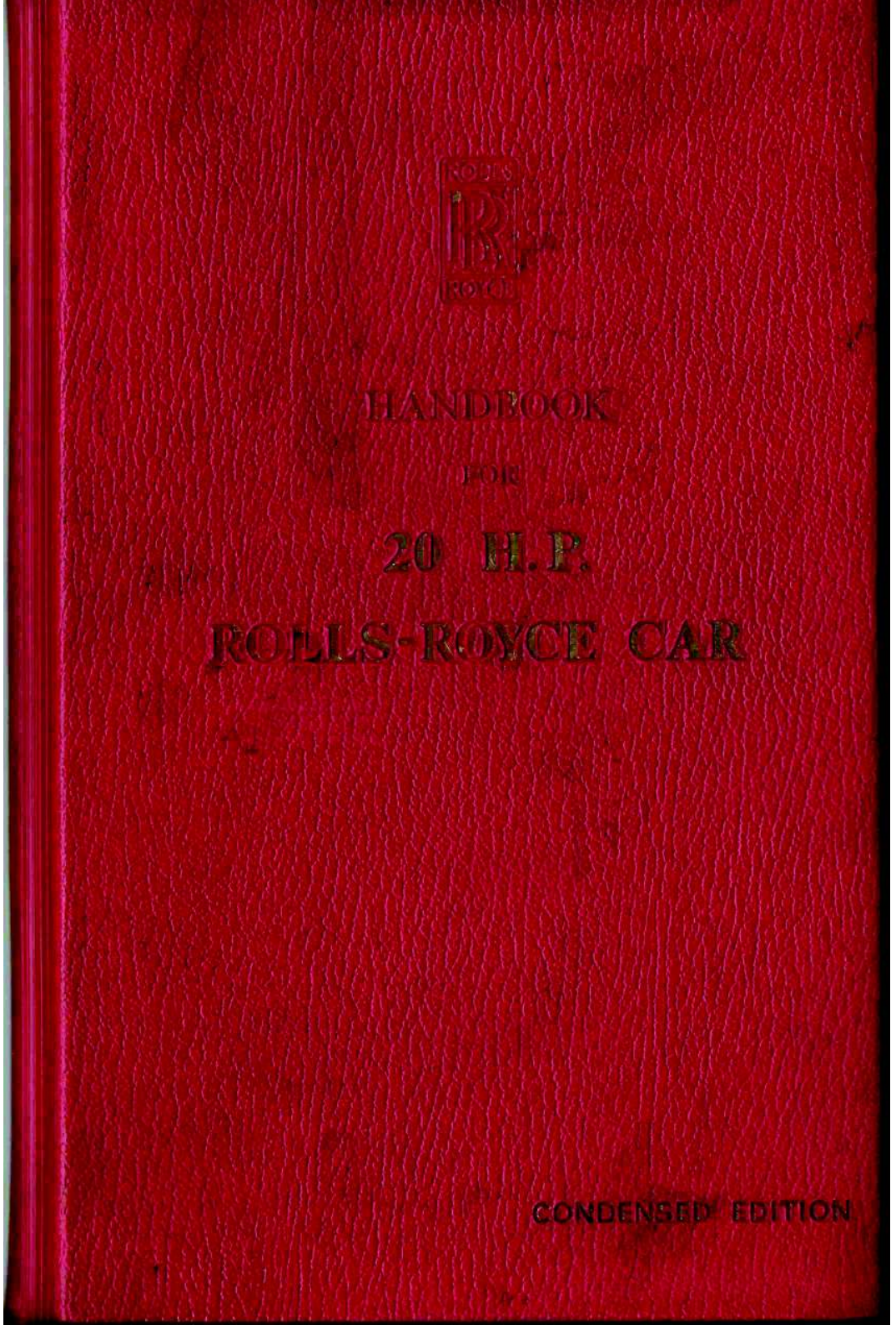
ROLLS
ROYCE
HANDBOOK
FOR
20 H.P.
ROLLS-ROYCE CAR
CONDENSED EDITION

HANDBOOK

20 H.P.
ROLLS-ROYCE CAR

CHASSIS SERIES
(In order of Issue)

GPK	GZK	GHJ	GXL	GKM	GEN
GSK	GUK	GAJ	GYL	GTM	GVO
GCK	GYK	GRJ	GWL	GFN	GXO
GOK	GMJ	GUJ	GBM	GLN	

Liable to alteration without notice

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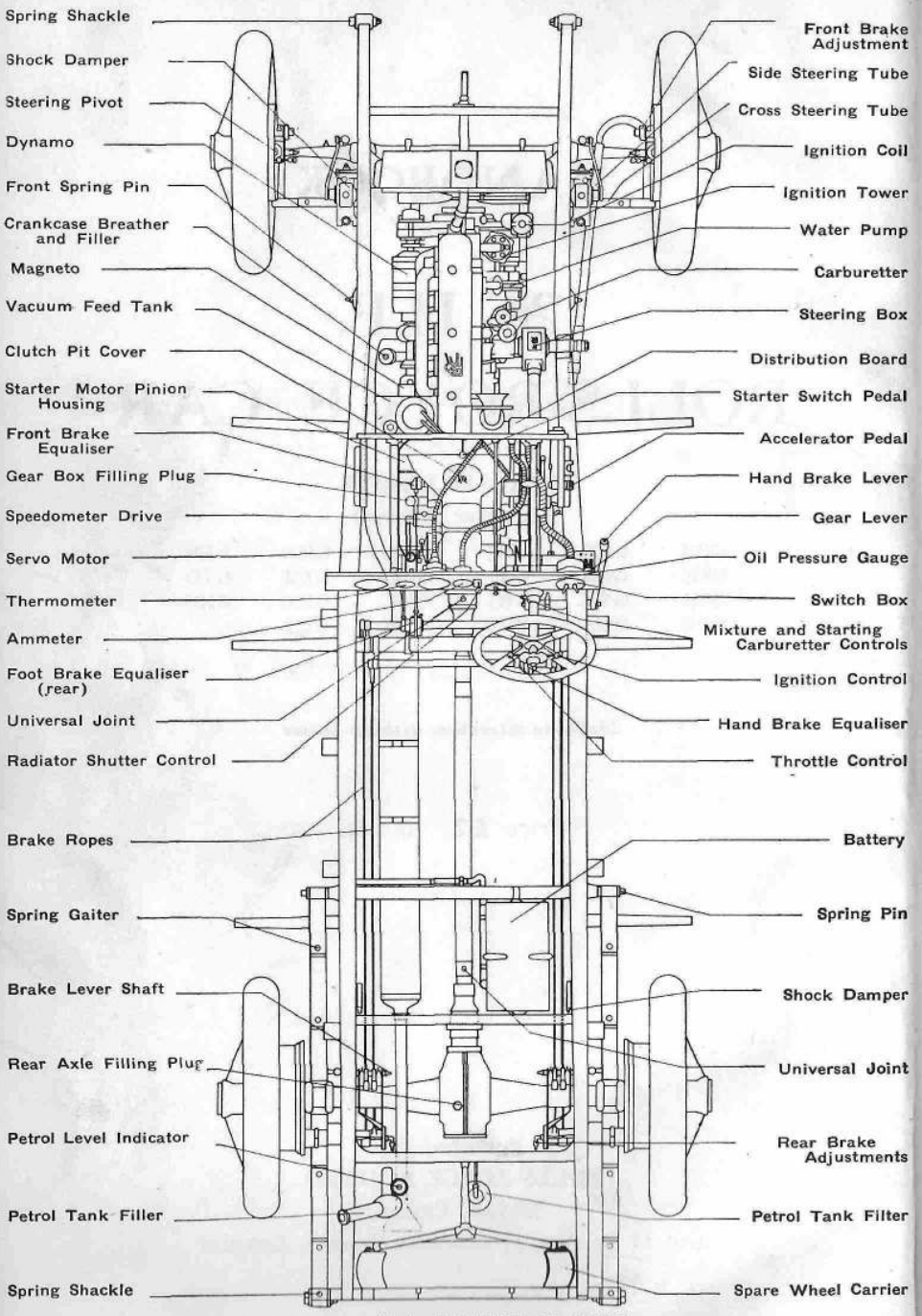

Fig. 1.—PLAN VIEW OF CHASSIS.

ROLLS-ROYCE LIMITED

London Offices and Showrooms:

14 & 15 Conduit Street, London W.1

TELEGRAMS: "ROLHEAD, PICCY, LONDON."

TELEPHONE. MAYFAIR 8201 (7 LINES).

CODES USED: A B C (5TH EDITION), BENTLEY'S, MARCONI, MOTOR TRADE, WESTERN UNION.

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THE SECRET OF SUCCESSFUL RUNNING

Before a Rolls-Royce chassis is sold, it is very carefully tested and adjusted by experts. It will run best if no attempt is made to interfere unnecessarily with adjustments.

An owner would do well to instruct his driver as follows:—

Lubricate effectively, in strict accordance with the advice given in this Handbook, and do not neglect *any* part.

Inspect all parts regularly, but take care not to alter any adjustments unless really necessary.

CONTENTS

SERVICE FACILITIES FOR ROLLS-ROYCE CARS

Our interest in your Rolls-Royce car does not cease when you take delivery of the car. It is our ambition that every purchaser of a Rolls-Royce car shall continue to be more than satisfied.

With this end in view, we have appointed Special Retailers throughout the world, who have established properly equipped Service Stations, staffed by men who have been specially trained in servicing Rolls-Royce cars.

In addition, on the staff of Rolls-Royce Limited, there are experts whose sole duty it is to maintain contact with the Special Retailers, and they are available at all times, to be called in for consultation on any matters affecting your car.

If, therefore, you should require any assistance, we ask that you should immediately contact our nearest Special Retailer, who will be only too pleased to place his facilities at your disposal. If necessary he will call in for consultation our expert in that area. It is earnestly hoped that this arrangement will prove of mutual benefit, as we shall thus be kept in constant touch with our Customers, who may be spared the trouble of a long journey to one of our Company's Service Stations.

In the event of it being more convenient to call on us direct for assistance, our Main Service Station at Hythe Road, Willesden, London, N.W.10, and the one at our factory at Crewe, will be ready at all times to help. (See maps at end of Handbook.)

LEADING PARTICULARS OF CHASSIS

Engine.

Six cylinders, 3″ (76 m/m.) bore, 4½″ (114 m/m.) stroke, 3,127 c.c. cubic capacity.

Mono-bloc casting with detachable cylinder head, overhead valves operated by push rods.

Engine Lubrication.

Pressure feed to all crankshaft and connecting rod bearings. External oil pump with relief valve, giving a positive low pressure supply to the valve rockers and timing gears.

Carburetter.

Rolls-Royce automatic expanding type, incorporating two jets controlled by a lever on the steering wheel. Auxiliary carburetter provided for starting purposes only.

Fuel System.

Fourteen-gallon tank at rear of chassis.

Supply by vacuum feed system with vacuum service tank mounted on the dash-board. Fuel level gauge mounted on the tank at rear.

Cooling System.

By centrifugal pump circulation and fan, with hand-controlled shutters in front of radiator.

Coolant temperature thermometer and warning light mounted on the instrument board.

Electrical Equipment.

Twelve-volt system with automatic regulation of dynamo output.

Separate starter motor with Bijur coupling, providing gentle engagement.

Battery of 50 ampere-hour capacity approximately. Twin ignition systems, battery and magneto.

Clutch.

Single dry plate type.

Gearbox.

Either three forward speeds and reverse, or four forward speeds and reverse, depending on date of chassis, non-synchromesh. Right-hand control lever.

Rear Axle.

Full floating type. Spiral bevel drive.

Road Springs.

Semi-elliptic front and rear.

Brakes.

Internal expanding, servo operated, on all four wheels.

Independent hand brake operating on rear wheels.

Road Wheels.

Either Dunlop detachable wire wheels, with 32″ by 4½″ straight side cord tyres.

Or Dunlop detachable well-base wire wheels, with Dunlop cord, wired type tyres, 5¼″ for 21″ rim.

Or 6″ for 20″ rim
Or 6″ for 19″ rim } **depending on date of chassis.**

Dimensions.

Wheelbase	129″
Track—Front	56″
Rear	56″

CHAPTER I

Starting the Engine and Driving the Car

Starting the Engine—Ignition and Throttle Controls—Gear Changing —Battery Charging—Lighting Control and Switch—Radiator Shutters—Overheating—Fitting of Snow Chains.

Starting the Engine.

To start the engine, first check that the change gear lever is in neutral, close the radiator shutters by moving the control lever on the instrument board, then switch on the ignition by moving the right-hand thumb lever on the switchbox to position marked **"I"** (Ignition); retard the ignition and close the throttle by bringing both the levers on the steering column to their bottom positions; next open the starting carburetter by pushing the lever on the instrument board to the position marked **"Starting"** or **"On"**, and set the mixture control lever over to **"Strong"**. Now depress the small pedal situated low down in the centre of the dashboard; this closes the main switch between battery and starter motor, and the latter will start up the engine. As soon as the engine commences to run regularly, move the throttle control lever on the steering column about half-way up its quadrant and turn back the starter carburetter control lever to the position marked **"Running"** or **"Off"**.

The starting carburetter should not be used for more than half a minute before changing over to the main carburetter, and it should only be used when the engine is cold.

Excessive use may lead to failure of the cylinder lubrication owing to dilution of the oil by petrol.

When the engine has warmed slightly, the mixture control should be set half-way between **"Strong"** and **"Weak"**.

A starting handle is carried in the tool kit. After use, it should be removed from the bracket and returned to the tool kit.

Difficult starting may be due to dampness in the H.T. distributor caused by condensation. The distributor should be removed under such circumstances and wiped out with a clean dry rag. The rotor should also be wiped dry. This trouble is only likely to arise when the car has been standing. The warmth of the engine will prevent such condensation normally.

It will be noticed that while the working pressure indicated on the oil gauge is only 15 to 20 lbs. when the engine is thoroughly warmed up, the gauge will show a considerably higher reading with the engine cold, due to the greater viscosity of the oil at low temperatures. The pressure will however, fall to normal as soon as the oil becomes warmer.

Ignition and Throttle Controls.

When driving the car, the ignition lever should, normally, be advanced about three-quarters along its quadrant, and the throttle lever set to a position at which the engine will run as slowly as possible without risk of stopping when the clutch is withdrawn. For country driving, however, the throttle lever may with advantage be moved to its lowest position, when the throttle will be closed, and the engine can be used as a brake to assist in decelerating the car when it is required to slow up. Under these circumstances it must be borne in mind that the engine will stop if the accelerator pedal is released and the clutch withdrawn. Consequently, the throttle lever must be restored to its slow-running position when the necessity for such operations appears likely to arise.

The amount of advance on the battery ignition system is controlled partly by hand and partly automatically by means of a centrifugal governor operating on the distributor drive. This is capable of meeting 90 per cent. of the conditions due to varying road speeds, leaving only extreme conditions to be met by moving the hand control on the steering column.

Gear Changing.

The position of the gear lever for each of the four speeds and reverse is shown in Fig. 2.

It should be noted that the gearbox does not incorporate synchronous gear meshing devices, therefore, it is imperative that when making any change of gear, either up or down, that **the double de-clutching method must be used.**

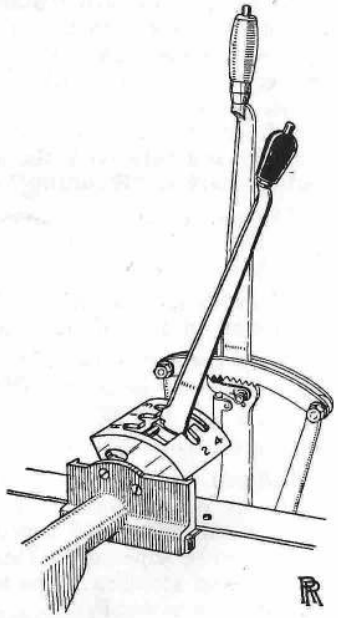


Fig. 2.—PERSPECTIVE VIEW OF GEAR LEVER GATE.

Battery Charging.

The position marked **I & C** (ignition and charging) on the switchbox for the thumb lever indicates that the ignition is on, and that the dynamo is charging the battery. In town driving, one should always have the switch in this position while the engine is running, but for long fast country runs it is desirable to use some discretion as to how long the switch should be in this position. Generally speaking, a good rule, if running under daylight conditions, is to run for the first quarter of the journey

charging, then switch over to the position marked **I** (ignition only), and run for the next half of the journey, and for the final quarter switch back to **I & C.**

Whenever the lamps are in use, and engine is running, always have the switch in the position marked **I & C.**

Lighting Control and Switch.

Adjacent to the ignition switch is the lighting control switch, for which alternative **ON** positions are provided, viz.:—

OFF.—No circuit in action.

S and **T.**—Side and tail lamps on.

H, S and **T.**—Head, side and tail lamps on.

This switch may be locked in either the **OFF** or **S** and **T** position, and the key withdrawn. Do not attempt to lock the switch in any other position.

Radiator Shutters.

A thermometer is arranged on the instrument board to indicate the coolant temperature of the engine. On certain chassis it incorporates contacts which close and complete an electrical circuit when the temperature of the coolant approaches boiling point. This lights a lamp behind a small red window on the instrument board, warning the driver that the temperature conditions of the engine require adjustment of the radiator shutters.

The normal working temperature should be between 70° C. and 90° C., and, therefore, when starting the engine the shutters should be closed. They should remain so until the coolant temperature reaches 70° C.

When driving, it is not necessary continually to readjust the shutters. So long as the temperature is somewhere between 70° C. and 90° C., the engine will be in a reasonable condition as regards jacket temperature. The temperature should be taken by reference to the thermometer, not by waiting until the warning lamp lights. The latter indicates a temperature condition which must be avoided.

The fitting for controlling the opening of the shutters is arranged on the left-hand side of the driver on the instrument board, in a position which enables him to open or close the shutters with ease.

On all occasions when the engine is stopped, the shutters should be closed in order to preserve the high temperature of the jacket coolant as long as possible.

Under night driving conditions, the instrument board lamp must be used to check the thermometer reading.

Overheating.

If, on long ascents, which call for full throttle, "boiling" should occur due to abnormal conditions of atmospheric temperature, and, or, following winds, etc., it is preferable to change into a lower gear and reduce the throttle opening.

Adjustment of the fan belt may be necessary, and this should receive attention.

Fitting of Snow Chains.

In the event of snow chains being necessary, they should be fitted to the rear wheels only.

A Parsons' chain, known as the "Special Rolls-Royce Type", is available. It is recommended that these be obtained through Messrs. Rolls-Royce Limited, or one of their "Special Retailers" in order to ensure the supply of the correct type.

When fitting these special chains, it is **essential** to commence by fastening the one hook on the inside of the wheel and always to take up the adjustment on the outside, where two fastening clips are provided. The tensioning springs which are supplied to go on the outside of the wheel must always be fitted.

CHAPTER II

Periodic Lubrication and Attention

LUBRICANTS RECOMMENDED.

Rolls-Royce Limited recommend a first quality oil of viscosity S.A.E. 30 for the engine all the year round, and viscosity 80/90 for the gearbox.

Note.—The recommended oil for use in the engine may require slight modification if the engine is in very poor condition, in which case use of an S.A.E. 40 viscosity oil may be to advantage.

Any of the following oils are suitable:—

	"A" Engine.		"B" Gearbox.	"C" Hand-oiling Points.
	SAE. 30.	SAE. 40.		
B.P. Energol	30	40	90	20
Wakefield's Castrol ...	X.L.	X.X.L.	S.T.	Castrolite
Shell	X-100 SAE 30	X-100 SAE 50	X-100 SAE 60	X-100 SAE 20

Equivalent oils to the above are also marketed by:—Sternol Ltd., Alexander Duckham & Co. Ltd., Anglo-American Oil Co. Ltd., Gulf Oil (Great Britain) Ltd., and Dalton & Co. Ltd.

In the instructions which follow, reference is made to oil "A", "B", or "C" as above, i.e. of the required viscosity.

Rear Axle, Steering Box and Propeller Shaft.

Viscosity 80/90, as under "B" above.

Hydraulic Shock Dampers.

As under "C" above, **do not mix.**

Front and Rear Hubs.

Belmoline "C", Retinax "R.B.", or similar type of ball-bearing grease.

Contact Breaker Cam and Wheel Hub Shells.

Retinax "C.D.", Mobilgrease No. 2, or a similar type of grease.

Water Pump.

Belmoline "A", Retinax "P", or a similar type of grease.

CAPACITIES.

Engine	1 gallon.
Gearbox	5 pints.
Rear Axle	2 ,,
Cooling System	3¾ gallons.
Fuel Tank	14 ,,

LUBRICATION BY MEANS OF THE OIL GUN.

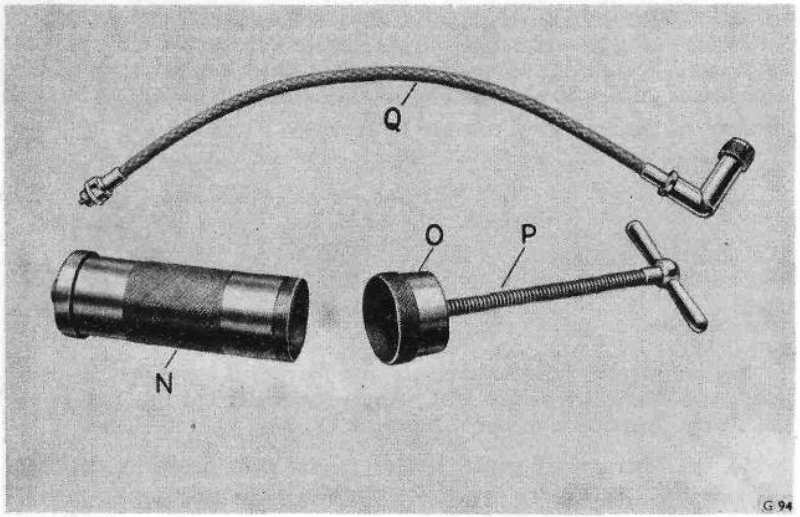


Fig. 3.—OIL GUN OPENED FOR FILLING.
N Barrel. P Piston Rod.
O Cap. Q Connection.

The oil gun is shown dismantled for filling in Fig. 3. It consists of a barrel **N** on to which is screwed the cap **O**. The rod **P**, carrying a cup leather, is threaded into the cap, therefore when this rod is screwed down by means of the handle, oil may be expelled from the barrel under considerable pressure.

The flexible connection **Q** is fitted with a non-return valve, which is closed with a spring, except when the connection is screwed on to

one of the chassis adapters or lubricators. Consequently, no oil can be expelled through the connection until this is in position on the lubricator.

In addition, each lubricator on the chassis is equipped with a ball non-return valve, which is opened by the valve in the flexible connection when this is screwed on.

Only the recommended oils should be used in the oil gun.

The gun is filled by unscrewing and removing cap **O**, together with rod **P**, and pouring oil into the barrel. To facilitate re-entry of the cup leather into the barrel, the cap **O** is formed with an internal diameter equal to that of the barrel, and before replacing the cap it should be screwed down on the rod as far as possible, as shown in Fig. 3. The leather will then be contracted by the cap, and on replacement of the latter will enter the barrel freely. The gun is then ready for use.

Owing to the arrangement of the valve in connection **Q**, care must be taken that this is screwed well home on a lubricator, otherwise the gun will not work.

The oil gun is of a special low pressure type, the angle of the screw on rod **P**, in combination with the size of the handle and the diameter of the barrel, being carefully proportioned to enable a sufficient pressure to be attained without undue effort for use on any lubricator on the chassis.

On no account must a high-pressure oil gun, or one provided with an "intensifier", be used on any of the lubricators. The use of such a gun may easily result in damage to the pipe lines or to the component on which the gun is used.

Caps are provided on the oil gun lubricators, which must be removed before screwing on the connection, and subsequently replaced.

POINTS FOR REGULAR ATTENTION ACCORDING TO USE OF CAR.

DAILY.

Crankcase Oil.

The engine oil level indicator situated on the left-hand side of the crankcase should be inspected **daily,** and the quantity of oil maintained at about one gallon, as shown by the indicator finger. The engine should never be run with less than half a gallon of oil. The oil filler is on the left-hand side of the engine, the cap being provided with a bayonet joint.

Water in Radiator.

The radiator water level should be inspected **daily.** It should stand between 3½″ and 4½″ from the top of the filler spout.

WEEKLY.

Tyres.

Check the tyre pressures. These should be:—

	32″ x 4½″ Straight-side	5¼″ x 21″ Well-base	6″ x 20″ Well-base	6″ x 19″ Well-base	
Front ...	45 lbs.	40 lbs.	35 lbs.	35 lbs.	} Cold.
Rear ...	45 ,,	35 ,,	30 ,,	35 ,,	}

EVERY 500 MILES.

LUBRICATION.

PARTS TO BE LUBRICATED.	NO. OF POINTS.	HOW LUBRICANT IS APPLIED.	LUBRICANT AND QUANTITY.
Front Spring Shackles	4	Oil Gun ...	Oil "B". Screw down until oil exudes from ends of bearings.
Rear ends of Front Springs	2	Oil Gun ...	Oil "B". Screw down two or three turns.
Cross Steering Tube (both ends)	2	Oil Gun ...	Oil "B". Screw down two or three turns.
Side Steering Tube (both ends)	2	Oil Gun ...	Oil "B". Screw down two or three turns.
Front Shock Damper Connections	2	Oil Gun ...	Oil "B". Screw down three or four turns.
Friction Shock Damper Leathers	2	Oil Can ...	Oil "C". Apply a few drops to exposed edges of leathers.
Steering Pivots ...	2	Oil Gun ...	Oil "B". Screw down until oil exudes. Carefully wipe off excess oil.
†Universal Joints at both ends of Propeller Shaft	2	Oil Gun ...	Oil "B". Screw down two or three turns into each joint.
Forward ends of Rear Springs	2	Oil Gun ...	Oil "B". Screw down two or three turns.
Rear Spring Shackles	4	Oil Gun ...	Oil "B". Screw down until oil exudes from ends of bearings.
Rear Shock Damper Connections	2	Oil Gun ...	Oil "B". Screw down three or four turns.
Steering Box ...	1	Oil Can ...	Oil "C". Inject a few drops in spring-lid lubricator.*
Water Pump Bearing and Gland	1	Screw-down Lubricator	Grease. Fill lubricator cap and screw right home.

* If Steering Box Cover has a fillling plug, see page 21.
† Early series, see page 26.

ALSO EVERY 500 MILES.

Inspect level of acid in battery cells—**this is most important**—and if required, top up with distilled water so as to maintain the level of the solution at ⅜″ above the tops of the plates.

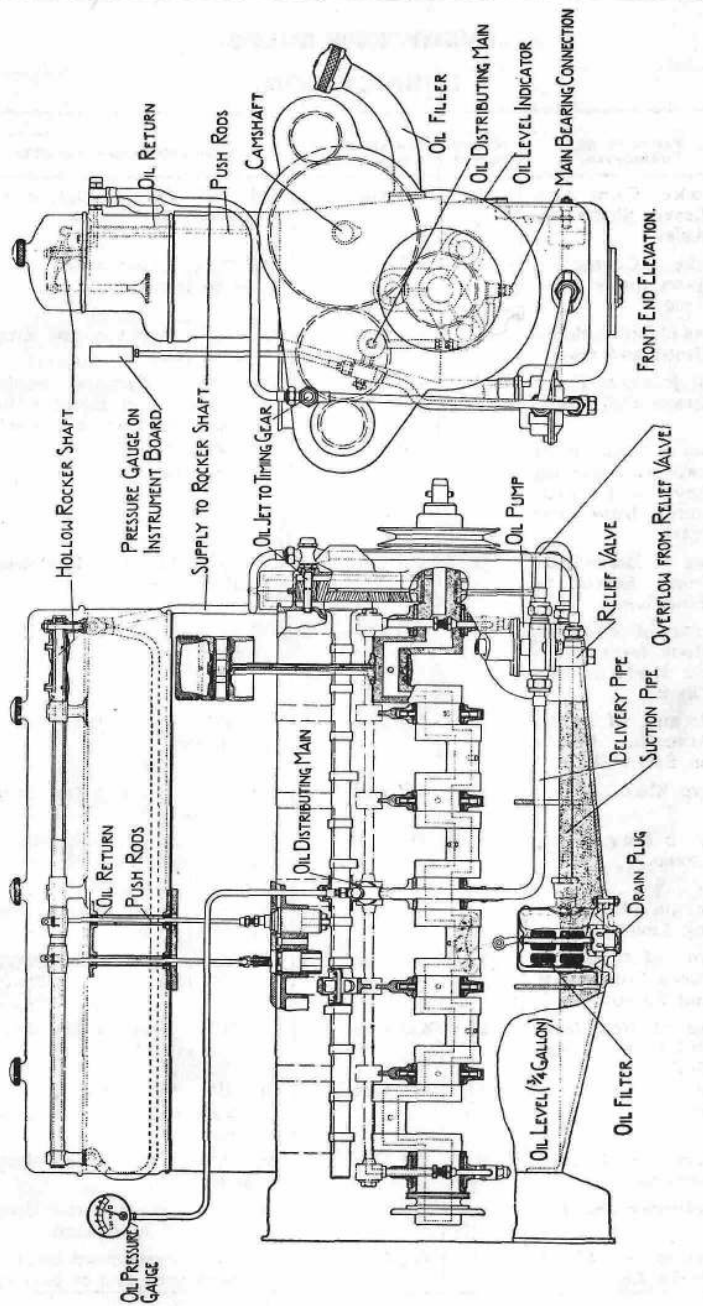


Fig. 4.—ENGINE LUBRICATION SYSTEM.

EVERY 1,000 MILES.

LUBRICATION.

PARTS TO BE LUBRICATED.	NO. OF POINTS.	HOW LUBRICANT IS APPLIED.	LUBRICANT AND QUANTITY.
Brake Cam and Lever Shafts on Axles	10	Oil Gun ...	Oil "B". Oil sparingly where shafts enter drums.
Brake Connection Jaws under Rear Axle	8	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Jaws of Brake Ropes (front and rear)	12	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Ball Joints of Front Brake Pull Rods	4	Oil Can ...	Oil "C". Remove leather stockings and inject a few drops into sides of sockets.
Jaws of Brake Rods between Balancing Lever and Equalisers (front and rear)	4	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Jaws of Brake Rod from Servo to Equaliser	2	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Joints of Coupling Rods from Servo to Balancing Lever	4	Oil Can ...	Oil "C". Inject a few drops on to joints.
Fulcrums of Brake Actuating Levers on Servo Shaft	2	Oil Can ...	Oil "C". Inject a few drops on to joints.
Servo Shaft	1	Oil Can ...	Oil "C". Inject a few drops into oil hole.
Servo Engaging Levers	1	Oil Can ...	Oil "C". Inject only one or two drops into oil hole in boss of outer lever.
Fulcrum of Balancing Lever	1	Oil Can ...	Oil "C". Inject a few drops into oil hole.
Joints of Links between Cross Shaft and Servo	2	Oil Can ...	Oil "C". Inject a few drops on to joints.
Jaws of Rod from Pedal to Cross Shaft	2	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Bearings of Pedal Shaft	1	Oil Gun ...	Oil "B". Screw down until oil exudes from ends of pedal bosses.
Clutch Pedal Connections	2	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Accelerator Pedal ...	1	Oil Can ...	Oil "C". Inject a few drops into small lubricator.
Fulcrum of Hand Brake Lever	1	Oil Gun ...	Oil "B". Screw down until oil exudes from end of bearing.

Every 1,000 Miles—*continued.*

PARTS TO BE LUBRICATED.	NO. OF POINTS.	HOW LUBRICANT IS APPLIED.	LUBRICANT AND QUANTITY.
Jaws of Rod from Hand Brake Lever to Equaliser	2	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Hand Brake Pawl Connections	4	Oil Can ...	Oil "C". Inject a few drops on to jaws.
Reverse Catch of Gear Lever	3	Oil Can ...	Oil "C". Inject a few drops on to each joint.
Cam of Battery Ignition Contact Breaker	1	—	Smear a trace only of oil "C" on to cam surface.
Spring Gaiters ...	12	Oil Gun ...	Oil "C". Screw down three or four turns on each lubricator.

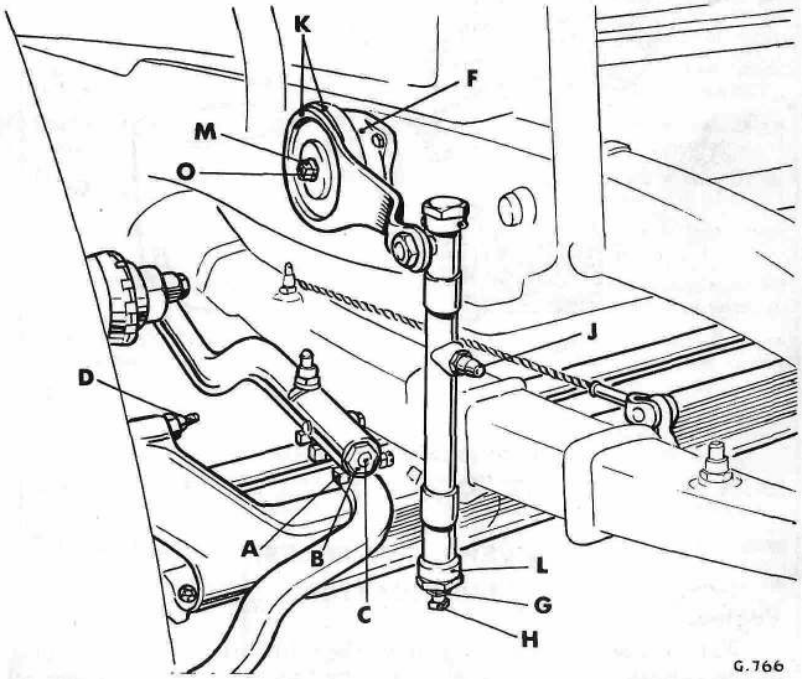


Fig. 5.—FRONT FRICTION SHOCK DAMPER AND FRONT END OF SIDE STEERING TUBE.

A Locking Bolt.
B Locknut for "C".
C Adjusting Screw.
D Pivot Lubricator.
G Locknut for "H"
H Set Screw.
J Lubricator.
K Leather Covers.
L Cap.
M Locknut for "O"
O Adjusting Nut.

ALSO EVERY 1,000 MILES.

Front Friction Shock Dampers.

The links of the front **friction** shock dampers should be disconnected and the setting of the dampers checked. It should be such that a weight of 25 lbs. suspended on the end of the lever just causes this to move.

Dashboard Petrol Filter.

The petrol filter fitted on the front of the dashboard should be dismantled and cleaned.

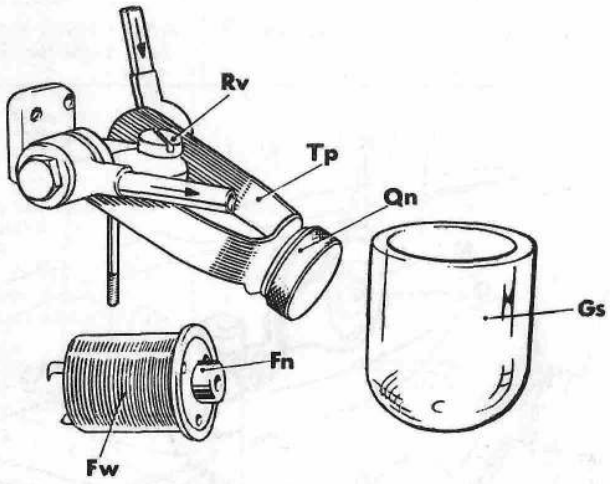


Fig. 6.—DASHBOARD FILTER DISMANTLED.

Fn	Nut—Filter.	Qn	Knurled Retaining Nut.
Fw	Filter Element	Rv	Valve—Petrol.
Gs	Sump.	Tp	Stirrup.

EVERY 2,000 MILES.

LUBRICATION.

Engine.

When the engine is warm, remove the split cotter of the drain plug in the bottom of the crankcase, unscrew this plug, and drain out all the oil. The oil filter should then be removed for cleaning by unscrewing the ring of nuts which will be found surrounding the drain plug. The filter gauze can be removed from its carrier plate by unscrewing the central nut. The gauze should be thoroughly cleaned with a brush dipped in paraffin.

When replacing the filter, care must be taken that the joint washer is in position, also that the drain plug is replaced with its aluminium washer, and locked by means of a split cotter.

Pour one gallon of fresh oil into the crankcase through the filler.

PARTS TO BE LUBRICATED.	NO. OF POINTS.	HOW LUBRICANT IS APPLIED.	LUBRICANT AND QUANTITY.
Rear Friction Shock Dampers	2	Oil Gun ...	Oil "B". Screw down a few turns on each lubricator.
Brake Equalisers ...	3	Oil Gun ...	Oil "B". Screw down about six turns on each lubricator.
Clutch Trumion ...	1	Oil Can ...	Oil "C". Remove clutch pit cover and inject a few drops into oil hole of trunnion.
Clutch Levers ...	4	Oil Can ...	Oil "C". Remove clutch pit cover and inject a few drops to lubricate fulcrum pins.
Clutch Withdrawing Shaft	1	Oil Can ...	Oil "C". Inject a few drops into open end of shaft.
Starter Motor Bearing	1	Oil Can ...	Oil "C". Inject a few drops in lubricator.
Dynamo Bearings ...	2	Oil Can ...	Oil "C". Inject a few drops in lubricators.
Dynamo Drive Coupling	1	Oil Can ...	Oil "C". Inject a few drops into oil hole.
Front Engine Support	1	Oil Gun ...	Oil "B". Screw down until oil exudes from ends of bearing.
Battery Ignition Governor	1	Oil Can ...	Oil "C". Inject a few drops in lubricator on low-tension rocker casing.
Steering Column ...	1	Oil Can ...	Oil "C". Lift cover of thrust race on column, and inject a few drops into race.
Steering Box ...	1	—	Oil "B". Remove plug and fill to mouth of plug orifice.*
Control Mechanism	—	Oil Can ...	Oil "C". Lubricate numerous joints on steering box, steering wheel, carburetter, instrument board, radiator shutters, etc.
Water Pump Bearing and Gland	1	Screw-down Lubricator	Grease. Full lubricator cap and screw right home.
Sliding Joint on Propeller Shaft	1	Oil Can ...	Oil "B". Remove plug and inject about one tablespoonful.

* If Steering Box Cover has a Spring Lid Lubricator, see page 16.

ALSO EVERY 2,000 MILES.

1. Remove wheels, grease interiors and hubs, and replace (see page 29).
2. Test steering joints and shock damper connections for play, and adjust if necessary.

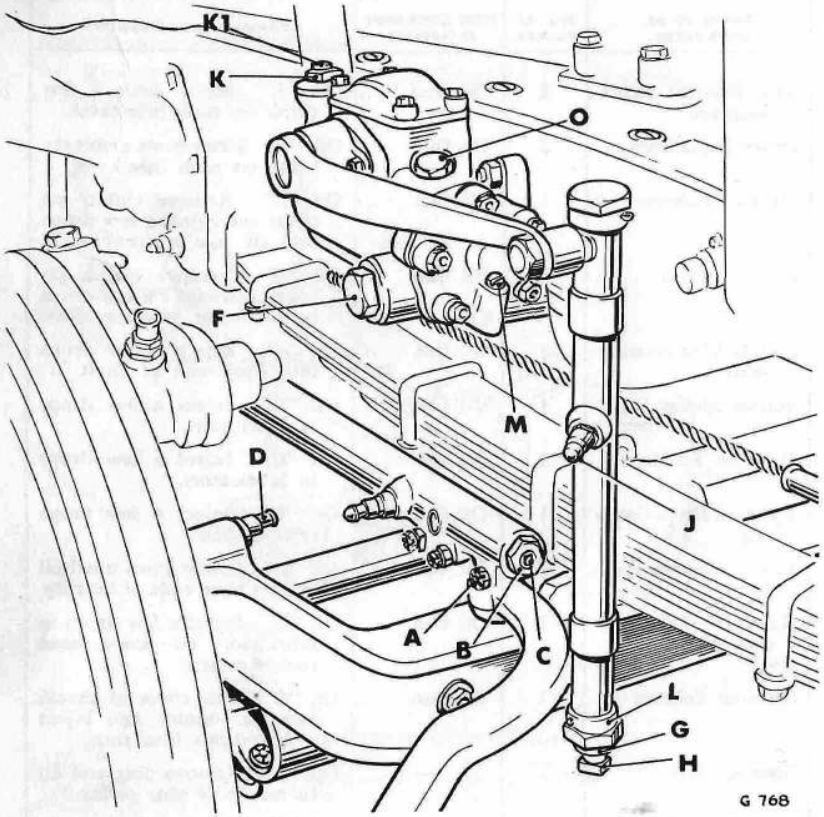


Fig. 7.—FRONT HYDRAULIC SHOCK DAMPER AND FRONT END OF SIDE STEERING TUBE.

A Locking Bolt.
B Locknut for "C".
C Adjusting Screw.
D Lubricator.
F Filter.
G Locknut for "H".
H Set Screw.
J Lubricator.
K Air Valve.
K1 Plug for "K"
L Cap.
M Valve.
O Filling Plug.

3. Remove dynamo and starter motor and covers, clear away any dust and inspect brush gear.
4. Inspect L.T. make-and-break contacts of battery ignition. Set gaps to .017" to .021".

5. Remove and clean carburetter air valve and chamber. Use no lubricant on these parts.
6. Remove rocker cover, and test tappet clearances with .003" feeler gauge when engine is cold.

Adjusting Tappets.

Access to the adjustable valve tappets is obtained by removing the two covers on the left-hand side of the engine. In Fig. **8** these covers are shown removed for adjusting the tappets.

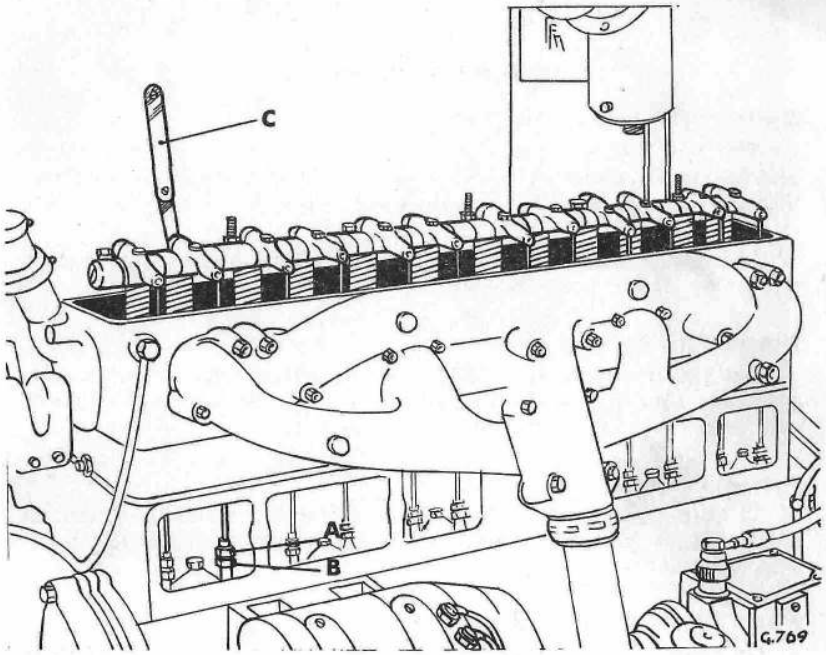


Fig. 8.—ADJUSTING THE TAPPETS.

A Tappet Head.
B Lock Nut.
C Feeler Gauge.

The tappet head **A** is screwed into the tappet and locked with a nut **B**. On releasing this nut, the tappet can be screwed in or out as may be required.

With the engine cold, and the valve roller on the base of the cam, there should be .003" clearance, measured between valve stem and rocker. A feeler gauge is provided in the tool kit, and is shown at **C** in position for measuring the tappet clearance.

Before commencing to adjust a tappet it should be ascertained that that particular tappet roller is well away from the cam, which is best done by turning the crankshaft by hand until the valve has opened and closed, and then cranking round half a revolution beyond this point.

As each tappet is adjusted, its lock-nut should be tightened up.

7. Remove and clean sparking plugs. Set gaps to .020".
8. Adjust brakes if necessary.
9. Test fan belt for tightness, and adjust if necessary (see Fig. **9**).
10. See that starter motor switch contains sufficient oil. Refill with engine oil if necessary.

EVERY 5,000 MILES.

Carburetter Float Chamber.

The float chamber cover should be unscrewed, the float removed, and the chamber wiped out with a piece of **clean, damp washleather.** The float should be shaken to discover if any petrol has leaked into it (see Fig. **20**).

Before replacing the cover the threads should be carefully cleaned and oiled, and it must be tightened by hand only.

Petrol Filters.

The petrol tank filters, the filter on the petrol inlet to the vacuum tank, and also that in the float chamber or on the dashboard (whichever is provided), should be removed and cleaned.

Petrol Tank.

The drain plug at the bottom of the petrol tank should be **released** a turn or so (not **removed**) to allow any water which may have accumulated to escape.

Front Friction Shock Dampers.

On chassis having front friction shock dampers, the links of these should be disconnected by removing the split cotters and caps at their bottom ends, after taking off the gaiters. The central adjusting nut and locknut should be unscrewed and the leathers removed. These must be cleaned and soaked in engine oil for a night.

The shock dampers should afterwards be adjusted so that a weight of 25 lbs. suspended on the end of the lever will just cause this to move.

Water Cooling System.

It is advisable to drain out the radiator and water system thoroughly, a tap being provided for this purpose just below the water pump. Clean soft water should be used for refilling, and the level should stand between $3\frac{1}{2}$" and $4\frac{1}{2}$" from the top of the filler spout.

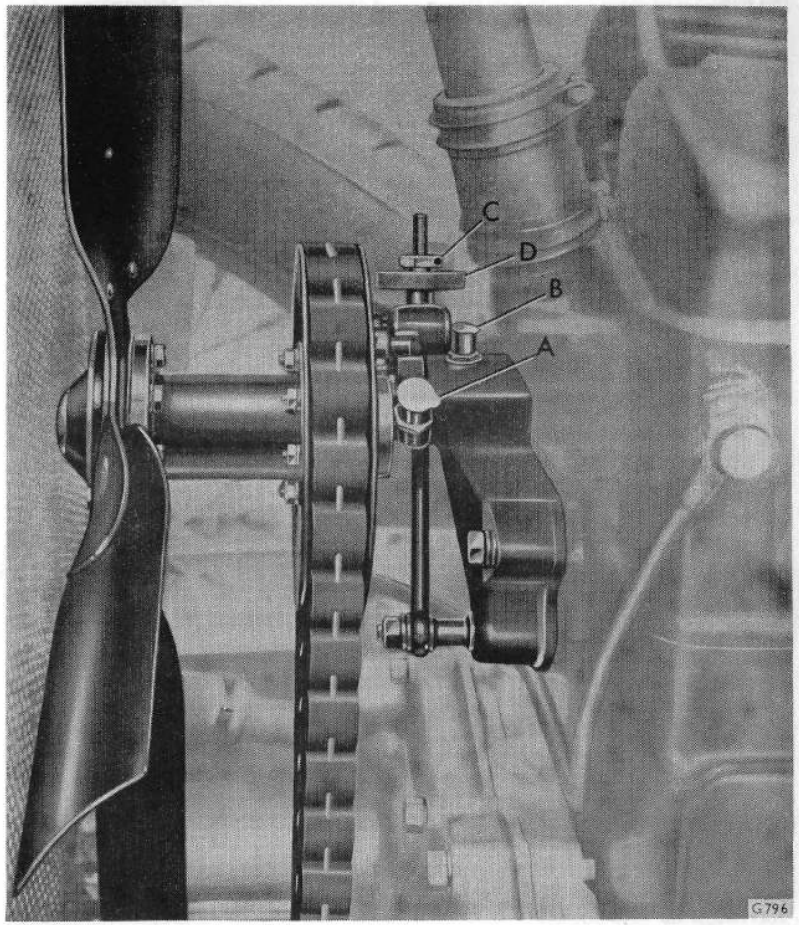


Fig. 9.—FAN.

A Lubricator—Fan Bearings.
B Lubricator—Trunnion.
C Locking Nut—Belt Adjustment.
D Adjusting Nut—Fan Belt.

Fan.

A few drops of engine oil should be injected into the lubricator of the fan **A**, and, on some chassis, **B** (Fig. **9**).

The fan belt, if of the Whittle type (see Fig. **9**) should be removed, scraped with a blunt knife, smeared with engine oil on the back (not on sides) and refitted. If of the later rubber and canvas type, this should be examined to see that it is not bottoming in the "Vee" of the pulleys, in this case it should be discarded and replaced with a new one.

Gearbox.

When the gearbox is warm, inspect level of oil by removing plug from filler spout located on near side of the box. If necessary, add more gear oil through this filler spout until the level stands at its mouth. The oil should first be heated to reduce its viscosity and enable it to find its correct level.

The appearance of froth at the mouth of the filler spout may give a false impression as to the amount of oil in the gearbox.

When the car is new, all the oil should be drained out after the first 5,000 miles' running and replaced with fresh oil. A drain plug is located on the lower side of the gearbox.

Universal Joints.

On the early series, the propeller shaft universal joints at each end of the shaft, are enclosed and provided with oil gun lubricators.

The driven position of the forward joint is mounted on serrations of the propeller shaft, to permit the necessary degree of telescoping movement.

As directed on page 16, oil "B" should be injected into the lubricators every 500 miles.

On the later series, the propeller shaft universal joints are of a special type, designed to be oil retaining, and having large bearing surfaces which are automatically flooded with oil by centrifugal force when the car is running.

The quantity of oil should be checked every 2,000 miles; to do this, the propeller shaft should be turned so that the oil gun lubricators of the universal joints are at the **bottom** and the air release plugs at the **top.** The plugs should then be removed and oil injected through each lubricator with the oil gun until it commences to flow from the plug hole, indicating that the casing is filled. The plugs must then be carefully replaced.

Under no circumstances should the gun be operated with the vent plugs in position, as this is liable to cause serious damage to the joint.

At the same time, the sliding joint should be lubricated by removing the plug and injecting about one tablespoonful of oil "B"; afterwards, carefully replace the plug.

Back Axle.

The plug at the bottom of the axle casing (see Fig. **10**). communicates with the interior through a standpipe which projects inside the casing to act as an oil level indicator.

The plug should be removed for testing the oil level when the axle is warm, and one should not be deceived by the appearance of a small quantity of oil, which is possibly only what has lodged in the standpipe.

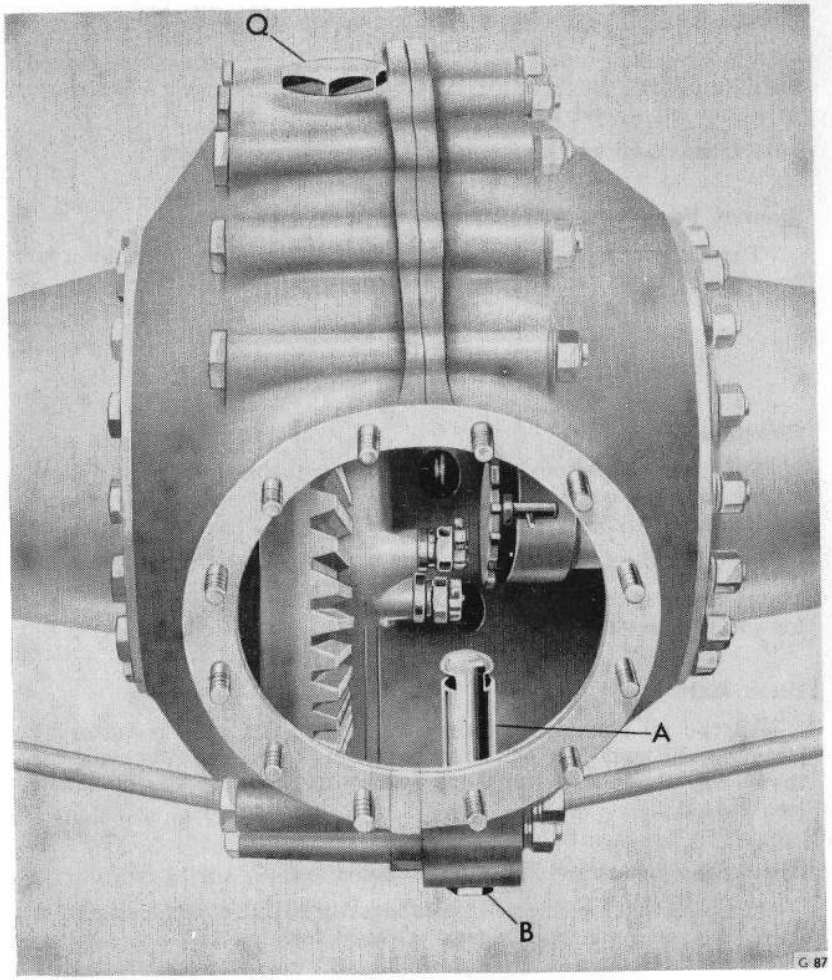


Fig. 10.—OIL LEVEL PIPE IN BACK AXLE CASING.

A Stand Pipe—Oil Level. Q Filler Plug.
B Drain Plug.

If necessary, gear oil, which has been thoroughly warmed, should be poured in through the filler plug at the top of the casing, until oil just commences to flow from lower plug-hole.

In replacing the plugs it should be noticed that their washers are in position.

Clutch Shaft.

The clutch-pit cover should be removed and crankshaft turned until an oil-hole on the clutch shaft is visible. Into this a few drops of engine oil should be injected.

Excess of oil at this point will cause clutch trouble.

Bonnet Fasteners and Locks.

The bonnet fasteners and locks should be carefully oiled, in order to prevent these parts from squeaking and rattling.

EVERY 10,000 MILES.

Gearbox.

The drain plug should be removed when the gearbox is warm and all the oil drained out. The plug of the filler spout should be removed at the same time.

Fresh oil should then be added up to the mouth of the filler spout.

On no account must paraffin, petrol or other oil solvent be used for washing out the box.

Back Axle.

All the oil should be drained out when the axle is warm by removing the standpipe, and fresh oil should be added, after replacing the standpipe, until it commences to flow out of the bottom plughole (see Fig. **10**).

Crankcase Breather Pipe to Carburetter.

The pipe which connects the carburetter air inlet to the crankcase should be removed and its gauze cleaned (see Fig. **20**).

Hydraulic Shock Dampers.

On chassis having hydraulic shock dampers, the oil level in these should be inspected and more oil added if necessary (see Fig. **7**).

EVERY 20,000 MILES.

Brake Servo.

The brake servo adjustment should be tested, and the clearance readjusted if necessary.

CARE OF WHEELS AND HUBS.

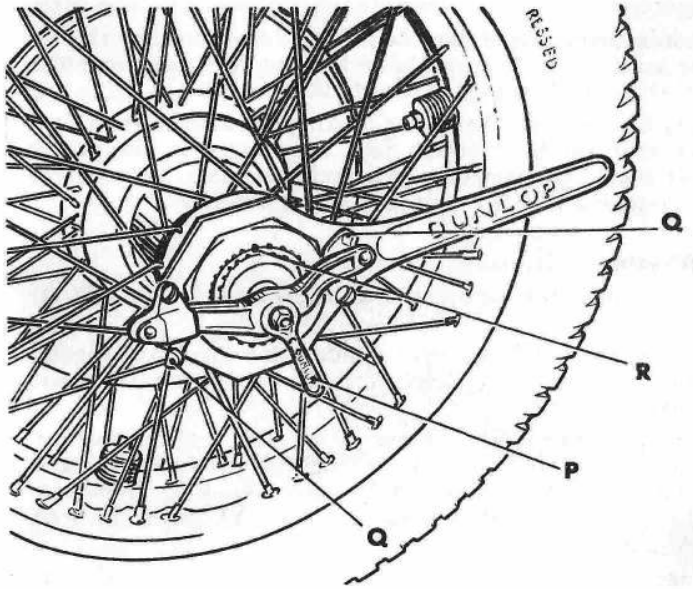


Fig. 11.—REMOVING DETACHABLE WHEEL.

Removal of Wheel.

Dunlop detachable wire wheels are fitted, and a special spanner is provided in the tool-kit for removing and replacing them.

In Fig. **11** the spanner is shown in position on a wheel.

Before using the spanner, the central screw **P** must be unscrewed as far as possible. After jacking up the car, the spanner can be placed in position by pressing the levers **Q** to clear the shoulder on the hub nut. On releasing these levers, it should be noticed that they correctly fit into the groove provided for the purpose.

Screw **P** should then be turned until the serrations of the locking plate **R** are seen to be clear of those on the hub nut. The latter can then be turned in an anti-clockwise direction and the wheel withdrawn.

The thread of the hub and nut is right-handed for all wheels.

When replacing a wheel, care must be taken that the engaging surfaces, serrations and threads of both hub and wheel are free from road grit and other foreign matter. Preferably, they should be slightly greased.

The hub nuts must be tightly screwed up by means of the special spanner, and the use of the mallet in conjunction with it, to ensure absolute tightness.

The locking plate should now be allowed to come forward by turning the small lever **P** in an anti-clockwise direction, in order that its serrations shall engage those of the hub nut.

It should be observed that when jacking up a rear wheel care is necessary that the head of the jack is arranged in the proper position. It should be immediately beneath the axle, between the two " U " bolts which secure axle and spring together.

Care of Wheels. (*Important*).

Every 2,000 miles hub nuts should be tested for tightness with the spanner.

On no account should the car ever be run with a wheel even slightly loose, as this will cause irreparable damage to the serrations and screw threads.

It is necessary to try each hub nut periodically with the spanner, and tighten if necessary. In order to tighten the hub nut, it is necessary for the locking plate to be forced back by means of rotation of the small lever **P** until its serrations are disengaged from those of the hub nut.

Care must be taken when driving close to a high curb to avoid catching the projecting spokes of wire wheels. Very serious damage may thus be done to the wheel.

Lubrication of Wheel Bearings.

The wheel bearings are filled with ball-bearing grease in the first instance, and should run a long period without attention.

Removing and Dismantling Front Hubs.

A section of the front hub is given in Fig. **12**. To remove the hub, after removing the wheel, the screw **A** must first be taken out and replaced with the special tool **B**, shown in position in Fig. **13**. Nut **C** should then be screwed up until the locking plate **D** is pressed inwards, clear of the split ring **E**. The latter can then be removed by inserting a screwdriver or other suitable tool through one of the slots on the edge of the hub.

The nut **C** should then be slackened and the stud **B** unscrewed, allowing the locking plate **D** to be pressed out by the large coil spring **F**. This spring can then be removed.

The cap **G** must next be removed.

It is secured by the nut **G1**, which is locked by a spring ring **G2**. After removing the latter, the nut can be unscrewed with the special spanner provided, the thread being right-handed.

With the cap **G** removed the stub axle nut **H** will be exposed.

This has a left-handed thread for the near side of the axle, and a right-handed thread for the off side.

After removing the split cotter, nut **H** should be unscrewed, when the hub, together with its ball-bearings, may be withdrawn from the axle.

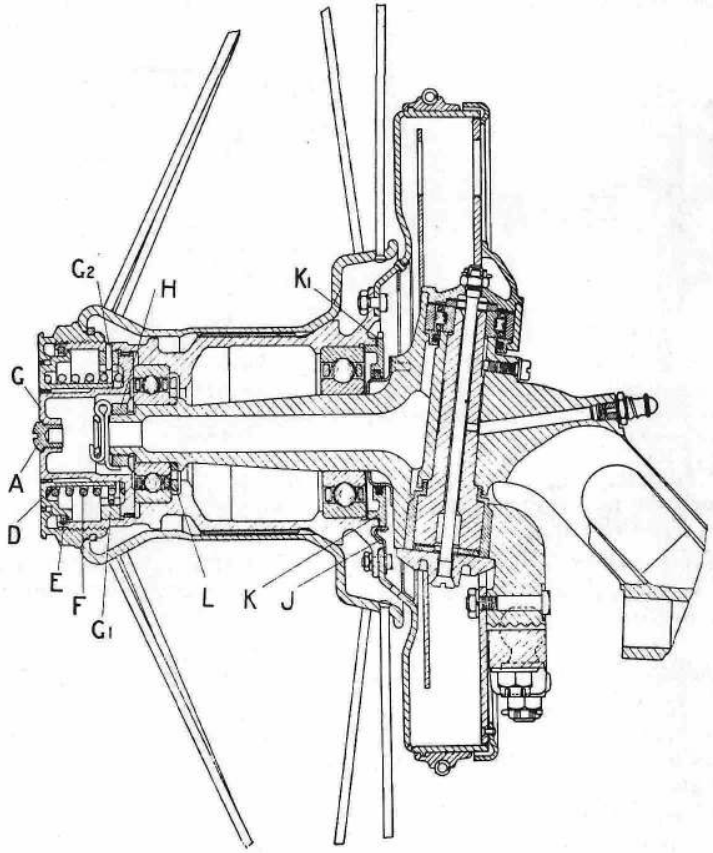


Fig. 12.—SECTION OF FRONT HUB.

If any difficulty is experienced in this operation owing to the ball races being a little tight on the axle, a wheel should be temporarily mounted on the hub and a better purchase on the latter thereby obtained.

The small outer ball-bearing can be removed with a hard wood drift passed through the inner bearing.

To remove the latter, the locking piece **J** must be removed and the cap **K** unscrewed.

It has a left-handed thread for the near side wheel, and a right-handed thread for the off side wheel. The large ball-bearing can then be taken out.

A joint washer, **K1**, is arranged between the flange of the cap **K** and the hub.

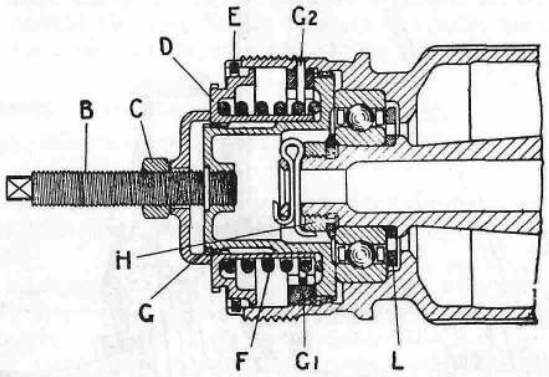


Fig. 13.—TOOL IN POSITION FOR REMOVING LOCKING RING.

It is important to see that the front hubs fit their axles without looseness or excessive end play, as undue slackness might cause a breakage through the shocks that would result.

The ball races should be cleaned and carefully examined for signs of rust or deterioration. If the races or balls are rusty, they must be discarded.

Reassembling and Replacing Front Hubs.

When reassembling the hub, the ball races should be packed with the recommended grease (see page 13), and about one-half to three-quarters of a pint (approximately one-half to three-quarters of a pound) of grease wiped round so that it forms an annulus on the inside of the hub shell about $\frac{5}{8}$ in. thick.

All internal parts should also be smeared with grease.

The large race should be replaced first, followed by the retaining cap **K** and its joint washer **K1**, the cap **K** being filled with grease in order that the latter may be forced into the ball race as the cap is screwed on. The locking piece **J** must then be refitted.

Next, the hub should be pressed lightly on the axle and safety washer **L** put into position, followed by the small ball race.

The axle nut **H** must then be tightly screwed up and locked with a split cotter.

It is important at this stage to test the hub for end play, by temporarily attaching a wheel, if necessary. There should be at least ·010″ end play before cap **G** is secured by its nut, because all end thrust which may be imposed on the wheel under running conditions is taken by the small outer bearing, and none should fall on the large inner bearing.

Finally, cap **G** should be filled with the recommended grease (see page 14), and secured by its nut **G1**, the spring locking ring **G2** being carefully refitted.

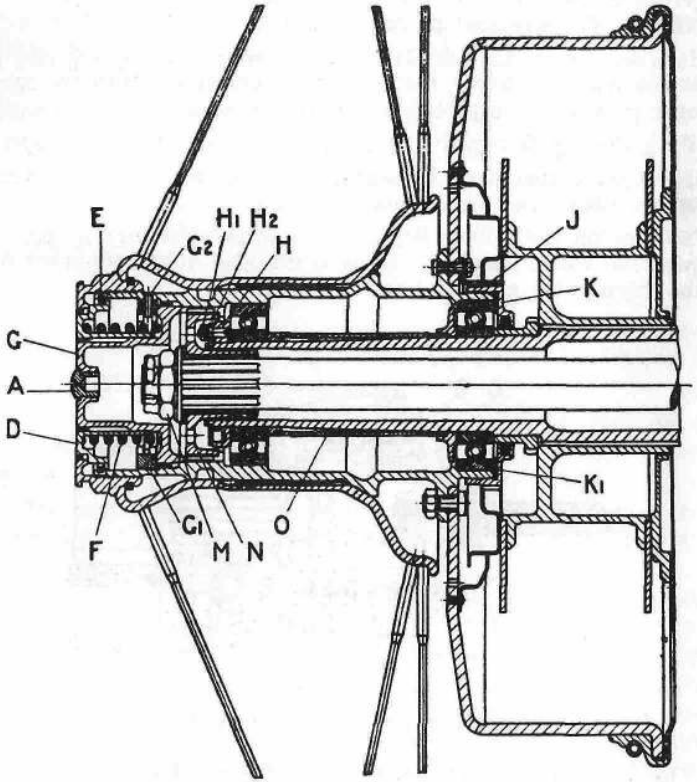


Fig. 14.—SECTION OF REAR HUB.

With locking plate **D** in position, the spring **F** should be compressed by means of the tool **B**, and the split ring **E** replaced.

Owing to the "handing" of the various screw threads, as described, it is, of course, vitally important that the hubs should not be changed over by mistake when replacing them.

Removing and Dismantling Rear Hubs.

A section of the rear hub is given in Fig. **14**. To remove the hub, the screw **A** must first be taken out and replaced by the special tool **B**, shown in position in Fig. **15**. Nut **C** should then be screwed up until the locking plate **D** is pressed inwards clear of the split ring **E**. The latter can then be removed by inserting a screwdriver or other suitable tool through one of the slots on the edge of the hub.

The nut **C** should then be slackened and stud **B** unscrewed, allowing the locking plate **D** to be pressed out by the large coil spring **F**. This spring can then be removed.

The cap **G** must next be removed.

It is secured by the nut **G1**, which is locked by a spring ring **G2**. After removing the latter, the nut can be unscrewed with the special spanner provided, the thread being right-handed.

With the cap **G** removed, the axle shaft nut **M** will be exposed.

The split cotter must be withdrawn, and this nut can then be unscrewed, the thread being right-handed.

To slide off the driving dog **N**, there is provided in the tool-kit a screwed rod which should be screwed into one of the threaded holes in the driving dog and the latter withdrawn.

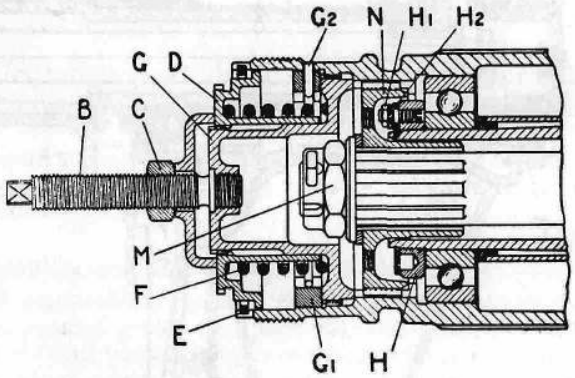


Fig. 15.—TOOL IN POSITION FOR REMOVING LOCKING RING.

The axle tube nut **H** will then be visible. To remove this, the three small nuts **H1**, which secure the locking plate **H2** in position, must be unscrewed, and the locking plate removed. Then, with the special spanner provided, nut **H** can be unscrewed, this having a left-handed thread for the near side wheel, and a right-handed thread for the off side wheel.

With this nut removed. the hub is free to be drawn off the axle tube, together with its ball-bearings. It may be found convenient temporarily to attach a wheel for this purpose.

To remove the ball-bearings, the locking piece **J** must be removed, and cap **K** unscrewed.

It has a left-handed thread for the near side wheel and a right-handed thread for the off side wheel.

The ball-bearings, together with the distance piece **O**, can then be removed, passing them through the inner end of the hub.

It should be noticed that the ball races are a good fit both on the axle tube and also within the hub shell.

The races should be cleaned and carefully examined for signs of rust or deterioration. If the races or balls are rusty, they must be discarded.

Reassembling and Replacing Rear Hubs.

When reassembling the hub, the ball races should be packed with the recommended grease (see page 13), and about one-half to three-quarters of a pint (approximately one-half to three-quarters of a pound) of grease wiped round so that it forms an annulus on the inside of the hub shell about $\frac{5}{8}$" thick.

All internal parts should also be smeared with grease.

The outer bearing should be placed in position in the hub first, and followed by the distance piece **O**, arranged with its flange towards the inside of the wheel.

The inner race should next be replaced, and the retaining cap **K** filled with grease in order that the latter may be forced into the ball race as the cap is screwed on.

The cap **K**, together with its joint washer **K1**, should then be screwed up tightly until the locking piece **J** can be put into position to lock it.

The hub may now be pushed home on the axle tube, nut **H** screwed up tightly, and the locking plate **H2** secured in position with its three small nuts **H1**.

Next, the driving dog **N** should be pushed on to the axle shaft. There are two washers between this part and its retaining nut, one being a distance washer which has a bore equal to the maximum diameter of the shaft, and the other a plain washer fitting on the screwed end of the shaft. The large bore washer should be replaced first, and it must be seen that this fits on the serrated portion of the shaft projecting through the driving dog. After fitting the smaller washer, the nut **M** can be tightened up and fitted with a split cotter.

The cap **G** should next be filled with the recommended grease (see page 14) and secured by means of its nut **G1**, the spring locking ring **G2** being carefully refitted.

The special tool **B** must be used to compress the spring with the locking plate **D** in position, in order to replace the split spring ring **E**.

Owing to the "handing" of the various screw threads, as described, it is, of course, vitally important that the hubs should not be changed over by mistake when replacing them.

Replacement Tyres.

When ordering new outer covers or inner tubes, the type and size should be specified. It should be noted that the straight-side tyre requires a tube with a short type valve, centrally located. The tube for a well-base tyre, on the other hand, has the valve located to one side. These two inner tubes are not interchangeable.

Balancing the Road Wheels.

It is most important, in view of the high speeds attainable, that the front road wheels should be properly balanced. Therefore, it is necessary to have all wheels balanced and to re-balance a wheel after changing its tyre.

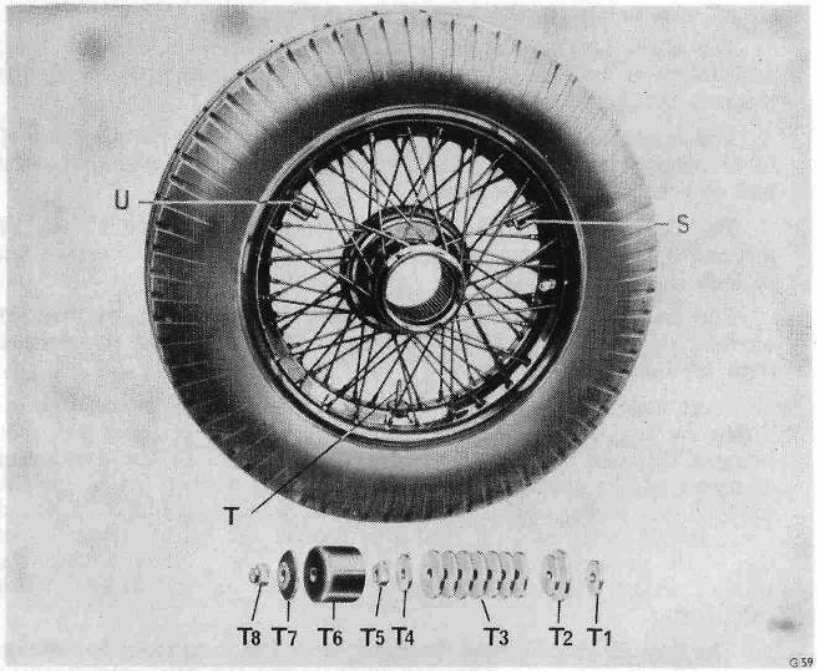


Fig. 16.—WIRE WHEEL WITH BALANCE WEIGHTS

An out-of-balance effect is usually present in the complete wheel and tyre due to:—

(a) The valve and its patch on the inner tube;
(b) the joint of the inner tube; and
(c) unavoidable irregularities in the outer cover due to movement of the material during vulcanizing.

A red spot on the outer cover wall indicates its lightest part, and the cover should be fitted so that the red spot is at the valve position.

To correct such out-of-balance, three bolts are provided, spaced at equal intervals around the wheel rim, as shown at **S**, **T** and **U** in Fig. **16**, and each carries a number of lead washers, enclosed by a metal cover.

One of the bolts, **T**, is shown with its cover and washers dismantled. The parts are assembled on the bolt in the following order:—

1. Rubber washer T1, which acts as a seal against the ingress of water.
2. Special steel washer T2, which forms a firm base for the cover and the lead washers.
3. Lead balancing washers T3, up to seven in number on any one bolt.
4. Steel washer T4.
5. Nut T5 for retaining lead washers.
6. Cover T6.
7. Steel washer T7.
8. Cap nut T8 for retaining cover.

To balance a wheel, all the lead washers should first be removed from each bolt, the other parts being fitted as indicated above.

The front axle being jacked up, the wheel must be turned gently and allowed to come to rest.

The lowest point of the tyre should then be marked.

The operation should be repeated, and if the original mark returns to the bottom position, one or more lead washers should be added to the bolt on the opposite side of the wheel.

If the mark made on the tyre is adjacent to the bolt, then one lead washer should be fitted on each of the other two bolts.

On the other hand, if no bolt should lie on the vertical centre line through the marked point on the tyre, the washers of the two bolts furthest from the mark must be altered, for instance, if the distance of one bolt from the centre line is approximately twice that of the other, two lead washers should be fitted on the bolt nearer to the centre line and one lead washer on the other bolt.

This process should be continued until the wheel will remain in any position in which it may be brought to rest, the number of lead washers being kept down to a minimum consistent with good balance of the wheel.

CHAPTER III

The Fuel System

Fuel Feed—The Carburetter—Cleaning the Air Valve—Setting of the Jets—Mixture Control—Slow Running—Starting Carburetter—Float Feed Mechanism—Crankcase Breather Pipe to Carburetter—Dismantling the Carburetter.

Fuel Feed.

The fuel feed is arranged on the system by which the vacuum induced in the induction pipe of the engine raises the fuel from the main tank situated at the back of the car to a small service tank on the engine side of the dash, when it flows by gravity to the carburetter float chamber.

There is a needle-type stop valve on the service tank to cut off the feed to the carburetter float chamber when the car is not in service. To open this valve, lift it and rotate it in a clockwise direction; to close, merely rotate it in the opposite direction—it will click home when in the correct position.

On later models this is replaced by a cork-seated rap, which is controlled by a thumb lever on the driver's side of the dashboard, a plate being fitted marked **"On"** and **"Off".**

If the main fuel supply be exhausted during a run it should be observed that the service tank will also have been emptied, and after filling the tank the service tank must also be recharged before the engine can be started. This can be done by cranking over the engine for a few revolutions, both main and starting carburetter throttles being closed meanwhile. A depression will thereby be induced in the induction pipe, which will draw up fuel from the main tank into the service tank.

Certain chassis are provided with a main tank which normally holds two gallons of petrol in reserve (see Fig. **18**). Use can be made of this reserve by turning the knurled knob of the valve on the tank from the position **M** (main) to the position **R** (reserve). Normally, it should stand at **M**, when, with the tank full, twelve gallons will be available. If the car be run with the valve in the **M** position until it stops through lack of fuel, the vacuum feed tank will have been emptied and must be re-primed, as explained above, after turning the valve to the **R** position.

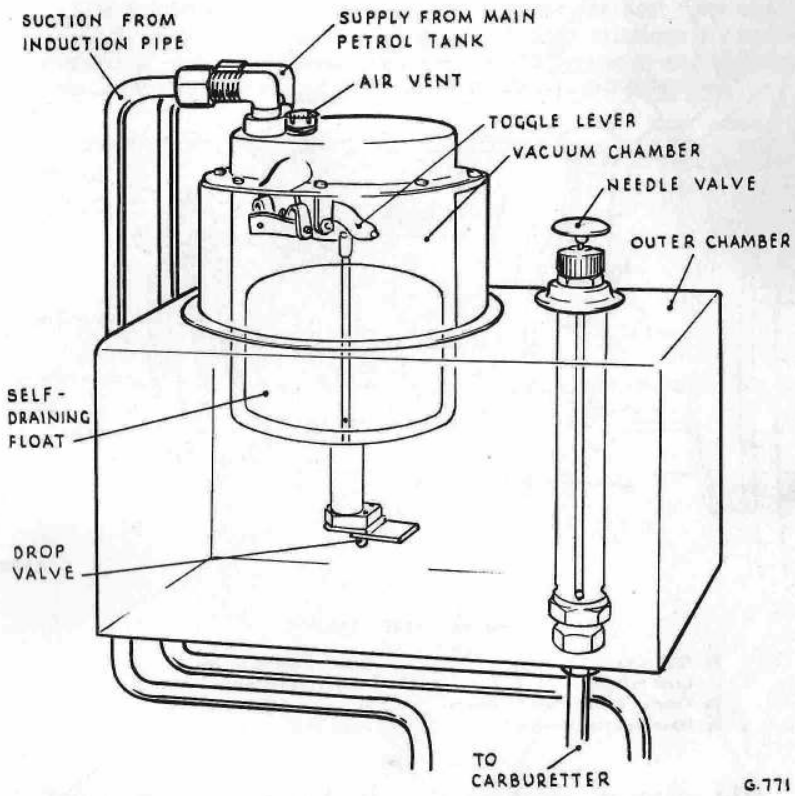


Fig. 17.—VACUUM FEED TANK.

The Carburetter.

The carburetter is of the Rolls-Royce automatic expanding type, provided with two jets adjustable by a single lever under the driver's control.

Each of these jets is located in a venturi tube, the smaller one always being in action, and the larger one being automatically brought into action by an increase, beyond a certain value, in the depression existing within the carburetter, due to an increase of engine speed or throttle opening, or both.

The complete carburetter is shown in Fig. **19**, and in Fig. **20** it is shown with certain parts removed.

The outlets of the jets are regulated by taper needle valves, that for the small or low-speed jet being shown at **W** (Fig. **19**), and the control for the large or high-speed jet needle at **T.**

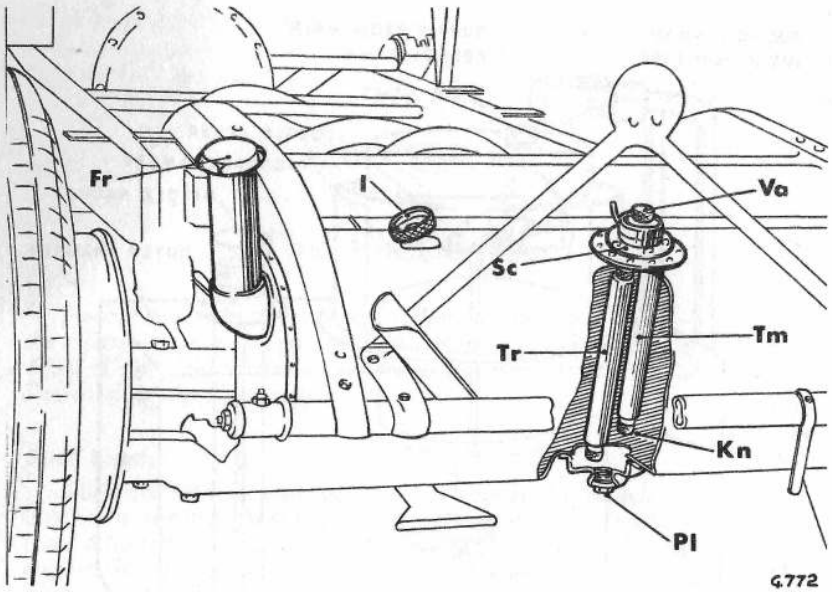


Fig. 18.—PETROL TANK.

Fr Filler Cap.
I Level Indicator.
Va Knurled Knob—Main to Reserve.
Sc Filter Securing Screws.
Tr Filter—Reserve Supply.
Tm Filter—Main Supply.
Kn Nut Retaining Gauze.
Pl Drain Plug.

The automatic expanding effect is attained by the provision of a suction-operated piston working in a cylinder, **D** (Figs. **19** and **20**), located above the high-speed jet.

The cylinder **D** and piston **E** are shown removed for cleaning in Fig. **20**. The cap **F** carrying the spring **F1** fits over the top of the cylinder, and is retained by a knurled nut **G**.

Increased depression in the carburetter raises the piston **E** against the spring **F1**, carrying with it a diaphragm **E1**, which fits into, and, in its lowest position, blanks off the larger choke tube. The lifting of this diaphragm admits air past the high-speed jet.

More movement of the piston not only opens the high-speed choke tube still further, but also admits air by uncovering the ports **D1**, the air gaining admission through ports **H** in the carburetter, thereby counteracting the tendency for the mixture to become over-rich at increased air velocity.

The various adjustments should on no account be altered, the carburetter having been carefully set by the makers in the first instance.

The mixture control lever, which operates on both jets simultaneously, provides ample range to suit ordinary variations in running conditions, such as different atmospheric temperatures and different fuels, including the use of benzole or benzole-petrol mixtures.

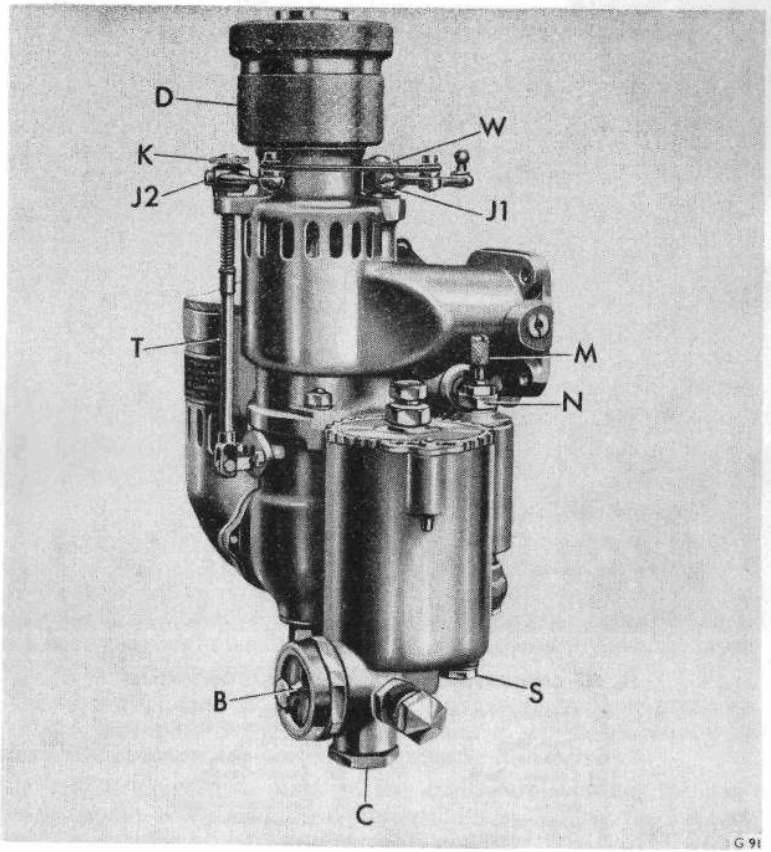


Fig. 19.—CARBURETTER.

B Filter.
C Drain Plug.
D Piston Cylinder.
J1 Clamping Screw—Low-speed Jet Control.
J2 Clamping Screw—High-speed Jet Control.
K Knurled Nut—High-speed Jet Control.
M Regulator—Starting Carburetter Jet.
N Piston—Starting Carburetter.
T High-speed Jet Control Rod.
W Low-speed Jet Control.

Cleaning the Air Valve.

The air valve and cylinder should be removed every 2,000 miles, and carefully wiped with a piece of clean dry cloth, as directed on page 23.

No oil should be used on the valve or its cylinder.

It is advisable when replacing these parts to re-fit the cylinder to the carburetter without the air valve, the latter being replaced afterwards.

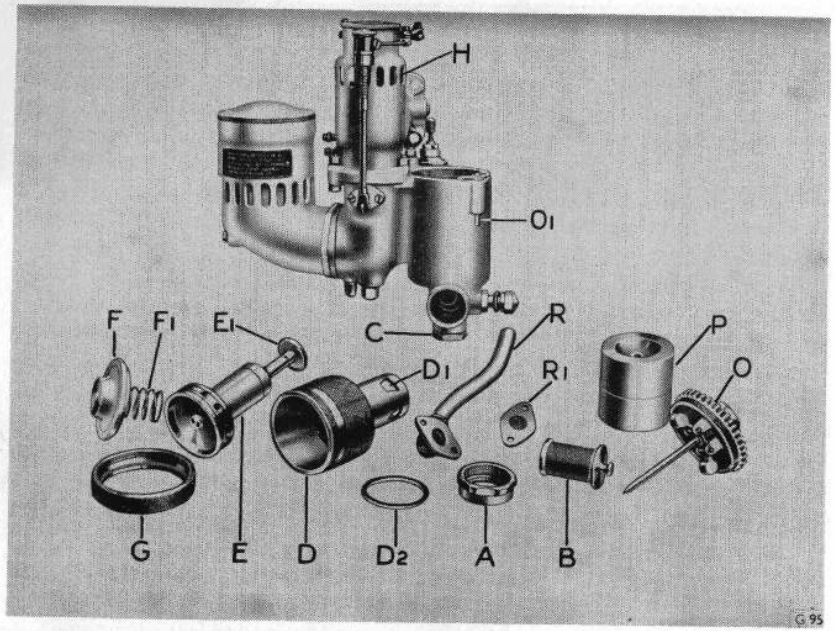


Fig. 20.—CARBURETTER, WITH CERTAIN PARTS DISMANTLED.

A Retaining Nut—Filter.
B Filter.
C Drain Plug.
D Cylinder.
D1 Cylinder Ports.
D2 Joint Washer.
E Piston.
E1 Diaphragm.
F Cap—Cylinder.
F1 Spring.
G Retaining Ring—Cap.
H Air Ports.
O Cover—Float Chamber.
O1 Catch—Cover.
P Float.
R Crankcase Breather.
R1 Gauze Filter.

Care should be taken when replacing the cylinder **D** to see that the metal washer **D2** is in position, and its joint faces are perfectly clean.

It must be emphasised that great care is necessary when handling these parts, as they have been machined to fit very accurately, and any slight distortion is liable to impair the working of the carburetter.

Setting of the Jets.

If the adjustment of the jet needles has been upset for any reason, it can be restored in the following manner:—

With the mixture control lever set half-way along its quadrant and the clamping screws **J1** and **J2** (Fig. **19**) of the jet needle levers slack, each of the knurled nuts **K** and **W** should be turned until the line filed across them registers with the line across the end of the corresponding screwed spindle, the end of the spindle being at the same time flush with the end of the nut.

The clamping screws **J1** and **J2** should then be tightened, and the makers' setting will have been restored.

If, owing to damaged and replaced parts, it becomes necessary to re-set the jets with no guide in the form of the markings referred to, it is strongly recommended that the makers should be consulted, and this work not attempted without their advice or assistance.

In the event, however, of circumstances rendering such a course impossible, or very inconvenient, proceed as follows:—

With the mixture control lever set half-way along its quadrant and the clamping screw **J1** slack, the knurled nut **W** should be turned in a clockwise direction until its lower side just commences to lift away from the facing against which it normally rests.

The low-speed jet will now be fully closed, the tapered part of the needle resting on the mouth of the standpipe.

A preliminary setting can then be obtained by rotating the nut **W** in an anti-clockwise direction through approximately one complete turn. The clamping screw **J1** should then be tightened.

In the case of the high-speed jet it is not practicable to obtain a preliminary setting in this way, because the tapered portion of the high-speed jet needle is arranged to pass freely inside the bore of its standpipe. This is done in order to protect these parts from damage which otherwise might result if the nut **K** were turned to force the taper of the jet needle into the standpipe.

Consequently, no visible indication is available to show precisely when the high-speed jet is fully closed, and it will be necessary to discover its approximate position by running the engine.

It will be possible to start up the engine after setting the low-speed jet needle as described, and this should now be done, the mixture control lever being set half-way along its quadrant.

If, when the throttle is opened moderately by means of the lever on the steering wheel, the engine pops back through the carburetter and possibly stops, the mixture is too weak, and if black smoke comes from the exhaust, and the engine misses fire and perhaps stops, the mixture is too rich.

To weaken the high-speed jet setting, the screw **J2** should be released and nut **K** turned in a clockwise direction; and to strengthen it, nut **K** must be turned in an anti-clockwise direction.

Having arrived at a preliminary setting for the high-speed jet in this way, and with the mixture control lever again set half-way along

its quadrant, the throttle should be opened by means of the lever on the steering wheel until a speed is reached at which the automatic piston valve is on the point of lifting but has not actually lifted. Movement of this can be observed by looking through the air ports in the carburetter.

The clamping screw **J1** of the low-speed jet needle should then be slackened, and the knurled nut turned in a clockwise direction until the speed becomes slightly reduced.

The clamping screw should then be tightened, and the mixture control lever moved first over to strong and then to weak. If in **both** of these positions the engine hesitates, or even possibly stops in the weak position, then the adjustment of this jet is fairly correct.

To test the high-speed jet setting, the accelerator pedal should be depressed momentarily, and the lever again tried in both its extreme positions. In either position a distinct loss of power should be experienced. If these variations do not occur, or occur in only one of the extreme settings of mixture strength, the settings should be varied accordingly by slackening the clamping screw and turning the high-speed knurled nut in a clockwise or anti-clockwise direction, according as the mixture requires weakening or strengthening respectively.

The foregoing will only provide an approximate or trial setting.

When the car is taken on the road for final adjustment, the driver should bear in mind that the high-speed jet comes into operation at about four miles per hour on top gear on the level. Consequently, any sign of too rich or too weak a mixture below this speed is an indication that the low-speed jet requires adjustment.

At speeds above four miles per hour, the high-speed jet has an increasing influence over the mixture.

The best all-round setting of the jets is one in which movement of the mixture control lever to either of its extreme positions will, at any speed, cause a distinct loss of power and possibly mis-firing. Steady running and good power at all speeds should be obtained with the lever set half-way on its quadrant.

Mixture Control.

Utilised in a proper manner, very economical running can be obtained.

When starting the engine from cold, especially in cold weather, the mixture lever should be moved over to **Strong** before changing from the starting to the main carburetter.

As the engine warms up, it will be found that the lever can be moved towards the half-way position, until, with a well-warmed engine and normal touring conditions, it can be taken a few notches towards **Weak.**

A weak mixture burns more slowly than a normal one, and to get the best power from such a mixture, the ignition needs to be well advanced. Consequently, the most economical running is obtained when the ignition lever is fully advanced and the mixture control set as far towards **Weak** as the conditions allow without seriously reducing the power available.

If, on the other hand, weakening of the mixture is carried too far, then, apart from the probability of mis-firing and popping in the carburetter, similar road conditions will call for a bigger throttle opening, and the economy desired be thereby nullified.

Under severe conditions, such as a long ascent which calls for full throttle, too weak a mixture may cause overheating. So the control lever may with advantage be set a little **Strong** under these circumstances.

Slow Running.

The best slow running will be obtained with the mixture control set two or three notches **Strong.** If difficulty is experienced in getting the engine to run slowly, this may be due to the flow of petrol past the low-speed jet needle being restricted by the presence of foreign matter.

To remove this, the jet needle should be raised with the fingers by lifting knurled nut **W** (Fig. **19**), and the throttle simultaneously opened to race the engine momentarily.

If this effects a cure, it would be advisable to clean the petrol filters, as these are probably dirty.

The trouble may also be due to sticking of the carburetter air valve, or faulty tappet adjustment.

Starting Carburetter.

A special auxiliary jet and expanding choke tube is incorporated in the carburetter for starting purposes only.

This jet can be regulated by means of the knurled screw **M** (Fig. **19**), which carries a taper needle running into the jet. Turning this screw in a clockwise direction reduces the jet opening, and in an anti-clockwise direction increases it.

Should occasion arise to re-set this jet adjustment, the screw should be turned with the fingers in a clockwise direction until it is felt that the needle is entirely closing the jet. It should then be rotated in the opposite direction for about one-and-a-half complete turns. This will give a setting at which the engine can be started. Then, with the engine running, the screw may be turned to weaken or strengthen the mixture slightly as may be required.

It is important that the setting of the needle valve should not be such as to provide an over-rich mixture. Although an average setting is one-and-a-half turns from the closed position as stated, this may be reduced to one-and-a-quarter turns in warm weather. On the other hand, in very cold weather, it may be increased to one-and-three-quarter turns, but must be again reduced when the weather becomes warm.

Adjustment of the starting carburetter should only be performed when the engine is cold.

The variable choke or throat of this small carburetter consists of a suction-operated piston, which is lifted against gravity and automatically adjusts the choke area to suit the engine speed.

Access to this throat is obtained by unscrewing the cap **N**, which may then be lifted out with the jet needle. It is advisable occasionally to remove and carefully wipe the piston, but no oil should be used on it.

As the successful working of this small carburetter is dependent on an air-tight induction system, it is essential that the main throttle should be fully closed when starting the engine.

When changing over to the main carburetter, the throttle should be moderately opened and the starting carburetter lever turned to the **Running** or **Off** position, where it should always remain, except for starting. If the engine hesitates and tends to stop, the starting carburetter should be opened again and the main throttle closed until the temperature conditions of the engine are suitable for steady running on the main carburetter.

Cases have arisen of piston seizure which have been traced to excessive use of the starting carburetter. It should be appreciated that the object of the starting carburetter is to facilitate starting when the engine is quite cold, the mixture it provides under such conditions being on the rich side. Consequently, excessive use of the starting carburetter, or its use with a hot engine, is liable to cause liquid petrol to be drawn into the cylinders and wash away the engine oil.

Further, if used with a hot engine, starting may be difficult, due to the over-rich mixture.

The starting carburetter should not be used for more than half a minute before changing over to the main carburetter, and not used at all with a hot engine, in which circumstances starting will be found quite easy on the main carburetter only.

Float Feed Mechanism.

The float chamber should be cleaned out every 5,000 miles, as directed on page 24, by unscrewing the cover **O** (after raising the catch **O1**, if such be fitted), and removing the float **P** (Fig. **20**). The interior of the float chamber should be wiped out with a piece of clean damp wash-leather.

No provision is made for floating the carburetter by agitating the float needle, as this is never necessary. The starting carburetter is provided to supply a suitably rich mixture for starting purposes.

If flooding occurs, it is probably due to foreign matter having lodged on the needle valve seating, and steps should be taken accordingly.

Crankcase Breather Pipe to Carburetter.

In order to reduce the emission of oil fumes from the engine, a pipe is carried from the crankcase to the carburetter air inlet.

This pipe is shown removed at **R** in Fig. **20**.

A small gauze, **R1**, is arranged between the pipe flange and the carburetter, which in course of time may require cleaning. It should be removed and cleaned every 10,000 miles, as directed on page 28.

Dismantling the Carburetter.

Normally it should not be necessary to dismantle the carburetter to a further extent than that already mentioned. On the other hand, it sometimes occurs that the jet needles become sticky in operation, due to sediment and impurities in the fuel, and the correct functioning of the carburetter is impaired.

Under such circumstances the carburetter should be removed bodily from the engine for dismantling.

The plugs below both jet needles should then be removed and cleaned of sediment. At the same time it should be ascertained that the spring plunger below the high-speed jet needle is working quite freely. The upward pressure of this spring is relied upon to open the high-speed jet, and its freedom of movement is therefore of great importance.

After removing the air valve and its chamber, two countersunk set-screws near the low-speed jet needle should be unscrewed. The jet needle can then be carefully lifted out.

The high-speed jet needle is removed by taking out the pin from the jaw at the lower end of control rod **T** (Fig. **19**) and unscrewing the two countersunk set-screws which secure the bearing of the operating lever to the side of the carburetter. The jet needle may then be lifted out.

It is advisable to clean both jet needles carefully in paraffin. The jets themselves should also be cleaned out by using a small wooden stick and a piece of rag soaked in paraffin.

There should be no need to separate the two parts of the carburetter body, but if this be done, it is of vital importance to remove the air valve and its chamber first of all, and also the low-speed jet needle. The latter will almost certainly be damaged if left in position when the carburetter body is divided.

CHAPTER IV

Adjustment of Brakes

General—Adjustment of Rear Brakes—Adjustment of Front Brakes —Adjustment of the Servo.

General.

The only points in the system where any adjustment is provided or is necessary are the following:—

(1) Rear Brakes ... The threaded rods coupled to the cam operating levers below the ends of the rear axle.

(2) Front Brakes... A serrated adjustment on the cam operating shafts.

(3) Servo ... ... A serrated adjusting nut on the end of the servo shaft.

These adjustments are dealt with in detail in the succeeding paragraphs.

It is very important to observe that under no circumstances should adjustment be attempted at any other points, for instance, by altering the lengths of other brake rods or any of the ropes. These are all carefully determined during the erection of the chassis, with a view to utilising to the best advantage the lengths of the various levers, taking into consideration the total movement of such levers from when the brakes are new until the facings are completely worn out.

Any alterations to the lengths of these rods or ropes will virtually shorten the lengths of some of the levers, and will interfere with the correct functioning of the system.

Adjustment of Rear Brakes.

Indication that adjustment of the rear brakes is required is readily observed by noting the pedal travel necessary to take up the clearance between shoes and drums.

The pedal should be comparatively lightly depressed with the hand, the floor-board being meanwhile removed and the servo engaging mechanism watched. It is also advisable during this operation to jack up one of the rear wheels and get someone to turn the wheel and to indicate when the brakes are applied.

Measuring from the top edge of the pedal towards the dash, the first $\frac{1}{4}$" of movement will be required to take up the servo clearances; a further $1\frac{1}{4}$" of movement should just apply the rear brakes, this further movement corresponding to about $\frac{5}{8}$" of movement of the brake ropes.

Adjustment of the rear brakes is imperative when the total pedal movement with light hand operation exceeds 3".

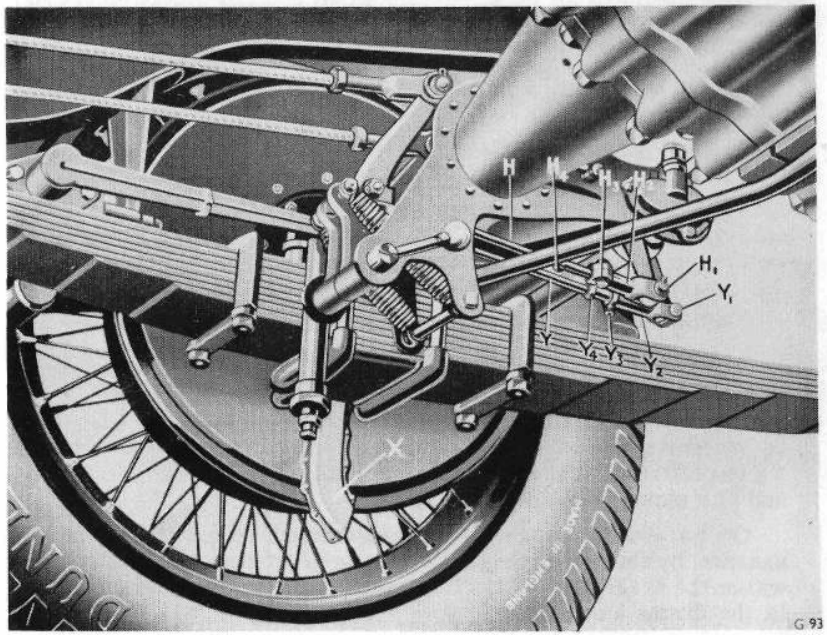


Fig. 21.—REAR WHEEL BRAKE ADJUSTMENT.
(Viewed from Below.)

As in the case of the foot brake, so with the hand brake there should be about $\frac{5}{8}$" of travel of the cables before the shoes come into contact with the brake drums. This will be found to correspond approximately with a movement of the brake lever from its fully off position to the third or fourth notch of its quadrant.

The method of adjustment is similar for both hand-operated and rear foot-operated brakes, and is illustrated in Fig. **21**. This is a view looking from the underside of the axle.

The outside rods **Y** actuate the foot brake shoes, and adjustment is effected by removing the pin **Y1** from the jaw **Y2**, this pin being secured by a collar and split cotter, slackening the small nut **Y3**, and

screwing the jaw further on to the rod **Y** to an extent depending on the amount of adjustment required.

It is important that the amount of adjustment made to both these rods should be the same. A convenient method of checking this is to measure the distance between the collar **Y4** and the jaw **Y2**.

Before replacing the pins **Y1** in the jaws, attention should be turned to adjustment of the hand brake, if any is required.

All adjustment for the hand brake is made on the inside rod **H** and the corresponding rod at the other end of the axle.

The adjustment is effected in a similar manner to that of the foot brake, but it should be noticed that the pin **H1** of the hand brake jaw **H2** cannot be removed until jaw **Y2** is disconnected.

Care should be taken that the collar, which fits the pin of each jaw, is in position before fitting the split cotter.

The adjustment of both brakes should be finally checked by measuring the travel of the cable, as already described, when the pedal or hand lever is moved from the off position to a point where the shoes just touch the drums.

The distance must be the same for both cables of each brake.

After replacing the pins and their collars, split cotters should be fitted to these, and the small nuts **H3** and **Y3** tightened up.

The amount of adjustment provided is so proportioned that when all has been utilised (jaws **H2** and **Y2** being against the collars **H4** and **Y4** respectively), it is a sign that the brake shoes require re-covering, and the makers should be consulted.

On no account should further adjustment be attempted, as, for instance, by shortening the brake ropes or interfering with adjustments within the brake drums. Such a course might result in serious injury to the drums and shoes.

Adjustment of Front Brakes.

It should be borne in mind that the correct pedal travel is in no way an indication that the front brakes are correctly set, because these are entirely servo operated and their adjustment will not influence the pedal travel.

The only indication that they require adjustment (apart from an observed decrease in the front braking) is excessive movement at the end of the levers **B**, Fig. **22**, on the front axle. When lightly pressed rearwards by hand the movement of this lever should be $\frac{5}{8}$" measured at the centre of its jaw pin for correct adjustment. If appreciably more movement than this is required, it will be necessary to utilise the adjustment provided. This is shown in Fig. **22**. To effect an adjustment proceed as follows:—

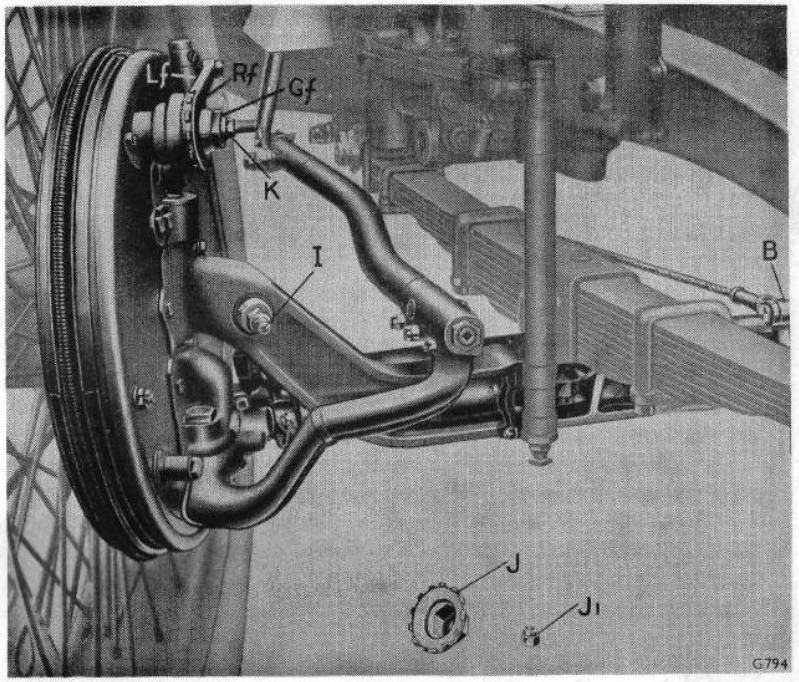


FIG. 22.—FRONT WHEEL BRAKE ADJUSTMENT.

Remove the split cotter of the castellated nut **J1**, and unscrew the latter. The cover **J** may then be removed, exposing the serrated adjustment. As this cover also acts as a locking piece, it will be found convenient to mark the position of engagement of its teeth with those on the member **Rf** before removing it.

The nut **Gf** should be unscrewed sufficiently to permit the serrated member **Rf** to be moved clear of similar serrations on the lever **Lf**. These two sets of teeth are marked respectively with an arrow and figures 0, 1, 2, 3, 4 and 5. If the brakes are being adjusted for the first time the arrow will point to 0.

Having noted the relative position of these serrated parts, they may be disengaged by tapping the lever **Lf** away from the wheel, carrying with it the serrated member **Rf**. While holding the latter in the hand, the lever should then be tapped towards the wheel again, when the serrations will be disengaged.

The cam operating shaft, and with it member **Rf**, should next be turned by means of a spanner on the hexagon **K** of the shaft until the parts can be re-engaged one serration further towards the on position of the cam operating shaft than before; that is, after the first adjustment the arrow will point to 1.

Finally, retighten the nut **Gf**, refit the cover **J**, which also acts as a locking-piece for this nut, and replace the castellated nut **J1**, fitting a split cotter to the latter.

If any difficulty is experienced in getting the teeth of cover **J** to engage with those on member **Rf**, the cover should be rotated slightly and tried in different positions.

The brake clearances should be tested again after adjustment by measuring the movement of levers **B**, as described. This movement must not be less than $\frac{5}{8}$" at the centre of the pin, otherwise the brakes may drag.

Particular care must be taken that each front brake is adjusted a like amount.

It should be observed that when the five teeth of adjustment have been utilised, this is an indication that the shoes require new facings.

On no account should further adjustment be attempted by, for instance, interfering with the lengths of any of the brake rods or ropes.

Apart from testing for the need of adjustment of the front brakes, it is important to test from time to time that the shafts and joints on the axle are free by pushing down the levers **Lf** with the hand, or by moving levers **B** similarly.

The mechanism should feel free, and be returned sharply to the off position by the pull-off springs.

If any tightness is found, the cause must be investigated and removed, otherwise there is a danger of the brakes dragging and becoming damaged.

Adjustment of the Servo.

The servo is of the dry, disc-clutch type, and should run 20,000 miles without the need of any adjustment.

If adjustment is necessary, it is effected by screwing up the nut **Z** (Fig. **23**).

This nut is locked by 25 rounded serrations formed on its face, which engage similar serrations on a washer, which is secured against rotation relative to the shaft. The depth of these serrations is carefully proportioned to give the correct clearance of the servo, the nut being turned so that the teeth lightly ride over each other and engage again.

On no account should force be used in this operation, as such treatment would nullify the object of the teeth, namely, to ensure the correct clearance with very little trouble.

After effecting adjustment in this way, care should be taken to see that the serrations are in proper engagement.

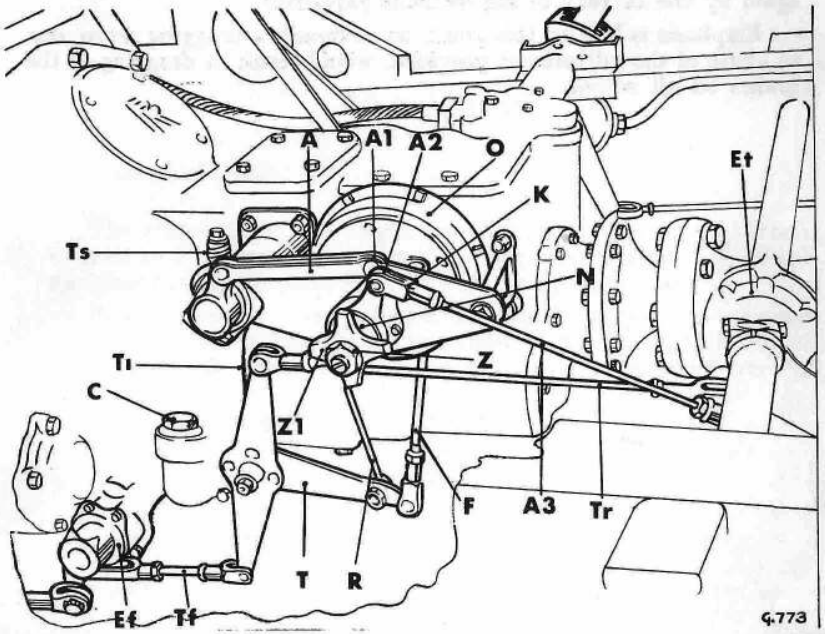


FIG. 23.—THE SERVO MOTOR AND ITS CONNECTIONS.

The adjusting nut should not be screwed up more than one serration—that is, 1/25 of a turn—without testing the servo adjustment.

To test the servo adjustment the pedal should be depressed lightly by hand, as when testing the rear foot brake adjustment. But in this case it should only be depressed sufficiently to engage the servo without appreciably compressing the buffer springs **Z1**, and just short of moving the lever **A2** rotationally.

The pedal travel should then be not less than $\frac{1}{4}$" measured at the top of the pedal towards the dash.

It must be realised that this movement is entirely due to the servo clearance, and does not alter the rear brake clearances. Hence, lever **A2** is not moved rotationally, as mentioned.

Another method of testing for the correct servo clearance is by measuring the gap on the straight or axial sides of the inclined teeth between levers **A1** and **A2**.

It should be possible to insert a .025" feeler gauge at this point when the servo is engaged lightly.

After adjustment, the servo clearance should always be checked again by one or both of the methods explained.

Emphasis is laid on this point, as obviously a dragging servo, due to abuse of the adjustment provided, would result in dragging of the brakes on all wheels.

CHAPTER V

The Clutch

Adjustment of Clutch.

The clutch is of the single dry-plate type, the fabric **O** being secured to the flywheel and clutch ring members respectively, thereby enabling the clutch plate **P** to be kept as light as possible.

Four levers, **R**, are provided for clutch withdrawal purposes, their ends pressed inwards on operation of the clutch pedal by the sliding sleeve **D**, actuated through a ball thrust bearing and trunnion.

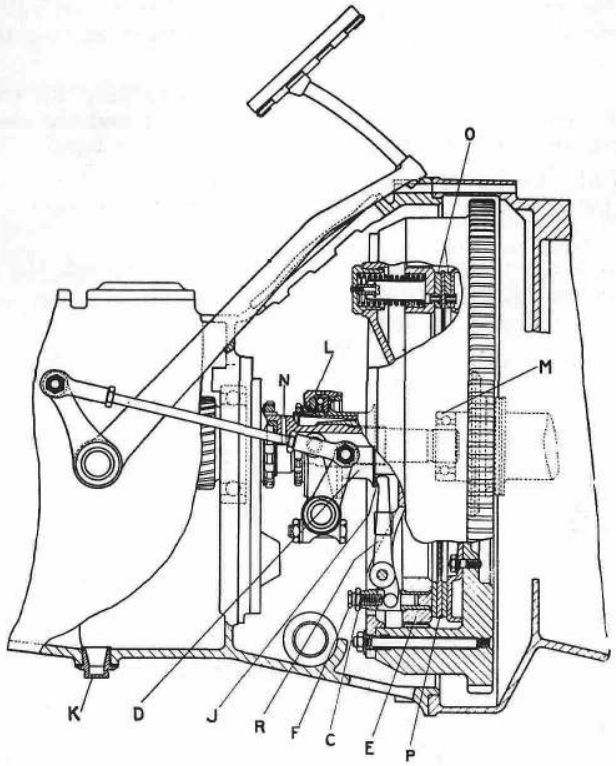


Fig. 24.—PART SECTIONAL VIEW OF CLUTCH.

Clutch Adjustment.

No external adjustment is provided.

An adjustment is provided, however, to ensure an equal outward movement being imparted to the clutch ring **E** by each of the four levers on withdrawal. This takes the form of four tappets, **F**, abutting the ends of levers **R**, and locked by nuts **G**.

Normally, it should be possible to raise the clutch pedal with the fingers about $\frac{1}{8}$" when the footboards are in position. If, owing to bedding down of the fabric, this is not possible, clutch slip may occur owing to the clutch being prevented by the footboards from proper engagement.

Under these circumstances, the clutch-pit inspection cover **H** should be removed, and, after slackening lock-nuts **G**, the tappet screws **F** should be unscrewed until there is .020" clearance, measured with a feeler gauge, at the point **J**, i.e. between the inner ends of the levers and the withdrawal sleeve **D**.

During this operation, the pedal must, of course, be in a position corresponding with that which it occupies when raised against the lower side of the footboards, the latter being removed to gain access to the clutch pit.

A convenient method of ensuring this is to prop up the pedal lightly by means of a piece of wood between it and the dashboard before removing the footboards.

It is of vital importance that this clearance should be equal for each of the four levers, the pedal not being moved during the adjustment.

When the necessary clearances have been obtained, the nuts **G** should be locked with care.

CHAPTER VI

The Coolant System

Coolant Level—Frost Precautions.

Coolant Level.

This should be inspected daily, and if plain water is being used, the level should be maintained between $3\frac{1}{2}$" and $4\frac{1}{2}$" from the top of the filling spout. Loss of coolant may be due to running unwittingly with the radiator shutters closed, which would result in boiling.

If an anti-freeze mixture is being used, the level should be maintained so as to just cover the upper tubes of the radiator core.

Frost Precautions.

Where plain water is being used as the coolant medium and there is any likelihood of the car being exposed to low, frosty temperatures, with the engine not running, it is of vital importance that the water system should be drained by opening the drain tap on the water pump and releasing the filler cap. Also, after a frost and before attempting to start, or even move, the engine again, *hot water should first be poured over the water pump*, as otherwise damage may be caused to the pump rotor by the presence of particles of ice within the casing. Warm water can be used with advantage for re-filling the radiator.

A suitable anti-freeze mixture is made by mixing soft water with either inhibited ethylene glycol or "Bluecol" in proportions dependent on the degree of frost likely to be encountered.

The following table gives an approximate indication of the amount of frost protection ensured by different strengths of mixture:—

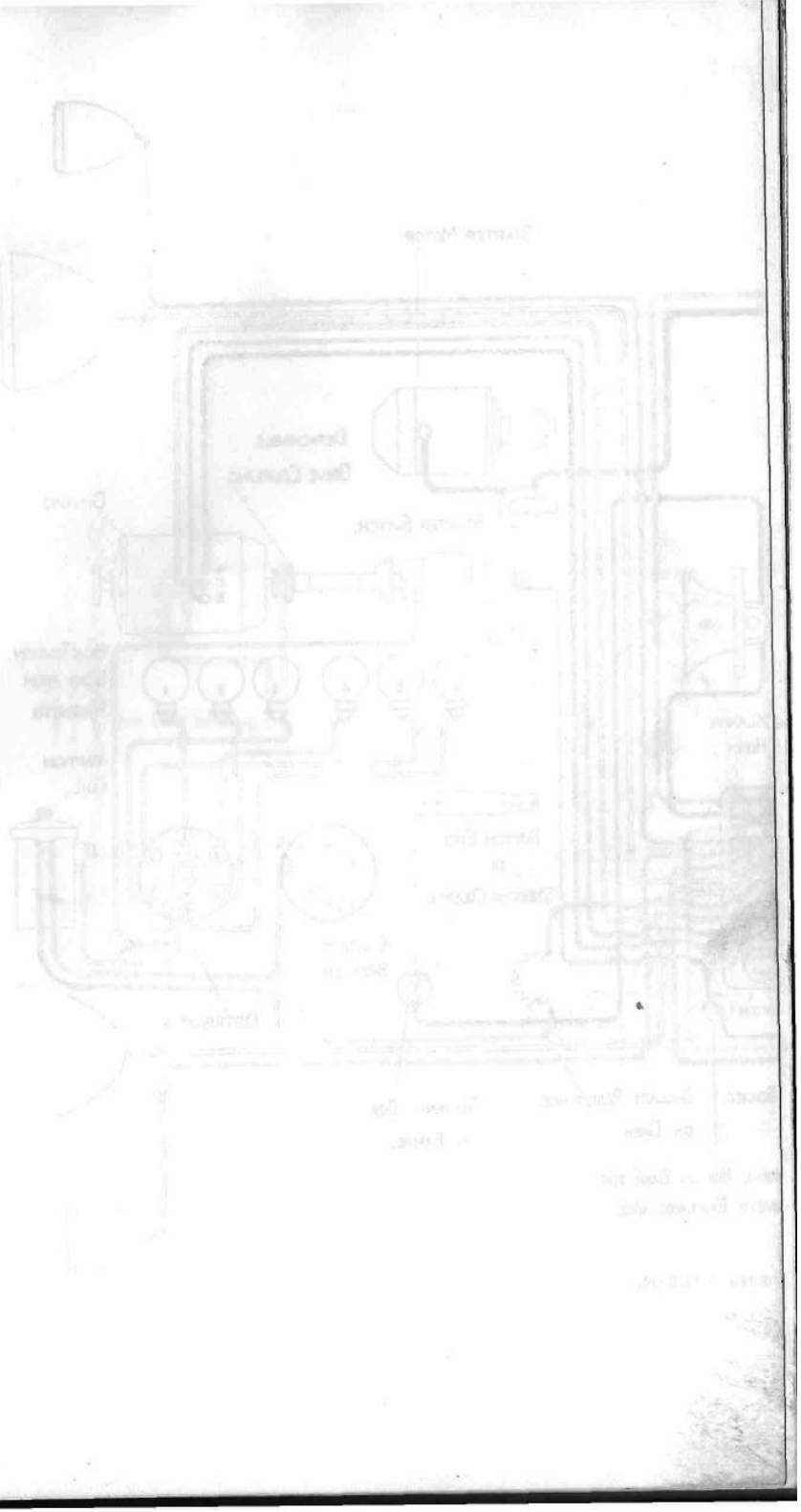
Freezing point ...	22° F.	12° F.	2° F.	−3° F.
Degrees of frost ...	10° F.	20° F.	30° F.	35F°.
1 Inhibited Ethylene Glycol ...	$4\frac{1}{2}$ pts.	$6\frac{3}{4}$ pts.	10 pts.	11 pts.
2 "Bluecol" ...	$4\frac{1}{2}$,,	$6\frac{3}{4}$,,	10 ,,	11 ,,

When changing from water to anti-freeze, the radiator system must be drained. New anti-freeze of the required amount should be mixed with an equal quantity of soft water before being poured into the radiator, the radiator being finally topped up with soft water.

The engine should then be run until normal operating temperature is reached, to ensure uniform distribution of the anti-freeze throughout the system.

The rubber connections must be carefully examined and replaced if unsound, as any leakage will necessitate replenishment with anti-freeze mixture.

When using an anti-freeze mixture as described, a similar mixture should be used for topping up purposes.



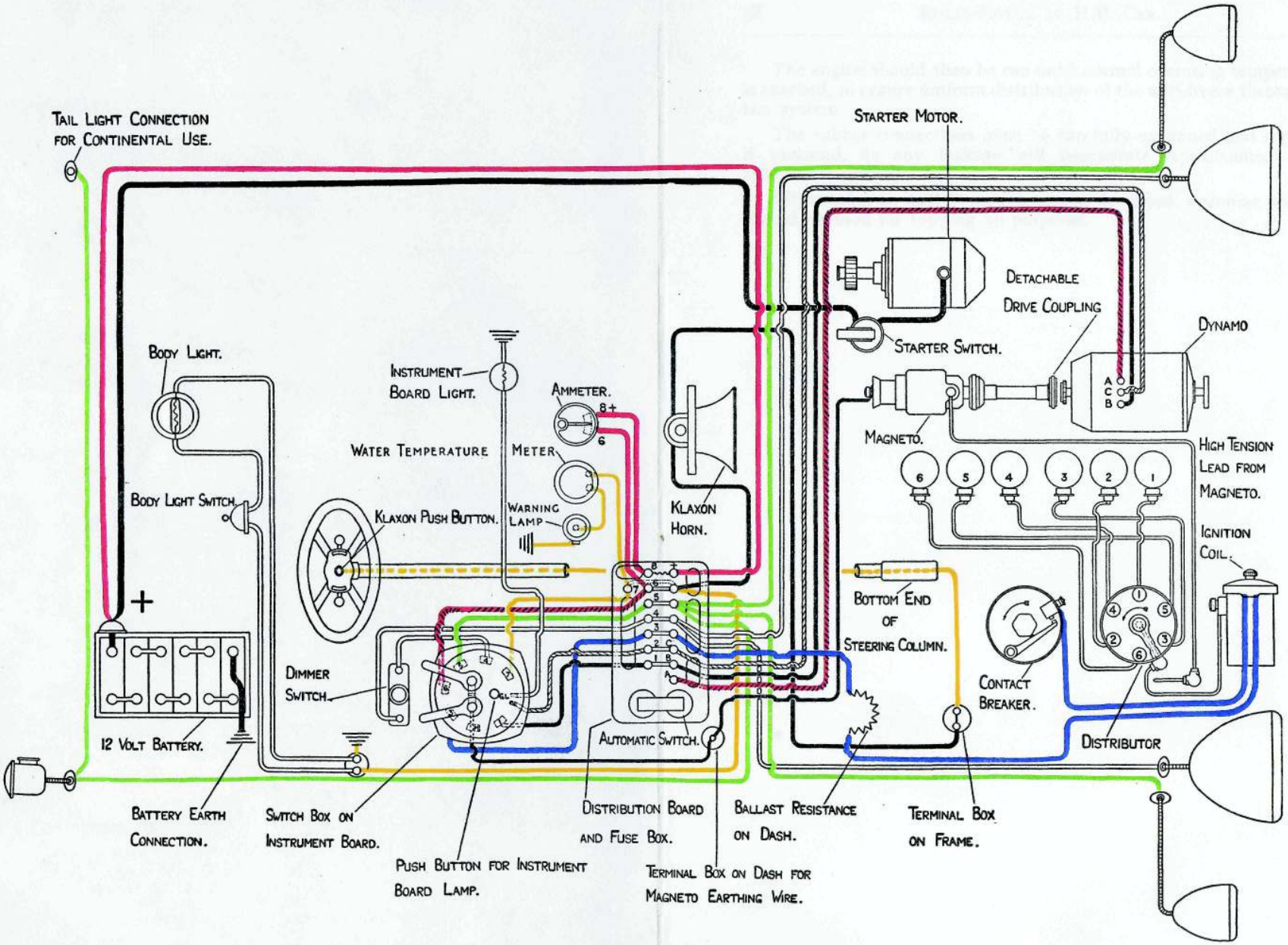


Fig. 25.—ELECTRICAL WIRING DIAGRAM.

CHAPTER VII

The Electrical System

Battery Ignition—Magneto Ignition—Sparking Plugs—Electrical Fault Location.

Battery Ignition.

The battery ignition is in a very accessible position (see Fig. **26**) and consists of an ignition coil **W**, and combined low-tension contact breaker **X** and high-tension distributor **X1**.

A ballast resistance is arranged on the dash, connected in series with the low-tension winding of the coil. Its function is to limit the current taken by the coil at slow speed, or if the ignition switch be accidentally left on while the engine is stopped. It also secures practical equality of intensity of secondary spark at all speeds.

A condenser connected across the contact points is located in a pocket **X2** of this apparatus, the condenser case and the main body of the contact breaker unit being together in direct electrical connection with the chassis frame.

The insulated terminal of the condenser is connected to the insulated contact, and they are brought out together to the insulated terminal to which the external low tension connection is made.

In setting the points the maximum gap opening should be from .017″ to .021″.

The low-tension rocker arm may require lubrication at long intervals. The rocker arm should be removed and a little grease smeared on the pivot pin.

A few drops of engine oil should be injected into lubricator **Z** every 2,000 miles, as directed on page 21, in order to lubricate the centrifugal ignition timing mechanism. In addition, the oil so injected serves to maintain an oil seal arranged at the base of the ignition tower to protect the contacts from oily vapour from the crankcase, which is liable to cause pitting.

The high-tension distributor requires no attention beyond an occasional wiping of the interior with a clean, dry rag.

If the timing of the battery ignition should have been deranged, due, for instance, to removal of the cam operating the low-tension rocker, it can be re-set by reference to the flywheel markings which can be seen on removal of the clutch pit cover.

To carry out this operation the engine should be cranked by hand until No. 1 piston is at the commencement of its firing stroke, as indicated by the T.D.C. (top dead centre) mark. A little further rotation will reveal the letters B.L.I. (battery, late ignition) on the flywheel periphery. The flywheel should be set so that this B.L.I. mark registers with the mark on the casing.

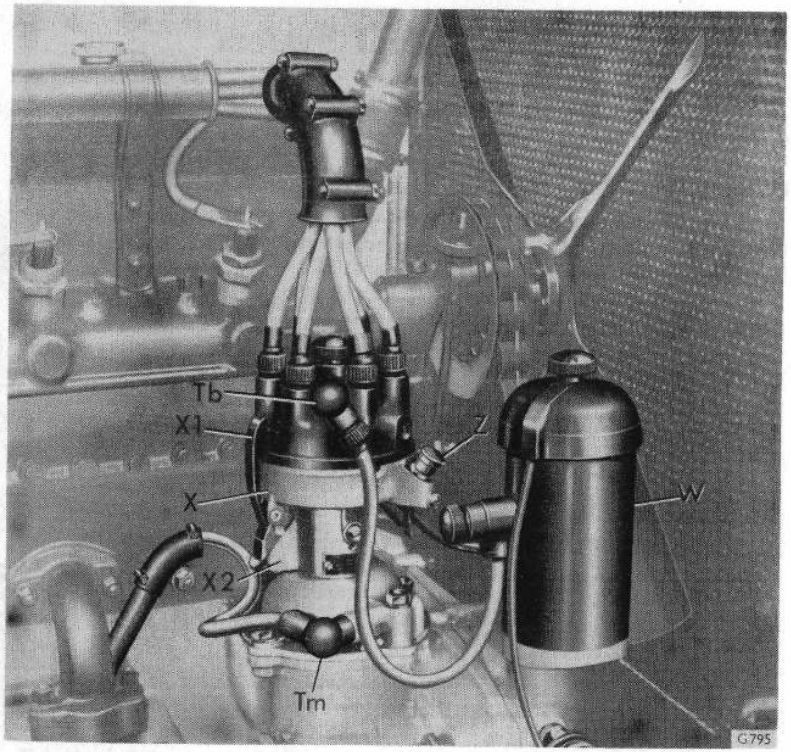


Fig. 26.—IGNITION COIL AND DISTRIBUTOR.

Tb H.T. Lead from Coil.
Tm Magneto Lead—Disconnected.
X Contact Breaker.
X1 Distributor.
X2 Condenser.
W H.T. Coil.
Z Lubricator.

With the ignition lever fully retarded, it is then necessary that the low-tension contacts should be just breaking, the high-tension distributor blade being meanwhile in a position which will bring it opposite No. 1 terminal of the distributor. A convenient method of determining precisely when the break takes place is by reference to the ammeter. With the ignition switched on, and someone watching the ammeter, the cam should be slowly rotated on the taper of its

shaft in the normal direction of rotation until the required peak breaks contact as indicated by the reading of the ammeter. The screw securing the cam should then be tightened.

Magneto Ignition.

The magneto is of a special type, having no high tension distributor, but a single high tension lead, the terminal of which is fitted to the centre of the battery ignition distributor in place of that from the standard ignition coil when required. The magneto is arranged to be put into service very quickly should the necessity arise, the following operations being performed in the order named:—

(1) Remove the battery ignition fuse marked No. 3 from the distribution box, inserting same in the dummy fuse holder in the cover.

(2) Pull out the high-tension terminal (**Tb**, Fig. **26**) of the battery ignition from the distributor and replace with the high-tension magneto lead (**Tm**), which is carried in a special holder on the ignition tower when not in use. Insert the battery high-tension lead in the holder.

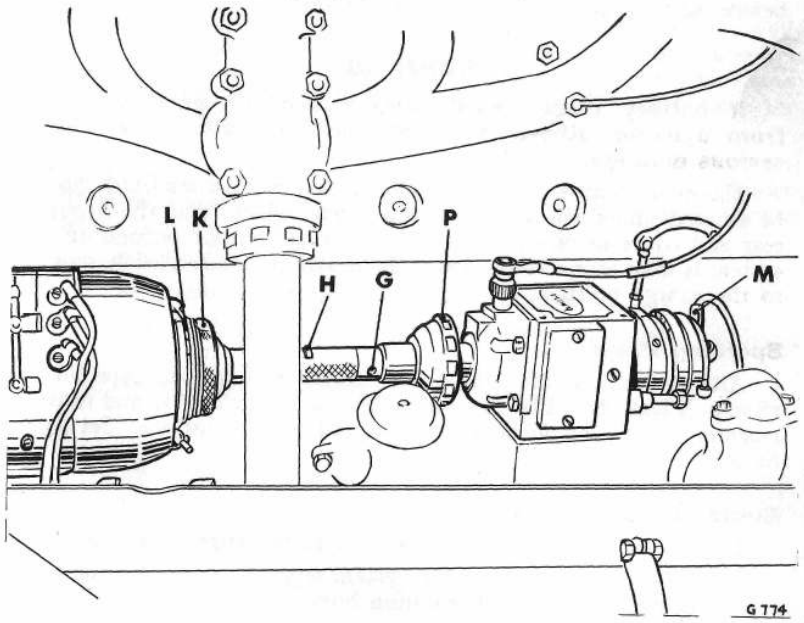


Fig. 27.—MAGNETO.

G Drive Shaft—Oil Hole.
H Engagement Catch.
K Cover—Dynamo Coupling.
L Locking Ring.
M Earth Wire.
P Cap—Magneto Coupling.

(3) Press down the catch **H** (Fig. **27**) projecting from the magneto drive shaft and turn the shaft gently by hand until the teeth are felt to engage.

The engine is then ready for running on the magneto, the thumb lever on the switch box being used for switching on and off in the same way as for the battery ignition.

Owing to the fact that the magneto is capable of giving a good spark when retarded, no attempt should be made to start the engine on the magneto ignition, either by hand or by the starter, without first fully retarding the ignition. Also, when running on this ignition it will be necessary, in order to obtain the best results, to use the ignition lever as the engine speed increases or falls off.

When changing back from magneto to battery ignition, the operations detailed in the preceding paragraphs (1), (2) and (3) must be reversed, the magneto drive being disconnected by sliding the shaft towards the rear against the pressure of an internal spring until it is felt that the catch is holding the engaging teeth clear of each other, when it will be possible to rotate the shaft by hand.

It is important that this uncoupling of the drive should be effected before running again on the battery ignition.

WARNING.

If battery disconnected, detach central (exciting) wire from dynamo, otherwise use of charging switch may cause serious damage.

The central wire is marked "C", and when disconnected should be secured under one of the thumb screws which hold the dynamo rear end cover in position. The dynamo and cutout portion of the system is then inoperative should the switch be inadvertently moved to the charge position.

Sparking Plugs.

Alternative plugs are K.L.G. Type M.30, or Champion Type No. 7, 18 mm. Plugs should be serviced on special plug cleaning and testing machine, which should be available in all service stations. Set gaps to .020".

Electrical Fault Location.

In case of faulty operation, proceed to investigate as follows:—

1. Failure of any part of the system separately may be due to a blown fuse in the distribution box.
2. Failure or incorrect operation of the system may be due to the fusing of the emergency battery fuse, due to an earth.

Repeated failure of a properly fitted fuse indicates a fault on the system.

If dynamo does not charge, this may be due to:—

1. Brushes sticking, due probably to oiliness. Clean brushes and holders with rag moistened with petrol.
2. Melting of dynamo armature or dynamo field fuse. which latter may be due to:—
   (*a*) Dirty cut-out contacts, which clean.
   (*b*) Discontinuity or bad contact in dynamo battery circuit. See that lights are in order and examine battery terminal connections.
   (*c*) Sticking dynamo negative brushes.

If, with the fuses intact, and the lights in order, the ignition:—

(*a*) Misses.

1. First confirm right condition of sparking plugs.
2. Assure correct condition of contact breaker points, and adjust gap .017" to .021", if necessary.
3. If missing still continues, test ignition circuit as below.

(*b*) Fails.

1. With battery ignition switched on, see by ammeter, while engine is cranked, that coil is taking current intermittently. If no current, test with a small voltmeter (to frame) availability of battery voltage on ballast resistance terminals then at coil terminals.

If, with battery in order, starter motor is sluggish or does not turn, examine commutator and brushes. Clean oily brushes and holders with a rag moistened with petrol. If motor turns without turning engine, examine Bijur drive.

If battery will not retain charge:—

1. Ascertain that no circuit is left switched on.
2. Test each individual cell with a small voltmeter, with all lights on.
3. See that no cell of the battery leaks acid.

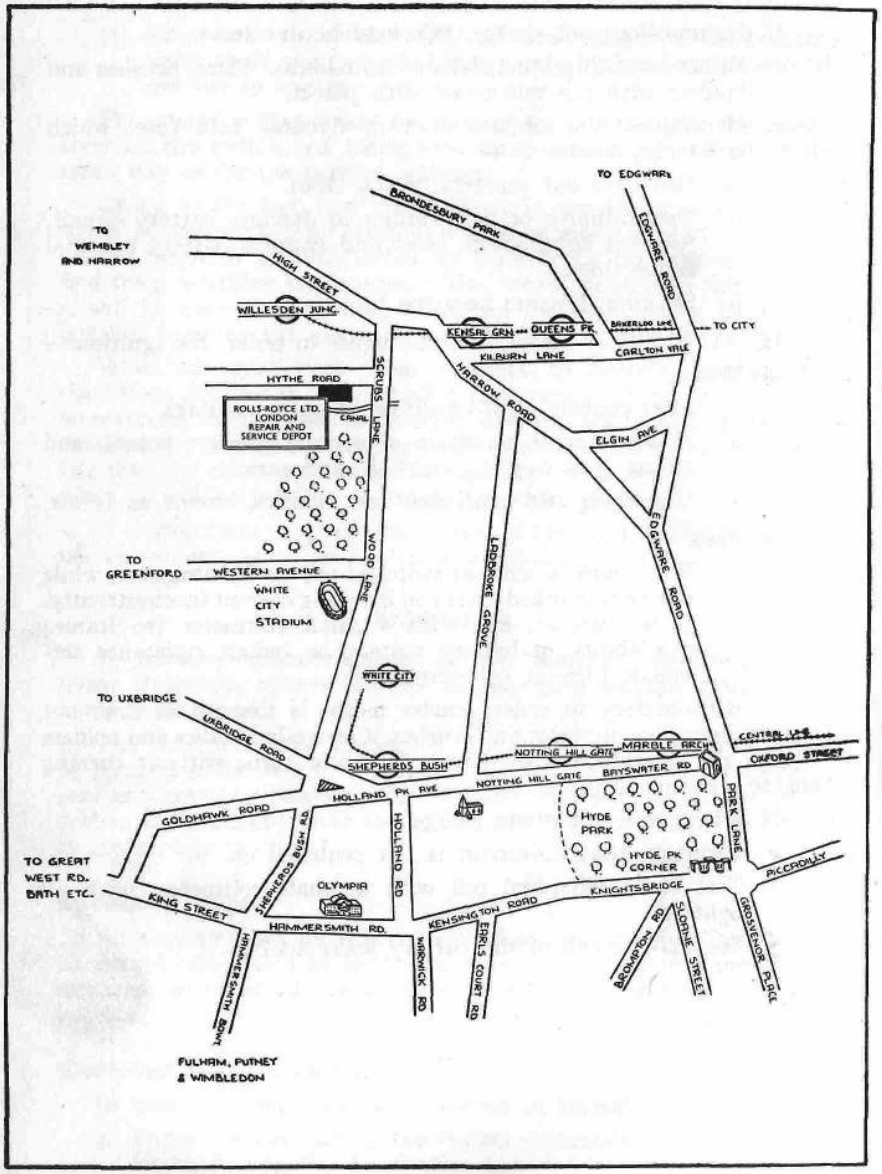


Fig. 28.—GUIDE TO LOCATION OF MAIN SERVICE STATION.

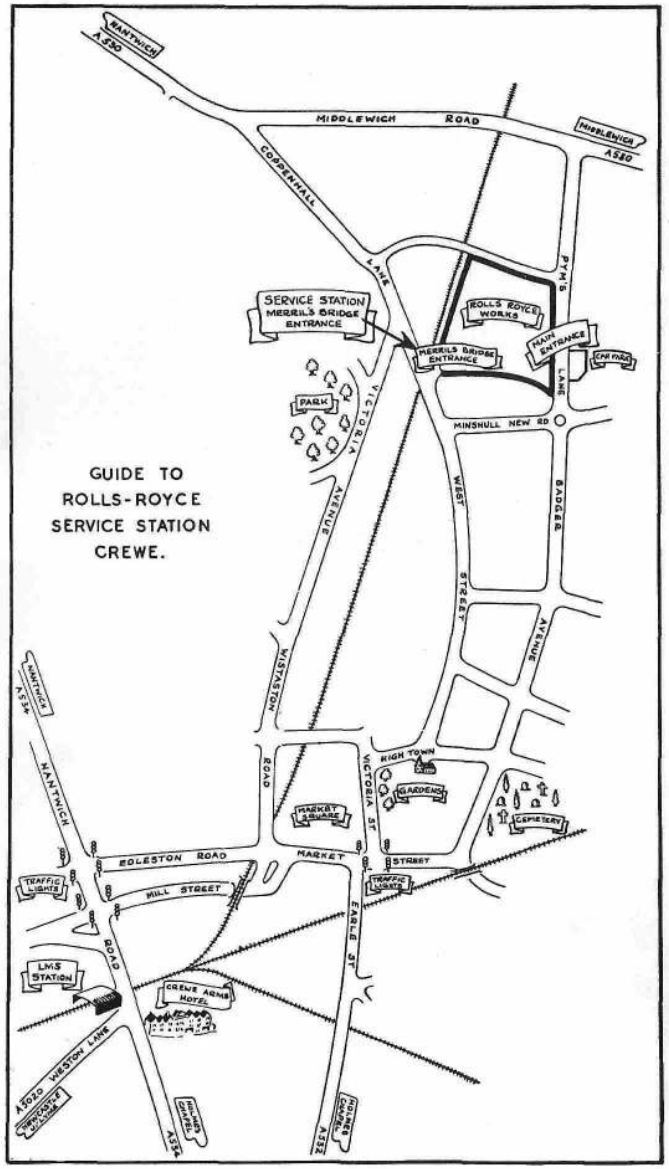


Fig. 29.—GUIDE TO LOCATION OF CREWE SERVICE STATION.

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