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The

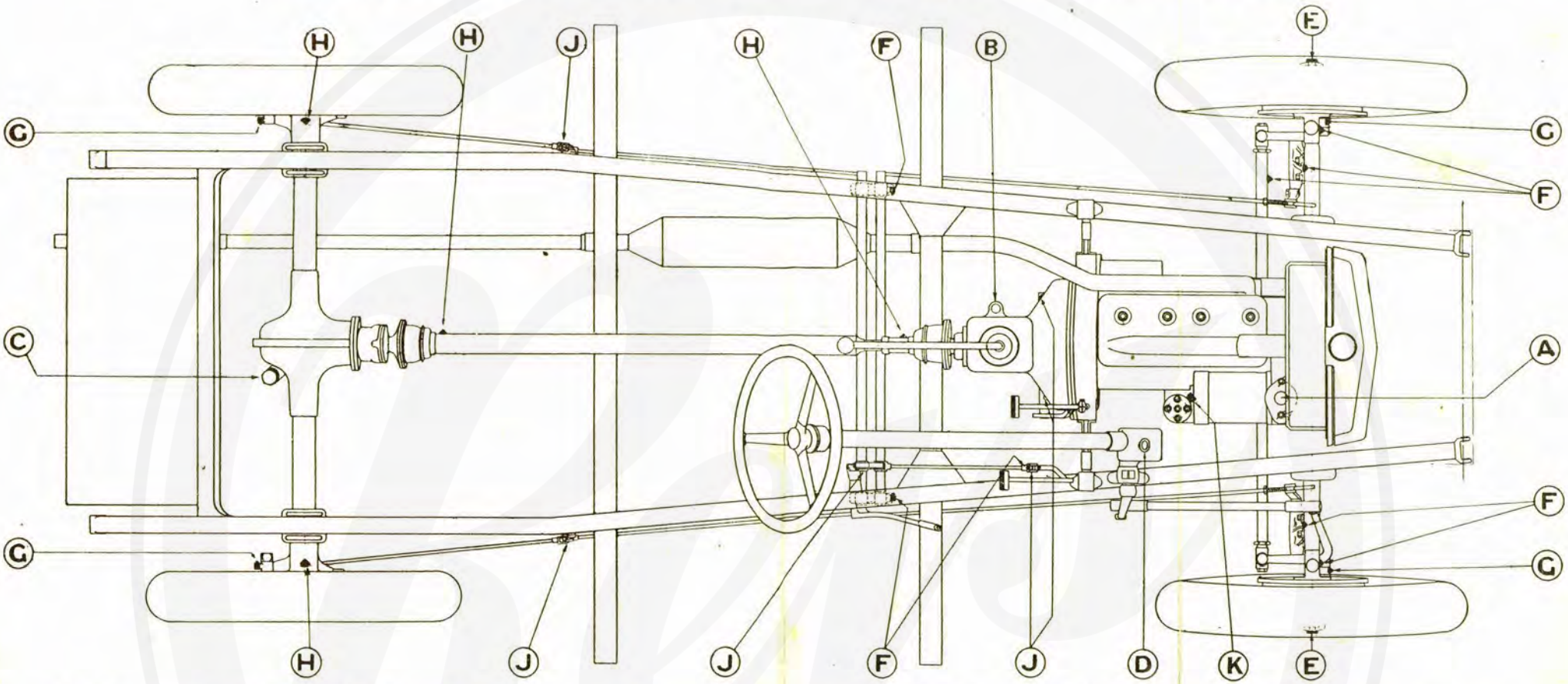
A·J·S

"Nine"

INSTRUCTION BOOK

Series A

OILING DIAGRAM FOR 9 H.P. A.J.S. CAR.



A. To ensure that it does not fall below the bottom mark on the dipper stick rod the oil level should be checked every 250 miles. When necessary fill up to top mark on the rod with Castrol "X L." Drain and flush through with thin oil every 2,000 to 3,000 miles.

B. Fill **up** to plug level on side of box every 500 miles with Castrol "D," and drain thoroughly through base plug every 4,000 to 5,000 miles. Over filling is undesirable.

C. Fill up to level of hole every 2,000 miles with Castrol "D," and drain through base plug every 4,000 to 5,000 miles.

D. Remove plug and fill to base of hole with Castrol "D" every 1,000 miles.

E. Remove wheel, and plug in hub, and charge with Castrol "D" or Mobilgrease every 2,000 miles. Over charging is undesirable.

We use and recommend Wakefield lubricants. Other suitable oils and greases are as follows :—

Engine.—Mobiloil "BB" in Summer; Mobiloil "A" in Winter. Price's Motorine "C" in Summer; Motorine "D" in Winter. Triple Shell in Summer; Triple Shell in Winter.

Gearbox.—Mobiloil "CW;" Price's Amber "B;" Golden Shell. (Amber "B" may be lightly diluted with Engine Oil in Winter).

Rear Axle and Steering.—Mobiloil "C;" Price's Amber "B;" Shell Gear Oil.

Grease Gun.—Mobilgrease;" Price's Belmeline "C; Shell Gear Oil.

F. Using Castrolese (Medium), charge with grease gun every 250 miles.

G. The brake cam bushes should be charged very sparingly by means of the grease gun every 250 miles. Over lubrication is undesirable.

H. By means of the grease gun inject a charge (*i.e.*, three strokes) of grease every 1,000 miles.

J. All joints to be lubricated periodically with machine or engine oil.

K. Give one turn every 500 miles. Re-charge when empty with Castrolese (Medium).

INSTRUCTION BOOK

OF

A·J·S

9 H.P. CAR.

Engine t-bar no A.350.

SERIES A.

A. J. STEVENS & CO. (1914) LTD.,
GRAISELEY HOUSE, WOLVERHAMPTON, ENGLAND.

TELEPHONE 1731 (Seven Lines)

CODES: A.B.C. 5th Edition. A.B.C. 6th Edition. Bentley's Marconi International.

TELEGRAMS: "HOPIT, WOLVERHAMPTON."

Publication No. 209.

INTRODUCTION.

THE information given in this Instruction Book on the 9 h.p. A.J.S. Car has been very carefully compiled in the hope that it will prove of assistance to the owner or mechanic in keeping the car in the best possible condition.

We realise that it is quite impossible to cover all the points which may have to be dealt with, and we welcome enquiries from A.J.S. owners who may require information which cannot be found in the following pages.

Where difficulty is experienced with proprietary fittings and the information required is not to be found in this book, or in the separate Instruction Books issued with the Car which deal with such items as the Electrical Equipment, Carburettor, Autovac (or Grav-Vac), Hardy-Spicer Joints and Shock Absorbers, we advise our clients to get into direct communication with the makers whose addresses are given on Page 32.

Finally, we recommend our clients to follow carefully the instructions in the ensuing pages devoted to the lubrication of the Chassis and the equally important matter of the maintenance of the Car. Only by careful attention to the details mentioned is it possible to obtain satisfactory results.

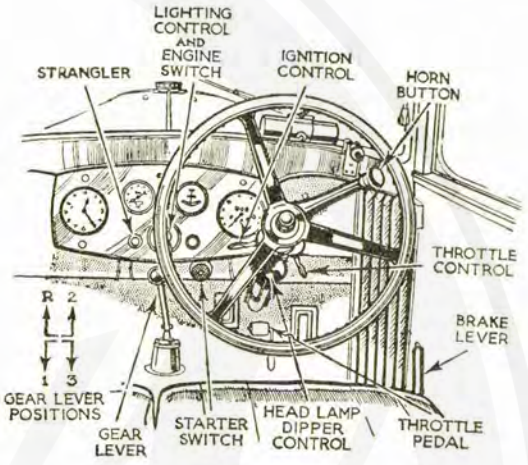
A copy of this booklet is supplied free with every new A.J.S. Car. Applications for extra copies must be accompanied in every case by a remittance for One Shilling to cover cost and postage.

A. J. STEVENS & CO. (1914) LTD.

DECEMBER, 1930.

INDEX.

GENERAL INFORMATION.



DRIVING CONTROLS.

INFORMATION FOR THE OWNER.

Engine Bore and Stroke	60 m/m by 90 m/m.
Cubic Capacity	1,018 cubic cms.
R.A.C. Rating	8.92 h.p.
Tax	£9.
Firing Order	1, 3, 4, 2.
Lighting and Starting Equipment ...	12-Volts.
Charging Rate	8 to 10 amps.
Gear Ratio	5.5, 10.2, 19 to 1.
Wheelbase and Track	7 ft. 7 ins. and 3 ft. 9 ins.
Ground Clearance	8½ ins.
Petrol Tank Capacity	8 Gallons.
Engine Oil Sump Capacity	7 Pints.
Oil Pressure at Touring Speed ...	15 lbs. minimum.
Tyre Pressures, Front and Rear ...	28 and 30/32 lbs.

DRIVING HINTS.

To the experienced driver very little can be said regarding the driving of the car, but to the beginner the following information will be useful. The radiator should be kept full of water—preferably soft or rain water, and of course the engine oil should be at the correct level in the sump. Before starting, the petrol tap underneath the scuttle inside the body should be pushed into the "On" position. If the engine is cold the strangler should be pulled out; this cuts down the air supply and facilitates starting. The ignition should then be switched on and the starter button pressed in. Immediately the engine fires the starter button must be released and the engine kept running by manipulation of the throttle control on steering column and the strangler. A little experimenting will enable the engine to be started from cold quite easily. Do not run the engine for any length of time with the strangler pulled out.

Under extremely cold conditions and before switching on the ignition, it is advisable to turn the engine over once or twice by the starting handle with the strangler pulled out, prior to using the electric starter; this reduces the load and wear on the starting motor caused by the gummy state of the oil due to severe cold.

The control levers on the steering column should be set for normal running in the lowest positions towards the driver; this will give full advance of the ignition (L.H. lever) and closed throttle position (R.H. lever).

To prevent a back fire when starting the engine by hand it is advisable to retard the ignition by moving the control lever upwards about one third of its travel.

As no special knowledge is required to actually drive the car and it is assumed that the owner can drive or will be taught to do so, it is not necessary to give here detailed instructions on general driving.

Gear engagement and changing is carried out in the orthodox manner and presents no difficulty whatever. (See page 5 for layout of controls.) Mention may be made that the reverse gear is engaged by turning the knob of the gear lever in a clockwise direction, the lever being moved to the left and forward at the same time; the knob returning to normal position when released.

We strongly recommend that the car when new should not be driven at a speed exceeding 35 m.p.h. for at least the first 500 miles.

DO'S AND DON'TS.

When starting the engine don't flood the carburettor unless absolutely necessary and then sparingly; don't open the throttle too far and don't race the engine, particularly when it is cold.

For the first 500 miles run the car at moderate speeds only, never exceeding 35 m.p.h. in top, 20 m.p.h. in second, and 8 m.p.h. in bottom gear.

When driving slowly in top gear round corners or in traffic, don't control the speed of the car by slipping the clutch; change down when necessary.

Always de-clutch when changing gear; use the gear control lightly. Changing down is assisted by double de-clutching; if you have to learn to do this get the assistance of a good instructor otherwise you may damage the gearbox.

Don't try to force the gear lever into the reverse position without the necessary clockwise twist of the gear knob.

Examine the contact breaker points regularly, particularly during the first 500/1,000 miles, adjust if necessary as mentioned on page 30.

Don't neglect the battery, keep the electrolyte up to its level by periodic replenishments as instructed on page 26.

Use only the best brands of oil and follow carefully the recommendations in the lubrication section.

Don't neglect the tyres; keep the pressures correct. Occasionally change the wheels round to new positions. **Periodically examine the wheel nuts to ensure that they are tight.**

Don't use violence when applying the brakes or in steering the car in difficult positions; it is bad for the tyres.

Don't apply too much force when closing the doors, otherwise damage may be done to the glass. It is only necessary to apply sufficient pressure to engage the locks.

LUBRICATION SECTION.

We use and recommend Wakefields lubricants as specified on pages 8 to 11 and oiling Diagram. Other suitable oils and greases are as follows :—

Engine.—**Summer**—Mobiloil " BB ;" Price's Motorine "C ;" Triple Shell. **Winter**—Mobiloil " A ;" Price's Motorine " D ;" Triple Shell.

Gearbox.—Mobiloil "CW;" Price's Amber " B ;" Golden Shell (Amber " B " may be lightly diluted with Engine Oil in Winter).

Rear axle and steering.—Mobiloil " C ;" Price's Amber " B ;" Shell Gear Oil.

Grease gun adaptors.—" Mobilgrease ; " Price's Belmoline " C ;" Shell Gear Oil.

ENGINE.

(*See oiling diagram letter "A."*)

Only best quality oil should be used. We use and recommend Wakefield Castrol " XL." For other suitable oils see above,

Every 250 miles the oil level should be checked and replenishments made if necessary. (See page 13 for detailed working of lubrication system.)

Careful and periodic attention must be given to the lubrication of the engine to ensure efficient working and long life.

The oil filler and breather on the offside of engine is provided with a filter which should not be removed when replenishing oil. An oil level dip stick on the same side has two marks stamped on it representing high and low level, and it is important that the height of the oil be within the limit of these two marks. Damage may be done if the oil level is allowed to remain any lower than the bottom mark. At the same time over-filling *i.e.*, above the top mark, will cause over-oiling, smoky exhaust and waste of oil.

The sump should be drained after the first 500 miles, by removing the drain plug at the base. It is not necessary to remove the sump filter to merely drain off oil. After draining wash out the sump with petrol or special light cleansing oil.

After the first 500 miles, the oil must be changed every 2,000 to 3,000 miles.

Every 10,000 miles the circular filter at the base of the sump should be removed, cleaned by washing in petrol and then replaced, taking care to make a good joint and eliminate oil leaks.

After a mileage of approximately 20,000 miles the oil sump should be drained and removed by taking out the pins fixing same into position. The removal of the sump exposes a large tray-type filter which should be thoroughly cleaned. Care must be taken when replacing the sump that an oil tight joint is made ; it should then be re-filled with approximately 7 pints of oil to the top level indicated on the dip stick.

GEARBOX.

(*See oiling diagram letter "B."*)

We use and recommend Wakefield Castrol "D." For other suitable oils see page 8.

Every 500 miles the oil level in the Gearbox should be inspected, and if necessary fresh lubricant added, as directed below :—

Removal of the front floor board (held down each side by screws) will expose the gearbox, which has a filler plug on top and an oil level plug on its near side. Remove both plugs and pour oil into the box until it begins to overflow through the oil level hole, afterwards carefully replacing and tightening the plugs back in position. It is essential that these instructions be rigidly adhered to, as the gearbox must not be over-filled on any account.

At the base of the gearbox is a drain plug, this should be removed once every **4,000 5,000 miles** and the old oil allowed to drain off. If the drain plug is removed immediately after a run the oil will flow more freely. When the old oil has ceased to drain, lightly replace the plug and wash the gearbox out with petrol or special thin cleansing oil ; we do not recommend the use of paraffin. Drain off thoroughly, replace drain plug tight home and refill gearbox with fresh oil to the correct level, using approximately $1\frac{3}{4}$ pints.

CLUTCH.

The clutch itself requires no lubrication but occasionally the inspection cover on the clutch housing, immediately in front of the toe boards, should be removed and the clutch toggle levers, spring pins and thrust race lubricated with an oil can or gun. This also applies to the clutch pedal shaft supported in the clutch housing on plain bearings.

BACK AXLE.

(*See oiling diagram letters "C," " G " and "H."*)

For the differential casing "C" we use and recommend Wakefield Castrol "D." For the greaser adaptors "G" and "H" use Wakefield " Castrolese " or Vacuum " Mobilgrease " in the grease gun. Refer to page 8 for other suitable oils and greases. Access to these lubrication points is obtained by lifting up the trap under the centre of the rear seat.

" C." **Every 2,000 miles** the oil level in the differential casing must be inspected, and if necessary fresh lubricant added by filling to the top of the oil filler elbow on the offside of the casing.

At the base of the casing is a drain plug which should be removed **every 4,000 5,000 miles,** and the old oil drained off, preferably at the end of a run when it will flow more freely. After draining wash out the casing with petrol or special light cleansing oil, replacing the drain plug tightly in position before refilling to the correct level with approximately $1\frac{3}{4}$ pints of oil.

"*H.*" **Every 1,000 miles** a charge (three strokes of gun each) of grease must be injected into the axle shaft bearings through the two grease gun adaptors on the top of the axle end brackets. THIS IS MOST IMPORTANT.

"*G.*" **Every 250 miles** a small charge of grease should be injected into the brake cam bushes through the two grease gun adaptors. Do not give too much grease as the surplus may get through on to the brake linings.

STEERING BOX.

(*See oiling diagram letter "D."*)

We use and recommend Wakefield Castrol "D;" for other suitable oils refer to page 8.

Every 1,000 miles remove the large plug on the steering box (under the bonnet on the offside) and refill with oil to the level of the bottom of the hole, tightly replacing the plug afterwards.

FRONT HUBS.

(*See oiling diagram letter "E."*)

Every 2,000 miles a charge of Castrol "D" or "Mobilgrease" should be injected into the hubs by means of an ordinary oil can or the gun. This can be done after removing the front wheels and the plugs in the outer end of the hubs, care being taken to replace the plugs tightly afterwards. It is essential not to overcharge, otherwise over-lubrication might lead to an escape of oil into the brake drums.

PROPELLER SHAFT.

(*See oiling diagram letter "H."*)

Every 1,000 miles inject a charge of "Castrolese" or Vacuum "Mobilgrease" by means of the gun into the greaser adapter at each end of the propeller shaft. For other suitable greases see page 8.

FRONT AXLE AND STEERING.

Should the steering become stiff and the car show a tendency to "wander" it is a sure sign that the front axle swivels require lubrication. The grease gun should be applied freely to the four adaptors "*F*" on the swivels, the best results being obtained by jacking up the front axle with both tyres clear of the ground and swinging the wheels from side to side to facilitate flow of the oil.

IGNITION DISTRIBUTION GEAR.

(*See oiling diagram letter "K."*)

Every 500 miles give one complete turn to the screwed greaser cap on the side of the distributor at the end of the dynamo. Replenish the cap when necessary with Wakefield "Castrolese" or other suitable grease; to do this unscrew the cap and fill from the gun.

GREASE GUN ADAPTORS.

(*See oiling diagram letters "F" and "G."*)

Every 250 miles a charge of "Castrolese" or other suitable grease should be injected by means of the gun into the greaser adaptors at the points enumerated below, care being taken not to overcharge the brake cam bushes "*G*" on front and rear axles.

F.	Front Axle Swivel Pins ...	4 points.
F.	Front Axle Brake Shafts ...	2 points.
F.	Steering Cross Tube	1 point.
F.	Brake Cross Shaft Bracket and Pedal	3 points.
G.	Front and Rear Brake Cam Bushes	4 points.

USE OF THE OIL CAN.

It is necessary to apply oil by means of an oil can at regular intervals to the places enumerated below, most of which are marked "J" on the lubrication chart.

All brake rod jaws and pins.
Brake rod adjusting wing nuts and springs.
Starting handle.
Hand brake lever.
Throttle and ignition control rods and joints.
Accelerator pedal.
Clutch pedal.
Rod controlling starter switch (sparingly).
Strangler control wire (sparingly).
Sliding seat fittings.
Door hinges and locks.
Bonnet fasteners.

COACH WORK AND FITTINGS.

The car should always be washed down at the earliest convenient time after becoming dirty, otherwise the general condition and appearance will deteriorate and subsequent washing will not have the desired effect.

We do not recommend the application of special preparations or polishes to the cellulose finish or the fabric covering of bodies; neither is this advisable on the interior trimmings and upholstery.

Fabric covered bodies should be washed down with a plentiful supply of cold water at a moderate pressure, using a sponge in the stream of water to remove the dirt and the mud. After washing, the body work should be dried off with a chamois leather and finally polished with a soft cloth. Dirt which may eventually become engrained in the fabric may be removed by washing down with lukewarm water and soap, using a soft brush and finishing off as above.

Cellulose finished bodies should be washed and dried in the same manner as for fabric bodies. The final polish with a soft cloth should be carried out thoroughly to renew the original lustre of the cellulose. If the water is allowed to dry on the body work or the wings it will cause a blotchy surface which can only be removed by subsequent washing and leathering down.

The mudguards, valances (and **bonnets** in the case of fabric bodies) are stove enamelled and should be cleaned on the lines indicated for the cellulose body work.

Tar spots should be removed from the surface of cellulose, fabric or enamel by the application of pure vaseline on a soft cloth, finishing off with soap and warm water.

The interior trimmings and upholstery should be cleaned, only when necessary, with a damp chamois leather and finished off with a soft dry cloth.

The polished interior woodwork should not be cleaned with water; use in this case a good quality furniture polish.

The chromium plated fittings including the radiator and lamps should not be cleaned with metal polish or any other abrasive. Use clean water, and soap if necessary, as in the case of the coach work. Water should not be allowed to remain on these parts longer than necessary.

The floor carpets are quickly detachable for cleaning purposes.

Care should be taken not to allow water to get into the interior of the bonnet through the radiator or bonnet louvres, **or into the interior of the brake drums through the small gap between the drums and the dust covers.**

Water or dampness may cause the door lights to work sluggishly; this can be overcome by light application of vaseline in the felt channels.

MAINTENANCE SECTION.

ENGINE LUBRICATION SYSTEM.

On the nearside of the engine, driven from the camshaft by a spiral gear, is mounted a highly efficient gear pump which has a capacity far in excess of engine requirements. All oil-ways leading to and from the pump are cast in or drilled through solid metal, and, with the exception of the pressure gauge lead, no loose piping is used.

Oil is drawn into the pump through a large diameter suction pipe projecting down into the sump, and surrounded at its lower end by a cylindrical fine mesh detachable filter which can be withdrawn when necessary for cleaning. In the suction pipe there is an oil check valve which keeps the oil galleries primed ready for immediate use. The oil pump itself is of the self-priming type and always remains in a working condition; thus there are two safeguards against lack of oil supply to the bearing when the engine is started after a long rest or after draining the sump.

Oil is forced under pressure from the pump into a gallery cast in the side wall of the cylinder block, and from the gallery it passes through drilled oil-ways to the three white metal lined crankshaft bearings. Large oil-ways are drilled through the crankshaft webs from the main journals to the crank pins; these distribute oil from annular grooves in the main bearings to similar ducts in the white metal lined crank pin bearings.

The pistons, gudgeon pins, cams and tappets are lubricated by "splash;" surplus oil from the main bearings and the crank pin bearings being directed on to them. The spiral gear driving the pump is completely submerged in oil in a small pressure tight compartment cast in the crank case and fed with oil direct from the pump.

For the purpose of maintaining the oil in the system at a fairly constant pressure, a release valve is provided which allows excess oil to escape when the desired pressure has been reached. Owing to the large output of the pump the pressure is obtained immediately, and the surplus oil, approximately 50% of the total, is used to lubricate the timing chain and the chain wheels at the front of the engine. The release valve comprises a small oval aluminium cover bolted to the nearside of the timing case, inside which is a spring loaded ball which "seats" into a passage communicating with the main supply gallery. Surplus oil passing this valve is directed through an oil-way into the timing case, after which it drains back into the sump.

Before oil which has circulated through the engine can return to the sump it passes through a large gauze tray extending over the whole surface of the sump; this effectively filters the lubricant for a second time.

OIL PRESSURE.

At a speed of 30 m.p.h. the oil should circulate at an average pressure, indicated on the gauge, of 25 lbs. It may rise at high speeds to 35 lbs. and drop to 15 lbs. at low speeds ; when the engine is cold higher pressures will be registered. In the unlikely event of a fall in pressure the spring behind the ball valve can be stiffened up by the insertion of a thin steel washer. If no pressure is registered, immediately stop the engine and check the oil level in the sump. Should this be satisfactory examine the pipe line to the oil gauge for a fracture or loose connection which would be revealed by escaping oil. If there is no trouble here it is possible that the ball release valve may be permanently off its seat owing to foreign matter, although this is very unlikely. To remove and clean the release valve is a simple operation but one which must be done with care, making sure that a sound joint is produced when re-fitting.

OIL PUMP AND SUCTION PIPE.

We do not advise owners to interfere with this unit unless absolutely necessary. It may be dismantled by withdrawing the screws which are exposed when the circular aluminium cover is removed. The complete pump with driving gear can be gently prised away from the crank case, care being taken not to damage the joint washer. To examine the pump gears remove the cover. If the pump is washed out it is advisable to pour fresh engine oil through the pump ports before re-fitting. Remember there is a steel thrust washer behind the driving gear on the end of the pump shaft which must be replaced.

If at any time the suction pipe projecting down into the sump is removed it is essential to make a pressure tight joint between the flange and the crank case face when it is re-fitted. The check valve must be in position in the pipe.

DECARBONISING.

The formation of carbon deposit in the combustion chamber is a characteristic of the internal combustion engine. We recommend decarbonising after the first 2,000 miles and then periodically at least every 4,000 to 5,000 miles. The process of removing the carbon should be carried out as follows :—

First drain the radiator by removing the plug at base ; take off the clips holding the top rubber water tube and remove the tubing. The radiator need not be disturbed.

The H.T. plug leads should be taken off the plugs and moved away from the cylinder by detaching the clip holding them to the head. The respective positions of the H.T. leads should be carefully noted so that, upon replacement, they will be fitted to the correct plugs.

After the cylinder head nuts have been removed the head can be lifted off, taking care not to damage the gasket.

The removal of carbon from the combustion spaces and piston tops should then be carried out, using a blunt scraping tool, care being taken to remove all traces of carbon and to prevent same entering the ports and water passages.

It is absolutely essential when replacing the cylinder head that a damaged gasket should be discarded for a new one ; also that great care be taken to ensure the head being tightened down correctly.

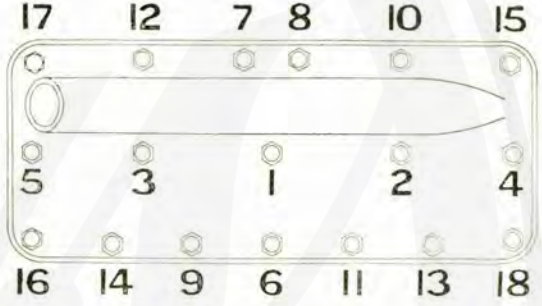


Illustration No. 1.

ORDER IN WHICH CYLINDER HEAD NUTS SHOULD BE TIGHTENED DOWN.

Screw down the cylinder head nuts **in the order shown in Illustration No. 1,** about a quarter or half a turn at a time, until all nuts **are tight.**

Before water is put into the radiator start the engine and let it run slowly for about two minutes (not more) ; then switch off, and again tighten cylinder head nuts in the same order as before, **dead tight.**

The radiator can now be filled in the ordinary way, and the car run on the road. After 5 or 6 miles it will be found that the nuts will still give a little more. Go over them again as before until **all are dead tight.**

A new gasket when properly bedded down is reduced to approximately half its original thickness, so that it is very necessary the above procedure is carried out to ensure a satisfactory and lasting joint.

VALVE GRINDING.

The inlet and exhaust manifold assembly, complete with carburettor, may be removed after taking off the six domed nuts, the two exhaust pipe flange bolts, undoing the carburettor control rod, the strangler wire, petrol and suction pipes. This, after removal of the cylinder head, gives clear access to the valve chamber and facilitates removal and replacement of the valves.

The engine should be rotated by hand until the valve to be removed is on its seat, after which the valve spring can be compressed, using a valve spring lifting tool, thus enabling the cotter to be withdrawn.

The seats should be carefully ground in, using a fine carborundum paste obtainable at any garage; this is an operation which should be carried out by a person already acquainted with the work, as it is absolutely essential that valves be compression tight. Considerable damage may result if the necessary precautions and care are not taken. The valves are numbered and should be replaced in their correct order, No. 1 being nearest the radiator. It should be noted that the exhaust valves are marked, as they differ from the inlet valves in the steel used.

When replacing the inlet and exhaust manifold, it is very necessary to tighten the nuts home evenly, *i.e.*, pressure on the nuts should be applied gradually and alternately until they are tight.

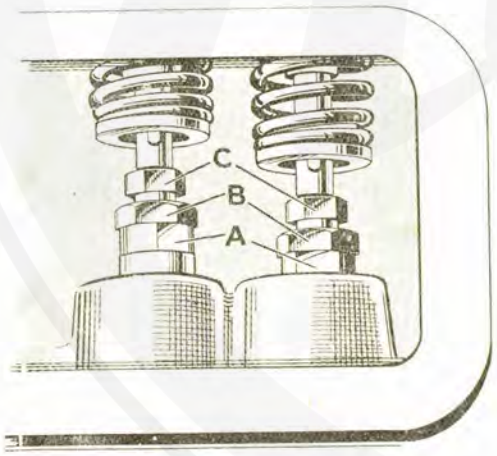


Illustration No. 2.

TAPPET ADJUSTMENT.

(*See Illustration No. 2.*)

When valve grinding has been carried out, it will be necessary to check and adjust the tappet clearances. This is done with the special spanners provided, by holding the tappet stem "*A*," slacking off locknut "*B*," and adjusting tappet screw "*C*" until the correct clearance has been obtained; finally locking tightly nut "*B*." The correct tappet clearance when the engine is cold is:—Exhaust 7, Inlet 5-thousandths of an inch; this should be carefully checked after the locknut has been tightened, using the gauges provided for this purpose in the tool kit.

IGNITION TIMING.

(*See Illustration No. 3.*)

It is most important that the contact breaker points be correctly set to open .015 in. (see page 30) before proceeding with work in this section. A gauge is provided for this purpose in the tool kit.

To check the ignition timing, first remove the clutch inspection cover, then bring No. 1 piston (nearest the radiator) to the **top of the compression stroke.** In this position one of the clutch operating levers in the clutch housing will be dead vertical. The flywheel must

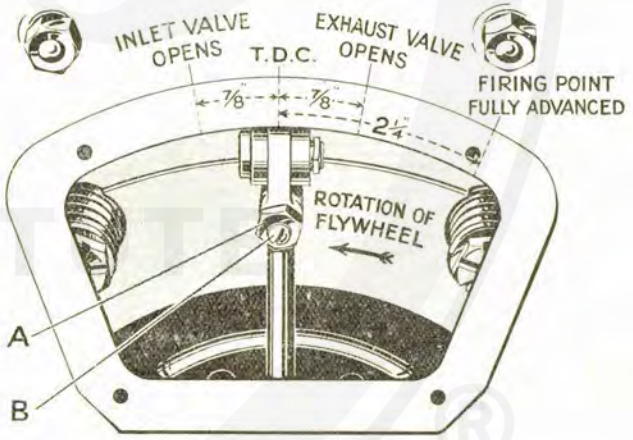


Illustration No. 3.

then be moved backwards about three inches and forward again to bring the lever 25 degrees from T.D.C., equal to two and one quarter inches, as illustration. The double movement, backwards and forward

again, is to eliminate the small inaccuracy which would otherwise result due to the slackness in the timing chain. With the ignition control lever set full advanced, the contact breaker points should now be on the point of opening, and the rotor on the distributor spindle should be opposite the segment in the moulding to which No. 1 plug lead is attached. The firing order is 1, 3, 4, 2, and the distributor rotor arm rotates in an anti-clockwise direction ; therefore, with the distributor moulding in position, the cable adjacent to No. 1 in an anti-clockwise direction should be attached to No. 3 plug, the next to No. 4 plug and finally the last one to No. 2 plug.

VALVE TIMING.

If at any time it is found necessary to re-set the valve timing (owing to removal of the timing chain, etc.), the correct setting when replacing should be according to Illustration No. 3. This can be checked on the flywheel, following the same procedure as for the ignition timing, but in this case No. 1 piston should be at the **top of the exhaust stroke.** The inlet valve should be on the point of opening when the flywheel is moved backwards from top dead centre, a distance of approximately $\frac{7}{8}$ of an inch measured on the clutch housing. The exhaust valve should close when the flywheel is moved approximately $\frac{7}{8}$ of an inch forward from top dead centre.

SPARKING PLUGS.

When correctly set the gap between the plug electrodes should be 20 to 25 thousandths of an inch, slightly more than is usual for magneto ignition. Periodically examine the plugs, removing any carbon deposit or burned oil by washing in petrol, carefully scraping the electrodes only to produce a clean surface. Re-set to give the above gap ; a gauge is provided in the tool kit for this purpose. Use good plugs having a reach of approximately $\frac{3}{4}$ of an inch ; we find Lodge H2 very suitable.

TIMING CHAIN ADJUSTMENT.

(*See Illustration No.* 4.)

The method of adjusting the chain tension is as follows :—Slack off nuts "*A*" and "*B*" and ease pin "*C*," then by means of a lever gently move the dynamo until the correct tension is obtained. The chain will be tightened by moving the dynamo away from the cylinder block, and vice-versa. The chain tension may be felt by removing the inspection cap on timing cover ; a movement of the chain up and down of approximately $\frac{1}{4}$ of an inch, *i.e.*, $\frac{1}{8}$ of an inch each way should be felt. Undue tightness of the chain will produce a "whining" sound and excessive slackness will cause a slight "clattering."

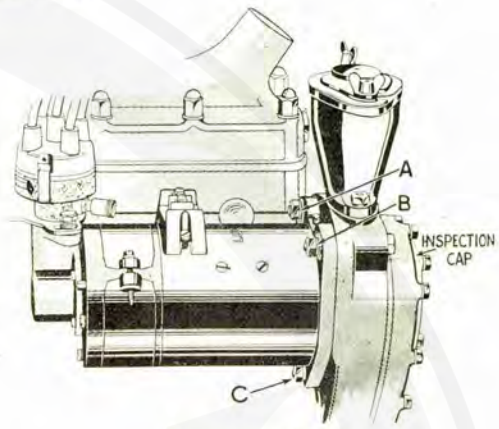


ILLUSTRATION No. 4

REMOVAL OF DYNAMO.

(*See Illustration No.* 4 *as Chain Adjustment.*)

To remove the dynamo from its mounting the inspection cap on the timing cover should be taken off. The three bolts and nuts "*A*," "*B*" & "*C*," holding the dynamo in place should be removed, after which the dynamo can be manoeuvred into a position which will allow the chain to be lifted off the sprocket ; the dynamo complete with sprocket can then be taken away. Care should be taken to keep the chain tight on the other two sprockets in the timing case, thus preventing it from jumping the teeth and upsetting the camshaft timing. This can be done by tying the chain securely to the dynamo housing while removing the dynamo.

It will of course be necessary to take off the dynamo leads and distributor cover, replacing them later in their correct positions.

It is not necessary to mark the dynamo sprocket or the chain, as the correct timing of the ignition can be carried out irrespective of the position of these parts by carefully following the instructions relating to ignition setting on page 17.

CLUTCH ADJUSTMENT.

(*See Illustrations Nos.* 3 *and* 5.)

This should only be necessary after prolonged use, as the friction material used in the single plate dry clutch is practically indestructable, providing it is not slipped unnecessarily or otherwise misused.

Adjustment is necessary when the free travel of the clutch pedal, *i.e.*, the movement that can be felt by pulling the pedal backwards, has become less than $\frac{3}{8}$ of an inch at the pedal face (see Illustration No. 5). If this is not attended to, clutch slip and consequent damage to the friction material will result.

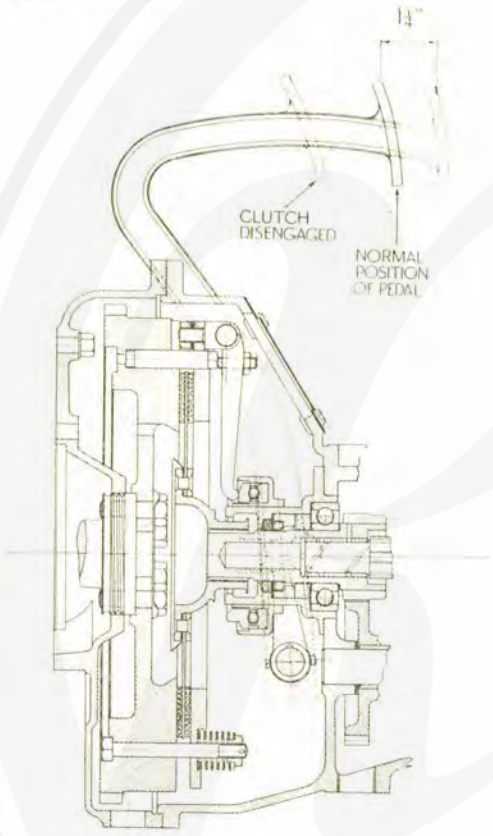


ILLUSTRATION No. 5.

Provision for adjustment is made in the form of a slotted screw with locking nut on each of the three actuating levers (*see Illustration No. 3*). By loosening the locknut "*A*" and turning the screw "*B*" in an anti-clockwise direction the amount of free travel in the clutch pedal is increased.

Great care must be taken to prevent the adjustment being uneven, that is, each adjusting screw must be turned the same amount as the other and finally tightened or locked with the nut "*A*."

The amount of adjustment necessary on the screws may be determined by rotating each one half a turn at a time until the free movement at the pedal face is $1\frac{1}{4}$ to $1\frac{1}{2}$ inches (*see Illustration No. 5*).

When correctly adjusted the inner end of each of the actuating levers should be in contact with the thrust race when the adjusting screw presses against the driving pin. Any slackness in one or more of the levers must be corrected at the adjusting screw to ensure even pressure and smooth operation of the clutch.

The pressure of the six clutch springs may be increased, although this should rarely be necessary as they are correctly set before the car leaves the factory. When adjusting, care should be taken to turn the spring collars an equal amount to ensure even pressure on the clutch plate. The split cotters must be re-inserted after adjustment.

BRAKE ADJUSTMENT.

It must be remembered that above all things the care of the brakes is the most important matter in connection with the maintenance of a car.

Neither the foot brake pedal nor the hand brake lever must be allowed to reach the limit of its travel even when the brakes are hard on.

Conversely the brake shoes must not be in contact with the drums when the brakes are off.

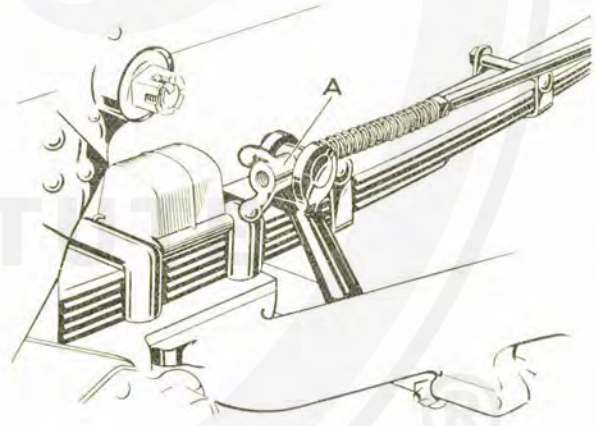


ILLUSTRATION No. 6.

Provision is made for the adjustment in the form of a wing nut at the end of each of the four brake rods (see "*A*" on Illustration No. 6 and "*C*" on Illustration No. 7).

To adjust, proceed as follows :—Jack up the rear axle with both wheels clear of the ground, and adjust each brake until an even hand pressure is required to rotate the wheels **when the pedal is depressed a distance of approximately 1 inch.**

The same operation should be carried out on the front brakes, but in this instance **the pedal should not be depressed more than $\frac{1}{2}$ inch,** ensuring at the same time that the brake shoes are perfectly free when the pedal is released. Adjustment of the hand brake is automatic owing to inter-connection of the controls.

After adjustment it is advisable to check the brakes to ensure that they are not rubbing, by tapping the periphery of the drums with a spanner, when a clear bell-like note should be produced ; this should be carried out with the car fully loaded. If the brakes are rubbing, the sound produced will be dull instead of being clear or ringing.

If, on the road, the application of the brakes tends to pull the the car to the right or the left, it is obvious that on the side in question either the front or rear brake is coming into action too soon, and adjustment should be made accordingly.

EXAMINATION OF BRAKE LININGS.

After removal of the road wheel, the brake drum may be detached by taking out the two small countersunk screws, and tapping its flat outer face on opposite sides alternately with a mallet until it is free of the shoulders on the wheel studs. The brakes must be in the "off" position while this is being done, and to ensure that the car will not move, the other wheels must be scotched.

The brake linings should be cleaned free of foreign matter and preferably roughed up with a coarse file before replacing the drum, which should also be cleaned on its working surface.

While the drum is removed it is advisable to operate the brake controls and ensure that the shoes and cams are working freely.

WITHDRAWAL OF AXLE SHAFT AND HUB BEARING.

(*See Illustration No.* 7.)

Should this be necessary, proceed as follows :—

After taking off the road wheel and brake drum as previously described, remove the four nuts and washers "*A*" at the back of the axle and bracket. The axle shaft assembly complete with ball bearing and housing "*B*" can then be withdrawn by gently prising the hub

outwards, using two screw drivers resting against the brake shoe cam and pivot. When re-inserting, smear the faces of the bearing housing and axle end with good quality grease for lubrication of the bearing. Clean off surplus grease after tightening the housing in position.

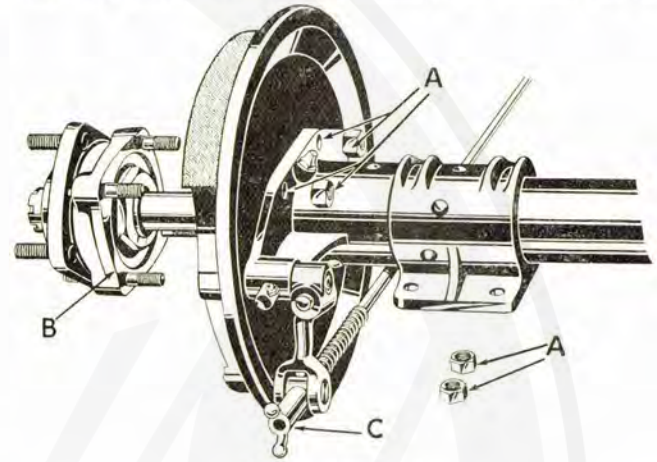


Illustration No. 7.

The whole operation of removal and replacement should be carried out using a minimum amount of force ; it should be noted that it is not necessary to remove the wheel hub from the taper end of the axle shaft before extraction.

STEERING BOX.

Very little, if any, attention is required to this component beyond periodic lubrication referred to elsewhere.

Owing to the use of the worm and nut principle with its large bearing surfaces, adjustment is unnecessary, as the wear of the parts is negligible.

Adjustable stop screws are provided on the steering box to limit the movement of the road wheels and prevent the tyres chafing against the controls ; no alteration to these should be necessary.

ALIGNMENT OF FRONT WHEELS.

(*See Illustration No.* 8.)

To ensure that there will be no undue wear of the tyres, the alignment of the front wheels should be checked occasionally, and if necessary, adjustment should be carried out.

When correctly aligned, the wheels should be parallel with each other, the maximum limit of error being $\frac{1}{8}$ inch "toe in;" the wheels should never "toe" outwards.

To adjust the track rod which controls the relative position of the wheels, slack off locknuts "*A*" and "*B*," which have right hand and left hand threads, and rotate the tube "*C*," using a pair of pipe grips for the purpose. Care must be taken to tighten the locknuts securely after adjustment.

ILLUSTRATION No. 8.

STEERING ROD JOINTS.

(*See Illustration No.* 8.)

To detect wear in the ball joints at the ends of the steering rods apply side pressure in alternate directions to the road wheels. Should it be necessary to adjust any particular joint, remove split cotter "*D*" and screw inwards the ball socket "*E*" at the extremity of the rods, until a bare running clearance remains which will not bind in any position. To allow for fine adjustment a number of cotter holes is provided. This operation is simplified if the front wheels are jacked up clear of the ground.

It is advisable to occasionally dismantle and clean the four joints, repacking with grease before assembling.

PETROL SUPPLY.

All pipe joints appertaining to the petrol supply should be periodically examined and kept tight; this applies to joints on the induction pipe, carburettor, petrol supply unit and rear tank.

The rear tank should occasionally be drained to remove any foreign matter which may have accumulated.

It is also advisable to drain the supply unit for the same reason by removing the plug at the base, and to clean the filter situated in the elbow on the supply side at the top of the Autovac or Grav-vac Unit.

After the cleaning and draining operations have been carried out, or in the event of the petrol supply running out, the supply unit will be automatically refilled after replenishing the rear tank by rotating the engine for a few seconds with the throttle closed; this creates the necessary vacuum in the system.

While the car is not in use, it is advisable to shut off the petrol tap to prevent wastage in the event of flooding at the carburettor.

CARBURETTOR.

The Carburettor fitted is Solex, type FH. For details see separate Instruction Book issued by Carburettor Makers. The following hints will, however, be useful.

The choke and jet fitted when the car leaves the factory are those most suitable for this car, and should not be changed without advice.

The flange nuts holding the carburettor to the induction pipe should not be allowed to come loose, also, when replacing the carburettor in the event of it being taken off for examining or cleaning, be sure that a good joint is made between the carburettor and induction pipe: failure of the joint will cause difficult starting and bad slow running.

Do not run the car for any length of time with the air strangler closed.

Spare parts should be obtained from the carburettor makers, always remembering to give the model and year of the car and type of carburettor fitted.

A list of service stations is given in the Solex handbook.

TYRES.

To obtain good tyre mileage with a maximum of riding comfort and ease of steering, the tyre pressures should be checked at least once a week. With normal loading, the front and rear tyres of the saloon models should register a pressure of 28 lbs. front and 30 to 32 lbs. rear; the pressure may be varied from 1 to 2 lbs. less for lighter models.

Serious damage will result to the tyre, tube and rim if, in the event of a puncture, the car is driven on a flat tyre.

MAINTENANCE OF LUCAS LIGHTING AND STARTING EQUIPMENT.

Detailed running instructions for the electrical equipment are given in the Lucas Handbook issued with each Car. We specially emphasize the following points.

BATTERY.

It is of the utmost importance that the battery should receive regular attention, as upon its good condition depends the satisfactory running of the starting motor, the illumination of the lamps and, when coil ignition is fitted, the running of the car.

The battery must never be left for a long period in a fully discharged condition, and unless some long runs are to be taken, it is advisable to have the battery removed from the car and charged up from an independent electrical supply.

STORAGE.

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

1. Keep the acid level $\frac{3}{8}$ in. above the top of the plates.
2. Add only distilled water, never tap water.
3. Test the condition of the battery by taking readings of the specific gravity of the acid with a hydrometer. This should be 1.285 when fully charged.

Keep the terminals spanner tight, and smeared with vaseline.

USE OF THE CHARGING SWITCH

The battery is the "reservoir" for the energy generated by the dynamo, and once it is full there is no object in delivering further current to it. While it is always better to keep a battery overcharged rather than undercharged, it should be remembered that excessive overcharging will quickly reduce the acid level and tend to shorten the life of the battery. Therefore, to ensure that the battery is kept in good condition without the possibility of excessive overcharging, the two rate charging scheme is provided.

The charging switch should be kept in the appropriate position according to the season. For cars running under average conditions this will ensure that the battery is kept in a fully charged state.

DYNAMO.

The dynamo requires very little attention to ensure satisfactory running. Very occasionally—about every season—remove the dynamo end cover, and examine the brushes and commutator, and if attention is required makers' instructions should be followed.

STARTER.

The armature spindle of this machine is fitted with a pinion which, on rotation, runs into engagement with the geared ring on the flywheel. Immediately the engine begins to fire, the pinion is automatically thrown out of mesh.

If for any reason the pinion wheel on the motor does not engage with the flywheel teeth, examine the screwed sleeve on the armature spindle to see that it is free from dirt; if necessary, wash over with paraffin. Occasionally give it a few drops only of thin machine oil through the hole in the side of the clutch housing.

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

WIRING AND FUSES.

The wiring of the electric system calls for no attention except that cables should not be allowed to become loose and chafe. The terminals should be clean and securely clamped, and if removed at any time they should be replaced exactly as they were originally, and in accordance with the wiring diagram issued in the makers' instruction book.

Before checking over the wiring for loose terminals or rewiring any of the units, it is important to disconnect the positive lead at the battery to avoid the possibility of short circuits.

FUSES.

Under the detachable cover of the wiring junction box, situated on top of the tool box, there are three fuses of the cartridge type, which protect the equipment in the event of short circuits. One, marked "*H*" protects the headlamps; another, marked "*S*" and "*T*," the side and tail lamps; and the third, marked "*AUX*," the circuits of any auxiliary accessories, including the horn.

There is another fuse to protect the mechanism in the dipping head lamp. This is referred to in the paragraphs dealing with the dipping and switching head lamps.

If both the headlamps, or the side and tail lamps, or all the units connected to the auxiliary accessory terminal fail to function, examine the particular fuse protecting them. If a fuse has burned out, before replacing it inspect the units that have failed, for evidence of short circuits or other faults that may have caused the fuse to blow.

DIPPING AND SWITCHING HEADLAMPS.

Should the car be run in countries where the rule of the road is right hand (as against left hand in the U.K.) the reflector can be arranged to dip and turn to the right by simply fitting it so that the slot in the rim marked "*R*" engages with the top support.

A fuse is provided with the electrical dipper unit to protect the equipment in the event of the reflector failing to function properly. The fuse is of the cartridge type, and is carried in spring clips alongside the dipping mechanism. If the reflector fails to function, remove the fuse from its holder and see if there is a break in the fuse wire. A spare fuse is clipped to the reflector bracket.

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

REPLACEMENT BULBS.

When replacing lamp bulbs we recommend Lucas Bulbs, as they are specially constructed to give the best results with the reflectors.

The type of Bulb fitted in the headlamps is B.A.S. No. 4S, and in the side and tail lamps, B.A.S. No. 10S.

LOCATION OF FAULTS.

Although every precaution is taken to eliminate all possible causes of trouble, failure may occasionally develop through lack of attention to the equipment or damage to the wiring. The most probable faults are tabulated according to the symptoms which are displayed in the fault finding tables issued in the makers' instruction book, pages 24 to 28.

IMPORTANT.

In the event of difficulty with the electrical equipment it is always advisable to have the advice of an experienced electrician, or the attention of one of the Lucas Service Depôts, a list of which will be found on page 32.

MAINTENANCE OF LUCAS COIL IGNITION EQUIPMENT.

Very little attention is needed to keep the ignition equipment in first-class condition. We advise that the set should be inspected occasionally and if necessary those parts referred to below should be cleaned and adjusted. **This particularly applies to the contact breaker points.**

DISTRIBUTOR UNIT.

(*See Illustration No.* 9.)

Occasionally remove the distributor moulding "*A*" by pushing aside its two securing springs "*B*." See that the electrodes are clean and free from deposit. If necessary, wipe out the distributor with a dry duster, and clean the electrodes with a cloth moistened with petrol. Next examine the contact breaker; it is important that the

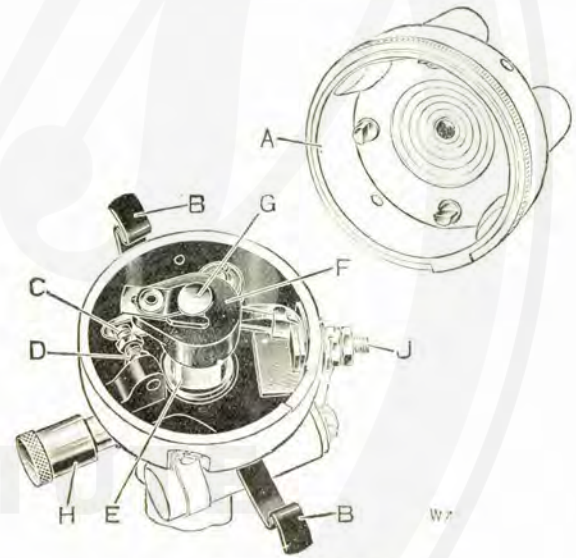


ILLUSTRATION No. 9.

DISTRIBUTOR TYPE D41.

A—Distributor Moulding.
B—Securing Springs for Moulding.
C—Contacts.
D—Locking Nut.
E—Rotating Cam.
F—Rotating Distributor Arm.
G—Spring Contact.
H—Greaser.
J—Terminal

contacts "C" are kept free from any grease or oil. If they are burned or blackened they may be cleaned with very fine emery cloth and afterwards with a cloth moistened with petrol. Care must be taken that all particles of dirt and metal dust are wiped away. It is possible that misfiring may be caused if the contacts are not kept clean.

CONTACT BREAKER ADJUSTMENT.

The contact breaker gap is set to about 15 thousandths of an inch before leaving the works, and it will probably need adjusting only at long intervals. **We strongly advise, however, that during the first few hundred miles, while the surfaces are settling down, the points be carefully checked and reset if necessary. This is important.** Failure to carry out these instructions may result in a poor spark, burning of the points and loss of power, due to late ignition.

If adjustment is necessary, proceed as follows:—Turn the engine round slowly by hand until the points are seen to be fully opened, then, with special spanner, slacken the locking nut "*D*" on the stationary contact screw, and rotate it by its hexagon head until the gap is set to the thickness of the gauge supplied in the tool kit. After making the adjustment, care must be taken to tighten the locking nut.

LUBRICATION OF DISTRIBUTOR UNIT.

The distributor main bearing is lubricated from a greaser "*H*;" this should be packed with a good quality high melting point grease, and the cap should be given one complete turn every 500 miles.

The cam should be given the slightest smear of vaseline about every 3,000 miles or whenever it appears to be dry.

COIL.

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

IGNITION WARNING LAMP.

When the engine is stopped, unless only momentarily, the ignition key should be always turned to the "OFF" position so as to prevent the battery being discharged by current flowing through the coil windings. To ensure that this does not happen, a red warning lamp is provided which gives a red light when the ignition is switched on, and the engine is stationary.

THE DETECTION AND REMEDY OF IGNITION FAULTS.

If a failure of ignition or misfiring occurs, unless the cause is at once apparent, the owner is strongly recommended to proceed in accordance with the following routine, which should quickly enable him to locate the trouble.

Before proceeding with the examination, however, make sure that the trouble is not due to defects in the engine, carburettor, petrol supply, etc.

If the engine will not fire switch on the ignition, turn the engine and observe the ammeter reading. The engine should be turned by hand if it is known that the battery is in a low state of charge.

If an ammeter reading is given which rises and falls with the closing and opening of the contacts, then the low tension wiring is in order. If the reading does not fluctuate in this way, a short in the low tension wiring is indicated or the contacts are remaining closed.

When no reading is given, the contacts may be permanently open, a broken or loose connection in the low tension wiring is indicated or the battery may be exhausted. Remove the distributor moulding and examine the contacts; turn the engine over by hand and see that they come together when off the cams. If necessary, clean and adjust them as described on page 30. Examine the low tension wiring, *i.e.*, the cables from switch-box to coil, coil to distributor, distributor to chassis. Also see that the battery terminals are tight and that the cables from the battery to the switch-box are secure. The battery may be dismissed as the cause of the trouble if the lamps will light.

Examine the high tension cables, *i.e.*, cables from the coil to the distributor and from the distributor to the plugs. If the rubber shows signs of deterioration or cracking, the cable should be renewed.

Test the coil independently of the distributor as follows:—Remove the cable from the centre distributor terminal, hold it about $\frac{1}{4}$ of an inch from some metal part of the chassis and turn the engine. The sparking should be strong and regular if the coil is functioning correctly.

If after carrying out the examination suggested the trouble cannot be found, we advise that the equipment should be examined by the nearest Lucas Service Depot, the addresses of which are given on page 32.

ACCESSORIES AND MAKERS' ADDRESSES.

LUCAS SERVICE DEPOTS.

BELFAST	**3/5, Calvin Street, Mountpottinger**	
Telephone : BELFAST 7017.	Telegrams : " SERVDEP, BELFAST "	
BIRMINGHAM	**Great Hampton Street**	
Telephone : CENTRAL 8401 (10 lines)	Telegrams : " LUCAS, BIRMINGHAM "	
BRISTOL	**345, Bath Road**	
Telephone : BRISTOL 8400 (4 lines)	Telegrams : " KINGLY, BRISTOL "	
CARDIFF	**54a, Penarth Road**	
Telephone : CARDIFF 4603 (4 lines)	Telegrams : " LUCAS, CARDIFF "	
COVENTRY	**Priory Street**	
Telephone : COVENTRY 3068 & 3841	Telegrams : " LUCAS, COVENTRY "	
DUBLIN	**41, Middle Abbey Street**	
Telephone : DUBLIN 653	Telegrams : " AUTOLITE, DUBLIN "	
GLASGOW	**227/229, St. George's Road**	
Telephone : DOUGLAS 3075 (5 lines)	Telegrams : " LUCAS, GLASGOW "	
LEEDS	**64, Roseville Road**	
Telephone : LEEDS 28591 (5 lines)	Telegrams : " LUSERDEP, LEEDS "	
LIVERPOOL	**450/456, Edge Lane**	
Telephone : OLD SWAN 1408 (3 lines)	Telegrams : " LUSERV, LIVERPOOL "	
LONDON	**Dordrecht Road, Acton Vale, W.3**	
Telephone : CHISWICK 3081 (18 lines)	Telegrams : " DYNOMAGNA, ACT, LONDON "	
LONDON	**759, High Road, Leyton, E.10**	
Telephone : WALTHAMSTOW 2161 (3 lines)	Telegrams : " LUSERDEP, WALT, LONDON "	
LONDON ...	**155, Merton Road, Wandsworth, S.W.18**	
Telephone : PUTNEY 5131 (4 lines) & 5501	Telegrams : " LUSERV, WANDS, LONDON "	
MANCHESTER	**Talbot Road, Stretford**	
Telephone : LONGFORD 1101 (5 lines)	Telegrams : " LUCAS, STRETFORD "	
NEWCASTLE-ON-TYNE ...	**64/66, St. Mary's Place**	
Telephone : CENTRAL 3571 (3 lines)	Telegrams : " MOTOLITE, NEWCASTLE-ON-TYNE "	

IN ADDITION THERE ARE OFFICIAL BATTERY SERVICE AGENTS IN IMPORTANT CENTRES THROUGHOUT THE COUNTRY.

CARBURETTOR.

LONDON ... **Solex Ltd., 223-231, Marylebone Road, N.W.1.**

PETROL FEED UNIT.

"AUTOVAC."

STOCKPORT ... **The Autovac Manufacturing Co., Ltd.**

"GRAV-VAC."

BIRMINGHAM The Grav-Vac Syndicate Ltd., 174, Corporation St. .