Douglas Mk.I – Mk.V, 1947 – 1954.

This information is aimed at persons new to the post-WWII 'Mark' series Douglas 348cc OHV twin motor cycles. The excellent illustrated parts list, entitled *"Spare Parts for Douglas Motor Cycles 1946-1951",* will be used in the order in which the illustrations occur. The drawings within this volume are for an early Mk.V, although many parts are interchangeable with the earlier Marks. The *"Douglas Motor Cycles Maintenance Manual 1948-1954"* will also help you. Copies of these books are still available, the supplier's name and address are at the end of this article.

This is written as a guide rather than a definitive version and the views expressed which may not always be shared by others, are mine and are based on experience of working on Mk.I, Mk.III, Mk.III Sports, Mk.IV and Mk.V machines.
It should be noted that in the Douglas Club the Mk.I is usually known as a T35. However as the Douglas works GA (General Arrangement) drawings refer to ALL their machines as T35, e.g. T35-90 Plus. I thought it would be easier to stick to the designated model, i.e. Mk.I, etc.

Please note that approx.90% of the threads used on these machines are BSF.

The following information will not make sense unless you have a copy of the aforementioned illustrated parts list mentioned above, available from:

Bruce Main-Smith & Co. Ltd
132 Saffron Road,
Wigston,
Leicestershire. LE18 4UP Tel/Fax:: 0116-277-7669
e-mail: www.brucemainsmith.com

Enquiries regarding this guide should be sent to mrmrsholmes@tiscali.co.uk

Plate 1, crankshaft.

Items 7 and 8, crankshaft pinions. The separate crankshaft gear pinions, one with fine teeth and one with coarse, are as would be fitted to the post-Mk.I models, i.e. Mk.III - V. The Mk.1 has a double coarse-toothed crank pinion, and is waisted, i.e., separated in the middle. If you want less 'clatter' from the whole timing gear train, try fitting the earlier coarse gears. You maybe surprised!

Item 9, the oil retaining plate, was intended to prevent too much oil loss AND hold the crank. This is not a good idea as the expansion of the crank cases, being much greater than the steel of the crank, will lead to the crank being pulled forward, then every time you operate the clutch you pull the crank assembly back again. It should be replaced by the earlier locating washer, Part No. 27798. You can make your own; the outside diameter should be slightly less than the diameter of the crank front bearing. HOWEVER you do have a

problem if your front crank bearing has an additional forward pointing machined oil groove allowing pumped oil to reach the oil retaining plate. This groove, if you are using a single top hat bush, will have to be blocked off, otherwise you will not have sufficient oil pressure to reach the big-end bearings: alternatively retain the two top hat bushes AND the oil retaining plate.

Item 3, the single top hat bush, is the preferred type as it allows the crankcase halves to expand without affecting the crankshaft, which should be held at the flywheel end only. The later Mk.V had two 'top hat' timing side bushes

Item 1, the crankshaft assembly. Any end movement in the big end, i.e. if the hollow crankpin is worn where it goes through the eye of the conrod to the extent that the conrod moves up and down, means that a rebuild will have to be considered. Evidence of this is a knocking sound when the engine is running. Fore and aft movement along the length of the crank pin at the 'big end' should be no more than .003" on each con-rod.

If you have 'inherited' a crank assembly that seems to be in good order, it would be prudent to take out the front hollow crank pin plugs, and remove any sludge. Wash out with petrol or cellulose thinners and, when clean, make replacement alloy plugs and pump oil of the type you intend to use in your engine right through the oilways until it runs clean of any impurities. One way to remove the plugs is to drill most of the front (forward facing) plug out and then tap out the other one of the two using a drift. Make sure that the 'web' of the crank is supported during this operation. There is no need to remove the rear crank pin plugs, as there are no oil ways in this hollow pin.

Item 4, the oil thrower plate. If this is still in place when the double row ball race (*Item 2*) is removed, it should be prised off and discarded as all it does is deprive the ball race of oil. The machined collar that holds the oil thrower plate is missing from the stationary engine crankshafts: if you intend to use one of these crank assemblies then you may need to make a loose collar in place of the missing oil thrower location boss to give you the same fitting measurements as the motorcycle crank. Machine a radius on one end of the internal diameter to match the radius on the crank at this point. This will then give side clearance for the bearing outer race.

Item 2, the double row ball bearing. If the bearing is loose on the shaft a 'bearing fit' Loctite will hold it. With the following, you should be prepared for a few 'dummy runs' prior to final assembly, so progress carefully.
When you are re-assembling the crank into the crankcase halves aim to have ·006" to ·008" clearance between the crank front thrust face and inner face of the phosphor bronze timing side bush. A feeler gauge can comfortably be inserted from the offside barrel housing to carry out this vital job. You should at this stage check that the connecting rods are running as centrally as possible in each respective bore. A certain amount of 'juggling' maybe required to achieve this! You should then ensure that there is no tightness at any point when rotating the crank in the crankcase housing. If you do find tightness, usually with the timing side bush, then you will have to use an engineer's scraper to give you a running clearance of 1½ to 2 thou. The engine will not

run for more than a few seconds if there is any tightness. Now is the time to sort out the problem, not when you have fully re-assembled the bike.

Plate 2, crankcase.

The crankcase halves can be made oil tight by removing all through-studs and dowels and re-facing the mating faces using 240 grit wet and dry paper on a surface plate or some other suitable flat surface. When reassembling use grease on all gaskets.

Item 3, the idler gear bushes, wear quite rapidly and should be replaced, as should the idler gears if they are badly worn. A complete new set of timing gears is of course the preferred option.Item 14, the oil filler cap. To improve the engine breathing on the Mk.IV and Mk.V models you can place the oil filler cap in a centre lathe chuck, drill it out to ½", soft solder a short piece of steel tubing, protruding upwards by about 1", and fit a suitable piece of engine breather tubing from a car. This is not as good a solution as a timed breather, or the 'flap valve' set into the timing cover of the Mk.1 and Mk.III (which does seem to work) but it is an improvement on the design used in the Mk.IV and Mk.V.

Two ¼"- $^{5}/_{16}$" countersunk holes drilled at an angle through the base of the timing chest oilbath into the main 'sump' area will help prevent too much oil being retained in the oil bath and forced out of the timing cover and the magneto to crankcase joint by the thrashing action of the gears. However care is required not to drill into and through the main vertical oilway feeding the crank!

Item 35, the clutch inspection cover. This can be replaced by a 'Plus' type air scoop, with a suitable gauze (which will require regular cleaning) between the scoop back plate and the crank case to prevent the ingress of foreign matter, although it will not stop dust. A series of $^{5/16}$" holes equal to the internal diameter of the scoop should be drilled in the bell housing of the gearbox, preferably alongside the existing drain hole, to allow air to flow through and out. As engines tend to run hotter with unleaded fuel this will help to cool the clutch, although you will find that fitting an air scoop increases the engine noises.

Plate 3, camshafts.

Items 1 and 2, the camshafts. These are available from Club spares, will have a letter T (for touring) stamped on the shank. The Mk.1 camshafts usually have T35 stamped on the shank of each camshaft: some have nothing at all, which is not very helpful.
Any original camshafts with the letter 'S' stamped on the shank are from a Mk.III Sports or Mk IV Sports.

Items 4 and 5, the bushes for the camshafts. If these need to be replaced use the earlier single bush with the thrust face, i.e. the 'brim' of the bush, facing inwards towards the thrust ring on the camshaft. It is essential to ensure that any tight spots are scraped-out to allow the camshafts to rotate smoothly, and

before fitting file a slot across the thrust face using a round needle file. This will help with lubrication at this point.

Items 6 and 7, the cam gears. You will probably find that these are too tight a fit onto their respective cam shafts. They should be "eased" by dressing the central holes of the gear pinions with a suitable sleeve sanding drum on your electric drill. Aim for a tap fit using a copper head hammer. Don't use *Item 9, the setscrew*, to pull the gear pinion onto the camshaft.

Item 8, the cam gear pinion keys. If required, these should be filed and fitted both to the individual camshaft and to its respective gear pinion.

On assembly of all these items into the crankcases there should be slight fore and aft play of the camshaft in its bearings. Any tightness must be sorted out prior to final assembly. It is a good idea to carry out a 'dummy run' assembly of the camshafts in the crankcases to ensure that there are no tight spots, especially if you do not have matched crank case halves. The matching numbers are stamped on the top of each crankcase half, and are partially hidden by the magneto when that unit is fitted.

Plate 4, oil pump.

This is literally the heart of the engine. Do not remove by trying to prise the pump body away from the underside of the crankcase. Instead us a soft drift and tap downwards from the worm gear end, when the crankcase halves have been parted.

Replace the vanes if they are badly scored, or dress to a smooth finish: as a matter of course the spring should be renewed. Countersinking or scraping a 'lead' into the oil-gathering hole is a good idea.

Item 3, the brass gauze. This should be cleaned very thoroughly as it is usually almost completely blocked. Here, if you are using a straight SAE 40 or 50 oil, it is prudent to suggest changing the engine oil every 500 miles, as most engines that I have worked on have suffered from lack of regular frequent oil changes, essential to your Douglas crank assembly. Contaminated oil will wreck your crank assembly big ends.

You can fit a Dragonfly oil pump which supplies a 50% increase in 'pumped oil'. However, try to use one with a 'fine' (Item 3) filter as the later ' coarse ' filters will not readily fit into the 'Mark' crankcase housing.

When fitting the gaskets for the oil pump, the cork one fits between the flange of the pump and the crankcase. With the paper gasket you may need to increase the diameter of the central hole so that the rotating vanes do not pick up any of the gasket material. Use grease on the paper gasket when re-assembling.

Plate 5, timing cover.

Item 2, the oil baffle and gauze. Fitted to the Mk.IV and Mk.V this can be discarded as it frequently 'furs-up', increasing the crankcase pressure, which is the last thing you want!

Plate 6, cylinders.

Item 1, cylinder barrels. Those on the Mk.I can be recognised by having 5 cooling fins and $^{5}/_{16}$" clearance holes for the cylinder head studs. The Mk.III - V barrels have 7 fins and ⅜" clearance holes where the cylinder head bolts on. Stationary engine cylinder barrels also have 7 fins and can be used as replacements on the Mk 1 model; however you will have to grind away part of the first two cooling fins to allow clearance for the three small horizontal cooling fins of the exhaust port of the cylinder head. You may also have to grind away part of the cooling fin that is in close proximity to the clutch inspection cover. These barrels are not recommended on the Mk.III - V models, as the alignment of the holes to take the cylinder head is not compatible with the cylinder head studs.

If you do use stationary engine barrels on your Mk.1 then be aware that the machined face to take the cylinder head is much narrower between the stud holes than on the motorcycle barrels; this can cause the head gasket to leak. The cure is to remove the cylinder head studs and re -face the machined surface of the head until it is flat again; alternatively the face of the barrel can be machined down to give a more generous mating surface. Using a vernier gauge, check the length of each barrel, measuring from the machined face that is to bolt onto the crankcase to the machined face where the cylinder head is to bolt on. Both barrels should be the same length if you want a smooth running engine.

Item 2, brass shims under cylinder barrels. If still fitted these should be replaced by the later thin compressed card gaskets available from Club spares; assemble using grease.

Item 3 tappets. Mk.I tappets/cam followers have rectangular heads and a spacer guide bolted to the base flange of the barrel. Those on the Mk.III - V engines have round heads as illustrated.

Item 4, push rods. Mk.1 push rods are not interchangeable with those on later models, as they are shorter. All push rods should be rolled along a known flat surface to check that they are not bent: replace them if you are unsure.

Plate 7, pistons.

Item 1, pistons. Mk.I pistons have a high domed crown, but later models are flat topped as illustrated. They require a ·004" to ·005" minimum skirt clearance.

Item 2, gudgeon pins. These are ⅝" diameter on all models. Note that those on the Australian JP pistons available from Club spares are fractionally larger in diameter and the piston rings are metric.

Item 4, compression rings. All models use the same size compression rings, $^{1}/_{16}$" thick x ·100" radial depth.

Item 5, oil control rings. The Mk.I has slotted oil scraper rings $^{5}/_{32}$" thick x ·080" radial depth, whereas the Mk.III - V have stepped oil scraper rings $^{3}/_{32}$" thick x ·100" radial depth.

With the later Mk. pistons you can widen the oil scraper ring groove to 5/32" and fit a slotted ring. If this is done, then drill a series of 'drain' holes of about 3/32" diameter through the ring groove to allow scraped oil to disperse. All piston rings should be gapped at ·006", i.e. 6 thou., when fitting.

Honda 250N pistons, which can be used as an excellent alternative, require ·002" to ·003" skirt clearance, and you don't have to 'gap' the rings.

Plate 8, cylinder heads.

Item 1, cylinder heads. The one illustrated is the type used on the Mk.III - V, it is very different to the earlier Mk.1 head which has a hemispherical combustion chamber similar to a Riley 9 engine. The Mk.III - V head will not readily fit onto a Mk.I barrel, as the studs on the cylinder head do not align with the 5/16" clearance holes on the earlier type barrel. Although I have seen it done, it was not a pretty sight!

Item 2, valve guides. Mk.I valve guides are much shorter than the later types; however, as the outside and inside diameters are the same for all models, the Mk.III – V guides can be shortened to suit the Mk.I heads and valves.

Item 12, valves. Those on the Mk.I are much shorter than on the Mk.III - V. Ensure that any replacement EXHAUST valve is non magnetic: later non-magnetic valves can be shortened to suit a Mk 1. If you use a petrol additive such as 'Castrol Valvemaster Plus' with your unleaded petrol you won't need to have expensive 'hard valve seats' fitted to your cylinder heads.

Items 18 and 19, rocker arms. The rocker arms of the Mk.I are not interchangeable with those fitted to the Mk.III - V.

Item 26, the rocker box covers. To ensure an oil tight seal, draw out the two dowel pins on the Mk.III - V types, which are a tap fit in the rocker box and, obtain a flat 'face' using 240 grit wet and dry paper on a suitable flat surface.
The Mk.I rocker box covers have a single dowel pin. There are 3 types of cover, all recognisable by having the word Douglas cast into the cover: these will not fit the Mk.III - V heads.

Item 27, the rocker box gasket. Both faces should be greased to help control any oil leaks.

Plate 9, carburettor.

The two-stud, vertically flanged, 'handed' Amal 274 carbs were used on all touring models, and the 274AJ/4A and the 274AK/4A will also fit the Mk.I. Many replica/replacement parts are available for the Amal 274 carbs, including information/settings pamphlets, but NOT, however, *Items 3, 23 or 28*.

The introduction of unleaded petrol has caused engines to run hotter, so you will probably have to increase the main jet sizes. My own 'Marks' have 85 main

jets, whereas my daughter's Mk.IV is happier with 90 main jets. Her Mk.1, however, is still happy on the original 75 main jets; so experiment to find the most suitable solution for your machine.

Item 1, the carburettor to cylinder head gasket. This is made of a hard insulating material. Do not use a soft compressed card, or you will bow the two-stud vertical flange of the mixing chamber, *Item 3*. Check that the central hole diameter is the same as the carburettor body choke diameter.

Item 2, the control cable: readily available either from Club spares or from one of the cable makers.

Item 3, the mixing chambers. Being made of aluminium rather than the more commonly used zinc based alloy known as mazak, these do tend to wear quite rapidly. However, fitting new throttle slides, *Item 9,* is a great help and will improve tickover. Throttle slides are 4/3 for the Mk.I and 4/5 for the Mk.III - V. The throttle stop screw thread and the pilot air adjuster screw thread are both 1 BA.

Item 4, the jet block, should have the number 21 stamped on the top and have a choke size of ·075". Check that it has not been distorted out of round by a previous owner trying to drive the jet block out of the close fitting *Item 3*. This is a real case of the chemical reaction of dissimilar metals to one another.

Item 5, the needle jet, should have the number 107 stamped on the side.

Item 6, the main jets. Sizes for the Mk.I are 75 up to 80, and for the Mk.III – V, 80 up to 90.

Item 13, the air valve assembly. New ones are available from Martin Bratby.

Items 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22 (which is Part No. 6/038 not 4/038), *24, 25, 26, 27 and 29* are all available from firms such as Hitchcock's Motorcycles.

Plate 10 air cleaner.

If you want to fit one of these you may need to experiment with the main jet sizes of the carburettors.

Plate 11, exhaust system.

The long exhaust pipes with their individual 'Burgess' silencers do make the engine sound pleasant, but, unless you have a Mk.III Sports, you have to use the narrow cast alloy centre stand, which does not offer much stability. An alternative is to fit short pipes and a 'woffle box' silencer which then allows you to fit one of the wide cast alloy centre stands available from Club spares; and the total cost is less!

Plate 12, electrical equipment.

Item 1, the magdyno unit. The Mk.I - V were all fitted with a Lucas MN2 magneto, which should have HT pick-ups that stick out horizontally. The short dynamo (5⅞" long) on the Mk 1 to Mk III Sports is a Lucas E3HM-LO of 40-45

watts: the longer dynamo (6⅜" long) on the Mk.IV - V is a Lucas E3LM-LO of 60 watts. If you have to have your dynamo rebuilt it is worth noting that the Mk.V is wired POSITIVE earth and all the other models are wired NEGATIVE earth.

One problem that does occur with the cam ring arrangement of the magneto is that of the unequal opening of the contact breaker points. This can be cured by using an abrasive drum sleeve fitted to your bench held electric drill and carefully grinding down the raised cam that is responsible for the LARGER of the two openings of the points. Reducing the height of this cam will reduce the points gap to give you equal openings. To do this you will have to remove the cam ring from its housing having marked which cam is to be ground. The points gap should be ·012" (twelve thou.).

If you need to remove the magneto gear pinion at any time always use an extractor, never try to prise it off the taper of the armature. Be warned, as this gear pinion is easily twisted out of alignment, thus rendering it useless.

Item 16, the battery carrier. The type used on the Mk 1, Mk.III and Mk.III Sports allows the battery to stick out sideways bringing the whole assembly too close to the rear brake pedal. On the Mk. IV and Mk.V the battery is turned sideways by using a different carrier and gives far more clearance for your foot on the brake pedal. You can use a more modern battery: a 6N6 3B, will fit inside a cleaned out old early battery case, or buy a fibre glass replica box in which to place it.

Item 25, the headlight. Modern/replica parts are available, including halogen quartz headlight bulbs which will transform your night vision.

Item 32, hooter. All models are fitted with a 6-volt Lucas HF1441.

Item 33, the voltage control. The unit fitted to the Mk.1, Mk.III and Mk.III Sports is a Lucas MCR 1 L31; Mk.IV - V have a Lucas MCR 2. You can easily convert both types to a modern solid state encapsulated regulator designed to suit the Lucas E3 type dynamo. These are designed to replace the original two coil unit and will fit under the cover once you have removed the original twin coil system, although it is a tight fit under the shorter MCR 1 cover. If you do carry out this 'mod', then make sure that you obtain one that is of the correct voltage and polarity for your model of Douglas. However, be aware that the modern solid state regulator does depend on some charge to be in your battery for all your electrics to work.!

Plate 13, clutch and flywheel.

To remove the flywheel assembly from the crank you must use an extractor. The two threaded holes close to the boss of the flywheel are threaded $^{5}/_{16}$" BSF, and it is here that you attach the flywheel extractor. Remove the split pin from the castellated nut and undo the ⅞" x 20tpi retaining nut: fix on your extractor, having placed a suitable distance piece between the end of the crank and the pressure bolt of the extractor. If you fail to use a distance piece then you are in danger of damaging the centre-drilled hole at the end of the crank. Having made provision on your bench or the floor to receive the quite heavy flywheel

unit, tighten the central pressure bolt and give it a sharp 'crack' with a small lump hammer. The removed flywheel unit can now be carefully dismantled.

If you are new to this type of flywheel clutch arrangement and have just removed the whole unit from the taper of the crank, which is the best way to carry out this operation, then pause to note the following: if the unit has not been apart before, then look for a hacksaw cut groove cut into the peripheral edge of *Item 1, the clutch outer plate, Item 5, the flywheel* and *Item 11, the pressure plate*: the grooves should all be in alignment. On reassembly, unless you have reasons for not doing so, they should all be aligned again. Assemblers at the factory would have determined that this was the option giving the smoothest working of the clutch.

Item 1, the clutch outer plate. As this item is a steel pressing, check that it is not twisted. To do this you will have to remove all six driving studs, put the plate on a faceplate or other flat surface and check for flatness. If it is more than a few 'thou' out of true then a replacement is required or your pressure plate, *Item 11*, will not lift equally during operation and you will always have a 'dragging' clutch.

Item 2, the shim, and *Item 3, the fibre thrust disc*, should be replaced if badly scored. When doing this be careful not to distort the thrust disc or the shim, and make sure that the replacement copper rivet heads finish up slightly below the face of the disc. I always finish off by dressing this operating face on a surface plate with 400 wet and dry paper, an operation that needs care.

Item 5, the flywheel. Quite often the internal taper on the flywheel is 'fretted', leaving pitting and/or small protruding lumps. The lumps can usually be dressed down with a file or small grindstone, and the flywheel then 'lapped' on to the taper of the crank using fine grinding paste. Aim for at least a 70% contact area of the two items. Do not be too enthusiastic with the lapping, or the flywheel will finish up too far forward so reducing the operating clearances of the clutch activating mechanism. The distance from the back of the rear crank web to the start of the flywheel taper should be 1·389". If it is less, then you may not have sufficient clearance for the operation of the clutch activating mechanism when everything is fully reassembled. Carry out a 'dummy run' assembly. To restore the required clearances you will have to machine some metal off the back of the back plate, *Item 6*, and the spigot.

On the flywheel, the six peripheral (3 if it is an early Mk.I) locating holes for the phosphor bronze bushes, *Item 15*, should be dressed to a smooth surface and the ends lightly countersunk so offering as little friction as possible. If you don't do this there is a tendency for the clutch to stick. On re-assembly a light smearing on the bronze bushes and their locating holes with 'copper ease' will help.

Item 11, the pressure plate. Most pressure plates are slightly dished as a result of the considerable pressure exerted by the double springs, which is why the clutch on these models is so heavy to operate. On re-assembly you could try leaving out the inner springs and have a lighter clutch. However this is only recommended if your Douglas is for solo use. You can try re-facing the

pressure plate, although you will obviously weaken it if you do. An alternative is to replace *Item 7, the friction discs*, with cork floor tile material stuck onto the driven plate and again do away with the inner set of clutch springs. However cork clutches can be very fierce in operation.

Item 15, phosphor bronze bushes. These should be highly polished, free from any 'steps' and all the same length; do check, otherwise you will never have a clutch that clears properly.

Item 9, the splined boss. When re-assembling the clutch driven plate, remember on final assembly to ensure that the protruding offset of the central splined boss faces towards the gearbox.

Items 6, 7, 8, and 9 are all available from Club spares, so it is worth replacing them.

Item 17, the 5/16" BSF nuts. On re-assembly these nuts can be secured using an appropriate 'Loctite', rather than the original method.

Carry out a 'dummy run' assembly on the flywheel clutch assembly to find the smoothest operation of the driving stud pins and their bushes in relation to the flywheel. If, as a result the peripheral hacksaw cuts do not line up then erase the old ones and cut or mark new ones.

Plate 14, clutch operation.

Item 1, the engine oil seal. The original leather types are readily available from Club spares, and are less prone to putting a 'groove' in the crankshaft than the more modern Nitrile seals. A replacement oil seal should be an interference fit in its housing: if it is not, place it between two steel plates and gently squash it in a vice until it is. Finally, when fitting, 'Loctite' it in position.

Item 2, the roller pivot pins. These often have a 'flat' worn on the operating raised centre section and as they are an interference fit in the back plate, *Item 6*, it is sometimes possible to turn them 180 degrees.

Item 3, the rollers. These can also have flats worn on them, causing them to stick, and should be replaced. An alternative roller you can use is one from a ⅝" x ¼" chain. Grease well before fitting.

Item 6, the back plate. There would seem to be at least three types used, although all will fit any of the Mk.III - V models. The earliest type had three alternative positions for the pivot pins, the next had two alternative holes, and finally there were no alternative positions for the pivot pins. Most back plates are hard and require a tipped cutting tool to carry out any machining. Any damage to the protruding boss that takes *Item 7* will need to be 'dressed out' as these two parts should move 'as smooth as silk' at all times.

Item 7, the clutch cam. Considerable attention should be paid to this very vital part. If the track of the 38 ball bearings has 'Brinelled', i.e. become pitted and uneven, then a replacement is your only alternative. However, if the ball bearing track has merely worn evenly, but sunk as a result of incorrect adjustment, then replacement ball bearings of 6mm. diameter rather than the

original $^{7}/_{32}$" diameter should help. Note: You will want fewer than 38 of the 6mm. ball bearings.

At the other end of *Item 7* are the three angled cams. These invariably have a groove in the sloping face, again caused by incorrect adjustment: more on this subject later. These grooves must be removed to leave each cam straight, smooth and highly polished, making sure that each cam is in constant contact with the appropriate roller on the back plate, *Item 6*, throughout it's travel. Also the ground internal diameter should be polished using an abrasive sleeve drum on your electric drill.

Item 14, the angled grease nipple. Ensure that the angled grease nipple is slightly offset to the adjustable arm: if you have an earlier straight grease nipple change it for a later 45 degree angled one on its short extension tube. The offset should be towards the gearbox so that you can easily reach the grease nipple with a grease gun. Try this out BEFORE you finally assemble.

Item 16, the thrust ring. If the ball bearing track has 'Brinelled' it will need to be replaced. Make sure that the thrust face (not visible in the illustration) is smooth and polished.

Item 17, the retaining plate. This should not be twisted, and on re-assembly should allow the engaging face of *Item 16* to protrude, or the retaining plate will score the fibre thrust disc riveted to the clutch outer plate. Check by placing a 6" ruler edge-on onto the engaging face to see that there is clearance.

Item 18, the three return springs are easily damaged when taking the whole activating assembly apart, so it would be prudent to obtain replacements from Club spares. On re-assembly use a pair of pliers to close the loop ends of the springs so that there is no chance of one end detaching from its housing. It has happened!

Final assembly. Press in the new oil seal with the lip of the seal facing towards the crank. As mentioned in *Item 1* above, I prefer to use the original leather seal. Some of the earlier back plates have a stop to press the seal up to. If you have a later type with no stop then lay the back of the back-plate on a flat surface and press the seal in to the end of the housing: use Loctite if the seal is not a tight fit. Grease all moving parts making sure that they all move smoothly. Remove the woodruff key from the taper of the crank and then stick a piece of PVC insulating tape over the key slot in the crank so that you do not damage the oil seal. Smear some grease onto the taper of the flywheel and the back face of the back plate, place any shims in position if required, and you are ready to offer the whole activating assembly to the three locating studs at the back of the crankcase.

Most clutch activating mechanisms are wrongly adjusted, so that there is constant contact between the flywheel thrust disc and the clutch thrust ring, and therefore constantly 'loading' the ball bearings and housings of this unit. It should be realised that this mechanism is designed for occasional use, i.e. when operating the clutch. Therefore when you have placed the clutch cable barrel nipples into their housings and are adjusting the cable for correct tension, aim to leave a few thou' clearance between the thrust disc on the flywheel and the

thrust ring of the activating mechanism when the handlebar lever is released: this equates to about ¼" of free play at the clutch lever. You will probably find that the lower barrel nipple of the clutch cable will not fit snugly without having to be twisted into position on the cam arm. Note which way the nipple needs to go, dismantle from the housing, melt the soft solder, and pivot the nipple so that it is in alignment in its housing: this will ensure that the cable operates smoothly.

Plate 15, the gearbox.

You would be well advised to obtain a copy of the "*Douglas Motor Cycles Maintenance Manual 1948-1954"* to help with understanding the gearbox, and to guide you both in the dismantling and re-assembly.

As with most machinery the first models tended to have defects that became apparent when they were sold to the public. This was the case with the Mk.I gearbox where changes were made, resulting in a robust and generally trouble-free unit for subsequent models.

One early design fault was the horizontal top of the gear housing. This close-fitting 'top' did not allow the selector quadrant to be moved upwards without striking the underside of the gearbox casing so hard that in some cases the top of the selector quadrant actually broke through the casing. This I have seen on two Mk.I gearboxes. Douglas then redesigned *Item 1, the gearbox shell*, and angled the top of to give us the more familiar shape.

A defect that was never rectified was the position of the oil filler screw-in cap with its soldered-in dip stick. When the kick start lever is operated *Item 7 on Plate 18, the pawl of the worm sleeve*, tends to strike the dip stick sufficiently hard enough to deflect the rod. There is every possibility that this action could loosen the dip stick, causing it to drop out of the housing in the filler cap! One way of overcoming this is to unsolder the dip stick, drill right through the screw-in cap and replace the original rod with one that is peened over at the top and soldered in. The Mk.I dipstick should not be swapped for a later type, or visa versa, as the max/min oil levels are different!

To those of you new to the post WW II touring models you will find parts are readily interchangeable and a gearbox from a T35/Mk.I model will fit onto a Mk.V engine and vice versa, which is helpful.

The gearbox number is stamped on the offside of the top of the casing just forward of *Item 24, the filler cap and dip stick* and models may be identified as follows:

The early Mk.I had T35/S/ and then three or four numbers.

On the later Mk.I, the Mk.III and Mk.III Sports the T35/S/ prefix was replaced by a B prefix followed by three or four numbers, for example B1234.

The Mk.IV and Mk.V gearbox numbers had no prefix, e.g., 4567 up to the middle 9,000s.

Alternative gears were available for the Mk.III Sports gearbox, and the gear selector quadrant was different. See Plate 16 of the Illustrated

Parts List for the Mk.III Sports alternative gears, no longer available from Club spares.

The kick-start spindles on the Mk.I – Mk.III are shorter than those used on the later gearboxes. Also the diameter of the spindle bush made of phosphor bronze, tapers as it protrudes from the gearbox casing.

The longer kick-start spindles on the later 'boxes have a parallel steel bush. The reason for these longer spindles is to give greater clearance for the kick-start lever, as it passes close to the lower mounting point of the later type sub frame.

For dismantling purposes follow the instructions in the previously mentioned Maintenance Manual. Generally these gearboxes are trouble free, but it all depends on use and or abuse by previous owners. As work on the gearbox is limited if it remains bolted to the engine you will have to detach it to get at the majority of the internals. It is possible to remove the gearbox without taking the engine out of the frame, however the oil must be drained from the gearbox before carrying out this operation. On the Mk.I – Mk.III, you will have to remove the tool box before attempting this as it will be in the way, you will also need to disconnect the petrol pipes.

Method: Support the engine, using a small bottle jack, to enable you to remove the engine through-bolt, so that when you remove the gearbox through-bolt you can ease the whole assembly forward by about 1". Tilt the rear of the gearbox upwards to clear the rear fork pivots, undo the cap screws around the bell housing and remove the gearbox backwards and towards the offside: it will be heavy!

Before dismantling you will need to make a peg spanner tool, if you don't already have one, to remove *Item 26, the screwed plug for the shock absorber spindle*. Two short lengths of $^{3}/_{16}$" diameter mild steel fixed to a strip of ¾" x ⅛" mild steel will suffice: an alternative is to alter an angle grinder peg spanner to fit. Do not try to drive this item undone with a screwdriver.

Once this has been done follow the dismantling procedure until you reach the removal of the mainshaft and layshaft bevel gears. As far as this stage of the dismantling is concerned, the greatest difficulty can be the removal of *Item 32 on Plate 16, the layshaft bevel gear nut*. It has been known for the end of the layshaft to break off rather than release the nut! An angled, not a cranked ring spanner is the best tool to get at this particular nut.

Plate 16, shafts and gears.

Once you have removed *Item 19, the bevel gears*, one from the mainshaft and the other from the layshaft, you need to draw out *Item 1 on Plate 17, the selector fork spindle* and then remove all the nuts holding *Item 2 on Plate 15, the cover plate* to the main gearbox casing. The two shafts and their respective gears can now be withdrawn from the gearbox casing. You may have to tap the ends of the shafts to initiate movement.

Item 1, the coupling with spinners, is best removed from *Item 8, the sleeve pinion*, by placing the sleeve bearing gear in a vice: USE SOFT JAWS SO THAT THE GEARS ARE NOT DAMAGED. Then undo *Item 3, the ⅞" x 20 tpi nut*, and gently ease the pressed steel spinner away from the coarse splined male coupling: the splines are often so badly worn that replacement is the only option.

Before you use an extractor to remove the male coupling, place a suitable distance piece over the threaded end of *Item 8*, so that you do not press the alloy end plug through the hollow sleeve. Tighten the extractor, applying heat to the splines if required and *Item 1* will drop off! Apart from the heat, re-assembly is the reverse of this method.

Item 23, Plate 16, the 'blind bearing', is best removed by placing *Item 2, Plate 15*, *the cover plate for main and layshafts* horizontally over the open jaws of a vice and applying heat to the alloy cover around the bearing. A light tap with a copper-headed hammer usually causes the bearing to drop free. One method for removing very difficult blind bearings is to tack-weld to the inner race a piece of loose fitting mild steel rod. This always works!

For the gearbox, the replacement open race ball bearings are;-

RHP. – LJ1 x 1 off and SKF. – 6203 x 3 off.

The one sealed-for-life bearing is;-

SKF. – 6205-2RS1 x 1 off. This replaces the original final drive open bearing. Prior to fitting you must remove and discard *Item 11, Plate 19, the sleeve in housing*, or the vital outer seal of the new bearing will be damaged. You can of course remove the inner seal if you so wish, and allow the gearbox oil to provide the required lubrication to the bearing.

Items 35, ¼" BSF csk head screws. When you are rebuilding the gearbox use a 'thread lock' Loctite on these screws, AND on *Item 32, the layshaft locknut*, as the only new layshafts available from Club spares are modified Dragonfly items; these have less splined support than the original Mark type. You can machine a thin collar to fit over the layshaft to give more inner support to the bevel gear at this point.

Kick start spindles: the following measurements are of the amount of protrusion from the gearbox casing.

The T35 and the Mk. III have short spindles, $2^{7}/_{16}$" long, whereas those on the Mk.III Sports - Mk.V are 3⅛" long. Both items have the same part number, so you will have to specify which type you require when ordering from Club spares.

Plate 17, gearchange mechanism.

Items 3 and 4, the selector forks. The pins that engage in *Item 5, the selector quadrant* can wear badly. One cure and this is the one that I favour, is to reduce the pin diameter to ¼" and 'sweat on' a $^{5}/_{16}$" silver steel sleeve, using soft solder. This method makes future replacement very easy.

Item 11, the pawl plate pivot, and *Item 18, the bush in gearchange cover*. These tend to wear so that oil leaks out. I usually make a replacement for the latter and assemble with grease as a barrier to the oil.

Item 27, the knockout pins, should be replaced as they are usually badly worn. All springs should be replaced.

Plate 18, kickstart mechanism.

One problem that does sometimes occur is that of the kick-start gears not engaging properly when the lever is smartly depressed. This is often caused by *Item 8, the kick-start ratchet pinion* and *Item 5, the face ratchet* on the bevel gear both having worn edges to their respective teeth. The problem is not helped by age weakening of *Item 9, the flat section spring*. As replacements of this type of spring are unavailable you may have to double up on *Item 10, the washer*. Attempt to dress the hardened teeth of *Items 5 and 8*, using a fine grit grinding wheel and arbor on your electric drill, making sure that *Item 7, the worm sleeve* and *Item 8* moves freely and smoothly in relation to one another. It is worth spending time to sort out this area of concern.

Item 1, the spindle for bevel and ratchet pinions. This spindle has, from the threaded end, a flat machined along the length of the shank for about 1". This flat has, when fitted, to be facing down towards *Item 16 on Plate 15, the locking screw*. There is no way of knowing where this flat is when you are assembling this unit. Use a triangular needle file to cut a slot in the face at the threaded end at 90 degrees to the long machined flat, BUT only cut into the top half of the end. You will then always know which way round the spindle should be, i.e. with the filed slot pointing upwards from the centre drilled hole in the end.

Plate 19, final drive.

If you are replacing *Item 7, the bearing*, do so with a sealed-for-life bearing, SKF 6205-2RS1, and remove the inner seal. You must then remove *Item 11, sleeve in housing for felt seal*. If it is a tight fit on the hollow shaft, then machine off that part of the collar that might rub against the bearing outer seal or it will damage the outer seal. *Item 12, the felt seal*, can be retained.

Item 13, the brass shim, or shims, are there to enable you to set up a clearance of about 8 thou, ·008", between *Item 19 on Plate 16, the mainshaft bevel gear*, and *Item 3, the 26 tooth bevel pinion*. These shims are no longer available from Club spares so, if required, you will have to make one or more yourself. I would recommend that the thinnest one you should attempt is ·010", i.e., 10 thou. thickness. The degree of difficulty is quite high.

When setting up the bevel gears of the final drive if you are rebuilding, place *Item 10, the final drive housing*, into position on the gearbox casing with no shims at all. Tighten down all ¼" BSF nuts and then rotate the layshaft by hand feeling for any stiffness or tightness. If there is none then all is well, BUT if there is any 'binding' then you must put in as much shim packing as required until you have a smooth working clearance. This is not an easy job and may take you some time. It is better to have too much clearance than too little! If you have insufficient clearance and/or unmatched bevel gears then the result will be a whining, and in some cases a howling gearbox!

Item 27, the drain plug, has a very fine thread, 28tpi x ⅜" diameter. The corresponding thread in the gearbox casing is very easily damaged, so do not over tighten!

Plate 20, frame and subframe.

Item 1, the frame. The frame number is to be found stamped into the nearside headstock lug of the down frame tube on that side of the frame.
The Mk.I numbers start at T35/S/101 and around 2,500 were made, the last number being 2976.
The Mk.III. numbers start at T35/S/4001/3 and there were 2,321 made, the last number being 6589.
The Mk.III Sports frame numbers end with /S and there were only 842 sports models made.
The Mk.IV and IV Sports numbers start at T35/S/7000 the prefix was changed to HPN at 7010 and eventually the prefix HPN is dropped. Most, but not all the Mk.IV frame numbers end in /4, or /4B. The Mk.IV Sports frame numbers end in /S/4 or /S/4B. The total number of Mk.IV and Mk.IV Sports was 1,941; the last number being 8999
The Mk.V numbers start at 9000, with no prefix, although many numbers ended in /5 or /5B. There were 3,517 Mk.V bikes made; the last number being 12540.

The early frames, i.e. Mk.I - III, can be readily identified by the 'ear lugs' at the rear of the main frame just above the tapered bronze or steel castings joining the frame down tubes and the lower horizontal tubes. These lugs are for attaching the earlier type sub frame lower mounting. Also on the early frames there are two transverse steel straps for attaching the tool box to the frame. These straps, which are not found on the Mk.III Sports, are welded onto the underside of the top frame tubes at the point where the tubes splay outwards and downwards below the saddle prow mounting. The Mk.IV - V frames do not have the 'ear lugs' or the two tool box straps, and the top of the cast lugs that hold the vertical frame tubes are straight i.e. horizontal.
Another identifying feature is the front saddle mounting lugs, which on the Mk.I - III are just angled forward, whereas on the Mk.IV - V the tapered top section sweeps up vertically.

Item 2, the subframe. There are three fairly common types. The one that is illustrated is suitable for the Mk.IV - V, in that the lower mounting points bolt onto the frame cast lugs just above the horizontal frame tubes. A variation of this type of subframe has separate lower seat spring mounting brackets held by two ¼" BSF bolts giving three alternative heights for the brackets.
The type of subframe used on the Mk.1 - III is vertically shorter than the later type and has 'stops' with hard rubber push-in plugs to prevent the rear forks from rising up too high. These early sub frames have a welded-on joining strap at the rear that fits snugly over the rear mudguard. The lower mounting lugs bolt onto the rear facing 'ear lugs' detailed previously. Only the Mk.I sub-frame has provision along the top near side to carry a hand pump.

Items 11 and 12, the distance pieces between frame and gearbox. These should be replaced by 1" diameter aluminium bar, which will offer more support than

the originals, and the longer nearside one should be 'dumbbell' shaped to clear the centre stand spring. If you do carry out this alteration, then remember to line up the gearbox final drive sprocket and the rear wheel sprocket first to give you the correct lengths for the respective distance pieces.

Item 15, the rear forks on the Mk.I - Mk.III have lugs to take pillion rider foot rests. The Mk.IV - V do not have lugs on the rear forks as the pillion footrests are at the lower end of the two pannier toolboxes.

Item 18, the rear fork pivot pins. There is a tendency for these pins to seize in their phosphor bronze bushes if the bike has been neglected. If this is the case you will have to remove them. Tap *Item 19, the 'Mills' pin*, upwards, remove *Item 22 the 'peened over' closure plate* and, using a suitable drift such as a length of copper rod, drive each fork pivot pin OUTWARDS to remove it. You may have to use heat on each frame lug to assist with the pivot pin removal. A more refined method of removal is to draw the pins out by the use of a ½" BSF bolt and various hollow distance tubes. Replacement pins if required are available from Club spares, or make your own using EN8M steel.

Item 23, torsion bars. On the Mk.I to Mk.IV the thickness of the torsion bars is 0·525", this was increased to 0·625" on Mk.V and 'Plus' Series machines. If you suffer from back trouble go for the thinner bars.

Most torsion bars, if bent can readily be straightened using a vice and a length of steel tubing to increase the leverage. To refurbish, clean well with a rotary wire wheel brush, repaint the colour coding, and re-grease before assembly.

Item 31, the felt oil seals, are not always available from Club spares. An alternative is to use a modern 'lip seal' of 40mm outside diameter x 32mm inside diameter x 7mm thickness. You will, of course, have to machine away the lip on *Item 29, the bush in the operating lever*, to allow the renewable seal to be pressed into position.

Item 37, the 'dog bone link', does tend to wear at the operating ends and one way to overcome this is to soften the hardened 'eyes', and grind them out to take a steel sleeved rubber bush glued into the housing with 'super glue.' Those that I have used are a Jaguar part No. C10940.

Item 38, the link pivot bolts, can be quite badly worn and if so should be replaced. Of course if you use rubber bushes you will not have to use hollowed pivot bolts, as you will not need to regularly apply grease to these items.

Plate 21, stand.

Item 1, the cast alloy centre stand. The one illustrated is the narrow cast aluminium stand which has its feet too close together to provide a stable support for the machine unless the ground is very firm and flat. There is a wide cast alloy stand available from Club spares, BUT in order to use it you will have to change your exhaust system to short pipes and a 'woffle' box silencer.

Plate 23, tool boxes.

Item 1, tool boxes. These cast aluminium pannier type tool boxes are fitted to the Mk.IV - V models. It is a good idea to replace the sometimes broken mild steel pivot pins holding the lids to the body with 1/8" diameter stainless steel rod. There is usually sufficient side clearance between the pivot lugs of the lid to use a junior hacksaw blade to cut through each seized-in pin. Considerable care is required when either drilling out or driving out the original pins. On assembly make sure that grease such as 'copper slip' is applied to the pivots.
The Mk 1 single flat-ended sheet steel tool box is fitted to the main frame via two welded-on steel straps situated below the saddle front mounting. These straps are another indicator to dating your frame: the Mk.III Sports – Mk.V frames do not have these straps.
The Mk.III has the same type of toolbox as the Mk.I and is recognisable by having dished ends rather than flat ends.
The Mk.III Sports has two separate small toolboxes bolted to the top horizontal rail of the subframe, one on either side of the rear mudguard.

Plate 24, front forks.

Item 1, the front forks. The Mk.I, Mk.III and Mk.III Sports front forks do not have an offside pivot housing for a brake reaction link, seen at the rear of the front fork down tube: instead they have forward facing welded-on lugs a few inches below the fork bridge that carries the steering column. These lugs enable the deeply valanced front mudguard to be bolted to the forks at this point. There are also forward facing lugs at the bottom of the front fork tubes, which take the combined front mudguard stay and front wheel stand. On the Mk.I these lower lugs also support mudguard stays that connect up to the valance at the front of the mudguard.

The Mk.IV, Mk.IV Sports and Mk.V front forks have two reaction link pivot housings at the rear of each fork leg. The Mk.IV, Mk.IV Sports and early Mk.Vs have phosphor bronze bushes in these housings to take *Item 43, $^{7}/_{16}$" diameter eye bolts*. Later Mk.Vs do not have these bushes, the ⅝" diameter eye bolts pivoting directly in the steel housings. This is not a good idea, and you can purchase from Club spares the earlier type bushes and pivot pins.

Item 2, the bottom bearing. In the illustration this is actually shown upside down, and it is the inner race that is the one that fits onto the base of the steering column. If you have to replace the taper bearing and have difficulty removing the inner race then prise off and discard the roller cage with the rollers. Then grind down a section of the inner race to within ½mm of its thickness, tap it firmly with a heavy hammer, which will crack the race, and the inner race will be freed. Some front forks were fitted with $^{5}/_{16}$" diameter crowded ball bearings as the bottom bearing.

For the top of the steering column the following should be noted;-
If you have a Mk.I or Mk.III, then *Item 4, ballrace, part No. 2016*, *Item 5, adjustable ballrace, part No. SA.1453*, and *Item 8, top bridge plate, part No. 31250*, are the compatible parts that should be used.

For Mk.IV and Mk.V the equivalents are: *Item 4, part No. 33731*, *Item 5, part No. SA.2760* and *Item 8, part No. 33774*. These cannot be mixed with the earlier types.

Item 9, the shim packing. It is important to realise that any adjustment of *Item 5, the adjustable top steering cone*, will alter the required 'shimming' between it and the underside of *Item 8, the top bridge plate*.

Items 14 and 17, the leading links. The bearing face at the pivot ends can corrode sufficiently to allow the front fork oil to leak from between the face of the link and *Item 23, the oil seal*. The solution is to have the link bearing faces ground to offer a smooth surface to the oil seal. You should then fit new seals. Straight SAE30 or SAE40 engine oil can be used as suitable fork oil. If after some usage one of the seals starts to leak, undo the filler screw plug at the top of that fork leg to release any build up of pressure. Perhaps a 2mm hole in the centre of the screw plug is the answer.

Item17, the nearside leading link. On the Mk 1, Mk. III and Mk. III Sports, this link has a slot across the wheel spindle end to take *Item 19, part No. SA.2773, the earlier type wheel spindle*. However you can use the later type spindle, part No. 37952.

Item 33, the front fork springs. If you are a lightweight person, then the tapered springs are the type to use.

Items, 39 and 40, the bottom cap and copper/asbestos substitute washer. To replace *Item 40* it is best to place *Item 39* upside down over the open jaws of a vice, apply heat and when very warm, tap the alloy housing with a copper headed hammer. The steel insert should then drop free, enabling you to remove and replace the copper/asbestos substitute seal available from Club spares. Reassemble with grease on the fork leg threads.

Plate 25, handlebar and controls.

Item 5, the handlebar links. These cast aluminium links do tend to crack at the handlebar end, so inspect yours carefully.

Item 14, the handlebar levers. A sensible alternative is to fit ball-ended levers.

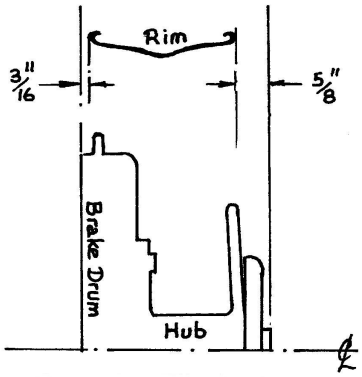
Plate 26, front wheel and brake.

Construction and colour scheme. The rim is WM2 with 40 x $^{5}/_{16}$" nipple holes. Apart from the raised centre section it is either chrome plated or silver painted, depending on model and year of manufacture. There is a painted white line, about 2mm wide, either side of the painted raised centre section, which, on the T35 and Mk.III is painted blue; on the Mk.III Sports it is light blue matching the tank panels, and on the Mk.IV and Mk.V it is the same colour as the frame.

Spokes are 9swg (standard wire gauge): *Item 14 - long inner* (10 off), *Item 15 - short inner* (10 off), *Item 16 - long outer* (10 off), *Item 17 - short outer* (10 off).

Item 18, spoke nipples (40 off) have a shank of 0·300" diameter and are usually bright nickel plated brass.

When building the front wheel the rim must be equidistant from each fork leg.



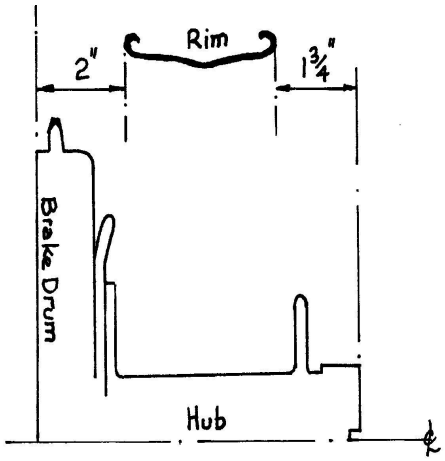
Before looking at individual parts it is worth mentioning that if you find that *Item 22, the front brake back plate*, seems to be a 'sloppy fit' on *Item 24, the shell bearing*, AND the front brake is working well, then so long as your MOT tester is happy to accept that 'sloppiness', leave everything as it is. These brakes do seem to work better when well worn.

Item 7, the front wheel bearings. The original open bearings can be replaced by sealed for life bearings, SKF 6204-2RS1 x two off, and replace the hub grease nipple with a cheese head machine screw.

Plate 27, rear wheel and brake.

The rim is identical to the front one, in size, colour and number of nipple holes.

As in the front wheel the spokes are 9swg (standard wire gauge): *Item 18 - long inner* (10 off), *Item 19 - short inner* (20 off), *Item 20 - long outer* (10 off).



Item 3, brake drum and sprocket. This item is no longer available from Club spares. Unless you have access to a lathe with sufficient 'swing' to enable you deal with such a diameter then you may have to consider converting to the

Dragonfly set-up of a $^{5}/_{8}$" x ¼" chain size and order part No. SA.1645, a Dragonfly rear brake drum and sprocket with 51 teeth, and a 16 tooth final drive sprocket for the gearbox. You will have to use your electric drill and a suitable drum sander to clean out a clearance track for the chain on *Item 6, plate 32, the shock absorber cover*, otherwise there will be horrible scraping noises! Whilst on the subject of the shock absorber cover, check that there is sufficient clearance when fitted, around and above the rear fork pivot area. It is better to have too much clearance than too little.
The 16 tooth sprocket and ⅝" x ¼" chain are together slightly larger in diameter than the 19 tooth ½" x $^{5}/_{16}$" of the original set up, hence the requirement to provide a clearance track for the chain run.

Item 7, the open bearing, can be replaced with sealed-for-life, RLS5-2RS, or RHP LJ 5/8-2RS bearing and the hub grease nipple replaced with a cheese head machine screw.

Item 22, the alloy rear brake back plate. On the Mk.V there is only one *Item 38, the stud for chain guard*, all other models have two. If you have to replace this item it is vital that it is well secured to the back plate: peening over the end of the thread is a guarantee.

Item 46, rear brake pedal. The Mk.I, Mk.III and Mk.III Sports have a pedal that has only one-foot pad. The Mk. IV, Mk.IV Sports and Mk.V have a two pad rear brake pedal.
Your MOT tester will not be happy if the pivot of this pedal is badly worn and is floppy. One solution is to machine a thin wall phosphor bronze bush for the worn pivot hole in the pedal and 'Araldite' it in position. Then machine the bearing surface of *Item 47, the bolt*, to fit. To improve it further, drill into the end of the pivot bolt, fit a $^{3}/_{16}$" or ¼" BSF grease nipple and drill a hole halfway across the pivot bearing surface to meet the end drilled hole; thereby giving this whole assembly a much longer life, and keeping your MOT man happy.

Plate 28, front mudguard.

The front mudguard linkage of the Mk.IV and Mk.V is notorious for rapid wear. Although it was an ingenious solution to having a close fitting mudguard that moved with the front wheel, little thought seems to have been given to longevity. Perhaps the factory being in receivership at the time had something to do with this.
There are five areas of wear on the front mudguard linkage. Together these, in a very short space of time, cause the mudguard to rattle backwards and forwards AND from side to side; they are:

1. Wear on the parallel side plates;
2. The 2BA screws which slacken their grip on the $^{9}/_{16}$" mudguard stays.
3. Wear at the end of the brake reaction links
4. Wear at the ends of the side plates.
5. Wear of the shell bearing supporting the brake back plate and the facing Plate.

I don't know about you but I like everything on my Douglas's to work properly and I look to ways of achieving that: so, what to do to improve matters?

First: order from Club Spares *Items 8, 9, 10 and 11, side plates for mudguard stays*, and *Item 15, pivot bolt, R.H.* for the mudguard link; then soft solder or Araldite the pivot bolt to the offside inner bracket: that will eliminate one potential rattle!

Second: an inspection of the two holes through *Items 6 and 7, the mudguard stays*, will probably reveal considerable wear, because it is not possible to tighten the 2BA screws without crushing the $^{9}/_{16}$" tubing, thereby increasing the side plate pressure at the pivot end of the reaction link! Here, in one fell swoop, so to speak, you can eliminate problem No.2 by replacing that section with a piece of $^{9}/_{16}$" rod with the ends reduced in diameter of the ID of the tubing. Alternatively (and this is what I do) replace the tubing with 18 swg x ½" OD (12·5 mm x 1·22 mm) mild steel tubing annealed for ease of bending. This has the added advantage of greater clearance along the inside of the front forks. You will have to braze the new solid section to the tubing but the result is far longer lasting than the original set up.

Third: wear at the pivot end of the brake reaction links will necessitate a replacement phosphor bronze bush and internal sleeve: use ⅝" silver steel.

Fourth: close inspection of the wear at the wheel spindle end of the side plates, particularly on the near-side plate where it has been bearing on the leading-link, will show a considerable groove worn in the link as a result of it pivoting. You can either weld this up and clean back to the original profile, OR (and this is what I do) machine a stepped sleeve washer, Araldited to the link, with a larger diameter than the original bearing/running surface for the side plate to locate on. Also machine a support washer for the other side so that the side plate is held but not clamped. It does mean that not only will you have, carefully, to open up the forked end of the side plate, but also crank the outer side plate to allow for the depth of the new stepped sleeve washer now fixed to the nearside leading link. This can be done with an abrasive drum sleeve attached to your electric drill. Wear of the offside outer side plate, where it is located on and held by the front wheel spindle nut, will best be cured by a replacement nut, or a suitable sleeve.

Fifth, wear of the shell bearing. If the wear is considerable then a replacement is the only solution, with the possibility of having to sleeve the alloy brake back plate as well. However you can improve matters by making a new facing-plate for the shell bearing, as this will offer more support for the brake back plate. Use a 75mm 3mm thick disc or 3" x ⅛" of mild steel sheet machined to prevent any shake of the brake back plate. This will please your MoT tester but it is doubtful if it will improve the efficiency of your front brake as they do seem to work better when everything is worn!

The original cranked grease nipple for the pivot end of the brake reaction link is not as good an idea as you might think because it cannot easily be reached with a grease gun. Make an extension which will allow you to reach these parts easily.

Replace all castellated nuts with the self-locking type on ALL parts of the linkage; this enables minute adjustments to be made. Regularly grease and check for slackness, adjust accordingly, and you will have an 'acceptable' linkage on your Mk.IV or Mk.V front mudguard that is no longer an embarrassment to you. This improvement of my own Mk.IV has done approximately 6,000 miles and is just beginning to show wear. Give it a try, you will be pleasantly surprised.

Plate 29, rear mudguard.

Item1, the rear mudguard. Here the mudguard illustration is for a Mk.V, easily recognised by the 'butterfly strap' in the area where the rear of the sub frame and the mudguard meet. This strap presumably had to be hastily devised as the original design used on the Mk. IV did not have any strengthening at this point. This, in time resulted in the mudguard fracturing from the edge of the valance inwards to the centre of the mudguard, and was caused by the continuous sideways flutter of the lower part of the mudguard. This problem was self inflicted as the metal for the 'guard was too thin AND at the point of attachment to the rear end of the sub frame the rolled edge of the valance was flattened to allow the two separate ends of the sub frame to be bolted to the mudguard.
If you require a replacement mudguard, then ensure that the maker is aware that the front lower part (the part that is bolted to the main frame) needs to be STRAIGHT for the first 6½"- 7". If this is not done then the mudguard will foul the rear forks, and considerable remedial action will be required. Do not make the mistake of painting the rear mudguard before you have made sure that it will fit. It has been done!

The Mk 1 rear mudguard is a far more substantial item, and has a sensible detachable rear section. This permits removal of the rear wheel merely by placing the bike onto its centre stand in order to carry out this operation. This mudguard was painted black.

The Mk.III rear mudguard does not have a detachable rear section and is painted black with a 1" wide silver-painted centre line, as on the front 'guard.

The Mk.III Sports rear mudguard is not as deeply valanced as the touring model mudguards (as is fitting for a sports bike!) and both mudguards are normally painted silver.

Plate 30, petrol tank and pipes.

Item 1, the petrol tank. The basic shape and capacity (3½ gallons) of the petrol tank remained the same from the Mk.I right through to the Mk.V.

The Mk 1 tank can be recognised by the following;-
The single front lug fitting offers only one bolt-on position.

There is only one offside Ewerts petrol tap, which is set midway along the underside.

The early Mk.I tanks did not have any provision, i.e. welded -on bosses, on the front underside to take *Item 18, the strap*, which on the later

tanks proved so useful in preventing their splitting in the area above and between the front mounting points.
The tank panel colours are Douglas Royal blue, Silver and black with white lining.

The Mk.III tank has single front lugs to bolt to the frame headstock as on the Mk.I.
There are two Ewerts petrol taps set midway along the underside.
On the front underside there are two welded on bosses to take *Item 18, the strap,* which is found on all subsequent models and must be used.
The painted panels are different to the Mk.I in that the side panels are not broken by the kneepads. The top panel is painted silver, and the blue side panels are separated by a fore and aft dividing strip of chrome or silver paint edged with black. The colours are as for the Mk.I.

The Mk.III Sports tank has the same panelling as the Mk.III, BUT the blue is a mid-blue rather than the darker Royal blue of the Mk.I and Mk.III.

The Mk.IV tank has front mounting lugs that offer three different height positions for bolting to the frame headstock, and is as illustrated in the parts list.
The two Ewerts petrol taps are positioned more towards the rear of the underside of the tank than those on the Mk.III.
The panelling is much simplified, there being a single basic colour, polychromatic blue, divided by a chrome or silver painted strip edged with thin black lines.

The Mk.IV Sports tank is identical to that on the Mk.IV.

The Mk.V tank is in detail the same as the Mk.IV
The only differences to the Mk.IV are the three alternative colours: polychromatic blue, polychromatic green, or black enamel with silver lower side panels, carrying the "Douglas" tank transfer on either side.

If, when fitted, the rear of the tank is in contact with the frame tubes where they splay out, it will eventually split. To prevent this happening it is essential to install a sufficient number of *Item 17, rubber buffer, tank mounting, rear* to raise it clear of the frame.

Plate 32, chainguard.

Item 1, the chain guard. The Mk.I 'guard was slightly longer forward of the welded on strap than the Mk.IV - V type.

The Mk.III and Mk.III Sports 'guard had provision to carry a hand pump along the top.

The Mk.IV, Mk. IV Sports and the Mk.V guard is slightly shorter forward of the welded on strap than the earlier types, and there is no provision to carry a hand pump.

Item 6;- the shock absorber cover. The top chain cover part of this item on the Mk.I, Mk.III. and the Mk.III Sports is very much shorter than the one shown in the illustration which is for a Mk.IV and Mk.V.

Plate 33, speedometer.

Item 2, bracket for speedometer head.

The Mk.I, Mk.III, Mk.III Sports, Mk.IV and Mk. IV Sports all have a double cranked bracket that holds the speedo. head further away from the headlight than the one in the illustration which is for a Mk.V.

Plate 35, crash bars.

Item 1, the crash bars will fit Mk.I - Mk.V and can be chrome plated or painted. They serve a useful purpose as they do provide protection for the quite vulnerable alloy rocker box covers.

John Holmes.

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APPENDICES.

The subsequent pages contain the following lists, diagrams and drawings.

Providers of parts and services.

Gearbox - cutaway drawing 1

Gearbox - cutaway drawing 2

Mk.IV wiring diagram - negative earth

Mk.V wiring diagram - positive earth

List of original electrical equipment - Mk.I

Lucas Spare Parts List - Mk.I

Front wheel and forks

Rear wheel

Businesses or individuals mentioned in the previous pages who have provided parts and or excellent service.

Amal 274 carb. parts: Hitchcock's Motorcycles,
Rosemary Cottage,
Oldwich Lane West,
Chadwick End,
Solihull. B93 0DL. Telephone: 01564 783 192

Amal 274 carb. parts:

Martin Bratby,
No.1 The Coachouse Works,
Limepit Lane,
Huntington,
Cannock,
Staffs. WS12 4PA. Telephone: 01543 572 583

Magneto, dynamo and voltage control regulator supply and repairs;

Stuart Towner,
117 Church Lane,
Chessington,
Surrey. KT9 2DP. Telephone: 0208 397 6599

Crankshaft rebuilding:

Chris Odling Engineering,
61 Ellenabeich,
Seil by Oban,
Argyll. PA34 4RQ. Telephone: 01852 300 191

Alpha Bearings Ltd.,
Kingsley Street,
Netherton,
Dudley,
W. Midlands. DY2 0QA. Telephone: 01384 255 151

Stainless steel fasteners:

Dave Middleton,
Unit 5,
Lady Ann Mills,
Batley,
W. Yorks. WF17 0PS. Telephone: 01924 470 807

Wheel rims, spokes etc. in stainless or chrome:

Brickwood Wheel Builders,
Old Brickwood Farm,
West Grimstead,
Salisbury. SP5 3RN. Telephone: 01722 712 701

Speedo heads, correct for the Marks:

David Woods,
'La Casita'
Church Lane,
Eastergate,
Chichester,
W.Sussex. PO20 6UZ. Telephone: 01243 542 521

Various cycle parts: e.g. handlebar fittings, levers etc.:

Armour Motor Products,
784 Wimborne Road,
Moordown,
Bournemouth,
Dorset. BH9 2HS. Telephone: 01202 519 409

Douglas wiring looms:

Dave Wilson,
14 Leicester Close,
Washingborough,
Lincoln. LN 4 1DS. Telephone: 0115930 5454

Electrical cables, snap connector's etc.

Vehicle Wiring Products,
9 Buxton Court,
Manners Ind. Estate,
Ilkeston,
Derbyshire. DE7 8EF. Telephone: 0115 930 5454

Piston rings (made to order):

Philip Daintree,
22 Hawkstone Avenue,
Whitefield,
Manchester. M45 7PG. Telephone: 0161 766 4487

Petrol pipe and fittings:

Auto-hose,
7(b) Bagnall Road,
Milton,
Stoke-on-Trent,
Staffs. ST2 7AY. Telephone: 01782 542 486

Photo-copy literature, including the 'Illustrated Parts List and Maintenance Manual:

Bruce Main-Smith & Co. Ltd
132 Saffron Road,
Wigston,
Leicestershire. LE18 4UP Tel/Fax:: 0116-277-7669
e-mail: www.brucemainsmith.com

LUCAS

ORIGINAL EQUIPMENT

DOUGLAS 350 cc TWIN EQUIPMENT SPECIFICATION Mk.1 [T 35]

UNIT	MODEL & TYPE	SERVICE No.	SERVICED BY	REMARKS
MAGDYNO	MN2/5 XX/1	46021E	46021E	
CONTROL BOX	MCR1 L31	33018A	33018A	
BATTERY	PUW7E/4			
LAMP, HEAD	MU42	50128D	50128D	
LAMP, TAIL	MT211	53056A	53056A	
HORN	HF1441	70001D	70048A	
HORN PUSH	4A L1	762164	762164	
SWITCH, MAGNETO CUT-OFF	4A L1	762164	762164	
SWITCH, DIP	99	380521	380521	
CABLES		991281	991281	

SERVICE NOTES AND TEST DATA

6 VOLT EQUIPMENT. NEGATIVE EARTH RETURN

DYNAMO

Two-pole ventilated design; compensated voltage control; anti-clockwise rotation viewed from driving end. Crossed connections will cause serious damage to the regulator. Connect lead with YELLOW IDENTITY TAG to main terminal, and GREEN AND BLACK TRACER CABLE to field terminal.

TEST DATA. Dynamo cold:
Cutting-in speed 1,050—1,200 r.p.m. at 6.5 dynamo volts. Output 8.5 amps. at 1,850—2,000 r.p.m. at 7.0 dynamo volts, taken on .82 ohm resistance load without regulator. (Resistance must be able to carry 12 amps. without overheating.) Brush tension 15—25 ozs. Field resistance 3.2 ohms.

MAGNETO

Clockwise rotation viewed from driving end. Contact breaker gap .010"—.012". Condenser capacity .130—.150 microfarad.

CONTROL BOX. Houses cut-out and dynamo voltage regulator.

TEST DATA

(*a*) Cut-out. Cut-in voltage 6.3—6.7 volts. Drop-off voltage 4.5—5.0 volts.

(*b*) Regulator.
Setting at 10°C. (50°F.) 7.8—8.2 volts. Setting at 30°C. (86°F.) 7.7—8.15 volts.
Setting at 20°C. (68°F.) 7.8—8.2 volts. Setting at 40°C. (104°F.) 7.6—8.1 volts.

HEADLAMP. Correct lamp setting is important to prevent dazzle.

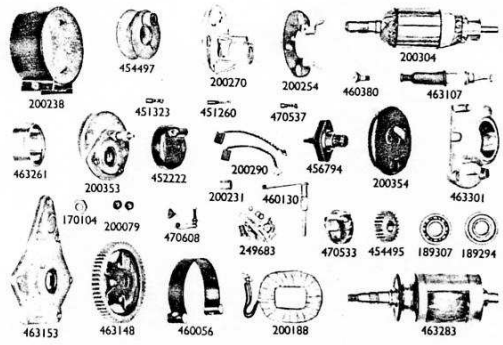
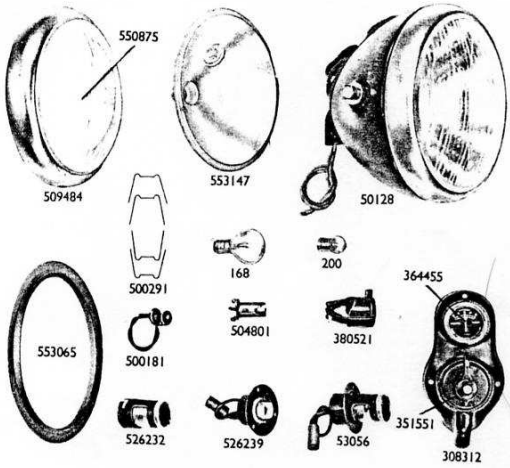
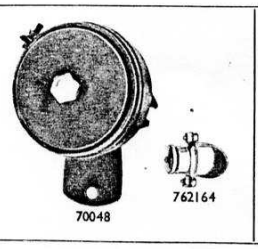
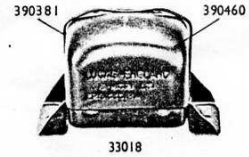
HORN. High-frequency type. Current consumption 4 amps. (approx.).

BATTERY

Capacity 12 ampere hours at 10 hour rate. The importance of carefully carrying out the initial charging cannot be overstressed as non-adherence to correct initial charging procedure will result in a considerably shortened service life of the battery. First charge: Some batteries have seals in the filler plug apertures and these should be carefully broken. Half fill each cell (¼ pint to each cell) with dilute sulphuric acid of specific gravity 1.270. Allow battery to stand at least six hours and then add further sulphuric acid to bring the level in each cell to the top of the separators. Stand for a further two hours before applying the initial charge. Initial charge rate 0.8 amperes for 50 hours. Correct the specific gravity of electrolyte to 1.280—1.300 at completion of charge when voltage and specific gravity remain constant. The figures given are for climates where temperature is normally below 80°F. (27°C.). For sub-tropical climates where temperatures range between 80°—100°F. (27°—38°C.) the appropriate figures are: Filling, 1.270; Fully charged, 1.250—1.270. For tropical climates where temperatures are over 100°F. (38°C.) the figures are: Filling, 1.245—Fully charged, 1.250—1.270. In service, the battery should be kept topped up to the level of the separators, using distilled water only, and terminals should be kept clean and connectors tight.

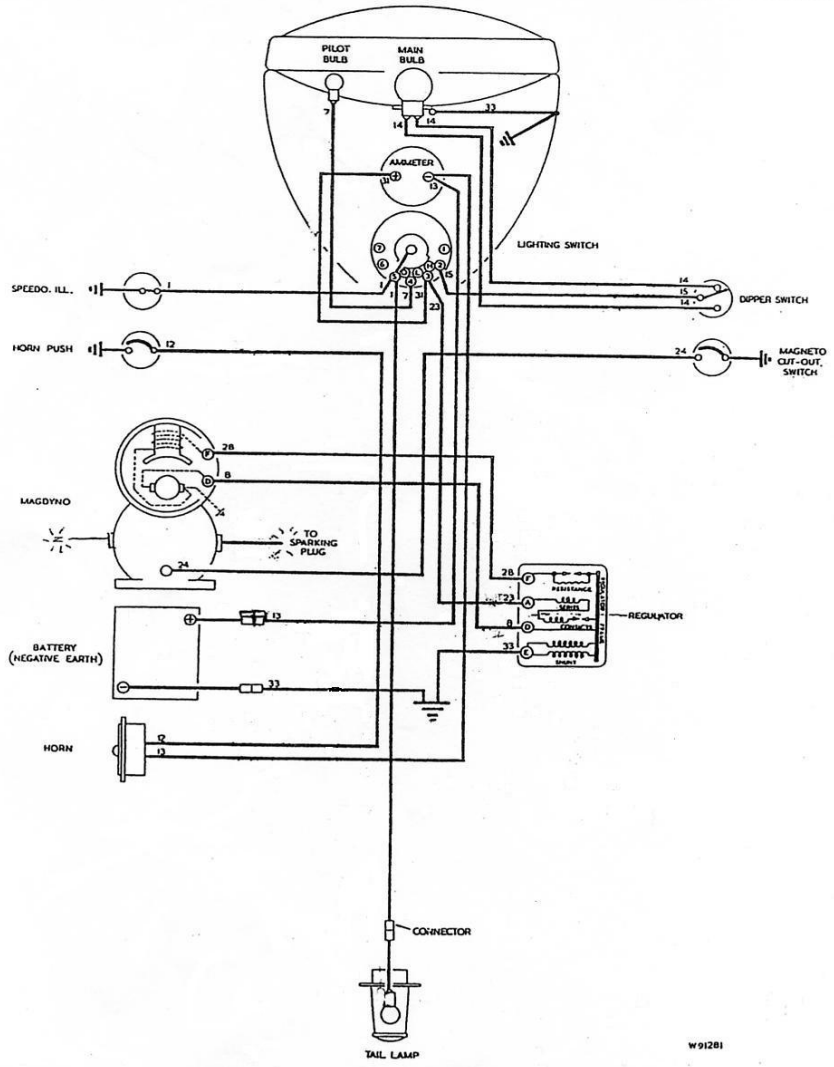
DOUGLAS MARK 1 [T 35]

LUCAS SPARE PARTS

ILLUSTRATION	DESCRIPTION OF PART	ORDERING No.
	**MAGDYNO, MN2/5 XX/1** ... ... **DYNAMO, E3HM/0 L/0** ... ... Cover, band ... ... Brush, set ... ... Cover, commutator end ... ... Bracket, commutator end ... ... Bush, commutator end ... ... Brush gear ... ... Spring, set, brush tension ... ... Bearing, drive end ... ... Bracket, drive end ... ... Armature ... ... Coils, field ... ... Sundry parts, set (dynamo) ... ... Fixing strap (dynamo) ... ... **Magneto Parts** Pick-up assembly ... ... Brush and spring, pick-up ... ... Cover, contact breaker ... ... Contact breaker, complete ... ... Contact set ... ... Brush and spring (contact breaker earth) ... Cam ... ... Control parts, set ... ... Spring and pin ... ... Plate with outer ring ... ... Nut, spindle ... ... Plate assembly, drive end ... ... Gear assembly, clutch type ... ... Gear, dynamo ... ... Armature assembly ... ... Slip ring ... ... Bearing, complete, Hoffman N3048 ... Brush, spring and holder ... ... Brush and spring, magneto earth	**46021** **200286** 200238 200290 200354 200270 200231 200254 200079 189307 200353 200188 249683 460056 456794 451260 452222 470533 470608 470537 463261 463107 460130 463301 170104 463153 463148 463283 454497 460380 451323
	**HEADLAMP, MU42** ... ... Rim and glass... ... ... Wire, glass fixing ... ... Panel ... ... Ammeter ... ... Switch ... ... Reflector ... ... Bulb holder, double contact ... Bulb holder, interior ... ... Glass ... ... Bead, rubber ... ... **LAMP, TAIL, MT2I1** ... ... Cover ... ... Flange assembly ... ... **SWITCH** **Magneto cut-off, 4A LI** ... **SWITCH, Dip, 99**... ... ... **BULBS** Headlamp, pilot ... ... Headlamp, main ... ... Tail lamp	**50128** 509484 500291 308312 364455 351551 553147 553065 504801 500181 **53056** 526232 526239 **762164** **380521** 200 168 200
	**HORN, HFI44I** ... ... **HORN PUSH, 4A LI** ... ... **CONTROL BOX, MCRI L3I** ... Cover ... ... Clip	**70048** **762164** **33018** 390460 390381
		

LUCAS
ELECTRICAL EQUIPMENT

DOUGLAS 350c.c. DE-LUXE MOTOR CYCL
MARK IV
(1950)



KEY TO CABLE COLOURS

1 RED	10 YELLOW & GREEN	18 BLUE & PURPLE	27 GREEN & PURPLE
2 RED & YELLOW	11 YELLOW & BROWN	19 BLUE & BLACK	28 GREEN & BLACK
3 RED & BLUE	12 YELLOW & PURPLE	20 WHITE	29 BROWN
4 RED & WHITE	13 YELLOW & BLACK	21 WHITE & GREEN	30 BROWN & PURPLE
5 RED & GREEN	14 BLUE	22 WHITE & BROWN	31 PURPLE
6 RED & BROWN	15 BLUE & WHITE	23 WHITE & PURPLE	32 PURPLE & BLACK
7 RED & BLACK	16 BLUE & GREEN	24 WHITE & BLACK	33 BLACK
8 YELLOW	17 BLUE & BROWN	25 GREEN	
9 YELLOW & BLUE		26 GREEN & BROWN	

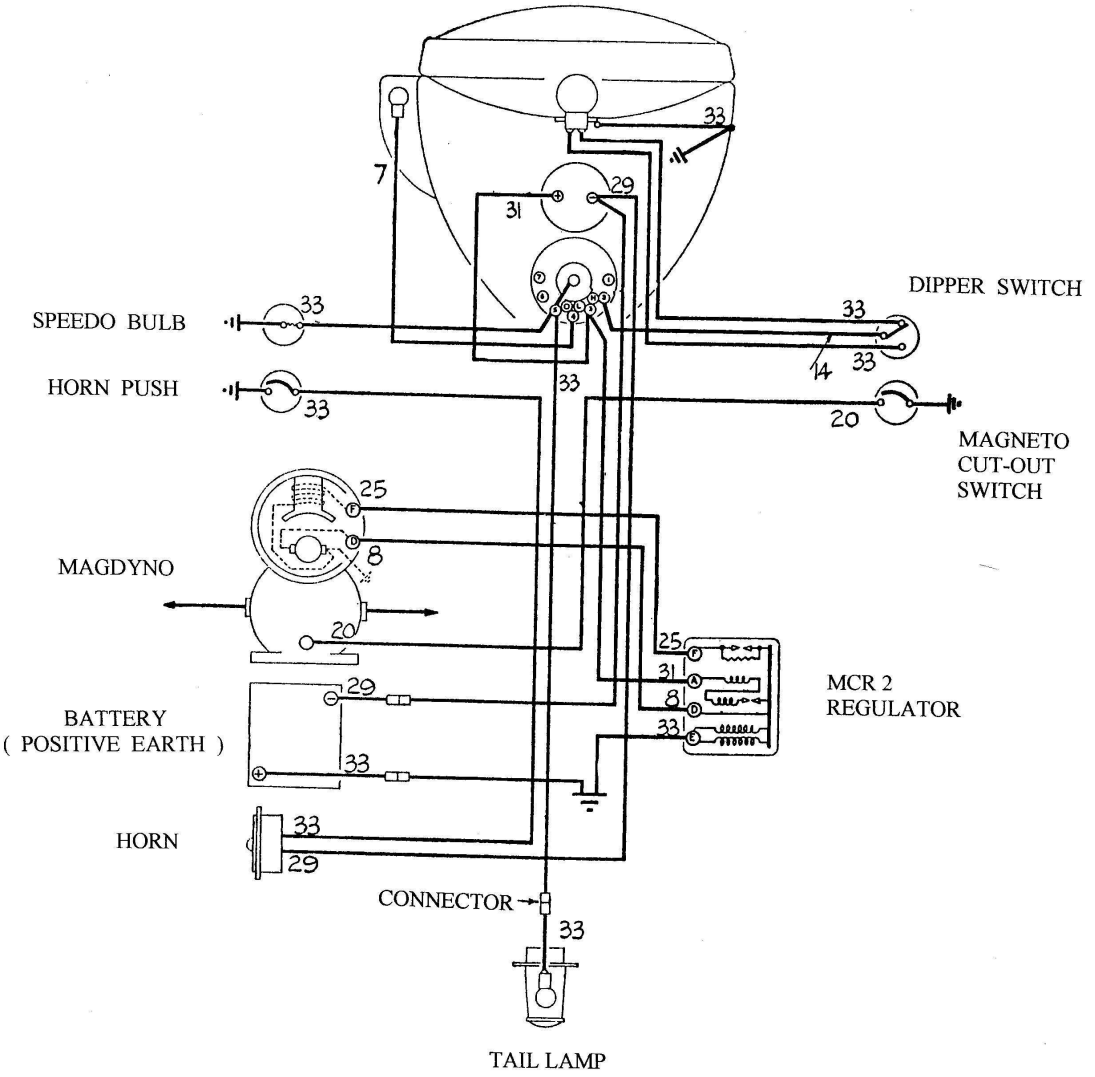
WIRING DIAGRA
No. W9128
6 VOLT

ISSUED:
SEPTEMBER 1951
F/10511L

NUMBERS INDICATE CABLE IDENTIFICATION COLOURS, SEE KEY ABOVE

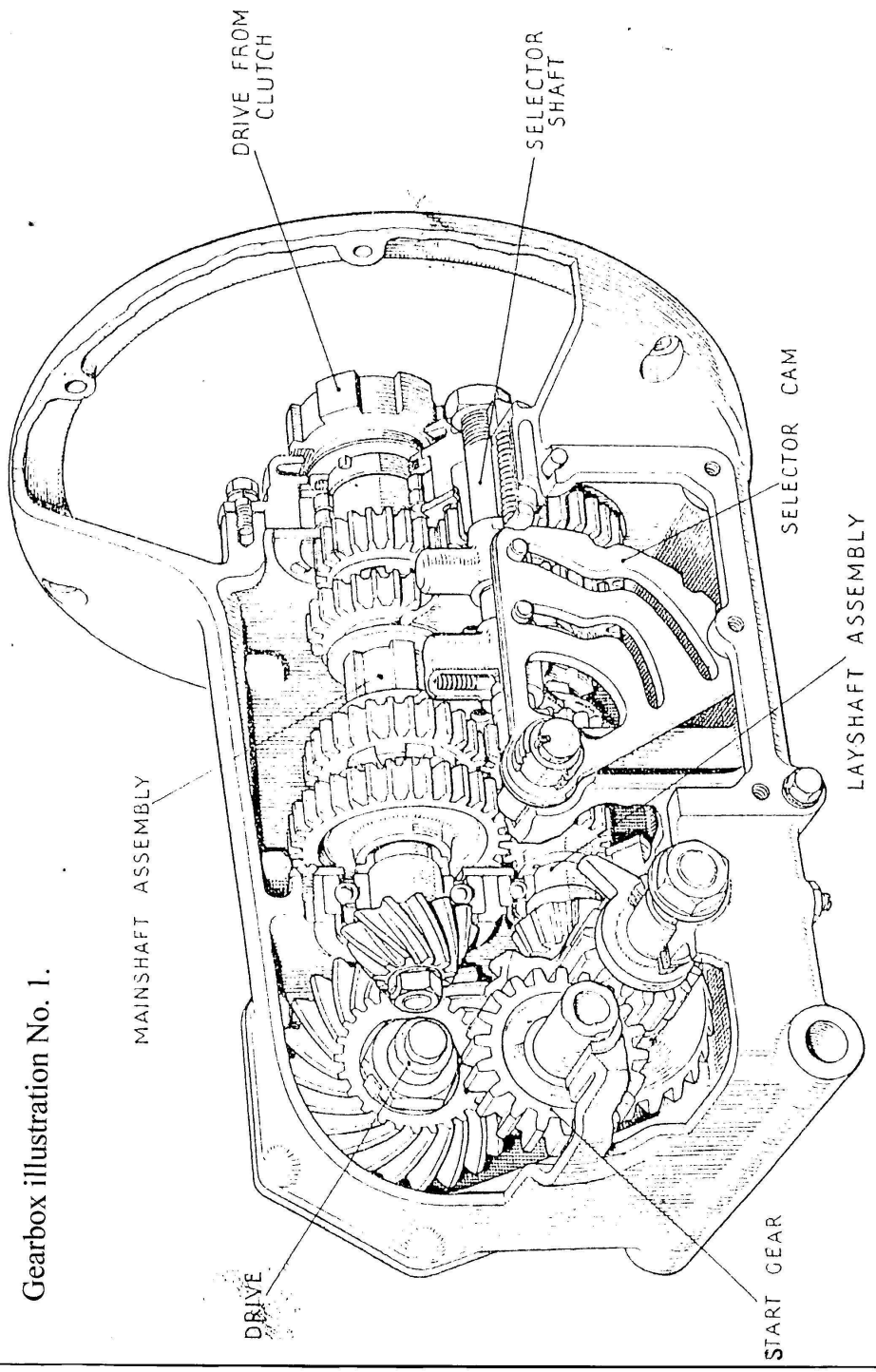
Printed in England

Wiring diagram for Douglas Mk V

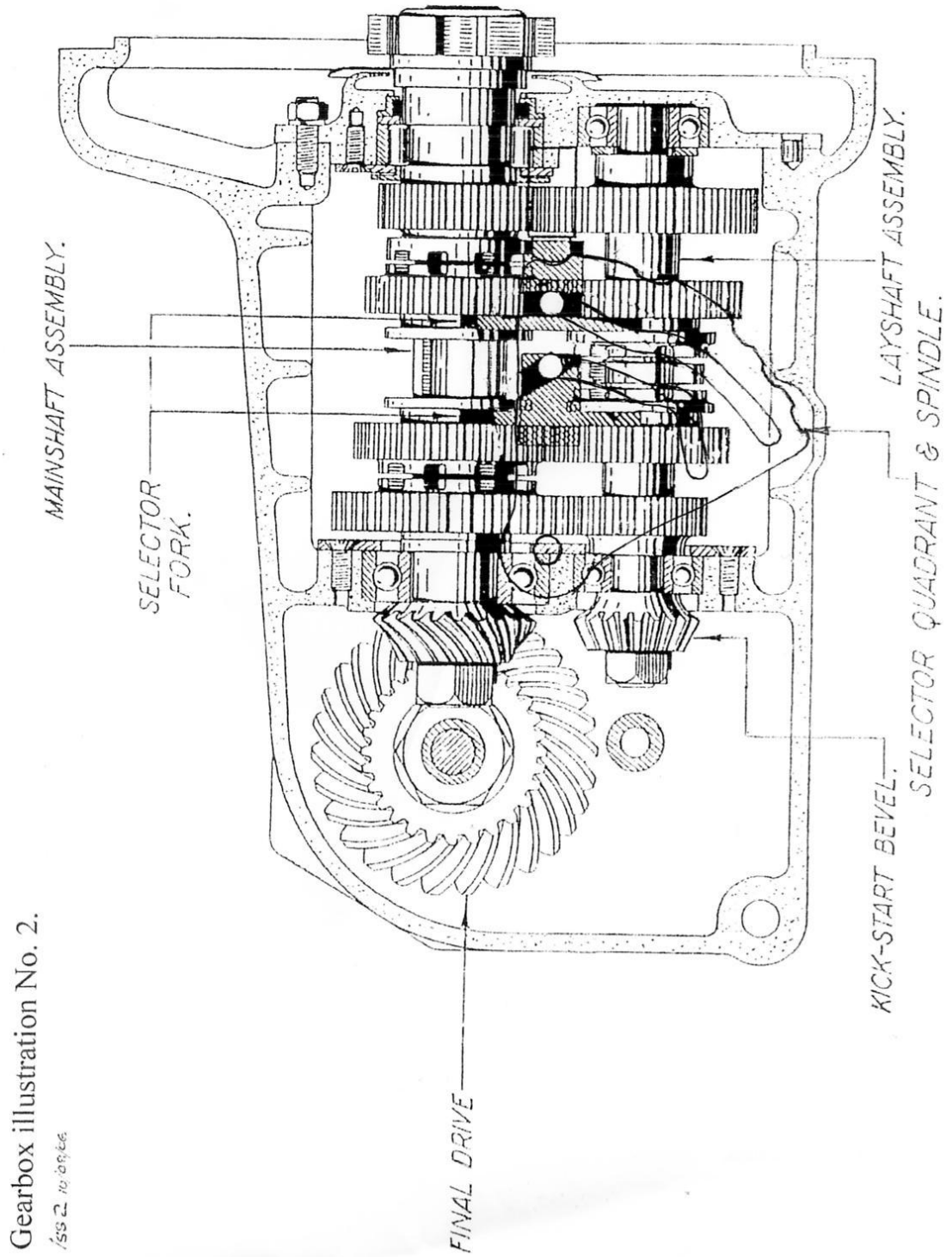


KEY TO CABLE COLOURS

1 RED	10 YELLOW & GREEN	18 BLUE & PURPLE	27 GREEN & PURPLE
2 RED & YELLOW	11 YELLOW & BROWN	19 BLUE & BLACK	28 GREEN & BLACK
3 RED & BLUE	12 YELLOW & PURPLE	20 WHITE	29 BROWN
4 RED & WHITE	13 YELLOW & BLACK	21 WHITE & GREEN	30 BROWN & PURPLE
5 RED & GREEN	14 BLUE	22 WHITE & BROWN	31 PURPLE
6 RED & BROWN	15 BLUE & WHITE	23 WHITE & PURPLE	32 PURPLE & BLACK
7 RED & BLACK	16 BLUE & GREEN	24 WHITE & BLACK	33 BLACK
8 YELLOW	17 BLUE & BROWN	25 GREEN	
9 YELLOW & BLUE		26 GREEN & BROWN	

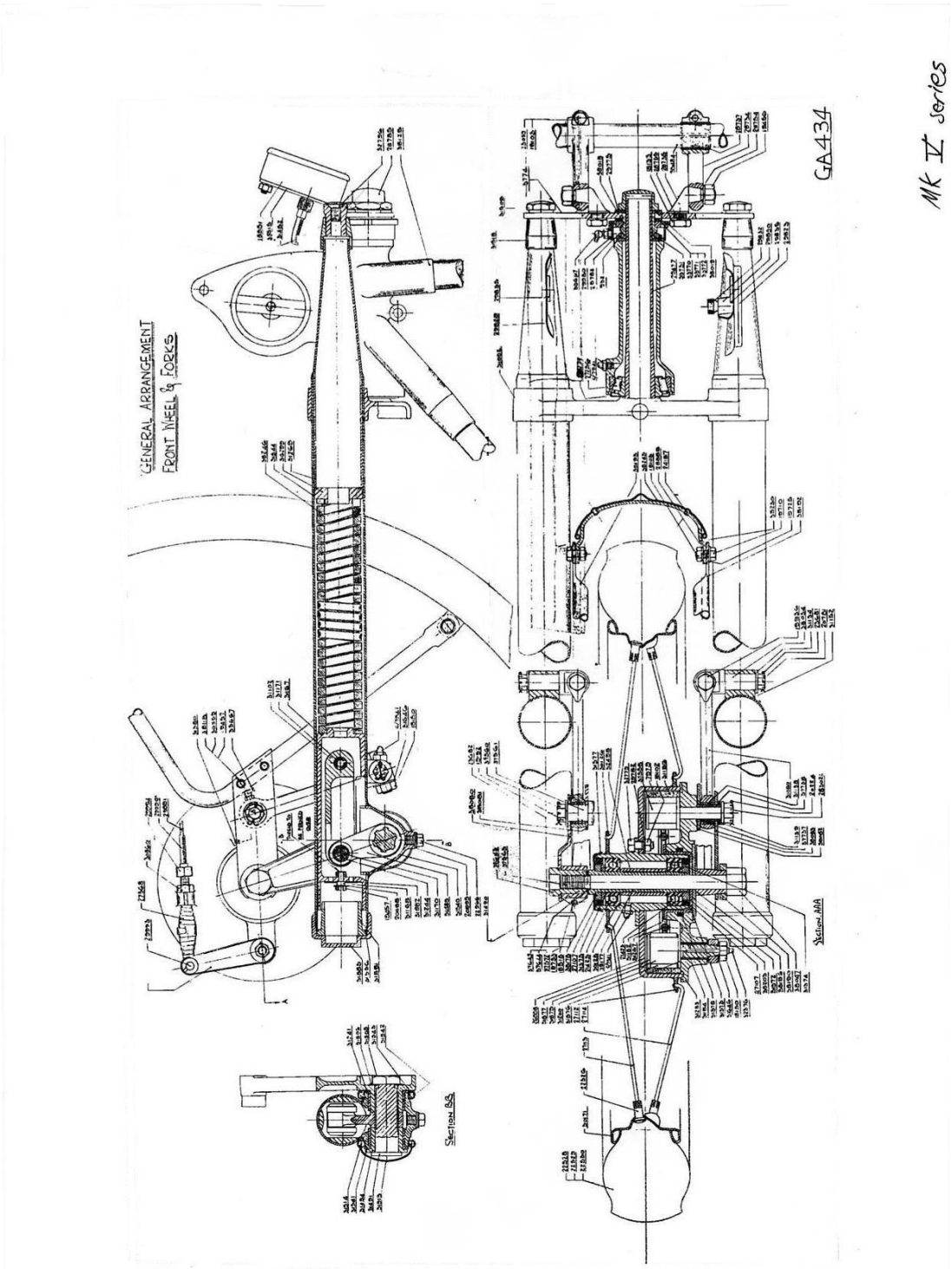


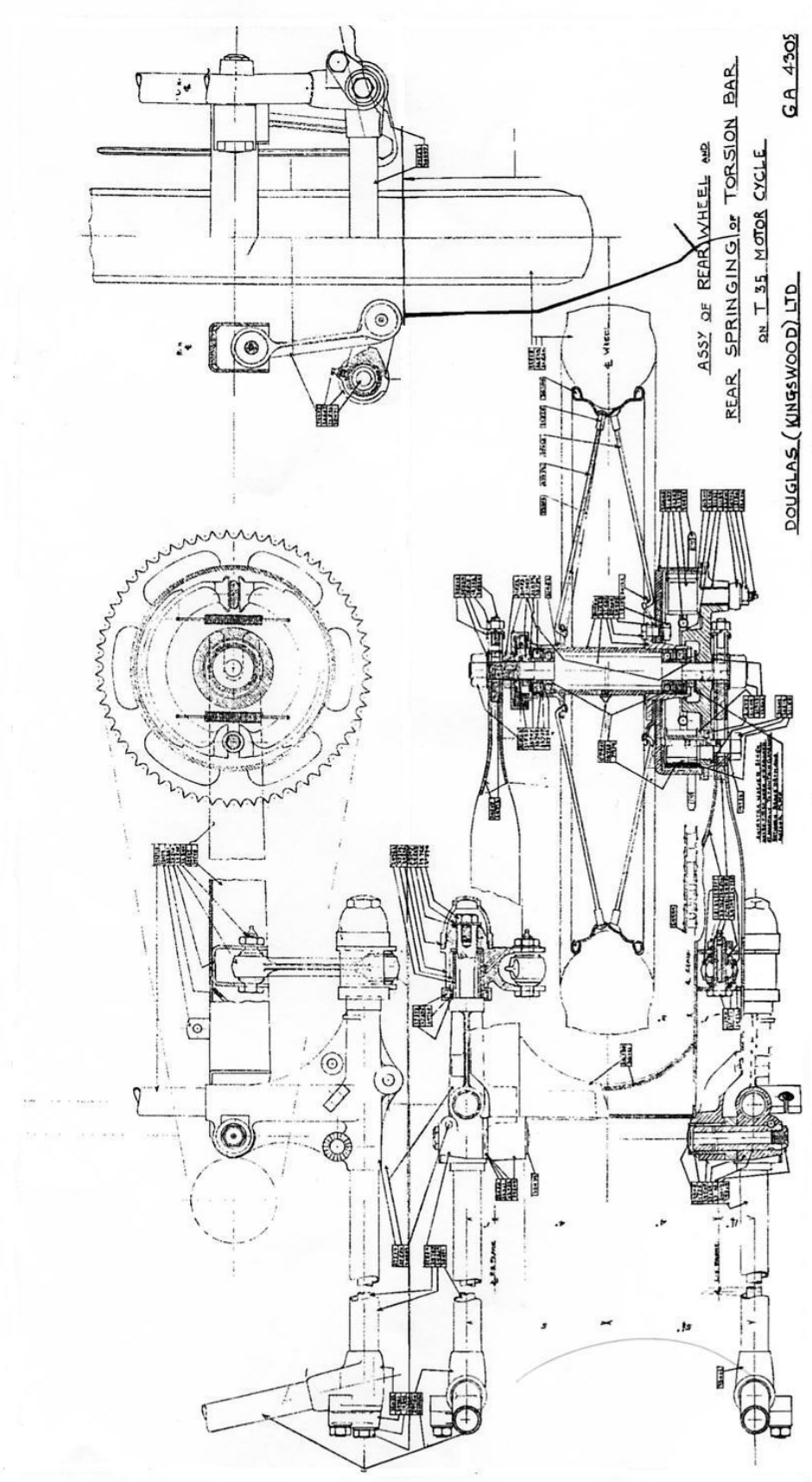
Gearbox illustration No. 1.



Gearbox illustration No. 2.

Iss 2. no drgs.


GENERAL ARRANGEMENT
FRONT WHEEL & FORKS
GA434
Mk II Series


ASSY OF REAR WHEEL AND
REAR SPRINGING or TORSION BAR
on T 35 MOTOR CYCLE
G.A. 4305
DOUGLAS (KINGSWOOD) LTD