Lambretta
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THE Lambretta SERVICEMAN'S BOOK

AN OWNER'S GUIDE TO SERVICING

A FULLY COMPREHENSIVE HANDBOOK

Introduction

To all those who have telephoned or written telling us of strange and various symptoms displayed by their Lambrettas, we are indebted for the information in this manual. They and their troubles have indicated what it is necessary to know and, by their sufferings, what to avoid. It is not to be concluded from this that the book was conceived in misery, on the contrary, many a callous laugh we have had from those who have stripped and checked half the internals of the engine and gearbox before finding that the rear wheel nuts were loose. Hard to believe? It's absolutely true! Come to think of it we've done some pretty silly things ourselves, only it doesn't seem that way at the time.

What this introduction really intends, is a warning; like reading a medical book which proves to you that you have all the symptoms of all the illnesses under the sun, so, reading this can give sleepless nights to anyone who is hypersensitive about his scooter. It is too dangerous to recommend that you ignore bangs, rattles and bits dropping off, and if it seems that something is wrong, don't hesitate to get a second or third opinion if necessary, preferably from a Service Agent; but do remember this: when a machine is brand new it is wonderfully quiet and smooth, as it loosens up piston rattle becomes evident, also you get accustomed to it and notice all the little sounds that occur. Therefore be prepared to live with some of the noises and vibrations at different speeds and give up worrying. To prove it, swop machines with a friend for a few miles; both of you should find the other's Lambretta apparently sweeter running than his own.

Nevertheless, if something is wrong try to trace it. If it is a rattle, see if it stops when you coast with the engine cut; rattle gone, possibly it is in the engine. Noise present when stationary and engine running; probably in the engine, but look and see if the tools are loose in the tool box. Kick the silencer, if there's a baffle loose, you'll hear it. Hold a piece of rag around the cylinder cowling, any piston noise will immediately quieten. A broken or cracked gear tooth rumbles, so will a very worn or rusty bearing. But a bearing with normal wear will not be obtrusive; if it has a pitted track it will scream, not to be confused with the characteristic whine of badly meshed bevel gears which assumes a different note when accelerating or slowing.

Supposing the engine won't start, don't believe what you are really certain of, but turn the petrol tap to reserve and also look in the petrol tank. Next, see if the sparking plug lead has fallen off. After that try and push start; this

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Foreword

This book is designed to cover in full the attentions which can be necessary to the Lambretta 150. It includes LD Marks I, II and III machines and therefore applies also to the 125 Mark III. LD 125 machines which were manufactured prior to 1955 are included to a large extent and where differences exist these are shown in the supplement which includes also the LC machine. Engine numbers quoted in the main sections apply to the LD 150.

" C " and " D " models are similar to the equivalent machines mentioned above but differ in that the engine covers are absent and the protective shielding is considerably reduced. Parts other than frames, petrol tanks and panelwork are interchangeable.

Li and TV machines are the product of twelve years of research and experience. Little resemblance will be found between them and the other models but the broad principles of maintenance remain. The frequency with which attention is required is considerably less and not only are there fewer points to which it is needed but also the ease of access to them has been perfected to a pitch where it becomes difficult to see where room for further improvement exists. However, the fact remains that experience shows nothing to be foolproof and if long service is to be obtained at minimum expense it is reasonable to expect intelligent application to service and adjustments which are necessary.

The salient points and special differences of these modern magic carpets are shown and also the methods of dismantling and reassembling, but general work is the same as that described for the LD and the information given should be read in conjunction with the chapters on that model.

If some of the recommendations seem trivial please realise that generally they have been included because common faults arise out of inattention to them. Often the most complicated and sinister symptoms and certainly the most inopportune breakdowns are caused by simple things. Incorrect adjustments, carried out through lack of knowledge, are half of them.

is a very useful expedient but so many people don't do it properly. Use first gear, not second like the cautious books say, run the scooter down the road holding the clutch lever in and then leap into the saddle, dropping the clutch at the same instant. Immediately get off and continue pushing with engine turning, trying with the twistgrip wide open and tight shut for short periods until either the engine starts or you reach your destination. Much hilarity can be caused, particularly amongst a good group of onlookers if, in the act of leaping into the saddle, you drop the clutch too soon and sail gracelessly over the handlebars.

A fault finding chart is not given, on the basis that a little learning can do more harm than good, and the reader will be well advised to read the whole chapter, or better still the whole book, before attempting a diagnosis or repairs on a particular part. Above all, don't carry out a decoke just for the fun of it. Most of the time it isn't necessary, unlike the two-stroke engines of the past.

Any special tools necessary can be obtained through Lambretta Service Agents and lists of each are given ; both are necessary, use them. Some troubles can only be detected by skilled operators and all Service Agents' mechanics receive strict training at the Lambretta Works. Also several parts cannot be dismantled without special tools and an attempt to do so may result in damage being caused which is expensive to repair.

However, many routine attentions can be undertaken with great economy in expense, using only standard tools and a set of metric spanners and allen keys. The sizes commonly used are as follows :—

5 mm. diameter bolt — 8 mm. spanner
6 mm. diameter bolt — 10 mm. spanner — 5 mm. allen key
8 mm. diameter bolt — 14 mm. spanner — 6 mm. allen key

Also needed : 3½ mm. allen key, 11, 12, 17 and 19 mm. spanners and 8, 10, 11, 14, 17, 19, 21, 22, 24 and 27 mm. socket spanners. The size of spanners or nuts and bolts quoted is the width across the flats of the hexagon unless otherwise specified.

MAINTENANCE

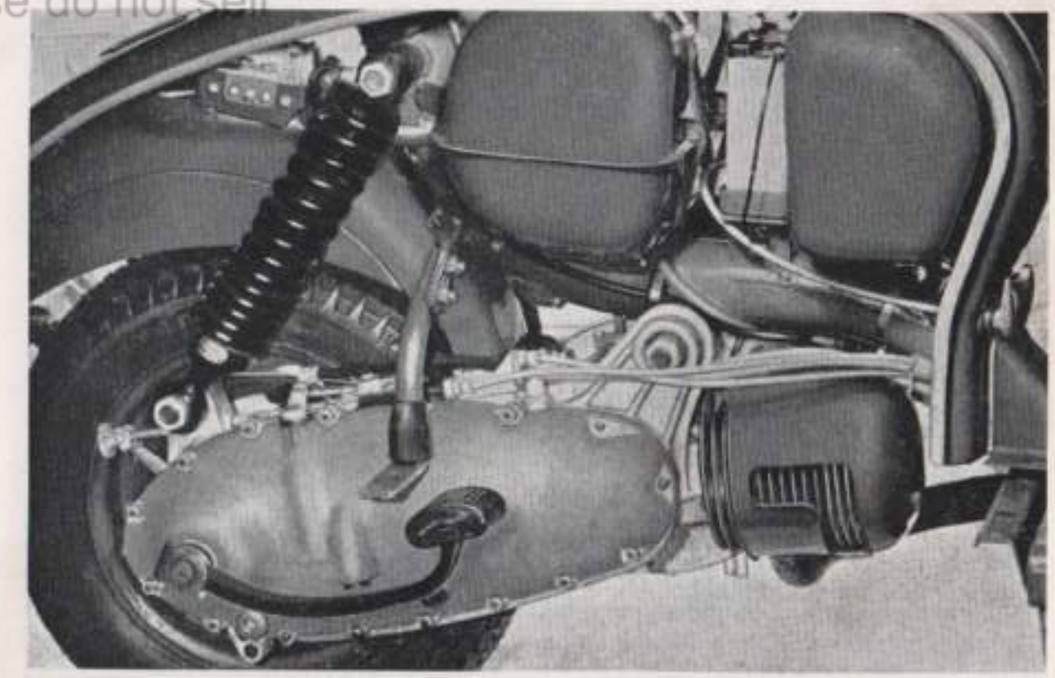
Although every reasonable precaution is taken against mistakes, check lubrication and adjustment of controls and tighten all nuts and bolts on a new machine.

Petrol/oil lubrication of piston assembly, big-end and magneto side main bearing is used and found to be very satisfactory, and due to the horizontal position of the cylinder and general improvement in bearing materials, one part of oil to twenty-five of petrol is sufficient. This is equivalent to half a pint of oil to one and a-half gallons of petrol. However, if self-mixing oil is used the proportion must be increased to one to twenty, or half a-pint of oil to the gallon if the exact proportion is not obtainable.

Severe damage to the engine will follow the use of petrol without the proper addition of oil and it must be appreciated that each owner is responsible for seeing that petrol attendants comply with the requirements. No advantage will be found by using quantities of oil greater than those specified nor are any special additives necessary or recommended ; further, the engine is designed to be used with the cheapest grades of petrol.

The unique Lambretta cable oilers are continued, please apply an oilcan and plastic pipe, preferably weekly, as described in the LD maintenance chapter.

Only one oil level has to be maintained ; the filler is in the form of a 21 mm. domed breather plug on top of the crankcase and the drain and level plugs are on the cover near the kick-starter pedal, the 10 mm. hexagonal key in the tool kit fits them. Use 90 grade oil, making sure that ordinary motor oil is obtained



Li engine unit after removing footboards and silencer

and avoiding the special E.P. additive oils designed for extreme pressures. The quantity required is 1¼ pints.

Be sure to change this oil at least once during the first 500 miles but afterwards only at 3–5,000 mile intervals.

Grease nipples on the pivot bearings of the front fork links and on the spring guide cups beneath the links require two strokes of the grease gun as also does the rear brake pedal spindle, but be particularly sparing with the grease for the rear brake cam spindle on the back of the engine casting. It is better to dismantle the brakes in order to grease all the pivots and avoid the possibility of grease contaminating the linings. When the front brake is dismantled the wheel bearings can be packed in high melting point grease such as Castrolease WB or equivalent. All the points previously mentioned should have a soft grease such as Castrolease C.L. or equivalent. Read the chapters dealing with the brakes before attempting to dismantle them.

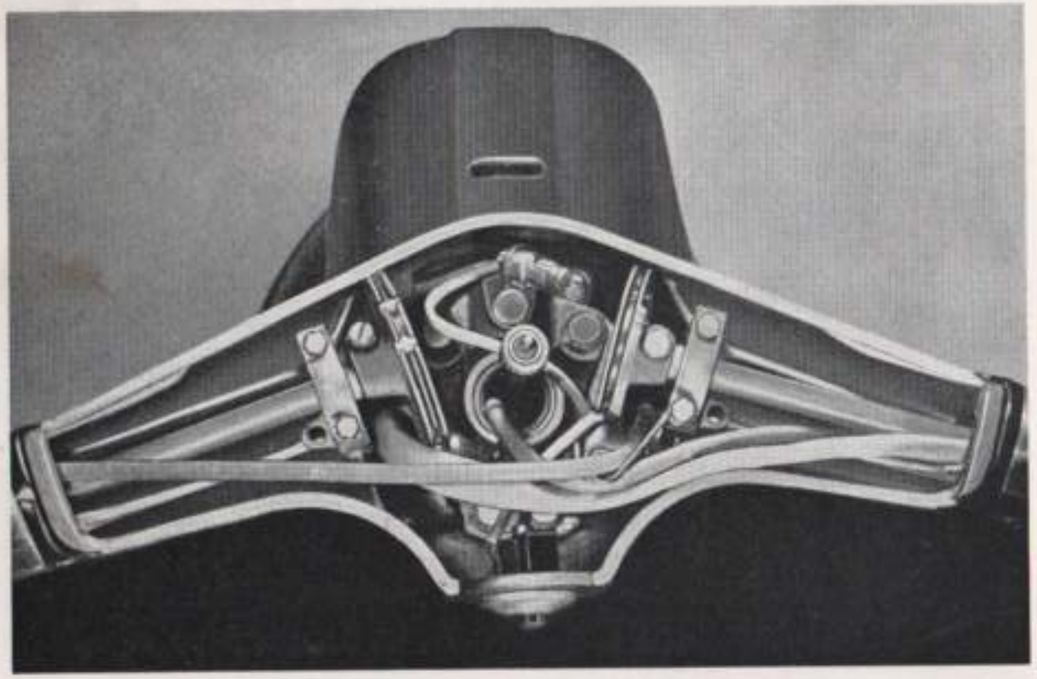
Side panel catches, hand lever pivots, twistgrip bearings, steering head bearings and stand pivots require some grease but this need only be applied on assembly.

Note that the steering lock and glove box lock will remain easy to operate if a few drops of oil are introduced occasionally.

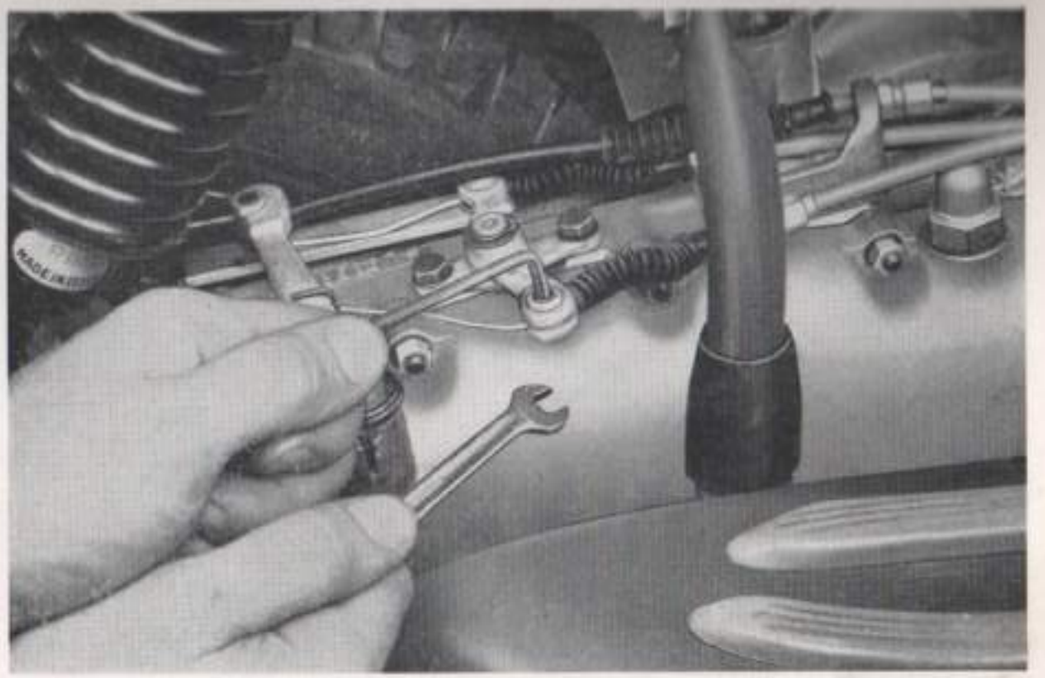
A little oil is also needed on the felt pad which rubs on the cam of the flywheel and prevents the contact point heel from wearing. To get at this the fan cover and flywheel dust cover must be removed but as attention will only be needed when new and at 3–5,000 mile intervals, it can be given when the contact points are adjusted. This is dealt with in the chapter on the magneto.

ADJUSTMENTS

All cables have screw adjusters at the ends furthest from the handlebar controls. The throttle and gear change cables should have no free play but



Gear change and throttle cable operating pulleys inside handlebar



3½ mm. allen key from toolkit used for cable nipples

must not be in tension until the twistgrip is turned. Any end float of the twistgrip may be taken up by fitting spacing washers between the cable pulley and its spherical bronze bearing. To do this the handlebar cover must be removed and the pinchbolt holding the pulley to the control rod taken out. The self-closing of the throttle twistgrip is prevented by these spacing washers and a dished spring washer between the twistgrip and the front brake lever support.

The clutch and brake cables should have a considerable amount of slack and the levers should begin to operate when the hand grips them comfortably and not when nearly against the twistgrip rubber or with the fingers fully extended. The rear brake pedal particularly should have plenty of free travel to allow for expansion of the back plate assembly as it warms up.

Steering head bearings must be free with no perceptible play and, after running in, may require re-tightening by removing the handlebar assembly and applying the special tools 40482 and 40490 to the lock nuts, as described in the chapter on front forks and frame.

Tyre pressures must be varied according to the load carried, and may be increased beyond the recommendation in the manual where fast driving is of greater importance than comfort. Under these conditions 18 lb. per sq. in. front and 28 lb. per sq. in. rear will be suitable for solo use, increasing the rear to 34 lb. per sq. in. when a passenger is continuously carried.

The sparking plug gap should be re-set to approximately .020 inches every 1,000 miles and it will be seen that it has a longer reach of thread than normal. The Champion N.5 is the type to use, but with novices or anyone who drives slowly, it may be found that this one will not keep clean internally and lead to difficult starting. In these cases the hotter running type, N.8 will be better suited since carbon deposits and oil will be burned away more readily.

Usual routine applies to the battery which has a level of acid, and this

should be restored monthly with clean, pure water. More frequent attention will be necessary when touring because overcharging tends to occur on long runs. Do not overfill the battery, and be sure to re-connect the leads so that the negative (—) side is joined to the frame.

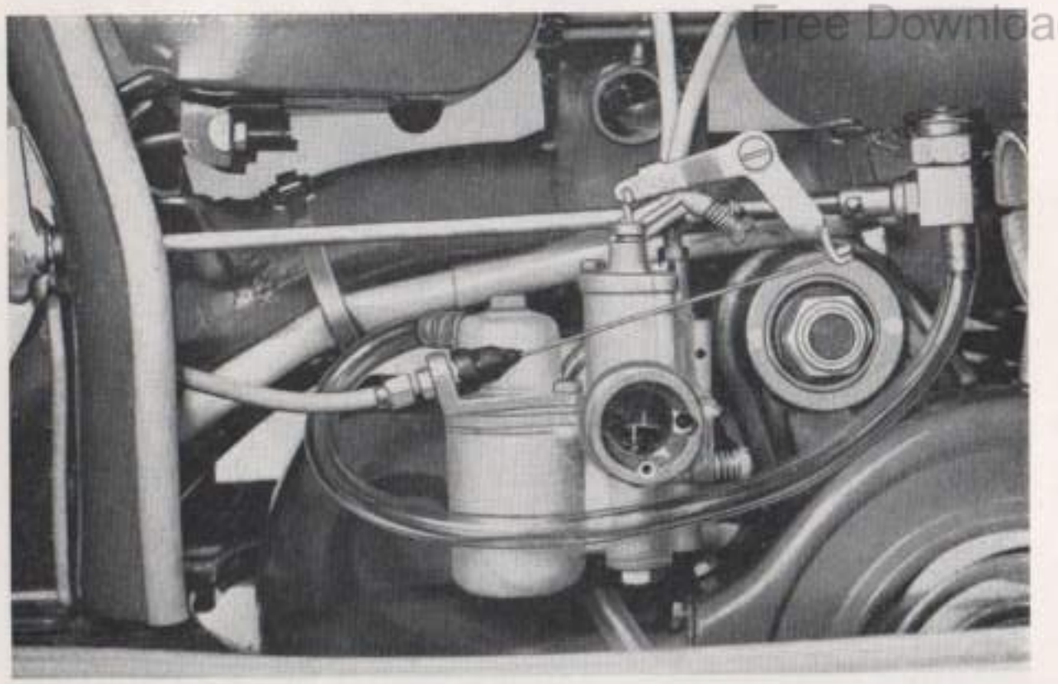
CONTROL CABLES

The choke cable passing between the battery and the toolbox may become trapped in some cases and engine suspension movements cause the choke to lift, giving the effect of an extra rich mixture. The cure is to take the cable around the base of the battery bracket and through one of the holes in this to the carburettor.

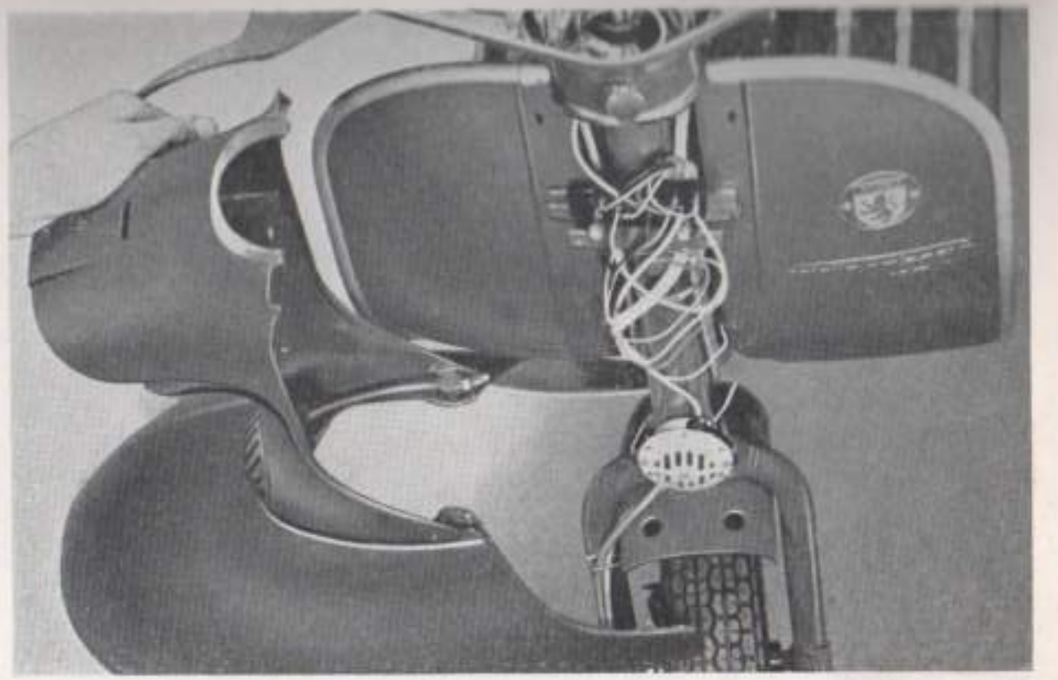
To replace front brake or clutch inner cables, disconnect the cable clamp at the end further from the handlebar, and take out the pivot nut and bolt of the hand lever. This enables the lever to be pulled away from the handlebar, bringing with it the inner cable. The end of the replacement must be entered in to the outer cable visible in its socket in the cavity left by the removal of the lever, and fed right through.

In the unusual case of the outer cable slipping from its socket during the foregoing operation or when changing a gear or throttle cable, it will be necessary to remove the handlebar cover held by two countersunk screws, one on either side, which are accessible from underneath the handlebar. After taking out these screws, lift the cover a couple of inches allowing it to pull the speedometer cable up through the stem of the forks. This will permit the knurled ring nut of the speedometer cable to be undone and the cover freed.

The 3½ mm. allen key in the tool kit is for the grub screw in the detachable nipple holding the clutch inner cable at the lever on top of the crankcase and it also fits those on the gear cables. The upper ends of these latter wrapped around



Throttle linkage and slow running adjustments of carburettor. Air cleaner removed



. Mudguard and headlamp casting removed to show cables

the pulley, are seen when the handlebar cover is removed. The inner cables of the gear change can be withdrawn after the clamps at their lower ends have been slackened but the throttle cable has soldered nipples and must be removed complete. For this latter operation it is necessary to remove the headlamp casting and front mudguard together. However, it is possible to remove the soldered nipple from the carburettor end of a new cable, and slide the inner wire only into the old sheath from the pulley end, using a detachable nipple of the type fitted to the clutch and gear cables to secure it at the carburettor.

If the gear change pulley is not centred directly over the outer cables set in the bottom casing of the handlebar the movement will be stiff. To re-position it, the operating rod will have to be filed on the tongued outer end to allow it to move inwards, and extra spacing washers will be needed between the pulley and the spherical bush bearing. These washers also control the end float of the twistgrips which must be kept at a minimum. Should the pulley have to be moved nearer to the handgrip end, it will be necessary to build up the tongue of the operating rod and reduce the number of spacing washers.

To remove the twistgrip rubber, grease the outside and roll the lipped end back over itself, towards the end of the handlebar. Never try to take it off by pulling. When replacing it make sure that all trace of grease is removed from the twistgrip sleeve and the inside of the rubber ; it will push on easily. When dismantling the handlebars however, there is no need to take off the rubber separately because if the slotted 8 mm. pinchbolt holding the pulley to the operating rod is taken out, and in the case of the gear change side, the far end of the clutch cable disconnected from its clamp, the whole twistgrip unit can be pulled off the end of the handlebars. See that on replacement, the splined end of the operating rod is aligned correctly with the pulley because there is a notch filed in the rod into which the pulley pinchbolt must fit.

Smear grease on all working surfaces on re-assembly.

Mind the speedometer light wire when the handlebar cover is being put back and pressed down after the speedometer cable has been connected. The wire can easily rub on the gear change pulley and cause a short circuit in time.

If the headlamp casting is to be removed take it off in one piece with the front mudguard. Four countersunk screws on the inside of the legshield secure the casting and also two 10 mm. bolts located behind the headlamp. Remove the headlamp by undoing the four screws round the rim and prising it off. Disconnect the mudguard by taking out the two 8 mm. screws placed either side at the inside bottom where it meets the legshield. Note that as the headlamp rim has slotted holes for beam adjustment, it must be re-set on assembly.

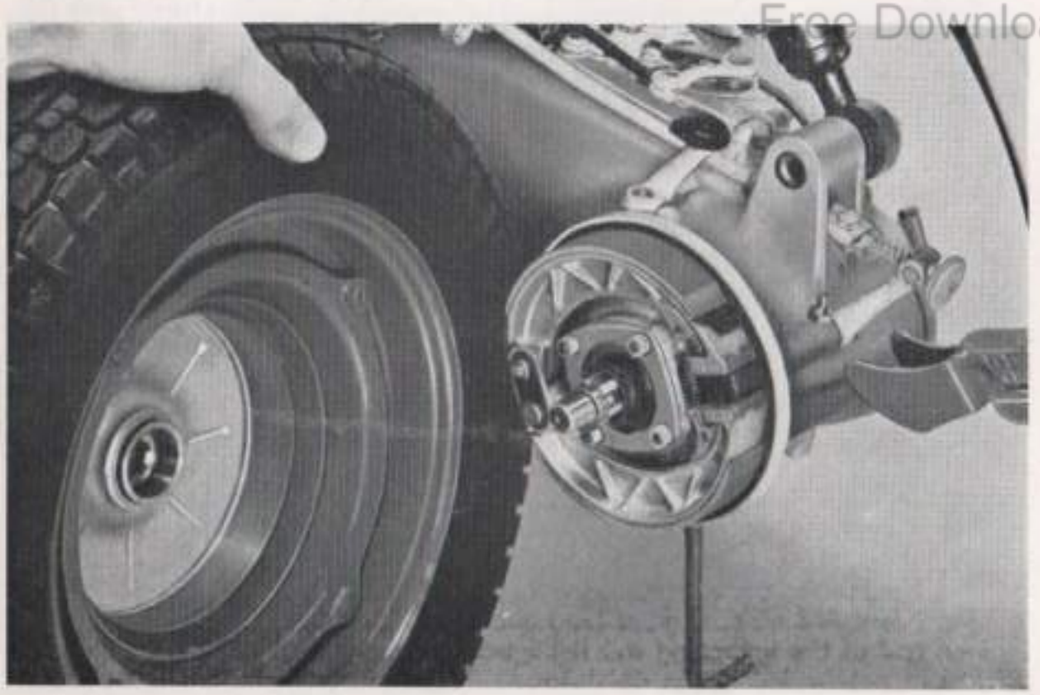
BRAKES

For attention to the brakes, the method for the LD machines should be followed exactly, although both brakes are considerably larger and front and rear are equal in size. The brake shoes are all identical, but should not be interchanged among their respective positions because the even pressure obtained after bedding in will be upset and their operation will give a feeling of sponginess.

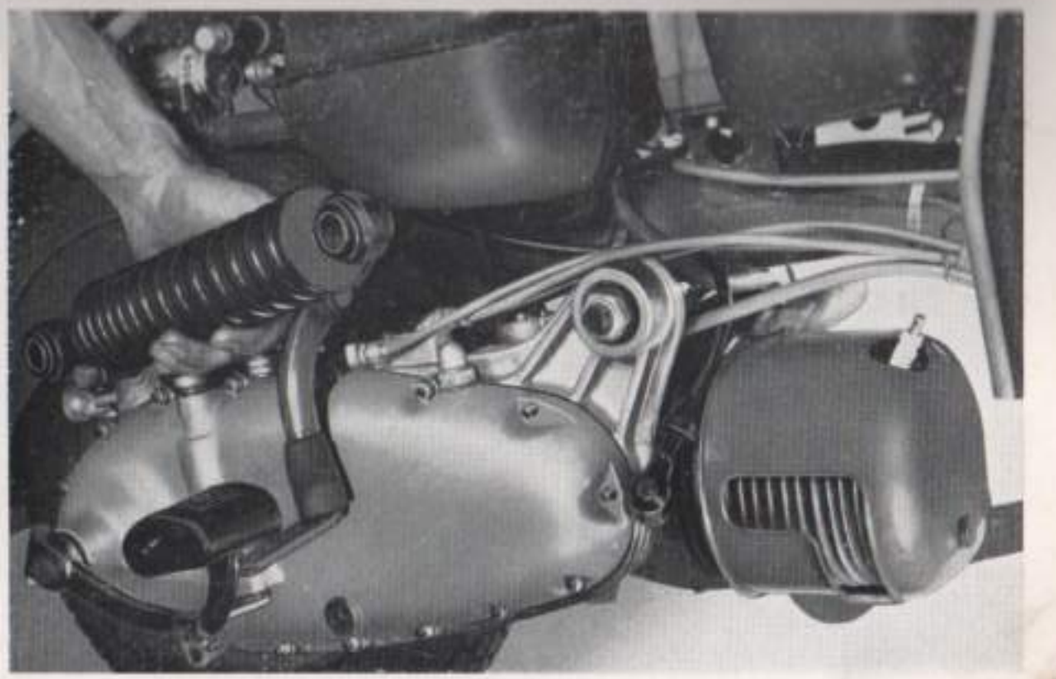
To support the rear wheel a small rest is supplied in the tool kit, which fits into a lug underneath the rear of the casing. Slide it into position from the wheel side of the lug.

When removing the rear hub, undo the 27 mm. nut in the centre, but do not strike the axle with a mallet as for the LD, because this can damage the axle support in the gearbox. An extractor 59826 is available but it will be quite satisfactory to use the mallet on the offside of the tyre to remove the hub.

Do make sure to tighten the hub nut really adequately and preferably use the LD axle spring washer part number 73170170 to replace any other sort that may be fitted.



Back wheel taken off for attention to brake



Suspension unit removed to give access to the cylinder

Note that there will be considerable side play in the rear wheel because of the axle bearing design. This is not an indication that a fault is present.

DECARBONISATION

This must not be carried out until at least 5,000 miles have been covered and will often not be needed until 8-10,000.

Take off the side panels, the silencer, held by three of the 10 mm. crankcase cover stud nuts and a clip around the exhaust pipe (14 mm. spanner), and the pillion footboards by undoing the five 8 mm. nuts on the nearside and four on the offside. Two of the nuts secure the countersunk screws of the bridge piece.

Remove the long reach sparking plug and twist and pull the carburettor from its spigot after disconnecting the petrol pipe and throttle cable and slackening the 8 mm. pinchbolt. The air hose on the inlet should be detached by undoing one of its clips.

For the 8 mm. nuts and the 10 mm. nuts on the crankcase cover studs, it is worthwhile obtaining the 8 and 10 mm. tube spanners, tools 1010 and 1011 respectively.

Unscrew both of the 24 mm. nuts holding the suspension unit and force this off, so enabling the machine to sink on to the crankcase buffer, and the cylinder to drop below the frame. In this position, the cylinder cowl can be removed after unscrewing the 14mm. bolt attaching it to one of the cylinder nuts and the two 8 mm. bolts connecting it to the magneto flange. The 14 mm. end of the standard plug spanner will fit the cylinder head nuts and when these are removed the head and barrel can be drawn off. Afterwards the two 11 mm. brass nuts securing the exhaust pipe flange can be undone and the pipe removed from the cylinder. If the piston is to be taken off, it should

be noted that the ring pegs must be positioned on either side of the exhaust port and not on the upper side of the piston as with the 175 TV Mk. I.

Do not be surprised if quite a loud piston rattle is heard when the engine is cold ; this will not affect performance and in any case should disappear after three or four miles.

The gudgeon pin is intended to be a sliding fit in the piston and not tight. The small end only needs replacing when the wear exceeds .008 inches.

Piston rings should not be changed until the end gap measured with the ring placed squarely in the bore exceeds .060 inches. Re-boring of the cylinder is unlikely to have to be carried out in the average lifetime of the scooter unless the bore becomes damaged.

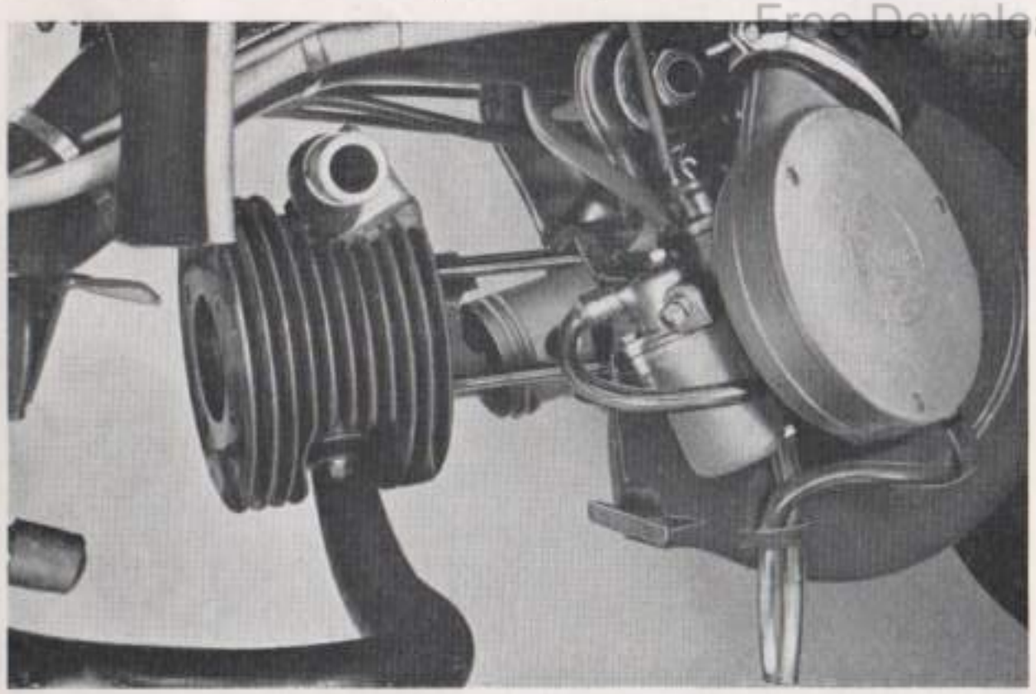
General information on decarbonising the LD is applicable but in addition it should be noted that extra quietness of the exhaust can be obtained by sealing the pipe joints with Bostik No. 3 cement on reassembly. The silencer itself will not suffer from internal blockage and only the joint with the tailpipe will have to be cleaned.

The carburettor does not require a separate chapter, being similar in design to the LD and its layout differs only in the type of filter fitted with the float chamber. Note that thick plastic washers are fitted between the cylinder, manifold and carburettor for heat insulation and they must be carefully positioned to avoid air leaks.

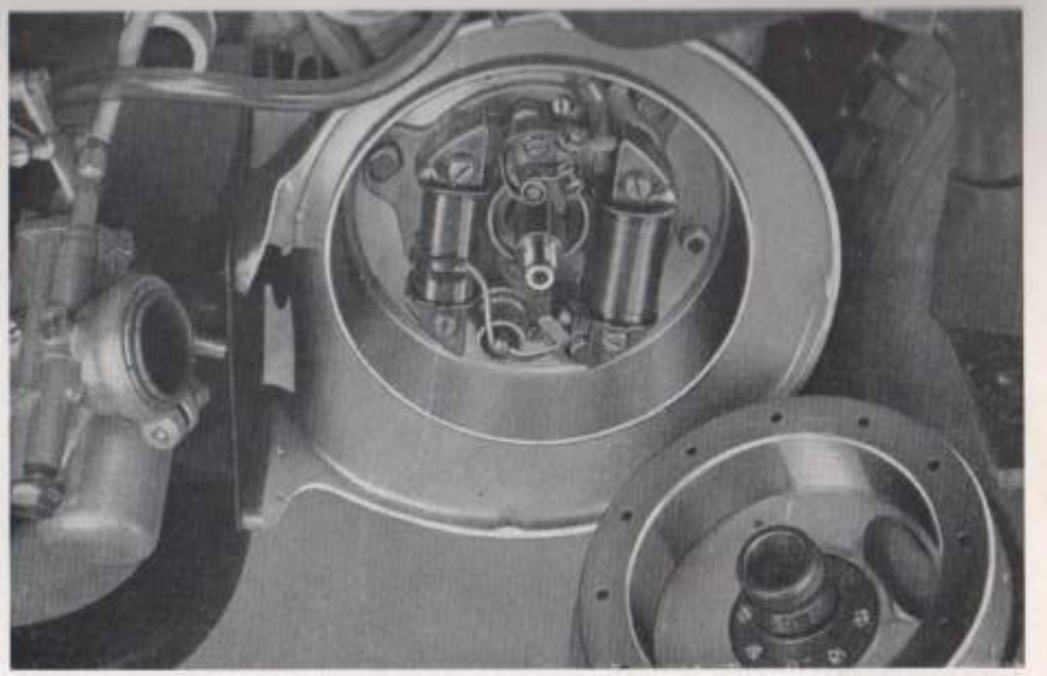
Normal setting for the pilot airscrew is one complete revolution from the gently screwed in position. Unscrewing tends to weaken the mixture, but only at closed throttle conditions.

MAGNETO

This follows previous practice in having an external H.T. coil which is similar to a 6-volt car coil and has been improved to a point where it is now most reliable.



Drawing off the cylinder with exhaust pipe still attached



Carburettor, cowling and flywheel removed to show stator plate

If the magneto is set properly, a spark from the bare end of the H.T. lead should jump $\frac{5}{16}$ inches to earth when the sparking plug and suppressor cap are removed and the kick-starter operated vigorously. If in doubt with a machine which is difficult to start, close the sparking plug gap by half ; any improvement indicates that the ignition is at fault.

Mis-firing under load in conjunction with easy starting, or difficult starting with the headlamp switched on, denotes a contact breaker gap which is too large or too small. A faulty H.T. coil is likely to be worse in wet weather. Failure of the ignition feed coil or the condenser is practically unknown. Tests should be made in accordance with the chapter on the LD magneto, but the following differences exist.

The flywheel is keyed to the crankshaft and fits on a taper of more generous dimensions ; it is retained by a left-hand threaded nut of 17 mm. hexagon. To obtain access to it the five 8 mm. screws around the flywheel cowling must be removed and this will be easier if the carburettor and air inlet tube are taken off. Adjustment of the contact points is carried out through the flywheel aperture disclosed when the centre dust cover held by two 7 mm. screws is removed, but to fit new points the flywheel must be removed. The LD extractor will fit, but because of the larger taper an improved extractor has been made with a $\frac{1}{2}$-inch diameter centre bolt to withstand the greater force required.

The stator plate is set by the factory to be correct for an ignition timing of 23° before top dead centre and this should not need to be altered. Its position should be such that the pole pieces of the magneto are equally spaced between the pole pieces of the coils 10° before the ignition occurs, i.e., 33° B.T.D.C.

Replacement magneto parts must be ordered for the particular make of assembly fitted to the machine in question, either Marelli or Filso. Owing to

the reverse direction of rotation of the flywheel, i.e., clockwise, the contact points are different from all previous models, although the two makes are similar to, but not interchangeable with, each other ; the Marelli points have eccentric cam adjustment, but the Filso have a vee notch. Part numbers for replacement sets are 00831599 and 00811419 respectively.

When fitting new points, take care that the contacts face one another squarely and if necessary, bend the fixed contact to suit with a pair of pliers. Do not attempt to file.

Ensure that the felt pad touches the flywheel cam and is oiled.

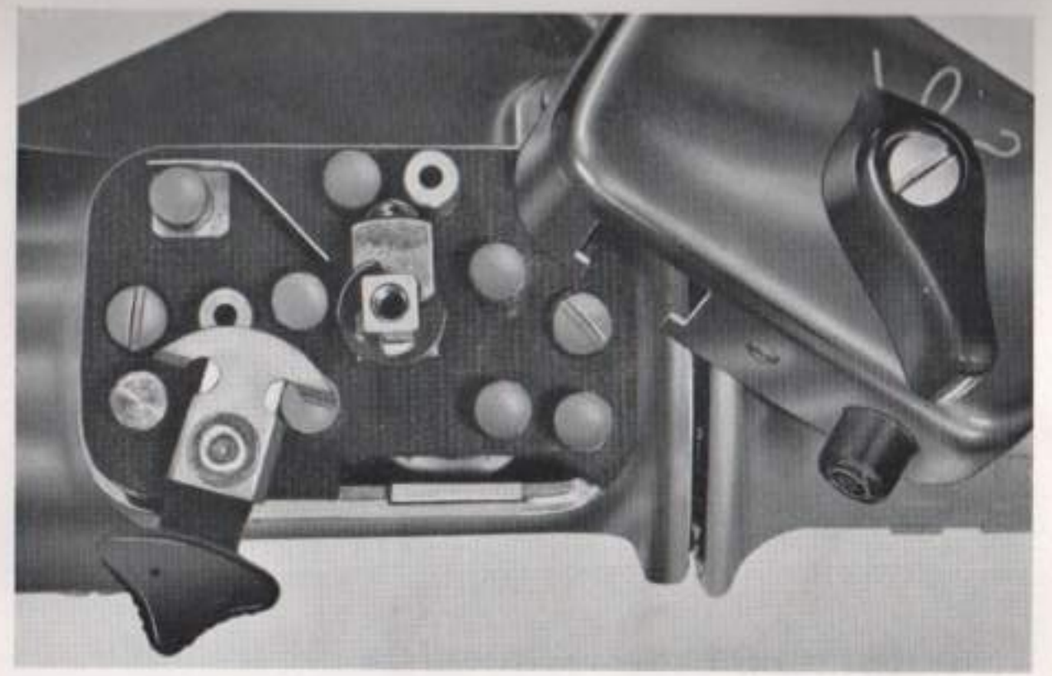
No fixed gap can be determined and it must be set so that the contacts just separate at the correct timing position. A screwdriver only is needed to effect the adjustment, increasing the gap observed in the open position will tend to advance the moment of separation and reducing the gap will retard it. If possessed, a Lambretta Contact Tester 0517/C should be connected between earth and the green wire junction in the rectifier box on the side of the frame behind the petrol tank. This will show whether the circuit is electrically good when the points are closed and also indicate the moment of separation.

The flywheel and adjacent housing may be marked to correspond with the top dead centre of the piston and 23° of advance will be equivalent to a movement of one and three sixteenths inches anti-clockwise measured along the rim of the flywheel.

LIGHTING

150 Li's are equipped with battery parking lights and have a similar circuit to the 150 LDB, except that there is a two-rate charge to the battery which gives an increased output when the parking lights are switched on with the engine running. However, in Great Britain there is no restriction on the use of a dipped headlamp when driving in illuminated areas and therefore the need to drive on the parking lights should not arise. In fact it is not advised because of the possibility of a scooter only lit in this manner being mistaken by other motorists for a slower moving pedal cycle and thus be dangerous.

From top to bottom :— 5 amp. fuse, rectifier, impedance choke



Underneath the switch cover, check for dirty contacts

All three wires from the magneto lead directly to a junction at the top of the rectifier unit. The green wires are for ignition only and are not connected to the lighting wires. Brown from the lighting coil is the main headlamp feed and blue is the tapping for charging the battery via the rectifier. After the rectifier the wire divides, one part going through an impedance and the fuse to the battery positive and the other, carrying the full charge current, to the switch. This latter wire is coloured purple.

The grey wire carries the normal battery current to the switch but when the lever is moved to the parking light position "1" it is joined by a contact to the purple wire and both together join to the yellow and black wires for the front and rear lights respectively.

The fuse, which protects the system from heavy discharge in the event of a short circuit, must not be greater than 5 amp. rating. Incorrect positioning of the red battery wire in the junction box could by-pass the fuse and lead to damage being caused to the rectifier and battery.

When all lights are switched off and without the engine running, not more than approximately .005 amps. leakage from the battery through the rectifier should exist. It may be measured by a sensitive milliammeter connected between one of the battery terminals and its respective lead. With the engine running at a speed roughly equivalent to 30 miles per hour in top gear a charge of approximately 0.4 amps. should be measurable. A low rate of charge may be due to too big a gap between the flywheel and coil pole pieces or insufficient number of wire turns on the coil, but these should only be suspected if the leakage current through the rectifier reads correctly. Otherwise the wiring or rectifier is at fault.

The main output to the lights is 27 watts and as with the LD it should be balanced by a headlamp bulb of 24 watts and a tail lamp of 3 watts, both operating at a nominal 6 volt potential. The speedometer bulb is a 12 volt, 2.5 watts, and actually takes far less than 2.5 watts when the applied voltage is 6.

Stop lights are not fitted as on the TV model and also unlike this the horn operates from the magneto current and is thus similar to the LD. If desired, the stop lamp switch part number 15081260 of the TV could be obtained and bolted on to the brake pedal and a connecting wire added to the grey wire at the junction box. Two 6 volt, 3 watt bulbs should be used but it must be noted that the three bulb bracket part number 15083030 of the TV rear light will need slight modification to fit early models.

125 Li's have no battery and prior to Engine 514081 the low light bulb is a 12 volt, 10 watt. Subsequent machines have a different switch and also a 4.5 ohm resistance, these use a 6 volt, 5 watt low light.

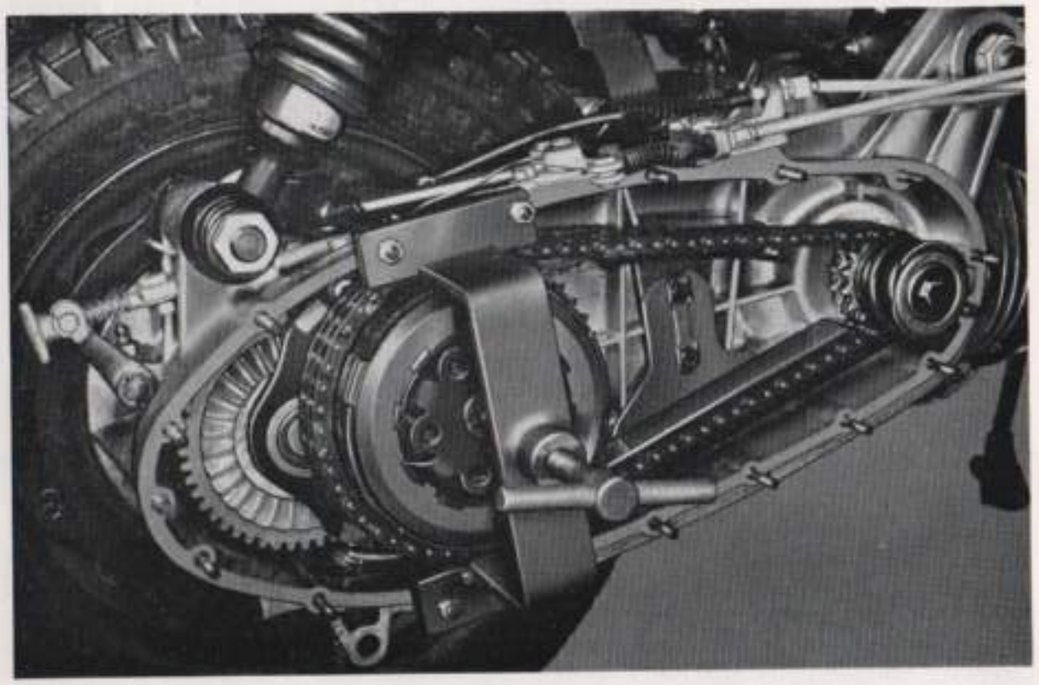
ENGINE UNIT

The work on the clutch, gearbox and engine of the Li is very straightforward. Do not take the engine from the frame but disconnect the silencer, undoing the three 10 mm. crankcase cover nuts and the 14 mm. exhaust pipe clip, and remove the offside pillion footboard together with its supporting bracket held to the frame by two 14 mm. nuts and bolts.

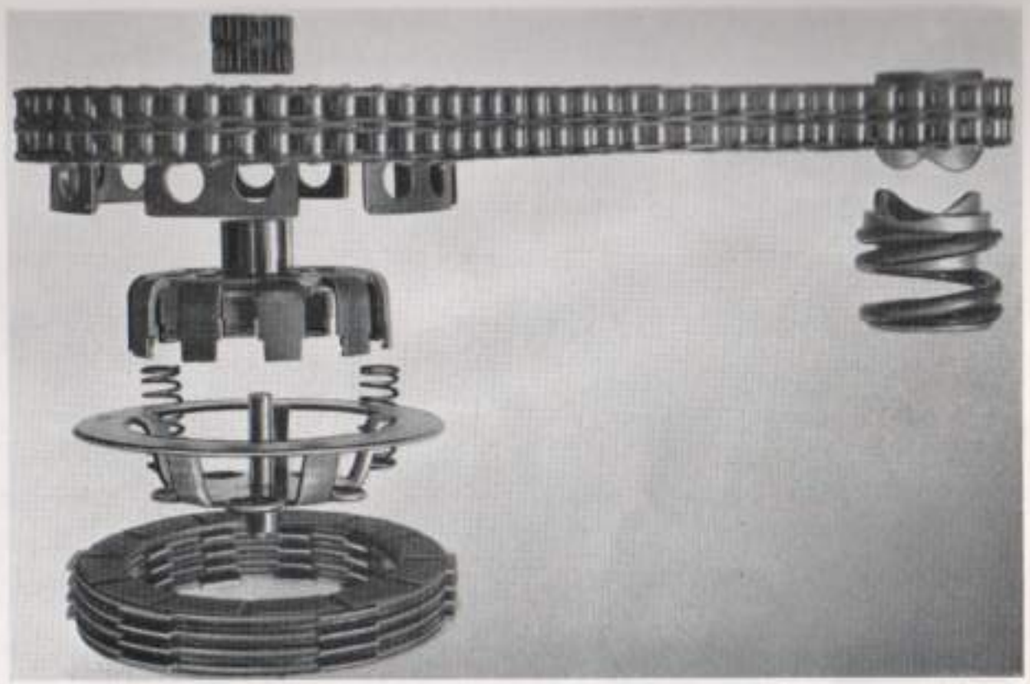
Take off the thirteen remaining crankcase nuts and place a tray to collect the gearbox oil. Disconnect the clutch cable and take off the cover complete with the kick-starter pedal and mechanism.

CLUTCH

To dismantle the clutch it is practically essential to have the compressing



Applying clutch compressor 59351



Double roller chain, clutch assembly and engine sprocket shock absorber

tool 59351. This bridges the sides of the crankcase and a threaded rod bears on the clutch centre to compress the springs while the circlip retaining the plates is removed. Do not lose the small cap, acting as a thrust pad to the withdrawal mechanism, fitted to the carrier plate which will now be released and together with the clutch plates and five springs should slide easily off the splines of the inner and outer members of the clutch. If it is necessary to check the freedom of the plates on their splines do this with the outer steel pressure plate in position, because this prevents distortion of the centre piece.

A 22 mm. nut holds the clutch centre to the input gear and the two parts are splined. Tool 59804 prevents the centre from turning as the nut is undone, and extractor 59328 is available although not always necessary, to remove it from the splines ; when it has been removed, the outer clutch member which carries the chainwheel and runs freely on the centre piece supported by two needle roller races, can be slipped out of the chain and taken off.

Distance washers between the clutch unit and the gearshaft bearing determine chain alignment, and provided that the same ones are replaced behind the clutch members on reassembly, no check should be necessary on chain alignment ; but if the sprockets or associated parts have been renewed, careful measurement of the depths of the sprocket faces below the face of the crankcase must be made and the number and thickness of the distance washers varied to give an equal reading for each sprocket. A special bridge piece 57865 for assembling a dial gauge to compare these distances is available.

Some difficulty may be experienced in positioning the five springs on reassembly and although these can be held in their sockets around the carrier by the tips of five fingers using two hands, it may be preferred to make a simple jig consisting of five nails pressed through a piece of hardboard or similar, corresponding to the five holes in the carrier plate. The springs can then be supported on the nails while the carrier plate is entered on to the splines of

the clutch centre, and then the carrier held in place while the jig is removed and the compressing tool applied to enable the circlip to be replaced.

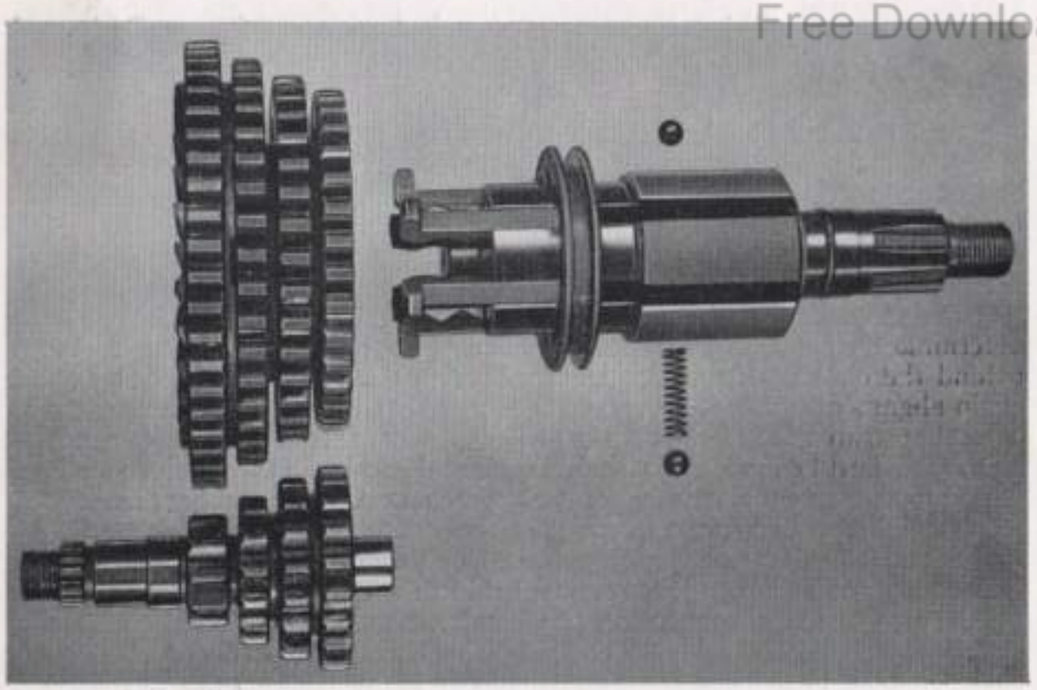
The chain runs in rubberised guides and should not require attention. Although the upper guide is adjustable by being moved when the 10 mm. fixing bolts in the slotted holes are slackened, this provision is only to accommodate slight differences between one engine and another when new. On no account should the chain be tight.

GEARBOX

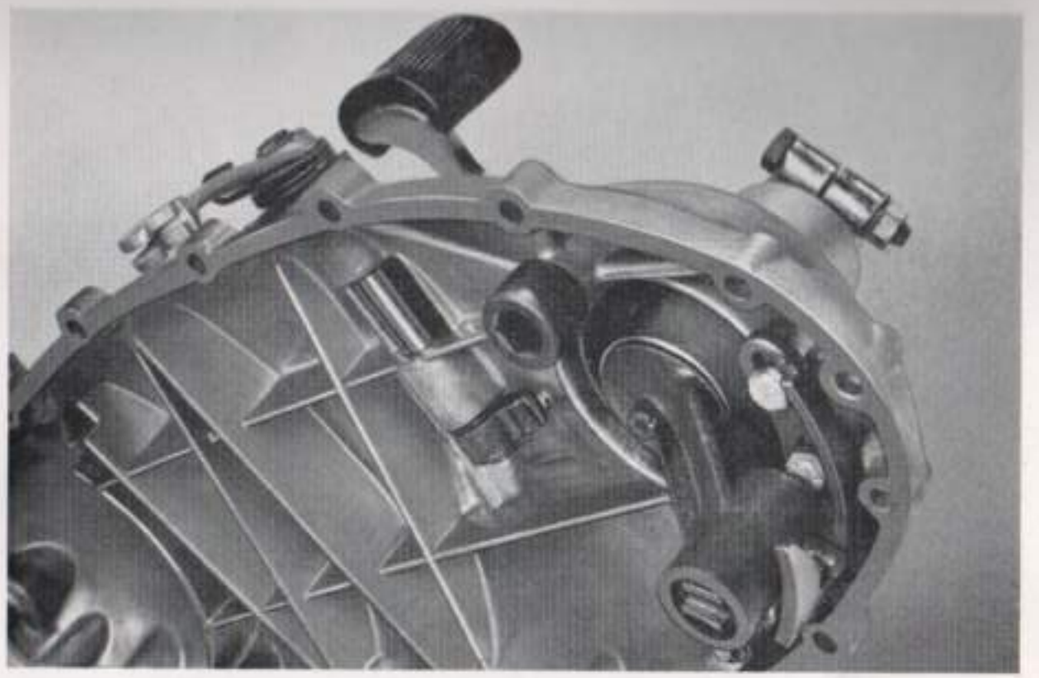
Leaving the engine sprocket in place surrounded by the chain after the clutch has been removed, proceed by unscrewing the six 11 mm. nuts holding the iron flange supporting the gear and axle shafts. There are two holes, threaded 6 mm. diameter 1 mm. pitch, in the flange which allow long screws or special tools 50406 to be inserted and cause the parts to be extracted ; but it will not generally be very tight and if the rear wheel is rotated to allow the gears to move, the flange will come out complete with the input gear shaft and cluster which can afterwards be pressed our from the bearing. There should be a plain washer next to the needle roller bearing on both the gear cluster and the rear axle.

The selector mechanism need not be disturbed during normal attention to the gearbox, but if the axle is to be taken out, then the 10 mm. pinchbolt must be unscrewed from the operating arm on top of the casing and the arm removed from the splines. Refit this arm on reassembly, ensuring that it is in the same position on the splines, as otherwise the gear change lever will not correspond with the gear engaged.

If the crankcase is supported by means of the small stand in the tool kit the rear wheel may be removed with a blow from a mallet on the offside of the



Four gears, cursor and spring loaded balls on rear axle



Kickstarter, mechanism in casing. Engaging teeth retracted

tyre after the 27 mm. centre nut has been removed from the hub. The axle may then be driven out towards the offside, allowing the selector fork to disengage from the gear engagement cursor ring. This ring is integral with the six cursors and once dismantled from the axle is easily damaged. Its position to engage each gear is determined by notches on the inside edges of each cursor, two of which are engaged by $\frac{5}{16}$ inch ball bearings pressed outwards by the action of a spring in a crosswise drilling in the axle. Should the cursor ring be inadvertently pulled too far along the splines in the axle, these balls will spring out and the easiest way of replacing them is to take out the axle, press the balls and cursor ring back into position and reassemble.

As a group, the four gears on the axle and the gear cluster can be interchanged between the 125 and 150 Li. Thus the lower gear ratios of the smaller machine are available to be fitted to the 150 Li for sidecar use.

When reassembling the four gears, which can be taken off the axle when the gearbox flange is removed, note that they do not have the internal ring of dogs spaced centrally and it is therefore most important to face them in the correct direction. The largest gear, with a face ratchet which is engaged by the kick-starter, must be fitted with the ratchet towards the cover where the kick-starter mechanism is contained. The smallest gear which is placed nearest the wheel hub will be seen to have the internal ring of dogs offset to one side. The side with the dogs must be towards the wheel hub when assembled.

With the position of the largest and smallest gears determined, the remaining two should be placed between in descending order of size and must face so that the gear teeth and the ring dogs are equidistant on all four gears. If they are placed together before assembly it will be obvious whether or not the gaps are equally spaced. Incorrect assembly will cause the gearbox to seize in operation and may lead to serious damage.

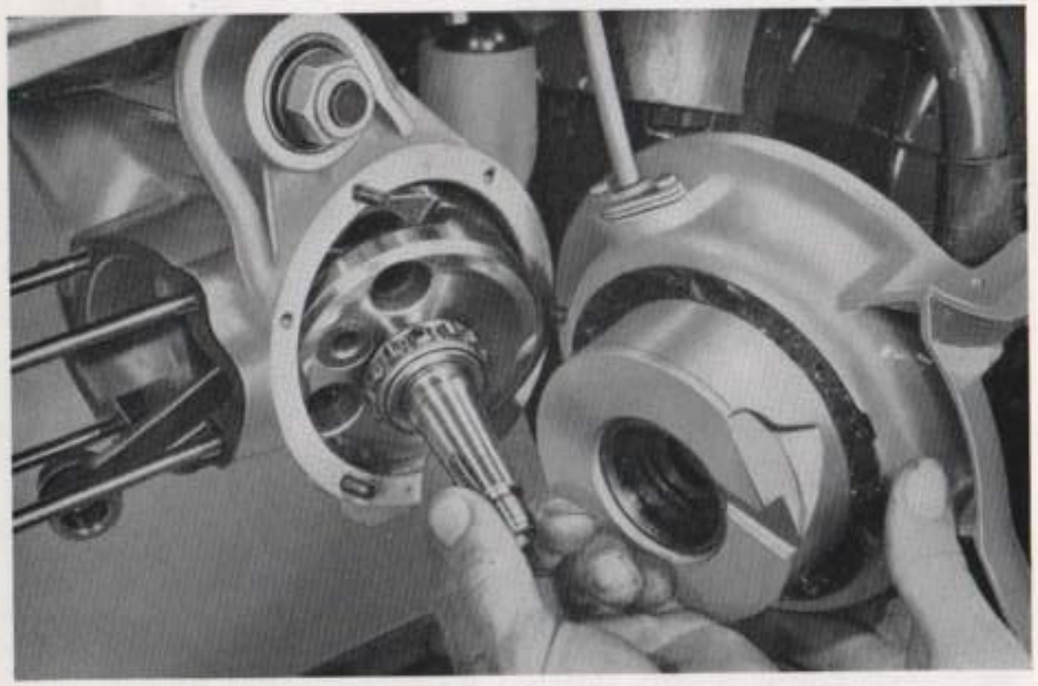
Number of Teeth		Li 125	Li 150
1st Gear	.....	51	50
2nd Gear	.....	42	41
3rd Gear	.....	39	37
4th Gear	.....	35	34
Gear Cluster	.....	9	11
	.....	12	14
	.....	16	17
	.....	19	20

KICK-STARTER

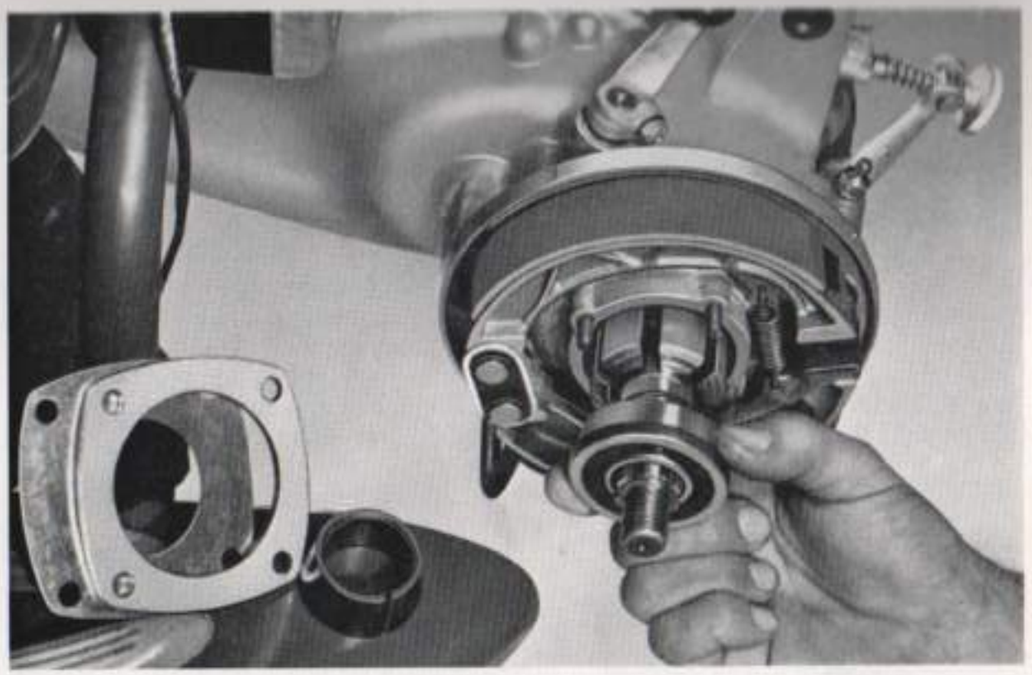
This mechanism is mounted entirely in the crankcase cover. The return buffer is a rubber bush inserted into a lug on the cover and as the pedal approaches this, the double-toothed finger on the kick-starter shaft arm is disengaged from the face ratchet on first gear by an adjustable ramp held by three 10 mm. screws to the inside of the cover.

The pedal may be removed without upsetting the mechanism but when it is replaced the spline position must be selected which just enables the pedal to return against the buffer under the action of the return spring on the shaft. If this, or the position of the adjustable ramp, is not correct, the ratchet teeth will tend to engage and thus become prematurely worn. However, the fault will be accompanied by considerable noise when running and is easily detected.

The return spring is loaded one half-turn and is dismantled when the crankcase cover is removed, and after the adjustable ramp has been disconnected, by taking off the circlip from the pedal shaft, slackening the 11 mm. pinchbolt and withdrawing the pedal to the point where it can pass the buffer and complete its arc of movement to the relaxed position.



Removing crankshaft from magneto side of engine



Axle driven towards the nearside to press out the bearing

The gear engagement finger is spring loaded in a barrel formed on the arm of the pedal shaft. It must slide freely within the limits imposed by the peg which is screwed into the side of the finger. If the peg is removed at any time, the thread must be burred after replacement by means of a centre punch inserted in the hole in the end of the finger. When the pedal is in position, the ramp must be adjusted so that it withdraws the finger to the full extent of the ramp, but allows plenty of clearance for further rotation of the shaft so that the pedal buffer will resist the return shock and no load will be imposed on the peg.

Note that if the kickstarter shaft is entirely withdrawn from the cover, then on replacement the oilseal protector thimble 57776 should be fitted over the splines to prevent damage to the oilseal as the shaft is pressed in.

CRANKSHAFT

If the cylinder and piston are dismantled as for decarbonising, and the crankcase cover removed, it will be little extra work to take out the crankshaft and main bearings.

Without disturbing the clutch, unscrew the 14 mm. bolt holding the engine sprocket shock absorber lock plate, spring and cam. The lock plate is splined and care must be taken to engage this with the sleeve on assembly.

Remove the flywheel cowling and the flywheel as previously described. Take off the stator plate, undoing its three 10 mm. bolts and disconnecting the wires at the junction on the rectifier box. Unscrew the three 10 mm. nuts which remain holding the magneto flange and withdraw this by inserting two of the stator plate fixing bolts into the special threaded holes provided ; screw them in evenly to press off the flange. If it is very tight, the special tool 49188/2 will be useful.

The crankshaft will now come out through the aperture left by the removal

of the magneto flange if a ½ inch drift of soft material is placed against the end of the shaft inside the sprocket sleeve on the offside and tapped with a hammer. Take care not to damage the oilseal next to the main bearing when replacing the crankshaft in position

Considerable end float of the crankshaft is permitted by the ball bearing race on the driving side and a small amount of clearance in the roller bearing on the magneto side gives the effect that the flywheel will " lift " an appreciable amount, but this need cause no concern.

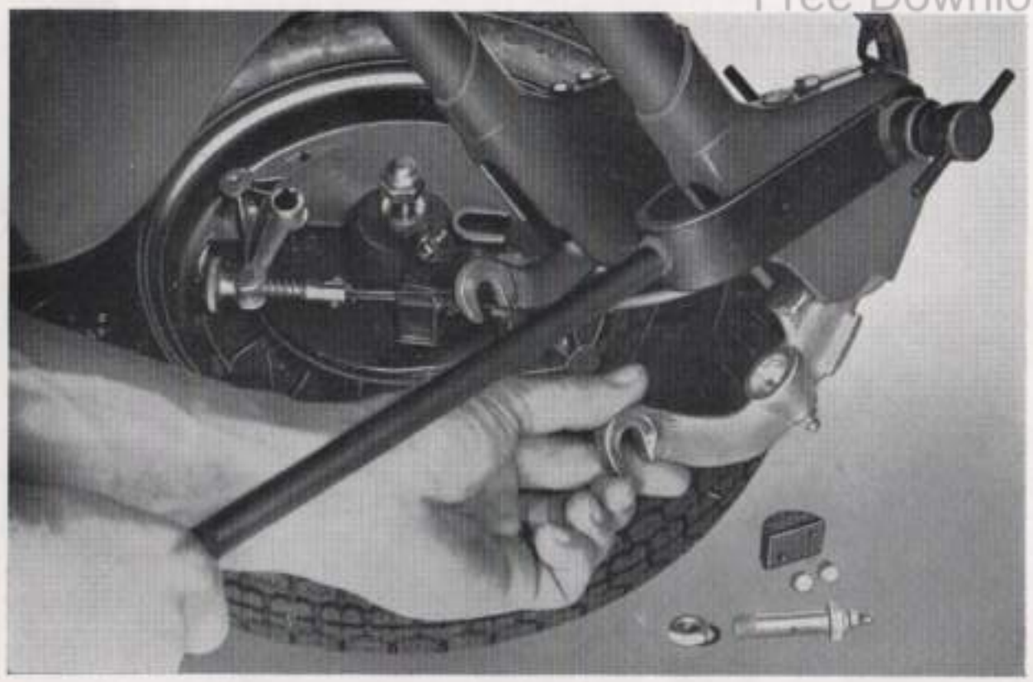
As with LD machines, the crankshaft is precision ground after assembly to ensure maximum life of the big-end and this is unlikely to fail during the normal life of the scooter unless oil is omitted from the petrol/oil mixture at any time, but if it has to be replaced a complete new crankshaft assembly will be necessary. The connecting rod will rock sideways a considerable amount and under suitable conditions clearance in the big-end will be felt ; up to .003 inches is permissible. Side float may exceed .020 inches.

REAR AXLE BEARING

To replace the rear axle oilseal it is only necessary to take off the hub and remove the bearing retaining plate and washer held by four 10 mm. nuts. The old oilseal can be levered out with a screwdriver.

If the bearing is to be removed, the crankcase cover must be taken off and without further dismantling, top gear should be engaged and the axle driven towards the nearside with the help of a soft drift placed on the exposed end. This will dislodge the bearing from its seating and the axle can then be tapped back into position, provided that the washer, ring and first gear which will have dropped down, are aligned.

Care must be taken not to drive the axle out further than necessary or the spring loaded balls controlling the gear positions will fly out.



Compressing spring with tool 58021 to release trailing link

Do remember that this bearing is intended to have considerable clearance, and it should not be changed merely because there is rock in the rear wheel.

FRONT FORKS

In order to tighten the steering head bearings the handlebars must be removed. After taking off the cover, disconnect the throttle, gear and front brake cables at the ends furthest from the handlebar, and undo the clamp around the frame where the cable oilers are situated. Pull through the front brake cable from the fork stem to give plenty of slack, taking care to ease it in to the hole where it enters the fork stem at the bottom and not to stretch the outer cable. Afterwards press the speedometer cable end down into the stem out of the way.

Use the large oil plug tool 43385, together with the 10 mm. hexagonal key 57836 to slacken the pinchbolt across the base of the handlebars and remove the bolt completely. The handlebars can then be tapped upwards with a mallet, taking advantage of the slack in the cables to let the unit drop down on the driver's side of the legshield.

The standard workshop tools can now be used to adjust the races in the normal way or to continue and dismantle the forks from the frame. Note that looseness of the steering can also be caused through slackness of the four 10 mm. nuts and bolts holding the iron centre piece to the handlebar casting. The spring lock washers here are essential.

Unlike the LD, the front suspension cannot be dismantled without the special spring compressing tool 58021. The forks need not be removed from the frame, but take out the front wheel complete and remove the lower rubber buffer from the end of the fork leg where it is held by two 10 mm. bolts. Unscrew the 19 mm. securing nuts, press out the pivot pins and screw the spring compressor into the holes vacated by the pivots. Lever the spring up to the limit of the travel of the tool and pull out the trailing link ; this allows the spring to be released and the guide parts to fall out. Take care during reassembly to hold the thin washers either side of the trailing link eye in position as it is entered into the fork leg.

The wheel bearings and their assembly are identical to the LD, but difficulty may be experienced if the speedometer drive ring gear has to be removed from the hub. The easiest way to accomplish this is by drilling a ¼ inch hole in the face of the hub either side of the boss and immediately adjacent to it. These will not be unsightly and they will allow a thin punch to be entered into each alternatively to drive the ring gear off squarely.

If the steering lock has to be taken out, release the small retaining screw accessible when the handlebar cover is removed. The lock is not a tight fit and may be pulled out from the front. On replacement, use the screwdriver to depress the spring loaded peg inside the recess with the handlebars in the locked position, and prevent the peg from slipping up again by pressing the handlebars towards the straight ahead position whilst the lock is pushed home.

Lambretta 175 TV

The largest scooter in the range, the 175 TV is designed for sports use, and the engine is very high powered in relation to its size. Several variations of the model exist, but generally it is a " big brother " to the Li and has the same frame and lay-out, although incorporating many extras. The differences between it and the Li are dealt with here and also the dismantling and reassembling of those with the special engine unit. Engine components of this type are not interchangeable with the Li, although many other parts are.

Machines up to Engine 7022 have knurled adjusters fitted to the front brake and clutch controls on the handlebar but these are locked to prevent tampering. If it is desired to remove the locking screw, grip the handlever back against the twistgrip and insert a thin screwdriver into the gap between the front of the lever where the cable nipple is contained and the enclosing support. The screw to be undone can be seen through this gap and is actually threaded into the barrel of the knurled adjuster ; it must be removed completely to allow use of the adjuster.

To disconnect either the front brake or clutch levers or the respective inner cables of machines before the engine number quoted, unscrew the inner cable clamp at the further end, down by the front wheel or the engine unit according to which is concerned, and use a piece of wire or a nail formed into a hook to pull the inner cable through at the handlebar lever end. This hook must therefore be inserted between the knuckle of the lever where the cable nipple is held and the support housing. The inner cable must be pulled out until it forms a loop large enough to allow the nipple to be slipped out from the lever and then the cable can be entirely withdrawn.

Only after removing the inner cable as described can access be obtained to

Handlebar with adjuster. Cable and nipple hooked out and locking pin extracted

Wheel with extra bolt clamping back plate. Tapping out spindle

the bent end of a small wire pin set in the lever behind the cable nipple recess and locking the lever pivot pin. If a hook has been made, it can be inserted behind the end of this pin to ease it out and the lever pivot pin thus released can be withdrawn with the fingers. This pivot pin cannot be unscrewed as would appear to be the case when its 8 mm. hexagonal end is seen on the underside of the lever support.

Sometimes an annoying vibration occurs with the gear change twistgrip and this can be cured by removing the group and fitting three rubber washers, part number 11110309, on the handlebar tube beneath.

FORKS AND BRAKES

The front brake shoes are identical to the Li but the rear shoes of the special engine unit are different. Also the front brake backplate is secured in the offside suspension link by a stud and a 21 mm. nut. The backplate cannot be removed from the hub unless the inner spindle nut on the nearside is unscrewed and the spindle driven out to the offside.

Hydraulic shock absorbers are fitted to the front suspension and as these are single acting it is quite normal to be able to compress them freely in the hands when removed, but resistance should be felt when they are extended quickly. They will not work lying down or inverted.

Except for the shock absorber brackets, the forks are the same as the Li and the handlebar casting is identical. Note that looseness can exist between the handlebars and the iron bracket clamping them to the fork stem. After Engine 7501 the four fixing bolts were increased in size, subsequently having 10 mm. nuts the same as the Li, and the modification can be applied to earlier machines.

Prior to Engine 3956 no spacing washer is present beneath the lower

bearing cone on the fork stem and this part, number 15060033, does not appear in the spares list. The only difference with the forks of machines of the earlier type lies in the position of the groove at the top of the fork stem where the handlebar pinchbolt passes.

SPECIAL NOTES

Not all types have the cable oilers grouped around the frame in a clamp. If not they will be hidden behind the frame tube inside the mudguard and the cables will have to be pulled round until the oilers are accessible.

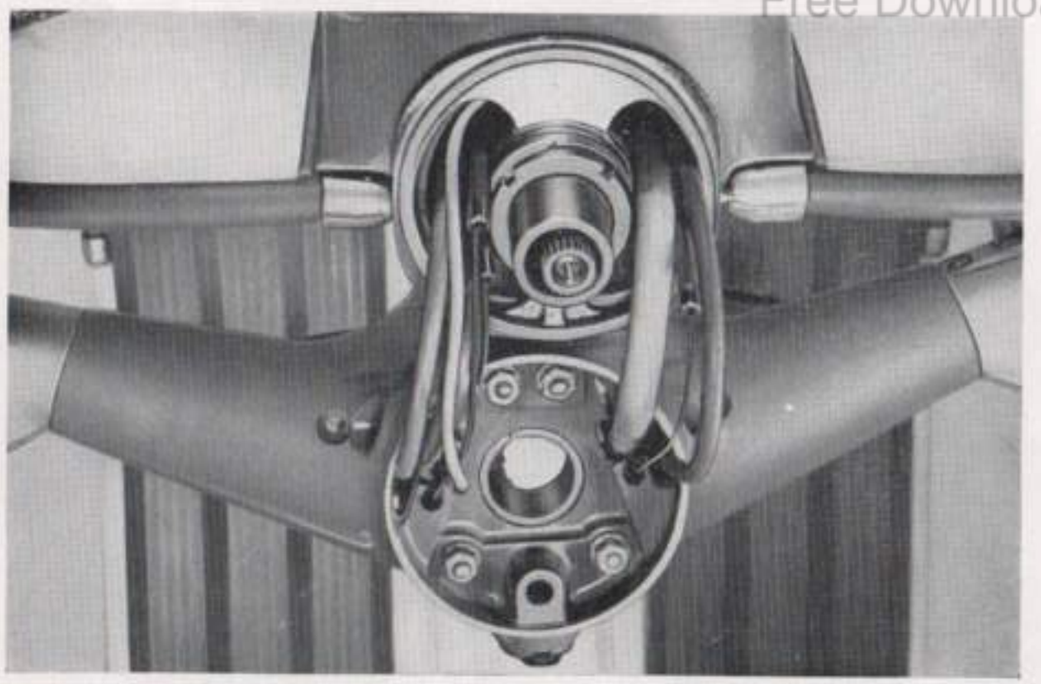
The rear brake cable must have free play amounting to almost half of the total travel of the brake pedal. This is because of the high rate of expansion of the aluminium casting when heated, which can cause the brake to bind.

The gap of the magneto contacts is fairly critical for best performance and easy starting. Increasing the gap has the effect of advancing the ignition. To be correct therefore, vary the gap until the points just " break " when the flywheel is positioned one and five eighths inches before top dead centre of the piston, equivalent to 28° of advance ; the measurement to be made on the outside rim of the flywheel fan.

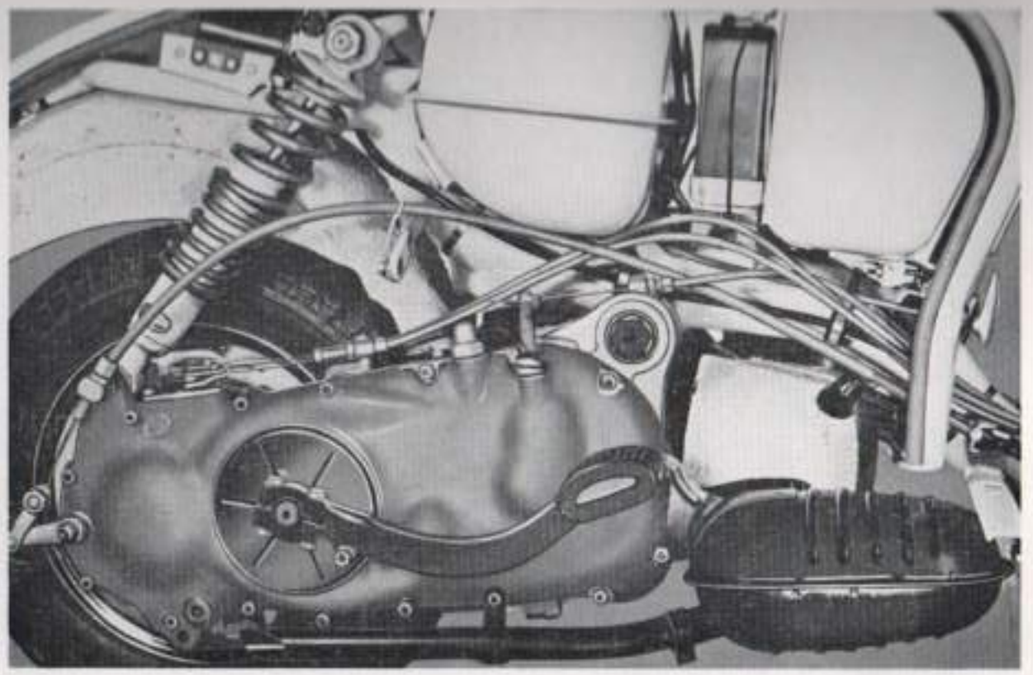
Where a machine suffers from change in the tick-over speed by merely being moved on and off the stand, it is an indication that the throttle cable is rather short and the condition may be cured by eliminating the clip around the frame just ahead of the engine cylinder where this cable is held.

DECARBONISATION

After taking off the side panels, remove the silencer, using the exhaust pipe spanner 57842 and a 10 mm. socket spanner, before removing the pillion



Handlebars lifted away to show steering bearing adjustment



Special engine unit of Mk. I 175 TV

footboards. Without the silencer it will be considerably easier to reach the 8 mm. nuts holding the footboards and the two nuts and screws holding the centre bridge piece.

Unscrew the long reach sparking plug and the 14 mm. bolt adjacent which holds the cylinder cowling. There is an 8 mm. screw holding this to the flywheel fan cover and when it has been removed the cowling can be slid from under the carburettor. Take off the air cleaner and inlet tubing as a unit by slackening the 8 mm. pinchbolt holding it to the front of the carburettor and the 8 mm. clamp between the tube and the frame. Uncouple the throttle cable and undo the two 11 mm. nuts holding the manifold to the cylinder ; the carburettor can then be pulled away from the cylinder and will remain hanging on the choke cable and the petrol pipe.

The cylinder head nuts require a 12 mm. socket or ring spanner, but in order to be able to take off the head and barrel, undo the 19 mm nut on the bolt through the lower eye of the suspension unit and also slacken the 17 mm. nut on the cable clamp of the rear brake, then withdraw the bolt. Note there is one plain washer in between the lugs of the crankcase where the suspension end fits and this is important ; without it there will be a tendency to break the lugs when tightening the bolt on re-assembly.

With the suspension unit moved out of the way, the machine will settle down on the crankcase buffer and allow the cylinder head and barrel to be removed.

It is quite unnecessary to fit new piston rings at every de-coke. Similarly, lack of compression is no cause for concern. See that the gaps of the piston rings are uppermost in the piston when it is re-fitted. These gaps will foul the inlet port while the cylinder is being put back but the piston rings do not pass the inlet port during the normal movement of the piston. When pushing on the cylinder, take the first inch very carefully because then the ring gaps are just negotiating the port.

When re-assembling, connect the plastic petrol pipe before fitting the carburettor ; it is very difficult afterwards.

Be careful not to over-tighten the two 11 mm. manifold nuts, there is a plastic distance piece between the manifold and the cylinder and the joint is easily distorted.

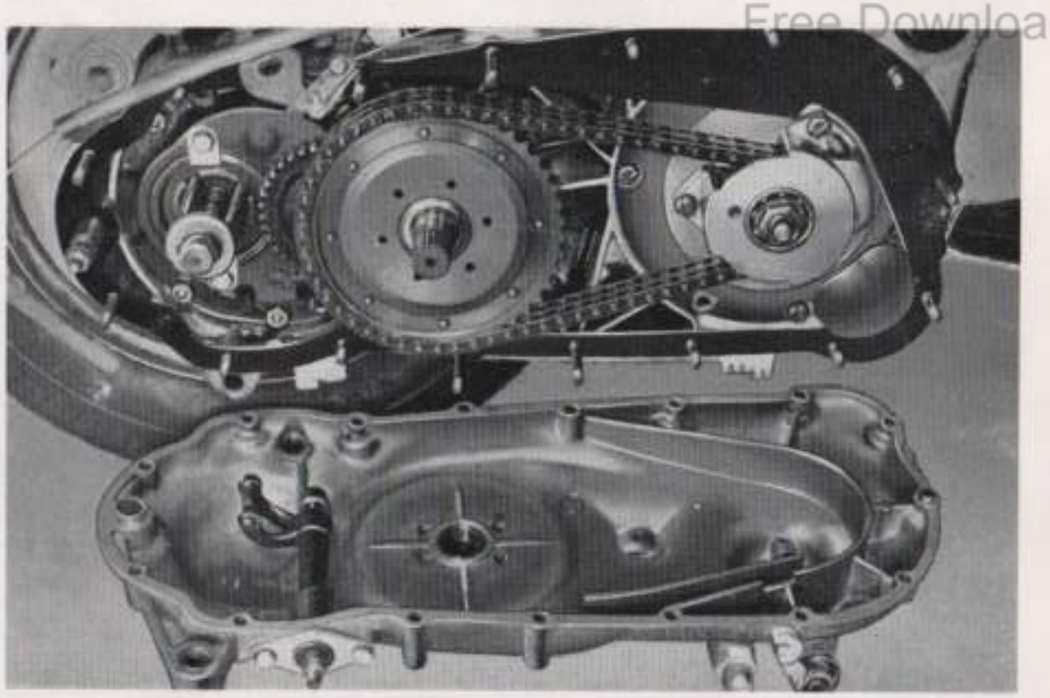
Normal setting for the pilot airscrew is approximately three-quarters to one turn out from the screwed-in position. Unscrewing tends to weaken the mixture at tick-over.

If the engine does not two-stroke evenly at 30 miles per hour, lower the taper needle in the throttle slide by fitting its clip in the top groove.

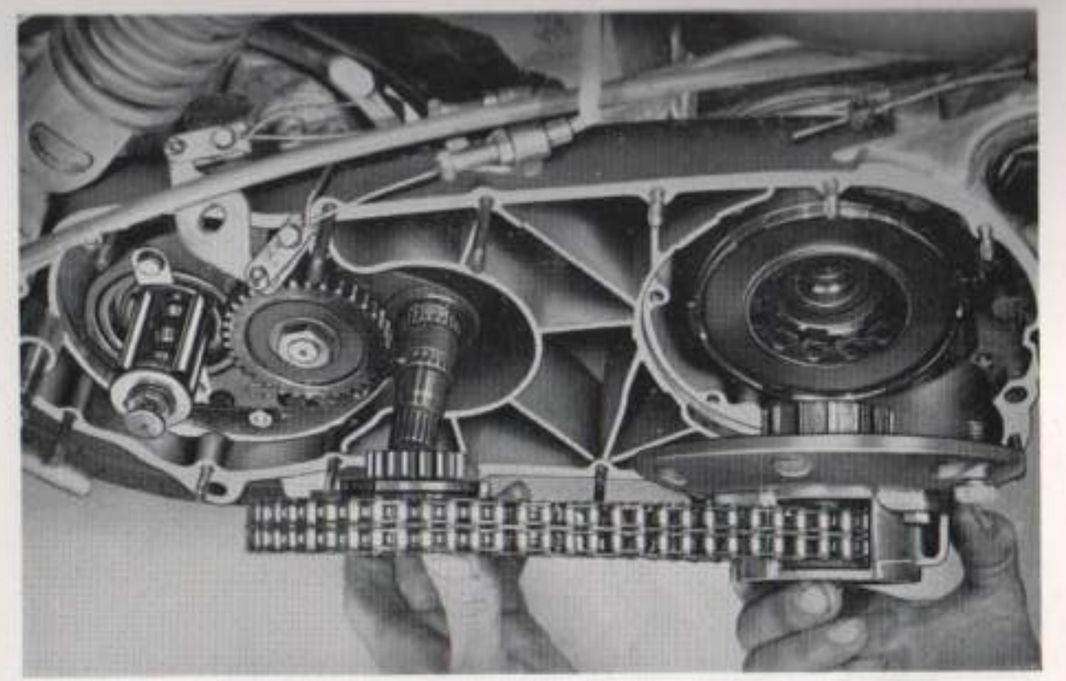
ENGINE UNIT

As with the Li there is no need to take the engine from the frame when dismantling it, but remove the silencer and the offside footboard together with its supporting bracket held to the frame by two 14 mm. bolts with nuts.

Remove the rear brake arm with its two circlips, one either side, and disconnect the lower suspension unit bolt retained by a 19 mm. nut on the side nearest the wheel rim. Pull out the bolt and allow the machine to settle down on the crankcase buffer. Take off the kick-starter shaft circlip and slacken the two 11 mm. bolts holding the pedal. Do not remove the pedal until the 10 mm. nut holding the chromium spring return disc is undone and take care as this will spring round anti-clockwise a half turn as the pedal is levered off. Another circlip on the kick-starter shaft holds the disc in place and after removing it, the disc complete with the spring can be pulled away from the crankcase. A screwdriver inserted through the ¼-inch hole near the centre will help to ensure that the spring does come away with the disc. On re-assembly the same means can be used to help locate the inner end of the



Gear casing cover removed. Gear selector operating arm on left, clutch on right



Engine sprocket, chain and chainwheel come off together

spring in one of the three slots in the crankcase. Do not overload the spring, half to two-thirds of a turn is sufficient.

Undo all the 10 mm. nuts with their Belleville washers surrounding the crankcase cover and disconnect the gear and clutch cables. Gentle pressure on the clutch lever on the front of the cover will help to push it off and the rear can be eased off at the same time with the fingers. Try to keep the gasket intact, it is not stuck with any adhesive.

To get at either the clutch or the gearbox it is necessary to remove the chain with its sprockets. Remove the third circlip from the kick-starter shaft and take out the seven 10 mm. slotted bolts holding the engine sprocket housing and carrier assembly. Insert the two 14 mm. bolts from the pillion footrest bracket into the threaded holes provided in the carrier plate. As these are screwed in they will extract the whole assembly which can then be lifted out complete with chain and chainwheel. Behind the chainwheel are plain washers which are used to vary the sprocket alignment ; make sure that the same ones are put back here or the chain will suffer. Notice also that there is a 7/32-inch ball bearing in the engine sprocket shaft which is part of the clutch withdrawal mechanism, it will now fall out.

From this point attention will be divided either towards the gearbox or the clutch and crankshaft units, therefore these follow under separate headings. No special tools have been needed yet and re-assembly of the sprockets and chain, and replacement of the cover is also possible without them, except as regards the protection of the oilseal in the cover which surrounds the kick-starter shaft. As the cover is pushed into place the splines of the shaft would tend to tear the oilseal and therefore to protect it, a thin metal thimble, tool 57776, is available to place over the shaft before assembly.

Regressing a little to where the chainwheel, chain and engine sprocket with housing and carrier are to be refitted, note that some difficulty may be

bearing cone on the fork stem and this part, number 15060033, does not appear in the spares list. The only difference with the forks of machines of the earlier type lies in the position of the groove at the top of the fork stem where the handlebar pinchbolt passes.

SPECIAL NOTES

Not all types have the cable oilers grouped around the frame in a clamp. If not they will be hidden behind the frame tube inside the mudguard and the cables will have to be pulled round until the oilers are accessible.

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Where a machine suffers from change in the tick-over speed by merely being moved on and off the stand, it is an indication that the throttle cable is rather short and the condition may be cured by eliminating the clip around the frame just ahead of the engine cylinder where this cable is held.

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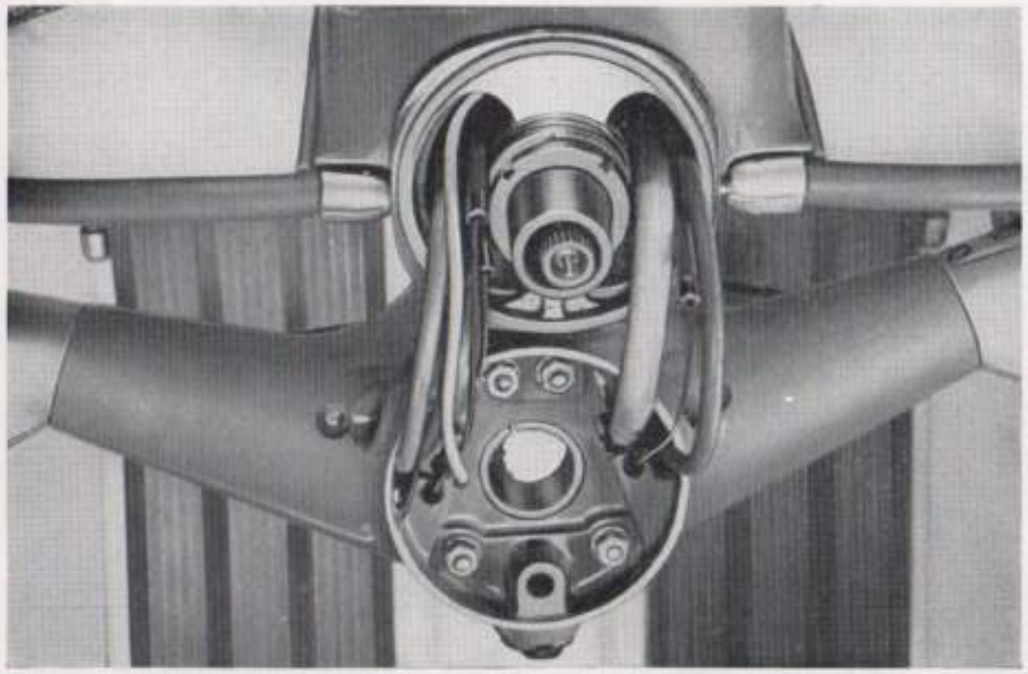
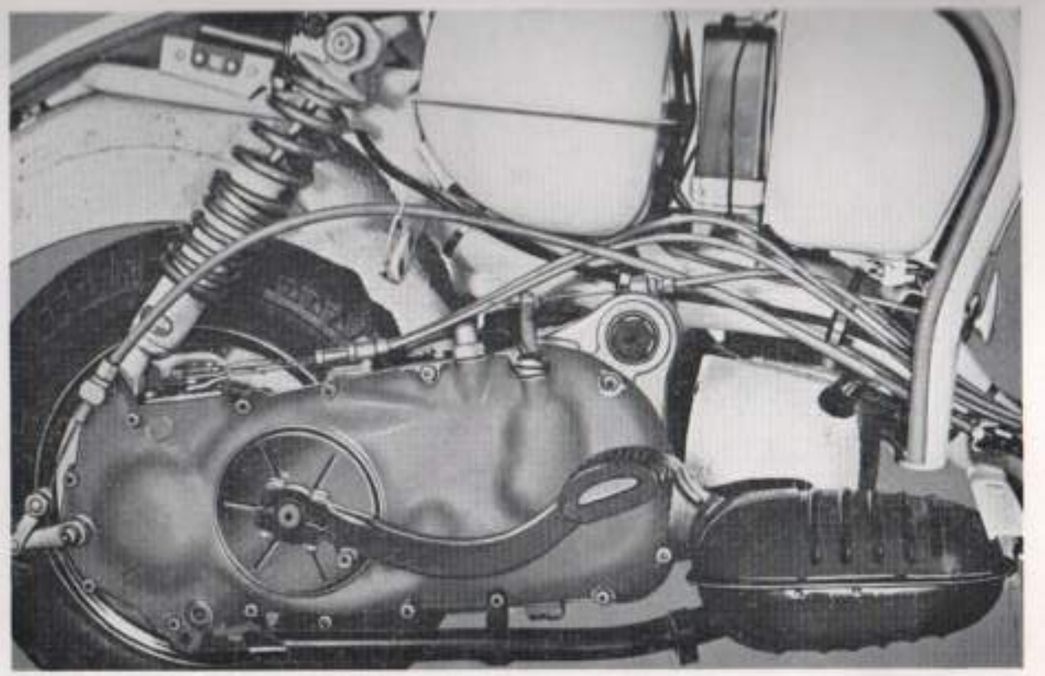


Handlebars lifted away to show steering bearing adjustment



Special engine unit of Mk. 1 175 TV

footboards. Without the silencer it will be considerably easier to reach the 8 mm. nuts holding the footboards and the two nuts and screws holding the centre bridge piece.

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The cylinder head nuts require a 12 mm. socket or ring spanner, but in order to be able to take off the head and barrel, undo the 19 mm nut on the bolt through the lower eye of the suspension unit and also slacken the 17 mm. nut on the cable clamp of the rear brake, then withdraw the bolt. Note there is one plain washer in between the lugs of the crankcase where the suspension end fits and this is important ; without it there will be a tendency to break the lugs when tightening the bolt on re-assembly.

With the suspension unit moved out of the way, the machine will settle down on the crankcase buffer and allow the cylinder head and barrel to be removed.

It is quite unnecessary to fit new piston rings at every de-coke. Similarly, lack of compression is no cause for concern. See that the gaps of the piston rings are uppermost in the piston when it is re-fitted. These gaps will foul the inlet port while the cylinder is being put back but the piston rings do not pass the inlet port during the normal movement of the piston. When pushing on the cylinder, take the first inch very carefully because then the ring gaps are just negotiating the port.

experienced in sliding home the splined clutch centre which is part of the engine sprocket unit. First the chainwheel must be rotated to align the splines with the plates and secondly the carrier housing must be centralised over its recess in the crankcase. After it has been remounted with its seven bolts, enter the 7/32-inch ball bearing and the short stub which the clutch lever presses on, into the centre of the sprocket shaft. To check that the clutch plates have not been trapped when the sprocket carrier was screwed home, measure the clearance between the underneath of the head of the stub and the end of the shaft ; if all is well there will be distance of $\frac{1}{4}$ inch to $\frac{5}{16}$ inch. If there is hardly any clearance it means that the clutch plates have been forced back as the carrier was tightened ; slacken off the bolts and rock the housing to help it to engage the splines and try again.

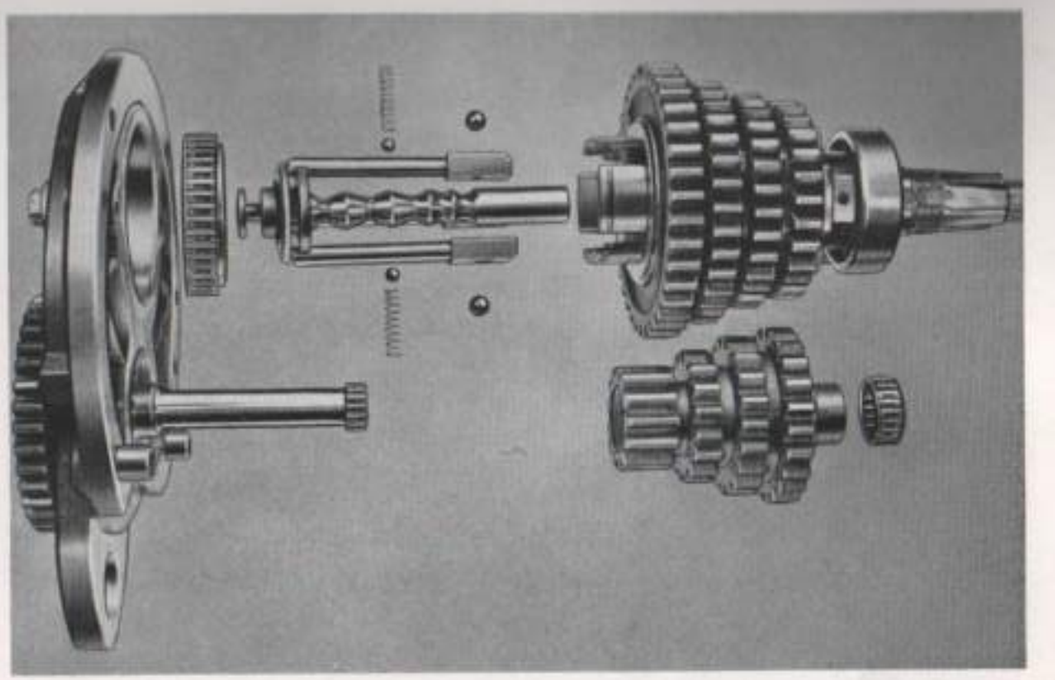
Assuming that the distance washers have been fitted behind the chainwheel, replace the one plain washer on the outside and then the circlip. Put the cover back, sliding the gear change horseshoe on its pivot into the mushroom end of the gear selector in the axleshaft so that its open end faces to the rear of the machine. When the kick-starter pedal is to be re-fitted, twist the kick-starter spring disc through its half turn and hold it there with a screwdriver wedged under the pedal engaging stud while the pedal is forced on.

Again, remember the one plain washer between the eye of the suspension unit and the crankcase lugs.

GEARBOX

When the crankcase cover and the primary drive have been removed, the iron casting on the side of the gearbox can be extracted. First undo the five 11 mm. nuts with a thin socket spanner and then insert the same two pillion footrest bracket 14 mm. bolts used to extract the engine sprocket carrier, into the threaded holes provided in the iron casting. Gently rotate the

Clutch on crankshaft, compressor and plate aligning tool 56686 in foreground



Four gears on rear axle with cursors and dog engaging balls

kick-starter shaft as the operation proceeds in order to prevent it from jamming. The shaft can remain in place or come with the casting, whichever is wished.

Take off the 27 mm. rear wheel centre nut and after supporting the rear of the crankcase on the small fork stand from the tool kit, withdraw the wheel and hub complete, using the extractor number 57028. Some machines will have the 8 mm. left-hand threaded locking screw in the centre of the axle common to the LD 150. Others, after Engine 6550, have a serrated locking plate fitting over the hexagonal form of the nut and secured to the hub by two 8 mm. screws ; but more satisfactory than either of these is the spring washer part number 73170170 which can be fitted to all models.

The ball race supporting the rear wheel and axle has a small amount of clearance, therefore do not worry if there is side movement of the wheel, provided that the nuts are tight.

Fit the holding tool number 57971 on the axle splines and after bending back the tab washer, undo the 36 mm. nut clamping the axle in its bearing. Tap the end of the axle with a hide mallet to withdraw the whole shaft carrying the selector and gears, bringing with them the layshaft gear cluster.

Put the tool number 57971 in place again on the axle and secure it with the wheel hub nut. Support the handle of the tool in a vice so that the axle is uppermost, and remove the large circlip. Prise off the roller bearing race ring by means of two levers set to wedge the gears off the shaft, taking care to keep the ring square whilst so doing. Two springs and 7/32-inch ball bearings will fly out as the ring releases them and these form the gear engagement positions with the notched centre of the selector. They can be held compressed during re-assembly by sliding the first gear over them while the bearing ring is being pressed home.

It is very easy to fit third gear the wrong way round when placing the gears on the axle and this will cause the gearbox to seize in operation. Note

that between any two gears, only one side should carry oil slots. Second gear which has no oil slots should be placed with its slightly higher boss facing the road wheel end of the axle.

When correctly positioned the gaps between the dogs will all be equal and this can be seen if the gears are placed together when dismantled.

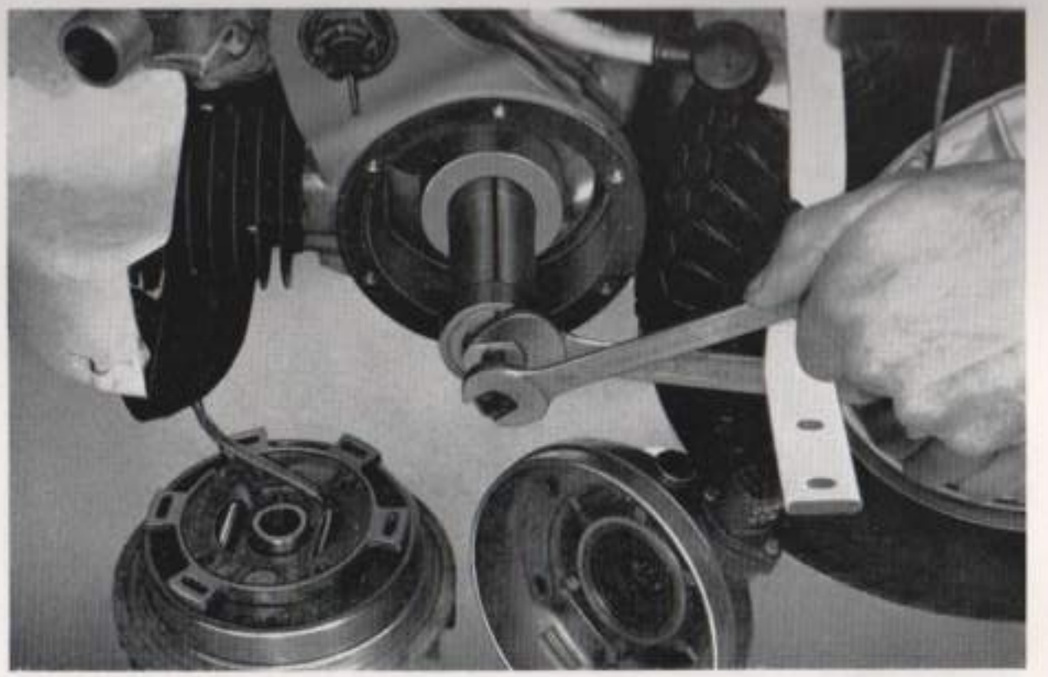
During re-assembly of the gearbox after the axle and gear clusters have been mounted, check that the projection on the friction spring around the kick-starter ratchet is fitted into the recess in the crankcase. Note that a plain washer is sometimes left off the inner end of the kick-starter shaft if there is insufficient clearance for it when the iron casting is bolted home; thus there should be a very small amount of end float of the shaft and it must not be tight.

CLUTCH AND CRANKSHAFT

Once the engine sprocket has been removed together with its housing, the clutch is laid bare for the removal of the plates. These are retained in the usual manner by a large circlip and the pressure plate with its six springs is at the back. Special tool number 56686 bolts on to the side of the crankcase and screws against the pressure plate so that the circlip can be taken out. During re-assembly the clutch plate spline aligning piece which is part of tool number 56686, serves to position the plates so that when the circlip is back in place and the tool centre is removed, the clutch plate splines will be ready to receive the splined centre of the engine sprocket group.

Further dismantle the clutch if the crankshaft is to be removed, by undoing the 27 mm. left-hand threaded nut locked with a tab washer in the centre of the clutch bell and draw this latter from the crankshaft splines,

Face ratchet of kickstarter engages by action of helix as the shaft rotates



Bearing sleeve extractor 50405, the large ring must be up against the crankshaft

preferably using the tool 57840. When unscrewing the nut, the crankshaft can be prevented from turning by applying tool 57841 to the clutch bell or inserting a suitable implement into the crankcase neck after removing the cylinder.

Apart from the locking screw sometimes present in the centre of the rear hub nut, the only left-hand threads used on the machine are that with the 27 mm. nut in the clutch bell and the one on the end of the engine sprocket shaft with a 19 mm. nut.

Continue by removing the nearside footboard, engine cowling, carburettor, cylinder and piston as for decarbonising and take off the flywheel fan cover held to the magneto flange by three 8 mm. screws. Release the dust cover and circlip and undo the 19 mm. flywheel centre nut with the socket spanner suitable for the LD. Use the extractor 37058/2E to pull off the flywheel. Remove the second half of the fan cover held to the magneto flange by a pinchscrew on the side nearest the front of the machine and take out the five screws holding the stator plate, marking its position for reassembly if the timing is correct. Note that the green wire is for ignition, blue to rectifier and brown the main feed to the switch.

Take out the six 10 mm. magneto flange securing bolts and use the extractor 49188/2 to draw it off. Afterwards the crankshaft may be taken out in the usual way.

The crankshaft is supported on a journal ball race on the driving side and up to Engine 5001 a double row journal ball race is fitted on the magneto side; subsequently it is replaced by a roller race.

The usual clearances are permissible in the big-end and small end, and as with the Li, the relatively large clearance in the main bearings gives nearly .004 inches up and down play of the flywheel, which may lead to the supposition that the bearing is worn, when in fact this is quite unlikely. Since

the introduction of the roller bearing necessitates a thicker shoulder on the crankshaft next to the bearing sleeve, a washer of .040 inches thickness must be added if this bearing is to be fitted to a machine possessing the original type of crankshaft. The thickness may be made up from several LD bevel shim washers part number 07060163. Note also that a thicker distance piece is used in the magneto flange with the roller bearing.

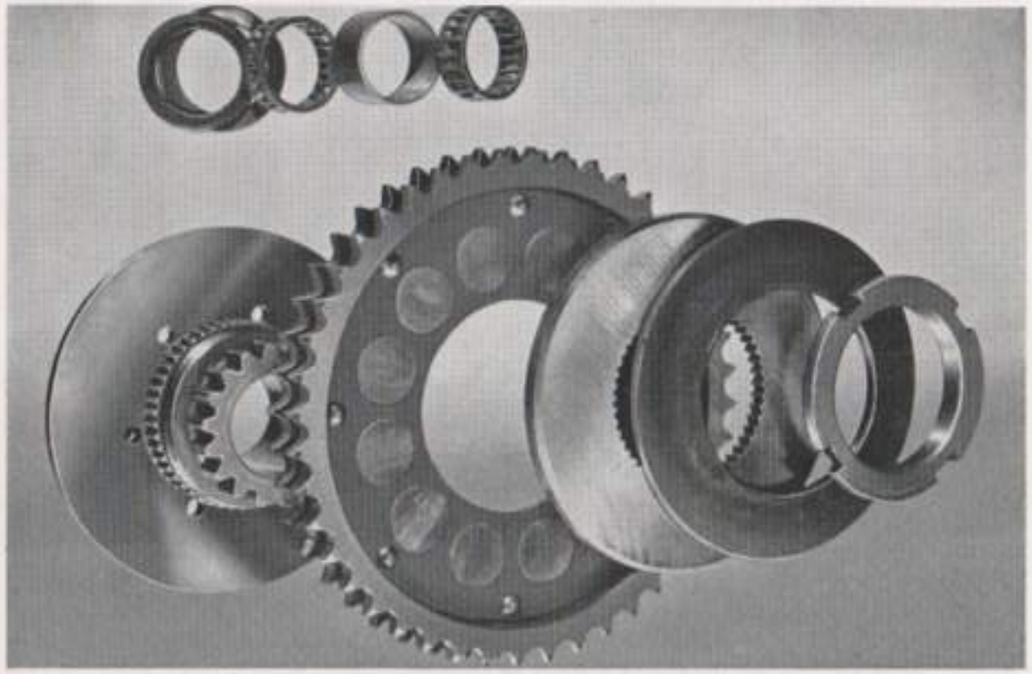
For removing the roller bearing sleeve from the crankshaft, extractor 50405 is available.

TORSION DAMPER

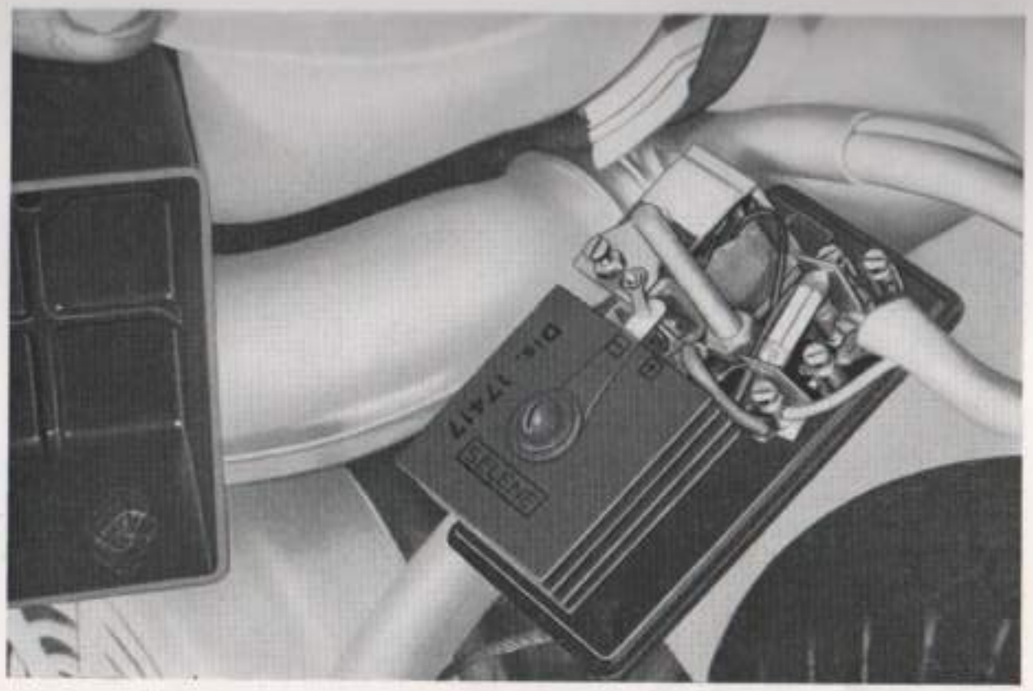
Owing to the fact that the clutch operates on the end of the crankshaft, both sprockets and chain have sudden speed variations imposed on them when gear changes are made, and consequently a slipping device is incorporated with the chainwheel to prevent overloading of the system. Also because of the position of the clutch it is characteristic of the engine unit that a loud rattle is heard from the transmission at low idling speeds, which disappears if the clutch lever is lifted. This noise is perfectly normal.

If a gear change is roughly made the torsion shock damper will slip and will continue to do so for a few moments if the throttle is held wide open. Do not confuse this with clutch slip, but if it is persistent the chainwheel must be removed and the spring loading re-set.

The device is similar to a clutch in principle and the pressure on the plates is produced by a thick conical washer which is compressed by a ring nut threaded on the centre hub. To load the spring correctly, a torque wrench should be used on the ring nut to tighten it to a reading of 116 lb. ft. Use a steady pull and do not jerk the nut tight. If a sidecar is fitted the loading may be increased to 125 lb. ft. and no other modification is required to this model for sidecar use.



Exploded view of overload device in chainwheel



Relay unit and large half-wave rectifier. Note 5 amp. fuse

Return the chainwheel unit to Lambretta Concessionaires for setting if a torque wrench is not available and do not under any circumstances over-tighten the ring nut or damage to the gears will result.

LIGHTING

The TV is equipped with a battery for supplying the current to the parking lights, the stop light and also the horn. Consequently this latter is different from the type fitted to the Li and LD and may be identified by the small screw set in the back for adjustment of the contacts.

The main switch is of the type fitted to the LDA but is not identical to it. In both the vertical and anti-clockwise positions the key is removable and the green wire of the ignition is short circuited to earth ; therefore before the engine can be started, the key must be turned to the first position clockwise from the vertical. Because the stop light switch is not over-ridden by the main switch, it is important that it shall not stick in the " on " position and so discharge the battery. A little oil applied periodically will maintain it working freely.

On machines after Engine 6102 an increase in the rate of charge to the battery is caused when the city or parking lights are switched on with the engine running. This is brought about by a relay switch which is only affected by battery current and is connected to a tapping from the rear light wire. When the relay arm is closed, the main feed from the generator is connected to the rectifier instead of the low output from the blue wire of the lighting coil as when the relay arm is released.

LD 150, Mks. I, II, III, and LD 125, Mk. III

Maintenance

Within the first 500 miles of the scooter's life, the following points must receive attention. After this, maintenance will be required at regular intervals, but the frequency will depend much on the conditions under which it is used. If the machine is not housed in a dry garage, lubrication, particularly of the control cables, will be necessary more often. For a given mileage, deterioration will be greater in the case of a number of short journeys than a few long ones.

Tighten

The wheel nuts around the rim and on the centre spindle.

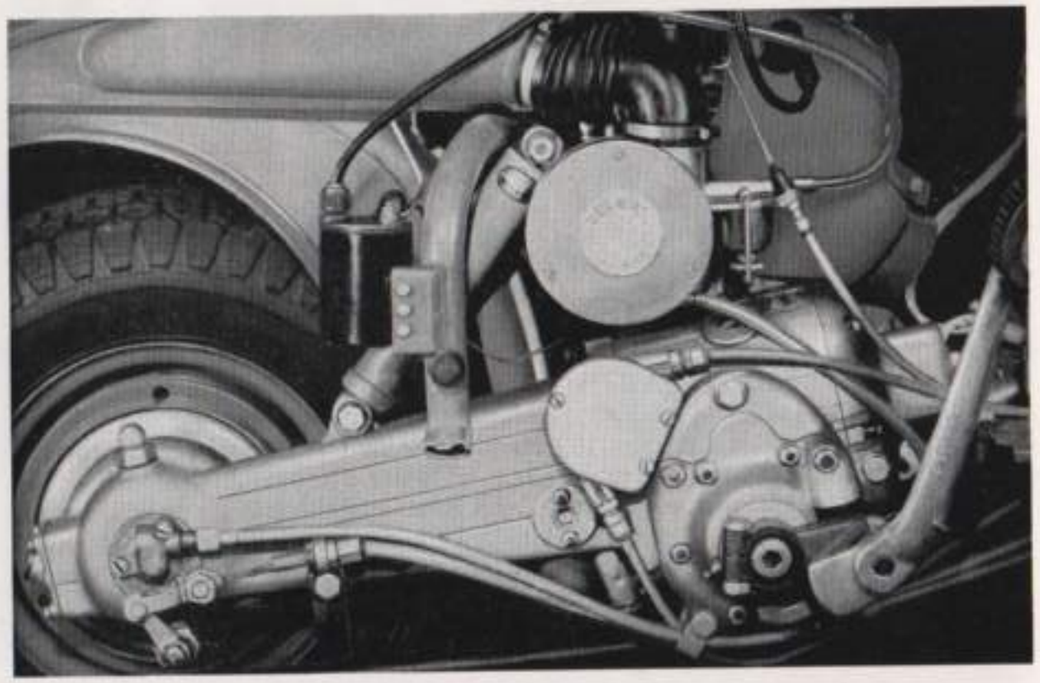
The cable clamps on the gear cable ends inside the selector box on the offside of the engine, level with the pillion footrest; for these a 3½ mm. allen key is supplied in the tool kit, and it is also for the detachable nipple on the end of the clutch cable. The front brake cable clamp requires an 8 mm. spanner and those at each end of the rear brake cable, a 17 mm. spanner.

The hand-lever pivots, using a screwdriver and pliers.

The saddle and pillion seats. 14 mm spanner.

The nuts on the kick-starter pedal and group needing 12 and 14 mm. spanners.

The oil filler plug and inspection plug on the crankcase beneath the carburettor, the drain plug beneath the engine on the transmission case just ahead of the frame lug, also the rearmost transmission case filler plug and



Engine unit of Mk. III 150 LD

Idling mixture adjusting screw indicated, to the left the throttle stop screw

underneath and a little further forward of it, the inspection plug. Also, the plug on the end of the kick-starter shaft. All these are fitted by the oil plug tool with hexagonal ends in the kit.

The silencer neck, where it joins the cylinder, using tool number 57842 or a hammer and drift, the nut fitted by a 10 mm. spanner, holding the silencer underneath to the crankcase and with an 8 mm. spanner, the clamp on the tailpipe.

The small grub screws holding the wires into the horn.

Also tighten the terminal on the end of the sparking plug beneath the bakelite cap with a pair of pliers.

Sometimes the steering column bearings work loose, and these must be adjusted in the manner of bicycle steering bearings. To get at the two ring nuts around the front fork stem it is necessary to remove the handlebars and for this refer to the chapter on the front forks.

Carburettor

Gently screw in the spring loaded adjusting screw on the carburettor located immediately behind the air cleaner and lying horizontal and facing towards the rear of the machine. Be very careful not to tighten this beyond the point when resistance is felt and then withdraw it one and a-half complete turns. This is an approximate setting for the mixture strength at tickover. Sometimes "banging" in the silencer will be heard when the twistgrip is shut and the scooter is slowing down, this may be reduced by screwing this adjuster in or out about a quarter of a turn.

Set the speed for tickover when the engine is warm by adjusting the other spring loaded screw which enters the carburettor also from the rear but at approximately 45°.

Tyres

Check the tyre pressures and set to 16 lb./sq. inch front and 24 lb./sq. inch to 30 lb./sq. inch rear according to load.

If it is necessary to remove the wheels, do so by unscrewing the three domed nuts around the wheel rim with a 14 mm. spanner. In the case of the front wheel also slacken the spindle nuts using the sparking plug spanner and ease the wheel from the suspension links towards the rear, holding the thick washers next to the spindle nuts clear of the recesses in the links. Note that there is a thin washer between the offside link and the brake backplate.

Do not unscrew the remaining three rim nuts until the tyre is completely deflated and avoid excessive pressures in the tyre at all times, but particularly when only the three nuts remain securing the rims.

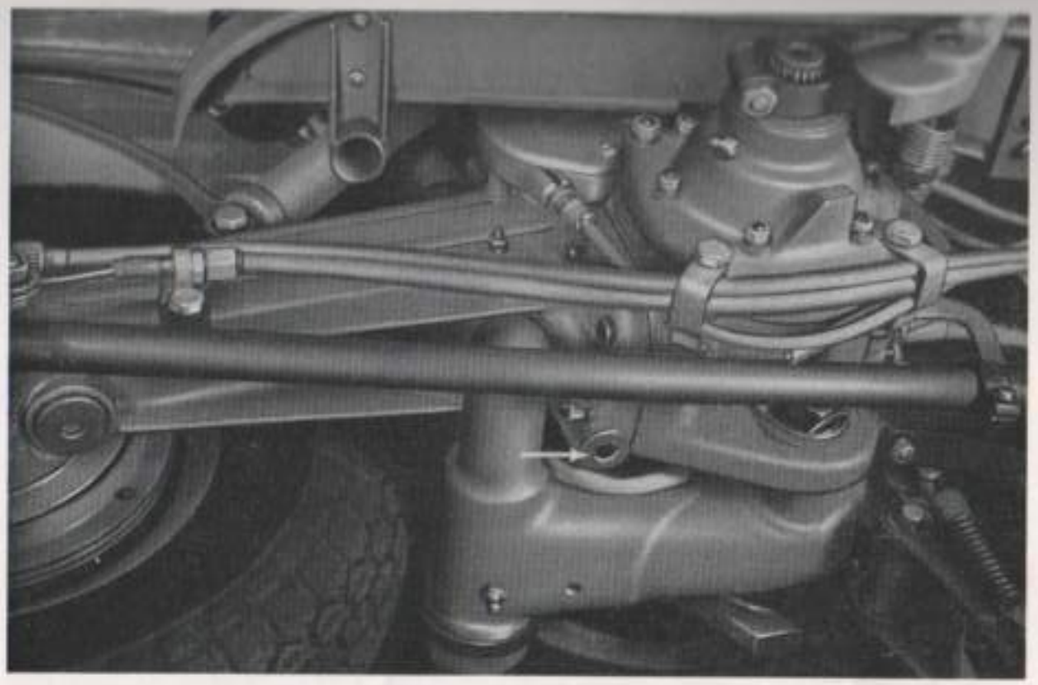
Be sure to enter the projection on the offside suspension link into the slot on the brake backplate when replacing the front wheel in the forks and tighten the spindle nut with the weight of the foot on the spanner. Also keep the rim fixing nuts tight and don't lose the spring washers.

Cable Adjustments

All the cables will settle in during initial use. Front and rear brakes can be adjusted by the knurled screw at the hand lever and the threaded support on the side of the transmission case respectively. Tighten these cables until the wheels are only just able to be rotated without any resistance of the brakes being felt.

The clutch is also adjusted by a knurled screw at the handlever but the cable must not be at all tight and there should be at least ¾ inch free movement at the tip of the lever. When no further adjustment remains at the lever end,

Adjusting the 8 mm. nuts on the clutch pull-rod



Arrow shows gearbox oil drain plug

remove the 19 mm. domed nut from the centre of the clutch cover on the offside at the front of the engine compartment and slacken the two 8 mm. hexagon nuts locked together on the end of the clutch withdrawal pull rod beneath, using suitably thin spanners. Set the nuts in a position which will allow the adjustment at the handlebar end to be restored and re-tightened.

The throttle cable, which is adjusted at the carburettor end by an 8 mm. spanner, should be tight enough to avoid free play of the twist grip but not so much as to cause the engine speed at tickover to increase when the handlebars are turned. If the twistgrip is loose on the handlebars it can be prevented from self-closing by slackening the nut and screw on the aluminium support beneath the lighting switch by half a turn, using a 10 mm. spanner, and then tapping the whole support with a mallet towards the twistgrip and the end of the handlebar. Afterwards re-tighten the nut. Machines after Engine 190851 have a conical spring washer, part number 11770402, between the twistgrip and the lever support. This can be fitted to previous machines with advantage.

The gear cables must be without free play but when adjusting them, which is by using a 12 mm. spanner on the two threaded cable sockets entering the selector box on the offside of the engine, avoid introducing any tension in the cables which would make the gear change stiff. Note that although the relative positions of these adjusters will determine the alignment of the gear indicator marks on the handlebar, nevertheless the internal position of the gears in the gearbox will be unaffected.

Lubrication

The gearbox oil should be changed at least once during the running-in period to eliminate such particles of metal as are rubbed off the moving parts when bedding down. Do not worry therefore if there is some sediment on the drain plug, but clean this off. Note that the correct plug to remove is the

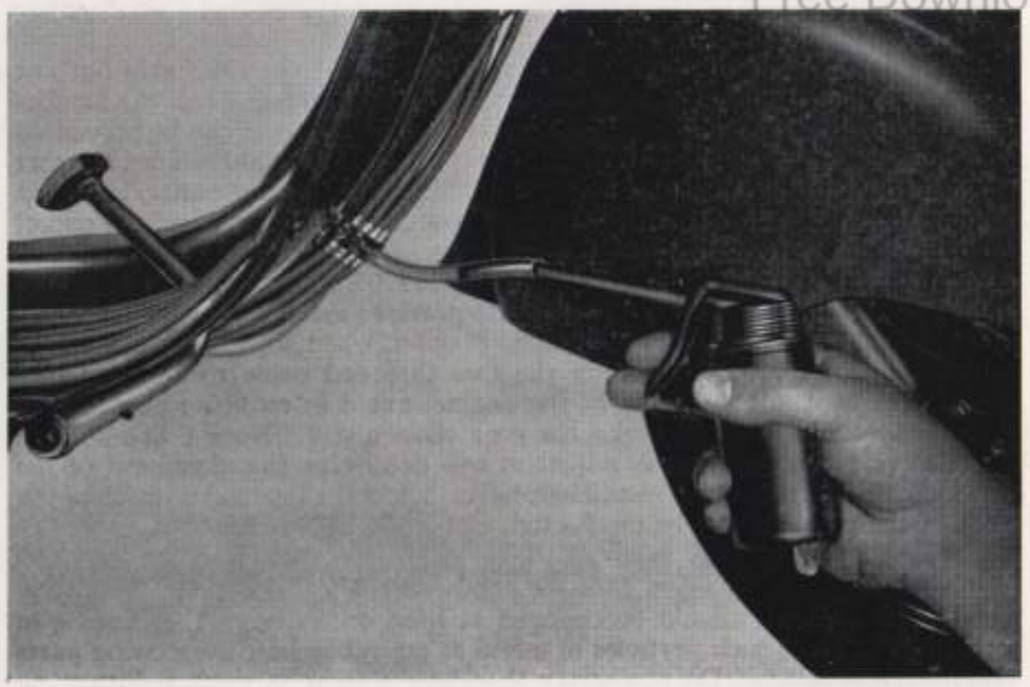
one fitted by the hexagonal ended tool in the kit. It is situated beneath the engine immediately ahead of the lug on the frame which contains the torsion bar ; the adjacent plug fitted by a 19 mm. spanner contains the spring loading the gear engagement pawl and this must not be removed.

When refilling, use oil of 30 grade in summer, 20 grade in winter. These are thinner than recommended for warmer climates and will help to prevent the clutch plates from sticking on cold mornings. With the introduction of the Mark II and III machines the capacity of the gearbox was increased from ½ pint to 1¼ pints to the level plug. This is situated on the clutch cover and fitted by a 14 mm. spanner. On the later models it is on the side near the offside pillion footboard but on Mark I machines it is beneath the cover. With these it is permissible to add an extra ¼ pint when the level plug is replaced to avoid having to top up frequently.

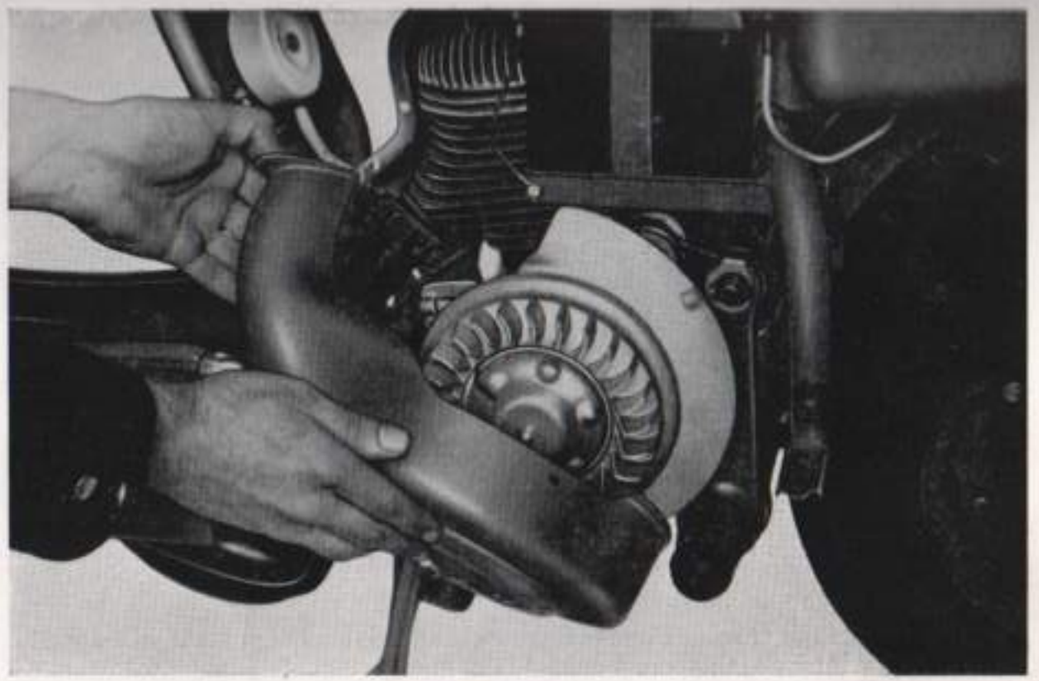
The oil in the back axle need not be changed but the filler cap should be removed to make sure that it is well up to the level. If topping up is needed add 140 grade oil.

Cables require regular oiling and this is an important factor determining the ease of movement of the controls. All Mk. II and III machines have oilers provided and these are situated in a group of four at the bend in the frame tube immediately behind the front mudguard. Never use grease, the method is to fit a short piece of plastic petrol pipe over the end of a force feed oilcan and hold this over the nipple while giving five or six slow strokes of the force feed. For the front brake cable the oiler is situated in front of the suspension box of the forks and it is vitally important to tie a scrap of rag to the cable support on the brake back plate in order to prevent the excess oil from draining on to the brake linings.

Lubricate the choke cable by applying a little oil around the stem of the knob.



Oiling cables. Usually the plastic pipe will have to be held in place



Taking off the fan cowling

Earlier machines will benefit from the application of a little oil to the cable ends weekly, but periodically the end of each cable should be detached from its support furthest from the handlebar and the pipe attached to the oilcan can then be fed over the nipple, and inner cable, on to the outer to provide a joint through which the oil can be pumped. In these cases the gear cables will need to be detached from the handlebar end on machines prior to Engine 150351 when the detachable cable nipple was first introduced. A rubber tube as used for bleeding hydraulic braking systems will be better than the plastic pipe.

Soft grease such as Castrolease CL must be used for the torsion bar bearing and the front suspension. Both of these can seize unless they are well filled and to the torsion bar bearing particularly the grease gun should be applied until grease is seen to come from behind the rubber sealing ring to the side of the grease nipple. This latter is located beneath the machine approximately three inches ahead of the front of the rear wheel.

Less important are the grease points on the rear brake pedal and the knuckle joint behind the engine fan cowling but particular care must be taken when greasing the rear brake cam spindle and the front wheel hub. Too much grease will cause some to enter the brakes and render them ineffective. Preferably dismantle the hubs and smear the brake cam spindles and brake shoe pivots with high melting point grease (Castrolease W.B. or equivalent) and after removing the oil seals on the front wheel spindle pack this same grease around the bearings. Note that where the oil seals are of the type having a spring ring surrounding the inside rim, the open side should face outwards in order to prevent damage or displacement of the seals if any pressure builds up in the hub.

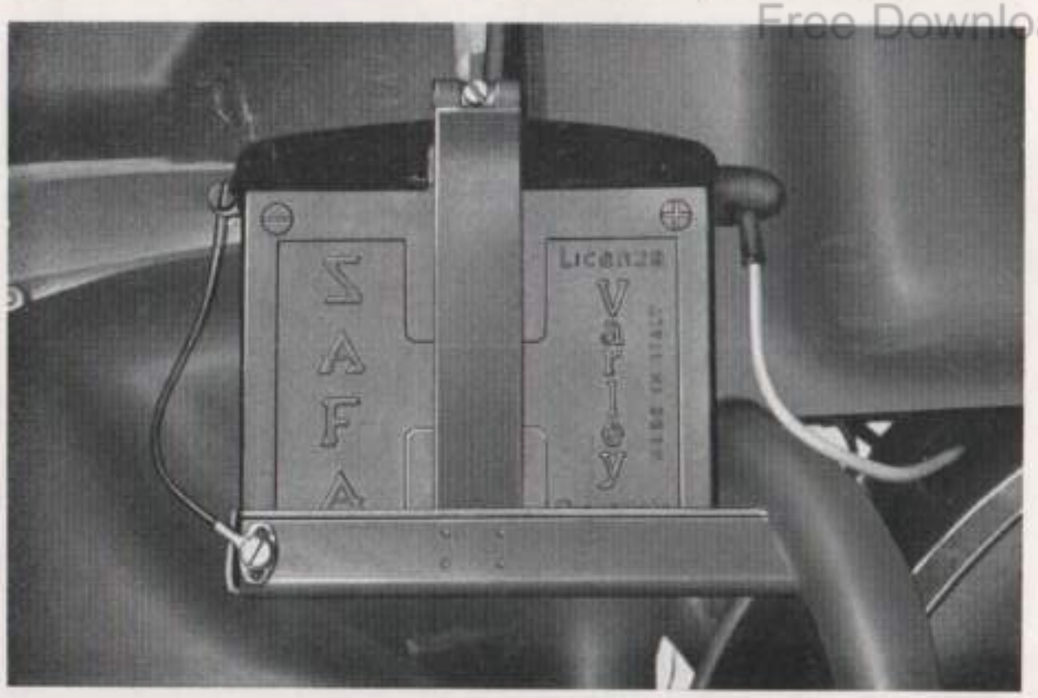
The high melting point grease should also be used for the magneto side main bearing. Access to this is obtained by removing the nearside pillion

footboard held by four 8 mm. nuts, and the fan cowling. On models prior to Engine 189700 proceed by slackening the carburettor clamp securing bolt with an 8 mm. spanner (preferably of the tube type with an extension) and after twisting and pulling the carburettor from its spigot, release the cowling at this point and undo two of the screws connecting the cowling halves. Leaving the third and least accessible screw in place, slacken the pinch screw holding the fan cowling clamp ring in place around the magneto housing, using a short screwdriver inserted through the slot in the edge of the cowling at the front to reach the screw which is hidden, but can be felt near the magneto terminal block.

Pull off the cowling from the nearside, allowing the offside half to pivot on the remaining connecting screw around the front of the cylinder. Later machines have a lip at the joint of the two cowling halves and the three nuts and bolts are accessible to an 8 mm. tube spanner. With these, the carburettor does not have to be taken off but it will be necessary to remove the three screws around the outside of the cowling because a flywheel fan of increased diameter prevents the clamp ring from being taken off.

It is most important to remove the plug fitted by a 10 mm. spanner adjacent to the grease nipple when applying grease to the main bearing. Otherwise grease will be forced into the crankcase.

Because of the trouble involved in reaching this grease point it will usually be convenient to do this only at 3-5,000 mile intervals when attention to the magneto contact points is required. At the same time ensure that the felt pad rubbing on the flywheel cam opposite to the contact breaker points receives a few drops of oil. This is very necessary to keep the heel of the contact arm from wearing but do not overdo it or oil will find its way between the points and cause misfiring.



The battery for the parking lights. Note negative earth connection

Sparking plug on right shows normal condition, that on left is overheating

Battery

Read the instructions issued with the battery. Varley batteries are usually received already filled with acid but require a long charge at approximately $\frac{1}{2}$ amp. Charging at too high a rate will cause damage as will not charging for the full period. When it is topped up, it should stand for a few minutes and then all liquid in the cells must be emptied away. This is because the acid is held by an absorbent material and no excess should be left.

Exide batteries are often received charged but not filled. The acid used must be of the correct strength and when filled the battery must stand for a period of hours before being used. The correct level of liquid is indicated.

Never use other than pure clean water, preferably distilled, for topping up. Do not overfill and dry off all moisture afterwards. If the battery becomes discharged do not let it stand in this condition because permanent harm will result.

All Lambrettas use a negative earth. Connect the "—" terminal of the battery to the frame. Even momentary reversal of the connections will cause the fuse to burn or ruin the rectifier. If in doubt check that the battery has been charged with the indicated polarity before fitting.

Replace the fuse when burned only after tracing and correcting the cause of the burning. Use 5 amp fuse wire for machines with battery parking lights and 8 amp for L.D.A. self-starter models.

Sparking Plug

The sparking plug has been left until last, not because of its relative importance but rather because it almost justifies a chapter to itself.

In the combustion chamber exist conditions of changing temperature and pressure and the presence of solid particles and corrosive gases. The

effect of these on the small electrodes either side of the intermittently ionised sparking plug gap during the passage of the spark and the eroding effects of this latter are reason enough to cause the life of the plug to be very short indeed. These factors are considered by the manufacturers and using different materials and methods of construction they produce an article which suits as nearly as possible the particular engine.

Because engines and driving habits vary considerably the same plug cannot be correct for every application and in fact quite a range of different ones are available, many looking very similar. The greatest difference is in the temperature at which the electrodes and insulator are kept in relation to the body of the plug and the engine generally. If they are too cold, the formation of carbon will be promoted and the insulator will rapidly become blackened and allow the current to leak away without producing a proper spark.

This insulator must withstand very high voltages in the neighbourhood of 10,000 or more, particularly if the points become burned and the gap enlarged.

When a sparking plug is overheated, the tendency for the points to burn away is increased and they may become incandescent, causing the mixture to burn before the passing of the spark and in turn leading to higher pressures than normal to the point where combustion is of an explosive nature. When this happens there occur different dissociations of the gases which may deposit particles of solid in the chamber which are attracted to the plug gap by the electric charge and bridge the gap in the form of a " whisker." Choosing the right plug, fitting the washer supplied, tightening it properly in the cylinder head and re-setting the gap at regular intervals, will reduce the possibility of trouble.

When " pinking " is experienced or the plug looks particularly white with chalky deposits on the points, overheating is indicated and a cooler running type must be used. If, on the other hand, the insulator looks black and shiny inside the plug, then it is not hot enough. However, an ignition fault will also give the plug this appearance.

Set the gap by tapping the outer metal point towards the central electrode. Approximately .020 inch or the thickness of a postcard or finger-nail will be a satisfactory measurement.

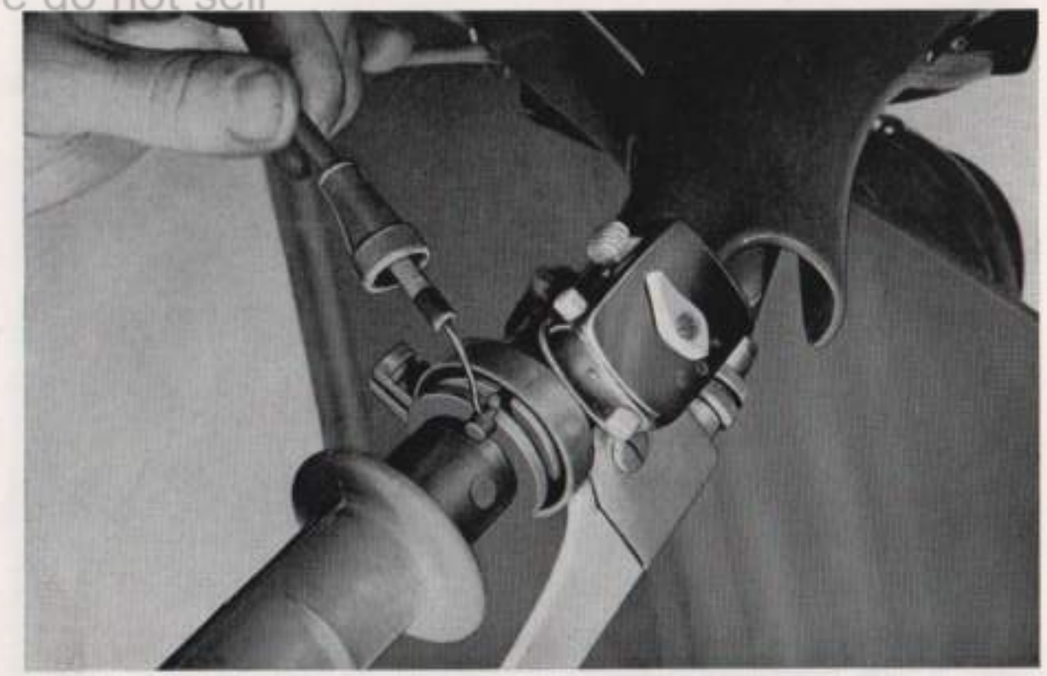
Always make sure that the H.T. lead is tight in the bakelite suppressor cap fitting over the plug and also at the H.T. coil connection. Replace the lead if it has been chafed by the throttle cable and position the lead so that it does not touch any moving parts.

Control Cables

Long life may be expected from the cables if they receive proper lubrication and are adjusted as described in the chapter on maintenance. When however, they do eventually break, it is possible to fit a replacement fairly easily. On machines after Engine 150351 the inner cables of the gear change were made detachable and this was done to front brake and clutch cables after Engine 173451. The modification can be made fairly simply on earlier models to allow the gear and front brake cables to have the detachable nipple fitted, but the clutch requires a different lever (part number 40060166) to be fitted to the clutch cover.

The throttle cable can be fitted with the detachable nipple (assembly 15022030) used on the clutch and gear cables, to enable the inner cable only to be replaced in an emergency, but for this and the choke no separate inner cables are supplied. The owner who would provide himself as much as possible against the chance of a breakdown, is well advised to carry spare inner cables and detachable nipples.

Gear cables or throttle cables should be detached from the end further from the handlebars and by slackening the 10 mm. pinchbolt holding the aluminium support adjacent to the twistgrip, the support may be loosened and slid along the handlebar to allow access to the cable and the inner to be withdrawn and the new one entered. Where the soldered type of nipple is fitted to the gear change, the selector box cover should be removed after first taking off the offside pillion footboard and the selector box and arm taken away bodily from the casing before attempting to slip out the cable nipple from the selector arm. The box is held by three screws which can be reached



Move the supports along the handlebar and slip out the throttle cable

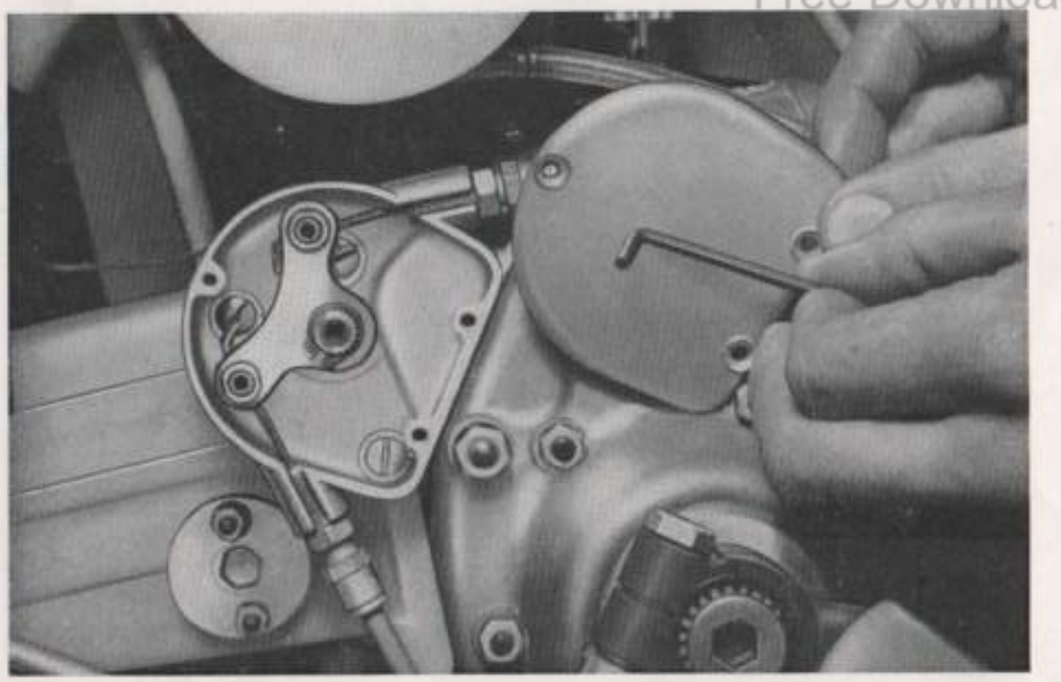
with a large screwdriver if first gear is selected. Since the screws will be very tight they should each be loosened by a blow from a hammer and drift placed on the screw head. A circlip surrounds the selector shaft and must be lifted off before the assembly can be withdrawn by levering with a screwdriver behind the box. Note the position of the selector arm on the splines for refitting.

On assembly the cables should be replaced in the selector arm and the unit fitted back into place before attempting to solder the nipples at the handlebar end. Pull the inner cables as tight as possible with a pair of pliers before selecting the position to solder the nipples and after fitting them, cut the cable cleanly with good cutters or a cold chisel and splay the ends of the wires where they are to be soldered.

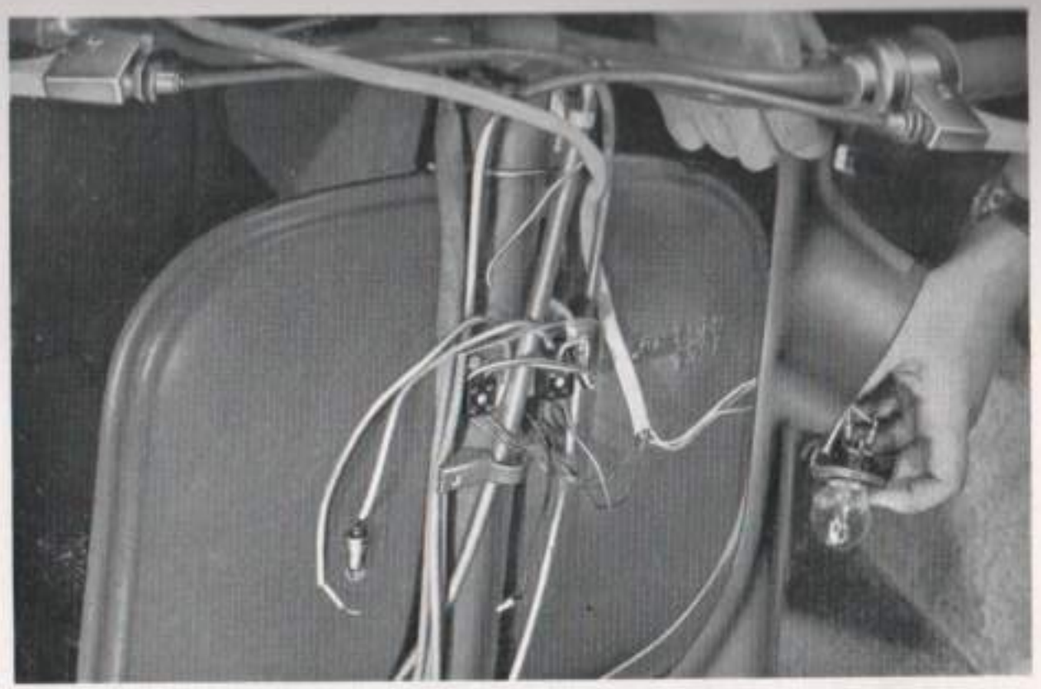
Alternatively, the selector arm can be replaced with the modified part, number 12030315, to accommodate the later type of inner cables and detachable nipples. Note that with the introduction of the Mk. II and Mk. III models the length of the longer of the two gear cables was further increased, and again still more on LDA's.

Cables with oilers can be fitted to machines previous to Engine 190850 not having them as original equipment, but note that the front brake and clutch cable were increased in lengths after Engine 173451, when they were re-routed, crossing one another in front of the handlebars to give a more gentle sweep. Later cables can be fitted in earlier models but not *vice versa*.

This has particular importance in the case of the front brake cable where sufficient loop must exist in the cable between the eye on the suspension box and the support on the brake backplate to allow for suspension movement. If there is too little the cable will tighten as weight depresses the suspension and when the front brake is applied the wheel may lock with serious consequences.



Inside the selector box. The 3½ mm. allen key fits the cable nipples



Removing the headlamp casting

Inner cables can be removed from clutch or front brake controls by detaching the cable end further from the handlebars and taking out the pivot and nut retaining the hand lever. Pulling the hand lever away from its socket will draw out the inner cable.

Changing the complete cable on a Mk. I machine is best accomplished after removing the headlamp and horn support casting. This is held in place by two countersunk screws which face the rider on the inside of the legshield and two 10 mm. bolts disclosed when the headlamp is removed after taking out the securing screw at the bottom of the rim. Some early models may need a 4½ mm. allen key to fit these two bolts but most have a hexagon.

Help the removal of the cables from the plastic sheaths by inserting oil and use grease when sliding in replacements. This will not affect the plastic material.

Where cables assembled with soldered nipples are used for clutch or front brake controls, it will be found that no ferrule is fitted to the replacement outer cable in order to allow it to be fed through the adjuster on the handlebars. Be very careful therefore to see that the slotted cable stop is slipped into position on each end of the cable after fitting and turn the cut end of the wire coil forming the cable outwards with a pair of pliers to avoid the possibility of it being squeezed in by the pressure against the cable stop and thus pinching the inner wire.

To replace a choke cable, remove the carburettor after slackening the pinch bolt holding it to the manifold and unscrew the choke unit with a 10 mm. spanner. Fit the new part by entering the appropriate end into the choke knob support and pressing the nipple, which passes through the support, into the knob. Pass the nipple on the lower end through the adjuster and hold the spring compressed in position with the fingernails whilst

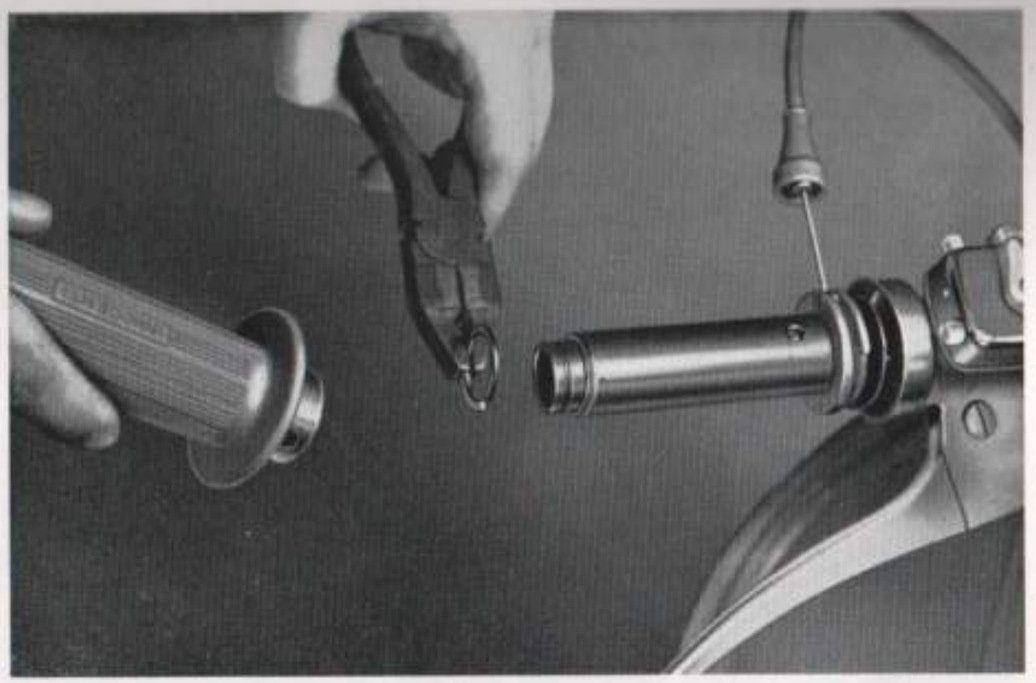
attaching the brass valve. Ensure that a small amount of play exists in the cable or otherwise the choke will not close properly.

Self-starter operating cables are supplied complete with adjusters where fitted and the later types having the lever mounted on the side of the glove box are shorter. At the starter motor, the inner cable is anchored and the movement of the outer cable towards the anchor point pushes a sleeve engaging the gears and switch contacts when the lever is pressed. To dismantle the cable, remove the starter motor and switch and press out the small pin fitting across the switch cover end where the cable enters covered by a rubber sheath. Care will be needed to line up the drilled end of the new cable for the pin to be re-inserted. Make sure that once in place, the sleeve moved by the outer cable slides easily over the nipple. Otherwise, reduce the nipple by filing. Re-new the rubber sheath over the cable end if torn or water can enter and corrode the switch.

Mk. III LDA machines are fitted with rear brake cables and lower gear cables of increased length.

To fit the conical spring washer, part number 11770402, controlling the self-closing of the throttle twistgrip to machines prior to Engine 190851 not originally supplied with it, slacken the 10 mm. pinch bolt holding the aluminium switch and front brake lever support and slide this along the handlebar, disconnecting the cable. Press back the lip of the handgrip rubber and remove the two grubs from the sleeve beneath. Slide off the handgrip and sleeve and push the twistgrip up the handlebar, allowing the circlip on the end of the handlebar to be gripped with a pair of pliers and removed. Place the conical washer with its larger diameter against the aluminium support and reassemble in the reverse sequence of operations. Sufficient friction will be produced in the twistgrip by tapping the aluminium support towards the twistgrip and the end of the handlebar as the pinchbolt is tightened.

Re-fitting the cable of the starter switch of an LDA



Dismantling the twist grip assembly

When inner cables of the type secured by a detachable nipple are to be changed, the repair can be accomplished quite simply by the roadside. The split cable stop is still fitted to both ends of the clutch and front brake cables and the selector box ends of the gear cables. Since it may become lost, spares should be carried together with the inner cables and detachable nipples. The part number is 11770805.

Besides the tools in the kit, which include the 3½ mm. allen key 15086066, a medium sized pair of pliers are necessary. With these, the detachable nipple can be held while the 3½ mm. allen grub screw is slackened or tightened, and also, in the case of the gear change, the inner cables can be pulled taut.

Provided that the spare inner cable for the gear change is of the longer type, it may be used for either side and the excess cut off after fitting. Be sure to bend over the small end left protruding through the nipple so that it cannot press on the projecting lug in the selector box and prevent either first or top gear from engaging properly. Note that the position of the gears in the gearbox will not be affected by the cable adjusters but the position of the handlebar lever will. If the lever is too high or low so that the red numbers do not correspond with the arrow, slacken one adjuster and tighten the other and the lever will move one way or the other.

The throttle cable has soldered nipples at both ends, but if the nipple is removed from the carburettor end of a new cable the inner can be taken and used to replace a broken cable by entering it into the outer cable from the handlebar end and attaching it to the twistgrip after moving the support clamp as previously described. If the new inner wire is too short to take the detachable nipple, the end of the lever arm on the carburettor can be bent down slightly towards the cable. Also it is permissible to cut a little off the outer cable but definitely take no more than half an inch.

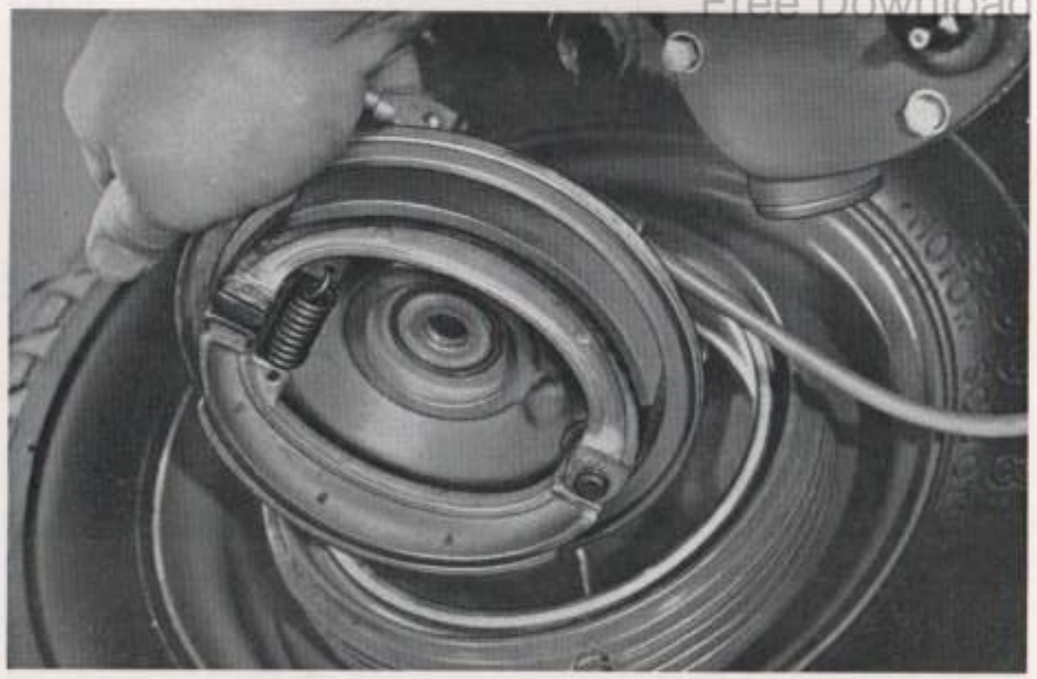
Brakes and Wheels

Properly serviced, the brakes will be capable of stopping the machine very rapidly in an emergency and should both be used together at all times. Normally they should only be applied lightly and the hand or foot should not be allowed to remain on the control except when actually being used. Constant heavy use will wear tyres and brake linings very quickly.

Although the cables and brake operating cams and pivots must be lubricated in order to move freely with a minimum of friction, the brake linings on the shoes need to be protected from oil and grease. The lining surfaces should be quite clean and if dirty or oily the shoes can be washed in clean petrol and after drying, the surface only of the lining may be wiped with carbon tetrachloride (sold as " Pyrene " or " Thawpit "). The same procedure may be followed for the steel insert of the brake drum.

The shoes should bear evenly on the drum and because of slight differences in the parts which are bound to occur during manufacture, the shoe positions on the brake back plate should never be reversed after they have been used.

Where some areas of the lining show heavy rubbing, emery cloth can be used to relieve the high spot. If necessary assemble the unit, try the brake and dismantle again, several times until even contact all over both shoes is obtained by judicious use of the emery cloth. Do not remove more of the lining than is absolutely essential or their condition may be made worse than originally. A rough surface is not desirable. When the linings are worn so thin that the cam is unable to press the shoes outwards to make satisfactory contact with the drum before reaching an angle which no longer gives



Examining the brake shoes from the front wheel

Rear wheel and hub removed for attention to brake shoes

efficient operation, service exchange shoes and linings should be purchased. This is usually better than trying to fit linings yourself.

To remove the rear hub, unscrew the centre nut with a 27 mm. ring spanner. That supplied in the tool kit can be used provided that on reassembly it is hammered home in order to obtain the necessary tightness of the nut with the small length of arm on the spanner. Some machines will have a locking screw visible in the centre of the nut and this screw has a 5 mm. 0.8 mm. pitch left-handed thread. If using the hub extractor 37061/E with these, take care to see that the end threads in the hole are recessed out with a 3/16 inch drill to a depth of 1/8 inch to prevent fouling of them by the point of the tool. Early models have a round centre nut with three notches, which is not so easy to tighten as the one with the 27 mm. hexagon and should be replaced with the later type if there is any doubt.

The extractor screws into the two 6 mm. threaded holes in the hub on either side of the centre nut. The screws and centre bolt of the tool should be tightened and the hub removed by hitting the bolt bearing on the end of the axle squarely with a hammer. If several blows are needed, tighten the bolt a little between each, but take care not to over-tighten. Alternatively the hub can be jarred from its taper fitting by hitting the centre of the axle squarely with a 2 lb. copper mallet, or the off-side of the tyre with a wooden mallet.

After the circlip on the brake shoe pivot has been lifted off, the two shoes can be prised off taking care that they withdraw evenly and avoiding excessive presure which will snap the shoe at the pivot.

Replace the pair on the back plate together with the spring in position ; do not try to lever the spring on afterwards.

If oil is entering the brake drum in the case of Mark III models, check that the end of the silencer tailpipe is not lying too close against the trans-

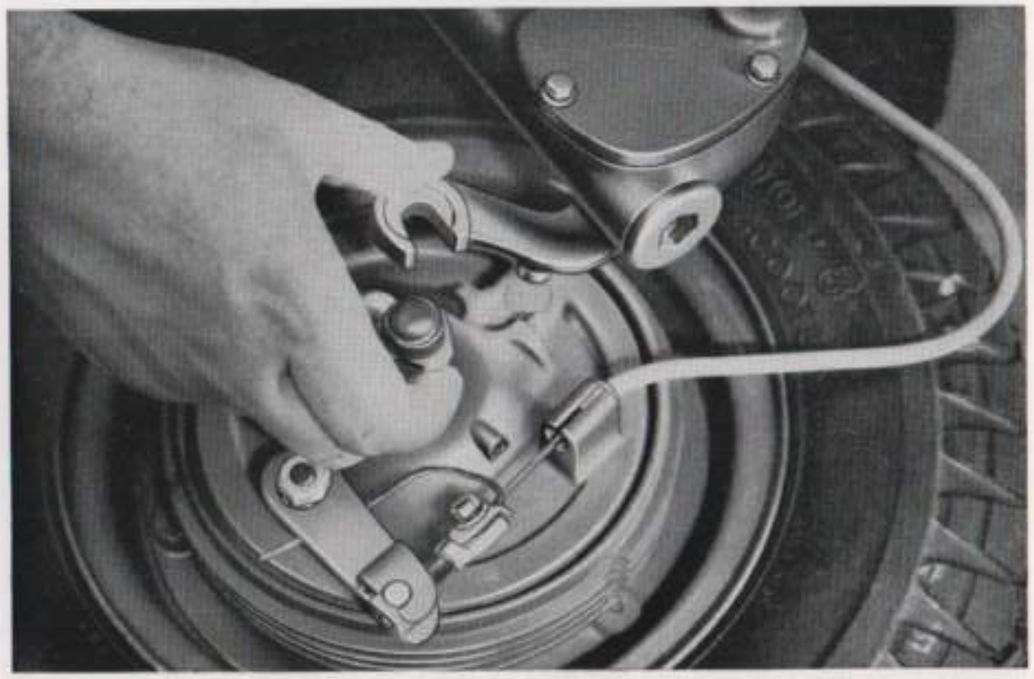
mission case near to the brake cam spindle ; it should be bent as far out from the case as its bracket will allow. Any oil around the centre inside the hub near the axle will indicate failure of the axle oilseal which should be replaced, not forgetting also the rubber ring which is between the axle support casing and the oilseal housing flange. Overfilling of the gearbox can sometimes cause oil from this to force its way into the axle end of the case, but it can be prevented by drilling a hole approximately 1/16 inch diameter in the top of the front piece of the clutch cover above where the clutch operating arm enters. This relieves any pressure in the gearbox and is present on some Mark I and all Mark II and III machines.

For attention to the front brake, slacken the nut between the offside suspension link and the brake backplate with a 19 mm. spanner after loosening the offside spindle nut and before undoing the nearside one.

Take the wheel complete from the links, holding the thick washers away from the recesses in the end of the links where the spindle is held. Slide the wheel to the rear of the mudguard and out towards the offside, turning the handlebars to the left. Complete the removal of the offside spindle nut and the back plate fixing nut. If the backplate now sticks, drive the spindle towards the nearside with a mallet, not forgetting to re-centre it afterwards.

Proceed to remove the shoes as described for the rear brake. In this case the pivot circlip is a small wire ring which is best levered off with the aid of two small screwdrivers. Grease the pivot and cam before re-assembly, taking out the cam if need be to lubricate its spindle.

Most Mark III machines have different hubs and backplates from Mark I and II models, although all brake shoes are inter-changeable, differing only between front and rear. Mark I 125 machines have brake assemblies identical with Mark I 150's except in the case of very early models having a smaller front brake. The advantage of the Mark III type is in the labyrinth



Ensure that the anchor peg engages the slot in the backplate on re-assembly

gland formed between hub and backplate to exclude dirt and water. A further improvement is the increase in diameter of the front brake cam spindle which is splined to a larger brake operating lever, enabling different positions to be selected to compensate for wear of the lining. The assemblies are inter-changeable as groups.

The wheel bearings are of the journal type and need no adjustment. They are a sliding fit on the spindle and are tightened together by the two nuts on the spindle fitted by the 19 mm. spanner. A distance piece lies between them and a further short piece on either side acts as a bearing surface for the hub oilseals.

Dismantle by driving out the spindle and tap out the bearings with the aid of a small diameter drift passing obliquely through the centre of one bearing to press on the edge of the other from the inside. A circlip retains the bearing on the nearside, providing sideways location of the hub.

Two sorts of oilseal are fitted, the later ones being of the standard type having a spring ring supplementing the pressure of the inner rim on the shaft. These must face outwards so as to prevent damage to them if pressure builds up due to greasing of the hub. The early type have no spring ring and face inwards. They are interchangeable as a group complete with distance pieces. Note that they will squeak if dry and should therefore be assembled with a little grease.

When fitting the wheel back into the front forks take great care to enter the projection on the offside link into the slot in the brake backplate.

A thin washer is fitted to the wheel spindle in addition to the two thick ones. This is placed between the offside suspension link and the nut retaining the brake backplate. Occasionally an extra washer may be needed to fit between the backplate and the centre to prevent rubbing on the brake drum.

Carburettor

The object of this instrument is to mix petrol with the air that is drawn through it by the suction of the engine. The flow of the air is partially restricted by the throttle slide which almost completely blocks the passage when the twistgrip is shut and rises clear of it when the twistgrip is turned to the wide open position. Petrol is drawn through the small jets by the suction of the air passing through the carburettor and the effective size of the central jet through which the main supply of petrol is fed is increased by the action of the rising throttle slide, as the twistgrip is turned, withdrawing from the jet a tapered needle connected to the slide.

The unit is usually trouble-free and is quite simple for anyone to check.

Fuel is supplied from the petrol tank via a tap which draws from two levels, the difference between the upper and main one and the lower being the quantity held in reserve. Air must enter the tank to replace the space left as fuel drains out and provision for this is via a small hole in the centre of the filler cap on models up to Engine 267751 and afterwards through a tube ending inside the tank at the filler neck, and open to the air beneath the tank. This must be kept clear at all times.

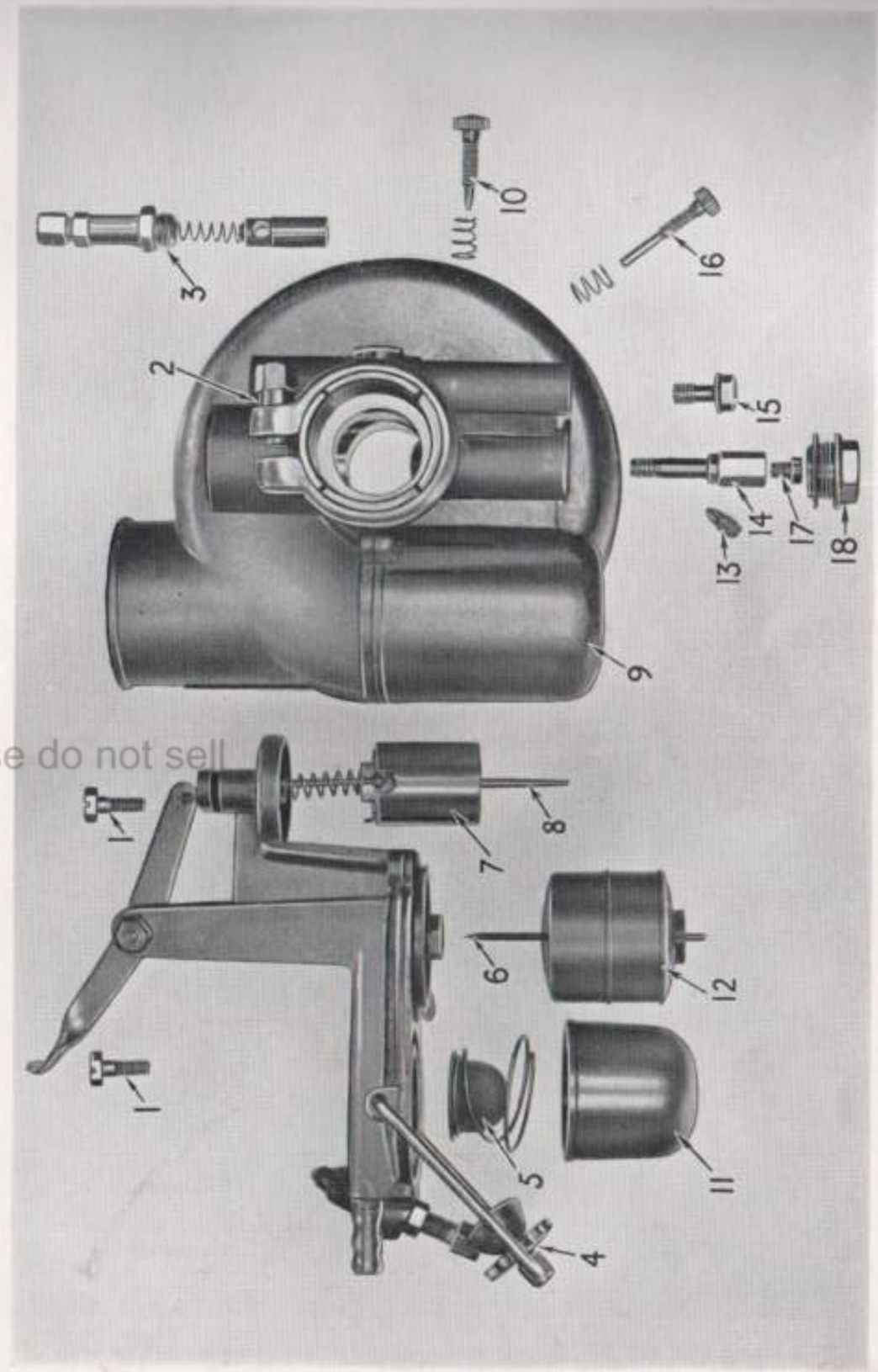
The tap selects the petrol supply according to the position of the lever relative to the holes in the face of the tap. A rubber washer prevents leakage between the face and the rotating piece which is spring loaded against it by a dished washer which must be balanced to press on the centre of the disc by adjusting the two fixing screws.

An air bubble will always be present in the plastic petrol pipe connecting the tap to the carburettor petrol filter but this does not obstruct the flow unless the pipe is too long and hangs in a loop below the point of entry to the carburettor. Because of the effect the petrol has of hardening the plastic pipe, this should be replaced every year with a new one.

In this country little difficulty with dust or dirty petrol will be encountered and therefore it should rarely be necessary to clean the filters. Once the slow running adjusting screws have been set, no attention will be needed except perhaps to lower the taper needle in the throttle slide so that its spring clip rests in the topmost of the three grooves in the needle, when the machine has covered a few thousand miles or the consumption tends to increase. Some wear does take place between this needle and its corresponding jet and since they have a considerable effect on petrol economy, the pair should be replaced with new parts if in doubt.

The choke acts as a separate and very small carburettor which is pre-set to give a very rich mixture correct for starting from cold and comes into operation when the choke knob is raised. It is most effective when the throttle twistgrip is closed and in this position the machine should start easily after a maximum of three to four operations of the pedal starter even in the coldest weather. At all times other than when the engine is cold, use of the choke will tend to flood the crankcase with petrol, particularly when the twistgrip is

1. *Top fixing screw*
2. *Clamp ring & pinchbolt*
3. *Choke assembly*
4. *Filter bowl stirrup*
5. *Filter*
6. *Float needle*
7. *Throttle slide*
8. *Throttle needle*
9. *Carburettor body*
10. *Idling mixture screw*
11. *Filter bowl*
12. *Float*
13. *Idling jet*
14. *Needle jet*
15. *Starter jet*
16. *Throttle stop screw*
17. *Main jet*
18. *Base plug*



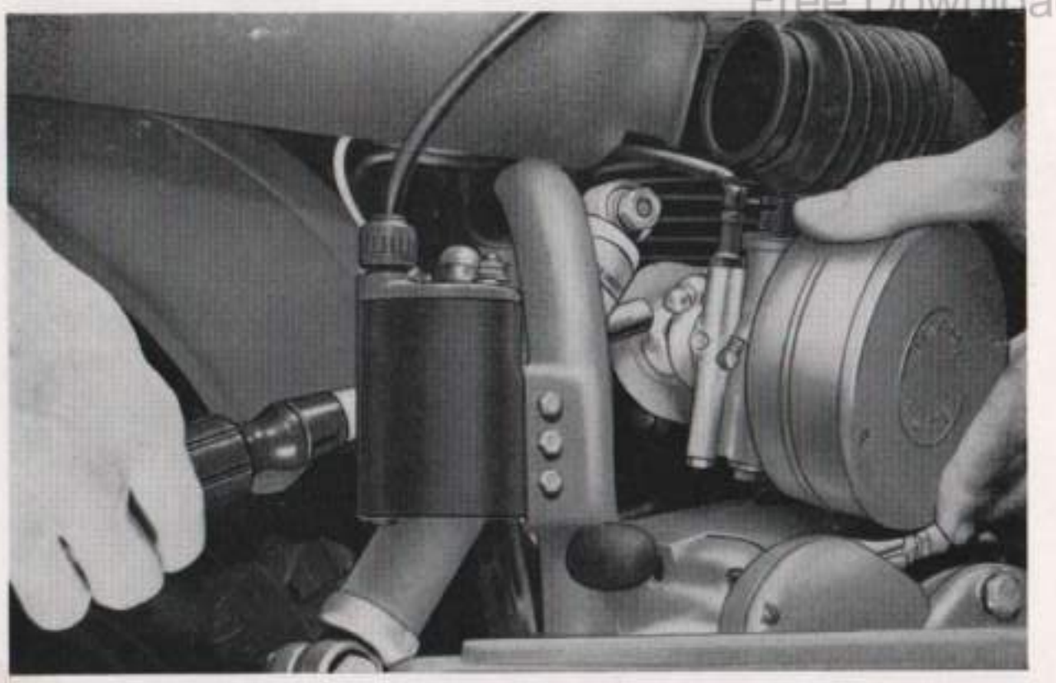
left closed, and therefore if this is suspected, the choke should be closed and the engine started by holding the throttle twistgrip wide open while the pedal starter is operated vigorously.

If there is any doubt about the petrol supply, even though fuel flows steadily from the pipe when disconnected from the carburettor and the tap turned on, remove the carburettor, undo the 14 mm. hexagon plug in the base and push the carburettor back into place, collecting the fuel which runs out when the tap is opened, in a measure. The flow should be sufficient to provide a quarter of a pint in considerably less than two minutes. Provided this is satisfactory, the only remaining blockage can be in the main jet which is covered by the 14 mm. hexagon plug already removed.

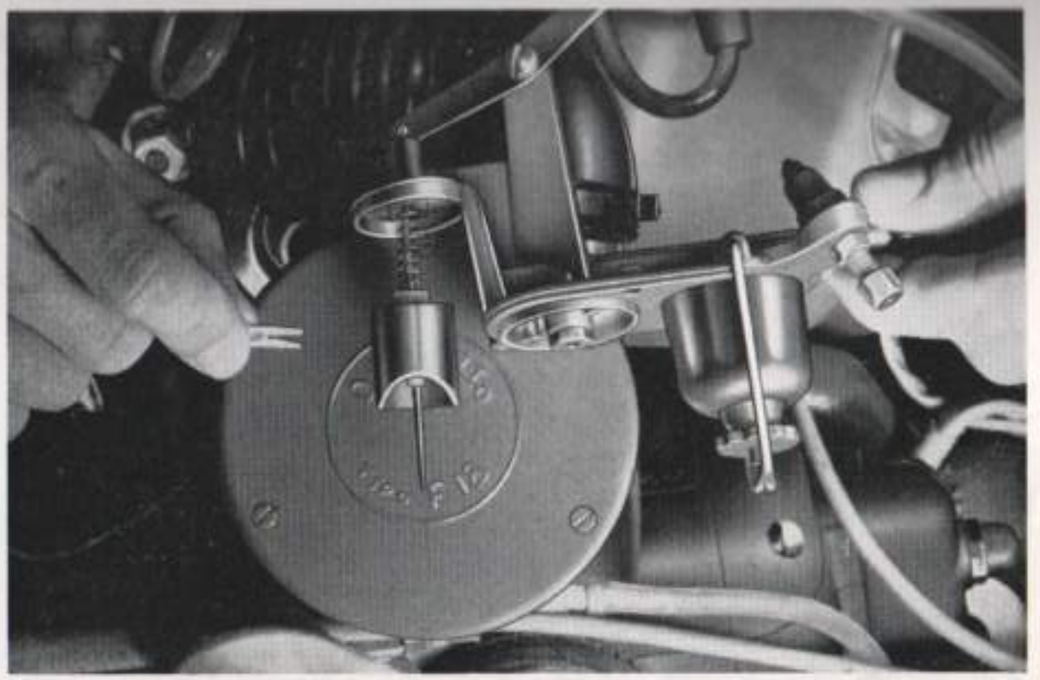
To dismantle the carburettor, pull off the petrol pipe, unclip the throttle cable and pull the end right through the protective rubber and cable adjuster. Slacken the 8 mm. hexagon pinchbolt clamping the carburettor to the manifold on the cylinder and twist and pull the carburettor towards you. Remember when replacing, to ensure that the carburettor is right " home " and is approximately upright when the machine is off its stand and resting on both wheels with the weight of the rider. Also see that the choke cable is properly entered into its socket after assembly or otherwise it will not permit the choke to close.

Disconnect the choke cable unit using a 10 mm. spanner.

The main jet is disclosed beneath the 14 mm. hexagon plug in the base of the carburettor as previously mentioned and is screwed into the throttle needle jet. The diameter of the needle jet (2.55 mm.) remains unchanged on all L.D. Models, but the main jet should be No. 72 for Mark I LD 150, No. 75 for Mark II and III LD 150, and No. 68 for Mark III LD 125. In some cases where " pinking " is experienced, a larger main jet may be beneficial but this trouble is usually related to the sparking plug and compression ratio.



Slackening the 8 mm. pinchbolt with socket spanner 1010 to release the carburettor



Removing the clip which positions the needle in the throttle slide

Undoing the two 8 mm. slotted screws on the float chamber top will enable this to be lifted away complete with petrol filter and throttle slide. The filter is dismantled by slackening the knurled nut in the stirrup which holds the bowl against the top of the assembly with a cork washer in between. The float is plastic and although unlikely to leak it should be shaken in order to hear whether there is petrol within ; if so replace with a new part. The needle fits with its groove in a clip at the base of the float and should present an unworn conical point to the seating in the cover. Take care that the needle enters the seating when replacing the cover. Also ascertain that the cut-away portion of the throttle slide faces towards the air cleaner ; it is prevented from rotating by the spring loaded screw set slantwise in the carburettor body, which acts as an idling speed control. The other and similar screw lying horizontal, immediately behind the air cleaner is the mixture strength adjustment for the pilot jet.

The pilot jet can be reached with a small screwdriver after the main and needle jets have been removed. The adjuster screw allows extra air to reach the small chamber above the jet and weakens the mixture by reducing the suction on the jet when it is unscrewed. The normal position is approximately one and a-half turns out from fully screwed in. Note that if it is over tightened at any time, its conical end will become damaged and the regulation will be upset.

If consumption is found to be excessive and the ignition timing has been checked, then the fuel system should be examined for possible leaks and the throttle needle lowered in its clip. If no improvement results the needle and its jet should be replaced with new parts. However, provided that the engine runs well it is likely that high consumption will only be caused by driving at large throttle openings.

Decarbonisation

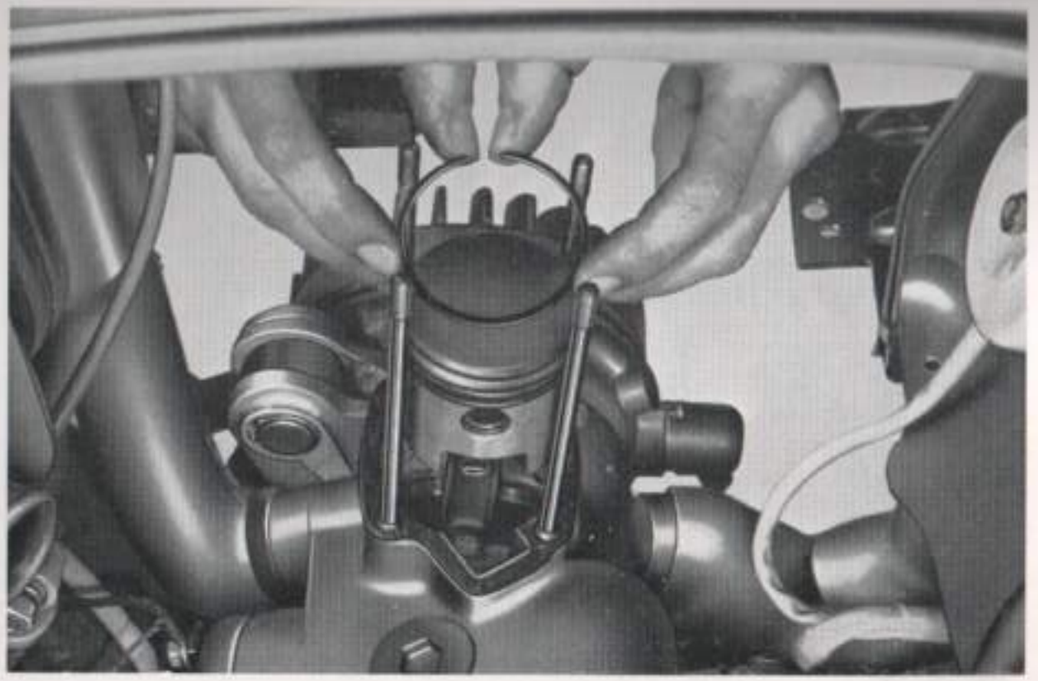
It is a mistake to undertake this just because it is felt it is time the scooter had some attention. In fact probably half of the times this job is carried out it is either entirely unnecessary or the true cause of any trouble lies elsewhere. Do not expect to have to do it at less than 5,000-mile intervals nor be surprised if there is no sign of it being required until 8–10,000.

Difficult starting, misfiring or " pinking " have little to do with it ; only when there is a noticeable fall off in power, when a lower gear has to be engaged on hills previously climbed easily, should it be thought that the accumulation of carbon in the exhaust port or tail pipe of the silencer is sufficient to restrict the passage of the gases.

Besides the tool kit, it is essential to have an 11 mm. socket spanner to fit the cylinder head nuts and it does help to have the special tool for the ring nut holding the exhaust pipe to the cylinder. However, both this and the ring nut around the filler neck of the petrol tank can be turned by using a hammer and drift. Also it ought to be considered whether the small end bush should be replaced, because if this is the case, an extractor will be needed to press out the old bush and a reamer will have to be used to remove the excess metal from the new bush and obtain a good fit with the gudgeon pin. It may well be decided to entrust the entire work to a Service Agent if a new small end bush is to be fitted.

Once the cylinder is dismantled, it will be noticed that the piston can be lifted a small amount indicating some clearance in the big end and small end ; also it will move sideways a large amount. The sideways clearance is entirely unimportant and the up and down movement of the connecting rod will not generally exceed .002 inch unless over 30,000 miles have been covered or the

The cylinder exposed for dismantling and decarbonisation



Gently removing the piston rings

bearing has suffered through lack of lubrication and then it will have broken down completely. However, the clearance in the bearing at the piston end will be of a much larger order when worn and give rise to a loud rattle at high engine speeds or at a very slow tick-over. This noise will predominate over other engine sounds after the first 2,000 miles of the bearing's life but this does not indicate that it necessarily has to be replaced. .008 inch wear may be allowed and this will occur between 5,000 and 15,000 miles according to the speeds at which the Lambretta is driven. No clearance is permitted between the piston and the gudgeon pin although the two may be an easy sliding fit ; if up and down play is perceptible here the piston must be replaced.

Piston rings should not need to be renewed unless the gap between their ends exceeds .070 inch. This measurement is made with the ring removed from the piston and placed squarely in the bore of the cylinder. Note that they are of cast iron and will break if stretched unduly when taking them off the piston.

Begin dismantling, after removing the side panels and pillion footboards, by taking off the carburettor, slackening the pinchbolt with an 8 mm. socket spanner and pulling and twisting the unit from the aluminium manifold on the cylinder. Disconnect the petrol pipe and the throttle cable which pulls out through its adjuster. With Mark III machines it is also necessary to undo one of the clips holding the rubber inlet hose. Unscrew the choke unit with a 10 mm. spanner.

Unscrew the sparking plug and take out the screws around the fan cowling. With earlier models before Engine 189700, where the cowling halves are joined by three screws set in the cowling as opposed to 8 mm. nuts and bolts on the later ones, undo two of the screws with a short screwdriver leaving the inaccessible one in place. Slacken the pinchbolt holding the cowling around the flywheel. This is located near the magneto terminal

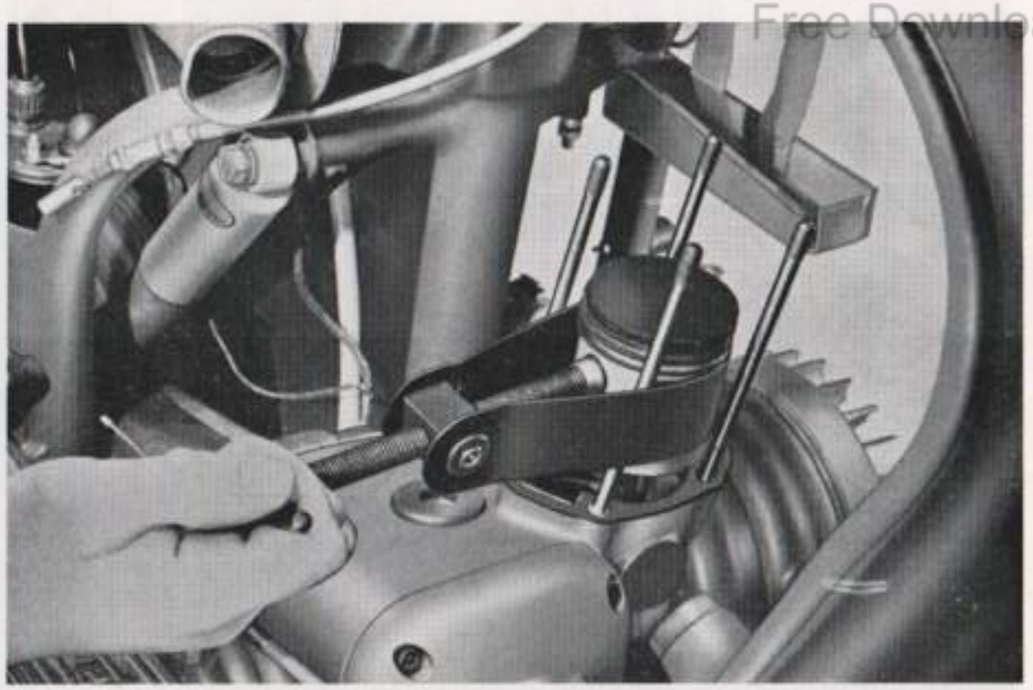
block beside the exhaust pipe and can be reached with a screwdriver inserted up through the slot just beneath it. The screw itself is hidden from view but may be felt behind the edge of the cowling with the fingers. On Mark III machines undo the three screws around the outside instead of slackening the pinchbolt, because the flywheel is too large to allow the cast clamp ring to pass over it. The cowling halves may now be removed, sliding the smaller half round in front of the cylinder in cases where the top screw has had to be left in place.

Take out the petrol tank, pulling off the spring clip attaching the petrol tap control rod, undoing the blind nut in the middle of the saddle bracket and unscrewing the notched ring around the filler neck. For early types rotate the tank anti-clockwise viewed from above and take out towards the nearside. On others tilt the tank to one side and slide out.

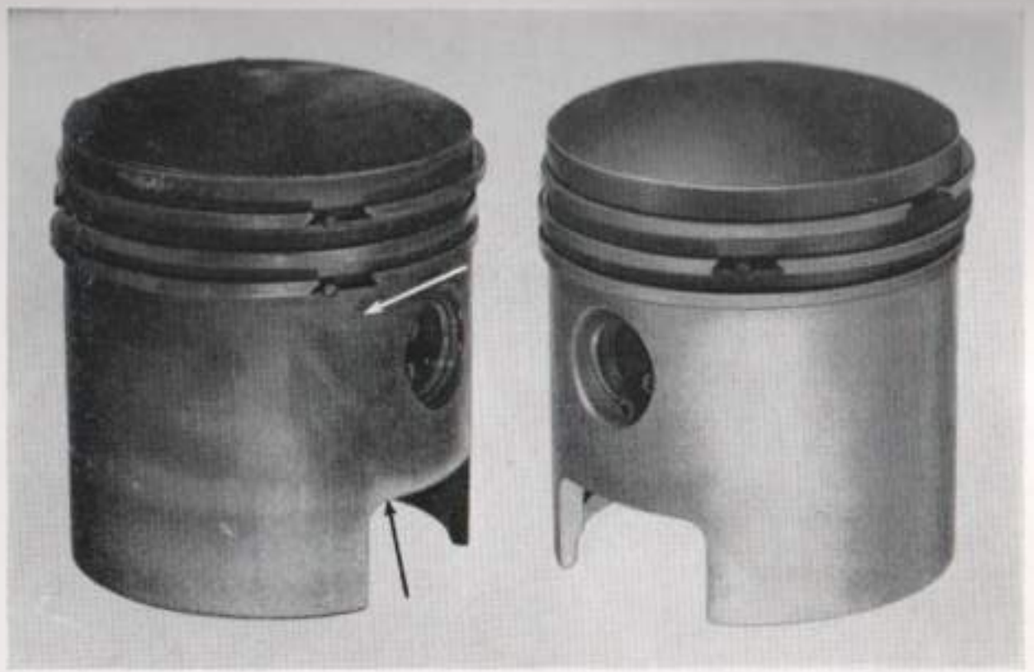
Take off the silencer, undoing the 10 mm. nut from the stud on the crankcase lug near the pivot on the frame, and the ring nut around the cylinder using the special tool number 57842 or a hammer and drift.

Use the 11 mm. socket spanner 49195/E to unscrew the four cylinder head nuts and lift this and the cylinder barrel from the studs. Take out the circlips from both sides of the piston and press out the gudgeon pin either using an extractor or tapping the pin with a hammer and drift, carefully supporting the piston whilst so doing. Although the position of the piston is unimportant on initial assembly when new, always put it back the same way round after it has been used.

Remove all the carbon from the exhaust port, piston crown and cylinder head. Do not mark the aluminium surfaces, because any roughness will promote the reformation of carbon and also may become overheated and cause "pinking." Similarly, of course the cylinder bore must not be scratched. Never rub off the blackening from the piston sides or skirt nor use abrasive on these.



Extracting the gudgeon pin. Tool 53419



Right piston normal, side of other shows blackening at top and rubbing at bottom indicating a bent connecting rod

Polishing the ports and filing down any uneven joints will reduce the tendency for carbon to form but although slight improvements in performance may result do not expect any startling results.

Ease the piston rings from their grooves if stuck, and clean the grooves with an old piece of ring or similar instrument. Take particular care to carry out this operation if new rings have to be fitted, but if the original ones are satisfactory and not stuck, leave the grooves alone. New rings must have an end gap of at least .012 inch when fitted in the bore.

If the ring location pegs in the piston grooves are loose or missing, or if there is any clearance between the piston bosses and the gudgeon pin, that is, up and down as opposed to endwise movement of the pin, which is unimportant, then a new piston must be fitted. These are supplied in three grades of the standard size : +, 0 and —, this being stamped on the piston crown and top surface of the cylinder barrel. However, the difference between each is only a matter of .0002 inch and is used to ensure good fitting and quietness on initial assembly. When the cylinder is at all worn, a + or 0 piston may be used irrespective of original marking.

Note that two different diameters of gudgeon pins have been used, those prior to Engine 127815 being 14 mm. and all subsequent ones 16 mm. Both types of piston are available.

Re-boring the cylinder will not be necessary until the clearance between the piston skirt and the upper part of the bore exceeds .012 inch which should not be before about 20,000 miles or more have been covered.

If the piston is blackened considerably more on one side than the other it indicates that the connecting rod is bent and a further check must be carried out in the following manner :—

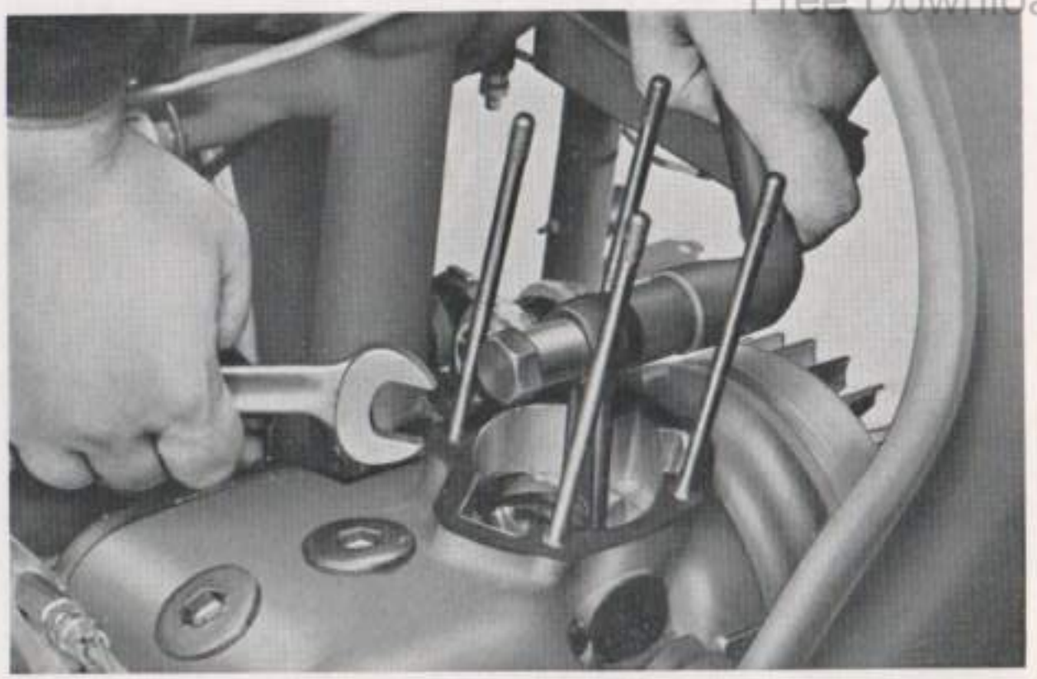
Replace the piston on the connecting rod without fitting the rings. Slide the cylinder barrel into place and holding it firmly on the base use a

feeler gauge to determine whether the clearance on either side of the top of the piston is equal. Any tilt will result in a different measurement of the left side from the right and if the difference exceeds .001 inch the connecting rod must be straightened. This can be done by removing the piston and applying a wrench to the point on the rod which appears to be bent. Avoid too much bending and re-check by assembling the piston and barrel again until by trial and error the fault is corrected.

The operation is not often necessary but may be needed if undue force is used when extracting the gudgeon pin or small end bush.

If a new piston has to be fitted, the noise which often accompanies it while bedding in may be lessened by relieving the edges of the exhaust port and the upper edge of the inlet. This does not apply so much to the Mark III machines with the oval exhaust port but particularly to the earlier rectangular type where the violent motion of the piston rings past the edges often produces ridges in the bore at that point. Carry out the work with a small half round file and remove most metal at the centre of the port edge, tapering off towards the corners. It should be continued approximately 1/8 inch to 3/16 inch up and down the bore, but must not take off more than .005 inch depth of metal at the deepest point. The face of the port will then show a curved edge to the piston ring passing it but will not have changed the effective area or shape of the port.

To replace the small end bush, assuming that the proper reamer is available and the clearance between the gudgeon pin and the old bush exceeds .008 inch, assemble a new bush on the inner sleeve of the bush extractor, part number 1061 for 16 mm. small ends and number 1060 for 14 mm., and pass the end through the connecting rod, fitting the larger sleeve and the nut and washer in place. Be careful that the new bush is centrally placed over the end of the old one and apply a little oil to the extractor thread before



Using the small end bush extractor 1061

Allow the cylinder to slide on by its own weight while positioning the rings

tightening the nut to replace the bush. A slight chamfer on the edge of the new bush will assist its entry.

New bushes may be blank or have the oilways ready cut. If they are not cut, where applicable, drill the two holes in the appropriate position to line up with those in the connecting rod, and after pressing the bush into place, saw through the bush with a piece of hacksaw blade or junior hacksaw to cut out the oil slots. Where the bush already has two slots, position it in the connecting rod so that the slots are symmetrically placed on either side of the rod even though only one slot may be cut in the end of the rod.

When using an expanding reamer, take a small even cut at each pass, turning the adjusting nuts half a turn every time. Be sure to obtain a good surface finish in the bush and avoid tilting the reamer. The gudgeon pin must not be tight and .0005 inch clearance is permissible. Replace the gudgeon pin as well if any marking is present on its surface.

Keep a piece of rag in the crankcase neck while the reamering operation is carried out and clean all parts afterwards. Press the gudgeon pin into the piston using a little oil on the pin and small end bush. Unless well fitting circlip pliers are to hand which will not damage or bend the circlips, they should be renewed, and great care is necessary to see that they are fitted properly into the grooves. Provided this is done they can never come out accidentally. Also oil the piston rings and press them into position in their grooves, making sure that the locating peg in each groove is in position at the gap of the ring. Allow the cylinder barrel to slide over the rings by the pressure of its own weight, only squeezing the ring into place with the finger-tips to assist it.

Do not forget the aluminium gasket between the cylinder and head. If severe " pinking " has been experienced which cannot be cured with a colder type of sparking plug it may be of advantage to fit two gaskets here. If they

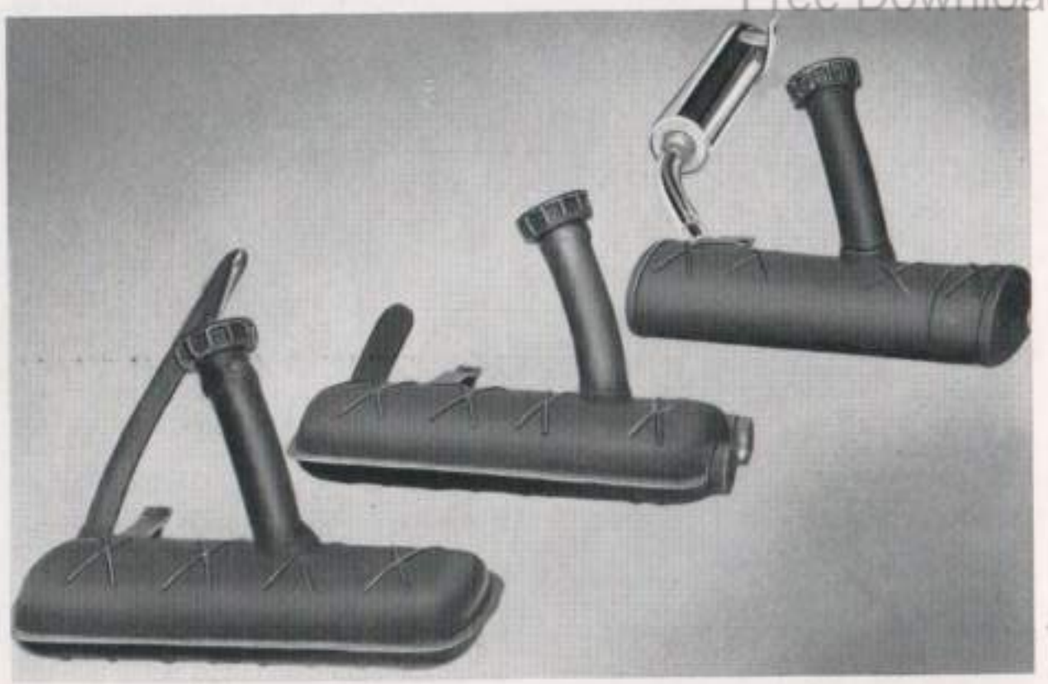
are necessary, no reduction in engine performance will be made by having them. " Pinking " and piston or small end rattle should not be confused. Piston noises generally form the major part of rattling sounds heard from the engine, whilst whining noises, rising and falling in pitch as the engine speed changes, are caused by the transmission system. Piston noises are usually most noticeable at idling speeds or at speeds over 30 miles per hour and particularly as the throttle is shut and the engine over-runs. " Pinking " occurs only under heavy loads at medium speeds when the engine is hot and is a very faint intermittent " clinking " ; it can lead to sudden stoppage of the engine through violently over-heating the sparking plug but will not cause much damage, except to the piston if continued for a long time.

Tightening the cylinder head nuts presents little difficulty if each is turned a little at a time to obtain even pressure over the surface of the gasket, although excessive tightening may lead to the studs pulling out of the crankcase.

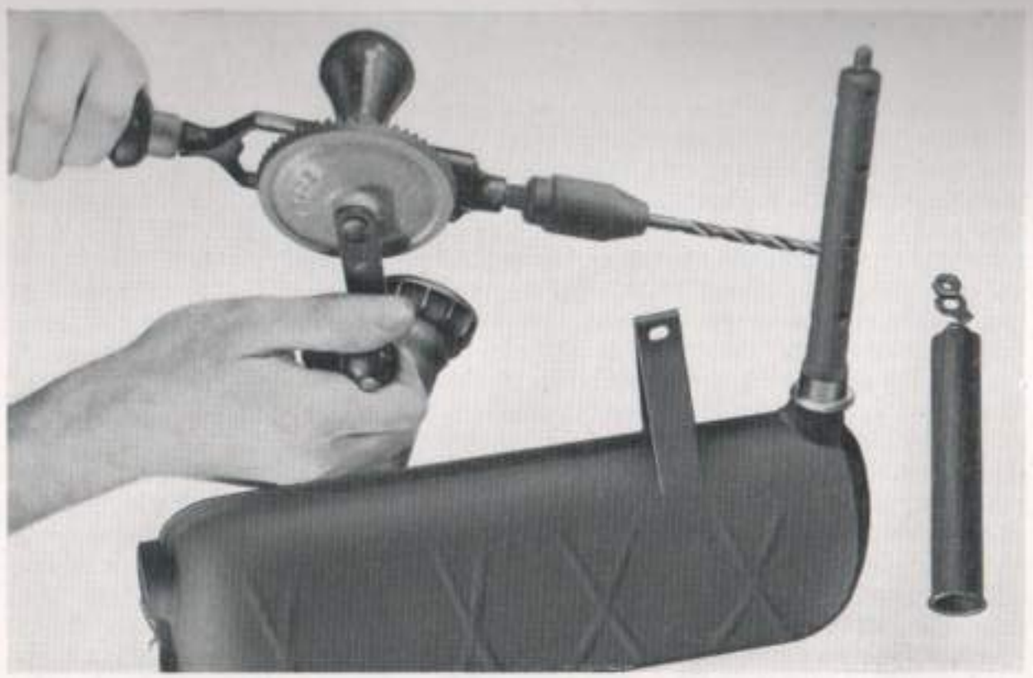
Do not be afraid of any leakage at the joints provided that they are clean and the gaskets undamaged. Gasket cement is not required.

Three types of silencer have been used, ranging from the first type, similar to the earlier 125 cc. machines, having detachable ends and a chromium plated extension silencer placed alongside the transmission case; then a silencer with a welded seam having only two plugs giving access to the body and a short tailpipe which is a double tube with the outer detachable and the inner perforated, terminating below the kick-starter; to lastly, a seam welded one with no access to the body and a long open tailpipe alongside the transmission case.

All are interchangeable but only the latest type can be supplied. This has few troubles and the only place that carbon will collect and restrict the exit of the gases, is at the joint with the tail pipe which is easily cleaned.



The three types of silencer used for the LD, the latest in the foreground



Drilling out the tailpipe to reduce the tendency to become blocked with carbon

However, it is possible for an internal baffle plate to work loose and reduce the performance. This can only be detected by trying a replacement silencer and therefore means obtaining the co-operation of a Service Agent. Repairs could only be carried out by cutting and welding.

The second type also only suffers from restriction at the tail pipe and with this it may be rather severe, necessitating the drilling of the holes in the inner tube to $\frac{1}{4}$ inch diameter and cleaning the neck where it joins the main body by means of a bent piece of stiff wire. It has been found that this tube can become clogged within 3,000 miles to the extent that the maximum speed is reduced to 30 miles per hour.

The original type does not usually suffer from blockage except in the chromium plated extension which is very difficult to clean. Trouble may be expected after about 10,000 miles and if suspected may be easily confirmed by testing the machine without the extension fitted. No difference in performance should be noticeable. If it is, prepare a bath of hot caustic soda to soak the unit in, remembering that this solution is extremely dangerous. Do not on any account allow your hands or clothing to touch it.

An alternative method, almost equally messy, is to burn the carbon out with an oxy-acetylene flame which has the added disadvantage of discolouring the chromium plate.

Seal the end caps of this early type of silencer to the main body with a packing of asbestos string and tap the ends all round with a hammer whilst tightening the threaded brass collar gently. It is the fitting of these caps which is most important to achieve the best possible silencing.

Note that with this silencer it is possible for the baffles to rattle and care must be taken to wedge them securely, not forgetting the small distance piece on assembly. Once tightened, the brass collar is prevented from loosening

by a grub, screwed into its end and butting up against the central rod. It must be removed before attempting to unscrew the collar.

When replacing the silencer get the ring nut as tight as possible around the exhaust stub on the cylinder, replacing the copper jointing ring if at all damaged. See also that the extension or tailpipe is pressed as far home as possible to avoid leakage or rattle. In the case of the latest type of tailpipe, pull the end with its bracket as far away from the end of the transmission case and the rear brake mechanism as possible ; if it is too near, oil may leak from the pipe on to the casing and into the brake drum.

Fit the petrol tank and join up the petrol tap control, observing that it fits loosely into its socket in the petrol tap or otherwise the control piece will be tilted on its rubber washer and allow petrol to leak. The cure if needed is to swing the tap slightly about the 16 mm. hexagonal plug fixing it to the tank to a position which allows the rod to enter the socket easily.

After replacing the flywheel cowling, turn the engine with the kick-starter to ascertain that the fan is not touching the cover and see that the pinchbolt is tight. Push the carburettor right home on its spigot and tighten the pinchbolt, having first attached the choke control and set the instrument so that it is upright. If the carburettor or manifold joints are not air tight, difficult starting and erratic slow-running will result ; this is particularly the case if the carburettor is not pressed as far on to the manifold as possible.

Another possible cause of trouble is the choke outer cable which may not be entered into its socket after reassembly and thus hold the choke slightly off it seating and give a rich mixture. It is sufficient to check that free play exists in the cable by lifting the knob.

If hardened with age the plastic petrol pipe should be renewed. Note that the new one must not be too long as explained in the chapter on the carburettor. The other pipe attached to the bottom of the air cleaner is a drain and not so important.

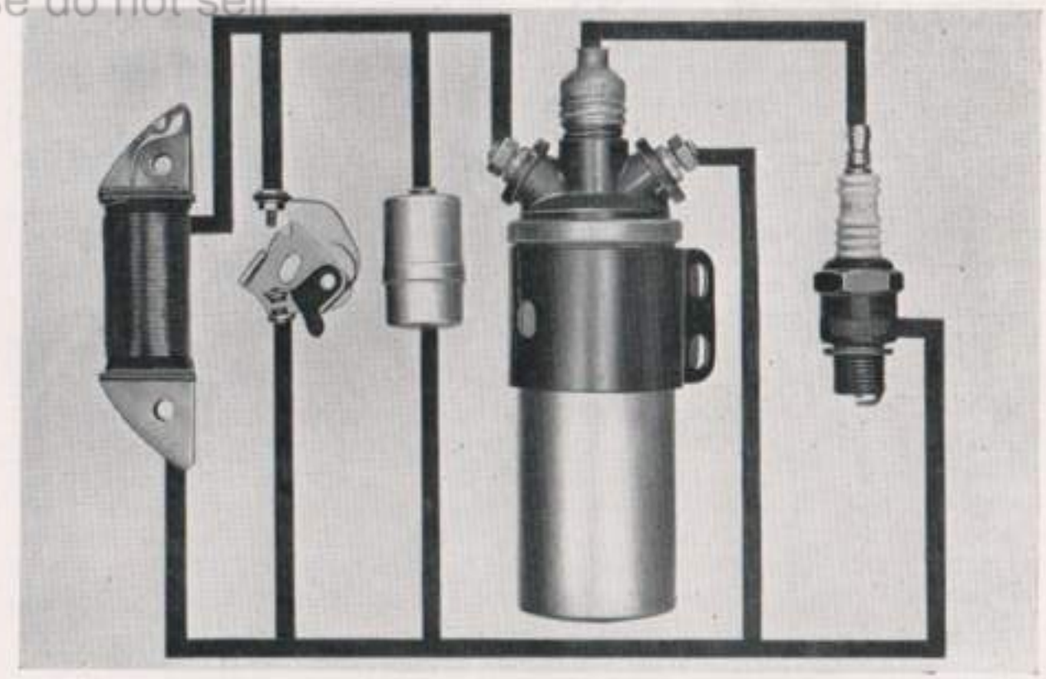
When putting the H.T. lead and suppressor cap back on the sparking plug, set the lead so that it will not be chafed by the throttle control, if necessary threading it under the petrol pipe.

The Flywheel Magneto and Generator

The ignition circuit, which on all machines except the LDA with self-starter, is separate from the lights, utilizes only half of one of the four impulses per revolution of the flywheel to create a spark. The actual amount of current available from this half of an impulse produced in the ignition-feed coil is not so important as the power used for the lights, because all that is wanted is a tremendously high voltage which will jump the gap at the sparking plug points. To do this, an H.T. coil, like a transformer, is used to change one voltage to another much higher. The effect produced is like a see-saw which has one arm very short and the other very long. If a tiny particle is placed at the tip of the long arm and a heavy weight is dropped from a height on to the short arm, then the tiny particle will be shot up much higher than the weight which produced the effect. The maximum height reached by the particle depends on several things. Firstly, the ratio of the lengths of the arms of the see-saw ; secondly, the smallness of the particle ; and thirdly the suddenness of the shock produced by the weight.

The ratio of the arms is equivalent to the ratio of the very large number of turns of the high tension winding in the coil to the relatively few windings of the low tension which has its ends in the two small terminals of the H.T. coil. These are wound together about a central iron core inside the case of the unit.

The size of the particle is the amount of current in the spark, and it varies with many factors. It has hardly any importance, because provided that there is a spark at all, it is sufficient to ignite the petrol-air mixture in the cylinder. By far the most important thing is the suddenness with which the weight



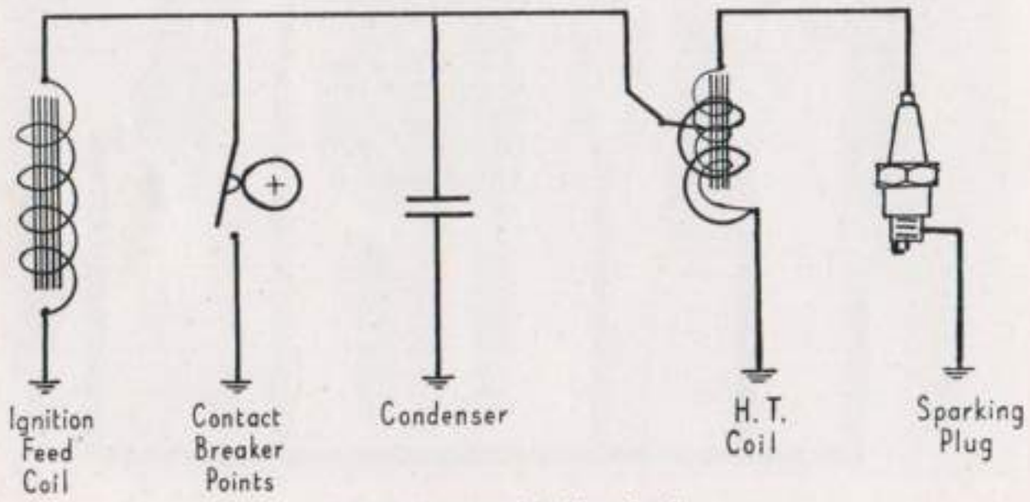
The H.T. coil, condenser, contact points and feed coil are connected in parallel

hits the short end of the see-saw. The normal impulse supplied by the magnets of the flywheel passing the ignition-feed coil is not sudden enough to shoot up the voltage in the H.T. coil, to a point high enough to spark across the sparking plug gap, so it is arranged that the first part of the impulse runs from the ignition-feed coil, across the contact points which are in the closed position, and straight back to the feed coil without passing the H.T. coil. This current flow is interrupted by the opening of the contact points, caused by the cam rotating in the centre of the flywheel. The current fills the condenser, which is a very small storage tank connected alongside the points, and then rushes along to the low tension winding of the H.T. coil, helped by the condenser, which immediately discharges in that same direction. Thus the current rises tremendously rapidly in the H.T. coil and has the effect of the sudden weight on the see-saw to send the voltage in the H.T. windings to a very high level. This happens so nearly instantaneously that the ignition spark appears to occur at the same moment as the contact points part company.

Unless the contact points close tightly, with no dirt or oil in between, and unless they open very smartly at the right moment when the feed-coil impulse is at a maximum, then the best possible spark will not be obtained. Actually the resistance of the ignition feed coil and the L.T. windings of the H.T. coil together does not exceed one ohm, and to have the necessary effect the resistance across the closed contact points must be less than one-tenth of an ohm.

A wire from a common connection with the ignition feed coil wire at the contact points joins to the condenser which is earthed. It will allow no current flow and under test should show a good insulation reading. The condenser is particularly reliable and need not normally be considered when tracing a fault.

If ignition trouble is suspected, the sparking plug should be removed and also the bakelite cover on the H.T. lead if fitted. Hold the end of this lead ¼ inch from a convenient point on the engine and operate the kick-starter vigorously by hand. A spark should jump the ¼ inch gap every time the motor revolves. If there is no spark whatsoever, even after the gap has been reduced to a hair's breadth, a broken connection or short circuit to earth must be suspected. The only connections which may be faulty are the connection of the



Wiring diagram of ignition circuit

The Lambretta Contact Tester

two green wires at the terminal block on the magneto near the exhaust pipe, the two connections to the H.T. coil, and the earth connection of the second wire from the H.T. coil. If these are sound, then the one of the green wires at the terminal block which is not that to the H.T. coil, should be disconnected. This leads to the ignition cut-out on the handlebar switch, and may possibly be worn through and touching the frame, or it may have become short-circuited in the switch. If so, a spark will be produced when the wire has been disconnected by testing with a ¼ inch gap as previously described.

If a weak spark only is obtained, the contact points should be checked for cleanliness and correct setting. If a Lambretta Contact Tester 0517/C is available, the resistance across the open contacts should be measured to be approximately ½ ohm. A slightly higher reading indicates a broken connection to one coil, full scale reading, no connection. When closed, no deflection from zero reading should be perceptible. Any greater reading means dirty contacts not closing properly. Zero reading shows a short circuit. Should there be no improvement after checking and setting the contact points, the H.T. coil must be tested ; to do this a 6-volt direct current supply as from a battery is necessary, together with a condenser of approximately .25 microfarads capacity and a pair of contacts which can be interrupted. The coil should be connected in series with the battery and contacts, with the condenser connected in parallel with the contacts. After the coil has been allowed to become warm with the resulting current in the circuit, interruption of the contacts must produce a good spark across a 9 mm. gap formed by needle points connected between the H.T. pick-up and either of the low tension terminals. If only an occasional spark or no spark at all is produced, the coil should be replaced.

If a satisfactory spark is observed when the engine is rotating with the H.T. lead held ¼ inch from the cylinder and difficulty is experienced with the engine running, the sparking plug should be examined. If the porcelain

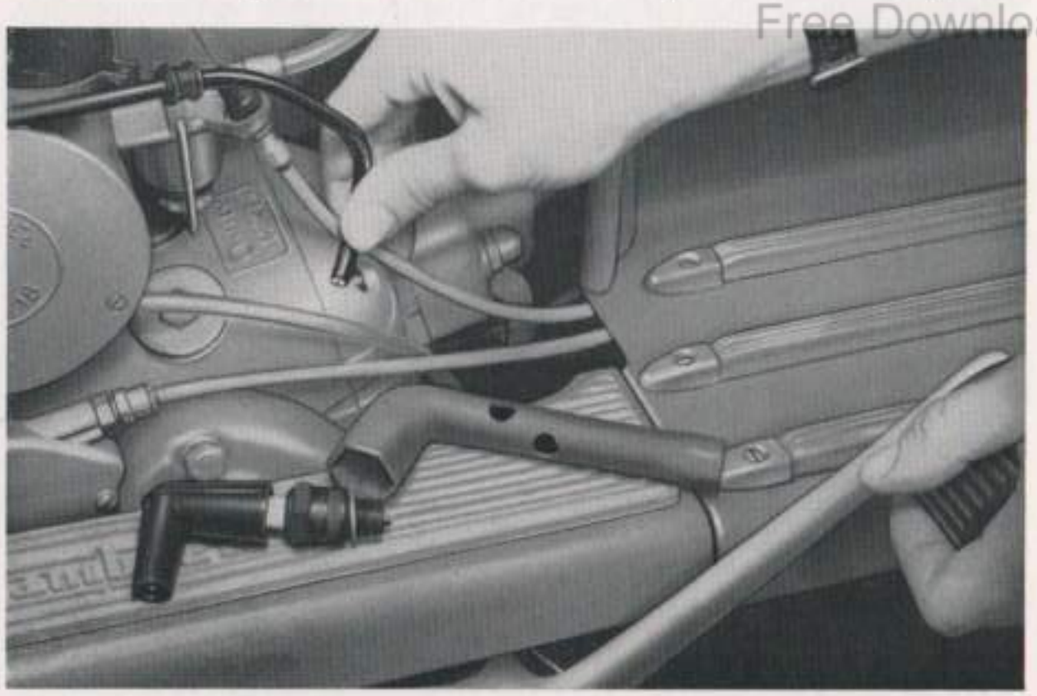
insulator, which can be seen behind the sparking points of the plug is not of a pale appearance such as is obviously caused by a high temperature which allows no blackening deposits to form, then such deposits may cause a leak for the current which will prevent any spark from being delivered. It is possible that a spark will jump the sparking plug points when observed with the sparking plug removed and held against the engine or convenient earth point, but when in the cylinder the compressed gases increase the effective difficulty of the gap which the spark has to jump by ten times ; thus a sparking plug gap which has burned to as much as .030 inch, although scarcely the thickness of two pieces of postcard, will require a voltage high enough to jump approximately 5/16 inch when observed from the end of the H.T. lead to the cylinder in the open air. Normally, the sparking plug gap should be approximately .020 inch, or the thickness of one postcard, and this should be re-set at not greater than 500 mile intervals.

Examine the H.T. lead closely for signs of burning or chafing, as by the throttle cable and change its position or replace it as necessary. Also note that a faulty suppressor in the sparking plug cover can give ignition trouble.

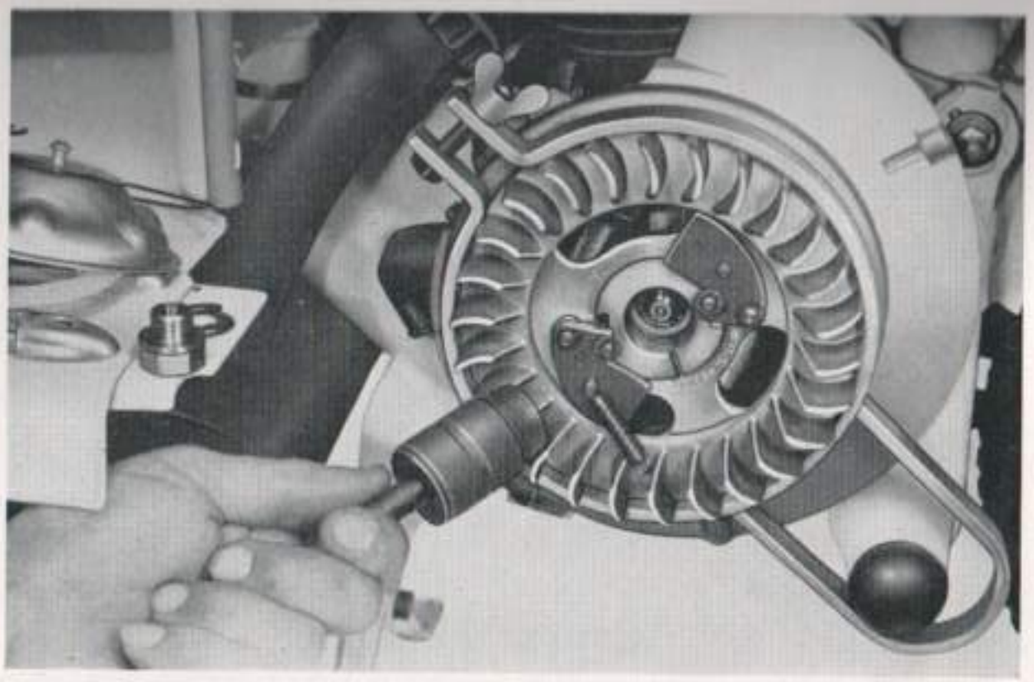
The ignition system may be either of Filso or Marelli manufacture since both are fitted to the Lambretta and when ordering replacement contact points etc., the make must be specified. H.T. coils, which are fitted on the frame externally to the magneto, are interchangeable and both may be replaced by the Bosch TJ/6 coil which is cheaper. In fact, in an emergency any 6-volt car coil could be used.

Contact points for the Marelli system are parts number 00831611 and for the Filso up to Engine 126950 are number 00811434. From this engine number onwards, the automatic advance and retard mechanism is fitted and the Filso contacts are of a different type having the part number 00811432.

There are very few troubles which can be experienced with the ignition



Testing the ignition spark



Holding the flywheel with tool 49220/E while applying the extractor 37058/2E

equipment and once such causes as the sparking plug and H.T. lead and H.T. coil are eliminated and the wiring connections checked, including disconnecting the green wire to the switch cut-out, it is likely that only the contact points can be the culprits. Do not suspect the ignition feed coil, which is the one on the left when facing the flywheel, or the condenser, unless they have been damaged. Only very rarely do these two give any trouble at all yet time and again replacements for them are purchased and the old ones discarded without proper test. Unfortunately however, no simple test is possible which is entirely reliable.

If the engine misfires at various speeds or steadily gets more and more difficult to start, then it is worth examining the contact points. If the engine tends to stop when the headlights are switched on, this can only be caused by the contact points or sparking plug gap which require adjustment.

Dismantle the flywheel cowling as described in the chapter on maintenance, remove the sparking plug and also the circlip and dust cover from the flywheel centre. Filso units with automatic advance and retard mechanism also have a plastic ring behind the dust cover. At this stage the points can be adjusted with a screwdriver but not cleaned very easily or replaced. To take off the flywheel it is essential to have a holding clamp tool number 49220/E, a 19 mm. socket of specially reduced outside diameter number 1015 and an extractor number 37058/2E. Note that there is a spring washer behind the flywheel nut which must not be lost and when the flywheel is extracted a small woodruff key will be seen which should be fairly stiffly embedded in the taper of the crankshaft ; care must be taken not to dislodge it when refitting the flywheel. It is only present to position the flywheel for the ignition timing and the joint is effected by the mating of the two tapers ; it is to achieve sufficient tightness of this joint that the proper socket spanner and flywheel holding tool are so necessary and if the nut is not fully tightened, damage may follow which

will necessitate the renewal of both flywheel and crankshaft which will be most costly.

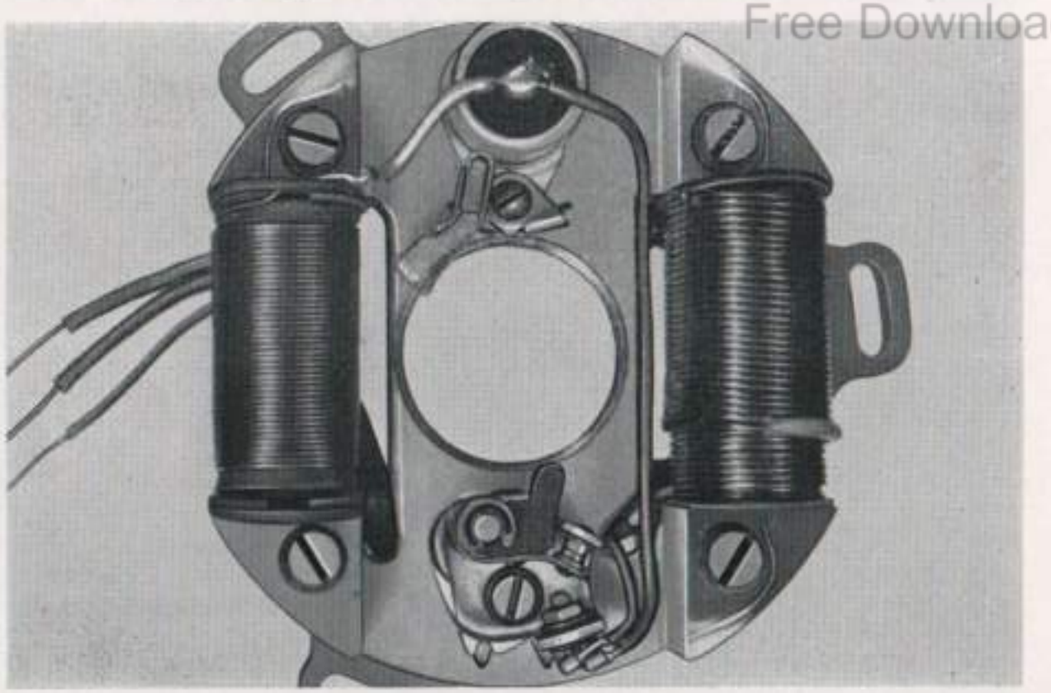
If slight damage is caused to the tapers at any time they may be re-mated by using a smear of valve grinding paste and lapping in carefully. For this purpose the woodruff key is easily removed.

The contact points are on the stator plate beneath the shaft end. Almost opposite them and also bearing on the cam in the centre of the flywheel is a felt pad which must be oiled occasionally to prevent rapid wear of the contact heel. Attention need only be given to this when the points are adjusted, but avoid over-oiling it, because any excess will foul the contact points and cause misfiring.

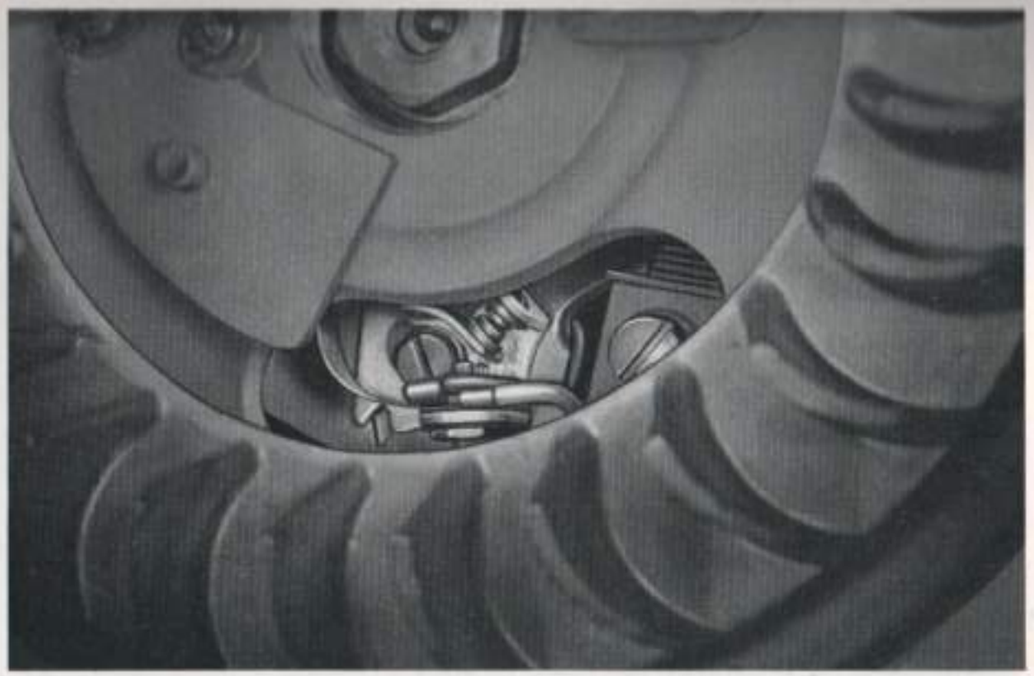
Normally, the points should be set squarely opposite one another, but this is not always done and then a ridge forms on one side after a lot of use. When the ridge is only slight the points can be removed and the ridge filed off, but if it is deep a new pair will be necessary. Do not on any account file the points until they are removed from the stator plate, otherwise the difference in the angle of the two surfaces caused by the thickness of the file will prevent them from seating evenly after filing. At the best this can only be a temporary repair. When new ones are fitted, after making sure that the appropriate washers are in place, bend the fixed point with a pair of pliers or tap it with a hammer and small drift into the position which exactly aligns it with the point on the contact arm. Provided this is done correctly the life of the parts will be 10,000 miles or more. Never file new points, but remove any protective coating from them with very fine emery cloth.

Some oil is necessary on the contact arm spindle but be sure to wipe ofi all excess afterwards.

All the different contact points are locked by a single screw which can be reached through the apertures of the flywheel. After this is slackened enough



Stator plate of the Filso magneto



Filso contact points. Note locking screw and V-notch adjustment

to permit the plate holding the fixed contact to be adjusted, the plate may be moved by wedging the screwdriver between the locking screw head and the side of the plate in the case of most Marelli points, by fitting the screwdriver into the vee-notch of most Filso points and twisting, or by turning a small eccentric screw set in the plate near the locking screw in the case of the early Filso and latest Marelli types. Although this may seem complicated, examination will soon show which type of adjustment is fitted on any particular machine.

The gap cannot be set to any definite measurement for the best results but must be varied until it is found that the points just begin to separate when the ignition timing marks coincide. Increasing the gap gives the effect of advancing the timing and reducing the gap retards it.

The importance lies in arranging that the contacts shall separate when the current in the feed coil is at a maximum and this occurs 10° after the flywheel has passed the position where the four pole pieces of the magneto are spaced equally between the pole pieces on the ends of the coils. Obviously this occurs four times every revolution but only one position can be nearly correct for the spark to occur just before the top dead centre of the piston.

The setting of the stator plate, which is adjustable by three screws in slotted holes fixing it to the inner flange member, is arranged so that the inbetween pole position occurs 10° before the timing marks which are in turn 26° before top dead centre of the piston. This total amount of 36° corresponds to a movement of one and thirteen-sixteenths of an inch of the flywheel rim and the ignition advance of 26° corresponds to one and five-sixteenths of an inch. Mark III flywheels with the larger rim which prevents the cowling clamp ring from being removed must have greater measurements of two inches and one and seven-sixteenths of an inch respectively.

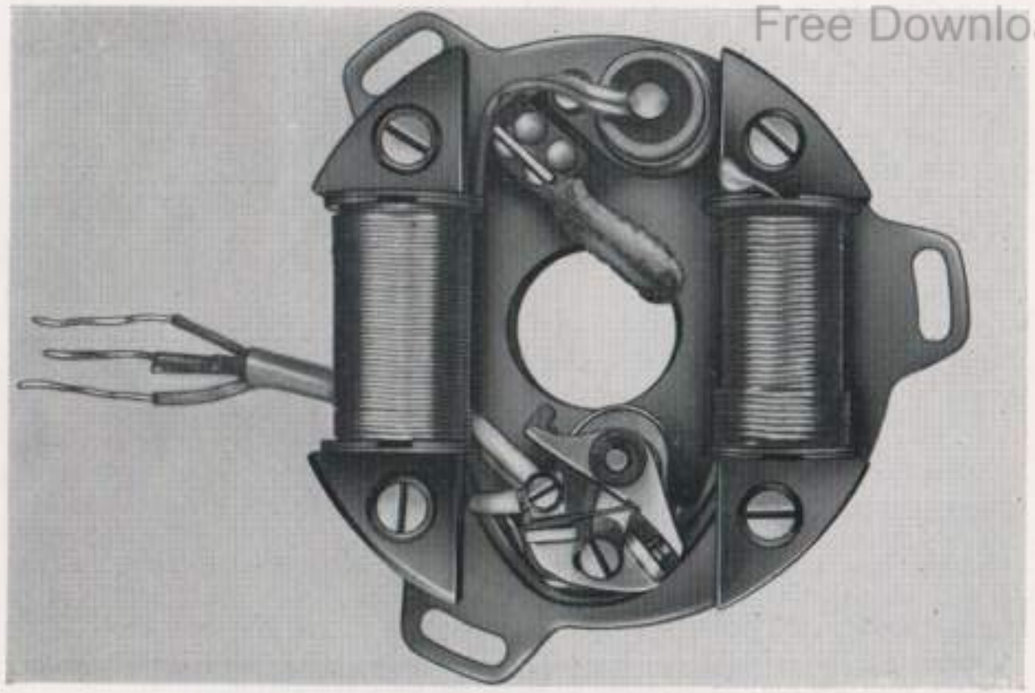
The stator plate setting is fixed at the Factory and should not generally

have to be altered. If it has to be, the flywheel must be removed in order to get at the screws.

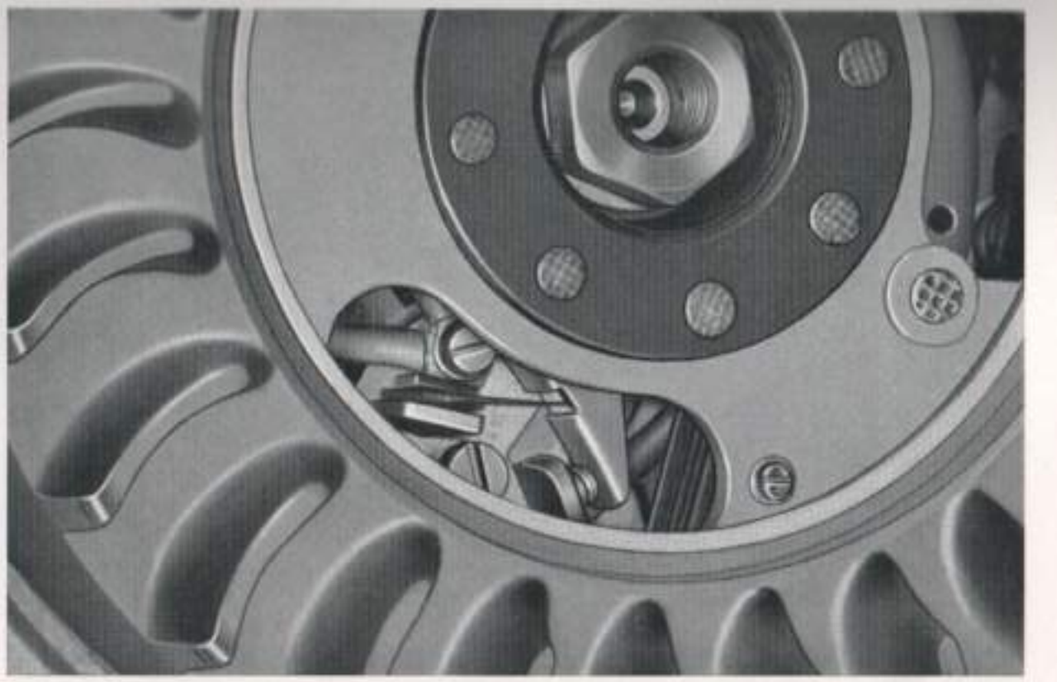
If there are no timing marks on the flywheel, they may be made by turning the flywheel to the point where the piston is exactly at the top of its stroke, which can be felt with a screwdriver inserted through the sparking plug hole or better still determined with a dial gauge, using the special holder number 48059, then scribing a line at any point on the flywheel rim to coincide with another on the adjacent housing. Next measure the appropriate distance of one and five-sixteenths of an inch or one and seven-sixteenths of an inch, according to flywheel diameter, from the mark on the flywheel and make a second to the left of (anti-clockwise from) the first. When the flywheel is turned clockwise until this second mark aligns with the mark on the housing, the position is then found where the contact points should separate and the ignition spark occur. This will correspond to a reading of 3.8 mm. on a dial gauge.

If a Contact Tester is connected between earth and the green wire at the terminal block on the left of the magneto housing, and switched on, the sudden deflection of the needle as the flywheel is turned slowly will show the moment of separation of the points. Alternatively a piece of thin paper between them can be used to indicate when pulled gently, the moment that the pressure is released. To correct the timing, vary the gap as mentioned previously, making it larger or smaller according to whether the points separate too late or too soon respectively in terms of anti-clockwise (normal) rotation of the flywheel.

Adjustments must be made with the automatic advance mechanism held in the outwards or advanced position. This is fitted from engine 126950 and consists of one springloaded arm behind the face of the flywheel in the



Stator plate of the Marelli magneto



Marelli contact points

case of the Marelli and two arms on the front of the flywheel with a spring connecting them on the Filso. They are pivoted on the flywheel face and by a lever action rotate the cam, which is in the form of a loose sleeve on the flywheel centre, as they swing outwards. This movement is caused by centrifugal force acting on the arms as the engine speed increases and results in the cam being turned through 18° in the advance direction.

The mechanism is intended to retard the ignition for starting purposes only in order to prevent the possibility of any kick-back ; it should be fully advanced at all normal running speeds. If however, a rattle is heard from the mechanism at tick-over it is because the return spring is too weak. This may be strengthened by cutting off one coil to shorten it, but it must allow the arm, or arms, to assume the fully open position by the equivalent engine speed of 18 m.p.h. in top gear. The movement can be seen with a torch as a blur in the centre of the flywheel and may be checked with the aid of a colleague if the machine is rested with the rear wheel clear of the ground and the speedometer reading noted as the engine is accelerated in top gear.

Troubles to look for are oil on the contacts, preventing the flow of current ; or small pieces of swarf rubbed off the locking screw or coil pole pieces, causing a short circuit. With the Marelli unit it is possible for the contact arm spring to be bent so that it touches the side of the slot cut in the arm and does not exert a proper pressure on the contacts.

If the single advance and retard arm of the Marelli flywheel is not bent to lie against the back of the flywheel face it may touch the two coils on the stator and wear through, causing a short or broken circuit.

When dismantling for cleaning or greasing, note that there is one particular way round for the cam of the Filso flywheel, if it is put back the wrong way the spark will occur 180° out of time.

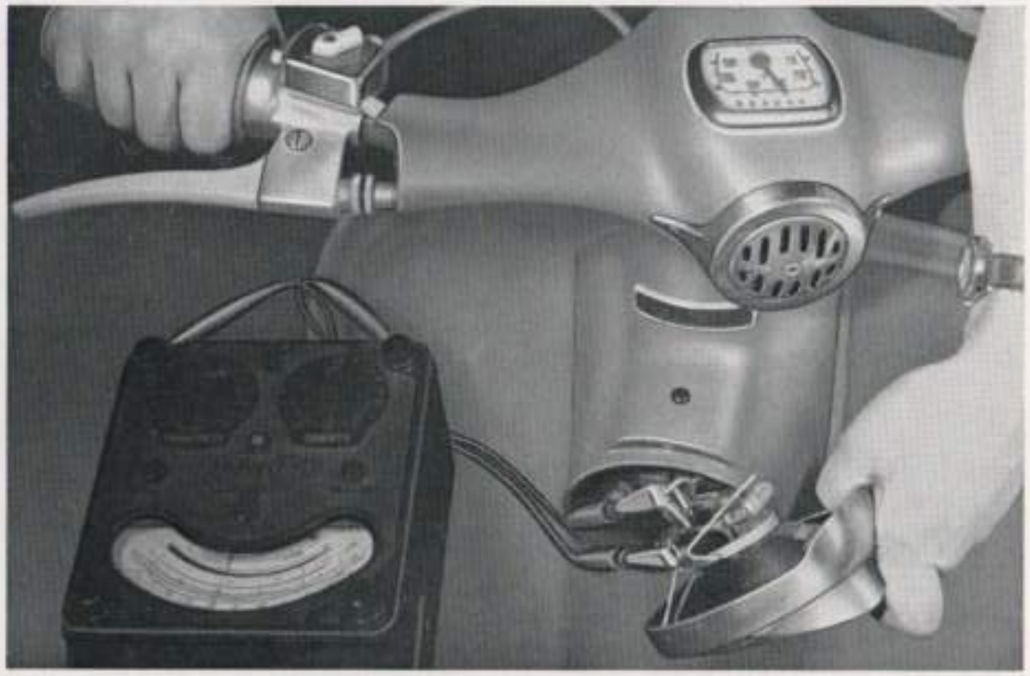
LIGHTING

The lighting coil produces an alternating current as the flywheel rotates and this is used to operate the lights and the horn, and to charge the battery when fitted.

The strength of the output from this coil determines the brilliance of the lights and varies with the speed of rotation of the flywheel, the power of the magnets, and to a lesser degree the gap between the pole pieces of the coils and those of the flywheel magnets. This output is not at a constant voltage like a battery and the voltage not only varies with the conditions in the generator but also falls as the load on the system is increased. Thus, although no damage can be caused to the thick copper wire of the lighting coil by overloading it, the result of putting too many or too powerful bulbs into the lighting circuit will be to reduce their brilliance owing to the voltage dropping below that required.

The output from the lighting coil is approximately 27 watts at 3,000 revolutions or about 30 miles per hour in top gear. This would therefore exactly balance the consumption of a 24 watt headlamp and a 3 watt tail lamp. The nominal voltage of 6 should just be reached under these conditions and a suitable test would be to measure this between the headlamp connection and earth, with the engine running in gear and the back wheel raised clear of the ground for a speedometer reading. On open circuit without any load the voltage will rise above 15.

If a lower value than 6 volts is measured with the headlamp illuminated, it may be due to wrong connections, incorrect bulbs, or a weak output. In the latter case the gap between the flywheel and coil pole pieces can be checked with a feeler gauge entered through the openings in the flywheel face and varied by slackening the two screws holding the generating coil and moving it within the limits of the screw holes which are slightly oversize for



Checking voltage at headlamp. Machine on stand, engine running in top gear

Terminal block on the side of the magneto flange

the purpose. Do not let the gap be less than .005 inch or the flywheel may rub with consequent damage to the magnets through the vibration caused. Re-magnetisation which is often necessary on an old machine can only be carried out by returning the flywheel to Lambretta Concessionaires Ltd.

However, a much improved brilliance can be obtained by fitting a bulb of lower wattage which by virtue of its lower consumption will cause the voltage to rise. The rear lamp should have a bulb of 6 volts 3 watts value, although other sizes are often fitted, and a smaller one must not be used ; but if the power of the lights is below normal the headlamp bulb may be replaced with one of 6 volts 20 watts or even less. This must not be taken to extreme or a bulb which is strongly over-run will burn out at high speed through too much extra current.

Do not confuse such a failure with burning out of the rearlamp bulb which can occur if there is a bad connection to the headlamp. This is often caused by the dipswitch as it is moved from one headlamp beam to the other and momentarily disconnects both. Normally the copper piece moving with the lever should bridge the contacts before leaving one of them, but if it is bent this may not happen and the rear lamp bulb will receive the full generator output for long enough to ruin it.

A very dim light will result if the connections at the terminal block are reversed. The blue wire from the lighting coil inside the generator is the main feed and this joins to a brown wire at the terminal block. The two green wires connect together at an adjacent point and join a wire from the ignition coil and contact points. One green wire going to the cut-out on the switch and the other to the H.T. coil. The third terminal is left blank on most Mark I 150 and Mark III 125 machines but on others it contains a red wire which is a tapping from the lighting coil to feed the parking light battery via a rectifier when fitted. All Mark III 150 machines have this red wire. The

output from it is much less than the main feed and it is confusion of the red and brown wires which can produce a dim light.

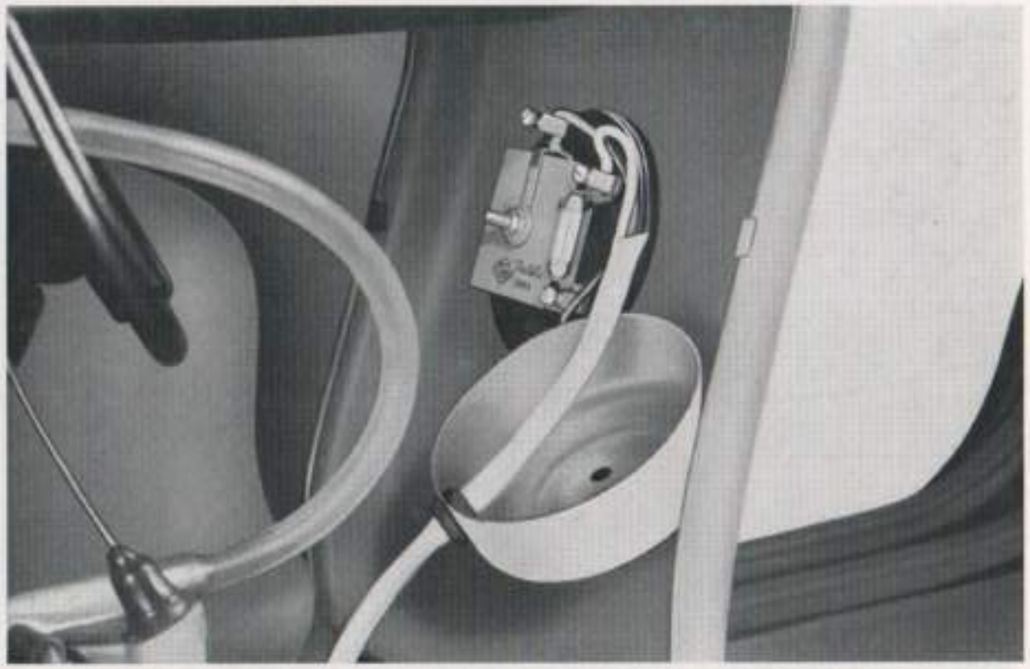
On very early Mark I models the third position is occupied by a brass tag joining to a red wire from the other end of the main lighting coil which on all other machines is soldered to earth internally via one of the coil pole pieces. This brass tag is pinched between the terminal block and the aluminium housing and sometimes is the source of a bad connection of the lighting circuit on these models.

The focussing of the headlamp is pre-set in manufacture and any incorrect beam setting can usually be traced to a faulty bulb filament, the remedy being to replace the bulb. The direction of the beam is also fixed on Mark I machines but the Mark III has the unit fixed by three screws around the headlight rim and the holes in the rim are slotted. It is permissible to elongate the slots further with a file if required. Although no such adjustment is provided on the earlier models, the setting can be altered by re-positioning the tag on the rim which engages a slot in the top of the housing. Originally spot welded, it may be easily pulled off and either soldered in a new position or drilled and secured to the rim with a nut and bolt.

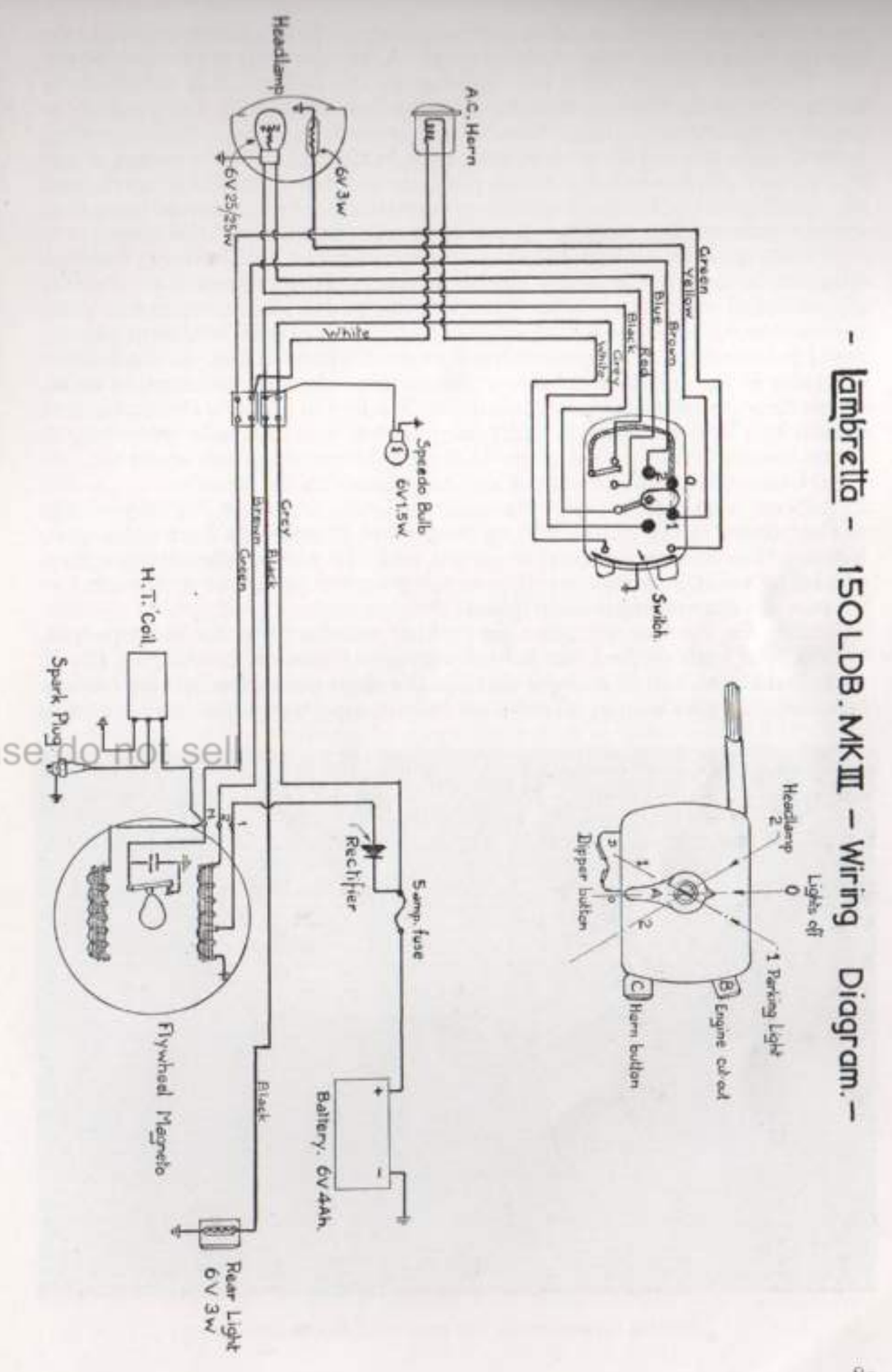
Do be careful not on any account to even touch the silvered surface of the reflector because it will immediately become spoiled and it is quite impossible to restore it.

Where parts of the headlamp have to be replaced it should be noted that various makes are fitted. The first, Cardini, are now obsolete and therefore any replacement will have to be of reflector and bulb holder together, although rims and glasses are interchangeable with other makes. The three others in current use at the time of writing are Carello, C. E. V. Pagani and Aprilia.

Battery operated parking lights are fitted to all Mark III 150's but not Mark III 125's. They can be fitted as an accessory to Mark I 150's only but on



Fuse and rectifier group of the LDB



very early ones with the brass earthing tag at the magneto terminal, the lighting coil will have to be changed for the later type with the extra tapping.

The small output from this tapping on the lighting coil is fed to the battery via a half wave rectifier in a circular box mounted in the front of the engine compartment. This allows only the positive part of the alternating current from the coil to be directed to the battery in order to charge it and also acts as a one-way valve which prevents the battery discharging through the lighting coil when the engine is not running. The maximum leakage of current through the rectifier allowable in this direction is .005 amp.

There is a fuse fitted between the rectifier and the battery, which is intended to melt under heavy discharge rates and thus protect the battery and electrical components from damage in the case of short circuit or reversed connections to the battery. If the battery is incorrectly connected with positive to earth instead of the negative, the fuse should immediately fail and unless the fault is found and the battery connections changed to negative earth, severe damage will follow any attempt to fit a fuse of higher value or to short circuit it. Thus it must be understood that if the fuse fails, something is wrong causing a heavy discharge which must be corrected and on no account should more than a single strand of 5 amp fuse wire be fitted.

When working properly the generator will supply a 0.4 amp charge to the battery at the equivalent engine speed to 30 miles per hour in top gear. Measure this with an ammeter in circuit with the wire to the battery ; there can be no point in measuring the output from the generator to the rectifier because a false reading will be given.

Only use the battery lights for parking and then just for short periods, because the battery does not hold a very great amount of charge. If you wish, and are able to fit a larger battery, the output from the lighting coil can be increased to 0.6 amp at 30 miles per hour in top gear by putting more turns

Varying the note of the A.C. horn which has no adjuster

of wire on the coil and this operation may even be necessary on a standard machine which is getting old, to restore the normal 0.4 amp charge. The work is best entrusted to an electrician.

Stop lights can usually be operated satisfactorily from the parking light battery and in this case a connection should be made with the grey wire at the rectifier box. Use any stop lamp switch of proprietary manufacture, and mount it beneath the footboard with a block approximately an inch thick to bring the switch level with the brake pedal. Make the connection to the brake cable clamp using about one inch of the spring usually supplied with the switch. Do not use bulbs of greater value than 6 volts 6 watts. Mark II and III machines have sufficient space in the existing rear lamp for the extra bulb and the bracket part number 12011831 may be used for mounting.

Less satisfactory is the operation of stop lights direct from the main feed which is carried by the brown wire from the magneto terminal block. In this case a bulb of approximately 12 volts 6 watts value may be fitted but it is possible that this will have a short life if the brake is applied a lot at high speeds. Also when the brake is used at night the headlamp will dim noticeably.

Spotlights cannot be run from the battery because of the low rate of charge, but it is possible to mount one on the mudguard and take a connection from the headlamp bulb so that it is used as an alternative to either the main or dipped beam. If this is done it is important to have a bulb of the same value as the headlamp.

The horn is operated by the alternating current except on self-starter models. It has an earth return on Mark I and II machines and current is supplied to it when the horn button on the lighting switch is pressed. On Mark III machines with the square type of lighting switch the horn has two terminals and a connection is made with either of these direct to the main feed at the junction behind the headlamp. The wire from the second terminal then only has to be earthed by pressing the operating button in order to sound the horn.

The battery operated horn of the self-starter machine has an adjuster screw in the back, but none is fitted on the A.C. instrument. However, if the note from one of these is weak it may be improved after taking it off, by altering the distance of the magnets from the diaphragm by tapping the sides or back of the aluminium casing with a light hammer. Experiment carried out with the horn held against earth and the button pressed while the engine is running, will show which is the best place to tap to bring about an improvement.

Self-starter

The work done per minute in starting the engine may be quoted in terms of horsepower, and the power given by the Lambretta electric starter for the short period it operates is about ½ h.p. ; this represents more power than is needed to pedal a bicycle. Horsepower has a set relationship to electrical power, and approximately 1¼ h.p. is equivalent to the consumption of a small 1 kilowatt electric fire, or reversing this, 746 watts equal 1 horsepower. Electrical power (watts) is measured by volts and current, and is given by the equation : volts × amps = watts.

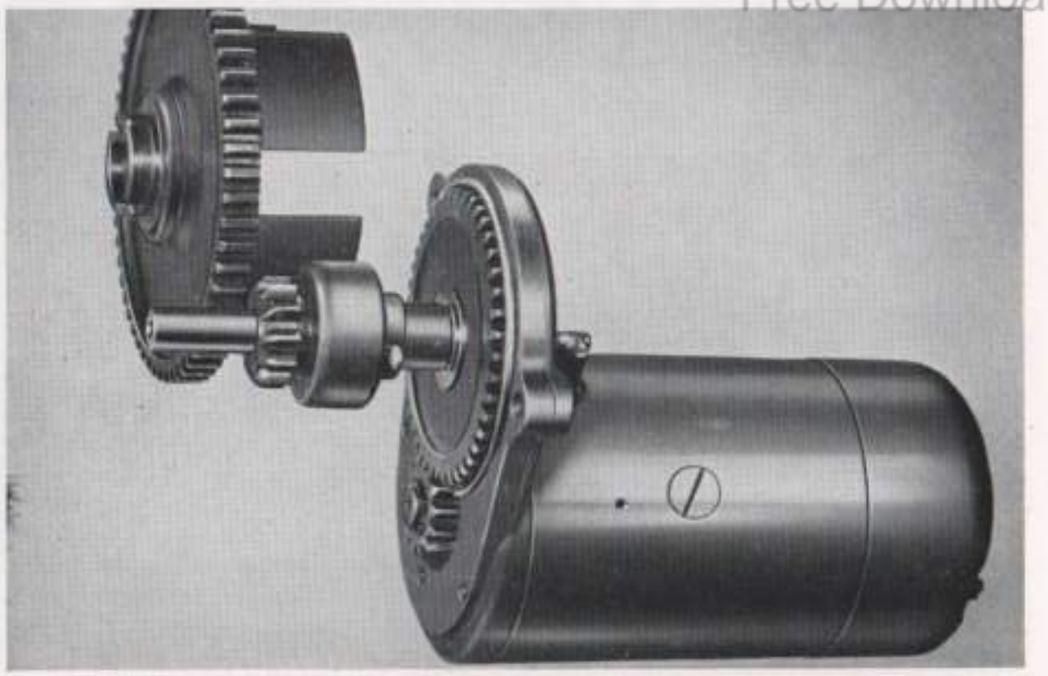
Since a 12-volt battery is used to drive the starter motor the current needed can be worked out as follows :—

$$\tfrac{1}{2} \text{ h.p. equals } \frac{746}{2} \text{ watts} = 373 \text{ watts.}$$

$$\frac{373 \text{ watts}}{12 \text{ volts}} \text{ gives approximately 31 amps.}$$

Actually the current will be rather higher because the electric motor is not efficient enough to turn all the electrical current into horsepower and some is lost.

To give a current of over 30 amps. requires a battery designed to allow rapid discharging, and to carry the current a very thick wire must be used between the battery and the starter motor. Also a switch with large copper contacts is necessary to withstand the heating and burning which such a current causes.



Electric starter motor and train of gears engaging toothed clutch bell

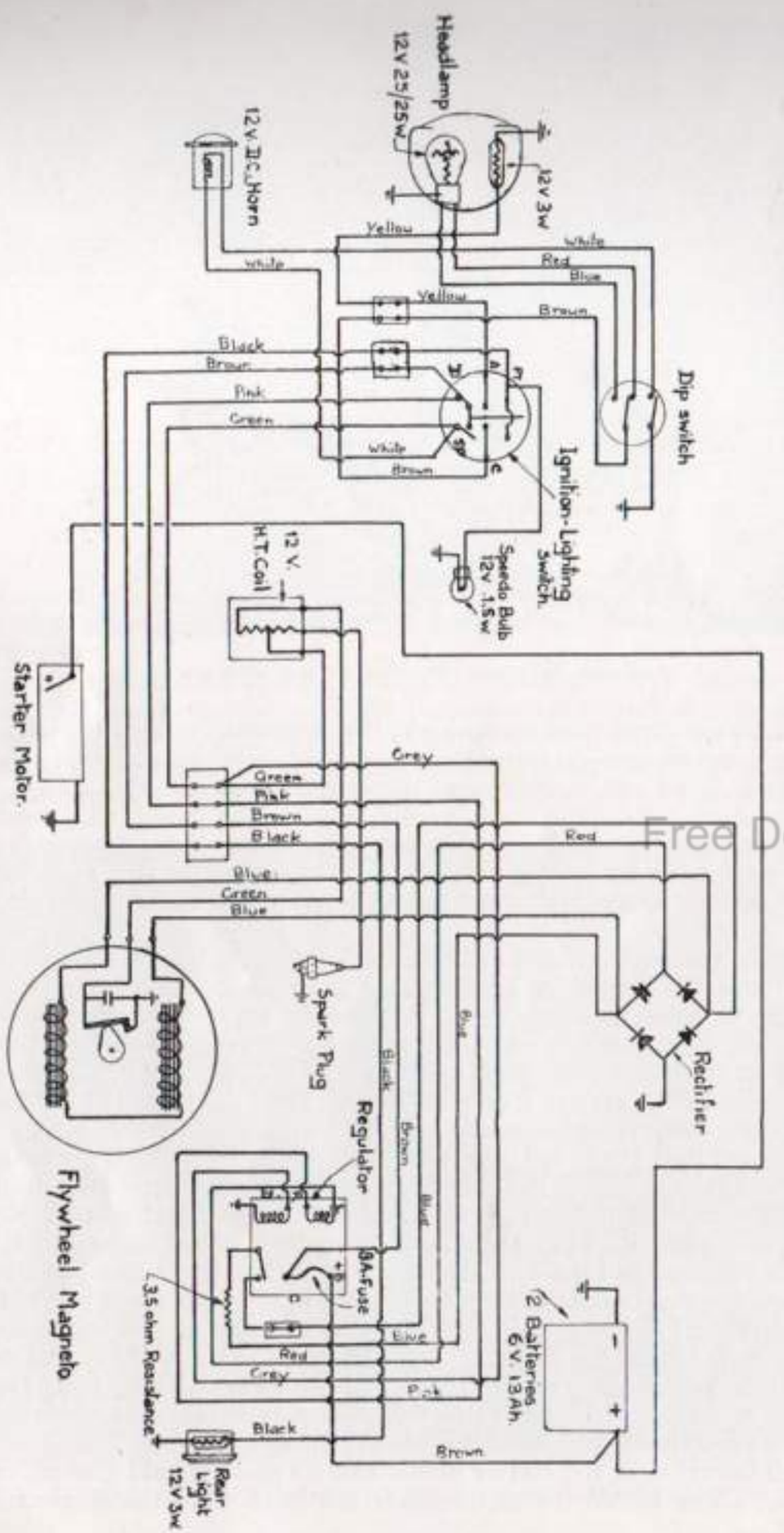
Removing the motor unit using a 5 mm allen key

It will be seen from these reasons why it is important to keep the batteries well charged and filled to the top of their plates with acid ; also why the connections must be good and the wire and the contacts not corroded away.

If the engine does not start readily, the starter motor will overheat through continuous use and the batteries will use up all their energy ; just as it is pointless to keep operating a kick-starter if there is a fault in the engine, so it is pointless and also harmful to do the same with the electric starter.

To drive the engine, the starter motor is connected by a train of gears of which the last is formed by a ring of gear teeth around the clutch. Except for this one, the gears do not rotate all the time the engine is running normally but only while the starter is operating. For this purpose the pinion which meshes with the gear teeth on the clutch is made to slide in and out of engagement by the movement of the starter lever and cable. The initial travel of the lever when pressed, slides the pinion into position in the gear train ready to turn the engine, and then at the full extent of its travel the lever closes the contacts of the switch on the top of the starter motor and the current starts to flow. Notice therefore, that unless the cable is well lubricated and there is plenty of free play to allow the sliding pinion to spring back out of engagement, this pinion will continue to turn with the clutch gear after the engine has started and will wear out or break. A freewheel device in the pinion will prevent the engine turning all the gear train and the starter motor if this happens, but obviously high engine speeds will very soon cause it to overheat and seize. To avoid this do make sure that the lever and cable have plenty of movement. Incidentally, anyone familiar with the machine will soon hear whether the pinion remains in gear from the whine it makes.

The lubrication of the starter motor and its gears should give no cause for worry. Those within the clutch cover run in oil from the gearbox, and



– Lambretta – 150LDA. MK I-III Self Starter. – Wiring Diagram. –

the two in between the motor and the clutch cover are packed in grease. The motor itself runs in porous bronze bushes which have their own lubricant absorbed in them. No attention is thus required unless the unit is dismantled, and then a drop of oil may be given to each bush and fresh grease packed around the first pair of gears. Oil from the gearbox may enter the starter motor if the gearbox is over-filled and also if the rubber oilseal around the shaft which passes through the clutch cover, or that around the pinion engagement spindle inside the shaft, is damaged.

To take off the motor unit, unscrew the allen screws with a 5 mm. hexagonal key. There are two bolts, one on either side of the motor, and a third facing the rear, just behind the protruding side of the clutch cover which supports the unit. With these bolts removed the motor will be loose, but it cannot be lifted out until a colleague bears on the rear of the machine with sufficient weight to make the suspension " give " and the engine pivot enough to allow the starter motor to clear the footboard.

To disconnect the cable, pull the rubber sleeve back away from the switch body and push out the small pin across the hole where the cable enters. Do not try to do this until the motor unit has been taken away from the engine, because it is too difficult to align the drilled nipple on the cable end with the hole for the pin on re-assembly, unless the unit is away from the footboard so that it can be seen.

The 12-volt system of the Lambretta, besides operating the self-starter, also provides current for the ignition spark and the lights. No magneto exists in the form associated with the standard machine which produces a spark directly from the current created by the movement of the flywheel magnets past the ignition coil. The generator, which looks the same as the flywheel magneto, supplies current to the battery and then the battery supplies the ignition. This is the method used in a car and its main advantage lies in the fact that a spark is produced every time the contact points " break " no matter how slowly the engine turns.

Since the battery supplies the current to the H.T. coil when the contact breaker points close, it is necessary to have a separate switch to shut off the current flow when the engine is not being used. The horn is also connected so that it will work only when the ignition is switched on. The switch is a five-position one giving : (1) parking lights without ignition ; (2) off altogether ; (3) ignition only ; (4) ignition and head-lights ; (5) ignition and low lights.

There is a big advantage in operating the lights as well from the battery because, since its output is at constant voltage, the bulbs can always receive the correct current for bright illumination. This is not possible on the standard machines, where the lights are supplied directly from the generator and the current and voltage vary with changes of engine speed.

A drawback of the system is the complexity of the wiring and also the possibility of damage to the batteries or the components in the event of a short circuit due to insulation becoming worn through or defective. However, a fuse in the circuit near the battery prevents overloading by burning out if the normal maximum discharge of 8 amps. is exceeded. This is like a deliberate weak link in a chain which is not expensive to replace after the fault causing the trouble has been corrected.

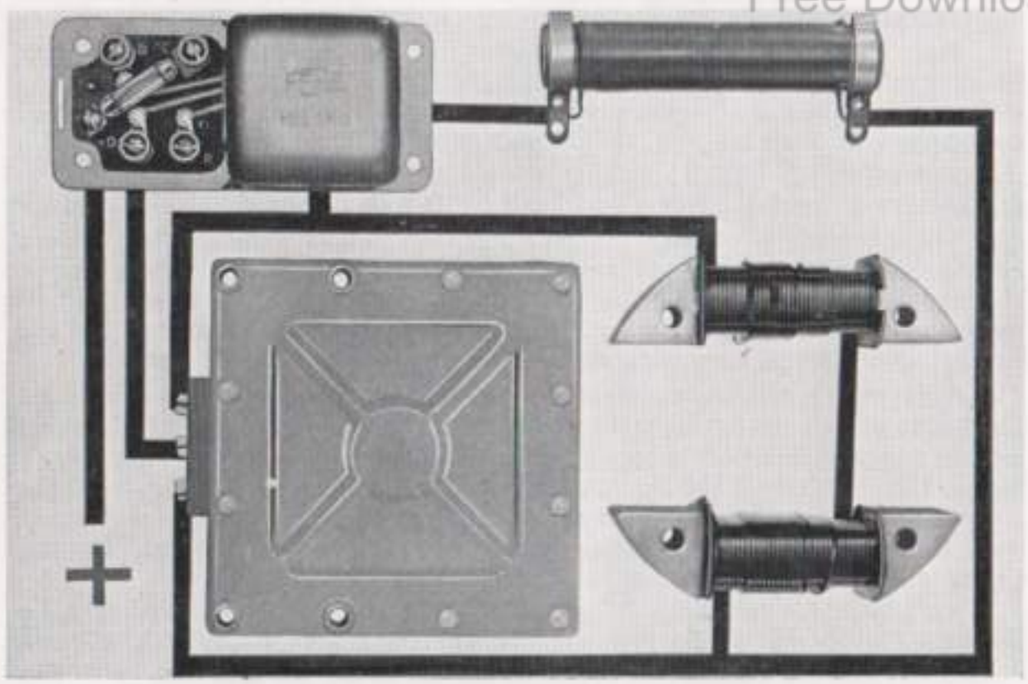
An advantage with the Lambretta is that if the batteries accidentally become completely discharged the machine will still start with a push, provided that the ignition is switched on as usual, because the generator charge will go straight to the ignition and, provided that the contact points

" break " at the right moment in relation to the flywheel magnets, a spark will be produced at the plug. To make sure of this effect, the setting of the contact breaker points should be carried out in the manner described for the standard machine.

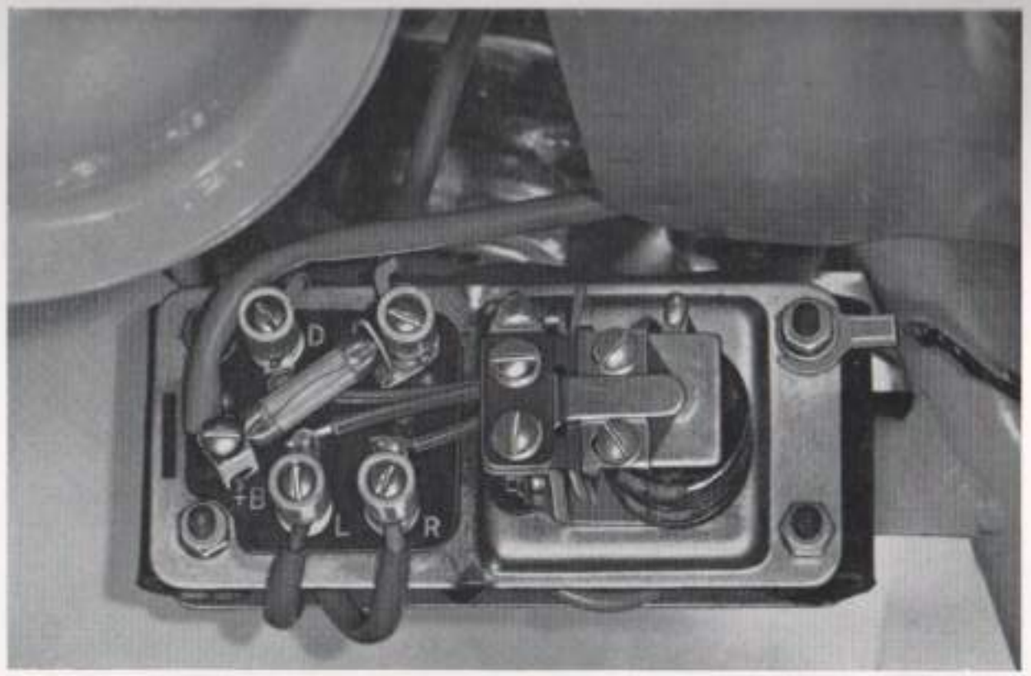
Because of this automatic magneto ignition the engine will also run if the batteries are disconnected or the fuse is blown, but this must be regarded only as a possibility in emergency, and the regulator will not take kindly to the treatment if continued.

The charging system is often blamed for troubles it does not cause, but nevertheless it must always be checked and measured if the batteries do not remain well up. The principle of it is simple, but this is not at all evident when examining it. As the flywheel rotates, current goes backwards and forwards in the two coils inside the generator, and these currents have to be sorted out so that the positive ones are sent to the positive terminal of the battery and the negative ones to the negative of the battery and the frame of the machine to which it is connected. The rectifier is the valve which allows the current to pass only one way, and this is inserted in the wires between the generator coils and the battery.

The rectifier has to be a double valve, because a positive current exists at one end of the coils simultaneously with a negative current at the other ; thus the valve at one end is set to receive the positive current and another valve at the other end allows the current from the negative battery terminal to pass. A second set of valves operates to re-direct the current in the coil when it changes round due to the influence of the next magnet of the rotating flywheel. The four valves together form a full-wave rectifier, so-called because the current rising and falling alternatively above and below zero can be traced on a graph and appears as a series of waves. All these waves, up and down, are re-directed to the correct battery terminal by the full-wave rectifier.



Coils, rectifier, regulator and load resistance form the charging circuit



Regulator viewed from above, showing connections and 8 amp fuse

A half-wave rectifier would take only the tops of the waves and send them to one side of the battery.

Acting as a one-way valve, the rectifier also stops the battery current from flowing away through the generator coils when the engine is stationary. It is not perfect, because about .005 amp. leaks through, but it is sufficiently good to do away with any need for a switch or cut-out to interrupt the charging circuit when it is not being used. The charging circuit is unbroken by contacts or brushes.

The rate at which the batteries are charged depends almost entirely on engine speed. The coils and magnets of the generator are designed to ensure that enough current is fed into the battery at speeds as low as 25 m.p.h. in top gear, to balance the demands of headlamp and ignition together, which represent about 40 watts. Since the charge is higher at higher speeds and, of course, the lights are used only at night, the batteries soon become fully charged, and provision has to be made to reduce the full current from the generator. If this is not done the extra current will cause the batteries to " gas " and harmful acids can be given off which will damage the paintwork.

Luckily the batteries show a symptom of being fully charged, which is a rise of their voltage well above the nominal 12. Actually it is found that when it reaches 15 while being charged, then is the moment to reduce the charging current. This is done by allowing most of the generator current to flow through a resistance connected across the output by the action of the regulator contacts closing. These contacts are made to close by the magnetic effect of a small current from the batteries which runs through a coil in the regulator to earth. When the small current increases slightly as the batteries reach full charge, the magnetic effect overcomes the pull of a spring, and when the contacts of the regulator close, the charging current runs across them into the resistance and only a trickle remains to go to the batteries. To

prevent fluttering of the contacts, the charging current passes through a separate coil of few turns, wound with the main regulator coil, but in the opposite direction. This gives an opposing magnetic effect which almost disappears once the contacts close and only the trickle charge remains. Thus, once closed they remain closed until a much lower voltage is reached as the batteries discharge. However, an unstable situation can occur if the regulator closes just below 15 volts and this is apparent by alternate dimming and brightening of the headlamp at approximately 30 miles per hour.

Possible Faults

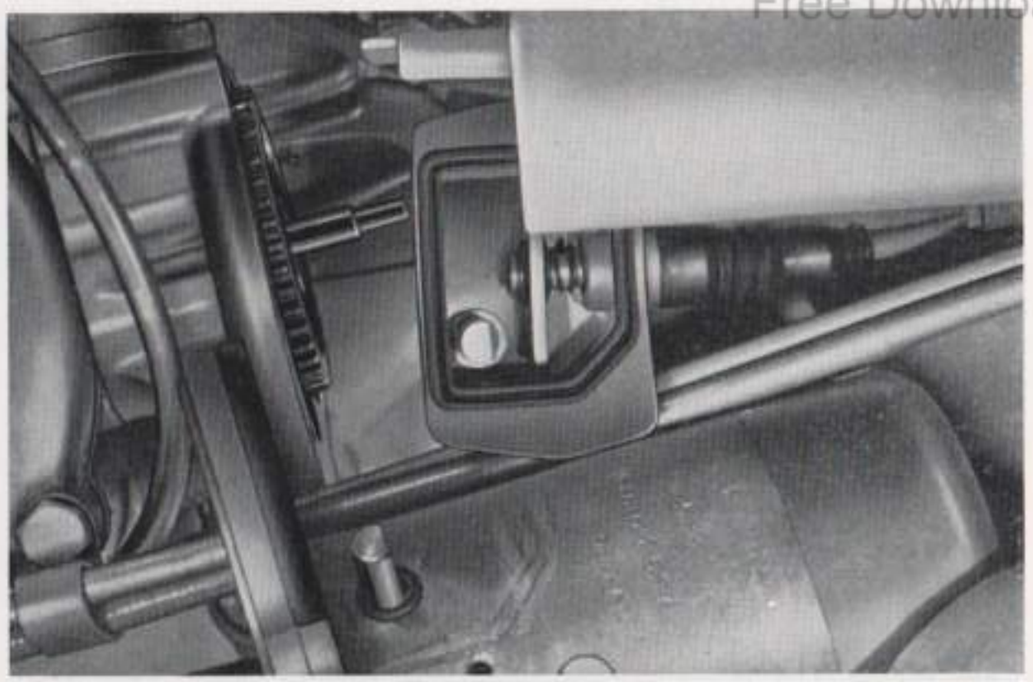
There is only a limited number of faults that can occur with the electrical system, but it is not easy to sort out which particular fault has occurred when difficulty arises. Work logically, eliminating the parts which are not concerned, until you can see which particular circuit is offending, and then test it, piece by piece.

If the engine won't start, but the starter motor turns it merrily, don't blame the starter. You may keep it turning for about five minutes until the batteries are flat and the engine will probably never start but that's your fault.

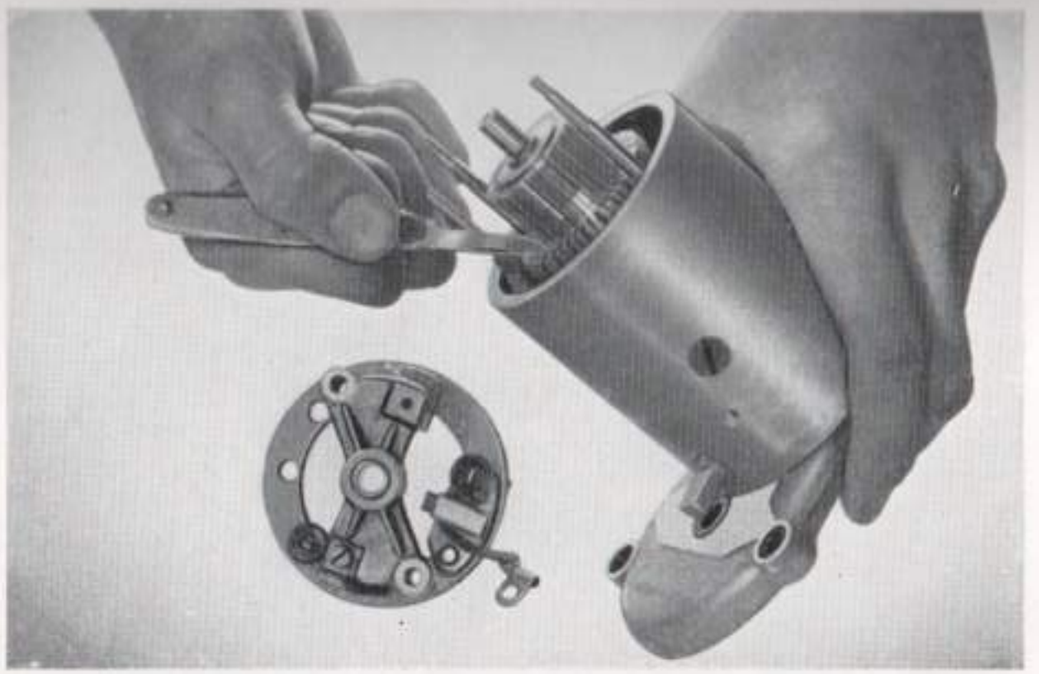
Just as with a kick-starter, check the petrol flow, take out the plug and look for a spark. Change the plug if necessary, and if it is wet try starting with the twistgrip throttle kept wide open. However, if there is definitely no spark, or if the starter motor hardly turns, proceed as follows :—

Starter turns slowly — Battery flat ; try a push-start.

Starter won't turn — Switch on the head-light and press the starter lever ; if the lamp goes out or very dim the batteries are flat. If the lamp remains bright, then the starter switch contacts are bad or the starter-motor needs attention.



Starter switch removed from motor showing contacts



Undercutting the mica insulation between the commutator segments

No spark — See if the ignition is on ; make sure the lights are turned off. The wires may have dropped off the H.T. coil, off the battery, off the generator terminal-block, or unhappily almost anywhere in the circuit. However, see if the fuse has blown or if the contact-breaker points in the generator aren't opening.

Spark only when the engine turns fast or engine starts only with a push — Fuse blown or connection to batteries loose.

Engine stops when lights switched on — same reason, fuse blown or some bad connection between regulator box and batteries, because it means the ignition and lights are only working direct from the generator and the batteries are not helping.

Batteries flat — this is so if the head-lamp, when switched on, goes out when the self-starter lever is operated. May be caused by a fault in in the charging system, ignition left switched on all night, or even a fault in one of the batteries. Remember however, that a loose or corroded battery connection may also make it seem that the batteries are flat.

Batteries quickly go flat — This can also be a symptom of a faulty battery, but often it will happen if the regulator causes the charging current to be reduced before the maximum of 15 volts is reached.

Lights won't work — fuse blown or connection loose in headlamp or in glove-box.

Lights only work with engine running — Same reason.

Lights flicker — regulator cutting down charge rate before batteries are fully charged. The cure is to have the regulator re-set.

Repairs

Three parts which require servicing are easy to attend to : the horn, the starter switch and the starter motor.

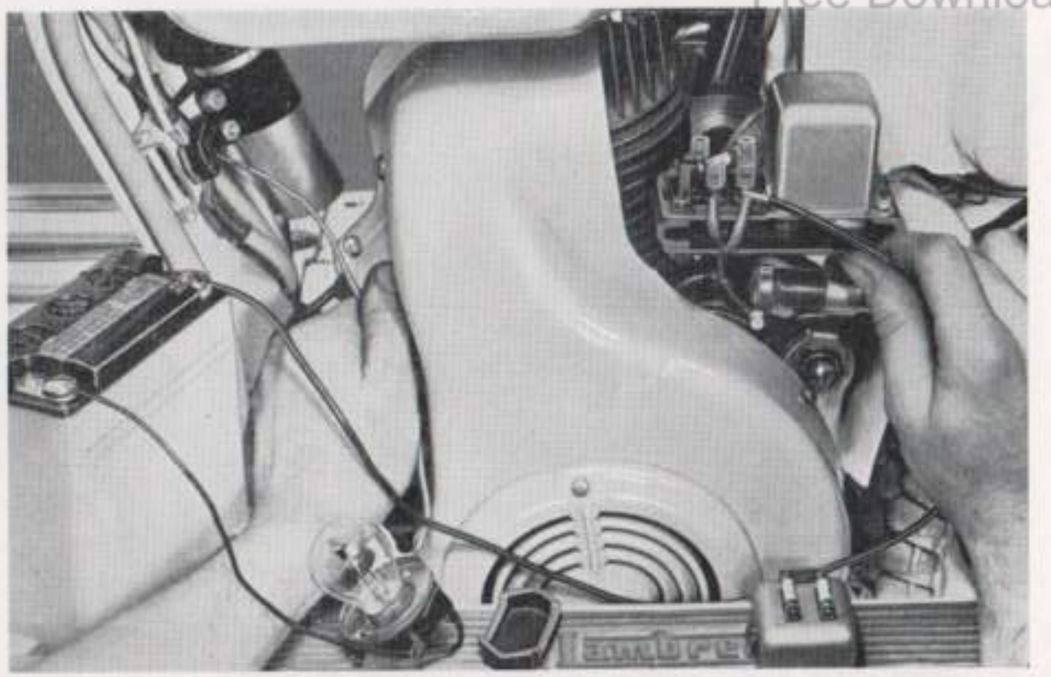
In most cases all that the horn needs is a half turn of adjustment to the screw set in the back, but it is necessary to remove the horn from the machine to get at this. Also the screw in the centre of the diaphragm works loose occasionally, and this will come apart for repair by undoing all the screws around the horn. After tightening this diaphragm screw, hammer the ends of the screw over like a rivet, to prevent recurrence of the trouble.

To give attention to the starter switch, the motor must be taken off. When this is done, the switch can be removed by undoing the two 8 mm. hexagonal screws on either side. There is no need to disconnect the cable, and the only attention the switch will need is to clean off oil and corrosion from the contacts and the surrounding insulation. If this insulation is very dirty there will be more current leakage here than through the rectifier, which may lead to the mistake of thinking the latter is faulty. When refitting the switch make sure the rubber washer around it is in good condition and properly fitted to avoid the entry of rainwater.

A modification to reduce condensation in the switch is the drilling of two holes approximately .080 inch diameter and 3/8 inch apart on the side of the switch cover further from the observer when in place, adjacent to the fixing screw and communicating with the switch chamber. This allows a slight circulation of air.

The end cap can be taken off the motor, and if the nuts on the two studs running through the motor are unscrewed it all comes apart. Be careful not to let the copper braid brush wire of the positive brush, which lies near the end cap, actually touch this when it is all assembled because it can cause a short circuit. Also note, when reassembling, that the nuts must be tightened evenly to avoid distortion and consequent stiffness of the armature shaft.

Besides needing cleaning it may be found that the mica insulation between the copper commutator segments of the armature needs cutting



Tracing a bad contact with bulb and battery

Measuring the leakage current from the batteries with the ignition switched off

down. A penknife will do this, and do not be afraid to recess the mica well below the surface of the copper, so that it cannot touch the brushes or interfere with their proper contact. Afterwards polish off any roughness of the commutator with emery cloth.

The accompanying wiring diagram will probably look rather complicated, but this is because the several different circuits of ignition, lighting and charging are all shown together. Since it will be required to refer to only one at a time it may help to thicken the wires of the circuit which is to be followed with a pencil line so that they may become more obvious.

Lambretta Electrics cannot give any troubles more complicated than those described here, and therefore, it is true that there is nothing too formidable to tackle with the help of a couple of meters measuring voltage and current, and these are necessary only occasionally. Without them a bulb, a battery and a piece of wire can usually find a bad connection.

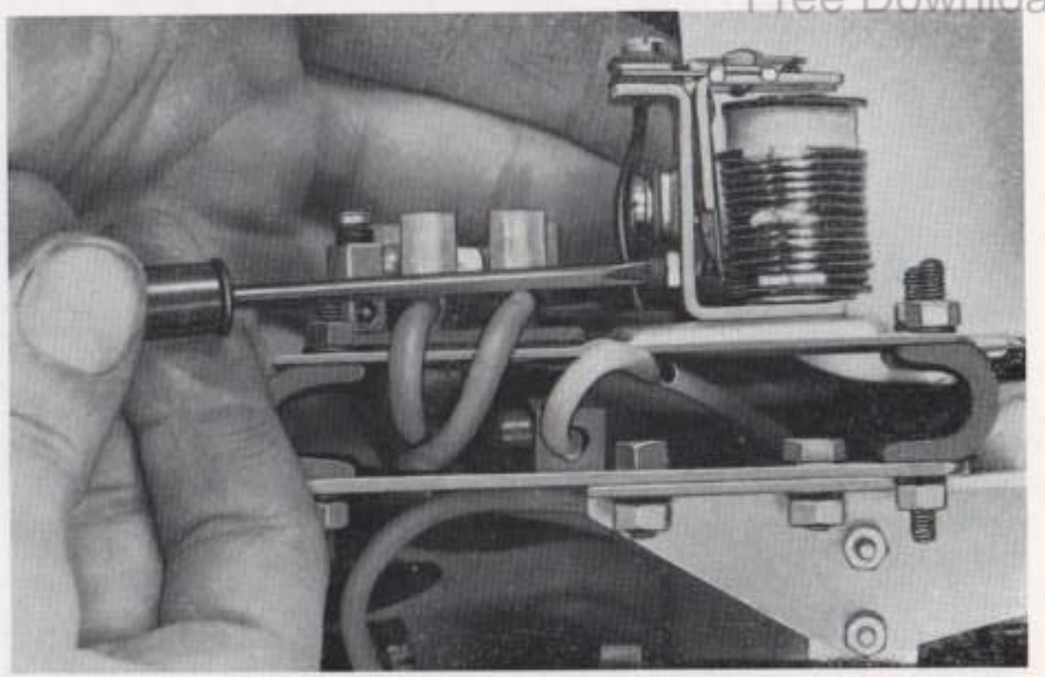
Tests

Assuming that you've been able to make some sense of the foregoing, there are several tests which can be made to get closer to the real cause of the trouble. However, when making measurements of voltage or current do not fall into the trap of believing everything the instruments show, unless they are good ones. When it is necessary to measure the voltage to the regulator an accuracy to at least half a volt is needed, and for this a meter should be borrowed from an electrician or a radio repair shop. The assistance of such a person would also be useful because ammeters for instance, are easily damaged if connected wrongly. Current leakage through the rectifier cannot be detected by an ordinary ammeter, and again a very sensitive instrument is required.

Easiest to measure is the charging rate to the batteries. To do this, disconnect one of the wires to the battery from the battery terminal itself and put in a D.C. ammeter reading up to about 10 amps. When this is in circuit do not operate the self-starter because the first surge of current to the starter will be 50-60 amps., and quite enough to ruin the ammeter instantaneously. Therefore start the engine first, then afterwards put it in top gear with the rear wheel clear off the ground, switch on the head-lamp and accelerate the engine. As the speedo needle climbs, the ammeter should move from discharge to zero at 25 m.p.h. and to 1 amp. charge at 30 m.p.h. If it is less, suspect the generator, rectifier or batteries. If there is no proper reading try changing over the ammeter connections. Make sure though, that the regulator contacts do not close during testing.

Change the wires round on the ammeter terminals and measure the discharge when the ignition is switched on and the engine stationary. If the contact breaker points happen to be closed the reading will be about 3 amps. Turn the engine slowly by rotating the back wheel in gear and the current will suddenly drop to about 0.125 amp. This will prove whether the ignition circuit is O.K. If the current never exceeds 0.125 amp., as the engine is turned, then there is a bad connection ; if it never drops below 3 amps., then the contact breaker points are not opening, or there is a short circuit.

Switch off everything and measure the discharge from the battery with a sensitive ammeter. About .005 amp. should show. This is the discharge through the rectifier. If it is within .002 amp. of this value the rectifier is sound. If it is absolutely zero, then there is a break in the wiring from the rectifier up to the ignition switch and back to the battery. If the current is much higher, then there is either a short circuit or the rectifier has burned out. Please note that, should the batteries be inadvertently connected the reverse way round, i.e., positive to earth instead of the correct negative earth, then this will burn out the rectifier unless the fuse blows first.



Adjusting the screw stop of the regulator contacts spring

The extra 0.125 amp. noticed when the ignition is switched on is used to control the regulator. To test this, start the engine and measure the voltage at which the regulator contacts close with a D.C. voltmeter between earth and the grey wire to a terminal in the fuse box. Do not disconnect the wire for this purpose. Incidentally, it is not obvious how to take the lid off the regulator, but this is held by a small screw set in the bottom of the unit.

If the batteries are fully charged the regulator will close as the voltage reaches 15 when the engine speed is increased. They will not open again until the voltage drops to 12. To test the regulator when the batteries are not fully charged, take out the fuse and connect in a low resistance, such as a bulb similar to the head-lamp, though preferably a 6 volt with both filaments connected at once. The resistance of this will be enough to cause the voltage to rise considerably, and quite a low engine speed will give the necessary 15. If the contacts close at less than 14½ volts or more than 15½, they must be adjusted.

In later types of regulator a small screw adjuster is provided to vary the spring pressure, but if this is not fitted it will be necessary to bend the contact arm very carefully to alter the tension. Even slackening and re-tightening the two screws which hold the arm will cause a re-positioning and consequently a slight difference.

To test the output from the generator is fairly simple. This unit either functions properly or not at all. Disconnect the two blue wires from the terminal block on the engine cowling near the generator, and measure the voltage across the ends of the two wires from inside the generator at the same terminals. The reading, this time with an A.C. voltmeter, should rise to about 30 volts at high engine speeds.

Kick-starter

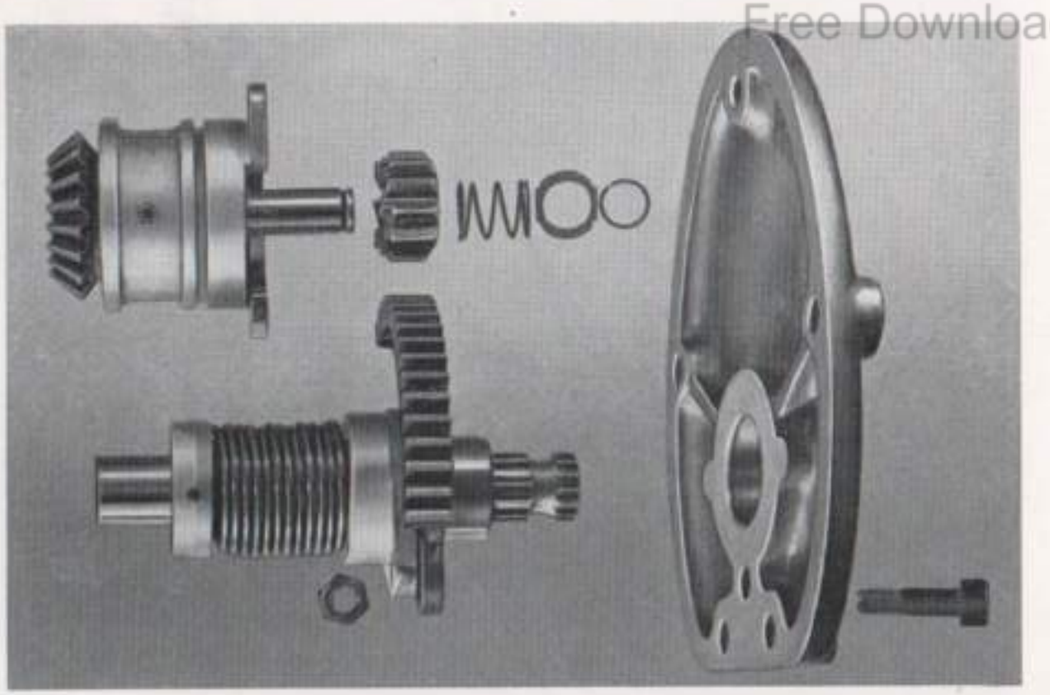
More correctly defined as a pedal starter, this is an arrangement of gears to transmit the force on the pedal to a turning movement of the engine. The best results are obtained by giving a strong pressure of the foot steadily throughout the travel of the pedal from beginning to end of the movement.

Basically, the shaft which is rotated by the pedal is spring returned and carries on it a large diameter gear or section of a gear which turns a small pinion meshed with it but supported on another shaft inside the mechanism. This small pinion is connected with a bevel gear which drives the engine through the bevel gears on the clutch and crankshaft. A ratchet between the pinion and bevel gear allows the engine to over-run the kickstarter after it has begun to fire.

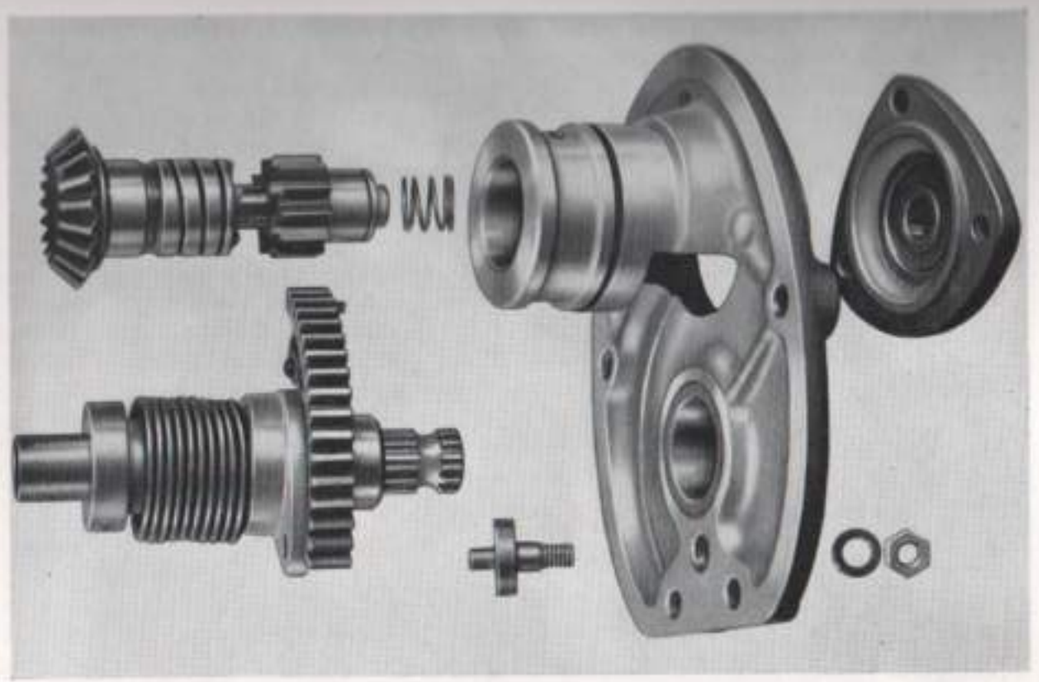
Four different types of kickstarter are likely to be encountered ; the first used up until Engine 117171, is interchangeable with, and almost identical to, that fitted to the previous 125 LD model. From 117171 to 184351 the mechanism remained unchanged in principle but differed from the first type inasmuch as the cover plate incorporated an outrigger bearing for the bevel shaft supporting the pinion, and a ratchet disengagement device prevented the edges of the first teeth of the quadrant from being overloaded.

Engine 184351 to 214637 had the best type of mechanism, consisting of the same cover plate as previously fitted, but with a quadrant and pinion having much larger teeth than formerly and with only three ratchet teeth on the face of the pinion instead of six. This modification can be applied quite cheaply to all earlier LD's and D's.

After 214637 to the end of production a larger kick-starter was fitted,



Kickstarter mechanism used up to Engine 117171



First modification. Flange, spring and circlip of pinion omitted

utilising a step-up gear ratio by means of epicyclic gears and needing a different crankcase. These are Mark II and III machines.

Mark I machines have the kick-starter group supported by five 6 mm. diameter bolts or studs. One of the bottom pair which have nuts and washers retaining them, is of slightly enlarged diameter and must be fitted in the right-hand hole. Originally it was double-ended, and a second nut on the outside held a cable clip, but if the aluminium pedal, discontinued after Engine 138399, is replaced by a steel one, this extension of the bolt will foul the pedal and therefore must be cut off. The cable clip is then placed beneath the bolt head.

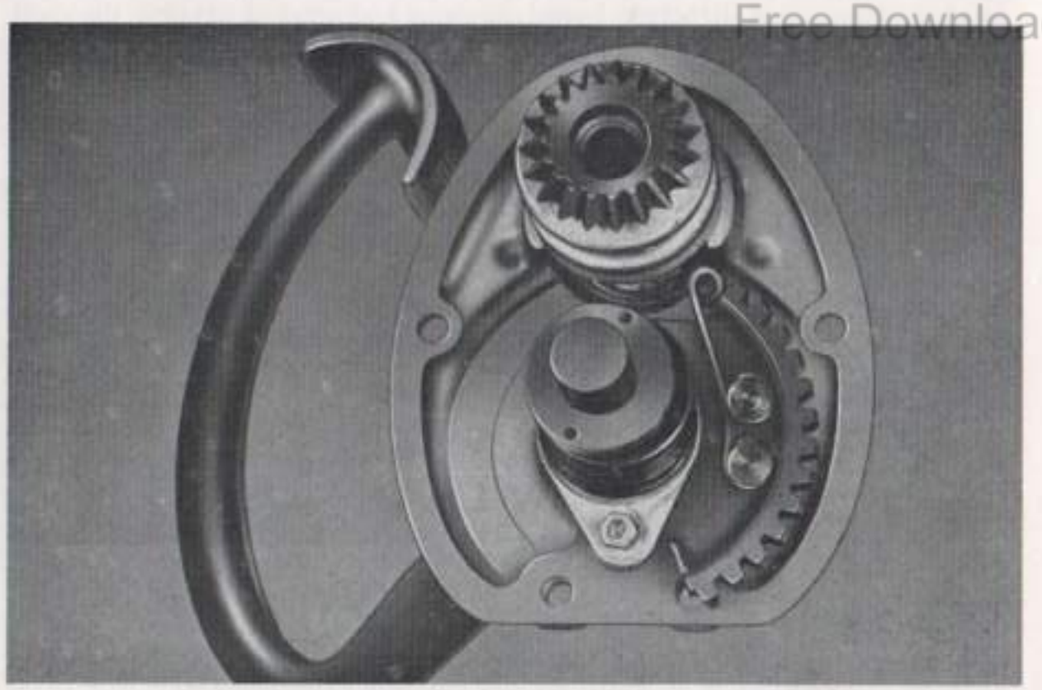
The top bolt on the assembly also retains the outrigger support bearing cover on the later machines and this cover distinguishes the modification. Since it protrudes outside the main kick-starter cover it is necessary to form a bulge in the side panel to avoid it and also to cut away the pillion footboard slightly. After the five cover screws or nuts have been undone, the unit can be removed by tapping the back of the kick-starter pedal with a mallet. On machines after Engine 117171 the whole group will be withdrawn in this manner, but with earlier models, the bevel gear and pinion group will be left in the crankcase where it is supported by two 8 mm. screws. The bevel gear is present on all LD Lambrettas and it meshes permanently with the bevel gear on the clutch which is also in constant mesh with the bevel gear on the driving end of the crankshaft. The three are set at right angles and the kickstarter bevel has a corresponding number of teeth to the crankshaft bevel and faces this. 19 teeth are standard but sidecar machines have only 17. These teeth may be of ordinary straight form or they might have a slight curve denoting the helical form. When ordering it is important to obtain the right type of bevel gear, helical or straight, for the particular machine.

If the kick-starter bevel gear is set too tightly in mesh with the clutch

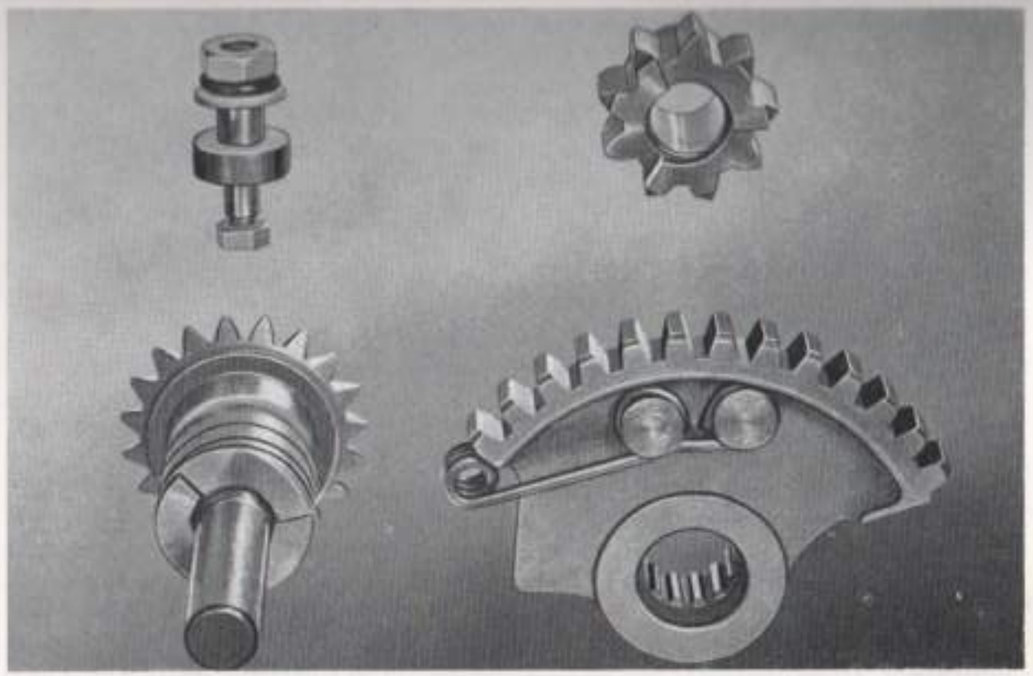
bevel there will be a pronounced whine when the engine is running in neutral. Backlash between these gears must be provided by fitting paper gaskets between the bevel housing and the crankcase on machines where this is a separate part, or between the kick-starter cover and the crankcase where the group is in one complete assembly. Clearance between the teeth can be felt if the gear is rocked with one finger inserted through the hole of the gearbox oil filler plug.

This whine between the gears can also be caused if the outrigger bearing on the spindle extension of the bevel gear is tight. Normally it should be a sliding fit on this spindle and when the small triangular cover of the bearing is removed from the top of the main kickstarter cover, it should come away easily. Any tightness should be eliminated by starting the engine with the bearing removed and applying emery cloth to the rotating spindle.

Modifying groups, consisting of the three kick-starter gears, are supplied complete with a shouldered stud to fit the hole immediately beneath the kickstarter pedal shaft. This stud is of 7 mm. diameter and thus too large for the 6 mm. hole in the cover plate of earlier models; however, it can usually be entered into a worn hole by judicious use of a rat-tail file. The 10 mm. nut with its washer can just be fitted in the recess of the hole on the outside of the cover and tightened by screwing in the stud with a spanner applied to two flats on the stud shoulder. Note that although this was originally referred to as a quadrant stop stud it must on no account be allowed to perform this function. When the kick-starter group is withdrawn from the crankcase, the quadrant rests against the stud, but when it is assembled, the aluminium casting of the crankcase around the bottom left-hand bolt hole should act as the quadrant stop. In order to ensure this it may be necessary to grind away any lobe on the quadrant which may touch the stud shoulder, and also to turn the stud until it presents one of its flat sides to the quadrant edge.



The crankcase acts as the return buffer for the later type of quadrant



The modified group fitted after engine 184351, also shown on the opposite page

If oil leaks from this stud beneath the pedal shaft, particularly with early machines where an allen screw was fitted at this point, improvement will be brought about by carrying out the foregoing modification, but no oil should be present because the kick-starter group is packed in medium grease. Oil can find its way in around the bevel gear if the gearbox is overfilled but sometimes it will also leak through the joint between the bevel housing and the crankcase aperture. This housing is surrounded by a rubber ring in a groove and the ring may need to be renewed or its pressure implemented by placing an ordinary elastic band in the groove first. Also the edge of the crankcase aperture should be bevelled with a scraper or file in order to prevent the rubber ring from becoming torn during assembly.

If trouble is experienced with the kick-starter slipping or jamming, the quadrant pinion and ratchet teeth should be examined. Prior to Engine 117171 a fault which can cause slipping of the kick-starter is dislocation of the small wire circlip on either end of the spindle passing through the kick-starter bevel gear. This circlip contains a small washer and spring serving to engage the pinion ratchet; if it is too large, so that its ends butt together when it is in place on the spindle, then it must be removed and shortened by about 1/16 inch with a pair of wire cutters.

Generally with an early model, it can be assumed that all shafts and bearings will be worn and if the quadrant and pinion are jamming, a satisfactory repair can only be brought about by fitting a modification. To change a machine with an engine number prior to 117171 to the type of mechanism fitted after Engine 184351 it will be necessary to change both the cover plate and bevel housing and also the quadrant, pinion and bevel; the part number for ordering the modifying group is 12004007. This is only obtainable with the helical tooth bevel gear, although the straight tooth bevel gear can be

purchased separately. The modification is applicable to 125 LD machines after slight adjustment.

To modify a machine between engine 117171 and 184351 it is only necessary to fit a new quadrant, pinion and bevel gear. Part number 11004006 or 12004006 applies to the group necessary according to whether the bevel is straight or helical respectively. Machines after 184351 need no modification.

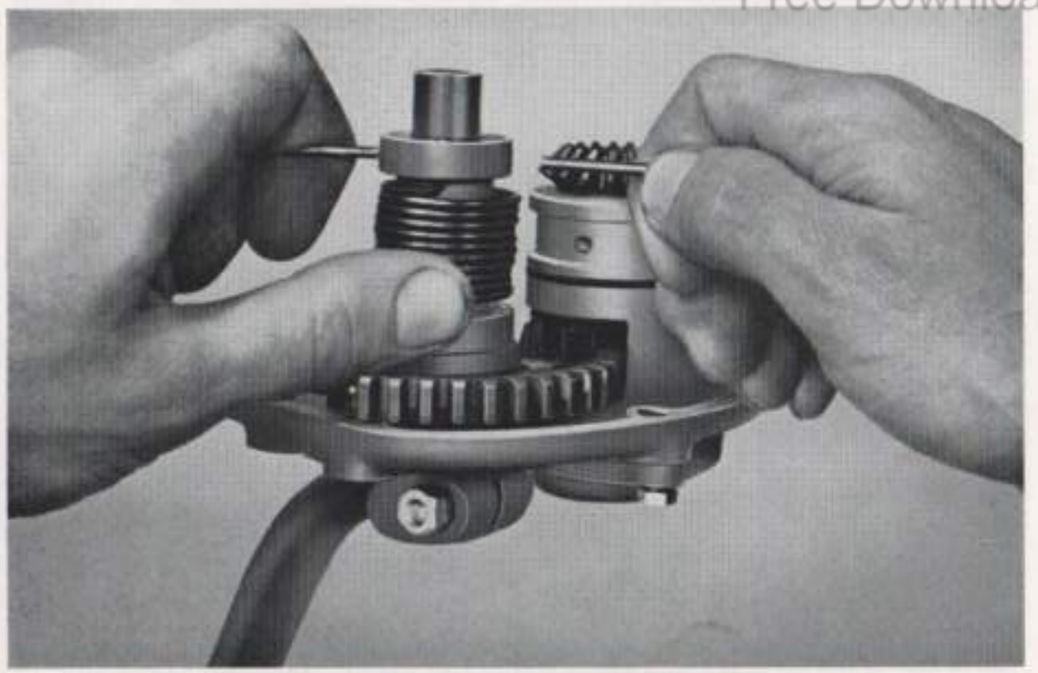
Kick-starter pedals are all interchangeable up to Engine 214637.

Dismantling and Re-assembly

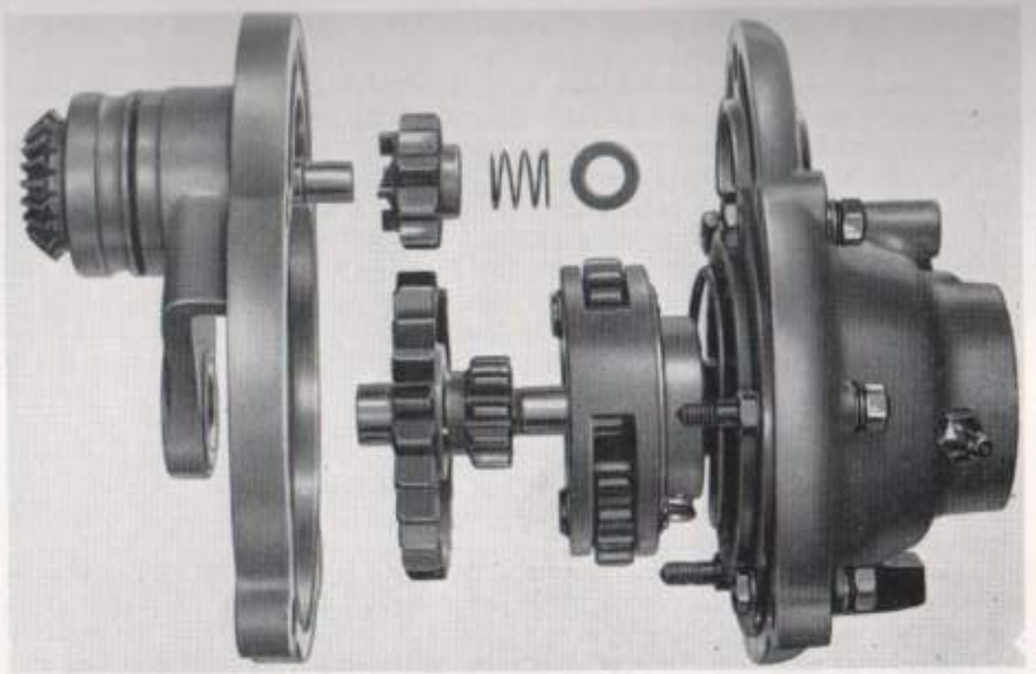
The bevel gear is held in its housing simply by a circlip and washer; however, to change the quadrant or kick-starter pedal shaft necessitates reloading the pedal return spring, and this operation requires some explanation. Whether the shouldered type of stud is already fitted to the coverplate beneath the kick-starter pedal shaft, or if this modification is to be applied, remove the kick-starter group in the manner formerly described. Then detach the pedal from its shatt after removing the 10 mm. pinchbolt; unscrew the nut on the back of the stud, and tap the shaft, quadrant and spring assembly away from the cover plate. On later models, keep the fingers away from the aluminium boss which holds the end of the spring nearest the quadrant because this will spin round as the spring unwinds.

Hold the shaft assembly in a vice by gripping the sides of the quadrant so that the shaft is on top of the vice at right angles to the jaws. Tap the splined end of the shaft with a copper hammer to drive it out of the quadrant, then remove the wire pin from the aluminium boss on the end of the shaft by tapping it through from one side using a punch, or nail of sufficiently small diameter.

Fit the new quadrant on the shaft by driving the splined end of the latter through it. Slide the two together into the cover plate where the shouldered



Holding the spring wound up 1½ turns while refitting the pin



The Mk II and III kick-starter showing the epicyclic step-up ratio gear train

stud has already been fixed. There is a circlip on the shaft next to the quadrant and this should be followed by a plain washer and the aluminium boss with the lug to fit over the stud. If this stud has just been fitted to replace the early type, it will be necessary to saw off the spigot on the end of the lug on the aluminium boss, which was originally surrounded by the steel collar. Do not worry that the hole in the lug of the boss where it fits over the stud is a very loose fit, but add the small retaining nut to prevent it from slipping off.

Replace the pedal on the shaft and support the group by holding the former in a vice, then place the spring and second aluminium boss in position on the shaft. Enter a suitable rod or nail into one of the pin holes of the boss and rotate it one and a half revolutions anti-clockwise facing the end of the shaft furthest from the pedal in order to load the spring. With a little effort it will be possible to push the retaining pin back into place in the boss and secure it to the shaft, keeping as near as possible to the one and a-half turns of the spring.

Note that when presenting the group to the crankcase, it will be necessary to depress the pedal slightly in order to raise the end of the quadrant over the lip of the crankcase.

If the kick-starter pedal does not spring back vigorously after a modified quadrant has been fitted, it may be that the rivets supporting the spring on the quadrant designed to position the pinion for engagement are fouling the crankcase. In this case the rivet heads may be slightly reduced with a file.

Mark II and III Kick-starter

Mark II and III machines have a much heavier and more complicated starter, and the only point of similarity with the Mark I is the fact that the teeth on the bevel gear are identical because they must mesh with the same clutch bevel. Because of this similarity it follows that the thickness of gaskets

between the kick-starter group and the crankcase again control the depth of mesh of the bevel gears.

Dismantling and re-assembling is quite straightforward, the group being removed by undoing three 14 mm. bolts, one at the top and two at the bottom with nuts behind the unit under the crankcase, and also two nuts on studs at either side, fitted by a 12 mm. spanner. The casing is in two parts secured to one another only loosely once removed from the crankcase, by extensions of two of the six bolts holding the gear ring. When the two parts are separated a washer and spring assembled onto the bevel gear spindle will fall out and care is necessary to fit these back in position on re-assembly.

If the 14 mm. pinchbolt holding the pedal is slackened and the circlip on the shaft end removed, the pedal can be withdrawn. As this is done it will be seen that the shaft carrying the two planet gears moves a small amount under the action of its return spring until it comes against the aluminium cover where the outrigger bearing is contained ; when re-fitting the pedal be sure to twist the shaft this small amount against the spring in order that the pedal shall return against its rubber buffer and so prevent the shaft assembly from hitting the casing.

With the pedal in place, the quadrant which is in the form of an almost complete circle, must be placed in the hollow shaft between the planet gears in such a position that the gap in the quadrant corresponds with the position of the ratchet pinion at the top. Because of the importance of selecting this position it is not advisable to remove the kick-starter pedal when the group is assembled to the engine. If this is done by mistake it will be difficult to replace the pedal in the right place and the quadrant may rest in the engaged position, resulting in a loud noise from the ratchet and consequent damage when the engine is running.

If removed, the kick-starter return spring should only be loaded a little over three-quarters of a turn with this model.

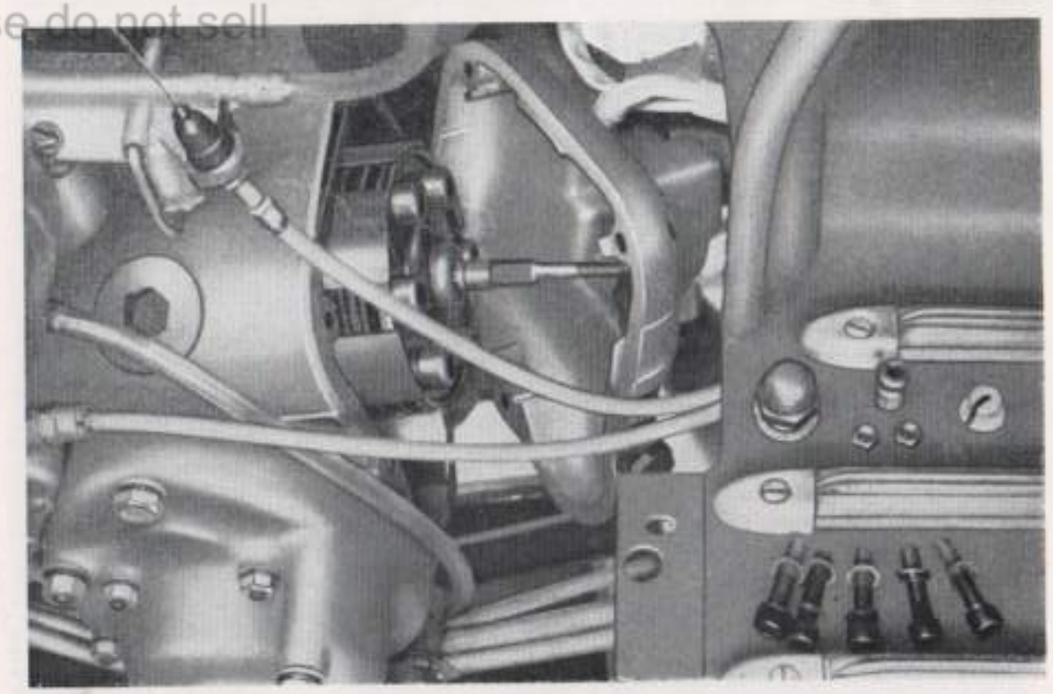
Some Mark II machines will be found to have no grease nipple on the kick-starter casing and these may be assumed to be lubricated by the gearbox oil. Others having the nipple should be packed with medium grease. Tighten the five nuts and bolts securing the unit regularly to prevent loss of lubricant.

Clutch

To allow a smooth take-up between road and engine speeds, the clutch transmits the drive by gripping three plates lined with bonded rubber and cork between steel plates driven by gears connecting them with the engine crankshaft. The lined plates are splined on the shaft to the gearbox and rear drive and the pressure between the plates to transmit the drive is provided by six springs. Lifting the clutch lever pulls the first steel plate away from the others, thus relieving the spring pressure. Therefore the smoothness with which the machine gets under way depends upon the skill of the driver in letting the plates gradually receive the spring pressure and start to grip.

The whole mechanism runs in oil from the gearbox and under normal conditions the parts are very hard wearing. However, all the time that the clutch is held disengaged there is a load imposed by the springs on the cup and cone race which transmits the pull of the withdrawal mechanism to the revolving plates. If the adjustment is too tight so that there is a constant load on this and the full spring pressure is prevented from acting on the plates, then slipping and overheating will occur which can eventually lead to burning of the lined plates and failure of the cup and cone bearing.

The threaded end of the pull-rod which forms the centre of the cup and cone bearing will be seen if the 19 mm. acorn nut in the centre of the clutch cover is removed. Two small nuts fitted by an 8 mm. spanner form the adjustment and are locked together on the end. These and a small spherical ended distance collar behind them are pressed outwards by a yoke straddling the pull rod and pivoting with the clutch operating lever on the side of the clutch cover as the clutch control is operated.

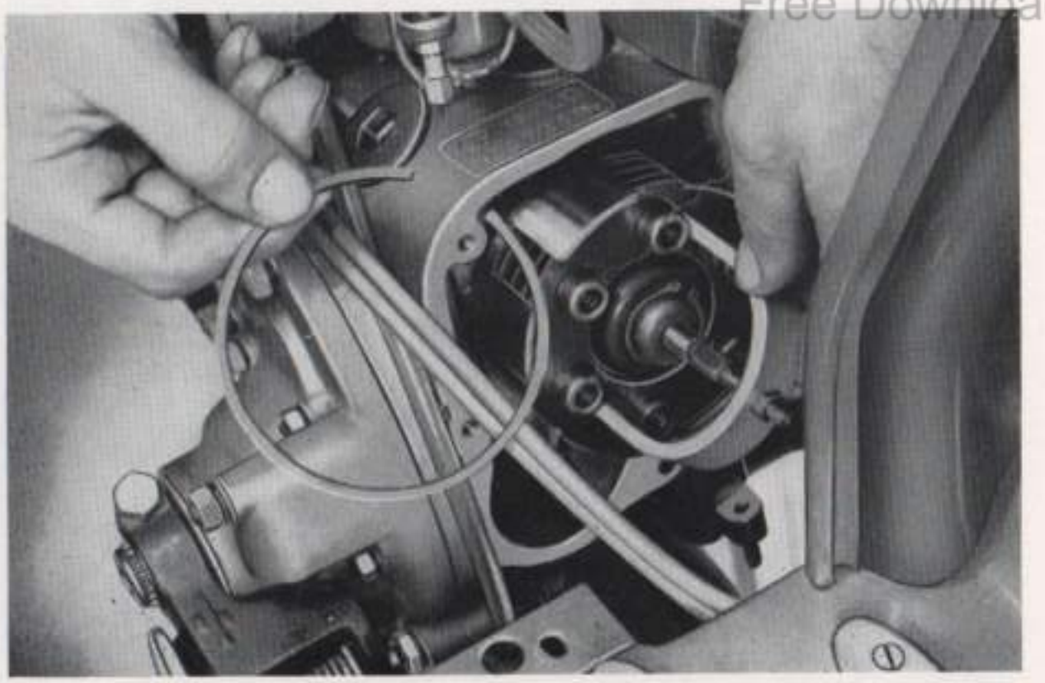


Manoeuvring out the clutch cover

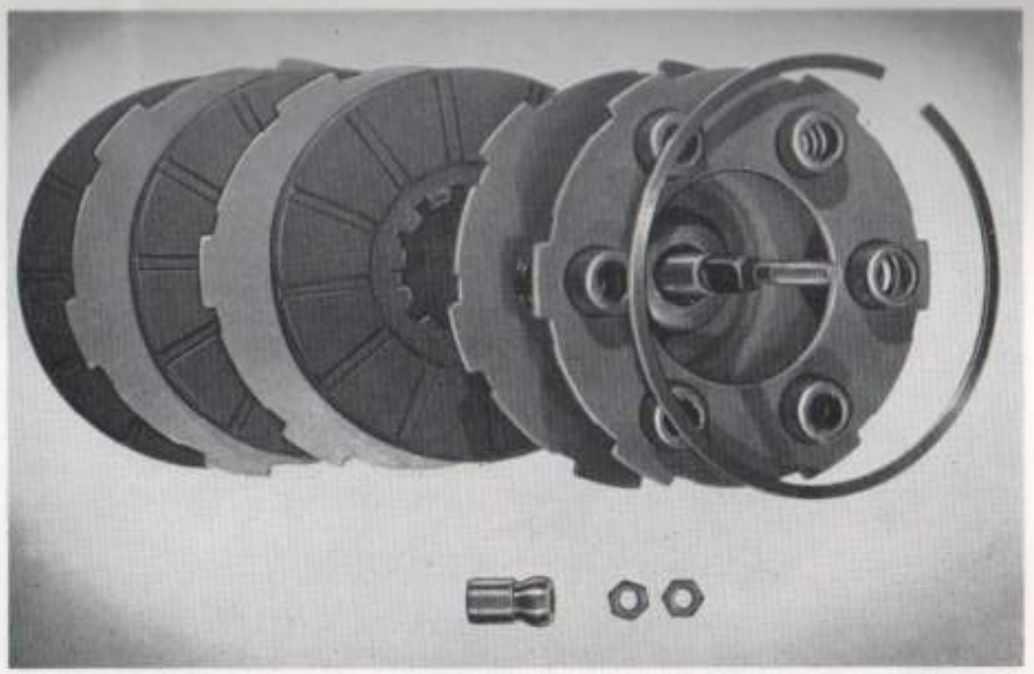
The adjustment should always be set so that free play exists in the cable and also a small amount of end-float in the pull-rod. Generally this can be achieved with the adjuster on the cable at the handlebar but if it has reached the limit of its travel or the two 8 mm. nuts have been slackened, these should be re-set to allow further cable adjustment and when locked together again the pull-rod must still have end-float of approximately .020 inch. Should the withdrawal bearing fail through excessive use, as when the clutch is held disengaged continuously or through the adjustment being too tight, the clutch action will suddenly be lost and the hand-lever will be found to move easily without the normal effort being required to operate it. Check that a broken cable is not the cause and see whether the adjustment can be restored by resetting the two small nuts ; but if they move forward freely with the pull rod as the clutch is operated then the unit must be dismantled.

First, take off the silencer to give access to the five 6 mm. diameter allen screws holding the clutch cover. A 5 mm. key is required for these and it is essential to have this if damage to the screws is to be avoided. Slacken and remove the two small nuts on the pull-rod and place a tin to catch the small amount of oil which will drain out as the cover is taken off. Disconnect the cable and do not lose the distance collar on the pull rod.

The clutch compressor tool number 49753/E is almost indispensable for holding the springs, pressure plate and withdrawal assembly while it is taken down or reassembled. The compressor is very cheap, consisting only of a horseshoe-shaped piece of metal which must be placed with its two ends resting securely on the spring carrier plate and the hole in the centre of the arch fitted over the pull-rod end. Tightening one adjuster nut back on to the pull-rod against the arch causes the springs to be compressed and allows the large circlip holding the clutch plates and springs together to be released. If, of course, the pull-rod has failed it is not possible to use this tool for dismantling



Using the clutch spring compressor 49753/E



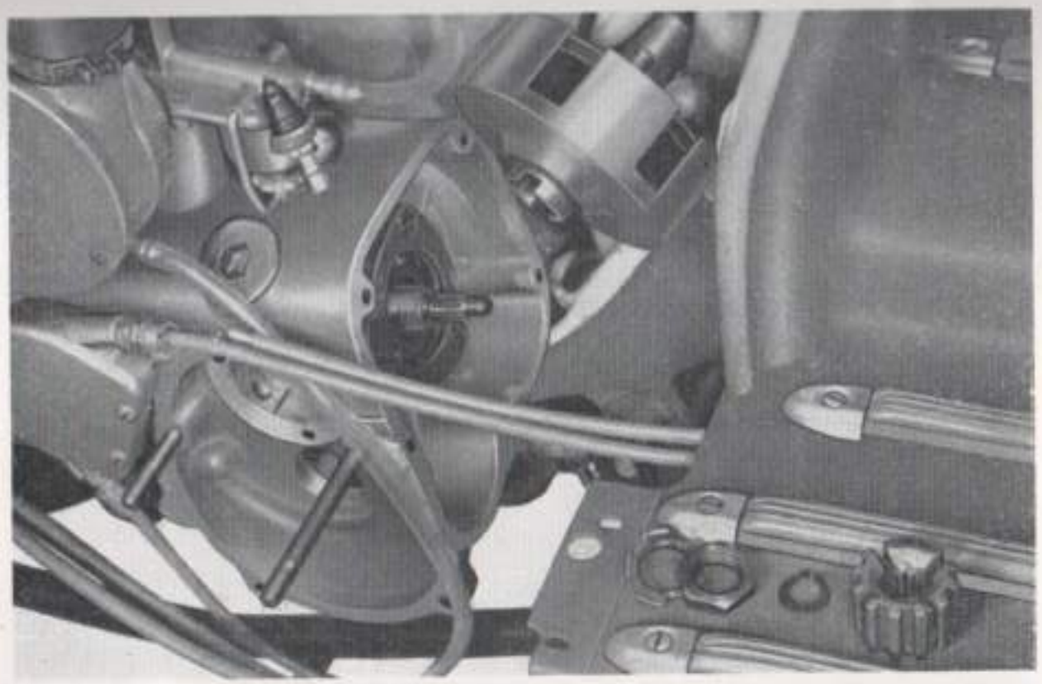
Clutch plates, springs and pull-rod assembly

but the circlip will have to be prised out with a screwdriver. Place a piece of rag around the back of the clutch in this case to prevent any of the ball bearings of the cup and cone bearing from running down into the transmission case and necessitating the stripping of the gearbox to recover them. Note that even after failure of the pull rod it is almost impossible for the balls to escape until the clutch cover is removed and the broken pull-rod drops out.

Machines up to Engine 182850 have a light pull-rod and cup assembly with ten 5/32 inch balls, but it was then changed to a heavier type using six balls in a cage. After Engine 240961 the circlip and washer retaining the balls, which had been eliminated on the heavier assembly, were re-introduced with a thicker spacing washer, part number 12060173, and soon after this the cage was discontinued and the number of balls increased to ten again. When renewing, use only the latest type which is interchangeable as the assembly of cup, pull-rod and balls.

With the introduction of the Mark II and III machines stronger clutch springs, part number 40060105, were fitted and these can be used on earlier machines if slipping of the clutch is suspected, particularly when the machine is used with a sidecar. Note that early 125 machines originally have thicker lined clutch plates and if these are replaced with the later type, as is permissible, the stronger springs should also be fitted. Because of the extra effort needed to disengage the clutch with the stronger springs the length of the operating lever on the side of the clutch cover and the cable bracket was increased to give greater leverage, but it is not essential to carry out this modification when stronger springs are fitted ; if however, it is to be applied, or in a case of replacing the lever with the later type taking the detachable cable nipple, the assembly can be dismantled by removing the split pin from the shaft holding the yoke in the centre of the clutch cover.

When the plates are removed the splined centre of the clutch should



Removing the clutch bell with extractor 39146

spin easily in its bearings in the clutch sleeve when in neutral ; some end float will be normal. To remove the centre it should be locked with tool number 37101 and the nut, which has a left-handed thread and is held by a tab washer, unscrewed with a 14 mm. socket spanner. Early 125's have no tab washer and the thread is right-handed. Lever off the splined centre and remove the thick circlip which acts as a shoulder. Good circlip pliers are needed for this and often it will be bent and have to be replaced. Also be sure to renew the tab washer holding the centre nut because this is rather brittle and two tabs must lie flat in the slots of the splined piece and the remaining two be bent against the nut sides. If this is not done the nut may become unscrewd and jam the clutch.

The clutch bell is held by a nut fitted by a 24 mm. socket spanner and locked also with a tab washer, the bevelled side of the nut is presented to the washer to prevent the latter from being damaged. It has a normal right-handed thread and serves to tighten together the clutch bevel gear and the clutch bell which are tongued and grooved. Tool number 49256 should be entered through the aperture disclosed after removing the kick-starter unit, to hold the clutch centre sleeve whilst undoing the nut. Extract the clutch bell with tool number 39146. The clutch bevel gear can now be taken out if desired after undoing the three screws holding the clutch support bearing locking flange in place, but the engine bevel gear cannot be taken out until the transmission case is removed to allow the gearbox mainshaft to be withdrawn.

Torsion Bar

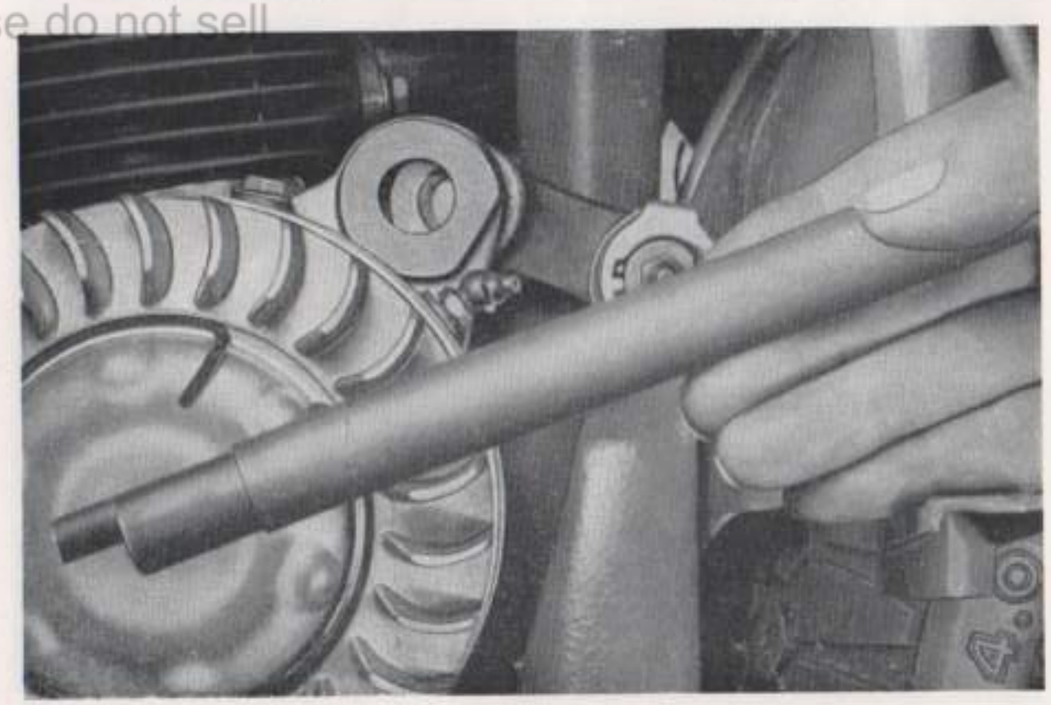
The rear suspension is provided by the swinging of the complete engine unit about a pivot on the frame resisted by a spring steel rod which is twisted by the movement.

Between the crankcase and the frame is a buffer stop and the spring steel rod which is the torsion bar, is preloaded to hold the unit against this when the scooter is on its stand. The bar itself is splined at each end, one fitting into the frame lug where it is held rigid and the other into the boss of a strong lever supported in a large bronze bearing in the frame. The forked end of the lever arm is connected by a link to the crankcase and thus tends to rotate the one end of the torsion bar as the engine unit moves.

The preloading is important and is given by the initial setting of the torsion bar which makes it necessary for considerable force to be used in pulling forward the lever arm and connecting link when assembling the bearing pin in the knuckle joint with the crankcase. If it is to be released, in order to give attention to the gearbox or remove the engine from the frame, the link must be disconnected using part of a special tool which is essential for this and the re-loading operation.

Only very occasionally will a torsion bar break, although the lever arm may seize in its bronze bush if not properly greased and the suspension will then become immovable.

To dismantle, remove the carburettor and fan cowling as described in the chapter on maintenance ; if the cowling clamp ring has to be left in place around the back of the flywheel, release the pinch bolt and rotate the flange until it is possible to get at the torsion bar arm connecting link and unscrew

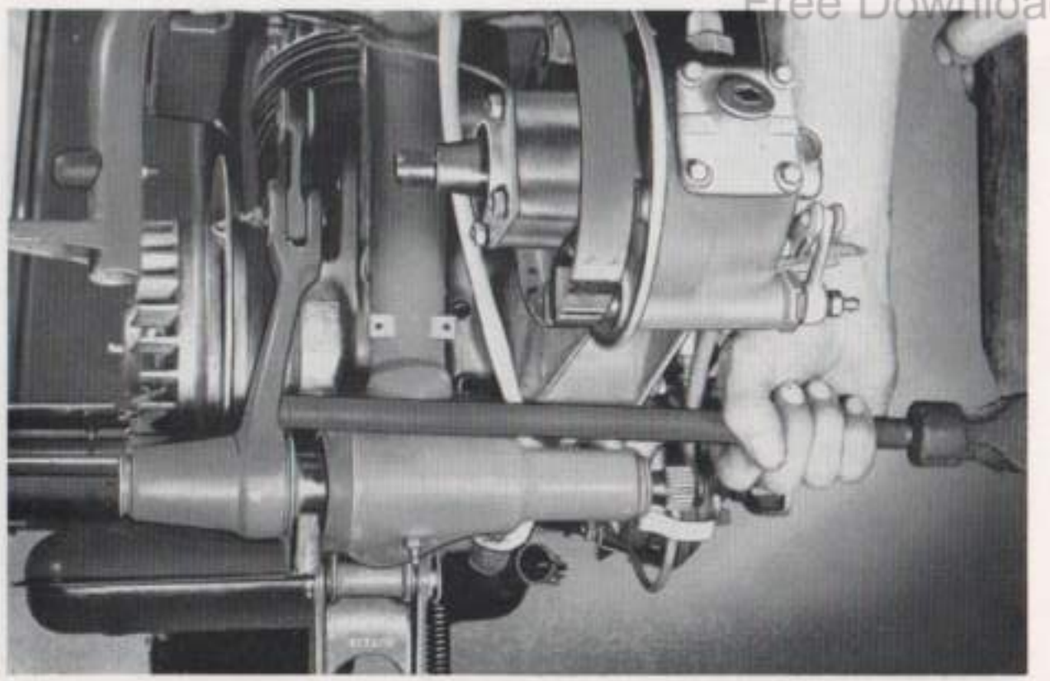


Reload the suspension by entering tool 46604/E into the bush and rotating it 180°

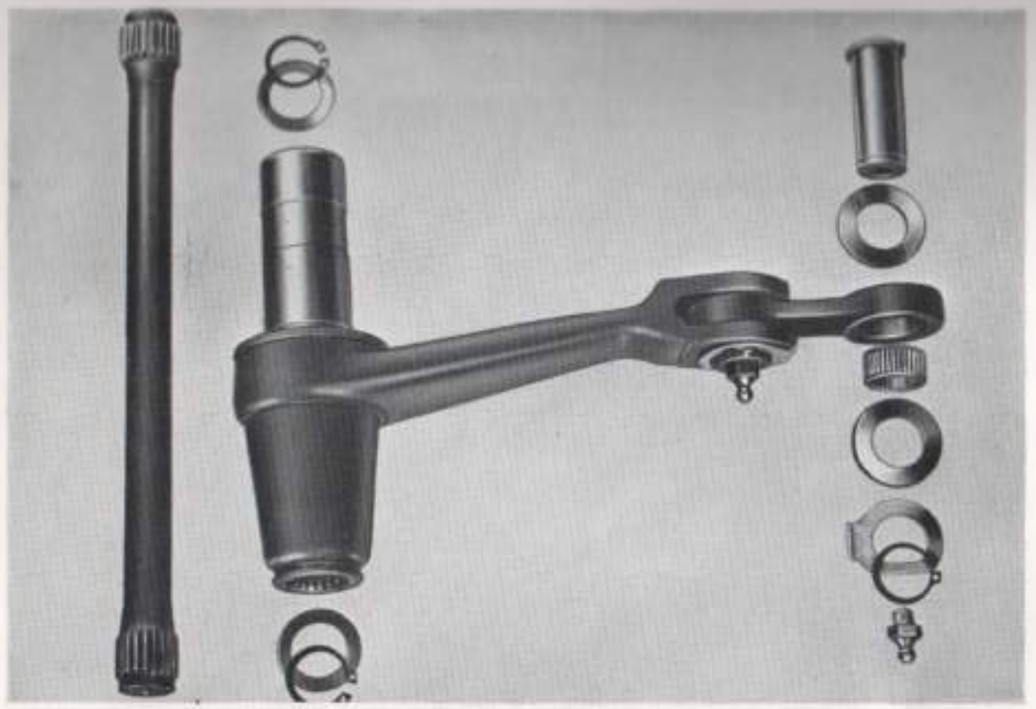
the grease nipple and take off the circlip from the end of the further forward of the two hardened steel bearing pins. Begin to drive out the pin with a hammer and drift, but before it is halfway, follow it with the bush of the loading tool number 46604/E. This bush is only as long as the width of the link together with its two washers and as the bush and pin are driven through, a position will be reached where the link is able to spring back under the influence of the torsion bar, leaving the bush in the eye of the link protecting the fragile caged needle roller bearing. Do not take out the bush but use it in conjunction with the rest of the tool when re-assembling.

The amount the link will move to the free position is only five-sixteenths of an inch and the eccentric end of the T-bar part of the tool can be inserted through one of the crankcase lugs into the part of the hole in the centre of the bush which remains visible through the holes in the lugs after the bearing pin has been removed. Rotation of the T-bar through 180° will reload the torsion bar by pulling the link forward to a position where a little manoeuvring of the tool will align the bush and permit an assistant to tap the pin back into position, displacing the tool and bush. Do not use more force than necessary when driving in the pin because if the bush is not properly aligned there will be a danger of breaking off one of the lugs.

With the link released it will be possible to pivot the engine forward to gain access to the screws holding the transmission case to the crankcase or to take out the engine from the frame after first disconnecting the cables and removing the rear wheel, silencer and petrol tank. When removing the engine, note the positions of the wires as they are taken from the magneto terminal block. Also detach the self-starter motor if applicable and then remove the engine pivot bolt which passes across the frame and is held by a 27 mm. nut locked with a tab washer. Movement of the pivot in the frame is prevented by two split cones which clamp the bolt as the nut is tightened. The suspension



Considerable force is needed to free a torsion bar lever which has seized



The torsion bar, lever arm, link and pin with the caged needle bearing

movement is accommodated by two Silentbloc rubber bushes needing no lubrication.

Two circlips prevent the torsion bar from moving sideways and behind these are plain washers. After they are removed the assembly can be dismantled by driving the torsion bar out of its splines, but do not attempt to force the larger end of the bar on the offside through the smaller splined hole on the nearside.

If the lever arm bush has seized it will not be necessary to remove the engine but it must be pivoted as far forward as possible after disconnecting the link, and a large iron drift, such as an old half shaft from a car back axle, inserted beneath the transmission case from the offside to rest against the base of the arm. Take off the rubber caps from the torsion bar end and also the circlips beneath. The frame lug should be heated to less than dull red heat with oxy-acetylene equipment and at least a seven pound sledge hammer used on the drift to drive out the lever arm.

Do not worry if considerable clearance exists between the lever arm and its bush after they have been cleaned up because it will have no effect on the suspension.

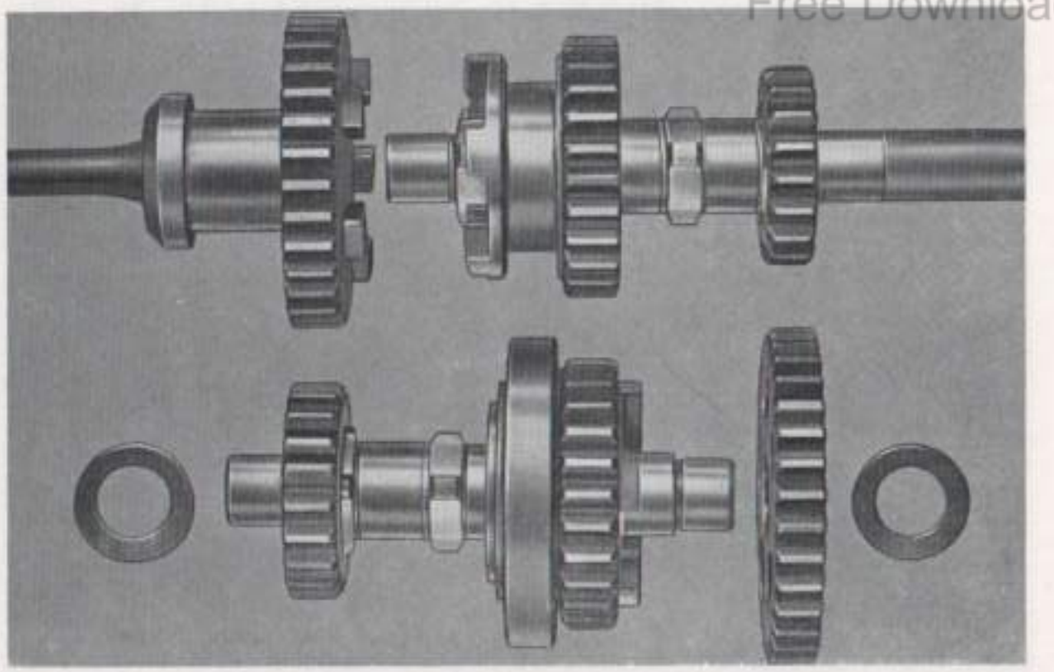
The torsion bar must be re-fitted in the correct position, determined by the need for the five-sixteenths of an inch preload from the free position of the arm and link to the engine crankcase lugs. Twenty-two splines on the off-side end and twenty-one on the other permit very small angular differences to be obtained ; by driving the torsion bar out to either side sufficiently to disengage the splines and rotating it to various positions and entering it again, a setting can be found nearest to the required measurement. If heavy loads are consistently carried a slightly extra amount of preload up to almost half-an-inch may be an advantage.

Gearbox

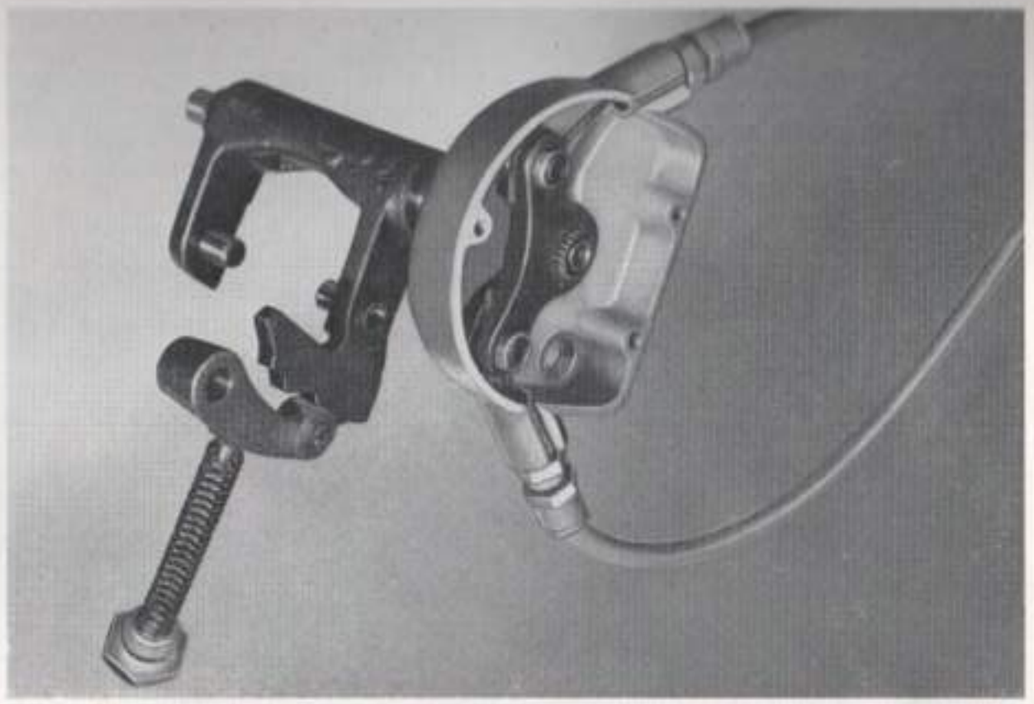
Top gear is arranged so that the mainshaft from the clutch is connected directly to the slim torsion driveshaft inside the transmission case which is splined into the bevel pinion driving the crown wheel on the scooter road wheel. For first gear a step-down ratio is added by a gear on the clutch main shaft which is caused to drive a larger gear on a layshaft. The layshaft has a further small gear fixed to turn with it and this drives another large gear in line with the original driving gear on the clutch mainshaft but splined to the torsion driveshaft. In this case the clutch mainshaft turns at a higher speed than the torsion driveshaft and is able to do so because its hard steel end runs freely in a bronze bush in the centre of the final driven gear.

An alternative pair of gears having little relative difference in size is used between the clutch mainshaft and the layshaft for second gear, engaging short splines on the shafts in the centre position of the gearbox, to transmit the drive. These gears are coupled and by sliding together on the shafts from one end of the gearbox to the other, each of the three speeds is selected in turn. They cause first gear to turn with the layshaft by the lower one of the pair splined on the layshaft engaging face dogs on the large first gear while the upper of the pair turns freely on the mainshaft. When at the rear end of the gearbox the lower gear of the pair runs free of the layshaft splines while the upper one, turning with the mainshaft, engages face dogs on the final driven gear and gives direct drive.

Provided that the sliding gear pair are correctly positioned it is unlikely that trouble can be experienced with second gear, but first and top depend on the good condition of the face dogs as well as the full movement of the selector and gear pair to each end of the gearbox. Any slipping from gear is noticeable



The gears in their relative positions. The drive is from right to left



The selector arm and gate operated by the gear change cables

as a jolting from the drive under heavy loads and is accompanied by sudden, short rises in engine speed. In first or top gear it may be suspected that the cause will lie with the gear cable ends if newly fitted, fouling the projection inside the selector box on the side of the engine casing. If the trouble occurs in all gears it may be that the plug beneath the gearbox adjacent to the drain plug and fitted by a 19 mm. spanner has been removed and the spring it contains lost or wrongly positioned so that it moved into the gearbox. Without the spring the gear change will tend to fall easily through the gears without the engagement of each being noticeable to the hand. Note that if accidentally removed the spring can be replaced in the right place by sliding it up in the hole with the upper end resting against the side of the hole towards the rear of the scooter ; in this way it will engage the projection on a small pawl and must be pressed up against it whilst the plug is replaced.

The sliding gear pair are positioned by the selector gate carrying two pegs projecting into a groove around the upper sliding gear. The gate is hinged from the top of the case on a splined shaft which protrudes through into the selector box and carries the arm connected to the cable ends. The bottom of the gate moves in an arc and has a curved edge with vee notches cut in it to correspond with each gear and neutral ; engaging these notches is the pawl loaded by the spring contained by the 19 mm. plug previously mentioned.

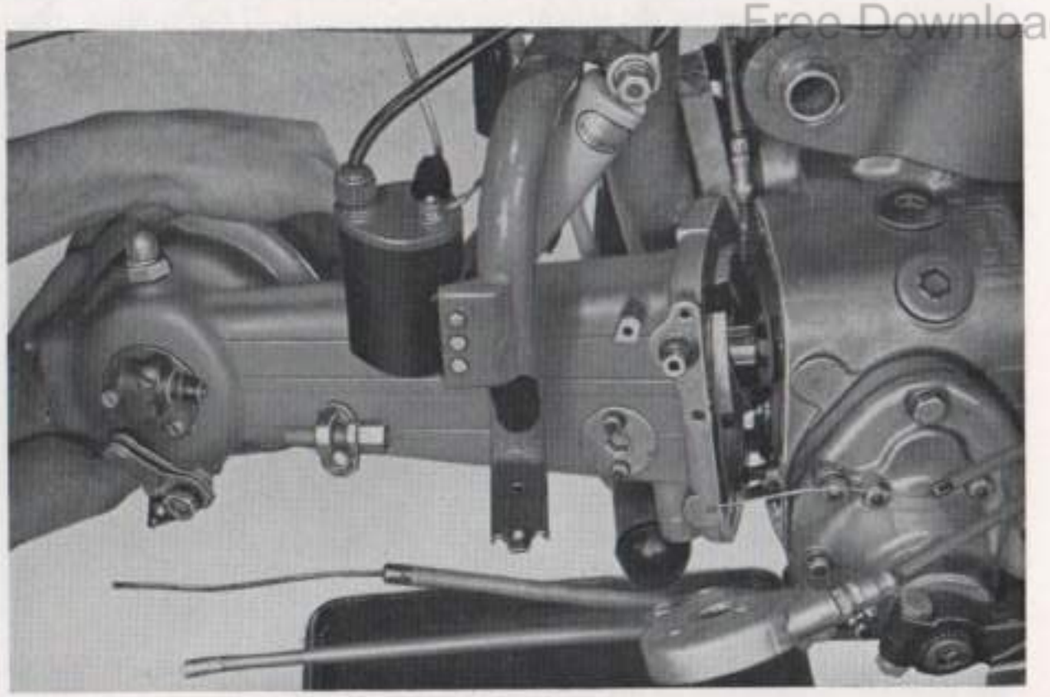
As the position of the pawl engaging any particular notch in the selector gate determines the position of the sliding gears, movement of the pawl will vary the setting. Below the selector box on the side of the engine casing is a circular adjuster, locked by two 8 mm. nuts on studs and having a 10 mm. hexagonal hole in the centre fitted by the oil plug tool. This adjuster carries the pawl on an eccentric so that partial rotation by means of the oil plug tool will move the pawl forwards and rearwards giving greater or less depth of

mesh to the dogs of first or top gear. Also, as neutral depends on the sliding gears having a position where they neither engage the shaft splines nor the face dogs of first gear, the pawl must be set within limits which keep the gears free of the splines and the dogs when fitting into the notch corresponding with neutral. Incorrect adjustment will be noticeable as a " clicking " sound if the machine is pushed along in neutral without the engine going ; it should not be confused with the similar noise caused by loose wheel rim nuts.

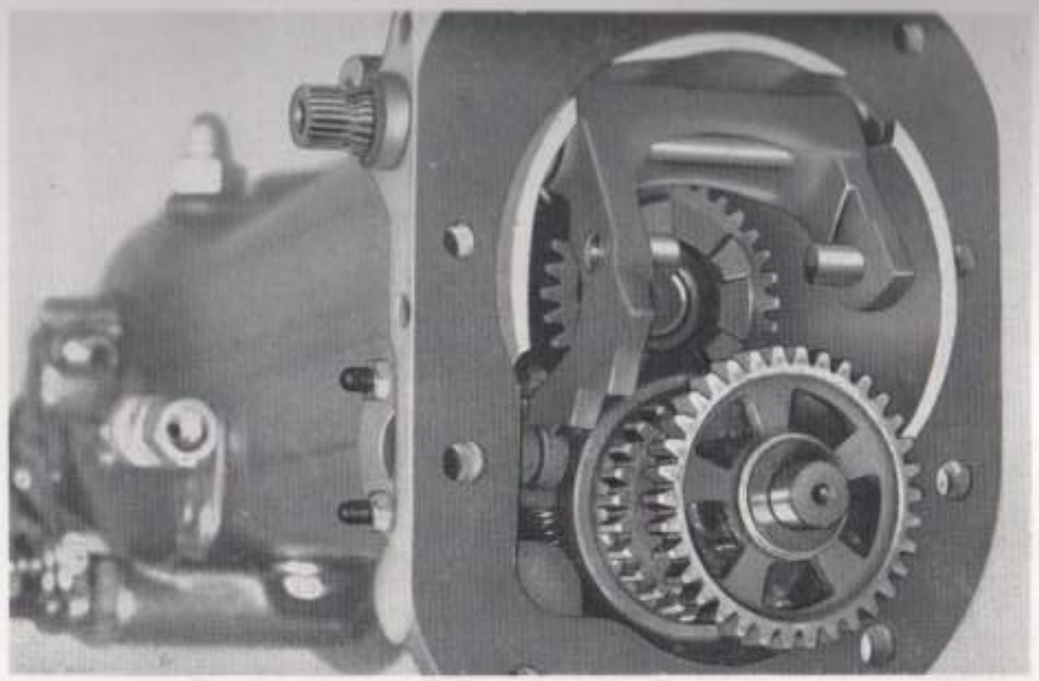
If slipping from first or top gear occurs it may be prevented, if it has not continued to the point where the dogs on the gears have become worn, by adjusting the pawl to give further depth of mesh to the gear concerned. Remove the selector box cover by undoing its three screws and engage second gear, make sure the gear cables are fairly slack and then move the pawl adjustment first one way then the other ; a very slight movement of the selector lever will be noticed and when the adjustment is set so that this movement is the maximum amount clockwise then maximum depth of mesh for top gear is obtained. Movement of the selector lever towards anti-clockwise will give greater depth of engagement for first gear.

If slipping continues the gearbox must be dismantled and gears with serious wear on the face dogs replaced. Mark I machines have gears with three dogs but from Engine 190630 the upper sliding gear and final driven gear were changed to have five dogs and this modification was introduced for the lower pair from Engine 199781, the object being to make gear changing easier. Only five dog gears are available, so that when fitting replacements to early machines the pair together must be changed.

To obtain access to the gearbox it is necessary to remove the transmission case from the crankcase and in order to do this the torsion bar must be released to enable the engine to be pivoted as far forward as possible, even removing the front rubber buffer from its socket in the frame, to allow the case to be



The transmission case can be removed with the engine in the frame



The gears assembled in the transmission case

taken off. Consequently it is probably more convenient to remove the engine from the frame if this attention is necessary.

Proceed to disconnect the torsion bar link as described in the chapter on that unit and remove the rear wheel and mudguard. Take out the lower 14 mm. bolt holding the shock absorber, take off the off-side pillion footboard and the selector box cover and engage first gear. In this position the three countersunk screws holding the selector box can be undone and if the circlip is removed from the end of the selector shaft the whole box can be levered off with a screwdriver without disconnecting the cables. Note that the three countersunk screws will be exceptionally tight but may be loosened with a direct blow from a hammer and drift. Also note that there is only one correct position for the selector lever on the splines and incorrect fitting will cause it to come in contact with the selector box at one side of its movement and prevent proper gear engagement.

Uncouple the speedometer cable and rear brake cable clamp using a 17 mm. spanner for the latter. If the engine is to remain in the frame, prop it in the forward position with a wedge between the back of the crankcase and the frame and remove the 19 mm. plug and spring, placing a tin to collect the oil. Take out the seven 6 mm. diameter screws, fitted by a 5 mm. allen key except for one which has an earthing lead joined to it and requires a 12 mm. spanner, and also the four 8 mm. diameter screws needing a 6 mm. allen key.

In the centre at the bottom is a ground bolt fitting into a reamered hole to align the two casings ; take off the 8 mm. nut from this and tap the bolt forwards until it is clear of the transmission case. This can then be pulled away from the engine and the gears will fall out. Two plain washers will be found and these fit one at each end of the layshaft.

The clutch mainshaft can only be withdrawn after dismantling the clutch assembly and although it is unlikely to have to replace this part it will have

to be taken out if the crankshaft bevel gear is to be removed. There is a large plain washer between the gear on this shaft and the bearing behind it.

The final driven gear in the transmission case can be pulled out if the selector gate is removed. This is held by a horseshoe shaped circlip on the end further from the selector box, between the selector gate and the inside of the casing ; it can be dislodged with a screwdriver. Withdraw the selector shaft, levering between the selector gate and the casing to cause it to slide along the splines on the shaft as this is pulled out. Note that there are 24 needle rollers around the journal on the final driven gear and when this is re-entered into its steel seating and on to the splines of the torsion drive shaft they will have to be stuck in place with grease.

Some machines, particularly early Mark I's, will not have the notches on the selector gate sufficiently spaced to allow full meshing of both top and first gears. This can be seen quite readily by setting up the gears on their shafts in the transmission case held on end in a vice, and the condition may be remedied by grinding the end notch corresponding with top gear. The roller of the pawl running in the notches is caused to slide to the base of the notch by the pressure of the spring ; if therefore, the base of the notch is ground down on a bench grinder, allowing the sloping side of the notch which is at an angle of approximately 45° to be continued down a little further without actually taking any metal from the slope, then the gate will be pressed a little further along by the spring pressing on the roller and give deeper meshing of top gear. The flat base of the notch can usually be reduced by about .080 inch or just over one-sixteenth, or more if it is found to be necessary. Do not take off too much metal, because then the pegs on the selector gate will be continually pressed against the groove in the sliding gear and caused to wear.

The gear teeth will not give any trouble through wear unless run without oil and unless obvious trouble is present they will not usually be noisy. A scuffed appearance of the tooth face need be no cause for concern. Note that the fixed gear on the layshaft and the final driven gear have different numbers of teeth on the 125 Mark III from the 150's, the latter having 21 teeth on the layshaft gear and 32 teeth on the final driven.

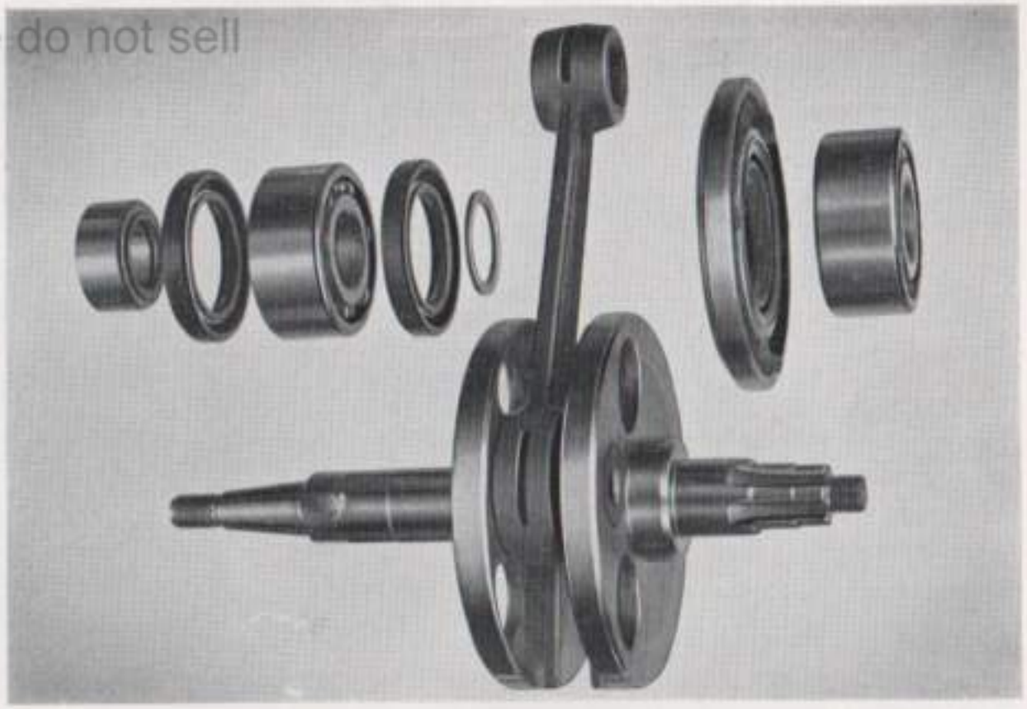
If for any reason the transmission case has to be replaced on machines prior to Engine 143580, only the later type having the raised shock absorber lug can be supplied and therefore the shock absorber lug on the frame will have to be re-welded ⅜-inch higher than previously.

Crankshaft and Bevel Gears

Both these parts have a long life and failures are rare. The exceptions are often caused either by using petrol without the addition of oil, which results in failure and complete seizure of the big-end bearing, or alternatively, the tapered end of the crankshaft where the flywheel fits may be damaged if the flywheel is not replaced properly or the retaining nut not tightened sufficiently. In these cases the entire crankshaft must be replaced because the two main shafts are ground parallel to the big end after original assembly of the unit and if disturbed, satisfactory alignment cannot be restored. In normal use the bearing will not wear out until tremendous mileages have been covered.

The correct side clearance for the connecting rod on the crankpin is approximately .020 inch and it will be found that the rod will rock quite a lot from side to side. This is quite normal as is also a small but perceptible " lift " in the big end up to approximately .003 inch. Do not be deceived into imagining that you can feel more than this because it is most unlikely unless 30,–40,000 miles have been covered and even then it is better to make a measurement with a dial gauge if there is any doubt. Before Engine 127815 a 14 mm. small end was fitted and as only new crankshafts with 16 mm. small ends are available, a new piston of the later type will be needed if the crankshaft is to be changed on an earlier machine.

The main bearings will also usually last extremely well, but if one should wear its track prematurely it will be evident by a screaming noise, rising and falling with engine speed. The noise will be present in neutral, and is similar to that from the kick-starter bevel gear if meshed without sufficient clearance.



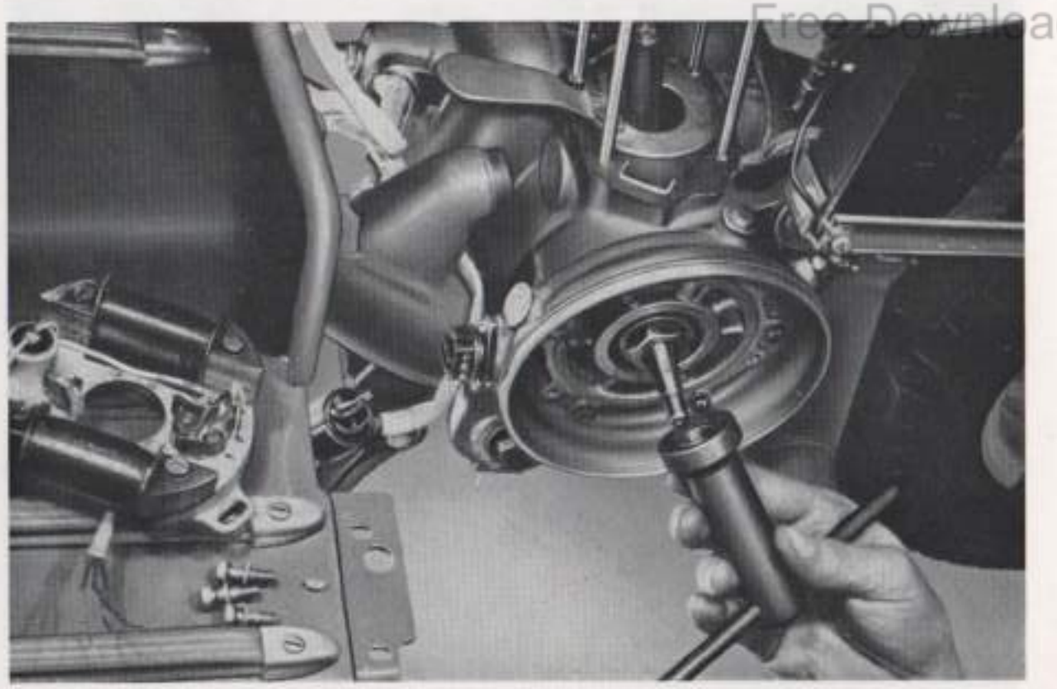
Crankshaft, main bearings and oilseals

Owing to the difference in heat expansion ratios of the crankcase and the crankshaft, the main bearing on the magneto side will creep backwards and forwards in the magneto flange housing, and the outer track may slowly rotate giving a polished appearance to the housing where it fits. This will not cause trouble unless the aluminium becomes considerably worn and allows the bearing to " lift " appreciably.

To replace the crankshaft or the gearbox side oilseal on machines after Engine 167530 which have the oilseal supported in a flange fitting against the crankcase on the gearbox side to retain the main bearing, it is not necessary to dismantle any components other than the magneto and flange, and cylinder and piston ; but for earlier models the kickstarter, clutch, torsion bar and gearbox will also have to be stripped down in order to gain access to the left-hand threaded nut of 17 mm. hexagon which retains the bevel gear on the gearbox side of the crankshaft.

To replace the magneto flange or main bearing on that side, it is only necessary to dismantle the cylinder and piston as for decarbonising and remove the flywheel with the tools referred to in the chapter on the magneto. Then take off the stator plate held by its three screws, marking its position so that it can be fitted back without altering the ignition timing. Hold the crankshaft from rotating either with a piece of wood inserted in the crankcase neck or using the special tool 49221, so that the nut retaining the bearing on the crankshaft can be undone. It is locked with a tab washer and has a 27 mm. hexagon, for which a tube spanner tool 49146 is available having a supporting piece fitting over the tapered shaft end to prevent it slipping from the nut which is rather thin. When using this tool, remove the woodruff key from the shaft but remember to replace it before putting back the stator plate.

Unscrew the six 10 mm. bolts holding the flange to the crankcase and withdraw it, complete with the main bearing. It is not a very tight fit, but the



Removing the magneto side main bearing locking nut with tool 49146

After engine 167530 remove the crankshaft without dismantling the gearbox

operation will be easier with the extractor 49188/2 which fixes to the flange with the three stator plate screws.

A washer with a bevelled hole is placed on the shaft with the bevelled side against the shoulder of the crankshaft. In the housing is the double row ballrace with an oilseal on either side positioned by circlips. Both of the oilseals face with their open ends towards the crankcase, the one on the outside runs on a hardened steel bush with a recess in its face where a rubber ring fits, adjacent to the bearing. Replace the oilseals if they are damaged or if the edges of their inner rims running on the shaft are worn flat.

If the bearing is to be removed, heat the flange in boiling water and using a hammer and drift, tap the bearing out squarely, not allowing it to tilt. Re-pack the unit with high melting point grease on reassembly.

To continue from the point where the flange has been removed and to take out the crankshaft, all that is needed on the later models is to use a slim 8 mm. tube spanner, tool 50400, to remove the three bolts securing the oilseal flange. These can be reached through the large holes in the crankshaft webs provided that the shaft is rotated to the right positions. Afterwards use a large screw-driver inserted through the neck of the crankcase, between the side of it and the crankshaft, to lever it gently out towards the near side. Assist this by rocking the free end of the shaft up and down.

Some wangling of the connecting rod will enable the whole assembly to be withdrawn, bringing with it the oilseal and flange, its rubber sealing ring, the main bearing, the bevel gear, tab washer and retaining nut. Remove the nut, which has a left-hand thread and slide off the other parts, being careful not to lose the shim washers between the bevel gear and main bearing and to put the same ones back.

The oilseal faces with its open end towards the crankshaft shoulder and is held in the flange by peining the lip of the recess. It may either be replaced

complete with a new flange, or pressed out from the flange, the lip filed off with a half-round file, and a new seal pressed in. Preferably renew the rubber ring between the flange and the main bearing every time it is dismantled.

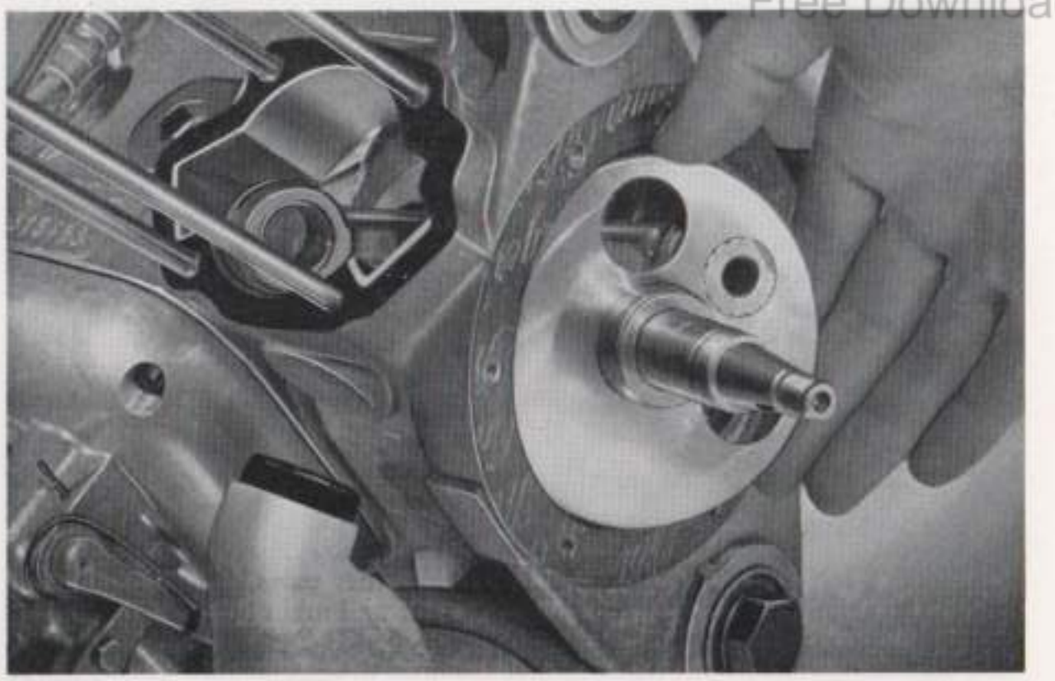
Fit a new tab washer, and after tightening the 17 mm. nut which should face with its bevelled side against the washer, bend over all the tabs. Re-enter the assembly into the crankcase, pressing it right home, and put back the three oilseal flange bolts, tightening them evenly a little at a time.

When refitting the magneto flange, note that a gasket is fitted between the flange and the crankcase and this replaces the rubber ring used prior to Engine 160901. If the extractor tool 49188/2 is positioned on the flange and the centre unscrewed, it will serve to enable the flange to be driven back into place.

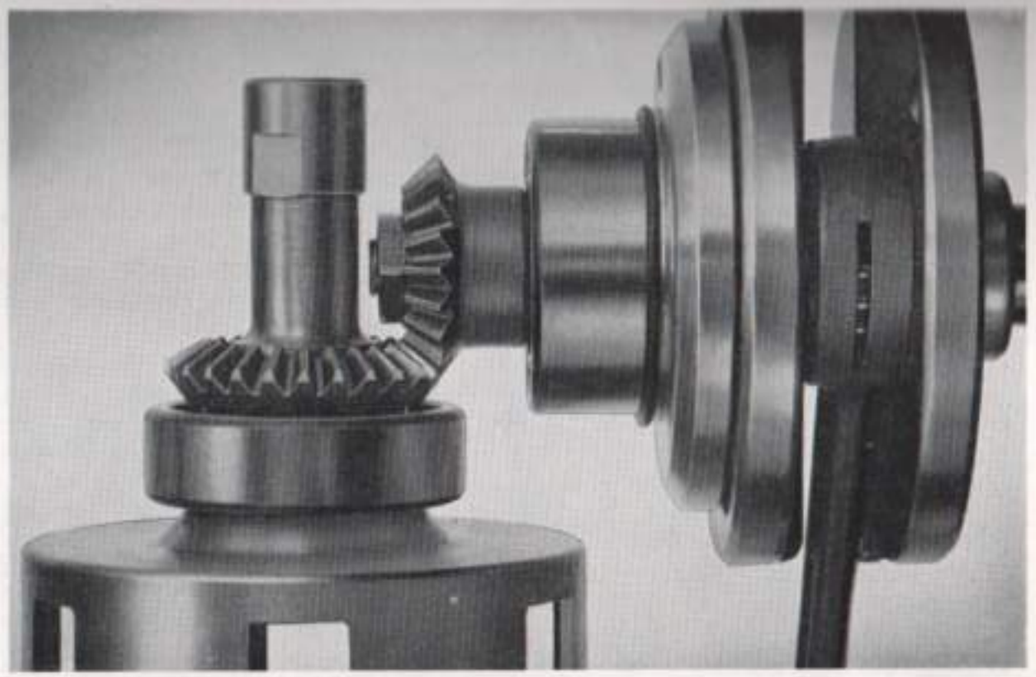
It is possible that the crankshaft may become slightly distorted after tightening the 27 mm. nut and a check should be made with a dial gauge, temporarily re-fitting the flywheel for the purpose. Any eccentricity can usually be cured by slackening and re-tightening the nut, although sometimes the bearing may have to be repositioned with a hammer and drift, if it is a particularly tight fit in the flange. If the nut face has not been machined squarely the same effect will be given and in any case of doubt this should be renewed.

As previously mentioned the crankshafts of machines prior to Engine 167530 cannot be dismantled in this way and with these, as well as on all machines if the bevel gears have to be changed or re-meshed, it is necessary to remove all the other engine components in order to reach the nut retaining the bevel gear on the crankshaft. Consequently it will usually be more convenient to take the engine from the frame to perform the operation.

When the kick-starter, clutch and gearbox have been removed, the main shaft from the clutch to the gearbox can be pulled out rearwards. The



The crankshaft is removed complete



The relative position of the bevels is determined by shims behind each

bevel gear on the clutch with its bearing and sleeve can be levered out towards the front with tool 43170, or tapped out with a drift entered obliquely through the aperture for the kick-starter bevel housing.

If only the bevels are to receive attention, the cylinder and magneto need not be dismantled and therefore if the flywheel is held, the 17 mm. left-hand nut on the crankshaft can be undone with a socket spanner. The bevel is not a tight fit on the crankshaft splines and may be eased off with a screwdriver.

When continuing to withdraw the crankshaft, tap it out towards the nearside once the cylinder and piston, magneto, flange and main bearing on that side have been removed. This is applicable whether or not the oilseal is contained in a flange. On those where it is not it will be found that the oilseal can be levered out and behind it is a circlip positioning the gearbox side main bearing. Shim washers are fitted between the circlip and bearing to prevent side movement.

The depth of mesh of the bevel gears is determined by the thickness of shim washers between them and their respective supporting bearings. These washers are available in a variety of sizes. Not only is the actual clearance between the teeth important but also there is only one correct relative position for the tooth faces. Obviously, removing shim washers from behind either will increase the clearance, but if one has too few shims and the other too many, the teeth will not be exactly opposite one another and will whine when under load. The setting is critical to .005 inch thickness of shim. It is characteristic of wrong setting that the whine will occur either only when the engine is pulling, or only when the scooter is slowing and the engine is turned by the forward motion of the machine, i.e. on the over-run ; but not under both conditions.

Another trouble which can occasionally happen is breakage of the teeth, usually with Mark II and III machines through improper use of the kick-

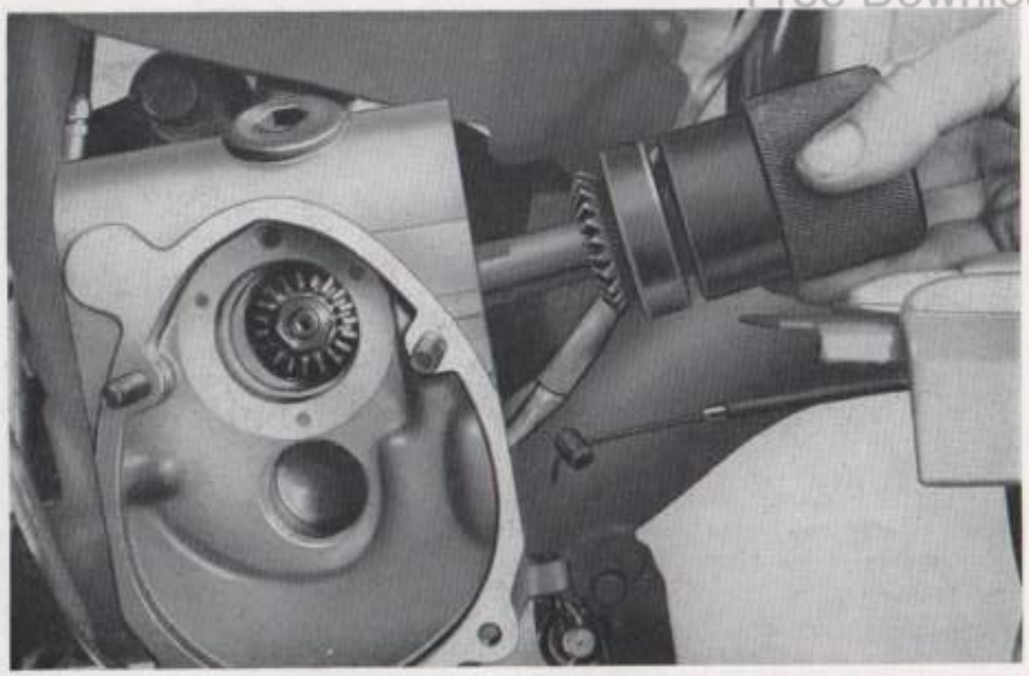
starter. In the early stages of failure when a crack is starting at the base of the tooth, the clatter caused may seem indicative of big-end trouble and several times, mystified mechanics who have not noticed the hairline crack on the tooth, have returned crankshafts for examination. Actually, if a big-end does cause trouble there will be no doubt about it because the engine seizes up solid almost immediately.

If any part affecting the bevel gear setting, such as the crankcase, the supporting bearings, or the gear pair themselves, have been changed, it is essential to check the bevels for smooth running when they are in position.

With the magneto and piston and cylinder assembled, the crankshaft bevel should be put back with any shims in place previously, and the nut tightened without its tab washer. Press the clutch bevel into its bearing with a good thickness of shims in between, and with the centre sleeve, fit on either the clutch bell and secure it with the 24 mm. nut or, preferably, the meshing tool number 44354. Tap this unit into place, leaving off the bearing retaining flange, and when it is approximately positioned, rotate the clutch bell or meshing tool by hand, thus causing the bevel gears to run together, and the crankshaft to turn. Any roughness in the drive will be felt after a little practice and it will be found that the drive is usually more rough when rotated in one direction than the other.

Provided that there is sufficient thickness of shims behind the clutch bevel, tapping the unit slightly in or out will vary the tooth clearance within wide limits, and at different positions the roughness will be found to decrease.

The bevels should feel to be smoothest when there is approximately .002 inch clearance. If the results are better with the clutch bevel withdrawn slightly, giving excessive clearance, it indicates that the engine bevel is too far withdrawn and therefore the thickness of shims behind this must be increased.



Tool 44354 allows quick assembly to test the smooth running of the bevels

When, by trial and error, a setting is found which gives reasonable results at minimum clearance, but without any spots where no clearance at all exists, then the clutch bevel unit can be taken out again and the engine bevel nut finally tightened with a new tab washer behind it. Place the nut with its bevelled face against the washer. Lastly, select shims for the clutch bevel which, with the bearing pressed up against the end of its housing by the retaining flange, will give the clearance found to be best.

Although some skill is necessary, with practice the setting found to be smooth when the gears are rotated by hand can confidently be predicted to give quiet running.

SIDECAR GEAR RATIOS

The standard engine bevel has 19 teeth and the clutch bevel 26. For lowering the gear ratios for use with sidecars an alternative pair having 17 and 25 teeth respectively is available. It is of course necessary to change the kickstarter bevel also for one with 17 teeth.

The part number for the group of three gears is 11110005 for Mark II and III machines and these are fairly simply fitted. However, for Mark I models with the kick-starter bevel gear of smaller journal diameter, a bevel pair of similar number of teeth is available but the diameter of the clutch bevel is greater and the crankcase must be machined out and a flanged supporting bearing fitted in order to accommodate it. For this work the crankcase should be returned to Lambretta Concessionaires and the number of ratchet teeth on the kickstarter bevel specified, so that the right type can be supplied.

Final Drive and Rear Axle

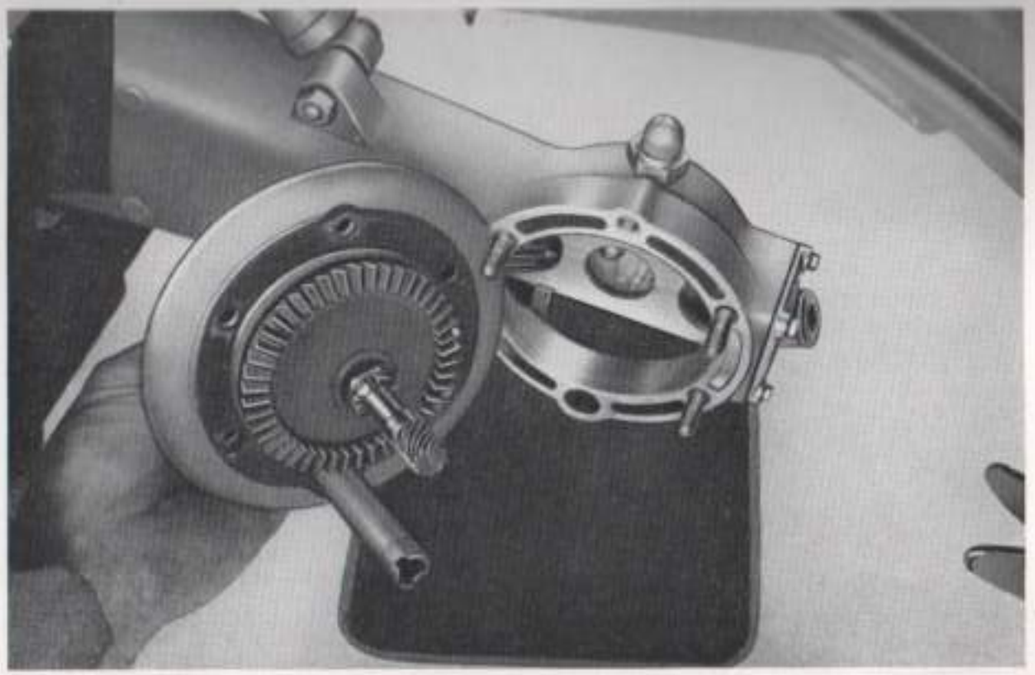
The axle is supported on two non-adjustable journal ball races and carries the road wheel hub on one end and a crown wheel bevel gear on the other. The pinion bevel gear on the end of the torsion driveshaft meshes with this crown wheel and is mounted at right angles to it, also supported on journal bearings. Both gears and the axle assembly run in a thick oil, separated from the gearbox lubricant by an oilseal between the two pinion bearings.

The unit needs no attention other than topping up the oil level as described in the chapter on maintenance. However, it must be appreciated that the good condition of the taper joint between the axle and the wheel hub depends on the proper fitting and tightening of the centre nut fitted by a 27 mm. spanner. If the spanner in the tool kit is used it must be hammered home to give sufficient tightness. Reference to this point is also made in the chapter on brakes and wheels. Note that some models have a small 8 mm. left-hand threaded locking screw in the centre of the large nut, but this is ineffective in keeping it tight and was dropped on later models. Most important for the proper locking is the large spring washer between the nut and the hub.

Machines prior to Engine 261051 can suffer after a considerable mileage from wear of the first ball-race behind the pinion. This was subsequently changed to one having larger balls although identical in diameter. If the trouble is not detected in the early stages it may lead to the expensive consequence of a new crown wheel and pinion and therefore, to be safe, the later type of bearing ought to be fitted to any early machine which has covered 15,–20,000 miles or more.

Mark III 125 machines have a lower gear ratio than other models and the

Crown wheel and pinion assembled with rear axle and bearings



The crown wheel and axle are removed complete with the housing

number of pinion teeth in this case is 12 instead of 13. This runs with a crown wheel having the normal number of 45 teeth but all these gear pairs, which have the part number 08330001, have straight cut teeth instead of the helical cut commonly, but not universally, found on all other LD's. This 45/12 ratio can be applied instead of the 45/13 on a 150 machine to give a suitable reduction for sidecar use, but only use it in conjunction with the later type of pinion bearing. The result is approximately similar to the normal modification of the engine bevel gears for the same purpose. Note that the two gears can only be supplied as a pair.

Since the rear compartment is isolated from the gearbox oil by the oilseal between the pinion bearings, it follows that failure of this part will allow dilution of the thick final drive oil and then possibly the oil will leak out past the oilseal on the road wheel end of the axle and on to the brake. The likelihood of this occurring can be reduced by preventing any pressure from building up in the gearbox by drilling a one-sixteenth inch hole on the top of the extension of the clutch cover where the operating lever arm enters. This hole is present on all Mark II and III machines.

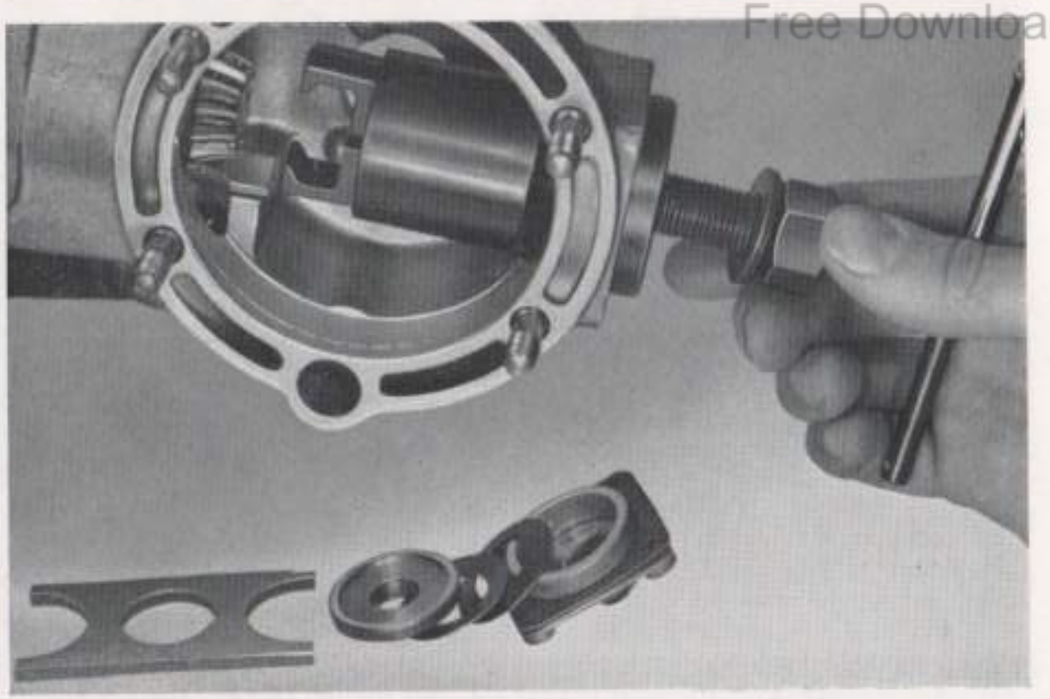
The crown wheel and pinion and also the torsion driveshaft can be dismantled without disturbing the torsion bar suspension or the gearbox. After the wheel and hub have been removed as for attention to the brake, the brake shoes must be taken off and the whole back plate assembly carrying the axle and crown wheel released by unscrewing the four 14 mm. nuts on studs, the brake shoe fulcrum pin, by applying a 12 mm. spanner to the two flats, and the sleeve carrying the brake cam spindle. This latter is held by a nut of 24 mm. hexagon on the further side of the transmission case ; to get at it, take off the circlip from the brake cam spindle end and also the lever and locking washer. Afterwards place a tin to catch the oil and tap the backplate assembly away from the transmission case, allowing the cam spindle sleeve to be drawn

away with it. On re-assembly, enter the sleeve and backplate together into the transmission casing. Do not try to drive out the sleeve separately because the threaded end is easily damaged.

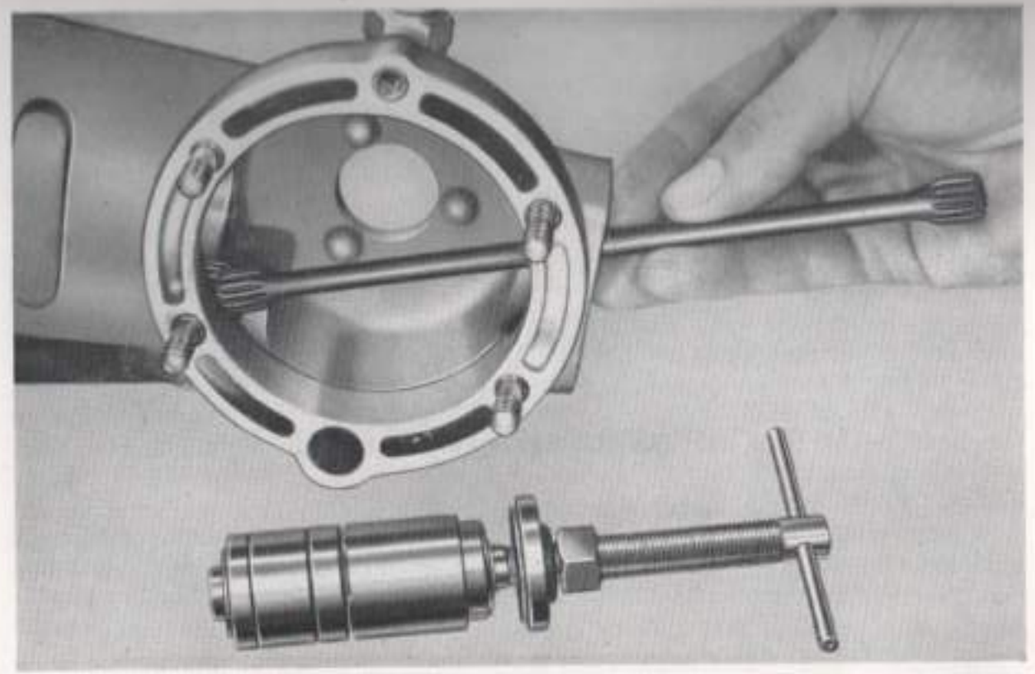
The two axle bearings, a distance piece and the crown wheel are clamped together by a nut on the axle fitted by a 19 mm. spanner and locked with a split pin. It should be very tight and to hold the axle with sufficient purchase when it is to be loosened or tightened the assembly should be fitted back into the wheel hub complete with wheel and tyre, not forgetting the woodruff key in the axle, and the whole unit held. Preferably use a ring spanner of good length on the nut. The axle is a light press fit in its bearings and is splined to the crown wheel. Sideways movement is normally prevented by the bearing nearest the road wheel which is clamped against a shoulder in the housing by the flange supporting the oilseal. If this flange, which is held by four 10 mm. nuts and spring washers is removed, the rubber ring behind it should be renewed. Some free play will be perceptible in the bearings even when new; they are unlikely to require replacement. Note that the oilseal runs on a highly polished portion of the axle, which if gripped in a vice or scored can damage the oilseal.

The pinion with its bearings is held in place by the spring action of two dished washers which are placed so that their inside rims are together and compressed by the plate carrying the oil filler plug on the end of the transmission case. Behind the plate and the dished washers is a steel collar which transmits the spring pressure via an aluminium bridge piece to the pinion group.

Having taken out the axle assembly and removed the speedometer drive box, which is best left off until afterwards so that it will not cause difficulty during re-assembly, the pinion group can be withdrawn using a special extractor number 42589. This has two claws fitting behind the pinion and held



Slide the sleeve of extractor 42589 over the claws to grip the pinion



The torsion driveshaft can be assembled either way round

in place by a sleeve while the drawbar of the tool pulls the group out. Take care to fit this sleeve right over the claws or the tool will be damaged.

If this extractor, which is rather expensive, is not owned, then the pinion group can be punched out from the forward end using tool number 42988 or a drift of at least $\frac{3}{4}$ inch diameter. This of course entails complete dismantling of the gearbox.

Should the torsion driveshaft have broken, it can be replaced after dismantling only the final drive. Any broken end left inside the final driven gear of the gearbox can be retrieved by means of a piece of plastic tubing of $\frac{1}{4}$ inch bore or the size used for petrol pipe on the Li model. This must be fixed securely on the end of a rod and pushed up into the transmission case until it fits over the broken shaft, gripping it so that it can be pulled out. Note that as the two ends of the shaft are identical the replacement can be fitted either way round, unlike the suspension torsion bar.

Two more dished washers, this time with their outer rims together, keep the bearings and distance piece together on the sleeve which is part of the pinion. A circlip on the end retains them and a small plain washer between the dished washers prevents them turning inside out. Note that the oilseal is inside the distance piece and faces with its open end towards the gearbox.

The larger bearing of the later type to replace the one nearest to the pinion teeth is part number 12330208 and when it is fitted the distance piece should be replaced with the shorter one, part number 12330205. The second bearing part number 07330207 remains the same.

When fitting back the pinion group, put the torsion driveshaft in place in the transmission case first. In this way it may be entered into the splines of the final driven gear in the gearbox and registered with the splines in the pinion by turning the latter as the group is punched squarely home, preferably using the tool number 42987.

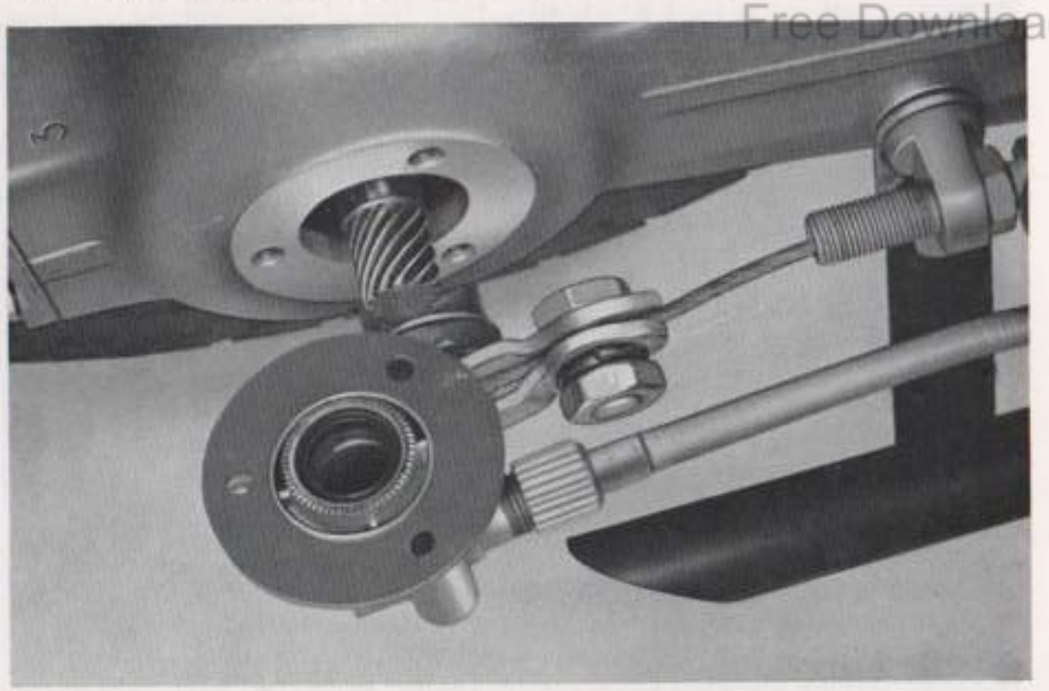
If, on the other hand, the torsion driveshaft is entered into the pinion first, the aluminium end cap pressed in the pinion centre may be dislodged by the shaft. This cap normally prevents the shaft sliding out and also stops oil leaking through.

Depth of mesh of the crown wheel and pinion teeth is determined by the thickness of paper gaskets between the backplate carrying the axle and the transmission case, and the steel washers behind the pinion group up against the shoulder inside the transmission case. If any parts have been changed, the position of the pinion should be checked to see that its teeth are in line with those of the crown wheel when it is in place. This can be seen with difficulty through the hole beneath the transmission case after the inspection plug has been removed. Provided that the teeth do not overlap at one side or the other, they will probably run quietly, but to be sure, the two gears can be rolled together held in the hands before assembly and the best relative position of the teeth where they run smoothly, noted. Adjustment should be made by varying the number and thickness of the steel washers behind the pinion group.

After this has been settled satisfactorily, a clearance of about .005 inch between the teeth must be given by varying the paper gaskets behind the backplate. Make sure that there is clearance in all positions of the crown wheel and remember that .005 inch is quite a lot. If the final drive whines after assembly it is probable that another gasket is necessary.

SPEEDOMETER

Early 150 LD's and all Mark I 125's had Smith's speedometers. The 150's used an Italian Coronetti drive box which is mounted on the transmission case opposite the rear axle. Later machines, and the majority, have an Italian Veglia instrument and a cable and drive box of the same manufacture.



The speedometer drive is mounted on the rear axle

All 150 LD's have a small extension piece pressed on to the end of the axle and secured there with a pin, made from a rolled metal strip, passing through a drilling made crosswise in the axle. It is easily removed with a pin punch. Whereas this extension carries only a slot to match with a spade end in the Coronetti drive box, in the case of the Veglia it has a small gear, meshing with a similar one in the drive box.

Few of the Smith-Coronetti type will be encountered, and of the Veglia there are two variations. Both use the same drive box, but for the Mark I and II machines the cable is shorter and the head of the instrument is circular. The Mark III using the longer cable has a rectangular shaped head.

If the Veglia instrument fails or oil saturates it and its reading becomes erratic it may be returned to Lambretta Concessionaires for a service exchange part costing only a fraction of the new price. However this can only be done if the speedometer returned has not been damaged or tampered with in any way.

Preventable troubles are oil entering the cable from the transmission case and finding its way to the speedometer head, which is cured by fitting a new oilseal to the drivebox, and breakage of the inner cable. This is usually caused by unduly sharp bends in the outer cable, not properly tightening the union nuts at the cable ends, or a bent metal end of the outer cable causing the drive to enter at an angle. Occasionally an intermittent trouble occurs with the instrument and if both cables are replaced and yet further breakage of the inner occurs without apparent reason, a service exchange speedometer head will probably be necessary.

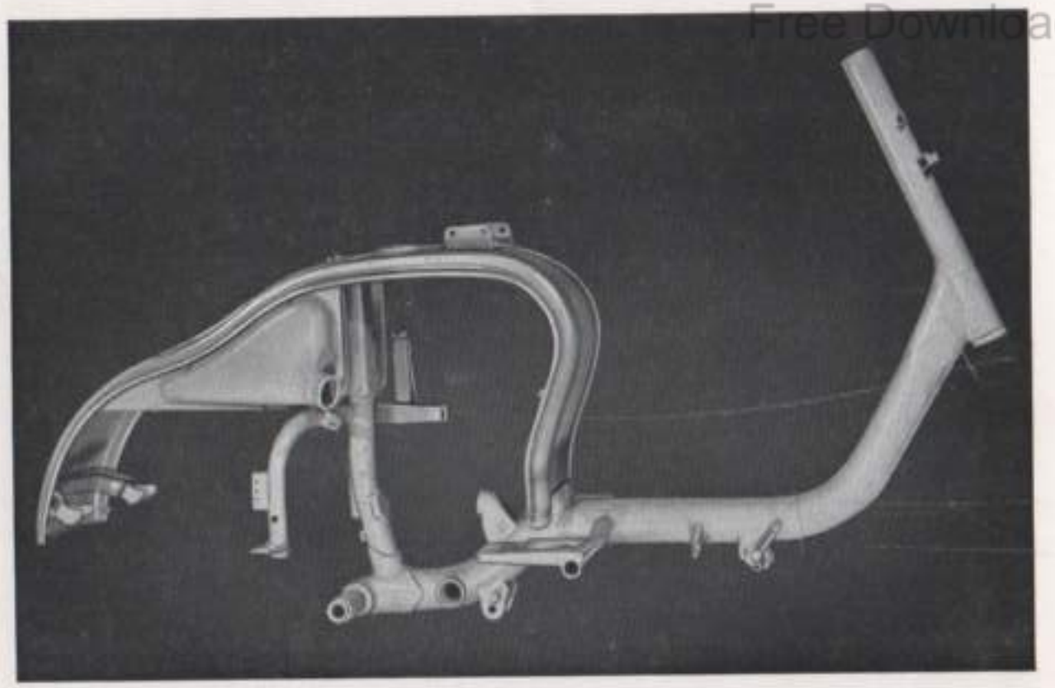
Front Forks and Frame

All L.D. front forks are interchangeable although differences exist in the positioning of the grease nipples. Later types have a waisted fork stem to reduce stresses at the base and also these have slightly stronger fork legs.

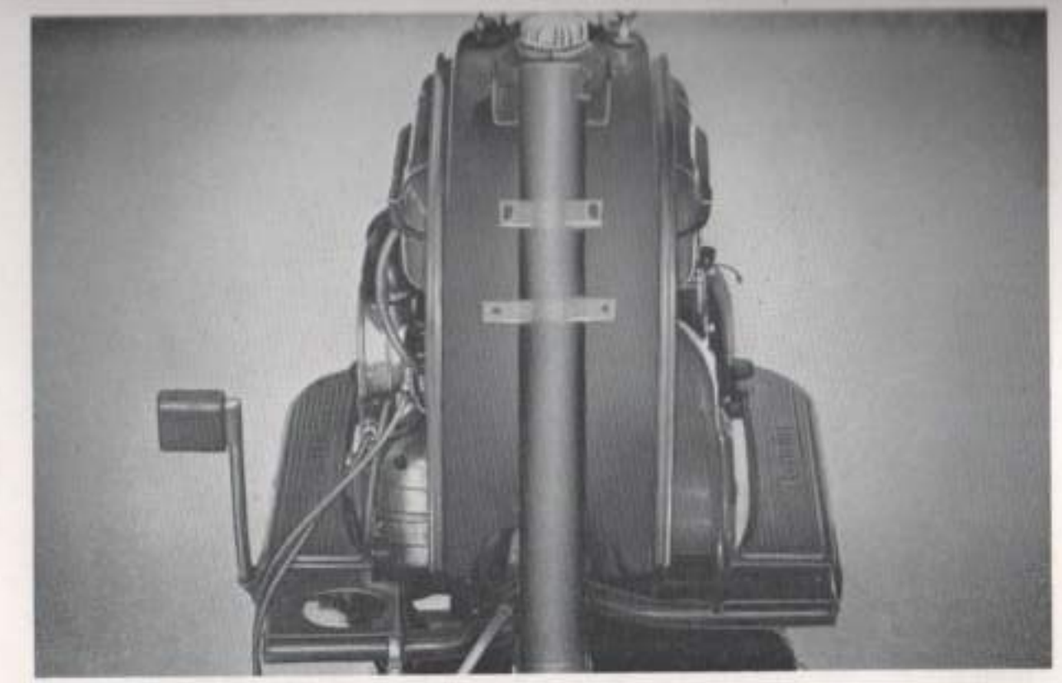
Frames differ in several respects. The first important variation was the change of position of the rear shock absorber mounting lug from Engine 143580. This was turned round on the frame member so that the lug now lies almost horizontal with the supporting tube and the stud holding the shock absorber is approximately $\frac{3}{8}$ inch higher than previously. This modification allowed the transmission case to be changed, subsequently having a flat top with the shock absorber lug raised above the surface instead of being semi-recessed in a manner troublesome to cast. Only transmission cases of the later type are available so that the lug on the frame will have to be re-welded if a replacement has to be fitted to an early machine.

With the introduction of the Mark II machines after Engine 214637 a large luggage box was incorporated in the rear of the frame and the bracket, which formerly supported the parking light battery carrier or the regulator of the self-starter machine, was changed to a box shape suitable only for the parking light battery and moved forward to a position where the battery comes in the way of the original petrol tank. In the unlikely event of a new frame being required, the Mark I will be substituted for a Mark III type and therefore a new petrol tank of the type having a recess on the nearside to avoid the battery will be necessary.

A phenomenon that became apparent on the Mark II frames up to the introduction, from Engine 221140, of the Mark III with the covered handlebar,



The Mark III frame



Any twisting of the steering column can be detected by careful observation

is the tendency for the cowling supporting the driver's saddle to start small cracks around the edge where small clips are pressed out to grip the rubber beading between the frame cowling and the side panels. However, this is not serious and only confined to the clips near the driver's saddle. If it occurs, it is sufficient to tap the pressed out pieces back into position and weld these and the cracks together. No recurrence of the trouble will be found, provided that the repair is carried out by a welder experienced in sheet metal work.

Straightening

In the event of an accident it is likely that the forks will become bent without damage to the frame, but several easy checks can be made of the latter without the need for special jigs, in order to ascertain whether there is serious mis-alignment.

Bending, if any, will take place mainly at the base of the steering tube. Should the back section be distorted then the side panels will not be a snug fit around the rim of the cowling. A measurement taken between the back edge of the chromium plate fitted around the base of the handlebar support and the nearest point of the bracket on the frame cowling to which the driver's saddle is attached should be approximately $20\frac{3}{4}$ inches; $\frac{1}{8}$ inch more or less is not serious. Any departure of the steering head from the vertical to one side is not easily seen until the legshield and front casting are removed; then, observation of the steering tube from the front will show any inclination in relation to the engine compartment behind. No more accurate check than this, if carried out by a skilled mechanic, is needed to ensure good steering.

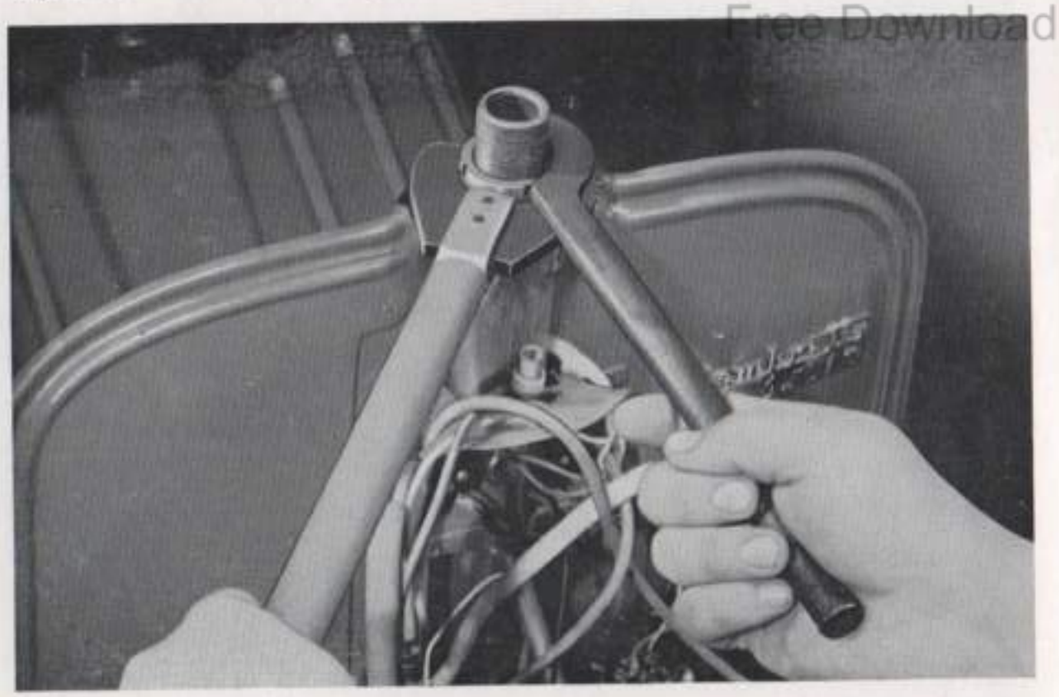
When straightening the frame, the tube may be heated to a dull red. Be very careful if using an oxy-acetylene flame not to allow temporary local overheating to occur. A large gentle flame is preferable. Do no quench the tube under any circumstances but allow to cool in still air.

If the forks are not bent it will just be possible to insert the fingers between the rear of the front mudguard and the frame ; thus the clearance will be approximately $\frac{5}{8}$ inch to $\frac{3}{4}$ inch. The wheel should be centrally placed between the inside faces of the suspension pivots, but an error of $\frac{1}{8}$ inch total movement from one side to the other of the tyre is permissible as the wheel is rotated. Viewed from behind the machine, sighting along each side of the rear tyre in turn, the front wheel should appear central when the steering is set accurately facing forwards. A discrepancy of $\frac{1}{4}$ inch offset is permissible but if more exists, the suspension links should be eliminated as the cause by replacing with a new set before proceeding to remove the forks for straightening. Only such straightening as can be accomplished without kinking or cracking the tubes should be attempted. On no account use heat. This work is best carried out by a Service Agent or if in doubt the forks should be returned to Lambretta Concessionaires for exchange. Remove all parts except the suspension link bushes if sending the forks to be exchanged.

Dismantling the Front Forks and Suspension

To dismantle the forks, remove the handlebar fairing where applicable, by undoing the centre screw and the two on either side holding the fairing to the handlebars by means of a clip. Also disconnect the speedometer cable by unscrewing the knurled nut and the light wire by pulling the bulb and socket from the instrument. The two white wires to the horn may be replaced either way round to the terminals and if these are taken out the fairing may be placed on one side to avoid damage to the paintwork.

Take out the steering lock, undoing the 10 mm. nut from the bolt which also serves as a pinchbolt for the handlebar support. Note that the alignment of the peg on the lock depends on the position of the lock when this nut is tightened after re-assembly and this best achieved by carrying out final



Use the special tools 40482 and 40490 to tighten the steering bearings

The cup and cone bearings of the steering with caged ball races

tightening in the locked position. Sometimes a thin washer may be necessary between the lock and the handlebar support to enable the pin to be centralised in the hole in the support and the lockplate beneath. Only attempt to lock the machine when the steering is turned to the left ; using it the other side will damage the lock and will not completely immobilise the steering.

Insert a wedge or large screwdriver in the vertical slot at the rear of the handlebar support and force it in sufficiently to release the clamp and enable the handlebars to be jarred upwards away from the fork stem with a mallet.

The two ring nuts on the stem beneath are for the purpose of providing an upper track for the ballrace at the top of the steering stem and a means for adjustment of the two bearings, which must allow the steering to turn completely freely, but have no sideways rock or up and down movement.

A "C" spanner tool number 40490 and a bearing ring holding fork, tool number 40482 are required to ensure adequate tightness of the ring nuts when locked together. If in spite of the use of these tools, the nuts will not remain tight, it is because their faces are not square to one another and one or both should be replaced. Alternatively a soft aluminium washer between the two will often accommodate any discrepancies.

If the front brake cable is detached from its clamp or trunnion at the lower end, the forks, wheel and mudguard may be lowered out of the frame after the ring nuts are unscrewed. Later models have a caged ballrace top and bottom of the steering but many machines have thirty-six $\frac{1}{8}$ inch balls in the upper bearing and twenty-three $\frac{1}{4}$ inch balls in the lower. It does not matter which type is fitted, but when entering the forks back into place extreme care is necessary or otherwise the cage may displace to one side or one or more balls drop into the recess around the bearing cone and remain unnoticed. However, difficulty in the adjustment or stiffness in the bearing will usually show the fault.

The front suspension can be dismantled either with the forks in the frame or without. Take out the three 8 mm. bolts securing the suspension box cover and slide this down, using a hammer and soft drift against the edge, so causing it to pivot about the bearing of the suspension link at the front until it can be levered and tapped gently away from the bush. Once the wheel has been removed the link can be taken off after unscrewing the pinch-bolt, fitted by an 11 mm. spanner, which secures it to the pivot and arm. Take out the bottom plug from the fork and lever the ball end of the spring reaction arm from the spring cup. Provided the arm is pressed out squarely it will slide easily from its bush in the suspension box. Note the small rubber sealing ring and plain washer on the pivot between the suspension link and the suspension box bush. These must be carefully positioned when the link is pressed back into place on its splines. Only one position of the splines will allow the link pinchbolt to be entered and this should not give any difficulty.

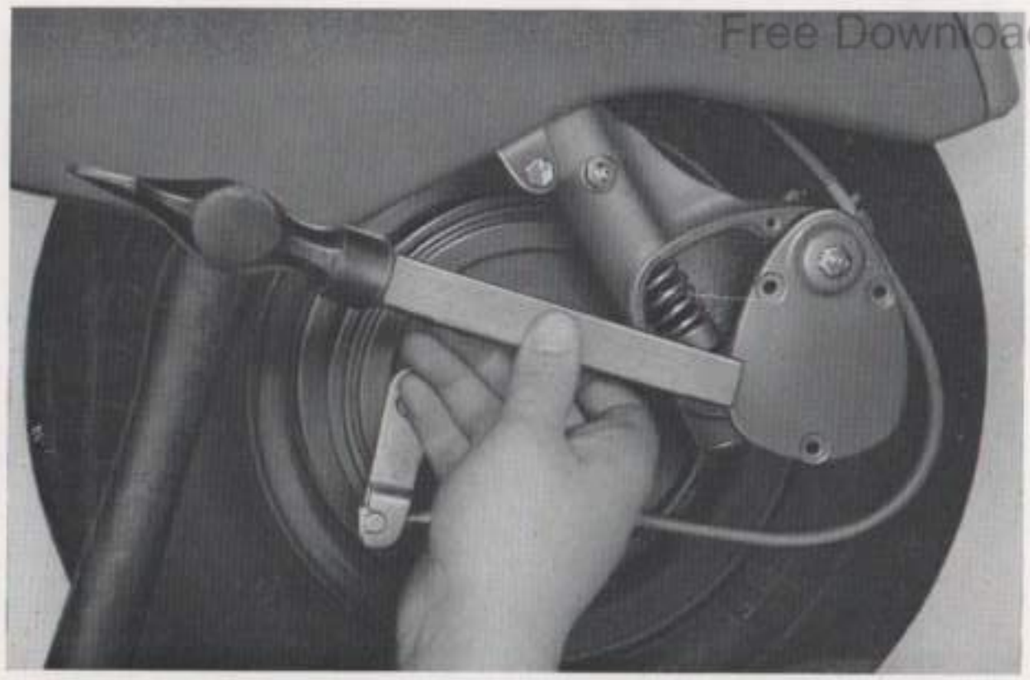
To prevent rattle of the springs and deflection against the sides of the fork legs, the cup ended guides in the springs were increased in length after Engine 163127 and again after Engine 224365 to a maximum of over 8 inches. These latest type can be fitted to earlier models.

If it is desired to fit stronger springs for sidecar or other uses, the springs from the Li or T.V. machines, part number 15060021, may be assembled. Pack the springs and internal suspension parts with soft grease when refitting.

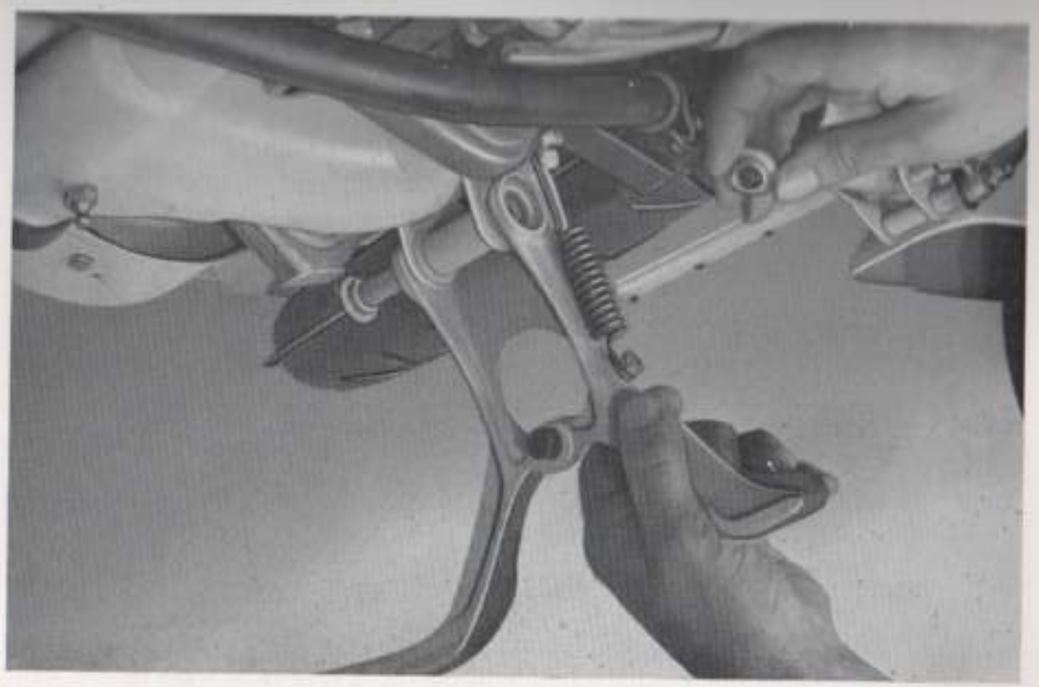
If the forks are to be exchanged, remove the lower steering bearing cone with a pin punch inserted through the holes in the base of the fork stem.

CENTRE STAND

To raise the scooter on the stand with minimum effort, place a foot on the extension with the full weight of the body behind it and pull gently rearwards with the hands on the handlebar and pillion seat hand grip. Note that the



Tap the suspension box cover to one side and then prise it off



Levering the stand into position to fit the collars

position of the return spring ends allows the stand to remain down when lowered and it will not spring up unless lifted slightly.

The position of the stand permits either road wheel to be removed, leaving the machine resting on the other.

No attention is required to the part, but if it is ever dismantled, the pivot pin should be re-assembled with a little grease to prevent it from seizing in the frame lug. Should this happen it will be very difficult to remove, and if the first attempts to drive the pin out after the split pins or circlips have been taken off are not successful, the lug should be heated and paraffin or penetrating oil applied to it. Do not continue hitting the pin without doing this or the end will be distorted and prevented from passing through the lug subsequently to the pin being loosened, or the lug will be bent. In an extreme case it may be necessary to chisel the lug off the frame, press out the pin and gas weld the lug back in place.

After Engine 201520 the original pin with circlips on the ends was changed to a type with split pins. Either is satisfactory, but if it is found that the pin on a new assembly is not long enough to allow the split pins to be fitted or if the circlips keep becoming forced off and lost, then the outer faces of the two steel collars must be filed to give a little end clearance.

To re-fit the stand at any time, or if the return spring has to be replaced, first attach the spring to its pegs on the frame lug and stand and press the pivot pin in afterwards. In this way it will be found quite easy to lever the stand into position by pulling on its legs, and to insert the pin from the side further from the spring. When the pin is half in position it can be used as a fulcrum whilst the other leg of the stand is pulled to take the tension of the spring and allow the pin to be pushed through and the collars fitted. When doing this, lay the machine on the ground on its nearside, spreading sacks to prevent damage and blocking it up slightly to give clearance for the stand extension.

The 125 LD Lambretta

Only small differences in maintenance requirements exist between the LD 125 introduced in 1953 and the LD 150 which came two years later. Few of the major improvements of the later model can be adapted to the 125 but many components are almost identical and in these cases the modifications can be applied. Because of this, only the points of difference will be noted here and where repair procedure is not given it may be taken as similar to the 150. In any case the information given must be read in conjunction with the appropriate main chapters.

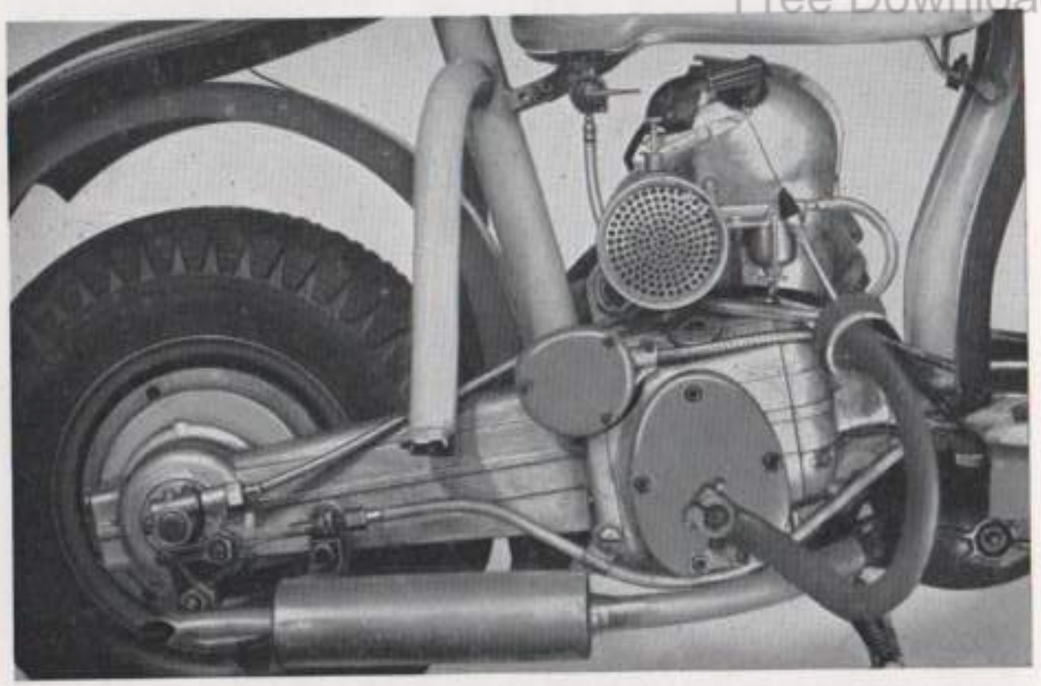
MAINTENANCE

There is no separate provision for greasing the magneto side main bearings and these require no attention.

Some machines have no greasers provided on the front forks and to lubricate the moving parts of the suspension, the covers on each side must be removed and the cavity packed with grease.

Not all types have the filler and level plug at the rear of the transmission case and to replenish the oil level where the plug is not present it is necessary to remove the speedometer drive box held by three screws and fill to the level of the bottom of the hole.

No cable oilers are fitted and although weekly oiling of the ends will be beneficial, it will be necessary periodically to detach the ends of the front brake, clutch and throttle cables furthest from the handlebar and pump oil in with a force feed oil can and a rubber tube. For the clutch and front brake the 150 cables with oilers can be adapted.



The 125 LD engine unit

Taking out the pin and rollers after sliding off the twistgrip sleeve

The twistgrips operate by pulling the inner cables along inside the handlebar tube, where their ends are mounted on sliding trunnions which are engaged in helical grooves in the twistgrip sleeve by a pin passing across a diameter of the handlebar tube and running in little rollers. The pin and rollers will be exposed when the twistgrip rubber is pulled back and the outer sleeve released by taking out the two pressed in grubs either side of the inner end.

Early types with steel handlebars and also the L.C. models have these grubs at the outer end and also the twistgrip is retained on the handlebar by an aluminium end cap secured by a cross pin instead of by a circlip as on later types.

The assemblies should be greased when dismantled and any rollers which have worn must be replaced. Note that thicker ones are fitted to the aluminium handlebar type and if the wrong ones are used they will not bear on the full thickness of the grooves and wear prematurely.

The inner gear cable can be pulled out from the handlebar end for greasing, once the selector box cover has been removed and the cable clamp slackened with a 7 mm. spanner. Take care to avoid the outer cable becoming chafed through by the footboard which it passes near and may rub against as the engine moves with the suspension. Any stiffness in the gear change can usually be attributed either to a worn twistgrip mechanism or too sharp bends in the gear cable.

Starting is not the same as for the 150 because the only rich mixture control is a small slide which is pushed down into the main air stream through the carburettor by operating a lever on the top of the instrument, accessible through the flap in the offside engine compartment panel. When cold, turn on the petrol tap and depress the "tickler" button on top of the carburettor float chamber and only release when petrol floods out beneath the button. One or two operations of the kick-starter pedal, opening the throttle slightly at the

same time, should be enough to start the engine. Only lower the rich mixture lever in cold weather; at other times and when the engine is running it must be in the raised position.

DECARBONISATION

Follow the same methods as for the 150. However, the petrol tank is attached differently and before it can be removed it is necessary to unscrew the petrol cap filler extension using the special tool 40229, or a piece of wood shaped to an octagon of one and three eighths inches across the flats which will fit in the mouth of the extension to unscrew it. Do not lose the fibre washers from the joint at the base.

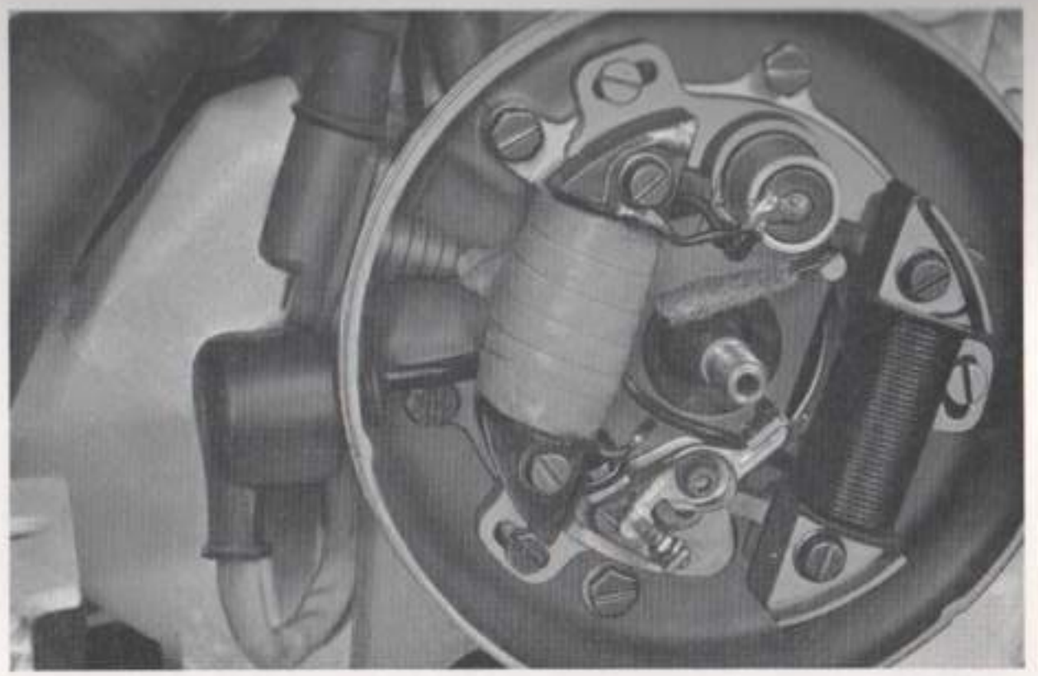
An 8 mm. bolt holds the tank at the rear and a 10 mm. bolt at the front presses the tank upwards as it is tightened and is locked with a counter nut. In this manner the tank is pressed against the frame tube with a strip of rubber in between and is held firmly. Do not allow the rubber strip to be displaced or the tank will be loose and vibration will break the brackets away.

A 14 mm. diameter small end is used and the piston has two rings, the pegs in the ring grooves facing to the rear of the cylinder. There is an aluminium gasket fitted beneath the cylinder head but this may be discarded with a resultant slight increase in compression ratio and improvement in performance. Note that a 10 mm. socket spanner is required for the cylinder head nuts.

After re-assembly, mount the carburettor fully home on its spigot and set so that the bottom of the float chamber almost touches the crankcase. The horizontal, spring loaded, idling mixture strength screw will be normally about three-quarters of a turn unscrewed for correct adjustment. The petrol pipe runs down from the tap, under the carburettor and up to the connection.

Make sure that the end of the H.T. lead is bent well away from the aluminium cowling so that the spark cannot leak across.

Tapping the silencer end-caps into position to obtain a gas-tight seal



The stator plate with the internal H.T. coil and bakelite H.T. pick-up

The silencer is similar to the first 150 type and again is interchangeable with the later ones. Only the latest can be supplied as a replacement.

MAGNETO

The flywheel magneto does not have an external H.T. coil, and the high voltage windings are wound directly on top of the low voltage coil. Consequently there is little room for proper insulation and the part is more prone to trouble than the external type. If required it is quite simple to replace the original coil with the two parts of the 150 and use the circuit of this latter.

Marelli and Filso units are fitted and their parts are not interchangeable. Replacement contact points are parts numbers 00811433 for the Filso and 00831614 for the Marelli. Both are adjustable by an eccentric after slackening the usual locking screw. No automatic advance and retard mechanism is fitted, and the points should be set to " break " 28° before top dead centre or a measurement of one and three eighths inches on the flywheel periphery. The setting of the stator plate for the interpole position to occur 10° or half an inch of flywheel movement before the points " break " should be carried out as for the 150.

The H.T. pick-up, which is of bakelite and mounted on the flange of the magneto near the terminal block, can occasionally fail and then the spark tracks across its surface, leaving in time a blackened crack. This gives rise to misfiring under load at first and when continuing, makes starting difficult in damp weather. Thus its symptoms are similar to those from a faulty H.T. coil. Do not confuse the trouble with sparking from the brass spade in the centre of the H.T. coil to the back of the flange, which will occur if the spade is bent away from the spring loaded end of the H.T. pick-up.

SELF-STARTER

The starter motor and drive follows the same lines as the 150 LDA and on the later types the clutch cover and gear train are identical with the LDA unit, but the system used is 6 volts and there is one 20 ampere hour capacity battery located to the near side of the rear wheel. No special flywheel is used and the ignition is supplied in the same manner as the standard machine. However, the lighting coil is not earthed and early types have three tappings taken to a relay unit which selects two of the tappings for full charge and two for half charge. From the relay the current is taken to the battery via a full wave rectifier of the same type used on the LDA. When the lights, which are battery supplied, are switched on, the current to them passes through the relay coil and causes the contacts to close and select the full charge tappings from the lighting coil.

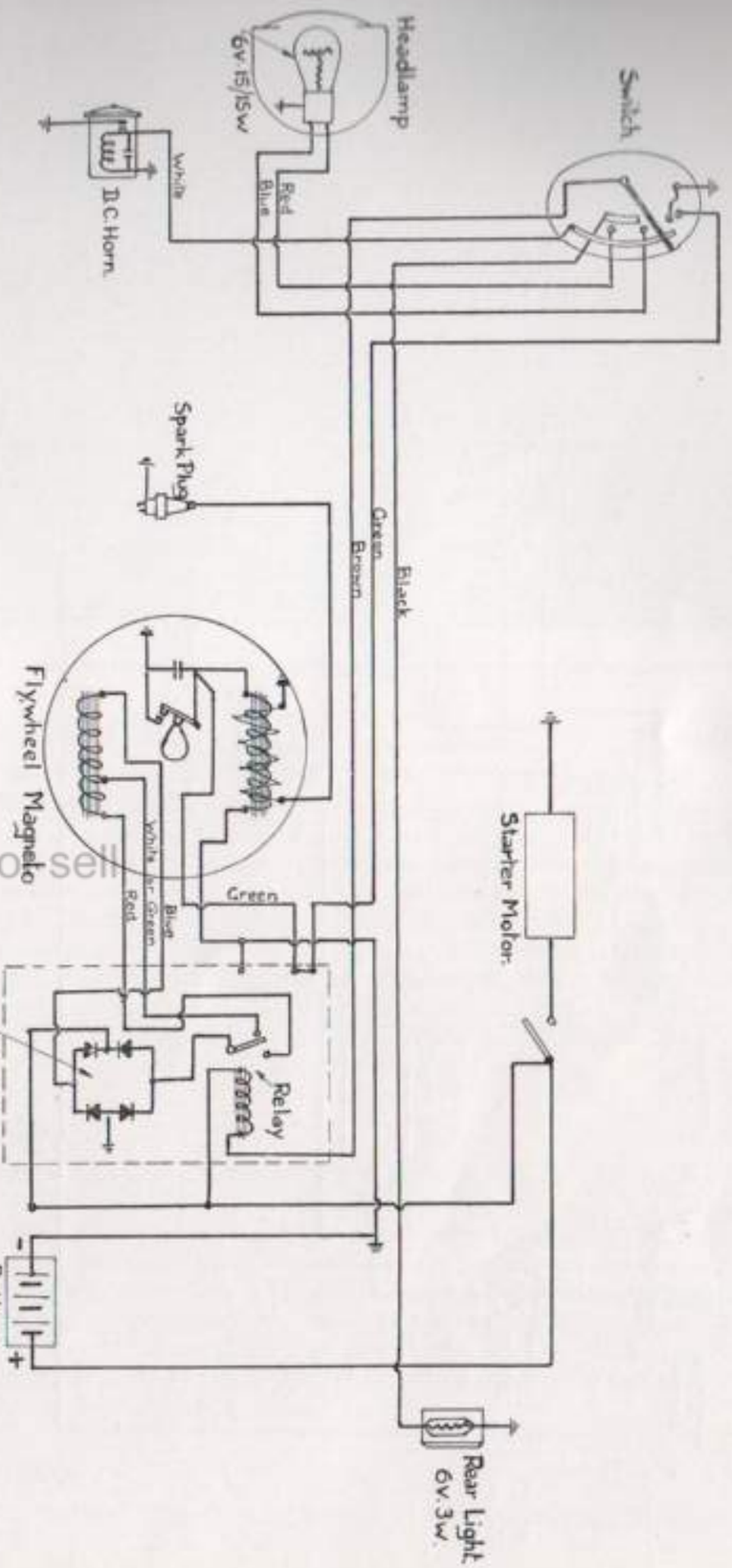
The same system is also used on machines having fully battery supplied lights but no self-starter. In these cases the rectifier is smaller and it is housed in a black bakelite box with the relay, and the group is mounted in the engine compartment on the nearside. A drawback with the relay system is that when a battery is nearly discharged, the current is insufficient to close the relay contacts properly and so full charge is not obtained and the battery does not recover.

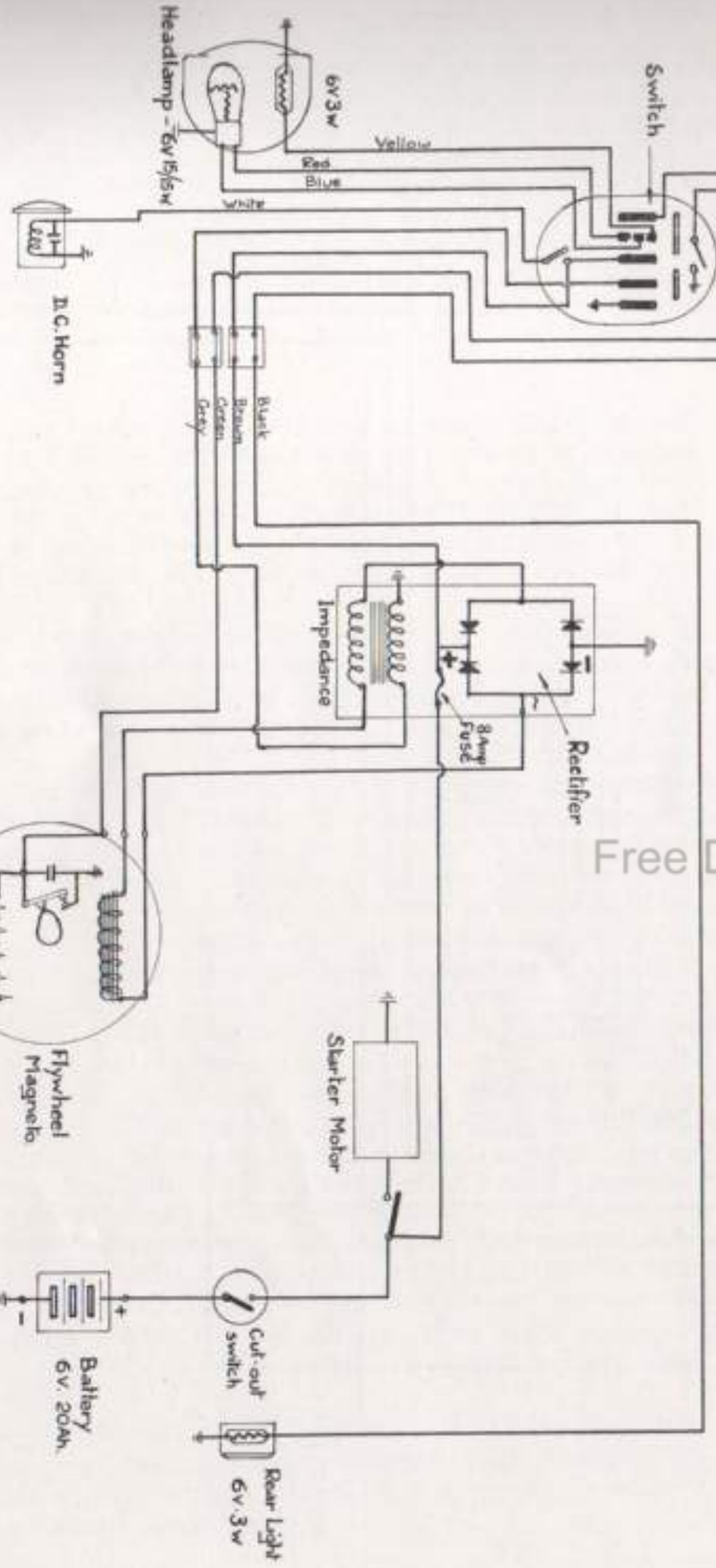
A later type introduced only on self-starter machines and only with the Marelli magneto, eliminates the contacts of the relay and has a simple lighting coil with each end connected to the rectifier but with the addition of a choke coil in one of the wires carrying the A.C. current. Wound with the choke coil but insulated from it, is another coil earthed at one end and with a grey wire from the other end connected to a contact in the lighting switch on the handlebar. In the lights " on " position of the switch a connection is made between this contact and earth, thus completing the circuit of the secondary coil with the result of lowering the impedance of the choke and increasing the charging current. This works satisfactorily so long as the resistance of the contacts in the lighting switch is negligible. Both this and the earlier system will benefit by cutting out the half charge device and connecting the lighting coil directly to the rectifier. However, this modification should not be made to the machines with the " black box " equipment without self-starter, unless a larger capacity battery is fitted, because the original will not accept the higher charging rate.

Note that several different switches have been fitted to the 125 LD's but as a replacement the part number 07011161 will do for all machines without batteries except in the case of those fitted with a city light and no battery, for which part number 11011491 is needed. For early machines with batteries, part number 08011231 should be used, and this will do for the later type provided that the choke coil originally fitted is taken out of circuit, or made to allow full charge to pass by earthing the grey wire from the bottom terminal in the regulator unit. The correct switch for this circuit is part number 08011396.

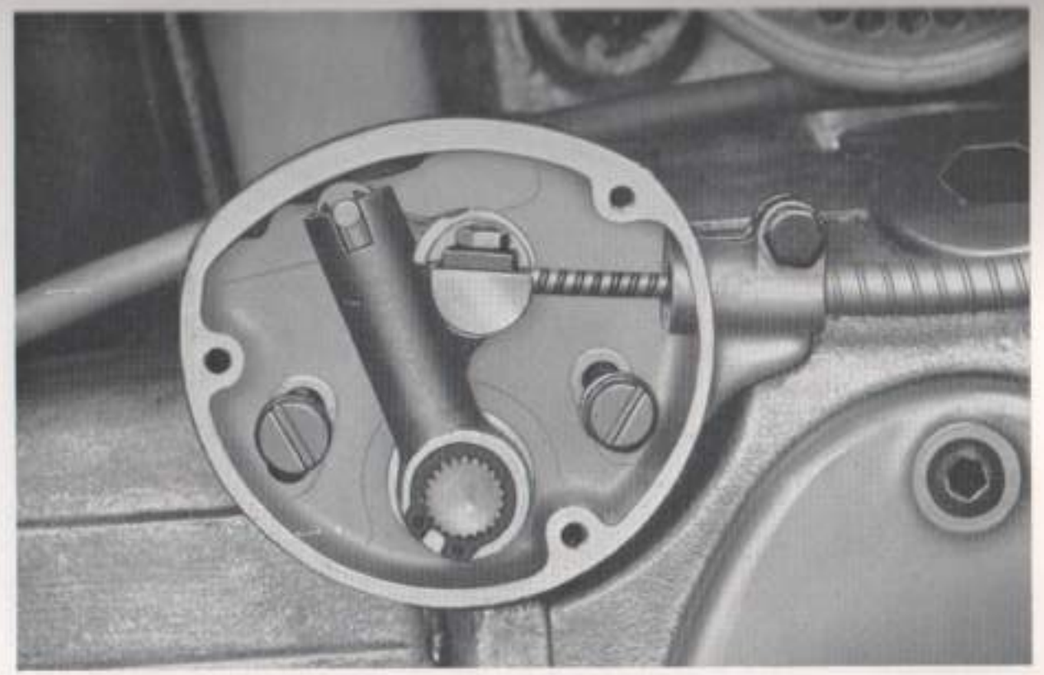
All battery models use a 6 volt D.C. horn which is non-adjustable and should be replaced with the adjustable one, part number 15081270, in the event of failure.

6 volt 15/15 watt headlamp bulbs are standard for battery models because full charge for a self-starter machine is only 3 amps at the equivalent of 30 m.p.h. in top gear and this will not charge the battery sufficiently to maintain a bulb of larger size.





– kambretta –125LD MKI. Self Starter 2nd Series. – Wiring Diagram –



The selector box showing the spring loaded roller in the second gear notch

KICK-STARTER

This is similar to the first type of 150 unit but is fairly trouble-free. Nevertheless, if extensive replacements are required, it will often be economical to replace it with the modified group part number 12004007 available for the 150's, which is easily fitted, but the two lower holes for the fixing bolts must be drilled right through, and also the heads of the rivets on the quadrant must be filed to prevent them from rubbing on the inner face of the casing.

One point of difference is the ring surrounding the bolt immediately beneath the pedal shaft acting as a quadrant stop. In the 150's, this ring is of steel and not satisfactory unless modified, but in the case of the 125's it is of rubber and gives no trouble. Pedals and shafts of all types except for Mark II and III machines are interchangeable.

CLUTCH

Only small modifications have been made to this and are applicable except for the nut of 14 mm. hexagon retaining the splined clutch centre on the mainshaft. Whereas this has a left-hand thread and a lock washer on the 150's, it has a normal right-hand thread and spring washer on the 125.

125 clutch plates are a little thicker and the springs weaker, if 150 plates are used the springs must be changed for the stronger type. If the pull-rod assembly has to be replaced the later type may be fitted provided that the bearing cup is also changed. Note that early models do not have clutch covers interchangeable with later ones.

GEARBOX

The method of gear engagement is unchanged but the gears have three

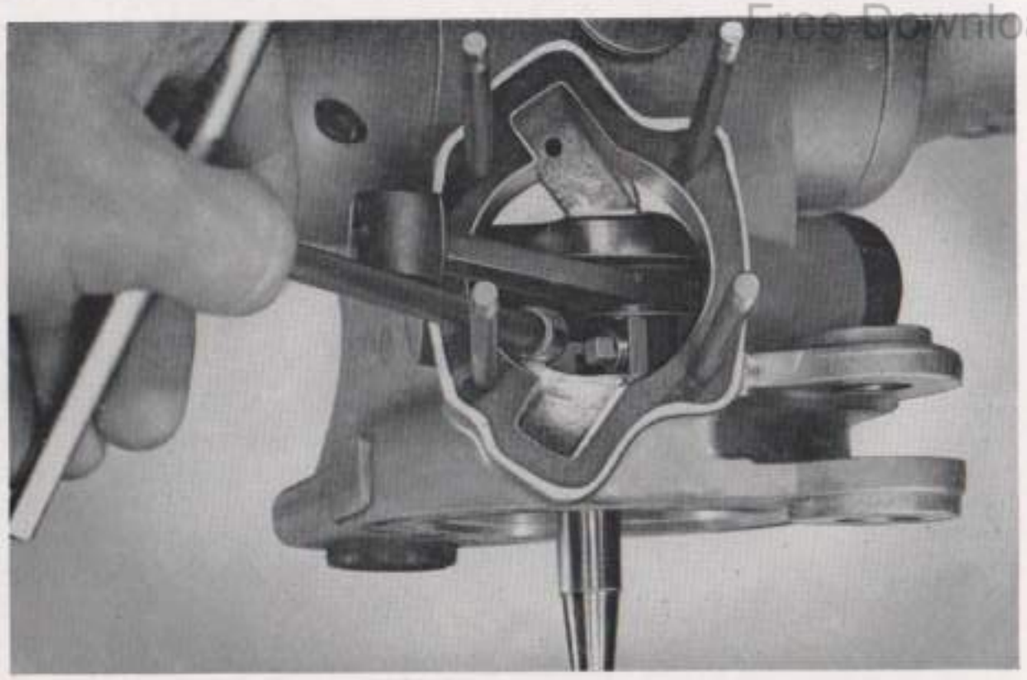
small pegs on their faces instead of the rectangular " dogs " which are more familiar ; they cannot be interchanged.

The gear selector lever has only one peg running in a groove in the upper sliding gear and it is not therefore in the form of a gate. The spring loaded roller engaging the different notches to determine the gear position as the selector moves is not internal but lies in the selector box where the gear cable enters. The roller itself fits in a spring loaded plunger in the hollow brass selector arm splined to the end of the selector lever shaft, and the notches are formed on the inside of the top of the selector box.

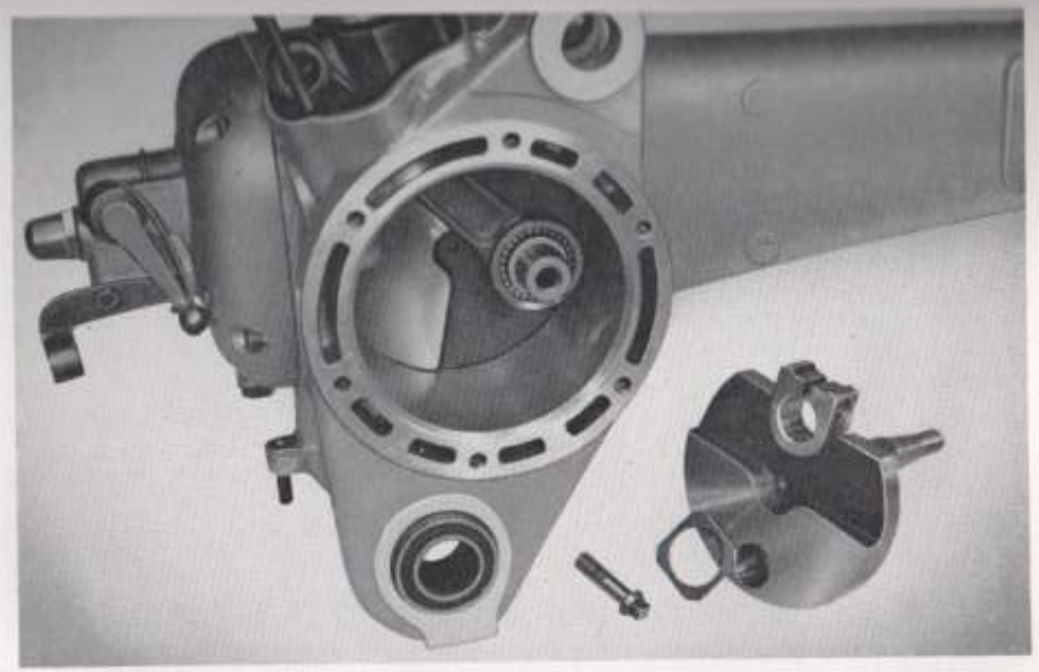
The position of the notches is adjustable because the selector box has two slotted holes with screws securing it to the engine casing and setting it in different positions varies the gear meshing. The forward one of the two screws traps a rubber washer between the selector box and the crankcase to accommodate machining differences. Unfortunately the range of movement permitted by the slotted holes is not equal to the angular change of position of one spline on the selector arm ; thus, if this has to be replaced, as may become necessary due to wear on the splines or of the cable clamp pivot, the new one should be examined to see that the splines match those on the old one for position.

Notice that the inner and outer cable clamps can be tightened in any position of the cable ends and therefore allow adjustment of the setting of the gear control lever in order to find that which is most comfortable to the hand and also to align the gear indicator positions. Early machines have a brass ferrule on the end of the outer cable and for these the hole in the clamp on the selector box must be larger.

Inside the gearbox, there is no washer between the fixed gear on the mainshaft and the adjacent bearing, but on the layshaft there are three washers, two are fitted at the forward end and one at the rear ; otherwise details are similar to the 150.



Unscrew the big-end pinchbolt with tool 37598/E



The magneto side crankshaft half removed. Note the square big-end bearing washer

CRANKSHAFT

The crankshaft is mounted on four journal bearings of the size used to support the rear axle. It is in separate parts with the magneto side shaft and shoulder clamped to the crankpin by a bolt having a square end accessible through the neck in the crankcase after the cylinder is removed.

The unit is only supplied as a complete assembly, although the connecting rod and big-end needle rollers, of which there are 27, are available separately. To dismantle the big-end, it is only necessary to take off the cylinder and remove the magneto flange as described in the chapters on the 150.

No nut retains the magneto side bearings on the crankshaft and they will draw off with the flange. Against the circlip in the outer end of the flange is an oilseal, running on the crankshaft, which prevents leakage of the crankcase pressures. Like the bearings on that side it relies on the petrol/oil mixture for lubrication and consequently does not wear well, particularly with machines which are only driven slowly and do not get warm enough to evaporate the corrosive acids present.

Symptoms of a worn oilseal are difficulty in starting unless the carburettor is flooded copiously and engine not running slowly ; also speed varies unevenly, not responding to the opening and closing of the throttle.

The oilseal should be removed by taking out the circlip, placing the flange face down and then driving the bearings through with a suitable hammer and drift. Fit the circlip back and place the new oilseal in from the back, following it with the bearings which should be assembled with a little grease. Note that the flat face of the oilseal must be towards the outside.

To continue dismantling, insert the special square socket tool number 37598/E through the crankcase neck to remove the pinchbolt holding the crankshaft halves together. The magneto side of the shaft may now be pulled off and the connecting rod and big-end bearing released. Note that

there is a square washer either side of the big-end and when assembled there must be approximately .020 inch side float of the connecting rod at the bearing. If there is less, the crankpin has been pressed too far into the driving side of the crankshaft or the square washers are too thick. Failure to remedy this will cause the big-end to seize.

Removal of the other half of the crankshaft is accomplished after dismantling the clutch and gearbox as with the 150 Mark I.

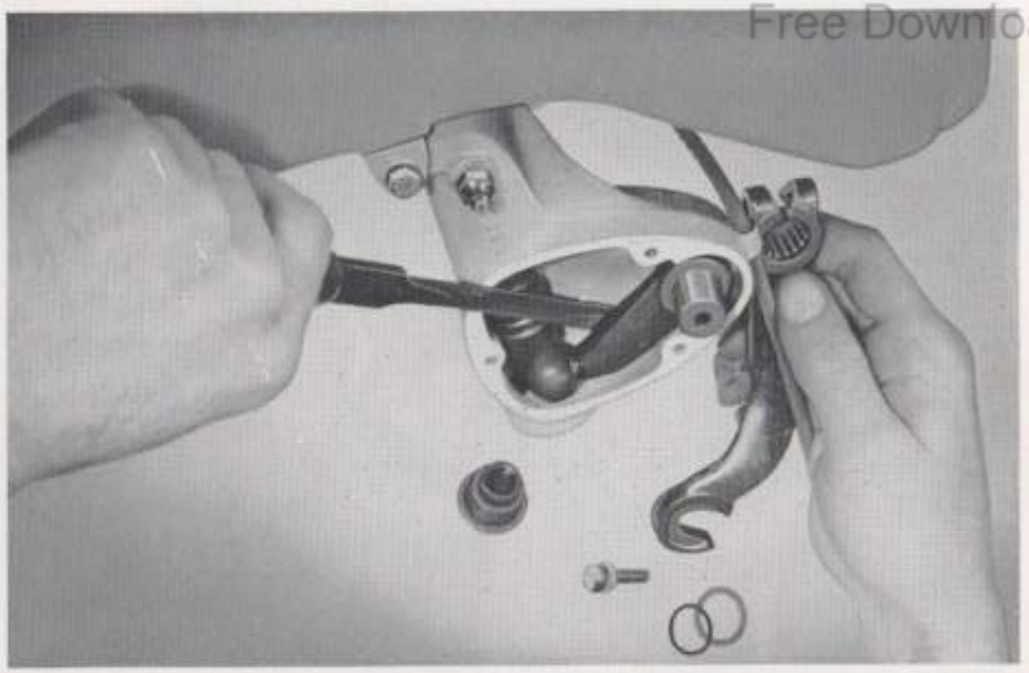
Note that the oilseal on the driving side is fitted between the two main bearings and runs on a small distance piece ; the open end of the oilseal faces the crankshaft. Taking up the space between the oilseal and the bearings is a wavy Belleville washer and the bearings themselves are contained between two circlips in the crankcase. Shim washers take up any clearance between the bearings and the circlips, but care must be taken not to force more of these in than necessary, because then the bearings will be loaded against one another and wear rapidly.

When re-assembling, the crankshaft halves can either be aligned with a mandrel, tool number 44006/E, which will enter into two reamed holes in the sides of the crank webs opposite the crankpin while the pinchbolt is tightened, or alternatively, it can be aligned roughly by eye and trued properly after the magneto flange and flywheel have been mounted, using a dial gauge on the flywheel rim.

CROWNWHEEL AND PINION

This assembly is identical to the 150 except for the rear axle, and the only difference with this is the extension on the end of the 150 one to take the speedometer drive.

The modification of the 27 mm. hexagon nut part number 11330312 is applicable and so is the larger bearing fitting next to the head of the pinion.



Levering out the front suspension arm

Where necessary to prevent oil leaking back from the gearbox and out through the axle on to the rear brake, the one-sixteenth inch hole should be drilled in the clutch cover.

Torsion driveshafts are interchangeable although the 150 part is actualiy thinner and more flexible than the 125.

BRAKES

On later machines the brakes are identical to the 150 but early ones have a smaller front brake. However, the principle remains the same and complete hub assemblies are interchangeable. Note that when the larger front brake was first introduced the flange on the outside of the backplate was slightly larger and the hub machined differently to accommodate it ; thus these particular machines have a special front hub and backplate.

WHEELS, FORKS AND FRAME

Wheels and forks are interchangeable with 150 parts, and all later types of suspension parts and steering head bearings can be fitted to earlier machines. However, very early types of forks have end buffer plugs of different thread pitch and of course the plug must match the type of fork.

Frames are not interchangeable although engine mountings are simiiar. Some 125's have the lug formed in the transmission case to take the 150 type shock absorber but provision is not made on the frame ; nevertheless it can be adapted suitably if required and welding equipment is available.

Early machines have a bronze bushing for the engine pivot mounting and when worn, the assembly should be changed to the later Silentbloc type.

The 125 LC Lambretta

These are similar to the 125 LD except that the suspension, both front and rear, is different.

Lubrication of the gearbox remains the same but the final drive is packed in medium grease which is entered through the plug on the top of the rear of the transmission case until it appears out of the rearmost and smaller plug on the swinging part of the casing. Filling of this compartment can be made simpler by drilling and tapping the larger plug to take a grease nipple so that a grease gun can be used.

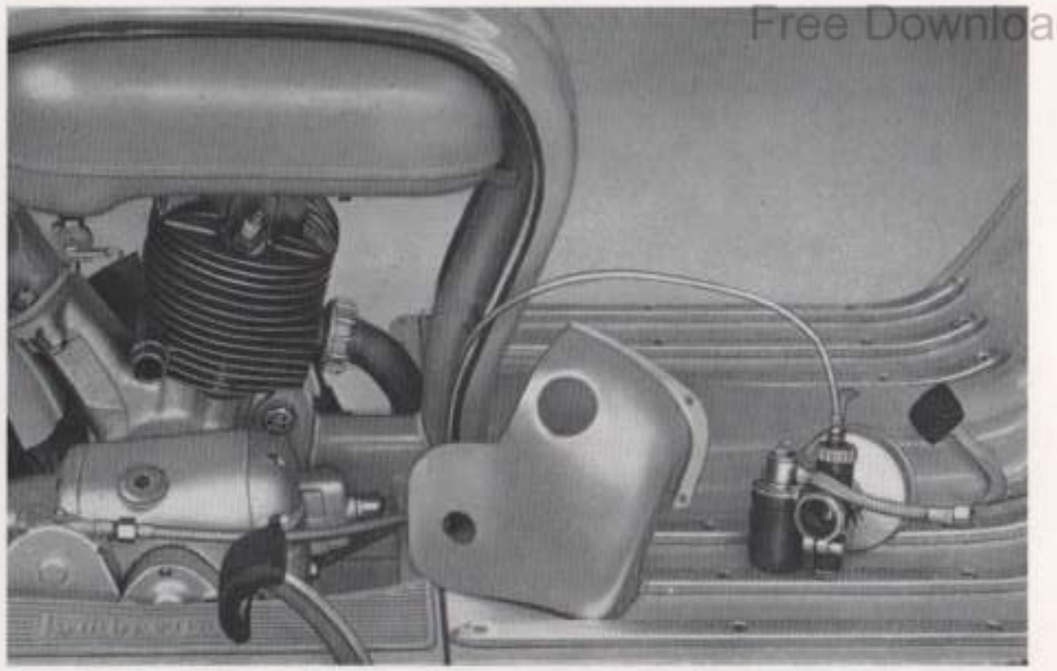
More regular attention is necessary to the greasing of the front suspension because it is exposed to rain and grit.

Handlebar controls are mostly interchangeable with early 125 LD types but instead of the trunnion in the handlebar being driven up and down via a pin with rollers, two small brass slippers, one either side, are used. Improvement to the operation will result from replacing the group with the roller type.

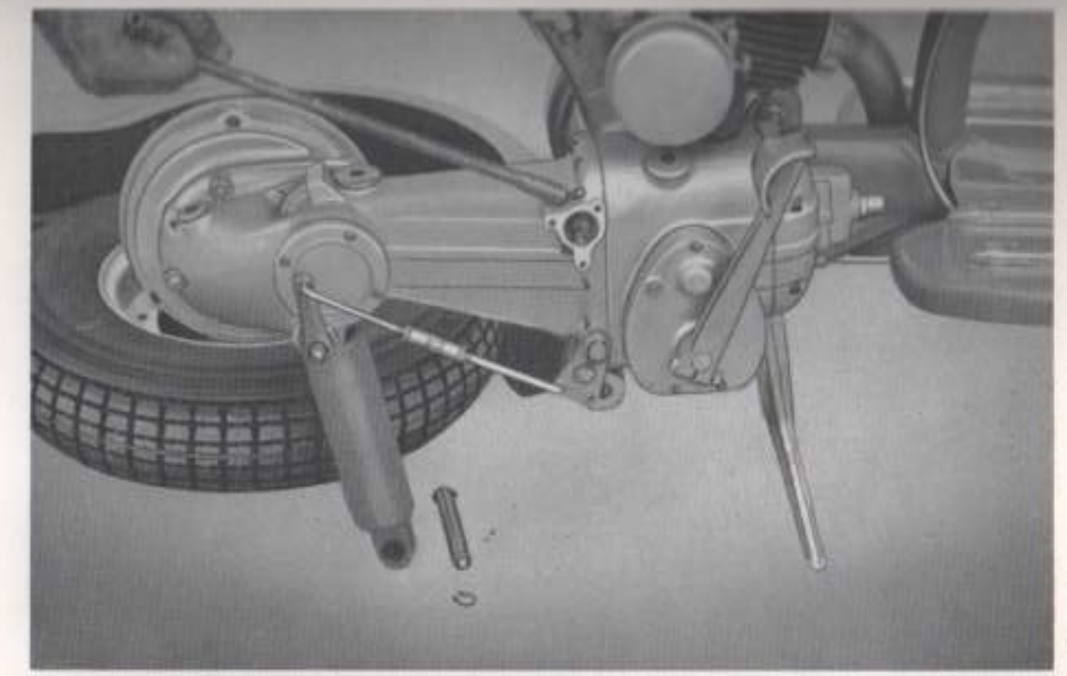
Either Dell'Orto or Zenith carburettors both of 16 mm. choke will be encountered, and these are similar although their parts are not interchangeable. The adjustments are the same as the 125 LD but the throttle cable enters the carburettor from the top and the inner cable is connected directly to the throttle slide. Because of this the cable is of exceptional length and must be well lubricated if it is to operate freely.

The petrol tank is the same as the 125 LD but because the petrol pipe is armoured and has union connections, the tap is different.

The brake shoes are interchangeable with the early 125 LD but the hubs are not. The rear brake is rod operated. Note that the arm on the end of the



The LC engine is rigidly attached to the frame



A 5 mm. allen key with a universal joint permits rapid operation

rear brake cam spindle must be positioned on its splines so that when the brake is applied, the end of the arm where the rod is connected will be approximately in line with the axis of the suspension pivot in the centre of the circular cover plate.

Magnetos are identical to the 125 LD.

Almost all of the rest of the engine with the exception of the piston assembly, main bearings and oilseals, and many of the clutch parts, is unique, and although the bevel gear layout is similar, the clutch bevel, situated on the gearbox side of the crankshaft, is formed in one piece with the clutch supporting sleeve.

Note that clutch pull-rod assemblies are not interchangeable.

The kick-starter unit, which is complete with its bevel gear and housing, is mounted on the crankcase by one 6 mm. diameter screw on each side and a 6 mm. diameter stud with a nut beneath the pedal shaft. These and the three screws retaining the cover, have a tendency to work loose and the arrangement can be improved by drilling and tapping the crankcase to take a larger size.

Meshing of the kick-starter bevel gear is determined by the thickness of the pairs of gaskets between the unit and the crankcase face.

TRANSMISSION

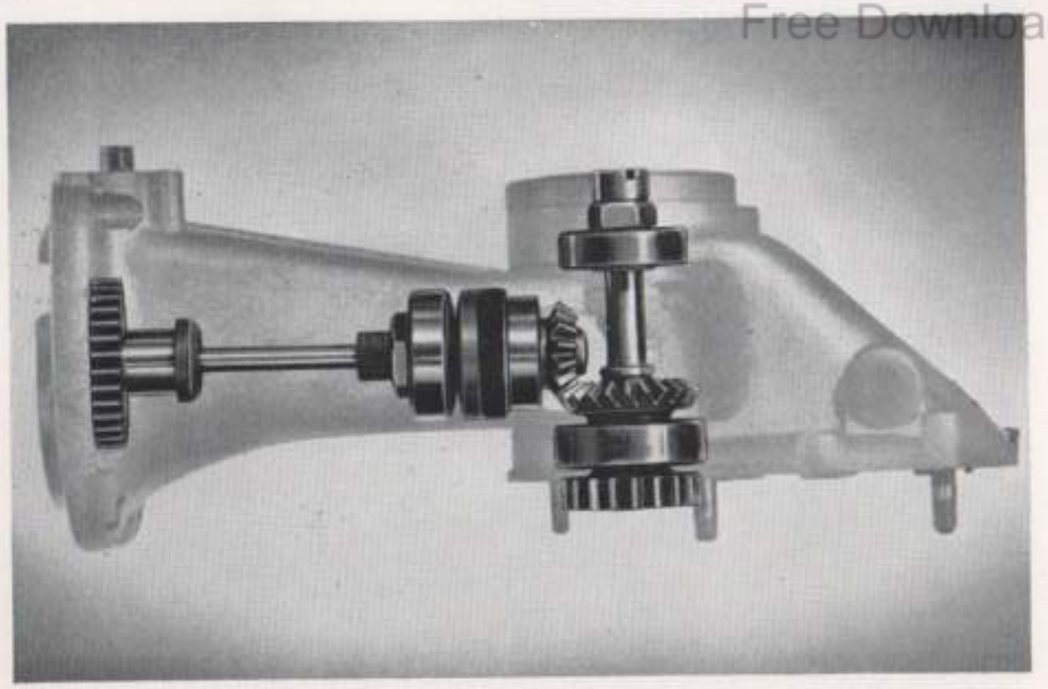
Because the rear suspension is provided by the swinging of only the rearmost portions of the engine unit, the main crankcase is fixed rigidly in the frame. There is no torsion bar and the transmission case may be removed after taking off the mudguard and disconnecting the rear brake, the gear change mechanism and the telescopic suspension unit beneath the case. The transmission case itself is held by ten 6 mm. diameter bolts fitted by a 5 mm. allen key and four 8 mm. diameter bolts fitted by a 6 mm. allen key. One of these latter four bolts has a nut on its end beneath the crankcase.

The gears have the same lay-out as on the later machines but are different in form. Splined into the final driven gear is a short driveshaft with its other end fitted into a bevel pinion supported in the fixed part of the transmission case and meshing with a bevel gear mounted on a shaft on the same axis as the pivoting part of the casing which acts as the suspension arm.

The adjustment of these two bevel gears, although not critical, is likely to give some difficulty. When not set up properly the teeth will be overloaded and lead to rapid wear of them and their supporting bearings.

When dismantling the suspension arm, it is necessary to withdraw the bevel pinion before the suspension pivot sleeve can be taken out. After taking off the transmission case, the final driven pinion can be pulled out with the 24 supporting needle bearings and the driveshaft will also come away. The end of the bevel pinion and its supporting bearings will be seen at the bottom of the casing but they cannot be drawn out until the final driven pinion bearing ring is extracted and the circlip in the casing which holds one of the bevel pinion bearings in position is removed. Special tool 38489 should be used to extract this bearing ring, but heating the casing will usually cause it to expand sufficiently for the ring to drop out. However, the bevel pinion group will be rather tighter and will probably require the use of extractor 40601. Nevertheless the operation may possibly be successful without this, using a screwdriver entered in through the greaser plug to gently lever the group back. Note that there are shim washers between the large circlip and the bevel pinion bearing nearest to the gearbox ; these may have to be varied in order to obtain alignment of the bevel teeth.

Adjustment of the driven bevel gear to give proper tooth clearance after the bevel pinion has been aligned with it, is by two nuts locked together on the spindle supporting the bevel gear in the centre of the suspension arm pivot bearing.



The layout of the final drive bevel gears in the knuckle joint

The pivot cover plate, bevel adjustment and bearing with retaining pieces removed

When the pivot cover plate is removed by taking out the four countersunk screws securing it, the outer nut of the adjustment will be seen. It is circular and has a crosswise slot to be engaged by a forked tongue which can be made from a piece of steel strip. The second nut, lying beneath it, is secured in the centre of the spindle support bearing on that side and is fitted by a 19 mm. ring spanner. It is easier to obtain access to this nut by removing the large circlip from the pivot bearing and taking out the washers and bearing retention plate behind it, but if this is done, note that the bearing will tend to move out when the 19 mm. adjusting nut is unscrewed and will therefore give a false adjustment. Also the pivot bearing sleeve can slip back. However, provided that it is tapped back firmly into position each time, the correct bevel meshing can be obtained and checked after replacing the circlip and other parts.

To dismantle further, the hub, brake shoes and backplate must be removed and then provided that the bevel pinion group has been extracted, the large pivot bearing sleeve can be tapped out to the nearside, bringing with it the bevel gear assembly. The short sleeve forming the bearing surface for the pivot on the offside, is easily slid out from that side. Re-assemble all parts with grease.

SUSPENSION

There is a possibility that after long usage the springs in either the front or rear suspension may break and this will cause excessive play to develop.

The forward support for the telescopic leg of the rear suspension is a pin located in a lug on the suspension case either side of the eye of the leg and it is retained by two circlips. At the rear, the support is the sleeve in which the brake cam lies and it is secured by the 24 mm. nut next to the brake operating arm.

Generally it will be necessary to replace the pin, sleeve and bushes in the

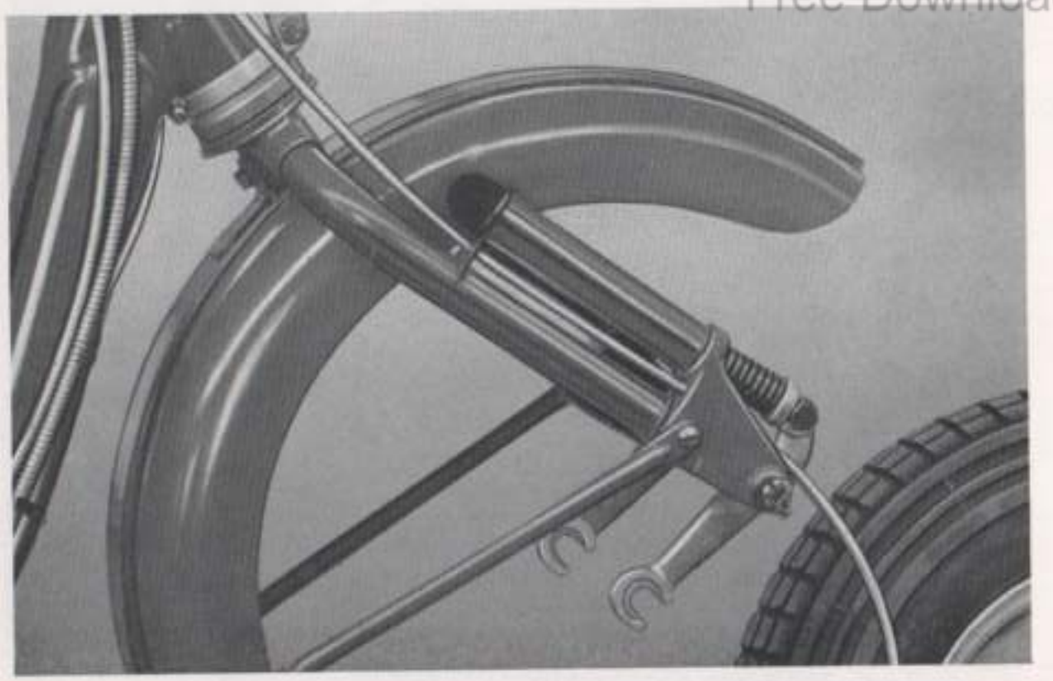
eyes of the telescopic leg if wear has taken place, but if there is any free movement in the leg itself, it should be taken apart by gripping the outside cover and unscrewing the thicker end. Beneath will be disclosed a thick rubber buffer and, under this, the flange screwed on to the centre spindle attached to the other end. A suitable tool is fairly simply constructed with two pegs to fit in the drillings in the flange in order to grip and unscrew it. Note that when new springs are fitted, some pressure will be needed to compress them while the assembly is screwed together ; however, this can usually be achieved by placing it endways in the jaws of a large vice.

The front suspension consists of trailing links attached to the wheel spindle, but instead of compressing springs inside the fork tube as with the LD's, they are extended forward of the pivot bearings in the fork ends and are linked with clevis pins to long pull rods passing up inside the springs contained in separate tubes lying in front of the actual forks. The top of each pull rod is threaded and a nut, secured with a split pin, presses on the top of the spring with a rubber distance piece in between. Thus, upward movement of the wheel causes the trailing links to draw the pull-rods downwards so compressing the springs against the bottoms of their containing tubes on the forks.

Wear of the clevis pins and the pivot bearing pins and bushes takes place in time and when considerable clearance exists there will be a tendency for the steering to wobble at very low speeds.

Access to the springs is obtained by unscrewing the nuts on the ends of the pull-rods, which are disclosed by removing the rubber caps on top of the spring tubes, and the trailing links can be taken out if the wheel is removed, the nuts unscrewed from the pivots and the pivot pins tapped out. Note the rebound springs between the front of the trailing links and the bottom of the main spring tubes ; these should also be replaced if broken.

Assemble all parts with grease.



The forks and front suspension with the wheel taken out

Lambretta Service Tool Kit

TV, Li and LD MODELS

ALL MODELS

Tool No.	*Description*
0517/C	Lambretta Contact Tester
1010	8 mm. Tube spanner
1011	10 mm. Tube spanner
1016	5" extension for socket
1017	T Bar for socket
1025	Set of open ended spanners
1030	3½ mm. Allen key (15086066)
1061	16 mm. Small end bush extractor
1100	14 mm. Socket
1101	17 ,, ,,
1101/A	22 ,, ,,
1102	24 ,, ,,
1103	27 ,, ,,
2021/14	14 mm. Jointed socket spanner
02050/4	Contracting circlip pliers
02050/6	Expanding circlip pliers
37058/2E	Flywheel extractor
39847	Piston ring clamp (125 models)
40482	Steering head bearing spanner
40490	Steering lock ring spanner
43385	Oil plug tool
48060	Dial gauge
49188/2	Magneto flange extractor
49194	Piston ring clamp (150 models)
49221	Connecting rod holding tool
50400	8 mm. Socket spanner and bar (alternative to 1010)
50401	10 mm. Socket spanner and bar (alternative to 1011)
53419	Gudgeon pin extractor
57776 *	Oil seal protector bush
57836 *	Steering head allen key
57865 *	Dial gauge bridge for sprocket alignment
57988 *	T.D.C. holder for dial gauge
58013 *	Flywheel holding tool
58021 *	Front fork spring lever

* *Not suitable for LD Models*

Li & TV Mk. II MODELS ONLY

50406	Gearbox flange extractor key
50407	Tie rod for suspending engine unit
59170	Crankshaft roller bearing race extractor
59328	Inner clutch bell extractor
59329	Crankshaft ball bearing extractor and refitting tool
59351	Clutch compressor tool
59804	Clutch bell locking tool

Tool No.	*Description*
59826	Rear hub extractor
60051	Crankshaft shock absorber sleeve extractor
60186	Extension to dial gauge for sprocket alignment tool

TV Mk. I MODEL ONLY

1015 †	19 mm. Socket for flywheel
43783 †	19 mm. Wrench for flywheel (alternative to 1015)
48061	Extension to dial gauge for sprocket alignment tool 57865
50404	36 mm. Open ended spanner
50405	Roller main bearing inner sleeve extractor
56686	Clutch compressor
57028	Rear hub extractor
57837	Piston ring clamp
57840	Clutch bell puller
57841	Clutch bell holding tool
57842 †	Silencer neck spanner
57843	Cylinder head spanner
57971	Axle holding tool
58000	Threaded flange extractor key

† *Common to LD Models*

LD MODELS ONLY

1015	19 mm. Socket for flywheel
1031	4½ mm. Allen key
1032	5 ,, ,, ,,
1033	6 ,, ,, ,,
1060	14 mm. Small end bush extractor
1112	Torsion bar loading tool bush
37061/E	Rear hub extractor
37101	Clutch splined drum holder
37179/E	Cylinder head spanner (125 cc. Mark I)
37380/3514	Jointed 5 mm. allen key
37598/E	Big end spanner (125 cc. Mark I)
39146	Clutch bell puller
40229	Tank neck spanner (125 cc. Mark I)
42589	Rear pinion extractor
42987	Rear pinion assembling punch
42988	Rear drive dismantling punch
43170	Clutch bearing extractor lever
43291	Long 6 mm. allen key
43783	19 mm. Socket with bar
44006/E	Crankshaft aligning mandrel (125 cc. Mark I)
44354	Gear mesher
46604/E	Torsion bar loading tool complete with bush
49123	Tank neck spanner
49146	27 mm. Crankshaft socket spanner
49195/E	Cylinder head spanner
49220/E	Flywheel holder
49256	Clutch sleeve holder
49753/E	Clutch compressor
57842	Silencer neck spanner

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The Lambretta Serviceman's Book

written and compiled by

D. B. PALMER, Grad.I.Mech.E.

FIRST EDITION

Models TV Li LD LC

Published by

LAMBRETTA CONCESSIONAIRES LTD.

Beverley Works, Kingston-by-Pass, London, S.W.20

Printed by

ACME PRESS AT THE WIMBLEDON PRINTING WORKS, (Est. 1862)

30 Homefield Road, Wimbledon, S.W.19

LJ