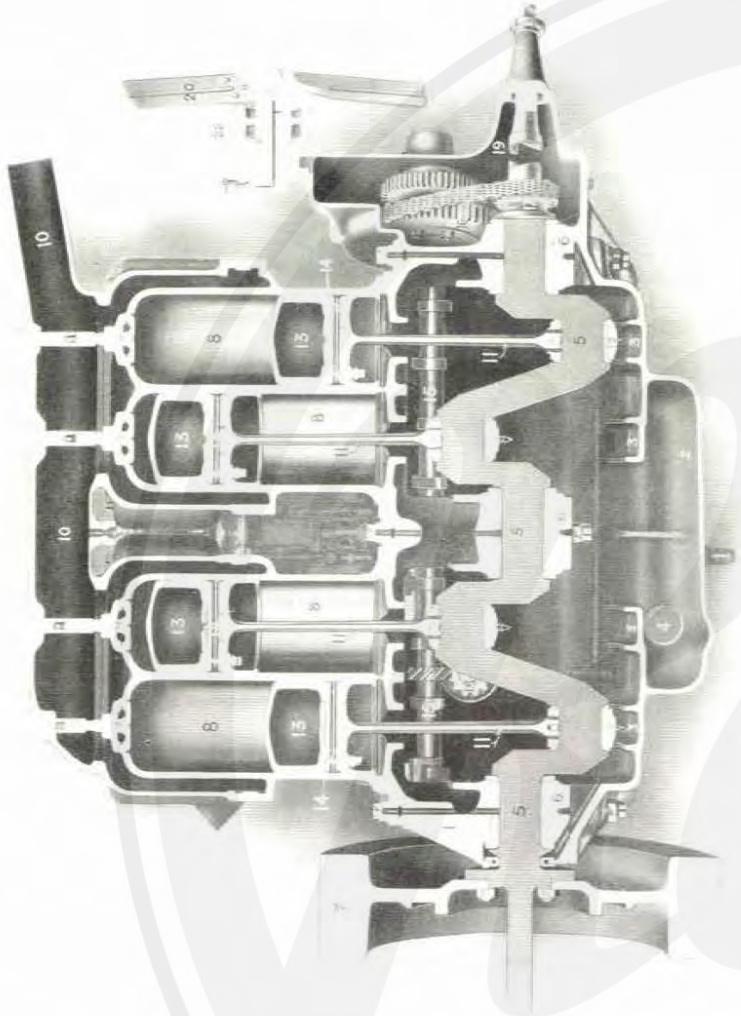
THE WOLSELEY INSTRUCTION MANUAL

SEASON
1912.

THE WOLSELEY TOOL AND MOTOR CAR CO.
LIMITED



16/20 h.p. Engine Sectioned to show Working Parts.

Crankcase and Oil Base.

1. Crankcase.
2. Oil Base.
3. Oil Troughs for Connecting Rods.
4. Oil Drain.

Crankshaft and Flywheel.

5. Crankshaft.
6. Crankshaft Bearing Blocks.
7. Flywheel.

Cylinders.

8. Cylinders.
9. Cylinder Plugs.
10. Water Outlet Pipe.

Connecting Rod and Piston.

11. Connecting Rods.
12. Connecting Rod Bearings.
13. Pistons.
14. Gudgeon Pins.

Camshaft and Engine Chain Wheels.

15. Camshaft.
16. Camshaft Chain Wheel.
17. Crankshaft Chain Pinion.
18. Oil and Air Pump Driving Wheel.
19. Engine Chain Cover.

Fan.

20. Fan Complete.
21. Fan Spindle.
22. Fan Centre and Pulley.

Season 1912.

Price 5/= net.

By Appointment to
H.M. Queen Alexandra.

THE WOLSELEY INSTRUCTION MANUAL

BEING

HINTS AND DIRECTIONS FOR THE CARE AND MANAGEMENT OF WOLSELEY AUTOCARS.

THE WOLSELEY TOOL AND MOTOR CAR CO. LIMITED

(Proprietors: VICKERS LIMITED).

HEAD OFFICE:

ADDERLEY PARK, BIRMINGHAM.

Telegrams—"Exactitude, Birmingham."
Telephone—5133 Central.

LONDON: York St., Westminster.
Telegrams—"Autovent, London."
Telephones—831 Victoria, 4823 Victoria.
" Repairs—2635 Victoria, 3744 Victoria.

MANCHESTER: 76, Deansgate.
Telegrams—"Autocar, Manchester."
Telephone—6995.

Makers' Car No.

Type of Car

Owner:

Car Registration No.

License No.

Date Renewal Due

CONTENTS.

Chapter I.

Chapter II.

Chapter III.

WOLSELEY AUTOCARS.

Introduction.

This book of reference has been compiled for the help and guidance of owners and motor drivers in the adjustment and maintenance of **Wolseley Autocars.** The descriptions and illustrations have been arranged so that all mechanical details may be easily located, and the book has been specially written with a view to assisting those who do not possess a mechanical training.

At the same time we do not advise a novice to undertake the charge of a car without having first received some practical training in its working and adjustment. There are many excellent Motoring Schools now available where such training can be acquired, and we have instituted Special Schools of Instruction in Birmingham and also in connection with our London Depot. We shall be pleased to supply to interested clients a small brochure giving full particulars and scale of charges.

In compiling this book some previous general knowledge of motor-cars and their control and operation has been presupposed. Readers are referred to any one of the several books dealing with motor-car construction for general information on the subject. We shall be pleased upon application to furnish clients with a list of suitable books.

We have endeavoured as far as possible to deal with all difficulties which may arise, but at the same time realise that there will be times when it is difficult to diagnose some fault. We are always pleased to give such cases our special attention.

THE WOLSELEY TOOL & MOTOR CAR CO. LTD.

(Proprietors: VICKERS LIMITED),

ADDERLEY PARK, BIRMINGHAM.

CHAPTER I.

Dealing in detail with the various types of chassis.

It is not here proposed to give detail specifications of the various models; such specifications may be found in the current catalogue. The chassis described in the following chapters are:—

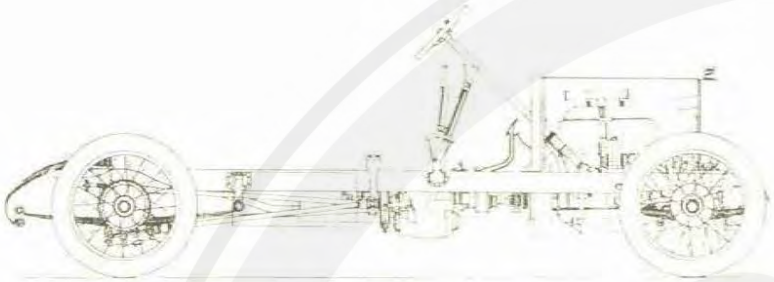
12/16 h.p., A5 type.
16/20 h.p., C5 type.
20/28 h.p., L5 type.
24/30 h.p., M5 type.
35/40 h.p., R5 type.
50 h.p., D6 type.

These chassis are each fitted with a motor having four cylinders with the exception of the 24/30 h.p. and 50 h.p., which have six. The normal engine speed is 1,000 revolutions per minute with the exception of the 12/16 h.p. and 16/20 h.p., which run at a normal speed of 1,200 revolutions per minute.

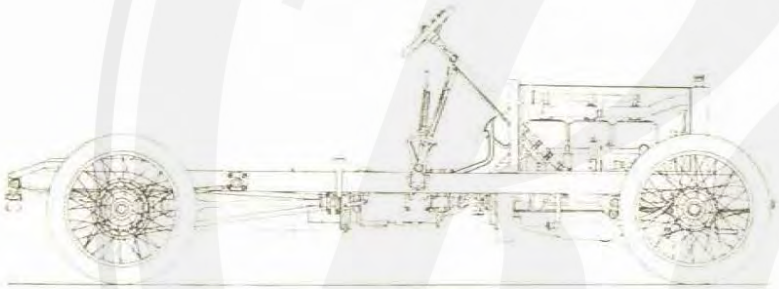
The general specification for all models is similar, so that descriptions of the various details are made general, and special reference is made to the differences in the various models.

All clutches are of the multiple disc type. On all models except the 12/16 h.p. the tension of the clutch spring is adjustable by means of a nut on the clutch cover.

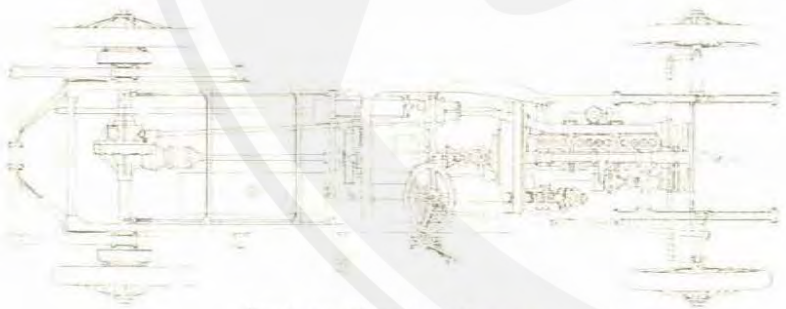
On the 12/16 h.p. the carburetter is fed by gravity from a petrol tank placed beneath the driver's seat, but on all larger types the tank is situated below the frame of the car, and petrol is fed to the carburetter by air pressure, maintained by a pump on the motor.



Elevation of 16/20 h.p. Chassis.



Elevation of 24/30 h.p. Chassis.



Plan of 24/30 h.p. Chassis.

On the 12/16 h.p. model Bosch Standard Magneto is fitted, but on all other models the Bosch dual ignition system is employed. Honeycomb radiators are fitted on all types.

The gear-box for the 12/16 h.p. model has three speeds, the direct drive being on the third speed. All other models have four speeds, with direct drive on top.

The front axles are of Vickers' axle steel, dropped type, with inverted jaw ends.

The foot brakes are operated by the right pedal, and act upon a drum secured to the main gear-shaft. (For adjustment see page 57.)

The hand brakes in each type are applied by a "pull-back" lever. These brakes are of the internal expanding type, and are self-equalising.

All models from and including the 20/28 h.p. and upwards are fitted with a dual silencer, which consists of an extremely efficient silencer with regard to noise, intended for slow running and town use, in combination with a bye-pass for country use. This bye-pass allows a portion of the gas to escape direct through the tail pipe to the atmosphere, having exactly the same effect on the engine as the usual noisy cut-out, but without the noise. Although this bye-pass when opened makes the engine rather more noisy when running slowly, under ordinary touring conditions the difference is scarcely noticeable. It is found in practice that in addition to increasing the power of the engine at high speeds there is a saving of petrol due to the freer exhaust. This dual silencer has not been adopted on the smaller models, as naturally the difference is not so noticeable, and the small advantage gained was not considered to warrant the extra expense and complication. The lever for changing over is fitted on the steering column.

The steering is irreversible through a worm and sector, and the throttle and ignition levers move in racks on the top of the wheel.

CHAPTER II.

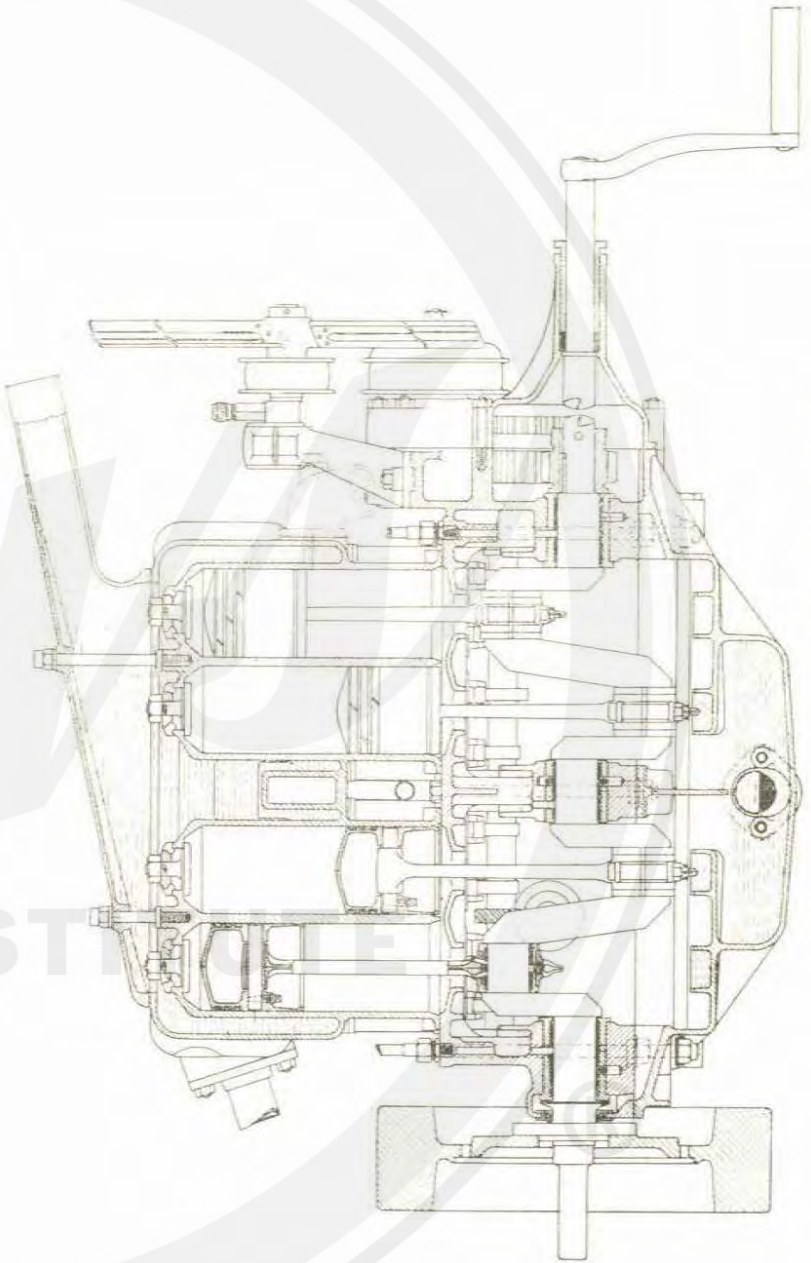
This chapter describes in detail the arrangement and working of the motor and other portions of a car's mechanism which need regular attention and adjustment.

The chassis are all of the live axle type, and representative drawings are shown on page 8.

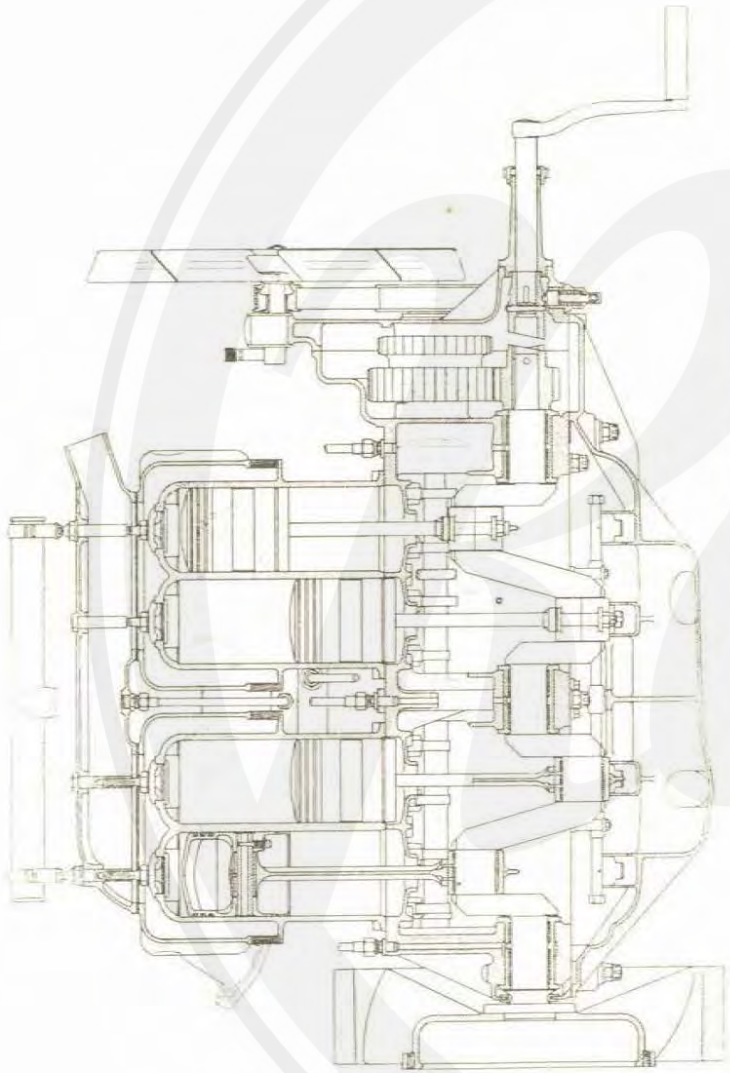
The frames are of pressed steel. In all cases except the 12/16 h.p., which has four cylinders en bloc, the cylinders are cast in pairs, having the valves fitted in the underside of the combustion chamber, both inlet and exhaust valves being on the same side of the motor and interchangeable with each other. Access is obtained to the valves by removing the cover plate and the screwed caps on the top of the engine; these caps also serve to carry the sparking plugs and compression cocks.

The valves are operated from the camshaft through tappets, which have screw adjustment for setting the clearance between the tappet and the valve. These tappet heads are recessed for the insertion of fibre discs, which serve to reduce the noise, and are readily renewable.

The care of the bearings in an engine is an important matter. The main bearings, and the connecting rod big ends, are white-metal lined. The small ends of the connecting rods are fitted with phosphor bronze bushes.

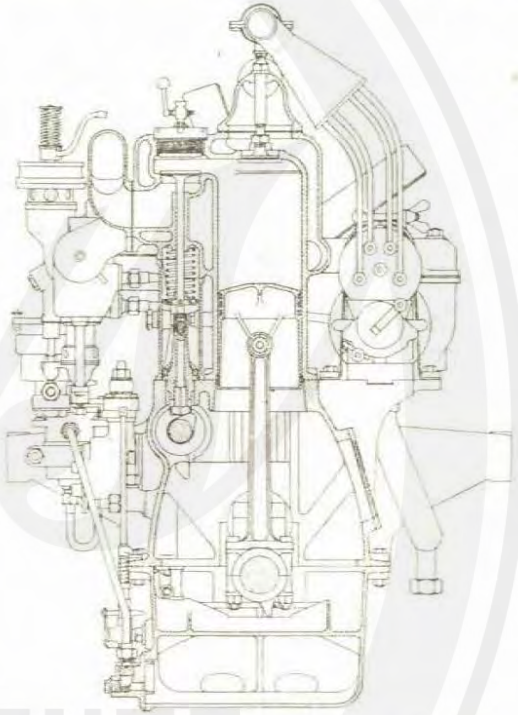


LONGITUDINAL SECTION OF 12/16 H.P. ENGINE.



Longitudinal Section of 20/28 h.p. Engine.

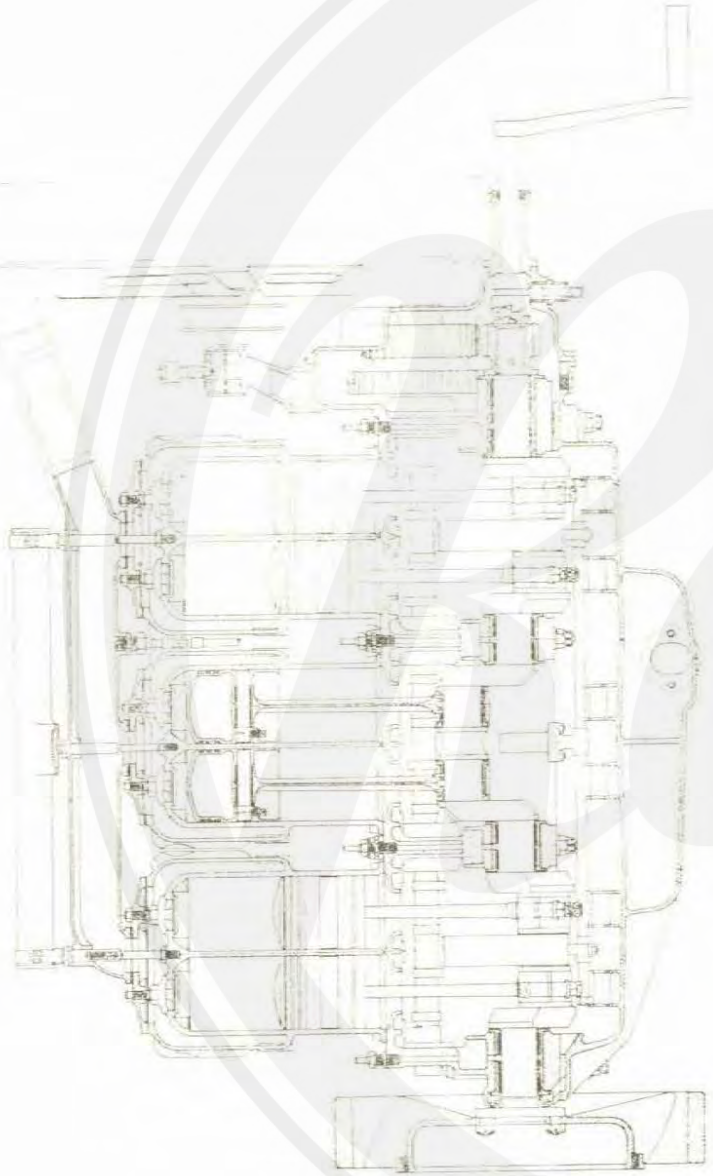
The pistons are lubricated by splash from scoops on the connecting rods. Although the amount of oil splashed to the pistons is reduced to the minimum that is safe for efficient lubrication, some of this is liable to work past the rings to the pistons and heads; these therefore require cleaning occasionally to remove carbon deposit. This, if excessive, is likely to cause pre-ignition, which is readily diagnosed by the "pinging" noise



Transverse Section of 20/28 h.p. Engine.

made when the engine is labouring on a stiff hill, or when picking up on one of the high gears, but this noise must not be confused with that of an ignition which requires retarding, as the magnetos fitted to the 1912 models have a much greater effective range of advance than previous types.

Air Pump.—This is for maintaining the air pressure in the petrol tank, and is fitted to all pressure-fed cars. It is driven and automatically lubricated from the engine. It needs



LONGITUDINAL SECTION OF 21/30 H.P. ENGINE.

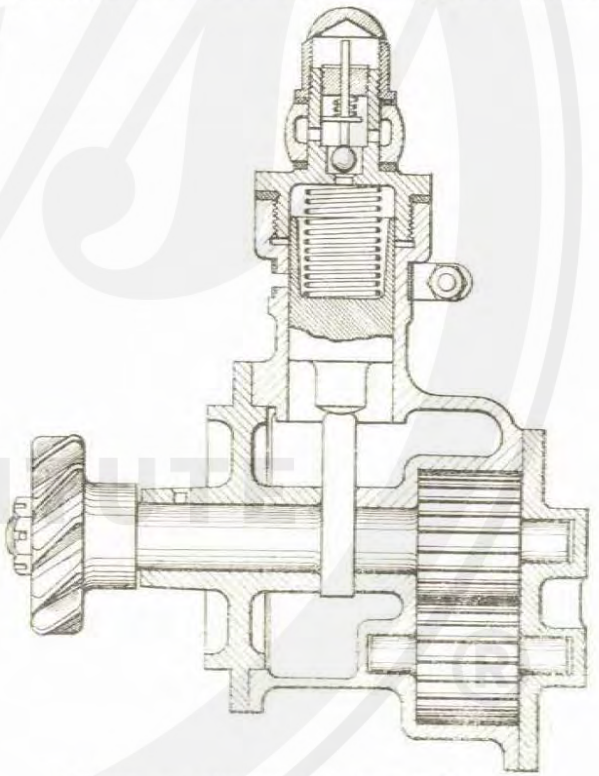
little attention, except that occasionally the ball delivery valve may stick. The only effect of this when the engine is running is to make the pump feed somewhat more slowly, but it has the effect of letting down the pressure when the engine stops. This valve is on the pump, and access is obtained to it by removing the screwed cap over the valve box.

An adjustable sleeve is provided on the air intake to regulate the amount of air pumped.

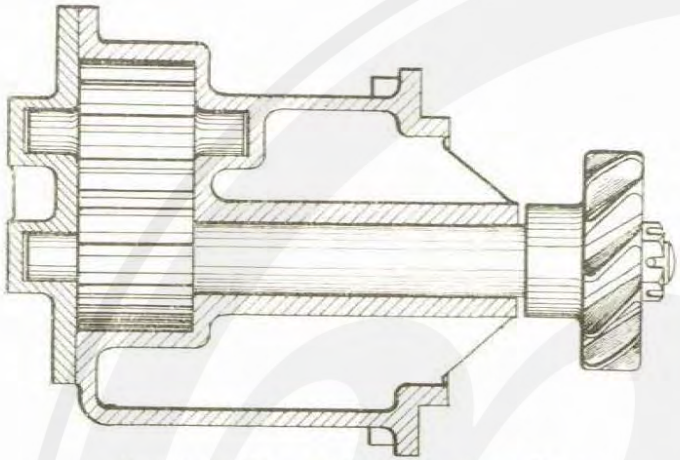
LUBRICATION.

Efficient lubrication with a good quality oil is probably the most important feature in connection with the upkeep of a car.

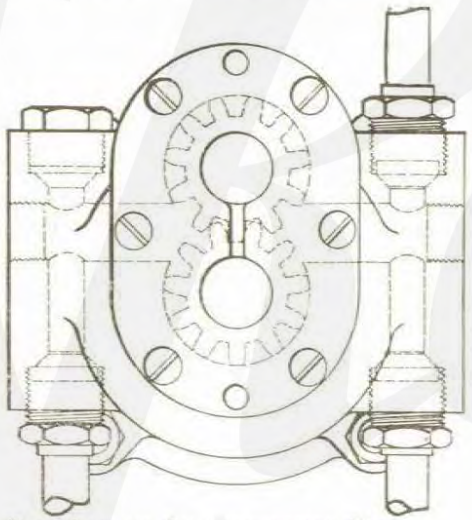
The oil we recommend, which is a high grade pure mineral oil, is **Wolseley Extra Heavy Filtrate**, for which oil all our engines are adjusted, it being the oil which, after many years of accumulated



SECTION OF COMBINED OIL AND AIR PUMP, SHOWING ACTION OF AIR PUMP.



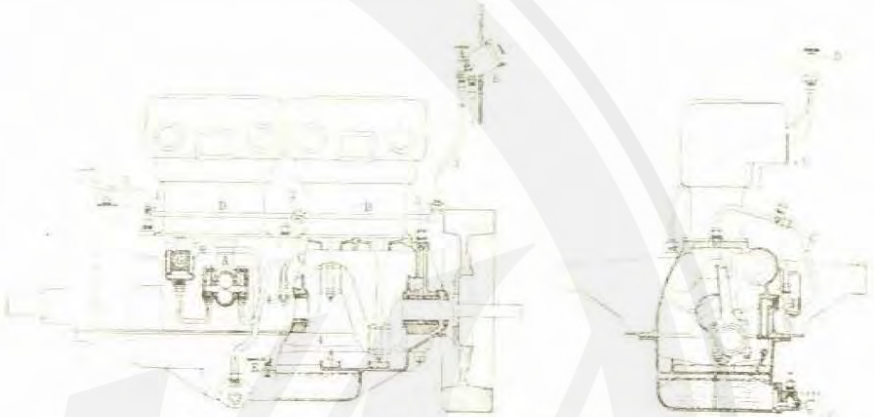
Sectional View of Oil Circulating Pump.



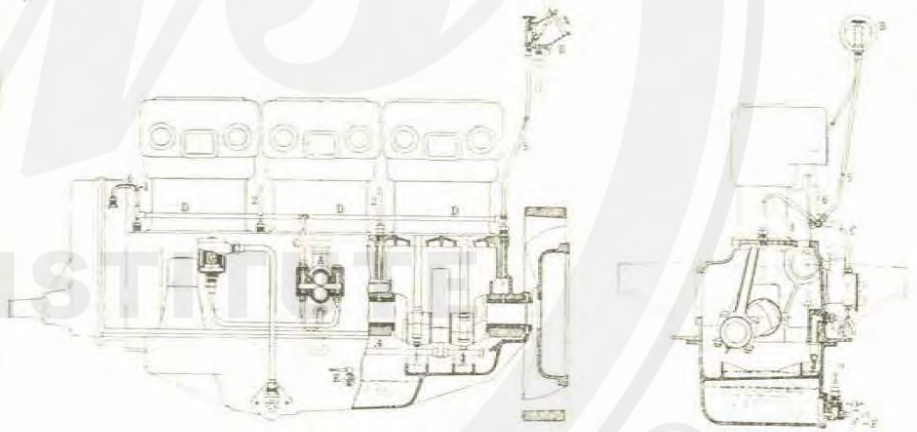
End View of Oil Circulating Pump.

experience, and much money spent on careful and accurate testing, has been found to give the best all-round results. If owners of our cars do not use the oil we use and recommend they deprive themselves of the advantage of our exhaustive experiments and experience.

For owners of cars who are touring on the Continent and cannot obtain **Wolseley Extra Heavy Filtrate,** we recommend "Huile Jupiter A.D. Lubricating Oil" as a satisfactory substitute.

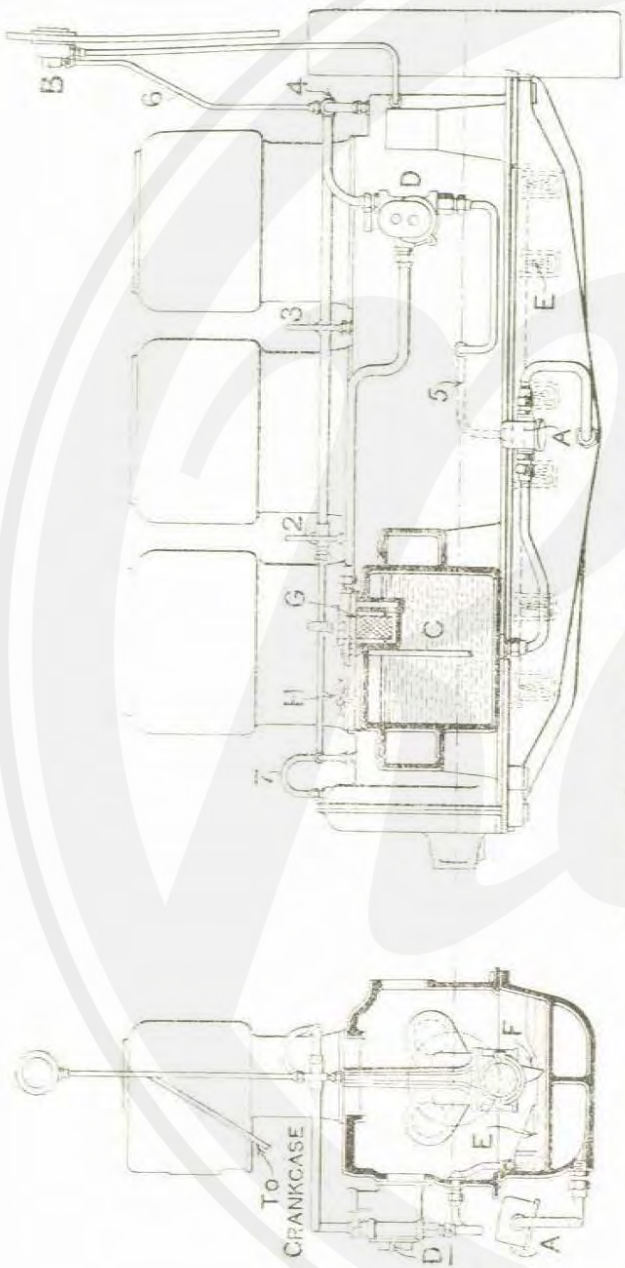


Lubricating Diagram for Four-Cylinder Engine.



Lubricating Diagram for 24/30 h.p. Six-Cylinder Engine.

A. Pump.
B. Indicator on dash.
C. Supply pipe.
D. Distributor pipe.
E. Level cock.
F. Drain cock.
G. Strainer.
1. To crank front bearing.
2. To crank centre bearing.
3. To crank rear bearing.
4. To oil troughs.
5. To oil indicator.
6. To engine gears.



LUBRICATING DIAGRAM FOR 50 H.P. SIX-CYLINDER ENGINE.

This is a standard lubricant, and is obtainable at most garages throughout France.

In all types described in this book the lubrication system is automatic.

The action of this system of lubrication is exactly the same as the usual splash system, except that it is more exact, the levels being automatically kept correct under all conditions.

The engine oil base is in the form of a deep reservoir, and bridging this reservoir are narrow troughs into which scoops on the connecting rods dip. The main bearings also have troughs formed over them, which are pressure-fed, and a further branch pipe delivers oil directly on to the engine chain wheels. The main body of oil is carried in the reservoir, and is drawn from it, through a gauze filter, by a small rotary pump, which is driven from the camshaft.

Oil Indicator.—An indicator on the dashboard enables the driver to ascertain if the pump is working properly.

It is a drip feed, and should be so adjusted that when the engine is warm, and running at normal speed, a continuous stream of oil is visible.

The oil passing the indicator returns direct to the crank-chamber and does not lubricate any bearing.

50 h.p. Lubrication.—The lubricating system on the 50 h.p. model is slightly modified, the oil being carried in a tank at the side of the engine, fed by a second pump, instead of in a sump below the cranks. The crank chamber is kept empty by the second pump, which lifts the oil into the oil tank, whence it is drawn by the ordinary circulating pump, and forced to the troughs of the main bearings and big-ends.

An excess of oil is continually being pumped into the troughs. These are thus always kept full, the excess overflowing into the reservoir.

After a new car has run 500 to 1,000 miles, the oil base should be drained by removing the oil connection, and the engine case and oil pipes thoroughly cleaned out with paraffin, filling up again with

fresh oil to the correct level. Any deposit which may have collected at the bottom of the sump should also be washed out. In cleaning out the oil base, it is preferable to use a brush; on no account should fluffy material, waste, or sponge cloth be used, as particles are liable to remain in the oil base and eventually choke the strainer. This process should be repeated about every two months, or every 2,000 miles, whichever happens first, as after a time the oil loses some of its lubricating properties.

When it is required to change the oil the reservoir should be emptied by removing the drain plug, which will be found at the side of the oil base.

For replenishing the oil base, a filler is provided on the crank chamber into which the oil should be poured until it commences to run out of the level cock, which should be open when filling and closed for running.

When replenishing it is sufficient to pour the oil into the filler, as mentioned previously, but if the oil base has been removed and the engine washed out, it is advisable to refill the troughs before replacing.

On the 50 h.p. model it is advisable to run the engine for a short time after filling up with fresh oil and then refill to the correct level, as this enables the pumps to distribute a portion of the oil to various parts of the engine.

Oil Strainer.—The strainer, which strains all the oil passing to the pump, is in the form of an independent box with readily detachable gauze, removable for cleaning by slackening the clamping screw. It is placed in a fitting bolted to the engine case arm, from which passes the suction pipe. The strainer has a very large straining area, but it is liable to get choked up, especially on new engines, and it is advisable to clean after the first 100 miles to prevent risk of particles being

drawn through, and afterwards every 500 miles. If this is not done, it results in shortage of supply of oil to the engine.

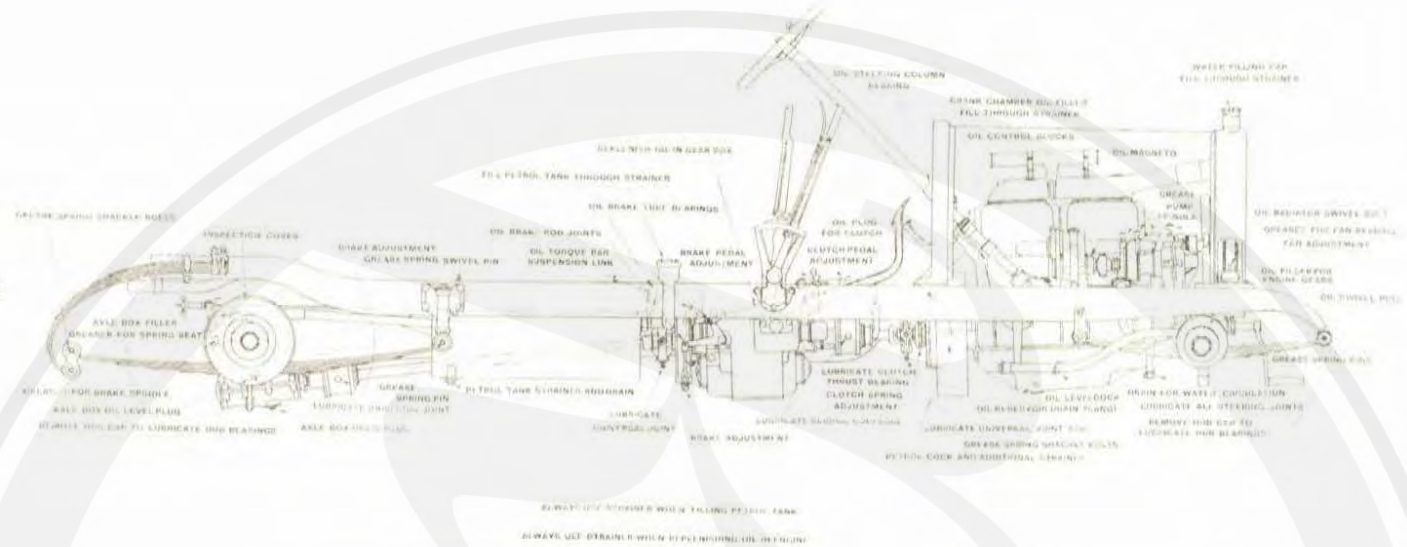
A clear indication that it is necessary to clean this strainer is the stopping of the drip in the indicator. To clean, the strainer must be drawn out and washed, care being taken to ensure that all dirt is washed off the outside and does not find its way inside. On no account should the strainer be immersed in the cleaning liquid.

Special care should also be taken to ensure that the strainer is absolutely intact before replacing, and that the cover fits tightly on to the strainer so as to make an air tight joint, failure to observe which may cause the pump to cease pumping.

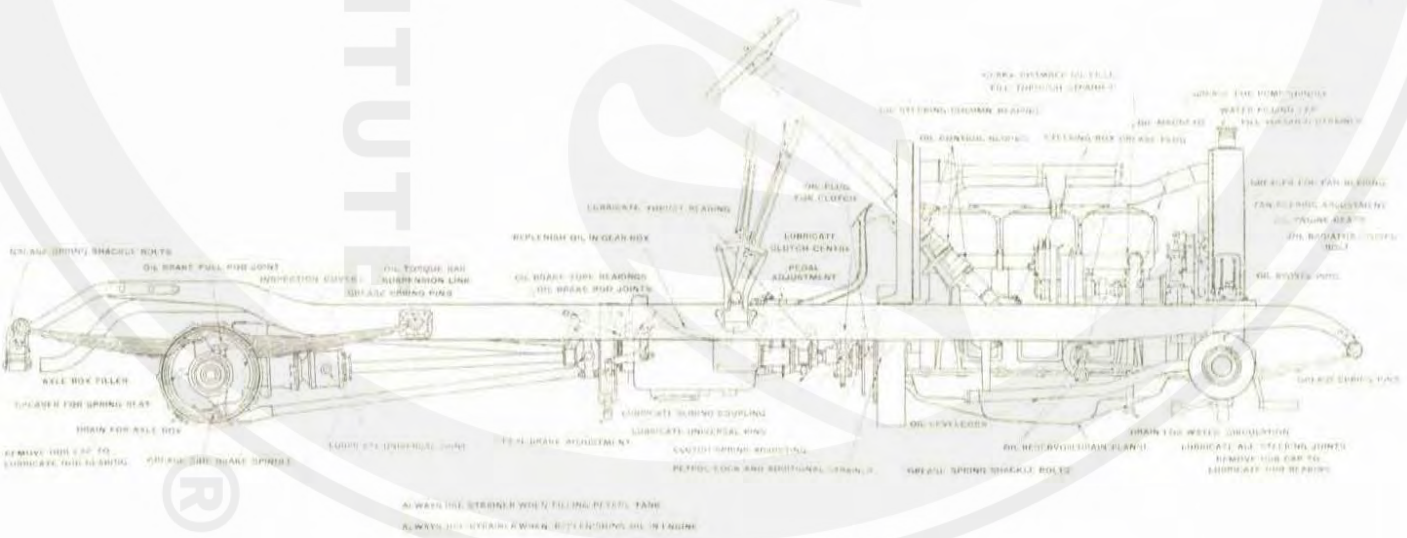
When the oil base is filled to the level of the overflow cock, there should be sufficient for about 300 to 500 miles running, according to type. It is advisable, however, to replenish by adding oil, say every 200 miles, especial care being taken to ensure that the oil is not added to excess, so that it rises over the level of the troughs, as such a condition permits of too much oil being thrown up by the scoops and causes excessive deposit on the pistons, and also a foul exhaust, which latter cannot occur if our instructions are carefully followed.

When the car has been standing for a period of, say, three weeks or a month, it is well to put about half-a-pint of oil into the engine chain-case, for which purpose a cap is fitted on the top of the chain-cover. The surplus oil runs back into the reservoir, and the engine chains and wheels are afterwards fed from the oil pump direct. It is also advisable to fill the strainer to prime the oil pump.

It is of vital importance that no foreign matter should find its way into the engine with the oil; it is therefore essential to carefully strain all oil put into the engine.



Chassis Lubricating Diagram illustrating 12/16 h.p. and 16/20 h.p. Models.



Chassis Lubricating Diagram illustrating Models above 16/20 h.p.

IGNITION SYSTEM.

Ignition.—The magnetos on all models are gear-driven from the motor, being placed conveniently on a bracket forming part of the crank case. The machine only requires occasional lubrication, and must be kept clean and free from grease or damp. The magnetos on all models are of the latest pattern made by the Bosch Company, who have very well-prepared instruction books, giving full particulars of their machines.

The sparking of the new type magneto is efficient throughout its whole range, and consequently the full range of magneto advance and retard can be used with advantage. It is so set that approximately a quarter advance is the right position on hills, and when running fast it can be advanced right up to the limit of the lever; it is of vital importance that it should be fully retarded for starting.

The magnetos fitted to the various types are as follows:—

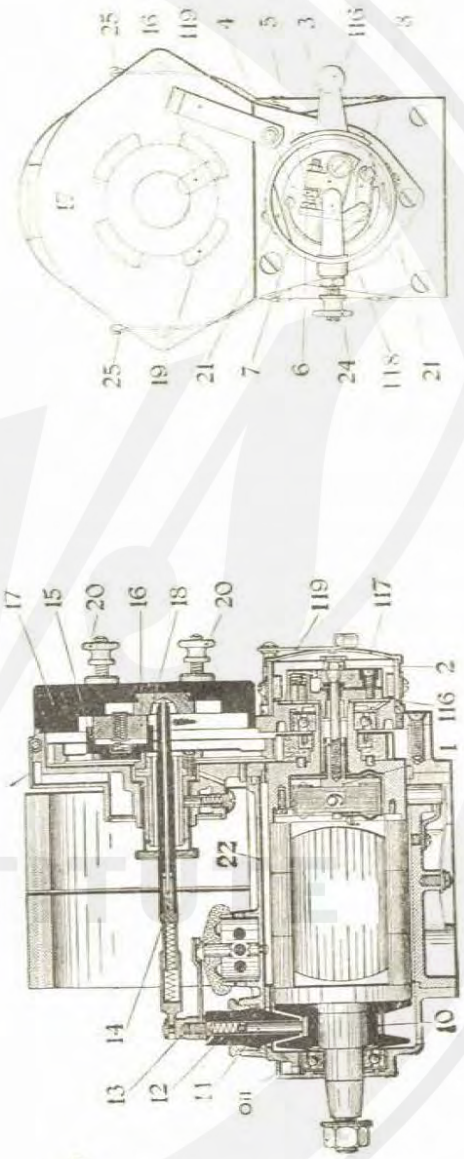
12/16 h.p.	DU. 4 Standard.
16/20 h.p. and 20/28 h.p. ...	DU. 4 Dual.
35/40 h.p.	DR. 4 Dual.
24/30 h.p. and 50 h.p.	DR. 6 Independent Dual.

The ignition cables should be kept dry and free from oil.

The magneto distributor requires to be periodically cleaned, particularly on the six-cylinder engines. This should be done at least every 1,500 miles, and a suitable metal polish such as "Shinio" is the best medium for cleaning.

Illustration on page 29 is given, showing diagram of the wiring for the Bosch dual system, as now fitted. This diagram applies to 16/20 h.p., 20/28 h.p., and 35/40 h.p. models.

For the convenience of our clients we give extracts from the Bosch booklets dealing with the description and working of the magneto machine, and also with methods of detecting faults.



One third actual size.

MAGNETO "DU 4" STANDARD TYPE AS FITTED TO 12/16 H.P. MODEL.

LONGITUDINAL SECTION. REAR VIEW.

1. Brass plate for connecting the end of the primary winding.
2. Fastening screw for contact breaker.
3. Contact piece for contact breaker.
4. Contact breaker disc.
5. Long platinum screw.
6. Short platinum screw.
7. Contact breaker spring.
8. Bell crank lever.
9. Condenser.
10. Slip ring.
11. Carbon brush for high tension current.
12. Carbon holder for same.
13. Fastening nut for carbon holder.
14. Spring contact for conducting the high tension current.
15. Rotating insulating block.
16. Distributor carbon brush.
17. Distributor disc.
18. Central distributor segment.
19. Metal segment.
20. High tension terminals.
21. Steel segments.
22. Dust cover.
24. Nut for short circuiting terminal.
25. Spring for holding distributor disc.
116. Timing lever.
117. End cap.
118. Contact spring for short circuiting terminal.
119. Spring for holding flat end cap.

Generation of Current.—Between the pole shoes of two steel magnets, which form a strong magnetic field, a so-called shuttle armature rotates. By this motion a current is produced in the armature winding which reaches its maximum twice in one revolution, i.e., at each 180° of rotation; therefore a spark can be produced at each half revolution of the armature.

The armature is wound in two parts, one of which is the primary, consisting of a few turns of heavy wire, and the other the secondary, consisting of many turns of fine wire.

The current is produced in the primary winding by the rotation of the armature. On the interruption of this primary circuit, by means of a contact breaker, a high tension current is induced in the secondary winding, which at the moment of the breaking of the contacts causes a spark to jump across the points of each sparking plug in succession, according to the position of the brush on the high tension distributor.

Speed and Rotation.—The armatures of the magnetos "DU.4" and "DR.4" Types are positively driven at crankshaft speed, the magneto "DR.6" Type at 1½ crankshaft speed. The construction of the magneto allows the rotation of the armature in one direction only.

On every magneto the direction of rotation is indicated by an arrow stamped on the lubricator cover at the driving end of the magneto.

Distribution of Current.—The gear wheel, which carries the distributor carbon brush 16, is so arranged that it revolves at the same speed as the camshaft of the motor.

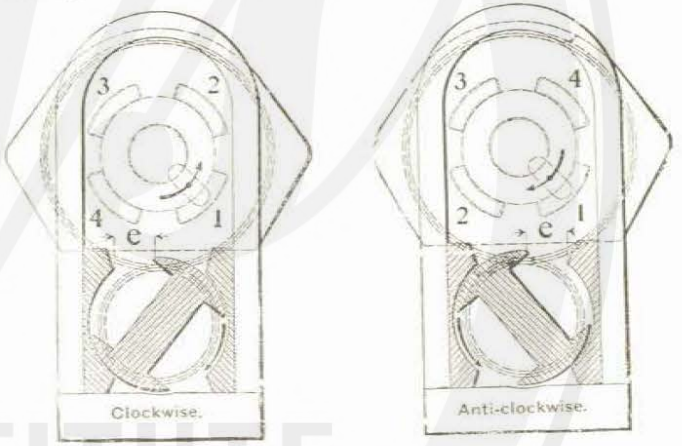
Contact Breaker.—The contact breaker is fitted on the rear end of the armature spindle, and is held in position by the screw 2, by removing which it can easily be taken out.

The short circuiting and interrupting of the primary current is effected twice during each revolution of the armature by means of the contact breaker lever 8 on one hand and the

steel segments 21, which are arranged in the timing lever 116, on the other. As long as the contact breaker lever 8 is pressing against the contact screw 5, the primary current is short circuited. The rocking of the lever by means of the steel segments 21 effects the break of the primary circuit, and at the same moment ignition takes place. The distance between the platinum points when the lever is depressed by the steel segments must not exceed 0·4 mm. The distance may be adjusted by means of the screw 5.

Special care has to be taken that the platinum points of the contact breaker are always free from oil, as otherwise it is impossible to make a good contact, and the production of the current from the magneto is considerably reduced.

The magnetos on all our models run clockwise looking on the driving end.



End View of Magneto, showing direction of Rotation of Armature.

The sketches above indicate the order of sparks as supplied by the magneto, but do not indicate the sequence of firing. The explosion, of course, varies according to the arrangement of the cylinders, and the order in which they come under compression (see page 28).

To assist in setting the magneto each top centre is marked on the flywheel.

The order of firing for a four-cylinder motor is as follows:—1, 3, 4, 2.

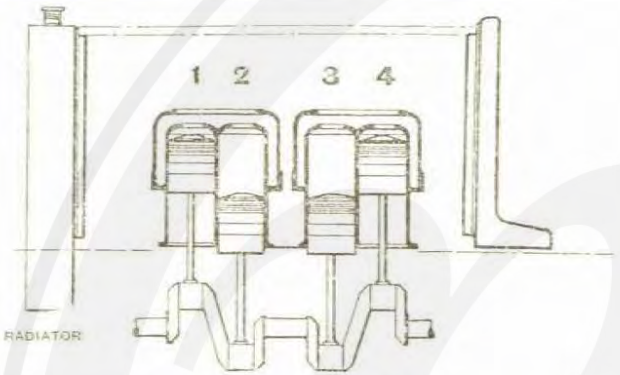


Diagram showing Order of Firing for Four-Cylinder Motor.

The order of firing for a six-cylinder motor is as follows:—1, 4, 2, 6, 3, 5.

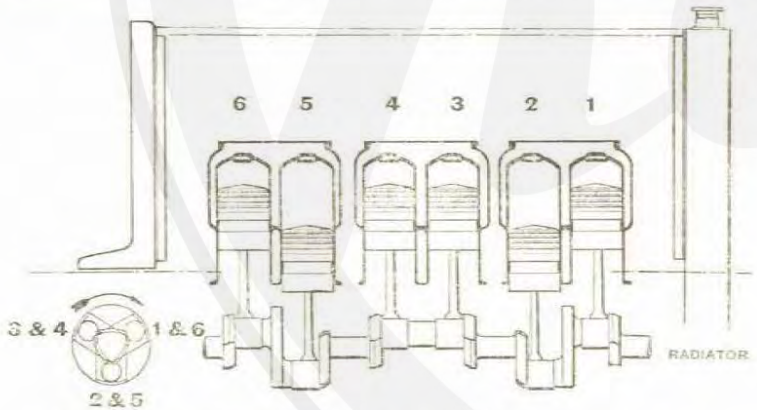


Diagram showing Order of Firing for Six Cylinder Motor.

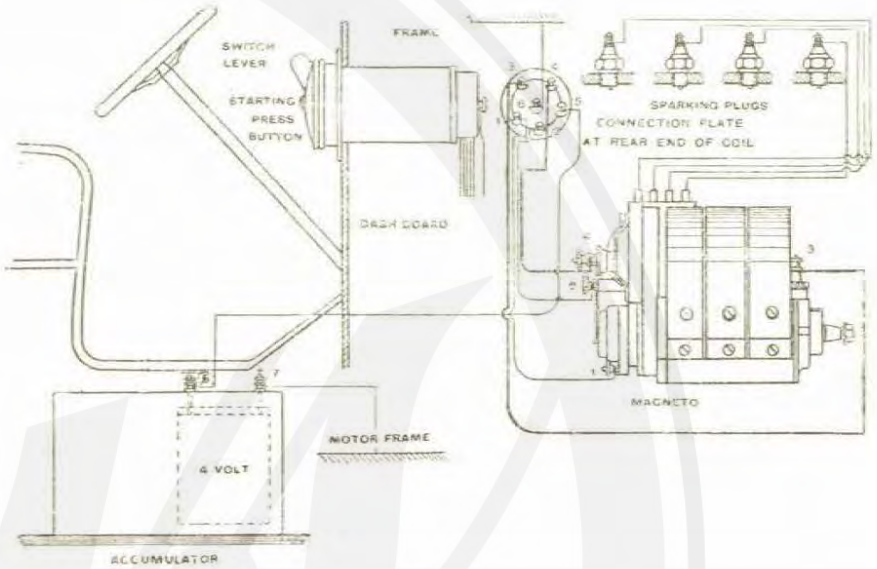


Diagram showing Wiring with Dual Ignition for Four Cylinder Engine.

1. To contact breaker (accumulator)	Low tension.
2. To short circuiting terminal	
3. To magneto high tension terminal	High tension.
4. To distribution terminal	
5. To battery terminals	Low tension.
6 & 7. Connections to frame	

Timing of the Ignition.—The variation in the time of ignition is effected by causing the interruption of the primary circuit to take place earlier or later. For this purpose the timing lever 116 (page 25) is arranged to be either advanced or retarded, which produces either an early or a late interruption, and consequently an early or a late ignition.

Sparking Plugs.—The points of the sparking plugs in the cylinders require to be periodically examined and cleaned. If these points are too wide it makes starting difficult. The correct adjustment is the thickness of the gauge on the spanner supplied with the magneto or roughly that of a visiting card, which is approximately ·014 inches.

On the facing page we give an illustration of a longitudinal section showing Bosch magneto arranged for dual ignition. From this it will be seen that this magneto differs somewhat from the ordinary standard. The illustration shows "D.4" type, but also applies to the "DR.4" and "DR.6" types, the difference being the two latter have only two magnets instead of three, and consequently are somewhat shorter.

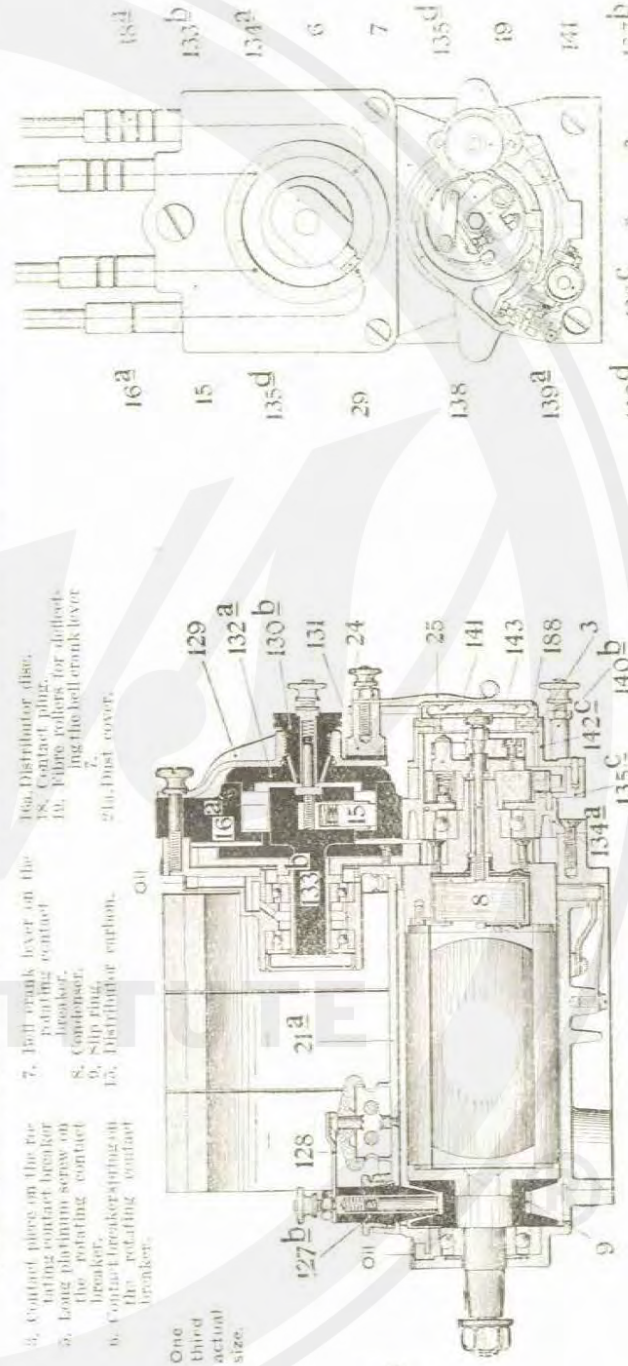
Setting of the Dual Ignition.—In order to give a good starting on the switch, the coil should commence to "tremble" (retarded position) when the piston is on the top centre.

In order to check the correct setting, fully retard ignition, open compression cocks, press lightly on the button of the coil, and it should commence to "tremble" just as the piston reaches the top centre.

The accumulators should be tested occasionally with a voltmeter, and when the voltage drops to 3·8 it is necessary to re-charge. Accumulators will not last long if allowed to rest for many months uncharged. They need to be discharged and recharged about once a month to keep them in good order.

How to operate the Dual Ignition.—*For starting the motor on coil*, fully retard the timing lever and move switch handle 1 to position "A," thus bringing the battery into circuit. The coil is provided with a press button to cause a spark to enable the engine to self-start, if the

LONGITUDINAL SECTION AND REAR VIEW OF BOSCH MAGNETO TYPE "D4," ARRANGED FOR BOSCH DUAL IGNITION.



One third actual size.

5. Contact piece on the rotating contact breaker.
6. Long platinum screw on the rotating contact breaker.
7. Bell crank lever on the rotating contact breaker.
8. Condenser.
9. Slip ring.
15. Distributor carbon.
16a. Distributor disc.
18. Contact pin.
19. Fibre rollers for deflecting the bell crank lever.
21a. Dust cover.
24. Nut on short circuiting terminal.
25. Flat spring for holding end cap 188.
28. Short platinum screw on the rotating contact breaker.
127b. Carbon holder with nut for fastening cable terminal.
128. Spring to the safety spark gap.
129. Triangular clamp.
130b. Carbon holder on the brass angular clamp 129.
131. Contact block for short circuiting terminal.
132a. Ebonite cover.
133b. Rotating distributor piece.
134a. Rear end plate cover.
135c. Timing lever with battery contact breaker.
136a. Bell crank lever on the battery contact breaker.
137. Flat spring on battery contact breaker.
138. Short platinum screw on battery contact breaker.
139a. Long platinum screw on battery contact breaker.
140b. Battery terminal.
141. Rotating magneto contact breaker with steel cam for battery contact breaker.
142. Carrier for fibre rollers 19.
143. Fastening screw for rotating contact breaker 141.
188. End cap.

conditions under which it stopped permit of this. Provided the engine contains a compressed charge of explosive mixture, the motor may be started from the driver's seat by slightly depressing the button 4. In starting on the switch there are two conditions to be considered.

1. At normal position of the pistons, *a light pressure on the push button* is sufficient to start the motor.

2. If the pistons are not in normal position, the motor may be started by applying a *further, and heavier pressure to the button*. Care must be taken, however, not to *prolong* this operation, which should be *sharp and momentary*.

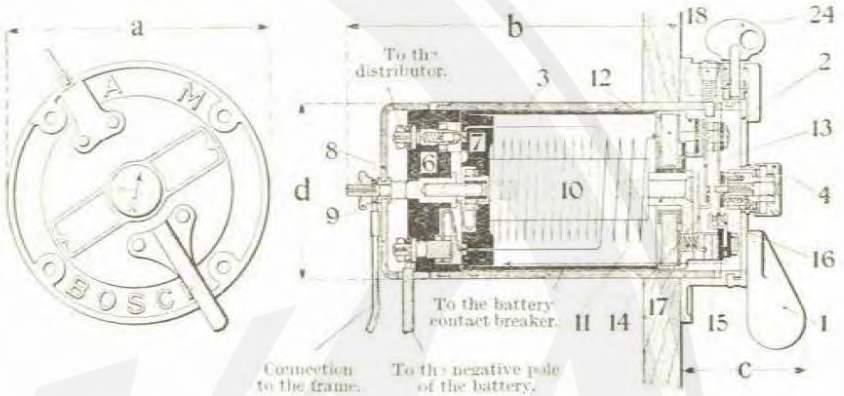
To be able to re-start in this manner, it is essential that the engine should be stopped by switching off the ignition, so that the cylinder contains gas for re-starting. For this purpose it is necessary to move the switch handle 1 into the off position marked "O."

If the above conditions are observed, the engine, when warm, will frequently self-start after a brief stop on pressing the button, but this method of starting cannot be depended upon.

The dual ignition is, however, recommended, as it provides a second ignition in the somewhat remote case of electric failure of the magneto, and being provided with current from the accumulator renders starting by cranking easier than when starting on magneto.

Magneto ignition is obtained by moving the switch handle 1 to the extreme left, into the position "M." It is important that the switch should not be left in position "A" *when the motor is at rest* otherwise it is possible that the battery might discharge itself, if by any chance the battery contact breaker is closed. For the same reason the switch handle 1 must be at once *placed in the "off" position* if the motor is stopped by closing the throttle, or if same should be stopped

accidentally. Care should be taken that the handle 1 *is always properly switched over*, as otherwise the connection plate 7 is liable to be burnt, through the current jumping across the contacts.



Section of Starting Coil as Fitted to Wolseley Models.

1. Switch handle.
2. Movable cover.
3. Coil case.
4. Starting push button.
6. Fixed connection plate.
7. Movable switch plate.
8. Cable cover.
9. Milled edge nut.
10. Iron core.
11. Plate carrying the starting arrangement and the condenser.
12. Condenser.
13. Contact spring.
14. Trembler.
15. Auxiliary contact breaker.
16. Trembler spring.
17. Trembler spring.
24. Key.

Methods of Locating Faults.—In case of defective ignition it must first of all be ascertained whether the fault is on one cylinder or whether all are misfiring. Besides this the dual ignition should always be tried to see whether the fault appears with both ignitions or only with one. Upon these observations all further examinations depend.

Missing of the Ignition in one Cylinder. — Noticed with both ignitions. Ascertain whether the cables leading from the magneto to the sparking plugs are in good order. Exchange the plug in the faulty cylinder.

Irregular Firing in all Cylinders.—Magneto ignition working correctly. Test the batteries to ascertain whether they show the proper voltage (4 volt normal). Connect the

reserve battery which we recommend all clients to carry. Examine whether all connections are properly made. If this is correct, see whether the battery contact breaker is working regularly (instructions below) and whether the platinum screws are dirty or worn out. **Battery ignition only working regularly :** Examine contact breaker for magneto ignition (instructions below). Examine the platinum screws.

No Sparks.—Faults appear on both ignitions : Examine the connection 4 (page 29) if same is interrupted or shorting to frame. **Magneto ignition working regularly :** Ascertain whether the battery is in good order. Connect reserve battery. Determine whether other connections are perfect. Examine battery contact breaker. See that the platinum screws are the right distance apart when separated. Examine the switch contacts. **Battery ignition working regularly :** See that connection 2/2 is not "shorting" to the frame, and connection 3 is not interrupted. Ascertain whether the magneto contact breaker is in order, and if the bell crank lever in same is working properly.

CARBURETTER.

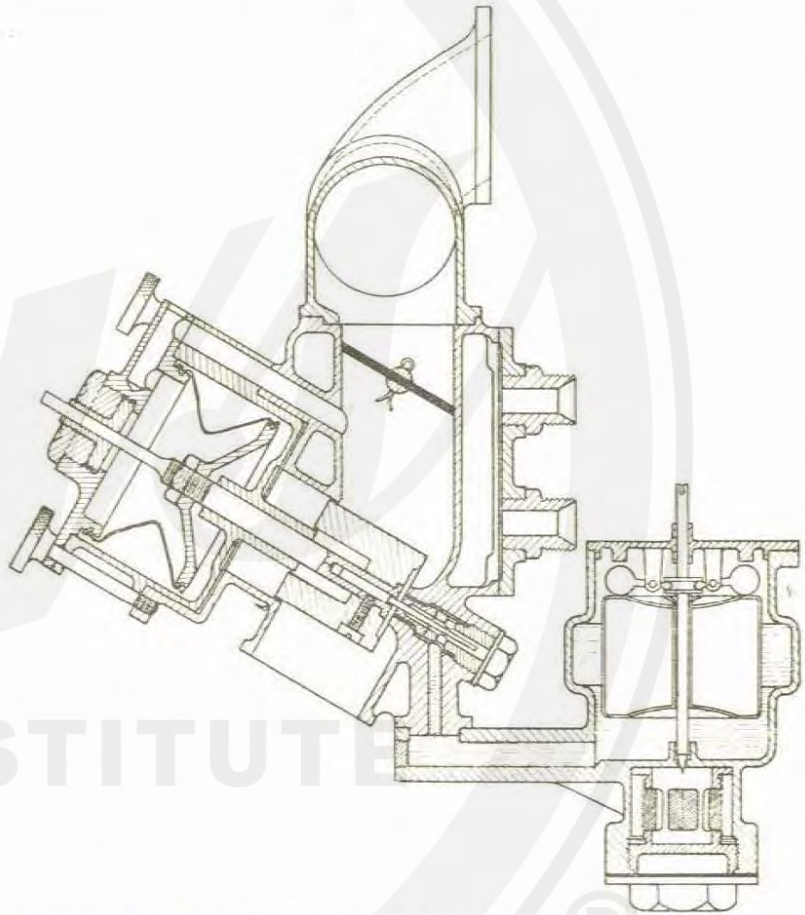
The carburetter on the smaller models, where the power range is not so great as in the larger engines, is of the floating weight taper needle type, which gives similar results on the smaller cars to the multi-jet type fitted to the larger engines, and is much simpler.

The carburetter on the 12/16 h.p. model is arranged for gravity feed, and all other models for pressure feed.

Floating Weight Type.—In starting do not open the throttle too far, otherwise the floating weight is liable to lift too high, thus preventing sufficient suction on the jet. When warm, if correctly set, the engine accelerates freely and quickly from the minimum position to high speeds. When cold the engine may accelerate better if the throttle is not fully opened.

If there is any difficulty in accelerating when the engine is hot it may be due to the engine not getting the correct

proportion of petrol. This can easily be checked by setting the hand throttle for the engine to run at a fixed speed, then slightly depressing the floating needle. If the engine increases in speed when the piston is slightly lowered (thus strengthening the mixture) the taper needle should be slightly raised out of the floating weight and *vice versa*.



Diagrammatic View of Floating Weight Carburetter as Fitted to Wolseley Models.

Under no circumstances should flats be filed on the needle as this is designed to give the correct ratio of petrol to air for all speeds and loads of the engine.

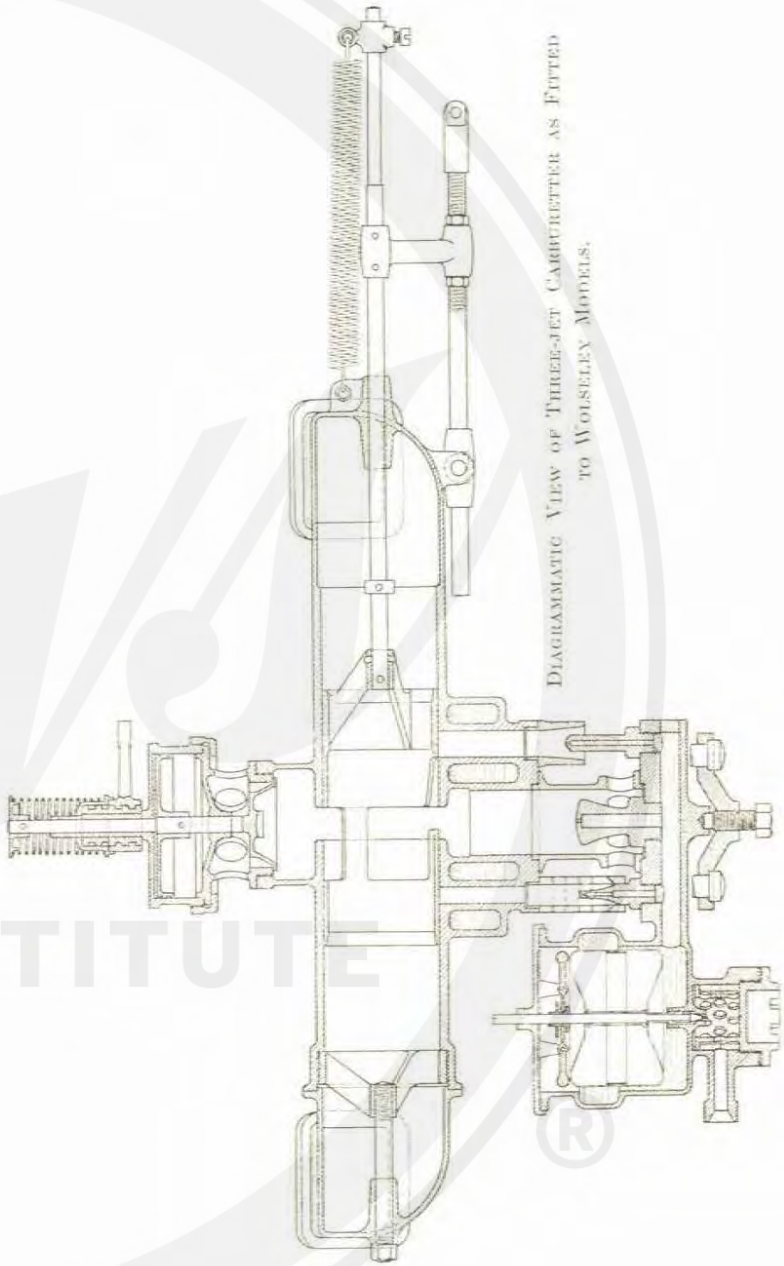
Under certain conditions it may be found an advantage to adjust the distance between the bottom of the bellows and the top of the floating weight. The bellows must be carefully handled. The weight should fully lift when the engine is running at its maximum speed with throttle full open. Lengthening the bellows by screwing down the base plate gives a higher lift of needle, weaker mixture, greater economy (within limits), but lessens the quickness of acceleration; and shortening the bellows gives richer mixture, greater rapidity of acceleration with higher petrol consumption.

Multi-Jet Type.—The extra air valve in connection with the multi-jet carburetter is provided with a dashpot, and the tension of the spring holding the valve on its seat is adjustable by means of a quick thread screw adjustment in conjunction with a control lever which forms a third lever on the steering wheel.

When starting up, the throttle lever should be in the position which gives the greatest audible suction on the small jet, as it is difficult to start if the throttle is open to the main jet. If the throttle is opened wide too soon after starting up from cold, there is a liability to "pop back," and this, if preliminary flooding of the carburetter has occurred, may fire the petrol lying around the base of the carburetter. If any tendency to "pop back" is noticed, the throttle should be immediately brought back to the slow running position and the petrol turned off. If the engine is left running light for a few minutes, in order to warm the carburetter, this liability to "pop back" is avoided. The position of the throttle makes a considerable difference to the ease of starting. When the throttle is in the correct position, a distinct sucking noise can be heard when turning the engine by hand, and if this sound cannot be heard, the throttle is either too far open or not open enough.

If these directions are followed the engine can be started quite readily under any conditions of temperature or weather.

With the aid of the foregoing descriptions and drawings, the construction of the carburetters should be obvious. The



Diagrammatic View of Three-jet Carburetter as Fitted to Wolseley Models.

auxiliary air valve can be removed by unscrewing from the upper part of the throttle box. Access to the jets is by removing the float chamber bodily. The float chamber is removed by uncoupling the petrol pipe and slacking the nuts on the swing bolts holding the float chamber on to the carburetter. If the petrol consumption appears to be excessive, the extra air valve should be carefully examined to see that it is working correctly. The carburetter should require little attention, but as it is extremely sensitive and consequently very easily deranged, it should not be adjusted without careful consideration and, if possible, advice should be obtained from ourselves or our accredited agents.

The carburetter is carefully adjusted during its trial runs at the works, and the size of jets is fixed so as to give the best possible results under all conditions, and therefore on no account should the setting or size of the jets be altered.

If a jet has become stopped, the float chamber should be cleaned as well, as it is probable there may be more than one piece of foreign matter in the petrol supply.

General.—If difficulty is experienced on very cold and damp mornings in starting the engine, a little petrol may be injected into the compression cocks in the exhaust caps. It will also be found a convenience to slightly flood the float chamber, so as to ensure that when the starting handle is turned a mixture is drawn into the engine. When the engine is warm, this precaution is not necessary. As the carburetter is heated sufficiently only when the engine is thoroughly warm, it is recommended that the engine should be run light for a few minutes before attempting to drive the car.

If the carburetter floods, the following are the principal causes :—

1. The float may have a leak and become wholly or partially filled with petrol, and therefore cannot rise to hold the needle valve tight.

2. There may be a little grit under the needle valve which will probably be removed by letting the petrol flood through it for an instant. The needle valve should be held up for a short time, and not pulled up and down, as this is very liable to damage the valve seat.

3. The needle valve seat may require re-grinding, which should be carefully done, great care being taken that there is no grit on the seat when being ground, or it will be ruined. The best grinding medium for this valve is jewellers' rouge.

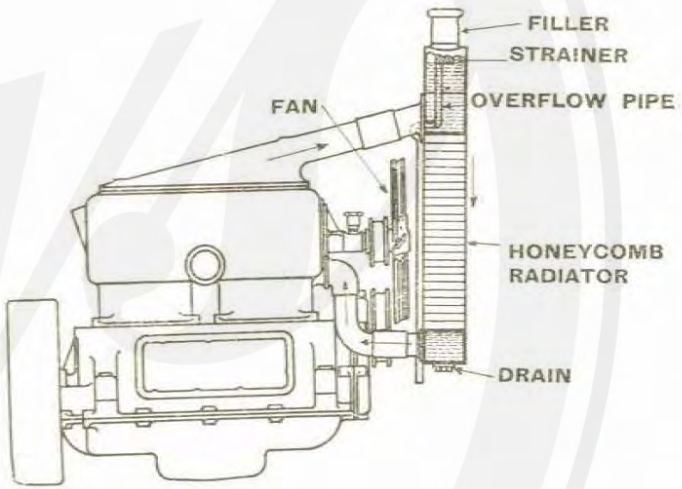
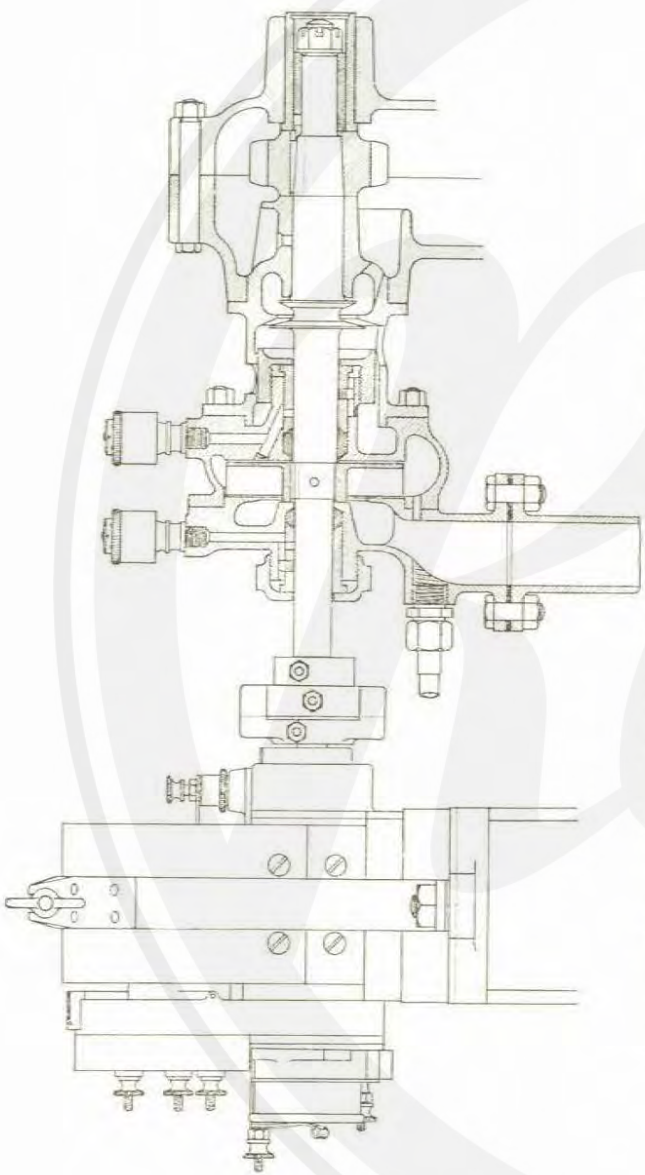


Diagram of Thermo-Syphon Cooling System as used for 12-16 h.p. Car.

The carburetter is extremely sensitive to air leaks, therefore great care must be taken in replacing carburetter if it has been removed. A very slight air leak prevents engine running slowly.

Strainer.—A strainer is combined with the petrol cock, and another strainer is also fitted in the float chamber. These should be removed and cleaned periodically. If these strainers become



Sectional View of Water Circulating Pump, showing Pump and Magneto Drive.

choked it may result in explosions in the exhaust silencer due to the carburetter being starved. A further cause of carburetter starving may be failure of air pressure (see page 15).

WATER CIRCULATION.

For the 12/16 h.p. motor, circulation is maintained on the thermo-syphon principle, but with all other types it is maintained by means of a pump driven from the motor. The cooling is further assisted by a fan mounted behind the radiator and driven from the engine by means of a belt. The radiator is filled through a cap in the top, and

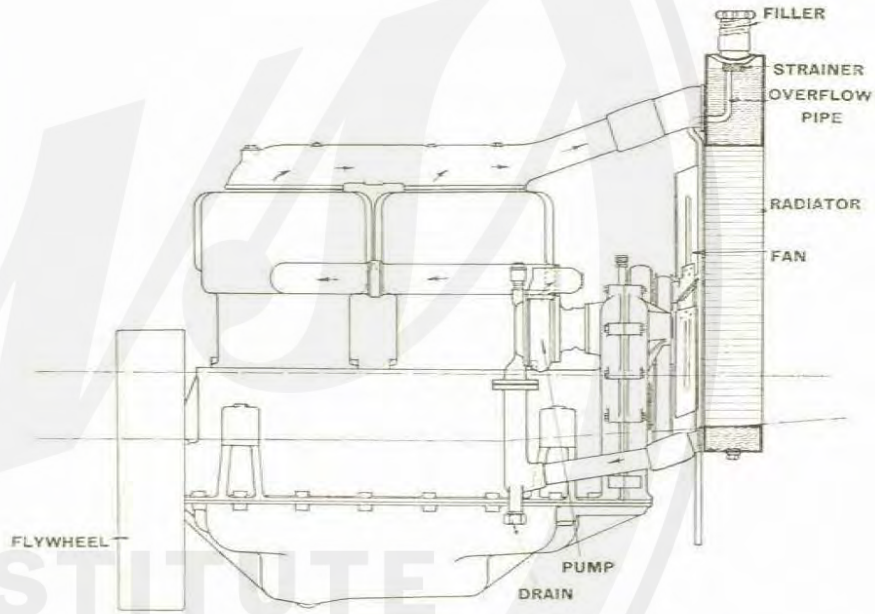


Diagram of Cooling System in connection with a Pump.
As used for 16/20 h.p., 20/28 h.p., and 35/40 h.p. Wolseley Cars.

Note.—The same arrangement applies to 24/30 h.p. and 50 h.p. cars (with an additional pipe to the third pair of cylinders).

replenishment of water should be made as may be found necessary. With the thermo-syphon system it is essential that the

water should cover the top water-pipe, else no circulation can take place, and the water will boil.

It is well known that water expands considerably on being heated, and the expansion of water is sufficient to cause an appreciable wastage during the first few miles' running, or whilst the temperature is rising to its maximum after filling up with cold water. This wastage need not cause any apprehension, as after 5 or 10 miles running the surplus water will have been ejected and further loss by evaporation will be very slight, except under abnormal conditions.

Under ordinary working conditions the cooling system should require very little attention.

Filling Circulation.—It is essential when filling the radiator that the water should be clean, and at intervals the water-pipes should be disconnected from the pump and the cooling system thoroughly flushed out. If hard water is generally used, depositing lime or magnesia, a strong boiling solution of washing soda will remove the deposit, but care must be taken that this solution does not come into contact with any paint work. If the ordinary water of the district is "very hard" it is preferable to use rain water well-strained. In frosty weather it is necessary to guard against frost, and should it not be possible to store the car in a warm building, the precaution should be taken of draining all water away, refilling when the car is again wanted for use, with hot water if available.

Emptying Circulation.—For this purpose there is a plug underneath the radiator, and also a blind nut in a convenient position on the lowest part of the water circulation. This nut is not at the same relative place on all engines, but an examination enables its position to be readily located. Draining the water circulation also drains the pump, as there is a special hole drilled on the suction side of the pump to effect this. Remove filling cap from top of radiator when draining water-cooling system.

If the water in the engine should be allowed to freeze there is great risk of damaging the pump when starting up again or, if the freezing is serious, of cracking the cylinders, radiator, or other part that contains water.

Water Pump.—The water pump used is of very simple construction; it is of the centrifugal type, driven from the motor by enclosed chain gearing. Grease lubricators are fitted on the outer casing of the spindle, and a packing gland at the inner end. In case of leakage, which tightening the gland does not stop, it is necessary to re-pack, but great care should be taken not to over-tighten the gland, otherwise it is liable to run hot or cause excessive wear.

Fitted in the filling hole, in the top portion of the radiator, is a gauze strainer. This is removable, but it should always be used when filling up.

Fan.—The fan spindle bearing requires ordinary attention with regard to lubrication, especially when new. The fan is driven by a flat leather belt from a pulley on the shaft driving the pump spindle. This belt is adjustable by rotating an eccentric sleeve which carries the fan spindle. It should not be adjusted too tightly, but just enough to allow the fan to be moved easily by hand.

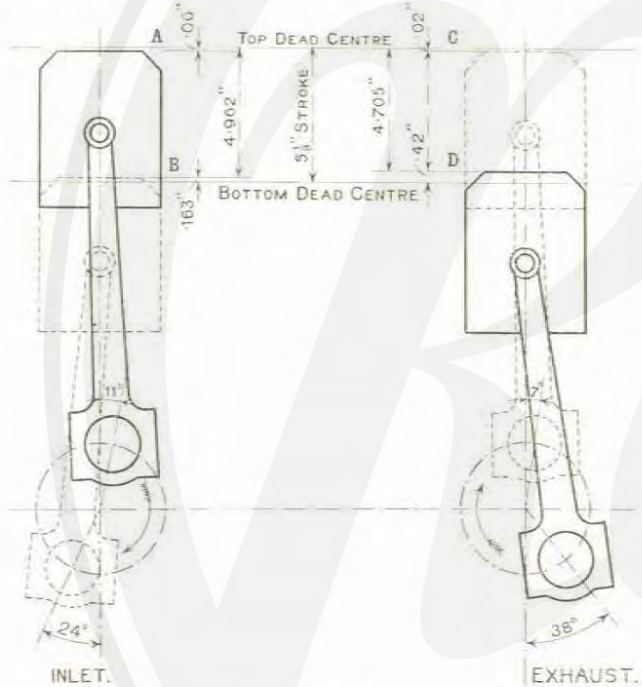
Engine Timing Gears.—Access to these wheels is obtained by removing the radiator and the engine front cover, but for the purpose of lubrication there is a screw plug on the top of the chain gear cover.

The lubrication of the timing chain wheels is automatic and on no account should grease be put in the timing gear-case, as it is in direct communication with the engine crank case.

Valve Grinding and Adjustment.—If the whole of our instructions regarding engines are carefully carried out, it will be found that valves seldom require attention.

If, however, it is found that grinding in is necessary, the operation should be carried out as follows:—

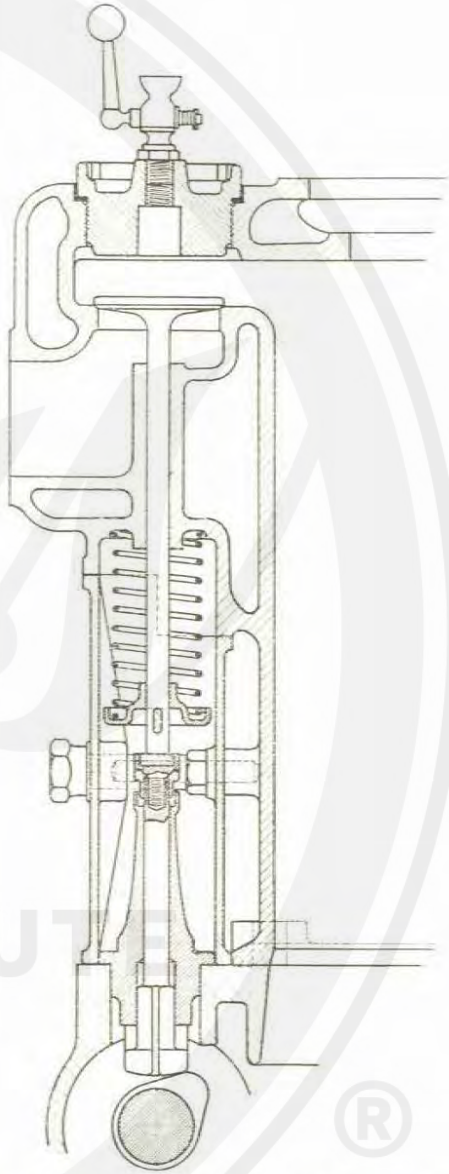
Remove the valve caps by means of the special plug and spanner provided. After the cover plates have been taken down, the cotters below the springs should next be removed, when the valves can be lifted out. The valves should then be smeared with a suitable grinding paste and ground to their seat by means of a screwdriver or brace and bit. In the latter case, it is convenient to put a light spring under the valve head. When grinding, only **slight pressure** is necessary. A suitable grinding paste is put up in convenient tins and can be supplied on application.



A. Valve opens after completion of exhaust stroke (approx. '06" for 5¼" stroke).
B. Valve closes after completion of suction stroke (approx. '163" for 5¼" stroke).
C. Valve closes after completion of exhaust stroke (approx. '02" for 5¼" stroke).
D. Valve opens before completion of working stroke (approx. '42" for 5¼" stroke).

The above are the mean settings; considerable variation is permissible without affecting results.

DIAGRAM OF VALVE SETTING.

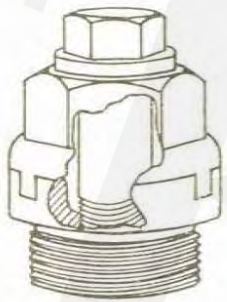


SECTIONAL VIEW SHOWING VALVE MOTION AND TAPPET ADJUSTMENT.

While grinding, valves should be constantly lifted and moved round at the same time, so that the seating may be ground quite true all over. After this operation, valves and seats must be thoroughly cleaned—preferably with a material which does not leave fluff. Do not wash with petrol or paraffin, as it is liable to wash the grinding material into the working parts.

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

The tappets which lift the valves are provided with an adjustment. This is carefully set at the works to give the correct amount of clearance, which is ·003 inches, and should



Method of Removing Valve Caps.

be occasionally re-adjusted. With too much clearance the valves become noisy; if clearance is insufficient the valves cannot close.

When adjusting tappets, two spanners must be used, one to hold the head of the tappet whilst the lock nut is being slacked off; if this is not done the probabilities are that the fork at the bottom of the plunger guide will be badly strained, and the tappets will then become very noisy.

The correct timing of the valves depends on the form of the cam and relation of the engine gear wheels. The diagram shows the setting for a 5½ in. stroke; settings for all other strokes are proportionate.

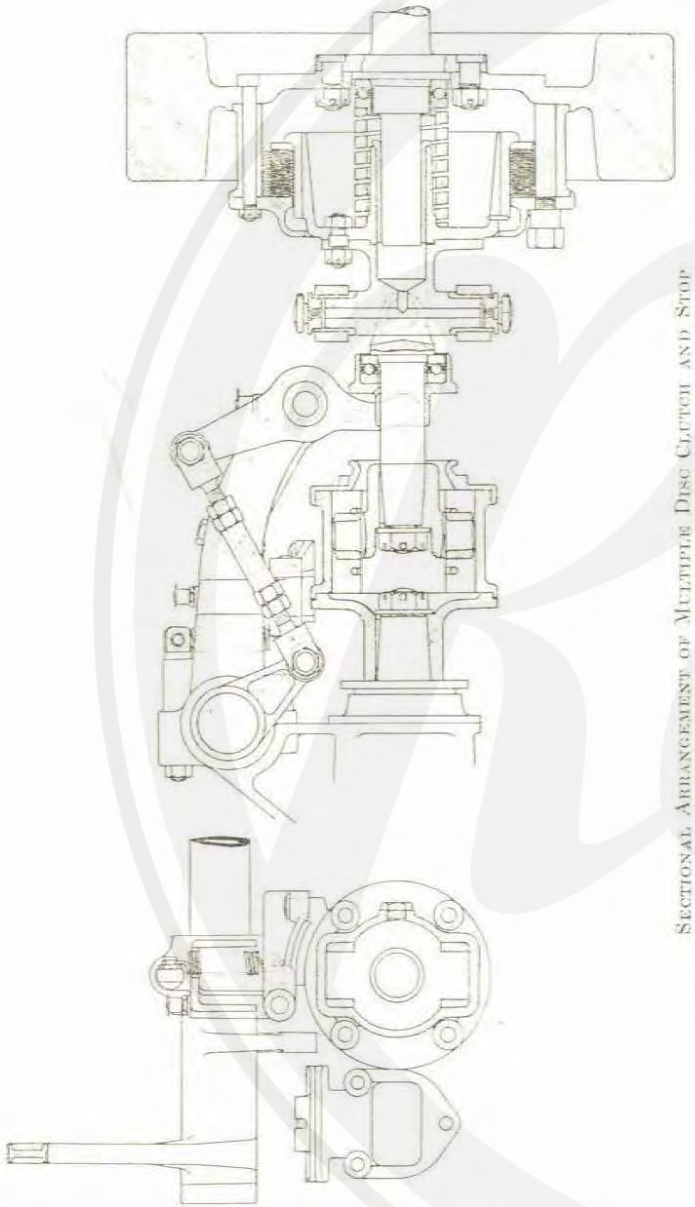
Covers are provided over the valve tappets and springs. It is well known that valves can only maintain silence if the plunger bearings are in perfect condition, and it is the wear of these bearings that largely contributes to the noisiness of the valves on worn engines. The casing over these parts does not tend in any way directly to the reduction of noise, and makes no difference to the silence of new engines, but by keeping out dirt lengthens the life of the tappet bearings, and thus helps to prevent engines becoming noisy by wear. As condensation takes place inside the valve covers it is necessary to remove them and thoroughly lubricate parts periodically.

CHASSIS DETAILS.

Silencer.—After the car has run a considerable distance, the holes in silencer centre tube may require cleaning, as they are liable to become choked with soot. This tube can be drawn out of the silencer quite readily after removing the exhaust pipe. A choked silencer results in loss of power.

Clutch.—The clutches on all models are of the multiple disc type, fully enclosed, running in oil. It is necessary to add oil occasionally to make up for wastage. The clutch should be thoroughly washed out with paraffin after the first 500 miles, the plugs provided being removed for the purpose. The engine should be run with the clutch out, but the car not moved, so that the paraffin and metal particles which get into the clutch plates are washed away. Then put in four to six fluid ounces of **"Wolseley" disc clutch oil** (20 ozs. to the pint). This should be done every 500 miles on a new car until the clutch plates have thoroughly bedded themselves, which will be evidenced by the cleanliness of the oil when it is drained out. The clutch then need only be washed out about every 1,500 miles.

The oil is added through the same plugs that are used for draining. The clutch spigot is oiled through the front universal joint, and while oiling this bearing, the clutch pedal should be moved up and down to facilitate the entrance of the oil.



Sectional Arrangement of Multiple Disc Clutch and Stop Fitted to 12/16 h.p. Model.

We recommend **"Wolseley" disc clutch oil** as being the most suitable. This oil has been put on the market for the convenience of our customers rather than for any small profit that we may make out of it. We attach great importance to this recommendation, as we have found in several instances that clutches have been ruined, and sometimes damage to the change speed gears has been caused, solely by the use of an unsuitable lubricant.

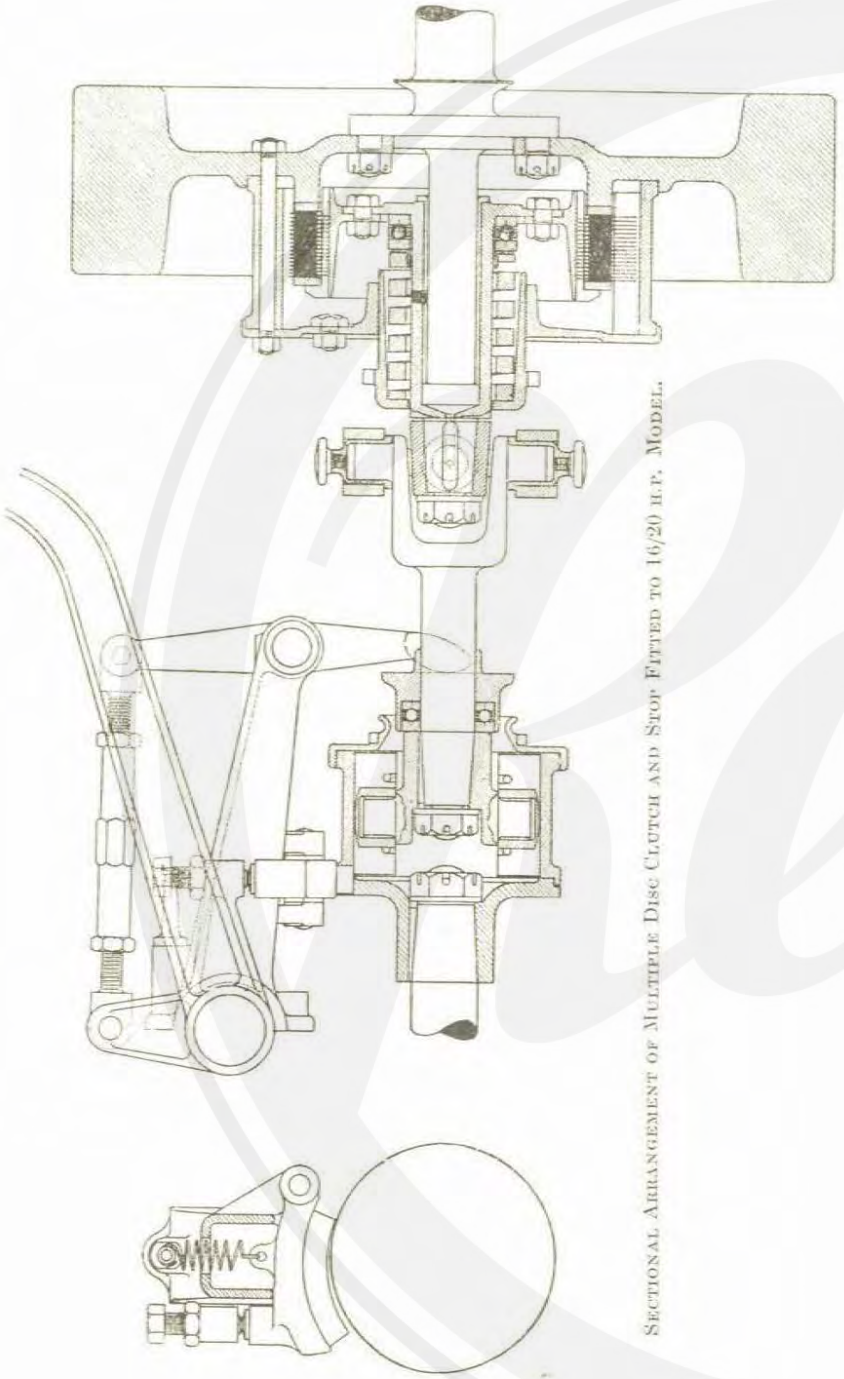
The clutch should take up its drive quite smoothly, and under no circumstances should a car be driven with a slipping or fierce clutch, as slipping necessarily means heating and wear. If the plates become slightly rough, they should be taken out and smoothed; if they are very rough, all plates should be renewed.

Clutch Adjustment.—A nut for tightening the clutch spring is provided on all the larger models, but the spring on the 12/16 h.p. is not adjustable without taking down the clutch.

If the clutch slips, either the spring requires tightening, the clutch has too much oil in it, or the oil (if not "Wolseley" disc clutch oil) may be too thick. Slipping, however, may be caused by the clutch pedal fouling the floor-board, and thus preventing full engagement of the clutch. Tightness of the universal joints, or stiffness in the pedal actuation, can also prevent the full pressure of the spring taking effect on the plates. If the clutch is too fierce, more oil should be used. Never run a Disc clutch with paraffin or graphite.

The correct total number of plates for each model is as follows:—

12/16 h.p.,	"A5" type	... ...	29 plates.
16/20 h.p.,	"C5" "	... ...	33 "
20/28 h.p.,	"L5" "	... ...	27 "
24/30 h.p.,	"M5" "	... ...	33 "
35/40 h.p.,	"R5" "	... ...	33 "
50 h.p.,	"D6" "	... ...	44 "



Sectional Arrangement of Multiple Disc Clutch and Stop Fitted to 16/20 h.p. Model.

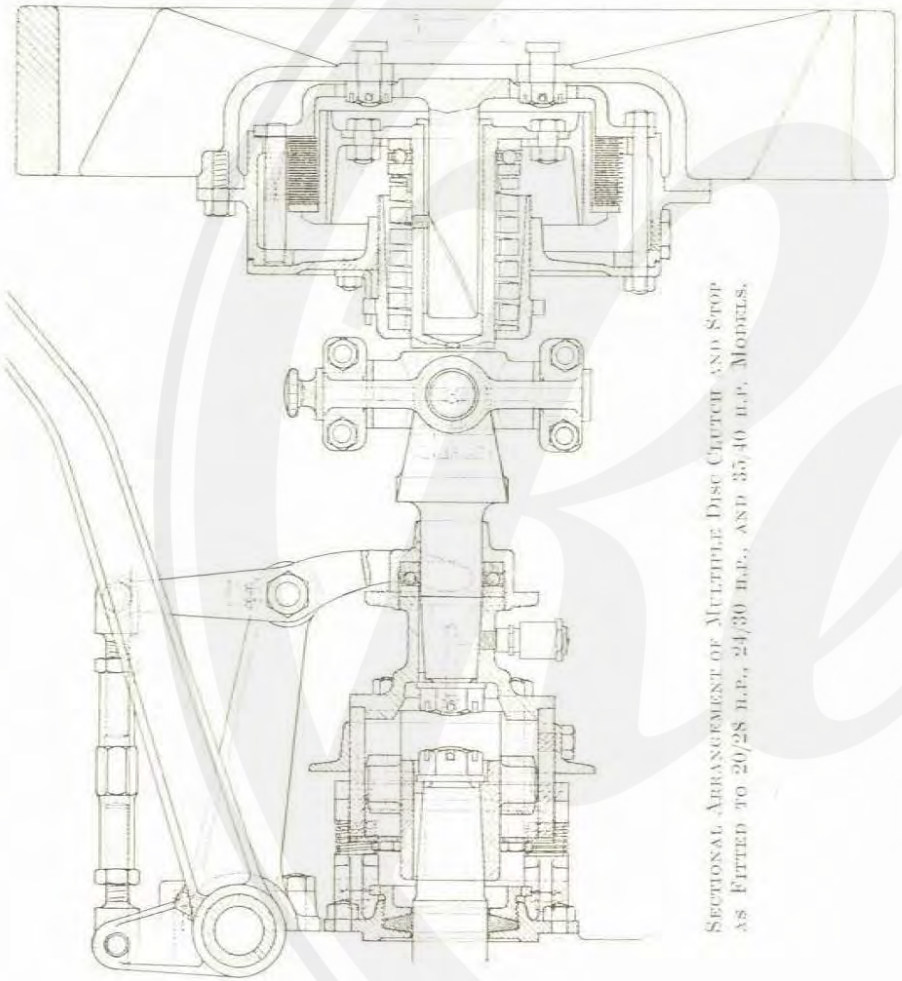
The clutch thrust on all models is self-contained, except when the pedal is depressed, when it is taken by a ball bearing, which should be occasionally oiled. Means are provided on all models for adjusting the height of the clutch pedal independently of the clutch spring adjustment.

If the original plates become worn further ones should be added to make up the thickness, as if the plates are much worn the reduction of spring pressure, due to the thinning of the plates, renders the clutch liable to slip.

Clutch Stop.—The clutch stop is correctly adjusted before a car leaves the works, and should not require any further attention in the matter of adjustment. It should be occasionally cleaned with a little petrol, as it is apt to absorb oil and thus become ineffective. The stop should leave sufficient clearance to allow the plates in the clutch to clear themselves before it comes into action, as otherwise wear of the plates would be occasioned, and difficulty experienced in changing speed. If the clutch does not stop readily, it is probable the stop requires adjusting away, rather than closer (see paragraph on changing speed, page 71).

To check this adjustment, put the stop entirely out of action, adjust pedal so that the clutch is fully withdrawn when the pedal has been pushed forward to its limit. Then adjust the stop so that it comes into full operation only when the above limit has been reached. This adjustment should be made when the clutch is quite cold and contains the correct quantity of oil.

Tightness of the spigot bearing due to lack of oil, may cause a serious difficulty when changing-up in speed, as it prevents the shaft slowing sufficiently when the clutch is withdrawn.



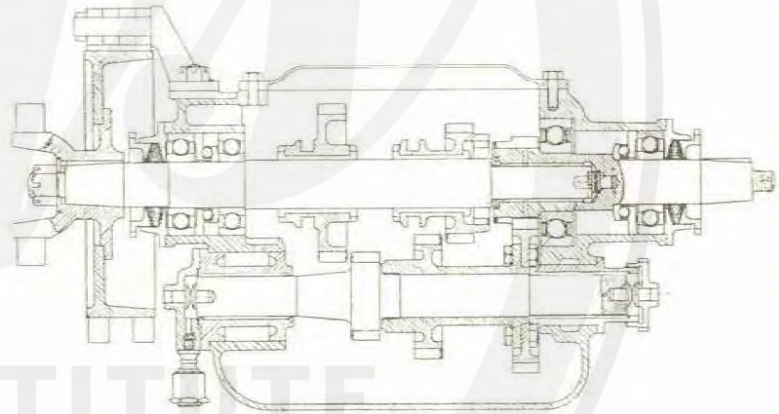
Sectional Arrangement of Multiple Disc Clutch and Stop as Fitted to 20/28 h.p., 24/30 h.p., and 35/40 h.p. Models.

Gear-box.—The 12/16 h.p. model has a three-speed gear-box. All other models have four-speed gear-boxes with direct drive on top speed.

All models are fitted with a selector gate change speed, with a button on the change-speed lever, to permit access to the reverse gate.

On all models the change-speed lever has a patent swing-over motion to facilitate movement of the lever across the gate.

With the exception of the 12/16 h.p. countershaft, the whole of the bearings in the gear-boxes are ball bearings, with independent thrust bearings to take the end pressure. These thrust bearings are adjustable, but the adjustment should not be required except after long service.

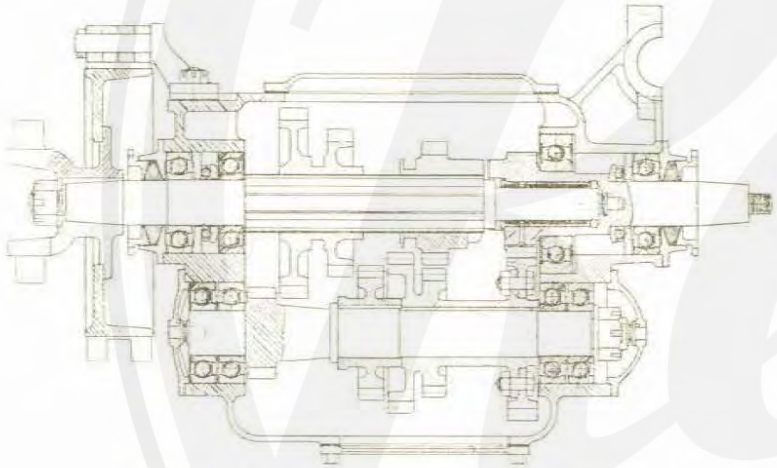


Sectional Arrangement of 12/16 h.p. Gear-box.

The lubrication of the gear-boxes should be by special thick gear oil. We strongly advise clients to use only **Wolseley filtrate gear oil.** Under no circumstances should any thicker oil or grease be used than that recommended, particularly on the 12/16 h.p. model, where the countershaft runs in plain bearings. On no account should graphite be used. Glands are provided for keeping the lubricant from leaking where the

various shafts enter the gear-box. These glands require occasional tightening and very occasionally re-packing, but the greatest care must be taken not to screw up the gland too tightly, otherwise it may run hot, or cause excessive wear. An inspection cover is provided on the top of the gear-box. The gears should be inspected occasionally, and the gear oil replenished as required.

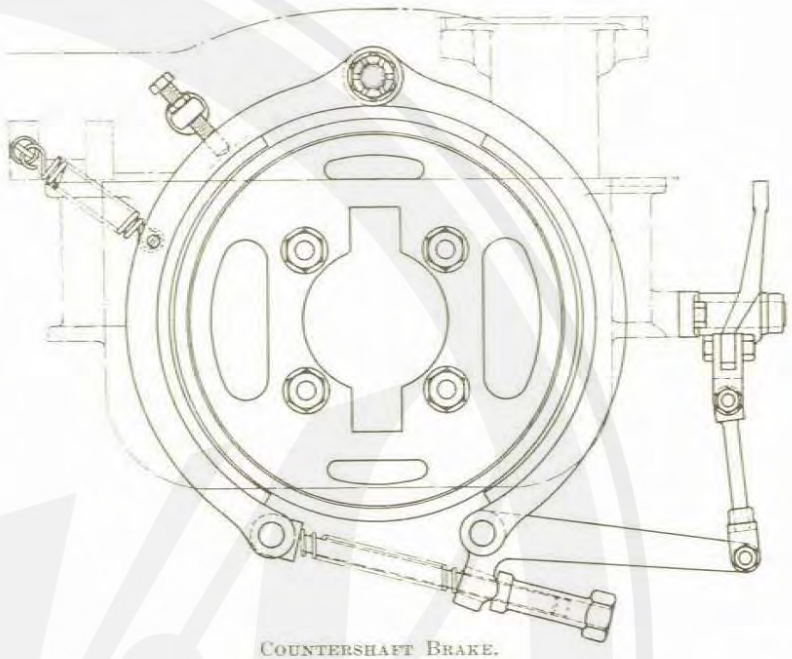
The box should not be filled higher than half an inch below the centre of the lower shaft. Should the gears become noisy there is probably not sufficient oil in the box.



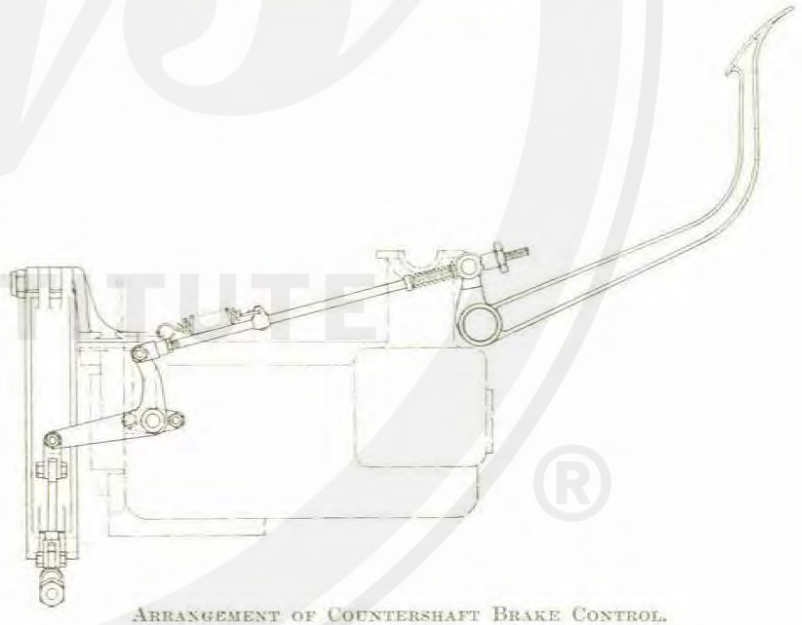
Sectional Arrangement of 10/20 h.p. Gear-box.

For correct quantity of oil to be put in when renewing, see page 75.

At the conclusion of the first 1,000 miles with a new car, the gear-box should be emptied, by removing the bottom inspection cover, and then thoroughly washed out with paraffin, using a paint brush to make sure that all foreign matter

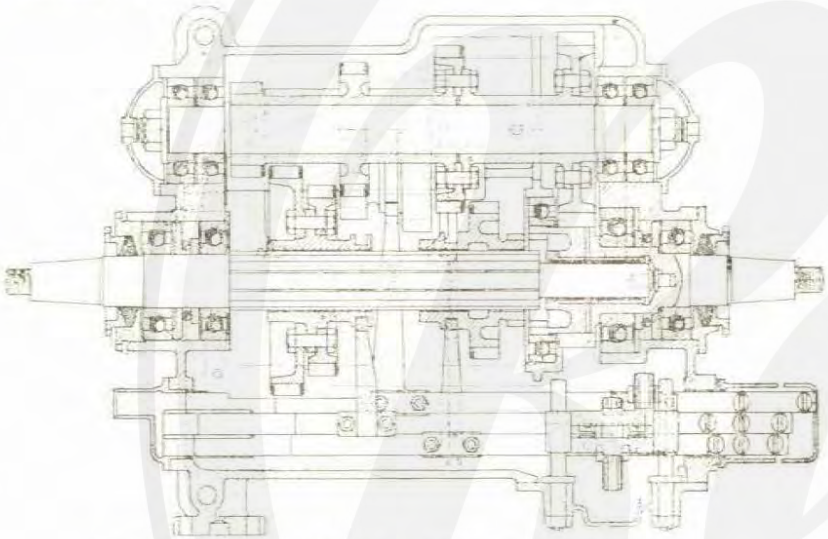


Countershaft Brake.



Arrangement of Countershaft Brake Control.

has been washed away. The box should then be replenished with new oil. Afterwards it is sufficient to do this every 2,000 miles. If an intermittent knocking sound in the gear box is heard, this is perhaps caused by chips from the change speed gears becoming embedded in the constant mesh gears. The box should then be thoroughly washed out, and any particles removed. These particles may be no larger than a pin's point, and may be overlooked if the inspection is not very carefully carried out.



Sectional View of 20 28 h.p. and 24/30 h.p. Gear-box.

Countershaft Brake.—In all models the countershaft or foot brake is anchored on the gear box by a steel bracket. The pin on which the brake is carried requires lubrication, otherwise the joint is liable to become stiff, with the result that the brake does not entirely release.

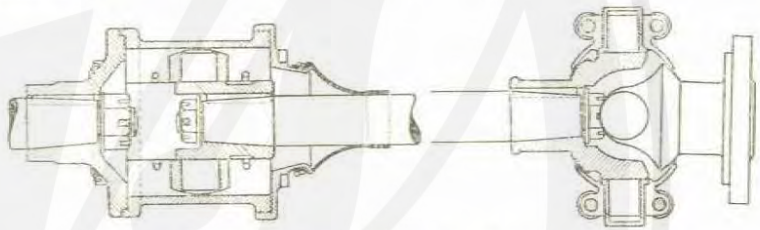
There is an independent adjustment for the height of the pedal to suit individual requirements. This is by means of a set screw abutting on the pedal bracket.

The adjustment for the shoes is by means of a self-locking nut on the lower part of the off-side shoe, but in addition to this there is a quick adjustment provided on the brake

pedal. This latter should serve for ordinary adjustment when necessary on the road.

We recommend that after an adjustment has been made on the road by means of the nut at the pedal, the first opportunity should be taken of transferring this adjustment to the adjusting rod under the brake shoes, and this should be done as follows :—

First return the pedal nut to its original position, **then adjust the set screw forming the shoe stop so that the near side shoe is just clear of the drum.** The self-locking nut under the brake may then be adjusted to the position which allows of adequate clearance of shoes, and at the same time a minimum movement of the pedal to give a full braking effect.



Details of Propeller Shaft and Universal Joints.

Careful attention to the foregoing will be amply repaid, as the brake will wear equally throughout and its efficiency will be maintained to the end.

On all models larger than the 12/16 h.p. the shoes are provided with renewable faces.

Propeller Shaft.—The drive is taken from the gear-box to the live axle by means of a propeller shaft, which is provided with a universal joint at each end. The universal joint behind the gear-box is of the cross-pin type, commonly known as a "Hooke's Joint," and is enclosed and oil retaining. The enclosing ring carries a large amount of gear oil, which should be replenished every 500 miles. The four pins forming this joint are provided with gun-metal bushes, which are readily renewable. The joint at the axle end of the propeller shaft is

of the pin and block type. The blocks are easily renewable, as are also the steel faces in the slots in the muff. This joint is also oil retaining. Care should be taken that the car is not run without the leather cover over this, so as to prevent the possibility of the entrance of grit to the working surfaces.

The universal joints on the propeller shaft, which transmits the power to the axle, need careful attention to ensure that lubrication at all times is adequate. These joints should be lubricated **with gear oil and not with grease,** which is poured in through holes closed by brass screw plugs in the coupling boxes.

WHEEL BRAKE.

Road Wheels and Side Brakes.—The road wheels which are of the Rudge Whitworth detachable pattern require attention and a certain amount of care and knowledge of their peculiar points to obtain satisfaction.

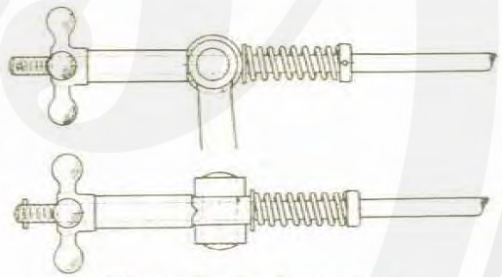
Make certain that the wheel is thoroughly home after changing by observing that the proper amount of the inner hub projects through the lock nut, and that both hand and automatic safety catches are fully engaged.

Do not run the car with a loose wheel; the effects of doing so are that the driving dogs and the screw threads wear badly.

See that all wheels are kept constantly tight. Check by periodically rocking the wheel and by applying the spanner to see if the lock nut can be turned further round. These precautions are necessary because grit is liable to get between the surface of the inner hub and wheel when it is being changed. The grit grinds away and leaves the wheel loose.

In tightening a wheel, before removing the spanner see that the word "Safe" on the automatic pawl is fully exposed; if it is not fully exposed, the spanner should not be pulled backwards, but should be forced further round until the pawl is fully exposed by engagement with the next notch.

The insides of the wheels and the outsides of the permanent hubs should be kept thoroughly clean, and greased or oiled to prevent rusting or sticking. The wheels should occasionally be removed from the car to see that their contacting surfaces are in good order and well oiled. The interior of the spare wheel can be kept free from dirt by carrying it on a dust excluding hub.



WHEEL BRAKE ADJUSTMENT.

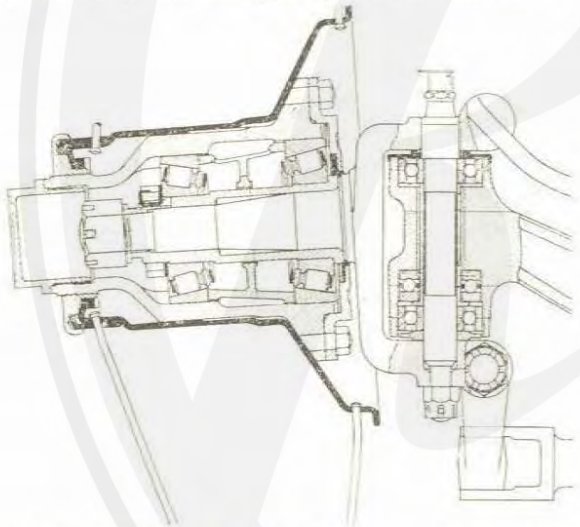
Side Brakes.—The brakes on the road wheels are applied by the hand lever at the side of the driver. As shown in the illustration, these are of the cam type, and operate inside drums carried on the hubs. These drums are fitted with renewable liners and the shoes with renewable faces, so that all working parts of these brakes may be renewed when necessary.

The brakes are hand adjusted, as illustrated, by means of nuts with automatic lock on the levers on the back axle, and access to these nuts is from the back of the car. The brakes are operated from the hand lever entirely by rods, and are equalised

by a lever mechanism to both sides of the car. To prevent rusting, the brake pin joints should be occasionally oiled.

Axles.—The front hubs on the 12/16 h.p., 16/20 h.p., and 20/28 h.p. run on roller bearings of the Timken type. These bearings are adjustable to take up any play that may be caused by wear. On all other models the front hubs run on ball bearings, consisting of two load-carrying bearings and two thrust bearings. These hubs require occasional attention, to ensure adequate lubrication to the inside bearings (see page 62).

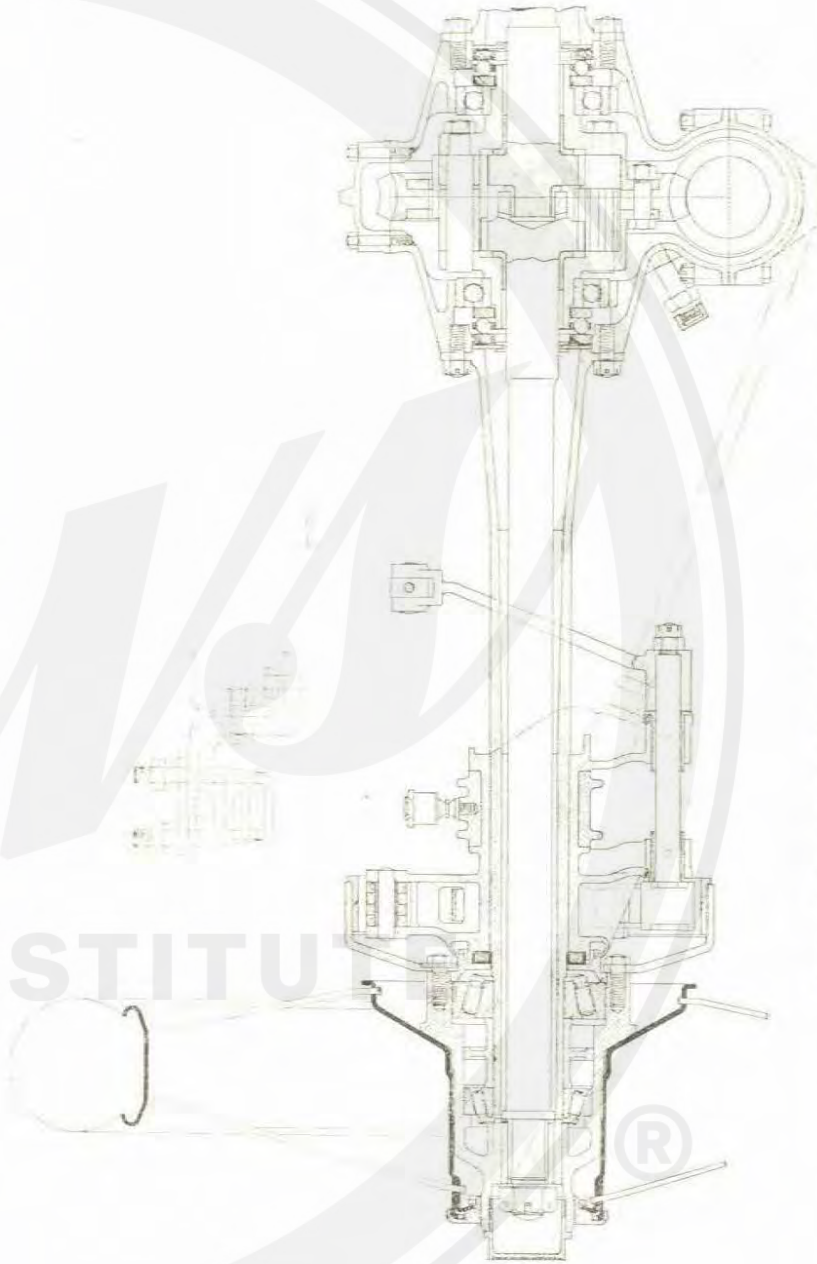
The swivels on the 12/16 h.p. model have plain bearings to take the side strain, and ball bearings to take the weight. These require frequent oiling through the oilers provided on the top of the axle. All other models are provided with ball bearings throughout, and require similar attention. It is very necessary to keep the oil passages clean and free.



Sectional Arrangement of Front Hub and Swivel Axle, showing Timken Bearings as Fitted to 16/20 h.p. Model.

A car should never be run when the wheels have too much end play.

It is a simple matter to take up this end play in hub bearings, and in all front wheel bearings proper provision is made, but where there is no provision by screw threads in



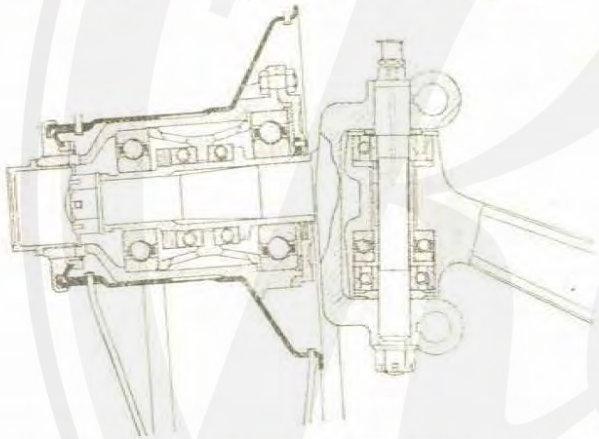
Note.—Three pairs of differential pinions are fitted to 16/20 h.p. model.

Section of Worm Drive Live Axle, showing Rear Hub with Timken Roller Bearings, as Fitted to 12/16 h.p. and 16/20 h.p. Models.

the rear wheel bearings, the adjustment should be made by fitting washers of suitable thicknesses.

To remove the inner hub, the hub cap and the nut on the end of the internal shaft should be removed; the hub can then be drawn off.

To lubricate the hub bearings remove the hub cap and replace by the adapter for the grease injector which is supplied with the tool kit. The end of the injector, which holds 1½ fluid ozs. of grease, is provided with a screw thread which will engage with the thread in the hub cap adapter. The advantage of this kind of grease injector is that by its use the bearings can be kept full of grease, and as an important result water is excluded from getting into the bearings. Care should be taken that the grease is free from grit.

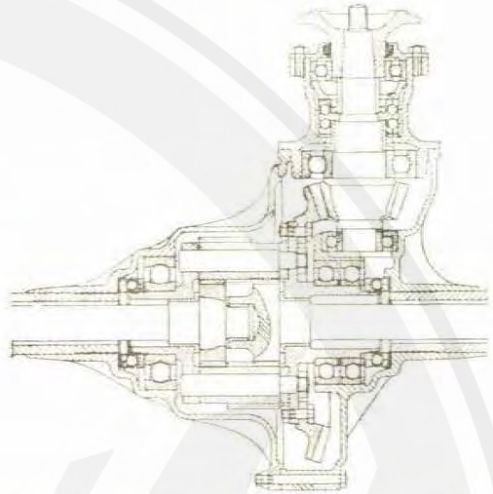


Sectional Arrangement of Front Hub and Swivel Axle, as Fitted to 24/30 h.p., 35/40 h.p., and 50 h.p. Models.

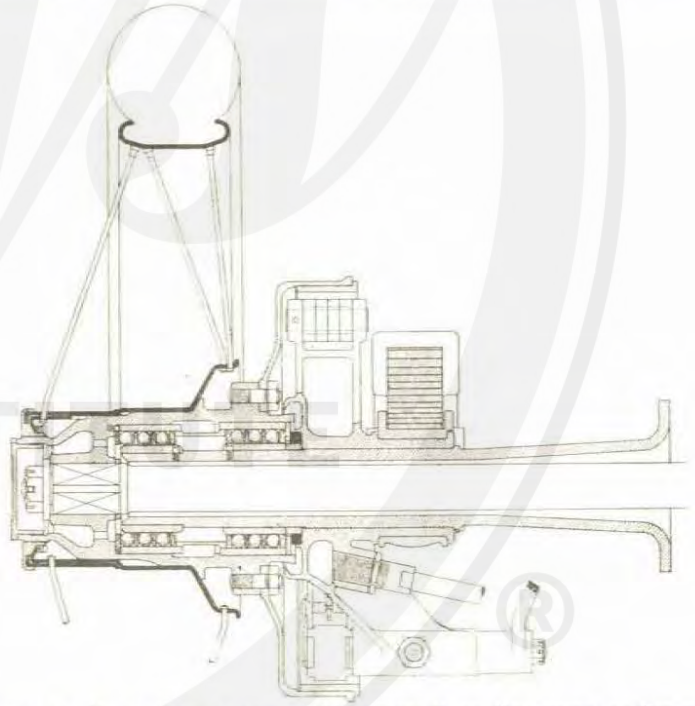
If it has been necessary for any purpose to adjust any hub bearings, especially those fitted with Timken roller bearings, the following instructions should be carefully borne in mind :—

Do not overtighten these bearings. Screw up the adjusting nut until there is the **least perceptible** end play, and then lock in this position.

The internal cones are a good sliding fit on the sleeve so that they can be adjusted easily.



Section of Live Axle, as Fitted to 20/28 h.p. and 24/30 h.p. Models.



Section of Rear Hub, showing Wolseley Ball Bearings, as Fitted to Larger Models.

The external cones are a tight fit in the housing.

Do not hammer the cups into place, but apply a steady even pressure.

Live Axle.—The live axles are all of the same general type, the 12/16 h.p. and the 16/20 h.p., however, being fitted with worm gearing, while all the larger models are provided with bevel gearing. It is important that the cases in the centre of the axle should always be provided with sufficient lubricant, the oil used being of a high grade; particularly is this the case with the worm axles. We recommend **Wolseley Filtrate Gear Oil** as being most suitable. GRAPHITE OR THICK GREASE SHOULD ON NO ACCOUNT BE USED.

All the bearings in the axles, with the exception of those carrying the differential shafts in the differential cage, are of the ball-bearing type, and are automatically lubricated from the oil in the axle casing. For correct quantity of oil to put in when renewing see page 75.

The setting of the worm gears and bevel gears is by means of packing washers of suitable thickness. The thrust is in all cases taken by thrust ball-bearings.

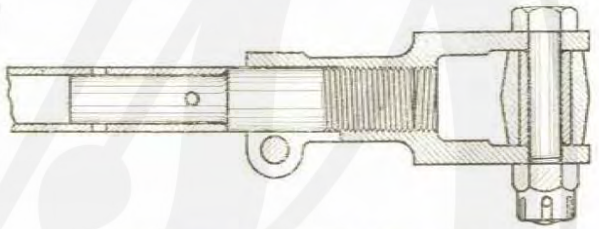
The rear hubs in all models are driven from the internal shafts by square ends, fitting in corresponding squares in the hubs. The nuts holding the hubs on to the axle should be screwed up sufficiently tight, but not so tight as to run the risk of injuring, or breaking, the thread on the end of the differential shaft.

The rear side springs on all models are carried on plummer blocks, which are free to rotate to a more or less extent upon the rear axle tube, to accommodate the relative movement between the spring and the axle consequent upon the action of the springs. It is very important that these blocks receive adequate lubrication.

Steering.—The steering is by a hand wheel on an inclined pillar, and on the top of the hand wheel are placed the

controls for the throttle and ignition, and in the larger models for the extra air also.

The steering is of the worm and sector type, the sector being of phosphor bronze bolted on to the sector lever. The thrust of the worm is taken on ball and pivot bearings, the lower pivot joint being adjustable. The worm box should be kept fairly full of oil for efficient lubrication. It is also advisable to oil the blocks and collars of the control mechanism and the bearings of the rotating steering pillar, so as to keep the steering perfectly free. The connection from the steering sector lever to the axle is by means of a ball-jointed longitudinal steering tube. These ball joints should occasionally have the leather covers removed and filled with grease, so as



STEERING CROSS ROD ADJUSTMENT.

to lubricate the joints and protect them from water and grit. For the same reason, the steering cross rod behind the axle also requires its covers removed occasionally for the purpose of lubrication.

The nuts securing the steering arms to the axle swivels should be periodically examined and tightened up if necessary, as if they are at all slack the excessive strain caused by the consequent hammering is liable to cause fracture by fatigue, and may result in a serious accident.

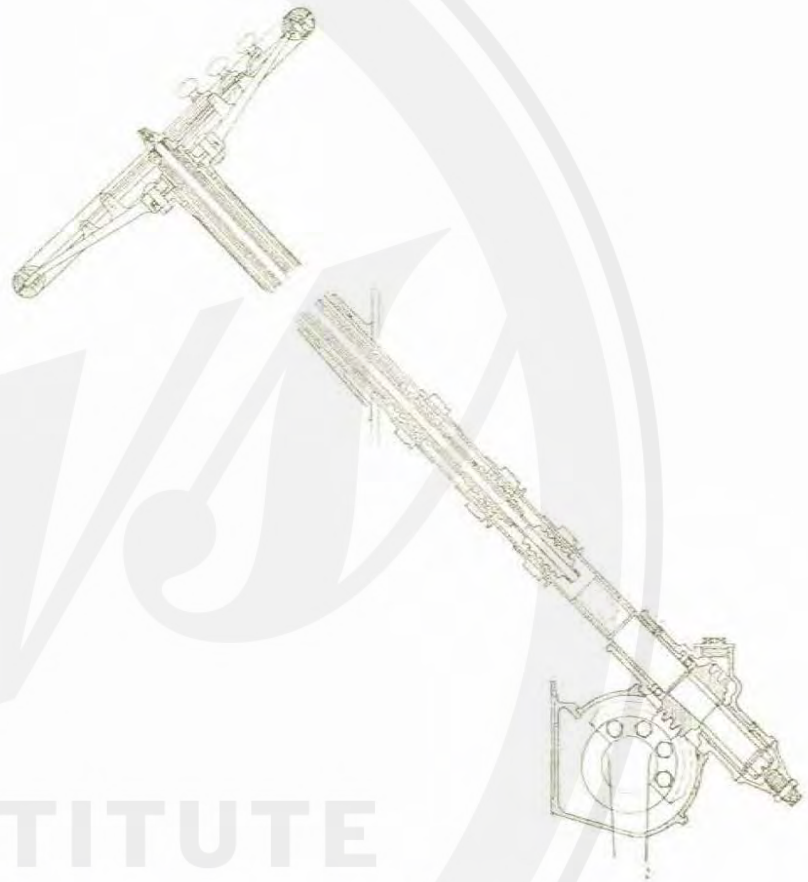
When a car is stationary, the wheels should never be forced round by the steering wheel. This causes unnecessary strain to be placed on the steering gear unless assistance is rendered by someone also pulling the road wheels in the direction required. When manœuvring, the slightest movement of the car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

It is important that the steering wheels should be correctly set. The correct setting is that the measurement from centre

Section of Steering, showing Control Levers, as Fitted to 12/16 h.p. and 16/20 h.p. Models.

to centre of the tyre, at lines passing through the centre of the wheels, should be $\frac{1}{4}$ inch less at the front than at the

back. It is possible that the steering arms may become slightly set. To counteract this, an adjustment of the steering



Section of Steering Column, as Fitted to 20/28 h.p., 24/30 h.p., 35/40 h.p., and 50 h.p. Models.

cross rod is provided. The method of adjustment will be obvious from the illustration on page 65. The adjustable end must never be allowed to become loose.

Carriage Springs.—In all cars the springs are standardised, and are made to various specifications to suit different weights of carriage work. To obtain satisfaction from the springing it is essential that the load on the chassis should weigh approximately what is provided for in the spring specification. If the carriage body is heavier than the specification allows, the car will swing on the springs at corners, and perhaps bump the axle or wings on rough roads; also if the front springs are too light the car will "pitch." If, on the other hand, the springs are too strong, the car will ride uncomfortably, especially on rough roads.

When bodies have insufficient clearance for the tyres below the mudguards the wheels may foul, and this is sometimes diagnosed as weak springs. The necessary clearance varies on the different models, but advice in this respect is willingly given.

If a spring should break, to obtain complete satisfaction it should be returned to the works for repair, as it is important that the camber between the various successive plates should be right to make the spring act properly.

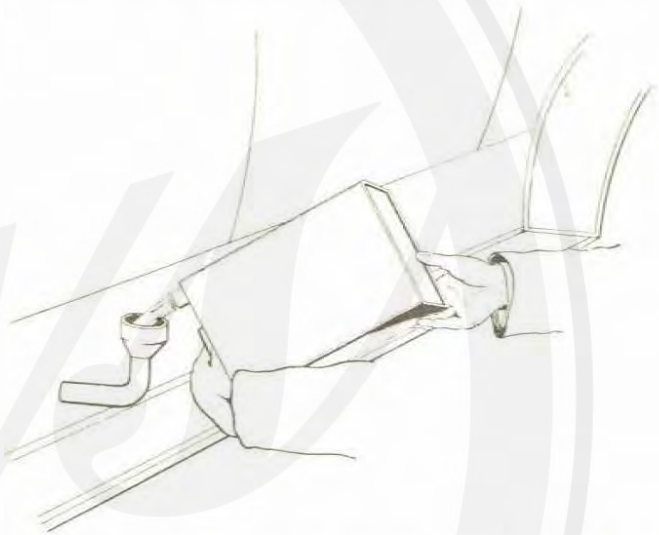
The usual method with carriage builders is to paint the springs in between the leaves with a special composition. This wears away in time, with the result that the metal of the various leaves comes in contact, causing the springs to "squeak." This can be overcome by lubrication, but the lubricant soon works out. The best procedure is to have the springs taken to pieces and repainted with a suitable composition, such as white lead paint and graphite, when the car is overhauled.

It is most necessary that all the pins of the springs should be lubricated, as even if they do not squeak they rapidly wear if allowed to become dry. Lubricators are provided on all the pins for this purpose.

The clips which hold the springs to the axles are made of Swedish iron, which material is somewhat liable to stretch under prolonged excessive vibration. IT IS ADVISABLE, ESPECIALLY WHEN THE CAR IS NEW, TO OCCASIONALLY TRY THE NUTS ON THESE CLIPS TO ENSURE THAT THEY ARE ALWAYS KEPT TIGHT. If the car is driven with these nuts slack, it usually

ends in the centre bolt of the spring breaking, allowing the axle to move on the spring, sometimes with serious consequences.

Petrol Tank.—When filling petrol tank it is necessary to open the blow-off cock on the petrol gauge, and, in order to avoid injury to the carriage work, the petrol can should be tipped, with the spout on top as shown in the sketch below.



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 their correct pressure. This varies according to the weight of the car and the size of the tyres, and therefore it is advisable to obtain from the tyre manufacturers their special books of instruction for guidance.

The pressures for the front tyres vary from 70 lb. to 80 lb., and the rear from 80 lb. to 90 lb.

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

CHAPTER III.

Driving.—Skilled driving of a car is only acquired by long practice, and when a driver is able to manipulate without conscious effort of will the clutch, brakes, ignition, and throttle levers, a car can be said to be safe in his charge.

When driving in traffic or passing other vehicles on the road, the driver should never take any risks, but should be ready to declutch or apply the brakes on the instant if necessary. On account of the silence and smooth running of "Wolseley" cars, drivers are apt to estimate the speed much lower than it actually is. The brakes should never (unless in case of emergency) be strongly applied, as this can inflict injury to the tyres or cause a side-slip; at the same time causing unnecessary wear on the mechanism.

When descending long or dangerously steep gradients, the hand brakes should be used in conjunction with the foot brake, but neither brake should be kept on long enough at one time to overheat it. In such circumstances a throttled engine has a very steadying influence, especially if one of the lower gears is engaged before the descent has begun.

Do not continue running the car if it is not working properly. Stop at the first convenient place and make what adjustments are necessary.

When touring it is advisable to add a good supply of spares, and one or two extra tools to the kit.

The art of changing gears can only be acquired by practice, and, as mentioned in the Introduction to this Manual, we do not advise a novice to undertake the charge of a car without having first received a course of instruction.

When changing up, i.e., from first to second, or second to third, or third to top, the accelerator pedal should be released, the clutch pedal depressed momentarily while the gear lever is smartly moved over to its correct position.

When changing down, without throttling the supply of gas to the engine (it already has full throttle, as the supposition is that it is pulling hard on the present gear), and without retarding the ignition, merely slip the clutch by depressing the pedal very slightly and without hesitation bring the lever forward into the third gear (or **second** on 12/16 h.p. model).

In changing from third to second (with 4-speed gear boxes), throttle the engine by releasing the accelerator at the same moment as the clutch is very slightly depressed, bring the lever smartly into neutral, then just tap the accelerator momentarily with the foot, while the lever is being moved quickly across the quadrant; then depress the clutch pedal slightly to "snap" the lever into the second gear; at the same moment that the clutch is engaged, supply gas to the engine by depressing the accelerator pedal fully.

The effect of pushing out the clutch and pulling the lever into neutral is to disengage the third gear; the effect of depressing the accelerator with the clutch engaged, while the lever is being moved sideways across the quadrant, is to spin the clutch and with it the gear-wheel to the proper speed, when the third motion can be performed without noise, that is to say, releasing the clutch and engaging the second speed gear-wheels with one another.

This operation can be performed without undue hurry, but the three operations described should be carried out as one even motion, as far as possible.

In changing from second to first adopt the same method as from fourth to third.

Difficulty in changing speed may arise from the adjustment of the clutch stop. It will be noticed that the clutch stop limits the travel of the clutch pedal, and should the clutch stop be adjusted too closely, not allowing sufficient movement of the pedal, the plates will not be properly

separated and will probably be pressed together sufficiently to overcome any friction that can be put upon the clutch stop. If, however, the clutch stop is adjusted in accordance with our instructions on page 51, allowing much more travel to the pedal before it comes into operation, it allows sufficient distance for the plates to separate, when the stop coming into operation will have ample power to stop the clutch spinning. Even with the clutch stop properly adjusted, changing speed downwards, if the clutch pedal is too far depressed, that is to say, far enough to bring the stop into action, becomes a very difficult matter, because the momentum of the revolving parts is so small that even a slight application of the clutch stop retards the moving parts very much.

Great care should be taken that the reverse gear is never brought into engagement until the car has come to a dead stop, otherwise there is great risk of damaging the gears.

The correct method of decreasing the engine speed is by closing the throttle valve, and not by retarding the spark, as the latter method is wasteful of fuel and also causes pitting of the exhaust valves, due to the gases passing through in an incandescent form; then, as the speed of the engine decreases due to the closing of the throttle, the spark may be retarded.

For night driving, an electric lamp on dash or steering column it often very useful, as it enables the driver to see if the oil indicator is working properly.

Storage.—The motor-house must be a dry, well-ventilated building, and preferably arranged so that it can be heated during cold, frosty weather. It should be kept clean and free from dust and should be sufficiently large to allow a gangway around the car for convenience of inspection, and also because the car is liable to suffer from dampness if it is placed too close to the walls of the house. It is imperative that smoking should be entirely prohibited. As an additional safeguard against fire, have a chemical extinguisher in readiness and a supply of sand in a box. Petrol should be stored in a separate building. It is advisable to fill the petrol tank when the car is outside the motor-house.

When filling with petrol, water, or oil, a gauze strainer should be used in order that no dirt may pass through.

Lubricating oil and grease may be stored in the motor-house, preferably in steel drums, so that supplies may be drawn off as required.

To keep the floor of the motor-house clean from any oil which may drop from the motor while standing, a sheet-iron tray should be kept under the motor and gear-box while the car is in "garage." Convenient dimensions for this tray are 5 feet long by 3 feet wide, with sides about 1 inch high.

Lamps, tools, spare parts, and other small articles should be stored in lock-up cupboards.

To preserve the smart look of a car it should be washed down immediately it comes in from the road, and never left to stand dirty.

Direct rays of sunlight should never be allowed to play for any length of time on the panels of a car.

If the varnish becomes spotted, the application of a little linseed oil by means of a soft rag or lint may have a beneficial effect.

Overhauling.—It is convenient to have in the motor-house an engineer's bench fitted with a parallel vice, and provided with a few tools, so that adjustments and small repairs may be done at once, instead of being neglected and only taken in hand when absolutely necessary.

By immediately attending to any adjustments or replacements that may be required, a car is not only kept in better order, but the cost of upkeep is also reduced to a minimum, as if one portion of the mechanism fails to do its work properly undue strain is thrown on other parts, with consequent risk of sudden breakdown.

The following special tools are recommended to clients for garage use:—Valve lifter, wheel withdrawer, hub oil injector, and adapter for hub oil injector for filling rear axle case.

Spare Parts.—When ordering spare parts, to avoid any possibility of error, it is essential that the **number of the car and the horse-power** should be given, and, if possible, the

number of the parts in our spare part catalogue. If there is any doubt of these points it is advisable to send the old part or a sketch of the part required.

We would remind clients when sending telegrams for parts to make them clear, as it is far better to put a few extra words in a telegram than risk having an incorrect part forwarded.

When chassis only are delivered by ourselves, it is of course impossible for us to give the car the finished test it would have if the complete car were delivered by our works or our depot. In such cases we are prepared to place at the disposal of the client the services of one of our testers, charging for his services thirty shillings, plus out of pocket expenses. It is sometimes found that coachbuilders are not fully alive to the peculiarities of the chassis and consequently trouble arises which might have been avoided. These troubles perhaps are quite trivial, but at the same time they may be none the less disconcerting, and are calculated to give the owner a bad impression of the car. Moreover, if one of our men proves the car before it is taken into service, we have his finished test report, which not only completes the chassis record but stands us in good stead should any attention be necessary afterwards. Attention of this kind, too, is frequently found beneficial to drivers who may be quite competent men, but at the same time not fully acquainted with the peculiarities of the car for which they are about to be responsible.

Guarantee.—The Company undertakes, subject to the terms as given in the catalogue, and on the sale specification, to repair and make good within a period of twelve months from date of delivery of any chassis or autocar from its works any part or parts which may be discovered within such a period to be defective in material or workmanship. It must, however, be clearly understood that where free replacement is required, and it is necessary for work to be done on a car at our expense in any town where we have an authorised agent, this work is only to be done by such agent, but before work is commenced involving serious expense, it is necessary to first obtain our authority.

Insurance.—For the convenience of their customers the Wolseley Tool & Motor Car Co. Ltd. have made arrangements for the issue of Lloyd's Policies in accordance with the terms given in the catalogue. Policies can be obtained through our offices, and depots, or through any of our agents.

In the event of accident, repairs up to any amount may be put in hand immediately, either with ourselves or with one of our authorised agents, without waiting for permission of the insurers, provided the repair permit is produced, which, together with a list of authorised repairers, is supplied with each policy. *Necessary temporary repairs, or permanent repairs up to £10, may be executed immediately by any competent repairer, without consent of the insurers.*

Garage.—Our London garage, which is the official garage of the Royal Automobile Club, is in a most convenient position, opposite St. James' Park Station. It has available space for the storage of several hundred cars, and is open day and night for the reception of cars of all makes. Special inclusive tariffs quoted on application.

	12/16 H.P.	16/20 H.P.	20/28 H.P.	24/30 H.P.	35/40 H.P.	50 H.P.
Capacity of Petrol Tank.	8 gall.	10 gall.	12 gall.	14 gall.	14 gall.	20 gall.
Amount of water required when refilling system.	30 pints.	44 pints.	45 pints.	43 pints.	45 pints.	54 pints.
Amount of Extra Heavy "Wolseley" Filtrate required when refilling lubricating system.	$3\frac{7}{7}$ pints.	$5\frac{1}{2}$ pints.	$6\frac{1}{2}$ pints.	7 pints.	12 pints.	12 pints.
Amount of "Wolseley" Disc Clutch Oil required when renewing.	4 fl. oz.	4 fl. oz.	5 fl. oz.	5 fl. oz.	5 fl. oz.	6 fl. oz.
Amount of "Wolseley" Filtrate Gear Oil to be put into Gear Box after washing out.	5 pints.	5 pints.	9 pints.	9 pints.	9 pints.	9 pints.
Amount of "Wolseley" Filtrate Gear Oil to be put into Rear Axle after washing out.	$1\frac{1}{2}$ pints.	$1\frac{1}{2}$ pints.	2 pints.	2 pints.	2 pints.	$2\frac{1}{2}$ pints.

HINTS ON THE CARE OF "WOLSELEY" AUTOCARS.

Before starting a journey make sure there is sufficient petrol in the tank to feed the engine at least as far as the next pre-arranged stopping place. Great inconvenience is often caused to driver and passengers if the petrol tank has to be replenished on the road side.

Make sure there is sufficient oil in the engine sump.

Make sure the lubrication system is working properly.

Make sure the pressure system is working properly.

Make sure there is sufficient water in the radiator.

Make sure the clutch has sufficient oil but does not slip.

Make sure the brakes are working freely and are properly adjusted. (See note *re* foot brake, page 57.)

Make sure the universal joints in the transmission are thoroughly lubricated.

Make sure the tyres are all pumped up, including the spare.

Make sure the detachable wheels are properly fixed and are readily removable if found necessary.

Make sure the spares are sufficient and are reasonably accessible.

Don't try to start the engine with the throttle too far open.

If the engine does not start readily on a cold morning, inject a little petrol to each cylinder (see page 36).

Don't unduly flood the carburetter.

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

Don't adjust the tappets by means of one spanner only; have a second spanner to hold the tappet head whilst the lock nut is being slackened or tightened.

Don't neglect the lubrication of the engine, but don't have too much oil in the base.

Don't grind in valves unless it is really necessary.

Don't swill out valve pockets with paraffin or any other liquid after grinding—clean them with a piece of good clean rag.

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 1,000 r.p.m. (See table of speeds, page 79.)

Don't change "up" too soon. Let the engine run up to about 1,600 r.p.m. before engaging the next higher gear.

Don't slip the clutch unduly.

Don't forget the greasers on the plummer blocks carrying the springs on the rear axle.

Don't forget the greasers for the bearings of the cam spindle operating the rear brakes.

Don't neglect the tyres—see recommendations by tyre makers.

Don't let detachable rims and wheels get rusty.

Don't let door hinges, dovetails, screen, hood, and grille joints get rusty for want of a little oil.

Don't let screen joints remain loose; they soon wear and perhaps cannot then be tightened up.

Don't force windows unduly—if they are tight at any time apply a little soap or vaseline to the grooves.

When lowering windows don't let them fall with a bang.

Shut the doors with sufficient smartness to ensure that the slam lock engages fully.

Don't lean upon the doors of a car when open.

Don't let accumulators rattle in their boxes or run down, and don't let the acid be spilt.

Don't leave carbide in headlights overnight after use, or you may have trouble when next they are wanted.

Remove detachable wheels every month and well lubricate.

A very slight smearing of the bonnet with linseed oil will prevent spotting of the paint on the bonnet if applied before the car goes out into the rain.

Don't leave a car dirty longer than absolutely necessary. If mud is allowed to dry on, it quickly destroys the lustre of the varnish.

Don't have the car cleaned with a dry cloth, even if only dusty. Use plenty of water, and soap if necessary, to remove grease. A vacuum cleaner is very useful for removing dust from the bodywork of a car.

When washing a car with a hose don't let the water get in any joints of doors, &c. This applies specially to covered bodies. If water is driven into the joints, it may get behind the panels and cause the grain of the wood to rise and distort the panels, and spoil the appearance of the car.

Don't use petrol or paraffin to assist in removing grease. Use a soapy lather and thoroughly rinse with clean water.

Remove spots on the varnish and leather with a little linseed oil on lint or cotton wool.

Use turpentine for cleaning aluminium surfaces.

Don't try to remove tar spots on varnish unless they can be got off at once, when wet, with linseed oil after first removing the bulk of the spot.

When cushions get wet, remove and dry them as soon as possible, and don't put them back until the leather is thoroughly dry.

Don't take the curtains off until they are dry, otherwise they will shrink, and perhaps they cannot be replaced without altering buttons, &c.

Use soap and water for cleaning cape cart hoods; on no account employ petrol.

Don't fold the hood when it is wet.

Don't leave cape hoods or leather hoods down when car is not in use.

Wolseley Chassis, Season 1912.

Makers' H.P.	R.A.C. Rating	Prices of Chassis	ENGINE. Bore.	Stroke.	No. Cylds.	Normal Revs.	Wheel Base.	Track.	Body Space. Dash to end of Frame.	Body Space. Width of Frame.	No. of Gears.	Drive.	Standard Axle Ratio.	Normal Speed M.P.H. 1st	2nd	3rd	4th	Tyres. All Wheels.	Tax
							Ft. in.	Ft. in.	Ft. in.	In.								Millimetres.	£ s. d.
12 16	15·6	£305*	3½ × 4½ in. (79×121 m/m.)		4	1200	9 3	4 1	7 8	30	3/3	Worm	8/35	7½	15	26	—	810 × 90	4 4 0
16 20	20·3	£390	3⅛ × 4¾ in. (80×121 m/m.)		4	1200	9 8	4 4½	7 11	32	3/3	Worm	9/37	7	14	21	28	815 × 105	6 6 0
16 20	20·3	£400	3⅛ × 4¾ in. (80×121 m/m.)		4	1200	10 4	4 4½	8 7	32	3/3	Worm	8/35	6½	13	19	26	820 × 120	6 6 0
20 28	25·6	£490	4 × 5½ in. (102×130 m/m.)		4	1000	10 9	4 6	8 7	32	4	Bevel	18/65	7½	12	18	26	820 × 120	6 6 0
20 28	25·6	500	4 × 5½ in. (102×130 m/m.)		4	1000	10 9	4 6	8 7	32	4	Bevel	18/69	7½	12	18	26	880 × 120	6 6 0
24 30	30·4	£600	3⅝ × 5½ in. (90×130 m/m.)		6	1000	10 10	4 6	8 11	34	4	Bevel	18/65	8	13	19	28	895 × 135	8 8 0
35 40	36·1	£600	4⅜ × 5½ in. (121×130 m/m.)		4	1000	10 10	4 6	8 11	34	4	Bevel	18/65	8	13	19	28	895 × 135	10 10 0
50	48·6	£1000	4½ × 5¾ in. (114×146 m/m.)		6	1000	11 9	4 8	9 0	34	4	Bevel	18/62	10	16	22	31	935 × 135	21 0 0
50	48·6	£1000	4½ × 5¾ in. (114×146 m/m.)		6	1000	12 3	4 8	9 6	34	4	Bevel	18/62	10	16	22	31	935 × 135	21 0 0

* If fitted with four-speed gear-box, the road speeds will be as 16/20 h.p. Chassis, to ft. 4 in. wheelbase. The extra charge for this is £15.

All models have direct drive on top speed. The price of the Chassis includes spare detachable wheel and four tyres of the various dimensions at the current market prices. In the event of the prices of tyres being increased or decreased, the Company reserve the right to revise the Chassis prices.

MOTOR INDEX MARKS.

Index Mark.	County or Borough Council.	Index Mark.	County or Borough Council.	Index Mark.	County or Borough Council.
A.	London.	D.H.	Walsall.	I.O.	Kildare.
A.A.	Southampton.	D.I.	Roscommon.	I.P.	Kilkenny.
A.B.	Worcestershire.	D.J.	St. Helens.	I.R.	King's County.
A.C.	Warwick.	D.K.	Rochdale.	I.T.	Leitrim.
A.D.	Gloucestershire.	D.L.	Isle of Wight.	I.U.	Limerick.
A.E.	Bristol.	D.M.	Flint-shire.	I.W.	Londonderry.
A.F.	Cornwall.	D.N.	York.	I.X.	Longford.
A.H.	Norfolk.	D.O.	Holland (Lincs.).	I.Y.	Louth.
A.I.	Meath.	D.P.	Reading.	I.Z.	Mayo.
A.J.	Yorkshire.	D.R.	Devonport.	J.	Durham.
A.K.	Bradford.	D.S.	Peebles.	J.I.	Tyrone.
A.L.	Nottinghamshire.	D.U.	Coventry.	J.S.	Ross and Cromarty
A.M.	Wiltshire.	D.W.	Newport (Mon.).	K.	Liverpool.
A.N.	West Ham.	D.X.	Ipswich.	K.I.	Co. Waterford.
A.O.	Cumberland.	D.Y.	Hastings.	K.S.	Roxburgh.
A.P.	Sussex (East).	E.	Staffordshire.	L.	Glamorgan.
A.R.	Hertfordshire.	E.A.	West Bromwich.	L.B.	London.
A.S.	Nairn.	E.B.	Isle of Ely.	L.C.	London.
A.T.	Kingston-on-Hull.	E.C.	Westmorland.	L.D.	London.
A.U.	Nottingham.	E.D.	Warrington.	L.N.	London.
A.W.	Salop.	E.E.	Grimsby.	L.I.	West Meath
A.X.	Monmouth.	E.F.	West Hartlepool.	L.S.	Selkirk.
A.Y.	Leicestershire.	E.H.	Hanley.	M.	Cheshire.
B.	Lancashire.	E.I.	Sligo.	M.I.	Wexford.
B.A.	Salford.	E.J.	Cardiganshire.	M.S.	Stirling.
B.B.	Newcastle-on-Tyne.	E.K.	Wigan.	N.	Manchester.
B.C.	Leicester.	E.L.	Bournemouth.	N.I.	Wicklow.
B.D.	Northamptonshire.	E.M.	Bootle.	N.S.	Sutherland.
B.E.	Lindsey (Lincs.).	E.N.	Bury.	O.	Birmingham.
B.H.	Bucks.	E.O.	Barrow-in-Furness.	O.I.	Belfast.
B.I.	Monaghan.	E.P.	Montgomeryshire.	O.S.	Wigtown.
B.J.	Suffolk (East).	E.S.	Perth.	P.	Surrey.
B.K.	Portsmouth.	E.T.	Rotherham.	P.I.	Cork.
B.L.	Berkshire.	E.U.	Breconshire.	P.S.	Zetland.
B.M.	Bedfordshire.	E.W.	Huntingdonshire.	R.	Derbyshire.
B.N.	Bolton.	E.X.	Great Yarmouth.	R.I.	Dublin.
B.O.	Cardiff.	E.Y.	Anglesey.	R.S.	Aberdeen.
B.P.	Sussex (West).	F.	Essex.	S.	Edinburgh.
B.R.	Sunderland.	F.A.	Burton-on-Trent.	S.A.	Aberdeenshire.
B.S.	Orkney.	F.B.	Bath.	S.B.	Argyll.
B.T.	Yorkshire (E.R.).	F.C.	Oxford.	S.D.	Ayr.
B.U.	Oldham.	F.D.	Dudley.	S.E.	Banff.
B.W.	Oxfordshire.	F.E.	Lincoln.	S.H.	Berwick.
B.X.	Carmarthen.	F.F.	Merionethshire.	S.I.	Bute.
B.Y.	Croydon.	F.H.	Gloucester.	S.K.	Caithness.
C.	Yorkshire (W.R.).	F.I.	Tipperary (N.R.)	S.L.	Clackmannan.
C.A.	Denbighshire.	F.J.	Exeter.	S.M.	Dumfries.
C.B.	Blackburn.	F.K.	Worcester.	S.N.	Dumbarton.
C.C.	Carnarvonshire.	F.L.	Peterborough.	S.O.	Elgin.
C.D.	Brighton.	F.M.	Chester.	S.P.	Fife.
C.E.	Cambridgeshire.	F.N.	Canterbury.	S.R.	Forfar.
C.F.	Suffolk (West).	F.O.	Radnorshire.	S.S.	Haddington.
C.H.	Derby.	F.P.	Rutland.	S.T.	Inverness.
C.I.	Queen's County.	F.R.	Blackpool.	S.U.	Kincardine.
C.J.	Herefordshire.	F.T.	Tynemouth.	S.V.	Kinross.
C.K.	Preston.	F.X.	Dorset.	S.W.	Kirkcudbright.
C.L.	Norwich.	F.Y.	Southport.	S.X.	Linlithgow.
C.M.	Birkenhead.	G.	Glasgow.	S.Y.	Midlothian.
C.N.	Gateshead.	H.	Middlesex.	T.	Devon.
C.O.	Plymouth.	H.I.	Tipperary (S.R.).	T.I.	Limerick.
C.P.	Halifax.	H.S.	Renfrew.	T.S.	Dundee.
C.R.	Southampton.	I.A.	Antrim.	U.	Leeds.
C.T.	Kesteven (Lincs.).	I.B.	Armagh.	U.I.	Londonderry.
C.U.	South Shields.	I.C.	Carlow.	U.S.	Govan.
C.W.	Burnley.	I.D.	Cavan.	V.	Lanark.
C.X.	Huddersfield.	I.E.	Clare.	V.S.	Greenock.
C.Y.	Swansea.	I.F.	Co. Cork.	W.	Sheffield.
D.	Kent.	I.H.	Donegal.	W.I.	Waterford.
D.A.	Wolverhampton.	I.J.	Down.	W.S.	Leith.
D.B.	Stockport.	I.K.	Dublin.	X.	Northumberland.
D.C.	Middlesbrough.	I.L.	Fermanagh.	X.S.	Paisley.
D.E.	Pembrokeshire.	I.M.	Galway.	Y.	Somerset.
D.F.	Northampton.	I.N.	Kerry.	Y.S.	Partick.

THE WOLSELEY SPEED CALCULATOR.

From 30 to 60 Miles per Hour.

INSTRUCTIONS.—Carefully time the car over one mile, and read off the time clockwise on the inner circle. The facing figure in the outer circle gives the speed in miles per hour. For example:—1 minute 46 seconds equals 34 miles per hour.

Table of Speeds per Hour in Miles and Kilometres.

Time of one mile.	Miles per hour.	Kilom. per hour.	Time of one mile.	Miles per hour.	Kilom. per hour.	Time of one mile.	Miles per hour.	Kilom. per hour.
Min. Sec.			Min. Sec.			Min. Sec.		
1 0	60	96·5	1 43	34·9	56·2	3 36	16·7	26·9
1 1	59	94·9	1 44	34·6	55·7	3 42	16·2	26
1 2	58	93·3	1 45	34·3	55·2	3 48	15·7	25·2
1 3	57·1	91·7	1 46	34	54·7	3 54	15·4	24·8
1 4	56·3	90·5	1 47	33·7	54·2	4 0	15	24·2
1 5	55·4	89·1	1 48	33·4	53·7	4 6	14·6	23·3
1 6	54·5	87·6	1 49	33	53·1	4 12	14·3	23
1 7	53·7	86·4	1 50	32·7	52·6	4 18	13·9	22·4
1 8	53	85·2	1 51	32·4	52·1	4 24	13·6	21·9
1 9	52·2	84	1 52	32·1	51·6	4 30	13·3	21·4
1 10	51·4	82·7	1 53	31·8	51·1	4 36	13	20·9
1 11	50·7	81·5	1 54	31·6	50·7	4 42	12·8	20·6
1 12	50	80·4	1 55	31·3	50·3	4 48	12·5	20·1
1 13	49·4	79·4	1 56	31	49·9	4 54	12·2	19·6
1 14	48·6	78·3	1 57	30·8	49·6	5 0	12	19·3
1 15	48	77·2	1 58	30·5	49·1	5 12	11·5	18·5
1 16	47·4	76·1	1 59	30·2	48·7	5 24	11·1	17·8
1 17	46·7	75·1	2 0	30	48·3	5 36	10·7	17·2
1 18	46·2	74·2	2 3	29·2	47	5 48	10·3	16·6
1 19	45·6	73·3	2 6	28·6	46	6 0	10	16·1
1 20	45	72·4	2 9	27·9	44·9	6 15	9·6	15·4
1 21	44·4	71·5	2 12	27·3	43·9	6 30	9·2	14·8
1 22	43·9	70·6	2 15	26·7	42·9	6 45	8·9	14·3
1 23	43·3	69·7	2 18	26·1	42	7 0	8·6	13·8
1 24	42·8	68·9	2 21	25·5	41·1	7 15	8·3	13·4
1 25	42·4	68·1	2 24	25	40·2	7 30	8	12·9
1 26	41·9	67·4	2 27	24·5	39·4	7 45	7·7	12·4
1 27	41·4	66·6	2 30	24	38·6	8 0	7·5	12
1 28	40·9	65·8	2 33	23·6	37·9	8 30	7·1	11·4
1 29	40·4	65	2 36	23·1	37·1	9 0	6·7	10·8
1 30	40	64·4	2 39	22·6	36·3	9 30	6·3	10·1
1 31	39·6	63·7	2 42	22·2	35·7	10 0	6	9·6
1 32	39·1	63	2 45	21·8	35·1	10 30	5·7	9·2
1 33	38·7	62·3	2 48	21·4	34·4	11 0	5·5	8·8
1 34	38·3	61·6	2 51	20·1	33·9	11 30	5·2	8·4
1 35	37·9	61	2 54	20·7	33·3	12 0	5	8
1 36	37·5	60·4	2 57	20·3	32·7	13 0	4·6	7·4
1 37	37·1	59·7	3 0	20	32·2	14 0	4·3	6·9
1 38	36·7	59	3 6	19·4	31·2	15 0	4	6·4
1 39	36·4	58·5	3 12	18·8	30·2	20 0	3	4·8
1 40	36	57·9	3 18	18·2	29·3	30 0	2	3·2
1 41	35·7	57·4	3 24	17·7	28·5	60 0	1	1·6
1 42	35·3	56·8	3 30	17·1	27·3			

The Law calls for lights one hour after Sunset on all Motor Vehicles.

LIGHTING-UP TIME TABLE FOR 1912 (Greenwich).

Date.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.
1	4.58	5.45	6.38	7.31	8.20	9. 5	9.19	8.47	7.46	6.38	5.33	4.53
2	5. 0	5.47	6.39	7.32	8.22	9. 6	9.19	8.45	7.44	6.36	5.31	4.52
3	5. 1	5.49	6.41	7.34	8.24	9. 7	9.18	8.43	7.41	6.34	5.29	4.52
4	5. 3	5.51	6.42	7.35	8.25	9. 8	9.17	8.42	7.39	6.31	5.27	4.52
5	5. 4	5.52	6.43	7.37	8.27	9. 9	9.17	8.40	7.37	6.29	5.26	4.51
6	5. 5	5.54	6.45	7.39	8.29	9.10	9.16	8.38	7.35	6.27	5.24	4.50
7	5. 5	5.55	6.47	7.40	8.30	9.11	9.16	8.37	7.33	6.24	5.22	4.50
8	5. 6	5.57	6.50	7.42	8.31	9.12	9.16	8.35	7.30	6.22	5.20	4.50
9	5. 8	5.59	6.52	7.44	8.32	9.12	9.15	8.33	7.28	6.19	5.19	4.50
10	5. 9	6. 1	6.54	7.45	8.34	9.13	9.14	8.32	7.26	6.17	5.17	4.50
11	5.11	6. 3	6.56	7.47	8.36	9.14	9.13	8.30	7.24	6.15	5.16	4.49
12	5.12	6. 5	6.57	7.49	8.38	9.15	9.12	8.28	7.21	6.13	5.14	4.49
13	5.13	6. 7	6.59	7.51	8.39	9.15	9.11	8.26	7.19	6.11	5.12	4.49
14	5.14	6. 9	7. 0	7.52	8.41	9.16	9.11	8.24	7.17	6. 8	5.11	4.50
15	5.16	6.11	7. 2	7.54	8.42	9.16	9.10	8.22	7.14	6. 6	5.10	4.50
16	5.17	6.13	7. 4	7.56	8.44	9.16	9. 9	9.20	7.12	6. 4	5. 9	4.50
17	5.19	6.14	7. 6	7.57	8.45	9.17	9. 7	8.18	7.10	6. 2	5. 7	4.50
18	5.20	6.16	7. 7	7.58	8.46	9.18	9. 6	8.16	7. 7	6. 0	5. 6	4.50
19	5.23	6.18	7. 9	8. 0	8.47	9.18	9. 5	8.14	7. 5	5.58	5. 5	4.50
20	5.24	6.20	7.11	8. 2	8.49	9.18	9. 4	8.12	7. 3	5.56	5. 4	4.51
21	5.26	6.22	7.12	8. 4	8.50	9.19	9. 3	8.10	7. 0	5.54	5. 3	4.51
22	5.28	6.24	7.14	8. 6	8.52	9.19	9. 1	8. 8	6.58	5.52	5. 1	4.51
23	5.30	6.26	7.16	8. 7	8.54	9.19	9. 0	8. 6	6.56	5.50	5. 0	4.52
24	5.31	6.28	7.17	8. 8	8.56	9.19	8.58	8. 3	6.54	5.48	4.59	4.53
25	5.33	6.29	7.19	8.10	8.57	9.19	8.57	8. 1	6.52	5.46	4.58	4.53
26	5.35	6.30	7.21	8.12	8.58	9.19	8.56	7.59	6.49	5.44	4.57	4.54
27	5.37	6.32	7.23	8.14	8.59	9.19	8.55	7.57	6.47	5.42	4.56	4.55
28	5.38	6.34	7.24	8.15	9. 0	9.19	8.53	7.55	6.45	5.40	4.55	4.56
29	5.40	6.36	7.26	8.16	9. 1	9.19	8.52	7.53	6.42	5.38	4.53	4.57
30	5.42	—	7.27	8.18	9. 3	9.19	8.51	7.51	6.40	5.36	4.53	4.58
31	5.43	—	7.29	—	9. 4	—	8.49	7.48	—	5.34	—	4.58

The following table enables the approximate time to be found at which lamps must be lit in various centres.

The figures in ordinary type represent the extra number of minutes to be added to the times given in the above table for the months stated.

The figures in heavy type denote the number of minutes to be subtracted from the times in the above table.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Birmingham	2	3	6	8	10	13	13	11	9	6	5	3
Glasgow ..	**9**	0	10	22	33	43	45	37	25	14	3	**7**
Manchester..	**2**	2	6	11	16	21	22	18	13	8	3	0
York	**10**	**5**	1	6	11	17	18	13	8	2	**3**	**9**