

Vauxhall

Instruction Book

A GUIDE TO THE
PROPER CARE OF
VAUXHALL MOTOR
CARRIAGES



VAUXHALL MOTORS LIMITED
LUTON BEDFORDSHIRE

PRICE 5/-

The Vauxhall Instruction Book

THE type of Vauxhall chassis dealt with in the present edition is the 25 h.p. "D," of which there is now in use a much larger number than of any other of our productions.

To some extent, however, the instructions apply also to the 30-98 h.p. "E" type, the lubrication system of which is practically identical with that of the "D" type.

Owners are requested to consult us on any matter that may not be fully understood. It may be pointed out that, as improvements in design are constantly being made, parts of the book are liable to be rendered out of date in a comparatively short time. Should any difficulty be presented by this or any other cause, our advice and assistance can always be counted upon.

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VAUXHALL MOTORS LIMITED
LUTON BEDFORDSHIRE

Telephone : LUTON 466 (4 lines)

Telegrams : CARVAUX LUTON

SECTION I.

RADIATOR TO HAVE DAILY ATTENTION.

Keep filled with water (clean rain water is the best) to within 1 in. of filler base. (On starting engine do not mistake water escaping from overflow pipe for a leakage.)

LUBRICATION.

GENERAL SUGGESTIONS.

Absolute cleanliness of all utensils.

Separate utensils for different kinds of lubricant.

Replenishments for the garage should *not* be made from the car kit.

Proper storage place for lubricants and utensils in garage.

Wipe up surplus oil, spilt oil, or oil drippings *immediately*.

Wipe around each grease cap after filling, as exuding grease collects dust.

Proceed through a regular routine, and do not neglect any part.

Clean all ball-oilers and oil holes before lubricating.

Use those lubricants recommended by Vauxhall Motors Limited. If others must be used, make sure that they are similar in quality.

Many little points where lubrication is obviously needed are not specifically mentioned in this book. It is well to bear in mind that wherever movement occurs, however small, lubrication is necessary.

LUBRICATION ROUTINE.—1. DAILY.

ENGINE.

Keep filled with oil. The filling cap on crank case side indicates correct level by the mark "Full" on scale. (See A, Fig. 5.) Joggle float indicator to ensure that it is working freely and giving an accurate reading. Do not be misled if the float has become damaged by rough usage and thereby "oil-logged."

Oil valve stems, by inserting spout of force feed oil-can filled with engine oil between coils of valve springs.

Where valve stem lubricators are fitted, oiling is necessary only once weekly.

Fill grease cap on fan spindle. (See A, Fig. 4.)

Oil starting handle shaft. (See C, Fig. 10.)

CLUTCH.

Oil ball-bearing in clutch-withdrawing bridle and put a few spots on withdrawing sleeve just below points marked M (Fig. 6), operating clutch meanwhile.

Screw down grease caps of clutch-withdrawing shaft a few turns.

Insert oil-can spout in duct in fly-wheel boss, and lubricate ball-bearing. (See C, Fig. 4.)

Lubricate all carburetter and magneto control gear forward of dashboard, taking particular note of the telescopic coupling rod from hand-control lever to carburetter.

Squirt engine oil on to ball-bearing of the pump eccentric rod by inserting oil-can spout through hole K. (See Fig. 6.) Unscrew dust cap of suction valve of air pump and drop in a few spots of oil. (See A, Fig. 6.)

BACK AXLE.

Fill grease cap on spring saddle each side immediately under spring and *force grease well home*. This at the same time lubricates the hand-brake camshaft via an outside tube from the spring saddle bracket. (See A, Fig. 9.)

Inject oil with gun into spring loaded ball valve on side of propeller shaft. This lubricates the back sliding joint. (See Fig. 8.)

CHASSIS.

Oil front end of front springs.

Oil shackle pins at end of front springs.

Oil front and back ends of back springs, three oil valves per spring.

FRONT AXLE.

Inject oil with oil gun into centre of steering pivot cap in front axle.

FOOT BRAKE.

If foot brake has been fierce the previous day, put into drum small quantity of graphite, getting same as near brake surface as possible, using a thin knife blade.

If foot brake has felt greasy the previous day, squirt small amount of petrol inside drum.

GEAR BOX.

Examine oil level in gear box, and, if necessary, fill the gear oil to within 6 in. of lid seating.

Replace lid, noting that the arrow on the handle indicating the crossbar points *across* the car. (See F, Fig. 6.)

When removing lid do not turn it over; otherwise dirt from the top may drop into the gear box.

ELECTRIC STARTER.

Lubricate square thread upon which starter pinion rides into mesh with the teeth cut in flywheel. (See B, Fig. 6.)

LUBRICATION ROUTINE.—2. EVERY 500 MILES.

FRONT AXLE AND STEERING GEAR.

Jack up front axle so that both front wheels are off the ground.

Swing steering through its whole range. Inject oil with oil gun into centre of pivot caps. Oil dashboard bearings of steering column, also at centre of steering wheel where control bracket takes its bearing.

A few spots of oil on dust-excluding washer at inside bearing of each front wheel.

Again swing steering through its whole range before removing jack.

Oil all foot brake operating mechanism, working pedal meanwhile.

Oil *all* hand brake jaws and joints, operating hand brake meanwhile.

Fill grease cap on hand brake lever shaft at bottom of change speed quadrant.

Oil hand brake trigger and rack, operating trigger meanwhile.

Inject oil on each side of hand brake countershaft; ball oilers are provided for this purpose.

CHANGE SPEED AND CONTROL GEARS.

A few spots of engine oil on change speed shaft, sliding same sideways meanwhile. (See D, Fig. 6.)

A few spots of engine oil on reverse trigger, operating same meanwhile.

A few spots of oil on carburetter control gear, aft of dashboard and under footboards, operating accelerator pedal meanwhile.

UNIVERSAL JOINT.

Re-fill universal joint on front end of propeller shaft with grease. (See C, Fig. 7.)

LUBRICATION ROUTINE.—3. EVERY 2,000 MILES.

ENGINE.

Run out all oil from base-chamber and flush out with paraffin. Refill with clean oil to correct level.

Remove plate at front end of engine base chamber, slide out the filtering tray, thoroughly cleanse and replace (See Fig. 10.)

MAGNETO.

Lubricate with a spot or two of engine oil through the oil-lids, of which there are four. Oil sparingly here as the magneto parts must not be flooded with oil. If magneto be removed for cleaning or examination, note position of distributor-brush and do not move the engine. If the distributor brush be maintained in its original position no error can be made.

See notes on Magneto, page 20.

FRONT AXLE AND STEERING GEAR.

Remove plug in steering box and pour in $\frac{1}{2}$ fluid oz. gear oil. Remove all steering-joint covers. Remove any grease which has become hardened and gritty. Jack up front axle. Work as much gear-oil as possible into all joints, swinging steering gear through whole range meanwhile. Replace steering-joint covers, using small quantity of fresh grease.

Test for any side play of each front wheel. Check tightness of spring clamping bolts.

Remove front wheel hub-caps and inject into each recess thus opened up about $\frac{1}{2}$ fluid oz. of gear or engine oil.

GEAR BOX.

Remove drain plug and run out the oil. Flush out bottom of box with paraffin, but see that no paraffin gets on the ball bearings. Feel edges of all teeth and topspeed dogs. If they are rough, burred or chipped, that is evidence of a wrong method of gear changing. It will be necessary to search the recesses of the gear-box for steel chips and to remove them. Replace drain plug, wipe away all traces of paraffin and strain the oil back into the box through a few thicknesses of muslin. (N.B.—If the gear-teeth have been chipped, consult the directions on gear changing, page 16.)

BACK AXLE AND BRAKES.

Jack up axle. Remove wheels and hubs, examine condition of brake surfaces. If dry, remove metal dust, clean thoroughly and lubricate with graphite.

If oily, wipe and clean all oily parts, cleaning carefully the ends of the back-axle tubes as far up inside as possible, and lubricate brake surfaces with dry graphite powder fairly liberally.

In both cases apply a little graphite grease to cam faces, and a spot or two of oil to fulcrum joints.

Before replacing wheels, inject into the cavity of each hub about $\frac{1}{2}$ fluid oz. of gear or engine oil for the purpose of lubricating the ball-bearings of back wheels.

CHASSIS.

Taking each spring in turn, remove bolt of spring plate-retaining clip, jack up frame slightly (so as to relieve the weight on the spring) with a screw-driver prise each leaf apart from its neighbour and insert between the leaves gear or engine oil.

CLUTCH.

Should clutch be fierce admit a small quantity of powdered graphite through filler-plug J, Fig. 6, holding clutch pedal right down while so doing. If the clutch should be found to slip because too much graphite has been put in remove filler-plugs and run engine slowly, working clutch pedal up and down, to allow the surplus graphite to exhaust itself. PUT NO OIL INTO THE CLUTCH CASING.

SECTION II.

GENERAL INSPECTION AND ADJUSTMENTS AT INTERVALS AS REQUIRED.

CHASSIS.

The whole mechanism should be gone over carefully; every split pin, nut and screw tested. A good plan is to go round with a stiff brush and can of paraffin, washing over with same each part that is about to undergo inspection; a careful cleansing of those parts which are usually out of sight will frequently reveal any slack parts.

NOTE.—Never get paraffin on ball bearings, but if by accident this should occur, thoroughly cleanse same with machine oil.

ENGINE (Inspecting for carbon deposit).

Remove one or two valve-cover plugs and note quantity and state of carbon deposit on the valve heads.

This will give some indication as to the amount of carbon there is deposited upon piston head. (Combustion chambers will probably require cleaning after 5,000 to 6,000 miles.)

NOTE.—A temporary measure for delaying the necessity for cleaning combustion chambers is to fit under the valve-cover plugs steel packing rings (supplied by Vauxhall Motors Limited) which can be fitted in a few minutes.

VALVES.

Remove one or two valves and examine condition of faces. These should not require grinding until about 5,000 miles have been run under normal conditions, but an occasional examination is nevertheless advisable.

To remove valve, lift valve washer with "lifter" and the two halves of a split cone will drop out and the valve be free.

To replace valve-spring washer, lift spring and washer on "lifter," support the two halves of split cone on the wire tongs provided, by means of the holes drilled in the under side of each half cone, clip the two half cones together around the neck of the valve stem and then lower the washer by means of the "lifter."

If valves *really* require grinding, use a screw-driver that neatly fits the slot.

If in doubt as to whether a valve requires grinding, decide not to grind it.

After grinding any valve, examine tappet adjustment to same.

TAPPETS.

The approximately correct tappet clearance is 60/000ths in., but the exact setting for each engine is shown on a small brass plate attached to the rear valve door. (See D, Fig. 3.)

This clearance must not be varied in any way, and clearances must be set with the tappet roller resting at centre of the back of the cam.

Always securely lock tappet adjusting nuts. (See B, Fig. 4.)

Should an *excessive* tappet clearance be discovered and yet the lock-nut be tight, remove tappet and examine roller. If the roller falls into the crank case while this is being done, it can usually be recovered by withdrawing the oil filter tray (seen in Fig. 10), into which the roller will probably have fallen. Be sure to replace this tray before replacing tappet and roller, in case it should again be dropped.

CAMSHAFT DRIVING CHAIN.

Eccentric housings are provided for tightening chain when it becomes settled down. (See B, Fig. 3.) Great care must be taken that both housings are rotated the same number of holes and in the same direction.

Magneto table must be aligned to correspond.

Whether this operation is needed may be ascertained by removing a plug in the underside of chain case, through which hole the chain slack can be felt. (See A, Fig. 10.)

SPARKING PLUGS.

Remove each plug. Gaps should be from .020 in. to .025 in. The plugs should be perfectly dry, and at the most there should be only a very fine soot. There should be no cracks in insulating material, and no large "beads" of metal sweated from any of the metal portions. If wet or oily clean in petrol.

FAN AND PUMP.

The only likely troubles are gland leaking and belt slipping. The gland, situated on the engine side of the driving pulley, is easily accessible for re-packing. Do not pack too tightly.

A slipping belt can be dealt with by the adjustable pulley (shown at A, Fig. 3).

To adjust belt remove set screw, screw the front flange inwards, and replace set screw.

CARBURETTER.

Flush through with petrol, using the drains provided. For full information see p. 24.

MAGNETO.

See notes, p. 20.

CONTROL GEAR.

See that all control connections of ball-and-socket type are secure; if slack, remove split pin of slack joint and take up socket plug one or two castellations.

CLUTCH BRAKE.

This is fitted on the clutch-coupling shaft and engages with the withdrawing bridle when clutch pedal is fully depressed. This clutch brake is adjustable, and the distance between the engaging faces should be about $\frac{7}{16}$ in. when the clutch is engaged. The leather should be dressed occasionally with castor oil. If set too closely, or allowed to get dry, it will stop the clutch "dead" when applied, and make gear-changing difficult.

HAND BRAKE.—Jack up axle. Pull on hand lever four to five notches; each back wheel should now just feel the brake equally. Test if this is so by pulling each wheel round, and if not equal adjust the side-brake rods by turnbuckles provided. These turnbuckles have R.H. and L.H. threads, so be careful to turn them in the correct direction. Always securely lock the turnbuckles and *use two spanners* for so doing.

Note that back wheels are quite free when hand-brake lever is in "off" position.

FOOT BRAKE.—This is adjusted by milled nut at the foot of pedal lever (see C, Fig. 6) which can be turned by hand; it should be adjusted so that the brake shoes are as close as possible to the drum without actually touching. This can be tested by jacking up one back wheel and spinning same, when there should be no scraping noise and no heavy feeling.

PETROL SYSTEM.

Turn off petrol. Open up petrol filter on side of frame, wipe out and flush through with petrol.

N.B.—The tap at base of filter should be turned on each day and a teaspoonful of petrol allowed to run away. Petrol should always be carefully poured into the main tank through a funnel fitted with a proper strainer.

PETROL TANK.

It is advisable at long intervals to remove drain plug from petrol tank, choosing a convenient opportunity when there is only about half-a-gallon of petrol in same. (The petrol thus wasted may be useful for cleaning purposes.) Take care in replacing plug, as the boss in the centre of this plug locates and steadies the lower end of the petrol supply pipe. (See note regarding tank filter, page 25.)

WATER SYSTEM.

Run off all water from the drain tap (See B, Fig. 10) at base of radiator, and refill (with rain water if possible) through a funnel fitted with a strainer. To empty the water system completely in frosty weather, drain the water from the impeller casing also, by means of the pet cock provided. Do this *after* emptying radiator.

SECTION III.

POSSIBLE DIFFICULTIES.

CAUSES OF DIFFICULTY IN STARTING ENGINE.

No petrol in carburetter due to petrol being turned off or lack of pressure in petrol tank.

Switch not on.

Spark not two-thirds advanced.

Throttle too far, or not sufficiently, open.

Carburetter may require flooding (temporarily open throttle after flooding).

Carburetter flooding. If this should be the case, an excessive throttle opening, for the moment, will "get the engine away."

Switch defective or magneto earthing wire chafed through; disconnect wire at magneto if there is doubt on this point.

Sparking plugs may have moisture on their points, or the points themselves may be improperly spaced. (See page 9.)

Magneto contact points imperfectly adjusted. (See p. 20.)

Water in carburetter inlet having been squirted in while washing car.

MISFIRING.

1. Burnt or imperfectly adjusted platinum points on contact maker (see notes on magneto at end of book), or rocking arm stiff on its pin.

2. Imperfect sparking plugs. When misfiring is at slow speeds only, the points have generally been set too wide. If not either of these, the cause will most probably be traced to carburetter (see page 24), broken or sticking valve, broken valve spring, loosened or too closely adjusted tappet.

N.B.—If magneto is removed for close examination, see that wires are returned to their correct terminals.

CARBURETTER AND PETROL SYSTEM.

The carburetter booklet deals with the difficulties that may arise and the best method of locating and overcoming them. (See also page 24.)

ENGINE CONTROL GEAR.

If resistance has been offered to the working of magneto or carburetter, and the control gear forced, there is the possibility of the various levers slipping round on their tubes or shafts.

To remedy magneto control: Set magneto contact maker full advance, fully loosen the lever that is suspected of slipping, set hand-control lever *almost* fully advanced, clip tightly the lever that has been loosened. Work magneto through its whole range, advance and retard, and note that all levers involved are striking mechanically correct arcs.

To remedy carburetter *hand* control: Set carburetter shut, fully loosen lever that is suspected of having slipped, set carburetter hand-control lever to the *almost* shut position, clip lever tightly.

To remedy carburetter *foot* control: Set carburetter *full* open, fully loosen the suspected lever, press accelerator pedal right down, clip lever tightly.

NOTE.—The *hand-throttle* control does not necessarily give full throttle opening.

CHANGE-SPEED GEAR.

If change-speed lever has been bent sideways from a point *below the surface of the gate*, this will embarrass the proper selection of the striking forks in the gear box, so that in an endeavour to strike two gears at once a stiffness or obstruction will be felt. It may even be possible to get a gear in, but impossible to get back to neutral.

A casing will be observed on the gear box, from which projects the change-speed shaft. By removing the cover of this casing the plunger-locking mechanism will be disclosed, the function of which will be obvious by sliding the shaft sideways. It will be observed that when the change-speed lever is in either of its three slots that only one plunger at a time is free to rise, but *that* plunger is *quite* free and unobstructed by the tail of the locking plate.

Sideways bending of change-speed lever (as for instance for the purpose of clearing coachbuilders' work) will cause the internal mechanism of the gear box to be imperfectly controlled by the change-speed lever.

OIL LEAKS.

Engine.—Serious leakage here is very unlikely unless base chamber has been removed, and in any case the matter had better be referred to Vauxhall Motors Limited.

Gear Box.—If overfilled with oil, will possibly leak more than normally from glands, but if leakage is suspected, first make *certain* where such leak is occurring, *e.g.*, wipe box perfectly clean outside and after two or three miles run examine for source

of leak. Glands are provided at each projecting shaft which are capable of re-packing, but a skilled mechanic only should undertake such work.

If leaking from small bevel pinion bearing, this can be checked by the packing gland provided (but see note on gear box glands).

OVERHEATING.

This is most unlikely under normal conditions, but is possible under the following conditions:—

1. Insufficiently filled radiator.
2. Driving belt of fan and pump slipping.
3. Water circulating pump jammed by obstruction, or by seizure.
4. Obstruction in circulating pipes.
5. Failure, or partial failure, of engine lubrication.
6. Far too rich a mixture being supplied by carburetter flooding.

N.B.—When the radiator has been filled too full, do not mistake the overflow of the expanding water for boiling.

WATER LEAKS.

Are to be expected after overheating has taken place; they are easy of location and the remedy obvious if they occur in any of the joints.

Should a leak occur in the radiator this is a more serious matter, and Vauxhall Motors Limited should be applied to.

The radiator, or its filling cap, should never be used as a means of pushing or pulling the car, as a most serious strain is thereby imposed upon its mountings.

Never pour cold water into an overheated engine, or a cracked cylinder will almost certainly result.

ENGINE LUBRICATING SYSTEM

May fail under the following conditions:—

1. Shortage of oil in base chamber.
2. Obstruction of pump valve or plunger ducts.
3. If the oil in the base chamber happens to be low, and the pump has been stationary for a long time, there is a remote possibility of the pump needing priming.

The remedy to the first is obvious.

To remedy the second. Remove oil-pump cover (first removing air pump, A, Fig. 2), disclosing the oil-pump drive. Unscrew eccentric pin (Note R.H. thread), taking care that the ball bearing is properly *sliding through* the eccentric strap. Pump plunger can now be withdrawn and examined. If no defect here then the foot valve in pump casing must be examined. Cast off oil-supply pipe union, undo three nuts holding down pump barrel and withdraw same.

The pump plunger should be worked up and down by hand before resorting to this latter dismantling, as it can be easily detected whether oil is being drawn and delivered by feeling the resistance and watching the oil gauge.

If failure should occur under embarrassing circumstances, the base chamber may be filled until the "big ends" just dip, and the car driven very steadily until a favourable opportunity for investigation occurs, which should take place as early as possible.

OIL PRESSURE.

Should rarely fall below 5 lb. \square , but will sometimes rise as high as 20 lb. \square or 30 lb. \square , varying with temperature and engine revolutions. A relief valve is fitted to prevent excessive pressure. (See B, Fig. 5.)

CARBONISATION.

After running some thousands of miles, a knocking or "pinking" sound will be heard whenever the engine is pulling hard, and is a sign of carbonisation of combustion chambers. A temporary remedy is to pack up one valve-cover plug of each cylinder with a steel ring (obtainable from Vauxhall Motors Limited). This will cure the defect for some time, after which the other plug of each cylinder must be similarly packed up. When the noise again occurs it will be time to consider a convenient opportunity for having combustion chambers cleaned.

It is not unreasonable to expect this necessity to arise after 5,000 miles to 6,000 miles have been covered under normal conditions.

COMPRESSION.

If serious loss of compression is felt when cranking engine over, examination of valves of the weak cylinder should be made; one may be stuck open, or held off its seat by tappet, or it may be that both require grinding. If an exhaust valve has been running for some time with its tappet having been allowed to hold it slightly but permanently off its seat, then serious burning of the valve face will have occurred and serious loss of compression would result.

Have throttle open when testing compression.

Do not be influenced entirely by the amount of compression felt at the starting handle; if one cylinder "holds" twice as long as another it does not follow that it will give twice the power. A very slight leakage which might be detected at 5 or 6 r.p.m. would have practically no influence at 100 r.p.m., and at 1,000 r.p.m. would be negligible.

A serious compression leak is very unlikely to be caused by piston or piston-ring leakage, unless a very great mileage has been covered.

Valve-cover plugs should be screwed down fairly tightly upon their copper and asbestos washers (always put a little oil upon the threads of these plugs). Black-lead and tallow is very useful as a jointing medium upon these washers. Do not pull these plugs up so tightly that they will give difficulty in unscrewing.

AIR PRESSURE.

This is accomplished first by an air pump driven by engine and situated immediately over the oil-circulating pump, and second, by a hand air pump situated on the dashboard.

The hand air pump is for raising an initial pressure in petrol tank for starting engine, after which the engine pump will maintain the pressure, the requisite amount of which is controlled by the adjustable relief valve situated at the highest point of the engine pump. (See A, Fig. 2.)

Any pressure above $\frac{1}{2}$ lb. \square is sufficient and it should not rise beyond 2 lb. \square . There are bound to be fluctuations of pressure due to rise and fall of temperature in petrol tank and due to prolonged variations of engine speed.

Should pressure read persistently high, unscrew relief-valve adjusting screw; should pressure read persistently low, screw down same screw, locking same after either operation. (See A, Fig. 2.)

Should pressure occasionally read very high and also occasionally fall very low, then the relief valve is adjusted too closely, and *there is also a leak somewhere*.

Test all joints by dropping oil around them and looking for bubbles, examine relief valve itself for causing a permanent leak.

Should the engine air pump fail to maintain pressure, and no leak is occurring in tank, system of pipes, the gauge itself, or relief valve, then the air pump must be dismantled to examine whether the valves have become obstructed.

SECTION IV.

HOW TO HANDLE THE CAR.

STARTING CAR.

It is advisable to let the engine run for a few minutes before attempting to drive the car, until the engine has settled down to a regular beat. It must be the endeavour to manipulate the car without appreciably altering the revolutions per minute of the engine.

Assuming that the car has to be handled out of the garage, set the engine running at about 200 to 250 r.p.m. by hand throttle, and each call for power by partial engagement of clutch must be so exactly met by a supply, controlled by foot throttle, that a listener at the exhaust would hear a slight change of note, rather than an alteration in rapidity of exhaust beat.

The sense of security imparted to the occupants of a car so handled will enhance their confidence in the driver; no drive will be a happy one during which the occupants cannot feel absolutely secure while in the driver's charge.

A start should generally be made on first speed, to just move the car, except on favourable ground, when the second speed may be used for starting.

On fairly favourable surfaces, and with a fairly light load, the start may be made on third speed, while if the surface and gradient conditions are of the most favourable a top-speed start can be made by a skilled and delicate driver.

The clutch must not be slipped *excessively* on any gear, or its life will be shortened and the risk of seizure will be run.

In whatever gear the car is started, it should move off like a locomotive, without jerk or shock to the occupants.

GEAR CHANGING.

CHANGING UP :

Movements.
Slowly declutch, and raise foot throttle.

Press gear lever into neutral.

Effects.

Engine will drop back towards 250 r.p.m., and clutch will also slow down.

Clutch shaft is now floating free of both engine and gears.

When clutch pedal has just FELT the brake, press gear lever slowly but FIRMLY into next gear.

Re-engage clutch and open throttle.

CHANGING DOWN :

Throttle is already open and engine pulling, or it would not be necessary to change down.

KEEP THROTTLE OPEN ALL THE WHILE.

Put moderate load on lever towards neutral position.

Depress clutch slightly until lever "gives way."

IMMEDIATELY lever has reached neutral position re-engage clutch.

Pause in neutral for a fraction of a second (length of pause varies with the engine speed at which change is being made).

Disengage clutch again and engage next lower gear firmly and steadily.

NOTE.—A good method of practising the foregoing is as follows :

Choose a good smooth piece of level road, one upon which the car will keep its "way" for some distance, and starting on second, progress through to fourth, then step back from fourth to third and second endeavouring to maintain an even acceleration and retardation throughout by the following method :

Start on second, get car going at about 12 m.p.h., declutch and raise foot throttle, change-speed lever will then be pressed freely into neutral because load is removed from teeth, pause in neutral while clutch is slowing down, because 12 m.p.h. on second means 1,000 r.p.m., and 12 m.p.h. on third means only 600 r.p.m., therefore, as the car is still moving at 12 m.p.h. by inertia, the third will drop in when clutch has slowed to 600 r.p.m. The length of pause will vary with different cars and can only be definitely settled by experience of the particular car. Exactly the same procedure is observed between third and fourth, and exactly the same reasoning applies.

Coming back again from fourth to third, car travelling at about 20 m.p.h., declutch, for the purpose of relieving load, and disengage from fourth to neutral, keeping foot throttle open meanwhile; re-engage clutch, the engine now being freed from resistance will speed up, and the clutch *being engaged will speed up also* until, when it reaches 1,000 r.p.m., which on the third speed equals 20 m.p.h., with the car still travelling at 20 m.p.h. or thereabouts by inertia, the third will be easily pressed in.

The same process exactly from third to second, or second to first, having confidence in keeping the throttle open and re-engaging clutch *immediately* you have disengaged the higher gear.

Judgment is required in gauging just how long to pause in neutral—for the particular road speed with which the car is endowed. Of course an occasional "faux pas" is likely to happen even to the most skilled, but ninety-nine times out of a hundred, on a car to which one is fairly accustomed, a good change can be guaranteed.

By this time clutch has slowed just sufficiently to bring the gears that are about to engage to the same rim speed.

So that it (gear lever) will move immediately load is removed from gear teeth.

Declutching relieves load on gear teeth and allows gears to slide.

Engine will be accelerating due to relief of load, and the re-engaged clutch will also be accelerating, and thus tending to bring the gears that are ABOUT to engage to the same rim speed.

To allow the freed and accelerating engine sufficiently to accelerate the clutch.

If a gear is "nipped" by the load when only half or two-thirds engaged, clutch must be relieved again and gear lever pressed properly home. Do not attempt to *force* gear lever from half to *full* engagement without easing clutch; neither attempt to pull gear lever *forcibly* out of mesh while there is a "load" on the gear teeth, or the lever will be "wrung" upon its shaft and finally even loosened; this looseness will be manifested by the lever "fouling" the tongues of the gate when passing across same.

DESCENDING HILL.

If the hill is of considerable length, slip gear lever into neutral; engine will then just run as set by hand throttle and car will float down. When nearly at the foot accelerate engine with foot throttle until engine speed is judged to be equal or suitable to that of the car on top speed; top gear can now be dropped in without shock or noise.

Should the engine stop while gear is disengaged, due to improper setting of hand throttle, *on no account attempt to re-engage gear*, for this will be impossible until car has come to rest; therefore, stop the car before the foot of hill is reached, engage the gear and hold out clutch, allow car to roll off again and gently re-engage clutch, which will start engine.

Should it be necessary to check the car's progress, the hand brake is the correct brake to use, the foot brake being in reserve for an emergency.

There is no need to declutch unless the car is to be slowed to less than 8 to 10 m.h.p.

STOPPING CAR.

Release foot throttle; the engine revolutions will then tend to drop down to the 200 to 250 r.p.m., as set by hand throttle, which on top gear equals 7 to 8 m.p.h., therefore there is no need to withdraw clutch until speed has dropped to this number of miles per hour. A sudden and complete closing of the throttle while the car is travelling at a high speed may require a light pressure on clutch pedal. The hand brake should have been used for thus retarding the car, the foot brake being kept in reserve for emergency, or should the retarding effort require to be suddenly increased.

When speed has fallen to 7 to 8 m.p.h., the clutch must be withdrawn and the car finally brought to rest *on the hand-brake*.

If the stopping place is known beforehand, then instead of withdrawing clutch at 7 to 8 m.p.h., slip gear lever into neutral, and bring car to rest on hand-brake. Should the final retardation of car be rapid, the hand brake should be eased off at the instant of coming to rest, thereby obviating the unpleasant jerk to the occupants caused by the "settling down" of a suddenly arrested car.

BRAKES.

Always remember that *the hand-brake* is the correct brake for normal and leisurely use, the foot brake being reserved for suddenly required and rapid retardation.

The brakes should be used as little as possible, the throttle always being closed in such sufficient time that the car has almost *naturally* come to rest by the time the obstacle or the stopping place has been reached.

ASCENDING HILL.

Endeavour to have throttle well open *just before* the car commences to feel the hill, not waiting until car has actually slowed before opening throttle.

Should the hill be of such gradient that the car will not complete the ascent upon top gear, it is better to change into third gear *well* before the car begins to labour, rather than to wait until a change is compulsory. The same reasoning applies to other downward gear changes.

Do not be in a hurry to change up into the higher gears again while still on the hill, as there need be no fear concerning the comparatively high engine revolutions, speeds of 40 m.p.h. on third, and 26 m.p.h. on second, being nothing unusual.

If it is desired to ascend a hill with greater speed, use the next lower gear to that on which the car can climb the hill without labouring.

EXTRA AIR CONTROL, USE OF

Controlled from centre of steering wheel, air may be admitted to mixing chamber of carburetter. It is advisable to make frequent use of this, keeping the lever as far towards the "open" side as possible, and remembering to bring it back towards "closed" for steady running of engine at low revolutions.

Sometimes this lever may be kept permanently open a little, in order to counteract a rich mixture at low speeds.

Judicious use of this lever will economise petrol.

SPARK CONTROL, USE OF

This is brought into use for great variations of engine revolutions, but for all normal running about 2/3 advance will be found about right. Spark should be retarded, however, when engine is commencing to labour slightly on any gear, notice of which will be given by the usual sharp "clicking" or "pinking" produced by early ignition.

When this noise asserts itself and ceases to be influenced by retarding the spark control, *but goes off by closing the throttle slightly*, this is a clear indication that the combustion chambers need decarbonising.

THROTTLE CONTROL, USE OF

Throttle should always be opened *gradually*, the opening of same increasing as the engine revolutions increase. Remember that full power at moderate engine revolutions *does not necessarily* demand full throttle. If the best throttle position for given engine revolutions is "overrun," close throttle slightly, when best position will be easily felt.

SECTION V.

NOTES ON MAGNETO.

Most magneto troubles can be traced to either :

- 1.—Sticking rocker arm in contact breaker.
- 2.—Sticking or broken carbon brush.
- 3.—Water, dirt or excessive oil in the interior of the magneto.

When it has been ascertained that the magneto is giving no spark, first of all remove the switch wire from the contact breaker cover to eliminate one possible "short," and try again. If no spark results remove magneto for inspection by loosening, holding down strap, removing control rod (it will be found simplest to loosen the pinching bolt of arm secured to the rod projecting from between the valve doors) and sliding magneto bodily backwards from the timing gear case.

Before removing magneto from the engine, dismantle the distributor cover without disarranging the high tension wires. (See E, Fig. 3.) This is secured by either two screws or two spring clips. (See F, Fig. 3.) Note position of distributor brush. Do not turn engine while magneto is disconnected, and, when replacing, note that the distributor brush is in the same position as when originally opened up. No error can then be made.

Having removed magneto :

1.—Examine contact breaker arm. If stiff in action remove and slightly ease the fibre bushing upon which it pivots. When the points are separated the clearance should be about 0.4 m.m. Make sure that the adjustable platinum tipped screw is not loose.

2.—Examine all carbon brushes and ensure that they are quite free in their holders and are making good contact, free from carbon dust, dirt or oil. If necessary their springs can be slightly pulled out by hand to give them increased pressure. These brushes are :

(a) Behind the contact breaker plate which is removable by extracting the central screw with the special spanner provided ; a little leverage will then suffice to remove it from its taper.

(b) The distributor brush itself, already laid bare by the removal of the distributor cover.

(c) The brush in a pencil bearing on the centre of the distribution mechanism, seen by removing the aluminium cover plate at forward end of magneto.

(d) A brush in a vulcanite carbon holder bearing on the slip ring at the forward end of magneto, disclosed by the removal of the cover plates. Examine the slip ring for cracks. If any are found a new ring will be necessary.

(e) In addition the Watford Magneto has two brushes at its forward end, at the base of the magnets, mounted in brass studs removable from outside, and these should be clean and free.

If all these brushes are free, and making good contact, and the interior of the magneto is spotlessly clean, a good spark should now be obtainable. If not, there is probably an internal "short" which is beyond the ability of the owner to rectify, and the instrument should be returned to us.

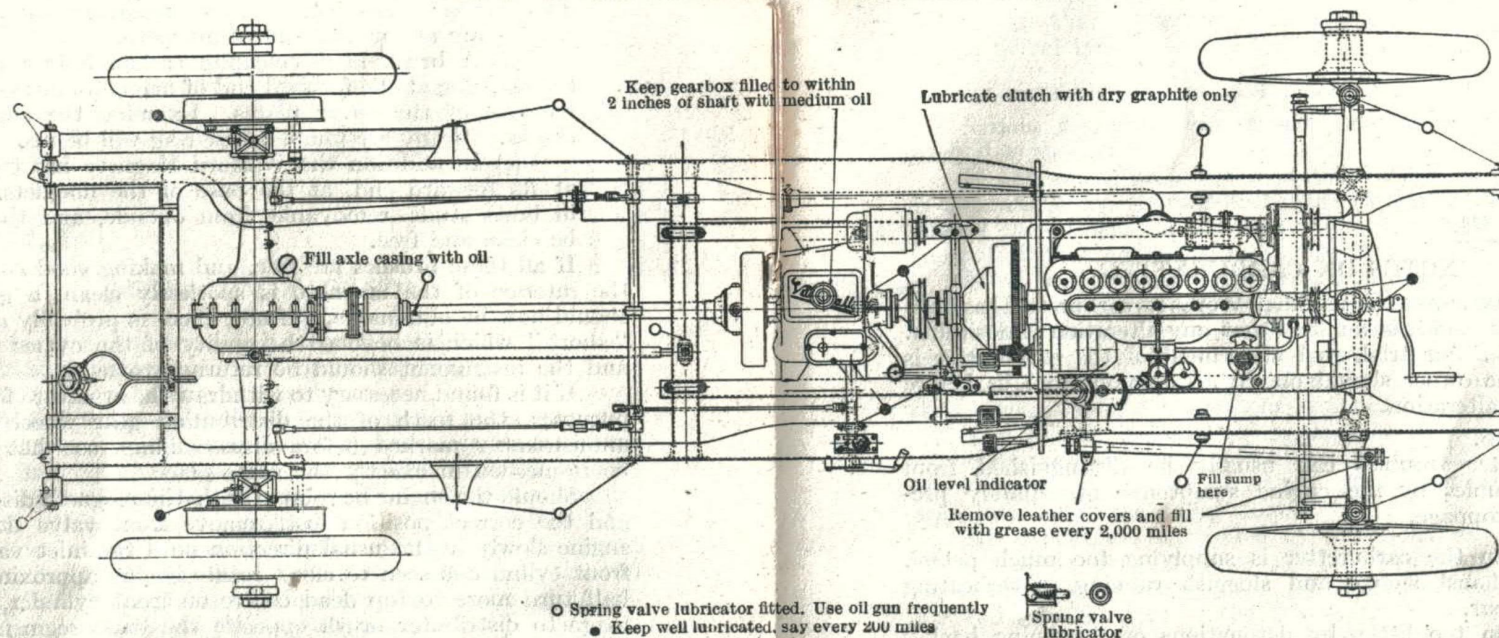
If it is found necessary to withdraw the armature for cleaning purposes, the teeth of the distribution gear wheel should be unmistakably marked before disassembling, so that they can be re-meshed in exactly the same place.

Should the engine be rotated with the magneto disconnected, and the correct position lost, remove front valve door, rotate engine slowly in the usual direction until the inlet valve of the front cylinder is seen to close, rotate engine approximately one half turn more to top dead centre on front cylinder, place the magneto distributor brush opposite the brass segment through which current is supplied to the front cylinder, and the couplings will be found nearly at the same angle ; the connection may then be made, and the timing will be found correct.

Mysterious troubles are occasionally traced to a control arm having loosened and slipped round its centre member, and this point is worth attending to.

NEVER PUT MORE THAN A TRACE OF OIL IN LUBRICATION CAPS. MORE IS NOT ONLY USELESS BUT HARMFUL.

FIG. 1. 25 H.P. CHASSIS. LUBRICATION CHART.



SUMMARY OF LUBRICATION INSTRUCTIONS.

ENGINE.—The engine is lubricated by oil from the oil sump, being forced through the hollow crankshaft to the main and big end bearings by a pump at the rear end of the camshaft.

The pressure of the oil is controlled by a regulator fitted at the front end of the crankcase.

The oil pump plunger can be removed for inspection by unscrewing the eccentric at the end of camshaft.

The oil filter tray can be removed for cleaning by unscrewing the nuts and withdrawing tray at the front end of the sump.

Do not fill sump with oil above level shown by indicator. Clean out with paraffin every 1,000 miles and refill with fresh oil.

WHEELS.—Every 2,000 miles remove rear wheels: fill hub with grease and examine and clean brakes.

Remove front wheels every 2,000 miles and fill hubs with grease. Inject a little oil into hubs every 500 miles.

IGNITION GEAR.—Inject a few drops of thin oil into magneto lubricators occasionally.

ENGINE CONTROL.—Oil occasionally all lever spindles and joints of control rods.

Oil telescopic rod every day.

CHASSIS.—The chassis should be frequently examined to see that all nuts are tight and split pins, etc., in place.

Keep all pin joints and spring shackles and bolts well oiled.

Every 1,000 miles open plates of springs by lifting the weight of the car off them and inject oil between.

BALL BEARINGS.—Must not be cleaned with paraffin or petrol, but only with clean oil. During overhaul, say once a year, examine exhaust pipe and see that it is clear.

LUBRICANTS RECOMMENDED.

ENGINE.—Wakefields' C.W. Carbonless or Price's Motorine C.

BACK AXLE.—Gear Oil.

GEAR BOX.—Price's Battersea Gear Oil.

GREASE.—Price's Bermoline Grease.

SECTION VI.

NOTES ON CARBURETTER.

When a car leaves the Vauxhall Works its carburetter has been set by experts, and it is unlikely that any alteration is desirable.

If, after a fair trial, mal-adjustment of the carburetter is suspected, the owner should obtain an opinion from us before making any alteration.

ON THE ROAD.

Carburetter troubles can usually be distinguished from magneto troubles by the engine symptoms immediately preceding the stoppage.

A. When the carburetter is supplying too much petrol, by black exhaust smoke and sluggish running. Overheating may also occur.

B. When too little, by detonations or "popping back" through the main air port of the carburetter, difficulty in starting engine, and absence of power. These symptoms occur when the extra air valve, controlled from the steering wheel centre, is left open at low car speeds; if they disappear upon this valve being closed, all is well.

IN THE CASE OF TOO MUCH PETROL.

See that the petrol pressure does not exceed 2 lbs.

Remove float chamber cover, complete with float needle, and thoroughly clean chamber.

Ensure that no grit is present on the face of the needle, or its seating.

See that the balance weights are working freely, and that the needle has not been bent by rough handling.

Remove float and shake it close to the ear. It is possible that a leak may have developed and petrol admitted to the interior of the float. If petrol can be heard splashing about inside the float, immerse it in boiling water; the leak will be revealed by air bubbles. The hole may then be slightly enlarged, by the use of a jeweller's drill, all petrol carefully dried out, and the hole re-soldered, using a minimum of solder. Test the float again in boiling water before replacing.

See that the main jet is screwed right home, without using excessive force.

Ensure that a pressure of at least 1 lb. to the sq. in. exists in the petrol tank.

IN THE CASE OF TOO LITTLE PETROL.

Remove float from float chamber and note whether petrol flows freely from the inlet.

If not, open drain tap mounted on side of chassis frame. If this runs freely, yet no petrol comes through to the carburetter, release the pressure in the tank, unscrew the bottom half of the petrol filter and clean the gauze thoroughly.

If no petrol reaches this filter, the trouble will probably be found to be in the tank filter, which is removed by unscrewing the tank drain plug upon which it is mounted. This may have become water-logged and need careful drying.

If the petrol is freely reaching the float chamber, however, it is obvious that a jet is being starved.

The Zenith carburetter employs a slow running device, vertically mounted in a barrel cast at the side of the mixing chamber, which may be pulled out after loosening the set screw seen just below the finger knob.

An adjustment controlled by serrations will be noticed at the top of the pencil thus revealed. The setting of this should be noted when removing the jet itself, which will be found screwed into the base of the device.

A good plan is to screw the adjusting knob down as far as it will go, carefully noting the number of turns necessary to send it home. The jet may then be removed, blown out, and re-fitted, and the slow running adjustment screwed back to its original position.

Remove the two plugs found at the base of the Zenith carburetter. A jet will be found immediately above each, which may be easily removed by means of the special key supplied.

Blow through these and thoroughly clear them, taking care to use no instrument which may alter the size of the holes in the jets.

Run a little petrol through the passages supplying the jets before re-assembling.

Mysterious troubles are occasionally traced to a control arm having loosened and slipped round its centre member, and this point is worth attending to.

SECTION VII.

THE ELECTRICAL EQUIPMENT.

DYNAMO.

The dynamo is belt driven, and is mounted on a slotted table for belt adjustment purposes. The belt should never be adjusted dead tight, but slip (indicated by violent oscillation of the ammeter needle, or its failure to indicate at all) should be eliminated without delay. The occasional application of castor or collan oil is beneficial to the belt. About two drops of oil should be put into the lubrication caps about every 1,000 miles.

BATTERY.

When the voltmeter registers 16 volts. the battery is fully charged. ALWAYS switch on the dynamo whenever the engine is running if the voltmeter shows a lesser reading than this, AND WHENEVER THE LIGHTS ARE IN USE. Distilled water may be added to the battery occasionally to make up for evaporation, but never fill above the top of the plates, as too much water is detrimental to the battery. Should solution be spilled the loss may be replaced by adding pure brimstone sulphuric to a sufficient quantity of distilled water until the specific gravity reaches 1.225, but do not place it in the cells before cooling down.

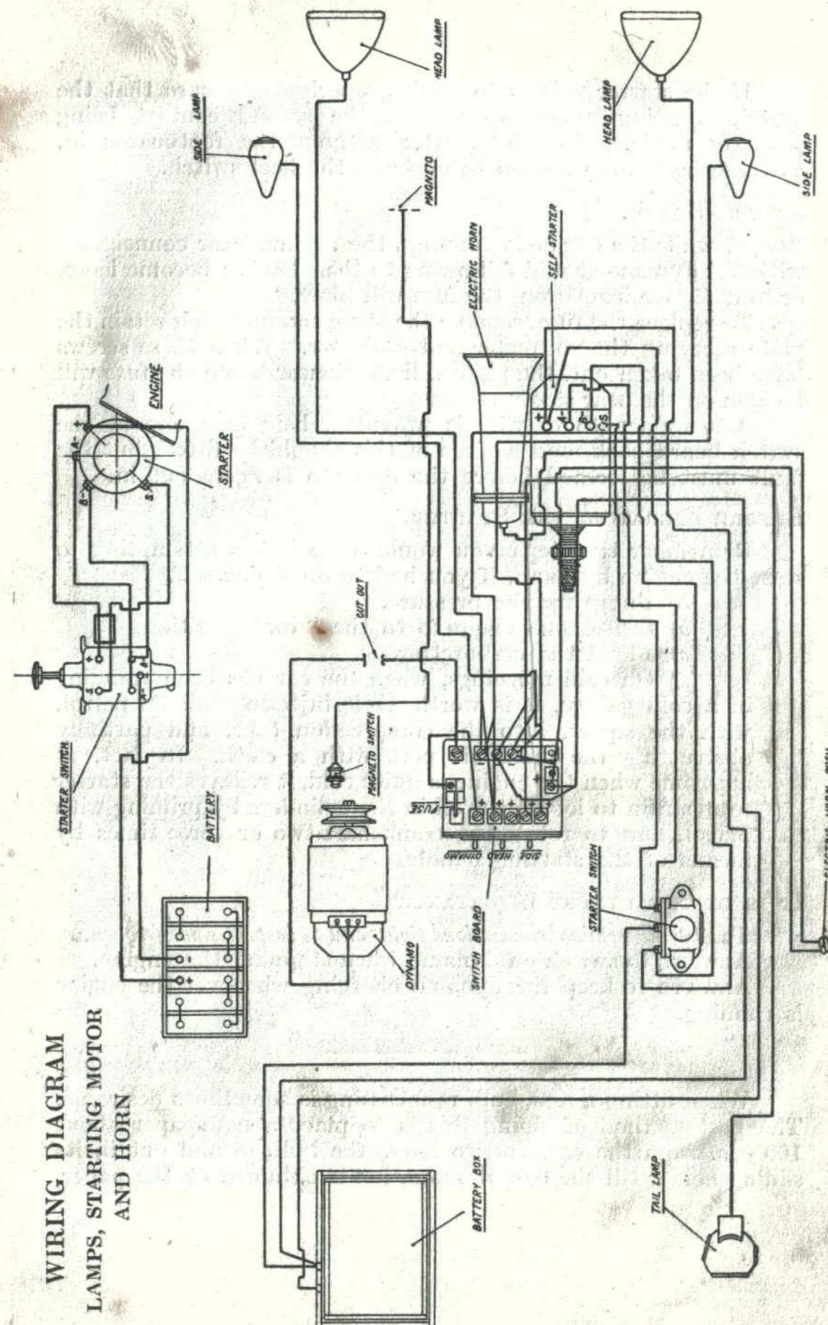
STARTING MOTOR.

Keep the holding-down straps absolutely tight. Well lubricate the square thread upon which the starter pinion rides into mesh, and occasionally drop a spot or two of oil into the lubrication caps provided.

STARTING MOTOR SWITCH.

This switch has two contacts. The first contact, made when the switch is depressed about half the length of its travel, serves to draw the starter pinion into mesh with the teeth cut in the flywheel. Through the second contact full power is applied for engine starting purposes.

(Continued on page 28)



If the starter refuses to work properly make sure that the switch is going RIGHT HOME, and the second contact being properly made. Test the matter without the footboards in, as these have been known to obstruct the heel switch.

SWITCH BOARD.

If, while the engine is running, the accumulator connections with the dynamo should fail owing to their having become loose, or to defective insulation, the fuse will blow.

To replace the fuse, remove the three screws which retain the plate carrying the voltmeter and ammeter. When these screws have been taken out, the plate will fall forward, and the fuse will be seen on the near side.

A spare length of wire is provided, held in a clip at the switch board back, and a piece of this should be fitted, but the fault must be located before the dynamo is again cut in.

BEFORE OPERATING THE STARTER.

Remember the steps you would take before attempting to start the engine by hand, if you had to do it yourself.

- (a) Pump up the pressure.
- (b) Switch the magneto to the "ON" position.
- (c) Flood the carburetter.

(d) On cold mornings, when the car has been standing in a cold garage, it is worth while injecting a little petrol, with the squirt, into the compression taps, and partially obstructing the main air port with a cloth. In fact, at any time when the engine is quite cold, it relieves the starter from strain to loosen the oil in the cylinders by priming with petrol, and to rotate the crankshaft two or three times by means of the starting handle.

IT IS OF THE UTMOST IMPORTANCE

To keep all terminal connections tight, and to inspect same frequently.

ALWAYS to switch off dynamo when stopping the engine.

ALWAYS to keep the dynamo charging whenever the engine is running.

When fitting a new bulb re-focussing is sometimes desirable. The best method of doing this is to place a newspaper about 100 yds. from the car, and to move the bulb in and out in its sliding holder till the best illumination is obtained on the paper.

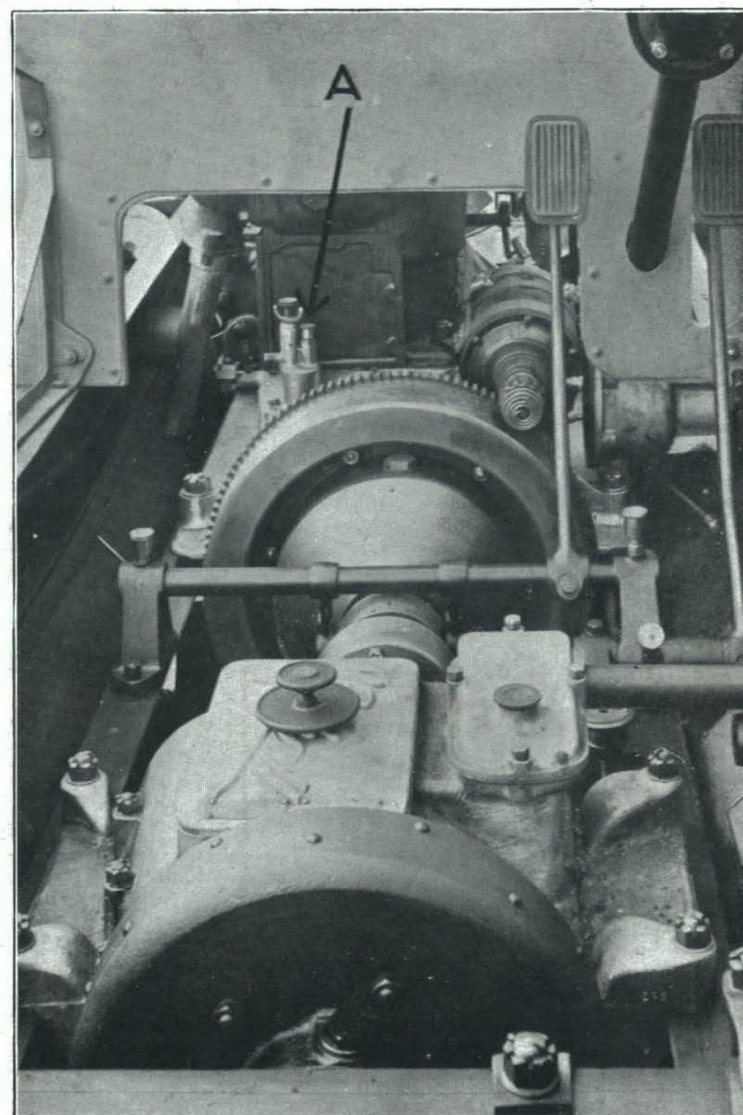


FIG. 2
END VIEW OF GEAR BOX AND CLUTCH
A—Air pressure pump

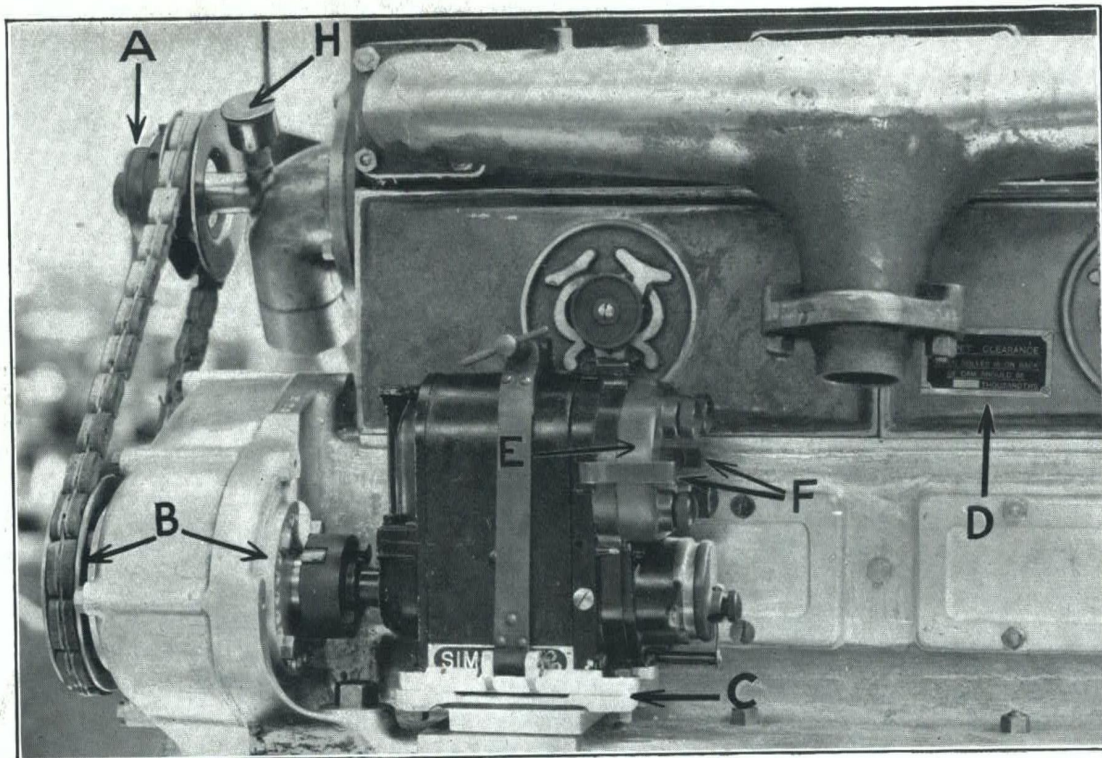


FIG. 3

FIG. 3

NEAR SIDE VIEW OF ENGINE DETAILS

A—Fan belt adjustment

B—Eccentric housings for timing chain adjustment

C—Slotted magneto platform for re-aligning magneto after chain adjustment has been carried out

D—Instruction plate giving correct tappet clearance for engine

E—Distributor cover

F—Distributor cover clips

H—Screw greaser down daily

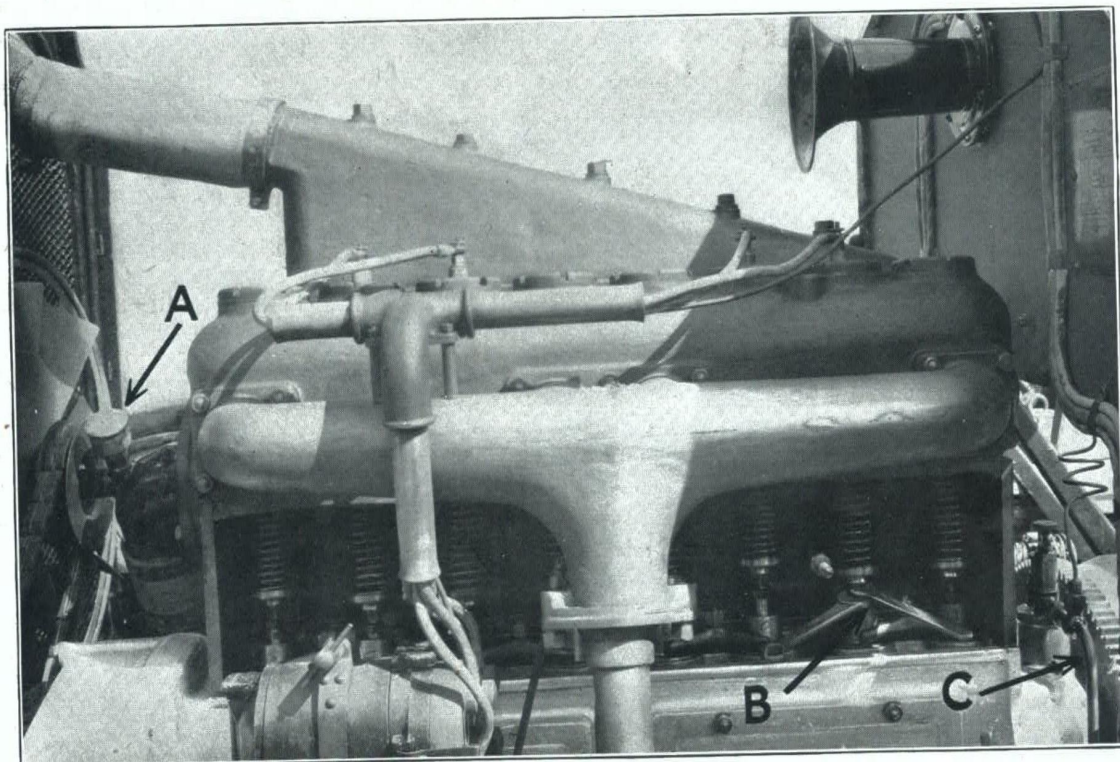


FIG. 4

FIG. 4

TAPPET ADJUSTMENT

A—Greaser should be screwed down daily

B—Note method of adjusting tappets

C—A duct will be noticed in boss at back of flywheel, leading to a ball bearing carrying front end of clutch shaft. A little oil should be run in frequently

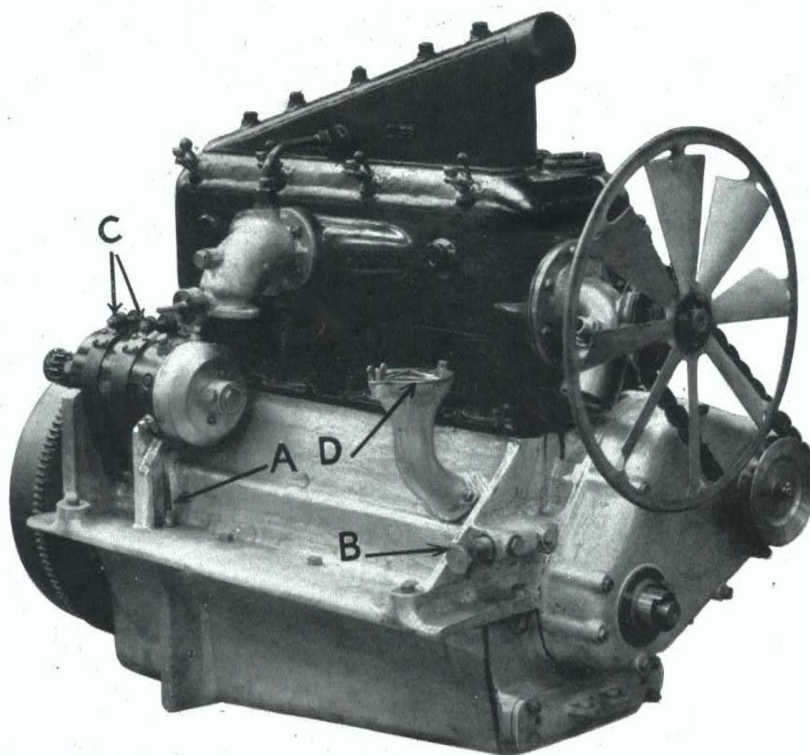


FIG. 5

FIG. 5

OFF SIDE VIEW OF ENGINE

A—Gauge indicating height of oil in sump

B—Oil pressure relief valve, shown partly withdrawn

C—Keep these nuts up tight

D—Oil filler

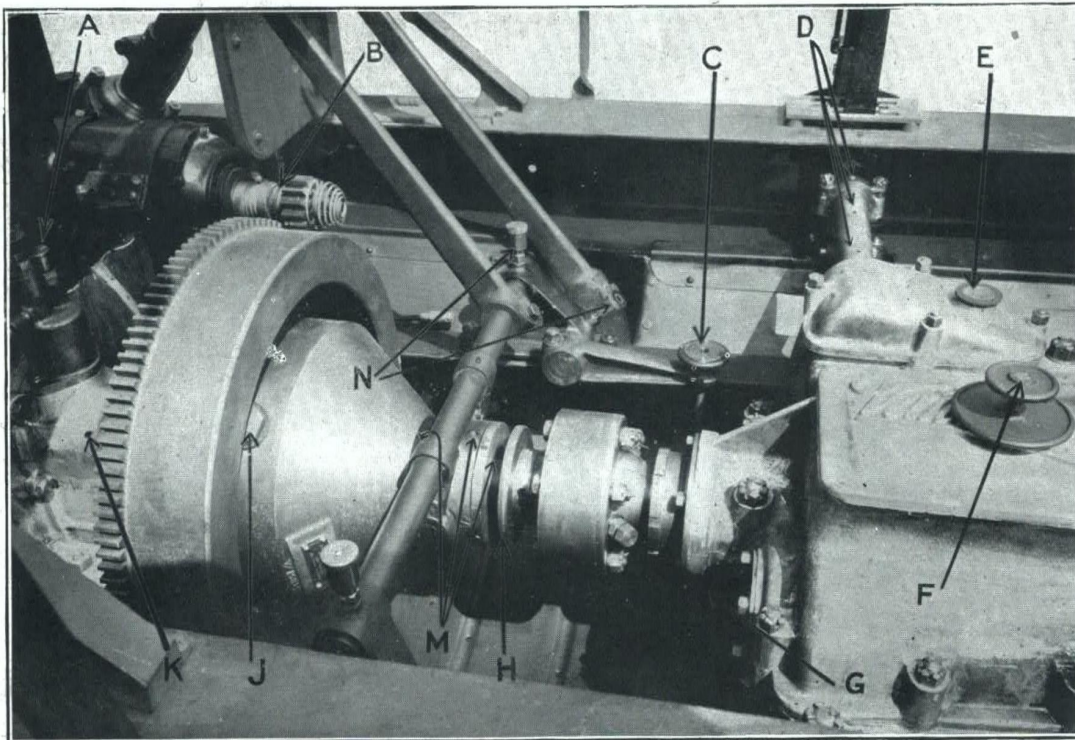


FIG. 6

FIG. 6

NEAR SIDE VIEW OF CLUTCH AND GEAR BOX LAYOUT.

- A—Unscrew dust cover and drop in spots of oil occasionally
- B—Keep starter pinion square thread oiled
- C—Footbrake adjusting disc
- D—Keep gear control shaft moving through sleeve freely, and well oiled
- E—Keep breather free
- F—Note punch marks are *across* the frame when replacing
- G—Occasionally oil footbrake bearings below gear box
- H—Apply a little oil to clutch stop leather occasionally
- J—Occasionally introduce $\frac{1}{4}$ oz graphite powder
- K—Inject oil through hole in casing on eccentric bearing daily
- M—Oil these points occasionally
- N—Screw down occasionally

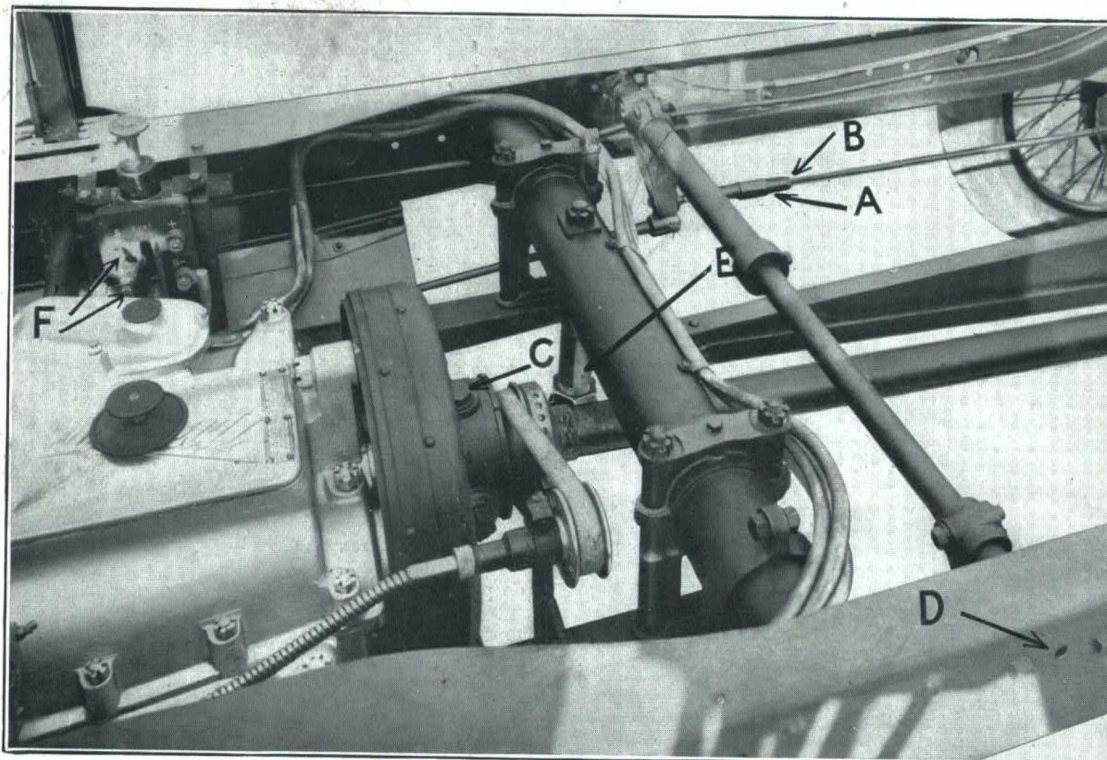


FIG. 7

FIG. 7

FRONT UNIVERSAL JOINT AND TORQUE ARM SWINGING LINK

- A—Hand brake adjustment
- B—Adjustment locking nut, which must always be kept *tight*
- C—Universal joint filling plug
- D—Ball valve oiler, lubricating cross shaft of hand brake. There is one situated on each end of shaft
- E—Swinging link
- F—First and second contact starter terminals

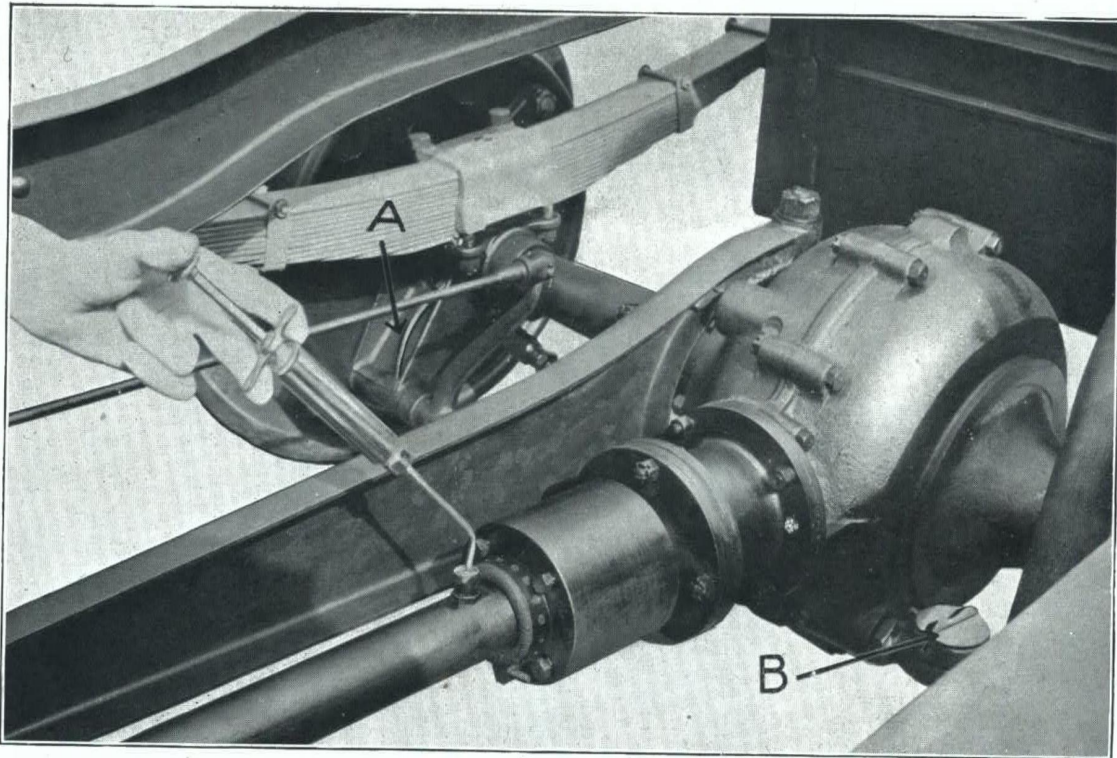


FIG. 8

METHOD OF LUBRICATING BACK UNIVERSAL JOINT, AND ILLUSTRATING USE OF OIL GUN WITH THE BALL VALVE OILER
 A—Note tube conveying grease from spring saddle bushing to hand brake camshaft B—Rear axle filler cap

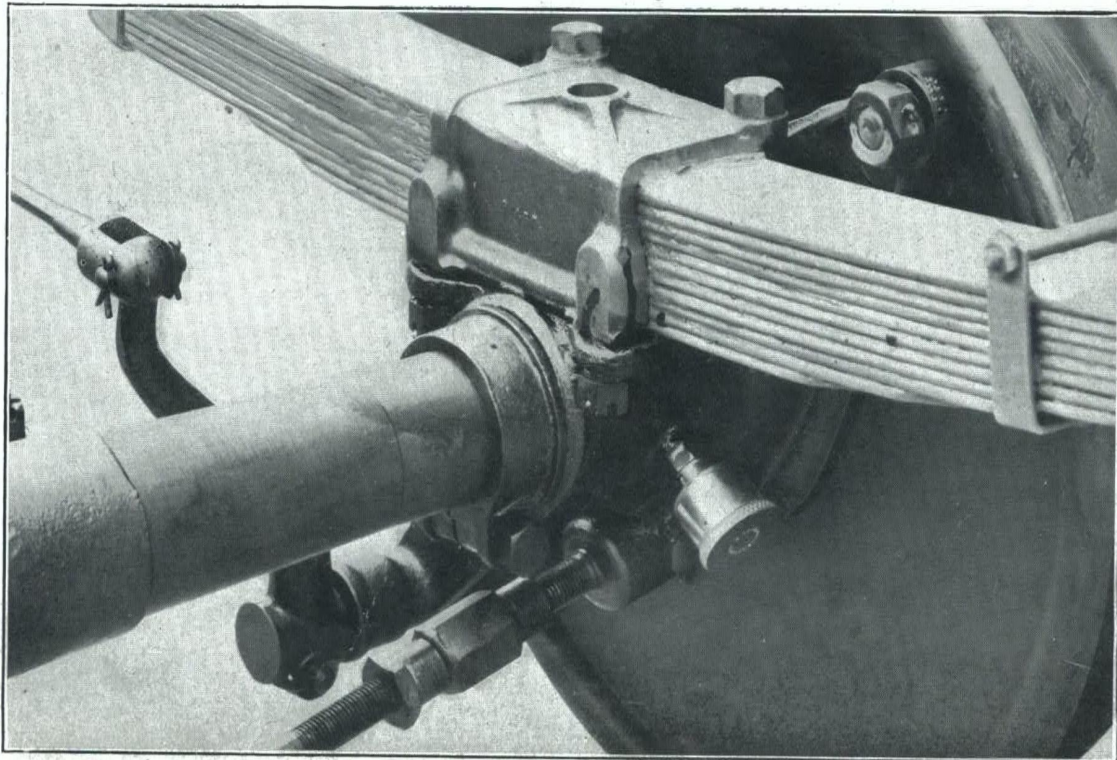


FIG. 9

SPRING SADDLE
 Screw greaser down daily

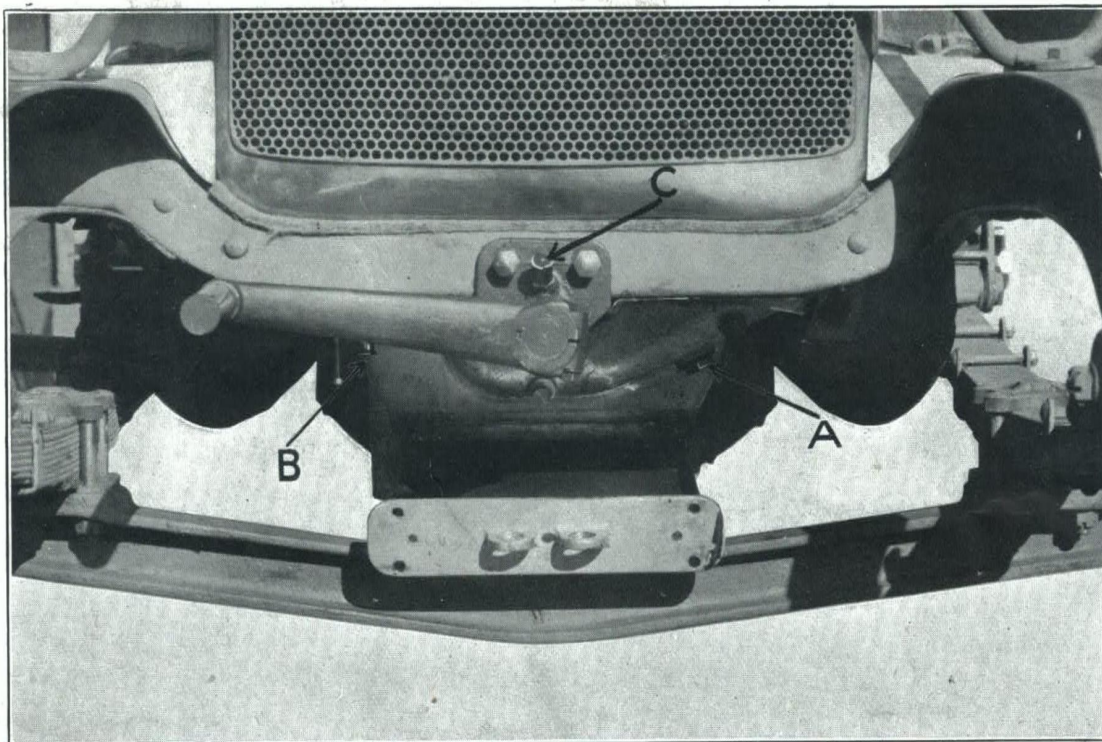


FIG. 10

OIL FILTER TRAY PARTLY WITHDRAWN

A—Plug through which the timing chain tension may be tested
B—Radiator drain tap C—Starting handle lubrication cap

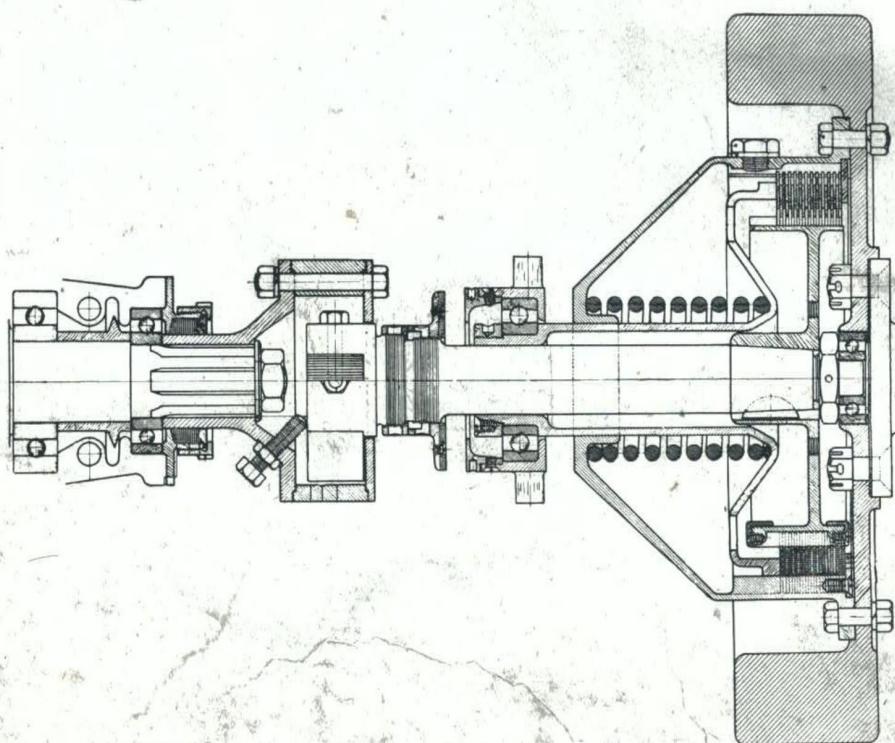


FIG. 11

VAUXHALL MULTI-DISC CLUTCH