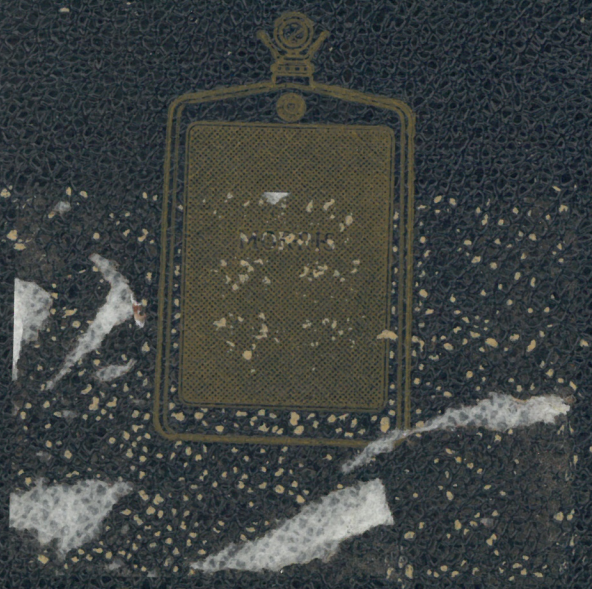
The MORRIS MINOR

SERVICE INFORMATION



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MORRIS

Service Information

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Under no circumstances should Dealers impart the information contained in these sheets to their clients or leave these sheets lying about in places where unauthorised persons may have access to them.

1929 - 1932

Date of issue : March, 1932

INDEX TO MORRIS MINOR AND MORRIS FAMILY EIGHT SERVICE INFORMATION

Date of issue : February, 1932

GENERAL DATA

8 H.P. O.H.V. MODELS

Bore	57 mm. (2.244 in.)
Stroke	83 mm. (3.268 in.)
Cubic capacity	847
R.A.C. rating	8.056 h.p.
Bearing sizes	Connecting rod $1\frac{1}{2}$ in. dia.$\times 1\frac{1}{8}$ in. long
	Crankshaft rear $1\frac{3}{4}$ in. dia.$\times 1\frac{3}{16}$ in. long
	Crankshaft front $1\frac{3}{8}$ in. dia.$\times \frac{13}{16}$ in. long
Connecting rod centres ...	165 mm. ($6\frac{1}{2}$ in.)
Compression ratio	4.75–1
Valve head diameter	1 in. Inlet and exhaust valves interchangeable
Valve springs	Free length $1\frac{3}{4}$ in. free coils $7\frac{1}{2}$.
Valve timing	Inlet valve opens 9° A.T.D.C.
	Inlet valve closes 35° A.B.D.C.
	Exhaust valve opens 43° B.B.D.C.
	Exhaust valve closes 7° A.T.D.C.
Firing order	1, 3, 4, 2
B.h.p. at 1000 r.p.m.	5.75
1500 ,, ...	9.00
2000 ,, ...	12.00
2500 ,, ...	15.00
3000 ,, ...	17.50
4000 ,, ...	20.00
Dynamo drives at engine speed	
Reduction gear on top 2–1 for camshaft drive	
Sump capacity	$\frac{1}{2}$ gallon
Gearbox capacity	1 pt. gear oil
Rear axle capacity	1 pt. gear oil
Petrol tank capacity	5 gallons
Rear axle ratio	4.88–1 (1929–1931). 5.875–1 (1932)
Pinion 9 t. Drive gear 44 t. (1929–1931). Pinion 8 t. Drive gear 47 t. (1932)	
Steering gear ratio	7.7–1
Starter ratio	8.3–1

	(1929–1931)	(1932)
Gearbox ratios : Top	1–1	1–1
Second ...	1.83–1	1.833–1
First ...	3.5–1	3.4–1
Reverse ...	2.83–1	2.75–1

Wheelbase	6 ft. 6 in. (1929–1931). 7 ft. $6\frac{3}{4}$ in. (1932)
Track	3 ft. 6 in.
Tyres	4.0–19
Wheels	3 in.$\times$ 19 in.

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Date of issue : March, 1932

Morris Minor and Morris Family Eight Pistons and Cylinder Bores

SYSTEM OF MARKING TOLERANCES, ETC.

PISTONS and cylinders on the Minor engines are made in standards as to size, A being nominal or (57 mm.) 2.244 in. and B .010 in. larger.

Additionally, pistons and cylinders are graded X, Y and Z, the equivalent diameter being as shown below :—

Pistons.	Cylinders.
A.X—2.240 in.	A.X—2.243 in.
A.Y—2.2405 in.	A.Y—2.2435 in.
A.Z—2.241 in.	A.Z—2.244 in.

It will be noted at once that the difference between the piston size and the cylinder size is .003 in. and this is the correct working clearance on the skirt of the pistons. Thus an X piston will always be assembled into an X cylinder, a Y piston into a Y cylinder and so on, when correct working clearances will be assured automatically.

Between the X grade and the Y grade, and between the Y grade and the Z grade of either piston or cylinder bore, there is a difference of .0005.in. The cylinder bore grade marks X, Y or Z will be found stamped on the top face of the cylinder block on the off-side, and the size, A or B, will immediately follow the grade mark on No. 1 bore. In addition the letter A or B, denoting the size of the cylinders, will follow the engine number stamped on the near-side of the crankcase.

A and B sizes of bore will not be found together in one engine, i.e. the cylinders will all be size A or size B, but X, Y or Z piston grades will be used in an engine to give the requisite working clearances.

EXPLANATION OF MARKINGS ON PISTON CROWN

The pistons are stamped on the crown with the letter A or B, according to size. Also X, Y or Z, according to grade. There is another mark, e.g. 4–14, which gives an indication of the weight in ounces and drams.

Thus a piston may be found marked :—B.X
4–15

N.B. There should not be a total variation in weight between any of the pistons in one engine exceeding four drams. The ringed numerals on the piston crown can be disregarded as they have no bearing on the type or grade of piston.

Each piston is fitted with two plain pattern piston rings and one special oil scraper ring fitted to bottom groove with the **bevelled edge upwards.** A clearance of .002 in. to .004 in. should be present between the gaps of each ring.

For replacement purposes the X size of piston in both the A and B grades will not be supplied, as Dealers will appreciate that when initial wear has taken place in a cylinder bore the next size of piston, namely Y, will be required, for this is only .0005 in. larger. The following oversize pistons complete with piston rings can, however, be obtained on application to Service Parts Department, for cases of engine overhaul.

A.Z 1—.001 in. oversize	B.Z 1—.011 in. oversize
A.Z 2—.002 in. ,,	B.Z 2—.012 in. ,,
A.Z 3—.003 in. ,,	B.Z 3—.003 in. ,,
A.Z 4—.004 in. ,,	B.Z 4—.004 in. ,,
A.Z 5—.005 in. ,,	B.Z 5—.005 in. ,,
A.Z 7—.007 in. ,,	B.Z 7—.007 in. ,,

Note.—Up to Engine No. U.15298 all engines were fitted with oval type pistons, after which round type pistons are fitted as standard. All replacement pistons issued in future will be of the round pattern.

Date of issue : February, 1932

Valve Timing

O.H.V. MODEL AND FAMILY EIGHT

TO RE-TIME VALVE WHEN REFITTING CYLINDER HEAD WITH DYNAMO LEFT IN POSITION

RE-TIMING the valve gear on the Minor engine when replacing the cylinder head should provide little difficulty if the few rules given below are observed during the process of assembling.

Since the valves cannot be removed unless the camshaft is lifted from its bearings, we will first explain how to reassemble the camshaft to take up its correct position in relation to its drive gear. This is a simple though very important matter. The tooth marked X on the driving bevel pinion must be engaged between the two teeth marked X on the camshaft driven bevel pinion, otherwise the whole process of re-timing will be upset.

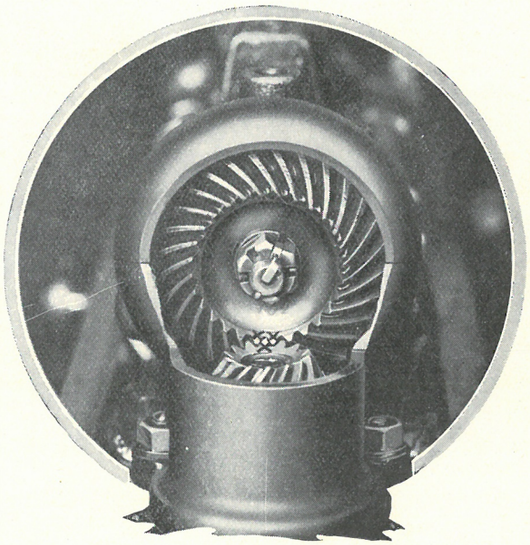
When the head is ready for remounting on the cylinder block, and before setting the valve gear to the final position, prepare the engine in the following way.

Remove the distributor cover and turn the engine slowly by means of the starting handle until Nos. 1 and 4 pistons are on top dead centre, with the distributor rotating arm pointing towards No. 1 contact stud, which is the one nearest to No. 1 sparking plug. In this position the dynamo yoke should be dead parallel with the crankshaft centre line. This point is very important and should be checked carefully, because if the yoke does not lie parallel with the crankshaft centre line, the crankshaft to dynamo pinions are not set correctly. This will mean removal of the dynamo. (See notes on re-timing valves after dynamo removal.)

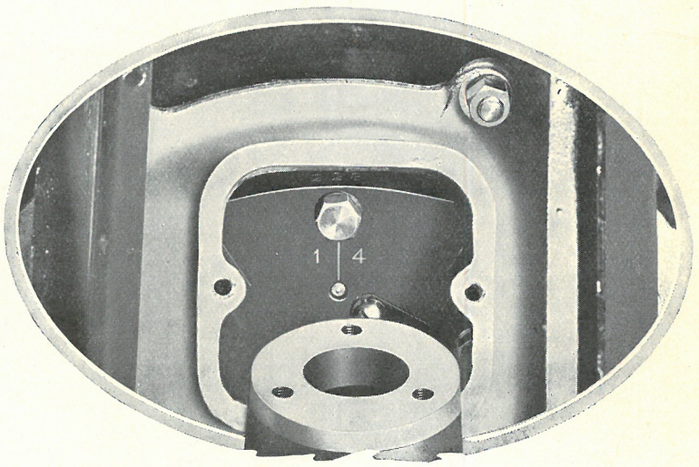
Top dead centre positions for the respective pistons are clearly marked on the flywheel cover-plate and can be easily observed through the clutch housing cover-plate. Top dead centre is with the timing marks exactly in the centre of the opening in the clutch housing.

As the engine is now timed to No. 1 piston firing stroke, the valve gear must be set to correspond. Turn the vertical shaft until both cams of No. 1 cylinder are pointing upwards at equal angles, and at the same time the drive yoke lies at right angles to the corresponding yoke on the dynamo. Refit cylinder head to engine and tighten down before inserting the flexible coupling bolts.

Very important. Before tightening up the flexible steel coupling bolts between the driving yokes above the dynamo, the engine should be turned by hand sufficiently to permit the yokes to take up a natural position in relation to the flexible coupling.



The camshaft timing wheel marks are here clearly shown.



Showing the timing marks on the face of the flywheel cover-plate.

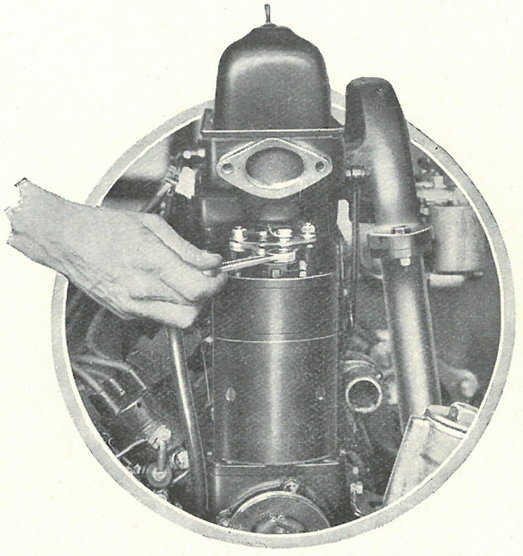
Date of issue : September, **1929**

Dynamo Removal without Disturbing Cylinder Head

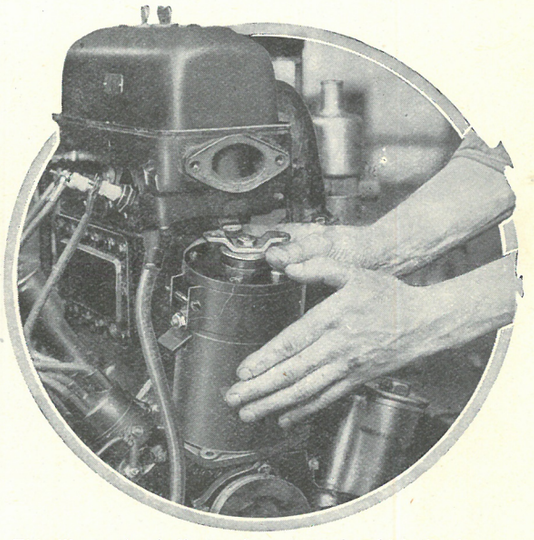
TO remove or replace the dynamo it is quite unnecessary to lift off the cylinder head, as easy access can be obtained by the removal of the radiator, complete with water outlet pipe and fan, cylinder head oil feed and drainage pipes and external oil filter.

With the above details out of the way, undo and remove the flexible coupling bolts and turn the camshaft until the driving yoke in the cylinder head vertical shaft is in line with the crankshaft. Then turn the engine until the dynamo yoke is at right angles to the vertical shaft yoke. Having removed the four bolts securing the dynamo to its platform, it will be found possible to withdraw the dynamo by tilting it towards the near-side and rear of the engine.

Very important. Note the number of brass shims between the dynamo base and platform and replace with exactly the same number.



Removing the coupling bolts of the flexible coupling.



This illustration indicates the manner in which the dynamo should be removed or replaced.

Date of issue : September, 1929

Re-timing Valves after Dynamo Removal or Overhaul

ALTHOUGH the crankshaft and dynamo bevel pinions are clearly marked, it will be appreciated that when replacing the dynamo it is impossible to see if the correct teeth are meshing, and this can only be checked by making sure that the yoke on the end of the dynamo is dead parallel with the crankshaft centre line when Nos. 1 and 4 pistons are at the top of their stroke. No difficulty in this direction should be experienced, however, as the distance from one tooth to the next on the dynamo bevel pinion is sufficient to make an appreciable and discernible difference to the position of the dynamo yoke.

Before replacing the dynamo, therefore, prepare the engine in the following way.

1. Remove the distributor, valve gear and clutch inspection covers. Turn the engine slowly by means of the starting handle until the distributor rotating arm points to No. 1 contact stud, and at the same time the mark 1/4 on the flywheel cover-plate appears exactly in the centre of the clutch inspection opening. In this position the tooth marked X on the crankshaft bevel pinion will be immediately above and in the centre of the crankshaft.
2. Turn the cylinder head vertical shaft until both cams of No. 1 cylinder are pointing upwards at equal angles, and the driving yoke is parallel with the front face of the cylinder head—or, in other words, at right angles to the crankshaft centre line.
3. With the two teeth marked X on the dynamo bevel pinion facing towards the crankshaft bevel pinion, drop the dynamo into position, making sure that, when the teeth mesh, the yoke on the end of the dynamo is **dead parallel** with the crankshaft centre line, and, of course, at right angles to the corresponding yoke on the vertical shaft in the cylinder head.

Very important. Before tightening up the flexible steel coupling bolts between the driving yokes, above the dynamo, the engine should be turned by hand sufficiently to permit the yokes to take up a natural position in relation to the flexible coupling.

Date of issue : September, 1929

Ignition Timing

TO RE-TIME THE CONTACT BREAKER

PROVIDING the oilpump has not been removed, no difficulty will be experienced in timing the ignition when replacing the distributor, as the distributor spindle cotter and corresponding slot in the oilpump drive skew gear have been set purposely out of centre, so that the distributor cannot be replaced a half revolution out.

After removing the clutch inspection and valve gear covers, the engine should be turned slowly by means of the starting handle until both the inlet and exhaust valves of No. 1 cylinder are closed and the mark 1/4 on the flywheel cover-plate appears exactly in the centre of the clutch inspection opening.

The distributor body should be refitted to the engine with the greaser pointing towards the radiator. By turning the rotating arm until the segment is opposite to No. 1 contact stud on the cover (which is the one nearest to No. 1 sparking plug), the spindle cotter will engage with the slot cut in the combined oilpump and distributor drive skew gear.

The final setting is obtained by moving the ignition control lever on the steering column as far as it will go towards the retarded position, and turning the distributor body until the rocker-arm points are just about to open on the cam action. The control ring clamp bolt should then be tightened and the distributor cover replaced.

TO RE-TIME THE DISTRIBUTOR WHEN THE OILPUMP HAS BEEN REMOVED

SINCE the distributor drive spindle driving dog connects with the oilpump skew gear, the ignition timing will be upset if the oilpump is removed from the engine. It is, of course, possible to replace the oilpump in any position, and correct the ignition timing by changing over the high-tension leads on the distributor cover, but as this is likely to lead to confusion the oilpump should be refitted to the original setting.

The correct timing of the distributor is such that the points of the contact breaker are just about to separate when the piston is on top dead centre, with the distributor placed to the fully retarded position. To simplify matters, the engine should be set to No. 1 piston top dead centre firing stroke, and the oilpump should be replaced so that when the distributor is connected, No. 1 contact stud on the cover will be the one nearest to No. 1 sparking plug.

To commence, the clutch inspection and valve gear covers should be removed, and the engine turned slowly by means of the starting handle until both the inlet and exhaust valve cams of No. 1 cylinder are pointing upwards at equal angles, and the mark 1/4 on the flywheel cover-plate appears exactly in the centre of the clutch inspection opening.

With the distributor still in place on the engine, and after removing the cover, the rotating arm segment should be turned until it is pointing towards the contact stud on the cover which is nearest to No. 1 sparking plug. After slackening the advance and retard control ring clamp bolt, the distributor can be removed, when the position of the drive cotter should be observed carefully, so that when the oil pump is replaced the corresponding slot in the skew gear can be set to the relative position. As the pump driving gear will turn slightly towards the rear of the car when meshed with the crankshaft driving gear, allowance should be made by turning the oil pump spindle in the opposite direction.

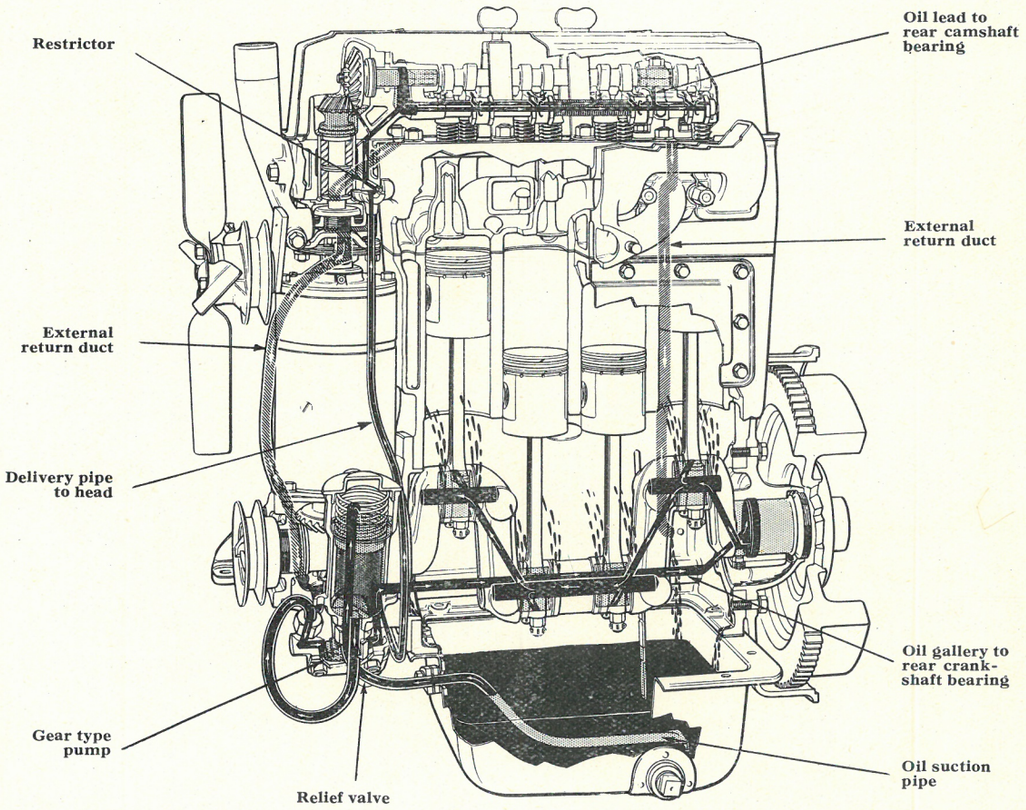
If the foregoing points have been carried out correctly, the distributor when replaced will have the rotating arm segment lying opposite to the contact stud on the cover which is nearest to No. 1 cylinder. The final timing can be obtained by moving the advance and retard control ring as far as it will go towards the engine, and turning the distributor body until the contact breaker points are just about to open on the cam in action. The control ring clamp bolt should then be tightened and the necessary attention given to the oil pump.

Date of issue : February, 1932

Lubrication System (O.H.V. Model)

THE lubrication system on the Morris Minor O.H.V. model is of the pressure feed type, a rotary gear oilpump being employed.

The oil is drawn direct from the engine sump into the external filter, whence it passes down through the internal gauze feeding the pump. Since the external filter is placed in the suction side of the system, it is imperative that the filter be primed with fresh oil each time the engine sump is emptied or whenever the suction side of the system is broken at any point. In addition, it must be understood that the filter cover and pipe connections must be kept perfectly tight to exclude the possibility of air leakages.



From the pump the oil is fed under pressure through a passage to a hole in the top face of the pump body, which coincides with a hole drilled in the crankshaft front bearing housing. A relief valve is fitted in the pump body, consisting of a plunger and spring, which controls the oil pressure fed to the engine. Excess oil passes direct into the crankshaft front bearing housing.

Continuing from the crankshaft front bearing housing the oil is fed through a passage cast along the off-side of the crankcase, which runs to the bell housing and direct to the crankshaft rear main bearing. To prevent the bearing from turning in its housing, thus cutting off the oil supply, a grub screw is fitted which passes through the housing and bush. If the occasion arises to remove the bush it must be replaced so that the oil holes will register, and the grub screw must be refitted securely.

Coinciding with an oil way cut in the rear main bearing is a hole drilled right through the crankshaft rear sleeve and journal, through which oil passes into the drilled crankshaft, thus feeding the big-end bearings and incidentally supplying the pistons and gudgeon pins by splash.

Continued

Date of issue : February, 1932

Lubrication System (O.H.V. Model)—*continued*

The overhead valve gear is supplied with oil at pressure from a copper pipe connected to the main oil way at the crankshaft front bearing housing. At the cylinder head end of this pipe a restrictor pin is introduced which regulates the oil feed to the valve gear. Consequently, this pin should on no account be altered dimensionally in any way. It is very necessary, however, to remove it from its housing at frequent intervals for the purpose of cleaning, since any foreign matter which is not trapped in the oil filter will collect here and eventually cut off the supply of oil to the cylinder head.

At this point the oil passes to the camshaft front bearing bracket through a passage which communicates with the front bearing and the forward end of the rocker shafts. A stream of oil is supplied for the vertical shaft and camshaft bevel pinions through a hole drilled into the camshaft front bearing bracket. This hole also supplies the vertical shaft roller races.

Each rocker-arm bush is supplied independently through holes drilled at intervals in the rocker shafts to correspond with grooves cut in the eccentric bushes. From here the oil reaches the faces of the rocker-arms through holes drilled in the eccentric bushes which communicate with grooves cut in the rocker-arms. Since the holes in the eccentric bushes will register with the rocker-arm grooves through 50 per cent. of their travel only, it is most important to ensure that the thick side of the eccentric bushes be kept to the insides of the rocker shafts, otherwise the oil supply will be stopped.

The rear camshaft bearing is fed from each rocker shaft through holes drilled for the grub screws.

Surplus oil from the rear end of the cylinder head drains back to the engine sump through a passage which connects to an external copper pipe. The drainage from the front end, however, is utilised to lubricate the timing gears at the forward end of the crankshaft, whence it passes through the crankshaft front journal bearing back to the sump. The lead down from the head is again through a copper pipe.

Date of issue : September, 1929

Oil Leaks from Cylinder Head Vertical Shaft

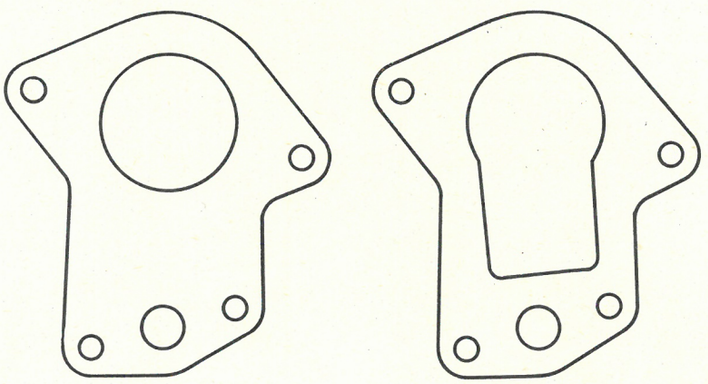
WE give below the causes for oil leakages past the vertical shaft, but in doing so we should like to emphasise the fact that in most cases the trouble has been due to external leakages at some of the joints at the front end of the engine, or to over-oiling of the fan bearing. Dealers should therefore make perfectly sure that oil is actually passing the vertical shaft before any work of dismantling is commenced.

The most difficult joint to make is the one between the vertical shaft drainage casting and cylinder head. Owing to the fact that the position of the vertical shaft drive pinion in relation to the camshaft bevel pinion is controlled by various thicknesses of brass shims placed between the drainage casting and the cylinder head, it will be understood that the faces of the cylinder head and drainage casting must be perfectly flat if the joint is to be made oiltight.

Apart from a possible fault in machining or a cracked or porous casting (which would mean its renewal), there is a possibility that the large washer or bearing retaining plate which fits into the recess of the drainage casting may be standing above instead of below the top face, preventing the casting from going right home against the face of the cylinder head. A defect of this nature can be rectified by reducing the thickness of the washer, or alternatively deepening the recess in the drainage casting. If the latter remedy is adopted, care should be taken to see that the dowel pin, when replaced, also stands flush or below the top face. In addition, it is advisable to test the top face of the drainage casting with a straight-edge, as there is a possibility that tightening of the stud nuts with the washer or dowel pin standing proud may have caused the casting to become distorted.

On early Morris Minor O.H.V. models the brass shims previously referred to shrouded the return passage in the drainage casting, with the result that oil coming down the outside of the roller races was trapped. An improvement, therefore, was effected by cutting the shims so that the return passage in the drainage casting was not covered.

This modification to the shims is illustrated below.



Original type **Present type**

Assuming the foregoing points to be in order, attention should be paid to the pressed-steel oil thrower. It will be understood that if this is not clamped securely between the driving yoke and shoulder on the vertical shaft when the driving yoke nut is tightened it will not revolve with the vertical shaft, and consequently will not function as an oil thrower.

An irregularity of this nature can be caused by the driving yoke being a shade short, so that the lower face does not stand proud of the shoulder on the vertical shaft when the nut is tightened. Needless to say, it can be rectified by the addition of a suitable packing washer which can be fitted above or below the driving yoke.

The condition of the oil return thread on the driving yoke itself is also important, as certain cases have been discovered where the starting point of the thread has been closed or damaged. It is a simple matter to rectify any damaged portions of the thread with a half-round or other suitable file.

Continued

Date of issue : January, 1930

Oil Leaks from Cylinder Head Vertical Shaft—*continued*

The next modification is one which is particularly recommended for all cases where the vertical shaft assembly is dismantled for the purpose of overcoming oil leakages.

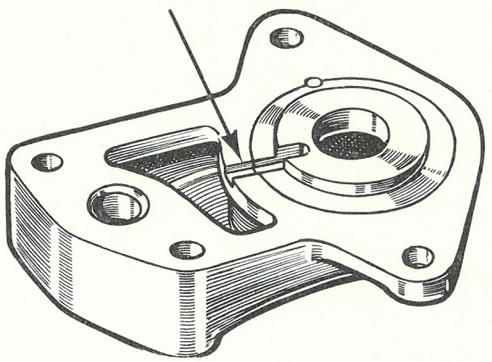
To prevent oil trapping in the vertical shaft roller bearing sleeve, and to assist its release, an oil groove should be cut across the top face of the bearing retaining plate and bridge of the drainage casting, leading into the return passage at the off-side.

The oil groove should be started at the centre boss of the bearing retaining plate immediately below the centre of the roller cage, and should be cut parallel with the top faces until a depth of approximately $\frac{1}{16}$ in. and breadth of $\frac{3}{16}$ in. is reached in the drainage casting.

Where it is found impossible to machine the groove, assistance in starting will be gained by drilling a $\frac{3}{16}$ in. diameter hole in the centre of the bearing retaining plate boss for the depth of $\frac{5}{32}$ in. This will give a good starting point so that the groove can be cut with a suitable chisel and finished off with a file.

In reassembling, a little gold size or liquid packing should be introduced between the faces of the drainage casting, shims and cylinder head to ensure an oiltight joint at this point.

Cut Oil Drainage Groove $\frac{3}{16}$ in. wide × $\frac{1}{16}$ in. deep.



This illustration clearly shows the situation of the oil groove recommended to be cut in the face of the bearing retaining plate and the bridge of the drainage casting.

Continued

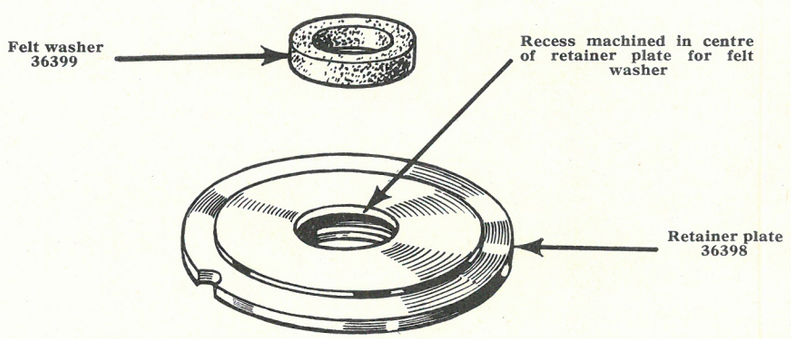
Date of issue : January, 1931

Oil Leaks from Cylinder Head Vertical Shaft

FURTHER to the information contained in Service Information MM/8, Sheets Nos. 1 and 2, it should be noted that, commencing at Engine No. U28100, an additional modification has been introduced on the roller bearing retainer plate, which greatly minimises the possibility of oil leaks from the vertical shaft assembly.

The modification referred to comprises a felt washer, which has been introduced in the centre of the bearing retainer plate, thus sealing it against the vertical spindle, and preventing an overload of oil from reaching the drainage casting.

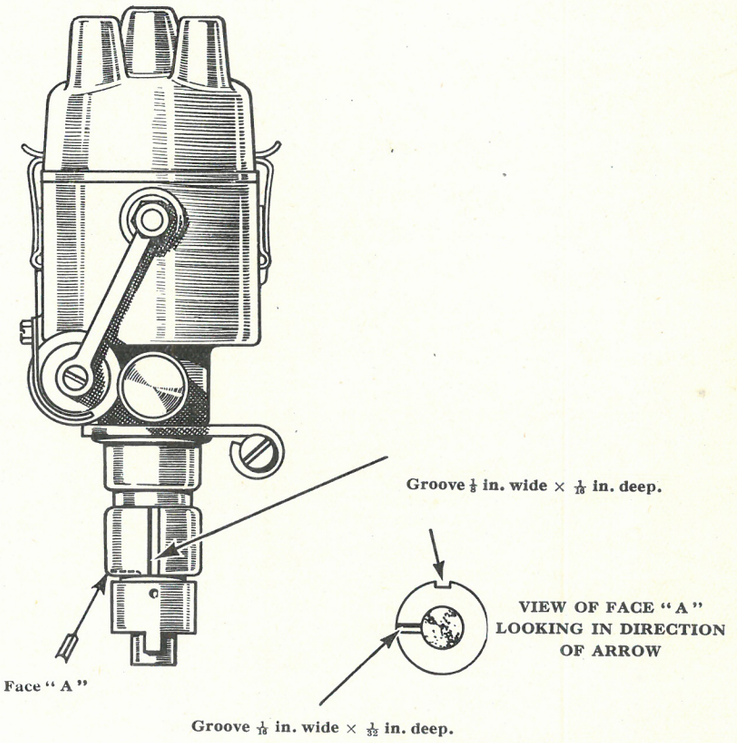
To effect the modification it is necessary to machine out the centre boss of the retainer plate to take a felt washer $\frac{3}{16}$ in. thick, $\frac{1}{2}$ in. inside diameter, and $\frac{13}{16}$ in. outside diameter. Where it is found impossible to machine the retainer plate, the latest pattern, together with the necessary felt washer, can be obtained on application to our Spare Parts Department. The Part Number for the retainer plate is 36398, and for the felt washer 36399.



Date of issue : September, 1929

Oil Penetration on Lucas Distributors

IN a few isolated cases on the early Minor O.H.V. models this trouble manifested itself, but was quickly overcome by cutting a groove $\frac{1}{16}$ in. wide $\times \frac{1}{32}$ in. deep across the lower face of the distributor body, as shown hereunder.



To effect this modification, remove the distributor from the engine and withdraw the spindle by knocking out the driving dog pin. The spindle will then come out from the top after the driving dog has been removed.

Date of issue : December, 1929

Oil Passing into Speedometer Head

THE first point which should be checked when investigating an irregularity of this nature is the level of oil in the gearbox, since the speedometer drive gears are lubricated from the gearbox. On no account should the level of oil be above that of the filler plug.

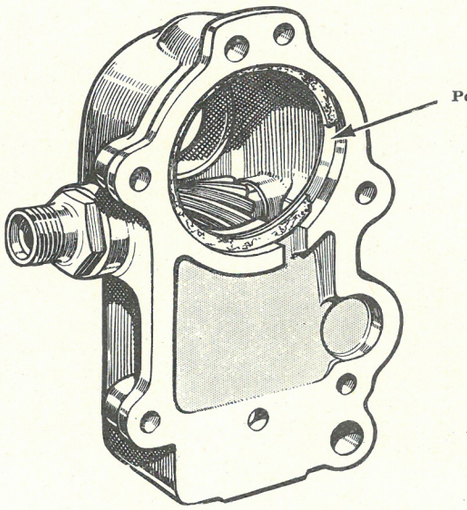
Through a hole immediately above the mainshaft ball bearing, oil passes into the gearbox rear cover for the purpose of lubricating the speedometer gears, whence it passes back to the gearbox through a return passage cut in the rear cover immediately behind the cork washer in the mainshaft ball bearing recess. It will be readily understood, therefore, that to prevent oil from piling up in the rear cover the return passage must be kept perfectly clear.

As there is a possibility that the cork washer in the mainshaft ball bearing recess may expand or buckle, in consequence partially restricting the return passage, advantage will be gained by fitting a pen steel stiffening washer in the recess to reinforce the cork washer and keep it clear of the return passage. If necessary, the return passage should be widened and deepened by the use of a suitable file. The pen steel washer has been provided on all but the first few hundred units.

It should not be overlooked that there is a possibility of the lay of the wires, forming the speedometer inner cable, acting as an oil impeller, thus taking the oil up into the speedometer head. In addition, it is important that the outer cable union at the gearbox end shall be kept tight, for the large washer on the inner cable, when locked firmly in position, tends to seal the oil in the speedometer bearing bush.

Care should be taken to see that the end float on the driven spindle is not excessive, since this sets up a pumping action which tends to force oil into the speedometer cable.

N.B.—For cases of oil leaks at the rear end of the gearbox, attention should be given to the oil return passage in the gearbox rear cover, on the lines suggested above.



Here is clearly shown the position of the special pen steel washer placed behind the cork washer to keep the oil return passage clear.

Date of issue : September, 1929

Clutch Slip

CLUTCH slip can be produced by one or a combination of the following irregularities : —

(*a*) Driver's foot resting on clutch pedal.

(*b*) Faulty adjustment.

(*c*) Seizure in withdrawal mechanism.

(*d*) Weak clutch springs.

(*e*) Oil leaks from engine or gearbox into clutch mechanism.

Complaint (*a*) Obviously is in the hands of the owner.

„ (*b*) Can be overcome by readjusting toggle arms, toggle arm keeps and adjusting screws, as suggested in Service Information No. MM/12 on **Clutch Lubrication and Adjustments.**

„ (*c*) If serious, this will necessitate the removal of gearbox and the withdrawal of clutch operating shaft. Where not already provided, an oil hole should be drilled through the near-side bush and housing, similar to the hole on the off-side. This suggests lack of adequate lubrication, see Service Information No. MM/12.

„ (*d*) Can only be rectified by fitting replacements.
Note.—The latest and rather stronger type of clutch springs are recognisable by being painted a brilliant red.

„ (*e*) Will mean the removal of flywheel to ascertain correct cause. See notes on method of removing crankshaft rear sleeve and flywheel and oil leaks into clutch mechanism, Service Information Nos. MM/17 and MM/13.

Date of issue : December, 1929

Clutch Lubrication and Adjustments

LUBRICATION

A FEW drops of engine oil should be introduced to the working parts of the clutch, as follows, after removing the clutch inspection cover.

(*a*) To the clutch thrust race.

(*b*) To the spline shaft. On late models an oil hole is drilled in the hub of the driven plate, but, in any case, oil dropped on to the spline will work along and allow the driven plate to slide freely.

On still later models lubrication is automatic from the gearbox (see Service Information Sheet No. MM/26).

(*c*) To both bearings of the clutch withdrawal fork.
Note.—On early models it was necessary to lubricate the left-hand bearing from the inside, but this has since been modified by drilling an external oil hole through the left-hand bearing and housing, similar to the one drilled for the right-hand bearing.

(*d*) One drop of oil on each of the withdrawal lever bearing pin felt washers. (There are six of these.)

N.B.—The Morris Minor clutch runs dry, and for this reason lubrication of the above details must be sparing. Oil finding its way on to the friction linings will cause clutch slip.

ADJUSTMENTS

(*a*) Make sure that the clutch pedal has at least $\frac{1}{2}$ in. clearance to the underside of the toe board.

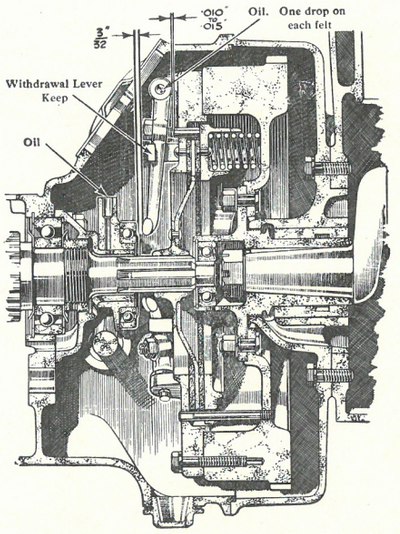
(*b*) Adjust the withdrawal levers by means of the adjusting screws so that the toes of the withdrawal levers are each exactly 3/32 in. from the face of the clutch thrust bearing, making quite sure that there is clearance between the toggle lever and the spring keep. (To do this it is necessary to prepare a suitable gauge for insertion between the withdrawal lever toes and the face of the withdrawal race. Any piece of clean metal strip a bare 3/32 in. thick will do.)

(*c*) With the gauge removed there should be a clearance of from .010 in. to .015 in. between the adjusting screws and the pressure pins on the three withdrawal levers. If this amount of clearance is not present the keeps should be sprung out with a screwdriver until this clearance is obtained.

N.B.—With any type of clutch a certain amount of " settling down " is inevitable in the course of the first few hundred miles' running. In the case of the Morris Minor this means that as the friction surfaces bed down to one another the pressure plate will take up a position nearer to the flywheel cover-plate, and in doing so the clearance provided originally between the pressure pins and the withdrawal lever adjusting screws, and thus between the withdrawal levers and their keeps, will tend to be absorbed.

It is important that there should be adequate but not excessive clearance between the levers and their keeps as set out in paragraph (*c*) above. Lack of clearance at this point prevents the pressure plate from being fully released and causes clutch slip.

The clutch cover-plate is not intended to make an airtight joint. One edge is turned up to ensure ventilation of the clutch compartment.



Date of issue : September, 1929

Oil Leaks into Clutch from Engine

O.H.V. MODEL AND MORRIS FAMILY EIGHT

SINCE the bell housing carrying the rear main bearing (which is supplied with oil at pressure) forms part of the clutch compartment, it is only to be expected that a certain amount of oil in the form of a vapour will pass through from the engine. To prevent the accumulation of an undue quantity of oil in the clutch compartment it is recommended that a 1/16 in. diameter hole be drilled in the centre of the clutch housing drainage plug if one does not already exist. Where there is a distinct leakage of oil, however, it is very necessary to ascertain the cause, as clutch slip will certainly occur if any great quantity of oil finds its way to the friction surfaces.

Supposing, on the removal of the flywheel (see Service Information No. MM/17), the real cause of the leakage is not apparent, the bell housing should be cleaned thoroughly with paraffin, when the flywheel and crankshaft sleeve can be replaced and the engine run until the oil becomes perfectly fluid. On the second removal of the flywheel the exact location of the leakage should be fairly obvious.

Firstly, there is the possibility of a cracked or porous bell housing casing, in which case it may be necessary to fit a replacement.

Secondly, the oil may be leaking through the steel plug connecting the oil passage in the bell housing to the main oil way cast along the off-side of the crankcase. An irregularity of this nature can usually be rectified by tightening the plug or, if necessary, by fitting a new copper washer. The face of the plug must, of course, be quite square, and if there is any doubt at all in respect to this it is best to fit a new plug. In cases where a plug locking plate is not already provided, one should be fitted, as this prevents the plug slackening off by engine vibration. The Part Number of the locking plate is 36450.

Thirdly, if the bolts securing the bell housing to the crankcase are not properly tightened, oil may percolate through the bolt holes. In cases of this nature it is of advantage to remove the bolts and treat their threads with liquid packing.

Fourthly, there is a possibility that oil may be passing along the keyway of the crankshaft and crankshaft sleeve. This irregularity will be recognised at once should the drive gear tail end bearing be found saturated with oil.

On all but a few early units a pen steel washer has been fitted under the nut which secures the sleeve to the crankshaft, this washer providing an oiltight joint between the faces of the crankshaft sleeve and the nut. In odd cases it may be advisable to true up the face of the nut before replacing.

With the introduction of the taper crankshaft rear sleeve, commencing with Engine No. U12326, this pen steel washer is no longer necessary, and no washer is therefore used beneath the castellated crankshaft sleeve nut on engines equipped with this type of crankshaft sleeve.

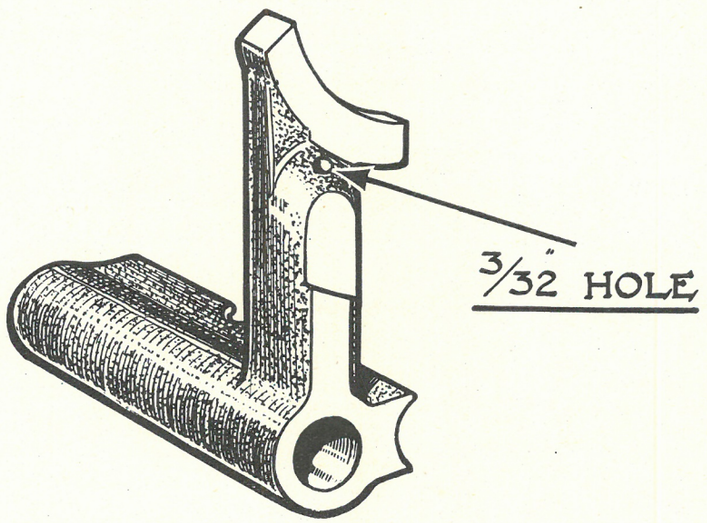
Continued

Date of issue : September, 1929

Stiff Gear Change

THERE is a possibility of trouble of this nature arising in the very early Minor models, as a result of oil finding its way into the lock ball spring housings of the selector forks, where it becomes trapped, thus creating a hydraulic pressure when the selector is moved by changing gear.

Rectification is achieved by drilling a 3/32 in. diameter drainage hole at the foot of the lock ball spring housing of each selector, thus allowing the trapped oil to escape.



Where the oil relief hole should be drilled.

Date of issue : December, 1929

Final Drive Assembly

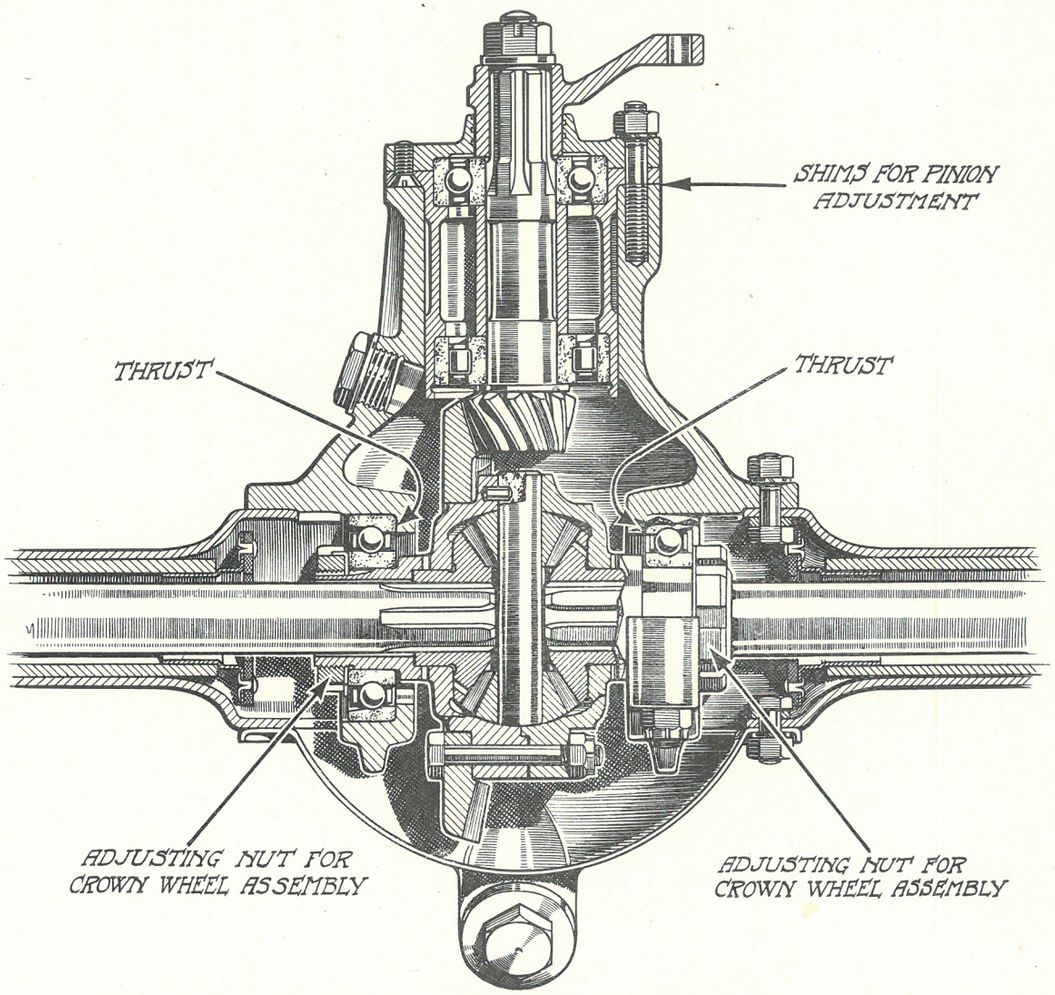
REPAIRS and adjustments to the Minor final drive assembly are comparatively simple to effect, since the differential carrier, complete with drive pinion, can be removed from the axle by withdrawing the half shafts, disconnecting the Hardy coupling at the rear end of the propeller shaft and unscrewing the stud nuts securing the differential carrier to the banjo casing.

As the position of the bevel pinion in relation to its crown wheel is controlled by shims fitted between the bevel pinion housing and differential carrier, and is set correctly when the car leaves the Works, any future adjustment to correct the meshing of the teeth should be obtained by adjusting the differential bearing nuts. Adjustments of this nature can, of course, be done after removal of the rear axle cover only, although advantage is certainly gained by taking the complete assembly away from the axle, when the operator will obtain a clear view of the mechanism.

Where it is found necessary to fit replacement parts, or dismantle the axle for overhaul, care should be taken to assemble and adjust the various components correctly. No difficulty in this respect should be experienced if the following points are carefully noted.

To simplify matters the adjustments will be dealt with under the following three headings.

1. The assembling of the bevel pinion in its housing.
2. The mounting of the crown wheel complete with differential gear and drive pinion in the differential carrier.
3. Final adjustments to obtain the correct meshing of the bevel pinion and crown wheel teeth.



(1) The parts comprising the bevel pinion housing are the bevel pinion, bevel pinion housing, bevel pinion housing cap and countersunk screws, roller and ball bearings, roller bearing spring ring, bearing distance piece, thrust washer, and universal joint spider, nut and washer.

Continued

Date of issue : December, 1929

Final Drive Assembly—*continued*

The roller race should be fitted to its recess in the bevel pinion housing and kept in position by inserting the spring ring. The bevel pinion, with thrust washer in place against the gear, can then be passed through the roller race until the washer bears against the inner ring of the race. After this, the bearing distance piece can be passed over the pinion, when the ball bearing can be pressed home until it seats in the bottom of its recess in the bevel pinion housing. This leaves for replacement the bevel pinion housing cap, which is secured to the housing by means of the two countersunk screws, the heads of which are countersunk into the housing flange. To make sure the bevel pinion is right home in the housing the universal joint spider should be fitted and drawn up tight by means of the nut and washer. When tightened the nut can be secured by a suitable split pin.

(2) The parts comprising the differential assembly are the crown wheel complete with right- and left-hand differential cases and differential gears assembled, the two differential thrust races, the adjusting nuts and lock washers, and differential thrust bearing caps.

The differential thrust bearings are pressed on to the differential case spigots, care being taken to see that the two faces marked " thrust " face each other. At this stage the assembly can be fitted to the differential carrier, the lock washers placed in position, and the adjusting nuts screwed home until the thrust bearings are pressed into the machined recesses in the differential carrier. After this, the thrust bearing caps with shoulders towards the centre of the axle can be fitted, and the stud nuts tightened and secured by suitable split pins. The assembly is now ready for mounting with the bevel pinion housing.

(3) Should it be found, when the bevel pinion housing is fitted to the differential carrier, that no backlash can be felt between the crown wheel and bevel pinion teeth, the off-side differential case adjusting nut should be slackened off and the near-side nut tightened, to set the crown wheel farther away from the bevel pinion.

The correct position of the bevel pinion in relation to its crown wheel is such that the forward and rear edges of the teeth shall be flush with each other. This adjustment is determined by fitting the correct number of shims between the bevel pinion housing and differential carrier.

The final adjustment is obtained by setting the position of the crown wheel in relation to the bevel pinion by means of the off-side and near-side differential adjusting nuts until .005 in. to .006 in. backlash can be felt between the teeth when the crown wheel is oscillated by hand. When the correct position of the crown wheel has been finally determined the adjusting nuts should be tightened sufficiently to take the thrust of the bearings. *Excessive tightening of these nuts is quite unnecessary and will only induce rapid wear in the differential bearings.* After this, the nuts can be locked by bending a tongue of the lock washers into a corresponding recess.

If the foregoing points have been carried out correctly the action of the bevel pinion and crown wheel will be perfectly quiet under all road conditions. Supposing, however, the axle is noisy on the drive, it denotes the bevel pinion and crown wheel are meshing too deeply, and if noise is audible on the overdrive then the teeth are not meshing deeply enough. In both cases it will be possible to obtain all the necessary adjustments by means of the differential case adjusting nuts without disturbing the bevel pinion housing.

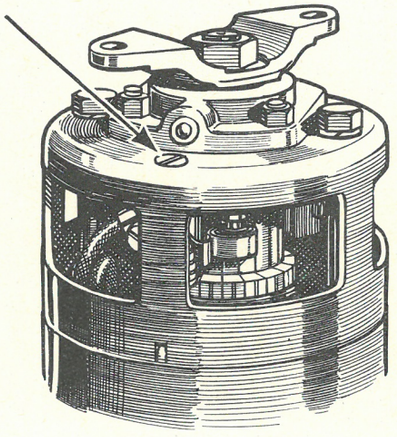
Date of issue : December, 1929

Adjusting Dynamo Output

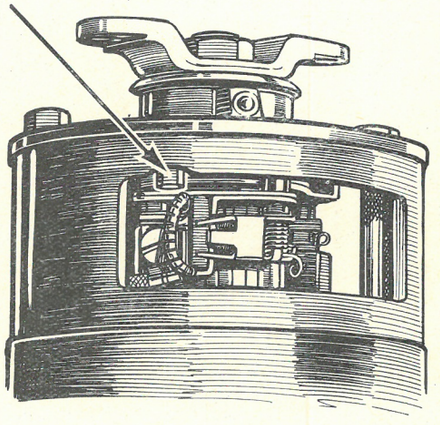
TO increase the charge, the control brush (which is the thinnest of the three) should be moved in the direction of armature rotation, and in the opposite direction to reduce the charge.

On the very early Minor models, where a shield is fitted over the top of the DEL7 type dynamo, it may prove impossible to move the control brush without slackening the brush locating screw (which passes through the dynamo end cover below the shield), in which case access to the screw can be gained by drilling a $\frac{3}{8}$ in. diameter hole through the shield so that a screwdriver can be inserted. The centre of this hole should be approximately $\frac{3}{8}$ in. from the outer edge of the shield. This will allow a screwdriver to be placed on the screw when the hole in the shield is opposite the screw.

With the DEL19 and DDS2 type dynamos the control brush holder is secured by a hexagon-headed screw located below the brush holder and pointing upwards towards the dynamo end cover. A magneto spanner can be utilised.



DYNAMO TYPE DEL 7.
The arrow indicates the control brush carrier locking screw.



DYNAMO TYPE DEL 19 and DDS2.
The arrow here indicates the control brush carrier locking bolt.

Date of issue : December, 1929

Removing Flywheel and Crankshaft Rear Sleeve

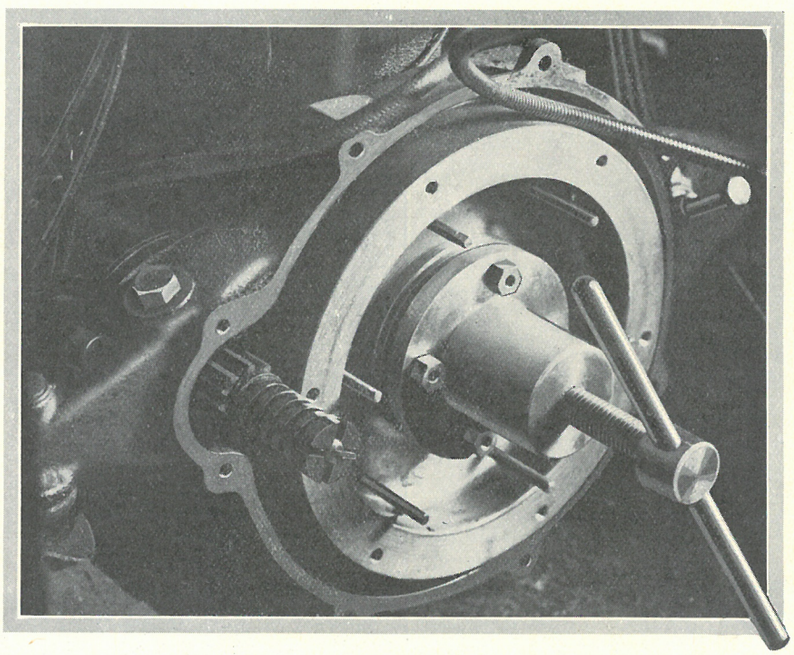
TO withdraw the crankshaft rear sleeve and flywheel, it is necessary to remove the gearbox by first of all disconnecting the Hardy coupling at the front end of the propeller shaft and unscrewing the eight bolts locating the gearbox casing to the bell housing. This will allow the gearbox, complete with drive gear, clutch withdrawal shaft, and pedals, to be lifted away from the engine after the foot brake rod fulcrum pin has been withdrawn and the starter switch and speedometer cables have been disconnected.

The next operation lies in dismantling the clutch mechanism by unscrewing the six bolts securing the clutch cover-plate to the flywheel. Three of the bolts referred to are sufficiently long to permit the clutch springs to lose their tension before these bolts unscrew fully, and for this reason the three short bolts should be taken out first.

Since the flywheel is bolted behind the crankshaft rear sleeve, the sleeve must be withdrawn from the crankshaft before the flywheel can be removed. This is accomplished by taking out the drive gear tail end bearing spring ring and withdrawing the bearing from its housing. *A special drawer is required* to remove this ball race, otherwise a damaged sleeve will surely result. The special drawer referred to is Part No. **35870,** and can be obtained on application to Service Parts Department.

The removal of the ball race reveals the crankshaft nut, which is locked by means of a parallel cotter. This cotter is extracted by using special tool No. **37105.** A well-fitting box spanner must be obtained to unscrew the nut after the cotter has been removed, **and particular care must be taken to keep the box spanner in line with the crankshaft, as the sleeve is easily damaged during this operation.** A suitable box spanner, Part No. **36292**, is obtainable from our Service Parts Department.

After the flywheel bolt nuts have been taken off, the sleeve can be removed by the use of a special extractor, Part No. **36195,** obtainable from Service Parts Department for the sum of 13s.



The special extractor, Part No. 36195, in position for withdrawing the flywheel and crankshaft rear sleeves.

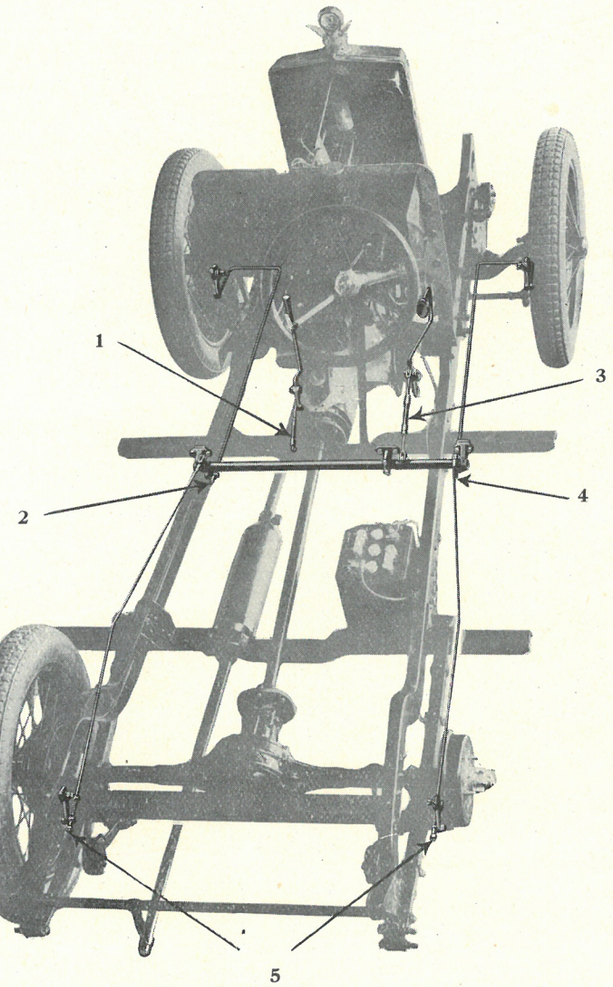
Date of issue : September, 1929

Foot Brake Adjustment

THE method of adjusting the Minor foot brake is simple, since each pair of shoes is provided with an independent adjustment, so that the brakes of all four wheels can be balanced evenly. In addition, a running adjustment is provided in the form of a right- and left-hand screwed turnbuckle, situated between the brake pedal and cross shaft, which when used will adjust the shoes on all four wheels simultaneously. This latter adjustment should never be used in the garage, however, without first balancing and equalising the shoes, as it is provided for use by the owner for running adjustment purposes on the road.

Although every precaution is taken in the design of the brake operating gear to exclude mud and water, in cases where lubrication has been neglected it is still possible for partial seizures to take place. It is essential, therefore, to see that the complete operating gear is perfectly free, before attempting to adjust and equalise the shoes.

In addition, it is highly important that the cable adjusting nuts be free to turn easily on their threads, and that



1.—Hand brake adjustment.

2.—Cross shaft double lever and front brake cable adjusting nut.

3.—Running adjustment turnbuckle.

4.—Cross shaft double lever and front brake cable adjusting nut.

5.—Rear brake cable adjusting nuts.

Here are shown the adjustments provided for the brakes. The four-wheel brakes are equipped with individual adjustments so that they may be accurately balanced, and all four can be taken up simultaneously to compensate for wear by means of the main turnbuckle adjustment indicated.

Continued

Date of issue : September, 1929

Foot Brake Adjustment—*continued*

the cable pulleys revolve freely. Cable failures, in a great many cases, can be traced to seized pulleys or to imposing twisting stresses on the cables by careless turning of the adjusting nuts on rusty threads.

The solid end of the cable is provided with a hexagon so that the cable can be held against rotation by means of a spanner while adjustment is taking place.

Another point worthy of consideration before finally adjusting the brakes is the angle of the brake cross shaft levers. If the running adjustment turnbuckle has been taken up too far, the levers on the cross shaft will be placed at such an angle that a direct pull on the brake cables will not be obtained when the foot pedal is depressed. With the foot pedal in the " off " position the cross shaft single lever should be at an angle sloping backwards.

The most simple method to adopt when adjusting and equalising the brakes is first of all to jack up all four wheels clear of the ground, and tighten the front and rear cable adjusting nuts until the shoes just begin to bind on their drums. By tightening the running adjustment turnbuckle, sufficient braking pressure can be applied to each wheel so that the operator can discern if one is braking more than another, and correctly balance them by slackening or tightening the cable adjusting nuts. After all four wheels have been balanced evenly in this manner, final adjustment can be obtained by slackening the running adjustment turnbuckle until the wheels are free and the foot pedal has at least 1 in. free travel before the shoes come into operation. Although this method will be found satisfactory for most cases, a final road test on a dry macadamised road is recommended, where, when the car is braked hard, it is easy to ascertain by means of the road marks that all four wheels are braking evenly.

N.B.—Since Chassis No. 1348 the foot brake pedal stop bracket has been increased in length by 1 in., affording this amount of additional travel to the foot pedal. The original stop brackets can be modified by fitting a suitable wooden packing 1 in. thick between the bracket and dash, and providing longer bolts to suit.

Continued

Date of issue : January, 1931

Adjustment of Modified Four-Wheel Brakes

IN the new brake gear fitted to the later Morris Minors both hand and foot brakes operate shoes on all four wheels through the medium of a single countershaft, and the layout of the front brake cables has been modified to reduce the sharpness of the bends in the cables and thus provide a more direct pull.

Individual adjustment for each of the four sets of brake-shoes is provided, the location for the adjustment of the front shoes being situated at the countershaft levers, and those for the rear shoes at the brake camshaft levers. They take the form of hexagon-headed adjusting nuts which are all readily accessible. A main adjustment taking up the four sets of brake-shoes simultaneously is provided at the junction of the brake pedal pull rod and the countershaft lever by means of a large butterfly type adjusting nut, and a similar adjustment is provided at the junction between the hand-brake cable and the lever on the countershaft for the hand brake adjustment. This latter adjustment should, however, never be used in the garage without first balancing and equalising the shoes, as this adjustment is primarily provided to enable the owner rapidly to effect running adjustment while on the road. In order to afford him the maximum degree of adjustment and to provide the best working angle for the countershaft levers it is always advisable to slacken the main adjustments off as far as possible before equalising the brakes by the individual adjustment.

Although every precaution is taken in the design of the brake operating gear to exclude mud and water, there are cases occurring where lubrication has been neglected, thus allowing dirt to find its way to the bearings and producing partial seizures ; it is therefore essential to see that the complete operating gear is working with perfect freedom before attempting any adjustment to the brake-shoes themselves. It is also of importance to make sure before using the adjustment that the adjusting nuts are free to turn easily on their threads. Liberal application of paraffin to the threads before making use of the adjusting nuts will be of advantage. It is further essential to see that the guide pulleys for the front cable are revolving freely on their spindles. Many cable failures are traceable directly to chafing occasioned by seized pulleys, and the new pulleys are provided with oil-less bearings to mitigate this.

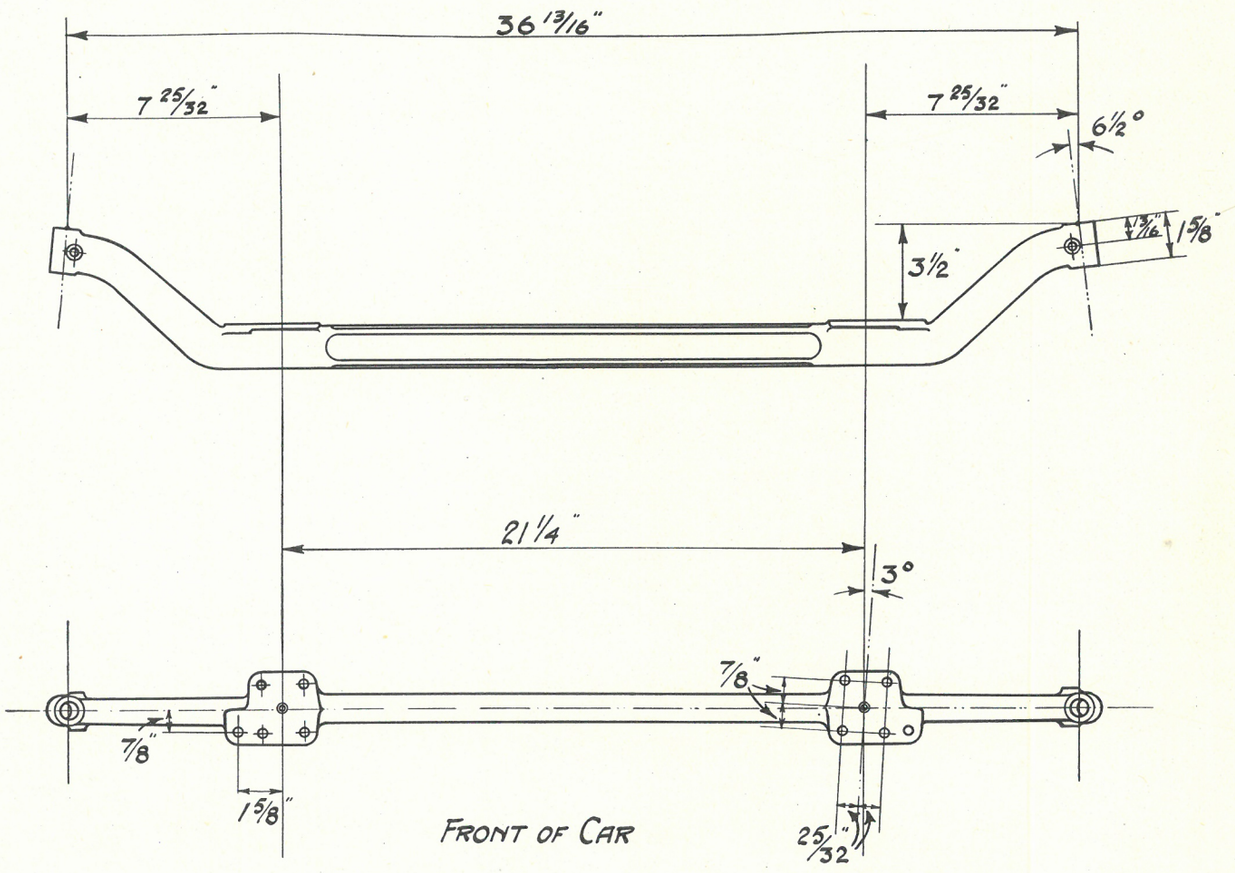
When making use of the individual adjustments the greatest care should be taken to avoid twisting the cables unduly, as this has the effect of greatly weakening them. The solid end of the cable forming the adjusting thread is provided with a hexagon by means of which the cable can be held against rotation with a spanner while the adjustment nut is being turned.

An important point which frequently fails to receive attention is the working angle of the countershaft levers. These should make an angle of approximately 60° with their respective cables when in the " Off " position—that is, they should lean appreciably backwards towards the rear of the car in order to allow for the inevitable backlash and clearance, and provide a sufficient range of adjustment by the main adjustment.

The most simple method to adopt when adjusting and equalising the brakes is first of all to jack up all four wheels clear of the ground and then to slacken off the main wing nut adjustment for both the hand and foot brakes, leaving a small amount of adjustment in hand. This will permit the countershaft levers to lay backwards to the desired extent. The individual adjustments to each brake-shoe may now be tightened up until the shoes are just beginning to bind on their drums. If the main adjustment is now tightened up sufficient braking pressure can be applied to each wheel to enable the operator to discern if one wheel is being braked more than another, and correct any lack of balance by slackening or tightening the individual adjusting nut belonging to its particular operating cable. When all four wheels have been evenly balanced in this manner final adjustment can be obtained by slackening the running adjustment turnbuckle until the wheels are free and the foot pedal has at least one inch free travel before the shoes come into operation. The hand brake main adjustment wing nut should now be tightened up until all slack in the operating cable has been taken up when the hand brake lever is in the " Off " position. Although this method is completely satisfactory in the majority of cases, we would take this opportunity of impressing the advisability of a final road test on a dry macadamised surface, where the correctness of adjustment can be tested by braking the vehicle hard and ascertaining by means of the road marks produced the equality of the braking on each wheel.

Date of issue : September, 1929

Front Axle Beam Dimensions



THE above illustration giving particulars of the principal dimensions of the front axle beam has been prepared to enable Dealers to check axles which are suspected of having suffered damage.

If the axle is straight all holes on the centre line of beam must be in line.

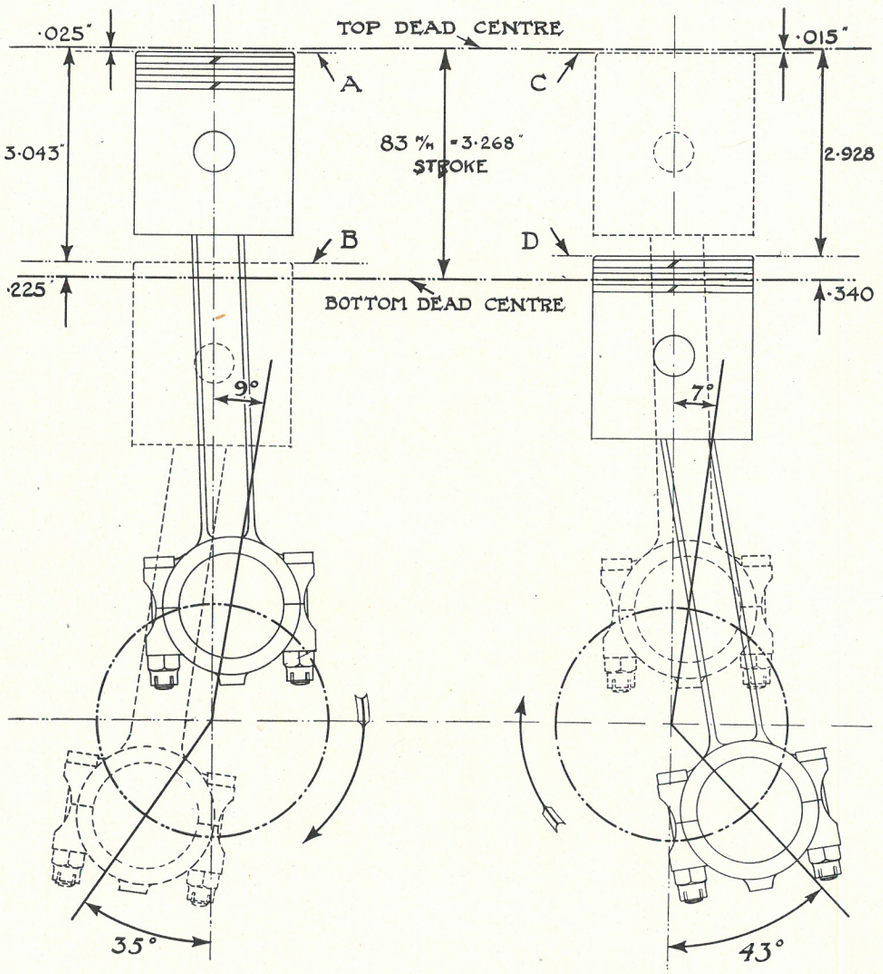
Date of issue : September, 1929

Timing Diagrams

INLET

Opens approx. .025 in. after completion of exhaust stroke.

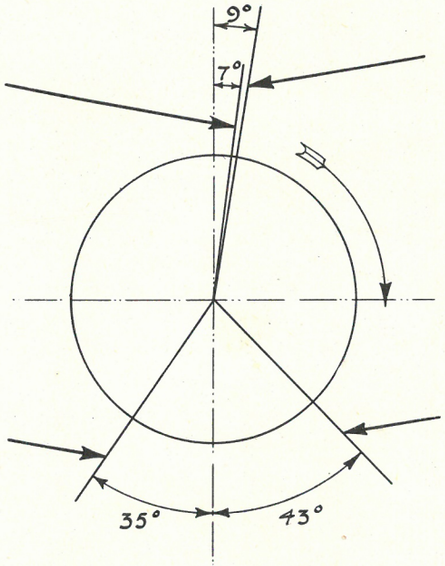
Closes approx. .225 in. after completion of inlet stroke.



EXHAUST

Opens approx. .340 in. before completion of firing stroke.

Closes approx. .015 in. after completion of exhaust stroke.



"C" Exhaust valve closes arc approx. $\frac{5}{8}$ in.

"A" Inlet valve opens arc approx. $\frac{3}{4}$ in.

"B" Inlet valve closes arc approx. 3 in.

"D" Exhaust valve opens arc approx. $3\frac{11}{16}$ in.

Arc lengths are measured on the outside diameter of the flywheel rim.

Date of issue : December, 1929

O.H.V. Minor Models and Morris Family Eight

RE-MESHING THE CRANKSHAFT TO DYNAMO BEVEL PINIONS

LITTLE or no difficulty should be experienced in re-meshing the crankshaft to dynamo bevel pinions if the few simple rules detailed hereunder are carefully observed.

At the outset it should be explained that the ideal setting of the pinions is such that there will be the least perceptible backlash between the teeth whilst the top and bottom edges of the teeth lie flush with each other. This latter point is very important and should be checked, if necessary, by raising the engine and removing the crankshaft front bearing housing cover, when a clear view of both pinions can be obtained by the aid of an inspection lamp.

In most cases it will be found that the same number of shims as fitted with the original dynamo will suit the replacement, although it must be understood that owing to a certain machining allowance in the manufacture of the dynamo the correct meshing of the teeth may not be obtained without readjusting by means of the shims. To avoid unnecessary dismantling and assembling, therefore, the meshing of the teeth should be checked and tested before the radiator, etc., is refitted.

By plugging the lower cylinder block water connection and filling the water chambers it is possible to run the engine sufficiently long to test the gears.

In the first place the replacement dynamo should be fitted with the original number of shims. Any backlash then felt between the teeth, tested by oscillating the dynamo yoke, should be eliminated by removing shims until practically no backlash remains. At the same time the pinions must be free to revolve without riding. By turning the dynamo yoke, thus driving the crankshaft, it is possible to feel if the pinions are bottoming or running freely.

If it is found necessary to remove or replace an undue quantity of shims the position of the dynamo bevel pinion in relation to the crankshaft bevel pinion should be checked carefully in the manner explained in the second paragraph. When the dynamo pinion meshes too deeply into the crankshaft bevel pinion when the correct amount of backlash is present, it denotes that the crankshaft bevel pinion is too far away from the dynamo centre line. To correct this it is necessary to fit a shim, or if necessary shims, behind the crankshaft bevel pinion to bring it farther forward and then add a suitable thickness of shims below the dynamo base plate. Should it be found necessary to alter the position of the crankshaft bevel pinion, care should be taken to see that the end float of the crankshaft is correct. This is controlled by shims fitted between the front bearing housing and cover. A clearance of .004 in. to .006 in. should be present between the face of the housing cover and thrust washers.

Shims can be supplied for the crankshaft bevel pinion and dynamo base plate and front bearing housing cover in the three following thicknesses :

.003 in., .005 in., .007 in.

In connecting up the dynamo with the cylinder head to test the gears, care should be taken to line up the flexible coupling correctly. With the flexible coupling and bolts in place, the engine should be turned by hand until the driving yokes take up their natural position. Without allowing the yokes or coupling to move, the nuts should then be tightened carefully.

Date of issue : December, 1929

Penetration of Oil and Water into Dynamo

WITH a view to preventing damage by water or oil to dynamos on Morris Minor O.H.V. cars, it has been decided to incorporate protective cowls and covers, and this modification is incorporated on all current models.

As regards dynamos already in service without this protection, it has been arranged that cowls and covers shall be added whenever units are returned to any of the Lucas Service Stations for repair. **It will be essential, however, to include, with the dynamos, the driving forks, so that the cowl can be added.** This is, of course, a departure from the usual procedure, in which all fittings are removed, and we shall be obliged, therefore, if you will give careful instructions to your Stores Superintendents, in order that mistakes may be avoided.

Cowls and covers can be obtained from our Service Parts Department for use when the dynamo is not returned to the makers for attention.

Date of issue : February, 1932

VERY IMPORTANT

Shim-less Big-end Bearings with High-pressure Lubrication

WITH reference to the full-ring butted-type bearing, as fitted to the 8 h.p. Morris 4-cylinder engines, it is felt that some Distributor Service and Repair organisations have not yet appreciated to the full the essential features of the system and its relation to high-pressure lubrication.

We therefore submit certain additional information which is worthy of the most careful consideration, primarily by the technical staffs of Distributor organisations, although the sales staffs should also be interested, as this up-to-date system possesses strong sales features.

(*a*) All bearings fitted to the 8 h.p. Morris 4-cylinder series of engines are manufactured to such close limits that they are absolutely interchangeable.

(*b*) The work that these engines are called upon to do demands the employment of a full force feed oiling system, for which reason all engine bearings are assembled with a normal clearance of 0.04 mm. (i.e. one and a half thousandths of an inch). This ensures that there is always an appreciable film of oil, under pressure, acting as a cushion between the bearings and the shaft.

This clearance, when the bearing is dry, allows a certain amount of shake, and, in the case of the connecting rods particularly, may give rise to a **false impression** that considerable slackness exists between the bearing and the journal. It will be found in practice, however, that a film of oil will eliminate this shake.

The cushioning effect of the oil film reduces wear to an absolute minimum, so that with reasonable care a crankshaft and its bearings will run for upwards of 50,000 miles without attention. Incidentally, in the unlikely event of a lubrication failure, the presence of clearance on each bearing gives audible warning immediately, which, if heeded in time, will prevent any serious damage. Thus, as a matter of absolute fact, there is little excuse for anyone claiming that lubrication shortage was unknown. The oil gauge on the instrument board is, in any case, an additional safeguard.

(*c*) The interchangeable system enables the effect of damaged bearings to be overcome quickly and at small cost, by the installation of new ones, when the original factory alignment and clearance is instantly restored without fitting. *Thus, the bearings should not be* **interfered** *with in any way other than to replace them, except as detailed in paragraph* (*d*).

N.B.—A bearing cap should never, in any circumstances, be machined or filed.

(*d*) It is possible that through lack of lubrication, and subsequent bearing failure, some minor damage may have been occasioned to the crankshaft, which causes difficulty in retaining the oil when the new bearing is fitted. If the crank pin is slightly damaged, it can be corrected by the use of a Grade OO emery paper strip. The work must be very carefully done so that no actual reduction in size takes place.

To permit restoration to the original bearing clearance, as specified in paragraph (*b*), the rod can then be dealt with by placing a piece of emery cloth, of medium grade, on a surface plate and rubbing the cap down, taking care to present it squarely to the plate and to have both sides of the cap bearing on the emery cloth at the same time. A few strokes should be sufficient.

The clearance of the bearing can be tested by the insertion of a cigarette paper between the crank and white-metal bearings. The paper should be placed in the cap half of the connecting rod. When bolted up, the connecting rod should swing freely, with only a slight suspicion of drag. **This will indicate the minimum clearance permissible.**

It should be clearly understood that the connecting rod caps only should be adjusted in this way, and then, if any mistake is made, replacements can be obtained at a reasonable price, whereas it would be expensive to correct or replace the major component.

Continued

Date of issue : February, 1932

Shim-less Big-end Bearings with High-pressure Lubrication—*continued*

(*e*) If a pin or journal is deeply scored or otherwise badly damaged, the crankshaft must be removed for re-grinding, otherwise bearing trouble will follow owing to loss of oil. (See General Service Information Sheet G/24 re Crankshaft Re-grinding Facilities.)

It must not necessarily be assumed, however, that loss of oil pressure indicates escape at the bearings, as there are many other causes which should be first investigated. Since crankshafts which have not been damaged will run upwards of 50,000 miles without attention, bearings should only be given attention on very clear evidence of damage or excessive wear.

The automatic release in the pump deals with any excessive pressure when starting from cold. When hot, the pressure naturally drops as the oil becomes more fluid, thus the reading on the gauge is dependent on the temperature : furthermore—and this is very important—on the condition of the oil itself. Cold running is often the cause of serious oil dilution by petrol and a consequent drop in pressure. Under normal running conditions, the pressure should not drop below 35 lb. on the gauge, whilst 10 lb. should be shown when the engine is ticking over.

New engines with new oil will, of course, give considerably higher readings than the above. For this reason **particular attention is called to the recommended change of oil after every 1200 miles.** Oil which has been damaged by dilution, indicated by consistently low pressure readings, should naturally be changed at once.

(*f*) It should be brought home to customers that while bearing failures are rare, they are one of the recognised hazards in motorcar driving, and that when they have a failure the car should either be towed, or driven in such a fashion that there is no audible knock. A customer who drives a car in such a manner as to damage the crankshaft badly should be treated in exactly the same way as the man who drives on a punctured tyre. Nobody would consider replacing an alleged faulty tyre driven under such conditions, and this Company cannot consider replacing a crankshaft which has been damaged through driving, either over a long distance or at speed, after a bearing has run out.

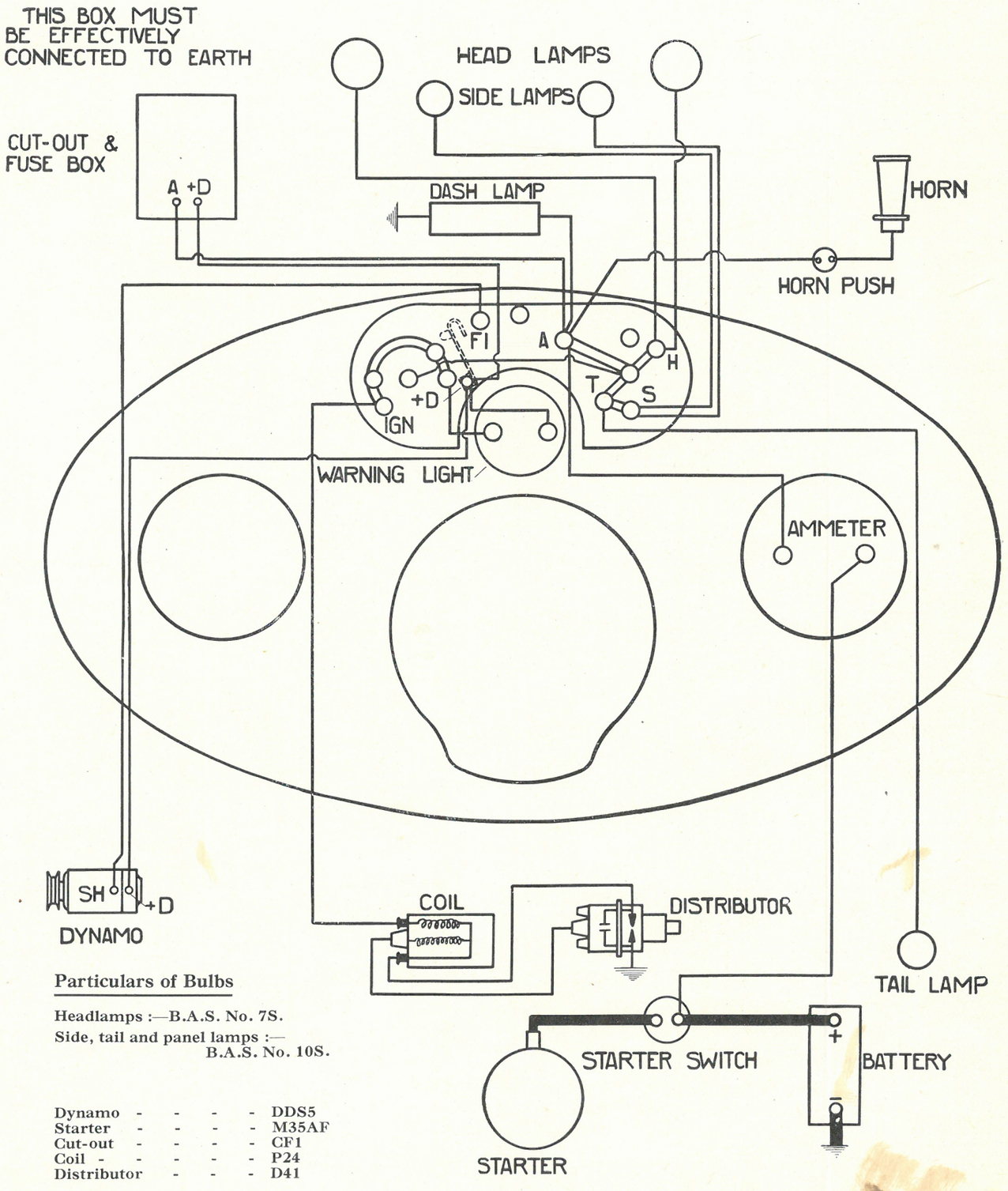
N.B.—**All connecting rods requiring re-metalling should be returned to the Works at Cowley.** They will be finish-machined to the original size.

Date of issue : January, 1931

Lighting, Starting and Coil Ignition System

WIRING DIAGRAM FOR 6-VOLT EQUIPMENT (EARTH RETURN)

FITTED TO MORRIS MINOR CARS (1930-1931)



Particulars of Bulbs

Headlamps :—B.A.S. No. 7S.
Side, tail and panel lamps :—
B.A.S. No. 10S.

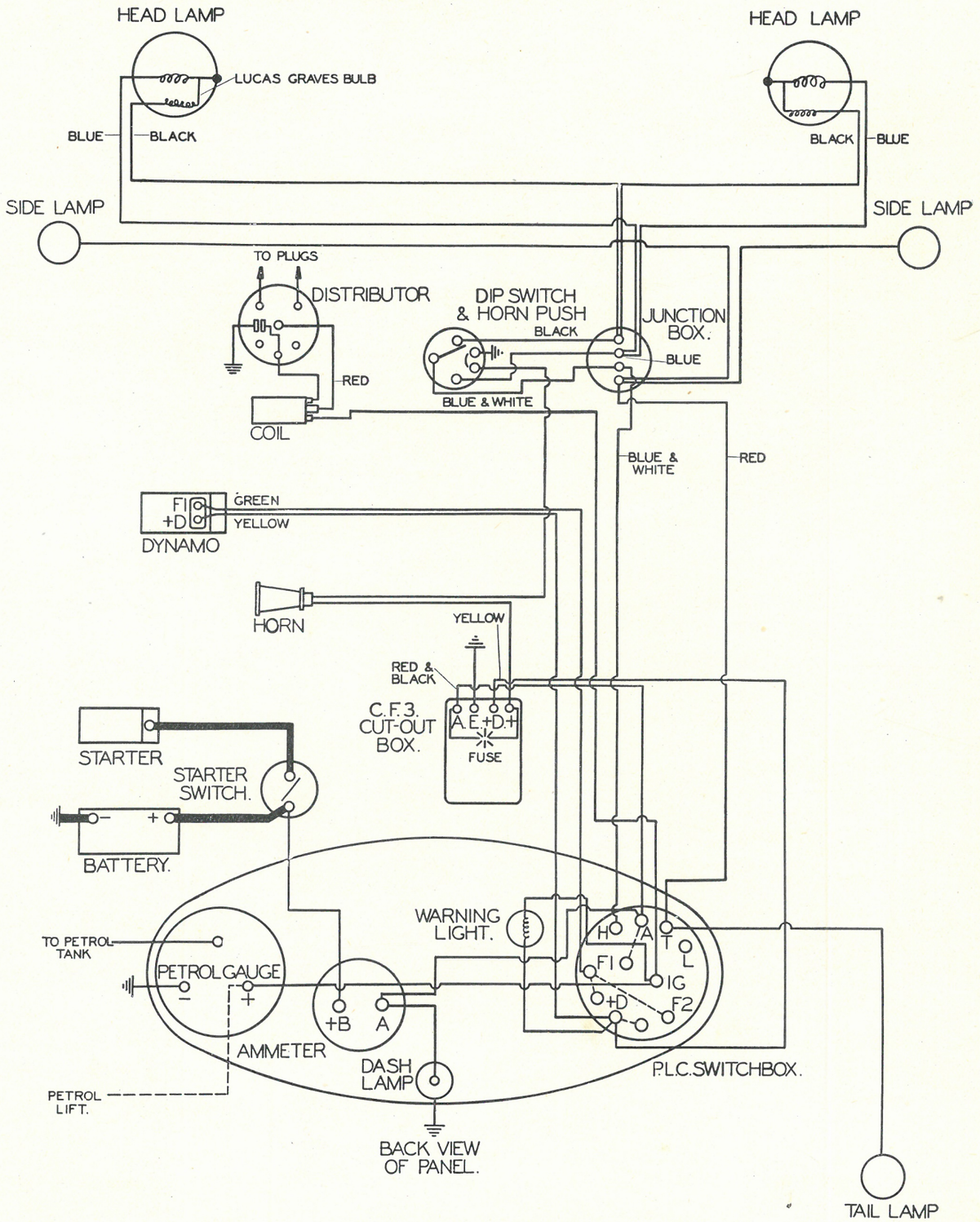
Dynamo - - - -	DDS5
Starter - - - -	M35AF
Cut-out - - - -	CF1
Coil - - - - -	P24
Distributor - - -	D41

Continued

Date of issue : February, 1932

Lighting, Starting and Coil Ignition System

WIRING DIAGRAM FOR 6-VOLT EQUIPMENT (EARTH RETURN) FITTED TO MORRIS FAMILY EIGHT CARS (1931-32)



PARTICULARS OF BULBS

Headlamps	L.G.D.	No. 612	6 volts	12 watts
Side, tail and dashlamp	B.A.S.	No. 8S	6 volts	3 watts
Ignition warning lamp	M.E.S.	No. 252	2.5 volts	.5 watts

Date of issue: January, 1931

Adjustment of Modified Four-Wheel Brakes

IN the new brake gear now being fitted to the Morris Minor both hand and foot brakes operate shoes on all four wheels through the medium of a single countershaft, and the layout of the front brake cables has been modified to reduce the sharpness of the bends in the cables and thus provide a more direct pull.

Individual adjustment for each of the four sets of brake-shoes is provided, the location for the adjustment of the front shoes being situated at the countershaft levers, and those for the rear shoes at the brake camshaft levers. They take the form of hexagon-headed adjusting nuts which are all readily accessible. A main adjustment taking up the four sets of brake-shoes simultaneously is provided at the junction of the brake pedal pull rod and the countershaft lever by means of a large butterfly type adjusting nut, and a similar adjustment is provided at the junction between the hand-brake cable and the lever on the countershaft for the hand brake adjustment. This latter adjustment should, however, never be used in the garage without first balancing and equalising the shoes, as this adjustment is primarily provided to enable the owner rapidly to effect running adjustment while on the road. In order to afford him the maximum degree of adjustment and to provide the best working angle for the countershaft levers it is always advisable to slacken the main adjustments off as far as possible before equalising the brakes by the individual adjustment.

Although every precaution is taken in the design of the brake operating gear to exclude mud and water, there are cases occurring where lubrication has been neglected, thus allowing dirt to find its way to the bearings and producing partial seizures; it is therefore essential to see that the complete operating gear is working with perfect freedom before attempting any adjustment to the brake-shoes themselves. It is also of importance to make sure before using the adjustment that the adjusting nuts are free to turn easily on their threads. Liberal application of paraffin to the threads before making use of the adjusting nuts will be of advantage. It is further essential to see that the guide pulleys for the front cable are revolving freely on their spindles. Many cable failures are traceable directly to chafing occasioned by seized pulleys, and the new pulleys are provided with oil-less bearings to mitigate this.

When making use of the individual adjustments the greatest care should be taken to avoid twisting the cables unduly, as this has the effect of greatly weakening them. The solid end of the cable forming the adjusting thread is provided with a hexagon by means of which the cable can be held against rotation with a spanner while the adjustment nut is being turned.

An important point which frequently fails to receive attention is the working angle of the countershaft levers. These should make an angle of approximately 60° with their respective cables when in the "Off" position—that is, they should lean appreciably backwards towards the rear of the car in order to allow for the inevitable backlash and clearance, and provide a sufficient range of adjustment by the main adjustment.

The most simple method to adopt when adjusting and equalising the brakes is first of all to jack up all four wheels clear of the ground and then to slacken off the main wing nut adjustment for both the hand and foot brakes, leaving a small amount of adjustment in hand. This will permit the countershaft levers to lay backwards to the desired extent. The individual adjustments to each brake-shoe may now be tightened up until the shoes are just beginning to bind on their drums. If the main adjustment is now tightened up sufficient braking pressure can be applied to each wheel to enable the operator to discern if one wheel is being braked more than another, and correct any lack of balance by slackening or tightening the individual adjusting nut belonging to its particular operating cable. When all four wheels have been evenly balanced in this manner final adjustment can be obtained by slackening the running adjustment turnbuckle until the wheels are free and the foot pedal has at least one inch free travel before the shoes come into operation. The hand brake main adjustment wing nut should now be tightened up until all slack in the operating cable has been taken up when the hand brake lever is in the "Off" position. Although this method is completely satisfactory in the majority of cases, we would take this opportunity of impressing the advisability of a final road test on a dry macadamised surface, where the correctness of adjustment can be tested by braking the vehicle hard and ascertaining by means of the road marks produced the equality of the braking on each wheel.

Date of issue: November, **1931**

Clutch Lubrication

IT is perhaps not generally known that automatic lubrication is now provided from the gearbox for the splines of the gearbox drive gear and clutch driven plate hub, which dispenses with the necessity of oiling these parts by external means.

The oil is taken from the gearbox through the drive gear journal bearing, where it collects in a V-shaped recess formed by the front oil-retaining washer (which is reversed from its original position) and a new pattern drive gear bearing nut. Three grooves cut in the face of this nut register with three holes drilled into the centre of the drive gear. Therefore any oil passing from the gearbox through the journal bearing will collect in the V-shaped recess and will pass into the centre of the drive gear each time the engine comes to rest. This ensures moderate but efficient lubrication.

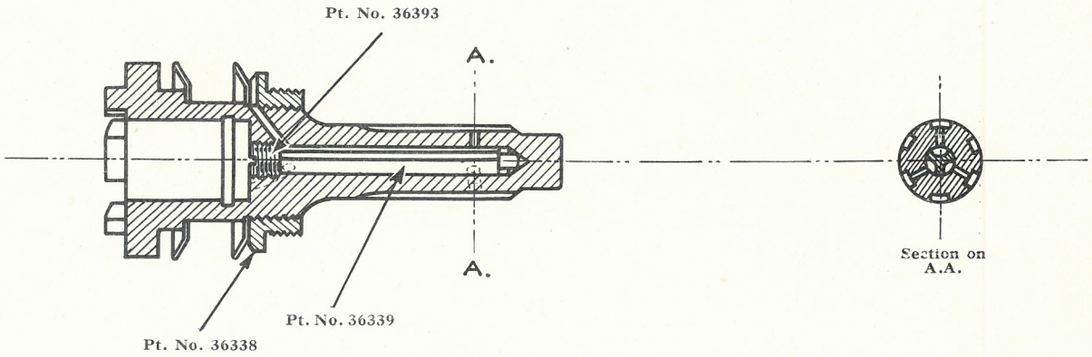
The modified pattern of drive gear is hollow from the rear end to a point opposite the normal position of the clutch driven plate hub, where three small holes are drilled leading to the outside. Fitted to the hole passing along the centre of the gear is a restrictor having three flutes, which connect up with the three holes at the splined end, and the three feed holes at the rear. The restrictor is kept in position by means of a grub screw plug.

The oil, therefore, which passes into the centre of the drive shaft is collected by the restrictor and taken along to the front end. When the engine is started, centrifugal force throws this small quantity of oil through the small holes on to the splines of the gear and driven plate hub, thus providing automatic lubrication.

In future only the latest pattern gearbox drive gears will be supplied by our Service Department for replacement purposes, and therefore if it is desired to incorporate automatic oil feed, Dealers should requisition the following extra parts which are required :—

1 Drive gear bearing nut	Part No. 36338
Several drive gear bearing nut shims	Part No. 35354-5-6
1 Drive shaft oil restrictor	Part No. 36339
1 Drive shaft oil restrictor plug	Part No. 36393

In addition, it should be noted that the drainage hole in the front wall of the gearbox casing has been deleted, and therefore, when introducing the modified parts, it will be necessary to fit a suitable plug at this point. Also there are now no holes drilled in the clutch driven plate hub for external lubrication, and although it is not altogether necessary to plug these to suit the automatic lubrication, it will be appreciated that when the occasion arises to fit a replacement plate to earlier models not provided with automatic lubrication, *the three holes must be drilled in the hub* similar to the plate which is being removed.



The Morris Minor drive gear shaft showing the clutch plate hub lubrication scheme.