

INSTRUCTIONS FOR FITTING, RIDING
AND SERVICING THE DUCATI

cucciola

(little Pup)

AUXILIARY MOTOR UNIT FOR
PEDAL BICYCLES



DUCATI

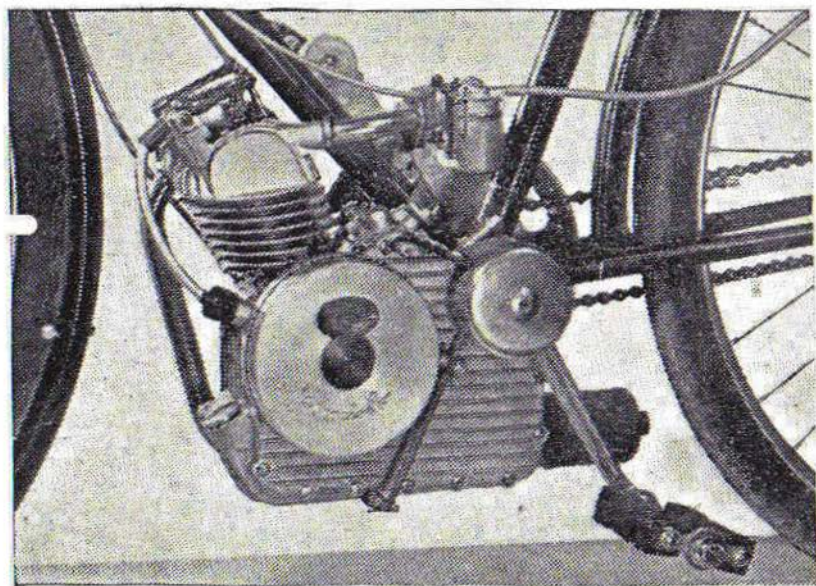
GENERAL AGENCY FOR AUSTRALASIA
251 GEORGE STREET, SYDNEY, N.S.W.

DUCATI

cucciola

(little Pup)

48 c.c. AUXILIARY MOTOR UNIT FOR
PEDAL BICYCLES



FOUR STROKE OVER HEAD VALVES
TWO SPEED GEARS, CHAIN DRIVE

An Outstanding Achievement in Precision Engineering

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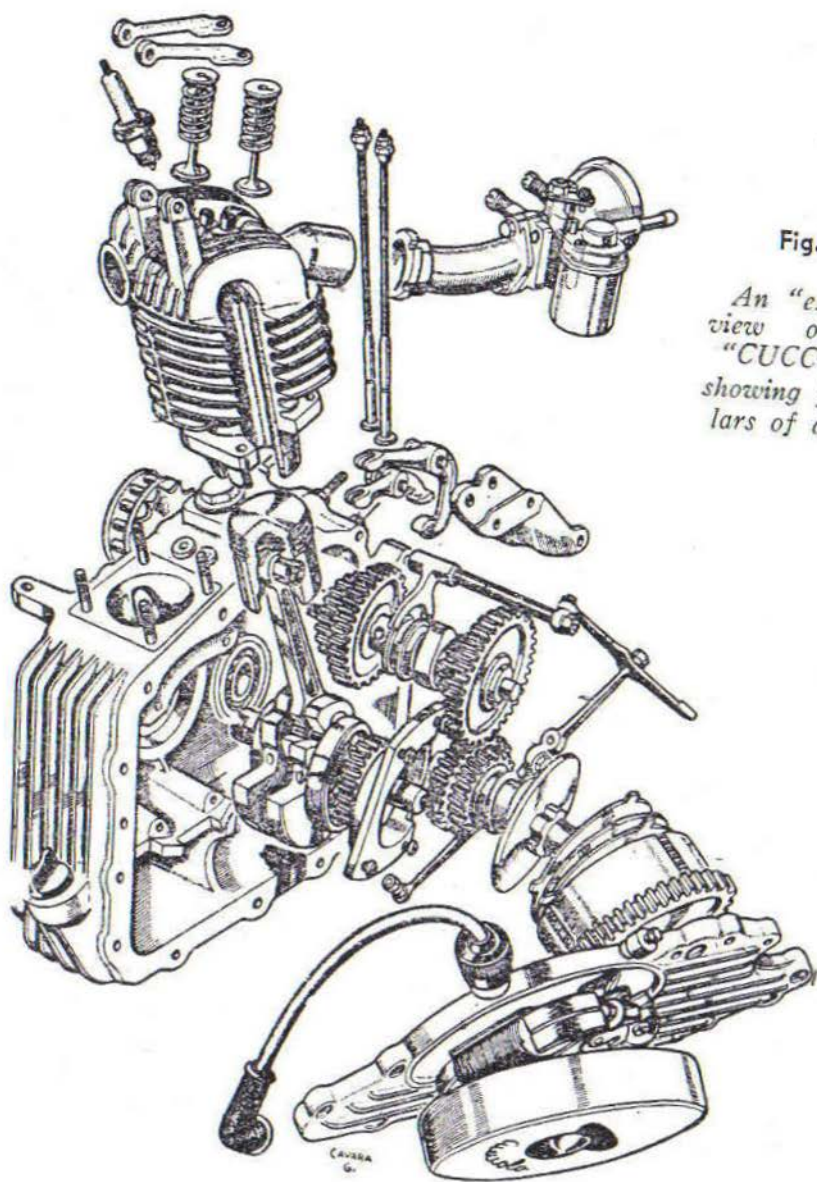


Fig. 1

An "exploded"
view of the
"CUCCILO"
showing particu-
lars of design.

The working man and girl whose job is beyond the ambit of the ordinary cycle, and the elderly man or woman who is past "pushing pedals" find the time-and-money saving "little Pup" most helpful.

The more speedy and economical transport made possible with the "Cucciolo" particularly appeals to the younger set, especially those who expend their energies in other sports.

The weight of the engine (17½ lb.) is evenly distributed between front and back wheel. The low positioning, together with the gyroscopic effect of the fly-wheel and the absence of the alternate thrusts, of foot-peddalling, contribute to make bicycle riding comfortable, steady, safe and effortless.

Cylinder bore is 39 m.m. (1½") stroke 40 m.m. (1.9/16"). Ignition is from a high tension coil energised by the fly-wheel magneto. A separate low tension coil supplies lighting current at 6 volts. 2 amp (12 watts), at average running speed.

The crankcase, cylinder, and cylinder head are all die cast in aluminium alloy and heavily finned for efficient cooling. The cylinder is detachable from the crankcase, simplifying inspection, decarbonising, valve grinding and reboring.

The alloy finning of the cylinder is diecast onto an alloy iron sleeve in which runs the aluminium piston, connected by a steel connecting rod running on needle rollers to the crankpin, which is held between two cranks, running on ball-bearings.

The drive is transmitted from the crankshaft pinion through the cam driving gear to the multiple metal plate clutch, then through the mainshaft gear pinions to the lay shaft pinions, the inner end of the lay shaft being the bearing spindle for the single profile cam and the cam gear. The outer end of the lay shaft passes through the crankcase casting and carries the driving sprocket.

Lubrication is separate, ample and positive, with about a pint of oil carried in the bottom of the crankcase.

The exhaust pipe sweeps downward from the port and runs rearward to a 3½" x 2½" detachable silencer box at the back of the crankcase.

Spark advance is fixed and set at about 27 degrees before top dead centre on the compression stroke.

The **valve timing**, with a clearance of 6/1000th of an inch between valve stems and operating arms, is approximately as follows: Inlet valve opens between 5 deg. and 15 deg. before top

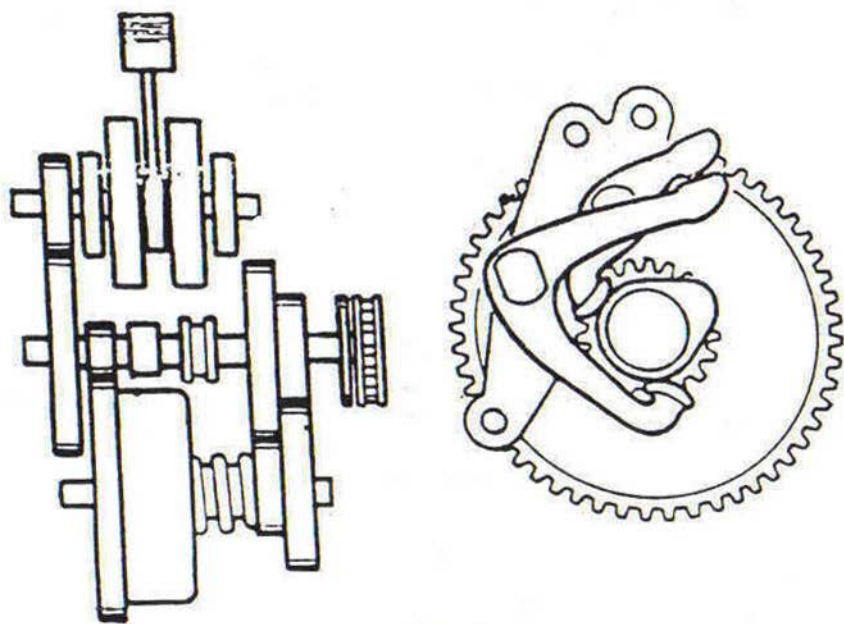


Fig 2

POWER TRANSMISSION AND CAM GEAR

dead centre and closes between 25 deg and 30 deg. after bottom dead centre. Exhaust valve opens between 45 deg. and 35 deg. before bottom dead centre and closes between 0 deg. and 20 deg. after top dead centre.

The above figures refer to degrees of rotation of the fly-wheel (crank-shaft) and mark the point of opening and closing of the valves. Tolerance for each phase can be about 10 deg. As the cam has a single profile, the duration of opening of each valve is constant and not subject to variation. The compression ratio is $5\frac{1}{2}$ to 1. The horse power rating (for registration purposes) is 0.95 H.P. although the engine will develop 1.2 BHP. constantly at from 3,000 to 4,000 r.p.m at which speed the ratio of petrol consumption is lowest compared to the power developed. Peak revolutions of the engine are approximately 5,200. The gear ratios between main shaft and power sprocket are: in high gear, 10.5 to 1; in low gear, 18.2 to 1. The ratio between high and low gears being 1 to 1.73. Of course, as it will be seen further on, these gear ratios can be adapted to the back wheel sprocket

of the bicycle to give best performance according to the average road gradient where the bicycle is to be used. It is therefore possible, with the extraordinary flexibility of the "Cucciolo" engine, to obtain always a suitable riding ratio with only two gears. If the engine has a tendency to "rev-up" while riding uphill in low gear, it is always possible to change into high gear assisting eventually acceleration with a few strokes of the pedals.

Gradients of 18-20 per cent. are negotiable in low gear by a normal weight adult rider, while in high gear a speed of 20/25 m.p.h. can be reached on a level road and maintained as long as road conditions will allow. Further flexibility is obtainable when the "Cucciolo" Unit is fitted on a bicycle using a variable-ratio back-wheel sprocket ("derailleur" or "enclosed hub" type) With correct proportioning, from 5 to 6 different ratios are available following somewhat the well known "Jeep" dual-ratio gear principle. However, with a 28" wheel, ratios higher than that corresponding to a 17-tooth sprocket are not advisable.

The carburettor is a 14 m.m. (17/32") "Weber-Cucciolo" model, with single lever automatic operation, flange fitted to the induction pipe. Two jets ensure easy starting, smooth running and economy at all engine speeds. The idling jet is bored at 0.45 mm. (.018") and the main jet is bored at 0.55 mm. (.022"). A metal gauze filter is incorporated in the carburettor and in conjunction with the petrol tank tap filter, doubly filters the fuel.

With a total weight of approximately 200 lbs. between the rider and the bicycle, petrol consumption is about 275 miles per gallon at an average speed of 17-18 m.p.h. on level roads. With steady riding on good surfaced level roads over 300 miles per gallon has been obtained on continuous rides of 60-80 miles, at an average speed of 14-16 m.p.h. The carburettor has two adjustment screws, A & B (see Figure 9). The screw A will adjust the ratio of petrol to air for idling mixture, and has been adjusted at the factory for normal running. It is not advisable to alter this adjustment unless definite variations in carburation are encountered, such as might be experienced with different qualities or densities of fuel, tropical or extreme winter climate, a new engine or one in badly worn condition. The B screw is simply a stop to prevent the full closing of the butterfly valve; with this screw the speed of idling can be adjusted.

The recommended maximum speed of the "Cucciolo 48/2" properly fitted and having suitable gear ratios is about 20 m.p.h. Higher speeds are obtainable, but when the motor is fitted on a normal bicycle with unsprung frame, it is always advisable not to travel at speeds in excess of 18-20 m.p.h.

Petrol tank capacity is approximately half a gallon. Automatic reserve supply is always available from the right lower part of the tank and should the machine run out of petrol a tilt of the bicycle to its left side will transfer this reserve to the "tap side", allowing another 5 or 10 miles running of the motor. Pedal riding of a bicycle fitted with the "Cucciolo" unit is available whenever desired provided the gears are in the neutral position. When riding with the power of the motor it is always possible to assist the engine with a few light pedal strokes should quicker acceleration or greater speed in hill climbing be desired.

The aluminium pedal crank has an insert with 45 teeth, the slip-sprocket has twelve roller pins. The ratio between pedals and back wheel is therefore the same as an ordinary bicycle, whilst the ratio between the pedals and the motor (for starting the engine) is 43 to 1 (high gear).

The driving sprocket, carried by the lay shaft, has fourteen teeth engaging the chain. A fixed-type back wheel sprocket with from 17 to 21 teeth can be used. The higher ratio sprocket (17 tooth) is suitable for general level road use, while lower ratios will be found more suitable in hilly locations or for heavy riders. It follows that top speed will be inversely proportional to decreased ratios whilst pulling power will be improved.

The normal suitable lubricating oil for the "Cucciolo 48/2" is grade 40. In very hot climates grade 50 would be advisable while grade 30 will make starting easier in very cold weather.

The set of tools supplied with each motor comprises:

1 double ended flat spanner (8 and 10 m.m.)

1 double ended tubular spanner (14 and 21 m.m.).

These, together with a screw driver and a pair of pliers are the only tools needed to fit the "Cucciolo" Unit to a bicycle frame of standard design.

FITTING OF THE "CUCCILO" UNIT TO THE BICYCLE FRAME

1. **Dismantling of the pedal axle and cranks (bottom bracket spindle.)** Unscrew the lock-ring and the near side (left) bottom bracket cup. Take from the assembly the axle (spindle) with the two pedal cranks. Of these only the left crank and its pedal will be utilised and also the right pedal, but without its crank.

2. **Brake alteration.**

If a "coaster" brake-hub is used on the back wheel, a normal rim-brake should be fitted. A "coaster" brake would not operate because the chain is controlled by the free-wheeling slip sprocket (22) and cannot be reversed in direction.

3. **Re-assembling of bottom bracket spindle and bearings.**

The original spindle should be replaced with the new "Cucciolo" spindle supplied with the Unit. When reassembling the bearings, pack the cups with fresh grease, this will also hold the balls in position and fitting made easier. The "Cucciolo" spindle must be fitted with the threaded end on the near (left) side of the bicycle.

4. **Fitting of the Motor to the frame.**

The motor unit should be fitted in order that the semi-circular recess (14) fits snugly on the lower part of the bottom bracket (4) and that the cradle (13) holds firmly to the bicycle main bar (also called front down bar). The recess (14) shall fit around the bottom bracket with packing placed between the crank-case and the bottom bracket, and at the cradle (13) — and two clamps (16) will fit around the top part of the bottom bracket and will be kept into position by the pin attaching the motor (15). Above, against the cradle (13) is fitted the clamp (17) which will close around the tube 1 (Figure 3). Attention must be given while tightening the clamps (the necessary spanner is supplied with the motor) that the valve operating rods of the motor shall not touch or be too near to the bicycle tube 1. (A clearance of $3/32$ " is sufficient.) If the clearance is not sufficient, an extra layer or two of red fibre or metal packing can be inserted at recess (13). Attention must also be paid to the distance between centre of the slip sprocket (see Fig. 7) (22) and the centre of the bottom bracket spindle, which is $2\ 5/8$ ". If distance is not correct either the inner teeth of the crank-wheel will engage too deeply into the slip sprocket

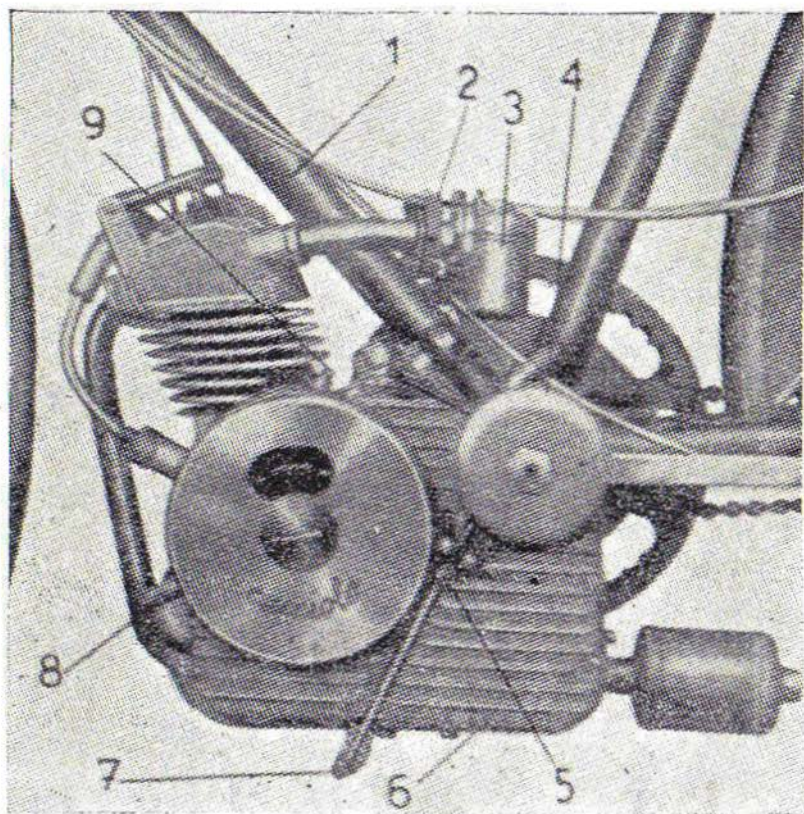


Fig. 3

NOTE: For easy inspection of oil level, the filling plug (8) is now placed on the right of the crank-case cover, under the gear-selector.

causing stiffness in pedalling, or will not engage enough, resulting in undue strain and eventual damage to the slip sprocket rollers. It is equally important that the crank support (21) be 1/16" past the line of the slip sprocket, as shown in Fig. 8. By sighting from the top correct alignment can be checked (see Fig. 4.)

Twisted frames or lugs sometimes require uneven packing of the engine so that this will line-up with the chain (see Fig. 4 & 5). As an example, the thicker packing on the right will move the front of the engine to the left, and vice versa. It is seldom necessary to pack unevenly. If additional packing is necessary red fibre or metal, such as brass or copper, should be used.

Clamps (13 and 16) can then be tightened. Tighten first slightly clamp 16, then lightly clamp 17, then fully both 16 and 17, alternating the spanner between right and left side nuts. With the tightening of these four nuts the motor is fitted. Make sure that the recess (14) fits snugly against the body of the bottom bracket (4) and does not step over the cups and rings of the centre bracket spindle bearings.

Should interference be experienced at this point (exceptional and caused only by defective or abnormal construction of the bicycle) and it is not possible to tighten clamps 16 as the recess (14) remains slightly spaced, it will be necessary either to file slightly the edge of the crankcase or to remove with a file or grinding wheel the excess portion of the locking ring or of the bearing cups where protruding. Make sure however, such being the case, that the recess (14) still fits.

5. Fitting of crankwheel support (21) and crankwheel (22).

The crankwheel support (21) may now be assembled onto the right end of the "Cucciolo" spindle, making sure to fit the cotter-pin carefully and tightly. The support (21) must be 1/16" past the line of the slip sprocket (22), as shown in Fig. 8, in order that the toothed insert (19) Fig. 9, runs freely and true in the centre of the rollers of the slip sprocket.

The crankwheel (20) is then secured to the crank-support (21) by means of the six flathead screws and lockwashers. Check for smooth and silent revolving of crankwheel and correct meshing of teeth with slip sprocket. Sometimes the six screws may tend to loosen if not fully tightened: dipping the threads in gasket cement will stop this, and still assure

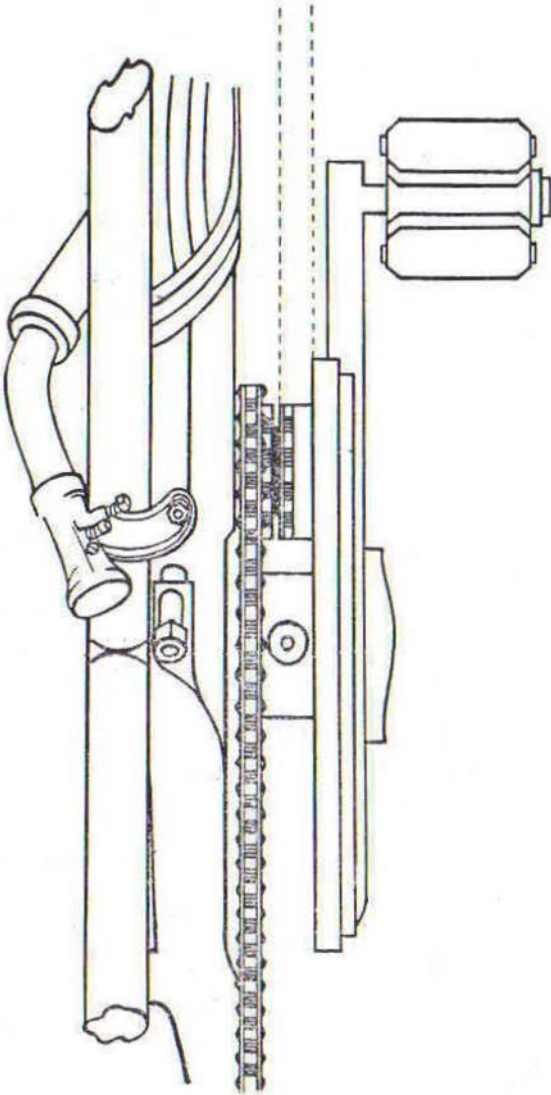


Fig. 4

How to check alignment of Engine.

easy removal. Now fit the guard cover over the six screws and screw the original pedal into the end of the crank. Incidentally, it may be found that the pedal thread is rather tight; this is intentional, as pedal axle threads are often loose or worn; when fitting a very tight pedal, a standard tap will open out the thread the little extra for free screwing.

The preceding instructions have been set out in detail to show that the fitting of a "Cucciolo" Unit to any standard bicycle frame does not require any special skill and can be undertaken very successfully by the owner of the bicycle himself. Fitting is straightforward and calls for attention only at the bottom-bracket assembly in order that correct alignment and clearance between the valve operating rods and the front down-bar is obtained.

6. Synchronising of the automatic gear pre-selector.

In order to synchronise the gear change it is necessary to free completely the screw which will register the clutch (5) (Figure 3). Assemble the lever of the change (24) on the clutch lever and fit the washer and split pin. Hold the change into neutral, with the left pedal down. Thread the Bowden wire into the eyelet of the clutch lever (7) and pull until the two contacting parts are about $3/32$ " from the preselector bell shaped cam. The Bowden wire should then be locked with the screw (7) (Fig. 3). The screw (5) is then registered to contact the clutch and locked by its locking nut. With the left pedal forward the low gear will automatically be engaged by actuating the clutch lever (the gear shifting pin (23) should be right in). With the left pedal down the gear change will cut back into neutral position. With the left pedal backwards (or correspondingly the right pedal forward), the top gear will become engaged. (The gear changing pin (23) will then be right out.) When either of the two gears are engaged the pedal must revolve backwards (or anti-clockwise) freely with the bell shaped cam selector (25) touching the gear changing lever (24). Should it be found necessary to register the automatic gear to have greater distance between the bell shaped gear selecting cam and the gear lever, it will be sufficient to insert between the gear selecting cam of the pedal axle a suitable washer in order that the internal part of the bell shaped gear selecting cam (25) shall always be well "shouldered" to the pedal crank.

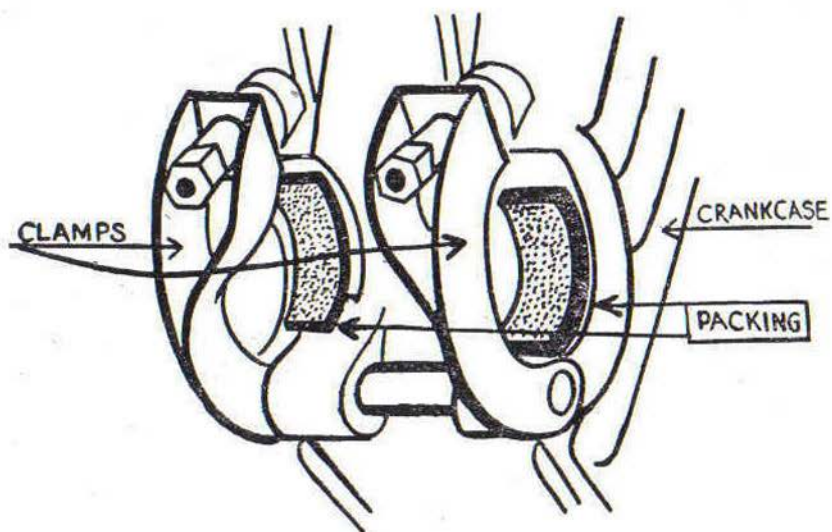


Fig. 5

Method of using additional packing when the bicycle frame is not perfectly "true."

7. Transmission

As a general rule it is advisable to fit a fixed sprocket on the back wheel. This will not eliminate the free wheel riding of the cycle, free-wheeling being obtained by the slip-sprocket (22). The fixed wheel will make possible to start the engine by "momentum" or pushing, also permitting use of the motor as a brake.

Recommended ratios for the back wheel sprocket are:—

28" Wheel

A : 18 tooth
B : 19/21 tooth

26" Wheel

A : 17 tooth
B : 18/20 tooth

N.B. A: Normal use of the motor with two speeds for a rider of normal weight on normal roads.

B: Normal use of the motor with two speeds, for a heavy-weight rider in hilly country.

The bicycle chain can now be fitted. As the circumference of the power sprocket is smaller than the original pedal crank, it will be only necessary to shorten the chain a few links. Adjust back wheel to give a fairly tight chain, (about $\frac{1}{2}$ " up-and-down slack).

8. In order to complete the fitting of the "Cucciolo" it only remains to:
 - (a) Fit the Petrol Tank astride the back mud-guard. For this purpose the tank is supplied with suitable mounting brackets. It is advisable to place one layer of insulating tape between brackets and frame. The tank may also be fitted at the front down-bar, if a luggage carrier is desired over the back-wheel. Suitable brackets can be made inexpensively.
 - (b) Fit the plastic petrol tube to the petrol tank cock and onto the carburettor petrol inlet. (For easy fitting, dip ends of tube in hot water for a few seconds.) The pipe may be secured alongside the seat-bar with tape.
 - (c) The carburettor should be perfectly level. Its position can be corrected by loosening the round screw (10) (fig. 6), which locks the induction pipe to the motor. Fit the Bowden cables, which are supplied already connected to their levers, to the carburettor, the Bowden wire to the throttle is threaded in the hole of the little thimble on the lever of the carburettor throttle and locked with the screw. The Bowden wire for the valve lifter is fixed to the top part of the cylinder head

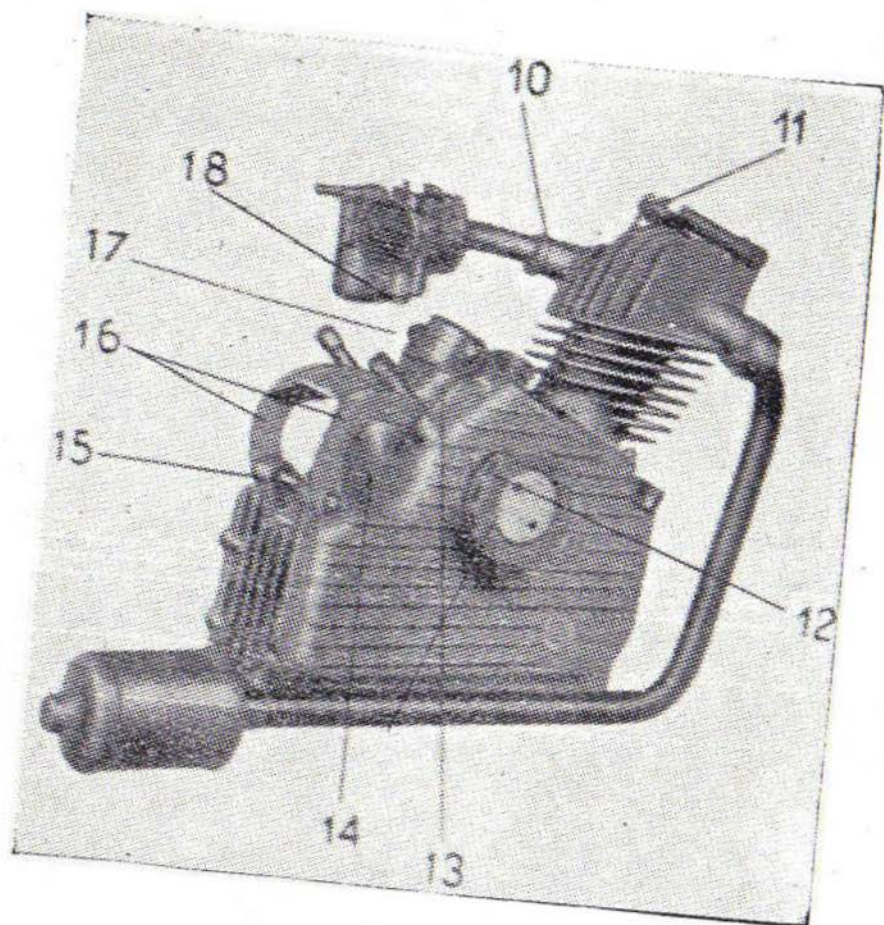


Fig. 6

with a small nipple. Note that the operation of the valve lifter control is "inverse", that is, the Bowden Wire is **fixed** while the casing does the "pushing": therefore do not tape the casing too tightly to the bicycle frame. For neatness the casing can be passed through a small piece of metal tubing or sleeve, 1" long, and this sleeve can then be neatly taped to the down-bar, together with the clutch and throttle Bowden control casings. It is recommended to **oil or grease the inner cable** of all Bowden controls before fitting thus ensuring smooth and long-life service. The suitable fitting of the controls is as follows:

On the left handle-bar fit the throttle and valve lifting control and back wheel brake; on the right handle-bar fit clutch lever and front wheel brake. With extremely curved handle-bars the clutch lever may be attached on the front section, in a transverse position. Reversing racing type handle-bars will give a very comfortable riding position.

- (d) **Electric current** (a.c.) at 6 volts is generated by the lighting coil of the flywheel magneto when the engine is running. The bicycle headlight wire should be secured to the lug screwed on the insulated terminal (9) (Figure 3). Check that engine is in good electrical contact with the bicycle frame, also the headlight bracket. About twelve watts are available from the flywheel generator, sufficient for bright headlight and tail light illumination. As electric current will be always available when the engine is running, provision for a switch must be made in the headlamp electrical circuit.

ATTENTION: Avoid carefully shortcircuiting the electrical circuit of terminal (9) while engine is running: the magnetic fields of the fly-wheel would be cancelled in a very short time were this to occur and spark plug would cease to operate.

- (e) The saddle should be lowered as much as possible. Check brakes for efficiency, especially if the **free-wheel back-sprocket** has been retained, as the motor will not then contribute as an added brake. A chain guard is not necessary with the "Cucciolo" Unit, because the pedal crank gives full protection. However, if it is desirable to cover the rear part of the chain (Ladies' bicycles) the usual chain-shield can be fitted; just cut away a small part at the forward section, clearing the slip-sprocket (22).

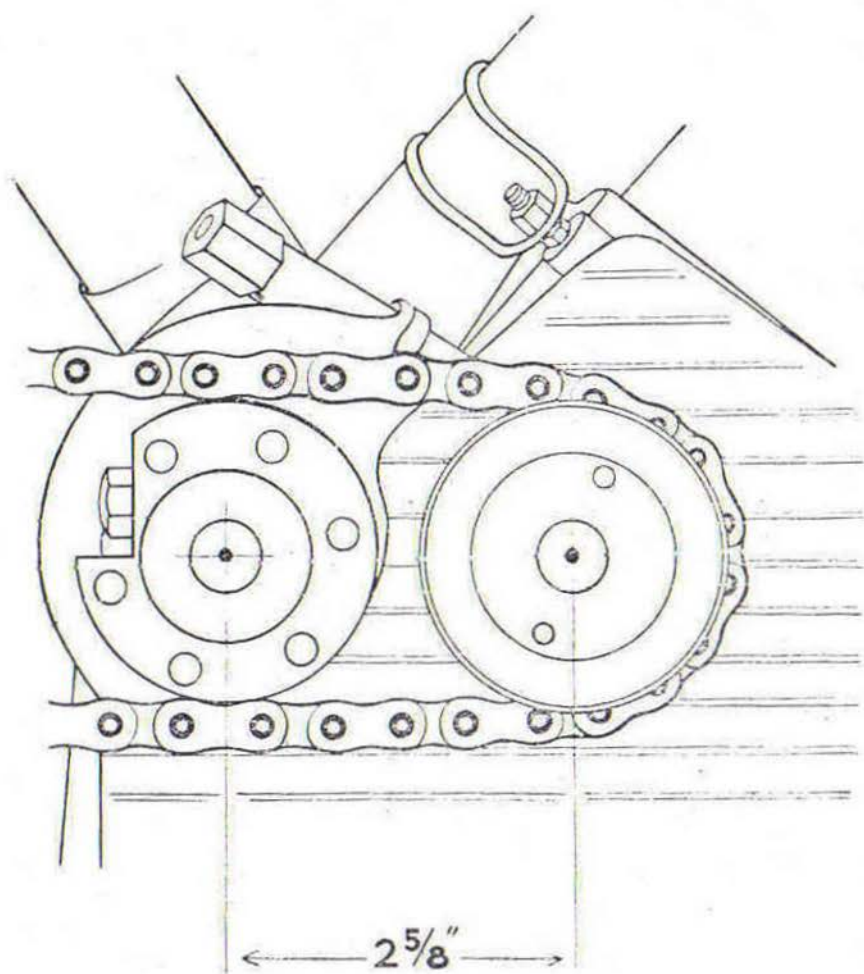


Fig. 7

Correct distance between pedal spindle and slip-sprocket.

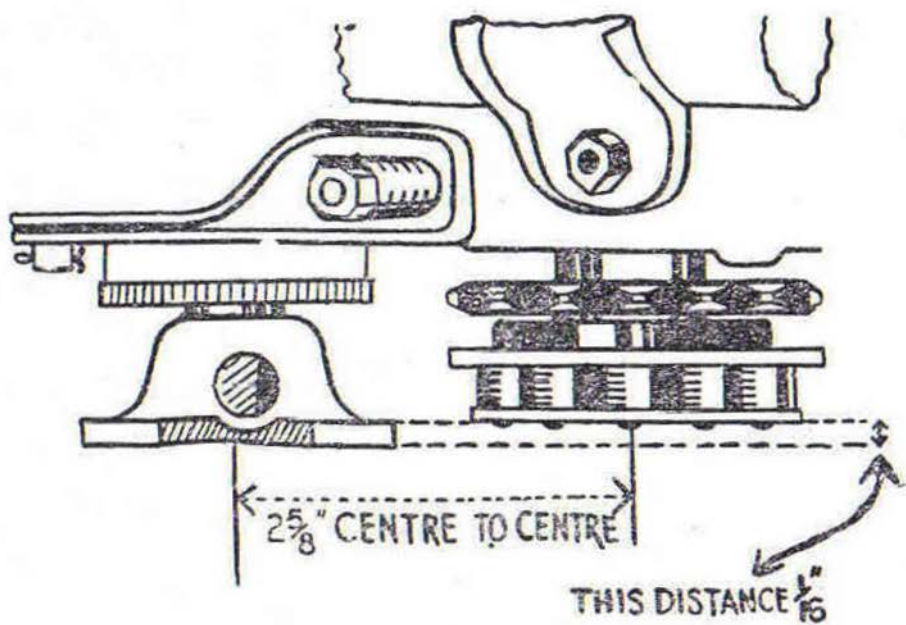


Fig. 8

Keep crank-support $\frac{1}{16}$ " past the line of slip-sprocket.

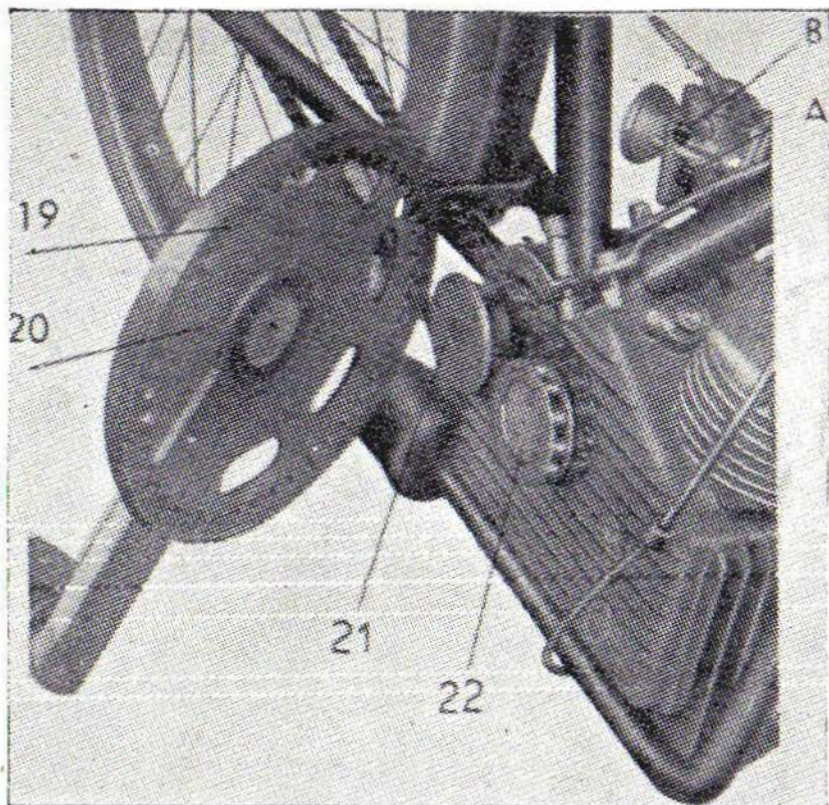


Fig. 9

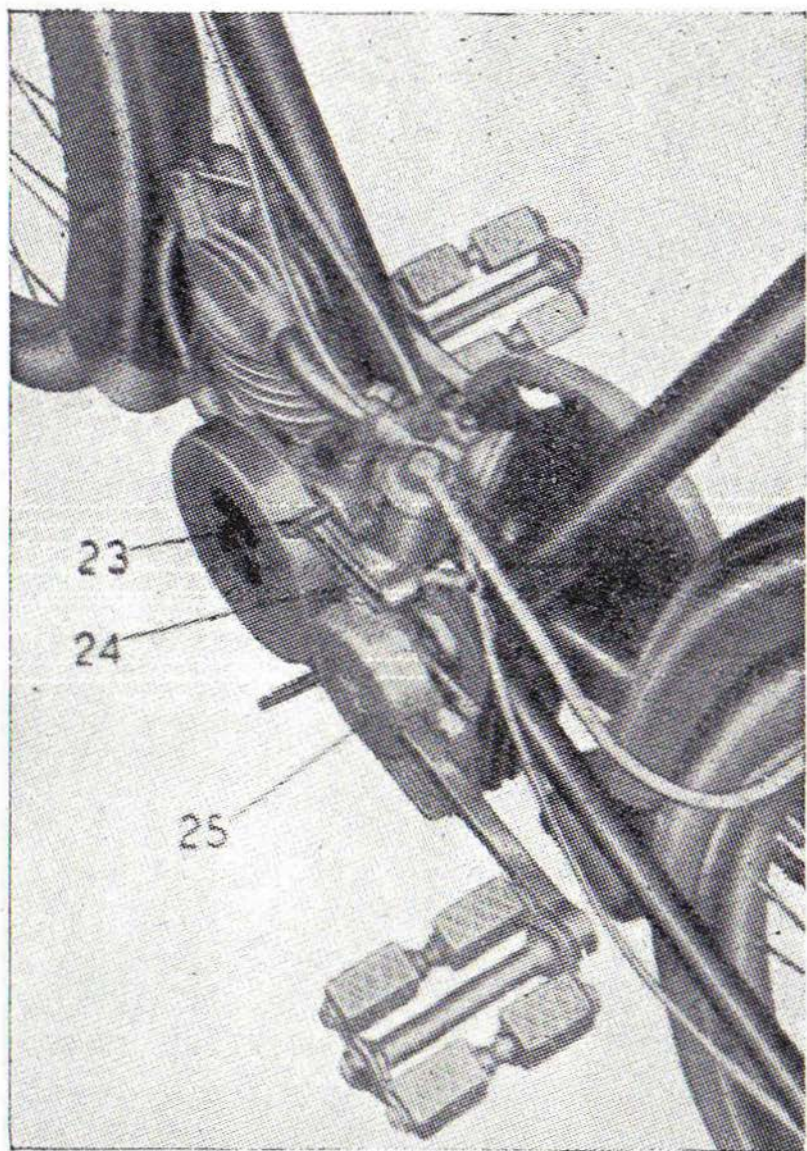


Fig. 10

INSTRUCTIONS FOR RUNNING AND RIDING THE "CUCCIOLÒ"

N.B. Every "Cucciolo" Motor is delivered after having been fully tested on the bench but not "fully run-in."

For the first 150/200 miles it is advisable not to ride at an excessive speed and to avoid excessive effort and over heating. For any kind of motor the "running-in period" is most important and the life of the engine depends on it. Use small throttle openings, without labouring of the engine, until about 1 gallon of petrol is used. Careful running-in will amply repay.

LUBRICATION: Every motor is delivered dry; before it is started, unscrew the plug on the left side of the engine and fill the crank case with a little less than one pint of good motor oil, Grade 40.

With such quantity and with the motor horizontal (normal design of the cycle frame and bicycle on the level) the oil level should come almost to the opening of the filling plug.

As the position of the oil filling plug has been specially designed for correct oil level, subsequent topping up of the oil level is extremely simple. Never let the level fall below $3/8$ " of the normal; check this every 150-200 miles (as long as the motor does not lose oil). In any case after the first 150-200 miles and then every 500/700 miles, the oil should be completely drained and new oil put in. Drainage is effected by **unscrewing** the plug (b) (Figure 3) under the crank case with the tube spanner, supplied with the tool kit. To obtain a full drainage, this operation should preferably be done whilst engine is warm.

PRIMING. Open the cock under the petrol tank and make sure that the petrol reaches the carburettor by pressing for a few seconds the brass priming rod on the top of the carburettor. This operation (which should not be overdone) is advisable when starting a cold engine, but is not necessary when the motor is warm as this would over-enrich carburation and make starting of the engine more difficult.

UPPER CYLINDER LUBRICATION is advisable during the "running-in" period but not necessary afterwards. Add this lubricant to the first gallon of petrol, in the proportion normally supplied by any petrol-service station.

STARTING OF THE ENGINE.

(a) **Momentum Starting:** This is the normal way to start the engine when the bicycle is fitted with a standard fixed-wheel back sprocket.

Make sure that the gears are in the neutral position, that is rod (23) (Figure 10) is **half way in**. This can also be controlled by moving the cycle backwards as this will free the motor if either gear is "in." The motor being in neutral position there will be no difference from an ordinary bicycle and pedalling will be as usual. When a speed of about 3 to 4 miles per hour has been reached with the aid of the pedals, stop with your right pedal in a horizontal forward position. (Pre-selection of high gear).

Bring the valve lifter/throttle control into full forward position. Simultaneously pull fully-in the clutch control lever and release, this movement will automatically engage the top gear and the release will start rotation of the engine immediately, the exhaust valve being open and the cylinder therefore decompressed.

Rotation of the engine is thus obtained by the momentum gained while pedalling. As soon as the engine is rotating bring back the valve lifter and throttle control slightly over the central notch, that is not more than $\frac{1}{4}$ throttle. The motor will start immediately.

If the engine should start jerkily (due to insufficient riding speed or a dirty spark plug or carburetter) or should the motor give irregular firing or be slow to start, you can help it with a few pedal strokes, but **without touching the clutch lever**, as this would throw the gears into neutral, then low gear, neutral, top gear etc., position on every quarter revolution of the pedal crank. Eventually use valve lifter again while pedalling for a few seconds and then throttle halfway back-and-forth two or three times until the motor starts. Obviously if the road is on a gradient you will start towards down hill then as soon as the motor is started, brake and turn back up hill in high or low gear.

When the engine has "warmed up," even in cold weather, and always in warm weather, "momentum" starting is obtainable just by operating the clutch lever, that is without acting on the "valve-lifter" control.

IMPORTANT. When engine is cold, **never start in low gear**, but **always and only in high gear**, in order not to submit pedals, chain and sprockets to excessive effort. Open valve-lifter.

Low gear should be used when moving from a halt with the engine already running, or immediately after the engine has

been started in high-gear, if it is felt that the engine is under strain and if it is not desired to pedal for a few yards.

OPERATION OF THE GEARS. From what has been said before, the automatic operation of the pre-selector is already evident; the single clutch-control (7) (Figure 3) with the same movement which will disengage the motor from the power-transmission, will actuate simultaneously and automatically also the change of the gears, without the necessity of a separate gear lever.

For this purpose, the "bell-shaped" cam selector (25) (Figure 10) fitted on the left end of the pedal shaft will act as a pre-selector in conjunction with the combination lever (24). If the clutch-control lever is actuated while the left pedal is in the horizontal forward position the low gear will be engaged (or kept into, if previously already in low gear). With the right pedal in a forward horizontal position, actuating the clutch lever will engage the high gear.

With the pedals in a vertical position (left pedal down) actuating the clutch will disengage either gear into neutral position. (Remember to close slightly the throttle when operating the clutch, so as to "float" the power of the motor).

If the clutch is not actuated the pedals are completely free, either with the motor engaged in one or the other gear or in neutral position.

From this it will be understood that the clutch lever should never be actuated while pedalling, nor for avoiding to change continuously from one to other gear and vice versa at every half revolution of the pedal crank nor to bring unavoidable reciprocal wear to the pre-selection cam and lever device. Therefore, it is advisable to have the pedals in the desired gear position before actuating the clutch lever and actuate the lever without moving the pedals. The only exception to this rule is when a free-wheel back-sprocket is fitted on the bicycle: when the engine is stopped or the chain not moving, it may be found necessary to move slightly the pedals back and forth while the clutch lever is kept about half way in order that the teeth of the gears may find their way into mesh.

To change gear "smartly" while riding, operate as follows:

- (a) To change from high into low gear: close slightly the throttle just before pressing the clutch and open the throttle decisively before releasing the clutch.

- (b) To change from low into high gear; close the throttle slightly and open it after the clutch has been pressed and released. These particulars will be best learned in actual practice, just as when first learning to ride or drive a motor-cycle or a car.

Practically, beginners may use throttle and clutch without any fear of being mixed up, acceleration or slowing down, changing into high or low gear will always be made instantly and without trouble. The advantage of the "Cucciolo" automatic pre-selector gear change is the absolute and immediate operation and the possibility of releasing the clutch lever without any particular attention.

RIDING

When riding the "Cucciolo" no special attention is required; the engine may run at length at low or high revs. on a flat or up-hill. However, half to three-quarter throttle is the advisable average running-speed. Change into low gear when you feel the engine tending to labour. Do not run for too long a period at maximum revs. Excessive speed is harmful to all engines.

Do not rotate the engine by hand or by pushing the cycle with the spark plug disconnected: an excessive voltage would develop and burn-out the spark coil. If for test or any other reason the motor must be revolved, earth the high tension wire terminal on one of the cylinder fins.

To use the vehicle as a common bicycle, just pass into neutral gear. The neutral gear position is placed "ahead" of all other gear mechanisms of the engine, which therefore remain idle and disconnected from the pedals. Any superfluous friction is completely eliminated. When riding down hill (with fixed sprocket back wheel) the motor will be a helpful brake. Do not, however, keep too long into low gear nor too fast a speed in order not to oil the spark plug. Now and then open the throttle for a few revs. to keep the spark plug "hot".

An interesting feature of the design of the "Cucciolo" is that when riding up-hill lubrication is automatically increased, and decreases when riding down-hill.

When it is necessary to use the clutch, but without changing gear, just keep in mind to have the pedals in the position corresponding to the gear in operation at that time.

The clutch does not wear if it is kept "pulled", even for

minutes at a time (riding through traffic, stopping at traffic lights, etc.), it must be avoided, however, to make it slip under effort in order to obviate a change of gear or pedalling for a few yards.

To stop the engine, actuate clutch and push valve lifter, holding the left pedal down in order to pre-select into neutral gear at the same time, and be set for the next start.

If you run out of petrol remember that the right lower section of the tank is the automatic reserve supply. Just tilt the bicycle on the left side in order to "pass-over" the reserve to the side where the outlet tap is fitted.

CONDENSED INSTRUCTIONS ON HOW TO START THE ENGINE:

(a) Fixed back sprocket.

1. With the gear change into neutral position, pedal the cycle until a speed of 3 or 4 m.p.h. is reached.
2. Decompress the cylinder by pushing fully out the valve-lifting control.
3. Stop pedalling with the right pedal forward, thus pre-selecting high gear.
4. Pull and release fully clutch lever, thus engaging high gear and start engine revolving.
5. Release valve lifting control and follow-up with throttle. Engine will fire immediately.

Do not pedal while pulling clutch lever, as this would only change gears unnecessarily.

To change into low gear, have left pedal forward. Pull and release clutch while opening throttle.

Decrease throttle if changing from low into high or neutral gear (left or right pedal down).

If on a gradient, start down hill and turn back in low gear. Always start engine in high gear.

(b) Free-wheel back sprocket.

If the bicycle is fitted with a free-wheel back sprocket, the engine must be "kick-started" while riding at a speed of 4 or 5 m.p.h., by using the left pedal, and with valve-lifter fully open.

Always "kick-start" the engine in top gear only, close valve lifter towards the end of the "kick" and open throttle slightly above idling position. Never start engine under compression.

When engine is running, open the throttle slowly to match engine revolutions to bicycle speed so as not to "jar" the ratchets of the free-wheel sprocket.

(If the top gear doesn't mesh immediately when clutch control lever is actuated, move the pedals just a few inches back and forth with clutch lever half-pulled).

When riding down hill, the engine can be throttled into idling or altogether stopped. A slight "kick" on the pedals will start it immediately when necessary, the gear having been kept engaged. As the engine will not act as a brake, front and back wheel brakes must be kept fully efficient.

When familiarity of control is gained, "free-wheel" riding is most pleasant, it gives still more mileage to the gallon and increases the actual life of the engine. For hilly country, "down hill coasting" will increase petrol mileage by 15 to 20 per cent.

With a new engine, "kick-starting" will be found slightly hard, but when the engine is run-in (after one gallon of petrol has been used), starting will gradually become easier.

TROUBLE SHOOTING AND ADJUSTMENTS

(a) **The engine doesn't start.** Does petrol reach carburettor?

If petrol does not trickle from the air intake after pressing the priming button, pull the plastic tube from the carburettor petrol inlet and try to find where the obstruction is. A filter is incorporated in the petrol tank cock and dirt may have accumulated on the fine mesh. A slight tapping on the cock may be sufficient to clear it. If not, unscrew the tap and clean.

If petrol drips continuously from the carburettor air intake, the float needle is not closing properly. Turn off petrol supply at the tank, start engine with throttle fully open and turn on petrol supply after a few seconds.

If petrol supply is regular and compression of the engine rather low, (excessive ease in revolving the engine), look for a "sticking" valve stem which may keep valve partially open. This may happen if unsuitable or gummy lubricating oils have been used, or if oil level is too high (filling of crank-case with the bicycle tilted). In this case it will be sufficient to put a few drops of petrol on the valve stem and eventually pull it upwards by hand or with a screw-driver inserted between the loading spring coil.

If the cause is not traceable to valves (look also that your service engineer has not set the tappet clearance too close — or tight — and also that the valve-lifter Bowden cable is not pulling too tightly), verify the spark plug, which may be wet with petrol, following the first unsuccessful attempts to start with a flooded carburettor; such being the case, burn the wet plug with a match, away from engine. Also the spark plug can be fouled across the points by dirty oil; such being the case, clean the spark plug.

(b) **If Engine "misses" or does not answer to the throttle control, or spurts etc., at the carburettor.**

Most probably the cause is a dirty spark plug. Clean or substitute with a Pyrox P.A. 14B or 14 m.m., or equivalent type.

Do not forget to insert the copper ring between spark plug and cylinder head.

Verify also that the upper section of the ignition cable does not spark against the valve rockers or the cylinder head.

Occasionally the cause may be traced to a fault in the petrol supply system such as dirty carburettor, low level in petrol tank, water mixed in petrol.

(c) The motor idles well but stops when throttle is opened.

The cause is an obstruction in the main carburettor jet (18) (Figure 6). Unscrew and blow energetically with the mouth or with the type pump and screw on again.

(d) The motor is apparently normal but does not "pull" with its usual power.

The cause is too much clearance or play at the valve tappets. Normal clearance is from 4 to 12/1000 of an inch, and must never be over 20/1000 of an inch.

The "Cucciolo" engine has a most economical valve timing and is rather "sensitive" (or "responsive") to the setting of valve, or tappet clearance. Therefore it is advisable after the engine has undergone an initial "running-in" period of about 150 miles and thereafter every 600 or 700 miles to check tappet clearance and reduce same to the above indicated fractions.

Adjustment of clearances can be effected readily by loosening the top (locking) nut of the rod (11) (Figure 6) and setting clearance by turning the second nut. One full turn of the nut will correspond to a difference of 15/1000 of an inch. Oil occasionally the operating-arm bushings on cylinder head.

(e) Slipping clutch, or locked clutch.

The Bowden wire control is too tight or too loose — or the clutch registration screw, fixed on lever (7) (Figure 3) is screwed too far in or respectively too little.

Remember, however, that a rather "soft" operation of the clutch is normal. It has a slight "slipping effect" for a few yards when starting, as it operates as an elastic transmission coupling. Inversely it is not necessary for the clutch to disengage entirely when the automatic selector operates for changing from one gear into the other. In any case, when the clutch "slips", decrease throttle until it "grips" then open throttle again.

- (f) When "pedalling" with the high gear engaged, the engine falls back into neutral.

Wrong adjustment of the combined pre-selector group, or Bowden wire of clutch-control pulled too tight, the lever (24) being too close to the selector (25) (see fig. 10).

Verify operation following closely fitting and adjustment instructions as indicated in Paragraph 6. "Registration of the automatic gear pre-selector."

- (g) When going up hill "full-throttle", the engine misfires or backfires (very rarely).

The spark-plug electrodes are set too close to each other for the high current supplied by the fly-wheel magneto.

Increase distance between "points" from the usual 18-20/1000th up to 40/1000th. Eventually check for opening of contact breaker at correct setting, as explained further on.

For other running faults or major breakdowns, it must be remembered that the "Cucciolo" is a **FOUR STROKE** precision built micro motor. Its principle, design and performance are in every way identical to normal motor cycle engines, therefore a "Cucciolo" can be entrusted to any competent motor cycle specialist or engineer, who will trace the fault just as easily as would be the case with a bigger engine.

The same observation is valid with regard to the electric circuits of the fly-wheel magneto (electric light and spark coils, contact breaker, etc.).

VALVES & CONTACT BREAKER TIMING, Reference Marks.

A line, about $\frac{3}{16}$ in. forward from the electric light terminal is etched on the crank-case pointing to the fly-wheel magneto. Two similar lines are etched on the inner edge of the fly-wheel.

The line marked "M" indicates top dead centre of piston stroke. As the fly-wheel makes two revolutions for a complete cycle this line will indicate either compression or exhaust positions. These can be identified by turning the fly-wheel "anti-clockwise" by hand and watching the valve tappets which operate only at the fourth and following first stroke (exhaust, inlet); the next coincidence of the "M" line will therefore be on the full compression stroke. Just before this position (from 25 degrees to 27 degrees) is another line on the fly wheel marked "A" which corresponds to "advance" angle when the contact breaker should open out to generate the spark. For controlling the moment of opening of contact-breaker, insert between points one strip of cigarette paper, and check that release of paper coincides with "A" position of fly wheel. For adjustment loosen slightly large screw and work on small screw; after setting tighten large screw fully.

CARBURETTOR SETTING

Must be made while engine is warm. Turning screw "A" (fig. 9) clockwise will weaken mixture. If idling-speed of engine (in neutral gear) is too fast or too slow, adjust screw "B", which will control opening of main butterfly valve.

Should further information be found necessary, write to Ducati, General Agency for Australia, G.P.O. Box 1254, Sydney, N.S.W. mentioning the serial number of the engine, which will be found on the lower forward corner of right side of crank case. Your enquiries will receive immediate attention.

SPARE PARTS

A full range of spare parts and oversized pistons and piston rings is available for servicing of the "Cucciolo" Motor Unit. Order these parts through the "Cucciolo" Distributor in your State, mentioning date of purchase and serial number of engine and giving a clear description of the part required.

THE END.

The "CUCCILO" (little Pup) 48 c.c.
4-stroke Auxiliary Motor Unit for
Pedal Bicycles

and

ORIGINAL DUCATI "CUCCILO"
replacement parts are obtainable from
the Distributors