

Matchless
IN NAME & REPUTATION

INSTRUCTION BOOK

MODEL B
"Silver Hawk"

Supplied free with each
new cycle

Replacement Copies
1/6 each



DRIVING & ADJUSTMENT INSTRUCTIONS

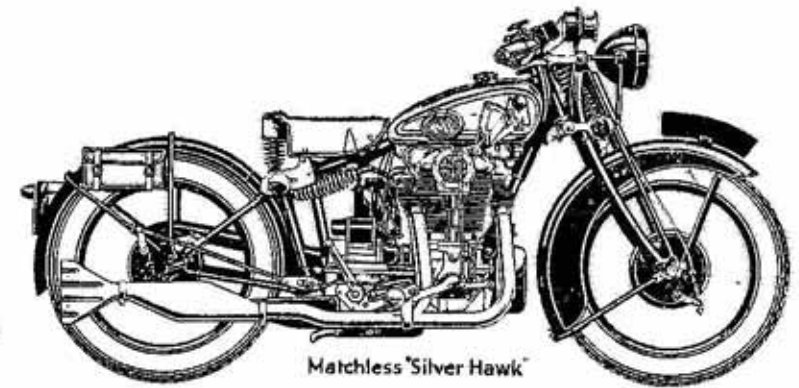
INTRODUCTION.

A Personal Message to all "Matchless" Owners.

It is our sincere desire that you obtain from your Matchless "Silver Hawk" the service, comfort, enjoyment and innumerable miles of low cost travel that we have earnestly endeavoured to build into it.

A motor cycle, it must be remembered, is a highly specialised piece of engineering, and while it does not call for great engineering skill in driving, the exercise of a little mechanical sense, and the occasional use of a spanner, cleaning cloth, etc., is very necessary if the maximum service is to be obtained with the requisite degree of satisfaction. In the following pages we give, without going into intricate technical detail, much valuable information that you should have, in order to give your cycle the careful occasional attention which it merits. Neglect to make necessary adjustments, or only casual attention to the lubrication of important parts, will soon neutralise the best efforts of the designers who have wholeheartedly devoted their skill and knowledge to the production of this ideal machine, and may also bring needless trouble and expense to its owner.

MATCHLESS MOTOR CYCLES (COLLIERS) LTD.



MATCHLESS MOTOR CYCLES

(COLLIERS) LIMITED,

Manufacturers,

Registered Offices:

**44-45, Plumstead Rd., Plumstead,
London, S.E.18, England**

Nearest Station: WOOLWICH ARSENAL, S.R. Factories: BURRAGE GROVE and MAXEY ROAD,
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GENERAL INFORMATION

TAKING OVER A NEW MACHINE.

Having filled up with petrol and oil of the recommended brand it is advisable before starting the engine to sit on the cycle and to become familiar with the controls. Neutral or free engine position of the gears will be found midway between first and second gear positions, and although no actual notch is provided in the gate for free position, the action of the spring-loaded internal gear selector plunger makes the location easy to find. The engine must always be started in the neutral position. An ignition switch is provided on the panel and it should be noted that a red warning light appears when this switch is on and engine stationary, or slowly idling. This light is provided purely as a reminder that current is passing from the battery and should the lamp burn out it should be replaced as early as possible, although its absence will not in any way affect starting or running. The ignition switch must always be turned off when the engine is idle, and it is on account of the importance of this that the warning light is provided. The throttle is operated by a twist grip control on right handlebar and the air and ignition by levers also on the right. The longer or lower lever operates the ignition, and the shorter one the air control. All open or advance by an inward or clockwise movement. For starting, the ignition should be about two-thirds advanced, air completely closed and throttle about one-sixth open. The petrol is turned on when the sliding tap plunger is pulled out as far as possible. Assuming that the tanks have been filled with petrol and oil of the recommended brand and that all levers have been set as above, to start engine first flood the carburettor by depressing the tickler button on the float chamber until petrol actually overflows from the vent hole, then after turning the ignition switch on panel to the "on" position give the kickstarter a sharp push downward. The engine should start immediately, and if it fails to do so, or stops after a few revolutions, try further flooding. If everything is in order the engine will start with ridiculous ease and the kickstarter may even be operated by hand if desired. Allow the engine to idle for a moment or so to warm up, and see that the oil is circulating properly. Then seated on the cycle disengage the clutch by drawing inwards the lever situated on the left side of the handlebar. Then shift gear lever into the starting gear position (first notch forward from neutral) after which gently release the pressure from handlebar clutch lever, when the cycle will commence to move forward. When well under way smartly declutch and simultaneously shift the gear lever into third speed position as before, releasing the clutch lever gently when the change has been made, after which repeat the operation to obtain high gear. In all changes of gear the clutch should be released a fraction of a

Taking Over a New Machine—contd.

second only before shifting the gear lever and with reasonable care a change of gear can be made without a sound.

The movements of gear lever must be made slowly and firmly, and under no circumstances should the gears be allowed to grate (see Gear Control Adjustment).

DRIVING.

In general driving it is always advisable to advance the ignition as far as possible without causing knocking. When ascending a steep hill, as the engine slows, care should be taken to retard the ignition just sufficiently to prevent knocking, and if a change of gear then be made the ignition should be again advanced, as the speed of the engine is increased by the use of the lower gear. For descending exceptionally steep and dangerous hills the third or even second gear may be engaged, enabling the frictional resistance of the engine to assist in retarding the descent. We do not however, under any circumstances, recommend using the bottom gear for this purpose, as by doing so, an abnormal and unfair strain would be imposed upon the rear driving chain under certain circumstances.

It is advisable to ease the clutch slightly when rounding acute corners or when travelling slowly on top gear. If this practice is adopted from the first, much unnecessary gear changing will be avoided.

"DON'TS" IN DRIVING.

- DO NOT race the engine unnecessarily or let the clutch in sufficiently suddenly to cause the wheel to spin. Take a pride in a silent, smooth getaway.
- DO NOT use the brakes with violence. Brake early and drive on the throttle instead of the brakes.
- DO NOT allow the engine to labour on high gear on a steep gradient and remember that an easier, faster, and better ascent can be made on the next lower gear.
- DO NOT under any circumstances allow the rear chain to run very slack or very dry. Either will soon cause trouble, and adjustment is easy. Slack chains will inevitably cause harshness of transmission.
- DO NOT force engine or drive above a maximum speed of 30 m.p.h. for the first 500 miles. Mention is made of this warning on account of the natural desire of a new owner to ascertain his mount's maximum capabilities. However, until all bearings are well run in, it is advisable to refrain from speed bursts and the accompanying possibility of seized bearings, piston rings, etc. The first 500 miles of an engine's existence is far more important than the next 5,000.
- DO NOT omit to turn the ignition switch to "Off" at the conclusion of a run. Make a practice of looking at the warning light on instrument panel.

"Don'ts" in Driving—contd.

DO NOT race the engine in neutral gear position, violently accelerate from a standstill, or drive at full speed on full throttle, etc., when in a residential district. Any motor cycle, or for that matter, any motor vehicle when so driven creates abnormal noise, and in the interests of all motorists we earnestly implore every "Matchless" owner to studiously refrain from any of the practices enumerated, or any calculated to cause annoyance to the public in general. Recollect that the degree of silence of your cycle is judged not by the actual noise it is making, but by comparison with other noises present. For example, in a busy street your cycle might be inaudible, while in a quiet narrow street of high buildings, it might be heard for several hundred yards, although in each case being driven in exactly the same manner.

LUBRICATION

ENGINE.

Proper lubrication is of vital importance and the use of only the best lubricant will be repaid many times over by long wear and good service. After extensive tests we have decided to recommend Wakefield Castrol XXL or XL, the former for preference, as the most suitable, and advise owners to use this and no other. The identifying letters used by most oil firms denoting the different grades in which that oil is supplied are imitated so that it is essential, when ordering oil, to specify the brand as well as the grade, "Castrol XXL or XL," not just "XXL" or "XL." As an additional precaution, it is advisable to buy from the branded cabinets or from sealed packages. See where your oil is drawn from. The oil is carried in a tank fixed to the front of the engine crankcase, and the level in this tank should never be allowed to fall below half-full. The mechanical oil pump is of the double-diameter single-plunger type, the larger diameter being used for exhausting the crankcase sump and the smaller diameter for delivering fresh oil to all the essential parts of the engine from whence it drains back into the sump to be returned to the tank again. No provision is made for external adjustment of the oil supply, the correct flow to various parts being arranged internally by means of suitably dimensioned passages. Oil is fed to the timing side crankshaft main bearing and thence through holes drilled in the crankcase to the driving side crankshaft main bearing and to the cylinder walls. From each of these bearings the oil passes through holes drilled in the shafts and flywheels to the respective big end bearings, the splash from which acts as an auxiliary for cylinder lubrication. Through a by-pass on the feed side of the oil pump oil is taken up to an indicator

Engine—contd.

on the panel, from whence it drains by gravity to the camshaft tunnel and the top bevel gear chamber. The oil in this chamber, upon reaching a pre-determined level, is conducted through an external pipe back to the supply tank. Oil is supplied to the bearings of the vertical bevel shaft by gravity through spiral grooves cut in the vertical shaft bushes, so that under working conditions the whole of the shaft assembly is submerged in oil up to the level of the hole to which the oil return pipe to the tank is connected. The leakage of oil through the various overhead rocker bearings, after providing adequate lubrication for the valve stems, is conducted back to the sump via holes drilled in the cylinder head, which holes join up with tubes passing through the entire cylinder block (see sectional illustration). No attention to the oiling system is necessary beyond observing the flow of oil through the indicator before and during each run. In the event of the early type glass-top sight feed becoming clouded with dirty oil deposit, the two rubber tubes should be disconnected and a small quantity of petrol pumped through. Under no circumstances should any attempt be made to dismantle the sight feed, and in the event of the glass window being accidentally broken, the assembly may be temporarily short-circuited by connecting up the metal tubes with one of the rubber connectors. In such an event, the circulation of the oil may be verified by raising the oil supply tank filler cap, when the returning oil will be seen emerging from the small spout immediately underneath the cap. On all except 1931 Models a double system of filtering the oil is provided, the first consisting of a gauze screen in the filler cap orifice to prevent the admission of fluff or foreign matter when adding fresh oil, and the second consists of a readily detachable felt cartridge, through which the oil is compelled to pass before emerging from the small spout underneath the filling cap. This cartridge can be removed upon unscrewing the hexagonal cap on the oil tank. Every 1,000 miles both filters should be removed and thoroughly cleaned in petrol, while once each season or every 5,000 miles the entire tank should be removed and thoroughly washed out with petrol. After refitting, a fresh supply of new oil should be used. To save unnecessary waste it is quite satisfactory to arrange this clean out when the oil is at a low level in tank, although normally it must be noted, it is highly desirable to frequently add fresh oil to the tank in preference to allowing it to run almost empty and then replenishing, the reason being that the more oil the tank contains, the cooler it will keep in circulation.

Normally, the level of oil in the tank should never be allowed to fall below the half level mark, and it should not be filled to a higher level than about 1 inch below the return oil nozzle. If excessively filled, sufficient space is not available for the settling out of oil mist from the crankcase breather arrangement, and in consequence at high speed some leakage of oil-laden mist may occur from the vent pipe in the supply tank through which (it should be noted) any crankcase pressure is passed to the atmosphere.

NOTES ON THE OILING SYSTEM.

If the engine is for any reason dismantled the crankcase must not on any account be separated before the oil pump plunger has been withdrawn. To remove the plunger it is necessary to first remove the two end caps and then the plunger guide screw, when the plunger may be pushed out large end first. To remove the guide screw it is necessary to detach the bottom bevel gear cover plate, when the cheese head of the guide screw will be observed on the left-hand side. A good stout screwdriver is necessary for the removal and re-fixing of this guide screw. Upon re-assembling the plunger must be inserted, of course, after the crankcase has been bolted up and before fitting the end caps the guide screw must be replaced with its relieved end engaging with the profiled cam groove cut in the plunger end. By moving the plunger to and fro while the screw is being introduced the correct position of the groove can be quite easily felt. It will be observed that the oil pump plunger, which is of the double-diameter type, is rotated by a worm cut on the engine shaft and moves backward and forward in its housing under the influence of the guide screw referred to above. As the pump plunger moves in one direction oil is drawn from the sump by the large end and at the same time the smaller end delivers fresh oil to the various channels. Upon the reverse movement the large end returns to the tank the oil already drawn from the sump, while the small end draws a fresh charge from same in readiness for delivery upon the following movement. This action, of course, goes on all the while the engine is revolving and since the exhausting end of the plunger is the larger one the crankcase sump is always drained of oil, hence the expression "dry sump."

CHAINS

The primary chain lubrication is automatically maintained so long as sufficient oil remains in the cast aluminium oil bath case. This case carries a little over half-pint of a 50-50 mixture of ordinary engine oil and paraffin, and the correct level is obtained by filling up when cycle is level to the height of the level plug on the rear end of the case. This level should be verified every 500 miles. The rear chain should be removed once every 2,000 miles in summer and 1,000 miles in winter and thoroughly washed in paraffin to remove grit, etc. After carefully wiping it should then be immersed in a bath of molten tallow or as a poorer substitute ordinary engine oil. If the latter is used, the chain should be laid in soak overnight to ensure penetration to all the link joints.

FORK SPINDLES.

Every 500 miles the fork spindle bearings should be flooded with a good quality grease, preferably Tecalemit Grease or Wakefield Castrolase. This process takes a few seconds only by means of the special grease gun provided, which merely requires holding nozzle end against the rounded nipples on fork spindles and given a few sharp strokes.

HUBS.

Every 500 miles (or more frequently in continuous bad weather), the lubricators in the centre of both front and rear hubs should have a small quantity of grease forced through them. (Wakefield Castrolase suitable).

NOTE.—Castrolase can be obtained in special push-down lid canisters for easy filling of grease gun in $\frac{1}{4}$ -lb., 1-lb. and 2-lb. sizes.

GEAR BOX.

Once every 500 miles a grease gun full of Wakefield Castrolase (light) should be injected into the gear box via the small nipple provided. Occasionally the filling plug should be removed in order to verify the level of lubricant in the box which should be from one-third to half full. If the above-mentioned injections do not maintain this correct level the interval between each should be reduced accordingly.

BRAKE AND GEAR ROD JOINTS ETC.

In addition to the foregoing, all moving parts such as brake and gear rod joints should be oiled occasionally, particularly in bad weather. Bicycle lubricating oil or machine oil suitable.

BOWDEN CABLES.

To lubricate Bowden inner cables has hitherto meant the entire removal of the cable, unsoldering one end nipple, etc., altogether a difficult and expensive job and one as a result neglected. By means of a specially designed oil gun it is now possible to flood the inner wire with lubricant in a few seconds and we can only state that the effect of this on a dry cable has to be tried to be believed. Oil is injected through a small bared patch on the outer casing and is forced through the spiral wire casing on to and along the inner wire. All Bowden cables on the "B" Model are fitted with small metal clips which will be observed fitted approximately to the centre of each. These clips cover the small bared patch referred to above and to apply the gun it is only necessary to slide the clip along the casing to enable the specially constructed gun to be clamped with the bared patch occupying a central position on the rubber pad on the gun nozzle. A few turns of the screwed plunger is then all that is required to efficiently flood the entire length of the cable with lubricant. The cost of this special gun is 5s. 9d. and we recommend every owner to have one in his home tool kit.

GENERAL DESCRIPTION AND MAINTENANCE REPAIRS

ENGINE.

The power unit of the "Silver Hawk" incorporates the latest research discoveries. The four cylinders are cast in one block and are arranged in the form of a double "V," generously finned, with adequate air spaces between each barrel. Likewise, all four cylinder heads are cast in one unit, the intake manifold being integral and so arranged to provide an equal length of passage for the incoming gases to each cylinder. By this means cold spots and difficulties of carburation are impossible. The pistons are of aluminium alloy and are of generous length, employing three compression rings, the lower of which acts as an oil scraper in addition to its usual duty. Fully floating gudgeon pins of 11/16in. diameter are fitted, secured end-wise by means of spring rings operating in grooves cut in the bore of the piston bosses. The crankshaft is built up with two throws, and is mounted upon three bearings, the centre being a roller, while at each end is a phosphor-bronze plain bearing fed with oil under pressure. The oiling system, as already described, is of the dry sump type and particularly simple in layout. The overhead valves are all operated from one camshaft through the medium of ingenious built-up rockers which carry at the valve end the usual type of adjusting screw and lock nut. All valves work in long detachable chilled cast-iron guides, generously lubricated, and totally enclosed. The overhead camshaft is mounted parallel to the crankshaft, and is driven by two pairs of bevels giving the necessary two to one reduction. These gears run entirely submerged in oil, providing in operation an extraordinary degree of silence. They are marked for correct setting, the keyway on the small bevel fixed to crankshaft coinciding with a groove cut across the end of the bottom vertical bevel shaft. The top large bevel has a tooth space marked with a groove across the hub on the opposite side to the keyway, which groove registers with a centre mark opposite one of the teeth of the top vertical shaft bevel. When all these marks register the two left side pistons are at equal height near the top of their respective cylinders, and the left side front inlet valve is just commencing to open while the exhaust valve is closing and the ignition unit pick-up rotor arm is pointing towards the back, edge of rear exhaust pipe or roughly, if regarded as the minute hand of a clock, at about twelve minutes past the hour position (see illustration opposite).

TIMING GEAR.

As already described, the timing gear consists of one camshaft running in an enclosed oil bath case on two large bearings and driven from the crankshaft through the medium of a vertical shaft and two pairs of bevel wheels. All eight cams are machined on the one shaft and are accurately ground after hardening to give the correct cam profile. Suitably shaped feet on the rocker ends bear directly on the cams. The rocker arms are mounted in bushes which are free to rock in tunnels bored in the camshaft-housing, so providing the bearing for the rockers, while at the same time sealing to the desired extent the valve chambers from excess oil. The rockers are mounted

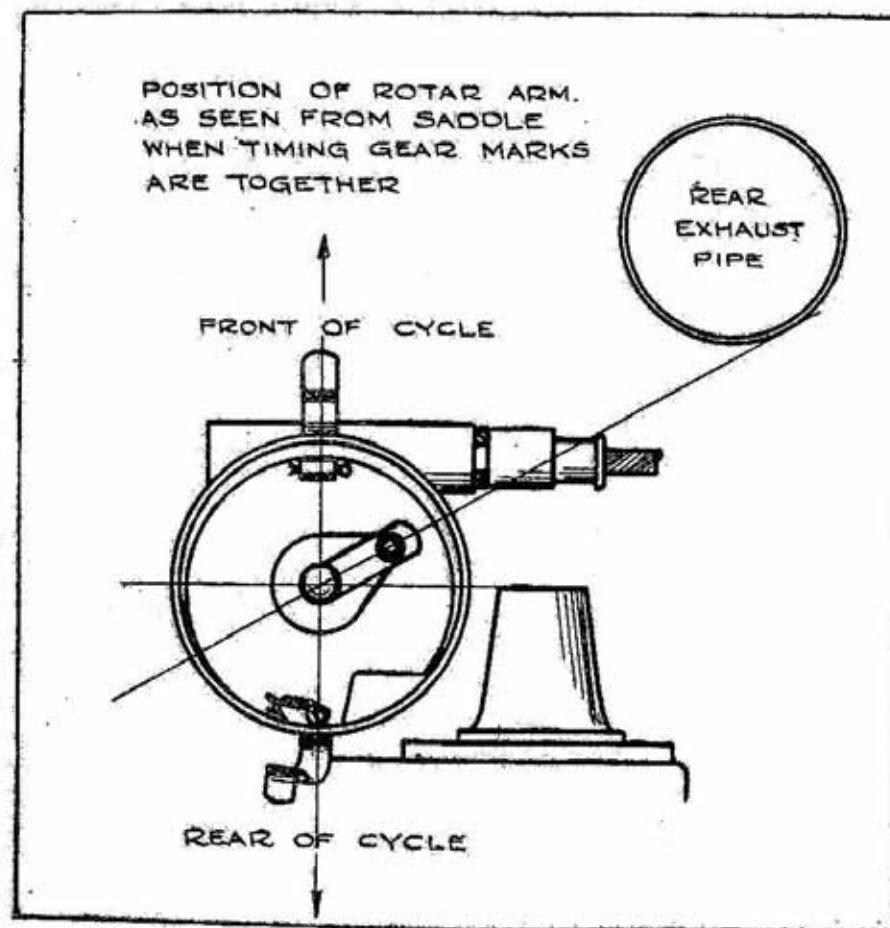


Illustration of position of Rotor Arm when marks on all bevel wheels are together.

Timing Gear—contd.

in two lines of four each, and their large bearings are generously lubricated by splash from the camshaft which latter runs partly submerged in oil. As already described, the timing gears are marked for correct setting, and the valve openings with .008 clearance are as follows:—

Inlet commences to open 20° of 3/32in. before T.D.C.

Inlet closes 65° or 45/64in. after B.D.C.

Exhaust commences to open 65° or 45/64in. before T.D.C.

Exhaust closes 25° or 5/32in. after T.D.C.

NOTE.—For checking purposes the rockers must be set to .008 clearance, but for running the clearance must be .004 for all valves when engine is cold.

DECARBONISING.

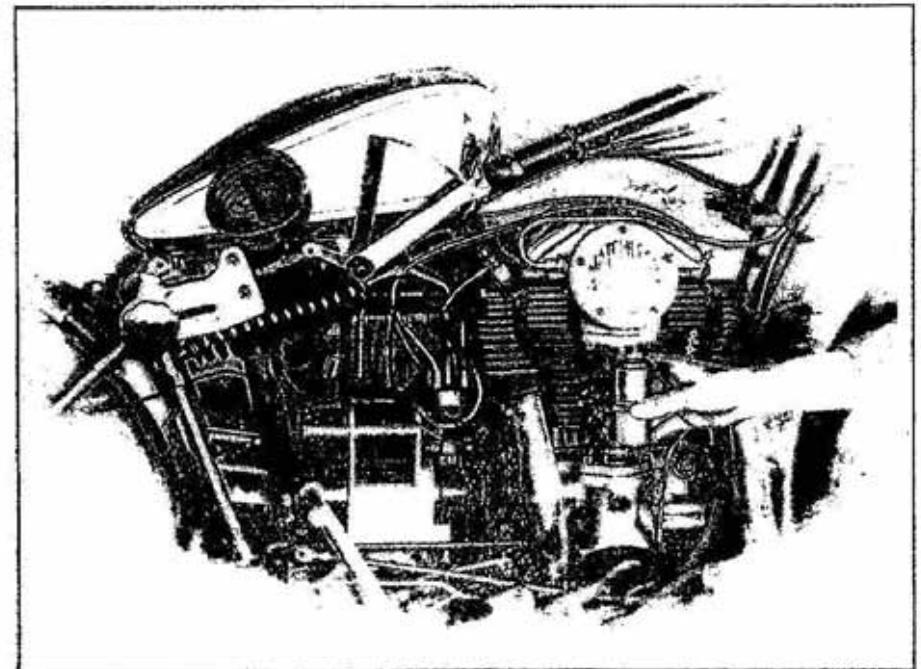
Although the period for which an engine will run satisfactorily without being decarbonised depends largely upon driving conditions, it is nevertheless advisable to carry out this operation once every 3,000 miles. The need for decarbonising will be indicated by a tendency for the engine to ping or knock when ascending hills or upon accelerating, particularly so when hot. Although possible without disturbing the petrol tank, the process of decarbonising is considerably simplified by sliding the tank back in to the approximate position normally occupied by the saddle (see illustration). The procedure is as follows:—first remove the saddle nose bolt and then slack off only the two nuts securing the saddle springs to the frame of the saddle. The springs may then be turned in order to unscrew them from the spring frame side plates to which they are anchored, when the saddle may be removed. Next remove the two bolts securing the petrol tank at its front end and also the nut and bolt securing the rear end. Then disconnect petrol pipe, top end of the gear rod and the small tie bracket supporting the gear quadrant from the top bevel gear housing. The tank may now be slipped back into the position indicated, leaving the entire top of the engine clear. Next remove sparking plugs and cylinder head stay. Then remove the silencer and exhaust pipes and after withdrawing the carburettor air and throttle valves, detach the carburettor body to prevent any damage to same occurring while the cylinder head is removed. Next unscrew the top gland nut of the vertical shaft covering tube and slide this nut, together with the metal collar and rubber gland washer, down the tube sufficiently to expose the top vertical shaft Oldham coupling joint. Next remove the two valve inspection covers and disconnect the oil pipes from the camshaft housing. Next lift the distributor cap on the dynamo unit (cap to which all H.T. cables are connected), and gently revolve the engine until the pick-up rotor arm is pointing to the approximate position shown in the foregoing illustration.

Decarbonising—contd.

The object of this is explained later, and it is only necessary to remark here that in the indicated position all the marks on the various timing gears coincide. Now taking care not to move the engine further, unscrew the twelve holding-down bolts for the cylinder head and camshaft assembly, removing all but the two centre ones marked 1 and 2 on illustration overleaf. The cylinder head and camshaft housing may now be lifted off. Then separate the two units, taking care not to revolve the camshaft or to damage the impregnated asbestos washers on the underneath side of the camshaft housing, which unit should be gently laid aside awaiting refitting. Care must also be taken of the small hardened steel valve end caps and the cylinder head gaskets, which latter should be scraped and cleaned and also laid aside carefully until required. All carbon deposit should next be removed from the cylinder head and valve heads by means of a suitable scraper or an old penknife.

GRINDING IN VALVES.

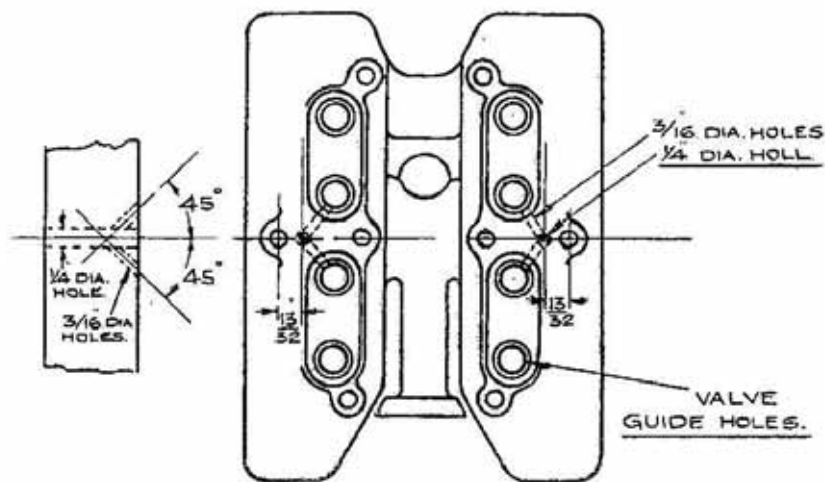
It is advisable to grind the valves in upon each occasion the cylinder head is removed for decarbonisation. To remove the valves it will be found convenient to lay the cylinder head face downwards



Showing saddle removed and tank moved back to facilitate
Cylinder Head removal.

Grinding In Valves—contd.

on a bench with a wooden block under each pair of valve heads. Then give each valve spring cap in turn a sharp tap to release the taper collar, and afterwards compress each spring in turn with the fingers sufficiently to permit the removal of these divided taper collars, when the valves may be withdrawn. It will be observed that each valve head is stamped with a number to correspond with a similar number stamped on the cylinder head, and care must be taken to grind in and replace all valves in their correct position. Having removed any deposit from valve stems and valve ports, smear the seating with a thin layer of grinding paste (obtainable already mixed), and after inserting the valve to be ground in its correct position turn by means of a screwdriver applied to the slit across valve head, to and fro only, never making a full revolution. After a few such movements raise the valve head off its seating and turn it slightly, afterwards repeating the to and fro movement. Continue the process until the grinding paste ceases to bite when remove the valve and carefully wipe. If all traces of pit marks have not disappeared apply another coating of paste and grind in as before. Generally one application only is sufficient to restore the seatings of either inlet or exhaust, although it may on occasion be necessary to apply a second or even a third coating to the latter in order to obtain the desired clean matt finish. Before replacing the valves, it is desirable to clean out the diagonally drilled drain holes which connect up with the tubes passing through the cylinder block. To make the location of these holes clear, a sectional illustration of the cylinder head is given below. It should be explained that these holes have a tendency to become choked with sludge and carbon deposit and when this occurs there is no possible



VIEW SHOWING DRILLING OF THE
CYLINDER HEAD.

Grinding In Valves—contd.

outlet for oil which is splashed out from the camshaft tunnel into the two valve chambers, with the result that oil accumulates in these chambers and is eventually drawn into the combustion chambers, via the inlet valve guides. This, of course, results in very heavy oil consumption, usually accompanied with a very smoky exhaust and naturally very rapid carbonisation. It is therefore necessary to take the advised precaution each time the cylinder heads are removed. Having done this and satisfactorily dealt with all valves, both they and the cylinder head should be carefully washed in petrol, making quite certain that no trace of the grinding mixture remains on either. The valves may now be refitted in their correct position, each stem prior to refitting being smeared with graphite grease for preference, or failing that, engine oil may be used as a poor substitute. Lastly the hardened steel valve end caps should be refitted, when the camshaft housing may then be applied to the head, care being necessary again to avoid damage to the asbestos joint washers. It must be remembered that the whole assembly, i.e., the head and camshaft housing, must be refitted exactly as removed, i.e., with the two holding-down bolts 1 and 2 already in position.

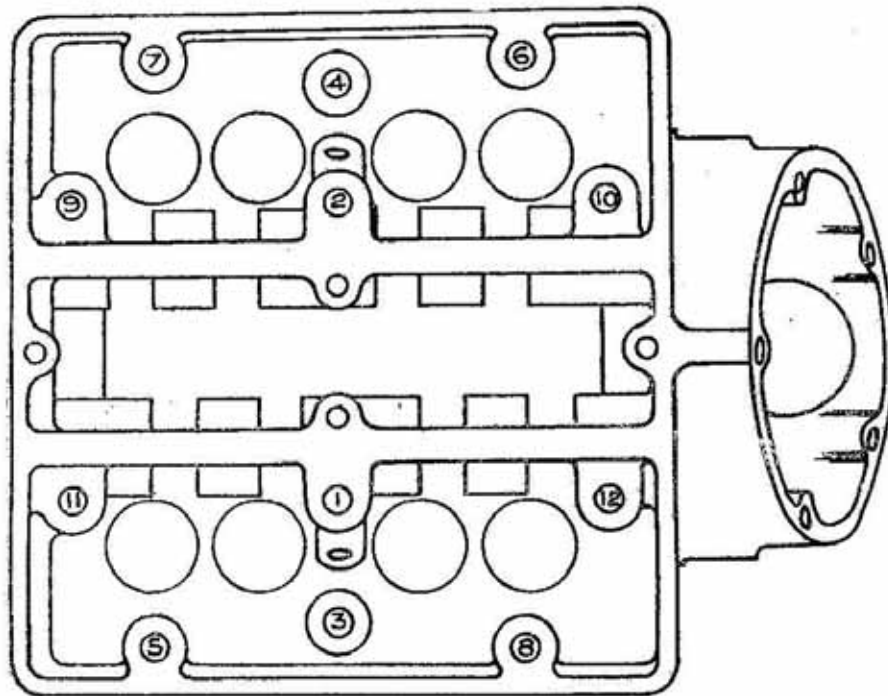
REFITTING CYLINDER HEAD.

Before refitting the head the carbon deposit must be removed from piston tops. To do this, revolve the engine until one piston is at the top of its stroke, when after covering the other three cylinder tops with a calico rag to prevent the admission of any carbon chips, carefully scrape the piston top with a suitable scraper or an old penknife, afterwards wiping off all traces of the deposit. Repeat the process until all pistons have been dealt with, in each case covering the cylinder tops to prevent chips entering, and lastly carefully wipe the top face of cylinder block. Now carefully revolve the engine until the pick-up rotor on the ignition unit comes to the position already described in the removal instructions and then lay the cylinder head gaskets in their correct positions on cylinder block. Next gently place the cylinder head and camshaft assembly in position, when if the camshaft has not been moved the top vertical shaft joint should roughly register. Gently work this joint into correct engagement and then introduce the various cylinder head holding-down bolts, making certain that they each pass through the corresponding holes in both asbestos jointing washers and cylinder head gaskets. Screw all the bolts down finger-tight only and then going over each with a spanner in the order shown in the sketch gently tighten down. Lastly, again in the order shown, apply more pressure until all are firmly and evenly tightened down. It must be explained here that there are four positions in which the vertical joint can be coupled, only one of which, however, will give the correct synchronisation of valve and ignition timing. If the camshaft has not been revolved during the dismantling or re-erection process the correct connection will be automatically obtained. Should there be any doubt on the matter the correction if made before the head is fitted

Refitting Cylinder Head—contd.

will save a good deal of unnecessary labour, and in such an event all that is necessary is to remove the top bevel chamber cap (secured by five cheese head screws). Then while holding the camshaft housing up sufficiently to permit, turn the projecting end of the shaft from the housing until the marks on the bevel gear teeth coincide when, providing the engine has been revolved to give the described position for the pick-up rotor, the tongue portion of the vertical shaft coupling will be in the correct position to engage the corresponding slot in the shaft projecting from the camshaft housing. Having completed the refitting of cylinder head, slide the top vertical shaft covering tube gland nut and washer up into position and firmly screw home. Next refit the pick-up cap and then gently revolve the engine and check in turn each valve rocker for correct clearance, making any adjustment necessary while the tank is still well out of the way. As already mentioned the correct clearance is .004 and .006. A feeler of correct thickness is provided in the tool kit. Now refit the valve inspection

FRONT.



REAR.

Plan View showing order for slacking and re-tightening cylinder head fixing bolts.

Refitting Cylinder Head—contd.

covers, sparking plugs and cables, camshaft housing oil pipes, carburettor, cylinder head stay, petrol tank, gear quadrant stay, gear rod, saddle and exhaust pipes all in their order of removal, when the machine is again ready for the road.

IMPORTANT NOTE.—In the event of new copper and asbestos cylinder head gaskets or asbestos impregnated jointing washers being fitted, it is of the utmost importance to run the cycle subsequently for ten to fifteen miles with a generous rocker clearance, not less than .008. After this distance has been covered the washers will have settled down and the twelve cylinder head fixing bolts should be given a final tighten down, still in the order shown. Finally the rockers should be set to their correct clearance.

REMOVING CYLINDER BLOCK.

Upon each alternate decarbonisation, or not less frequently than once every 5,000 to 6,000 miles, the entire cylinder block should be removed in order to examine the piston rings and clean out the grooves in which they operate. To do this, first remove cylinder head, etc., as already described, then after removing the four cylinder holding-down nuts, gently lift the block of the pistons. Help is desirable during both the removal and refitting of the cylinder block, in the former to prevent the connecting rods rocking and possibly bruising the crankcase edges, and in the latter to carefully introduce the pistons into their respective bores, square with same, instead of square with the cylinder base as is usual. All cylinder bores are generously chamfered to facilitate the easy entry of the pistons, but considerable care is necessary to avoid damage to the fragile rings. All piston rings should be carefully examined, and any showing brown marks, particularly near the ends, should be replaced, as such symptoms are a certain indication of leakage. When new the ring gap when fitted in the cylinder should be .004 to .008.

TO REMOVE PISTONS FROM CONNECTING RODS.

It will be observed that the gudgeon pins are held in position by means of spring rings operating in shallow grooves cut in the bore of the piston bosses. Only one of these rings need be removed to permit the withdrawal of the floating gudgeon pin. To remove the spring clip, grip the projecting ends in the jaws of a small pair of pliers. A little pressure so applied will contract the spring ring sufficiently to allow its extraction, after which the gudgeon pin may be pushed out. Under no circumstances should the pistons be interchanged and it is important also that their position on the rod to which they are fitted is not reversed.

Care is necessary to avoid unduly compressing the spring circlips upon removal or re-assembly, and it should be observed upon refitting that each is a tight snug fit in its groove. This is of utmost

To Remove Pistons from Connecting Rods—contd.

importance and in the event of finding them otherwise upon refitting, they must be withdrawn and opened out by pressure from the fingers or alternatively renewed. For the latest type square-edge circlips, a special pair of pliers may be obtained, price 6d. This new type, although somewhat more difficult to insert, are much more robust than the earlier wire type, and are much less easily dislodged when in position. Remember if these circlips are not properly fitted a ruined cylinder will most likely result.

REFITTING CYLINDER BLOCK.

Before refitting the cylinder block carefully wipe all the bores out and also all pistons with a clean calico rag. Then generously smear both piston and cylinder bores with fresh engine oil, and having observed that the base jointing washer is fitted correctly, gently apply the block with the pistons as mentioned earlier, square with the bores and not with the base as is usual. Gently work the cylinder on to the pistons with a slight rocking motion. See that the four base nuts are evenly and firmly tightened down.

NOTE.—A set of four piston ring clamps to facilitate cylinder refitting can be obtained, price 2s. 6d. per set.

TO RE-TIME IGNITION.

Should it at any time be found necessary to reset the ignition timing it should be done as follows:—First remove the two off side fixing bolts and loosen only the near side bolt securing the ignition unit. Now draw the entire unit back upon its platform about half-inch, when the head of this third bolt can be passed through the large end of the pear-shaped slot provided in the platform for the purpose. The unit may now be drawn back until the rubber coupling is disengaged and it should be arranged that the rubber coupling comes away with the unit instead of remaining on the driver attached to the engine shaft. Now apply a spanner to the nut securing the driving disc on engine shaft and turn clockwise to loosen, the nut in question being left-hand thread. Next gently lever the driving disc off the taper end of the shaft to which it is attached, but do not remove. Now tighten the left-hand thread fixing nut sufficiently loosely to permit the disc to be turned on the taper end shaft with some pressure from the fingers. Next slide the ignition unit back into proper position with the holes in the rubber disc engaging the pins on the loosely fitted driver. Now set the piston of No. 1 cylinder, i.e., right hand front, to 9/16in. before the top of its firing stroke (i.e., the top of the stroke at which both valves are closed). Now fully advance the ignition lever and after removing the distributor cap (i.e., cap to which all H.T. cables are connected) turn the shaft of the ignition unit by means of the rubber coupling in its normal direction of rotation until the contact points are just breaking on the No. 1 cam. The correct cam may,

To Re-time Ignition—contd.

of course, be identified by the position of the pick-up rotor arm which on the No. 1 cam will be opposite the H.T. cable entry marked 1. Now taking great care not to move either the engine or the loosely fixed driver, again slide the ignition unit back upon its platform and carefully tighten the left-hand thread nut securing the driving disc, when the unit may be again tightened down upon its platform. It should be explained here that looking down on the distributor cap when seated on the cycle the right rear socket No. 1 carries the cable for No. 1 cylinder right-hand front, the left rear socket No. 3 carries the cable for No. 3 cylinder, left-hand front, the left side front socket No. 2 carries the cable for No. 2 cylinder, right-hand rear and lastly the right side front socket No. 4 carries the cable for No. 4 cylinder, left-hand rear.

GEAR BOX.

The construction of the gear box is roughly as follows:—The body or shell consists of an aluminium casting secured to the rear engine cradle plates by two bolts, which pass through the casting and also through holes in the engine plates. This shell carries a main and also a secondary shaft, upon each of which is mounted four gear wheels, by the alternate clutching of which to their respective shafts by means of keys or splines, four speeds are obtained. The sliding movement of the gears is imparted by means of a lever operating in a suitably shaped quadrant fixed to the tank and the correct location of each gear position is ensured by an internal indexing spring plunger. The clutch consists of cork-faced sliding plates, kept in contact with plain metal plates by means of six springs, the pressure of which is released by means of a hand lever operating through the medium of a Bowden cable, and a long push rod passing through the mainshaft. In driving, it should always be remembered that the engine gives best results when running smoothly. It should not be driven at low speeds on top gear with full throttle, as this will cause snatch in the transmission, leading to heavy tyre wear and unevenly worn chains. The gears should be freely used, and at the least sign of jerkiness when hill climbing or running slowly on the level, a change to a lower gear should be made. It is not possible to lay down a hard and fast ruling on this matter, as conditions vary to such a large extent as the result of the load carried, wind velocity, etc. Generally speaking, however, it is desirable to change down to third gear on the level when the road speed falls below 20 m.p.h., and on a steep hill when the speed falls below 25 m.p.h., and to second gear when the speed in third drops below 16 m.p.h. The bottom gear is only required for exceptional or emergency circumstances, such as re-starting on a steep hill. Always remember to make full use of the gears, as although for example very low speeds on top gear are obtainable, for a fast get-away the gears must be used.

TO REMOVE GEAR BOX END PLATE FOR EXAMINATION OF GEARS.

First remove kickstarter crank, after which the return spring and cover, together with tubular sleeve, may be withdrawn. Next detach the clutch cable from the push rod operating arm and slip the cable through the slot in the aluminium bracket upon which it is supported. Now remove this aluminium bracket, which is secured by one large nut only, after which all the end plate nuts may be removed, leaving the plate free to be withdrawn. In the actual withdrawal process pressure should be applied to the end of kickstarter axle in order to prevent same, and also possibly the layshaft upon which it is mounted, being drawn out of position. The gears will now be exposed. The re-assembly must be made in reverse order, care being necessary to see that the kickstarter pawl does not foul the trip cam rivetted to gear box end plate, before the end plate nuts are tightened down.

NOTE.—While the end plate is being removed, a pan or some receptacle must be placed underneath to catch the lubricant, the bulk of which will run out. When re-assembling, the faces of the end plate and gear box must be thoroughly cleaned and a new paper washer used if the old one has been damaged. Preferably coat with quick-drying gold size.

TO REMOVE GEAR BOX ENTIRELY.

First remove the near side footrest hanger, then withdraw the footrest rod, together with the off side hanger and distance tube. Now place a receptacle of some kind underneath the front chain case to catch the oil contained therein, and after removing the fourteen screws securing the outer plate of this case, gently remove same, taking particular care to avoid any buckling or damage to the joint faces. Next gently withdraw in one unit the two spring tensioning blades, together with the spring shoe. This may best be done by pulling the rear ends of the spring blades out of their anchorage with a pair of pliers, and at the same time working the spring shoe outward with the fingers. Next remove the six clutch spring screws and then the springs and thimbles, when the clutch plates may be drawn off the clutch hub. Now remove the respective nuts securing the engine shaft sprocket and the clutch hub to the gear box mainshaft. Then with the special extractor provided in the tool kit release the engine shaft sprocket, draw same together with the clutch sprocket and front chain off in one unit. Now draw off the clutch hub, which is a sliding fit only on the splined gear box shaft, and gently remove the oil sealing disc and spring fitted at the rear of this hub. Next disconnect and remove the rear chain. It will now be necessary to lean the near side of cycle against a wall or alternatively jack up with boxes of suitable height in order to permit the removal of prop stand. This is accomplished by detaching the spring and then removing the pivot bolt. The stop bolt must then be removed, together with the two distance tubes between the rear engine plates through which the two stand

To Remove Gear Box Entire —contd.

bolts pass. Next from the off side of cycle, remove the footrest hanger, front portion of rear brake rod, brake pedal, exhaust pipe, clutch cable, and the two bolts which pass through gear box shell and also cradle plates. Next remove all nuts securing the off side cradle plate, also the two bolts securing same to the platform, and the other securing the platform support bracket. Now remove this small bracket and also the silencer support arm. Next remove the split pin from the gear rod yoke end attached to the gear striker lever on gear box, and withdraw the pin. The off side cradle plate may now be removed. Then after removing the nut securing the near side of gear box tie bar, the box itself may be removed and the speedometer cable detached. The replacement of all parts must be carried out in the reverse order to their removal, and there are one or two details that require special attention during the re-assembly. Firstly, before tightening the tie bar nuts or the bolts which secure that gear box to the cradle plates, make certain that the shallow tongue or feather on the gear box shell registers correctly with the groove provided for it on the cradle plate. Secondly, when the clutch hub and oil retaining washer are being refitted make certain that the nuts on the back of the former register with the serrations on the washer which is intended to revolve with the hub. Do not omit the spring for this oil-retaining disc and make certain that it is in correct position. Lastly do not under any circumstances run the engine until the oil level has been restored in the front chain case. Although a somewhat lengthy description is necessary for this gear box removal process it will in practice be found quite straightforward should the occasion arise.

CLUTCH ADJUSTMENT.

In the event of clutch slip being experienced the adjustment of the clutch operating cable should be suspected. When adjusted correctly it should be possible to move the clutch operating arm on the gear box not less than 1/32in. laterally to and fro with the fingers, and if this free movement cannot be felt the cable stop should be adjusted accordingly. Alternatively the screw which operates on the clutch push rod may be slacked off, but if the adjustment is made here it is important that the nut securing this screw be carefully tightened subsequently.

TO ADJUST REAR CHAIN.

Owing to the fact that the movement of the spring frame affects slightly the tension of the rear chain, it is essential when checking or making adjustments to the latter, to set the frame in the normal position occupied when rider is seated, and springs consequently somewhat compressed. To ensure this it is necessary to sit upon the cycle with wheels on the ground and excessively tighten the frame dampers so that the friction is sufficient to hold the frame in its somewhat compressed state when the load is removed. Having proceeded as above, next slack off slightly the two wheel axle nuts and then care-

To Adjust Rear Chain—contd.

fully raise the cycle on to the prop stand. If the frame damper has been properly tightened the rear tyre will be well clear of the ground, and it must be noted that this is so. Now adjust chain as required by means of the adjuster bolts provided, taking care to screw the bolts in to a similar extent. The chain tension should be tried in a number of positions by revolving the rear wheel, and the correct adjustment at the tightest place should allow a movement up and down midway between the sprockets of $\frac{1}{8}$ in. to $\frac{1}{4}$ in. Finally, carefully re-tighten the wheel axle nuts and return the damper adjustment to normal. Care is necessary when tightening the rear chain to leave the wheel in correct alignment. When correct, a piece of thin string stretched taut across both wheels, and about four inches from and parallel to the ground, should be observed to just touch each tyre at both sides of wheel centre simultaneously. Alternatively a straight wooden batten, about five feet long, is a very handy article to be used for the purpose of checking wheel alignment applied as in the case of string parallel to and about four inches from the ground.

FRONT CHAIN ADJUSTMENT.

Correct adjustment of the front chain is automatically maintained by means of the patented tensioning device, and the only attention required is to verify and if necessary bring up to the correct level the oil normally contained in the chain case. A level plug is provided at the rear of the case and at least every 500 miles the oil level should be checked and topped up if necessary. A 50-50 mixture of ordinary engine oil and paraffin recommended as mentioned elsewhere.

ADJUSTMENT OF GEAR CONTROL ROD.

As already mentioned, in changing gear a slow steady firm movement is very much preferable to a violent jerk and under no circumstances should the gears be allowed to grate. If any difficulty is experienced in obtaining the gears the adjustment of the control rod should be tested. To do this place the machine on the stand and while moving the rear wheel to and fro work the gear lever into third gear position. Then remove the top gear rod yoke end pin, i.e., the pin which passes through the end of gear lever. Then lightly alternatively pull and push the gear rod by hand in order to feel the action of the gear box internal spring indexing plunger. As the sliding gears move either side of the correct third gear position the resistance of this spring plunger will be plainly felt and the exact position at which this plunger is in full engagement with the third gear notch must be accurately and definitely found. Having established this correct position offer up the gear rod to gear lever which latter must, of course, be in the third gear position of the gate and then screw the top gear rod yoke end up or down as the need may be until the yoke end pin can be quite freely inserted. Before locking the yoke end in position it is advisable to again obtain by hand the correct third gear position and check the rod length for

Adjustment of Gear Control Rod—contd.

correct setting, after which the yoke end may be secured and the pin refitted. It must be understood that if the correct adjustment is obtained for the third gear all the remaining gears will also be correct as regards rod adjustment. Keep all joints lubricated.

STEERING HEAD ADJUSTMENT.

The steering head should be occasionally tested for correct adjustment by exerting pressure upwards from the extreme tips of the handlebars with the steering damper well slacked off. Should any shake be felt it must be immediately taken up as follows:—

First loosen the top nut on the steering column and then screw the under nut down until all shake has disappeared, when securely lock in position by means of the upper nut.

IMPORTANT NOTE.—To guard against unconsciously overtightening the head bearings, the effect of which is extremely difficult steering, it is advisable to jack up the front of the machine (a box of suitable height under oil supply tank will serve), in order that all shake may be taken up satisfactorily and the steering head left perfectly free.

TO ADJUST FRONT FORKS. SPINDLE ADJUSTMENT.

Provision is made for taking up side or endwise wear of the various fork spindle bearings. The need for such adjustment will be made apparent by a click or creaking noise when the steering head is abruptly turned. First by placing the fingers partly over the spindle link end and partly upon the lug through which the spindle passes, while the steering head is turned, ascertain which spindle or spindles require adjustment. Then after slacking off both end nuts, turn the spindle bodily by means of its hexagonal end, left-hand or contra clockwise to tighten. Do not turn at the most, more than one half a revolution before a re-trial with the end nuts tightened, as it is essential to guard against overtightening, when the fork will become stiff in action or most likely refuse to function entirely. It should be explained here that the fibre washers fitted between the spindle lug ends and the spindle side plates are not intended for frictional purposes, but to prevent actual seizure in the event of the spindles being adjusted too tightly. The necessary damping action is provided independently and should be adjusted as follows:—

TO ADJUST FORK ACTION DAMPER.

The fork action damper can best be adjusted while the cycle is actually in motion, and a badly corrugated surface such as may be found on many bus routes provides the best condition for the purpose. The ebonite damper hand nut should be screwed sufficiently tight to make the fork action sluggish under such circumstances as those described and will subsequently require very little variation for other conditions of road surface to provide the maximum degree of comfort.

SPRING FRAME ATTENTION.

The rear wheel springing arrangement, as will be seen, is extremely simple in layout and possesses perfect lateral rigidity. The moving portion carrying the rear wheel is hinged on "Silentbloc" bearings, and therefore requires no lubricating or other attention whatsoever. The spring damping action is arranged by means of fibre discs which slide across both faces of two parallel steel plates bolted to the frame seat lug. Since these plates are not adjustable, provision against wear of the inner friction discs is made by clamping the spindles which carry same in the top bridge lug. Although wear of the friction discs is almost negligible, nevertheless once each season or each 5,000 miles, the two clamping bolts in the top bridge lug should be slacked off, and the hand adjusting ebonite nuts screwed up as tightly as possible, in order to draw the spindles out of the clamping lug, when the pinch bolts should be again tightened securely and the damper hand-nuts re-adjusted to give the desired degree of friction. It will be found that the amount of friction required to give the maximum comfort varies considerably with the road surface, i.e., the rougher the surface, the more damping action will be required. For all normal conditions it will be found quite satisfactory to adjust this damping action in exactly the same manner as prescribed for the front forks, taking care to adjust each side nut to give as near as can be judged, equal pressure. Rubber stop buffers are provided to limit the spring frame movement, but only an exceptionally severe jolt will compress the springs sufficiently to bring these buffers into action, and the remedy is to apply more friction.

TO ADJUST WHEEL BEARINGS.

To adjust either front or rear wheel bearings, which are of the taper roller type, first slack off the left hand side spindle nuts. Then loosen the outer of the two lock nuts on the inner side of fork ends and turn the inner of these two nuts in the required direction, i.e., clockwise to tighten the bearing adjustment and contra-clockwise to loosen. After making the adjustment and before tightening the outside spindle nut, be careful to securely tighten the outer of the two lock nuts inside fork end, after which the axle nut must be securely tightened.

IMPORTANT NOTE.—It must be understood that taper roller bearings must not be adjusted tightly, and unless a trifling amount of slackness is observed it is possible quite unknowingly to impose an enormous crushing strain on the slightly tapered rollers without same being made apparent by undue friction. This slight slackness must therefore always be maintained.

TYRES AND SERVICE.

To obtain satisfactory life and service from the tyres is largely within the user's control, and the first essential to obtain this is proper inflation. The correct amount of pressure is governed substantially by the load to be carried, and it is therefore difficult to lay down a hard and fast ruling. Assuming the weight of driver to be normal,

Tyres and Service—contd.

the pressures recommended below may be regarded as satisfactory, and we urge all users to make a practice of checking the actual pressure by means of a low-pressure Schrader tyre gauge. This takes a few seconds only, and will amply repay the owner by reason of additional service and immunity from failures.

		Solo.	With pillion passenger.	
Front wheel 26x3.25	...	15-16lbs.	...	15-16lbs.
Rear wheel 26x3.25	...	22-23lbs.	...	24-25lbs.
Front wheel 27x4	...	13-14lbs.	...	13-14lbs.
Rear wheel 27x4	...	19-20lbs.	...	21-22lbs.

INCORRECT ADJUSTMENT OR MISUSE OF BRAKES.

With the highly efficient brakes fitted, harsh application is liable to result in heavy tyre wear. Particularly does this apply if the brake coupling is not correct, thereby allowing a large proportion of the braking effect to be taken by one wheel only. The instructions given hereafter regarding brake synchronisation should be carefully followed, and under no circumstances, other than emergency, should the brakes be applied sufficiently harshly to cause either of the wheels to stop revolving or to cause a squeak of protest from the tyres.

BRAKE CONTROL ADJUSTMENT.

Owing to the fact that the foot operation of the front wheel brake is effected through a Bowden cable, it is necessary in order to obtain the correct and maximum braking effect to adjust the controls so that the front brake is applied slightly before the rear. To do this both wheels should be jacked up on stands, and during the process of setting the knurled adjusting nuts, the brake pedal should be lightly applied and the controls so adjusted that when it becomes difficult to move the front wheel against the action of the brake, the effect is only just noticeable on the rear wheel. When correctly adjusted, both wheels must, of course, turn freely when the brake pedal is released, and upon applying a moderate pressure to the brake pedal it should be observed that application of the hand brake lever does not cause any additional movement of the front brake expander lever, this indicating that the brake in question is in full engagement. Any tendency of the back wheel to squeak or skid upon a moderately strong application of the brake pedal indicates that the adjustment of the front brake foot operated cable is not sufficiently in advance of the rear, and in such a case the remedy is to either tighten up the front adjustment slightly or alternatively slacken the rear.

CUTS IN TYRES.

Any but superficial rubber cuts are a menace to the whole tyre structure. The tyre casing retains its strength only so long as the whole of its plies are unbroken. If two or three strands are severed, the whole tyre casing is weakened and a large burst may result. The penetration of wet and road matter results in rapid deterioration of

Cuts in Tyres—contd.

the casing material to which it may gain access. Covers should be periodically examined, and any cuts, other than those purely superficial, efficiently repaired.

CONCUSSION BURSTS.

If a tyre when travelling and bearing its share of the load, comes into contact with an obstruction, the impact, which is a product of the load carried and the velocity of the vehicle, may reach an extremely high figure and produce an excessive localised strain upon the material forming the casing, and a resultant fracture. The tread rubber, owing to its nature, may not show perceptible signs of bruising or damage as the result of even the most severe blow. An incorrectly inflated tyre is more susceptible to damage resulting from such blows than one inflated to the recommendations on previous page.

CARBURETTOR ADJUSTMENT.

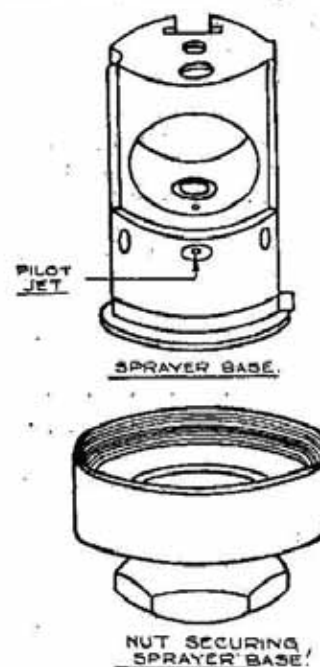
Although owners are advised to refrain from tampering without good cause with the setting of the carburettor, a rough idea how this unit functions and how adjustments may be effected is given below. The correct level of petrol is maintained by means of a float and needle valve operating in much the same manner as the ball float and valve of an ordinary domestic water cistern. The correct level is obtained by the carburettor manufacturers, and no alteration under any circumstances should be made. In the event of a leaky float or worn needle valve, the part in question should be replaced. Control over the main petrol supply to the engine is obtained firstly by the jet or orifice, and secondly by a taper needle passing through the jet and attached to the throttle valve. As the throttle valve is opened a smaller part of the taper needle comes into action, thereby increasing the passage for the petrol. This needle, being adjustable in length, provides a fairly wide range of control without actual alteration to the jet size. A pilot or slow running jet is provided to take care of slow running or idling, and a throttle stop controls the actual speed at which the engine runs when the throttle is closed to the maximum extent possible, in which position the engine should run or "tick over," to use an expression favoured by motor cyclists, slowly but positively. The correct setting of the main jet should permit of full air being used when running fast on full throttle. To test for correct setting, start up engine, and after allowing a few seconds to warm up, fully retard the ignition and fully open throttle. If it is now possible to open the air beyond the one-third or half open position it would indicate a too large jet, and the needle attached to throttle valve must be lowered or lengthened. This needle, it should be explained, is secured by a flat strip cotter engaging with a small notch in the needle. Several of these notches are provided to permit adjustment. When correct, the engine should commence to splutter immediately the air lever is opened more than about one-third, but should run satisfactorily on the fully closed air position. In no circumstances should the engine be run for more than a few seconds in this fully retarded, fully opened throttle

Carburettor Adjustment—contd.

position. The only other adjustments are the air supply to the pilot jet and the throttle stop. The adjusting screw for the pilot jet air supply will be observed at the base of the mixing chamber. Screwing in enriches the mixture and, vice versa, unscrewing weakens it. It must be clearly understood that adjustments to this screw affects the mixture only on extremely small throttle openings. Having set the throttle stop screw to give the desired idling engine speed, the pilot jet air screw is turned in the required direction to give even firing. The adjustment is not particularly sensitive, and no difficulty should be experienced in finding the correct position, when the locking nut should be tightened down to prevent any movement by vibration. Adjustment, if any, should be made to this air screw while the engine is warm and the ignition fully or nearly fully advanced and air lever one-third open. We mention this in order to remove the possible impression that the pilot jet setting is not correct should the engine stall when started up from cold. Once correctly set the pilot jet

should not require attention, except perhaps in extremes of temperature.

In the event of adjustment of the air screw failing to affect slow running in the manner described, it may be reasonably assumed that the minute passage for petrol has become choked. This is always a possible danger unless meticulous care is taken to prevent the entry of dust or foreign matter of any description into the petrol tank. The jet or petrol passage in question consists of a small hole drilled in the side of the sprayer base. This sprayer base may be pushed out of the mixing chamber upon removing the float chamber and the large nut at the bottom of the mixing chamber. To make the location of the petrol passage in question quite clear, a line illustration is shown, and in the event of difficulty being experienced, a fine piece of steel wire (a strand of Bowden cable will do) should be passed through the very small hole indicated by an arrow.



TO REMOVE REAR WHEEL.

First put down the centre prop stand by holding same on the ground and gently pulling the cycle backward. Next lean the cycle bodily to one side sufficiently to permit of the attachment of one side prop stand lengthening piece, after which lean the cycle to the opposite direction to apply the other side extension piece. The rear wheel will now be well raised from the ground. Now disconnect the rear brake rod cross head by withdrawing the split pin by which it is attached

To Remove Rear Wheel—contd.

to the brake shoe expander lever and also disconnect the rear chain connecting link, after which release the wheel axle nuts. The wheel is then ready to be removed by drawing same backward until the axle is free from the slotted fork ends, at the same time twisting the wheel in the fork to release the brake cover plate anchorage.

NOTE.—See instructions re wheel alignment when refitting wheel (To Adjust Rear Chain).

TO REMOVE FRONT WHEEL.

First put down prop stand with extensions as directed above and then raise the front of cycle on to the front wheel stand, which it should be explained is not sufficient to provide a safe balance by itself. Then remove the nut securing the expander lever and gently force this lever off the splined end of the expander to which it is attached. Next withdraw the two cables from their anchorage, and after slacking off both axle nuts, gently force out each washer from the recesses in the fork ends in turn with a stout lever, at the same time exerting pressure downwards upon the wheel, which will then fall out of position.

PERIODICAL INSPECTION OF NUTS.

Satisfactory service depends largely upon the necessary immediate attention to details. The old adage "A stitch in time saves nine" applies with particular force to motor cycle maintenance. Make a point of occasionally testing the security of all nuts. There is possibly more dissatisfaction and damage caused through neglecting details than for any other reason. It must be remembered that a motor cycle is a highly specialised piece of engineering, and that while it does not call for great engineering skill in driving, the exercise of a little mechanical sense and the occasional use of a spanner, cleaning cloth, etc., is very necessary if the maximum service is to be obtained with the requisite degree of satisfaction. Therefore, do not wait until to-morrow, but adjust it now.

CLEANING.

If the machine is used to any extent in bad weather, a small hose is almost indispensable for removing mud. Care should be exercised to avoid directing water on to the engine and magneto, or other such parts. If a hose is not available, soak dirt with paraffin before removing. Do not attempt to rub or brush mud off an enamel surface when dry, or the polish will soon be destroyed. For the engine, magneto, etc., a good stiff paint brush and a pot of petrol is preferable.

IMPORTANT NOTE.—Upon no account should ordinary metal polishes be used upon chromium-plated parts, as almost without exception such polishes contain oleic acid which attacks chromium. Should the chromium plating become dirty or lacking in lustre, a little "Goddard's Silver Plate Powder" should be used. This powder, incidentally, is obtainable at any domestic store. Reckitt's "Karpol" is also recommended for cleaning purposes.

CORRECTIVE MEASURES.

No adjustments should be made nor any part tampered with until the cause of the trouble is known. Otherwise adjustments which are correct may be destroyed.

Engine Suddenly Stops :—

- Petrol shortage in tank.
- Choked petrol supply pipe or tap.
- Water in float chamber.
- Oiled-up or fouled sparking plug.
- Water on distributor cap or sparking plugs.

Engine Fails to Start :—

- Lack of fuel, or insufficient flooding if cold.
- Oiled-up sparking plug.
- Stuck-up valve, or valve stem sticky.
- Weak valve spring, or valve not seating properly.
- Too liberal throttle opening.
- Ignition switch not on (electric models only).
- Contact breaker sticking.
- Choked pilot jet.
- Run-down battery (no warning light visible).

Loss of Power :—

- Valve or valves not seating properly.
- Weak valve spring or springs.
- No tappet clearance or excessive clearance.
- Lack of oil in tank.
- Brakes too closely adjusted.
- Badly fitting or broken piston rings.
- Punctured carburettor float.
- Silencer choked with carbon deposit.
- Late ignition.

Engine Overheats :—

- Lack of proper lubrication.
- Weak valve springs.
- Pitted valve seats.
- Worn piston rings.
- Late ignition setting.
- Punctured float, causing rich mixture.
- Air control to carburettor out of order.
- Silencer choked with carbon deposit.

Engine Misses Fire :—

- Valve spring weak.
- Defective or oiled plug.
- Incorrectly adjusted contact breaker.
- Incorrectly adjusted tappets.
- Defective sparking plug cable.
- Contact breaker arm sticking.
- Choked petrol jet.

INSTRUCTIONS FOR THE LUCAS ELECTRICAL EQUIPMENT FITTED TO THE "SILVER HAWK."

The equipment comprises the combined dynamo and coil ignition unit, type DFV4, the type S51 head lamp, MT110 tail lamp, R370 side-car lamp (when required), high-frequency type HF314 horn, and an instrument panel mounted on the handlebars housing the control switches and instruments. The instruments are illuminated by indirect lighting controlled by means of a switch in the panel.

Access to the panel lamp is obtained by removing the speedometer head, whereupon the bulb can be easily removed and replaced through the aperture normally occupied by the speedometer.

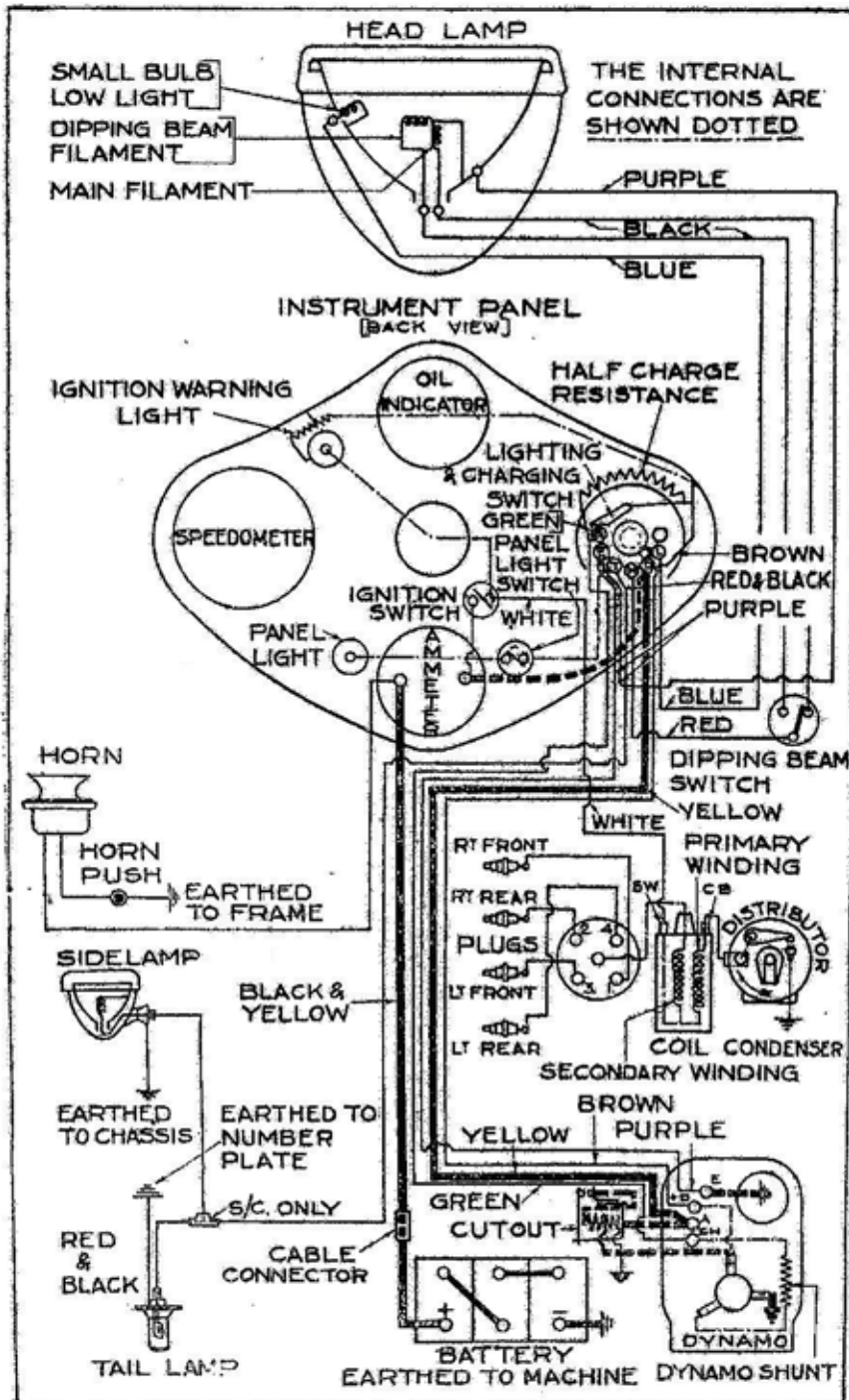
The DFV4 machine houses the dynamo, the cut-out, the ignition coil and the distributor and contact breaker, which is driven by skew gears off the dynamo shaft.

The head lamp is fitted with a double filament bulb: one filament is arranged to be approximately at the focus of the reflector and gives the normal driving light, while the second one, mounted slightly above the other, gives a dipped, anti-dazzling beam for use when meeting traffic or driving in fog or mist. This anti-dazzle device is controlled by a switch mounted on the handlebar. A small pilot bulb is also provided for use when the machine is stationary or for town riding.

The instrument panel houses the ammeter, ignition switch, lighting switch, and an ignition warning lamp which gives a red light to remind the rider to switch off while the machine is stationary.

The dynamo is arranged so that when the lighting and charging switch is in the "½ C" position it gives half its normal output and when the lamps are switched on ("H" or "L" position) it automatically gives its maximum output. A further full charge position marked "F" is provided for continuous daylight slow driving. This position should only be used when driving in heavy traffic, or other conditions which do not provide sufficient charging current on the "½ C" position to keep the ammeter needle in the centre of the scale, or preferably slightly to the "charge" side. Judicious use of the switch must at all times be made, firstly to avoid a discharged battery, and secondly to avoid overcharging. Continuous overcharging will cause excessive "gassing" and rapid loss of acid solution, in addition to serious battery deterioration.

Although it should not be disturbed without good cause, provision for varying the electrical output from the dynamo is made. It will be observed upon removing the end cover that the centre brush is mounted upon a movable clamp. By loosening the clamp screw and moving the position occupied by this brush considerable variation to the charge rate is made. The adjustment is very sensitive and should it be necessary to make any alteration, care must be exercised to avoid an excessive rate of charge, which will ruin the battery and also result in a burnt-out armature. When making adjustment it should be noted that at maximum engine revolutions the charge rate with all lamps on high does not exceed 2 amps. or alternatively with lamps off 5 to 6 amps. See note above re the danger of overcharging.



Wiring Diagram.

MAINTENANCE IN SERVICE.

The equipment should receive regular attention, and where necessary should be cleaned and adjusted in accordance with the instructions given below.

Before disconnecting any lead on the equipment or making any alteration to the wiring, disconnect the positive battery lead to avoid the possibility of short-circuiting the battery.

BATTERY.

Topping Up.—At least once a month, the vent plugs in the top of the battery should be removed, and the level of the acid solution examined. If necessary distilled water, which can be obtained at all chemists and most garages, should be added to bring the level above the top of the plates, but well short of the bottom of the vent plugs. When examining the cells do not hold naked lights near vent, as there is a danger of igniting the gas coming from the plates.

Storage.—If the equipment is laid by for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate any permanent sulphation of the plates. In no circumstances must the electrolyte be removed from the battery and the plates allowed to dry, as certain changes take place which result in loss of capacity.

Testing the Condition of the Battery.—It is advisable to complete the inspection by measuring the specific gravity of the acid, as this is a very good indication of the state of charge of the battery.

An instrument known as a "hydrometer" is employed for this purpose. These can be bought at any Lucas Service Depot, price 4s. 6d.

The specific gravity figures are: 1.285 to 1.300 when fully charged, about 1.210 when half discharged, and about 1.150 when fully discharged.

DYNAMO.

The only parts of the dynamo calling for occasional attention are the brushes and commutator which are readily accessible when the end cover is removed. The brushes should slide freely in their holders. They should be clean, and the face in contact with the commutator should appear uniformly polished. Dirty brushes may be cleaned with a cloth moistened with petrol. The commutator surface must be kept clean and free from oil or brush dust.

Lubrication.—As the bearings are packed with grease before leaving the works, lubricators are not provided. After the motor cycle has run several thousand miles, the dynamo should be dismantled for cleaning, adjustment and repacking the bearings with grease. This is carried out preferably at the nearest Lucas Service Depot. (See list on back page).

DISTRIBUTOR.

Cleaning.—Occasionally remove the distributor moulding and wipe it out with a dry duster, cleaning the metal electrodes, if necessary, with a cloth moistened with petrol. Next examine the contact breaker; it is essential that the contacts are kept clean and free from oil or grease. If they are burned or blackened, clean with very fine emery cloth, and afterwards with a cloth moistened with petrol. Take care to wipe away all particles of dirt or metal dust.

Adjustment.—The contact breaker gap is carefully set and should not be altered unless it varies considerably from the gauge on the ignition spanner. If adjustment is necessary, proceed as follows: Turn the engine until it is seen that the contacts are fully opened, then slacken the locking nut and rotate the contact screw until the gap is set to the thickness of the gauge. After making the adjustment, care must be taken to tighten the locking nut.

Lubrication.—Give the greaser on the side of the distributor one turn about every 500 miles. When refilling the greaser, use a good quality high melting point grease. The cam should be given the slightest smear of vaseline every 3,000 miles, or whenever it appears to be dry.

Renewing High Tension Cables.—When fitting new high tension cables to distributor and coil, the ends should be fitted with special clips as fitted to the original leads (spare part No. R412), and pushed well home into the moulded terminals.

LAMPS.

Replacement of Bulbs and Focussing.—It is essential that correct replacement bulbs are used. Particulars of bulbs fitted in the lamps and instrument panel are as follows:—

For	No.	Watts	Remarks
Headlight (driving and dipped beamlight) ...	624.DVMC	24 and 24	Double filament gas-filled bulb
Headlamp (pilot light), sidecar, tail and panel lamps	B.A.S.8S	3	Centre contact vacuum bulbs
Ignition warning lamp	353.M.E.S.	1.05	Screw cap

Headlamp Type S.51.—To remove the lamp front press the front rim evenly and then rotate to the left (looking at the front of the lamp).

Lamps—contd.

When removing the main bulb for replacement, screw it out two or three turns in an anti-clockwise direction. This will enable the bulb to be withdrawn easily. Care should be taken that the bulb is fitted the correct way round, i.e., with the dipped beam filament above the centre filament.

To enable the lamp to be focussed, the bulb holder is arranged so that it can be adjusted. By turning the bulb in a clockwise direction it is moved inwards, and by turning it in an anti-clockwise direction, it is moved outwards. The best position can be readily found by trial. The normal driving light should, of course, be switched on while focussing is being carried out.

Sidecar Lamp Type R.370.—The front, together with the reflector, can be withdrawn by slackening the fixing screw. The bulb holder can be withdrawn from the back of the reflector for bulb replacement. The bulb holder is provided with alternative locations for the bulb. Each position should be tried for the best result.

Tail Lamp MT.110.—The rear portion of this lamp is removed for a bulb replacement by giving it half a turn to the left, when it becomes detached from its fixing.

ADJUSTMENT OF HIGH FREQUENCY TYPE HF.314 HORN.

The horn will give long periods of service without any attention, but a means of adjustment is provided if required. For instance, should the horn become uncertain in its action, giving only a choking sound, or does not vibrate, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g., a discharged battery, a loose connection or short-circuit in the wiring of the horn. It is also possible that the performance of a horn may be upset by the horn becoming loose on its mounting.

The horn is tuned by moving the adjusting screw in the centre of the front or grille. This screw is notched on its underside. Do not turn through more than one or two notches at a time. The best adjustment can be found by trial. It should be noted that the centre screw is the only one provided for adjustment and no other screw should be moved. If, after the adjustment, the tone of the horn is still unsatisfactory, the owner is urged to return it to a Lucas Service Depot to have other adjustments made.

LEGAL MATTERS.

NOTE.—In view of the growing public objection to noisy motor cycles, a word of warning on this subject may not be out of place here. Firstly, it has been noted, and freely commented upon, that much of the noise complained of is unnecessary, being due to injudicious driving as, for instance, violently accelerating from a standstill, racing the engine when stationary, driving on full throttle when ascending hills in residential districts, etc. Any motor cycle, or for that matter any motor vehicle, driven in this manner creates abnormal noise, and in the interests of all, we earnestly implore every "Matchless" owner to studiously refrain from any of the practices enumerated.

To comply with the Law relating to motor cycles, the owner of a "Matchless" Model B must:—

1. Hold a driver's licence, which can be obtained from the Chief Constable or Corporation of a County Borough, or from the County Council. The charge for this licence is 5s. yearly, and must be renewed annually from the date of issue. A motor car driver's licence covers the driving of a motor cycle.
2. Insure against Third Party Risks (other risks may also be embodied in the Insurance Policy as owner may desire, but are not compulsory by law), and obtain from the Insurance Company decided upon either a Certificate of Insurance covering the full period of twelve months, or alternatively, as is most general, a temporary Certificate, which must be produced when applying for Revenue Licence.
3. Apply to the Taxation Department of the Local Authority of the district in which the vehicle is to be ordinarily kept, for Inland Revenue Licence and Registration Form R.F.1/2 (motor cycles only). The address of the above Taxation Department can be obtained by enquiry at a Post Office.
4. The Form R.F. 1/2, when obtained, must be filled in and returned, accompanied by the Insurance Certificate referred to above, and the requisite remittance, which varies according to the date of registration and the term covered. For a full year, January 1st to December 31st, the fee chargeable is £3 if the cycle is to be used solo, or £4 if a sidecar is attached.
5. See that his rear number plate is illuminated at night.
6. Never drive at a speed which is dangerous to the public.
7. Wherever necessary, give audible and sufficient warning by horn, or other instrument, of the approach of his cycle.

For registration purposes the following particulars will be required:—

Weight of cycle unladen (with equipment required by Law), 370 lbs.
Type or Model, "Matchless" Model B.
Manufacturer's horse-power, 5.93.

NOTE.—The above weight applies only to machines without electrical equipment, for which add 30 lbs.

GUARANTEE

We give the following guarantee with our motor cycles, motor cycle combinations and sidecars, which is given in place of any implied conditions, warranties or liabilities whatsoever, statutory or otherwise, all such implied conditions, warranties and liabilities being in all cases excluded. Any statement, description, condition, or representation contained in any Catalogue, advertisement, leaflet or other publication shall not be construed as enlarging, varying or over-riding this guarantee. In the case of machines which have been used for "hiring out" purposes, or racing, or from which the trade mark name or manufacturing number has been removed, no guarantee of any kind is given or is to be implied.

WE GUARANTEE, subject to the conditions mentioned below, that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, but this guarantee is to extend and be in force for six months only from date of purchase, and damages for which we make ourselves responsible under this guarantee are limited to the free supply of a new part in exchange for the part of the motor cycle, motor cycle combination, or sidecar which may have proved defective. We do not undertake to replace or refix, or bear the cost of replacing or refixing, such new part in the motor cycle, motor cycle combination or sidecar. We undertake, subject to the conditions mentioned below, to make good at any time within six months any defects in these respects. As motor cycles, motor cycle combinations and sidecars are liable to derangement by neglect or misuse, this guarantee does not apply to defects caused by wear and tear, misuse or neglect.

The term "misuse" shall include amongst others the following acts:—

1. The attaching of a sidecar to the motor cycle in such a manner as to cause damage or calculated to render the latter unsafe when ridden.
2. The use of a motor cycle or motor cycle and sidecar combined, when carrying more persons or a greater weight than for which the machine was designed by the manufacturers.
3. The attaching of a sidecar by any form of attachment not provided, supplied, or approved by the manufacturers, or to a motor cycle which is not designed for such use.

Any motor cycle, motor cycle combination or sidecar sent to us to be plated, enamelled or repaired will be repaired upon the following conditions, i.e., we guarantee that all precautions which are usual and reasonable have been taken by us to secure excellence of materials and workmanship, such guarantee to extend and be in force for three

Guarantee—contd.

months only from the time such work shall have been executed or until the expiration of the six months above referred to, and this guarantee is in lieu and in exclusion of any common law or statute warranty or condition and the damages recoverable are limited to the cost of any further work which may be necessary to amend and make good the work found to be defective.

CONDITIONS OF GUARANTEE.

If a defective part should be found in our motor cycles, motor cycle combinations or sidecars, or in any part supplied by way of exchange before referred to, it must be sent to us CARRIAGE PAID, and accompanied by an intimation from the owner that he desires to have it repaired or exchanged free of charge under our Guarantee, and he must also furnish us at the same time with the number of the machine, the date of the purchase, or the date which the alleged defective part was exchanged, as the case may be.

Failing compliance with the above, such articles will lie here AT THE RISK OF THE OWNER, and this guarantee and any implied guarantee, warranty or condition shall not be enforceable.

We do not guarantee specialities such as tyres, saddles, chains, magnetos, lamps, etc., or any component parts supplied to the order of the purchaser differing from standard specifications supplied with our motor cycles, motor cycle combinations, sidecars or otherwise.

IMPORTANT NOTE.—Any part sent to us for any reason whatsoever must bear distinctly the sender's name and address and instructions or requests relative to parts must be sent separately by letter post.

MACHINE NUMBERS.

The frame number will be found stamped on the right-hand side of lug under saddle.

The engine number is stamped on the aluminium crankcase, transmission side, immediately beneath cylinder base.

Always quote these numbers when corresponding or ordering spare parts.

MATCHLESS MOTOR CYCLES (COLLIERS) LTD.

LUCAS SERVICE DEPOTS

In the event of any difficulty with any part of the Lucas electrical equipment, no matter how trivial, Messrs. Lucas will be only too pleased to give every assistance possible. The best course to adopt is to call at the nearest Lucas Service Depot (the addresses of which are given below), when the equipment can be examined as a whole. The depots are not only at your disposal for repairs, overhauls and adjustments, but to give free advice.

- BELFAST—3-5, Calvin Street, Mountpottinger.
Telephone: Belfast 7017. Telegrams: "Servdep, Belfast."
- BIRMINGHAM—Great Hampton Street.
Telephone: Central 8401 (10 lines). Telegrams: "Lucas, Birmingham."
- BRIGHTON—Old Shoreham Road, Hove.
Telephone: Preston 3001 (4 lines). Telegrams: "Luserv, Brighton."
- BRISTOL—345, Bath Road.
Telephone: Bristol 8400 (4 lines). Telegrams: "Kingly, Bristol."
- CARDIFF—54a, Penarth Road.
Telephone: Cardiff 4603 (4 lines). Telegrams: "Lucas, Cardiff."
- COVENTRY—Priory Street.
Telephone: Coventry 3068 and 3841. Telegrams: "Lucas, Coventry."
- DUBLIN—41, Middle Abbey Street.
Telephone: Dublin 653. Telegrams: "Autolite, Dublin."
- EDINBURGH—32, Stevenson Road, Georgie.
Telephone: Edinburgh 62921 (4 lines). Telegrams: "Luserv, Edinburgh."
- GLASGOW—227-229, St. George's Road.
Telephone: Douglas 3075 (5 lines). Telegrams: "Lucas, Glasgow."
- LEEDS—64, Roseville Road.
Telephone: Leeds 28591 (5 lines). Telegrams: "Luserdep, Leeds."
- LIVERPOOL—450-456, Edge Lane.
Telephone: Old Swan 1408 (3 lines). Telegrams: "Luserv, Liverpool."
- LONDON—Dordrecht Road, Acton Vale, W.3.
Telephone: Riverside 3160 (10 lines). Telegrams: "Dynomagna, Act, London."
- LONDON—759, High Road, Leyton, E.10.
Telephone: Walthamstow 2161 (3 lines). Telegrams: "Luserdep, Walt, London."
- LONDON—155, Merton Road, Wandsworth, S.W.18.
Telephone: Putney 5131 (6 lines) and 5501. Telegrams: "Luserv, Wands, London."
- MANCHESTER—Talbot Road, Stretford.
Telephone: Longford 1101 (5 lines). Telegrams: "Lucas, Stretford."
- NEWCASTLE-ON-TYNE—64-66, St. Mary's Place.
Telephone: Central 3571 (3 lines). Telegrams: "Motolite, Newcastle-on-Tyne."