MORRIS ARCHIVE

MORRIS

G22 to G30

SERVICE INFORMATION

Published by
MORRIS MOTORS LIMITED
COWLEY, OXFORD

MORRIS ARCHIVE

MORRIS ARCHIVE

Circular Letter No. 66

Date of issue : January, 1930

Sump Service—Important

DURING the past twelve months we have been watching the important question of Sump Service, because it has been very apparent that too little attention is paid to the changing of engine oil at regular intervals.

As the outcome of our investigations we are convinced that, in addition to the fact that a great many car owners fail to appreciate the importance of changing oil, many of our Dealers have been up against the difficulty of disposing of their accumulation of used oil, with the result that they have felt themselves unable to push Sump Service as they would like to do. It is to such Dealers in particular that this letter is addressed.

We are pleased to be able to advise you that the Shell-Mex Company have now given an undertaking that any Morris Dealers who have been unable to find a way of disposing of used oil will receive assistance. Upon application to the nearest Shell-Mex Depot empty steel barrels will be supplied, and as soon as these are filled they will be collected, emptied and returned for further use.

It will be impossible to make any allowance for used oil collected thus, as there is practically no market for it. However, since some of our Dealers have, in the past, been paying for disposal, we are quite sure that the facilities afforded by Messrs. Shell-Mex will be greatly appreciated.

In consideration of the fact, therefore, that used oil disposal will no longer cause anxiety, the opportunity is taken of seeking your very close co-operation in " boosting " Sump Service to the utmost.

With a chain of keen Morris Dealers up and down the country, there should be no excuse for drivers failing to realise that worn-out oil spells disaster to all the working parts of an engine. A little intensive propaganda work at this time will be highly beneficial, and we would even suggest the posting of notices in your Service Waiting Rooms calling attention to the advisability of changing oil at least once in every 1200 miles.

MORRIS ARCHIVE

MORRIS ARCHIVE

Date of issue: February, 1930

Water Cooling System Capacities

Model	Type of Radiator	Radiator Capacity	Cylinder Block Capacity	Total Capacity
11.9 h.p. Morris-Cowley	Round Nose	18 Pints	11½ Pints	29½ Pints
11.9 h.p. Morris-Cowley	Square	11¼ "	11½ "	22¾ "
11.9 h.p. Morris Van	Flat Small	13½ "	11½ "	25 "
11.9 h.p. Morris Van	Flat Large	15 "	11½ "	26½ "
14/28 h.p. Morris-Cowley (Export)	Square	19½ "	10¼ "	29¾ "
14/28 h.p. Morris-Oxford ...	Round Nose	26¼ "	10¼ "	36½ "
14/28 h.p. Morris-Oxford ...	Square	19½ "	10¼ "	29¾ "
17.7 h.p. Morris Six	Square	21½ "	23 "	44½ "
Morris Isis Six	Square	19½ "	23 "	42½ "
Morris Isis Six (Export)	Square	20¾ "	23 "	43¾ "
15 h.p. Morris-Oxford Six ...	Square	20 "	13 "	33 "
Morris Minor (all models) ...	Square	9¾ "	7¼ "	17 "

Revised : 1st April, 1940

Crankshaft Re-grinding

WE offer an immediate service on Morris crankshaft re-grinding, including the supply of new main and big-end bearings to suit, at inclusive charges as under.

This specialised work is undertaken by our Engines Branch at Coventry, which undoubtedly has the best equipped shops in the country for this class of work, and absolute accuracy of finish and balance is guaranteed.

Crankshafts will be re-ground in accordance with the amount of wear and marked R1 (0.30 mm.), R2 (0.50 mm.) or R3 (1 mm.) undersize, with the exception of the types indicated by an asterisk, which cannot be re-ground below R2 (0.50 mm.) undersize. In the case of the Morris Eight, Series "E," and Morris Ten, Series "M," the third undersize will be known as R3a (0.75 mm.). Crankshafts which will not clean up to the limits indicated will have to be replaced by new ones. **It is essential when ordering new bearings at any later date that these markings are quoted.**

Connecting rods must also be sent for re-metalling in all cases where the white metal is run direct into the big-ends.

With the exception of 11.9 h.p. and 14/32 h.p. four-cylinder models prior to 1934, the bearings of which will need fitting, all bearings which are pressure fed, and supplied to definite dimension, do not require any adjustment or scraping before fitting.

It is most important that crankshafts should only be re-ground in accordance with the above definite standards in order that replacement bearings and connecting rods can be readily obtained at any future date.

When ordering new bearings, the markings must be quoted. **Undersize bearings and suitable connecting rods should be maintained in Dealers' stocks in order to meet the normal demand for replacement spares.**

The retail charges, which are subject to alteration without notice, are as follows, carriage charges extra :—

	£	s.	d.	
*Morris Minor, O.H.V.	4	15	0	(*a*)
Morris Minor, S.V.	4	0	0	
Morris Eight, 1935	3	15	0	
Morris Ten-Four	4	10	0	
Morris Ten-Six	6	0	0	
*Morris Cowley, up to 1934	4	10	0	(*b*) (*e*)
*Morris Oxford, up to 1930	4	10	0	(*b*) (*e*)
Morris Cowley Four, 1934	5	0	0	
Morris Twelve-Four, 1935	5	0	0	
Morris Cowley Six, 1934	7	10	0	
Morris Fifteen-Six, 1935	7	10	0	
Morris Major	8	5	0	(*c*)
Morris Major	7	10	0	(*d*)
Morris Oxford Six, 15 h.p.	8	5	0	(*c*)
Morris Oxford Six, 15 h.p.	7	10	0	(*d*)
Morris Oxford Six, 16 h.p. and 20 h.p.	8	0	0	(*d*)
Morris Isis	10	10	0	
Morris Twenty-five	9	7	6	
SERIES II MODELS				
Morris Eight	3	15	0	
Morris Ten-Four	4	10	0	
Morris Twelve-Four and 10-cwt. Van	5	0	0	
Morris Fourteen-Six	8	0	0	
Morris Sixteen and Eighteen Sixes	8	0	0	
Morris Twenty-one and Twenty-five Sixes	9	7	6	
SERIES III MODELS				
Morris Ten-Four	4	10	0	
Morris Twelve-Four	5	0	0	
Morris Fourteen-Six	8	0	0	
Morris Twenty-five-Six	9	7	6	
Morris Eight, Series "E"	3	7	6	
Morris Ten, Series "M"	3	12	6	

(*a*) Includes new flange and bush.

(*b*) Includes new crankshaft gear, except with chain-driven timing.

(*c*) Bronze back bearings.

(*d*) Steel back bearings.

(*e*) A scraping allowance is left on bearings for these models, and an additional charge will be made for fitt the bearings to the cylinder block if sent at same time for re-boring.

Revised : 1*st July,* 1939

Crankshaft Re-grinding—*continued*

In order to facilitate quick overhauls the Company will, when requested, forward immediately on receipt of order, thoroughly reconditioned replacement crankshafts with bearings and connecting rods to suit.

All such orders must be accompanied by particulars of type of car, engine and chassis numbers, with an indication that reconditioned exchange crankshafts are required.

Replacement units will be invoiced for record purposes, and providing the original corresponding units are returned promptly, and **found to be suitable for reconditioning,** the debit will be adjusted in accordance with the above charges.

All parts should be forwarded carriage paid, carefully labelled, bearing sender's name and address and directed to :—

Messrs. Morris Motors Limited, Service (Technical) Department, COWLEY, OXFORD,

accompanied by a letter of advice similarly addressed.

All orders should state definitely whether own crankshafts are to be re-ground and returned, or replacements forwarded.

If replacement reconditioned units have been supplied in advance, reference should be made to your original order and credit asked for.

Revised : 1st *April*, 1940

Straightening Front Axle Beams

DAMAGED front axle beams can only be reconditioned successfully by employing the same methods as in manufacture.

While it is possible to straighten a bent or damaged beam without jigs or dies, the use of these tools ensures a degree of accuracy not otherwise obtainable.

After straightening has been carried out, whether the beam has been heated or not in the process, **it is essential to restore its original strength by again carrying out the heat treatment to which it was subjected during manufacture.** Lack of this heat treatment may lead to the failure of the axle in service after straightening has been carried out, although there may be no visible indication of weakness, and as such a failure might be attended with serious results, the vital importance of the proper heat treatment of the repaired axle beam cannot be over-estimated.

We have special facilities for this work, and providing an axle beam is **not more than 3 in. out of alignment,** we are prepared to undertake the reconditioning of all Morris front axle beams.

Immediately on receipt of your order we will forward a **guaranteed** reconditioned axle beam, against the return of the damaged one. The retail charges for these repairs, which are subject to alteration without notice, are as follows, carriage charges are extra :—

Model	*Retail* £ s. d.
Morris Minor, 1929-1934	1 6 0
Morris Eight, 1935	1 6 0
Morris Ten-Four, 1933-1935	2 0 0
Morris Ten-Six, 1934-1935	2 0 0
*Morris Cowley (non-F.W.B.)	1 13 0
Morris Oxford, 1922-1927 (non-F.W.B.)	1 13 0
*Morris Cowley, 1926-1934 (F.W.B.)	2 0 0
Morris Twelve-Four, 1935	2 0 0
Morris Oxford, 1925-1926 (F.W.B.)	2 10 0
Morris Oxford, 1927-1929	2 0 0
Morris Oxford, 16/40 h.p., 1927-1929	2 10 0
Morris Major Six, 1931-1933	2 0 0
Morris Cowley Six, 1934	2 0 0
Morris Fifteen-Six, 1935	2 0 0
Morris Oxford Six, 1930-1933	2 0 0
Morris Oxford Six, 1934	2 5 0
Morris Oxford Sixteen and Twenty, 1935	2 5 0
Morris Six, 1928-1929	2 15 0
Morris Isis, 1930-1931	3 0 0
Morris Isis, 1932-1935	3 7 6
Morris Twenty-five, 1933-1935	3 7 6
SERIES II MODELS	
Morris Eight	1 6 0
Morris Ten- and Twelve-Four	1 15 0
Morris 10-cwt. Van	1 15 0
Morris Fourteen-Six	2 10 0
Morris Sixteen, Eighteen, Twenty-one and Twenty-five Sixes	2 15 0
SERIES III MODELS	
Morris Ten-Four	1 15 0
Morris Twelve-Four	2 0 0
Morris Fourteen-Six	2 10 0
Morris Twenty-five-Six	2 15 0
Morris Eight, Series "E"	1 10 0
Morris Ten, Series "M"	1 18 6

* Includes Light Vans. (*Note.*—F.W.B.=Front Wheel Brakes.)

Damaged axle beams should be sent, carriage paid, addressed to :—

Messrs. Morris Motors Ltd.,
Service (Technical) Department,
Cowley, Oxford,

aring your own Order Number, and with name and address on reverse.

When ordering reconditioned axle beams in advance, please state model and chassis number.

MORRIS ARCHIVE

Revised : 1st *July,* 1939

Engine and Gearbox Overhauls

MANY owners who use their cars continuously for business purposes cannot conveniently afford to have their vehicles off the road during the time normally required to undertake comprehensive overhauls ; for their convenience, and in order to render prompt service, Morris Motors Limited offer to send immediately on receipt of order, Factory thoroughly reconditioned Replacement Units, at standard charges, subject to the original units being promptly returned to the Works intact and no major components damaged or broken.

The exchange of units under this scheme only applies where a complete overhaul is required, and units cannot be exchanged where only specified work is ordered.

Owners can, of course, have their own units reconditioned and returned to them under this scheme at the flat rate charges indicated. Orders must, however, be endorsed accordingly.

We outline below detailed information concerning the scheme, which should be very carefully noted :—

(*a*) **Packing and Dispatch.** Orders for replacement reconditioned units should state existing engine and chassis numbers, and be sent direct to Messrs. Morris Motors Ltd., Service (Technical) Department, Cowley, Oxford. All units will be dispatched immediately on receipt of order, per Goods Train, carriage forward, unless otherwise specified.

Dealers should always await the arrival of the replacement unit and then transfer all external assemblies from the original unit to the replacement unit.

The original unit should then be sent **promptly** in our packing case, bearing sender's name and address, per Goods Train, carriage paid, together with letter of advice, and addressed to Messrs. Morris Motors Ltd., Service (Technical) Department, Cowley, Oxford.

(*b*) **Constitution of Reconditioned Exchange Engine.** Engine, including clutch where indicated, fan assembly, water pump, etc., but not including carburetter, sparking plugs or any electrical equipment, except dynamo and distributor on O.H.V. Minor models only.

It will be readily realised that all electrical equipment should be put into first-class condition if the best results are to be obtained from reconditioned engines, and, with the above exception, should be sent to the manufacturers for overhaul, if necessary.

Constitution of Reconditioned Gearbox Units. Gearbox, gear lever, including clutch and universal joint where indicated.

(*c*) **Specification of Engine Overhaul.** Completely stripping, reboring cylinders, fitting new pistons, rings and gudgeon pins, re-grinding crankshaft, fitting new bearings, thoroughly reconditioning and fitting new parts where necessary, including clutch where indicated, reassembling and testing.

All reconditioned power units are modernised as far as possible.

It should be noted that reboring necessarily increases the cylinder diameters, and an owner may become liable to an additional horse-power tax.

Specification of Gearbox Overhaul. Completely stripping, thoroughly reconditioning and fitting new parts where necessary, including clutch and universal joint where indicated, reassembling and testing.

(*d*) **Prices.** At the time of dispatch exchange reconditioned units will be invoiced in full for record purposes only, but the debit will be adjusted on the receipt by us of customer's original unit as specified in paragraph (*b*).

MORRIS ARCHIVE

MORRIS ARCHIVE

Revised : 1st April, 1940

Engine and Gearbox Overhauls—*continued.*

The following are the standardised charges for complete overhaul to units as specified in paragraph (*c*), conditional upon the units returned being intact and no major components damaged or broken.

	Gearbox Only	*Engine Only*	** Extra if Block Required*
Four-cylinder Models	£ s. d.	£ s. d.	£ s. d.
Morris Minor, S.V.	4 10 0	12 0 0 (*a*)	6 0 0
Morris Minor, O.H.V.	4 10 0	17 10 0 (*a*) (*c*)	4 10 0
Morris Eight, 1935	4 10 0	12 0 0 (*a*)	7 15 0
Morris Ten-Four, 1933-1935	5 15 0	14 15 0 (*a*)	10 10 0
Morris Cowley, 11.9 h.p., up to 1934	6 0 0 (*a*) (*b*)	16 15 0	13 5 0
Morris Cowley, 11.9 h.p., 1934	5 15 0	16 10 0 (*a*)	12 0 0
Morris Twelve-Four and 10-cwt. Van, 1935	5 15 0	16 10 0 (*a*)	12 0 0
Morris Cowley, Morris Oxford, Morris Light Vans — 14/32 h.p.	6 0 0 (*a*) (*b*)	16 15 0	13 15 0
Six-cylinder Models			
Morris Ten-Six, 1934-1935	5 15 0	21 0 0 (*a*)	12 0 0
Morris Major, 1931	6 0 0 (*a*) (*b*)	23 0 0	13 15 0
Morris Major, 1932-33	5 15 0 (*b*)	23 7 6 (*a*)	13 15 0
Morris Cowley Six, 1934	5 15 0	23 7 6 (*a*)	13 15 0
Morris Fifteen Six, 1935	5 15 0	23 7 6 (*a*)	13 15 0
Morris Oxford Six, 15 h.p., 1930-1931	6 0 0 (*a*) (*b*)	23 0 0	13 15 0
Morris Oxford Six, 15 h.p., 1932	5 15 0 (*b*)	23 7 6 (*a*)	13 15 0
Morris Oxford Six, 16 h.p., 1933	5 15 0	23 7 6 (*a*)	15 0 0
Morris Oxford Six, 16 h.p., 1934-1935	6 17 6	23 7 6 (*a*)	15 0 0
Morris Six, 18 h.p., 1928-1929	6 0 0 (*b*)	34 5 0 (*a*)	P.O.A.
Morris Isis Six, 1930-1931	6 0 0	34 5 0 (*a*)	P.O.A.
Morris Isis Six, 1932-1933	6 5 0	34 5 0 (*a*)	P.O.A.
Morris Isis Six, 1934-1935	7 0 0	34 5 0 (*a*)	P.O.A.
Morris Oxford Twenty, 1935	7 0 0	25 0 0 (*a*)	16 10 0
Morris Twenty-five, 1933	5 15 0	28 0 0 (*a*)	17 10 0
Morris Twenty-five, 1934-1935	6 17 6	28 0 0 (*a*)	17 10 0
SERIES II MODELS			
Morris Eight	4 10 0	12 0 0 (*a*)	7 15 0
Morris Ten-Four (3-speed)	5 10 0	14 15 0 (*a*)	10 10 0
Morris Ten-Four (4-speed)	5 15 0	14 15 0 (*a*)	10 10 0
Morris Twelve-Four (3-speed)	5 10 0	16 10 0 (*a*)	12 0 0
Morris Twelve-Four (4-speed)	5 15 0	16 10 0 (*a*)	12 0 0
Morris 10-cwt. Van	5 10 0	16 10 0 (*a*)	12 0 0
Morris Fourteen-Six (3-speed)	5 10 0	23 0 0 (*a*)	15 0 0
Morris Fourteen-Six (4-speed)	5 15 0	23 0 0 (*a*)	15 0 0
Morris Sixteen and Eighteen-Six (3-speed)	5 10 0	23 10 0 (*a*)	15 10 0
Morris Eighteen-Six (4-speed)	5 15 0	23 10 0 (*a*)	15 10 0
Morris Twenty-one and Twenty-five-Six	5 10 0	28 0 0 (*a*)	17 10 0
SERIES III MODELS			
Morris Ten-Four	5 15 0	16 15 0 (*a*)	14 15 0
Morris Twelve-Four	6 10 0	18 5 0 (*a*)	11 5 0
Morris Fourteen-Six	5 15 0	25 0 0 (*a*)	13 10 0
Morris Twenty-five-Six	5 10 0	30 10 0 (*a*)	17 10 0
Morris Eight, Series "E"	5 0 0	12 0 0 (*a*)	8 0 0
Morris Ten, Series "M"	6 0 0	16 15 0 (*a*)	10 10 0

(*a*) Includes clutch. (*b*) Includes universal joint. (*c*) Includes dynamo and distributor.

P.O.A. denotes price on application.

* Only in cases where cylinder block is damaged, due to accident, such as broken bearer arms, or frost, etc., necessitating renewal, or where cylinder block will not clean up at or below .050 in. oversize.

N.B. Carriage charges are extra to all the foregoing prices.

The above prices are only applicable to England, Scotland, Wales and Northern Ireland. An allowance of half carriage can be claimed from the Railway Company in respect of the "forward" journey to Cowley, provided the original and replacement units are both consigned by the same route, at goods rates, Ireland excluded.

Whilst every endeavour will be made to maintain the prices contained in this schedule, we reserve the right to make any alteration necessary without notice.

(*e*) **GUARANTEE. Every unit reconditioned by us under this scheme is covered by our guarantee for a period of six months.**

NOTE. Owners should be advised to notify Registration Authorities and Insurance Companies the change of engine numbers, and the chassis identification plate returned to us for exchange

MORRIS ARCHIVE

Date of issue: May, 1932

Lockheed Hydraulic Braking System

GENERAL DESCRIPTION

IN the Lockheed hydraulic brake the effort from the foot pedal is conveyed to the brake-shoes by means of a column of incompressible fluid.

The system consists of a master cylinder in which the hydraulic pressure is generated; wheel cylinders operating the brake-shoes; a supply or reserve tank by which the system is maintained full of fluid; and the "line," consisting of copper tubing, flexible hoses and unions interposed between the master cylinder and wheel cylinders.

The master cylinder is fitted with a piston, and the wheel cylinders are each fitted with opposed pistons, all of which are provided with cup washers which act as a seal to maintain pressures and prevent any loss of the fluid.

When pressure is applied to the foot pedal the piston within the master cylinder is forced forward and causes the fluid to flow through the copper tubing and flexible hose connections into the wheel cylinders. (See Fig. 1.)

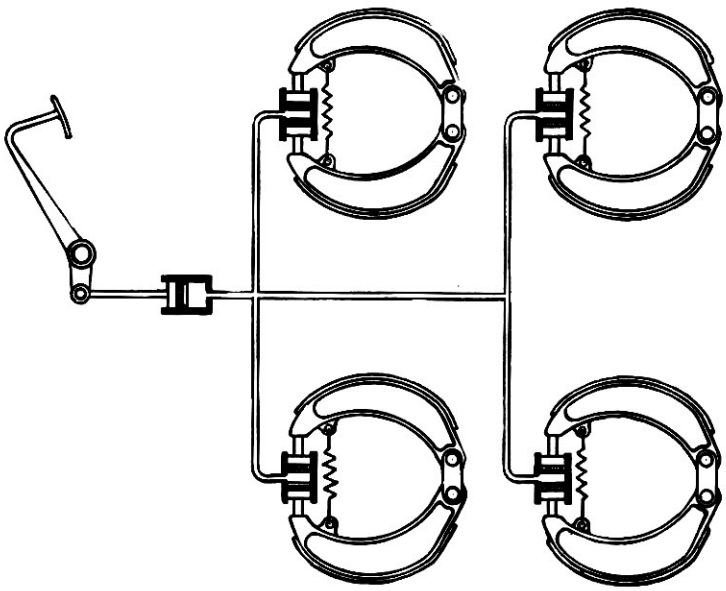


Fig. 1
Diagram of the Lockheed Hydraulic Braking System.

The brake fluid enters into each of the wheel cylinders between their opposed pistons, causing the latter to move outwardly against the brake-shoes, thus bringing the shoes into contact with the drums.

The pressure generated in the master cylinder is transmitted to each wheel cylinder "with equal and undiminished force," and the pressure applied to all shoe tips is identical, thus providing perfect equalisation.

When the pressure on the foot pedal is released the brake-shoe return springs force the wheel cylinder pistons to their normal "off" position, and the fluid is forced back through the pipe line into the master cylinder.

The Master Cylinder (Barrel Type—Single Outlet)

The barrel type compensating master cylinder is designed to maintain automatically in the system when at rest a constant volume of fluid at a uniform pressure of 8 lb. per square inch, this pressure acting as a liquid expander on all rubber cups, ensuring complete and efficient sealing of the system.

Automatic compensation is provided for expansion or contraction of the fluid due to temperature changes by suitable inlet and outlet valves. A special fluid is used in the system which is immune from freezing and unaffected by high temperatures.

Within the master cylinder (Fig. 2) is a piston (A) and a cupped washer (B), normally held in the "off" position by a coiled spring (C). Immediately in front of the cup washer, when the piston is in the "off" position, is a small port hole (D), connecting the cylinder interior with the hollow boss above it, which is connected by a length of copper tube to the fluid supply tank. Any rise in temperature causing the fluid to expand in the system allows the fluid

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

to pass through the port into the supply tank. Any drop in temperature causing the fluid to contract allows the fluid to flow back through the port. Thus a constant volume of fluid is maintained in the system.

Pressure is applied to the piston (A) by means of a spherically ended push rod (E), which is attached directly to the brake pedal.

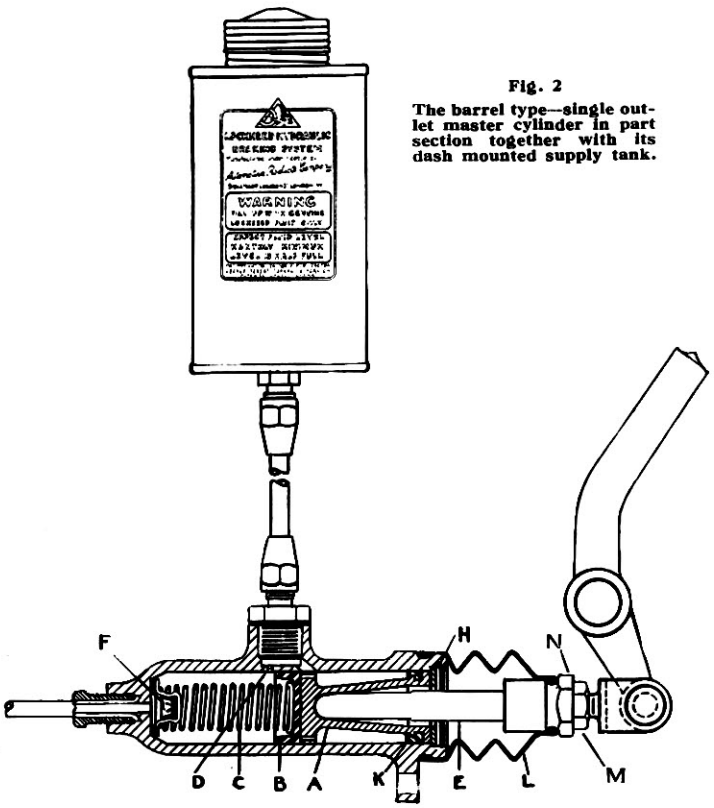


Fig. 2

The barrel type—single outlet master cylinder in part section together with its dash mounted supply tank.

In the head of the master cylinder, held in place by the return spring (C), is a combination inlet and outlet check valve (F), shown enlarged in Figs. 2A and 2B. When brakes are applied the master cylinder piston is pushed forward, displacing fluid which opens the outlet check valve (F). The fluid is forced through the latter into the system. When the brake pedal is released, the master piston return spring forces the piston back to its "off" position against its stop (H). At the same time the pistons in the wheel cylinders are forcing the fluid back through the inlet check valve (F), due to the action of the brake-shoe return springs, until the fluid pressure balances the effort of the master cylinder return spring, when the inlet valve closes. Leading from the interior of the hollow

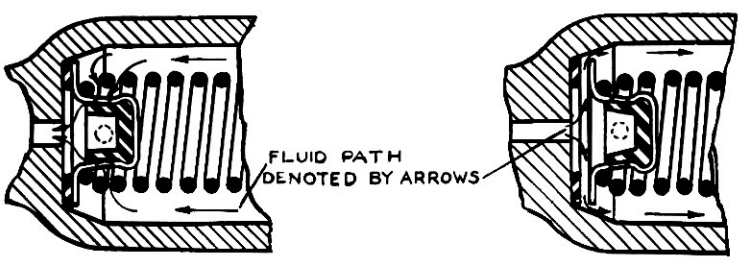


Fig. 2A **Fig. 2B**

These two figures illustrate the manner in which the outlet check valve functions.

boss above the cylinder to the annular space formed by the reduced skirt of the piston (A) is a large diagonal port. Through this port the annular space is at all times kept full of fluid from the supply tank, leakage at the rear of the piston being prevented by the secondary cup (K).

If for any reason the return of fluid is insufficient to equal the displacement caused by the return of the master piston, a vacuum is created in the master cylinder sufficient to cause the master piston cup (B) to turn in at the lip and allow the fluid to by-pass from the annular space, through the small holes in the master piston head into the master cylinder.

Any excess fluid thus introduced into the system will pass freely into the supply tank through the port when the master cylinder piston returns to its "off" position.

The open end of the master cylinder is fitted with a rubber boot (L) to prevent the ingress of dirt.

Date of issue : May, 1932

Lockheed Hydraulic Braking System—*continued*

The Master Cylinder (Tank Type)

The master cylinder proper is contained within the supply tank. It is composed of the cylinder casting (M, Fig. 3), piston stop (D), piston (P), piston cup (F), piston cup return spring (C), return spring retainer (N), and double check valve (A and B). The supply tank in turn is mounted to frame of car. It serves to carry the reserve supply of fluid and protects the master cylinder submerged in the fluid from any danger of taking in air, dirt or water.

The filler plug (G) in the tank cover is fitted with breather valves. These valves seal the tank, preventing the evaporation of the alcohol content in the fluid and the ingress of foreign matter.

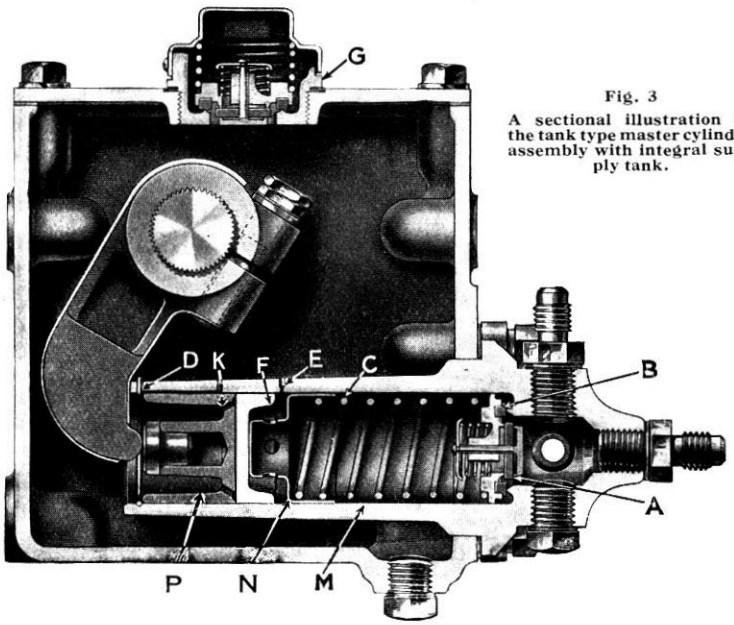


Fig. 3
A sectional illustration of the tank type master cylinder assembly with integral supply tank.

The power necessary to stop a car is transmitted to the fulcrum lever (Fig. 3), which forces the master cylinder piston to displace the fluid through the lines and into the wheel cylinders, whose opposed pistons in turn actuate the brake-shoes. When the brake pedal is released, the return of the master cylinder piston and cup is accomplished by spring (C). The piston and cup return is so much faster than the return of the fluid from the wheel cylinders that a momentary vacuum is created in the cylinder barrel. This vacuum draws fluid through the small drilled holes (K) in the master piston, and past the edges of piston cup (F).

The introduction of additional fluid from the reservoir into the line on each brake application necessitates locating a by-pass port (E) directly ahead of the master cylinder cup (in release position). After each brake application all surplus fluid is by-passed through port (E) into supply tank. **Brakes will drag** if the by-pass port is blocked, either from improperly set brake pedal or swollen cups (caused from mineral oil) and pressure will be built up in the system, thus forcing shoes into contact with drums.

Proper Adjustment of the Brake Pedal (Barrel Type)

It is important that the push rod (E) should have a slight clearance where it seats in piston (A) when in the " off " position. Should the push rod be adjusted tightly against the piston the port hole (D) will be covered by the cup washer (B), thus destroying the compensating action of the master cylinder.

It is essential that the cup washer (B) should be clear of the port hole (D). To be absolutely sure of this allow a slight amount of free movement of the brake pedal before the master cylinder piston starts to move. Adjust at lock nut (M) and push rod end (N) (Fig. 2).

Proper Adjustment of the Brake Pedal (Tank Type)

The above remarks concerning adjustment of the brake pedal apply in the main principles to the tank type master cylinder also. Make sure that the fulcrum lever is not adjusted tightly against the piston (P) (Fig. 3). Allow a slight amount of free movement of the brake pedal before the piston starts to move.

The Supply Tank (Barrel Type)

The supply tank is a simple container mounted on to the front side of the dash. A reserve supply of fluid is carried within the tank for replenishing any loss in the system.

The tank should be kept three-quarters full of **genuine** Lockheed brake fluid.
Under no circumstances must substitutes be used.

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

The Pipe Line

The pipe line is composed of special copper tubing, tested to withstand high pressures and internally clean and free from any scale or dirt. Inspect periodically for loose or misplaced pipe clips to prevent vibration of the tubing and possible fracture.

The Patent Flexible Hose

The patent flexible hose is specially manufactured and tested to withstand six times the highest pressure ever applied when braking.

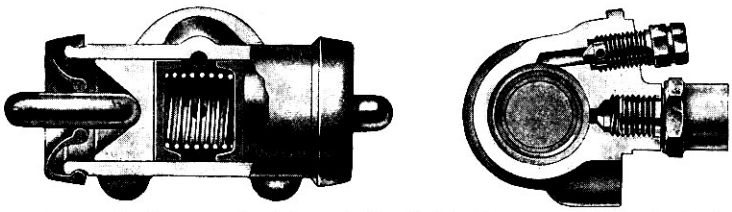


Fig. 4. Wheel cylinder details. The conical-ended bleeding screw and plug is clearly shown at the top of the right-hand illustration.

The Wheel Cylinder

The wheel cylinder is mounted rigidly to the brake-shoe back plate, and the opposed pistons act through push rods directly on the tips of the brake-shoes. The ends of the wheel cylinder are fitted with rubber boots to protect the cylinder from dust or dirt. At the uppermost position, and between the opposed pistons, is a bleeder screw, required for expelling all air when filling the system.

TO DIS-ASSEMBLE BRAKES

Removal of Front Wheel Cylinder

It is advisable not to unscrew the flexible hose at either end. Proceed, therefore, as follows: Disconnect copper tubing from the hose union (A) (Fig. 5) at the frame, then remove nut and lock washer (B), when the hose union may be removed from the bracket. Unhook brake-shoe return spring. Removal of the two set-screws holding the cylinder to the back plate allows cylinder to be withdrawn with hose in place.

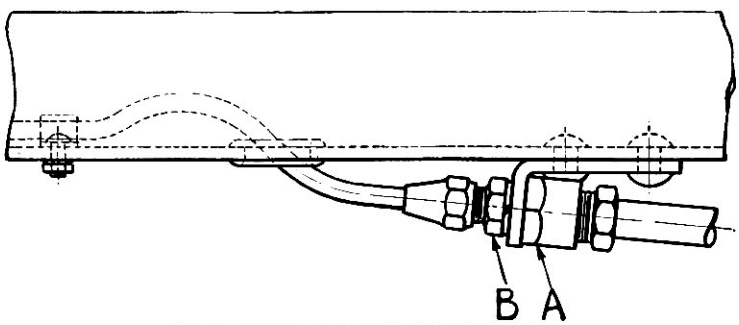


Fig. 5. Details of the flexible hose connection.

Removal of Rear Wheel Cylinder

Follow above instructions, except that the copper tubing must be disconnected at the cylinder inlet.

Removal of Master Cylinder from Supply Tank (Tank Type)

Take out drain plug in bottom of supply tank and draw off fluid into a clean glass container. Disconnect the pipe line, remove the set-screws holding the cylinder in position, and withdraw cylinder.

To Dis-assemble Master Cylinder

Remove piston stop (D) (Fig. 3), when the piston cup, spring, etc., are readily removed from the cylinder bore.

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

Removal of Master Cylinder from Chassis (Barrel Type)

Drain supply tank. A convenient way of doing this is to disconnect the pipe line at the master cylinder head and depress the foot pedal slowly by hand, allowing the return spring to return the pedal to its " off " position. Repeated application on the foot pedal will drain the supply tank : use a clean glass container to hold the fluid forced out at the master cylinder outlet. Disconnect the supply tank lead at the master cylinder and detach foot pedal from the push rod. Remove bolts holding cylinder in place and withdraw the cylinder from chassis.

To Dis-assemble Master Cylinder (Barrel Type—1 in. and 1¼ in. System)

Remove boot from end of cylinder, remove piston stop, remove retainer washer and withdraw piston. The cup, spring, etc., are now readily removable from cylinder bore.

Cleaning after Dis-assembly

Any necessary cleaning must be carried out with " Lockheed " Fluid, and before reassembly the parts must be dipped in the fluid. **Never use petrol, paraffin or oil.**

Removal of Brake-shoes

Unhook brake-shoe return spring and release brake-shoe anchor pins, after which the shoes may be pulled off. In assembling these operations are reversed.

To Re-line Brakes

When re-lining brake-shoes it is important that the same make and quality of lining be used on all four wheels, otherwise the braking on the wheels will be unequal.

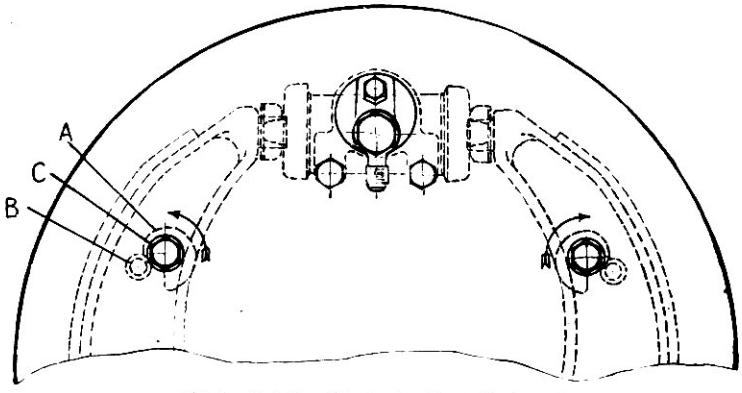


Fig. 6. Details of the brake-shoe adjustment.

To Adjust Brakes

When lining wear has reached a point where the foot pedal goes almost to the floorboard, it becomes necessary to adjust the brake-shoes into closer relation to the drums. Raise car on jack until wheel is free. Adjustment is made by rotating the adjustment cam (A) (Fig. 6) against stop pin (B) on shoe. Rotate adjustment nut (C) with wrench until brake-shoe comes in contact with drum, then back off adjustment slightly until wheel rotates freely without any appreciable drag.

Repeat the above on all wheels.

Date of issue : May, 1932

Lockheed Hydraulic Braking System—*continued*

Bleeding the Line

Whenever any part of the system has been disconnected, it is necessary to " bleed " the system in order to expel all air. Fill the supply tank with genuine " Lockheed " brake fluid before starting this operation, and keep the tank at least half-full of fluid during the whole period of bleeding.

Remove set screw at (A) (Fig. 7) from end of bleeder screw, and screw in bleeder drain, which is a screwed brass fitting with rubber tube attached. Allow rubber tube to hang in a clean glass container. Unscrew bleeder screw half a turn with wrench (B) (Fig. 7) and depress foot pedal slowly by hand, allowing return spring to return pedal to the " off " position. This gives a pumping action which forces fluid out at the wheel cylinder, carrying with it any air that may be present. Not less than ten strokes of the foot pedal will be necessary to bleed each wheel cylinder. Watch flow of fluid from bleeder drain, the end of which should be kept below the surface of the fluid, and when all air bubbles cease to appear, close bleeder screw. Open bleeder screw again to allow a slight amount of fluid to drain, then tighten bleeder screw securely. Fluid withdrawn in " bleeding " the system should not be used again. The bleeding operation must be repeated on each wheel cylinder, and the supply tank replenished each time. Should the supply tank be drained during the bleeding operation, air will be drawn into the system at this point, necessitating re-bleeding.

Fig. 7

The correct method of using the special box spanner and rubber bleeding tube, which should be threaded through the centre of the spanner. The illustration also indicates a convenient method of supporting the glass jar during the bleeding operation by a wire loop terminating in a hook.

Equalisation of Brakes

No adjustment is required for equalisation. Adjustment is only necessary to compensate for wear of the brake lining. While the pressure delivered to the brake-shoes will always be equal, yet paint, grease, oil or any foreign substance on the brake lining will so change the co-efficient of friction of the lining that the brakes will be unequal. This inequality can only be remedied by thoroughly cleaning the linings with petrol or methylated spirit. Should the linings be thoroughly saturated, it will be necessary to re-line the brake-shoes affected. In this case it is important that the same make and quality of lining be fitted as on the other shoes.

In cases where brakes are not functioning perfectly satisfactorily, the following information is given which should enable the cause of the trouble to be diagnosed and remedied.

Normal Faults and Causes

1. Should the pedal touch the floorboard or should two strokes of the pedal be required to apply the brake, the following are the most likely causes that should be checked over in the order as stated :—

(*a*) If the pedal touches or nearly touches the floorboards before braking is evident, it is a sure sign that the brake-shoes require adjusting. This adjustment should be made in accordance with the instructions given.

(*b*) Should the brake pedal exhibit a springy or spongy feeling, it may be taken as a sign that air is present in the system. If this is the case, the system should be bled throughout as per instructions.

(*c*) Should the pedal go down to the floorboards and by pumping on the pedal it is found that pressure cannot be created, it is an indication that either there is no fluid in the supply tank or that there is a big leak at some point in the pipe line. To check out this it will mean examining all joints for signs of a leakage. When leakage is located, this should be rectified, the system filled with Lockheed fluid and the lines bled.

(*d*) Under sustained pressure should the pedal move gradually towards the floorboards, it is an indication leak in the system, either at one of the cylinders or in the pipe lines. To check this over, it will be neces for pressure to be kept on the pedal while the leak is traced by an examination of the pipe lines and cylind

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

2. Should brakes appear sluggish in coming " on," and in addition have a tendency to stop " on " and not come " off " promptly, the following are the most likely causes, and each should be checked over in rotation until the cause is found :—

(*a*) Unsuitable fluid in system—such as mineral oil—causing sluggish operation. Only **genuine Lockheed fluid** should be used (a sure indication of incorrect fluid being used is that the rubber cups will have become swollen and sticky, and in this case the whole of the cups and valve rubbers in the system should be replaced after thoroughly flushing out the system with genuine fluid).

(*b*) Brake-shoe adjusting cams should be checked to see that shoes are just free when the wheel is jacked up and rotated.

(*c*) In cases where the hand brake lever operates mechanically on to the same shoes as operated by the Lockheed system, it may be found that the hand brake is adjusted up, causing the cam to expand the shoes on to the drum, or if the hand brake link gear is not correctly located, although the shoes are free when there is no load on the car, the deflection of the springs due to load may tend to pull on the hand brake and cause binding. In this case the hand brake should be slacked off when the car is fully laden to give clearance for the shoes.

(*d*) Pull-off springs weak, thereby not pulling shoes off when pressure is released. As a check on this the drum should be removed and a screwdriver, etc., inserted between the hub and shoe and the shoe levered away from the hub. The brake-shoe return spring should return this smartly up against its stop upon removal of the screwdriver. If the spring tends to give a sluggish return of the shoe, this should be renewed.

(*e*) Seizing or tight anchor pins preventing release when pressure is " off." This can be checked in the same way as above trouble by levering the shoe away from the hub. If anchor pins are seized or tight the shoe will not return promptly and the shoes should be removed from the anchor pins, the bushings of the shoe cleaned, the anchor pins cleaned and reassembled with a lubricant.

(*f*) It is essential to have free pedal play of about half an inch at the pedal tip to allow the piston in the master cylinder to go right back in the " off " position to release excess fluid pumped into the system when the brake is applied. If there is no pedal slack when in the " off " position, it prevents the release of the fluid, thereby keeping the brake-shoes on. A floorboard fouling the pedal may cut out this required pedal slack or an incorrect adjustment of the pedal link gear may also be the cause. (Refer Sheet 8.)

3. Should one wheel drag or the car pull to one side on braking application, the following points should be checked over :—

(*a*) Weak brake-shoe return spring—see remedy under No. 2 (*d*).

(*b*) Hand brake lever operating mechanically—see remedy under No. 2 (*c*).

(*c*) Seized or tight anchor pins—see remedy under No. 2 (*e*).

(*d*) Brake-shoes not in correct adjustment—see remedy under No. 2 (*b*).

(*e*) Wheel cylinder cups distorted—should a spurious fluid have been in contact with the rubber portions of the system, the cups would swell and distort, the return action of the wheel cylinder cups will be retarded, so causing the shoes to stay " on " and produce drag. If this is the case the system should be thoroughly flushed out with genuine Lockheed fluid and all rubber parts renewed. When cleaning the system do not use petrol, paraffin, etc., in flushing out. Use either pure alcohol or Lockheed brake fluid.

(*f*) Oil or grease in contact with the brake-shoe lining—this will reduce the co-efficient of friction of the lining and cause unequal braking or pull to one side on braking application. If the linings are found to be in this condition, they should be thoroughly cleaned with methylated spirit or petrol and slightly roughed up. Should, however, the linings be badly soaked in grease, it is useless to try to clean this off and the shoes should be re-lined.

(*g*) Varying grades or makes of linings fitted to each shoe would also give unequal braking or a tendency for the car to pull to one side when the brakes are applied. If equal braking is expected it is necessary that in the event of re-lining, the same make and grade of linings are used on all shoes.

(*h*) Distorted brake-drums.

4. After inspection, should the level of the fluid in the supply tank be found to have dropped considerably, this will indicate that there is a leak at some point in the system which should be traced and rectified. Should the loss of fluid be small, this may be taken as an indication that a very slight evaporation of the alcohol contents of the fluid has taken place and the supply tank should be brought up to its correct level of about half an inch from the top with genuine Lockheed fluid.

MORRIS ARCHIVE

MORRIS ARCHIVE

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

REASSEMBLY OF BARREL TYPE MASTER CYLINDERS

We should like to draw your attention to the fact that it is essential to exercise very great care when assembling the piston, complete with secondary cup, into position in the cylinder bore on all barrel type master cylinders.

The back end of the cylinder is machined to take the piston stop and stop retainer, this machining taking the form of a counter-bored recess and a groove. When the piston is inserted in the bore, it has to be pushed down past the groove and the counter-bore to enable the stop and retainer to be fitted.

Owing to the initial diameter of the secondary cup prior to insertion being greater than the bore, there is a risk of the edges of the cup becoming nipped and cut owing to the cup edge tending to jam in the counter-bored portion of the cylinder prior to entering the bore proper. (See Fig. 8.)

In order to overcome any possibility of damage taking place to the secondary cup in this respect, a suitable sleeve to facilitate assembly has been produced.

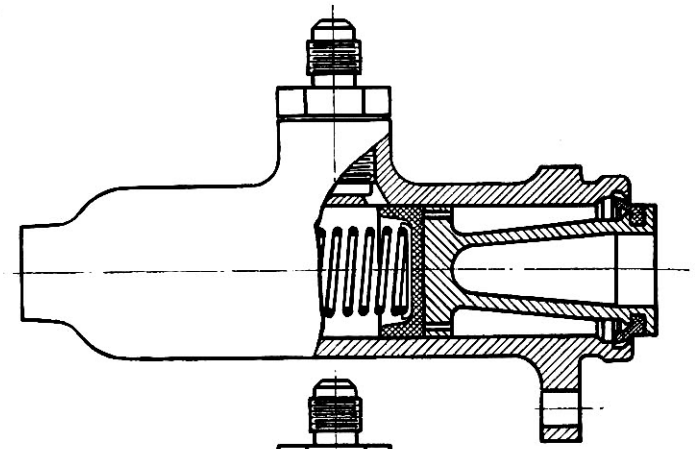


Fig. 8
Showing the manner in which the secondary cup may be damaged by the cylinder barrel counter-bore on reassembly.

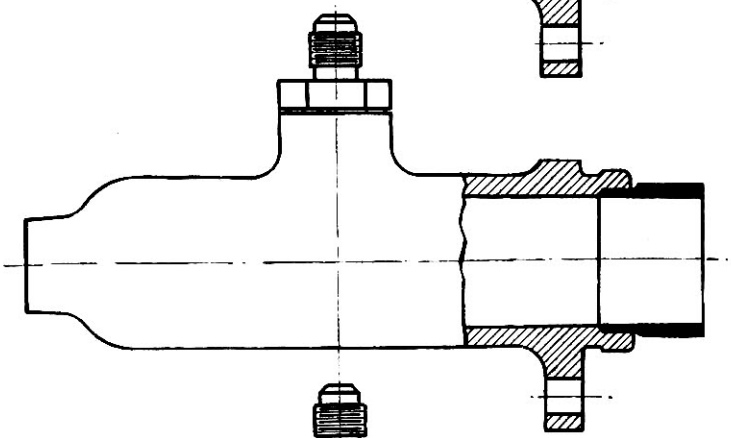


Fig. 9
The special sleeve inserted in the cylinder barrel prior to reassembly of the piston.

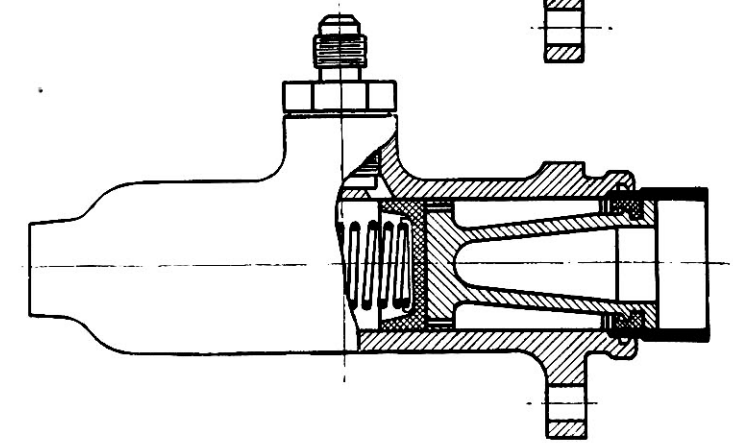


Fig. 10
Illustrating the correct method of inserting the piston assembly to avoid damage to the cups.

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

There are two sizes of sleeves, one for cylinders having 1 in. diameter bore, and the other for cylinders having 1¼ in. diameter bore.

The method of assembly is as follows :—

(1) Insert valve, spring and master cylinder cup into the cylinder bore.

(2) Assemble sleeve on to cylinder as shown in Fig. 9.

(3) Dip piston and secondary cup assembly in fluid, after which the assembly can be inserted into the cylinder through the sleeve, taking care to push the piston well down into the cylinder bore. (Fig. 10.)

The sleeve can now be removed, taking care to keep the piston down the bore, and the stop and retainer fitted.

This sleeve has been found satisfactory in every respect, providing that reasonable care is observed in its use. *The sleeve is hardened and should, therefore, not be dropped or maltreated, as this may cause chipping of the rim, which would probably result in damage taking place to the cup, due to cutting when assembling.*

We very strongly recommend the use of this tool when it is necessary to assemble barrel type master cylinders, and these are obtainable direct from the Automotive Products Co., Lockheed Hydraulic Brake Service Department, Tachbrook Road, Leamington Spa, Warwickshire.

It has also been brought to our notice that incorrect methods of servicing the single-outlet barrel type master cylinder has resulted in damage to the rubber valve washer located in the cylinder head, thereby rendering the valve inoperative.

The barrel type of master cylinder is fitted to the 1932 Morris Isis, Morris Major, Morris-Cowley and Family Eight models.

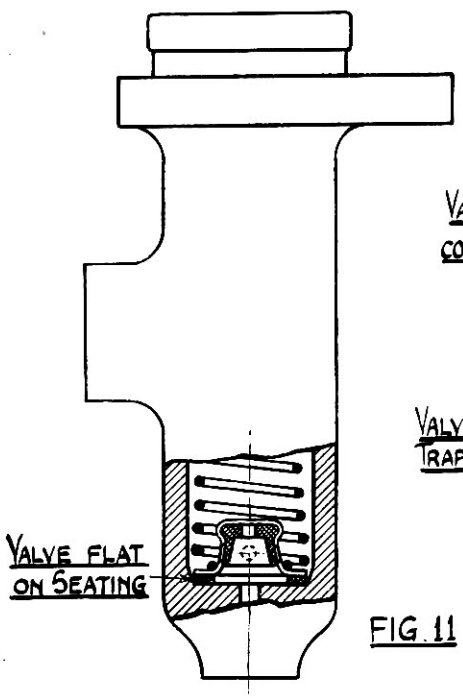


FIG. 11

SKETCH SHOWING VALVE WASHER CORRECTLY ASSEMBLED WITH CYLINDER IN VERTICAL POSITION

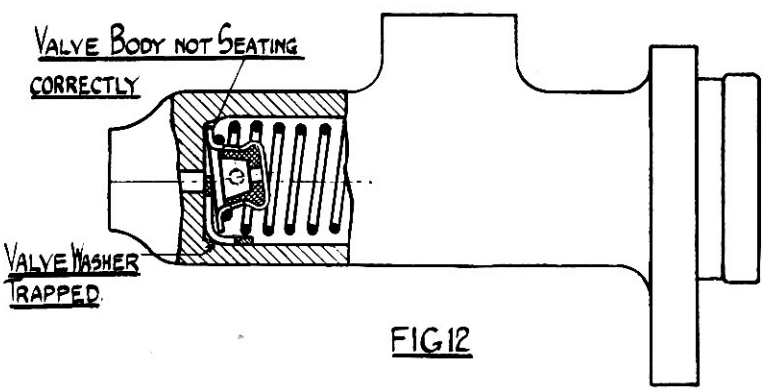


FIG 12

SKETCH SHOWING POSSIBLE POSITION FOR VALVE WASHER TO TAKE DUE TO ASSEMBLING CYLINDER IN HORIZONTAL POSITION

For correct functioning of the braking system, it is essential that the flat rubber valve washer seats correctly in the head of the master cylinder, as shown in Fig. 11.

Should attempt be made to assemble the component parts of the cylinder in position in the chassis, i.e. in a horizontal position, it would be almost impossible to guarantee that the valve washer is correctly seated.

Faulty methods of assembly when servicing may give rise to the condition shown in Fig. 12, therefore **ıster cylinder unit should always be removed from the chassis when any internal examinatic :essary.**

Date of issue: May, 1932

Lockheed Hydraulic Braking System—*continued*

After servicing the master cylinder unit, all parts should be cleaned with and dipped in genuine Lockheed fluid before reassembling in the following order :—

(1) Hold the master cylinder vertically and drop in rubber valve washer, making sure that it seats properly in the cylinder head.

(2) Insert valve body and cup assembly in end of spring and drop into cylinder.

(3) Insert master cylinder cup, pressing it firmly on to end of spring.

(4) Insert piston and secondary cup assembly, using special assembly sleeve as previously described.

CAUTION

DON'T

use any substitute for " Lockheed " Brake Fluid. A substitute may seriously affect the working of the system.

DON'T

allow grease, paint, oil or brake fluid to come into contact with the brake lining.

DON'T

clean rubber parts or inside of cylinders with anything but genuine " Lockheed " fluid or methylated spirit. **Never use oil, petrol or paraffin.** The introduction of any fluid with a mineral base causes the rubber cups to swell and distort, making it necessary to renew all cups and to flush the system thoroughly with " Lockheed " fluid.

DON'T

re-line one wheel with a different make of lining than is used on the others, as you cannot expect equal braking effect if this is done.

DON'T

make tubing joints with packing compounds; straight clean metal-to-metal joints only should be made.

DON'T

allow the supply tank to be less than half full of brake fluid.

Date of issue : August, 1932

FUSES

THE fuses on the Lucas electrical equipment on Morris cars are of five standardised types. Their part number and carrying capacity are given in the following table :—

Fuse Part No.	*Carrying Capacity.*
L.3275/4	25 amps.
F.A.8	8 amps.
F.A.5	5 amps.
F.A.4/5	4.5 amps.
L.1898/4	Fusable Strip.

These fuses are available in handy boxes containing six fuses, at the retail price of 1s. 6d.

Your attention is also drawn to the box of replacement fuses bearing reference number No. S.T.500, which contains four 5 amp. fuses and two 25 amp. fuses of the cartridge type.

In order to assist Morris Dealers in identifying the correct fuse to be fitted in cases of fuse replacement, a list of fuses fitted to all Morris models since 1930 has been compiled.

SCHEDULE OF FUSES ON VARIOUS VEHICLES

Vehicle.	Horn Amps.	Headlamp Amps.	Dynamo Amps.	Auxiliary Amps.	Amps.	Amps.
MINOR 1929 MINOR 1930 MINOR 1931	—	—	Fuse Strip L.1898/4	—	—	—
MINOR S.V. 1932 FAMILY EIGHT 1932	—	—	F.A.8	L.3275/4	—	—
COWLEY 1932	—	F.A.5	Fuse Strip L.1898/4	—	—	—
MAJOR 1931	L.3275/4	—	F.A.4/5	L.3275/4	—	—
MAJOR 1932	—	F.A.5	F.A.4/5	L.3275/4	—	—
L.A. 1930	L.3275/4	F.A.5	L.3275/4	L.3275/4	—	—
L.A. 1931	L.3275/4	F.A.5	F.A.4/5	L.3275/4	—	—
L.A. 1932	L.3275/4	F.A.5	F.A.4/5	L.3275/4	—	—
ISIS 1930	L.3275/4	F.A.5	L.3275/4	L.3275/4	—	—
ISIS 1931	L.3275/4	F.A.5	F.A.4/5	L.3275/4	—	—
ISIS 1932	L.3275/4	F.A.5	F.A.4/5	L.3275/4	—	—

MORRIS ARCHIVE

Date of issue : August, 1932

Front Tyre Wear

AMONGST the letters of general enquiry on technical matters dealt with by this Department are a few which call for information on the subject of undue front tyre wear. As a rule these follow failure on the part of tyre manufacturers to establish any inherent fault in the tyres themselves.

It is well known, of course, that modern four-wheel braking systems and high average road speeds induce greater front tyre wear than was formerly the case. However, it is generally assumed by the car owner that there is some fundamental fault in the construction of the car which causes this wear, and we therefore take the opportunity of giving an assurance to our Distributors and Dealers that, so far as Morris cars are concerned, the steering mechanism need never be responsible for excessive tyre deterioration. Indeed, no single instance of undue tyre wear, within our knowledge, has failed to respond to commonsense treatment, and in ninety-nine cases out of a hundred the causes are directly attributable to low inflation pressures, incorrect front wheel alignment, or lack of general stability in the steering gear as a result of undue play in the usual four steering connection joints or in the steering gearbox. A point very commonly overlooked is the necessity for retracking the wheels to toe-in $\frac{1}{16}$ in. after the track rod ends have been adjusted.

Thus complaints in respect of rapid front tyre wear ordinarily resolve themselves into a demonstration of the fact that the steering gear of a car requires adjustment or overhaul. It is herein that Distributors' and Dealers' Service Staffs can be of material assistance to owners of Morris cars, the front tyres of which are showing signs of unusual or abnormal tread wear.

The purpose of this sheet, therefore, is to request you to be so good as to afford the benefit of your advice whenever the question of front tyre wear is raised.

MORRIS ARCHIVE

MORRIS ARCHIVE

MORRIS ARCHIVE

Date of issue : August, **1932**

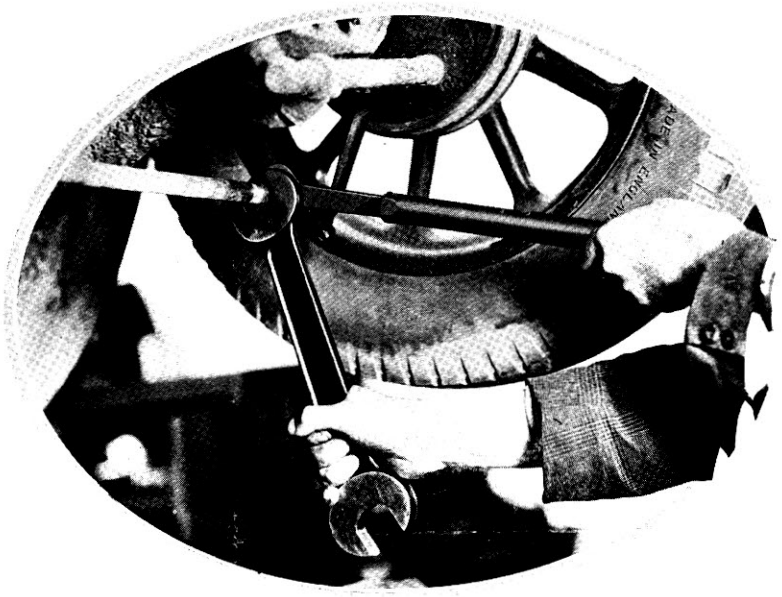
Steering Adjustment

YOUR attention is drawn to a point which becomes increasingly important with the passing of time and as more and more Morris cars are put on to the road which, eventually, cover considerable mileages and pass from the original owners' hands into the second-hand market. Reference is made to safety of the steering mechanism.

Either by reason of neglect or perhaps misuse in the manner of effecting adjustments, trouble may develop with possible serious results.

For this reason every Morris car visiting our Service and Repair Departments is subjected to careful examination as to its steering connections, and whenever undue wear is located the owner is warned and advised to have the necessary rectification put in hand at once. It is only possible here, of course, to examine a very minute percentage of cars, but with the co-operation of all Morris Distributors and Dealers a very much wider field will be covered.

You are asked, therefore, particularly to be so good as to have a special word with your Service and Repair Departments on this subject, requesting all who are concerned to give the matter careful attention.



It is essential to hold the ball end socket centrally against rotation with an adequate spanner while tightening or slackening the lock nut.

As you are aware, to check the roadworthiness of steering gear connections is a matter of minutes only, and, nowadays especially, modern car-lifting garage equipment lends itself readily to a system of quick steering inspection.

Generally speaking, the tightness of the drop arm on the steering gearbox shaft, and the correct adjustment of the four steering connections at the ends of the draglink and steering cross rod, are the only points which are likely to require attention from a safety point of view.

In a preceding paragraph mention was made of the manner of effecting adjustments, and in this respect we refer chiefly to the adjustable track rod ends. *It is vitally necessary to hold these by spanner on the flats before the lock nut is tightened.* Unless this is done, the sides of the slot in the track rod ends are brought into violent contact with the neck of the steering arm ball pin, and serious damage may result, reducing very considerably the factor of safety which the original design incorporates.

The same result is produced by hammering action when, due to any wear and tear of the ball or cups, or deterioration of the elasticity of the cup springs, undue play is allowed to develop.

The illustration herewith makes our meaning quite clear. The spanner in the left hand is holding t end *centrally* by means of the flats provided, whilst the lock nut is checked up with the larger spanne ht hand.

MORRIS ARCHIVE

MORRIS ARCHIVE