

Book No. 101/EM1

MAINTENANCE MANUAL

for

Excelsior

98 cc.

“WELBIKE”



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101EM1

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DATA.

MAKE OF MACHINE: Excelsior.

TYPE OR MODEL: Welbike-folding, 98 cc. two-stroke.

No. OF CYLINDERS: One. ARRANGEMENT: Horizontal.

BORE: 50 m/m. STROKE: 50 m/m. CUBIC CAPACITY: 98 cc.

COMPRESSION RATIO: 5.7 to 1.

TYPE OF CYL. HEAD: Detachable. MATERIAL: Aluminium.

METHOD OF SUSPENSION IN FRAME: Bolted to lugs provided on frame.

PISTON: TYPE: Flat top. MATERIAL: Aluminium Alloy.

No. OF RINGS: Two.

MAKER'S CLEARANCE (Piston to Cylinder-cold) Max.: .0063".
Min. .0053".

CONNECTING ROD MATERIAL: Steel.

TYPE OF BIG END BEARING: Roller. SIZE OF ROLLERS: $\frac{3}{16}$ "
dia. \times 23/64".

CRANKSHAFT BEARING: Single row ball. SIZE: Web end S.9,
 $\frac{7}{8}$ " \times $1\frac{1}{8}$ " \times $\frac{1}{8}$ ". Mag. end, S.8 $\frac{1}{4}$ " \times $1\frac{1}{8}$ " \times $\frac{5}{16}$ ".

CARBURETTOR: TYPE: Midget. JET SIZE: 7. CONTROL:
Twist Grip. O.S. Handlebar.

IGNITION, MAGNETO: TYPE: Flywheel. ROTATION: Anti-clock-
wise from flywheel end. TIMING: $\frac{1}{4}$ " before T.D. centre.

LUBRICATION SYSTEM: TYPE: Petroil. W.D. LUBRICANT:
M160.

CYCLE LUBRICATION: Oil.

FUEL SYSTEM: TANK CAPACITY: 6 $\frac{1}{2}$ pints. FILTER, incorpor-
ated in tap, and carb. union.

FILLER CAP: TYPE: Screw embodied in Air Pump. SECURED:
With combination tool.

CLUTCH: TYPE: Double Plate. LOCATION: On countershaft.
FRICTION MATERIAL: Cork.

OVERALL GEAR RATIO: 6.18.

CHAINS, PRIMARY: TYPE: Roller. MAKE: Renold (Roller dia., .250". METHOD OF ADJUSTMENT: None. No. OF LINKS: 54. PITCH: .375". WIDTH: .125".
SECONDARY TYPE: Roller (Roller dia.: .305"). METHOD OF ADJUSTMENT: Slide rear wheel. No. OF LINKS: 76. PITCH: .5". WIDTH: .187".

CHAIN SPROCKETS: No. of teeth: Engine: 17. Driven: 42. DRIVING SPROCKET. 10. REAR WHEEL: 25.

WHEELS: BEARING, FRONT, TYPE: Cup and Cone. SIZE: $\frac{1}{4}$ " dia. balls. BEARING, REAR, TYPE: Cup and Cone. SIZE: $\frac{1}{4}$ " dia. balls. SPOKES, GAUGE: 12. LENGTH: 20, $3\frac{1}{8}$ "; 10, $3\frac{1}{4}$ "; 10, $2\frac{1}{2}$ ". THREAD: 12G x 56 T.P.I. SINGLE OR DOUBLE BUTTED: Plain. ANGLE OF HEAD: 95°. RIMS: SIZE 8" dia.

TYRES: MAKE: Dunlop. TYPE: Carrier. SIZE: $12\frac{1}{2}$ " x $2\frac{1}{4}$ ".
TUBE: MAKE: Dunlop. VALVE No.: 8435. TYRE PRESSURES: FRONT: 25-lbs. per sq. in. REAR: 25-lbs. per sq. in.

BRAKE: HOW OPERATED: Foot pedal. DRUM DIA.: 4". LINER MATERIAL: Ferodo.

FRAME: TYPE: Tubular. WEIGHT: MACHINE WITH TANKS EMPTY: 70-lbs. FRONT FORKS: Tubular Rigid. STEERING DAMPER: Not fitted.

DIMENSIONS: OVERALL HEIGHT (OPEN): $30\frac{1}{4}$ ". WIDTH: .22". LENGTH: 52". WHEEL BASE: $39\frac{1}{2}$ ". max. GROUND CLEARANCE AT LOWEST POINT: 4". LOCATION OF LOWEST POINT: Bottom Rail of Frame.

MAINTENANCE MANUAL.

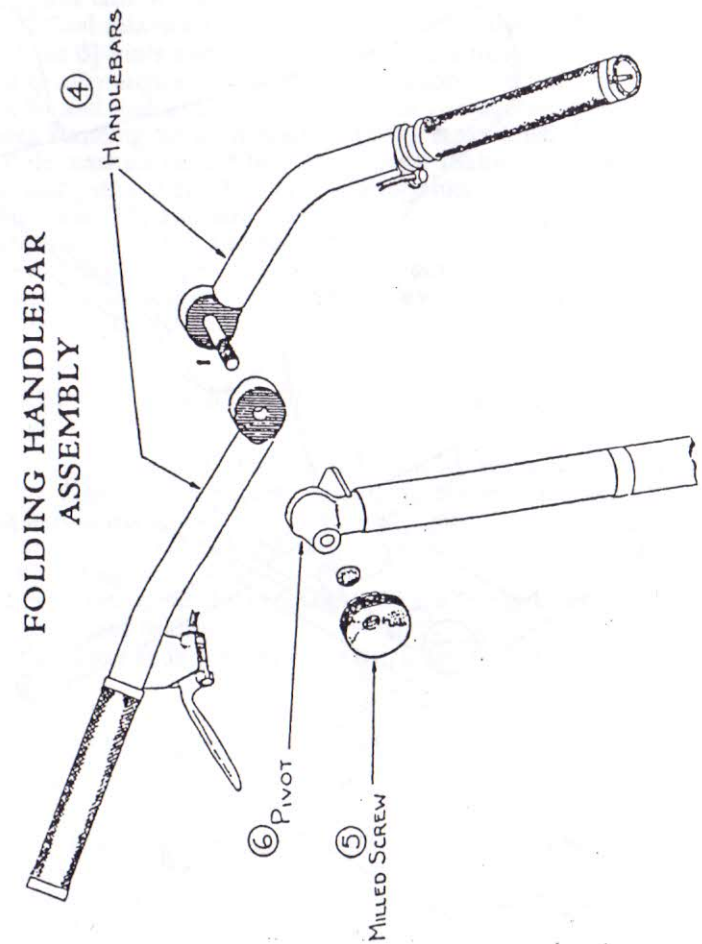
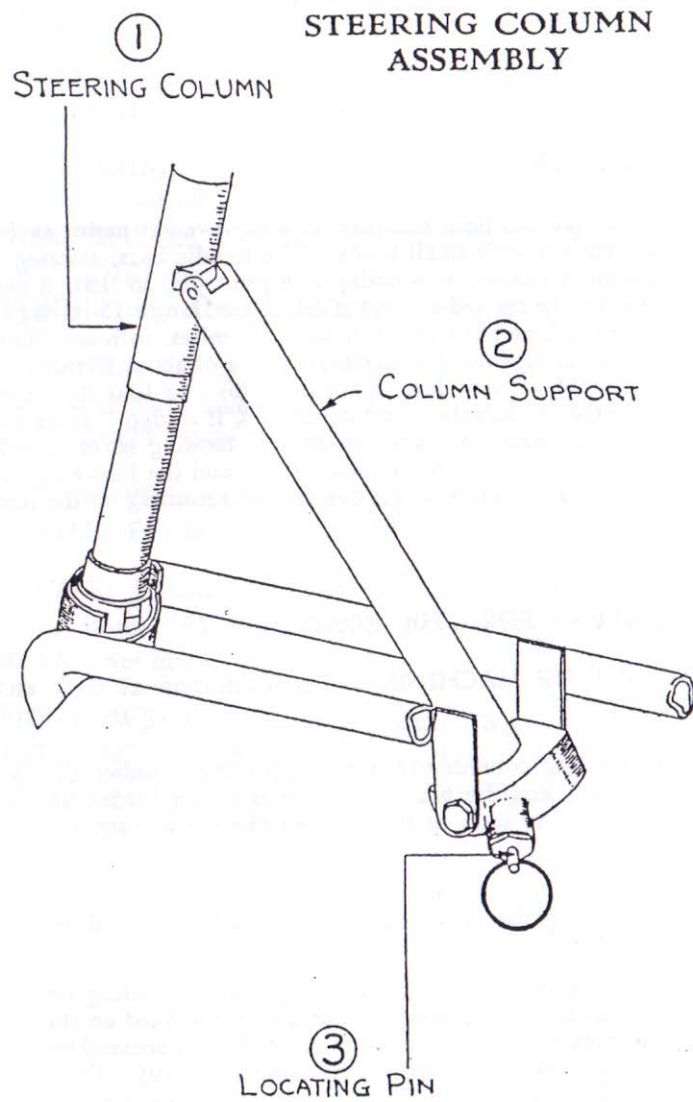
WELBIKE.

INTRODUCTION.

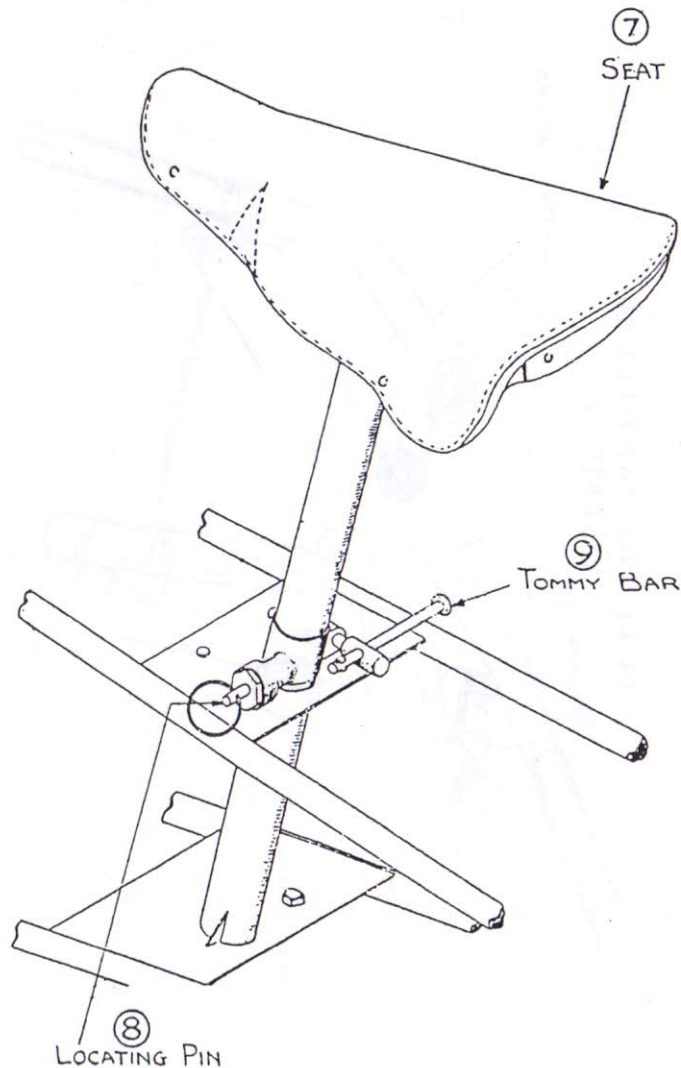
The Welbike has been designed as a lightweight motor cycle, which can be carried in a very small space. The handle bars, steering column, and saddle are arranged on a collapsible principle, so that, if necessary, the machine can be carried in a space 4-ft. 3-ins. long x 15-in. high x 12-in. broad. The machine has a range of about 90 miles, with one filling of the fuel tanks, and is capable of a maximum speed of about 30 miles per hour. The total weight without fuel is about 70-lbs., so that it can easily be lifted over difficult obstacles, such as ditches, if ridden "cross country." The frame and forks, etc., are capable of standing severe shock. The machine is supplied in a collapsed condition, and the following procedure covers all actions necessary to get the machine running on the road:—

PREPARATION FOR THE ROAD:

- (A) TO SET UP MACHINE. (See illustration at back and pages 4, 5, 6.)
- (a) Raise steering column (1) until supporting member (2) is secured by trunnion locating pin (3), which is spring loaded and will click into position as soon as the hole on the supporting member comes opposite the pin.
 - (b) The handle bars (4) will fall into position automatically, and must be secured by the milled screw (5), which is located on the handle bar pivot (6).
 - (c) Pull up the seat (7) until the spring loaded locating pin (8) clicks into position, this pin ensures that the seat is fixed on the centre line of the machine; the seat column must then be secured by the clamping screw, which is turned by the tommy bar (9). DO NOT RIDE MACHINE until saddle has been securely clamped.
 - (d) Push down foot rests (10).



COLLAPSIBLE SADDLE ASSEMBLY.



(B) TO FILL TANK. (See illustration at back and page 30.)

- (a) Unscrew filler cap (11) on the off side tank with the special tool provided. This cap carries the pump for raising the pressure in the tanks.
- (b) Remove vent screw (12) on the near side tank, a screw-driver blade will be found combined with the special tool provided for removing the filler cap. The purpose of this vent is to let the air escape from the near side tank while fuel is being poured into the off side tank.
- (c) Pour the fuel mixture slowly into the off side tank. The tanks will hold about $6\frac{1}{2}$ pints and the fuel should be a mixture of half a pint of best quality engine oil mixed with 1 gallon of petrol; the mixture should be well shaken before use, and this also applies if the machine has been standing for some hours with the tanks filled, in which case the whole machine should be given a good shaking. ALWAYS mix the oil and petrol BEFORE putting into tanks.
- (d) Replace vent (12) and screw tight.
- (e) Replace filler cap (11) and screw tight.
- (f) Unscrew pump plunger (13) which is located in the centre of the filler cap (11), and give about 6 sharp downward strokes to raise the air pressure in the tanks.

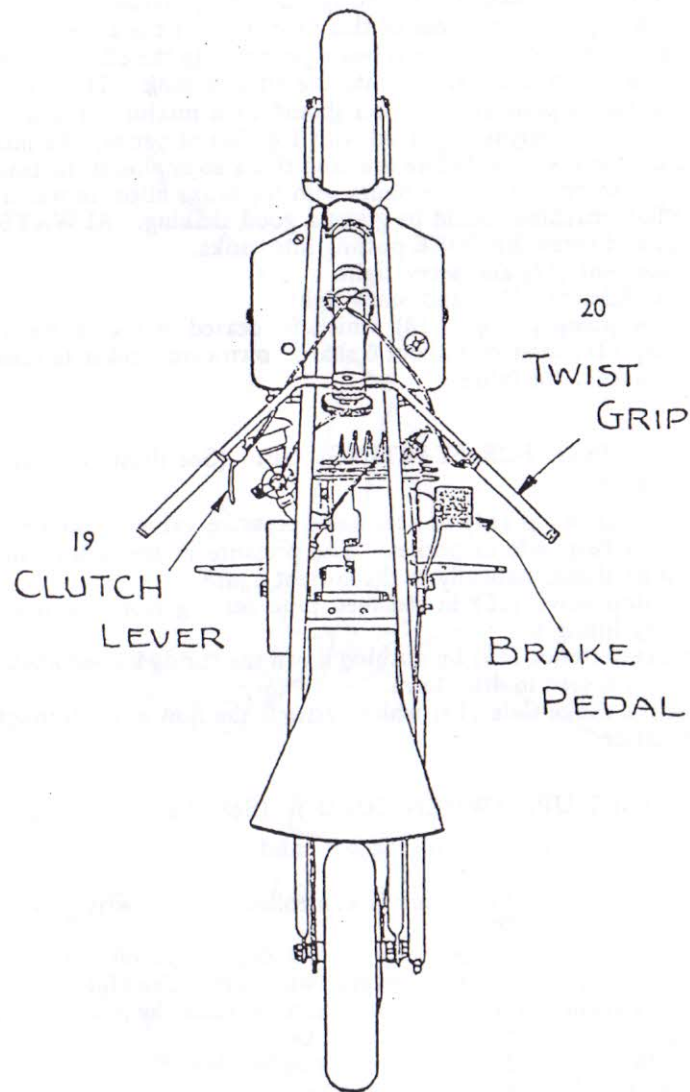
(C) TO PREPARE FOR STARTING UP. (See illustration at back and page 30.)

- (a) Remove screw top (14) of automatic pressure valve on the near side tank and keep safe in pocket. The pressure in the tanks will now adjust itself automatically to the correct figure.
- (b) Open stop valve (15) in the feed pipe coming from the near side tank, by lifting tap.
- (c) Flood carburettor (16) by pushing down the spring loaded knob (17) until fuel is seen to drip down.
- (d) Close the choke slide (18) which restricts the flow of air through the carburettor.

(D) TO START UP. (WHEN COLD.) (See illustration, page 3.)

- (a) Press clutch lever (19) with the left hand, until it touches the handle bar.
- (b) Open throttle a little, which is controlled by the twist grip on the right handle bar (20).
- (c) Push the machine a few steps, throw the weight on the seat, and release the clutch, when the engine will start. The clutch may now be lifted again to keep the engine running while the machine itself is brought to rest, or riding may continue.
- (d) Open the choke slide (18), after engine has been running 30 seconds. There is only one fixed gear, the speed of the machine being controlled entirely by the throttle.

CONTROLS.



(E) TO STOP THE MACHINE. (See illustration, pages 8 and 30.

- (a) Close throttle by means of the twist grip (20).
- (b) Press clutch lever (19) when the engine will stop.
- (c) Push down petrol cock (15) in the feed pipe.
- (d) Replace screw in top of the automatic pressure valve (14).

TO START UP. (WHEN HOT):

Do not flood the carburettor, and see that the choke slide (of strangler) is in the open position, otherwise follow out exactly the same instructions as given for COLD STARTING.

RUNNING-IN:

This machine is capable of running at nearly full power even when new, and until the rider is thoroughly at home with his machine he will probably be running at a lower speed with a small throttle opening. Under these conditions carbon is formed more rapidly on the skirt of the piston, due to the fact that insufficient heat is generated. These conditions will gradually disappear as the rider gains confidence, and a wider throttle opening is used. By maintaining a higher road speed and throttle opening the engine is given more work to do, and the formation of carbon will be greatly reduced.

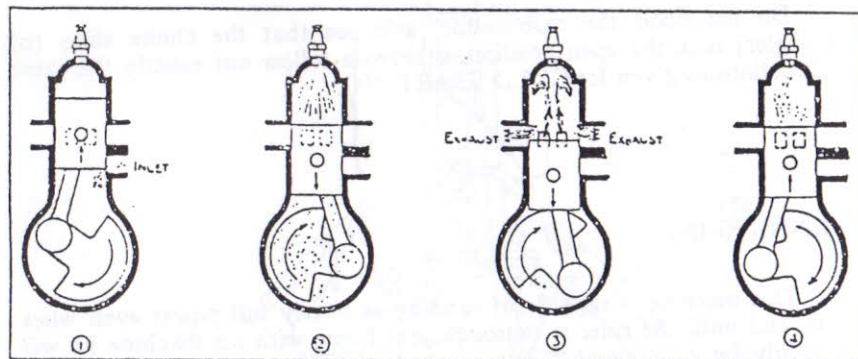
IMPORTANT:

Finally, make a point of turning off the fuel supply to carburettor every time the machine is to be stopped for periods of 15 minutes to 1 hour. If to be stopped for longer periods turn off the fuel to carburettor, and use up all fuel in float chamber, by running the engine until it dies out. This will then ensure an easy start when fuel is turned on again to start the machine.

HOW THE TWO-STROKE WORKS:

Two-stroke engines with flat-topped pistons differ from the more familiar deflector piston type chiefly in the design of the ports and in the characteristics of their performance. The operating principles are, broadly speaking, the same; an explanation of the functioning of the two-stroke engine is appended.

A flat-topped piston in a cylinder is connected to a crank. As the crank is turned through one revolution the piston travels once down and once up. Every down stroke is a firing stroke, i.e., there is an explosion of gases every two strokes of the piston as distinct from once in every four on a four-stroke. In other words, there is one explosion in the cylinder for every revolution of the crank.



What happens inside a two-stroke engine with flat-topped piston. 1. On the upstroke of the piston a vacuum is created in the crankcase, the piston uncovers the inlet port and the mixture enters. 2. The piston descends, compressing the mixture. The previous charge is fired, which causes the descent of the piston. 3. At the bottom the piston uncovers the exhaust and transfer ports, burned gases rush out and fresh mixture enters. 4. The piston starts a new cycle by compressing the fresh mixture.

If a study is made of the diagrams which illustrate the cycle of operations it will be appreciated that compression of the gas takes place in the crankcase below the piston, as well as in the combustion head above it. It is essential, therefore, that the crankcase is gas tight. There are seven ports in the cylinder, made up as follows—one inlet, two exhaust, and four transfer. The exhaust ports are diametrically opposite; the inlet is immediately underneath one of the exhaust ports, and the transfer ports are in pairs arranged between the exhaust ports. The gas from the carburettor is drawn into the crankcase through the inlet port, is transferred to the combustion space by the transfer ports, and is expelled as burnt gases via the exhaust ports.

The cycle of operations is as follows:—

(1) The piston rises, uncovering the inlet port, and gas is sucked into the crankcase. Simultaneously the crown of piston compresses the previous charge in cylinder head.

(2) When the piston nears the top of the stroke this compressed charge is fired, the piston travels down, compressing the gas in the crankcase and delivering power to the crankshaft, through which it is transmitted to the rear wheel.

(3) The piston uncovers the exhaust ports, spent gas still at fairly high pressure rushes out into the silencers. Fractionally later the four transfer ports are uncovered, and the new charge from the crankcase is released into the cylinder. The design of the transfer ports, which enter the cylinder tangentially and inclined upwards, helps the new charge to clear the burned gas without mixing with it.

(4) The piston rises, closing all ports, and a fresh cycle is begun.

OVERHAULING THE ENGINE—DECARBONISING:

It should not be necessary to decarbonise the engine, except after a considerable mileage. If it becomes necessary and no other work is required on the engine, decarbonising may be carried out without removing the engine from the frame.

DECARBONISING:

When an engine has run for a considerable mileage deposits of carbon are formed in the combustion space of the cylinder head, in the piston crown, under the piston rings, and round the edges of the ports of the cylinder. This deposit affects the efficiency of the engine, and must be removed. The engine need not be removed from the frame, but the following parts must be removed from the engine:—

To remove Cylinder Head.

(1) This is a simple operation, and it is only necessary to remove the sparking plug, remove the four bolts securing the head in position on the cylinder barrel, and this automatically releases the cylinder head steady, when the head can be removed from the cylinder, sliding same upwards and sideways.

There is no gasket fitted, the joint being made between the cylinder head (aluminium) and cylinder barrel (cast iron).

The piston crown and cylinder head can now be cleaned, and care must be taken when cleaning the head not to in any way damage the face joint, which, being aluminium, acts as its own gasket, but as it is more than likely that the ports, ring grooves and silencing system also require decarbonising it will be necessary to remove the cylinder.

To remove Cylinder.

(2) Remove the carburettor, exhaust manifolds, silencer pipe, and silencer. The silencer under engine can then be removed. Remove the four nuts securing the cylinder to the crankcase. The cylinder can now be pulled away, but do not turn it while doing this, as the piston ring joints may foul the ports. If the cylinder base joint washer is damaged, replace with a new one on re-assembling the engine.

(3) To clean the piston skirt and ring grooves it is advisable to remove the piston. Remove the circlip from one end of the gudgeon pin hole. The gudgeon pin is a floating fit, and will push out unless carbon deposit prevents this, when an extractor of the band type is useful. Remove the rings from the piston with great care, as they are very brittle. Clean out the grooves, and the carbon from the rings. A section of an old ring ground to a point makes an admirable tool. A knife will do, however. The piston, being of aluminium, is soft, so care should be taken not to remove any metal. Scrape the piston crown and the inside of the piston clean with a stick of solder cut or hammered to a chisel shape. The piston crown may be lightly polished. Wipe off all traces of polish and do not let it touch the piston skirt.

(4) Clean out the various ports of the cylinder with a screw-driver or old knife. A bent tool will clean round corners more easily. Be careful not to damage the walls of the bore, or the top face of the cylinder, which has to make a gastight joint with the cylinder head.

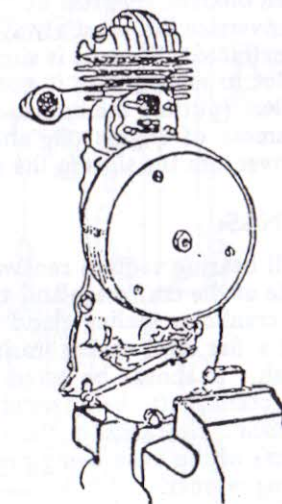
REMOVAL OF ENGINE UNIT FROM FRAME:

The removal of this unit is very simple—disconnect the rear chain and all controls, including the petrol pipe to carburettor, the carburettor complete with the manifold to which it is attached, then the N.S. Exhaust Manifold, next the cylinder head stay bolt, the rear silencer and pipe, and, finally, the expansion box under engine. Remove the two $\frac{1}{8}$ " Hexagon Headed Engine fixing bolts which pass through the engine securing brackets welded to frame, and the engine unit will lift out on the rear side of the frame.

TO DISMANTLE ENGINE.

STRIPPING DOWN:

Stand the engine upright by holding the bottom lug in a vice. Remove exhaust and inlet manifolds. Remove the two slotted screws in the clutch cover in order to lift off the clutch bridge piece and lever complete, thus revealing the driving sprocket. When the engine is taken out of the vice it is advisable to tip out the clutch operating push-rod, which consists of three sections and a ball. The outer section will probably come away with the bridge piece.



ENGINE ADJUSTMENTS AND RENEWALS.

RENEWAL OF BEARINGS:

All bearings can be renewed, but a certain amount of skill and care is needed, and renewals should not be undertaken unless they are thoroughly understood. The small end of the connecting rod has a bronze bush which FLOATS in the rod and on the gudgeon pin. Three $\frac{3}{8}$ in. oil holes are drilled round the bush. The gudgeon pin hole in the piston is bushed, the bushes having grooves for the locating circlips.

BIG END BEARINGS:

Renewal of the big end bearing calls for a press. First drive out the rivet (10) through the crankpin. This releases the large washer (11) which retains the rod and rollers on the pin. There are eight steel and eight bronze rollers. The pin can be pressed out from the back. (See page 15.)

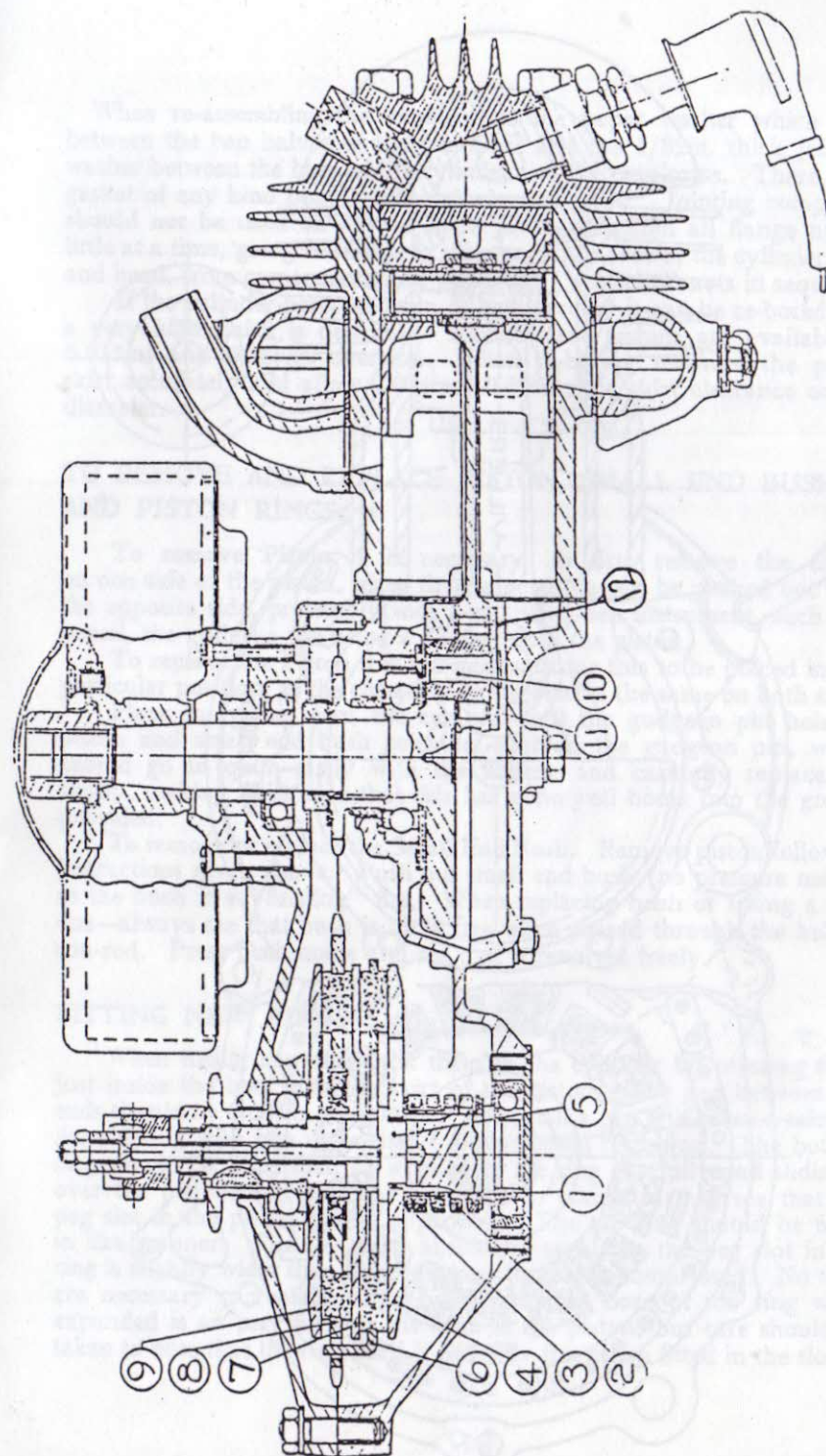
New pins are supplied 0.001 in. oversize on the part which is pressed into the crank web. An oversize pin must always be used as once a pin has been pressed in and extracted, the hole is slightly enlarged. Press in the new pin, using a pilot to ensure that it goes in absolutely square. Assemble the rod and rollers (putting the bronze rollers between the steel ones) with a generous smear of engine oil, and rivet the washer on; punching the end of the rivet into the slots in the washer.

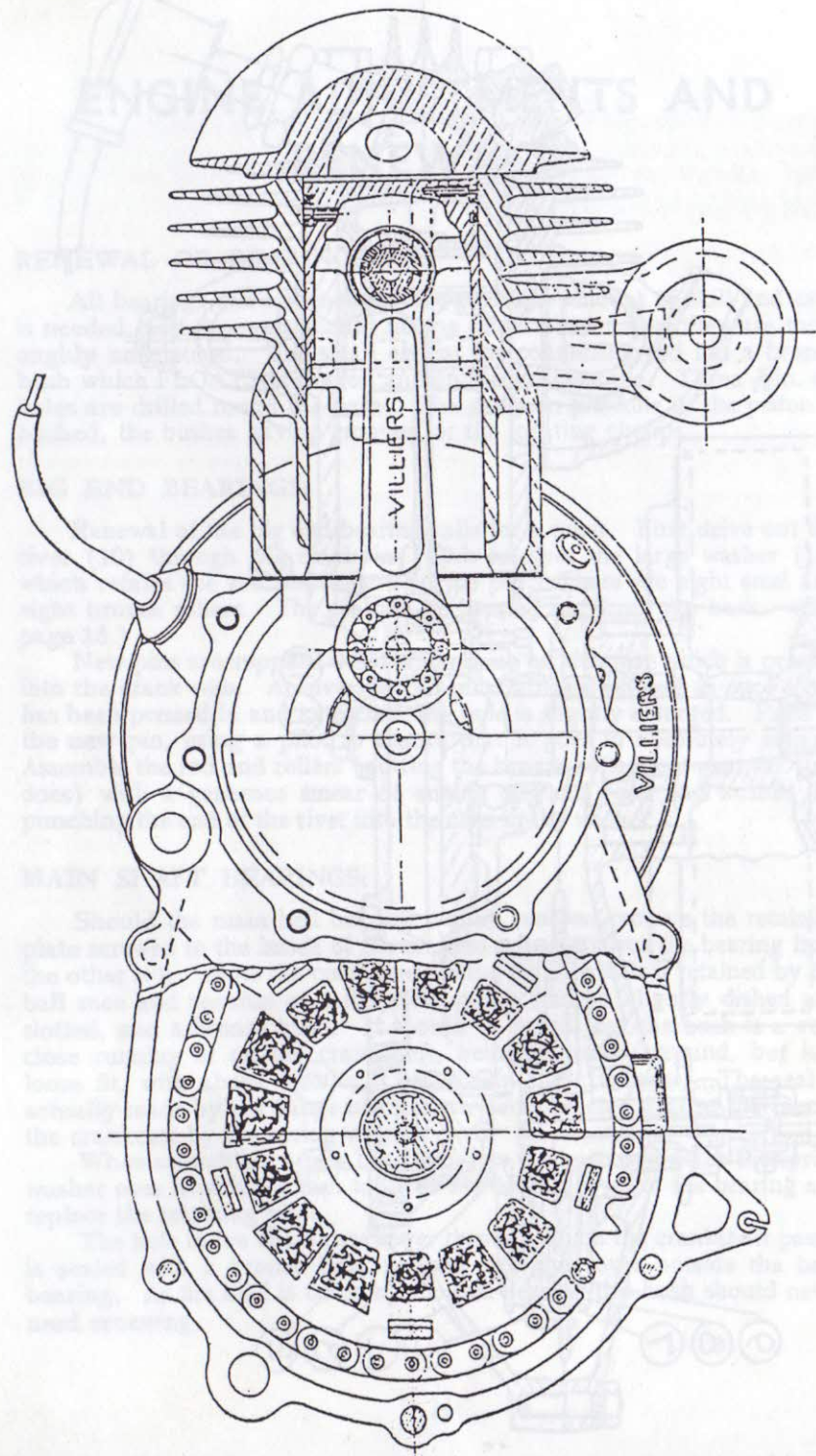
MAIN SHAFT BEARINGS:

Should the main ball bearing require renewal remove the retaining plate screwed to the inside of the crankcase and tap out the bearing from the other side. Note the crankcase sealing gland which is retained by the ball race and consists of a flat steel spring washer, slightly dished and slotted, and a bronze bush. It should be noted that the bush is a very close running fit on the crankshaft, being internally ground, but is a loose fit, with about 0.080 in. clearance in the crankcase. The seal is actually made by the flange of the bush being pressed against the face of the crankcase by the spring washer.

When assembling a new bearing insert the bush and place the spring washer over it with the dish towards the bush. Press in the bearing and replace the retaining plate.

The hole in the chain-case cover through which the crankshaft passes is sealed with a bronze bush pressed into the cover outside the ball-bearing. As the load is taken by the ball-bearing this bush should never need renewing.





When re-assembling the engine note the paper washer which goes between the two halves of the crankcase and the 1/32in. thick jointing washer between the base of the cylinder and the crankcase. There is no gasket of any kind between the cylinder and head. Jointing compound should not be used on any of these joints. Tighten all flange nuts a little at a time, going from side to side, or, in the case of the cylinder base and head, from corner to corner, tightening "opposite" nuts in sequence.

If the cylinder becomes worn or badly scored it can be re-bored, but a very high finish is desirable. Replacement pistons are available in 0.015in. and 0.030in. oversize. When re-boring measure the piston skirt accurately and allow 0.004in.—0.005in. for skirt clearance on the diameter.

0.1 mm

TO REMOVE AND REPLACE PISTON, SMALL END BUSHES, AND PISTON RINGS:

To remove Piston it is necessary to first remove the circlip on one side of the piston, when the gudgeon pin can be pushed out from the opposite side, preferably with a small wooden instrument, such as a pencil, the gudgeon pin being a floating fit in the piston.

To replace the Piston it is not necessary for this to be placed in any particular position, as the cut-away on the skirt is the same on both sides.

Place the piston over the con-rod until the gudgeon pin holes in piston and small end bush coincide, push in the gudgeon pin, which should go in quite easily with the fingers, and carefully replace the circlip, making quite sure that this has gone well home into the groove provided.

To remove or replace the Small End Bush. Remove piston following instructions given above. Push out small end bush (no pressure needed as the bush is a "floating" fit). When replacing bush or fitting a new one—always see that bush is quite free when passed through the hole in con-rod. Press bush home and see that it revolves freely.

FITTING NEW RINGS:

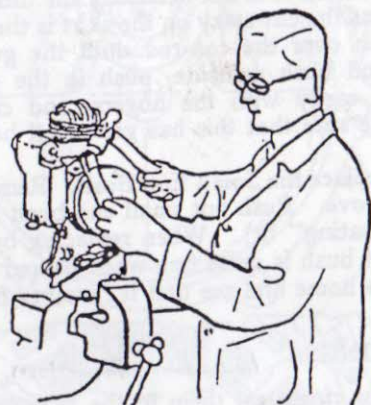
1.6 to 1.5 mm 0.1/0.2 mm

When fitting new rings test them in the cylinder by pressing them just inside the bore with the skirt of the piston. The gap between the ends should be 0.004in. to 0.008in. Too small a gap will cause a seizure. An old ring with gap more than 0.030in. needs replacing. The bottom ring should be fitted first, by expanding the ring carefully and sliding it over the piston, and past the first groove, taking care to see that the peg slot in the piston ring is uppermost. The top ring should be fitted in like manner. Finally, make absolutely sure that the peg slot in the ring is slightly wider than the peg when the ring is compressed. No tools are necessary to replace rings, as the internal bore of the ring when expanded is an easy fit over the land of the piston, but care should be taken to note that the ring itself is perfectly free when fitted in the slot.

0.76 mm

FLYWHEEL MAGNETO:

The 3-pole flywheel magneto fitted to this engine should not be removed unless absolutely necessary. If necessary to remove the magneto a "hammer tight" spanner is necessary to undo the centre nut. The centre nut has a right-hand thread, and therefore, unscrews in an anti-clockwise direction. After about one turn the nut will be found to tighten—this is when the extracting flange commences to withdraw the flywheel. The end of the nut should then be tapped sharply with a wooden mallet, after which the nut can be unscrewed without difficulty, and will automatically withdraw the flywheel from this shaft—there are no key ways. To refit the flywheel, screw the centre nut in a clockwise direction until just finger tight, then take out the sparking plug preparatory to re-timing the engine. Rotate the engine shaft until the piston is at the extreme end of its stroke, i.e., nearest to the cylinder head. This position can be felt with a pencil through the sparking plug hole. Then position the flywheel, which is loose on its shaft, by hand, with the mark of the rim of the flywheel in line with the mark on the edge of the armature plate, this is near the high tension terminal. Hold the flywheel firmly in this position, and lock up the centre nut (clockwise direction) with a "hammer tight" spanner. (See Illustration).



If the above is carried out correctly, the magneto will be timed so that the contact breaker points are just opening with the piston $\frac{1}{4}$ in. before top dead centre.

Access to the contact breaker points is obtained by removing the Cover from the front of the magneto. This is held in place by three small screws, which must be perfectly tight when replaced, and the plate itself is positioned on the flywheel by locating points on flywheel, and cover. (See Illustration, page 18.)

ADJUSTMENT OF THE MAGNETO:

The magneto is located inside the flywheel (41) and can be exposed by removing three countersunk screws in the flywheel cover. The ignition points should be checked from time to time to see they are clean and free from oil. The gap should be maintained at approximately 0.015 in. To check the timing of the engine set piston at top dead centre, when the line on the inner edge of the flywheel should coincide with the arrow on the back plate of the magneto. This arrow is situated at the side of the carburettor intake manifold. If it is found impossible to line up in this way, the flywheel must be moved on its shaft (see flywheel magneto). The nut securing the flywheel will also withdraw the flywheel, which can then be rotated while the shaft is kept stationary. Great care must be taken to screw up the flywheel nut hammer tight.

To remove the magneto flywheel undo the nut, using a $\frac{1}{8}$ in. spanner and hammer. (A ring spanner fitting well over the nut is best.) NOTE: This nut, right-hand thread, has a flange which draws the flywheel off as it is unscrewed. After the first turn or two it will be found to tighten, because the flange is pulling against face of the flywheel boss. Place a piece of wood against the face of the nut and give a sharp hammer blow. The flywheel will then be loosened on its taper, and the nut can be turned with the fingers.

Having removed the flywheel place a spanner or piece of iron across the pole shoes to prevent loss of magnetism.

Releasing four screws in the centre now enables the armature plate, magneto components and contact breaker to be taken off as a unit. If these screws are obdurate, tap the end of the screw-driver sharply with a hammer before turning.

The contact breaker points are accessible without removing the flywheel, by removing the three small screws which secure the large disc in front of flywheel.

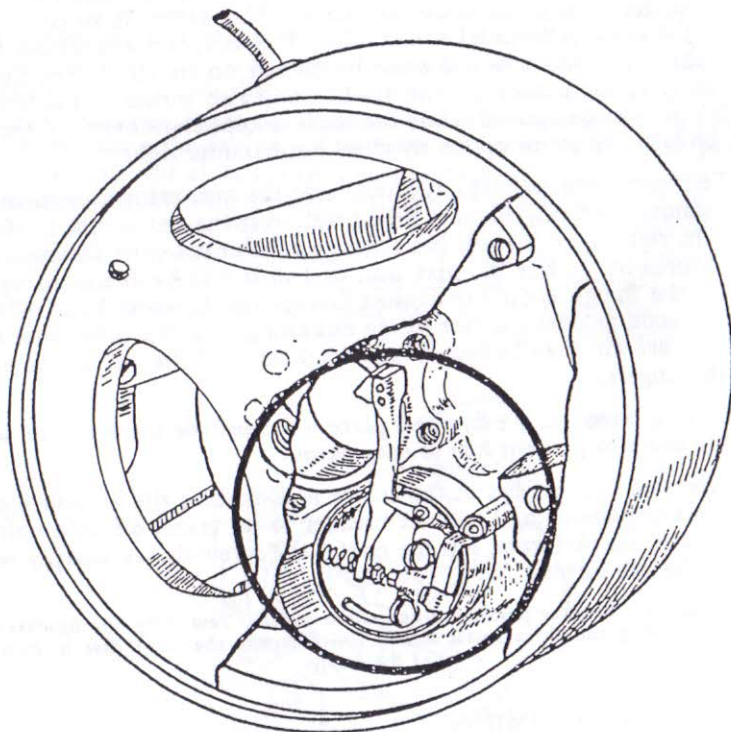
MAGNETO AND TIMING:

The contact points in the magneto are enclosed in a circular brass case. The points should break or open when the piston is $\frac{1}{4}$ in. from the end of the outward stroke. The position of the piston can be checked by a pencil through the sparking plug hole in the head. If the timing is not correct loosen the flywheel as described under "Magneto," turn the engine anti-clockwise until the piston is at the extreme end of its stroke—nearest to the cylinder head; then position the flywheel by hand with the mark on the rim in line with the arrow stamped on the armature plate near the high-tension terminal, taking care that the crankshaft does not move. Hold the flywheel firmly in this position, and lock up the centre nut with the hammer tight spanner.

0.38 mm

Check the contact breaker points after the first 150/200 miles. Turn the flywheel to lift the rocker arm to its highest position. Undo the locknut (the lower one) and turn the other nut until the faces of the points are $\frac{1}{64}$ in. (.015 in.) apart, using the feeler gauge supplied with the magneto, then re-tighten the locknut. Never file the points. Clean, if necessary, with a non-woolly rag dipped in petrol.

(See instructions below.)



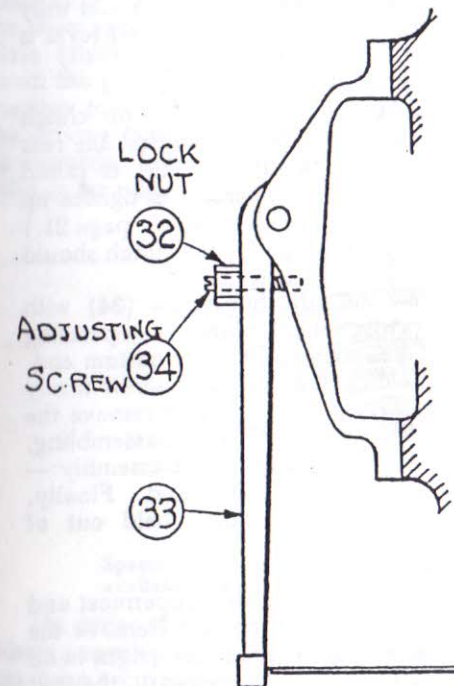
SPARKING PLUG:

The gap between the side and central electrodes should be 0.025 in. In use the points of these electrodes get burnt, thus causing the gap to widen. Close up the gap by bending the side electrode. Never bend the central electrode. If there is plenty of fuel in the carburettor and the engine fails to start, remove the sparking plug and examine the points, which may be bridged by a film of oil. Clean thoroughly in petrol.

The sparking plug (45) should be kept clean and the gap at 0.025 to 0.030 in.

0.64 mm

CLUTCH FULCRUM LEVER



CLUTCH. (See illustration on page 15.)

The clutch on this engine is a two-plate cork inserted type running in oil. All faces and corks are ground when manufactured, with the result that the clutch is very smooth in action, and has a long life, demanding the minimum of attention, but owing to the restricted movement of the clutch due to the short lever provided on handle bar it is necessary to keep this in perfect adjustment whilst the clutch is new, as there is a tendency for the clutch to settle down quickly, and if adjustment is not attended to there will be a tendency for the clutch to drag, and so become partially inoperative. The adjustment is by means of the small screw, and lock nut on the fulcrum lever. Only a small amount of movement of the adjusting screw is necessary, and at all times there must be $\frac{1}{16}$ in. slack movement on the cable, which will be perceptible at the handle bar lever end. A few spots of oil occasionally on the end of the adjusting screw (34) is advisable.

CLUTCH CASE:

This should be inspected periodically for oil level. Remove filler plug on magneto side, just underneath drive sprocket, and insert as much oil (M160) as will enter, the plug hole being so placed as to act as a level with the machine standing vertically. The above attention should only be necessary once every 1,000 miles, but make sure that the oil level is correct before starting the engine up for the first time.

ADJUSTMENT OF THE CLUTCH: (31).

This can be adjusted by slackening off lock nut (32) on clutch fulcrum lever (33) and turning the adjusting screw (34) so that the rear wheel is free when the clutch lever on the handle bar (19) is raised approximately three-quarters of its movement. Be careful to tighten up the lock nut (32) securely after adjustment. (See Illustration, page 21.)

If the clutch drags and will not free itself properly, the clutch should be adjusted immediately, as follows:—

Release lock nut (32) and unscrew the adjusting screw (34) with screw-driver, by turning in an anti-clockwise direction until the operating lever (33) has approximately $\frac{1}{4}$ in. of free movement at its bottom end. Then tighten up the lock nut whilst holding the necessary screw firmly with the screw-driver. It may be necessary at some time to remove the clutch operating rod, which is in several pieces. When re-assembling, these parts should be inserted in the following order of re-assembly:— 1st, Long Rod; 2nd, Ball; 3rd, Short Rod; 4th, Medium Rod. Finally, it is not advisable to coast down-hill with the clutch held out of engagement.

TO DISMANTLE CLUTCH:

Lay the engine on its side with the protruding shafts uppermost and remove the seven nuts and washers holding clutch cover. Remove the sprocket from the clutch shaft by unscrewing hexagon nut (right-hand thread) anti-clockwise. There is a lock washer underneath the nut which must first of all be flattened to allow the nut to turn. Pull off the sprocket, using a claw type extractor, and remove the key from the shaft. The clutch cover can now be removed by tapping gently the ears provided on the cover, both ends at the same time.

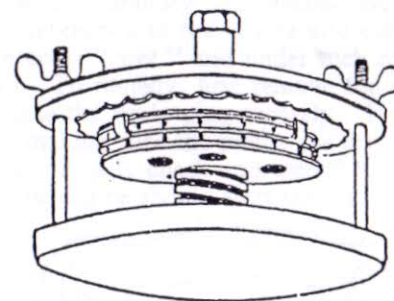
With the cover off the primary chain, engine sprocket and clutch sprockets are revealed. On the other side of the case is a small name-plate, held in position by four slotted screws. When this cover is removed the clutch shaft can be drifted through from that side, bringing away the complete clutch, which will drop apart when released from the chain. If the chain is very tight it may be necessary to remove the mainshaft sprocket, but after some service the chain is usually slack enough to dispense with this, as it will ride off when the clutch sprocket is tilted.

BIG END AND CRANK CASE:

When the clutch is down the only material part left to strip is the crank assembly. Remove the right-hand crankcase cover and take out the key in the protruding end of the shaft. Using a soft hammer, tap out the shaft, connecting rod and crank assembly complete.

CLUTCH RE-ASSEMBLY:

The clutch must be assembled as a unit before replacing it in the chain case. Hold the shaft with the threaded end upwards and slide on the short spring sleeve (1), spring (2), long sleeve (3), and outer clutch plate (thick plate with six holes) (4), shiny side uppermost. Press down the plate and insert the flat cotter (5) in the slot in the shaft, with the ears towards the top. Then assemble the cork insert plate (6) with the driving tangs upwards, the centre plate (dished) (7) with the bulge downwards, followed by the driving sprocket (8), either way on, the solid outer plate (9) and the ball race. (See illustration, page 15.)



Special jig for compressing the clutch spring. If this is not available the procedure outlined in the text is quite effective.

In order to engage the outer plate with the splines on the shaft the whole assembly must be compressed and held until the clutch case cover has been secured in place. A special jig is used at the factory, and the Excelsior Motor Co. Ltd. can supply a simple jig, but in the absence of this aid the simplest way is to proceed as follows:—

Obtain a tubular distance piece $\frac{1}{4}$ in. long and not more than $\frac{3}{4}$ in. in diameter, which will fit easily on the shaft, and assemble this over the ball race. Then take a piece of steel rod $\frac{1}{8}$ in. in diameter and about 3 in. long. Insert this in the hole down the middle of the shaft and thread the nut over it. Lift the whole assembly carefully and place it end-ways between the jaws of a vice. Tighten the vice so that the push-rod compresses the clutch spring. This will enable the nut to be screwed on to the end of the shaft and tightened gently. Fit the chain round the clutch sprocket, and replace the assembly in the chain case, passing the chain round the engine sprocket before pushing the clutch home in the ball race at the back. Replace the name-plate. The cover can now be fitted and it will be found that the nut on the end of the clutch shaft protrudes through the hole. If the cover is heated slightly in boiling water before fitting, it will drop over the ball race quite easily. Do not omit the thin jointing washer. When the nuts holding the cover have been tightened down the nut can be removed from the shaft and the distance piece replaced by the sprocket, after the Woodruff key has been inserted.

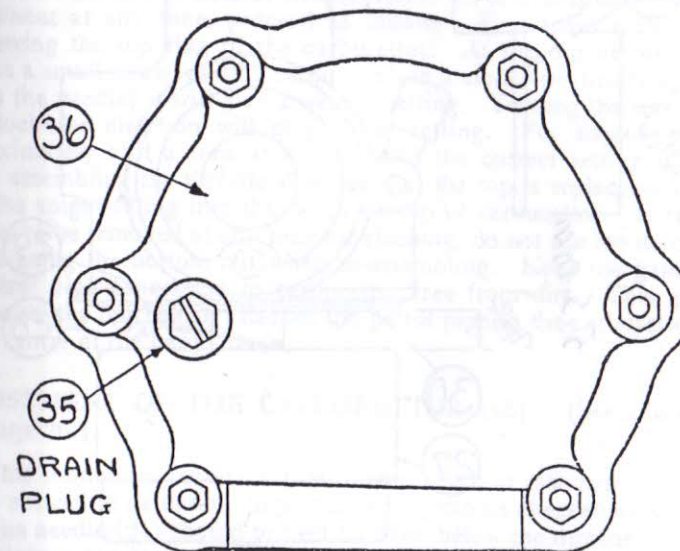
Tighten the nut fully and turn up the lock washer. Then with the unit lying on the bench insert the sections of the clutch operating push rod, long section first, then ball, short section and medium section, the last fitting in a bush in the bridge piece, which should be attached last. When the unit is replaced in the frame check the adjustment of the clutch control wire, and adjust with the grub screw and lock nut on the lever on the bridge piece so that there is slight play on the lever, ensuring that the clutch is fully engaged and that the push-rod is not in compression under normal running conditions. (See Illustration, page 21.)

FUEL SYSTEM.

THE FEED PIPE (45):

Must be kept clear. This pipe is easily removed by unscrewing the nuts at each end. On the top nut (46) will be found a small gauze filter, which should be cleaned. There is another filter inside the fuel tank attached to the stop valve (15), which can be withdrawn when the valve (15) is unscrewed. (See illustration at back.)

A drain plug (35) is fitted to the crankcase (36). The drain plug needs removing only when the crankcase has become flooded. This condition is usually caused by repeated efforts to start the engine with the carburettor flooding continuously and excessively. Such attempts to start induce a rich mixture into the engine and consequently causes the sparking plug to become "wet," and under such conditions all attempts will be of no avail. To remedy, first remove the drain plug, drain the crankcase and replace the drain plug securely. Next remove and clean the sparking plug, making sure the points are dry and the gap correctly set before replacing. Finally check and correct the cause of flooding the carburettor, when the engine should start readily.



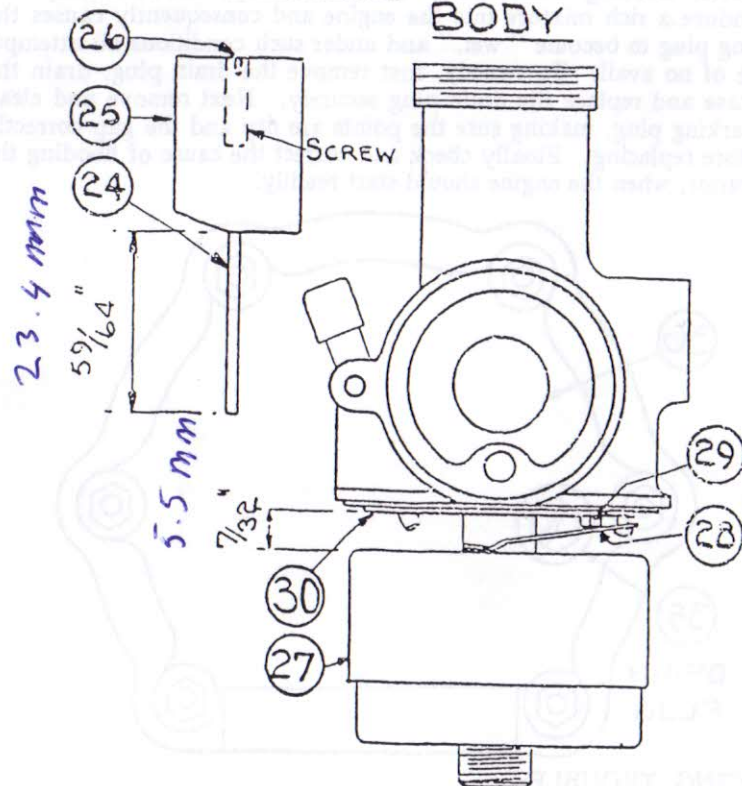
TRACING TROUBLE:

Troubles are usually traceable to dirt on the float chamber needle, causing creep or flooding, or dirt in the filter, loose top cap, punctured float, air leak through fixings becoming slack, air-lock in tank (cure by removing petrol cap and blowing into the tank), too much or wrong kind of oil in petrol mixture, choked fuel pipe or tap. The strangler, of course, is only used to give rich mixture on starting. Release when the engine is warm or starts to "four-stroke" when running or idling.

CARBURETTOR

THROTTLE SLIDE

BODY



SILENCER:

Should appreciable loss of power become apparent after many weeks of running, it may be due to the silencer or exhaust pipe being choked with carbon. There are no baffles in either of the silencers, so that the parts which are more likely to become choked are the two aluminium manifolds directly bolted to the cylinder barrel. Remove these and clean out all carbon from this point, and upon re-assembly the engine should show a marked increase of power.

CARBURETTOR:

This instrument is fitted with a large gauze filter underneath the protecting dome on the air intake. The gauze should be cleaned at intervals, but on no account must the engine be used without the gauze and dome. In this carburettor a taper needle is attached to the throttle and provides a correctly adjusted mixture at all throttle openings. The carburettor is set at the Works before delivery to use pool petrol, with a 16 to 1 mixture, i.e., 16 parts of petrol to 1 of oil, and will generally found to be correct at normal temperatures. If it is desired to make an adjustment at any time, proceed as follows:—First remove throttle by unscrewing the top ring of the carburettor. At the top of the throttle there is a small screw, and by turning this in a clockwise direction (which lowers the needle) it will give a weaker setting. Turning the screw in an anti-clockwise direction will give richer setting. For adjustment give approximately half a turn at a time until the correct setting is found. When assembling the throttle slide see that the top is replaced correctly, with the spigot fitting into the notch on top of carburettor. If the float cup has to be removed at any time for cleaning, do not use too much force in tightening the bottom nut when re-assembling. Keep the gauze filter on petrol pipe connection to carburettor free from dirt. This gauze is fitted over the bolt which attaches the petrol pipe to the carburettor, i.e., in the centre of the banjo union.

ADJUSTMENT OF THE CARBURETTOR (16). (See illustration, page 26.)

This should not require any adjustment, but in case petrol consumption is noticed to be unduly high, the setting can be checked as follows:—

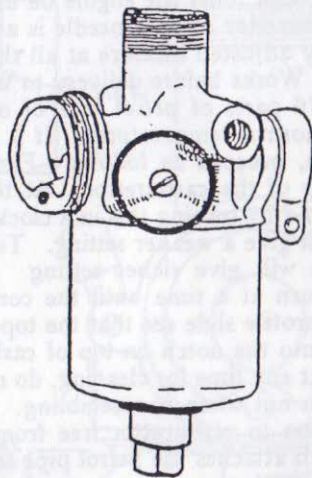
The needle (24) should project $59/64$ in. below the throttle slide (25). The mixture can be made richer by turning the screw (26) in the centre of the throttle slide in an anti-clockwise direction; to weaken the mixture turn in a clockwise direction, but in any case the adjustment should not exceed $1/32$ in. above or below the measurement given. Adjustments of screw (26) should not be more than half a revolution at any one time.

The float (27) should rest on a small lever (28) which holds down the intake needle (29) and should be $7/32$ in. above the carburettor plate (30). The carburettor must be kept clean.

CARBURETTOR ADJUSTMENT:

To adjust the needle, first of all remove the throttle by unscrewing the top ring. At the head of the throttle there is a small slotted screw (20). Turning this in a clockwise direction lowers the needle and will give a weaker setting. Turning in an anti-clockwise direction will give a richer setting. For adjustment give approximately half a turn at a time until it is found to be correct. As a starting point, if the adjustment has been entirely lost, the top of the screw should be about two threads or $\frac{1}{8}$ in. below the top of the throttle.

If the float cup has to be removed at any time for cleaning, when re-assembling do not use too much force in tightening the bottom nut. Periodically see that the gauze in the petrol pipe "banjo" connection (46) is free from dirt, or the petrol will not flow freely.



View of the carburettor, showing in the black circle, the grub screw which must be taken out before the centre-piece and jet "J" is removed.

DISMANTLING:

It is best to detach the carburettor from the engine. Unscrew the top ring and lift out the throttle slide. Invert the instrument and unscrew the bottom nut. Take off the fibre washer, lift off the cup and float, undo the small grub screw in the side of the body. Push out the centre-piece and jet, noting the position of the fibre washer under the head. The lever controlling the fuel needle can now be pushed aside and the needle removed.

A screw-on type of air filter is fitted, the gauze of which should be cleaned at intervals by dipping in petrol.

PETROL TANKS AND FILTERS.

TO REMOVE TANKS:

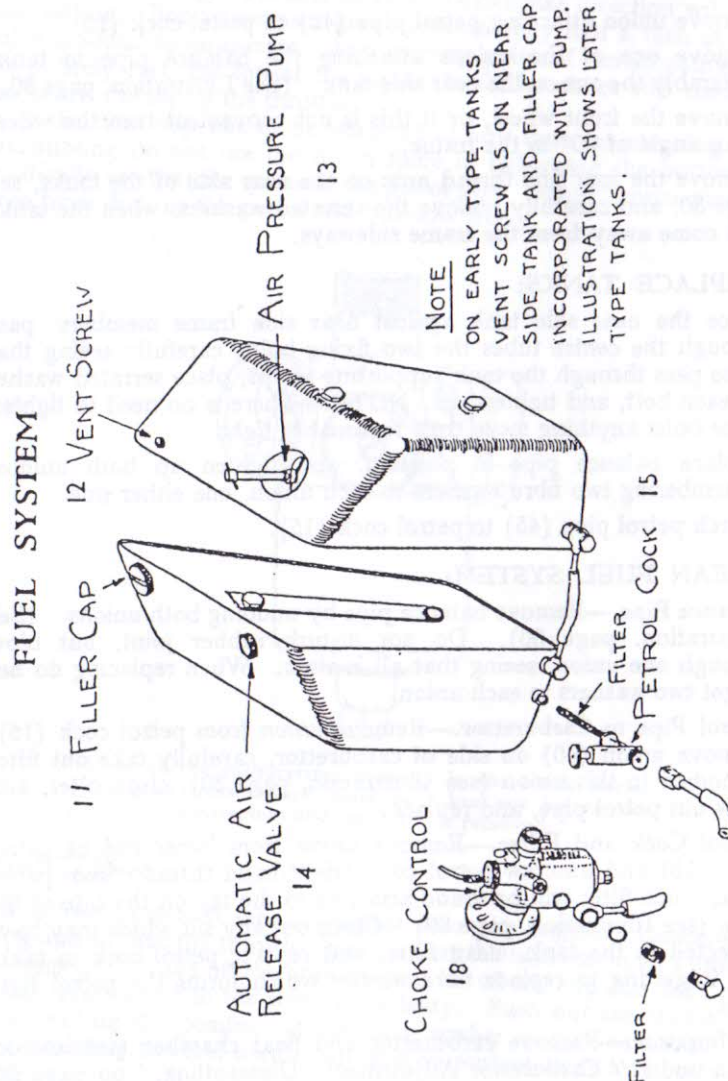
- (1) Remove union attaching petrol pipe (45) to petrol cock (15).
- (2) Remove one of the unions attaching the balance pipe to tank, preferably the one on the near side tank. (See Illustration, page 30.)
- (3) Remove the front wheel, or if this is not convenient turn the wheel at an angle of 90° to the frame.
- (4) Remove the four fine thread nuts on the near side of the tanks, see page 30, and carefully remove the serrated washers, when the tanks will come away from the frame sideways.

TO REPLACE TANKS:

- (1) Place the near side tank against near side frame members, pass through the centre tubes the two fixing bolts, carefully seeing that these pass through the tank supporting straps, place serrated washer on each bolt, and tighten up. NOTE.—There is no need to tighten these bolts anything more than reasonably tight.
- (2) Replace balance pipe in position, and tighten up both unions, remembering two fibre washers to each union, one either side.
- (3) Attach petrol pipe (45) to petrol cock (15).

TO CLEAN FUEL SYSTEM:

- (a) Balance Pipe.—Remove balance pipe by undoing both unions. (See Illustration, page 30). Do not disturb rubber joint, but blow through one union, seeing that all is clear. When replacing do not forget two washers to each union.
- (b) Petrol Pipe to Carburettor.—Remove union from petrol cock (15). Remove union (46) on side of carburettor, carefully take out filter embodied in this union (see Illustration, page 30), clean filter, and blow out petrol pipe, and replace.
- (c) Petrol Cock and Filter.—Remove union from lower end of petrol pipe (15) and unscrew petrol cock (right-hand thread) from petrol tank, when filter will be found attached to the tap on the side of the tank (see Illustration, page 30). Clean out any silt which may have collected in the tank, clean filter, and replace petrol cock in tank, not forgetting to replace fibre washer which forms the petrol tight joint.
- (d) Carburettor.—Remove carburettor and float chamber (see instructions under "Carburettor Adjustment—Dismantling," on page 28. Clean out any silt which may have collected in the bottom of the float chamber, and replace carefully, without using too much force in tightening the bottom nut holding float chamber.



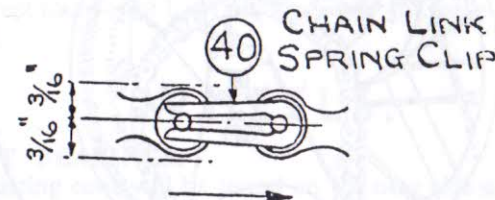
CHAINS.

TO ADJUST CHAINS. PRIMARY CHAIN:

This needs no adjusting, and none is provided for. It is a pre-stretched chain, running in oil, and requires no attention.

ADJUSTMENT OF THE DRIVING CHAIN:

To adjust the chain release the rear wheel nuts (38), and turn the chain adjuster nuts (39), one on each side of the forks, an equal number of turns until the correct tension is obtained. When the limit of travel of the chain by slipping out the chain link spring clip (40) (see Illustration below), and removing one of the links. The chain must not be too tight, the correct adjustment being, when the lower part of the chain is in tension, it should be able to move about $\frac{3}{16}$ in. up and down, halfway between the driven and driving sprockets. Be careful to replace the chain link spring clip, so that the rounded end is pointing in the direction of motion. Finally, tighten wheel nuts and adjust brake if necessary. (See illustration, page 32.)



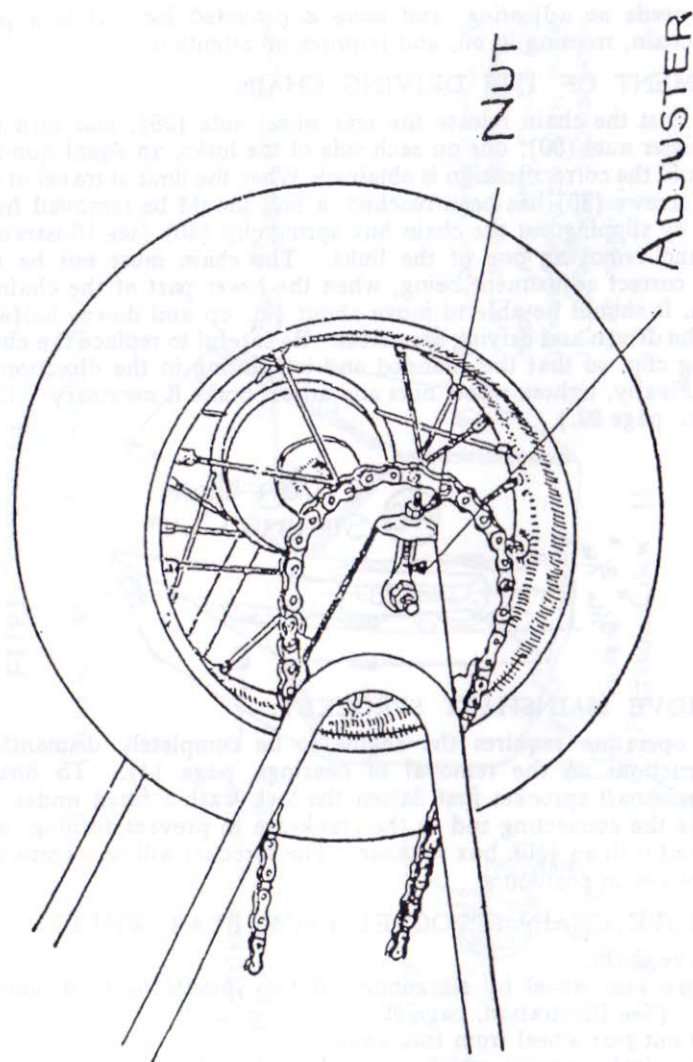
TO REMOVE MAINSHAFT SPROCKET:

This operation requires the engine to be completely dismantled. (See instructions on the removal of bearings, page 14). To finally remove mainshaft sprocket first flatten the lock washer fitted under the nut, wedge the connecting rod in the crankcase to prevent turning, and undo the nut with an $\frac{11}{16}$ in. box spanner. The sprocket will now come off, leaving the key in position.

TO REMOVE CHAIN SPROCKET FROM REAR WHEEL:

- (1) Remove chain.
- (2) Remove rear wheel by slackening off two spindle nuts on spindle (38). (See Illustration, page 32.)
- (3) Draw out rear wheel from fork ends.
- (4) Remove locking screw which passes through locking ring.
- (5) Remove locking ring, right-hand thread (unscrew anti-clockwise).
- (6) Remove rear wheel sprocket, left-hand thread (revolve clockwise to unscrew).

REAR WHEEL ASSEMBLY.



STEERING.

STEERING HEAD ADJUSTMENT:

The steering column (1) may become loose in the head bearing (42) through wear. To adjust—remove front wheel, slacken locking screw (43), in head crown, and turn adjusting ring (44) in clockwise direction inside the crown head. Adjust so that the head moves freely and without play, then tighten up screw (43). (See Illustration at back.)

TO DISMANTLE:

Remove front wheel, slacken lock screw (43) in crown head, and remove adjusting ring (44), unscrewing it in an anti-clockwise direction. Draw off fork crown assembly complete (sliding fit over key), press out key sideways (either way) withdraw steering column complete.

TO RE-ASSEMBLE:

Grease head races, press into steering head, and place the correct number of balls in position top and bottom. Insert steering column, replace crown race, replace key through hole in steering column, replace the fork crown assembly, locking ring, and proceed as instructions given under "Steering Head Adjustment."

The correct number of balls required is 30 $\frac{1}{4}$ in. balls for both top and bottom races.

WHEELS.

TO ADJUST BEARINGS:

The adjusting cone will be found on the near side of both front and rear hubs; in the case of the front hub this cone is not locked in any way, but on the rear hub the cone is locked by a thin lock nut R.H. thread. Adjust by screwing up cone (clockwise direction) to tighten, and unscrewing cone, anti-clockwise (to loosen). Do not run cones tight, and with NO play at all. There should be about $\frac{1}{16}$ in. of sideways movement at the tyre for the wheel to be correctly adjusted.

TO DISMANTLE HUBS:

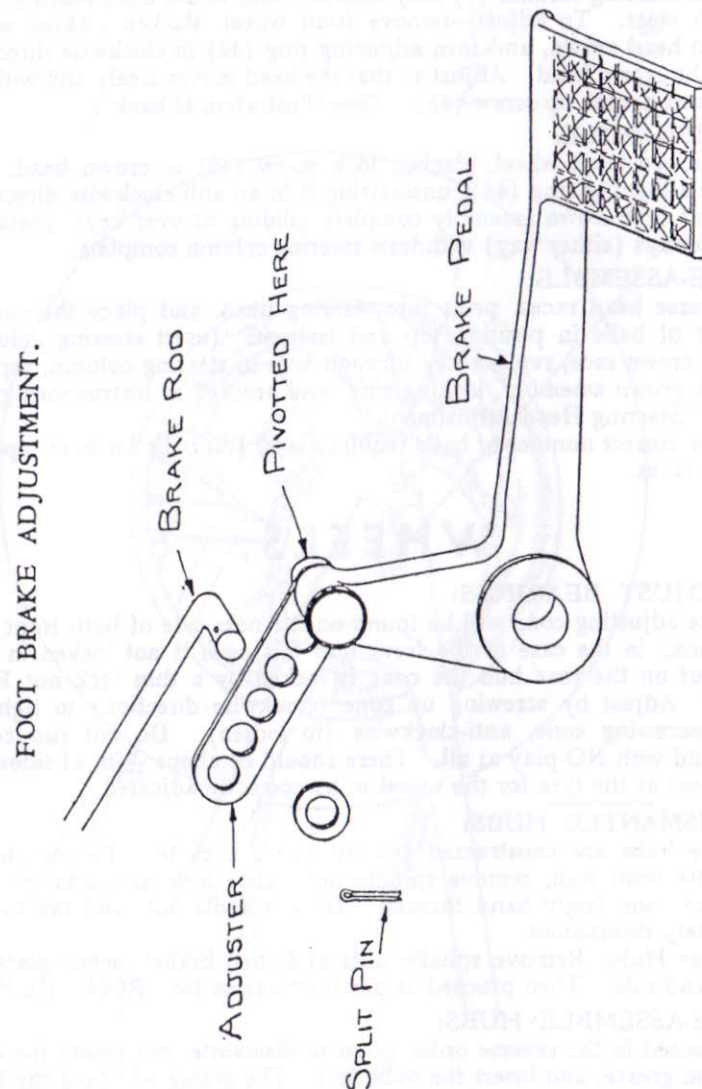
The hubs are constructed exactly as on a cycle. To completely dismantle front hub, remove spindle nuts, cone lock nut, and, finally, left-hand cone (right-hand thread). Draw spindle out, and the hub is completely dismantled.

Rear Hub: Remove spindle nuts and then brake anchor plate on right-hand side. Then proceed as per instructions for FRONT HUB.

TO RE-ASSEMBLE HUBS:

Proceed in the reverse order given to dismantle, but smear the cups with thin grease, and insert the balls first. The grease will hold the balls in position whilst spindle is inserted.

The correct number of balls for either front or rear hub is nine per side, $\frac{1}{4}$ in. balls.



TO ADJUST REAR BRAKE:

Remove split pin and washer from forward end of brake rod, and insert latter into next hole FORWARD. Replace washer and split pin.
(See illustration, page 34.)

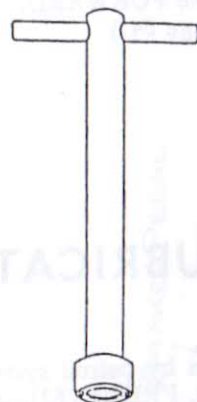
LUBRICATION.

- (1) **Engine:** Lubrication by petrol system. Correct mixture $\frac{1}{2}$ -pint of oil to 1-gallon petrol, PREMIXED—ratio 16 to 1.
- (2) **Steering Head:** A few drops of oil down the slot on hinge point of folding steering column will lubricate the ball head races.
- (3) **Chain, Rear:** Keep chain clean, and lubricate with a little engine oil.
- (4) **Chain, Primary:** Fill the transmission case with engine oil after removing level plug. This plug is so arranged as to give the correct level of oil in transmission case when filled up to top of hole.
- (5) **Hubs:** A few drops of thin oil in the oil holes provided is all that is necessary.
- (6) **Brake Cam: Control Lever:** A small quantity of oil applied at this movable point will prevent seizing.
- (7) **Brake Rod Clevis:** A spot or two of oil occasionally.
- (8) **Brake Pedal:** Oil at movable joint occasionally.
- (9) **Control Wires: Clutch and Carburettor:** A few spots of oil inserted at the angle bar end of these controls will preserve them, and make the control work smoothly.

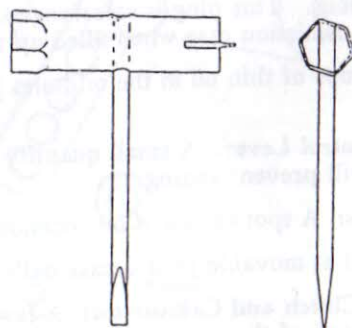
CONTROLS:

- (1) **THROTTLE** twist grip off side handle bar twist inwards to open.
- (2) **CLUTCH** lever near side handle bar press inwards to de-clutch.
- (3) **BRAKE** foot lever for right foot—press down.

SPECIAL TOOLS:



SPECIAL TOOL FOR
LOCKING RING ON
STEERING COLUMN



COMBINATION TOOL PROVIDED WITH
MACHINE

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