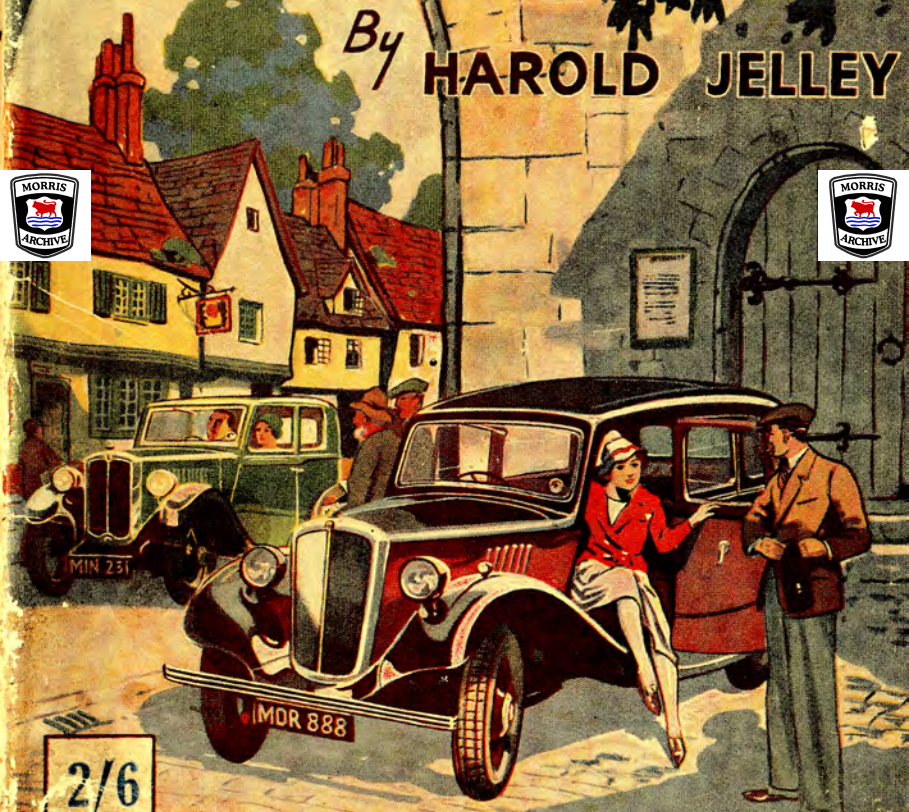
# THE BOOK OF THE MORRIS MINOR and the MORRIS EIGHT

By HAROLD JELLEY

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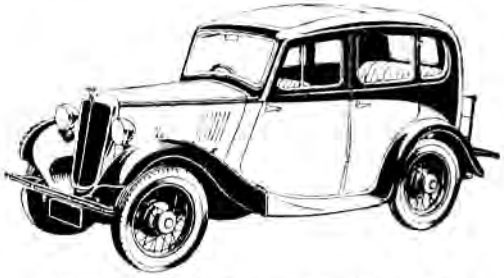

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# THE BOOK OF THE MORRIS MINOR AND THE MORRIS EIGHT

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# THE BOOK OF THE MORRIS MINOR AND THE MORRIS EIGHT

A COMPLETE GUIDE FOR OWNERS AND PROSPECTIVE PURCHASERS OF ALL MORRIS MINORS AND MORRIS EIGHTS

BY

HAROLD JELLEY



*THIRD EDITION*

LONDON
SIR ISAAC PITMAN & SONS, LTD.
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# PREFACE

Although the Morris Minor is no longer marketed, there are still thousands in use to-day and it was for owners of this particular model that the first edition was introduced. Series I has replaced the Minor and all maintenance points for both models are dealt with in the present edition.

Since the previous edition, I have received a large number of requests for a chapter on the Overhead Valve Models, and this is now included. I trust that it will be of assistance to those who own one of the earlier Minors.

Every endeavour has been made to anticipate the requirements of the reader and, where I fail to fulfil these requirements, I shall be glad to hear from readers so that any useful information may be embodied in future editions of this book.

In conclusion, I should like to express my appreciation of the courtesy shown by Morris Motors Ltd. in supplying information and photographs which have assisted in the compilation of this book.

H. J.

London
1937

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# THE BOOK OF THE MORRIS MINOR AND THE MORRIS EIGHT

## CHAPTER I

### THE RANGE OF MODELS

THE Morris Minor is no longer marketed and its place has been taken by the Eight, which was introduced at the 1934 Motor Show. Since then it has steadily gained in popularity and to-day it is probably the most popular car of its type. A description of the various models is given, followed by the specification and prices.



**The Eight Two-door Saloon.** Possessing the same roomy interior and comfortable seating accommodation as the four-door saloon, the two-door saloon (Fig. 1) will make a forcible appeal to those who only carry rear passengers on occasion, and those who have a preference for the clean appearance possessed by the two-door saloon body. It possesses the same high performance and attractive economy as the four-door model. The driver's seat is adjustable on roller type sliding fittings, while the passenger's seat is also adjustable and tips up to give free access to the rear seats. Exceptionally good interior ventilation is assured by the large winding quarter windows with unusually large opening range.

In addition to the general equipment, the Fixed Head model has: single-panel adjustable windscreen with toughened Triplex glass, winding door and quarter windows, interior driving mirror, concealed rear blind with remote control, bucket type front seats, sliding driver's seat, passenger's seat, tip-up, adjustable, private locks to doors.

In addition to the general equipment the Sliding Head model has: Pytchley sliding head, single-panel adjustable windscreen and winding door windows, and quarter windows with toughened Triplex glass, interior driving mirror, concealed direction indicators, trafficator mirrors, concealed rear blind with remote control,

bucket type front seats, sliding driver's seat, passenger's seat, tip-up, adjustable, private locks to doors.

**The Four-door Saloon.** This (Fig. 3) is a particularly spacious car with exceptionally easy access to all seats, and it combines the best features of the large car with low running costs and general upkeep economy of the baby car. It has comfortable seating accommodation and ample leg room for four fully-grown people. Its well considered interior dimensions and the generous



FIG. 1. THE TWO-DOOR FIXED HEAD SALOON

depth of its upholstery remove every tendency to fatigue on long journeys. The driver's seat is adjustable on roller type sliding fittings, while the passenger's seat is also adjustable.

In addition to the general equipment the Fixed Head model has: single-panel adjustable windscreen with toughened Triplex glass, winding door windows, interior driving mirror, concealed rear blind with remote control, private locks to doors, bucket type front seats.

In addition to the general equipment the Sliding Head model has: Pytchley sliding head, single-panel adjustable windscreen and winding door windows with Triplex toughened glass, interior driving mirror, concealed direction indicators, trafficator mirrors, concealed rear blind with remote control, private locks to doors,

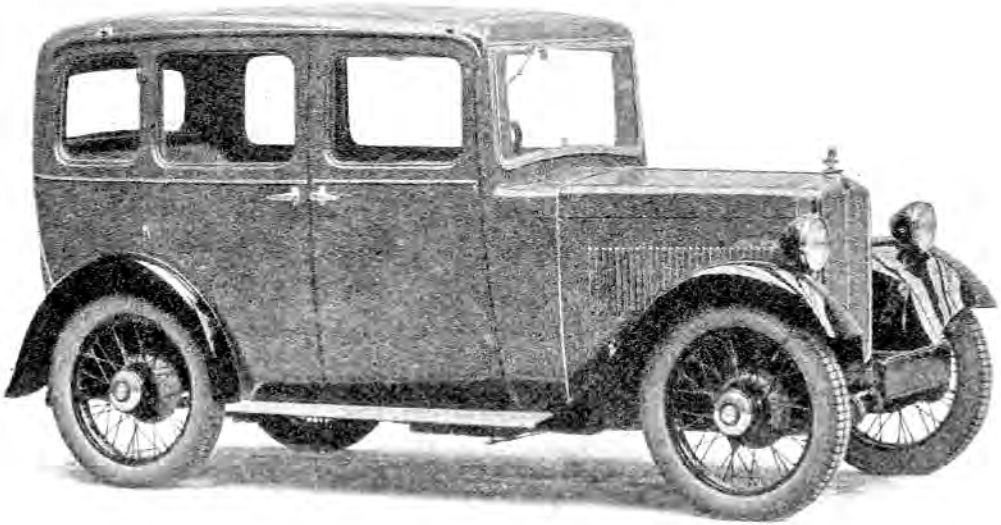


FIG. 2. THE FAMILY MODEL (MINOR)

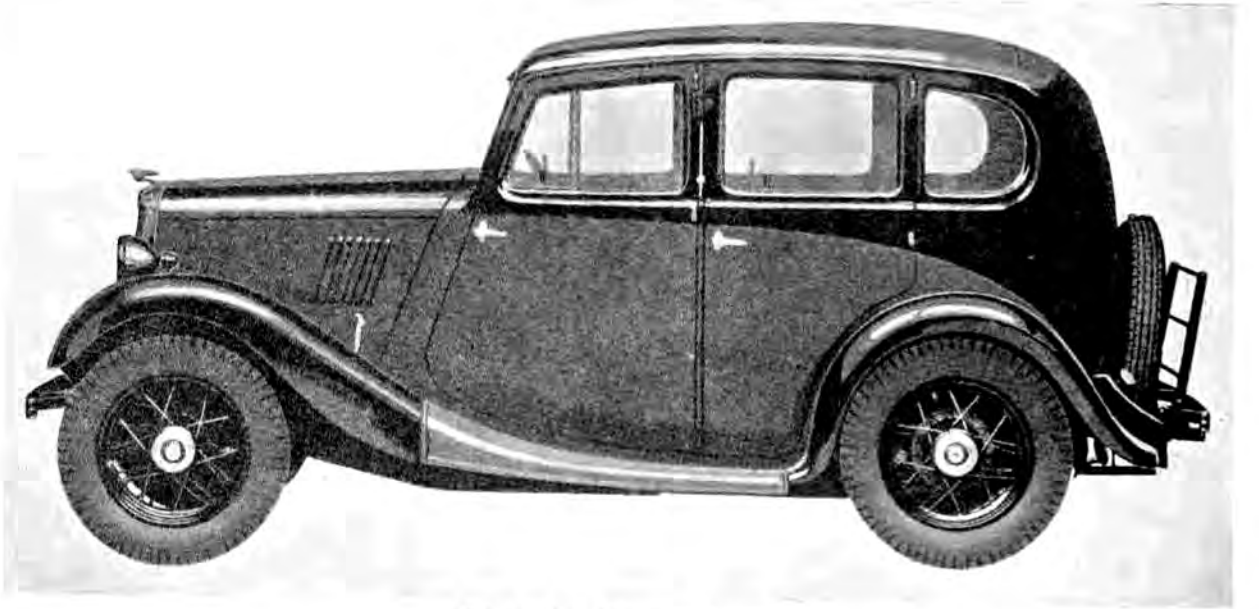


FIG. 3. THE FOUR-DOOR SALOON

bucket type front seats, sliding driver's seat, adjustable tip-up passenger's seat.

**The Two-seater.** This highly attractive two-seater (Fig. 4) possesses extraordinarily spacious accommodation and exceptionally comfortable seating arrangements. The single-piece seat squab is deeply upholstered and carefully shaped to fit snugly to one's back, both the seats and the squab being adjustable to ensure the maximum driving comfort. Ample luggage accommodation is provided by the spacious boot, in which is also housed the sidescreen equipment when not in use. It has the following additional equipment: folding toughened Triplex glass windscreen, hood, hood bag, detachable sidescreens, exterior driving mirror, adjustable seat. A Tonneau cover is provided.

**The Tourer.** This is a full four-seater touring car (Fig. 5). It is not only particularly attractive in appearance but extraordinarily comfortable. The deeply upholstered bucket front seats are unusually well shaped and are adjustable to give the best driving position. The passenger's seat tips up to give free access to the rear seating accommodation, which is particularly roomy for so small a car. The rear seat is provided with a pneumatic cushion. The toughened Triplex glass windscreen can be folded flat on the scuttle when desired, and full all-weather equipment is provided. This model has the following additional equipment: folding toughened Triplex glass windscreen, hood, hood bag, detachable sidescreens, exterior driving mirror, adjustable bucket seats.



## SPECIFICATION OF THE EIGHT

**General.** The Morris Eight does not differ in general design from a big car. It possesses a sound and exceptionally efficient four-cylinder water-cooled engine built in unit construction with a totally enclosed three-speed synchro-mesh gearbox, a full length downswept box-sectioned frame of special design with semi-elliptic springs front and rear of generous dimensions, hydraulic shock absorbers, hydraulic brakes, and a rear axle of the three-quarter floating type with spiral bevel final reduction gears and differential. The transmission from the gearbox to the rear axle is by a large diameter Spicer tabular propeller shaft and needle type universal joints. The track is 3 ft. 9 in. (1·14 m.) and the wheelbase 7 ft. 6 in. (2·29 m.).

**Engine.** Four-cylinders, bore 57 mm. (2·25 in.), stroke 90 mm. (3.54 in.), cubic capacity 918 c.c. (56·7 cub. in.). The tax is £6 per annum.

It is mounted on improved equipoise suspension. Cylinders cast in one with the upper half of the crankcase, which is extended

FIG. 4. THE TWO-SEATER

well below the crankshaft centre to ensure maximum stiffness. Detachable head, facilitating decarbonization. Combustion spaces of the most advanced formation. Side valves operated by adjustable tappets from a three-bearing camshaft of unusually generous diameter. Camshaft driven by silent duplex roller chain from crankshaft. Large diameter three-bearing crankshaft with steel backed white metal bearings of largest possible dimensions. Every

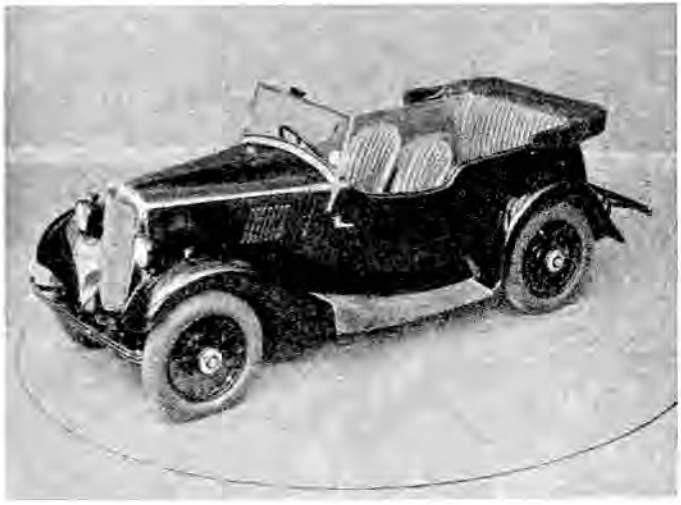


FIG. 5. THE FOUR-SEATER TOURER

crankshaft balanced to very close limits, both statically and dynamically. Steel connecting rods. Aluminium pistons with three-rings, lower piston ring of oil-return pattern. Piston and connecting rod assemblies are equalized in weight to within ·2 oz. (best aero engine practice). 14 mm. sparking plugs.

**Cooling System.** Thermo-syphon cooling, with large ports carefully positioned to obviate steam pockets, and radiator fan.

**Clutch.** Single-plate dry clutch hub built in unit construction with the engine and gearbox. It is exceptionally smooth in action. Operation of the clutch is particularly light and suited to lady drivers.

**Synchromesh Gearbox.** The gearbox provides three forward speeds and reverse with synchromesh mechanism for top and second gears. All gears are of nickel steel and accurately finished.

The gearbox is provided with an accessible oil-filling orifice and dipstick oil level indicator.

**Lubrication.** The engine is automatically lubricated by a spur gear pump mounted internally and positioned low down so that it is immune from priming troubles. It is driven by helical gearing direct from the camshaft. All oil is effectively filtered before circulation by a large oil filter. Oil delivered under pressure to the main big-end and camshaft bearings and a special oil feed is provided for the camshaft driving chain. Enots high-pressure chassis lubrication by accessible nipples is employed.

**Carburation.** S.U. automatic piston type carburettor. The petrol is carried in a 5½ gallon (25 litres) tank mounted at the rear of the chassis. Petrol feed to carburettor by S.U. automatic electric pressure pump. The inlet and exhaust manifolds are an integral casting, with adequate hot spot. Wide control over the mixture strength is provided by a conveniently-operated control. The petrol tank is equipped with a dash-reading electric petrol gauge.

**Transmission.** By Spicer balanced tubular propeller shaft of large diameter fitted with needle type universal joints at each end. The final drive gears are silent spiral bevel, and are mounted with the differential in a sturdy pressed-steel rear axle.



**The Four-wheel Brakes.** The foot brake operates internal-expanding shoes on all four wheels by the Lockheed hydraulic system. The brakes are extremely light in operation, smooth in action, and fully compensated. Their adjustment is simple and there are no bearings or cross shafts needing lubrication attention. A centrally disposed horizontal hand brake lever operates the rear shoes by cable. The hand brake is provided with instantaneous adjustment from the driver's seat.

**Steering.** The steering gear is of the Bishop cam type, which provides exceptional lightness of steering control with extreme accuracy, and reduces the transmission of road shocks to the steering wheel to a minimum.

**Electrical Equipment.** Ignition is supplied by a Lucas 6-volt battery and coil. The distributor has automatic control for advance and retard. Current for the battery and lighting system is produced by Lucas dynamo of large dimensions (4½ in. dia.). The starter motor is mounted direct to the flywheel housing. Full five-lamp equipment is provided, including headlamps with dimming mechanism, sidelamps and tail-light. The electrical equipment incorporates ammeter, electric screen wiper, electric horn, instrument panel illumination, and ignition warning light.

**Wheels.** Five detachable Magna type wire wheels fitted with 4·50–17 Dunlop cord tyres are provided. The wheels have six-stud fixing.

**Suspension.** Long semi-elliptic springs are fitted front and rear and are fully controlled by shock absorbers of the Armstrong hydraulic type with improved automatic cold weather regulation. The front shock absorbers are mounted "outboard."

**Tool Kit.** A kit of tools is provided with every car and housed in an accessible toolbox on the dash under the bonnet.

**General Equipment.** Lockheed hydraulic brakes; pile carpets; gearbox draught excluder; speedometer; oil gauge; S.U. electric pressure petrol pump; dash-reading electric petrol gauge; electric windscreen wiper; licence holder; pressure chassis lubricating pump; electric horn; electric lighting and starting; headlamps

FIG. 6. THE "SUPER EASYFIT" LUGGAGE CARRIER

with dimming mechanism; sidelamps; hydraulic shock absorbers; door pockets; spare wheel carrier; tyre pump; kit of tools; spare tin of oil.

PRICES OF THE EIGHT

| | |
|---|---|
| Two-door Saloon[1] (Fixed Head) | £120 |
| Two-door Saloon (Sliding Head) | £132 10s. |
| Four-door Saloon[1] (Fixed Head) | £130 |
| Four-door Saloon (Sliding Head) | £142 10s. |
| Two-seater[1] | £118 |
| Tourer[1] | £120 |

**Luggage Carrier.** A very useful fitment to add to the Minor is the "Super Easyfit" luggage carrier, which is manufactured by Messrs. Frank Ashby & Sons, Ltd., Birmingham. The type shown in Fig. 6 is particularly suitable for the Minor and can be fitted with ease in a few minutes.

The platform is formed of two equal folds, so that by means of the special hinges and fittings provided, the rack can be folded up when not in use. There are no unsightly projecting arms when folded, these being concealed inside the rack. The size of the carrier is 33 in. by 13 in. for the double fold, and 32 in. by 9 in. for the single fold.

[1] Bumpers and Trafficators, £2 10s. extra.

## CHAPTER II

### LICENCES, INSURANCE, AND LAW

WE now come to the important matter of preparing oneself and one's car for the road. There is the insurance policy and driving licence to be obtained, also the registration of the car. The latter is often carried out by the agent who sells you the car, but it is dealt with here in case you do it yourself.

All new applicants for a driving licence have to pass a driving test. This rule applies to any person obtaining a licence after 1st April, 1934. For those who wish to know all about the test I cannot do better than recommend them to Pitman's *Your Driving Test: How to Pass It*, 2s. net.

### LICENCES


**The Driving Licence.** This costs 5s. per annum and expires twelve months from the date of issue. Every driver of a mechanically-propelled vehicle *must* be in possession of a driving licence while driving such a vehicle. Seventeen is the minimum age for a licence to drive a Morris.

Application for a licence to drive must be made to the offices of the town or county council in which the owner resides. These municipal authorities will provide the appropriate form of application which must be completed and returned to the council with the necessary fee of 5s. The possession of a driving licence is no proof of driving ability, indeed, it is compulsory that one take out the licence before receiving any tuition in the driving of the car. A declaration as to physical fitness must be made by every applicant for a driving licence. This declaration must be in the form prescribed by the authorities, and it must state whether or not the applicant is suffering from any disease or physical disability which would be likely to render it dangerous to drive. Application for a licence may be made either personally at the municipal offices or through the post. If a driving licence should become lost a duplicate may be obtained on payment of 1s.

A licence is non-transferable, and the authorities do not notify the holder when his licence is due for renewal, the onus of taking out a renewal resting entirely with the holder.

*The licence must be signed in the space provided before attempting to drive. This should be done immediately it is obtained.*

A police officer may at any time stop a motorist, and ask to

see his or her driving licence without giving any reason for so doing. If unable immediately to produce the licence, the driver cannot be convicted of an offence if, within five days of the request for production, he produces the licence *in person* at any police station he may specify.

A police officer is not allowed to take note of any endorsements which may have been entered in the licence on the back pages. These endorsements, if any, are a record of any motoring offence of which the motorist has been convicted. In some cases, although the motorist may have been found guilty by the magistrate, no order is made by them that the licence shall be endorsed.

When the court have ordered the licence to be endorsed, it must be produced in court *within five days* or such longer time that the court may determine. If not the holder of a licence, but subsequently obtaining one, he shall produce it to the court within five days. Failure in either case entails automatic suspension of the licence until produced.

If any person during his period of disqualification applies for or obtains a driving licence, or drives a motor vehicle, he is liable to imprisonment up to six months or to a fine of £50, or to both such imprisonment and fine. Such proceedings can be taken within six months of the date of the offence, or within a period which does not exceed three months from the date on which it came to the knowledge of the prosecutor, or one year from the date of the offence, whichever period is the longer.

The holder of a licence which has been endorsed is entitled (*a*) on renewal; or (*b*) *at any time* on payment of 5s., to receive a new licence free from endorsements provided he has not had any conviction endorsed during a continuous period of not less than three years since the last endorsement and expiry of any period of disqualification.

Particulars of all endorsements or disqualifications are forwarded by the court to the authorities who granted the licence and in whose area the driver resides. Where disqualification occurs, the court forwards the licence to the authority that issued the licence, who retain it until disqualification expires and the driver has made a request in writing for its return.

**Renewing the Driving Licence.** Upon the expiration of the licence at the end of twelve months, it will be necessary to complete a form for the application of renewal of driving licence and send this, together with the fee of 5s., to the appropriate local council offices from which the licence was originally obtained. Strictly speaking, one is then not allowed to drive owing to his not being in possession of a licence. It will usually be found, however, that if some proof is carried, such as a copy of any letter which may have been sent to the council, requesting the

renewal of a licence, or the counterfoil of the postal order, if payment was made in this way, it will satisfy the police, should they wish to see the driver's licence. It is a good plan, however, to apply for renewal of the licence a week or so before the date the licence actually expires. Better still, the driver should call at the licensing authority's offices in person, when a renewal will be issued without delay.

**Registration of the Car.** Before the owner may take a car on the public highway it must be taxed, registered, and fitted with registration number plates, one at the front and one at the back.

The tax is worked on a horse-power basis at the rate of 15s. per horse-power, and in the case of a Minor or Eight is £6 per annum commencing on the 1st January and expiring on the 31st December. A quarterly tax is obtainable, the quarter days being 24th March, 30th June, 30th September, and 31st December. Alternatively, the car may be taxed from any day the owner wishes, the tax in this case to run to the end of the year.



Before a new car can be registered, the authorities will require some proof that the vehicle is brand new and demand production of the manufacturers' or agents' sales delivery note, or the agents' invoice, either of which should bear the engine and any other number by which the car can be proved not to have been previously registered. Also the authorities will require to see the certificate of insurance issued to the owner by the insurance company. These, and other details which the authorities will ask for, must be supplied on the appropriate form of application for a licence. In return for this form and the amount of the tax, the owner will receive a registration book and the licence. The latter must always be carried in the licence holder provided on the near side of the car. There is no necessity to carry the registration book, but the owner will be advised to read the instructions printed thereon. Upon the expiration of the licence a renewal can be obtained either from the council with whom the vehicle is registered or from any post office authorized for this purpose. Fourteen days grace is allowed, but a post office cannot grant a renewal after the fourteen days grace has expired. This must be obtained from the authorities referred to above.

If the registration book is lost a new one can be obtained on payment of a fee of 5s. In the event of a duplicate being issued and the original subsequently found, return the original to the authority from whom it was obtained. If any alteration in the car, e.g. change of colour, or different type of body, which will affect the particulars previously registered, notify (in writing) the council of the alteration and forward the book for amendment.

If transferring ownership (1) deliver the book to the new owner;

(2) notify the change, in writing, to the council whose name appears last in the book, also the index mark, and registration number, the make and class of the vehicle and the name and address of the new owner.

If the owner changes his address, enter particulars of new address in the space provided in the book and forward it to the council with which the car is registered.

## INSURANCE

Before venturing on the public road with his car every motorist is now compelled to take out a third party insurance policy. In addition to the usual policy, or cover note, the insurance company will hand to the owner a certificate of insurance in the prescribed form, and, as already stated, when applying for his car licence, the applicant must—by production of the certificate or otherwise—satisfy the licensing authority that the necessary cover against third party risks will be in force at the time the car licence becomes operative.

There is a very large number of insurance companies catering for motorists, and these are divided into two classes, i.e. tariff and non-tariff. Full information regarding rates can be obtained on application to the insurance companies, and an announcement of a well-known company will be seen on the page facing the List of Contents of this book.



**A Comprehensive Policy.** This type of policy is recommended (except when the car is an old one). There is some variation in the Private Car Comprehensive Policies issued by different companies; the following are brief particulars of the cover given by the office already referred to—

**Third Party Risks.** Unlimited indemnity in respect of claims by the public (including passengers not carried for hire or reward), or damage to property, against the policyholder or any person driving with his permission.

The policy also covers the policyholder's liability whilst driving a private car or motor cycle not belonging to him and not hired to him under a hire-purchase agreement.

Liability for hospital expenses and emergency treatment under the Road Traffic Acts is included.

**Loss of or Damage to the Insured Car and or Accessories and Spare Parts from Any Cause.** Exceptions include: loss of use, depreciation, wear and tear, mechanical or electrical breakdown, damage to tyres by application of brakes.

The insurance company bears the reasonable cost of removing the car from the scene of the accident to the nearest repairers, and the reasonable cost of delivery to the owner after repairs.

Repairs, up to a reasonable amount, may be executed without prior notice to the company, provided that a detailed estimate is supplied forthwith.

**Injuries to Occupants (caused by accident in direct connexion with the insured car).** Personal accident benefits in respect of policyholder and wife or husband: in case of death, £1,000: loss of two limbs or sight of both eyes or one limb and one eye, £500: loss of one limb or sight of one eye, £250. Medical expenses incurred by any occupant or driver not exceeding £20 per person for any one accident.

**Loss of Rugs, Coats, and Personal Luggage.** From the insured car by fire or theft, up to £5 per article or £20 per year of insurance. Money, valuables, etc., are not covered, and this section applies only in Great Britain, N. Ireland, the Isle of Man, and Channel Islands.

**Legal Defence.** The company will pay the solicitor's fee for defence of any proceedings in any Court of Summary Jurisdiction, and representation at any coroner's inquest or fatal accident inquiry arising from any event which may be the subject of Third Party Indemnity under the policy.



**Continental Touring.** Provided prior notice in writing is given to the corporation of each proposed journey, the policy will be extended to apply for a total period not exceeding one-fourth of its current period while the insured car is temporarily in the Irish Free State, on the Continent of Europe, or in Algeria or Tunisia, and while in transit between ports in such countries, subject to certain restrictions.

**No-claim Bonus.** If no claim has been made or is pending, the renewal premium is reduced by 10 per cent first renewal, 15 per cent second renewal, 20 per cent third renewal, 25 per cent fourth and subsequent renewals.

## THE LAW AND THE MOTORIST

Membership of either the Royal Automobile Club or the Automobile Association will be found to be well worth while in case of accident or police prosecution. These organizations provide free legal defence and will give all possible aid in any trouble appertaining to motoring. The addresses of these organizations are as follows—

Royal Automobile Club, Pall Mall, S.W.1.

Automobile Association, Fanum House, New Coventry Street, W.1.

**Accidents.** (What to do.) It cannot be too strongly emphasized that in an accident of any kind, it is most important for all those concerned to keep calm, and say as little as possible.

The natural tendency is to become flurried and perhaps make some rash statement which may later be regretted.

The first thing to do, in the event of any person being injured, is to obtain medical assistance and a policeman. This may in some circumstances be rather difficult, should the accident occur in some out-of-the-way place, but it is usually possible to find a telephone within at least a mile from any spot in England at any rate.

Having done all that is possible in this connection, take the names and addresses of all available witnesses, particularly any disinterested parties. Get the policeman to take note of the positions of the damaged vehicles, and of any marks on the road which may be of assistance at a later date.

Do not omit to report the matter to your insurance company within twenty-four hours from the time of the accident; also advise your motoring associations. Should a policeman not be on the spot the accident *must* be reported at any police station, within twenty-four hours. Do not deal with any correspondence yourself. This should be posted to your insurance company, road association or solicitor, as the case may be. Never offer any money to an injured person or to a witness at any time, as this may be taken as admitting liability.



**Address.** If a motorist is accused of driving recklessly, dangerously or carelessly, he must give his name and address to any person having reasonable ground for requiring the information. If he refuses or gives a false name and address he is guilty of an offence.

**Arrest.** A police officer, whether in uniform or not, who observes the driver of a car commit the offence of reckless, dangerous or careless driving may arrest him without warrant unless he gives his name and address or produces his driving licence for examination.

It is not generally known that, under the Highways Act, 1835, a person who sees a motorist driving furiously to the danger of any person may arrest the motorist without a warrant.

**Endorsement of Licence.** On conviction of a motorist for a road offence an order is sometimes made for the nature of the offence to be endorsed on the licence. Details of endorsements are also sent to the authorities granting the licence, but, if the holder has a good driving record for three years from the date of the last endorsement, the offences are not recorded on any new licence issued. It is not permissible for a police officer to take notes of any endorsement.

**Driving Test.** A driving test is provided for in the case of all new holders of driving licences, but this regulation does not apply to a person who held a driving licence before the 1st April, 1934.

The form of the official test includes such matters as examination in the Highway Code; starting a car, overtaking and backing the car within a limited space. The full regulations are issued by the Minister of Transport. Licences issued before the test are marked "provisional," and the holders are liable to be called upon to pass the specified test during the period of the licence.

**Speed Limit.** Authority has also been given for the general speed limit to be fixed at thirty miles an hour in built up areas. A "built up area" is defined as a length of road in which a system of street lighting is maintained by lamps not more than two hundred yards apart. Suitable signs are to be erected in areas in which the speed limit is to be enforced. It must be remembered however, that in certain areas, such as the Royal and municipal parks, there are definite limits to the speed of road vehicles.

**Reckless, Dangerous, or Careless Driving.** These forms of driving are regarded as very serious offences and may result in imprisonment and disqualification from holding a licence. Motorists must not drive on a road recklessly, or at a speed or in a manner which is dangerous to the public. Careless driving is defined as driving without due care and attention or without reasonable consideration for other persons using the road. A police officer has power to arrest for these offences without warrant, unless the driving licence is produced or the driver's name and address is given to him. Anyone driving furiously to the danger of the public may be arrested by any person without a warrant.



**Driving Under the Influence of Drink or Drugs.** If when driving, or attempting to drive, or in charge of a motor vehicle any person is under the influence of drink or a drug so as to render him incapable of having proper control of the vehicle, he is liable to heavy penalties of fine or imprisonment, or to both fine and imprisonment. Disqualification from holding a licence for twelve months may be imposed if the Court thinks fit.

**Motoring Elsewhere than on Roads.** It is unlawful for any person to drive a motor vehicle on to or upon any common land, moorland, or other land of whatsoever description (not being land forming part of a road) or on any road being a bridleway or footway, unless so authorized. This provision does not prevent the parking of vehicles on land within fifteen yards of the road, or driving on land in cases of extreme emergency, such as the saving of life or extinguishing a fire.

**Accident Procedure.** If when on the road a motorist is concerned in an accident whereby damage or injury is caused to any person, vehicle, or animal (including any horse, cattle, ass, mule, sheep, pig, goat, or dog) the driver must stop and, if required so to do by any person having reasonable grounds for so requiring, give his name and address and also the identification marks of the car.

If such details are not given at the time of the accident, the driver must within twenty-four hours report the accident at a police station or to a police officer.

When involved in an accident requiring medical assistance, the driver should do everything possible to render aid to those injured.

It is advisable to give to those concerned only essential details, and not to make any statement which may afterwards have a detrimental effect on your own position and also on that of the insurance company.

If possible, secure the names of likely witnesses of the accident so that your legal advisers and insurance company can take all steps necessary to protect your interests.

**Motor Horn Silence.** A motor horn should not be used at any time when a vehicle is stationary on the highway, but an exception is made when it is necessary to do so for reasons of safety.

A recent order has established what are known as "Silence Zones." The regulation has been issued by the Minister of Transport under the powers vested in him by the Road Traffic Acts, and it provides that no person shall sound any instrument fitted to any motor vehicle for signalling its approach by sound between the hours of 11.30 p.m. and 7 a.m. on any road on which there is provided a system of street lighting, furnished by means of lamps placed not more than 200 yards apart.



If a dangerous situation should occur, with the possibility of injury to a pedestrian or a large insurance claim for damage, it would be preferable to sound the horn and take the risk of being fined a few shillings.

**Traffic Lights.** The red, green and amber lights are now familiar to all road users. The red and green discs give definite "Stop" and "Go" instructions, and the chief difficulty has been the amber light. Simultaneous lighting of red and amber discs means "prepare to start," and the crossing should not be taken until the green light is displayed. Amber following the green light is equivalent to stop, unless the vehicle is in such a position as to render crossing essential—to prevent an accident through sudden stoppage, or to avoid obstruction. Do not "race the lights."

Motorists should not disregard the signals given by the traffic lights even though vehicular traffic is absent. There is the pedestrian to consider, and an accident in such cases may involve the driver in heavy penalties.

**Pedestrian Crossings.** In an endeavour to reduce the number of road accidents, pedestrian crossings have been instituted. These crossing places for foot passengers are indicated by means of white lines, "Belisha beacons," metal studs, etc., as prescribed for the purpose by regulations of the Minister of Transport. Each

local authority decides which method they propose to adopt, but it must be one of those authorized.

Drivers approaching a crossing are to proceed at a speed that will enable them, if required, to stop before reaching the crossing. Where the crossing is not controlled by a police officer or light signals, pedestrians have precedence over all vehicular traffic at these crossings. Drivers are not to stop on any crossing unless it is necessary to do so to avoid accident.

**Penalties.** The penalties for motoring offences range from a fine of a few shillings for minor offences to severe terms of imprisonment and disqualification for the more serious offences. They have not been set out fully in this handbook. Drive carefully and with consideration for others and there will be no necessity to concern yourself with the penalties which the law exacts for each individual offence.

**Obstruction.** Be careful where you leave your car if you wish to avoid summons for obstruction. Thousands of motorists are convicted for offences of this kind. Although in quiet side streets it is often safe to leave a car unattended outside a house, it is definitely not safe to do so in a street where there is any considerable volume of traffic, and to leave a car unattended in a busy thoroughfare is to invite trouble. In certain places streets are to be found where parking is allowed and this is indicated by a "P" sign.



**Highway Code.** All motorists should secure a copy of the Highway Code, the official publication issued by the Minister of Transport for the guidance of road users. It can be obtained from H.M. Stationery Office or through any bookseller, and the price is one penny. Among the useful hints given are those on speed, signals, overtaking, corners and bends, cross roads and road junctions, and white lines. The Code also fully explains the signals that every motorist should know—those to be given by the motorist, and those to be given by police constables and others engaged in the regulation of traffic.

## CHAPTER III

### ON THE ROAD

This chapter is *entirely* for the beginner and is in terms which can be easily understood.[1] Firstly, the controls and gear positions should be thoroughly examined, and here, Figs. 7, 8, and 9 should be of some assistance. The best way in which to become familiar with the controls is to sit in the driving seat.

Probably the first thing you will notice is the gear lever. This is on your left and is the longer of the two levers, the shorter one being the handbrake. The handbrake is in operation when pulled back and will stay on until the ratchet catch lever is pressed. This is done by pulling the lever back and squeezing the hand, this action releasing the catch.

The next thing to catch your eye (or more truthfully, your foot) is the clutch pedal. This is the left pedal, and, with the exception of the brakes, is the most important control on the car. Its object is to break the drive between engine and gearbox. This is necessary, for example, when changing gear. Constant slipping of the clutch, however, should be avoided. Some people imagine the clutch should be slipped to enable the car to crawl up a hill, or go slowly through traffic in top gear. The gearbox is supplied for occasions such as these.

The pedal next to the clutch is the throttle or accelerator, and is the middle pedal. This pedal regulates the supply of petrol gas to the engine, and thereby the speed and power of the car. It works with immediate effect, and any sudden acceleration or deceleration of the engine has to be transmitted to the car in the form of extra or less speed, and is bound to cause a strain on the clutch and other parts of the car responsible for turning the back wheels. The next pedal is the foot brake. The function of this needs no explaining, but it may be well to state here that the brakes should be treated with respect. Fierce application in wet weather will, in all probability, start a skid which the driver may find difficulty in correcting.

Going back to the gear lever and looking down, a round black knob will be seen behind the gear lever in the centre of the floorboards. This is the starter button. Pressure on this knob has the result of turning the crankshaft of the engine, the same as is obtained by turning the starting handle. This knob should

[1] The text deals mainly with the Minor controls. See Fig. 9 for the positions of the Eight controls.

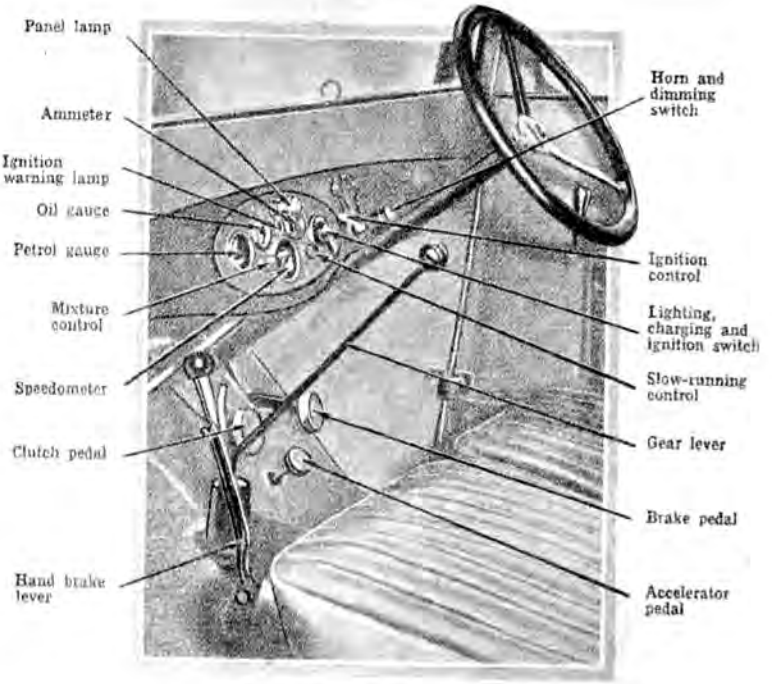



FIG. 7. THE CONTROLS OF THE MORRIS MINOR

be operated firmly and should be released immediately the engine fires.

On the left of the speedometer will be found a projecting knob. This controls the strength of the mixture (that is, the amount of petrol in proportion to the amount of air) that is fed by the carburettor to the engine. When starting from cold, this knob should be pulled out as far as it will go, but on no account should the engine be run for any length of time with the knob in this position. If this is done, neat petrol will be drawn

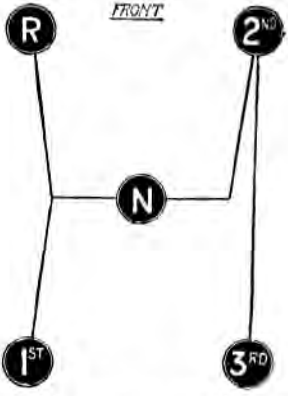



FIG. 8. THE GEAR POSITIONS OF THE THREE-SPEED GEARBOX

into the cylinders, which will break down the oil film and may cause considerable damage. When the engine is pulling evenly this knob should be pressed inwards as far as it will go without causing the engine to spit or splutter. If the engine fails to run evenly with the mixture control knob pushed right in, it is probable that the engine is not warm enough.

On the right of the speedometer will be found another projecting knob. This is the slow running control, which controls the speed of the engine when the foot is off the accelerator pedal. Turning it to the right decreases the engine speed, while turning to the left has the opposite effect. It should be set so that the engine is just ticking over and then left in this position.

On the right of the instrument board in front of the driver is a large black switch set in a circular dial. This controls the electrical circuits, serving the dual purpose of controlling the dynamo output and the lights. There are four positions for this switch. When in the position in which the pointer head coincides with the words "Summer Half," it indicates that the dynamo is

on half-charge and only giving half its normal output. When the pointer coincides with the words "Winter Full," the dynamo is delivering its full output. When the pointer coincides with the word "Side," it means that the side and tail lamps are alight. When pointing to "Head," this means, of course, that the head and tail lights are on. During the summer months the switch should be kept on the "Summer" mark, and during the winter on the "Winter" mark, as obviously the demand is then greater.

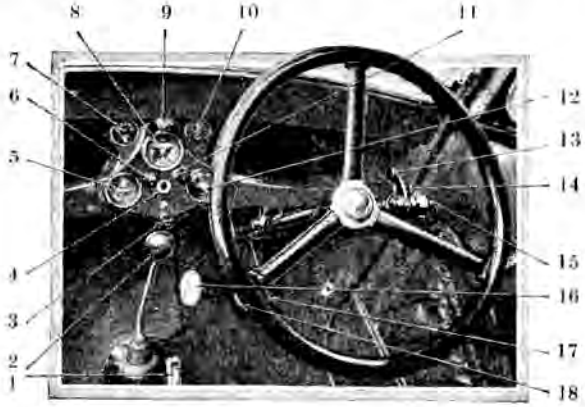



FIG. 9. THE CONTROLS OF THE EIGHT

KEY TO FIG. 9

1. Handbrake lever
2. Gear lever
3. Starter button
4. Ignition warning light
5. Petrol gauge
6. Mixture control
7. Oil gauge
8. Speedometer
9. Dash light
10. Ammeter
11. Slow-running control
12. Lighting and charging switch
13. Trafficator control
14. Head light dipper
15. Horn button
16. Clutch pedal
17. Throttle pedal
18. Footbrake pedal

In the centre of the switch is a removable key. This serves to switch the ignition on and off. Turning the key clockwise switches on the ignition, turning it anti-clockwise switches off the ignition. *If you remove the key when parking your car, put it in a safe place.*

In the centre of the panel is a red indicator light. When the dynamo output is insufficient to supply the needs of the ignition system the red light appears, indicating that current is being drawn for ignition purposes from the battery. *Never leave the*

*engine idling or stationary for long periods with this red light showing.* If you do, it is quite likely that you will find your battery has been drained. Make a practice of switching the ignition off, when the stop is to be of some duration.

The advance and retard control lever is shown in Fig. 7. When the engine is running slowly, or when it is being started, the ignition should be retarded, i.e. the lever should be pulled back. When the engine is running fast, and also for normal running, the lever should be pushed right forward. This is the fully advanced position. Always keep it in this position, provided the engine is not showing signs of distress, i.e. spits, knocks, or backfires.

In the centre of the panel is the speedometer; this indicates the speed at which you are travelling and also the total mileage the car has run. This can be of great assistance when working out running costs.

To the right of the speedometer is a somewhat smaller instrument, which is the ammeter. Its sensitive finger swings both to the right and to the left showing that the battery is being charged or discharged. When the lights are off and the dynamo and ignition switch is turned to the "Winter" position, the ammeter needle should swing over to the right-hand side until it reads about 8 amps. when the car is running between 20 and 25 miles per hour. If the ammeter does not register when the dynamo and ignition switch is on, and the car is travelling at this speed, it means either that the fuse has blown, or that attention is necessary to the electrical system (see Chapter VII).

To the left of the panel near the centre is the oil gauge which gives indication of the pressure of the oil being fed to the engine. The pressure should be about 50 lb.[1] when the engine is warm and the car is travelling at about 30 m.p.h.

The remaining instrument is the electric petrol gauge, which gives indication of the petrol tank contents. It should be noted that it only registers when the ignition is switched on.

Having mastered the controls we now prepare the car for the road.

**Filling-up.** First see that the radiator has sufficient water (rain water is preferable), then make sure that there is sufficient petrol in the tank. This can be verified by reading the gauge on the instrument panel (see Fig. 7). The tank capacity is five gallons. Now check the oil supply in the engine sump. This may be done by using the dipstick. Remove the "stick" with hooked end which will be found projecting on the right-hand side of the engine between the filler spout and the dash. Wipe the lower portion of the "stick," reinsert and withdraw. Oil will

[1] Morris Eight, 60 lb. when engine is warm.

cling to the stick, thus showing the actual quantity present in the sump. The correct level is indicated by a deep depression on the "stick," and the engine should *not* be run for long periods when the oil has dropped below the half-full level. The filter should on no account be removed when replenishing with oil. Clean, fresh oil is essential for good running and freedom from breakdowns.

**Starting-up.** First see that the gear lever is in neutral (see Fig. 8). Then turn the key in the switch on the switchboard (see Fig. 7) and wait until the S.U. petrol pump ceases to pump. Pull the mixture control knob at the left of the instrument panel right out.

The engine-starting switch is controlled by the round black knob in the centre of the floorboard next to the gear lever. When this switch is pressed the engine will be heard revolving and should start firing, when the starter switch should be immediately released. In cold weather it is advisable to swing the starting handle with the ignition switch off before using the self-starter. It is bad practice to keep the starter switch depressed if the engine is not revolving as sometimes happens if the battery is run down, or with a new stiff engine, or in very cold weather. Use the starter sparingly, and it will repay you by giving good, trouble-free service.



**Driving-off** (three-speed model). Having got the engine turning over slowly, press the clutch pedal down (which is the left-hand pedal) and then engage low gear. Do not force the gear in; it should engage quite easily. Now release the handbrake and let the clutch pedal come up gradually; at the same time increase the speed of the engine by gentle pressure on the accelerator pedal. The car should now be moving smoothly away. The beginner will probably find that he either stops his engine or starts off with a jerk. This is caused by letting in the clutch too quickly and should be rectified at an early stage, as enormous strains are placed upon the transmission.

After having travelled some few yards the driver should try to change into second gear. (The road speed will be in the region of 10 m.p.h.) To do this, again press the clutch pedal down, bring the gear lever into the neutral position, release accelerator, then swing the lever to the right and push it forward, which will engage the second speed gear. The clutch pedal may now be released and the accelerator depressed simultaneously. Care must be exercised when making the change to avoid pushing the gear lever into the reverse position. If a light pressure to the right of the gear lever is maintained while making this change, no damage will be done.

Changing to top gear is perhaps the easiest of all. Simply press the clutch pedal down, release accelerator pull the gear

lever straight back, and you are in top and on again depressing the accelerator should be travelling at a respectable speed. Remember, however, that the engine is new, and don't exceed 30 m.p.h. until it is well run in, i.e. at least 500 miles. The great thing to remember is that you can always stop by pressing the clutch and brake pedals down hard. (Extreme left and right pedals respectively.)

When the engine is cold and the gearbox oil thick, the gear change should be made quickly, otherwise the gearbox will audibly protest.

Referring to Fig. 8 again, the reverse gear position will be seen to be top left. This gear is obtained in the same way as the other positions with the difference, of course, that the car is stationary. *Never* try to engage reverse while the car is in motion, as this sets up terrific strain on the gear wheels and might cause a serious breakdown.

**Four-speed Model.** The gear positions on this model are entirely different from those of the three-speed model just described. Therefore, we will commence from the beginning again for the benefit of the owner of the four-speed model.

Starting from neutral, with the engine turning over slowly, press the left pedal down (clutch) and then swing the gear lever to the left and forward. Now release the handbrake. The pressure on the left pedal may now be lightened, at the same time gently pressing the accelerator pedal with your right foot, when you should glide slowly away. If the engine stops (as it probably will do until you are used to it) you must push the left pedal down and bring the gear lever back to neutral, start the engine and begin again.

You are now in low gear and should stay there until you feel safe enough, and the engine speed fast enough to change up to the next position. This change is made very easily. Simply put out the clutch, release the accelerator pedal, pull gear lever right back in a straight line, and you are then in second. Now take your foot off the clutch again and press the accelerator pedal.

To change into third gear, press the left pedal down, release accelerator, push gear lever forward with right hand pressure, through neutral, and then forward again. You may now take your foot off the clutch and press the accelerator pedal.

You are now travelling somewhere in the region of 25 m.p.h., and you will be well advised to stay there until you feel perfectly confident to make the next and last change, e.g. to top. This is done by pressing the left pedal down, releasing accelerator, bringing the gear lever straight back, releasing the clutch pedal and pressing the accelerator pedal again. You are now in top and doing famously, but don't take any liberties. All you have to do

now is to watch your steering and use the accelerator pedal as the contour of the road demands. Remember to keep the left side on the road and to slow down when approaching cross-roads and corners.

**A Few Hints on Gear Changing.** If you have bungled the gear change, and cannot get into the desired position, don't lose your temper and try to force the lever into position. Stop the car by pressing the clutch and brake pedals, get the lever back into the neutral position, and start again from the beginning. Not only will this save the gears from being damaged, it will also give you additional practice. Remember the old saying "Practice Makes Perfect," and you will realize you are not wasting time.

As already stated, you should never try to engage a "forward" speed while travelling backwards or *vice versa*; reverse while travelling forwards. Make certain the car is stationary before engaging a gear which will reverse the direction of travel.

When changing to a higher gear the left (clutch) pedal must always be pushed down and the foot removed from the accelerator pedal until the change has been made. A slight pause in the neutral position may be advisable when the engine is hot.

When changing down to a lower gear, the clutch pedal should be depressed, and after waiting for approximately half a second with the right foot pressing on the accelerator pedal, so that the engine can gain speed, the change can be made.

Double de-clutching (practised by all "old hands") is the best method for changing down on those gearboxes which have not got sycromesh gears. (The beginner should not attempt this, however, but must wait until he has had a certain amount of "straight" gear changing.) The procedure is as follows—

Holding the gear lever lightly, push down the clutch pedal, move the gear lever into neutral position, and let the clutch pedal rise again. Now "rev" the engine up by pressing the accelerator pedal, put the clutch out and move the gear lever into the required position, once more releasing the clutch. After a time this will become "second nature," and all downward gear changes will be positive. A great point to remember is that you should never look down when changing gear.

## CARE OF THE CAR

**Running-in New Engines.** After buying a brand new Morris, special caution must be exercised for a certain period of driving, in order to allow all moving parts to become bedded down and bearing surfaces to harden. Any attempt to expedite matters is doomed to failure and may permanently spoil the engine. Until 500 miles have been covered, a speed in excess of 30 m.p.h. in top gear should not be attained, and large throttle openings should not be used. The first 500 miles of an engine's existence

are far more important than the next two thousand. When starting from cold allow the engine to turn over at a fairly fast speed.

New engines should be given frequent attention during the first 500 miles if they are to give long and trouble-free service. After the first 250 miles the tappet clearances should be checked and adjusted if necessary (see page 41). The cylinder head stud nuts should also have attention at the same time. The oil should be drained and the engine refilled with fresh oil after the first 500 miles have been covered; the oil filter should be thoroughly cleaned at the same time.

**Care of the Wings.** The wings are stove enamelled and should not be rubbed with a dry duster, as this is likely to scratch the enamel. Always rub them down with a soft sponge, using plenty of water. On no account attempt to remove tar spots with the aid of paraffin or a similar medium.

After the wings have been well washed down with hose and sponge, all beads of water remaining should be carefully cleaned off with a chamois leather.

**Chromium Plating.** It should be noted that chromium plating does not require, and should not be treated, with metal polish, for it does not oxidize in the same manner as nickel-plating. The chromium-plated parts should be treated in the same way as the wings, and the surfaces will then improve with cleaning.

**Care of the Cooling System.** The radiator should be kept almost full and, as stated previously, it is advisable to use only rain-water for this purpose, as ordinary tap-water contains lime, which will become deposited throughout the cooling system and possibly set up overheating owing to the radiator being affected. Any leaks at the hose connections should be corrected by tightening the clips, or, if necessary, re-making the joint. Naturally, only clean water should be used, and it is as well to filter the water through linen to make sure that no foreign matter can enter the radiator, which would clog up its tubes. The radiator may be cleansed by putting in a handful of ordinary household soda, and leaving it to dissolve, when it will eventually break up all foreign matter. It is best to leave the soda in until the water has been thoroughly warmed up by the engine two or three times, after which the radiator should be drained, and the cooling system flushed out with ordinary tap-water, before refilling with rain-water.

**Winter Precautions.** In extremely cold weather, care must be exercised so that water does not freeze whilst the car is in the garage. It is advisable to drain off the water when the car is put away. If this is not practicable (in the case of a doctor, for instance), a radiator lamp may be used. These lamps are made on the principle of miners' lamps, and are absolutely fireproof. Special anti-freezing mixtures can be obtained, which, when

emptied into the water, will be proof against freezing. Ordinary glycerine is also a good frost prevention, the necessary quantity being four pints of glycerine to each gallon of water, this being sufficient to stand against almost any degree of temperature which is to be experienced in this country. Any evaporation can be made good by simply adding rain-water.

**Care of the Springs.** The spring clips which secure the front and rear springs to the axles should be examined periodically to see that they are bolted up tight. It is essential, particularly when the car is new, to test the nuts on these clips to ensure that no slackness has taken place. The majority of spring failures are traceable to the fact that slackness has occurred at these points and has not been attended to.

## CHAPTER IV

### HOW THE ENGINE WORKS

A CHAPTER of this kind is often thought relatively useless by the "expert," but I feel that the majority of our readers will, eventually, want to know exactly what work each part has to do. The power unit looks, but is *not*, complicated, and the illustrations (Figs. 10 to 13) will help to clarify matters.

**The Engine.** Referring to Fig. 10, all component parts are clearly shown, and the key provides an easy means of reference. The cylinder is of uniform diameter and, when the detachable head is in position, is closed at one end, the interior being machined to a glass-like smoothness. The piston is also uniform in diameter, and also closed at one end, and this is made to fit the cylinder as closely as possible, but still allowing it to move easily therein. The combustion chamber is the space between the top of the piston and the cylinder head, and it is essential for this to be gas-tight, so that the explosive mixture may be compressed without loss. It is impossible to make the pistons themselves a gas-tight fit within the cylinder, for, if this was so, the friction set up would render movement difficult and, very soon, impossible; hence, the piston is fitted with what are known as piston rings. These are rings of springy iron, and are inserted into grooves in the outer wall of the piston. Owing to their natural expansion, they press closely against the cylinder wall; therefore, no gas can get past them. When the engine is working, the piston moves up and down in the cylinder, but before the power developed can be utilized for propelling the motor-car, it is necessary to convert this movement into a rotary one. A main- or crankshaft is fitted in the crankcase, this being constructed with the necessary number of crankpins, one for each cylinder. The formation of a four-cylinder crankshaft may be seen from Fig. 11. The piston is connected to the crankpin by means of a connecting rod, which is fitted with suitable bearings at each end, so that as the piston works up and down the motion rotates the crankshaft. On the crankshaft is mounted a flywheel, the object of which is to store up the energy developed by the engine, so that the rotary movement of the crankshaft may be continued steadily and jerks obviated.

The explosive mixture, a mixture of fuel vapour and air, is induced to enter the combustion chamber through an inlet valve, while the exits of the products of combustion—carbon dioxide

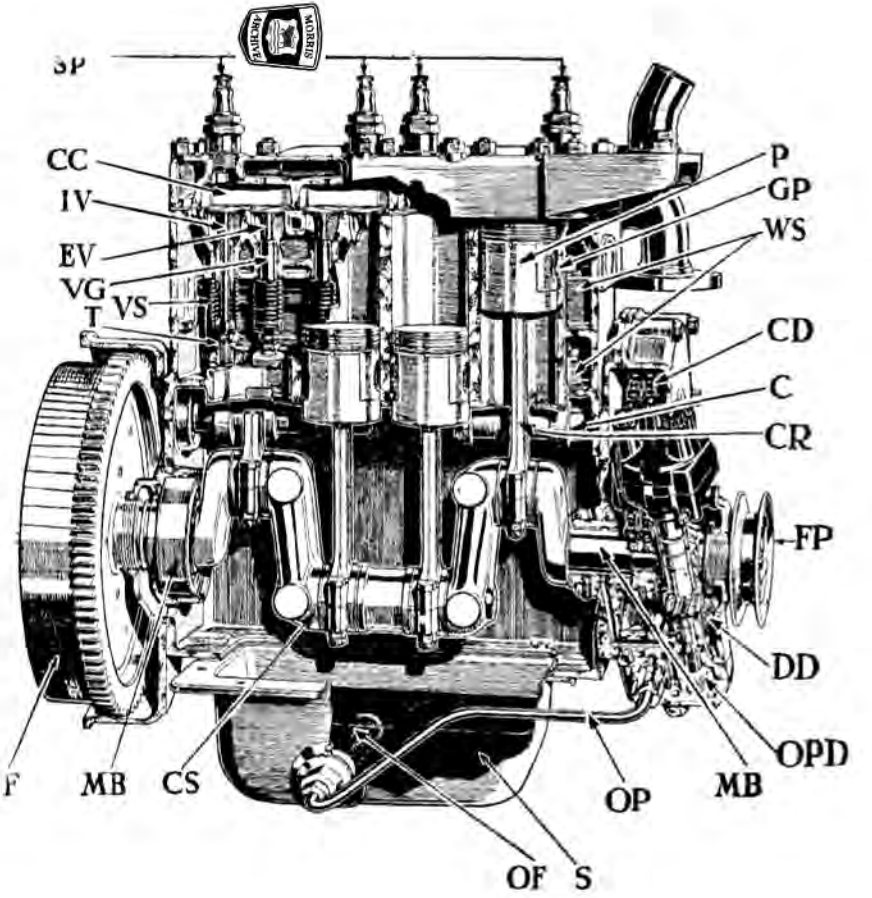



FIG. 10. THE MINOR ENGINE

*SP* = Sparking plug
*CC* = Combustion chamber
*IV* = Inlet valve
*EV* = Exhaust valve
*VG* = Valve guide
*VS* = Valve spring
*T* = Tappet
*F* = Flywheel
*MB* = Main bearing
*CS* = Crankshaft
*OF* = Oil filter
*S* = Sump
*OP* = Oil pipe
*OPD* = Oil pump drive
*P* = Piston
*GP* = Gudgeon pin
*WS* = Water space
*CD* = Camshaft drive
*C* = Camshaft
*CR* = Connecting rod
*FP* = Fan pulley
*DD* = Distributor drive

and water vapour—are expelled through the exhaust valve. The valves are opened and closed by means of tappets, these being actuated by a camshaft which carries the necessary number of cams or protrusions (Fig. 12). As the cam comes into action the tappet is forced upwards, which action raises the valve. The valve closes after the cam comes out of action by means of a strong spring which encircles the valve stem.

**The "Otto" Cycle.** The majority of engines are operated on what is termed the "Otto" principle, a principle which is adopted

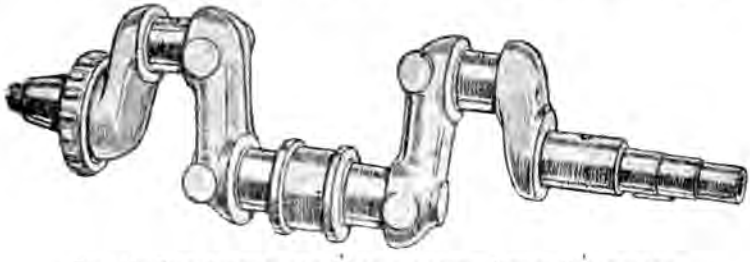


FIG. 11. THE STURDY AND WELL BALANCED MINOR CRANKSHAFT

FIG. 12. THE CAMSHAFT EMPLOYED ON THE MINOR IS OF GENEROUS DIMENSIONS AND CARRIED ON BALL AND ROLLER BEARINGS

for the Minor and the Eight. This type of engine is more generally known as the four-stroke, in that an explosion occurs in the cylinder only once for every four movements of the piston, i.e. two up and two down. This means that each valve, the inlet and the exhaust valve, must open only once for every second revolution of the crankshaft; hence, they are timed so that the camshaft revolves at half-engine speed. Generally, it may be said that the inlet valve is timed to open when the piston is at the top of its stroke, that is nearest to the cylinder head, and closes when the piston is at the bottom of its stroke, while the exhaust valve opens when the piston is at the bottom of its stroke and closes when it reaches the top. The explosive mixture is ignited by means of an electric spark. The electric current which causes the spark at the plug points is supplied by the battery and

induction coil. The spark is timed to occur once for every second revolution of the crankshaft, in the same way as the valves, and this takes place when the piston is at the top of its stroke and the combustion chamber is filled with compressed mixture.

When the explosive mixture is fired, a considerable amount of heat is generated, and the cylinder, piston and valves become very hot. This surplus heat, which cannot be converted into power, must be dissipated; hence, the cylinders are surrounded by water-jackets.

**The Cycle of Operations.** To describe the cycle of operations, it is advisable to begin at that stage when the piston is at the top of its stroke, both valves being closed, and here Fig. 13 will be of assistance. As the piston begins to descend on its first stroke the inlet valve is opened, and the suction caused by the descending piston in the gas-tight combustion chamber draws in a charge of explosive mixture from the carburettor. When the piston reaches the bottom of its travel, the combustion chamber is filled with mixture, and the inlet valve then closes. The piston next rises on its second stroke, and the mixture contained in the combustion chamber is compressed until by the time the piston has arrived at the top of the stroke—the compression stroke—a pressure of between 70 lb. and 80 lb. per square inch is obtained. At this moment a spark is caused to jump across the electrodes of the sparking plug, which ignites the mixture. As the mixture burns—it does not explode suddenly—the heat generated causes the gases to expand, and, therefore, the piston is forced down the cylinder on its third, or firing, stroke. When the bottom of the stroke is reached the combustion chamber is filled with inert gases, which must be expelled before a new charge can be induced into the cylinder. As soon as the bottom of the firing stroke is reached, therefore, the exhaust valve is timed to open, so that as the piston ascends on its fourth stroke these products of combustion are forced out into the exhaust pipe, and finally to the atmosphere. At the termination of this stroke—the exhaust stroke—the exhaust valve closes and the inlet valve opens, so that a new charge of explosive mixture may be taken in by the engine.



The four strokes of the engine are, therefore—

Induction, piston descending and inlet valve opened.

Compression, piston ascending, both valves closed.

Firing, piston descending, both valves closed.

Exhaust, piston ascending, exhaust valve opened.

Only the third stroke of the cycle is a power, or impulse, stroke; the other three strokes are carried out by the power stored up in the flywheel.

**Multi-cylinder Engines.** No cars are fitted with single-cylinder engines to-day, although such machines were common in the early days of motoring. In the case of multi-cylindered engines,

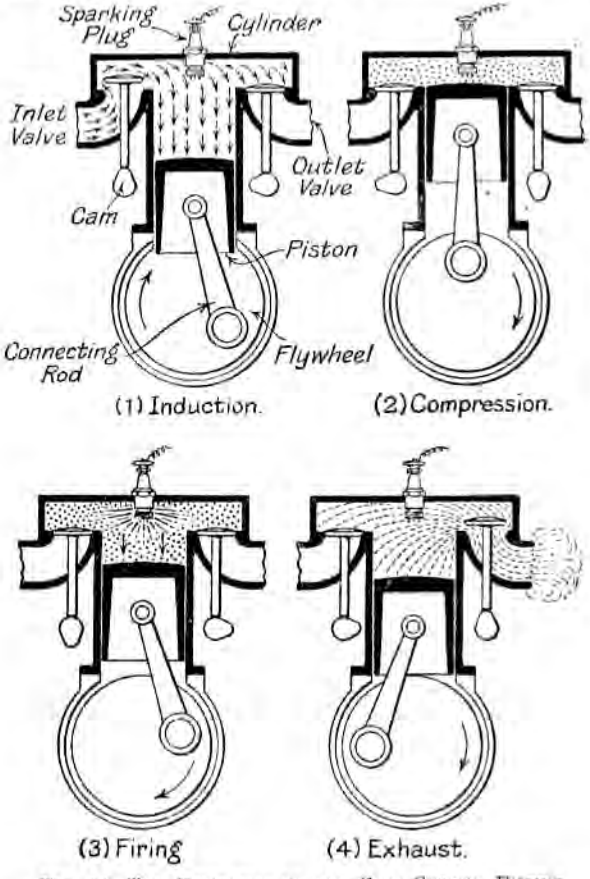



FIG. 13. THE PRINCIPLE OF THE FOUR-STROKE ENGINE

the cycle of operations in each cylinder is exactly the same as that described in the foregoing paragraphs, but the firing strokes are timed to occur one after the other, so that in a four-cylinder engine there is a power of impulse stroke for every half-revolution

of the crankshaft. The crankshaft of a four-cylinder engine is constructed with four "throws," these being in pairs, so that No. 1 (the cylinder nearest the radiator) and No. 4 are in the same plane, while Nos. 2 and 3 are placed at an angle of 180 degrees to No. 1 and No. 4.

With this arrangement of throws, it is possible to make the cylinders fire in two different orders, i.e. 1, 2, 4, and 3, or 1, 3, 4, and 2. The latter is adopted on Minor and Eight engines.

## CHAPTER V

### OVERHAUL AND MAINTENANCE

In this chapter the author has aimed at putting in a convenient form all the information and data necessary to enable the Morris owner to keep his car and engine in first-class trim, and this it is hoped will be of value both to the beginner and expert. All motor-cars, and for that matter all mechanical contrivances, require periodic lubrication, minor adjustments, and occasional overhauling; and at regular intervals the I.C. engine requires to be decarbonized and the valves ground-in if a reasonable degree of efficiency is to be maintained. Lubrication is dealt with in Chapter VI, therefore no further reference is necessary here.

### DECARBONIZING, VALVE GRINDING, ETC.

Decarbonizing and grinding-in the valves of the Morris engine should be undertaken at every 10,000 miles. I give this figure on the presumption that the oil level during this mileage has been strictly in accordance with the maker's instructions. Many owner-drivers make the mistake of giving the engine "just a little extra"; this practice generally results in excessive oiling of the cylinder walls, and the oil works upwards on to the piston head, where it is burned by the exploding charge of petrol gas and formed into carbon. The presence of excessive carbon in the cylinder head can always be detected by the falling-off of power and "pinking," i.e. a metallic noise when the engine is pulling hard. When this is noticed, decarbonizing should be undertaken. "Pinking" is a definite complaint from the engine that it is dirty, and the job should be undertaken as soon as possible, after the noise has been noticed.



It is the best plan, when decarbonizing, to have ready all the necessary tools and materials. In addition to the standard tool kit, we shall need plenty of clean rags, paraffin, valve grinding paste, some jointing compound, and a deep flat tin for a washing bath. It is also useful to have one or two small wooden boxes to keep small parts, nuts, washers, etc., as these are liable to be lost if they are just laid on the garage bench. Having collected the required equipment we can now proceed. The first thing to do is to start the engine and leave it running until it is fairly warm. This has the effect of making any joints that have to be parted much easier, also it is more comfortable to work on a warm engine. Next, we move the car to a convenient spot where the

water from the radiator can be drained off. When this is done the car can be manœuvred to the place chosen for the work. *Do not attempt to run the engine after the water has been run off.* Serious damage will be done if you do. Next remove the bonnet by unscrewing the two bolts which attach the bracket at the rear end of the bonnet rod to the scuttle rim. In the case of the Eight the best method is to disconnect the radiator support rods and tilt the radiator slightly forward till the bonnet hinge rod is clear of its support in the radiator. It will not be found necessary to remove the electric horn which is suspended on the radiator stay, as this can be swung round above the radiator stay and will not interfere with later operations. On the Eight the horn is of course mounted on the cylinder head and must be removed. Next, the tension of the fan belt should be released by slacking the dynamo clamping bolts, and the top water connection should be released from the cylinder-head block by removing the two attachment bolts. Care should be taken not to lose the joint washer, which should be placed in one of the wooden boxes which we have ready for loose parts of this description. We next remove the dynamo clamping bolts which we have previously slackened; this will allow the dynamo to be taken away (after all wires have been disconnected) and put into one of the boxes for safety. It will not be found necessary to remove the dynamo bracket from the cylinder head.



Next remove the high tension wires from the sparking plugs, taking care to replace the terminals after removing the wire. In the case of the Eight it is necessary to withdraw the distributor from the cylinder head by unscrewing the nut fastening the timing quadrant to the head and releasing the pinch bolt of the clamping plate. We are now ready to proceed with the removal of the cylinder head. This is held on to the cylinder block by nuts screwed to studs which pass through the cylinder head. These nuts should be slackened off in rotation, about half a turn at a time. This is important, as the complete removal of any one of these nuts before the remainder imposes uneven stress on the cylinder head and causes distortion. Having removed all the nuts we are now ready to lift the cylinder head from the block. The joint between the two must be broken, and this is best done by tapping the sides of the head with a wooden mallet, or if a mallet is not available, with a hammer, interposing a piece of wood to take the blow. It is possible that this may not be sufficient to break the joint, in which case it is permissible to insert a screwdriver or similar blunt wedge between the joint at the two places where the cylinder-head gasket has been cut away for this purpose. These will be found one either side of the engine. Care should be taken not to insert the screwdriver too far, or

damage to the gasket will result. Having broken the joint the head should be lifted clear of the studs, and little difficulty will be experienced if you are careful to lift the head squarely. Now lift the gasket off the cylinder head. This should be done very carefully, and force must not be used. Should it catch on the studs, or should the gasket be bent or otherwise damaged, it will be rendered useless, and a new gasket will be necessary before the cylinder head can be replaced.

Everything is now ready for decarbonizing the piston crowns, valve heads, and the face of the cylinder block. Turn the engine



FIG. 14. REMOVING CARBON FROM PISTON CROWNS

by the starting handle until two of the pistons are at the top of their travel. We then find that the remaining two pistons are at the bottom of their travel. In order that carbon may not get into these two cylinders the tops should be stuffed with rag. Now take an old screwdriver and scrape the carbon from the top of the piston and cylinder block. When this has been done, clean all trace of carbon with a rag which has been damped in paraffin.

When these two have been cleaned, bring the other two pistons to the top of their travel and repeat the process. Do not under any circumstances use emery cloth or other abrasive to give a final polish, as this can be very harmful. Do not forget to go round each valve and remove every trace of carbon. This can best be done with a small screwdriver (Fig. 14).

The removal of carbon from the cylinder head is the next job. Remove the sparking plugs and turn the head upside down on the bench and, again using the blunt screwdriver, scrape away all carbon deposit adhering to the surface of the combustion heads. When this is completed, carefully clean the head with a rag damped with paraffin.

Now turn your attention to the valves.

First remove the exhaust-inlet manifold by unscrewing the

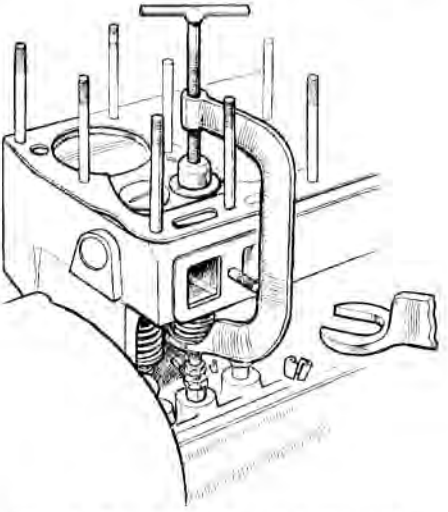




FIG. 15. THE MORRIS VALVE COMPRESSING TOOL IN ACTION
(*From "The Autocar"*)

three nuts. Now remove the cover plate on the near side of the engine, and be careful not to damage the composition gasket.

In order to remove the valves, the springs must be compressed, and by far the best way to do this is to use a valve spring compressing tool (Fig. 15), which may be obtained from any Morris dealer. When the valve spring is compressed we find two conical cotters at the end of the valve stem, and the removal of these will release the valve spring cap from the valve stem. The valve can now be withdrawn from the guide. This process can be repeated on the remaining valves, and if all the valves are removed, make sure that you know from which port they came;

this is an important point. Should the valves become mixed, however, it is perfectly easy to replace them in the correct order, as all the valves are clearly numbered on the head and the corresponding number will be found on the upper face of the cylinder block by the valve ports. Remove all traces of carbon from the valves and all will be ready to start the grinding-in process. It is my aim that this should be done easily and well, and the following process reveals the secret of good valve grinding. First of all obtain a coil spring that can be inserted in the valve

FIG. 16. SHOWING USE OF SPRING TO FACILITATE VALVE GRINDING

port, beneath the valve head (Fig. 16); this should not be too strong. Next take the valve to be ground and coat the bevelled surface with valve-grinding paste, insert the valve in the guide with the spring just mentioned behind the head, and with a screwdriver (a suction type of tool is required for the Series I valves) oscillate the valve on the seating, and here is the secret of good valve grinding. Every few oscillations allow the spring to raise the valve from the seating, then give the valve half a turn and continue. Always give that half-turn to a fresh position every few oscillations, the object of this being that constant grinding with the valve in one position will cause circular grooves to be cut in the surface of the valve and its seating, which would prevent obtaining an absolutely gas-tight fit. Grinding should be continued until an even matt-like surface has been obtained on both the valve and its seating. Should the valve show a series of black spots on its face, it is what is known as "pitted," and if

normal grinding does not remove these, the remedy is to have the valve face trued up at a garage. Do not attempt to grind these pits out—it will only cause extensive damage to the seatings in the cylinder block; this is important, as it cannot be renewed. Should any valves show signs of distortion, they should be replaced by new ones, as any attempt at grinding will also cause damage to the seatings. When the valves have been ground-in they should be withdrawn and thoroughly washed in the paraffin bath, and the seatings and the valve ports thoroughly cleaned with a rag moistened with paraffin. Do not attempt to wash away the grinding paste with paraffin owing to the danger of the paste finding its way into the valve guides or other working parts of the engine, where very serious damage would be done. Having satisfied yourself that all traces of grinding paste have been removed, the reassembling of the valves may be begun. This is a perfectly easy operation if you possess the compressing tool previously described, and should be carried out in the following manner.

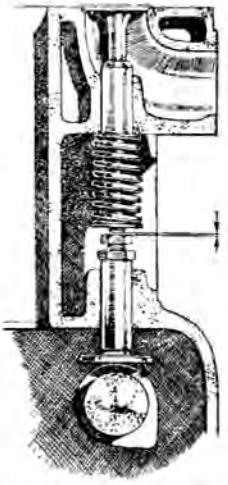



FIG. 17. SHOWING THE CORRECT TAPPET CLEARANCE

Insert the valve in its guide, making sure that the valve is in the correct guide for that particular port, place the valve spring in position and then the valve spring cap. Now, with the special tool, compress the spring until nearly the whole of the groove in the end of the valve stem is exposed. Now insert the two conical cotters in the groove, small end upwards, and release the spring. Having released the spring make sure that the cotters are properly engaged in the grooves.

It will be realized that the process of grinding will have removed a certain amount of metal from the valve head and the seating, so that it will be necessary to readjust the clearance between the valve stem and the head of the tappet. The amount of clearance recommended by the makers is ·019 in.[1] (Fig. 17). This clearance can easily be checked by using the feeler gauge,

[1] S.V. engines up to No. 20712, ·004 in. clearance; Nos. 20713 to 31750, ·019 in. to ·023 in. clearance; Nos. 31751 and onwards (4-speed models), ·004 in. clearance. Series I, Eights ·019 ins.

which is attached to one of the special tappet spanners supplied in the tool kit. Many people use an ordinary visiting card for this process, but I strongly deprecate this practice, as visiting cards vary in thickness. Should the clearance be found incorrect, proceed as follows: at the upper end of the tappet will be found two flats, and with a spanner engaged on these hold the tappet against rotation (Fig. 18). Now slacken the steel nut with a ¼-in. spanner, and without removing the spanner insert the feeler gauge between the tappet and valve stem. If you find the gauge cannot be inserted, rotate the tappet adjusting nut until the gauge can be inserted and withdrawn easily. When this has been done tighten the lock nut. It is always well to use the feeler gauge after the lock nut has been tightened in order to make sure that no movement of the setting took place while the lock nut was being tightened (Fig. 19).

It must, of course, be understood that the valve should be in the closed position when the adjustment of the tappets is taking place. In order that we may be sure that the tappet we wish to adjust is in the closed position, it is necessary to adjust them in the following sequence—

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Set | No. | 1 | tappet | with | No. | 8 | fully | open. |
| ,, | ,, | 3 | ,, | ,, | ,, | 6 | ,, | ,, |
| ,, | ,, | 5 | ,, | ,, | ,, | 4 | ,, | ,, |
| ,, | ,, | 2 | ,, | ,, | ,, | 7 | ,, | ,, |
| ,, | ,, | 8 | ,, | ,, | ,, | 1 | ,, | ,, |
| ,, | ,, | 6 | ,, | ,, | ,, | 3 | ,, | ,, |
| ,, | ,, | 4 | ,, | ,, | ,, | 5 | ,, | ,, |
| ,, | ,, | 7 | ,, | ,, | ,, | 2 | ,, | ,, |

We now come to the replacement of the cylinder head, and it is here that cleanliness should be strictly adhered to. First let us prepare the gasket for replacement. Remove any carbon adhering to the edges and coat both sides with an even film of jointing compound, and when this has been done place the gasket into position on the upper face of the cylinder block. In doing this I must stress the importance of keeping the gasket parallel with the cylinder head when it is being lowered over the studs. Do not use force should it bind on the studs. A short piece of tube, such as a box spanner, will be found very useful to push the gasket into position. Should the gasket be damaged, do not attempt to use it, but obtain a new one from a Morris agent. If required, Morris Motors Ltd. will supply other names.

The next operation is the replacement of the cylinder head. Having made sure that this is quite clean, it can be lowered on to the cylinder block, once again keeping it parallel in order to obviate jamming on the studs. In the case of the Series 1 Eight, insert the special cylinder head locating tool right home into

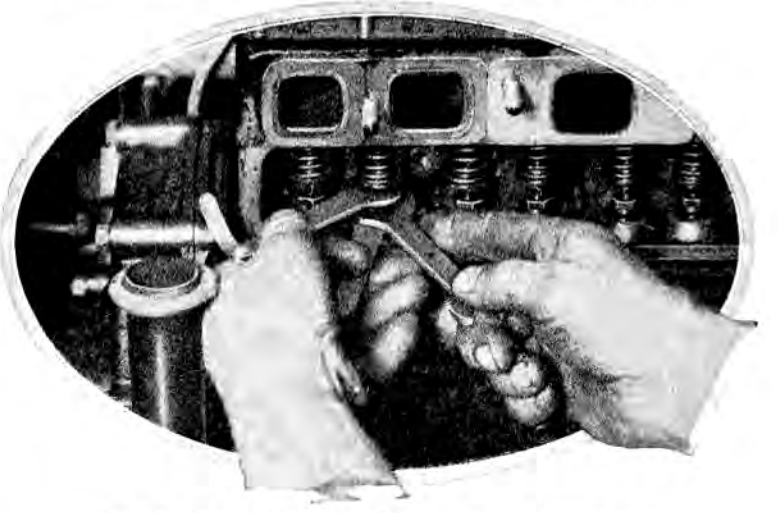


FIG. 18. TIGHTENING UP THE TAPPETS AFTER ADJUSTMENT



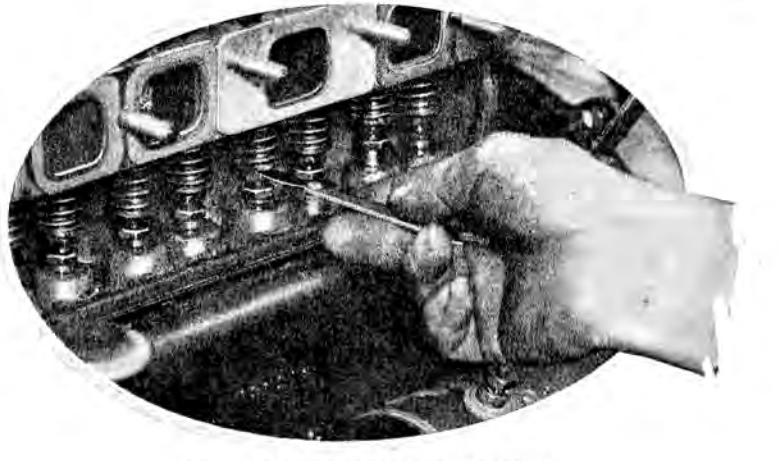


FIG. 19. TESTING THE VALVE CLEARANCE

the distributor spindle tunnel and replace the horn and dynamo brackets. When the cylinder head is in position replace the sixteen (thirteen on the Eight) cylinder-head nuts and tighten them up in the rotation indicated in Fig. 20. It will be found best to tighten these nuts a quarter turn at a time until they are all up tight. Be sure only to tighten the nuts in the order indicated.

Our next job is the replacement of the sparking plugs, but before we do this let us make sure that these are in good condition. The following plugs are recommended for use in the Minor: A.C. Sphinx type 331, K.L.G. K2, Lodge C3, and these are illustrated in Figs. 21, 22, and 23, or, on the Eight, Champion

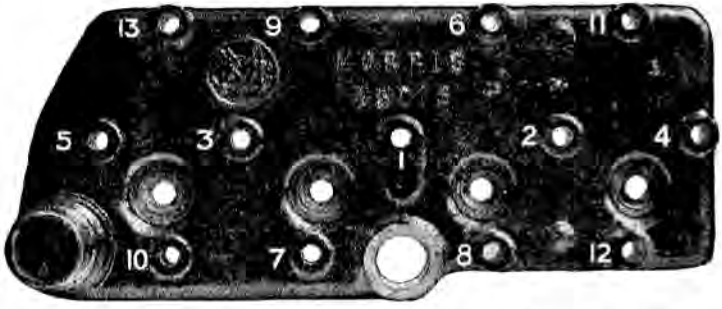



Fig. 20. Showing the Sequence in which the Cylinder Head Stud Nuts should be Tightened

14 m/m. No. L.10 and Lodge C.14. Some of these plugs have the advantage that they can be taken apart for cleaning purposes by using two spanners, as shown in Fig. 24. When the plug has been taken apart, remove all traces of carbon and wash the interior of the steel body with paraffin. Next wash all the components in a petrol bath and dry them with a clean cloth. Reassemble the plug and test the gap between the electrode and the points. The correct gap should be from ·022 to ·025 in.

Having completed this, replace the plugs and connect the high-tension leads, making sure to have the correct lead to each plug. We now replace the dynamo belt and dynamo. This involves the tightening of the dynamo cradle bolts (Fig. 25). It will, of course, be understood that the dynamo belt tension will be adjusted with this operation. When the distributor is replaced, the distributor rotating arm should be carefully rotated until the tongue of the lower end of the spindle engages with the slot on the upper end of the drive shaft. The tongue and slot are offset


FIG. 21. A.C. SPHINX


FIG. 22. K.L.G.

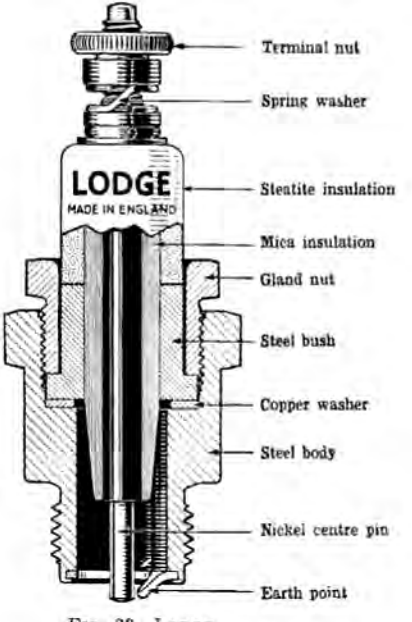



FIG. 23. LODGE

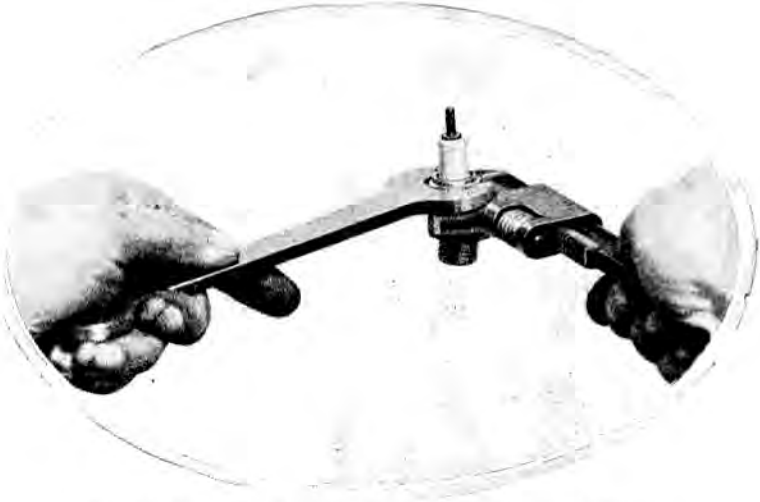


FIG. 24. TAKING A PLUG TO PIECES FOR CLEANING PURPOSES



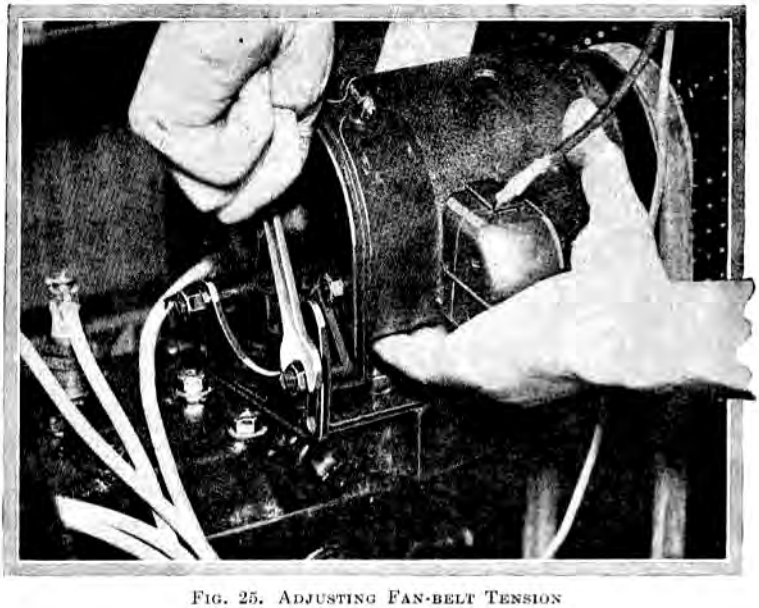


FIG. 25. ADJUSTING FAN-BELT TENSION

to ensure their correct replacement. Set the distributor timing arm to the correct mark and tighten up the locking screw. We next replace the top water joint, not forgetting the joint washer, which we have safely in the box. Should this have been damaged, replace with a new washer. Using a damaged washer would result in a water leak, which is very undesirable. And now, having made sure that everything is in order, fill up the radiator with water, and while we are on the subject let us remind you that rain-water, or water which has been softened, is the most desirable for the radiator, as it obviates the possibility of clogging the circulating system with fur, which would lead to the overheating of the engine due to faulty water circulation.

Having filled the radiator, turn on the petrol, start the engine, and let it idle until it is thoroughly warm. Now switch off and again go over each cylinder-head nut, giving a final tightening up. It will be found that quite half a turn can be given to each nut. Be sure to adhere to the sequence given previously. And now a word of warning. *Do not attempt to speed up the engine until the final tightening of the head-nuts has been effected.* All that remains is to replace the cover from the valve chamber, swing the electric horn back to its original position and replace the bonnet.



When you have covered 250 miles after decarbonizing, the cylinder-head nuts should again be tightened up, and the valve cover removed and tappet clearance checked.

## THE CARBURETTOR

The Minor and Series I are fitted with an S.U. carburettor, and I will endeavour to explain in the following pages the functions of this fitment. It will be clearly understood that the petrol which we have in the petrol tank must be atomized and mixed with air in the correct proportions, in order that easy combustion can take place, and it is the carburettor which does this. As the conditions of engine speed and load carried necessitate varying adjustment of the mixture proportions, it will be realized that in order to avoid complications this must be done automatically. The S.U. carburettor does this in the following manner. Reference to Fig. 26 will make this easier to follow.

Petrol flows into the float chamber through the union at the top. As the petrol rises in this chamber it causes the float to rise also. The float rises against a pivoted lever which engages with the lower end of a needle. The upper end of this needle terminates in a cone which engages in a corresponding conical orifice in the petrol feed and upon which it is forced by the lever. Thus the petrol supply is shut off when a predetermined

level is reached. The lever and needle mechanism is attached to the float chamber lid, and can be readily detached by unscrewing the retaining nut in the centre of the float chamber lid.

The petrol is then fed to the jet, whose function it is to break up the petrol into a petrol mist. This mist is too rich in itself for the purposes of combustion, so air is drawn in through the air intake and automatically mixed with the petrol in the correct

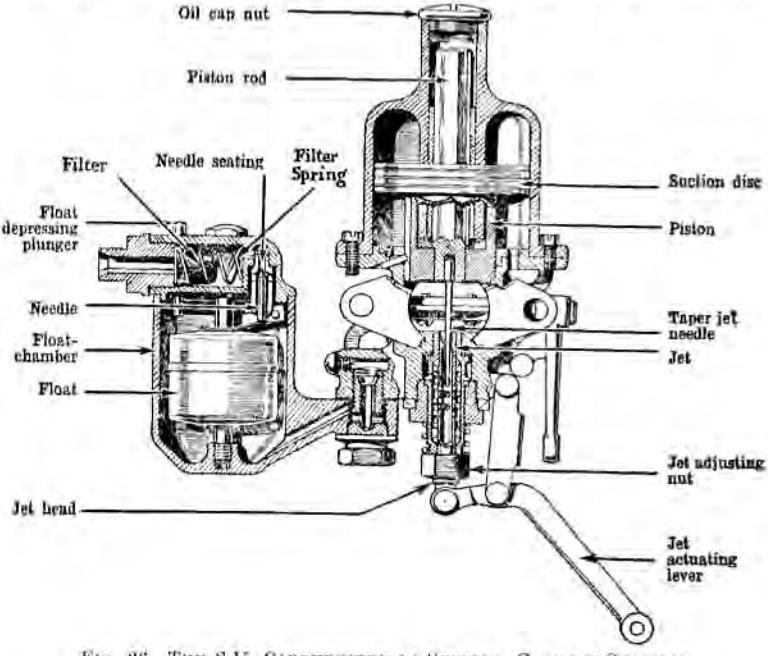



FIG. 26. THE S.U. CARBURETTOR IN SECTION, CLEARLY SHOWING ITS INTERNAL CONSTRUCTION

proportions. It is very easy to understand that the greater the demand on the engine, the more petrol air mixture will be needed. This is done on the S.U. carburettor by a tapered needle attached to the lower end of a piston. This piston is controlled by the suction from the engine. As the suction increases the needle is gradually withdrawn from the jet into which it slides. Thus the opening in the jet is enlarged, and more petrol is allowed to pass. The lower end of the suction-operated piston also works as a variable choke, which regulates the size of the passage in the

region of the jet as it rises and falls, thus maintaining an almost constant suction on the jet even though the engine demand varies.

The jet is so mounted that it may easily be moved up or down relative to the tapered needle, in order to weaken or strengthen the mixture over the working range.

This movement is regulated by a plunger situated on the instrument panel. The function of this control is to give a rich mixture, so that starting the engine from cold is an easy matter. It also

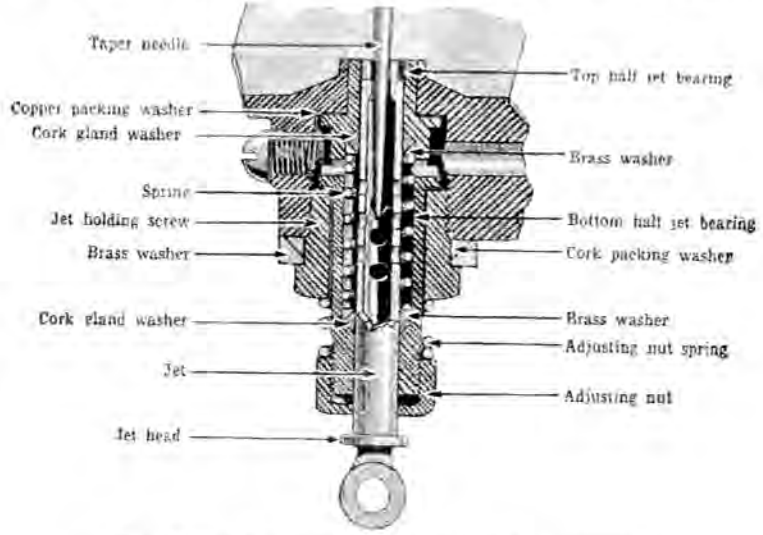



FIG. 27. AN ENLARGED SECTION OF THE JET ASSEMBLY

ensures the even running of the engine when cold. The minimum jet opening can be set by means of an adjusting nut (clearly shown in Fig. 27), which forms the abutment for the enlarged head of the jet. This should be set as indicated on page 52.

As the S.U. carburettor is extremely simple, it is very unlikely that trouble will be experienced with any of the working parts. The only adjustment which can be made, other than the slow running adjustment, is the fitting of a different size needle. This should not be undertaken, however, as the needle fitted at the works is of the correct size. It will be found that the suction chamber is sealed by the makers, which constitutes a broad hint not to interfere.

Let us now deal with the few troubles which may cause a stoppage on the road. These are very easily dealt with and may easily be avoided if the owner will spend a few minutes occasionally with an oil can. Let us deal with one cause, the piston sticking. Reference to Fig. 26 will show that the suction piston consists of the piston proper which forms the choke, the suction disk into which is inserted the hardened and ground piston rod which works in a bearing in the suction chamber, and the tapered needle which regulates the jet opening. This piston should

FIG. 28. FREEING STUCK PISTON

operate freely, and it may save delay on the road if you make sure at regular intervals that this is so. This can be ascertained in the following manner: Insert the finger in the air intake and raise the piston, which, when the finger is released should return to its seat with a click. If it does not do this, the piston rod is dry or sticky. To cure this, remove the oil cap nut on top of the suction chamber and pour in a few drops of good quality thin oil and replace the cap. Wakefield "Oilit" is particularly suitable for this purpose (Fig. 28).

Do not under any circumstances use a heavy oil such as engine oil for this purpose. Neither must oil be introduced to any other part of the suction chamber. Should it be found that oil is insufficient to free the piston a small quantity of paraffin can be

introduced in the oil cap and the piston worked up and down by means of the finger in the air intake. Should neither of these means free the piston you would be well advised to call in the aid of a Morris dealer, as it will be found that the piston chamber is sealed and should not be interfered with.

Another cause of irregular running of the engine is the presence of dirt or water in the petrol filter or in the float chamber, and you would be well advised to give a little time at intervals (say once a month) to cleaning these.

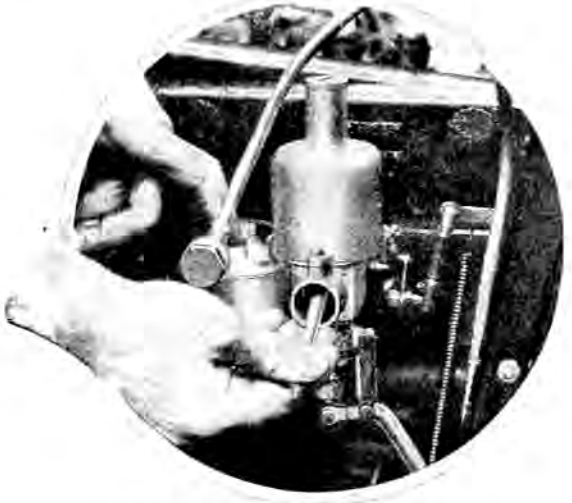


Fig. 29. Testing for Dirty Jet

Let us deal firstly with the filter. This is to be found by unscrewing the large hexagon nut at the junction of the petrol pipe and the float chamber cover. Remove the filter, and with a stiff brush and some clean petrol thoroughly clean the gauze. Do not use rag for this job as there is danger that fluff from the rag will cause greater stoppage than the dirt which has been removed. When replacing the filter care should be taken to replace the coil spring first into the filter housing and see that you replace the filter with the open-end bearing on the hexagon nut.

It sometimes happens that water finds its way into the float chamber, and an occasional inspection of the float chamber will be found well worth while.

Should you find that flooding is taking place, i.e. petrol constantly dripping from the air inlet, this may be caused by a particle of dirt on the seating of the float chamber needle. This is not very probable, as the incoming petrol tends to wash the seating clear of any particles of grit. But in order to make sure that this is not the trouble, remove the float chamber lid and twist the needle on its seating a few times. When flooding occurs always clean the filter housing.

Another cause of flooding which, fortunately, is extremely rare,

FIG. 30. CLEARING AN OBSTRUCTED JET

is a punctured float. Should this occur I advise you to seek the aid of a Morris dealer for the repair or for a new float.

If dirt in the jet is suspected, this can be confirmed in the following manner: With a small article—a pencil will do—raise the piston so that the jet can be seen through the air intake, and flood the carburettor by depressing the plunger on the float chamber lid and observe whether petrol issues from the jet (see Fig. 29). If it does not, then the passage to the jet is blocked by dirt. In order to free this, start the engine and open the throttle, then block the air inlet by placing the hand over it (Fig. 30), keeping the throttle open until the engine starts to race.

**Carburettor Adjustment.** Make adjustments when the engine

has reached its normal running temperature. Unscrew the slow running control on the dash until it is clear of the accelerator control. Screw the jet adjusting nut upwards as far as it will go and disconnect the mixture control wire from the end of the brass lever actuating the jet. Pull this jet actuating lever upwards towards the body of the carburettor as far as it will go, then slowly move it downwards away from the carburettor until the engine idles evenly, firing on all four cylinders. The jet adjusting nut should now be unscrewed until its head just comes into contact with the jet head. This will be the normal slow running position when the engine is hot, and as the jet needle is of the correct size the performance of the carburettor on the road should be satisfactory. The mixture control wire can now be reconnected to the jet lever and the final slow running adjustment carried out with the spring loaded throttle stop screw.

## S.U. PETROLIFT

One of the greatest dangers in the case of serious accidents, such as the overturning of a car, is the presence of a large quantity of petrol inside the body. This has now been overcome by fitting the petrol tank outside the body at the rear of the chassis, and it is in this position that we find the petrol tank on the Morris Minor. It will be realized that the petrol in the tank is below the level of carburettor and, therefore, a means must be found to raise the petrol from that level and to gravity feed the carburettor. This is done by means of the S.U. Petrolift, a very simple and ingenious device about which we will give a short description and a few hints on maintenance.

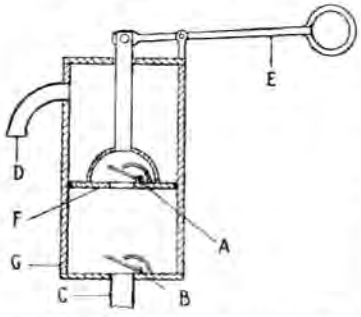



FIG. 31. WORKING PRINCIPLES OF S.U. PETROLIFT

We may safely assume that the majority of our readers will understand the working of a simple pump—perhaps we may call it the village pump—with which water is raised from a well.

We know that this type of pump consists of a cylinder *G* (Fig. 31), into which is fitted a piston *F*, and that the piston is operated by the hinged lever *E*. At the base of the cylinder is fitted a flap valve *B*. The piston which has a hole bored in it is also fitted with a valve *A*. On the upward stroke of the piston the valve in the piston head is closed and water is drawn into

the cylinder through the intake *C*, the incoming water causing the valve to rise. On the downward stroke of the piston, the inlet valve is automatically closed by the tendency of the water to run back through the intake. At the same time the descending piston compressed the water, and this is forced into the space above the piston via the valve *A*. As the piston again rises the valve *A* closes, and the water is discharged by the outlet *D*.

The principle of the Petrolift is fundamentally the same, except that we do not have to operate the pump by hand. This is done electrically. In the top of the body of the Petrolift is a cork float. Petrol in this chamber causes the float to rise and fall, and when the petrol reaches a predetermined low level an electrical contact is made which causes a solenoid coil to be charged with electricity from the starter battery. This causes the piston to rise and draw petrol from the rear tank, which rises into the upper chamber from whence it is gravity fed to the carburettor. This function is entirely automatic, and it will be readily understood that a constant flow is maintained, no matter how heavy or light the demand from the engine.

The construction of this instrument is extremely simple, and it is very unlikely that any trouble will be experienced, but a few hints it is hoped will not be out of place.

Should it cease to function, the trouble will probably be due to—

1. The pump plungers *C* or *K* (Fig. 32) sticking, due to dirt or grit getting between the pump plungers and the body. Often a blow on the pump with the fist is sufficient to get it working, when the dirt will pass right through. Should it not do so, the remedy is to remove the filter bowl *U* and foot valve *V*, also the top cap of the pump and the cork float, when it will be possible to push the plunger *C* through the bottom, after which a clean rag can be drawn through the bore of the pump. Note, when assembling the plunger of the pump that valve *E* is on top.

If the above is found to be in order—

2. First of all remove the top cap *V* from the pump to see if the float chamber contains petrol. If it does, then the trouble is not due to the pump.

3. If the pump continues to make a pumping noise without delivering petrol, it is due to one of the following causes—

(*a*) Lack of petrol in the back tank.

(*b*) Air leak, which may be due to (i) a bad joint between the filter bowl *U* and the casing, in which event tightening up will generally correct. If it does not do so a new washer will have to be fitted; or (ii) a loose petrol union on the suction pipe, that is to say any point between the bottom union of the pump and the back tank. The washer between the filter bowl and its bolt *T* should also be inspected.

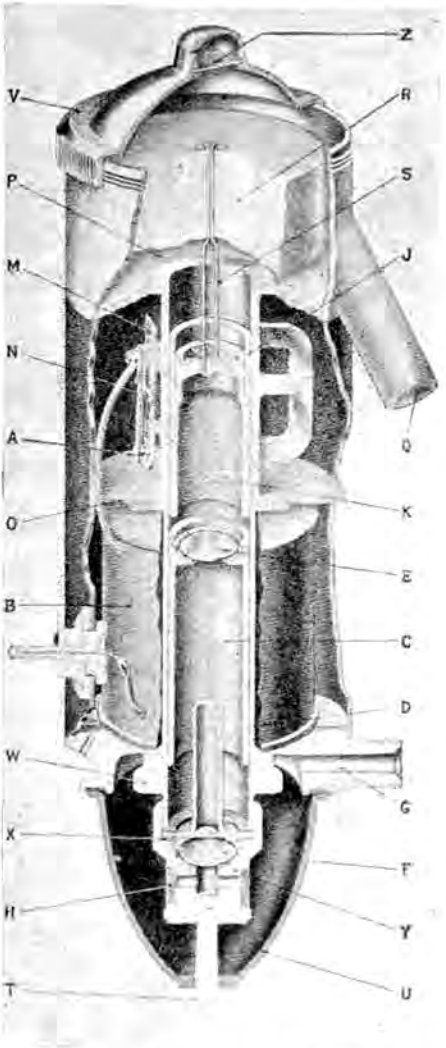



FIG. 32. SECTION THROUGH THE S.U. "PETROLIFT"

(*c*) Foot valve *F* held up. This is a very rare source of trouble. To rectify, remove the filter bowl *U*, filter *H*, and foot valve *Y* by means of a tommy bar through one of the holes. The foot valve can then be cleaned. A second filter *X* will be found in the foot valve underneath the priming tube.

4. If the pump works very slowly without delivering petrol, it is due to—

(*a*) Blocked petrol pipe or filters, in which case the filters or pipe must be cleaned out.

(*b*) Batteries run down, in which case fill the float chamber of the pump with petrol. This will probably enable the engine to be started up by hand, and as the dynamo comes into action it will boost up the batteries sufficiently to run the pump.

5. Should the pump not work at all, providing the plunger has not stuck the trouble will be due to a bad electrical connection. To test this, remove the terminal from the pump and flash the wire across the pump body. If there is a bright flash this is in order. If not, the trouble is due to the batteries being run down or bad connections somewhere in the system.

The electrical apparatus is to all intents and purposes absolutely foolproof. Practically the only thing that can cause this to cease to function is a broken wire. If reference is made to the diagram (Fig. 52) the connections will be clearly seen. To gain access to the electrical part of the pump it will be necessary to remove filter bowl *U*, foot valve *Y*, unscrew the large hexagon nut *W* holding the inlet ring, when the casing can be drawn off and the internal parts of the electrical equipment and connections inspected. Care must be taken to see that the cork gland washer which makes a petrol-tight joint between the inlet ring and electrical equipment, is in perfect condition. A new washer is advisable if the existing one is damaged.

When the casing is removed, care must also be taken to see that the wires are not broken, and particularly that the top wire does not come across the rocking contact plate *M*. A simple test to prove that the contacts are in working order, providing the bottom plunger has not stuck, is to remove the cap *V* from the top of the pump and lift the float *R* up and down its full stroke. If listened for intently the rocker plate can be heard to click as it breaks the contact.

If, after being reassembled, the pump works but does not deliver petrol, it should be primed by pouring a small quantity of petrol into the top chamber. If petrol is not available a few squirts of thin oil down the tube of the pump after removing the float *R* and top plunger *K* will have the same effect. Note that the oil *must* be thin.

## THE S.U. ELECTRIC PETROL PRESSURE PUMP FITTED TO MORRIS EIGHTS

The diaphragm type of pump is fitted, its construction being such that it will give prolonged service with the minimum attention.

The only actual maintenance attention called for is the occasional removal and cleaning of the filter. The filter is inserted into the bottom of the pump body and can easily be withdrawn

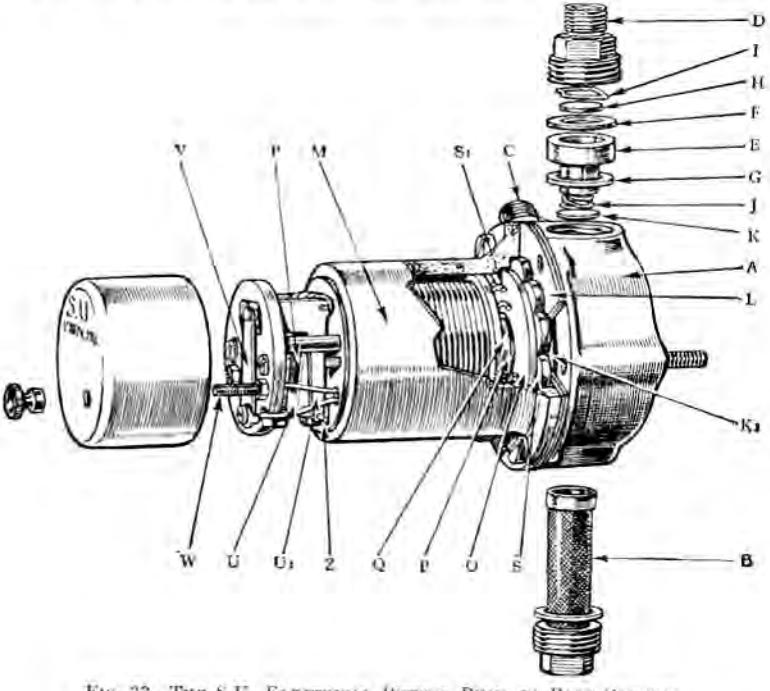



FIG. 33. THE S.U. ELECTRICAL PETROL PUMP IN PART SECTION SHOWING SALIENT FEATURES

by unscrewing its hexagon attachment screw. When removed it should be thoroughly cleaned in petrol with a stiff brush: *never use rag.*

**Tracing Troubles.** In the event of pump trouble, first disconnect the pump union of the pipe from the pump to the carburettor and switch on the engine. If the pump functions the

shortage is due either to blockage of the petrol pipe to the carburettor, or possibly to the carburettor float needle sticking up. If the pump will not function after this has been done, first remove the filter, which is held in position by the brass hexagon nut at the base of the pump, and see if this is clear. Then disconnect the petrol pipe leading to the tank and blow down this with a tyre pump to ensure the pipe being absolutely clear, and reconnect the petrol pipe.

Should the pump still fail to function or only works slowly, the stoppage may be due to a bad earth return. To test for this, make definite metallic contact between the brass body of the pump and the car chassis with the length of copper wire fitted. To ensure a good earth it may be necessary to scrape off a small portion of the black enamel with which the chassis is coated. If the pump then functions normally, the copper earth wire connections should be cleaned and remade.

A bad connection in the pump itself may sometimes be traced to the nut on the terminal inside the cover not being screwed down firmly.

Should these points be found in order, but the pump still does not work, the trouble is in the pump itself and the cause will be too much tension on the diaphragm or blackened contact points, the cause of which is the tensioning of the diaphragm. The remedy is to remove the cover from the contact points and pass a piece of thin card between the points when pressed together, so as to effect the necessary cleaning.

To release the tension on the diaphragm, remove the body from the base of the pump by undoing the small screws which hold these two parts together. The diaphragm itself will then be found to be adhered to the body of the pump, from which it will have to be separated. A knife will help in this operation, care being taken to prevent the rollers which support the diaphragm and act as a bearing from falling out. The body should then be replaced on to the base, and the screws put in loosely, but before finally tightening up it is advisable to stretch the diaphragm to its highest possible position. This is effected by switching on the pump and holding the contact points together while tightening the screws well up. This will effect a permanent cure.

In cases where the pump works intermittently or does not start clicking when the ignition is switched on, it is an indication that this trouble is occurring and it should be given immediate attention to obviate final stoppage on the road.

**The Filter.** The filter is situated at the bottom of the pump body and is easily removed for cleaning purposes by unscrewing the hexagon plug holding it in position. It should be removed and cleaned in petrol with a stiff brush every 1000 miles.

**A Noisy Pump.** In the event of the pump becoming noisy it is usually an indication that an air leak is taking place on the suction side of the pump. Check the level of the petrol in the tank and see that it is not too low; also check all unions and joints, making sure that the filter union and inlet unions are quite air-tight.

The connections to the pump may still be in order but the trouble continues to persist. It is probable that an air leak has developed somewhere in the petrol feed pipe between the tank and the pump. The best way to test this is to replace the feed pipe by a short length of temporary piping, the mouth of which can be inserted in a can of petrol. If the pump then functions properly it is obvious that a leak has developed somewhere in the feed pipe.

Beating of the pump without delivering petrol suggests that some dirt has become lodged under one of the valves, in which case they should be dismantled by unscrewing the top or delivery union and lifting out the valve cage, when they can be cleaned and reassembled. If, however, the pump struggles to pump and becomes very hot, it is probable that the pipe line has become obstructed or that the filter has become clogged.



## BRAKES

The adjustment and care of the brakes is one of the most important matters in the maintenance of a motor-car. Upon them depends the life of the driver and his passengers. During the first 500 miles the maximum braking power may not be available, and adjustment may have to be carried out in order to take up the natural surface wear inevitable with new brake linings.

Brake adjustments are of a very simple nature, and on models without the Lockheed system take the form of main adjustment by a wing nut situated at the end of the brake pedal pull rod. This adjustment is revealed by removing the floorboard just in front of the driver's seat. Tightening up the wing nut will cause all four brakes to be taken up simultaneously.

It is important with any system of four-wheel brakes that the pressure on all four wheels should be equal, that is to say, that when the pedal is depressed one wheel should not be braked more than another, and therefore the careful owner will, after the first 500 miles, carry out the following procedure. With the Lockheed system fitted to the "Eights," this is automatically cared for, but the system will be described later. In the meantime, with regard to other types, the following notes should be acted upon.

Obtain a number of bricks or blocks of wood of such a size that they will support the wheels clear of the ground. Each wheel in turn is then jacked up, the blocks being placed under-

neath the axle (thus leaving the jack free to carry on with the operation on the other wheels). When all four wheels are clear of the ground they should be turned one by one, and nuts on the corresponding brake cable should be screwed up until the shoes can just be heard rubbing on the drum when the wheel is revolving. Each nut should then be slackened back one full turn, and the brake on that wheel will be properly adjusted. This should be done to all four wheels in turn.

If when on tour (or at any other time during the life of the car) the footbrakes require adjustment, this can be easily effected

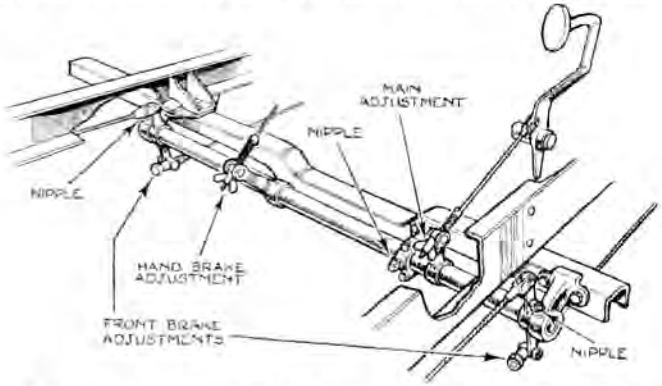



FIG. 34. SHOWING THE BRAKE ADJUSTMENT ON THE CROSS-SHAFT AND THE LUBRICATION POINTS
(*From "The Autocar"*)

by means of the wing nut already referred to. Do not forget to take up the wing nut adjustment of the handbrake a similar amount whenever use is made of this main adjustment, or you may find your handbrake ineffective.

It is important that during the life of the car the oiling nipples on the brake countershaft should receive a proper charge of oil at intervals of 500 miles.

Should the brakes not be satisfactory at any time it is always as well to ascertain that they are operating freely inside the brake-drum, as although every precaution has been taken in the design to exclude dirt and wet, it is still possible after continuous running in bad weather to have some trouble from this source. To ascertain if this is the cause, it is necessary to disconnect the cables at their junction to the brake camshaft levers and see if these levers can be easily applied by hand. If not, remove the brake-drums, as described in the following paragraphs, and

thoroughly scrape out and oil cams and clean camshaft bearings until they work quite freely; then reassemble the brake-drum, reconnect the brake-application cables and readjust. This work should not become necessary unless the brakes have been badly neglected.

**Brake Shoes.** Removal of the wheel will reveal three (two on the Eights) countersunk-headed screws between the wheel studs. Withdrawal of these screws permits the brake-drum to be drawn off the wheel studs, thus exposing the brake-shoes for examination. Should the brake linings require renewal, the brake-shoes can be removed by unhooking their return springs. This may be done by passing a length of stout string through the end of the spring, which can then be extended sufficiently to permit of its being passed out of the eye of the brake-shoe.

On the Eights, remove also the splitpins and washers from the guide-pins passing through the brake shoe webs. To release the pivot pin to allow the shoes to come away, remove the nut fastening the pivot pin to the brake cover. In the case of the rear shoes the brake return spring remains in position, and the shoes are released by removing the split pins and washers from the guide pins and releasing the pivot pin, as before.



Complete sets of brake linings and the necessary rivets may be obtained from the local Morris depot, or direct from the Morris works. When replacing the brake-shoes, care must be taken to see that they are replaced in the right position. The spring eyes are not quite in the centre of the shoes, but are offset. The shoes should be replaced so that the spring eyes are on that half of the shoe which is towards the centre of the car, or the springs may foul the wheel stud bosses at the back of the hub flange. It is a good plan to mark the shoes before removal so that they may be replaced in the same position.

If faulty functioning of the brakes is due to grease from the hubs having found its way on to the brake-drums, and this is not due to over-greasing of the hubs with the gun, it is probable that the felt oil-retaining washer is faulty and requires replacement. Since this entails removal of the hub and the use of special extracting tools, the job should be handed over to the local service depot.

**Brake Lubrication.** The brake gear of the 1933 Minor is equipped with oilless bearings for the camshaft levers. No lubrication attention is therefore required for these.

The oil can should be applied to all brake control fork joints and equalizing adjustment screws after every 500 miles freely.

Every 500 miles the oil gun should be applied to the oil nipples on the brake countershaft bearings and given two or three strokes.

## THE HYDRAULIC BRAKES

Self equalizing hydraulic brakes are now fitted to Morris Eights. They have no cross shafts, operating rods, or hinged joints to rattle or need lubrication, but are actuated by a master cylinder operated from the brake pedal. Pressure on the brake pedal is conveyed to fluid contained within the master cylinder and equally distributed by special pipe lines to each individual wheel brake.

The master cylinder and supply tank are of the automatically compensating type and maintain a constant volume of fluid in

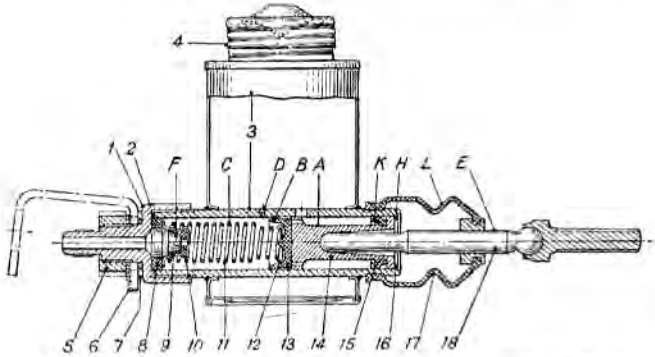



FIG. 35. THE COMBINED MASTER CYLINDER AND SUPPLY TANK

1. Master cylinder head
2. Cylinder head gasket
3. Supply tank and master cylinder barrel
4. Filler cap
5. Nut for cylinder head
6. Tabwasher
7. Stakeproof washer
8. Valve washer
9. Valve body
10. Valve cup
11. Return spring
12. Retainer for spring
13. Master cup
14. Piston
15. Secondary cup
16. Seeger circlip
17. Boot
18. Push rod assembly

the braking system. Special expanders are fitted to all the cup joints, ensuring that the system is completely sealed and leak-proof.

Automatic expansion and contraction of the fluid in the system due to temperature changes is automatically compensated for.

The fluid supply tank is mounted on the master cylinder beneath the floorboard.

The supply tank is merely a simple reservoir containing a sufficient quantity of fluid to feed the braking system under all conditions.

**The Wheel Cylinders.** The wheel brake-shoe cylinders are open at both ends, rigidly attached to the brake dust covers,

and are each equipped with two opposed pistons with cup washers and push rods for connection to the brake-shoe ends. The open mouths of these cylinders are covered with rubber boots to prevent the entry of dirt.

Depression of the brake pedal introduces fluid to the centre of the cylinder between the opposed pistons, and they are as a result forced apart, thus applying the brakes.

Since it is imperative that all air should be withdrawn from the braking system, provision is made at each wheel brake cylinder

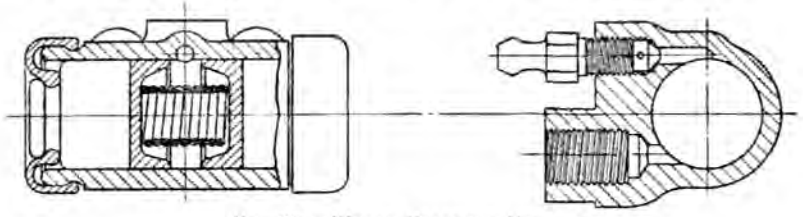


Fig. 35A. Wheel Cylinder Details



to expel any air which may be present in the pipe line. This consists of a "bleeder valve" situated at the top of each cylinder immediately above the pipe line union.

**The Pipe Line.** The pipe line is of stout gauge copper tubing, specially prepared and cleaned, and should not be replaced by piping of an inferior quality. Where spring deflection and steering movement must be provided for, special patent flexible hose connections are fitted. These, though flexible, are non-expansible, and are capable of withstanding a pressure of 6000 lb. per square inch.

**Adjustments and Replenishment.** The brakes on all Morris cars are carefully adjusted before leaving the Works, and all Morris dealers have instructions to check the brake adjustments before handing the car to you. The brake mechanism should therefore require but little attention for a lengthy mileage. The supply tank filler cap should, however, be removed every 1000 miles, and the level of the fluid checked. If it is found to be particularly low it is an indication that a leak has developed somewhere in the system, and it should be traced and rectified without delay. The supply tank should be about three-quarters full of fluid, and never less than half full. *Always use Lockheed brake fluid.*

No equalization adjustment is required, since the pressure applied to the shoes will always be equal. In the case of particles of foreign matter getting on to any particular lining with the effect of retardation, these can be cleaned off by the use of petrol, afterwards roughing the brake lining with a file.

Adjustment to compensate for lining wear is provided by two hexagon adjustment bolts to be found on either side of the wheel cylinder. Jack up each wheel in turn, spin the wheel and partly rotate these bolts, turning each *away* from the wheel centre until the brake shoes come just into contact with the drum, thus stopping the wheel rotation. Then slack back this adjustment until the wheel just rotates freely and without drag. The adjustment bolts operate snail-type cams bearing against the shoes. They are frictionally held, and require no locking device; they can easily be rotated with a spanner into the desired position. To bring the shoes closer to the drums the adjustment bolts should be rotated away from the centre of the wheel, and to bring the shoes farther away from the drums they should be rotated towards the centre of the wheel, with the spanner above the nut. When these operations have been carried out on all four wheels, all brakes should be in correct adjustment.

All brake re-lining should preferably be entrusted to a competent Morris dealer, who is also a Lockheed service agent. During the first 500 miles after re-lining the maximum braking effect may not be available, and adjustments may have to be carried out, at fairly frequent intervals, by the owner in order to take up the natural surface wear inevitable with the new brake lining.

*Do not interfere with the wheel brake cylinders unless they are found to be leaking, and obviously need attention, and do not operate the brake pedal while the drums are removed, or the wheel cylinder pistons may be forced out of their cylinders.*

**Bleeding the System.** The process of bleeding is necessary only when a portion of the system has been disconnected, or when the level in the supply tank has been allowed to fall below the half mark, thus permitting air to enter the fluid circuit. It consists of removing any air which may have found its way into the system. While this is not a difficult matter, it entails the use of special equipment to obtain the best results, and is at the best not a pleasant operation. Owners are therefore advised to entrust this work to an authorized Morris Dealer, who is also a Lockheed service agent.

**The Brake Fluid.** The Lockheed fluid used in the Morris Eight braking system is specially prepared for the purpose and it is important that no other fluid be introduced into the system for replenishment or serious trouble will ensue. This special fluid is unaffected by high temperatures, and is immune from freezing. Oil, petrol, paraffin and similar mediums are definitely injurious to some parts of the system, and should on no account be introduced to the system or used for cleaning purposes. If it is required to clean any parts of the braking system, they should be washed

either in this special brake fluid supplied or alcohol. If alcohol is used, the parts should be well dried and treated with brake fluid before being replaced.

**Leakage of Brake Fluid.** Excessive consumption of brake fluid is an indication of a leak somewhere in the system. A leak may be traced by applying very heavy pressure to the brake pedal with the car stationary and checking over the various connections until the point of leakage is found. *Note.*—The pistons of the

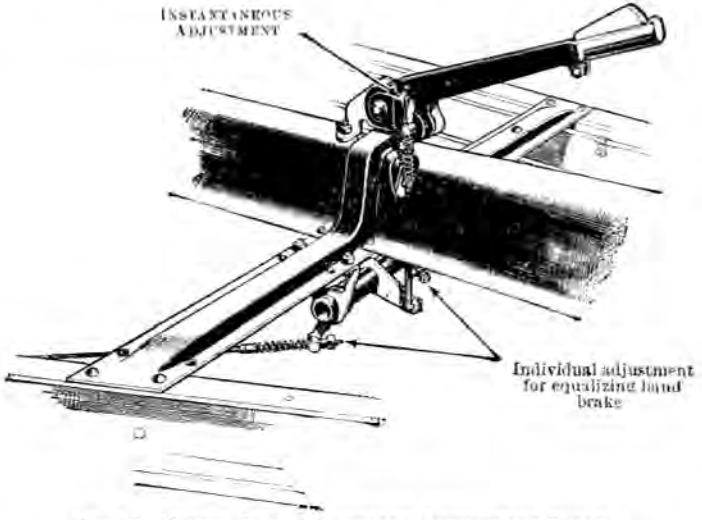



Fig. 36. Morris Eight Handbrake Adjustment Points

wheel or master cylinders should never be removed. Special tools are required correctly to assemble these components and there is nothing in them to give trouble.

**In Conclusion.** Don't use any substitute for the special brake fluid, or you will have trouble.

Don't permit grease, paint, oil or brake fluid to get into contact with the brake linings.

Don't use packing compounds for the joints; only straight metal-to-metal joints should be made.

Don't use paraffin or petrol for cleaning purposes. Nothing but alcohol or brake fluid should be used.

Don't re-line one wheel with a different make of lining from that used on the others. Always use genuine Morris linings.

Don't allow the supply tank to become less than half full of brake fluid.

**The Hand Brake.** The hand brake on the Morris Eight is centrally situated next to the gear lever and operates the shoes in the rear brake-drums by cable mechanism. Ample and simple equalization adjustment for the cables is provided at their junction to the brake cross shaft levers below the floorboards, and care must be taken to see that both brakes are applied with equal force in order to obtain maximum braking efficiency.

Instantaneous adjustment from the driving seat whereby both the hand brake-shoe controls are adjusted in unison, is provided at the junction of the brake lever pull rod with the hand lever, and it takes the form of a spring-loaded self-locking wing nut.

Great care must be taken not to take up the hand brake adjustment too tightly, or a tendency may exist for the brake to come on of its own accord when additional passengers are carried.

Other than a free use of the oil can on all joints; the hand brake mechanism requires little attention.

**Front Wheels.** These operate on journal type ball bearings, and are protected from dirt by a dust excluder and felt washer. The bearings are filled with grease before leaving the factory and should only require attention once every 1000 miles, when the wheel should be removed and the oil gun applied to the nipple found on the edge of the large circular washer. Once a year it is desirable to remove the wheel hub with its ball bearings and clean the dust excluder. This job should preferably be handed to the service depot.



## THE STEERING

**Worm and Wheel.** Worm and wheel steering is fitted to the three-speed Minors. The method of working is easily followed by referring to Fig. 36A, but in this chapter we will deal only with possible adjustments. There are two adjustments which may be necessary. Firstly, end play in the steering column; and secondly, excessive play in the steering wheel, and we will deal with these points in this order.

If end play is noticed, this may be corrected by slacking back the locknut (Fig. 37) which is to be found below the steering wheel, and giving the adjusting nut a fraction of a turn; lock the nut in position again.

Should the second adjustment become necessary (excessive play in steering wheel), first of all make sure that the play does not exist in the connections between the steering gearbox and the front axle. If these joints are all tight, there may be end float on the worm wheel, which can be eliminated by the adjusting

stud provided. If there is wear on the worm wheel, the cure is to turn the worm wheel 90 degrees to a new position. To do this, remove the steering arm below the gearbox, having also removed the stop plate which spans it. Rotate the steering wheel 90 degrees to the new position and replace the steering arm. *Replace the stop plate.* These should be the only adjustments necessary to the steering gearbox and column. Lubrication is dealt with in Chapter VI.

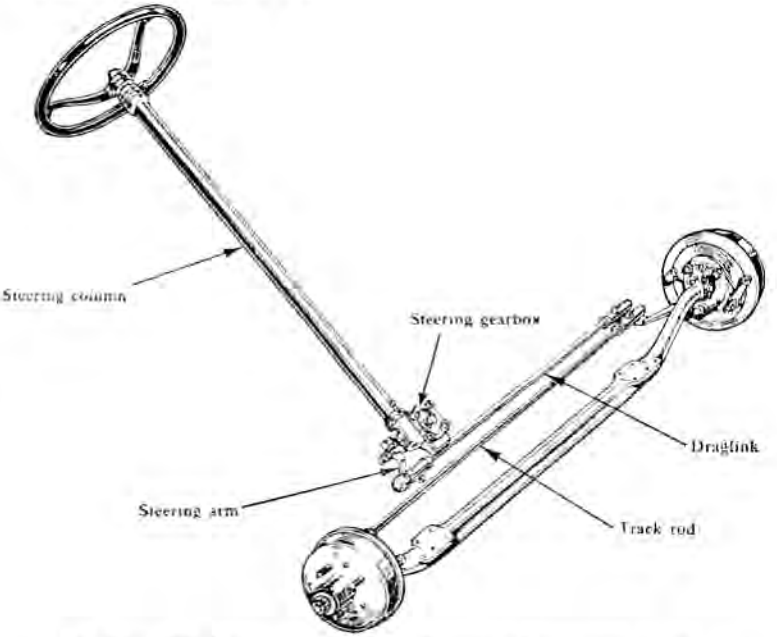



FIG. 38A. THE ARRANGEMENT OF THE STEERING MECHANISM OF THE THREE-SPEED MINOR

**Bishop Cam Steering.** This type of steering (Fig. 38) is fitted to all four-speed Minors, or to the Series I Eights, and below are given a few hints on maintenance.

Should any stiffness be noticed that we know is not due to half-inflated tyres, the front of the car must be jacked up so that both front wheels are clear of the ground and disconnect the rear end of the draglink from the steering drop arm. This will make it easy to ascertain whether the stiffness is due

to wheel mounting and steering connections or in the steering column and gearbox. End play in the steering column can be found by lifting the steering wheel in line with the column, and if you consider this excessive we recommend you to consult your local Morris agent, as the rectification of this fault has to be done inside the steering gearbox. In the case of slackness, if it is found that this is due to lost motion between the cam and the end of the rocker shaft, this can be rectified by removing one or

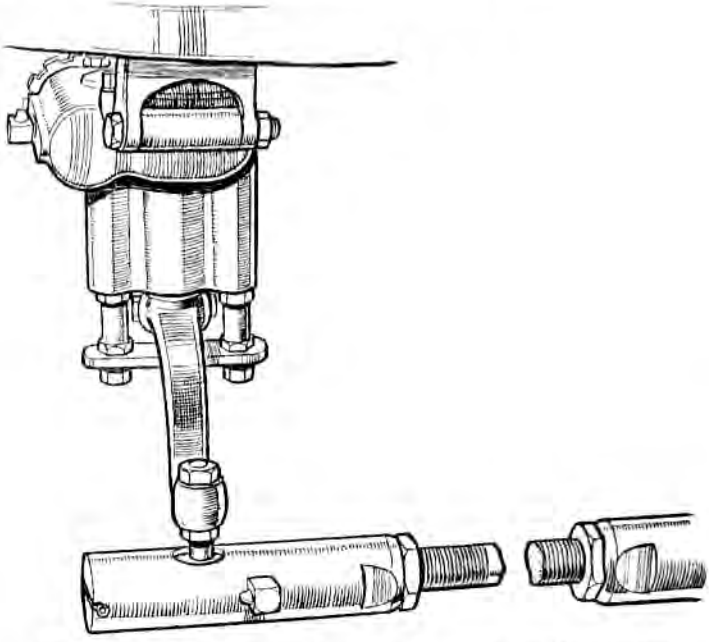


FIG. 37. LOCK STOPS BELOW STEERING GEARBOX, AND ADJUSTMENT IN DRAG LINK FOR EQUALIZING THE LOCKS OF THE FRONT WHEEL
(*From "The Autocar"*)

two of the brass shims which will be found between the cover-plate and the main gearbox casing. This lost motion should be tested when the gear is in the mid-position, as the gear is so made that there is no appreciable backlash when it is in this position. On reassembling, see that the drop arm is in such a position that you obtain full lock in both directions, i.e. the wheel stub axles

should come in contact with the stops on the axle beam in either direction.

Another cause of heavy steering is faulty wheel tracking, and it is as well to check this occasionally. This is a fairly simple matter. The length of the track rod should be such that the forward inside edges of the wheel rims measure $\frac{1}{16}$ in. less than does the distance between the rear edges. These measurements should be taken at axle level above the ground. It should also

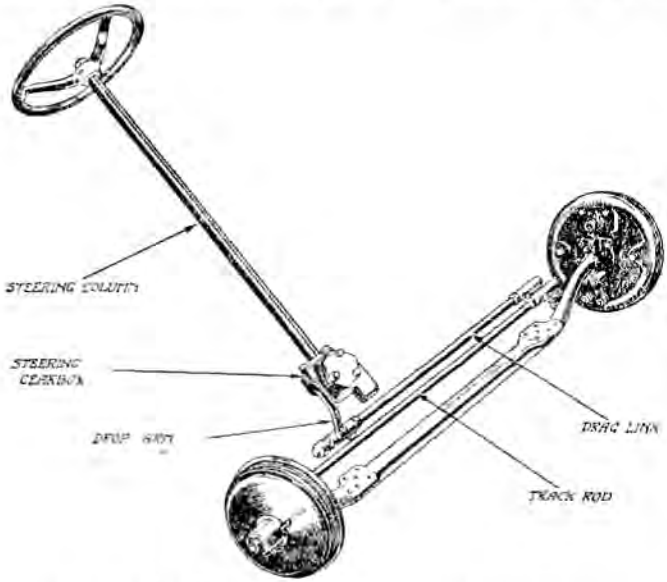



FIG. 38. THE BISHOP CAM STEERING GEAR FITTED TO THE FOUR-SPEED MINORS

be ascertained that the wheel rims are true. Correct setting entails the use of a wheel alinement gauge, which the owner is not likely to possess, so we recommend that this job be done by your local Morris agent.

**Shock Absorbers.** An important part of the satisfactory maintenance of the car which is often overlooked is the care of the shock absorbers. These are rather out of sight, therefore out of mind, but it should be realized that, in order to obtain the utmost comfort from your trips in the car, attention must be paid to these fitments.

The Minor is fitted with Armstrong shock absorbers, which are a combination of the friction band and the friction disk types, and the tension of the band is so controlled to restrain the springs on the rebound more than on the deflection. Thus, the single and double action are combined into one type. Briefly, the construction (Fig. 39) is as follows.

Two arms are pivoted together at one end. At the two ends which connect to the chassis and axle are fitted rubber bushes.

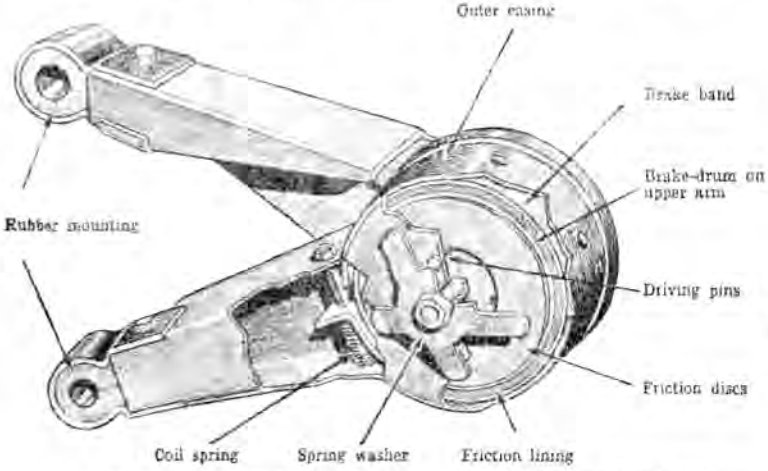



FIG. 39. THE ARMSTRONG SHOCK ABSORBER CUT AWAY TO SHOW THE DISPOSITION OF ITS COMPONENTS

These ensure a silent bearing which will not require attention as well as allowing for any angular movement between chassis frame and axle without causing strain to the arms of the shock absorber. The arm connected to the chassis carries a brake drum, while the arm connected to the axle carries a brake band encircling this drum. This band is kept in constant contact with the surface of the drum by a tension lever, which is spring loaded.

The load to the brake band is controlled by a coil spring which applies a constant load to the brake band. In addition to this spring load is a certain amount of wrapping action taking place as the two arms separate, and the resistance to the rebound of the spring is thereby increased. The opposite takes place when the arms come together; when the spring is deflected the band unwraps itself and so allows a free movement. The arm con-

nected to the axle is fitted with three driving pins which engage a steel pressure plate, the function of this being to force two disk-type friction clutches in contact with the end face of the brake drum, and by this means a constant frictional damping is imparted. The pressure exerted by the pressure plate is regulated by a star-shaped spring washer, the tension of which is controlled by a central nut. As we have already stated, little or

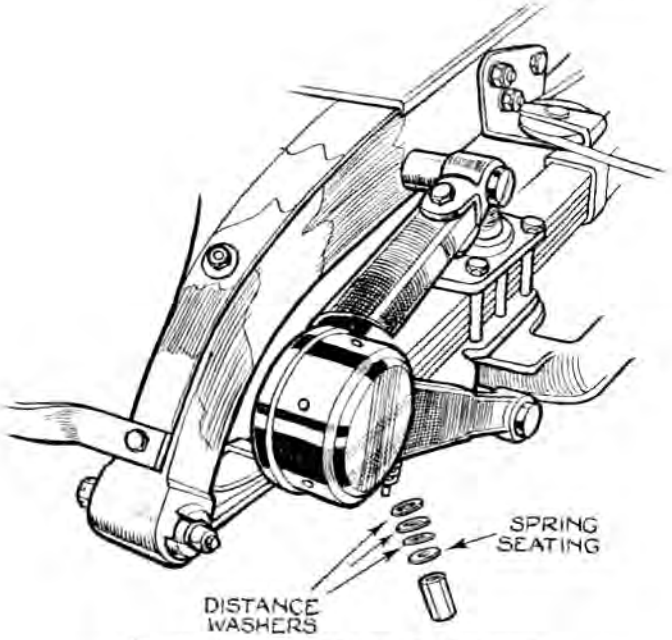



FIG. 40. ADJUSTING THE SHOCK ABSORBERS
(Do not remove the spring seating instead of a washer)
(*From "The Autocar"*)

no attention will be needed to the shock absorbers, but should it be found after, say, 2,000 to 3,000 miles, that your springs seem to cause your car to bound, it is probably due to the friction linings, which are composed of woven material, having bedded down, and in doing so caused the absorber to become slack. This is easily put right by screwing up the hexagon-headed nut in the centre of the star washer one complete turn (Fig. 40). Once the bedding down of the linings has taken place it should

not be found necessary to make any further adjustments for, say, 10,000 miles. This figure must not be taken as a definite time for adjustment; it may be found necessary to do so more often, as it is largely dependent upon the type of road over which the car may travel. Rough going will make it necessary to adjust sooner than we have stated above.

Armstrong hydraulic shock absorbers are fitted to the Morris Eight and are of the double-acting type, controlling spring action on both deflection and rebound. They are self-regulating in the sense that their shock-absorbing properties are automatically and progressively regulated to meet the road conditions prevailing. For instance, on a good road the shock absorber provides a normal resistance just sufficient to damp the spring action and avoid all trace of harshness, but when bad roads are encountered and the amplitude of the spring motion is thus increased, the shock absorber automatically builds up an additional resistance which effectively damps out excessive spring motion and enables the car to traverse bad ground exceptionally comfortably.

The shock absorbers are provided with an improved regulating valve which automatically compensates for differences in the viscosity of the fluid due to changes in temperature. These shock absorbers therefore give the maximum riding comfort under all conditions.

The regulating valve of this type of Armstrong shock absorber is controlled by springs. It is correctly set by the manufacturers and cannot be altered. No adjustments are therefore possible.

Under normal conditions the shock absorber should need no attention whatever, except replenishment of the casing with oil at lengthy intervals. Providing leakage does not take place there is sufficient oil in the casing to last 10,000 miles, or approximately one year's normal mileage. It is, however, advisable to inspect the quantity of oil in the casing at least once a year and replenish the supply, if necessary, through the filler and seal plug "N," taking care to tighten it up firmly again. Ordinary oil must not be used, and it is essential only to use the special oil prepared by Armstrong Patents Ltd. for this purpose. This is obtainable in quart tins either from Messrs. Armstrong Patents or from the Service Department at Cowley at 4s. 6d. per tin.

A special packing gland is provided to prevent oil leakage past the shock absorber spindle where it emerges from the casing. Any leakage taking place at this point should immediately be rectified by tightening up the gland nut with a suitable "C" spanner.

Care must, however, be taken not to overtighten the gland nut, or undue strain will be placed on the shock absorber spindle. It is only necessary to tighten up the nut sufficiently to effect an oil seal.

The working parts of the shock absorber are sealed within the casing and cannot be interfered with.

In case of trouble the defective shock absorber should be sent for servicing to Armstrong Patents Co. Ltd., Eastgate, Beverley, E. Yorks, who make a point of rapid servicing in connection with both repairs and spares.

**Clutch.** The clutch fitted to the Minor is extremely simple and reliable, and no trouble should be experienced with it provided the owner follows the lubricating instructions given in Chapter VI.

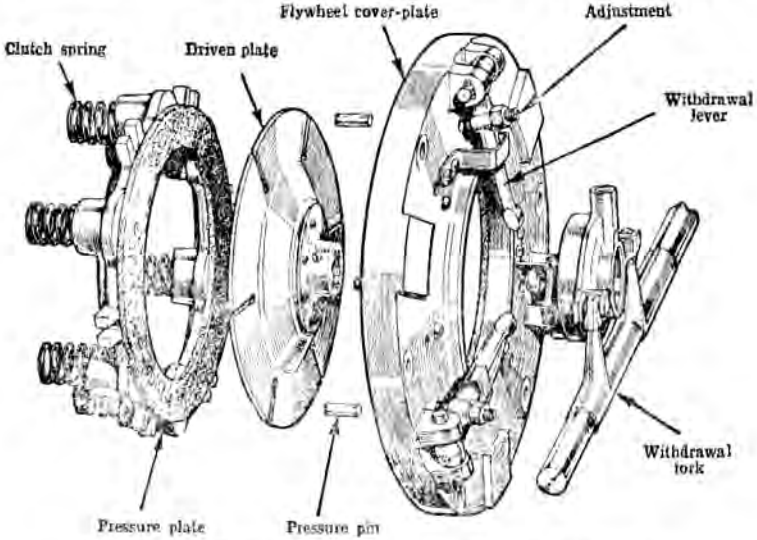



FIG. 41. THE COMPONENT PARTS OF THE CLUTCH SEPARATED TO SHOW THEIR CONSTRUCTION

In the clutch are two friction surfaces, the first consisting of two rings of bonded asbestos fabric, one attached to the flywheel cover plate and the other attached to the pressure plate. The second surfaces comprise both sides of a single steel disk splined to the driven shaft. Six driving pins pass through the flywheel, pressure plate, and flywheel cover plate, all of which consequently revolve together. In order that the driven plate may be gripped between the two rings of asbestos fabric or driving plates, six helical springs are housed between the pressure plate and the flywheel. In simple language, the working of the clutch is as follows: You will understand by reference to Fig. 41 that the

pressure plate and the flywheel cover plate are attached to the crankshaft of the engine, while the driven plate is attached to the shaft of the gearbox. When pressure is applied to the clutch pedal it causes the pressure plate and flywheel cover plate to move away from each other; thus the driven plate has no connection with the engine, and the shaft to the gearbox to which it is attached ceases to revolve. The reverse of course takes place when the foot is taken off the clutch pedal; this causes the two

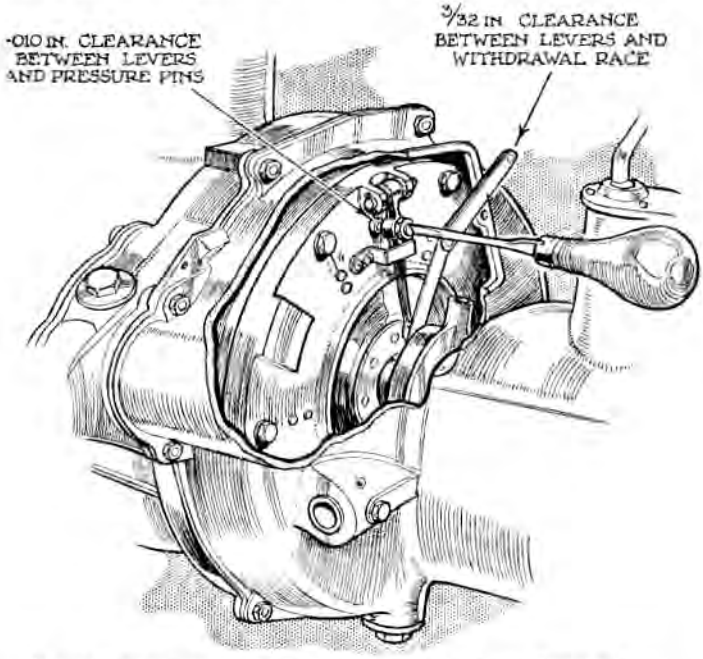



FIG. 42. ADJUSTING THE CLEARANCE OF THE CLUTCH TOGGLE ARMS
*(From "The Autocar")*

driving plates to come together, and in doing so they grip the driven plate, which in turn drives the shaft to the gearbox and so on, via the back axle to the road wheels. Although the "Eight" clutch is of somewhat different construction, the principles of operation are similar.

The clutch is intended to run dry, and oil should only be given to those points which are indicated in Chapter VI. Should you

ever notice the clutch is slipping, it is possible that oil may be finding its way into the clutch housing. I sincerely hope that this will not happen to any of my readers' cars, as the only cure is the removal of the gearbox. I shall not attempt to describe this procedure, but would advise you to let your local Morris agent deal with the job. Just one word about slipping clutches. Do not allow the clutch to slip indefinitely, as the centre-driven disk will become excessively hot, and the heat will very quickly destroy the asbestos fabric facings. When a new car is delivered from the works all the adjustments are correct, but in the cases where such materials as asbestos fabric are used, a certain amount of bedding down takes place, and while this is taking place these adjustments are altered slightly. This may happen in the clutch. In bedding down, the fabric will allow the pressure plate to take a position nearer the withdrawing mechanism, and this will reduce the clearance between the withdrawing levers, the withdrawing race, and the lever restraining springs. If this takes place, the clutch will tend to slip and the readjustment of the clutch must be undertaken immediately if damage is to be avoided. The adjustment is carried out as follows—



Remove the rectangular plate in the top of the clutch housing; this will give access to the adjustment for the withdrawal levers. It will probably be found that there is insufficient clearance between the lever ends and the face of the withdrawal race, and the locknut on each lever should be released, and with a screwdriver the screw should be slackened back until the clearance is $\frac{1}{16}$ in. between each lever and the face of the clutch withdrawal race (see Fig. 42).

I must stress the very great importance of making this adjustment so that there is exactly the same clearance between the inner ends and the face of the clutch withdrawal race. It is of the very greatest importance. I strongly advise the use of a strip of metal $\frac{1}{16}$ in. thick to be used as a gauge for this purpose. When this adjustment has been made we will find that there is now a clearance of ·010 in. between the end of the adjusting screw on the lever and the pressure pin when the lever is in contact with the restraining spring. Should there be any difficulty in obtaining the necessary clearance when the clearances at the end of the withdrawal levers are correctly set, then the withdrawal lever restraining springs should be carefully opened out, using a screwdriver for the purpose. Lastly, lock the adjusting screws by means of the lock nuts, taking care not to disturb the setting. This is easy if the screw is held with a screwdriver while the nut is being tightened. If you have carried out this work correctly there should be an appreciable amount of play in each lever when the clutch is fully released. All that remains to be done is to

replace the inspection cover. This cover is intended to function as a breather, so do not attempt to straighten the lip which is to be found at one end. You did not bend it; it is meant to be there.

On the Eight, there should always be a free movement of ½ in. at the clutch pedal. When the clutch pedal movement approaches this figure, it is essential to make use of an adjustment provided at the base of the clutch pedal so that it has ample clearance.

The adjustment consists of a slotted quadrant lever with serrated face to which the clutch pedal arm is held by a bolt. Slackening the locking nut enables the clutch pedal to be moved into the desired position. The serrated washer between the pedal and the quadrant lever has its serrations offset so that adjustment to the extent of half a serration can be obtained by rotating this washer through half a revolution. Be certain carefully to tighten up the locking nut after an adjustment has been carried out.

The thrust bearing consists of a solid graphite block and therefore requires no lubrication.

## CHAPTER VI

### LUBRICATION

In this chapter dealing with lubrication, I should like to stress the very great importance of keeping your car well lubricated. Unfortunately, one hears many cars on the road "groaning" for the want of attention to the many oiling points on their chassis. It is of the utmost importance to a piece of mechanism that it should be correctly lubricated, and in using the word "correctly" I mean that the choice of lubricant is equally as important as its application to the mechanism. Every Morris engine on leaving the works is filled with Morrisol "Sirrom" (Registered) Brand, and it is to be recommended that this brand of oil should be used when the car comes under the care of the owner. The following brands of oil are also suitable should any difficulty be encountered in obtaining "Morrisol": Wakefield Patent Castrol (XL summer, AA winter); Mobiloil BB; Motorine M; (Filtrate (Med. winter, Ex. My. summer); Shell (Double winter, Triple summer); Essoluble (40 winter, 50 summer); Sternol (W.W. Med. winter, W.W. My. summer. If any of these alternatives is used I would stress the importance of draining the sump before filling up, as it is generally considered bad practice to mix oils in the sump. *Perhaps the most important warning of all is against the use of cheap, unnamed oils which are to be found on sale at many places. Do not under any circumstances use these oils*; if you do, it may mean the ruination of your engine.



**Engine Lubrication.** The oil supply is carried in a pressed steel sump below the cylinder block. On the right of the block will be found the filler cap and the oil level indicator. On withdrawing the indicator rod it will be found that there are two marks at the lower end. These marks indicate the maximum and minimum levels for the oil in the sump. Oil adhering to the rod indicates the level in the sump. This level should be checked at intervals, and in no case should the oil be allowed to drop below the lower mark on the indicator. This level should be checked every 250 miles. The following is the best method of doing this—

Withdraw the rod and wipe it clean. Again insert the rod and take the reading. The reason for doing this is that surging and splashing of oil take place when the engine is running and accurate reading is not possible unless this is done.

And now let me describe the method of lubrication of the engine taking the Minor as an example. At the front of the engine, driven from an inclined shaft, is a gear-type pump. The oil to

this pump is filtered by a large filter situated in the sump, thus we can always be certain of clean oil circulating.

After passing through the filter the oil passes through a large diameter pipe to the pump, and from the pump it is passed the length of the crankshaft under high pressure, the crankshaft

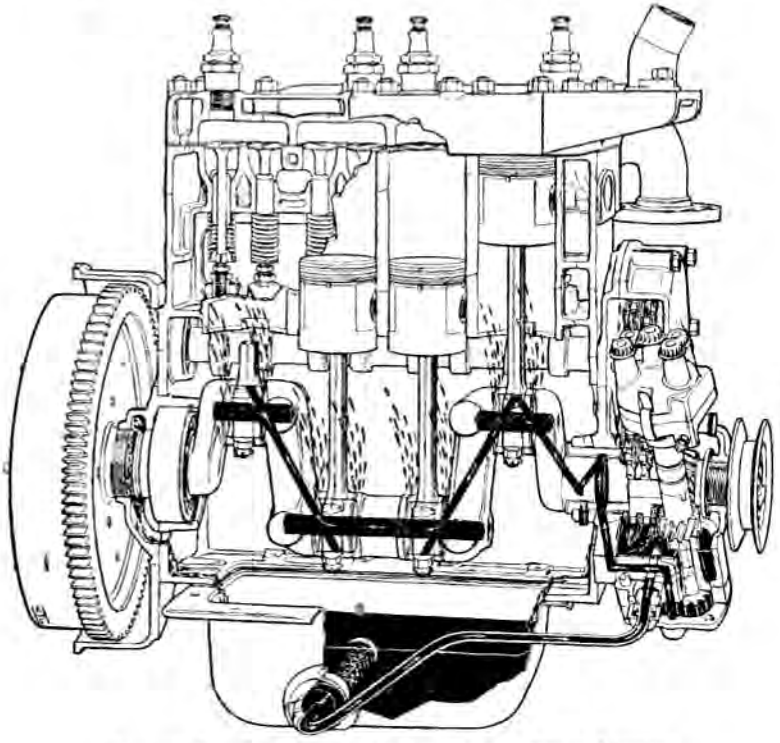




Fig. 43. The Lubrication Circuit of the Minor Engine

being drilled for this purpose. In the course of its travel the big end bearings are lubricated; mud pockets are cut in each big end bearing. The course of the oil can easily be followed by reference to the sectional illustration of the engine (Fig. 43).

It will be understood that a certain amount of oil will be splashed from the big end bearings, and this surplus oil serves to lubricate the large roller bearing at the rear end of the crankshaft.

This surplus oil also lubricates the camshaft bearings and the cylinder walls.

From the front main bearing there is an oil lead which provides a constant supply of oil to the camshaft chain and distributor drive gears. Lubrication of the small end of gudgeon pin bearing is carried out by splash from the crankshaft. In order that we may know that the oiling system of the engine is working correctly, an oil pressure gauge is fitted to the instrument board. The driver should cultivate the habit of frequently glancing at this gauge while driving. A word about the read-



FIG. 44. REMOVING OIL FILTER FROM SUMP FOR CLEANING PURPOSES

ings on this dial will be useful. It will be found on starting from cold that the gauge will show a reading of 100 lb. to the square inch. This is due to the oil being a little thick. As the engine warms up and the oil becomes more fluid, the gauge will drop back to about 60 lb. (30–60 lb. on the Series I Eight), and as long as it remains somewhere about this pressure all is well with the pump. Should it ever occur that the gauge drops back or even fails to register, stop the engine immediately and do not under any circumstances attempt to run the engine until the cause of the trouble has been found. Practically the only cause of loss of pressure is a fractured oil pipe. This would be either the pipe from the sump to the pump, or the pipe to the oil gauge.

Neglect to clean the filter would also cause loss of pressure owing to the pump being starved. I strongly advise the cleaning of the filter at regular intervals (every 1,000 miles). To do this, unscrew the oil pipe from the union on the side of the sump when the filter itself can be unscrewed and removed (Fig. 44). Clean the filter with paraffin, using a stiff brush for the purpose. Do not use any rag owing to the danger from fluff.

You have now been given sufficient details for the efficient lubricating of the engine, but before we pass on to the other sections a word on the importance of correct lubrication of what we can rightly call the heart of the car will not be out of place. Because you do not have to fill up with oil as often as you do with petrol, do not forget this vastly important thing: you should pay as much attention to engine lubrication as anything else on the car. If you neglect oil you will certainly get a "rough" engine, over-heating, bad loss of power, and in the end "seizing up" of pistons and bearings. It is to be hoped that you will come to regard your engine with a certain amount of affection. This may sound odd to some, but constant association with engines does tend to make one regard them as something more than just a piece of mechanism which hauls you and your family or friends about the country. Correct oiling is important, so "oil correctly."

**Gearbox.** Let us now turn our attention to the gearbox. Here, again, it is very important that the oil level should be correctly maintained. When the car is delivered to you it has the correct amount of oil in the gearbox, and it will not be necessary to worry about this until 500 miles have been covered. It would do no harm, however, to inspect the level after the first 250 miles. Inspection of the oil level can be carried out by the unscrewing of the plug on the side of the gearbox. The removal of the floorboards will be necessary. This is simplified on the Eight by the fitting of a dipstick level indicator, which can be withdrawn merely by removing the gearbox draught excluder.

The gearbox should be completely emptied and refilled with fresh oil after the first 500 miles. To drain the gearbox unscrew the plug which is to be found at the bottom. Just a tip; if you take the car for a short run, say two or three miles before you empty, you will find that the oil will run out more freely. Refill the gearbox with "Morrisol" Transmission Oil. Other oils for this purpose are Castrol "S," Mobiloil, "C.W.," Essolube Gear Oil Medium, Filtrate Synchro Gear Oil, Golden Shall, Sternol Liquid Ambroleum S.G., and Motorine to Gear oil A.

After the first 500 miles it will only be necessary to drain and refill every 1,000 miles. Inspect the oil level at intervals and top up if necessary. Do not allow the level (Fig. 45) to drop, as this will result in harsh running.

**Back Axle.** During the first 500 miles the oil level (Fig. 46) in the back axle should be checked at intervals. This is done by removing the plug to be found on the rear of the axle casing. A dipstick is now fitted on the Series I Eight. After the first 500 miles the oil should be drained off and the axle washed out with paraffin, the method being as follows: remove the domed cover of the axle case, wash out the axle with paraffin, using a brush for the purpose, replace the cover and refill with "Morrisol" XS-Press Oil to the level indicator. The amount of oil required will be roughly one and a half pints. After this initial 500 miles

FIG. 45. THE GEARBOX FILLING ORIFICE AND LEVEL INDICATOR



it will only be necessary to drain the axle every 1,000 miles, but the careful owner will inspect the level at intervals and top up with oil if it is found necessary.

Alternative oils are: Wakefield Hypress, Filtrate E.P., Mobiloil E.P., Shell E.P. Spirax.

**The Clutch.** As already stated, the clutch thrust bearing on the Eight consists of a solid graphite block and therefore requires no lubrication. On other models, however, it should receive regular oiling. Every 500 miles the cover plate on the clutch housing should be removed and a few drops of oil introduced to the clutch withdrawal race, through the oil duct.

which is projecting from the withdrawal race sleeve to each of the six felt washers, and to the withdrawal fork bearings through the oil holes provided. Also to the splines of the clutch shaft. Reference to Fig. 47 will show these points clearly. No difficulty should be encountered. Should it be found that the oiling holes are in a wrong position, half a turn of the engine will soon bring them to the correct position.

**The Dynamo.** A few drops of Wakefield "Oilit" should be introduced to the oilers found at either end of the dynamo every 1,000 miles. Do not overoil—two drops *only*.

**Ignition Distributor.** A screw-down greaser will be found on

FIG. 46. REAR AXLE FILLING ORIFICE AND LEVEL INDICATOR

the distributor on some models, and this should be given two complete turns every 500 miles. When empty replenish with good quality grease (Wakefield Castrolease is very suitable, or Mobilgrease No. 5).

On the Eight, add two drops of thin oil to the oiler every 1,000 miles. Every 3,000 miles withdraw the rotating arm from the top of the distributor spindle and add a few drops of thin machine oil. Do *not* remove the screw which is exposed. Take care to refit the arm correctly and push it right home. Every 3,000 miles the cam should be given the slightest smear of vaseline, and every 5,000 miles a single drop of thin oil should be added to the contact-breaker pivot.

**Steering Gear.** Worm and wheel steering is fitted to the three-speed model and the oiling of this is as follows: with the oil gun

attached to the lower Enots lubricator on the steering box the pump should be worked until oil exudes from the worm wheel bearing. Two or three strokes with the pump will be all that is necessary with the lubricator situated at the bottom end of the steering column. Where the steering fitted is Bishop's Cam, an Enots nipple will be found on the gearbox. The oil gun should be applied liberally and used until the gearbox is filled. Use "Morrisol" Transmission Oil in the oil gun. Alternative oils are Castrol "S" and Mobiloil "C."

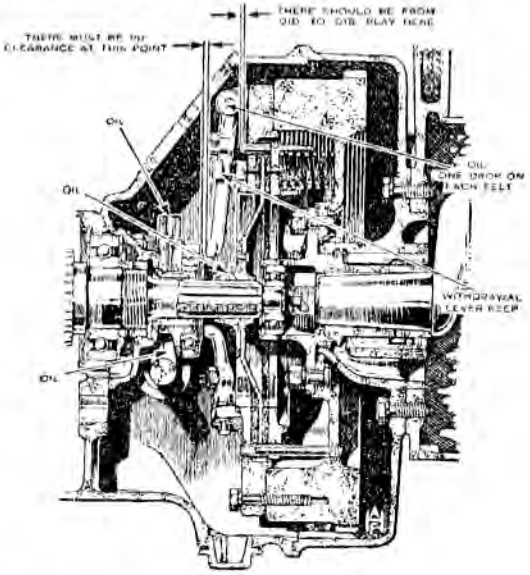



FIG. 47. SHOWING THE OILING POINTS OF THE CLUTCH

**Wheel Hubs.** We strongly advise every 1,500 miles the removal of the wheels and the application of the oil gun to the nipple, which is to be found on the end of the axle. Two strokes will be enough. Before the replacement of the wheels a little oil should be applied to the wheel stud threads, and the outside of the hubs should be smeared with grease.

**Chassis Lubrication.** Chassis lubrication is carried out by the use of the oil gun to 25 Enots lubricating nipples. In the case of the three-speed model there is one extra on the steering column, 26 in all, and 20 on the Eight, the difference being because there are no brake rods to lubricate. Every 500 miles the

oil gun should be attached to each in turn and given two or three strokes. We will not attempt to describe the position of these points, as reference to the chassis chart (Fig. 48) will show all points clearly. Perhaps chassis lubrication is the most monotonous job on a car, and for this reason many owner-drivers only lubricate the points which are easy to get at or may give the job up when it is only half done. May we stress the importance of chassis lubrication: it is equally important as the rest of the car. You must remember that many of these points are exposed to weather conditions, water and mud can accumulate at many of these points, and if plenty of grease is not present to resist the damaging effect of this, rapid wear will take place and in its trail your hand will go into your pocket for replacements. So our advice is, do the job thoroughly. You will not regret the time spent.

**Bodywork.** It is not generally realized by owners that some lubrication to the bodywork of a car is necessary. Here, again, we have a large area open to the elements, and it is necessary to apply a little oil or grease at regular intervals to the following places—

| | |
|---|---|
| Door locks and pin | A little thin grease |
| Door hinges | Wakefield "Oilit" |
| Seat slide runners | Thin grease lightly applied |
| Sliding roof | A few drops of thin oil to the felt pads on the end of the runners which slide in the side channels of the roof. |



## GENERAL SUMMARY

We now give you a general summary, giving each job under a mileage heading. This will save hunting through the chapter in order to find out when a job should be done.

*Every* 250 *miles.* Inspect oil level in crankcase of engine. Inspect gearbox and back axle. Top up to correct level if necessary.

*Every* 500 *miles.* Oil clutch withdrawal race sleeve and clutch. (except Eights). Shaft splines: give two turns to greaser on distributor. Oil steering gear. Oil all chassis points.

*Every* 1,000 *miles.* Drain old oil from engine and refill with *fresh* oil. Clean oil filter. Drain gearbox and back axle and refill with *fresh* oil. Add few drops of Oilit to Dynamo and Distributor.

*Every* 1,500 *miles.* Remove all wheels, rub over with grease, oil wheel studs and give two strokes with oil gun to nipple on end of axles. A few drops of oil ("Oilit") to dynamo bearings.

*Every* 3,000 *miles.* Add Oilit to Distributor spindle, and smear distributor cam with vaseline.

*Every* 5,000 *miles.* Add Oilit to contact-breaker points.

A word about filling and using the oil gun may save frayed tempers. Unscrew the large cap at the end of the container and

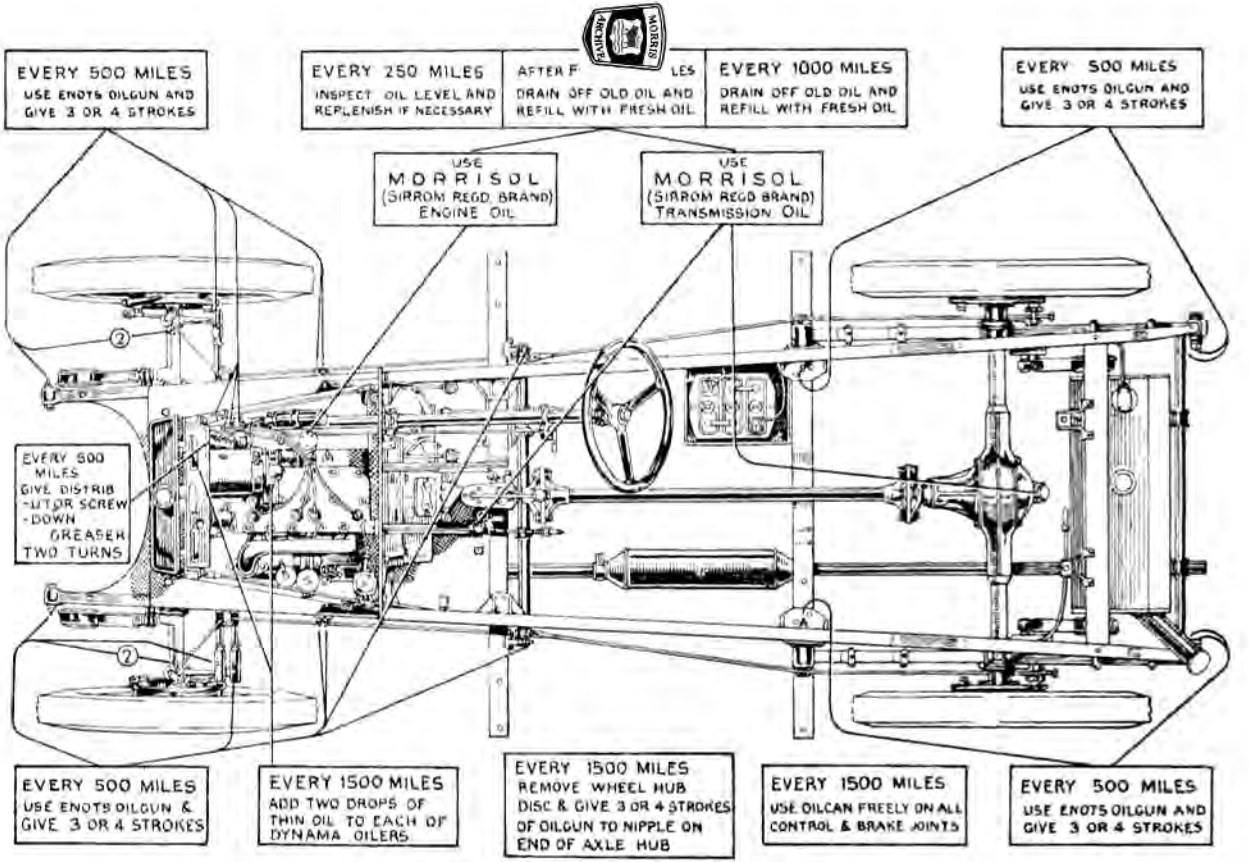



FIG. 48 MINOR CHASSIS LUBRICATION CHART

by pulling on chain you will remove the automatic feed plunger to which this chain is attached. Fill the gun and replace the plunger and end cap. At the other end of the gun will be found an extension piece with a strong recoil spring surrounding it. This extension forms a type of high-pressure pump, and in it will be found a recess with a hole in the centre. This recess is applied to the projection formed by the nipple, and by pushing the whole pump towards the nipple it will be found that oil will be forced under high pressure into the nipple.

As soon as the pressure is released the extension is again forced out by the return spring, and the vacuum created causes the extension to be ready for delivering the next charge. Always remember to replace the cap on the extension in order that the gun will not leak when not in use.

## CHAPTER VII

### THE ELECTRICAL EQUIPMENT
### LIGHTING AND STARTING

THE electrical equipment consists of a dynamo which is driven by the engine, the starter motor, the battery, and lamps and the necessary wiring. On the later models trafficators are fitted. The function of the dynamo is to supply the current for the operation of these fitments; it also supplies current for the operation of the ignition system which is described on page 91. The output from the dynamo is controlled by what is known as the third brush method. This method is used to regulate the output of the dynamo at high speeds and to keep it steady irrespective of the speed at which the dynamo is running. The dynamo speed of course must vary because it is driven by the engine. The dynamo is arranged to give alternative outputs. For instance, when running in daylight half charge can be used. This rate is only to be used in the summer when the lights are in little demand. The full charge must be used in the winter when the lights are in much greater demand. This arrangement allows you to keep your battery in good condition always. Between the dynamo and the battery is the cut-out. This is in effect an automatic switch which acts as a valve in the dynamo charging circuit, allowing a flow of current from the dynamo to the battery only. It completes the charging circuit when the dynamo is running fast enough to generate a voltage sufficiently high to charge the battery and disconnects it again when the speed is low. We wish it to be definitely known that the cut-out serves no other purpose than that of preventing current from flowing from the battery through the dynamo windings when the car is running slowly or when it is stationary. It does not prevent overcharging of the battery, as many people think.

We will now run over the circuit in order that we may see what takes place when the equipment is in use. When we switch on we allow current to flow to the coil for the purpose of ignition. Then we depress the starter switch, and this allows current to flow and operate the starter motor. When the engine is running it is of course driving the dynamo, but no charging of the battery takes place until the cut-out operates. When the engine speed is increased the cut-out will operate and allow current to pass to the battery. You can observe the cut-out coming into operation by watching the ammeter on the

dash-board. You will notice that as the speed of the engine is increased the needle will flicker over to the charge side, the flicker indicating that the cut-out has operated. As the speed of the engine is further increased the needle will rise until it reaches maximum charging rate and will remain nearly constant, irrespective of the car speed, owing to the third brush regulating system. When the car is in use at night with lights on, current flows from the battery to the lamps. If the lamps are on when

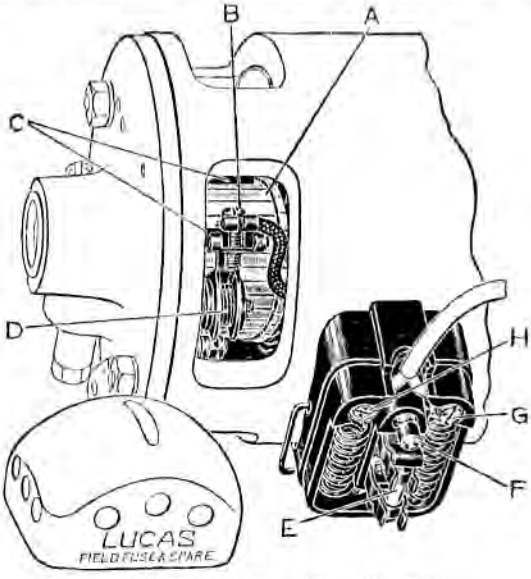



FIG. 49. DYNAMO WITH COVER REMOVED

*A* = Commutator
*B* = Screw securing brush
*C* = Brushes
*D* = Brush tension spring
*E* = Field fuse
*F* = Spare fuse
*G* = Positive termina
*H* = Field terminal

the car is stationary and engine not running, all current for lighting has to come from the battery and the amount will be shown on the discharge side of the ammeter. When you are running with lights on, the ammeter will show the difference of the amount of current being discharged by the battery, and the current passing to the battery from the dynamo, e.g. the charging rate is 8 amps., while the lights are taking 3 amps. The ammeter will show 5 amps. on the charge side. When you stop the car the cut-out will operate and a discharge of 3 amps. will be shown.

Now let us deal with the maintenance of the equipment. Firstly, the dynamo which is situated on the platform at the front end of the engine. This really requires very little attention, but periodical inspection is recommended.

**Brushes.** To gain access to the brushes slacken the single screw from the metal cover (Fig. 49); this will allow the cover to be taken away. Be careful not to lose the nut as the cover is liable to fly open when the screw is released. Test the action of the brush holders and see that they have sufficient spring tension to hold the brushes firmly pressed against the commutator when

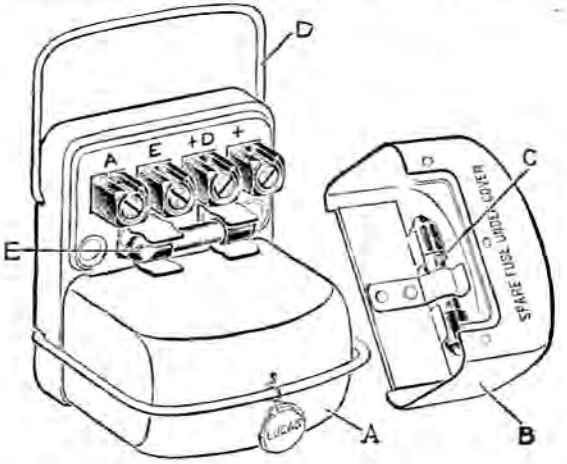



FIG. 49A. CUT-OUT AND FUSE

*A* = Cut-out cover
*B* = Fuse cover
*C* = Spare fuse
*D* = Clip for securing fuse cover
*E* = Fuse in auxiliary accessories circuits

the dynamo is running. They should also be free to move on their pivots. This is about all that can be done to the brushes by the owner-driver. After long use the brushes will become so worn that new ones will be necessary, but we do not advise you to do this job yourself but rather go to a Lucas service depot, in order that the necessary job of bedding down can be done properly.

**The Commutator.** The commutator upon which the brushes press will need cleaning at intervals in order to keep it free from oil and dust from the brushes. If the car is in regular use this should be done about once a month. Do not neglect this job as dirt will cause sparking at the brushes which will have the

effect of shortening the life of the dynamo. It is a very easy matter to clean; all that is needed is a clean duster and a piece of suitably shaped wood. Stretch the duster over the end of the wood and hold it against the commutator, slowly revolving the armature as you do so. Make sure that the segments or slots in the commutator are quite clean and free from dust. If they are not, clean them out by using part of an old hacksaw blade. Do not exert too much pressure when doing this for fear of damaging the material in the segments.

**Field Fuse.** This needs little explanation, as I believe that most owners will know that fuses are really a form of safety valve which will break the circuit should any fault occur and so save considerable damage to the equipment. A fuse in the dynamo field circuit will be found in the rectangular unit on the dynamo. On the "Eight," the fuse is housed in the cut-out and fusebox on the engine side of the dash. The fuse is of the cartridge type fitted into two clips. If it is found that the dynamo is failing to charge (this is indicated by the ammeter showing a discharge during daytime running) the fuse should be inspected. If it is found that the fuse has blown it should be replaced with the spare fuse supplied (see Fig. 49A). Should it blow again after the engine has been started we advise you to take the car to a service station, as the trouble may be serious. Replacement fuses are of the 8 amp. type, and no attempt should be made to use any other type or value.

**Lubrication.** The only lubrication necessary is a few drops of oil every 1,000 miles introduced in the lubricator at either end of the dynamo. The bearings are packed with grease on leaving the works. They will need repacking after 5,000 miles have been covered, and we advise you to have this done at a service station, as the treatment is of a special nature.

## STARTER MOTOR

The armature spindle of the starter motor is fitted with a pinion which engages with a geared ring integral with the flywheel of the engine. The pinion is absolutely automatic in action. When the starter switch is depressed the pinion engages with the flywheel. When the engine starts the pinion returns to its original position. Should it be found that the pinion does not engage, examine the screwed sleeve on the shaft to make sure that it is free from dirt. If necessary, clean with paraffin and give a few drops of thin oil. Very rarely the starter pinion becomes jammed in mesh. Should this happen it is easily freed by removing the metal cap (Fig. 50) at the end of the starter motor and turning the squared end of the shaft with a spanner. The commutator and brushes should be kept clean in the same

manner as the dynamo. It will amply repay you to exercise some thought in the use of your starter. Do not try starting your engine on a cold morning without first giving a few turns with the starting handle with the carburettor flooded; this will free the pistons in the cylinders and thus make it easier for the starter to turn the engine. The engine should be switched off when turning the engine by hand. Do not forget to switch on again when you use the starter.

A few things to observe when starting the engine—

1. Always retard the ignition where manual advance is fitted. This minimizes the possibility of back-firing.
2. Operate the starter switch firmly without hesitation.
3. Never operate the starter when the engine is running. If

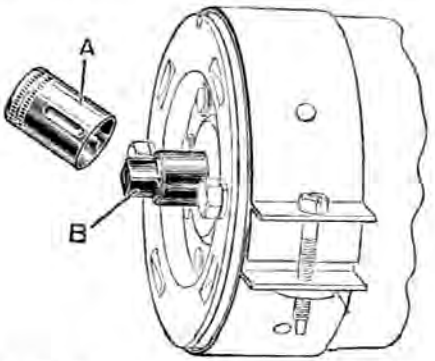



FIG. 50. SQUARED END OF STARTER SHAFT WITH COVER REMOVED

*A* = Metal cover *B* = Squared end of shaft

the engine does not fire at once, allow it to come to rest before pressing the switch again.

**Maintenance of Coil Ignition System, and Lighting System.** In the following paragraphs we give all the information which we consider necessary for the satisfactory maintenance of the ignition system, together with a brief explanation of how it works.

Current from the battery is passed to the coil which consists of an iron core around which are wound the primary or low tension and the secondary or high tension windings, and it is the function of the coil to convert the battery voltage of 6 volts to a voltage somewhere in the region of 6,000 volts which is necessary to form a spark across the plug points. When you switch on the ignition, current flows from the battery through

the primary winding. This current is interrupted by means of the contact breaker, which causes a high voltage to be induced in the secondary winding. The distributor moulding is provided on the inside with metal inserts, which are in contact with the high tension cables which connect to the sparking plugs. The centre terminal of the distributor moulding is connected on the outside to the high tension terminal on the coil and on the inside it is connected by means of a carbon brush contact to the rotating distributor arm. This arm is provided at its outer tip with a metal electrode, which, when the arm rotates, passes very close to the metal inserts. So the cycle of events is as follows—

When the starter switch is depressed the distributor shaft rotates, causing the contact breaker points to make and break alternately. This causes, every time the points open, a high secondary voltage, which will be passed from the coil to the distributor arm. From here it jumps the gap to one of the metal inserts in the distributor moulding, which in turn is connected by cable to the sparking plug. Immediately after the spark occurs, the contact breaker points will close and the cycle of operations will be repeated for the spark to occur in the cylinder next in firing order. Very little attention is needed to keep the ignition system in good condition. We will run over all the points which we advise you to give a periodical inspection. We are strongly in favour of doing these jobs at fairly regular intervals, as experience has taught us that it is far better to spend time in the comfort of a garage than having to make adjustments on the road through ignition trouble. We have found that these things generally wait for unfavourable conditions to manifest themselves.

Firstly, there is the coil. This will not need to be touched as no adjustment can be made to it. We can only advise you to keep the connection terminal clean and tight. Keep the moulded top clean and free from dirt or oil. At intervals remove the distributor moulding (Fig. 51). Examine the electrodes for any deposit, if they are at all dirty, clean them with a cloth which has been damped with petrol. Wipe the distributor with a clean dry rag. Examine the carbon brush, and make sure that it slides freely in its holder. Clean the outside of the moulding, paying particular attention to the spaces between the terminals. Now examine the contact breaker points, and here it is very important that the contacts are kept free from any grease or oil. If they are burned or blackened they may be cleaned with very fine emery cloth, and after with a cloth moistened with petrol. Take special care to see that all particles of dirt and metal dust are wiped away. Failure to keep the contacts clean will result in misfiring.

The contact breaker gap is carefully set before leaving the

works, and a gauge is provided on the spanner dispatched with each distributor. To test the gap, slowly turn the engine over by hand until the contacts are seen to be fully opened. Now insert the gauge on the spanner in the gap; if it is correct the gauge should be a sliding fit. It is not advisable to alter the setting unless the gap varies considerably from the gauge. If adjustment is necessary, proceed as follows. So far as all models except the Eight are concerned.

When the contacts are fully opened, slacken the locking nut "D" on the stationary contact screw, and rotate it by its hexagon head until the gap is set to the thickness of the gauge. After

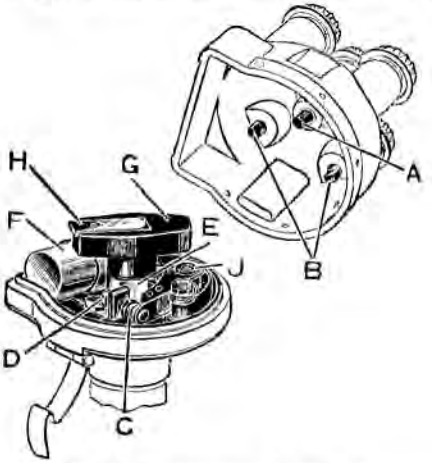



FIG. 51. DISTRIBUTOR TYPE DJ4

*A* = Carbon brush
*B* = Electrodes
*C* = Contacts
*D* = Locking nut
*E* = Rotating cam
*F* = Condenser
*G* = Rotating distributor arm
*H* = Distributor arm electrode
*J* = Contact breaker pivot

making the adjustment, care must be taken to tighten the locking nut. With the Eight slacken the two screws in the contact-breaker plate and move the plate until the gap is set to the thickness of the gauge.

**Lubrication of Distributor.** The main bearing of the distributor of the earlier models is lubricated from a greaser; this should be filled with a good quality grease, and should be given one turn about every 500 miles. With the Eight, the oiler should be given one or two drops of thin machine oil every 1,000 miles. The cam should be given the slightest smear of vaseline about every

3,000 miles or whenever it appears dry. The pivot of the contact breaker should begiven a single drop of oil about every 5,000 miles. This is all the lubrication necessary to the ignition system.

Before passing on to the detection and remedy of ignition faults I would advise you to examine the high tension cables from time to time in order to be sure that they are not perished or cracked. If you find the cables faulty replace them at once, using 7 mm. high tension cable for the purpose: the method of renewing is as follows—

Thread the knurled moulded nut over the cable, bare the end of the cable for about ¼ in. and thread the wire through the brass washer and bend back the strands over the side of the washer. Then screw the nut into its terminal.

**Ignition Warning Lamp.** This lamp is incorporated in the instrument panel. It automatically gives a red light whenever the ignition is switched on and the engine is stationary, and so reminds you to switch off. This reduces the possibility of the battery being discharged by current flowing through the coil windings. It will also be noticed that the light will remain alight when the engine is running slowly. This is because the lamp is connected across the cut-out points and will light up at speeds below the cutting-in speed of the dynamo.

Should the lamp burn out at any time replace with a 2·5 volt ·2 amp. screw-cap type.

**Trafficators.** Every two or three months raise the trafficator arm and, by means of a brush or other suitable article, apply a drop of thin machine oil to the hinge between the arm and operating mechanism.

To replace a bulb, switch the trafficator on and then, supporting the arm, move the switch to the off position. Withdraw the screw on the underside of the arm and slide off the metal plate, when the burnt out bulb can be replaced. To replace the metal plate, slide it on in an upwards direction so that the side plates engage with the slots on the underside of the spindle bearing. Finally, secure the plate by means of its fixing screw.

## THE DETECTION AND REMEDY OF IGNITION FAULTS

If a failure of ignition or misfiring occurs, unless the cause is at once apparent, the owner is strongly recommended to proceed in accordance with the table on the page 95, which should quickly enable him to locate the trouble.

Before proceeding with the examination, make sure that the trouble is not due to defects in the engine, carburettor, petrol supply, sparking plugs, etc.

**Engine Will Not Fire.** Switch on the ignition, turn the engine

and observe the ammeter reading. The engine should be turned by hand if it is known that the battery is in a low state of charge.

If an ammeter reading is given which rises and falls with the closing and opening of the contacts, then the low tension wiring is in order. If the reading does not fluctuate in this way, a short in the low tension wiring is indicated, or the contacts are remaining open. When no reading is given, a broken or loose connection in the low tension wiring is indicated, or the battery may be exhausted.

If an ammeter is not included in the set, the low tension wiring may be checked as follows: switch on the ignition and turn the engine by hand until the contact breaker points are closed. If the movable arm of the contact breaker is now pulled quickly aside with the fingers, thus separating the contacts, a spark should occur between them as they separate, indicating that current is flowing through the primary coil windings.

If a fault is indicated in the low tension wiring, examine the cables from switch or junction box to coil, and from coil to distributor. See that the battery terminals are tight and that the cables from the switch-box to the battery are secure. The battery may be dismissed as the cause of the trouble if the lamps will light.



Examine the high tension cables, i.e. cables from the coil to the distributor, and from the distributor to the plugs. If the rubber shows signs of deterioration or cracking, the cable should be renewed. Remove the distributor moulding and examine the contacts; if necessary, clean them as described. Turn the engine over by hand, and see that the contacts come together.

Test the coil independently of the distributor as follows: remove the cable from the centre distributor terminal, and hold it about ¼ in. from some metal part of the chassis and turn the engine. The sparking should be strong and regular if the coil is functioning correctly.

**Misfiring and Bad Starting.** Examine the high tension cables and the plugs. If necessary, adjust the gaps to the correct setting (about 20 thousandths of an inch). Sooty or oiled plugs may be dismantled and washed out with petrol.

The plugs and high tension cables may be tested by removing the plugs in turn and allowing them to rest on the cylinder head and observing whether a spark occurs at the points when the engine is turned by hand. It should, however, be noted that this is only a rough test, since it is possible that a spark may not take place when the plug is under compression.

Remove the distributor moulding and see that the electrodes and contacts are clean. If necessary, clean them as described on page 95. See that the contact gap setting is correct.

| Condition | Method of Detection of Possible Causes | Remedy |
|---|---|---|
| Engine will not fire. | Starter will not turn engine and lamps do not give good light. Battery discharged. | Start engine by hand. Battery should be recharged by running car for a long period during day time with charging switch in full charge position. Alternatively recharge from an independent electrical supply. |
| | Controls not set correctly for starting. | See that ignition is switched on, petrol turned on and everything is in order for starting. |
| | Remove lead from centre distributor terminal and hold it about ¼ in. away from some metal part of the chassis, while engine is turned over. If sparks jump gap regularly, the coil and distributor are functioning correctly. If the coil does not spark, the trouble may be due to any of the following causes— | Examine the sparking plugs, and if these are clean and the gaps correct, the trouble is due to carburettor, petrol supply, etc. |
| | Fault in low tension wiring, indicated by (1) No ammeter reading when engine is slowly turned and ignition switch is on, or (2) No spark occurs between the contact points when quickly separated by the fingers when the ignition switch is on. | Examine all cables in ignition circuit, and see that all connections are tight. See that battery terminals are secure. |
| | Dirty or pitted contact points. | Clean with fine emery cloth and afterwards with a cloth moistened with petrol. |
| | Contact breaker points out of adjustment. Turn engine until contacts are fully opened and test gap with gauge on spanner. | Adjust gap to gauge. |
| Engine misfires. | Dirty or pitted contact points. | Clean with fine emery cloth and afterwards with a cloth moistened with petrol. |
| | Contact breaker points out of adjustment. Turn engine until contacts are fully opened and test gap with gauge on spanner. | Adjust gap to gauge. |
| | Remove each sparking plug in turn, rest it on the cylinder head, and observe whether a spark occurs at the points when the engine is turned. Irregular sparking may be due to dirty plugs or defective high tension cables. If sparking is regular at all plugs the trouble is probably due to engine defects. | Clean plugs and adjust the gaps to about 20 thousandths of an inch. Replace any lead if the insulation shows signs of deterioration or cracking. Examine carburettor, petrol supply, etc. |

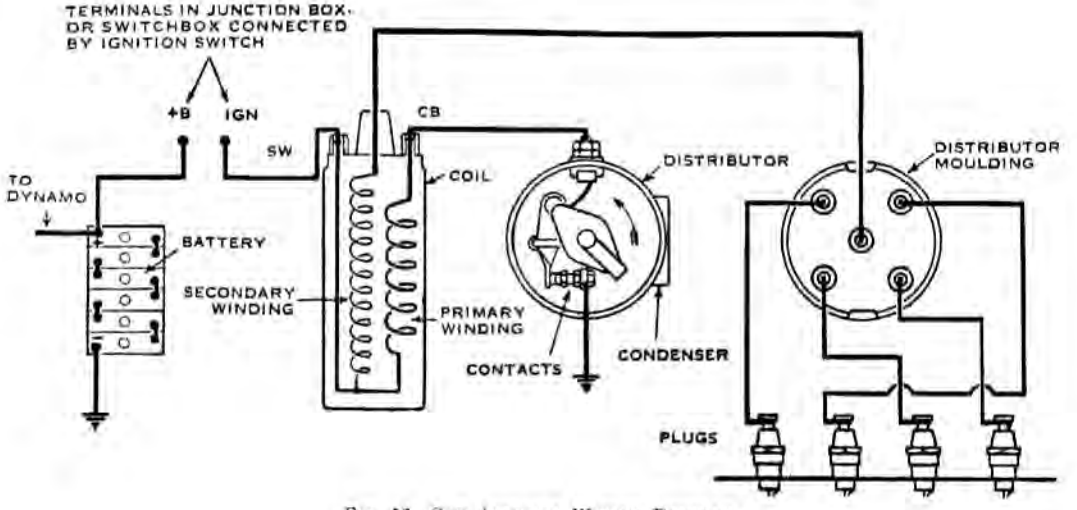



Fig. 52. Coil Ignition Wiring Diagram

If, after carrying out the examination suggested, the cause of the trouble cannot be found, we advise that the equipment should be examined by the nearest service depot.

## CARE OF THE LIGHTING SYSTEM

**Headlamps.** The headlamps employed have double filament bulbs which give a normal driving beam or an anti-dazzle light according to the position of the switch which operates them. A small pilot bulb is also fitted for use when the car is parked, thus effecting a saving in the current drawn from the battery where side lamps are not fitted. The pilot bulbs can also be used when driving along brightly-lit roads where visibility is good. We would stress the importance of having the lamps correctly adjusted and the occasional checking of this is advised. If the lamps are correctly alined the normal driving beam should be parallel with the road and with each other, in other words, straight ahead. If the lamps become out of alinement it has the effect of destroying the anti-dazzle properties. Alinement is very easy; the mountings are universal and are locked by a single nut. The important thing to remember is, when replacing bulbs use only the bulb specified by the makers. As the headlamp bulbs are carefully standardized the fitting of replacements will not necessitate refocusing. To remove the front of the headlamp, slacken the fixing screw at the bottom of the lamp and swing it aside from the slot. The front can then be withdrawn. When replacing, press the front on to the lamp body, locating the top of the rims first, then swing the screw in to the slot and lock the front into position. Should it be found necessary to remove the reflector, a cork washer will be found at the top of the reflector; turn this back, taking care not to damage it. This will expose a screw which, when removed, will allow the withdrawal of the reflector by turning it to the left. Do not attempt to clean the reflectors with anything else but a soft chamois leather, as the surfaces are protected with a colourless coating. *On no account use metal polish.*



**Dashlamp.** This operates by turning the knurled cover of the lamp which operates the switch. Withdraw the cover when it becomes necessary to replace the bulb. Turning the head to the right switches on the light. When replacing the cover make sure that the small stud is placed opposite the slot in the base.

**Electric Horn.** The horn is carefully adjusted before leaving the makers and should not be interfered with. Should it fail to function or become intermittent in action, make sure that the trouble is not due to a loose connection in the wiring, run-down battery, or a blown fuse. If an alteration of the note is noticed, this may be due to the horn becoming loose on the mounting.

We do not advise the dismantling of the horn itself but recommend you to seek the advice of the nearest service depot.

**Wiring.** Periodically, examine all the wiring of the car in order to make sure that it has not come adrift or is rubbing on parts of the chassis or body. Should any signs of chafing of wires be noticed, tape all such places with good quality black tape. Do not allow oil to stay on the wiring.

**Anti-Dazzle System.** The bulb is a special double filament type, either filament of which can be used at will, to give a normal driving beam or an anti-dazzle light as required. The main filament is located at the focus of the reflector in which the bulb is fitted, and is the source of the normal driving beam. The secondary filament is slightly in advance of the main filament, and is provided on its underside with a shield which cuts off all the rays which ordinarily would be reflected upward to cause dazzle. The combination of this forwardly placed filament and the shield results in a downward projection of a flood of light which is completely non-dazzling, and provides a driving light for an ample distance ahead.

The glass front fitted to lamps in which these bulbs are fitted is of special design, consisting of a series of vertical lenses of correct optical curvature, which spread the beam sideways so as to illuminate the full width of the road; it also diffuses the beam, giving an even field of illumination in the normal or dipped positions.



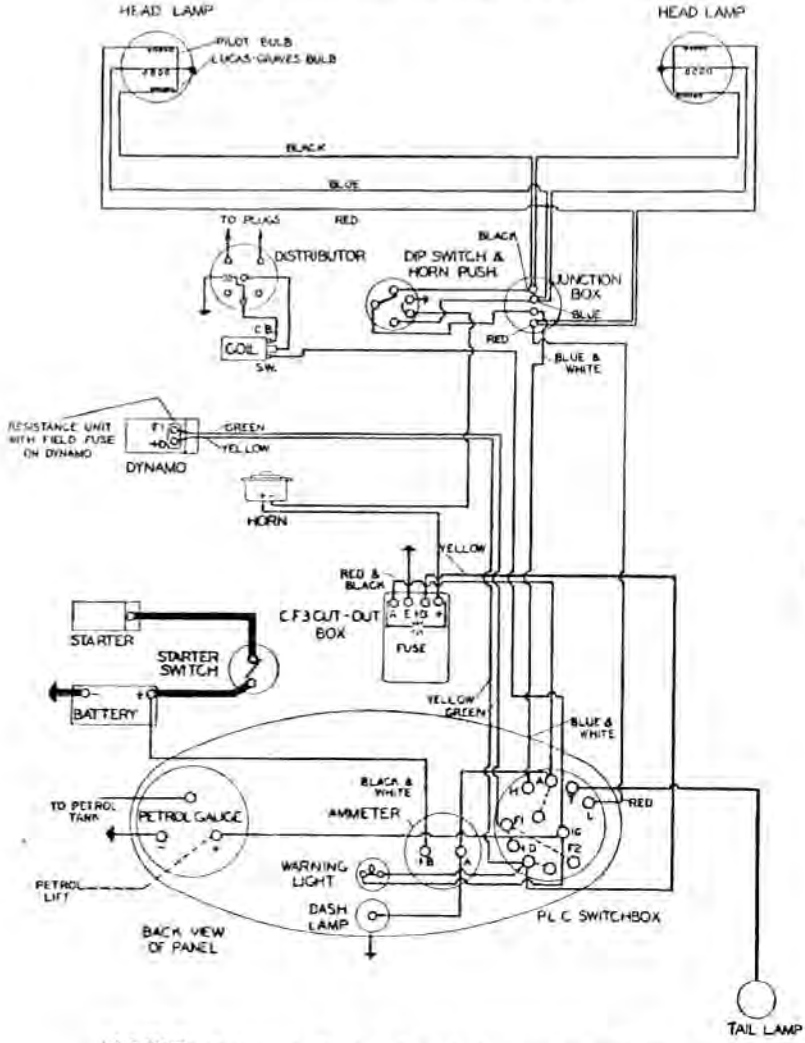
## RUNNING INSTRUCTIONS AND MAINTENANCE

**The Battery.** It is of the utmost importance that the battery should receive regular attention, as upon its good condition depend the satisfactory running of the starting motor, the current for the lamps, and, when coil ignition is fitted, the running of the car.

The following are the most important maintenance hints—

1. Keep the acid level $\frac{3}{8}$ in. above the top of the plates.
2. Add only distilled water, never tap water.
3. Test the condition of the battery by taking readings of the specific gravity of the acid with a hydrometer.
4. Never leave the battery in a discharged condition.
5. Keep the terminals spanner tight, and smeared with vaseline. Also, with earth return sets, see that the nut securing the lead from the negative battery terminal to the chassis is tight.

**Topping Up.** At least once a month, remove the vent plugs in the top of the battery and examine the level of the acid solution. If necessary, add distilled water, which can be obtained at all chemists and most garages, to bring the level above the top of




***NOTE.*** *Colours indicate coloured sleevings on ends of leads.*

FIG. 53. LIGHTING AND STARTING WIRING DIAGRAM

the plates, but well short of the bottom of the vent plugs. If acid solution has been spilled, it must be replaced by a diluted sulphuric acid solution of the strength indicated on either the side or the cover of the battery. When examining the cells, naked lights must not be held near the vents, on account of the possible danger of igniting the gas coming from the plates.

**Greasing Terminals.** Examine the battery terminals and see that they are quite tight. Keep them smeared with vaseline to prevent corrosion. Keep the top of the battery clean and dry; take care not to spill water on it when adjusting the level of the electrolyte or taking specific gravity readings.

**Testing the Condition of the Battery.** It is advisable to complete the inspection by measuring the specific gravity of the acid, as this gives a very good indication of the state of charge of the battery.

An instrument known as a hydrometer is employed for this purpose, and is obtainable from Messrs. Lucas. Voltmeter readings of each cell do not provide a reliable indication of the condition of the battery unless special precautions are taken which make such a test unsuitable for the average owner, and on that account we do not recommend this test.



**How to Use the Hydrometer.** Before measuring the specific gravity of the acid solution by means of the hydrometer, see that the acid is at its correct level. Readings should be taken for each of the cells in turn after a run on the car, when the electrolyte is thoroughly mixed. The readings should be approximately the same. If one cell gives a reading very different from the rest it may be that the acid has been spilled or has leaked from this particular cell, or there may be a short between the plates. In this case we advise the owner to have his battery examined at a Lucas service depot to trace the cause and prevent the trouble from developing.

With batteries for which the strength of the acid recommended is 1·225, the specific gravity of the solution when the battery is fully charged will be 1·225-1·250. When half discharged, it will be about 1·200, and when fully discharged about 1·150.

For other types of batteries for which the strength of acid recommended is 1·285 or 1·320, the specific gravity figures are: 1·285-1·300 when fully charged, about 1·210 when half discharged, and about 1·150 when fully discharged. These figures are given assuming the temperature of the solution is about 60 degrees Fahrenheit. For fuller particulars regarding temperature corrections write to Messrs. Lucas of Birmingham, who will send you a copy of their "First Charge" instructions.

If the battery is found to be in a half-discharged or lower state of charge, leave the charging switch, if possible, in the full

charge position for longer periods of running (see below). It should be remembered that the battery will be helped to regain its normal condition if its load is temporarily lessened, as for instance by using the side instead of the head lamps. If the gravity does not rise in a reasonable time, it is advisable to have the battery inspected at a Lucas service depot. On the other hand, if the battery is always found to be in a fully charged condition and the acid level gets unusually low, then decrease the charging time.

The battery must never be left in a fully discharged condition, and unless some long runs are to be taken it is advisable to have the battery charged up from an independent electrical supply.

**Storage of a Battery.** If the equipment is not used for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate any permanent sulphation of the plates. In no circumstances must the electrolyte be removed from the battery and the plates allowed to dry, as certain changes take place which result in loss of capacity.

**Use of the Battery Charging Switch.** The battery is the "reservoir" for the energy generated by the dynamo and once it is "full" there is no object in delivering further current to it. While it is always better to keep a battery overcharged rather than undercharged, it should be remembered that excessive overcharging will quickly reduce the acid level and tend to shorten the life of the battery.

In summer, when the lamps are very little used, keep the switch in the "half-charge" position; and in winter, when the lighting and starting load is heavier, keep the switch in "full-charge" position. For cars running under average conditions, this will ensure that the battery is kept in a fully-charged state.

However, in exceptional cases it may be advisable to use the switches out of season. For instance, if in winter the car is run regularly during the day with practically no night running, and the hydrometer readings are always found to be about 1·225 or 1·285 (according to the type of battery), and if the acid level gets unusually low, then it is probable that the battery is being overcharged. In these circumstances, move the charging switch to the half-charge position. On the other hand, if exceptional use is made of the lamps and starter in the summer, causing the battery to be in a low state of charge (hydrometer readings of 1·200 or under), then run with the charging switch in the full-charge position.

HOW TO LOCATE AND REMEDY LIGHTING TROUBLE

| Symptoms | Probable Fault | Remedy |
|---|---|---|
| | Battery discharged. | Charge battery either by a long period of daytime running or from independent electrical supply. |
| Lamps give insufficient illumination. | Lamps out of alinement, or bulbs out of focus. | Aline lamps and focus bulbs. |
| | Bulbs discoloured through use, or reflectors dirty. | Fit new bulbs or clean reflectors. |
| Lamps light when switched on, but gradually fade out. | Battery discharged. | As above. |
| Brilliance varies with speed of car. | Battery discharged. | As above. |
| | Battery connection loose or broken. | Tighten connections, or replace faulty cables. |
| Lights flicker. | Loose connection. | Locate loose connection and tighten. |
| Failure of lights. | Fuse blown. | Examine wiring for faulty cables and remedy. Fit replacement fuse. |
| | Battery discharged. | As above. |
| | Loose or broken connection. | Locate and tighten loose connection, or re-make broken connection. |

HOW TO LOCATE AND REMEDY STARTER MOTOR TROUBLE

| Condition | Probable Fault | Remedy |
|---|---|---|
| Motor sluggish or fails to move engine. | If engine cannot be turned by hand, then fault is due to a stiff engine. | Locate and remedy cause of stiffness. |
| | If engine can be turned by hand, then trouble may be due to— | |
| | Battery discharged. | Start by hand. Charge battery either by a long period of daytime running or from independent electrical supply. |
| | Broken or loose connection in starter circuit. | See that connections to battery, starter, and starter switch are tight, and that cables connecting these units are in order. |
| | Starter commutator or brushes dirty. | Clean. |
| | Brushes worn, not fitted correctly or wrong type. | Replace worn brushes. See that brushes "bed" correctly. |
| | Starter pinion jammed in mesh with flywheel. | Rotate squared end of starter shaft with spanner. |
| Starter operates but does not crank engine. | Pinion of starter drive does not engage with flywheel, due to dirt on screwed sleeve. | Clean sleeve with paraffin and add a few drops of machine oil. |
| Starter pinion will not disengage from flywheel when engine is running. | Starter pinion jammed in mesh with flywheel. | Rotate squared end of starter shaft with spanner. |

HOW TO LOCATE AND REMEDY DYNAMO TROUBLE

| Symptoms | Probable Fault | Remedy |
|---|---|---|
| Ammeter fails to indicate charge when running with no lights in use, or gives heavy discharge with lights on. | Dynamo not charging due to: Broken or loose connection in charging circuit causing field fuse to blow. (When fitted.) | Examine charging circuit wiring. Tighten loose connection or replace broken lead. Particularly examine battery connections. Fit replacement fuse. |
| | Commutator greasy or dirty. | Clean with soft rag moistened in petrol. |
| Ammeter gives low or intermittent charge reading | Dynamo giving low or intermittent output, due to— | |
| | Loose or broken connections in dynamo circuit. | Examine charging circuit wiring. Tighten loose connections or replace broken lead. Particularly examine battery connections. |
| | Commutator or brushes greasy. | Clean. |
| | Brushes worn, not fitted correctly, or wrong type. | Replace worn brushes. See that brushes "bed" correctly. |
| Ammeter gives high charge reading. | Dynamo giving high output due to— | |
| | Loose connections in dynamo charging circuit. | Examine charging circuit wiring, particularly battery connections. Tighten loose connections. |
| | Battery acid level low. | "Top up" cells with distilled water. |
| | Brushes not fitted correctly. | See that brushes "bed" correctly. |
| | Control brush position altered. | Have control brush adjustment re-set at nearest Lucas Service Depot. |

## CHAPTER VIII

### CARE OF TYRES

DUNLOP tyres are fitted as standard on all Minors and Eights and it is advisable to refit with the same make of tyre. Dunlop's attribute 90 per cent of premature tyre failure in some degree to inadequate inflation. It is necessary to determine the degree of inflation by the load to be carried, in relation to the size of tyre used, as a tyre must have sufficient air pressure to support the load. "Overloading" and "under-inflation" are different terms for the same thing. The fault usually lies in under-inflation, as the tyre section is chosen for the normal load of the car. The pressures recommended are given later.

The effects of under-inflation are as follows—

1. The rocking motion causes the tyres to become chafed, and will possibly result in their being cut through at the base of the side wall.

2. A severe "hingeing" action is developed on the shoulders of the tyre, causing undue flexion or bending, which in turn produces excessive internal friction, and there is a tendency for the plies of material to slide upon one another, so that adhesion between them is destroyed.

3. The edges of the tyre tread, not designed to resist continuous wear, are forced into contact with the road, thus increasing the risk of puncture.

4. The capacity of the tyre to resist other destructive influences is considerably reduced.

Do not, even for a short time, run with under-inflated tyres, for periodical wear may have destructive effects which will not disappear when the condition is remedied. It is advisable to test air pressure in the tyres at short intervals and remedy any deficiency. Tyre mileage, liability to tyre destruction, and more tyre troubles on the road will all be the sacrifice for any additional comfort secured by running with tyres at low pressure.

It is a mistake to reduce the pressure of tyres in hot weather, as lowering the pressure causes internal friction, resulting in more heating up. If the pressure is not sufficient a tyre will become too hot and internal friction is being developed. The effect of hot weather on tyres is negligible.

Specially designed gauges for testing pressure will be found more satisfactory than gauges attached to tyre pumps.

Never run on a tyre entirely deflated, even for a short distance,

as the flexible walls of the tyre, deprived of all support, are crushed flat and cut by the rim, and the material will be torn. There is also a danger of cutting the tube and tearing out the valve.

Though a tyre is hard wearing, one should avoid all risks of damaging even in slight ways. Sharp edges such as a kerb, struck by the tyre at speed or with a load may cause heavy strain on the material forming the casing of the tyre. This may only show later by a split of the fabric cover, though the tyre and tube may still be unharmed. The tube, however, will probably force its way into the crevice caused by the split and become worn, when a burst will follow, involving further damage to the weakened part of the cover. Cord tyres withstand impact better than canvas tyres, and only a very violent concussion will cause a split.

If a cut is deep enough to penetrate one or more plies of the casing material it should be attended to at once, as if left it will develop into a burst, which is a far more serious proposition. It is important, whenever one discovers a cut, to fill it with the special preparation sold for this purpose, in order to prevent water penetrating through the cut to the casing, which causes rapid deterioration of the material. Severe cuts should be placed into competent hands as these need vulcanized repairs.



The trouble of a tyre blowing off the rim is more likely to be caused by too small a pressure than one too large, for below a certain point it is insufficient to hold the tyre firmly in place, and a swerve of the car is likely to pull the tyre off the rim. The blow-out is probably due to reduction of pressure caused by a puncture, so before fitting a new tube examine the cover for the object which has caused the puncture. Bent steering tie rod, looseness in steering connections, unequal "set" of springs, broken spring leaf, or the wheel loose on its hubs, will cause irregular and rapid wear of tyre treads. Any faults of this kind have the effect of allowing the tyre to run in a direction which is not parallel with its diameter.

Harsh application of the brakes tends to lock the wheels and skid the tyres along the ground. In this way it is quite possible to grind off a portion of the tread completely, the extent of the damage depending, of course, upon the momentum of the car in relation to the power of the brakes.

Tram lines, although impossible always to avoid, are dangers sufficiently pronounced to discourage making a habit of regularly running along them. The rails often protrude above the level of the road, exhibiting a sharp edge that will quite likely cut the tyre, and cause unequal distribution of the tyre load. Points should always be avoided, as they are generally very sharp, and

will cut the tyre. The danger of skidding upon wet or greasy rails is too well known to need emphasis.

Oil and grease produce softening of the rubber which will eventually penetrate to the casing, causing a tendency to separate the material ply from ply. Accordingly, care should be exercised

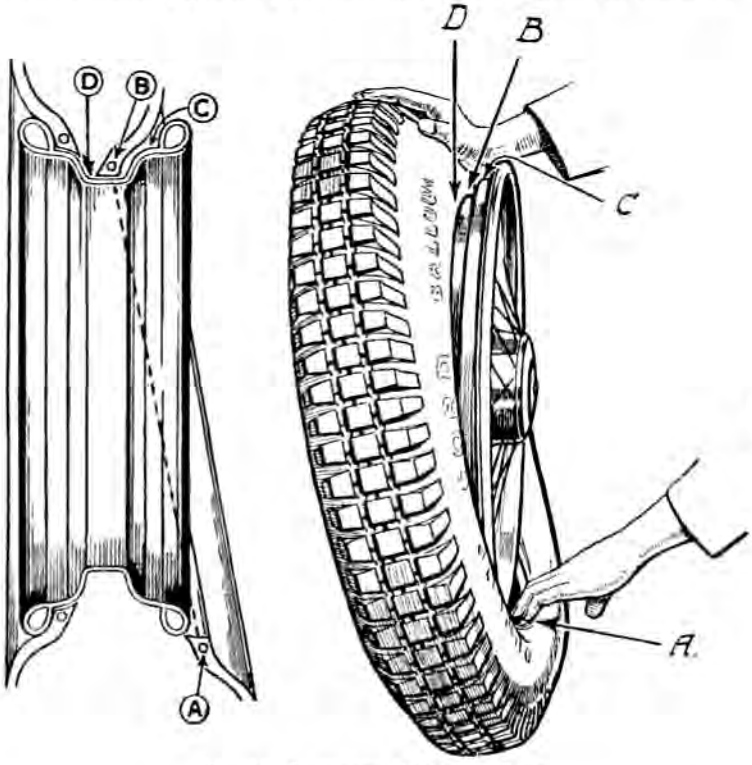



FIG. 54. REMOVING WIRED-ON TYRE

to avoid over-lubrication generally, and especially of the back axle differential or part hubs. Also, tyres should be kept free from oil and grease, which should never be allowed to accumulate on garage floors. Petrol dissolves oil and grease quite easily, but should only be used very moderately, as it is also detrimental to rubber.

Damage to inner tubes chiefly arises as the result of penetration or failure of the cover, but there are one or two forms of misuse

which are peculiar to tubes and sometimes puzzling in their effects.

**French Chalk Damage.** As a lubricant, to prevent the tube adhering to the inner side of the cover, chalk is essential, except where covers are painted inside, as is the case with Dunlop tyres.

However, a perished and wrinkled condition of the tube is almost invariably due to an accumulation of french chalk. The best way of avoiding this damage is not to put any chalk inside the cover, but to dust the tube freely with it and shake off any surplus. Thus, a sufficient quantity has adhered to serve the purpose for which it is intended. Tubes damaged by chalk can seldom be repaired, as the chalk collects in little lumps, and by

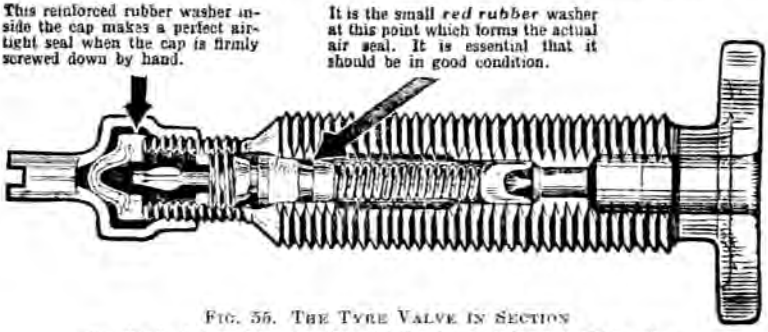



FIG. 55. THE TYRE VALVE IN SECTION
Showing its internal construction and the slotted valve cap which, when reversed, can be used as a screwdriver to remove the interior

a purely physical action will wear away the rubber until it can be quite easily torn by the fingers.

**Fitting Tyres.** The fitting of tyres is quite an easy matter. The edges of the tyres enclose a slightly smaller wire ring, and to get the smaller tyre edge over the edge of the rim all that is necessary is to push the tyre edge at one place into the centre of the rim. The tyre edge at the opposite place will then fit in quite easily. When the tyre is inflated, it will be found that the edges will then fit quite comfortably in their correct place. The tyre cannot now be moved again, unless it is deflated.

To fit the tube, it must be very slightly inflated before placing it into position. First place the tyre on the edge of the rim, then with the valve through the hole in the rim the tube can be placed in the cover. The tube must be the correct way round before placing in the cover. Fit the cover at the edge opposite to the valve hole and press into position. A lever may be found useful for the last few inches, but always be careful not to damage

either the tube or cover. Do not force the wire edge of the rim, and while inflating, see that the edges of the cover are fitted evenly round the rim. It will be found a much easier job if opposite points are carefully fitted first.

**Removing Tyres.** Fig. 54 shows how to remove a tyre without damage. The tyre cannot blow-off because the edges are inextensible—neither can the tyre edges be lifted by levers from the rim shoulders over the rim edges. But by pushing the tyre edge down off the rim shoulder into the depressed centre of the rim at *D*, then the tyre can be easily lifted off the rim at *A*. You cannot, however, pull the tyre edge at *A* over the rim edge until the tyre edges at *B* are pushed off the rim shoulder *C* down into the well *D*, then tyre edge at *A* comes over the rim easily. This is an easy and simple operation, and requires no force.

Above all, remember the tyre edges are inextensible—force will only damage the tyre and cannot stretch the edge.

**Valve Interior.** The airtightness of the valve depends upon the proper functioning of its "interior" (Fig. 55). It may be tested for airtightness by rotating the wheel until the valve is at the top, and inserting its end in an egg-cupful of water. If bubbles appear, in spite of the fact that the valve interior has been well screwed down, it is evidence that its seating is faulty. It should be removed and replaced by a new interior. It is advisable always to have spare interiors handy, and these are procurable suitably packed in small containers.

The rim nut should be kept tightly screwed up on to the rim. This nut, in addition to holding the valve in position on the rim, forms a water seal, preventing the entry of water through the valve opening.

TYRE PRESSURES

| Type | Tyre Size | Front | Rear |
|---|---|---|---|
| (1933 models) | | | |
| Two-seater | 3·5—19 | 22 lb. per sq. in. | 27 lb. per sq. in. |
| Tourer | 3·5—19 | 22 lb. ,, | 26 lb. ,, |
| Saloon | 3·5—19 | 22 lb. ,, | 26 lb. ,, |
| Family Saloon | 4·0—19 | 24 lb. ,, | 27 lb. ,, |
| Special Coupé | 4·0—19 | 24 lb. ,, | 27 lb. ,, |
| (1934 models) | | | |
| Two-seater | 4·0—18 | 22 lb. ,, | 24 lb. ,, |
| Tourer | 4·0—18 | 22 lb. ,, | 26 lb. ,, |
| Saloon | 4·0—18 | 22 lb. ,, | 26 lb. ,, |
| Family Saloon | 4·0—18 | 24 lb. ,, | 27 lb. ,, |
| Special Coupé | 4·0—18 | 24 lb. ,, | 27 lb. ,, |
| Eight: two-seater | 4·5—17 | 24 lb. ,, | 24 lb. ,, |
| All other Eights | 4·5—17 | 28 lb. ,, | 28 lb. ,, |

## CHAPTER IX

### THE O.H.V. MODELS

As the space available is extremely limited, I propose to give maintenance instruction only. For the reason just stated, the instruction will be of the briefest, but all *essential* wants will be dealt with.

**Valve Rockers.** These should be adjusted so that the clearance between the rocker and cam when the engine is hot is 0·003 in.

FIG. 56. ROCKER CLEARANCE

The rocker clearance should be ·003 in. Should the rockers be dismantled at any time, care must be taken to see that upon replacement the thick portion of the eccentric bush lies within the area indicated by the arrow, or the oil supply to the cam will be stopped.

When the valves are ground-in, the rocker clearances must be reset, and it is advisable again to check the clearances when the car has run 50 to 100 miles after grinding, as the valves have a tendency to "bed down."

The valve rockers are mounted on the rocker-shaft by means of eccentric bronze bushes, which are normally locked to the

rockers by means of thin hexagon steel nuts. Adjustment of the rocker clearance is easily and quickly effected by holding the hexagon head of the bronze brush (found on one side of the rocker) by the thin spanner provided, and slacking off the steel lock nut on the other side. Rotation of the bronze bush in one direction or the other will enable the operator accurately to set the clearance. When the correct clearance has been obtained, the bush

FIG. 57. ARROW SHOWS ADJUSTING NUT

must be relocked to the rocker by tightening up the steel locknut. While tightening up this nut it is essential not to disturb the position of the bronze bush which has been reset, and it should be rigidly held in position, by the spanner provided, during the relocking operation.

**Connecting Rods.** It should be distinctly understood by the owner that the white-metalled bearings in the Morris Minor engine are of the full-ring butted type: the two halves of the white-metalled bearing completely encircle the connecting rod and make contact with each other at their joint, without leaving a gap and without the use of packing shims.

On no account whatever should these bearings be closed together, as this will immediately render the whole bearing non-standard and render the connecting rod valueless for future bearing replacement. The bearings are made on a system which ensures a sufficient degree of accuracy to make it totally unnecessary for the caps or rods to be touched by a file or scraper,

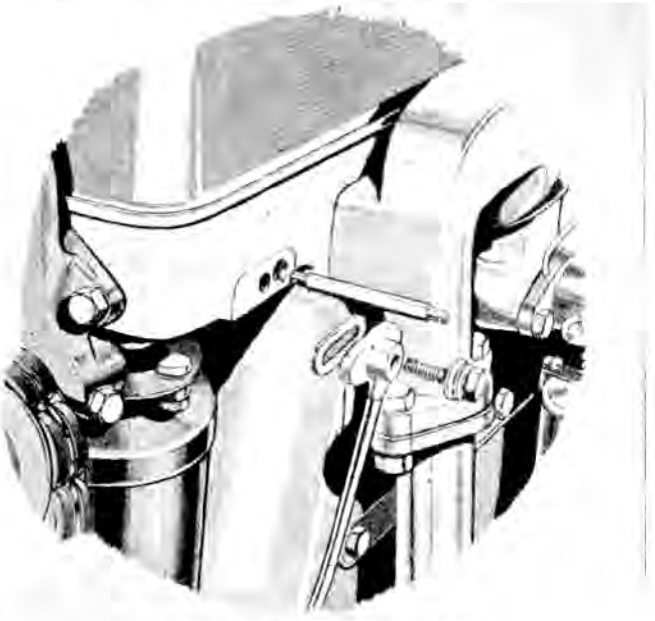


FIG. 58. THE OIL RESTRICTOR PIN
The pin is shown withdrawn from the housing in the cylinder head. (Make certain that it is kept clean.)

and, in fact, renders any hand fitting superfluous. The bearings are of a heavy type, in which the white metal is run direct on to the connecting rod and, if this white metal should run in use or become worn, the connecting rods should be replaced by new ones. Morris Motors Ltd. will not recognize any trouble consequent on interference with these bearings by owners. Any attention required to connecting rods should be entrusted to a competent Morris dealer.

It is important to note that when a connecting rod has been

removed for any purpose, it should be reassembled with the little-end clamp bolt on the opposite side of the oil filler orifice.

**Fan-driving Belt.** The fan belt should be kept fairly taut and adjusted from time to time by moving the fan lever so as to take up the slack. To do this, loosen the clamping screw, when the fan will be released, and can be reset by pushing the spindle up against the tension of the belt and locking it in the new position. During the cold weather it may be necessary to remove the fan to allow the engine to operate at the correct temperature.

**Lubrication.** The sump should occasionally be dismantled and cleaned. To do this, remove the screws attaching the oil sump to the bottom of the cylinder block and the union connecting the oil suction pipe at the front of the sump, when the sump may be withdrawn. It is advisable to remove the cover from the external filter and fill it full of oil, after the sump has been replaced, before starting the engine.

Every 500 miles the gauze cylinder should be removed from the external oil filter and thoroughly cleaned in paraffin. After cleaning, the filter should be filled with clean oil and care taken to screw the filter cover on tightly before starting the engine. On no account introduce paraffin into the filter.

**The Oil Restrictor.** At the junction of the oil delivery pipe to the cylinder head is the oil restrictor (Fig. 58) or metering pin, regulating the quantity of oil which is delivered to the overhead valve gear. Every 500 miles this restrictor pin should be withdrawn by passing a piece of stiff wire, hooked at its end, through the hole which can be seen in the end of the pin. The restrictor and its housing should be carefully cleaned before replacement. On no account file the pin, alter its shape, or otherwise interfere with it.

Should the oil gauge suddenly show a steady rise in pressure when the engine is hot, it is an indication that the restrictor is choked and requires immediate cleaning.

**Gearbox.** The oil in the gearbox should be drained every 5,000 miles by removing the plug underneath it, and refilling with fresh oil when the plug has been replaced.

To fill the gearbox, remove the oil-filler and inspection plug on the side of the gearbox. When the gearbox has been drained, approximately one pint of oil is required.

If the oil-filler orifice provided is always used, there is no possibility of overfilling; but if—as some owners prefer—the gear lever is removed and oil poured in from the top, the filler plug should be taken out, so that, if too much oil is poured in, the surplus may be free to escape. When using the filler orifice, make sure that the neck of this orifice is not choked with congealed oil, and that the oil poured in is actually getting to the

gearbox and not merely filling the spout. Use Morrisol "Sirrom" (Regd.) Brand Transmission Oil.

**Rear Axle.** This should be filled to the level of the top of the filler with approximately one and a half pints of oil, and this supply well kept up. Use Morrisol "Sirrom" (Regd.) Brand Transmission Oil. The rear axle should be drained every 5,000 miles and refilled with fresh oil.

**Brake Gear.** The intermediate brake shaft is carried in brackets riveted to the chassis frame cross member. On this shaft are mounted the levers operating the four-wheel brakes. A nipple is provided on each of the intermediate brake-shaft brackets for the purpose of introducing lubricant to the bearings, and these must not be overlooked.

Nipples are provided on the brake camshaft brackets on the brake flanges also. Care should be taken not to over-lubricate these, or oil may find its way on to the brake-drums, seriously reducing the brake efficiency. One pump stroke every 1,000 miles is adequate.

TYRE PRESSURES

| Type | Tyre Size | Front | Rear |
|---|---|---|---|
| Morris Minor Tourer | 27" × 4·0" | 22 lb. per sq. in. | 27 lb. per sq. in. |
| " " Saloon | 27" × 4·0" | 22 lb. " | 27 lb. " |
| Morris Eight Saloon | 4·0" × 19" | 24 lb. " | 27 lb. " |
| " " Sports Coupé | 4·0" × 19" | 24 lb. " | 27 lb. " |



**Removing the Cylinder Head.** There is no need to remove the electric horn suspended on the radiator stay. If it is swung round until it is above the radiator stay, it will not interfere with subsequent operations. The domed cover protecting the overhead valve gear may now be removed by unscrewing the two large wing nuts near its centre simultaneously.

The tension of the fan belt should now be released by slackening the fan bracket clamping bolt, and the top water connection should be released from the front face of the cylinder head block by removing the two attachment bolts, taking care not to lose the joint washer.

Now devote attention to the left-hand side of the engine and uncouple the exhaust pipe from the manifold, the mixture control rod at its junction to the brass lever on the carburettor, and finally the throttle control. Draw off the windscreen wiper tubing from the tube in the carburettor body and unscrew the petrol pipe at its junction to the carburettor float-chamber. The

induction and exhaust manifolds can then be removed by unscrewing the four retaining nuts located between each branch of the manifolds.

At the forward end of the cylinder-head block will be found an oil delivery pipe. Uncouple this by removing its centrally disposed retaining bolt. Beneath this pipe is an oil flow restrictor pin. If it is at all loose, withdraw it before it becomes lost.

Now attend to the items on the right-hand side of the engine. At the front will be seen a large diameter copper pipe—the oil return pipe. Uncouple this at its upper end by removing the two retaining nuts. There is no need to withdraw it from its studs, as these will draw straight out when the head is lifted. At the rear end of the engine will be found a similar pipe. Uncouple this at both the top and bottom attachments and remove it bodily, taking care not to lose the joint washers. Uncouple the high-tension wires from the sparking plugs.

Between the projecting portion of the cylinder-head block and the dynamo will be found a circular flexible coupling. Remove the two bolts which attach it to the dynamo drive yoke. This will permit the flexible coupling to be withdrawn with the cylinder head.

The cylinder head is held on to the cylinder block by ten nuts screwed on to the long studs passing through the cylinder head. Slacken off these nuts in rotation, half a turn at a time, until they are quite loose, then finally remove them. It is unwise to unscrew any one of these nuts completely before slackening off the remainder, as this will impose uneven stress upon the cylinder head, leading to its distortion.

The cylinder head is now ready to be lifted from the cylinder block. The breaking of the joint between the two will be facilitated by smartly tapping the sides of the head with a wooden mallet or with a hammer with a piece of wood interposed to take the blow. The joint may, however, not break freely, in which case it is permissible to insert a screwdriver or similar blunt wedge-shaped tool between the joint at the two places—one on either side of the engine—where the cylinder-head gasket has been cut away for the purpose. Do not insert the screwdriver too far. It should on no account be forced against the gasket, which would become damaged as a result. When the joint is broken, no difficulty should be experienced in lifting the head clear of the studs, providing it is withdrawn squarely. Place the head on a bench out of harm's way, and carefully lift the copper asbestos gasket straight off the cylinder-head studs, keeping it parallel with the upper face of the cylinder-head block and taking particular care that it is not bent or otherwise damaged in the process.

**Decarbonizing.** Everything is now in readiness for decarbonizing the piston crowns and the surrounding face of the cylinder block, and proceed as given on page 37.

To obtain access to the valve spring, it is necessary to remove the camshaft. This is easily achieved by unscrewing the four nuts holding the camshaft bearing caps in position. These should be given half a turn in rotation, in a similar manner to the cylinder-head retaining nuts, until they are eventually removed. The camshaft can then be lifted from its bearings and removed by passing it through the valve cover saddles. Removal of the camshaft enables all the valve rocker-arms to be swung clear of the valves.

A small wood block slightly thicker than the depth of the combustion spaces and an easy fit within them should now be prepared. Slip this block into the combustion space so that the valve heads are resting upon it, in order that the valve spring can be compressed with the special valve tool previously described, without forcing the valves open. Depression of the springs will expose two small conical cotters engaging in a groove in the pencil-like end of the valve stem. Removal of the cotters will release the valve spring cap from the valve stem, permitting its removal and releasing the valve spring. When the springs of both valves have been removed, the head may be raised from the bench and the wood block withdrawn, thus allowing the valves to be drawn from their guides. Repeat this operation on the remaining valves until they are all removed.



**Reassembling the Valves.** When you are satisfied that all trace of the grinding compound has been removed, the valves may be reassembled. Care should again be taken to see that they are in their correct ports. Reassembly of the valve is not a difficult matter with the aid of the valve tool sold by Morris agents. After inserting the valve in its guide and resting its head on the wood packing block, the valve spring and valve spring shroud may be placed in position with the valve spring cap resting on top of it. Engage the valve tool on the cap and depress the spring so as to expose very nearly the whole of the groove in the upper end of the valve stem. Insert the two conical cotters into the groove in the valve stem (small ends downwards, of course), and gradually release the spring. Make sure that the cotters are properly engaging in their grooves before dealing with the next valve. If the valve cover saddles have been removed, do not forget to replace them in position before reassembling the valves which are between the camshaft bearing brackets, or you will find that these are in the way and that you cannot replace the saddles.

**Replacing the Camshaft.** Swing all the valve rockers into position against their respective valves and replace the camshaft with the two marked teeth of its bevel wheel engaging on either side

of the marked tooth of the driving pinion (see Fig. 59). The camshaft bearing caps are dowelled into the bearing brackets so that there is no possibility of misalinement. Care should be exercised, however, to tighten up the camshaft bearing cap nuts evenly.

FIG. 59. THE CAMSHAFT TIMING WHEEL. MARKS CAN BE CLEARLY SEEN

Each should be given a partial turn at a time until all are perfectly tight.

**Adjusting the Rockers.** In the process of grinding-in the valves, a certain amount of metal is removed. This tends to reduce the clearance existing between the head of the valve and the undersurface of the rocker-arm. It is essential for the proper functioning of the engine that this clearance should not be less than 0·003 in., and it is therefore necessary to check the clearance of each valve with the feeler gauge attached to one of the special rocker-adjusting spanners. On one side of the rocker will be found a hexagon steel nut and on the other side a similar bronze nut. Engage the plain rocker adjusting spanner on the bronze nut and, holding it firmly in position, slacken the steel nut with the spanner

having the feeler gauge. Withdrawing the spanner from the steel nut, insert the feeler gauge between the valve rocker and the cam—after seeing that the peak of the cam for that particular valve is pointing directly upwards—and rotate the bronze nut until the feeler gauge can just be withdrawn easily. Now, holding

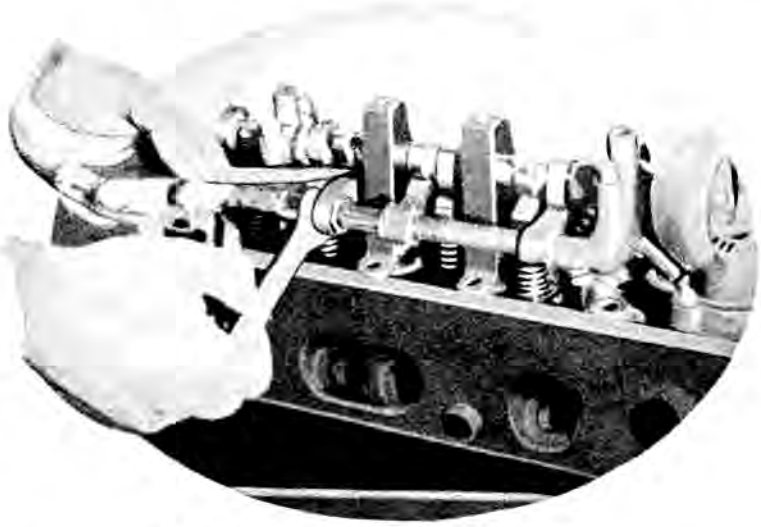


FIG. 60. ADJUSTING THE VALVE CLEARANCE



the spanner engaging the bronze nut exactly in this position, tighten up the steel locknut. The clearance should then again be checked to make sure that no movement of the setting took place while the locknut was being tightened up. When adjusting the rockers, care should be taken to see that the thick portion of the eccentric bronze bush is towards the centre of the engine (except when it is either at the top or bottom), or the oil supply to the cam will be stopped.

**Replacing the Cylinder Head.** When all the valve clearances have been correctly adjusted, the cylinder head is ready for replacement. It is first of all necessary thoroughly to clean the gasket and remove any carbon deposit adhering to its edges. If the gasket has been in any way damaged during the removal of the cylinder head, do not attempt to use it again, but immediately procure a new one. See that the new gasket does not burr up around the stud holes and that the cylinder bore openings are

clear of the cylinder bores themselves. The gasket can then be located over the studs in the cylinder block and gently pushed into position on to the upper face of the cylinder block. It will be found convenient to use a short length of tubing (a box spanner does quite well) over the studs to push the gasket in position. This should be done very gently, taking care to keep the gasket


Fig. 61. Sequence of Tightening Cylinder-head Stud Nuts

parallel with the cylinder head and not to force one end or one side down before the other. In the case of an old gasket, improved results will be obtained by lightly coating it on each side with gold size.

Turn the camshaft until the timing marks on the spiral bevel drive gears coincide, and rotate the engine by the starting handle until numbers one and four pistons are at the top of their stroke, with the metal electrode on the distributor rotating arm pointing towards No. 1 contact stud (No. 1 cylinder is the one nearest the radiator). This stud is easily located by tracing the high-tension lead from the sparking plug for No. 1 cylinder to its junction on the distributor cover. On removing the distributor cover, the position of the metal electrode on the end of the distributor rotating arm can be seen, and its position relative to this stud noted. That the pistons are exactly at the top of their travel can be ascertained by removing the rectangular plate on the clutch housing (just in front of the change speed lever), when a mark will be found on the face of the flywheel, bearing the numbers 1/4. This mark should be exactly in the centre of the opening in the clutch housing.

Having made sure that the pistons and camshaft are in their correct positions, the head may be lowered into position on to the cylinder block. The two holes in the flexible coupling should now be not very far from those on the drive yoke of the dynamo.

Rotate the drive yoke attached to the cylinder head until the bolt holes exactly coincide with those of the flexible ring. Replace the ten cylinder-head nuts, not forgetting the copper washers on the studs passing through the inlet ports, and tighten them up in the rotation indicated in Fig. 61, giving each a quarter of a turn at a time until all are up tight.

The flexible coupling bolts and washers should now be replaced in their correct positions, taking care to replace the distance washers in exactly the same position as they were originally. The oil pipes, exhaust and inlet manifolds, carburettor controls, petrol pipe, windscreen wiper tubing, sparking plugs, high-tension cables, and the valve cover should then be replaced. When replacing the oil pipe on the left-hand side of the head, make sure that the oil restrictor pin is in place (see page 113) and that it is clean.

Fill the radiator with water, start up the engine, and let it idle reasonably slowly until it is thoroughly warm. Then, switching off again, remove the valve cover and go over each of the cylinder-head nuts in turn, giving each a final tightening up. It will be found that now the engine is warm an extra half turn or so can be given to each nut. Do not attempt to speed up the engine until this final tightening has been effected. Start up the engine and ascertain that oil is exuding from the small oil passage drilled in each valve rocker-arm, and lubricating the cam surfaces. If oil is coming freely from these oil passages, the valve gear cover can be replaced, together with the bonnet, and the car is ready for the road.



After 250 miles the valve cover should again be removed, the cylinder-head nuts tightened up and the valve clearances checked.

**The Dynamo.** In order to obtain easy access to the dynamo for removal, it is necessary to take off the radiator. Drain the radiator by opening the tap in the lower water tank under the bonnet and, while the water is running away, take off the bonnet by removing the two retaining screws which attach the bracket at the rear end of the bonnet rod to the scuttle apron. When the radiator is empty, slacken off the fan belt by loosening the clamp bolt, and disconnect the top water connection by removing the two screws which attach it to the front face of the cylinder head. This will enable the top water connection, complete with fan, to be withdrawn with the radiator. Disconnect the rear clip on the lower hose pipe and loosen the hose from the water inlet pipe. Remove the two bolts fastening the radiator chassis frame, slacken the nuts at the rear end of the bonnet rod and release it from its bracket, and uncouple the wires from the electric horn. This will permit the removal of the radiator complete with fan assembly, bonnet rod, and horn.

Between the projecting portion of the cylinder head and the top of the dynamo will be found a circular flexible coupling. Remove the nuts on each of the four coupling bolts in turn, leaving the bolts in position, so that the coupling can be rotated by use of the starting handle to bring each bolt into a position where the nut may easily be reached.

Having removed all four nuts, take off the valve gear and clutch housing covers, and turn the engine by the starting handle

FIG. 62. REMOVING THE COUPLING BOLTS OF THE FLEXIBLE COUPLING

until the 1/4 timing mark on the flywheel coincides with the centre of clutchcase opening. This will bring the driving yoke on the cylinder head across the engine, and the driving yoke on the dynamo parallel with the engine centre line. The bolts themselves may now be withdrawn, care being taken not to lose the distance washers, which must be replaced in the same position. Removal of the bolts enables the flexible coupling to be withdrawn.

Detach the two cables on the distributor side of the dynamo, noting from which terminal they are removed, and disconnect the oil delivery pipe on the manifold side of the engine at its upper end, taking particular care not to lose the oil restrictor pin beneath it or its jointing washer.

Remove the two bolts securing the body of the large external oil filter to its supporting bracket. Now unscrew the four set-screws which attach the dynamo to its platform at the front of the engine, releasing the dynamo and the filter bracket. Lift the dynamo approximately ¼ in. and tilt it towards the near-side of the car until the driving yoke on the dynamo is just clear of that

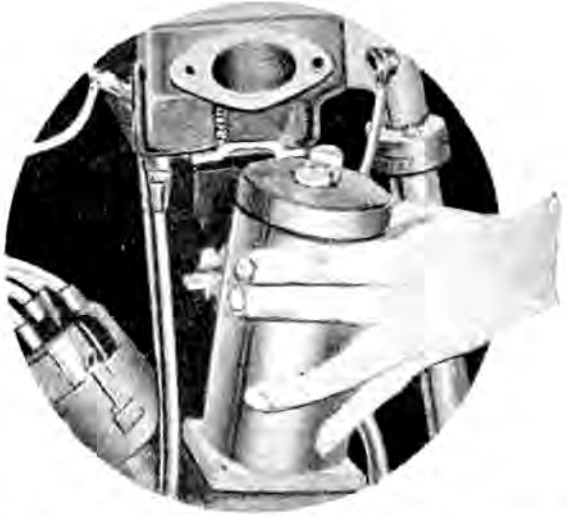


FIG. 63. SHOWING HOW THE DYNAMO SHOULD BE REMOVED OR REPLACED



in the cylinder head. The dynamo can then be tilted forwards and easily withdrawn.

Replacement of the dynamo is effected in the reverse way, but it is necessary to make sure that the engine timing has not been disturbed while the dynamo was removed. Observation through the rectangular cover-plate in the clutch housing—just in front of the gear lever—should reveal the timing mark on the flywheel for Nos. 1 and 4 cylinders, exactly in the centre of the opening. Place the brass packing pieces which fit under the dynamo base in position on the dynamo platform, making sure that you replace the same number that you took off. If for any reason the dynamo is replaced by another, it may be necessary to readjust the mesh of the driving gears to obtain silent running

by suitable selection of the packing shims used. Turn the dynamo spindle until the timing mark on the dynamo drive gear coincides with the centre line of the dynamo and is at the rear—that is, ready for engagement with the correspondingly marked teeth of the drive gear on the crankshaft. The holes in the dynamo coupling yoke will then be parallel with the engine centre line. Tilting the dynamo towards the near-side of the car and holding the dynamo coupling yoke in this position, insert the drive gear into the opening of the dynamo platform, and swing the dynamo backwards and downwards into position. The gears can be felt to be meshing properly if the coupling is slightly oscillated as the dynamo is replaced, but do not overdo the oscillations or you may engage the wrong teeth.

See that the bolt holes in the dynamo base are coinciding with the holes in the dynamo platform, and then observe if the dynamo coupling yoke is exactly parallel with the engine centre line. If it is not, withdraw the dynamo, reset the coupling yoke, and re-insert the dynamo. No difficulty should be experienced in getting the dynamo in position with the correct teeth in mesh, as the distance between one tooth and the next is sufficient to make an appreciable difference to the position of the dynamo coupling yoke, a difference which is immediately discernible.

Having satisfied yourself that the correct gear teeth are in mesh, replace the oil-filter bracket and the screws in the dynamo base, taking particular care to tighten them up evenly, a partial turn at a time until all are quite tight.

Now make a final test. The flywheel mark 1/4 should show exactly in the centre of the inspection cover opening with the distributor rotating arm pointing towards No. 1 cylinder. (This can easily be found by tracing the high-tension lead from No. 1 sparking plug to its junction on the distributor. Removal of the distributor cover should show the distributor arm directly beneath it.) The dynamo coupling bolt holes should be exactly fore and aft, and at right angles to the coupling yoke on the cylinder head.

If all the foregoing are correct, replace the flexible coupling and coupling bolts, taking care to replace the distance washers in exactly the same position as they were originally. Tighten up the nuts firmly and rotate the engine slowly by hand. If the distance washers are in the correct position, the flexible coupling should run absolutely true. If it does not do so, note where the error is and adjust the distance washers accordingly. Replace the valve cover, attach the dynamo cables on to their correct terminals, and reconnect the oil delivery pipe on to the cylinder head. It is an advantage to withdraw the oil restrictor pin before doing this and wash it in paraffin to make sure that it is perfectly clean.

Replace the radiator and bolt the upper water connection to

the forward face of the cylinder head, not forgetting to place the fan belt in position over the pulleys or to replace the jointing

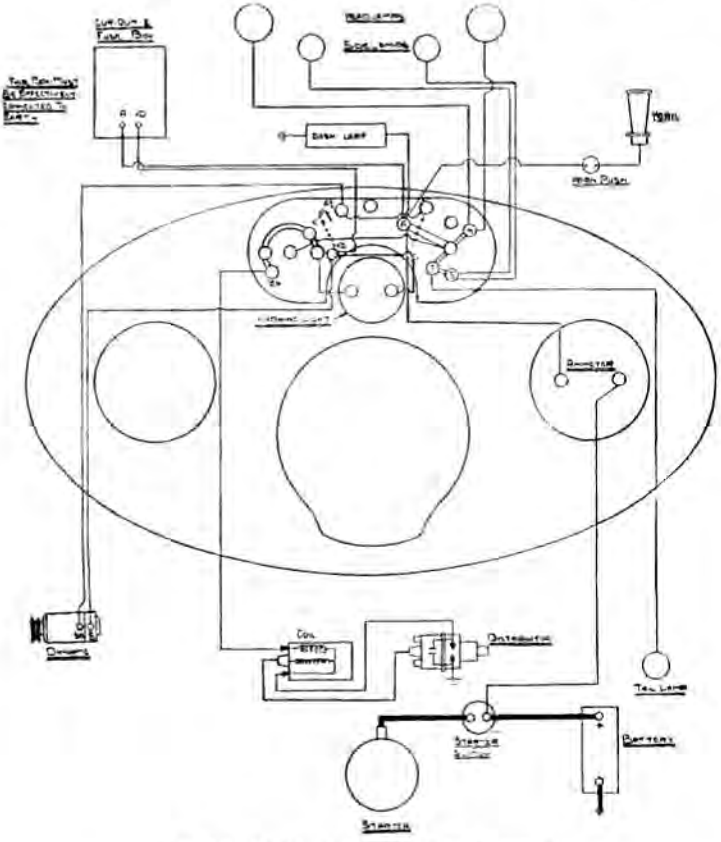


FIG. 64. O.H.V. MINOR WIRING DIAGRAM

washer. Engage the rear end of the bonnet rod in its bracket and tighten up the nuts. You may now connect the horn wires to their terminals, connect up the bottom hose, and replace the bonnet, thus completing the reassembly.

## CHAPTER X

### ON TOUR

By Harold Shelton, M.A. (Oxon)

A TOURIST, says my dictionary, is "one who performs a journey in a circuit." How inadequate, yet how typical of the spirit in which many approach a touring holiday! Without hesitation, I would choose a tour of almost any district, with genial companions, as the ideal form of holiday. It is the type of holiday which, more than any other, takes us out of ourselves, and causes us to forget all the worries and responsibilities which we have left behind us. The constant change of scene and interest, and the insight into strange customs and strange places act as a tonic to the most jaded of nerves; and there is laid up in the memory a fund of experiences, and an impression of new beauties which persist long after less exciting holidays have been forgotten.

It is a holiday which satisfies the craving to explore, innate in almost all of us. When we return, we feel that we have learnt something about our own country which must somehow help us to a broader and more tolerant outlook. The globe-trotter who "does" Europe in one month, and America in two, can crowd no more into his time than the modest tourist who sets out to see his own country first; for Great Britain is essentially a land of character, where only a few miles separate one type of countryside from another entirely different.

There is no need to travel great distances in order to gain variety, as there is, for instance, in the New World, where the great plains stretch hundreds and hundreds of miles, featureless and uninteresting. The low hills and the narrow valleys which predominate in England, and for that matter, in Wales and Scotland also, lend Britain its chief charm . . . that, and the byways over which a small car can be driven with perfect safety.

Each man to his taste; but there can be few who will not place some moment of a tour among the most treasured of their lives, that moment, perhaps, when the explorer comes unexpectedly, by a winding byway, upon some village of surpassing beauty . . . Bibury, with its flowering gardens, set in a great fold of the Cotswolds, or Lamorna, rising from one of the fairest coves of the Cornish coast . . . or, perhaps, when driving up one of the rough roads through a Scottish glen, the full grandeur of the surrounding mountains grips his imagination, and strikes

an answering chord in his mind; or, perhaps, when breasting the summit of some long hill, there is spread before him a vast panorama of fields and woods, which seem to typify the quiet temper of an English countryside.

The ways of planning a tour are many. One of the most popular is to have no plan at all. It is very attractive to set out in the morning, with no fixed route, merely to explore haphazard

FIG. 65. BREASTING THE DEVIL'S ELBOW
(*Morris Oxford Press, Ltd.*)

the highways and the byways, and the villages and towns which lie on them. We take one road because the name on the signpost looks attractive, another because it seems to lead uphill, and we think there will be a good view from the summit. At every turn, we follow the whim of the moment. But there are disadvantages also; we may miss some of the places most worth seeing, or we may find ourselves in an industrial area which we would have preferred to have avoided.

Another method is to select some wide area, such as the South of England, or Scotland, and proceed to "do" it in traditional tourist style. Generally, this ends in a frenzied dash from one town to another, with little attention to the country which lies

between. The man who boasts that he has explored Bath and Bristol, Cheltenham and Gloucester, in one day will have only a confused recollection of a cathedral or two, a Roman bath, and a city with obscure police regulations.

Yet another way is to go in search of some one feature of England, which has particular interest for the tourist. It may be the cathedrals or the abbeys; it may be ancient dwelling-houses or Norman castles, or, perhaps, the pre-historic antiquities that abound in Great Britain. It must be granted that such an interest gives a unity to the tour that otherwise might be lacking, and provides many with the opportunity of comparing their own impressions with those of the authors they have read.

For most, however, the ideal plan is to choose a relatively small area of the countryside, and try to explore the whole of it, avoiding hurry, or too rigid a schedule. In that way, I think, they will secure the most from their holiday. It is well to make a rough scheme to cover about three quarters of the time available, leaving the remainder to be filled in later, or, as often happens, to make up lost time. We usually plan more in a given time than we are able to achieve. In this way, too, there will be many happy hours spent in planning. The pleasure of anticipation is sometimes as great as the pleasure of performance.

It matters little what district is chosen, for almost every district has its own charm, and its own distinction, excepting parts of the Midland Plain, and of the eastern counties, and the industrial north. In the better-known touring districts . . . Lakeland, the West of Scotland, Snowdonia, and Devon and Cornwall, July and September are better months than August: for in August the byways are sometimes as congested as the main roads, and the charges for accommodation are often exorbitant. Of the great number of other touring districts, the Cotswold country, Somerset, South-west Wales, especially Pembrokeshire, Yorkshire, with the valley of the Wharfe, the Border Country and the Cheviots, the Shakespeare country, with Stratford-on-Avon as a centre, the Wessex country of Thomas Hardy, and the Sussex of Kipling, are among the finest. There is a great fascination in seeking out the places immortalized by one's favourite author, whether, as in the case of Kipling, they are explicit, or, as in the case of Hardy, disguised under fictitious names.

One important point must be remembered. Its truth is attested by every experienced tourist. If the greater part of the day is spent in driving, unavoidable fatigue is the result, especially in a small car like the Minor; it is far better to have frequent breaks in the journey. The best cure for the "tired feeling" which is often felt after driving for two or three hours is to leave the car and walk, preferably in the open country. Many views, which can


FIG. 66. WHARFEDALE
(*Morris Oxford Press. Ltd.*)

only be secured after a tramp across country, are far finer than any which can be obtained from the highway.

Having decided what part of the country we are to explore, and how we are to explore it, it remains for us to decide the ways and means. The chief problem is that of accommodation. Three methods are popular, and each has its own following. The first is the "camping" tour, necessitating the transport of equipment

FIG. 67. ON THE ROAD WITH A MINOR
(*From "The Autocar"*)

which cannot conveniently be stored in a Minor. There are, however, a number of trailers, such as the "D.B. Super," adapted to light cars. This method has the advantage of economy, and commends itself to true lovers of an open-air life. The disadvantages are that camping sites are not always accessible, or easy to find, and that even a two-wheeled trailer considerably reduces the average speed, and renders the car more cumbersome to manage on winding or steep roads. Also, it must be admitted that pitching camp on a wet evening is not every one's conception of an ideal holiday.

The second method is the "caravanning" tour, which obviates the last-named drawback to camping. Moreover, a caravan is

marketed which is suitable for attachment to the Minor, and these vehicles can be hired at moderate figures ranging from £2 per week. There still remains in some districts the difficulty of finding suitable sites, and to a greater extent, the drawback of reduced speed, and increased difficulty of handling. One of the chief advantages of touring with a Minor is that the short wheelbase renders it easy to negotiate the sharp turns and hairpin bends which are frequent in hilly country. With a trailer attached, this advantage is discounted. In fact, there are some passes, especially in West Scotland, and a number of byways in the South-West which should not be attempted with a caravan attached except by experienced drivers. A possible escape from the difficulty is to use one site for several days, and tour the district without the impediment of the caravan.

The third method, the most popular, and the most convenient, though less economical than caravanning or camping, and lacking the adventurous character of these, is to find accommodation at hotels. If you decide on this course, you will find a detachable luggage-grid (as illustrated on page 9) a useful accessory for the two-seater, and for other models if more than two people are travelling. Admittedly, hotels differ in quality, but generally they maintain a high standard at a moderate cost, in spite of the periodic attacks on them in the Press. If we confine ourselves to hotels which exhibit the signs of the accredited Motor Associations, there will be little fear of disappointment, though it is always advisable to inspect rooms before making a decision. If you are dissatisfied with an A.A. or R.A.C. hotel, report the matter to the organization concerned, and you will probably be the means of preventing others from being similarly "stung." In a country town, 6s. 6d. is an average charge for bed and breakfast at a commercial hotel. There is generally superior accommodation for those who are willing to pay more, and if economy is necessary, the N.C.U. sign is an indication of cleanliness and willing service.



My personal advice is not to spend the night in coast towns, at least, in the holiday seasons; it is always possible to drive a few miles inland, where ample accommodation can be found. That is one great advantage that the motorist has over the pedestrian. Generally, it is not necessary to arrange the night's lodging before about 9.30 p.m.

A slight variant on this method is to find some suitable hotel in your chosen locality, and stay there for several days, using it as a centre from which to explore the surrounding country. This obviates the necessity of packing one's bags every morning . . . always a tiresome operation . . . and arriving at a suitable town at a suitable time in the evening. The only drawback is that

you will find it impossible to avoid traversing the same stretch of road several times. In any case, most men at least find a certain pleasure in driving into a strange town, hungry and tired, in search of food and bed. If the prospect does not appeal to you, it is always possible to book rooms in advance, though this entails adhering to your itinerary, as previously planned, and so robs the tour of some of its freedom.

Many feel hesitation in selecting the mountainous districts on

FIG. 68. ON THE SHORES OF LOCH SCAMMADALE
*(From "The Morris Owner")*

their first touring holiday. Their fears are in truth groundless. There is scarcely a main road between towns in Great Britain which will cause difficulty to the veriest novice. There are, of course, a few main road hills; Porlock Hill in Somerset has a gradient of 1 in 4, Lynton Hill and Countisbury Hill in the same district both have a gradient of 1 in 4½. In Yorkshire, the Thirsk-Helmsley road has a gradient of 1 in 4, and even in the Midlands of England there is the Leek-Buxton Road with a gradient of 1 in 4½, but all of these the Minor will take in its stride, and no difficulty will be experienced if the change down is made early.

With by-roads the difficulty is generally one of surface, and of sharp bends allied with a steep incline. All hills, where there is not a clear view of the road ahead, *must* be descended at a moderate pace, and preferably in a gear lower than top. If in ascending you fail to make a clean change down and find yourself on the point of stopping, it is best, if practicable, to come to rest at the nearside of the road, using the grass verge or bank as a support, and then make a fresh start. Remember that even a Minor clutch is human! Curiously, the worst hills in my experience are in Devon and Cornwall; some of the little-used passes in Scotland rank next. Applecross Hill on the Jamestown-Applecross Road, and Mam Rattachan near Glenelg, both with a gradient of 1 in 3, are probably best avoided, though with careful handling, it can be said that the Minor fully loaded will ascend any road hill not marked "Impassable for Motors." The by-roads of Wales and of the Lake District are generally good, a notable exception to this being the Honister Pass, though here an alternative approach is by the toll road from Seatoller. But it is not so much in ascending hills as in descending them that the experienced motorist shows his quality. Even on such comparatively easy roads as that over the Kirkstone Pass, many accidents have occurred through motorists descending in too high a gear, especially on the Ullswater side, and consequently burning out their brakes in a futile attempt to reduce speed at a bend in the road. In descending a steep hill, it is wise as well as economical to engage low gear, and change up only when the breaking power of the gear is sufficient to check the car.



If you are touring in Spring you may chance on an unexpected fall of snow on high ground; do not despise it. Soft snow on any road can be very embarrassing! Above all, do not be bold and attempt a snow-bound pass. If, as once happened to me, you are in the end compelled to back your car for two or three miles, you will not repeat the adventure. The only other advice worth giving is always to respect the police even if they seem a trifle strange, and to keep a sharp look-out for automatic traffic signals in unknown towns. If you make a genuine error, you will find that frequently "A soft answer turneth away wrath." Finally, do not attempt to average the same speed in new country as you do in your own district. If you make a schedule, do not attempt to keep abreast of it; you will find that in hilly country 100–120 miles is a sufficient average for a day. Some days you will be well-advised to average less. So you will have plenty of time to stop occasionally and admire the view (always remembering not to inconvenience other road-users), and even if a few hours tramping does not appeal to you, you will be able to alight and stretch your legs whenever you feel inclined. That is half

FIG. 69. BERRIEDALE, CAITHNESS
*(Morris Oxford Press, Ltd.)*

the joy of touring . . . doing what you like, when you like. A schedule can be a cruel taskmaster.

Whatever district you decide to explore, whatever method of touring you adopt, you cannot fail to have the best holiday of your life, and take home the memory of pleasures which not even the wettest of summers can damp. Do not be dismayed by possible difficulties; you will find they all resolve themselves far more easily than you could imagine. The great thing is to start. The rest will look after itself.

To give a comprehensive guide to the touring grounds of Great Britain here would be impossible. A few of the possible districts have been mentioned above. Probably you will in the end decide to see the best-known first; so I shall take five of these districts and set down some random jottings from my notebook. . . . If they are the means of leading you to a few places that otherwise you might have missed, my purpose will have been admirably fulfilled.

## THE SOUTH-WEST OF ENGLAND



The south-west, in which I include Devon and Cornwall and part of Somerset, is in some ways the most fascinating district of England. Certainly it is the most intimate, and probably the most "foreign." In Cornwall, the Celtic strain of the inhabitants is noticeable in their appearance, and the quaint names of the Saints to which the characteristic Cornish churches are dedicated, and the unusual place-names, such as St. Winnow and St. Columb, are ever-present reminders that the history of Cornwall was not that of the rest of England until the end of the eleventh century. For the lover of moorland scenery, Exmoor, Dartmoor, and Bodmin Moor are all wonderfully impressive, though the beauties of Bodmin Moor cannot be appreciated from the roads. This is not the case with Dartmoor. The highroads from Moretonhampstead to Princetown, and from Tavistock to Okehampton, are as exciting as any main roads in England, and the by-way which leads from Moretonhampstead through North Bovey to Widdicombe-in-the-Moor must not be missed.

Of the Lorna Doone country, I can say that any turning south from the Minehead-Ilfracombe road will lead you to places of exquisite beauty. Two of the fairest villages I know are Withypool and Simonsbath.

The finest part of Cornwall is undoubtedly the coastal district. In the south it is a green coast as far west as the Lizard, but the granite headlands of the extreme south-west and the rugged coast between Tintagel and Newquay are unsurpassed. There are still dozens of unspoilt fishing villages—Polperro,

FIG. 70. BRIXHAM HARBOUR

Mevagissey, and Porthleven on the south; Portreath and Crackington on the north, to mention only a few.

With the interior you may be disappointed. Certainly, you will be if you keep to the main roads; but it would be a harsh critic who was not enchanted by the by-way which leads from Bolventor to St. Cleer, and so to Liskeard and Looe. The grandest part of all is the extreme south-west, and you might spend a week in the Peninsula west of a line drawn from Hayle to Marazion, working slowly round Mount's Bay, dominated by the island fortress of St. Michael's Mount, through Penzance and Newlyn to Mousehole, one of the most romantic villages in the world; then following as near the coast as you can to Lamorna Cove, St. Levan, and Land's End itself. From Land's End the coast road to St. Ives through St. Just is less interesting, but the interior is crossed by a number of winding lanes which display its charm to the full.

Of Devon, apart from the Dartmoor District and the north coast, the finest part for touring is the extreme south, in the valleys of the streams which rise in Dartmoor, and flow into the English Channel and along the coast with its noble bays and fine havens—Teignmouth, Brixham, Dartmouth, and the others. The Dart and the Tavy are world-famous, and justly so; the district between the Tamar and the Tavy is traversed by tiny by-ways, each one of which you will think more beautiful than the last. The valleys of the Avon and the Plymm are little inferior, and can be explored with the added advantage of greater privacy. To explore the Avon Valley take the by-road south-east from the village of Brent on the Ashburton-Ivybridge Road, and follow it to Diptford and Loddiswell, then turn south-west to Bigbury. For the Plymm Valley, take the by-road to Meavy from the Princetown-Plymouth road, passing under Ringmoor Down, then proceeding through the Bickleigh Valley. You will find your problem is not to discover places of beauty or interest, but rather to decide which you can afford to omit.



## THE LAKE DISTRICT

For all who do not crave a frequent sight of the sea, the mountain districts of Cumberland and Westmorland have glamour and fascination enough to satisfy the most critical. Only at one point does the coast-line merit a special visit, and that is at St. Bees Head. If you chance on this spot in a high wind, with the waves dashing among the tumbled rocks, it cannot fail to leave a vivid impression of untamed strength. To the north the coast is marred by industrial towns; to the south it is relatively uninteresting.

For a first tour it is best to confine ourselves to the district

contained within lines joining Penrith, Kendal, Ulverston, Egremont, and Cockermouth. Certainly to the east of that area, where the high moors merge into the Pennines, there are many roads of grand and rugged beauty, but they are not typical of Lakeland. Ambleside is the centre of the wildest country, and the road from Bowness through Ambleside to Keswick will give you a foretaste of the infinite delights of mountain and lake. From this highway, in under twenty miles, you will have grand

FIG. 71. CONISTON WATER
*(From "The Morris Owner")*

views of Windermere, Rydal Water, Grasmere, and Thirlmere, and you will pass close beneath the summit of Helvellyn, while at Keswick, Derwent Water and Bassenthwaite are near at hand, as are the grassy slopes of Skiddaw, which is the easiest of all mountains to climb, and one which affords as satisfying a prospect as any. Nor must you neglect to traverse the Kirkstone Pass and so to Ullswater and Penrith, and from Keswick you must go west to Low Lorton, thence turning south, and skirting Crummock Water and Buttermere to the Honister Pass.

So far, you will have been on the beaten track, but off it there is no less of splendour. The by-way from Bowness by the verge of Windermere to Newby Bridge gives an ever-changing panorama

of lake and mountain scenery. Even finer are the lanes which wind through the Furness Fells on the west of Windermere in the direction of Hawkshead. Thence a better surfaced road skirts Coniston Water, and another goes west to Coniston, dominated by the crags of Brown Pike, and the Coniston Old Man. Then there is Ennerdale, which can only be approached from the west, and Borrowdale, the lovely valley between Derwent Water and Seatoller, and Haweswater, best reached from Penrith over rough roads through Bampton. The finest place of all is Wast-

FIG. 72. A LAKELAND VALLEY
(*From "The Morris Owner"*)



dale. To reach this, you must take the road from Gosforth, a few miles south of Egremont, and drive slowly (you could not go fast if you tried) by the shore of Wast Water, from which the dark cliffs rise sheer for hundreds of feet, to where the road ends at Wastdale Head. There, I think, you will be at the most romantic spot in all Lakeland; on three sides you are surrounded by the mountains, Kirkfell, the Great Gable, and Scaw Fell Pikes. If only for this spot, your journey to Lakeland would repay you well.

For the rest, you will find the towns, Penrith, Keswick and the others, less attractive than you might hope, but the villages are compensation enough, and there are many ancient churches for the lover of antiquities. Staveley, Bampton, set in the heart

of the Lowther Valley, and Lamplugh, are among the villages which pleased me most, while the Ambleside and Rydal district, and Grasmere, have countless literary associations, especially with Wordsworth and Coleridge. Probably Lakeland, more than any other part of England, is the spiritual home of the great poets. The reason is not far to seek.

## NORTH WALES

The charm of North Wales lies as much in the variety of its scenery as in its magnificence; not only are there the mountains and grand waterfalls, but green fertile valleys, often with hanging woods leading down to the banks of the rivers.

The coast, particularly near the great estuaries, is the equal of anything you will find in Great Britain. For Snowdonia the chief centres are Llandudno, Caernarvon and Bettws-y-Coed; for the district which lies to the south of Snowdon, Dolgelly and Machynlleth. Aberystwith is the gateway to the Plynlimon Mountains and the Wye Valley.

Without doubt, the best approach to North Wales is from Gloucester, through Ross and Hereford, then by Builth and Rhayader, following the line of the Wye Valley. Much of the way, the road runs beside the river or over hills from which its silvery course can be traced for miles. When once you have tried this approach, I doubt if you will seek another. From Rhayader the road runs near the summit of Plynlimon close to the Devil's Bridge, set in the midst of scenery of great austerity. Turning north from Aberystwith, you will drive to Machynlleth, then westward following the coast to Aberdovey and Towyn, thereafter encircling the Peaks of Cader Idris past Arthog, whence the ascent of the mountain can best be made; then by Dolgelly, and so to Barmouth over wooded heights, overlooking some of the grandest river scenery in all Wales.

From Barmouth the way is by the coast to Harlech and Festiniog. There you have reached Snowdonia, and it matters little which road you take. They are all worth exploring. You will long remember the Valley of Festiniog which leads towards Bettws-y-Coed, where you will find the Swallow Falls well merit their fame, and the Conway Falls and Fairy Glen, and the Cauldron Bridge, as noble as their enthusiastic advocates have painted them. The Pass of Llanberis and Nant Francon will take you from Capel Curig, first to Caernarvon, then to Bangor. From the Penn-y-Pass above Llanberis is the easiest ascent of Snowdon. The Vale of Gwynant towards Beddgelert, passing beneath the southern slopes of Snowdon, yields nothing in beauty to the others; Llanrwst, with Gwydir Castle, and Bethesda will both detain you long.

FIG. 73. DEVIL'S BRIDGE
*(Great Western Railway)*

No holiday in Wales would be complete without a row on Lake Bala, the largest of Welsh lakes, in quieter, but for many, equally attractive surroundings. Nor must you overlook, as many do, the peninsula in which are Criccieth and Pwllheli. When you leave North Wales, whether you make for Chester or Shrewsbury, try to see something of the Vale of Clwyd, and cross the Horseshoe Pass to Llangollen, and so into the Valley of the Dee. It may be that this district will make as strong an appeal to you as did Snowdonia.

## THE COTSWOLD COUNTRY

This is a country of grey stone walls, white roads, and spreading landscapes. It is a true wold, an upland plateau, undulating, wooded in parts, and pastoral. A land of surprises, of tiny villages hidden between swelling ridges, of old churches, and of strange corners of a rural countryside which might have sprung from the annals of a hundred years ago.

On the east the ascent to the plateau is gradual, and Burford, with a church containing an unparalleled collection of stained glass, is the gateway to the Wold. On the west and north-west, the plateau falls away abruptly, giving views across the Severn Valley to the Welsh Hills and across the Avon Valley to the Midland Plain. Broadway Hill, Frocester Hill, Birdlip Hill, and Cleeve Hill Common afford some of the finest view-points.

The main road from Burford through Northleach and Andoversford to Cheltenham, and the road from Bourton to Stowe-on-the-Wold and Broadway give a good impression of the character of the countryside. The Roman road from Cirencester to Birdlip is as exhilarating a series of hills and declivities as any I know. But far finer are the minor roads from Burford through Aldsworth, Bibury, and Barnsley; and that other by-way, perhaps the gem of them all, which leads from Stowe-on-the-Wold to Ford and Stanway and so to Winchcombe, in ancient times the capital of the Kingdom of Mercia, and now holding the ruins of Hailes Abbey, with Sudeley Castle close at hand. Of the other Cotswold towns, Moreton-in-the-Marsh, Chipping Campden, the storehouse of ancient architecture, and Bourton-on-the-Water, are three which must on no account be missed; of the villages, Windrush, Turkdean, Winson, Coln Rogers, with an almost perfect Saxon Church, and Condicote, with an equally notable Norman Church, are a few whose colourful harmony and sequestered peace give unmixed pleasure to all who chance on them.



## SCOTLAND

Many Englishmen conceive of Scotland as a country which can be toured in one short holiday. So it can . . . just as England

FIG. 74. LOCH TULLA
(*From "The Morris Owner"*)

can, or for that matter, any other country; but even in two months it would be difficult to gain an adequate impression of the great variety of scenery and interest which it offers. For touring purposes it may well be divided into four sections: the Lowlands, south of a line drawn from Edinburgh to Glasgow; the Western Highlands; the Eastern Highlands; and the Extreme North.

The first of these districts belies its traditional name. It is

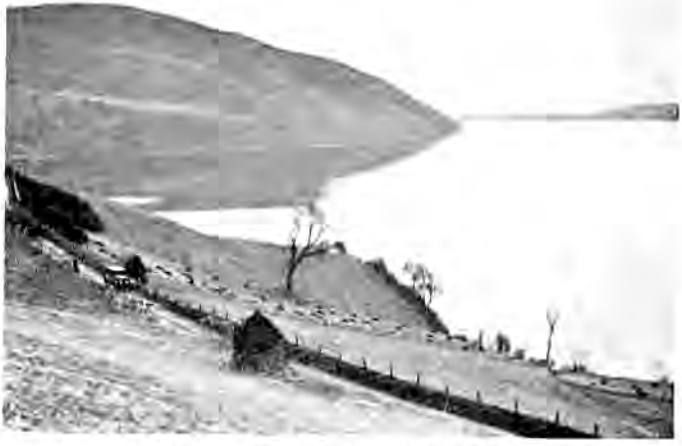


FIG. 75. BY THE CALEDONIAN CANAL
(*Morris Oxford Press, Ltd.*)

really a district of many ranges of hills and secluded valleys, in which the scenery is often as fine if less austere than the mountain areas. The Pentland Hills, and the Tweed Valley, and the whole of the counties of Roxburgh and Selkirk are highly picturesque; in particular, I have pleasant memories of the Cheviot country, while Riccarton, and New Castleton are two towns in which you will discover an unusual store of interest.

The Western Highlands present the most awe-inspiring scenery in Great Britain. To many this appears an unkind country, for one misses the relief offered by the fertile valleys of the Lake District and North Wales. The roads too are often extremely difficult, though, for compensation, the standard of driving, on the whole, is far higher than in England. Argyleshire, around

Inverary and Loch Awe north to romantic Loch Tulla; the Ben Nevis area, and the road from Fort William by Glen More and Loch Ness to Inverness; and the country still further west, which includes Glen Garry, Ben Attow, and Glen Cannich are among the most magnificent districts. But the better-known and more accessible Southern Highlands, in which I place the Trossachs and Ben Lomond, lack nothing of grandeur.

The north of Scotland—Ross, Sutherland, and Caithness—is the most desolate part of the British Isles, and cannot be recommended for a first tour; the wild unbroken moors, and the scattered mountain-ranges have a fascination of their own, but further north the pine-woods, which lend added beauty to much of Scotland, are absent, and the great distance between towns and the scarcity of roads combine to make it a land of adventure in which some will see the beauty of unspoilt Nature, but others only a barren wilderness.

Finally, the Eastern Highlands, including East Perthshire, Inverness, and parts of Angus, Kincardine, and Aberdeen, though less wild than the mountains of the north, are almost equally attractive. The Valley of the Dee leading from Aberdeen to Banchory, Ballater, and Lochnagar is probably the most fascinating approach to the Grampians. Little inferior is the Valley of the Don, leading to the beauties of Glen Avon and Cairngorm, as compelling as anything east of the Caledonian Canal. Quieter is the country behind Montrose, and the Valley of the Esk, and the Braes of Angus.

Go and explore, and see for yourself the great wealth of Britain. It will repay you a hundred times.

# FUEL AND OIL

## RUNNING EXPENSES

| Date | Petrol | | Oil | | Speedometer Reading | M.P.G. | |
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| | Gallons | £ s. d. | Pints | £ s. d. | | Petrol | Oil |
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