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The MORGAN PLUS 4



ERRATA

Page 5 - VALVE TIMING DIAGRAM

For 15° as shown in diagram read 17°

Instruction Book

THE MORGAN MOTOR CO. LTD.
MALVERN LINK :: :: WORCS.

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FOREWORD

The Morgan has been designed to provide a car with a good performance, comfortable and easy to handle and handsome in appearance, at the same time simple to maintain and economical to run.

Each car is carefully built and tested, but the continued satisfaction of the owner is largely in his own hands. The best of cars will not run well unless careful attention is paid to their upkeep.

For this reason we are issuing this Instruction Book, hoping that it will be of interest and use to owners.

There are three points we wish Morgan Users to bear in mind.

1. The importance of regular lubrication, which in the Morgan is a very simple matter.

2. The necessity of keeping nuts, bolts and screws tight. The pleasure of driving a car is often spoilt by noises and rattles, which can easily be avoided if loose parts are attended to at once.

3. The importance of seeing that the brakes are adjusted properly and in good working order.

We do not advise alterations or adjustments unless absolutely necessary, and then it will be better to get our advice which will be given if it is asked for.

LICENCE DATA

Chassis Number	On O/S top of cross member under front seat (Two-seater and Coupe)
	On O/S top of cross member behind front seat (Four-seater)
Engine Number	On cylinder block alongside ignition coil

GENERAL SPECIFICATION

	2.2 LITRE	2 LITRE
Number of cylinders	Four	Four
Bore of cylinders	3.386" (86 mm.)	3.268" (83 mm.)
Stroke	3.622 (92 mm.)	3.622" (92 mm.)
Cubic Capacity	130.5 cu. ins. (2,138 c.c.)	121.5 cu. ins. (1,991 c.c.)
Compression Ratio	9—1	8.5—1
Firing Order	1, 3, 4, 2	1, 3, 4, 2
B.H.P.	100 at 4,600 r.p.m.	100 at 4,800 r.p.m.

OIL CAPACITY

Engine	11 pts. (6 litres). Refill 10 pts. (5.7 litres)
Gearbox	2½ pts. (1.3 litres)
Rear Axle	2½ pts. (1.3 litres)

WATER CAPACITY

Cooling system 16 pts. (9 litres)
It is recommended that Bluecol Anti-Freeze be used in the winter months. The correct mixture is 20% Bluecol, 80% water, which gives protection against frost damage down to 35° of frost.

PETROL

Tank Capacity—2-seater	11 galls. (50 litres)
4-seater	9 galls. (41 litres)

GENERAL DIMENSIONS

Wheelbase	8 ft. (244 cm.)
Track (Front and Rear)	3 ft. 11 ins. (119 cm.)
Ground Clearance	7 ins. (19 cm.)
Turning Circle	32 ft. (10 metres)
Tyre Size	5.60" X 15"

Overall Dimensions	2-Seater	Coupe	4-Seater
Length	12' 0" (366 cm.)	12' 0" (366 cm.)	12' 0" (366 cm.)
Width	4' 8" (142 cm.)	4' 8" (142 cm.)	4' 8" (142 cm.)
Height (Hood erected)	4' 4½" (133 cm.)	4' 2" (127 cm.)	4' 6½" (137 cm.)

BODY DIMENSIONS

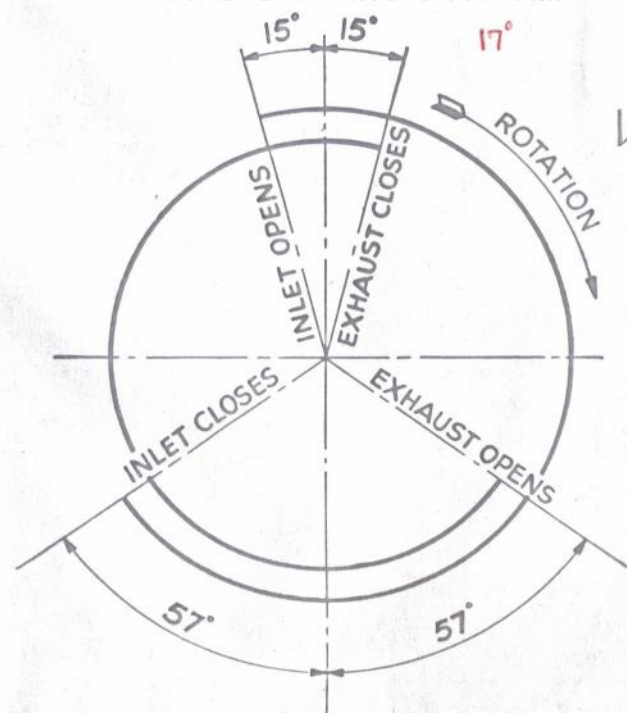
	2-Seater	Coupe	4-Seater Front Seat	4-Seater Rear Seat
Seat to Hood	3' 1"	3' 1"	3' 2"	2' 9"
Width at Elbows	3' 8½"	4' 1"	3' 8½"	3' 6"
Width between Arm Rest	—	—	—	3' 2"
Height of seat from floor	10"	10"	10½"	13"
Leg room	24"	24"	24"	19"
Door width at waistline	2' 2"	2' 3"	2' 2"	—
Luggage Space. Length	3' 2"	3' 2"	—	—
Width	1' 5"	1' 5"	—	—
Depth	1' 2"	1' 3"	—	—

Weights

	Complete with tools and full of petrol	Shipping Weight
	cwts. qrs.	cwts. qrs.
2-seater	16 3 (850 Kg.)	15 3 (800 Kg.)
Coupe	17 2 (888 Kg.)	16 2 (837 Kg.)
4-seater	17 0 (863 Kg.)	16 0 (812 Kg.)

VALVE TIMING. (With valve rocker clearance set at .040" when exhaust and inlet valves of No. 4 cylinder are rocking).
Inlet opens 17° B.T.D.C.
Inlet closes 57° A.B.D.C.

VALVE TIMING DIAGRAM



VALVE TIMING—continued

Exhaust opens 57° B.B.D.C.
Exhaust closes 17° A.T.D.C.

Valve rocker clearances (measured with engine cold)

Inlet 0.010" (0.25 mm.). Exhaust 0.010" (0.25 mm.).

For high-speed motoring the clearances should be .013" (0.33 mm.) for both inlet and exhaust measured with engine cold.

IGNITION TIMING

Set to fire 4° before top dead centre
(distributor contact points just opening).

As the advance is entirely automatic, the setting is fully retard.
Contact breaker gap should be set at 0.015" (0.4 mm.).

FRONT WHEEL ALIGNMENT AND SUSPENSION

Castor 4°.

Camber 2°.

King pin inclination 2°.

Toe-in $\frac{1}{8}$ " to $\frac{3}{16}$ " (3.2 mm. to 4.8 mm.).

PERFORMANCE DATA

	Engine speed at	
	10 m.p.h.	10 km.p.h.
Top	485 r.p.m.	300 r.p.m.
3rd	590 "	365 "
2nd	825 "	510 "
1st	1,400 "	870 "
Rev.	1,400 "	870 "

Chapter I

CONTROLS, SWITCHES AND INSTRUMENTS

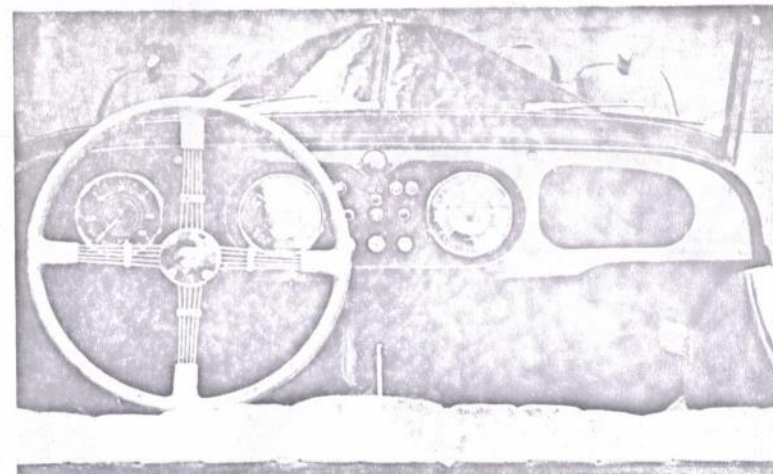


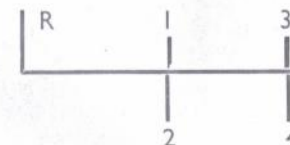
Fig. 2.

CHOKE CONTROL

Pull out the control to the stop when starting, when engine is sufficiently warm push choke back to half-way. After one or two minutes driving as the engine reaches normal temperature it will be possible with a clockwise movement to push the control right in without causing the engine to run with undue hesitation.

GEAR LEVER

Always select neutral position before starting the engine.



The lever requires lifting to engage reverse gear.

HAND BRAKE

Is of the "fly-off" type. To operate the handbrake pull backwards, the lever is fixed in the on position by pressing the knob

on the top of the lever and engaging pawl in the ratchet. To release brake pull the lever to the rear and allow to go forward to the full extent.

ACCELERATOR

The pedal is connected by a Bowden cable to the carburettor throttle. Do not depress pedal when starting engine from cold.

FOOT BRAKE

Operating four wheel hydraulic brakes.

CLUTCH

Press pedal to disengage drive from engine to gearbox. *Do not rest your foot on the pedal when driving, or hold the clutch out to free wheel, as this will CAUSE UNNECESSARY WEAR TO THE CARBON THRUST PAD.*

BRAKE LIGHT SWITCH

The switch is connected to the brake pedal mechanism but will operate the red rear lights only with the ignition switched on.

HEAD, TAIL AND SIDE LAMPS

Pull switch outwards to first control notch for operating side and tail lamps. Pull switch further to second control notch to operate headlamps.

HEADLAMP DIPPER SWITCH

Foot operated, situated above the clutch pedal on scuttle. Press foot dip switch to operate headlamp dip. Press again for full-on position.

HEADLAMP WARNING LIGHT

Glow red when the headlights are on main beam.

HORN

Press to operate.

IGNITION AND STARTER SWITCH

Turn clockwise to first stop for ignition. Do not leave the switch "on" when engine is stationary, to avoid the battery being discharged by current flowing through the coil windings. Turn the ignition key clockwise beyond the "on" position to operate starter. Release key and allow to spring back immediately engine fires. Do not re-operate until starter motor and engine have come to rest.

WINDSCREEN WIPER SWITCH

Press down to operate wipers, they will only function when the ignition is switched on. Press upwards to stop when arms are in the desired parking position.

FOOT LUBRICATION CONTROL

Press to operate (see Lubrication, pages 13-14, for full instructions).

DIRECTION INDICATORS

A warning light on the panel shows when the indicators are operating, also indication is given by audible "ticking."

OIL PRESSURE GAUGE

Indicates pressure of oil being pumped to the bearings. It does not show the amount of oil in the sump (excepting that if the oil level is dangerously low the pressure usually falls, due to overheating). The oil pressure gauge should read 20-40 lbs/sq. in. when the car is travelling at approximately 30 m.p.h. and the oil is hot. A low oil pressure is quite normal if the engine is idling or running at low speeds.

IGNITION WARNING LIGHT

Glow red when ignition is switched on with the engine idling or stopped. Should the light appear when the engine is running at normal speeds, this indicates a fault on the battery charging system.

WATER TEMPERATURE GAUGE

Electrically operated, acting when ignition is switched on.

AMMETER

Indicates the rate of charge or discharge of the battery. The rate of charge falls off progressively as the battery approaches fully charged condition.

FUEL GAUGE

Operates only when ignition is switched on.

SPEEDOMETER

Is fitted with a trip which is cancelled by pushing up the serrated knob (situated under the dash board) and turning anti-clockwise.

PANEL LIGHT

Press down knob to switch on panel lights. These lights will only operate when parking lights are switched on.

INSPECTION LIGHT SOCKET : 12-VOLT

This socket may be used as an inspection light terminal or alternatively gives a useful means of fitting charging plant leads.

Chapter II

NEW ENGINES

When the car is new, the engine may seem to be somewhat lacking in power due to the working surfaces not having become fully bedded down. This will continue for the first 200 or 300 miles (320-480 km.) during which time the engine will become gradually "run-in" (with proper use). The power will then improve as the car is used for the first 2,000 miles (3,200 km.), and this will be accompanied by a corresponding improvement in petrol consumption. The engine sump should be drained and refilled with new oil at the completion of the first 1,000 miles.

At approximately 5,000 miles much benefit is gained by having the valves ground in as described on Pages 28-29. Although this involves some slight inconvenience in giving attention to a new engine, the trouble is well repaid by the results obtained.

It is inadvisable to run a new car fast or to run the engine at high speeds in low gears. The good and lasting bearing surfaces obtainable by careful running-in are well worth the patience required to drive at only moderate speeds for at least the first 500 miles (800 km.).

It is not recommended that the engine should be religiously driven at the specified speeds for the first 500 miles, but suggested that "running-in" should be progressive and that no harm is done if the engine is allowed to "rev" fairly fast (not raced) so long as it is thoroughly warm, but do not allow it to *pull hard and labour* on hills in any gear.

During the running in period the use of an upper cylinder lubricant is beneficial. This should be added to the petrol in quantities as recommended by the makers of the preparation used.

The following table gives the permissible speeds in top gear :

During the first 250 miles (400 Km.)	45 m.p.h., 72 Km/hr.
During the following 150 miles (240 Km.)	50 m.p.h., 80 Km/hr.
During the following 100 miles (160 Km.)	55 m.p.h., 88 Km/hr.
During the first 500 miles (800 Km.),	it is inadvisable to exceed

the following speeds in gears :—

First gear	... 15 m.p.h., 24 Km/hr.
Second gear	... 30 m.p.h., 48 Km/hr.
Third gear	... 40 m.p.h., 64 Km/hr.

This table is not intended as a hard and fast ruling on the matter, but should be regarded as a guide.

MORGAN RECOMMENDED LUBRICANTS

	SHELL	ESSO	B.P.	CASTROL	MOBIL OIL
Engine— U.K.					
Summer	X-100 Motor Oil 30	Extra Motoroil 30	Energol S.A.E. 30	Castrol XL	Mobiloil A
Winter	X-100 Motor Oil 20/20W	Extra Motoroil 20	Energol S.A.E. 20	Castrolite	Mobiloil Arctic
Overseas					
Temps. above 70°F.	X-100 Motor Oil 40	Extra Motoroil 40	Energol Motor Oil S.A.E. 40	Castrol XXL	Mobiloil AF
Temps. 40°—70°F.	X-100 Motor Oil 30	Extra Motoroil 30	Energol Motor Oil S.A.E. 30	Castrol XL	Mobiloil A
Temps. below 40°F.	X-100 Motor Oil 20/20W	Extra Motoroil 20	Energol Motor Oil S.A.E. 20W	Castrolite	Mobiloil Arctic
Gearbox	X-100 Motor Oil 30	Extra Motoroil 30	Energol S.A.E. 30	Castrol XL	Mobiloil
Rear Axle	Spirax 90 EP	Esso Gear Oil GP 90	Energol Transmission Oil EP—S.A.E. 90	Castrol Hypoy	Mobilube GX.90
Steering Box	Spirax 140 EP	Esso Gear Oil GP 140	Energol Transmission Oil EP—S.A.E. 140	Castrol Hi-Press	Mobilube GX.140
Wheel Bearings	Retinax A	Esso Grease	Energol L2	Castrol Heavy	Mobil Hub Grease
Dynamo	Retinax A	Esso High Temperature Grease	Energol L2	Castrol Heavy	Mobilgrease M.P.
Chassis Grease Points	Retinax A	Esso Pressure Gun Grease	Energol L2	Castrol LM	Mobilgrease M.P.
Oil Can	X-100 Motor Oil 20/20W	Extra Motoroil 20	Energol Motor Oil S.A.E. 20W	Castrolite	Mobiloil Arctic

We also approve Multigrade Oil marketed by the above named Companies

Chapter III LUBRICATION

CHASSIS. This is one of the most important subjects in connection with the upkeep of the car, and careful attention to the following remarks and instructions will be amply repaid by the results obtained, and the utmost satisfaction from the Morgan Plus Four will result from the use of the Lubricants specified.

A chassis lubrication chart is included in the centre pages of this Instruction Book, and the recommended mileages at which lubrication should be carried out are indicated.

Grease nipples are located as follows (see Chassis diagram) :—

1 to each front sliding axle.

1 Water Pump.

1 behind Clutch housing (lubricates clutch thrust mechanism) ; access to this is through a hole in the top of the Gearbox shaft tunnel.

2 on pedal brackets (access to the greaser on the centre pedal brackets is from under the car).

1 on front end of propeller shaft (access to this is from under the car).

1 to each universal joint on the Propeller Shaft.

1 to each Rear Hub.

1 at each end of Track Rod and 1 at each end of drag link.

In addition to the nipples mentioned, apply oil periodically to the rear brake yoke pins, and balance lever pivots, the engine control lever joints, etc. It is also beneficial to apply a spot of oil occasionally to the threads of the wheel-studs in order to prevent the nuts becoming rusted on.

FRONT SUSPENSION

Lubrication of the sliding axles is carried out by the "one shot" lubrication system. The plunger for operating this lubrication is situated in the centre of the metal scuttle and is foot operated. Although it is difficult to give a definite mileage between use it is recommended that the plunger be pressed at least every 200 miles (320 Km.). The plunger should be pressed down by foot for a few seconds during which

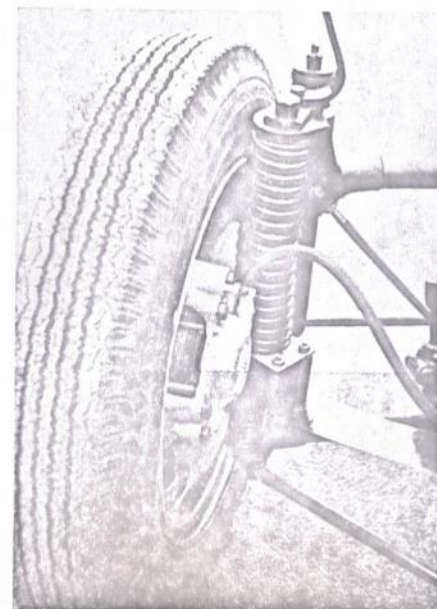


Fig. 3

time a very small decrease in oil pressure may be observed on the oil gauge.

As mentioned before, the sliding axles are also provided with grease nipples which should be lubricated with grease every 3,000 miles, the grease helping to retain oil supplied by the "one shot" system.

A small amount of lubricating oil on the steering friction dampers is beneficial should the steering become stiff.

The importance of frequent lubrication to the sliding axles cannot be too highly stressed as comfort is to a large extent dependent on the free working of these parts, and neglect will result in tightness which not only makes the springing harsh, but results in excessive wear, necessitating renewal before it should be necessary.

ENGINE

We recommend low viscosity oils for use in the engine sump. These oils, whilst maintaining sufficient body when hot, are fluid enough to give early lubrication to cylinder walls, etc., when starting the engine from "cold." They are of the correct viscosity and character to afford complete lubrication protection. Additives which dilute the oil or otherwise impair this protection must NOT be used. We therefore stress the value of using only the recommended oils. After many thousands of miles running the rate of oil consumption will increase. When the rate becomes higher than one gallon per 1,000 miles (1 litre per 400 Km.), it will be desirable to use the next heavier grade of the brand of oil you normally employ.

The working parts of the engine are lubricated by oil contained in the sump, drawn through a filter by the gear type pump and delivered under pressure to the crankshaft journals, crankpins, connecting rod little ends, camshaft bearings and rocker shaft. Oil returning from the rocker gear lubricates the tappets and cams. The jets of oil from connecting rod bearings lubricate the pistons and the timing chain is fed with oil from the camshaft bearing. Suitable oil seals are embodied at the front and rear ends of the crankshaft which effectively prevent oil leaking along the shaft.

EVERY 250 miles (400 Km.) the oil level should be checked and topped up if necessary. Withdraw dipstick and wipe clean, then insert and push fully home before withdrawing for reading. Should the level be at the lower mark on the dipstick, 4 pints (2.2 litres) of oil will be required for topping up.

The regular addition of oil not only maintains the correct level, but also tends to keep up the quality of the lubricant. However, gradual deterioration takes place until it becomes advisable occasionally to drain the sump and refill with fresh oil. If the engine is found

to require very little oil for replenishment then it is desirable to drain the oil every 2,500 miles (4,000 Km.) and refill with fresh oil.

CAUTION

Do not attempt to clean out the sump with paraffin or petrol unless it is removed from the engine, as any remaining liquid will tend to dilute the oil.

THE OIL CLEANER

The Oil Cleaner has been designed to filter the oil to a very fine degree and the only attention it requires is to see that the filtering cartridge is removed and that a new replacement cartridge of the correct type is fitted at periods not exceeding 10,000 miles (16,000 Km.).

It is essential that this operation be carried out at the specified periods to ensure the full filtration of the oil. The cleaner manufacturer's name and cartridge number, which are clearly marked on the top of the cleaner body, must be quoted when obtaining a replacement cartridge.

To renew the cartridge, unscrew the securing bolt and remove the container, the cartridge can then be withdrawn (Fig. 4). Wipe out the container to remove foreign matter trapped by the filter, using a non-fluffy cloth and inspect afterwards to make certain that no cloth fibres remain.

It is desirable to discard the old container and cartridge washers, replacing them with new ones, every time the cartridge is renewed. When re-assembling the container ensure that the washers and spring are correctly positioned (see Fig. 4). Do not tighten the bolt more than is necessary to obtain an oil tight joint.

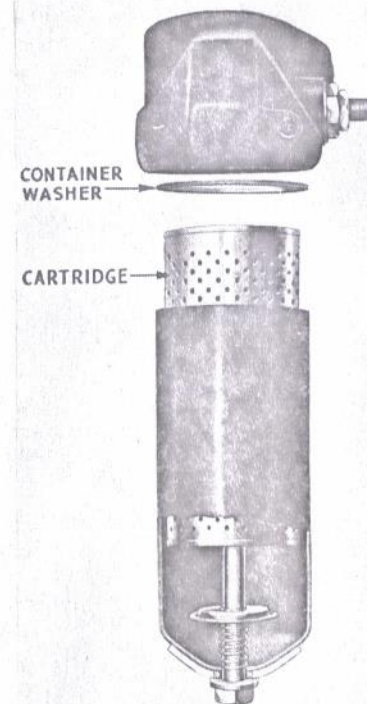


Fig. 4

Approximately one pint of oil will be lost due to the removal of the container and the sump should be topped up with new oil after assembly. However, as this operation should be done when the engine oil is being drained the refilling of the sump by the specified amount will automatically allow for this loss.

The container should not be disturbed until cartridge renewal is required ; to do so invites the hazard that the accumulated dirt on the outside of the container may be allowed to contaminate the inside and thus be carried into the bearings when the engine is re-started.

If at any time the cleaner body is removed from the crankcase, take great care to fit the joint washer correctly, otherwise damage will be caused when next the engine is started, through the " blanking off " of the oil passages. It is advisable to fit the washer to the crankcase and ensure that the holes in the washer match those in the crankcase before attaching the body.

IGNITION DISTRIBUTION (See Fig. 5)

Every 5,000 miles (8,000 Km.) the cam should be smeared lightly with engine oil. A pronounced squeak occurs when the cam is quite dry. Withdraw the moulded rotor arm from the top of the spindle (care should be taken because this part is made of a brittle material), but do not remove the screw exposed to view. Apply, by means of oil-can, a few drops of thin machine oil around the edge of the screw and down the hole provided, to lubricate the cam bearings and distributor spindle respectively. At the same time, place a single drop of clean engine oil on the contact breaker arm pivot.

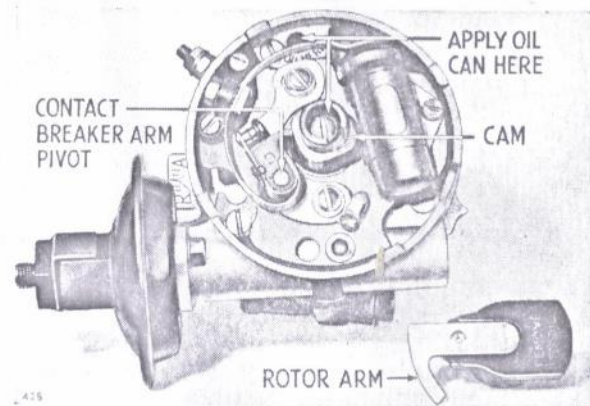


Fig. 5

When replacing the rotor arm make sure that it is pushed on as far as possible.

The moving parts of the automatic advance mechanism should be lubricated with winter grade engine oil. This can be squirted through the gap between the cam and the base plate. Take great care not to allow any oil to get on or near the contacts.

WATER PUMP AND FAN

There is one nipple provided, to which the grease gun should be applied every 5,000 miles. Give five strokes only with gun.

DYNAMO AND STARTER

Once every 5,000 miles a few drops of oil should be applied through the hole in the centre of the commutator end plate boss at the rear of the generator.

The Starter is fitted with special bearings which require no lubrication.

GEARBOX

Overall ratios : 3.73-1, 3rd 5.24, 2nd 7.38, 1st 12.85, Reverse 12.85.

The correct oil only should be used in the gearbox as the use of very thick oil or grease will spoil the operation of gear changing.

Every 2,500 miles (4,000 Km.) the oil level should be checked and topped up if necessary.

To check the oil level, the dipstick is found on the left hand side of the gearbox beneath the flap on the gearbox cover. Withdraw the dipstick and wipe clean, then insert stick and push it fully home before withdrawing for reading. The correct level is the top mark. The dipstick orifice is also the gearbox oil filler.

REAR AXLE

It is essential to drain and replenish the axle with " Hypoid " oil every 5,000 miles (8,000 Km.).

The hypoid bevel gears fitted in the rear axle require a special lubricant to ensure efficient operation and long life.

This type of gear incorporates a sliding action between the exceptionally sturdy gear teeth, resulting in silent operation. However, the rubbing action is too severe for normal oils, so special " Hypoid " oils have been developed which contain additives that make the oil capable of withstanding pressures many times heavier than normal oils can cope with. A further feature of " Hypoid " oils is that they are " lighter "—that is to say, more fluid than normal axle oils. However, the special additives begin to lose their properties in the course of use, and the oil tends to revert to a light gear oil.

Thus it is advisable to completely drain and replenish with new " Hypoid " oil every 5,000 miles (8,000 Km.), and in any event do not exceed a period of 10,000 miles (16,000 Km.).

It is desirable to have the oil level checked during this period and if the oil level is below the plug on the rear do not "top up" but drain the oil and refill with new oil, this will overcome the danger of mixing the various grades of oil.

The filler and level plug is combined on the rear of the differential case, clean away grit before unscrewing the plug.

BRAKES

It is important that the filler cap on the brake fluid reservoir should be removed every 5,000 miles (8,000 Km.), the fluid level checked and topped up if necessary. The level in the reservoir should be about half-an-inch from the top; do not fill completely.

The reservoir is situated above the master cylinder and is located under the right-hand side of the bonnet on right-hand drive models, and on left-hand drive in a corresponding position on the left-hand side.

As the cups in the master and all wheel cylinders are pure rubber it is imperative to use only Girling hydraulic fluid. Ensure that the air vents in the filler caps are not choked. Blockage at this point would cause the brakes to drag.

REAR ROAD SPRINGS

The spring blades should not be allowed to get rusty as this will prevent the correct working of the springs and provide a hard suspension.

Service stations are often equipped to spray the springs with penetrating oil, but this is not lasting in effect, and it is advisable afterwards to paint over with rear axle or engine oil.

It is the area around the tips of the blades which most requires the lubricant, as it is at these points that one blade presses upon the next. The spring clips should also be oiled.

Rubber bushes are fitted in the rear spring ends and must not be lubricated.

STEERING

Check oil level in box every 5,000 miles (8,000 Km.).

Grease should never be used in the steering box, or seizure of the rockershaft will occur. The recommended oil is a medium to heavy gear oil such as Hypoid 90 or S.A.E. 140.

The felt bush at the top of the steering column may in time become dry and cause a squeak when the steering is operated. It is recommended that the application of a little graphited oil, such as upper cylinder lubricant, be used to cure this. Do not saturate the felt with oil or it will soon become useless.

HYDRAULIC DAMPERS

The piston and telescopic type dampers fitted should not require any attention such as "topping up." If they become inoperative they should be serviced by the makers.

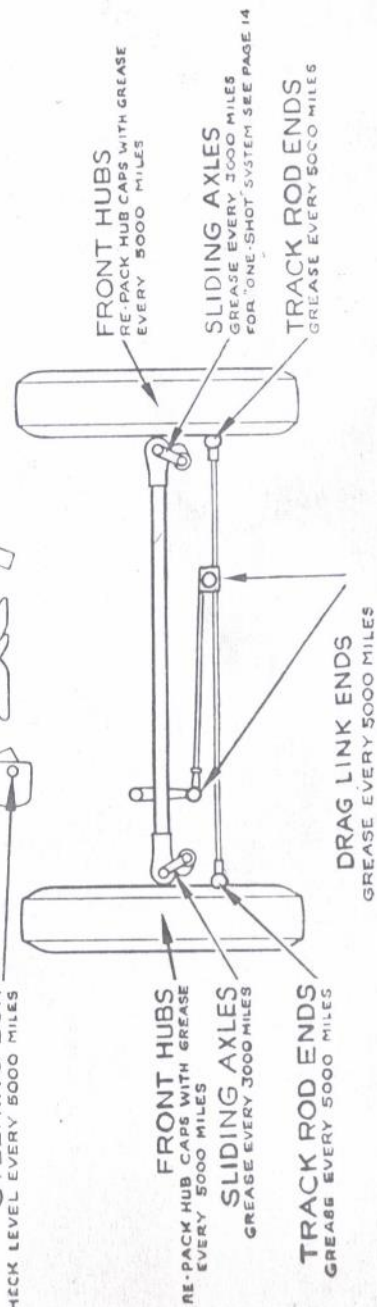
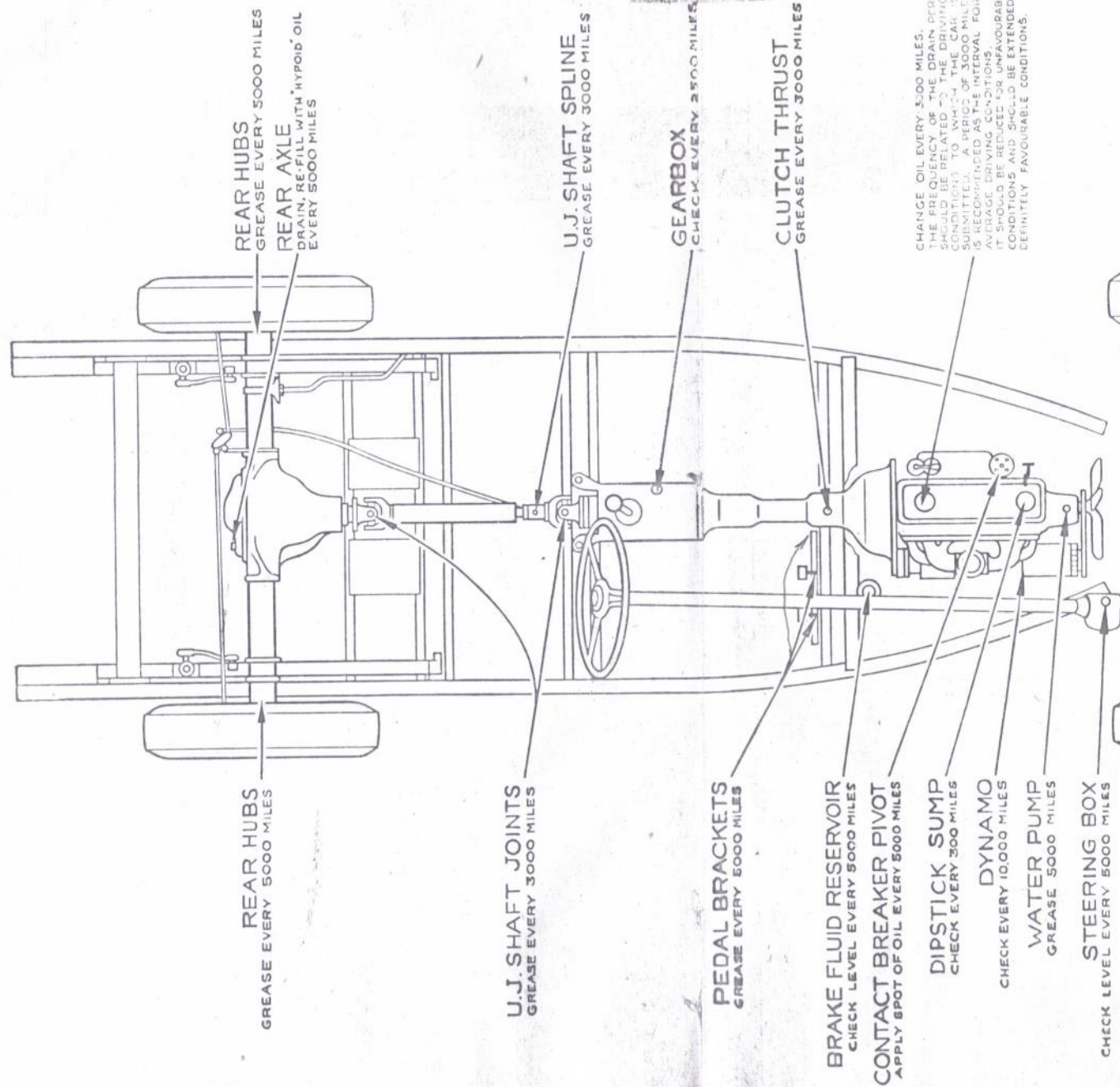
HINGES, CONTROLS, DOOR LOCKS, ETC.

The bonnet catches, hinge and several small control joints should be given occasional attention with the oil can. Door locks should receive a drop of oil every month to ensure easy operation.

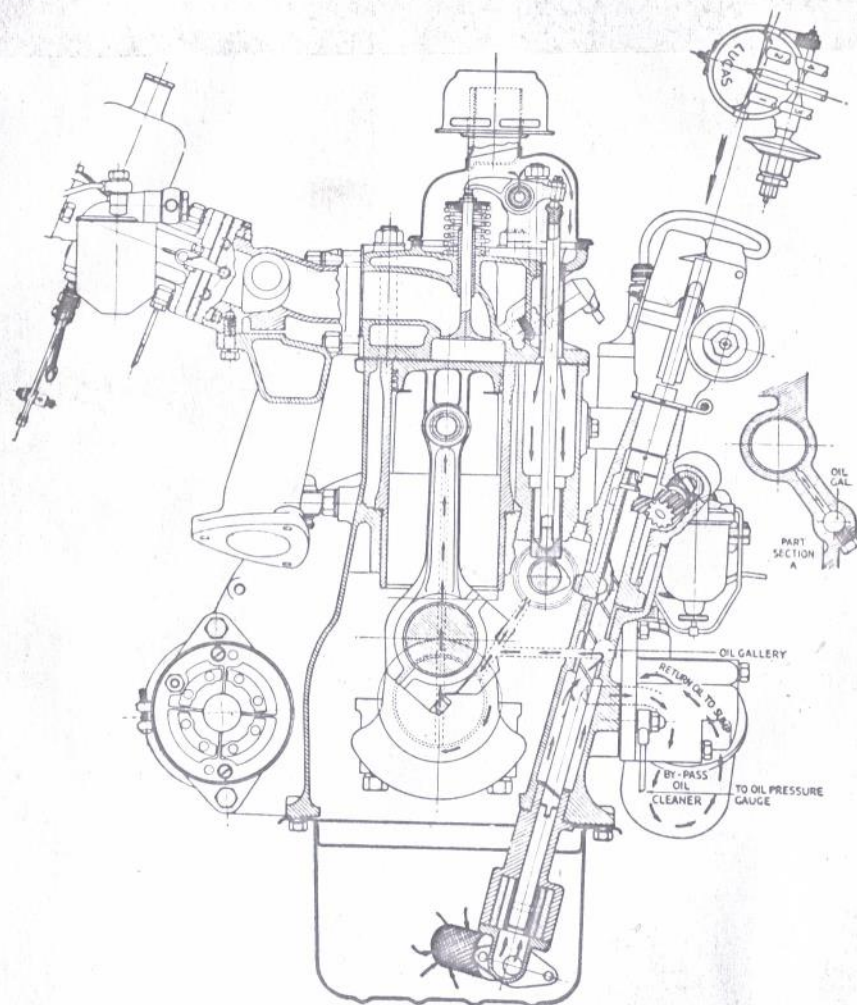
The clutch operating links, and accelerator cable, etc., all require occasional attention to allow controls to work freely and prevent unnecessary wear.

THE BATTERY

At frequent intervals (especially in hot climates) top up each cell with distilled water to bring the acid solution (electrolyte) level with the top of the separators. Do not use a naked light when examining the conditions of the cells and on no account use tap water when topping up. Keep the terminals clean and well covered with petroleum jelly. If they are corroded, scrape them clean, assemble and cover with petroleum jelly. Wipe away all dirt and moisture from the top of the battery, and make sure that the connections are clean and tight.



ENGINE FRONT END VIEW



Chapter IV

ENGINE

ENGINE MAINTENANCE AND ADJUSTMENTS

Various adjustments are necessary from time to time in order to keep the mechanism in efficient running order. The periods between depend largely upon the manner in which the car is used and no definite time can be given here for carrying out these corrections. The car should be examined, however, every 5,000 miles (8,000 Km.) and any adjustments which appear necessary can then be made.

CYLINDER HEAD NUTS

After the first 500 miles (800 Km.) the cylinder head nuts should be checked, with engine warm, for tightness (100 ft. lbs.) in the order shown (see Fig. 7).

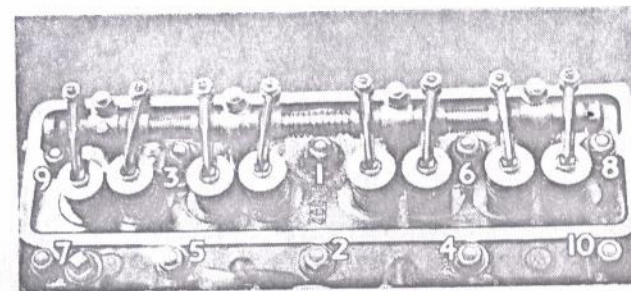


Fig. 7

VALVE ROCKER CLEARANCES

The running clearances are .010" (0.25 mm.) Inlet and .010" (0.25 mm.) Exhaust for normal touring purposes. For high speed motoring the clearance should be .013" (0.333 mm.) for both inlet and exhaust, measured with engine cold.



Fig. 8

ADJUSTMENT OF VALVE-ROCKER CLEARANCE

Remove the rocker cover and turn the engine crank for half a revolution after the valve to be adjusted has closed. It is easier to do this if the sparking plugs are removed. This also provides an opportunity for inspecting and checking the sparking plug gaps. Slacken the lock nut and adjust the rocker screw with a screw driver until the gauge is a sliding fit between the top of the valve stem and the rocker face (Fig. 8). Now tighten the lock nut and check that the clearance has not altered.

IGNITION TIMING

On initial assembly the ignition is set as previously. Premium grade fuels of 90 octane or higher must be used for these engines and with this fuel a "clean" engine will not "pink." However, with a substantial amount of carbon build up, it may be necessary to retard the ignition slightly so that "pinking" is only just audible when pulling hard with the engine speed above 1,500 r.p.m. To advance ignition, rotate the knurled screw. Each division on the distributor vernier scale represents 2° of the distributor—i.e. 4° on the crankshaft. The firing order is 1, 3, 4, 2. To obtain T.D.C. position turn the crankshaft until the small hole on the belt pulley is in line with the pointer attached to the timing cover.

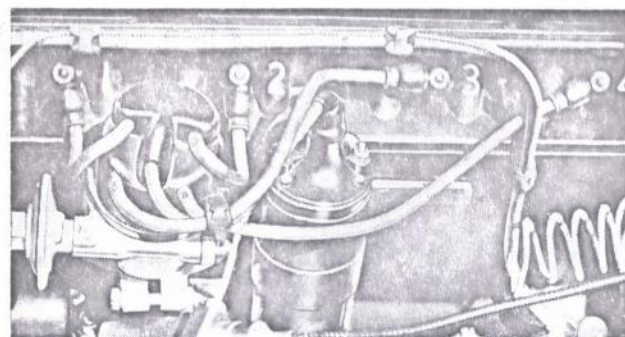


Fig. 9

VALVE TIMING

See page 5 for correct valve timing. To obtain top dead centre see Ignition Timing.

SPARKING PLUGS

The sparking plugs were adopted for original equipment after lengthy tests, and as sparking plug types vary in suitability for different engines it is important that the correct type of plug be fitted when making replacements; this is: Lodge CNY— $\frac{1}{2}$ " reach. For high-speed touring, however, use Lodge HN— $\frac{1}{2}$ " reach. The gaps (i.e. the width between the firing point of the centre electrode and earth point) are originally set and should be maintained at thirty-two thousandths of an inch (0.8 mm.) to ensure even running of the engine. Incorrect gap settings may cause misfiring or erratic slow running. Faulty plug leads or cracked porcelain insulation in the sparking plug will also cause faulty ignition. Sparking plugs should be thoroughly cleaned by a sand-blasting process and checked and adjusted (if necessary) for gap setting after 5,000 miles (8,000 Km.) use and at 10,000 miles (15,000 Km.) should be replaced by new plugs.



Fig. 10

CARBURETTOR



Fig. 11

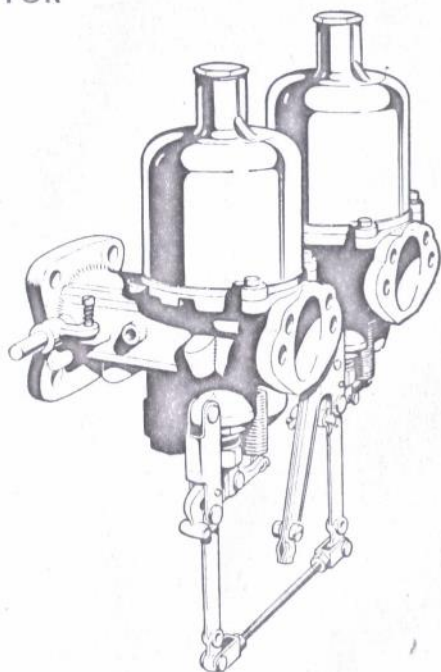


Fig. 12

CARBURETTORS

Twin S.U. Type—H6. Standard Needle S.M.

ADJUSTMENT.—As the needle size is determined during engine development, adjustment of the carburettors is confined to correct idling adjustment. Run the engine until it has attained its normal

running temperature, slacken one of the clamping bolts on the throttle spindle connection and disconnect the mixture control link by removing one of the fork swivel pins. Adjust the idling speed to approximately 500 r.p.m. by moving each throttle adjusting screw an equal amount. By listening to the hiss in the intakes, adjust the throttle adjusting screws until the intensity of the hiss is similar on both intakes. This will synchronise the throttles. When this is satisfactory, the mixture should be adjusted by screwing both the jet adjusting nuts up or down to exactly the same extent, at the same time keeping the jet levers pressed forward to ensure that the jets are hard up against the nuts, until even running is obtained. As these are adjusted, the engine will probably run faster, and it may therefore be necessary to unscrew the throttle adjusting screws a little, each by the same amount, in order to reduce the speed. When the mixture is correct on both carburettors, lifting the piston of one of them with a penknife blade should make the engine beat become irregular from excessive weakness. If lifting the piston about $\frac{1}{8}$ " (3 mm.) on one carburettor stops the engine and lifting the other about $\frac{1}{8}$ " increases the engine speed, this indicates that the mixture on the first carburettor is set weak and the second is set rich. The first one should, therefore, be enriched by unscrewing the jet adjusting nut one flat at a time and the second should be weakened off by screwing up the jet adjusting nut in a similar manner. When the mixture is correct, the exhaust beat should be regular and even. If it is irregular with the splashy type of misfire and a colourless exhaust, the mixture is too weak. If there is a regular or rhythmical type of misfire in the exhaust beat, together with a blackish exhaust, then the mixture is too rich. When re-connecting the mixture control link, make sure that the jet levers are pressed forward and the control rod adjusted correctly for length so that the clevis pins may be inserted freely while the jets are in this position. The throttle spindle interconnection clamping bolts should now be tightened. The desired fast idle necessary when the choke is in operation is controlled by an adjusting screw. Every 5,000 miles (8,000 Km.) unscrew the two brass hexagon plugs in the top of the carburettor and top up with current engine oil to the level of the inner hollow shaft. Apply oil also to the throttle linkages on the engine. For further information on the tuning, adjustment and maintenance of S.U. Carburettors, you are advised to get in touch with the S.U. Carburettor Co. Ltd., Wood Lane, Erdington, Birmingham, 24, from whom the necessary literature may be obtained.

FUEL PUMP

The mechanically operated fuel pump mounted on the left-hand side of the crankcase, provides a constant pressure of fuel to the carburettor. A hand primer is fitted which can be used to pump fuel to the carburettor if the float chamber is not already full, under

which condition a slight pumping resistance is felt before the lever reaches its stop. This resistance ceases when the chamber is full.



Fig. 13

The glass bowl acts as a sediment chamber for the petrol passing to the pump (Fig. 13). The foreign matter collects on the underside of the gauze and, being washed off by the petrol, sinks to the bottom of the bowl. To remove the sediment, detach the bowl by unscrewing the nut at its base and wash the bowl out with the fuel that will be in it. When refitting the bowl tighten the nut just sufficient to ensure a fuel-tight joint as overtightening may result in damage.

If the pump fails to supply fuel to the carburettor it is advisable to attend to the following points : (a) inspect the fuel pipe unions which, if any are loose, should be tightened up ; (b) a blockage may have been caused in the fuel pipe which may be removed by blowing through the pipe with the aid of a tyre pump.

If, after attending to the above points, the pump still fails to operate, it should be renewed and the old pump sent to the nearest A.C. Service Station.

DECARBONISING AND VALVE GRINDING

It is recommended that the cylinder head be removed for decarbonising and valve grinding after the first 5,000 miles (8,000 Km.) This is chiefly to give attention to the valve seats, the metal of which becomes stabilised during this period. Thereafter it will be found that decarbonisation will be required only after a period of about

20,000 miles (32,000 Km.). Providing that the engine is running satisfactorily after this period and that each cylinder gives a normal compression, showing that the valves are seating reasonably well, it is much better to leave it alone and delay decarbonising for as long as the engine continues to run satisfactorily. The grinding of the valves becomes necessary in order not only to increase the efficiency of the engine but to prevent a badly seating valve becoming worse and getting burnt. We recommend that the work should be carried out by the skilled mechanics at your nearest Morgan Agent. For those who desire to do this work themselves, the main points to watch are outlined below :—

1. The procedure of turning the crankshaft in order that the compression will " break " the seal of the cylinder head should not be practised with this design of engine. Once the cylinder head has been removed it is important that the crankshaft is not rotated unless the cylinder sleeves are firmly clamped down against their seatings. This can be accomplished by using two tubes and washers fitted over the cylinder head studs and each secured with a cylinder head nut Fig. 14. If this precaution is not observed the sleeves may rise with consequent risk of water leaking into the crankcase after assembly. On removal of the head and withdrawal of the push rods, the passage ways in the block leading to the camshaft and thence to the crankcase and sump must be sealed off with a clean rag or masking tape. The same applies to the rocker shaft oilway, both in the head and the block to prevent the entry of carbon particles which could do serious harm to the engine.

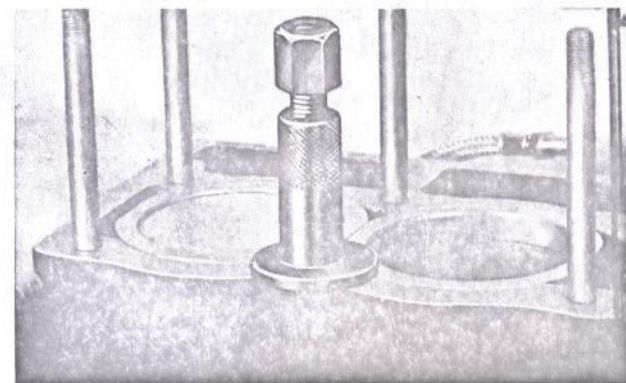


fig. 14

2. A stick of soft solder is the most suitable tool for removing the carbon. On no account should emery cloth or sandpaper be used.
3. It has been found advantageous to remove the tappets and clean the insides just prior to refitting the cylinder head to ensure that any chips of carbon which may have fallen into the chamber are removed from the push-rod seatings.
4. A new gasket must be fitted each time the cylinder head is removed. The plain side of the gasket must be downwards against the cylinder block and should be coated on both sides with a non-setting sealing compound.
5. When replacing the cylinder head nuts, tighten them gradually in the sequence shown in Fig. 7 of the Instruction Book in order to produce an even pressure on the gasket and prevent undue strain in the cylinder head casting. If a new gasket has been fitted it will be necessary later to go over the nuts again and give them a further tightening. This should be done when the engine has been thoroughly warmed through.

Chapter V

CLUTCH, GEARBOX, TRANSMISSION SHAFT AND REAR AXLE

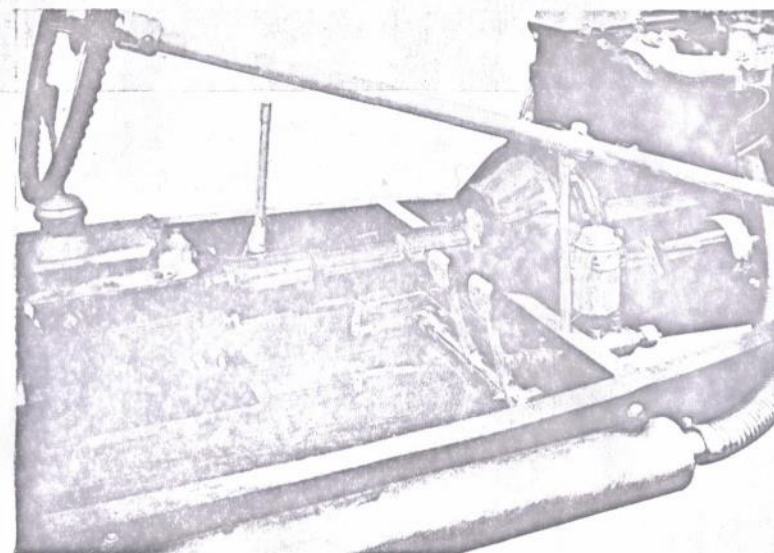


Fig. 15

CLUTCH

This is of the single dry plate type, which is totally enclosed.

An aluminium sleeve, sliding within the electron casting enclosing the shaft to the gearbox, operates the Borg and Beck clutch through a graphite thrust bearing. To allow easy operation lubricate as directed in Chapter III. At all times there should be a small amount of play in the clutch pedal. This will increase with use and when it is desired to take up excess play, adjustment is made on the right and left hand threaded rod underneath the shaft tube.

GEARBOX

This requires no adjustment or attention beyond replenishment of the oil at the periods given in the lubrication chart. Should for any reason the cover of the box be removed, it should be done with great care, otherwise one or more of the three springs and pawls which load the gear selector rods is likely to be dropped into the box. After removing the screws, it is advisable to slide the cover backwards before lifting.

TRANSMISSION SHAFT

The Hardy Spicer Needle Bearing type universal joints require no other attention than that mentioned in Chapter III. Usually long and severe service is required before any appreciable wear is noticed. The trunnions and needle bearings are the only parts subject to wear, and when replacement is finally necessary they may be removed and replaced by hand without the need for special tools. The needle bearings are locked in position with lock rings in recessed grooves in the yokes, requiring only a pair of pliers for removal. If for any reason there is necessity to remove the bearing assembly, be sure to hold the trunnion in an upright position, so that the assembly to be removed is at the bottom. This is necessary in order to prevent the needles from falling out. In the event of their doing so, the assembly should be washed in petrol and then by smearing them with light oil or vaseline, to hold the needles in position, the bearings can readily be re-assembled. Do not use grease when re-assembling as this is liable to clog the oil passages, use a light oil. The joints have four independent oil reservoirs which carry the oil to the needle bearing assemblies. Each universal coupling is fitted with a grease nipple, and a third nipple is provided for the slip spline shaft (Fig. 16) and is indicated on the lubrication chart. Lubricant should be applied every three or four thousand miles.

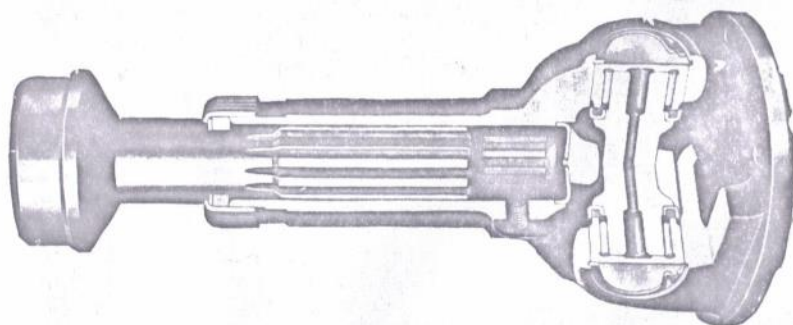


Fig. 16

REAR AXLE AND DIFFERENTIAL

The rear axle fitted to the Morgan Plus Four, is of the hypoid type, of extremely sturdy construction, and should require no attention other than *correct lubrication* as indicated on the chart.

STEERING AND FRONT SUSPENSION

CAM GEAR STEERING—RATIO 12:1 VARIABLE

The cam itself is not actually a worm, but is generated on a special machine the cutter of which travels in the same arc as the peg in the rocker shaft. This ensures accurate peg engagement at all positions. At the centre of the cam, corresponding to the straight ahead position of the road wheels, there is a "high spot," details of which are explained below.

To test the steering gear, disconnect the drag link from the ball pin of the drop arm so that the steering wheel may be freely rotated from lock to lock. At the central position it should be possible to feel some resistance, as the peg passes over the high spot referred to above. If this cannot be discerned and it is possible to spin the wheel from lock to lock without feeling the cam centre, then the thrust screw on the top cover should be turned clockwise a small amount at a time until a torque of approximately 12 lb. in. at the rim of the steering wheel is required to move over the centre. The thrust screw is secured in place by a locking nut. It should be noted that when connected up with the steering linkage on the chassis, this high spot cannot be noticed when the vehicle is driven on the road and therefore does not cause any feeling of discomfort to the driver. If it does, the adjustment is excessive and will harm the mechanism.

It should be observed that in properly adjusted condition, there will be no backlash or lost motion of the drop arm at the central position. But at any other position it will be found that the drop arm can have a certain amount of shake, which reaches a maximum at each lock. This comes about due to clearance of the peg in the cam track at all positions other than the straight ahead.

During manufacture the shims in the end cover are adjusted to allow a maximum of only 0.002" end float of the cam in the box. In time it may be necessary to remove a shim to prevent this amount being exceeded due to normal wear in service. Shims are usually provided in three sizes:—0.0024", 0.005", 0.010".

If one or more shims are removed, the end cover should then be replaced and tightened up, care being taken to ensure that the ball cages are running true and have not been allowed to become askew and forced home in this way. (Should this occur, the cages will break up and the ball bearings will drop out into the box and cause considerable damage). It should then be possible to rotate the column by hand to guard against pre-loading if too many shims have been removed. To facilitate shim adjustment, it is advisable to carry this out with the steering gear held vertically upside down in a suitable fixture after draining off the lubricating oil. When clamped horizontally in a vice, the ball cages may slip out of position before the end cover has been re-secured.

When it is necessary to remove the drop arm from the taper splined end of the rockershaft, a proper extracting tool must be employed. Hammering is likely to damage the gear and often leads to no further progress in any event due to the firm hold of the arm on the taper.

After the vehicle has been initially run-in and oil changes are made to engine and gearbox, etc., the high spot on the cam may have been lost due to "bedding down" of the new parts. Therefore it is recommended that at this stage the appropriate thrust screw adjustment should be made (in the manner already described) to ensure that the centre is correct. It should then remain in adjustment for some time.

FRONT SUSPENSION

The front wheels are suspended independently, and slide vertically on the main axle pins which hold the complete assemblies in position.

The sliding axles, wheel spindles, and brake plates form complete units and require no other attention than that of lubrication as directed.

The Morgan Plus Four is fitted with simple steering dampers, consisting of a flat spring steel arm, free to slide at one end, and fitted at the other end with a phosphor bronze ring which is assembled between the main coil spring and the top face of the stub axle body.

The purpose of this damper is to prevent any twisting motion set up on the springs when under compression, being transmitted to the stub axles and interfering with the steering.

Phosphor bronze bushes are pressed into the sliding axles and should last a long time unless lubrication is neglected. New bushes become necessary with wear, but a period at which renewals should be made cannot be laid down, as this is primarily dependent on the attention or otherwise which the owner may give to maintenance and lubrication.

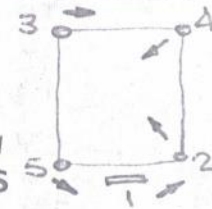
When new bushes are required, it is recommended that the sliding axle assemblies be sent to the works for them to be fitted. The method of dismantling is simple, and is carried out as follows :—

Jack up the front of the car to a height of at least 15 inches, and remove the road wheels. It is advisable to put suitable blocks under the front of the car, in order that it will remain firm while this work is being carried out. Remove the track rod, drain the braking system and uncouple the flexible brake pipes, remove the nuts over the top axle tube and lugs. Next remove the nut from the bottom axle end lug plate. Precaution should be taken when finally removing these two bolts, to see that the rebound spring does not fly out.

When re-assembling, see that all nuts are properly tightened. Check the front wheels for correct alignment, and bleed the hydraulic braking system.

TYPE ROTATION.

Chapter VII BRAKES



Girling Hydraulic brakes are fitted to all four wheels. 11 in. dia. discs and callipers being used on the front wheels, leading and trailing shoe type on rear wheels.

The pedal operates the brakes on all four wheels hydraulically whilst the handbrake control operates the brakes on the rear wheels, by means of cable and rods.

MAINTENANCE OF FRONT BRAKES

The brake pads should be inspected for wear every 5,000 miles, or more frequently if the car is used in motoring competitions. No adjustment is necessary, but replacement of lining pads should be considered when the lining material is approximately $\frac{1}{8}$ " thick, and under no circumstances should the pad be allowed to wear below $\frac{1}{16}$ " thickness. To replace pads jack up and detach front road wheel, remove the hairpin-like clips and slide out the pad retaining pins. Lift the pads out of the calliper.

Push in the pistons with an even pressure to the bottom of the cylinder bores and slip in the new pads. Replace the pad retaining pins and secure with hairpin clips.

The replacement of pads is then complete and bleeding is unnecessary, but the foot pedal should be pumped until a solid resistance is felt.

ADJUSTMENT OF REAR BRAKES

After a considerable mileage it may be found necessary to adjust the rear brakes. This is evident when the brake pedal has considerable amount of "free movement." There is one adjuster to each rear wheel.

The correct procedure for adjusting is as follows :—

1. Jack up the car, and it is recommended to remove the wheels, although this is not essential.
2. Turn the adjuster nut in a clockwise direction until the shoes contact the drum and release back one or two notches until the drum is free. The single adjuster is placed facing in a forward direction on the backplate.

There is a constant drag on the rear wheels due to the action of the differential and axle oil: do not confuse this with brake drag.

HANDBRAKE ADJUSTMENT

Adjustment of the brake shoes as previously described automatically re-adjusts the handbrake mechanism. The rods are correctly set before leaving the works and only maladjustment will result from

tampering with the mechanism. Cable adjustment may be made by turning the adjuster at the rear of the handbrake cable. The lever compensating mechanism on the rear axle should be lubricated and moving freely.

BLEEDING THE SYSTEM

Except for periodical inspection of the fluid level in the reservoir chamber and lubrication of the handbrake cables and connections (see page 18) no attention should be necessary. If, however, a pipe joint is uncoupled at any time, or the wheel cylinder cups are inspected or replaced, the system must be bled in order to expel any air which may have been admitted.

Air is compressible, and its presence in the system will affect the working of the brakes.

Whilst the majority of owners will prefer to have these operations carried out by their Agent, for the benefit of those desiring to carry out their own running adjustments, the procedure is as follows :—

1. Wipe clean the bleeder nipple of the brake concerned and fit a piece of rubber tube over it, allowing the tube to hang in a clean container partially filled with fluid, so that the end of the pipe is below the level of the fluid.

2. Unscrew the bleeder nipple one complete turn with a suitable spanner. There is only one bleeder nipple to each wheel.

3. The fluid reservoir of the master cylinder must be topped up before commencing the bleeding operation, and must be kept at least half-filled during the whole operation, otherwise more air will be drawn into the system via the master cylinder. Always clean the area around the plug before removing it, this will lessen the risk of grit falling into the chamber after removal of the plug.

4. Depress the brake pedal quickly and allow it to return without assistance. Repeat this pumping operation with a slight pause between each depression of the pedal. Observe the flow of fluid being discharged into the glass jar and when all air bubbles cease to appear, hold the pedal firmly down and securely tighten the bleeder nipple.

Note.—Depending upon the position at which a pipe joint has been uncoupled it will be necessary to bleed the system at either both front or both the back wheels. If the pipe was uncoupled at the master cylinder then the system must be bled at all four wheels.

JACKING SYSTEM, WHEELS AND TYRES

The Jack is used in the following manner :—

First make sure the car cannot move back or forwards by using the handbrake, gear engagement, or chocking the stationary wheel on opposite side to the jack.

Remove the seat from whichever side of the car it is intended to raise ; lift mat and open metal cover over hole in floor board ; insert jack through hole, mushroom head first ; push pin through hole in chassis cross member and operate by screwing in a clockwise direction. It is essential that the jack be placed in relation to the angle at which the car is standing, *i.e.*, if on a perfectly flat surface it should be just off upright ; if on a cambered surface it should be so placed that when the car is lifted there is no possibility of sliding either way.

WHEELS

In the normal course of wear and tear, or due to minor impacts, the wheels may develop irregularities, or cease to point directly in the direction of motion. A check should be made periodically to ensure that the wheels are in correct alignment or "track." Every garage possesses an alignment gauge and can carry out a test in a few moments. Errors in alignment can be corrected by adjustment of the track rod, the ends of which are threaded for this purpose. The "Toe-in" for the front wheels should be $\frac{1}{8}$ "— $\frac{3}{16}$ ". "Toe-out," even in the smallest degree, is to be avoided.

To ensure smooth running especially on the front wheels and at high speeds, it is recommended that wheels and tyres are periodically balanced, this can be carried out by most garages, and the trouble in having this done is well repaid by the results obtained.

TYRES

The recommended tyre inflation pressures for normal driving are, front and rear 16-18 lbs. per sq. inch, this pressure may be increased when carrying heavy loads, or sustained travelling at high speeds.

Pressures should be checked and adjusted at least once a week. Do this when the tyres are cold and not when they have attained normal running temperatures.

Under-inflation causes rapid and sometimes irregular wear, also the casing may be damaged by excessive bending.

To obtain the best tyre mileage, equal wear and to suppress the development of non even wear on the front tyres, exchange them with the rear tyres at least every 2,000 miles.

BODY WORK

HOOD

When erecting the hood, always fix the eyelets in the back curtain over the turn-buttons first and then fix snaps across the top of the windscreen. If secured at the front first some strain will be necessary to pull the eyelets over the eyes, which in time will pull away from the fabric.

However, it is recommended that if the hood is tight when dismantling it is advisable to release it at the rear which avoids straining at the eyelets.

It is not intended that the tonneau cover over the rear compartment should remain in position when the hood is up as the turn-buttons do not allow for the double thickness, and unnecessary strain is placed on the hood fabric and turn-buttons alike.

When standing and rain is imminent it may be noted that the loose hood top makes a useful tonneau cover if fitted in the usual way without erecting the hood frame.

SIDE CURTAINS

It should be remembered that Vybak is easily scratched and soiled, spoiling vision at the sides. When not in use, therefore, do not throw the side curtains carelessly into the rear compartment or they may move about and become damaged.

SERVICE

Our Service depot is especially equipped to take care of customers' requirements, and can at all times undertake anything from adjustments to major repairs and complete overhauls, at reasonable charges consistent with expert workmanship.

Machines or parts sent for repairs must be consigned carriage paid and should be clearly labelled with the sender's name and address.

Instructions should be sent separately stating whether an estimate is required before putting the work in hand. When it is inconvenient to send repairs to the works an accredited "Morgan" Dealer should be consulted.

WARRANTY

The goods manufactured by The Morgan Motor Co. Ltd. are supplied with the following express Warranty which excludes all warranties, conditions and liabilities whatsoever implied by Common Law, Statute or otherwise, that is to say :—

In the event of any defect being disclosed in any part or parts of the goods and if the part or parts of the goods alleged to be defective are returned to the Company's works carriage paid within six months from the date when the goods are delivered new to the retail customer, the Company undertakes to examine same and should any fault due to defective materials or workmanship be found on examination by the Company, it will repair the defective part or supply free of charge a new part in place thereof.

This Warranty is limited to the delivery to the purchaser free at the Company's works of part or parts whether new or repaired in exchange for those acknowledged by the Company to be defective.

The Company gives no warranty of the goods except as herein stated, but desires and expects that customers shall make a thorough examination before purchasing.

Persons dealing in the Company's goods are in no way the legal Agents of the Company and have no right or authority to assume any obligations on its behalf expressed or implied or to bind it in any way.

For the purpose of this Warranty the term "Goods" means and includes new cars or vans or chassis or parts thereof including replacement parts manufactured by the Company.

It does not include Tyres, Speedometers, or Electrical Equipment or other proprietary articles or goods not of the Company's own manufacture although supplied by the Company. Proprietary articles are covered by the warranty (if any) given by separate manufacturers. On second hand goods no Warranty is given by the Company or is to be implied.

The Company's responsibility is limited to the terms of this warranty and it shall not be answerable for personal injury, or consequential or resulting liability damage or loss arising from any defects.

The Warranty is dependent upon the strict observance by the purchaser of the following provisions :—

(a) The purchaser shall send to the Company's works such part or parts as are alleged to be defective promptly on discovery of the claimed defect. Transportation is to be prepaid and the said part or parts to be properly packed for transport and clearly marked for identification with the full name and address of the purchaser and with the car and chassis numbers of the vehicle from which the parts were taken.

(b) The purchaser shall post to the Company on or before despatch of such parts as are alleged to be defective a full and complete description of the claim and the reasons therefore.

(c) The decision of the Company on all claims shall be final and the purchaser agrees to accept its decision on all matters relating to defects and the exchange or replacement of parts.