Sabra Sport

INSTRUCTION BOOK

Sabra

AUTOCARS COMPANY LTD.

MANUFACTURERS OF PASSENGER AND COMMERCIAL VEHICLES

PLANT AND OFFICES:
TIRAT CARMEL (NEAR HAIFA)
TEL. 941961-8 TELEX 044-778

P. O. B. 444 HAIFA OR 57 TIRAT CARMEL
CABLES:
PIT HAIFA OR AUTOCARS TIRAT CARMEL

IN REPLY PLEASE QUOTE:
1371

TIRAT CARMEL 26TH JULY 1973

WE APOLOGIZE FOR THE DELAY IN ANSWERING YOUR LETTER FROM MARCH 26TH, WHICH WAS CAUSED BY CHANGE OF OWNERSHIP IN OUR COMPANY.

UNDER SEPARATE COVER WE SENT YOU F.O.C. A MAINTENANCE MANUAL FOR YOUR CAR AND HOPE IT WILL BE HELPFUL FOR KEEPING THE CAR IN TOP CONDITION.

A WELL-ILLUSTRATED WORKSHOP MANUAL IS AVAILABLE FROM HERE AT $ 6.00 PLUS $ .60 SURFACE MAIL FEES OR $ 4.60 FOR AIR MAIL FEES. IN ORDER TO OVERCOME LOCAL CURRENCY RESTRICTIONS, PLEASE, ENCLOSE WITH YOUR ORDER A BANKER'S CHEQUE ON THE NAME OF "AUTOCARS CO.LTD.HAIFA" ON THE RECEIPT OF WHICH THE MANUAL WILL BE SENT IMMEDIATELY.

PROPRIETARY PARTS ARE: ENGINE MADE BY FORD ENGLAND, MODEL CONSUL 204E.
CLUTCH FROM BORG & BECK, ENGLAND.
GEARBOX MADE BY Z-F, GERMANY, FRIEDRICHSHAFEN.
REAR AXLE AND REAR SUSPENSION FROM RELIANT, TAMWORTH, ENGLAND/
FRONT AXLE FROM RELIANT, TAMWORTH, ENGLAND.
SHOCKABSORBERS FRONT AND REAR FROM GIRLING, ENGLAND, PART NUMBERS STAMPED ON SHOCK BODY.
BRAKES FROM GIRLING, ENGLAND.
INSTRUMENTS FROM SMITH, ENGLAND.
ELECTRICAL EQUIPMENT MOSTLY FROM J.LUCAS, ENGLAND.

AVAILABILITY OF SPARES IS TEMPORARILY SUSPENDED DUE TO THE A/M CHANGE IN OWNERSHIP OF THE COMPANY. ALL SPARES ARE TO BE SOLD BY TENDER, WHICH MAY TAKE SOME TIME. WHEN SALES WILL START AGAIN WE WILL SEND YOU A NOTE. MEANWHILE WE SUGGEST TO TRY TO PROCURE THE MOST NEEDED SPARES FROM AGENTS OF THE A/M MANUFACTURERS.

WITH BEST REGARDS,

AUTOCARS COMPANY LIMITED

D.CHWOL
TECHNICAL INFORMATION DPT.

COPY: H.Z.PELED
R.ABADI

DC/EW

AUTOCARS COMPANY LIMITED
HAIFA – ISRAEL

PLANT & OFFICES:
145, Jaffe Road
TEL. 521226/7, 523708 ■ CABLES: PIT HAIFA

SABRA – SPORT

SPECIFICATIONS

BODY

Types	Soft Top; Hard Top; Gran Turismo
No. of seats	ST/HT : 2 G.T. 2 + 2
Type of frontseats	separate
rearseats	single bench, from wall to wall, G.T. only
No. of sidedoors	2
Main material	polyester resin, fibreglass reinforced

DIMENSIONS

Length	419 cm (13 ft. 9 in.)
Width	155 cm (4 ft. 11 in.)
Height laden	127 cm (4 ft. 2 in.)
Ground clearance	17.5 cm (7 in.)
Track	Front : 122 cm (48 in.) Rear : 122 cm (48 in.)
Wheelbase	228 cm (90 in.)
Dry weight	800 kg (1760 lbs.) approx.
Weight/power ratio	8.9 kg/bhp (19.6 lb/bhp)

ENGINE

Position	front
Type of fuel	gasoline
Octane requirement	91 min.
No. of cylinders	4
Position of cylinders	in line
Bore and stroke	82.6 × 79.5 mm (3.25 × 3.13 in.)
Cubic capacity	1703 c.c. (104 cu.in.)
Working cycle	4
Compression ratio	8.9 : 1
Max. power net	90 BHP at 4400 r.p.m.
Max. torque net	13.6 kg/m (98 lb/ft at 2600 r.p.m.)
Max. engine revolutions	6000 approx.
Specific power	52.9 H.P./ltr.
Fuel consumption	9.5 ltr./100 km (30 m/Imp. gal. – 25 m/US gal.)
Specific fuel consumption	– –
Piston speed	– –
Valve arrangement	overhead valve
Operating system	chain
Camshaft No.	1
Camshaft position	in crankcase
Valve tappet clearance : for operation : inlet	0.35 mm (.014") hot
: exhaust	0.35 mm (.014") hot
: for timing : inlet	0.38 mm (.015") cold
: exhaust	0.69 mm (.027") cold
Valve timing inlet opens	17° BTDC
closes	51° ABDC
exhaust opens	49° BBDC
closes	19° ATDC
Lubrication pump	vane type, or eccentric bi-rotor
Oilfilter : type	full flow
Carburettor : make & No.	SU HV 1½, two
type	Constant vacuum
size	1½ inch
mounting	30° side draught
Fuelpump : make	A – C mechanical

ENGINE ctd.

Coolant	water
Cooling system	pressurized at 0.5 atm. (7lb/sq.ft, thermo-syphon, assisted by centrifugal waterpump
Fanbelt : size	3/8" (9.5 mm) width × 32" (81 cm) outer length
Pistons : oversize available	.0025" .005" .015" .030" .045" .060"
Crankshaft : mainbearings standard size	2.376 in (60.35 mm)
undersize available	.010" .020" .030" .040"
conrod bearings standard size	2.185 in (54 mm)
undersize available	.002" .010" .020" .030" .040"

TRANSMISSION

Clutch : make	Borg & Beck
: type	single dry plate
: size	8 in.dia. × 0.16 in. lining thickness
: release fork	hydraulically operated
: mastercylinder	3/4" dia.
: slave cylinder	1" dia.
Gearbox	manual, synchronized
Ration & max speed : 1st	2.53 40 k.p.h. (25 m.p.h.)
2nd	1.71 64 " (40 " .)
3rd	1.23 96 " (60 " .)
4th	1.0 175 " (109 " .)
Rev.	2.50 53 k.p.h. (33 m.p.h.)
Max. speed in direct drive at 1000 r.p.m.	
Synchron. gears	1 – 2 – 3 – 4
Lever position	floor centre mounted
Propshaft type	open
No. of universal joints	2
Final drive	spiral bevel gear
Rear axle ratio	3.55 : 1 (32/9)

CHASSIS

Material	steel
Construction	separate frame, boxed side members, arc welded

SUSPENSION

Front suspension	independant with tubular leading arms, coil springs, telesc. double acting hydr. dampers
Caster	+ 6
Camber	+ 2°
Toe in	1/16 in. (1.5 mm)
Slide slip	Zero, permissible from – 0 to + 2 m/km (+ 10 ft/mile)
Turning circle	9.5 mtr (31 ft.)
Rear suspension	Live axle located by modified watt linkage, coil springs, coaxial telesc. double acting hydraulic dampers,
Steering : make	Burman
: type	Rack and pinion, friction damped

TYRES

Tyres : size	155 × 15
make	Pirelli – Cintura
Air pressure : for normal speeds	1.47 atm. (21 lb/ft) front and rear
for higher speeds	1.61 atm. (23 lb/ft) rear; 1.47 atm front.

BRAKES

Type	Hydraulic control
Front	disc 267 mm (10.5 in) dia.
Rear	drum 229 mm (9 in) dia.
Master cylinder	.75 in. dia.
Front caliper	48 mm dia.
Rear wheel cylinder	3/4 in. dia
Shoe lining : size	4.8 mm × 45 mm × 222 mm (3/16"× 1 3/4" × 8 3/4")
Total area of pads (front)	110 sq.cm. (17 sq.in.)
shoes (rear)	392 sq.cm. (61 sq.in.)
lining (all wheels)	502 sq.cm. (78 sq.in.)
Swept area : front	1303 sq. cm. (202 sq. in.)
: rear	639 sq. cm. (99 sq. in.)
: (metal area in contact with linings) on all wheels	1942 sq. cm. (301 sq. in.)

ELECTRICAL EQUIPMENT

Voltage	12 Volt
Battery	58 AH
Generator output	250 Watt
Ignition distributor : make	Lucas
Ignition control	centrifugal and vacuum
Ignition advance (static)	8° BTDC
Headlamps	"sealed beam" 45/60 Watt
Sparkplug size	14 mm N.A.8.
Temperature & fuel gauge	10 Volt
Windscreen wiper : make	Lucas
: type	adjustable , self parking, Two-speed
Breaker point gap	.014" to .016"
Sparkplug gap	.032"
Firing order	1 – 2 – 4 – 3
Direction of distributor rotation	anti clockwise
Revolution counter	electronically operated

BULBS

Front flasher & side lamp	21/6 W offset peg-socket D.C.
Rear flasher & tail lamp	21/6 W offset peg-socket D.C.
Rear stop lamp	21 W parallel peg-socket S.C.
Interior lamp	6 W festoon
No.-plate illum. lamp	2.2 W miniature bayonet
Instr. illum. & warning lamp	2.2 W screw cap
Flasher indicator lamp	1.2 W screw cap

FUSES

35 Amperes

Left fuse (without ign. switch)	protects interior lamp and horn
Right fuse (through ign. switch)	protects stoplamp, wiper, flasher, gauges, radiator fan, heater fan.

CAPACITIES

Fuel tank	38 ltr
Coolant	11.6 ltr (20.4 imp.pt.) soft or rainwater preferred
Engine sump	3.4 ltr (6 imp.pt) SAE 20
Engine oilfilter	0.9 ltr (1.5 imp.pt.) SAE 20
Transmission gear	0.6 ltr (1.05 imp.pt.) SAE 90
Rear axle	1.0 ltr (1.75 imp.pt.) SAE 90
Steering gear	Grease

LUBRICATION

Engine oil change	Each 8000 km (5000 mls)
Oil filter element change	Each 8000 km (5000 mls)
Front suspension & steering lubricate change	Each 3200 km (2000 mls) 11 lubr.points
Prop shaft lubricate	Each 3200 km (2000 mls) 2 lubr. points
Rear axle + gear box oil change	Each 8000 km (5000 mls)
Generator lubricate	Each 8000 km (5000 mls)
Front wheel bearings change grease	Each 8000 km (5000 mls)

TIGHTENING TORQUES

Cylinder head	8.9 to 9.7 m/kg (65 to 70 lb/ft)
Main bearings	7.6 to 8.3 m/kg (55 to 60 lb/ft)
Con rod bearings	2.8 to 3.5 m/kg (20 to 25 lb/ft)
Flywheel	8.9 to 10.4 m/kg (70 to 75 lb/ft)
Manifold	1.1 to 1.4 m/kg (8 to 10 lb/ft)

OUR POLICY IS CONTINUOUS TECHNICAL IMPROVEMENT, THEREFORE AUTOCARS COMPANY LIMITED RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT PREVIOUS NOTICE.

With Compliments

Chwolles

DAVID CHWOLLES

AUTOCARS COMPANY LTD.

MANUFACTURERS OF PASSENGER AND COMMERCIAL VEHICLES

TIRAT CARMEL. P. O. B. 21 TEL. 941961/8

6.8.73

The "Sabra Sport"

manufactured by

AUTOCARS COMPANY LTD · HAIFA · ISRAEL

~~*U.S.A. Distributors:*~~

~~SABRA MOTORS CORPORATION OF AMERICA~~
~~1836 · BROADWAY · NEW YORK 23 · NY~~

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INSTRUCTION BOOK

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INDEX

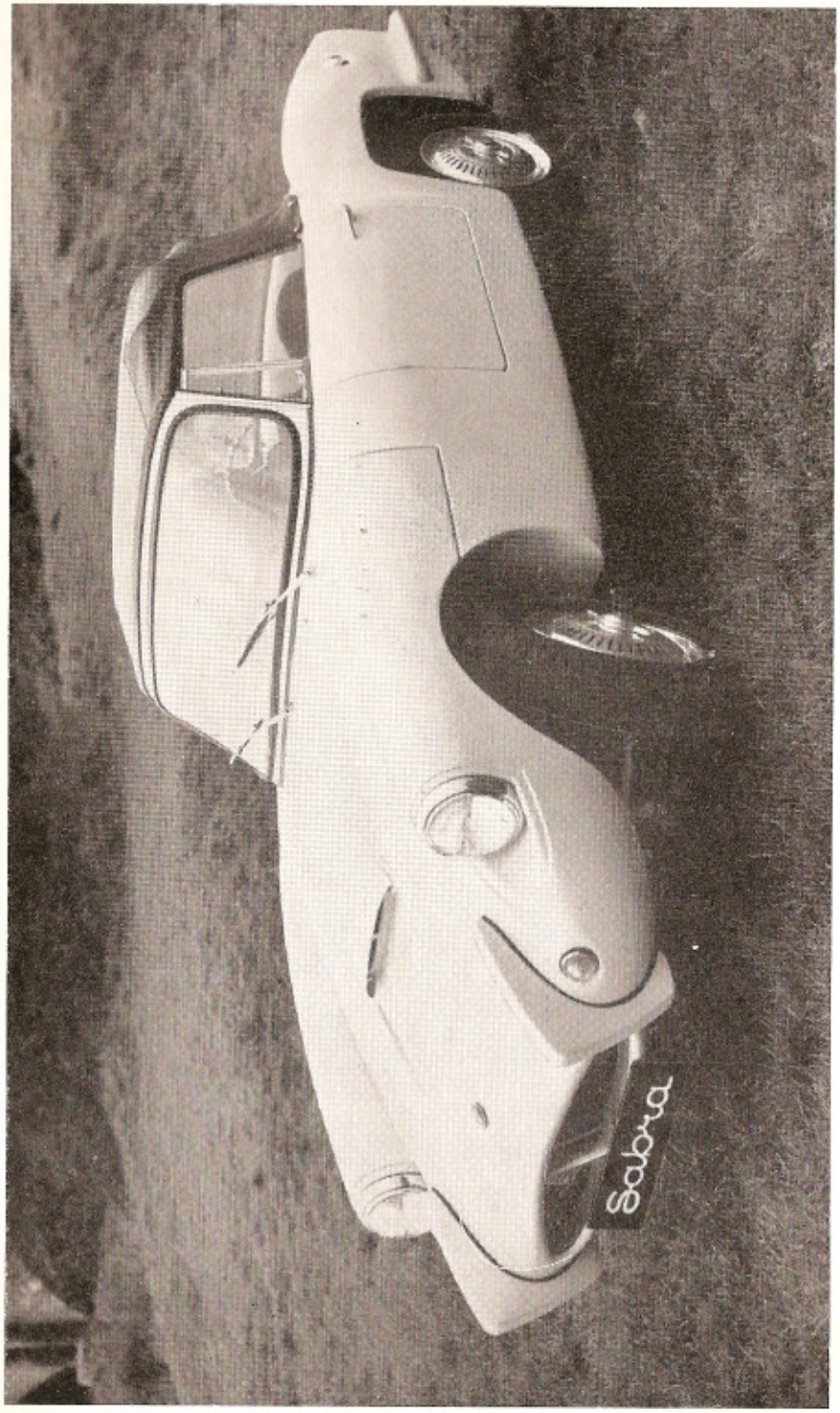
FOREWORD

This book has been compiled in order to present in as clear a manner as possible the information necessary for the car and maintenance of your "Sabra Sport." Read this book carefully as early as possible after taking delivery of your car and thus make yourself acquainted with it. Make the necessary arrangements with your Dealer to have regular maintenance carried out. In this way you will ensure its longevity and reliable service.

The "Sabra" is a handbuilt quality car designed by craftsmen to give performance, excellent road holding, and long life, but like all other machines its peak performance can only be maintained by regular attention to ignition, lubrication, and fuel systems as outlined in this book. The running in instructions must be adhered to during its initial mileage.

Should repairs or replacements become necessary use only genuine parts and ensure that any work is carried out by a skilled mechanic.

We are confident that your "Sabra" will serve you well and we wish you many miles of trouble-free motoring.



The "Sabra Sport"

General Specification

ENGINE	
Type	4 cylinder overhead valve water cooled push rod operated valves.
Dimensions	82.6 m.m. x Stroke 79.5 m.m. (3.25in. x 3.13in.).
Cubic Capacity	1703 c.c. (103.9 cubic inches).
Max. BHP	61 at 4,400 rpm.
Max. Torque	91 lb. ft. at 2,300 rpm.
Comp. Ratio	7.8:1
LUBRICATION SYSTEM	
Type	Full pressure feed, wet sump. Full flow external oil filter with replaceable element. Right-hand-drive models are fitted with a remote filter. Sump capacity, 7.2 U.S. pints (3.41 litres). Plus 1.8 U.S. pints (0.852 litre) for dry oil filter.
COOLING SYSTEM	
Type	Pressurized radiator with electric thermostatically controlled fan (cut in at 85° C., cut out at 75° C.). Independant header tank. Radiator pressure cap 7 P.S.I. (0.492 kg./sq. c.m.).
Capacity	2.25 Imp. gallons (2.95 U.S. gallons, 11.6 litres).
FUEL SYSTEM	
Type	Single Zenith down-draught carburettor. Mechanical fuel pump ~~(R.H.D. electric)~~. Oil wetted air cleaner. Fuel tank capacity 10 U.S. gallons.
IGNITION SYSTEM	
Type	Coil and distributor with auto and vacuum control.
CLUTCH	
Type	Single dry plate 8½ in. dia. Hydraulically operated by pendant pedal.
GEARBOX	
Type	4 speed synchromesh on all gears.
Oil Capacity	1 pint.

Gear Ratios

	GEARBOX	OVERALL
First	2.53:1	9.00:1
2nd	1.71:1	6.00:1
3rd	1.23:1	4.37:1
Top	1.00:1	3.55:1
Reverse	2.59:1	9.22:1

REAR AXLE	
Type	Semi-floating spiral bevel.
Track	4ft. (1.219 m.).
Capacity	1.5 pints (.85 litres).
Ratio	3.55:1

SEE AMENDMENT 7 FOR TWIN CARBURETTORS S.U.

DATA FOR CONVERTED VERSION SEE (YELLOW COLOURED PAGES) SPECIFICATIONS.

PROPELLER SHAFT

Type Open with needle-roller bearing universal joints. Sliding splines in gearbox.

STEERING GEAR

Type Rack and pinion 2¼ turns to lock. Friction damped. 15 in. wood rim, three-spoked steering wheel. Column universally jointed to pinion.

SUSPENSION

Type Front: Independant through coil spring and damper units to tubular suspension arms. Rear: Coil spring and damper units to axle located by modified Watt linkage.

BRAKES

Type Foot, pendant pedal operating four-wheel hydraulic brakes. Disc on front 9 in. dia. x 1¼ in. wide drum on rear. Lever type handbrake operating rear brakes through compensator.

ROAD WHEELS

WIRE WHEELS OPTIONAL

Type Bolted type 4J x 15 in. pressed steel. Light alloy and stainless steel discs with spinner. Fitted with 155 x 15 sports tyres.

Tyre pressure:— Front 21 P.S.I. (1.476 kg. per sq. cm.) For speeds up to
Rear 21 P.S.I. (1.476 kg. per sq. cm.) 70/80 m.p.h.

For higher speeds increase pressure of the rear tyres to 23 P.S.I. (1.610 kg. per sq. cm.).

ELECTRICAL SYSTEM

Type 12 volts 45-amp/hr. capacity battery. Dipping headlamps with foot-operated dip switch. Sidelamps combined with front flashers. Twin stop-tail lamps combined with red reflectors. Rear number plate lamp. Twin flashing direction indicators. Twin self-parking wind-screen wipers. Twin horns operated by lever switch on fascia. Combined ignition and starter switch. Cigar lighter.

DIMENSIONS

Weight 1,770 lb. approx. (~~690~~ 804 kg.).

Track 48 in. (1,220 m.m.).

Wheel Base 90 in. (2,286 m.m.).

Length 165 in. (4,194 m.m.).

Width ~~61~~ 59 in. (1,5~~6~~0 m.m.).

Height 50 in. (1,270 m.m.).

JACKING POINTS The hood must first be raised to give access to the front jacking points. The front suspension arms carry tunnels into which the toe of the jack is fitted. Operation of the ratchet jack wrench will then raise the car. To lift the rear of the car the jack is fitted into the appropriate tunnel which will be found under the lower edge of the rearwing.

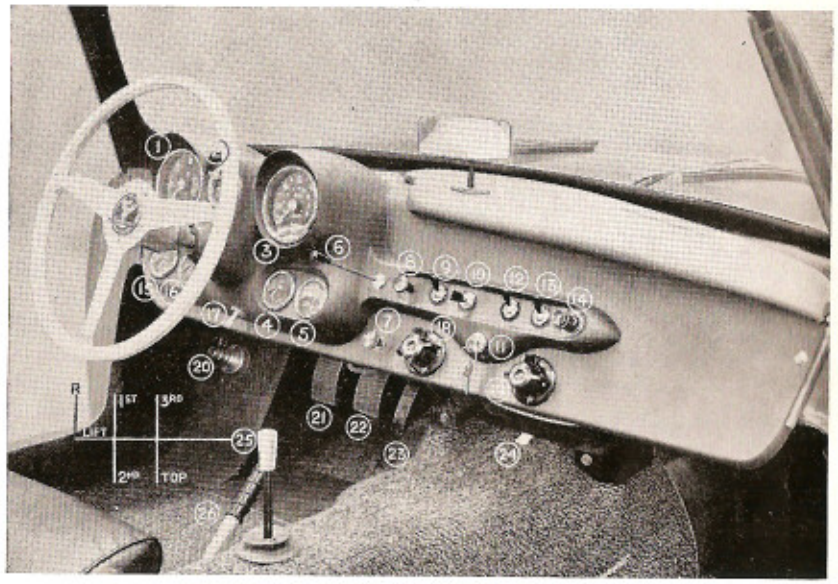


FIGURE 1.

1. Tachometer.
2. Clock.
3. Speedometer.
4. Fuel Gauge.
5. Ammeter.
6. Horn Push.
7. Windscreen Washer.
8. Choke Control.
9. Lights.
10. Direction Indicators.
11. Ignition Switch.
12. Windscreen Wipers.
13. Heater Fan.
14. Cigar Lighter.
15. Oil Gauge.
16. Temperature Gauge.
17. Trip Zeroing Control.
18. Ventilator.
19. Heater Control.
20. Dip Switch.
21. Clutch Pedal.
22. Footbrake Pedal.
23. Accelerator Pedal.
24. Heater Door.
25. Gear Lever.
26. Handbrake Lever.

DRIVING CONTROLS

Ignition Switch Located in the centre of the switch panel. Anti-clockwise rotation of the key operates the auxiliary circuit thereby permitting the radio (when fitted) to be switched on when the car is stationary. Clockwise rotation of the key against spring pressure starts the engine.

Choke Control Located to the left of the switch panel. The choke control should be pushed home as soon as possible after a cold start as excessive use will result in neat fuel washing lubricant from the cylinder walls, causing increased wear.

Director Indicator Switch This is marked " FLASHERS " and is mounted on the switch panel. Throwing this switch to the right operates the right-hand direction indicators and movement to the left operates those on the left side of the car.

Horn Switch The horn operating switch is in the form of a slender lever projecting from the fascia close to the rim of the steering wheel. Pressing this lever with the finger tip, from any direction, will sound the horns.

Windshield Wiper Switch (x) To operate the windshield wipers the switch, which is marked " WIPERS," is thrown to the left.

Light Switch This has three positions: " OFF," " SIDE " and " TAIL," and " HEAD," operating from left to right.

Heater Switch This is marked " HEATER FAN " and operates a booster fan placed in the heating system. It may also be employed for boosting cool air. (See " Heater and Demister.")

Dip Switch Located on the left footrest to the ~~right~~ LEFT of the clutch pedal. Depressing the switch changes the headlamp beams from the normal to the dipped position; depressing the switch a second time returns the beams to the normal position.

Throttle Pedal This control is located in the normal position to the right of the brake pedal. It will be found possible to employ " heel and toe " technique for those who wish to take advantage of the rapid retardation possible by use of the brake pedal in conjunction with downward gear changes.

Brake and Clutch Pedals Both are of the pendant type and are fully adjustable.

Handbrake The handbrake lever is on the right of the driver's seat and may be released by pressing with the thumb on the small knob located on the end of the lever, at the same time easing the weight on the pawl by pulling the lever slightly upwards.

Gear Change A short lever projecting from the transmission tunnel on the right of the driver selects ratios in the four speed and reverse all-synchromesh gearbox. The gear positions are marked on the gear change lever knob.

Windshield Washer Pulling out the black knob located on the fascia operates the twin jet washers automatically. The knob may be pushed in immediately without interrupting the 15 second spray.

INSTRUMENTS The seven instruments are grouped in front of the driver in a hooded, non-reflecting nacelle (Fig. 1), and are arranged in such a way as to be immediately visible to the driver, only a small deflection of the driver's eyes being required to read the information they provide.

Tachometer Situated on the left of the steering column this dial indicates the number of revolutions per minute. Depending upon the engine fitted to the car the maximum permissible revolutions vary, and is indicated by a coloured segment.

The maximum rpm should not be exceeded.

(x) FOR TWO SPEED WIPERS. P = PARKING
N = NORMAL SPEED
H = HIGH "

In the lower half of the tachometer dial are two lights. The right-hand one (blue) is the main beam indicator and the left-hand one shows with a flashing green light that the left-hand direction indicator is working.

Speedometer Located on the right of the steering column and indicates the speed of the car in miles per hour and, on an inner scale, in kilometres. In addition, two smaller dials register the mileage covered, the lower one having a zeroing control operated by the small knurled knob in the side of the nacelle. The dial of this instrument also carries two warning lights, that on the right showing with a green light that the right-hand direction indicator is working. The one on the left is the ignition warning (red) and the bulb is illuminated when the ignition is switched on and goes out when the engine speed rises above a fast idle, indicating that the generator is charging the battery.

Water Temperature Gauge Mounted in the lower left of the instrument nacelle, indicates the water temperature in the cylinder head. The normal operating temperature is 185° F. (85° C.).

Oil Pressure Gauge Mounted next to the water temperature gauge on the left side of the steering column and indicates the pressure of the lubrication system in the engine. When starting from cold the pressure may rise to 60 pounds per square inch but will gradually fall as the engine temperature rises to about 50 pounds per square inch. In the event of no oil pressure being indicated the engine should be immediately switched off and the oil level checked on the engine dip stick.

Fuel Level Gauge Mounted on the nacelle immediately to the right of the steering column. The fuel gauge has been carefully designed to give a very accurate reading and needle flutter has been entirely eliminated. The fuel level is indicated only when the ignition is switched on and the needle may take several seconds to travel across the scale to give a true reading.

Ammeter The ammeter is situated on the extreme lower right of the nacelle and is graduated to indicate rate of charge from 0 to —30 on the discharge side and 0 to —30 on the charge side.

Clock This is installed in a position directly above the steering column. Adjustment for gain or loss or resetting can be carried out by means of fittings incorporated in the instrument bezel.

Seat Adjustment Both driver's and passenger's seats are adjustable in a fore and aft direction, the driver's seat being so placed as to permit a " straight arm " driving position.

Movement of the seats is effected by pressing to the right the small lever located on the left side near the floor.

Hood Lock The hood is released by pulling the black knob which is visible under the centre of the fascia. This is positioned just to the left of the heater controls. Spring pressure causes the hood to rise, when it may be lifted by hand until the pawl of the telescopic safety strut engages.

To lower the hood it must first be raised about 1 inch further than its normal open position to disengage the pawl, and then lowered gently on to the locking devices mounted on the left and right of the

firewall. Hand pressure on the wings will then close the locks. No safety catch is fitted to the front hinged hood.

Trunk Lock After unlocking with the key provided, the handle is turned anti-clockwise. A telescopic strut retains the trunk lid in the open position and this is released in a similar manner to that fitted on the hood.

Cigar Lighter This is fitted on the extreme right of the switch panel and is operated in the normal way.

Heater and Demister Use of the heating, cooling and demisting system involves the operation of four controls: the water valve, which admits warm water to the system, the fresh air inlet, the booster fan and the demister flap.

To introduce warm air into the car the black knob marked " Warm " should be turned in a clockwise direction and the other knob marked " Fresh Air " turned, also clockwise, to the " Open " position. Additional air may be then introduced if necessary, by switching on the " Heater Fan." To demist, the flap on the bottom of the heater body should be closed.

To admit cool air into the car the water valve should be turned to the closed position, the demister flap being opened. Again the flow of air may be boosted by switching on the " Heater Fan."

Starting, Driving and Running in

STARTING FROM COLD Ensure that the gear lever is in " Neutral " before attempting to start the engine.

When starting from cold, pull out the " Choke " control to its fullest extent. This automatically sets the carburettor in the correct position and thus provides the necessary richness of mixture for cold starting.

Turn the ignition key fully clockwise to operate the starter motor.

Immediately the engine fires release the key. Do not " pump " the accelerator pedal as the action of the accelerator pump will enrich the mixture unduly. As soon as possible drive away so that the normal engine temperature may be quickly reached. Do not race the engine from cold, but allow time for the oil temperature to rise.

CHOKE CONTROL Push the choke control progressively home as the engine warms up. This action should be completed as soon as possible otherwise an excessively rich mixture will dilute the oil thus causing premature wear. Do not use the choke control when the engine is warm.

Should the engine at any time be flooded with a rich mixture, press the accelerator slowly to the floor board and operate the starter motor to clear the rich mixture from the cylinders. Close the throttle as soon as the engine fires.

DRIVING THE CAR Depress the clutch pedal fully and move the gear lever into 1st gear position. If the gear does not engage easily do not use force, but return the gear lever to neutral and release the clutch pedal. Depress the pedal again and it will now be possible to engage the gear.

Release the handbrake lever and accelerate the engine speed gently to take up the load and simultaneously release the clutch pedal gradually.

CHANGING UP Accelerate the car to a reasonable speed, release the accelerator and at the same time depress the clutch pedal. Move the gear lever into

2nd gear position, engage the clutch and at the same time accelerate. Repeat these actions through the gears until " Top " gear is engaged.

CHANGING DOWN Declutch and allow the engine to speed up by maintaining or, at high speed, increasing the pressure on the accelerator pedal.

Select the next lowest gear, release the clutch pedal and accelerate as necessary.

COASTING Do not coast downhill with the car in gear and the clutch pedal depressed as this will result in wear on the release bearing.

BRAKING Do not apply the brakes harshly except when in an emergency as this will cause undue tyre wear and stress on the transmission.

When traversing slippery or greasy surfaces braking should be carried out cautiously to avoid skidding. If the car does go into a skid always steer into the direction in which the car is skidding and use the brakes very sparingly if at all until correct line is achieved.

RUNNING IN The " SABRA " is built to high standards of design and manufacture, but it is essential that certain rules be laid down for the guidance of the owner during the running in period.

It is suggested that for the first 500 miles (800 k.p.h.) the followings speeds should not be exceeded.

55 m.p.h. (88 k.p.h.) in Top Gear.
50 m.p.h. (80 k.p.h.) in 3rd Gear.
30 m.p.h. (48 k.p.h.) in 2nd Gear.
15 m.p.h. (24 k.p.h.) in 1st Gear.

These speeds should not be held for long periods at first but as the running in progresses the top gear cruising speed should be increased. After 500 miles (800 k.p.h.) has been covered bursts of speed at a higher rate can be indulged in until 1,000 miles (1,600 k.p.h.) has been covered when, if these instructions have been complied with running in should be complete.

During running in never allow the engine to " labour," always change down in good time thus using the gearbox and assisting in its running in also. This initial careful treatment will be amply repaid by a quieter and more efficient unit.

After the running in is completed the engine should be checked over in case ignition and carburettor settings need adjusting to suit the now more flexible engine.

Lubrication System

Lubrication of the engine is by submerged gear type pump with a full flow oil filter fitted direct to the cylinder block.

The correct grades of oil are as follows and those recommended here should be strictly adhered to:—

Temperature Range	S.A.E. Viscosity No.
Summer or Winter	20 or 20W.
From 32° F to —10° F	10W
Below —10° F	10W + 10% Kerosene or 5W if available.

RECOMMENDED LUBRICANTS

	MOBIL	B.P.	CASTROL	ESSO	SHELL
Engine	Mobil Oil Special or Mobil Oila	Energol SAE 20W or Visco-Static	Castrolite	Esso Extra Motor Oil	Shell X-100 20/20W or Multigrade 10W/30
Gearbox	Mobilubs C.90	Energol SAE. 90	Castrol ST.	Esso Gear Oil ST. 90	Dentax 90
REAR AXLE					
Summer	Mobilubs C.140	Energol SAE. 90	Castrol D.	Esso Gear Oil ST. 140	Dentax 140.
Winter	Mobilubs C.90	Energol SAE. 140	Castrol ST.	Esso Gear Oil ST. 90	Dentax 90

CHECKING OIL LEVEL

It is impossible to over-emphasise the importance of regular lubrication servicing in order to obtain the best results from your car. Never be tempted to use oil of an indifferent quality, the use of cheaper oils is invariably false economy.

Each day, or before starting out on a long run, check the engine oil and add oil if necessary to bring the level up to the "full" mark on the dipstick.

Since more oil is consumed by the engine when running at high speeds, the level must be watched carefully when the car is operated at sustained high speeds.

To determine the oil level, ensure that the car is standing on level ground, open the bonnet and use the oil level dipstick located on the right-hand side of the engine as follows:—

Pull out the dipstick (Fig. 2), wipe off the traces of oil with a clean rag, re-insert it into the engine sump and again withdraw the stick. The mark made by the oil on the lower end of the dipstick will indicate the oil level.

When this reaches the point marked "Full" it is at its maximum level and any added above this point will only be wasted.

Further oil need only be added when the level falls below the line marked "Full." In no circumstances should the oil level be permitted to fall below the "FULL" line into the sector marked "DANGER."

Any attempt to run the engine with insufficient oil will cause serious damage. When replacing the dipstick, push it right into the tube otherwise oil may be lost through the gap left between the underside of the handle and the end of the tube.

DRAINING THE ENGINE OIL

The engine oil should be drained after the first 300 miles (480 km.) and thereafter every 5,000 miles (8,000 km.) or earlier if excessive fouling has taken place. The oil filter element (Fig. 2) should also be changed at this latter mileage or whenever the sump is refilled with fresh oil.

The drain plug is located in the lowest part of the sump (Fig. 2). Always drain off the engine oil when the engine is hot, as the oil will then flow more freely and tend to carry away any foreign matter in the sump. When the oil has all drained away replace the drain plug securely.

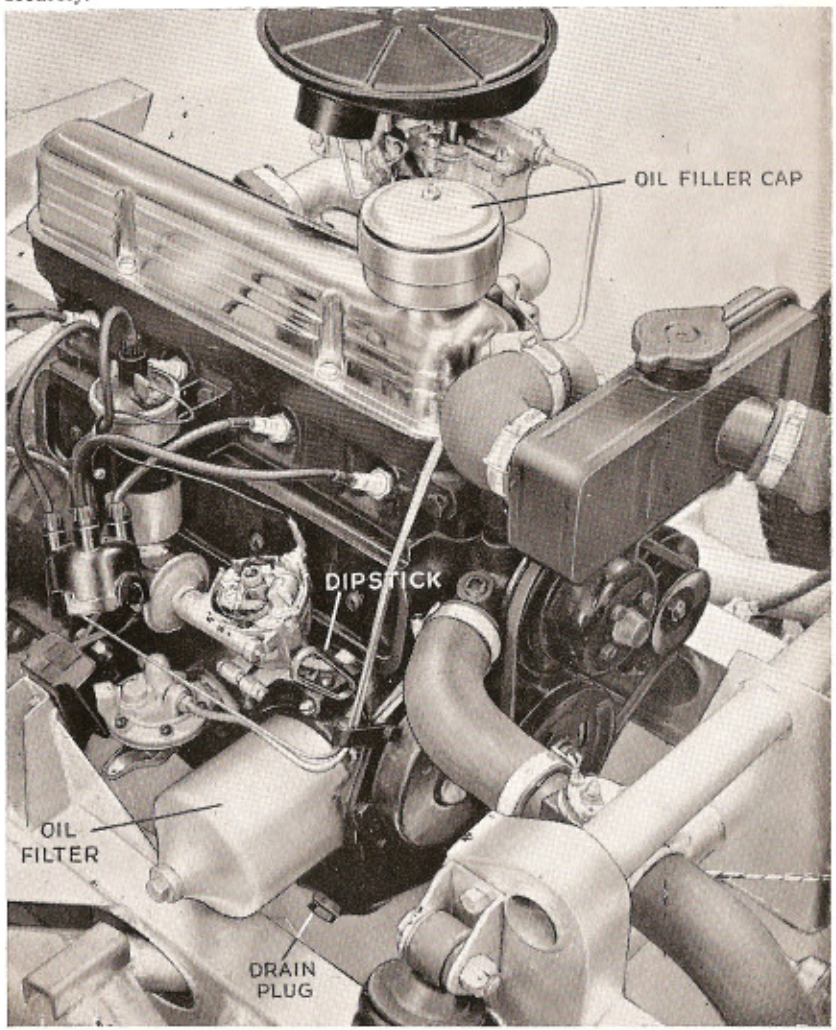


FIGURE 2.

RE-FILLING THE SUMP

The oil filler (Fig. 2) is mounted on the valve rocker cover.

To add more oil to the engine, it is only necessary to remove the filler cap as shown in Fig. 2 as the filler cap is of the oil bath air filter type, do not tilt the cap or oil will be spilt.

Repeat each day or before starting out on a long run, check the engine oil and add more oil if necessary to bring the level up to the "Full" mark on the dipstick as described on Page 8. Note that the car must be standing on level ground to give an accurate reading.

GEARBOX

At the first 1,000 miles (1,600 km.) the gearbox oil should be drained off (preferably whilst warm) and re-filled up to the combined filler-level plug with oil of SAE 90 Viscosity. Care must be taken to avoid overfilling as this may lead to clutch slip. Thereafter the oil should be changed every 5,000 (8,000 km.) and the level checked every 1,000 miles (1,600 km.).

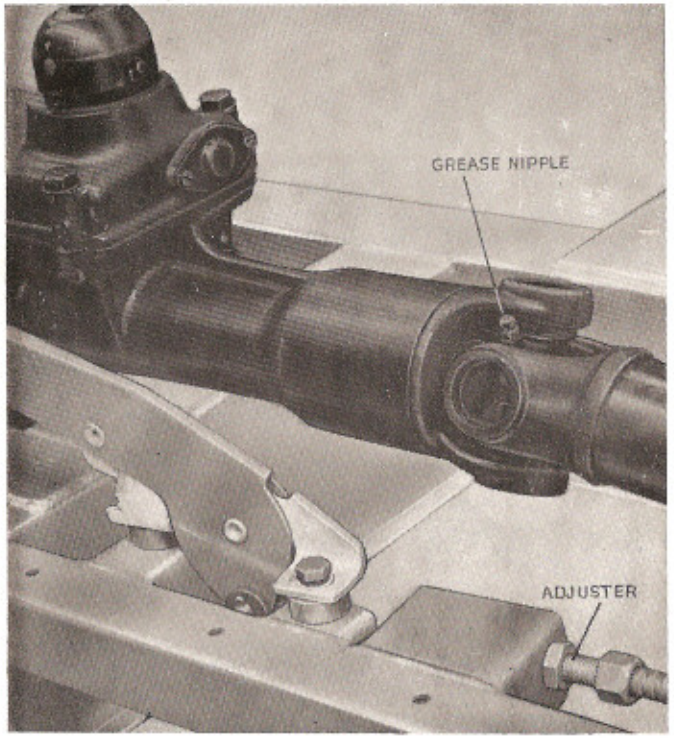


FIGURE 5.

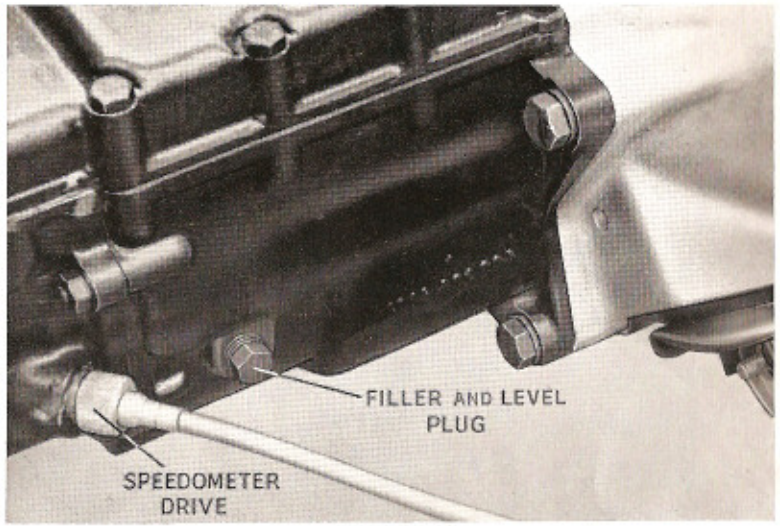


FIGURE 3.

REAR AXLE

The oil in the rear axle should also be changed at the first 1,000 miles (1,600 km.) and thereafter at every 5,000 miles (8,000 km.). As with the gearbox the level should be checked every 1,000 miles (1,600 km.).

Details of the correct lubricants are to be found on the identification plate fitted to the bulkhead and on Page 8.

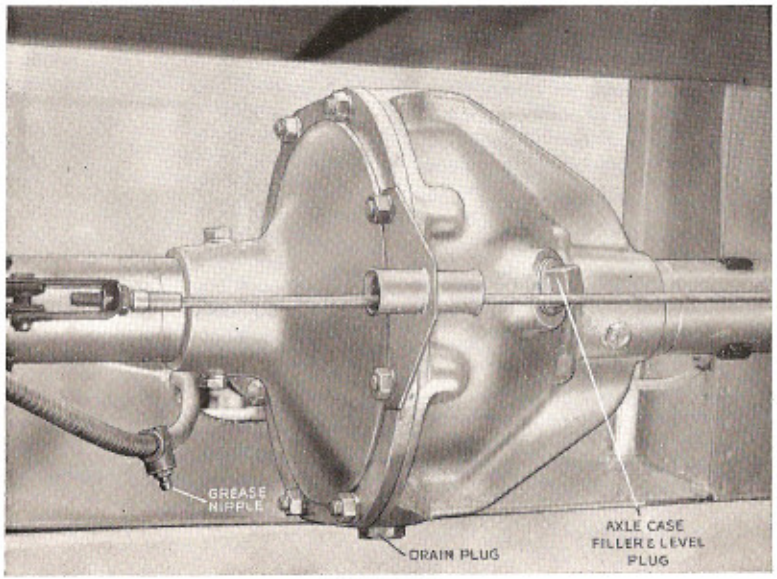


FIGURE 4.

UNIVERSAL JOINTS The propellor shaft universal joints should be lubricated by applying a grease gun containing SAE 140 oil to the nipples on each spider (Fig. 5).

WHEEL BEARINGS Every 5,000 miles (8,000 km.) the front wheels bearings should be replenished with ball bearing grease as required.

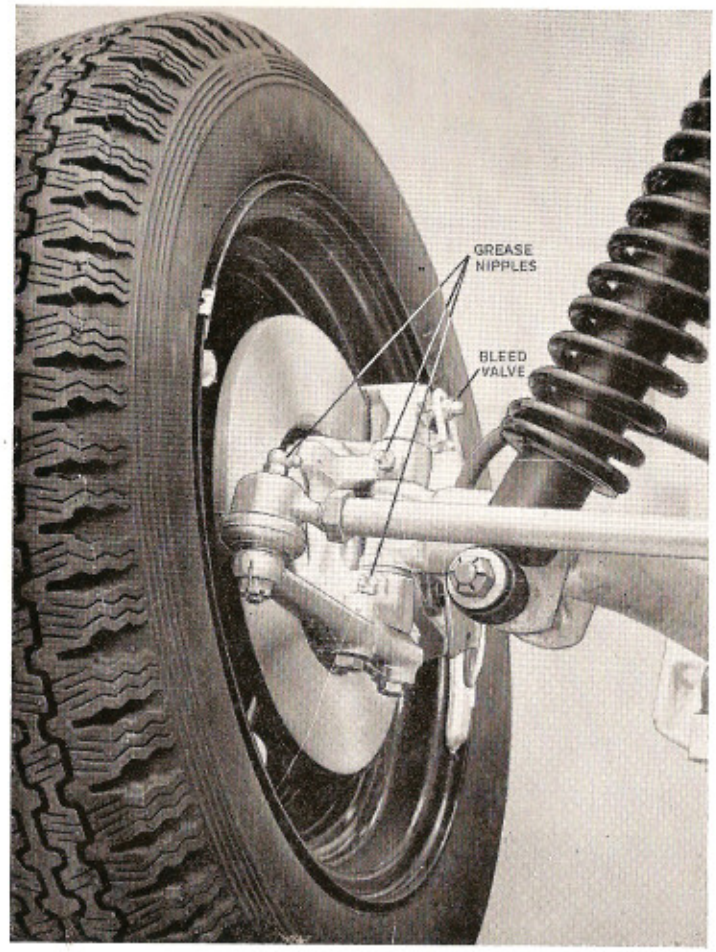


FIGURE 6.

CHANGING THE OIL FILTER ELEMENT

The oil filter is fitted direct to the cylinder block, no connecting pipes to the engine being required. To change the filter element, undo the hexagon-headed bolt retaining the filter unit to the cylinder block and withdraw the filter assembly.

Withdraw the filter element from the casing and replace it with a new element.

A new rubber sealing ring is supplied with each element. Remove the existing ring, then locate the new ring to the groove at four diametrically opposite points.

Do not fit the gasket at one point and then work it round the groove, as the rubber may stretch, thus leaving a surplus which may cause an oil leak.

Re-fit the filter assemply to the cylinder block ensuring that the washer is in place under the bolt head.

STEERING

Every 2,000 miles (3,200 km.) a grease gun should be applied to the front axle king pins (four nipples) (Fig. 6), to the steering idler bearing (one nipple, which is located beneath the fan motor) (Fig. 7), and to the steering box (two nipples) (Fig. 8). All these points are readily accessible when the hood is raised. The track rods should also receive similar attention at this stage (Fig. 7).

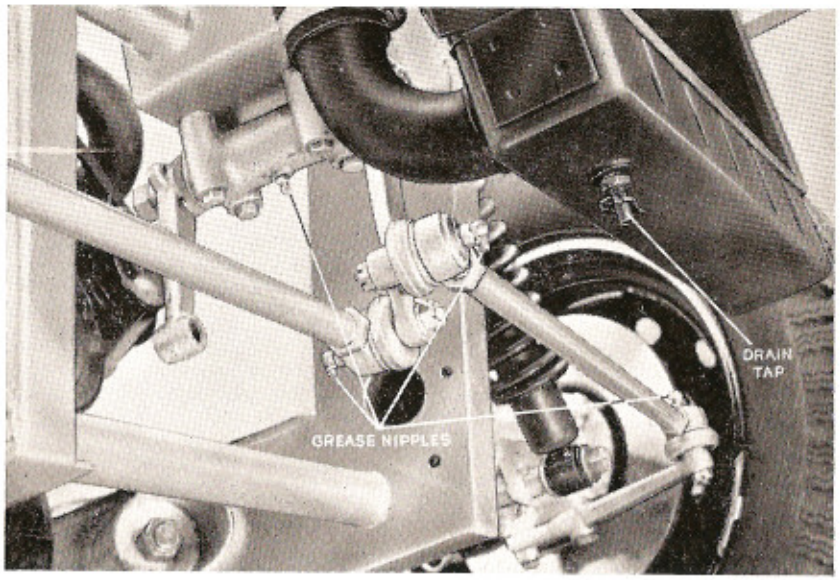


FIGURE 7.

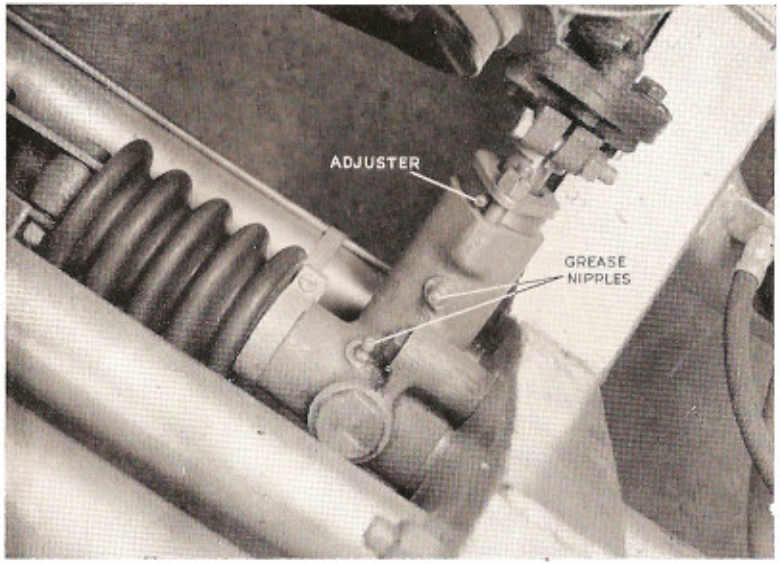


FIGURE 8.

(x) Fuel System

The Petrol Tank is mounted under the rear chassis members. Fuel is fed from the tank to the carburettor by means of a mechanical pump operated from the camshaft.

The Carburettor is of the down-draught type incorporating an accelerator pump economy device and power valve. Each instrument is adjusted at the time of manufacture and no adjustments are necessary except to the idling adjustment and accelerator pump stroke.

The main and compensating jets are located in the base of the emulsion block and this can be unscrewed after the float chamber has been detached and the float removed. The main jet is located centrally and the compensating jet is positioned to one side of it (Fig. 9 and 10). When replacing the gasket between the emulsion block and the float chamber ensure that the slot is in register with the lug on the emulsion block beak. The float hinge arm if removed must be replaced with the word "TOP" uppermost.

Partially obstructed jets can be cleared with an air line or a tyre pump. Never poke through the jets with wire.

ADJUSTMENTS
Idling

With the engine at its normal running temperature turn the throttle stop screw so that the engine is running at a fast tick-over.

Screw the mixture control screw in or out until the most even running position is obtained. If the engine is now running too fast re-adjust the throttle stop screw and follow by a further adjustment of the mixture control screw until satisfactory idling is achieved.

With a new engine idling may not be perfect until the running in is completed.

(x) SEE ALSO ADDENDUM

CHOKE CONTROL

When the choke control is operated an interconnecting linkage opens the throttle slightly to facilitate starting.

If this adjustment is disturbed loosen the pinch bolt and re-set the link as required.

The adjustment should be such that when the choke is fully released the throttle lever is resting against the stop screw.

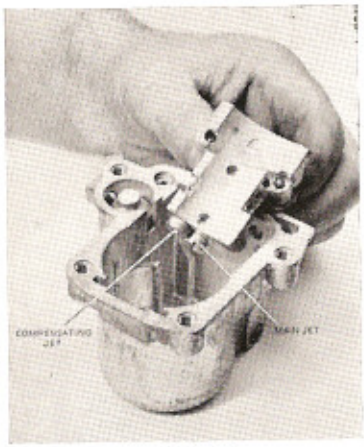


FIGURE 9.

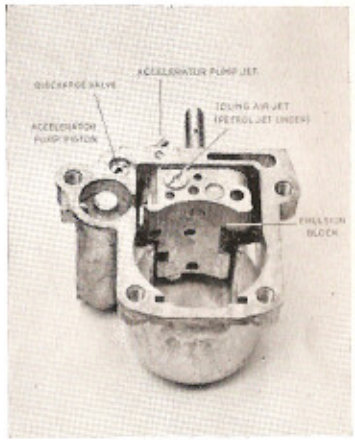


FIGURE 10.

ACCELERATOR PUMP STROKE ADJUSTMENT

The pump stroke can be adjusted by altering the position of the stop fitted under the operating arm. For normal temperatures set the stop so that the operating arm will contact the higher boss. For colder climate conditions set the stop so that the arm contacts the lower boss thus supplying more fuel per stroke (Fig. 11).

In order to effect adjustment lift the stop clear of the float chamber against the spring tension and turn it through 180°.

OIL BATH AIR CLEANER

To carry out normal servicing disconnect the air hose and unscrew the three securing bolts and one nut. The cleaner can now be removed from the car. Unscrew the filter bowl, empty out the old oil, clean out thoroughly and re-fill to the indicated level. Re-assemble and fit to the car.

FUEL PUMP

The fuel pump is entirely automatic in action and requires little attention other than occasional checking of the fuel lines to ensure tightness and absence of air leak.

FUEL FILTER

A glass sediment bowl and filter screen is fitted in the fuel line and mounted on the bulkhead.

TO CHECK FUEL SUPPLY TO CARBURETTOR

Ensure that there is petrol in the fuel tank. Examine the filter screen and sediment bowl, they may have become choked up. Check the fuel lines for air leaks.

To ensure that pump is delivering correctly, disconnect the fuel pipe from the carburettor. Operate the starter whereupon a spurt of petrol should be emitted for every two revolutions of the engine.

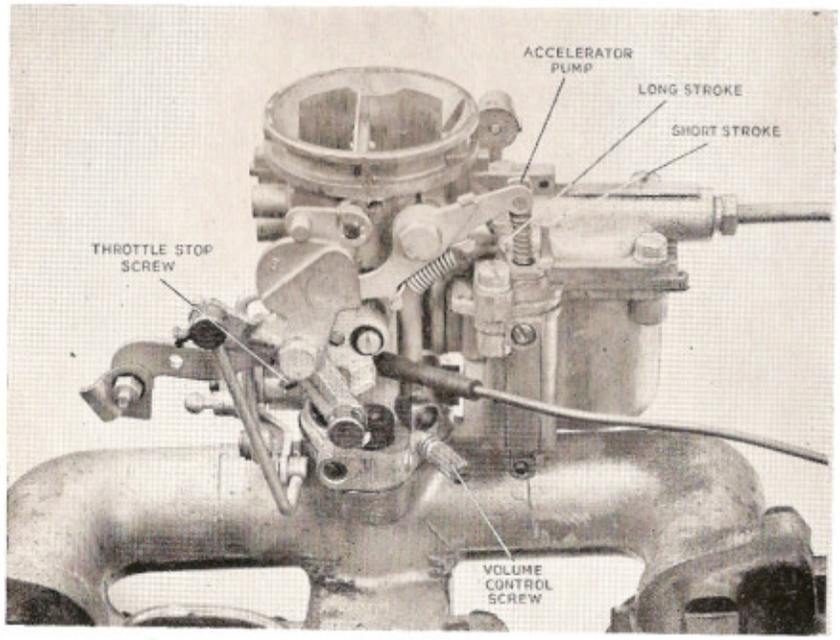


FIGURE 11.

Ignition System

The ignition system consists of the battery, ignition switch, distributor, coil, sparking plugs, and the necessary leads.

Low tension current is fed from the battery to the coil in conjunction with the distributor, it is transformed into high tension of sufficiently high voltage to bridge the spark plug gaps and thus ignite the compression charge in the cylinder head.

The distributor rotor distributes the H.T. current from the coil to the sparking plugs in the firing order 1, 2, 4, 3.

The drive to the distributor is taken from the oil pump drive gear from the camshaft. The degree of ignition advance from fully retard is controlled mechanically in accordance with the engine speed by governor weights located inside the distributor body and according to engine load by a vacuum control which acts on the contact breaker plate.

TO ADJUST THE CONTROL BREAKER POINTS

The contact breaker points should be set so that when the fibre heel of the moving contact is on the highest point of the cam there is a gap of 1.014 ins. (.355m.m.) to 0.016 ins. (.406m.m.) between the points. This gap can be adjusted to compensate for wear by slackening the adjusting screw on the fixed contact and moving it until the correct gap is achieved. Tighten the locking screw securely and re-check the gap in case the action of tightening the screw has altered it.

If the contact points are slightly burned they can be dressed with a small oilstone, but if in any doubt renew them.

IGNITION TIMING

If the distributor has been removed for any reason carry out the following instructions.

Remove the sparking plugs and rotate the engine until the raised timing boss on the cylinder front cover and the notch on the rim of the crankshaft pulley coincide. No. 1 piston is now on Top Dead Centre on the Compression Stroke. With the Distributor Cap removed ensure that the rotor arm is facing where No. 1 cylinder contact in the cap is located. Check that the offset tongue at the bottom of the drive will engage correctly with the offset slot in the drive shaft in the cylinder block.

Re-fit the distributor and secure the body clamp plate to the cylinder block by means of the two clamping screws. Check that the knurled micro adjusting nut is set to the fourth line on the graduated scale which is the zero setting.

Slacken the body clamp bolt and turn the distributor head clockwise until the contact points are just breaking. The exact position can be ascertained by inserting a piece of very thin paper between the points when they are fully closed and pulling gently on it whilst the distributor head is being turned. Immediately the paper can be eased out it can be said that the points are about to break.

Tighten the clamp bolt and re-check the adjustment.

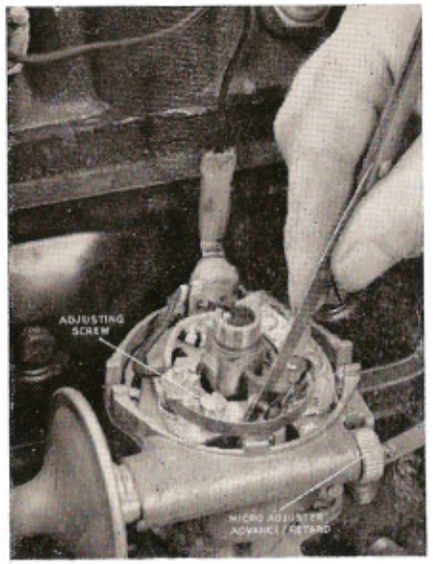
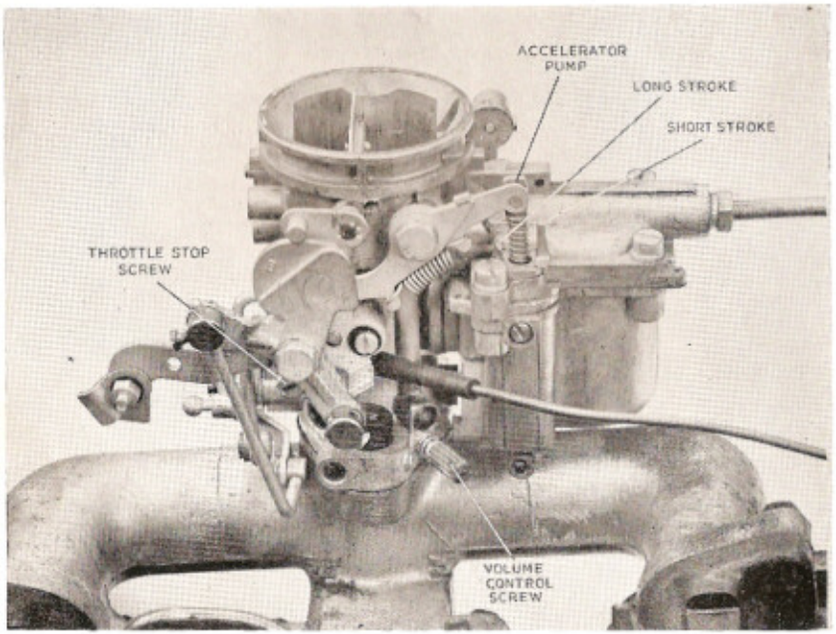


FIGURE 12.

ATTENTION TO COIL

Apart from keeping the connections clean and tight no attention is needed. Do not leave the ignition switched on for any length of time after the engine has stopped as this may cause the coil to overheat with subsequent damage, and will also tend to discharge the battery.



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Tighten the clamp bolt and re-check the adjustment.

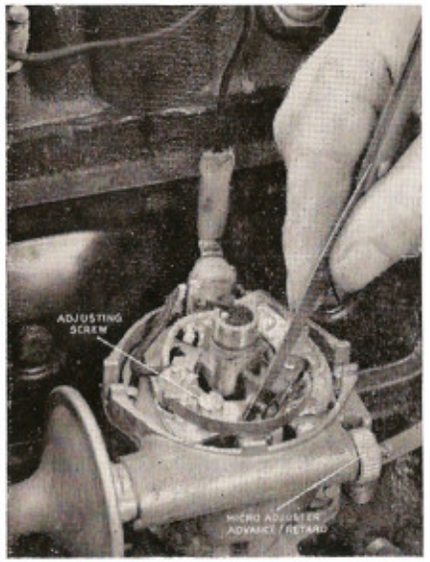


FIGURE 12.

ATTENTION TO COIL

Apart from keeping the connections clean and tight no attention is needed. Do not leave the ignition switched on for any length of time after the engine has stopped as this may cause the coil to overheat with subsequent damage, and will also tend to discharge the battery.

SPARKING PLUGS The plug gaps should be kept at .032 ins. and periodically checked and cleaned on a shot blasting apparatus with which most repair stations are equipped.

Adjustment should be made by bending the earth (outer) electrode towards or away from the central electrode. Do not bend the central electrode on any account. The plug washers should be replaced if they have become worn or flattened to ensure a gas-tight joint.

SUPPRESSORS Do not fit additional suppressors as an adequate radio and television suppressor is ~~fitted in the distributor cap.~~ INCORPORATED IN THE SPARK PLUG CABLES.

Tappet Adjustment

Every 5,000 miles (8,000 km.) it is advisable to check the clearances between the valve stems and their rockers with a feeler gauge.

First remove the rocker cover after undoing the five retaining screws. The valve gear will now be exposed and the clearances should be adjusted to .014 for both inlet and exhaust valve with the engine at its normal running temperature.

Each valve must be fully closed when the adjustment is made and to ensure that this is so check as follows:—

Valves open	Adjust Valves
1 and 6	3 and 8
3 and 8	1 and 6
2 and 4	5 and 7
5 and 7	2 and 4

After each valve clearance is set ensure that the locknuts are tight and replace the rocker cover. If the gasket has been damaged when removing the cover fit a new gasket otherwise an oil leak will develop.

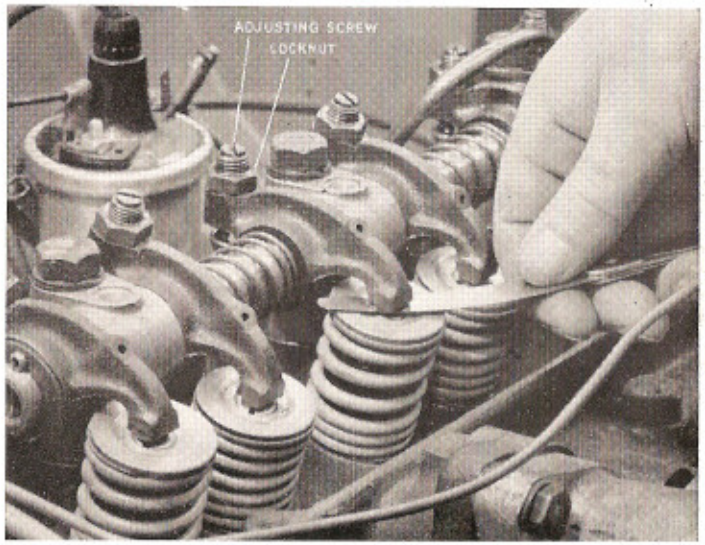


FIGURE 13.

The Clutch is operated by a hydraulic system which is actuated by the Foot Pedal.

A reservoir which also serves the brake supplies the master cylinder which feeds fluid to the hydraulic system and should be kept topped up with the recommended fluid. No other attention should be necessary except if the level is allowed to fall unduly. This may cause air to enter the system and in order to expel it the system must be "bled." This task should be done by your dealer. (X)

ADJUSTMENT (Linkage Free Travel)

The correct amount of free travel on the release arm is 1/16 in. (1.6 m.m.) measured between the end of the adjusting nut and the release arm.

This "free movement" is indicated by the amount that the pedal can be pressed down before resistance is met and the hydraulic pressure operates on the release mechanism.

To adjust for wear, disconnect the release arm return spring (Fig. 14), slacken the operating rod locknut and turn the domed adjusting nut clockwise to increase the free movement and anti-clockwise to reduce it. The clearance between the domed nut and its point of contact in the clutch release arm indentation should be 1/16 in. (1.6 m.m.). Ensure that the locknut is fully tightened and re-engage the return spring.

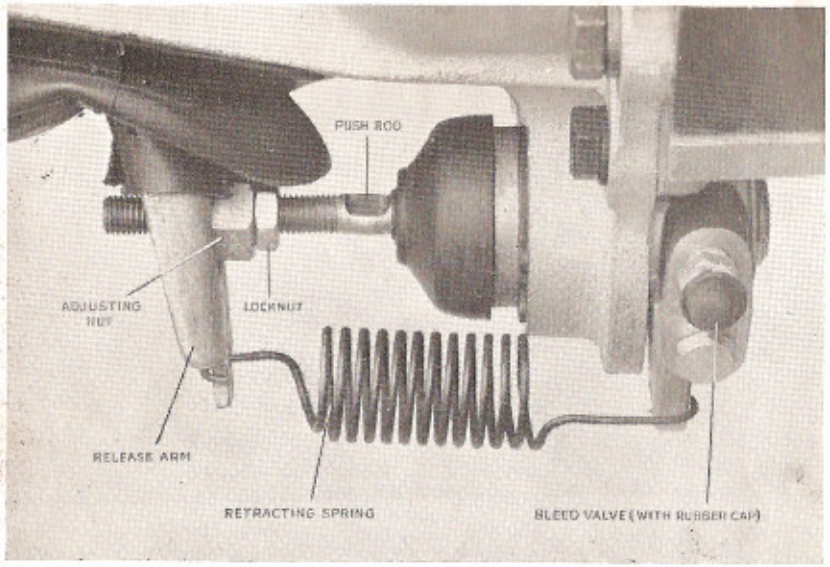


FIGURE 14.

HYDRAULIC SYSTEM

The fluid should be kept at the level marked on the reservoir (about ¼ in. from the rim) and the vent kept clear of obstruction. When the lid is removed for topping up take care that no foreign matter is allowed to fall into the fluid. Check the level every 1,000 miles (1,600 k.m.).

(X) ON SOME CARS SUPPLY TANKS ARE INCORPORATED IN MASTER CYLINDERS

The Brakes are GIRLING HYDRAULIC, the front brakes being of the disc type, the rear of the leading and trailing shoe type.

In this system pressure exerted on the brake pedal forces fluid from a master cylinder into cylinders at the wheels applying pressure on pistons which in turn actuate the brake shoes and pads.

The handbrake is mechanically operated through a cable and compensating linkage mounted on the rear axle casing and operates the rear brakes through levers incorporated in the back plates.

The handbrake is quite independent of the hydraulic system.

MASTER CYLINDER SUPPLY TANK

The brake fluid is contained in a small tank which also serves the clutch and is located on the bulkhead.

The fluid level should be examined periodically and topped up with the recommended fluid to within ½ in. (13 m.m.) of the top. Do not fill completely. If the fluid requires frequent topping up it may indicate a leak in the system which should be immediately traced and rectified.

Ensure that the air vent in the supply tank filler cap is not choked otherwise the brakes may drag.

BRAKE ADJUSTMENT

Adjust when the drums are cold. Jack up the rear wheels and release the handbrake.

Turn the square-headed adjuster at the rear of the back plate in a clockwise direction until resistance is felt. The wheel will now be difficult to rotate. Slacken the adjuster until the wheel rotates freely (two clicks are usually enough).

A slight drag from the trailing shoe may be felt but this should not prevent the wheel from turning freely.

Spin the wheel as fast as possible and apply the brakes hard to centralise the shoes in the drum. Re-check adjustment and repeat for the other wheel.

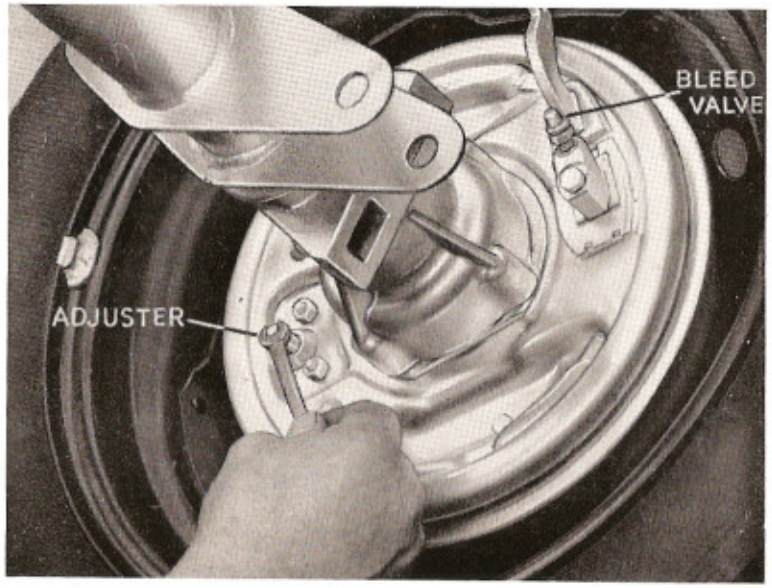


FIGURE 15.

(x) See Remark on page 19.

HANDBRAKE

Adjustment of the rear brakes automatically effects the handbrake.

If it is found that with the rear brakes correctly adjusted excessive free movement of the handbrake lever is evident then adjust the cable as follows.

Jack up both rear wheels and lock the shoes by means of the adjusters with the handbrake off. Adjust the cable length (Fig. 5) so that the slack is taken out of the linkage. Release the adjusters until the wheels turn freely. The handbrake should now be in correct adjustment.

BLEEDING THE HYDRAULIC SYSTEM

Expelling air from the Hydraulic System (" Bleeding ") should only be necessary when a part of the system has been disconnected or damaged or if the level of fluid in the reservoir has fallen so low as to introduce air into the master cylinder.

Proceed as follows: Top up the supply tank and ensure that the hydraulic connections are secure. Remove the rubber cap from the right ~~left~~-hand rear wheel cylinder bleed valve and fit a bleed tube over the valve with the free end of the tube immersed in a clean glass jar containing clean brake fluid.

Unscrew the bleed valve about three-quarters of a turn and get an assistant to operate the brake pedal with slow full strokes until the fluid entering the jar is free from air bubbles. During a downward stroke of the pedal tighten the bleed valve (without using undue force) remove the tube and replace the dustcap.

Repeat the process for each of the remaining wheels, finishing at the wheel nearest the master cylinder (Fig. 16 and 17).

FIGURE 17.

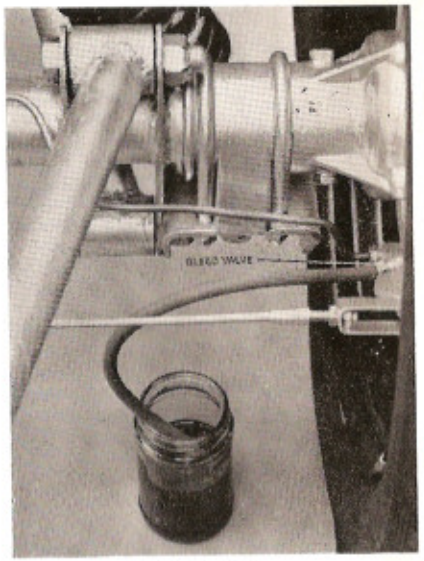


FIGURE 16.

During the operation keep a check on the supply tank and maintain it at its full level otherwise air may be admitted to the master cylinder and the whole operation will have to be repeated.

Never use fluid which has been bled from the system for topping up purposes as this may be fouled and to some extent aerated. Scrupulous cleanliness must be observed at all times or a complete brake failure may occur through the presence of dirt in the system.

HYDRAULIC CONNECTIONS

It is of vital importance that there are no leaks at any of the pipe lines, unions, hoses, etc. Check these points regularly and do not use undue force when tightening unions.

HANDBRAKE

Every 4,000 miles (6,400 km.) the greaser located on the handbrake cable (Fig. 5) should receive grease gun attention.

GENERAL

Periodically a few drops of oil should be applied to the throttle linkage, heater control cables, and choke cable, door hinges, etc.

Electrical System

The electrical system consists of the 12 volt generator, starter motor, battery and ignition circuit. It also includes the circuits for the instruments and other electrically controlled accessories.

THE BATTERY

The Battery is a 12 volt lead acid type of 45 amp. hour capacity located under the bonnet in front of the bulkhead.

The generator charge rate is controlled automatically to suit the loads being placed upon the battery and thus apart from occasional topping up with **distilled water** and cleaning of the terminals the battery requires little attention.

If it has become run down for any reason it should be re-charged as soon as possible. It will deteriorate if allowed to stand for any length of time in a discharged condition.

The terminals are of different sizes and thus it is normally impossible to interchange the connections. It is, however, advisable to note that the positive terminal is always connected to the earth strap.

The terminals must be kept tight and clean otherwise high resistances may be set up in the battery circuit. A coating of petroleum jelly will protect the terminals from corrosion. Check the acid level every 1,000 miles (1,600 km.) and top up with distilled water if necessary to about ¼ in. (6 m.m.) above the tops of the separators. In hot weather it may be found necessary to top up more often.

BATTERY SPECIFIC GRAVITY

The specific gravity is an indicator of the state of charge and can be checked by means of a hydrometer (Fig. 18).

When the battery is fully charged a reading of between 1.270 and 1.285 at 70° F should be obtained.

When the acid temperature varies from 70° F a correction must be made as follows.

For every 10° F above 70° F add .004 to the S.G. reading.

For every 10° F below 70° F subtract .004 from the S.G. reading.

If the level is so low that a reading cannot be taken, the battery should be topped up and put on charge for at least an hour.

If the S.G. reading is low the battery should be removed and re-charged.

GENERATOR

A two brush generator is mounted on the left-hand side of the engine and its output is automatically controlled by a separate voltage control regulator. If at any time it is thought that the charge rate is not being controlled correctly seek the assistance of your Dealer.

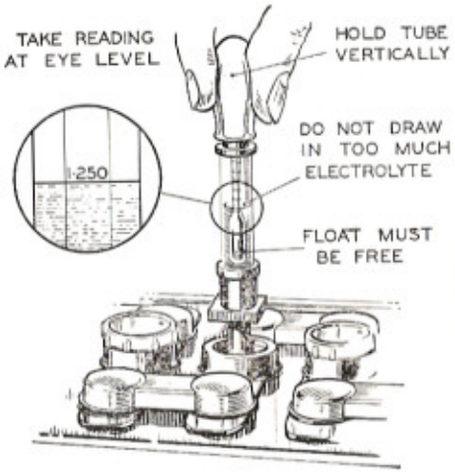


FIGURE 18.

MAINTENANCE OF THE GENERATOR

The only attention the generator is likely to require is the occasional cleaning of the brush gear and commutator. AND OILING OF REAR BUSH.

To do this remove the generator from the car and withdraw the end-plate. The commutator can now be inspected. If it is dirty it can be cleaned by holding a petrol-moistened non-fluffy cloth lightly against the commutator whilst the armature is rotated. Never use emery cloth.

If the commutator is scored it will require the attention of your Dealer who will have the necessary equipment to restore the surface. Check the brushes in their holders and ensure that they are free to move. If the brushes are found to be tight or sticking they should be freed by withdrawing them from their holders and easing them with a fine file.

If the brushes are worn and reduced in length they should be replaced as there will be insufficient spring pressure to hold them firmly pressed against the commutator.

DRIVING BELT ADJUSTMENT

It is essential that the Generator driving belt be kept adjusted otherwise the charge rate may be effected. To adjust the tension of the belt undo the anchor bolts at the front and rear of the generator, slacken the adjuster bolt and pivot the generator by hand until the belt has about ¼ in. (19 m.m.) free movement.

THE STARTER MOTOR

The Starter Motor requires little attention other than ensuring that the cable connections are tight and clean and that the commutator and brush gear are maintained in the same way as the generator.

In the event of the Starter jamming on the flywheel ring, the starter pinion can be manually disengaged by removing the end cap of the starter motor and turning the square end of the shaft.

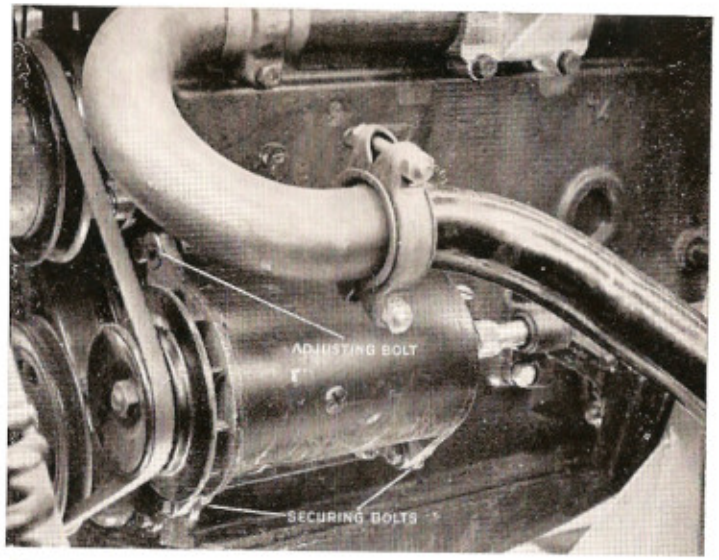


FIGURE 19.

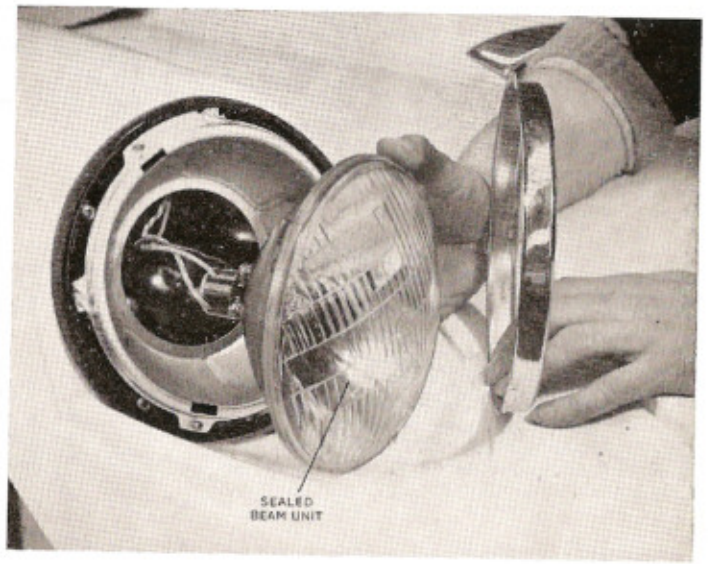


FIGURE 20.

HEADLAMPS
To Remove the Lamp Rim

Remove the screw at the base of the lamp rim (Fig. 20). The rim can then be lifted off, leaving the glass bulb and reflector, which are permanently sealed together as a unit, still in position. Reverse procedure to re-assemble.

To Remove Sealed Beam Unit

The Bulb is incorporated with the Sealed Beam Unit and in the event of a bulb blowing the whole unit must be replaced.

To remove the unit unscrew the three securing screws and turn the unit so that it can be drawn away leaving the screws in position. The elongated slots have one end enlarged to facilitate this (Fig. 20).

SIDE (FENDER) LAMPS— To Renew Bulbs

The rim and glass are retained by shaped lips formed in the rubber surround. First remove the rim by easing back the rubber lip and then remove the glass by the same method. The lips may be carefully eased back by means of a screwdriver. The bulb can then be removed; it will be noted that the bayonet pins are staggered, thus ensuring that the bright filament is connected to the flasher circuit.

Re-assembly is a reversal of the above instructions.

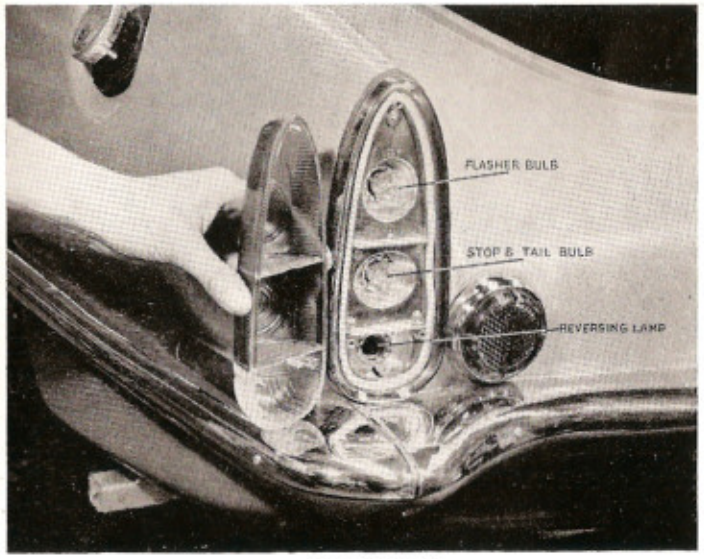


FIGURE 21.

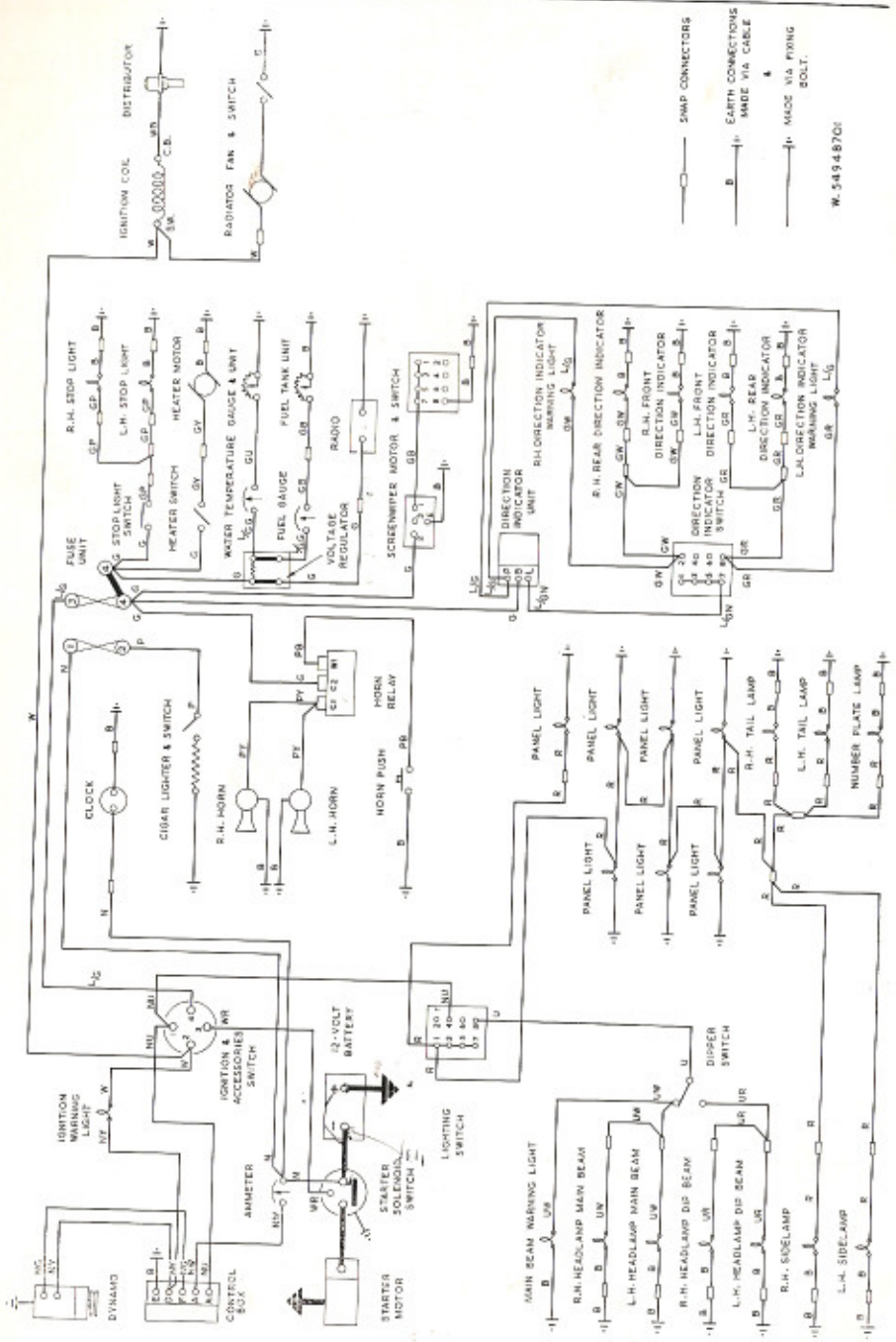
REAR LAMPS (X)

The rear lamb bulbs and rear direction indicators are readily accessible after the cover, which is unscrewed by three screws, is removed (Fig. 21).

FOCUS ADJUSTMENT

Two adjusting screws are provided (Fig. 22), one for vertical adjustment and one for horizontal adjustment. Your Dealer will be equipped with Beam Setting Equipment and it is advisable to have the setting checked occasionally.

(X) ON SOME CARS DIFFERENTLY SHAPED LAMPS (MADE BY J. LUCAS, ENGLAND) ARE USED.



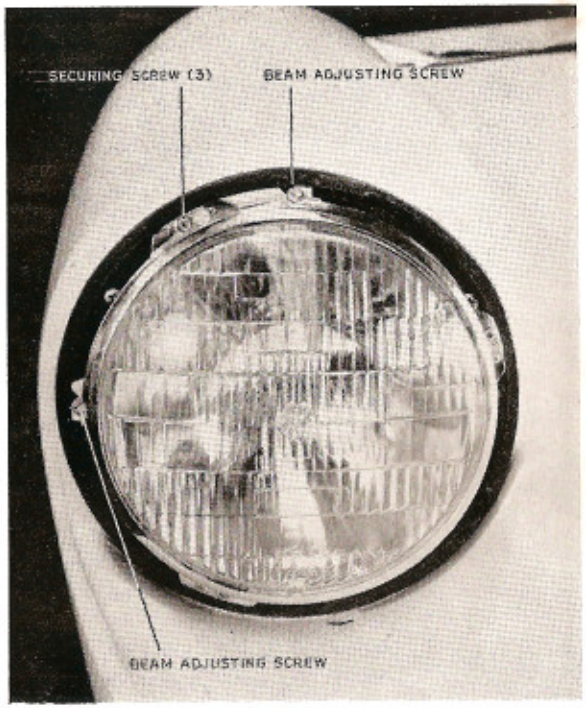


FIGURE 22.

TABLE OF BULBS

Side and Flasher	No. 380	12 v 21/6w.	S.B.C.
Stop and Tail	No. 380	12 v 21/6w.	S.B.C.
Rear Flasher	No. 382	12 v 21w.	BA15S/19.
Rear Illuminator	No. 989	12 v 6w.	M.C.C.
Panel Illuminators	No. 987	12 v 2.2w.	11/12mm. Ball M.E.S.
Warning Light	No. 987	12 v 2.2w.	11/12mm. Ball M.E.S.
Headlight			Seal Beam Unit
Electric Clock	No. 1229	12.2w.	Mini.

THE COOLING SYSTEM

The engine is cooled by the circulation of water through the water jackets which surround the cylinders and combustion chambers. The water circulates by thermo-syphon action assisted by a centrifugal-type water pump, which is located at the front of the cylinder block.

The radiator header tank (Fig. 2) is fitted with a 7 P.S.I. Pressure Cap which allows the engine to operate at slightly higher temperatures without boiling. When removing the cap turn it slowly, or if the system is very hot allow it to cool first.

Whilst the engine is warming up a thermostat fitted in the cylinder head water outlet restricts circulation.

The Fan is driven electrically and is regulated by a thermostat set to cut in the fan at 85° C and to cut out at 75° C.

DRAINING THE SYSTEM

Drain taps are fitted at the base of the radiator (Fig. 7) and in the cylinder block on the left-hand side rear to the starter motor. When draining remove the pressure cap and if the taps are blocked with sediment use a piece of wire to clear the obstruction.

Occasionally the system should receive a thorough flushing out.

FROST PRECAUTIONS

In frost conditions it is necessary to protect the system from damage by using anti-freeze mixture or by draining away all water.

Ethylene-Glycol or Glycerine solutions are satisfactory and are readily available from your Dealer. They must be mixed with water in the recommended proportion. All Dealers possess charts giving these figures.

Do not on any account use a Salt solution.

STEERING

The steering is of the Rack and Pinion type, and will require very little attention from the owner other than the normal lubrication maintenance.

An adjustment is provided to take up the back lash if any excessive amount is evident at the steering wheel.

On the steering box gland which is held in position by a plate and two self-locking nuts there is located a small peg with a screw-driver slot. To effect adjustment slacken the two self-locking nuts and push the peg thus rotating the gland in a clockwise direction until the excess back lash is eliminated (Fig. 8). Do not turn the peg itself, the slotted end is merely to enable the peg to be removed.

WHEELS AND TYRES

The wheels are of the pressed steel type and are secured by conical-ended nuts. After the first 300 miles check the nuts for tightness.

When replacing a wheel it should be noted that the conical end of the nut screws on to the stud first and all threads are right-hand. Each nut should be tightened alternately otherwise the wheel may not run true.

The tyres are of the conventional tubed type and renewal is easily effected by pressing the tyre bead into the wall and at the same time drawing the opposite side over the rim by means of a tyre lever. Ensure that the tube is fully deflated and that the tyre bead is not adhering to the wheel rim.

Whenever possible use tyres which have a moulded line for accuracy of fitting. If the tyre is correctly mounted the line will be equidistant from the rim at all points.

In order to equalise tyre wear it is recommended that the wheels are changed round from time to time as follows.

Spare to left front. Left front to left rear.
Left rear to right front. Right front to right rear.
Right rear to spare.

Tyres should be inspected regularly and all embedded objects such as pieces of glass, flints, nails, etc., removed before they work through and penetrate the tube.

Maintain the correct pressures at all times as this has a pronounced effect on road holding. If at any time you suspect that

uneven wear is taking place on the front tyres have your Dealer check the wheel alignment. He will be in possession of the necessary special equipment for this purpose.

In order to obtain the best possible steering and road holding particular attention should be paid to wheel balance and this should be checked by your Dealer fairly often.

If the front wheels are out of balance it is usually indicated by vibration and steering wheel judder.

FRONT WHEEL AND WHEEL BEARINGS

The front wheels are mounted on tapered roller bearings and after considerable mileage it may become necessary to adjust them.

To test them jack up the wheels and grasp the wheel at the top and bottom of the tyre and rock it to and fro.

Do not be confused by any possible looseness which may exist in the various steering connections. If excessive play exists the bearings should be adjusted.

To Adjust

Remove the wheel, and prise off the Domed Dust Cap.

Withdraw the split cotter which secures the castellated nut and unscrew this nut.

Remove the thrust washer and tapered roller bearing, thoroughly clean these components and re-pack with recommended grease.

Replace the bearing followed by the thrust washer and castellated nut. Tighten the nut at the same time rotating the wheels: continue until heavy wheel drag is felt. Then turn back the nut one flat at a time until the wheel is perfectly free with just perceptable end float. This can best be determined with the wheel in position. Fit a new split cotter and replace the domed cap.

Care of the Bodywork

The Body fitted to the SABRA SPORT is manufactured from Glass Fibre. This is a completely inert material completely impervious to weather conditions and highly resistant to impact damage. Severe impact will not dent the material but it will crack or shatter still retaining its original form.

It can be repaired quite easily without highly skilled labour, i.e., panel beating being necessary.

Cleaning is carried out in the normal manner with water, sponge and chamois leather, finishing off with an approved polish.

The Chrome parts should be kept free from rust and during the winter take care that the salt or calcium chloride solutions used to treat icy roads, are removed from the chrome as quickly as possible. A chrome cleaner can be used periodically but this must be a recommended preparation which is non-abrasive.

Erecting and Lowering the Soft-Top

TO ERECT

First push forward the seats, but make sure that they do not strike the cigar lighter.

Undo the fasteners securing the soft-top cover, fold the cover and stow it in the boot.

Pull out the soft-top and fold the material on to the boot. Pull the metal frame forward and upwards to a near vertical position.

Sit in the car and pull the frame towards the windscreen top rail. Engage the three front clip pegs in their slots, lift the levers, engage the toggles, and press down the levers. Pull the soft-top material

towards the fastening studs on the rear body and secure the dot fasteners working from the centre. Do not forget the interior fasteners. Wind up the windows and run a finger inside the flap so that it lays over the glass.

When opening and closing the door wind the window down a few inches and wind it up again when the door is closed. This will help to locate the window correctly within the flap.

TO LOWER

Undo all fasteners and the catches on the windscreen top rail. Sit in the car and lift the frame to a near vertical position. Pull the soft-top clear and fold so as to rest on the boot. Fold the frame and push the frame down and back until it stows inside the body well. Fold the soft-top forward so as to cover the frame. Fit the cover over the soft-top and frame and secure the fasteners. Early models had cover fasteners located on the rear floor.

PT. II.

Decarbonising

After a considerable mileage has been covered the presence of carbon formation on the combustion chambers and on the piston crowns, coupled with the effect of constant heat on the valves and seats may result in a loss of power.

This mileage will vary considerably according to the conditions under which the car is operated.

The process of decarbonising and valve reconditioning is one which requires skilled attention but certain capable and enthusiastic owners may desire to carry out the task themselves. For the assistance of such owners the following notes are intended.

Preparation:—

A set of genuine gaskets must be to hand, together with the appropriate tools and cleaning materials.

1. Valve spring compressor.
2. Suitable spanners of the socket type.
3. Valve grinding paste.
4. Valve grinding tool.
5. Cleaning material.
6. Wire brushes.
7. Feeler gauges.

DISMANTLING

Drain off the cooling system.

Disconnect the battery heads to prevent the possibility of short circuits.

Disconnect the H.T. cables to the sparking plugs and number each cable 1 to 4. Remove the sparking plugs and have them cleaned and checked ready for re-assembly.

Unscrew the top hose clip and remove the hose and the alloy branch pipe from the cylinder head. Disconnect the heater hose and the temperature gauge connection. Disconnect the pipe leading to the windscreen washer reservoir and the fuel pump to carburettor pipe.

Disconnect all the carburettor controls and the vacuum pipe to the distributor. Remove the carburettor and the manifold.

Disconnect the exhaust pipe and the exhaust manifold. Remove the rocker box which is secured by five retaining screws. The valve gear will now be exposed. Remove the tappet chamber cover. Remove the rocker shaft retaining bolts and withdraw the oil feed

pipe which is a push fit in its union in the middle of the push rod chamber. The rocker shaft can now be removed from its location.

Lift out the push rods.

Unscrew the cylinder head bolts working in a pre-determined criss-cross pattern so that the forces exerted on the head when it was tightened down are released evenly The head should now be free and can be lifted clear. If a hard setting gasket cement has been used the head may stick but do not be tempted to prise it away with a screwdriver, a sharp tap at the rear with a hide mallet will suffice to release it.

Remove the valves using a valve spring compressor and be careful not to lose the collets and the "umbrella" type oil seal. Place the springs and valve caps in a safe place and identify each valve so that it is returned to the seat from whence it came. Do NOT centre punch the valve head or it may distort. Prepare a piece of wood or stiff cardboard 18 in. long x 3 in. wide and drill 8 holes in a line equidistant from each other numbered 1—8. This will serve as a holder and at the same time identify the valves.

CLEANING

Clean the carbon deposits from the combustion chambers, piston crowns and valves with your wire brush. The power-driven brushes designed for this purpose are most efficient ~~if access to them can be gained~~. Take care not to mark the soft alloy of the piston crown. Carefully clear away all carbon afterwards. Clean all machined surfaces and ensure that all the old gasket cement is removed. Do not use emery cloth or minute particles of powder may find their way down the bores. Clean out all carbon deposits from the exhaust ports.

When cleaning the piston crowns turn the engine so that two pistons at a time rise to top dead centre. As they are rising smear a little grease round the bore thus forming a seal which will prevent particles of carbon making their way between the piston and the bore.

Pieces of rag should be placed in the other two bores and also into the push rod chamber.

Do not disturb the ring of carbon round the edge of the piston crown as this helps to control the oil.

VALVE GRINDING

Ensure that the valves and seats are clean. If the valves or the seats are badly burned the valves should be replaced and the seats re-cut. The re-cutting of valve seats is a workshop job demanding special equipment. Apply a little grinding paste to the valve face and fit the valve into its correct seat. Fit the valve grinding tool which has a suction cup enabling it to adhere firmly to the valve head and rotate the tool to and fro by holding it between the palms of the hands.

From time to time raise the valve from its seat and turn it through 90° in order to re-distribute the grinding paste. Only a light downward pressure is required.

When correctly ground, the valve seat and face should have an even, clean, grey, matt, finish. This line should be even around the face of the valve and its width will depend on the width of the seat into which it is being ground. Repeat the process for each valve.

RE-ASSEMBLY

Scrupulous cleanliness must be observed.

Re-assemble the valves by first placing them in their respective guides. Hold the valve against its seat and press the oil seal down

the valve stem. Fit the valve spring and retainer with the closed coils towards the cylinder head. Compress the spring using the valve spring compressors and locate the collets A little grease smeared on them assists them to locate properly—release the compressor and repeat for each valve.

REPLACING THE CYLINDER HEAD

Ensure that the bores and push rod ports are free from dirt also that none adheres to the underside of the cylinder head.

See that the by-pass pipe is correctly seated with a rubber sealing ring at each end.

Smear a liberal quantity of clean engine oil around each bore and place a new cylinder head gasket in position. Smear both sides of the gasket with grease.

Place the cylinder head carefully in position and replace the bolts.

Tighten them a little at a time in such a manner that the pressure is evenly distributed, starting from the centre and working outwards.

REPLACING THE VALVE GEAR

Before fitting the push rods, oil the lower ball ends; this will help to locate them accurately. Next replace the valve rocker shaft assembly. Do not forget that a rubber sealing ring fits on to the end of oil supply pipe which is located in No. 4 rocker shaft support. The end of the pipe must pass into the hole in the rocker shaft—turn the shaft if necessary.

The lower end of the oil pipe must fit into its union in the centre of the pushrod chamber. Replace the tappet chamber cover and its gasket.

Carefully tighten the rocker shaft bolts and ensure that the push rods are correctly located.

Adjust the tappet clearances as described on Page 18 and replace the valve rocker cover using a new gasket. Tighten the screws from the centre.

Replace the sparking plugs. Re-fit the carburettor using a new gasket and re-connect the controls; the vacuum pipe to the distributor, the fuel pipe and the vacuum pump connector to the inlet manifold.

Re-connect the exhaust pipe ensuring that the insert is correctly located.

Re-connect the plug leads. Re-fit the radiator hose and re-fill the radiator.

Check over everything to see that all is in order. Re-connect to battery leads.

After the engine has reached its working temperature re-set the tappet clearances.

ITEM	After 300 miles	1,000 miles	2,000 miles	3,000 miles	4,000 miles	5,000 miles	6,000 miles	7,000 miles	8,000 miles	9,000 miles	10,000 miles	11,000 miles	12,000 miles	13,000 miles	14,000 miles	15,000 miles
Change engine oil	0					0					0					0
Renew oil filter						0					0					0
Lubricate front suspension & steering			0		0		0		0		0		0		0	
Lubricate universal joints			0		0		0		0		0		0		0	
Lubricate throttle linkage		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Check gearbox oil level		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change gearbox oil		0					0					0				
Check rear axle oil level		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change rear axle oil		0					0					0				
Check clutch and brake reservoir		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lubricate generator						0					0					0
Re-pack front wheel bearings ...						0					0					0
Clean air cleaner						0					0					0
Check battery		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clean fuel filter						0					0					0
Check clutch linkage free travel ...		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Check and adjust brakes						0					0					0
Check carburetter adjustment ...						0					0					0
Check contact breaker points ...						0					0					0
Clean sparking plugs						0					0					0
Clean coil and distributer cap ...						0					0					0
Tighten cylinder head bolts ...	0															
Check wheel nuts	0					0					0					0

DAILY

Check engine oil level.
Check water level in radiator.
Check fuel level.

WEEKLY

Check tyre pressures.
Check lights.

Addendum

Engines with Twin S.U. Carburettors

Later engines are fitted with twin S.U. carburettors. The following notes are for those drivers who are capable of carrying out their own adjustments.

Description

The S.U. carburettor is of the automatically expanding choke type in which the size of choke and the effective area of the jet vary according to the degree of throttle opening used against the prevailing load.

This regulation of the choke size gives a fairly constant air velocity over the jet and ensures good atomisation, therefore, multi jets are unnecessary. The single jet used is varied in effective area by a tapered needle which moves up and down in the jet orifice. The profile of the needle is decided to suit each type of engine and running conditions.

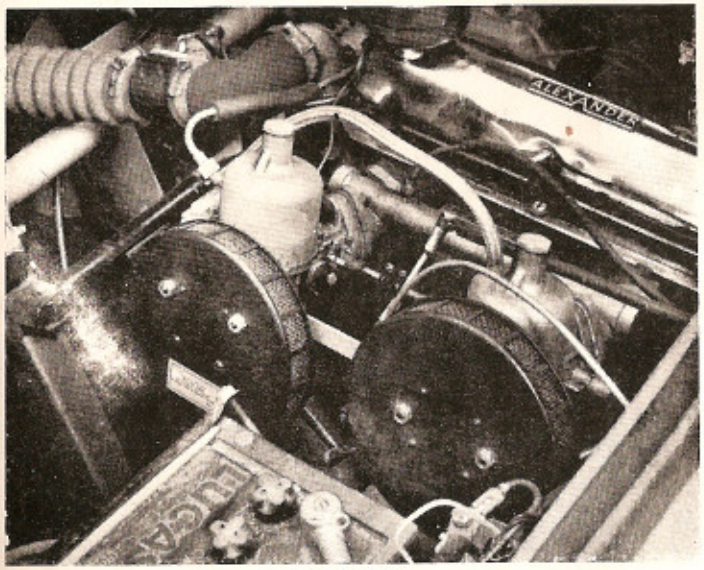


FIGURE 23

Tuning

Multi carburettor installations cannot be successfully tuned unless the general condition of the engine, i.e., compression, ignition system, are in a satisfactory state.

With regard to the carburettors themselves the cleanliness of the suction piston units, the position of the needles, the jet centring and oil level in dampers should be checked.

The following sequence of tuning should be followed :

1. Remove the air cleaners and run the engine until the normal operating temperature is reached.

2. Slacken one of the clamping bolts on the throttle spindle connections (1) Fig. 24, so that the throttles may be set independently.

3. Ensure that the throttle adjusting screws (2) Fig. 24, are holding the throttles slightly open. About one-and-a-half turns from being clear of the abutments. Disconnect the mixture control rod (1) Fig. 25.

4. The choke control screw (4) Fig. 24, should be clear of its abutment and the choke cable disconnected if it is likely to interfere with adjustment.

5. Set the engine idling speed to about 500 rpm and using a length of rubber tube about 1ft. long and ⅛in. bore as a stethoscope check the hiss of air at the carburettor intakes. They should be equal in volume, if not proceed as follows :

6. With a downwards pressure on the throttle adjusting screw (2) Fig 24, adjust each until the "hiss" is equal and the speed 500 rpm. To reduce "hiss" unscrew the adjusting screw.

7. When the desired condition has been achieved, stop the engine and tighten the throttle spindle clamping screw and re-check.

8. Re-start the engine and allow it to idle at 500 rpm approx.

9. Check the mixture strength by lifting the piston off the front carburettor using the lifting pin (2) Fig. 25, approx. 1/32in. (1.75mm.) when if :

   (a) the engine speed increases, the mixture strength of the front carburettor is too rich.

   (b) the engine speed immediately decreases the mixture is too weak.

   (c) the engine speed momentarily increases very slightly followed by fall off in speed the mixture strength is correct.

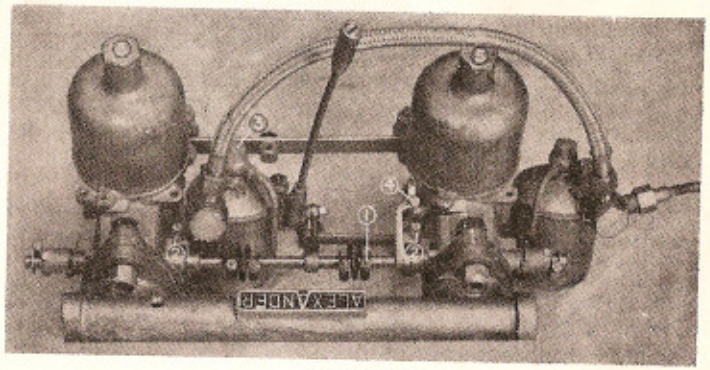


FIGURE 24

10. Carry out a similar check on the rear carburettor and if adjustments to mixture strength are necessary, it can be varied by screwing or unscrewing the jet adjusting nuts (3) Fig 25. To enrich the mixture the nut should be screwed down and to weaken it screw the nut up. During this adjustment it is necessary to ensure that the jets (4) Fig. 25, are pressed upwards so that they are in contact with the adjusting nuts. When the adjustments are satisfactorily completed the exhaust note should be regular and even.

11. Re-make any connections which may have been disturbed and replace air filters.

Jet Centralising

When the piston (5) Fig. 25, is lifted by hand with the engine not running and the jet adjusting nut screwed up fully it should fall freely and come into contact with the jet bridge with a soft metallic click.

If it does not, then repeat the test with the jet in its fully lowered position. If the click is now audible and the piston falls freely then the jet nut must be re-centralised with the needle.

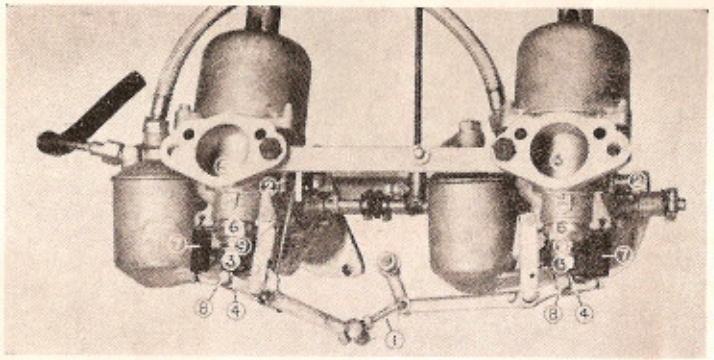


FIGURE 25

The jet nut which is clamped in position by the gland nut (6) Fig. 25, is located in a clearance bore which permits a limited amount of float when the gland nut is slackened. Therefore, it can be moved until it is concentric with the jet needle allowing the piston to fall freely to its lower position. To re-centralise proceed as follows:—

1. Remove the air filters.

2. Remove the return springs (7) and pivot pins (8) Fig 25, move the linkage out of the way.

3. Remove piston dampers (5) Fig. 24.

4. Withdraw the jet (4) Fig. 25, and remove the adjusting nut (3) and springs (9) Fig. 25.

5. Replace the adjusting nut and screw it up to its uppermost position.

6. Slacken the gland nut and insert the jet.

7. Hold the jet in its upper position and move the jet assembly laterally until the jet is concentric with the needle, then tighten the gland nut. When the correct condition is achieved the piston assembly will fall freely hitting the jet bridge with a soft metallic click, and replace the spring (9), adjusting nut (3), jet (4), pivot pins, damper unit, etc., and replenish the dash pots (5) Fig. 24, with oil of S.A.E. 20 viscosity. The oil level is correct when using the damper as a dip stick, its threaded portion is approx.

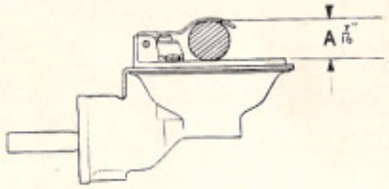


FIGURE 26

¼in. above the dash pots when resistance is felt. The oil should be replenished if necessary every 3,000 miles.

Float Chamber Fuel Level

The level of the fuel in the Float Chamber is governed by the action of the forked lever in the float chamber lid which acts upon the needle valve.

The following procedure should be adopted if ever it is suspected that the fuel level is not correct :

1. Disconnect the fuel pipe and remove the float chamber lid securing bolt (3) Fig. 24—lift off the lid.

2. With the lid inverted and the forked lever resting on the needle valve thus closing it, it should be possible to pass a 7/16in. dia. (11mm.) rod between the radius of the forked lever and the float chamber lid (Fig. 26). If the forked lever fails to conform within 1/32in. (18mm.) of the check figure, bend it carefully at the start of the fork section, but take care to keep both prongs parallel with each other. There should be no need to alter the fuel level unless flooding is experienced, and this can be caused by grit jamming the needle valve, a punctured float, or excessive engine vibration; these points should be checked first.

3. Re-assemble.

OILFILTER
FRAM CH-885PL

Bendix P&D
LU-71
ROTOR

Bendix
P&D
Ignition
LU-21
Contact Set
0020BT

Bendix
P&D
Ignition
LUC-32
CONDENSER
1066AT

Autolite
AGR22
DIFZ12405B
SPARK PLUG

Gabriel
Strivers
FRONT SHOCKS
N-45037

NAPA ECHLIN
EP 38
Distributor Cap