut and turn the camshaft in a clockwise direction until the inlet valve of No. 4 cylinder is about to open. Replace the cylinder head and gasket to engine, and tighten the head nuts evenly half-a-turn at a time, working from the centre outwards. Re-assemble 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.



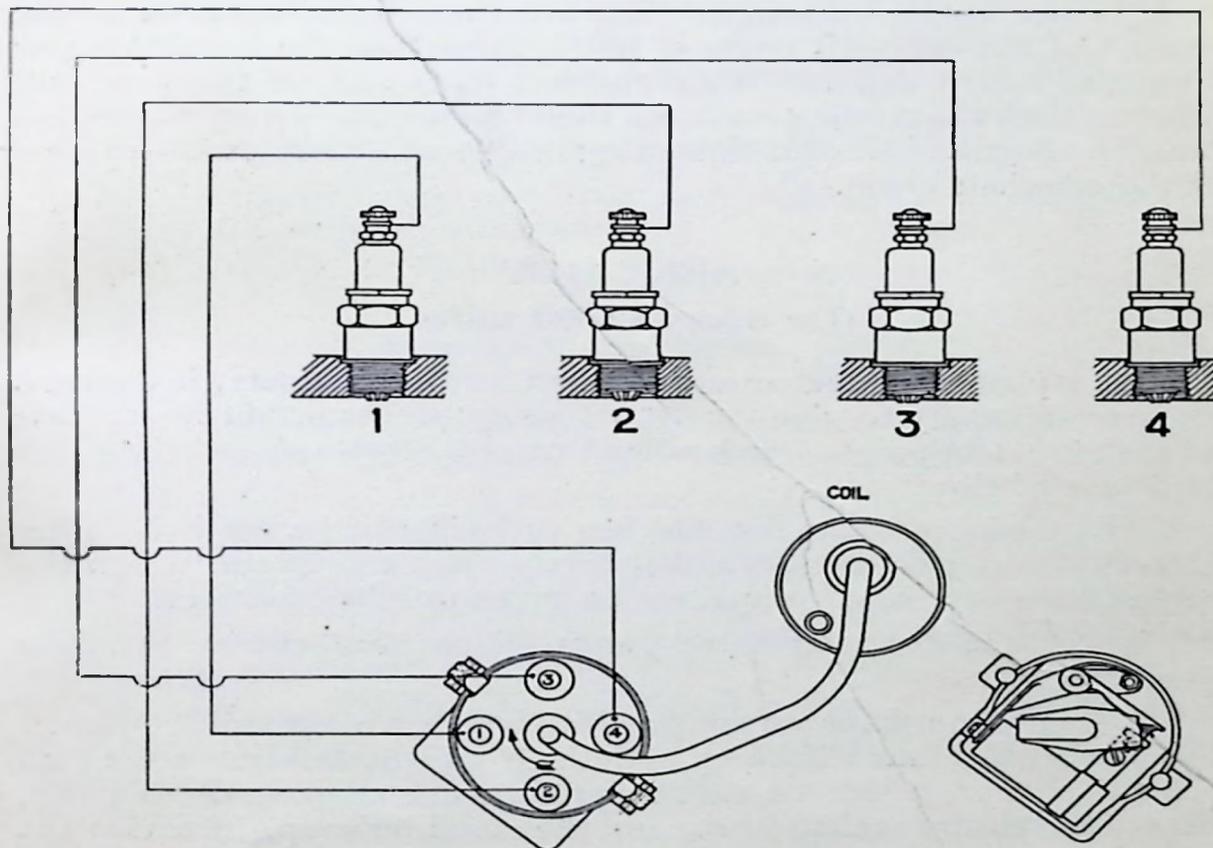
If the previous instructions have been closely followed, the engine valve timing will be correct, i.e., inlet valve about $15/16$ " before the mark $1/4$ on the flywheel is at top dead centre and the distributor

rotor arm opposite the segment for No. 1 cylinder high tension lead, that is, the lead to No. 1 sparking plug.

IGNITION TIMING. After any operation that 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 $\frac{1}{2}$ " before top dead centre, this measurement and the valve timing measurements being taken from the periphery of the flywheel.

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 the flywheel inspection cover, and turn the engine until the inlet valve of No. 1 cylinder closes. Continue to turn the engine until the 1/4 mark on the flywheel is in the position previously specified. 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.

6. **DYNAMO CHAIN ADJUSTMENT** to compensate for stretch of the dynamo chain may be necessary after considerable running and will be noticeable by the chain becoming noisy. The dynamo chain can be adjusted by slackening the three nuts that secure the dynamo to its housing, and the two nuts holding the dynamo shaft cover to the timing cover. The whole assembly can then be slung over, pivoting on the bottom dynamo stud. Do not tighten or excessive wear will result, and carefully tighten all nuts after adjustment.

7. **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.

ANNUALLY

(Or every 12,000 miles).

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

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

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

1. The front hubs are not provided with a greaser, and it becomes necessary at this time to jack up both the front wheels, remove the road wheel dust caps, which are each secured by one central slotted screw, 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 page 71 of the electrical equipment section.

OVERHAULING INSTRUCTIONS

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

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

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

CAUTION.

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

REMOVING ENGINE FROM CHASSIS.

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

(2) Remove the nuts securing the radiator tie bars and remove both tie bars.

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

(4) 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. Any forward or backward movement of the radiator can be adjusted by the bonnet side rods.

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

(5) Disconnect oil gauge pipe.

(6) Disconnect exhaust pipe (as in paragraph *e* of Decarbonising Section).

(7) Disconnect carburetter controls.

(8) Disconnect petrol pipe from pump and carburetter and remove the pipe.

(9) Disconnect the battery negative terminal from the battery and the engine rear bearer plate, and remove the cable.

(10) Disconnect the horn wires, release the dome nut securing the horn, and remove the horn. See paragraph F, page 26.

The following details can be carried out in their order from the offside of the engine.

(11) Release the distributor earth wire, and two wires to the dynamo.

(12) Disconnect the two starter motor cables and the starter switch control.

(13) Disconnect the wire from the coil to the distributor.

REMOVING GEARBOX FROM CHASSIS.

(14) Remove front seats.

(15) Remove front carpets and the cover over the gearbox assembly.

(16) Remove eight coach bolts securing the toe boards.

(17) Remove eight screws securing the side floor boards (four to each floor board).

(18) Remove four bolts and nuts (two each) securing the front ends of the metal floor board rails and remove the floor board rails entirely.

(19) Disconnect the propeller shaft front flange by removing the four nuts, bolts and shake-proof washers.

(20) Remove the pinch bolt and nut securing the speedometer drive cable to the driving bracket.

(21) Remove the pin securing the clutch pedal link from the cross shaft lever to the foot pedal lever.

(22) Remove the three bolts securing the starter motor to the engine bearer, one of which secures the pull-off spring of the clutch pedal. The starter motor may then be removed.

(23) Disconnect the earth wire from the clutch extension case, but do not remove from the chassis.

(24) Remove two studs and four nuts and bolts securing the clutch extension casing to the engine bearer plate.

(25) Withdraw the gearbox from the chassis.

(26) It now becomes necessary to fit the pulley block and tackle in position in order to sling the engine.

(27) Release the rear engine bearers. The offside bearer secures the foot brake pedal pull-off spring. The bearers are merely secured by two nuts and bolts passing through the side bearers and the chassis frame.

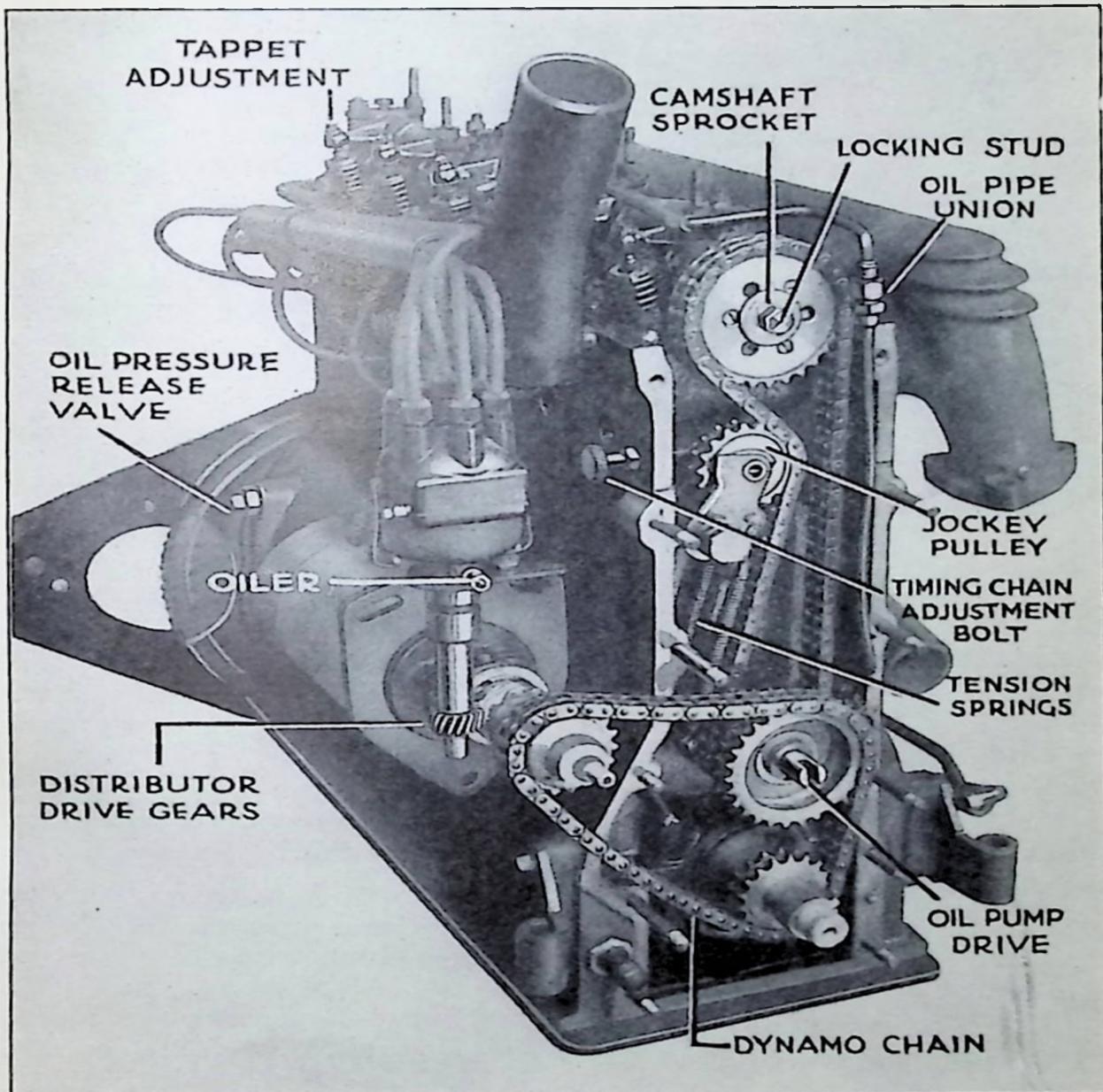
(28) Remove the nuts and the two rubber bushes from the front engine bearer.

(29) Lift the engine from the chassis, tilting to the nearside to clear the steering box.

DISMANTLING ENGINE. REMOVING TIMING CASE ASSEMBLY.

(1) Release the union and banjo nut which secure the oil suction pipe to the oil sump and the oil pump.

(2) Remove camshaft main feed pipe by releasing the union on the oil sump and set screw securing union to the oil pump, also the set screw for the union to the timing case. Release the four set screws



and tab washers securing the oil pump to the timing case, and withdraw the pump.

(3) Release the seven nuts and washers securing timing case cover and withdraw the cover from the dowels.

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

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

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

(7) We will assume that the camshaft chain wheel has already been removed, as in decarbonising, and to take away the camshaft driving chain it is merely necessary to remove the intermediate timing shaft thrust washer and to take away the intermediate gear assembly complete.

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

REMOVING BIG END BEARINGS, ETC.

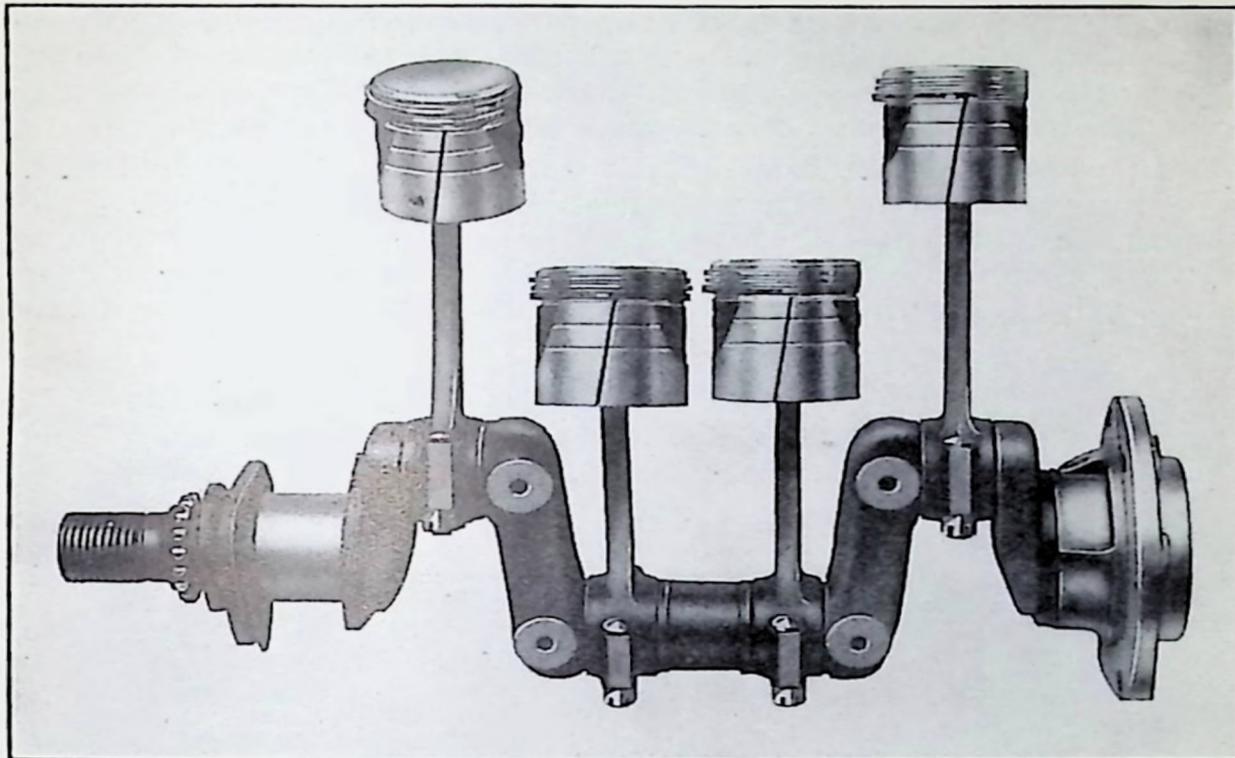
(1) Remove dip stick and drain engine oil by taking away the drain plug on the offside of the sump. Remove the sixteen nuts and washers which secure the oil sump and baffle to the base of the engine case, allowing the oil sump, tray and oil filter to be lowered. Care must be taken to avoid damaging the cork washer between the sump and the bottom face of the cylinder case.

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

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

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

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



A nominal charge is made for the replacement rods procured from your Dealer or one of our Depots.

DISMANTLING MAIN BEARINGS, ETC.

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

- (1) Remove six hexagon headed nuts securing clutch cover plate assembly to flywheel. Upto Car No. 10501. See page 41.
- (2) Remove four nuts and locking plates securing flywheel to crankshaft.
- (3) Dismantle timing case, intermediate gear assembly, etc., as previously detailed.
- (4) Remove six set studs and locking washers from the rear main bearing housing, and withdraw crankshaft and rear main bearing from engine case.
- (5) The front main bearing is in the form of a white metal lined bush located in the engine case by one set pin.

CLUTCH

TWO types of clutches have been fitted to the Bantam and Coupe models. On all cars up to No. 10501 the clutch fitted is of the single dry plate type wherein the clutch floating plate is isolated from the drive by means of a flexible coupling (see Fig. 1).

In course of time wear of the clutch friction plate will make adjustment necessary. This is most readily observed by a lack of free play in the foot pedal—it should be possible to depress the pedal at least one inch before the pressure of the clutch springs is felt. There is a clutch stop at the foot of the pedal to prevent contact with the

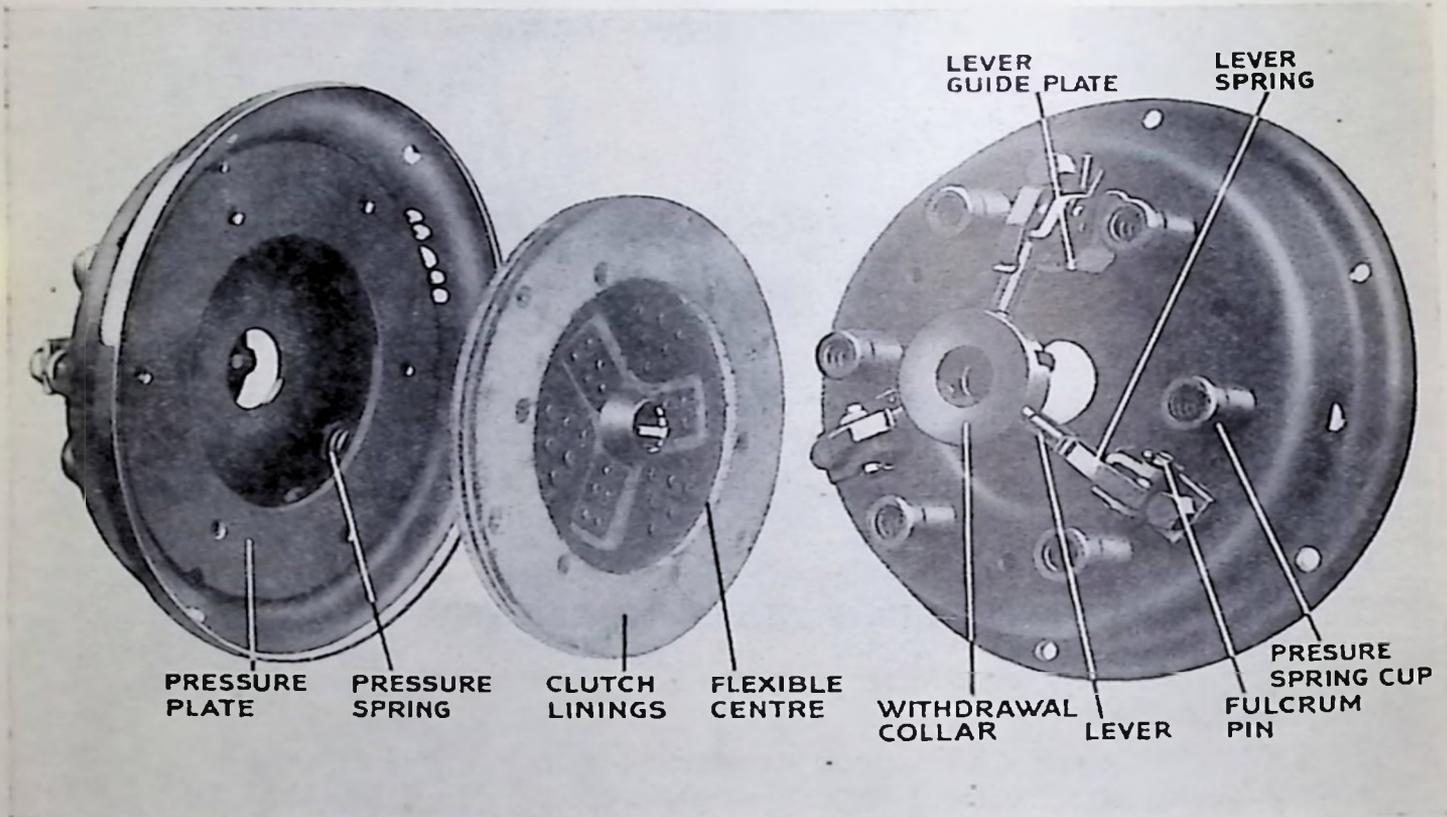


Fig. 1.

floorboard. The adjustment for the travel of the foot pedal is effected by the coupling rod which connects the clutch pedal to the clutch operating lever. When adjustment is necessary slacken the lock nuts, turn the coupling rod until the desired amount of free play is obtained and re-tighten the lock nuts.

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

DISMANTLING CLUTCH ASSEMBLY. **(Single Dry Plate Type. Up to Car No. 10501.)**

Remove clutch assembly as in paragraph one (crankshaft assembly).

The clutch floating plate was released when the clutch assembly was removed from the flywheel, and to dismantle the clutch cover plate assembly it is necessary to remove the three toggle lever adjustment bolts and guide plates. This releases the clutch pressure plate and the three toggle lever adjustment springs. Remove the six spring cups and clutch springs from the cover plate.

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

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

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

CLUTCH. **(After Car No. 10501).**

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

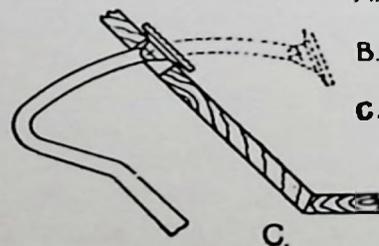
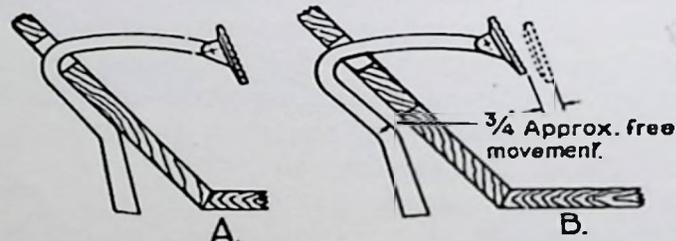
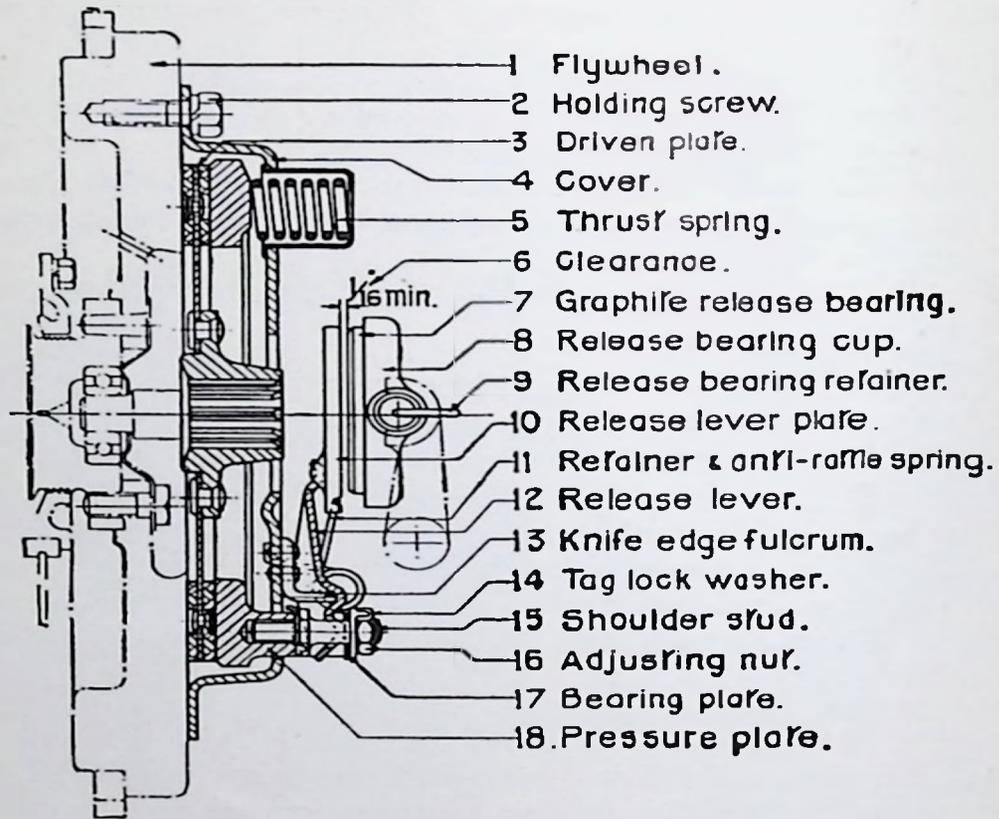
A graphite release bearing (7) is used, mounted in a cup (8) attached to throw-out fork, and a release plate (10) is attached to inner ends of release levers(12) by means of retainer springs (11). Release is accomplished by moving release bearing forward against the release plate (1). The release levers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

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

As the clutch facings wear the pressure plate moves closer to the flywheel face and the outer or shorter ends of the release levers follow. This causes the inner or longer ends of the levers to travel farther 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 or free travel under toe board, which is the

distance clutch pedal moves down away from the underside of toe board before release bearing comes in contact with release lever plate. Some free movement must always be maintained to prevent clutch pedal riding against under side 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



A. Normal driving position
 clutch fully engaged.
 B. free pedal movement taken
 up prior to clutch release.
 C. Clutch fully released.

FIG 2

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 $\frac{1}{4}$ " for 6 $\frac{1}{4}$ " A types. If it does not travel that distance move pedal up, bearing in mind that pedal pad must touch stop as above when pressed down for full clutch release.

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

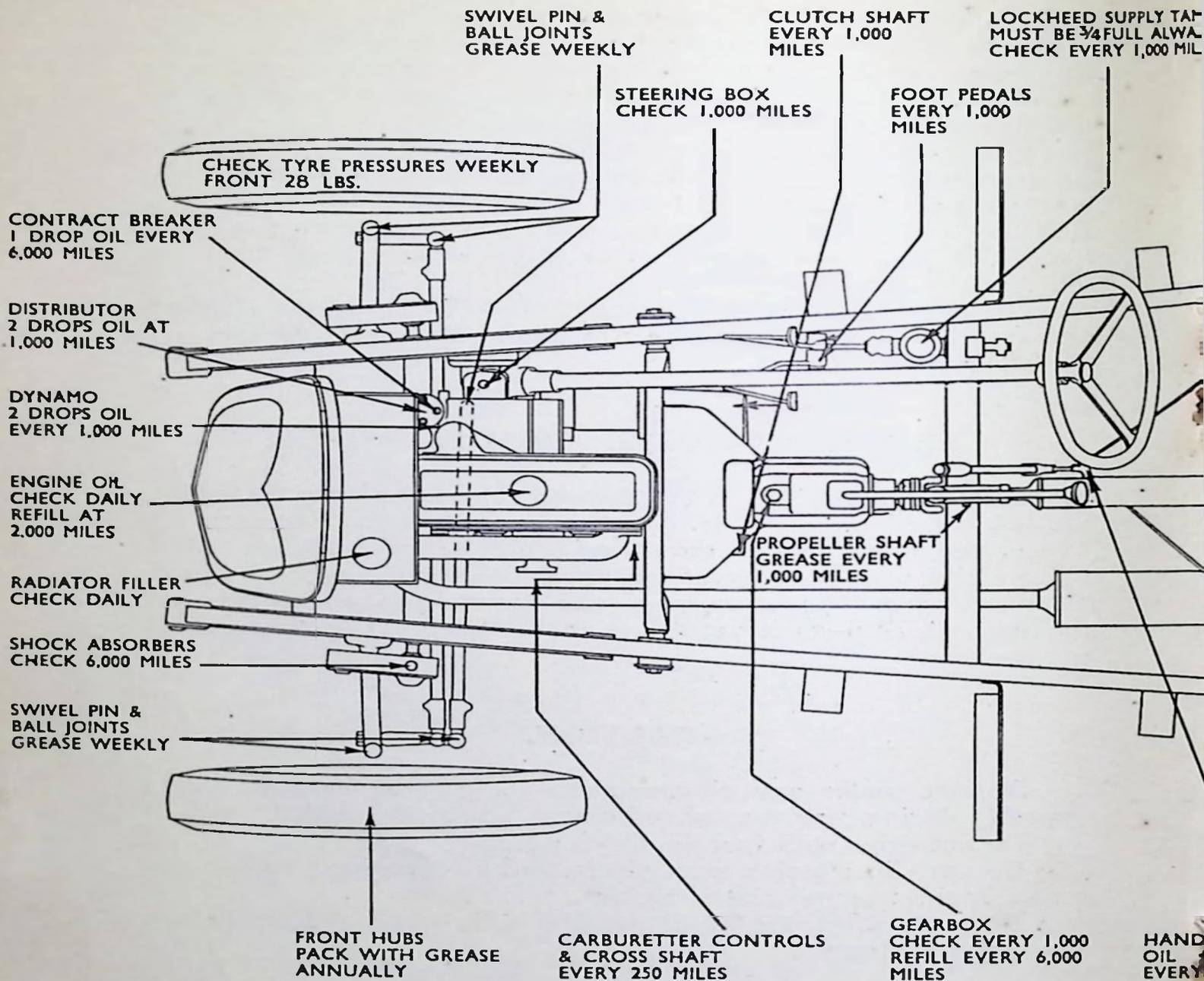
CAUTION.

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

Do not drive with foot on clutch pedal.

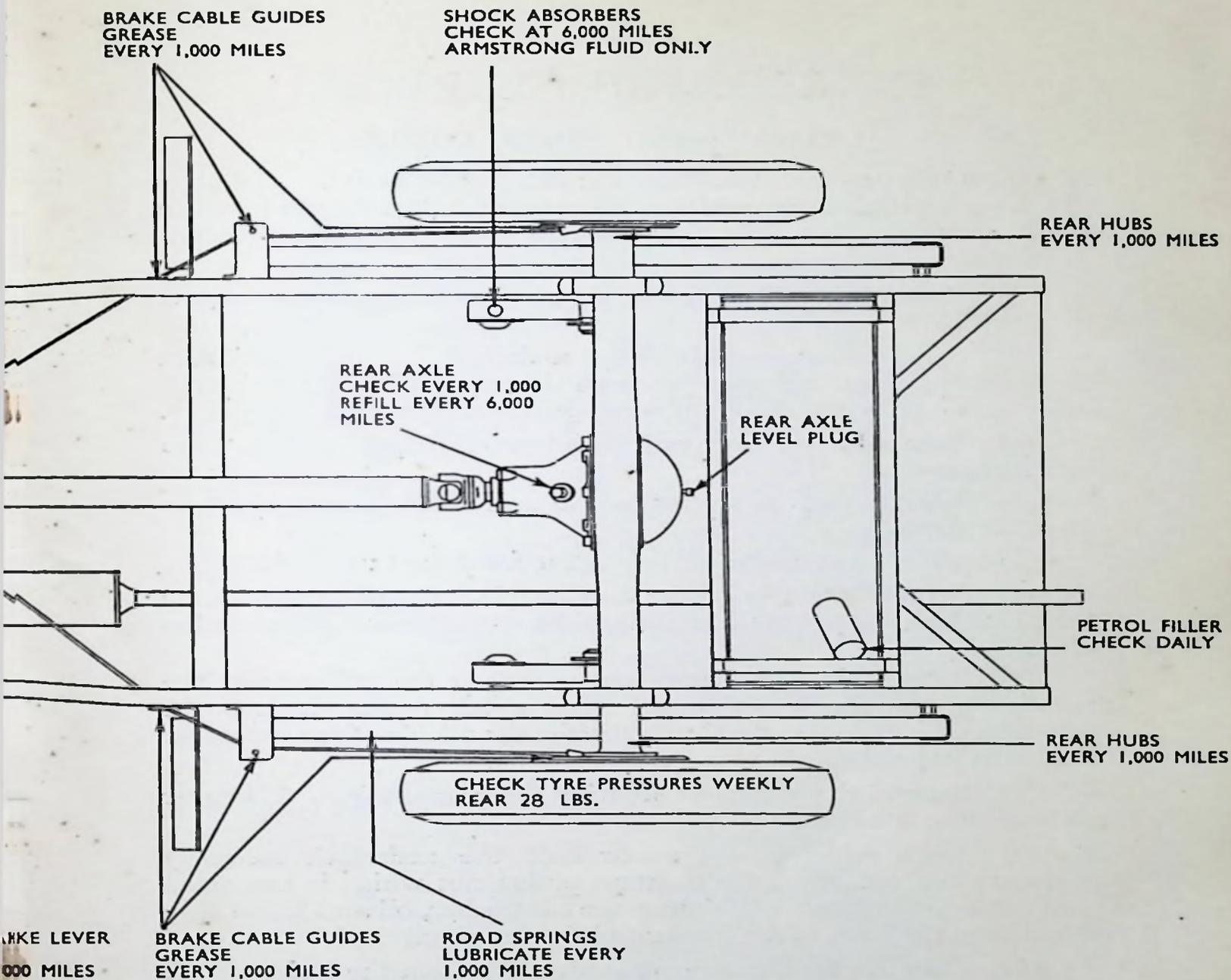
Do not slip clutch excessively instead of changing gears, as this causes rapid wear of clutch facings.

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



RECOMMENDI

Model and Component							Wakefield
Engine and Gearbox.	..	..	..	..	SUMMER	..	Castrol X
					WINTER	..	Castrol A
Upper Cylinder Lubrication	..	..	..	..	..	..	Wakefield Ca
Rear Axle and Steering Box	..	..	..	..	..	..	Castrol Gear
Wheel Hubs : propeller shaft splines and chassis greasers	..	..	..	..	..	..	Castrol M
Road Springs	..	..	..	..	..	..	Castrol Penetra



LUBRICANTS.

	Price's	Vacuum	Shell-Mex & B.P.
ollo	Motorine C Motorine M Motorine U.C.L.	Mobiloil BB Mobiloil A Gargoyle Upper Cylinder Lubricant	Triple Shell Double Shell Shell Upper Cylinder Lubricant
ll D	Motorine Amber B	Mobiloil C	Shell Spirax
itum	.Belmoline C	Mobilgrease No. 4	Shell R.B. Grease
gg Oil	—	Voco Penetrating Oil	Shell Penetrating Oil

SYNCROMESH GEARBOX

DISMANTLING INSTRUCTIONS.

REMOVE gearbox from chassis as detailed on page 34, 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 four nuts securing the gearbox end cover and take away the cover.

(5) Slide the speedometer drive gear from the mainshaft.

(6) Remove the two spring locking rings securing the clutch trunnion block and pad to the trunnion fork, and take away the trunnion block and pad.

(7) Release the grub screw and withdraw the collar from the earside of the clutch withdrawal shaft which passes through the extension case, and slide the clutch shaft to the offside of the extension case as far as possible.

(8) Remove the four bolts securing the gearbox front end cover and withdraw the cover.

(9) 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.

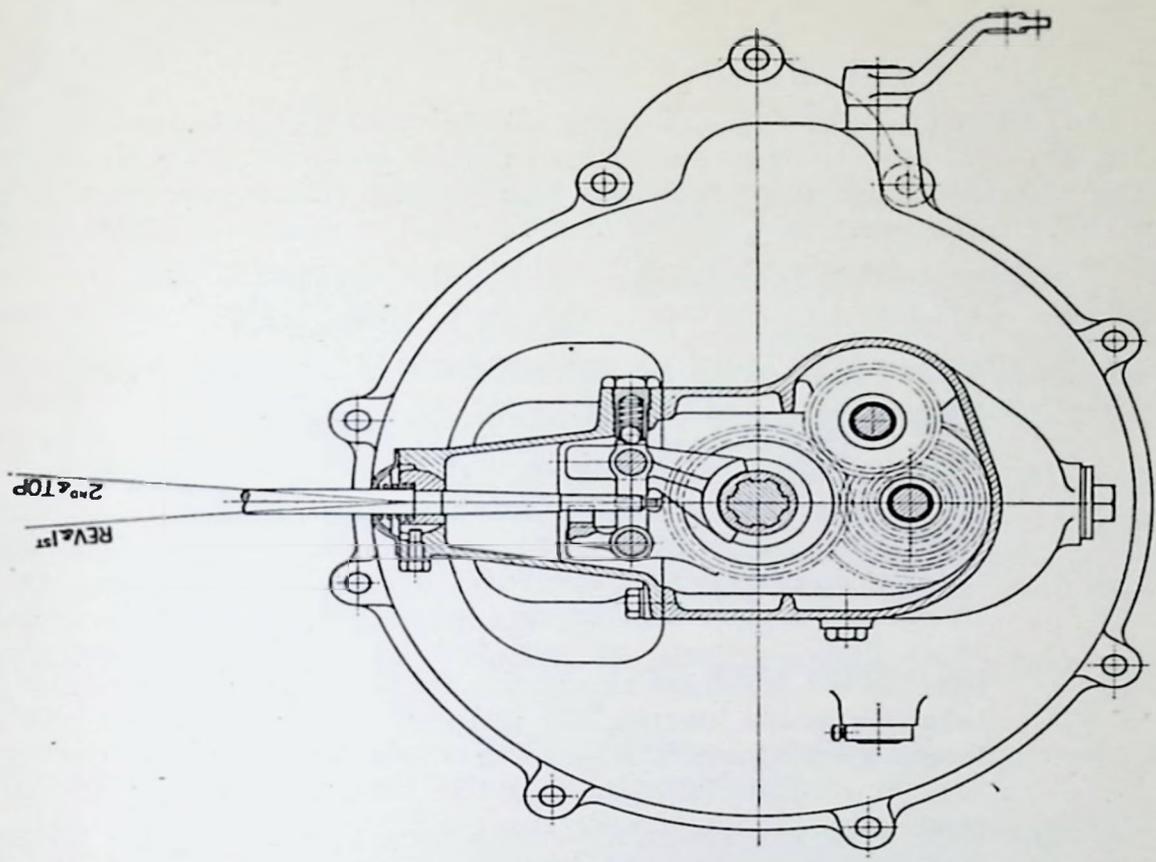
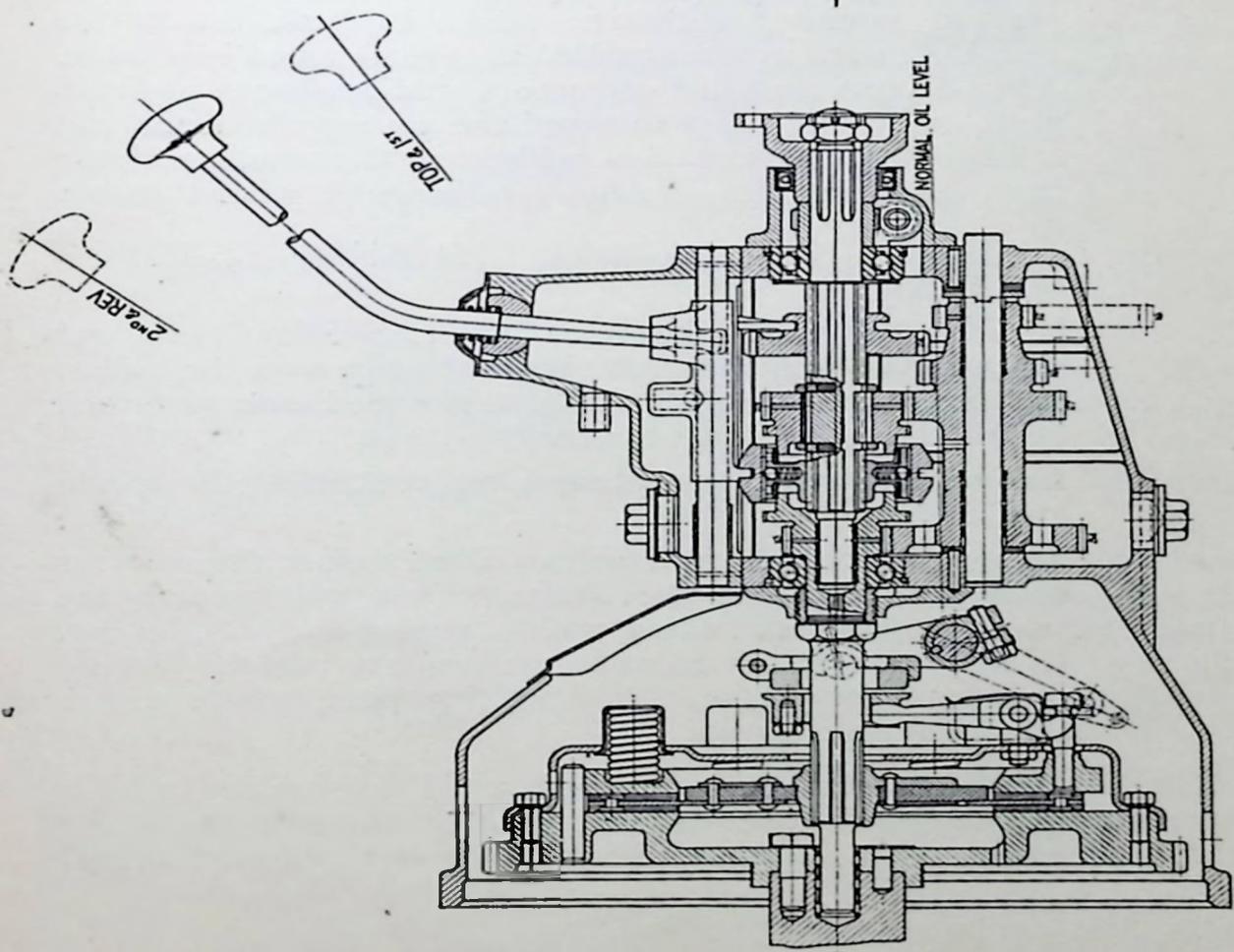
(10) Tap out the constant pinion bearing from the inside of the box and remove the inner chip shield.

(11) Tap out the rear end mainshaft bearing from the inside of the box and remove the steel thrust washer.

(12) 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.

(13) Remove the set pin and shake-proof washer which secures the lock plate for the reverse shaft and layshaft.

(14) Tap out the layshaft from the front through the rear of the gearbox.



GENERAL ARRANGEMENT OF CLUTCH & GEAR BOX

(15) Remove the layshaft gear cluster from the top of the box taking especial care of the one bronze thrust washer at the front end of the assembly, and one steel and one bronze thrust washers at the rear end of the assembly. The slotted steel washer registers in the reverse gear.

(16) Tap out the reverse shaft and remove the reverse gear.

(17) DISMANTLING MAINSHAFT ASSEMBLY.

(a) Slide first speed gear from mainshaft.

(b) Remove synchro assembly complete from mainshaft.

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

(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.

(18) DISMANTLING GEARBOX LID AND SELECTOR MECHANISM.

(a) Hold the gearbox lid in a vice and remove four bolts and shake-proof washers which secure the cap over the ball of the change speed lever. The change speed lever may then be withdrawn from the tower.

(b) Extract the reverse gear plunger cap containing the spring and ball.

(c) Remove two small grub screws from below the selector shafts and tap out the shafts. This will release the selector forks, each fitted with a spring loaded plunger. In this case too, care must be taken not to lose the locking ball from the centre of the locking plate which passes across the gearbox lid.

On the Coupe models only the gearbox lid is provided with a remote control assembly, but with the exception of the lever, actuating rod and striker lever, the method of dismantling is as detailed above.

REAR AXLE

REMOVING REAR AXLE FROM CHASSIS.

(1) To remove the propellor shaft, remove the four nuts, bolts and washers securing the rear universal joint flange. The front end of the propellor shaft has been dealt with (see page 34, paragraph 19). The propellor shaft may then be removed entirely.

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

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

(4) Disconnect handbrake cable.

(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 and lift the shock absorbers to the top of their stroke.

(7) Disconnect the Lockheed pipe line.

(8) Disconnect petrol pipe line from the tank.

(9) 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).

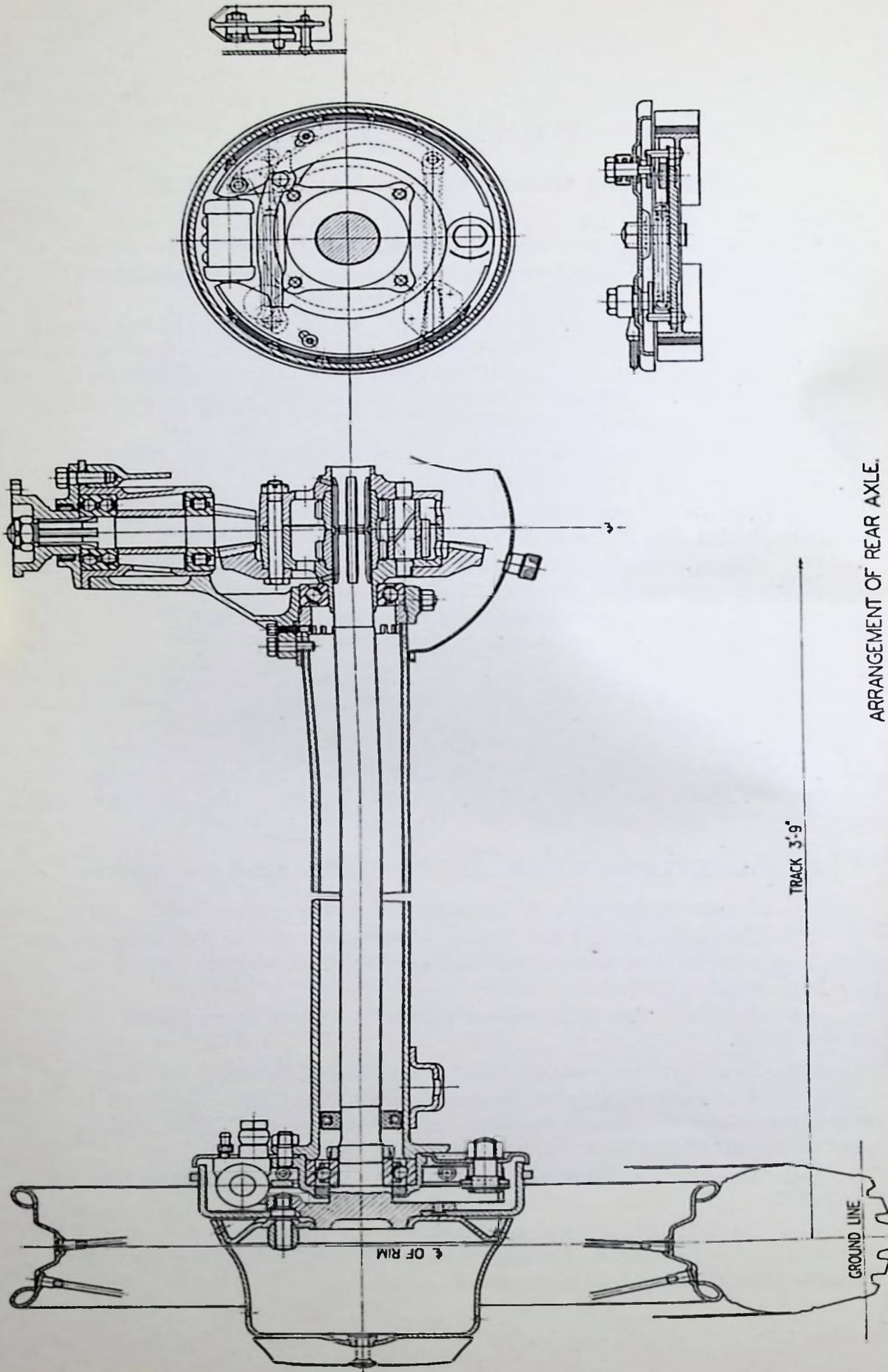
(3) Remove two split pins, nuts and washers from the brake shoe steady bolts.

(4) Remove the brake return spring at the top of the shoes.

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

(6) Remove brake shoes and disconnect the handbrake link from the cable.

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



ARRANGEMENT OF REAR AXLE.

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

(9) 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.

(10) 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.

(11) 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.

(12) 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.

STEERING AND FRONT AXLE ASSEMBLY

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

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

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

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

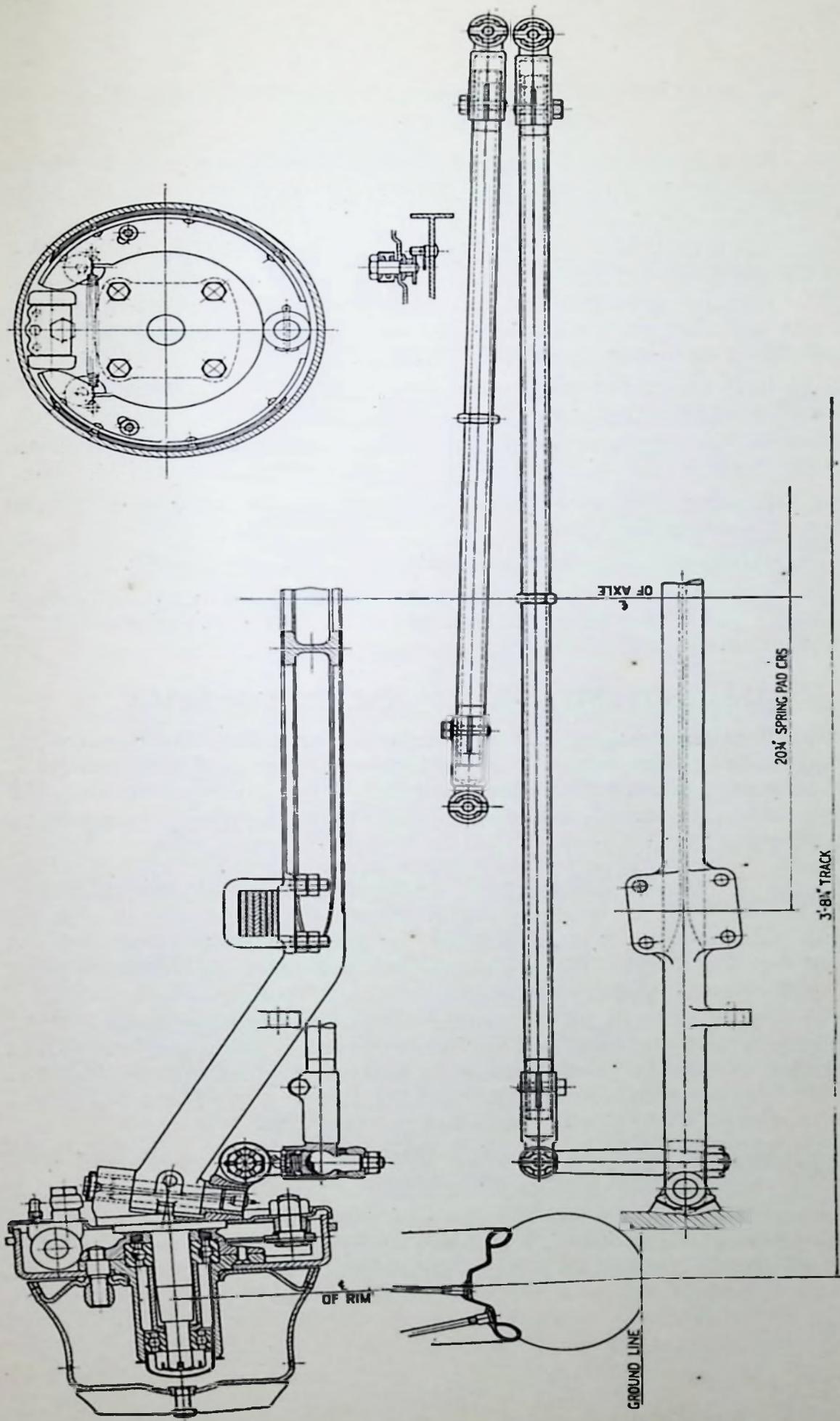
TRACK ROD AND COUPLING TUBE.

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.



FRONT AXLE ARRANGEMENT

REMOVING STEERING ASSEMBLY FROM CHASSIS FRAME.

- (1) Remove one stud securing the signal and horn push extension arm from the steering column and release the clips securing the cable loom to the column.
- (2) Remove rubber cable guard from steering column where it passes through the scuttle board.
- (3) Remove split pin and nut securing the steering drop arm to the steering rocker shaft extension, or alternatively disconnect the ball joint securing the steering drop arm to the steering coupling tube.
- (4) Remove three nuts securing dynamo and withdraw the dynamo from the driving sleeve.
- (5) Release the swinging bracket securing the steering column under the facia board.
- (6) Remove the two bolts securing the steering box to the bracket on the chassis frame.
- (7) Withdraw the steering assembly from the chassis.
- (8) The steering wheel is secured to the column merely by a dome nut. It is no trouble to remove the steering wheel should the occasion arise.

DISMANTLING FRONT AXLE ASSEMBLY.

- (1) Remove road wheels and hubs by releasing the cover plate screw, 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. It is not necessary to detach the Lockheed feed pipe from the wheel cylinder except when the brakes require attention.
- (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.

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 S.U. pressure pump to the carburetter, secondly the S.U. petrol pump, and lastly, the carburetter, for which a separate book is supplied.

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.

S.U. PRESSURE PUMP.

Should pump trouble be suspected, first disconnect the pump union of the pipe from the sump to the carburetter and switch on the engine. If the pump functions the shortage is due either to blockage of the petrol pipe to the carburetter, or possibly to the carburetter float needle sticking up. If the pump will not function after these points have been checked, first remove the filter which is held in position by the brass hexagon nut at the base of the pump and see if this is clear. Then disconnect the petrol pipe leading to the tank and blow down this with a type pump to ensure the pipe being absolutely clear, and re-connect the petrol pipe.

If the pump still does not function, or only works slowly, the stoppage may be due to a bad earth return. To test for this, make definite metallic contact between the brass body of the pump and the car chassis with a short length of wire, preferably copper. To ensure a good earth it may be necessary to scrape off a small portion of the black enamel with which the chassis is coated. If the pump then functions normally, the earth wire may be permanently connected.

A bad connection in the pump itself may sometimes be traced to the nut on the terminal inside the cover not being screwed down firmly.

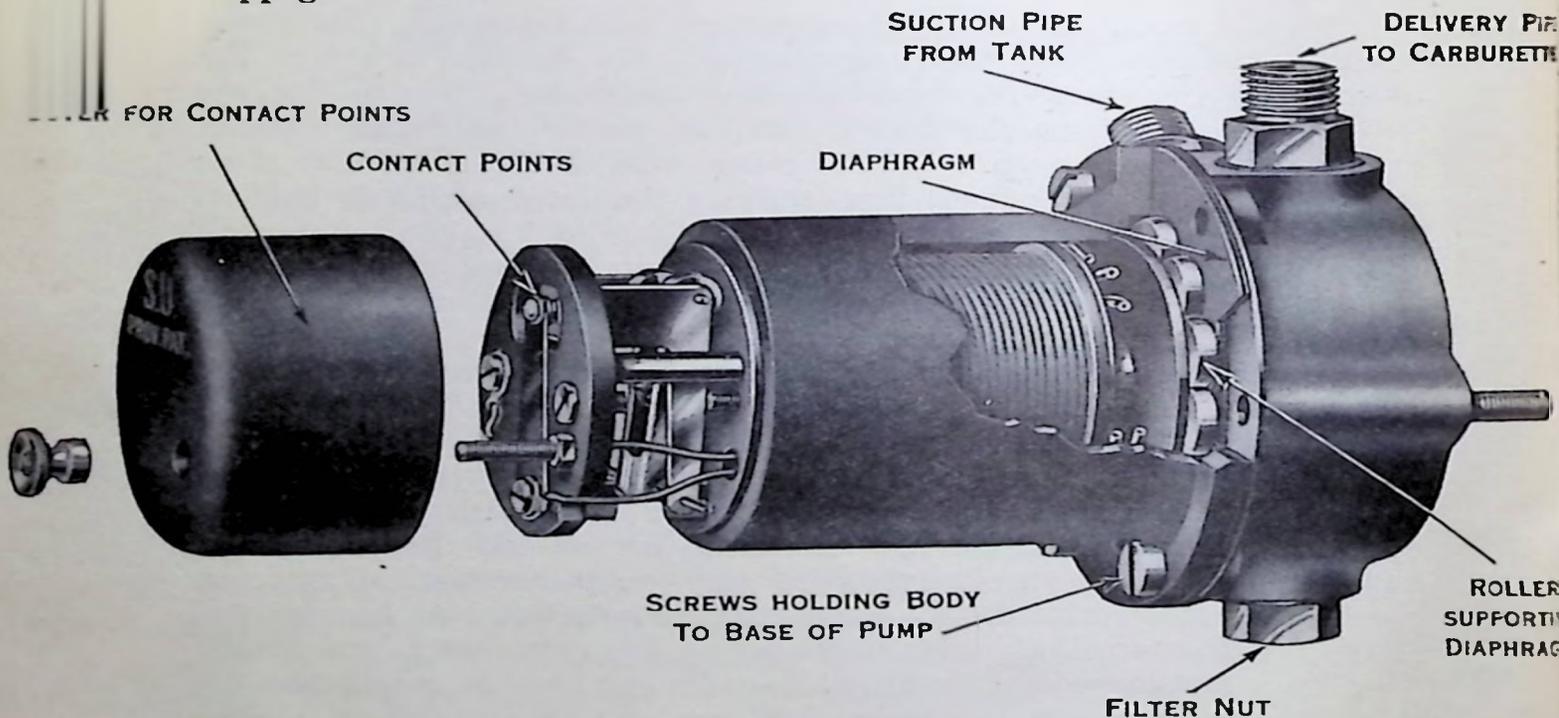
Should these points be found in order but the pump still does not work, the trouble is in the pump itself and the cause will be too much tension on the diaphragm or blackened contact points, the cause of which is the tensioning of the diaphragm. The remedy is to remove the cover from the contact points and pass a piece of thin card between the points when pressed together, so as to effect the necessary cleaning.

To release the tension on the diaphragm, remove the body from the base of the pump by undoing the small screws which hold these

two parts together. The diaphragm itself will then be found to be adhered to the body of the pump from which it will have to be separated. A knife will help in this operation, care being taken to prevent the rollers which support the diaphragm, and act as a bearing, from falling out. The body should then be replaced on to the base, and the screws put in loosely, but before finally tightening up it is advisable to stretch the diaphragm to its highest possible position. This is effected by switching on the pump and holding the contact points together while tightening the screws well up. This will effect a permanent cure.

When releasing the tension of the diaphragm care should be taken not to alter the adjustment of the pump by unscrewing the armature, which is the steel plate fixed at the back of the diaphragm. Should the position of this be inadvertently altered it will have to be reset which is done by screwing the diaphragm and armature into such a position that the contact breaker just throws over without the assistance of the contact blade, which should be held away when being set. When this position has been found, the armature will have to be unscrewed to the extent of two-thirds of a turn, when the cast iron pot may again be fixed to the base as per instructions.

Should a pump work intermittently or not start clicking when switched on in the morning, it is an indication that this trouble is recurring, and it should be given immediate attention to obviate final stoppage on the road.



CARBURETTORS.

On all Bantam and Coupe models the carburettors fitted are of the Solex Type 26F.H.G. with the self-starting appliance, but on the earlier Bantam models the carburettor jet assembly was of the type known as Assembly 20.

The carburettor is generally the same as the one described in the separate book issued with the owner's instruction book, but the arrangement of the main jet assembly is slightly different. However, this is fully dealt with on the inside back cover of the carburettor book.

On other Bantam and Coupe models the carburettor is of the 12 assembly type, and this too is dealt with in the main section of the Solex book supplied.

BRAKES

THE brakes fitted to the Singer Bantam Models are of the Lockheed hydraulic type operating on large diameter brake drums. The foot brake operates on all four drums, the hand brake on the rear drums only.

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

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

The master cylinder is fitted with a piston and the wheel cylinders are each fitted with opposed pistons, all of which are provided with cup washers which act as a seal to maintain pressure and prevent any loss of fluid. When pressure is applied to the foot pedal, the piston within the master cylinder is forced forward and causes the fluid to flow

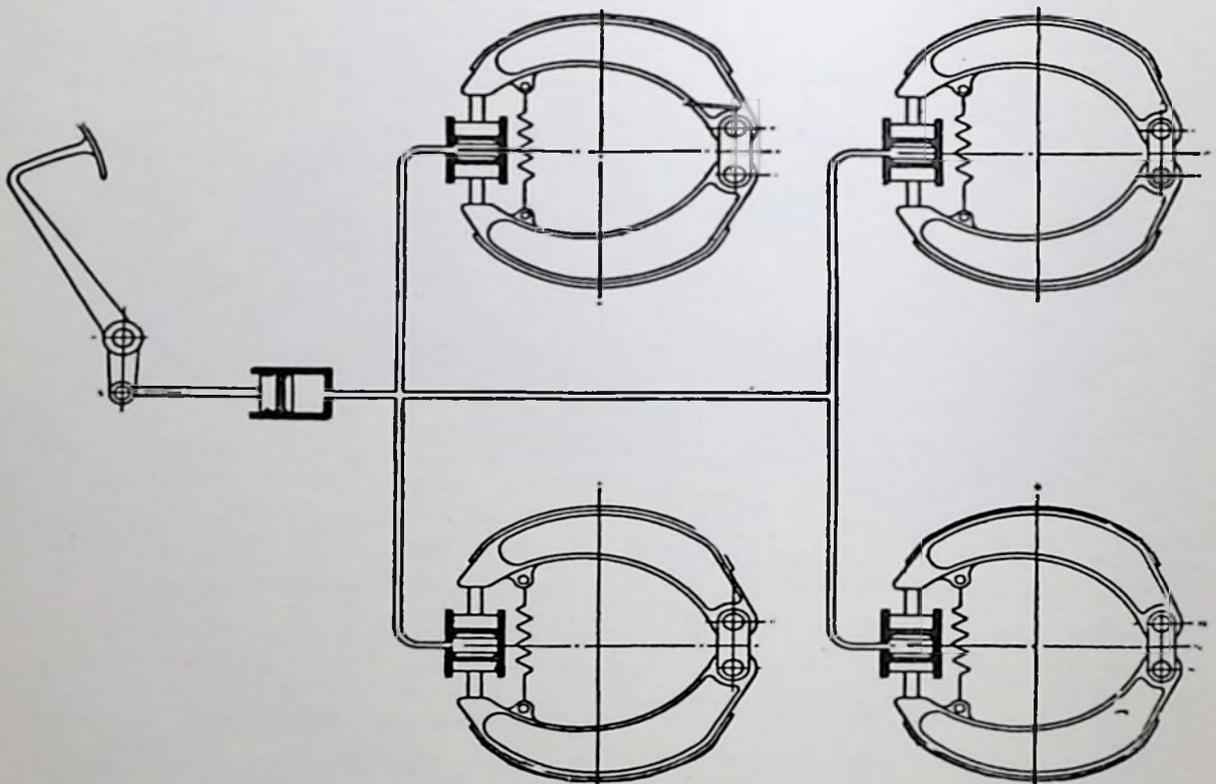


Fig. 1.

through the copper tubing and flexible hose connections into the wheel cylinders. (Fig. 1).

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

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

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

THE MASTER CYLINDER. The single outlet barrel type compensating master cylinder is designed to maintain automatically in the system, when at rest, a constant volume of fluid at a uniform

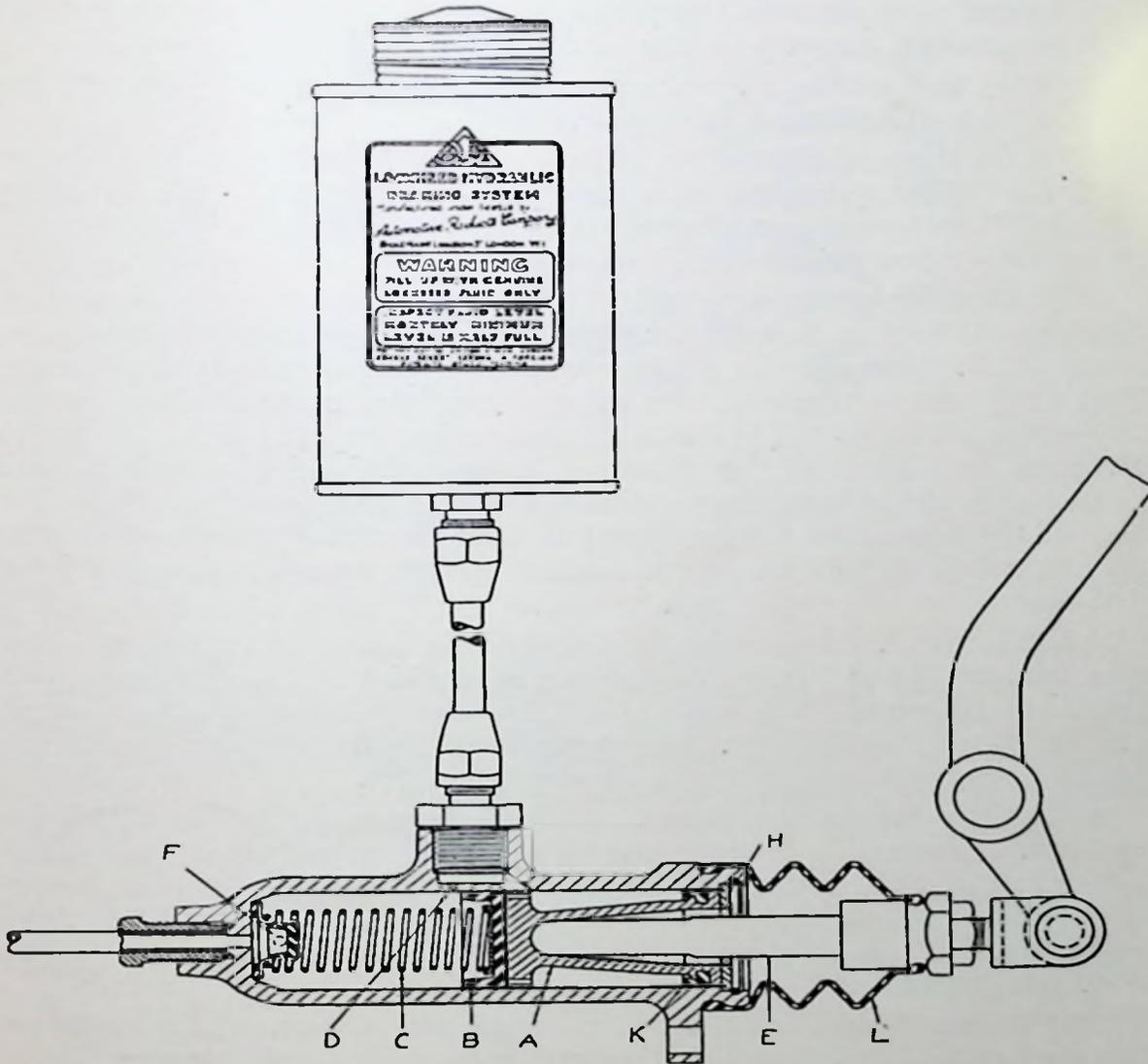


Fig. 2.

pressure of 8 lbs. per square inch, this pressure acting as a liquid expander on all rubber cups ensuring a complete and efficient sealing of the system.

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

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

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

In the head of the master cylinder, held in place by the return spring (c) is a combination inlet and outlet check valve (f).

The function of this valve is to cut off the return to the master cylinder of fluid pumped into the pipe line during the bleeding operation, thus ensuring a fresh charge of fluid being delivered at the next stroke of the pedal.

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

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

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

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

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

THE SUPPLY TANK is attached to the offside of the chassis frame close to the foot brake pedal, and is accessible by removing the floorboard. The tank is connected to the master cylinder and should be kept three-quarters full of GENUINE LOCKHEED BRAKE FLUID.

THE PROPER ADJUSTMENT OF THE BRAKE PEDAL. It is important that the push rod (E) should have a slight clearance where it seats in piston (A) when in "off" position. Should the push rod be adjusted tightly against the piston the port hole (D) will be covered by the cup washer (B), thus preventing the compensating action of the master cylinder.

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

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

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

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

TO RE-ASSEMBLE THE MASTER CYLINDER. Dip all parts in LOCKHEED BRAKE FLUID.

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

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

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

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

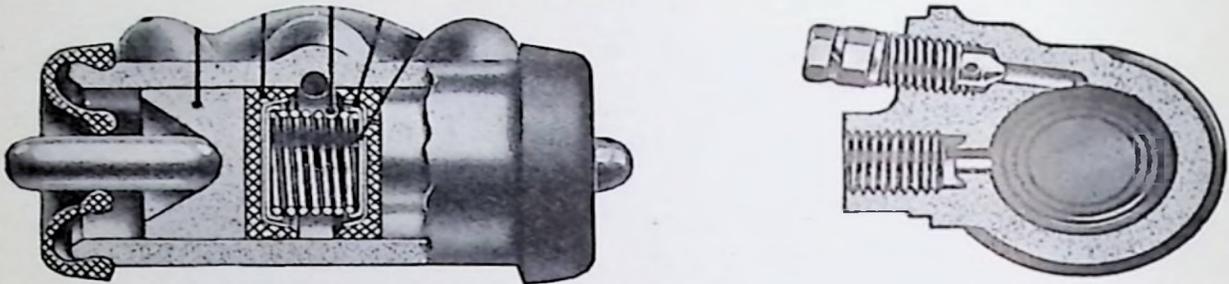


Fig. 3.

DISMANTLING INSTRUCTIONS.

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

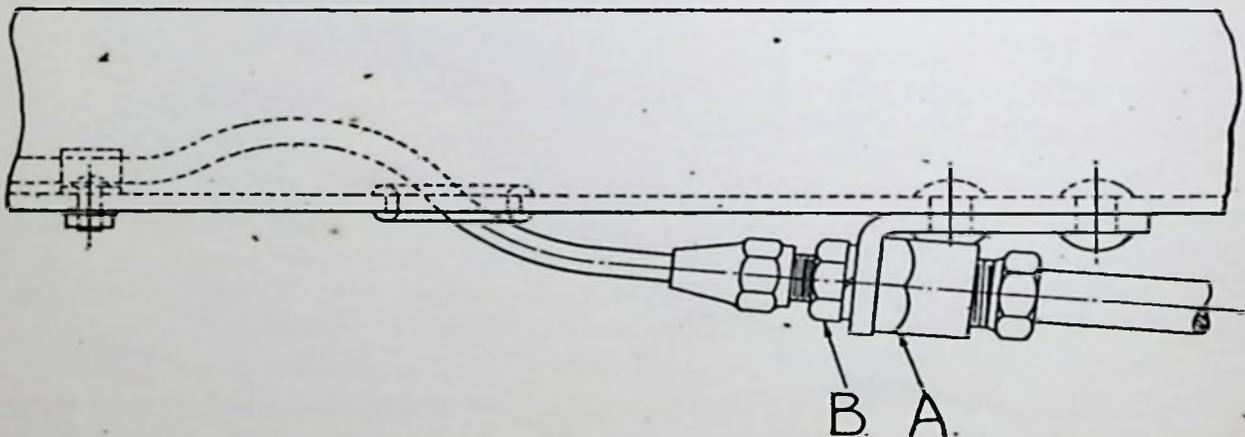


Fig. 4.

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

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

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

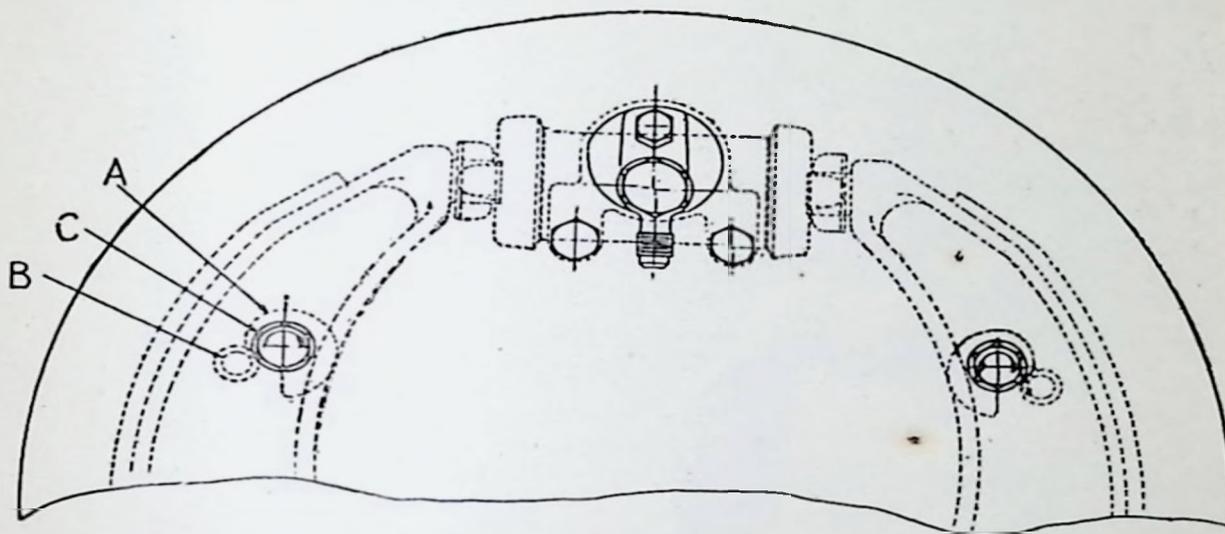


Fig. 5.

TO ADJUST BRAKES. When lining wear has reached a point where the foot pedal goes almost to the floor board, it becomes necessary to adjust the brake shoes into closer relation to the drums. Raise the car on a jack until the wheel is free. Adjustment is made by rotating the adjustment cam (A, Fig. 5) against a stop pin (B) on the shoe. Rotate the adjustment nut (C) with a wrench, until brake shoe comes into contact with drum. Then back off adjustment slightly, until the wheel rotates freely without any appreciable drag.

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

BLEEDING THE LINE. Whenever any part of the system has been disconnected, it is necessary to "Bleed" the system in order to expel all air. Fill the Supply Tank with genuine LOCKHEED BRAKE FLUID before starting this operation, and keep the tank at least half full of fluid during the whole period of bleeding.

Remove the set screws at A (Fig. 6) from end of bleeder screw, and screw in the bleeder drain, which is a screwed brass nipple fitted with a rubber tube. Allow the rubber tube to hang into a clean glass container. Unscrew the bleeder screw one turn with the wrench B (Fig. 6) and depress the foot pedal quickly, allowing it to return fully

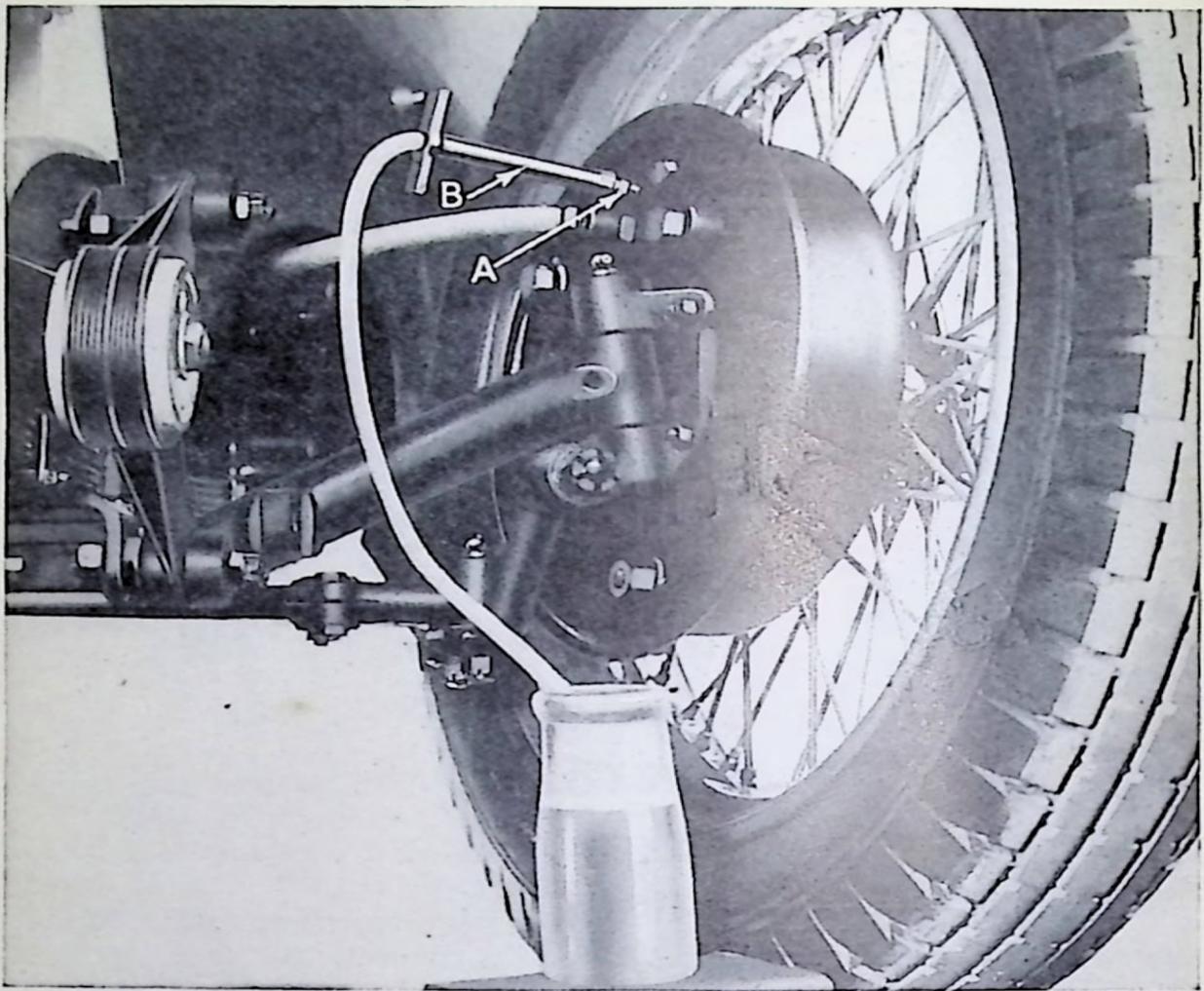


Fig. 6.

without assistance. This gives a pumping action which forces fluid out at the wheel cylinder, carrying with it any air that may be present. No less than ten strokes of the foot pedal will be necessary to bleed each wheel cylinder. Watch the flow of fluid from the bleeder drain, the end of which should be kept below the surface of the fluid, and when all air bubbles cease to appear, close the bleeder screw. The bleeding operation must be repeated on each wheel cylinder, and the supply tank replenished each time. Should the supply tank be drained during the bleeding operation, air will be drawn into the system at this point, necessitating rebleeding.

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

thoroughly saturated, it will be necessary to reline the brake shoes affected.

HOW TO LOCATE BRAKE TROUBLES.

EXCESSIVE PEDAL TRAVEL. (Requires pumping).

- (a) Brake shoes require closer adjustment to the drums.
- (b) A leakage in the system—tighten line unions.

PEDAL FEELS SPRINGY.

- (a) The system requires bleeding, see page 62.
- (b) No fluid in supply tank—replenish.

INEQUALITIES IN BRAKING.

- (a) Shoe linings not bedded in—of different makes or grades—rectify or reline.
- (b) Protruding rivets or scored drums—rectify.
- (c) Grease on shoe linings—carefully clean or scrape.

POOR BRAKING.

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

BRAKES STAY "ON".

- (a) Brake shoes too closely adjusted—re-adjust.
- (b) Brake shoe seized on anchor pins—rectify.
- (c) Brake shoe return spring weak or broken—renew.
- (d) No initial clearance on pedal—it is essential to have free play of about half-an-inch at the pedal tip to allow the piston in the master cylinder to go right back in the "off" position, to release excess fluid pumped into the system when the brake is applied. If there is no pedal slack when in the "off" position, it prevents the release of the fluid thereby keeping the brake shoes on. A floor board fouling the pedal may cut out this required pedal slack, or incorrect adjustment of the pedal gear may also be the cause—see page 59.
- (e) The master cylinder cup and/or wheel cylinder cups sticking in the cylinder bores due to the use of spurious fluid—thoroughly flush out the system with genuine Lockheed brake fluid and fit new rubber parts.

BRAKE DRAG.

- (a) The shoes adjusted too closely to drums—re-adjust.
- (b) Hand brake operating mechanism seized or is fouling some portion of the chassis, etc.—release.
- (c) Brake shoes are tight or seized on their anchor pins or brake shoe return springs weak or broken—remedy.
- (d) No initial clearance on foot pedal—remedy.
- (e) Oil or spurious fluid in system—cleanse and replenish.
- (f) Wheel bearings loose—remedy.

BRAKES GRAB OR THE CAR PULLS TO ONE SIDE.

- (a) Brake linings incorrectly bedded—re-bed linings to drums and chamfer ends.
- (b) Brake linings have varying co-efficients or friction due to grease, etc.—cleanse or re-line.
- (c) Incorrect inflation of tyres—check and rectify.
- (d) Back plate loose on axle or front spring loose at anchorage—check and rectify.

IMPORTANT.

In the design of the brake drum and brake back plate assembly every endeavour has been made to prevent the entry of water into the brake drums, as this of course nullifies the braking effect. Cases have been brought to our notice, however, where water has gained entry to the brake drums and this has been traced to the use of a high pressure jet of water when washing the road wheels. Do not under any circumstances allow a high pressure jet of water to be directed on to the road wheels and brake drums.

The best and correct way of washing wire wheels is to remove them from the car. It does not matter if water is applied to the road wheels or brake drums by means of a spoke brush or similar medium, but if water is squirted on to the road wheel and brake drum assembly at high pressure there is a chance that it may enter the drums and cause inconvenience.

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

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

HAND BRAKE.

This is normally adjusted by the turn buckle on the brake cable near by the hand brake lever, and is accessible by removing the floor boards. The hand brake should be so adjusted that the lever is pulled "on" three or four notches to give full braking effect.

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

It is important that the brakes are perfectly free when the lever is in the "off" position, as rubbing brakes cause excessive petrol consumption, lack of power, besides causing undue wear of the brake shoes and linings. **ALWAYS BE QUITE CERTAIN WHEN DRIVING THE CAR THAT THE HAND BRAKE LEVER IS IN THE "OFF" POSITION.**

SHOCK ABSORBERS

ON all Singer Bantam models, Armstrong Hydraulic shock absorbers are fitted. These shock absorbers are lubricated internally by the operating fluid, and should not require any attention except examination after about 6,000 miles, and if necessary, a little oil added.

**ARMSTRONG SPECIAL SHOCK ABSORBER OIL ONLY
MUST BE USED FOR RE-FILLING.**

HOW IT WORKS.

The flanged spindle B (to which is attached a double crank C) is fixed to the frame of the car.

On the crank pins are plungers E and G which work in their respective cylinders F and H.

These cylinders are connected by a passage K so that oil is pumped from one to the other.

The cylinders, plungers and cranks are all inside the main casing A, which is filled with oil and sealed by an oil tight cover M. The casing or arm, since it acts as both, is connected at L to the axle of the car by a suitable link.

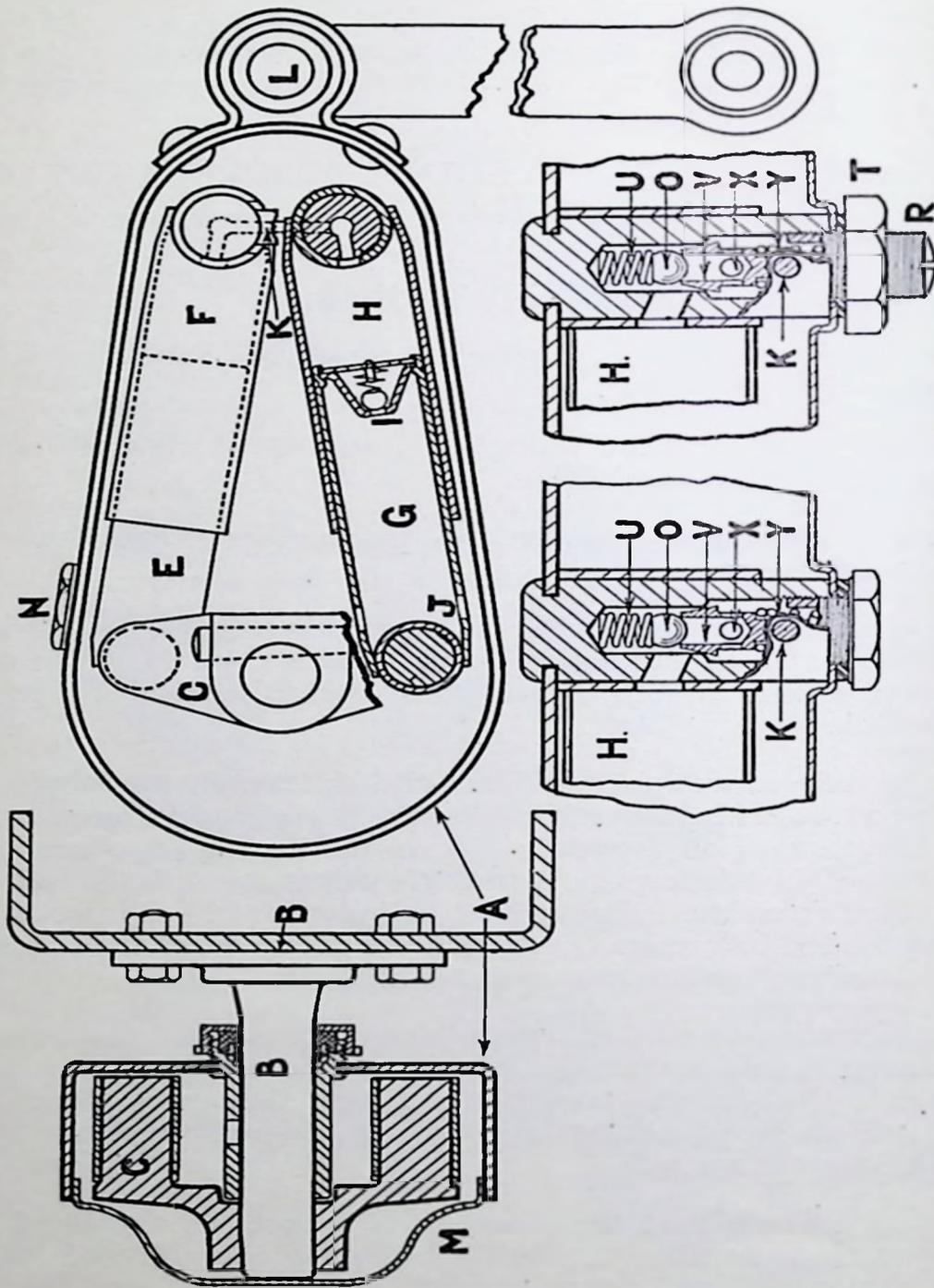
As the axle moves to and from the car frame, so the plungers move in or out of their respective cylinders pumping oil from one to the other. The flow of oil, however, is governed by the valve gear placed in the passage K as follows: As the axle moves towards the frame the oil is pumped from the cylinder F to cylinder H, but as it has to pass the spring loaded ball valve O, a resistance governed by the tension on spring U is offered to the movement of the axle.

On the return or rebound stroke the oil is pumped from cylinder H to cylinder F, and as the ball valve only opens in one direction the oil must now find its way to cylinder F past the spring loaded cone valve V, which is adjustable to offer any desired resistance to the rebound of the car spring.

Any oil leakage past the plungers is immediately replaced from the recuperating chamber through a hole in plunger G and into the cylinder H through non-return valve I.

WHY IT IS SELF-REGULATING.

Cylinder H is larger than cylinder F, consequently the plunger in cylinder H has more oil to force into cylinder F than cylinder F will



accommodate until the surplus oil has leaked past the plungers ; it therefore builds up an added resistance, in proportion to the length of movement of the Shock Absorber, i.e., when the movement is slight the added resistance is slight, when the movement is great the added resistance is also great, giving perfect control to the Car under all conditions, a most valuable feature.

The shock absorbers should not be filled absolutely as a slight space is essential for air which acts as an expansion medium. The correct level for the fluid is half-an-inch below the filler cap.

Every shock absorber is set and tested on a special machine to the adjustment arrived at by the Experimental Department, and no further adjustments should be necessary, but if, due to local or special conditions, adjustment is desired, proceed as follows :—

To increase resistance, slack off the lock nut on the boss side of the shock absorber, taking care the screw does not turn with the lock nut.

Next, turn the screw a quarter to half a turn clockwise, tighten up the lock nut, still taking care the screw does not move.

To lessen the resistance, carry out the above instructions, but turn the screw anti-clockwise. This adjustment controls both compression and rebound.

The adjustments should never be more than half-a-turn at a time, without taking the car out on the road for test.

The front pair of shock absorbers must be treated together and the rear pair together, but not necessarily the front and rear together.

If there is any doubt as to whether the shock absorbers are too tight or too slack, always slacken off the adjustment first.

Armstrong shock absorbers are manufactured by Armstrong Patents Co., Beverley, who give a four hours' service delivery, and shock absorbers for servicing should therefore be sent to Messrs. Armstrong.

ELECTRICAL EQUIPMENT

THE COIL IGNITION EQUIPMENT.

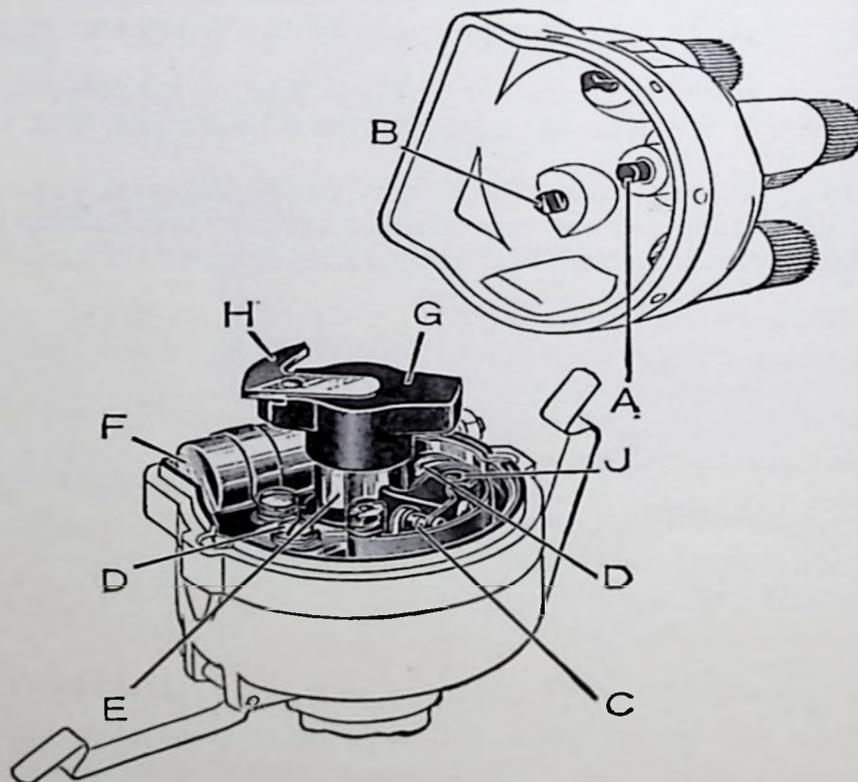
THE coil ignition equipment comprises a coil and a combined distributor and contact breaker, which is driven from the engine.

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

COMBINED DISTRIBUTOR AND CONTACT BREAKER.

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

To test the contact breaker gap, slowly turn the engine by hand until the contacts are seen to be fully opened. Now insert the gauge on the ignition screw driver in the gap between the contact points ;



if it is correct, the gauge should be a sliding fit. It is not advisable to alter the setting unless the gap varies considerably from the gauge. If adjustment is necessary, proceed as follows :—

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

LUBRICATION.

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

The cam should be given the slightest smear of vaseline about every 2,000 miles or whenever it appears to be dry. After every 6,000 miles, place a single drop of oil on the pivot on which the contact breaker rocker arm works.

About every 2,000 miles, withdraw the moulded rotating arm from the top of the spindle by lifting it off, and add a few drops of thin machine oil. Do not remove the screw exposed to view, as there is a clearance between the screw and the inner face of the spindle through which oil passes to lubricate the automatic timing control.

COIL.

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

RENEWING HIGH TENSION CABLES.

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

IGNITION SWITCH AND WARNING LAMP.

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

After long service the warning lamp bulb may burn out. However, this will not affect the ignition, but it should be replaced as soon as possible so as to act as a safeguard for the battery. To replace the bulb unscrew the front. The bulb can then be withdrawn by means of the small tab provided. The bulb is a 2.5 volt, .2 amp. screw cap type (No. 252 M.E.S.).

THE DETECTION AND REMEDY OF IGNITION FAULTS.

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

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

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

HOW TO LOCATE AND REMEDY COIL IGNITION TROUBLE.

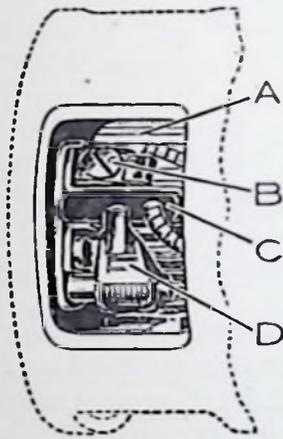
Condition	Method of Detection of Possible Causes.	Remedy.
Engine will not fire.	Starter will not turn engine and lamps do not give good light. Battery discharged.	Start engine by hand. Battery should be recharged by running car for a long period during day time. Alternatively recharge from an independent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

LIGHTING AND STARTING EQUIPMENT

DYNAMO.

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

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



After long service, when the brushes have become worn, so that they will not bear properly on the commutator, they should be replaced. It is recommended that none but genuine Lucas brushes are fitted, as these are specially made and will give the best results and the longest life. We advise owners to have the brushes fitted at a Lucas Service Depot so that they can be properly "bedded" to the commutator.

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

LUBRICATION. As the bearings are packed with grease before leaving the works, very little attention is needed. About every 1,000 miles add one or two drops of thin machine oil through the lubricator provided at the driving end of the machine. When the car is undergoing a general overhaul, move aside the flap marked "grease" at the commutator end of the machine and add a very small quantity of high-melting point grease.

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

DYNAMO FIELD FUSE. A fuse is provided in the dynamo field circuit to protect the machine in the event of anything being wrong in the charging circuit, e.g., a loose or broken battery connection. The fuse is of the cartridge type and is housed in the cut-out and fuse box on the engine side of the dash. If the dynamo fails to charge at any time (indicated by a discharge reading being given on the ammeter

during daytime running), check the wiring and then inspect the fuse. If it has blown replace it with the spare fuse provided. If the new fuse blows after starting up, the cause of the trouble must be found, and we advise that the equipment is examined by one of our Service Depots. Never fit any other fuse than the Lucas standard fuse as originally fitted. The size of the fuse is marked on the coloured paper slip which can be seen inside the fuse.

STARTER MOTOR.

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

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

CUT-OUT AND FUSE BOX.

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

The cut-out is accurately set before leaving the works, and does not need any adjustment ; the cover protecting it, therefore, is sealed.

This unit incorporates two fuses, one connected in the dynamo field circuit (see page 80) while the other protects the circuits of the auxiliary accessories (e.g., electric horn, screenwiper, etc.).

INSTRUMENT PANEL.

The instrument panel houses the combined lighting, charging and ignition switch, ammeter, ignition warning lamp, together with the speedometer, clock, etc. The instrument dials are illuminated at night by means of a dash lamp. The knurled head of the cover of this lamp operates as a switch. To switch on, turn it to the right.

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

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

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

The switch positions are :—

“Summer half charge”. Dynamo giving about half its normal output.

“Winter full charge”. Dynamo giving full daytime output.

“Side”. Side and tail lamps on.

“Head”. Head, side and tail lamps on.

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

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

USE OF THE CHARGING SWITCH.

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

In exceptional cases, however, it may be advisable to modify the use of the switches. For instance, if in Winter the car is run regularly during the day with practically no night running, thus causing the battery always to be in a fully charged condition (Hydrometer readings of 1.285 or over, see page 74), the charging switch should then be kept in the “half charge” position. On the other hand, if exceptional use is made of the lamps and starter in the Summer, thus causing the battery continually to be in a low state of charge, (hydrometer readings of 1.200 or under) then the car should be run with the charging switch in the “full charge” position.

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

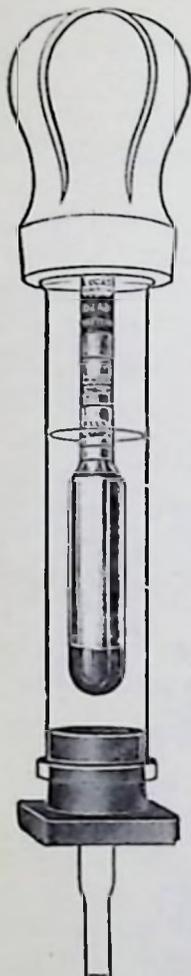
BATTERY.

The following are the most important battery maintenance points :

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

At least once a month, the vent plugs in the top of the battery should be removed and the level of the acid solution examined. If necessary, distilled water, which can be obtained at all chemists and most garages, should be added to bring the level to the top of the

separators. If, however, acid solution has been spilled, it should be replaced by a diluted sulphuric acid solution of the same specific gravity as that in the cell to which it is to be added. It is important when examining the cells that naked lights should not be held near the vents, owing to the possible danger of igniting the gas coming from the plates.



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

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

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

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

LAMPS.

HEADLAMPS. The headlamps are provided with an electrically operated anti-dazzle device for operation by a switch on the steering column. When the switch is moved to the "dip" position, the nearside headlamp beam is dipped and turned to the nearside of the road, while at the same time, the offside headlamp is switched off, thus causing no discomfort to drivers of approaching traffic.

The dipping of the headlamp beam is effected by a movement of the reflector. This is made in two parts: the centre portion is pivotted in a fixed rim which is in turn secured to the body. Movement of the reflector is controlled by means of a solenoid and plunger which, when the current is switched on, tilts the reflector to give the dipped beam. To remove the lamp front, slacken the fixing screw at the bottom of the lamp and swing it aside from the slot. The front can then be withdrawn. When replacing, press the front on to the lamp body, locating the top of the rim first. Finally swing the screw into the slot and tighten it to lock the front into position.

To remove the nearside reflector, withdraw the fixing screw at the back of the lamp. The reflector can then be withdrawn by dislocating the tongues of the two fixing brackets rivetted to the reflector rim from the slots in the lamp body. The offside reflector can be removed together with the front.

To replace a bulb in this lamp, it is first necessary to remove the bulb holder from the rear of the reflector by springing back the two securing spring clips.

ALIGNING LAMPS.

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

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

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

No provision is made for focussing the bulbs in these lamps, as the bulb holders and the reflectors are made to close limits and the Lucas bulbs are carefully standardised to ensure that the filament will be at the focus of the reflector. When a new bulb is required it is therefore important to use only the correct Lucas bulb to ensure that the lamps will be in focus.

SIDE LAMPS. With these lamps the front is removed by twisting the front of the lamp to the left.

TAIL LAMP. To replace a bulb, the front can easily be removed by turning it to the left and withdrawing it from the base.

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

If the ebony black finish of the body becomes dull in service, it can readily be restored by cleaning with a good car polish.

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

Particulars of replacement bulbs are given below :—

<i>Lamps</i>	<i>Bulb Types.</i>	<i>Volts</i>	<i>Watts</i>
Headlamps	Lucas No. 50 ..	12	24-24
Side, tail and dash lamps ..	Lucas No. 207 ..	12	6
Ignition warning lamps ..	No. 252 M.E.S. .	2.5	.5
Trafficators	Lucas No. 256 ..	12	3

ELECTRIC HORN.

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

If the horn becomes uncertain in its action, giving only a choking sound, or does not vibrate, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g., a discharged battery or a loose connection or a short circuit in the wiring of the horn or a blown fuse.

It is also possible that the performance of the horn may be upset by the horn becoming loose on its mounting.

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

TRAFFICATORS.

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

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

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

ELECTRIC WINDSCREEN WIPER.

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

To stop the wiper push in the knob and pull out the curved handle and turn the end of it into the switch knob. The wiper requires no lubrication or attention.

HOW TO LOCATE AND REMEDY DYNAMO TROUBLE.

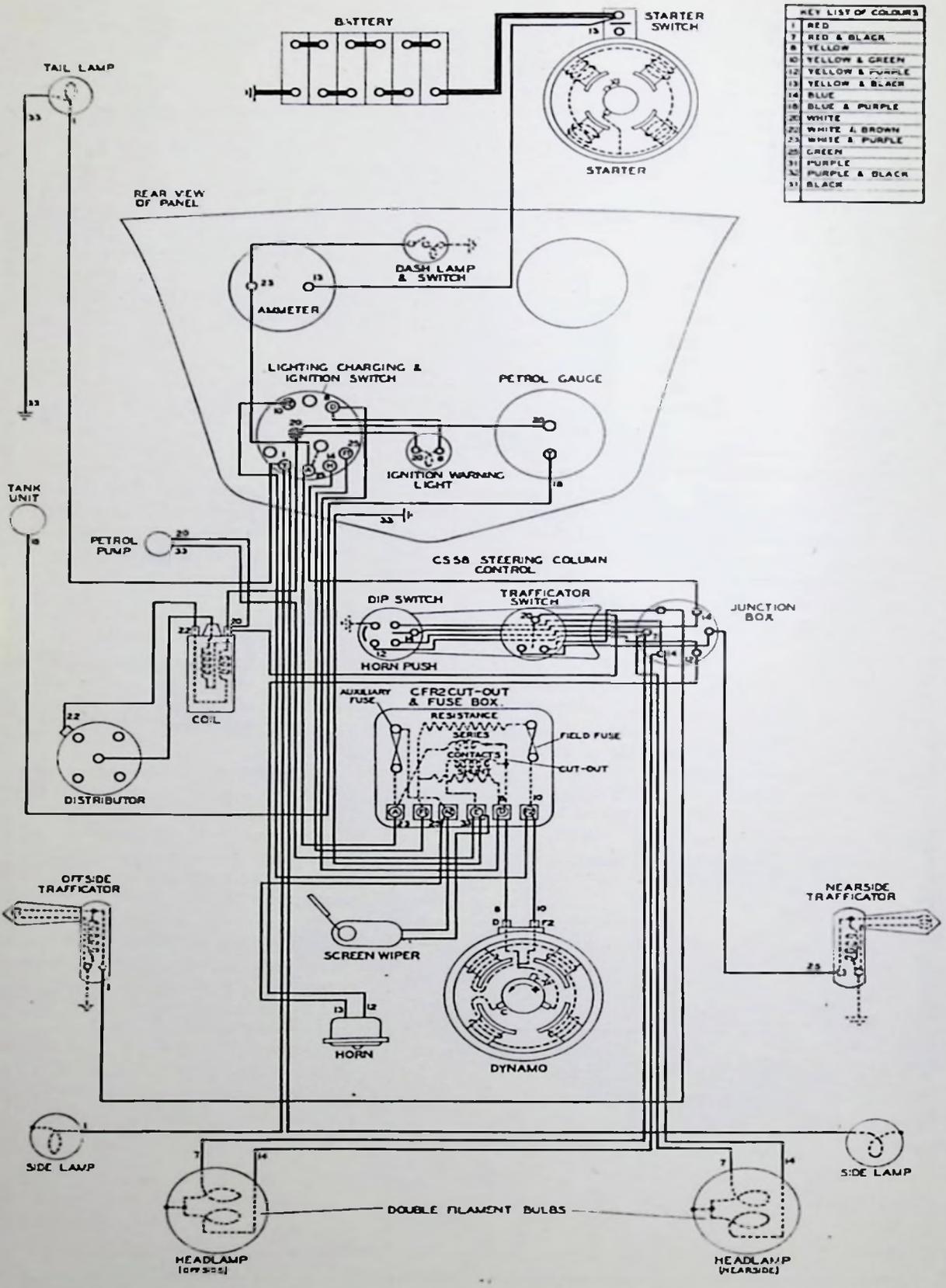
Symptoms.	Probable Fault.	Remedy.
Ammeter fails to indicate charge when running with no lights in use, or gives heavy discharge with lights on.	Dynamo not charging due to : Broken or loose connection in charging circuit causing field fuse to blow.	Examine charging circuit wiring. Tighten loose connection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

HOW TO LOCATE AND REMEDY STARTER MOTOR TROUBLE.

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

HOW TO LOCATE AND REMEDY LIGHTING TROUBLE.

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



KEY LIST OF COLOURS	
1	RED
2	RED & BLACK
3	YELLOW
4	YELLOW & GREEN
5	YELLOW & PURPLE
6	YELLOW & BLACK
7	BLUE
8	BLUE & PURPLE
9	WHITE
10	WHITE & BROWN
11	WHITE & PURPLE
12	GREEN
13	PURPLE
14	PURPLE & BLACK
15	BLACK

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	- - - -	3/5 Calvin Street, Mount Pottinger
<i>Telephone : Belfast 57291 (3 lines)</i>		<i>Telegrams : "Servdep, Belfast"</i>
BIRMINGHAM, 18	- - - -	Great Hampton Street
<i>Telephone : Central 8401 (10 lines)</i>		<i>Telegrams : "Lucas, Birmingham"</i>
BRIGHTON, 4	- - - -	85 Old Shoreham Road, Hove
<i>Telephone : Hove 1146/1149</i>		<i>Telegrams : "Luserv, Brighton"</i>
BRISTOL	- - - -	345 Bath Road
<i>Telephone : Bristol 76001 (4 lines)</i>		<i>Telegrams : "Kingly, Bristol"</i>
CARDIFF	- - - -	54a Penarth Road
<i>Telephone : Cardiff 4603 (4 lines)</i>		<i>Telegrams : "Lucas, Cardiff"</i>
COVENTRY	- - - -	Priory Street
<i>Telephone : Coventry 3068</i>		<i>Telegrams : "Lucas, Coventry"</i>
DUBLIN	- - - -	Portland Road North, North Circular Road
<i>Telephone : Drumcondra 434 (4 lines)</i>		<i>Telegrams : "Luserv, Dublin"</i>
EDINBURGH, 11	- - - -	60 Stevenson Road, Gorgie
<i>Telephone : Edinburgh 62921 (4 lines)</i>		<i>Telegrams : "Luserv, Edinburgh"</i>
GLASGOW	- - - -	Corner of Grant Street and St. George's Road
<i>Telephone : Douglas 3075 (5 lines)</i>		<i>Telegrams : "Lucas, Glasgow"</i>
LEEDS	- - - -	64 Roseville Road
<i>Telephone : Leeds 28591 (5 lines)</i>		<i>Telegrams : "Luserdep, Leeds"</i>
LIVERPOOL, 13	- - - -	450/456 Edge Lane
<i>Telephone : Old Swan 1408 (5 lines)</i>		<i>Telegrams : "Luserv, Liverpool"</i>
LONDON	- - - -	Dordrecht Road, Action Vale, W.3
<i>Telephone : Shepherd's Bush 3160 (10 lines)</i>		<i>Telegrams : "Dynomagna, Ealux, London"</i>
LONDON	- - - -	757/759 High Road, Leyton, E.10
<i>Telephone : Leytonstone 3361 (5 lines)</i>		<i>Telegrams : "Luserdep, Leystone, London"</i>
LONDON	- - - -	155 Merton Road, Wandsworth, S.W.18
<i>Telephone : Putney 5131 (4 lines)</i>		<i>Telegrams : "Luserv, Put, London"</i>
MANCHESTER	- - - -	Talbot Road, Stretford
<i>Telephone : Longford 1101 (5 lines)</i>		<i>Telegrams : "Lucas, Stretford"</i>
NEWCASTLE-ON-TYNE, 2	- - - -	64/68 St. Mary's Place
<i>Telephone : Newcastle 25571 (3 lines)</i>		<i>Telegrams : "Motolite, Newcastle-on-Tyne"</i>

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

GENERAL

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

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

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

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

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

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

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

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

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

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

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

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

TOOL KIT

Starting handle.
Lifting jack.
Tool bag.
Large adjustable spanner.
Small adjustable spanner.
Screwdriver.
Pliers.
Three box spanners.
Tommy bar for above.
Pin punch.
Distributor spanner.
Tappet spanner.
Box spanner—sparking plugs.
Foot pump.
Oil can.
Grease gun.
Wheel brace.
Tyre lever.
Hammer.
Funnel—oiling steering column.

SPARES.

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

Sparking plugs.
Lamp bulbs.
Carburettor washers.

REPORT

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