

THE 20/60 H.P.
SIX - CYLINDER
SUNBEAM



**HANDBOOK OF
INSTRUCTIONS**

Handbook of Instructions for the 20/60 h.p. SUNBEAM Car.

FOURTH EDITION.

REG. No. 318. JANUARY, 1926.

This Handbook is Published for the use and assistance of owners of 20/60 h.p. SUNBEAM Cars. It embodies in a concise form the advice and suggestions of the Company's Technical Staff in regard to lubrication and the general care and maintenance of this Model, together with supplementary information regarding the necessary adjustments which may be required from time to time.

Price 5/- Nett.

Compiled and Published by
THE SUNBEAM MOTOR CAR CO. LTD.,
Moorfield Works, Wolverhampton.

TELEPHONE :
WOLVERHAMPTON 985.

TELEGRAMS :
" MOORFIELD, WOLVERHAMPTON."

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Dear Sirs,

Kindly enter my name and address in your records, and send me from time to time any printed matter or revised instructions you may issue for my 20/60 h.p. Sunbeam Car,
No.....*

Date.....192

Name.....

Address.....

From whom car purchased (through agent or direct)

Date car received.....192

*The car number will be found (a) on a brass plate on the dash, under the bonnet, (b) stamped on the second cross member of the frame.

PRINCIPAL CHASSIS DIMENSIONS.

Below we give the principal dimensions, with their metric equivalents, of the 20/60 h.p. six-cylinder Sunbeam. It will be noticed that, in addition to the 20/60 h.p. Sports Model, two distinct models are supplied as regards wheelbase. The shorter wheelbase chassis is that on which open touring bodies are mounted, the bodies of the saloon, limousine and landaulette type being mounted on the longer chassis.

	English.	Metric.
Bore	2.95"	75 $\frac{m}{m}$
Stroke	4.72"	120 $\frac{m}{m}$
Cubic capacity of cylinders....	194.25 cu. in.	3180.8 c.c.
Wheelbase, Sports Model	10' 7 $\frac{1}{2}$ "	324 $\frac{c}{m}$
Wheelbase, Open Touring Model	10' 11 $\frac{3}{8}$ "	334 $\frac{c}{m}$
Wheelbase, for Closed Models	11' 5 $\frac{3}{8}$ "	349 $\frac{c}{m}$
Track	4' 9"	145 $\frac{c}{m}$
Ground clearance	8"	20 $\frac{c}{m}$
Length overall (Sports Model)	14' 9"	450 $\frac{c}{m}$
Length overall (short wheelbase, Open Touring Model)	15' 1"	460 $\frac{c}{m}$
Length overall (long wheelbase, Closed Models)	15' 7"	475 $\frac{c}{m}$
Width overall (all models)	5' 10"	177.8 $\frac{c}{m}$
Front of dash to centre of rear axle (Sports Model)	6' 10 $\frac{3}{4}$ "	210 $\frac{c}{m}$
Front of dash to centre of rear axle (short wheelbase)	7' 2 $\frac{1}{2}$ "	220 $\frac{c}{m}$
Front of dash to centre of rear axle (long wheelbase)	7' 8 $\frac{1}{2}$ "	235.3 $\frac{c}{m}$
Chassis width	3' 1"	94 $\frac{c}{m}$
Gear Ratios—	4th. 3rd. 2nd. 1st. Reverse.	
Sports and open Touring Models	4.5 to 1, 6.5 to 1, 9.9 to 1, 18.1 to 1, 16.7 to 1	
Closed Models	4.72 to 1, 6.9 to 1, 10.5 to 1, 19.1 to 1, 17.7 to 1	
Tyre sizes	820 x 120 $\frac{m}{m}$	
R.A.C. rating	20.9 h.p.	
Tax payable	£21	

FOREWORD.

This handbook is not intended to be a complete manual of motoring, or a treatise on the principles governing modern automobile practice. In its preparation it has been assumed that the reader is conversant with the general features of the motor car. As the title specifically explains, it is a "Handbook of Instructions for the 20/60 h.p. Sunbeam Car" and has been compiled solely with a view to providing, in a handy form, necessary information as regards the general care, lubrication and maintenance of this car. Further chapters deal with the simple adjustments and operations which may be necessary from time to time, together with useful hints in the event of any minor troubles being encountered.

It will early be realised by the Sunbeam owner that everything has been done to render the lubrication and adjustment of chassis parts as simple as possible. If the instructions given in the following pages are carefully studied, and as carefully followed out, the fullest measure of efficiency will be obtained.

In the rare event of any unforeseen defect or unusual trouble developing, it is especially requested that the matter should be **at once** brought to the notice of the Company, either at their Head Office or at any of their Depots, a list of which appears on page 1.

With regard to the various accessories not of our own manufacture, such as electrical equipment, carburetter, etc., brief instructions on their care, based on information supplied by the respective makers, are included in this handbook, but in the event of difficulty clients are strongly recommended to consult the makers themselves. Most of them issue their own instruction pamphlets, which are generally supplied gratuitously on request.

The Sunbeam Motor Car Co. Ltd.

January, 1926.

READ THIS CAREFULLY.

The instructions embodied in the early chapters of this handbook give all the information re starting up and driving necessary for the motorist who has had some experience in handling a car.

Later chapters deal with the all-important question of Lubrication, the necessary adjustments which may be required from time to time, and the general points to be observed in maintaining the car in a condition which will ensure satisfaction to its owner. The best of cars will suffer under neglect.

Study the chapters on Lubrication. Lack of proper lubrication—of chassis parts as well as the engine—is responsible for most of the repair bills in the motor trade. Use a good brand of oil (see recommendations on page 10).

Treat the new car with consideration. Although the engine, gear box, back axle, etc., of every Sunbeam car are “run-in” before being assembled in the chassis, and the complete car exhaustively tested on the road, the first few hundred miles should be done at moderate speed. The owner who treats his car considerably during this initial period, instead of immediately attempting to attain a high rate of speed, will make doubly sure of getting the utmost satisfaction from his car, and add appreciably to its life.

These matters are important. Do not overlook them !

GENERAL RUNNING HINTS.

It has been remarked on an earlier page that this book is not intended as a manual on the art of driving a car. It is assumed that the Sunbeam owner has at least a rudimentary knowledge of a motor car and of driving. The following information may therefore be regarded more as general hints for the driver rather than as an instruction in driving. The quality of design, the care taken in the assembly of the chassis, and the convenient disposition of all controls make the 20/60 h.p. an unusually pleasing car to drive. Sunbeam owners express the opinion that they have never handled a more responsive or more easily driven car.

The illustrations upon this and the three following pages show the position of the magneto and carburetter controls (on the steering wheel and fascia board respectively) the instrument board, the clutch, brake and accelerator pedals, the gear lever and the gate through which the gear lever operates.

Assuming that the car is ready for its first trip on the road after reaching its owner, the following points should be borne in mind. See that the oil level is correct (see page 12),

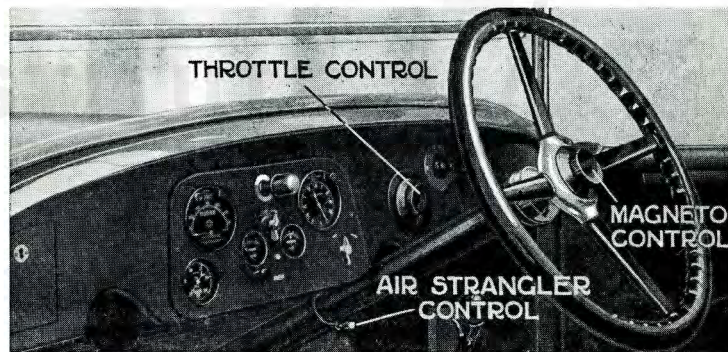


Fig. 1. View shewing Ignition control and Carburetter controls.

GENERAL RUNNING HINTS.

the radiator filled, and the petrol turned on and reaching the carburetter. Always see that the gear lever is in the neutral position before attempting to start up the engine.

Before starting the engine with the electric starter, switch off the magneto, close the carburetter air strangler (this is fitted on the steering column below the steering wheel) and open the throttle by means of the control knob. The latter is on the fascia board. Then swing the engine over for a few seconds with the starting handle. This eases the pistons and ensures gas entering the cylinders and as the ignition is switched off there is no danger of backfire. Switch on the magneto, leave the throttle in the position mentioned above, advance the magneto to midway

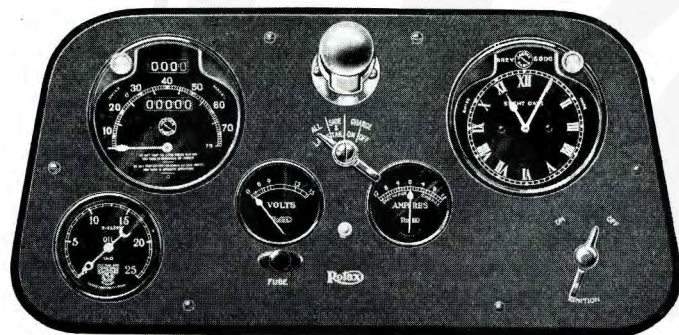


Fig. 2.
Instrument Board on 20/60 h.p. Car.

between the advance and retard positions (the magneto control is fitted in the centre of the steering wheel) depress the starter, and the engine should fire within the first twenty revolutions. If no explosion takes place, release the starter so as not to waste current, open the throttle fully, release the air strangler and again depress the starter. The engine should then fire immediately, but if no explosion takes place repeat the first procedure, that is, with the throttle slightly open. No difficulty should be experienced, but in the unlikely event of the engine still refusing to fire, the cap should be taken

GENERAL RUNNING HINTS.

off the magneto and the contact breaker examined. If this is working satisfactorily again open the throttle and endeavour to start before the contact breaker cap is replaced.

Do not run the engine with the carburetter air strangler closed longer than is necessary, either under its own power or by the starting motor, as the petrol sucked in is liable to wash away the oil and dry the pistons.

With 20/60 h.p. Sports Models it is most important when first starting up, and particularly in cold weather, that assistance should be given with the starting handle owing to the sticky nature, when cold, of the engine oil recommended for use with these cars. When the engine is warm no difficulty should be experienced.

The following is a brief explanation of the reason for opening the throttle fully if the engine does not quickly start with the throttle slightly open. By turning the engine with the throttle only slightly open and the air strangler closed, a very rich mixture, practically pure petrol, will enter the cylinders and this in itself may be too rich to fire. By opening the throttle fully and releasing the strangler sufficiently, air is admitted to reduce the richness of the mixture until it is more easily fired. With the engine running (the air strangler should then always be released) the magneto should be kept at half advance or slightly retarded as the driver's judgment may suggest. The same applies to the throttle. It is impossible to fix actual positions,

as there may be slight deviations with various engines, and this, like many more little points in connection with driving, must be left entirely to the driver, who will soon find from experience just the right positions for the controls at all speeds. It should be emphasised that when driving at speed the magneto should always be kept as far advanced as possible.

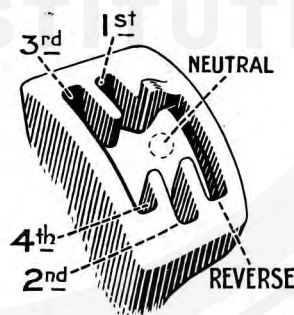


Fig. 3.
Showing Gear Lever Positions in gate.

It may be pointed out that if the position of the front seat is not just suitable for the individual driver as regards leg reach, etc., when the car is first delivered, on all Sunbeam open touring cars the front seat is adjustable within a variation of about six inches, and it can be moved backwards or forwards until the most comfortable position is obtained.

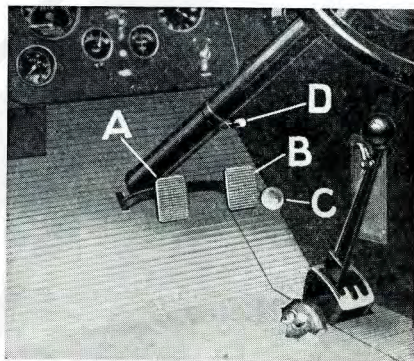


Fig. 4.
Showing Clutch (A), Brake (B) and Accelerator (C) Pedals.
D is the Carburettor "air strangler."

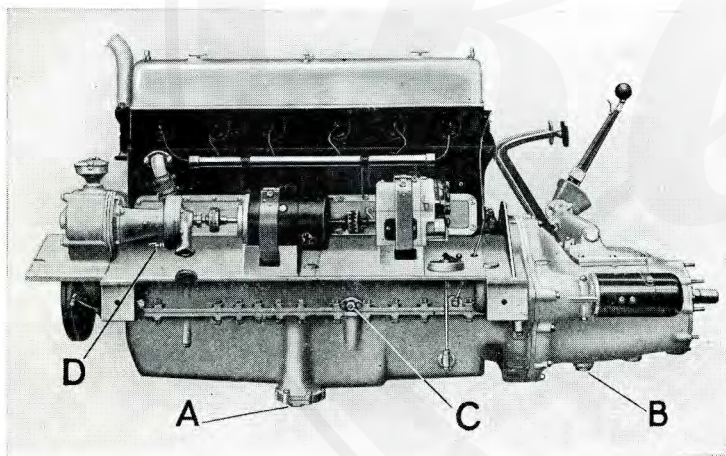


Fig. 5.
View of near side of 20/60 h.p. Engine, shown out of chassis to illustrate more clearly Relieve Valve, Drain Cock, etc. Showing Drain Plug (A) in centre of Crank Case Filter and Drain Plug in Gear Box (B). The Oil Pressure Relief Valve is also shown (C), and the Drain Cock for the Water Pump (D).

CARE AND MAINTENANCE.

The 20/60 h.p. six-cylinder Sunbeam is built with the engine, clutch and gear box combined in a single unit suspended directly from the main frame. A glance at the chassis plan on the Lubrication Diagram at the front of this book will show that the design is on very clean lines, and all accessories are placed in convenient positions. The various chassis lubricators and oil fillers for the engine, gear box and back axle, are all accessibly placed. It is only necessary to treat the car with regular care and follow out the instructions given on the Lubrication Diagram and in these pages regarding lubrication to obtain and, what is more important, MAINTAIN the best possible service.

Lubrication is the most important matter for the motorist who wishes to get the best out of his car. Most of the troubles with which motor repairers have to deal are directly traceable to lack of proper lubrication. The absence of oil will damage any bearing and may necessitate costly repairs.

All Sunbeam engines are designed to provide perfect lubrication automatically and yet have a clear exhaust. An oil level cock (See Fig. 6) is fitted in the crankcase so that the correct level for the oil in the sump can always be maintained. The oil filler is shown in the illustration on next page.

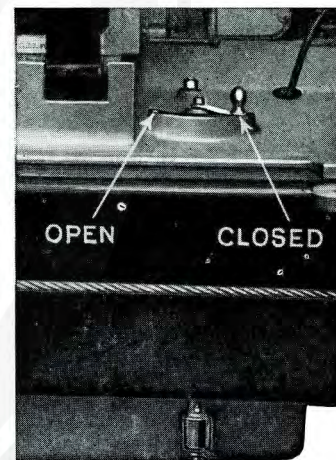


Fig. 6.
Oil Level Cock in Crankcase. Always turn to "closed" position when the crankcase has been filled with oil to the correct level.

LUBRICATION.

As regards lubricating oil, only the best quality oil should be used. It is false economy to buy a low-priced oil, which is almost sure to be deficient in those properties necessary in a good lubricant. For the 20/60 h.p. Sunbeam model we recommend the following oils, which we have found from our own experience to be most suitable:—for the engine, Wakefield's "Castrol A," Vacuum "Mobiloil A," or "Double-Shell"; and for the gear box and transmission, Wakefield's "Castrol S," "Mobiloil C" or "Shell-Mex Gear Oil."

For the 20/60 h.p. Sports Model use "Castrol R."

Never buy oil of unknown name or brand; or buy oil in bulk from a barrel, which may contain anything. Good quality oil is assured by the fact of the makers' name and brand appearing on the tin.

The Sunbeam engine lubrication system consists of a gear driven pump placed in the lower half of the crankcase. This forces oil to the main crankshaft bearings and through the hollow crankshaft to the big-end bearings of the

connecting rods. The surplus oil from the crankshaft is thrown by centrifugal force on to the cylinder walls and into the interior of the pistons, and this effectively lubricates the bearings of the small ends of the connecting rods. The oil drains back into a large

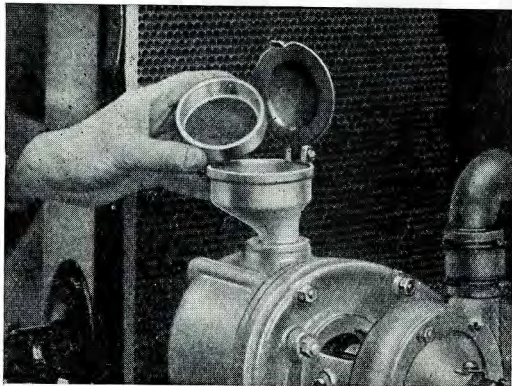


Fig. 7.

Oil Filler for Crankcase, at front of engine, with detachable gauze filter. Swing hinged lid right back, and filter can then be withdrawn by the fingers for cleaning.

sump in the base of the crankcase and passes through a filter, see Figure 5, so that it is cleansed before being again circulated by the pump.

The rocker shafts, rockers and push rods are also lubricated from the main oiling system. An oil lead carries oil to the overhead shaft and effectively lubricates each rocker, the surplus oil passing to the push rods and falling by gravity on to the tappets and camshaft bearings.

It is advisable occasionally to remove the valve cover and, with an oil can, pour a **small quantity** of oil through the slot in the washer of each valve spring. This will lubricate the valve stems and guides, and prevent the possibility of rust forming (through condensation) or "squeaks" developing. Wipe away any trace of moisture from inside valve cover before replacing.

OIL PRESSURE.

With the supply of lubricating oil properly maintained, and the crankcase cleaned out periodically, it is almost impossible for the lubrication system of Sunbeam cars to fail. One point to note carefully is the maintenance of the correct oil pressure. The pressure gauge is fitted on the instrument board as shown in Figure 2. For all average purposes the oil pressure should be 25-lbs. per square inch. A relief valve of the usual ball type is fitted in the crankcase and deals with any excess pressure of oil which is returned to the sump. The position of the relief valve is shown in Figure 5. To remove this first unscrew the large hexagon nut in centre and the two smaller nuts afterwards. The relief valve can then be withdrawn.

N.B. When first starting up, the engine should never be "raced" while the oil is cold, as this will damage the pressure gauge.

FAILURE OF OIL PRESSURE.

Although, as mentioned above, it is practically impossible for the lubrication system to fail, the following instructions are given to provide for the rare occurrence when trouble may

OIL PRESSURE. CLEANING OUT CRANKCASE.

be experienced. When the system is not working, the needle of the oil gauge will either move erratically to and fro across the dial, or not register at all. The trouble may be due to one or a combination of several of the causes given below.

- (1.) Lack of oil supply, *i.e.*, an empty crankcase.
- (2.) A broken or choked oil gauge pipe.
- (3.) A blocked system, due to not keeping the crankcase clean, or inferior or dirty oil being used.
- (4.) Dirt under the ball of oil relief valve.
- (5.) Not cleaning out oil filter periodically.
- (6.) Damage to oil pump or oil gauge.

When failure of pressure is indicated on the gauge, the engine should be immediately stopped. First ascertain if there is the correct quantity of oil in the crankcase by opening the oil level cock and adding oil through the filler (see Figure 7) until the tap overflows (see Figure 6). Leave this tap open for a few minutes to allow the oil to distribute itself evenly throughout the length of the crankcase. Then pour in a further slight quantity, and if it drips again the correct level has been reached. After doing this, make quite sure that the oil cock is turned to the "closed" position.

When the engine is restarted, if the gauge still fails to register any pressure, test for the other causes of trouble enumerated above. Before examining the oil pump, detach the pipes which connect to the gauge and thoroughly clean these. This may remedy the trouble.

CLEANING AND REFILLING CRANKCASE.

It is important that attention should be regularly given to the oil level. After about every 500 miles the oil level should be maintained by replenishing with oil through the filler (see Figure 7), until it drips from

CLEANING OUT CRANKCASE, REFILLING, Etc.

the overflow tap. Under normal running conditions the crankcase should be thoroughly emptied and cleaned after about every 2,000 miles.

To empty and clean out the crankcase, remove the drain plug underneath (see Figure 5.) Drain off all the oil, which will drip more readily if the engine is warm when this operation is commenced. The drain plug should then be re-inserted and properly screwed up and three or four pints of paraffin, **not petrol**, poured into the crankcase through the crankcase oil filler (see Figure 7). With the sparking plugs removed, turn the starting handle vigorously for a few minutes so as to circulate the paraffin through the oilways, which will thoroughly cleanse the lubricating system. The drain plug should be again removed and the paraffin drained away, care being taken to see that no paraffin is left inside the engine.

The filter in the base of the crankcase (see Figure 5) can be cleaned at the same time and the starting handle again turned for about a minute to ensure that neither old oil nor paraffin remains.

Do not run the engine under power until the supply of oil in the crankcase has been renewed.

After allowing ample time for the paraffin to drip from the crankcase, insert the drain plug and carefully screw up so that it is perfectly tight. Open the overflow oil tap, or oil level cock (see Figure 6) by moving the lever to the "open" position. Pour in the lubricating oil through the filler (see Figure 7) until it drips from the overflow tap. Leave this tap open for a few minutes to allow the oil to distribute itself evenly, and pour in a further slight quantity if necessary (see previous instructions on opposite page). Turn the lever to the "closed" position. **Do not forget this.**

Note.—When refilling the crankcase with oil see that the car is standing on level ground. If the crankcase is tilted, even at a slight angle, it is impossible to gauge exactly whether the correct amount of oil has been poured in.

VALVES.

One of the advantages of the Sunbeam overhead valve engine is that the operation of grinding-in the valves needs to be carried out at less frequent intervals than in the case of a side valve engine. This is largely due to the design of the valve seats, which, on the overhead valve engine, ensure more effective cooling for the valves themselves and the liability to burning and distortion is very appreciably reduced.

It is difficult to fix the exact period when valve grinding is necessary. The care with which the car has been driven and the quality of the fuel and oil used are all factors which have a bearing on the condition of the valves. Very largely it must be left to the judgment of the individual owner, although the majority of engines should have the valves examined, and ground in if necessary, after about every 5,000 miles on the road. The exhaust valves usually require grinding-in earlier than the inlet valves owing to the continual passage of the hot gases over their faces and seatings.

VALVE GRINDING.

Grinding in the valves is not a difficult matter on the Sunbeam engine. After draining the water from the cylinder block, the cylinder head is easily removed by following these instructions:—(a)—Disconnect the high tension wires and sparking plugs and remove the plugs from the cylinder head. (b)—Remove the hose clip on the water outlet connection and detach the hose. (c)—Remove the nuts which hold down the valve cover and lift the latter away. (d)—Disconnect the carburetter controls. (e)—Remove the inlet and exhaust manifold and the carburetter. (f)—Disconnect all piping. (g)—Remove, first unscrewing each nut a few turns at a time (see Diagram, Figure 10), the nuts which hold down the cylinder head. (h)—Carefully lift the head clear of the studs in the cylinder block.

The push rods should not be removed from the cylinder block. These rods may vary slightly in length to suit their

respective positions and if replaced differently it may be necessary to re-adjust all the tappet clearances. For the adjustment of individual tappets see paragraph on Valve Tappet Adjustment, page 18.

No difficulty should be experienced in lifting the head off the cylinder. Should the head, however, through some cause or other not be easily removed, care must be taken not to damage the joint (by the use of a screwdriver or similar tool) at the point of junction of the cylinder block and head. Special lugs are provided on the corners of the cylinder head to facilitate removal. Free the joint by lightly tapping the head with a mallet.

DEPRESSING VALVE SPRING.

Having removed the cylinder head, place in position as shown in Figure 8 with a block of wood under each end. This will allow the hook end of the valve removing tool

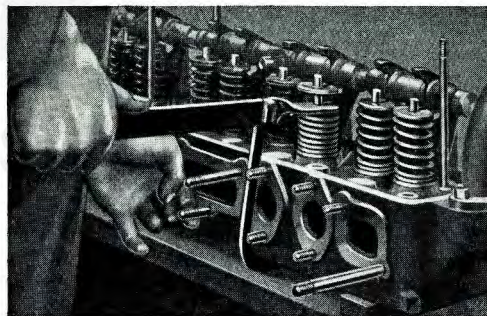


Fig. 8.

Using Valve Removing Tool, showing the cylinder head supported on two blocks of wood.

(included in tool kit) to be placed in the cup of the valve head, and the fork of the tool under the washer of the valve spring. When the spring is depressed the washer can be easily removed and the spring withdrawn from the valve. Then turn the cylinder head on its side.

GRINDING IN VALVE.

To grind a valve in, it is only necessary to smear a little valve grinding compound, which can be purchased from any accessory dealers, on the seating of the valve, insert a tool into the slot in the valve head, as shown in Figure 9 and give it a light semi-rotary motion backwards and forwards. During this operation the position of the valve should be moved from time to time in order to secure even grinding all the way round.

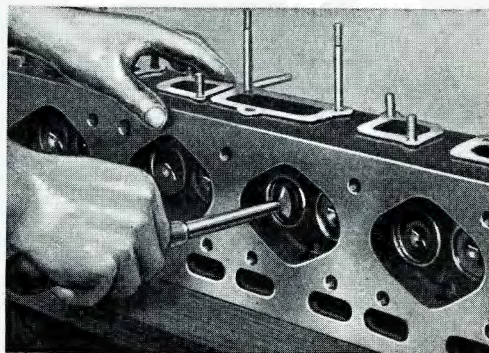


Fig. 9.

Showing method of Grinding in Valve.

Only the smallest possible quantity of grinding compound should be placed on the valve. After a minute or so the valve should be removed and another small smear of compound put on. The valve should be occasionally wiped with a piece of rag in order that the surface may be seen, when the "pitting" will be found to be gradually disappearing. As soon as it has disappeared, it is as well slightly to blacken the valve seat in a candle flame and carefully return the valve, very lightly pulling it into its seat. On removal the seat should show an even contact all the way round. If this is so it may be taken that the valve is tight and is seating properly.

Scrupulous care must then be taken to wash out with a brush and petrol and clean away all particles of emery that

have been used in the grinding process, paying particular attention to getting well into the valve guide.

Do not remove all the valves before starting the grinding process ; remove them one at a time, grind, and replace. The object of this is to prevent any risk of a valve not being replaced in its original position.

In replacing the cylinder head, care must be taken to avoid damaging the ends of the studs, and the head should be lowered steadily and evenly with the joint faces parallel.

See that the surfaces of the cylinder and head are clean, and that the gasket is flat and not wrinkled. If it is damaged fit a new one. It is important that the nuts should be free (but not slack), and any nut which has a tendency to jam on the stud must not be used when tightening up, otherwise the stud itself is likely to come out when the head is again removed.

TIGHTENING NUTS.

The nuts should be tightened progressively, that is, each nut should be given about one-third of a turn at a time. The order of tightening recommended is given in the diagram (Figure 10), the numbers indicating the order of succession. By this means the joint will be made evenly, without putting undue stress on the cylinder head or the studs.

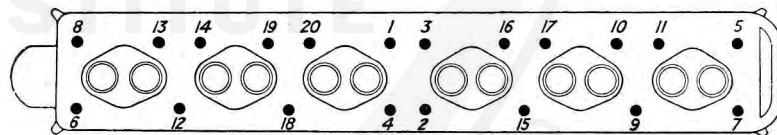


Fig. 10. Numbers give the order for tightening Cylinder Head Nuts.

NOTE—In the event of the copper and asbestos gasket being damaged in removal and a new one having to be replaced, the following precautions should be taken :—First try the gasket on the cylinder block and make sure that the hole in the gasket that should be coincident

with the hole in the cylinder block through which the water passes, registers exactly. This is most important.

When replacing the head, the use of gold size or other cementing material is not recommended, for the reason that damage to the gasket will almost certainly be caused when the head is again lifted.

TAPPET ADJUSTMENT.

Grinding in the valves slightly reduces the distance or clearance which should be maintained between the push rods and tappet heads.

The clearance can be corrected and any slight wear counteracted by means of the separate hardened steel pin which is screwed into the split end of each rocker arm. Before commencing to adjust the tappet for the inlet valve of each cylinder, make sure that the exhaust valve of the same

cylinder is fully open. In dealing with each exhaust valve, the corresponding inlet valve should, of course, be fully open. To adjust, loosen the locknut (see Figure 11) and with a screwdriver turn the pin until the correct clearance is obtained. Then securely tighten the locknut again. The correct clearance for the inlet valve tappets is .004" (4 thousandths of an inch). The correct clearance for the exhaust valve tappets is .006" (6 thousandths of an inch). These clearances should be measured when the engine is at normal

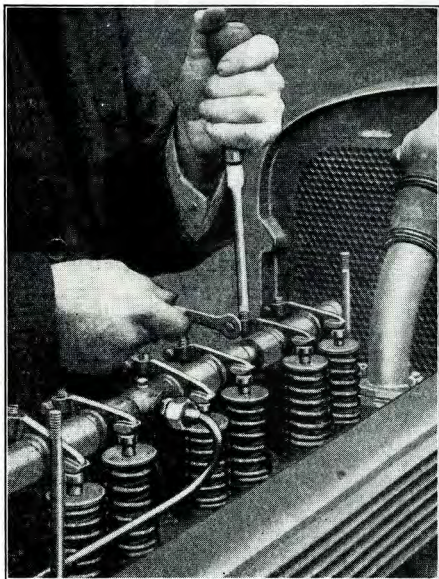


Fig. 11.
Showing method of adjusting the clearances for the valve tappets.

running temperature. The measurements may be accurately determined by the use of "feelers."

DECARBONISATION.

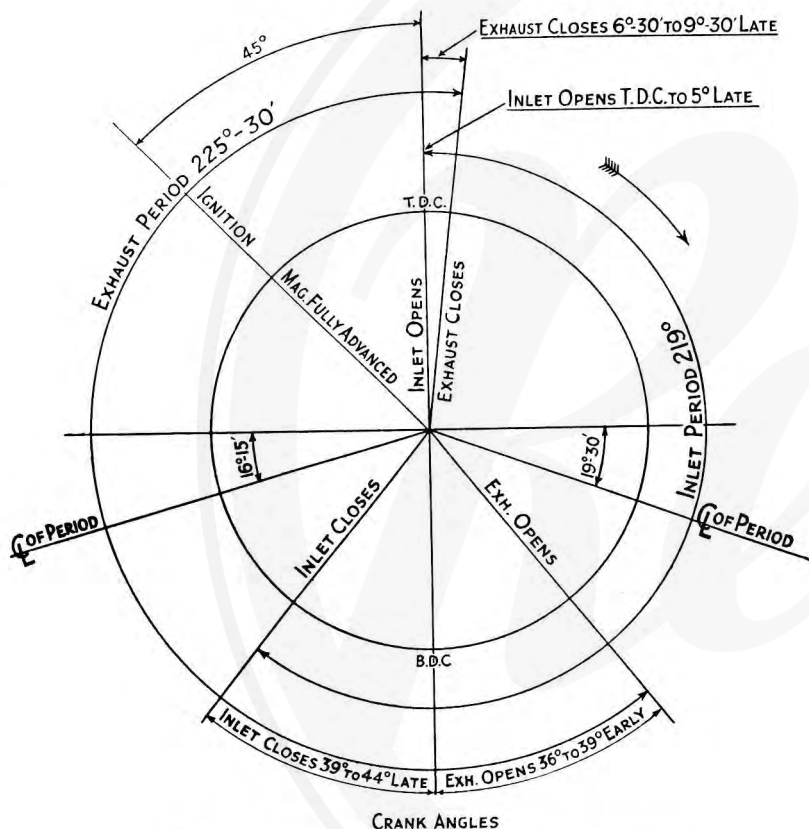
Even with the greatest care in the construction of an engine it is impossible to avoid a small leakage of oil past the piston rings. This will cause carbon deposit to form in the combustion chamber, and the carbon should be removed periodically. The cylinder head should be removed as described on page 14 and the interior, together with the piston crowns, thoroughly scraped, afterwards wiping away all particles of carbon with a rag moistened with petrol. Before each piston is scraped bring it to its top dead centre to avoid risk of damage to the cylinder wall, and also more easily to remove the small pieces of carbon as they become detached. Smear a little engine oil round the edges of the piston crowns, only a very small quantity, before replacing the cylinder head.

WEAR ON FLYWHEEL TEETH.

After the car has been in use for some time, it may be found that some of the teeth on the flywheel gear ring are worn due to the engagement with the starter motor. In this case it will be advisable to move the flywheel in order to bring a new set of teeth into operation. Take off the nuts securing it to the crankshaft so that the flywheel can be removed and refixed in a different position relative to the crankshaft, and then secured again by the nuts. It will be necessary to re-mark the timing line on the periphery of the wheel and to obliterate the original line. This should be done only by a very competent mechanic.

ENGINE AND MAGNETO TIMING.

On the following page a diagram is given which shows the timing for the engine and magneto of the 20/60 h.p. six-cylinder Sunbeam. This diagram should be followed whenever it is necessary to re-time the engine or magneto. When timing the magneto the contact breaker should be in the fully advanced position. For correct timing the points should be just breaking when the dead centre line of the flywheel is 45 degrees BEFORE the top centre.



TIMING DIAGRAM FOR 20 HP. ENGINE.

Fig. 12.

Engine and Magneto Timing Diagram for 20 60 h.p. six-cylinder Sunbeam.

MAGNETO.

The magneto is such a specialised machine that it is not advisable to attempt to take it apart or to make adjustments other than those of a simple nature. If trouble should arise, it should be sent to the actual makers for expert attention.

The platinum points of the contact breaker must be kept absolutely free from oil. This is of the utmost importance. The contact breaker is intended to operate with a gap of .012", and this should be checked periodically by the aid of the feeler gauge on the magneto spanner.

Whenever the magneto is lubricated this must be done with care and excessive lubrication avoided. The distributor gear wheel bearing and the main bearing at the contact breaker end are lubricated by means of the oil well on the distributor end plate. A few drops of special magneto oil introduced into the oil well after about every 1,000 miles is all that is necessary.

Examine the bell crank lever bearing bush occasionally, and if this is dry smear with a little magneto oil. After refitting the lever on the bush any excess of oil should be wiped away.

The distributor should be removed after every 4,000 to 5,000 miles and the internal surfaces cleaned with a cloth soaked in petrol. The surface of the brush holder should be similarly treated.

Although the instructions above are based on information supplied by the magneto manufacturers the special instruction book issued by them should be consulted on all matters appertaining to the magneto.

SPARKING PLUGS.

Keep the sparking plugs free from carbon deposit by occasionally brushing the points with a file card and afterwards washing them in petrol. The gap between the points should not exceed .025".

CARBURETTER.

The standard carburetter fitted to the Standard Sunbeam 20/60 h.p. engine is the Claudel-Hobson model M.Z.P.2, and Model A.Z.P. on the 20/60 h.p. Sports Car. These are of the diffuser type, being provided with an arrangement which gives a high degree of atomisation. This is effected by using a diffuser jet in combination with the usual main jet. The function of the diffuser jet is to ensure the provision of correct mixture at all speeds, and its action is perfectly automatic.

From experience it has been found that a 210 c.c. main jet is the most satisfactory size for use on the standard 20/60 h.p. and a 350 c.c. jet on the 20/60 h.p. Sports model and these sizes are fitted. Except in very rare instances it is inadvisable to make any alteration or to spend needless

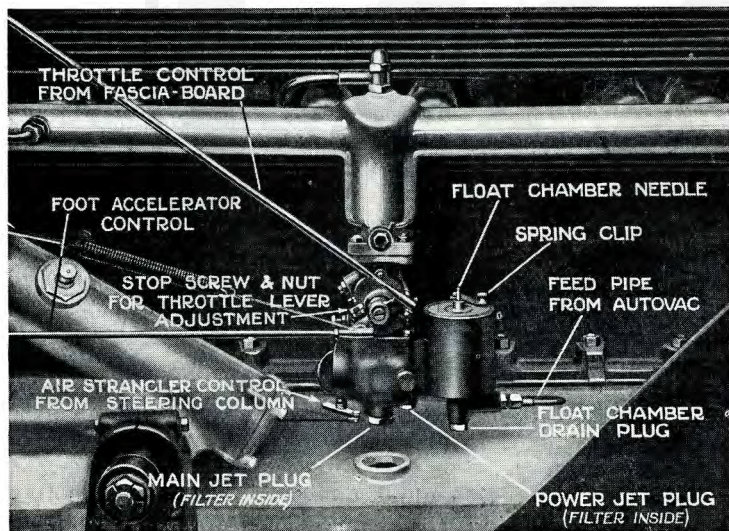


Fig. 13. Showing Carburetter and Controls.

time in experimenting. Obviously the size of jet fitted has been standardised only after exhaustive tests, and for all round running cannot be improved upon.

If adjustment should be necessary the following points must be borne in mind. Under no circumstances should the diffuser be tampered with, and adjustment should be confined to the following points:—

- | | |
|-----------------------|--------------------|
| (a) Main jet. | (d) Throttle stop. |
| (b) Slow running jet. | (e) By-pass screw. |
| (c) Air screw. | (f) Heating. |

The petrol level is set by the makers at from $3\frac{m}{m}$ to $6\frac{m}{m}$ below the top of the guard tube, and variations between these limits are not highly important.

Before attempting any adjustment of the carburetter, all the induction pipe joints must be rendered air tight, and the engine should be warmed up to its normal working temperature.

A full explanation of the working of the carburetter, together with hints on diagnosing faults, is given in the booklet issued by the carburetter manufacturers.

ADJUSTMENTS FOR BENZOLE, Etc.

Benzole and petrol require slightly different settings to obtain the best results, but an adjustment can be found which will serve equally well when running with either fuel.

Generally speaking, the best results with benzole are obtained by having one size smaller jet, though if the carburetter has been in use with petrol with the air screw screwed well in, the necessary extra supply of air for benzole may possibly be obtained by withdrawing this screw. Further adjustments may then be made in the usual way.

Very good results can be obtained from a mixture of petrol and benzole of good quality in equal quantities, the standard carburetter setting being used.

AUTOVAC FUEL SUPPLY SYSTEM.

The fuel is fed to the carburettor from the tank carried at the rear of the chassis by means of the Autovac fuel supply system. The Autovac system employs a small tank (which is mounted under the bonnet on the engine side of the dash) connected by tubing to the induction pipe, also to the main fuel tank and to the carburettor. Every engine draws its supply of fuel through the carburettor by reason of the pumping action of the pistons. It is this same pumping action which draws fuel from the main supply tank into the Autovac tank by the aid of the vacuum caused as described below.

The Autovac consists of two chambers—one inside the other—the inner one is the filling chamber from the main tank, and the outer one is the emptying chamber to the carburettor. At the bottom of the inner chamber is placed a drop valve. The suction of the pistons on the intake stroke creates a vacuum in the inner chamber, and this vacuum closes the valve between the two chambers, and also sucks or pumps up the fuel from the main supply tank into this inner chamber. As the fuel flows into this inner chamber it raises a valve float. When this valve float has risen to a certain point, it operates a valve which shuts off the suction and at the same time opens an air valve. This admission of outside air releases the vacuum, thus causing the valve leading into the emptying chamber to open, and this allows the fuel to flow through. The emptying chamber is always open to the outside air, so that nothing can ever prevent the fuel in this chamber from feeding through its connections to the carburettor in a perfect, even and uninterrupted flow.

CARE AND REPAIR OF THE AUTOVAC.

The simple and durable construction of the Autovac ensures its reliability and freedom from derangement. If the instructions given are carried out the Autovac should continue to operate perfectly for an indefinite period.

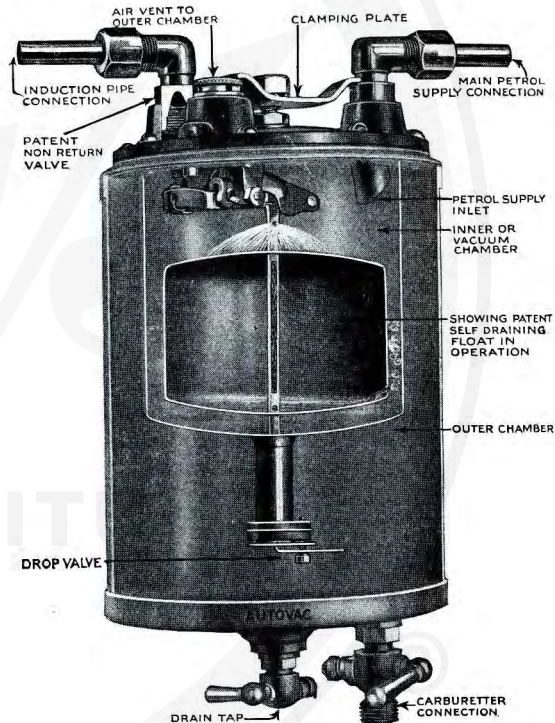


Fig. 14.
Sectional view of Autovac.

THE AUTOVAC FUEL SUPPLY SYSTEM.

The Autovac should not be dismantled or touched in any way unless there is felt to be absolute necessity for dismantling it, and if any trouble is experienced with the fuel supply all other possible causes should first be investigated. If fuel is properly delivered to the carburetter the Autovac is doing its work and any carburetter trouble must therefore be in the carburetter itself. AS FAR AS POSSIBLE LEAVE THE AUTOVAC ALONE.

When adjustment does become necessary first examine the Strainer (see page 27). The following suggestions should then be carefully read :

AIR VENT CAP.

In the air vent cap four holes are drilled, which allow an atmospheric condition to be maintained in the outer or emptying chamber, and these must always be kept clear of paint, glue or other kindred substances. If the cover has been removed for inspection, when replacing care should be taken to see that air port corresponds with the port leading to the outer chamber.

FUEL LEAKAGE.

If fuel leaks from the system, it can only do so from the following causes :—

(a) A leak in the outer wall of the Autovac may exist. If so, soldering up the hole will eliminate the trouble.

(b) The carburetter connection in the bottom of the Autovac may be loose. If so, it should be tightly screwed up.

FAILURE TO FEED FUEL TO CARBURETTER.

The air hole in the main fuel tank filler cap may be stopped up. If so, clean out the obstruction.

There may be a leak in the pipe line leading from the main supply tank to the Autovac, or from the induction pipe to the Autovac.

Do not blame the system until you are sure that the fault does not lie elsewhere. After flooding the carburetter, if the

THE AUTOVAC FUEL SUPPLY SYSTEM.

fuel runs out of the carburetter float chamber, you may be sure that the Autovac is performing its work.

TO REMOVE THE TOP.

When removing the top of the Autovac, take out the screws and run the blade of a knife carefully round the top between the cover and the body of the Autovac, so as to separate the washer without damaging it.

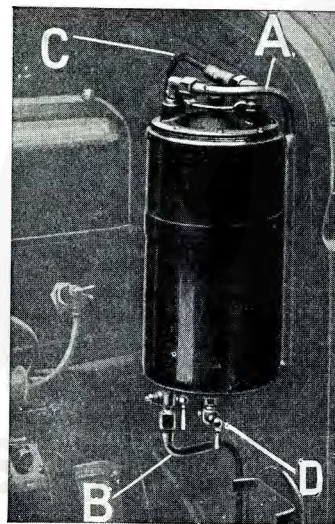


Fig. 15.

Showing position of Autovac. A is the pipe to main fuel tank ; B the pipe to carburetter C the suction pipe ; D is the drain tap.

See that all unions and joints are screwed up tightly so as to avoid air leakage at any part.

The strainer is a screen fixed at the top of the Autovac, and is a continuation of the main supply line. This screen is purposely placed there to collect all foreign substances that might get into the Autovac and be carried through to the carburetter. It may be that this screen is clogged, thus preventing fuel from entering the Autovac. If so, it can be easily cleaned by unscrewing the clamp and releasing the connection. It should be cleaned every three weeks. **If the Autovac should ever fail to operate, examine the strainer first.**

INCREASED FUEL CONSUMPTION.

The Autovac should show the same rate of consumption as with ordinary gravity feed. If the consumption is excessive the cause is:—

(a) There may be a leak in the tank or tubing—note instructions under “Failure to Feed Fuel.”

(b) If the motor speeds up when the Autovac is drawing from the main supply, it shows that either your carburetter mixture is too rich, or your connections are so loose that it is drawing air into the manifold. There should be no perceptible change of engine speed when the tank is operating.

FILLING UP AUTOVAC.

To fill the Autovac, should it ever become entirely empty, switch off the magneto, close the throttle and turn the engine over a few revolutions. This will create sufficient vacuum in the tank to fill it. If the Autovac has been allowed to stand empty for a considerable time and it does not easily fill when the engine is turned over, this may be caused by dirt or sediment being under the drop valve; or perhaps the valves are dry. Removing the connection in the top and squirting a little petrol into the tank will wash the dirt from the drop valve, and also wet the valves, and cause the Autovac to work immediately. The drop valve sometimes becomes pitted with a carbon deposit, which may tend to hold it from being sucked tightly on its seat. In this case the valve should be scraped with a knife.

CONNECTIONS AND TUBING.

Coupling and elbow connections should always be kept screwed down tightly.

FLUSH THE AUTOVAC EVERY THREE MONTHS.

Every three months, whether it seems to need it or not, flush the Autovac through the fuel connection. At the same time open the drain tap in the bottom of the tank, and let out any sediment or water which may have collected. Also, look over the suction and petrol pipe connections to see that they are absolutely tight.

See that the strainer is cleaned **EVERY THREE WEEKS**. Note exact position when removing to ensure replacement being properly made.

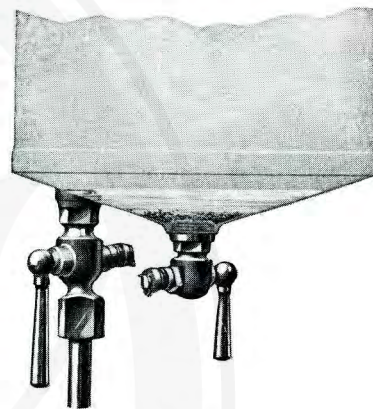


Fig. 16.

Showing the Drain Tap and Sediment Trap in bottom of Autovac which should be opened occasionally and any sediment cleared out.

Further information will be found in the separate booklet issued by the manufacturers of the Autovac.

FILLING UP WITH FUEL.

When filling the fuel tank, it is advisable to use a tundish fitted with a fine gauze strainer. A gauze filter is fitted inside the filler of the tank but the tundish provides a second filter and should almost entirely prevent particles of grit reaching the tank and eventually finding their way to the carburetter. Avoid using a tundish with a long funnel as this will damage the gauze in the tank filler.

If the carburetter jet tube becomes choked through the presence of grit or dirt, unscrew the plug at the base of the carburetter casing and the jet can then be unscrewed from

FUEL SUPPLY-IMPORTANCE OF CLEANLINESS.

its seating and the obstruction removed. See pages 22 and 23 which deal more fully with the carburetter.



Fig. 17.

Showing correct method of holding Can when filling Fuel Tank.

ably lead to waste through the spirit splashing on to the tank.

Keep the fuel system clean. The filters provided should be regularly cleaned out. Despite the care taken in using a tundish with gauze bottom and the assistance of the gauze in the tank filler, minute particles of dirt are liable to get into the pipe and in course of time may cause an accumulation. This is not due to any lack of cleanliness in the pipe system when the car is new but to the fact that some of the present day fuels are not entirely free from particles of foreign matter. If the Autovac is to receive a perfectly regular supply of fuel, the pipe system **must** be kept clean.

Any dirt which may accumulate in the carburetter casing should also be removed immediately it is noticed. **The importance of cleanliness in regard to the whole system of fuel supply cannot be too strongly emphasised.**

When filling the tank from the usual motor spirit can, hold this so that the outlet from the can is at the top, as shown in Figure 18. If the can is held the reverse way it will be impossible for air to enter as the can empties, and there will be a tendency for the spirit to emerge in irregular gushes, which will prob-

ELECTRIC LIGHTING & STARTING EQUIPMENT.

ELECTRICAL EQUIPMENT.

Rotax electrical equipment is fitted to the 20/60 h.p. Sunbeam. The dynamo is positively driven through the water pump and magneto driving shaft, with the great advantage over a belt drive that no slip can occur and a regular and constant charge is assured.

LUBRICATION OF DYNAMO.

A small oiler is fitted at the driving end of the dynamo. This should be lubricated about every four to six weeks, and only good quality lubricating oil should be used. Very little oil is required, as over-lubrication will result in trouble through leakage of oil on to the commutator and carbon brushes.

COMMUTATOR AND BRUSHES.

These parts should be periodically examined by removing the end cover of the machine. The commutator should be kept quite clean and free from dust; a very dirty commutator should be polished with a piece of fine glass paper (not emery cloth). See that the brushes move freely in their holders and are bearing evenly on the commutator, and that the flexible leads from them are quite free.

FUSE.

In the event of the fuse "blowing," a careful inspection should be made of all the battery connections, including those between the individual cells, verifying that all terminals are quite tight before a new fuse is fitted. Also examine the "cut-out" which may be sticking. Special fuse wire should always be used for replacement (*on no account use copper or iron wire*).

CHARGING SWITCH.

This switch should always be kept in the "charge" position until there is no doubt that the battery is fully charged. If any doubt exists, err on the side of overcharging.

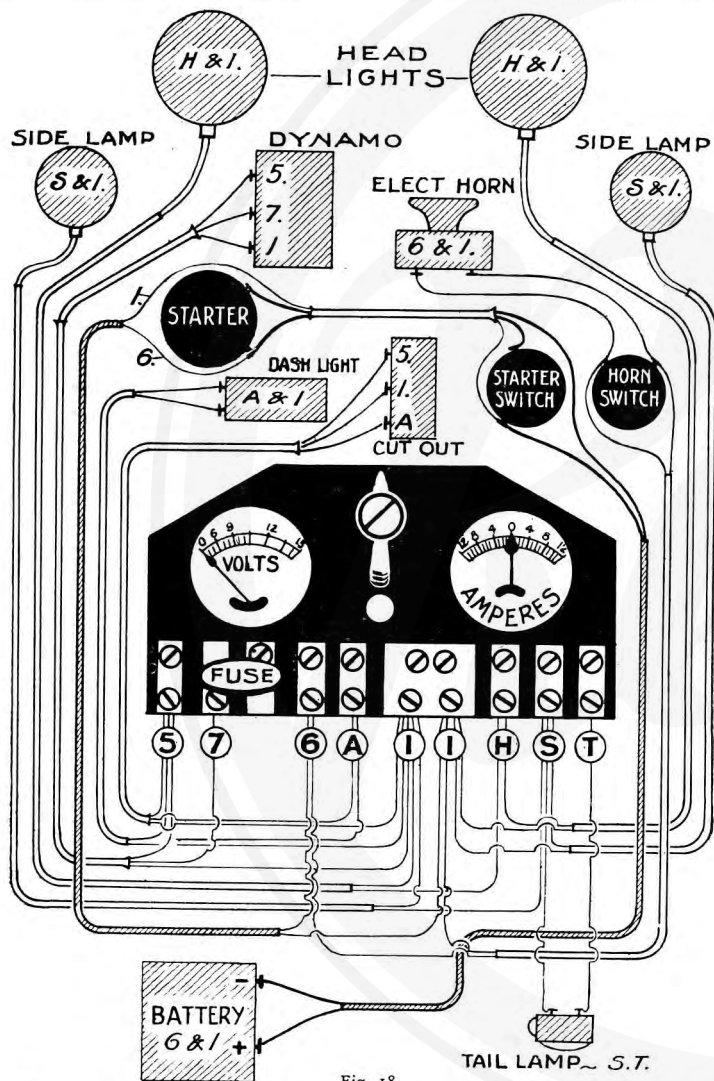


Fig. 18.

If any extra electrical fittings are added these should be wired to terminals 6 and 1.

STARTING MOTOR.

The starting motor will require little attention with the exception of refilling the lubricator with grease about every six months.

The gear drive should never be oiled or lubricated in any way; the gear works to the best advantage when the screwed sleeve is quite clean and dry.

BATTERY.

The battery forms a most important part of the whole system, and too much attention cannot be given to its proper care and maintenance. It is not possible in the small space here available to give full instructions, but we would draw attention to the following highly important points. The booklet issued by the manufacturers of the electrical equipment contains more complete information. Any time and trouble expended in carrying out these recommendations will ensure longer life and better functioning of the battery.

DISCHARGING.

The battery should not be discharged below 11 volts, shown with all lamps alight and the dynamo stationary. Neither should it be allowed to stand completely discharged.

UNDERCHARGING.

This causes the positive plates of the battery to sulphate and probably ultimately to buckle, and should be avoided. On the other hand, over-charging, to a reasonable degree, will do no harm to the battery. THEREFORE, ALWAYS GIVE THE BATTERY THE BENEFIT OF THE DOUBT WHEN CHARGING UP.

It should be noted that the colour of the plates gives the best indication as to the state of the battery.

FIRST CHARGING.

If the battery is dry when the car is received (although this would occur only with cars which have been shipped overseas) full instructions will be found in the Rotax Co.'s handbook as to charging.

EVAPORATION.

Evaporation should be made good by the addition of distilled water, always taking care to see that the solution is of the correct specific gravity (viz., 1.225), when the battery is fully charged.

STORING.

The safest way of keeping a battery in good condition whilst stored is to see that the solution is of the correct specific gravity (as above), and that it covers the tops of the plates. The battery should then be given a thorough charging, the terminals and tops thoroughly cleaned and the former greased with vaseline. If it is then stored away in its container box or in a dark place it will keep in good condition and retain its charge for several months, although it is advisable to give a short freshening charge every four or six weeks. Never empty away the acid, nor fill the battery with water. Even when washing out the battery a weak solution of acid should always be used.

GENERAL INSTRUCTIONS.

Do not rely upon the dynamo to charge the battery when it is badly run down, but have it thoroughly charged from an independent source. Always keep the battery tightly clamped in its container.

CARE AND MAINTENANCE OF STARTING AND LIGHTING EQUIPMENT.

Although every possible care is taken to eliminate any likely causes of failure, lack of attention or damage to wiring will invite trouble. It is the object of these instructions to simplify the location of the trouble and to give advice as to its correction.

FAILURE OF LIGHTS.

If the lights fail entirely when the car is stationary, or become suddenly bright and varying in intensity with the speed of the car, the cause will usually be found in broken battery connections due to the vibration of the car, or alternatively, loose or broken connections between the individual cells of the battery. If these are in order the switchboard should be examined, particularly the main connections, after which see that the terminals to the automatic switch are quite tight. The trouble is usually to be found in one of these directions.

DYNAMO UNDERCHARGING.

If the ammeter fails to indicate any charge going into the battery, the fuse in the switchboard should first be examined, and if "blown" it should be replaced only with special fuse wire.

Investigation should be made to discover the cause of the original fuse blowing, which will probably be due to loose or broken connections at the battery or the switchboard terminals. If, on examination, the fuse is found to be intact, see that the fuse is making proper contact in its clips; and the switchboard terminals, to which the dynamo connections are made, should be examined, also the connections on the generator itself. The trouble will usually be due to one of these being loose.

GRADUAL FALLING-OFF OF LIGHT.

If the lights become dull very quickly when the car is left standing with the lights on, the acid in the battery should be tested. If it is found to be too weak, do not correct by adding acid, but have the battery removed from the car and given a good long charge at its normal charging rate. Afterwards the acid should be emptied out, the battery rinsed out with a weak solution of acid (not water) and refilled with acid of 1.225 specific gravity.

BATTERIES.

The battery should be regularly inspected, at least every month, and care taken to see that the cells are kept clamped in the case. The terminals of the battery should be kept quite clean and well vaselined, and always screwed up quite tightly. The wires leading from the battery box to the switchboard and starter should be kept in good condition, and if the insulation becomes frayed or damaged the wires should be covered with rubber tubing to avoid any short circuiting on the battery terminals. The acid should always be kept just over the tops of the plates.

Distilled water only should be added. See previous note on evaporation (page 34).

SHORT CIRCUIT.

Frequent sources of short circuits are additional wires which are run to the battery for such units as electric horns, dash lamps, etc. A short circuit will usually be indicated by the heating up of the wiring affected, and will result in the lamps not lighting and no movement of the ammeter when the dynamo is running. The remedy is to disconnect, one by one, all fittings wired direct to the battery until the defective circuit is found and put right.

LIGHTS FLICKERING.

This may be attributed to several causes. The most usual is loose battery connections. If the flickering takes place in one lamp only, it will generally be found due to a defective holder connection, or a loose connection at the particular lamp terminal on the switchboard.

LAMP REFLECTORS.

The reflectors of head and side lamps should never be cleaned with ordinary metal polishes, otherwise they will be dulled and scratched, and as they are silver-plated the silver deposit will be taken off by any form of acid polish. Ordinary Selvyt cleaning cloths should be used, as supplied for cleaning silver. Any further polishing required should be done with a soft chamois leather.

A FEW IMPORTANT "DONT'S"

DON'T disconnect the wires leading from the dynamo to the switchboard, etc., unless you are careful to replace them according to their respective numbers.

DON'T run the dynamo with the batteries disconnected, except with the switch in the "off" position, otherwise you will probably burn out all the lamp bulbs.

DON'T drop oil on the commutator or inside the machine, when attempting to lubricate the dynamo bearings.

DON'T expect your lighting system to operate efficiently if you permit frayed ends of wire to come into contact with each other at any of the connections.

DON'T replace blown fuses with copper wire, but replace with special fuse wire.

The Rotax head lamps fitted to the 20/60 h.p. Sunbeam are internally wired and fitted with an externally operated arrangement for focussing.

From the sectional view, Figure 19, it will be seen that a screw head is placed in a recess at the back of the lamp body. This may be turned by using a coin or screw-driver and the bulb moved backwards or forwards until the desired position is obtained. If the light is reflected on to a white object, a sheet for instance, the correct adjustment may easily be arrived at, *i.e.*, when the light reaches the highest point of brilliancy with a total absence of shadows.

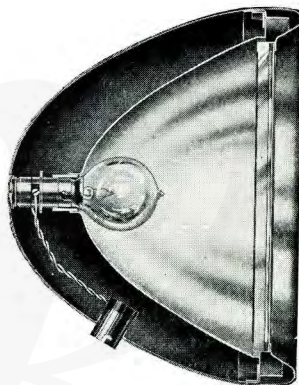


Fig. 19.
Sectional view of Head Lamp.



Fig. 20.
Side view of Head Lamp.

It is seldom necessary to re-adjust the bulb when once it is set, but it is always advisable to do this when fitting new bulbs.

To remove front of head lamp, the round-headed screw which passes through the tag of the name-plate should first be removed, and the front turned to the left as indicated by the arrow stamped on the rim of each lamp

WATER PUMP.

As shown in Figure 21, two glands are provided to prevent leakage from the water pump. This must be kept well packed with any standard gland packing. If any leakage is noticeable, first tighten up the gland nuts. Should the leakage persist drain all the water from the radiator and cylinder block, as explained below. Unscrew the locking nut "A," and the small pin "B," which retains the spring "C," to allow the gland nuts "D" being unscrewed as far as possible.

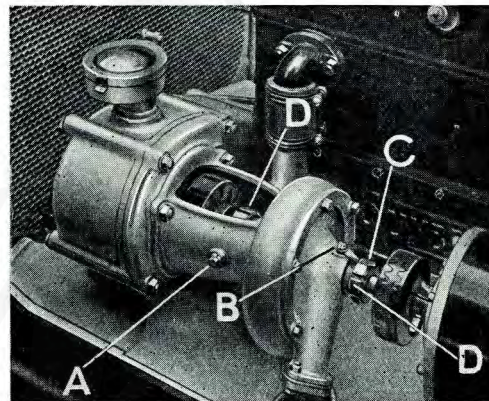


Fig. 21.
Showing the Water Pump and Glands which should be packed when required to prevent leakage.

Remove the old packing and repack carefully by winding the new packing round the spindle and forcing it at the same time towards the pump to ensure water tightness. See that it is wound towards the engine so that the rotation of the spindle does not tend to unwind it. Then screw up the gland nuts and tighten the locking nut and pin.

RADIATOR—Special Note.

During cold and frosty weather, when the car is left standing overnight, it is advisable to drain the water out of the radiator and cylinder block, also from the small cock on the water pump. A plug for this purpose is fitted at the bottom of the radiator just above the starting handle, and a drain cock on the off-side of the cylinder block, between the first and second holding down studs. The position of the water pump cock is shown at "D," Figure 5 (page 8).

DO NOT FORGET TO REFILL THE RADIATOR BEFORE AGAIN STARTING THE ENGINE.

STEERING GEAR.

The steering fitted on the 20/60 h.p. Sunbeam is of the screw and nut type. This method has been found very efficient. The surfaces in contact are of large area, the steering being very easy in operation, and there is an absence of all backlash. Owing to the simple design no adjustment is necessary.

A lubricator is fitted in the plug on the steering box (see Figure 22), and the box should be regularly filled with oil.

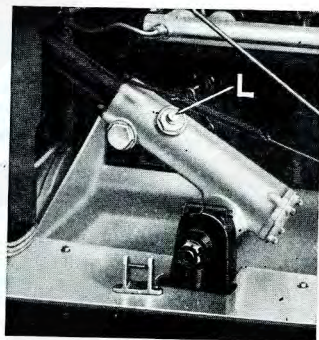


Fig. 22.
Keep the Steering Box well lubricated through the lubricator shown above.

Do not turn the road wheels entirely by the steering wheel when the car is stationary, as this practice strains the joints. If it is required to alter the position of the wheels when the car is standing, they should be as-

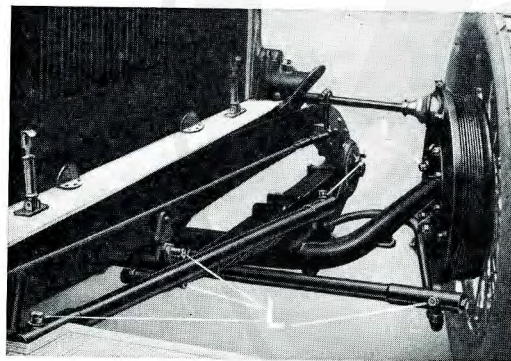


Fig. 23.
Showing Lubricators on steering rods.

sisted by hand, and not turned by the steering wheel alone.

The lubricators on the steering side rod, etc., are shown in Figure 23. Inject oil regularly in accordance with the instructions given on the lubrication diagram at the front of this book.

CLUTCH.

The clutch is of the single plate type and is readily accessible for any purpose of adjustment by removing the inspection plate. Adjustment of the clutch is, however, very rarely required. If necessary any imperfect contact of the friction surfaces can be adjusted as follows:—In the illustration, Figure 24, will be seen a nut, of which there are twelve placed around the periphery of the clutch. These should be tightened or slackened as required (each nut being given equal adjustment) so as to compress or expand the clutch springs, and thus increase or decrease the friction where necessary.

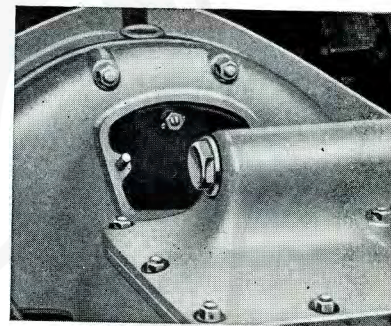


Fig. 24.
Showing Clutch inspection plate removed, with one of the adjusting nuts visible.

This being a dry plate clutch, under no circumstances must oil be applied to the friction surfaces. A very small amount will be sufficient to set up clutch slipping, causing continual waste of power and unnecessary wear.

The clutch withdrawal race on the stem wheel is packed with grease when assembled, and no attempt should be made to lubricate this further.

GEAR BOX LUBRICATION.

In the gear box, as in the case of other units requiring regular lubrication, there is a correct level for the oil. The screw plug shown in the accompanying illustration should be unscrewed and the oil replenished every 500 miles.

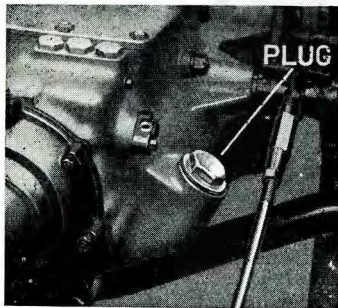


Fig. 25.
Showing Oil Filler in Gear Box.

Although the consumption of oil is small, the level must be maintained. If the oil is poured in slowly it will drain down into the gear box and when it reaches the bottom screw thread in the plug hole the correct level has been reached. This level is marked by an arrow. Do not forget to screw the plug up tightly after filling with oil.

If the supply of oil is not maintained at the correct level there will obviously be unnecessary wear on all the gears and their life will be shortened. It cannot be emphasised too strongly that proper lubrication is most important.

SPECIAL NOTE.—Engine lubricating oil is not suitable for the gear box. We specially recommend Wakefield's "Castrol S," Vacuum Mobiloil "C" or Shell-Mex Gear Oil.

On the change speed lever shaft is a grease cup, and this should be filled with grease periodically to ensure the shaft sliding easily.

LUBRICATION OF THE SPEEDOMETER DRIVE.

If at any time the speedometer is not registering correctly, or is intermittent in action, it is possible that the drive may need lubrication. When required, inject a little oil at the speedometer end of the flexible coupling. Usually this operation will be required about once every three months.

LUBRICATING REAR AXLE.

At the back of the axle casing, as shown in Figure 26, is a screw plug through which the axle is supplied with oil. As a safeguard, and to ensure getting the longest life from the axle parts, the supply of oil should be replenished every 500 miles.

The consumption of oil is small, and only a very small quantity will be required every 500 miles to maintain the proper level. The correct level is indicated when the oil overflows from the plug hole through which it is filled. This lubrication **MUST NOT BE NEGLECTED**

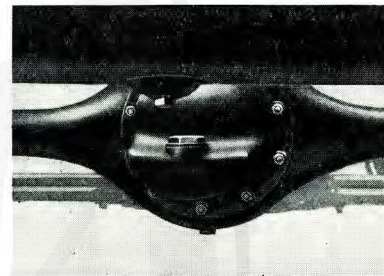


Fig. 26.
Unscrew Plug to replenish oil supply in Rear Axle. The small Plug shown above it is the Drain Plug in the Fuel Tank.

In cold weather the oil tends to form a film across the plug hole. This conveys the impression that the oil level is correct. The film should be pierced and it will then probably be found that a small quantity of oil is required to bring the supply up to the proper level. Use oil as recommended for gear box.

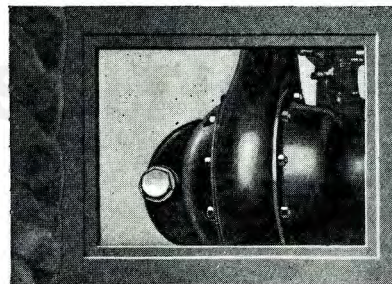


Fig. 27.
The oil plug is reached through the opening under the rear seat.

See that the plug is properly screwed up after the oil supply has been replenished.

THE BRAKING SYSTEM.

The four-wheel braking system fitted to the 20/60 h.p. Sunbeam is the outcome of long practical experience with four-wheel brakes. The system is patented and complies with legal requirements. In use Sunbeam brakes are perfectly reliable. The braking power is applied progressively, the steering is not affected by the action of the front wheel brakes, whilst tyre wear is much more evenly distributed than when a car is braked through the rear wheels alone. The introduction of four-wheel brakes of such proved reliability as those incorporated in the Sunbeam system is a definitely progressive step in motor car design.

The relation between the braking effort on the front and rear of a car fitted with four wheel brakes necessitated a great amount of thought and experiment. The difficulties have been surmounted in the case of Sunbeam four-wheel brakes, and it will be found that in operation there is no tendency at all for the car to swing as the brakes are correctly balanced.

The Sunbeam front wheel brakes give considerably more than normal braking effort when pressure is applied to the pedal. This increased effectiveness is obtained by an internal arrangement in the drums themselves, the operating shoe forcing the main shoe against the drum and giving an increased effort of approximately 2 to 1. Both shoes actually come in contact with the drum and therefore are effective as brakes, but the second or main shoe, which has a larger area, has applied to it a greater pressure than would be obtained by direct pedal application alone. This arrangement which entails no complications, and in no way can get out of order, is sometimes termed a "self-servo" brake.

The principle governing the Sunbeam front wheel brakes will be easily understood from the following brief description in conjunction with the accompanying diagram (Figure 28). The brake drum on each wheel contains two

shoes, C and D, one smaller than the other. The two shoes are connected together by a pivot B which is free in its housing. The other end of the smaller shoe is connected to the cam gear. E is the main anchor pin.

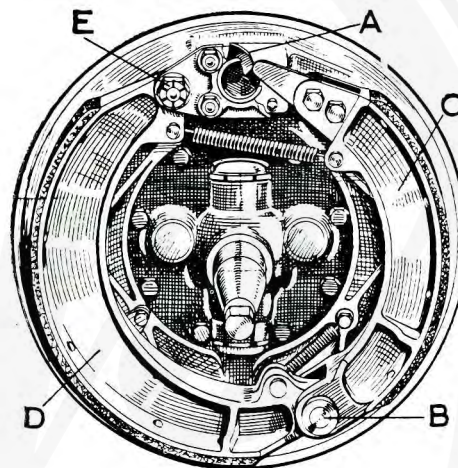


Fig. 28.
Showing lay-out of Sunbeam Front-wheel Brake.
A portion of the plate has been cut away to show the cam A.

When the brake pedal is depressed the movement of the cam A, forces the smaller shoe into contact with the brake drum and the shoe thereupon tends to revolve with it. This alters the pivotal centre of the shoes, and in turn expands the larger or main shoe against the drum, both shoes thus exerting a retarding pressure on the drum.

In each rear brake drum two pairs of brake shoes are fitted. When the pedal is depressed one pair of shoes is expanded through the action of a cam. The second pair of shoes provides quite independent braking, being operated by the hand lever and not controlled in any way by the pedal.

It will be seen from this that the Sunbeam four-wheel braking system actually provides six brakes—four operated by the pedal, and the two separate rear wheel brakes operated by the hand lever.

FOUR WHEEL BRAKE ADJUSTMENT.

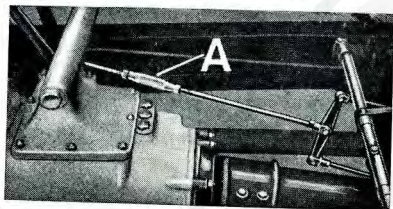


Fig. 29.

Showing Adjusting Nut between Pedal and Brake Rods of Front and Rear Wheel Brakes.

When any adjustment of the brakes becomes necessary the following instructions should be followed.

The brake rod from the pedal operates both front and rear brakes through a compensating bar which apportions the

required pull. No other method of compensation to either front or rear brakes is provided. A stop is fitted on the pull rod to the rear brakes, which should come against the chassis cross member when the brakes are off. For normal purposes all four brakes are adjusted by means of the right and left hand nut on the brake rod. (See A, Figure 29.) If the balance

of adjustment between all four brakes has been disturbed by the removal of brake shoes, rods, etc., for any purpose, it can be restored as follows:—The main adjusting nut A should be screwed well back but leaving at least $\frac{3}{4}$ " of each rod in engagement with the nut. The car should be jacked up from underneath each axle

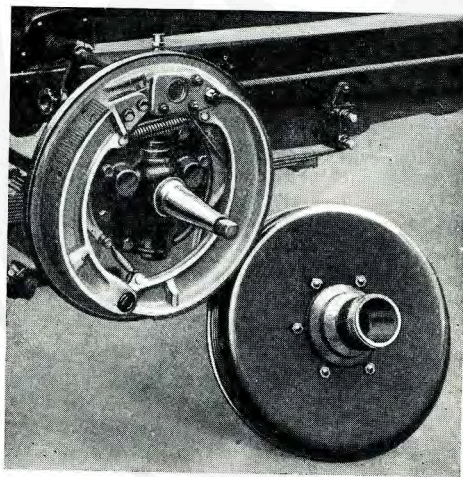


Fig. 30.

Showing Front Wheel Brake, with Wheel and Brake Drum removed.

so that the weight remains on the springs. The front and rear brakes should be adjusted through their independent adjustments (see later paragraphs) until the brake shoes are just touching the drums and the compensating bar is approximately at right angles to the rods. Then tighten up the nut A until one of the four wheels is just tight enough to require an appreciable effort to turn it. The three remaining wheels should now be adjusted by means of their independent adjustments until they are equally tight. Then screw back the nut A until the front brakes are just free of the drums. This should be tested with the wheels pulled round into full steering lock in each direction. The brakes should now be in correct balance, and the adjusting nut A should be securely locked by means of the lock nuts provided.

INDEPENDENT ADJUSTMENT FOR BRAKES.

The cable adjustment for one of the front wheel brakes is shown in Fig. 32. The adjusting nut is marked F B. The nuts at the end of the spring on the inside of the

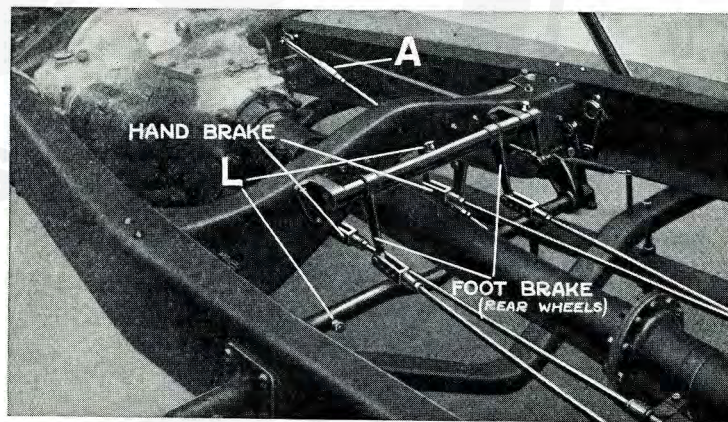


Fig. 31.—Showing Brake Adjusting Points. A is the Main Adjusting Nut. The Lubricators are marked L.

ADJUSTMENT OF BRAKES.

brake lever are not adjusting nuts, and **no attempt should be made to effect adjustment through them.**

As shown on Fig. 31, long jaws are fitted for the adjustment of the rods to the rear brakes. Fine adjustment can be made by taking out the joint pin and screwing the jaw on or off the brake rod as required.

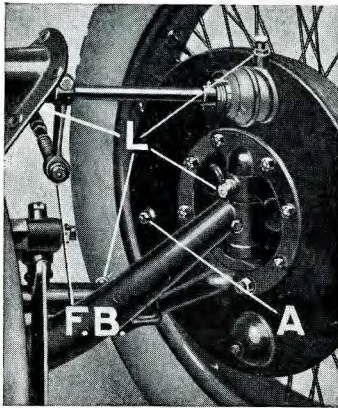


Fig. 32.

Showing near-side Front Wheel. F.B. is the Front Wheel Brake Adjusting Nut, A the Eccentric or Equalising Stop for the Brake Shoes, and Lubricators are marked L.

Justment would only be slight, about $\frac{1}{8}$ of a turn of the screw (the nut is a lock nut) being sufficient. The screw must be held firmly with a screwdriver, both while unscrewing the lock nut, and also when tightening up again. After adjustment the wheel should spin freely. If it does not the adjustment has been overdone and the screw will have to be screwed back slightly until the wheel spins freely. This should be tested with the wheels pulled round into full steering lock in each direction.

To remove a brake drum unscrew the six nuts which

See that sufficient thread, at least $\frac{3}{4}$ ", is left in engagement with the jaw. If an unusual amount of adjustment is ever required it can be effected by placing the pin through another pair of holes in the jaw.

An eccentric stop marked A, Fig. 32, is fitted to hold the brake shoes in their proper position relative to the drum. It may be necessary after the car has been running for a considerable time to adjust this stop in order to counteract wear of the shoe linings. Such ad-

REMOVING BRAKE DRUMS, Etc.

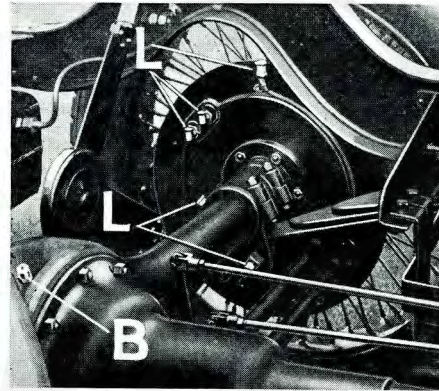


Fig. 33.

Showing Lubricators, marked L, on Rear Wheel. B is **not** a Lubricator but a "breather" for the Differential Casing.

and the preceding pages the lubricators are marked L. Regular lubrication is most important.

As shown in Fig. 34 twin brake shoes are fitted on the rear wheels, the hand brake operating separate shoes to those actuated by the four-wheel brake pedal.

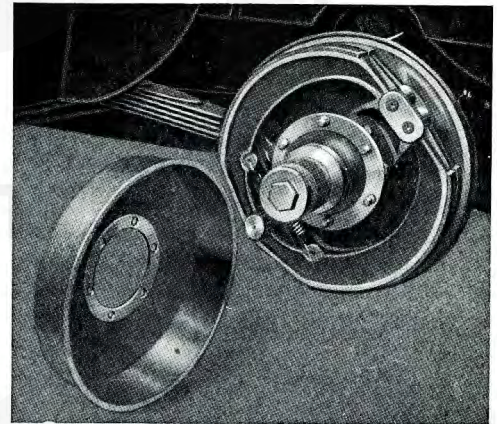


Fig. 34.

Rear Wheel Brake with Wheel and Brake Drum removed, showing Twin Brake Shoes.

hold this on the hub. See Figures 30 and 34. If the drum should be too tight to pull off after the nuts have been unscrewed tap it lightly around its outer edge with a mallet or raw hide hammer. Do not use an ordinary steel hammer or the drum may be damaged.

In all the illustrations on this

THE SPRINGS—LUBRICATION IS IMPORTANT.

SPRINGS.

The springing of the 20/60 h.p. Sunbeam is designed to give the fullest comfort at all road speeds. Full cantilever springs are fitted at the rear and semi-elliptic springs at the front, the latter being considerably offset.

The springs and their attachments need regular attention as they are such highly important features of the car. The principal points for lubrication are indicated on the lubrication chart at the front of the book, and also on the accompanying illustration.

The lubricator which is on the cantilever spring seat underneath the spring, is a very important point and this must not be neglected. Oil should be injected regularly through the lubricators marked L. See also spring lubricators marked on Figure 33. There is considerable frictional movement on the springs and shackles and it is highly important that they should be regularly lubricated, both front and rear springs being given proper attention in this respect.

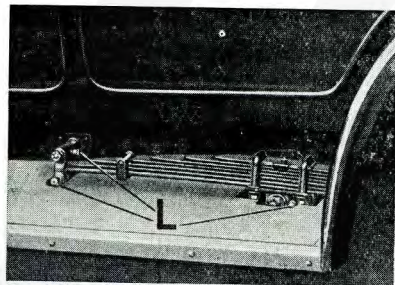


Fig. 35.
Showing Lubricators on Cantilever Spring Seat
(on right of photograph) and Shackle.

On cars which are fitted with spring gaiters provision is made for lubrication on the gaiters themselves, a grease gun being supplied which fits the nipple on each gaiter. Lubrication is advisable after about every 1,000 miles.

Whether gaiters are fitted or not it is necessary periodically to separate the springs as shown in the illustration Figure 36 and apply a mixture of Russian tallow and graphite. The leaves of the spring are the ONLY PARTS OF

THE SPRINGS—LUBRICATION IS IMPORTANT.

THE CAR TO WHICH GRAPHITE SHOULD BE APPLIED. The illustration shows the method of lubricating the leaves. The corners of the frame—not the axles—must be supported, the two corners of the back of the car when dealing with the rear springs, and the two corners of the front for the front springs. A strong trestle with a baulk of timber across the top and under the dumb irons of the frame is the simplest

method of supporting the car at the front end (see Figure 36). As the illustration clearly shows this takes the weight of the car off the springs, the leaves of which can then be easily separated by means of a screwdriver or similar tool, and the graphite grease inserted between the leaves with a thin knife.

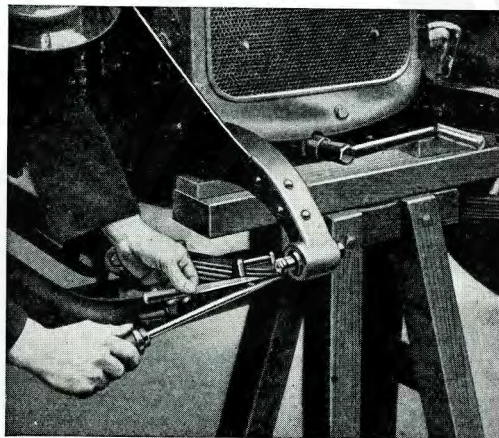


Fig. 36.
Showing method of Greasing Leaves of front Springs.
Rear Spring Leaves should be similarly treated.

Before the front corners can be raised, as shown in Figure 36, the front shield must first be detached, otherwise there is insufficient room to insert a strong baulk of timber. Removing this shield will also prevent it being damaged during the operation.

To apply the grease to the leaves of the rear springs the weight of the car must be taken off them by raising the frame at the rear. The leaves should then be separated in a similar manner to that described in connection with the front springs, and the grease inserted between the leaves with a thin bladed knife.

DETACHABLE WHEELS.

The wire wheels fitted to the 20/60 h.p. model are easily detached whenever removal is necessary.

To remove a wheel, the car should be jacked up and the lock nut on the wheel unscrewed by turning it in the direction in which the wheel revolves when the car goes forward. A special wheel spanner is provided with the tool kit. The lock nuts on the off, or right hand side of the car have a left hand thread. Each lock nut is marked (e.g. "Left side, Near side" or "Right side, off side") and arrows are stamped on showing the direction in which the lock nut should be turned.

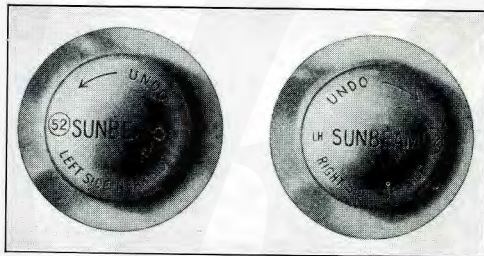


Fig. 37.
Showing lock nuts of Detachable Wheels.

In fitting a spare wheel the inside of the wheel hub and the outside of the permanent hub should be quite clean except for lubricant. Push the wheel right home on the inner hub, fill the inside of the lock nut with oil and screw up the lock nut, while the car is jacked up, until it is quite tight.

After changing a wheel it is advisable to test the lock nut after the wheel has been running fifteen or twenty miles to see if there is any slackness. This will be noticeable if the wheel is rocked backwards and forwards, and any tendency to movement should be removed by again tightening up the nut. This slackness is sometimes wrongly attributed to the lock nut unscrewing, a thing which never happens if it has been correctly put on.

REAR HUBS.

The rear hubs are very simply removed, no special tools being necessary. When the wheel and brake drum have been removed, see Figure 38 a castellated circular nut will be seen, in the position shown in the accompanying illustration. B is the castellated nut, A is a locking plate held in position by a small set screw. If this locking plate is removed and the circular nut B unscrewed the rear hub, complete with the shaft, can easily be withdrawn. The nut B remains on the axle.

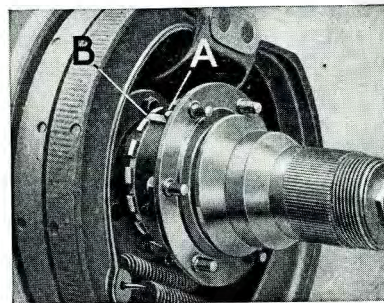


Fig. 38.
Showing Locking Plate and Screw (A),
and Castellated Nut (B).

When replacing it is very important that care should be taken to screw up tightly the nut B and make sure that the locking plate A is firmly in position and the set screw properly screwed up.

We recommend Price's Hub Lubricant—**soft** for winter use, **stiff** for summer—for the lubrication of front and rear hubs.

THE OIL GUN.

Again it cannot be too strongly emphasised that lubrication must be thoroughly and regularly carried out. No manufacturer can accept responsibility for wear or damage caused through neglect to pay proper attention to lubrication.

The lubricating diagram in the front of this book should be carefully followed. In addition, lubrication is referred to in every chapter dealing with the engine and chassis parts, so that no lubricating points can possibly be missed by the reader of this book.

:: GUN LUBRICATORS ON CHASSIS PARTS. ::

The shackle pins of the springs, control gear and steering connections, and the other principal chassis parts requiring regular lubrication, are fitted with special ball lubricators through which thick oil can be forced by means of the gun supplied with each car.

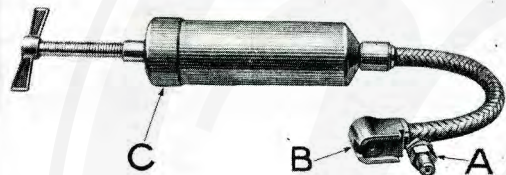


Fig. 39.
The "Tecalemit" Oil Gun.

We recommend the use of "Shell-Mex" Gear Oil for chassis lubrication instead of grease, as the latter is apt to solidify in cold weather. The "Tecalemit" gun is suitable for use with oil. To fill this gun the cap of the plunger, marked C, Figure 39, is unscrewed, which brings away the plunger. The oil is then poured into the barrel, the plunger and cap replaced and the cap screwed tightly on to the barrel. In operation the grooved end piece of the nozzle B is pulled on to the lubricator as far as it will go. The plunger handle is then screwed in the usual rotary direction and oil is forced through the lubricator as long as the handle is turned. Screw back the plunger about one turn before detaching from the lubricator to prevent oil exuding wastefully. One of the ball lubricators as fitted to the chassis is shown at A, Figure 39.

The only parts of a car where graphite lubricant should be used is between the leaves of both front and rear springs. Lubrication of the springs and leaves is fully dealt with on pages 50 and 51.

:: THE 20/60 H.P. TOOL KIT. ::

Complete list of the tools provided with each 20/60 h.p. Car :—

- 1 Double ended spanner, $\frac{1}{4}$ " and $\frac{5}{8}$ "
- 1 Double ended spanner, $\frac{3}{8}$ " and $\frac{7}{16}$ "
- 1 Double ended spanner, $\frac{1}{2}$ " and $\frac{9}{16}$ "
- 1 Double ended box spanner, $6\frac{m}{m}$ and $8\frac{m}{m}$
- 1 Double ended box spanner, $10\frac{m}{m}$ and $12\frac{m}{m}$
- 1 Double ended open spanner, $6\frac{m}{m}$ and $8\frac{m}{m}$
- 1 Double ended open spanner, $10\frac{m}{m}$ and $12\frac{m}{m}$
- 2 Box spanners, $\frac{3}{16}$ ", $\frac{1}{4}$ " and $\frac{3}{8}$ ", $\frac{7}{16}$ "
- 1 Box spanner, $\frac{11}{16}$ " and $40\frac{m}{m}$
- Spanner for valve tappet adjustment.
- Spanner for removing plug in carburetter.
- Spanner for removing hub caps.
- Spanner for removing fuel tank cap.
- Spanner for adjusting water pump gland.

Spanner for magneto.

Set of 3 tyre levers.

Jack, with handle.

Oil can.

Set of valve thimbles.

Valve lifting tool

Carburetter jet key.

1 small adjustable spanner.

1 large adjustable spanner.

2 tommy bars for use with
all box spanners.

Tyre pump.

Oil gun.

Set of Valve Springs.

Valve wire remover.

1 hammer, 2 screwdrivers,
pair of pliers, punch, chisel,
sponge cloth, tool bag.

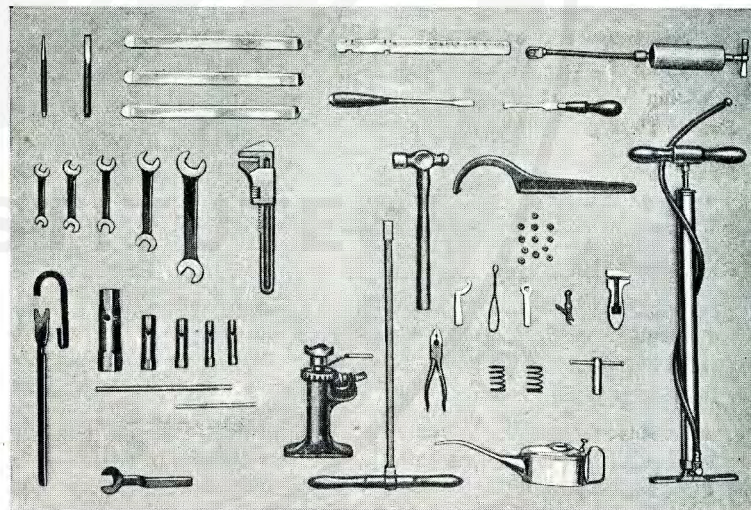


Fig. 40. Illustration showing complete Tool Kit of 20/60 h.p. Sunbeam.

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This Handbook of Instructions
for the 20/60 h.p. six-cylinder

SUNBEAM

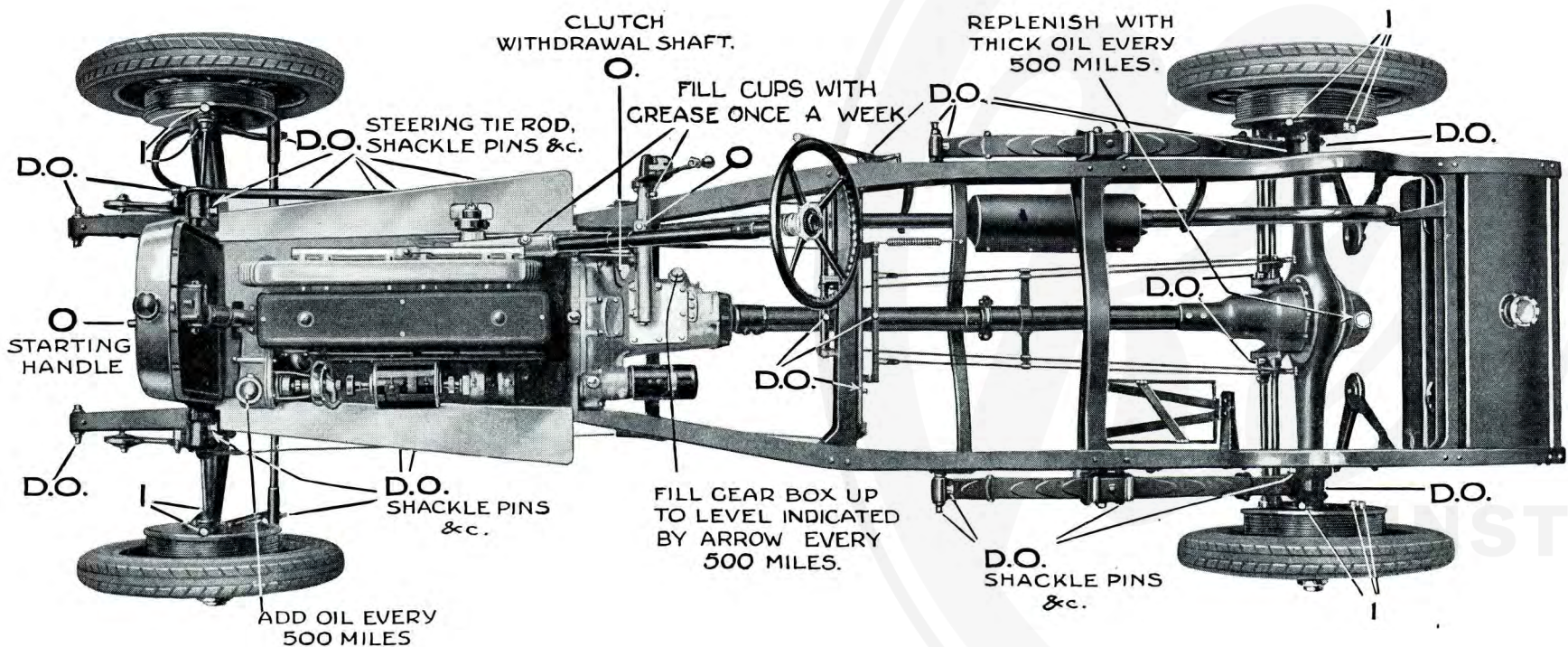
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LUBRICATION DIAGRAM

FOR THE

20/60 H.P. SIX-CYLINDER SUNBEAM ENGINE AND CHASSIS.



I. INJECT OIL ONCE A WEEK. D.O. INJECT OIL WITH GUN DAILY.

O. INJECT OIL WHEN REQUIRED.

FOURTH EDITION.

REG. No. 318. JANUARY, 1926.

Handbook of
for
20/60 h.p. SUNBEAM

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