WOLSELEY

No. 918

# *The* HORNET INSTRUCTION MANUAL

WOLSELEY MOTORS (1927) LIMITED
*Governing Director* . . SIR WILLIAM R. MORRIS, Bt.
WARD END, BIRMINGHAM, 8

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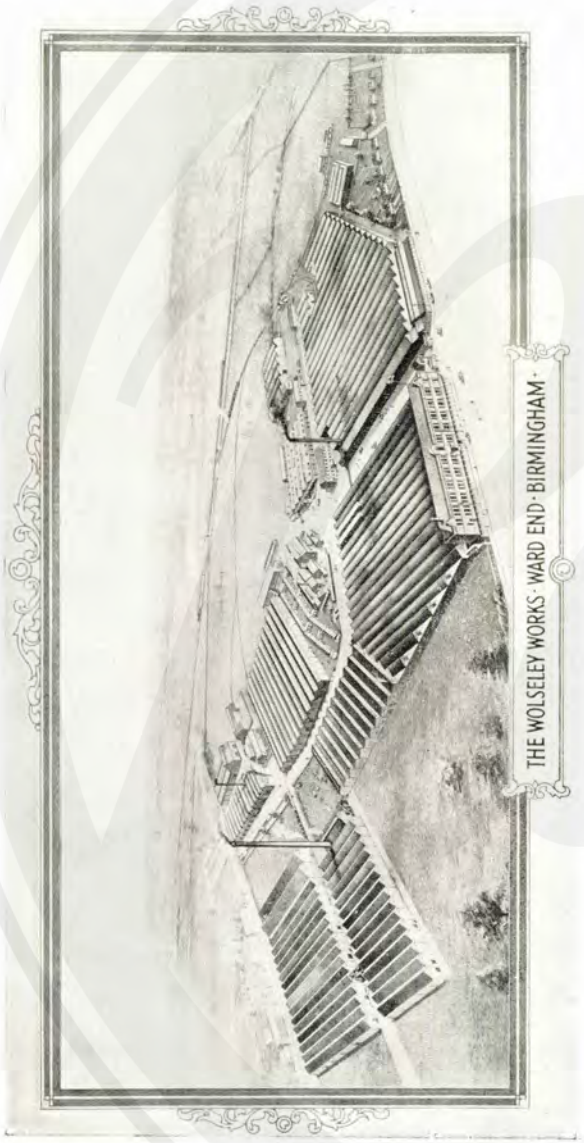


No. 918

Price 2/6 net

# INSTRUCTION MANUAL

FOR THE

# WOLSELEY

# HORNET

(SIX-CYLINDER)



WOLSELEY MOTORS (1927) LTD.

*Governing Director* - - Sir William R. Morris, Bt.

HEAD OFFICE:

DREWS LANE, WARD END, BIRMINGHAM, 8

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LONDON REPAIR WORKS : EUSTACE WATKINS LTD.
Manor Street, Chelsea, S.W.3

## INTRODUCTION

THIS book has been compiled to provide owners of the Wolseley 6-cylinder Hornet with the necessary information for the proper care and maintenance of the car.

The first part of this book contains all the necessary instructions for the ordinary running and driving of the car, while the second portion deals with running adjustments and maintenance of the various component parts.

It has been assumed that the reader has some knowledge of the working and control of motorcars, but if he is a novice we should recommend him to obtain and study one of the excellent handbooks published by the motor press.

The owner of a Wolseley naturally desires to get the best out of his car, and to do this it is well worth while to spend a few minutes every week in giving the car the small amount of attention required.

The car is very carefully tested and adjusted before leaving the Works, and the owner will be well advised to avoid interference with the adjustment without good cause.

We have endeavoured, by the liberal use of illustrations, to make the instructions as simple and clear as possible; at the same time we realise that there may be occasions when the owner finds himself in some difficulty. We are always pleased to give such cases our special attention, and to reply as fully as possible to any queries our customers may raise.

WOLSELEY MOTORS (1927) LTD.

# Part I

CHAPTER I

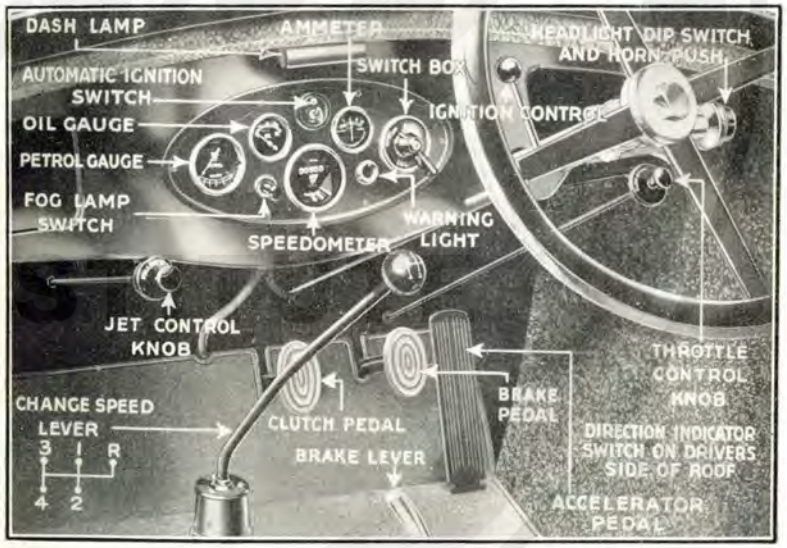
# How your Wolseley is Controlled

IT is essential that new owners or drivers should familiarise themselves with the position, function and adjustment of the control mechanism before running the car.

**Engine Control.**—From the driver's seat two knobs will be noticed on the instrument board, the knob nearest the steering column or right-hand side being the hand throttle control, while the other knob is for the jet control. The hand throttle control sets the minimum or idling speed of the engine.

Turning the knob to the right increases the engine speed; the position of the knob should be set so that the engine will tick over nicely without the accelerator pedal being depressed.

The jet control is fully described under the heading of Carburetter, wherein it will be seen that its main function is to ease the starting of the engine from cold. It is imperative that the knob should be pushed in as far as it will go as soon as the engine continues to fire evenly.




**Controls.**

**Switches on Instrument Board**

*Ignition and Starter :* Turn the key switch to the right, ignition on and automatic starting switch in operation. Turn the key switch to the left, ignition on and independent switch for starter immediately above the key switch.

*Switchbox :* Summer Half : Dynamo on half charge.
Winter Full : Dynamo on full charge.

*Lamps : Side :* Side and tail-lamps on, dynamo on full charge.
*Head :* Head, side and tail-lamps on, dynamo on full charge.

*Dashboard Light :* Lamp is fitted with separate switch.

*Red Warning Light :* Reminder to switch off ignition.

*Petrol Gauge :* The petrol gauge is inter-connected to the ignition switch, and will only function when the ignition is switched on.

**Note.**—See remarks regarding red warning light.

**Ignition.**—The ignition switch is operated by a removable key. The automatic starter switch (i.e. the key turned to the right) puts the self-starter into action immediately the engine stops ; this is an advantage for town running. For normal running the key should be turned to the left, ignition only.

The ignition must be switched off when the engine is stopped. Should the switch be allowed to remain in the " on " position when the car is standing for a considerable period, the battery may discharge itself through the coil.

**The Red Warning Light** is provided to indicate that such conditions are in operation.

A dip and switch control for the headlamps is mounted on a bracket carried on the steering column.

**Reversing Light,** see page 8.

**Ammeter and Battery.**—Special attention is directed to page 76 for important instructions on the care of the battery.

**Ignition Control.**—The advance and retard of the ignition is operated by the lever rod attached to the steering column, but in addition an automatic advance and retard device is fitted inside the distributor as a safeguard against backfiring when the auto. starter switch is in operation. For normal running the hand control lever should be left in the advanced position, but should be retarded when accelerating from low speeds, or when the engine is pulling slowly on full throttle, such as when climbing hills.

**Fuel Supply.**—The S.U. Petrolift fitted to the dashboard under the bonnet draws the petrol from the tank mounted at the rear of the chassis.

**Starting Engine.**—*Rotate the hand throttle control* to the right.

*Pull out* the carburetter jet control knob to the " start from cold " position.



*Set the ignition lever* to full retard.

*Switch on* the ignition. If the key is turned to the left, push the starter switch to start the engine.

**Engine Running.**—The oil pressure gauge will now start to register, and it will be noticed that at first a high pressure is indicated, especially in cold weather. This is due to the oil being more viscous when cold, and it will not, in consequence, flow so freely through the pipes. For this reason the engine should not be raced as soon as it is started, but should be allowed to run at a moderate speed, say 1000 r.p.m., for a short time to get the oil circulating properly. The practice of running an engine slowly to warm it up before starting on a journey is not correct, and it should not be done.

The pressure on the gauge will eventually fall to a minimum of 20 lb. (1.4062 kg. per sq. cm.) with the engine running slowly and thoroughly warmed up, while it should normally be about 40 to 60 lb. when running at 35 miles per hour, or 4.216 to 5.62 kg. per sq. cm. when running at 56 km. per hour.

If the oil pressure gauge fails to register or behaves irregularly the engine should be stopped at once and the cause investigated.

**Loss of pressure** may be due to lack of oil in the crankcase sump, a choked strainer, or a leaking union, or possibly the strainer cover is not making an airtight joint. There is one other possible cause of loss of pressure, but the chance of this arising is extremely remote. This is the sticking up of the oil relief valve. If this is in default it should be taken out and cleaned.

The oil pipe flanges must be securely screwed down to prevent oil leaks, occasional attention may be necessary.

**Gear Change.**—The position of the hand lever when engaging the various gears is indicated on illustration of controls. The change speed lever when in neutral is free to move sideways.

**Moving from Rest.**—Depress the clutch pedal to its fullest extent, and after waiting a few seconds move the change speed lever to the right and forward into first speed. The hand brake lever should now be released and the clutch gently engaged by gradually raising the left foot. At the same time the accelerator pedal should be gradually depressed with the right foot to speed up the engine.

*When moving from rest on a level road or slightly falling gradient it is permissible to start in second speed.*

**Second Gear.**—Depress the clutch pedal and at the same time release the pressure on the accelerator pedal. The change speed lever should then be pushed into neutral, back into second speed.

**Note.**—No force should be used in making this change. Let in the clutch gently and accelerate the engine as before.

**Third and Fourth Gears.**—The same procedure should be followed as when changing from first to second, with the exception that the change speed lever must be moved to the left. This change should be made smartly.

**Changing Down.**—When changing down, depress the clutch pedal, but in this case the accelerator pedal must be kept slightly pressed down. The change speed lever should be moved into the neutral position and the clutch pedal released. After pausing momentarily for the engine to gain speed, depress the clutch pedal again, move the change speed lever into the next lower speed and release the clutch pedal.

**General Hints on Gear Changing.—Bear in mind that the engine speed should be increased when changing to a lower gear, and decreased when changing to a higher gear.**

If first speed cannot be engaged from rest at the first attempt, release the pressure on the clutch pedal and again declutch. It may be necessary to do this more than once before the gear teeth are brought into proper alignment with each other, but when they are so the change speed lever will go forward with very little pressure.

If a bad change has been made, with the result that the lever cannot be got into the desired position, do not use force, but stop the car and start again from neutral. By this course damage to the gears will be avoided and additional practice obtained.

Anyone finding it difficult to change down should practise on a level road until it can be done quickly and confidently.

With a little practice the length of the pause in neutral required to effect a noiseless change can be determined. The steeper the hill on which changes are made, the less time must be occupied in making the change.

**Acceleration.**—It is not advisable to accelerate the engine too suddenly; better results will be obtained by gradually depressing the pedal. When the engine slows down owing to increased load, such as a gradient, too much depression of the accelerator pedal may cause a decrease in power of the engine instead of an increase.

Do not accelerate before the clutch is home.

**Reversing.**—The use of the reverse gear should not be attempted until the car can be effectively controlled in the forward direction.

Before attempting to engage the reverse gear the car should be brought to rest. The clutch pedal should then be depressed, the change speed lever should be placed in neutral, moved to the right as far as possible and then forward; the action of moving sideways from neutral to the reverse gear position is against a spring-loaded plunger which is distinctly noticeable on the change speed lever. When reversing at night the action of the change speed lever switches



on a rear white light to enable the driver to discern objects at the rear of the car. This light is also wired to the sidelamp switch, so that it is inoperative when the sidelamps are not switched on.

**Stopping the Car.**—The car is fitted with hydraulic controlled four-wheel brakes which will bring the car to rest quickly in an emergency. Under normal circumstances the brakes should be used with discretion. The brakes should never be applied so hard that the wheels are locked, because not only does this cause excessive wear of the tyres, but the braking capacity is considerably reduced if tyre skid takes place.

To stop the car, decelerate, apply the brake gently, and just before the car stops declutch. When the car has stopped put the hand brake hard on, the change speed lever into neutral, release the clutch pedal and switch off the ignition.

**Descending Steep Hills.**—When approaching a very steep hill the car should be slowed down and a low gear engaged **before the descent is begun.** If the foot is then taken off the accelerator pedal and the clutch left in engagement the engine will act as the main brake: leaving the hand and foot brakes as additional braking power.

**Ammeter.**—When the engine speed rises to a rate corresponding to approximately 18 miles per hour on top gear the automatic cut-out switch will close the generator to battery circuit and the dynamo will commence to charge the battery.

When this takes place the ammeter will start to register. The ammeter is a centre zero instrument and shows the current flowing into or out of the battery.

In other words, this type of meter shows at a glance whether the dynamo is giving sufficient output to keep the battery charging when the different circuits which are consuming current are switched on; thus, if the lamps are on and take 6 amperes, and the dynamo is charging at 8 amperes, the ammeter shows 2 amperes, this being the current in excess of the lamp load which is available for charging.

The current taken by the starter is not registered. This is owing to the fact that the current used for the starter is only intermittent and the load comparatively heavy.

# "MORRISOL"

## The Only Recommended Oil

FOR

## WOLSELEY CARS


As the word "MORRISOL" is being used as the name of an oil without the authority or the approval of this Company, the word

# "SIRROM"

(i.e. the name "MORRIS" reversed) has been registered as a Brand name.

In the interests of car owners all containers of that "MORRISOL" which, because of its superfine quality and high degree of purity, is the ONLY oil recommended by us (being especially manufactured and marketed for Wolseley Motors (1927) Ltd. by Alexander Duckham & Co. Ltd.) now bear in addition the words "SIRROM Regd. Brand."

Please look carefully for this distinguishing mark when asking for "MORRISOL" for your car and thus be sure of obtaining the ONLY recommended lubricant and the best results.

WOLSELEY MOTORS (1927) LTD.



CHAPTER II

# Lubrication

CORRECT lubrication is the most important factor to be dealt with in the maintenance of a Wolseley Hornet six-cylinder car. It is of vital importance that the correct lubricant should be supplied to all working parts of the car.

It is false economy to use inferior lubricants, as damage caused by the lack of proper lubrication will entail expensive repairs, the cost of which will more than balance any possible saving made by using cheap lubricants.

The Morrisol series of lubricants we recommend have been selected after careful research work and prolonged trials, but if the Morrisol series is not obtainable we recommend the use of the lubricants shown in table.

Before introducing a new brand of lubricant it is most essential to thoroughly drain off the old. We would emphasise the fact that the mixing of different brands of lubricant will have a detrimental effect on the car, and therefore strongly advise the continuity of the same brand if at all possible.

### TABLE OF LUBRICANTS

| *Unit* | *We recommend* |
|---|---|
| Engine ... ... ... | **Morrisol Engine Oil** |
| Gearbox ... ... ... | **Morrisol Transmission** |
| Axle ... ... ... | **Wolseley Rear Axle Compound** |
| Hubs, Chassis Lubricators, Water Pump ... | **Duckham's H.B.B. Grease** |
| Universal Joints ... | **Duckham's Universal Joint Grease** |

*If unobtainable the following alternatives may be used*

| *Engine* | *Gearbox, Steering Box and Back Axle* | *Hubs, Chassis Lubricators and Water Pump* |
|---|---|---|
| Filtrate Extra Heavy | Filtrate Gear Oil, but for Rear Axle Filtrate Rear Axle Compound | Filtrate Solidified Oil |
| Adcol NP3 | Adcol Hydrocarbon N | Adcol H.B.B. Grease |
| Vacuum BB (Summer) Vacuum AF (Winter) | Vacuum C | Mobilubricant Soft |
| Triple Shell | Shell Gear Oil | Shell Motor Grease Soft |
| Castrol XL | Castrol D | Castrolease Medium |

**Engine.**—The oil should be replaced at regular intervals, and it is an advantage when the oil gets low to **entirely drain off the old oil and replace** with new Morrisol instead of merely filling up to the correct level.

This is due to the conditions prevailing inside the combustion chamber leaving a certain amount of residual matter, and owing to the fact that a portion of this matter finds its way down the cylinder walls to the sump, where it merges with the oil, until finally the whole of the oil becomes impregnated.

The oil in a new engine rapidly becomes dirty, carrying in suspension minute particles of foreign matter, and it is essential that this oil should be drained off after, say, about 1000 miles (1600 km.).

**Do not wash out with paraffin.**

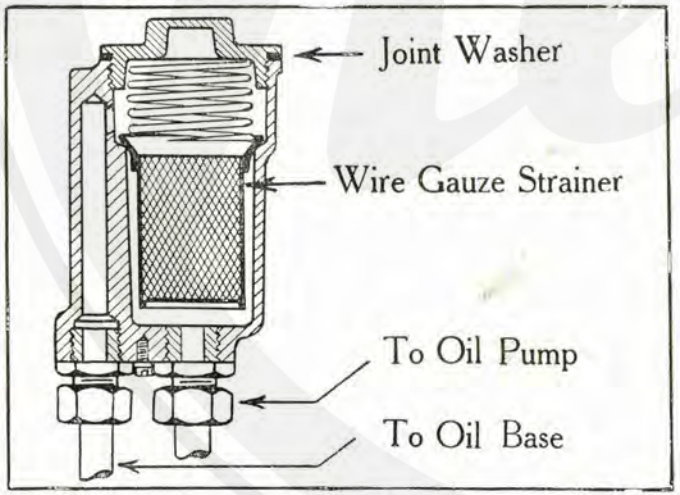
The oil consumption is comparatively small and the engine should only need replenishment about every 400 miles (640 km.). It is advisable to inspect the oil level daily during the first 1000 miles, and add new oil fairly frequently, say every 200 miles (320 km.), in order to maintain it at the level of the upper mark on the dip stick. It is useless to take a reading of the oil level just after the engine has been running, owing to the fact that quite a large quantity of oil will not have drained back to the oil base, and, in view of this, we advise that the reading for the oil level should be taken before running the engine each day.

If the oil level is very low it is advisable to drain off and refill with fresh oil.

**Note.** The dip rod should be wiped dry before taking a reading. The level of the oil should lie between the two engraved marks on the dip rod, never above and never below. A perforated baffle is provided in the filler to prevent the entry of foreign matter when filling.

**To Drain the Engine.**—Remove plug from oil base. It will be found that the oil will drain out more readily when the engine is warm, and thus will carry out the sediment more easily.

**The oil strainer** that is interposed on the pipe line between the oil base and the oil pump must be opened when draining the engine. Take






out the strainer gauze and insert it in a vessel containing sufficient paraffin to submerge the gauze ; shake the vessel so that all the dirt is removed. It will be noticed that the dirt or foreign matter is trapped in the interior of the gauze. The oil in the strainer body will not drain off as it acts as a " header " for the oil pump. A few turns of the engine by hand will be found sufficient for the pump to pull this oil through into the oil base ; this action will also release a quantity of dirty oil from the delivery pipes. Replace the gauze in the strainer body and fill with new oil—this is most necessary.

A joint washer is placed between the cap and the strainer body to make an airtight connection : to ensure this, screw the cover down securely, but without undue force.

The engine should be drained and new oil added every 1500 miles (2400 km.), also the strainer taken out and cleaned.

The cylinder head oil restrictor must be withdrawn and cleaned, say, every 2000 miles. A piece of wire hooked at one end should be used to withdraw the restrictor. If this is neglected the restrictor is liable to " gum," making it difficult to remove. Do not in any way alter the shape or size of the flat on restrictor.

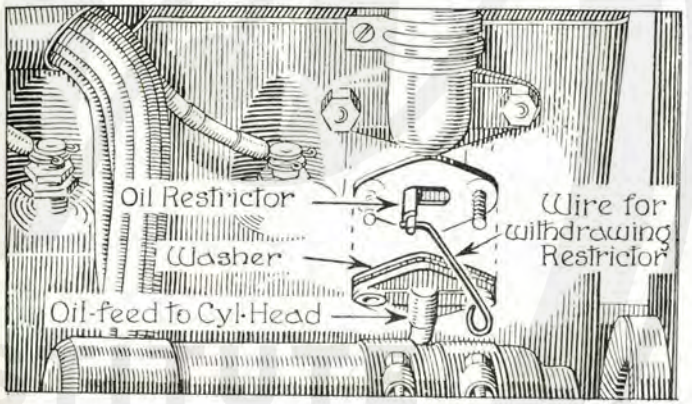



Illustration showing Oil Restrictor.

The oil pipe flanges must be securely screwed down to prevent oil leaks.

An observant driver will pay as much attention to his supply of lubricating oil as to his petrol supply. Neglect of this results in harsh running and an overheated engine, loss of power, and finally " seizing-up " of pistons or bearings.

## CHASSIS LUBRICATION

**Gearbox.**—The gearbox requires special oil. We recommend Morrisol Transmission, but if at any time this is unobtainable one of the alternative lubricants shown in table on page 11 may be used. It is advisable to check the oil level in the gearbox when taking over a new car. The oil level should be just up to the filler hole when the car has been standing long enough to allow the oil to drain back off the various components on to which it is flung when the car is in motion.

When a new car has run about 1000 miles (1600 km.), drain off the oil by removing the plug from underneath, and swill out with paraffin. It is an advantage to drain off immediately after a run, while the oil is still warm.

After the draining and refilling operation has been performed at the end of the first 1000 miles' running, no further attention should be necessary for at least 5000 miles except a periodical examination for oil level; this should be done about every 2000 miles and fill up if necessary. After about every 5000 miles, drain off oil, wash with paraffin and fill up with new oil.

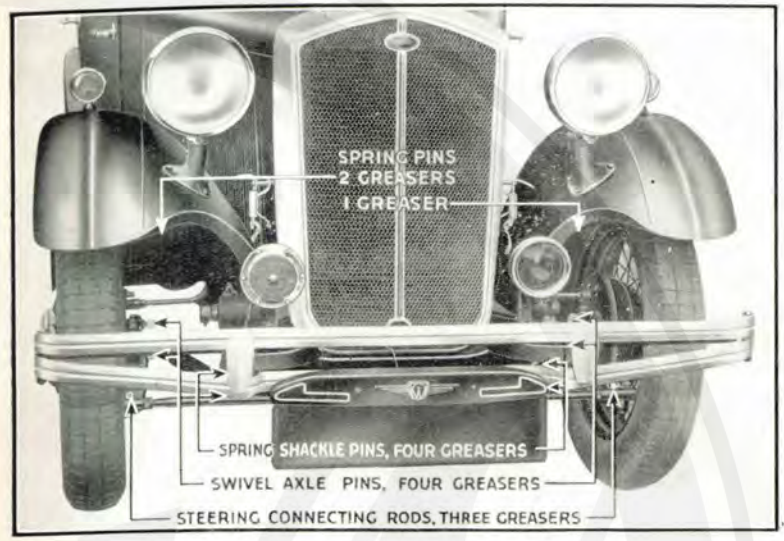
**Rear Axle.**—The rear axle is lubricated with **Wolseley Rear Axle Compound**, which can be obtained from the Wolseley Service Dept. The oil retainers in the rear axle reduce the possibility of leakage to a minimum, but it is advisable, when a new car is delivered, to check the oil level. The oil should be up to the mark on the dip stick when the car has been standing long enough to allow the oil to drain back into the axle case.

When the car has run about 1000 miles drain off the oil and swill out with paraffin, and refill the case with fresh oil. This oil should be sufficient to last for approximately 10,000 miles (16,000 km.), but at intervals of, say, every 2000 miles (3200 km.) inspect the oil level and fill up if necessary.

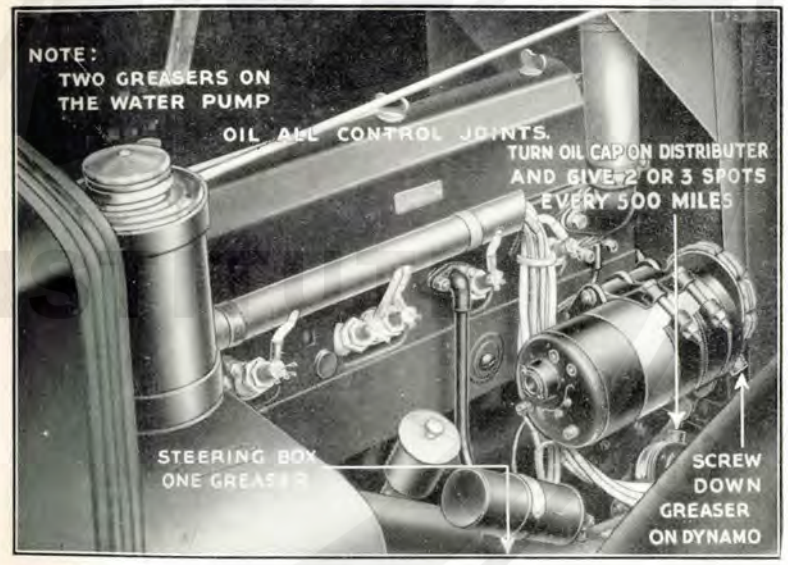
**Front and Rear Hubs.**—The hubs should be kept full of lubricant (see page 11), primarily to combat any tendency towards the condensation of moisture; rust is a great enemy to ball or roller bearings, but the presence of a lubricant will prevent any damage being done. To grease the hubs remove the road wheels, greasers will be found fitted ready for the grease gun application.

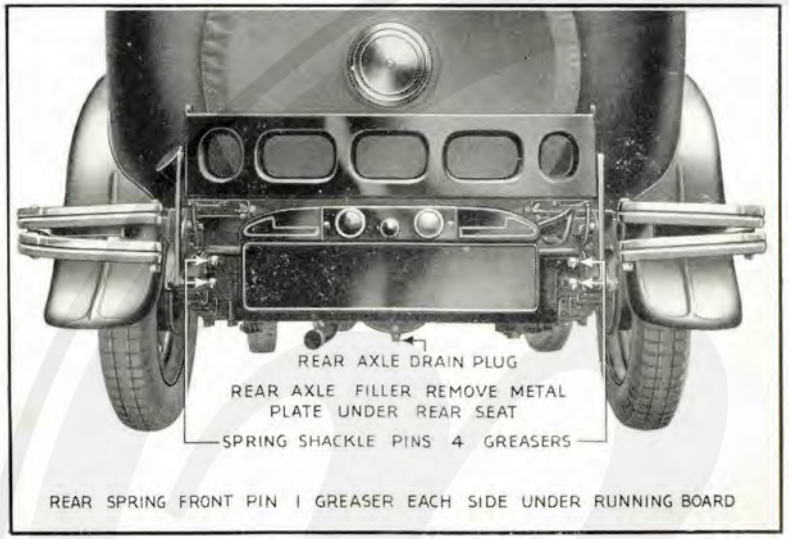
**The Grease Gun.**—Grease connections are fitted to all parts of the chassis which require grease lubrication. These connections are all very accessible and it only takes a few minutes to replenish them.





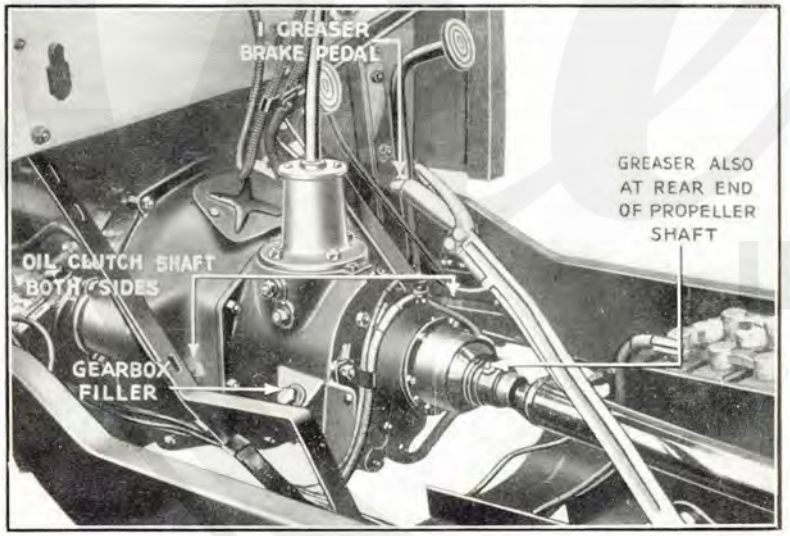

A practice should be made of going round the car with an oilcan periodically, putting a drop on the following places:—Control rod joints, brake connections, clutch pedal shaft and operating levers, bonnet catches and hinges, door locks and hinges.






**Carburetter Piston.**—The carburetter piston must rise and fall quite freely; if it does not, remove cap, and pour a small quantity of thin cycle or machine oil into the orifice. (See Carburetter.)

**Distributor and Dynamo.**—For lubrication, see pages 72 and 74.






The question will arise in the mind of the owner—How often should the grease gun be used? The answer to this depends largely upon the use made of the car. If the car is taken out every day it will obviously require more attention than if it is only used at longer intervals.

The owner who uses his car every day should make a practice of greasing up every week, while those who use their cars less frequently will not find it necessary to do this so often.

The best advice we can offer is to add a little often; the grease will then always be fresh and clean, and will go in easily, while if the job is neglected, not only will serious wear take place, but it will be found much harder to force in the new grease.

It is quite probable that a greaser may be continually overlooked; we suggest that it is advisable to deal with each side of the car as shown below:—

**Front of Car**—Eleven greasers.

| | |
|---|---|
| Front spring shackle pins ... | ... 4 greasers |
| Swivel axle pins | ... 4 greasers |
| Steering cross tubes | 3 greasers |

**Near-side of Car**—Four greasers.

| | |
|---|---|
| Water pump... | ... 2 greasers |
| Front spring pin | ... 1 greaser |
| Rear spring pin | ... 1 greaser |

**Rear of Car**—Four greasers.

| | |
|---|---|
| Rear spring shackle pins ... | ... 4 greasers |

**Off-side of Car**—Five gun greasers and one screw-down type.

| | |
|---|---|
| Rear spring pin | ... 1 greaser |
| Front spring pin | ... 2 greasers |
| Steering box ... | ... 1 greaser |
| Foot brake pedal | ... 1 greaser |
| Dynamo | 1 screw-down greaser |

About two strokes of the gun should be sufficient, although at the spring pins and shackles it is a good plan to force in the grease until all the dirty grease is expelled from the ends, when it can be wiped off.

The universal joints on the propeller shaft are packed with special lubricant at the Works, and should only require attention every 1000 to 1500 miles, when fresh special lubricant (see page 11) must be added, using the grease gun. Too much lubricant will not be harmful, as the surplus will be thrown out and only the correct amount will remain in the casing.

CHAPTER III

# General Running Instructions

## RADIATOR AND COOLING SYSTEM

THE water in the radiator will not normally evaporate very quickly, but it should be added to as found necessary.

It is important that the radiator should be filled only with clean rain water. Do not use hard water under any circumstances, as the use of such water results in a deposit of lime or magnesia, which reduces the efficiency of the cooling system.

While the engine is warming up, after filling the radiator with cold water, a small quantity of water will run down the overflow pipe owing to the expansion of the water on being heated, but this overflow will cease as soon as the engine reaches its normal working temperature. It will also be noticed that a certain amount of water is lost down the overflow pipe when applying brakes hard at high speeds.

This will account for the fact that even on a short run the quantity of water used seems excessive, but after a little experience it will be observed that the radiator need not be filled to the top.

**Flushing-out System.**—It is advisable about every six months to flush out the cooling system. This should be done when the engine is warm. Drain off the water by turning on the cock at bottom of the water pump, close cock, and fill up with a strong boiling solution of washing soda (approx. 2 gallons are required), with about a pound of soda to the gallon. Run the engine to circulate, drain off, and then, when the engine has cooled down somewhat, flush out the system with a hose. Do not allow the soda solution to get on the paintwork.

**Frosty Weather.**—In frosty weather, unless the car is stored in a warm building, the system should be drained before leaving the car for the night or for any period long enough for the water to be frozen. After the water has been drained it is possible for a small quantity of water to still remain around the lower portion of the



cylinder block; this must be drained off by opening the small cock on the off-side of the engine cylinder block. If the water freezes there is great risk of bursting the radiator and cylinder jackets.

When refilling it is an advantage to use hot water, because not only is this more free from substances which cause furry deposits but it also facilitates starting in cold weather.

**Water Pump.**—The centrifugal vane water pump has a capacity sufficient to keep the whole of the water in the engine and radiator under constant circulation. The grease connection on the water pump body requires frequent applications of the grease gun, say every 500 miles, but the connection on the water pump cover only requires a limited quantity every 1000 miles. Replace caps on the grease connections after using grease gun.

## TYRES

The tyres are such an important item in the upkeep of a car that they should receive very careful attention in order that the best service shall be secured from them. In the first place it is very necessary to see that all tyres are fully inflated to the correct pressure. A Schrader gauge for testing the pressure in the tyres should be used. The following are the tyre makers' pressures for our six-cylinder Hornet car, which is fitted with Dunlop tyres, 27×4·75 (18 in.×3½ in. rims).

### TYRE PRESSURES

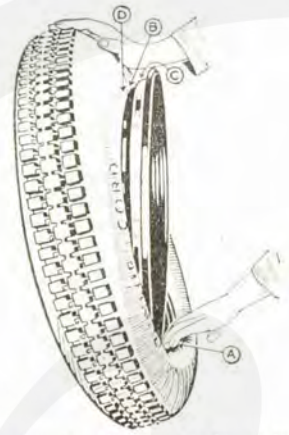
| | |
|---|---|
| Front wheels | 30 lb. per square inch. |
| Rear wheels | 30 lb. per square inch. |

The above tyre pressures relate to a car carrying two passengers in the front seats. When the rear seats are occupied a slight increase of pressure in the rear tyres is recommended, say to 32 lb.

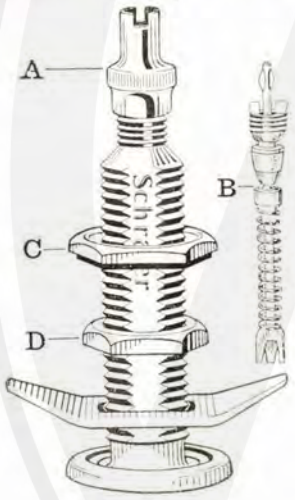
**To Remove Tyre.**—First completely deflate by removing all valve parts, and push the tyre edges into the base of rim at part diametrically opposite valve, then lift the cover edges near the valve over the rim edge. The small lever which is supplied with the car may be used, but it is not essential. No force is required to do this, but the edges of the cover opposite the valve must be in the base of the rim.

**To Fit Tyre.**—Push one edge of the cover over the edge of the rim. It will go quite easily if you see that the part of the edge first put on is pushed right down into the rim base. Very slightly inflate the inner tube—do not distend it—place it in cover, with valve through hole in rim. Commence to fit second edge of cover at a point diametrically opposite the valve by placing it over the rim and pushing down into the base of the rim.

The small lever may be used for the last few inches, but it is not essential. On no account use large levers. Force is unnecessary and may damage the cover edges.




**You cannot pull the tyre edge at "A" over the rim edge until the tyre edge at "B" is pushed off the rim shoulder "C" down into the well "D," then tyre edge at "A" comes over the rim easily. Remember the tyre edges are inextensible—force will only damage the tyre and cannot stretch the edge.**




**Tyre Valve.**

**Inflation.**—Whilst inflating see that the edges of cover are seated evenly round the rim.

**"A" Valve Cap.**—Screw on tightly by hand only.

**"B" Valve "Inside."**—When necessary to renew, unscrew by using the slot in the valve cap as a screwdriver.

**"C" Rim Nut.**—Screw down on to the rim. Holds the valve rigidly and prevents entry of water.

**"D" Hexagon Nut.**—Important. Always tighten this nut with a wrench before fitting the tube in the tyre.

Do not let oil or grease get on the tyres, as they have a destructive effect on rubber.

We always recommend owners to carry, in addition to the spare wheels, one or two spare inner tubes for replacement in case of more than one puncture, as it is not always possible to effect a satisfactory repair to a punctured tube at the roadside.

A few spare valve "insides" should also be carried.



**Test Compressions.**—The engine should be turned by hand two or three times a week to check compressions; if these are unequal, perhaps one or more of the tappets are too close, in which case there will be a serious loss of power in the engine, and, in the case of the exhaust valves especially, the head of the valve will rapidly burn away.

**Sparking Plugs.**—The sparking plugs should be taken out and cleaned by washing with petrol about every three or four thousand miles, and the gap between the electrodes checked and readjusted if necessary. The gap should be between .015 in. (.380 mm.) and .018 in. (.460 mm.). One of the most apparent effects of fouled sparking plugs is difficult starting.

**Hints on Driving.**—Don't try to start the engine with the throttle too far open.

Don't flood the carburetter.

Don't open the throttle too far or too quickly until engine is sufficiently warm, otherwise you may have a "pop back," and if the carburetter has been flooded a more or less serious fire.

Don't slip the clutch unduly.

**Don't accelerate the engine after changing up until the clutch is home.**

Don't hang on to the high gears too long when ascending hills. It is a good rule to change down when the engine speed has dropped to about 2000 r.p.m.

## CAUSES OF BAD RUNNING

**Difficulty in starting.**

Ignition not switched on.
Dirty sparking plugs.
Faulty connection on electric wiring.
Throttle open too far.
Plug points too far apart.

**Popping in carburetter.**

Mixture too weak.
Sticky inlet valves.
Ignition retarded too much.
Faulty petrol supply.
Plug points too far apart.

**Popping in exhaust.**

Sticky exhaust valves.
Tappets not adjusted correctly.

**Bad acceleration.**

Mixture too weak.
Tappets require adjustment.
Plug points too far apart.

**Note.** It is most unlikely that any adjustment to the carburetter is necessary. (See Carburetter in Part II.)

**Hints on Care of Car.**—Don't assume the car is at fault when trouble is experienced, as it may be due to omission on the part of the driver.

Don't neglect the tyres. (See recommendations by tyre makers.)

Don't allow a chipped place on the wheels or axle to get rusty, as the rust will eat under the surface of the surrounding enamel and blister it off. Use black japan to touch up any parts so chipped. This should be laid on as thinly and evenly as possible.

**Hints on Cleaning Car.**—Exterior fittings are chromium finish (metal polish must not be used). Use only soap and water, and thoroughly dry with a soft duster. This should be done frequently.

For cleaning nickel plating the best silver polish should be used, ordinary metal polish being too abrasive.

Do not attempt to polish the lamp reflectors with metal polish.

**Hints for Cars in Regular Service.**—The following hints may be found useful where a car is in regular service, assuming a daily run of about 100 miles :—

| | |
|---|---|
| **Daily or every 100 miles.** | Fill up fuel tank.<br>Fill up radiator to normal level.<br>Check oil level in crankcase with dip rod. |
| **Weekly or every 600 miles.** | Lubricate the chassis parts with the grease gun and oil can.<br>Oil bonnet hinges, bonnet catches, door locks and hinges.<br>Test compressions.<br>Adjust tappets if necessary.<br>Test tyre pressures. |
| **Monthly or every 2500 miles.** | Remove and clean oil strainer. See pages 12 and 13.<br>Examine and clean contact breaker.<br>Remove wheels.<br>Lubricate the hubs.<br>Oil brake cable pulleys.<br>Check level of oil in gearbox and rear axle.<br>Drain off engine oil and replenish with fresh supply. This should be done every 1500 miles.<br>Adjust brakes if necessary.<br>Check level in brake fluid supply tank. |

**Before starting a journey** make sure there is sufficient fuel in the tank to feed the engine at least as far as the next pre-arranged stopping place.



Check the level of the oil in the engine sump and see that the lubrication system is working properly. (See pages 11 to 13.)

Fill up the radiator to normal level. (See page 18.)

The brakes should be examined to see that they are working freely and are properly adjusted, and also that the cam spindles are adequately lubricated.

The tyres should be pumped if necessary, not forgetting the spare. (For suitable pressures see page 19.) See that the road wheels are properly fixed, and are readily removable if found necessary.

## BATTERY

Inspect the level of the electrolyte or acid solution every month, and if necessary make up the level to the bottom of the filling tube with pure distilled water. Specially note that this requires doing more frequently in the Summer.

If the car is stored away for a long period the battery should be fully charged and afterwards inspected every month to see that the gravity and level of the electrolyte are correct. Give a freshening charge from an external source at least every three months. Do not store a discharged battery.

## WASHING THE CAR

Never put the car away in a dirty state if you desire to keep the appearance in new condition for the longest possible period.

When a car has been washed with a hose it is possible for a small quantity of water to find its way on to the brake-shoes ; this will somewhat impair the efficiency of the brakes for the moment, but if the brakes are applied fairly hard for a short time with the car running at, say, 30 m.p.h. (50 km.), the efficiency will be restored.

Chromium plating should not be left in a wet state.

## Table of Oil and Water Capacity

| | |
|---|---|
| Capacity of Petrol Tank ... ... ... ... ... | 8 galls. |
| Amount of Water required when refilling system ... | 2½ galls. |
| Amount of Morrisol required when refilling the Engine after draining, including the oil cooler ... ... ... | 7 pints |
| Amount of Morrisol Transmission to be put into Gearbox after draining ... ... ... ... ... ... ... | 1½ pints |
| Amount of Wolseley Rear Axle Compound to be put into Rear Axle after draining ... ... ... ... ... | 2 pints |

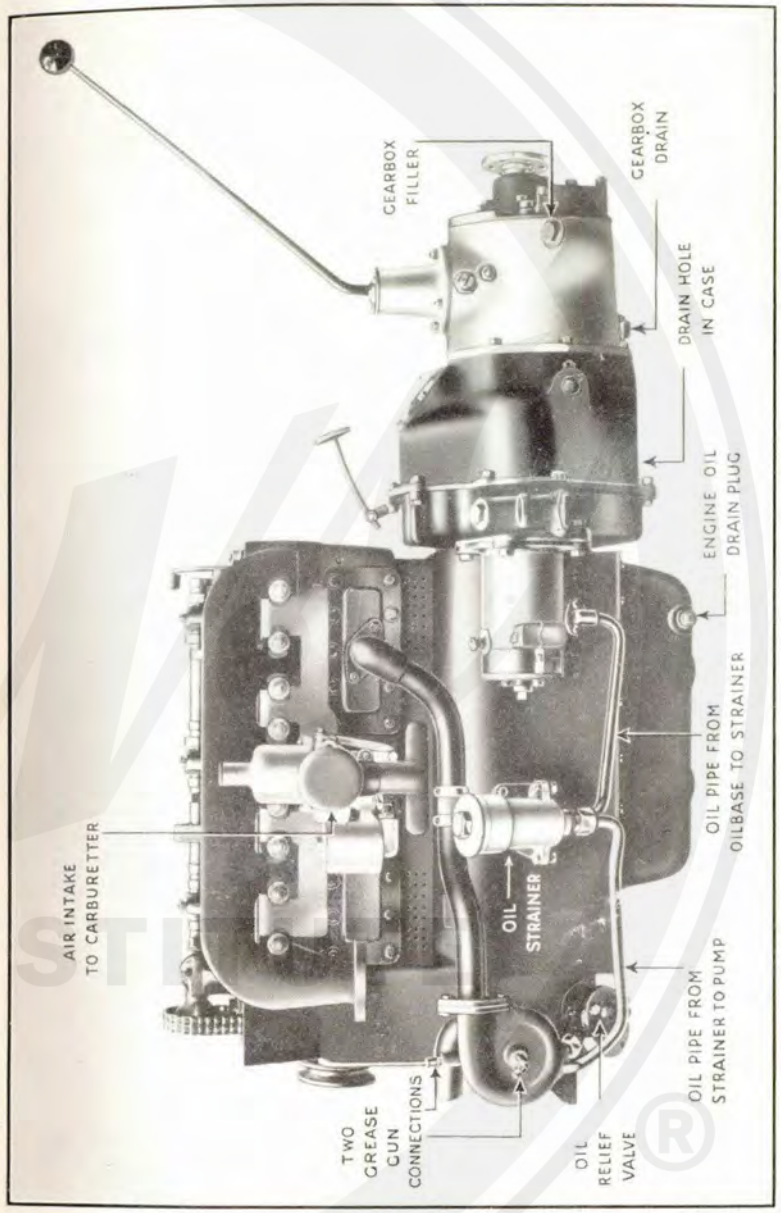
## Principal Chassis Dimensions

| | |
|---|---|
| Bore ... ... ... ... ... ... ... ... | 57 mm. |
| Stroke ... ... ... ... ... ... ... ... | 83 mm. |
| Cubic capacity... ... ... ... ... ... ... | 1271.3 c.c. |
| Wheelbase ... ... ... ... ... ... ... | 7 ft. 6½ in. |
| Track ... ... ... ... ... ... ... ... | 3 ft. 9 in. |
| Overall length (without grille) ... ... ... ... | 11 ft. 9 in. |
| Overall width ... ... ... ... ... ... ... | 4 ft. 7⅛ in. |

| | | 1st | 2nd | 3rd | 4th | Reverse |
|---|---|---|---|---|---|---|
| Road speeds at engine speed of 1000 revs. per min. | m.p.h. | 4.51 | 7.5 | 11.88 | 16.1 | 4.51 |

| | |
|---|---|
| Tyre size ... ... ... ... ... ... | 27 in. × 4.75 in. |
| Treasury rating ... ... ... ... ... | 12.08 h.p. |





# ADJUSTMENTS
AND
# MAINTENANCE
OF
# THE WOLSELEY HORNET SIX - CYLINDER CHASSIS

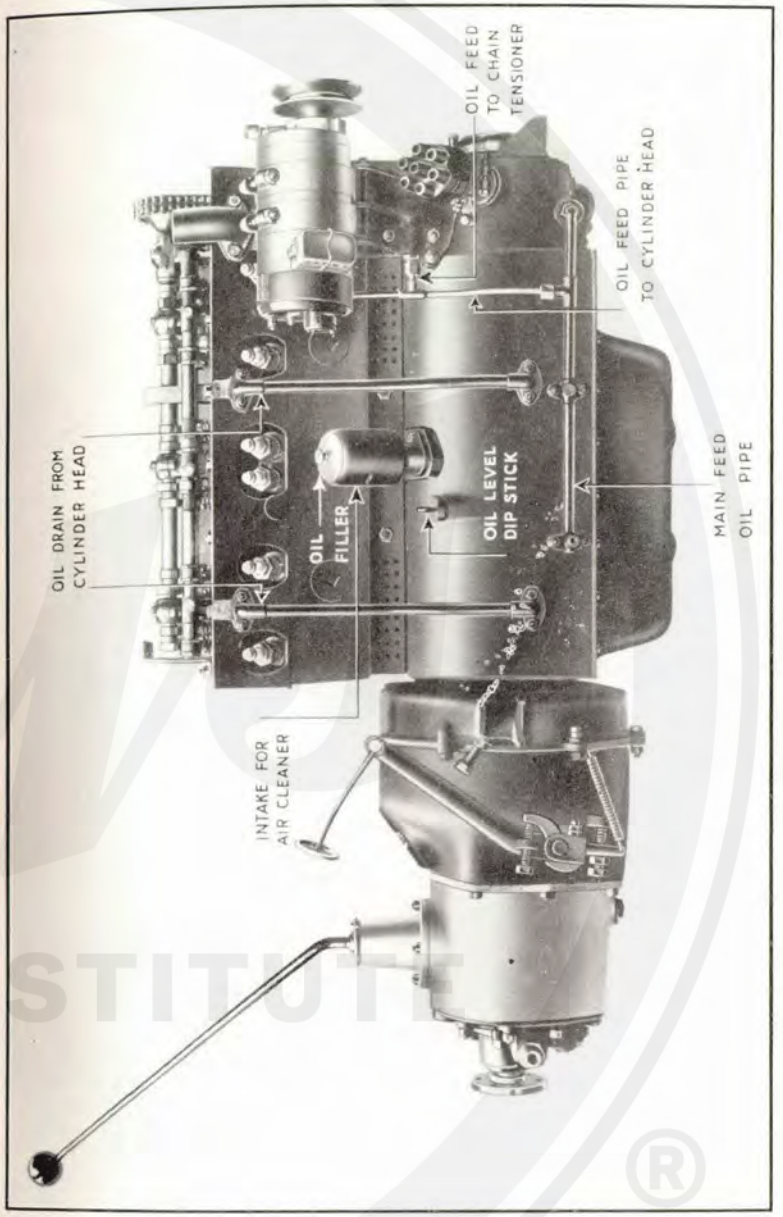
*The following portion of the book deals more in detail with the necessary running adjustments and maintenance of the various component parts of the car.*

*There are many small adjustments of a simple nature which the majority of owners will desire to do for themselves, and instructions sufficient to enable the owner to carry them out, with the help of the tools provided in the kit, are given in the following pages. We also devote considerable space to instructions for the removal of the cylinder head for the purpose of decarbonisation and valve grinding.*

*Immediate attention to any adjustments or replacements that may be required will not only keep the car in good order but also reduce the upkeep cost to the minimum, as if one portion of the mechanism fails to do its work properly, undue strain is thrown on other parts, with the consequent risk of sudden breakdown.*

*A word of warning may not be out of place, however, against inexperienced persons attempting repair work beyond their capacity.*





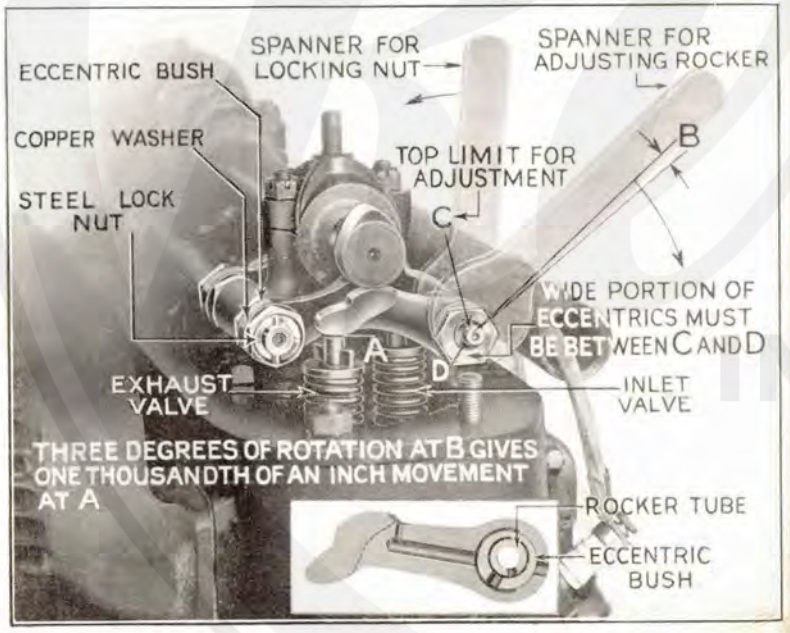

Power Unit.

# Part II

CHAPTER I

## Engine Adjustments

**Valve Tappet Adjustment.**—The top cover of the engine is easily removed and will expose the valve-operating gear. The jointing material is riveted to the cover, and care should be taken to see that this is not detached or trouble may be experienced with oil leakage.




Valve Tappet Adjustment.



The rockers which actuate the valves are mounted on eccentric bushes, by the rotation of which, in the proper direction, the clearance between the rockers and valves may be adjusted. The thick side of the bush should **always be towards the centre of the engine (except when at the top and bottom).** No useful purpose will be served by turning the bush the other way, as if this is done **the oil supply to the cam will be stopped.**

It is advisable after making these adjustments to run the engine at about 1000 r.p.m. with the top cover removed, and ascertain if oil is being delivered to each rocker.

The clearance should be checked occasionally with the feeler gauge provided in the kit. **The gauge is .003 in. (three-thousandths of an inch) (.076 mm.) thick and should just slide through between the rocker and the heel of the cam when the engine is cold.**

When checking the valve clearance the peak of the cam operating that particular valve should be vertically upwards. If the clearance is not sufficient, i.e. .003 in. (.076 mm.), the valve will not go down on its seat, which will cause a loss of power ; if, however, the clearance is allowed to become too great the tappets will develop a noise.

To adjust the tappets loosen the steel lock nut, turn the bush until the clearance is correct and tighten up the lock nut, afterwards checking the clearance again. A thin soft copper washer is placed under the lock nut to prevent the nut working loose.

When the valves are ground the rocker clearances must be reset *and it is advisable again to check the clearances when the car has run 50 to 100 miles after grinding, as the valves have a tendency to " bed down " a little after having been disturbed.*

The running of an engine is frequently spoilt through the owner seeking silence by cutting down the rocker clearance. In order to maintain good tune over long periods it is advisable to set the rocker clearance after a valve-grinding operation one or even two thousandths more than the amount indicated above. *This may increase the valve gear noise but will undoubtedly lead to improved maintenance of tune over lengthy periods and prevent the possibility of burnt exhaust valves.*

**Sparking Plugs.**—The sparking plugs should be taken out and cleaned by washing with petrol about every three or four thousand miles, and the gap between the electrodes checked and readjusted if necessary. The gap should be between .015 in. (.380 mm.) and .018 in. (.460 mm.). One of the most apparent effects of fouled sparking plugs is difficult starting.

If other means are not available, the gap can be measured by using the contact breaker spanner gauge.

## DECARBONISING

A deposit of carbon may be formed in the combustion chamber and on the top of the pistons after the engine has been running for a considerable time.

No hard and fast rule can be expressed either in mileage or time as to when it is necessary to decarbonise.

If the valves are kept properly adjusted and the correct clearance maintained, it is not advisable to disturb the engine for decarbonising unless definite evidence such as "pinking," overheating, etc., indicates that this operation is necessary.

**When a car is used for long fast runs, the engine should not need to be decarbonised for thousands of miles,** whereas the engine of a car used for town running may need to be decarbonised at more frequent intervals.

The presence of excessive carbon deposit is usually indicated by falling off in power and "pinking" when the engine is labouring on a hill or picking up on one of the high gears, but this must not be confused with the similar noise made when the ignition is too far advanced. To remove the carbon deposit proceed as follows :—

### Removing the Cylinder Head

The cylinder head can be removed without taking down the radiator, but if the duplex chain which drives the camshaft requires adjustment it is necessary to remove the radiator.

It is an advantage to remove the radiator before taking down the cylinder head for decarbonising.

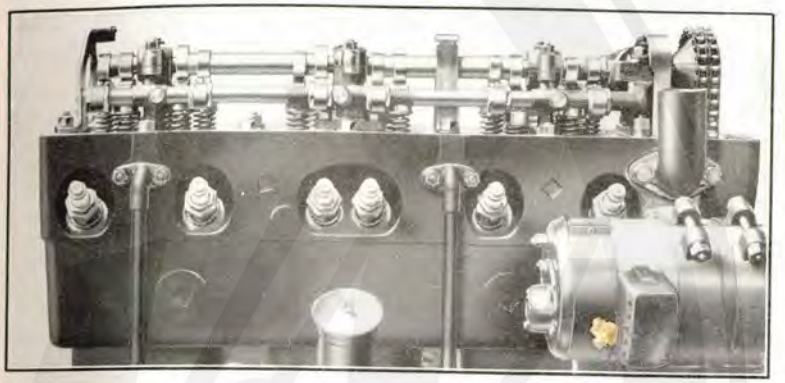
Take off the cylinder head cover and test the chain (if it is possible to pull one side of the chain and make it touch the side of the hole in the cylinder head, then adjustment is necessary).

To remove the cylinder head without taking down the radiator proceed as follows : remove the bonnet, empty the radiator, disconnect the throttle control, petrol pipes, rubber hose from cylinder head, and ignition wires from the sparking plugs ; take out sparking plugs. Disconnect the exhaust pipe from the manifold, remove the carburetter and exhaust manifolds. Unfasten the top connection of the oil feed and drain pipes, take off the cylinder head cover. Turn the engine so that No. 1 cylinder is in the firing position and the connecting link on the duplex chain on the top of the camshaft chain wheel. The connecting link is held in position by a spring clip—it is advisable to always have ready to hand one or two spare spring clips, as they can be easily lost or mislaid —before taking out the connecting link attach a piece of string or wire to each end of the chain to hold it in position on the lower chain wheel.



The cylinder head is now ready for lifting ; slack off each of the 14 nuts, half a turn at a time, until they are quite loose, and then finally remove them. It is not wise to unscrew any one of these nuts completely before slackening off the remainder as it would impose uneven stress upon the cylinder head and may cause distortion.

The breaking of the joint between the cylinder head and the cylinder block will be facilitated by smartly tapping the sides of the head with a wooden mallet or a hammer, with a piece of wood interposed to take the blow. The joint may, however, not break freely, in which case it is permissible to insert a screwdriver or similar blunt wedge-shaped tool between the joint at the two places—one on either side of the engine—where the cylinder head gasket has been cut away for the purpose.



View showing Cylinder Head with Top Cover removed.

When lifting the cylinder head off the studs it is an advantage to have the help of a second person to hold the strings or wires attached to the ends of the duplex chain and secure them to the cylinder block when the head has been raised sufficiently for them to be passed underneath.

If the radiator is taken down when removing the cylinder head, the chain cover can be removed so that duplex chain be taken off the engine.

### Removing the Carbon Deposit

Everything is now in readiness for decarbonising the piston crowns and the surrounding face of the cylinder block. Turn the engine by the starting handle until any two pistons are at the top of their travel, when it will be found that the remaining four are part way

down their cylinders. Stuff the open ends of these cylinders with clean rag, and with an old screwdriver, or some other blunt tool, scrape the black deposit off the top of the cylinders and the face of the cylinder block adjacent to the cylinder bores. Do not scrape off the deposit on the piston crowns right up to the edge, leave a band of deposit, say about $\frac{1}{4}$ to $\frac{5}{16}$ of an inch wide, around the edge of the piston. If the deposit on the piston crowns is only very thin and is hard and dry it is advisable not to interfere with them at all.

Do *not* attempt to polish things up with emery cloth or other abrasive, or you will do far more harm than good. When these two pistons have been properly cleaned give the starting handle part of a turn and clean the two more pistons in the same way. Repeat the operation to clean the remaining two pistons.

Attention should now be given to the cylinder head. Remove the sparking plugs and turn the head upside down, thus exposing the combustion chambers, in each of which will be observed the circular heads of two valves—one inlet and one exhaust.

With a blunt screwdriver carefully scrape away the carbon deposit adhering to the surface of the combustion spaces, taking particular care to go round each valve with a small screwdriver in order to remove all trace of carbon. Clean the combustion chambers and valve heads carefully with rag moistened with paraffin.

## Removing the Valves

Having thoroughly cleaned the combustion spaces and valve heads, place the cylinder head on the bench the right way up. To obtain access to the valve springs, it is necessary to remove the camshaft. This is easily achieved by unscrewing the eight nuts holding the camshaft bearing caps in position. These should be given half a turn in rotation, in a similar manner to the cylinder head retaining nuts, until they are eventually removed. The camshaft can then be lifted from its bearings and removed by passing it through the valve cover saddles. Removal of the camshaft enables all the valve rocker-arms to be swung clear of the valves.

A small wood block slightly thicker than the depth of the combustion spaces and an easy fit within them should now be prepared. Slip this block into the combustion space so that the valve heads are resting upon it, in order that the valve springs can be compressed without forcing the valves open. Depression of the springs will expose two small conical cotters engaging in a groove in the pencil-like end of the valve stem. Removal of the cotters will release the valve spring cap from the valve stem, permitting its removal and releasing the valve springs. When the springs of both valves have been removed,



the head may be raised from the bench and the wood block withdrawn, thus allowing the valves to be drawn from their guides. Repeat this operation on the remaining valves until they are all removed.

## Grinding-in the Valves

Examination of the valves will show that the edges of their mushroom-like heads are bevelled off at an angle to correspond with the similar bevelled edges of the valve ports in the cylinder head and thus provide a gastight joint when they are in contact. Obviously, gastightness is not attained if these bevelled surfaces are dirty or "pitted," and in order to clean them up so that they make perfect contact over the whole of their surfaces it is necessary to grind them in. When grinding-in the valves the utmost care should be taken to see that they are inserted into the correct port. Each valve is clearly numbered on its head, and on the lower face of the cylinder head adjacent to the valve port will be found its corresponding number.

The grinding-in process consists in coating the bevelled face of the valve with a small quantity of valve-grinding paste—applied on the end of a match-stick—reinserting the valve in its guide and partially rotating it backwards and forwards on its seating by means of a screwdriver. Here we come to the secret of good valve grinding. The valve should be raised from its seating every few reciprocations and given a half turn in order that the grinding compound may spread itself evenly over the whole of the surface. If this is not done there is the possibility that minute circular grooves will be cut into the face of both the valve and its seating, which will absolutely prevent one from obtaining a good gastight fit. Probably the most convenient way of carrying out this periodical lifting is to obtain a light coil spring (similar to the valve spring but much lighter), and insert it into the valve port beneath the valve head. When pressure is released on the screwdriver the valve will rise up, when it can easily be rotated into a fresh position.

It is not necessary to continue grinding the valves once the faces of both valve and seating have assumed a clean, even, matt-surfaced appearance. A polished surface must not be expected and is quite unnecessary. If the engine has been run for a long period without being decarbonised, the valve face may be badly "pitted"—that is to say, it will have a number of small black spots or depressions on its face. Should these depressions be at all excessive or deep, it is best to have the valve face trued up on a special machine at a garage. This will prevent needless grinding away of the valve seating in the cylinder head—a matter of importance, as it cannot be renewed. Any valves which are distorted should immediately be replaced by new ones. To attempt to grind them in will only produce extensive damage to the seating.

After each valve is ground in it should be withdrawn and carefully washed in paraffin, and, what is equally important, the valve seating and the surrounding valve port should also thoroughly be cleaned with a rag moistened with paraffin. Do not wash out the valve ports with petrol or paraffin or some of the grinding compound will find its way into the valve guides or other working parts, and it is of the utmost importance that it should be prevented from finding its way on to any of the working surfaces of the engine, where extensive damage may be done.

In the event of a new valve being fitted it will, of course, be necessary to grind it to its seat.

After grinding the valves the tappet clearance will require adjustment.

If after repeated grinding in the valve does not seat and give the correct clearance, and the full adjustment on the eccentric bush in the valve rocker has been used, then the end of the valve stem must be shortened until sufficient clearance is obtained. If this operation has removed the hardened portion of the valve end, it must be surfaced hardened before replacing in engine.

### Reassembling the Valves

When you have satisfied yourself that all trace of the grinding compound has been removed, the valves may be reassembled. Care should again be taken to see that they are in their correct ports. Reassembly of the valve is not a difficult matter with the aid of a valve tool which we can supply. After inserting the valve in its guide and resting its head on the wood packing block, the valve springs may be placed in position with the valve spring cap resting on top of them. Engage the valve tool on the cap and depress the springs so as to expose very nearly the whole of the groove in the upper end of the valve stem. Insert the two conical cotters into the groove in the valve stem (small ends downwards, of course) and gradually release the springs. Make sure that the cotters are properly engaging in their grooves before dealing with the next valve. If the centre valve cover saddle has been removed, do not forget to replace it in position before reassembling the valves which are between the camshaft bearing brackets.

### Replacing the Camshaft

Swing all the valve rockers into position against their respective valves and replace the camshaft. The camshaft bearing caps are dowelled into the bearing brackets so that there is no possibility of misalignment. Care should be exercised, however, to tighten up the camshaft bearing cap nuts evenly. Each should be given a partial turn at a time until all are perfectly tight.



### Adjusting the Rockers

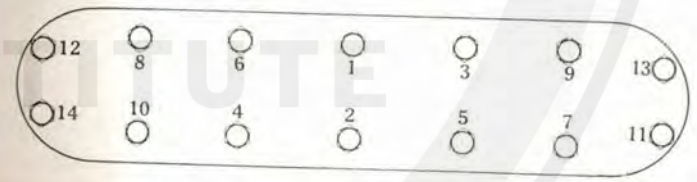
In the process of grinding-in the valves a certain amount of metal is always removed. This tends to reduce the clearance existing between the head of the valve and the under-surface of the rocker-arm. It is essential for the proper functioning of the engine that this clearance should not be less than .003 in., and it is therefore necessary to check the clearance of each valve with the feeler gauge attached to one of the special rocker adjusting spanners. (See page 29.)

### Replacing the Cylinder Head

When all the valve clearances have been correctly adjusted, the cylinder head is ready for replacement. It is first of all necessary thoroughly to clean the gasket and remove any carbon deposit adhering to its edges, and to coat both sides of it with an even film of Castile soap. If the gasket has been in any way damaged during the removal of the cylinder head, do not attempt to use it again, but immediately procure a new one. See that any new gasket does not burr up around the stud holes and that the cylinder bore openings are clear of the cylinder bores themselves. The gasket can then be located over the studs in the cylinder block and gently pushed into position on to the upper face of the cylinder block. It will be found convenient to use a short length of tubing (a box spanner does quite well) over the studs to push the gasket in position. This should be done very gently, taking care to keep the gasket parallel with the cylinder head and not to force one end or one side down before the other.

The cylinder head may now be lowered into position on to the cylinder block; at the same time arrange for the duplex chain to be pulled through up the slots in the cylinder head by the strings or wires as described on page 30.

Replace the 14 cylinder head nuts and tighten them up in the rotation indicated in the illustration, giving each a quarter of a turn at a time until all are up tight.




Order of Tightening Cylinder Head Nuts.

Turn the camshaft so that the timing marks on the chain wheel are on bottom centre.

Replace the duplex chain, fit the connecting link complete with loose centre links and secure with the spring clip. It will be found of great assistance when refitting the chain to use a piece of wire.

The wire should be $\frac{1}{8}$ in. dia. (10 S.W.G.), approximately 10 in. long, with a right-angle bend about 1 in. from the end. Place the one end of the chain on the camshaft chain wheel so that the connecting link will fit on the top tooth, put the bent end of the wire through the hole in the last link of the other end of the chain and pull up into position.

Check the timing of the engine—the marks on the camshaft chain wheel should be exactly on bottom centre, the marks on the flywheel 1/6 to be on top centre, and the distributor to be in a position for firing on No. 1 cylinder when fully retarded.

Replace oil pipes, exhaust and inlet manifold with carburetter and controls, petrol pipes, sparking plugs, high-tension cables, and the valve cover. When replacing the oil feed pipe, make sure that the oil restrictor pin is in place.

Fill the radiator with water, start up the engine and let it idle quietly until it is thoroughly warm. Then, switching off again, remove the valve cover and go over each of the cylinder head nuts in turn, giving each a final tightening up. It will be found that now the engine is warm an extra half turn or so can be given to each nut. Do not attempt to speed up the engine until this final tightening has been effected. Start up the engine and ascertain that oil is exuding from the small oil passage drilled in each valve rocker-arm, and lubricating the cam surfaces.

After 250 miles the valve cover should again be removed, the cylinder head nuts tightened up and the valve clearances checked.

## CHAIN ADJUSTMENTS AND ENGINE TIMING

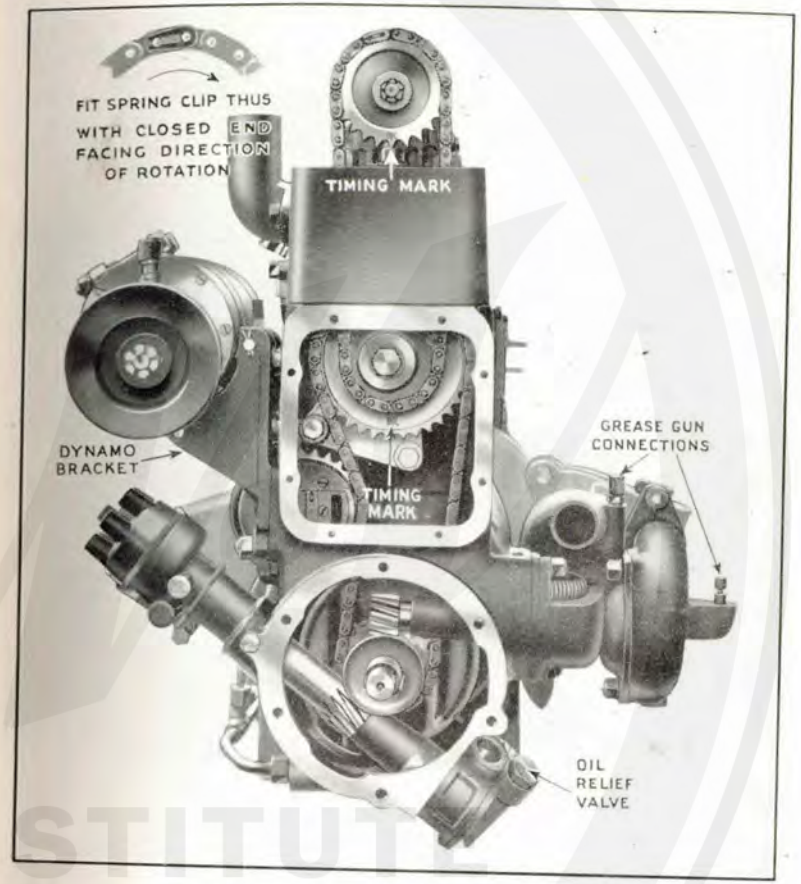
The camshaft is driven by roller chains in two stages. A single roller chain with a patent automatic adjuster carries the drive from the front end of the crankshaft to a countershaft bracket mounted on the front of the cylinder block. A duplex roller chain is used to transmit the drive from the countershaft to the camshaft, adjustment being obtained by swinging the countershaft bracket (see illustration).

To adjust the chain it is necessary to take down the radiator, having first of all removed the bonnet, radiator stay rods and rubber hose connections and cylinder head cover. Remove the chain cover from the cylinder block, which exposes the automatic adjuster and the countershaft chain wheels. Slacken the hexagon-headed screw which secures the chain wheels to the countershaft bracket, loosen the screws marked A and B on illustration. The bracket will pivot on screw A and allow the duplex chain to be tightened and the slackness transmitted to the single chain which is automatically tightened by the patent chain adjuster.

The single-roller chain is endless and all the necessary adjustment will be taken up by the automatic chain tensioner. If it is desired to



remove the single-roller chain it is necessary to raise the front end of the engine, remove the front support, disconnect the oil pipes to the oil cooler, remove the oil pump and water pump and the dynamo support bracket complete with chain tensioner, which will slacken the chain sufficiently to allow it to be taken off the chain wheels.




**Front view of Engine with Chain Cover removed.**

To raise the front of the engine release the rear engine arm bolts, take out the front support bolts and place the jack under the front portion of the engine case (not the oil base).

To fit a new single-roller chain or to reassemble the old one, turn the engine so that No. 1 and No. 6 pistons are on top centre ; place the countershaft chain wheels with the marks on bottom centre.

Place the chain in position with right-hand side taut, press in the left-hand side of the chain by hand as far as possible and see that the chain wheel mark is still at the bottom centre. Turn the camshaft chain wheel to bring the marks at bottom centre. Reassemble the dynamo bracket with chain tensioner, which will automatically take up the slack in the left-hand side of the chain.

Refit the oil pump, water pump and front support, taking care to replace rubber packing washers in their original position; connect oil cooler pipes.

**Important.**—An examination of the chain tensioner will reveal two pawls operating against two ratchets. When refitting the tensioner


**View of Engine Chains, showing Eccentric Bush and Chain Adjuster.**

these pawls must be placed out of action until the bracket carrying the tensioner has been securely bolted up. This can be done by binding together the two horizontal pins at the base of the pawls by means of a piece of thin wire. Refit duplex chain and adjust as previously mentioned.



Re-check the markings on the chain wheels. It should be noted here that only once in every ten revolutions of the engine will the pistons in No. 1 and No. 6 cylinders be on top centre at the same time as the markings on the chain wheels are in their correct relative positions.

## Pistons and Piston Rings

To remove a piston it is first of all necessary to remove the engine oil sump, when the big-end bearing caps can be taken off and the piston withdrawn through the crankcasing.

Turn the crankshaft so that the piston which is to be removed is at half stroke, i.e. the crankpin for this connecting rod being in a horizontal position. Take one connecting rod at a time, remove the cap. Push the connecting rod and piston a short distance up the cylinder to allow the connecting rod to clear the crankshaft. The connecting rod and piston can now be withdrawn. Do not use force or pressure of any kind, and great care should be taken not to damage the skirt or lower portion of the piston.

When the piston has been withdrawn to a position opposite the crankpin it will be found to be an advantage to slightly rotate the crankshaft; this action will give more clearance around the piston.

**Note.**—If the cylinder head has not been removed do not push the piston too far up the cylinder, as it is possible to push the top of the piston past the cylinder bore and thus allow the rings to spring open, which will prevent the piston from being withdrawn and will necessitate the removal of the cylinder head.

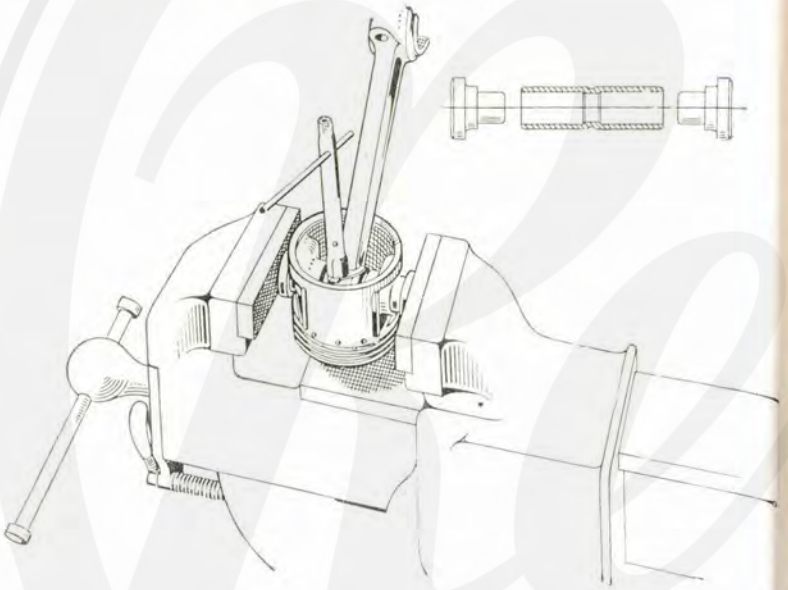
The piston rings can then be removed by working one or two pieces of strip tin underneath them, which will enable them to be withdrawn from their grooves. The piston ring grooves should be scraped quite clean from carbon deposit before the piston rings are replaced, and the latter should be quite free in the grooves but without appreciable play in a vertical direction. When fitting new rings try these in the working portion of the cylinder bore and see that the ends do not butt together, but leave a space of about .003 in. To effect this test it is necessary temporarily to replace the piston and hold the piston ring firmly on to the piston crown.

When replacing the connecting rods and pistons, see that the parts are replaced in the same position as they were before they were disturbed. Each connecting rod is numbered on the cap with the number of the cylinder to which it belongs, and the connecting rod and cap are also numbered on the bolt bosses, so that the bearing cap can be replaced in the correct position. No. 1 cylinder is that nearest the radiator of the car.

When replacing the pistons into the cylinders, care must be taken in introducing the rings into the cylinders. If a clip is not available, the ring must be gently pressed into position in the groove by using a long screwdriver to gently lever the ring into position, first one side and then the other, using the slot cut away at bottom of cylinder walls as the fulcrum.

### Gudgeon Pin

The gudgeon pin is of the fixed type, and special precautions are necessary when removing it from the piston.



The illustration shows how the gudgeon pin must be held in a vice to remove the set screw. Do not hold the connecting rod or piston in a vice.

The plugs should be made as illustrated with a small diameter to insert in the bore of the gudgeon pin, and a shoulder of sufficient diameter to register against the end of the gudgeon pin. We can supply these plugs to order.

Having placed the plugs in position and secured the piston firmly in vice, bend back the tab on the locking washer and then remove set screw with a box spanner. The gudgeon pin can now be pressed or driven out.



It is advisable to use new tab locking washers each time the set screw is removed.

**Note.**—The set screw must be screwed up firmly, but do not overstrain it—use the small tommy bar supplied in tool kit; do not exert a great pressure on the tommy bar. Do not, under any circumstances, omit to lock the set screw. Bend up the tab on the locking washer against a side of the hexagon on the head of the set screw. This can be done with a cold chisel or a screwdriver.

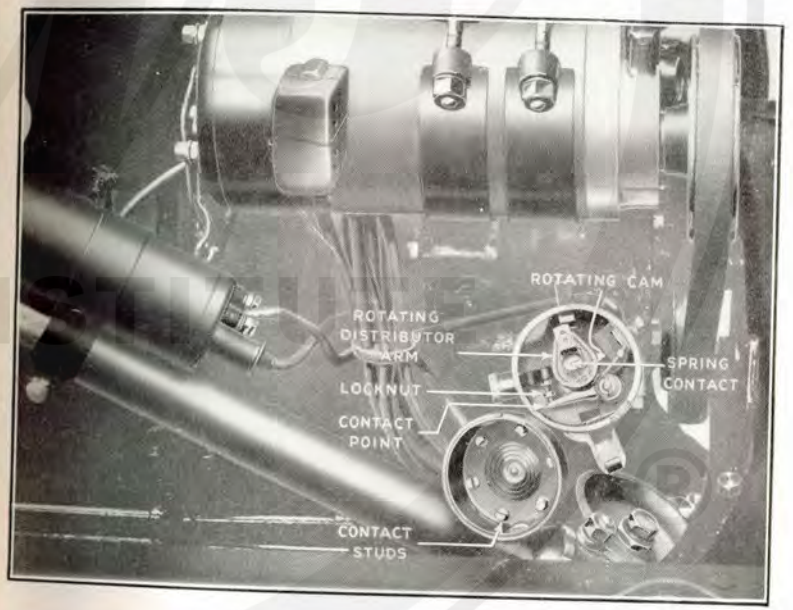
### The Dynamo

There is very little on the modern dynamo likely to give trouble and for this reason there will seldom be need to disturb it. On those few occasions when trouble is experienced with the electrical equipment, it is always advisable to entrust its rectification to specialists. We therefore give on page 92 a list of Lucas Service Depots, and if you can arrange to call upon any of these with your car you will be assured of the best possible expert attention.

See chapter on Electrical Equipment for remarks on the care and maintenance of the dynamo.

### To Adjust the Dynamo Belt

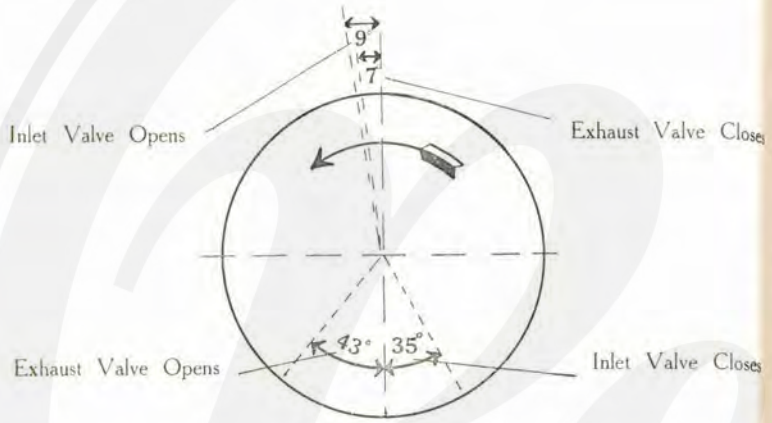
An intermittent or faulty output of the dynamo can be caused by the driving belt slipping. The belt should always be kept tight.



The dynamo spindle is carried eccentric to its outer casing, so that by releasing the saddle clips and revolving the dynamo in its cradle the driving belt can be tightened or slackened as desired.

The firing order of the cylinders is 1, 4, 2, 6, 3, 5, No. 1 cylinder being nearest to the radiator.

Numbered clips will be found on each ignition cable.




View looking at flywheel.

**Valve Timing.**

## Ignition Timing

The ignition hand control should be set to be at full retard when the piston is on top dead centre.



CHAPTER II

# Carburetter

**Carburetter.**—The carburetter is of the S.U. controllable jet type, and the method of working is as follows. The area of the air passage or choke and the orifice of the fuel jet are automatically varied by means of a sliding piston (" P.N.") and a tapered needle valve (" N.V.") attached thereto. The piston is raised under the influence of the motor suction, its movement increasing as the engine accelerates, until it reaches its upper limit of travel at maximum engine speed. It will be seen that as the piston is raised a larger space is available for the passage of air, and at the same time the tapered needle is withdrawn from the jet to allow more fuel to pass. The piston and tapered needle in conjunction with a controllable jet (" J.T.") are so proportioned as to provide the correct mixture at all speeds and loads.

We would draw the attention of owners to the fact that the carburetters are adjusted to each individual engine before the car leaves the Works, and it is therefore unlikely that any further adjustment by the owner will be necessary. To provide for exceptional conditions of climate or weather, however, the setting of the jet for normal running may be varied by the adjustment of the jet adjusting screw.

**The Controllable Jet.**—It is well known that a somewhat richer mixture is required when starting and while the engine is warming up than is required when the engine is hot. Provision is therefore made for controlling the effective orifice of the jet in relation to the tapered needle by means of a control knob on the instrument board.

The following are the main objects of the controllable jet :—

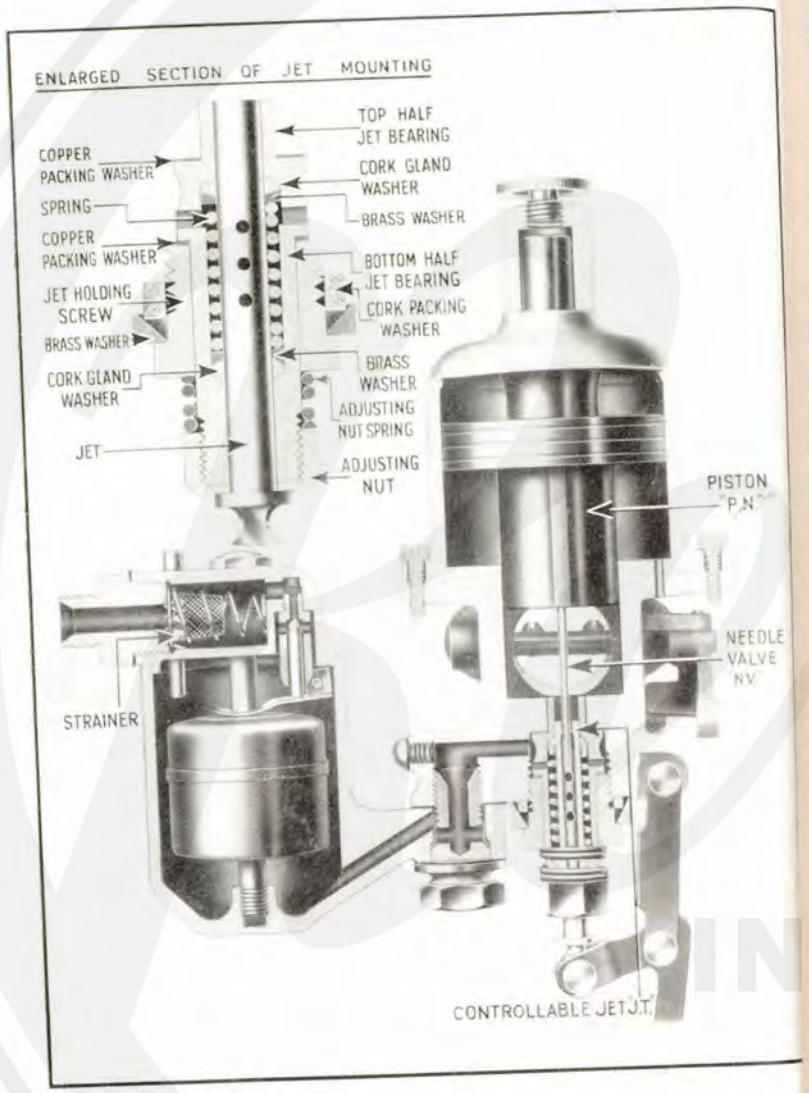
(1) To place in the hands of the driver an easy means of controlling the strength of the mixture either on the road or when the car is stationary.

(2) To facilitate starting.

(3) To give the greatest economy of fuel.

(4) To give good running, even when the engine is cold.

**Starting from Cold.**—To start the engine pull out the jet control knob on the instrument board and open the throttle slightly more than the normal slow-running position when the engine is hot. **Do not flood the carburetter,** as this may give an excess of fuel, and starting will then be very difficult until this excess has been cleared,




**Carburetter.**



and **do not open throttle too wide.** As soon as the engine starts push in the jet control knob to such a position that the engine will continue to fire evenly, and as soon as possible push in the knob to its full extent, which is the normal running position when hot.

**Erratic Running.**—There is a number of causes of bad running of the engine, the more common being enumerated below, but if the carburetter is at fault it can only be due to one of the following :—

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

**(1) Piston Sticking.**—The piston should at all times rise and fall quite freely. Test this by inserting a finger in the air intake and lifting the piston to its full extent, when on being released it should fall rapidly to its seat. If it does not, remove the oil cap from the top of the suction chamber and pour a little paraffin into the orifice at the top, at the same time work the piston " P.N." up and down ; when perfectly free put a little thin oil, such as sewing machine or bicycle oil, into the orifice and replace the cap.

The lead seal which will be noticed attached to the dashpot is merely a precautionary measure to prevent indiscriminate opening of the dashpot. This has been found necessary, due to the fact that it is quite easy to bend the needle when reassembling and so destroy the essential freedom of the needle and the floater.

**(2) Dirt or Water in the Carburetter.**—When this is suspected flood the carburetter by holding up the float-chamber needle, raise the piston to its fullest extent and watch the jet ; if the fuel does not flow freely there is a blockage. To remedy this start the engine, open the throttle wide and block up the air inlet **momentarily,** without shutting the throttle—keep the throttle open until the engine starts to race. It is most important not to block up the air inlet for more than one or two seconds. A strainer is provided in the float-chamber connection, and this should be inspected periodically to see that it is quite clear of foreign matter. This trouble seldom arises with the S.U. carburetter, owing to the large size of the jet and fuel passage. If it happens the above method will nearly always clear it. Should it not do so, however, it may be necessary to remove the jet, but as the reassembling of this is a delicate operation every other possible cause of shortage of fuel should be carefully investigated and the jet only removed absolutely as a last resort.

Take off the petrol pipe and blow through it to make sure there is no obstruction. See that there is no sediment in the float-chamber, and no obstruction in the form of fluff or other foreign matter in the passage between the float-chamber and the jet.

If all this fails to remedy the trouble the only alternative is, of course, to remove the jet, which is done by unscrewing the large hexagon nut at the bottom of the body of the carburetter. The jet consists of several parts and care must be taken to reassemble in the correct order (refer to the diagram of the jet parts). When the jet has been refitted into the carburetter make sure that the piston is perfectly free ; if it is not, slacken off the large nut and re-tighten. It may be necessary to do this several times before the piston is free.

(3) **Float-chamber Flooding.**—This can be seen by the fuel flowing over the float-chamber and dripping from the air inlet, and is generally caused by grit between the float-chamber needle and its seating. To remedy this turn off the fuel, remove the float-chamber lid and carefully clean out the chamber, paying special attention to the needle seat. After replacing the lid turn on the fuel and twist the needle round a few times on its seating. Do not grind the needle or its seating.

Other causes of erratic running are as follows :—

**Plug Points**—being too far apart, causing misfiring and popping in the carburetter when the engine is at full throttle, pulling hard on hills, also difficult starting from cold.

**Oily Plugs**—causing bad starting and misfiring.

**Sticky Valves or Faulty Tappet Adjustment**—causing misfiring and popping in exhaust and through carburetter.

**Bad Joint**—between the carburetter and the engine.

**Worn Inlet Valves or Guides**—causing bad starting, and engine will not idle well.

**Blockage or Air Lock in Petrol Pipe**—causing carburetter to give symptoms of weak mixture, i.e. lack of power and popping back through air inlet. This can be tested by removing float-chamber lid and float from carburetter to see if there is free flow through the fuel passage in the bottom of the float-chamber. If air bubbles come through, an air lock is the trouble, and it is generally due to shortage of fuel in the tank.

**Adjustment for Idling.**—The correct needle is fitted before the car leaves the Works ; the only adjustment is the setting for idling.

No adjustment should be attempted before the engine has attained its normal running temperature.

Adjust in the following manner. First screw up as far as possible the jet adjusting nut, which will be found at the base of the jet, and push in the jet control knob. In this position the mixture will probably



be found to be too weak and the engine will not start or run. It should be enriched gradually by pulling out the jet control knob on the dash until the correct idling mixture has been obtained. The jet adjusting screw should then be unscrewed until the base of this nut comes into contact with the jet head.

As previously pointed out, this is the one possible adjustment, and it is of no use whatever trying to adjust the carburetter in any other manner.

The jet itself is a standard size and never varies ; therefore on no account alter its size.

The correct adjustment having been found, the carburetter will continue to function indefinitely without alteration, but if after a period of satisfactory running the engine runs badly do not make alterations to the adjustment of the carburetter on the chance of putting the matter right, but seek the cause by the methods indicated on an earlier page.

**Fuel.**—No readjustment of the carburetter is necessary with different fuels, and it will function equally well with petrol, benzole, or mixtures of these in any proportions.

The fuel we recommend for these engines is a mixture of benzole and petrol in equal proportions.

**"Pinking."**—" Pinking " is due to the spontaneous ignition of the residue of the charge after primary ignition has occurred round the sparking plug points, caused by the pressure rising to such an extent that the spontaneous ignition temperature of the mixture is attained.

As this pressure depends upon the initial compression, it follows that a high efficiency engine is more liable to " pink " than one having a relatively low compression.

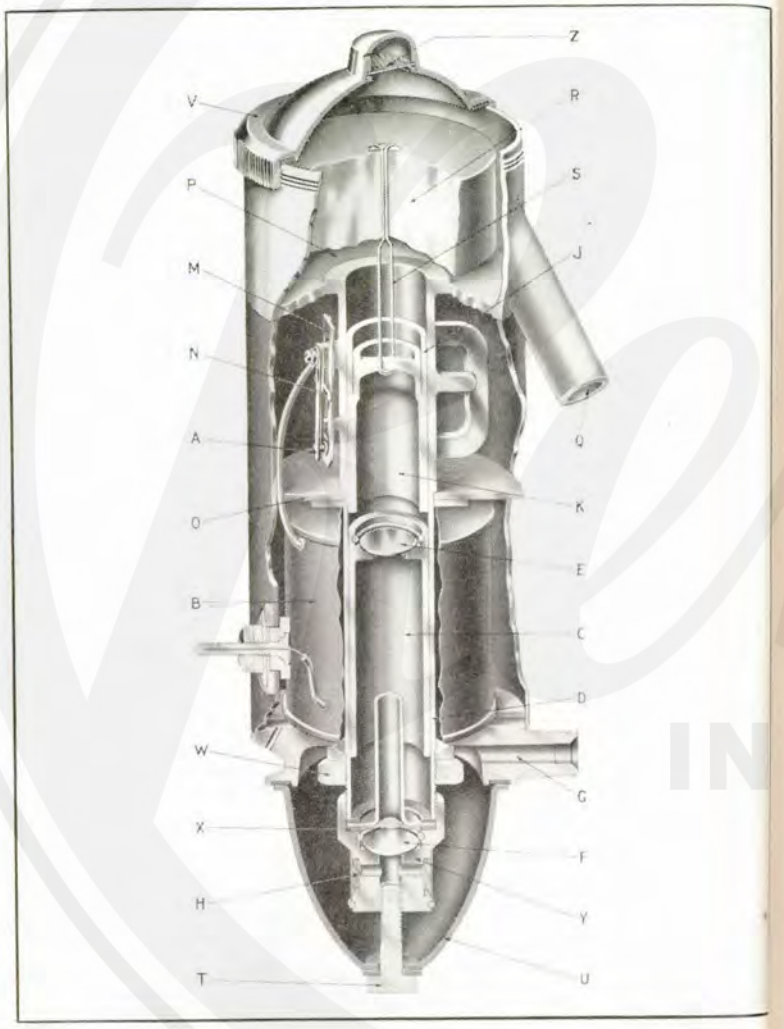
The liquid fuels at present available vary considerably in their spontaneous ignition temperatures, and some of them have a comparatively low spontaneous ignition temperature, consequently the tendency to " pinking " is greater when using these fuels in a modern high efficiency engine.

A ready means of preventing " pinking " is, however, available. Benzole has a spontaneous ignition temperature several hundred degrees above that of any petroleum spirit, and if mixed with any type of petrol in equal proportions practically eliminates the tendency to " pinking."

## THE S.U. PETROLIFT

This instrument is constructionally very simple and it is very improbable that it will give any trouble at all. Should it, however, cease to function, the trouble will probably be due to :—

(1) The pump plungers (C or K) sticking, due to dirt or grit getting between the pump plungers and the body. Often a blow on the pump with the fist is sufficient to get it working,






when the dirt will pass right through. Should it not do so, the remedy is to remove the filter bowl (U) and foot valve (Y), also the top cap of the pump and the cork float, when it will be possible to push the plunger (C) through the bottom, after which a clean rag can be drawn through the bore of the pump. Note when assembling the plunger of the pump that valve (E) is on top.

If the foregoing is found to be in order,

(2) Remove the top cap (V) from the pump to see if the float-chamber contains petrol. If it does then the trouble is not due to the pump.

(3) Should the pump continue to make a pumping noise without delivering petrol, it is due to one of the following causes :—

(*a*) Lack of petrol in the back tank.

(*b*) Air leak, which may be due to

(1) a bad joint between the filter bowl (U) and the casing, in which event tightening up will generally correct. If it does not do so a new washer will have to be fitted,

or

(2) a loose petrol union on the suction pipe, that is to say any point between the bottom union of the pump and the back tank. The washer between the filter bowl and its bolt (T) should also be inspected.

(*c*) Foot valve (F) held up. This is a very rare source of trouble. To rectify remove the filter bowl (U), filter (H) and foot valve (Y) by means of a tommy bar through one of the holes. The foot valve can then be cleaned. A second filter (X) will be found in the foot valve underneath the priming tube.

(4) If the pump works very slowly without delivering petrol, it is due to

(*a*) Blocked petrol pipe or filters, in which case the filters or pipe must be cleaned out.

(*b*) Batteries run down, in which case fill the float-chamber of the pump with petrol. This will probably enable the engine to be started up by hand, and as the dynamo comes into action it will boost up the batteries sufficiently to run the pump.

(5) Should the pump not work at all, providing the plunger has not stuck, the trouble will be due to

(*a*) A bad electrical connection. To test this remove the terminal from the pump and flash the wire across the pump body. If there is a bright flash this is in order. If not, the trouble is due to the batteries being run down or bad connections somewhere in the system.

The electrical apparatus is to all intents and purposes absolutely foolproof. Practically the only thing that can cause this to cease to function is a broken wire. If reference is made to the diagram the connections will be seen exactly. To gain access to the electrical part of the pump it will be necessary to remove filter bowl (U), foot valve (Y), unscrew the large hexagon nut (W) holding the inlet ring, when the casing can be drawn off and the internal parts of the electrical equipment and connections inspected. Care must be taken to see that the cork gland washer which makes a petrol-tight joint between the inlet ring and electrical equipment is in perfect condition. A new cork gland washer is advisable.

When the casing is removed care must also be taken to see that the wires are not broken, and particularly that the top wire does not come across the rocking contact plate (M). A simple test for the contacts being in working order, providing the bottom plunger has not stuck, is to remove the cap (V) from the top of the pump and lift the float (R) up and down its full stroke. If listened for intently the rocker plate can be heard to click as it breaks the contact.

If, after being reassembled, the pump works but does not deliver petrol, it should be primed by pouring a small quantity of petrol into the top chamber. If petrol is not available a few squirts of thin oil down the tube of the pump after removing the float (R) and top plunger (K) will have the same effect. Please note the oil must be thin.

The Petrolift is unconditionally guaranteed (except for obvious mishandling) by the makers, Messrs. S.U. Company, East Works, Bordesley Green Road, Adderley Park, Birmingham, to whom all queries should be addressed.

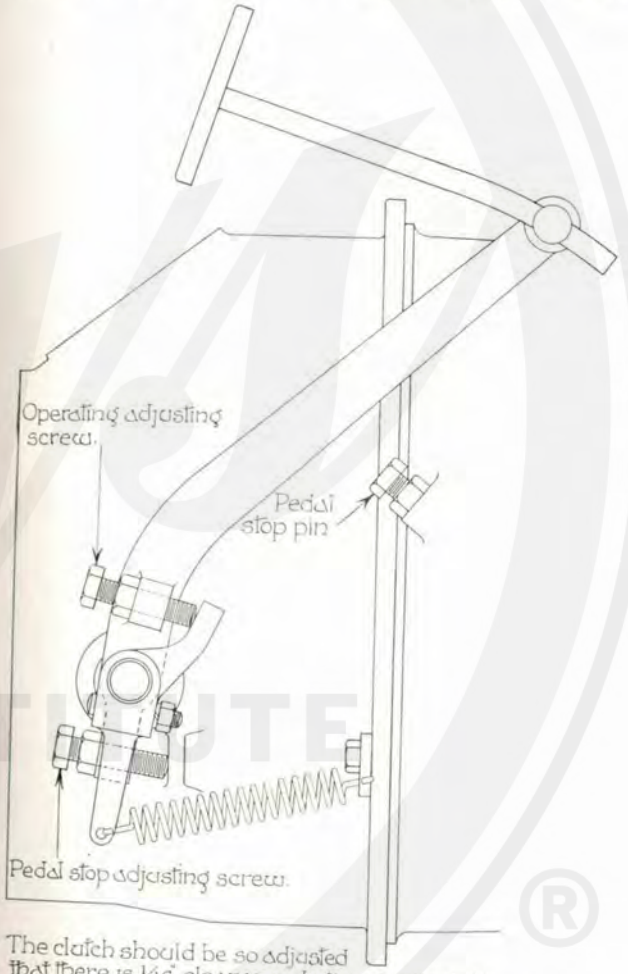


CHAPTER III

# Chassis Adjustments

**Clutch.**—The clutch is of the single dry plate type, the driven member, carrying the fabric facings, being gripped between two highly finished surfaces.

These surfaces must be kept absolutely free from oil. The clutch does not require any lubrication, neither should any adjustment be necessary except, of course, the operating pedal, which may

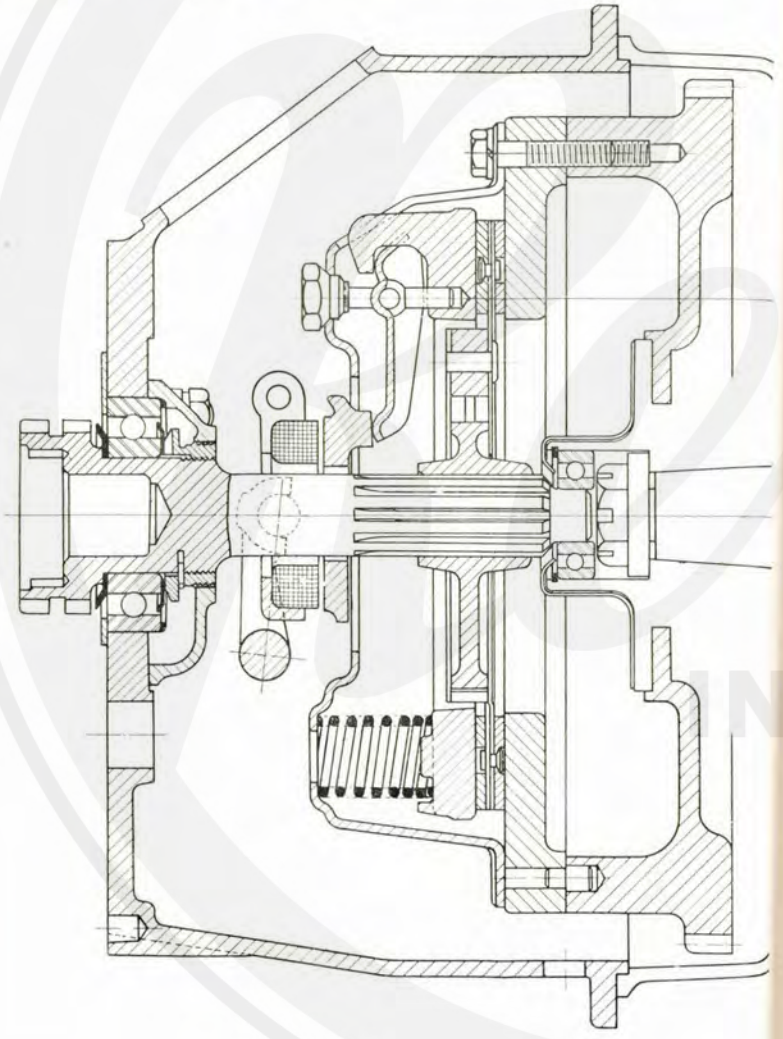



The clutch should be so adjusted that there is 1/16" clearance between graphite release bearing and the clutch release lever plate. Remove clutch cover to check this figure.

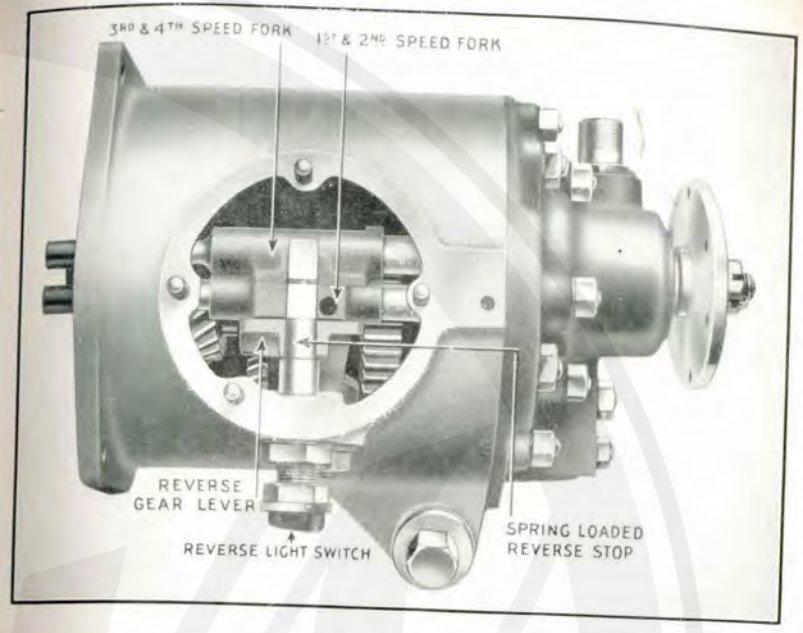
occasionally require adjustment to compensate for wear and give the correct pedal travel.

The illustration below shows the general construction of the clutch.

If at any time it is desired to remove the clutch for examination it is advisable that wedge pieces be inserted between the pressed-steel operating lever and the outer steel casing before attempting to unfasten the set screws which hold the clutch casing to the flywheel. The wedge pieces require to be approximately $\frac{1}{4}$ in. thick by $\frac{3}{8}$ in. wide and, say, about 1 in. long.

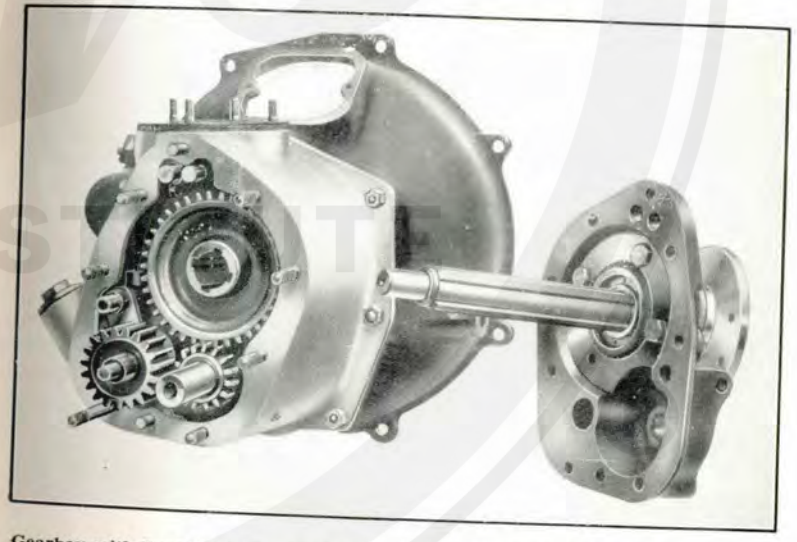




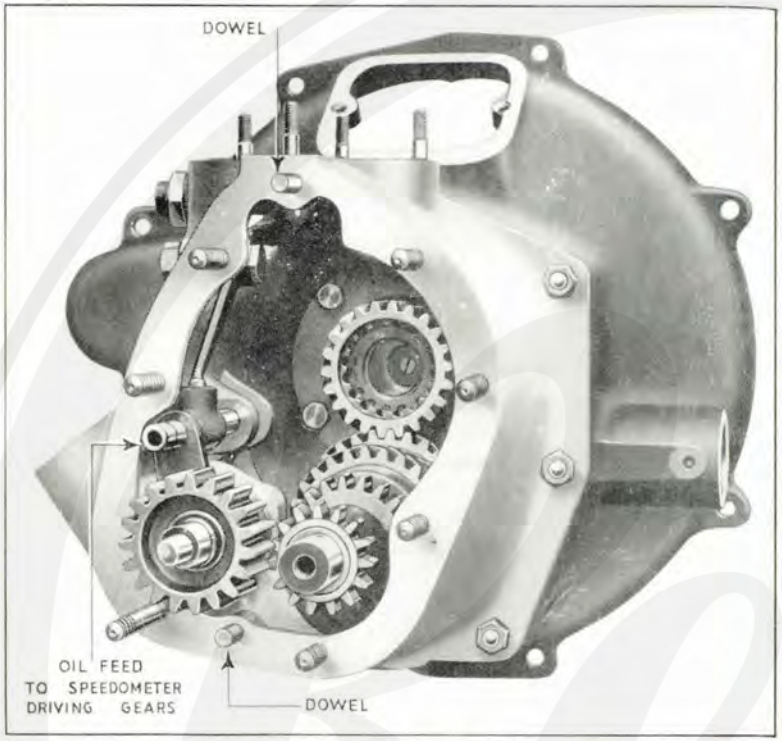



**Change Speed Lock**

**Gearbox.**—The gearbox should not require any attention beyond the instructions regarding lubrication given on page 14. If at any time it is found necessary to dismantle the gearbox the illustrations will be helpful.



**Gearbox with Rear Cover removed, showing how the Mainshaft can be taken out.**




**Gearbox with Rear Cover and Mainshaft Gears removed.**



## REAR AXLE

The rear axle is of the three-quarter floating type; the driving shafts only transmit the driving torque and do not support the weight of the vehicle. The bearings are therefore not mounted on the driving shaft itself but on the axle casing, and the wheel hub, with driving shaft attached, can be withdrawn without interfering with any other part, after the wheels and brake-drums have been removed.

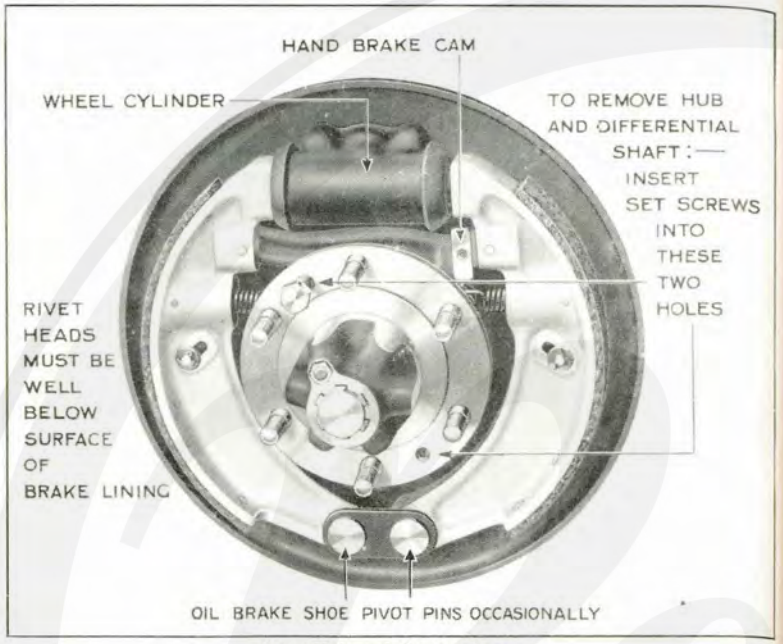
The removal of the driving shaft is quite an easy task, and the only special tools required are two set screws which should be threaded $\frac{5}{16}$ in. British standard fine thread. The rear hub is pressed on to the driving shaft and difficulty will be experienced in removing the rear hub from the driving shaft unless a powerful press is available.

We therefore recommend that if it should at any time be necessary to fit a new driving shaft, the hub should be returned to the Works for fitting to the shaft or the new shaft ordered complete with hub.

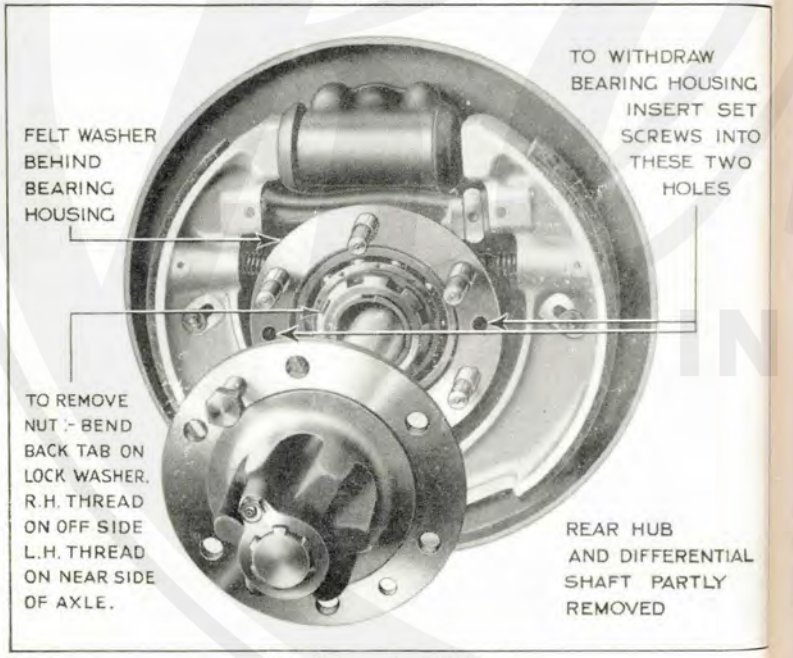
The differential with spiral bevel gear can be removed after withdrawing the driving shafts and disconnecting the universal joint; the whole unit can then be taken out complete as shown on illustration (page 57).

If any adjustments to the differential bearings are required, these should be made before remounting the unit by bending back the tabs on the locking washer engaging the castellations of the lock nut, and, after tightening the nut, relocking it by bending back those tabs of the locking washer which coincide with the lock nut castellations. The bearings should be equally distanced from the ends on both sides. It must be understood that the bearings take the load and thrust of the crown wheel and pinion, and care must be taken to see that they are squarely bedded down before the caps are replaced, and when the caps are screwed down the differential cage must be free to rotate in either direction.

When the differential has been remounted, adjustment to the drive pinion may be required. This will be evidenced by undue noise either on the " drive " or " overdrive " when the car is on the road. If the pinion produces noise on the " drive "—that is, when the engine is under load—the pinion is in too close engagement with the crown wheel. If, on the other hand, the pinion produces noise on the " overdrive "—that is, when the foot is taken off the accelerator pedal and the engine functions as a brake—this indicates that the pinion does not mesh sufficiently deeply into the crown wheel. The position of the pinion relative to the crown wheel is adjusted by adding to or removing the packing shims between the pinion shaft ball race sleeve and the face of the differential carrier. Access to these shims is attained by removing the nuts just behind the rear universal joint and withdrawing the pinion shaft assembly from the differential carrier.

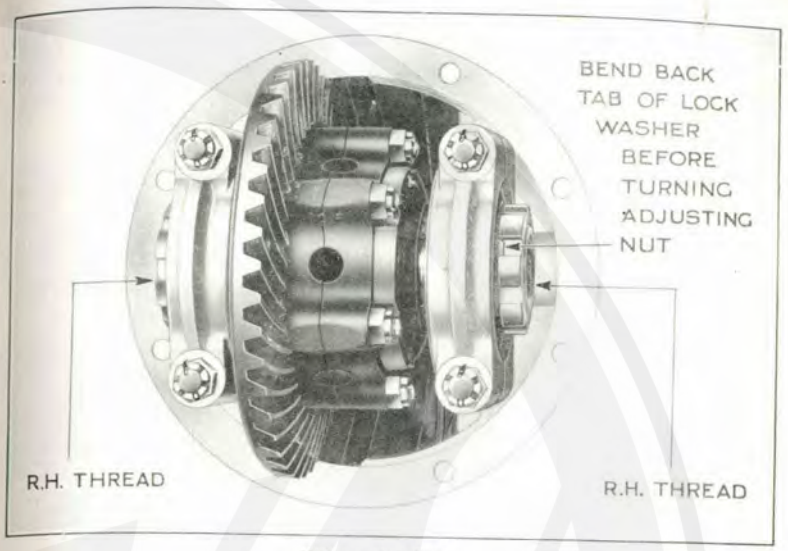



Rear Hub and Brake-shoes.

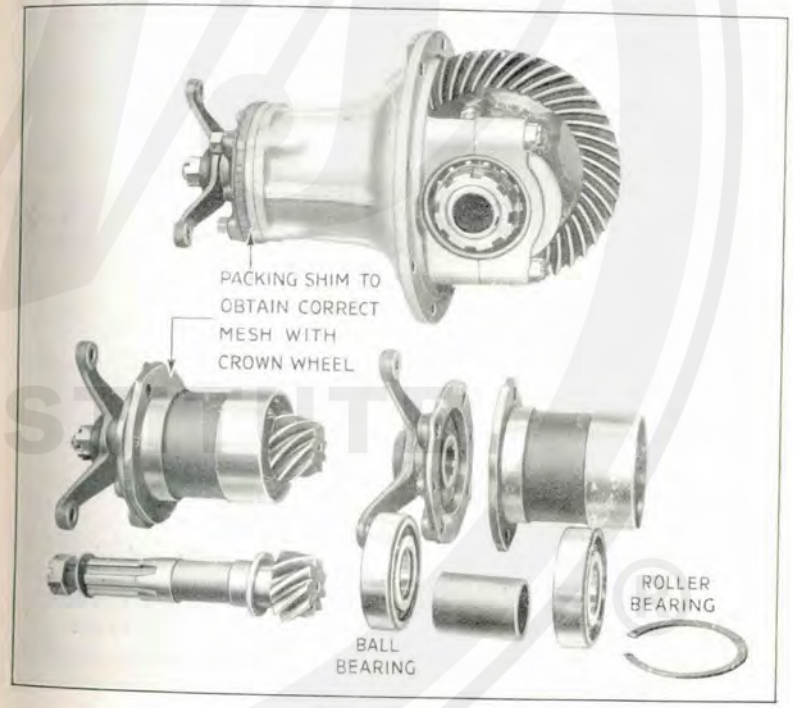



Rear Hub partly withdrawn






Differential Gear.

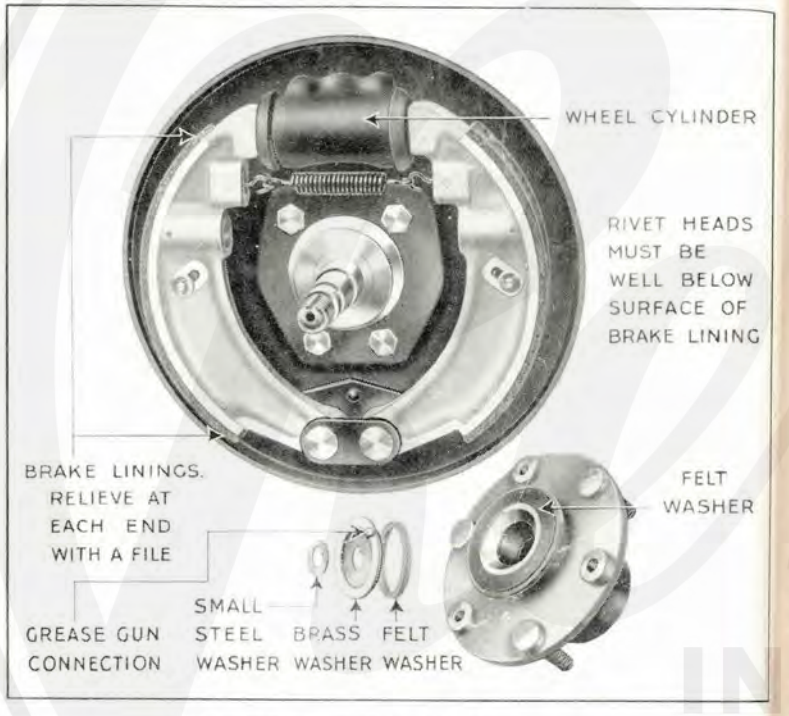



Differential Gear.

## Front Hubs

These run on journal type ball bearings, and are protected from dirt by a dust excluder and felt washer. The bearings are filled with grease before leaving the Works and should only require attention once in three months.

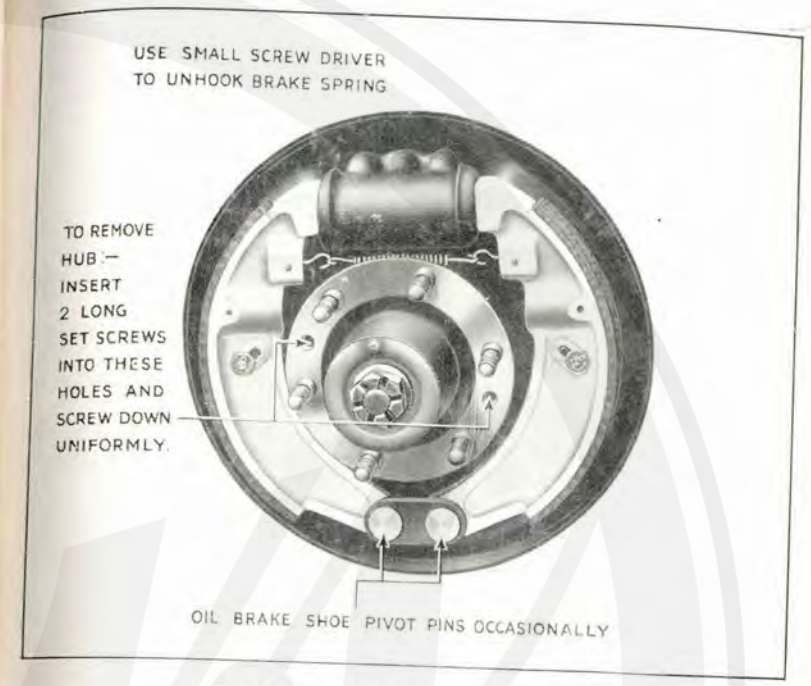
It is then desirable to remove the wheel hub with its ball bearings and clean. Before replacing see that the bearings are well supplied with solidified oil (see page 11). Before replacing the hub, make sure that the felt washer is in good condition. If it is not, replace it by a new one.




**Front Hub and Brakes with Hub removed.**

If a withdrawal tool is not available, three set screws may be inserted in the holes vacated by the countersunk-head screws which secure the brake-drum. Care must be taken to screw in each set screw a small amount, so that the hub flange is not tipped sideways. The set screws required should be threaded with $\frac{5}{16}$ in. British standard fine threads.






**Front Hub and Brakes (Magna Wheels).**

## BRAKES

**Foot Brake.**—The foot pedal operates simultaneously a pair of brake-shoes on each road wheel. The control is by the Lockheed Hydraulic system.

**How the Hydraulic System Functions.**—It should be known that **"pressure exerted upon any portion of a fluid enclosed in a vessel is transmitted undiminished equally to all surfaces."**

When pressure is applied to the foot pedal, the piston in the master cylinder is forced forward and causes the fluid to flow through the entire pipe line; the pressure created is given to each road wheel cylinder with equal and undiminished force.

The fluid in the wheel cylinder, being thus put under pressure, forces out the wheel cylinder pistons and so causes the brake-shoes to engage with the brake-drum.

The action of the brake-shoe return spring forces the fluid back to the master cylinder when the pressure on the foot pedal is released.

A feature of the design is the ease with which the brakes can be inspected, the brake-drums being fitted to the outer side of the hub

flanges. After taking off the road wheel, removal of two screws will allow the brake-drum to be drawn off and the whole of the interior mechanism will be exposed.

The supply tank, which is mounted on the dashboard, must be kept more than half full of fluid; this forms a reserve supply for the system.

**The supply tank must be replenished with Lockheed brake fluid.** The use of any other liquid would have a detrimental effect on the component parts of the master cylinder and the wheel cylinders.

The level of the fluid in the supply tank should be examined approximately once a month.

Cleanliness in regard to the fluid used is of paramount importance.

## The Master Cylinder

This is of the compensating type and is designed to maintain automatically a constant volume of fluid in the system when at rest, at a uniform pressure of 8 lb. per square inch, this pressure acting as a liquid expander on all rubber cups in the wheel cylinders, and ensuring complete and efficient sealing of the system. Automatic compensation is provided for expansion or contraction of the fluid due to temperature changes, by inlet and outlet valves. The special fluid used in the system is immune from freezing and unaffected by high temperatures.

Within the master cylinder is a piston " A " and a cupped washer " B " normally held in the " off " position by a coiled spring " C." When the parts are in this position the small port hole " D," immediately in front of the cup washer, should be just uncovered, thus connecting the cylinder interior with the hollow boss above it, which in turn is connected by a length of copper tube to the fluid supply tank.

Any expansion or contraction of the fluid due to rise or fall in temperature is compensated by a flow, through the port " D," either into, or out of, the supply tank, as the case may be.

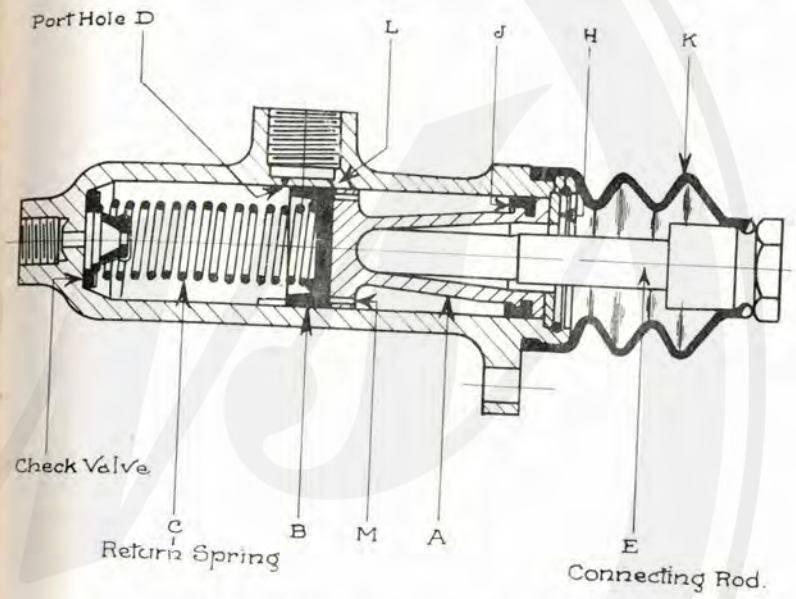
Pressure is applied to the piston " A " by means of a connecting rod " E " which is attached directly to the brake pedal, and is adjustable at " F." From the foregoing it is apparent that the connecting rod must be set so that the master cylinder cup " B " is clear of the port hole " D " when the brakes are in the " off " position. This is adjusted at the Works and should not be altered.

In the head of the master cylinder, held in place by the return spring " C," is a combination inlet and outlet check valve. When brakes are applied, the master cylinder piston is pushed forward, displacing fluid which opens the outlet check valve " G." The fluid is forced through this into the system. When the brake pedal is released, the master piston return spring " C " forces the piston back to its " off " position against its stop " H." At the same time



the brake-shoe return springs are forcing the fluid back through the inlet check valve " I," which, being of large diameter, allows the brakes to release immediately, until the fluid pressure balances the effort of the master cylinder return spring, when the inlet valve closes.

Leading from the interior of the hollow boss above the cylinder to the annular space formed between the two ends of the piston " A " is a large diagonal port " L." Throughout this port the annular space is at all times kept filled with fluid from the supply tank, leakage at the rear of the piston being prevented by a secondary cup " J."



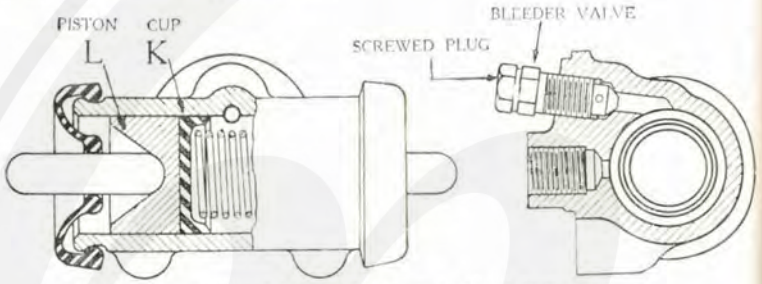

**Sectional View of Master Cylinder.**

If for any reason the return of fluid from the system, after braking, should be 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 fluid to by-pass from the annular space round the centre of the piston, through the six holes " M " in the master piston head, into the master cylinder.

Any excess fluid introduced into the system by this means will pass freely into the supply tank through the port " D " when the master cylinder piston returns to its " off " position.

A rubber boot " K " completely covers the open end of the cylinder and is fitted to prevent the ingress of dirt, etc.

**The Wheel Cylinder.**—The wheel cylinder is mounted rigidly on the brake carrier and is fitted with opposed pistons " L." In front of each piston is a rubber piston cup " K," held in position by a spring. The pistons are directly connected to the top end of the brake-shoes. On the top and in the centre of the wheel cylinder a bleeder valve is provided.




**Sectional Drawing showing Wheel Cylinder.**

It should be mentioned here that the adjustment provided limits the amount of travel of the brake-shoes to their " off " position, and so regulates the amount of travel required to move the brake-shoes to their " on " position.

The adjustment can be readily made by using a spanner on the two nuts shown on illustration. Jack up the car until the wheel is free. Turn the nuts in the direction indicated on the illustration until the brake-shoes can be felt to be contacting with the brake-drum. Now turn the nuts in the opposite direction just sufficient to free the brake-shoes from the brake-drum, so that the road wheel can be rotated without feeling any appreciable drag. Repeat this operation on all four road wheel brakes.

**Note.**—The brake-shoe anchor pins should not be adjusted or interfered with in any way, except when a new brake-shoe or lining is fitted.

To examine the brake-shoes or the wheel cylinders, take off the road wheel and remove the two countersunk-head screws, which will allow the brake-drum to be removed, thus exposing the brake-shoes.

To remove the wheel cylinder from the front-wheel brakes, disconnect the flexible hose at the frame end, remove the nut and lock washer. This is to allow the hose itself to rotate when unscrewing it from the wheel cylinder.

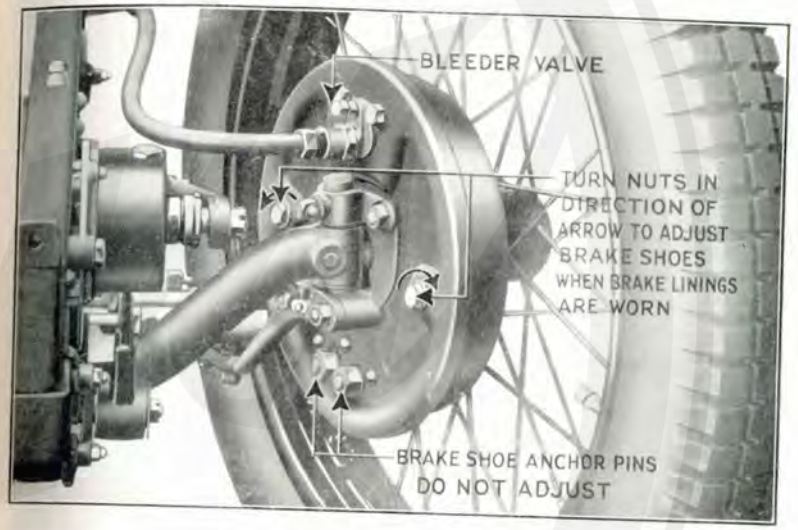
Rotate the cam adjustment nuts so that the brake-shoes can be swung back when the brake-shoe return springs are unhooked. The wheel cylinder can now be dismounted by removing the two set screws from the outside of the brake carrier.

To remove the wheel cylinder from the rear-wheel brakes, follow the above instructions, except that the copper pipe must be disconnected at the cylinder inlet. Care should be taken not to bend the copper pipe.



The wheel cylinder pistons will be forced out by the spring when the wheel cylinder rubber boots have been removed. See notes on page 64 regarding cleaning, etc.

**Filling and Bleeding the System.**—Bleeding the system is only necessary when some portion of the hydraulic system has been disconnected, or the fluid in the supply tank allowed to fall, so that the master cylinder is not full. In other words, air has been allowed to enter the system, and owing to the fact that air can be compressed, whereas a fluid is practically incompressible, this air must be removed. The action of removing the air is termed " Bleeding."




**Front Wheel Brakes.**

**To Bleed the Line.**—Fill up the supply tank with fluid ; exercise great care to prevent any dirt getting in.

Take one brake at a time, remove the screwed plug from the bleeder valve (" A "), and screw in its place the rubber tube with a union end, which will be found in the tool kit. Now obtain a clean glass vessel into which the open end of the rubber tube can be placed. Using the special spanner (" B ") supplied in the tool kit, pass the rubber tube through the centre of the spanner and then unscrew the bleeder valve about $\frac{3}{4}$ of a turn.

Depress the foot pedal by hand, allowing the pedal to return to its " off " position very slowly.

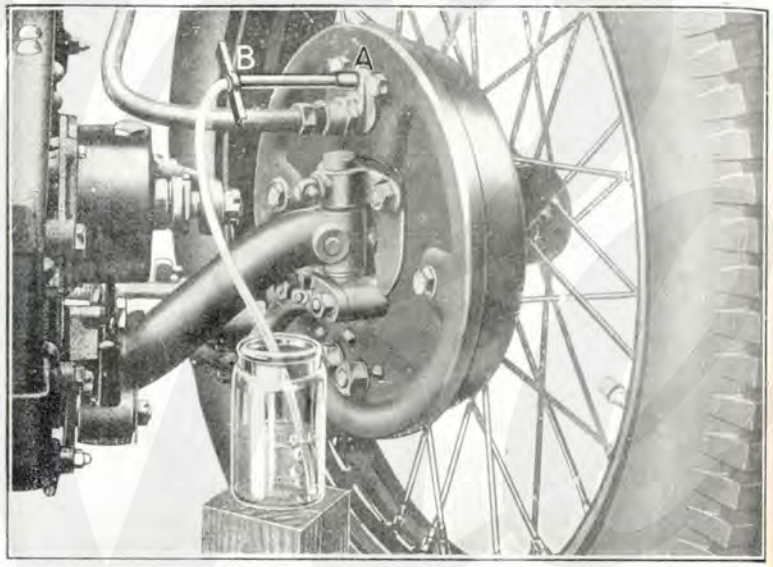
Approximately ten strokes of the pedal will be necessary to bleed each wheel cylinder, and no air bubbles should now be seen escaping from the end of the rubber tube.

When the fluid flow shows itself to be free from air, tighten down the bleeder screw hard, remove bleeder tube and replace dust screw and washer. It is not necessary to tighten this latter screw very tightly, as its only function is to exclude dirt.

Repeat this procedure on the other three wheel cylinders.

The fluid which passes through the rubber drain tube into the vessel mentioned above can be used to refill the supply tank, provided it is perfectly clean.

After the bleeding operation has been performed, the supply tank must be filled and the filler plug screwed down tightly.




Bleeding the System.

**When cleaning** the various units of the brake mechanism :—

**Do not use** paraffin or petrol on the rubber parts or on the inside of the cylinders.

**Use only** alcohol or brake fluid.

**The cup and the piston** should be dipped and cleaned in the brake fluid before inserting into the cylinder.

**Do not make** pipe joints with packing compounds ; clean metal-to-metal joints only should be made.

**Do not allow** the supply tank to be less than half full of brake fluid.



**Do not allow** grease, paint, oil or brake fluid to come in contact with the brake lining.

When the pipe line has been disconnected, the unions and joints must be carefully protected to prevent the entry of dirt or foreign matter.

**The brake-shoe linings** used throughout must be of the same type on all brake-shoes, owing to the fact that the coefficient of friction varies with different brands of linings.

When fitting new linings care must be taken to ensure that the rivet heads are well below the surface of the lining, also each end of the lining must be filed well back so that it is relieved from the brake-drum for about 1 in.

**Do not depress the brake pedal while a brake-drum is removed.**

## DIAGNOSIS OF FAULTS IN BRAKING SYSTEM AND THE REMEDIES

### Pedal travel excessive without resultant braking power

This may be due to several causes according to the symptoms displayed.

(1) Apply the brake vigorously several times in quick succession and hold. It will sometimes be found that by so doing a pressure can be built up and held in the system, only to be lost again as soon as the foot is removed. This is a certain indication that the brake-shoe clearance is excessive and requires adjustment, the explanation being that the first forward movement of the master piston merely serves to take up shoe clearance without doing any useful work, while working the pedal quickly several times operates the master cylinder as a simple force pump supplying fluid more quickly to the line than the brake-shoe pull-off springs can return it. **The remedy : Adjust the brake-shoes.**

(2) Lack of resistance may be due to the presence of air. This will show itself by an unmistakable " springy " feeling when the pedal is applied, and it will generally be found to be owing to a slight leak, perhaps, or insufficient attention when " bleeding " last time, or the fluid level in the supply tank has been allowed to get dangerously low, admitting air through the feed hole, instead of fluid. **Remedy : Fill up the supply tank and " bleed " the line clear.**

(3) Fairly solid feeling on the pedal but steady movement downwards under sustained pressure, sometimes coupled with poor and uneven braking.

This is indicative of a leak at one of the following points :—

Tube nut or hose fitting. Examine the pipe line carefully for evidence of leaky unions and tighten.

Wheel cylinder cup—this will possibly be the weak point if unequal braking is complained of. Remove drums and examine cylinders

and shoes for fluid leaks. Turn back the rubber boots (a slight amount of fluid is always present behind these, and provided that it is only in the nature of moisture, it need give no cause for alarm).

If a genuine leak is traced, remove the wheel cylinder completely and examine the bore and the pistons. If these are at all scored, they should be replaced together with the cups. In the case of a wheel cylinder leaking fluid into the drum or on to brake-shoes, the equality of braking will be greatly affected, and it is generally found most profitable to re-line the affected shoe, rather than to clean it. When new cups are fitted, care should be exercised that no dirt is allowed to enter the cylinder from surrounding parts—a warning that applies to all work with Lockheed brakes.

**At no time must any fluid other than "Lockheed" Brake Fluid be allowed to come in contact with the parts.**

### Leak at the Master Cylinder Cup

This may be detected readily by applying sustained pressure to the foot pedal for a long period and observing the level in the supply tank. If the pedal descends, showing that there is without doubt a leak, but there is no evidence of leakage either in the line or at the wheel cylinders, and moreover the fluid level in the supply tank does not descend, then the leak is at the master cylinder cup, which should be renewed.

This may best be done by draining the fluid from the supply tank by means of the drain plug, detaching all connections, undoing the four set screws in the master cylinder head and withdrawing the master cylinder. The small circlip retaining the master piston may then be removed, when the piston will be pushed out by its return spring and the faulty cup easily withdrawn.

### Loss of Fluid in the Supply Tank

Since the fluid is used merely as a power transmission medium, and is not in any way destroyed, it should last indefinitely, except for slight losses in "bleeding." Evaporation of the alcohol content in course of time, however, is inevitable, so that a slight drop in level in the supply tank is to be expected. Even so, an inspection of the tank level once a month should be sufficient. If the drop is observed to be excessive, then some direct and more serious cause must be sought, as a leak at the drain plug or in the line.

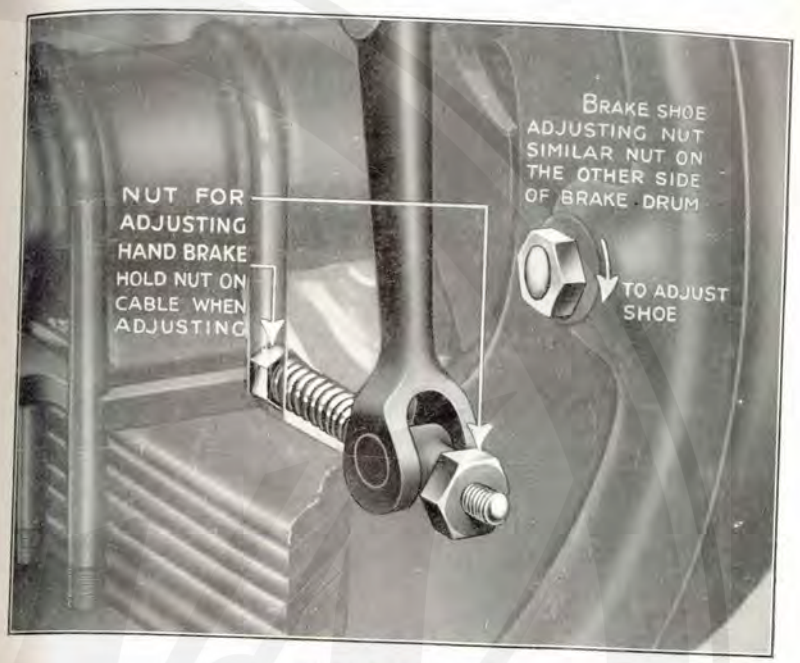
## HAND BRAKE

The hand brake is connected to cams which operate the rear brake-shoes as shown on illustration on page 56.

The adjustment for the hand brake is shown on illustration on opposite page.

The hand brake should be adjusted so that three notches on the quadrant are always left from the "on" position of the brake lever. This is necessary in order to avoid interference between the hand brake cam and wheel cylinder operation.






**Hand Brake Adjustment.**

## LUVAX HYDRAULIC SHOCK ABSORBERS

This shock absorber is of the double-acting type and is designed to control the road springs both on compression and on recoil. Consequently, when the road wheels hit a bump, part of the blow will be absorbed by the shock absorbers, and part stored in the spring to be given out during the recoil. The recoil is also controlled by the shock absorbers, so that the energy of the blow is completely absorbed and not transmitted to the chassis.

The general design is very simple and consists of a vane rotor working in a pressure chamber; this chamber being divided by a partition, in which is incorporated the control regulator.

As the road spring compresses when the wheel hits an uneven road surface, the lever arm moves and rotates the rotor in the working chamber, driving the oil through an adjustable orifice.

The energy stored in the road spring will now be given out on recoil and absorbed by the shock absorbers driving the oil in the reverse direction.

To safeguard against any possible loss of oil in the pressure chamber, a means of automatic recuperation is provided by an outer chamber which carries a large supply of reserve oil. By means of specially designed valves connecting the two chambers, the pressure chamber is always kept full.

These shock absorbers are very carefully adjusted before leaving the Factory. Facilities for re-regulating are, however, given through the filler plug situated at the top of the shock absorber. When the filler plug is removed, the regulator screw is easily turned by means of a short screwdriver. If turned to the right, the control action becomes greater, if turned to the left it becomes weaker. The screw is automatically locked in position.

*Do not move regulator screw more than a quarter of a turn at a time.*

**Connecting Link.**—Tilting bearings are used in the connecting links between the lever arm and the spring. These bearings consist of round blocks of rubber which grip the bearing portion of the connecting link firmly and obviate the use of ball joints. With this construction, they do not require any attention, such as lubrication, etc.

**Maintenance.**—The recuperating chamber must not be allowed to become empty, otherwise air will enter the pressure chamber and affect the action of the shock absorber.

Use only Luvax oil for refilling the recuperating chamber after about every 8000 to 10,000 miles' running. Luvax oil is a special grade vegetable oil, having properties essential for efficient working under all conditions.

Luvax oil and service generally may be obtained from any of Messrs. Lucas's Service Stations. (See page 92.)

## STEERING GEAR

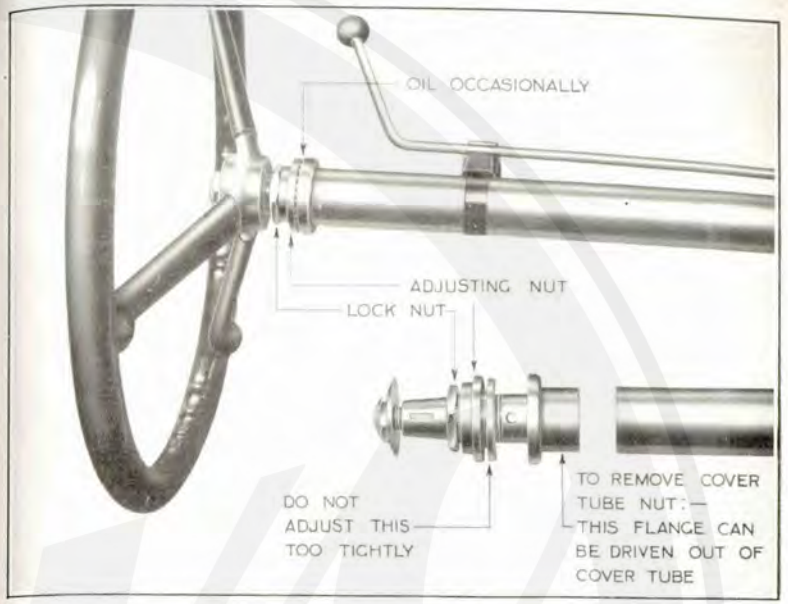
The steering gear is of the worm and wheel type, of simple design, and not likely to get out of order.

If the steering column shows signs of end play, this may be corrected by slacking back the lock nut which is to be found immediately below the steering wheel and giving the adjusting nut a fraction of a turn. Care should be taken to lock the lock nut in position again.

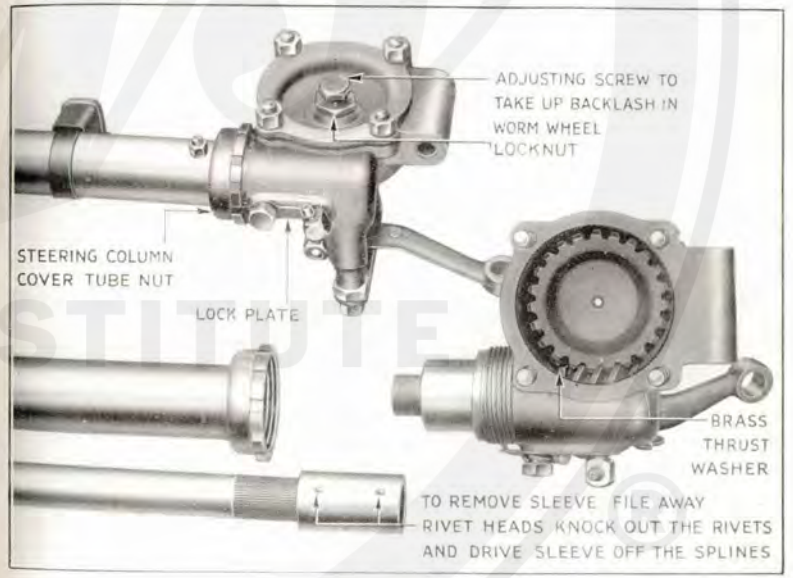
**Backlash** in the steering gear—that is, movement of the steering wheel without a corresponding movement of the front wheels—may be brought about by two things, of which wear in the worm and the wheel is one, and wear in the various joints of the steering links the other. The latter will not cause any trouble until the ball joints are worn out, as they are spring loaded and the springs will keep the ball cups up to their work. If any looseness of these joints ultimately develops, the balls and cups should be renewed. Backlash in the teeth of the worm and wheel may be detected by careful rotational oscillation of the steering wheel. If the movement of the steering wheel is excessive before the steering lever begins to move it may be necessary to bring into use a new set of teeth of the steering worm.

It will be noticed that although the worm wheel is a complete wheel, only a portion of the teeth are used to give full steering lock;






**Steering Wheel and Column.**



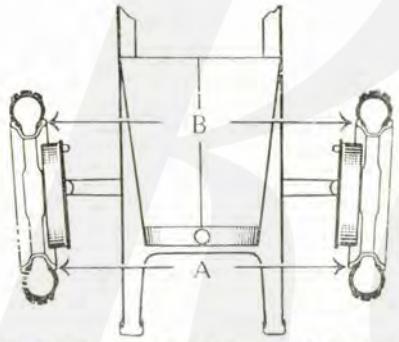

**Steering Gear.**

therefore when wear has taken place it is only necessary to turn the worm wheel so as to bring the unused portion of the wheel into mesh with the worm. It is advisable, however, before turning the worm wheel, to ascertain if there is any appreciable end movement of the worm wheel shaft. This will be indicated if the steering wheel can be moved each way sharply and no corresponding motion observed at the front wheels, or the road wheels may be oscillated sideways, which causes an up and down motion on the steering column ; this, however, must be hardly perceptible, and any excess motion can be taken up by adjusting screw. Do not tighten this screw too tightly or the steering will be stiff. Care must be taken to lock screw after adjustment.

If the backlash is still excessive a new portion of the worm wheel may be brought into use as follows :—

The steering arm below the steering gearbox should be removed. The worm wheel can then be turned through 90 degrees by rotating the steering wheel, and the lever put on in the new position.

It is important, to prevent undue strain on the steering gear and wear of front tyres, that the front wheels should be correctly set. The correct setting is that the measurements from rim to rim, at




Diagrammatic View of Front Wheel Setting.

lines passing through the centre of the wheels, should be $\frac{1}{8}$ in. (3.18 mm.) less at the front ("A") than at the back (" B "). This should be checked after striking the kerb or after a collision.

When a car is stationary the wheels should never be forced round by the steering wheel. This causes unnecessary strain to be placed on the steering gear unless assistance is rendered by someone also pulling the road wheels in the direction required. When manœuvring the slightest movement of the car is sufficient to prevent this strain.

**Road Springs.**—The clips or bolts which secure the front and rear springs to the axles are made of a material which may stretch under prolonged vibration. **It is necessary, especially when the car is new, to try the nuts on these clips to ensure that they are always kept tight.**



CHAPTER IV

# Electrical Equipment

## Dynamo

The ignition key switch operates in the dynamo circuit so that when the ignition is " on " the dynamo is " on." (See also page 6.)

The red light on the instrument panel indicates that " no charge " is being taken to the battery, in which case the battery can exhaust itself through the ignition coil. The ignition must be switched off when the engine is stopped.

The red light will continue to show with the engine running, but as soon as the engine speed is increased and the voltage of the dynamo output increased accordingly the light will dim, and when the voltage of the dynamo output is equal or higher than the battery the light will go out.

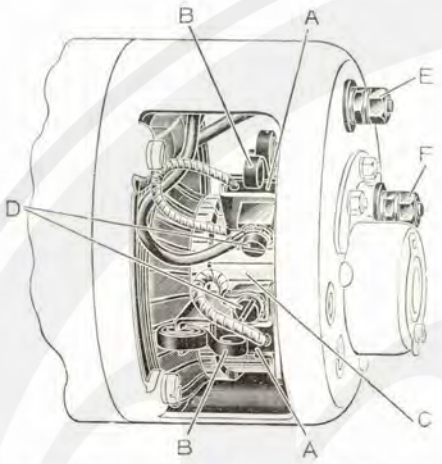
The switchbox controls the output by means of a half-charge switch for Summer running and a full-charge position for Winter. When the lights are switched on, the dynamo is automatically placed on full charge.

It should be known that the output of the dynamo is not constant ; it varies with the engine speed, but its operation is restricted electrically in the higher range of speed, while at low engine speeds the cut-out switch (which is mounted on the dash) remains open until the voltage of the current being generated is as high as that in the battery.

The dynamo requires very little attention to keep it in good order. The commutator cover strap should be removed periodically to inspect the brush gear and the commutator.

## Brushes

The brushes must work freely in their holders. This can be ascertained by holding back the spring lever and gently pulling each flexible lead ; the brush should move without the slightest suggestion of sluggishness. The brushes should be clean and " bed " over the whole surface—that is, the face in contact with the commutator should appear uniformly polished. Clean dirty brushes with a cloth moistened with petrol, but do not put the brushes back into the dynamo until they are perfectly dry. When the brushes are badly worn they must be replaced by new ones of the same type, which can be obtained from any of the Lucas Service Stations. The tension of the springs must not be altered, but they should be examined




**Dynamo Type AT125 with Cover removed, showing Brush Gear and Commutator.**

A—Brush.
B—Brush spring.
C—Commutator.
D—Brush lead eyelets.
E—Field terminal.
F—Positive terminal.

occasionally to see that the brushes are firmly bedded down against the commutator when the dynamo is running.

## Commutator

The commutator should be wiped free of dust occasionally, and it should at all times present a perfectly smooth surface.

A slight deposit of carbon from the brushes is unobjectionable provided the commutator is not rough or oxidised. A good method of cleaning 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.

If the commutator has been neglected for long periods it may need cleaning with fine glass paper. This is a more difficult operation but it should not be necessary if the commutator has received regular attention.

The grooves between the commutator segments should be examined occasionally, and any deposits of copper or carbon dust may be cleaned out by means of a thin saw blade or similar article.

## Lubrication

The bearings are packed with grease before leaving the Works, and very little attention is needed. A few drops of oil, however, may be added through the lubricators provided—every 1000 miles.



Over-lubrication is liable to cause more trouble than under-lubrication. Do not allow any oil or grease to get on to the commutator.

When the car has run about 10,000 miles the dynamo should be thoroughly cleaned, adjusted and the bearings repacked with grease. This should be done by an expert at one of Messrs. Lucas's Service Stations.

## Coil Ignition System

The 12-volt current which is supplied by the dynamo is converted into high-tension current by the coil. The coil is clipped to the lower portion of the steering column.

A combined circuit breaker and distributor mechanism together form one unit known as the distributor.

## Distributor

The distributor is mounted on the off-side of the engine adjacent to the dynamo (see illustration on page 41). The direction of rotation is indicated on the plate fixed to the distributor body.

The advance and retard of the firing position of the distributor is both manual and automatically controlled.

The distributor cover should be removed occasionally and the interior wiped out to remove any dust which may have collected. Examine the contact points; these must be kept clean and free from oil. If the points are oily they can be readily cleaned by inserting a piece of paper between the points and drawing it through.

The contact points should have a clean greyish frosted appearance. If the points are burned or blackened they should be rubbed down with very fine emery paper.

The points should not be filed unless absolutely necessary, and then only with a very smooth file. Care must be taken that all particles of dirt and metal dust are wiped away.

The contact breaker gap should be set to the gauge supplied on spanner. This will only need adjustment at long intervals.

It is not advisable to alter the setting unless the gap varies considerably from the gauge.

If adjustment is necessary the following method should be used. Turn the engine slowly by hand until the contacts are seen to be fully opened, then slacken the locking nut on the contact screw, and rotate the screw until the gap is set to the thickness of the gauge.

After making the adjustment care must be taken to tighten the lock nut securely.

### Lubrication of the Distributor

The distributor bearing requires very little lubrication. Put two or three spots of oil in the oil cup about every 500 miles. The cam may be very lightly smeared with grease when necessary.

### Coil

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

To test the coil, remove the cable from the centre distributor terminal and hold it about $\frac{1}{4}$ in. from some metal part of the chassis. Switch on ignition and slowly turn the engine. The sparking should be strong and regular. If weak or irregular, fit a new coil and return the defective one for repair. **Note.**—See that your fingers are at least three inches from the connection on coil when making this test.

### The Detection and Remedy of Ignition Faults

When a failure of ignition or misfiring occurs, unless the cause is apparent, the following method will assist to diagnose the cause.

Switch on the ignition, turn the engine and observe the ammeter reading. The engine should be turned by hand if it is known that the battery is in a low state of charge. If an ammeter reading is given which rises and falls with the closing and opening of the contacts, then the low-tension wiring is in order. If the reading does not fluctuate in this way a short in the low-tension wiring is indicated or the contacts are remaining closed. If the ammeter shows no discharge a broken or loose connection in the low-tension cable is indicated, or the battery is exhausted.

Switch on lamps or operate starter; this will prove the battery. If the battery is run down it will be shown by poor headlights and the starter will not function.

Having proved that the low-tension cables and the battery are in working order, examine the high-tension cable. If the rubber shows signs of deterioration or cracking, the cable should be renewed.

Remove the distributor cover, examine the contact points and clean as described under the heading of "Distributor." Test the coil. For method see paragraph about Coil. Take out the sparking plugs and check the plug point gaps. The points should be set at about fifteen thousandths apart. Dirty plugs must be cleaned. If



after applying the above tests, and also having examined other parts of the engine for possible faults, such as carburetter, petrol supply, etc., the trouble has not been located, we advise that the electrical equipment should be examined by the nearest Lucas Service Station, the addresses of which will be found on page 92.

### Starter

To start the engine push in the switch smartly and release immediately the engine fires, or turn the ignition key to right, which automatically causes the starter to function. With the ignition left in this position the starter will automatically come into action immediately the engine stops.

The starter drives the engine by means of a sliding pinion which works upon a screw thread on the starter shaft, the pinion engaging with the gear ring on the flywheel. When the switch press is depressed and the starter shaft commences to turn, the inertia of the pinion causes it to slide along the shaft and engage with the flywheel gear. Conversely, when the engine fires, the pinion overruns the starter shaft and slides out of engagement.

If the starter races out of engagement with the flywheel, as may sometimes happen—for instance, when the engine fires and then stops—switch off and allow the starter to come to rest before re-starting.

**Before attempting to start** make all the carburetter and ignition settings as described on page 6, as omissions in this respect cause needless discharge of the battery. If the engine does not fire within a reasonable time do not keep the starter running and so exhaust the battery, but look for ordinary engine faults. If for any reason the pinion wheel on the motor does not engage with the flywheel teeth, examine the screwed sleeve on the armature spindle to see that it is free from dirt; if necessary, wash over with paraffin. Occasionally give it a few drops of thin machine oil.

The starter requires practically no attention save an occasional cleaning.

The bearings are packed with grease, and as the total running time is relatively very small, this lubricant will last a very long time.

The commutator and brushes seldom require attention during the life of the car, but they may be examined occasionally, the same remarks applying in this respect as for the dynamo.

It should be remembered that the power of the starting motor is derived entirely from the battery, and that the condition of the battery depends to a great extent upon receiving ample and regular charging; thus, if the starter becomes gradually weaker in action the fault may really be due to the battery being run down for some reason, or else to dirty battery terminals.

## Automatic Cut-out Switch

This is mounted in conjunction with the fuse box on the forward side of the dashboard, and is provided for automatically closing the generator to battery circuit as soon as the dynamo is driven at sufficient speed to cause its voltage to rise above that of the battery. The reverse action breaks the circuit when the generator voltage falls below that of the battery, thereby preventing the battery discharging through the dynamo windings.

The cut-out switch closes the charging circuit at approximately eighteen miles per hour on top speed, and allows a maximum output of the dynamo to occur when the car is doing thirty miles per hour on top gear.

The cut-out switch is carefully adjusted by the makers, and then sealed, and as it is unlikely to get out of order it should not be tampered with or adjusted.

**The cut-out does not switch off the dynamo when the battery is fully charged, and no such automatic device is provided.**

## Fuses

Occasionally examine the fuse in order to ascertain that it is held tightly in position.

The fuse in this unit is in the accessories circuits and the indication that it has blown will be the failing of the horn or any other electrical accessory connected to the "+" and "E" terminals. Remove the fuse from its holder, and see whether there is a break in the fuse wire. Before replacing with the spare fuse "C," inspect the equipment for faulty wiring and see that all connections and terminals are tight. If the fuse blows repeatedly and the cause cannot be traced, have the equipment examined at the nearest Lucas Service Depot.

**Battery.—It is absolutely essential, for the efficient working of the electrical equipment, that the battery is kept in good condition.** The care of the battery may be summed up in the following rules :—

(1) Add nothing but pure distilled water to the cells, and do this often enough to keep the plates always covered.

(2) Take frequent specific gravity readings with the hydrometer (See below.)

(3) Give the battery a special charge whenever the gravity readings are below 1.150.

(4) Keep the battery clean, and the filling plugs and connections tight.



**Adding Water.**—The electrolyte consists of pure sulphuric acid diluted to the correct specific gravity with pure distilled water. The water evaporates from the electrolyte, and it is necessary, therefore, to add water from time to time to make up the level to $\frac{3}{8}$ in. above the top of the plates. This should be done once a month, because if the plates are exposed for any length of time they may be very seriously damaged.

**The cells need replenishing with water more frequently in the Summer than in Winter.**

**Testing the Specific Gravity.**—The specific gravity of the electrolyte is ascertained by means of a hydrometer of the syringe type. To use this instrument enough electrolyte is drawn up into the glass tube to lift the hydrometer float about 1 in., thus enabling the readings to be taken. Care must be taken that the stem of the float does not touch any part of the barrel or bulb while the reading is actually being taken. After the reading has been observed the electrolyte must be returned to the cell from which it was taken, as otherwise the specific gravity and the level of the electrolyte will be affected.

Hydrometer readings should be taken after a run on the car, when the electrolyte is thoroughly mixed.

When the cells are in good condition, fully charged, and the electrolyte is at its correct level, the specific gravity will be 1.285 to 1.300 (1.270 to 1.285 in tropical climates) in each cell. If these specific gravities are about 1.210 (1.195 in tropical climates) the cells are approximately half discharged. Such condition may be due to excessive use of lights or starter, or it may be due to leakage in the system. The remedy is to keep the dynamo switched on and to use the lights and starter sparingly until the gravity rises. If the gravity does not rise in a reasonable time, look for defects in the system.

If the gravity falls to 1.150 (1.135 in tropical climates) the battery is exhausted, and should be removed at once from the car and given a long steady charge from an external source. The reason for the exhaustion should be ascertained.

A "TROPICAL CLIMATE" IS DEFINED AS ONE IN WHICH WATER NEVER FREEZES.

If the gravity of one cell is much lower than the others the cause should be investigated. It may be due to a leakage of electrolyte, or a short circuit in that cell.

**Battery Hints.**—Never add acid except to compensate for spillage.

Keep the battery clean, and if any water or acid has been spilt it must be dried off at once.

Keep the connections tight. Any corrosion of the metal should be removed and the parts smeared with vaseline. This is very important, as corroded terminals are often responsible for trouble with the starter.

Never bring a naked light near the battery.

Keep the vent holes clear.

See that the battery is held firmly in position to prevent jolting, or the connections will be broken.

The energy of the battery can be very considerably conserved and its life prolonged if on cold mornings, **before switching on the ignition**, you turn the engine a few times with the starting handle. The reason for this is that in cold weather the oil on the pistons becomes stiff, and if the electric starter is used before the preliminary turning by hand a great strain is put upon the battery in overcoming the initial stiffness of the engine. No great effort need be expended in doing this, as it is not necessary to turn the engine quickly; it is sufficient to engage the starting nandle at the bottom and pull up two or three times. Lady drivers will not usually find this is beyond their capacity.

The charging arrangements with this equipment are such that, for cars running under average conditions, the dynamo will keep the battery fully charged without the possibility of any overcharging. During daytime running, the dynamo gives a reduced output which more than compensates for the coil ignition and starting load, and the use of the stop lamp and horn. When the lamps are switched on, the dynamo automatically gives its full output, so as to allow for the lamp load. It will be seen that the charging scheme is quite automatic, and calls for no attention on the part of the owner.

**Batteries Shipped Abroad.**—On cars dispatched abroad the battery is sent dry and uncharged, and before being put into service the cells must be filled with electrolyte and given a long charge. The results obtained from the battery depend largely upon this initial charge, and it is therefore necessary that the following instructions are carried out in detail:—



(1) Remove the filling plugs and fill the cells to about $\frac{3}{8}$ in. above the top edge of the plates with pure brimstone sulphuric acid which has been previously diluted with pure distilled water to the specific gravity of 1.320 at 60 deg. F. (1.300 in tropical climates). The proportion is roughly one part of acid to 2.8 parts of water by volume.

It is important in mixing to pour the water into the vessel first, adding the acid slowly and stirring thoroughly to assist diffusion. A mixing vessel made of glass, glazed earthenware or lead should be employed, and a glass rod used for stirring the solution. The mixture must be allowed to cool to approximately atmospheric temperature before use (should not exceed 90 deg. F. as a maximum).

After filling, the battery may with advantage be allowed to stand for a period not exceeding 12 hours before charging. It is not essential, however, to soak the plates in this way, and no harm will result if the battery is put on charge immediately after being filled with acid, provided that the temperature does not rise above 100 deg. F. In tropical climates the temperature of cells can be kept down by lowering the charging rate by 25 per cent., and allowing a period of rest after 12 hours' charging.

No dry or uncharged accumulator should be filled with acid solution unless the charge be commenced within the period of time indicated above.

(2) For charging, direct current only must be used, and not alternating current. Connect the positive (+) terminal of the battery to the positive terminal of the charging source, and the negative (—) terminal of the battery to the negative of the charging source.

Arrange resistance in the form of lamps, or otherwise, in series with the battery so that the charging rate will be 4.5 amperes.

The maximum rate of charge for the first charge is 4.5 amperes and should be continued for 36 hours. At the end of this period it will be found that gas is being produced at the surfaces of all the plates, and the density of the electrolyte is at its maximum.

Towards the end of the first charge take careful hydrometer readings of the electrolyte in each cell. If in any cell the

reading is above 1.300 (1.285 in tropical climates), after correction for temperature (see below), withdraw some of the electrolyte and add distilled water, continuing the charge meantime.

The temperature correction referred to above is as follows :— For each 2½ deg. F. above 60 deg. F. add .001 to the hydrometer reading, and subtract .001 for each 2½ deg. F. below 60 deg. F.

**Subsequent Charge.**—On completion of the first cycle (i.e. charge and discharge) the battery will be put into regular working condition by charging at 10 amperes until the specific gravity remains constant at 1.300 (1.285 in tropical climates).

**Headlamps.**—These lamps are provided with an anti-dazzle device arranged for operation by a switch. When the switch is moved the near-side headlamp beam is dipped and turned to the near-side of the road, while the off-side lamp is switched off.

The dipping of the headlamp beam is effected by a movement of the reflectors. These are made in two parts, the centre portion being pivoted on ball bearings in a fixed rim which is in turn secured to the headlamp body. The 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.

**Removing the Lamp Front and Reflector.**—To remove the front, slacken the fixing screw and swing it aside from the slot in which it fits. The front can then be withdrawn from the body of the lamp.

The reflector can be removed by simply withdrawing it from its supports.

When replacing the dipping reflector, the word " TOP " marked on the edge indicates the position. Then press the rim over the supports, locating each support with the slot provided in the rim.

To replace the front, press it on the body, locating the top of the rim first. Finally swing the fixing screw into the slot and tighten it to lock the front in position.

**Adjusting and Focussing.**—The lamps are provided with universal mounting which allows the beam of light to be adjusted on the road to the best advantage. This adjustment is obtained by slackening the locking screw, turning the lamp to the desired position and locking by tightening the screw.



The very accurate formation and particularly high polish on the surface of the reflectors is the result of many years of research work, manufacturing experience and prolonged night driving observations on the road. If however, the bulb is not correctly focussed the advantages of this scientific design are lost ; it is therefore essential that the filament should be approximately at the focus of the reflector.

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

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

**Fuses.**—A fuse is provided with each electrical dipper unit to protect the equipment in the event of the reflector failing to function properly. A spare fuse is provided and is clipped to the back of the reflector.

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

**Cleaning.**—The reflectors are protected by a transparent and colourless covering, which prevents tarnishing and enables any accidental finger marks to be removed with chamois leather or a soft cloth without affecting the surface of the reflector. Do not use metal polishes on Lucas reflectors.

Ebony black lamps may be cleaned with a good car polish.

In the event of any difficulty with any part of the equipment, no matter how trivial, we shall be only too pleased to give every assistance possible. The best course to adopt is to call at the nearest **Lucas Service Depot**, the addresses of which are given on page 92, when the equipment can be examined as a whole. The depots are not only at your disposal for repairs, overhauls and adjustments, but to give free advice. If it is necessary, however, to communicate, or when ordering spare parts, always give the type and number of the unit in question, as well as the type, h.p. and number of the car.

## ELECTRIC HORN

Every electric horn before being passed out of the Works is adjusted to give its best performance, and it is compared with a standard for power and purity of tone.

These horns will give long periods of service without any attention, but a means of adjustment is provided if required. For instance, should the horn become 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, a loose connection or short circuit in the wiring of the horn, or in some cases a blown fuse. It is also possible that the performance of a horn may be upset by the horn becoming loose on its mounting. If the tone of the horn is still unsatisfactory, the owner is urged to return it to a Lucas Service Depot to have other adjustments made.

In the event of any difficulty with any part of the equipment, no matter how trivial, the best course to adopt is to call at the nearest Lucas Service Depot, the addresses of which are given on page 93, when the equipment can be examined as a whole. The depots are not only at your disposal for repairs, overhauls and adjustments, but to give free advice. If it is necessary, however, to communicate, or when ordering spare parts, always give the type and number of the unit in question, as well as the type, h.p., and number of car.

### Petrol Gauge

The electric petrol gauge is directly connected to an instrument mounted in the rear tank known as a Potentiometer. Neither of these instruments should be opened or interfered with. If the gauge is at fault see that all connections are securely made; if this does not remedy the fault we recommend the owner to call or write to Messrs. Smith & Sons. (See page 90.)



## Lights Fault-Finding Table

LAMPS—

- Insufficient illumination
  - Lamp badly set on bracket.
  - Bulb discoloured through use.
  - Out of focus.
  - Dirty reflector or bulb.
  - Battery exhausted.
- Light when switched on, but gradually diminish
  - Battery exhausted.
- Brilliance varies with speed of the engine
  - Battery exhausted.
  - Acid level low.
  - Battery connection loose or broken.
- Lights flicker
  - Loose connection.
  - Lamp adapter contacts faulty.
- Lights out
  - Battery exhausted.
  - Broken or loose connections.
  - Lamp filament broken.

## Dynamo Fault-Finding Table

- Dynamo not charging
  - Broken or loose connections.
  - Charging switch off.
  - Fuse blown.
- Charging intermittently or low output. Red warning light flickers in and out
  - Dynamo
    - Brushes
      - Loose terminal nuts.
      - Greasy or dirty
      - Worn.
      - Tight in holders.
      - No spring tension.
      - Shunt brush position altered.
    - Commutator
      - Greasy or dirty.
      - Worn or rough.
      - Copper dust between segments.
  - Switchbox
    - Loose connection.
  - Cut-out and fuse box
    - Loose fuse strip or connection.
  - Battery
    - Loose or broken connections.
    - Acid level low.
- Dynamo charging with excessive output
  - Shunt circuit
    - Control brush position altered.
    - Control brush not bedding properly.

# Starter Motor Fault-Finding Table

| | | | |
|---|---|---|---|
| | | | —Engine partially or entirely seized. |
| | | | —Oil too thick for Winter use. |
| Motor sluggish or fails to move engine | —Motor | —Brushes | —Loose terminal nuts. |
| | | | —Greasy or dirty. |
| | | | —Worn. |
| | | | —Tight in holders. |
| | | | —No spring tension. |
| | | —Commutator | —Greasy or dirty. |
| | | | —Worn. |
| | —Operating switch | | —Loose terminal connections. |
| | | | —Exhausted. |
| | —Battery | | —Bad connections. |
| | | | —Acid level low. |
| Starter motor rotates but fails to engage | | | Sliding pinion screw thread dirty. |



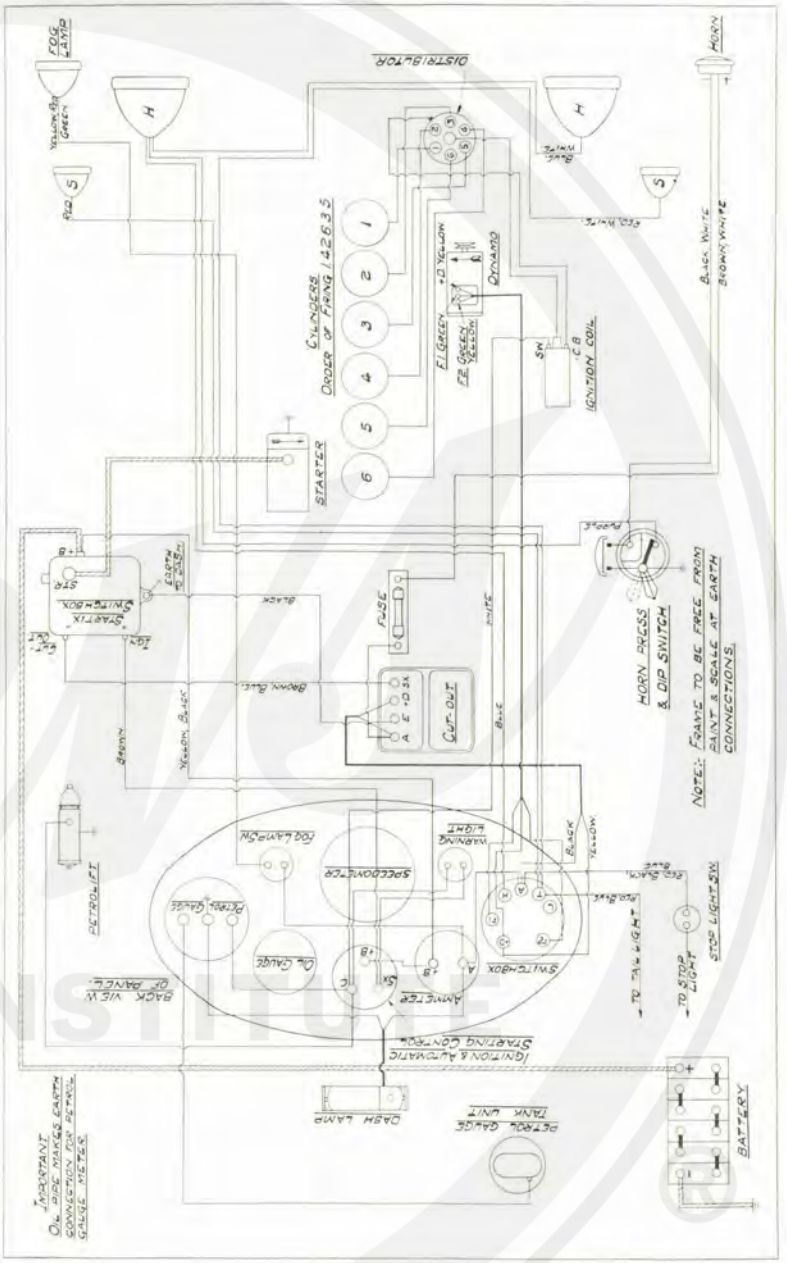



Diagram showing how the Electric Wiring is arranged for Lighting and Starting.

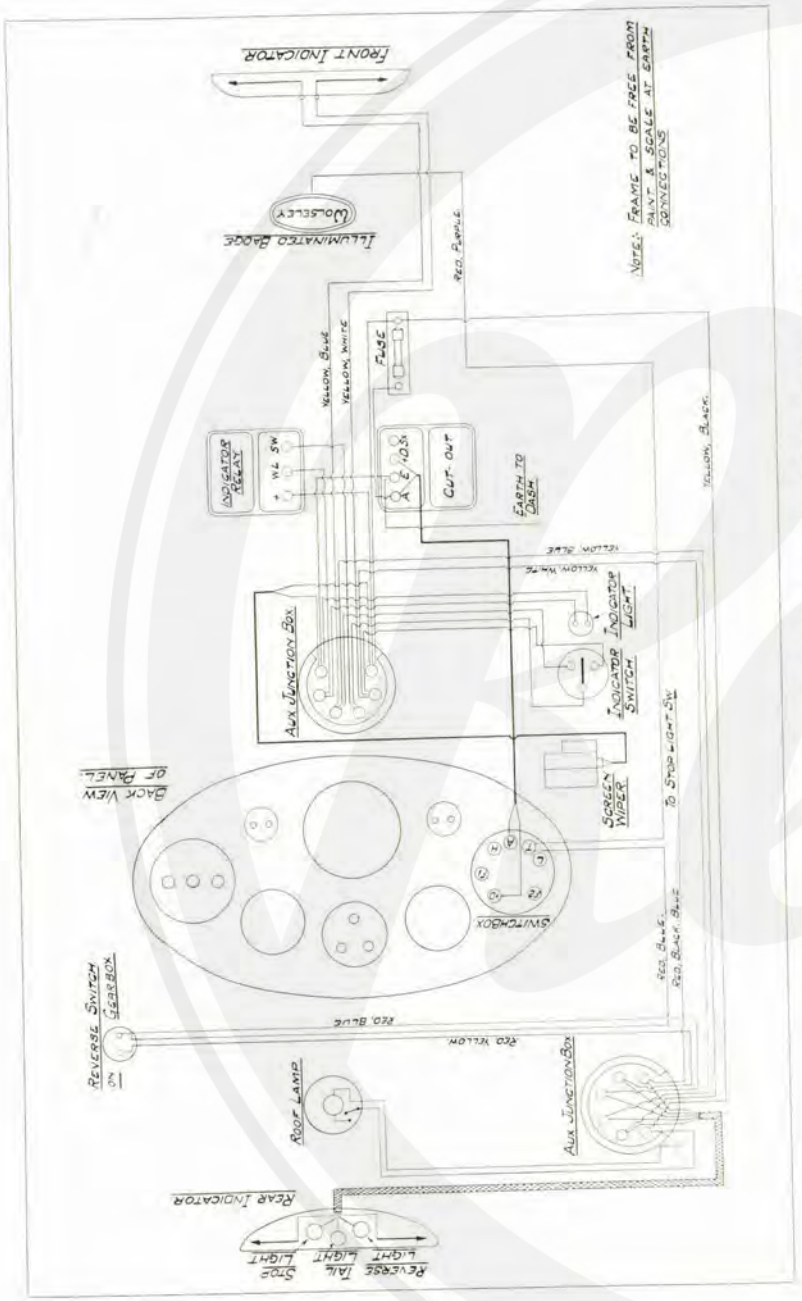



Diagram showing how the Electric Wiring is arranged for the Auxiliary units.



CHAPTER V

# Care of the Coachwork

**Cellulose.**—Cars having "cellulose finish" may be dusted with a dry duster without harming the surface, but mud, whether wet or dry, should be carefully washed off. Spots of mud from tar-sprayed roads, or spots of tar, may be very easily removed by a cloth damped with benzol.

The cellulose should be polished weekly with a special polish. This maintains the brilliant finish and makes it weather- and waterproof. "Bripal" Car Polish or "Cellusol" Wax Polish is recommended by us, and if not obtainable in your district, supplies can be ordered from our Service Department.

The polishing wax should be applied as sparingly as possible—a very little rubbed in with a soft pad and afterwards polished off with a clean polishing cloth, care being taken to clean all the polish out of the corners, edges of mouldings, etc. Soft stockinette cloths or cotton wool suitable for the above work can be obtained at most drysalters.

**Wings.**—The wings and enamelled portions of the car should not be dusted with a dry duster, but should be washed down with plenty of water. Spots of tar may be effectively removed with butter after the wings have been washed and dried. Do not use petrol, benzol, or paraffin for cleaning.

**Care of Upholstery.**—When cleaning the car, water should not be allowed to splash on to the upholstery. A soft dry cloth should always be sufficient to remove superficial dust, and a brush can be used in awkward places. On no account must oil or oily rags be allowed to come in contact with the leather. A small spot of oil will develop and spread to a surprising extent. If by any chance the leather becomes spotted with oil or grease, it should be rubbed off at once with a wad of cotton wool.

A vacuum cleaner is very useful for removing dust from the upholstery of a car.

**Chromium Finish.**—Metal polish must not be used to clean exterior fittings which are chromium finished. The parts should be washed with soap and water and thoroughly dried with a soft duster. This should be done frequently.

CHAPTER VI

# Service

## SPARE PARTS AND REPLACEMENTS

The illustrated spare part catalogue which is supplied with each car is arranged so that the possibility of ordering an incorrect part has been reduced to a minimum.

All communications relating to the car must refer to the car number, which will be found on the metal nameplate attached to the dashboard shroud under the bonnet.

Full instructions for ordering spares will be found in the preface of the spare part catalogue. In order to assist customers who desire to send a telegram, we give below the telegraphic codes referring to service matters :—

| | | |
|---|---|---|
| YAIKD | ... | Wolseley Hornet Car No..... |
| SEREB | ... | Referring to your communication Manager dated..... |
| SEREM | ... | Referring to your communication Estimating dated..... |
| SEREP | ... | Referring to your communication General Office dated..... |
| SERFU | ... | Dispatch immediately per post and charge our account for Car No..... |
| SERGI | ... | Dispatch immediately per passenger train and charge our account for Car No..... |
| SERJO | ... | Dispatch per post direct to Customer and charge our account for Car No..... |
| SERKS | ... | Dispatch per passenger train direct to Customer and charge our account for Car No..... |
| SERMY | ... | Advise delivery date for our Order No..... |
| SERNA | ... | Please quote but do not supply pending official order for following spares for Car No..... |
| SEROT | ... | Can you supply from stock for Car No..... |
| SERSK | ... | Priced invoice to be sent with spares. |
| SERTE | ... | Complete with all fittings. |
| SERUS | ... | With studs and nuts only. |
| SERYL | ... | Complete with bearings. |



## SERVICE STATIONS FOR RADIATOR REPAIRS

| | |
|---|---|
| ABERDEEN | Francis Craigmile & Son,<br>56 Gordon Street. *Telephone :* 3599 |
| BELFAST | Serck Radiators Ltd.,<br>59 May Street. *Telephone :* 6938 |
| BIRMINGHAM | Coventry Radiator & Presswork Co. Ltd.,<br>107 Pritchett Street. *Telephone :* Central 5823 |
| BOURNEMOUTH | Hants & Dorset Sheet Metal Co.,<br>154 Ashley Road. *Telephone :* 2840 |
| BRIGHTON | Brighton Motor Sheet Metal Works,<br>50a St. James Street. *Telephone :* 2191 & 2192 |
| BRISTOL | A. J. Rees & Sons,<br>Bishop Street, Moorfields.<br>*Telephone :* 5174 (2 lines) |
| CARDIFF | Serck Radiators Ltd.,<br>60a Clive Road, Canton. *Telephone :* 6124 |
| CARLISLE | Serck Radiators Ltd.,<br>Hardwick Circus, Lowther Street. |
| COVENTRY | Coventry Radiator & Presswork Co. Ltd.,<br>Raglan Works, Lower Ford Street.<br>*Telephone :* 3071 |
| DUBLIN | George Pappin & Sons,<br>7 Upper Stephen Street. *Telephone :* 51607 |
| EDINBURGH | Alder & Mackay Ltd.,<br>Stewart Terrace. *Telephone :* 61151-2 |
| ESSEX | J. Keeling & Sons,<br>Grand Garage, The Broadway, Leigh-on-Sea. |
| EXETER | Saunders & Biss Ltd.,<br>172 Sidwell Street. *Telephone :* 3813 |
| GLASGOW, C.4 | James C. Urie & Co.,<br>399 Parliamentary Road.<br>*Telephone :* Douglas 3062 |
| HULL | Bowman's Hull Sheet Metal Company,<br>Boothferry Road. *Telephone :* Central 2319 |
| LEEDS | Excelsior Motor Radiator Co. Ltd.,<br>Oldfield Lane. *Telephone :* Armley 38041/2 |
| LEICESTER | Victory Radiator & Welding Works,<br>Woodgate. *Telephone :* Leicester 20189 |
| LIVERPOOL | Liverpool Radiator Co.,<br>Fontenoy Street. *Telephone :* Central 382 & 383<br>W. Watson & Co. (Liverpool) Ltd.,<br>7 Mount Pleasant. *Telephone :* 5480 Royal (4 lines) |
| LONDON | Serck Radiators Ltd., Park Royal Road,<br>N.W.10. *Telephone :* 5441 & 5442 |
| MAIDSTONE | Serck Radiators Ltd.,<br>Palace Avenue. *Telephone :* 1035 |
| MANCHESTER | Pendleton Radiator Co.,<br>72a Broad Street, Pendleton. *Telephone :* 709 |
| MANCHESTER | H. O. Serck Ltd.,<br>Lyon Street, Garrett Street, Oldham Road.<br>*Telephone :* Collyhurst 1541 |
| NEWCASTLE-ON-TYNE | Serck Radiators Ltd., Skinnerburn Road<br>(Off Wayer Street). *Telephone :* Central 5863 |
| NORTHAMPTON | Central Sheet Metal Co.,<br>12a St. Michael's Road. *Telephone :* 676 |
| NORWICH | Wm. F. Smith & Sons,<br>90 King Street. *Telephone :* Norwich 30 |
| NOTTINGHAM | Minerva Motor Radiator Co.,<br>Boulevard Works, Radford. *Telephone :* 75631 |

## Service Stations for Radiator Repairs—*continued*

| | |
|---|---|
| OXFORD | Morris Motors Ltd. (Radiator Branch), Osberton Works, Oxford. *Telephone :* Summertown 5232 |
| PERTH | Leslie & Murray, 14 Victoria Street. *Telephone :* 770 |
| PLYMOUTH | Edmund Metal Works, Sutton Road. *Telephone :* 2181 |
| SHEFFIELD | Excelsior Motor Radiator Co. Ltd., Jessop Street. *Telephone :* Sheffield 22634 |
| SOUTHAMPTON | Serck Radiators Ltd., Ryde Terrace, Floating Bridge. *Telephone :* 3560 |
| STOKE-ON-TRENT | Coventry Radiator & Presswork Co., 56a Ashford Street. |
| SUDBURY, SUFFOLK | Serck Radiators Ltd., Cornard Works. *Telephone :* 57 |
| WOLVERHAMPTON | Baggott's Motor Fittings, Steelhouse Lane. *Telephone :* 101 |

## Messrs. Smith & Sons for Clocks, Speedometers, Petrol Gauges

| | |
|---|---|
| LONDON | Cricklewood Works, London, N.W.2. *Telephone :* Willesden 2335 |
| | 179-185 Gt. Portland Street, W.1 *Telephone :* Langham 2323 |
| MIDLAND | 122 Alma Street, Birmingham. *Telephone :* Northern 2724 |
| NORTHERN | 14a Jackson Row, Deansgate, Manchester. *Telephone :* Central 13 |
| SCOTTISH | 19 West Regent Street, Glasgow. *Telephone :* Douglas 2298 |
| NORTHERN IRELAND | H. A. Turnpenny & Co., 18 Sussex Place, Belfast |
| IRISH FREE STATE | Messrs. Buckley Motors Ltd., 34 Lower Abbey Street, Dublin. |

## Messrs. Smith & Sons' Overseas Service Stations

### AFRICA

| | |
|---|---|
| EGYPT | |
| E. & D. de Picciotto | Rue Matrah 2, Alexandria, Egypt. |
| Moring & Co. | Midan Suares, Cairo. |
| SOUTH AFRICA | |
| Auto Electric Supply (Cape) Ltd. | 20/22 Bree, Cape Town, S. Africa. |
| Auto Electric Supply (Natal) Ltd. | 199 Smith Street, Durban, South Africa. |
| Wm. Over & Co. Ltd. | P.O. Box 441, Salisbury, Rhodesia. |
| Connocks (S.A.) Motor Co. Ltd. | P.O. Box 2767, Johannesburg. |

### ASIA

| | |
|---|---|
| INDIA | |
| T. R. Pratt | Hughes Road, Bombay. |
| Breakwell & Co. | 44 Free School Street, Calcutta. |
| Addison & Co. | Mount Road, Madras. |



## Messrs. Smith & Sons' Overseas Service Stations—*continued*

| | |
|---|---|
| BURMA | |
| Watson & Son | P.O. Box 178, 59 Phayre Street, Rangoon, Burma. |
| CEYLON | |
| C. A. Hutson & Co. Ltd. | P.O. Box 337, Colombo, Ceylon. |
| STRAITS SETTLEMENTS | |
| Malayan Motors Ltd. | 209/212 Orchard Road, Singapore. |
| CHINA | |
| Auto Palace Co. | 484 Avenue Joffre, Shanghai. |

### AUSTRALIA

| | |
|---|---|
| Smith, Sons & Rees Ltd. | 30/32 Wentworth Avenue, Sydney, Australia. |
| *Sub-Agents of above :* | |
| Keep Bros. & Wood Pty. Ltd. | 339 Batman Street, West Melbourne. |
| E. T. Fisher & Co. | Adelaide. |

### NEW ZEALAND

| | |
|---|---|
| Teagle, Smith & Sons Ltd. | 276/278 Wakefield Street, Wellington, New Zealand. |

### EUROPE

Magyar Abroncs es Kerekgyar R. T. Jokai (Gyar) Utca 8, Budapest, Hungary.

## Messrs. The S.U. Company, Carburetter

| | |
|---|---|
| BIRMINGHAM | East Works, Bordesley Green Road, Adderley Park. |

## MESSRS. LUCAS FOR ELECTRICAL EQUIPMENT

| | |
|---|---|
| BELFAST<br>3-5 Calvin Street, Mountpottinger | *Telephone :* Belfast 7017 |
| BIRMINGHAM<br>Great Hampton Street | *Telephones :* Central 8401 (10 lines) |
| BRISTOL<br>345 Bath Road | *Telephones :* Bristol 8400 (3 lines) |
| BRIGHTON<br>Old Shoreham Road, Hove | *Telephones :* Preston 3001 (4 lines) |
| CARDIFF<br>54a Penarth Road | *Telephone :* Cardiff 4603 |
| COVENTRY<br>Priory Street | *Telephones :* Coventry 3068 and 3841 |
| DUBLIN<br>41 Middle Abbey Street | *Telephone :* Dublin 653 |
| EDINBURGH<br>32 Stevenson Road, Gorgie | *Telephones :* Edinburgh 62921 (4 lines) |
| GLASGOW<br>227-229 St. George's Road | *Telephones :* Douglas 3075 (3 lines) |
| LEEDS<br>64 Roseville Road | *Telephones :* Leeds 28591 (5 lines) |
| LIVERPOOL<br>450-456 Edge Lane | *Telephones :* Old Swan 1408 (3 lines) |
| LONDON<br>Dordrecht Road, Acton Vale, W.3 | *Telephones :* Chiswick 3801 (18 lines) |
| LONDON<br>759 High Road, Leyton, E.10 | *Telephones :* Walthamstow 2161 (3 lines) |
| LONDON<br>155 Merton Rd., Wandsworth, S.W.18 | *Telephones :* Putney 5131 (4 lines) and 5501 |
| MANCHESTER<br>Talbot Road, Stretford | *Telephones :* Trafford Park 1410 (3 lines) |
| NEWCASTLE-ON-TYNE<br>64-66 St. Mary's Place | *Telephones :* Central 3571 (3 lines) |

## Lucas Overseas Service Stations

### AFRICA

| | |
|---|---|
| EGYPT | |
| CAIRO | Moring & Co., 1 Sharia El-Antik-Khana, El-Masria |
| GOLD COAST | |
| ACCRA | Trading Association of Nigeria Ltd. |
| NIGERIA | |
| LAGOS | West African Motors Ltd., Broad Street |
| JOS | West African Motors Ltd. |
| UNION OF SOUTH AFRICA | |
| CAPE TOWN | Stansfield Ratcliffe & Co. Ltd., 8 Waterkant Street |
| DURBAN | Stansfield Ratcliffe & Co. Ltd., 467 Smith Street |
| JOHANNESBURG | Stansfield Ratcliffe & Co. Ltd., 63 Anderson Street |
| *Sub-Stations in* | |
| BULAWAYO | Sykes (Rhodesia) Ltd., Main Street |
| EAST LONDON | Hubert Davies & Co. Ltd. |
| KIMBERLEY | Auto Electrical Service Station, 44 De Beers Road |
| PORT ELIZABETH | Hall & Co., Central Garage, Peel Street |
| SALISBURY | Hubert Davies & Co. Ltd. |

### AMERICA

| | |
|---|---|
| ARGENTINE | |
| BUENOS AIRES | W. Stephan, Charcas 1339 |
| PERU | |
| LIMA | Alexander Eccles & Co., Casilla 1939 |



### Lucas Overseas Service Stations—*continued*

| | |
|---|---|
| BRITISH WEST INDIES | |
| TRINIDAD | |
| PORT OF SPAIN | F. J. Miller & Co., 17 Chacon Street |
| CANADA | |
| TORONTO | A. Cross & Co., 45-47 Elm Street |

### ASIA

| | |
|---|---|
| INDIA | |
| BOMBAY | Bombay Battery & Elec. Co., 15 New Queen's Road |
| CALCUTTA | Thornycroft (India) Ltd., 6 Lyons Range (*Works*—Diamond Harbour Road) |
| DELHI | British Motor Car Co. Ltd., Kashmir Gate |
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# INDEX





# INDEX—*continued.*

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*Type of Car.....*

*Owner :*

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*Car Registration No.....*

*Licence No.....*

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