Excelsior

TWO STROKE ENGINE UNITS

TALISMAN TWIN

244 c.c. and 328 c.c.

and

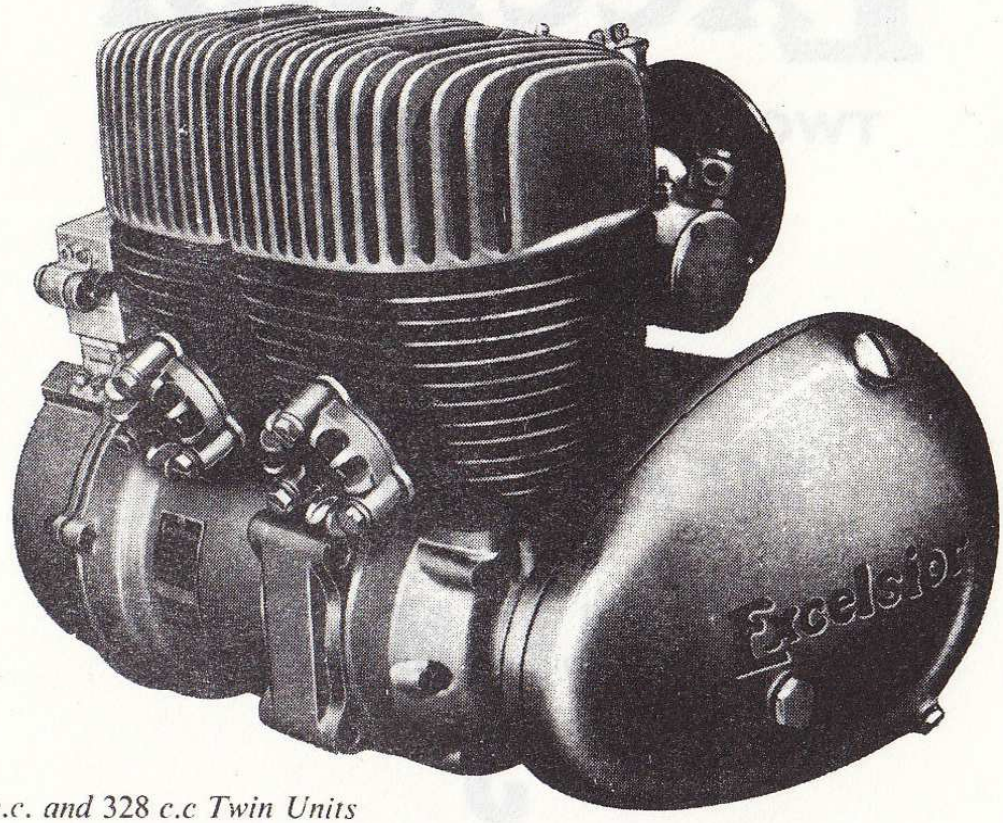
TALISMAN 3

HALF LITRE

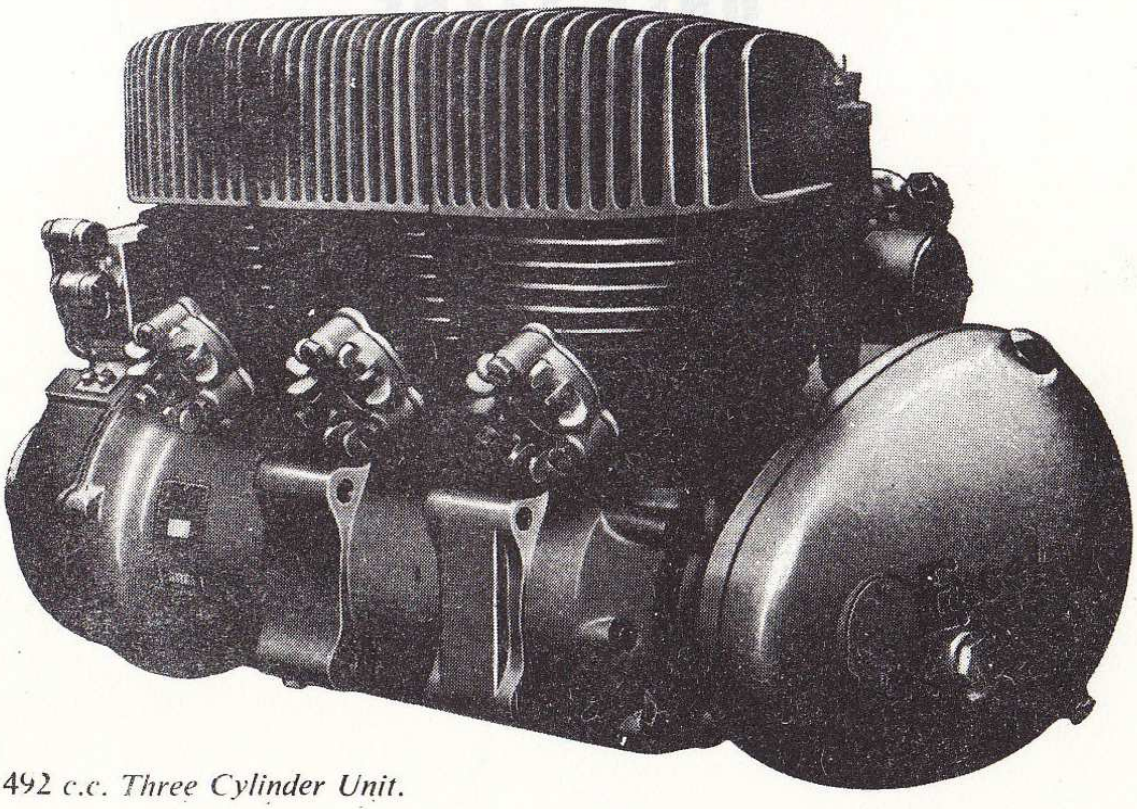
492 c.c.

RUNNING and MAINTENANCE INSTRUCTIONS

EXCELSIOR
· TWO-STROKE ENGINE UNIT



244 *c.c. and* 328 *c.c Twin Units*



492 *c.c. Three Cylinder Unit.*

ENGINE

The EXCELSIOR " Talisman Twin " Engine is a vertical twin cylinder two-stroke of either 244 cc.. or 328 c.c. capacity, each cylinder having a compression ratio of 7.9, with 50 m.m. bore and 62 m.m. stroke on the 244 c.c. unit and 58 m.m. bore and 62 m.m. stroke on the 328 c.c. unit. The " Three Cylinder " Engine is 492 c.c., each of the three in line cylinders have a bore of 58 m.m. and a stroke of 62 m.m. with a compression ratio of 7.5 to 1. The aluminium alloy cylinder heads and the cast iron cylinders are conjointly secured to the crankcase by long studs and nuts with paper joint washers between the case and the cylinder bases. A three-piece crankcase on the 244 c.c. and 328 c.c. units and a four-piece crankcase on the 492 c.c. unit houses the built-up crankshaft, the flywheel and the ignition and starter unit. Each crank has a separate compartment sealed by oil seals and the crankshaft is carried on two ball bearings and three roller bearings on the 244 c.c. and 328 c.c. units, and two ball and five roller bearings on the 492 c.c. unit.

Double row roller bearings are used in the big ends of the connecting rods; the small ends are bushed and work on fully floating gudgeon pins held in the alloy pistons by circlips. Two compression rings are fitted to each piston and they are pegged in position to avoid the possibility of fouling the ports.

Induction manifolds are flange fitted to the cylinders, joint washers being interposed, and to the pipe is attached the Amal monobloc carburetter.

K.L.G. sparking plugs, type FE 70D, are fitted as standard.

RUNNING-IN

The useful life of the engine will depend a great deal upon the way in which it is treated during the first 1000 miles. As a general rule it is not advisable to exceed 35 m.p.h. in top gear with the 492 c.c. engine and 30 m.p.h. in top gear with the 244 c.c. and 328 c.c. engines, 20 m.p.h. in second, 15 m.p.h. in bottom gear. After the running-in period is completed, do not throw caution to the winds and open up the engine to its full extent. The engine should be gradually brought up to its peak performance.

It will be appreciated the fitment of bearings or complete overhaul of the engine and gearbox calls for skill and careful attention, and should consequently only be undertaken by a skilled mechanic. Where attention of this nature is required, we strongly recommend that this should be entrusted to your local Service Agent or be returned to our Works. For those who find it impossible or inconvenient to avail themselves to the advantageous service thus offered by

our Service Agents or ourselves, we have specially compiled detailed instructions as to the correct manner of dismantling and re-assembling these components although we ask owners who may contemplate such a procedure to bear in mind that reasonable workshop facilities must be available for satisfactory results to be obtained. We indicate the method of decarbonising the engine which can be successfully undertaken by the average owner.

DYNASTART.

On some engines a supplementary oiler is fitted to the outside of the stator plate, through which a few drops of oil should be inserted occasionally.

LUBRICATION

ENGINE.

The " Talisman " engine is lubricated by the **petroil system of mixing oil with petrol** in the ratio of one part of oil to sixteen parts of fuel (half pint to one imperial gallon). If self mixing oil is used then the ratio must be thirteen to one (12½ fluid ounces to one imperial gallon). When the engine is new and for the first 500 miles or so the proportion of oil should be slightly increased to aid running-in.

Recommended oils are printed in the detailed chart.

Always use the correct grade and quantity of oil.

CLUTCH AND PRIMARY CHAIN.

The clutch is enclosed in the primary chaincase, and runs in oil. The lubricant should be poured into the case through the filler hole at the top (after the level plug near the bottom of the case has been removed) until it commences to overflow. Periodically check the oil level and do this after the engine has stood idle for a considerable time. Every 5,000 miles drain away the old oil by removing the front cover of the chain case. Thoroughly clean the interior, inspect the chain the sprockets for wear and other faults, test the clutch for freedom and even movement, replace the cover, remove first the level plug then the filler plug and refill the case with fresh oil. Replace the filler plug, the fibre washer and the level plug.

GEARBOX.

Remove the oil filler plug (to which is attached the dipstick) from the top of the gearbox and see that the oil level is maintained at the lowest part of the trapping on the dipstick. After the first 500 miles drain the oil away by removing the plug in the bottom of the box and repeat this procedure every 5,000 miles. Put in new oil to the correct level after re-fitting the drain plug. Use only the recommended grades of oil.

RECOMMENDED LUBRICANTS

	MOBIL	SHELL	WAKEFIELD	B.P.	ESSO	REGENT
Engine: U.K.	Mobiloil A	Shell 2T	Castrol XL	Energol SAE 30	Essolube 30	Regent 2T
Overseas: Above 32°F.	Mobiloil D	Shell 2T	Castrol XXL	Energol SAE 40	Essolube 40	Regent 2T
Below 32°F.	Mobiloil A	Shell 2T	Castrol XL	Energol SAE 30	Essolube 30	Regent 2T
Gearbox	Mobiloil BB	Shell X-100 40	Castrol XXL	Energol SAE 40	Essolube 40	Havoline 40
Primary Chaincase	Mobiloil D	Shell X-100 40	Castrol XXL	Energol SAE 40	Essolube 50	Havoline 40

IMPORTANT:

If self-mixing oil is used the ratio must be thirteen to one (12½ fluid ounces to 1 Imperial gallon).

TRACING FAULTS.

If the engine stops, symptoms will generally give a clue to the cause, but where this is not the case, the trouble can be more easily traced by investigating the following three essential conditions:—

1. A proper supply of fuel must be available from the carburetter (or carburetters where more than one is fitted) and the throttle must open and close freely.
2. Each sparking plug must give a good spark, at the right time in relation to the position of the piston on its upward stroke.
3. The engine must be in good mechanical condition, with no air leaks at the various joints.

When the cause of the trouble is not evident, carry out a check covering the following points.

Having made sure that there is "petroil" in the tank, and that the tap is in the "ON" position, depress the tickler on the carburetter body to ensure that there is no blockage in the fuel supply, either in the tap, banjo union or fuel needle seating. If the fuel supply is clear, fuel will spurt from the side of the tickler.

Being satisfied that the fuel is reaching the carburetter, next unscrew each sparking plug in turn, and with the high tension lead still attached, lay the plug on the cylinder head. Revolve the engine by means of starter, and if the magneto and high tension lead are in order, there should be a good spark at the plug points.

Finally, examine the carburetter controls to make certain that the throttle is actually opening when the throttle pedal is moved, and that the air slide cable and control, if fitted, are operating satisfactorily.

If this fails to trace the cause, reference should be made to the Fault Chart.

ENGINE FAULT CHART

SYMPTOM AND SEQUENCE OF TESTING	POSSIBLE CAUSE
ENGINE WILL NOT START.	
Depress tickler on each carburetter to check whether fuel is reaching carburetter.	No fuel reaching carburetter. Air lock in petrol pipe.
If no fuel even when tap is on and fuel is in tank.	Choked petrol pipe, filter on tap, filter in banjo. Fuel needle sticking in seating.
Test for spark by holding each sparking plug body on cylinder head.	Leak along insulation of plug or high tension lead.
If still no spark: Test for spark at end of each H.T. lead held ⅝ from cylinder fins.	Plug points may be oily or sooted up. If no spark at end of H.T. lead, contact breaker point gap may be too narrow, points pitted or dirty. Moisture on insulation of condenser. Damaged insulation on wires connecting contact breaker to coil or condenser. Faulty condenser. Faulty ignition coil.
If above tests are satisfactory, but engine will not start.	Mixture may be too rich due to excessive use of choke. Air leaks at carburetter flange or manifold to cylinder joints causing weak mixture. Incorrect ignition timing.
ENGINE—FOUR STROKES.	
(Engine will four stroke for a while after standing due to accumulation of oil in crankcase).	Choke not fully open. Carburetter needle set too high. Air filter, if fitted, requires cleaning. Flooding of carburetter.
ENGINE LACKS POWER.	
	Engine requires decarbonising. Unsuitable sparking plug. Loss of compression. Incorrect "petroil" mixture. Exhaust system choked with carbon. Incorrect carburetter setting. Air filter choked. Obstruction in fuel supply. Incorrect ignition timing. Driving chains too tight.

ENGINE FAULT CHART (continued)

ENGINE WILL NOT RUN SLOWLY.

Weak mixture due to air leaks.
Crankcase drain plug loose or missing.
Worn crankshaft bearings and leaking oil seals.
Ignition timing too far advanced.

ENGINE SUDDENLY STOPS FIRING.

Sparking plug lead/s detached.
Plug points bridged by oil, carbon or deposit.
Short circuit of high tension current by water on H.T. lead.

DECARBONISING TWIN CYLINDER ENGINES.

It is desirable to decarbonise new engines after the first 3,000 miles and every 5,000 to 6,000 thereafter, depending upon the type and the quality of the fuel employed and the circumstances under which the vehicle is used.

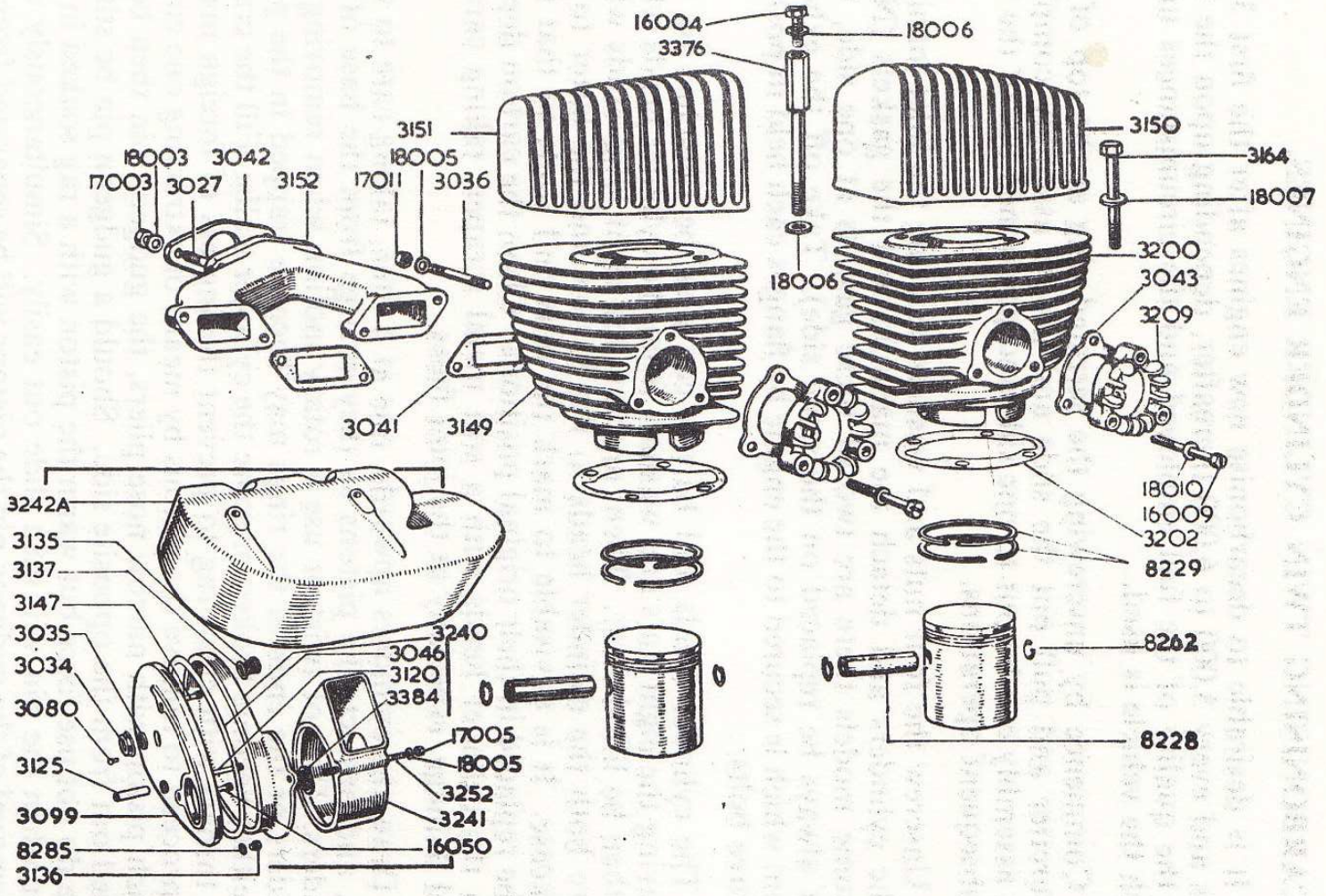
Commence by unscrewing the serrated ring at the top of the carburetter and pull out the slide and needle assembly complete. This assembly can be put to one side and positioned out of the way of subsequent operations.

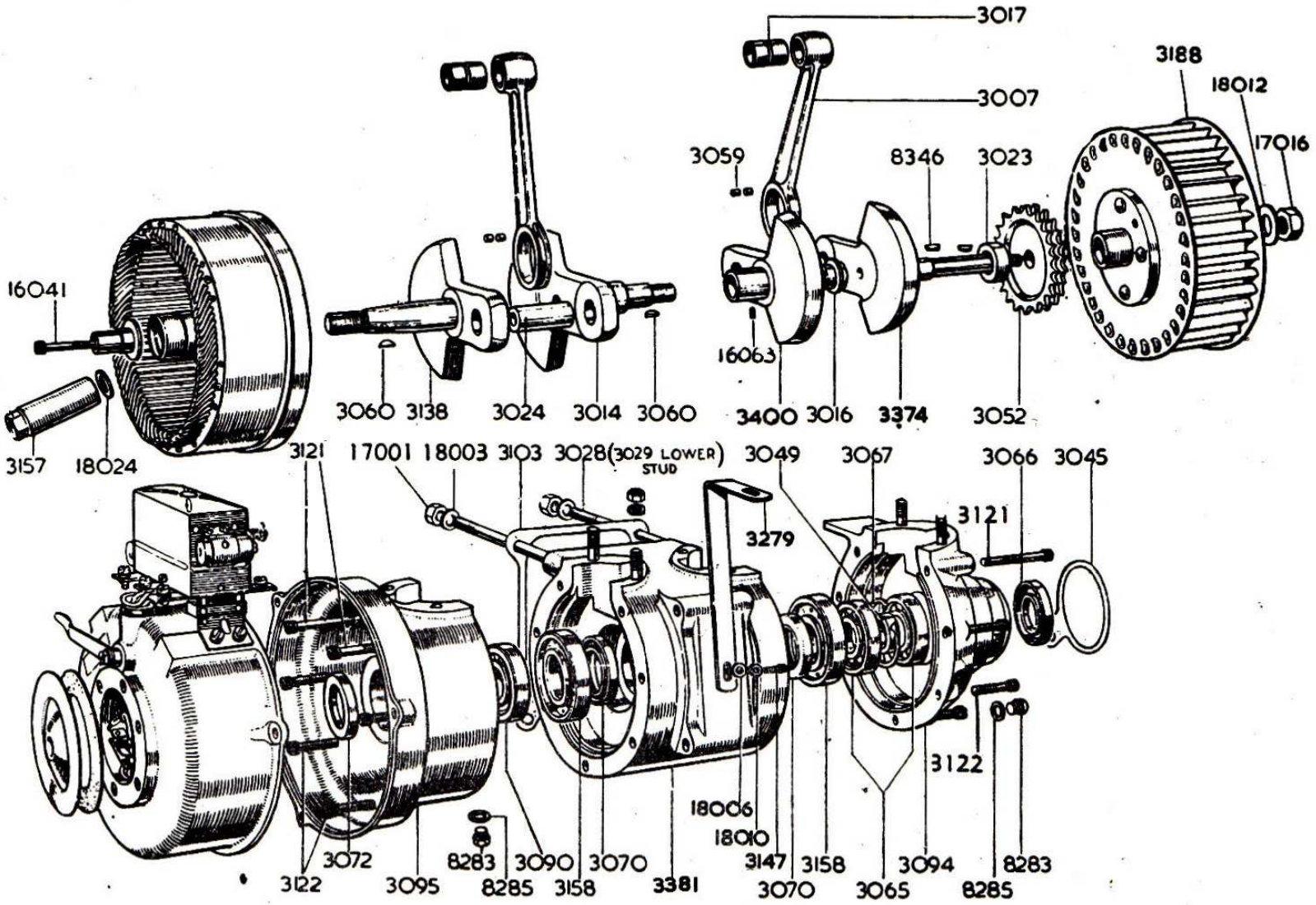
Unscrew the four nuts and washers securing the inlet manifold to the cylinders and detach the manifold and the gaskets (**Note:** on some models there are two of these gaskets at one side, they must always be replaced on the same side). Take off the exhaust system which is secured to the engine by flanges each held in position by three bolts.

The cylinder heads and barrels can now be detached by first removing the eight nuts and washers from the cylinder heads which can then be lifted clear. Then unscrew the eight long studs which secure both the cylinder heads to the barrels and the latter to the crankcase. It is advisable to mark the nuts and studs so that they can be replaced in their original positions. Clean the carbon deposit from the cylinder heads with a soft metal scraper, taking care to avoid damage, especially at the joint faces.

Draw the cylinders upwards, one at a time, taking care to support, and protect, the pistons as they emerge from the base of the cylinders. Do not twist or use a rotary motion when removing the cylinders or the ends of the rings may become trapped in the ports and either become broken or score the cylinder walls. Fill the crankcase throats with clean rag to prevent the ingress of foreign matter and proceed to remove the pistons by means of extracting one circlip of each piston with narrow nose pliers, the gudgeon pin then being pushed out from the opposite side. Should a gudgeon pin be stiff to move do not use force but warm the piston with a rag soaked in hot water when the pin will then slide out easily. Simultaneously with the removal of the gudgeon pin the pistons will be separated from the connecting rods and they should then be marked inside the skirt so that they can be replaced in the correct cylinder and the right way round—this is important.

SECTIONAL DRAWING OF 244 c.c TALISMAN TWIN ENGINE

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3028(3029 LOWER STUD)
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18010
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Carefully spring the rings from the piston, and detach the expander ring from the groove of the lower compression ring. It is unusual for rings to become stuck in the piston, but should they cling, soaking the assembly in hot water will usually allow them to be readily detached. Mark the rings so that they too can be replaced in the original location and the same way up. (the fore-going instruction applies to engines up to Serial No. B9841 where the upper and lower compression rings are identical. Engines which have No. B9842 and thereafter, are fitted with a different pattern piston, having rings $\frac{1}{16}$" wide, the upper one being Vacrom plated and the skirts have radial grooves for oil retention. It is therefore imperative that the rings are placed in their correct grooves and the upper surfaces, which are marked " Top," facing the piston crowns).

If there are any brown patches on the outer bearing surfaces of the ring, indicating leakage, or there are any apparent defects whatsoever, the rings should be replaced; in fact we recommend the fitting of new rings and gaskets each time the engine is decarbonised. Clean all carbon from the piston crown and ring grooves, again taking care not to damage the working surfaces. The exhaust, transfer and inlet ports of the cylinder should be thoroughly clear of carbon and this operation is the most important to be undertaken during decarbonisation. Whilst this is taking place endeavour to avoid marking the cylinder bores. Having removed carbon from the heads, pistons and cylinder wash these parts in petrol or paraffin to remove all traces of particles that may remain and then thoroughly dry.

To reassemble fit the expander rings in the lower ring grooves, replacing the compression rings in their respective grooves (not applicable when new rings are used) copiously lubricating these with clean engine oil and treat the gudgeon pin and small end bush in a similar fashion. Place the piston in position over the connecting rod, ensuring that it is facing in the correct direction, and slide the gudgeon pin fully home. Using a new circlip, for utilising the old one is a false economy, fit this with a rotary motion to ensure that it beds down in the groove cut in the gudgeon pin boss. Repeat for the other piston. Make certain that the cylinder base and crankcase faces are clean and undamaged, fit new cylinder base washers, lightly smearing these on both sides with engine oil, then remove the rag from the crankcase throats and smear the cylinder bores with clean engine oil.

Fully compress the rings of one piston into their grooves, then taking the appropriate cylinder gently slide the piston into the bore and lower the cylinder into position. Repeat for the other cylinder and screw into the crankcase the eight holding down studs. Replace the cylinder heads and refit the washers and nuts until these are finger tight.

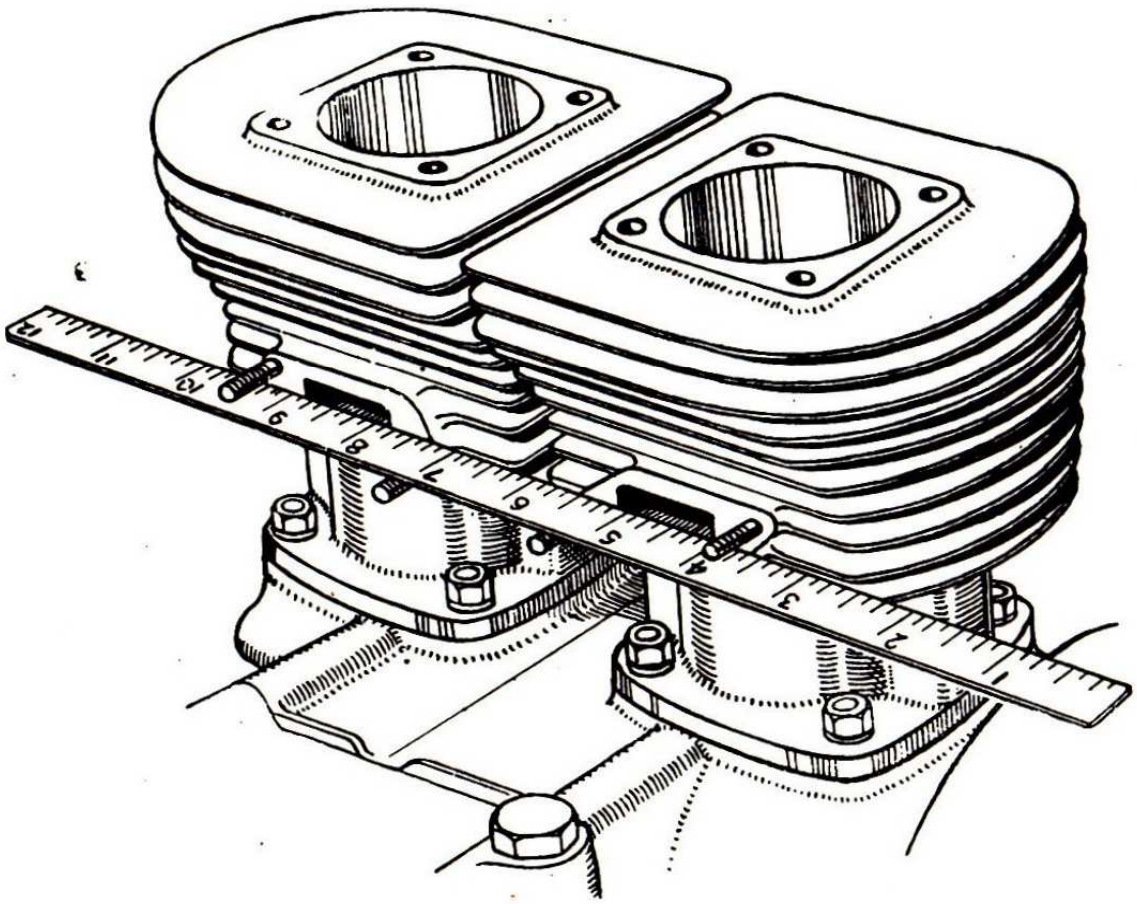


Fig. 1.

Line up the inlet manifold faces of the cylinder with a straight edge (Fig. 1) and then tighten down the cylinder head nuts a little at a time, working diagonally so that the cylinders and heads bed down evenly. Check the inlet faces as the work proceeds to see that the cylinders are accurately aligned.

Clean the inlet manifold faces, fit new gaskets to the cylinder, place the manifold in position on the cylinders and fully tighten up the four securing nuts. Clean the exhaust system thoroughly, attaching it to the cylinders, using new gaskets, and tighten down the exhaust manifold bolts evenly.

Replace the throttle slide assembly in the carburetter and screw down the serrated ring, ensuring that the locking tongue is in position before so doing.

Finally we would add that engine performance can be adversely affected by an excess of carbon in the exhaust system and it is, therefore, as well to ensure that this is adequately cleaned at the time of decarbonising the engine.

One final note: The small end bushes are fully floating and not, therefore, firmly fixed in the connecting rods.

CRANKCASE ASSEMBLY

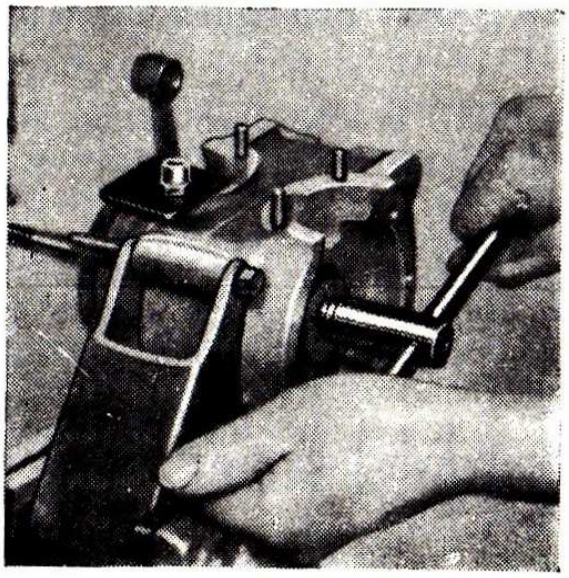
DISMANTLING.

It is essential that dismantling and rebuilding of the crankcase assembly is only undertaken by a qualified Service Agent who has the essential equipment and facilities to carry out the work correctly and efficiently. The aftergoing therefore, indicates the procedure to be adopted assuming the necessary facilities are available.

First note that all threads are right hand unless specifically stated otherwise.

The engine having been dismantled as far as the crankcase by removing the primary drive, clutch assembly (dealt with in conjunction with the gear box), chaincase, cylinders and pistons, and the gearbox been separated from the main engine assembly, detach the inspection cover from the Dynastart housing, remove the cam fixing screw and withdraw by hand the cam from the crankshaft. A special extractor, available upon application, is required to remove the flywheel, the body being screwed on to the flywheel thread as far as it will go when the bolt head is turned in a clockwise direction to free the taper.

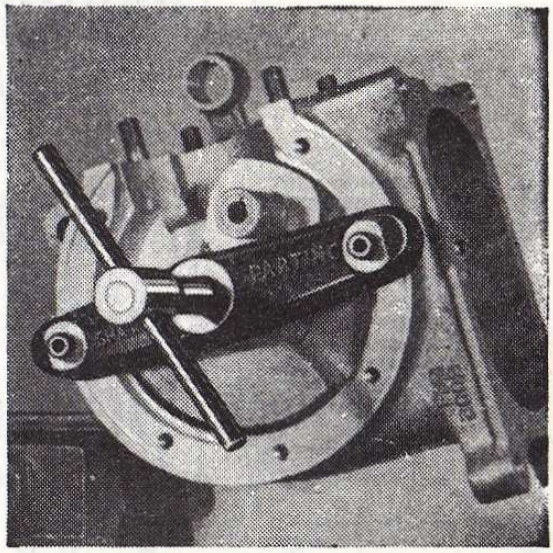
Then remove the driving side crankcase cover (3094) by unscrewing the seven Allen bolts (3121 and 3122), turn the driving side crankshaft assembly to B.D.C. and with the aid of a soft drift which is inserted to contact the inner face of the crankshaft web (3013). tap the web off the crankpin (3024) which will release the outer crankshaft with crankcase cover and bearings, etc., as one subassembly. This will reveal the driving side big end and the connecting rod with rollers can be slid from the crankpin.



CRANKSHAFT LOCKING PLATE. For locking or removing crankshaft CENTRE NUT when assembling or dismantling engine. Fig. 2.

Apply the crankshaft locking plate to the inner front cylinder base stud (timing side as Fig. 2) with the aid of a suitable length tube and a cylinder hold nut (3203) so that the plate secures only the timing side inner web (3014). The centre nut (3016) has a $\frac{5}{16}$" Whit. head and should be removed with the aid of a close fitting socket spanner which has a tee bar 12" long.

The timing side outer crankcase (3095) should then be detached from the centre crankcase (3096) after removing the seven Allen bolts (3121 and 3122) for which a $\frac{3}{16}$" key is required. It should be possible to manually separate the cases, if not lightly tap the timing side case to free the spigot. The outer race of the timing side roller bearing (3090) will remain, together with the oil seal (3072), in the case and the inner race and roller assembly will be retained on the crankshaft (3138).

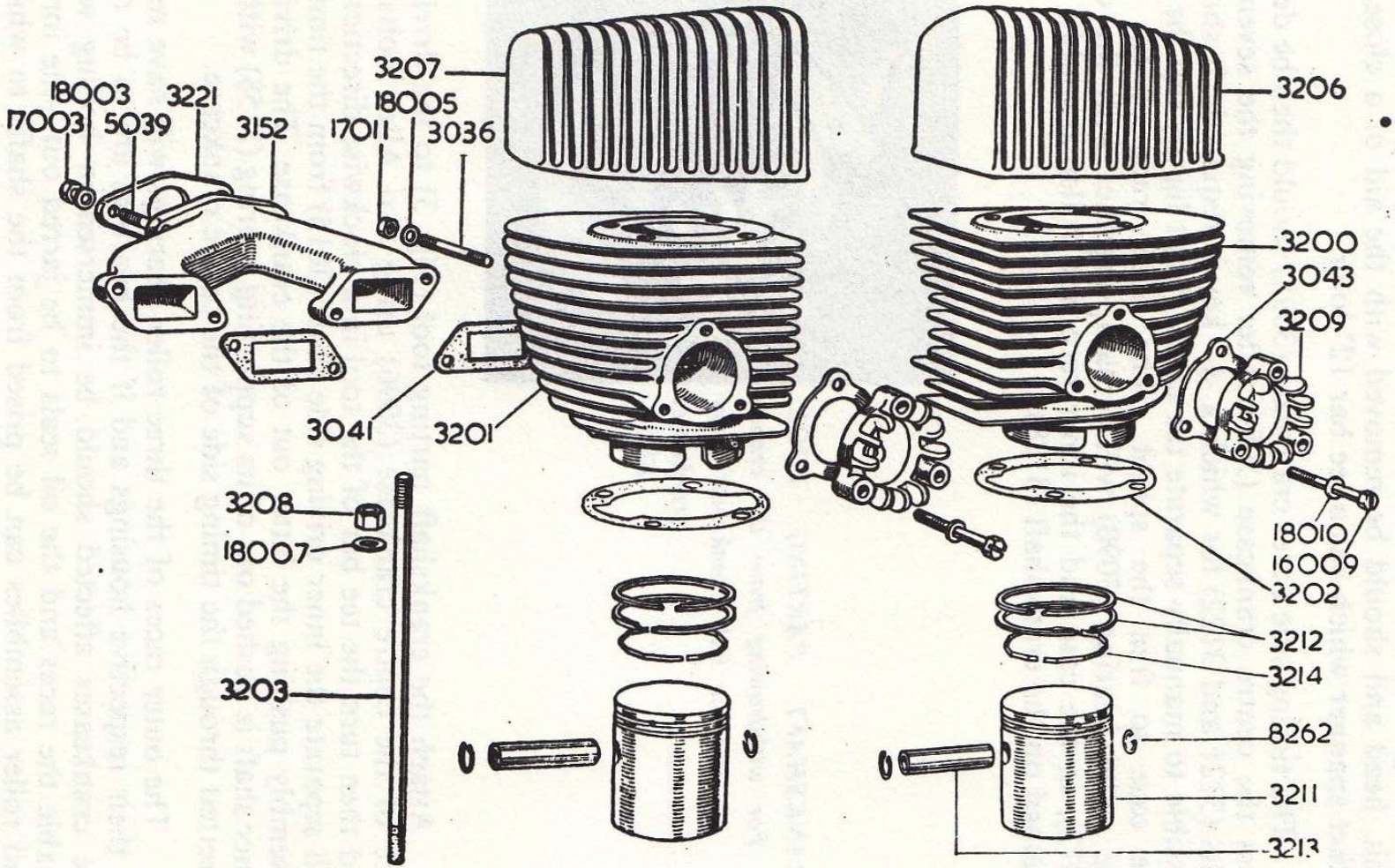


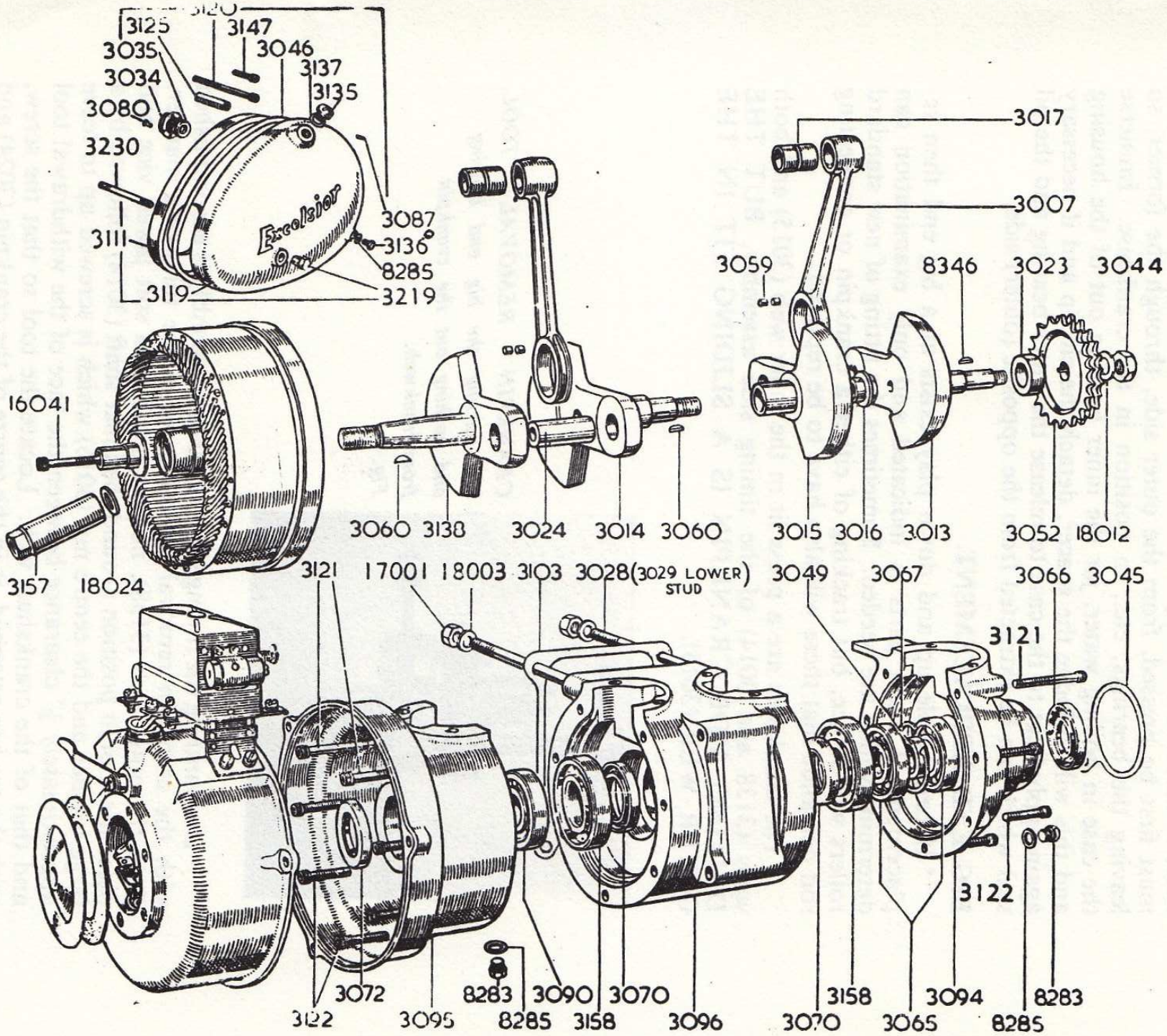
CRANKSHAFT PARTING TOOL. For withdrawing from the crankcase the half crankshaft from crankcase. Fig. 3.

Attach the crankshaft parting tool (Fig. 3) to the driving side face of the centre crankcase (3096) using two Allen bolts (3121) and then turn the tee bar of the tool in a clockwise direction which will separate the inner driving side shaft (3015) from the timing side assembly pushing the latter out of the crankcase. The driving side inner shaft is pushed out of its supporting bearing (3158) with a drift inserted through the timing side of the centre crankcase.

The outer races of the three roller bearings will have remained in their respective housings and if the bearings are to be replaced the crankcases affected should be immersed in boiling water to enable the races and the oil seals to be jarred out—the inner race and roller assemblies can be prised from the shafts to which they are attached. All main bearings have an interference fit whereby the outside diameter exceeds, when cold, the bore of the housing in which they are installed hence the necessity for heating the crankcases to release or fit the ball bearings and/or the roller bearing

SECTIONAL DRAWING OF THE TALISMAN 328 c.c. ENGINE

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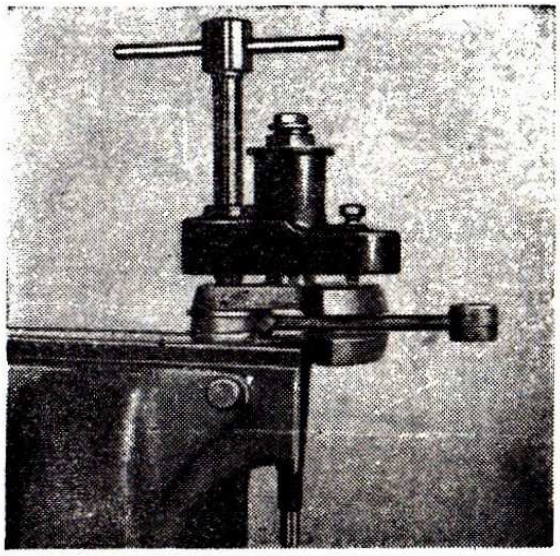
outer races. There are two ball bearings (3065) in the driving side outer crankcase (3094), the outer of the two being axially located by a circlip (3067) and there is a spacer (3049) between the inner races of these two bearings. To remove the bearings the shaft (3013) must first be pressed, from the outer side, through the former, so leaving the bearings, etc., in position in the crankcase. Immerse the case in boiling water, jar the inner bearing out of the housing and this will dislodge the spacer, detach the circlip and if necessary again apply heat to the case to release the outer bearing and the oil seal which can be extracted from the opposite (outer) side.

BIG END REPLACEMENT.

If perceptible up and down play exists at a big end then replacement of worn parts is indicated and only examination can determine which are needed. Sometimes the fitting of new standard rollers will suffice, but tracking of either a crankpin or connecting rod demands that these will also have to be replaced.

The crankpins are a press fit in the inner web (3015) and both webs (3138 and 3014) of the timing side assembly, BUT THE DRIVING SIDE CRANKPIN IS A SLIDING FIT IN THE OUTER WEB (3013).



CRANKPIN REMOVAL TOOL. For parting the big end bearing and pushing out the crankpin from crankweb.
Fig. 4.

Dismantling the timing side crankshaft assembly is accomplished with the crankpin removal tool (Fig. 4) in the following manner. Grip the outer web (3138), not the shaft, in a soft jawed vice and place the tool in position around the inner shaft (3014) followed by a large washer and the centre nut (3016) which is screwed up to leave approximately $\frac{1}{2}$" clearance between the face of the withdrawal tool and that of the crankshaft web. Locate the tool so that the screw, with the tee bar attached, is in the centre of the crankpin (3024) and then lightly tighten simultaneously the tee bar and the hexagon bolt so that the face of the tool is parallel to the crankshaft web. Turn

the tee bar in a clockwise direction when the inner web (3014) will be drawn from the crankpin from which the connecting rod and rollers can be removed. If the crankpin is to be replaced, then it must be pressed from the outer web (3138).

REASSEMBLING.

Normally, oil seals have a considerable life, but their efficiency can be reduced when wear takes place in the main bearings. The rubber working surface of a seal should present a fairly sharp edge to the shaft and if a "flat" has been produced as the contact surface, then the seal should be replaced.

Assuming new seals are to be fitted, the crankcases should be heated to a temperature of 200–212°F. and new seals pressed into position. The two outer oil seals (3066 and 3072) are a flush fit with their respective housings and the two inner seals (3070) are inserted $\frac{1}{16}$" beyond the centre bearing shoulders. Note from the illustration the correct manner of positioning the seals.

Continue by building up the timing side crankshaft assembly by placing the outer face of the web (3138) on the bed of a press and pressing in a new crankpin until it is flush with the outer face of this web. Surround the crankpin with a set (24) of new rollers, fit the connecting rod and positioning the inner web (3014) in line with the outer one, press the former on to the crankpin until this too is flush. Under no circumstances should the crankpin project beyond the outer face of either web since this would reduce the side clearance of the connecting rod and cause seizure.

When re-assembling either crankshaft assembly, it should be noted that the minimum side float of a connecting rod is .008/.010", but can be up to a maximum of .030" for the driving side rod and should clearance at the latter exceed .030" then this can be remedied by fitting special shims (obtainable from the works) between the driving side inner main bearing (3065) and the face of the driving side outer web (3013).

The timing side crankshaft assembly must be placed between lathe centres and then set until both shafts run true to within .001" using dial guages. A similar procedure must be adopted even if the assembly has not been dismantled, since if reasonable care is not taken during dismantling of the crankcase, the two shafts (3014 and 3138) can be misaligned.

It is usual to deal with the fitting of a new seal and bearings to the driving side outer crankcase (3094) as a unit although the method adopted for the seal has been previously explained. Scrupulous cleanliness is required when fitting seals and bearings to ensure that they are positioned as intended. A new seal having

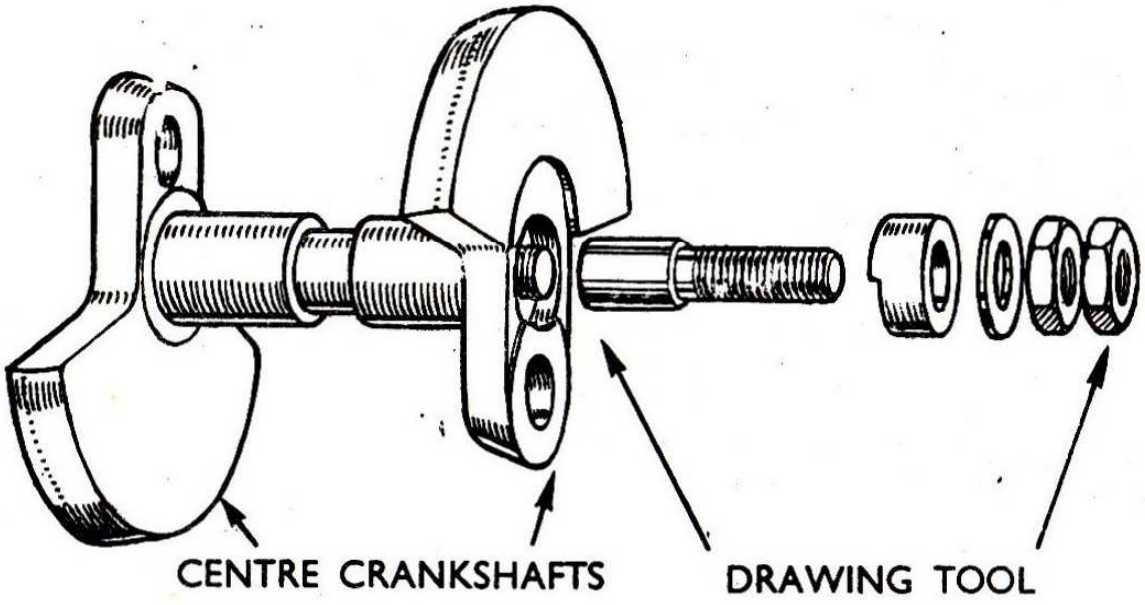
been fitted, and the case being hot, press an LS8 bearing (3065) as far as it will go into the housing, re-insert the circlip (3067) ensuring that it seats evenly in the radial groove, place the spacer (3049) against the bearing and press the other LS8 bearing into the housing so trapping the spacer. Then press the shaft (3013) through the bearings (3065) making certain that the shoulder face of the former is tightly against the inner race of the bearing (3065).

Fit the outer races of the two centre roller bearings (3158) with the lips innermost to the centre crankcase (3096) which has been previously heated—they enter quite readily providing the crankcase temperature is correct.

Before endeavouring to assemble the shafts to the crankcase ascertain that the key (3060) is a firm fit in both crankshafts (3014 and 3015). It should not be possible for the key to be inserted in the slot of the timing side shaft by hand, if it can then it is too free and an oversize key, obtainable from our Works, must be used. Note that oversize keys may have to be trimmed on both the side and upper faces to enter the slots.

Having fitted the key to the timing side inner shaft, essay a trial fit, by hand, of the driving side shaft to ensure that it can be located partially over the inserted key and then separate.

The roller race inner assemblies are then pressed onto the crankshafts (3014 and 3015) until they are fully home. Take the timing side built up assembly, with the key in position, and manually push this into the centre crankcase when some resistance will be felt due to friction of the oil seal (3070). Apply the driving side centre shaft (3015) to the opposite side in the same manner, making certain that it engaged on the key. Bring the shafts together as close as possible by hand.



Special Drawing Tool (Fig. 5).

The timing side assembly and the driving side shaft are then completely drawn together with the aid of the special drawing tool illustrated and which we supply (Fig. 5). Lock two $\frac{1}{2}'' \times 20$ TPI nuts on the thread of the drawer, that is then inserted through the aperture on the driving side shaft (3015) and tightened, using a spanner on the outer nut. Unlock the two nuts by slackening off the nut nearest the crank web and remove both nuts from the thread. Place the stepped spacer in position over the drawer thread so that the relief is located over the crankpin cheek, add the plain washer and lastly one $\frac{1}{2}''$ nut which is then fully tightened so bringing the crankshafts together. Apply the remaining nut to the thread, lock the two nuts against each other and withdraw the tool by applying a spanner to the inner nut in an anti-clockwise direction.

Secure the crankshaft locking plate at the timing side inner front stud location to prevent the crankshaft turning and complete the operation by screwing the centre nut (3016) to the timing side shaft thread, fully tightening with a socket spanner. NEVER HOLD THE CRANKSHAFT OR PARTS THEREOF OTHER THAN IN THE INTENDED MANNER WITH THE LOCKING PLATE.

The timing side crankcase together with roller bearing outer race can then be manually pushed into position locating this on its spigot, the seven Allen screws can be completely tightened, thus leaving only the driving side big end to be assembled and the driving side outer crankcase with crankshaft to be replaced. Fit the big end roller and connecting rod and turn the driving side crankshaft assembly to T.D.C. position, the outer web (3013) to the crankpin and push on the outer crankcase cover. It is advisable, again with a soft drift, to tap the crankshaft web (3013) onto the crankpin rather than secure the cover in position by its seven locating bolts, which are tightened last, in as much that if the latter procedure is adopted it is possible that the threads in the crankcase may be stripped.

Always bear in mind upon re-assembly that it is possible due to oversight, for the crankshaft to be assembled the incorrect way round and for sake of clarity ensure that the front engine fixing lugs are kept in the same position on the bench to avoid this.

492 c.c. THREE CYLINDER ENGINE

DECARBONISING.

The procedure for decarbonising the three cylinder engine follows the same pattern as that for the twin and these instructions apply, but certain differences should be noted.

Each cylinder has a separate inlet manifold and carburetter and whilst it is necessary to detach the carburetters, there is no need to part the manifold from the cylinders when decarbonising.

No particular sequence need be followed when removing or replacing the cylinder barrels and heads.

The pistons are similar to those used in the latest type twin cylinder engine with the exception of the fact that the skirts have a radius relief at the inlet side. It is therefore imperative that a piston be returned to the same cylinder and also that the relief is facing the inlet port.

DISMANTLING.

Basically, the construction of the three cylinder engine follows that of the twin, and as with decarbonising a similar procedure for dismantling and re-assembling is adopted.

Remove the carburetters, primary drive, the gear box, Dyna-start stator, flywheel, cylinders, heads and pistons, so leaving the crankcase assembly.

Proceed to remove the driving side outer crankcase cover (3094) and the attendant parts, and slide the connecting rod from the crankpin (3318) the rollers for which are $\frac{3}{16}$" in diameter in two tracks of 17 rollers each.

Then approach the engine from the timing side removing the seven crankcase fixing nuts (17011) and washers (18005) and this will allow the timing side outer crankcase (3316) to be tapped off and it will contain the outer race of the bearing (3090), the inner race assembly remaining in position on the shaft (3138). Grasp the timing side inner crankcase (3302) and withdraw it along the studs (3304 and 3305) so separating this from the driving side inner crankcase (3096).

The timing side inner crankcase (3302) will then contain the complete timing side crankshaft assembly and the centre crank shaft

timing side (3015), the crankpin, connecting rod and rollers. Slide the connecting rod and rollers from the crankpin and hold the crankcase (3302) in a vice gripping the fixing lug. Apply the crankshaft locking plate (Fig. 2, page 14) to the front fixing stud (3203) and remove the nut (3016). Attach the crankshaft parting tool (Fig. 3, page 17) to the inner face of the crankcase, turn the tee bar and displace the complete timing side crankshaft assembly. The crankshaft centre timing side (3015) with crankpin is then tapped out from the timing side. OBSERVE THAT THE CENTRE CRANKPIN IS A SLIDING FIT IN THE CRANKSHAFT CENTRE DRIVE SIDE (3307).

There remains the driving side inner crankcase (3097) to be dealt with and the crankshaft parts are removed in exactly the same manner as that for the timing side inner crankcase, first removing the studs (3304 and 3305), then removing the nut (3016), applying the crankshaft parting tool to the driving side face and pressing out the crankshaft (3307), finally tapping out crankshaft (3015) from the case.

Shims, of varying thicknesses, may be placed at certain locations and it is important to refit them in the same positions as originally sited. Under no circumstances should additional shims be inserted except to eliminate connecting rod side float at the driving side crankshaft assembly.

Replacement of main bearings, oil seals and bit end parts, has been dealt with in the preceding chapter covering the twin cylinder unit.

RE-ASSEMBLING.

Follow the same procedure as for the twin cylinder, checking true running of the timing side crankshaft assembly whether or not this has been dismantled, and fitting new bearings and/or seals as required to the driving side crankcase cover (3094) as indicated on page 19.

Make a trial fit of the key (3060) in the two crankshafts (3307 and 3015) and after ensuring that it is a satisfactory fit, leave the key in position and insert the shaft (3307) into the inner side of the driving side centre crankcase (3096) through the bearing (3158) and oil seal (3070) as far as can be accomplished manually. Fit the crankshaft (3015) into the outer face of the crankcase (3096) in the same manner lining up the keyway with the key that is positioned in the shaft (3307). Use the drawing tool to pull both shafts together (see page 20) and finally tighten up the nut (3016) using the crankshaft locking plate to secure the web of the crankshaft (3307). Refit the studs (3304 and 3305), the latter two being the longer and are fitted nearer to the cylinder base faces.

Place the recessed oil thrower (7)—recess away from ball race—on the end of the mainshaft and screw on the left hand nut (6).

The bearing cap together with the clutch lever can now be fitted, also the plunger box nut and washer. Next slide the clutch back plate assembly on to the mainshaft splines and secure with clutch nut (54) and spring washer (53). Insert the push rod (43)—after first greasing—and the push rod end piece (44), then assemble clutch in the reverse order to dismantling.

PRECAUTIONS.

A ball race should not be fitted unless the gearbox case has been removed from the engine. It must be ensured that the ball race is pressed right home and sealed squarely with the mainshaft.

When fitting the layshaft cluster of gears, engage the pegs of the operator fork with the end of the inside operator.

Ensure that the plunger box is not locked down into the inside operator, and that the plunger engages in the vee-slots correctly.

In all correspondence please state the prefix letter and numbers stamped on the gearbox cover.

When ordering gears and sprockets state the number of teeth required, and in the case of sprockets also state the chain size. This information is essential, but if the letters and numbers of the gearbox are not available, it is advisable to forward a pattern to avoid errors.

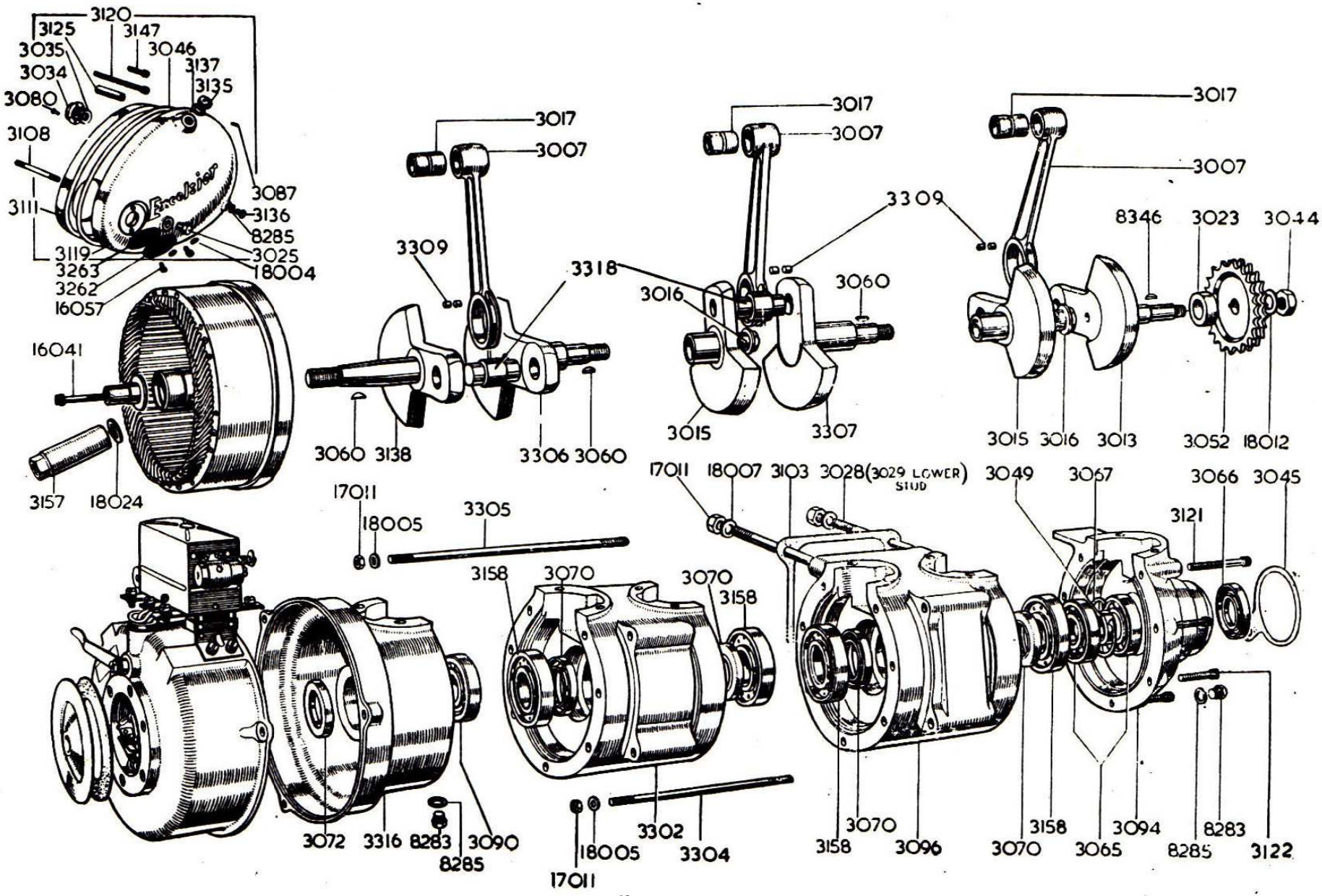
GEAR BOX

4-SPEED AND REVERSE UNIT—TYPE TR—FITTED TO 328 c.c. & 492 c.c. ENGINES.

ADJUSTMENTS.

The precautions for the 3-speed gearbox apply similarly to the 4-speed unit as do the instructions for adjustment of the gear rod.

No attempt should be made to force a gear into engagement when the machine is stationary, nor should reverse gear be engaged with the machine in forward motion or vice-versa. This stresses all gears to the extreme and damage in some form is almost sure to result.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Also check the fit of the next key (3060) in the keyways of shafts (3306 and 3015) and being satisfied with this (or having fitted an oversize key) take the complete timing side crankshaft assembly, insert the shaft (3306) through the bearing and oil seal located in the outer face of the crankcase (3302). Align the keyway in the crankshaft (3015) to which is fitted a crankpin (3318) with the key in crankshaft (3306) and insert the former into the inner face of the crankcase (3302) drawing the shafts together. Apply a nut (3016) to the thread of shaft (3306) and holding the web of this shaft with the locking plate, firmly tighten the nut.

Now adhere the big end rollers to the crankpin with the aid of grease and fit the connecting rod (3007) over them. Hold the connecting rod vertical and then slide the timing side centre crankcase assembly along the studs (3304 and 3305) and engage the crankpin in the web of the crankshaft (3307).

The timing side outer crankcase (3316) with the outer race of the bearing (3090) and oil seal (3072) fitted is then placed on to the studs (3304 and 3305), the washers (18005) and nuts (17011) applied, the latter being firmly tightened.

It remains to fit the driving side connecting rod and big end rollers to the crankpin, to attach the driving side crankcase (3094) and crankshaft assembly, rotating the web of the crankshaft (3013) to engage the crankpin (3318) and mating the two crankcase faces by tapping the web (3013) with a soft drift to bring those faces together afterwards fitting the Allen bolts (3121 and 3122) which are then firmly tightened in position.

Thoroughly cleanse the taper of the crankshaft (3138) and that of the flywheel rotor, check the fit of the key (3060), apply the flywheel to the shaft, place the washer (18024) against the boss of the flywheel, fit the securing nut (3157) to the shaft and tighten this preventing the crankshaft rotating by means of the locking plate positioned so that it contacts the web of the outer shaft (3138). Do not place the locking plate when removing or replacing the flywheel securing nut (3157) against the web of any other shaft, otherwise there is the risk of misaligning the timing side crankshaft assembly.

GEAR BOX

3-SPEED AND REVERSE UNIT—TYPE HJR5 FITTED TO 244 c.c. & 328 c.c. ENGINES.

ADJUSTMENTS.

Do not run with the drive chains too tight, as this causes the bearing to be heavily stressed. There should be not less than ½" up and down movement in the middle of the run at the tightest spot. Wheels should be turned and the movement tried in several places. Always check for tightness after locking down all bolts and nuts. After adjusting the chains check over the positions of the gear lever in the quadrant for the various gears. Adjust the gear rod backwards or forwards, as is necessary, by disconnecting the yoke and screw or unscrew until the hole in the yoke end lines up exactly with the hole in the lever when in one of the middle gears.

If difficulty is found in changing gear, make sure that the clutch is freeing and there is no drag. Clutch drag is the chief cause of rough gear changes. It is usually due to unequal spring pressure in which case the weak springs should be renewed. After considerable wear clutch drag may be caused through worn tangs on the cork plates.

No attempt should be made to force a gear into engagement when the car is stationary nor should reverse gear be engaged with the car in forward motion or vice versa. This stresses all gears to the extreme and damage in some form **is almost** sure to result.

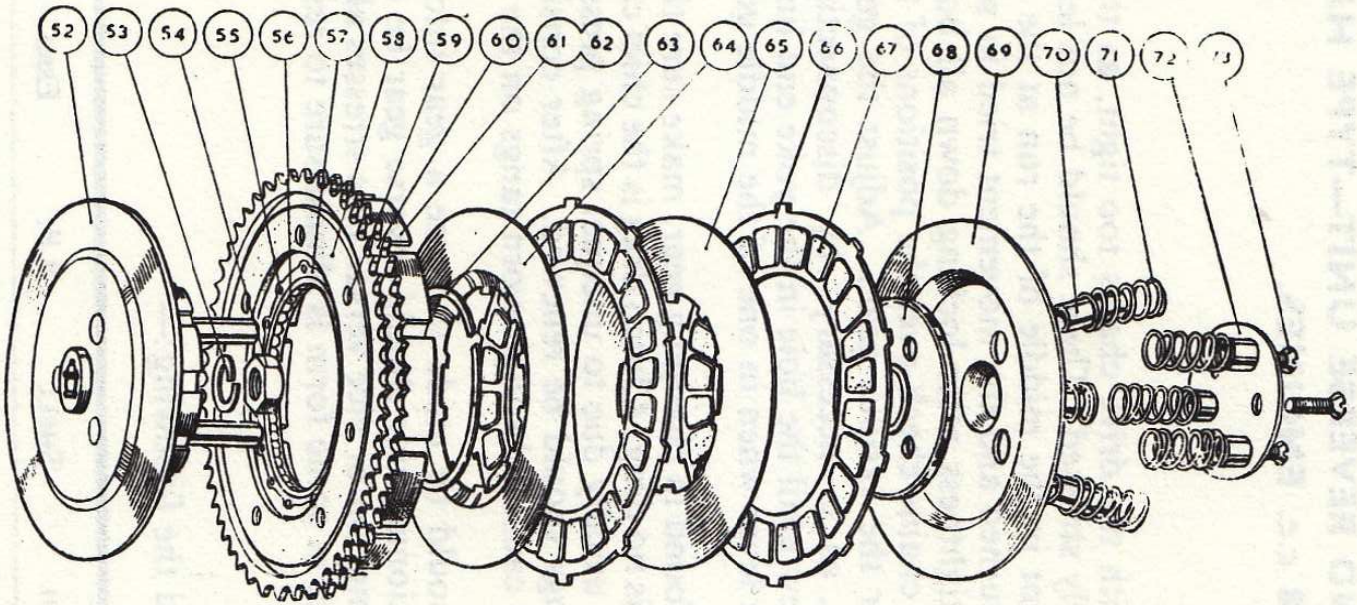
LUBRICATION.

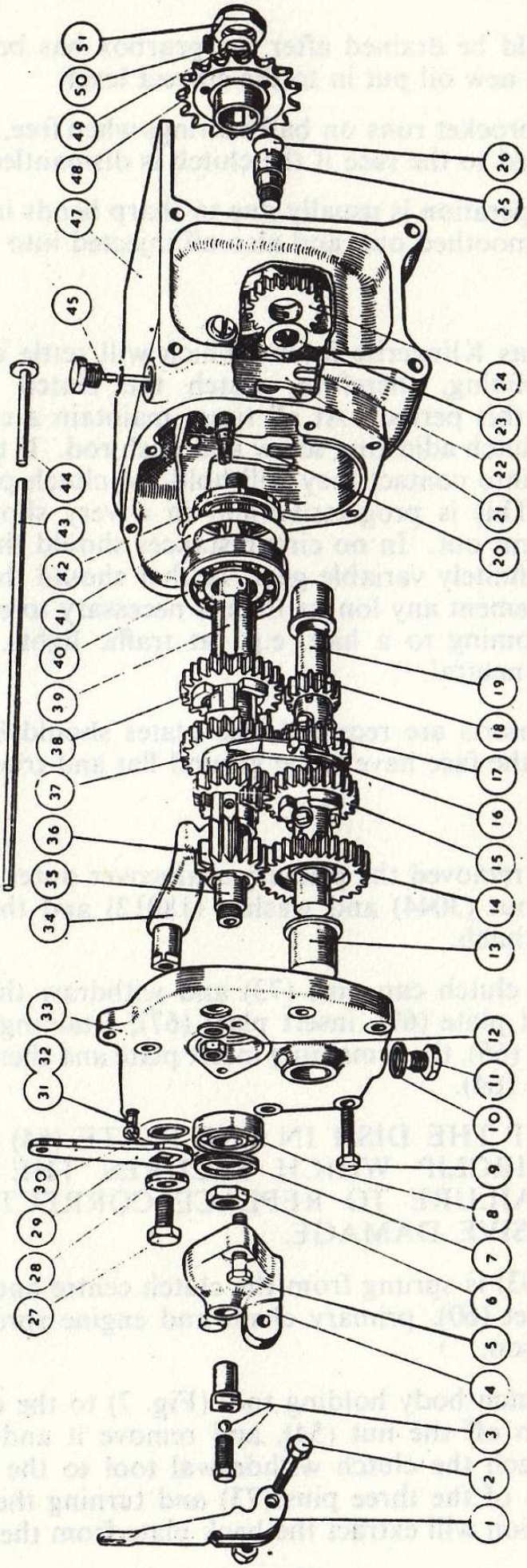
We recommend the following:—

WAKEFIELD	MOBIL	SHELL	B.P.	ESSO	REGENT
Castrol XXL	Mobiloil B.B.	Shell X 100—40	Energol SAE 40	Essolube 50	Havoline 40

All outside connections, yoke ends, etc., should be oiled at least monthly and a dab of grease should be put on the end of the push rod where the clutch adjusting screw in the clutch lever makes contact.

SECTIONAL DRAWING OF GEARBOX TYPE HJR5—3 SPEED AND REVERSE

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The oil should be drained after the gearbox has been running for 500 miles and new oil put in to the correct level.

The clutch sprocket runs on ball bearings when free, and a little oil should be added to the race if the clutch is dismantled.

Stiff clutch operation is usually due to sharp bends in the cable; these should be smoothed out, and also oil injected into the cable.

CLUTCH.

The clutch has Klingerite inserts which will settle down when new or after relining, therefore, watch the clutch adjustment especially during this period. At all times maintain a clearance of $\frac{1}{32}$" between the clutch adjusting screw and push rod. If the ends are allowed to come into contact they will hold the clutch partially out of engagement. This is progressive and in a very short time the inserts will be burnt out. In no circumstances should the clutch be regarded as an infinitely variable gear, neither should the clutch be held out of engagement any longer than is necessary to effect a gear change. When coming to a halt, e.g., at traffic lights, it is most essential to select neutral.

When new inserts are required, the plates should be returned to the Works, as the face have to be ground flat and true.

DISMANTLING.

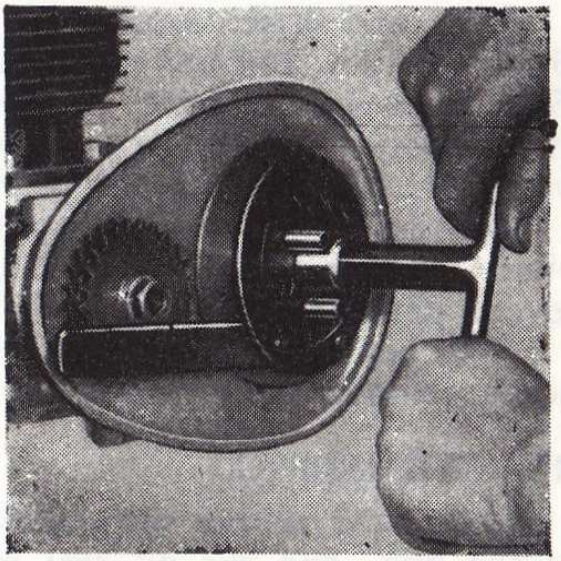
After having removed the primary chaincover outer, detach the engine sprocket nut (3044) and washer (18012) and then proceed to dismantle the clutch.

Unscrew the clutch cap pins (73) and withdraw the cap (72), springs (71), front plate (69), insert plate (67), retaining plate (48), intermediate plate (65), the remaining insert plate and then the dished intermediate plate (64).

NOTE THAT THE DISH IN THE PLATE (64) IS AWAY FROM THE CIRCLIP WHICH SECURES THE CLUTCH SPROCKET. FAILURE TO REPLACE CORRECTLY WILL CAUSE EXTENSIVE DAMAGE.

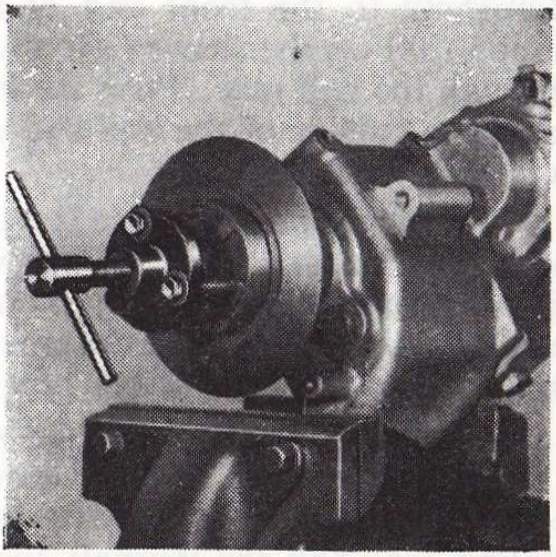
The circlip (63) is sprung from the clutch centre and will allow the clutch sprocket (60), primary chain and engine sprocket to be withdrawn in unison.

Apply the clutch body holding tool (Fig. 7) to the clutch back plate (52), slacken off the nut (54), and remove it and the spring washer (53). Attach the clutch withdrawal tool to the back plate (Fig. 8) by means of the three pins (73) and turning the tee bar in a clockwise direction will extract the back plate from the mainshaft.



CLUTCH BODY HOLDING TOOL. For holding the clutch body from turning while MAINSHAFT nut is tightened or removed. Fig. 6.

Now remove the two Allen bolts which secure the primary chaincase inner to the gearbox and detach the chaincase. Separate the gearbox from the crankcase by removing the four securing nuts and washers and sliding the gearbox off its fixing studs.



CLUTCH BODY WITHDRAWAL TOOLS. For removing clutch body from splined shaft of gearbox. Fig. 7.

Turning to the cover end of the gearbox take out the two bolts (5) holding the bearing cap (4) in position and remove complete with clutch lever (1).

The mainshaft nut (6) is LEFT-HAND, and must therefore be unscrewed in a clockwise direction, followed by the oil thrower (7). All cover bolts (9, 31 and 32) should now be withdrawn, together with the selector plunger box nut and washer (12) and the cover (33) lifted off. Do not prize the cover off by means of a screwdriver or similar tool, as this will destroy the joint and cause oil leaks. A gentle tap on the clutch end of the mainshaft will free it.

The mainshaft (35) can now be withdrawn, followed by the layshaft (19), layshaft gears (14, 15 and 17), mainshaft sliding gears (37) and fork (16) in one block.

The final drive sprocket (48) is fixed on the mainshaft sleeve (39) by splines, and locked down by a nut (51) with a grub screw (52) preventing the latter from unscewing. With the removal of the final drive sprocket the mainshaft sleeve can be taken out, and with it the mainshaft reverse gear pinion (38).

To unscrew the reverse pinion shaft (25) it is necessary to pierce the reverse shaft cover plate (26) in order to remove it. The reverse pinion shaft has a LEFT-HAND THREAD.

The ball race (40), oil seal retainer (41) and oil seal (42) should not be removed unless worn, nor should the inside operator (21).

RE-ASSEMBLING.

Place the rubber oil seal (42) with the lip facing the inside of the box—and the oil seal retainer (41) in the main bearing housing, then press the ball race (41) into position and caulk over.

Next place the idler pinion (24), bush, steel washer (23) in position and screw in idler pinion shaft (25)—LEFT-HAND THREAD—then place a new reverse shaft cover plate on the head of the shaft and expand with a single blow on centre of dome. Returning to the front end of the box, fit the mainshaft reverse pinion (38) on the sleeve (39) and put the screwed end of the sleeve through the ball race. Push the final drive sprocket on to the splines from the outside of the box and secure with the locknut and locking screw.

Fit the inside operator (21) (if it has been removed) into the case with the anchor pins (22) and when these have been screwed up tightly caulk some aluminium into the slot to prevent the screws turning. Make sure that the operator is quite free and the vee-slots move central to the plunger box hole.

Assemble the layshaft and see that the mainshaft sliding gear (37) is free to slide on the sleeve, then fit the assembled layshaft with the operator fork (16) in position between the mainshaft sliding gear and the layshaft sliding gears (15 and 17). Locate the pegs of the selector in the slots of the inside operator and ease the assembly into the box. Now make sure that all these parts are operating easily with no undue friction.

Screw in plunger box assembly (20) ensuring that it does not lock down on the inside operator (21) and that the operator plunger engages in the vee-slots correctly. The screwdriver slot lies in the same plan as the head of the plunger and these should be horizontal.

Fit the mainshaft high gear pinion (36) on the mainshaft (35) and insert in the mainshaft sleeve (39), giving a liberal coating of oil, then fit the end cover carrying the small ball race (8) ensuring that the arm of the inside operator is located in the spoon of the operator lever.

Place the recessed oil thrower (7)—recess away from ball race—on the end of the mainshaft and screw on the left hand nut (6).

The bearing cap together with the clutch lever can now be fitted, also the plunger box nut and washer. Next slide the clutch back plate assembly on to the mainshaft splines and secure with clutch nut (54) and spring washer (53). Insert the push rod (43)—after first greasing—and the push rod end piece (44), then assemble clutch in the reverse order to dismantling.

PRECAUTIONS.

A ball race should not be fitted unless the gearbox case has been removed from the engine. It must be ensured that the ball race is pressed right home and sealed squarely with the mainshaft.

When fitting the layshaft cluster of gears, engage the pegs of the operator fork with the end of the inside operator.

Ensure that the plunger box is not locked down into the inside operator, and that the plunger engages in the vee-slots correctly.

In all correspondence please state the prefix letter and numbers stamped on the gearbox cover.

When ordering gears and sprockets state the number of teeth required, and in the case of sprockets also state the chain size. This information is essential, but if the letters and numbers of the gearbox are not available, it is advisable to forward a pattern to avoid errors.

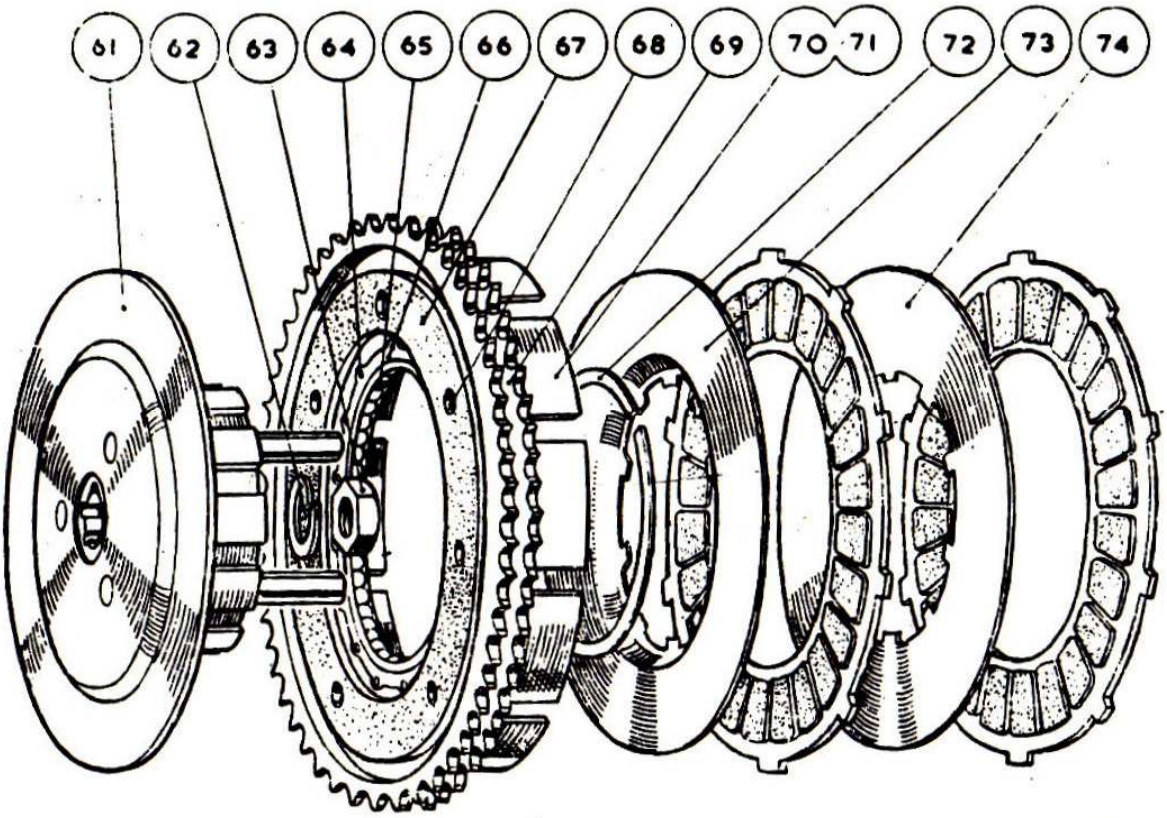
GEAR BOX

4-SPEED AND REVERSE UNIT—TYPE TR—FITTED TO 328 c.c. & 492 c.c. ENGINES.

ADJUSTMENTS.

The precautions for the 3-speed gearbox apply similarly to the 4-speed unit as do the instructions for adjustment of the gear rod.

No attempt should be made to force a gear into engagement when the machine is stationary, nor should reverse gear be engaged with the machine in forward motion or vice-versa. This stresses all gears to the extreme and damage in some form is almost sure to result.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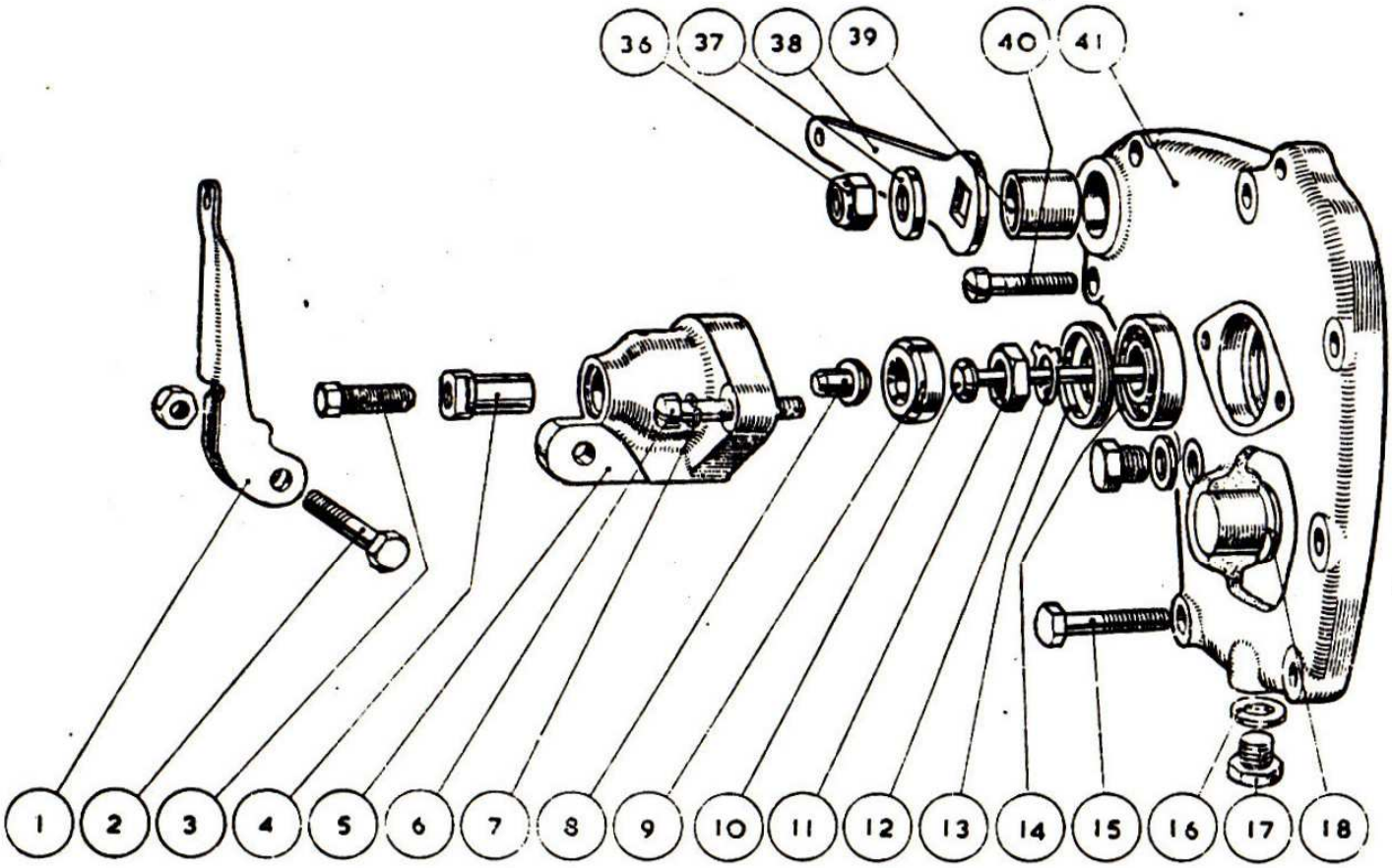
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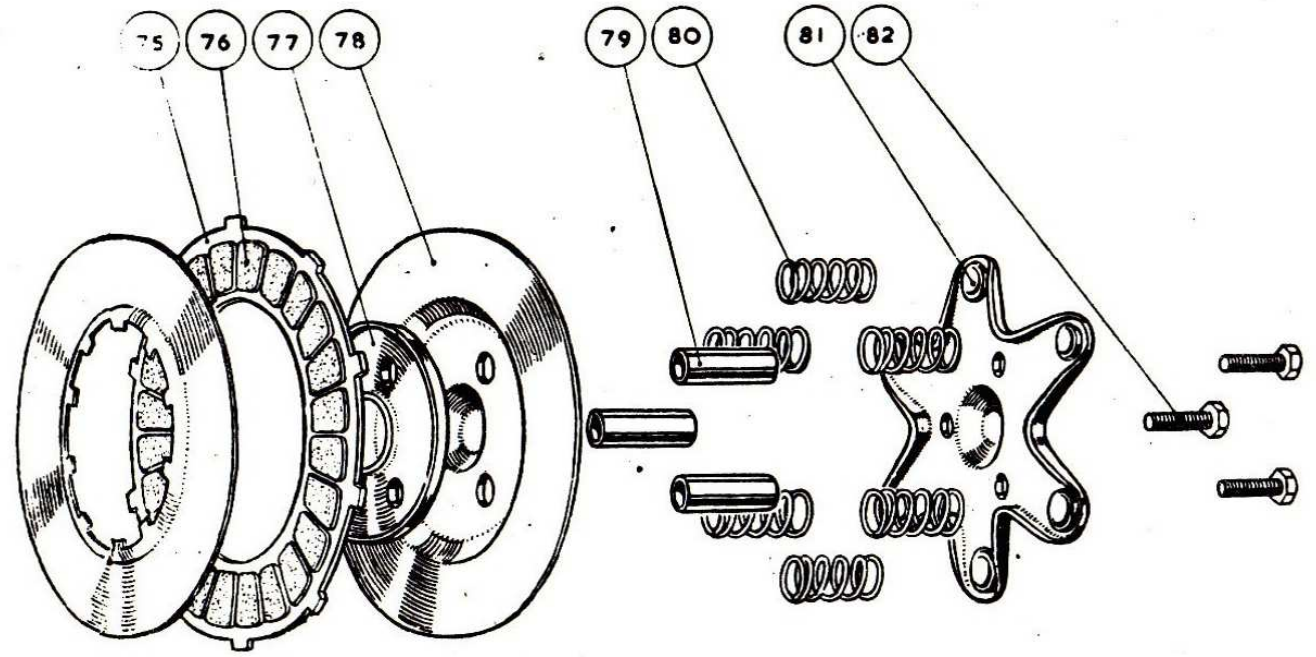
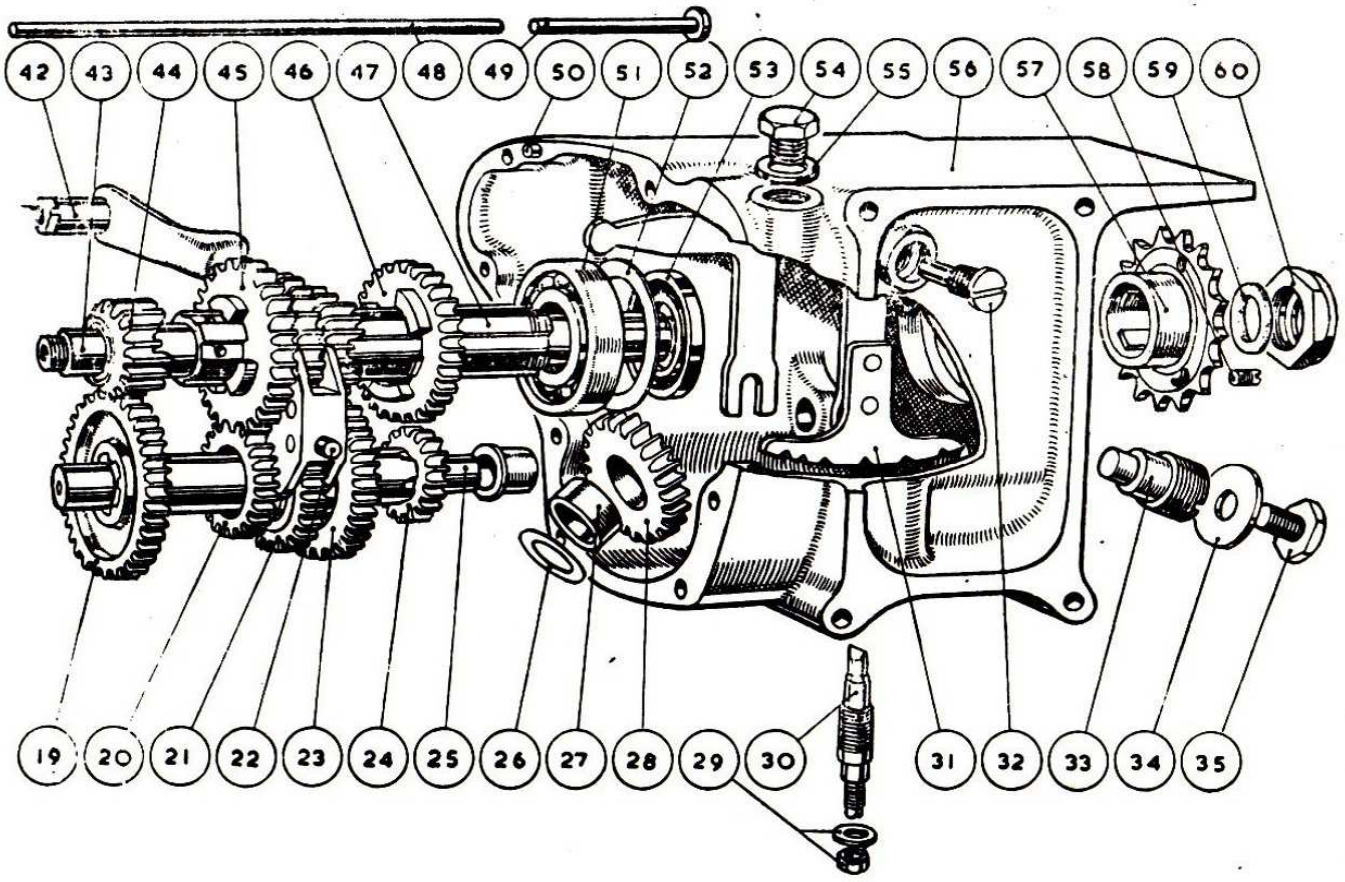
TYPE TR—4 SPEED AND REVERSE





LUBRICATION.

We recommend the following:—

WAKEFIELD	MOBIL	SHELL	B.P.	ESSO	REGENT
Castrol XXL	Mobiloil B.B.	Shell X 100—40	Energol SAE 40	Essolube 50	Havoline 40

All outside connections, yoke ends, etc., should be oiled at least monthly and a dab of grease should be put on the end of the clutch adjusting screw, where it makes contact with the thrust pad.

The oil should be drained after the gearbox has been running for 500 miles and new oil put in to the correct level. The clutch sprocket runs on ball bearings when free and a little oil should be added to the race if the clutch is dismantled.

CLUTCH.

The clutch has Klingerite inserts which will settle down when new or after relining, therefore, watch the clutch adjustment especially during this period. At all times maintain a clearance of $\frac{1}{32}$" between the clutch adjusting screw and adjuster sleeve thrust pad. If the ends are allowed to come into contact they will hold the clutch partially out of engagement. This is progressive and in a very short time the inserts will be burnt out.

Under no circumstances should the clutch be held out of engagement any longer than is necessary to effect a gear change. When coming to a halt with the engine running it is most essential to change into neutral, e.g., at traffic lights. When new inserts are required, the plates should be returned to the Works, as the faces have to be ground flat and true.

DISMANTLING.

Follow precisely the same procedure as for the 3-speed unit by removing the primary chaincase outer, dismantling the clutch which in effect has merely additional insert and plain plates, removing the engine sprocket, primary chain and the clutch sprocket; withdraw the clutch back plate, remove the chaincase inner and separate the gear box from the crankcase.

The pressure plate (81) has the same function as the clutch spring cap used on the 3-speed gearbox and is secured in an identical manner. It should, however, be noted that there are three springs of 13 gauge and three springs of 14 gauge—when reassembling these springs should be placed alternately.

Turning to the cover end of the gearbox, unscrew the two pins (6) holding the bearing cap (5) in position, and remove complete with clutch lever (1) adjuster pin and sleeve (3 and 4).

The mainshaft nut (1) has a LEFT HAND thread, and must therefore be unscrewed in a clockwise direction, followed by the oil thrower (13). The cover pins (15) and (4) should now be withdrawn and the cover (41) lifted off. Do not prize the cover off by means of a screwdriver or similar tool as this will destroy the joint and cause oil leaks. A gentle tap on the clutch end of the mainshaft will free it. The selector plunger box assembly (30) which is at the bottom of the box can now be unscrewed allowing the inside operator (31) to swing. Withdraw the mainshaft (43), layshaft (25), layshaft gears (19, 20, 21 and 23) mainshaft sliding gear (45) and fork (22) in one block.

The final drive sprocket (57) is fixed on the mainshaft sleeve (47) by splines and locked down by a nut (60) with a grub screw (58) preventing the latter from unscrewing. With the removal of the final drive sprocket, the mainshaft sleeve (47) can be taken out and with it the mainshaft reverse gear pinion (46).

To remove the idler pinion (28) unscrew the locking bolt (35)—(R.H. thread), remove the washer (34) and unscrew the idler pinion shaft (33)—(L.H. thread).

The ballrace (51), the oil seal retainer (52) and oil seal (53) should not be removed unless worn, nor should the inside operator (31), although similar methods for fitting a new bearing and seal apply as for the crankcase.

RE-ASSEMBLING.

Place the rubber oil seal (53)—with the lip facing the inside of the box—and the oil seal retainer (52) in the main bearing housing, then press the ball race (51) into position and caulk over. Next place the idler pinion (28) and pen steel washer (26) in position and screw in the idler pinion shaft (33)—left hand thread—then lock down with locking bolt (35) and washer. Turning to the opposite end of the box, fit the mainshaft reverse pinion (46) on the sleeve (47) and push the screwed end of the sleeve through the ballrace. Push the final drive sprocket onto the splines from the outside of the box and secure with the gland nut and locking screw, noting the nut contains the felt washer (59).

Fit the inside operator (31) into the case with the anchor pins (32) and when these have been screwed up tightly caulk some aluminium into the slot to prevent the screws turning. Make sure that the operator is quite free.

Assemble the gears on the layshaft and see that the mainshaft sliding gear (45) is free to slide on the sleeve, then fit the assembled layshaft with the operator fork (22) in position between the mainshaft sliding gear and the layshaft sliding gears. Locate the pegs of the selector in the slots of the inside operator and ease the assembly into the box. Now make sure that all these parts are operating easily with no undue friction.

Screw in the plunger box assembly (30) ensuring that it does not lock down on the inside operator (31) and that the operator plunger engages in the vee-slots correctly. The screwdriver slot lies in the same plane as the head of the plunger.

Fit the mainshaft high gear pinion (44) on the mainshaft (43) and insert in the mainshaft sleeve (47), giving a liberal coating of oil, then fit the end cover carrying the small ballrace (14) ensuring that the arm of the inside operator is located in the spoon of the operator lever.

Place the recessed oil thrower (13)—recess away from the ballrace—on the end of the mainshaft and screw on the left hand threaded nut (11). Push the push rod thrust pad (10) into the hole down the centre of the mainshaft and then fit the bearing cap after first inserting the adjuster sleeve thrust pad (8) followed by the thrust race (9). Screw on the clutch lever and insert adjuster sleeve (4) and pin (3).

Returning to the clutch end of the gearbox, slide the clutch back plate assembly onto the mainshaft splines and secure with clutch nut (63) and spring washer (62). Insert the push rod (48)—after first greasing—and the push rod end piece (49), then assemble clutch in the reverse order to dismantling.

PRECAUTIONS.

The ballrace should not be fitted unless the gearbox case has been removed from the engine. It must be ensured that the ballrace is pressed right home and seated squarely with the mainshaft.

When fitting the layshaft cluster of gears, engage the pegs of the operator fork with the slots in the inside operator.

Ensure that the plunger box is not locked down onto the inside operator, and that the plunger engages in the vee-slots correctly.

In all correspondence please state the prefix letters and numbers stamped on the gearbox cover, also the Model of machine and year of manufacture.

When ordering gears and sprockets state the number of teeth required, and in the case of sprockets also state the chain size.

This information is essential, but if the letters and numbers of the gearbox are not available, it is advisable to forward a pattern to avoid errors.

4-SPEED AND REVERSE UNIT—TYPE VR—FITTED TO 328 c.c. TWIN & 492 c.c. 3-CYLINDER ENGINES.

The detailed instructions given on the TYPE TR gearbox in the previous chapter apply equally to the TYPE VR except for the following:—

DISMANTLING.

1. When dismantling the clutch there are additionally a shock absorber centre with six rubbers to be removed.

2. It should be noted all the six clutch springs are now of 13-gauge.

3. The oil seal retainer (52) is no longer fitted.

RE-ASSEMBLING.

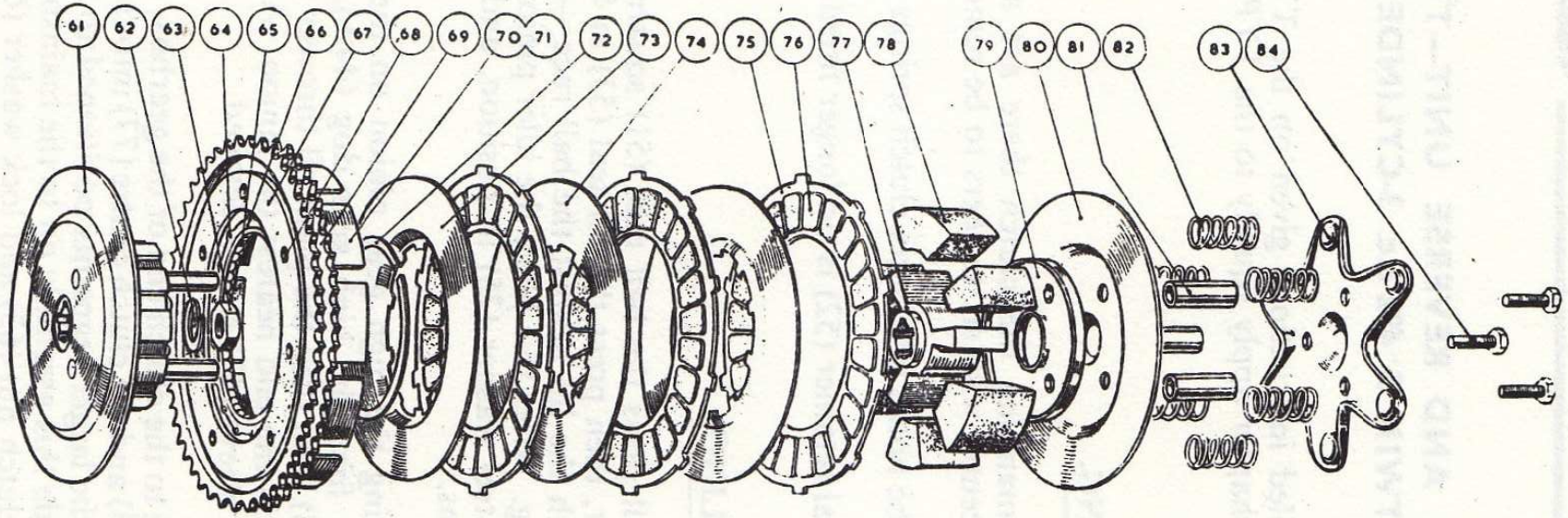
4. First of all press the ball race (51) squarely into position and caulk over, then press the oil seal (53) in from the back of the case —with the lip nearest the ball race —until it is flush with its housing. After this place the idler pinion (27), the bush (26), and pen steel washer (25) in position, and proceed as detailed instructions.

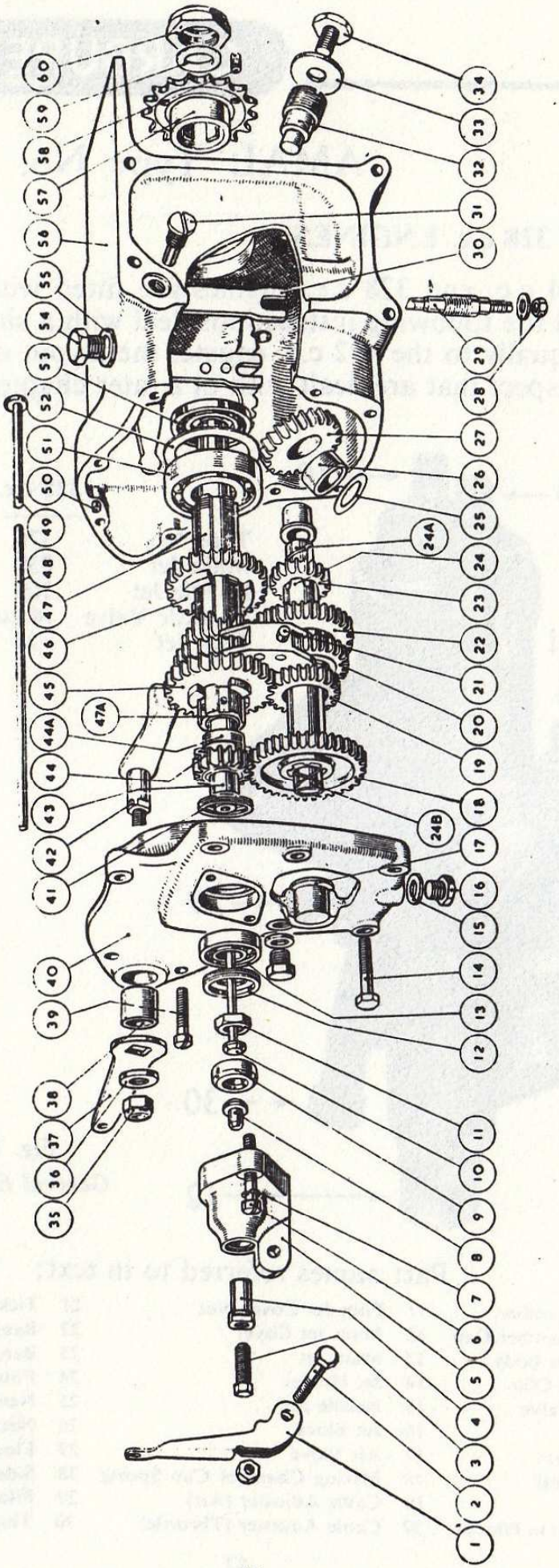
5. When fitting the high gear pinion on the mainshaft the procedure is, first, the high gear dog (44A), then the high gear pinion (44), and then the plain oil thrower (41), making sure the dogs are on the end nearest the pinion. After this insert in the mainshaft sleeve (47) etc. as detailed.

6. Returning to the clutch end of the gearbox, fit the shock absorber rubber (78) and the clutch centre (77) into the back plate assembly (61) with the larger segments positioned to take the main driving force. Slide this assembly on to the mainshaft splines and secure with the clutch nut (63) and lock washer (62).

   Insert the push rod (48) etc. as detailed.

SECTIONAL DRAWING OF GEARBOX TYPE VR—4 SPEED AND REVERSE

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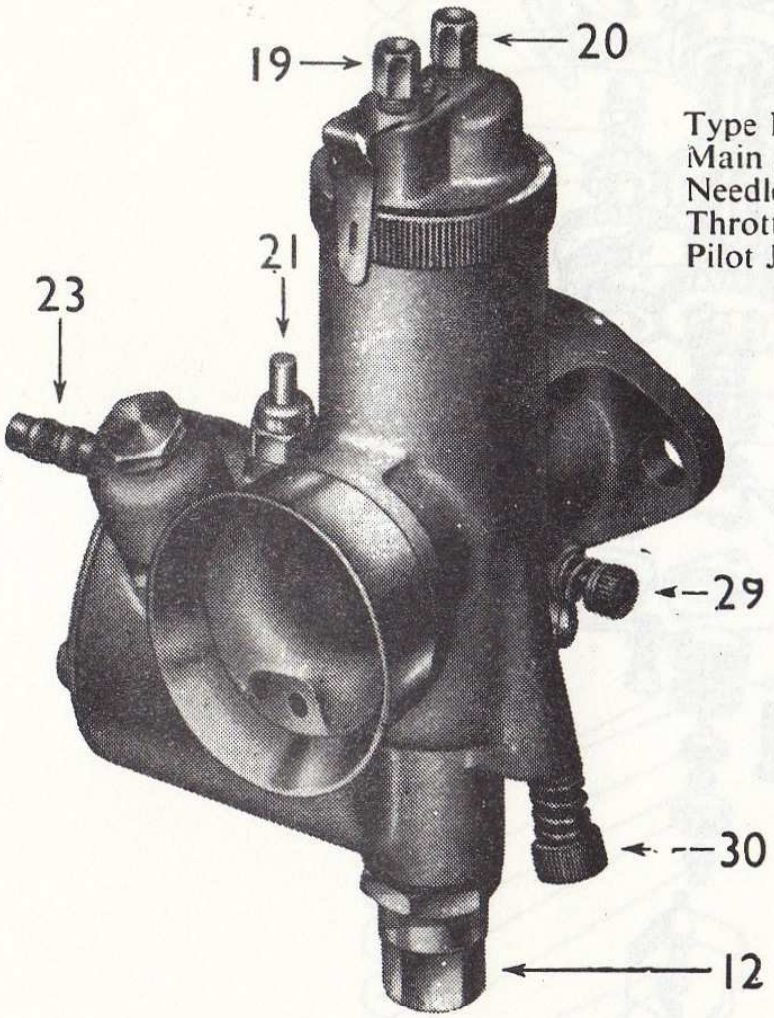
AMAL Type No. 376 & 375

244 c.c. and 328 c.c. ENGINES.

The 244 c.c. and 328 c.c. engines are fitted with a single carburetter and the following instructions deal with a single instrument but apply equally to the 492 c.c. engine, the layout of which differs in certain respect that are dealt with in a later chapter.



	328 c.c.	244 c.c.
Type No.	376	357
Main Jet	230	120
Needle Jet	.105	.105
Throttle Valve	/4 cutaway	/3½ cutaway
Pilot Jet	25	30

Fig. 1.
General External View.

Part names referred to in text:

1 Mixing Chamber
2 Mixing Chamber Cap
3 Carburetter Body
4 Jet Needle Clip
5 Throttle Valve
6 Jet Needle
7 Pilot Outlet
8 Pilot By-pass
9 Pilot Jet
10 Petrol Feed to Pilot Jet
11 Pilot Jet Cover Nut
12 Main Jet Cover
13 Main Jet
14 Jet Holder
15 Needle Jet
16 Jet Block
17 Air Valve
18 Mixing Chamber Cap Spring
19 Cable Adjuster (Air)
20 Cable Adjuster (Throttle)
21 Tickler
22 Banjo Bolt
23 Banjo
24 Filter Gauze
25 Needle Seating
26 Needle
27 Float
28 Side Cover Screws
29 Pilot Air Adjusting Screw
30 Throttle Adjusting Screw

The carburetter proportions and atomises the right amount of petrol with the air that is sucked in by the engine because of the correct proportions of jet sizes and the main choke bore. The float chamber maintains a constant level of fuel at the jets and cuts off the supply when the engine stops.

The throttle control operated by the driver controls the volume of mixture and therefore the power, and at all positions of the throttle the mixture is automatically correct. The opening of the throttle brings first into action the mixing supply from the pilot jet system for idling, then as it progressively opens, via the pilot by-pass, the mixture is augmented from the main jet, the earlier stages of which action is controlled by the needle in the needle jet. The main jet does not spray directly into the mixture chamber, but discharges through the needle jet into the primary air chamber, and goes from there as a rich petrol-air mixture through the primary air choke into the main air choke. This primary air choke has a compensating action.

The carburetter has a separately operated mixture control, called an air valve for use when starting from cold and until the engine is warm; this control partially blocks the passage of air through the main choke.

HINTS AND TIPS.

Starting from Cold.

If climatic conditions are favourable it is only necessary to close the air valve and set the throttle approximately one-third open, then operate the self-starter. Remember to always re-open the air valve as the engine warms up.

Starting from Hot.

Half close the air valve, set the throttle about one-eighth open and the engine should start immediately. If the carburetter has been inadvertently flooded and will not start because the mixture is too rich, open the throttle wide and give the engine several turns to clear the richness, then start again with the throttle one-eighth open and the air valve wide open.

Cable Controls.

See that there is a minimum of back-lash when the controls are set back and remedy accordingly by the adjusters on top of the carburetter. See that the throttle shuts down freely.

Petrol Feed, Verification.

Detach petrol pipe union at the float chamber end, turn on petrol tap and ensure that a full flow of the fuel exists. Flooding of the float chamber may be due to a worn needle or a leading float, but nearly all flooding with a new engine is due to impurities so

that it may be necessary for the float chamber to be periodically cleaned until the trouble ceases.

Irregular Running.

Irregular slow running is often caused by air leaks, so verify there are not any at the point of attachment between the carburetter and the manifold/s, and the manifold/s and the cylinder/s. Check by means of an oil can and eliminate by ensuring that the faces are flat, fitting new washers and equal tightening up of the flange nuts.

Inferior Petrol Consumption of a new engine may be due to flooding caused by impurities lodging on the fuel needle seat and so preventing the valve from closing. If the engine has been in use for several years, flooding may be caused by a worn float needle and also petrol consumption will be affected if the throttle needle jet has worn. It may be remedied or improved by lowering the needle in the throttle, but if it cannot be—then the only remedy is to fit a new needle jet.

The trouble may not be carburation and if irregular running of one nature or another cannot be remedied by making the mixture richer or weaker with the air valve, and you have ensured the petrol feed is good and the carburetter is not flooding, the trouble is elsewhere.

TRACING FAULTS.

There are only two possible faults in carburation, either richness or weakness of mixture, so in case of trouble, decide which in the cause, by—

1. Examining the Petrol feed
    - (a) Verify jets and passages are clear.
    - (b) Verify ample flow.
    - (c) Verify there is no flooding.
2. Looking for air leaks
    - (a) At the carburetter flange/s.
    - (b) At the manifold to cylinder joints.
3. Defective or worn parts
    - (a) Such as a worn throttle valve or worn needle jet.
    - (b) The mixing chamber union nut not tightened up or loose jets.
4. Testing with the air valve to see if by richening the mixture the results are better or worse.

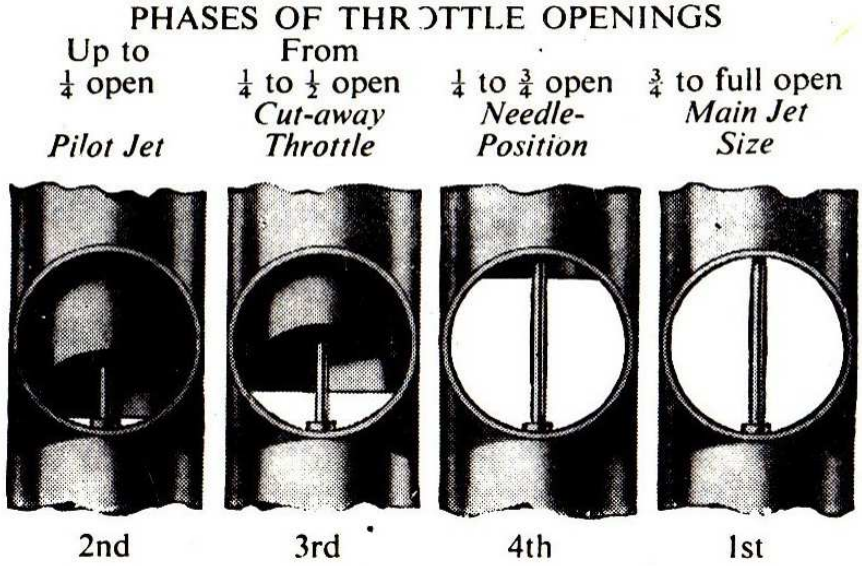
Indication of:—

Richness.	Weakness.
Black smoke in exhaust.	Spitting back through carburetter.
Excessive blow back at carburetter.	Erratic slow running.
Four-stroking under load.	Over-heating.
Heavy, lumpy running.	Poor acceleration.
Excessive fuel consumption.	
Air cleaner choked up.	
Needle jet worn.	

Verify correctness of fuel feed, stop any air leaks, check over ignition and timing ($\frac{11}{64}$" before T.D.C.) and decide whether richness or weakness is the trouble and at what throttle position. If at a particular throttle opening you partially close the air valve and the engine runs better, weakness is indicated. If on the other hand the running is worse, richness is indicated. You then proceed to adjust the appropriate part for that throttle position.

To Cure Richness.	Order	To Cure Weakness.
Fit smaller main jet.	1st	Fit larger main jet.
Screw out pilot adjusting screw.	2nd	Screw pilot adjusting screw in.
Fit a throttle with larger cut-away.	3rd	Fit a throttle with smaller cut-away.
Lower needle one or two grooves.	4th	Raise needle one or two grooves.

PHASES OF THROTTLE OPENINGS



Sequence of Adjustment.

Adjust in the following order only, and by so doing you will not upset previous adjustments made.

1st MAIN JET.—Test the engine for full throttle and if when at this position the power seems better with the throttle less than

wide open or with the air valve closed slightly, the main jet is too small. If the engine runs " heavily," the main jet is too large.

2nd PILOT JET.—The usual setting for the pilot adjusting screw is for it to be screwed to the fully rich position, i.e., turn in a clockwise direction as far as it will go and then unscrew half-a-turn.

3rd THROTTLE CUT-AWAY.—If when the throttle is moved off from the idling position there is objectionable spitting from the carburetter, slightly richen the pilot mixture, but if this is not effective, screw it back again and fit a throttle with a smaller cut-away. If extremely uneven running under load at this throttle position occurs, and there is no spitting, either the throttle needle is much too high or a larger throttle cut-away is required to cure richness.

4th THROTTLE NEEDLE.—The needle controls a wide range of throttle opening and also the acceleration. Try the needle in a low position, i.e., with the clip in a groove as near the top of the needle as possible and if acceleration is poor and with the air valve partially closed the results are better, raise the needle by two grooves. If very much better, try lowering the needle by one groove and leave it in a position where the best results are obtained. If the mixture is still too rich with the clip in the first groove, i.e., the one nearest the top, then in all probability the needle jet is worn and requires replacement.

We have provided the above information to give the Talisman Twin Engine owner an understanding of the essentials of good carburation. In practice, it will rarely be found that adjustment except to the throttle needle/s is required, until such time that prolonged use requires the fitting of new parts.

DISMANTLING.

It is advisable to slacken off the main jet cover (12) and the jet holder (14) preparatory to detaching the carburetter from the engine. Unscrew the mixing chamber cap spring (18), slide up and detach the mixing chamber top (1) complete with throttle valve (5), air valve (17) and jet needle (6), etc., as one assembly. If replacement of either the air or throttle valve is required then the respective springs should be compressed, the cable nipples disengaged, and new parts attached in a similar manner. The jet needle is secured in the throttle valve with a spring clip (4) and it will be noted that it can be located in one of five grooves although it is set in the second groove from the top at the Works.

Then detach the carburetter from the manifold by removing the nuts and washers, allowing the carburetter to be pulled from its studs and disconnect the petrol pipe at the tap. Remove the main jet cover so exposing the main jet affixed to the jet holder which can be detached from the carburetter body bringing with it both main

and needle jets. For cleaning purposes there is no particular need to part the jet from the holder and it should be quite easy to determine the cleanliness, or otherwise, of the various apertures. If removal of the jet block is necessary note that both the small located screw, adjacent to the pilot air adjusting screw (29), and the throttle stop screw (30) must first be completely removed from the carburetter body, which when inverted will allow the jet block to slide out. The pilot jet (9) can be unscrewed, to enable it to be cleaned, after first detaching the jet cover nut (11).

Unscrewing the banjo bolt (22) allows the banjo (23), and the attendant petrol pipe to be lifted off the carburetter, so revealing the filter gauze (24) which can be carefully withdrawn for cleaning. The occasion should not arise to remove the needle seating (25) for upon further dismantling its cleanliness can be readily determined.

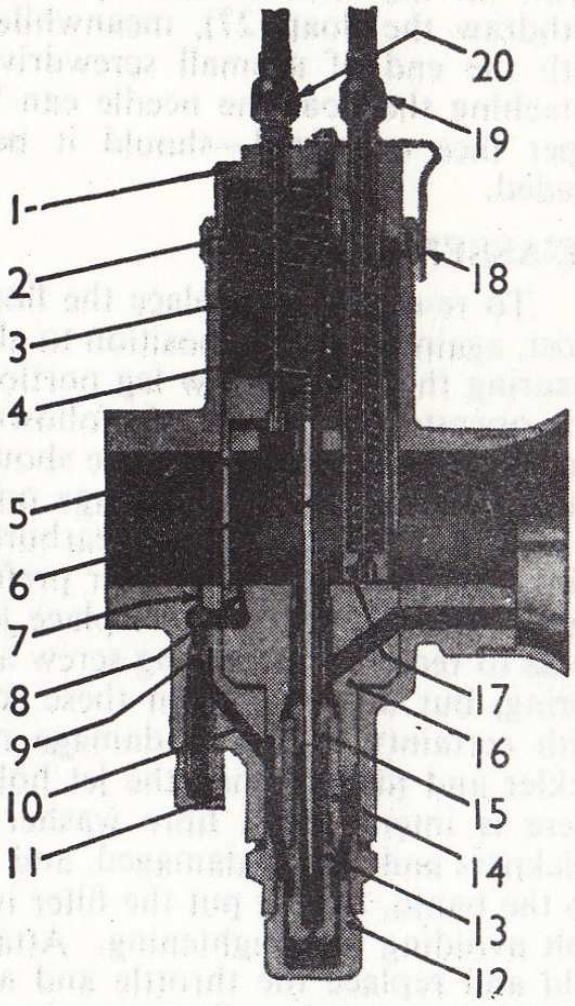


Fig. 2. Section through Mixing Chamber, showing Air Valve and Throttle Closed.

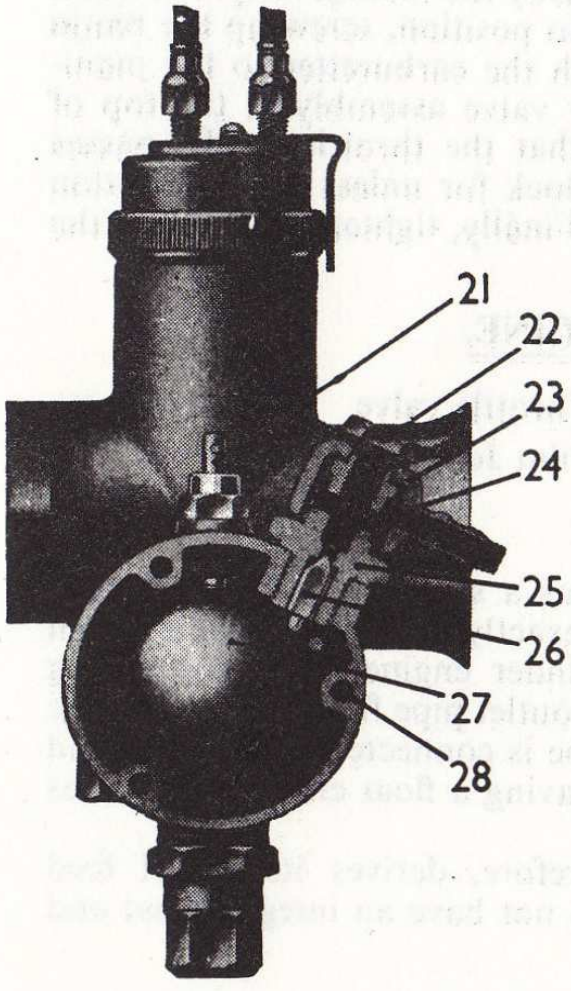


Fig. 3. Section through Float Chamber.

The tickler (21) is held in position by the hexagon nut beneath it, unscrewing of this exposes the captive spring which returns the tickler during use. To examine the float chamber or replace parts within it, remove the three side cover screws (28) and pull away the cover avoiding damage to the joint washer.

Draw off the brass distance piece on the float spindle and gently withdraw the float (27), meanwhile hold the needle (26) in place with the end of a small screwdriver to prevent it falling. After detaching the float the needle can be allowed to slide out and its taper face examined—should it be stepped then replacement is needed.

RE-ASSEMBLING.

To re-assemble, replace the float needle, with the taper uppermost, again holding in position to allow the float to be pushed home ensuring that the narrow leg portion of the hingle is uppermost as this operates the needle. It follows that the float can be replaced incorrectly and, therefore, care should be taken to avoid this. Refit the side cover avoiding damage on the working face and the one to which it impinges on the carburetter body. Make sure that the joint washer is undamaged, or preferably fit a new one, and firmly tighten the three screws. Replace jet block in the body positioned so as to receive the locating screw and throttle adjusting screw with spring, but do not tighten these screws until the block is located with certainty otherwise damage may be sustained. Replace the tickler and fittings, then the jet holder, between this and the body there is interposed a fibre washer that should be of the correct thickness and also undamaged, and lastly the main jet cap. Connect up the banjo, having put the filter into position, screw up the banjo bolt avoiding over tightening. Attach the carburetter to the manifold and replace the throttle and air valve assembly in the top of the mixing chamber, first ensuring that the throttle needle passes through the centre orific in the jet block for unless this precaution is adopted a bent needle will result. Finally, tighten up by hand the mixing chamber cap.

CARBURETTER FOR 492 c.c. ENGINE.

Main Jet No.	...	190	Throttle valve	...	/4 cutaway
Type No.	...	376	Pilot Jet No.	...	25
Needle Jet	...	·105			

For this engine each cylinder has a separate carburetter, that for the right hand (timing side) being exactly the same, with exception of jet size, as that on the twin cylinder engine, the centre being similar except for the provision of an outlet pipe from the base of the float chamber to which a balance pipe is connected to the left hand (driving side) instrument, this also having a float chamber cover as the centre carburetter.

The left hand carburetter, therefore, derives its petrol feed from the centre carburetter and does not have an integral float and needle.

Tuning of each carburetter is precisely the same as that for the twin cylinder engine, and there should be no disparity between carburetters, i.e., the jet sizes, throttle valve cutaways, pilot jets and needle settings must not differ for all three instruments. Individual setting of the pilot adjusting screws can be accomplished yet it is considered advisable to set the screws identical. Absolute co-ordination of throttle valve movement is imperative to ensure even running of the engine during the whole of the first three-quarters of the throttle travel (after that the carburetters operate solely upon the main jets and therefore the size of these determine the mixture strength).

A gallery, not manufactured or supplied by us, is usually employed to carry toggle arms to operate either short rods or cables to which adjusters with lock nuts are attached. Open the air control lever fully and place the tips of the forefingers against the throttle valve cutaways of the left hand and centre carburetters, and have the throttle gently operated when any discrepancy can be immediately discerned, which discrepancy should be corrected with one adjuster of the carburetter whose throttle valve lifts the earlier, i.e., lower this throttle valve. Carry out the same procedure for the centre and right hand carburetters and then cross check that both the left and the right hand throttle valves move consistently.

The throttle stops and pilot adjusting screws should be set before the car leaves the Works and it should not normally be necessary to effect re-adjustment. If low running speed is uneven and the initial acceleration unsatisfactory, first check the contact breaker points for condition and setting, making any correction needed, before adjusting the carburation.

As in the case of all other features of carburation, we consider it advantageous to set the pilot jet screws and throttle stops to the same position for each of the three carburetters, and it will be found somewhat easier to reset the screws to a datum, if re-adjustment is required, rather than endeavour to effect individual corrective adjustment. Ensure that the air lever is fully open and that all throttle valves move in unison, screw all pilot adjusting screws completely up, noting the position of the clots in the heads which will invariably differ between one carburetter and another, then screw each one back exactly one-half of a complete turn. Slacken off all throttle stop screws until the springs are free and proceed to screw any one of these back again, meanwhile placing the tip of a forefinger against the throttle valve cutaway to determine the precise position when the stop screw contacts the slide—treat the remaining carburetters accordingly. Again noting the position of the slots, screw the throttle stops in exactly two complete turns and the datum position has been arrived at. Start the engine and should it run too fast, bring back all the throttle stops one-eighth of a turn and again check the running—proceed in this manner until the

slowest possible engine speed is attained without there being any tendency for hesitation—if the engine will not tick over then progressively raise the stops to obtain the same result. The next phase is that of obtaining a correct mixture strength for the pilot jets. Start the engine progressively operating the throttles until they are about one-quarter open and during this there should not be any momentary hesitation since the datum setting is purposely rich. Stop the engine and turn the pilot adjusting screws outwards (anti-clockwise) one-eighth of a turn and follow the procedure of running to check the result—do this gradually until a definite "flat spot" can be reproduced and then turn the pilot adjusting screws inwards (clockwise) one-eighth of a turn or slightly more so that the "flat spot" is eliminated. This will result in the mixture strength becoming weaker and in consequence the engine speed, at the setting previously obtained, will increase and it remains therefore to unscrew the throttle stops an equal amount each until satisfactory idling is obtained.

Note that a completely even tick over cannot be obtained with a two-stroke engine and the idling speed will of necessity be somewhat greater than that of a four-stroke.

THE SIBA DYNASTART

GENERAL DESCRIPTION

The Dynastart Unit consists of a bell type armature, a stator, a contact breaker and a cam. The stator is constructed from twelve pole pieces of which six carry the starter windings and six which carries the switch assembly box, and is called the stator housing.

When starting the engine the Dynastart operates as a series motor and is controlled by a push button or starter switch which operates a solenoid and thus does not control the main current but only an auxiliary circuit. When the Dynastart is driven by the engine the shunt windings are excited and generate current which is utilised both for the ignition system and for lighting and battery charging.

Initially the generated voltage increases with engine speed and as soon as the rated level of twelve volts has been reached the cut out switch closes and charging of the battery begins. When running, this voltage is maintained by automatic voltage control and is kept nearly constant independent of speed, the normal no-load voltage being approximately fifteen volts. As current is consumed the voltage drops in conformity with the output. The prescribed charging rate is reached at speeds varying between 1200 and 1500 r.p.m., and will meet a continuous load of 90 watts thereafter.

COMPONENTS

The armature is keyed to the crankshafts and fits on a taper.

The timing cam is secured by one Allen bolt, and located by a dimple in the hub of the armature.

The contact breaker is located in the stator housing and provision is made for rotation to allow for timing adjustment.

The aluminium switch assembly box houses the voltage regulator, cut out and starter solenoid on a common support.

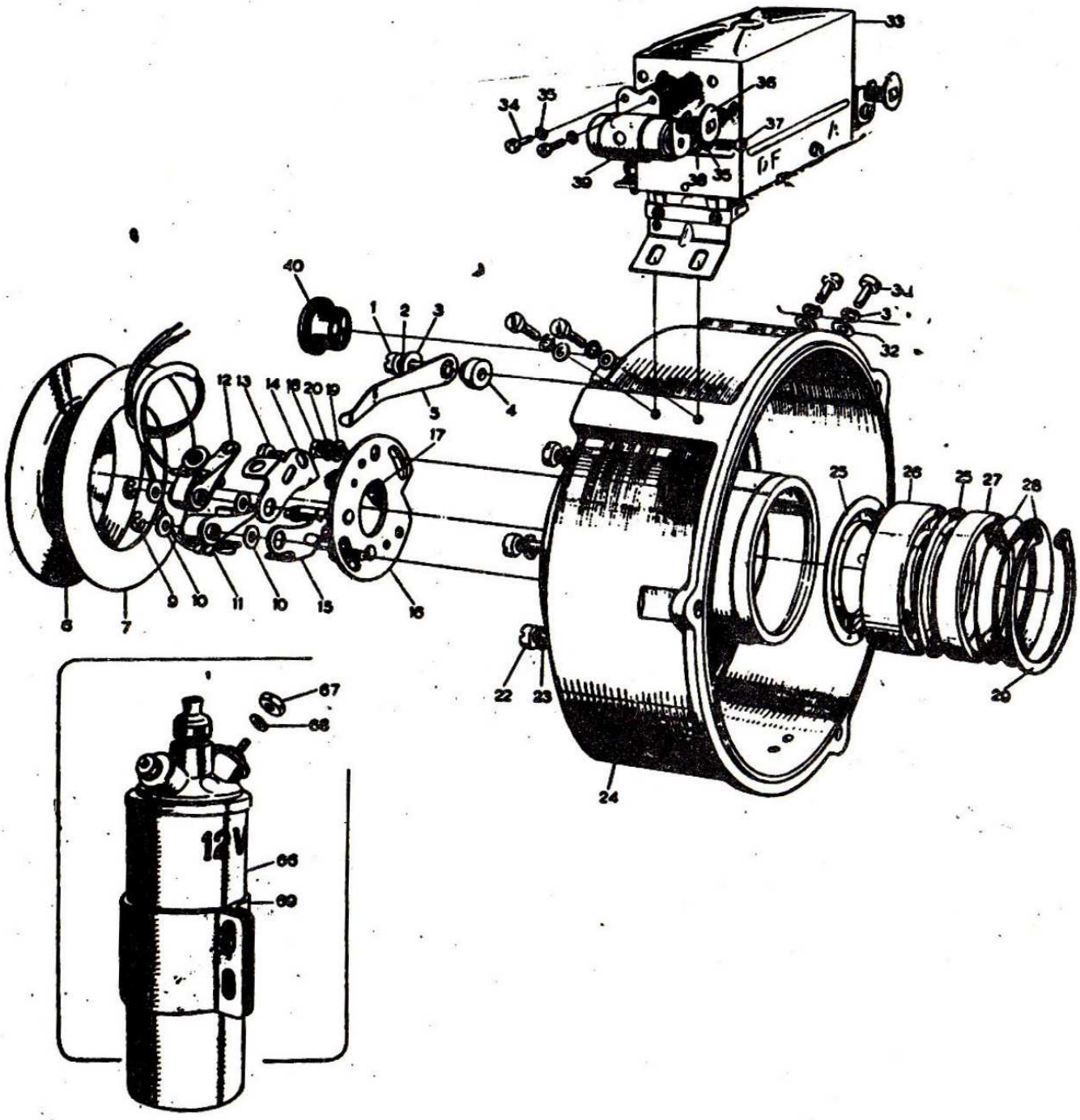
The ignition coils are 12 volt heavy duty type.

Two condensers are attached to the switch assembly box.

ROUTINE ATTENTION.

Contact Breaker.

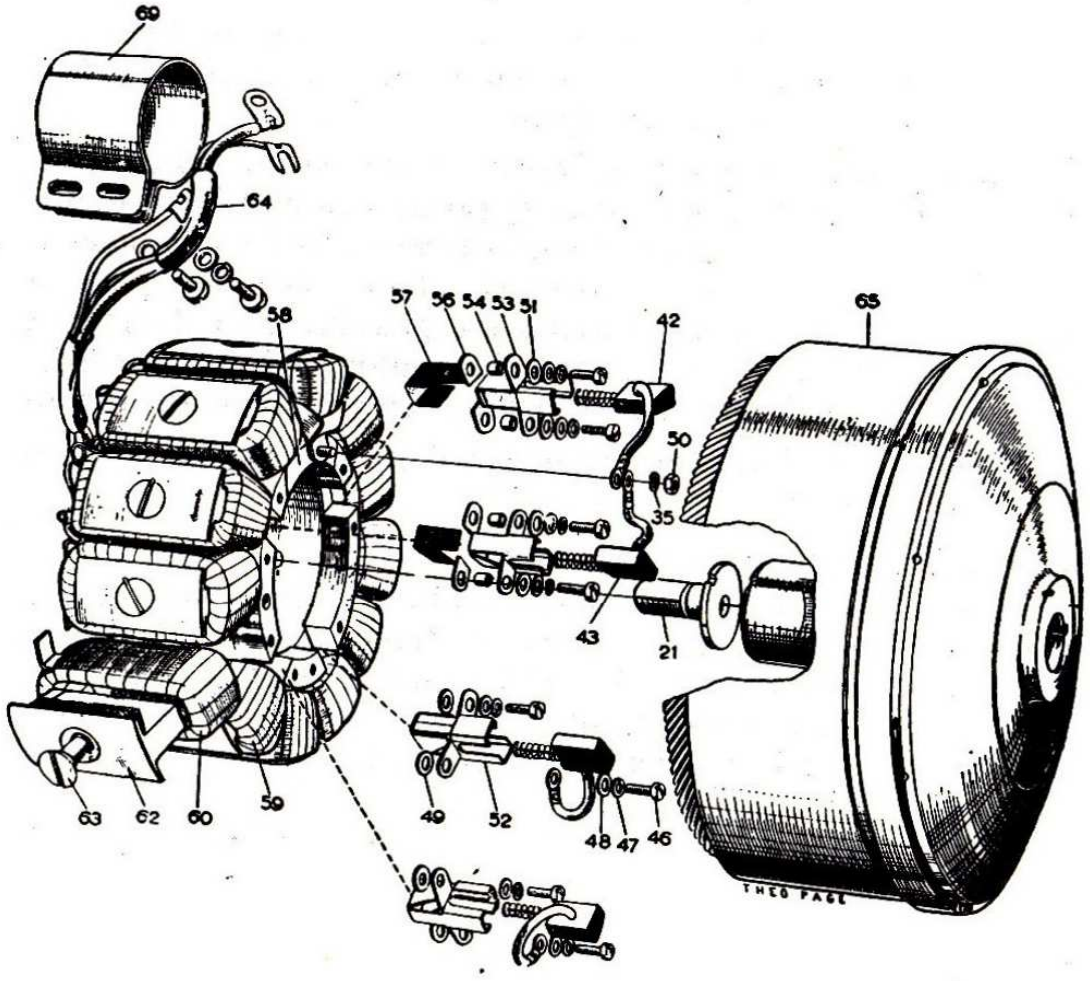
The contact breaker is housed in the centre of the stator cover and access is obtained by removing the small plate which is retained by a flat spring clip. The contact breaker point gap should be maintained at .020" measured with the piston set at top dead centre. Provided that the contact breaker points are kept clean



and in adjustment, replacements will not be necessary until a considerable mileage has been covered. It should not be necessary to remove the complete assembly from the stator housing unless major replacements are required, but it should be noted that if the contact breaker base plate has been disturbed from its original position, the ignition must be re-timed. Turning the assembly clockwise will retard the ignition and vice versa.

The Stator Housing.

To remove the stator housing disconnect the battery, and cables A, D+ and DF from the switch assembly box, also disconnect the wires to the condensers. Remove the three Allen screws securing the stator housing to the crankcase spigot, and withdraw the complete housing from the engine, during this operation great care must be exercised to see that the brushes and brush holders and the windings are not damaged. The brushes may now be examined and replacements fitted if required.



Armature (Rotor).

To remove the armature, first remove the cam securing Allen screw and the cam. The timing side cylinder must be removed and the crankshaft held with the crank shaft holding tool as described in the engine overhaul whilst the armature centre nut is removed with a $\frac{5}{16}$" Whitworth box spanner. The correct extractor may then be applied to withdraw the armature from its taper.

Switch Assembly Box.

In case of defect or failure this unit must be returned for repair and adjustment. **REMOVAL OF COVER WILL AUTOMATICALLY INVALIDATE MAKER'S GUARANTEE.**

RE-FITTING.

Generally re-fitting is the reverse of the operations outlined above, but the following points should be noted:—

1. The drive shaft key must be of the correct size and correctly positioned before the armature is fitted to the shaft. Ensure that the tapers are clean and undamaged. The crankshaft must be held with the correct holding tool while the armature centre nut is securely tightened, and care must be taken not to damage the armature during this operation.
2. Replace the ignition cam checking to ensure that it is correctly located by the dimple in the hub of the armature and secure with the cam fixing screw.
3. Brush pigtail connections must be against the stator windings with the brushes correctly positioned and free to move in the holders, and be replaced if worn by the shoulder of the brush. The stator cover should be slid into position very carefully so as to avoid the possibility of damage to the brushes and holders and the winding. The three Allen screws should be tightened down evenly to avoid distortion.
4. Ensure all cables are reconnected in accordance with the wiring diagram.

DYNASTART—3 CYLINDER ENGINE.

This takes the same form as that fitted to the twin cylinder engine except that the cam is of larger diameter and the contact breaker plate carries three rocker arms and contact plates.

There are correspondingly, three condensers fixed to the control box, to each of which is a lead to a contact breaker and 3 H.T. coils.

DYNASTART FAULT FINDING CHART

FAULT	POSSIBLE CAUSE	REMEDY
1. When push - button is depressed the starter does not operate or alternatively fails to turn the engine with sufficient power. *NOTE:* *If, when it is known that the battery is not discharged the starter fails to turn the engine properly, do not continue to press the button as serious damage may result.* *Check for faults first.*	(a) Battery flat or insufficiently charged.	Remove battery for charging. Check acid level. Check regulator voltage.
	(b) Faulty battery connections.	Clean oxidised battery terminals and apply grease. Tighten terminal connections.
	(c) Short circuit in the wiring — detected by the appearance of a heavy spark on connecting the battery.	Trace and rectify.
	(d) Solenoid failing to operate.	Check bush-button control.. Ensure no break in electrical connections. Replace switch assembly box.
	(e) Faults within the unit: (i) Stator fouling the armature.	Remove armature and check location.
	(ii) Carbon brush jammed in holder or excessive wear of brush.	Free or replace brushes.
	(iii) Earth connection in armature.	Return armature to manufacturer.
	(iv) Earth connection in stator.	Return stator to manufacturer.
2. Starter turns engine but engine refuses to start on account of an ignition defect.	(a) Defective sparking plug.	Clean and replace if necessary.
	(b) Contact breaker gaps.	Reset.
	(c) Sticky contact breaker arm.	Remove contact breaker arm taking care not to damage the spring and grease the bearing.
	(d) Dirty contact breaker points.	Clean and renew if necessary.
	(e) Defective condenser.	Renew.
	(f) Defective ignition coil.	Renew.
3. Irregular running of engine.	(a) Incorrect ignition timing.	Adjust to engine manufacturer's instructions.
	(b) Faulty timing cam.	Renew.
4. Pilot lamp fails to light when ignition is switched on.	(a) Defect bulb.	Renew.
	(b) Battery flat.	See 1 (a).
	(c) Faulty connection.	Rewire.

TYPICAL WIRING DIAGRAM

for 244 c.c. and 328 c.c. Twin Cylinder Engines.