Daimler

Instruction Manual

Type: C1 - 35 h.p.

THE DAIMLER COMPANY LIMITED, COVENTRY, ENGLAND.

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INTRODUCTION.

We publish the following books for the convenience of the owner:—

On the Sleeve-valve Engine and other Special Features of Design.

On Learning to Drive. Instruction Manual.

Spare Parts Catalogue.

The Instruction Manuals are supplementary to the general description book explaining the principles of operation of the sleeve-valve engine and other special features of Daimler design. They give the further illustrations and information required to enable the adjustments to be made and the lubrication to be carried out. Additional information about any particular point will be supplied on request.

A complete illustrated index to the official names and identity numbers of every part in the car will be found only in the Spare Parts Catalogue, which should always be used for reference when ordering replacements.

The first few pages of this Instruction Manual are devoted to the routine maintenance of the car, beginning with a chart in which the more important items that should receive systematic attention are arbitrarily allocated to specific days of the week.

This method of dealing with car maintenance will be found both convenient and effective, for although there is no necessity to conform strictly to the schedule, its existence is an insurance against neglect and is an aid to the efficient use of any time that can be devoted to the care of the car.

The routine daily inspection will occupy only a few minutes, but, if regularly performed, it will not only be the means of preventing trouble arising from the neglect of trivial defects, but it brings its own immediate reward in the added pleasure of driving a car that is in perfect tune throughout and in which every accessory functions in the manner intended.

INTRODUCTION—continued.

The same principles apply also to the operation of the schedule as a whole. The systematic lubrication of the chassis, for instance, is not really necessary every week, but if it is done on such Mondays as may provide an hour for the work it will suffice to keep the joints in good condition and thereby to maintain the standard of easy riding to which the passengers are accustomed, besides preventing the occurrence of trouble that is otherwise sure to come from persistent neglect. Even when subsequent faults are not located directly in the parts that have been neglected, the indirect effect of the negligence is none the less serious, as is illustrated, for example, in the delay that a single seized joint will cause in the process of dismantling a series of parts. Efficient car maintenance, therefore, is not only an insurance against the need for repairs, but it goes a long way to minimize the bill if repairs are necessary. Nor is this the only occasion on which conscientious care in the maintenance of the car is a service that pays. Sooner or later comes the question of *second-hand selling value*, and in this field, as is well known, there are no cars in the world that fetch such good prices as Daimlers that have been well kept.

Owners are reminded that repairs to their cars can be carried out expeditiously and economically at any of the Daimler Service Depots listed at the end of this book.

ROUTINE DAILY CAR INSPECTION.

Before Starting Out.

PETROL .. Refill tank.

RADIATOR Inspect water level and replenish if necessary.

TYRES .. Note appearance and test pressure if any tyre appears flatter than usual.

CLUTCH .. Test pedal clearance.

UNDER BONNET. Oil cylinder heads and inspect for any signs of water leakage at pipe joints as indicated by rusty deposit.

BRAKES .. Test pedal clearance. Test hand-brake lever.

HORN .. Test action.

SPEEDOMETER. Set trip.

CLOCK .. Wind and set.

DOORS .. Test action.

WINDOWS. Test action.

NUMBER PLATES. Clean.

LAMPS .. Clean and focus before going out at night.

Whilst Driving.

DYNAMO.. Note charging on ammeter.

After Using Car.

OIL .. .. Inspect level in engine base and replenish, if necessary, whilst warm.

TYRES .. Note appearance for pressure and inspect for nails and cuts.

WHEELS .. Tighten hub caps if necessary.

BODY .. Wash.
(*N.B.*—Cover up the petrol tank filler cap.)

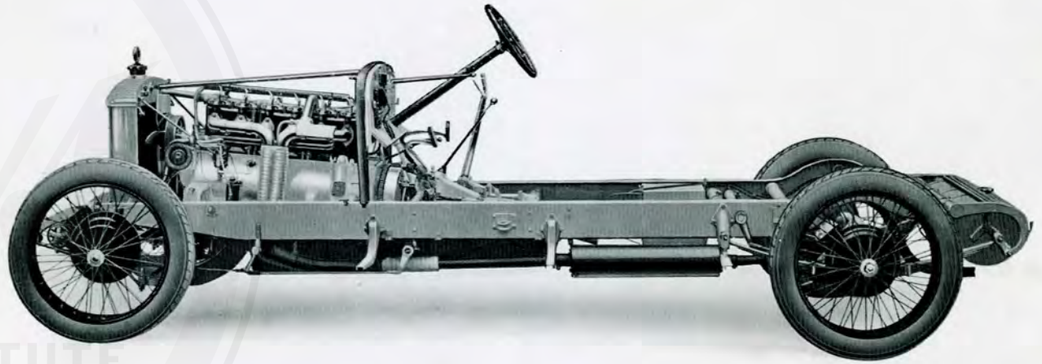
Special Points for attention on a New Car.

WHEELS .. .. Shake road wheels to test tightness on hub every day for the first month.
ENGINE .. .. Inspect the oil filter every day during the first fortnight.
GEAR-BOX .. Drain, wash out with paraffin, and refill with thick gear oil after one month.
BACK AXLE .. Drain, wash out with paraffin, and refill with thick gear oil after a fortnight.
COACHWORK .. To preserve the varnish and improve the second-hand selling value wash **immediately** after each day's work is finished.

DAIMLER CAR MAINTENANCE CHART.

EVERY DAY	**Routine Daily Inspection, plus:—**			
MONDAYS	LUBRICATE CHASSIS.			
TUESDAYS	TEST TYRE PRESSURES.			
Week of the month	*1st*	*2nd*	*3rd*	*4th*
WEDNESDAYS	Change Wheel NEAR FRONT	Change Wheel OFF FRONT	Change Wheel NEAR BACK	Change Wheel OFF BACK
THURSDAYS				
JAN. MAY SEPT. ..	ENGINE BASE (Wash out)	DAMPER (Add Thick Oil)	GEAR-BOX (Fill Thick Oil)	BACK AXLE (Fill Thick Oil)
FEB. JUNE OCT. ..	SPRINGS (Grease Leaves)		STARTER MOTOR (Greaser, back cover)	SPEEDOMETER (Oil inside Flex)
MARCH JULY NOV. ..	BATTERY (Fill Distilled Water)	PETROL TANK (Clean Filter)	IGNITER (Inspect and Lubricate)	IGNITION PLUGS (Test)
APRIL AUGUST DEC. ..				
ANNUAL INSPECTION	SILENCER (Clean out)	RADIATOR (Drain and Flush)	AUTOVAC (Drain and Flush)	ENGINE (Clean Carbon)
	JOINTS (Inspect)	ELECTRICAL (Inspect Cables)	GEAR-BOX (Drain and Flush)	BACK AXLE (Drain and Flush)

N.B.—The above table is mainly for the convenience of those who are able and who desire to give their cars systematic attention.. It is based on approximately 1000 miles per month. So long as the above points are not unduly neglected there is no need to conform strictly to any schedule in order to obtain efficient service from the car.



NEAR-SIDE VIEW OF CHASSIS.

TABLE OF DIMENSIONS.

	Type:	C 35h.p.
Engine.		
Number of cylinders		6
Bore, mm.		97
Stroke, mm.		130
R.A.C. rating		35.0
Crankshaft bearings		7
Stroke-volume, c.c.		5764
Chassis.		ft. in.
Wheel base		11 9½
Wheel track		4 4
Length (chassis)		15 8½
Width (wings)		5 5
Turning circle (diameter)		44 0
Clearance (engine)		10
„ (axle)		10
Height (body floor)		26½

	Type:	C 35h.p.
Chassis—*continued.*		
Weight (chassis)	cwt.	25½
Worm ratio		9/32
Gear-box ratios—Top direct		1
„ „ 3rd		1.62
„ „ 2nd		2.20
„ „ 1st		3.57
„ „ Reverse		3.57
Tyre sizes (Dunlop)		880 × 120 or 895 × 135
Battery voltage		12
Capacity in ampere-hours		66
Petrol tank (gallons)		15
Petrol, m.p.g. (as tested)		17

THE CONTROLS

CONTROL LEVERS AND PEDALS — GEAR LEVER POSITIONS

STARTING UP — USE OF THE ECONOMY LEVER

THE CONTROLS.

For a general description of the principles underlying the control of Daimler cars see separate booklet, "On Learning to Drive."

Control Levers and Pedals.

1. The clutch pedal is on the left, the brake on the right, and the accelerator is between them.
   The gear lever is in the centre and the brake lever is on the driver's right hand.
   The economy lever, ignition lever, and throttle stop control are above the steering wheel.
   The switchboard incorporates the ignition, charging, and lamp switches.
   The starting switch is on the dashplate above the clutch pedal and is operated by the left foot.
2. The clutch pedal is pressed forward with the left foot to disengage the clutch and to apply the clutch stop.
   The accelerator pedal is pressed forward with the right foot to open the throttle.
   The brake pedal is pressed forward with the right foot to apply the brakes that operate on the front and rear wheels.
   The brake lever is pushed forward with the right hand to apply the brake that operates on the transmission shaft behind the gear-box.

Gear Lever Positions.

The gear lever positions are as follow:—

	2nd	4th.
	Neutral	
Reverse	1st	3rd

The reverse is obtained by pressing the lever to the left as far as it will go against the action of the spring and then moving it backwards. The spring that guards the gate leading to the reverse is sufficiently stiff to prevent accidental entry when moving from second to first.

THE CONTROLS.

Starting-up.

1. Turn on the petrol from the autovac to the carburettor and see that the float chamber fills properly by lifting the needle valve to feel the buoyancy of the float. The needle should only be raised for a moment, in order to avoid flooding too much.
2. Move the economy lever to the position marked "Primer—Start" on the right of the quadrant.
3. Turn the throttle stop control almost as far as it will go in an anti-clockwise direction, thus nearly closing the throttle and ensuring proper action of the primer.
4. Keep the right foot off the accelerator.
5. Move the ignition lever forward to about three-quarters advance.
6. Place the barrel switch in the "Dynamo On" position. In this position the ignition is switched on, and although the next position in a clockwise direction switches on the ignition without bringing the dynamo into action, it is preferable to allow the dynamo to charge the battery whenever the engine is running. Especially is this the case in winter, when the lamps are in frequent use.
7. Depress the starter switch with the left foot and hold it right down until the engine starts. Release the starter switch immediately the engine starts, which should be in about ten seconds. (*N.B.*—Operate the starter switch smartly without hesitation.)
8. *Immediately* the engine fires move the economy lever half-way to the "Primer—Close" position.
9. If the engine does not start quickly do not continue to waste battery current before checking over the points requiring attention.

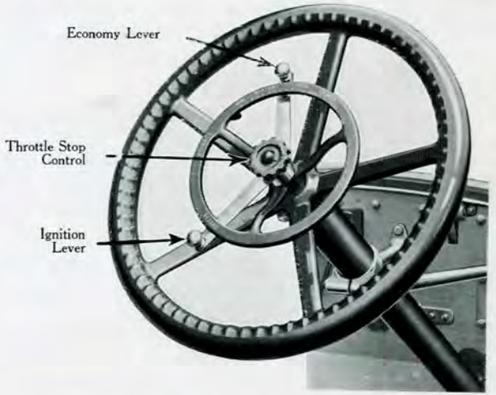
THE CONTROLS.

After Starting-up.

1. Move the economy lever to the left sufficiently to close the primer completely. It is dangerous to leave the primer in action too long, because the excess petrol entering the cylinders will destroy the lubrication.
2. Move the throttle stop control in a clockwise direction to open the throttle slightly.
3. Retard the ignition a little to give smoother running if necessary.
4. Allow the engine to run for five or ten minutes in order to warm up before driving the car.
5. Note that the ammeter indicates that the battery is being charged when the engine is accelerated

Use of the Economy Lever while Driving.

1. Move the economy lever further to the left until slight popping tends to occur at the carburettor.



2. The extent to which the economy lever can be moved to the left depends on the temperature of the jacket water and on the speed at which the car is being driven. Moving the economy lever

to the left opens the water valve, thus tending to cool the engine, and closes the regulator, thus tending to reduce the petrol supply from the float chamber to the jets.

3. If, in summer weather, the water cannot be prevented from getting too hot without restricting the petrol supply too much, or if, in winter, the converse is the case, the relative positions of the regulator and water valve can be reset under the bonnet by moving the rod to another hole in the valve lever. The rod itself is not to be altered in length.

4. When the engine is thoroughly hot the limiting position for the economy lever will be indicated by the sensation of a momentary check in the uniform motion, as if the brake had been put on and off suddenly. This symptom precedes any actual popping of the carburettor and indicates that the mixture is the weakest on which it is possible to run satisfactorily. Under such conditions the position of the economy lever virtually limits the speed of the car.

Use of the Throttle Stop Control.

As the throttle is regulated by the accelerator pedal the throttle stop control is intended only as a means of adjusting the setting to which the throttle returns when the foot is taken off the accelerator pedal. The best position depends upon the temperature of the jacket water.

Use of the Ignition Lever while Driving.

The ignition lever should be kept as far advanced as possible, and, in general, can remain in one position. It is only necessary to retard the ignition if the engine shows any signs of knocking.

Use of the Clutch Stop when Gear-changing.

The clutch stop is intended for use only when changing up, and the rate at which it slows down the clutch disc depends on the distance to which the clutch pedal is pushed forward when disengaging the clutch. A silent change-up depends on correct synchronism between the movement of the gear lever and the movement of the clutch pedal.

Double-clutching when Changing-down.

A sure and silent change-down is most readily effected by double-clutching, i.e., by re-engaging the clutch and reaccelerating the engine with the gear lever in neutral before finally disengaging the clutch and moving the lever into the lower gear.

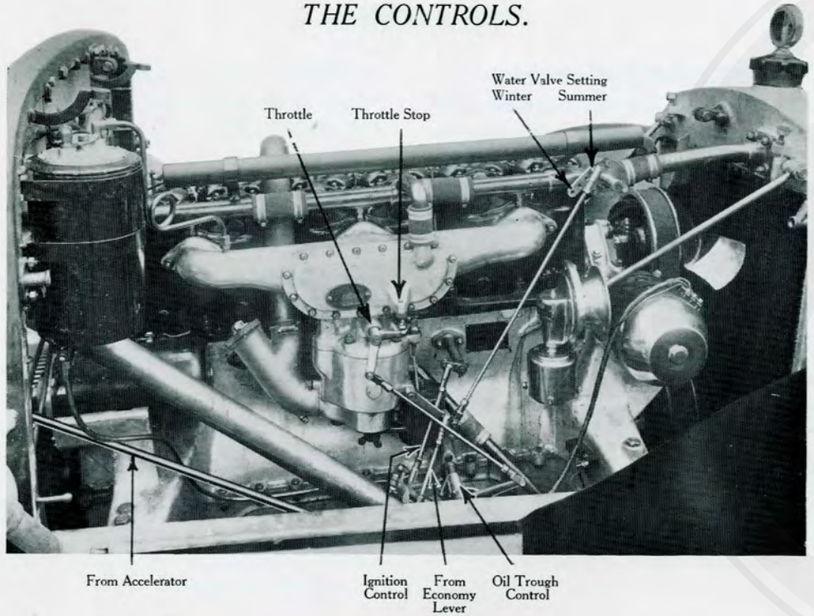
Charging.

1. Always keep the batteries on charge when the car is in use.
2. See Dynamo Section for correct ammeter reading.

The Red Lamp.

The red lamp is a reminder to switch off the ignition before leaving the car (*see* " Ignition ").

THE CONTROLS.



LUBRICATION

LUBRICATION OF ENGINE AND CHASSIS

USE OF GREASE GUN

LUBRICATION OF GEAR BOX AND BACK AXLE

LUBRICATION OF ENGINE.

Description. *See* General Description Book.

To Read Oil Level Indicator.

1. Put car on level ground.
2. Stop the engine.
3. Touch indicator rod to be sure it is free.
4. The visible length of rod indicates approximately the height of oil above the pump suction.
5. If indicator rod is nearly at the bottom replenish base immediately.

To Replenish Base.

1. Replenish base while the oil is still warm and fluid.
2. Put car on level ground.
3. Stop the engine.
4. Open oil filler (which also opens the oil level cock).
5. Pour in Daimler engine oil until oil issues from level cock.
6. Close oil filler (which also closes the oil level cock).
7. Fasten fly-nut on filler securely.

To Clean Strainer and Wash Out the Base.

1. Stop the engine.
2. Place a clean bucket under drain plug.
3. Unscrew drain plug (to which the strainer is attached).
4. Allow oil to drain into bucket.
5. Replace bucket with another if oil is required for use.
6. Remove the oil filter.
7. Pour paraffin through oil filter chamber to wash out the base.
8. Wash strainer and filter in paraffin.
9. Replace the strainer and the filter.
10. Replenish the base with new Daimler engine oil.

To Oil Cylinder Heads.

1. Start the engine.

2. Fill cups on induction pipe (with cocks shut).
3. Open cocks to let oil into induction pipe.
4. Close cocks.

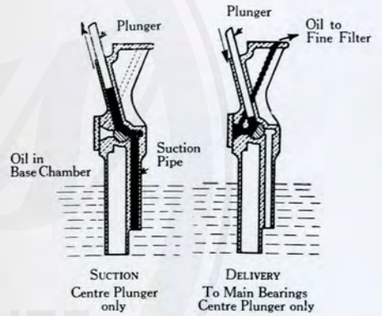
One cupful from each cup once a day is ordinarily sufficient, but if the engine has not been run for several days give a preliminary cupful before starting the engine as follows:—

1. Fill the cups (with cocks shut).
2. Half-open cocks.
3. Turn the engine by hand until the oil has been drawn in.
4. Close cocks.

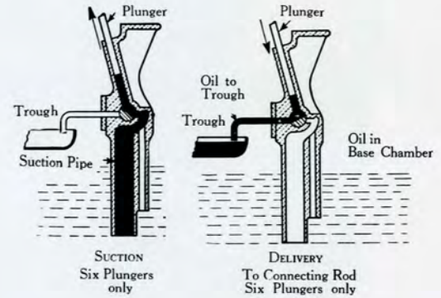
To Clean Filter.

1. Stop the engine.
2. Remove nuts from filter flange.
3. Withdraw filter.
4. Wash in paraffin.
5. Replace.

LUBRICATION OF ENGINE.

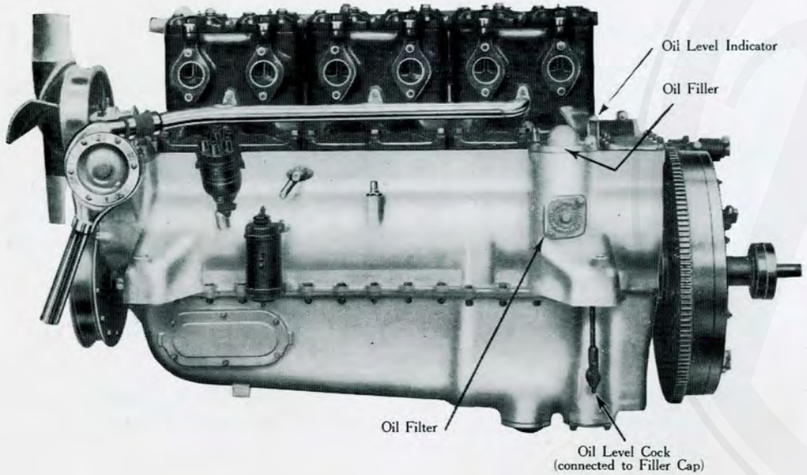


THE CENTRE PLUNGER
(Supplying Oil to Main Bearings)

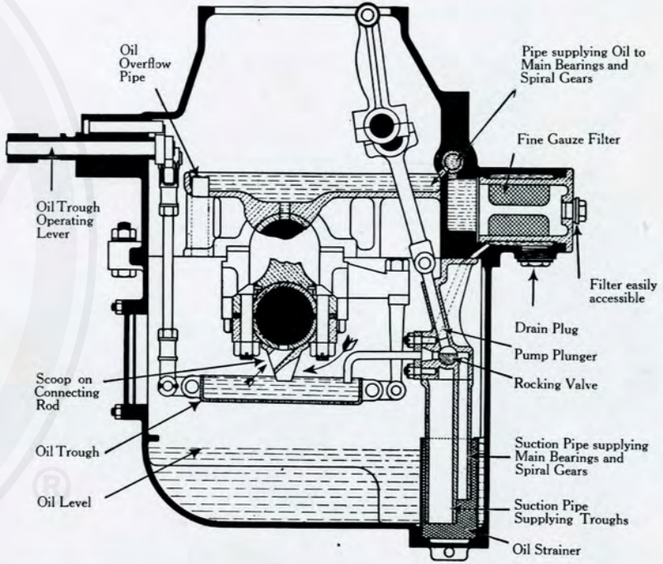


THE SIX PLUNGERS
(Supplying Oil to Troughs)

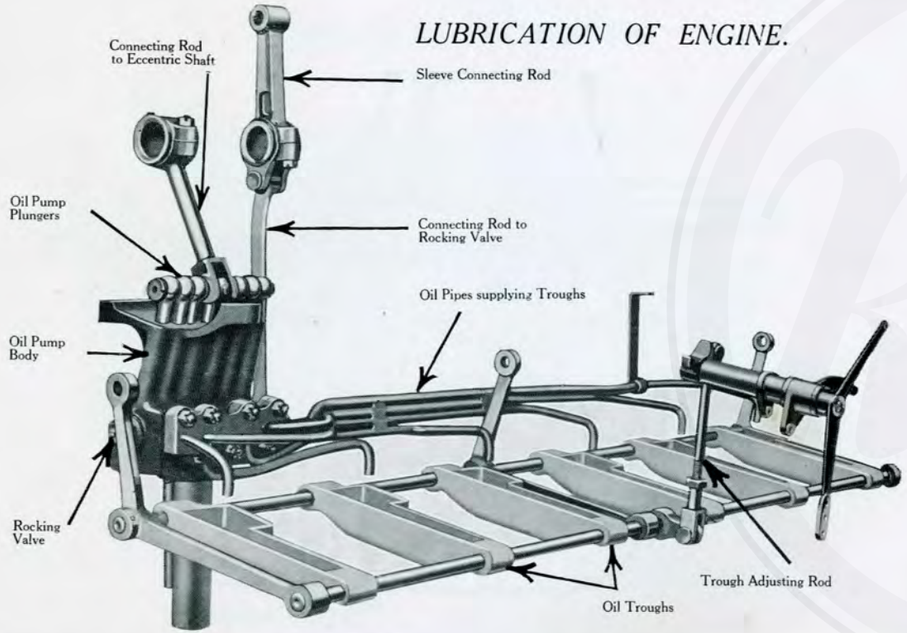
LUBRICATION OF ENGINE.



LUBRICATION OF ENGINE.



LUBRICATION OF ENGINE.



LUBRICATION OF CHASSIS.

Outside Car.

With GREASE GUN.

Front SPRING, front end	Near and off-side
Foot BRAKE Camshaft (front wheels)	„ „
STEERING Swivel	„ „
STEERING Tie Bar	„ „
Front SPRING, rear end	„ „
Front BRAKE Guide Lever	„ „
Rear SPRING, front end	„ „
Foot BRAKE Camshaft (rear wheels)	„ „
Rear SPRING, rear end	„ „

With OIL CAN.

STEERING, Connecting-rod (raise lid of oiler)	Near and off-side
Foot BRAKE Rod Joints (front and rear)	„ „

Under Bonnet.

With GREASE GUN.

STEERING Box.
FAN and Fan Bracket.

With OIL CAN.

CONTROL Rods.

N.B.—For positions of above parts see following illustrations.

Under Floorboards.

With GREASE GUN.

ACCELERATOR Pedal	Off-side.
PEDAL Shaft	Near and off-side.
Front BRAKE Cross Shaft	„ „
GEAR Control	Centre.
CLUTCH Coupling	„
Hand BRAKE Lever	Off-side.
Rear BRAKE Cross Shaft	Near and off-side.
PROPELLER Shaft Sliding Joint	Front end.
PROPELLER Shaft Mechanical Joints	Both ends.
Brake COMPENSATOR	Off-side.

With OIL CAN.

BRAKE Rod Joints.
Hand BRAKE Adjustment and Ratchet.
CLUTCH Pedal Adjustment.
BRAKE Pedal Adjustment.

Inside Car.

With GREASE GUN.

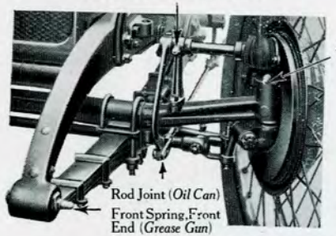
STEERING Column.

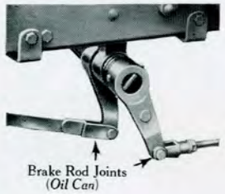
With OIL CAN.

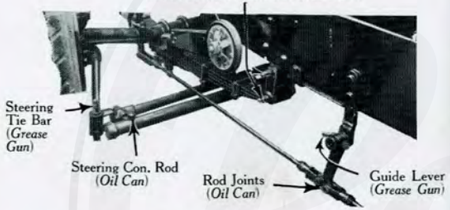
CONTROL Tubes (Steering Wheel centre).
SPEEDOMETER Flex. (Disconnect flex from instrument and inject a few drops of oil into flex.)

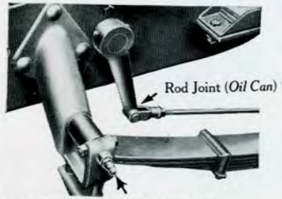
For lubrication of Igniter and Starter Motor see Electrical Section.

LUBRICATION OF CHASSIS.

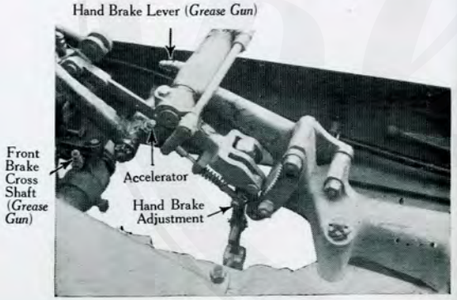




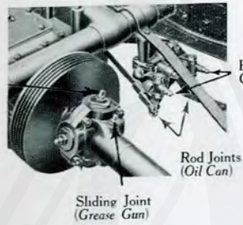








LUBRICATION OF CHASSIS.

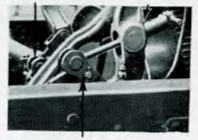






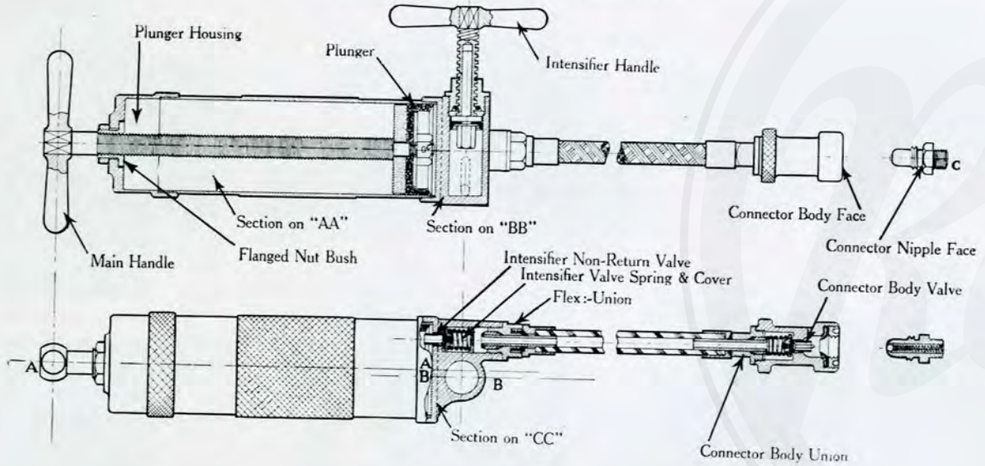








LUBRICATION OF CHASSIS.



THE GREASE GUN.

LUBRICATION OF CHASSIS.

To Fill Grease Gun.

1. Unscrew plunger housing and withdraw plunger by main handle.
2. Holding the handle, spin down cap to the bottom of the plunger.
3. Take the special charger provided with the gun and slide its cap to the top of the vanes.
4. Push the charger well home into a full tin of grease.
5. Rotate in either direction, and while continuing this motion slowly withdraw.
6. The charger, which holds a full charge of grease, must now be inserted into the gun and the cap at the top of the vanes screwed a few threads on to the gun.
7. Withdraw handle of charger and unscrew cap. The charge of grease is left in the gun.
8. Replace the plunger housing, screwing it on as far as it will go.

To Use Grease Gun.

1. Screw the connection body on to the connector nipple, making sure that it is screwed up to the connector nipple face.
2. Screw down main handle until clean grease can be seen oozing from the end of the bearing, the old and dirty grease having been cleared out by the fresh incoming lubricant.
3. If it is found impossible by the use of the main handle to obtain sufficient pressure to do this, slack back the main handle at least two turns and screw down the intensifier handle. The object of slacking back the main handle is to ensure that the intensifier non-return valve shall return to its seat. Otherwise the high pressure (5000lb. per square inch) might be transmitted to the main barrel and damage the plunger, flanged nut bush, or plunger housing.
4. Always use perfectly clean *ball-bearing grease only*. Any particle of dirt lodging on the non-return valve seat may damage the gun as explained above. Do not use ordinary yellow grease.

LUBRICATION OF GEAR-BOX AND BACK AXLE.



Gear-box.

At the intervals shown on the Maintenance Chart remove filler cap and fill with Daimler Heavy Gear Oil to the level of the top of the filler spout. When flushing the gear-box remove top and bottom covers by taking off the nuts and spring washers securing them.



Back Axle.

At the intervals shown on the Maintenance Chart remove filler cap and fill with Daimler Heavy Gear Oil to the level of the top of the filler spout. If possible replenish after a journey, when the axle is warm and the oil will flow easily in the worm casing.

CHANGING WHEELS

AND

CARE OF TYRES

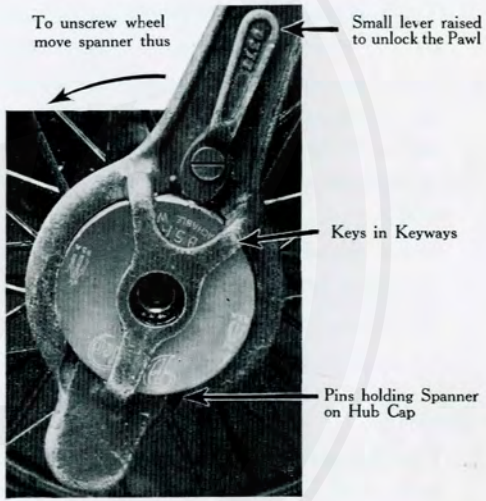
THE WHEELS.

Inspection.

1. Remove wheel and exchange with SPARE wheel.
2. Carefully examine the tyre and have cuts vulcanized at once.

To Remove Wheel.

1. Scotch one of the other wheels.
2. Jack up axle.
3. Remove grease cap from centre of hub, using small end of wheel spanner.
4. Fit large end of wheel spanner to hub cap. There are two key-ways in the hub cap to receive the two keys in the spanner. Press spanner right on until the Y-piece is touching the face of the hub cap. Small lever on spanner must be at right angles to the handle.
5. Raise lever into line with handle in order to unlock the pawl. When the pawl is unlocked two pins will project from the opposite side of



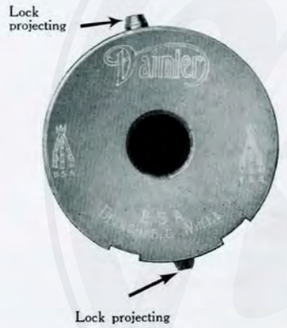
WHEEL SPANNER ON HUB.
(In position to remove wheel.)

the hub cap to keep the spanner in position. The two small grooves in the face of the spanner are to receive these pins.

6. Move the spanner anti-clockwise whilst holding the wheel stationary. Use a mallet to start the motion if necessary. When the motion is started it is easier to hold the spanner and to turn the wheel.
7. When the wheel ceases to advance outwards when turning it may be lifted off the hub. It will not fall off.

To Replace.

1. Use the grease gun to grease the interior of the hub. A nipple which screws into the hub is provided in the kit. Oil the locking mechanism.
2. Lift wheel on to hub and rock slightly to assist in registering the castellations.
3. Press wheel on as far as it will go.

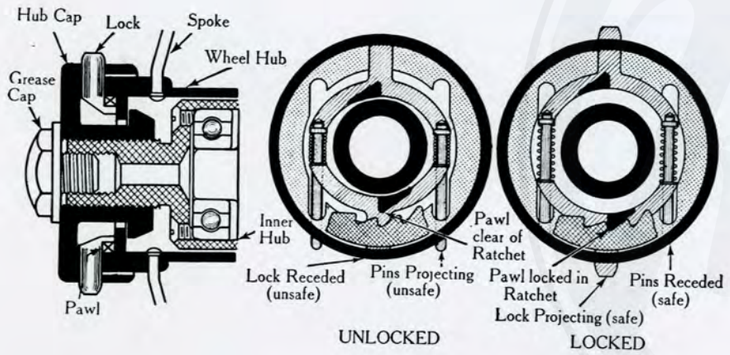


WHEEL HUB (Safe).

4. Fit large end of wheel spanner as in 4 above, **but with the small lever at right angles to the handle.**

5. Move the spanner clockwise until the wheel is right home, then tighten up with a few blows of the mallet **until the pins recede into their holes,** thus enabling the spanner to be removed while the small lever is still at right angles to the handle. If the pins project the wheel is still **UNSAFE.** The hub cap must be tightened (or moved back slightly) until the pins recede of their own accord and the spanner can be removed without force.
6. Replace grease cap.
7. Tighten valve stem nuts.
8. Release jack.
10. Test tyre pressure.
11. Remove scotch.
12. Store tools.

THE WHEELS.



THE TYRES.

Care.

1. Weigh the car, front and rear axles separately, and enter figures in the table below. Add to the rear axle weight 1½cwt. for each passenger to be carried on the back seat, plus ¾cwt. for each occupant of the front seats, plus 1cwt. for a heavy trunk if carried on the grid. Add to the front axle weight ¾cwt. for each occupant of the front seats.

	Front Axle Weight	Rear Axle Weight
Car ready for use without passengers	cwt.	cwt.
,, ,, with passengers		
,, with passengers and luggage		

2. Inflate front and back tyres to pressures corresponding to the above total laden weights in accordance with the following table:—

Axle Weight	Tyre Pressure	
	895×135 m/m	820×120 m/m.
Under 16 cwt. ..	45 lbs/sq. in.	45 lbs/sq. in.
20 cwt. ..	45	50
23 cwt. ..	50	60
29 cwt. ..	60	—

3. Note the appearance of the tyres when correctly inflated and remember to observe their appearance as often as opportunity offers. If any tyre seems flatter than usual test its pressure immediately.
4. Test the tyre pressure of each tyre once a week, using an accurate gauge applied directly to the tyre valve (*see* Car Maintenance Chart). Adjust the back tyre pressures to be equal to each other and the front tyre pressures to be equal to each other, as well as being in general accord with the table of pressures.
5. Never use the tyres with pressures below those specified in the table. No reduction of pressure is

needed in hot weather. Summer temperature will retard external cooling, but slack tyres will cause greater internal heat. For other reasons why slack tyres (i.e., pressure below those specified) must be avoided in the interests of long tyre life see the Dunlop booklet on the care of tyres.

6. A flat tyre may be ruined in a few yards.
7. Never wash the car while a tyre is deflated, otherwise water will get into the cover.
8. Keep the valve rim nuts tight. Tighten them before washing the car.
9. Inspect every tyre at least once a day for cuts and nails. Clean out every cut and fill with stopping at once in order to keep out the damp, which will otherwise rot the canvas and cause the internal damage to become far greater than is indicated by the small external size of the hole.
10. If the cut is too severe to seal properly with cement, change the wheel at once and have the tyre vulcanized.
11. Change the wheels around at regular intervals (*see* Car Maintenance Chart). This not only ensures that the wheels are easy and quick to change in emergency, but it wears the tyres uniformly and corrects the tendency for the front tyre treads to wear more rapidly on one side owing to the splay of the front wheels. When changing the wheels around adjust the tyre pressures to suit.
12. When changing a tube do not chalk the inside of the cover, which is painted, but chalk the tube itself slightly. Excessive chalk in the cover damages the tube.
13. Do not allow a tyre to stand on oil or grease. Wipe oil or grease off a cover with a rag soaked in petrol, but do not allow liquid petrol to remain on the rubber.

14. Repaint the rims if they show rust in contact with the bead.
15. Use the clutch and the brakes as gently as circumstances permit.
16. Avoid driving on the rails of a tramway.
17. Do not scrape the kerb.
18. Drive gently over rough roads. High speed may be conducive to comfort, but the tyres have to take the concussion, and the wall fabric may be so much strained from the inside that the tyre will burst later on without any apparent immediate cause.
19. Study the Dunlop book on the care of tyres.

To Remove Tyres.

As it is usually the tyre on the spare wheel that has to be removed, it will be more convenient if the operation can be performed with the wheel in a horizontal position. A steel bolt projecting vertically from a bench and fitted with a block of wood roughly shaped into the form of a dummy hub makes a serviceable centre on which to mount the spare wheel when removing a tyre.

The "inside" of the valve should be removed and the valve stem pushed well back into the tyre before inserting the levers under the bead to spring the front side of the tyre over the rim.

If a lever of suitable length is available the remainder of the tyre, complete with the tube, can be sprung over the rim. Otherwise it is usual to remove the inner tube separately.

Similarly, when replacing the tyre, levers of suitable length will enable the cover and the tube to be replaced together, the tube being inflated slightly.

French chalk should be rubbed lightly all over the inner tube, but none should be put inside the cover.

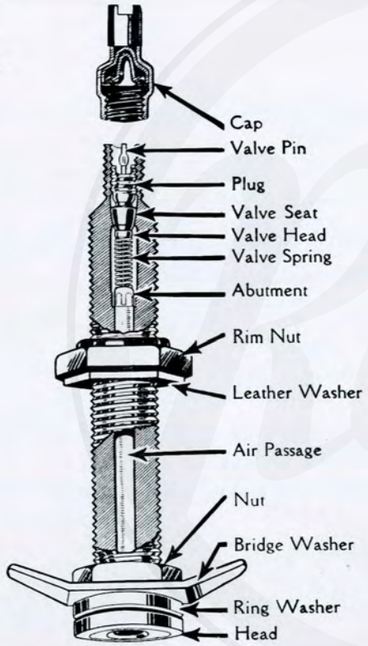
THE SCHRADER TYRE VALVE.

To Remove the "Inside."

1. Unscrew the cap and use the slotted end of the cap to unscrew the plug.
2. Lift out the "inside."

Care.

1. Always screw the cap on tightly after inspection or inflation.
2. Keep the rim nut tight.
3. When replacing an inner tube see that the bridge washer is parallel with the tube and that the hexagon nut above it is secure.
4. When ordering new inner tubes specify Dunlop tubes *with short valves.*



THE BRAKES

FOOT BRAKE (Operates on all four wheels)

HAND BRAKE (Operates on drum behind gear box)

THE FOOT BRAKE.

Adjustment.

1. Open bonnet on off-side. The single adjustment handle is located at the base of the pedal and is readily accessible. It screws on to a short rod attached to the pedal by a trunnion.
2. Turn handle clockwise as far as it will go.
3. Unscrew handle until the brake pedal has about 1½in. free travel (measured at bottom of pedal pad) before the brakes are applied.
4. This adjustment takes effect simultaneously on all four wheel brakes, and their correct relative setting is maintained by a compensating device operated by the pedal. The compensator should never be altered in any way, and requires no attention except lubrication.

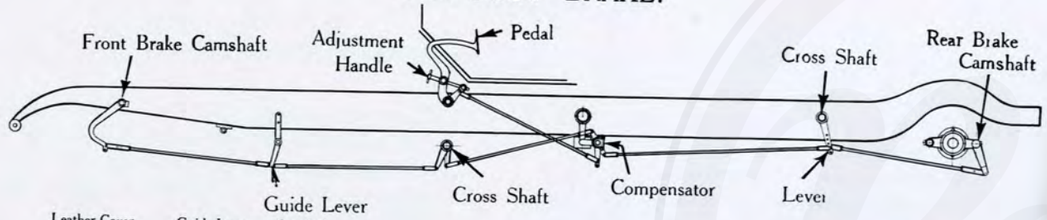
To Reset Adjustment.

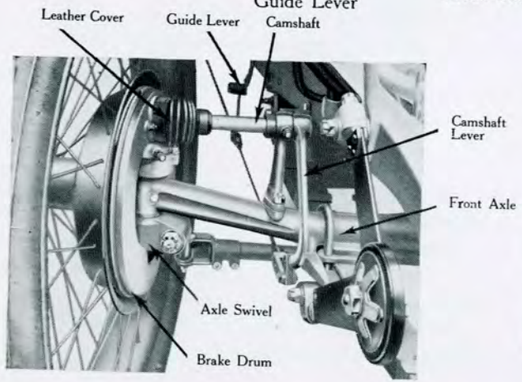
1. When nearly all the available screwed portion of the rod has been used in adjustment reset as follows:—
2. Unscrew the adjustment handle to the end of its rod.
3. Transfer the attachment of the rear brake camshaft levers from the rear to the forward holes in their pull-on rods and the attachment of the front brake camshaft levers from the forward to the rear holes in their pull-on rods.
   (*N.B.*—Be sure to replace the split-pins.)
4. Adjust the brakes by means of the handle on the pedal.

Relining.

When both the above adjustments have been used up the brakes must be relined with new die-pressed fabric lining obtained from the Daimler Company, and, if possible, one of the Company's Repair Depots should be employed to refit these linings.

THE FOOT BRAKE.

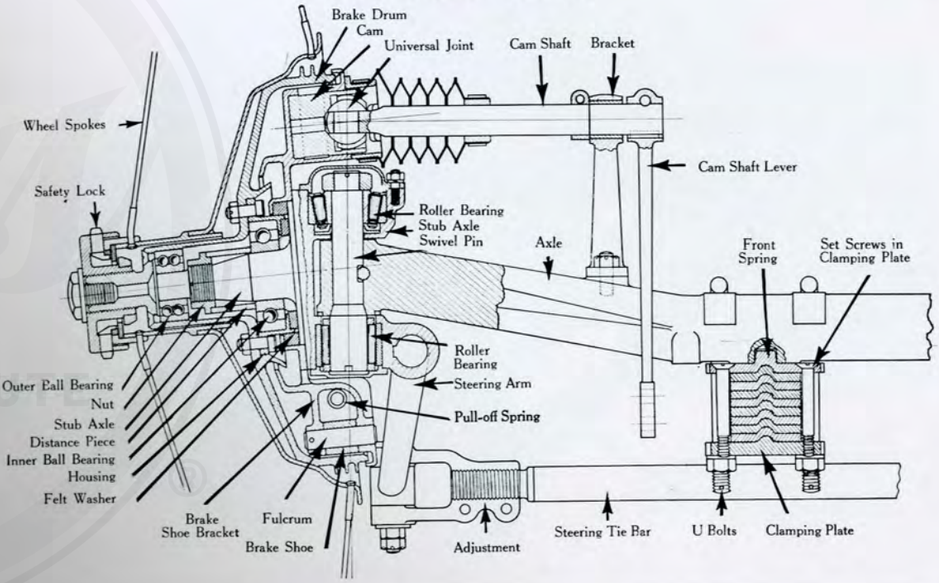




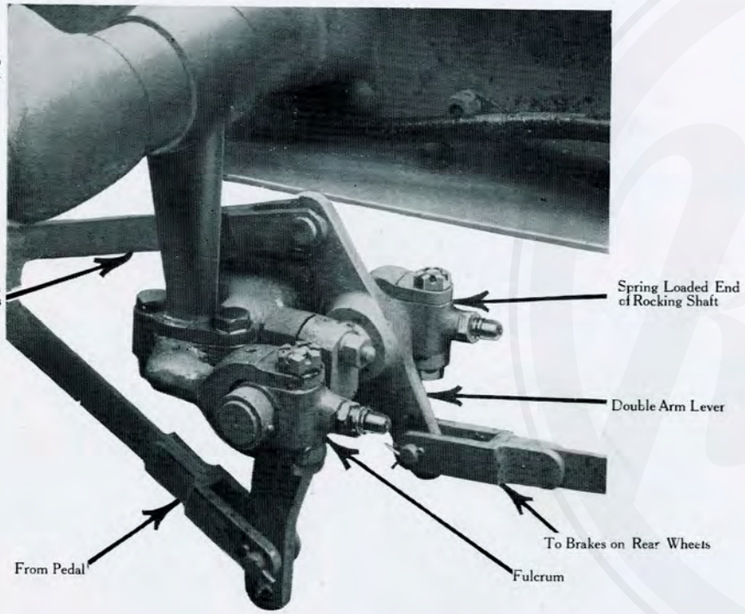


THE SINGLE ADJUSTMENT HANDLE.

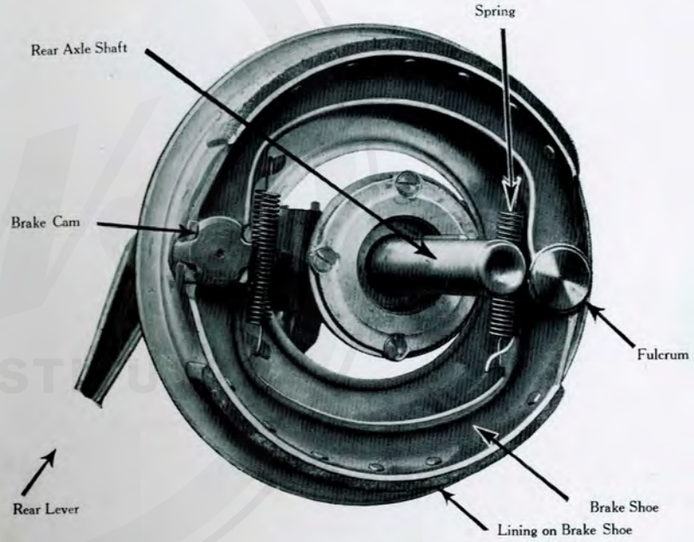
THE FOOT BRAKE.

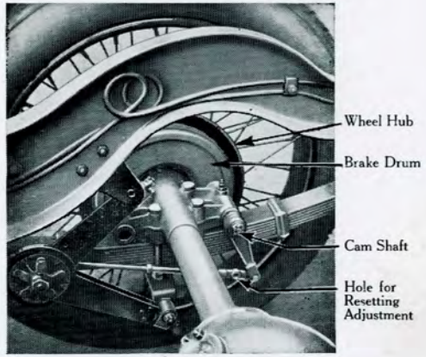


THE COMPENSATOR



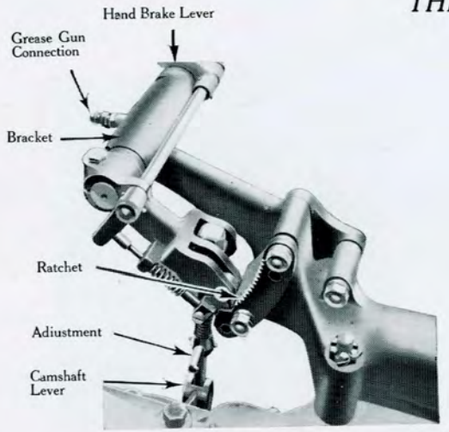
THE FOOT BRAKE.





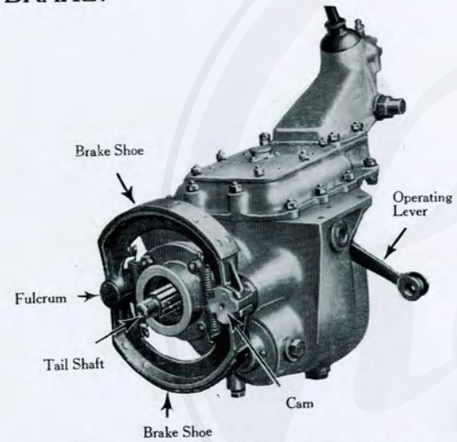
The left-hand photograph is a view from the outside with the brake drum removed, and shows the mounting of the shoes and their cam. The right-hand view shows the camshaft and fulcrum bracket, which is integral with the axle tube.

THE HAND BRAKE.



To Adjust Hand Brake.

1. Raise floorboard in front of driver's seat.
2. Adjust turnbuckle so that the hand brake is full on when the lever has travelled about half the distance provided by the quadrant.



3. When the brake linings have worn to such an extent that the pawl travels nearly the whole length of the quadrant before the brake is fully applied the shoes must be relined, and, if possible, a Daimler Repair Depot should be employed to re-line them.

THE CLUTCH

Adjustment of Clutch and Clutch Stop

THE CLUTCH.

Description. *See* General Description Book.

Inspection.

Move the pedal by hand. It should have about $\frac{1}{2}$in free play by virtue of clearance at the point "J." If there is *no* free play, or if the amount is excessive, adjust "J" at once.

To Adjust "J."

Unscrew the pedal adjustment nut to *increase* the clearance.

Clutch Lever.

As the clutch fabric wears the clearance at "J" and "P" decreases. Readjustment of "J" is sufficient until "P" is only $\frac{1}{8}$in.

To Adjust "P."

1. Unscrew each of the three adjustment screws by an equal amount until the clearance at "P" is about $\frac{1}{4}$in.
2. Press on the clutch pedal and observe that the adjustment screws come more or less simultaneously into contact with their pins. If necessary adjust individual screws to the nearest sixth of a turn.

Fierce Clutch.

Inject a few drops of paraffin at "A."

Clutch Stop.

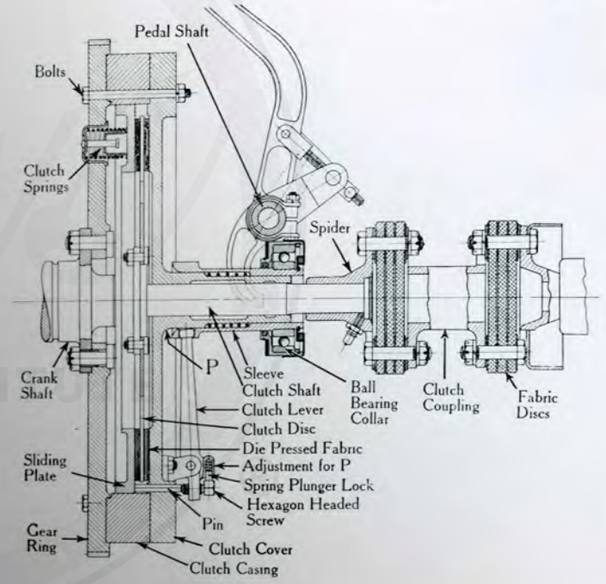
The clutch stop pad must be quite clear of the disc when the clutch is *in*. Adjust nuts on rear end of clutch stop rod only if required to give more or less clutch stop action. A suitable adjustment for the average driver may be obtained by the following method:—

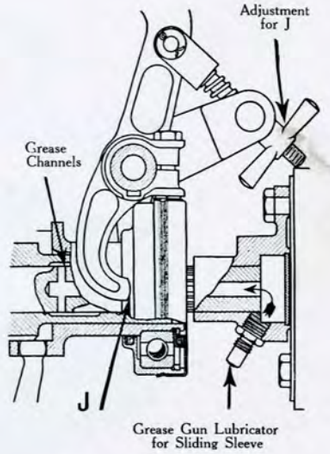
1. Hold the pedal right down, and in this position screw back the front nuts until the spring is almost closed up.
2. Adjust the rear nuts to give about $\frac{1}{2}$in. clearance behind the clutch stop lever.
3. Allow the pedal to return to its normal position.

To Adjust Clutch and Clutch Stop after Overhaul.

1. Check "P" for clearance as given above.
2. Depress the clutch pedal until its lever is clear from the underside of the pedal board throughout its length.
3. Adjust "J" to give at least $\frac{1}{16}$ in. clearance with the pedal held as above.
4. Press on clutch pedal until the pedal itself is within an inch of the top of the pedal board.
5. Adjust the setscrew on the far end of the clutch pedal shaft to touch the bracket so that the clutch pedal is thereby prevented from moving any nearer to the pedal board.
6. Set the front nuts to adjust the clutch stop action so that the spring is almost closed up with the clutch pedal right down, as above.
7. Allow the clutch pedal to return to the position indicated in paragraph 2 above.
8. Adjust the rear nuts to give $\frac{1}{2}$ in. clearance at the clutch stop with the pedal in this position.
9. Adjust the setscrew on the clutch stop bracket to touch the clutch stop lever with the clutch pedal in this position, thus preventing the clutch pedal from returning beyond this point. The clutch pedal and clutch stop mechanism are held steady against this setscrew by the action of the spring attached to the lever on the far end of the pedal shaft.

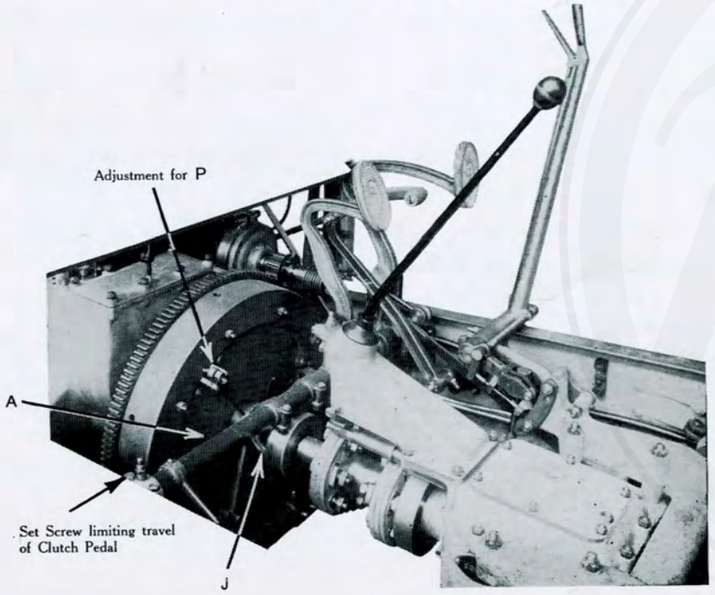
THE CLUTCH.



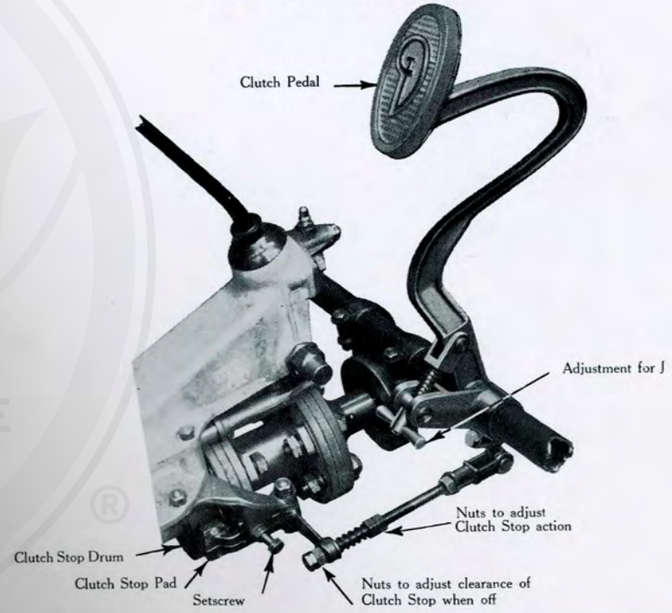


ENLARGED VIEW OF CLUTCH PEDAL ADJUSTMENT.

THE CLUTCH.



THE CLUTCH STOP.



THE PETROL SYSTEM

MAIN TANK AND PETROL FILTERS

AUTOVAC AND CARBURETTOR

INSTITUTE

THE MAIN PETROL TANK.

To Flush Out the Tank Sump.

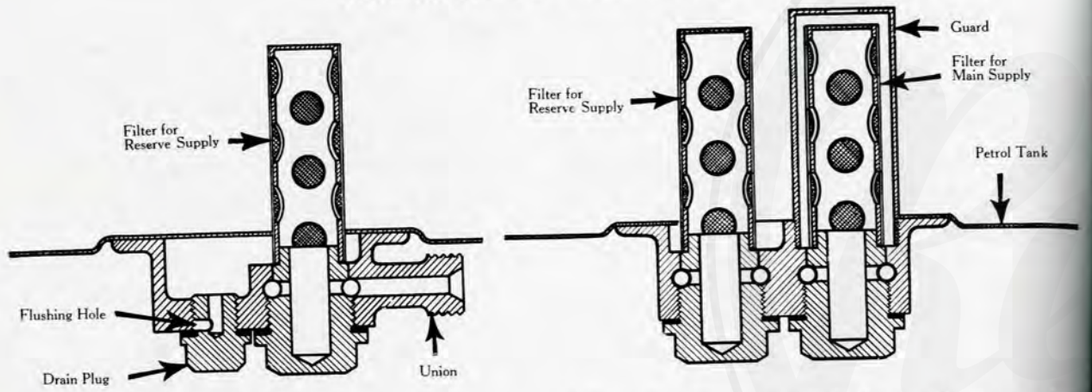
1. Unscrew drain plug two or three turns to expose the lateral orifice, through which any accumulation of sediment and water will be projected.
2. Screw up the plug again as soon as clean petrol begins to flow.

To Clean Petrol Filters.

1. Draw off petrol from tank by removing drain plug.
2. Unscrew both filter plugs and withdraw both filters complete.
3. Wash the gauzes with clean petrol.
4. Inspect carefully to see that the gauzes are free from any tear or enlarged hole.
5. Wipe out the sump with a piece of dry rag that is free from fluff.

INSTITUTE

THE MAIN PETROL TANK.



Reserve Supply.

In the petrol tank sump there are two filters. One is surrounded by a metal guard with a hole in the top, and when the tap on the dash (just to the right of the starter switch) is turned upwards petrol passes through this filter to the autovac. When, however, the petrol level falls to the top of the guard the supply stops, and the remaining two gallons of petrol cannot be used until the tap is turned downwards. This permits the remaining fuel to be drawn through the unguarded filter. To cut off the supply altogether turn the tap to a horizontal position.

THE AUTOVAC.

Action of Autovac.

The suction in the induction pipe induces a partial vacuum in the inner chamber of the autovac, and petrol is thereby withdrawn from the main tank at the rear of the car and flows into the inner chamber.

As the petrol flows into the inner chamber it raises a float that is mechanically connected to a pair of valves that are operated through toggle levers in such a way that they throw over instantly from open to close when the float reaches a certain position. One valve is always shut when the other is open.

One of these valves controls an air vent communicating with the atmosphere and also with the outer chamber. This vent is suddenly opened when the float rises to a certain level, and the air pressures in the inner and outer chambers being thereby put in equilibrium, the petrol in the inner chamber immediately flows down into the outer chamber through the force of its own weight. If the outer chamber already contains petrol the contents of the inner chamber subsides to the same level.

The passage from the inner to the outer chamber is formed by a short pipe, the lower end of which is covered by a simple plate valve that tends to close automatically under the action of a weighted lever. When the inner and outer chambers are in communication with the atmosphere any higher level of petrol in the inner chamber easily opens the valve. When, however, the inner chamber is sealed from the atmosphere and is under the influence of the suction of the induction pipe, the atmospheric pressure, which is at all times present in the outer chamber, holds up the valve with sufficient force to keep the petrol confined to the inner chamber whilst the inner chamber is being filled.

Any petrol in the outer chamber is at all times free to flow direct to the carburettor because the outer chamber is always under atmospheric pressure.

The other valve, which is closed by the rising float when the air vent to the inner chamber is opened, is a

valve controlling the passage from the inner chamber to the suction pipe, and it is closed during the evacuation of the inner chamber in order to prevent air being admitted to the induction pipe in such a way as to interfere with the mixture.

To Fill Autovac.

1. Close the throttle.
2. Turn the engine a few revolutions by means of the starter in order to create a vacuum in the inner chamber.
3. Wait a moment or two for the chamber to fill up of its own accord. As soon as the inner chamber is full it will evacuate into the outer chamber and supply the carburettor. The engine can then be started and the autovac will function automatically.

To Flush the Autovac.

1. Draw off petrol and sediment, if any, through the drain tap at bottom of tank.
2. Close drain tap.
3. Release clamping plate at top of tank and lift off the petrol supply pipe. It is not necessary to unscrew the union.
4. Remove petrol strainer from petrol supply pipe connection and clean it if necessary.
5. Pour clean petrol through the orifice into the inner tank so as to flush the plate valve.

To Inspect Interior of Autovac.

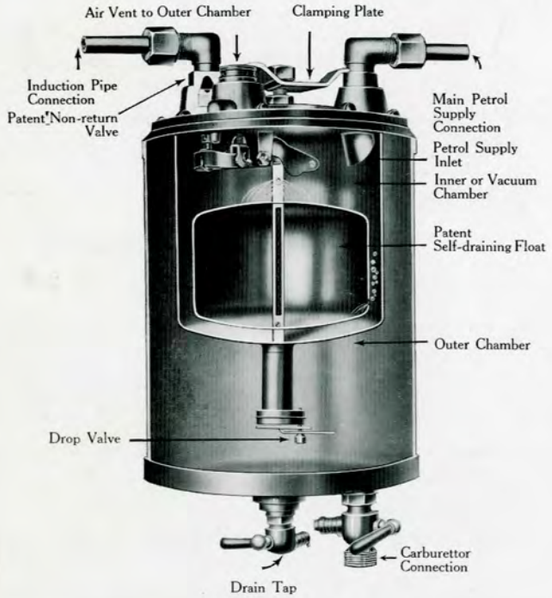
1. Drain off contents as above.
2. Release clamping plate as above.

3. Lift off both pipe connections.
4. Remove screws from top plate.
5. Lift off top plate with float and mechanism complete.
6. Lift out inner chamber complete with bottom valve. The joints between the inner and outer chambers and the cover plate in the inner chamber are made by cork rings, which, if stuck, may be loosened by inserting a knife, but care must be taken not to damage the cork. If the autovac fails to fill properly it may be due to faulty closing of the plate valve. The valve surface should be cleaned if necessary.

To Reassemble Autovac.

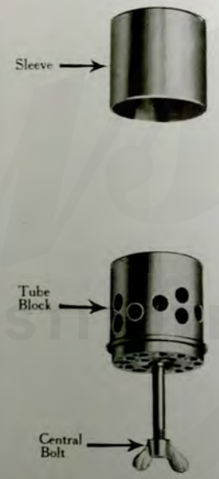
1. Reverse above operations, but be careful to see that the air vent passage from the inner to the outer chamber registers properly.

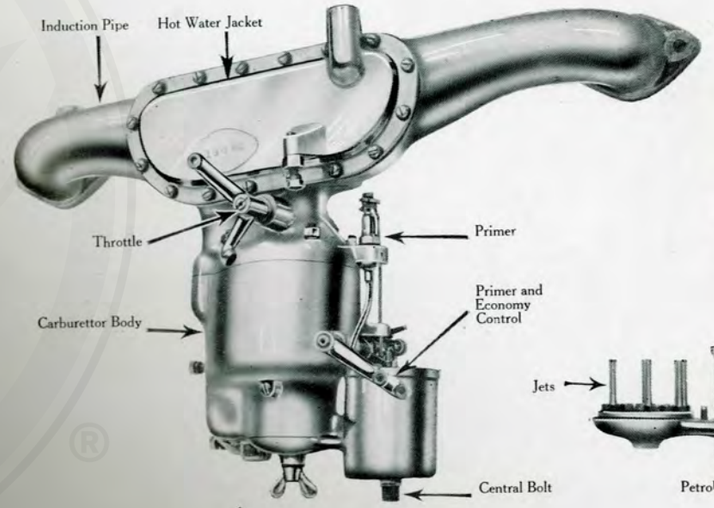
THE AUTOVAC.

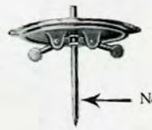


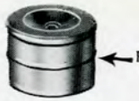


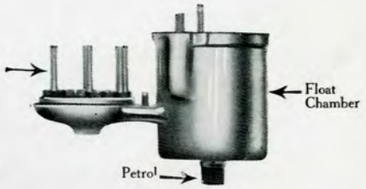
THE CARBURETTOR.



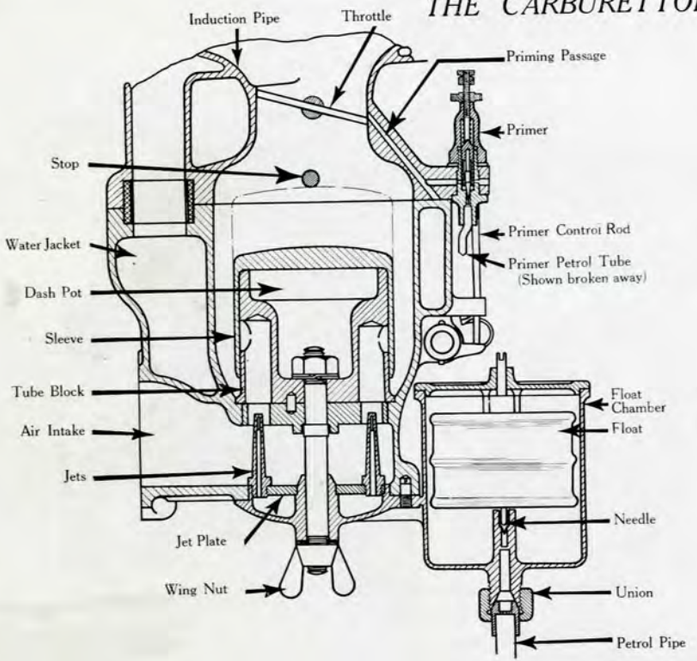


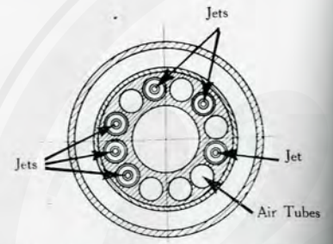




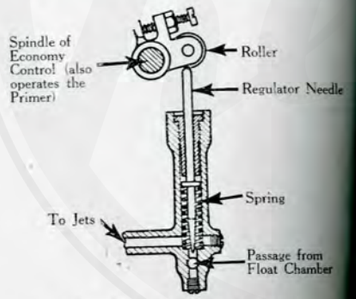


THE CARBURETTOR





USUAL ARRANGEMENT OF JETS AND AIR PASSAGES IN TUBE BLOCK.



THE PETROL REGULATOR.

THE CARBURETTOR.

To Take Down the Float Chamber.

1. Turn off the petrol below the autovac.
2. Disconnect the union below the float chamber.
3. Unscrew the wing nut below the carburettor.
4. Lower the float chamber complete with jet plate, taking care not to bend the primer tube.

   N.B.—All the jets are now exposed for cleaning, if necessary. This should be carefully done with a fine wire.

To Remove the Carburettor complete.

1. Disconnect the economy lever and throttle lever on the carburettor from the control rods.
2. Turn off the petrol below the autovac.
3. Disconnect the union below the float chamber.
4. Drain the cooling system.
5. Remove the fibre tube carrying the ignition cables by taking out the two setscrews and spring washers securing it to the cylinders.
6. Slack off the clips of the two rubber joints connecting the three sections of the top water pipe and slide the joints outwards.
7. Slack off the clips of the rubber joint connecting water pipe to induction pipe jacket.
8. Slack off the nuts holding centre section of water pipe to cylinders.
9. Remove centre section of water pipe.
10. Slack off the clips of the rubber joint on the water outlet pipe from carburettor jacket and slide joint down pipe.
11. Slack off the grip-bolt securing the hot-air pipe to air intake jacket.
12. Remove the two clips securing the hot-air muff to the exhaust pipe by taking off the nuts and spring washers.
13. Uncouple the union on the pipe which leads from the engine basechamber to the hot-air muff.
14. Lift hot-air pipe sufficiently to clear the air intake jacket on the carburettor.

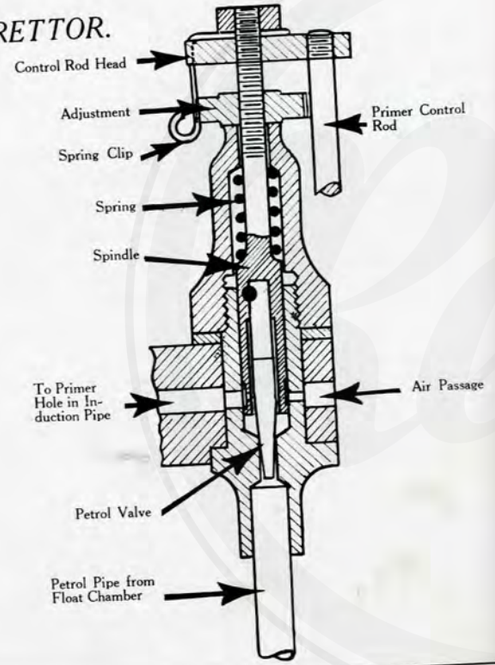
15. Remove the six nuts and spring washers securing induction pipe to cylinders.
16. Remove the carburettor and induction pipe outwards and upwards.

Hot-air Supply.

The proportion of hot air admitted to the carburettor is regulated by a shutter on the intake jacket. In cold weather the shutter may be turned in an anti-clockwise direction to increase the supply of hot air and *vice versa*. This adjustment should, if necessary, be made in conjunction with that of resetting the water-valve control (*see* "Control" Section).

The Primer and Slow-running Adjustment.

These are combined in a small valve comprising a spring-loaded spindle moving axially in a casing having three ports, one of which communicates with a hole in



the induction pipe on the engine side of the throttle, another with a tube having its orifice immerged below the petrol level in the float chamber, while the third is open to the atmosphere.

When the valve spindle is moved against the spring as far as it will go the air valve is closed and the primer hole in the induction pipe is in direct communication with the petrol in the float chamber. The primer is then fully in action.

When the primer is out of action the petrol valve tends to close under the action of the spring, but is prevented from quite closing through the position of the milled nut on the other end of the valve spindle. Its adjustment can be set by hand so as to give the best mixture for the slow running of the engine. In this condition the device is virtually acting as an additional carburettor jet.

To Adjust Slow-running.

1. Start up from cold (*see* "Control" Section).
2. Keep the throttle stop control in the shut position.
3. Adjust milled nut until the engine runs smoothly.

THE ENGINE

To Decarbonise

To Drain The Cooling System

To Renew Water Pump and Water Valve Gland Packings

The Vibration Damper

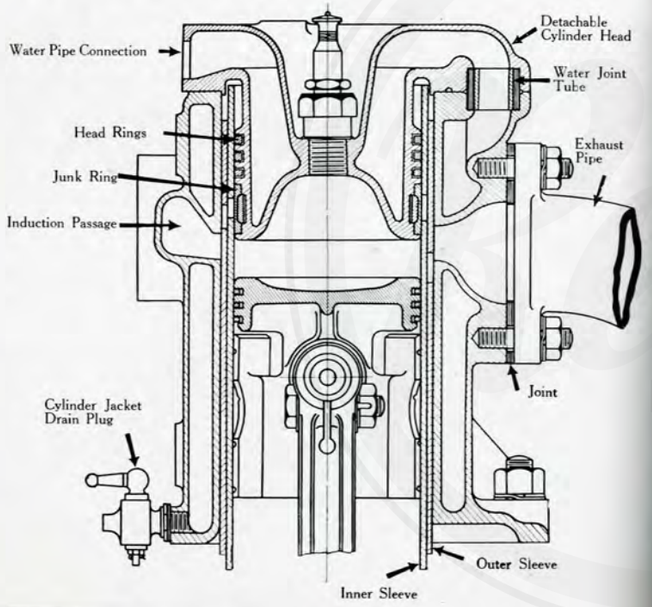
The Silencer

To Decarbonise.

1. Remove the bonnet and radiator stay rod.
2. Remove ignition cables and plugs.
3. Slack off the clips on the rubber joint in front of the water valve and slide the joint forward along the pipe.
4. Slack off the clips on the rubber joint connecting the top water pipe to the induction pipe jacket.
5. Disconnect the water valve control rod at the valve.
6. Slack off the nuts securing water pipe to cylinder heads.
7. Remove water pipe.
8. Slack off the grip-bolt securing the hot-air pipe to the air intake jacket on the carburettor.
9. Remove the two clips securing hot-air muff to exhaust pipe.
10. Remove four nuts out of the six on each cylinder head, leaving two opposite nuts only partly loosened.
11. Turn the crankshaft so as to lift the heads by means of the compression pressure.
12. Remove the two remaining nuts on each cylinder head.
13. Lift off heads complete with rings.
14. All carbon deposit should now be carefully removed from the tops of the pistons and from underneath the cylinder heads. If necessary carbon should also be removed from the cylinder head rings and grooves. The rings must be free in their grooves.
15. If carbon has accumulated in the ports of the sleeves to such an extent as to interfere with the satisfactory running of the engine, *but not otherwise*, it should be removed as follows:—
16. Remove carburettor and induction pipe.
17. Remove setscrews securing the two vertical exhaust pipes to the exhaust branches.
18. Remove the nuts and spring washers securing exhaust branches to cylinders.

THE ENGINE.

19. Remove exhaust branches.
20. Turn the engine until the ports open and can be cleaned. Deal with the exhaust and inlet ports of each cylinder in turn. The carbon should be scraped away carefully, taking care not to damage the sleeves nor to roughen the edges of the ports.
21. Before replacing the cylinder heads remove all the carbon that has been loosened with an oily rag, and finally smear the sleeve walls, pistons, and cylinder heads with clean engine oil.



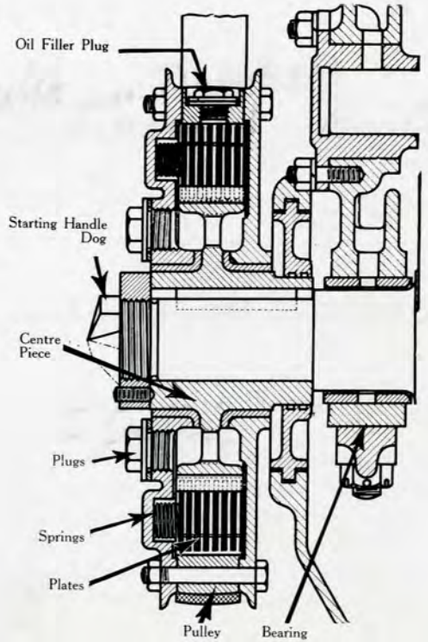
THE VIBRATION DAMPER.

Description. *See* General Description Book.

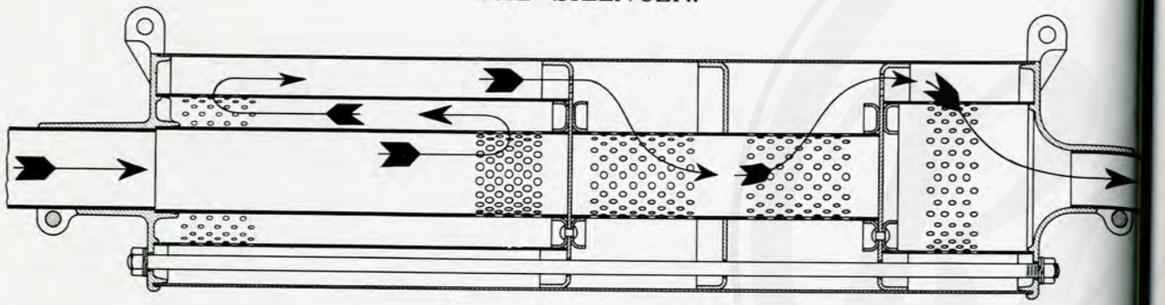
Lubrication.

To ensure proper functioning of the damper plates the damper must be replenished with thick oil at the intervals shown on the Maintenance Chart as follows:—

1. Turn the crankshaft until the plug in the periphery of the damper is in a convenient position near the top.
2. Unscrew the plug with a box-spanner.
3. Insert a charge of oil by means of the gun.
4. Replace the plug and screw up tightly.



THE SILENCER.



NOTE.—The illustration is not to scale.

To Remove the Silencer.

1. Slack off the grip-bolts securing the front and rear pipes in the end plates of the silencer.
2. Remove the tail pipe by disconnecting the clip securing it to the frame.
3. Remove the bolts securing the front and rear brackets of the silencer to the frame.
4. Slide the silencer off the front exhaust pipe.

To Clean Silencer.

1. Remove the bolts that pass through the silencer from end to end.
2. Separate all the tubes and partitions and thoroughly clean them from all burnt oil.
3. Reassemble the silencer, taking care that the tubes are replaced in their proper positions.

THE COOLING SYSTEM.

To Remove the Pump.

1. Drain the cooling system.
2. Slack off the clips on the rubber joints above and below the pump.
3. Slide the top rubber joint back along the pipe.
4. Slide the bottom rubber joint upwards.
5. Remove the guard over the pump spindle coupling by taking off the two nuts and spring washers.
6. Remove the pump bracket cap by taking off the two nuts and spring washers.
7. Push aside the spring wire retaining the coupling key.
8. Withdraw pump from its housing and put the coupling key in a safe place to avoid loss.

To Renew Water Pump Gland Packing.

1. Remove pump complete as above.
2. Unscrew gland nut. (The thread is *left-hand.*)
3. Remove gland spring, washer, and packing.
4. To repack use about four pieces of patent hydraulic packing $\frac{3}{16}$in. square and $3\frac{1}{2}$in. long. Place the pieces round the pump spindle so that the gaps are alternately one side and the other. When the four pieces are in position press them down with a suitable piece of tube passed over the spindle to act as a ram.
5. Replace gland washer, spring, and nut.

(*N.B.*—The packing should not be interfered with unless signs of leakage occur.)

Inspection.

When inspecting the water pipe joints and pump glands for leakage look rather for splashes of rust than pools of water, as any drops that leak from the joints will be blown by the draught of the fan on the surrounding surfaces.

The Fan Belt.

The fan belt is an endless woven fabric, and must be replaced by a new belt if it should stretch to such an extent that the tension mechanism is no longer able to keep it taut.

To Remove the Fan Belt.

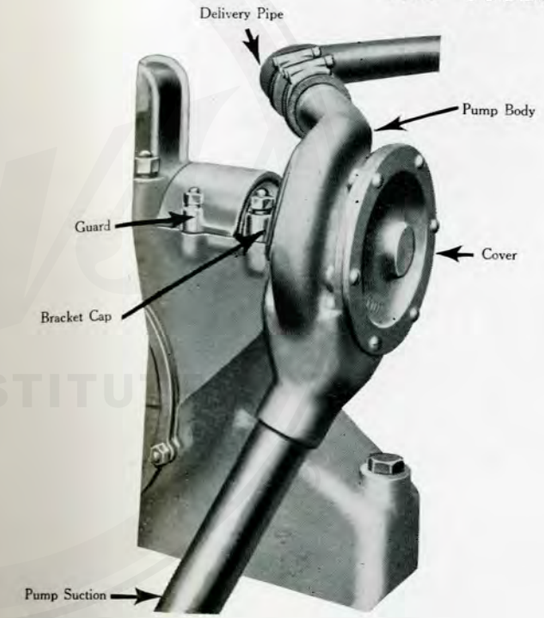
1. Work the fan belt over the inner flange of the pulley on the fan, twisting the belt into position and using the fan blade itself as a lever.
2. Remove belt from damper pulley.

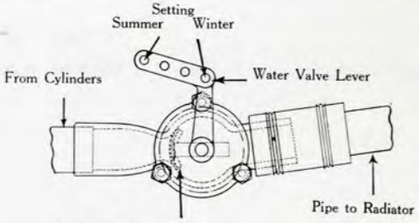
Water Valve Setting. *See* "Control" Section.

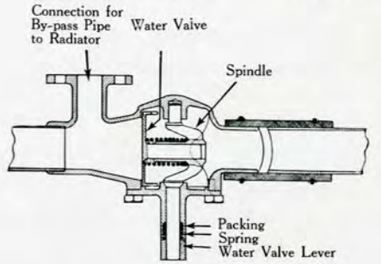
To Renew Water Valve Gland Packing.

1. Disconnect the control rod from the operating lever.
2. Remove the operating lever by tapping out the taper pin.
4. Remove the gland spring, washer, and packing.
5. To repack use a piece of asbestos string, $\frac{1}{8}$in. diameter and about 9in. long. Wind the string round the spindle and press it down with a suitable piece of tube passed over the spindle to act as a ram.
6. Replace the washer, gland spring, and operating lever, taking care to fix the latter correctly with its taper pin.
(*N.B.*—The packing should not be interfered with unless signs of leakage occur.)

THE COOLING SYSTEM.

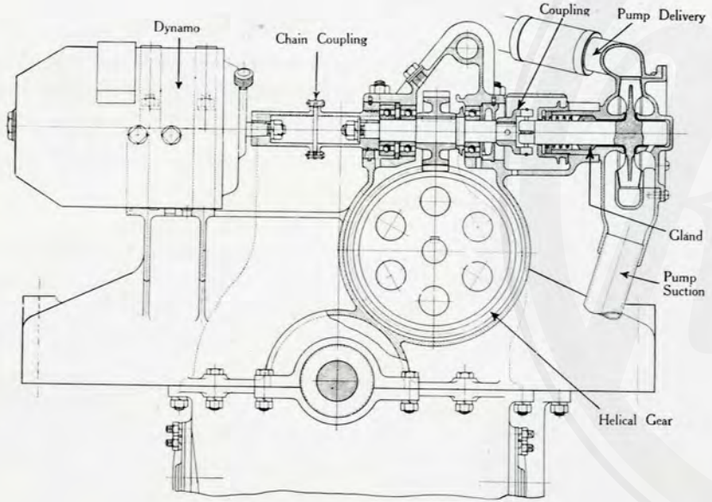


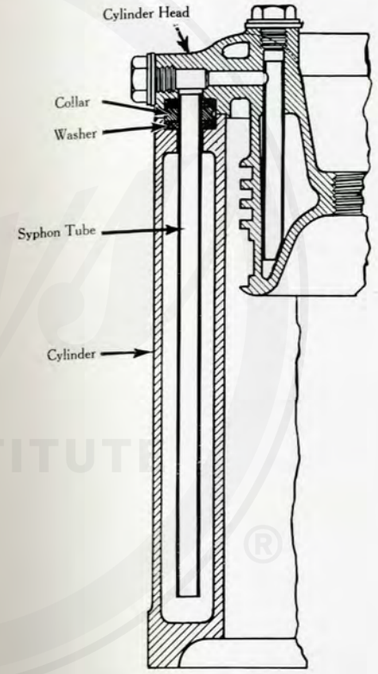




THE WATER VALVE.

THE COOLING SYSTEM.





THE COOLING SYSTEM.

Draining the System.

1. The drain plug is situated in the radiator bottom tank behind the number plate.
2. Removal of this plug drains the radiator, water pump and pipes, cylinders and cylinder heads, the latter being automatically emptied by means of a syphon.
3. Always drain the cooling system before leaving the car in an unheated garage during frosty weather.

Filter.

A filter is provided inside the radiator filler and is easily lifted out. This should be kept free of all dirt and deposit. The amount of attention it will require will depend upon the hardness of the water used.

THE ELECTRICAL CONNECTIONS

Diagram of Connections Starter Motor

Ignition Switchboard Dynamo Battery Lamps

THE ELECTRICAL CONNECTIONS.

DESCRIPTION.

1. The Circuits.

There are six distinct electrical circuits, as follows:—

(a) The dynamo-battery charging circuit.
(b) The lamp circuit (from switchboard to lamps).
(c) The ignition circuit (from switchboard to plugs).
(d) The starter motor circuit (from battery to starter motor).
(e) The electrical horn circuit (from battery to horn).
(f) The body lamp circuit (on closed cars only) from the battery to the body lamps.

2. The Earth Return.

Circuits (a) to (e) are wired on the "single wire" or "earth return" system, the chassis frame acting as "earth." This means that the negative terminal of the battery, the negative brushes of the dynamo and starter motor, the negative bar of the switchboard, the negative terminals of the lamp connecting blocks and horn, the negative side of the contact breaker, and the negative poles of the ignition plugs are all connected directly or indirectly to the chassis frame through which the current flows to complete the circuit.

The earthing of the battery is by means of an external wire to the chassis frame; the dynamo and starter motor are earthed to their own magnets, which are in metallic contact with the frame; the contact breaker is earthed internally to its own body; the instrument board and the lamp connecting blocks are earthed by external wires to the nearest point on the chassis. The ignition plugs are, of course, earthed by the direct contact of their bodies with the cylinder heads.

3. The Body Lamp Circuit.

On closed cars the interior lighting is carried out on the double wire principle, that is to say, the return wire from the lamps is carried direct to the negative pole of the battery.

4. The Lamp Connecting Blocks.

Lamp connecting blocks will be found on the front engine feet, and it is the negative terminals of these blocks that are earthed. Twin wires (i.e., positive and negative) run from these blocks to the lamps. The connecting blocks for the body lamps of closed cars are inside the body under the seat. There is a connecting block on each side of the body.

5. The Fuses.

There are only two fuses. One is situated on the switchboard junction box and belongs to the dynamo field circuit. It " blows " when there is excessive voltage across the field terminals, which may arise through a loose connection on the dynamo battery circuit, causing an abnormally high resistance in the main circuit. Under such conditions the dynamo voltage rises to a value that would, but for the action of the fuse, pass too much current through the field winding. It is for this reason that the dynamo must never be run with the battery disconnected.

The other fuse is in the positive terminal block of the body lamp circuit on closed cars. This fuse blows when there is a " short " in the body lamp circuit.

There is no fuse as a protection against " shorts " in any of the other circuits, but any flow of current through the main lamp circuit will show on the ammeter.

6. The Switchboard.

The switchboard proper, which is mounted on the windscreen moulding, carries a barrel switch controlling the lamps, dynamo, and ignition; the ammeter (with a lamp to illuminate its dial at night); the red lamp; and connections for an inspection lamp.

The switchboard junction box is a separate unit mounted on the dashplate and connected to the switchboard itself by a multiple-cable flex. It comprises a row of terminals, identified by letters and numbers for the external connections; the dynamo field circuit fuse; and the dynamo charging circuit cut-out.

The interior connections of the switchboard or junction box should never require attention. Inspection should be confined to tightening the main terminals and examining the fuse. If the fuse has blown it must be renewed from the small coil of fuse wire wound on the handle of the fuse holder. Never use copper wire in the fuse.

7. The Lamp Circuits.

The head lamps, the side lamps, and the tail lamp are each represented by a separate terminal on the switchboard, but the barrel switch connections are so made that the side lamps and tail lamp are always alight together and remain alight when the head lamps are switched on. Another position of the barrel switch allows the side and tail lamps to remain alight when the ignition is switched off. The near-side and off-side lamp connecting blocks are separately wired direct from the switchboard terminals, but the same terminal is used for each pair of lamps, i.e., terminal (H) connects to both head lamps and terminal (S) to both side lamps. Single wires are used from the switchboard terminals to the connecting blocks, which are earthed on their negative terminals. The lamps themselves are double wired from the blocks.

The tail lamp can be transferred to the other side for driving on the Continent, in which case the double wire from the connecting block in the centre of the cross member is carried across with the lamp.

8. The Dynamo.

The dynamo is shunt-wound and self-regulated on the three-brush principle. When the charging switch is " on " the field circuit is closed through the fuse between the positive and the third brush, the third brush being situated some distance behind the positive brush in the direction of rotation. The self-regulating action has for its object to prevent the voltage rising above the value

that is appropriate to the charging of the battery. The regulation is due to the current through the armature creating a magnetising force at right angles to the main field, which causes the main field to be distorted in the direction of rotation. This distortion results in a portion of the field shifting to one side of the third brush, thereby decreasing the voltage between the third brush and the positive main brush. The field current is thereby reduced, and any increase in dynamo voltage, that otherwise would accompany an increase of speed, is thereby prevented. It is of the utmost importance that the commutator be kept clean. It if gets too dirty the dynamo may cease to deliver any charging current to the battery. The commutator is easily cleaned by pressing a clean rag moistened with petrol against it whilst the dynamo is slowly revolving.

9. The Cut-out.

The positive terminal of the dynamo is connected to terminal No. 5 on the switchboard junction box, which carries two internal connections, one leading to the charging switch and the other to the cut-out. The cut-out is a compound coil supporting a magnetically operated switch. The shunt winding of the coil is connected directly to the negative bar, and is, therefore, virtually placed straight across the main brushes of the dynamo. When the voltage of the dynamo rises to a value sufficient to overcome the internal resistance of the battery the magnetic field generated by the shunt winding closes the contacts of the cut-out against the action of its restraining spring. Current thereupon flows through the series winding of the combined coil and the ammeter to terminal No. 6, to which the battery is connected. As a matter of convenience, the connection between terminal No. 6 and the positive terminal of the battery is made via one of the terminals of the starter switch.

When the speed of the dynamo is insufficient to charge the battery, current ceases to flow to the battery through the series winding of the compound coil, although it continues to flow through the shunt. Under these conditions current from the battery begins to flow in the reverse direction through the cut-out series coil, thus neutralising the magnetic field and thereby enabling the spring to separate the contacts of the cut-out. If the dynamo is accelerated the cut-out closes, its action being entirely automatic, but always dependent upon the charging switch being on. When the charging switch is off no current can flow through the dynamo field and no voltage is generated by the dynamo at any speed. Under these conditions the cut-out remains open.

THE ELECTRICAL CONNECTIONS.

10. The Ammeter.

The ammeter is connected between the battery positive terminal (No. 6) and the dynamo positive terminal (No. 5), the latter connection being via the series winding of the cut-out. It indicates, on the charging side, all current flowing into the battery, and, on the discharge side, all current flowing out of the battery except that used in the starter motor or the electric horn.

The total current consumed is the sum of the dynamo output plus the battery output. The ammeter only indicates the current into or out of the battery.

11. The Ignition Circuit.

The ignition circuit, which begins with the ignition switch on the switchboard, comprises the coil, the contact breaker, the condenser, the distributor, and the ignition plugs as its four main elements.

12. The Coil.

Two alternative types of coil, both of American Bosch design, are used. One model has its casing made entirely of insulating material, while the other has an " armoured " or metal case. The internal connections are the same in both models, there being no direct earth connection to the secondary winding, which has one end connected to the distributor in the usual way, while the other end is connected to the primary winding. The ignition plug

circuit thus embodies three parallel paths for the current, one into the condenser, another through the primary spark at the contact breaker points, and the other through the primary coil and the battery.

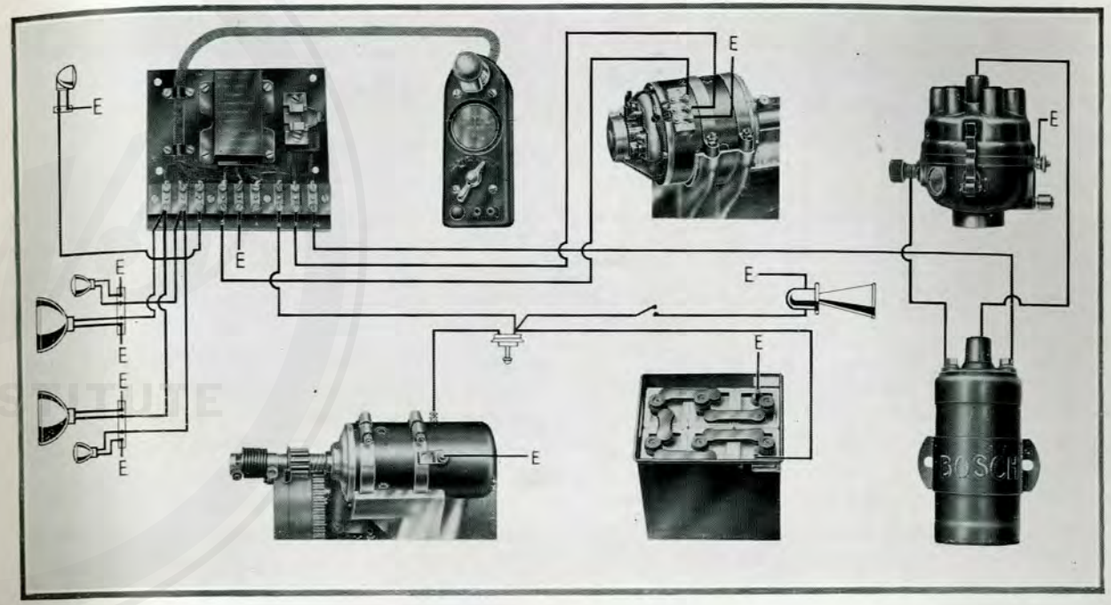
The essential difference which distinguishes that type of coil having an insulating case from the "armoured" type is that the former embodies a small additional coil known as the "resistance unit" and sometimes called the "ballast coil." It is in series with the primary winding of the ignition coil, and all primary current goes through it. When cool it does not seriously increase the resistance of the primary winding, and, under normal conditions of work, it remains cold because the current flowing through it is intermittent. If the current flows through this coil continuously, however, it becomes hot, and thus resistance increases. This tends to reduce the current, and thereby to protect the coil from overheating and the battery from discharging so rapidly if the ignition switch has been left on when the engine is at rest. This resistance coil must never be interfered with in any way.

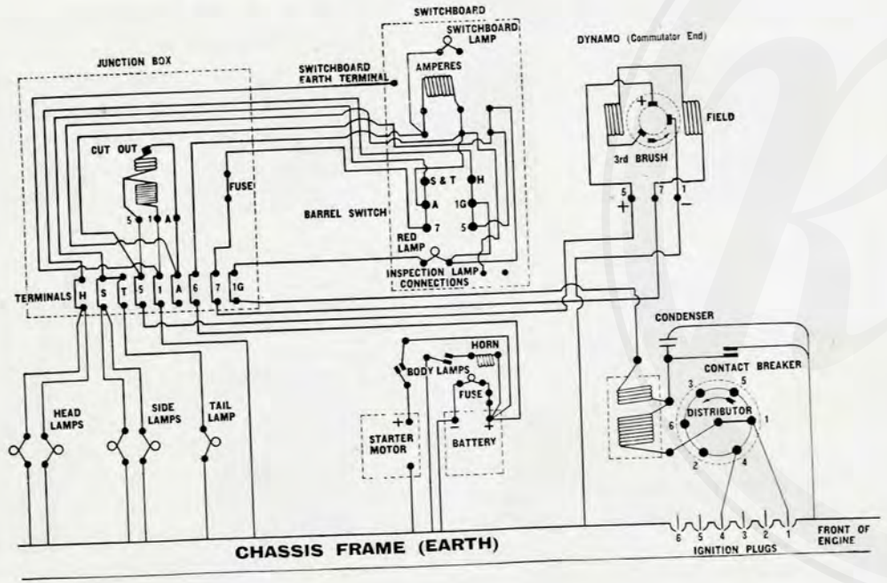
In the "armoured" type, however, the primary winding is wound around the outside of the high-tension secondary winding. Thus any heat generated in the windings is readily dissipated through the adjacent steel casing. This feature, together with the electrical and magnetic characteristics included in the coil, eliminates the necessity for a "resistance unit." The use of an hermetically sealed steel casing is made possible by impregnating the whole of the internal parts with an insulating compound.

13. The Contact Breaker and Distributor.

The contact breaker and distributor are incorporated in one unit called the igniter, the spindle of which is driven from the eccentric shaft by spiral gears. The igniter is of the American Bosch type, and on some cars its spindle incorporates a small centrifugal governor connected to the contact breaker cam, which automatically retards ignition with decrease in engine speed. This

THE ELECTRICAL CONNECTIONS.





THE ELECTRICAL CONNECTIONS.

automatic timing is supplementary only to the hand control on the steering wheel.

The contact breaker, which is similar in principle, action, and adjustment to that of a magneto, is situated below the distributor. It is a mechanical switch that opens and closes the primary circuit. When closed the current flows through the primary and builds up a magnetic field in the core of the coil. When the contacts are separated by the cam, and the direct path of the primary current is intercepted, the current flows momentarily into the condenser. The immediately ensuing discharge of the condenser sets up high-frequency electrical oscillations in the primary circuit, which are magnified by the secondary winding to a voltage that is sufficient to spark across the air gap at the ignition plug points. The high-tension current is also a high-frequency oscillation, and although the whole phenomena is completed in a flash, many reversals of electrical flow take place.

The distributor is a removable arm driven by the igniter spindle and definitely located in relation to the contact breaker cam. It carries a metal brush which distributes the high-tension current from the coil to the sparking plugs in the correct firing order of their respective cylinders.

The condenser, which also forms part of the igniter, consists of a packet of thin sheets of tinfoil interleaved with insulating material, alternative sheets being connected together. Electricity can flow into but not through a condenser. Its capacity is sufficient to receive small quantities of electricity, which are immediately discharged into the circuit. The discharge is of an oscillatory character and dies out rapidly of its own accord. If the condenser is damaged it is incapable of repair but can be replaced by a new one. A damaged condenser or loose connections to the condenser would be indicated by excessive sparking at the contact breaker points.

14. The Red Lamp.

On the switchboard is a red lamp which lights whenever the ignition switch is closed and the dynamo is "cut out." The red lamp is virtually a shunt across terminals Nos. 6 and 5, both of which are positive and of the same voltage when the dynamo is "cut in." Under these conditions no current can flow through the lamp, but when the dynamo cuts out current can flow from the battery via terminal No. 6, the ammeter, the positive bar of the switchboard, the ignition switch, and the red lamp to terminal No. 5, and thence through the dynamo armature to earth. Opening the ignition switch prevents the flow of this current and puts out the light, which has thus served its purpose as a warning.

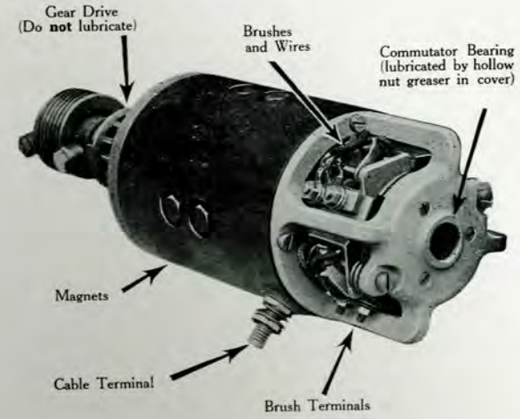
The red lamp goes out automatically when the dynamo cuts in, and at night this is a useful indication that the dynamo is in action. The going out of the red lamp is *not* a sign that the battery is no longer discharging; it is merely a sign that the dynamo is contributing directly to the circuit as much current as its speed permits. If th total current consumed is in excess of the total output the dynamo the ammeter will indicate discharge althoug the red lamp is out.

The lighting up of the lamp is *not* dependent upo any actual flow of current in the ignition circuit, and not in any way a test of it. It is merely an independe visible warning to show that the ignition switch is on a the battery is discharging through the dynamo. Und the practical conditions of driving the red lamp will lig up whenever the engine is running below the critic speed at which the dynamo "cuts in" to charge. Th lighting of the lamp under these conditions is not a sig of danger, but it should always be noted that the red lam goes out as soon as the engine is accelerated, and if th red lamp fails to go out under such conditions it is warning that something is wrong with the chargin circuit. Immediate attention should be paid to this, an the first action should be to clean the dynamo com mutator.

THE ELECTRICAL CONNECTIONS.

15. The Starter Motor.

The starter motor circuit is entirely independent of the switchboard, the positive terminal of the battery being directly connected to one of the terminals of the starter switch, the other terminal of which is directly connected to the positive terminal of the starter motor. Closing the starter switch passes current through the field winding and armature of the starter motor, which are in series. When the armature shaft suddenly begins to turn the pinion lags behind slightly by its own inertia, and it is thereby moved automatically along the screwed spindle towards the flywheel. As soon as it touches the teeth on the flywheel it is automatically screwed into full engagement, and the engine is thereby rotated. As soon as the engine fires the pinion is automatically thrown out of motion by the flywheel overrunning it. The starter motor switch should be operated by a quick press down, and should be released quickly as soon as the engine has started. The pinion is attached to the armature shaft by a coiled spring to minimise the shock in taking up the drive when starting the engine.



Inspection and Lubrication of Igniter.

1. Release the spring catch and remove distributor cover.
2. Lift the distributor arm off its spindle.
3. Platinum tips of contact breaker should be bright and flat. If dark or pitted file carefully with a proper file.
4. With contacts separated by cam the thickness gauge on the spanner should be a tight fit.
5. Pull cap back and fill oil hole to lubricate shaft assembly.
6. Put one drop of oil on pivot carrying interrupter lever.
7. Put a bit of hard grease the size of match head on leading side of fibre block on the interrupter lever.
8. Replace distributor arm. A flat is formed on its boss so that it will only fit on to the spindle in one position.
9. Replace distributor cover, taking care to register on the dowel.

To Remove the Igniter.

1. Make a mark on the igniter casing immediat beneath that distributor terminal which is c nected to the ignition plug in No. 1 cylinder, i the cylinder nearest the radiator.
   N.B.—In all the operations that follow this m is referred to as "Mark No. 1."
2. Remove the distributor cover.
3. Fully advance the ignition lever on the steer wheel.
4. Turn engine until distributor arm points "Mark No. 1."
5. Uncouple the ignition control rod from the tim lever.
6. Take out the setscrew, spring, cup, etc., hold timing lever to engine base.
7. Uncouple low-tension wire.
8. Pull out igniter complete. If it is tight a le may be carefully used to ease it upwards.

THE IGNITION.

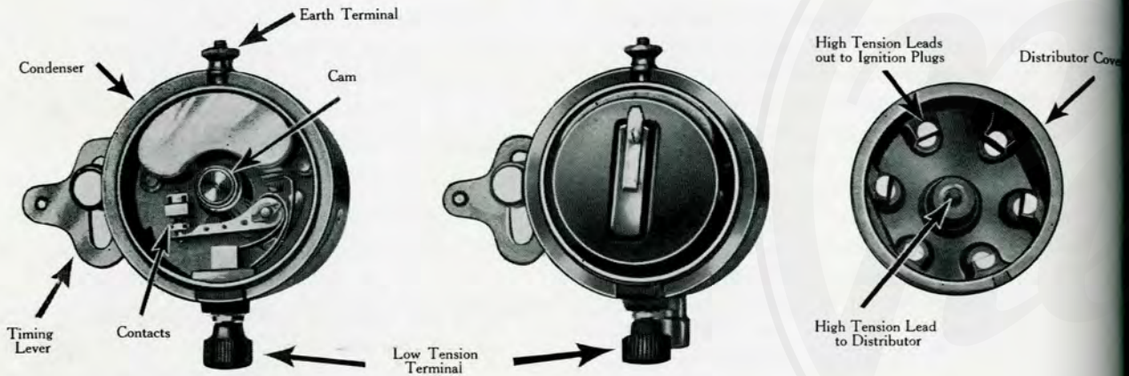
To Replace the Igniter.

N.B.—The engine and ignition lever must be as specified above.

1. Hold the igniter in position so that the timing lever will couple up with the ignition control rod.
2. Turn the distributor arm about $1\frac{3}{16}$ in. beyond "Mark No. 1" in the direction of rotation, i.e., anti-clockwise.
3. Push the igniter into place in the engine base and note that the distributor arm is pointing straight to "Mark No. 1," when the timing lever is ready to be coupled up to the ignition control rod. If the distributor arm does not return to this point pull out the igniter and reset the arm so that it will return correctly when the igniter is replaced.
4. Fix igniter in engine base.
5. Couple up the ignition control rod with the lever. (No movement of the ignition lever on the steering column should be required.)
6. Replace distributor cover, being careful to register the dowel.
7. Couple up low-tension wire.

To Check the Ignition Timing.

1. Remove distributor cover.
2. Fully advance ignition lever on steering wheel.
3. Turn engine until distributor arm points to "Mark No. 1."
4. If the igniter is of the automatic advance type turn the distributor arm in an anti-clockwise direction as far as it will go against the pull of the governor spring and hold it in this position during the next operation.
5. Turn the engine slightly forwards or backwards until the contact points just separate.
6. Remove ignition plug from No. 1 cylinder.



7. Insert a stiff straight wire into the plug hole to rest on the top of the piston and put a straight-edge as a bridge across the cylinder head so that the wire can be marked to coincide with the straightedge.
8. Turn the engine *forward* slowly.
9. The wire should ascend immediately and should cease to ascend when it has risen 8mm. If the wire rises more than 8mm. the ignition is probably too far advanced.
10. If timing is correct replace distributor arm and cover. If not correct proceed to reset the timing as follows:—

To Reset the Ignition Timing.

1. Loosen the grip-screw holding timing lever to igniter case and turn casing *anti-clockwise* slightly to *decrease* the amount of advance.
2. Tighten screw.
3. Check timing as above.

Standard Ignition Timing.

With the ignition fully advanced the piston is 8mm. below the top dead centre when the contact points are just separating.

Firing Order.

Counting the cylinder next to the radiator as No. 1, and numbering the other cylinders in sequence, the order in which the firing strokes occur is as follows:—

1 - 5 - 3 - 6 - 2 - 4 - 1, etc.

The distributor terminals, taken in anti-clockwise rotational sequence, are coupled to the ignition plugs in their firing order.

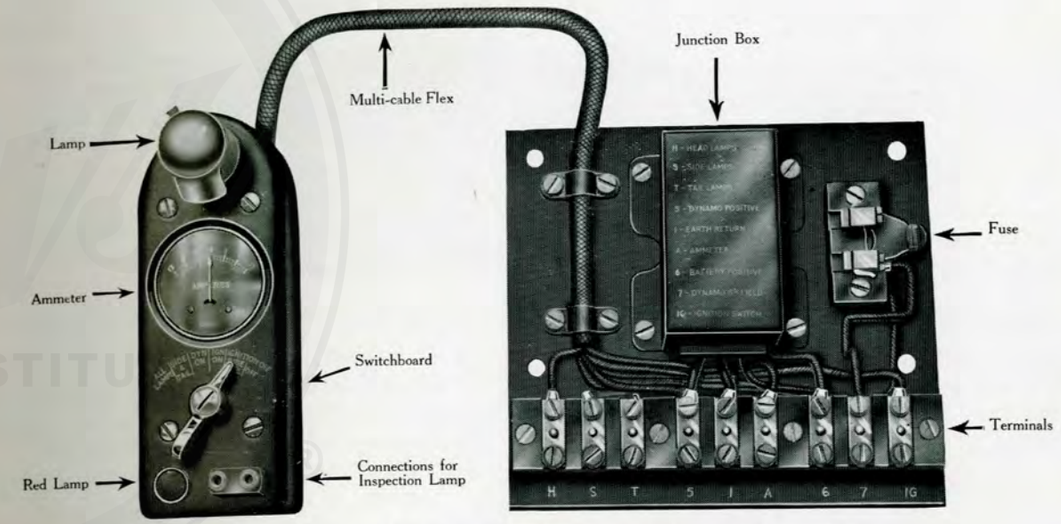
To Test the Ignition Plugs.

There are several plug-testing devices on the market, but the usual method of testing ignition plugs in action is to note the effect of cutting in and out each cylinder

in turn by short-circuiting the plug with any convenient metal instrument having an insulating handle. A screwdriver can be used for this purpose, but if two lengths of chain attached to two wooden handles are used the test can be carried out on a more stringent basis by cutting out all the cylinders except the one under observation.

To Inspect Ignition Plug.

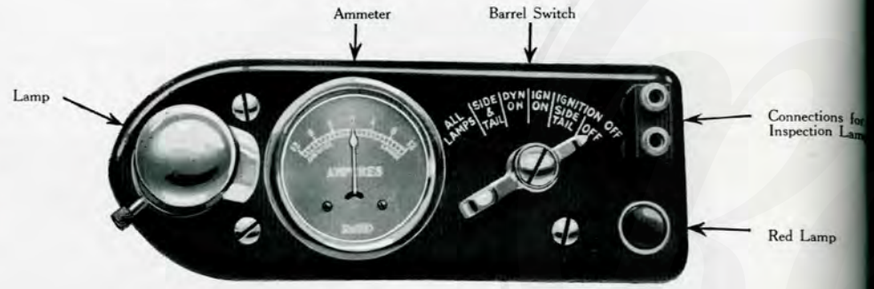
1. Disconnect the ignition wire from the plug and be very careful not to drop the terminal nut down the recess in the cylinder head. Spring washers should not be used on these plugs owing to the liability to drop accidentally when removing the wire. If a terminal nut is dropped it must be recovered before removing the plug, otherwise it will get into the cylinder.
2. Remove the plug with a properly fitting box spanner.
3. The points of the plug should be clean and just admit the gauge on the magneto spanner.
4. Before replacing the plug wipe the insulator and renew the washer if necessary.



For use with certain types of body, the switchboard itself is modified externally to provide for horizontal mounting, as shown on the next page.

THE SWITCHBOARD.

This type of switchboard, mounted horizontally, is used when certain bodies are fitted. Its internal connections are exactly the same as that shown on the previous page, and it is used with the same junction box.



To Inspect Junction Box.

1. Remove the carpet panel covering the left-hand side of the dashplate, thus exposing the junction box.
2. Tighten terminal screws.
3. Inspect fuse.

To Renew Fuse.

1. Remove broken ends of wire.
2. Unwind suitable length of new wire from co carried by handle of fuse holder and insert i holder.
   N.B.—Never use any other sort of wire for thi purpose.

Warning. Disconnect at the battery before disconnecting any wires elsewhere.

THE DYNAMO.

Daily Test.

1. Accelerate engine and note that the red lamp goes out properly and that the ammeter shows maximum net charging, as indicated in table below.
2. If red lamp does not go out properly, or *ammeter* needle vibrates, *clean* the *commutator*.
3. When car is started note that dynamo cuts in at about the speed indicated in table.
4. TABLE OF DYNAMO OUTPUT:—

Dynamo cuts in at	Net charging current at 28 m.p.h.	
	Ignition only	All lamps on
10 m.p.h.	10 amps.	4½ amps.

N.B.—The ignition current is about 2 amps.
The side and tail lamp current is about 1½ amps.
The head lamp (pair) current is about 4 amps.

The actual output of the dynamo is therefore about 12 amps. at 28 m.p.h., and does not increase at higher speeds. At lower speeds it is less, and charging ceases below the cutting-in speed.

To Clean Commutator.

1. Remove cover.
2. Press a clean linen rag, moistened with petrol, firmly against the commutator whilst it is revolving slowly.
   N.B.—If the rag is held on the finger turn the engine by hand. If a shaped stick is used to hold the rag the engine may be run slowly under its own power. Take care not to derange the brushes. It is *not* necessary for the commutator to be bright, and glass paper should only be used as an alternative to the rag under exceptional circumstances. Never use emery cloth on a commutator.

Lubrication.

The bearings are packed with high melting point grease, and will only require attention when the car is overhauled, say once a year. Never use oil anywhere on the dynamo.

To Inspect Brushes.

1. Remove cover.
2. Move the brushes in their guides to see that they are true.
3. Run engine and observe if the sparking is excessive.
4. If brushes appear to be worn out or otherwise defective they should be renewed.

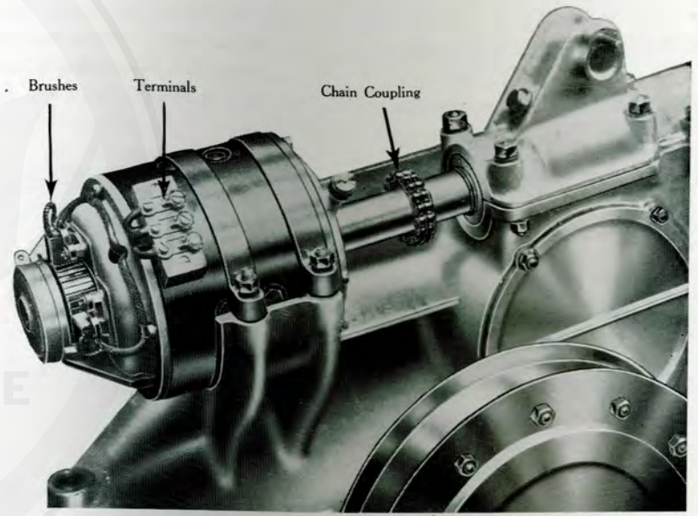
To Renew Brushes.

1. Slack off the clips holding the dynamo. The dynamo can be rotated to allow the removal of all the brushes.
2. Unfasten brush terminals.
3. Remove brushes with their wires attached.
4. Replace with new brushes complete with wires.

To Remove Dynamo.

1. Disconnect wires at dynamo.
2. Remove the chain coupling on the dynamo spindle by unscrewing the nut from one of the link pins.
3. Take off the two clamps securing the dynamo in position by removing the four nuts and spring washers.
4. Withdraw dynamo upwards and outwards.

THE DYNAMO.

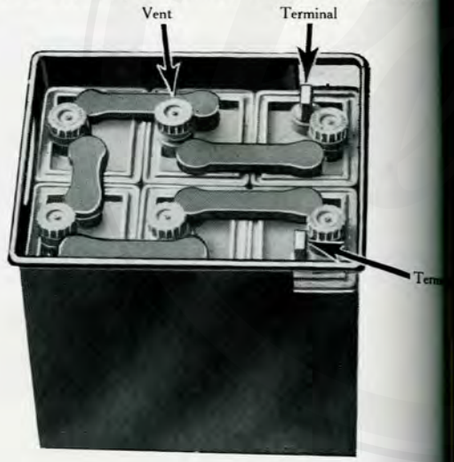


Care.

1. Keep the charging switch on whenever the engine is running.
2. Note that the ammeter shows a proper charging rate as indicated in table showing output of dynamo.
3. Note that the red lamp goes out as soon as the engine is accelerated. If it stays alight clean the commutator. If it still stays alight inspect the electrical connections.
4. Avoid running the battery right down.
5. Never allow the battery to remain discharged for any length of time.
6. Keep the outside of the battery dry and the terminals tight and coated with vaseline.

Inspection.

1. Remove the floorboards inside car and take off the lid of battery box.
2. Remove stoppers from the vents.
3. The acid should be just above the level of the of the plates. If low refill with distilled water o Never use ordinary water and never add acid un it is necessary to correct the specific gravity.



4. In a fully charged battery that is in good condition the positive plates are dark chocolate in colour and the negative plates pale grey. Light brown positive plates show that the battery is discharged.
5. Test the specific gravity of the acid.
6. Test voltage across battery terminals with a voltmeter. It should be between 14-15 volts. If only 11 volts the battery is practically discharged.

To Remove Battery from Car.

1. Unscrew wing nut and remove strap securing lid.
2. Remove lid.
3. Disconnect cables from terminals. (Replace nuts on the cable ends to avoid loss.)
4. Lift out the battery by means of the handles of its metal container.

To Recondition the Battery.

1. Charge up to the full voltage.
2. Empty out the acid.
3. Refill with new acid of 1.225 specific gravity.
4. Recharge.

To Prepare New Acid.

1. Partly fill a clean glass vessel with distilled water.
2. Insert a densimeter.
3. Pour in slowly the purest brimstone sulphuric acid until the specific gravity is 1.225. (*N.B.*—Never pour water on to acid.)
4. Allow the liquid to cool before filling the battery with the prepared acid.

To Charge a New Battery.

1. The first charge of a new battery should be at the rate of eight amps. for eighteen hours at least, without interruption, or at the lower rates and for the longer periods shown on the instruction labels attached to each battery.

2. In any case charging must continue without stopping until the acid turns milky and the specific gravity is 1.225. About thirty-six hours may be necessary for this charge. Neglect to give a proper first charge may ruin the battery.
3. After the first charge it improves the capacity of the battery to empty out the acid (whilst fully charged), refill with fresh acid of 1.225 specific gravity, and give a further short charge at the normal charging rate shown on the label until the battery registers 15 to 16 volts.

Transport and Storage.

1. Empty out the acid before sending batteries train.
2. Do *not* empty out the acid when storing batter but fully charge them and keep them in a d cool place.

To Remove Lamp Bulb.

1. Take out locking screw from rim of front glass.
2. Unscrew front glass.
3. Remove lamp bulb.

To Detach Reflectors.

Wholly unscrew *large* knurled ring at back of lamp.

To Focus Lamps.

1. Partly unscrew *small* knurled nut at back of lamp.
2. Move the lamp holder until lamp is in focus as shown by a clear beam ahead free from any black patch in the centre. Generally the bulb will need moving back towards the reflector when focussing.

To Polish Reflector.

Rub with "Selvyt" or chamois leather. Never use metal polish. The surface is *silver*-plated.



Lamp Bulbs.

Use Rotax 12-volt D.C. bayonet-type bulbs for all lamps.