

A PRACTICAL GUIDE COVERING ALL MODELS FROM 1952

Lambretta

RAYMOND BROAD

SCOOTER
MAINTENANCE
AND REPAIR
SERIES

This book provides a servicing guide to the whole range of Lambretta scooters from model C to the TV 175 and Li models.

It is intended for Lambretta owners who wish for reliable information that will enable them to undertake in some degree their own maintenance and repairs.

The book meets this requirement both for those whose object is to do as much servicing as possible and those whose aim is trouble-free running and the ability to make emergency repairs and adjustments. In meeting these requirements, the book also provides a useful servicing guide for the skilled mechanic.

The mechanical and electrical know-how covering the various components is in easily-readable form, supplemented by many clear drawings which bring greater confidence when tackling jobs.

A quick résumé of the servicing guide, with useful riding tips, is given in Chapter VIII.

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A PRACTICAL GUIDE TO
MAINTENANCE AND REPAIR

by

RAYMOND BROAD

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PREFACE

THE purpose of this book is to meet the requirements of the owner-rider who wishes to carry out his own maintenance and repair work, and also to provide a useful servicing guide for the skilled mechanic.

All but the first and the last chapters are devoted to servicing, each chapter being subdivided to cover the various components. Chapter VIII is a quick résumé of the servicing guide and provides useful riding tips. The first chapter describes the various models, while the final chapter describes the activities of "The British Lambretta Owners' Association".

Some of the major overhaul operations have been left out, since these require the use of special tools and jigs which are held by Lambretta service stations.

I wish to thank Lambretta Concessionaires Ltd., Croydon, Surrey, for their valuable co-operation in supplying information and illustrations. Thanks are also due to Mr. C. P. Davidson of the publisher's editorial department; to my local Lambretta specialists, S.M.A. of Nice, and to Signor Emilio Bono of Ventimiglia for their cheerful help in preparing this book.

R. B.

Vence, France, 1960

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CHAPTER I

THE LAMBRETTA MODELS

"LAMBRETTA" to most people is synonymous with scooter, and it is with the Lambretta range of scooters that this book is concerned. There are two other Lambretta machines: the popular "48" Mo-Ped, a 48-c.c. motorised bicycle, and the "Triporteur", a three-wheeled chassis marrying the larger Lambretta engine and front-wheel assembly to a conventional frame with a differential rear axle; but with these we are not here concerned.

Of the first model scooter, the type A, only three or four are to be found in the whole of England; and of the succeeding type B, such a very small number were sold on the British market that the As and the Bs do not warrant further mention. Next came the C and LC models, which were the first to be sold extensively in England, and which, therefore, deserve detailed description.

C and LC Models

The Engine.—The power unit, based on the same principles as that in the model B, is a high-efficiency two-stroke of 52×58 mm., 123 c.c. It has a dome-topped deflectorless piston in light alloy like the cylinder-head, which has a side-located sparking-plug. The cylinder barrel is of cast iron.

Like all Lambrettas, the engine in the models C and LC forms a unit with the transmission case, all the working parts being enclosed. On the end of the transmission case, and spring-mounted, is a block containing the reducing gear and axle of the rear wheel. Drive is transmitted by a bevel gear operating on the connecting

shaft of the spring-mounted block. This is linked to the bottom of the transmission case by a suspension unit in which two springs of different dimensions are under compression.

The engine crankshaft works at right angles to the line of the machine and drives the clutch by a bevel gear. Clutch and gearbox operate in line with the machine, and the gearbox drives the rear bevel gear by a small shock-absorbing torsion bar or cardan shaft.

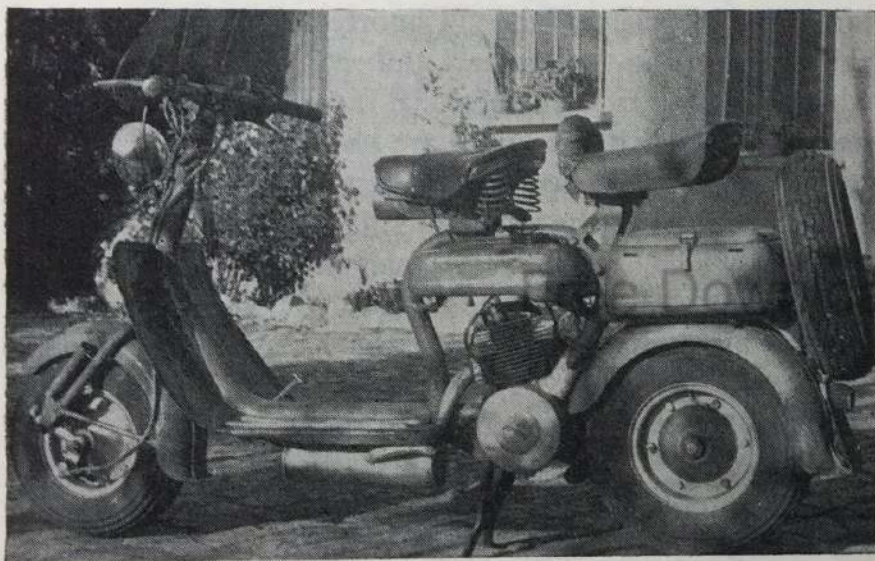


FIG. 1.—MODEL C.

The Clutch.—This is of the multiple-disc type, working in oil, with three friction discs of light alloy coated with a synthetic rubber and powdered cork compound. The three-speed gearbox is controlled by a twist-grip on the handlebar associated with the clutch lever.

The Frame.—The frame is a central beam made from a large-diameter tube, rising at the front to support the fork guide tube. At the rear it acts as a bearer for the engine crankcase. A smaller, curved tube is welded to the frame

forward of the engine and sweeps over the cylinder-head before curving down to join an arm cast with the rear end of the crankcase. This secondary tube carries the driver's and pillion seats, the fuel tank, the rear mudguard support, the tool locker and the spare wheel.

The shaped steel apron which forms a foot-rest and dashboard is bolted to outriggers from the central beam. On the C and D models this apron is narrow and reaches up to just above the bottom steering bearing; whereas on the LC and LD models it is much wider and extends close up to the handlebars. This is because the C and D models have no blower cooling, and too high an apron would, in certain circumstances, obstruct the free flow of cooling air.

The L prefix indicates that the machine is enclosed and blower cooled, as to the engine, by vanes on the flywheel; but in all basic respects the enclosed and unenclosed machines are of the same design.

The Front Suspension.—The front wheel is carried in two rocking arms, the longer part being to the rear and the oscillating pins being fixed in the fork ends. The forward parts of the arms compress two spiral springs enclosed in casings welded to the fork tubes, and the springs are arranged with their spirals unequal distances apart. The effect of this is that all the spirals are constantly in working positions throughout the full range of compression and extension. As with the rear suspension, that at the front has been considerably modified in the D series, which will be described later.

The Carburetter.—The model C has a Dell'Orto MA 16 carburetter. The throttle slide is operated by cable direct from the top of the mounting, and the instrument is a simplified one having a short atomiser tube without lateral holes. Choke and jet sizes are slightly smaller than in the model D, and there is no separate fuel filter, though the

intake to the float chamber contains a ring gauze screen. The needle height is variable by means of five grooves, the same as with most later models.

Silencer.—As the model C clutch-transmission block is fixed rigidly to the frame, the silencer is carried underneath the footboard on the near, or left, side, supported by a bracket with a 10-mm. bolt at the blind end and by the ring cylinder nut at the port end. The silencer is detachable for cleaning.

Rear Brake.—The rear brake is foot-controlled by a pedal on the right side of the footboard, as in all Lambrettas, and operates the rear shoes by rods. The front brake has the normal right-hand lever and works by the usual cable.

Electrical Equipment.—A Marelli, or Filso, flywheel magneto of 25-watt output mounted on the near-side crankshaft end, supplies the sparking-plug high-tension and alternating current through a lighting coil for the lamps and horn. In the C model the flywheel is enclosed by an aluminium cover, but in the model LC a crown fitted with vanes is mounted on the rotor. This, in conjunction with a shaped metal hood covering the engine, provides an air blast to cool the cylinder barrel and head.

Wheels and Tyres.—All models up to TV 175 and Li have 4-in. tyres on 8-in. wheels. Six studs hold the split rims together, three being ordinary nuts only unfastened when the tyre is deflated, and the remaining three being hooded nuts, which are released to detach the wheels from their mountings. Wheels and tyres are interchangeable, but the method of removing the front and rear wheels is different on all models.

The D and LD Series

Most popular of the LD series (the "L" indicating that the machine is enclosed and the engine cooled by

blower) is the 150 LD, which has a larger (148-c.c.) engine but is otherwise basically similar to the model C power unit. The most important differences are that the piston has three rings, the magneto generator is more powerful and the carburetter is of a slightly less simple design.

Front and Rear Suspension.—Though in principle resembling the front springing of the model C, the D series machines have a springing in which the front fork springs are enclosed in the forks themselves. The



FIG. 2.—MODEL 150 D—UNENCLOSED BUT BLOWER COOLED.

linkage and operating mechanism is also completely enclosed within small boxes integral with the bottom ends of the forks.

Rear-wheel suspension is by means of a long swinging arm which, in fact, consists of the complete engine-transmission unit, the whole assembly being pivoted on a robust pin incorporated in the frame. The moving points of the rear suspension are supported in rubber Silentbloc bushes needing neither attention nor lubrication. Directly behind the pivot pin and housed in a transverse forged lug,

integral with the frame, is a spring-steel torsion bar with splined ends. The splines on the offside engage with internal splines in the extended boss of the lug, and those on the nearside are similarly gripped in the boss of an arm pivoted on a bronze bush in the other end of the lug.

The arm extends upwards to form a yoke in which a small link with caged roller bearings at each end connects to a similar mounting on the crankcase casting immediately behind the cylinder. There are two hardened steel pins to complete this knuckle joint.

When the rear wheel is unloaded (as with the machine on its stand), the entire engine-transmission unit butts against a rubber buffer on the frame upright, and the torsion bar is designed to hold it in this position. There is, in fact, a $\frac{5}{16}$ -in. tension released when the hardened steel pins are removed from the knuckle joint, so that these pins cannot be replaced without the tension being re-established by a special tool. On the road, the movements of the rear wheel are thus checked in each direction by the torsion bar, and the levers reduce the bar angle in calculated proportion to the increase of load, such as when a pillion passenger is carried. A hydraulic damper is fitted which gives a still greater increase in springing comfort.

Brakes.—Rear brake shoes and linings are interchangeable on all models. Rear wheel and hub is removed complete to get at the brakes, the six rim-holding nuts being left in place. The central nut of the rear hub can be taken off by a special spanner, it being necessary on some machines first to remove an 8-mm. central locking-screw which has a left-hand thread and therefore unscrews clockwise. When the hub nut is away, a block of wood should be placed against the wheel rim at the offside and the wheel jarred lightly in two or three positions with a 2-lb. hammer to free the hub from its taper fit on the axle.

The front brakes are smaller and narrower than the rear. Whereas to get the front wheel out the two large domed spindle nuts are slackened, if one wants to reach the brakes only, the offside spindle nut should be loosened and then an open-ended 19-mm. spanner should be used to release the nut against the brake back-plate. This makes it possible, when the wheel is taken out of the forks, for the brake-plate, complete with shoes, to be removed without difficulty. On both wheels the plastic brake linings are bonded to the shoes and are not adversely affected by oil.

Any oil getting on the linings is burned to form a black carbon deposit by braking action, and the efficiency of the brakes must be periodically restored by lightly rubbing off this coating with glass-paper. Because of the special linings and their method of mounting, Lambretta replacements should always be used. The rear brakes are cable-operated by pedal, and the cable is adjustable.

Electrical Equipment.—A flywheel magneto with lighting and H.T. coils is used on all Lambrettas, and this on the standard D machine is 28 watts, a 40-watt generator being used on machines fitted with a self-starter. The model D has an external 6-volt H.T. coil mounted on the frame, of similar type to that used in a car. Either Marelli or Filso magnetos are used, and while the H.T. coils are interchangeable, the actual magneto parts are not.

Timing is particularly easy to verify on either instrument, as will be described in detail later in this book; the flywheel rim in most cases has transverse lines marked upon it, one corresponding with T.D.C. position and the other with the opening of the contact points.

Another refinement to be found on these models is automatic ignition advance effected by a small bob-weight under spring control on the flywheel. The Filso magneto has two bob-weights, and the resetting of the timing is a little more complicated.

Some "pinking" is normal on all Lambrettas, and should merely be taken as an indication that the engine is working at maximum efficiency. If it becomes excessive there are various means of reducing it which will be discussed later. A point needing special attention is the sparking-plug, which uses rather a small gap. This, for efficient operation, should be rechecked frequently, and it



FIG. 3.—EARLY MODEL LD.

is most important to make sure that a plug of the correct heat range is chosen.

On machines with no battery, excellent lighting is nevertheless given, but two points need to be remembered. The first is, that bulb consumption must balance the output from the lighting coil; and the second, that if a smaller bulb than usual is fitted to give good headlamp output at low speed, excessive engine revs must be avoided, or the smaller bulb will burn out.

Cables.—On D models all cables can be removed without dismantling either the front cowling, containing the

headlamp, or the front legshield. Thus the rider contemplating a long tour can fit spare cables both to the clutch and to the front brakes to safeguard against failure. These are the cables which have the hardest work to do, that on the throttle control being lightly loaded and the gear cable, or cables, being so robust that failure is unlikely during the life of the machine.

Kick-starter.—Early 150-c.c. machines have a kick-starter mechanism very similar to that of the 125-c.c. model. Three bevel gears transmit the motion at right angles to the engine; one on the crankshaft, one on the clutch unit and a third forming part of the kick-starter unit. Various small faults can develop through the bevels being too deeply meshed, and paper gaskets between the kick-starter housing and the crankcase must be correctly replaced if the unit is dismantled. Oil leakage past the screw beneath the kick-starter pedal sometimes occurs from the gearbox if the rubber-ring oil-seal becomes inefficient.

The Clutch.—Three steel plates interleaved with three plates lined with a bonded rubber-cork mixture form the clutch assembly, pressure being maintained by six springs. The 150-c.c. clutch unit has thicker plates and stronger springs than the 125-c.c. model, and if a sidecar is used still stronger springs are available. The pressure of the springs is, of course, relieved by pulling up the clutch lever, and free motion is provided by adjusting two lock-nuts on the thrust rod within the large brass acorn nut at the forward end of the clutch casing. There is also an adjuster to regulate the amount of slack in the cable.

As the clutch runs in oil, it is important to empty, flush and refill the gearbox, which supplies this oil, at least each summer and winter, otherwise the clutch plates may stick together and cause grating when bottom gear is engaged from cold. Another important point is that the clutch

thrust race at the inner end of the rod is under considerable pressure while the clutch is held out. For this reason, the rider should never wait in traffic with the gear engaged and the clutch out, or the thrust race will be quickly damaged.

Gearbox.—The gearbox has three speeds (except on Li and TV models which have four) with a delicate but positive twist control on the left handlebar. On earlier Lambretta models a single heavy cable was used to give both a push and pull effect through a selector box immediately behind the kick-starter and below the carburettor air-cleaner. Later models have a twin control so that the gear selector is pulled rather than pushed in each direction. A plate on the front of the selector casing, retained by three countersunk screws, enables the cables to be adjusted at the point of contact.

The principle of gear engagement is that the selector arm within this box has a small spring-loaded roller which moves over a track in which three depressions are formed corresponding with the engagement of the three gears. If correctly adjusted, the roller will move smoothly along the track and in and out of each notch. Inexperienced riders sometimes find difficulty in locating the middle-gear position, and if this occurs on a secondhand machine which may have covered a considerable mileage, a new selector could be fitted by the service station so that the middle-gear position engages positively yet freely.

Self-starter Machines

Self-starters have been fitted, in conjunction with a battery and rectifier both of 6 and 12 volts, to the LD series models. The LDA machines fitted with the 150-c.c. engine in its recent and current forms have 12-volt equipment. There was an earlier 125-c.c. LD model identical with the 150-c.c. apart from the slightly smaller

engine size, to which the 6-volt battery-generator lighting and starting equipment has been confined. However, generally speaking, self-starter models on the British market have been of the larger type, both as regards engine and battery power.

The separate self-starter motor is bolted to a variation of the clutch cover, and drives the engine through teeth



FIG. 4.—MODEL LDB 150.

on the outside of the clutch bell. There is a device equivalent to the sliding Bendix pinion, and the first movement of the self-starter lever on the handlebar pushes this free pinion along its shaft to engage with the teeth on the clutch. The arrangement of electric contacts delays the turning of the starter motor until the pinion teeth are at the point of engagement and ready to take up the drive.

All machines which have a 6-volt electric battery are fitted with a safety switch, on the front of the engine compartment, operated by a removable key. The battery is

earthed on the negative side, while the positive goes to this safety switch; and whenever the machine is left the switch must be turned off. Though the machine will run with the switch off, this must not be allowed to take place, since the battery is not then charged. With 12-volt self-starter machines, there is a normal ignition key by which current



FIG. 5.—MODEL LDB 150 MARK III.

is supplied to the H.T. coil and the voltage regulator. The safety switch is therefore not fitted, but as with a car, the ignition switch must be turned off when the engine is not running.

The flywheel magneto is of considerably more powerful type with stronger magnets. The 6-volt lighting coil gives 40 watts and in the 12-volt circuit two lighting coils

are used in series, giving an even greater output. The second coil replaces the ignition feed coil, and ignition is supplied entirely by the battery current, the wire from the H.T. coil to the generator leading only to the condenser and contact points.

Machines with no battery have a cut-out switch on the right handlebar which earths the H.T. current and stops the engine. The variations in light switches with both types of models are given later, in the electrical chapter.

LDB and LDA

To sum up the D series: the model D in 125-c.c. and 150-c.c. forms is not now generally on sale in this country, having been discontinued in favour of the more popular LDB with battery-operated parking lights, and the LDA, which is the same model with a 12-volt electrical circuit and the addition of the self-starter.

The unenclosed models, without the L prefix, are still popular on the Continent, and some have been produced without the side fairings but with blower cooling for the engine.* At the time of writing the LDA and LDB are the current models in England, plus the redesigned Li and TV machines, now briefly described.

The Li and TV Series

The Li models are made in 125-c.c. and 150-c.c. engine sizes and closely resemble the bigger TV 175, which has a capacity of 170 c.c. The most important change in these three models is that the engine, while still mounted in the central line of the frame, is horizontal instead of vertical. The construction of the clutch is similar to earlier models, but the gearbox has four speeds and is mounted directly alongside the rear wheel and driven from the clutch assembly by an endless non-adjustable chain. The gears are of a different type, enabling the rider to make clutchless

* See page 13.

changes. On the TV model the kick-starter operates at the rear end of the driving chain, but on the Li model it is mounted directly on the gearbox in line with the rear axle.

Cables.—All cables have screw adjusters on the ends farthest from the handlebar controls. End play on the



FIG. 6.—MODEL Li 150.

twist-grips can be taken up by dismantling the sleeve and inserting thin distance washers at either end. The throttle twist-grip is prevented from closing itself by an additional dished spring washer between the grip and the front brake-lever support.

Wheels and Tyres.—Smaller-section tyres (3.5 in.) are used, but of larger diameter (10 in.) and a slightly different mounting system is used.

Lubrication.—The engine is designed to work on one part of oil to twenty-five of petrol, or about 4 per cent,



FIG. 7.—MODEL TV 175 MARK I.



FIG. 8.—MODEL TV 175 MARK II.

resulting in more economy than previously. Additives are discouraged, and there is no occasion to use any but cheap grades of petrol.

Previous models have used engine oil in the gearbox and 140 S.A.E. heavy grades for the final drive; but the new models call for 90 grade in the gearbox and final drive.

Decarbonisation.—Principles of decarbonisation follow the lines laid down in the next chapter, but owing to the reduced oil mixture, the owner can expect his engine to go between 5,000 and 10,000 miles between full decarbonisations. Owing to its horizontal position, the engine must be detached from the suspension unit to bring the cylinder-head below the frame.

Electrical Equipment.—Again a Marelli or Filso flywheel magneto is used with an external H.T. coil. The flywheel, however, rotates clockwise and the contact points are different from previous models, neither are they interchangeable between the two makes. Emphasis is laid on the necessity that the contact points should separate at the correct timing position, rather than that any fixed figure of gap should be given.

A 6-volt battery is used on the Li 150 to feed the front and rear parking lights and the speedometer light, in the first switch position; and in the second position the lights are transferred direct to the alternator. In the zero and second positions of the switch the battery gets trickle charge, but in position 1 a resistance is cut out and the trickle is increased to a full charge. The battery and parking-light circuits are protected by a fuse.

The TV 175

This model, the most powerful yet produced by Lambretta, is capable of higher speeds and broadly resembles the Li series in appearance and general design. It has a comparatively small (28-watt) flywheel magneto and a

BRIEF SPECIFICATIONS

Model	Capacity (c.c.)	Bore × stroke (mm.)	Max. b.h.p.
C and LC	123	52 × 58	5
D and LD	123	52 × 58	5
	148	57 × 58	6
Li	123	52 × 58	6.5
	148	57 × 58	7.5
TV 175	170	60 × 60	8.6

Model	Sparking plug gap (in.)	Tyre pressure (lb./sq. in.)	Weight (lb.)
C and LC	0.015–0.018	F. 15–16 R. 22–24	C 154 LC 187
D and LD	0.015–0.020	F. 15–16 R. 22–24	D 165 LD 194
Li	0.015–0.020	F. 18 R. 28–34	230
TV 175	0.015–0.018	F. 18 R. 28–34	264

6-volt battery, and the rear suspension is controlled by a suspension unit having a large coil spring, of which the four top spirals are much more widely spaced than the lower ones, giving a very progressive control.

POWER-UNIT MAINTENANCE

ALL Lambretta engines are two-strokes, as has been previously mentioned, making use of a deflectorless dome-topped piston and a light-alloy cylinder-head. A little care in running-in and a strict observance of the correct petrol mixture (as discussed in the chapter on lubrication) will give the user a power unit of remarkable efficiency and high output. Apart from routine maintenance, as now detailed, there are two main essentials to trouble-free running: the use of the proper sparking-plug, kept clean and with the correct gap, and attention at, say, six-monthly intervals to the magneto points. These matters are dealt with elsewhere in this book.

After about 1,000 miles a certain loss of power will begin to be noticeable. This is due to the formation of carbon deposit in the exhaust port, and is easily put right in a few minutes. Because there is oil mixed with the petrol, carbon in a two-stroke engine tends particularly to build up in the exhaust port: it is, therefore, strongly recommended that at each thousand miles the owner should remove the silencer and clean out the exhaust port. This operation does not replace decarbonising, which should still be carried out (as detailed later) at about each 3,000 miles, but it does postpone the need for frequent stripping-down of the engine.

Cleaning the Exhaust Port

On "open" Lambrettas this can literally be done in a few minutes, and on the enclosed models the easily removable side and front fairings and engine-cowling add

but little complication to the work. First, then, remove all the coverings from the engine so as to expose the exhaust pipe and the silencer mounting.

A large ringed nut, with heavy fins, attaches the exhaust pipe to the port, and a large adjustable spanner will grip the ringed nut and unscrew it. It has an ordinary right-hand thread and can be tapped loose, if necessary, with a soft copper drift and a 2-lb. hammer. But the spanner method is better. If the nut proves unduly obstinate, paraffin shaken up with a little engine oil should be brushed round the thread and left for an hour or so. When the nut has been loosened, but not completely removed, the remaining silencer fastening should be completely undone, using a 10-mm. socket spanner and putting the nut and washer in a tin lid where it will not be lost. C models have the silencer held by a bracket at the blind end attached to the underside of the footboard, but enclosed models, in which the silencer is mounted transversely, have it secured to the underside of the crankcase. As soon as the under fastening is away, the ring nut at the port can be completely unscrewed and the silencer lifted off.

Checking the Silencer

At some time during this operation one should make sure that the silencer itself is not obstructing the flow of the gases. A rough and ready method of doing this is to expose the end of the pipe under the nut, wrap it with a piece of clean paper or rag to protect one's mouth, and simply blow hard through it. If no resistance is felt, it is fair to assume that the silencer is reasonably clear. If it seems obstructed, this will have a noticeable effect on engine performance due to back pressure, and one must clear it out. Before starting to do this, make sure that the flat asbestos washer inside the ring nut does not break up

and come away, and if this *has* happened, remember that it must be replaced before the silencer is put back.

Some Lambretta silencers can be taken apart by releasing the 10-mm. nut on the blind end (a grub-screw needs to be taken out first) and tapping the end plate off. The interior is generally extremely dirty, and many will prefer to leave it in one piece and fill it with a fairly strong caustic soda solution. Use, say, $\frac{1}{4}$ lb. of flake caustic soda added slowly to a quart of water and fill up the outlet pipe with some kind of plug—rag tightly packed in, or a

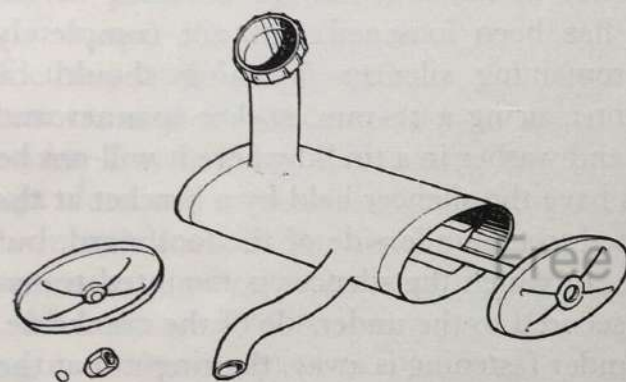


FIG. 9.—LD
SILENCER
DISMANTLED.

wooden bung. Then stand the silencer on end and fill it with the solution. Heat, if possible, or leave overnight, and eventually pour away the solution in a disused corner of the garden and flush the silencer very thoroughly with cold water.

If this method is used, it will be best to repaint the outside of the silencer with a rust inhibitor as the caustic eats away everything but the iron.

Cleaning the Port

Remove the sparking-plug from the engine and ease down the piston on the kick-starter until it can be felt, by a finger inside the exhaust port, to be at B.D.C. One

can then estimate by touch to what extent the oblong slot of the port is masked by carbon formation. The piston should be returned to a higher position and the carbon scraped away with an old, stout penknife or a short, broad-bladed screwdriver. A small mirror and a hand torch (unless the work can be done in bright sunlight) will be a help because the port is partly shadowed by the frame upright. The carbon will come away in scales and is of a light colour against the dark metal, and every so often a bicycle pump, or even a piece of rubber tubing blown through by the mouth, should be used to clear the bits out and prevent them getting into the engine. Great care should be taken not to jab or scratch the piston.

When all the carbon has been removed, lower the piston once more and carefully smooth off any projecting fragments that can be felt, blowing them out of the port as before. Clean up the port thoroughly with a little paraffin or petrol and do the same to the threads of the exhaust-pipe mounting.

Refitting the Silencer

In putting the silencer back, make certain not to get the ring nut cross threaded and ensure the asbestos washer is in position. It is best to screw on the ring two or three turns and then do the same with the 10-mm. bolt, working the silencer gently into position. Once both mountings are partly engaged, they can be screwed up firmly and there should be some kind of lock-washer underneath the head of the 10-mm. bolt. There is no need to try to tighten the ring nut to excess, which is why it is better to use a spanner on it than to hammer it home; and if the threads are smeared with graphite grease before the nut is tightened to the tension comfortably afforded by the spanner shank it will be that much easier to release next time.

Checking the Ignition

Because it is quickly and easily performed, the exhaust-port cleaning, as just described, should be one of two things to be done as soon as possible to a second-hand machine. The other work is to check over the ignition while the cowl and the shields are off the engine. This check covers three operations: the sparking-plug should be removed, cleaned and, if necessary, reset, as described in the chapter on ignition; the timing should be verified by the scribed marks on the flywheel, which will entail the separation of the contact-breaker points; and, finally, these should be examined closely in good light to see that they are not burned and pitted (if they are, make a note to have a new pair fitted as soon as possible).

If all the foregoing matters are in order, the machine should start instantly and run smoothly and economically. If it does not, then the carburetter may be at fault, and we should turn to the later chapter discussing this instrument. But the probability is that when the machine is tried on the road it will be much livelier, the exhaust note will be harder and crisper—which does not mean louder or more objectionable, since the Lambretta is basically a well-silenced machine.

DECARBONISATION

Eventually, at some mileage varying between 2,000 and 6,000 miles, depending on the model and the type of use it is getting, it will become necessary to remove the carbon from the interior of the engine, and not merely from the exhaust port. Decarbonisation, if tackled systematically, can be completed in an hour; but many people will like to start it one night and finish it off the next morning, leaving the caked, iron parts of the engine to soak overnight in a solution of caustic soda. This saves a great deal

of hard and dirty work, and sore fingers. Try to arrange when planning a "decoke", to run the petrol tank down to the reserve. Since the tank has to come off, it is both awkward and dangerous to have a gallon of fuel in it.

Dismantling the Engine

The various engine coverings must, of course, all be removed, and could well be put aside for a wash-over with warm, soapy water before they go back. The petrol tank is the first thing to take off, and this is held by a large ring nut round the filler-cap extension, and a 14-mm. acorn nut beneath the saddle. (This does not apply to the model C, on which the tank is held fore and aft by one 10-mm. and one 8-mm. bolt, one upright and the other transverse, so that it can be eased out as soon as the fuel pipe is disconnected and these two holding bolts are away.)

On later models there is also a petrol-tap extension to be disconnected by removing the spring clip holding it to the petrol tap body. A caution that applies to any Lambretta model is that before the tank can be withdrawn from the loop in the frame the sparking-plug must be taken out, because there is not enough room for the tank to clear it. Any effort at working the tank out past the sparking-plug will almost certainly result in a broken insulator.

Next, the carburetter must come off. It is held on the inlet stub on the transmission side by a pinch-ring having an 8-mm. clamping bolt. On LD and later models there is an aluminium tube extension on which the carburetter fits, and this extension will remain on the cylinder barrel when the carburetter is removed. Incidentally, if this tube is fitted, the caustic-soda method of decarbonisation must *not* be employed, since the aluminium will be destroyed.

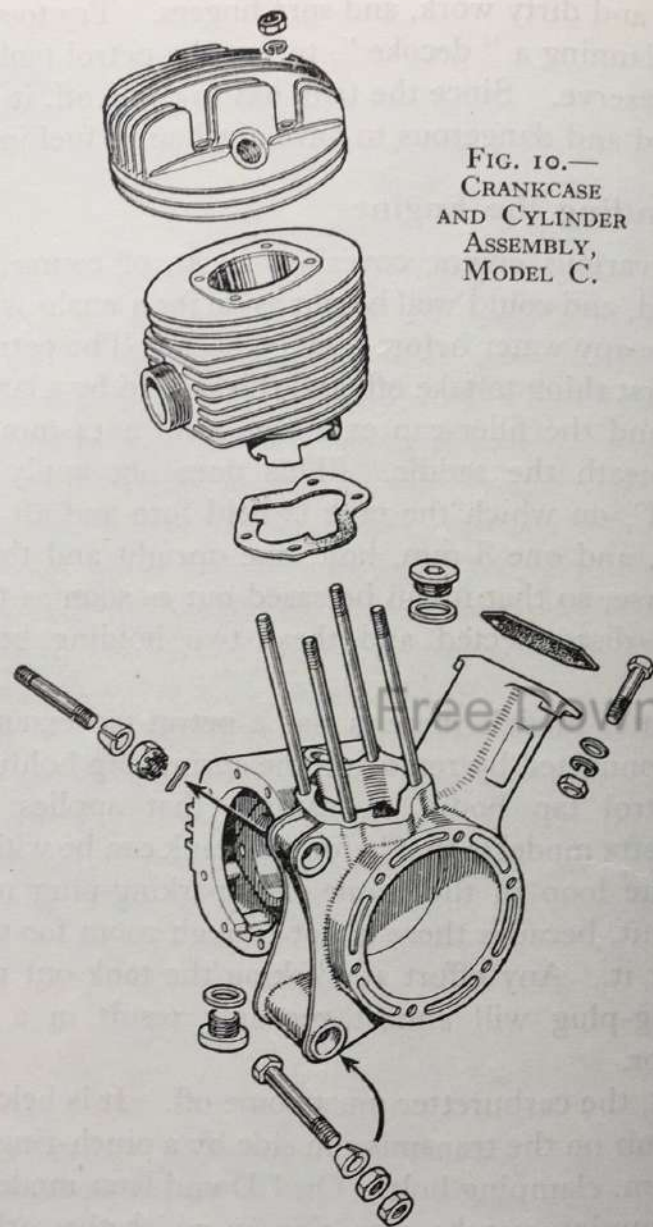


FIG. 10.—
CRANKCASE
AND CYLINDER
ASSEMBLY,
MODEL C.

Draw off the carburetter, complete with feed pipe, and disconnect it from the tank and throttle control. There is no need to dismantle it any more unless it is due for a clean, and it can be put out of harm's way on the footboard,

perhaps with a rubber band or length of string securing it to the frame upright.

The Cylinder-head

The aluminium cylinder-head is retained by four long studs running up from the crankcase and ending in nuts recessed into the cylinder-head fins. On 125-c.c. engines these are 10 mm., and 11 mm. on the larger engines. Some care is needed, both in loosening and tightening them, because there is little clearance for the socket spanner between the nuts and the rather brittle aluminium fins. It is, therefore, best to work slowly and to hold the spanner in position with the left hand while loosening the nut with the right. Initially, the four nuts should be unscrewed to the tops of their threads, but not actually taken off. The head is not likely to stick, and can probably be lifted without difficulty. If there does happen to be any adhesion, on no account prise it, even with a piece of wood, but give it a gentle bump or two with the heel of the hand. In extreme cases, press the thumb firmly over the plug hole and push smartly down on the kick-starter, when the cylinder-head will be lifted immediately.

Methodical Dismantling

In stripping and rebuilding any engine, every nut and washer should go back on the bolt, or stud, from which it was removed, and not on some other one. Therefore, when the cylinder-head nuts, each with its two associated washers, are removed, lay them out on a board in a square, or adopt some other means to ensure their correct replacement. Then the cylinder-head can be lifted off and taken to the work-bench. All 150-c.c. machines have an aluminium gasket between the head and the barrel which must be retained, and some 125-c.c. machines also have this gasket. It can be left out of the smaller engines,

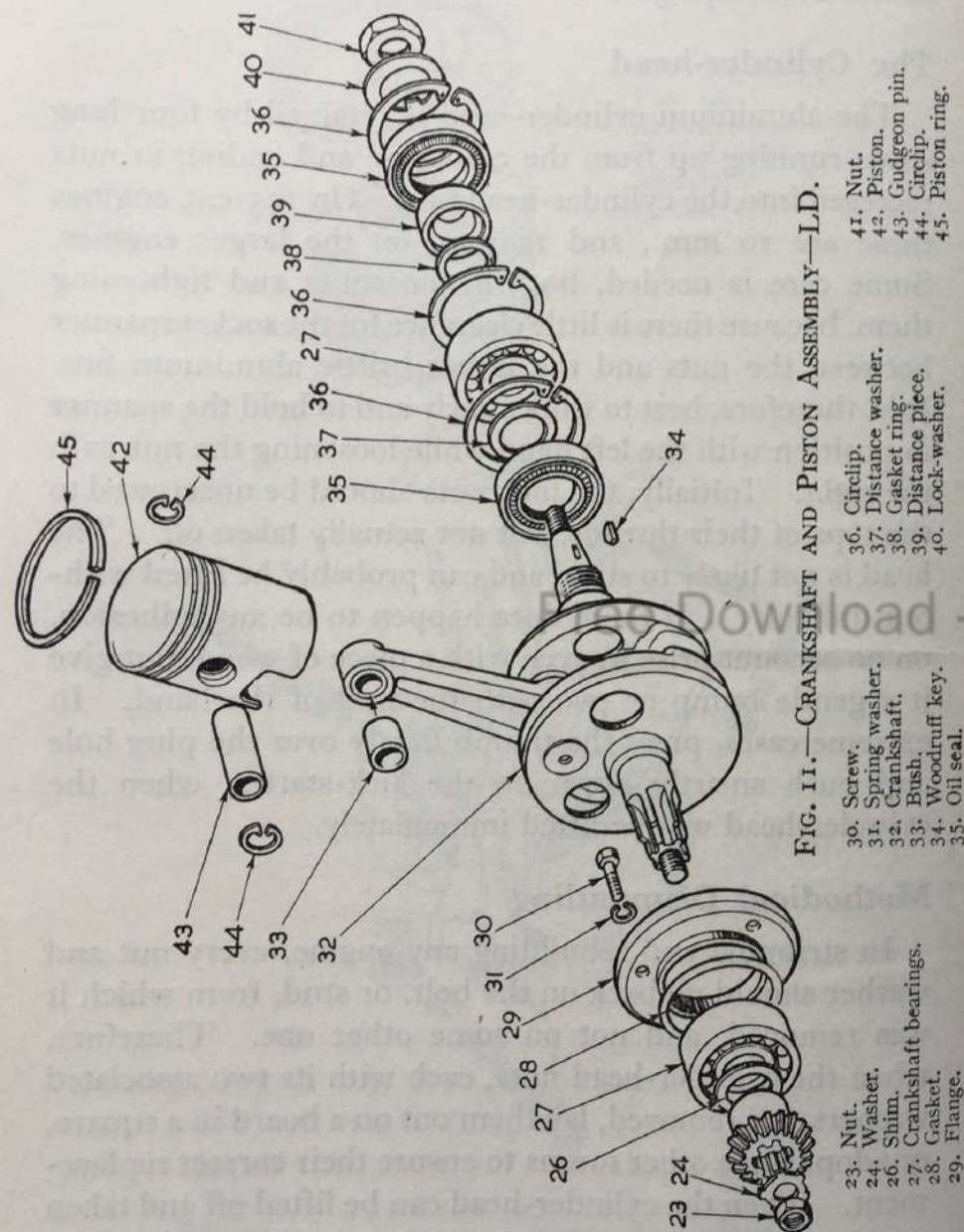


FIG. 11.—CRANKSHAFT AND PISTON ASSEMBLY—LD.

but rougher running and some extra pinking are to be expected.

The cylinder barrel will draw straight off; but being cast iron, this is both heavy and brittle. One should, therefore, make sure that one is literally in a position to lift it clear and lay it down safely, as, should it be dropped, it will almost certainly be damaged. Also in lifting it up, the piston and connecting-rod will fall down once they are out of the cylinder, another source of damage. The best thing to do, in spite of the small size of the engine, is to use two hands to draw the barrel off and to get an assistant to catch the piston and connecting-rod as they emerge.

Removing the Piston

A certain amount of carbon tends to form on the inside of the piston crown, and for this or other reasons it may be desirable to take the piston off. It is, in any case, extremely difficult to remove the rings without breaking them if the piston is still on the rod. The gudgeon pin is a floating fit in the piston, but is fairly tight in the connecting-rod small-end; and when the wire circlips have been removed—which can be done carefully with a pair of fine-nosed pliers—it is best to press out the gudgeon pin with a removing tool. It is possible to support the piston and tap out the pin with a hammer and soft drift, but the piston is brittle and the big-end bearing may be strained; no damage can be done with the proper tool.

Gudgeon-pin Sizes

Although the gudgeon pin is a push fit, there must not be any perceptible play either in the small end or between the pin and the piston. If it is found that the piston is a loose fit on the pin it would be well to fit an oversize pin, which will mean that both the piston and the small end will have to be reamed out. The small-end bush may

have to be renewed and must be reamed to give 0.0005 in. clearance. But though the piston should move freely on the pin, there should be no clearance. This sounds contradictory, but it must be observed.

Crankshaft Play

Quite a lot of side play on the connecting-rod—that is, at the big-end bearing—is permissible; but the maximum amount of up-and-down movement on the rod should not be allowed to exceed 0.002 in. If it does, a new crankshaft assembly must be fitted. As only those with 16-mm. small ends are now available, an earlier type of engine, having a 14-mm. gudgeon pin (small end) needing a new crankshaft assembly, will have to have a replacement piston, as pistons with the smaller mounting cannot be reamed out to take the larger.

Piston Replacement

When the piston has been removed it is important to mark it on the *inside* of the skirt by scratching an "F" here on the side that has to face to the front. This is because constant rubbing has mated the surfaces together and the piston is no longer perfectly round. When a new piston is fitted it can be put in either way round, but as it is fitted, so it must stay at each dismantling. There is also another caution. The ring stops should be fitted away from the exhaust port to avoid the possibility of the ring ends being trapped in the port and serious damage resulting. Equally, it is important to note, when fitting a new piston to an old cylinder, that the parts are matched up at the factory with plus, zero or minus signs, indicating that they are above, equal to or below nominal diameter. The cylinder wears to a far less extent than the piston, so that it is most important for the new piston to

have the same tolerance marking as will be found stamped on the top face of the cylinder.

Removing the Carbon

If the cylinder barrel has no aluminium carburetter stub it can be left to soak overnight immersed in an old bucket containing $\frac{1}{2}$ lb. of caustic soda dissolved in enough water to cover the barrel. Keep the hands out of the solution and lower the barrel into it by a strong iron wire loop. If boiled, every scrap of foreign matter (including, of course, paint and oil) will be removed from the metal within twenty minutes. It can be left overnight without boiling to get the same effect. When removed from the solution, the barrel must be thoroughly washed in cold water and the polished cylinder bore should be wiped dry and coated with oil to stop it rusting. Rust will also form all over the fins unless these, too, are quickly dried, not forgetting the transfer, inlet, and exhaust ports. When thoroughly dry, the fins and exterior, but not the ports, bore or the part that enters the crankcase, can be given a coating of heat-resisting cylinder black.

Cleaning the Cylinder-head

The aluminium cylinder-head must be treated with great care. Carbon can be softened by rubbing with a mixture of oil and paraffin, and scraped out with a piece of wood or solder; but on no account must anything hard be used, nor must the head be put in the caustic-soda bath. It is claimed to be permissible to heat an aluminium cylinder-head in one of the heavy household soapless detergents made for boiling, but the writer quotes this with the caution that he has not tried it. Judging by the brightly polished state of a household aluminium vessel in which detergent solution has been boiled, the method might work very well.

A brush with bristles of soft, fine brass, as sold for cleaning suède shoes, makes quite a good tool for cleaning up the combustion space in the cylinder-head, as does plenty of fine steel wool. In both cases, clean engine oil should be used as a rubbing medium and the work frequently washed off with petrol or paraffin and inspected. Get as high a polish as possible, inside and out, but do not use metal polish.

Cleaning the Piston

If the piston has satisfactorily passed examination and is to be replaced in the engine it should be cleaned with even greater care than that given to the cylinder-head. The rings are pegged, as will be immediately seen, to stop them rotating around the piston and getting the ends jammed in the ports. Cut three strips of stiff tin or aluminium foil, about $\frac{1}{4}$ in. wide, and ease them gently under the rings one at a time, moving them round till they are an equal distance apart. The rings may then be gently drawn off, in turn, towards the top of the piston. They can be snapped like a matchstick, hence the caution to handle them delicately. Scrape off all carbon from their inside edges and try not to get them mixed up so that they can be later replaced in their own grooves. The grooves themselves will contain an appreciable amount of carbon, and this too must be scraped out with a piece of wood.

In removing the carbon from the top of the piston, leave a little all round the edge on the bevelled part, as this helps to reform the essential oil seal. If the crown of the piston is discoloured or dull, rub it lightly with a small quantity of silver polish until it gleams, but wash it off with petrol afterwards. Put the lower ring on first, of course, and then the top one; and if a ring gets broken in this process,

take the pieces to a dealer for a replacement. Actually, if one ring breaks it is best to replace both.

If the piston is lightly marked with brown stains around the skirt, these are unimportant, but scores or scratches, unless very trivial, call for a new part. Press back the gudgeon pin in the same manner as that in which it was removed, first smearing it with oil, and see that the circlips go right into their grooves all the way round.

Rebuilding the Engine

Before starting to replace the cylinder barrel, make sure that the paper gasket which goes between the barrel and the crankcase is still in position and clean and intact. If it is torn, a new one must be fitted, and this has to be worked carefully over the four long holding studs and pressed into position round the crankcase opening with a thin even smear of grease to locate it.

To get the piston back successfully, it is best to have an assistant. One person can then stand astride the machine and lower the barrel down on to the studs while the other holds the piston and offers it to the bore. As there is no internal taper on the skirt of the barrel, the piston cannot be pushed straight in but must have the rings compressed before it can enter even the projecting part of the skirt. If the operator has to work single-handed he will find it best to borrow a ring-compressing tool, which consists simply of a spring band slipped on to the piston to cover and close in the rings, and which slides down the previously oiled piston as this is pushed up into the bore. A block of wood, on which the barrel can rest while one adjusts the position of the piston, is another necessity when reassembling the engine single-handed, but all these devices can be dispensed with if someone will hold the piston from the side and press the rings right into their grooves at the critical moment.

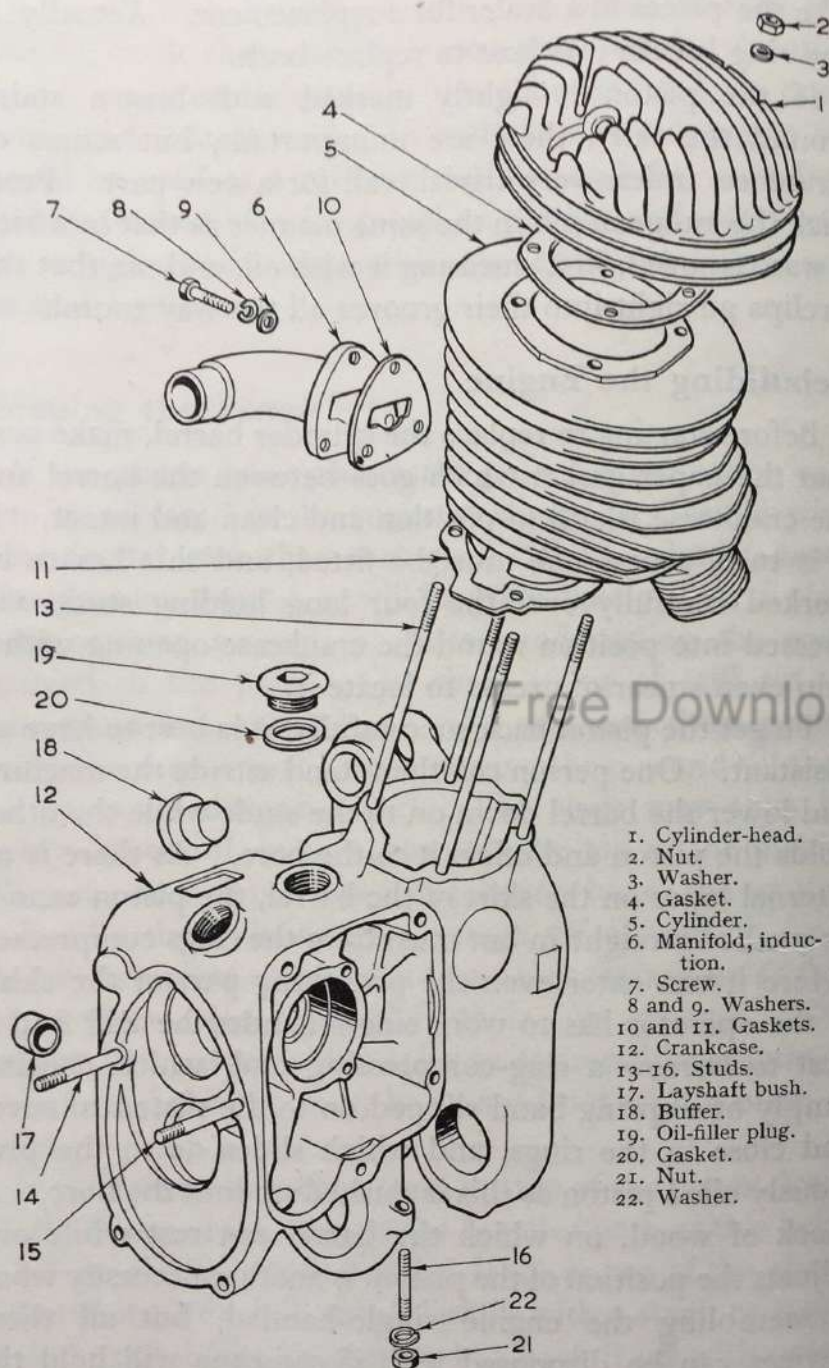


FIG. 12.—CRANKCASE AND CYLINDER ASSEMBLY, LD.

Oiling the Bore

As soon as the piston is safely inside, allow the barrel to slide right down on to the gasket, tapping gently with a block of soft wood or even slapping it with the gloved hand, to make sure that it goes down squarely. It is best to leave oiling the bore until this moment, because if one doses the piston and cylinder with oil the whole thing is liable to slip out of one's hands, with expensive consequences. Pour a teaspoonful of clean engine oil on the piston crown and then, with the kick-starter, move the piston up and down a couple of times to distribute the oil freely over the surface. This is very important; otherwise in the first minute or two of running there will not be sufficient lubrication inside the cylinder.

The 150-c.c. machines must have an aluminium gasket between the barrel and the head, and this again is best stuck down with a thin film of grease: every effort should be made to put the gasket back the same way up and the same way round as it came off. In replacing the aluminium head, see that the sparking-plug aperture is on the correct side—in the model C this is on the left of the engine, looking forward, but on the D and LD series machines the plug should be on the right, or carburetter, side. Incidentally, as already mentioned, most 125-c.c. engines do not have, or can dispense with, the aluminium gasket, and in this case it is important to make sure that the two surfaces bed down properly, preferably with a fine film of grease between them. Put back each nut and set of washers (two, first one plain and then one spring) on their own studs and run them down finger-tight; again, gently tap the assembly into position with a light wooden mallet or block. Go over the nuts with a 10- or 11-mm. socket spanner, depending on their size, working from corner to corner and tightening each not more than a quarter turn at

a time. This gradual tightening is extremely important, particularly if a new gasket has been fitted.

Finishing the Job

Put back the carburetter, petrol tank and sparking-plug, in that order, which is the easiest, assuming that all these components have had any attention they may need. As one frequently gets a drop or two of water in the petrol tank, it would be a good idea first to take out the petrol tap and drain the tank completely. Brush off the gauze filter on the petrol tap and replace this, taking care that the fibre washer is intact, and strain the fuel back into the tank through an old handkerchief and a funnel. It is best not to strip the carburetter unless one is reasonably expert or has at least read the carburetter chapter later in this book. Carburetters are best left well alone as long as they function correctly. Turn on the petrol, start the engine and run for a minute or so to warm it up: apply the socket spanner once more to the four holding nuts and tighten each a small fraction of a turn so that they all feel equally tight. After a day's run on the road, this operation should be repeated.

FURTHER DISMANTLING

If, at the stage when the engine is dismantled down to the crankcase, loose bearings or defective oil seals are suspected, the engine may be completely dismantled in a very short time, provided, of course, the proper tools are available.

Flywheel Magneto Removal

To strip the magneto, assuming that the fan has been removed from the flywheel, a lock-wrench is applied to the holes, the far end of the wrench resting on the ground, and the central lock-nut being then unscrewed with a socket

spanner. At this stage, if the operator is wearing a wrist-watch he should remove it to prevent it being magnetised.

A puller is then used to remove the rotor from the crankshaft pin. Next, disconnect the cables from the low- and high-tension terminals, replacing each screw in its hole to prevent loss. A locking-key will be found fixed in the end of the crankshaft, and this should be taken out and put in a safe place, after which the three screws (on the 125-c.c. D models there are six fixing screws) can be removed and the correct pulling tool used to take the stator plate off. It is most important to get the stator plate off as quickly as possible and to put it in its matching position on the rotor, otherwise the pole pieces will lose their magnetic characteristics. This is the same idea as when one puts a keeper-bar on a horse-shoe magnet. There is a punch tool with which the bearings and gaskets inside the stator flange are then taken out.

The Seeger Ring

This ring (a circlip) holds the oil seal in place, and damage to the outer gasket is avoided by striking with the punch on the opposite side only. This deals with the outer bearing.

Next remove the crank-throw locking bolt and take out the crank arm (early 125 models only). The needle-retaining washer follows, freeing the connecting-rod and the twenty-seven needle bearings between the rod and the throw. Be careful not to lose any of these needles, and afterwards remove the other washer from the throw. This completes dismantling from the magneto side, and before dealing with the gearbox, transmission and clutch, any surplus lubricant must be drained by unscrewing the plug underneath the gearbox. First place a small bowl to catch the oil.

The Kick-starter Case

Here, two groups have to be dismantled as follows: remove the five bolts fixing the kick-starter cover to the crankcase (special spanner) and loosen the two screws holding the bevel-pinion support so that this group can come away. These operations are necessary to dismantle the engine bevel gears and to drive out the clutch bearing. If the kick-starter group and the bevel-pinion support are to be overhauled, three pre-loading turns must be taken off the pedal-return spring, which is fixed to the locking-sleeve. The pedal is locked on the splined coupling by a screw with nut and washer, and when these are taken out the pedal can be withdrawn. For the bevel-pinion support, one must take out the spring ring on the shaft and then the washer and pinion. Next slide out the Seeger ring holding the bevel pinion in place and disconnect it from the support. Refer also to Chapter VII for further information.

Clutch Removal

There are again some detail variations between models, but the following general directions hold good. Unscrew the clutch-adjusting acorn nut and take the two lock-nuts and the round-headed bush off the clutch tie-rod. Disconnect the cable from the clutch-control lever and separate the rear-brake tie-rods from the return levers on the clutch cover. Five recessed screws fix the clutch cover to the crankcase, and after taking these out, the cover will come away from the crankcase. Two screws retain the outer cable-control support, which can be detached, and the inner and outer control levers are easily removed from the disconnected cover.

The Clutch Discs

These are dismantled by driving the clutch-control rod into the centre hole of the special extractor tool, after which, by screwing in a nut at the rod end, the spring assembly is compressed and the disc-retaining ring within

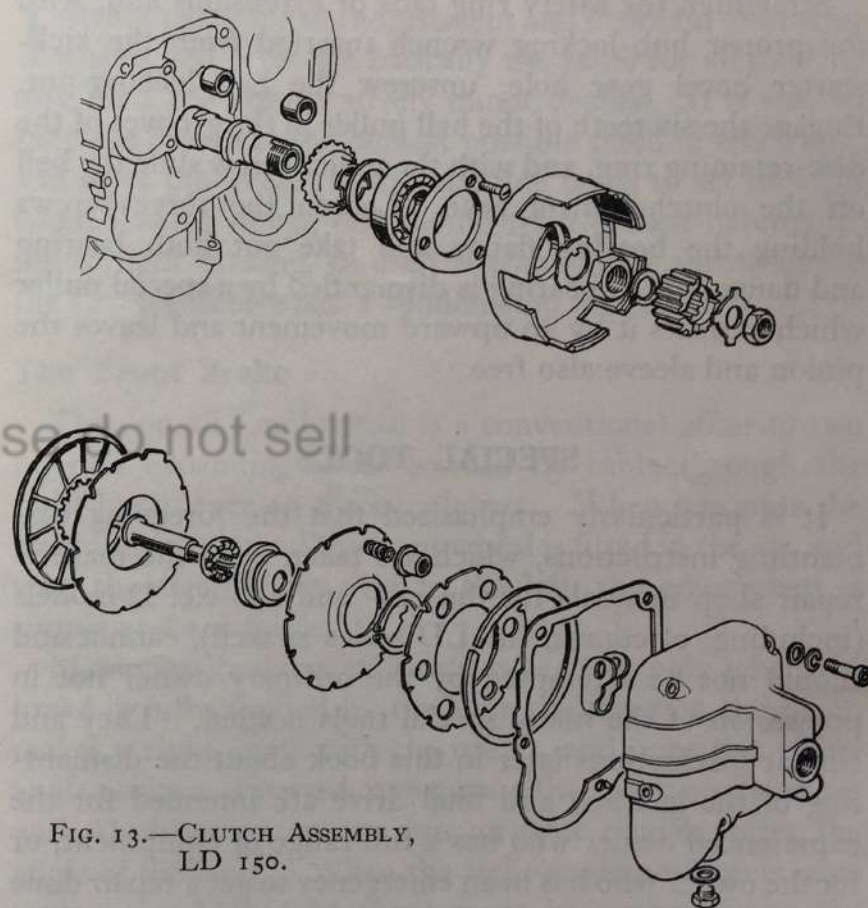


FIG. 13.—CLUTCH ASSEMBLY,
LD 150.

the inner groove of the bell is freed and can be driven out. After removing this ring, pull out the fork, which will extract the discs, cups and springs, forming a second group and still under compression. The puller should be left in position, if no further dismantling is wanted, because it is much simpler to reinstall with the puller in position.

Clutch Drum and Bearing

With the proper wrench inserted in the clutch-drum notches, loosen the lock-nut. Slide off the clutch drum, if necessary forcing a screwdriver between the clutch slotted drum and the bell.

Straighten the safety ring tabs or extensions and, with the proper hub-locking wrench inserted from the kick-starter bevel gear hole, unscrew the bell locking-nut. Engage the six teeth of the bell puller in the grooves of the disc-retaining ring, and with the puller screw slide the bell off the clutch-control gear. Loosen the three screws holding the bearing flange and take out both bearing and flange. The bearing is dismantled by a special puller which extracts it by an upward movement and leaves the pinion and sleeve also free.

SPECIAL TOOLS

It is particularly emphasised that the foregoing dismantling instructions, which are taken from the makers' repair shop manuals for the 125- and 150-c.c. D models (including, of course, the LD series as well), cannot and should not be attempted by the ordinary owner not in possession of the many special tools needed. They and similar instructions later in this book about the dismantling of the gearbox and final drive are intended for the experienced owner who has a full range of equipment, or for the owner who has in an emergency to get a repair done other than by a recognised Lambretta service station. The dismantling of the kick-starter and clutch assemblies is a necessary prelude to making the offside crankshaft bearing accessible and so enabling a new assembly to be fitted here.

CHAPTER III

BRAKES, WHEELS AND TYRES

INSTRUCTIONS for the adjustment and overhaul of brakes, wheels and tyres are basically the same for all models, save for a few comparatively minor details. It is easy to keep the brakes at the highest possible pitch of efficiency, and since the weight of the machine tends to act forward when slowing down, one should train oneself habitually, for all light braking, to use the front brake and to apply the two together when a sudden stop is needed.

The Front Brake

This, on all Lambrettas, is a conventional affair of two internal expanding shoes worked by cable through the right-hand lever on the handlebars. When one puts the machine on its stand the front wheel is lifted in the air, and with the steering set over to the left, the adjustment is simple and accessible.

Maximum braking efficiency is secured only when the brake is fully applied by the time the lever on the drum makes a right angle with the cable; and once this right-angle position is passed, one must either pack up the shoes with U-pieces or, as one can on later models, alter the angle of the lever. When the right-angle position is once again passed, the old shoes must be exchanged at the dealers for relined ones.

The cable on early models goes through a screw adjuster hooked into the brake lever and locked on the other side of it by a screw clamp. First adjustment, as with a new model or one that has recently had relined shoes fitted, is by releasing the lock-nut and unscrewing the adjuster until

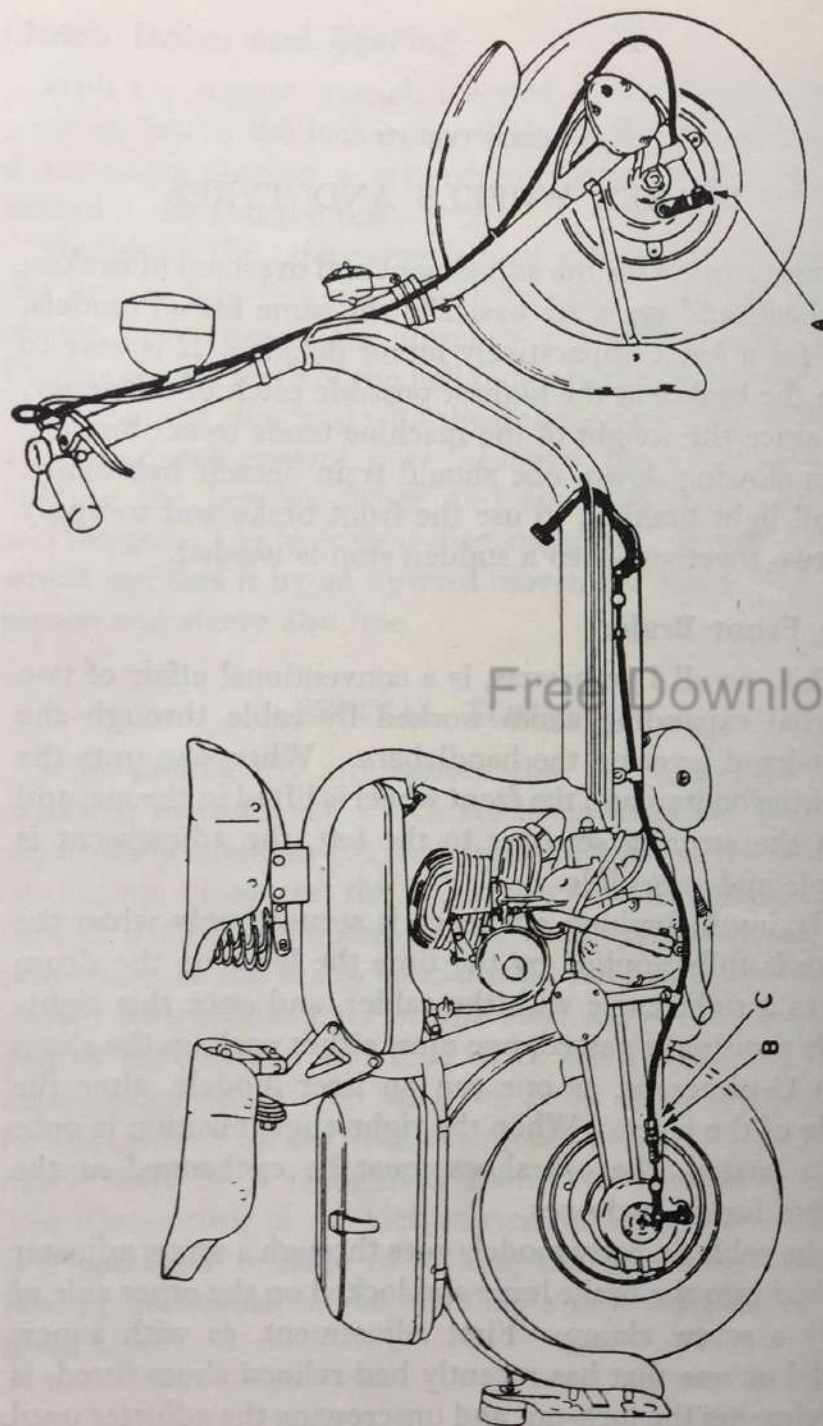


FIG. 14.—BRAKE LAYOUT ON D/LD 125.
A. Front-brake adjuster. B. and C. Rear-brake adjuster.

the wheel starts to bind, and then screwing back until it just spins freely again. Eventually this adjuster will be fully unscrewed, and then the cable must be shortened.

Altering the Screw Clamp

To shorten the effective length of the cable, either take up the slack on the adjuster at the handlebar lever or, if there is no adjuster here, put a screwdriver into the lever on the back-plate and with it apply the brake until the hooked-in adjuster can be slipped off the lever. Release the small nut and bolt securing the clamp on the cable, and slide this a small distance along until the slack has been taken up, retighten and refit to the brake lever. Make the necessary fine adjustment by unscrewing the adjuster. When satisfactory, tuck the free end of the cable out of the way in a loop—do not cut the excess length off or the wire will unravel. When this procedure results in the lever making an obtuse angle with the cable on full application of the brake, one of several further steps should be taken.

On later models the retaining nut can be unscrewed from the brake lever, which can then be lifted away and replaced at a more acute angle: but on the model C and other early machines this is not possible. It is therefore necessary to dismantle the brake.

Dismantling the Drum

With the wheel in the position indicated at the start of this chapter, release the cable and adjuster from the drum lever and, using the sparking-plug spanner, slacken off the large capped nut on the brake-drum side of the front spindle (leave the capped nut at the opposite end of the spindle untouched for the moment).

When the offside nut is quite slack apply an open-ended

spanner to the large hexagon nut, inside the front fork, which clamps the brake-plate in position on the spindle, and slacken this freely.

Now turn the wheel and release the capped nut on the other side, but do not remove either it or its fellow. In the ends of the forks the spindle passes through a thick, heavy washer let into a recess, and each of these should be prised carefully out so that the wheel will drop down out of the slots in the front-fork extremities. The wheel can now be lifted out completely.

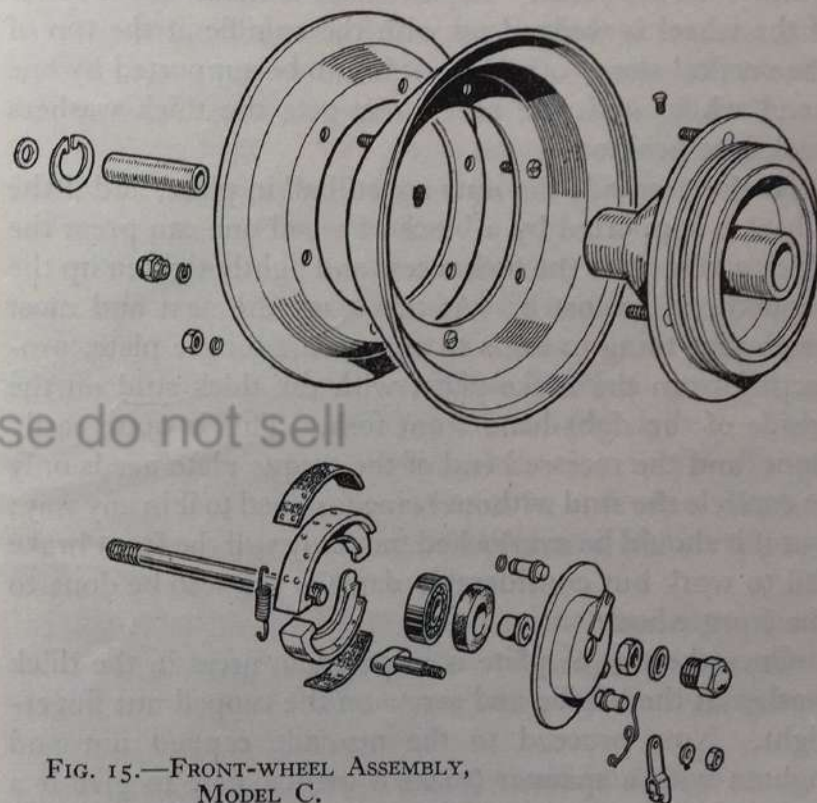
Taking off the Brake-plate

Lay the wheel on its side, brake-plate uppermost, take off the capped nut, the thick washer, the inner clamping nut which has been previously released and any associated washers. Try to do this without disturbing the position of the locking-nut at the other side of the hub; the free nut will probably come away if the threads are first brushed clean with a little paraffin. The brake-plate assembly can now be lifted off, and on the wheel itself nothing further need be dismantled unless, for example, the bearings are to receive attention.

If the linings are badly worn the simplest thing to do is to take the whole back-plate assembly to the Lambretta dealer and ask him to fit relined shoes. No attempt should be made to fit new linings, because these, in the Lambretta, are riveted and bonded to the shoes by using a special process. If there still seems to be plenty of lining left, the black glazed surface should be carefully removed by brushing over with a stiff brush and benzine or carbon tetrachloride. Petrol can be used, but it is not so effective. When the black, glazed discoloration begins to come away, the lining surface should be lightly rubbed with coarse abrasive paper—but take great care not to rub

away part of the lining itself, or braking operation will be impaired.

When the linings have been restored to good condition, ask the dealer to cut and bend up a pair of plates in mild steel or phosphor-bronze which can be slipped over the ends of the shoes, between them and the operating cam, so



as to pack out the shoes by an amount to bring the linings as close as possible to the drum. The thickness of these packing pieces depends on the amount of wear, and they should be made in the shape of a flattened U, so that they slide tightly over the brake shoes being, if necessary, lightly tapped into position. They should, of course, be the same width as the ends of the shoes.

Reassembling the Brake and Wheel

Replace the brake-plate, the spindle washer (if one was fitted) and the inner spindle nut, running this down finger-tight. Make sure that the adjusted or renewed linings do not foul the drum and lift the wheel back into position in the forks. Replacement is made much easier if the wheel is wedged up with the spindle at the top of the vertical slots; otherwise it has to be supported by one hand while, with the other, one gets the thick washers back into position.

At the near side the nuts are still all in place, and if the wheel is supported by a block of wood one can press the thick washer into the fork recess and lightly tighten up the capped nut against it. At this stage the next and most important thing to do is to engage the torque plate, projecting from the brake-plate, with the thick stud on the inside of the right-hand front fork. This is quite easily done, and the recessed end of the torque plate needs only to encircle the stud without being fastened to it in any way; but if it should be overlooked, not only will the front brake fail to work but considerable damage will also be done to the front wheel.

Once the torque plate is in position, press in the thick washer at the offside and screw on the capped nut finger-tight. Now proceed to the nearside capped nut and tighten with a spanner (make a mental note to give it a final tightening with its fellow at the end of the job).

It is now possible to apply the open-ended spanner to the brake-plate lock-nut at the offside, and to tighten this securely. It is, in any case, locked by the pressure of the outer capped nut, and this, and its fellow, need to be very well fastened. Therefore, when these capped nuts have been tightened with the hands on the spanner as far as this can be comfortably done, give them a little

extra fraction of a turn by foot pressure on the spanner shank.

Connect up the brake cable to the lever and adjust until the wheel will spin freely but the brake bites with the first movement of the handlebar lever.

The Wheel Bearings

When the wheel has been dismantled it may be desirable to take out and regrease the two non-adjustable ball-races on which the wheel runs. It is much better to do this about once a year than to pump grease through the nipple on the hub, since surplus lubricant will always find its way on to the brake linings.

The spindle can be withdrawn, still with one of the inner nuts in position, and washed off in paraffin; and the ball-races, which are a push fit, can generally be pulled out without difficulty. Immerse them in clean paraffin or petrol and work them till they are completely free of old grease and dirt. It is most unlikely that they will ever need renewal in the life of the machine, and when they are clean make sure that they spin freely and let them drain until they are quite dry.

Smear them with a heavy grease of the viscosity recommended for hubs, and work this well into the races; wash out the inside of the hub with paraffin, dry thoroughly and press the races back into place.

Before rebuilding the brakes, it would be a good idea to run a finger round the inside of the drum in case there are any ridges or scores. This, again, is unlikely; but if the brake is very fierce, or if it grabs badly, the drums may need skimming—a job for the dealer's workshop.

Care of the Tyres and Tubes

The split-rim wheels make tyre care particularly easy, and no levers are needed. To separate the wheels from

the hubs, it is only necessary to undo the three capped nuts around the inside of the rim, leaving the three plain nuts temporarily in position.

If the tyre has been punctured it will be already deflated: before the three plain nuts are taken off the tyre must be deflated by the valve if the air is not already out of it.

Unscrew the Schrader cap from the valve and procure a valve-core key, or else have one of the Schrader caps with a key top, so that the valve cores can be unscrewed. Then

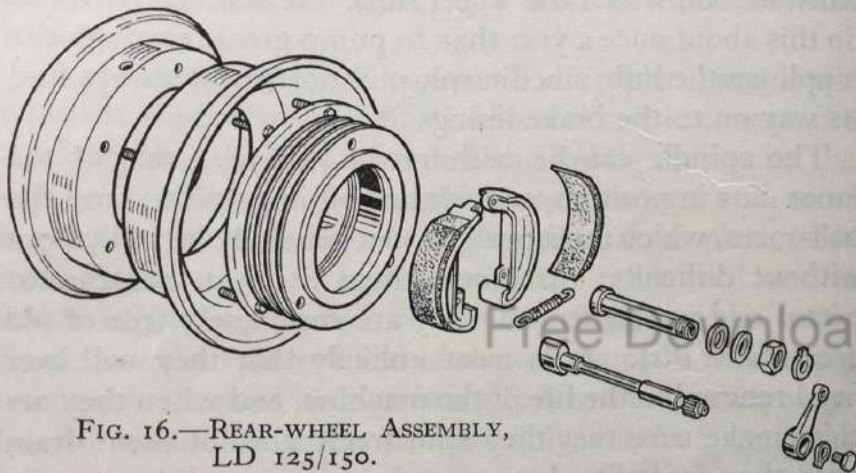


FIG. 16.—REAR-WHEEL ASSEMBLY,
LD 125/150.

unscrew the small brass ring which keeps the tyre valve in position on the rim, putting all these valve parts in a tin lid somewhere safe.

Unscrew the three plain nuts and put them safely aside—note that all six nuts have spring washers under them. Pull the split rims apart and ease the tyre valve out of its hole. At this stage, should the tyre be punctured, find on the outer cover the point at which the nail or flint has penetrated and pull the inner tube out of the cover at this point, marking the hole in the tube with indelible pencil to save hunting for it later. Then pull the tube completely away and mend the puncture in the usual manner: roughen the area round the hole with sand-paper, lightly

smear rubber solution on the roughened part, allow to dry completely, then take the backing off a patch and dab it down firmly over the hole. If the patch puckers, wet it with petrol, strip it off and start again with a new one.

Before putting the tube back, make sure the nail or flint has been pulled out of the cover, or of course the tube will be punctured again. Shake out any dust and dirt from the inside of the cover, rub a light coating of french chalk over the tube and tuck it back into the cover. Replace the valve core and partly inflate the tube so that it takes up its proper place inside the cover.

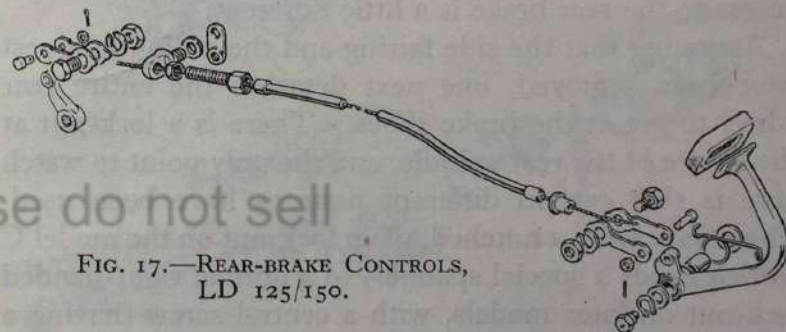


FIG. 17.—REAR-BRAKE CONTROLS,
LD 125/150.

Rust on the Rims

The rims are of steel and, therefore, liable to rust, internally as well as externally. If there are traces of rust on the inside of the rim, rub it off with steel wool and paraffin, clean and dry the metal, and apply a rust-inhibitor or a coating of zinc-base paint. This, of course, must be allowed to dry for at least twenty-four hours before the tyre is reassembled. If a coating of inhibitor or paint is being used, obviously one would coat both surfaces of both rims and leave all to dry for a day.

The two rims, the tyre and the three plain nuts and washers are then reassembled, the latter finger-tight, after which the tyre is partially inflated and the valve nut is

replaced. Check that the cover and rim are concentric with each other. Finally, tighten the three nuts securely and inflate the tyre to 22 lb./sq. in., if it is to be changed with the spare. It is a good idea to keep tyres changed round regularly, thus distributing the wear over all three instead of having the spare unused on its mounting (it tends to perish when not in use).

The Rear Wheel

All the foregoing remarks also apply basically to the rear wheel with its brake and tyre. The method of gaining access to the rear brake is a little different.

Assuming that the side fairing and the pillion foot-rest have been removed, one next detaches the entire rear wheel to get at the brake shoes. There is a lock-nut at the centre of the rear spindle, and the only point to watch here is that certain different patterns have been used. These vary from a notched, plain lock-nut on the model C (which needs a special spanner) to a normal right-handed lock-nut on later models, with a central screw (having a left-hand thread) which must be taken out first. When the nut, of whatever pattern, is off the spindle the wheel can be drawn off with a puller or tapped free by light blows on the tyre at the opposite side, while turning the wheel slowly round. As it comes away, it will probably bring with it the key, sunk in a slot in the spindle, which is an added safety factor.

The brake drum comes away with the wheel, and the brake-plate with attached shoes remains integral with the transmission case. The shoes have, therefore, to be cleaned, renewed or fitted with U-pads while still in position. They are wider and larger in diameter than the front shoes, but are bonded to the linings in the same way as described earlier.

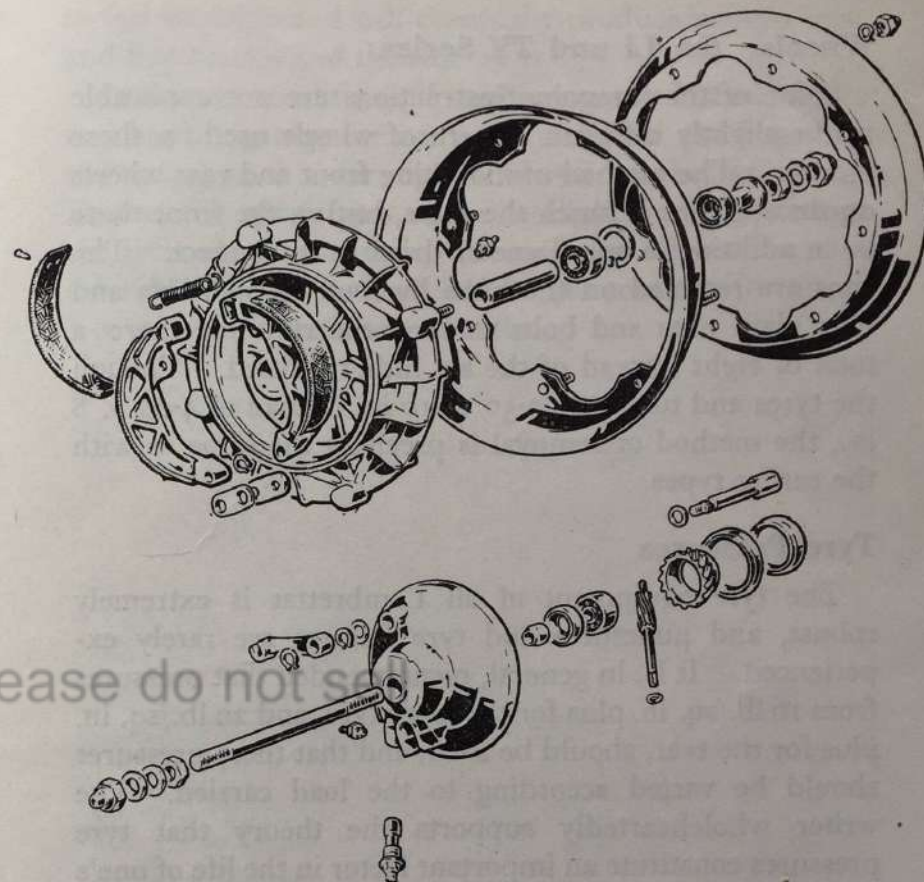


FIG. 18.—FRONT-WHEEL ASSEMBLY, Li MODEL.

The wheel is removed from the hub by the same arrangement of three capped nuts and the tyre is retained by the split rims and three plain nuts, like the front wheel. On self-starter models of the 125 LD the battery is mounted alongside and above the hub-line of the rear wheel, on the near side; in this case the wheel cannot be removed at the hub or the rim until the battery is loosened in its clamp, lifted on to the floorboard and swung outwards through ninety degrees, which gives room to manoeuvre the wheel.

Wheels: the Li and TV Series

Some of the foregoing instructions are not applicable to the slightly different pattern of wheels used on these models. The method of mounting front and rear wheels on the spindles is much the same, but on the front there is, in addition, a speedometer drive to disconnect. The rims are retained on the hubs by four capped nuts and four plain nuts and bolts to keep the rims together: a total of eight instead of the six hitherto fitted. Though the tyres and tubes are 3.50×10 in. instead of 4.00×8 in., the method of removal is precisely the same as with the earlier types.

Tyre Pressures

The tyre equipment of all Lambrettas is extremely robust, and punctures and tyre failures are rarely experienced. It is, in general, recommended that pressures from 16 lb./sq. in. plus for the front tyre, and 20 lb./sq. in. plus for the rear, should be used, and that these pressures should be varied according to the load carried. The writer wholeheartedly supports the theory that tyre pressures constitute an important factor in the life of one's wheels, but it is best not to become too much of a *fetishist* and be for ever taking the pressures of one's tyres. Provided they are kept neither iron-hard nor sponge-soft, they are robust enough to yield good mileage in a wide range of pressures, and the individual rider will wisely keep his tyres inflated to an extent which gives a comfortable ride without instability.

Too much or too little inflation of the front tyre has a pronounced effect on the steering. If the tyre is too hard it will bounce and tend to lose its shoulders so that the tread remains prominent at the centre but is scraped off at the sides. A tyre run too soft will cause the machine

to feel unstable and will eventually produce uneven wear and fine cracking of the side walls.

In average conditions, if one finds a comfortable figure and has the garage correct both tyres (and not forgetting the spare) once a fortnight this will not be far wrong. Protect the spare from strong sunlight or heat; change the tyres about once every three months, or less if a considerable mileage is done, and do not continue to run on a cover after it has worn smooth.

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CHAPTER IV

ELECTRICAL EQUIPMENT

ELECTRICAL energy for ignition, lighting and the horn is provided on all Lambretta machines by a flywheel magneto of either Marelli or Filso make. Those unfamiliar with the flywheel magneto will find it useful to know that this instrument combines two quite separate functions in one assembly. There is a fixed H.T. coil and contact-breaker around which the magnets on the flywheel rim rotate at crankshaft speed, so producing one spark per revolution of the engine, which, of course, suits the two-stroke. At the same time, the magnets generate in a L.T. coil, or coils, an alternating current which supplies light to the lamps and enables the horn to function, both as long as the engine is running. This is the arrangement on the C and early D series, and electricity for the various L.T. purposes is supplied from the 28 watts output of which the generator is capable.

With the introduction of the self-starter model LDA, the output has been increased by raising the voltage of the generator to 12, and a Bendix-type self-starter is fitted to the clutch casing.

The Ignition Coil

Most early models have the secondary coil wound on top of the primary, both being contained within the magneto framework. Later models have a separate ignition coil of car type mounted in the loop of the frame.

Flywheel Magneto Servicing

Several thousand miles will be covered before either make of magneto needs professional attention. The contact-breaker points will eventually need cleaning and adjustment, and may be fouled if too much oil is applied

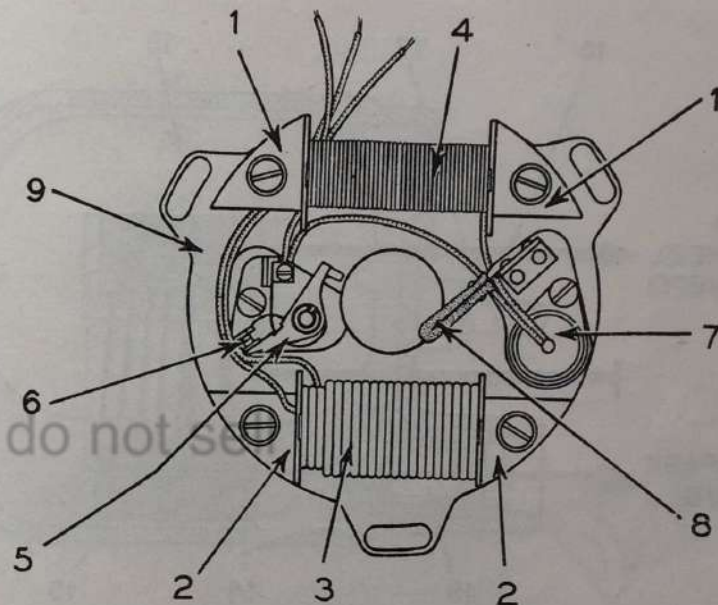


FIG. 19.—STATOR PLATE ON LD 125 (MARELLI).

- | | |
|--------------------------------------|---------------------------|
| 1. Ignition coil—green wire lead. | 6. Contact points. |
| 2. Lighting coil—red and blue wires. | 7. Condenser. |
| 3. Lighting-coil winding. | 8. Felt oiling-pad. |
| 4. High-tension winding. | 9. Adjustable back-plate. |
| 5. Rocker arm. | |

to the felt pad which supplies lubricant to the rotating cam. It is possible to adjust and clean the points without removing the flywheel, but their complete renewal makes such removal necessary. For those who have the aptitude and tools, a description of stripping the magneto was given in an earlier chapter as part of instructions for engine dismantling.

A word of warning there sounded must be repeated here.

Given the locking tool, box spanner and drawer, it is fairly simple to remove the flywheel; but if it is separated from the back-plate for any length of time it is liable to become de-magnetised. Naturally, the dealer's workshop contains a "keeper" apparatus to retain the flywheel magnetism so that the back-plate does not have to be removed as well.

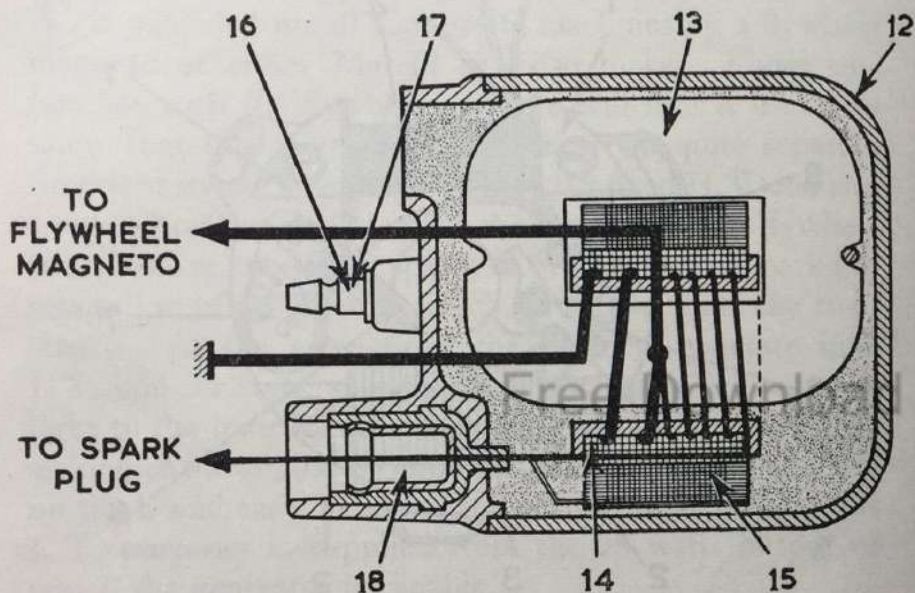


FIG. 20.—IGNITION COIL, LD 150.

- | | |
|----------------------|---------------------------------|
| 12. Insulated box. | 15. Secondary winding. |
| 13. Lamination set. | 16 and 17. L.T. terminals. |
| 14. Primary winding. | 18. Sparking-plug cable socket. |

Checking the Ignition

If a secondhand Lambretta has been bought it is possible to carry out three valuable checking operations without doing more than taking the cover off the magneto. These operations are: to verify the engine timing; to clean the contact-breaker points and adjust them; and to make sure that the sparking-plug works efficiently. Before any of these jobs are tackled the reader is invited to

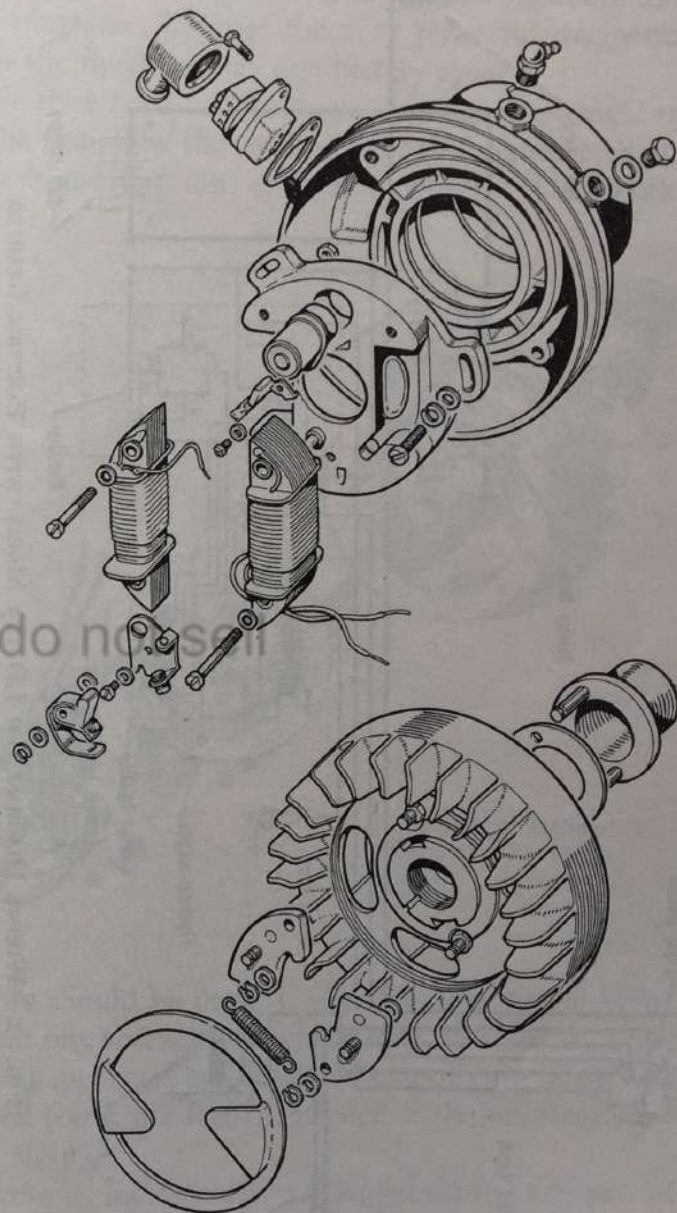


FIG. 21.—FILSO FLYWHEEL MAGNETO, LD 125/150.

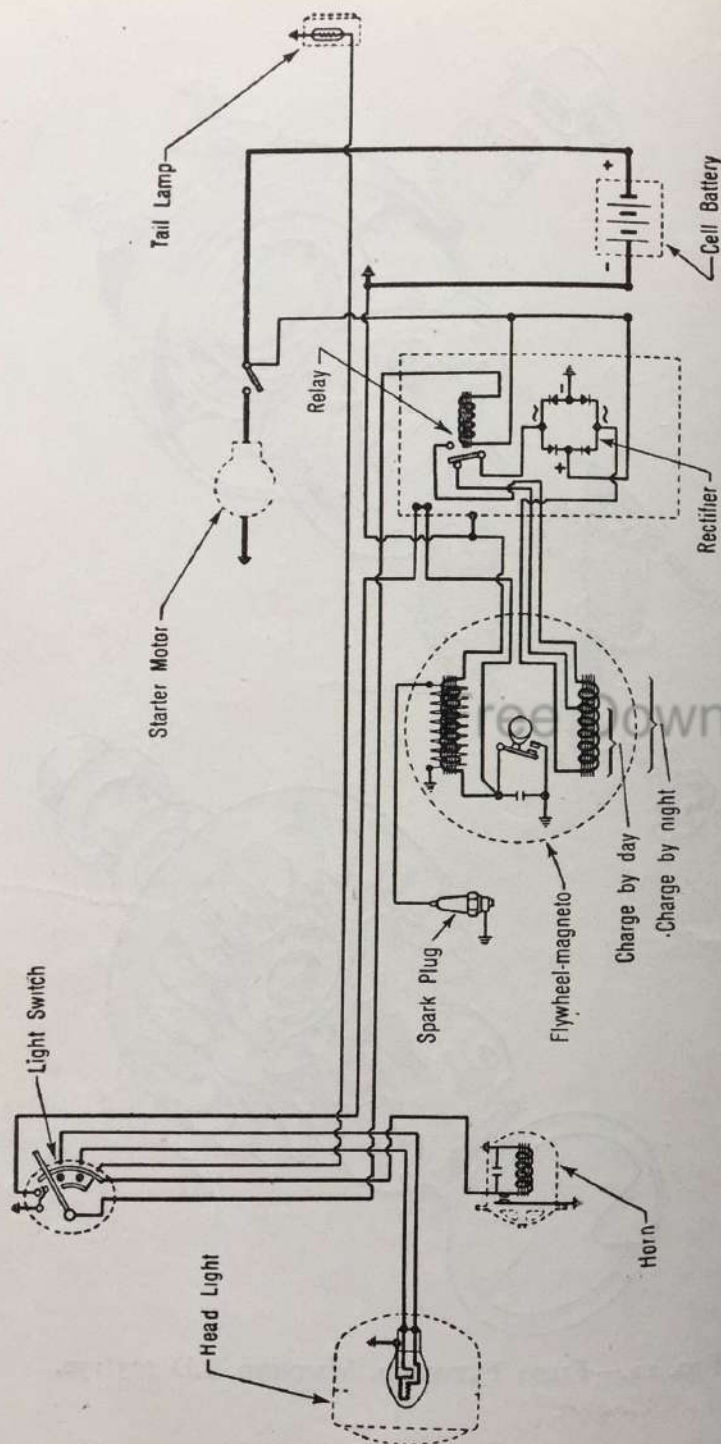


FIG. 22.—WIRING DIAGRAM FOR LD 125 MODEL WITH ELECTRIC STARTER.

remove his wrist-watch even if the makers claim that it is non-magnetic, because the very powerful magnetic field from the flywheel may completely upset it.

We then need to take down the engine fairings, at least on the near side, the cowling over the engine itself and the cast-aluminium fan on the flywheel. The work that

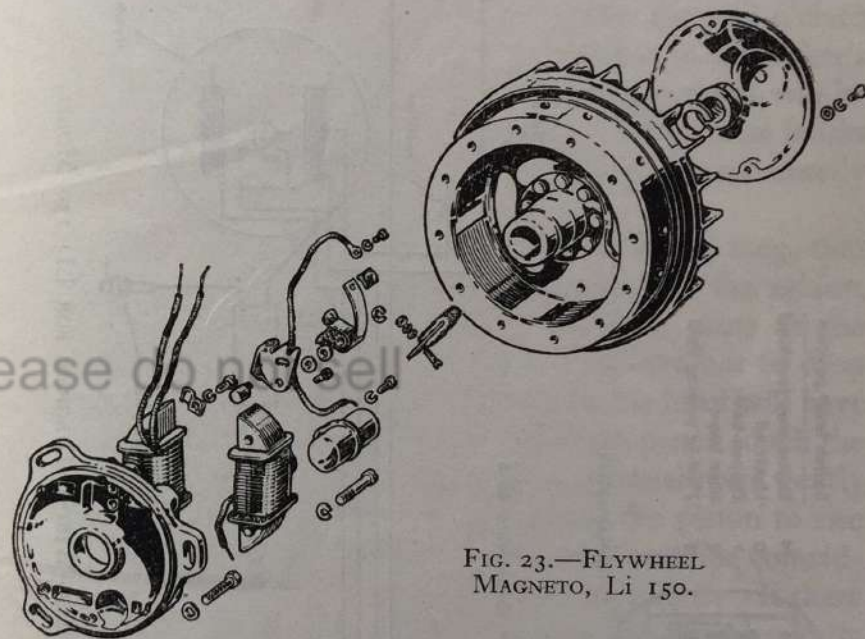


FIG. 23.—FLYWHEEL MAGNETO, Li 150.

follows should be done, if possible, in a strong light, and at least one screwdriver with a long, thin blade, a piece of tissue-paper and a jeweller's magnifying glass will be needed (omit the last-mentioned if the operator has very good sight).

There is, incidentally, no danger during any part of the following operation of receiving an electric shock. It is, indeed, true that a considerable shock results if one touches the terminal of the sparking-plug while the engine

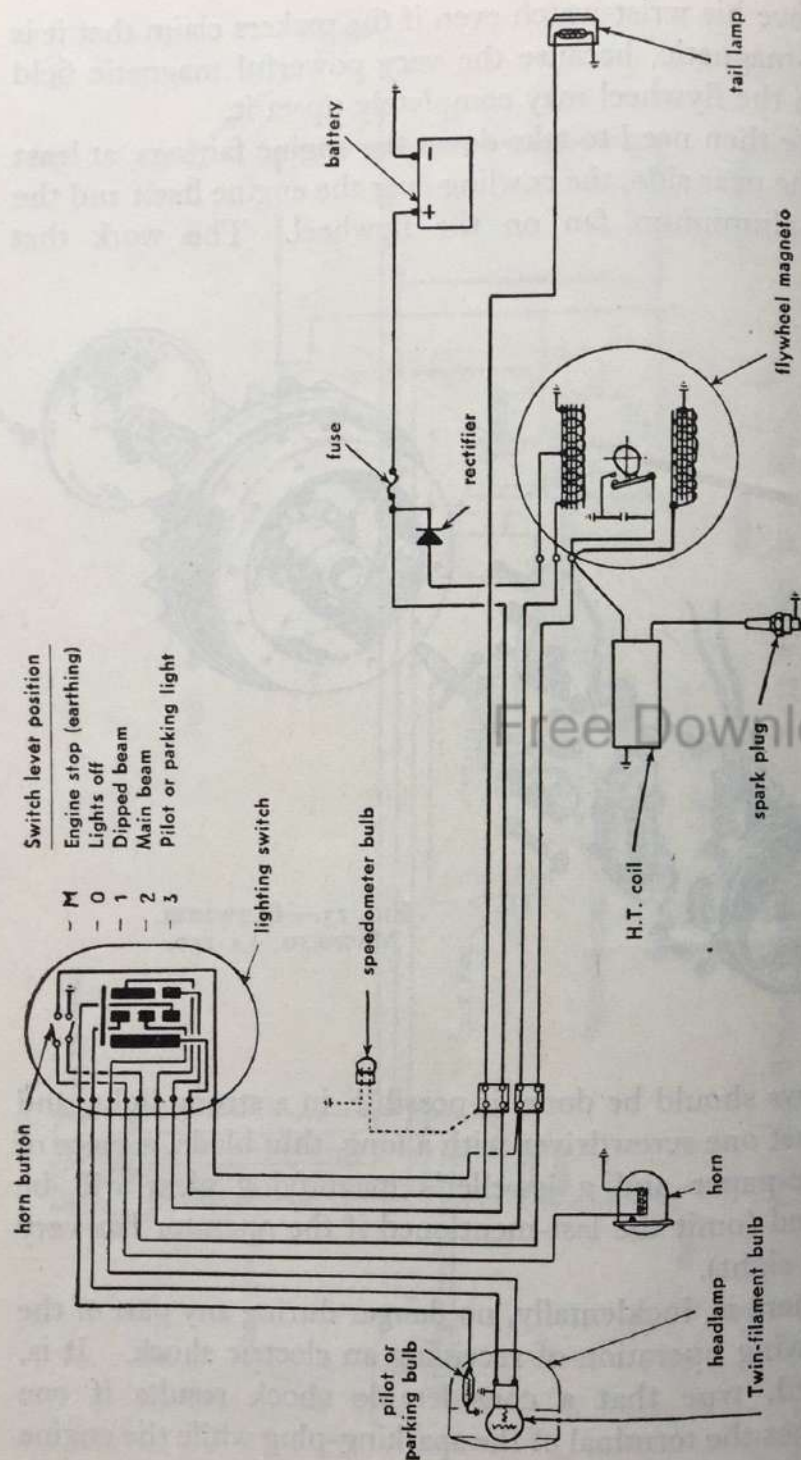


FIG. 24.—WIRING DIAGRAM FOR LD 150 MODEL.

is running, but in the present case the engine will be at rest and no current generated.

Checking the Timing

Take out the sparking-plug so that the engine can be turned over by movement of the flywheel. On the back-plate of the magneto an arrow will be found pointing towards the flywheel, at approximately the one-o'clock position. On the flywheel rim, in addition to the maker's type and model markings, two transverse grooves will be found, something over an inch apart. When these marks have been observed, set the right-hand groove exactly opposite the arrow point.

Now insert a lead pencil or some convenient long, thin object, in the sparking-plug hole, pressing it flat against the lower side so that it lies in the same plane as the sparking-plug when fitted. Take great care not to drop the pencil down inside the cylinder, or the head will have to come off. One will feel the end of the pencil touch the top of the piston and by moving the flywheel mark gently from side to side of the arrow, causing the piston to rise and fall a little, one can verify with arrow and line coinciding that the piston is indeed precisely at T.D.C. If there is more than the minutest variation the timing is basically incorrect and the position of the flywheel must be put right—probably a job for the dealer.

Separation of the Points

But if all is well, remove the pencil from the cylinder-head and look through the lower left-hand slot in the flywheel, where the points will be seen on the back-plate. Cut a strip of tissue-paper half the size of a piece of cigarette paper (such a paper would do very well, incidentally) and with a thin screwdriver gently lift the points

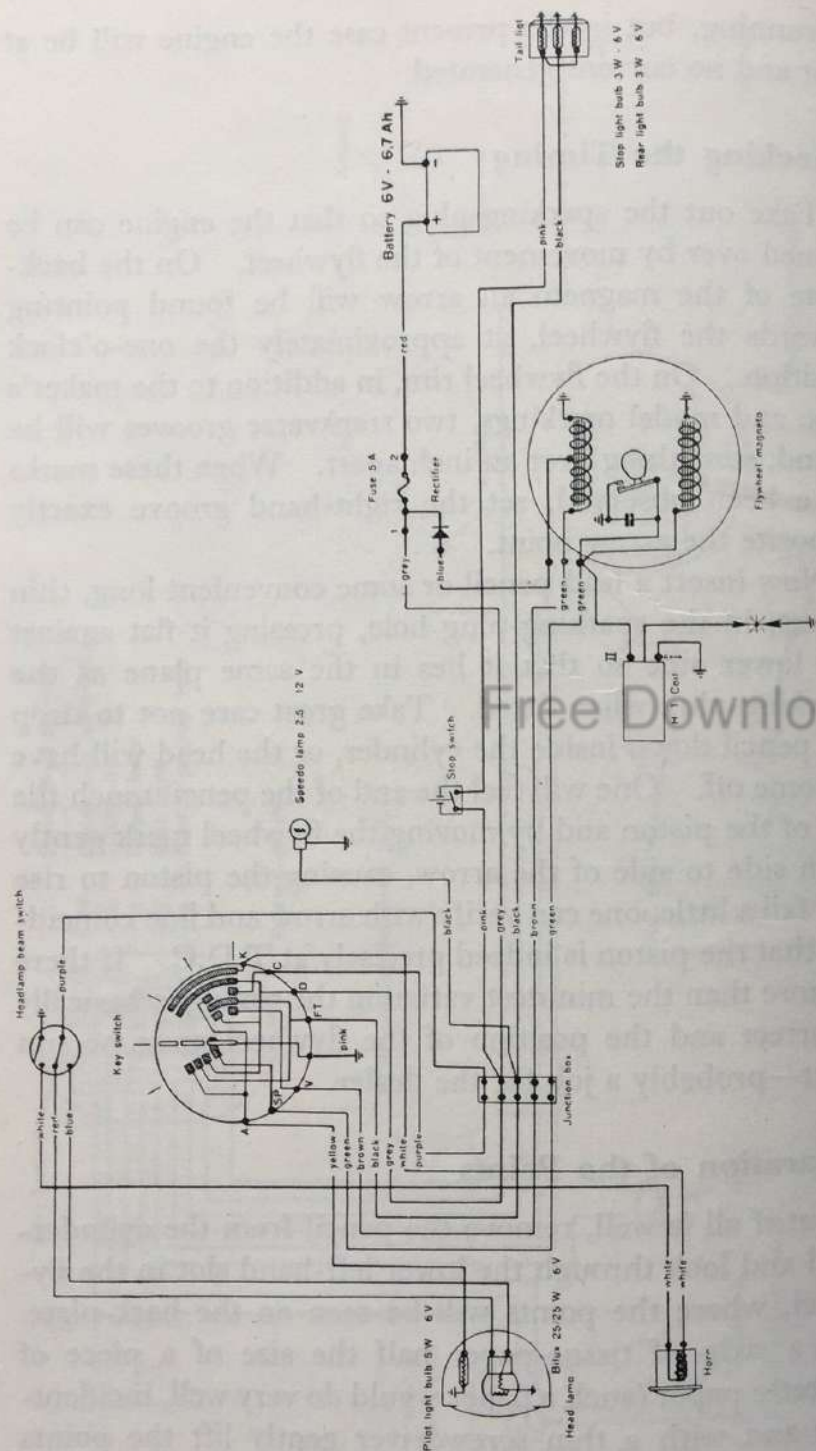


FIG. 25.—WIRING DIAGRAM FOR EARLY TV 175.

apart sufficiently to slip the end of the tissue between them. On releasing the moving point, the paper will be gripped.

Turn the flywheel slowly clockwise until the second, or left-hand, transverse line approaches the arrow, at the same time maintaining a delicate pull on the strip of tissue. As the second line comes opposite the arrow, the tissue should slip out, but if there is any doubt about it, repeat the process. This indicates that the points are opening at exactly the right moment. There is no need to bother about the so-called gap, because it is not the gap that matters so much as the moment of separation; and if this occurs at the right instant the full-open position of the points will be between 0.012 and 0.015 in. at maximum.

If the points break too soon the gap will open too wide, and the net result will be that the ignition is too far advanced. Apart from causing roughness and detonation in the engine, this can have another disconcerting effect, causing the engine occasionally to run backwards. There is absolutely no advantage to be gained from increasing the amount of advance—on the contrary, the engine's performance will be largely spoiled.

Adjusting the Points

On different models, and with the different makes of magneto, adjustment of the spark gap is by various means. Early Marellis have on the fixed point base-plate, two screws side by side, one with a large head and the other much smaller. To make the adjustment, the large-headed screw is loosened with a long, wide-bladed screwdriver; then an equally long, but narrower, screwdriver is applied to the small screw head, which is eccentrically mounted. A fraction of a turn, one way or the other, varies the gap, and this might be necessary on any secondhand machine even if the previous owner has not been experimenting with the ignition timing. The gap does not remain

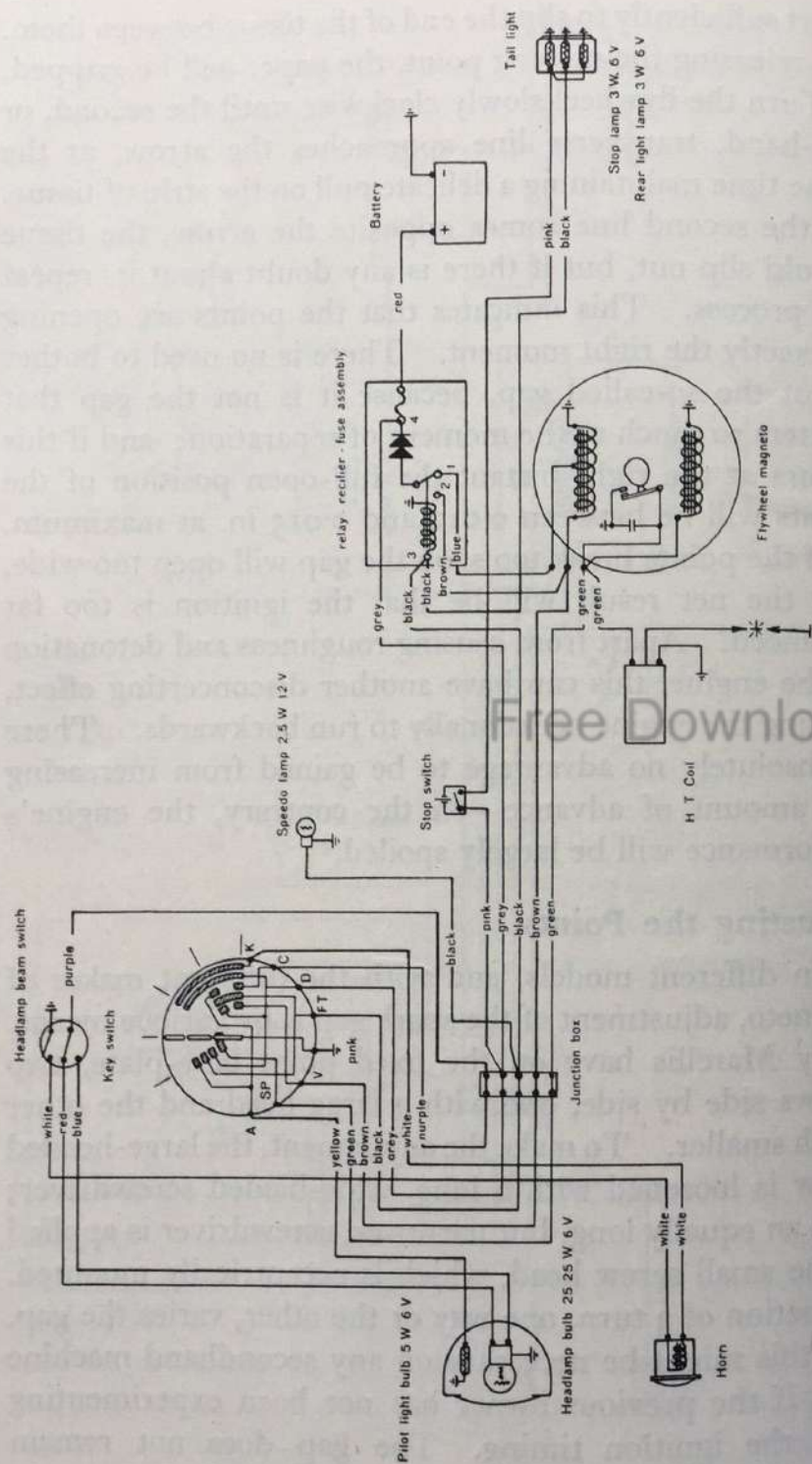


FIG. 26.—WIRING DIAGRAM FOR LATER TV 175.

constant but tends to close, because the fibre cam-follower itself gradually wears down.

On some other models the locking-screw, next to the contact points, is slackened enough for the fixed-point base-plate to be gently levered with the screwdriver till the points have been closed or opened as the case may be to a sufficient extent. In retightening the lock-screw one is always apt to disturb the setting, and this tendency is minimised by initially loosening it, by trial and error, only just enough to enable the adjustment to be made. The job in any case calls for considerable patience.

Worn or Pitted Points

If the points are in a poor state they can be improved by rubbing down until they are flat and clean and meet squarely. Lever them gently apart and insert between them a thin, flat blade with abrasive surfaces on both sides. The best thing to use is a proper magneto file, obtainable quite cheaply from any good accessory store; ordinary thin files are utterly useless to cut away the tungsten points. A reasonably efficient substitute is a nail-file, wrapped in a fold of 00 emery cloth so that two flat cutting surfaces are presented, but one must expect to work longer with this. Rub the cutting tool slowly to and fro until the points are satisfactory, getting rid of emery and tungsten dust every few minutes.

There is a limit to the extent to which the points can be filed. They start their life as two circular stubs of tungsten electrically welded each to a steel base, and to begin with there is as much tungsten as steel. When the tungsten is no more than a wafer on top of the steel the points must be discarded. The nuisance of this is that though they cost little, they definitely cannot be fitted without removing the flywheel. Their condition has a vital bearing on engine performance, and too thin points,

even after trueing and lapping, will cause an irritating intermittent miss when the engine is pulling hard.

Spark Failures

How does one search for the point of failure when, though petrol is getting into the engine and the plug is apparently sound, there is no response from repeated spinning of the power unit? One starts with the magneto. From the current side of the contact points a wire goes to the insulated end of the condenser, the body of which is earthed. Condensers are particularly reliable and need not normally be considered when tracing a fault; but ignition trouble can arise from any one or more of several places.

The sparking-plug should be removed (which will make the engine easy to spin) and if there is an insulated cover on the H.T. lead this should also be removed, or a twist of copper wire can be pushed into the clip so that it extends outside the insulator. Hold the lead by the cover, or by the covering of the H.T. wire, and place the twist of wire or the "business end" rather less than $\frac{1}{4}$ in. from the engine cylinder. Spin the engine by pressing down with the free hand on the kick-starter. A good spark should jump the under- $\frac{1}{4}$ -in. gap every time the engine turns round. Don't in any circumstances spin the engine without sparking the wire to some metal part of the engine—if the spark is *lost* the H.T. insulation of the internal or external coil may be punctured and rendered useless.

No Spark

If there is no spark at all, even after the gap has been reduced to a hair's breadth, either one of two things has happened—possibly, but rarely, both together: a broken connection or a short-circuit to earth. The only con-

nections which might be faulty are those of the two green wires at the terminal block on the magneto near the exhaust pipe, the two wires to the H.T. coil and the earth of the second green wire from the H.T. coil. If these prove to be sound, the green wire at the terminal block where this is joined by the green wire to the H.T. coil should be disconnected.

The first wire is the ignition cut-out to the handlebar switch; it could be worn through and touching the frame, or it could have become short-circuited in the switch. If either is the case, disconnecting it and once again testing with the under- $\frac{1}{4}$ -in. gap at the H.T. cable will result in a spark. If it is only a weak spark the contact points probably need cleaning and resetting.

Resistance Tests

Where suitable test equipment is available the resistance across the open contacts should be measured and read $\frac{1}{2}$ –1 ohm; when the contacts are closed no deflection from zero resistance reading should be perceptible. If still there is no result, the H.T. coil must be tested.

For this one needs a 6-volt battery, a condenser of about 0.25 microfarads and a pair of contacts which can be interrupted. Connect the coil in series with the battery and contacts and put the condenser in parallel with the contacts. When the coil has become warm from the current, interrupt the test contacts after rigging up a pair of needle points, with a gap of not less than $\frac{1}{8}$ in., from the H.T. pick-up to either side of the 6-volt battery. If only an occasional spark is produced, or none at all, the coil is faulty.

The H.T. Pick-up

On early 125 models the pick-up can develop a fault. The sparking-plug cable enters a terminal block which is

retained to the side of the magneto by one screw and a little projection. When this block is lifted away a small spring-loaded brush should protrude from the inner side. Press down the brush and see that it springs freely out again. If the spring is fouled the brush can become

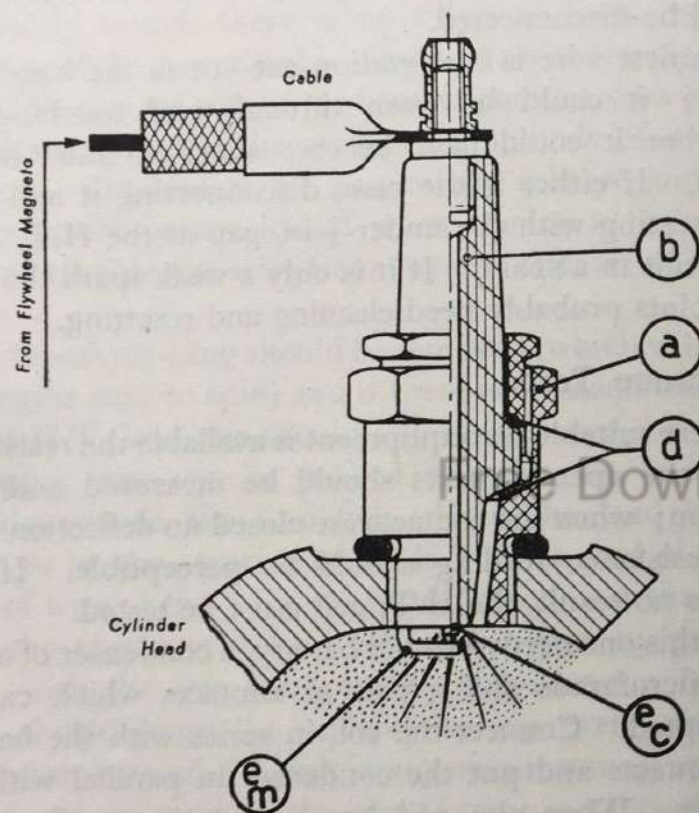


FIG. 27.—SPARKING-PLUG SECTION.

a. Steel shell. b. Insulator. d. Gas-seal washers.
ec. Centre electrode. em. Earth electrode.

trapped within the casing. Ease it out and refit, making sure the coils go right home without becoming enmeshed with one another. If the tip of the brush looks dirty rub it lightly with a scrap of worn emery cloth. Tear off a strip of clean rag $\frac{1}{2}$ in. wide, loop it tightly round a slim wooden skewer and, retaining hold of the ends of the rag,

push the skewer into the hole in the magneto casing. Clean out any oil and dirt there may be within, moistening with a drop of petrol at discretion.

The Sparking-plug

Correct choice of a sparking-plug, and its maintenance in efficient condition, is a matter of extreme importance in a two-stroke engine. The plug has a much tougher job to do than in a four-stroke, and nearly all the troubles that beset two-strokes start with plug faults.

The two-stroke is a hot runner. Generally speaking, this means that it needs a *cold* or *hard* plug, the terms being interchangeable in that a hot-running, high-revving engine must have a plug that will quickly get rid of excess heat and yet remain hot enough to burn off oily deposits that form at the electrodes and the tip of the internal insulator. The appearance of a plug is the best guide to its suitability for a particular engine; black carbon will tend to form around the business end, but the electrodes and the insulator will, in a suitable plug, assume a light biscuit colour. If the whole end looks whitish, and if corrosion of the fixed electrode keeps on enlarging the gap, then that particular grade of plug is too *soft* or *hot* for the engine and another, one step cooler, must be substituted.

Petrol Effects

On the other hand, if the scooter is used during cool weather and not driven hard, the engine will never get thoroughly hot. In this case a *cold* plug will foul and eventually misfire because the petrol mixture deposited on it will not burn away. This symptom is shown by a crust of partly burned oil over the insulator and electrodes, or perhaps by a blackened, sooty appearance. Such a plug is running too cold and a *hotter* or *softer* plug, that



(a)



(b)



(c)



(d)



(e)

FIG. 28.—SPARKING-PLUG POINTS SHOWING VARIOUS CONDITIONS.

- (a) Normal condition. Insulator light brown.
- (b) Burned condition. Excessive heat. Check causes. Use colder-type plug if necessary.
- (c) Oily condition. Excessive oil. Check cause. Use hotter-type plug if necessary.
- (d) Petrol-fouled condition. Sooty deposits. Check mixture. Use hotter-type plug if necessary.
- (e) Worn condition. Electrode deterioration. Weak sparking. Fit new plug.

is, one that does not get rid of its heat so quickly, is desirable.

The plug fitted to a new Lambretta is about two-thirds of the way down the heat scale, starting from hottest possible and going to coldest possible. Obviously this represents a compromise acceptable to the majority of owners under average conditions. There are two kinds of sparking-plug that will give unfailing service under every kind of condition, ranging from full-throttle work at high temperatures to pottering about in city streets in the winter; and these are the expensive types of plug with silver or platinum electrodes. Although they cost considerably more than the ordinary kind, they will not whisker or burn away and will probably outlast several of the cheaper variety.

Plug Reach

The correct place for the electrodes in the combustion chamber is flush with the surface. If the plug is too short the spark will be partly masked and incomplete combustion, loss of power and higher petrol consumption will follow. A plug that is too long, on the other hand, apart from possible damage due to the top of the piston striking the electrodes on the upstroke, will be burned away by the heat of the explosion. Lambretta models A, B, C (and LC) and most of the D series (including LD) take a plug of $\frac{1}{2}$ -inch reach. The Li and TV 175 machines should be fitted with a $\frac{3}{4}$ -in. plug, and great care should be taken in all cases that when a replacement is fitted it is indeed of the correct length.

Plug Inserts

Repeated removal and replacement of the sparking-plug may eventually result in the thread, which is cut directly in the aluminium cylinder-head, becoming worn.

Rather than go to the expense of a new cylinder-head, one can in this case have a steel insert fitted which is locked in position and irremovable. The writer's model C has been so fitted, and the insert makes necessary the use of a $\frac{3}{4}$ -in. plug instead of a $\frac{1}{2}$ -in. one.

The insert must be professionally fitted, because the different rates of expansion of steel and aluminium may cause it to loosen, especially if the engine is raised to a high temperature by hard work. The tightness to which the plug is screwed in is another matter of the greatest importance, both with or without an insert, and the plug makers prefer their products to be installed with a torque wrench set to slip at 27-30 lb.-ft. A sufficient approximation for the ordinary owner is to screw the plug in by hand as far as possible (assuming both threads to be perfectly clean and slightly oily), and then tighten with the plug spanner at the most by half a turn farther. Most people screw their plugs in with unnecessary force, which is highly undesirable when screwing steel into aluminium.

The Plug Gap

On most Lambrettas the plug gap is quite critical. The normal recommendation of about 0.020 in. is too wide, and one cannot rely on the good old stand-by of using one's thumb-nail as a gap gauge. Instead, one needs to set the gap to the thickness of an ordinary postcard or about 0.015 in., and one is then rewarded with instant starting and full power at all engine speeds. If the gap burns away and so becomes too large, difficult starting will be experienced, with spitting back at moderate speeds, though the machine will behave normally when thoroughly hot and running fairly fast. Therefore, the moment early spitting back is experienced the gap should be checked and will probably need to be reduced. If the thumb-nail will just not enter it, the gap is about right. The oft-repeated

caution about resetting the gap by lightly tapping in or bending the earth electrode, and never the central one, is still as necessary as ever, since any attempt to bend the centre electrode will break the insulator and ruin the plug.

False Gap

If the cheaper kind of plug is used, in which burning of the electrodes occurs in the natural course of wear and tear, both electrodes must be filed square before the gap is reformed. Use the magneto file for this purpose, and verify the work by close examination under a good light and if necessary, with a magnifying glass. This sounds finicky, but here is almost the whole secret of good engine performance, and the trouble is worth taking. Attention to this squaring of the points and meticulous checking of the gap can easily give as much as ten extra miles to every gallon of petrol.

Plug Cleaning

A veteran racing driver once told the writer that when a detachable plug is taken apart for cleaning it is ruined. Perhaps this is an exaggeration, but the insistence of at least one maker of detachable plugs that a proper worm-drive tool and nothing else should be used to take a plug apart does point the moral. Failing such a tool, the best way to take a plug apart is to mount it upside-down in a vice, gripping the smaller or locking-nut in the jaws only with sufficient restraint to hold the plug still, while the outer shell is carefully unscrewed with a box spanner. Too much screwing up of the vice will deform the locking-nut or crush the insulator.

When the shell is loosened lift it away while watching for the inner copper washer, which is probably fitted at the base of the insulator, and on no account lose this, or the heat characteristics of the plug will be completely altered.

Clean the one-piece inner electrode unit with fine glass-paper and scrape out the shell with the small blade of an old penknife. It is desirable to get all the carbon out of it, because this, too, alters the heat characteristics of the plug as it forms. Polish the inside of the shell, the insulator and the centre electrode, which delays further carbon formation. Scrub the plug threads, both of the locking-nut and of the main portion that screws into the cylinder-head, with a small wire brush, and smear both threads lightly with graphite grease before reassembling.

In screwing the plug together again, treat it with great care, running it up finger-tight and then giving not more than half a turn with the spanner. The worm-drive tool, of course, makes this an easily performed precision operation. If the outside copper washer is damaged, get a new one; but there is no need to renew it just because it has become flattened. In most cases the outside washer is fitted captive in the small annular space above the threads.

Sand-blasting

One-piece plugs must be cleaned by the garage sand-blast machine or by the special cleaning gadget the makers provide. Sand-blasting is excellent, but sometimes results in bits of sand remaining inside the plug and eventually wandering disastrously down into the engine itself. Mostly, the garage will finish the operation by air-blast alone, but if there is any doubt about it, squirt clean petrol inside and shake it well up with a thumb over the points. Allow to dry, of course, before replacing the plug in the engine.

The Spare Plug

Always carry a clean or new spare plug in the tool-kit, rolled up in a piece of rag kept in place by a rubber band.

This can save a lot of maddening delay on the road, and on tour it would be wise to have two spare plugs, *hotter* or *colder* as the case may be, than the one fitted in the engine. The writer can speak with appreciation of the courteous and helpful service provided by plug makers, who are always glad to receive back an unsuitable or faulty plug for laboratory examination, and who will invariably replace it by one better matched to the type of use the rider is giving his machine.

Suppressor Caps

There is now a legal obligation to suppress the interference caused by the sparking-plug with nearby radio and television sets. Suppressor plugs are not always available, but the H.T. lead can be fitted with a combined snap-on cap and suppressor which is quite cheap to buy. The advantages of having a connector of this type, apart from avoiding annoyance to listeners and viewers, lie in the extra protection it gives in damp conditions and in the avoidance of lost terminals. If a cap is fitted, as the writer recommends, see that the waisted brass terminal is tightened upon the top of the plug by light plier pressure, and ensure that the snap-on connector inside the cap does not become sprung apart. It should pull off quite easily for plug-changing, but should snap home with a definite click. Avoid having the magneto turning round with the cap disconnected which, as was written earlier, is liable to lead to a punctured coil.

Scrap Old Plugs

Most people, with a confused idea of economy in their minds, go on using plugs as long as they will spark somehow, forgetting that the inefficient performance of a worn plug results in an increase in petrol consumption which can waste the price of a replacement in a few weeks. Since the

Lambretta uses only one plug, it would not be wasteful to renew this annually. Of course, annual renewal is not necessary if one invests in a platinum-pointed plug, which costs about three times as much as the standard type and will probably last the life of the machine. Platinum plugs still need cleaning from time to time, but the precious metal is so hard and resistant to heat corrosion that the gap remains constant and there is no need whatever to file the points.

SPARKING-PLUG TYPES *

Model	A.C.	Champion	K.L.G.	Lodge
C and LC †	44F8	L7 or L10S	F75 or F80	HH14
D and LD	42, 56 or 42L	L5 or L11S	F75 or F80	HH14
Li ‡	45XL	N5 or NA8	FE70 or FE80	HLN or 2HLN
TV 175 ‡	45XL	N5 or NA8	FE70 or FE80	HLN or 2HLN

* Where plug adapters are fitted, long-reach ($\frac{3}{4}$ -in.) equivalents needed. Standard plugs are of $\frac{1}{2}$ -in. reach.

† Applicable also to models A and B.

‡ Long-reach ($\frac{3}{4}$ -in.).

The H.T. Lead

Where the plug is fitted on the carburettor side of the engine, the H.T. lead has to encircle the cylinder, and care should be taken that it stands well away from the engine. It is stiff enough to do this unsupported if the cable is not shortened; if it is too near the cylinder the insulation will eventually perish and crack from the heat, and so cause an intermittent short-circuit.

Lights and Horn

The lights and electric horn on the various Lambretta models work basically from the L.T. coil energised by the

flywheel magneto while the engine is running. In its simplest form, this electrical equipment uses the 6-volt alternating current generated by the magneto, and one has no battery to bother about, a system perfectly satisfactory within its limitations, though, of course, without a running engine there are no lights or horn. One gets quite an adequate riding light provided the right size headlamp bulb is fitted.

The simple 6-volt machines without battery have a magneto and lighting coil which gives a 28-watt output. Therefore, to have adequate lights front and rear the combined wattage of all bulbs should not add up to more than this figure; no damage will be done if one exceeds this figure, but the headlamp will rob the tail-light, and the lights will go to a dim glow every time the horn is sounded.

Balancing the Output

With all lights on, the generator output should be balanced, as it will be, for example, with a 24-watt headlight and a 3-watt tail bulb. One can ignore the effect of the horn, since this is only momentary. However, a 24-watt bulb paradoxically will not give enough light at low speeds, and the cautious night rider will prefer to try an 18-, 15- or even 12-watt bulb (all these bulbs have, of course, twin filaments each of these ratings, controlled by the handlebar switch). If a lower-powered headlamp bulb is fitted there will be quite a surplus of wattage at brisk throttle openings, and incautious revving up will burn the bulbs out.

The Handlebar Multi-switch

On simple 28-watt models, lights and horn are controlled by a neat multi-switch screwed on the right handlebar for thumb operation; the switch also has a spring-loaded ignition cut-out to stop the engine. The switch

lever traverses a slot in which a short movement to the right earths the ignition while the three click positions to the left give town light, dipped and main. On early models there is also a fixed central button below the slot, which—provided the engine is running—works the horn; later machines have the horn push combined with the switch lever and worked by downward pressure on it. The tail-light comes on as well and remains alight in all switch positions. (A stop-light may or may not be provided on recent machines, and there is generally provision

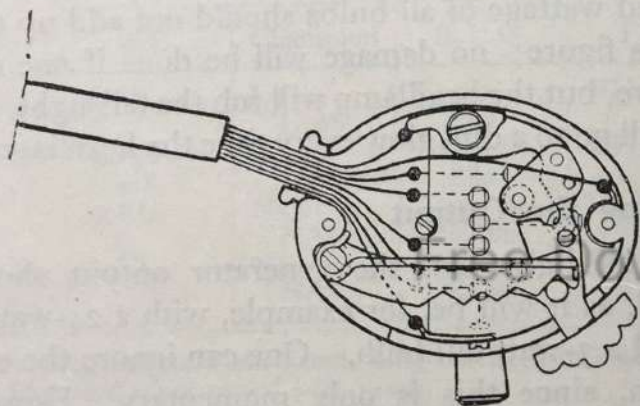


FIG. 29.—HANDLE-BAR MULTI-SWITCH ON LD 150.

for a second tubular bulb in the tail-light assembly so that a stop-light can be wired in on the horn circuit.)

Five position marks are engraved on the top plate of the multi-switch. The zero is the normal daytime position for the lever, and to the right is the spring-loaded ignition cut. First left position brings on 3-watt tubular bulbs in head- and tail-light; second left, the dipped beam, third left, the main beam.

Periodically the two small screws holding the plated cover on the switch should be removed (take care not to drop them, as they are very small and *not* captive) and dust and dirt gently brushed out of the inside. A little

petroleum jelly can then be introduced at strategic points so that the switch works easily but positively.

The 125-c.c. model D has the combined lever-and-horn button type of switch, and on this there are only four positions, the small bulb in the headlamp not being fitted to this model. The LD enclosed model of the same size has a single-control, five-position switch, a small bulb in the headlamp and provision for tapping off a speedometer light from the tail-lamp circuit. The same model was the first Lambretta to be offered with an electric starter, this being of the 6-volt type carried in a cradle at the near side of the rear wheel.

6-volt Electric-starter Model

This model had the more powerful 40-watt magneto generator and an interesting system whereby the output from the lighting coil was fed into a relay to regulate the charge by switching in or out of circuit a part of the lighting coil. From the relay the voltage was taken through a rectifier having a maximum load of 3 amps. and a half load of 1.5–2 amps. The rectifier and regulator were housed within the engine compartment underneath the front end of the petrol tank.

The self-starter motor was built into the front of the clutch casing, this, of course, being modified, and the motor is underneath the footboard on the off-side. From its front end, a flexible cable leads to an operating lever on the left handlebar. When the lever is pushed forward the starter pinion is moved mechanically into engagement with the crown wheel on the clutch bell, and only then is the current switched on, giving practically silent operation. When the engine starts it is important to close the handlebar lever to allow the pinion to free-wheel out of position.

The LD 125 still retains the flywheel ignition coil and the simplified lighting arrangement with a four-position

switch and single headlamp bulb. A second model was introduced with modifications, substituting an impedance transformer for the previous regulator and introducing a key-operated cut-out to isolate the whole electrical system from the battery. This model also has a fuse and pilot light and the separate horn button with the five-position switch.

The 150 LD

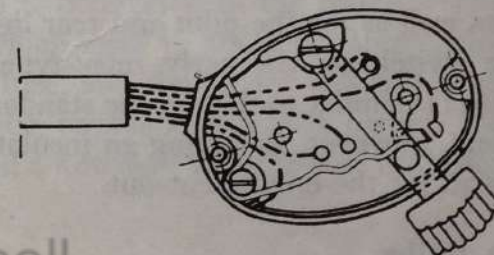
There is also an unenclosed D model of this machine, but it is the LD which has been most popular in Great Britain. This model has a separate ignition coil energised from the magneto lighting coil, a five-position, double-control switch and speedometer and pilot lights, all these components being energised from a 6-volt, 28-watt magneto. The same model, from the mechanical viewpoint, has been fitted with a battery and rectifier, and the modification can be carried out to any non-battery model. The original ignition lay-out is retained and a fuse is fitted in series with the rectifier and L.T. coil.

The principal advantage of battery-operated electric lighting fitted to the LDA electric-starter model is a steady light independent of the engine being running, and also that the brightness of the light has nothing to do with the engine speed. All the lights receive direct current from the battery, and it is no longer necessary to balance the consumption of the lamps with the output from the generator. With all machines which have a key switch disconnecting the battery from the electrical circuit it is very important to remember to close this switch when running, otherwise the battery will not be charged. The same applies to the fuse fitted in the rectifier circuit, and if this is blown the fault must be traced and the fuse replaced or, again, the battery will not be charged.

12-volt Self-starter Machines

The 12-volt LDA 150-c.c. machine, which was originally designed for women riders, shows a number of important modifications compared with its predecessors. Instead of the safety switch used on the 6-volt self-starter machines, there is a car-type ignition key. This controls the current supply to the H.T. coil and to the voltage regulator, and the switch must be turned off, both to stop the engine and to stop discharge of the battery through the coil.

FIG. 30.—
HANDLE-BAR
SWITCH ON
LD 125.



The 12-volt circuit uses two lighting coils in series, the second replacing the ignition feed coil, so stepping up the output above the 40 watts previously obtained. The wire from the H.T. coil to the generator leads only to the condenser and contact points, and the switch and key on the front of the engine compartment replaces the cut-out on the handlebar switch-lever.

The LD Handlebar Switches

Four types of switch are used, differing in internal construction. Reverting to the 125-c.c. LD with rectified lighting and self-starter, the handlebar switch in this case includes a pair of insulated contacts which are connected together when the headlamp is switched on. These connect the grey wire from the impedance regulator to earth to give an increased charging rate when full lighting is used. On this model it may be found that the lower

charge rate, when the headlamp is not in use, may not keep the battery up to the mark, and in this case the grey wire can be connected permanently to earth to give continuous full charge. The grey wire begins at the brass terminal which is lowest in the regulator box.

An outwardly similar switch is used for parking lights on the 150-c.c. machine. This has the normal lighting contacts and an extra and separate one connecting the battery to the parking light. The switch on the 6-volt 150-c.c. self-starter model is similar to this one, but there is a difference. It uses battery current for the lights and horn as well as for the pilot and rear lights.

The switch on the early relay-type 125-c.c. battery machines is similar to that on the standard 125-c.c. model. It differs, however, in having an insulated contact on the lever arm for the engine cut-out.

Lamp Bulbs

On all machines except the 125-c.c. battery model, standard headlamp bulbs are 24/24 watt. All are 6-volt, except the 12-volt self-starter, and the festoon bulb for the low (pilot) bulb of the standard machine. This must be 12-volt 10-watt. Battery 125-c.c. models have a 6-volt 15/15-watt headlamp bulb; where the machine is used constantly at 25 m.p.h. or less, at night, a 12/12-watt bulb can be substituted with advantage. At low speeds the charging rate is not enough to supply the larger bulb, and the 12-watt will give a better light. All machines, except one, should have a 6-volt, 3-watt rear-lamp bulb; the exception is the 12-volt self-starter machine, which needs a 12-volt, 3-watt bulb. The pilot light should be a 6-volt, 3-watt for battery machines. It is not advisable to use a headlamp bulb of greater power than 24 watts in a battery machine without modifying the lamp itself, because the heat will damage the reflector.

The Fuse

The fuse fitted in the box of the impedance regulator, or in a separate case on models with the voltage-control sealed unit, is rated either at 5 or at 8 amps. It will blow if the battery circuit is short-circuited or if the battery is connected with the wrong side to earth. The Lambretta still retains the negative earth despite the fact that nowadays the positive earth is becoming more common, and this point must be very carefully watched any time the battery is removed and replaced. Make sure the black, or negative, terminal is connected to the frame. The self-starter current, which rises to about 30 amps., does not pass through the fuse, and the starter will still work with the fuse blown, but, as was said a little earlier, the fault must be traced and a new fuse fitted before the machine is run.

Charging Rates

The following are the charging rates for the various Lambretta models; all at 30 m.p.h. in top gear:

Early type 125-c.c., rectified lighting and self-starter,
two charging rates:

Full charge 3 amps.

Half charge 1.5-2 amps.

125-c.c., rectified lighting/self-starter impedance-controlled charging (two rates):

Full charge 3 amps.

Half charge 1.5-2 amps.

6-volt, 150-c.c. self-starter, variable charge 4.5-1 amps.

150-c.c. standard machine, with parking lights 0.4 amps.

12-volt, 150-c.c. self-starter, variable charge 4-0.5 amps.

Since it will be seen that headlight consumption and generator output approximately balance, in the case of the 125-c.c. and the 6-volt, 150-c.c. machines, there is need to use a lower-powered bulb in a machine ridden at lower speeds. A discharged battery on a 150-c.c. machine will largely recover when used by day; but with the 125-c.c. machines, only half charge will be given, because the regulator does not allow full charge until the lights are turned on. Hence the earlier reference to the permanent closing of the two contacts in the handlebar switch when necessary.

A similar difficulty arises with the relay unit in machines so fitted. The current to the headlamp is used to close a contact and so to give full charge; and here again the full charge rate can be connected permanently if the battery needs it. On the moving-contact unit the contacts can be wedged in the closed position with several thicknesses of paper or by connecting the blue wire from the generator directly to the rectifier. The blue wire can be identified as one of three in a black sheath, and the wire can be soldered to the connection visible under the base of the regulator box. If this is done the white wire (of the three in the black sheath) must be disconnected or else the lighting coil will be short-circuited. As previously mentioned, full charge can be obtained on the impedance system simply by making an earth connection from the frame to the lowest brass terminal pin in the regulator box.

Faults

Good moving-coil meters should be used to test the electrical equipment. A voltmeter placed across the battery while the self-starter is turning the engine should show not less than 5 volts in the case of a 6-volt battery, and not less than 10.5 volts for a 12-volt battery. If the voltage falls rapidly past these readings, either the battery

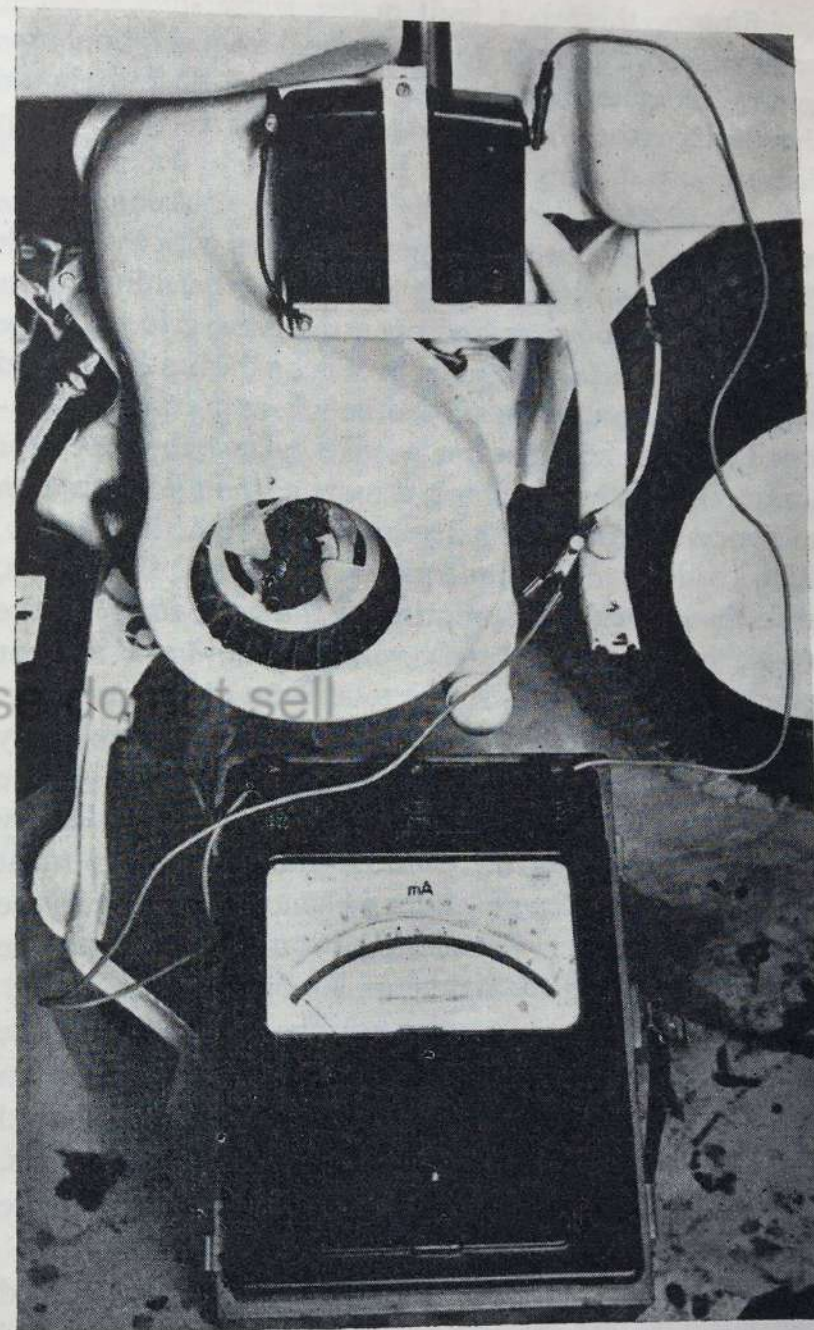


FIG. 31.—USING MILLIAMPERE METER TO MEASURE BACK-DISCHARGE THROUGH RECTIFIER.

is failing or there is a fault in the starter-motor. The battery should recover to its nominal voltage about two minutes after the starter has been released, and should show fully either 6 or 12 volts according to type. If it does so, any starting trouble lies in the electric motor.

If the battery continually weakens, disconnect the positive lead and put an ammeter in series with the circuit after the engine has started. Raise the machine on its stand, engage top gear and open the twist grip until the speedometer reads 30 m.p.h. Switch on the headlights and the ammeter should read 0. Although, as previously mentioned, there is not the same need to balance the generator output on a battery machine, if more current is taken than the generator can give it has to come from the battery, which will never be adequately charged. Therefore, check the current consumption of the bulb to see if the wattage is excessive (battery voltage $\times$ ammeter current reading in amps. will give the total lamp consumption in watts). If the lamps are apparently in order the fault may lie with the regulator system not giving full charge. Once again, remember that should the machine be ridden by night at less than 30 m.p.h. the headlamp wattage must be reduced to give the generator a chance. As long as the ammeter shows even a small amount of charge, with the engine running and the lights on, all will be well.

The back discharge rate through the rectifier, with the safety switch on, for 125-c.c. models, and with the ignition switch off for 12-volt, 150-c.c. self-starter models, should not be greater than 5 milliamps. For anything above this, suspect a fault in the rectifier. This test cannot be made on 6-volt, 150-c.c. self-starter machines.

On these models the test milli-ammeter must be placed between the battery positive with the safety switch off and the wire to the rectifier. The wire from the rectifier to the regulator should be disconnected. Again, 5 milliamps.

(max.) should be shown. This variation is necessary because, with the safety switch on and the regulator normally connected, a current of $\frac{1}{4}$ amp. will flow through it.

The Battery

The generator voltage always considerably exceeds, on open-circuit, that shown when the battery or lamps are connected. It may rise to as much as 20-25 volts, on open-circuit, at maximum engine revolutions, and so measurement of the battery voltage must be made under normal loaded conditions. Care of the battery itself, in amateur hands, should be restricted to keeping it topped up with distilled water (in no circumstances use tap water) to just above the level of the plates. In the case of a so-called *dry* accumulator having a sponge filling, this should be kept wet but not flooded. A simple hydrometer can be used for topping up, and should show a reading of 1.250 in each cell. In hot weather the water content evaporates quickly, and the level should be checked every fortnight; but monthly is enough in the winter. Keep the top of the battery clean and dry, wiping away corrosion (burn the rag afterwards) and smearing petroleum jelly round the terminal posts. Never allow the battery to remain in a discharged condition, and if the machine is laid up during the cold weather take the battery off and have an electrician maintain it, otherwise it will be quite useless when next needed.

CHAPTER V

THE CARBURETTER

MOST Lambrettas are fitted with the Italian Dell'Orto carburetter; some few with the Zenith instruments. Before the petrol-oil mixture can be burned in the engine it has to be reduced to a fine spray and mixed with large quantities of air to produce an explosive vapour. When introduced into the engine, compressed and ignited by the sparking-plug it generates the energy that drives the machine. This atomisation and vaporisation is performed by the carburetter.

In starting from cold the instrument must temporarily provide a richer mixture, one in which there is much less air dilution than in ordinary running. This is done either by putting some kind of mechanical restriction in the entering air stream, generally known as a strangler or air-slide; or by a choke device which greatly increases the volume of petrol vapour—amounting to the same thing as restricting the air. Early Lambrettas used the air-slide; later models have a car-type choke.

The Model C Air-slide

This slide is controlled by a finger-operated lever on the top of the carburetter. If one unscrews the air cleaner, a cowl containing oil-wetted steel wool that screws into the choke intake, the slide can be seen, and when pressed down it shuts off some two-thirds of the entering air. To start from cold on this model, and on the early D series machines, the fuel is turned on and the flooder button on the carburetter float chamber is held down for a second

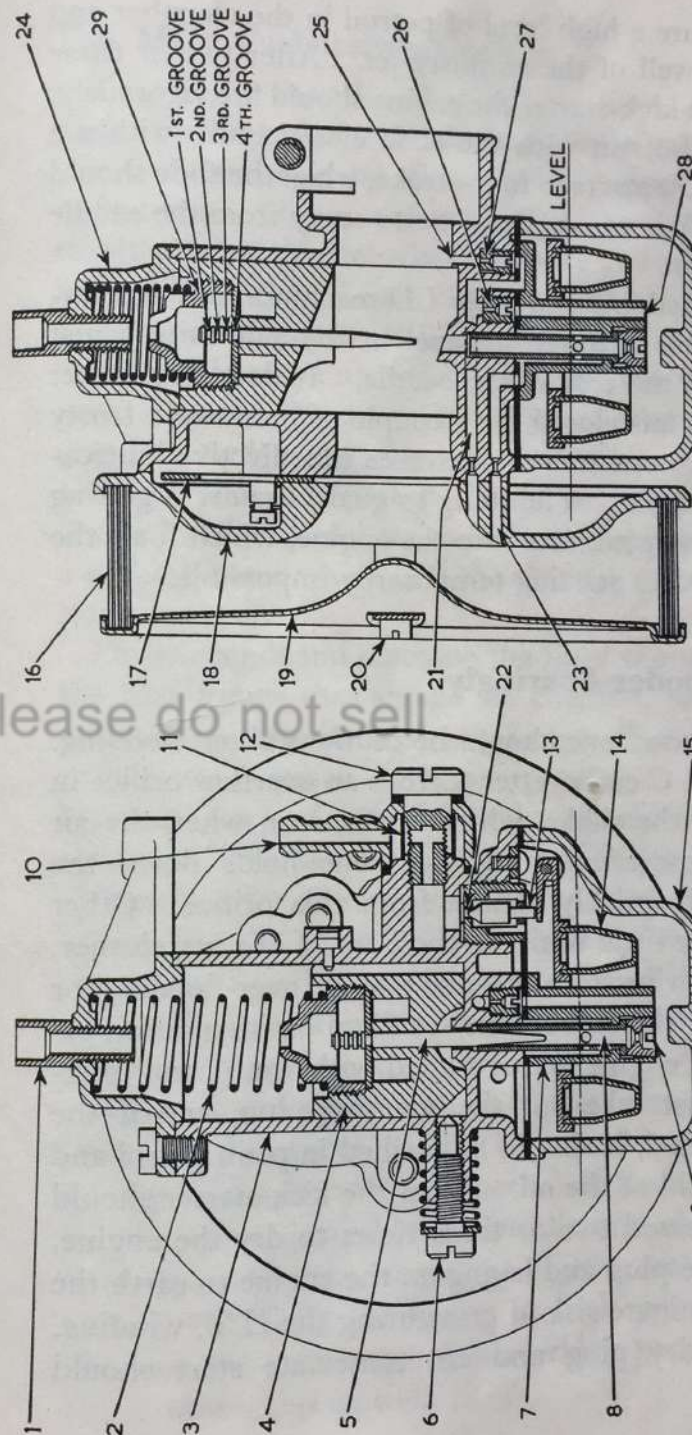


FIG. 32.—SECTIONS OF ZENITH CARBURETTER.

1. Control-cable attachment nipple.
2. Throttle spring.
3. Carburetter body.
4. Throttle slide.
5. Mixture needle.
6. Pilot adjuster.
7. Float-chamber well.

8. Needle jet.
9. Main jet.
10. Petrol intake.
11. Filter gauze.
12. Intake plug.
13. Float-needle valve.
14. Nylon float.

15. Float-chamber base.
16. Air filter.
17. Air shutter.
18. Choke outer-face.
19. Air-filter front disc.
20. Air-filter fixing screws.
21. Slow-running air-bleed.

22. Float-needle seat.
23. Needle-jet air-bleed.
24. Throttle-chamber cover.
25. Slow-running jet passage.
26. Slow-running jet.
27. Slow-running metering jet.
28. Feed to slow-running jet.
29. Cable-fixing nut.

or so to ensure a high level of petrol in the chamber and thus in the well of the atomiser jet. After two or three strokes of the kick-starter the engine should fire vigorously. It can then be run with the slide closed until, within a minute or so, it starts to four-stroke, when the slide should be lifted. This can be done quite easily from the saddle on the scooter.

The enclosed LC and early LD machines have the air-slide accessible through a panel in the side fairing just below and to the rear of the saddle. It does not matter if the slide is left closed for a couple of minutes in frosty weather, since one merely increases the effective lubrication of the engine. The thing to guard against is getting an excess of wet mixture into the engine, which fouls the plug and renders starting temporarily impossible.

Use the Flooder Sparingly

For this reason one should be cautious about flooding. On the model C carburetter there is an overflow orifice in the mouth of the choke, which can be seen when the air cleaner is unscrewed, and when one holds down the button petrol quickly exudes from this orifice. Other models have a little drain at the base of the air cleaner, and if liquid drips from this one may be over-flooding, or one may have the carburetter set tilted on its mounting.

Should the engine get overfilled with wet petrol mixture, one must take out the sparking-plug, and if the points are fouled, it should be washed in plain petrol and dried, to get rid of the oil. Then the kick-starter should be fully depressed two or three times to dry the engine, connecting the plug and laying on the engine to earth the spark and eliminate risk of puncturing the H.T. winding. Replace the dry plug and an immediate start should result.

The Main Carburetter Control

This is the throttle valve, which slides up and down under the control of the right-hand twist-grip, and is contained in the vertical chimney-like upper part of the carburetter. One can always check the operation of the throttle valve by removing the side fairing, where this is applicable, then the air cleaner, and then by inserting a finger in the air intake while the twist-grip is turned. The valve should move up and down freely but without looseness, returning positively by its internal spring when the grip is closed by turning this clockwise. On the model C the throttle cable sweeps round directly into the top of the carburetter; on later models the cable pulls down on a rocking beam which lifts the throttle valve to the same purpose.

On a secondhand machine the fit of the valve is one of the first things that should be checked, as after a considerable mileage its necessary piston effect is lost and the carburetter cannot function properly. Therefore, if looseness can be detected the valve should be taken out for renewal. This is merely a matter of taking the top off the carburetter by unscrewing the knurled ring and then lifting out the throttle-valve assembly with the needle attached to it. The rocking beam will have to be detached, and on the Zenith instrument the method of removing the top is a little different.

There is a number stamped on the valve, probably N50 or N75 in the case of the Dell'Orto, and it only remains to ask the dealer for a replacement. If there is wear in the throttle valve, probably the needle and atomiser jet will have also worn, the small cost of new components being quickly repaid by the saving in fuel consumption. See also that the return spring is working properly, and if in doubt renew this as well.

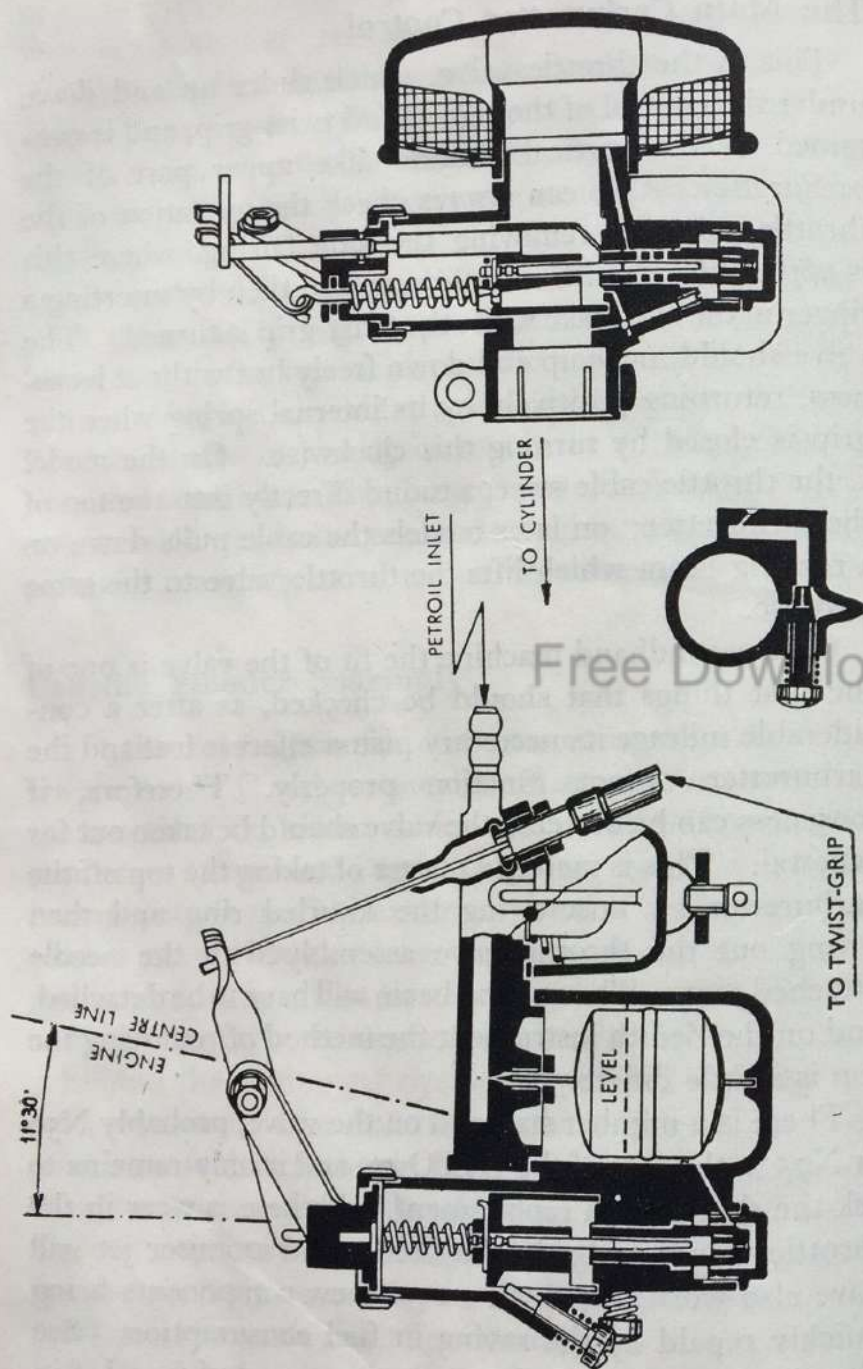


FIG. 33.—SECTIONAL VIEWS OF 125 L.D. CARBURETTER.

Throttle Stop and Pilot Jet

A slot will be seen in the side of the throttle valve. This is the point of abutment of the diagonally mounted, spring-loaded throttle stop screw fitted to the side of the instrument. Unscrewing it cuts down the tickover speed, but it is best not to reduce this overmuch, because a single-cylinder two-stroke will never idle smoothly, and too little tickover adjustment will only result in the engine continually stopping in traffic. Tickover is finely regulated by the adjacent horizontal pilot screw, also spring-loaded. If trouble is experienced with idling take this right out and blow through it with an air blast.

The pointed pilot screw regulates the admission of air to the pilot jet. This is difficult to get out because it is very small and completely masked by the atomiser jet, which must be removed with a small socket spanner. If the pilot is blocked one cannot get idling, and the throttle must be constantly opened to keep the engine running; which leads in turn to excessive fuel consumption. In replacing the pilot screw after blowing out the passage screw it completely home with the fingers and then unscrew it one and a half turns, after which it can be fine-set by trial and error with the engine warm.

Air Filter

The carburetter is protected with an external air filter as already mentioned, packed with fine steel wool wetted with engine oil. At a few pence a roll from the nearest ironmongers, it is hardly worth cleaning the old wool, which can be dumped in the paraffin tin for polishing purposes. Buy a couple of small rolls of the finest size, as used for cleaning aluminium ware; unwind these and fold them up together into a lightly packed pad to go into the filter casing, taking care to replace the front and back

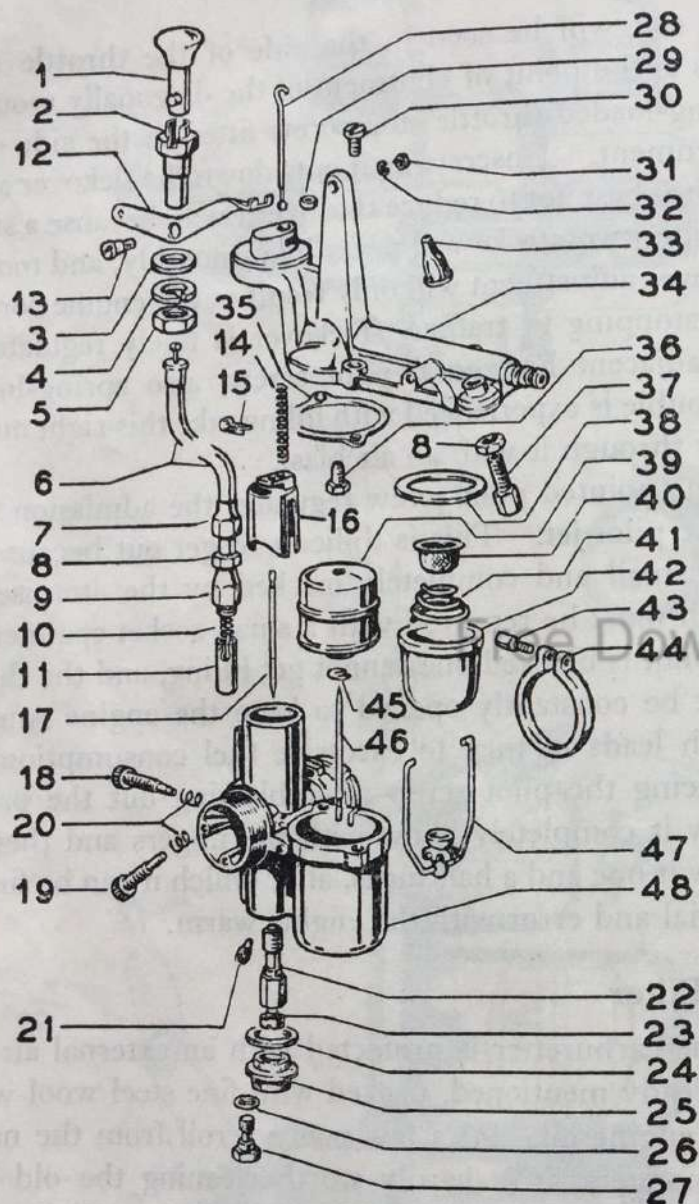


FIG. 34.—EXPLODED VIEW OF LD 150 CARBURETTER.
(See opposite page for key.)

KEY TO FIG. 34.
(opposite page.)

- | | |
|-------------------------------|------------------------------|
| 1. Choke-control knob. | 26. Gasket. |
| 2. Support. | 27. Main starter-jet. |
| 3 and 4. Washers. | 28. Air-slide operating rod. |
| 5. Nut. | 29. Gasket. |
| 6. Choke-control cable. | 30. Screw. |
| 7. Cable adjuster. | 31. Nut. |
| 8. Adjuster counternut. | 32. Washer. |
| 9. Cable-adjuster nut. | 33. Rubber dust-protector. |
| 10. Spring. | 34. Carburetter cover. |
| 11. Choke-control valve. | 35. Gasket. |
| 12. Fulcrum lever. | 36. Float-needle seat. |
| 13. Pin. | 37. Throttle-cable adjuster. |
| 14. Spring. | 38. Gasket. |
| 15. Retaining clip. | 39. Float. |
| 16. Air slide. | 40. Filter. |
| 17. Main-jet needle. | 41. Spring. |
| 18 and 19. Adjustment screws. | 42. Filter bowl. |
| 20. Springs. | 43. Bolt. |
| 21. Pilot jet. | 44. Securing ring. |
| 22. Atomiser. | 45. Retaining clip. |
| 23. Main jet. | 46. Float needle. |
| 24. Gasket. | 47. Retaining clip. |
| 25. Base plug. | 48. Carburetter body. |

plates and the spring clip in the right order. Pour a tea-spoonful of clean engine oil evenly over the wool and leave it for half an hour to percolate through the fibres. Never run the engine without the air filter in position, because, apart from letting dust and grit into the cylinder, the carburation will be upset.

Gauze Filters

Two extremely fine gauze petrol filters keep the fuel clean—one in the tank and forming part of the tap, and the other either in the collar on the top of the float chamber of the carburetter or else in the form of a supplementary filter mounted alongside it. When the petrol tank is removed, as for decarbonising the engine, it will be seen that the fuel tap screws into a small bowl-like depression in the tank which is intended to act as a sump for any foreign matter. When the tap is removed, the contents of this bowl will come away with the petrol, and before the fuel is replaced in the tank it should therefore be strained through an old clean piece of thin fabric.

The filter in the tank is likely to have the most dirt

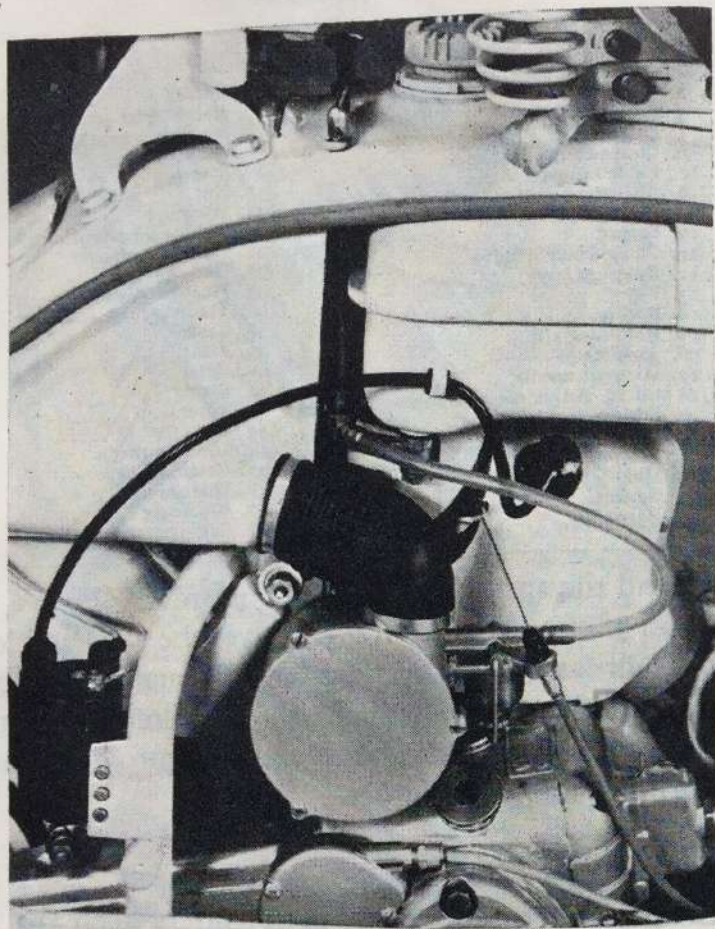


FIG. 35.—LD CLUTCH CASE AND
CARBURETTER AIR-INTAKE.

attached to it, and should be brushed off gently with a soft brush and a little clean petrol. Before replacing the tap in the tank, swill this out thoroughly (use petrol) to get rid of any residue. In replacing the tap, see that the red fibre washer at its base is intact and smear this with a little shellac or similar petrol-proof compound. A thoroughly sound joint is essential, but this must be got by cleanliness and good jointing, and not by trying to screw the tap up to great tightness.

Bowl Filter

The bowl filter at the side of the carburetter, or the ring filter at the top of the float chamber fitted to earlier models, is much less likely to choke, but should have the same treatment: a brush in clean petrol and rejoining, where applicable, with a sound fibre washer or washers and a trace of jointing cement. If one is careless about fitting the fuel line from the petrol tank to the carburetter it is quite extraordinary how much expensive fuel can be

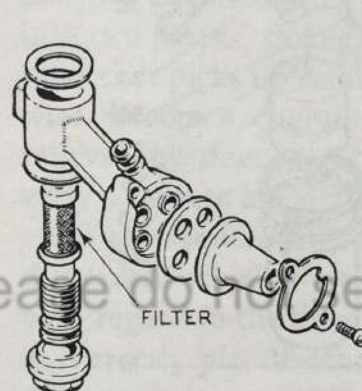


FIG. 36.—PETROL TAP AND
FILTER UNIT, TV 175.

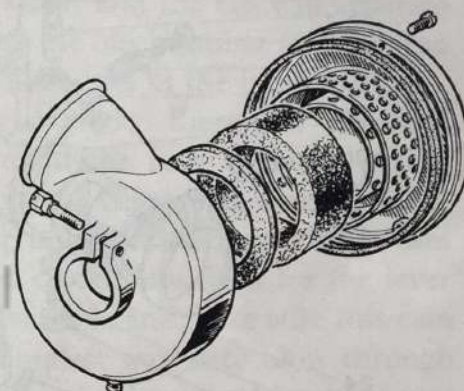


FIG. 37.—AIR CLEANER, Li 125.

lost through leakage at the various joints. Always, therefore, take the greatest care that all mating surfaces are flat and clean, and in tightening them up give no more than half a turn beyond the point of maximum finger-tightness. If no shellac is available one of the proprietary acetate cements will serve very well, and it has the added advantage that the washers stay on their components and do not get lost.

The Petrol Tap

A disc type of petrol tap is fitted to the majority of Lambrettas. This gives three positions—off (horizontal

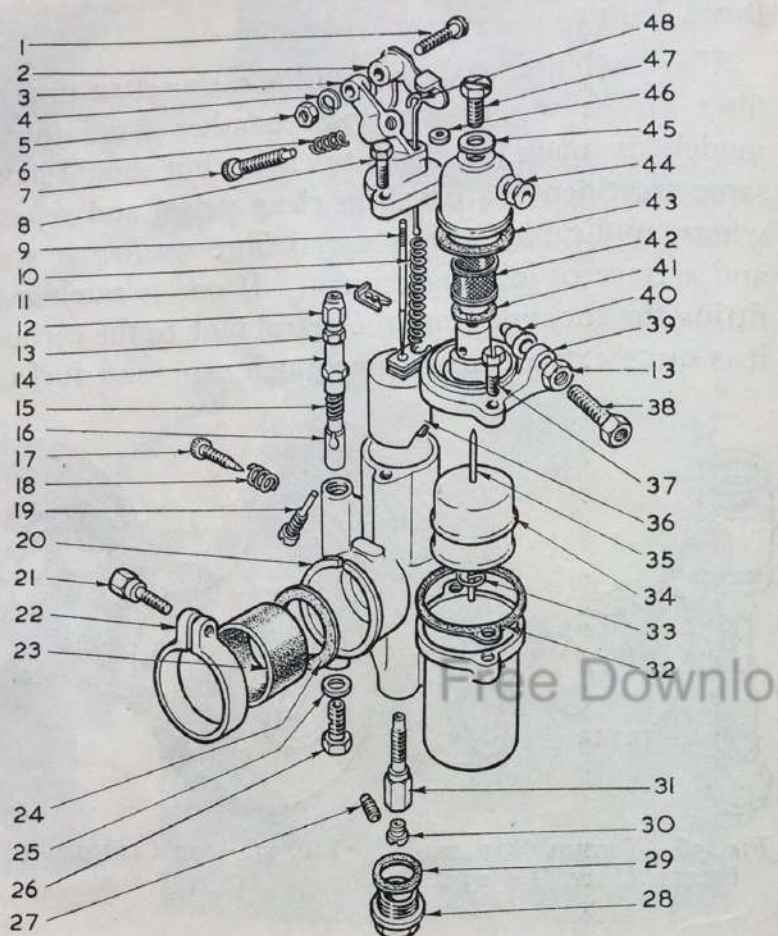


FIG. 38.—EXPLODED VIEW OF Li 150 CARBURETTER.

- | | | |
|-----------------------------------|--------------------------------|----------------------------------|
| 1. Fulcrum-lever pin. | 17. Pilot-jet adjusting screw. | 33. Float-needle retaining ring. |
| 2. Fulcrum lever. | 18. Spring. | 34. Float. |
| 3. Cover. | 19. Screw guide. | 35. Needle. |
| 4. Spring washer. | 20. Body. | 36. Air slide. |
| 5. Nut. | 21. Securing-ring screw. | 37. Screw. |
| 6. Spring. | 22. Securing ring. | 38. Throttle-cable adjuster. |
| 7. Screw. | 23. Insulating reduction tube. | 39. Float-chamber cover. |
| 8. Cover screw. | 24. Distance washer. | 41. Gasket. |
| 9. Main-jet needle. | 25. Gasket. | 42. Filter. |
| 10. Air-slide spring. | 26. Starter jet. | 43. Gasket. |
| 11. Main-jet needle re-tainer. | 27. Pilot jet. | 44. Filter cover. |
| 12. Choke-control cable adjuster. | 28. Main-jet plug. | 45. Gasket. |
| 13. Counter-nut. | 29. Gasket. | 46. Gasket. |
| 14. Choke-control nut. | 30. Main jet. | 47. Screw. |
| 15. Spring. | 31. Atomiser. | 48. Air-slide operating rod. |
| 16. Valve. | 32. Gasket. | |

outwards), main (straight down) and reserve (horizontal inwards). The tap consists of two discs with registering holes which rotate on a facing of petrol-proof rubber, and which are held in contact by a circular spring-steel washer, having two retaining screws. If these screws are over-tightened the tap will not turn and, of course, if they are too loose the petrol leaks between the discs. Adjust the tension by trial and error.

When the tap is removed for filter cleaning, and if leakage is suspected, remove the two round-headed screws and the circular spring washer, and the tap will separate into two parts. Sometimes the black rubber filling in the sandwich picks up round the edges of the holes or otherwise becomes slightly puckered: therefore, carefully relieve any unevenness round the feed holes by paring away a minute amount from the edges with a razor-blade.

In reassembling the tap note that there is a simple cam movement which gives the correct positions for the lever with regard to the three positions, and make sure this cam is correctly placed—the simplest way is to blow through the tap, or try to, when it is in the closed position and check that there is no resistance when *main* is turned on.

Removing and Dismantling the Carburetter

It is necessary to take off the carburetter to clean out the float chamber and to get at the main jet and atomiser. There is nothing difficult about removing or dismantling the carburetter, but reassembly and replacement present one or two snags.

The carburetter can be removed when the throttle control is detached, the fuel line is unfastened below the petrol tap and the 8-mm. pinch-bolt securing the chromium-plated clamp ring on the inlet stub has been slackened. The carburetter is a tight fit on the inlet stub and must be gently worked off with an oscillating movement. To get

at the main jet or the atomiser the large hexagonal plug at the bottom of the main column should be unscrewed, the method least likely to cause damage being to set the plug lightly but firmly in the jaws of a vice and unscrew the carburetter. The hollow plug serves as a sump and should be cleaned out; an 8-mm. socket key is needed to unscrew the atomiser-main-jet assembly, which should be extracted with great care, as it is generally a tight fit.

There are two types of atomiser (sometimes called the needle jet), that on the MA 16 instrument having no extension with diffuser holes and not being intended for periodical renewal. This type of jet is fitted to the model C and some early D models as well. Subsequent models have a longer atomiser jet with a tube drilled with from three to six minute holes through which the petrol escapes in the form of mist directly into the air intake. This type of atomiser is gradually worn by the needle, and on a well-used machine it would be wise to change both needle and atomiser, since after a time the combination allows too much petrol to pass. On the model C, as on all others, the needle has five annular grooves at its top, and these machines were originally sent out by the factory with the needles in the middle grooves. When petrol consumption becomes too high, due to needle wear, the answer is to experiment with the two top grooves; in cold weather the second groove will probably be needed, as the top groove with the needle fully lowered gives the maximum weak mixture.

Note.—It is not necessary, of course, to remove or dismantle the carburetter to experiment with needle positions, and this can be done quite easily by lifting out the throttle valve and gently prising out the spring slide which engages with one of the grooves so that the needle can be lowered or raised one groove. It is never advisable to

make so drastic a change as to lift or drop the needle by two grooves at a time.

The Main Jet

The main jet screws into the base of the atomiser, and should not need replacement in the life of the machine. However, in spite of highly efficient petrol filtration, bits of dirt do sometimes mysteriously find their way into the main jet, which must then be unscrewed and blown out. If a square-cut screwdriver is cautiously applied to the slot across this jet it will unscrew from the atomiser without further dismantling being necessary. To clean it, blow through it with compressed air, using a bicycle pump if nothing else is available, and check it against bright light by pushing it into the middle of a sheet of thin cardboard so as to make the small hole easier to see through. It is best never to poke anything through a jet to clear it, and certainly not a piece of wire. In removing and replacing it, beware of dislodging bits of brass by too rough use of the screwdriver, since if these get in the hole, the last state will be worse than the first.

The Float Chamber

Two small square-headed bolts, with screwdriver cuts, hold the top of the float chamber. There is a thin paper gasket between the lid and the body which must be replaced, otherwise the level will be upset and the bowl may leak. The Zenith instrument differs in design from the Dell'Orto, as the Zenith uses a hinged captive float and the Dell'Orto float is free. With the latter, it is an advantage to discard the old brass float for a nylon one, and in this case the needle should be changed as well, because in the old float the needle is clipped at the top, while the new one has the clip in the base. Otherwise the two are

interchangeable. The Zenith has a nylon float in all models.

Clear out any dirt accumulated in the base of the float chamber, and in replacing the float assembly make sure the needle goes in the right way up with the point at the top. The bottom of the needle registers in a blind hole in the base. The different construction of the Zenith employs a separate needle, and here again it is important to see that it is replaced correctly.

Pinking

A certain amount of pinking at the normal speed range is a feature of the Lambretta, and merely indicates that the engine is operating at maximum efficiency. However, while the carburetter is dismantled, excessive pinking can be cured by increasing the mixture strength at the speed range concerned. If it occurs at about 35 m.p.h. and is really troublesome a main jet one size larger can be tried; and if it is experienced, again to excess, at lower speeds, the needle may be raised by one groove. The petrol consumption may be affected, however, and, taking 100 m.p.g. as the standard minimum figure, if this is materially increased it must lie with the rider's discretion as to whether the extra petrol consumption is justified by the lessened pinking experienced.

Replacement of the Carburetter

Great care is needed in remaking the various joints, along the lines suggested in previous parts of this chapter. Fibre washers can be lightly stuck to their associated plugs by a thin coat of shellac or other petrol-proof cement, and the float-chamber paper gasket can be similarly stuck to the lid so that it will always come away with this when the top is removed. Any leakage at these various joints will

cause wastage of fuel and a messy engine, as well as faulty carburation.

When the carburetter is replaced on the intake stub it must be worked right home, and then the machine should be propped up on level ground, standing on its two wheels. The carburetter must then be adjusted until it is perfectly vertical, which means, in practice, that the float-chamber base should clear the top of the gearbox by about the thickness of a postcard. This matter of the carburetter level is so important that the owner may care to follow a slightly more elaborate procedure while the instrument is still partly dismantled. With the lid off the float chamber and the float removed, the carburetter should be pushed home on the inlet stub and the machine scotched up on its wheels, choosing a level piece of ground. Now lay a small spirit level across the open mouth of the float chamber and adjust the carburetter until dead centre is shown by the bubble. Scratch a vertical line on the outside of the float chamber and continue it downwards to make a similar mark on the gearbox casing. Thus, all that it is necessary to do on future occasions is to line the two marks up.

Carburetter Settings

The following are the official carburetter settings for most Lambretta models. Those for the earliest machines have been omitted, since there are very few of them about, but the writer understands that the settings for the model C are probably applicable to the models A and B:

Model C 125 c.c.

Dell'Orto MA16 *

Choke
16 mm.

Main Jet
65

Needle Jet
255 with C9
needle

Pilot Jet
40

* Or Zenith.

Models D and LD 125 c.c.

Dell'Orto MA18B2

Choke	Main Jet	Needle Jet	Pilot Jet
18 mm.	75	ND1 with N260/B	40

Dell'Orto MA18B3

Choke	Main Jet	Needle Jet	Pilot Jet
18 mm.	70	ND1 with N255/B	45

Zenith MCT19

Choke	Main Jet	Needle Jet	Pilot Jet
19 mm.	100	F	40

Models D and LD 150 c.c.

Dell'Orto MA19B4

Choke	Main Jet	Needle Jet	Pilot Jet
19 mm.	72	255B	40

Model Li 125 c.c.

Dell'Orto MA—BS5

Choke	Main Jet	Needle Jet	Pilot Jet
18 mm.	93	260B	35

Model Li 150 c.c.

Dell'Orto MA—BS5

Choke	Main Jet	Needle Jet	Pilot Jet
19 mm.	102	260B	40

Model TV 175.

Dell'Orto MB23B35

Choke	Main Jet	Needle Jet	Starter Jet	Pilot Jet
23 mm.	110	260B	60	45

Most 125-c.c. engines have N50 throttle valves and most 150-c.c. engines have N75 valves. All machines including D type have needles with five grooves, but the Li and TV machines have three-groove needles. All machines when new start with needles in the middle groove, except Zenith with four-groove needles fitted originally in the bottom groove.

CHAPTER VI

LUBRICATION

OILING and greasing the Lambretta should be carried out as a simple series of routine operations at set intervals. The engine itself, of course, needs only the correct proportion of oil thoroughly mixed with the petrol each time the tank is filled. One should use a 30-grade oil in summer and a 20-grade in winter, although it is not imperative to change the grade and, in any case, this is taken care of if one fills up from a mixing pump.

If economy is important, one can buy in bulk a two-stroke oil such as is marketed by all the major oil companies. In this case, one can refill by the gallon from the ordinary commercial-grade pump and carry a tin containing $\frac{1}{2}$ pint of the two-stroke oil. Enough petrol for 10–15 miles is left in the tank when the main supply runs dry, and if one fills up at the next pump the oil can then be put in first and swilled about with this small quantity of petrol, and will be further stirred up and mixed as the new petrol goes in. Or have the petrol put in first, then pour in the oil slowly and rock the machine once or twice from side to side. The oil measure in the filler cap should be filled and poured in five times per gallon of petrol if one is not carrying a measured $\frac{1}{2}$ pint of oil, or if one is in doubt about the petrol strength.

Petrol to Oil Ratio

The petrol to oil ratio in the two-stroke petrol mixture varies considerably for the different Lambretta models. One part of oil to twelve of petrol (roughly 8 per cent) is recommended in the early stages of new engines. When

the machine is thoroughly run in, the oil can be reduced to one in sixteen or even one in twenty. In the case of the latest models, one part in twenty-four is advised, resulting in greater mileage (6,000 and more) between decarbonisations.

Use oil rather liberally, therefore, as long as the engine is new and stiff; excess of oil can do nothing worse than foul

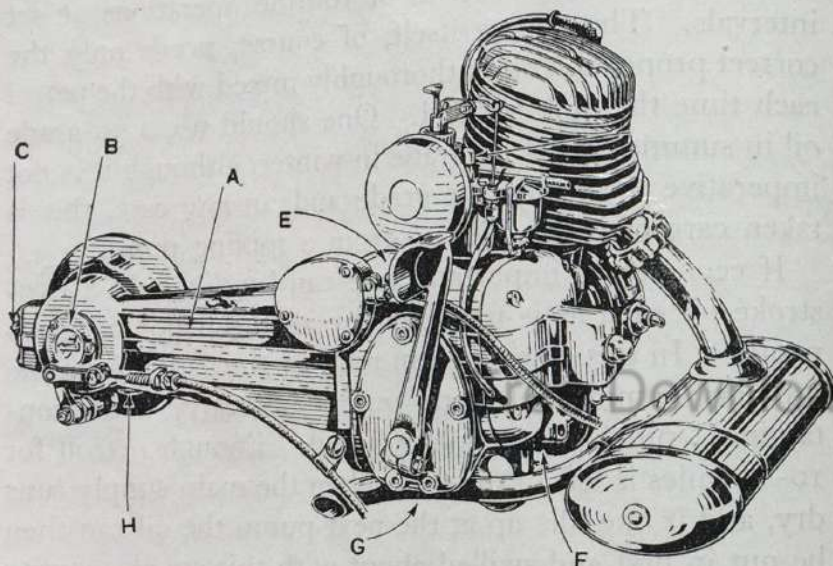


FIG. 39.—ENGINE LUBRICATION POINTS, 125 D/LD.

- | | |
|--|----------------------------|
| A. Transmission case. | F. Gearbox level plug. |
| B. Speedometer-drive take-off point. | G. Gearbox drain plug. |
| C. Final-drive oil filler. | H. Final-drive drain plug. |
| E. Location of gearbox filler plug (masked). | |

the sparking-plug, but insufficient lubrication might cause a piston seizure. After 1,000 miles it is worth experimenting at the self-mixing pump to find what strength best suits one's own engine. Five per cent (one in twenty) seems a satisfactory compromise on well-used models up to the end of the LD series; but no two engines are exactly alike. On the writer's own model C, 5 per cent is used in the cooler weather and 6 per cent in the heat of

summer. The lighter mixtures give hot running but keep the plug and engine cleaner, while the heavier blends cool the engine more but result in a heavier carbon deposit.

Cautions: Use only first-class branded two-stroke oils and straight commercial-grade fuel. Premium petrol is a waste of money in a two-stroke. Never, in any circumstances, run even for a short distance without *some* oil in the petrol.

Draining and Refilling the Gearbox

Having a supply of engine oil in bulk enables one to replenish or to drain and refill the gearbox, and this is quite important. With a new machine, it should be drained, flushed and refilled after 300 miles, and thereafter every 1,800 miles. Why drain and refill, particularly after the first 300 miles? The answer is to be seen in the soupy mess that comes away, no longer recognisable as oil, a greyish sludge glittering with bits of metal—fragments from the gear teeth—and greyish from contamination with worn-off particles of hard rubber and cork from the clutch-plates.

Draining.—One drains the gearbox by removing a recessed bronze hexagon plug found underneath the box. In the absence of a hexagon-headed tool, the handyman will not find it difficult to file six sides on a short piece of iron rod and to bend the shaped end over to form a cranked lever. Alternatively, a proper tool can be bought. Also remove the large steel bolt with an external hexagon head to be found on the forward end of the clutch casing; this is the level plug, and the oil may not flow through the drain until air is admitted to the gearbox.

Cleaning.—The bronze drain plug should be well cleaned in paraffin. Meanwhile, catch the $\frac{1}{2}$ pint of dirty oil in a tin of sufficient size and get rid of this soiled oil by burning it on the garden bonfire. Brush the drain hole

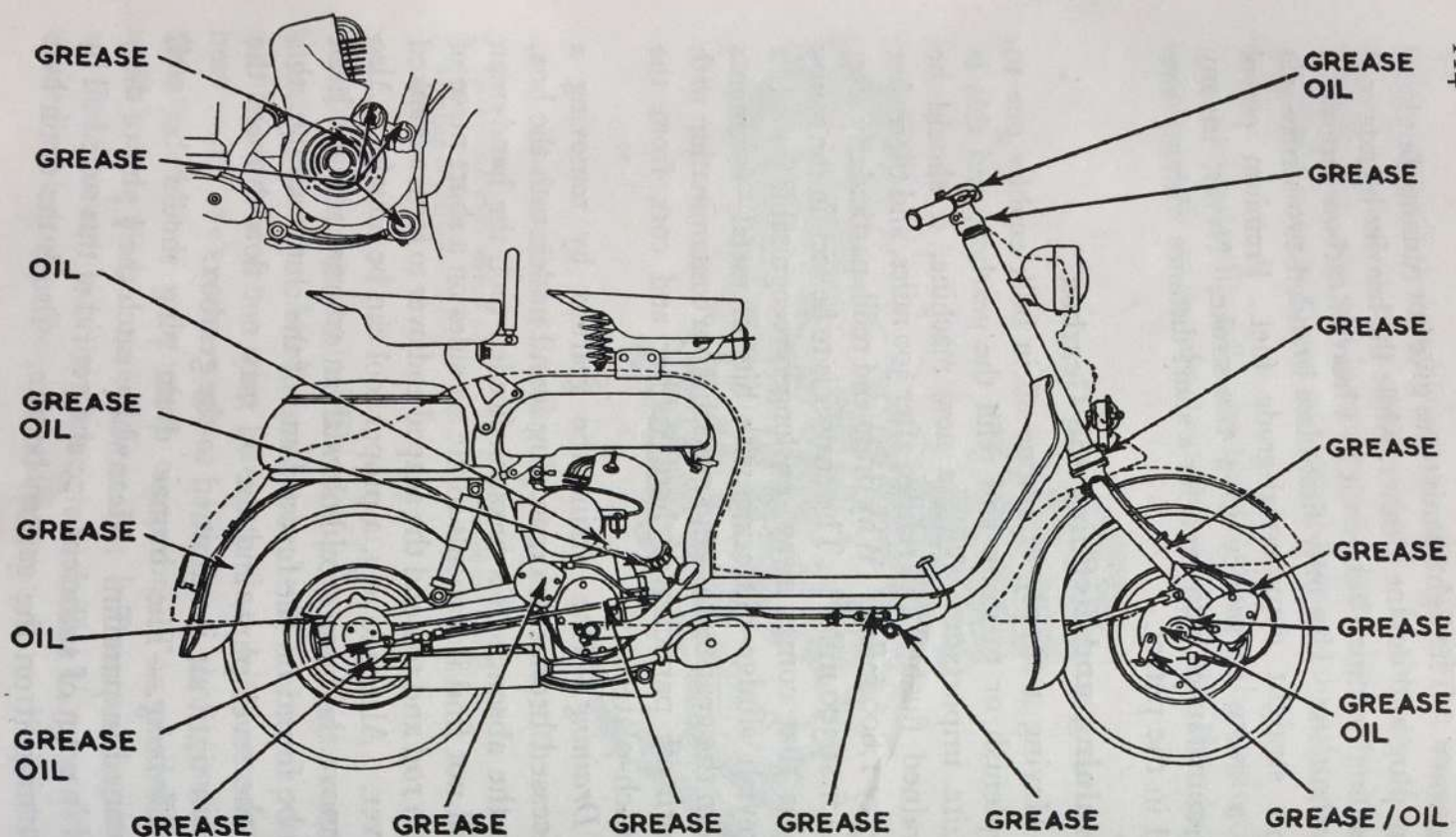


FIG. 40.—LD LUBRICATION CHART.

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clean with paraffin, replace the drain plug and take out the filler plug, also a bronze recessed-hexagon affair, on top of the gearbox casing immediately under the carburetter air filter. This will have to be taken off to make the plug accessible. Replace the level plug, pour a cupful or so of clean paraffin into the gearbox, replace the filler plug lightly, start the engine and run the machine up and down the road slowly for two or three minutes, changing up and down through the gears. After this, again drain the gearbox, tilting the machine as necessary, to ensure that all the paraffin comes away. Give plenty of time for this, because any appreciable residue of paraffin will destroy the lubricating value of the new oil, and it would therefore be a good idea to leave it to drain overnight. A lot more dirt will be removed from the gearbox with the paraffin.

Now, finally replace and tighten the drain plug and once more take out the level plug. Pour in clean, new oil, either of the special two-stroke variety or 20 grade in winter and 30/40 grade in summer, until it drips from the level hole; about $\frac{1}{2}$ pint will be needed. Replace the level plug and tighten it, and add a further $\frac{1}{4}$ pint—no more. Replace the filler plug and the air cleaner and the machine is ready.

The Final Drive

Although not specifically recommended by the makers, the drain, flush and refill procedure can, with advantage, be repeated for the bevel casing or final drive. This takes $\frac{1}{4}$ pint of heavy 140-grade oil. The drain plug is immediately forward of the bevel casing, and of course underneath it, and the same hexagon tool is needed as for the gearbox plugs. The best time to drain the final drive is when the machine has just come in hot from a run of at least an hour, since the heavy oil will then be fluid. If the weather is cold, put a carefully measured $\frac{1}{4}$ pint of new

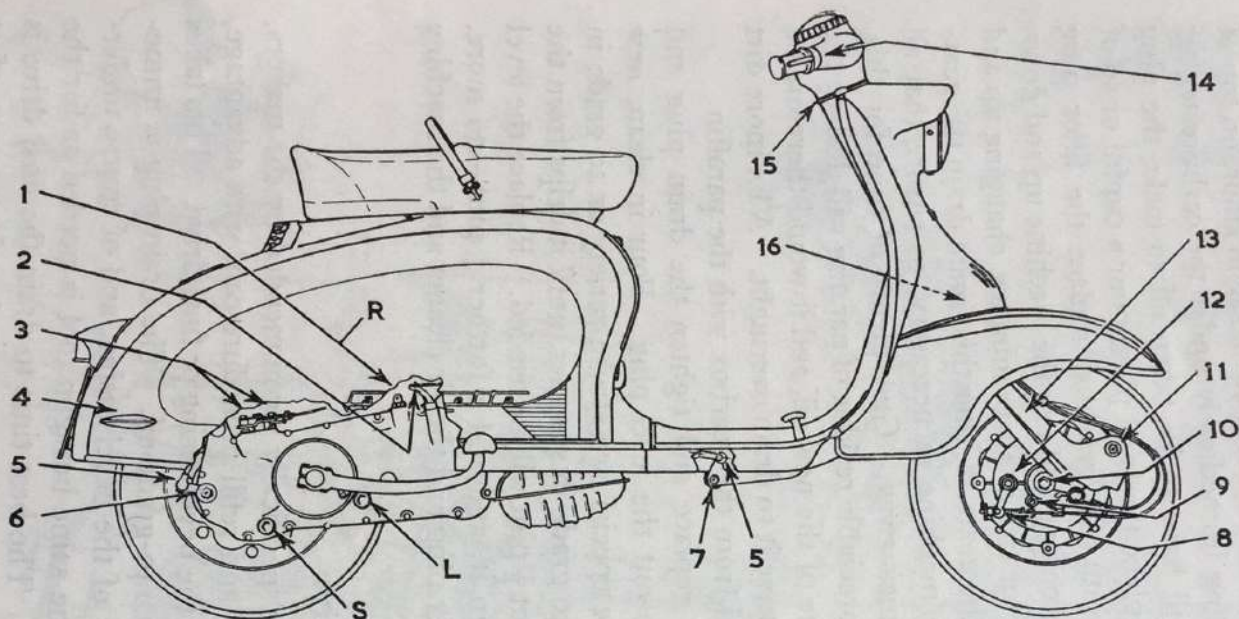


FIG. 41.—TV 175 LUBRICATION CHART.

- | | | |
|--|---|--|
| 1. Crankcase (A). | 10. Front-wheel bearing (F). | A. Re-establish oil level every 1,250 miles. |
| 2. Clutch-cable knuckles (B). | 11. Suspension-link boxes (D). | Change oil every 2,500 miles. Use |
| 3. Gear-change knuckles, twin lever (B). | 12. Front-brake cam pin (B). | Energol S.A.E. 30 (hot climates, |
| 4. Side-panel hooks (C). | 13. Front-suspension helical pins (C). | S.A.E. 50). |
| 5. Rear-brake knuckles (B). | 14. Handlebar-control lever knuckles | B. Use Energol S.A.E. 30 every 1,250 miles. |
| 6. Rear-brake cam pin (E). | (E). | C. Use Energrease A1. |
| 7. Rear-brake pedal pin (E). | 15 and 16. Steering ball-bearings (C). | D. Use Energrease A1 every 1,250 miles. |
| 8. Front-brake knuckles (B). | 17. Oil-level plug. R. Oil-filler plug. | E. Use Energrease A1 every 2,500 miles. |
| 9. Speedometer-drive box (D). | S. Oil-drain plug. | F. Use Energrease L3 every 2,500 miles. |

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140-grade oil to warm on a stove and, meanwhile, carry out the same procedure as for the gearbox, but this time using half a cup of paraffin. There is no reason why both bevel drive and gearbox should not be drained and flushed together, in which case the same short run on the road with flushing paraffin in the reservoirs will serve both purposes. The filler plug for the final drive is at the extreme end of the axle casing and there is no level plug; one simply pours in the new oil until the level rises to the bottom of the filler-plug hole. It is not possible in this case, nor would it be desirable, to add any extra beyond the specified $\frac{1}{4}$ pint.

Oil-can and Grease-gun

Remaining lubrication points on the machine are dealt with by oil-can and grease-gun. These operations, as detailed later, will be carried out by the Lambretta service station for a small charge, and if one has no grease-gun this avoids buying this comparatively expensive tool.

There are some seven points at which grease should be injected under pressure: three at the engine bearers on the magneto side, between the top of this instrument and the rear mudguard (one is underneath); another at the rear-brake cam, underneath the bevel drive; and two on the front wheel. One of these is on each fork-suspension box. All should receive a sparing shot every 1,000 miles.

If the grease-gun is used on the hub-greaser it is particularly important not to be over-generous, since excess loose grease in the hubs will inevitably find its way on to the brake linings. The wheel bearings, inside the hubs, are really better greased separately once a year with their own special lubricant, taking the hubs apart for the purpose. If this is done the grease can be put into the bearings where it is really needed. Finally, there is a greaser on the brake-pedal shaft. Wipe away exuded surplus grease, which collects road dirt.

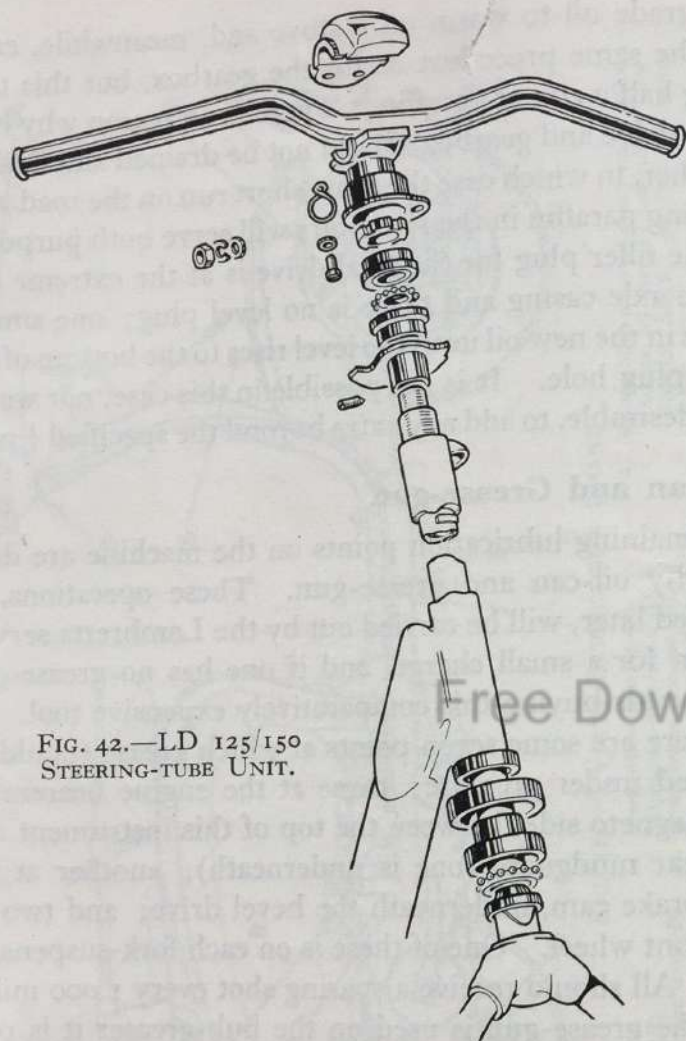


FIG. 42.—LD 125/150
STEERING-TUBE UNIT.

There are five places to which an oil-can should be applied, filled with any good, light machine or engine oil. These include the clutch control, cable knuckles at the front of the clutch housing, the rear-brake knuckles immediately in front of the final-drive casing and the various hand controls for front brake, throttle, clutch and gearbox on the handlebars.

Here the oil-can should be used with particular dis-

cretion. Though, for sensitive control, it is most desirable to have everything sufficiently oiled, any excessive amount will creep out over the levers and twist-grips. If the twist-grips themselves become stiff or sticky in operation, do not douse them with oil to effect a cure, because the oil, blackened by metallic rubbing, will work past the stationary end plugs on the handlebars and continually soil the palms of one's hands.

The Twist-grips: Lubrication and Wear

There is no provision for injecting lubricant into the twist-grips, which indicates that they are packed with grease on original assembly and intended to be lubricated only when stripped down and rebuilt. Brief instructions for dealing with wear in these grips are given in the next chapter, and that is the opportunity for lubricating the parts with high-melting-point grease, which will not run and spread all over the place.

Steering-head and Suspension Springs

Other components lubricated during assembly and intended to be regreased when they are dismantled for overhaul include the steering-head ball-races and the suspension springs in the front forks. In fact, the steering-head should not need to be dismantled in the life of the machine, since the races are a long way apart and subject to far less oscillating strain than is the case with the short steering-head of a bicycle or ordinary motor cycle. On the unenclosed models C and D it is easy enough to work a shot of fairly heavy oil into the races or to inject it with a pressure gun, and this could be done once in six months. As long as the steering is free from looseness, yet turns perfectly freely, there is no need to do more than this. As to the suspension springs, on the unenclosed model C

one can take off the top cap on the spring tubes and inject a little grease from time to time, as here the lubricant tends to work down and out at the lower end. On later models, with the springs actually enclosed in the fork tubes, these are heavily packed with grease during factory assembly, and no provision is made for more to be added.

The Saddles

An occasional spot of machine oil should be dropped on the rocking bearings of the saddles to keep these supple and free from squeaks.

The Magneto Oiling Pad

In both the Marelli and Filso magnetos a felt pad bears on the cam track, and not more than two drops of oil should be put on these pads at long intervals; say not more than six months. Excessive lubrication at this point results in the contact-breaker becoming fouled, so it is better to under- rather than over-lubricate here. The pad can be reached through one of the slots in the flywheel, and if it is visibly oily no more should be added.

CHAPTER VII

TRANSMISSION AND SUSPENSION

ATENTION to the gearbox and final drive in the models AC, LC and the D series will eventually become necessary in well-used machines. Although there are differences in the suspension, many adjustments are similar in the Cs and Ds. Once again, as with the lower engine and clutch assemblies briefly covered in an earlier chapter, thorough overhaul calls for a series of operations needing many special tools neither possessed nor normally acquired by the ordinary owner. Some, however, such as gearbox adjustment, can be coped with by a reasonably experienced rider with limited equipment.

Regulating the Gearbox

Later models C and LC have the same gear-selection mechanism as in the Ds. It consists of a small box, immediately to the left of the kick-starter case, housing a selector lever with a rolling spring-loaded stud that travels along a shaped track. Depressions in the track define the three gear positions and that for neutral between first and second. If the gears become elusive or tend to jump out, the push-pull cable may need shortening, and to regulate their engagement the four screws on the external plate should be unfastened and the plate removed.

First see that neutral (o) on the handlebar control coincides with the intermediate position, between first and second, of the rolling stud on the track. If it does not, loosen the lock-screw and plate securing the end of the cable to the small swivel block integral with the selector lever and see if it is then possible to make the handlebar

zero (sometimes an N) register with the indicator line on the fixed part of the handlebar, with the selector in the neutral notch. Where the outer cable enters the box there is a grip with a locking-bolt, and this can be loosened so that the end of the outer cover enters the box to a greater

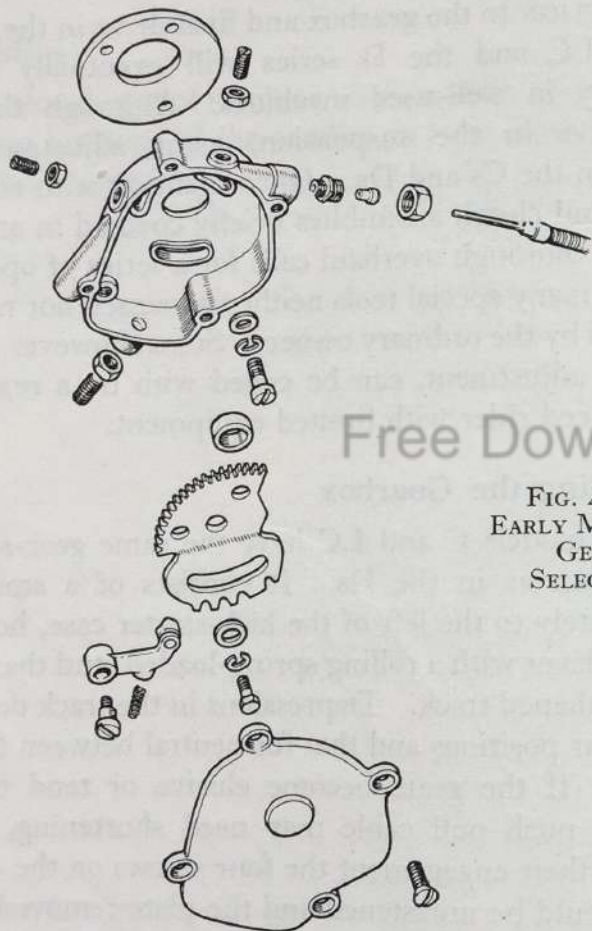


FIG. 43.—
EARLY MODEL C
GEAR
SELECTOR.

or less extent, thus in effect lengthening or shortening the inner cable by a small amount.

The cable may, however, have stretched too much, and after taking up the slack it may project beyond the edge of the swivel block. If so, the amount of the projection must

be noted and the cable taken completely out of the grip on the selector lever so that the projecting piece can be nipped cleanly off with a really sharp pair of cutting pliers. Any projection beyond the swivel block will cause the selector lever to jam against the cable end when one tries to change down from top to second gear.

Three Adjustment Points

There are three external points at which adjustment can be made to the gear-change control. Two of these, by the inner cable and the outer cover, have just been described; the third is by turning the whole selector box on its mounting. The selector box is secured to the gearbox casing by three screws which pass through slots in the back of the box and then through a large, thin steel disc, which masks the slots and acts as an oil-seal. When the gear control is put into first gear the top left screw is unmasked and can be unscrewed or tightened; when second gear is engaged the other top screw becomes accessible. The bottom screw remains unmasked.

When the screws are slackened the box can be rotated through a short distance, and this may be enough to get the spring-loaded roller into the appropriate depression on the track at the same time that neutral, or the gear on which one is working, is engaged in the box. This is best used as a fine adjustment only, because if one wants more clearance for top gear it can only be had at the expense of first, and vice versa.

The Early "C" Gear Control

In the first C models a toothed sector was used, against which the cable was pinned by two screws with lock-nuts, the teeth in the sector engaging the surface windings on the cable. In this case the position of the cable relative

to the sector cannot be altered, and the only adjustment is by slackening and afterwards retightening the back-plate screws. Note that the cable must not be pressed tightly against the sector, or it will be jammed.

In both the early and later devices the sector and the selector arm are mounted on splines cut in the fork-control shaft projecting from the gearbox. If it is desired to alter the position of either on the shaft the circlip is removed, and the part can then be pulled off to make the cable mounting more accessible.

D and LD 150 Gear Control

On these models there are two cables, operating on each side of a rocking control. Each cable has its own adjuster and is very robust. What little stretch develops in course of time can be taken up by the appropriate adjuster. If the gearbox is to be dismantled, the rocking control can be slid off the fork-control shaft at the same time that, after removing the back fixing screws, the control box is removed from the gear casing. The cables then stay in place without their adjustments being disturbed.

Dismantling the Kick-starter

On C and LC models the kick-starter mechanism can be removed in one block. The starter box is fixed to the engine crankcase by two cylindrical-headed screws and a locating pin at the bottom, and the whole mechanism is mounted in the box, and not partly on the cover plate, as in later models. The cover plate is held by three small countersunk screws. All the kick-starter mechanisms work on the same principle: a bevel pinion, driven by a ratchet and toothed sector, engages the bevel pinion of the clutch.

The D and LD kick-starters come away in two groups. After removing five bolts the cover is detached from the

crankcase when the two screws holding the bevel-pinion support have been loosened (but not removed). Then proceed according to the instructions given at the end of the engine-dismantling section.

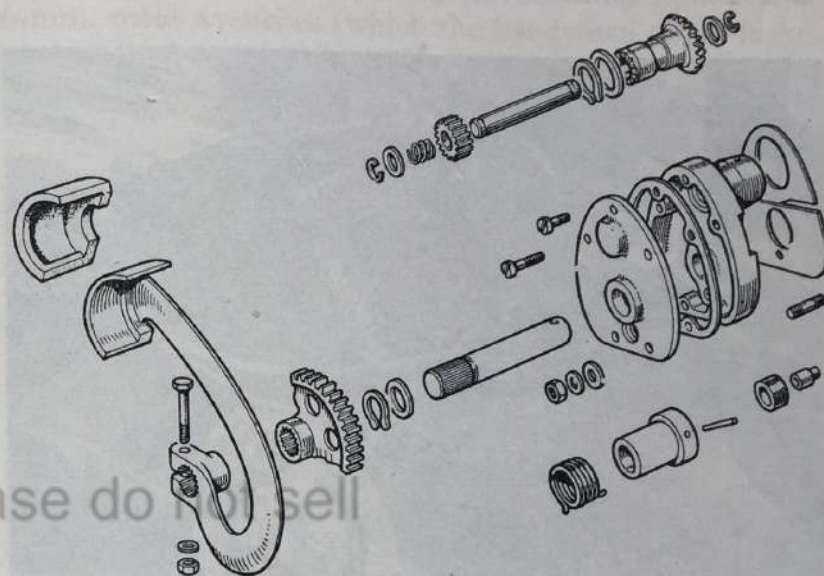


FIG. 44.—MODEL C KICK-STARTER COMPONENTS.

Transmission and Suspension Dismantling

On the model C the engine and transmission case form a rigid unit and the rear suspension takes place between the wheel and the transmission case. This is quite different from later models, in which the whole engine-transmission unit flexes under the restraint of pre-loaded torsion-bar mountings. Thus on the model C the whole transmission unit up to the back of the gearbox can be withdrawn without disturbing anything forward of this point, but on later models much more dismantling is necessary to get at the torsion bars.

With Cs and LCs one dismantles the rear mudguard and the gear-selector box, removing the mounting screws and

circlip to enable the box to be drawn off and laid aside still attached to the cable. Next take off the rear-brake-lever tie-rod and the back wheel and tyre. Underneath the transmission case is the large tubular suspension unit; at its forward end, directly beneath the joint between the

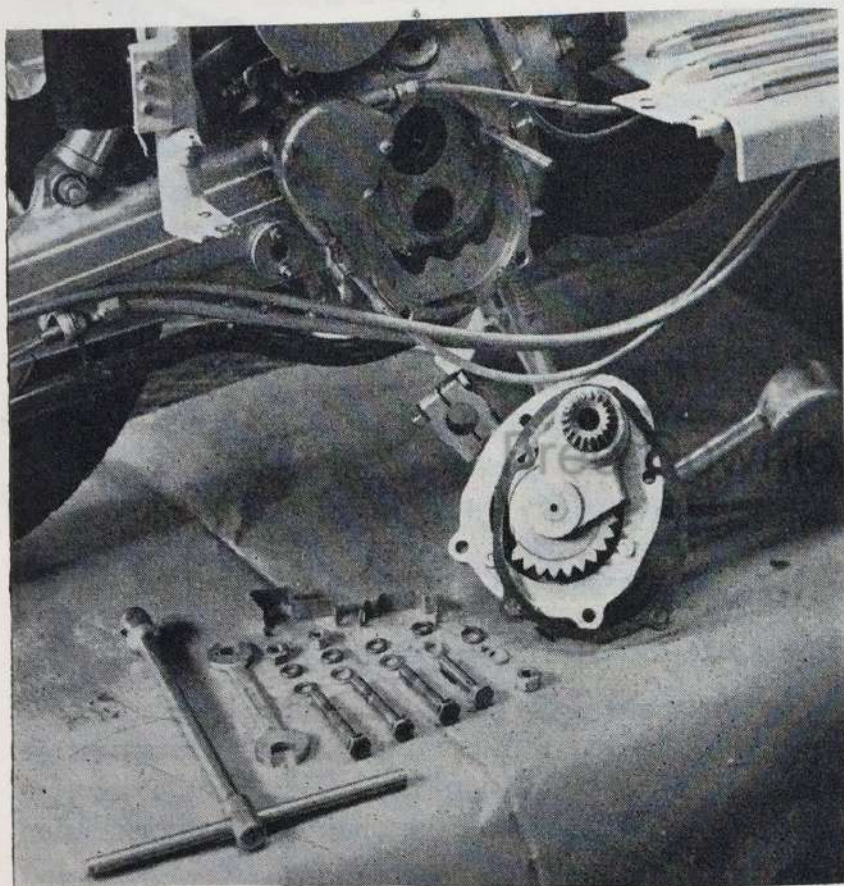


FIG. 45.—KICK-STARTER REMOVED ON LD.

transmission case and the gearbox, is a transverse pin retained by a circlip at each end. This is a point at which wear and looseness may be expected to have developed. Remove the circlips and pull out the pin, catching the suspension unit as it drops away.

There will now be exposed between the two bearings of the pin a 14-mm. nut threaded on a screw, which joins the two cases. They are locked by a punch, and must be similarly released, and removed. Next take out the thirteen hollow-headed (Allen) screws using 5-mm. and 6-mm. male wrenches (which the handyman could make as described elsewhere in this book). Pull the case away and it will part as in the LD model. The needles of the

FIG. 46.—MODEL C
TRANSMISSION-HOUSING
PIVOT.



pinion leading from the gearbox must be carefully preserved, as must the fork-control lever in its housing. When reassembling, fill the joint with grease and remake it with great attention.

The Rear Bevel Gear

To adjust the bevel pinion which rotates in the rear suspension joint, remove the round cover enclosing the joint. The axle of the pinion is held against its bearing with a nut and lock-nut; loosen the lock-nut and tighten the inner nut so as to adjust the pinion to have 0.12–0.14 mm. play between the sides of its teeth and the sides

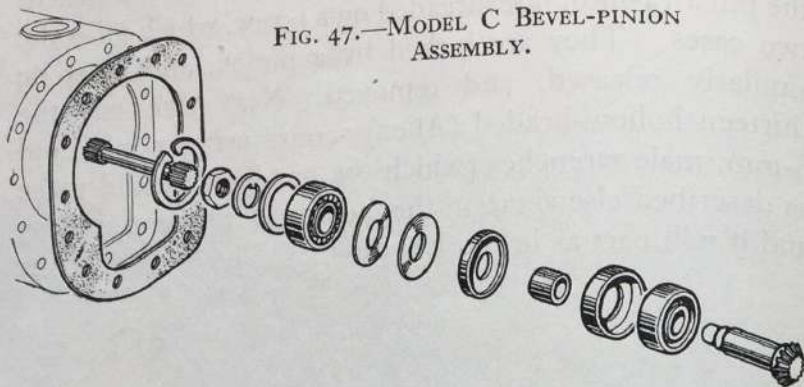


FIG. 47.—MODEL C BEVEL-PINION ASSEMBLY.

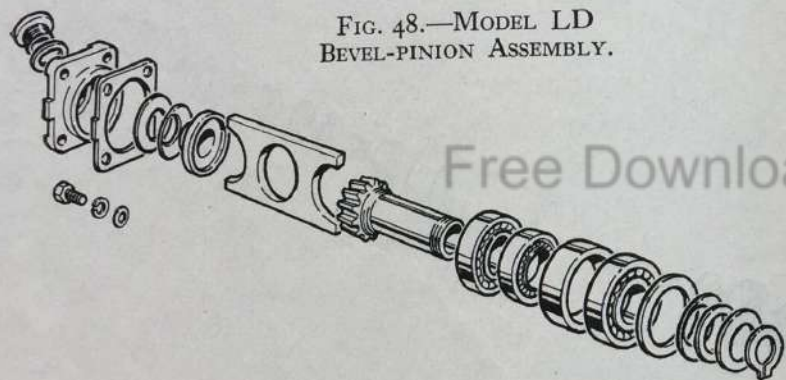


FIG. 48.—MODEL LD BEVEL-PINION ASSEMBLY.

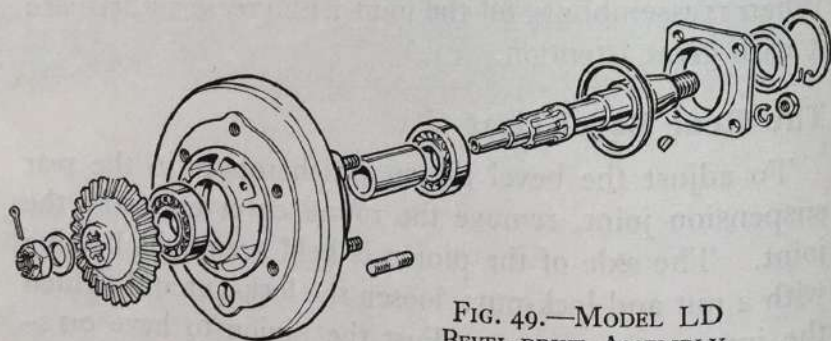


FIG. 49.—MODEL LD BEVEL-DRIVE ASSEMBLY.

of those of the bevel pinion driven by the transmission bar. Measure the amount of play through the greasing plug of the bevel gear behind the transmission box, using a feeler gauge between the teeth.

This play is of critical importance, and a similar amount of play must exist between the crankshaft bevel pinion and that on the clutch bell. Here regulating washers are used and should be replaced after dismantling.

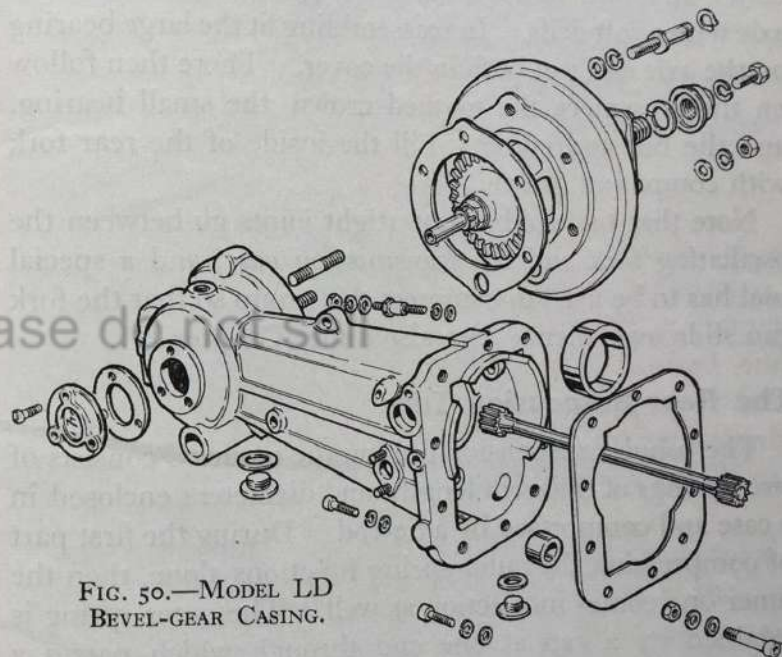


FIG. 50.—MODEL LD BEVEL-GEAR CASING.

Rear-wheel Ball Bearings

The drum and brake shoes should be removed. From the wheel side two 10-mm. nuts fix the cover on the casing of the sprung fork, and these and the trunnion of the brake shoe should come away. Take off the brake lever, if not so done already, and pull out the camshaft, and the guide rod of the brake cam; this also acts as a suspension spindle, and the complete tubular unit can now be put

aside. Take off the two 14-mm. nuts mounted on the two pins joined to the sprung fork, then, working from the opposite side, unfasten the three 14-mm. nuts fixing the pins to the cover, which will come away. With it come the wheel axle and its two bearings and the large toothed plate of the reducer.

Next there are four fixing nuts at the other side, on the oil-seal cover, and this can be removed. Take out the cotter and nut, remove the bearing, and knock out the axle with a soft drift. In reassembling fit the large bearing on the axle and put both in the cover. There then follow on the crosspiece the toothed crown, the small bearing, and the nut and cotter. Fill the inside of the rear fork with compound grease.

Note that two rubber watertight joints go between the oscillating fork and the transmission case, and a special tool has to be used to compress this group so that the fork can slide over them. See also under Chapter III.

The Rear Suspension Tube

The tubular suspension unit on the model C consists of two springs of different lengths and diameters enclosed in a case and compressed by a tie-rod. During the first part of compression the outer spring functions alone, then the inner one comes into action as well. The outer spring is retained by a cap at one end through which passes a plunger rod, the bottom end of which bolts into a ring with a rubber centre. When there is no load on the back wheel the rod is fully within the box and the springs are under very light compression. The weight of the machine and of the rider brings up the bevel casing into line with the transmission box, pulling the rod partly out of the shock absorber and compressing the springs. It is most unlikely that the interior of the shock absorber will need any attention for a very long time, but the continual

hammering on the two rocking pins causes these to loosen and makes replacement of the bushes and pins periodically necessary.

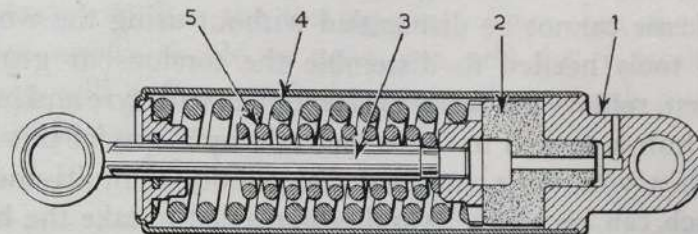


FIG. 51.—MODEL C REAR-SUSPENSION DAMPER.

1. Screw plug. 2. Rubber pad. 3. Tie rod. 4. Outer spring. 5. Inner spring.

Stripping the Bevel Gears

If it becomes necessary to dismantle the rear bevel gear one has first to take out the needle cage of the bearing of the rear transmission pinion. This calls for an extractor tool consisting of two steel rods, with hooked ends, attached to a metal block. The hooked ends are pushed into the pinion bush, and by levering under the assembly block and warming the case the bush and the needle cage can be pulled out.

The bevel gear is held by a circlip, and its removal is followed by that of the bearing in the bottom of the case. Behind it are regulating washers which come away next; and then, using an extractor, screwed to the shank of the pinion, this can be withdrawn. The pinion runs on two bearings with an intermediate oil-seal to prevent the gear-box oil from mixing with the much heavier lubricant used in the bevel gear.

Dismantling the LD Transmission

A brief indication was given in the chapter on engine dismantling how to take down the assembly as far as the

clutch, and in the main the principles involved in dismantling the transmission follow lines broadly similar to those of the model C. Owing to the different D-LD suspension system, using stressed torsion bars, the engine crankcase cannot be dismantled without using the workshop tools needed to disassemble the torsion-bar group.

First, remove the rear wheel complete with tyre and hub. The hub is locked to the wheel axle by a special nut for which a wrench is supplied; or a normal multi-ended wrench can be used. A puller is needed to take the hub off the shaft, and the key on the axle should be carefully preserved. The brakes and wheel bearings can now be overhauled; but if no work is to be done on these the hub itself can be left intact and the mudguard and wheel removed. In releasing the rear mudguard there is sufficient slack in the tail-light cable for this to be left in position, the mudguard being placed on the footboard. The mudguard is secured by two groups of bolts, fixing it to the frame.

From the other side of the machine, one dismantles the gear-change selector casing and the rear-brake control cable. The inclined damper, or shock absorber, fixed between the transmission case and the frame, can be freed at the transmission end and left in position.

At this stage the torsion bar has to be released. Then the rubber pad limiting the crankcase movement must be taken off and the crankcase allowed to swing to its maximum deflection. When this has been ascertained, raise the unit slightly and place a block of wood between the rear of the crankcase and the frame tube to keep the groups lifted away from the torsion-bar housing. If it rests on this the Allen screws on the transmission case cannot be easily slackened.

Before dismantling the transmission group, place a bowl under the joint between this and the crankcase to collect

the gearbox oil. There is now an alignment bolt to be first removed between the crank and transmission cases. It is found at the bottom and locked by a pinned nut at the transmission side. A light blow from a mallet is necessary to free the locking-pin. After this, the nine Allen screws should be taken out, and the transmission group will pull away from the crankcase with a slight rotary movement.

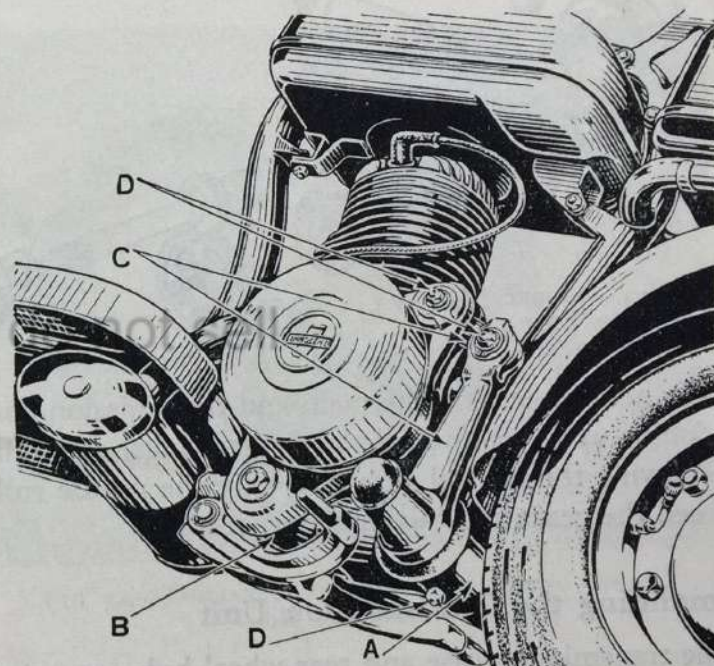


FIG. 52.—125 D/LD REAR SUSPENSION.

A. Torsion bar. B. Frame pivot-pin. C. Return levers. D. Grease nipples.

Dismantling the Gears

It is not difficult to extract the main and secondary shafts from the crankcase at this stage, or to remove the gears splined to them, but it should be emphasised that the owner will find considerable difficulty in reinstalling the

gears, and is not advised to attempt the work unless he has thorough knowledge and an adequate supply of tools.

After the main and secondary shafts and the second-gear connecting ring on the countershaft, the gear-shifting fork

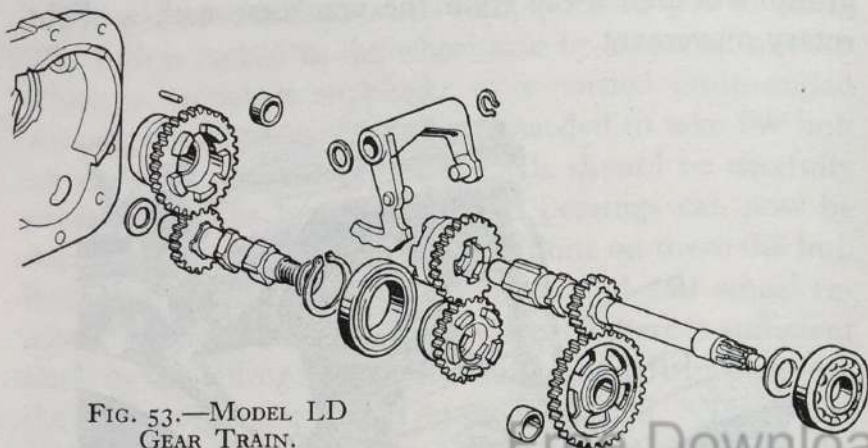


FIG. 53.—MODEL LD GEAR TRAIN.

and the neutral gear on the main and transmission shafts will follow upon removal of the Seeger rings, or circlips. In removing the neutral gear, take care the needle rollers between the gears and bushing are not lost.

Dismantling the Transmission Unit

The transmission case and rear-wheel hub can now be dismantled. The brake shoes are freed when the small circlip is released from the retaining pin and the cam assembly has been taken apart. It is necessary to use a threaded puller to extract the rear-brake-shoe pin bush. After this, loosen the brake-shoe pin and the lock-nut of the rear-wheel supporting flange; take out the washer and disconnect the flange from the transmission case. There is a gasket which should be preserved. The general assembly from wheel to bevel gear is fitted on the rear-

wheel supporting flange, and the sequence must be followed in dismantling.

Four nuts secure the bearing cover, and with these away the flange and packings can be detached. A castle nut locks the bevel gear, and after the cotter has been removed the nut which holds the axle in place can be unscrewed either by a special wrench or by temporarily refitting the wheel hub. To free the wheel bearing, strike the axle end

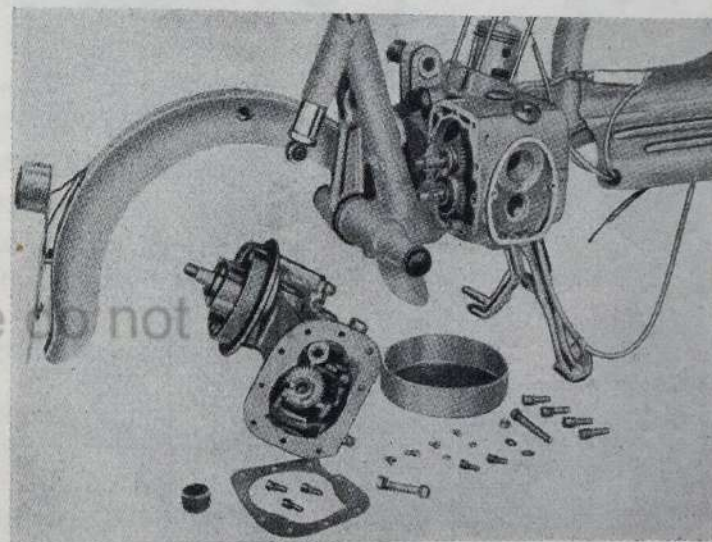


FIG. 54.—DISMANTLING REAR-TRANSMISSION GROUP, LD 150 MODEL.

with a punch, using an intermediate aluminium or lead pad to avoid damage to the thread. Next loosen the four screws retaining the transmission-case rear cover and the three screws fixing that of the speedometer drive. Under the transmission-case rear cover is a retaining ring and washer, and with these out of the way the bevel-pinion bearing-retaining plate can be extracted from the transmission case with a bevel-pinion puller.

As well as the pinion, the extractor should be used to

remove the bearings and gaskets. Insert the tool from the end of the transmission case and engage the clamps between the pinion and the bearing, first shifting the support partially out so that the clamps open; grip the part,

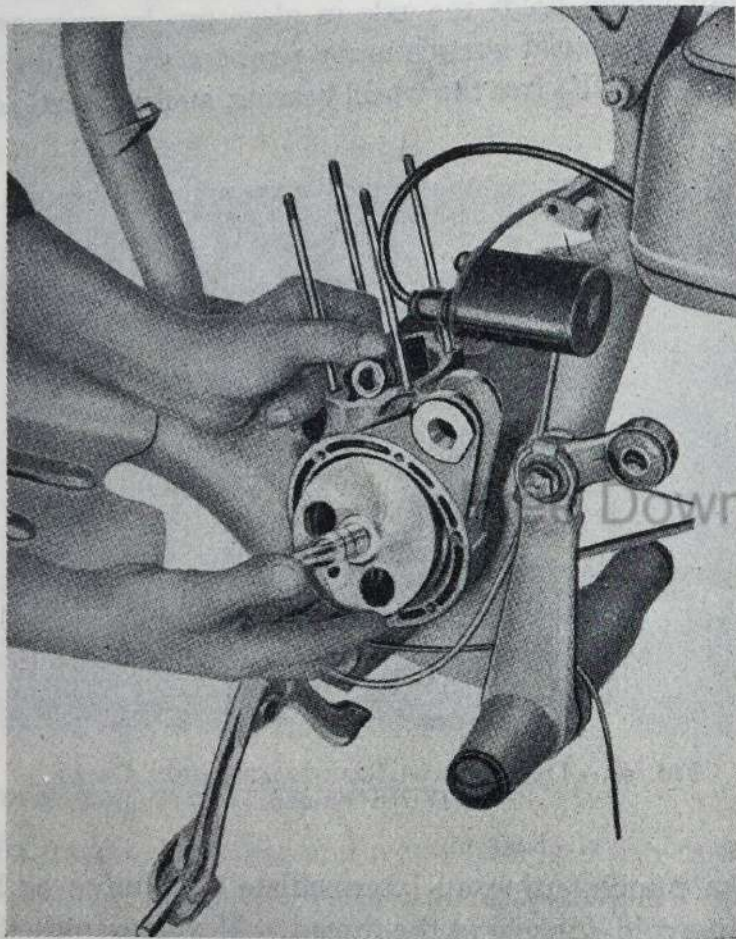


FIG. 55.—REMOVING CRANKSHAFT AND CONNECTING-ROD FROM CRANKCASE, LD 150 MODEL.

then press the support in again. A washer is next fitted at the transmission case end, and by operating the handle of the puller the group is removed from its seat.

Piston and Crankshaft Removal

Before the crankshaft assembly can be drawn out it is necessary to detach the piston by pressing out the gudgeon pin, as previously explained. The crankshaft and connecting-rod can be eased out of the crankcase at the magneto side after the bevel pinion has been removed from the carburetter side, there being enough clearance for this. A large number of special tools are needed for this operation, which should be performed in the workshop.

On the 125-c.c. LD and D models it is necessary to preload the rear suspension before the transmission assembly can be dismantled, as there is no shock-absorber device on these models. A pre-loading tool has therefore to be applied and operated, after which the procedure follows the general lines described in this chapter. For further information on the power unit see Chapter II.

Front-suspension Dismantling

On the model C, with its external suspension springs, the points at which wear occurs are at the bronze bushes at the bottom of the connecting-rods where they are articulated on the fork. Both spindles and bushes should be replaced when looseness develops. Later models have the front springing fully enclosed within the forks and the sealed cases at their extremities.

Detach the brake cable and remove the front wheel; loosen the three screws fixing the case covers and slide them off with the screwdriver. To extract the inner levers there is a special tool, after which the push blocks and springs can be taken out, first loosening the case bottom-plate plugs.

The inner lever pins on the bronze bushing forced into the fork ends may have seized, making extraction of the levers impossible by hand. In this case, a special pressing

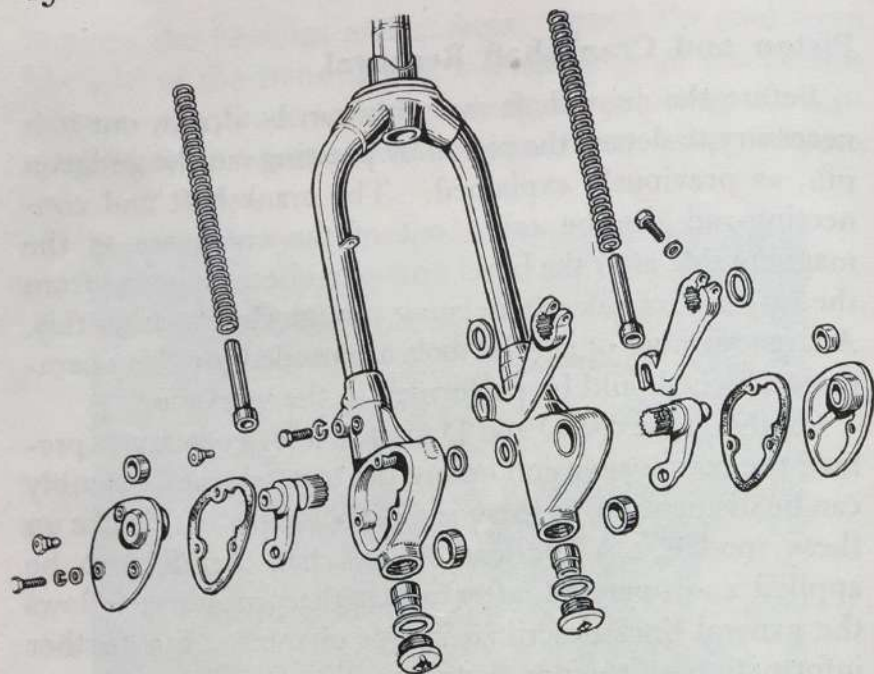


FIG. 56.—LD 125/150 FRONT-FORK UNIT.

tool is used. The bronze bushes are likely to need replacement, and calibration of these bushings must be made after they have been forced into the housings.

Size Allowances

Before reinstallation of any component, it should be thoroughly washed in paraffin or petrol and closely examined. Tables of limits for wear and for installation-size allowances are provided by the makers, and wear on the parts should be checked in accordance with these tables, available in the makers' workshop instructions. Close inspection will also enable the repairer to check whether wear is normal or whether early defects have been caused by poor lubrication, lack of maintenance or incorrect use of the machine. Parts showing excessive wear must always be replaced, but those within the limits laid down can, in most cases, be refitted.

CHAPTER VIII

SERVICE AND RIDING ALPHABET

MOST Lambretta owners, it has been proved, are not mechanically minded. They are the people who use their scooters day in and out, for business or pleasure. They do not want to tinker, but most of them wish to learn at least how to perform the simpler of the operations described in this book, so that if they have a mishap on the road, perhaps far from a service station, they will know what to do to get going again. But they very wisely have their machines serviced, as they now can, at a fixed charge and at regular intervals.

Maintenance

Maintenance covers three groups of operations. At 500 miles, or after one month, one can have the following operations carried out for a nominal sum: full lubrication, oil-levels check, adjustment to tyre pressures, cleaning of plug and regapping, carburettor adjustment, lights check, road test and report. The latter is specially valuable, because the expert can invariably spot little faults and prevent their growing into big ones.

Each 1,500 miles, or after three months, the same maintenance items are repeated and the following are added: clutch adjustment, brake linings check and shoe adjustment, wheels changed front to rear.

At 3,000 miles both sets of operations are repeated plus the following further items: gearbox and rear axle drained and refilled, all cable controls disconnected and oiled, ignition (magneto) checked and reset, power unit washed down, and all nuts and bolts checked and tightened.

In all three operations materials and oil are extra. Clearly this type of maintenance is something the ordinary owner could do for himself only with a full kit of expensive tools and the knowledge of how to use them. In addition, he would have to spend his time on the work, and while many men might be tempted in these directions, few women—and they form an increasingly large class of scooter-user—would be interested.

Parts Service

Eventually, the replacement of parts will be needed, and this takes one into a further aspect of Lambretta servicing facilities. Instead of having to buy new components, the owner can exchange his own for reconditioned engine, transmission and final-drive assemblies. Then there is a stock of works-conditioned service exchange frames, forks, wings, petrol tanks, legshields, magneto armatures and rear hubs. This means that any damaged or worn part, or assembly, can be turned in at an agreed exchange price and the machine need be off the road only so long as it takes to have the reconditioned components fitted—a great saving of time as against having the actual part stripped down and repaired.

Within the scope of this book, there remains, therefore, only the advice needed to help the owner who has to make an emergency repair or adjustment, or who prefers to carry out simple maintenance himself (or herself). The following alphabet of hints is therefore offered as a solution to these two types of query; some other matters, not actually concerned with repair or adjustment, are also included.

ACCESSORIES are available in a wide range to increase riding comfort and pleasure. Apart from a pillion seat and spare wheel, the first, and most useful, is a windscreen,

now considered indispensable for cold-weather riding. As to others, a study of the range of approved accessories at the dealer's will tug hard at the purse-strings; but the writer would suggest two quite modest items—a small first-aid kit and a pint-sized fire extinguisher.

ACCIDENTS will happen sometimes. Make no admission of liability and remember that mishaps, if not witnessed by a policeman, must be reported to the police within forty-eight hours if they involve injury or damage to third persons or vehicles or to dogs. Study the insurance policy carefully, and if any part of it is not clear have a word with the issuing company before anything happens.

ACCUMULATOR (or battery) when fitted, with or without self-starter, needs regular topping-up to just above the level of the plates with distilled water. Rain-water in emergency, tap-water never. Keep clean, remove corrosion, consult the service station if it becomes discharged. An expensive item, it should last at least a year, and can be made to go longer by proper maintenance.

ADDITIVES, graphites, upper-cylinder oil are unnecessary in two-strokes. Use commercial fuel and 20 or 30 S.A.E. oil of known make, about $\frac{1}{2}$ pint to the gallon of fuel, 140 S.A.E. for the final-drive, and waste no money on fancy preparations.

BRAKES should be kept in perfect trim and—paradoxically—used as little as possible. The pedal will hold the machine stationary, leaving both hands free. “Squeezes” of the front brake, rather than continuous application, are safest for normal slowing-down purposes. Use the gears—bottom gear if needed—to keep

speed down on long descents. Never brake on slippery roads; change down. Apply both brakes on-off, on-off, for dead stop, but never lock either wheel. Try to avoid situations leading to crash-braking.

When brake linings wear and the drum lever moves too far over, pack the free ends of the shoes with steel or wrought-iron U-plates which the garage will make up for you. Alternatively—though not on early Lambrettas—it is often possible to refit the brake lever on the drum at a more acute angle. The whole point is to have the brakes pulling on before the lever passes the right-angle position. When the shoes have again worn down, remove them and exchange for relined replacement shoes. Lambretta brake linings are bonded and riveted, and can be relined only by the makers.

Clean carbonised oil from brake linings with a stiff brush and petrol and a light rub with sand-paper. Never try to burn off oily deposits on linings.

CARBURETTER should be cleaned every six months. Make sure all washers and gaskets are sound, that the carburetter is reassembled firmly but not too tightly and that it butts right home on its stub. Check the level by a spirit bubble laid on the open mouth of the float-chamber. Suggestions: either scribe registering marks on carburetter and gearbox or make a little wooden jig to push-fit between the float-chamber base and the top of the gearbox and so automatically give the right level.

Flood the carburetter as little as possible. Periodically wash off the filler-cap of the petrol tank with unoled petrol and make sure the air-hole is clear—a little-thought-of but obvious point that can save maddening symptoms of petrol starvation. If air cannot enter the tank at this point petrol cannot get out of it and into the carburetter.

The plastic fuel hose between the petrol tap and the carburetter hardens, and sometimes splits, in the course of use. Fit a new piece about once in six months, at the cost of a few pence: its small cost will be more than saved by eliminating slight petrol leakage at entry and exit points.

CLUTCH adjustment is by unscrewing or screwing up the two lock-nuts on the clutch rod revealed by removal of the brass acorn nut on the casing. Shorten clutch cable by screwing left- and right-handed adjuster underneath the offside footboard. Allow $\frac{1}{8}$ — $\frac{3}{16}$ in. free movement to prevent clutch bind. Free play of about the same amount must remain in the hand lever.

If the clutch sticks and bottom gear cannot be engaged without grating, wash out the gearbox with paraffin, as described elsewhere in this book, and refill with a 20 grade oil instead of a 30. Gummy oil causes the plates to stick together, especially when the unit is cold.

DECARBONISING is called for at 3,000–5,000 miles (longer on Li and TV), but can safely be postponed if carbon deposits are cleaned regularly from the exhaust port. Loss of power and a woolly note in the exhaust are the clues to exhaust-port choking. At the same time, test the silencer for back pressure. A machine ridden hard forms less carbon than one used for pottering.

FREE-WHEELING: never free-wheel by holding the clutch out for long periods, or stand in traffic with a gear engaged and the clutch held out. On the end of the clutch rod is a thrust race, the seat of which will be worn down by running the engine with the plates in tension.

GEARS are meant to be used for braking against engine compression as well as getting up speed. Since there

is no decompressor on the Lambretta engine, use bottom gear, if need be, to check speed on steep descents. Pops in silencer do not matter. Change gears upwards (first to second, second to top) on a closed throttle; change down, as when climbing a hill, on a partly open throttle. Always change into a lower gear a little sooner than appears necessary: don't keep the engine labouring on a gear too high for the gradient.

HARD plugs and *soft* are difficult to understand unless one remembers that hard riding calls for a hard plug—one able to withstand heat. Hard, medium and soft plugs need gaps of about 0.015 in., 0.018 in. and 0.020 in., respectively. Fit a hard plug in summer and a medium one in winter, or use a platinum-electrode plug all the year round. A silver-electrode plug is nearly as good.

HUBS of wheels must not be over-greased. The wheels run on non-adjustable journal ball bearings. When the wheels are taken apart during overhaul (something like once a year), thoroughly wash out the ball races with petrol, let them dry completely, then pack them in again with bearing grease, such as high-melting-point, which will not liquefy and run out on to the brake shoes.

JETS of carburetter should never be poked with bits of wire, but blown with air blast from tyre pump or, in extreme cases, cleared with a piece of fine vegetable bristle which cannot enlarge the hole.

MAGNETO maintenance by the owner should be confined to a drop or two only of fine machine oil such as "Three-in-One", once every six months, on the felt pad which can be found through the slots of the flywheel. It bears on the cam track. At the same time inspect the points. The fibre cam wears very slowly, and over a long period tends to open the gap less than it should, which in turn

tends to retard the ignition. If the gap is set too wide the ignition becomes over-advanced, causing kicking back and sometimes getting the engine running backwards. Check the instant of separation with a strip of tissue paper and do not try to adjust the gap to a pre-determined figure on the high point of the cam.

The points should break at the left-hand scribing on the flywheel, or about $1\frac{1}{4}$ in. before T.D.C. If this is checked with great precision the gap and the timing will be automatically corrected.

Removing the flywheel is an extremely tricky job needing special tools. If new points are wanted, have the service station fit them, as the flywheel must come off for this.

Clean the points twice a year with fine emery cloth wrapped round a nail file, or with a magneto file or a carborundum slip. Ordinary files are useless. Afterwards, wash the points with a fine brush and a little petrol, and reset to break accurately as just described. Should the points not butt squarely, they must be taken out and stoned parallel, or new ones fitted.

MIXTURE strength is highly important. Use, generally, one part oil to sixteen of petrol, that is $\frac{1}{2}$ pint per gallon. Five of the tank-cap measures give an accurate mix of 6 per cent, near enough to one in sixteen.

Mixture reaching the engine is controlled at low engine speeds by the pilot jet, horizontal spring-loaded screw in the carburetter upper chamber. To reset, screw it right home finger-tight, and unscrew again one and a half turns. With the engine warm, adjust the slanting spring-loaded screw immediately above the pilot screw so that the engine idles steadily. Carefully adjust the pilot screw until the tick-over is as even as possible. A two-stroke can never idle quite regularly;

but see to it that the pilot is not less than one turn unscrewed, or the mixture will be too rich and high fuel consumption will result.

For running mixture, check that the right size throttle valve is fitted, but do not alter it otherwise. Verify main jet, needle jet, needle; if correct but consumption is too high change needle jet, which may be worn. Check for this: put the needle right down by engaging top groove, and if performance is unaffected, needle jet (sometimes called the atomiser) is worn and should be renewed.

Use standard-size main jet unless there is excessive pinking at speeds of 30-40 m.p.h., or the last quarter of throttle opening produces no result. If either condition is observed, try a main jet one size larger, but remember that hard driving on full throttle will produce much higher petrol consumption.

Another factor materially affecting mixture strength is the air cleaner. Never try to tune the carburetter with the air cleaner removed, as the extra air admitted will give a weaker mixture. When the air cleaner is renovated, after three months maximum, always use the same amount of fine steel wool, lightly oiled with engine oil, and see that it fills the allotted space—beware of spaces where unfiltered air can be drawn in to the detriment of the engine and the mixture strength.

NEUTRAL in the gearbox is sometimes difficult to find, especially when a little play has developed in the twist-grip gear control. To remedy this, ease back the edge of the rubber covering at the outer end of the grip and it will be seen that the domed cap on the end of the gear control is held in position by a grub-screw. Take this out and ease off the cap. Between it and the inner sleeve of the gear change will be found one or more

thin washers, or shims. Insert an extra shim and gently tap the domed cover back into place, reinsert the grub-screw and tighten. This should reduce rotary play in the gear-change movement. Play in the throttle grip can be similarly reduced.

Neutral is normally selected between first and second gears, but there is also a free-engine position between second and top. One can sometimes become flustered in traffic by stopping one's engine in gear and being unable to find either free-engine position quickly. In this case the following procedure can be adopted: de-clutch, kick-start and remount with the engine running and the clutch held out. Engage first gear normally, with the usual fully upward movement; ride away.

OIL of 20 or 30 grade, or of the kind sold specifically for two-stroke mixes, can be conveniently carried in a tightly stoppered tin holding $\frac{1}{2}$ pint. When reserve has to be turned on, refill at the first opportunity with a gallon of petrol and mix the tin of oil in with it. Refill the oil tin on returning home. This is also a useful check on consumption, since the machine should cover something like 100-140 miles between refills.

PAINTWORK should be cleaned with any of the advertised coachwork cleaners. Polishes with a wax base will protect the finish. Though the engine and all unpainted metal parts can be cleaned off with paraffin, avoid this getting on the paintwork, which it will dull and spoil. If very dirty and muddy, wash the footplates and side panels with a warm detergent emulsion; but, in general, it is best to avoid too much wetting of the machine, since rust is inevitably encouraged to form in out-of-the-way corners. In winter rub a wax polish over the chrome finish and leave it on unpolished.

PUNCTURES can largely be avoided nowadays by a once-weekly scrutiny of the tyre-treads, particularly if the machine is used over rough, flinty roads or where horse-nails and other bits of metal are frequently encountered. It takes quite a time for a sharp flint or iron fragment to penetrate the tough tyres, and only a few moments are needed to spin each wheel in turn and pick out intruders from between the ribs of the tread.

A good bicycle tyre repair outfit takes up little space in the tool-locker and will deal with any punctures likely to be met with on a tour. There is no need to carry the bulkier outfits sold for motor cycles or cars.

SADDLE comfort is very important, and care should be taken in choosing one's seating arrangements. Far the most comfortable of all, for rider and passenger, is the large, blue-grey, sponge-rubber variety, the passenger's saddle being fitted with a grab handle also covered in rubber. These seats are expensive, but luxurious and the only possible "wear" for a long tour.

A secondhand machine may already have a leather, or leathercloth, topped saddle, set on a fan of thin, coiled springs. These break and sag, and the top should be slipped off to see how the springs look. They should be just taut, and sometimes it is possible to adjust them by removing the end wire links and hooking the springs direct to the saddle frame.

On most Lambrettas one can shift the saddle along a sliding slot, after loosening the retaining bolts, giving it about an inch adjustment in either direction. This does not sound much, but makes a lot of difference towards a relaxed and comfortable seating position.

SIDECARS designed for the various models can be successfully fitted to the 150-c.c. machines; even the 125-c.c.

engine can cope with a light-weight version, but generally one needs the extra power. It is best to buy the machine-cum-sidecar as a complete unit, because lower gear ratios are desirable, and it may be necessary to alter the trail of the front forks. Stronger clutch springs and higher tyre pressures are also advisable. The type of sidecar is one with a small wheel like the machine itself, and capable of carrying a medium-sized adult and a child.

TOOLS, such as spanners, must be of metric (millimetre) sizes. The continental system refers to the width of the hexagon head in millimetres, whereas the British size system refers to the diameter of the bolt shank.

The standard toolkit contains the essential items for ordinary maintenance, but the enthusiast, particularly taking over a used machine, will find he needs to add and replenish. Good sets of socket and open-ended spanners, seven to a group in 7-27 mm., are a must, as is a cranked extractor for the oil-filler plugs. The handyman, making this up from a piece of bar, could also fashion Allen keys, for the recess screws on the clutch case and elsewhere, from large wire nails cranked over, filed to shape and hardened.

A ring spanner is best for the sparking-plug—the plug spanner supplied is apt to break the insulator if carelessly handled. Two minor abominations should never be included in the tool-roll; one is the cheap adjustable spanner, which no self-respecting mechanic would ever use. It gives the wrong leverage, slips and will swiftly ruin the flats of any nut to which it is applied. The other is the steel-headed hammer. Have a set spanner to fit every nut, and when a hammer is needed use only a soft-headed type with either a wooden, copper, plastic or hide head—but remember

that even these can snap off a cooling fin, particularly from the cylinder-head.

Try to use controlled pressure rather than blows; for example, in removing the gudgeon pin from the piston it is almost impossible to drive this out without doing damage. But the removing tool applies controlled screw pressure to the end of the pin, and no damage can be done unless one has forgotten to take out the other circlip (known in the Lambretta literature, by the way, as a Seeger ring).

Not everyone realises that the length of a spanner is no haphazard matter. It is calculated to give the right leverage in tightening up or loosening the particular size nut or bolt which it fits. If one increases the effort by slipping a foot of gas pipe over the end of the spanner one may easily shear off the bolt. The highest class of ratchet-action workshop tools have an adjustable slipping clutch on them which is set up to a pre-determined number of pounds-foot to prevent overtightening. As quoted elsewhere in this book, the sparking-plug maker, for instance, gives precise pound-foot (torque) figures for the amount of effort to be used when sparking-plugs are installed, and urges the use of a wrench that will slip when this figure is reached.

The ordinary set spanner is, therefore, a compromise, giving the maximum leverage permissible with the unaided hand. The only exception is in the case of the capped nuts on the front-wheel spindle, which, when tightened with the box spanner supplied in the tool-kit, can and should receive a final urge with foot pressure on the shank of the spanner.

Reverting to circlips, or Seeger rings, the number of these on the Lambretta makes desirable the acquisition of both expanding and contracting circlip pliers. However, if economy is of importance one can, with a

little patience, make one medium-sized pair of either type do both jobs.

WEATHER protection for the rider who must be abroad in all conditions is, in the first instance, a matter of a good handlebar screen (see ACCESSORIES). It should have an apron coming down past the top of the legshield and if sufficiently wide will do away with the need to wear heavy gauntlets. Those who dislike the encumbrance of a windscreen can wear a face visor in perspex or similar material, but the chest is then unprotected. The screen has many less obvious advantages; it deflects insects in summer, and many riders swear that it improves performance, since with it the machine makes a better-shaped "hole in the air".

Choose a screen with good horizontal curvature and set it with a very slight rearward lean. Have it at such a height that the rider looks over it, not through it, otherwise it is a nuisance at night and in wet weather.

Even more essential than the screen is a head-protecting crash hat with ear flaps. Choose one that has been manufactured according to the British Standards Institution (RS 1869: 1952). It may save the rider's life in the event of a fall, and with ear flaps down will less spectacularly save from neuralgia and worse during icy wind and frost. On the hands, mitts of flexible sheepskin prevent numb fingers better than any fingered glove.

The riding coat should be double-breasted, buttoned across the chest, with elastic inner cuffs, and should have the skirt strapped like a horseman's coat to stop the flaps flying off the knees. There is nothing like a solid proofed Melton, and the writer has affectionate memories of his enormous N.F.S. coat, which was a model of what such a garment should be. In bitter

weather a newspaper inside the coat in the front is an old tip. For the throat a thick silk muffler is best of all.

Slacks, for both sexes, in a dense material such as cavalry twill, and woollen socks covered by fleece-lined boots, will keep legs and feet warm in all weathers. In hot conditions reduce the extra covering appreciably, but keep the screen on. Ride then in leather-palmed string gloves as a protection against callouses on the insides of the thumbs. Choose white or light-coloured glove backs—they show up hand signals at night.

CHAPTER IX

THE TV 175 AND Li MODELS

WITH the introduction of the TV 175 and Li 125 and 150, a number of features of completely new design made their appearance under the Lambretta trademark. These models retain the widely appreciated characteristic of the centrally placed engine, which results in the excellent balance common to all Lambrettas; but the engine is mounted with the cylinder pointing horizontally (forward) instead of vertically as hitherto. This has necessitated some redesign of the frame pattern, which, however, remains a single large-diameter tube. The transmission and final drive are still in one piece, and pivot as a unit to form the rear suspension. Instead of the forward-mounted gearbox and shaft final drive, transmission from the clutch is by duplex chain, completely enclosed and non-adjustable, to a four-speed, spur-type gearbox directly driving the rear wheel from the output shaft. Apart from starting, clutchless gear changes, up or down, can be made with this type of gearbox.

Engine Modifications

The engine reverts to the use of a two-ring piston, and an important point of present-day economy is that the strength of the petrol mixture, after the engine has been run in, can be reduced to 4 per cent or one part oil in twenty-five of petrol.* A long-reach ($\frac{3}{4}$ -in.) cold plug is used, mounted, as before, in an aluminium cylinder-head.

* Except with the TV Series I.

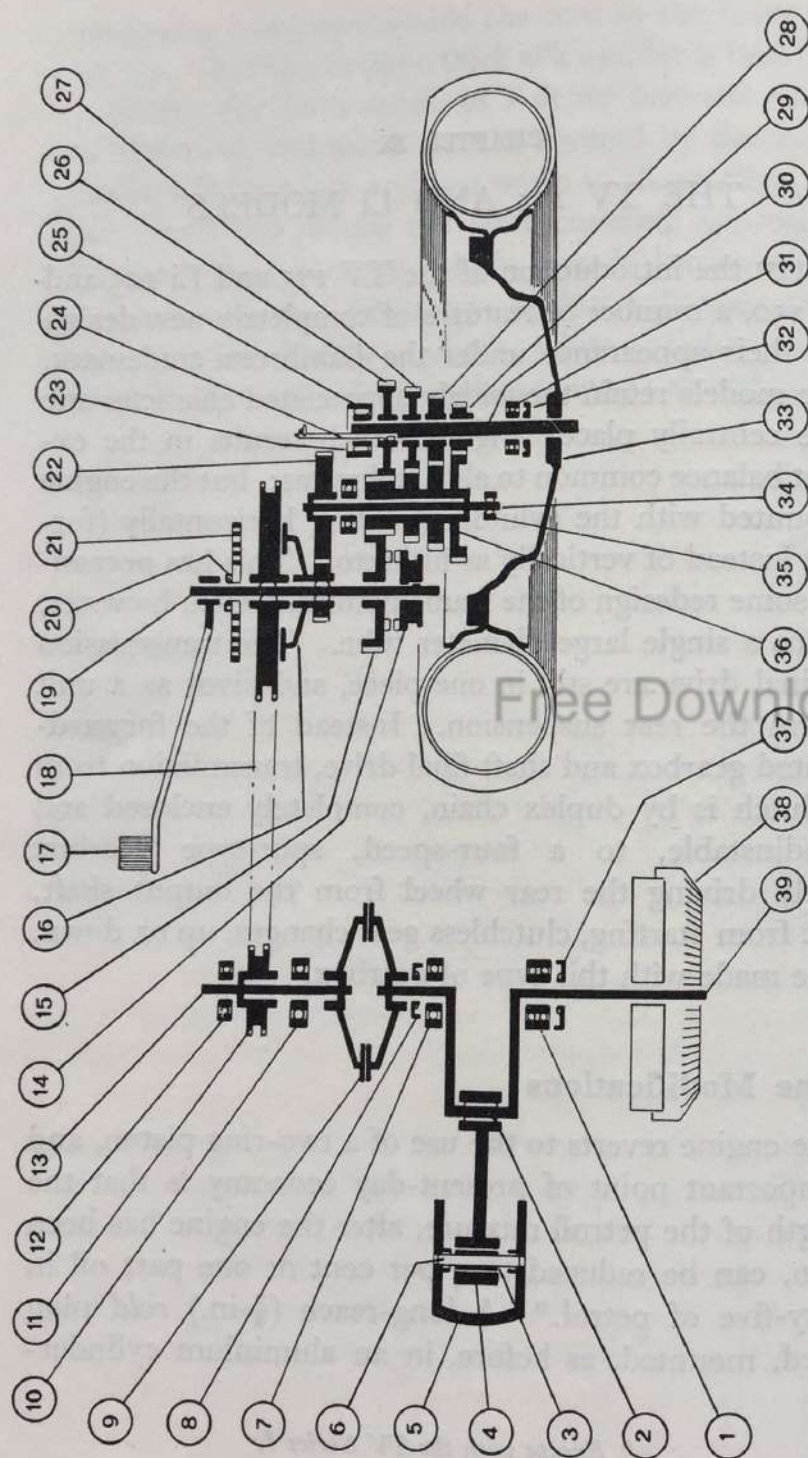


FIG. 57.—TV TRANSMISSION LAYOUT.
(See opposite page for key.)

KEY FOR FIG. 57.
(opposite page.)

- | | | |
|---------------------------|---------------------------------|-------------------------|
| 1. Ball bearing. | 15. Kick-starter pinion. | 27. 2nd-gear layshaft. |
| 2. Needle bearing. | 16. Damper friction disc. | 28. 3rd-gear layshaft. |
| 3. Bush. | 17. Kick-starter pedal. | 29. 4th-gear layshaft. |
| 4. Crankshaft. | 18. Transmission chain. | 30. Layshaft. |
| 5. Piston. | 19. Kick-starter shaft. | 31. Ball bearing. |
| 6. Gudgeon pin. | 20. Oil seal. | 32. Oil seal. |
| 7. Ball bearing. | 21. Kick-starter return spring. | 33. Rear hub. |
| 8. Oil seal. | 22. Mainshaft gear-drive. | 34. Transmission shaft. |
| 9. Clutch. | 23. Needle bearing. | 35. Needle bearing. |
| 10. Ball bearing. | 24. Gear-selector-shaft cursor. | 36. Main-gear group. |
| 11. Drive sprocket. | 25. Needle-bearing bush. | 37. Oil seal. |
| 12. Ball bearing. | 26. 1st-gear layshaft. | 38. Flywheel magneto. |
| 13. Splined-collar shaft. | | 39. Crankshaft. |
| 14. Kick-starter ratchet. | | |

Rear Suspension and Kick-starter

A large hydraulically damped coil-spring unit, in which half of the main spring has the coils more widely spaced than in the other half, restricts the movement of the single suspension unit formed by the engine and transmission; and a high-ratio kick-starter is mounted, in the TV 175 Series I, on the primary shaft of the gearbox, and on the Li models direct on the final drive. Though these models have batteries and a charging circuit (except in the case of the Li 125), the new high-ratio pedal starter renders unnecessary the fitting of an electric starter. More powerful magneto generators are used.

Other Features

Common to all three models are improved and more streamlined appearance, quickly detachable side panels, giving complete access to the engine-transmission unit and a wide range of duo-tone colour schemes. The brakes have been improved and enlarged, and the wheels are of a slightly different type. Their diameter has been increased from 8 to 10 in. and the tyre section reduced from 4 to 3½ in. The split-rim system of tyre mounting continues, but the wheels are now bolted, car-fashion, to the hubs with

four studs and have air slots round the rims. Apart from improved appearance, these slots minimise the effects of side-wind pressure that might otherwise be felt with the larger wheels.

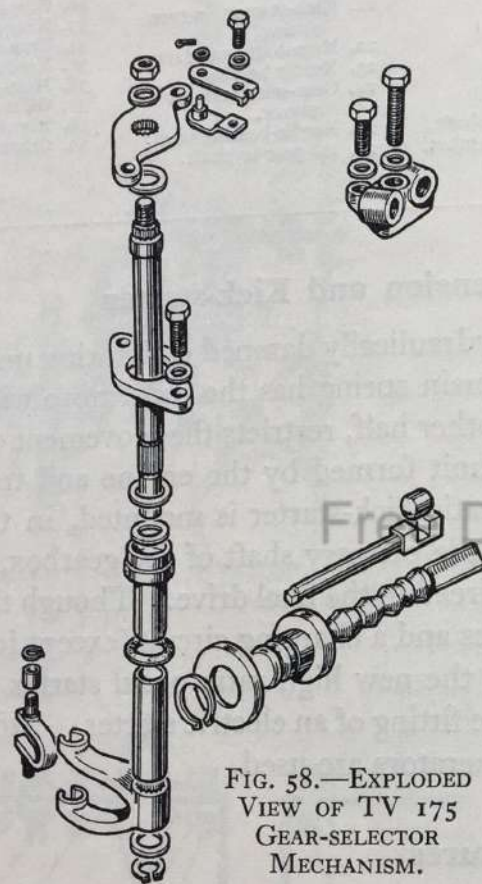


FIG. 58.—EXPLODED
VIEW OF TV 175
GEAR-SELECTOR
MECHANISM.

Servicing the TV 175 Series I

Many of the basic operations under the heading of "service" for all three new models follow the standard principles laid down earlier in this book for models A to LD. Crankcase oil should be changed each thousand miles, and the reduced petroil mixture enables decarbonisation to be postponed to intervals of 6,000 miles and more.

The number of grease-points on the machine has been reduced to six, and there are, all told, only sixteen lubrication zones on the whole machine, of which nine need attention at 1,250 miles or less.

Dismantling

To dismantle the rear wheel and shock absorber, the rear of the machine must be raised and rested on a wooden support, underneath the end of the rear mudguard, after the side panels have been removed. The makers have arranged a numbered dismantling sequence beginning with putting the machine on to its central stand and taking off the panels. *The second step* is to take off the silencer by unscrewing, with a 10-mm. spanner, the three nuts fixing it to the crankcase and by taking off the exhaust ring-nut on the cylinder. *The third step* is to remove the right-hand footboard by unscrewing (8-mm. spanner) the two nuts fixing it to the frame and the three screws of the frame-connecting piece and the footboard bracket. These are released by a 14-mm. spanner.

Fourthly, one takes off the kick-starter pedal, extracts the circlip, unscrews the return-spring nut (10 mm.), loosens the two 11-mm. pedal bolts and slides the lever from its shaft. A screwdriver is used to restrain the return-spring and allow it to unload gradually. *Fifth*: one removes the spring cover after extracting the circlip. *Sixth*: one drains the crankcase, unscrewing the drain plug with a 10-mm. Allen key and collecting the oil in a tray. *Seventh*: the clutch cable is freed from the external lever on the crankcase cover. *Eighth*: the rear-brake cable is similarly detached from the pedal-brake rod (19-mm. spanner). *Ninth*: removal of rear-brake lever mounted on the crankcase, by extracting the circlip, withdrawing the lever and then removing the second circlip.

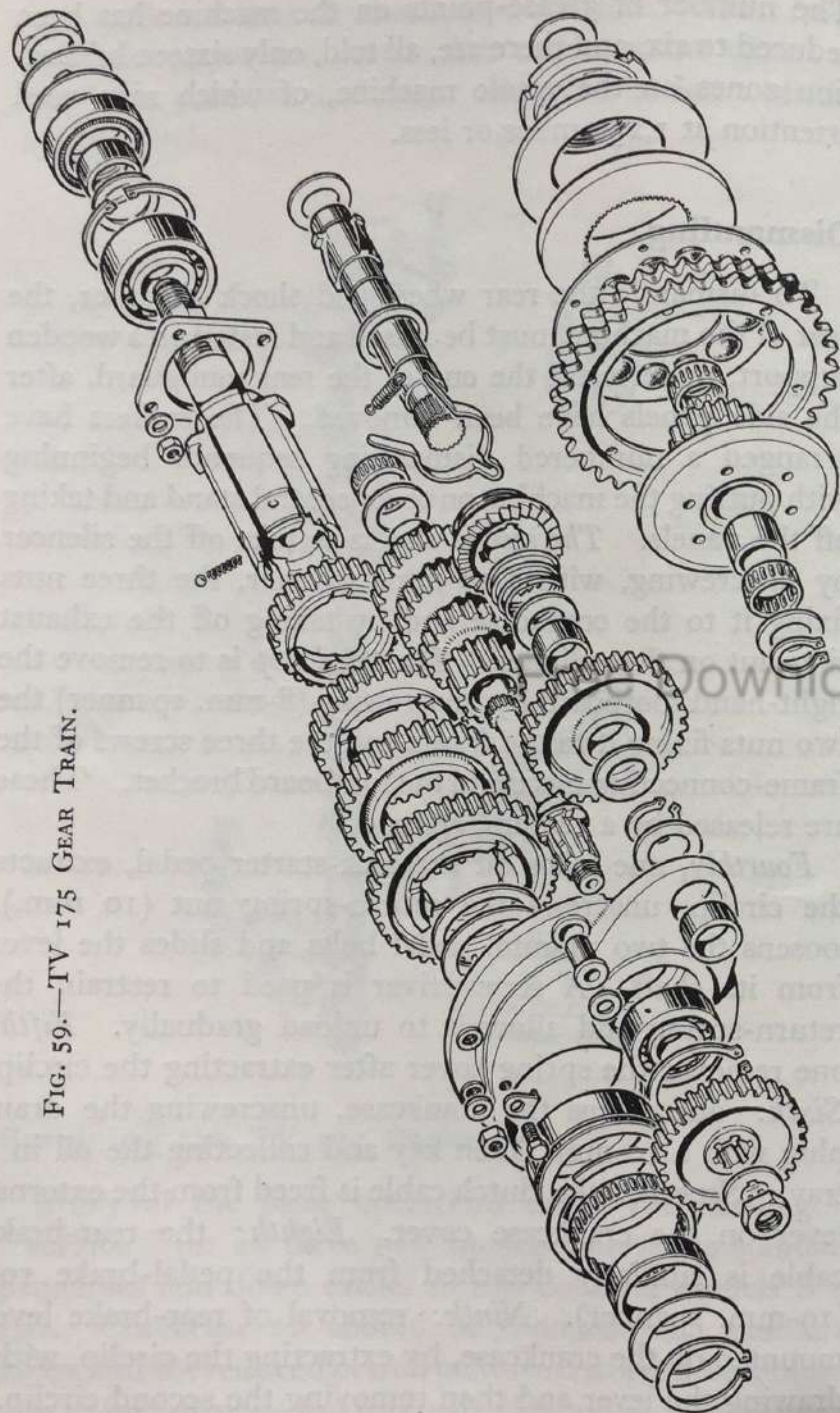
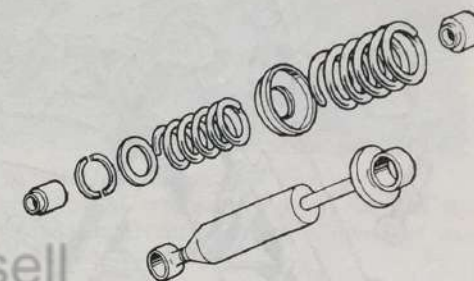


FIG. 59.—TV 175 GEAR TRAIN.

Tenth: one is now ready to draw out the shock-absorber bolt, and the rear of the scooter is placed on the stout wooden support, previously mentioned, approximately a foot high. The nut of the shock-absorber bolt is taken off with a 19-mm. spanner, and the bolt can be withdrawn if the wheel is supported and so prevented from dropping downwards. *Eleventh:* a 14-mm. nut secures the gear-change control-cable lever, which can be withdrawn after the nut is away.

FIG. 60.—REAR-SUSPENSION LEG.



Twelfth: the crankcase cover is now accessible. This is fixed to the crankcase by thirteen 10-mm. nuts and comes away with its gasket, which must be carefully preserved, exposing the entire transmission run. *Thirteen:* the clutch flange and torque damper can now be taken out. Seven 10-mm. bolts fasten the flange, and with these out of the way the circlip holding the torque damper and shims can be extracted. The damper comes off, together with the flange, the sprocket and chain. It may be necessary to screw two short 8-mm. bolts into the threaded holes on the flange to help removal. The two needle-bearing cages, the distance piece and shims on the kick-starter shaft can be withdrawn.

The makers emphasise two cautions at this point: the torque damper is pre-set at the works to slip when the torque reaches a pre-determined figure, and it should therefore never be altered or tampered with; the duplex

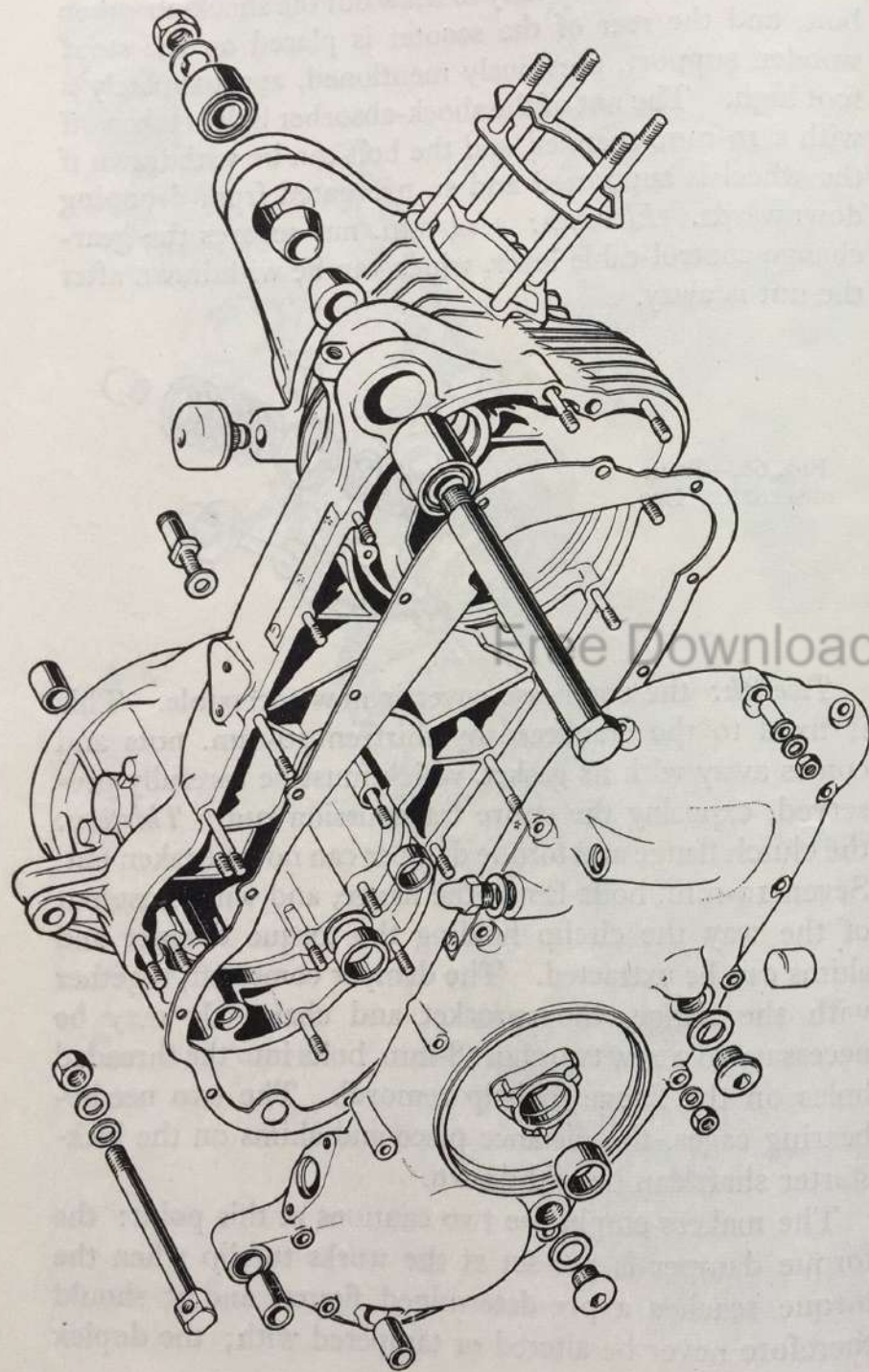


FIG. 61.—TV 175 CRANKCASE ASSEMBLY.

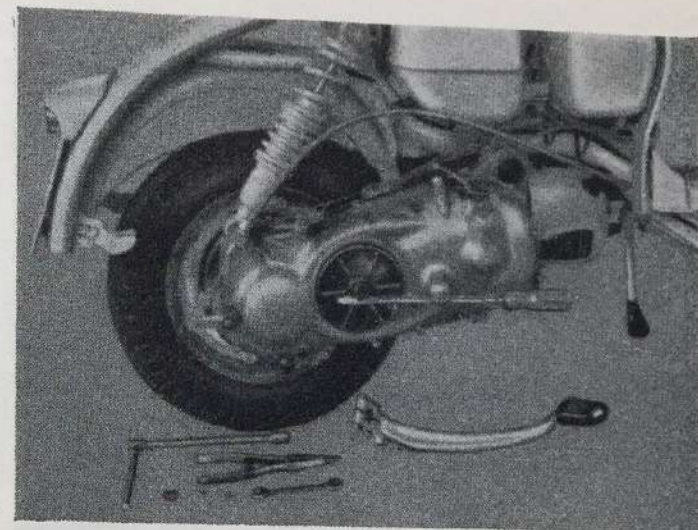


FIG. 62.—DISMANTLING TV 175.
Showing kick-starter pedal removed and the use of a screwdriver to restrain the return spring, allowing it to unload gradually.

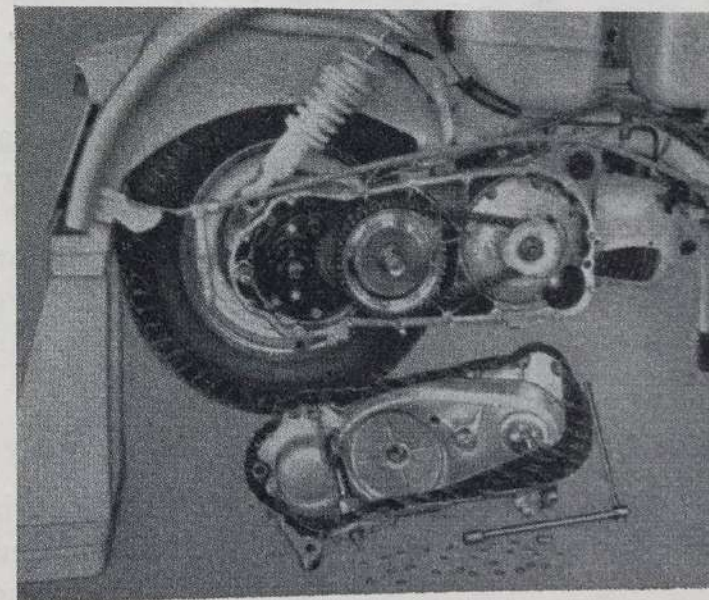


FIG. 63.—DISMANTLING TV 175.
Showing crankcase cover removed.

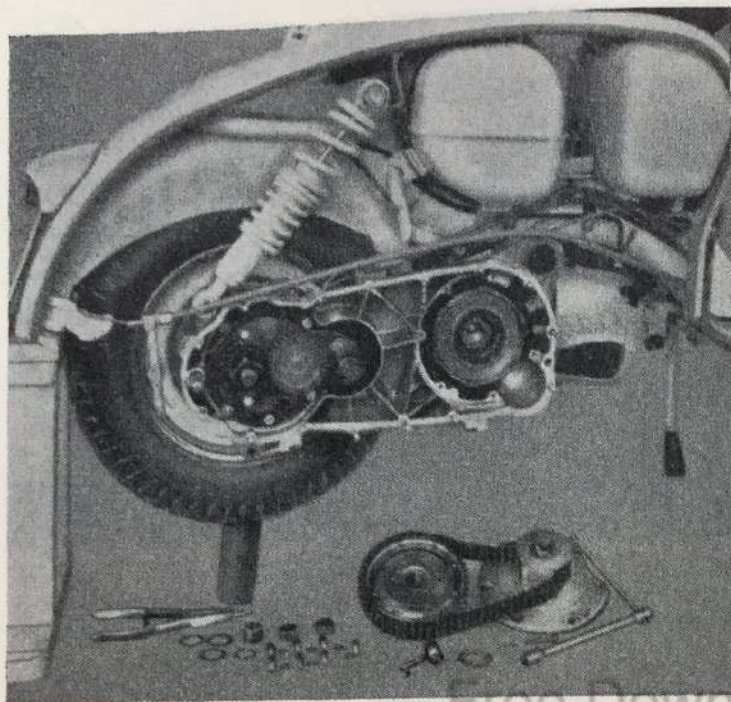


FIG. 64.—DISMANTLING TV 175.
Showing clutch flange, complete with sprocket and chain,
and torque damper removed.

chain, being completely enclosed, does not become saturated with gritty particles and should, therefore, never be washed with paraffin or petrol.

The *fourteenth stage* concerns dismantling the clutch, for which a compressor tool is applied to enable the circlip to be extracted. On removal of the compressor, clutch discs, springs and cups can be taken out.

Further Dismantling

The sequence outlined is different from that of previous models, and shows that many initial dismantling operations can be performed with the minimum of special tools; though, paradoxically, the machines of this design are intended to run for great mileages without stripping. The

remaining operations laid down by the makers call for an increasing amount of personal skill, and the number of workshop tools is also greater. The stages are therefore summarised, less space being given to those unlikely to be attempted by the amateur, and notes on the simpler jobs are correspondingly included more fully. *Operation fifteen* covers removal of the gear-shaft support flange and main-gear cluster shaft and the kick-starter shaft.

Sixteen extends this to the starter pinion. *Seventeen* governs rear-wheel removal, which follows previous Lambretta practice. *Eighteen and nineteen* detail the taking out of the axle shaft and its gears.

Number twenty concerns the straightforward operation

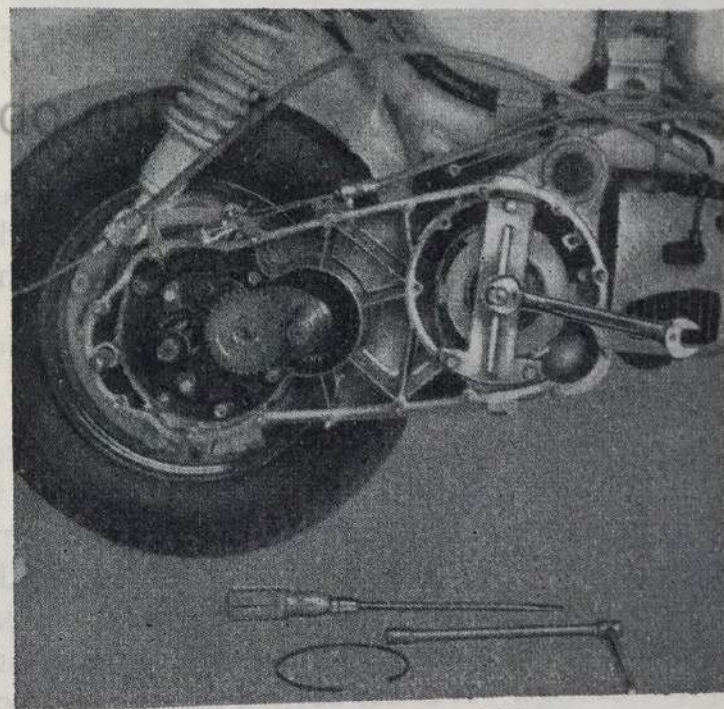


FIG. 65.—DISMANTLING TV 175.
To dismantle clutch, use clutch-compressor tool. The circlip
is freed by screwdriver.

of detaching the carburetter and air filter; *twenty-one*, the dismantling of the left-hand footboard. *Twenty-two* concerns removal of the sparking-plug, needing a 22-mm. spanner.

The apparent illogicality of this sequence is explained by the fact that the numbered items represent successive stages in complete dismantling and are therefore recommended by the makers in that order. It will be obvious that some jobs can be taken by themselves without this dismantling of the remainder.

Thus, numbers *twenty-three to twenty-seven* detail the removal of the engine cowl, the cylinder-head, the induction manifold, the cylinder and the piston and rings. The horizontal mounting of the engine makes it, in any case, necessary to support the transmission unit, detach the shock absorber and then lift the rear of the crankcase as high as possible so as to drop the axis of the engine down below frame level. Otherwise, the cylinder and head are not accessible.

Operations twenty-eight to thirty-four concern dismantling of the flywheel magneto; and *thirty-five to forty* deal with the stripping down of the clutch housing, crankshaft and crankcase.

Reassembly Hints

An important caution is given in refitting the piston. An arrow is marked on the crown and should point towards the exhaust port. This brings the piston stop pins facing the inlet port. Should a mistake be made, so that the ring pins face the exhaust port, the rings will be broken up in the first few minutes of running the engine, causing widespread damage. It is also advised that the gudgeon-pin circlips should be renewed at every strip down, and great care must be taken to ensure that they are well lodged in their grooves.

A piston-ring strap is advisable when inserting the piston into the cylinder. Otherwise the piston-ring ends may open into the inlet port. If this happens do not use force to get the piston home, but insert a screwdriver through the inlet port and carefully press the ring ends in while the piston is eased upwards.

Chain Alignment and Torque Damper

A special tool must be used to check the drive-chain alignment. The tool has a dial gauge. The torque

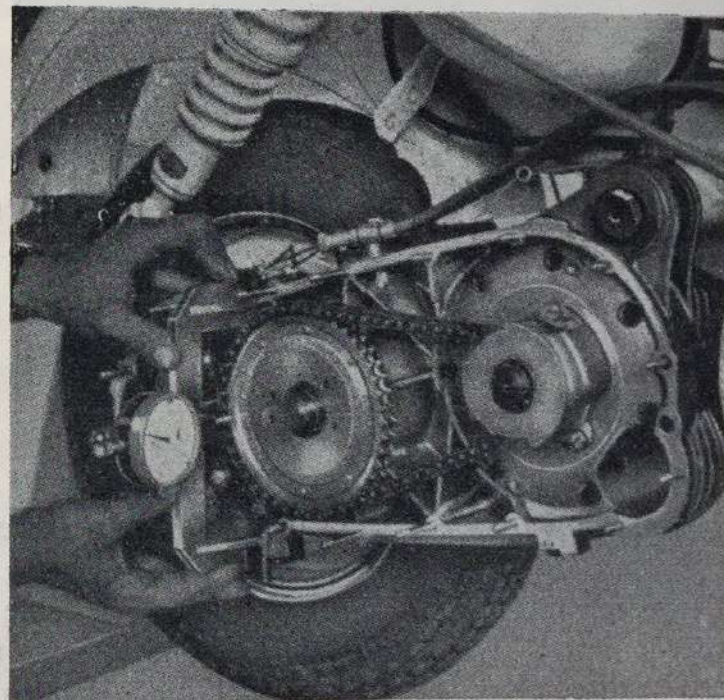


FIG. 66.—CHECKING CHAIN-DRIVE ALIGNMENT ON TV 175.

damper must have axial play of 0.1–0.2 mm. and must align perfectly with the sprocket pinion. When the alignment operation has been performed the dial tool is again

used to make sure the torque damper itself is not a source of misalignment. A clearance of 0.15 mm. is permissible, but if this is exceeded the complete damper must be replaced.

Handlebar Unit and Control Cables

The handlebar unit—a plastic cover—conceals the cable controls on these models and also carries the

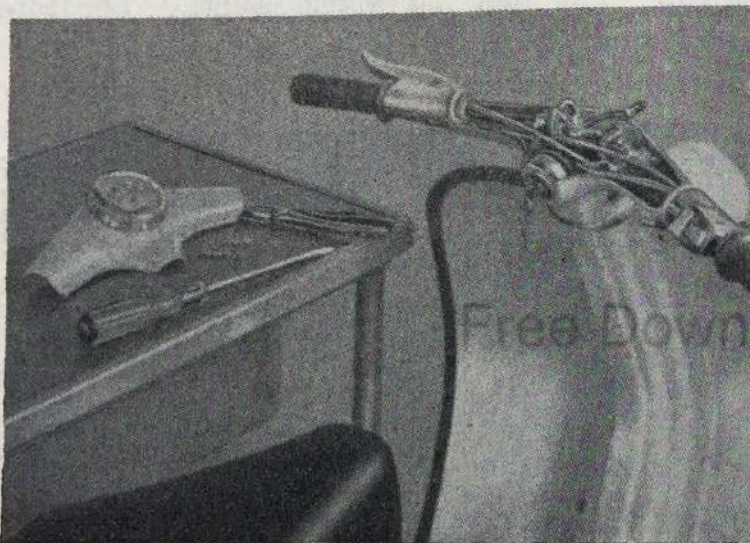


FIG. 67.—HANDLEBAR UNIT REMOVED ON TV 175.

speedometer head. The cover is held by two screws underneath, and when these have been released it can be lifted to reach the knurled nut connecting the cable to the speedometer. When this has been unfastened the unit can be lifted away. If any control cable is then to be renewed the inner wire can be pulled out at the handlebar end after the other extremity of the wire has been freed from its trunnion.

For the throttle cable it is necessary to unsolder the nipple at the carburetter end and subsequently to resolder

this. Then, and otherwise, replacement wires can be inserted into the outer covers from the handlebar end. There is normally no need to replace the outer covers unless these are kinked or damaged.

To renew the outer covers remove the headlamp (four fixing screws) and disconnect the electrical wires. In the



FIG. 68.—HEADLAMP CASING AND MUDGUARD REMOVED ON TV 175.

headlamp recess are two 10-mm. bolts which fix the headlamp casting to the frame. Four more (8-mm.) bolts secure the headlamp casting to the legshield, and two fasten the mudguard. When all these are away the headlamp casting and the front mudguard come free. The

cable cover or covers can then be slid through the retaining clip.

Clutch and Front-brake Levers

To remove either of these levers it is first necessary to take out the cable nipple from its seat. Behind the nipple is a retaining pin holding the lever pivot, and when the cable nipple is out the retaining pin can be pulled away with a small hook. This releases the pivot pin and so the lever.

Throttle and Gear-change Control Shafts

Free the outer extremities of the front brake and clutch cables. Loosen the clamp containing the cable control roller (8-mm. spanner) and remove the bolt. Tap with a small punch on the head of the shaft itself, when the shaft can be withdrawn. The clutch-lever support will slide off, but the front-brake-lever support remains fixed to the handlebar and is removed by unscrewing the two lock-screws near the headlamp control switch. If new throttle and gear-change control shafts are fitted the twist-grips should be removed before the cable-control roller is loosened.

Dismantling the Fuel Tank

Remove the battery and its support (two 10-mm. nuts fix these to the frame bracket). Empty all fuel from the tank; loosen the air-induction tube-clip screw and withdraw the tube from the air-chamber in the frame. Extract the pin of the petrol-tap control rod and remove this. With a 16-mm. spanner take the petrol tap out of the tank, and with an 8-mm. socket wrench detach the tank-support straps. Holding the tank from the flywheel side, turn it clockwise and slide it out of the frame.

Taking out the Front Wheel

With the machine on its stand, loosen the front-brake cable clamp and disconnect the trunnion from the front-brake lever on the back-plate. Unscrew the speedometer-drive lock-ring and remove the drive box. Loosen the two wheel nuts on the trailing links and the nut fixing the right-hand lever on the back-plate (22-mm.); incline the machine and take out the wheel.

For further dismantling remove the shock absorbers (10-mm. spanner). Unfasten the fixing nut (19 mm.) of the pivot pin on the trailing link. To take out the lower buffers under the trailing links unscrew the grease nipples under the levers, remove the buffer bolts (10 mm.) and prise the buffers out with a screwdriver.

The trailing links can be taken out when a compression tool is applied to the suspension springs. Afterwards the spring-guide pistons will come away as well as the springs and the piston guide ring—use a hook for this item in case of difficulty. This completes the dismantling of the forks.

Taking Down the Hub

Unscrew the left-hand wheel nut and the wheel lock-nut (19 mm.) and withdraw the left-hand distance piece. Tap the front-wheel spindle with a soft punch from the left-hand end; withdraw the spindle and the brake-shoe back-plate. Take out the two oil-seals, one at each end of the hub. Extract the circlip from the left side of the hub and tap out the bearings with a punch—right and left bearings towards their respective ends. When the oil-seals are refitted they must go with the rims outwards.

The Li Models

The Li 125 and 150 have a close family resemblance to the TV 175, and this is extended to interchangeability of

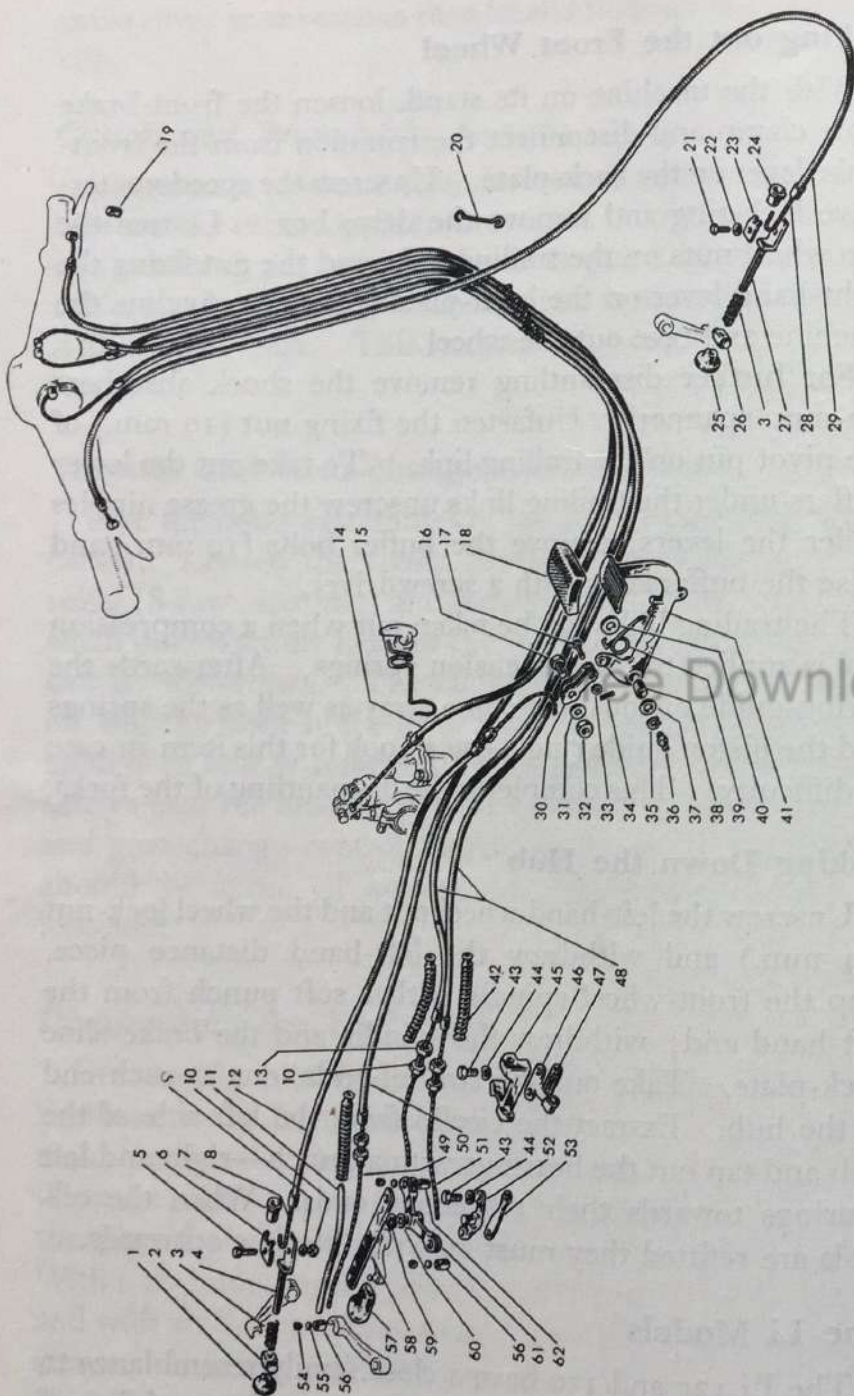


FIG. 69.—LAYOUT OF CABLES AND CONTROLS, Li MODEL.
(See opposite page for key.)

KEY TO FIG. 69.
(opposite page.)

- | | | |
|------------------------------|-----------------------------|-----------------------------------|
| 1. Rear-brake adjuster ring. | 22. Spring washer. | 44. Spring washer. |
| 2. Trunnion adjuster. | 23. Plate. | 45. Adjuster-screw support. |
| 3. Spring. | 24. Ferrule. | 46. Plate. |
| 4. Adjusting screw. | 25. Adjuster ring. | 47. Gasket. |
| 5. Screw. | 26. Trunnion. | 48. Gear-change cables. |
| 6. Plate. | 27. Adjuster screw. | 49. Inner cable. |
| 7. Ferrule. | 28. Inner cable. | 50. Clutch cable. |
| 8. Inner cable. | 29. Front-brake cable. | 51. Inner cable. |
| 9. Spring washer. | 30. Rear-brake control rod. | 52. Pin. |
| 10. Nut. | 31. Spring washer. | 53. Gasket. |
| 11. Protection hose. | 32. Nut. | 54. Grub screw. |
| 12. Rear-brake cable. | 33. Plain washer. | 55. Disc. |
| 13. Adjuster. | 34. Split pin. | 56. Trunnion. |
| 14. Throttle cable. | 35. Circlip. | 57. Gear-change lever protection. |
| 15. Band fixing cable. | 36. Grease nipple. | 58. Tie rod. |
| 16. Rear-brake cable pin. | 37. Spacer. | 59. Circlip. |
| 17. Rear-brake rod pin. | 38. Bush. | 60. Washer. |
| 18. Protection rubber. | 39. Return spring. | 61. Gear-change control lever. |
| 19. Trunnion. | 40. Washer. | 62. Trunnion. |
| 20. Grommet. | 41. Pedal. | |
| 21. Screw. | 42. Protection hose. | |
| | 43. Screw. | |

many frame and cycle parts. Thus the abbreviated overhaul hints just given for the larger machine apply to a great extent to the two smaller ones. On all three machines servicing needs have been reduced to a minimum as a result of over ten years' previous experience; but on all new machines there remain the two basic essentials: that the tightness of all nuts and bolts should be checked, together with the lubrication of working parts, with possible adjustment to the controls when settling down has occurred.

Reduction of operations calling for special tools has been successfully achieved, but for those that remain it would be difficult to perform them without help from the main stores. Among general hints applicable to the three machines, all cables have screw adjusters on the ends farthest from the handlebars, and those to the twist-grips, while having no free play, should have no tension until the grip is turned. End play should be eliminated by fitting shim washers between the cable pulleys and their spherical bronze bearings, in the manner described previously.

Only the clutch and brake cables should have slack, so adjusted that the levers begin to operate when the hand grips them comfortably and the lever does not need to be compressed against the twist-grip. With the rear brake, when the back-plate assembly warms up in use, much of the slack is absorbed, and this must be allowed for.

Lubrication

Engine lubrication should vary between the recommended satisfactory minimum of one part oil to twenty-five parts of petrol, to one part in sixteen ($\frac{1}{2}$ pint per gallon of petrol) where there is difficulty in measuring the reduced amount. The engine must never be run on petrol alone; commercial petrol without additives should be used to mix with the 20/30 S.A.E. oil. The gearbox needs 90 grade, a heavy oil, but extreme-pressure oils should not be substituted. The gearbox holds $1\frac{1}{4}$ pints of 90 oil.

Cable nipples, grouped together round the frame beneath the front mudguard, can be lubricated by the owner by fitting a short piece of plastic petrol pipe over the nozzle of a forced-feed oil-can. Hold the end of the pipe over the cable-oiler nipple, and give five or six strokes of the trigger to force oil right through the cable. Grease is unsuitable.

In oiling the front brake (the oiler is near the clip on the suspension box) tie on a small piece of rag, afterwards removed, which will soak up any surplus and stop it dripping on to the brake from the lower end of the cable. In the magneto the usual oil-bearing felt pad keeps a film of oil on the flywheel cam, and a couple of drops can be added at 3,000-5,000-mile intervals. To do this the fan and flywheel dust-covers must be removed, and it is convenient to combine the operation with that of cleaning and adjusting the contact points. For lubrication chart see under Chapter VI.

The Rear Hub

To release this, unfasten the 27-mm. centre nut, leaving the wheel attached, and hit the tyre on the offside with a series of light mallet blows, turning it at the same time. As the centre nut must be thoroughly retightened when

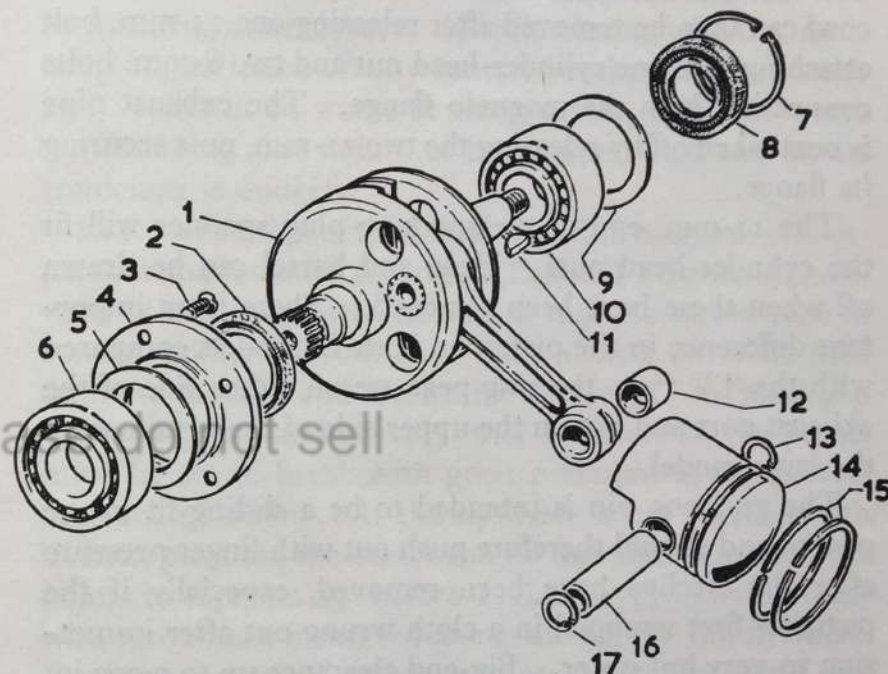


FIG. 70.—PISTON AND CONNECTING-ROD UNIT, Li 150.

- | | | |
|-------------------|---------------------|------------------|
| 1. Crankshaft. | 7. Circlip. | 13. Circlip. |
| 2. Oil seal. | 8. Oil seal. | 14. Piston. |
| 3. Screw. | 9. Thrust washer. | 15. Piston ring. |
| 4. Flange. | 10. Roller bearing. | 16. Gudgeon pin. |
| 5. Thrust washer. | 11. Key. | 17. Circlip. |
| 6. Ball bearing. | 12. Bush. | |

the wheel is refitted, light mallet blows should be applied to the spanner, since this unaided does not give enough leverage.

Considerable side play in the rear wheel is normal. It should not be taken as an indication of worn bearings.

Decarbonisation

After the usual preliminary dismantling, unscrew both of the 24-mm. nuts holding the suspension unit and remove this. The engine-transmission unit will then sink on to the crankcase buffer and the cylinder will drop below the frame to an accessible position. The cylinder cowl can then be removed after releasing one 14-mm. bolt attaching it to one cylinder-head nut and two 8-mm. bolts connecting it to the magneto flange. The exhaust pipe is next taken off by releasing the two 11-mm. nuts securing its flange.

The 14-mm. end of the sparking-plug spanner will fit the cylinder-head nuts. Head and barrel can be drawn off when these have been removed. There is an important difference in the piston on both Li models compared with the TV 175; the ring pegs are on either side of the exhaust port and not on the upper side of the piston as on the large model.

The gudgeon pin is intended to be a sliding fit in the piston, and should therefore push out with finger pressure after the circlips have been removed, especially if the piston is first wrapped in a cloth wrung out after immersion in very hot water. Big-end clearance up to 0.002 in. is permissible and 0.02 in. side float. Piston rings should be changed when the end gap measured with the ring square in the bore exceeds 0.06 in.

In refitting the cylinder-base gasket take care not to turn it round, which may cause a leak. Note its position during dismantling.

Carburation and Ignition Hints

To set the pilot air-screw, back it one complete turn from full closed. Opening it farther will weaken the tick-over mixture. Too hot a plug will cause excessive pinking if

the machine is ridden hard. Grade five cold plugs advised are A.C. 45XL, Champion N5, K.L.G. FE80, Lodge HLNP. Use a small (0.018-in.) gap

The external H.T. coil is interchangeable with all Lambrettas except the LDA. If sound, and if the magneto is set properly, a spark from the bare end of the H.T. lead should jump $\frac{5}{16}$ in. to earth. Easy starting followed by misfiring under load, or difficult starting with the headlamp on, indicates a faulty contact-breaker gap. A faulty H.T. coil will be worse in wet weather, and it is worth remembering that failure of the ignition-feed coil or the condenser is unlikely.

Reverse rotation of the Marelli or Filso magneto as compared with previous Lambrettas (Li and TV Series II clockwise, others anti-clockwise) means that the earlier type of contact points will not fit. They should never be filed on these models, and must meet squarely. No fixed gap figure is given, and as with other Lambrettas, the points must be set to break with great precision at the correct moment of timing. If the flywheel is not marked with T.D.C. position, the owner can do this and should set the points to separate 23° before T.D.C.— $1\frac{3}{16}$ in. anti-clockwise movement measured along the rim of the flywheel. For further detail of carburettors see under Chapter V and for ignition see under Chapter IV.

The Battery

This (on Li 150 Model) supplies front and rear festoon bulbs and speedometer light with the switch in position 1. At position 2 the headlamp, rear and speedometer lights are fed direct from the alternator. At 0 the battery receives a trickle charge, at 1 this is increased to full charge, and at 2 reverts to a trickle. The horn is A.C. fed. There is no terminal block at the magneto flange, connections being made at the junction direct to rectifier and resistance.

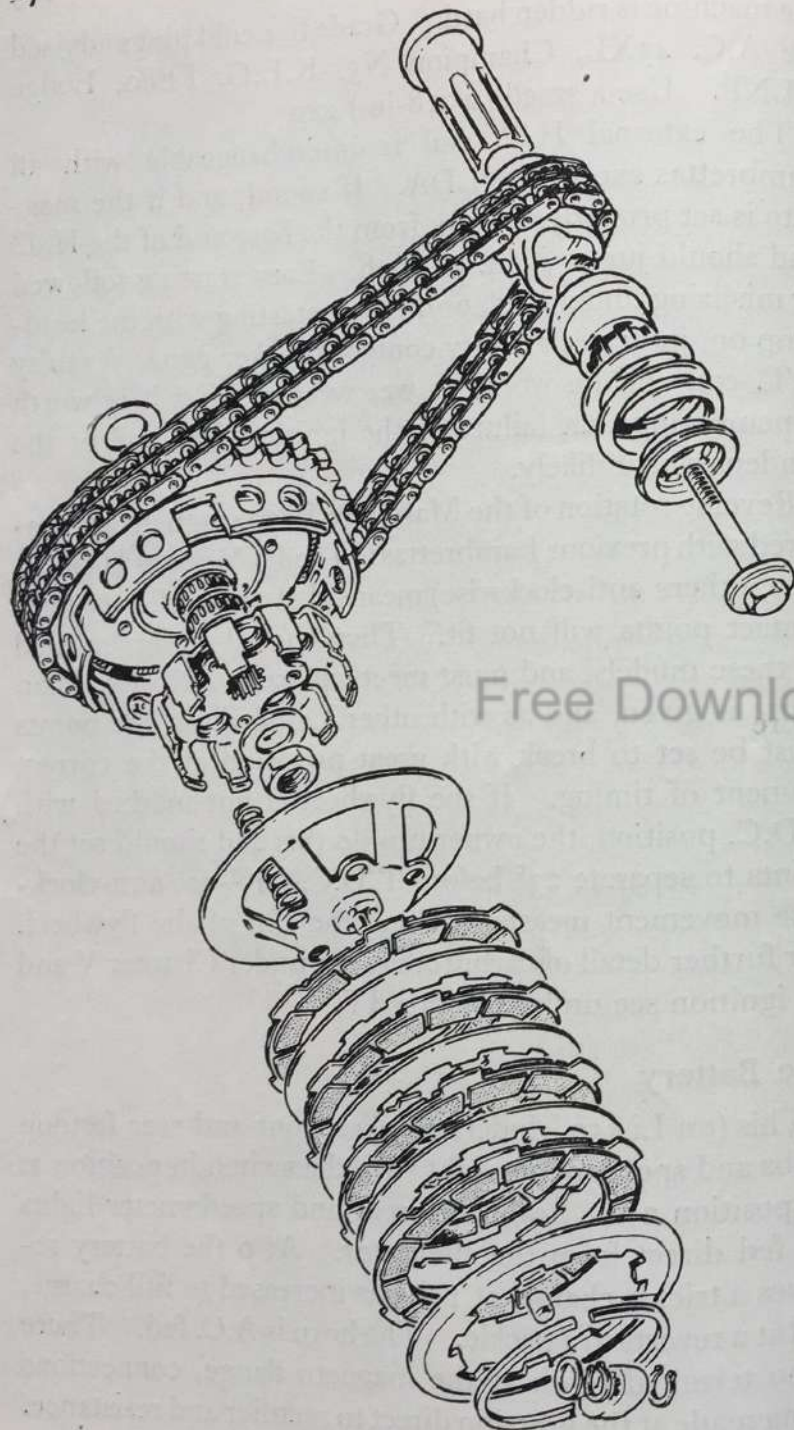


FIG. 71.—Li 150 CHAIN DRIVE AND CLUTCH ASSEMBLY.

Green wires are used for the ignition circuit, blue for the lighting and brown for the headlamp. The parking light circuit has a 5-amp. fuse.

Work on Engine, Clutch and Gearbox

This on the Li models is very straightforward, and the first special tool needed is a spring compressor for the clutch during removal of the circlip retaining the plates.

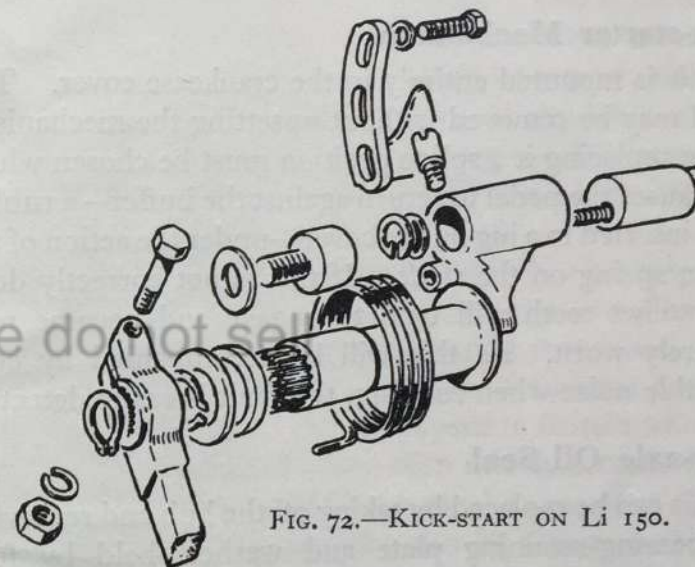


FIG. 72.—KICK-START ON Li 150.

An extractor is also needed for the clutch centre. Distance washers between the clutch unit and the gearshaft bearing determine chain alignment, and these must be fitted back in the same place. In positioning the five springs on reassembly, a simple jig can be made from five nails pressed through a piece of hardboard in positions corresponding to the five holes in the carrier plate. The springs can then be supported on the nails while the plate is entered into the clutch centre splines, after which the carrier is held in place while the jig is removed and the compressing tool applied.

Sidecar Gear Ratios

The four gears on the axle and the gear cluster can be interchanged as a group between the 125 and 150 models. The lower gear ratios of the smaller machine are thus available for fitment to the 150 when a sidecar is used. Reassembly of the four gears is a job for the expert, as an error may cause the gearbox to seize and cause serious damage.

Kick-starter Mechanism

This is mounted entirely in the crankcase cover. The pedal may be removed without upsetting the mechanism, but in replacing it a spline position must be chosen which just causes the pedal to return against the buffer—a rubber bush inserted in a lug on the cover—under the action of the return spring on the shaft. If this is not correctly done the ratchet teeth will tend to engage and become prematurely worn. As this will be accompanied by considerable noise when running, the fault is easily detected.

Rear-axle Oil Seal

This can be replaced by taking off the hub and removing the bearing-retaining plate and washer, held by four 10-mm. nuts. The old seal can then be levered out with a screwdriver. If the axle is driven out to remove the bearing it should only be drifted out until the bearing is dislodged from its seat, and then tapped back into position, realigning the washer and first gear, which will have dropped down. If the axle comes out too far the spring-loaded balls controlling the gear positions will fly out. The easiest way of replacing them is to take the axle out, press the balls and cursor ring back into position and re-assemble. The axle bearing is intended to have considerable clearance, and should not be changed merely because there is side play in the rear wheel.

CHAPTER X

THE BRITISH LAMBRETТА OWNERS' ASSOCIATION

ENTHUSIASTS tend to get together and are generally delighted to make the acquaintance of other enthusiasts interested in the same subject. This is particularly true of motor cyclists, and nowadays even more so of scooterists. Thus when Francis Gwynn started a Lambretta Club in Kingston, Surrey, in 1956 he touched off a movement which today has become the largest one-make scooter association in Britain: the British Lambretta Owners' Association.

In three phenomenal years membership has leaped past the 30,000 mark, divided among 112 branches all over the country. The B.L.O.A. badge is now recognised literally throughout the world as a symbol of national and international friendship. In fact, anyone in Britain who buys a Lambretta does much more than merely acquire a useful and economical means of personal transport; the new Lambrettist is able to share also in a large and human organisation offering numerous benefits in social matters as well as in touring and sporting events.

It costs nothing but a postage stamp to join the British Lambrettas Owners' Association. Headquarters are at the offices of the main concessionaires, Trojan Works, Purley Way, Croydon, Surrey, and there B.L.O.A. activities are decided by a series of policy committees formed from members. Anyone in membership is, of course, eligible for election to any committee. The monthly magazine, *Lambretta Leader*, a bargain sixpenny-worth, communicates all news and decisions to the countrywide membership network.

What other advantages can the Association offer? In February 1958 a personal accident-insurance policy, experimentally arranged for members, proved so popular that 2,000 policies were sold in the first few months. Those who want to take their Lambrettas abroad on holiday can on notification have this cover extended to three weeks on the Continent without extra charge.

The social side has been a big success. Rallies organised at the Crystal Palace, Buxton and Camberley received hearty welcomes. The Camberley event, in 1958, attracted 400 scooter owners with their machines, and the total "gate" exceeded 1,000. During a memorable afternoon sporting events and contests kept everyone happy and busy. Such events are planned on an increasing scale for the future, and pride of ownership in the handsome Lambretta is reflected in the large entries received for *concours d'elegance*.

Any Lambretta owner can become a member of the B.L.O.A. simply by writing to the Hon. Secretary, the British Lambretta Owners' Association, at the address given overleaf. He or she will be immediately sent a badge for display on the front legshield of the machine and full particulars of the immediate and other advantages arising from membership. These include admittance to the nearest local branch of the Association; the right, via the branch committee, to put forward any idea or suggestion about the machine or the B.L.O.A.; friendship in any of the other 111 branches throughout Britain; and an expert answer, through headquarters, to any problem connected with the machine, the branch or the Association.

Members are cordially invited to visit the headquarters of the Association at Trojan Works at any time during normal office hours.

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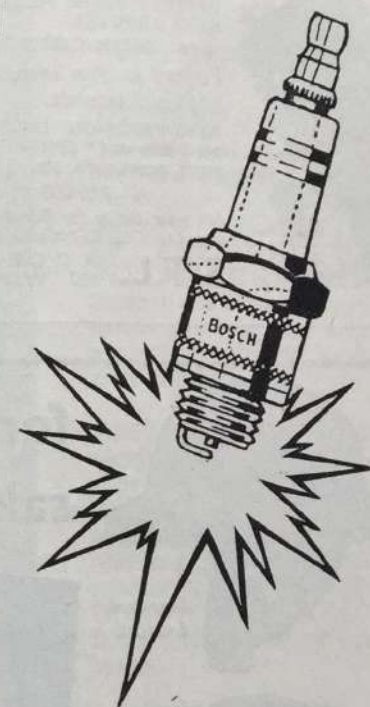
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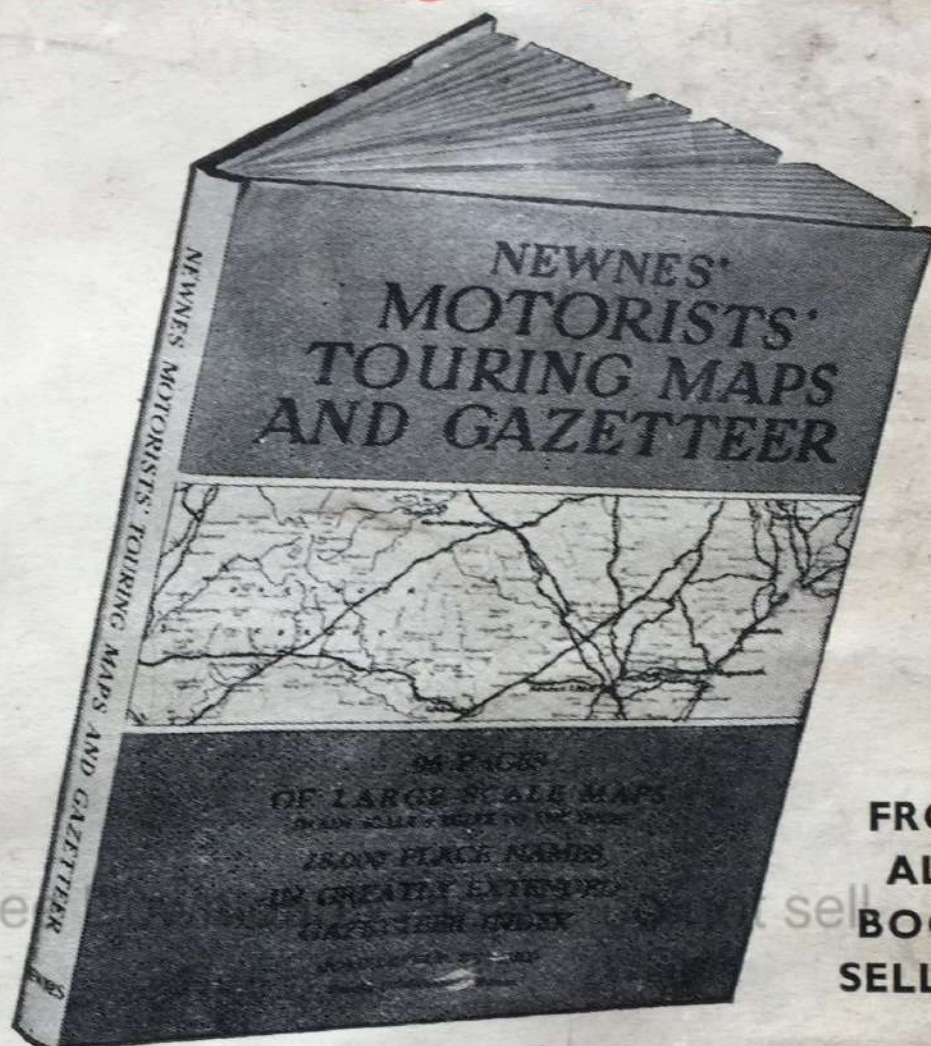
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