LEYLAND SERVICE MANUAL

Leyland

By Appointment
MANUFACTURERS OF
MOTOR
LORRIES and VANS
TO THE LATE KING GEORGE VI

LEYLAND MOTORS LTD

GR

SERVICE MANUAL

0680 VERTICAL DIESEL ENGINE

AND
PARTS LIST

LEYLAND MOTORS LIMITED

THE LEYLAND ORGANISATION

FOR SALES AND SERVICE
IN GREAT BRITAIN AND OVERSEAS

Head Office and Works : Leyland Motors Limited, Leyland, Lancashire, England.
Telephone : Leyland 81400.
Telegrams and Cables : Leymotors, Leyland.

Main Service Dept. : Leyland Motors Limited, Bolton Road, Chorley, Lancashire, England.
Telephone : Chorley 2231.
Telegrams : Leymotors, Chorley.
Cables : Leymotors, Leyland.

Export Sales Division : Leyland Motors Limited, Hanover House, Hanover Square, London, W.1.
Telephone : MAYfair 8561.
Cables : Leymotors, London.

DEPOTS AND AGENTS IN GREAT BRITAIN

Full sales and service facilities are available at the addresses below for all types of Leyland vehicles, unless qualified by one of the following symbols:

● Sales Office only ○ Service Depot only † Agent for Industrial Units only

ABERDEEN. John Gibson & Son, Ltd., 397-401 King Street. *Aberdeen* 20355.

BARNHAM, SUSSEX. † Barnham Engineering Co., Ltd., Engineering Works. *Eastergate* 300.

BELFAST. J. A. Potter Ltd., Ravenhill Road. *Belfast* 59311 *and* 59312.

BELFAST. ● Leyland Motors Ltd., 19 Adelaide Street. *Belfast* 25418.

BIRMINGHAM. Leyland Motors Ltd., New Wolverhampton Road, Langley, Oldbury, Birmingham. *Broadwell* 2805-6.

BOREHAM WOOD. ○ Leyland Motors Ltd., Elstree Way. *Elstree* 2901, 2902, 2903, 2904 *and* 2905. *After hours Elstree* 2901 *or* 2902.

BRISTOL. Leyland Motors Ltd., Bath Road, Brislington. *Bristol* 77024. *After hours Bristol* 64934.

BURY. ○ Bramwell, Preston & Co., Phoenix Street. *Bury* 523.

CARDIFF. Leyland Motors Ltd., North Road, Gabalfa. *Cardiff* 31516.

CARDIFF. ○ Arlington Motor Co., Ltd., Dumballs Road (off Penarth Road). *Cardiff* 30641.

CARLISLE. County Garage Co., Ltd., Hardwicke Circus, Lowther Street. *Carlisle* 24234, 24235, 24236. After hours *Carlisle* 24234.

CHORLEY ○ Leyland Motors Ltd., Bolton Road. *Chorley* 2231.

EDINBURGH. Joseph Wilkinson (Motors) Ltd., 2 Hope Crescent, Annandale Street. *Edinburgh Waverley* 4181.

GATESHEAD. Leyland Motors Ltd., Ninth Avenue, Team Valley Trading Estate, Gateshead-upon-Tyne, 11. *Low Fell* 75431. *After hours Low Fell* 75078 *and Low Fell* 75244.

GLASGOW. ● Leyland Motors Ltd., 4 Newton Place, C3. *Douglas* 6483.

○ Albion Motors Ltd., Hawick St., Yoker, W3 *Clydebank* 2446 (From 5-15 p.m. to 8 p.m. Mondays to Fridays and 8 a.m. to 12 noon Saturdays phone *Clydebank* 2448 for Leyland spares or *Clydebank* 2447 for Leyland repairs. *After these hours phone Clydebank* 2446 *or* 1774.) Scottish Co-operative Wholesale Society Ltd., Scotland Street (Sole concessionaires, Scottish Co-operative movement, Scotland and N. Ireland.)

GRIMSBY. Ford & Slater (Lincs.) Ltd., Macaulay Street, *Grimsby* 57181-2.

HULL. Albion Motors Ltd., 80-84 Cumberland Street, Wincolmlee, Hull. *Central* 32992 (2 *lines*.)

LEEDS. ○ Isles Ltd., Leyland Service Depot, Stanningley, Pudsey, Yorks. *Pudsey* 3001. *After hours Pudsey* 3005, 3660, 4321, 3915. (Also Industrial Units.)

LEEDS. ● Leyland Motors Ltd., Clarence Road, 10. *Leeds* 31201 *and* 31202.

LEICESTER. Ford & Slater Ltd., Gwendolen Road, *Leicester* 36117-8-9.

LEYLAND, LANCS. ● Leyland Motors Ltd., *Leyland* 81400. (*See also under* "*Chorley.*")

LINCOLN. Leyland Motors Ltd., Bracebridge Heath. *Lincoln* 22231-2-3.

LIVERPOOL. Leyland Motors Ltd., 334, Rice Lane, 9. *Aintree* 5133 *or* 5134. *After hours Royal* 9256 *or Argosy* 6607.

LONDON. ○ Leyland Motors Ltd., Elstree Way, Boreham Wood. *Elstree* 2901, 2902, 2903, 2904 *and* 2905. *After hours Elstree* 2901 *and* 2902.

LONDON. ○ Arlington Motor Co., Ltd., 57 High Road, Ponders End. *Howard* 1266. 25-27 Vauxhall Bridge Road, S.W.1 *Victoria* 6033.

LONDON. ● Leyland Motors Ltd., Export Sales Division, Hanover House, Hanover Square, W.1. *Mayfair* 8561.

LONDON. ● Leyland Motors Ltd., Southern Regional Sales Office, 3 Lygon Place, Ebury Street, Victoria, S.W.1. *Sloane* 6117/9.]

MANCHESTER. ○ W Senior & Son, Bolton Road, Pendleton. *Pendleton* 2234. *After hours, Pendleton* 1972.

MANCHESTER. ● Leyland Motors Ltd., 25 Brazennose Street, 2. *Blackfriars* 2755.

NEWCASTLE, STAFFS. ○ Newcastle-under-Lyme Motor Services Ltd., Newcastle Road, Trent Vale, Stoke-on-Trent. *Newcastle* (*Staffs.*) 64621.

NORWICH. Leyland Motors Ltd., 3 Harvey Lane. *Norwich* 33029.

NOTTINGHAM. Leyland Motors Ltd., Wollaton Park Gates Derby Rd., Lenton, *Nottingham* 77274. *After hours Sandiacre* 3007.

PLYMOUTH. Leyland Motors Ltd., Marsh Mills, Plympton Road. *Plympton* 2555-6.

PORTSMOUTH. ○ J. H. Sparshatt & Sons (Portsmouth) Ltd. London Road, Hilsea. *Portsmouth* 60361.

SHEFFIELD. Albion Motors Ltd., Beulah Road, Owlerton, 6. *Sheffield* 48827 or 48828.

SOUTHAMPTON. ○ J. H. Sparshatt & Sons (Southampton) Ltd., The Causeway, Redbridge. *Totton* 2258.

SUDBURY, SUFFOLK. ○ Arlington Motor Co., Ltd., Cornard Road. *Sudbury* 2301.

Overseas Branches and Representatives are shown on the next page.

OVERSEAS BRANCHES AND REPRESENTATIVES

ADEN. Cory Bros. & Co. Ltd., Steamer Point, Aden.

ARGENTINE. A. G. Pruden & Co., Bouchard 680, Buenos Aires.

AUSTRALASIA. Leyland Motors Ltd., P.O. Box 18, West Footscray, Victoria. ● Leyland Motors Ltd., 13 Dennison Street, Newcastle, N.S.W. Leyland Motors Ltd., 634 Botany Road, Alexandria, N.S.W. Leyland Motors Ltd., Polo Flat, Cooma, N.S.W. Doug. Norton Pty. Ltd., 484 King Street, Newcastle, N.S.W. Mr. W. E. Gladstone, Maitland Road, Islington, Newcastle, N.S.W. Colac Motor Body & Panel Works, Colac, Victoria. Leyland Motors Ltd., Cnr. Nudgee Road and Hedley Ave., Hendra, N.E.2, Queensland. Ray Howarth Motors, 40 Aplin Street, Cairns, Queensland. Leyland Motors Limited, 26 Crowther Street, Adelaide, S. Australia. West End Motors Pty. Ltd., 1056 Hay Street, Perth, Western Australia. H. C. Heathorn & Co. Ltd., 53 Bathurst Street, Hobart, Tasmania. *Sub-agents for* NEW GUINEA, PAPUA, SOLOMON ISLES, NEW CALEDONIA, NEW HEBRIDES, NORFOLK, GILBERT and ELLICE ISLES: W. R. Carpenter (New Guinea) & Co. Ltd., Rabaul, New Guinea. *Sub-agent for* BISMARCK ARCHIPELAGO: J. L. Chipper & Co. Ltd., Rabaul, New Guinea.

BARBADOS. Central Foundry Ltd., P.O. Box 240, Bridgetown, Barbados, B.W.I.

BELGIAN CONGO Leyland Belgium S.A., 19 Rue de la Chancellerie, Bruxelles, Belgium.

BELGIUM. Leyland Belgium S.A., 19 Rue de la Chancellerie, Bruxelles. Brossel Freres, 14 Avenue de Saio, Bruxelles.

BOLIVIA. Comercial Industrial Boliviana S.A., Casilla de Correo 1867, 2670, La Paz.

BRAZIL. S.A.M.D.A.C.O. Rua da Consolacao 1837, Sao Paulo.

BRITISH BORNEO (SARAWAK, BRUNEI and NORTH BORNEO). Concessionaires: Henry Waugh & Co Ltd., Khoo Hun Yeang Street, P.O. Box 93, Kuching, Sarawak. Head Office: 1 Cecil Street, Singapore 1.

BRITISH GUIANA. Sprostons Ltd., Lot 4, Lombard Street, Georgetown.

BURMA. Blackwood Hodge (Burma) Ltd., Chartered Bank Building, Rangoon, Burma.

CANADA. Leyland Motors (Canada) Ltd.: Factory and Head Office, 1150 Marie-Victorin Road Longueuil, Quebec.

CENTRAL AFRICAN FEDERATION (NORTHERN & SOUTHERN RHODESIA & NYASALAND). Leyland Albion (Central Africa) Ltd., P.O. Box 2422, Salisbury; P.O. Box 2043, Bulawayo; P.O. Box 886, Ndola; P.O. Box 1238, Lusaka.

CEYLON. Associated Motor Ways, Ltd., 185 Union Place, Colombo 2.

CHILE. Costabal y Cia. Ltda., San Ignacio 480, Santiago de Chile.

COSTA RICA. Almacen Electra S.A. P.O. Box 730, San Jose.

CYPRUS. Cyprus Commercial Co., P.O. Box 208, Nicosia.

DENMARK. Dansk Automobil Byggeri, Silkeborg.

EAST AFRICA (KENYA, UGANDA and TANGANYIKA). Gailey & Roberts Ltd., P.O. Box 30067, Nairobi, Kenya. Mr. Ian Dall, Leyland factory representative, c/o Gailey & Roberts Ltd., P.O. Box 3369, Nairobi.

EGYPT. T. W. M. Forsyth, 7 Sh. Maspero, Cairo.

EIRE. Ashenhurst, Williams & Co. Ltd., 15 Talbot Place, Store Street, Dublin.

FINLAND. Oy Suomen Autoteollisuus A.B., Fleminggatan 27, Helsingfors, Helsinki.

GHANA. United Africa Co. Ltd., P.O. Box 1642, Accra; and P.O. Box 146, Tamale, Northern Territories.

GIBRALTAR. As Spain.

GREECE. Const. J. Tambacopoulos, 4, Syngros Avenue, Athens.

HOLLAND. Leyland Holland N.V., Zwarteweg 43, Aalsmeer. † C. V. Timmermans & Co., Bloemendaal, Midden Duin & Daalseweg 24, Amsterdam W.

HONDURAS. Casa Comercial Mathews S.A., Apartado 39, Tegucigalpa, D.C. Honduras, Central America.

HONG-KONG. The Hong-Kong Garage Ltd., Stubbs Road, Hong-Kong.

ICELAND. Samband Isl. Samvinnufelaga, Reykjavik.

INDIA. Ashok Leyland Ltd., Ennore, Madras, and at Bank of Mysore Buildings, N.S.C. Bose Road, Madras 1. (*Distributors for the Indian Union*). Automotive Manufacturers Private Ltd., 108, Bazaar Ward, Kurla, Bombay, 37. Globe Motors Ltd., Prithvi Mansion, Asaf Ali Road, New Delhi, T. V. Sundaram Iyengar & Sons Ltd., P.O. Box No. 21, Madurai, Associated Indian Enterprises (Private) Ltd., 206 Lower Circular Road, Calcutta, 17.

INDONESIA. Java Motors Import Corporation N.V., Kramat Raya 17, Postbox 161, Djakarta.

IRAN. Shishmanian Vatan, Avenue Ferdowsi, Shahrdari Street, No. 61, Teheran. Resident representative: Mr. A. E. Hopper, 573 Avenue Saadi, Teheran.

IRAQ. African and Eastern (Nr. East) Ltd., P.O. Box. 17, Baghdad.

ISRAEL. Consolidated Near East Co. Ltd., 45 Haazmaut Road, Haifa.

JAMAICA. L. S. Panton Ltd., 279, Spanish Town Road, Kelly P.O., Jamaica, B.W.I.

JORDAN. Concessionaires: Al-Barq Arab Cars Co., Amman.

KUWAIT. Bader Al Muilla & Bros., Kuwait, Persian Gulf.

LEBANON. I. J. Saad & Fils, Souk-el-Jamil, Beirut, Lebanon.

MALAYA. Wearn Bros. Ltd., 45, Orchard Road, Singapore, 9.

MALTA. Michael Attard Ltd., 5.6.7, Marsa Cross Road, Marsa.

MAURITIUS. Rogers & Co. Ltd., P.O. Box No. 60, Port Louis.

MOROCCO. African & Eastern (Near East) Ltd., Boite Postale 519, Casablanca.

NEW ZEALAND. Leyland Motors Ltd., P.O. Box 2179, Auckland. Leyland Motors Ltd., 222-228, Wakefield Street, Wellington, C.1. A. & G. Price Ltd., P.O. Box 654, Auckland. Leyland Motors Ltd., P.O. Box 1451, Christchurch. Leyland Motors Ltd., P.O. Box 302, Palmerston North. Reilly's Central Parking Station Ltd., P.O. Box 770, Dunedin. H. E. Melhop Ltd., P.O. Box 321, Invercargill.

NIGERIA AND CAMEROONS. British West Africa (Engineering) Ltd., Private Mail Bag, 1 Commercial Road, Apapa, Lagos, Nigeria.

NORWAY. A. S. Autoindustri, Darresgate 2-4, Oslo.

PAKISTAN. James Finlay & Co., Ltd., P.O. Box 4670, Finlay House, McLeod Road, Karachi. James Finlay & Co., Ltd., Double Moorings, Chittagong, East Pakistan.

PERU. Milne & Co. S.A., P.O. Box 684, Lima.

PORTUGAL. Francisco Garcia & Cia. Ltda., Avenida Casa Ribeiro 28, Lisbon.

PORTUGUESE EAST AFRICA. Entreposto Comercial de Mocambique, P.O. Box 1153, Lourenco Marques and Edificio Dias da Cunha, Rua do Arangua, Beira.

PORTUGUESE WEST AFRICA. Comercia de Automoveis Ltda., Travessa da Asia, Luanda.

SIERRA LEONE. United Africa Co. Ltd., Freetown.

SOUTH AFRICA. Leyland Albion (Africa) Ltd.: Head Office, P.O. Box 6226, Johannesburg; P.O. Box 1885, Cape Town; P.O. Box 77, Mobeni, Natal; P.O. Box 1014, Bloemfontein; P.O. Box 800, Pietermaritzburg, Natal; P.O. Box 42, Eshowe, Zululand. Concessionaires: R. L. Weir & Co. (P.E.) (Pty.) Ltd., P.O Box 148, Port Elizabeth; Cape Eastern Diesel Services (Pty.) Ltd., P.O. Box 720, East London; Northern Diesel Services (Pty.) Ltd., P.O. Box 292, Kimberley; Northern Transvaal Diesel Services, P.O. Box 346, Pietersburg, Tvl.; Sam Cohen Ltd., P.O. Box 215, Windhoek, S.W.A.; De Jongh's Engineering & Motor Co. (Pty.) Ltd. P.O. Box 73, Pretoria North.

SPAIN. Leyland-Iberica S.A., Tomas Breton 10, Madrid.

SPANISH MOROCCO. As Spain,

SWEDEN. Forenade Bil, Ab I Malmo, Ostra Tullgatan 6, Malmo.

SWITZERLAND. Prata S.A., S Quai du Mont Blanc, Geneva.

SYRIA. Automotive & Engineering Co., S.A., Fardous Street, Damascus.

TANGIER. As Spain.

THAILAND. Henry Waugh & Co. Ltd., 226 Nares Road, P.O. Box 40, Bangkok.

TRINIDAD. Trinidad Agencies Ltd., 40 South Quay, Port-of-Spain.

TURKEY. Cifkurt Ticaret Ve Sanayi T.A.S., Halaskargazi Caddesi No. 368/2, Sisli Camii Karsisi, Istanbul.

URUGUAY. Corausa Corporacion Automotriz S.A., Dante 2258, Montevideo.

To keep this list up to date, please refer to your current issue of the Leyland Journal.

Conditions of Business and Guarantee

The following Conditions of Business and Guarantee apply to all orders accepted by LEYLAND MOTORS LIMITED (hereinafter called "the Company") for Motor Vehicles and chassis therefor, or for engines, components, or spare parts, or repairs, or other work of any description.

CONDITIONS OF BUSINESS

1. PRICE ALTERATION.—If, and whenever, after the date of the order or tender, and before completion of manufacture of the goods for the customer the Company's prices for chassis, engines or components, and/or for bodies of the type specified are changed, or the rate of wages are altered by national agreement, or the prices of the vendors to the Company for material, parts, accessories, components or other articles are increased or decreased, the Company may give notice of such variation to the customer, and the purchase price above specified and agreed shall, in that event, be correspondingly increased or decreased. If the specification of the goods does not vary from the Company's standard specification the Company will accept notice of dissent from the customer within fourteen days, the Company having the option either to complete the contract without increasing the purchase price, or to cancel the contract and return the deposit to the customer. No cancellations shall give cause for any claim for loss or damage. If the specification calls for variation from the Company's standard types, the customer is under obligation to complete the contract at the increased price.

2. ORDERS.—No order shall be binding until accepted in writing by the Company.

3. DELIVERY.—Delivery shall be at the Company's Works at Leyland, unless otherwise agreed. Customers will be notified when goods are ready for delivery and the goods shall be deemed to be accepted and delivery shall be taken within seven days thereafter.

4. DELIVERY DATES.—The Company undertakes to make every endeavour to deliver each order within the period quoted, reckoned from the date of receipt by the Company of all instructions and information necessary for the execution of the work, but is unable to guarantee that circumstances not in the control of the Company may not interfere. No liability shall attach to the Company for delay in delivery, howsoever arising, or for any contingent or consequential loss or damage arising from such delay.

5. PACKING.—All packing is charged extra.

6. PAYMENT.—Unless otherwise agreed, payment must be made at the Company's Works at Leyland, in full in sterling before delivery.
   (a) Where payment has been arranged by means of a Letter of Credit, the customer will establish a "Confirmed Irrevocable Letter of Credit" payable in sterling in London, by drafts at sight for 100% of the invoice value, all Bank and other charges being payable by the customer.
   (b) Where payment is to be secured by Bills of Exchange, such Bills, unless otherwise agreed in writing, will be subject to an interest charge at the rate of 1% over Bank rate, and all charges for negotiation in London and/or abroad are payable by the customer.
   (c) Where shipments are despatched "cash against documents (foreign Port)" all Bank and other charges abroad are payable by the customer.

The Company reserves the right to call for a deposit with the order. The property in the goods will not pass until payment in full has been made.

7. IMPROVEMENTS AND ALTERATIONS.—The Company, whose policy is one of continuous improvement, reserves the right to make, without notice, any changes in material, dimensions and designs, which, having regard to all the circumstances, it thinks reasonable or desirable, without affecting the validity of the contract.

8. ILLUSTRATIONS AND DESCRIPTIONS.—Illustrations, photographs and descriptions are intended as a general guide only, and must not be taken as binding in detail.

9. INSPECTION AND TESTS.—Reasonable inspection and tests will be allowed during convenient working hours at the Company's Works before acceptance, if asked for on or before the placing of an order. No claim made after delivery regarding the quality of the goods delivered will be entertained, except under any guarantee applicable to the goods.

10. CANCELLATION OR SUSPENSION OF CONTRACT.—Should the Company be delayed in or prevented from making delivery owing to strikes, lockouts, trade disputes, difficulty in obtaining workmen or material, breakdown of machinery, accident, fire, force majeure, war, civil riot, requisitioning by Government, or any other circumstances outside the Company's control, the Company shall be at liberty to cancel or suspend the contract without incurring liability for any loss or damage resulting to the customer.

11. EXCLUSION OF LIABILITY.—Vehicles ordered by customers are driven or towed by the Company's employees at the sole and entire risk and responsibility of the customer. All goods in the hands of the Company for delivery or repair or otherwise are held by the Company at the customer's risk as regards loss or damage, howsoever arising.

12. REPAIRS.—If goods received by the Company for repair or for other work are not removed whether because of non-payment of the Company's charges or otherwise within twenty-one days of the date of rendering the Company's account, the Company may thenceforth charge for storage, and, without further notice to the customer, may at any time thereafter sell the goods and retain all amounts due from the customer to the Company out of the proceeds, the balance of which shall be paid to the customer.

13. ERRORS.—Claims regarding errors in despatch or invoicing must be made within fourteen days after delivery of the goods to the customer. The Company refuses to recognise any claim not made within that period.

14. EXHIBITIONS AND COMPETITIONS.—The Company's products are sold upon the express condition that they are not without the previous written consent of the Company to be exhibited at any exhibition or used in any competition, competitive trial or collective demonstration. On any and every breach of this condition, whether by the customer or by a subsequent owner, the customer shall pay to the Company the sum of £250 (or other such sum as the Company may be ordered to pay by the Society of Motor Manufacturers and Traders), as agreed and liquidated damages. Every purchaser of the said products from the Company for resale shall obtain a like undertaking from his customer.

15. DEFAULT OF CUSTOMER.—If the customer becomes bankrupt or insolvent or compounds or makes any arrangement with his creditors, or being a Company goes into liquidation or has a receiver appointed of its assets, the Company may give notice cancelling the contract and without further notice to the customer may resell the goods, and any loss and expenses sustained on the resale shall be paid to the Company by the customer.

16. PREVENTION OF CORRUPT PRACTICES.—The Company in no circumstances commits or permits, in relation to its contracts, any act constituting or savouring of bribery or corruption, as laid down in the Prevention of Corruption Acts, 1889 to 1916, and Section 123 of the Local Government Act, 1933.

17. WAGES AND HOURS OF LABOUR.—The Company at all times observes the provisions normally found in contracts with Government Departments, Municipal Corporations or Public Bodies in regard to payment of standard rates of wages, observance of recognised hours and conditions of labour, and freedom of employees to belong to Trade Societies. Evidence of compliance with the conditions will be produced to such Authorities contracting with the Company, whenever required.

18. ARBITRATION AND INTERPRETATION.—Any dispute or difference as to the meaning or effect of these conditions or of the Company's guarantee, or as to the rights, or liabilities of either party under the contract, shall be and is hereby referred to the final decision of a single arbitrator in England to be nominated by the parties, or in default thereof by the President of the Society of Motor Manufacturers and Traders Limited. These conditions and the Company's guarantee and any arbitration hereunder shall be interpreted and governed in all respects according to the Law of England. Except where expressly stated to the contrary by the Company the trade terms incorporated in the contract shall bear the meaning set out in "Incoterms 1953" as published by the International Chamber of Commerce.

19. NOTICES.—Any notice (which expression shall include any advice note, invoice or other document) may be served on the customer (or, if more than one, on any of them on behalf of all) either personally or by leaving it at, or sending it by post or telegram to, his last known residence or place of business. Such notice shall be deemed to have been served in the case of a letter sent by post, in due course of post, and in the case of a telegram at the expiration of the time normally taken for transmission.

20. The Company will be responsible for obtaining any necessary export licence or permit that may be required for goods ordered by an overseas customer, but if the same cannot be obtained within twenty-eight days of the goods being notified as ready for delivery or if the same is cancelled before delivery has taken place the terms of Condition 10 hereof shall be deemed to apply.

21. The customer, if an overseas customer, shall be responsible for obtaining any necessary licence or permit for the import of goods to the overseas country, and shall be responsible for acquiring the necessary sterling to enable payment to be made to the Company. In the event that the customer shall fail to comply with this condition within twenty-eight days of being notified that the goods are ready for delivery the Company may declare the contract cancelled and resell the goods and any loss sustained by the resale shall be paid to the Company by the customer. The Company will not be liable for any loss or damage resulting to the customer.

22. SCOPE OF CONDITIONS.—The acceptance of any order by the Company shall incorporate these conditions into the contract and they shall supersede and exclude all general terms and conditions of contract imposed, or sought to be imposed, by the customer at any time in relation to the order, in so far as such terms and conditions are inconsistent therewith or additional thereto.

Guarantee

The Company uses its best endeavours to secure excellence of materials and workmanship and gives the following guarantee in regard to its products and repairs, namely:—

1. In the event of any defect being discovered within the period mentioned in Clause 2 hereunder in any goods supplied (whether originally or by way of replacement) or repaired by the Company, then provided that the alleged defective part is returned to the Company's Works at Chorley, carriage paid and properly labelled for identification, within seven days after discovery of the alleged defect, the Company will examine such part carefully and, if satisfied that the defect is due to faulty material or bad workmanship, will (save as mentioned in Clause 8 hereunder) repair the defective part, or supply a new one in place thereof, free of charge at Works. Any claim under this Clause must be made in writing on or before the despatch of the alleged defective part and must contain full particulars of the alleged defect together with the number of the chassis from which such part has been removed.

2. The period of guarantee is:—

   (a) For chassis and bodies, twelve months for home orders and six months for overseas orders from the date on which the vehicle is first registered or put into commercial use.

   (b) For parts supplied by way of replacement or repair, either under this guarantee or voluntarily at special rates or free of charge, the unexpired portion of the period applicable to the chassis or body concerned.

   (c) For parts supplied by way of replacement or repaired at normal rates of charge, twelve months for home orders and six months for overseas orders from the date of delivery of the new or repaired part.

   (d) For engines and marine and industrial units, twelve months for home orders and six months for overseas orders following the date of delivery ex Works, or 2,000 working hours, whichever is the less, on condition that

      (i) An adequate supply of filtered air is provided under all conditions of operation, and

      (ii) Approval of the Company is obtained of the installation of marine or industrial unit which forms the subject of this quotation/contract.

3. If the Company makes any alteration in or addition to any goods, the foregoing guarantee shall (subject as mentioned in Clause 8) extend to such alteration or addition, the period of guarantee being the period, or unexpired portion thereof, applicable under Clause 2 to the goods concerned.

4. Parts received from the customer and not repaired may be scrapped by the Company, unless the customer, within fourteen days of despatch of notification of the Company's decision in regard to the claim, asks for their return.

5. Charges for dismantling and reassembly, whether by the Company or by a third party, and for carriage, shall be borne by the customer.

6. The Company accepts no liability for any loss or damage, direct or consequential, or for any accident, or the effects of an accident, resulting from defective material, faulty workmanship or otherwise.

7. The benefit of this guarantee extends to the first registered owner only, or (in the absence of registration) to the first commercial user of the vehicle and cannot be transferred without the written consent of the Company.

8. The benefits of this guarantee do not apply to:—

   (a) Bodies, coachwork and proprietary articles (such as tyres, electric lighting sets, engines, gearboxes, axles and other major and minor components) not manufactured by the Company, and spare or replacement parts therefor, but the Company will pass on to the customer the benefit of any guarantee given by the manufacturer in regard thereto.

   (b) Defects due to wear and tear, racing, accident, improper adjustment, misuse (including the use of dirty or unsuitable oil), dirt or neglect.

   (c) Vehicles or goods which have been (i) altered or added to without the written consent of the Company, or (ii) loaded beyond the gross laden weight specified by the Company, or (iii) fitted with a body of a type or weight for which the chassis is not designed, or (iv) subjected to alteration, obliteration, removal or concealment of the Company's identification numbers or marks, or (v) let out on hire (excluding hire purchase), or (vi) used for military purposes.

   (d) Parts repaired by third parties, or by the customer.

   (e) Parts damaged by reason of defects in other parts.

   (f) Governed engines, or vehicles fitted therewith, which have had the setting of the governor altered otherwise than by the Company.

   (g) Goods supplied by the Company as second-hand.

   (h) Replacements or repairs to items (a), (c), (f) and (g) above.

   (i) Defects due to faulty workmanship by a third party, or by the customer, during fitting or assembly in connection with replacements, repairs, alterations or additions.

9. The Company gives no guarantee as to performance, unless by separate agreement in writing.

10. This guarantee is in lieu of and excludes all conditions, warranties, and liabilities expressed or implied, whether under common law, statute or otherwise, in relation to all goods and repairs, whether covered by the guarantee or not.

CHAPTER 3s

ENGINE

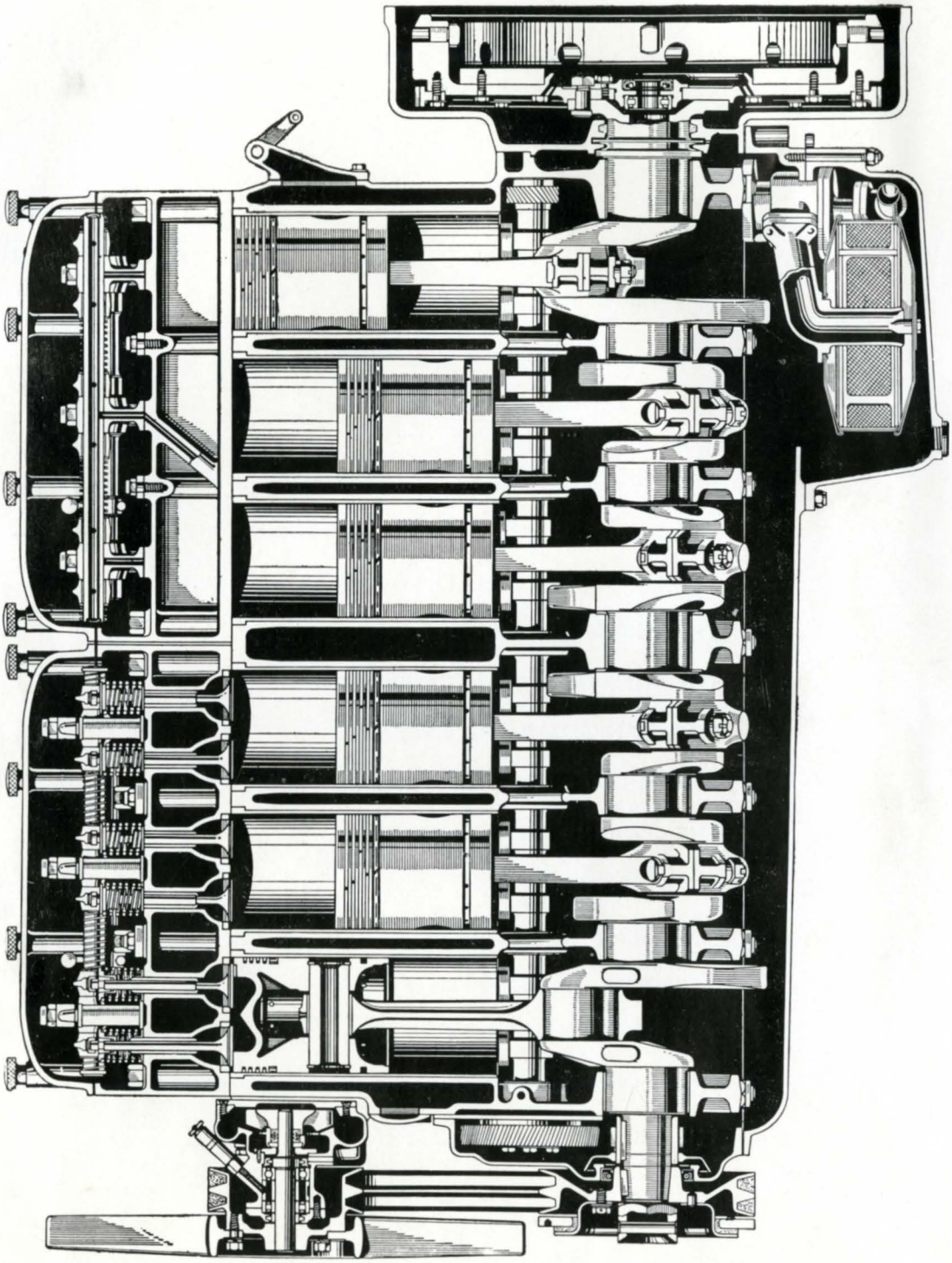


FIG. 1 TYPICAL SECTIONAL VIEW THROUGH ENGINE

ENGINE

DATA

GENERAL

Type	Leyland 0680 vertical Diesel engine (11.1 litres).
Main features	Six-cylinder, compression-ignition, direct injection, overhead valve, vertical, water-cooled.
Bore	5.0 in. (127 mm.).
Stroke	5.75 in. (146.05 mm.).
Cubic capacity	677 cubic inches (11,093 c.c.).
Maximum torque	450 lb./ft. at 1,100 r.p.m. (62.2 kg./m.).
Maximum b.h.p.	150 at 2,000 r.p.m.
Compression ratio	15.75 to 1.
Firing order	1, 5, 3, 6, 2, 4.

LUBRICATION

Type	Wet sump, gear-type pump.
Pump data	Interference of pump gear on shaft, .0003 in. to .0013 in. (.00762 mm. to .03302 mm.). Initial diametral clearance between idler-gear and spindle, .0012 in. to .0022 in. (.03048 mm. to .05588 mm.). Backlash between gears, .022 in. to .026 in. (.5588 mm. to .6604 mm.).
Sump capacity	32 pints (18 litres) approx.
Oil pressure	60 p.s.i. (4.2 kg./sq.cm.) at 1,000 r.p.m. or higher speeds with warm engine. Not below 5 p.s.i. (.35 kg./sq.cm.) with engine idling.
Pump delivery	40 pints (22.7 litres) approx. per min. at 1,000 r.p.m. crankshaft speed.
Filter	Leyland, full-flow, cloth-type filter element.

CYLINDER HEADS

Type	Detachable, 2 per engine, each covering 3 cylinders.
Material	Cast iron.
Valve guide interference in head	.001 in. to .002 in. (.0254 mm. to .0508 mm.).

ENGINE BLOCK

Type	Cylinders and crankcase in one-piece casting.
Material	Cast iron.
Liners	Pre-finished, dry, cast iron, press-fit, shoulder located.
Initial bore of liner before fitting to engine block	5.0017 in. to 5.0025 in. (127.043 mm. to 127.064 mm.).
Reline when wear of liner bore exceeds ...	.020 in. (.508 mm.).

PISTON AND RINGS

Piston make	Wellworthy.
Piston type	Toroidal cavity.
Piston material	Aluminium alloy.

Compression Rings

Number of rings	Three (1st, 2nd and 3rd grooves). The top compression ring is chromium plated.
Type of ring	.125 in. (3.175 mm.), 3° taper sides, hardened and tempered, 90° gap.
Initial gap	.020 in. to .024 in. (.508 mm. to .6096 mm.).

Scraper Rings

Number of rings	Two (4th and 5th grooves).
Type of ring	.250 in. (6.350 mm.) wide, straight sides, slotted, 90° gap.
Initial gap	.020 in. to .024 in. (.508 mm. to .6096 mm.).

CONNECTING RODS AND GUDGEON PINS

Gudgeon pin	1.625 in. (41.275 mm.) dia. hollow, fully floating.
Pin retained by	Two circlips in piston.
Connecting rod type	I-section.
Small-end bearing	Phosphor-bronze bush.
Initial diametral clearance of pin in small-end bush (cold)	.00045 in. to .001 in. (.01143 mm. to .0254 mm.).
Renew small-end bush when diametral clearance exceeds	.0025 in. (.0635 mm.).
Interference of small-end bush in connecting rod	.00225 in. to .00425 in. (.05715 mm. to .107950 mm.).
Big-end bearing type	Pre-finished, lead-bronze, steel shell, bearing surface indium-coated.
Big-end initial diametral clearance	.0018 in. to .0037 in. (.04572 mm. to .09398 mm.).
Renew when diametral clearance exceeds ...	.008 in. (.2032 mm.).
Undersize big-end bearings available ...	Prefinished in five steps of .010 in. (.254 mm.) each.

Do not grind sides of crankpins

CRANKSHAFT AND MAIN BEARINGS

Number of main bearings	Seven.
Main bearing type	Prefinished strip bearings.
Type of bearing	Lead-bronze, steel shell, bearing surface indium coated.
Crankshaft type	Forging, incorporating balance weights.
Crankshaft material	Alloy-steel, nitrided.
Thrust taken on	Thrust washers at centre journal.

TABLE OF CRANKSHAFT DIMENSIONS

TYPE	PART NUMBER	CRANKPIN DIAMETER		CRANKPIN WIDTH		JOURNAL DIAMETER		JOURNAL WIDTH							
								FRONT		CENTRE		REAR		OTHERS	
		in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.
Standard Service	Part Number as stamped on front web	3.0005 2.9998	76.213 76.195	2.203 2.200	55.956 55.880	3.5005 3.4998	88.913 88.895	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180
1st Service	Part Number /S.1	2.9905 2.9898	75.959 75.941	2.203 2.200	55.956 55.880	3.4905 3.4898	88.659 88.641	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180
2nd Service	„ /S.2	2.9805 2.9798	75.705 75.687	2.203 2.200	55.956 55.880	3.4805 3.4798	88.404 88.387	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180
3rd Service	„ /S.3	2.9705 2.9698	75.451 75.433	2.203 2.200	55.956 55.880	3.4705 3.4698	88.151 88.133	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180
4th Service	„ /S.4	2.9605 2.9598	75.197 75.179	2.203 2.200	55.956 55.880	3.4605 3.4598	87.897 87.879	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180
5th Service	„ /S.5	2.9505 2.9498	74.943 74.925	2.203 2.200	55.956 55.880	3.4505 3.4498	87.643 87.625	2.000	50.800	2.702 2.700	68.631 68.580	2.705 2.695	68.707 68.453	1.710 1.700	43.434 43.180

Note 1. When re-grinding crankpin and journals the sides must not be ground unless they have been damaged. If the location faces of the centre main bearing have been damaged, the width should be increased to 2.710 in./2.712 in. (68.834 mm./68.885 mm.); otherwise the dimension should remain unchanged.

Note 2. The crankshaft should be re-nitrided at service sizes S.2 and S.4.

Centre journal initial end clearance	.004 in. to .010 in. (.1016 mm. to .254 mm.).
Renew thrust washers when end clearance exceeds	.014 in. (.3556 mm.).
Oversize thrust washers available	One set .010 in. (.254 mm.) thick, .005 in. (.1270 mm.) each washer.
Regrind journals and crankpins	When .003 in. (.0762 mm.) oval.
Undersize main bearings available	Five, in steps of .010 in. (.254 mm.) each.
Main bearing initial diametral clearance ...	.0020 in. to .0042 in. (.0508 mm. to .1067 mm.).
Renew when diametral clearance exceeds ...	.009 in. (.2286 mm.).
Maximum run-out on shaft	.003 in. (.0762 mm.) total clock reading .006 in. (.1524 mm.).
Maximum run-out between two adjacent bearings	.003 in. (.0762 mm.) total clock reading.
Crankshaft damper	Rubber-bonded vibration damper at front of crankshaft.

CAMSHAFT

Number	One.
Camshaft type	Forged with integral cams.
Camshaft material	Steel.
Type of drive	Single-helical gear.
Number of bearings	Seven.

Material	Front and rear—leaded gunmetal; intermediate—carobronze.
Thrust taken on	Front bearing only.
Interference fit of all bearings in engine block	.0005 in. to .0025 in. (.01270 mm. to .06350 mm.).
Journal diameters	2.396 in. to 2.397 in. (60.858 mm. to 60.883 mm.).
Initial diametral clearance in all bearings ...	.004 in. to .0055 in. (.1016 mm. to .1397 mm.).
Renew bearings when clearance exceeds ...	.010 in. (.254 mm.).
Initial dimension from nose to back of cam	1.995 in. to 2.005 in. (50.673 mm. to 50.927 mm.).
Renew camshaft when this dimension is ...	1.983 in. (50.368 mm.).

TIMING GEARS

Type	Single-helical gears.
Gear material	Hardened and ground steel.
Permissible backlash between each pair of gears	.002 in. to .004 in. (.0508 mm. to .1016 mm.).
Idler gears, initial diametral clearance between bush and gear	.001 in. to .00325 in. (.0254 mm. to .0826 mm.).

Diametral clearance between bush and idler spindle	.001 in. to .00325 in. (.0254 mm. to .082550 mm.).
End float between thrust washers and idler gear	.004 in. to .0095 in. (.1016 mm. to .2413 mm.).
Renew thrust washers when end clearance exceeds	.012 in. (.3048 mm.).
Interference fit of timing gear on crankshaft	.00075 in. to .00225 in. (.019050 mm. to .057150 mm.).

VALVES

Type	Overhead poppet.
Valve material	Stellite-faced, hard chrome-plated stems.
Number per cylinder	One inlet, one exhaust.
Stem diameter:	
Inlet	.43475 in./.43425 in. (11.0425 mm./11.0300 mm.)
Exhaust	.43325 in./.43275 in. (11.0046 mm./10.9918 mm.).
Stem clearance in guide:	
Inlet	.0025 in. to .00375 in. (.06350 mm. to .09525 mm.).
Exhaust	.004 in. to .00525 in. (.1016 mm. to .13335 mm.).
Valve head diameter:	
Inlet	2.20 in. (55.88 mm.).
Exhaust	1.90 in. (48.26 mm.).

Angle of valve seat	30°.
Angle of valve face	29½°.
Valve lift	0.5 in. (12.70 mm.).
Number of valve springs	Two per valve, concentric.
Maximum spring pressure (valve open)	134 lb. (60.782 kg.).
Free length of spring:	
Inner	2.130 in. (54.102 mm.).
Outer	2.50 in. (63.50 mm.).
Renew springs when	Inner spring will compress to 1.25 in. (31.750 mm.) under a load less than 35 lb. (15.87 kg.). Outer spring will compress to 1.50 in. (38.100 mm.) under a load less than 74 lb. (33.56 kg.).
Initial diametral clearance of rocker shaft in rocker	.0005 in. to .00175 in. (.01270 mm. to .04445 mm.).
Renew rocker shaft bushes when diametral clearance exceeds	.003 in. (.0762 mm.).
Initial diametral clearance of tappet in engine block	.00175 in. to .00375 in. (.04445 mm. to .09525 mm.).
Renew tappet when diametral clearance in engine block exceeds	.004 in. (.1016 mm.).
Tappet clearance:	
Inlet	.020 in. (.508 mm.) engine cold.
Exhaust	.020 in. (.508 mm.) engine cold.

VALVE TIMING

Inlet opens	10° before T.D.C.=1.72 in. on flywheel rim. 43.688 mm.
Inlet closes	50° after B.D.C.=8.61 in. on flywheel rim. 218.694 mm.
Exhaust opens	46° before B.D.C.=7.92 in. on flywheel rim. 201.168 mm.
Exhaust closes	14° after T.D.C.=2.41 in. on flywheel rim. 61.214 mm.

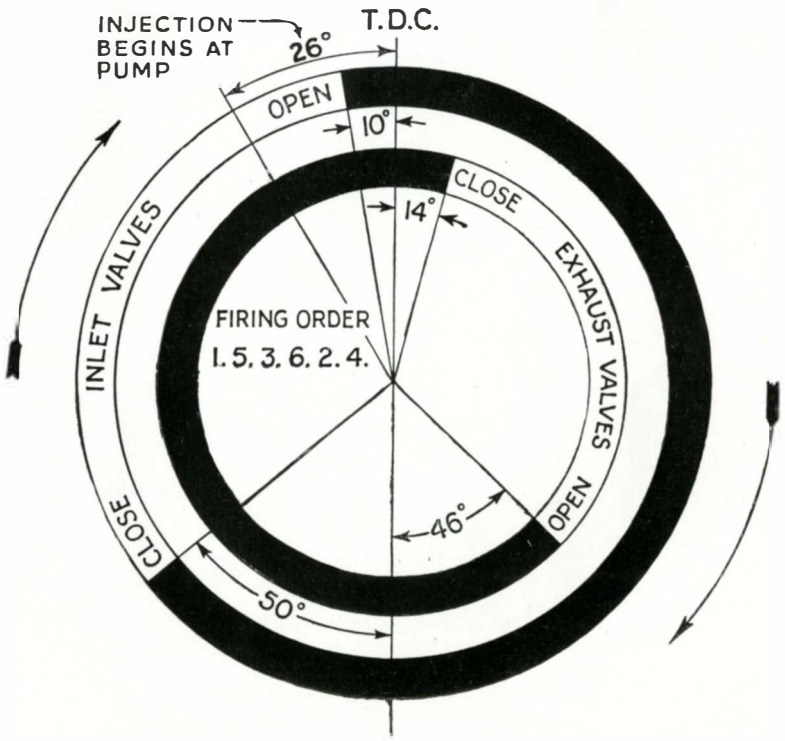


FIG. 2. VALVE TIMING DIAGRAM

INJECTION PUMP

Make	C.A.V.
Type	NL 6F 75.
Number of deliveries	6.
Plunger diameter	7.5 mm.
Plunger stroke	9 mm.
Helix	Right-hand.
Drive	Flexible, adjustable coupling, clockwise rotation, half engine speed.
Timing	Timing begins at the injection pump, 26° before T.D.C.

GOVERNOR

Make	C.A.V.
Type	RP 15/1A.
Cutting-in speed	2,000 r.p.m.
Runaway speed	2,200 r.p.m.
Idling speed	300/350 r.p.m.

FUEL FEED PUMP

Make	C.A.V.
Type	DFP 3/2.
Pressure maintained	4 to 5 p.s.i. (.28 to .35 kg./sq.cm.).
Operation	Operated by arm in contact with eccentric on injection pump camshaft.

EXCESS FUEL DEVICE (Diaphragm type)

Make	C.A.V.
Type	7125/1A.

EXCESS FUEL DEVICE (Baulking type)

Make	C.A.V.
Type	7097/326 C.

INJECTORS

Make	Leyland.
Type	N.35.
Discharge pressure	140 to 145 atmospheres 2,057 to 2,130 p.s.i. (144.6 to 149.7 kg./sq.cm.).
Adjusting washer	Available in ten steps of .010 in. (.254 mm.) each from .103 in. to .193 in. (2.6162 mm. to 4.9022 mm.) thick.
Needle lift	.016 in. to .018 in. (.4064 mm. to .4572 mm.).
Needle valve adjusting washer	Available in the following thicknesses:

.0925 in.,	2.3495 mm.
.0945 in.,	2.4003 mm.
.0965 in.,	2.4511 mm.
.0975 in.,	2.4765 mm.
.0985 in.,	2.5019 mm.
.0995 in.,	2.5273 mm.
.1005 in.,	2.5527 mm.
.1020 in.,	2.5908 mm.
.1040 in.,	2.6416 mm.
.1060 in.,	2.6924 mm.
.1080 in.,	2.7432 mm.
.1100 in.,	2.7940 mm.
.1120 in.,	2.8448 mm.
.1140 in.,	2.8956 mm.

Angle of sprays	140°.
Valve spring free length	1.5625 in. (39.687 mm.).
Valve spring length under a load of 48 lb. to 54 lb. (21.773 kg. to 24.494 kg.)	1.355 in. (34.417 mm.).

COMPRESSOR

Make	Clayton Dewandre.
Type	PC/GA66.
Bore	2.125 in. (53.97 mm.).
Stroke	1.75 in. (44.45 mm.).
Piston displacement	7 cu. ft. (0.198 cu. m.) per minute at 1,000 r.p.m.
Drive	Gear type dog coupling, driven from timing gear train at half crankshaft speed, clockwise rotation.

COMPRESSOR

Make	Westinghouse.
Type	E.7K.
Bore	2.25 in. (57.150 mm.).
Stroke	1.50 in. (38.10 mm.).
Piston displacement	7 cu. ft. (0.198 cu. m.) per minute at 1,000 r.p.m.
Drive	Gear type dog coupling, driven from timing gear train at half crankshaft speed, clockwise rotation.

DYNAMO DRIVE

Drive	Belt driven from pulley on crankshaft.
Rotation	Clockwise.
Dynamo runs at	1.72 × engine speed.

COOLING SYSTEM

Controlled by thermostat	Thermostat opens at 185°F. (85°C.).
Water pump and fan drive	Belt driven from pulley on crankshaft

AIR CLEANER

Make and type	A.C. Sphinx E/AC 32188.

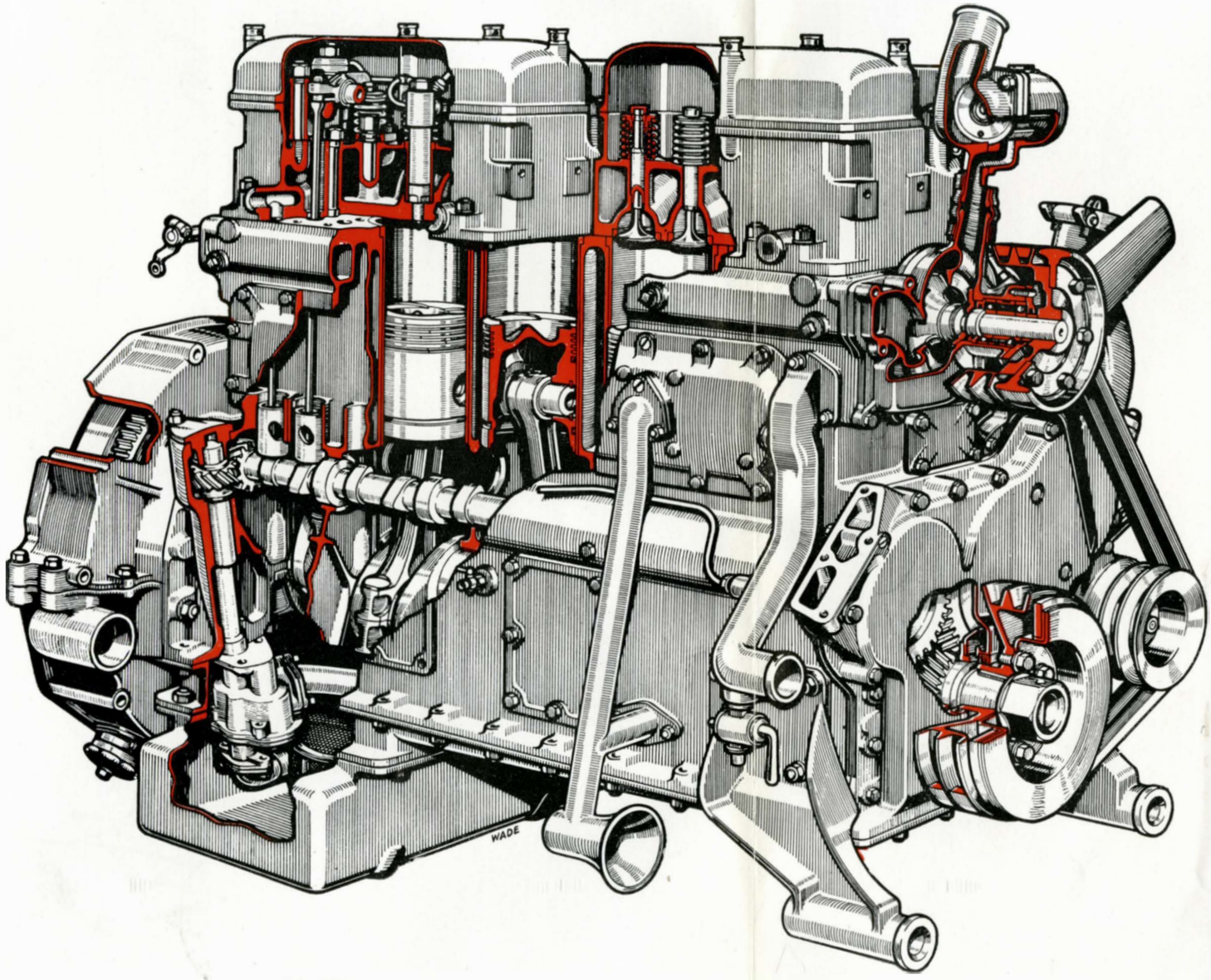


FIG. 3. TYPICAL CUT-AWAY VIEW OF ENGINE

ENGINE LUBRICATION

DESCRIPTION

Engine lubrication is on the wet sump system, the oil being circulated by a gear type oil pump.

The oil sump capacity is approx. 32 pints (18 litres) as shown by the full mark on the dipstick. The oil should be changed every 5,000 miles (8,000 kilometres).

Oil is drawn from the bottom sump well, through the suction filter, and pressure fed by the pump through a full-flow cloth element filter into the main lubrication system, which is provided with an adjustable relief valve.

Oil is fed to the crankshaft main bearings, big end bearings, idler-gear and camshaft bearings through oilways drilled in the crankcase. The cylinder walls and gudgeon-pin bushes are lubricated by splash and intermittent spray from oilways drilled in the crankpins and connecting-rod big-ends, Figs. 5 and 11.

The rocker gear is also lubricated by an intermittent feed from the second and fifth camshaft bearings via vertical oilways drilled in the engine-block and heads, up through the centre rocker shaft support bracket on each head, along the tubular rocker-shafts to the rocker levers.

Oil which escapes past the relief valve, spills back into the bottom sump well, via a short stand pipe below oil level to prevent aeration.

The sump suction filter should be removed and washed in paraffin every 20,000 miles (32,000 kilometres).

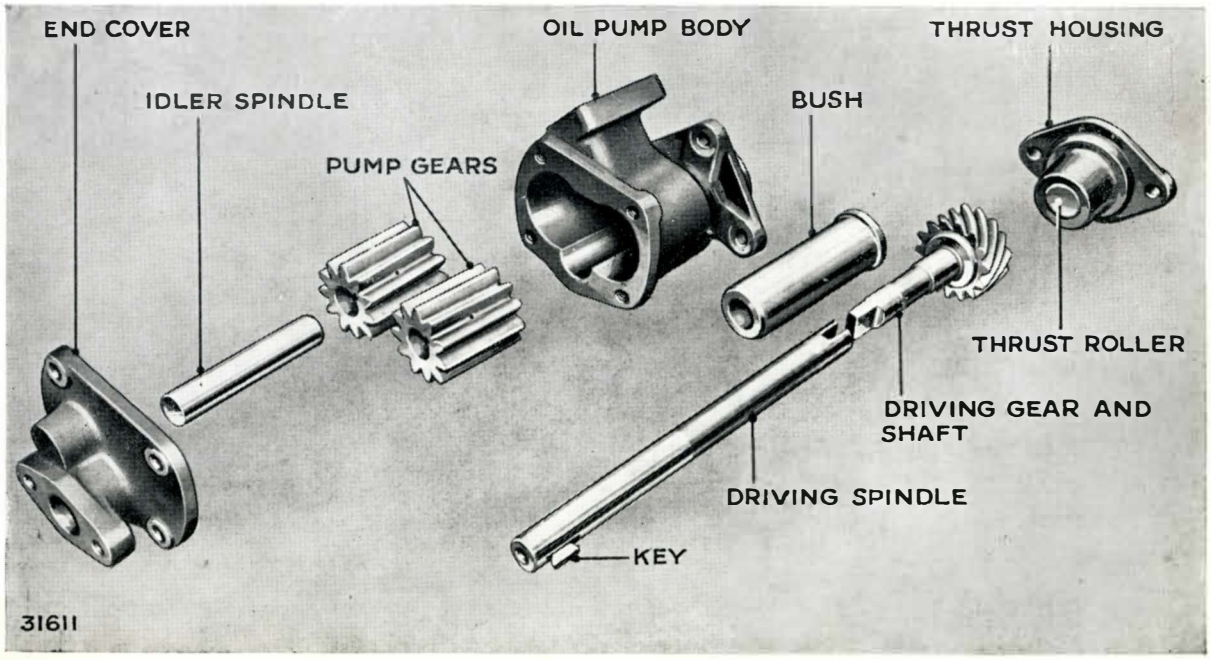


FIG 4. OIL PUMP AND DRIVE DISMANTLED

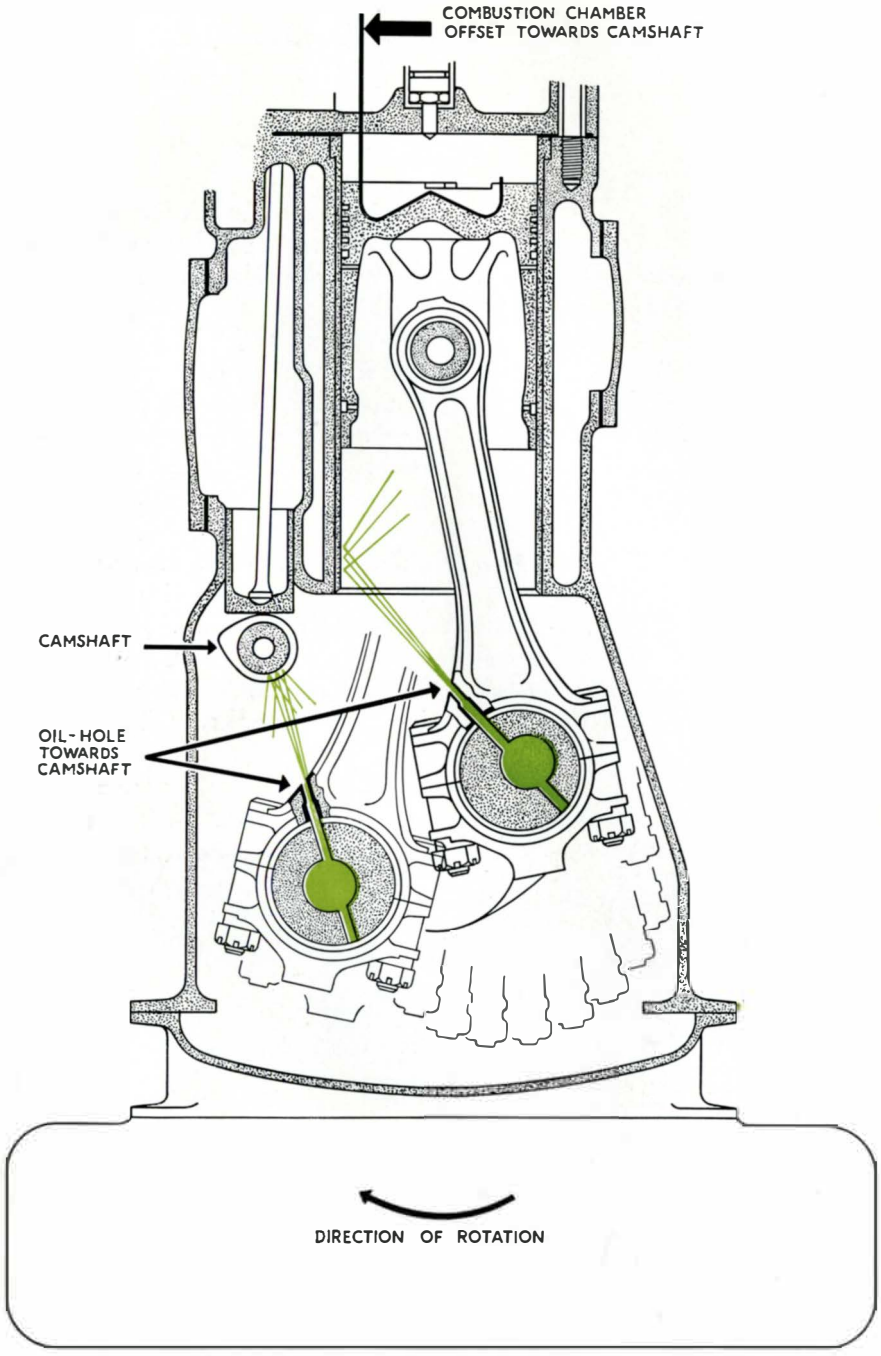


FIG. 5. CYLINDER-WALL LUBRICATION

To remove the suction filter, it is only necessary to drop the bottom sump and remove the two setscrews securing the filter basket to the oil suction pipe.

The lead to the oil pressure gauge is taken from the oilway feeding the centre main bearing and is connected to the gauge pipe through a tap on the left-hand side of the engine block. At all times the tap should remain open, but, in the event of a broken pipe or leaking gauge, the tap can be closed and serious loss of oil prevented.

Crankcase breathing is effected through holes drilled in the cylinder-head cover holding down bosses and vented to atmosphere from a venturi type breather attached to the front tappet gallery cover, Fig. 15.

OIL PUMP

The oil pump is housed in the right-hand rear of the engine block and consists of spur gears, shaft driven from the camshaft by spiral gears. At the lower end of the camshaft driven-gear, a tongue transmits the drive to the pump spindle, on which is pressed a spur gear, the woodruff key being used only to position the oil hole supplying lubrication to the spiral gears and thrust face.

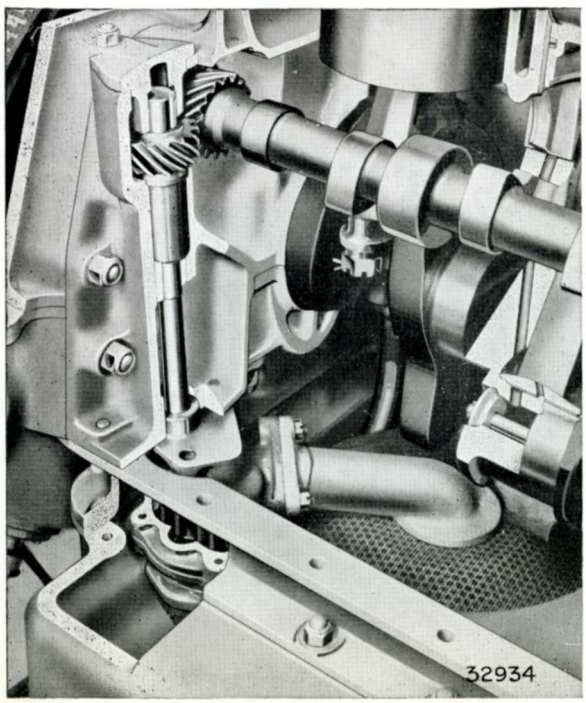


FIG. 6. OIL PUMP DRIVE FROM CAMSHAFT

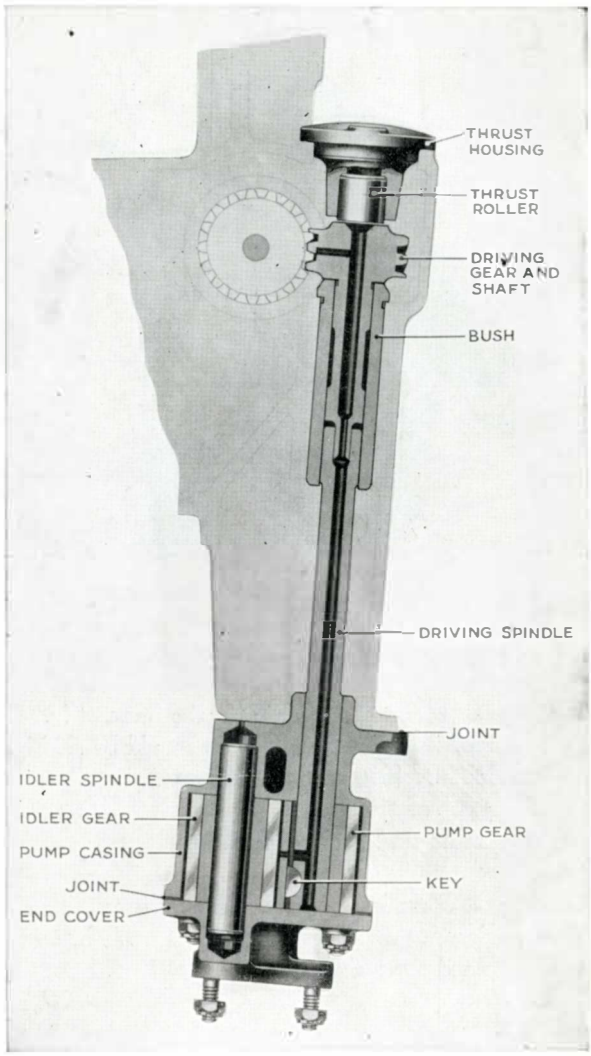


FIG. 7. OIL PUMP AND DRIVE

OVERHAUL

To Remove the Oil Pump

1. Drop the sump and remove the suction filter. Disconnect the oil feed pipe from the crankcase bottom face.

2. Remove the three nuts securing the pump body to the crankcase and withdraw the oil pump.

To Dismantle the Pump

1. Remove the oil pump end cover and withdraw the gear and spindle.

2. All parts should be examined for wear and checked against the limits as laid down in the **Data.**

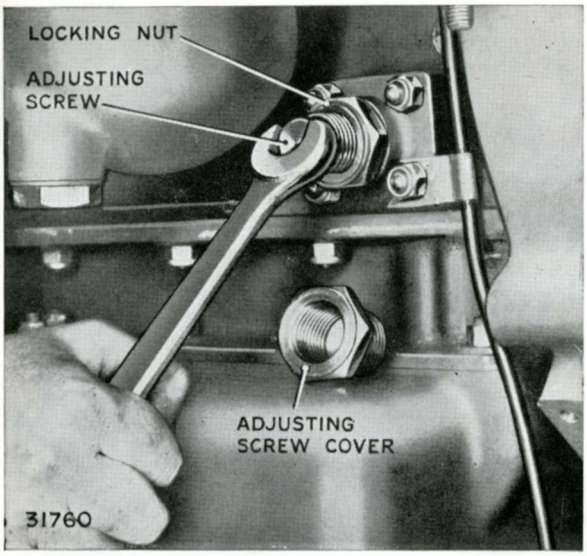


FIG. 8. ADJUSTING OIL RELIEF VALVE

3. To inspect the oil pump driving gear. Remove the thrust housing on the rear right-hand side of the engine block and withdraw the gear, Fig. 9. Backlash between the two gears should be .004 in. to .008 in. (.1016 mm. to .2032 mm.).

To Assemble and Refit Oil Pump

Reverse the operation for removing and dismantling oil pump. Ensure that an oil-tight joint is made between the pump end cover and casing.

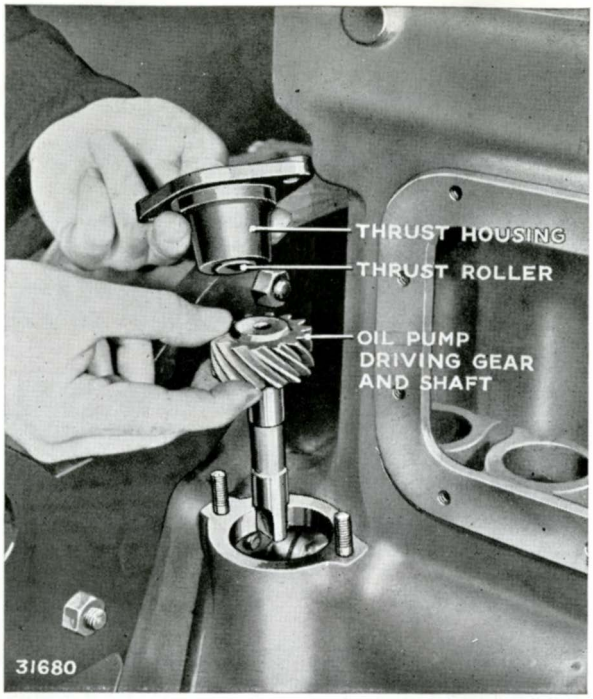


FIG. 9. FITTING OIL PUMP DRIVE GEAR AND THRUST HOUSING

To Adjust the Relief Valve

The oil pressure relief valve, Figs. 8 and 10, mounted at the rear left-hand side of the engine block, consists simply of a spring-loaded valve, provided with an adjusting screw.

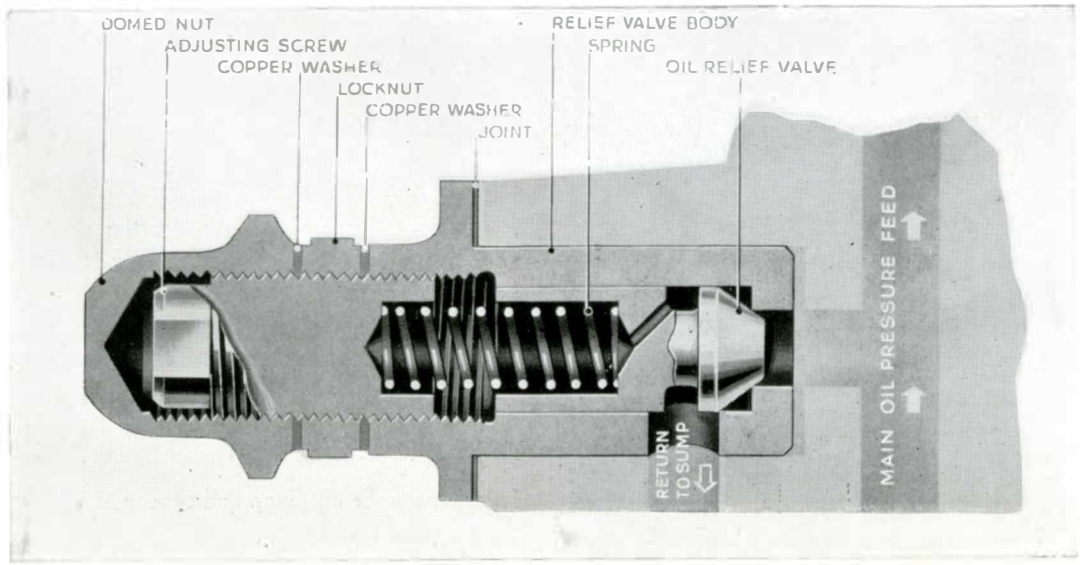


FIG. 10. OIL RELIEF VALVE

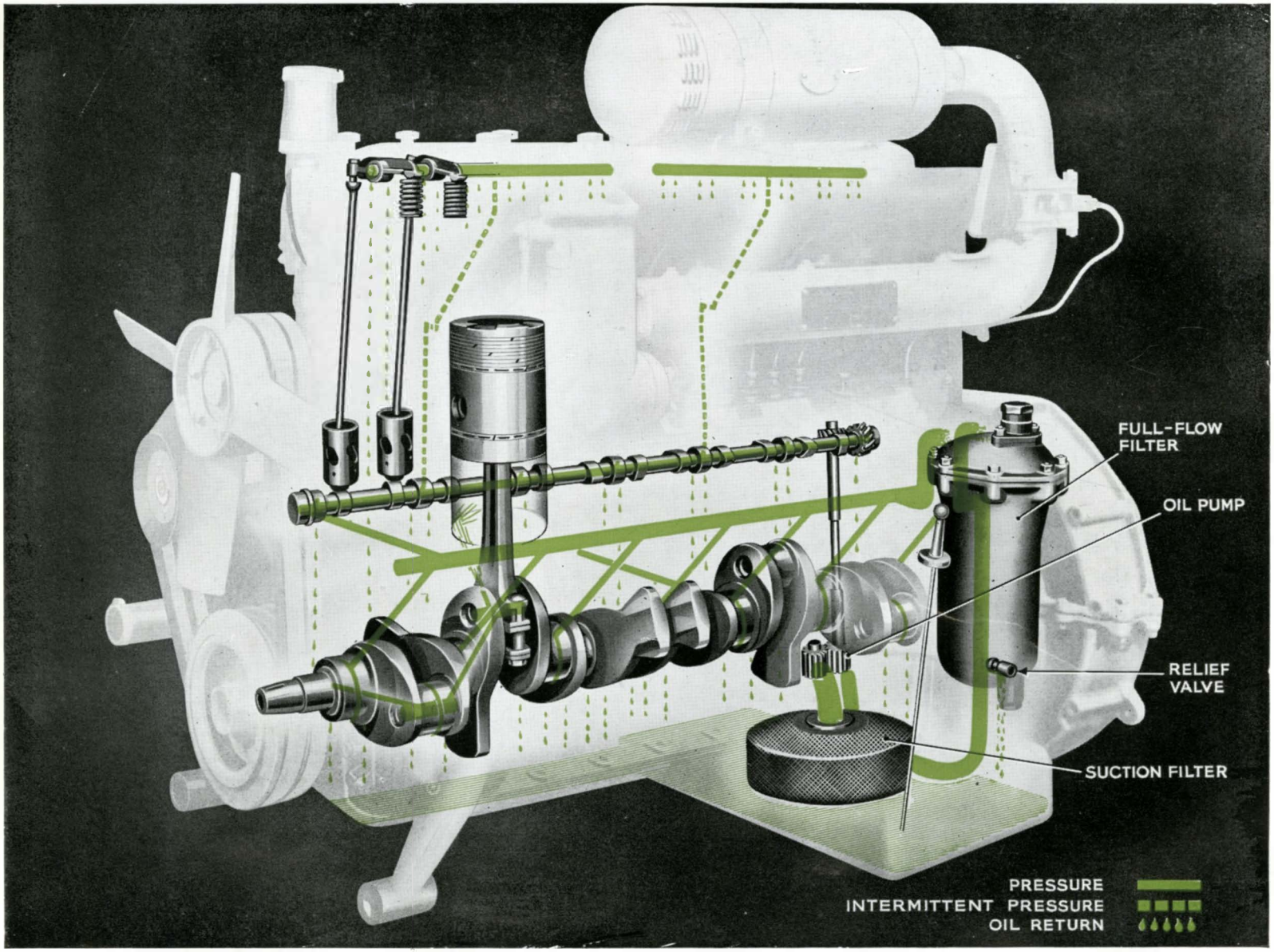


FIG. 11. TYPICAL OIL-CIRCULATION DIAGRAM

To adjust the relief valve, remove the cover, slacken the lock-nut and turn the adjusting screw. Screw **in to increase** and **out to decrease** the pressure. Lock the screw and replace the cover after adjustment.

The valve should be adjusted to give a maximum pressure of 60 p.s.i. (4.2 kg./sq.cm.) with a warm engine running at 1 000 r.p.m.

ENGINE OIL FILTER

The engine oil filter is of the full-flow cloth element type, and is mounted at the left-hand rear of the engine-block. The oil is drawn from the bottom sump well and pressure-fed into the filter housing, where it is filtered

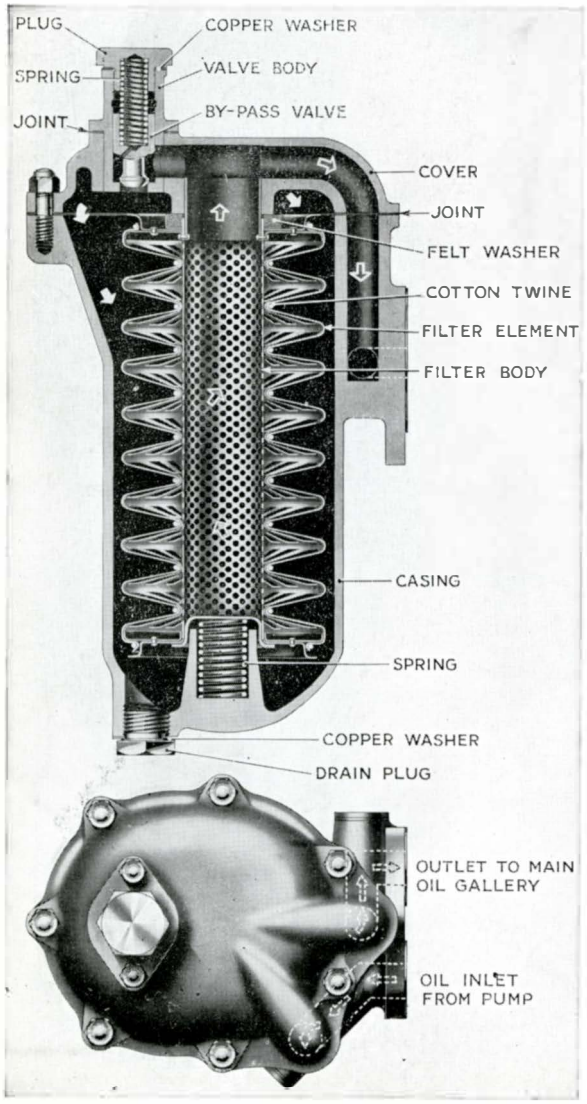


FIG. 12. THE OIL FILTER

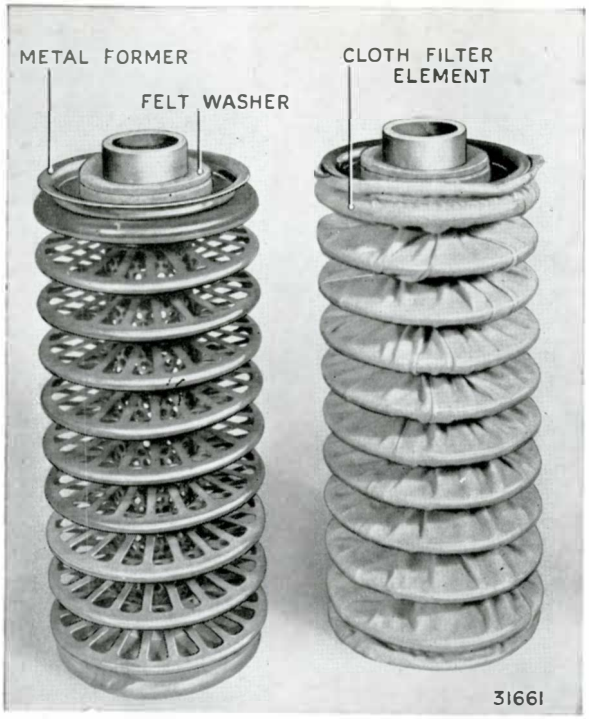


FIG. 13. OIL FILTER BODY WITH AND WITHOUT FILTER CLOTH

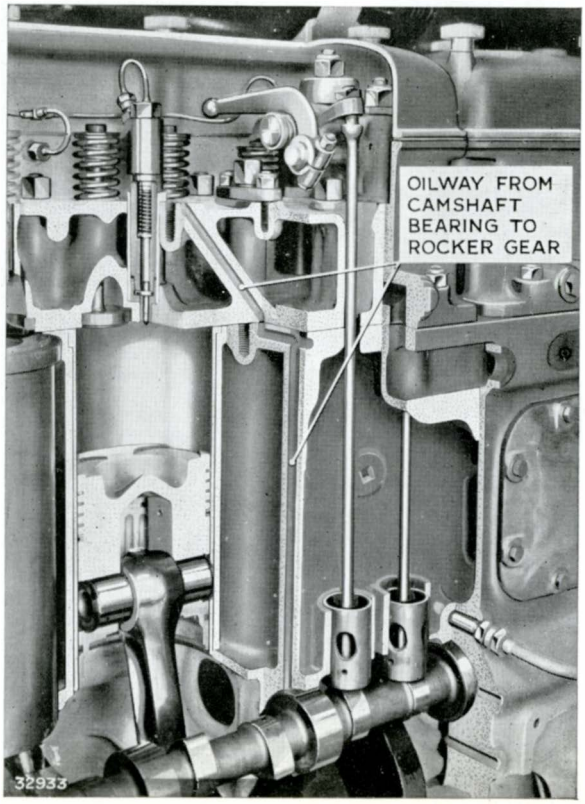


FIG. 14. ROCKER GEAR LUBRICATION

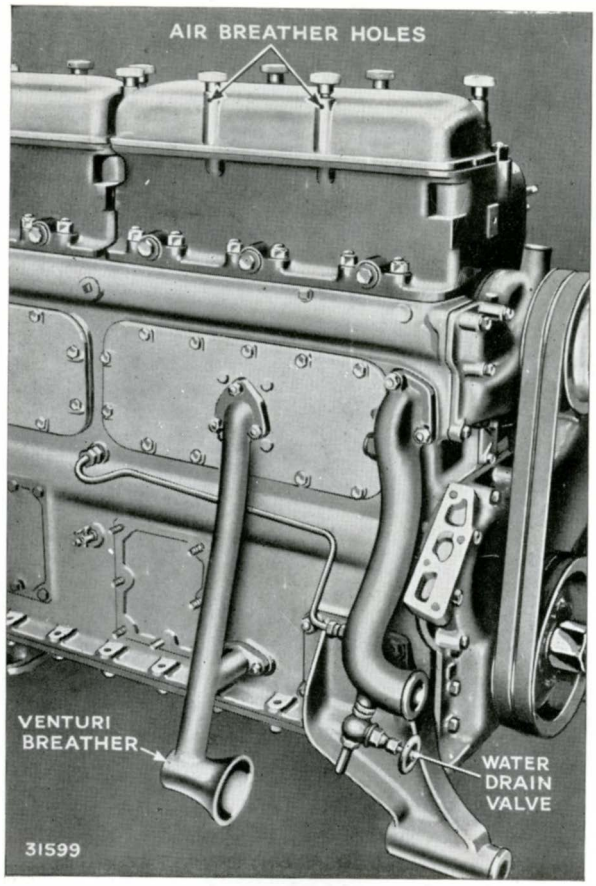


FIG. 15. ARRANGEMENT OF ENGINE BREATHING

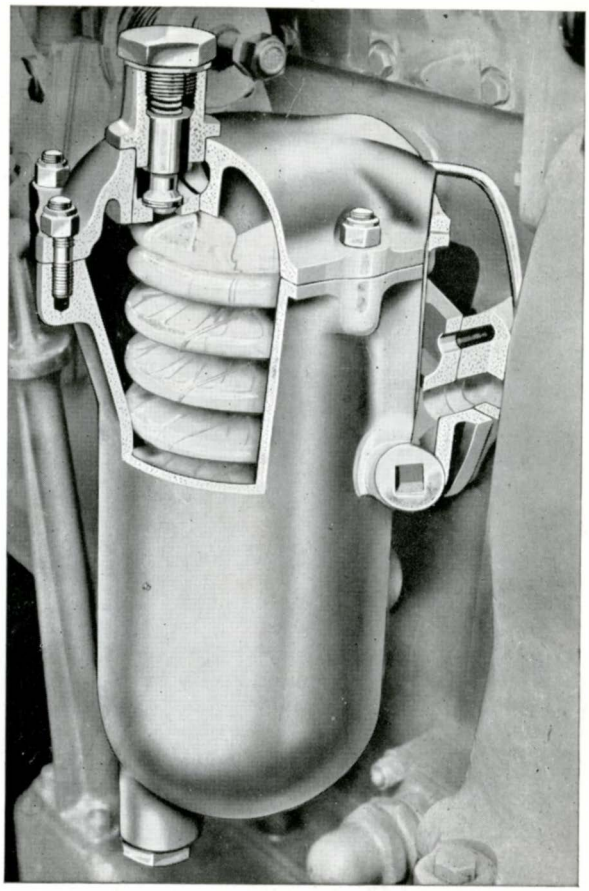


FIG. 16. CUT-AWAY SECTION OF OIL FILTER

and discharged into the main lubrication system. A by-pass valve, fitted in the top cover of the filter-housing, passes oil direct to the engine in the event of the filter element becoming choked.

The by-pass valve pressure is set before leaving the factory and should not be interfered with.

The filter, a metal former covered by a sleeve-shaped filter-cloth secured with cotton twine, is designed to give maximum filtration area, Fig. 13.

To prevent vibration the filter is spring-loaded at the base, Fig. 12, and a felt washer at the top of the filter prevents unfiltered oil passing into the main system.

The filter cloth should be changed every 5,000 miles (8,000 kilometres). A drain plug is provided in the bottom of the filter housing.

THE CYLINDER HEADS AND VALVE GEAR

CYLINDER HEADS

The two cylinder heads are interchangeable, each head covering three cylinders.

The Valmet exhaust valve seats are shrunk into the heads and the inlet valve seats are cut direct into the heads.

To Remove and Replace Cylinder Heads

1. Drain the radiator and engine block by opening the drain cock which is situated at the front right-hand side of the engine.

2. Drain and disconnect the main fuel filter.

3. Disconnect the inlet, exhaust and water manifolds and remove them from the heads.

4. Remove valve covers and uncouple and remove the fuel pipes.

5. Take off the nuts securing the rocker shaft brackets. Lift off the rocker assembly and withdraw the push rods.

6. Remove all cylinder head nuts and raise the heads by unscrewing the special lifting nuts, Fig. 17. The two lifting nuts are provided for each of the heads to prevent damage to the gaskets when lifting. Both nuts should be screwed evenly as far as they will go, then lift the head off the studs. If the heads are tight on the studs, a further lift can be obtained by screwing long $\frac{1}{2}$ in. B.S.F. bolts into the lifting nuts.

7. Before replacing the cylinder heads, wash out all water spaces. Clean all rust and carbon from the studs and engine block face. If this is left on, the heads may scrape some down and prevent a good bed being obtained when the nuts are tightened.

8. New gaskets should be fitted if the old ones are not in good condition. Gaskets must always be fitted so that the turnover reinforcement surrounding the cylinder bores is uppermost. **Do not use jointing compound on the gaskets.**

9. Lower each head on to the lifting-nut studs and screw down the nuts evenly a little at a time, keeping the heads parallel with the engine block.

10. To ensure freedom from distortion and gasket leaks, the cylinder head nuts must be tightened down evenly in a definite order, starting at the centre and working outwards, as shown in Fig. 28. First tighten down with a short spanner, then with a torsion spanner set at 150 to 160 lb./ft. (20.7 to 22 kg/m.), see Fig. 20.

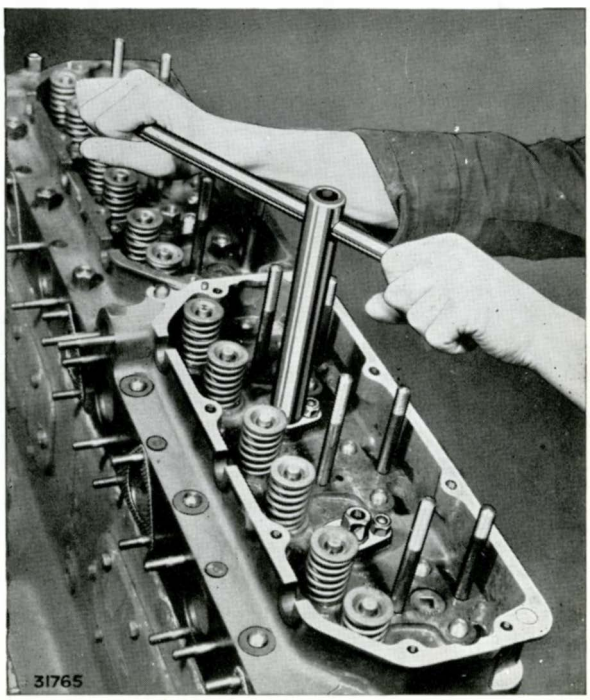


FIG. 17. TIGHTENING LIFTING NUTS

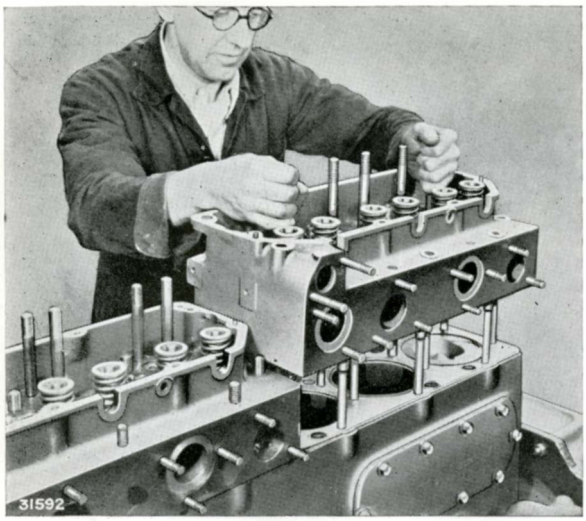


FIG. 18. FITTING CYLINDER HEAD

A torsion spanner set at 80 to 85 lb./ft. (11 to 11.7 kg/m.), should also be used for the $\frac{7}{16}$ in. dia., B.S.F. nuts along the right-hand of the cylinder-heads.

11. Replace push rods and fit rocker gear. Set inlet and exhaust valve clearances to .020 in. (.508 mm.) cold. Replace fuel pipes and manifolds.

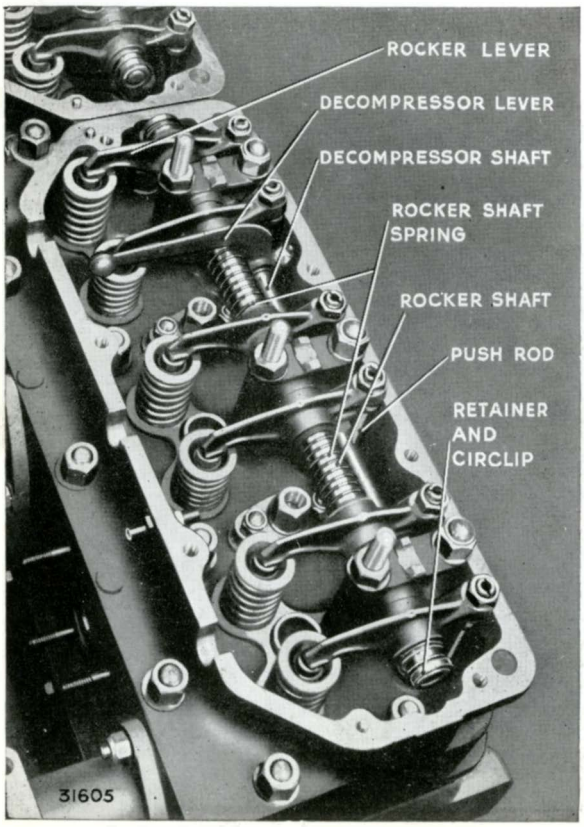


FIG. 19. THE ROCKER SHAFT ASSEMBLY

Note : Ensure that the manifold gaskets are fitted with the metal face next to the cylinder head.

12. Do not over-tighten the exhaust manifold nuts.

13. Check tappet clearances after the engine has had a short run.

VALVES AND ROCKER GEAR

The rocker levers, Fig. 19, are bushed and carried on hollow shafts. Each shaft is held in position by three support brackets which also carry the decompressor shaft. The number one bracket on each head carries a spring-loaded plunger which comes into contact with a flat, formed on the decompressor shaft, and holds it in the **off** posistion.

Lubrication is effected by an intermittent feed from the second and fifth camshaft bearings, via oilways drilled in the engine block and heads, up through the centre rocker-shaft support brackets, and along the rocker-shafts to the rocker levers.

The correct tappet clearance is .020 in. (.508 mm.) (cold) for both inlet and exhaust valves. When checking the clearances, make sure the tappets are on the backs of the cams. Turn the engine until the valve is fully open, then turn through one complete revolution to bring the tappet on the back of the cam.

Both valves are stellite-faced and have hard-chrome-plated stems. The valves can be distinguished by the difference in size across their heads, the exhaust being 1.90 in. (48.26 mm.) dia., and the inlet 2.20 in. (55.88 mm.) dia., Fig. 25.

When removing the valves and springs for inspection and refacing, it is important that subsequently they are replaced in their original position.

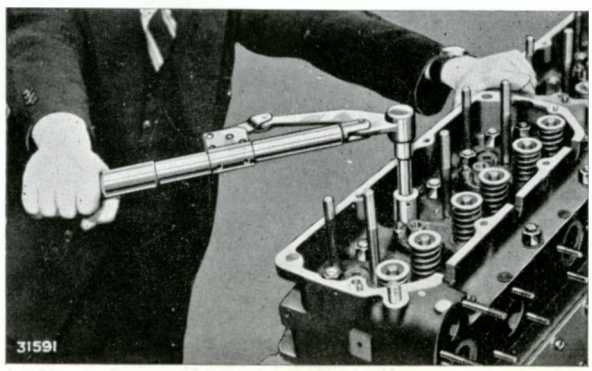


FIG. 20. TIGHTENING CYLINDER HEAD NUTS USING A TORSION SPANNER

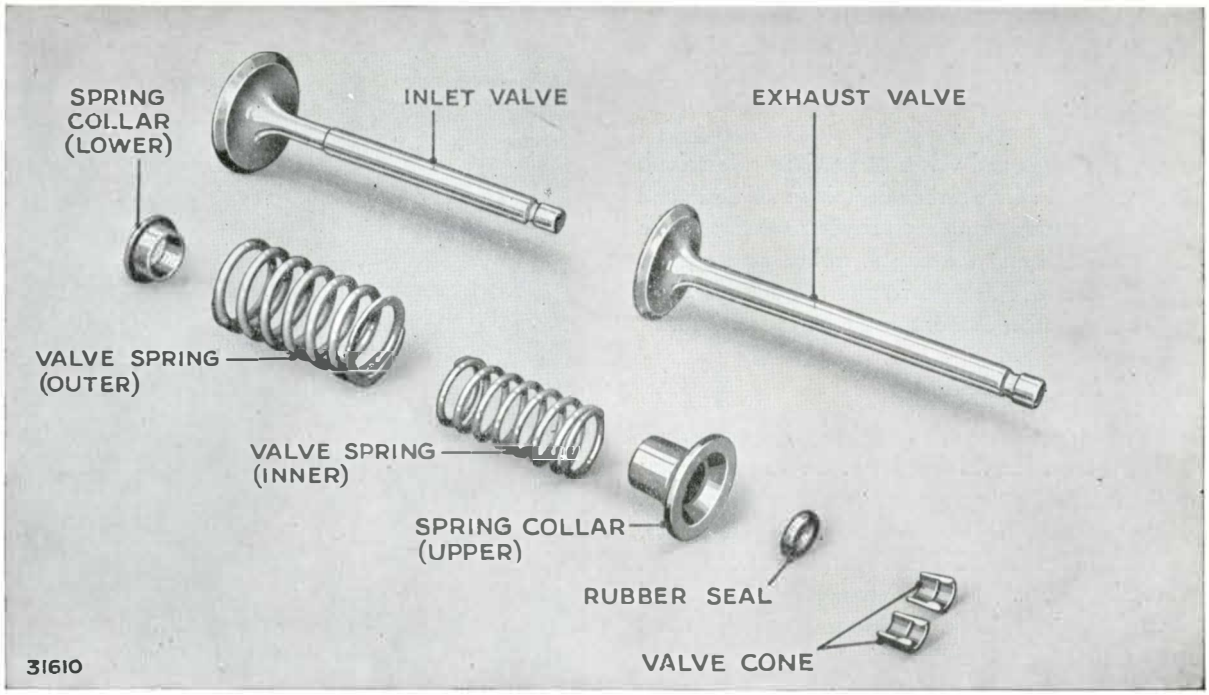


FIG. 21. VALVES AND SPRINGS

The valves and cylinder heads are numbered as shown in Fig. 26 to facilitate reassembly.

To Remove and Replace Valves

1. Remove the cylinder head and place it face downwards on the bench.
2. Extract the split cone, Fig. 22, and remove the valve collar together with the rubber sealing ring and valve springs, Fig. 21.
3. The rubber sealing rings should be inspected and renewed if perished.
4. Check valve springs for length, see **Data.**

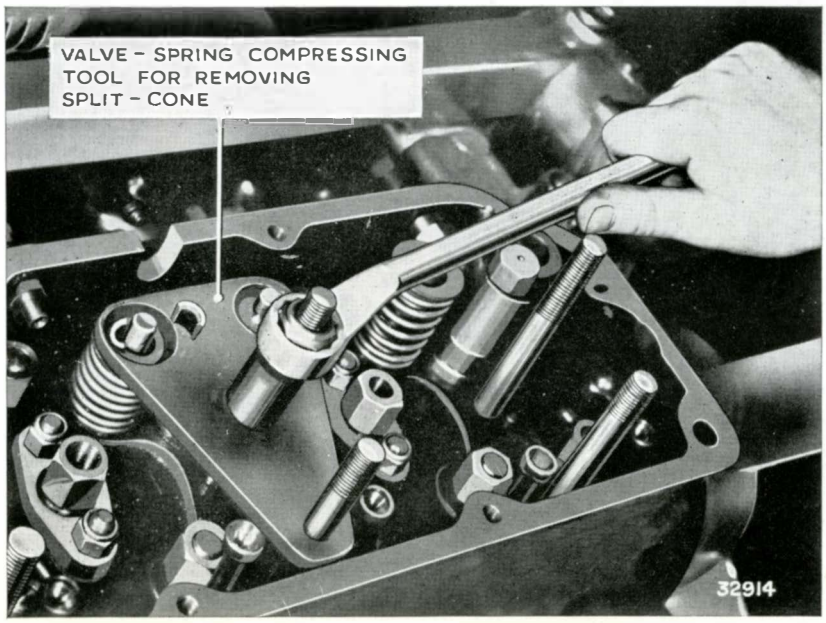


FIG. 22 VALVE SPRING COMPRESSING TOOL

DECARBONISING, VALVE GUIDE RENEWAL AND VALVE GRINDING

Decarbonising

Remove the heads and valves as previously described. Carefully scrape off the carbon deposit on the heads and pistons, but on no account must any form of abrasive be used. Do not disturb the ring of carbon at the top of the bore, as it will help to restrict the passage of oil into the combustion chamber if the bores are worn.

Renewal of Valve Guides

1. Check the valve guides for stem clearances. If this is excessive, .010 in. (.254 mm.) or over, renew the guide. If the stem is worn, renew the valve. Always check the fit of a valve in the new guides. They must have .0025 in. to .00375 in. (.0635 mm. to .09525 mm.) clearance for the inlet valves and .004 in. to .00525 in. (.1016 mm. to .13335 mm.) clearance for the exhaust.

2. The valve guides are an interference fit in the heads and must be pressed in and out when replacements are necessary. See Fig. 25 for position of valve guide in head.

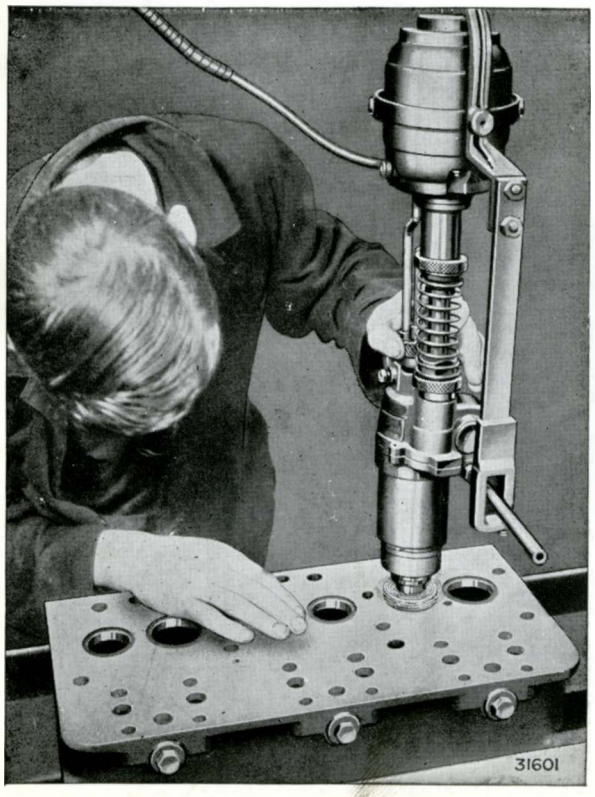


FIG. 23. GRINDING VALVE SEATS

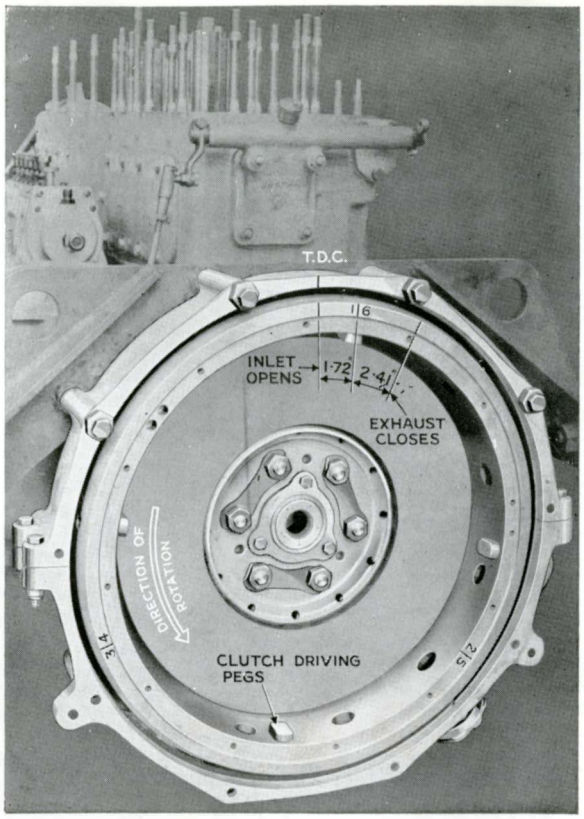


FIG. 24. VALVE TIMING MARKS ON FLYWHEEL

3. After fitting a new valve guide, always regrind the valve seat so that it is concentric with the guide.

Valve Grinding

1. Examine the valve facings and seats. If the valve seats are at all pitted and require grinding, a special carborundum tool must be used. This must have a working face of 30° (the accuracy of this angle is important), and must be accurately positioned by a spindle located in the valve guide. The stone must be rotated at high speed. **The face of the seat should be concentric with the valve guide bore to within .001 in. (.0254 mm.) (total clock reading).**

2. If the valves require refacing, this should be done in a valve-facing machine with the stone set at an angle of 29½°. **The valve facing must be concentric with the valve stem to within .001 in. (.0254 mm.) (total clock reading).**

3. On no account must badly pitted valves and seats be lapped together, as this will cause excessively wide seats.

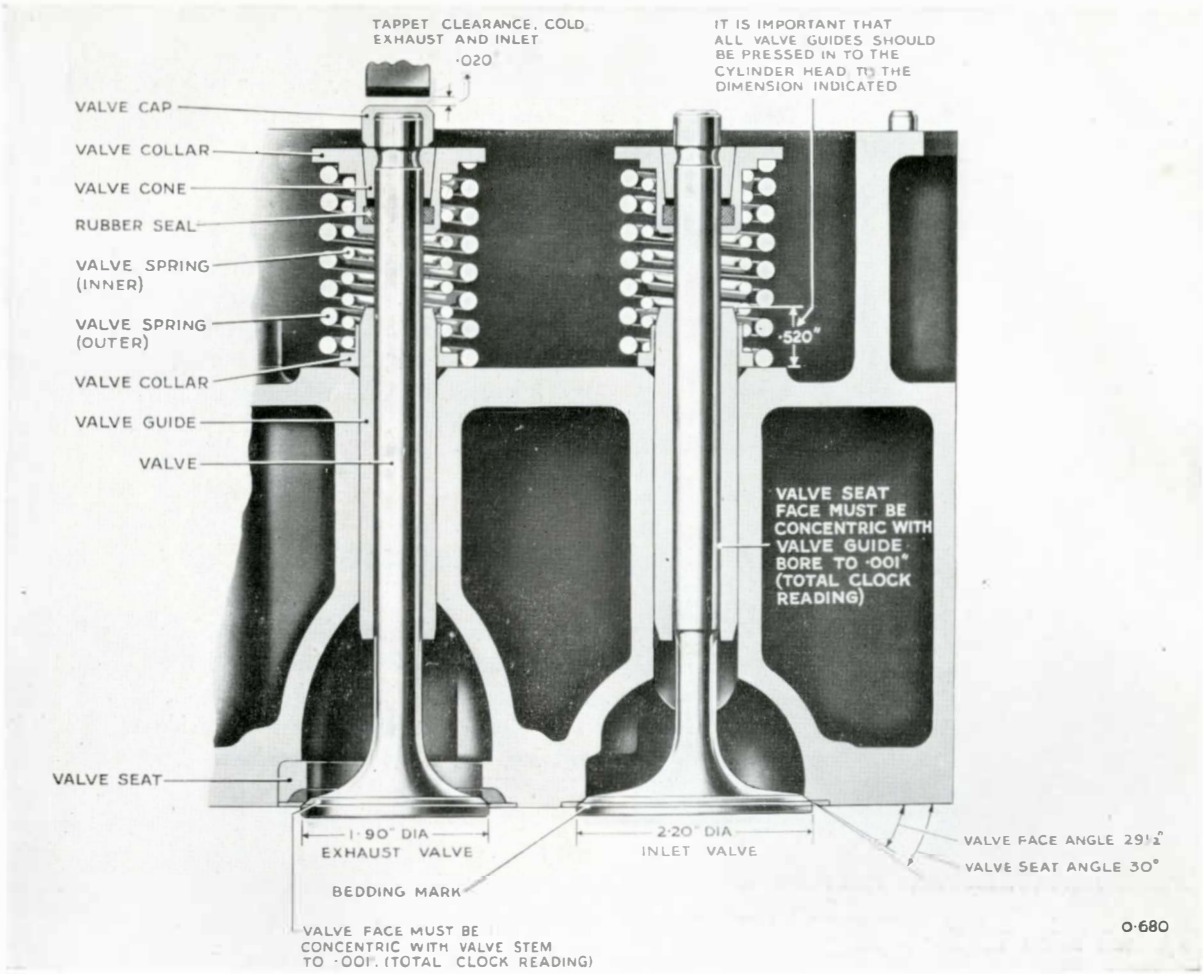


FIG. 25. VALVES AND SPRINGS IN POSITION

4. When the valves and seats have been re-cut, or when the valves and seats are in good condition, they should be lightly lapped together to give a perfect seating. The seating mark should be a thin line towards the top of the seat, Fig. 25.

5. To lap in the valves, put a thin layer of fine grade carborundum paste on the valve seat and rotate the valve to and fro on the seat, occasionally lifting the valve off the seat. Do not rotate the valve through a complete revolution before lifting as this will groove the seat. All traces of grinding compound must be removed before assembly.

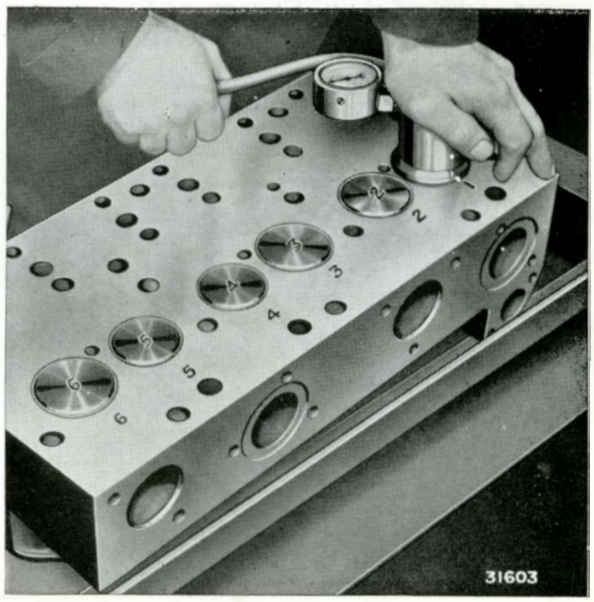


FIG. 26. TESTING GAS-TIGHTNESS OF VALVE ON ITS SEAT

VALVE TIMING

The valve timing is shown in Fig. 2, under **Data.**

FIG. 27. ADJUSTING THE TAPPETS

To Check Valve Timing

1. To check the valve timing, set the tappet clearances of all cylinders to .020 in. (.508 mm.) (cold).

2. Turn the engine until the timing-plunger engages in the flywheel, and No. 1 piston is on T.D.C. of the firing stroke, i.e., the fuel pump has just delivered. At this point the inlet and exhaust valves are closed.

3. Now turn the engine until the inlet valve of No. 6 cylinder just opens. To check when the inlet valve is just opening, hold the valve collar between thumb and forefinger and attempt to turn. When the valve lifts off its seat, the collar will turn. If the timing is correct, the valve should open 1.72 in. (43.7 mm.) before T.D.C. measured on the flywheel rim, Fig. 24.

TIMING PLUNGER

This is fitted to facilitate finding T.D.C. for Nos. 1 and 6 pistons and also the fuel pump injection positions which is 26° before T.D.C. of No. 1 piston (both valves closed). The plunger at lower right-hand side of flywheel housing, Fig. 3, has three positions: **T.D.C., INJ.** and **OFF.** To operate the plunger, lift and turn until the required position is shown, then turn the engine slowly until the plunger is felt to drop into the appropriate hole in the flywheel. **Never use the starter to turn the engine when using the plunger.**

Set the plunger in the **off** position when engine has been correctly timed.

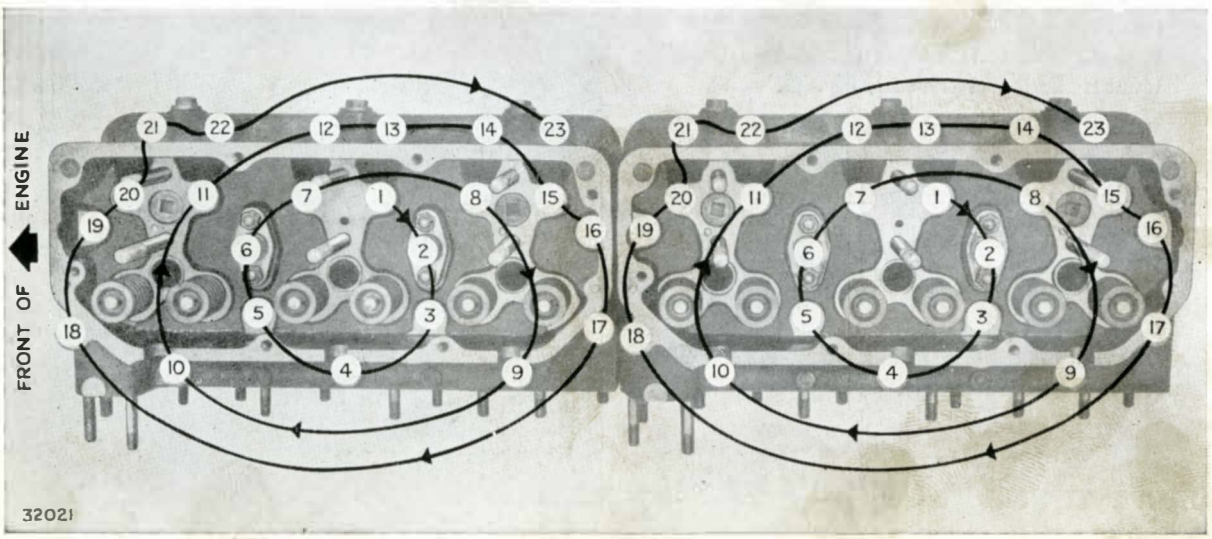
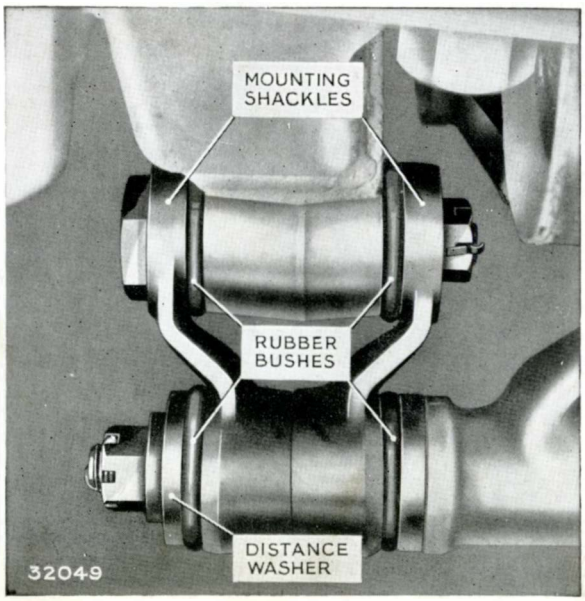


FIG. 28. CORRECT SEQUENCE OF TIGHTENING CYLINDER HEAD NUTS

TO REMOVE AND REPLACE THE ENGINE

TO REMOVE ENGINE

1. Isolate the battery by disconnecting at the terminals.
2. Drain the cooling system.
3. Remove the bumper, radiator top panel, radiator grille and the bottom centre panel.
4. Remove engine covers and floor in the driver's compartment.
5. Disconnect the top and bottom water pipes at the flanged joints on the radiator.
6. Disconnect the top radiator stay, remove the bolts from the radiator mounting brackets on the front crossmember and remove the radiator.
7. Remove the three nuts securing the exhaust pipe to the manifold.
8. Disconnect the fuel delivery pipe at the feed pump and the flexible leak-off pipe at the rear of the engine.
9. Disconnect the pipe at the compressor and detach the engine stop control cable from the stop control lever on the injection pump.
10. Remove the control rod connecting the accelerator to the cross-shaft at the rear of the engine.
11. Detach the cables from the dynamo and starter motor and uncouple the clutch operating rod at the gearbox.
12. Remove the seven nuts securing the change speed box to the side of the engine, uncouple the selector tube at the gearbox end of the tube and lift the change speed clear of the vehicle.
13. Uncouple the oil gauge pipe from the tap on the left-hand side of the engine block.



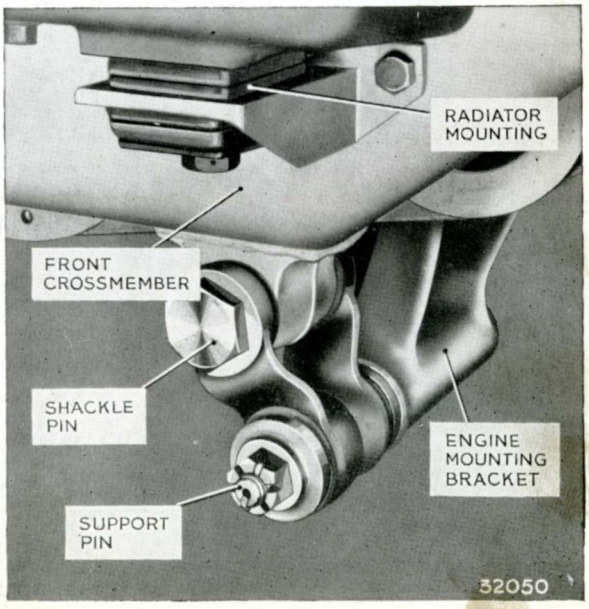


FIG. 29. ENGINE FRONT MOUNTING SHACKLES

14. Support the gearbox, remove the bolts securing the engine and gearbox through the banjo crossmember, Fig. 30, ease the gearbox back clear of the clutch driving centre and lower the unit to the floor.

15. All the interconnecting parts have now been removed except the two engine mounting bolts in the banjo crossmember, Fig. 30, and the front crossmember bolts. The weight of the engine must be taken with a suitable crane before removing these bolts.

16. Remove the split pins, nuts, and distance washers from the support pins, Fig. 29.

17. Remove the bolts which secure the front crossmember to the frame and the two engine mounting bolts in the banjo crossmember and withdraw the engine from the chassis.

To Replace the Engine

1. Replacement of engine is a reversal of the removal procedure.

2. When the engine has been replaced in the vehicle, fit and reset the change speed.

3. To reset the change speed, see **Gearbox** chapter.

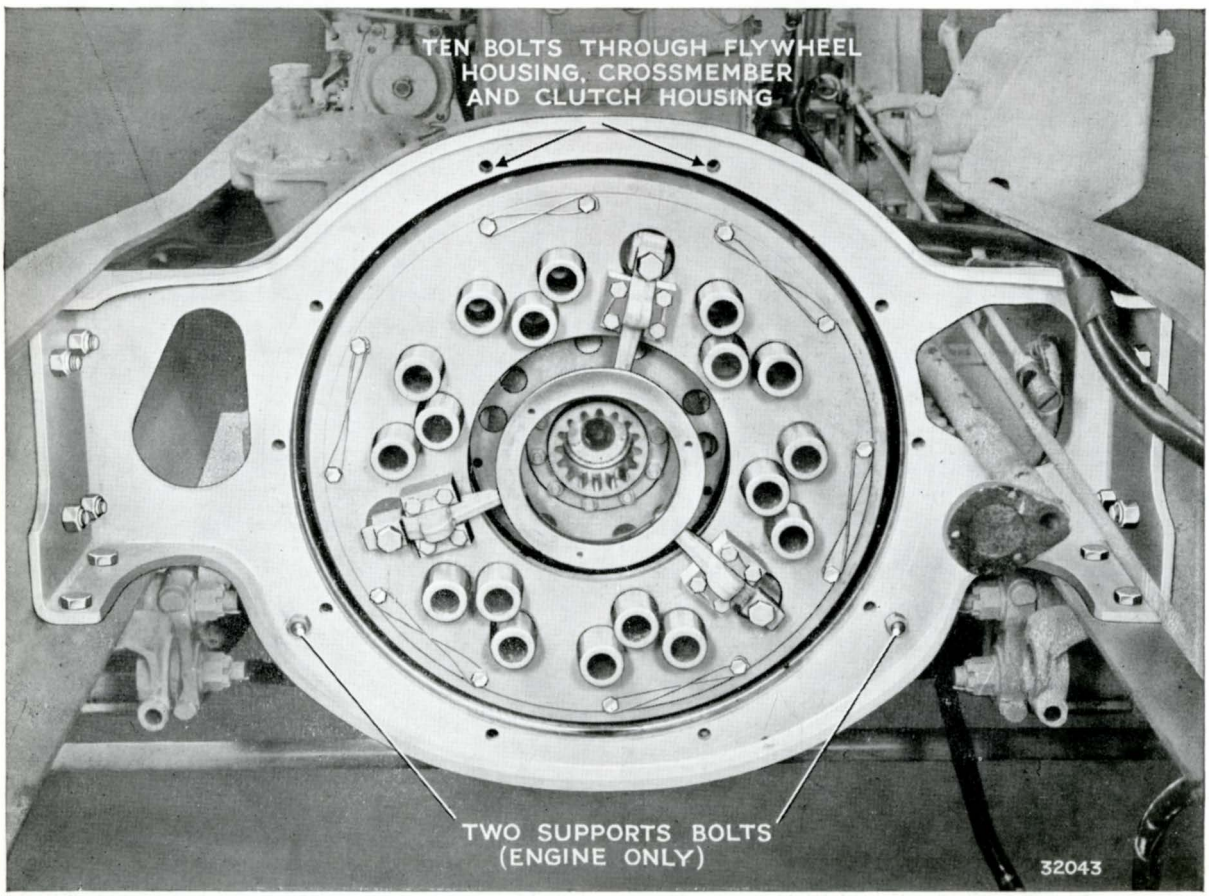


FIG. 30. ENGINE REAR MOUNTING

THE ENGINE BLOCK AND CAMSHAFT

DESCRIPTION

The engine block is a one-piece casting; the cylinders being fitted with dry cast iron liners shoulder located.

The camshaft is carried in seven pressure lubricated bearings which are setscrew located on the under side of the engine block, the thrust being taken on the front bearings only. The drive is transmitted from the front of the crankshaft through helical gearing.

OVERHAUL

To Remove Camshaft

1. Remove the rocker gear and extract the push rods.
2. Remove dynamo and driving belts.
3. Remove tappet gallery side covers and extract the tappets.
4. Remove vibration damper from pulley and then remove pulley with the special tool.
5. Disconnect the compressor oil feed pipe from the timing case side, if fitted, and remove all securing bolts and setscrews from timing case.
6. Now remove timing case, taking care not to damage the oil seal housed in the bore surrounding the crankshaft end.
7. Remove the four setscrews and locking plates securing the gear to the camshaft and withdraw the gear, taking care to note the position of the timing mark on the gear in relation to the mark on the timing back plate when No. 1 piston is on T.D.C. of firing stroke, Fig. 31.
8. Remove the four setscrews fixing the camshaft thrust washer, and withdraw the camshaft, Fig. 32.
9. To remove the camshaft bearings, take out the locating setscrews and drive out the bearings with a suitable drift. The intermediate bearings are interchangeable.

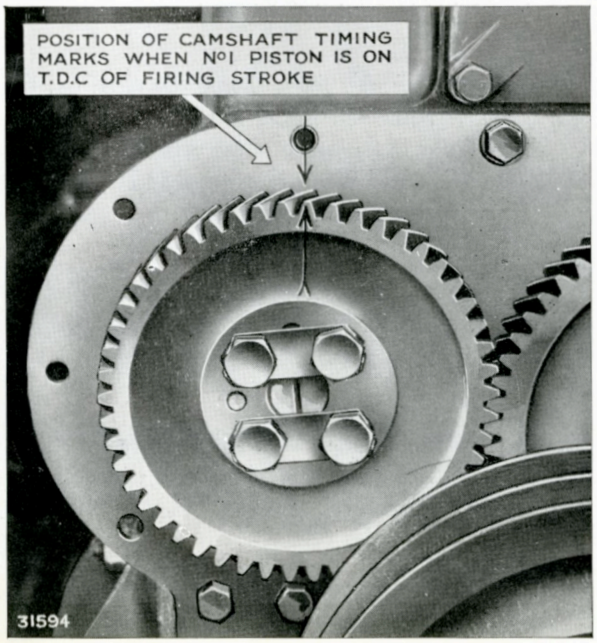


FIG. 31. CAMSHAFT TIMING MARKS

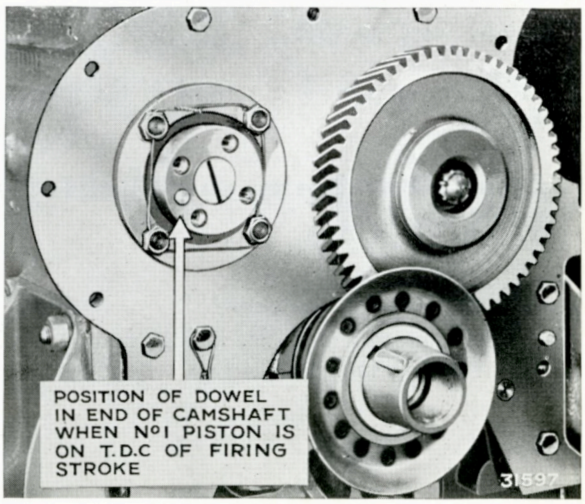


FIG. 32. GEAR LOCATING DOWEL IN CAMSHAFT END

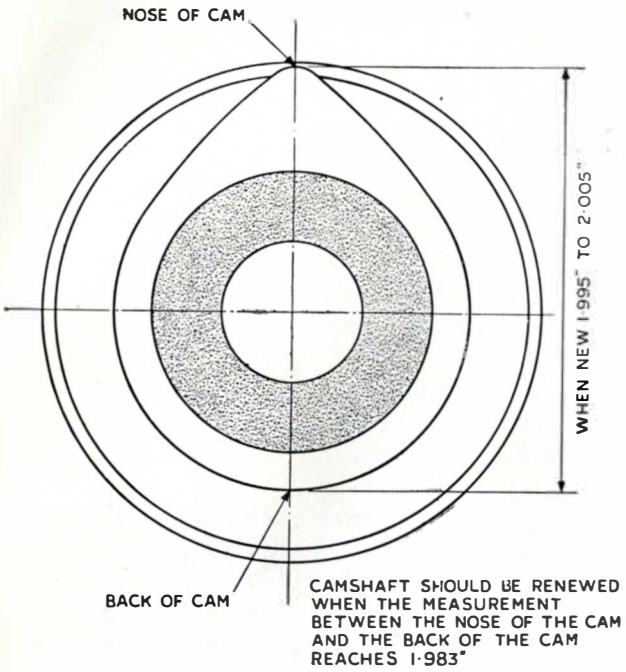


FIG. 33. CAM WEAR DIAGRAM

10. To drive out the rear bearing, it is necessary to remove the clutch, flywheel and top half of flywheel housing.

11. Check all bearings for wear and renew when diametrical clearance exceeds .010 in. (.254 mm.). Normal end-play of the camshaft with the retaining plate tight up and adjusting shim in position is .004 in. (.1016 mm.). If the end-play is .008 in. to .010 in. (.2032 mm. to .254 mm.) the shim should be removed.

To Refit the Camshaft

Refitting the camshaft is a reversal of the previous procedure.

Take care that the bearings are not burred when replacing them.

To Time the Camshaft

1. Turn the engine until No. 1 piston is on T.D.C. of the firing stroke.

2. Fit the camshaft gear so that when the dowel hole in the gear locates on the dowel in the camshaft end, the arrows on the gear face and timing back plate are in line, Fig. 31, that is 90° to the outer face of the engine block.

3. Refit the locking plates and tighten the setscrews securely. Make sure that the locking plate tabs are turned over after the setscrews have been tightened.

The Cylinder Liners

At overhaul the liner bores should be measured and if the maximum diameter exceeds 5.00 in. + .020 in. (127 mm. + .508 mm.) at the top, new liners must be fitted.

To Remove and Insert Liners

1. The cylinder liners are pre-finished ready for inserting into the engine block. A special tool has been designed both to extract the old liners and to insert the new ones.

2. The projection of cylinder liners above the top face of the engine block must be within the limits of .000 in. to .002 in. (.0508 mm.).

3. Before fitting new liners thoroughly clean out the cylinder bores and invert the liners, placing the liner flange in the recess of the cylinder and, using a straight-edge and feelers, check that the projection figures are within the limits stated.

If necessary shims (.002 in. thick) are available to ensure that the liners are correctly positioned within these limits.

4. When installing the liners, lightly smear the bores of the block with thin oil. This will facilitate subsequent removal.

CONNECTING RODS AND PISTONS

DESCRIPTION

The connecting rods are alloy steel stampings of exceptionally rigid design, drilled to provide intermittent oil spray for cylinder wall lubrication. The big ends have steel-shell type, lead-bronze bearings with the bearing surface indium-coated. The small ends are bushed.

The pistons are of special aluminium alloy, fitted with three compression and two scraper rings, the top compression rings are chromium plated. A toroidal cavity in the piston crown forms the combustion chamber. The hollow gudgeon pins are located in the pistons by circlips.

OVERHAUL

To Remove Connecting Rods and Pistons

The dimensions of the crankshaft are such that the pistons cannot be withdrawn through the crankcase; they can, however, be withdrawn through the cylinder bores.

Care should be taken not to scratch the bores when removing or replacing the connecting rod assemblies.

To Separate Pistons from Connecting Rods

1. Remove the gudgeon pin circlips.

2. Heat the pistons in boiling water and tap or push the pin out while the piston is hot.

Note: The gudgeon pins must not be forced in or out of the pistons when cold. The pins are an interference fit in the piston bosses when cold and an easy push-fit in the small-end bushes.

To Assemble Piston and Connecting Rod

1. Heat the pistons in boiling water or in an oven before the gudgeon pins are inserted. The oven temperature must not exceed 150° C. (302° F.).

2. Fit pistons to connecting rods with the offset combustion chamber in the piston heads on the same side as the oil spray hole in the connecting rod big-end, Fig. 35.

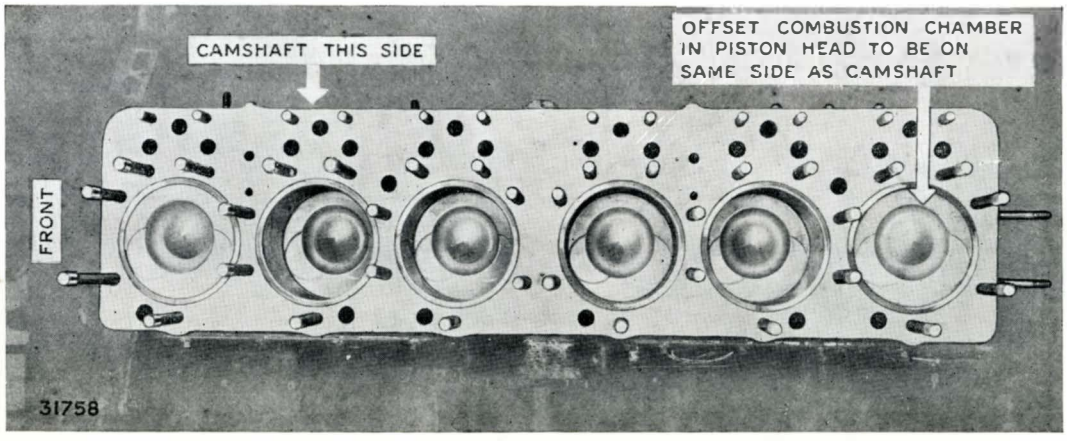


FIG. 34. POSITION OF OFFSET COMBUSTION CHAMBERS IN PISTON HEADS, IN RELATION TO THE CAMSHAFT

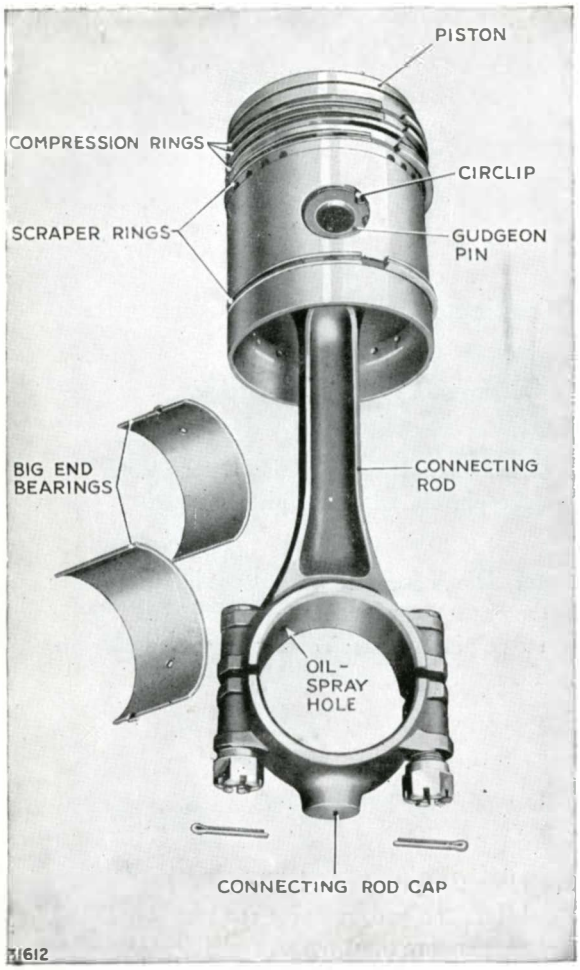


FIG. 35. PISTON AND CONNECTING ROD ASSEMBLY

To Fit Piston and Rings

1st, 2nd, 3rd grooves	Fit compression rings, these are plain, tapered rings, with a gap cut at 90°. The top compression ring is chromium plated.
4th and 5th grooves	Scraper rings, slotted, ring gap cut at 90°.

The initial piston ring gap is .020 in. to .024 in. (.508 mm. to .6096 mm.). Renew rings when side clearance in groove exceeds .015 in. (.3810 mm.).

To Replace Connecting Rods and Pistons

1. Wipe the crankpin and bearing surfaces with a clean rag and lightly smear with clean engine oil both crankpin and lead-bronze surface of bearing shells.

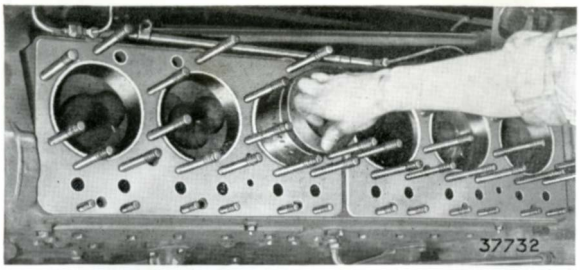


FIG. 36. FITTING THE PISTON

2. Fit the connecting rod assemblies with the offset combustion chamber in the piston heads and the oil spray hole in the big ends on the same side as the camshaft.

3. The connecting rod bolts must be tightened to a total elongation of .006/.008 in. (.1524 mm. to .2032 mm.). This dimension should be measured by micrometer.

4. On no account must the nuts be slacked off to bring the pin holes into line. If the pin holes will not line up with the correct bolt elongation, the nut must be filed to bring the pin holes into line, care being taken to keep the faces true. Fit the split pins and slack off nuts just sufficiently to "nip" the split pins.

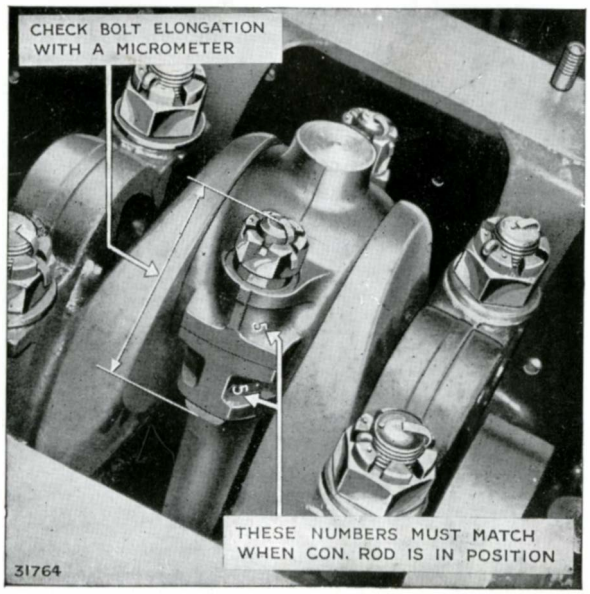


FIG. 37. CONNECTING ROD IN POSITION

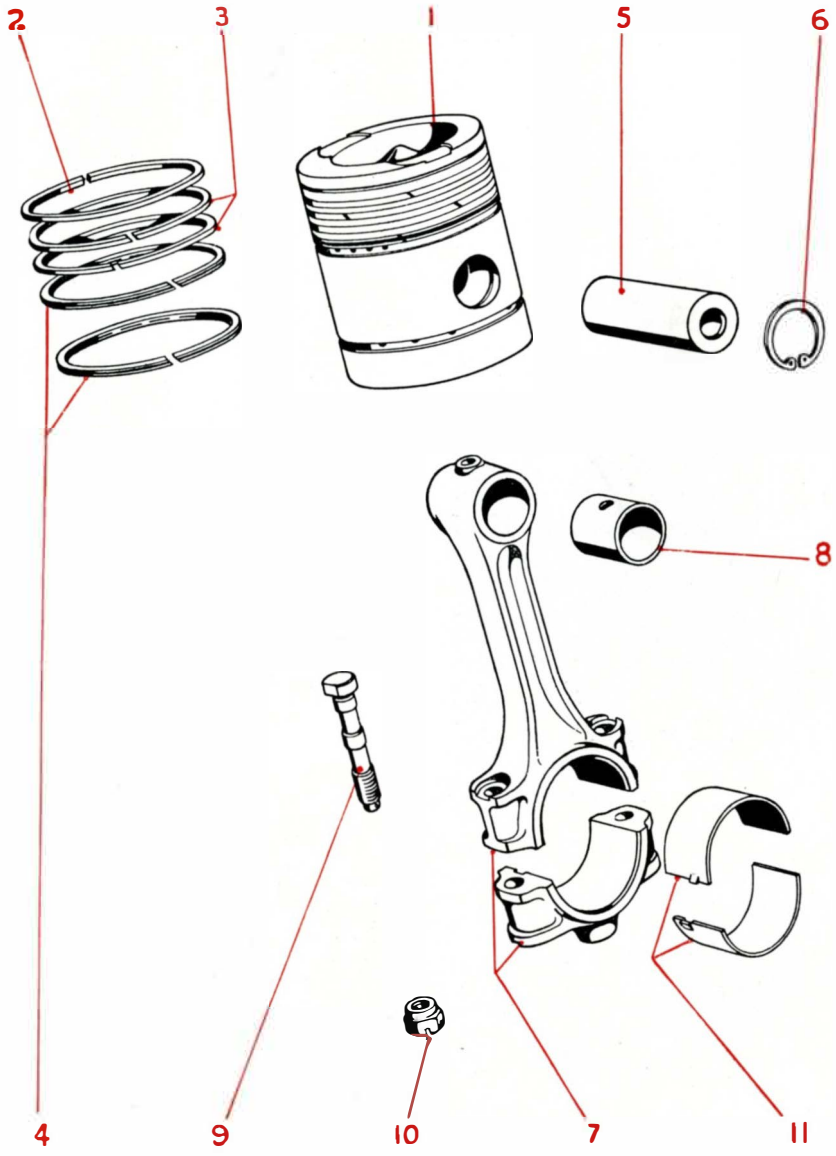


FIG. 38. EXPLODED VIEW OF THE CONNECTING ROD AND PISTON

1. Piston.
2. Piston ring, taper, top.
3. Piston ring, taper, second and third.
4. Piston ring, scraper.
5. Gudgeon pin.
6. Circlip.
7. Connecting rod and cap.
8. Small end bush.
9. Bolt.
10. Nut and split pin.
11. Big-end bearing (half-bearing).

THE CRANKSHAFT AND MAIN BEARINGS

DESCRIPTION

The crankshaft is supported in seven lead-bronze, steel-shell, indium-coated, main bearings. The oil holes in the crankpins are drilled eccentrically to reduce centrifugal loading and also to act as sludge traps to protect the big-end bearings.

A labyrinth oil seal at the rear end of the crankshaft prevents loss of oil from the lower half of the engine-block and a felt sealing ring fitted in the upper and lower halves of the flywheel housing prevents engine breathing, Fig. 40. A large diameter flywheel, fitted with a renewable cast iron clutch facing, is bolted to the crankshaft rear end flange. The bolt holes in the flange

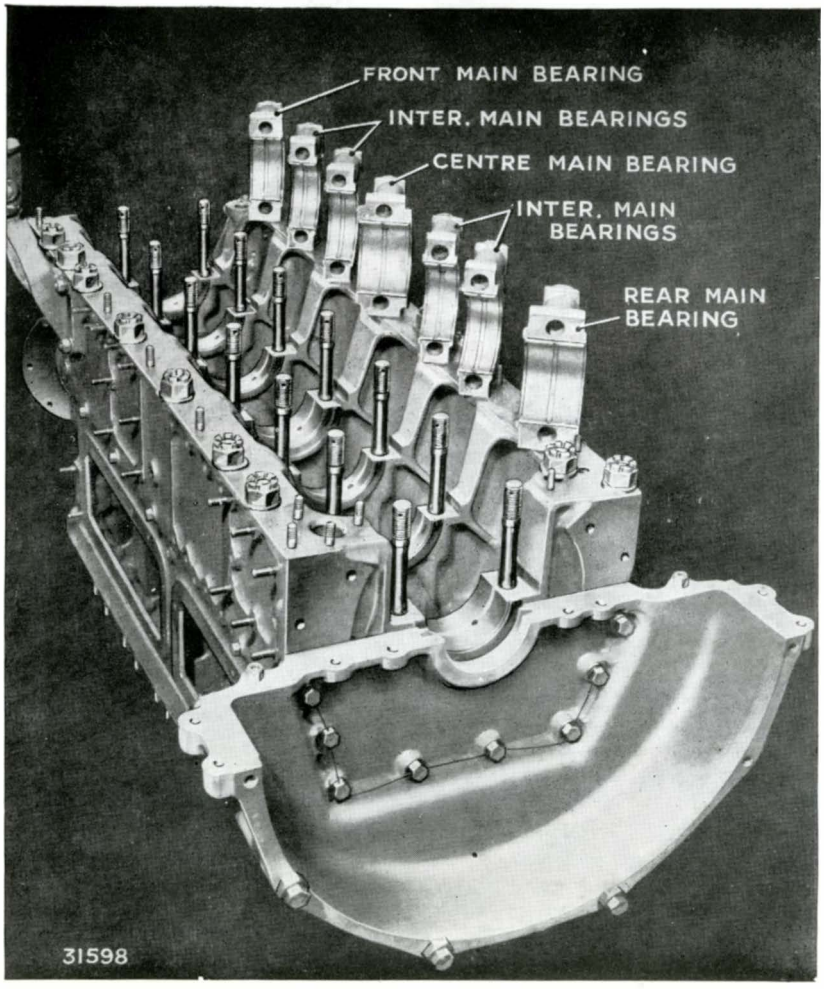


FIG. 39. ENGINE BLOCK AND MAIN BEARINGS

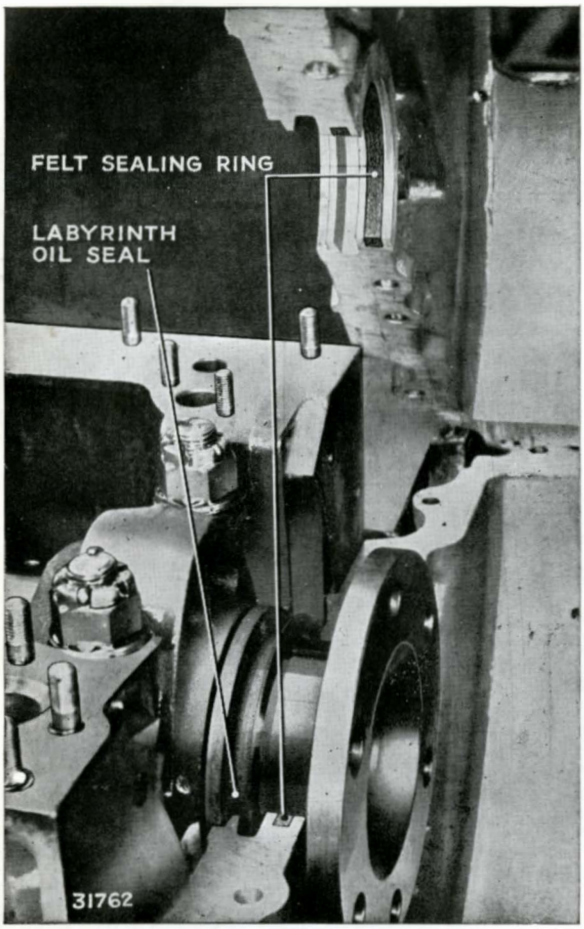


FIG. 40. LABYRINTH OIL SEAL

and flywheel are drilled out of pitch, so that the flywheel can only be mounted with the timing plunger holes in the flywheel rim, in correct relation to the throws of the crankshaft, for timing purposes.

A rubber-bonded vibration damper is bolted to the pulley at the front end of the crankshaft.

The starter gear ring, Fig. 49, is spigoted and bolted to the flywheel so that its position can be changed as local wear takes place. It is reversible and can be turned completely over to obtain further service.

OVERHAUL

To Fit New Bearings and Thrust Washers

Normally by the time the main bearings require replacing, the crankshaft will need to be removed for regrinding, the instructions for these two latter operations being detailed in the sections headed **To Regrind the Crankshaft.**

However, if at any time one or more bearings should have to be renewed or removed for inspection, this can be done satisfactorily without the necessity of removing the engine from the vehicle.

1. Remove the sump and oil pump.

2. To renew or inspect an individual bearing only, take off the cap of the bearing in question.

3. Slacken all the remaining bearing cap nuts one or two turns to facilitate removal of the top halves of the bearings.

4. Remove the lower half of the bearing from the cap, push out the top half of the bearing by rotating it on the crankshaft, using Leyland tool No. 245872, which should be placed in the oil hole in the journal, for the centre main bearing use Leyland tool No. 245869, this is placed on the bearing cap stud.

5. Inspect the old bearing shells and if they require renewing insert a new half-bearing in the top and also fit a new half-bearing in the cap. If the old bearings are under size, replace by a new bearing of the same size.

6. The thrust washers are also renewable. The bottom halves of the washers are tongue-located in the bearing caps and care must be taken to ensure that the tongue fits correctly in the caps.

To Remove Crankshaft

1. Remove engine from vehicle, and place in a suitable stand.

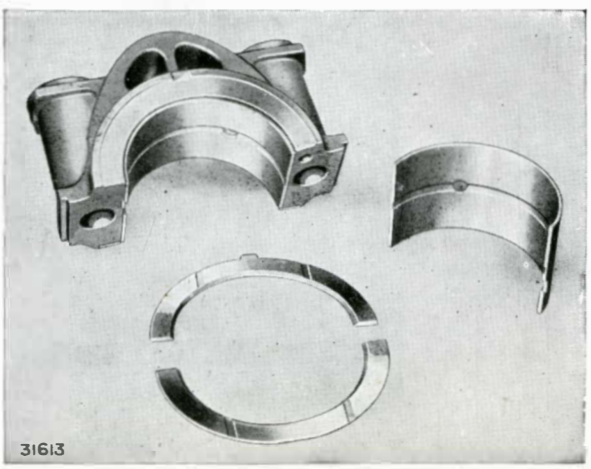


FIG. 41. CENTRE MAIN BEARING AND THRUST WASHERS

2. Remove the cylinder heads, push-rods and tappets.

3. Invert the engine and remove the sump, oil pump, flywheel and connecting rod assemblies.

4. Remove bottom half of flywheel housing.

5. Withdraw driving pulley from end of crankshaft.

6. Disconnect the exhauster or compressor oil feed pipe if fitted from timing case side and remove timing case.

7. Remove main bearing caps, and lift out the crankshaft.

To Replace the Crankshaft

Main bearing caps, bearings and nuts must be refitted in their original positions and, for this purpose, the caps and engine-block nuts are stamped with index marks A, B, C, etc., starting from the front of the engine. When correctly assembled all marks must correspond.

1. Fit the top halves of the main bearings in their correct seatings; check that the shells bed down correctly.

2. Remove the oil seal plugs, Fig. 45, and flush out the oil passages and oil holes. Replace the seal plugs and bolts, **do not** use sealing compound on these plugs. Ensure that the nuts are split-pinned and smear the main bearing journals with clean engine oil.

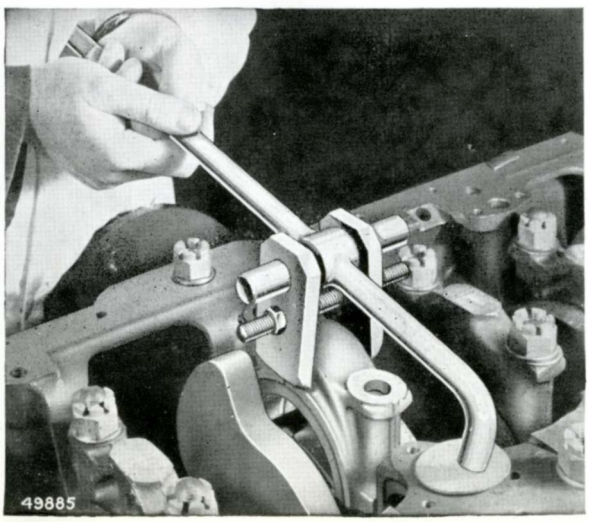


FIG. 42. REMOVAL OF BEARING CAPS

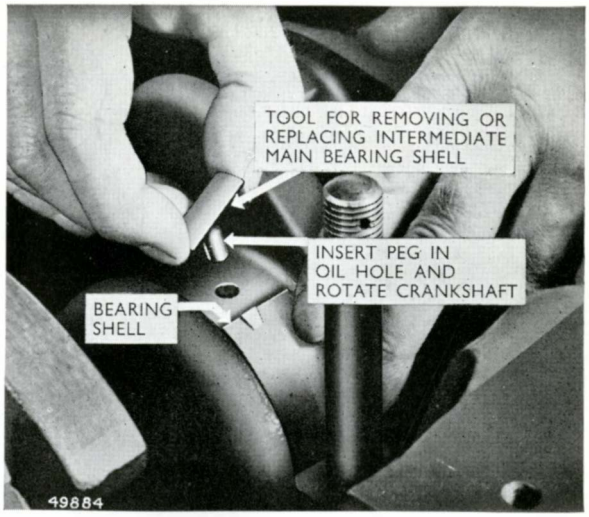


FIG. 43. REMOVAL OF INTERMEDIATE BEARING SHELL

3. Lower the crankshaft carefully into position, replace the main bearing caps in their correct positions, and tighten down, fitting the nuts to their original studs when possible. A torsion spanner set at 215 to 225 lb./ft. (29.7 to 31 kg./m.) should be used to tighten the bearing cap nuts.

4. Ensure that the timing gear mounted at the front main bearing is correctly meshed with the gear on the crankshaft.

5. Check the crankshaft end-play. This should not exceed .014 in. (.3556 mm.), Fig. 47.

6. Fill the crankshaft oilways with clean engine oil.

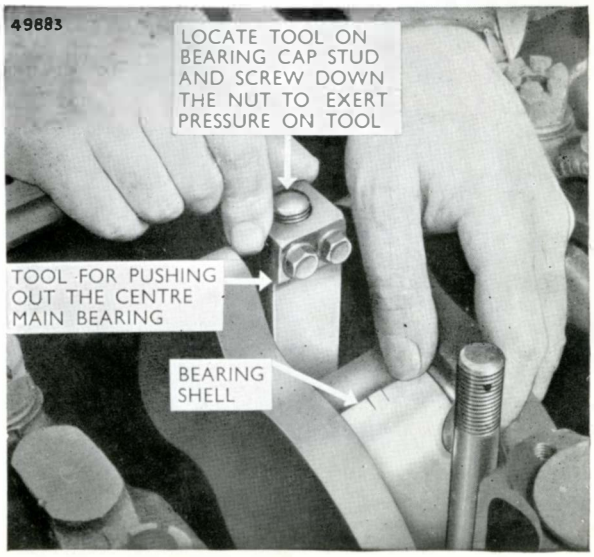


FIG. 44. REMOVAL OF MAIN BEARING SHELL

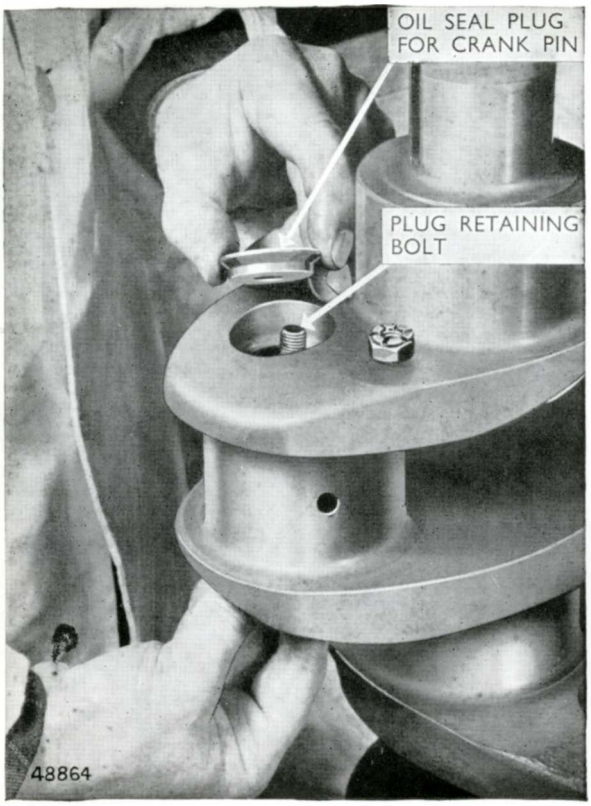


FIG. 45. REMOVAL OF OIL SEAL PLUG

7. Refit the connecting rods. The initial big-end clearance should be .0018 in. to .0037 in. (.0457 mm. to .0939 mm.) and should be renewed if it exceeds .008 in. (.2032 mm.).

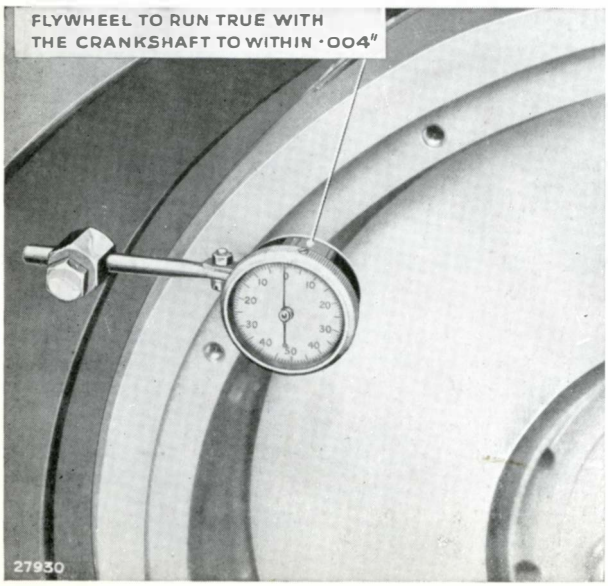


FIG. 46. CHECKING FLYWHEEL FOR RUNNING TRUE

Important

It cannot be emphasised too strongly that, in cases where the operator regrinds a crankshaft without re-nitriding, extreme care should be taken to ensure that an excessive amount of case is not removed from the fillets by using a grinding wheel having a corner radius considerably less than the designed radius between the journal and web of the crank, Fig. 48.

A grinding wheel having a radius of 0.15 in. to 0.17 in. (3.810 mm. to 4.318 mm.) should be used.

If the operator has any doubt on this point, crankshafts should be re-nitrided after regrinding irrespective of the amount of case which has been removed from the pin or journal diameter.

Check the main bearing diametral clearance. This should be within the limits .0020 in. to .0042 in. (.0508 mm. to .1067 mm.) when new bearing shells are fitted. Bearings should be renewed when diametral clearance exceeds .009 in. (.2286 mm.).

When refitting the flywheel to the crankshaft, check that the flywheel runs true with the crankshaft to within .004 in. (.1016 mm.) as shown in Fig. 46.

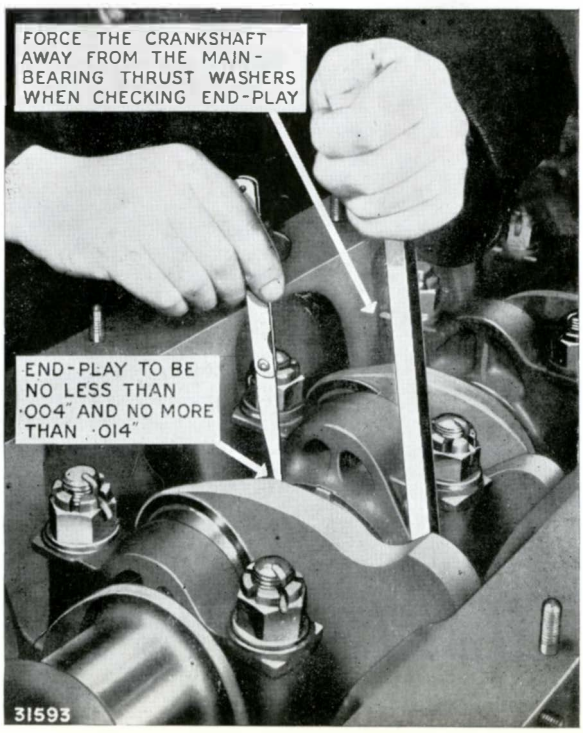
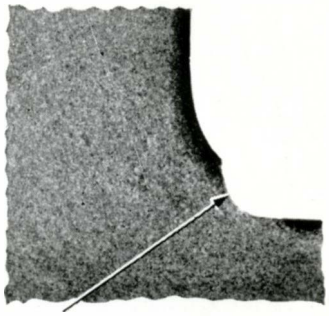


FIG. 47. CHECKING CRANKSHAFT END-PLAY

USE GRINDING WHEEL WITH
0·15 in./0·17 in. (3·810 mm. /4·318 mm.)
RADIUS



NITRIDED CASE REMOVED
OWING TO INCORRECT RADIUS
OF GRINDING WHEEL

FIG. 48. SECTIONS OF JOURNAL-TO-WEB FILLETS

To Regrind the Crankshaft

When regrinding journals and crankpins, the end faces must not be ground. If the location faces of the centre bearing have been damaged, the width should be increased to 2.710/2.712 in. (68.834/68.885 mm.) otherwise the dimensions should remain at 2.700/2.702 in. (68.580/68.631 mm.).

After grinding, support the crankshaft at the front and rear journals. Check the relative eccentricity of the centre main journal; this must not exceed .003 in. (.0762 mm.) in radius—total run-out of .006 in. (.1524 mm.). The permissible error between one bearing and its neighbour must not exceed .003 in. (.0762 mm.) (total clock reading).

It is not permissible to straighten a crankshaft in a press. The crankshaft should be re-nitrided at the second and fourth regrinds.

To Skim the Clutch Facing Plate

If the clutch facing plate is deformed it may be skimmed down. It is permissible to skim off .0313 in. (.7950 mm.) after this figure is exceeded compensation must be made by fitting skim plates (.064 in. (1.6256 mm.) thick) between the clutch facing plate and flywheel. A maximum number of three skim plates may be fitted, if two or more are fitted the standard retaining setscrew, Fig. 49, must be replaced by setscrews .125 in. (3.175 mm.) longer. It is not advisable to skim more than .100 in. (2.54 mm.) from the clutch facing plate, but when considering the number of skim plates required it is important to allow for the amount skimmed from the clutch back plate, see **Clutch Chapter.**

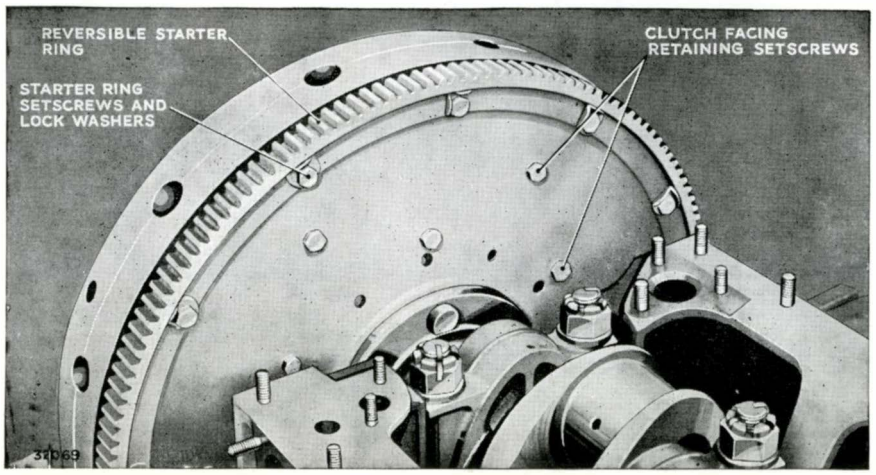


FIG. 49. REAR VIEW OF FLYWHEEL AND STARTER RING

THE TIMING GEARS

DESCRIPTION

The timing gears, Fig. 50, are single-helical hardened and ground gears, the drive to the camshaft and exhauster or compressor being transmitted from the timing gear on the crankshaft through an idler gear.

The gear on the crankshaft is an interference fit, the key being used only to locate the gear for timing purposes.

The idler gear, mounted on a spindle bolted to the engine block, runs on a floating bush, thrust being taken by two special washers, Fig. 51. The washers should be renewed when end float exceeds .012 in. (.3048 mm.). To remove the idler gear it is only necessary to remove the split pin and nut from the end of the fixing bolt and withdraw the gear and spindle.

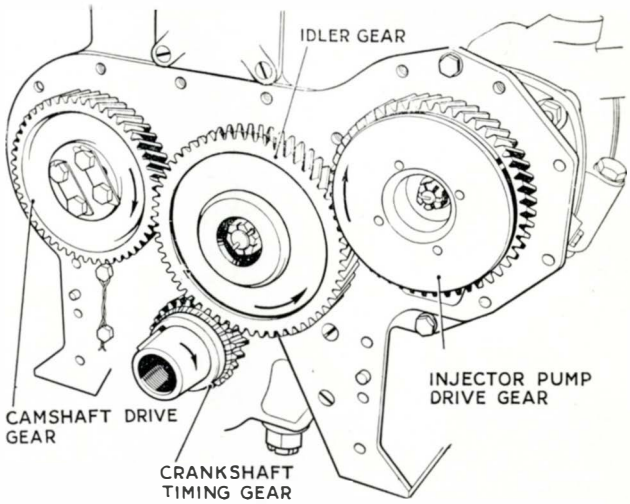


FIG. 50. THE TIMING GEARS

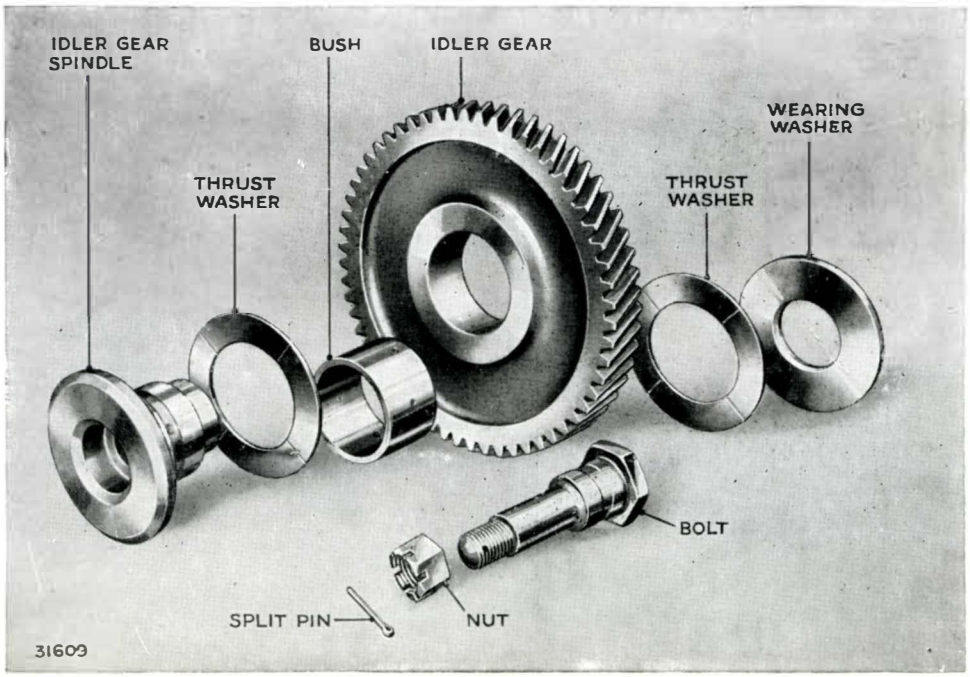


FIG. 51. IDLER GEAR DISMANTLED

The gear for the compressor and fuel-pump drive, is carried on ball and roller bearings mounted in a housing bolted to the timing back plate. Internally cut gear teeth integral with the compressor and fuel injection pump drive gear, mesh with a small mating gear on the compressor drive shaft, thereby transmitting the drive to the compressor and through a flexible coupling to the injection pump.

DISMANTLING COMPRESSOR DRIVE GEAR

1. Remove the two circlips behind the rear ball race.
2. Press the gear out of the housing and races. The outer race of the roller bearing will remain in the housing. The four holes drilled in the face of the gear are to enable the inner-race of the roller bearing to be pressed or driven off the gear.

The two slots cut in the housing are to enable the roller outer-race and the ball race to be pressed out of the housing.

THE COOLING SYSTEM

DESCRIPTION

Water passes through the pump direct into the engine block for circulation through the cylinder water jackets. After leaving the block the water enters a cored passage in the top of the casting and is then directed through drilled holes into the cylinder heads.

A thermostat, fitted in the front end of the water outlet manifold, Fig. 52, enables the engine to reach the correct running temperature in the shortest possible time. The thermostat valve seals the outlet to the radiator while the water is cold, but allows it to circulate through the block and heads until the water temperature rises to 185° F. (85° C.), when the valve opens and brings the radiator into full operation.

Draining the Cooling System

To drain the cooling system open the drain cock which is situated at the front right-hand side of the engine.

When draining the cooling system as a precaution against frost:

1. Park on level ground.
2. Open the drain tap.
3. Display a notice marked "No water in radiator ' in a prominent position.
4. When all water has been drained off, close the drain tap.

RADIATOR

The radiator is carried on special rubber bushes and mounted on support brackets attached to the front crossmember. Both top and bottom tanks and side standards can be removed without disturbing the cooling tubes. The frontal area and water capacity are such, that efficient cooling is obtained under all normal conditions. The top tank is a sheet brass pressing and the bottom tank is a gun-metal casting; this prevents "furring" up in districts where hard water is prevalent.

To Remove Radiator

1. Drain the system.
2. Disconnect the top and bottom water pipes at the flanged joints on the radiator.
3. Disconnect the top radiator-stay and remove the pinch bolts from the support brackets on the front crossmember.
4. Take the weight of the radiator and draw it off square with the mounting brackets.

Overhaul of Radiator

During annual overhaul the radiator should be thoroughly cleaned internally. If hard water has been

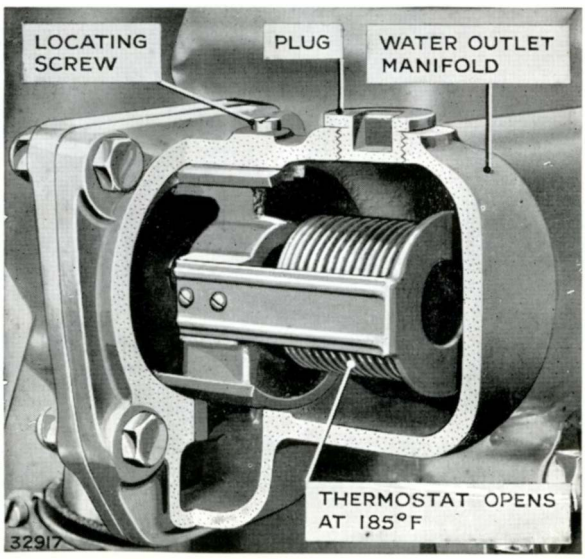


FIG. 52. THERMOSTAT IN POSITION

used, the top and bottom tanks should be removed and any deposit in the tubes loosened by passing a rod down each tube.

When refitting the tanks, use new joints obtained from Leyland Motors Service Department and paint with red lead before fitting.

To Replace Damaged Tubes

1. To remove a damaged tube, unscrew both top and bottom gland nuts and push the tube up far enough to free the bottom end, then pull out the top end.
2. The old ferrules should be removed and the cavities cleaned out.
3. Fit the new ferrules and replace gland nuts; these should be only just finger-tight whilst inserting the tube.
4. Insert the tube; rotating the tube will assist the operation.

WATER PUMP

The impeller-type water-pump, mounted at the upper front end of the engine block, is driven from the crankshaft by pulley and twin belts, Fig. 3. A spring-loaded, self-adjusting, carbon seal unit, Fig. 53, carried on the driving shaft, completely isolates the impeller chamber from the ball and roller bearings. The bearings are lubricated through a limited-supply grease nipple on the pump housing; loss of grease being prevented by felt washers.

To Dismantle Water Pump

1. Remove water-pump back plate.
2. Using the two $\frac{5}{16}$ in. B.S.F. holes drilled in the end face of the impeller for fixing withdrawal tool, withdraw the impeller from the driving shaft.
3. Withdraw the carbon seal unit.
4. Remove inner cover and press the driving shaft out of the pulley and bearings, pressing from the pulley end of the shaft.
5. Remove outer cover and distance piece, then press out bearings and retainer, pressing from impeller end of pump.

Renewal of Carbon Gland Unit

The carbon seal unit should not require attention for very long periods, but if at overhaul the rubber is damaged, or the carbon excessively worn, a new seal unit can be obtained from Leyland Service Department.

To Reassemble Water Pump

To reassemble the water pump, reverse the procedure for dismantling.

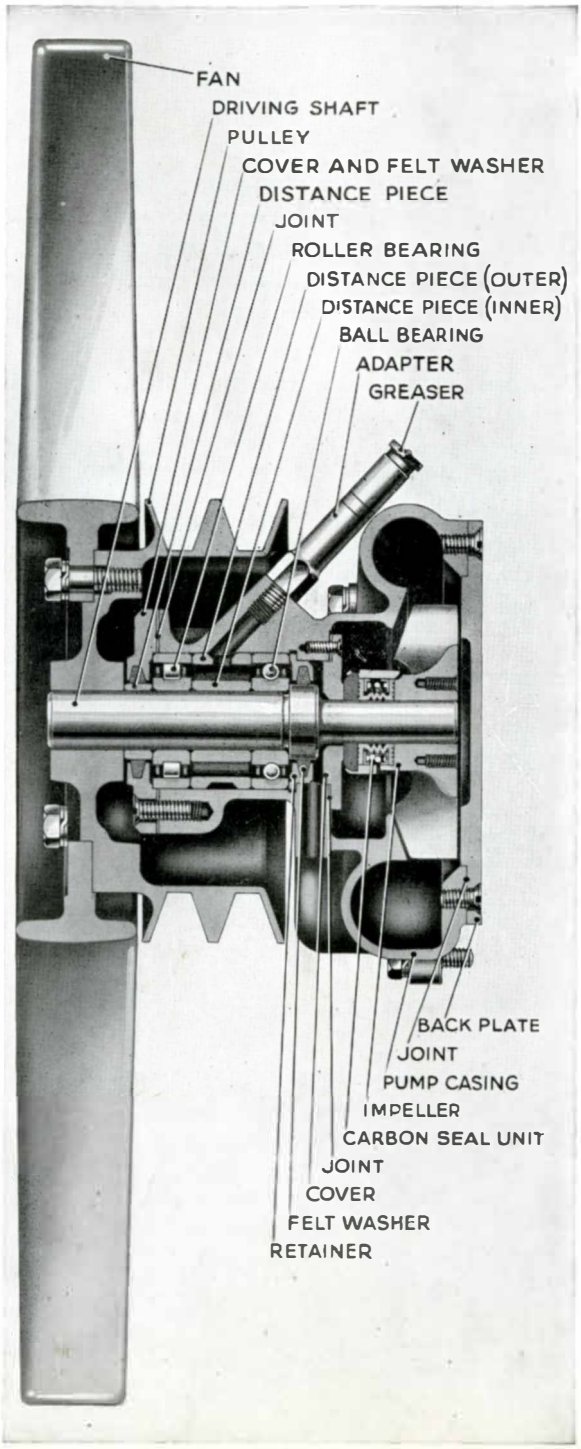


FIG. 53. SECTION THROUGH THE WATER PUMP

NOTE:

It is important that the driving shaft end and the impeller end face should be flush when in position, as this determines the correct spring pressure on the sealing face of the carbon gland. When pressing the impeller on the driving shaft, care should be taken that the tongue on the seal unit locates correctly in the driving slot cut in the impeller, Fig. 54.

On later models a "Romet" type sealing member is fitted. The construction of this unit comprises a rubber case having a metal stiffener, a stainless steel loading spring and a sealing face of "Monum". The unit is a taper fit in the bearing housing end cover. A phosphor bronze insert having lapped end faces is pressed into the hub of the impeller, the two sealing faces coming into contact when the impeller is pressed on to the pump spindle. A pressure of 10 to 15 lb. (4.5 to 6.8 kg.) is exerted by the loading spring on the two sealing faces.

FIG. 54. WATER-PUMP CARBON-SEAL POSITIVE DRIVE

THE FUEL INJECTORS

DESCRIPTION

The fuel is delivered at high pressure to injectors, Fig. 55, which break up the fuel into a fine mist and distribute it in the combustion chamber. They also ensure a snap-start and finish to injection and prevent air from entering the pipe lines during the compression stroke.

The inlet adapter is provided with an "edgewise" type filter. From the filter, fuel is fed through a drilled passage to the nozzle. When the required pressure is reached, the nozzle valve snaps open and allows fuel to be sprayed into the combustion chamber through four small, equally spaced holes in the nozzle tip. Although the needle valve is a very fine fit in its bearing in the injector body, a small quantity of fuel leaks past the valve stem and this is led away through a drilled passage in the injector body to a branch pipe and thence to the main leak-off gallery pipe, Fig. 57.

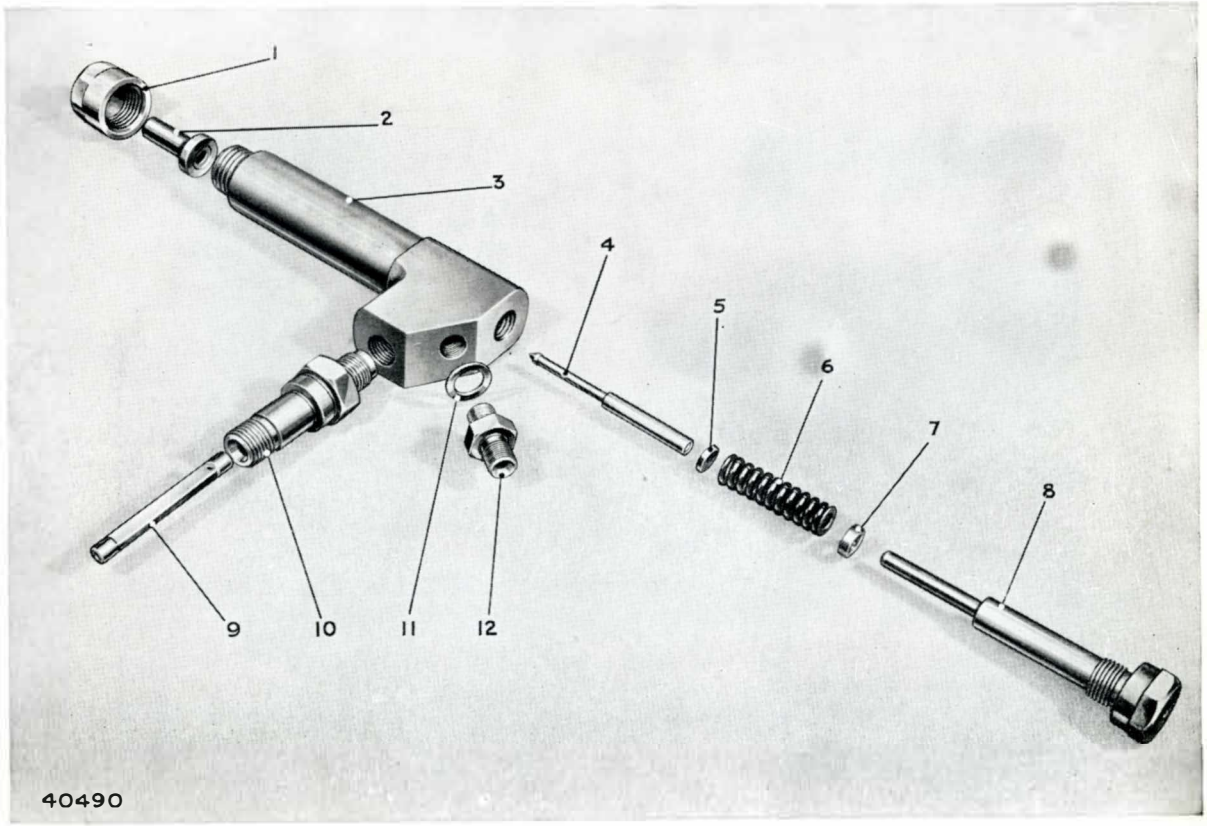


FIG. 55. EXPLODED VIEW OF THE INJECTOR UNIT

1. Locknut.
2. Nozzle.
3. Injector body.
4. Needle valve.
5. Needle valve lift distance washer.
6. Valve spring.
7. Discharge pressure adjusting washer.
8. End plug.
9. Edgewise filter.
10. Inlet adapter.
11. Copper washer.
12. Leak-off adapter.

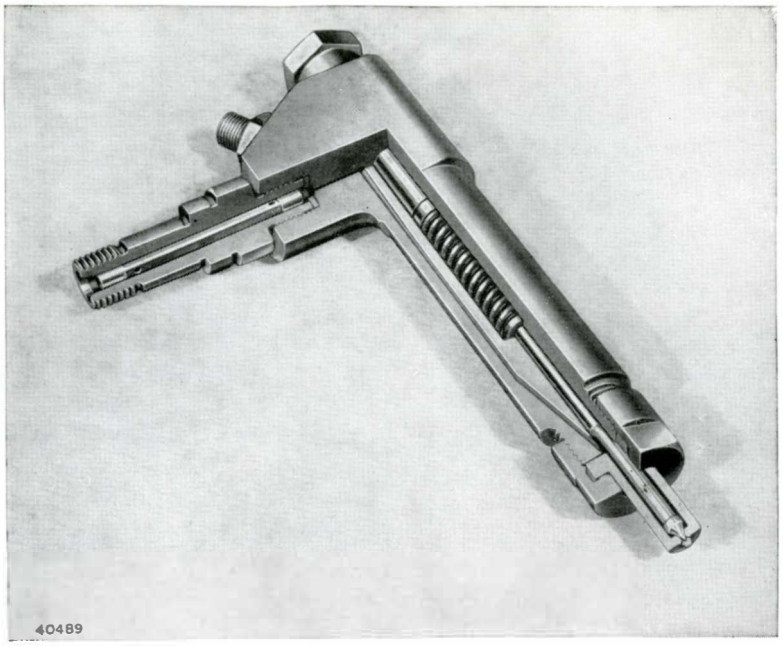


FIG. 56. AN INJECTOR UNIT SECTIONED

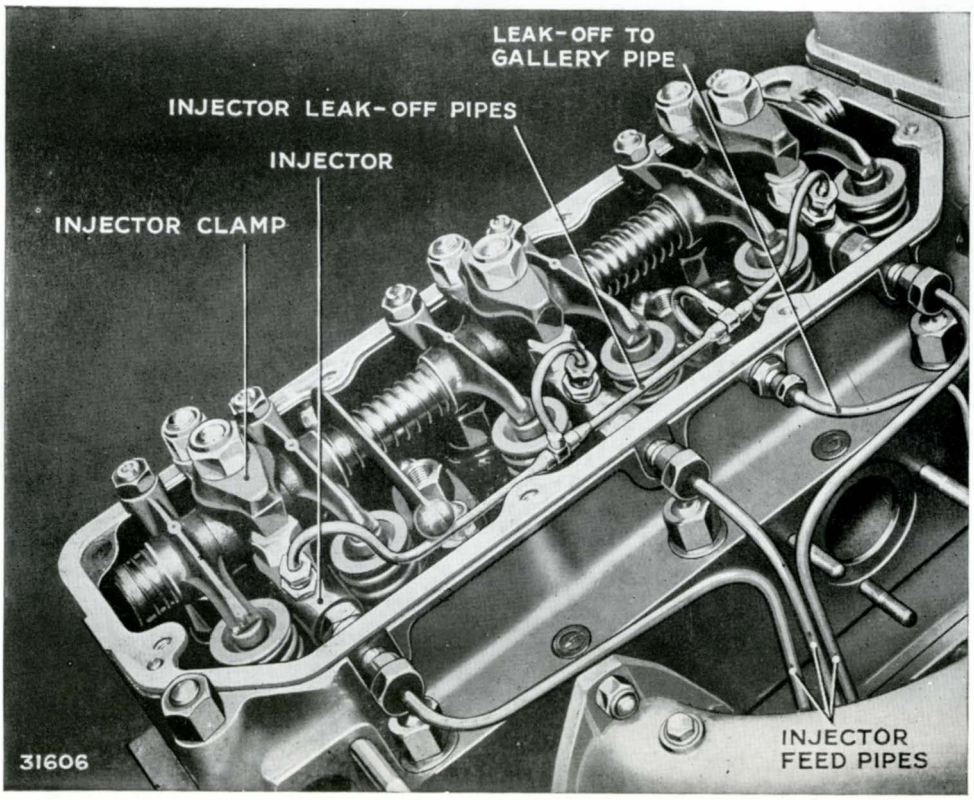


FIG. 57. INJECTORS AND LEAK-OFF PIPES IN POSITION IN CYLINDER HEAD

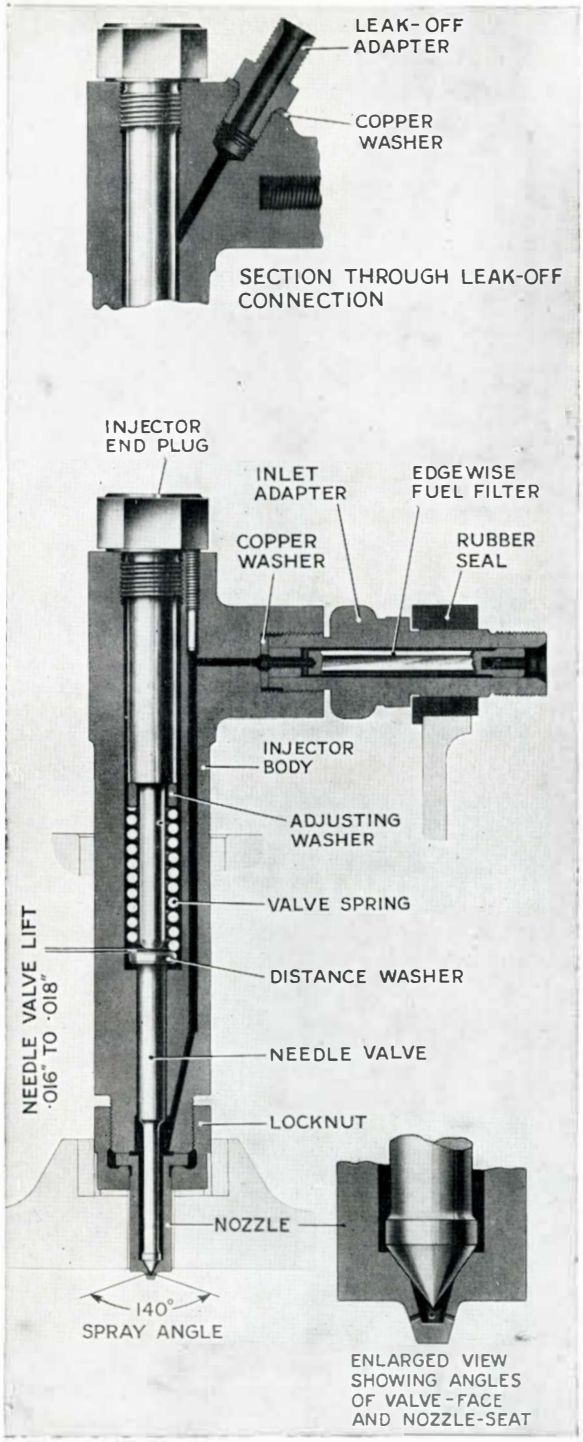


FIG. 58. THE INJECTOR UNIT

The injectors will give long periods of efficient service. Special equipment is required for reconditioning the injectors and special lapping tools are obtainable. If, however, no equipment is at hand, injectors should be returned to Leyland Service Department and a replacement set fitted.

Diagnosis of Injector Trouble

Provided the fuel filters receive regular attention, thereby ensuring that only clean fuel is fed to the injectors, no attention is likely to be required for long periods. Any inefficiency can usually be detected by one of the following symptoms:

1. Pronounced knocking on one (or more) cylinders.
2. Complete or intermittent misfiring.
3. Smoky exhaust (black), injector discharging unvaporised fuel; (blue), denotes a choked injector.
4. Increased fuel consumption.
5. Engine overheating.

To locate a faulty injector, slacken off the injector pipe union nut two or three turns and allow the fuel to leak past the threads while the engine is running slowly. This cuts out the injector and if no change in engine performance can be detected, it is reasonable to assume that the injector is faulty and should be removed for examination.

Note: It is important that the leak-off pipe is not bent when removing a single injector. To ensure that no damage is caused to the leak-off pipe, the pipe assembly attached to the three injectors should be removed.

Faulty injection may be due to any of the following:

1. External carbon on nozzles.
2. Choked nozzle spray holes.
3. Loose nozzle lock-nut.
4. Dirt on the joint face between nozzle and body.
5. Dirt or carbon on needle valve seat.
6. Needle valve sticking in body.
7. Faulty valve spring adjustment.
8. Broken needle valve spring.
9. Cracked injector body.

To Test Injectors

Connect the injector to an injector test pump, give the handle about ten strokes to expel all air, and observe the nature of the spray when pumping at about 2 strokes per second. If no test pump is available, connect the injector to the injection pump, so that the spray can

be observed. Slacken the unions on the remaining injectors to prevent unburnt fuel being sprayed into the cylinders. Decompress the engine. Turn the engine, and observe the spray.

When the injector is operating correctly, the spray from the nozzle spray holes should appear alike, and of equal length and free from streaks or jets of undivided fuel, Fig. 59.

A sharp, high-pitched, metallic squeak should be heard whilst the injector is spraying.

The nozzle tip must remain dry after fuel cut-off.

OVERHAUL

To Dismantle and Clean Injectors

When dismantling injectors absolute cleanliness is essential. **Needle valves are not interchangeable,** care must be taken when dismantling to keep all parts with their original injectors.

1. Remove the injector end plug and withdraw the valve spring, discharge pressure adjusting washer, needle valve lift distance washer and needle valve. If the needle valve is tight screw a piece of 3 BA screwed rod into the tapped bore of the needle valve and draw it out.

2. Remove the nozzle lock-nut and nozzle.

3. Wash the needle valve, nozzle and injector body in clean fuel oil. Both faces of the nozzle flange, the inner face of the lock-nut and face of the body should be bright and without trace of damage. They must bed perfectly to ensure a pressure-tight joint.

4. The stem of the needle valve must be free from high spots or scratches. If dirty or choked, clean with a fine brass wire brush.

5. Clean the nozzle seat thoroughly and clear the spray holes with a pricker. Brush through injector body bores and inlet adapter. Flush out the inlet port drilling and nozzle with fuel oil. Finally, rinse in clean white spirit before assembly.

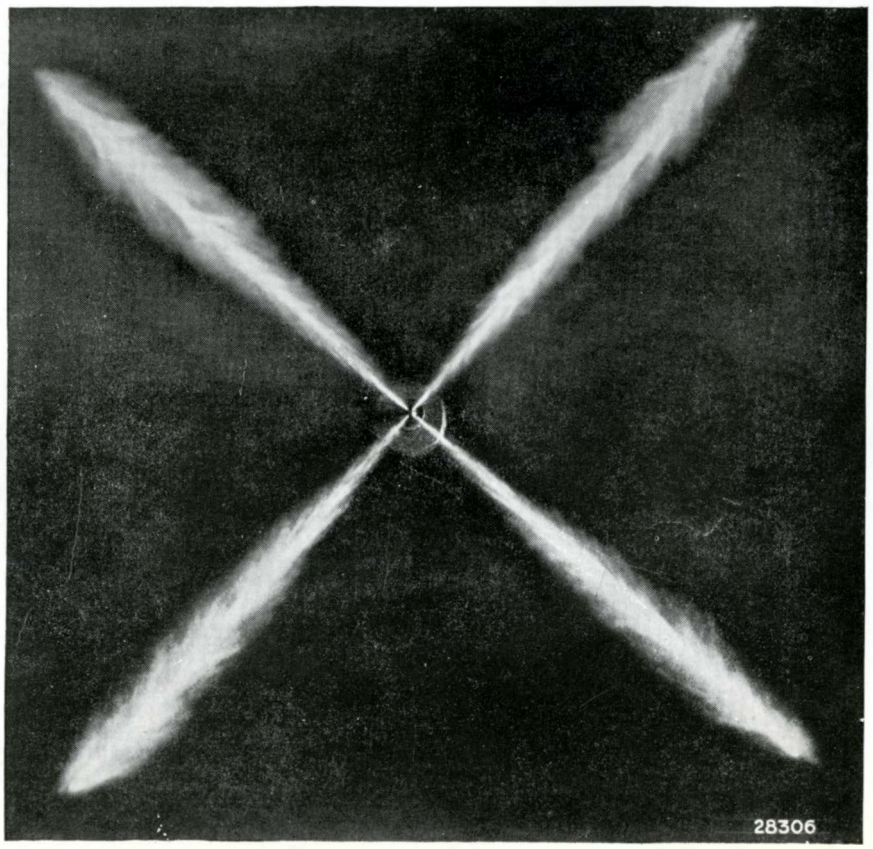


FIG. 59. INJECTOR SPRAY AS SEEN BY THE HIGH-SPEED CAMERA

FIG. 60. PART SECTIONED VIEW OF INJECTOR UNIT

To Re-lap Nozzle and Valve Seats

Use only the special fine grade lapping compound known as " 2A.700.O.F." supplied by the Carborundum Co., Ltd., Trafford Park, Manchester, 17.

When lapping, only use **very** light pressure.

Never give the needle or nozzle lapping jigs more than a **few** twists at a time between each test.

Wash away every trace of lapping compound, assemble the injector and test for a dry seat with a sustained pressure of 125 atmospheres. 1,827 lb./sq. in. (129 kg./sq. cm.). If the seat does not remain dry, repeat the lapping operations until such a condition is obtained.

Assembly and Test of Injectors

The most important point to check when assembling an injector unit is the correct alignment of the nozzle in relation to the bore in the injector body. If the alignment is not correct the unit will not function properly and failure will occur at very low mileages. The components should be thoroughly washed in white spirit or fuel oil and kept free from grit or dirt throughout the entire operation.

Fluffy material should not be used to wipe the components.

To Reassemble Injectors

1. Check that all parts are perfectly clean and dry.
2. Fit the injector body in the jig, Fig. 61.
3. Fit the nozzle and lock-nut and screw up the lock-nut so that the nozzle can just be rotated with the fingers.
4. Screw the 3BA rod into the needle valve bore and insert the valve into the injector body.
5. Tighten the lock-nut slowly and carefully with the fingers, at the same time using the 3BA rod to bounce the needle valve rapidly on the nozzle seat, Fig. 63.

This ensures perfect centralisation of the nozzle and needle, without which the injector will not operate correctly. When the needle valve bounces freely on

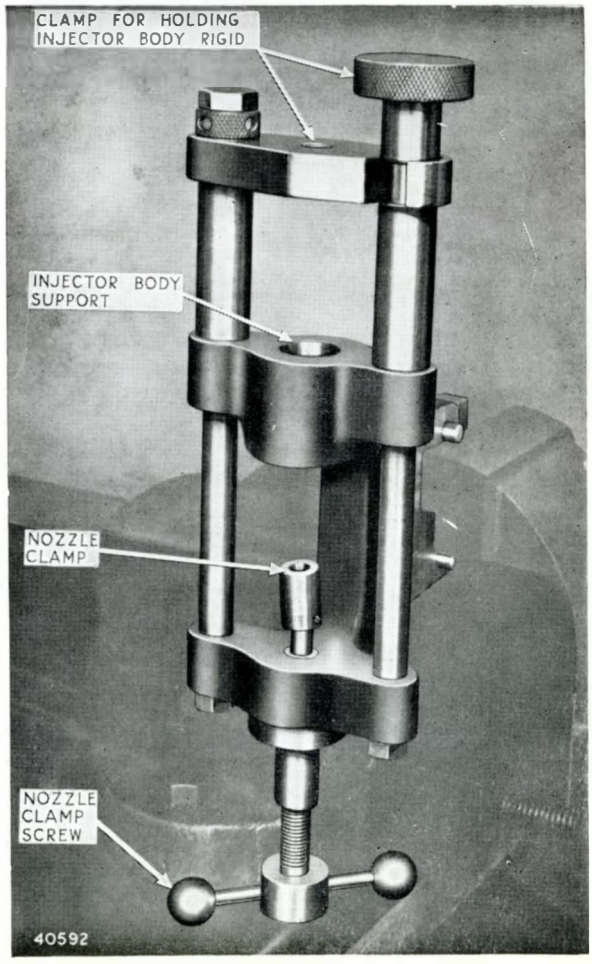


FIG. 61. NOZZLE AND NEEDLE ALIGNING JIG

its seat, tighten the jig clamp screw to hold the nozzle in position, Fig. 62, and finally tighten the lock-nut with the ring spanner, Fig. 66, taking great care not to knock the nozzle when fitting the spanner. When the lock-nut has been fully tightened a further and most important check that the needle valve operates freely, is the "Inverted Test" carried out as follows:

1. Remove the injector from the jig.
2. Hold the injector vertically in an inverted position, Fig. 67.
3. With the needle valve attached to the screwed rod, insert the needle valve into the injector body and push it firmly on to the nozzles seating.
4. Release the rod smartly for an instant, and check that the needle valve breaks cleanly from the nozzle seat without sticking or binding.

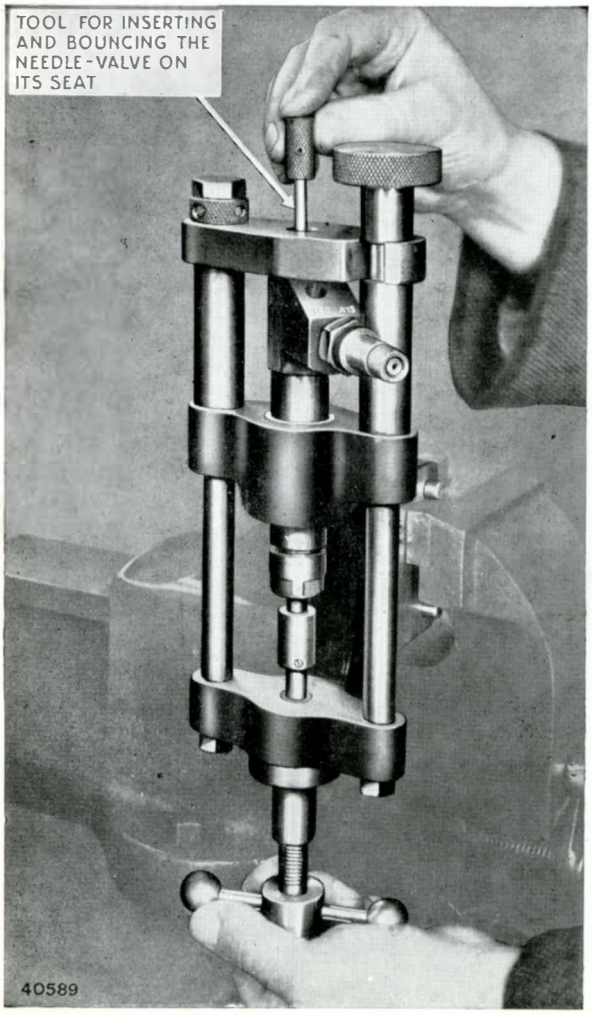


FIG. 62. CLAMPING THE NOZZLE AFTER CENTRALIZING THE NEEDLE VALVE

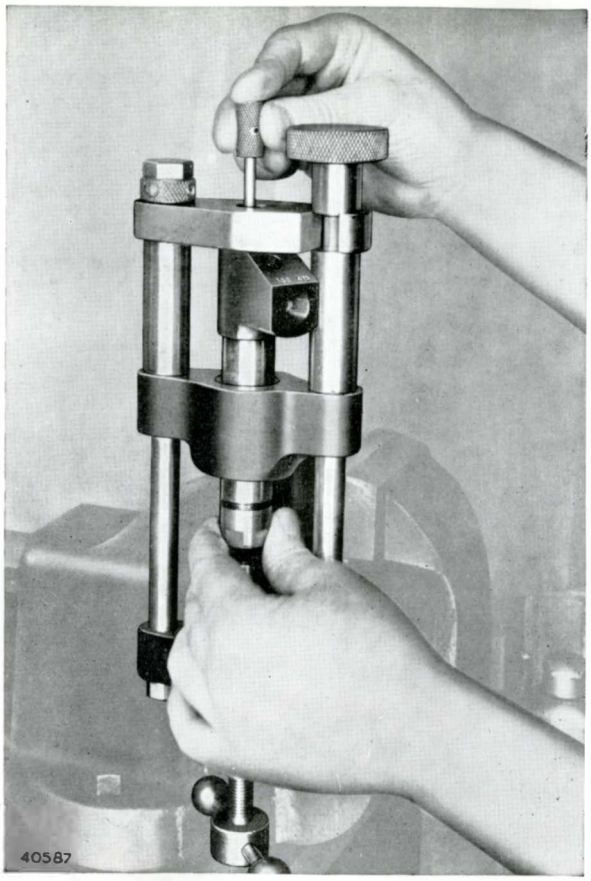


FIG. 63. BOUNCING THE NEEDLE VALVE ON ITS SEAT

Make this test with the needle valve in at least four different positions on the nozzle seat. If the needle valve sticks in any one position, then:

(a) Check the needle valve slides freely in the injector body.

(b) Check that the end face of the injector body and the end face of the nozzle are clean and fit flush

(c) After these checks, re-align the injector body and nozzle in the jig, and again carry out the "Inverted Test" until the condition described in paragraph 4 is obtained.

5. Now assemble the needle valve lift distance washer, valve spring and discharge pressure adjusting washer in the injector body and replace the injector end plug.

To Check and Adjust Injectors

This can only be done successfully with a specially designed injector test pump, Fig. 65.

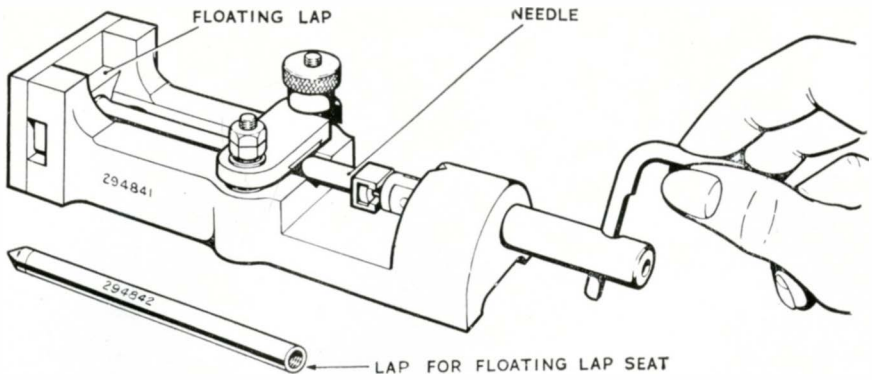


FIG. 64. INJECTOR NEEDLE LAPPING JIG

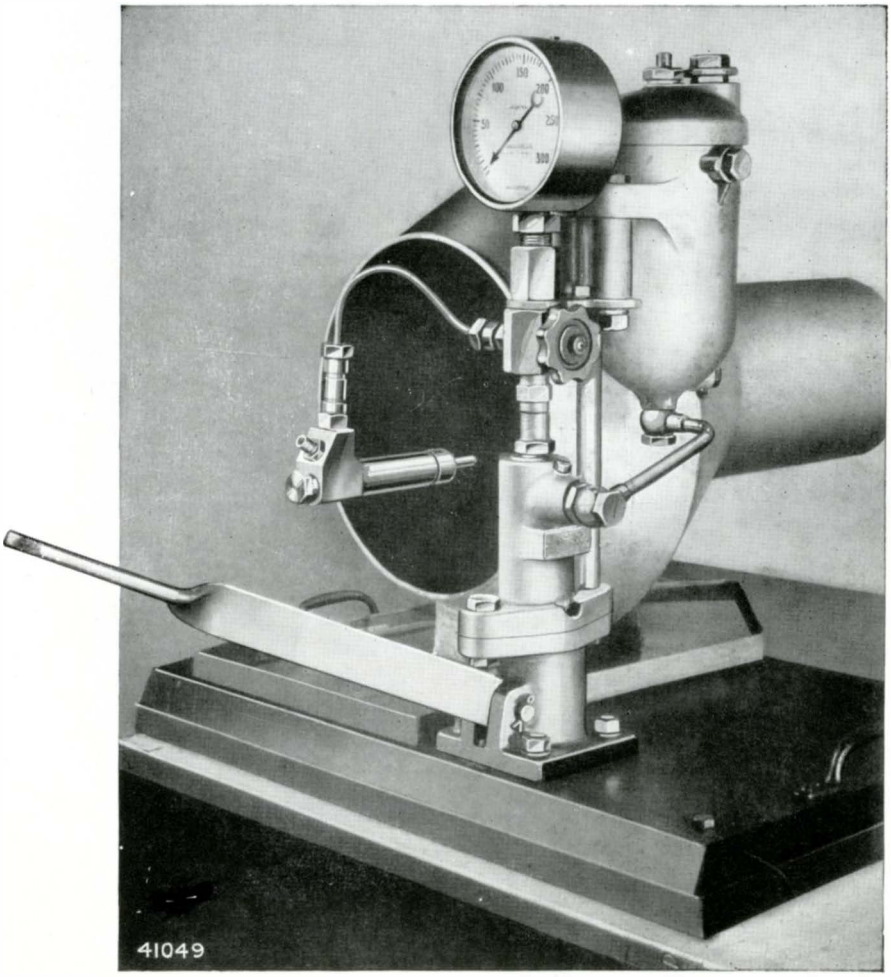


FIG. 65. INJECTOR UNIT TEST RIG

1. Connect the injector to the test pump; expel all air from the pump by pumping the handle for about ten strokes.

2. Carefully note pressure at which spray breaks when the pump handle is operated. The correct pressure is between 140 and 145 atmospheres (2,057 to 2,130 lb./sq. in.) 144.6 to 149.7 kg./sq. cm.

3. The seat must remain dry with a sustained pressure of 125 atmospheres (1,837 lb./sq. in.), 129 kg./sq. cm.

4. If the discharge pressure is not correct, check that the needle is free in the body; if this is in order adjust the spring pressure by inserting a discharge pressure adjusting washer of a different thickness (See **Data** under heading **Injectors).** Re-check the discharge pressure.

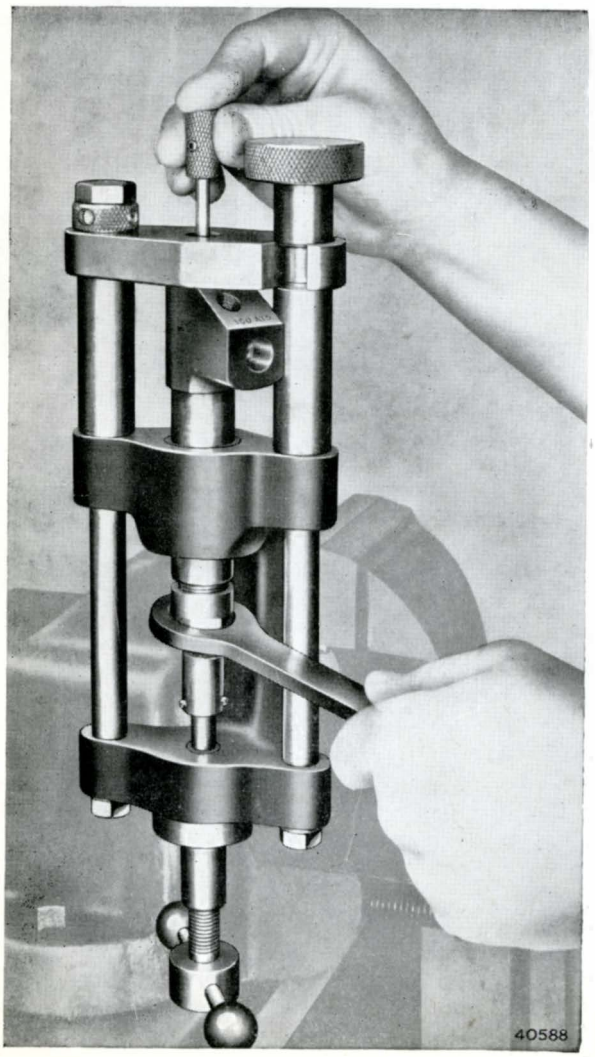


FIG. 66. TIGHTENING THE NOZZLE CLAMP NUT

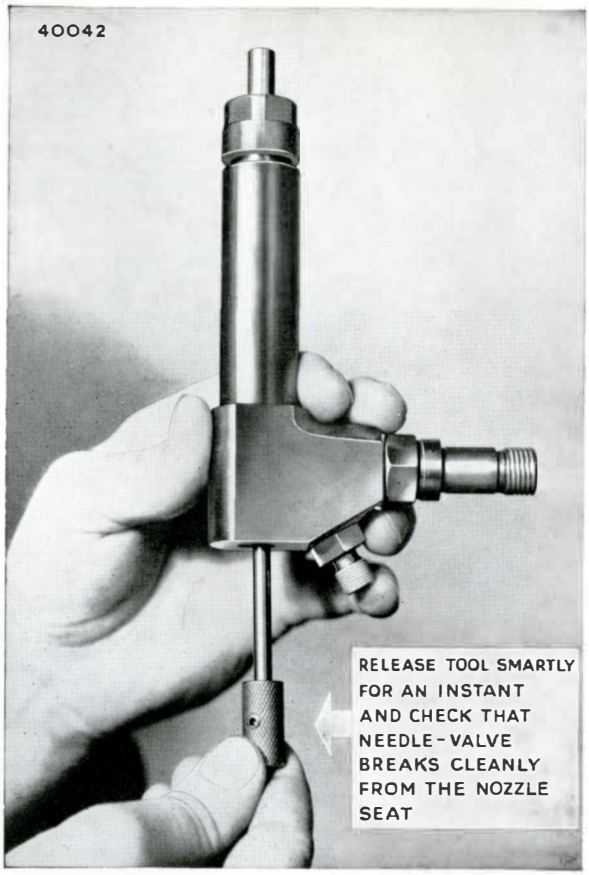


FIG. 67. THE INVERTED TEST

5. Check that the needle lift is between .016 in. and .018 in. (.4064 mm. to .4572 mm.). To do this remove the injector end plug and valve spring. Insert a .025 in. (.6350 mm.) thick shim on top of the needle valve lift distance washer and replace the end plug. Screw down the plug by hand and measure the gap between the end plug and injector body, using a set of feeler gauges, Fig. 69.

   If this gap is between .007 in. and .009 in. (.1778 mm. and .2286 mm.) the needle lift is correct. If the gap is not correct, fit a different thickness of distance washer and re-check (see **Data** under heading **Injectors),** when a needle valve lift distance washer of the correct thickness has been obtained, remove the .025 in. (.6350 mm.) thick shim and assemble the injector for test.

6. Check the time for the pressure to fall from 90 to 40 atmospheres (1,323 to 588 lb./sq. in., 93 to 41.4 kg./sq. cm.). The limits for rejection are as follows (at room temperature 40°F. to 70°F., 5°C. to 21°C.):

   Using fuel oil ... ... 4½ to 14 secs.

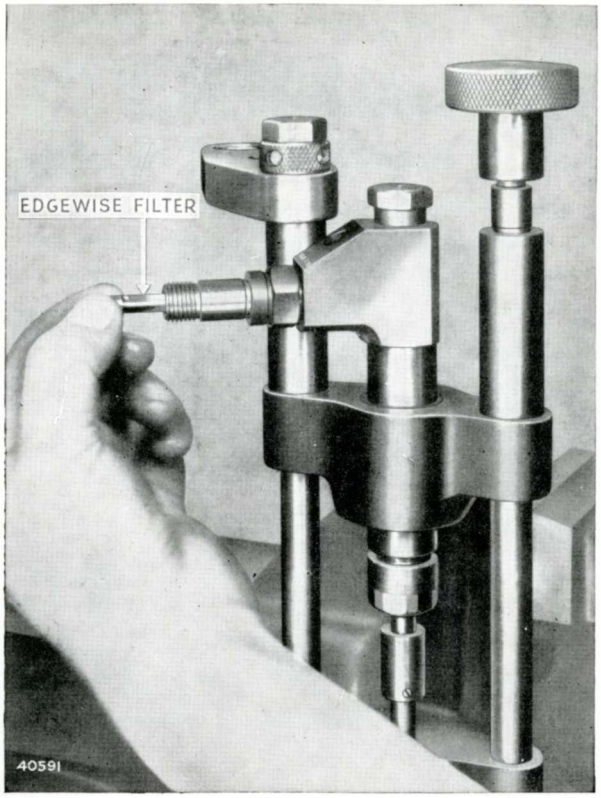


FIG. 68. FITTING THE EDGEWISE FUEL FILTER

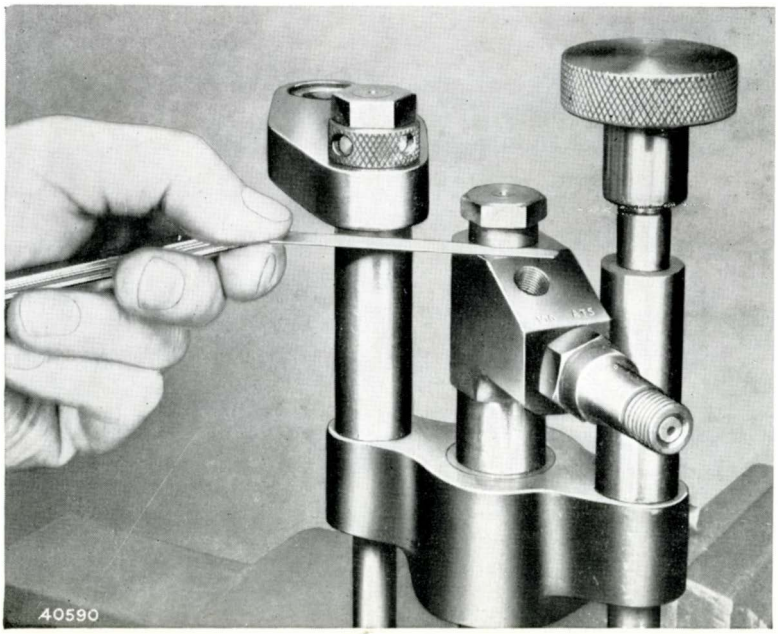


FIG. 69. CHECKING THE NEEDLE VALVE LIFT

THE FUEL INJECTION PUMP AND GOVERNOR

C.A.V. Type NL Pump
C.A.V. Type RP Governor

DESCRIPTION

The fuel injection pump is of the constant-stroke, cam-actuated, lapped plunger type and incorporates a pneumatic governor and an excess fuel device for easy starting. The pump consists of a body with a camshaft compartment at the bottom and with six individual pumping elements occupying the middle and upper portions.

In the middle and upper portions of the pump housing are located the plunger and barrel assemblies, metering control sleeves with regulating toothed quadrants, plunger springs and control rod. The upper portion of the housing contains the fuel chamber, delivery valve assemblies and delivery valve holders for connection to the injection feed pipes. Built into the rear of the housing is a secondary fuel filter composed of felt pads intended to supplement the main fuel filter.

Each pumping element comprises of a barrel (G) and plunger (H) see Fig. 70, and are of highly ground and hardened steel, finished to a high degree of accuracy to permit operation at high speeds and pressures. Thus each pair must be regarded as inseparable and not interchangeable.

Fuel oil is fed to each element from a common gallery; the stroke of the plunger is constant, but the effective pumping stroke, i.e., that portion of the stroke during which oil is actually forced into the combustion chamber, is variable by means of a control helix on the plunger which operates in conjunction with ports in the barrel.

Referring to Fig. 71, the form of the helix and its relation to the ports and oil passages of the element are clearly shown. It will be seen that when the plunger is at bottom dead centre (B.D.C.) oil can enter the barrel through the inlet port. As the plunger is raised

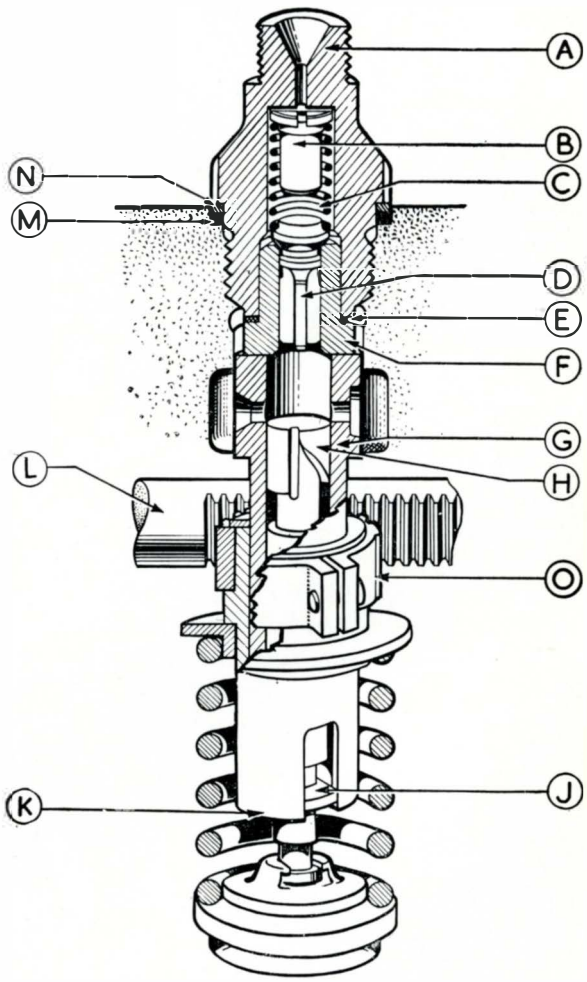


FIG. 70. THE PUMPING ELEMENT ASSEMBLY

A. Delivery valve holder.
B. Spring peg.
C. Delivery valve spring.
D. Delivery valve.
E. Washer.
F. Delivery valve seat.
G. Plunger barrel.
H. Plunger.
J. Plunger locating lug.
K. Control sleeve.
L. Control rod.
M. Rubber seal.
N. Washer.
O. Control quadrant.

by the cam, the top edge of the plunger covers the ports, sealing off escape for the oil, which is then forced out through the delivery valve and high-pressure piping to the injector, as in Fig. 71b. As the plunger rises higher, pumping continues until the edge of the control helix reaches the lower edge of the ports. This allows oil to escape via the spill port, as in Fig. 71c, releasing the pressure in the element and piping and thus terminating the pumping stroke. The plunger can now complete its stroke without any further pumping, and is then returned by the plunger spring to bottom dead centre ready for the next cycle.

The quantity of fuel oil pumped is dependent on the length of pumping stroke between the points shown in Fig. 71 (b and c). This effective stroke is varied by rotating the plunger to bring a higher, or lower, portion of the control helix into line with the spill port. Compare Figs. 71c, 71d and 71e, which show approximately the positions for full load, half load and idling respectively.

At its upper end the control helix emerges into an axial groove running up to the top face of the plunger. If this axial groove is in line with the spill port, then the oil in the barrel has a continuous line of escape to the spill port, and obviously no pumping stroke is possible. This represents the "Stop" position in pump operation, when no oil is delivered at all, as in Fig. 71f.

Rotation of the plunger, to give any required delivery position between "Full Load" and "Stop", is effected in the following way.

The lower end of the plunger (H) Fig. 70, carries a lug, or toe (J). This engages in a slot in the skirt of the control quadrant (K). Around its upper flange, the quadrant is machined to form gear teeth, and these engage with similar teeth on the control rack (L), the latter running the length of the pump and engaging the quadrant of each pumping element. Thus movement of the rack causes all the plungers to rotate in unison and selects the position of the helices corresponding to the fuel delivery required.

The control rack is normally coupled to and operated by the governor unit, or other control linkage.

In order to ensure complete and instantaneous relief of pressure in the fuel line after the pump plunger has completed its injection stroke, a delivery valve with the well-known "unloading collar" used in previous types of C.A.V. pumps is fitted immediately above the element, as shown in Fig. 73.

The delivery valve seating is held against the top of the element barrel (G) Fig. 70, both faces of this joint being lapped flat. The seating is held down by the delivery valve holder (A) which is screwed in to the pump body, a washer (E) being inserted between the valve seating (F) and the holder (A), to prevent leakage of high-pressure oil down the inside of the holder. Leakage of oil at low pressure up the threads in the pump body is prevented by a synthetic rubber seal ring (M), with a steel slip washer (N), which is trapped in a counterbore in the pump body by the delivery valve holder.

A steel peg (B) is used to centralise the upper end of the valve spring (C) and also to help reduce the fuel capacity of the holder. This fuel capacity has been kept to a minimum, as it is known that reduction of capacity between pump plunger and injector seat gives improved injection control under many conditions.

In operation, when the pump element barrel ports are closed and delivery occurs, the delivery valve is lifted from its seat so that the unloading collar is clear of the seat bore and the oil passes through. (See Fig. 73.) When delivery is ended by the opening of the spill port, the sudden collapse of pressure in the pump

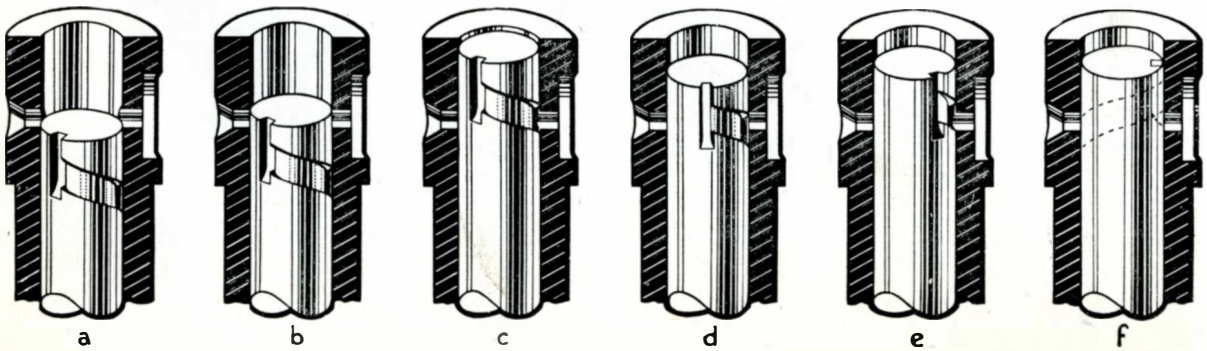


FIG. 71. THE PRINCIPLE OF FUEL METERING

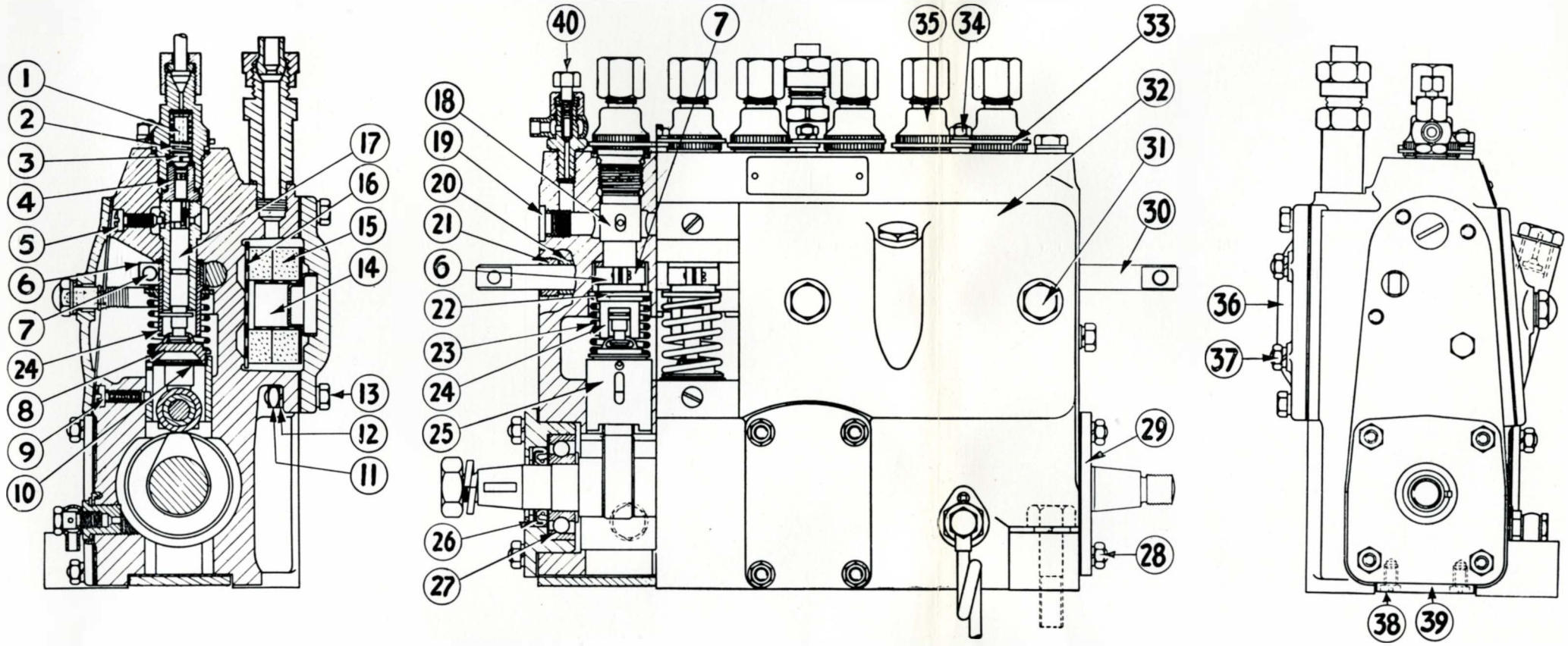


FIG. 72. SECTIONED VIEWS OF THE C.A.V. TYPE NL6F FUEL INJECTION PUMP

1. Delivery valve spring peg.
2. Delivery valve spring.
3. Delivery valve.
4. Delivery valve seat.
5. Barrel locking screw.
6. Control quadrant.
7. Quadrant clamp screw.
8. Lower spring plate.
9. Tappet locking screw.
10. Phasing shim.
11. Nut.
12. Washer.
13. Bolt.
14. Support pipe.
15. Filter felt.
16. Filter support plate.
17. Plunger.
18. Barrel.
19. Closing plug.
20. Control rod bush.
21. Locking ring.
22. Upper spring plate.
23. Spring.
24. Control sleeve.
25. Tappet.
26. Oil seal.
27. Ball bearing.
28. Nut.
29. Bearing end plate.
30. Control rod.
31. Screw.
32. Inspection cover.
33. Delivery valve holder locking plate.
34. Nut.
35. Delivery valve holder.
36. Filter cover.
37. Nut.
38. Setscrew.
39. Base sealing plate.
40. Vent cock.

element causes the valve to snap" on to its seating sharply. As the lower edge of the unloading collar enters the seat bore, it stops any flow of oil past the collar so that the capacity above the valve is sealed off. Further movement of the valve on to its seat now causes an increase of the capacity above the valve. The resultant sharp drop in pressure speeds up the closing of the injector, giving very positive shut-off and preventing dribble with its attendant troubles of carbon-formation and nozzle deterioration.

LUBRICATION

On fitting the pump to the engine, the cambox should be filled up to the level of the drain connection with engine oil, through the filler plug, see **Lubrication Chart.** This oil level will be maintained by the back leakage from the pumping elements as this leakage is all led back to the pump sump, any surplus being taken away by the drain on the side of the pump. This drain should be led back to the tank to prevent waste or oil drips.

Although the original lubricating oil will be thinned out by the back leakage fuel oil, experience has proved that the pump will run in perfect safety with fuel oil as a lubricant.

OVERHAUL

To Remove the Injection Pump

Immediately pipes are disconnected from the fuel pump, the ends of the pipes, together with the unions on the pump, must be covered with clean rag or caps. **On no account must dust be allowed to fall into the injection pump.**

1. Disconnect the pipes from governor to venturi.
2. Disconnect the stop control.
3. Uncouple the pipe from the main filter to the pump and the suction and delivery pipes to the diaphragm fuel feed pump.
4. Disconnect the delivery pipes to the injectors.
5. Remove the two setscrews connecting the coupling to the pump flywheel.
6. Remove the four bolts fixing pump to bracket and remove the pump.

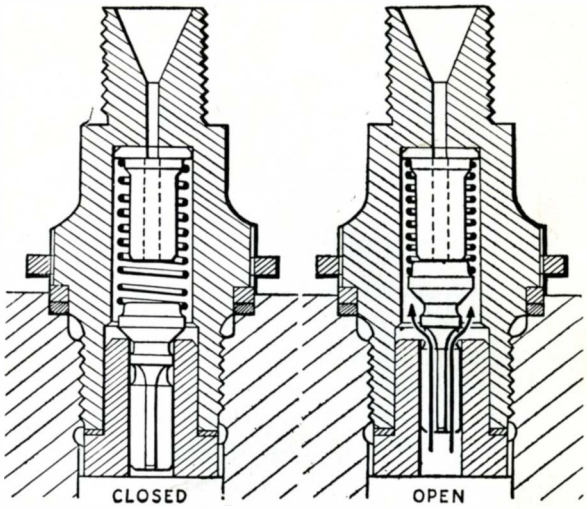


FIG. 73. INJECTION PUMP DELIVERY VALVE

To Replace the Injection Pump

1. Set the engine to the **"No. 1 INJ"** mark on the flywheel, so that **No. 1** piston is on the **compression** stroke (that is, both valves closed).
2. Turn the pump camshaft until the mark on its flywheel is in line with the pointer on the pump body.
3. Place the pump on its bracket and connect up to the drive coupling.
4. Check that all timing marks are in line.
5. Bolt the pump to its bracket.

If a replacement pump is being fitted and its flywheel has no timing mark, proceed as follows:

1. Set the engine to the **"No. 1 INJ"** mark on the flywheel, so that **No. 1** piston is on the **compression** stroke.
2. Fit the pump to the engine and couple up the main feed pipes, but only No. 1 cylinder delivery pipe and injector.
3. Prime the injection pump through to No. 1 injector.
4. Turn the pump flywheel **clockwise** until resistance becomes solid.

   At this point No. 1 injector starts injecting fuel; fit the coupling locking setscrews and tighten up.

5. When the pump is correctly timed, mark the pump flywheel opposite the timing pointer on the pump body, so that the pump can easily be fitted if subsequent removal is necessary.

6. Fit and tighten all fuel delivery pipes to injectors.

To Dismantle the Injection Pump

In the event of the injection pump being faulty in service, it should normally be removed complete and replaced by a spare pump, the faulty unit being despatched to the nearest C.A.V. or Leyland Service Depot or agent. As a replacement pump may not always be available, details whereby emergency repairs can be carried out are given in the following paragraphs.

Warning: Strict cleanliness must be observed when preparing to dismantle fuel injection pumps, care being taken that all filings, dust, dirt and grit, etc., have been removed from the bench on which work is to be done. The bench should then be covered with clean grease-proof paper and a number of clean containers provided for the various parts removed. It is also an advantage to have a supply of clean, fresh fuel oil for washing these parts.

The various parts of one pumping element should never be interchanged with another, particularly the barrel, pump plunger, delivery valve and seating. To keep the six elements isolated they should be placed in separate containers. The surfaces of these parts must never at any time be touched with a file, scraper, or other hard tool or any abrasive compound.

Procedure is as follows, the components being removed in the sequence given:

1. Remove the governor (see **To Remove the Governor**).

2. Remove the excess fuel device.

3. Remove the fuel feed pump by unscrewing fixing screws.

4. Remove the inspection cover-plate (32) Fig. 72.

5. Rotate the camshaft to bring each tappet assembly to its top dead centre position and insert tappet holder under the lower spring plate.

6. Remove the injection pump flywheel using the special withdrawal and holding tool, C.A.V. Tool No. ET.008. The removal of the flywheel from the tapered end of the camshaft must never be done by the use of a hammer or drift.

7. Remove the four nuts (28) securing one camshaft bearing end plate and remove the plate (29) by tapping the opposite end of the camshaft, keeping the end plate square and avoiding damage to joint face and gasket. The camshaft can now be drawn from the open end of the cambox. The camshaft is notched at the driving end to ensure that it is replaced correctly.

8. To remove the bearing inner race from the camshaft use C.A.V. Tool No. ET.026A. Shims, to adjust the end float of the camshaft when assembled in the pump, are trapped on the shaft, behind the bearing inner race. This end float should be maintained at 0.05 mm. to 0.10 mm. (0.002 in. to 0.004 in.), and if a shaft or bearing is changed the necessary shims should be equally divided between both ends of the shaft.

9. To remove the bearing outer race from the end plate use extractor tool C.A.V. No. ET.026B. Behind the outer race (27) is a shim plate, Fig. 72, then the oil seal (26) which is a push-fit in its location, and should not be removed unless it is intended to renew, as removal may cause damage.

10. Remove the delivery valve holder locking plates (33), the holders (35) can then be removed by using the serrated box spanner, C.A.V. Tool No. ET.661, and the spring (2), spring peg (1), and delivery valve (3) can be lifted out. The delivery valve seat (4) can be removed by using the extractor C.A.V. Tool No. ET.716.

11. Remove the base sealing plate (39).

12. Remove the tappet locking screw (9). Then hold up the tappet (25) against the plunger spring (23) with forceps C.A.V. Tool No. ET.859 and withdraw the tappet lifters, and allow the tappet to come away slowly under control. The tappet (25), phasing washer (10) and lower spring plate (8), with the plunger (17), can now be withdrawn. The plunger should be steadied to prevent it falling and being damaged, the plunger spring, upper spring plate (22) and quadrant (24) should next be removed. Do not separate quadrant from control sleeve.

13. Withdraw control rod (30) endwise, after removing location plate from the governor end of the pump housing.

14. If the control rod bushes (20) are worn and need renewing the locking collars (21) should be unscrewed, using special key, C.A.V. Tool No. ET.658. The bearing bushes which are a press-fit in the pump housing can be removed with extractor tool, C.A.V. No. ET.668.

15. Remove the barrel locking screw (5). The barrel (18) can then be pushed out from the bottom, using a fibre or copper drift. The plunger should be immediately replaced in the barrel for protection.

16. To dismantle the built-in filter remove the filter cover (36) together with filter packs. The filter pads (15) can now be removed from their support pipe (14) and replaced by new ones. Remove perforated backing plate (16). The fuel gallery closing plugs should not normally be removed, but if it is required to rejoint these plugs (19), the special key, C.A.V. Tool No. ET.003, should be used for removal and replacement.

To Reassemble the Injection Pump

The greatest cleanliness must be exercised in every assembly operation. Each part should be thoroughly washed in clean paraffin and dipped in clean light oil immediately before assembling. No rags or fabric should be used on working parts.

1. If control rod bushes have been removed, replace and lock in position with locking rings. Check for alignment by freedom of control rod. If new bushes are being fitted, they must be line-reamed, using reamer C.A.V. Tool No. ET.563.

2. Insert barrels from above, check that the slot for the locking screw is in line with the screw-hole in the housing. Insert and tighten the locking screws. No sealing washer is necessary on these screws.

3. Slide in control rod from one end of the pump. The end of the rod with two flats should be towards the governor end of the pump.

4. Replace control rod location plate temporarily. Assemble control quadrants on control sleeves. If

FIG. 74. THE PUMP CONTROL QUADRANTS

quadrants have been disturbed on their sleeves, scribed lines must be in register before clamping screws are tightened. Then position quadrant and sleeve assemblies on element barrels; check control rod for freedom of movement after each assembly is fitted. The rod must have perfect freedom of movement over its entire travel. Control quadrants are clamped on control sleeves by clamp screws. When assembled the control rod must be in mid-position with the clamp screws lying parallel with the front of the pump.

5. Insert the upper spring plate and the plunger spring.

6. Insert the plunger with the lower spring plate hooked to its head and the tappet with the phasing washer held in position by a spot of thick grease and hooked to the spring in the lower spring plate.

7. Use the tappet forceps C.A.V. Tool No. ET.859 to push the tappet right up, after locating the plunger toe in the quadrant slot. Now turn the tappet so that its slot is in line with the locking screw hole in the housing and insert tappet locking screw and tighten up. No sealing washer is necessary on this screw.

8. With tappet still pushed home insert tappet lifters.

9. Replace base sealing plate.

10. Insert camshaft, taking care that the notch on the camshaft is fitted at the correct end of the pump housing. Assemble and tighten the end plate ensuring that the end plate gasket is in good condition. Care is necessary to avoid damage to the oil seals when entering the camshaft. C.A.V. Protection Cap. No. ET.684 facilitates this operation. Check camshaft end float; this should be 0.05 mm. to 0.10 mm. (0.002 in. to 0.004 in.). If necessary, adjust by alteration to shims trapped on shaft behind the inner race, equalising shims at each end.

11. After assembling camshaft check to see that it rotates freely after removing tappet lifters. Check clearance between the control rod and its stop plate. This should be .0015 in. (.038 mm.) when the stop plate is tightened.

12. Place the delivery valve and seat on top of element barrel, with a new joint ring above the delivery valve seat flange. Fut the delivery valve spring on the head of the delivery valve, then insert spring peg in the upper end of the spring. A new low-pressure sealing ring, with the steel slip washer above, should be fitted on the shank of the delivery valve holder which can now be screwed into place. Care should be taken that the valve spring and peg are not knocked out of position.

    The delivery valve holder is tightened by using the two-handed serrated box spanner. A torque wrench should be used, and the holder tightened to a torque of 40 lb./ft. (5.3 kg./m.).

    The flat serrated ring spanner ET.655 is intended only for use if it is necessary to remove or tighten the delivery valve holders when the pump is on the engine, in a position where the two-handed box spanner cannot be used.

13. Fit and tighten delivery valve holder locking plates.

14. Fit new filter pads on the support pipes and place these in position in the filter cover. Then after putting in perforated plate and gasket, assemble to pump, making sure that cover gasket is in good condition. Replace bolts and nuts and tighten down evenly.

15. Refit fuel feed pump.

16. Replace the governor (see **To Replace Governor Assembly**).

17. Replace air vent valve and cambox drain connection, if these have been removed. Refill cambox to level of drain connection with engine oil before commencing to run the pump.

To Re-phase the Injection Pump

Adjustment of phase is performed by changing the phase washer between the lower spring plate and tappet. These washers are available in thickness from 0.3 mm to 1.4 mm. in steps of .1 mm.

1. Mount pump on a test machine, which has a suitable angular scale of degrees marked on the driving member. Couple pump to a gravity feed oil supply giving about 2 feet (.6 metre) head of oil.

2. Vent all air from the pump, including the built-in filter, by means of the air vent cock.

3. Shut off oil supply, remove excess fuel device and fix the control rod in mid-position.

4. Remove No. 1 delivery valve holder and delivery valve complete.

5. Check the height of the top face of the plunger, when at top of stroke, using a dial gauge or C.A.V. special tool No. ET.715. The top face of plunger should be .5 mm. below the top face of the element barrel. If necessary change the phase washer to obtain this dimension.

6. To change the phase washer, turn the camshaft to top dead centre.

    Insert tappet lifter and rotate camshaft 180°; then with tommy bar C.A.V. Tool No. ET.712 press in the spring catch through the small hole in the tappet to release the bottom spring plate from the tappet. The washer can now be lifted from the recess in the tappet by use of the special hook tool C.A.V. Tool No. ET.654, and the new washer guided into place with the same tool.

    Having changed the washer, turn the camshaft back slowly towards top dead centre until the top

of the tappet touches the spring catch. Press in the catch and at the same time turn camshaft to full top dead centre when spring catch should click into the hole in the tappet. Remove tappet lifter.

7. Replace the delivery valve seat, joint rings and holder, but leave out the delivery valve, spring and spring peg. Fit spill pipe, Fig. 76, to holder and turn on oil supply.

8. Note from the angular scale, the reading of the point at which the oil flow ceases, that is, the point of spill cut-off.

9. For each element in turn carry out operations (i) and (ii) as follows:

(i) Remove delivery valve spring, and spring peg, fit spill pipe and supply oil. Check angular reading of spill cut-off point. Adjust this point to correct relationship with No. 1 by changing the phasing washer. All elements should be within .5 degree overall error.

(ii) Remove delivery valve holder and seat and check plunger height as in paragraph 5. These readings must all be within .5 mm. plus or minus .15 mm. Replace and tighten delivery valve and holder complete.

10. Fit and tighten the delivery valve holder locking plates.

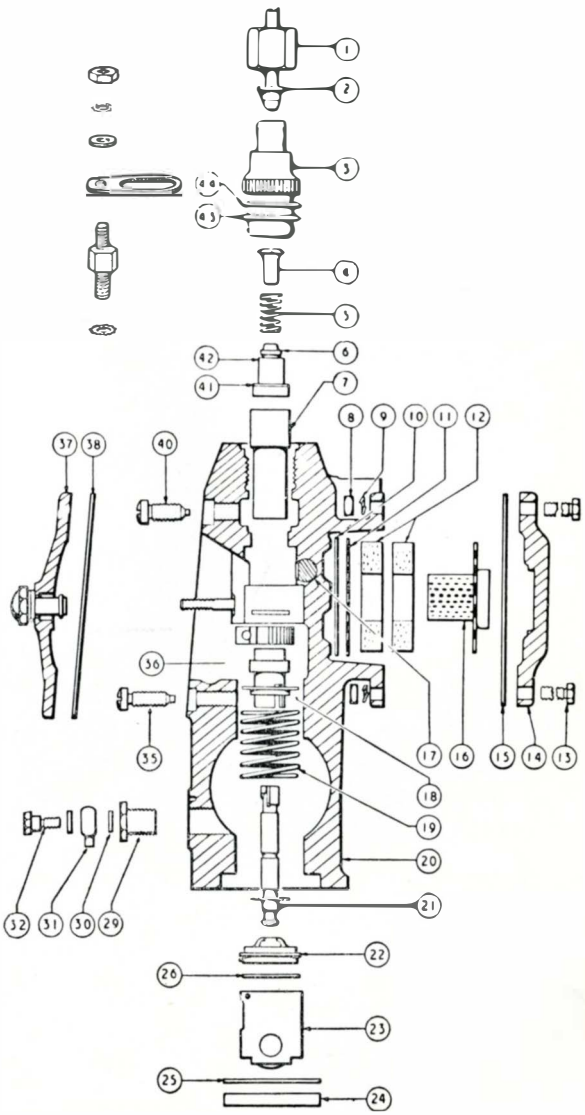


FIG. 75. EXPLODED VIEW OF THE PUMP UNIT

KEY TO FIG. 75

1. Delivery union nut.
2. Delivery union washer.
3. Delivery valve holder.
4. Delivery valve spring guide.
5. Delivery valve spring.
6. Delivery valve.
7. Barrel.
8. Nut.
9. Spring washer.
10. Filter support plate gasket.
11. Filter support plate.
12. Filter felt.
13. Bolt.
14. Filter cover.
15. Gasket.
16. Support tube.
17. Control rod.
18. Control quadrant.
19. Plunger spring.
20. Housing.
21. Plunger.
22. Lower spring plate.
23. Tappet assembly.
24. Base plate.
25. Base plate gasket.
26. Tappet shim.
29. Leak-off adapter.
30. Washer.
31. Banjo connection.
32. Connection stud.
33. Nut.
34. Spring washer.
35. Tappet locking screw.
36. Upper spring plate.
37. Inspection cover.
38. Gasket.
39. Calibrating bar and adjusting screw.
40. Barrel locking screw.
41. Delivery valve washer.
42. Delivery valve seat.
43. Sealing ring.
44. Slip washer.

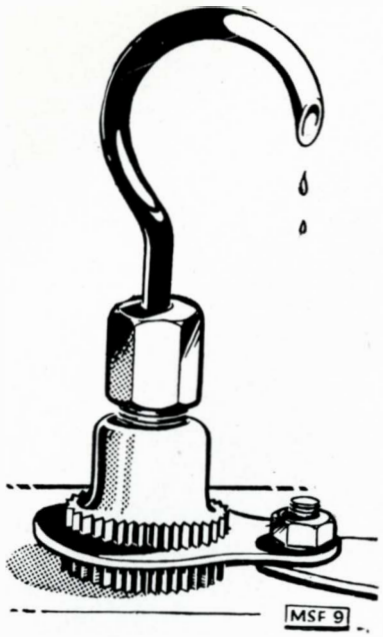


FIG. 76. THE SPILL PIPE

To Recalibrate the Injection Pump

Calibration should be carried out after the phasing operation on a power-driven test rig, using gravity feed and master test injectors.

The plunger toe is located in the axial slot in the skirt of the control sleeve, so that the sleeve and plunger rotate together. Alteration of calibration setting is carried out by slackening the control quadrant clamp screw and moving the control sleeve within the quadrant, thus moving the plunger to the required position.

This adjustment is very accurately carried out at the factory and a line is scribed across both control sleeve and quadrant to indicate the correct setting. Wear on the elements may necessitate a slight alteration to the setting after several hundreds of hours' running, but this deviation should be very slight.

Before testing it is advisable to see that the calibration marks are lined up as this will considerably reduce the amount of adjustment to be made. If, however, the pump has been overhauled and the control sleeves and/or quadrant have been replaced, this guide will not be available, in which case the pump will have to be very carefully readjusted with proper apparatus, and new marking lines scribed.

The calibration figure for the 0680 engine is:
20.2 c.c. per 200 strokes at 600 r.p.m. pump speed.

THE GOVERNOR

The pneumatic governor is secured to the rear of the injection pump and consists of a leather spring-assisted diaphragm, vacuum-operated through a pipe connected to the venturi unit which is fitted over the main air intake. A spring-loaded idling damper holds the diaphragm steady at idling speed.

LUBRICATION

The pneumatic governor should be lubricated weekly or every 1,000 miles (1,600 kilometres) by removing the breather cap and pouring into the diaphragm housing 5 c.c. of Neats Foot Oil or Castor Oil (as recommended by the manufacturers). If these oils are not available a non-detergent good quality mineral oil is a suitable alternative. A detergent oil must not be used.

OPERATION

When the engine is stationary the diaphragm and control rod are held in the full-load position by the diaphragm return spring, Fig. 77.

When the engine is idling, the butterfly valve in the venturi, operated by the accelerator pedal, is almost closed, and a high vacuum is created in the diaphragm block. The diaphragm, drawn by the suction, moves the control rod towards the stop position, but in doing so the control rod end opens the spring-loaded damper valve in the pipe connecting the governor chamber to the atmospheric side of the venturi, thus tending to destroy the vacuum in the chamber and allowing the control rod to return towards the full-load position under pressure of the diaphragm spring. Correct adjustment of the butterfly idling stop and the idling damper creates a balance giving steady idling.

When the accelerator pedal is depressed the butterfly valve is opened and the vacuum in the diaphragm block falls, thereby allowing the diaphragm under the pressure of its return spring to move the control rod towards the full-load position. As the engine speed and thus the air velocity in the venturi increases, so does the vacuum rise until, at a predetermined speed (which is governed by the size of the venturi), the suction is high enough to overcome the forward thrust of the diaphragm return spring, thereby governing the maximum speed of the engine.

1. Delivery union nut.
2. Delivery union washer.
3. Delivery valve holder.
4. Delivery valve spring guide.
5. Delivery valve spring.
6. Delivery valve holder washer.
7. Delivery holder seal.
8. Delivery valve washer.
9. Delivery valve.
10. Element.
11. Control quadrant.
12. Quadrant screw.
13. Control sleeve.
14. Spring upper plate.
15. Plunger spring.
16. Spring lower plate.
17. Spring clip.
18. Tappet shim.
19. Tappet guide.
20. Tappet roller.
21. Tappet roller bush.
22. Tappet roller pin.
23. Filter cover gasket.
24. Filter spigot.
25. Filter cover.
26. Spring washer.
27. Nut.
28. Air vent screw.
29. Air vent screw washer.
30. Filter felts.
31. Filter support plate.
32. Filter cover stud.
33. Filter support plate gasket.
34. Inlet union nut.
35. Inlet union.
36. Inlet connection.
37. Inlet connection washer.
38. Locking plate.
39. Washer.
40. Nut.
41. Washer.
42. Stud.
43. Release valve assembly.
44. Valve.
45. Union nut.
46. Banjo connection.
47. Body.
48. Washer.
49. Locking ring.
50. Stud.
51. Control rod locating plate.
52. Washer.
53. Washer.
54. Nut.
55. Control rod.
56. Control rod bush.
57. Screwed control rod bush.
58. Barrel locking screw.
59. Tappet locking screw.
60. Plug.
61. Inspection cover.
62. Gasket.
63. Nut.
64. Washer.
65. Stud.
66. Camshaft.
67. Key.
68. Shim.
69. Ball race.
70. Shim.
71. Oil seal.
72. Gasket.
73. End plate.
74. Washer.
75. Nut.
76. Stud.
77. Washer.
78. Nut.
79. Housing.
80. Washer.
81. Drain plug.
82. Drain level body.
83. Nipple.
84. Nut.
85. Base plate.
86. Gasket.
87. Screw.
88. Stud.
89. Washer.
90. Nut.
91. Gasket.
92. Housing.
93. Gasket.
94. Stud.
95. Nut.
96. Washer.
97. Plug.
98. Washer.
99. Connection.
100. Washer.
101. Nut.
102. Stop washer.
103. Washer.
104. Stop screw.
105. Plunger.
106. Spring.
107. Support plate.
108. Diaphragm.
109. Cover.
110. Screw.
111. Washer.
112. Cover screw.
113. Washer.
114. Nut.
115. Housing.
116. Gasket.
117. Stud.
118. Washer.
119. Nut.
120. Union adapter.
121. Shim.
122. Tab washer.
123. Spring.
124. Body with valve.
125. Locking nut.
126. Union, venturi pipe.
127. Diaphragm cover.
128. Main spring.
129. Diaphragm.
130. Guide block.
131. Pin.
132. Spring washer.
133. Breather assembly.
134. Bolt.
135. Tube.
136. Cap.
137. Gauze pad.
138. Base plate.
139. Nut.
140. Washer.
141. Pin.
142. Washer.
143. Split pin.
144. Operating spindle.
145. Key.
146. Pawl.
147. Grub screw.
148. Spring.
149. Felt washer.
150. Washer.
151. Spring clip.
152. Screw.
153. Lever.
154. Washer.
155. Nut.
156. Feed pump body.
157. Diaphragm spring.
158. Diaphragm spindle.
159. Diaphragm.
160. Support plate, large.
161. Support plate, small.
162. Spindle nut.
163. Cover bush.
164. Spindle washer.
165. Nut.
166. Stud, long.
167. Stud, short.
168. Spring washer.
169. Nut.
170. Inlet connection.
171. Union nut.
172. Union nipple.
173. Diaphragm cover.
174. Union nipple.
175. Union nut.
176. Air bell.
177. Steel ball.
178. Delivery valve seat.
179. Valve spring.
180. Valve disc.
181. Air bell washer.
182. Operating lever.
183. Lever return spring.
184. Fulcrum screw.
185. Washer.
186. Screw, priming spindle.
187. Spring washer.
188. Plain washer.
189. Priming lever.
190. Screw.
191. Stop plate.
192. Spring, priming lever.
193. Priming spindle.
194. Priming spindle spring.
195.
196.
197.

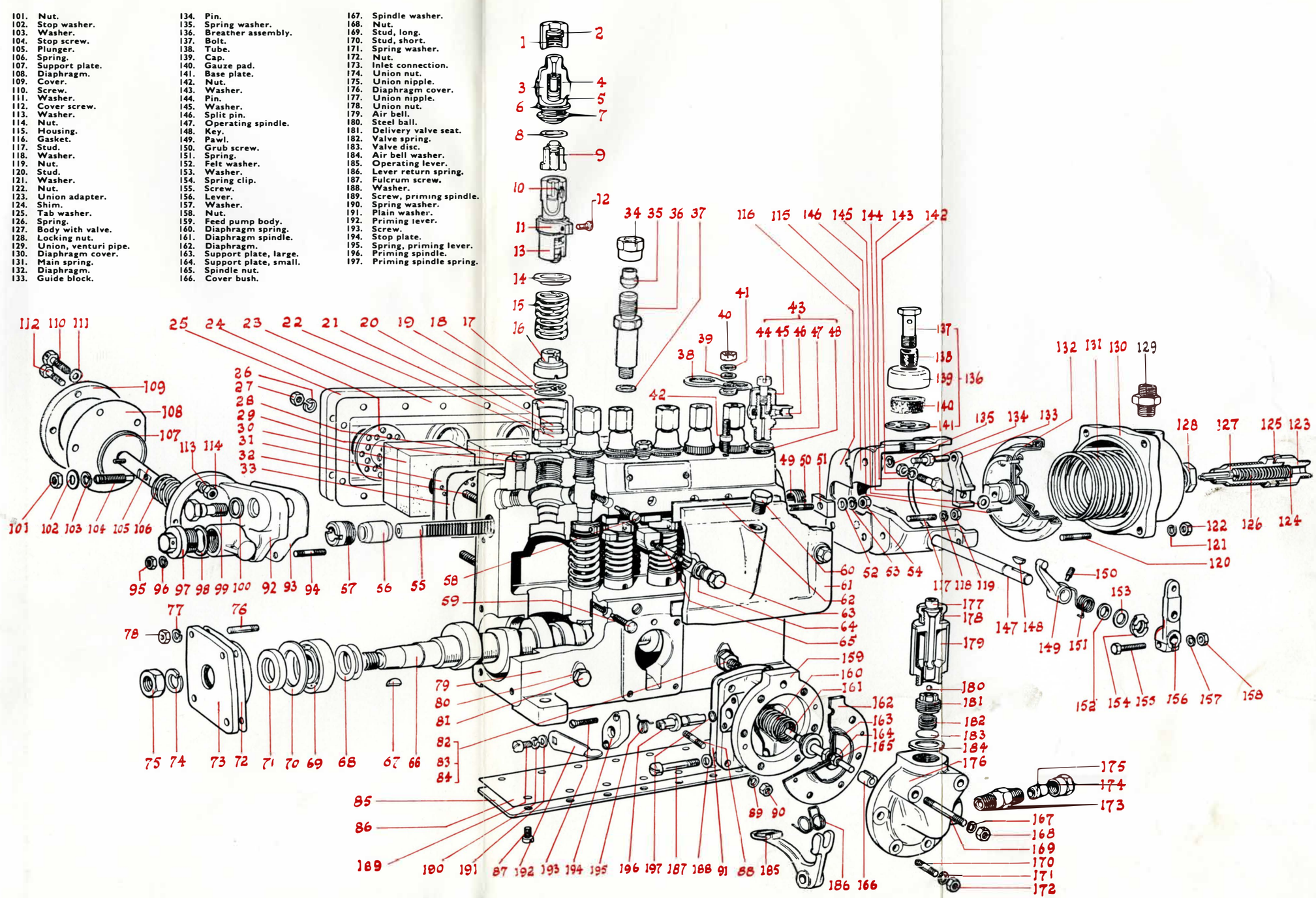


FIG. 77. EXPLODED VIEW OF THE C.A.V. TYPE NL FUEL PUMP, with diaphragm-type excess fuel device

1. Delivery union nut.
2. Delivery union washer.
3. Delivery valve holder.
4. Delivery valve spring guide.
5. Delivery valve spring.
6. Delivery valve holder washer.
7. Delivery holder seal.
8. Delivery valve washer.
9. Delivery valve.
10. Element.
11. Control quadrant.
12. Quadrant screw.
13. Control sleeve.
14. Spring upper plate.
15. Plunger spring.
16. Spring lower plate.
17. Spring clip.
18. Tappet shim.
19. Tappet guide.
20. Tappet roller.
21. Tappet roller bush.
22. Tappet roller pin.
23. Filter cover gasket.
24. Filter spigot.
25. Filter cover.
26. Spring washer.
27. Nut.
28. Air vent screw.
29. Air vent screw washer.
30. Filter felts.
31. Filter support plate.
32. Filter cover stud.
33. Filter support plate gasket.
34. Inlet union nut.
35. Inlet union.
36. Inlet connection.
37. Inlet connection washer.
38. Locking plate.
39. Washer.
40. Nut.
41. Washer.
42. Stud.
43. Release valve assembly.
44. Valve.
45. Union nut.
46. Banjo connection.
47. Body.
48. Washer.
49. Locking ring.
50. Stud.
51. Control rod locating plate.
52. Washer.
53. Washer.
54. Nut.
55. Control rod.
56. Control rod bush.
57. Screwed control rod bush.
58. Barrel locking screw.
59. Tappet locking screw.
60. Plug.
61. Inspection cover.
62. Gasket.
63. Nut.
64. Washer.
65. Stud.
66. Camshaft.
67. Key.
68. Shim.
69. Ball race.
70. Shim.
71. Oil seal.
72. Gasket.
73. End plate.
74. Washer.
75. Nut.
76. Stud.
77. Washer.
78. Nut.
79. Housing.
80. Washer.
81. Drain plug.
82. Drain level body.
83. Nipple.
84. Nut.
85. Base plate.
86. Gasket.
87. Screw.
88. Gasket.
89. Stud.
90. Washer.
91. Nut.
92. Spring washer.
93. Extension control rod.
94. Closing plug.
95. Stud.
96. Adapter.
97. Locking plate.
98. Locknut.
99. Washer.
100. Nut.
101. Body.
102. Screw.
103. Plunger.
104. Spring.
105. Screw.
106. Trip pin.
107. Spring.
108. Operating plate.
109. Retaining cap.
110. Gasket.
111. Housing.
112. Pin.
113. Washer.
114. Pin.
115. Spring washer.
116. Stud.
117. Spring washer.
118. Nut.
119. Stud.
120. Spring washer.
121. Nut.
122. Bolt.
123. Tube.
124. Cap.
125. Gauze pad.
126. Base plate.
127. Breather assembly.
128. Pin.
129. Guide block.
130. Washer.
131. Split pin.
132. Diaphragm.
133. Main spring.
134. Union venturi pipe.
135. Diaphragm cover.
136. Locking nut.
137. Body with valve.
138. Tab washer.
139. Union adapter.
140. Shim.
141. Spring.
142. Operating spindle.
143. Key.
144. Pawl.
145. Spring.
146. Grub screw.
147. Felt washer.
148. Spring clip.
149. Screw.
150. Washer.
151. Lever.
152. Felt washer.
153. Nut.
154. Feed pump body.
155. Diaphragm spring.
156. Diaphragm spindle.
157. Diaphragm.
158. Support plate, large.
159. Support plate, small.
160. Spindle nut.
161. Cover bush.
162. Union nipple.
163. Union nut.
164. Air bell.
165. Steel ball.
166. Delivery valve seat.
167. Valve spring.
168. Valve disc.
169. Air bell washer.
170. Diaphragm cover.
171. Inlet connection.
172. Union nut.
173. Union nipple.
174. Spindle washer.
175. Nut.
176. Stud, long.
177. Stud, short.
178. Spring washer.
179. Nut.
180. Lever return spring.
181. Operating lever.
182. Washer.
183. Fulcrum screw.
184. Priming spindle spring.
185. Priming spindle.
186. Spring, priming lever.
187. Stop plate.
188. Screw.
189. Priming lever.
190. Plain washer.
191. Spring washer.
192. Screw priming spindle.

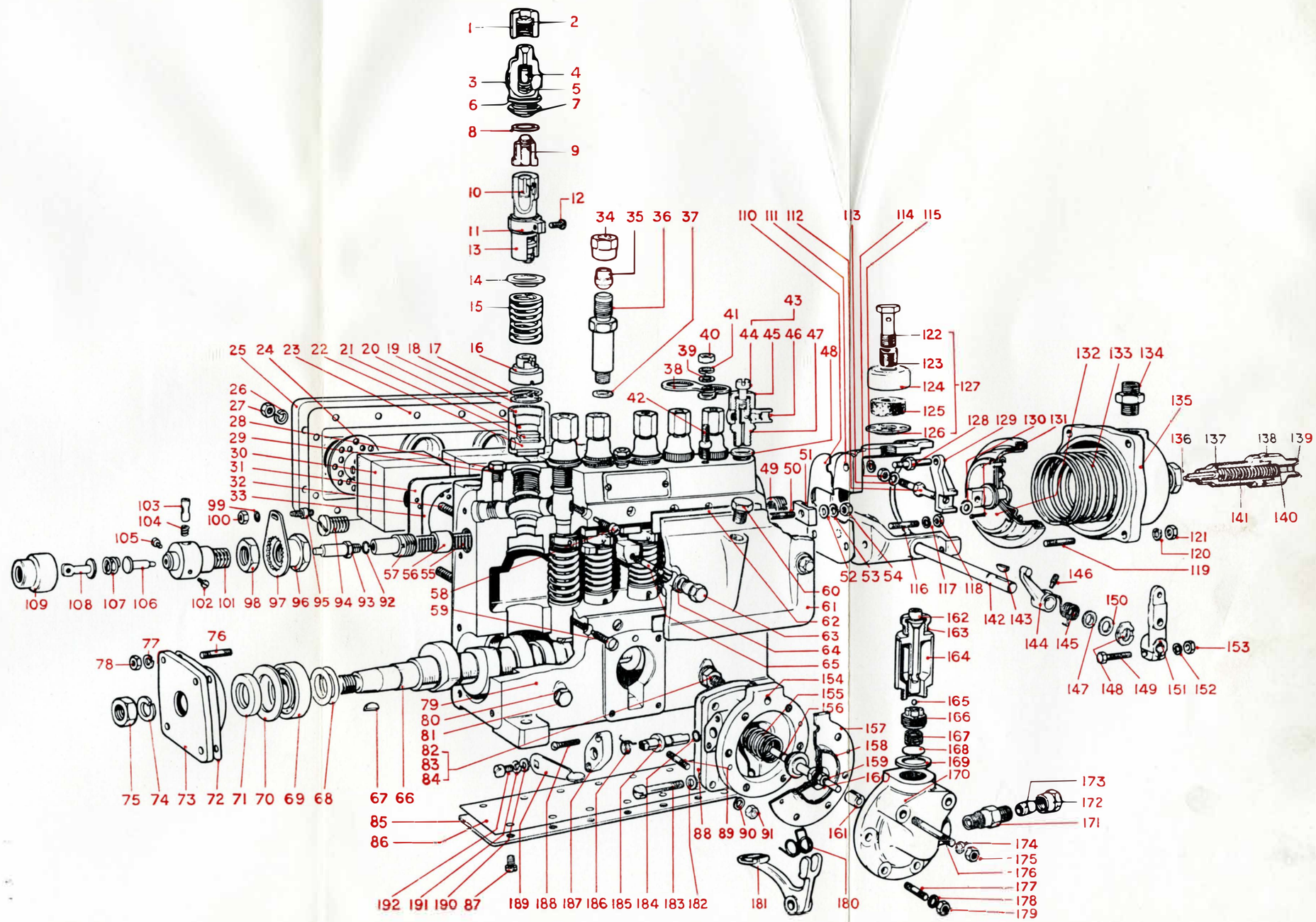


FIG. 78. EXPLODED VIEW OF THE C.A.V. TYPE NL FUEL PUMP, with baulking-type excess fuel device

Stop Control

The engine can be stopped by operating the stop control in the cab.

The stop control is connected to the stop lever, Fig. 77, and when operated pulls the control rod back to the stop position.

Governor Maintenance

No routine maintenance is required on the pneumatic governor except to test the condition of the diaphragm.

To Test Condition of Diaphragm

1. Move the control rod to the stop position by operating the stop lever.

2. Plug the two pipe adapters with the fingers and release the stop lever. The control rod should remain in the stop position. If the control rod returns to the full-load position, check if the leather diaphragm has become porous.

To Set Idling Controls

1. With warm engine running, adjust the idling stop on the venturi so that the engine idles at 300-350 r.p.m.

2. Slacken the pipe union to the idling damper at the rear of the governor housing.

3. Slacken the lock-nut on the idling damper barrel and screw the barrel out until the damper valve is clear of the diaphragm in the governor housing. To eliminate "hunting", screw the damper barrel in again. This adjustment is so extremely critical that a fraction of a turn of the barrel from the correct position will cause "hunting".

4. When the engine is idling to satisfaction, tighten the barrel lock-nut and the idling damper pipe union.

To Remove the Governor

1. Disconnect the pipe from the idling damper.

2. Remove the screws securing the housing cover to the main housing and withdraw cover. Remove the split pin from behind the diaphragm and unhook the diaphragm from the control rod.

On reassembly ensure that the location tab on the diaphragm ring fits into the recess in the top of the governor housing.

THE FUEL FEED PUMP

The feed pump, Fig. 79, is of the variable-stroke-diaphragm type, driven directly by an eccentric on the injection pump camshaft. The pump is of ample capacity to ensure an adequate supply of fuel at all speeds.

OPERATION

As the injection pump camshaft revolves, the eccentric pushes the rocker arm down; this pulls the diaphragm held between metal discs, inward against spring pressure thus creating a vacuum in the pump chamber.

Fuel enters the pump through the suction valve into the pump chamber. On the return stroke the return-spring pressure pushes the diaphragm outward, forcing fuel from the chamber through the pressure valve into the main fuel filter and so to the injection pump.

When the injection pump fuel gallery is full, a pressure is created in the pump chamber. This pressure will hold the diaphragm inward against the return-spring pressure, where it will remain inoperative until the pressure in the injection pump drops.

The hand priming device, which operates the diaphragm by a cam formed on the end of a spindle, is kept out of engagement during normal running by a torsion spring. The small spring on the rocker arm is merely to keep the arm in constnt contact with the eccentric to eliminate noise.

OVERHAUL

If trouble occurs in the fuel supply to the injection pump, the following checks should be made before attempting any repairs to the pump:

1. Make sure the fuel pipes are not blocked.

2. Check that all fuel filters are clean.

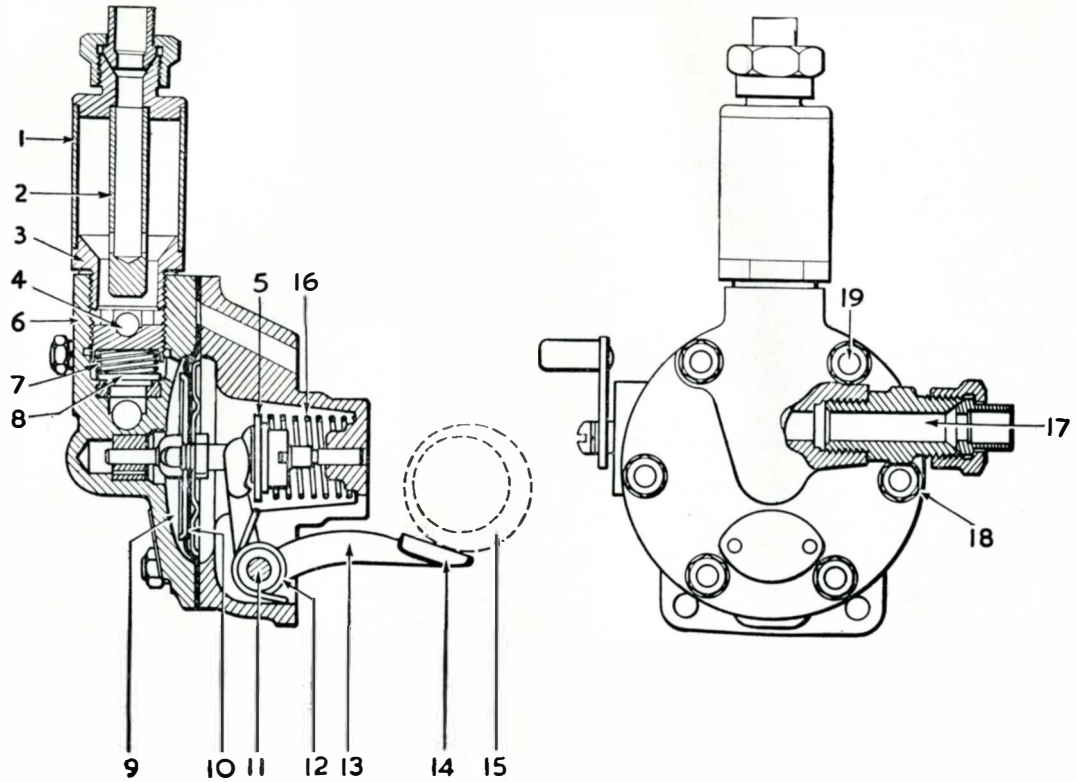


FIG. 79. THE FUEL FEED PUMP

1. Air bell.
2. Stand pipe.
3. Air bell base.
4. Ball valve.
5. Spring plate.
6. Pump casing.
7. Spring for plate valve.
8. Plate valve.
9. Pump chamber.
10. Diaphragm.
11. Rocker arm spindle.
12. Rocker arm return spring.
13. Rocker arm.
14. Contact pad.
15. Injection pump camshaft.
16. Diaphragm spring.
17. Suction passage from fuel supply.
18. Nut.
19. Stud.

3. Examine for leaks on the suction side of the pump.

4. Examine the valves and, if defective, renew.

If the pump still fails to operate satisfactorily, dismantle and check for the following:

1. Broken diaphragm return spring.

2. Diaphragm retaining-nut loose.

3. Punctured or worn-out diaphragm.

4. Leakage at diaphragm flange.

5. Broken rocker arm.

AUTOMATIC EXCESS FUEL DEVICE

(Diaphragm type)

The maximum fuel adjusting screw limiting the control rod travel is kept in the maximum fuel position, while the engine is running, by a spring-loaded diaphragm which is operated by the fuel oil in the fuel gallery, this being under pressure from the fuel feed pump. When the engine is stopped, the diaphragm is relieved of pressure and under the influence of its spring carries the maximum fuel adjusting screw into a position which allows the control rod extra travel and so gives a greater output of fuel for starting.

No operation is necessary on the part of the driver.

BAULKING TYPE EXCESS FUEL DEVICE

The baulking type excess fuel device is attached to the drive end of the fuel injection pump, Fig. 78, and is operated manually. The sequence of operations is shown in Fig. 80.

When the engine is at rest, the control rod is pushed back to the maximum fuel position through the action of the governor diaphragm spring shown at (A). Further movement is prevented by the end of the control rod contacting a cross-wise spring-loaded sleeve.

By operating the lever as shown at (B) the trip pin is pushed into contact with the control rod. During the forward motion of the trip pin the spring-loaded sleeve is depressed, thus allowing access for the control rod.

To obtain excess fuel position for the control rod the trip pin is pushed back by the control rod under the influence of the governor diaphragm spring shown at (C). The smaller diameter end of the control rod then enters the bore in the cross-wise sleeve thus taking up the excess fuel position for starting.

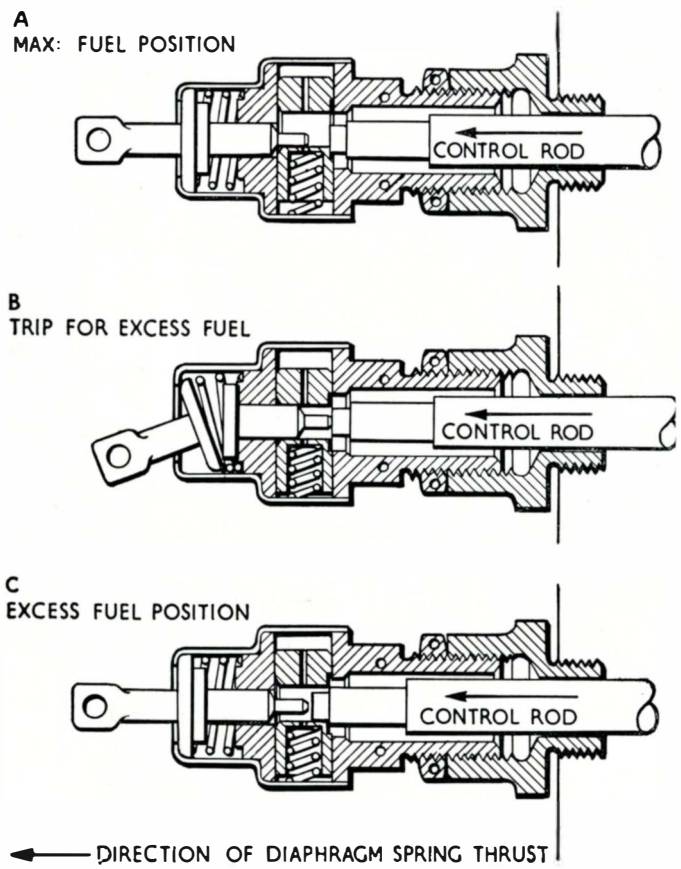


FIG. 80. OPERATION OF THE BAULKING TYPE EXCESS FUEL DEVICE

THE FUEL SYSTEM

DESCRIPTION

The fuel tank consists of a single tank of cylindrical construction, bracketed to the frame. The fuel is drawn from the tank by a diaphragm-type feed pump, secured to the side of, and driven by the injection pump. There are three filters through which the fuel must pass before entering the injection pump, one in the fuel tank, an on-off tap and filter in the fuel pipe line, and a main sack and pack type filter between the feed pump and the injection pump. The injection pump delivers fuel under high pressure through a separate pipe line to each injector, each pipe line consists of two pipes joined at the support bracket on the engine block.

OVERHAUL

If trouble occurs in the fuel supply to the injection pump, the following checks should be made before attempting any repairs to the pump:

1. Make sure the fuel pipes are not blocked.
2. Check that the main filter is clean.
3. Examine for leaks on the suction side of the pump.
4. Examine the valves and, if defective, renew.

If the pump still fails to operate satisfactorily, dismantle and check for the following:

1. Broken diaphragm return spring.
2. Diaphragm retaining-nut loose.
3. Punctured or worn-out diaphragm.
4. Leakage at diaphragm flange.
5. Broken rocker arm.

MAIN FUEL FILTER

DESCRIPTION

The fuel filter unit consists of a die-cast body and cap housing a double filtering element and fitted with a gravity air-vent-valve, see Fig. 81. The filtering element, known as the "Pack-and-Sack" type, is made up of fifteen square felt pads, assembled thick and thin alternately (18) and (19), on a perforated support tube.

The outer element (16) is a finely woven cloth, pleated to a cylindrical form over a support spring (17) and secured by cotton twist (21) at the bottom of the metal former. A handle fitted at the top of the filtering element facilitates the removal of the element for maintenance purposes. The gravity vent-valve fitted to the side of the filter body acts as a constant air bleed, allowing aerated fuel to be expelled automatically from the filter chamber and thereby preventing the possibility of air locks forming in the fuel system. No maintenance is required on the vent valve.

Fuel entering the filter chamber through pipe connection (29) passes through the cloth outer filter and then through the felt pack to the centre tube where it enters the drilled passage in the centre bolt (20) and is fed to the injection pump through a pipe connected to outlet adapter (25).

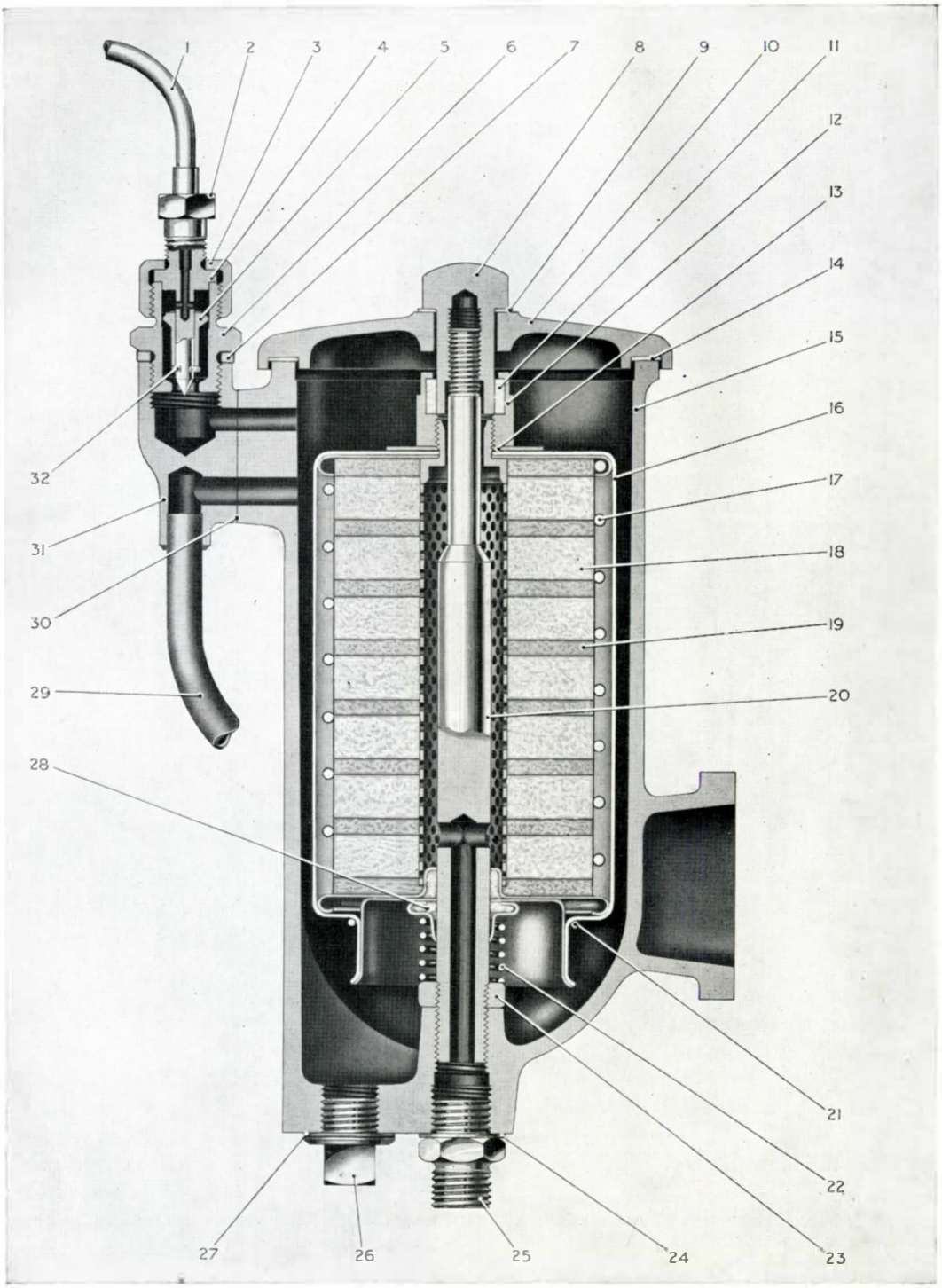


FIG. 81. SECTION THROUGH PACK-AND-SACK TYPE MAIN FUEL FILTER FITTED WITH A GRAVITY AIR-VENT-VALVE

1. Bleeder pipe.
2. Union nut.
3. Vent valve retaining nut.
4. Valve pillar.
5. Valve.
6. Adapter.
7. Washer for adapter.
8. Filter cover unit.
9. Washer for cover nut.
10. Cover for filter casing.
11. Seal.
12. Nut.
13. Washer.
14. Joint for filter cover.
15. Filter casing.
16. Cloth filter.
17. Spring.
18. Filter element (thick).
19. Filter element (thin).
20. Centre bolt and outlet gallery.
21. Cotton twine for securing cloth filter.
22. Support spring.
23. Locknut for centre bolt.
24. Washer for outlet adapter.
25. Outlet pipe adapter.
26. Drain plug.
27. Washer for drain plug.
28. Bush.
29. Fuel inlet pipe.
30. Joint.
31. Pipe connection and vent-valve carrier.
32. Split pin.

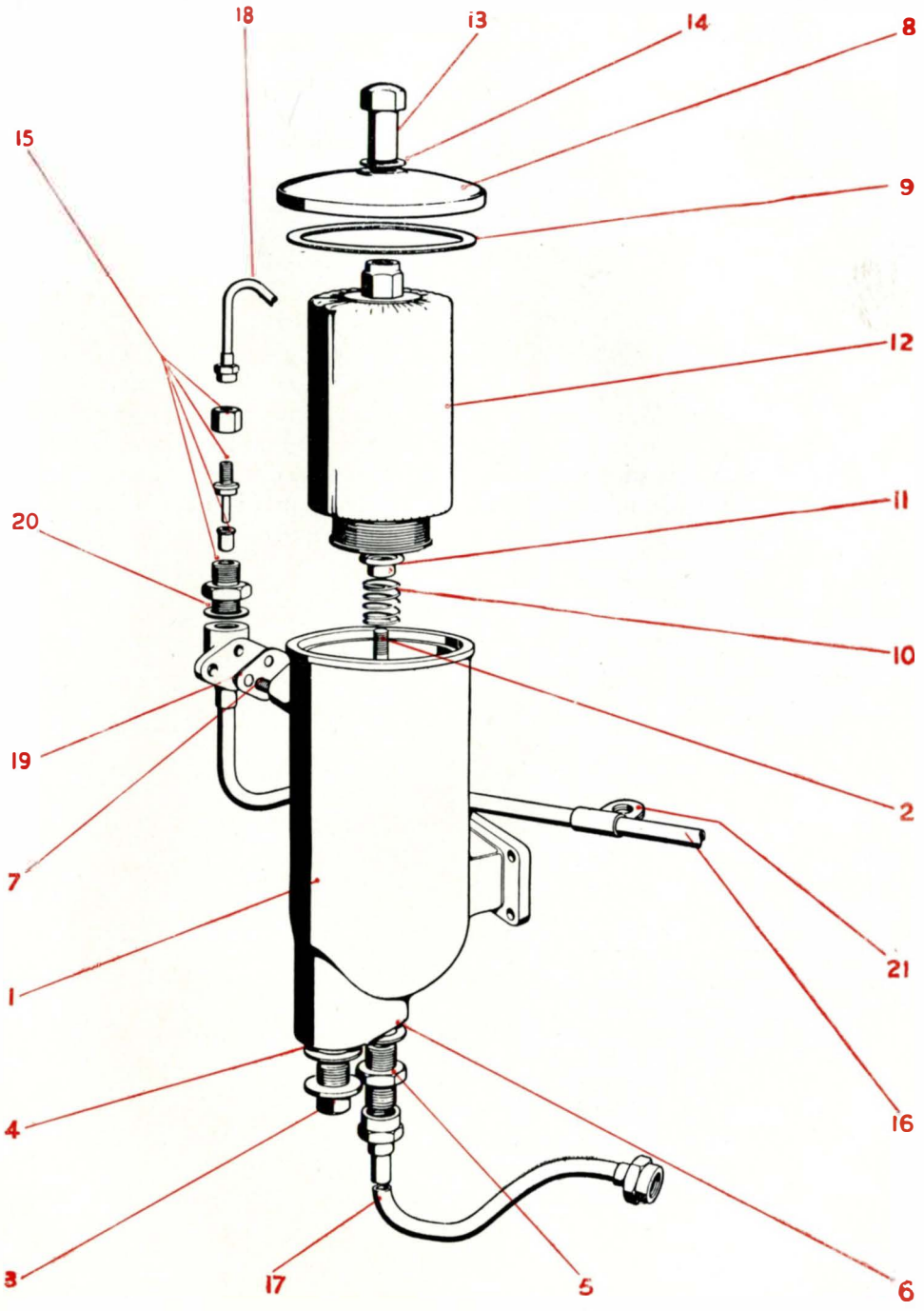


FIG. 82. EXPLODED VIEW OF THE FUEL FILTER

1. Casing
2. Stud.
3. Plug.
4. Washer.
5. Union.
6. Washer.
7. Stud.
8. Cover.
9. Joint.
10. Spring.
11. Seal ring.
12. Filter element.
13. Nut.
14. Washer.
15. Gravity vent-valve.
16. Pipe, feed pump to filter.
17. Pipe, filter to fuel pump.
18. Bleeder pipe.
19. Joint.
20. Washer.
21. Clip.

DISMANTLING THE FILTER ELEMENT

After removing the filter element from the housing, remove nut (12), and washer (13), then untie the twine securing the filter cloth to the metal former and strip off the cloth.

To remove the felt pads, lift off the top plate and support spring (17), the pads can then be taken off the perforated support tube.

Reassembly is a reversal of the above, but the following should be noted:

When rebuilding the felt pack start with a thin felt, then a thick and thin felt alternately, using a total of seven thick and eight thin.

To Renew Cloth and Felt

The cloth filter should be examined at regular intervals, approximately monthly or 5,000 miles (8,000 kilometres) dependent upon operating conditions for punctures or excess dirt and renewed if necessary. The filter cloth supplied by Leyland and C.A.V. service depots for this purpose is a special weave found by test to possess the maximum filtration qualities.

Providing the cloth is changed regularly the felt element should only require renewal when the engine is down for major overhaul. It is advisable when changing the filter cloth to clean the felt element. This is best done by applying compressed air to the support pipe, after suitably sealing the ends, so that the air passes from the inside to the outside of the pads. This should be done immersed in clean petrol or paraffin. It is not sufficient merely to rinse the felt pack or brush it in fuel oil, as this may cause dirt removed to settle on the inside and subsequently pass into the injection system when the filter is replaced on the engine.

THE AIR COMPRESSOR

CLAYTON DEWANDRE

DESCRIPTION

The compressor consists of a monobloc block-and-crankcase with detachable head and sump. The valves are discs held in cavities in the cylinder heads and are spring loaded.

Separate inlet and delivery valves are provided for each cylinder. The delivery valves are removable through plugs in the head for inspection and carbon removal. The inlet valves cannot be inspected without head removal.

The compressor is flange-mounted to the timing backplate of the engine and driven by a gear meshing with the timing idler gear. The fuel injection pump is driven in tandem with and from the back of the compressor. The speed of the drive is always half engine r.p.m.

LUBRICATION

Lubrication is provided by a pressure-feed from the main engine lubrication system. The oil is fed through the oil-feed gland to oilways in the crankshaft and then to the big-end bearings. The gudgeon pins, piston and crankshaft journal bearings are lubricated by splash. Surplus oil returns through the spill-port in the mounting-end cover to the engine timing case.

No daily inspection necessary. Drain completely when engine oil is changed every 5,000 miles (8,000 kilometres).

MAINTENANCE

The delivery valves and springs should be removed every 10,000 miles (16,000 kilometres) and any carbon deposit removed. If the valves become ridged or distorted they should be replaced.

Inspect the whole air-pressure system periodically for leaks in pipes, valves and cylinders. Leaks result in the compressor overheating.

The air inlet filter should be periodically dismantled, washed in petrol and dried.

The frequency of cleaning is solely dependent on the operating conditions. A sound rule is to clean the compressor filter at the same time as the main engine air filter.

OVERHAUL

To Remove and Replace the Compressor

1. Disconnect all injection pump pipe connections.
2. Disconnect all pipe connections to the compressor.
3. Remove the two setscrews securing the flexible coupling to the injection pump flywheel. Remove the injection pump.
4. Remove the setscrews securing the compressor to the timing backplate. Withdraw the compressor.

To replace the compressor, reverse the above procedure.

Warning : The coupling between compressor and injection pump must be assembled with at least $\frac{1}{32}$ in. float in an axial direction. Failure to obtain this condition will cause excessive ball-bearing and journal wear in the compressor and injection pump. When finally replaced, check the injection pump timing. See **To Replace the Injection Pump** and **The Fuel Injection Pump and Governor,** for injection pump timing.

To Dismantle the Compressor

1. Drain off the sump oil.
2. Remove the cylinder head complete.
3. Remove the oil sump.
4. Remove connecting rod caps (mark the rods and caps before removal).
5. Remove oil gland cap from crankshaft centre journal.
6. Remove baffle plates and withdraw pistons and connecting rods through top of the cylinder bore.
7. Remove setscrews from the mounting end cover and withdraw the cover and crankshaft complete.

To Reassemble the Compressor

1. Insert connecting rods and pistons through top of cylinder bore.
2. Fit baffle plates and wire up the bolts.
3. Fit the crankshaft and end covers. Take care not to damage the oil seals.
4. Fit connecting rod caps and fit oil gland cap to central journal of crankshaft.
5. Fit the seal housing to compressor crankcase side, taking care not to damage the oil seal when locating the oil-feed gland from the centre journal of the crankshaft, Fig. 83.
6. Refit the cylinder head, using new gasket.

To Dismantle the Cylinder Head

Remove

1. Inlet manifold.
2. Valve caps and springs.
3. Delivery valve sleeve (special tool required).
4. Delivery valve, spring and seat. (For seat removal a special tool is required.)
5. Inlet valve, spring keeper and spring.
6. To remove inlet valve seat, insert a piece of brass bar $\frac{7}{8}$ in. dia. × .4 in. (22.225 mm. × 10.160 mm.) long on to the valve seat, replace the valve cap and screw down until the seat falls away.
7. During a general overhaul it is advisable to fit new delivery valve discs and springs.
8. Reassembly of the cylinder head is a reversal of the above procedure.
9. Fit a new gasket when re-fitting the cylinder head.

Inspection of Individual Parts

1. Delivery valves should be renewed if they have become ridged or distorted. It is advisable to renew the springs as well.
2. The delivery valves can be removed and relapped if necessary.
3. Check crankshaft ball and roller bearings, and oil seals.
4. Inspect connecting rod bearings. It should not be possible to insert a feeler thicker than .003 in. (.0762 mm.) between crankpin and journal shoulder

or .003 in. (.0762 mm.) between oil pump gland and centre journal shoulder.

5. In the event of a connecting rod bearing having to be re-metalled, it is important to maintain the correct rod lengths at 3.652 in. to 3.648 in. (92.7608 mm. to 92.6592 mm.) centres.

6. Check cylinder bore for wear. The initial dimensions are within the limits 2.125 in. to 2.1255 in. (53.9750 mm. to 53.9877 mm.) dia. Wear is permissible up to .005 in. (.1270 mm.) but new piston rings should be fitted at this stage. If greater wear has occurred, rebore, fit liners and bore out to the initial dimensions and fit new piston assemblies.

7. When fitting new liners to cylinders for the first time, bore the cylinder to the dimensions 2.250 in. to 2.2505 in. (57.1500 mm. to 57.1627 mm.) dia., press in new liners and finally bore in position to the initial dimensions 2.125 in. to 2.1255 in. (53.9750 mm. to 53.9877 mm.) dia.

8. Standard clearances for cast-iron pistons are .001 in. to .0025 in. (.0254 mm. to .0635 mm.).

9. Piston and scraper ring gaps should be between .003 in. to .006 in. (.0762 mm. to .1524 mm.) for butt-jointed rings and .002 to .004 in. (.0508 mm. to .1016 mm.) for scarf-jointed rings. Both types can be used.

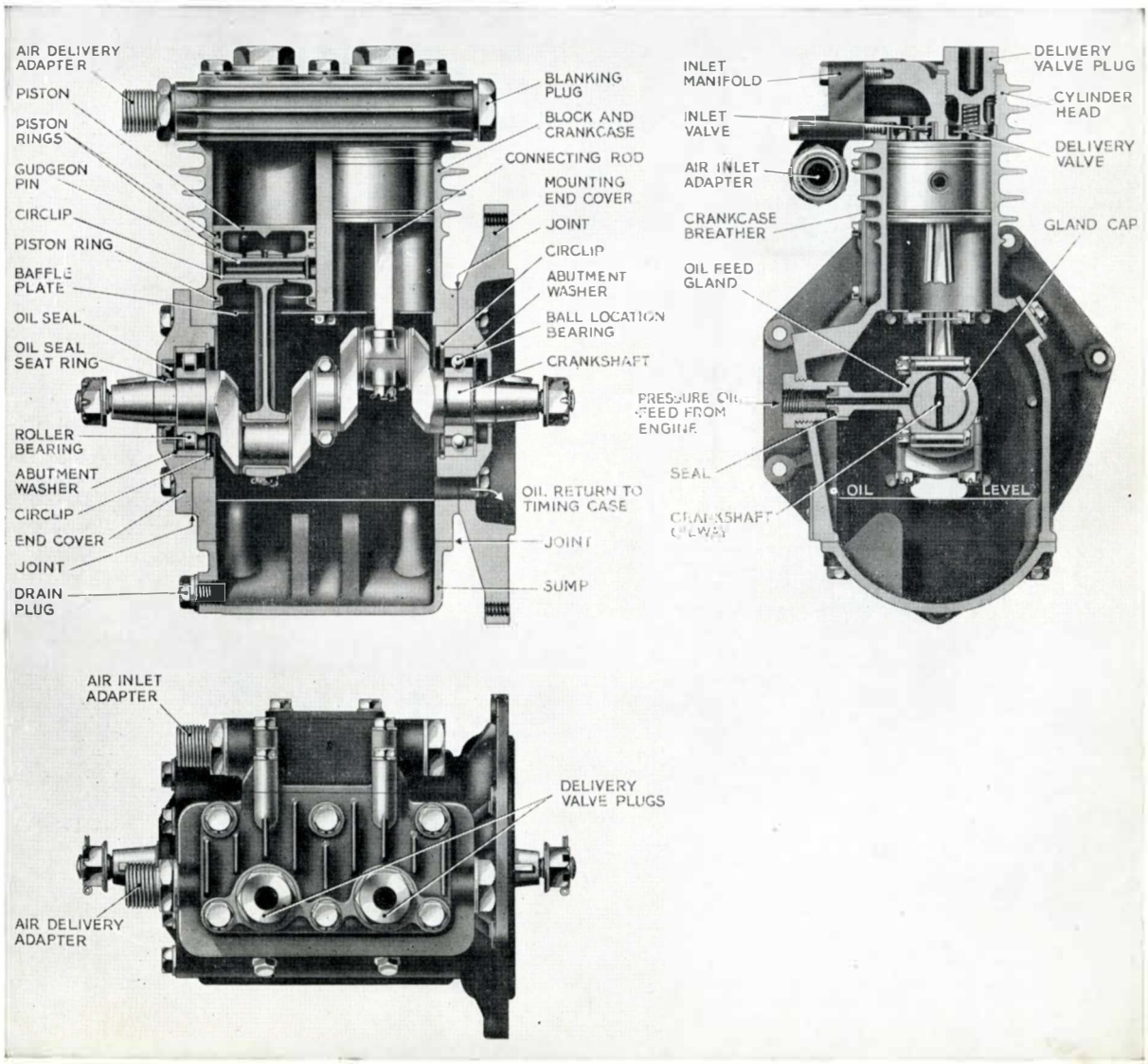


FIG. 83. SECTION THROUGH THE COMPRESSOR

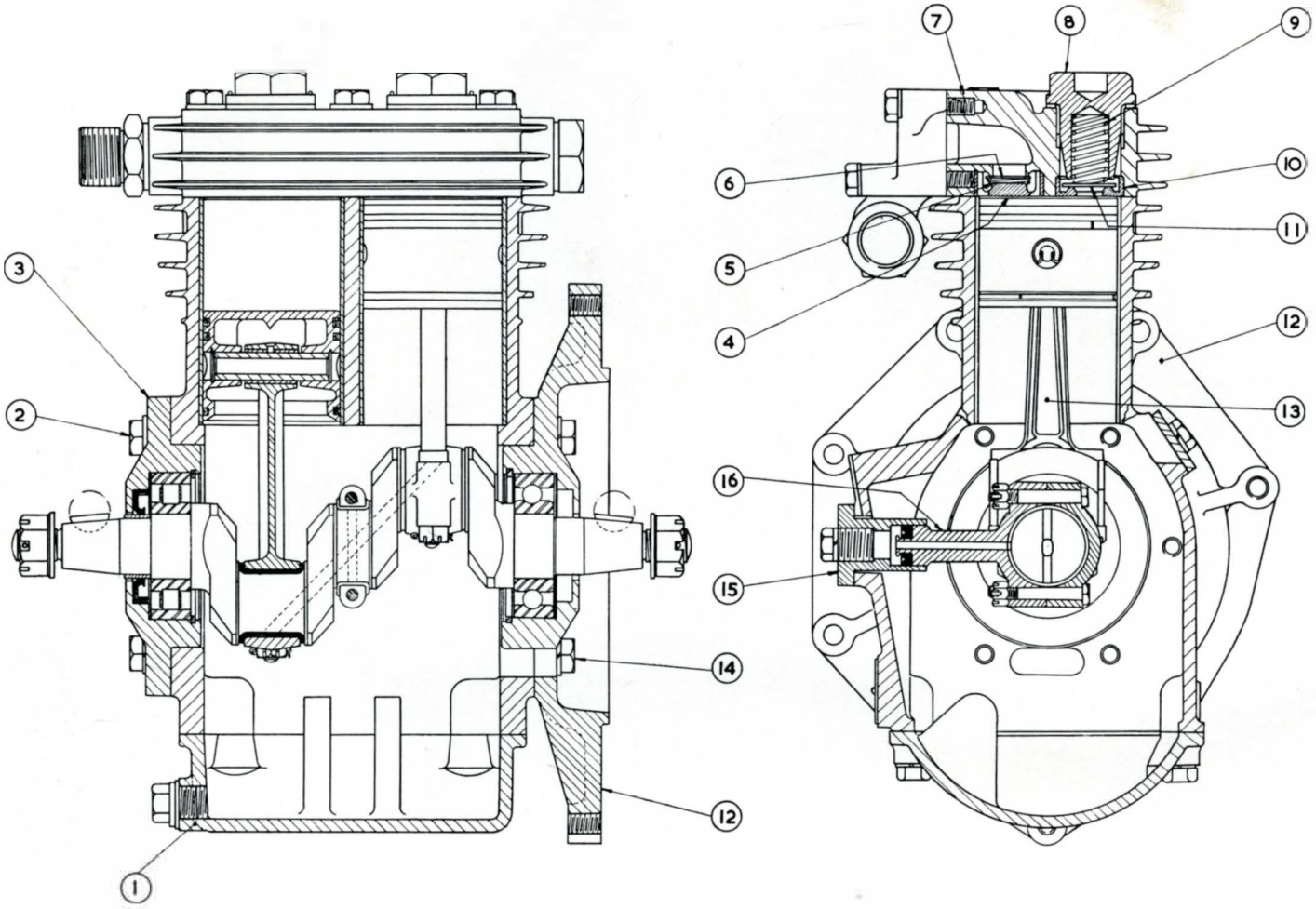


FIG. 84. SECTION THROUGH THE COMPRESSOR

1. Base cover.
2. Setscrew.
3. Rear end cover.
4. Valve keep.
5. Inlet valve spring.
6. Inlet valve.
7. Cylinder head.
8. Delivery valve cap.
9. Delivery valve spring.
10. Delivery valve seat.
11. Delivery valve.
12. Drive housing.
13. Connecting rod.
14. Setscrew.
15. Oil inlet supply flange.
16. Lubricator strap.

THE AIR COMPRESSOR

WESTINGHOUSE

DESCRIPTION

The compressor is a two cylinder, single stage, air cooled machine of 2.25 in. (57.15 mm.) bore and 1.50 in. (38.10 mm.) stroke, having a piston displacement of 7 cu. ft. (0.198 cu. m.) per minute when running at 1,000 r.p.m. The cylinder block and crankcase are formed from a single casting, the cylinders and detachable cylinder head being provided with ample cooling fins. No sump is provided as the crankcase is flange mounted on the engine crankcase with a large port incorporated in the flange for drainage of oil back into the engine sump.

The detachable cylinder head incorporates two each suction and delivery valves, one pair being provided for each cylinder. These valves are of the plate disc type held in their respective seats by a single coil spring. Each valve and spring may be easily inspected by unscrewing the respective caps (44) or (48). Removal and replacement of the valve discs or springs can thus be effected easily and quickly without breaking the cylinder head gasket or any pipe joints.

Each piston is provided with two internally stepped compression rings (4) and one scraper ring (5) above the fully floating hardened steel gudgeon pin (7) which is retained in the piston by two circlips (6). Bronze small end bushes (18) are fitted in the connecting rods (14) which are "H" section steel stampings with white metal lined half shell big end bearings (19).

The crankshaft (20) is of heat-treated steel and is carried at the drive end in a ball race and at the other end in a plain white metal lined bush, through which the oil enters under pressure via a pipe from the engine lubricating system. The oil passes through holes drilled in the crankcase to the big end bearings.

The pistons and gudgeon pins are splash-lubricated and surplus oil drains back through the mounting flange of the compressor into the engine timing case.

LUBRICATION

No daily inspection necessary. Drain completely when engine oil is changed every 5,000 miles (8,000 kilometres).

MAINTENANCE

The only maintenance required is at vehicle overhaul periods.

Every 10,000 miles (16,000 kilometres) or every twelve months, whichever occurs first, or if at any time the compressor is slow in building up pressure in the reservoir or fails to do so, and provided there is no leakage in other parts of the system, the valves should be removed and examined.

To remove the valves, unscrew the caps (44) and (48), lift out the springs (45) and (47), and valve discs (46). If the valve springs are in a bad condition, they must be renewed, and similarly the valve discs. The valve discs can be re-faced by rubbing on a flat surface lightly coated with fine grinding paste diluted with oil; all traces of paste must be removed before reassembly. At vehicle overhaul periods it may be necessary to renew the valve discs.

The delivery valve seat in the head may be re-faced with a cutter (details provided on request). If it is found impossible to re-cut the seat due to wear, a replacement head should be fitted, and the original head may be returned to Westinghouse for sleeving. The suction valve seat formed on the valve cap may be re-faced in a lathe, care being taken to obtain a smooth flat surface for the valve seat. If this seat is badly damaged it is advisable to replace with a new cap, as excessive clearance will give rise to loss in efficiency.

OVERHAUL

To Remove and Replace the Compressor

1. Disconnect all injection pump pipe connections.
2. Disconnect all pipe connections to the compressor.
3. Remove the two setscrews securing the flexible coupling to the injection pump flywheel. Remove the injection pump.
4. Remove the setscrews securing the compressor to the timing backplate. Withdraw the compressor.

To replace the compressor, reverse the above procedure.

Warning: The coupling between compressor and injection pump must be assembled with at least $\frac{1}{32}$ in. float in an axial direction. Failure to obtain this condition will cause excessive ball-bearing and journal wear in the compressor and injection pump. When finally replaced, check the injection pump timing. See **To Replace the Injection Pump** under **The Fuel Injection Pump and Governor** for injection pump timing.

To Dismantle the Compressor

1. Remove the cylinder head (42).
2. Remove the base flange (24).
3. Dismantle both connecting rod caps, care being taken to ensure that the caps are replaced as marked during manufacture; withdraw the pistons and connecting rods through the top of the cylinder bores.
4. Remove nuts holding the bearing cover in position and drive out the crankshaft from the other end

All parts can now be dismantled and examined.

Examination of Parts

During overhaul it is advisable to pay particular attention to the following:

Cylinder Head

Remove all carbon deposit and fit new valve discs and springs.

Piston

Check piston play, and if in excess of .010 in. (.254 mm.) the piston (3) should be renewed. Check ring gap and side play and renew the rings if the gap is greater than .010 in. (.254 mm.); minimum gap .003 in. (.0762 mm.) with .001 in. to .002 in. (.0254 mm. to .0508 mm.) side play. These limits apply to both compression and scraper rings (4) and (5) respectively.

When replacing the compression rings, check that the internal step is at the top.

If any gudgeon pin play is felt, renew the piston, gudgeon pin or bush, whichever may be worn.

Should new small end bushes be required these are supplied less oil hole, and slightly under size on the inside diameter. Ensure that the oil groove is in line with the hole in the connecting rod. After pressing the bush into the connecting rod, drill out the oil hole to .125 in. (3.175 mm.) diameter. Ream the bush to .6255 in./.6260 in. (15.887 mm./15.90 mm.) parallel to the big end bearing.

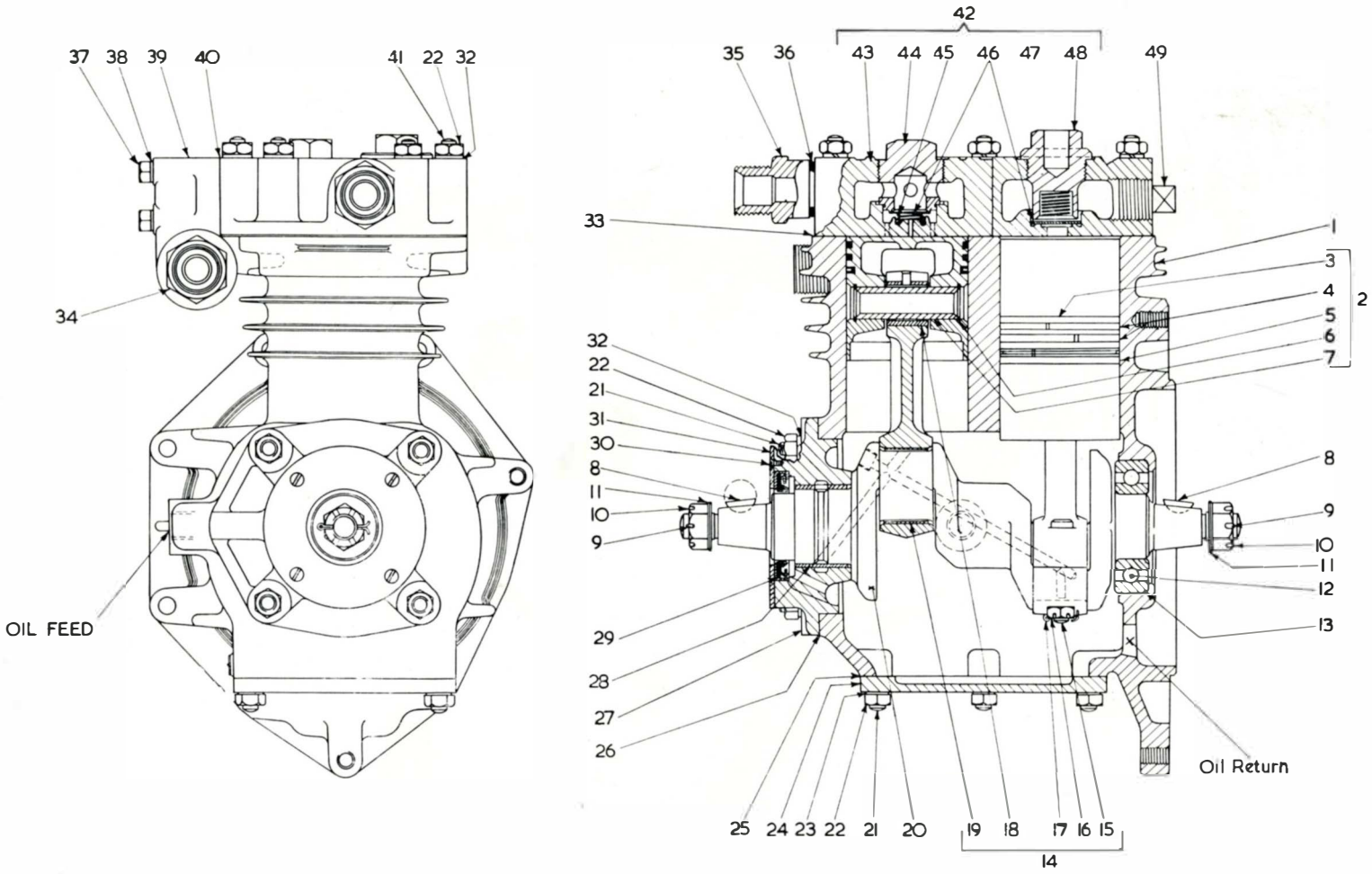


FIG. 85. SECTION THROUGH THE COMPRESSOR

1. Cylinder and crankcase.
2. Piston complete.
3. Piston.
4. Compression ring.
5. Scraper ring.
6. Circlip.
7. Gudgeon pin.
8. Woodruff key.
9. Split pin.
10. Slotted nut.
11. Washer.
12. Ball-race.
13. Shims.
14. Connecting rod, complete.
15. Big-end bolt.
16. Slotted nut.
17. Split pin.
18. Small end bush.
19. Big-end bearing.
20. Crankshaft.
21. Stud.
22. Nut.
23. Washer.
24. Base flange.
25. Gasket.
26. Gasket.
27. Bearing cover.
28. Bearing bush.
29. Oil seal.
30. Screw.
31. Oil seal retaining plate.
32. Washer.
33. Cylinder head gasket.
34. Adapter.
35. Adapter.
36. Washer.
37. Bolt.
38. Washer.
39. Suction manifold.
40. Gasket.
41. Stud.
42. Cylinder head, complete.
43. Cylinder head.
44. Suction valve cap and seat.
45. Suction valve spring.
46. Valve disc.
47. Delivery valve spring.
48. Delivery valve cap.
49. Plug.

CHAPTER 4F

CLUTCH

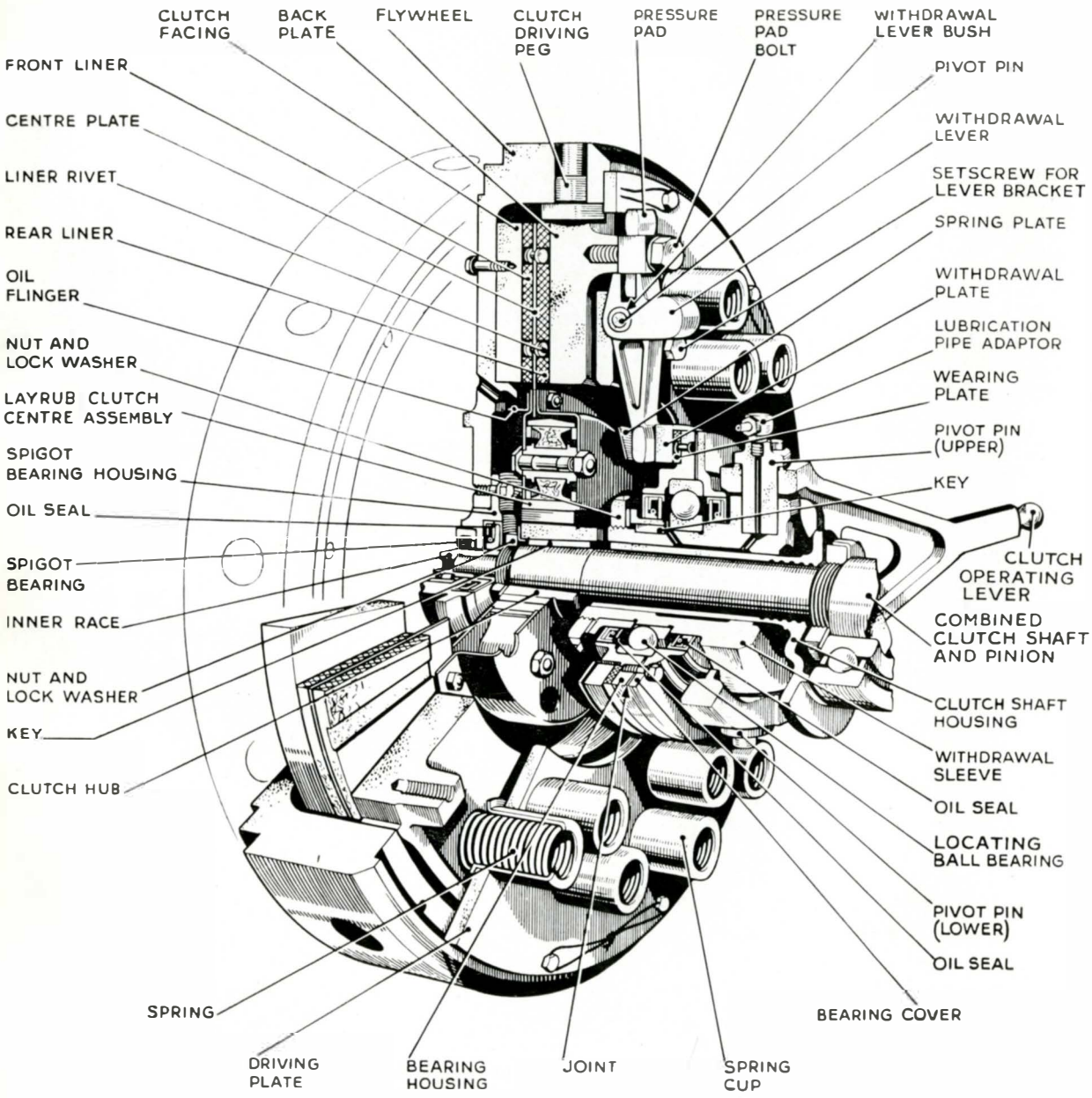


FIG. 1. CUT-AWAY VIEW OF THE CLUTCH ON THE PASSENGER VEHICLE

CLUTCH

DATA

Type	Leyland, single dry plate.

Liners

Outside diameter	16.25 in.
Thickness	Engine side: $\frac{1}{4}$ in. Gearbox side: $\frac{3}{8}$ in.
Material	Ferodo M.R. or Small and Parkes B.S.5.
Rivets	40 tubular brass rivets, $\frac{3}{16}$ in. dia. × .41 in. long.

Springs

Number	18.
Free length	5.25 in. ± .10 in.
Length when loaded with 106 ± 3 lb. ...	2.6 in.
Reject individual springs	If overall length is 2.60 in. or less under a load of 98 lb.
Withdrawal bearing	Ball location—120 mm. o/d × 65 mm. i/d × 23 mm. wide.
Withdrawal bearing seals	" Superfect " No. 4003.
Withdrawal lever pivot bearings	Early chassis: Hoffmann needle-rollers (48 rollers, 3 mm. dia. × 19.8 mm. long). Later chassis: Floating steel bush.

Clutch Centre and Hub

Gear tooth particulars	16 teeth, 6/8 D.P., 20° pressure angle.
Backlash between centre and hub	.003 in. to .006 in.

Withdrawal Wearing Plate

Thickness	.2 in.
Material	Small and Parkes L.G.3.
Rivets	8 tubular brass rivets, $\frac{5}{32}$ in. dia. × $\frac{1}{2}$ in. long.

Spigot Bearing

Bearing	Hoffmann—R.M.8. (less inner race and to suit an inner track of 1.0622 in. to 1.0617 in. dia.).
Oil Seal	" Superfect " No. 21912 (" Supertan " type).

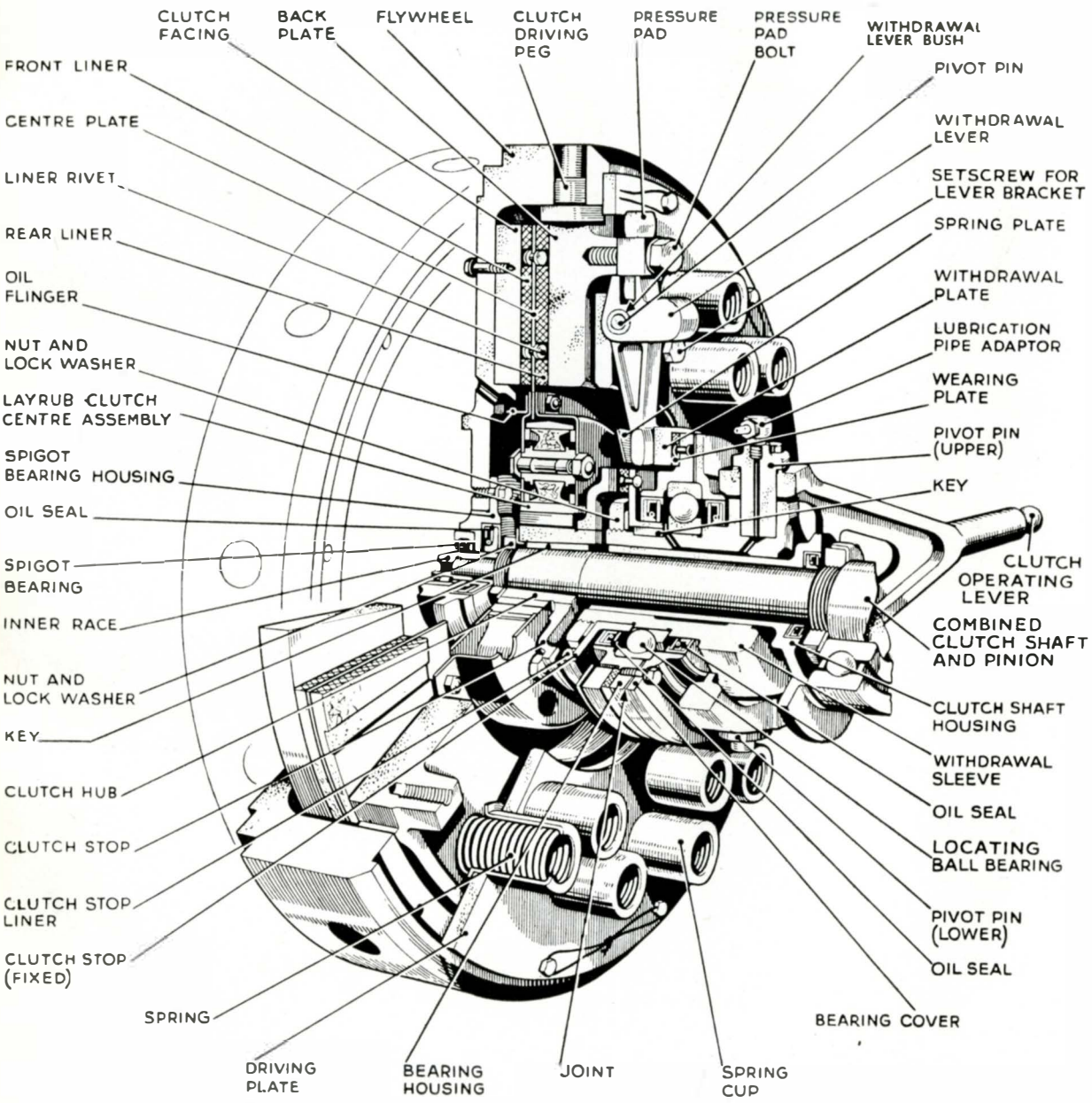


FIG. 2. THE CLUTCH ON THE HEAVY GOODS VEHICLE

(Fitted with a clutch stop)

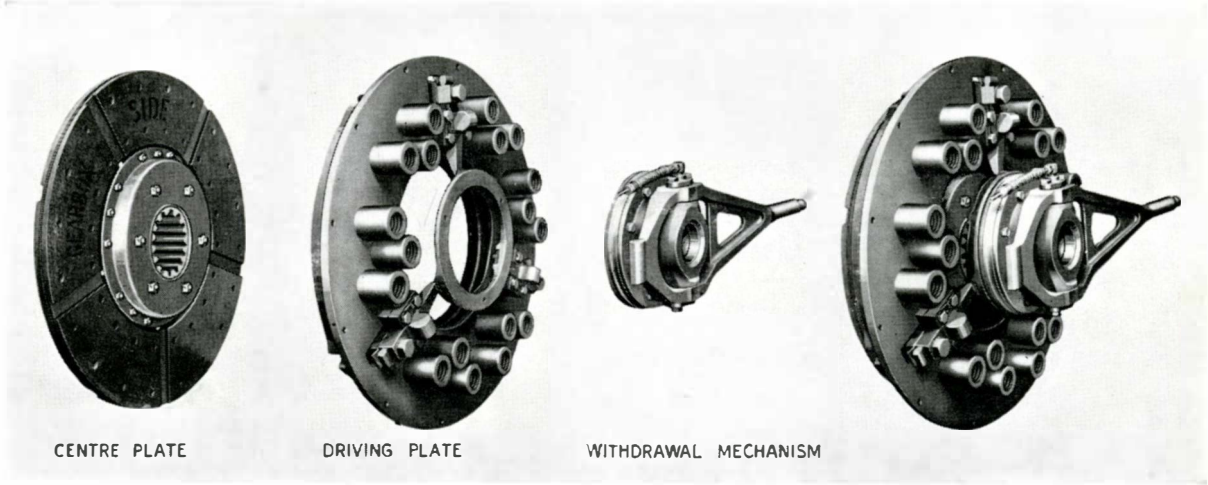


FIG. 3. CLUTCH SUB-UNITS VIEWED FROM GEARBOX SIDE

DESCRIPTION

Essentially the clutch consists of three sub-units, as shown in Fig. 3. The centre plate and liners and the driving plate with springs, withdrawal levers and back plate are on the engine. The withdrawal mechanism is mounted on the gearbox clutch-shaft housing.

The complete assembly is shown in Figs. 1 and 2.

The clutch facing is spigoted in to the flywheel and secured by setscrews. It is readily detachable for skimming-up or renewal.

The liners are riveted to a centre plate bolted to the housing enclosing the flexible clutch centre. The centre is shown in Fig. 6 and comprises six resilient blocks pressed into the clutch centre and housing.

The liners are unequal in thickness, the thicker one always on the gearbox side of the clutch where most wear takes place. Both liners are slotted radially to ventilate the friction faces.

The pressure on the clutch facings is supplied by eighteen springs in six groups of three springs, so disposed to give even pressure without distortion. The back plate, located in the flywheel by four driving pegs, has three bosses for the pressure pads. The driving plate is secured to the flywheel by setscrews, one of which is out of pitch so that the four driving pegs in the flywheel are matched with the four slots in the back plate. The withdrawal levers are bushed on eccentric pivot pins in the split lever brackets setscrewed to the driving plate. The pressure pads engage in the levers and can be reversed and/or turned to give three adjustments to the levers as the liners wear.

The withdrawal plate is centralised on the withdrawal levers by a spring plate and faces up to a fabric wearing plate on the withdrawal mechanism.

The withdrawal mechanism is a sleeve carrying a ball bearing, fully housed and protected by oil seals. The fabric wearing plate is riveted to the bearing housing, and the whole assembly is secured to the withdrawal sleeve by a nut and lockwasher. The clutch hub is keyed on the taper of the combined clutch-shaft and pinion and secured by a nut and lockwasher. The operating lever pivots in the withdrawal sleeve on the upper and lower pivot pins setscrewed into the lever, and hinges in a retaining block and plate, shown in Fig. 10.

Lubricant is fed through the upper pin from a flexible pipe to the inside of the withdrawal sleeve and to the bearing.

Note: The clutch fitted to the Heavy Goods vehicle is equipped with a fixed clutch stop. This comprises a flange mounted on the withdrawal sleeve and faced with a liner. When the clutch is operated this comes in contact with a flange fixed to the clutch hub, shown in Figs. 2 and 11.

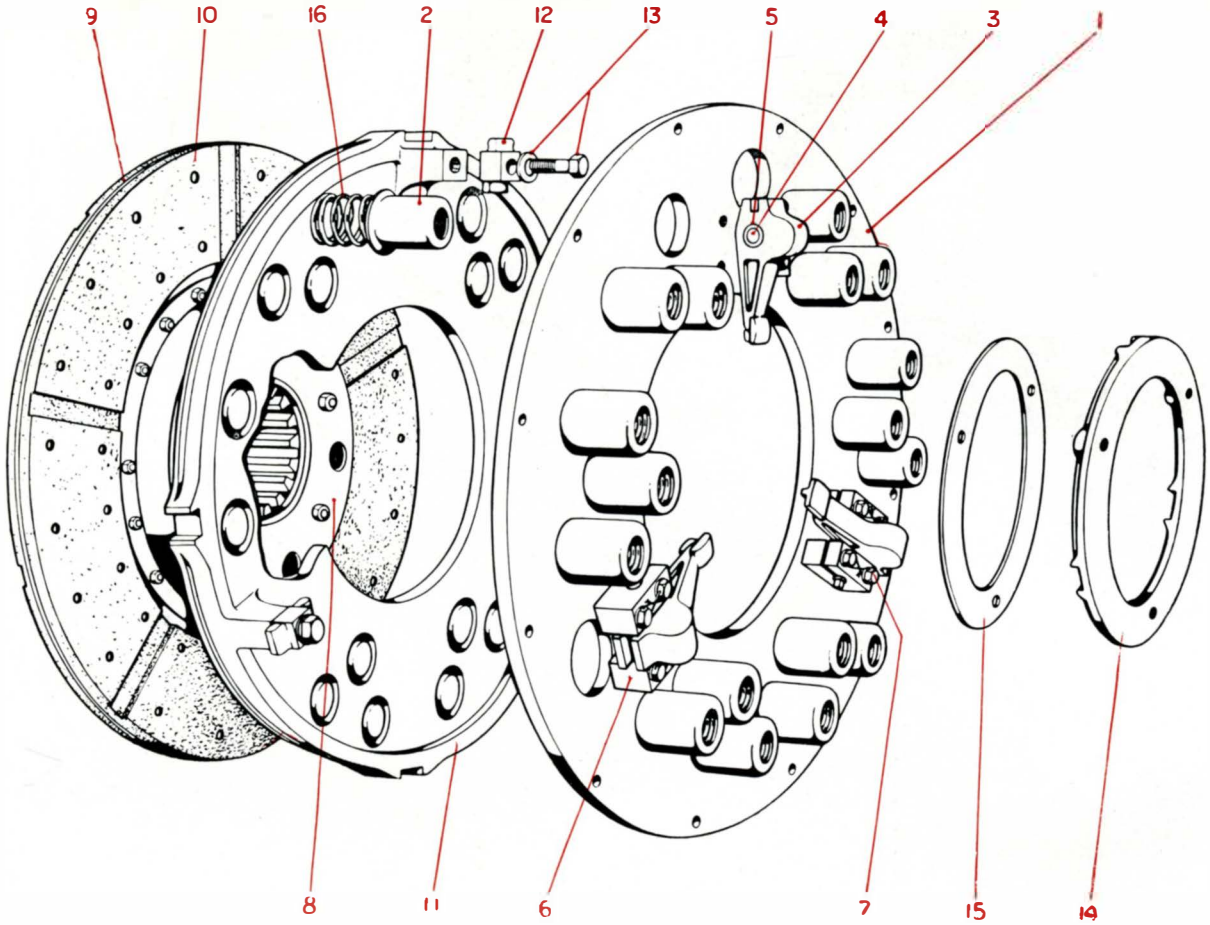


FIG. 4. EXPLODED VIEW OF THE CLUTCH

1. Driving Plate.
2. Spring Cup.
3. Lever.
4. Pin.
5. Bush.
6. Bracket.
7. Bolt.
8. Clutch Centre.
9. Front Liner.
10. Rear Liner.
11. Back Plate.
12. Pressure Pad.
13. Bolt and Washer.
14. Withdrawal Plate.
15. Spring Plate.
16. Spring.

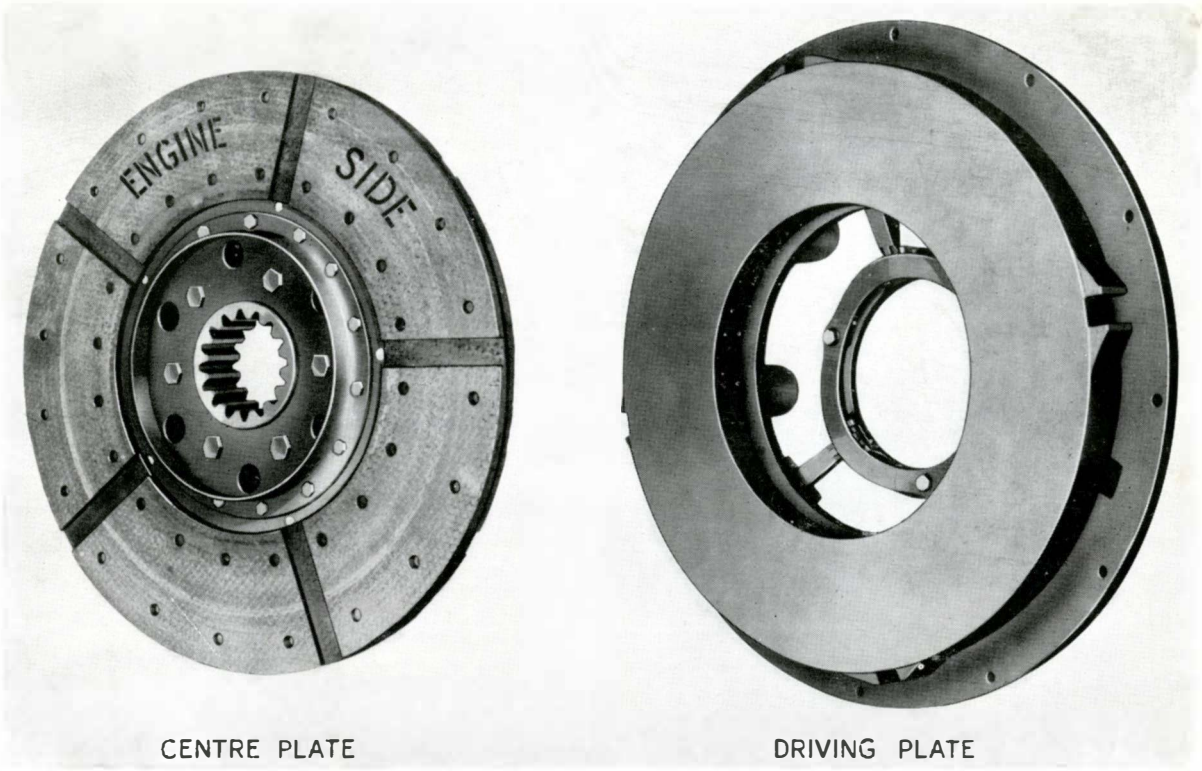


FIG. 5. CLUTCH SUB-UNITS VIEWED FROM ENGINE SIDE

The clutch shaft spigot bearing is mounted in a housing secured to the flywheel. An oil seal, pressed in the same housing, prevents leakage of lubricant. Any lubricant leaking past the seal is directed by the oil flinger to the holes in the flywheel and so to the outside of the clutch.

The inner race for the spigot bearing is pressed on the clutch shaft and is easily replaceable.

LUBRICATION

The withdrawal ball bearing and operating lever pivot pins are lubricated weekly, or every 1,000 miles, with oil by a lubricator on the left-hand of the clutch housing, see **Lubrication Chart.** One stroke of the oil-gun is sufficient, but a limited supply plug in the clutch housing prevents any over-lubrication.

The withdrawal ball bearing is packed with grease on assembly. Clean and repack at overhaul.

The spigot bearing is packed with high-melting-point (H.M.P.) grease on assembly. Clean and repack at overhaul.

The specifications of the above lubricants are given in the **Lubrication** chapter.

MAINTENANCE

Check the tightness of all bolts, setscrews and nuts after the first 5,000 miles' service of a new vehicle or replacement clutch.

If the clutch slips, check for:

1. The withdrawal levers not correctly adjusted, shown by excessive free pedal travel.
2. Worn out liners.
3. Weak springs, or some broken.
4. The withdrawal sleeve sticking.

If the clutch grabs, check for:

1. Oily liners or pressure facings.
2. Cracked liners or pressure facings.
3. Binding withdrawal mechanism.
4. Worn out withdrawal fabric wearing plate.

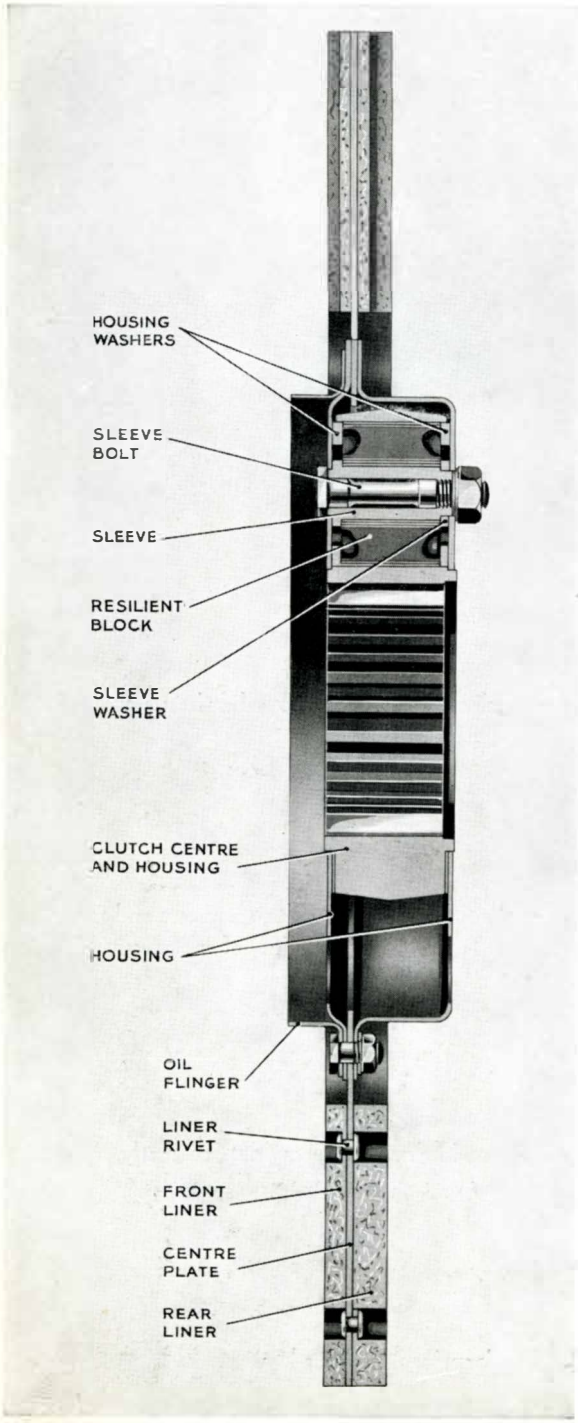


FIG. 6. LAYRUB FLEXIBLE CLUTCH CENTRE

If the clutch drags, check for:

1. The withdrawal levers not correctly adjusted, shown by excessive free pedal travel.
2. Loose liners.
3. Dry or seized spigot bearing.
4. Warped centre plate or liners.
5. Dry or seized withdrawal ball bearing.

If the clutch is noisy, remember:

1. Squealing is caused by the clutch slipping.
2. Grating or clicking when the pedal is depressed indicates a damaged, worn or dry withdrawal bearing.
3. Rattling when the clutch is disengaged indicates loose or cracked liners or excessive backlash on the clutch centre and hub.
4. The clutch and gearbox may be misaligned.

To Adjust the Withdrawal Levers

One initial and three service adjustments of the pressure pads ensure that maximum wear is obtained from the liners. The adjustments are made by turning and/or reversing the pads, as shown in Fig. 9.

To get full advantage from these adjustments, the pressure pads must be turned and/or reversed when the free pedal travel is reduced to about $\frac{1}{2}$ in. To adjust the pads too soon is as bad as adjusting them too late; the purpose of the pads being to give progressive adjustment of the withdrawal levers at definite stages of liner wear.

To carry out the resetting operation:

1. Remove the ventilation cover from the clutch housing, Fig. 8.

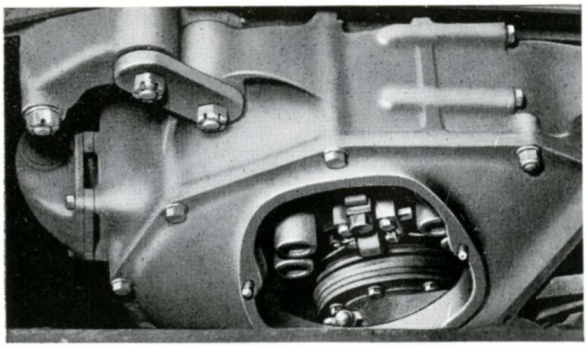


FIG. 7. ACCESS TO PRESSURE PADS
(Under-floor Engine Passenger Vehicles)

2. Slacken or remove each pressure pad bolt one at a time and turn and/or reverse the pads, as the case may be. Fig. 9 shows the appropriate change-round of the pads for whichever of the three adjustments is being made at the time.

3. Replace and/or tighten each bolt securely. When the third adjustment has been made and the free pedal travel is lost for the last time, then the clutch must be relined.

On Passenger Vehicles there is approximately 2½ in. free pedal travel when the clutch is correctly adjusted. When the free travel is reduced to about ½ in., the withdrawal levers have to be reset to regain the 2½ in. free travel.

The effective travel of the clutch pedal is not sufficient to allow the full free travel available on the withdrawal sleeve to be utilised. Therefore when setting the withdrawal levers with the pressure pads, adjust the turnbuckle shown in Fig. 8 until the free-travel is reduced sufficiently to allow the clutch to disengage fully when the pedal is nearly fully depressed. As the clutch wears and the free travel at the pedal is reduced to about ½ in., adjust the clutch operating rod by the turnbuckle until the free travel is regained. When the free travel is reduced again, reset the pressure pads.

Therefore the sequence is, set the pressure pads initially, then on first loss of free-travel adjust the clutch rod to regain the free-travel. On the next loss of free-travel reset the pressure-pads. Repeat this sequence until the liners are worn down to replacement thickness.

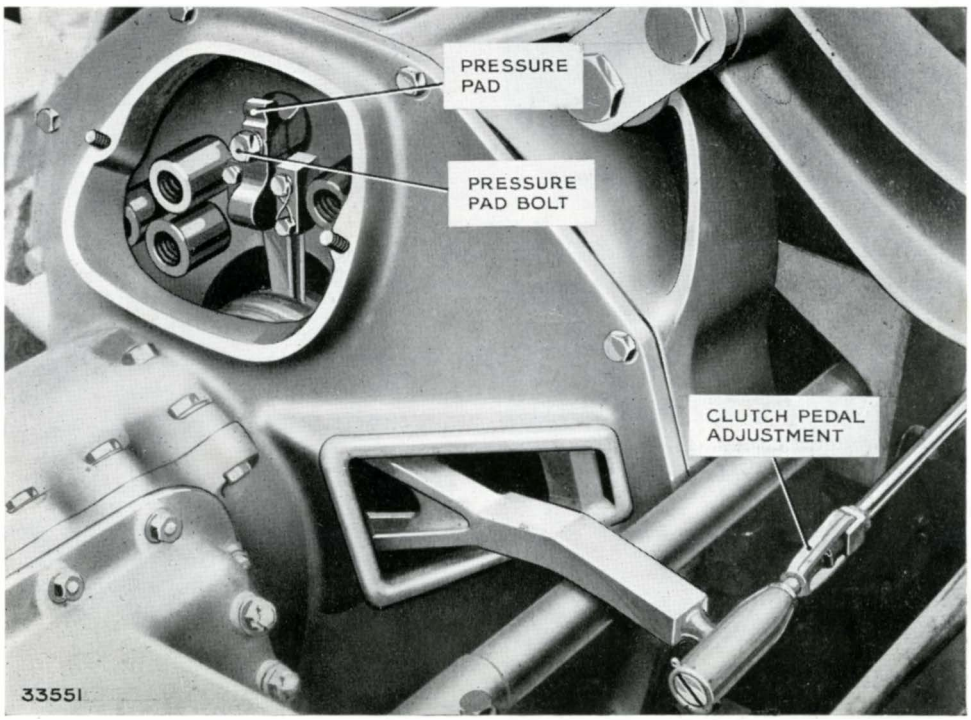


FIG. 8. ACCESS TO THE PRESSURE PADS
(Vertical Engine Passenger Vehicles)

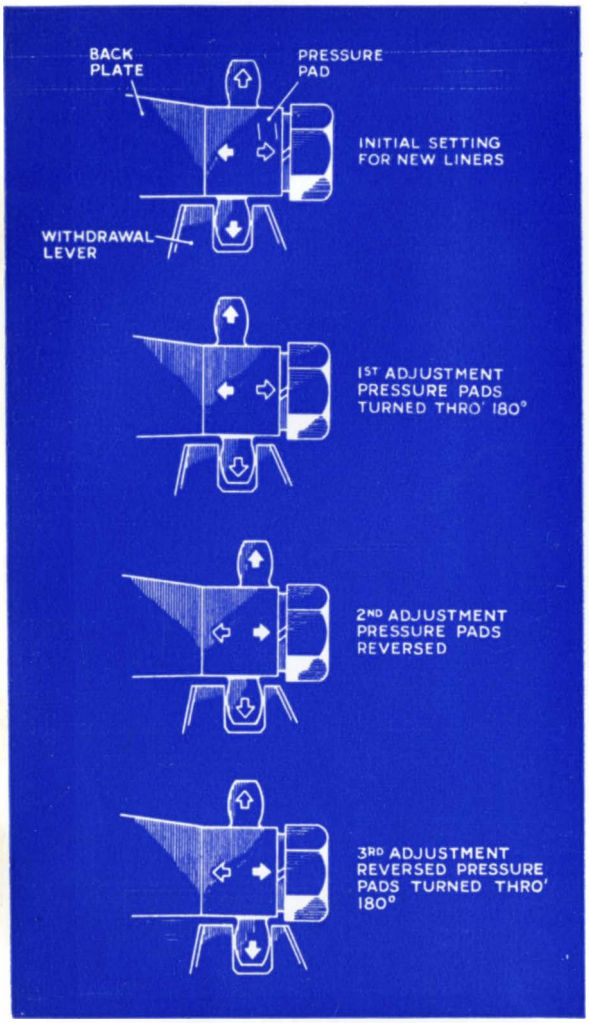


FIG. 9. WITHDRAWAL LEVER ADJUSTMENT

On Heavy Goods Vehicles there is approximately 3½ in. free pedal travel when the clutch is correctly adjusted. When the free travel is reduced to about ½ in., the withdrawal levers have to be reset to regain the 3½ in. free travel. **On no account must the length of the clutch operating rod be altered to regain this free travel**; the rod is set to the correct length on assembly and need not be touched until overhaul.

OVERHAUL

To Remove and Dismantle the Driving and Centre Plate Assemblies

1. Remove the gearbox, see **Gearbox** chapter. The withdrawal mechanism will come away on the gearbox, see **To Dismantle the Withdrawal Mechanism.**

2. Remove the setscrews securing the driving plate assembly to the flywheel, unscrewing them a little at a time. Lift out the centre plate and liners.

3. Before proceeding any further, clearly mark the driving plate, back plate, pressure pads and withdrawal levers, to ensure that they are re-assembled in the same relative positions, should replacements be unnecessary.

4. Remove the withdrawal and spring plates from the withdrawal levers.

5. Place the assembly, driving plate uppermost, on the bed of a screw press. Put a triangular wood block on the face of the driving plate clear of the withdrawal levers.

6. Apply the press to the block and compress the springs. While under compression remove the pressure pads. Relieve the pressure gradually to prevent the springs from flying out.

7. Lift the driving plate clear of the back plate. Inspect and test each individual spring for weakness or breakage. Replace any which do not come up to the required rating.

8. Remove the withdrawal levers and brackets. Inspect the pivot pins and lever bores for any signs of indentation from the rollers when fitted. Clean and inspect the needle rollers. If bushes are fitted inspect for excessive clearance.

9. Inspect the clutch facing and the back plate for wear or cracks. If cracks are detected in either part, replacement must be made. If either face is scored or unevenly worn, they must be reground to restore the smooth finish. Up to a maximum of 1/32 in. can be ground off the face of either part.

10. To separate the clutch facing from the flywheel, remove the flywheel from the crankshaft, see **Engine** chapter. Unscrew the setscrews securing the facing to the flywheel and remove it from the spigot. Regrind and replace the facing on the flywheel, tightening the setscrews down hard, replace the flywheel, noting that one of the six fixing bolts is out of pitch, which ensures that the flywheel is replaced on the crankshaft in the correctly timed and balanced position.

11. Remove the spigot bearing housing. Clean and inspect the bearing and oil seal, see **General Notes on Overhauling** in **General Instructions.** Do not remove the bearing or seal from the housing unless replacement is required. Inspect the inner race for wear and scuffing. To draw off the inner race for replacement, screw a $\frac{1}{2}$ in. dia. B.S.F. jacking bolt into the tapped end.

12. Inspect the centre plate assembly for liner wear, and the fit of the splined centre on the clutch hub.

Relining the Centre Plate

1. Remove the flexible clutch centre.

2. Drill out the old rivets with a $\frac{3}{16}$ in. dia. drill.

3. Check that the centre plate is perfectly flat and true.

4. Rivet the new liners to the centre plate. Always use liners supplied by a Leyland service depot. The liners should be fitted as evenly as possible with the radial slots on the outside. Tubular brass rivets of the correct diameter and length **must** be used. The liners and plate should be flat to within $\frac{1}{32}$ in. when riveted up.

5. Replace the flexible centre with the oil flinger on the engine side of the assembly, as shown in Fig. 6.

To Re-assemble and Replace the Clutch

1. Pack the spigot bearing with high-melting-point (H.M.P.) grease and replace on the flywheel.

2. Assemble withdrawal levers and brackets with the needle rollers or bushes on the pivot pins. Pack the rollers with grease on assembly. Replace the levers and brackets on the driving plate in their previously marked positions. Do not tighten the setscrews at this stage.

3. Lay the back plate, pressure face down, in the press and place the springs vertically in the small recesses in the plate.

4. Lay the driving plate on the tops of the springs, making sure the identification marks made before dismantling, line up.

5. Compress the assembly slowly and watch that the springs seat properly. Hold the assembly compressed and replace the pressure pads and bolts. Tighten the bolts hard down at this stage. A bolt coming loose in service will cause serious damage.

   The pressure pads must be fitted in the initial setting position as shown in Fig. 9, if new liners have been fitted, or one of the other settings marked before dismantling, if the liners have not been renewed.

6. Release the press and fit the withdrawal and spring plates.

7. Check the fit of the clutch centre on the hub. Place the centre plate assembly in position on the flywheel, centralising it with a dummy clutch shaft obtainable from a Leyland service depot.

8. With the centre plate still centralised by the dummy shaft, fit the driving plate assembly to the flywheel. There are thirteen setscrews, one of which is out of pitch to ensure that the clutch driving pegs in the flywheel enter the slots in the back plate. Tighten the setscrews evenly and wire the heads together in pairs, care being taken not to have any loose ends of wire. Remove the dummy shaft.

9. Check that the face of the withdrawal plate is at right angles to the clutch shaft axis all the way round. This ensures that all three withdrawal levers operate simultaneously. If the withdrawal plate shows that the levers are not lined up, turn the eccentric pivot pin by the square shank until the withdrawal lever in question is correctly aligned. When finally adjusted, tighten down the bracket setscrews and wire together in pairs.

   Check that the withdrawal levers are clear of the driving plate when the clutch is fully disengaged.

10. Replace the gearbox, see **Gearbox** chapter, after overhauling and re-assembling the withdrawal mechanism, see **To Re-assemble the Withdrawal Mechanism.**

To Dismantle and Re-assemble the Withdrawal Mechanism

1. Disconnect the flexible lubrication pipe shown in Figs. 10 and 11.

2. Remove the upper and lower pivot pins from the clutch operating lever.

3. Remove the retaining plate and block shown in Fig. 10, release the clutch operating lever.

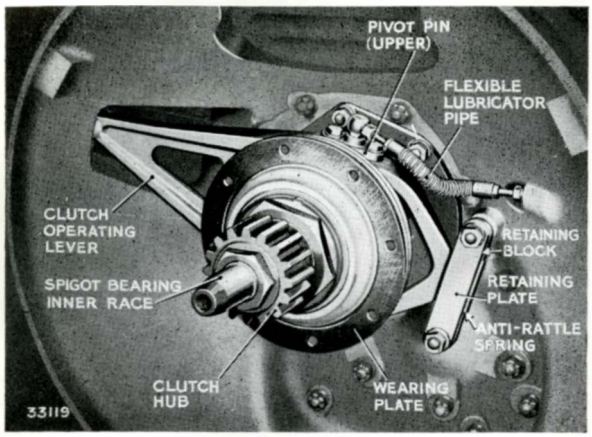


FIG. 10. THE WITHDRAWAL MECHANISM
(On the Passenger Vehicle)

4. Remove the nut and lock washer from the end of the clutch shaft, draw the clutch hub off the taper and remove key.

5. Slide the withdrawal sleeve assembly off the clutch shaft housing, as shown in Fig. 14.

6. To inspect the withdrawal ball bearing, unscrew the nut and lock washer on the sleeve and remove the distance piece and key. Press the ball bearing with housing and cover off the withdrawal sleeve, separate the housing and cover by removing the setscrews. Inspect the bearing and seals, see **General Notes on Overhauling** in **General Instructions.**

7. Inspect the fabric wearing plate, if the liner is worn down to the rivet heads, reline with a liner obtained from a Leyland depot.

   Use a No. 19 drill to remove the old wearing plate rivets; new tubular brass rivets of the correct diameter and length **must** be used when relining.

8. To re-assemble the withdrawal mechanism, reverse the dismantling procedure. If a new clutch hub has been fitted, test that it is a free fit in the clutch centre before fitting it on the taper. The hub must be a perfect fit on the clutch shaft taper, see **General Notes on Overhauling** in **General Instructions.** The nut must be tightened up hammer tight and locked with the washer.

To Dismantle and Re-assemble Flexible Centre

1. Remove the bolts securing the two halves of the pressed-steel housing and the oil flinger to the centre plate, see Fig. 6.

2. Remove the six sleeve bolts. Separate the two halves of the housing from the clutch centre and housing.

3. Inspect the resilient blocks for any signs of deterioration. If any signs are found, do not dismantle any further, but obtain a service replacement centre.

4. The centre must be re-assembled exactly as shown in Fig. 6.

SKIM PLATES

We are aware that it is the practice of operators to skim the clutch-facing and clutch back-plate when these faces have become worn or deformed.

In the case of this clutch, however, the effect of skimming would be to reduce to three, the number of adjustments obtained from the pressure pads.

To overcome this, a skim-plate (Part No. 265597) has been introduced, to be fitted between the clutch-facing and the flywheel. This skim-plate is 16 B.G. thick (.064 in.) and the maximum number of plates required for any particular clutch would be three.

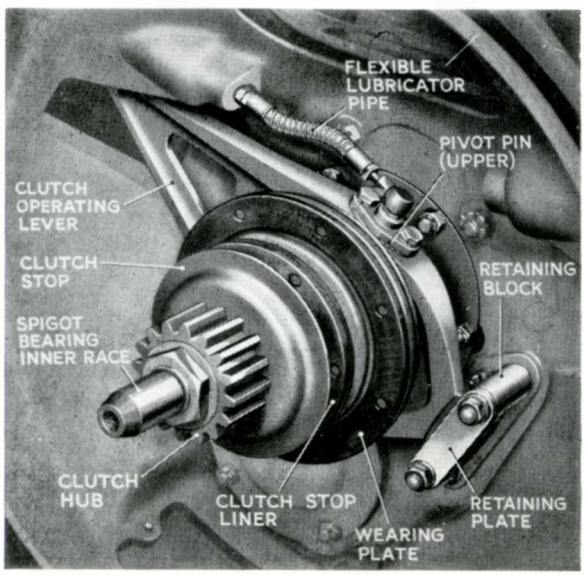


FIG. 11. THE WITHDRAWAL MECHANISM ON HEAVY GOODS VEHICLE SHOWING CLUTCH STOP

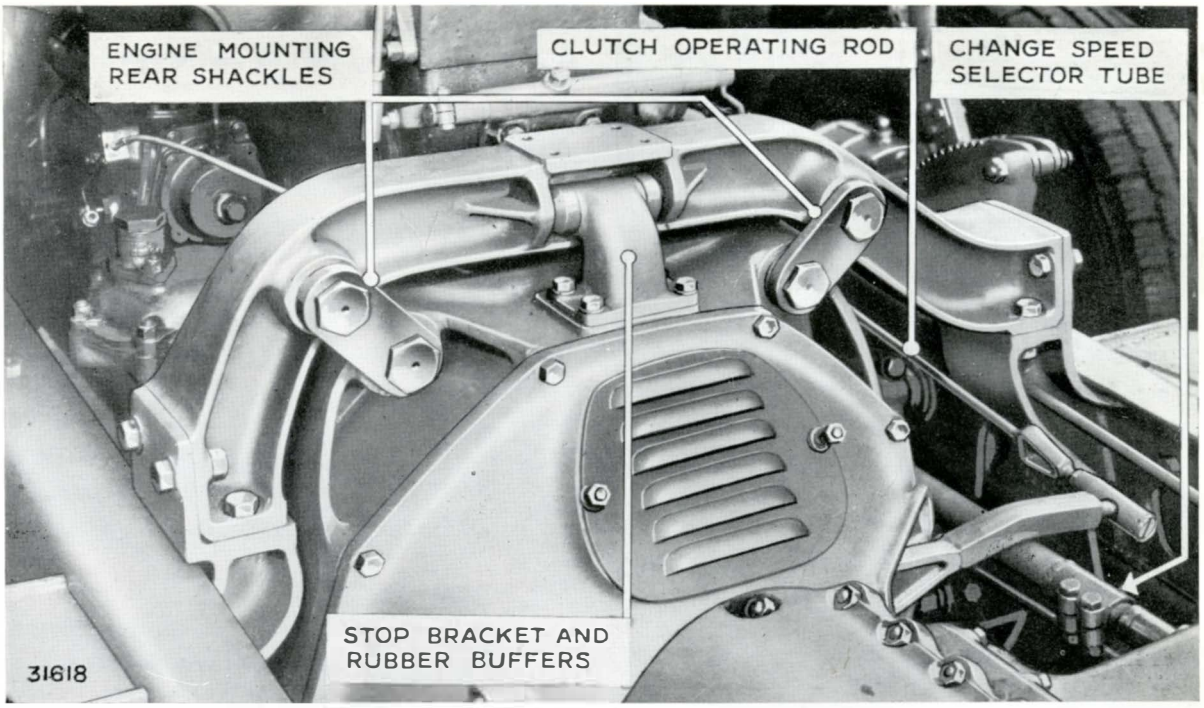


FIG. 12. THE CLUTCH HOUSING AND ENGINE REAR MOUNTING ON THE PASSENGER VEHICLE

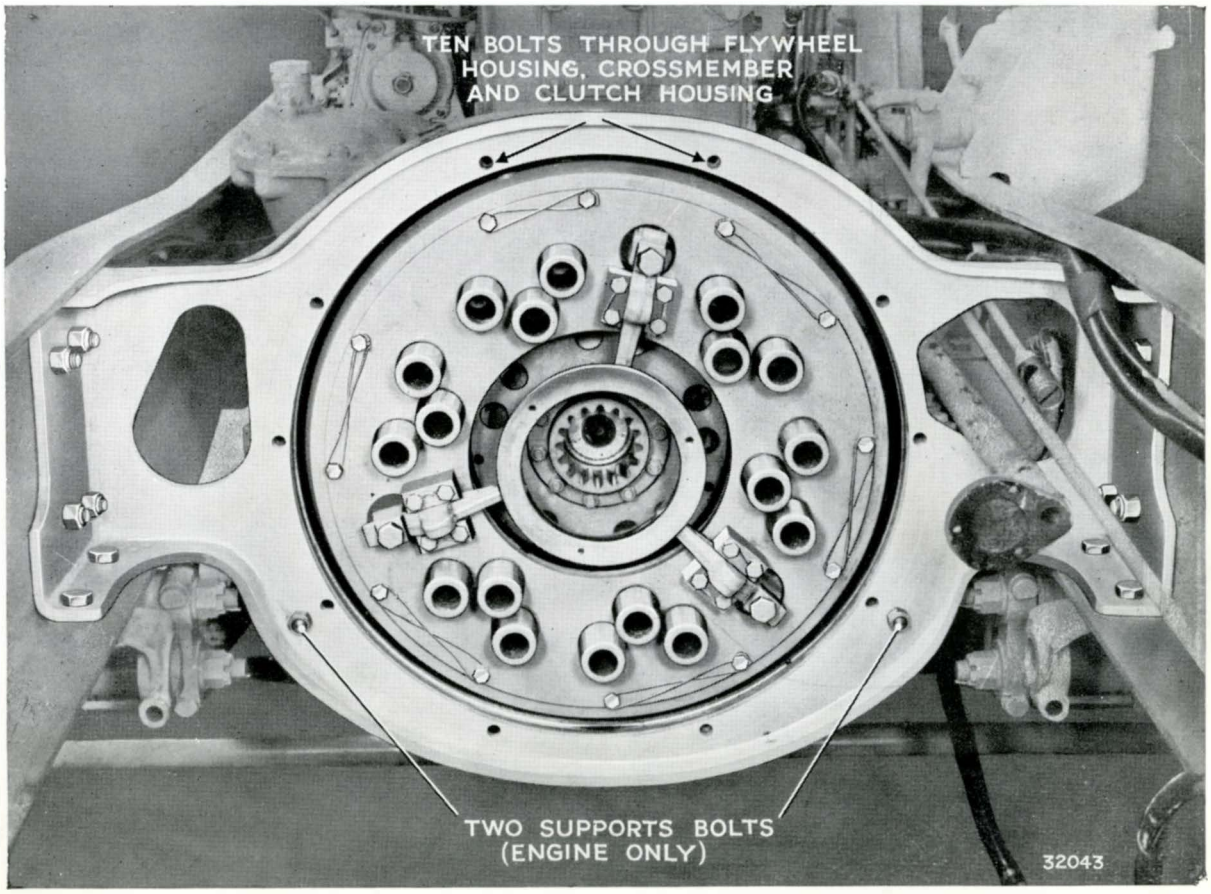


FIG. 13. THE CLUTCH WITH GEARBOX REMOVED ON THE HEAVY GOODS VEHICLE

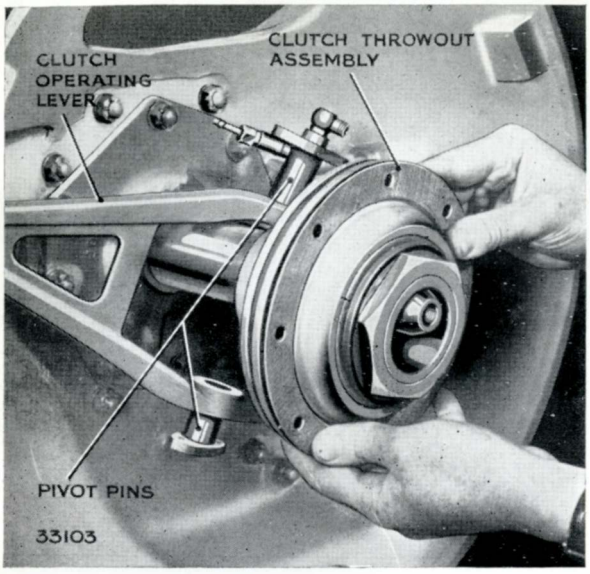


FIG. 14. REMOVING THE WITHDRAWAL ASSEMBLY

When two or more of these plates are fitted, it is recommended that retaining screws $\frac{1}{8}$ in. longer than standard should be fitted.

LOCKNUT ON CONTROL ROD

(The following remarks apply to vertical-engined Passenger vehicles only).

A plain locknut was originally fitted at the rear end of the clutch control-rod, between the turnbuckle and the ball-end socket; see **Clutch Pedal Adjustment,** as Fig. 8.

This has been replaced by a special locknut with a collar formed at one end (Part No. 260196).

With the new locknut fitted with the hexagon against the ball-end socket and the collar towards the turnbuckle, it is impossible to lock the ball cages solid on the ball pin with consequent failure of the turnbuckle end.

It is recommended that where machines are fitted with the plain nut, these should be replaced by the collared nut, supplies of which are available from the Leyland Service Manager.

Leyland

ENGINE

Leyland Section PL.

ENGINE

Unit EO.680/148

Sump	Unit ES.54	PL.6267
Water pump	Unit EWP.56A	PL.6268
Oil pump	Unit EOP.50	PL.6269
Oil filter	Unit EOF.7A	PL.6274
Fan	Unit EF.35	PL.6643
Fuel pump	Unit EFP.103	PL.6971
Dynamo drive	Unit DD.187B	PL.7124
Starter motor	Unit SM.56	PL.7125
Pistons and connecting rods	Unit ECN.79	PL.7967
Injectors	Unit N.35	PL.21362
Fuel filter	Unit EFF.39	PL.30126
Crankshaft	Unit ECS.100A	PL.40009
Crankcase and cylinder(Engine Block)	Unit ECC.131/29	PL.
Cylinder head	Unit ECH.134A/22.	PL.
Compressor	Unit ECR.28/8	PL.
Timing case	Unit ETC.82/2	PL.

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Sump. Unit ES.54 (Arrangement Part No. 234177)	
1–2	234178	**Sump, bottom half, complete**	1
3	227836	Stud, $\frac{3}{8}$" dia. × $1\frac{1}{2}$" long } Top to bottom sump	8
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F., plain } Top to bottom sump	8
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray } Top to bottom sump	8
4	227839	Stud, $\frac{5}{16}$" dia. × 1·4" long, B.S.F. } Dipstick housing to sump	4
	184806	Nut, $\frac{5}{16}$" dia., B.S.F., Simmonds ... } Dipstick housing to sump	4
5	121975	Plug, 1" dia., B.S.P.	2
6	231746	Washer, plug	2
7	234179	**Sump, top half, complete**	1
8	227836	Stud, $\frac{3}{8}$" dia. × $1\frac{1}{2}$" long, B.S.F., top and bottom sump	4
9	227877	Stud, $\frac{3}{8}$" dia. × $3\frac{5}{8}$" long, B.S.F., top and bottom sump	3
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds	7
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	7
10	227713	Joint, sump to crankcase	1
11	227714	Joint, top and bottom sump	1
12	309871	Dipstick housing	1
13	X32757	Joint, dipstick housing to sump	1
14	234311	Dipstick, complete	1
	FB106/9D	Bolt, $\frac{3}{8}$" dia. × $1\frac{1}{4}$" long, B.S.F., sump to timing case	4
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	4

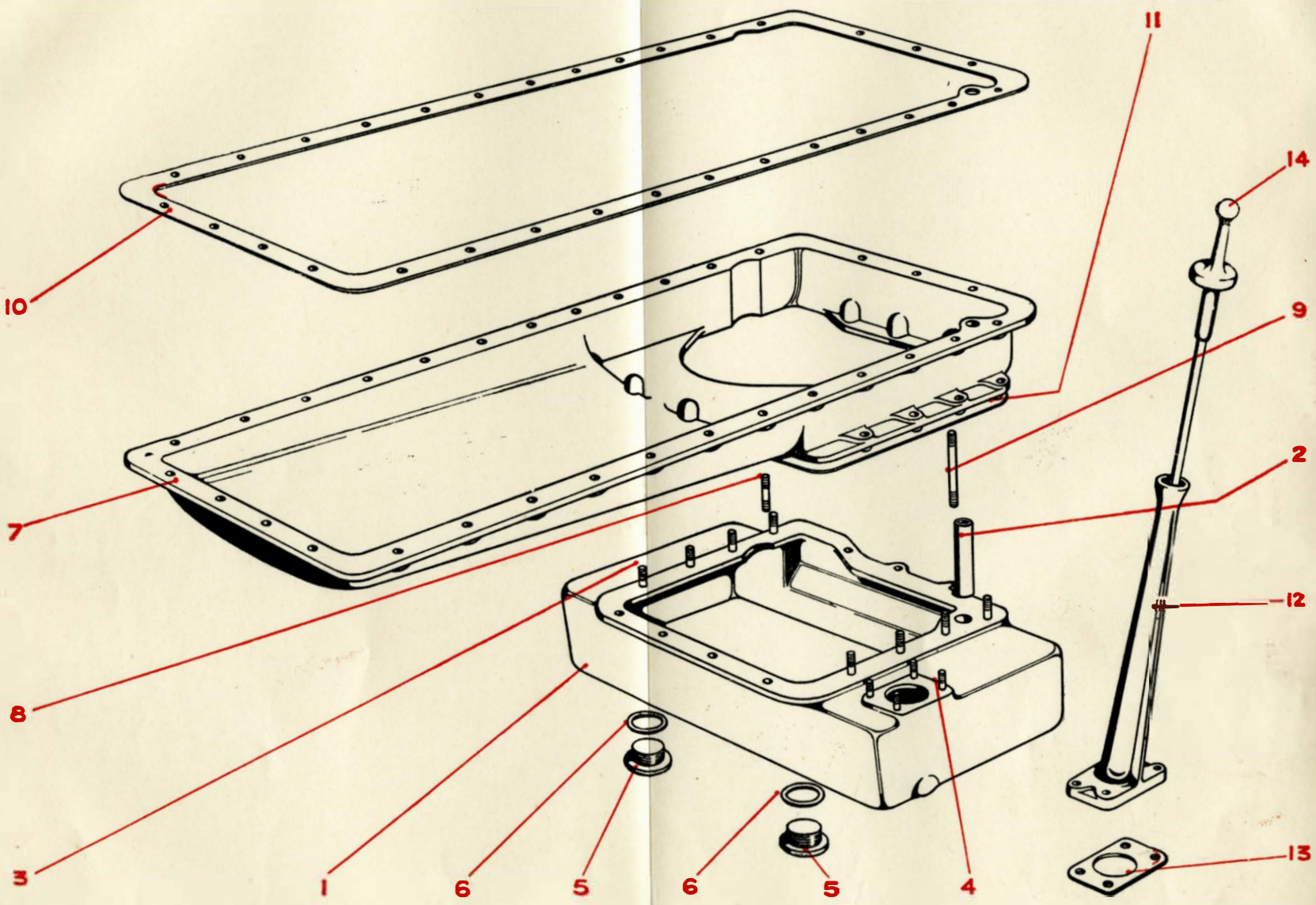
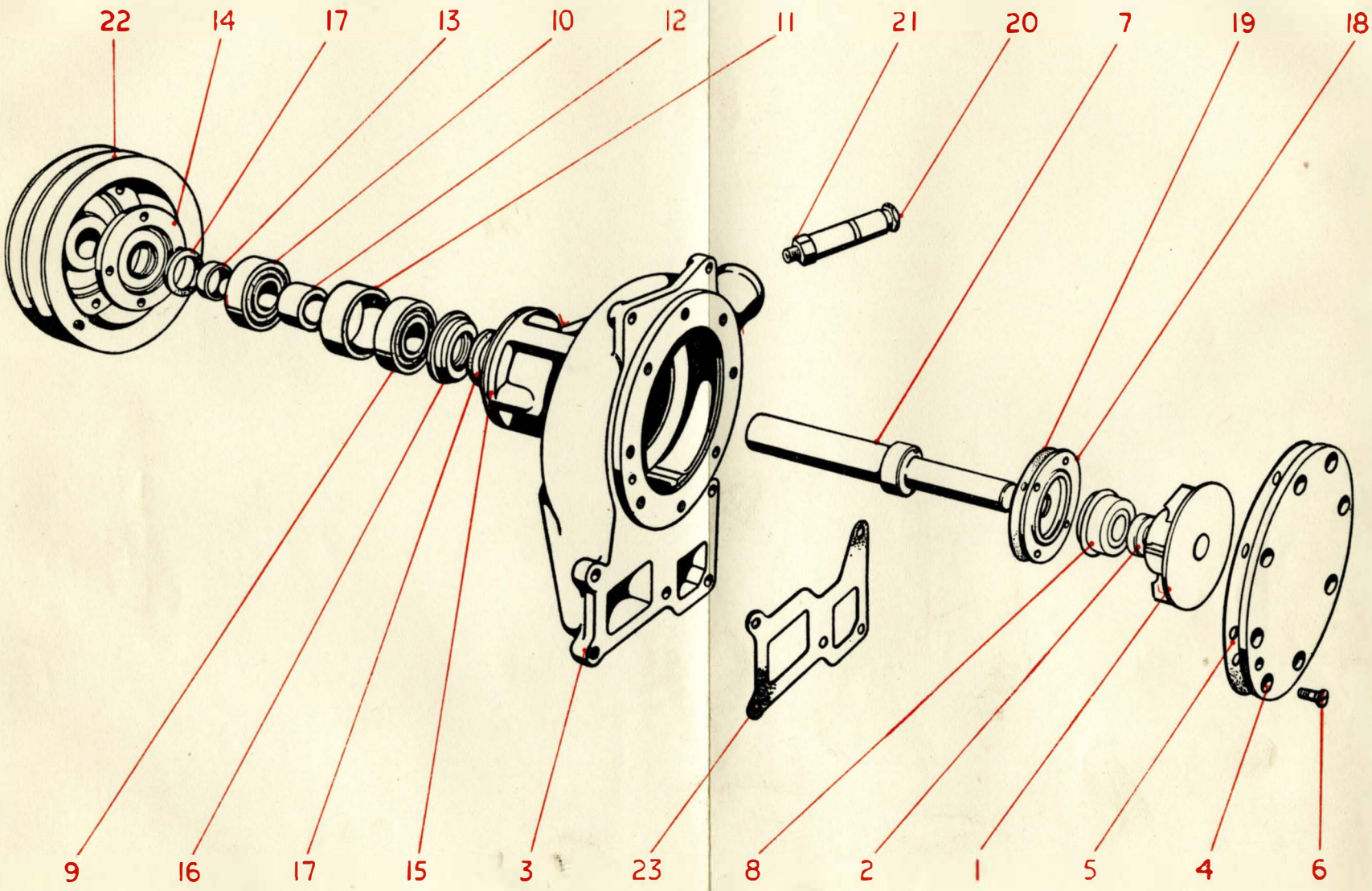

11
14
10
9
2
7
12
8
13
3
1
6
5
6
5
4

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Water Pump. Unit EWP.56A (Arrangement Part No. 299792)	
	299745	**Impeller, complete**	1
1	299370	Impeller	1
2	299747	Insert	1
3	227730	Casing, water pump	1
4	227729	Backplate	1
5	227736	Joint, backplate	1
6	227798	Screw, $\frac{5}{16}$" dia., B.S.F., backplate	8
7	227704	Driving shaft	1
8	266394	Seal, water pump, complete	1
9	132229	Ball bearing, Hoffmann LS.9	1
10	218905	Roller bearing, Hoffmann RLS.9	1
11	227698	Distance piece, outer	1
12	227699	Distance piece, inner	1
13	227697	Distance piece	1
14	227701	Bearing cover	1
15	227735	Joint, bearing cover	1
	235056	Screw, $\frac{5}{16}$" dia.. B.S.F., bearing cover	4
16	227705	Retainer	1
17	227700	Felt washer	2
18	299746	End cover	1
19	227734	Joint, end cover	1
	227799	Screw, 2 B.A.	4
20	242535	Greaser, Tecalemit	1
21	242824	Adapter, greaser	1
22	227706	Pulley	1
23	231607	Joint, water pump to crankcase	1
	X72340	Setscrew, $\frac{5}{16}$" dia. × 1" long, B.S.F., casing to crankcase	4
	FB105/16D	Bolt, $\frac{5}{16}$" dia. × 2" long, B.S.F., casing to crankcase	3
	X75948	Washer, $\frac{5}{16}$" dia., Kolok	7
	243013	Joint washer, casing to crankcase	2



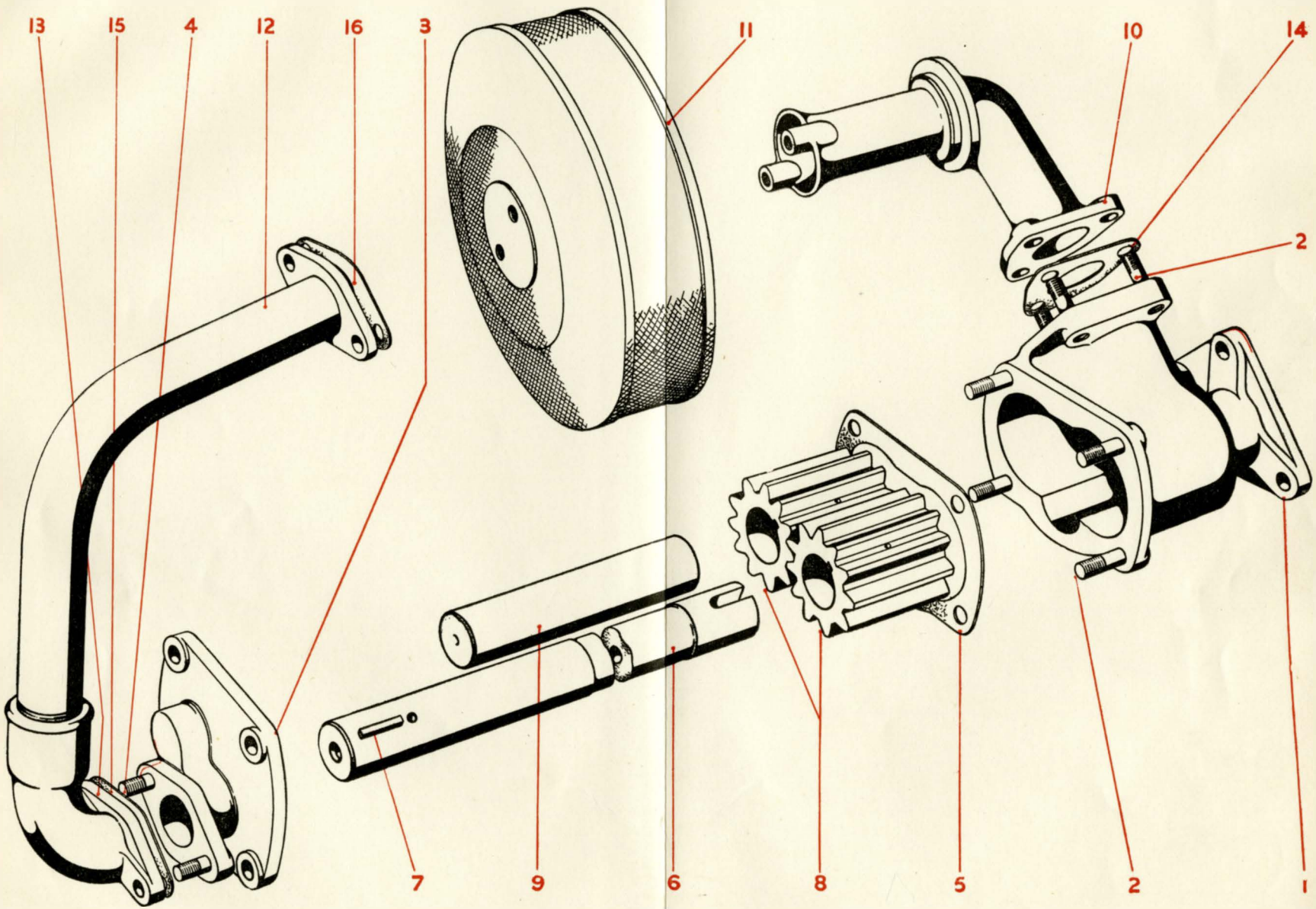
PL.6268 PL.21247

W/1256

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Oil Pump. Unit EOP.50 (Arrangement Part No. 234767)	
	234768	**Oil pump complete**	1
1	234892	**Oil pump body, machined and studded**	1
2	227694	Stud, $\frac{5}{16}$" dia. × 1$\frac{1}{4}$" long. B.S.F. } Cover to body	4
	FN405/L	Nut, $\frac{5}{16}$" dia., B.S.F., slotted ... }	4
2	227694	Stud, $\frac{5}{16}$" dia. × 1$\frac{1}{4}$" long, B.S.F. } Suction pipe to body	3
	FN405/L	Nut, $\frac{5}{16}$" dia., B.S.F., slotted ... }	3
3	234893	**Cover, oil pump, machined and studded**	1
4	227694	Stud, $\frac{5}{16}$" dia. × 1$\frac{1}{4}$" long, B.S.F. } Delivery pipe to cover	2
	FN405/L	Nut, $\frac{5}{16}$" dia., B.S.F., slotted ... }	2
5	227678	Joint, cover to body	1
6	234757	Driving shaft	1
7	119182	Key, Woodruff No. 6...	1
8	227679	Gear, oil pump	2
9	227681	Spindle, idler gear	1
10	227686	Suction pipe	1
11	227452	Suction filter, complete	1
	233755	Setscrew, $\frac{5}{16}$" dia. × $\frac{1}{2}$" long, pipe to filter	2
12-13	227688	Delivery pipe, complete with elbow and flange	1
14	227687	Joint, suction pipe	1
15	227691	Joint, delivery pipe elbow	1
16	227450	Joint, delivery pipe flange	1
	500018	Delivery pipe, complete (alternative)	1

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	SUFFIX A	
	PARTS DELETED	
	(Arrangement Part No. 235061)	
235062	Filter casing, complete	1
227785	Joint, filter to crankcase	2
	ADDITIONAL PARTS	
	(Arrangement Part No. 600501)	
600500	Filter casing, complete	1
600410	Filter casing	1
233156	Stud, $\frac{3}{8}$" dia. x 1.6" long, B.S.F., for cover	7
265461	Collared stud, for bracket	1
FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F.	8
X75962	Washer, $\frac{3}{8}$" dia., Thackeray	8
145565	Washer, for collared stud	1
247009	Insert for drain plug	1
227607	Drain plug	1
185484	Washer	1
24778	Plug for oilways	2
231170	Washer	2
600174	Gaco 'O' ring, Ref. No. R.138	2

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	OIL FILTER. UNIT EOF.7	
	(Arrangement Part No. 235061)	
	▷Note: See end of Section for Unit Suffix changes Parts affected are marked ▷	
▷235062	Casing, oil filter, complete	1
235038	Casing, oil filter	1
24778	Plug, oil ways	2
231170	Washer, plug	2
227607	Drain plug	1
185484	Washer, drain plug	1
233156	Stud, $\frac{3}{8}$" dia. x 1.6" long, cover	7
FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F.	8
X75962	Washer, Thackeray	8
265461	Stud, collared, bracket	1
145565	Washer, stud	1
247009	Insert, drain plug	1
235063	Cover, filter casing, complete	1
227933	Stud, 5/16" dia. x 1.3" long, B.S.F., by-pass valve	2
184806	Nut, 5/16" dia., B.S.F., Simmonds	2
24778	Plug	1
231170	Washer, plug	1
235064	By-pass valve, complete	1
235041	Body, by-pass valve	1
235043	Piston	1
223250	Spring	1
235044	Plug	1
185484	Washer, plug	1
235065	Filter body, complete	1
231173	Filter body	1
231172	Filter element	1
236376	Cotton twine	10 ft.
235184	Spring, filter body	1
235040	Joint, cover	1
235042	Joint, by-pass valve	1
▷227785	Joint, filter to crankcase	2
265462	Bracket	1



TYPICAL ILLUSTRATION

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Fan. Unit EF.35	
1	260895	Fan, complete...	1
2	265933	Adapter ring, complete	1
3	222883	Stud, $\frac{5}{16}$" dia. × $1\frac{1}{8}$" long, B.S.F. } For fan	6
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F. ... } For fan	6
	X75948	Washer, $\frac{5}{16}$" dia., Kolok ... } For fan	6
	FS106/9D	Setscrew, $\frac{3}{8}$" dia. × $1\frac{1}{8}$" long, B.S.F. } Adapter to pulley	6
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray ... } Adapter to pulley	6

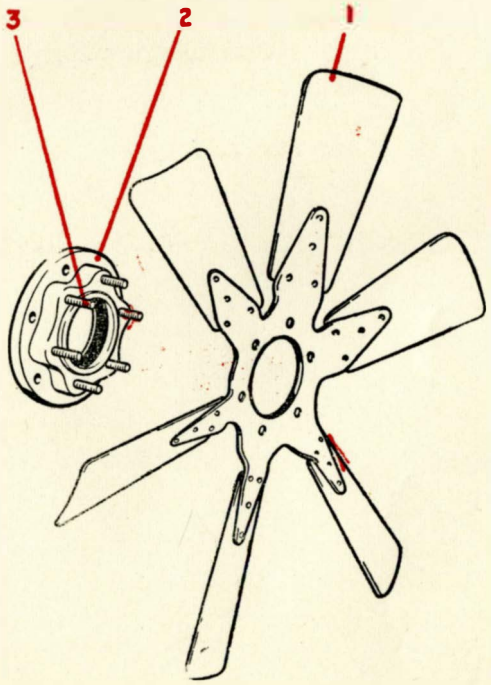
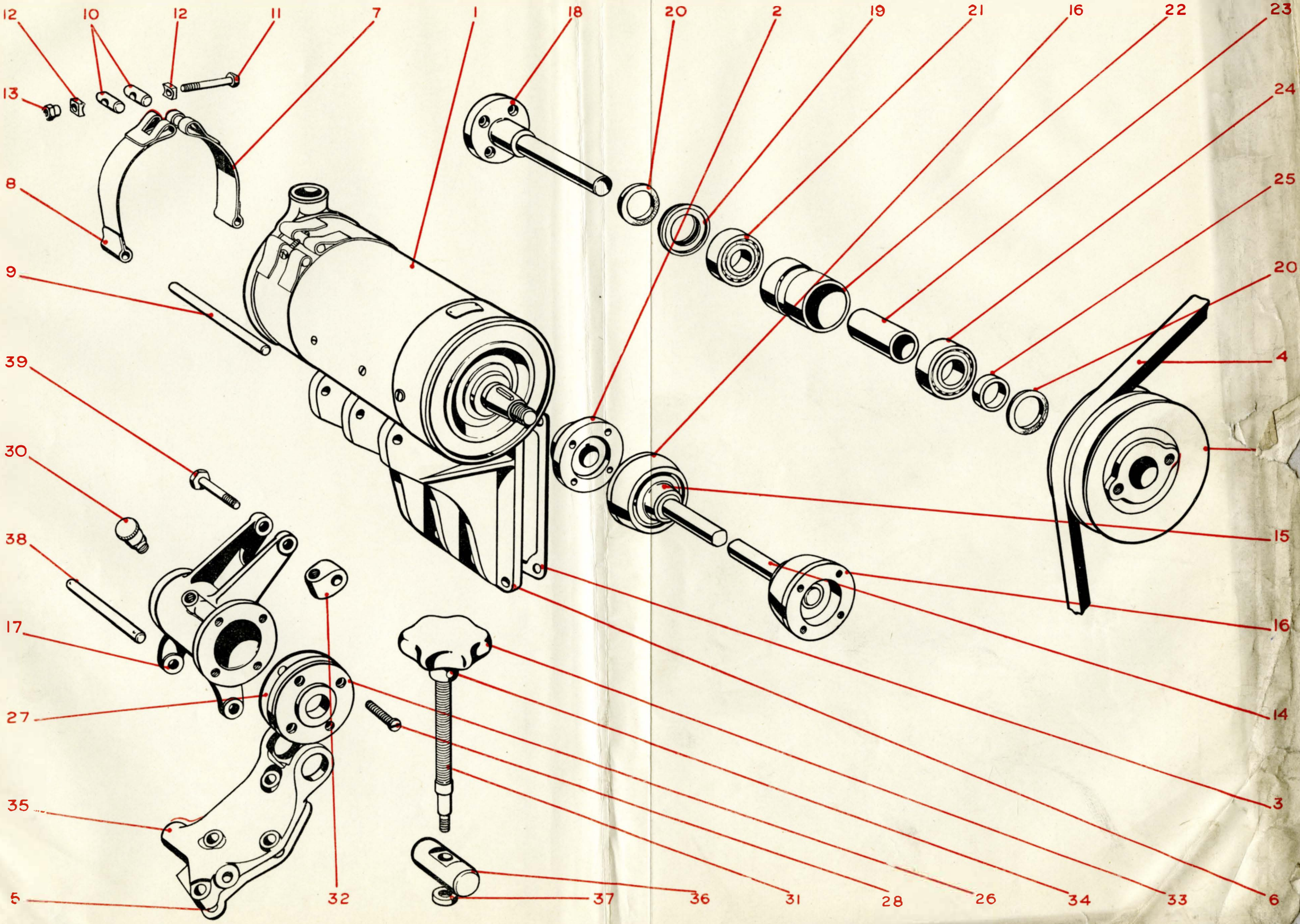


Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Fuel Pump. Unit EFP.103	
	539765	**Fuel pump, C.A.V. type NL680/127, Governor, C.A.V. type RPB21A, Feed pump, C.A.V. type DFP3/25, Excess fuel device, C.A.V. type 7097/326C**	1
	520968	Air bell, C.A.V. type 7092/239	1
	274654	Bleeder pipe, complete	1
	519497	Oil level pipe, complete	1
	524398	Pipe complete, governor to venturi	1
	524399	Pipe complete, relief valve to venturi	1
	262687	Pipe complete, No. 1 injection } With nut 276114 and washer 161655	1
	262689	Pipe complete, No. 2 injection	1
	262691	Pipe complete, No. 3 injection	1
	262693	Pipe complete, No. 4 injection	1
	262695	Pipe complete, No. 5 injection	1
	262697	Pipe complete, No. 6 injection	1
	262599	Bracket, fuel pump	1
	227862	Joint, for bracket	1
	FB106/60	Setscrew, $\frac{3}{8}$" dia., B.S.F. } Pump to bracket	2
	FB106/16	Bolt, $\frac{3}{8}$" dia., B.S.F. ...	2
	X75949	Washer, $\frac{3}{8}$" dia., Kolok	4
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F. ...	2
	239302	Flywheel, fuel pump	1
	241786	Timing bracket	1
	521311	Bracket, stop control cable	1
	239504	Banjo bolt, pipes to venturi	2
	146855	Washer	4
	227545	Clip, injection pipes	2
	227546	Clip, injection pipes	2
	233427	Setscrew, for clips	4
	X84337	Clip, bleeder pipe	1

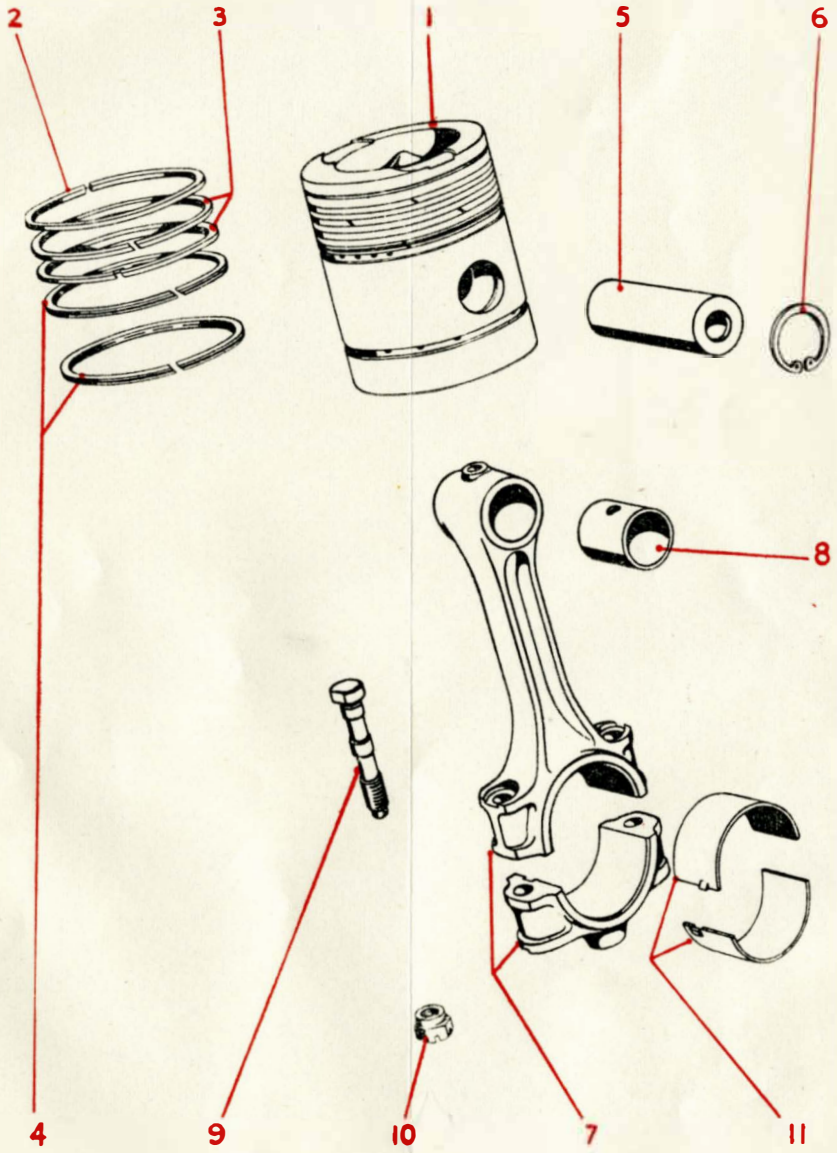
Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Dynamo Drive. Unit DD.187A	
		▶ **Note: See end of Section for Unit Suffix changes. Parts affected are marked ▶**	
1	259338	Dynamo, C.A.V. type G.724-4	1
2	▶ 235292	Coupling flange	1
3	227837	Joint, dynamo bracket	1
4	235277	Driving belt	2
5	239296	Joint, bracket to timing case	1
	511019	Screw, $\frac{5}{16}$″ dia. × ·55″ long, B.S.F., driving shaft	8
6	235276	Bracket	1
7	160423	Strap, dynamo, short	2
8	60101	Strap, dynamo, long	2
9	X1832	Pin, strap	2
	K5681	Split pin, $\frac{1}{8}$″ dia. × $1\frac{1}{8}$″ long	4
10	50572	Ferrule, straps	2
11	X70270	Bolt, $\frac{3}{8}$″ dia., B.S.F., straps	2
12	X70245	Washer, saddle	4
13	X63521	Nut, $\frac{3}{8}$″ dia., B.S.F.	2
	235286	**Driving shaft, complete**	1
14	235282	Driving shaft	1
15	542940	Drive coupling	2
16	227816	Housing, coupling	2
	▶ 235287	**Drive housing, bracket and adjusting screw, complete**	1
17	239243	Bracket and housing	1
18	227817	Driving flange	1
19	227705	Retainer	1
20	227700	Felt washer	1
21	132229	Ball bearing, Hoffmann L.S.9	1
22	227825	Distance piece, outer	1
23	227824	Distance piece, inner	1
24	218905	Roller bearing, Hoffmann R.L.S.9	1
25	227697	Distance piece	1
26	227701	End cover	1
20	227700	Felt washer	1
27	227735	Joint, end cover	1
28	235056	Setscrew, $\frac{5}{16}$″ dia., B.S.F., end cover	4
29	236443	Pulley	1
30	235526	Grease cup, $\frac{3}{8}$″ dia., B.S.F., Rotherham	1
	235290	**Adjusting screw, complete**	1
31	235280	Adjusting screw	1
32	235281	Pivot block	1
33	227828	Handle	1
34	K5542	Taper pin, $\frac{5}{32}$″ dia. × $\frac{7}{8}$″ long	1
35	239230	Bracket	1


12
10
12
11
7
1
18
20
2
19
21
16
22
23
24
25
20
4
15
16
14
3
6
13
8
9
39
30
38
17
27
35
5
32
37
36
31
28
26
34
33

Piston and Connecting Rod. Unit ECN.79

(Arrangement Part No. 281330)

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
1	281281	Piston	6
2	289382	Piston ring, taper, top	6
3	281282	Piston ring, taper, second and third	12
4	281283	Piston ring, scraper	12
5	281416	Gudgeon pin	6
6	116674	Seeger circlip, 1⅝″ i/dia.	12
7	227643	Connecting rod and cap with small end bush	6
8	97975	Bush, small end	6
9	227635	Bolt, ⅝″ dia., B.S.F.	~~10~~ 12
10	227634	Nut, ⅝″ dia., B.S.F., slotted	12
	K5681	Split pin, ⅛″ dia.	12
11	227845	Big end bearing, half bearings	12



PL.7967

W/1256

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	Starter Motor Unit SM.56 (Arrangement Part No. 234781)	
298467	Starter motor, C.A.V. type U.624/13	1
234542	Bracket, starter motor	1
160423	Strap	2
51101	Strap	2
X1832	Spindle	2
K5681	Split pin $\frac{1}{8}$" dia. x $1\frac{1}{3}$" long	4
50572	Pin	4
X70245	Saddle washer	4
X70270	Bolt, $\frac{3}{8}$" dia. x 3" long, B.S.F. strap	2
X63521	Nut, $\frac{3}{8}$" dia., B.S.F.	2
234543	Joint, starter motor bracket	1

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	INJECTORS. UNIT N.35.	
	(Arrangement Part No. 293529)	
293540	Injectors, assembled complete	
267600	Injector body and needle valve, complete	6
227941	Injector body	6
241462	Setscrew, 5 BA. cheese head	6
267596	Needle valve	6
293961	Nozzle	6
X89721	Locknut	6
X20508	Washer, for spring	6
X15108	Valve spring	6
238191	Spring adjustment washer	6
227942	Injector end-plug	6
X15116	Washer, inlet adapter	6
232427	Inlet adapter	6
226721	Edgewise fuel filter	6
231931	Oil seal	6
231256	Leak-off adapter	6
145565	Washer, leak-off adapter	6
191588	Washer, injector seating	6
232432	Leak-off pipe, assembled complete	2
235108	Pipe, complete, adapter to leak-off gallery	2
260057	Pipe, complete, leak-off gallery	1

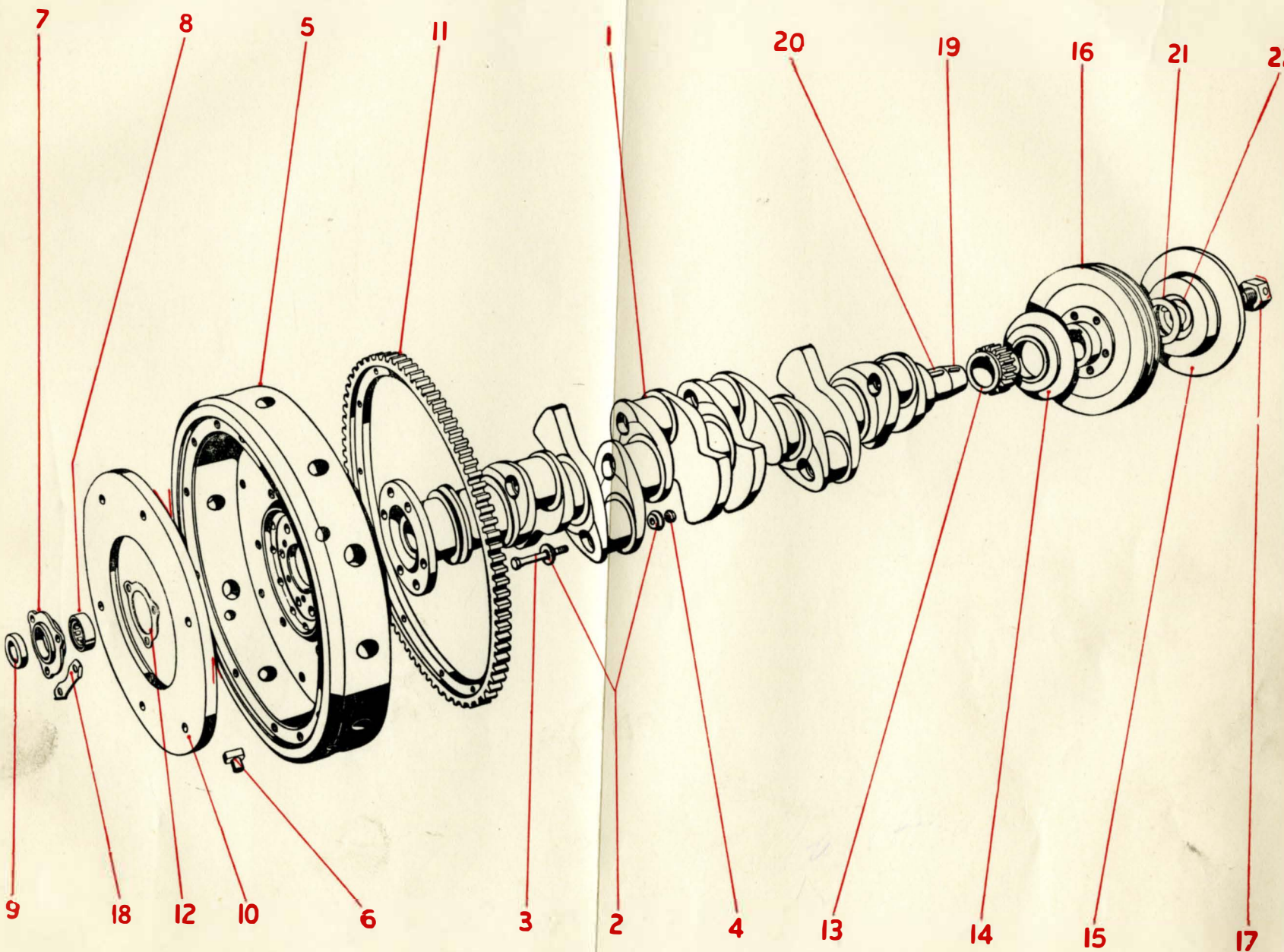
Fuel Filter. Unit EFF.39

(Arrangement Part No. 544906)

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	312883	**Fuel filter, complete**	1
	529192	Fuel filter, C.A.V. type 2F3/13L	1
	529352	Adapter, C.A.V. type 7092/78A	2
	529354	Plug, C.A.V. type 7097/81C	1
	529353	Washer, C.A.V. type 5339/308	3
	544921	Pipe complete, air bell to filter	1
	544908	Pipe complete, filter to fuel pump	1
	544920	Bleeder pipe, complete	1
	FB107/28	Bolt, $\frac{7}{16}$" dia. × $3\frac{1}{2}$" long, B.S.F. } Filter to water outlet pipe	2
	FN107/L	Nut, $\frac{7}{16}$" dia., B.S.F. ... ... } Filter to water outlet pipe	2
	X75963	Washer, $\frac{7}{16}$" dia., Thackeray } Filter to water outlet pipe	2
	544023	Orifice adapter for fuel filter	1
	600391	Filter element	2
	600400	Clip, fuel filter pipes	2

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Crankshaft. Unit ECS.100	
		(Arrangement Part No. 535523)	
		▶ **Note: See end of Section for Unit Suffix changes. Parts affected are marked ▶**	
1	509719	**Crankshaft, complete with plugs and bolts**	1
2	191198	Plug	12
3	227797	Bolt	6
4	191200	Nut	6
	K5659	Split pin, $\frac{1}{16}$" dia. × $\frac{3}{4}$" long	6
5	257754	**Flywheel, complete with clutch driving pegs**	
6	231326	Clutch driving peg	4
	234099	**Spigot bearing housing, complete**	1
7	X33335	Housing, spigot bearing	1
8	X31882	Roller bearing	1
9	234341	Oil seal, Super type No. 21912	1
	600785	Oil seal, Burtonwood, alternative	1
10	245886	Clutch facing	1
	X72339	Bolt, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F. } Facing to flywheel	12
	X75905	Washer, $\frac{5}{16}$" dia., shakeproof }	12
11	257756	Starter ring	1
	243477	Bolt, $\frac{3}{8}$" dia. × $\frac{7}{8}$" long, B.S.F. } Starter ring to flywheel	12
	257686	Locking plate ... ... }	12
12	X33336	Joint, spigot bearing housing	1
	233755	Setscrew, $\frac{5}{16}$" dia. × $\frac{5}{8}$" long, housing to flywheel	3
13	▶ 227789	Timing gear, complete with oil thrower	1
14	232480	Oil thrower	1
15	▶ 535522	**Pulley and damper, complete**	1
	528728	Damper, complete	1
16	535397	Pulley	1
	234119	Setscrew, $\frac{7}{16}$" dia. × $\frac{3}{4}$" long, B.S.F., damper to pulley	6
	X75921	Washer, $\frac{7}{16}$" dia., plain	6
	60544	Dowel	2
17	509720	**Starting clutch, complete**	1
	234175	Pin, starting clutch	1
	133709	Bolt, $\frac{5}{8}$" dia. × $1\frac{1}{2}$" long, B.S.F. } Flywheel to crankshaft	6
	133710	Nut, $\frac{5}{8}$" dia., B.S.F. ... ... }	6
18	X32531	Locking plate	3
19	227796	Key, pulley	1
20	507026	Key, timing gear	1
21	509722	Locking washer, starting clutch	1
22	509723	Shim, starting clutch	as reqd.

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		SUFFIX A	
		PARTS DELETED (Arrangement Part No. 535523)	
	535522	Pulley and damper, complete	1
	227789	Timing gear, complete	1
		ADDITIONAL PARTS (Arrangement Part No. 545542)	
	544371	**Pulley and damper, complete**	1
	544130	Damper, complete	1
	535397	Pulley	1
	544372	Spacer ring	1
	544392	Bolt, $\frac{7}{16}$" dia. × $1\frac{5}{8}$" long, B.S.F.	6
	X75921	Washer, $\frac{7}{16}$" dia., plain	6
	544393	Dowel	2
	234097	Timing gear, complete with oil thrower, Part No. 232480	1



TYPICAL ILLUSTRATION

PL.6595 PL.40011 PL.40009

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	CRANKCASE AND CYLINDERS	
	UNIT ECC.131/29	
	(Arrangement Part No. 552215)	
	All parts as quoted on unit specification ECC.131 with the following exceptions	
552216	Crankcase with bearings caps and covers complete, replaces Part No. 293133 and comprises the same with the following exceptions	1
	Additional	
227836	Stud $\frac{3}{8}$" dia x 1.5" B.S.F. for dynamo bracket	8
X85205	Nut $\frac{3}{8}$" dia Simmonds B.S.F. for dynamo bracket	8
227933	Stud 5/16" dia x 1.3" long B.S.F. Venturi Breather	2
184806	Nut 5/16" dia Simmonds B.S.F. Venturi Breather	2
FS106/5D	Setscrew $\frac{3}{8}$" dia x $\frac{5}{8}$" long B.S.F. in change speed facing	7
145565	Washer in change speed facing	7
	Parts Deleted	
FS106/5D	Setscrew, in dynamo bracket facing	8
145565	Washer	8
FS105/5D	Setscrew in Venturi breather stud holes	2
205159	Washer	2
227836	Stud $\frac{3}{8}$" dia x 1.5" long B.S.F Change Speed Casing	7
FN106/L	Nut $\frac{3}{8}$" dia B.S.F. Change Speed Casing	7
X75962	Washer $\frac{3}{8}$" dia Thackeray Change Speed Casing	7
241486	Side cover right hand front complete replaces Part No. 279176 and comprises the same with the following exceptions	1

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
241488	Side cover right hand front complete, replaces Part No. 234993 and comprises the same with the following exceptions	1
240958	Side cover right hand front, replaces Part No. 234365	1
227933	Stud 5/16" dia x 1.3" long B.S.F. (Oil Filler Additional)	4
184806	Nut 5/16" dia Simmonds (Oil Filler Additional)	4
234369	Shield (Additional Parts)	1
233755	Setscrew 5/16" dia x ½" long for shield (Additional Parts)	4
279177	Cover for breather facing (Parts Deleted)	1
227919	Joint (Parts Deleted)	1
235056	Setscrew 5/16" dia x ⅞" long B.S.F. for cover (Parts Deleted)	1
	ADDITIONAL PARTS	
241487	Oil filler and cap complete	1
241489	Filler complete	1
240955	Oil filler elbow	1
227809	Dowel	3
234009	Filler cap. complete	1
227813	Filler cap	1
227814	Sealing ring	1
227810	Cam	1
227811	Handle	1
227484	Spring	1
227815	Bolt	1
FN406/L	Nut ⅜" dia slotted B.S.F.	1
K5660	Split pin 1/16" x ⅞" long	1
227808	Hinge pin	1
K5658	Split pin 1/16" dia x ⅝" long	2
X75918	Washer ¼" dia plain	2
FB105/7D	Setscrew 5/16" dia x ⅞" long B.S.F. side cover right hand, replaces Part No. 235056	1

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	ADDITIONAL PARTS	
X75961	Washer 5/16" dia Thackeray	1
240956	Joint for oil filler	2
240957	Perforated plate for oil filler	1
	REPLACEMENT PARTS	
241258	Flywheel housing complete, replaces Part No.234988 and comprises the same with the following exceptions	1
	ADDITIONAL PARTS	
222890	Stud 5/16" dia x 2" long for cover	4
FN105/L	Nut 5/16" dia plain B.S.F.	4
X75961	Washer 5/16" dia Thackeray	4
241259	Cover	1
241260	Joint for cover	1
	REPLACEMENT PARTS	
242061	Water inlet pipe, replaces Part No.234859	1
FB106/8D	Bolt $\frac{3}{8}$" dia x 1" long rear cover, replaces Part No. FB106/13	2
	ADDITIONAL PARTS	
237961	Rear cover	1
234734	Venturi breather	1
227918	Air and oil separator	1
227919	Joint	2
235056	Setscrew 5/16" dia x $\frac{7}{8}$" long B.S.F. Venturi breather	1
310435	Smiths oil pressure switch	1
259803	Adaptor	1
146855	Washer	1
	PARTS DELETED	
234730	Rear control bracket complete	1
234733	Control rod complete	1
232884	Stop tail - Oil Gauge connection	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Crankcase and Cylinders. Unit ECC.131 (Arrangement Part No. 516971)	
	293133	**Crankcase, Part No. 280658, complete with bearing caps and covers**	1
	227663	Bearing cap, front	1
	227664	Bearing cap, intermediate	4
	227665	Bearing cap, centre	1
	227666	Bearing cap, rear	1
	131302	Dowel, centre bearing cap	1
	227805	Stud, $\frac{3}{4}$" dia. × 6·15" long, bearing caps, alternative to 535545	14
	535545	Stud, $\frac{3}{4}$" dia. × 6·75" long, bearing caps, alternative to 227805	14
	227804	Nut, $\frac{3}{4}$" dia., castle	14
	X75925	Washer, $\frac{3}{4}$" dia., plain	14
	K5698	Split pin, $\frac{5}{32}$" dia. × $1\frac{1}{2}$" long	14
	227781	Camshaft bearing, front	1
	283718	Camshaft bearing, rear	1
	227783	Camshaft bearing, intermediate	5
	227874	Locating screw	4
	227903	Locating screw	1
	205159	Washer, for locating screws	4
	121421	Dowel, front camshaft bearing	1
	121975	Taper plug, 1" B.S. pipe	8
	24778	Taper plug, $\frac{5}{8}$" B.S. pipe	1
	9545	Taper plug, $\frac{1}{4}$" B.S. pipe	5
	9806	Taper plug, $\frac{1}{8}$" B.S. pipe, oilway to cylinder head	2
	10335	Plug, $1\frac{1}{4}$" B.S. pipe, water gallery	1
	227864	Plug, $\frac{7}{8}$" dia., B.S.F., oil gallery	3
	267350	Plug, $\frac{1}{8}$" B.S. pipe, oilway to camshaft	1
	257782	Washer	1
	9545	Plug, $\frac{1}{4}$" B.S. pipe	1
	232470	Washer	1
	234413	Bush, oil pump driving shaft	1
	60544	Dowel, front suspension brackets	4
	60544	Dowel, starter motor bracket	2
	60544	Dowel, fuel pump bracket	2
	227869	Stud, $\frac{9}{16}$" dia. × 5·2" long, cylinder head	32
	227870	Stud, $\frac{9}{16}$" dia. × 7·1" long, cylinder head	2
	227872	Nut, $\frac{9}{16}$" dia., B.S.F.	32
	509561	Extension nut, $\frac{9}{16}$" dia., B.S.F., cylinder head	2
	232424	Stud, $\frac{7}{16}$" dia. × 2·4" long, cylinder head	12
	257153	Nut, $\frac{7}{16}$" dia., B.S.F.	12
	227873	Stud, $\frac{3}{8}$" dia. × 1·7" long, fuel pump bracket	4
	X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds	4
	231709	Stud, $\frac{3}{8}$" dia. × 1·4" long, starter motor bracket	6
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F.	6
	X75949	Washer, $\frac{3}{8}$" dia., Kolok	6
	FS105/7	Setscrew, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F., relief valve body	4
	X75948	Nut, $\frac{5}{16}$" dia., B.S.F., Simmonds	4
	227694	Stud, $\frac{5}{16}$" dia. × 1·25" long, delivery flange	2
	FN405/L	Nut, $\frac{5}{16}$" dia., B.S.F.	2
	227836	Stud, $\frac{3}{8}$" dia. × 1·5" long, sump to crankcase	22

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	233156	Stud, $\frac{3}{8}$" dia. × 1·6" long, B.S.F., sump to crankcase	2
	232470	Washer	1
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F.	24
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	24
	235074	Stud, $\frac{3}{8}$" dia. × 1·45" long, oil pump body	3
	FN406/L	Nut, $\frac{3}{8}$" dia., B.S.F., slotted	3
	X75920	Washer, $\frac{3}{8}$" dia., plain	3
	280843	Cylinder liner	6
	FS105/5	Setscrew, $\frac{5}{16}$" dia. × $\frac{5}{8}$" long } Venturi breather stud holes	2
	205159	Washer }	2
	222942	Stud, $\frac{7}{16}$" dia. × 1$\frac{3}{4}$" long, B.S.F. }	8
	FN107/L	Nut, $\frac{7}{16}$" dia., B.S.F., plain } Front suspension bracket	8
	X75950	Washer, $\frac{7}{16}$" dia., Kolok }	8
	227836	Stud, $\frac{3}{8}$" dia. × 1·5" long, B.S.F. } Water inlet pipe	1
	227914	Stud, $\frac{3}{8}$" dia. × 1·9" long, B.S.F. }	2
	X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds	3
	FS106/5	Setscrew, $\frac{3}{8}$" dia. × $\frac{5}{8}$" long, B.S.F. } Dynamo facing	8
	145565	Washer }	8
	227836	Stud, $\frac{3}{8}$" dia. × 1·5" long }	7
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F., plain } Change speed casing	7
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray }	7
	227836	Stud, $\frac{3}{8}$" dia. × 1·5" long, B.S.F. }	4
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F., plain } Oil filter	4
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray }	4
	535765	Stud, $\frac{9}{16}$" dia. × 5·2" long, for cylinder head, alternative to 227869	2
	535766	Stud, $\frac{9}{16}$" dia. × 7·1" long, for cylinder head, alternative to 227870	2
	279176	**Side cover, right hand front, complete**	1
	234993	**Side cover, right hand, complete with studs and nuts**	1
	234365	Side cover, right hand, front	1
	227933	Stud, $\frac{5}{16}$" dia. × 1·3" long, B.S.F.	2
	184806	Nut, $\frac{5}{16}$" dia., B.S.F., Simmonds	2
	279177	Cover, breather facing	1
	227919	Joint	1
	235056	Setscrew, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F., for cover	1
	241705	Retainer bar	1
	298172	Ferrule	2
	232886	Setscrew, $\frac{5}{16}$" dia. × 1$\frac{1}{8}$" long, B.S.F., retainer bar	2
	241713	**Side cover, right hand rear, complete**	1
	231604	Side cover, right hand	1
	241705	Retainer bar	1
	132402	Ferrule	2
	232886	Setscrew, $\frac{5}{16}$" dia. × 1$\frac{1}{8}$" long, retainer bar	2

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	234377	Front cover	1
	234378	Joint	1
	FB105/7	Bolt, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F., front cover	4
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	4
	227747	Side cover, left hand	2
	227855	Joint	2
	FS105/6	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, B.S.F., left hand side covers	20
	205159	Washer	20
	227752	Water gallery cover	1
	227753	Joint	1
	FB105/7	Bolt, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F., water gallery cover	3
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	3
	227759	Joint, right hand covers	2
	FB105/7	Bolt, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F., right hand covers	27
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	27
	235056	Setscrew, $\frac{5}{16}$" dia. × $\frac{7}{8}$" long, B.S.F.	1
	234988	**Flywheel housing, complete**	1
	FB106/12	Bolt, $\frac{3}{8}$" dia. × $1\frac{1}{2}$" long, B.S.F.	6
	FB106/19	Bolt, $\frac{3}{8}$" dia. × $2\frac{3}{8}$" long, B.S.F.	2
	FB106/14	Bolt, $\frac{3}{8}$" dia. × $1\frac{3}{4}$" long, B.S.F.	2
	X85205	Nut, $\frac{3}{8}$" dia., Simmonds	8
	X75949	Washer, $\frac{3}{8}$" dia., Kolok	2
	227876	Stud, $\frac{3}{8}$" dia. × 3" long, flywheel housing to sump	3
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F., plain	3
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	3
	232367	**Timing plunger, complete with housing**	1
	234088	**Timing plunger, complete**	1
	227425	Timing plunger	1
	145564	Peg	1
	232371	**Timing plunger housing, complete**	1
	X32838	Timing plunger housing	1
	X32840	Timing plate	1
	X44291	Screw, Parker No. 0	4
	171352	Pin	1
	X32839	Cap	1
	X32842	Spring	1
	233390	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long	1
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	1
	238771	Sealing ring	2
	239987	Screw, Allen, $\frac{1}{4}$" dia., B.S.F., plunger housing	3
	234728	**Camshaft, complete**	1
	234550	Camshaft	1
	234379	Plug	1
	60284	Dowel	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	234729	**Oil relief valve, complete**	1
	227771	Oil relief valve body	1
	237996	Oil relief valve	1
	260513	Oil relief valve spring	1
	227773	Adjusting screw	1
	227772	Domed nut	1
	227774	Locknut	1
	X84441	Washer	2
	234732	**Oil pump thrust housing, complete**	1
	227684	Oil pump thrust housing	1
	258340	Thrust button	1
	246568	Drain pipe, complete	1
	234730	**Rear control bracket, complete**	1
	234992	**Control bracket, complete**	1
	278730	Bush	2
	X830	Control shaft	1
	234858	Control lever, left hand	1
	243078	Control lever, right hand	1
	FB104/9	Bolt, $\frac{1}{4}$" dia. × $1\frac{1}{8}$" long, B.S.F.	2
	FN104/L	Nut, $\frac{1}{4}$" dia., B.S.F., plain	2
	X75947	Washer, $\frac{1}{4}$" dia., Kolok	2
	234733	**Control rod, complete**	1
	184718	Ball joint, complete	2
	122252	Control rod	1
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F., plain	4
	X75948	Washer, $\frac{5}{16}$" dia., Kolok	2
	227840	Main bearing, front	2
	227841	Main bearing, intermediate	8
	227842	Main bearing, centre and rear	4
	227843	Thrust washer, upper	2
	227844	Thrust washer, lower	2
	227790	Driving gear, camshaft	1
	227776	Tab washer, driving gear	2
	238832	Bolt, $\frac{7}{16}$" dia. × 1·12" long, B.S.F., camshaft driving gear	4
	227775	Thrust washer	1
	242667	Shim, for washer	as reqd.
	236513	Bolt, $\frac{3}{8}$" dia. × 1·10" long, B.S.F., thrust washer	4
	227750	Push rod	12
	227751	Tappet	12
	232482	Intermediate gear	1
	233364	Bush	1
	234853	Spindle	1
	234854	Bolt	1
	234855	Nut	1
	234856	Washer, plain	1
	233365	Thrust washer	2
	K5674	Split pin, $\frac{3}{32}$" dia. × $1\frac{1}{4}$" long	1
	227835	Timing backplate	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	227856	Joint, timing backplate	1
	116734	Dowel, timing backplate	2
	239792	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, B.S.F., timing backplate	4
	234917	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, B.S.F., backplate to crankcase	9
	234419	Driving shaft, oil pump	1
	227857	Joint, flywheel housing	1
	227755	Joint, rear control bracket	1
	242367	Bolt, $\frac{7}{16}$" dia. × 2$\frac{3}{4}$" long, B.S.F., flywheel housing to crankcase	3
	182955	Nut, $\frac{7}{16}$" dia., B.S.F., Simmonds	3
	235057	Bolt, $\frac{7}{16}$" dia. × 1$\frac{3}{4}$" long, flywheel housing to crankcase	9
	X75921	Washer, $\frac{7}{16}$" dia., plain	12
	232884	Stop tap, Rotherham type T1, oil gauge connection	1
	227854	Joint, oil relief valve	1
	234916	Joint, pump thrust housing	1
	145565	Washer	1
	233581	Engine suspension bracket, front, left hand	1
	233582	Engine suspension bracket, front, right hand	1
	235675	Joint, suspension brackets	2
	FB107/46	Bolt, $\frac{7}{16}$" dia. × 5$\frac{3}{4}$" long, B.S.F.	10
	FN107/L	Nut, $\frac{7}{16}$" dia., B.S.F., plain — Flywheel housing to clutch housing	10
	X75963	Washer, $\frac{7}{16}$" dia., Thackeray	10
	234859	Water inlet pipe	1
	227868	Joint	1
	13834	Plug, water inlet pipe	3
	X42629	Washer	3
	240380	Adapter, drain pipe	2
	146855	Washer	2
	298719	Water drain tap	1
	298248	Washer	1
	FB107/15	Bolt	2
	182955	Nut, $\frac{7}{16}$" dia., B.S.F., Simmonds — Flywheel housing to crossmember	2
	X75921	Washer, $\frac{7}{16}$" dia., plain	2
	231966	Setscrew, $\frac{5}{16}$" dia., B.S.F., oil pump thrust housing	2
	X75889	Washer, $\frac{5}{16}$" dia., S.P. external	2
	FB106/13	Bolt, $\frac{3}{8}$" dia. × 1$\frac{5}{8}$" long, B.S.F.	2
	FB106/8	Bolt, $\frac{3}{8}$" dia. × 1" long, B.S.F. — Rear control bracket	2
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	4

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	CYLINDER HEAD. UNIT ECH.134A/22	
	(Arrangement Part No. 552224)	
	All parts as quoted on unit specification ECH134A with the following exceptions	
	REPLACEMENT PARTS	
546704	Water outlet pipe complete, replaces Part No. 544904 and comprises the same with the following exceptions	1
546697	Water outlet pipe, replaces Part No. 544635	1
240919	Adaptor } Additional	1
X42629	Washer }	1
257140	Cylinder head cover front, replaces Part No. 281379	1
	ADDITIONAL PARTS	
510227	Instruction plate	1
	PARTS DELETED	
545253	Inlet manifold complete	1
311483	Venturi complete	1
278586	Breather Pipe	1
280853	Joint	2
FS105/6D	Setscrew for breather pipe	2
X75961	Washer 5/16" dia Thackeray	2
298401	Air and Oil separator	1
X85205	Nut 3/8" dia Simmonds for Venturi	2

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Cylinder Head. Unit ECH.134 (Arrangement Part No. 527156) ▶ **Note: See end of Section for Unit Suffix changes. Parts affected are marked** ▶	
	281317	**Cylinder head, Part No. 281108, and valves, complete**	2
1	281324	**Cylinder head, complete with plugs, studs, etc.**	2
	13834	Plug, ½" dia., B.S. pipe	4
	X31911	Core plug, ½" dia., B.S. pipe	14
2	255695	Plug, ¾" dia., B.S.F.	6
	131347	Washer	6
3	281325	Valve guide	12
5	281326	Valve seat, exhaust	6
6	227911	Sleeve, nozzle holder	6
7	227914	Stud, ⅜" dia., B.S.F., exhaust manifold	10
	227915	Nut, ⅜" dia., B.S.F.	10
8	227873	Stud, ⅜" dia. × 1·7" long, inlet manifold	10
	X85205	Nut, ⅜" dia., B.S.F., Simmonds	10
9	227763	Stud, ½" dia. × 4·6" long, B.S.F., rocker brackets ...	6
	182677	Nut, ½" dia., B.S.F., Simmonds	6
10	231614	Stud, ½" dia. × 5·5" long, rocker bracket and nozzle clamp	6
	FN108/L	Nut, ½" dia., B.S.F., plain	6
11	227761	Nut, ½" dia., B.S.F., Simmonds, special	6
12	227836	Stud, ⅜" dia. × 1½" long, B.S.F., lifting plate	8
	X85205	Nut, ⅜" dia., B.S.F.	8
13	121421	Dowel, for rocker bracket	4
14	121421	Dowel, cylinder head cover	4
15	242199	Liner in stud holes	as reqd.
	242709	Liner in oil holes	2
	256641	Liner in stud holes	as reqd.
16	227733	Lifting nut	4
17	60050	Lifting plate	4
18	280864	Valve inlet	6
19	280865	Valve exhaust	6
20	236489	Valve spring, inner	12
21	236490	Valve spring, outer	12
22	236177	Valve spring collar	12
23	236541	Valve cone, two halves	12
24	190832	Valve seal } Alternative	12
25	600881	Valve seal } Alternative	12
	236178	Valve spring collar, lower	12
	234068	**Decompressor and rocker gear, complete**	2
26	234736	**Rocker lever inlet, complete**	6
	234072	Rocker lever inlet with bush, Part No. 223256 Ref. 27	6
28	227737	Ball end, rocker lever	6
	227738	Locknut	6

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
29	234735	**Rocker lever exhaust, complete**	6
	234073	Rocker lever exhaust, complete with bush, Part No. 223256 Ref. 27	6
28	227737	Ball end, rocker lever	6
	227738	Locknut	6
30	227745	Decompressor shaft	2
31	231490	Decompressor lever	2
	FB104/14	Bolt, $\frac{1}{4}$" dia. × $1\frac{3}{4}$" long, B.S.F.	2
	185495	Nut, $\frac{1}{4}$" dia., B.S.F., Simmonds	1
	FN104/L	Nut, $\frac{1}{4}$" dia., B.S.F., plain	1
	X75947	Washer, $\frac{1}{4}$" dia., Kolok	1
32	232426	Plunger, decompressor shaft	2
33	12373	Spring, plunger	2
34	227743	Rocker shaft	2
35	232428	Rocker bracket	6
36	60166	Spring, long	4
37	60186	Spring, short	4
38	60143	Washer, spring	12
39	60112	Circlip, shaft	4
40	60142	Washer, circlip	4
41	60207	Welch washer, shaft	4
	▶ 234070	**Water outlet pipe, complete**	1
42	▶ 287521	Water outlet pipe	1
43	▶ 511608	Thermostat, complete	1
44	227937	Water outlet elbow	1
45	227938	Joint	1
46	X16631	Setscrew, locating thermostat	1
	227940	Washer	1
	FB105/10	Bolt, $\frac{5}{16}$" dia. × $1\frac{1}{4}$" long ... } Elbow to pipe	4
	184806	Nut, $\frac{5}{16}$" dia., B.S.F., Simmonds }	4
47	227923	Hose elbow to pump	1
48	262539	Hose clip, Jubilee No. IX	2
49	13834	Plug, $\frac{1}{2}$" dia., B.S. pipe	4
	X42629	Washer	4
	▶ 281318	**Inlet manifold, complete**	1
50	281119	Inlet manifold	1
51	121975	Plug, 1" B.S. pipe	2
	FS106/4	Setscrew, $\frac{3}{8}$" dia. × $\frac{1}{2}$" long, B.S.F.	1
	▶ 227873	Stud, $\frac{3}{8}$" dia. × 1·7" long, B.S.F. } Fuel filter	4
52	▶ X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds }	4
53	510227	Instruction plate	1
	229992	Parker Kalon screw	4
	FS104/4	Setscrew, $\frac{1}{4}$" dia. × $\frac{1}{2}$" long ... } Heat shield bosses	6
	X3076	Washer... ... ... }	6
	FS106/7	Setscrew, $\frac{3}{8}$" dia. × $\frac{7}{8}$" long ... } Pipe clip	1
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray ... }	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
54	311483	Venturi, complete	1
55	281379	Cylinder head cover, front	1
56	232430	Joint, covers	2
57	281321	Cylinder head gasket	2
	600854	**Non-return valve, complete**	2
	600848	Adapter	2
	600849	Union adapter	2
	600850	Spring	2
	600851	Ball, $\frac{1}{4}$" dia., Hoffmann	2
	270319	Washer	2
58	156885	Nut	2
59	191286	Valve cap	12
60	257140	Cylinder head cover, rear	1
61	227913	Joint, rocker bracket	6
62	281323	Joint, inlet manifold (1, 2, 4 and 5 cylinders)	2
63	281322	Joint, inlet manifold (3 and 6 cylinders)	2
64	231613	Clamp nozzles	6
65	281117	Exhaust manifold, front	1
66	281320	**Exhaust manifold, rear, complete**	1
	281118	Exhaust manifold, rear	1
	145257	Stud, $\frac{1}{2}$" dia. × $2\frac{5}{16}$" long, Whitworth	3
	41358	Nut, $\frac{1}{2}$" dia., Whitworth	3
	X75961	Washer, $\frac{1}{2}$" dia., Kolok	3
67	227784	Centre tube, exhaust manifolds	1
68	227764	Gasket, exhaust manifold	4
69	227931	Joint, venturi and inlet manifold	1
70	227767	Joint, water outlet pipe	2
71	246173	Setscrew, cylinder head cover	12
	FB106/16	Setscrew, $\frac{3}{8}$" dia. × 2" long, B.S.F., water outlet pipe	3
	FB106/11	Setscrew, $\frac{3}{8}$" dia. × $1\frac{3}{8}$" long, B.S.F., water outlet pipe	1
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	4
72	278586	Breather pipe	1
73	280853	Joint, breather pipe	2
	298401	Air and oil separator	1
	FS105/6	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, breather pipe	2
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	2
	X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds, venturi	2
	511177	Eye bolt	2

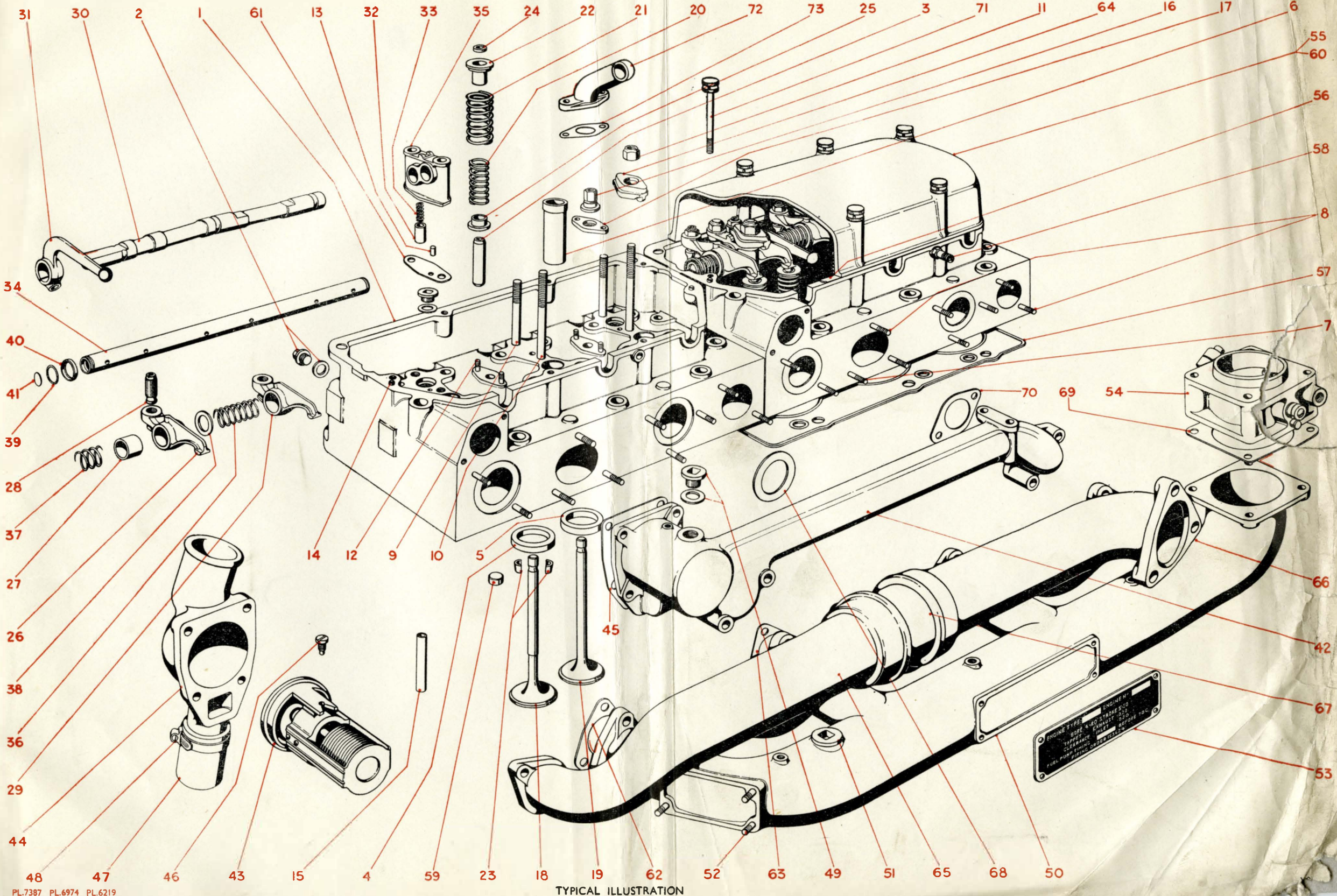
UNIT SUFFIX A
(Arrangement Part No. 544902)

544904	**Water outlet pipe complete, replaces Part No. 234070 and comprises the same with the following exceptions**	1
544635	Water outlet pipe replaces Part No. 287521	1
541165	Thermostat complete, replaces Part No. 511608	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	545253	**Inlet manifold complete, replaces Part No. 281318 and comprises the same with the following exceptions**	1
		PARTS DELETED	
	227873	Stud, $\frac{3}{8}$" dia. × 1·7" long, B.S.F., fuel filter	4
	X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds	4
		ADDITIONAL PARTS	
	FS106/4	Setscrew, $\frac{3}{8}$" dia. × $\frac{1}{2}$" long, B.S.F.	1
	233172	Plug, $\frac{3}{8}$" dia., B.S.F., filter pipe clip	1
	X85205	Nut, $\frac{3}{8}$" dia., B.S.F., Simmonds	1

Cylinder Head

Unit ECH.134



PL.7387 PL.6974 PL.6219

TYPICAL ILLUSTRATION

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	COMPRESSOR UNIT ECR.28/8	
	(Arrangement Part No. 552236)	
	All parts as quoted on unit specification ECR.28 with the following exceptions	
	REPLACEMENT PARTS	
262989	Pipe complete, compressor oil supply, replaces Part No's 247228 and 280640	1
	ADDITIONAL PARTS	
262993	Water outlet pipe complete	1
552660	Water inlet pipe complete	1
254529	Elbow in water inlet pipe	1
508236	Gear	1
238710	Coupling flange	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Compressor. Unit ECR.28 (Arrangement Part No. 529489)	
	529426	Compressor, Clayton, alternative to 529464	1
	529464	Compressor, Westinghouse, alternative to 529426	1
	508236	Gear	1
	238710	Coupling flange	1
	239307	**Coupling, complete**	1
	239303	Coupling	1
	X31724	Driving plate	6
	238711	Sleeve	8
	238851	Bolt, $\frac{3}{8}$" dia. × $\frac{7}{8}$" long, B.S.F.	8
	FN406/L	Nut, $\frac{3}{8}$" dia., B.S.F.	8
	K5660	Split pin, $\frac{1}{16}$" dia. × $\frac{7}{8}$" long	8
	239304	Adjusting plate	1
	247228	Oil pipe, complete, Clayton compressor	1
	280640	Oil pipe, complete, Westinghouse compressor	1
	239504	Banjo bolt	2
	146855	Washer, banjo bolt	4
	227897	Joint, compressor to back plate	1
	FB105/21	Bolt, $\frac{5}{16}$" dia. × 2·625" long, B.S.F., compressor to timing case	2
	FB105/25	Bolt, $\frac{5}{16}$" dia. × 3·125" long, B.S.F., compressor to timing case	2
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F.	4
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	6
	FB105/19	Bolt, $\frac{5}{16}$" dia. × 2·375" long, B.S.F., compressor to timing case	2
	244038	Bolt, $\frac{5}{16}$" dia. × ·75" long, B.S.F., compressor to timing case	2
	X75948	Washer, $\frac{5}{16}$" dia., Kolok	2
	231262	Cover, on timing case	1
	FS105/6	Setscrew, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, B.S.F., adjusting plate to flywheel	2
	X75919	Washer, $\frac{5}{16}$" dia., plain	2
	X75948	Washer, $\frac{5}{16}$" dia., Kolok	2

Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	TIMING CASE. UNIT.ETC.82/2	
	(Arrangement Part No. 543023)	
	All parts as quoted on unit specification ETC.82 with the following exceptions.	
	REPLACEMENT PARTS	
543024	Timing case complete, replaces Part No. 535530 and comprises the same parts with the following exceptions:-	1
227839	Stud, for oil filler } Deleted	3
184806	Nut, 5/16" dia., B.S.F. Simmonds } Deleted	3
	ADDITIONAL PARTS	
240298	Cover, oil filler facing	1
235056	Setscrew, 5/16" dia x $\frac{7}{8}$" long, B.S.F, cover to timing case	3
	PARTS DELETED	
234299	Oil filler and cap complete	1
227879	Joint, for oil filler	1
234301	Plate, perforated	1

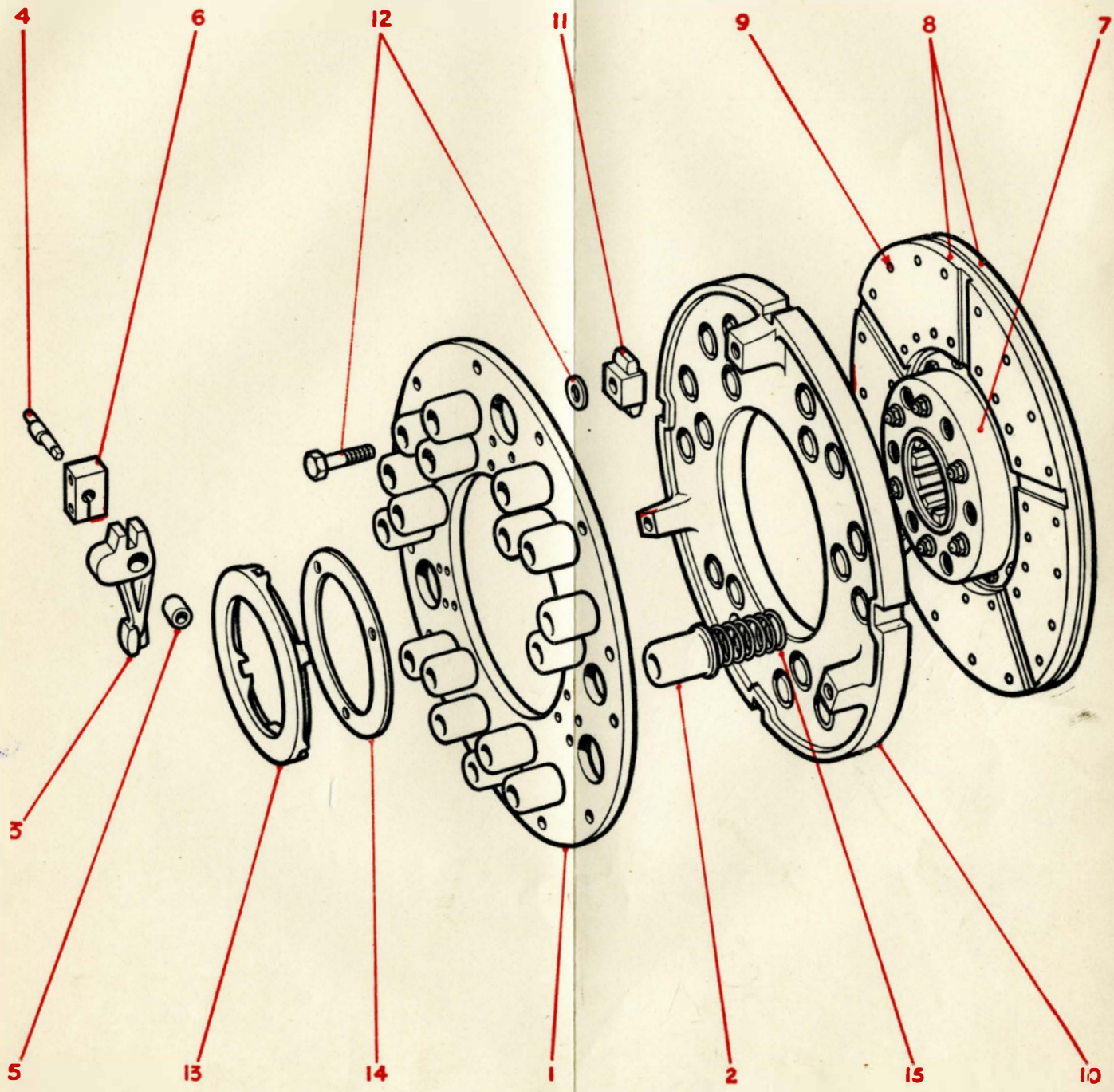
Leyland Basic Part No.	Description	No. reqd. per vehicle
	Timing Case. Unit ETC.82 (Arrangement Part No. 535529)	
535530	Timing case complete	1
535398	Timing case	1
529152	Oil seal, Superfect type DA.387224	1
227839	Stud, 5/16" dia. x 1.4" long, B.S.F., for oil filler	3
184806	Nut, 5/16" dia., B.S.F., Simmonds	3
187083	Stud, 5/16" dia. x 1¼" long, B.S.F., for flange or elbow	2
FN105/L	Nut, 5/16" dia., B.S.F.	2
X75948	Washer, 5/16" dia., Kolok	2
239190	Stud, 7/16" dia. x 2" long, B.S.F., for dynamo drive housing bracket	3
227871	Stud, 7/16" dia. x 1.8" long, B.S.F., for dynamo drive housing bracket	1
182955	Nut, 7/16" dia., B.S.F., Simmonds	4
238810	Ferrule	4
234299	Oil filler and cap complete	1
234302	Oil filler complete	1
234909	Filler cap complete	1
227813	Filler cap	1
227814	Sealing ring	1
227810	Cam	1
227811	Handle	1
227484	Spring	1
227815	Bolt	1
FN406/L	Nut, ⅜" dia., B.S.F.	1
K5660	Split pin, 1/16" dia. x ⅞" long	1
227808	Hinge pin	1
K5658	Split pin, 1/16" dia. x ⅝" long	2
X75918	Washer, ¼" dia., plain	2
227878	Joint for backplate	1
227593	Joint for elbow or flange	1
227879	Joint for oil filler	2
234301	Plate perforated	1
234918	Bolt, 5/16" dia. x 2½" long, B.S.F.) Timing	1
FB105/18	Bolt, 5/16" dia. x 2¼" long, B.S.F.) case to	2
184806	Nut, 5/16" dia., B.S.F., Simmonds) backplate	3

Leyland Basic Part No.	Description		No. reqd. per vehicle.
FB105/10	Bolt, 5/16" dia. x 1¼" long, B.S.F.	Timing case	3
FB105/18	Bolt, 5/16" dia. x 2¼" long, B.S.F.	to	6
X75961	Washer, 5/16" dia., Thackeray	crankcase	9
FB105/18	Bolt, 5/16" dia., x 2¼" long, B.S.F.	Timing case	1
184806	Nut, 5/16" dia., B.S.F., Simmonds	to exhauster	1

Leyland

CLUTCH

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Clutch. Unit C.30A (Arrangement Part No. 523957)	
	283950	**Driving plate, complete**	1
1	289861	Driving plate	1
2	231696	Spring cup	18
3	231621	Lever	3
4	255621	Pin, lever	3
5	256885	Bush, lever	3
6	231619	Bracket, lever	6
	255622	Bolt, $\frac{5}{16}$" dia. × 1$\frac{5}{16}$" long, B.S.F. } Brackets	12
	X75948	Washer, $\frac{5}{16}$" dia., Kolok ... } Brackets	12
	523956	**Clutch plate, complete with liners**	1
7	523964	Clutch centre, complete	1
8	521134	Liner, Duron type P28	2
8	298161	Liner, Capasco type F.30C (alternative)	2
	547902	Liner, M.19 Mintex ... } Alternative to Part Nos. 298161 and 521134	2
	547903	Liner, DS.4 Ferodo ... } Alternative to Part Nos. 298161 and 521134	2
9	236084	Rivet	40
10	245885	Back plate	1
11	231695	Pressure pad	3
11	243101/20	Shim, pressure pad	as reqd.
12	231730	Bolt, $\frac{1}{2}$" dia., B.S.F. ... } Pressure pads	3
12	X75951	Washer, $\frac{1}{2}$" dia., Kolok } Pressure pads	3
13	231625	Withdrawal plate	1
14	231626	Spring plate	1
	FS104/4D	Setscrew, $\frac{1}{4}$" dia. × $\frac{1}{2}$" long, B.S.F. } Spring plate	3
	X75947	Washer, $\frac{1}{4}$" dia., Kolok ... } Spring plate	3
15	283919	Spring	18
	283737	Bolt, $\frac{3}{8}$" dia. × $\frac{7}{8}$" long, B.S.F., driving plate to flywheel	12



TYPICAL ILLUSTRATION

Leyland

GEARBOX

GEARBOX

Change Speed	Unit CS.72	PL.6281
Gearbox	Unit GB.68	PL.6392

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Change Speed. Unit CS.72 (Arrangement Part No. 234820)	
	X84534	**Change speed lever, complete**	1
1	X71335	Lever	1
2	X5797	Shaft, lever	1
3	242166	Pin, for spherical pivot	1
4	K11012	Dowel	1
5	2161	Knob	1
6	38302	Screw, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long, Whitworth, knob	1
7	234821	**Selector tube, complete**	1
8	156964	Circlip	1
9	148003	Washer	1
	234822	**Casing, bottom, complete with studs**	1
10	234824	Casing, bottom	1
10	222900	Stud, $\frac{5}{16}$" dia. × $3\frac{1}{4}$" long, B.S.F.	4
	222884	Stud, $\frac{5}{16}$" dia. × $1\frac{1}{2}$" long, B.S.F.	10
11	231088	Casing, top	1
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F. } Top to bottom casing	6
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray } Top to bottom casing	6
	235700	Guide plate, complete with studs	2
12	235895	Guide plate	2
13	222884	Stud, $\frac{5}{16}$" dia. × $1\frac{1}{4}$" long, B.S.F.	4
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F. } Guide plates	4
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray } Guide plates	4
14	66494	Die, change speed lever	1
15	60178	Setscrew, $\frac{5}{16}$" dia., B.S.F.	1
15	X75961	Washer, $\frac{5}{16}$" dia., Thackeray	1
16	66497	Cap, lever pivot	1
17	66499	Spring	1
18	66495	Cover, cap	1
19	66502	Bolt, $\frac{1}{4}$" dia. × $1\frac{1}{4}$" long, B.S.F. } Cap	1
19	X75947	Washer, $\frac{1}{4}$" dia., Kolok } Cap	1
20	6972	Plug, oil filler	1
21	231090	Cover, bottom	1
22	231091	Joint, bottom cover	1
	FN105/L	Nut, $\frac{5}{16}$" dia., B.S.F. } Cover	8
	X75961	Washer, $\frac{5}{16}$" dia., Thackeray } Cover	8
23	13834	Drain plug	1
23	X42629	Washer, drain plug	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	231503	Bolt, $\frac{5}{16}$" dia. × 1" long, B.S.F. } Selector tube flange	3
	FN405/L	Nut, $\frac{5}{16}$" dia., B.S.F., slotted	3
	X75919	Washer, $\frac{5}{16}$" dia., plain ...	3
	K5659	Pin, split, $\frac{5}{16}$" dia. × $\frac{3}{4}$" long	3

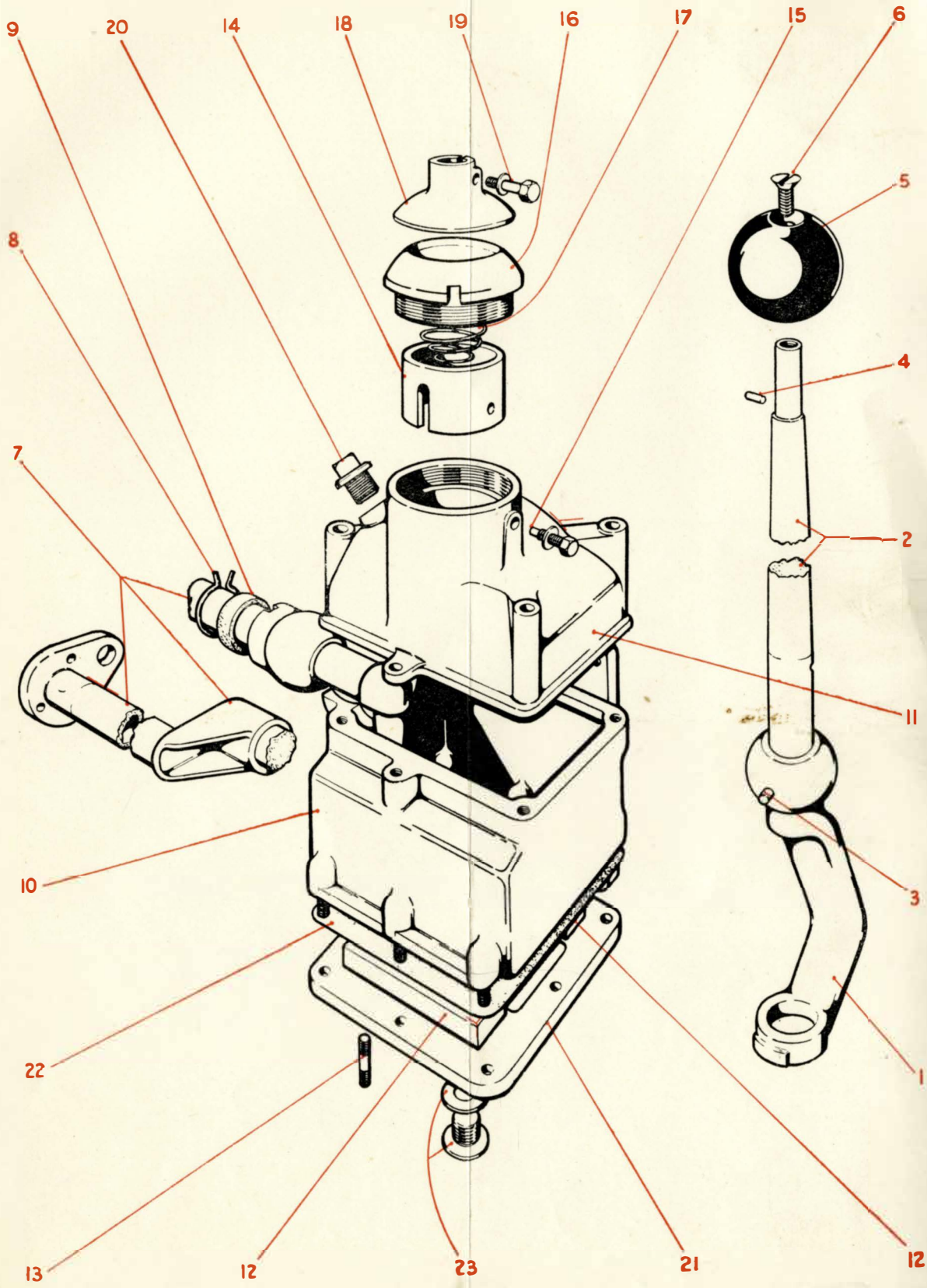

9
20
14
18
19
16
17
15
6
5
8
4
7
2
11
10
3
22
1
13
12
23
21
12

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
		Gearbox. Unit GB.68 (Arrangement Part No. 246143)	
	246144	**Gearbox unit, complete**	1
1	235047	**Gearbox casing, machined and studded**	1
2	63598	Stud, mainshaft front housing to gearbox housing ...	6
3	143285	Stud } Speedometer drive housing to gearbox casing	1
4	102002	Stud }	5
5	232089	Stud, layshaft housing to gearbox casing	4
6	121592	Stud, layshaft rear housing to gearbox casing	4
7	60278	Stud } Side cover to gearbox casing	2
	61163	Stud }	7
	60426	Stud }	3
8	242999	Stud, clutch housing to gearbox casing	7
10	143285	Stud } Change speed casing to gearbox casing	1
	131830	Stud }	1
	61172	Stud }	13
11	234919	Clutch housing	1
	235052	Bolt, $\frac{1}{2}$" dia., B.S.F.	2
	FN408/L	Nut, $\frac{1}{2}$" dia., B.S.F., slotted	2
	X75922	Washer, $\frac{1}{2}$" dia., bevelled	2
	K5672	Split pin, $\frac{3}{32}$" dia.	2
	FN407/L	Nut, $\frac{7}{16}$" dia., B.S.F., slotted	7
	X75963	Washer, $\frac{5}{16}$" dia., Thackeray	7
	K5674	Split pin, $\frac{3}{32}$" dia.	7
12	X3939	Bearing housing, clutch shaft	1
13	X3936	Joint, bearing housing	1
14	2129	Bearing, Hoffmann type M.S. 16...	1
15	238405	Combined shaft and pinion	1
16	X40600	Locknut	1
17	X40601	Lock washer	1
18	234921	Housing, clutch shaft	1
19	X70122 .	Oil seal, Super No. 237116	1
20	X3929	Joint	1
	FN306/L	Nut, castle	6
	K5659	Split pin, $\frac{1}{16}$" dia.	6
21	231634	Clutch withdrawal sleeve	1
22	236586	Clutch operating lever	1
23	231616	Pivot pin, upper	1
24	231617	Pivot pin, lower	1
	FB105/5D	Setscrew	4
	X75948	Washer, Kolok	4
25	242366	Retaining block	1
26	231699	Retaining plate	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
27	222924	Stud	2
	X75949	Washer, Kolok	2
	FN106/L	Nut	2
28	235935	Flexible tube	1
29	185450	Elbow connector, complete	1
30	143717	Adapter	1
31	62636	Union nut	1
32	62635	Olive, union nut	1
	242069	Distance piece	2
	238096	**Bearing housing, complete**	1
33	231623	Bearing housing	1
34	231622	Wearing plate	1
	251978	'Pop' rivet	8
35	190228	Bearing, Hoffmann No. 165	1
36	509809	Cover, bearing	1
37	231701	Joint, bearing cover	1
	FB104/6D	Setscrew	8
	X75960	Washer, Thackeray	8
38	X32717	Oil seal, Super No. 4003	2
39	235048	**Clutch stop, fixed, complete with liner**	1
40	231629	Liner, clutch stop	1
	67843	Rivet, liner	6
41	133007	Key	1
42	122628	Locknut	1
43	133812	Washer	1
44-45	235049	Clutch hub, complete with stop	1
46	61898	Key	1
47	X32088	Nut	1
48	X32089	Lock washer	1
49	X31850	Inner race	1
50	X71280	Ventilating cover	1
51	222908	Stud	2
	X75949	Washer, Kolok	2
	FN106/L	Nut	2
52	238417	Layshaft	1
53	60350	Nut	1
54	60349	Nut	1
55	238418	Gear, 4th speed, on layshaft	1
56	236017	Key	1
57	238419	Clamping washer	1
58	240536	Combined layshaft drive and typre pump gear	1
59	X3940	Abutment washer	1
60	X40622	Lockwasher	1
61	236601	Key, drive gear	1
62	X3931	Bearing, housing, layshaft, front	1
63	X3953	Bearing, Hoffmann, R.M.S. 13.1/2	1
64	X3946	Cover, housing	1
65	X3933	Joint, cover	1
	FN306/L	Nut, castle	4

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	K5659	Split pin	4
66	X3930	Bearing housing, layshaft, rear	1
67	170796	Chip shield, bearing	1
68	81043	Bearing, Hoffmann, R.M.S. 14	1
69	63203	Koyle Bearing, Hoffmann, M.S. 14, N.G.	1
70	X40621	Lockwasher	1
71	X3945	Cover, housing	1
72	X3933	Joint, cover	1
	FN106/L	Nut	4
	X75949	Washer	4
73	238476	**Reverse gear, complete with bush**	1
74	61155	Bush	2
75	X40579	Shaft, reverse gear	1
76	62227	Peg, shaft	1
	FN414/L	Nut, slotted	1
	X75926	Washer	1
	K5699	Split pin	1
77	246011	Mainshaft	1
78	238407	3rd speed gear	1
79	238408	Bearing sleeve	1
80	238409	4th speed gear	1
81	238410	Splined sleeve	1
82	238411	Washer	1
83	238412	Lock washer	1
84	231413	Lock nut	1
85	238414	4th and 5th speed coupling	1
86	65407	Bearing, spigot roller, Hoffmann No. 8341	1
87	238415	2nd speed gear	1
88	238416	1st speed gear	1
89	67978	Chip shield	1
90	246012	Bearing housing, mainshaft, rear	1
91	2129	Bearing, Hoffmann type M.S.16	1
92	79895	Locking washer	1
93	29893	Nut	1
	FS108/6	Setscrew	1
	239172	Washer	1
94	246013	Housing, speedometer drive	1
95	222866	Stud, housing	2
96	X3929	Joint	1
	FN106/L	Nut	6
	X75949	Washer	6
97	242700	Gear, speedometer	1
98	246097	Washer	5
99	60042	Key, Woodruff No. 5	1
100	229470	Oil seal, Perfect No. 45038	1
102	242701	Pinion, speedometer drive	1
103	232870	Sleeve	1
	FN104/L	Nut	2
	X75947	Washer	2
104	229498	Driving flange, on mainshaft, for propeller shaft	1
105	80041	Driving key	1
106	60384	Nut, slotted	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
	63172	Split pin, $\frac{1}{8}$" dia.	1
107	120028	Top cover, on gearbox casing	1
108	82860	Joint, top cover	1
	WS108/10D	Setscrew	6
	X75964	Washer	6
109	133145	Side cover and oil filler	1
110	133147	Joint, side cover	1
	FN106/L	Nut	12
	X75962	Washer, Thackeray	12
111	50938	Filler plug	1
	60418	Joint washer, plug	1
112	13833	Drain plug, $\frac{3}{4}$" gas	1
	37853	Washer, drain plug	1
113	6972	Drain plug, $\frac{1}{2}$" gas	1
	81474	Washer, drain plug	1
	239475	**Change speed, complete**	1
	231308	**Casing, change speed, complete with studs**	1
115	X7544	Casing, change speed	1
116	62287	Stud	2
117	60399	Stud	6
118	X5757	Cover, casing	1
119	X5758	Joint, cover	1
	FN106/L	Nut	6
	X75949	Washer	6
120	K12489	Anchor washer	1
121	235919	Selector tube	1
122	60317	Spherical bearing	1
	50534	Packing washer	1
	X65963	Selector lever	1
	X63763	Bolt	2
123	FN306/L	Nut, castle	2
	K5659	Split pin	2
	X65958	Setscrew	1
124	X5750	Locating setscrew	2
125	X5754	Locking bar	1
	X5749	Distance piece	2
	X5752	Bolt	2
126	FN406/L	Nut, slotted	2
	X75920	Washer	4
	K5659	Split pin	2
127	230912	1st speed selector shaft	1
128	238422	1st speed selector fork	1
129	K5742	1st speed selector piece	1
130	61085	Setscrew	2
131	X5746	2nd and 3rd speed selector shaft	1
132	238423	2nd and 3rd speed selector fork	1
130	61085	Setscrew	1
133	238421	4th and 5th speed selector shaft	1
134	X5939	4th and 5th speed selector fork	1

Illustration Ref. No.	Leyland Basic Part No.	Description	No. Reqd. Per Vehicle
135	X5743	4th and 5th speed selector piece	1
130	61085	Setscrew	2
136	X5748	Reverse selector shaft	1
137	X5740	Reverse selector fork	1
138	X5741	Reverse selector piece	1
130	61085	Setscrew	2
139	60335	Locking plunger	4
140	220225	Spring	3
	231880	Spring, for reverse selector	1
141	X5755	Cover, selector shaft end	1
142	X5756	Joint, cover	1
	FN106/L	Nut	2
	X75949	Washer	2
143	142619	Vent stud	1
144	142620	Vent cap	1
145	X3958	Joint, change speed casing	1
	FN106/L	Nut, $\frac{3}{8}$" dia., B.S.F.	15
	X75962	Washer, $\frac{3}{8}$" dia., Thackeray	15

Speedometer Drive. Unit SD.3

114	79067	Intermediate gearbox, with L.S. greaser, Smiths type	1

NOTE: When this gearbox is used in conjunction with Auxiliary Gearbox delete Part No. 242701 speedo drive pinion and 232870 sleeve. Replace by 242513 joint and 242512 cover plate.

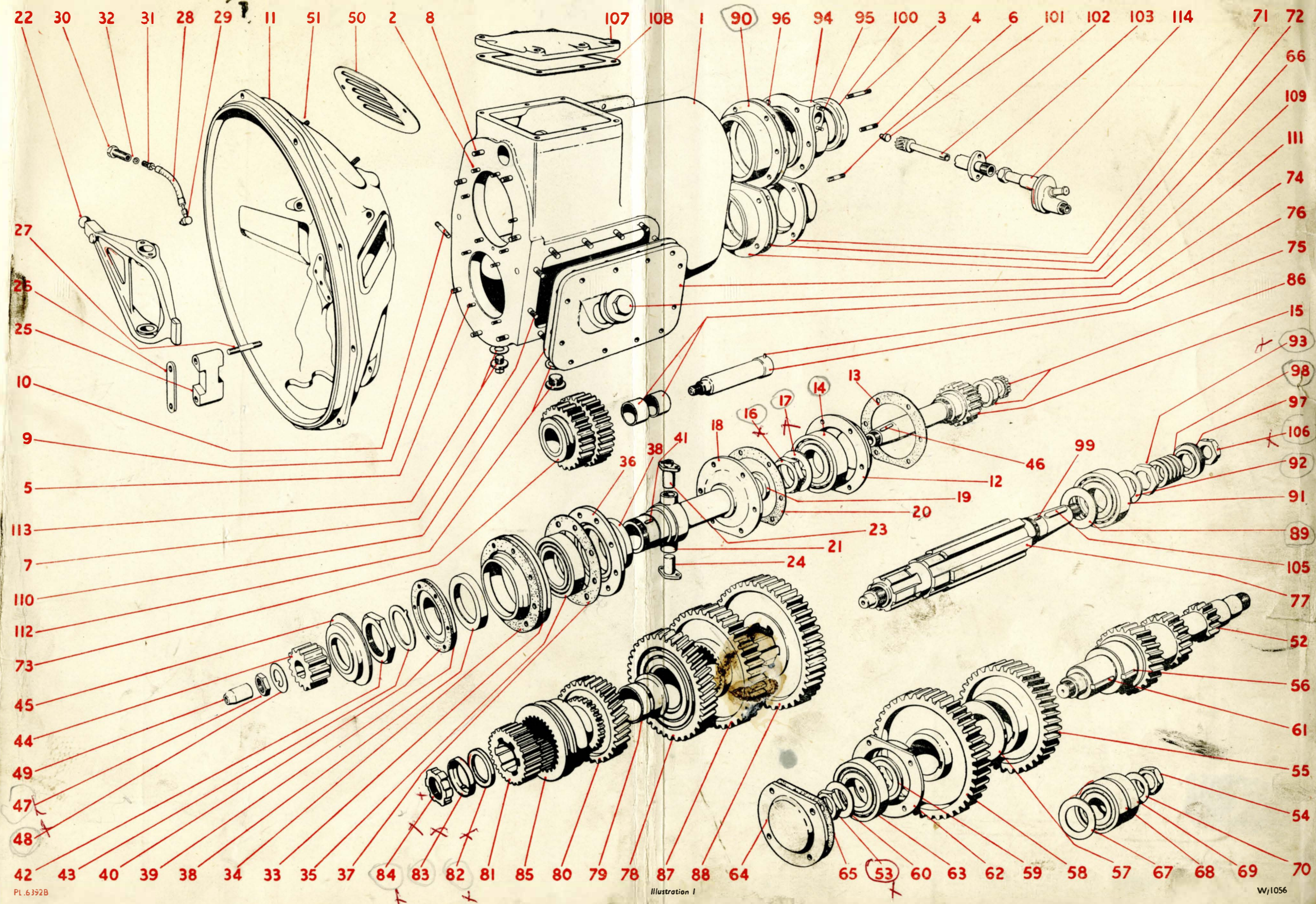
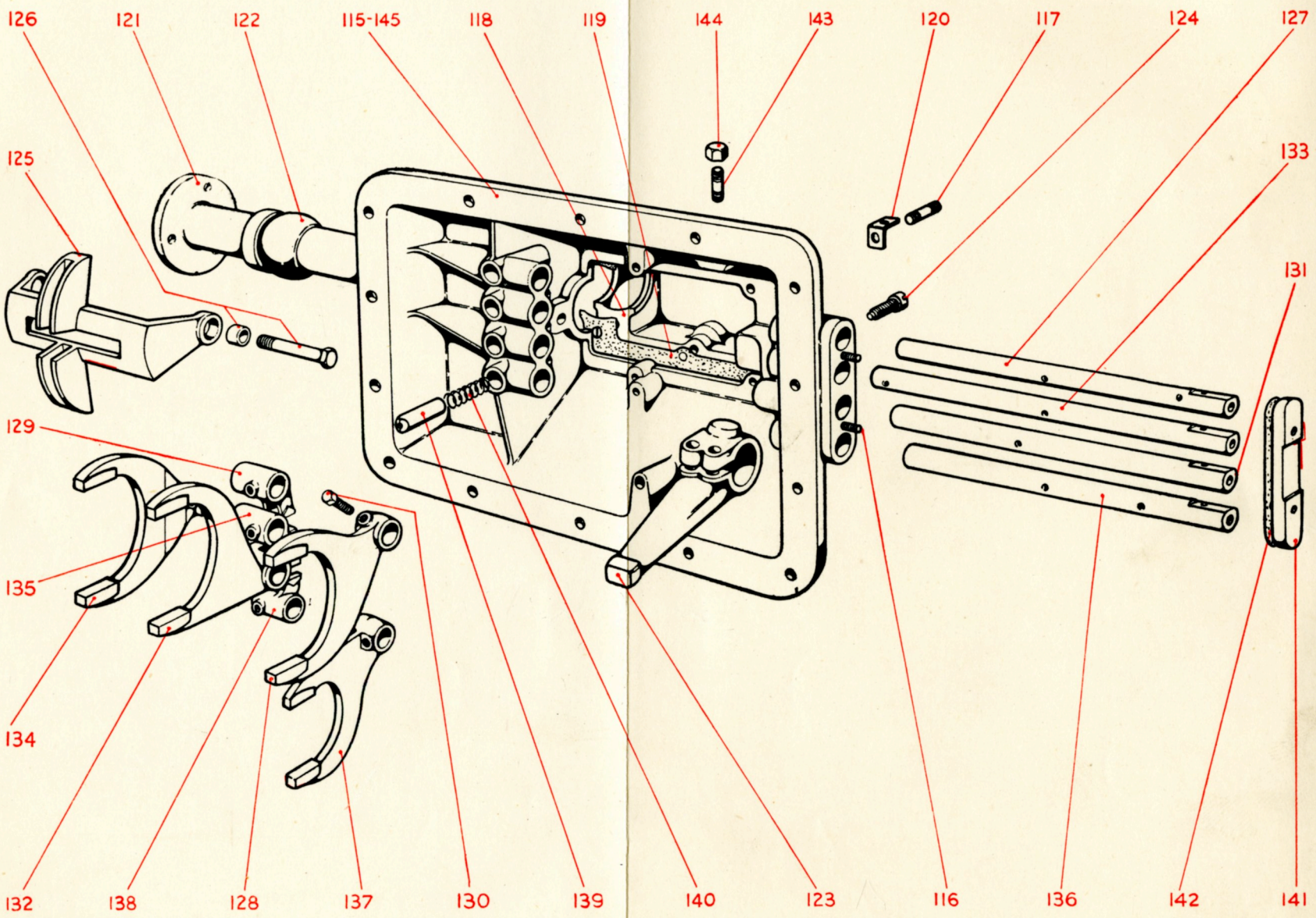


Illustration 1


126
121
122
115-145
118
119
144
143
120
117
124
127
125
133
131
129
135
134
132
138
128
137
130
139
140
123
116
136
142
141

WATERLOW & SONS, LIMITED