

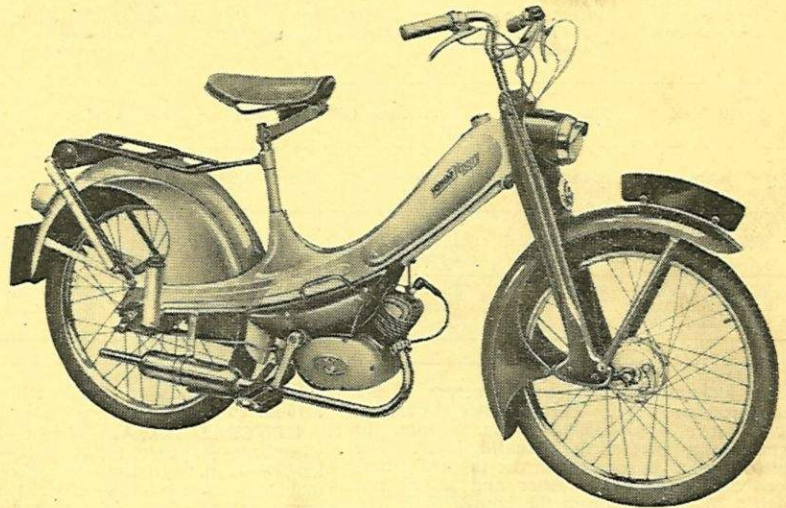
Motor Cycle & Cycle TRADER

TRADER AID SERIES

Servicing Data Sheet No. 24

NORMAN NIPPY DE LUXE MOPED

Manufacturer: Norman Cycles Ltd., Ashford, Kent.



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The Norman Nippy is a very good example of the ubiquitous moped. It has pleasing lines, a well-designed frame (incorporating a large-capacity petrol tank) and the power-unit is the well-known Sachs 50 engine-gear unit. The engine (which is of Continental design and manufacture) is noteworthy for its flexibility and mechanical reliability, and it combines with the British-made frame and components to make one of the most attractive machines of its class available today.

USEFUL DATA

ENGINE-GEAR UNIT

The Sachs 50 is an air-cooled, single-cylinder two-stroke engine built in unit with a two-speed handlebar controlled gearbox. On current models, the primary drive is by gears, and on earlier models it is by a pre-stretched endless chain. A 13-tooth sprocket (12-tooth on first 500 machines produced), fitted to the gearbox output shaft, drives the $\frac{1}{2}$ in. by $\frac{1}{8}$ in. final-drive chain. Engine starting is by pedal operation: Either (1) with machine on stand, neutral gear selected and clutch engaged; or (2) with machine off stand, first gear selected, clutch disengaged to begin with, but engaged as machine gains road speed. "Back pedalling" brings the rear brake-mechanism into action. The unit is attached to the cycle frame at three rubber-bushed pick-up points. **Note:** Engine rotation (viewed from magneto side) is anti-clockwise for gear primary drive models and clockwise for chain primary drive models.

PISTON/CYLINDER DATA

Bore—38 mm.; stroke—42 mm.; swept volume—47 c.c.; compression ratio—6 to 1; power output (short-term) 1.6 B.H.P. at 4,750 r.p.m., or (continuous rating) 1 B.H.P. at 4,000 r.p.m. The light-alloy piston carries two piston-rings (pegged). Piston-ring and end-gap—new .007 in.; maximum worn-gap .020 in.; ring dimensions—diameter (std.) 38 mm.; width 2 mm.; radial depth .063 in.; gudgeon-pin diameter—12 mm. Oversize pistons are available in sizes from 38.3 mm. to 39.2 mm. in stages of 0.3 mm. The cylinder

should be rebored when piston/cylinder clearance exceeds .007 in. **Note:** Pistons and cylinders, both standard and oversize, when supplied by the makers are "matched". Thus, a cylinder marked (in the induction port) with white has a "plus" tolerance and must be matched with a white-marked piston. The colour red indicates a "minus" tolerance. An arrow shows the front of the piston.

CRANKSHAFT DATA

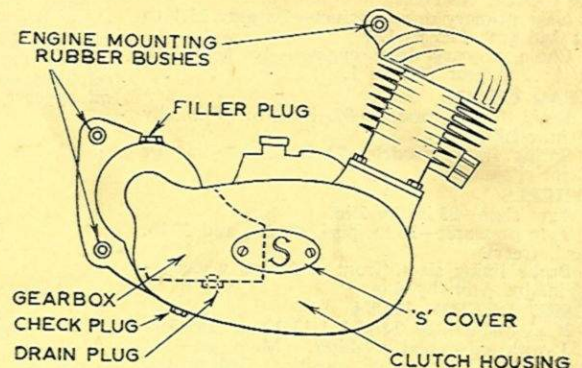
The crankshaft, which is supplied only as an assembly, runs on two deep-groove type E15 main bearings (15 mm. d by 35 mm. O.D. by

TRANSMISSION

On chain primary-drive models the ratio between crankshaft (9T sprocket) and countershaft (34T clutch sprocket) is 3.78 to 1. Shims are fitted (.015 mm., .3 mm., .8 mm., and 1.0 mm. are available) behind the crankshaft sprocket to adjust the chain line. The "lift" on the chain should be 5 mm. On gear primary-drive models, the ratio between crankshaft (16T gear) and countershaft (62T clutch gear) is 3.87 to 1. Shims are not fitted behind either gear.

The clutch-housing contains two Energit insert friction plates, one steel intermediate

FIG. 1—Engine-mounting parts, inspection covers, and oil-check and drain plugs.



8 mm. width). Crankcase compression is maintained by two synthetic rubber seals fitted outside the main bearings (with lips of seals facing inwards). Crankshaft end-float is adjusted (see Engine Repairs for method of adjustment) by shims (.1 mm., .15 mm., .8 mm., 1.0 mm. thicknesses available) until it is nil when crankcases are together without a gasket. The fitting of the .2 mm. thick crankcase gasket produces the correct clearance.

plate and one pressure plate which, with the help of six clutch springs and clutch-spring plate (secured by two locking plates) transmit the drive to the gearbox countershaft via the splined clutch-hub (secured to countershaft by RH nut [Metric 12 x 1] and lockwasher). The clutch-operating mechanism consists of: Actuating lever (operated by clutch cable), two equal-length thrust push-rods with a steel roller between them. An adjusting screw (Metric 6)

RECOMMENDED LUBRICANTS

	SHELL	ESSO	WAKEFIELD	BP	MOBIL
ENGINE Petrol/Oil Ratio 25 : 1 unless otherwise stated	Shell 2T Two Stroke Petroler Mix- ture or Shell T2 Two Stroke Oil	Esso Two Stroke Motor Oil (16 : 1) or Essolube 50	Castrol Two Stroke Oil (16 : 1) or Castrol XXL	Energol Two Stroke Petroler Mix- ture or Energol Two Stroke Oil	Mobilmix TT (16 : 1) or Mobiloil BB
GEAR BOX	Dentax 90	Esso Gear Oil 90	Castrol ST	Energol SAE 90	Mobilube C90
OIL CAN	Dentax 90	Essolube 50	Castrol XXL	Energol SAE 90	Mobiloil BB
REAR CHAIN	Retinax A	Esso Fluid Grease	Castrolase CL	Energolase L2	Mobilgrease MP
WHEEL HUBS and other Grease Lubricated Parts	Retinax A	Esso Multi- Purpose Grease H	Castrolase CL	Energolase L2	Mobilgrease MP

and a locknut are fitted to the centre of the clutch pressure-plate. This adjuster should be set to give approximately $\frac{3}{8}$ in. (8 mm. to 10 mm.) free play at the actuating-lever. The clutch housing is secured on the tapered outer-race bush by a lock washer and a LH nut (Metric 20.8 x 1). From the countershaft, the drive is transmitted to the gearbox-mainshaft (or output shaft) which runs on two uncaged roller bearing assemblies. The timing-side bearing assembly consists of 15 steel rollers (4 mm. by 8 mm.) running inside an outer ring with a thrust-washer on both sides. An oilseal is fitted to the outside of the assembly (with lip facing to inside of housing). The clutch side bearing assembly consists of 13 steel rollers (4 mm. by 6 mm.) running inside an outer ring with a thrust washer on both sides. A 13-tooth final drive sprocket and a 28-tooth rear-wheel sprocket are fitted.

GEARBOX RATIOS

Gear primary drive engines—1st gear 2.77 to 1; 2nd gear 1.61 to 1.

Chain primary drive engines—1st gear 2.78 to 1; 2nd gear 1.77 to 1.

OVERALL RATIOS

Gear primary drive engines—1st gear 23.1 to 1; 2nd gear 13.5 to 1.

Chain primary drive engines—1st gear 24.5 to 1; 2nd gear 15.6 to 1.

REAR CHAIN

Rigid frame models—92 links of $\frac{1}{2}$ in. by $\frac{3}{16}$ in. chain.

Spring frame models—94 links of $\frac{1}{2}$ in. by $\frac{3}{16}$ in. chain.

WHEELS

Tyre sizes—23 in. by 2 in.

Tyre pressures—25 lb. p.s.i. (front) and 37 lb. p.s.i. (rear).

Brake lining sizes (front and rear wheels)—3 $\frac{1}{2}$ in. by $\frac{1}{8}$ in. by $\frac{1}{4}$ in.

CARBURETTOR DATA

Bing carburettor Model 1/12/20 or 289-750/753 with oil-wetted air-filter. Main jet—56; needle jet—2.10; needle position—3rd groove from top; cable adjuster—Metric 5 thread.

FLYWHEEL MAGNETO

Clockwise magnetos are Bosch type LM/UR/1/115/17, R3, 17W. On anti-clockwise rotation the magneto is LM/UR/1/115/17, L15. LT output—6v 17w AC. See wiring diagram for bulb sizes.

Condenser type—B265-523, capacity .2 m/f. Insulation—infinity.

IGNITION TIMING. 0.078 in. to 0.098 in. before TDC.

CONTACT-BREAKER GAP approximately .011 in. to .015 in.

SPARK PLUG. KLG F70 (points gap .016 in. to .020 in.).

GENERAL DATA. Weight—104 lb. (dry); wheelbase—46 $\frac{1}{2}$ in.; total width—23 in.; total length—72 in.; ground clearance—4 $\frac{1}{2}$ in.; normal fuel consumption—180-200 m.p.g.; maximum speed—30 m.p.h.; cruising speed—20 m.p.h.; fuel-tank capacity—1 $\frac{1}{2}$ gallons.

Engine number is stamped on left-hand side of crankcase.

Frame number is stamped on the top of the seat tube just below the saddle.

RECOMMENDED LUBRICANTS

ENGINE. Lubricated by petrol mixture made up in the ratio of 25 parts petrol to 1 part SAE 50 engine oil (1 gallon petrol to $\frac{1}{2}$ pint oil). (See also lubrication chart).

Note: The petrol and oil should be thoroughly mixed in a clean container, before being poured into the tank.

GEARBOX AND CLUTCH HOUSING

Capacity— $\frac{1}{2}$ pint SAE 90 gear oil.

When the engine is running, the gear oil is constantly circulated between gearbox and clutch housing.

Every 2,000 miles (or every three months), check the oil level by removing the oil-check plug (see Fig. 1) on the right on the underside of the engine (to rear of clutch housing). If oil drips out, then the level is correct. If no oil appears, then the oil-filler plug (above the

plug hole. To allow air from the gearbox to escape, loosen S cover on RH side of engine. Replace check- and filler-plugs, run engine to distribute oil and then re-check level. Hypoid gear oils must **not** be used.

OTHER ROUTINE LUBRICATION

Weekly. Whether or not machine is in use, lubricate the control-lever pivots and the exposed control cable ends weekly, using an oil-can.

Every 250 miles. Apply small quantity of oil to the rear brake mechanism pivots.

Every 500 miles. Using oilcan, lubricate pedal end caps, pivot of centre stand and rear chain.

Give one stroke of grease gun to pivoting points of front fork links.

Every 2,000 miles. Check gearbox level (see above). Grease rear-suspension mechanism. (Every 10,000 miles inject SAE 30 oil into rear-suspension units to flush them out).

Once a year, remove rear chain, wash in paraffin, drain, then immerse in warm oil, drain and refit (with closed end of spring-link facing direction of travel).

The steering head races and wheel bearings are packed with grease on assembly and this will last between dismantlings (every two to three years).

ELECTRICAL SYSTEM

High tension current for ignition and low tension alternating current for lighting and electric horn are supplied by a Bosch flywheel magneto. This consists of a fixed armature plate (or stator) and a rotating magnetic flywheel (or rotor). The armature plate carries the ignition coil, contact-breaker, condenser and the lighting coil. The centre boss of the flywheel acts as the contact-breaker cam and it is tapered internally to mate with the crankshaft. It is located on the shaft by a woodruff key and secured by a collar nut and lockwasher. Three screws secure the armature plate to the crankcase and slots permit movement of the plate for setting the pole piece/armature core gaps (electrical timing).

MAINTENANCE OF IGNITION SYSTEM

RESETTING IGNITION TIMING (when re-fitting armature plate and flywheel) see Fig. 2. Ensure that mating tapers are clean and that woodruff key is in position in crankshaft. Fit armature-plate and secure with three screws. Locate the rubber grommet and block for the LT (yellow) cable, cut-out (black) cable and HT lead. Fit the flywheel onto shaft and secure with nut and washer. Check that c/b fully-open gap is .011 in. to .015 in. (0.3 mm. to 0.4 mm.). Set piston at TDC (using tool 277131) and check that O mark on flywheel

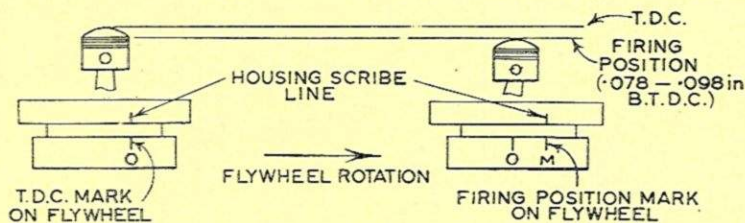


Fig. 2—Diagram showing relation between ignition-timing marks and piston positions.

pedal shaft) should be removed and gear oil added until it begins to run out at check-plug hole.

Once a year, the gearbox and clutch housing should be drained. Warm up engine, remove drain-plug from gearbox and check-plug from clutch housing. When gearbox oil has drained out, raise the front wheel of the machine until the check-plug is at its lowest position. This will drain clutch-housing. Replace oil-drain plug in gearbox, pour SAE 90 gear oil into filler-plug hole until it emerges from the check-

coincides with housing scribed line. Turn flywheel in opposite direction of rotation until the piston is 2 mm. to 2.5 mm. (.078 in. to .098 in.) BTDC whereupon the flywheel M mark should coincide with the housing scribed mark and the c/b points should be just breaking. At this piston position, the gap between the trailing edges of the flywheel pole pieces and the edges of the ignition coil shoes should be 8 mm. to 12 mm. (.315 in. to .472 in.). If not, adjust by rotating the armature base-plate and then re-check c/b gap.

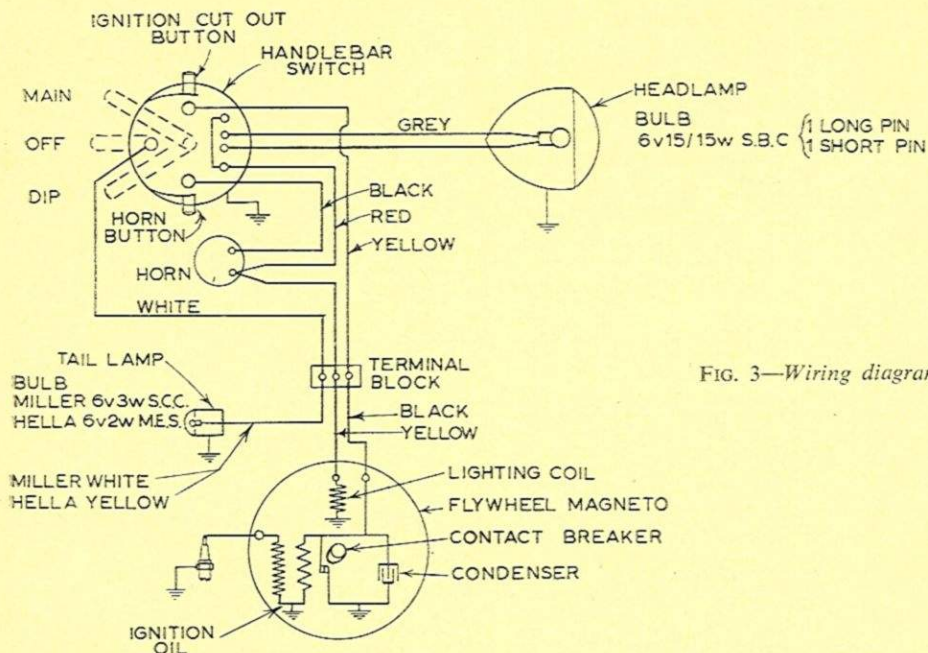


FIG. 3—Wiring diagram.

PERIODIC MAINTENANCE

(1) After first 500 miles, check c/b gap and, subsequently, every 3,000 miles check c/b points for cleanliness and correct gap. **Note:** The contact-breaker gap and the ignition-timing are correct if, when turning engine in normal direction of rotation (see engine gear-unit Useful Data), the contact points are just breaking when the flywheel M mark is opposite the line scribed on the housing. The piston is then at the ignition position (2 mm. to 2.5 mm. or .078 in. to .098 in. BTDC). If, however, the mark M has not reached the housing mark, then reduce the c/b gap; if it has passed the housing mark, then increase the gap.

(2) After first 500 miles and, subsequently, every 1,000 miles, check, and if necessary, clean spark plug and reset points gap to .016 in. to .020 in.

(3) Every 3,000 miles work a little bearing grease into the cam lubricating pad.

MAINTENANCE OF LIGHTING SYSTEM

TESTING GENERATOR AC LT OUTPUT. Disconnect yellow (output) lead from generator. Connect an AC moving coil voltmeter (with a 1 o.h.m. load) across yellow lead and earth. At 2,000 r.p.m. the output should be at least 3 volts.

FAULTS. Burning out or blowing of bulbs is usually due to:

(1) Use of incorrect wattage bulbs (bulb load should not be less than generator output).

(2) Faulty dipswitch operation (any pause in the operation of the dipswitch during which neither main nor dip filaments of the headlamp bulb are burning will cause the rear bulb to burn out).

(3) Faulty connections in wiring system. Poor lights can be caused by use of bulbs of too high a wattage.

Check all cable terminals and connections for security. Ensure all wiring to be secure from chafing and adequately supported.

ROUTINE ADJUSTMENTS AND MAINTENANCE

CLUTCH CONTROL. Disconnect cable from clutch actuating-lever at gearbox and check that end of lever can be moved through $\frac{1}{2}$ in. of free travel before commencing to lift clutch. If this free travel is not present, then remove S cover on RH side of engine and

re-set adjuster (secured by locknut) in centre of clutch pressure-plate. Reconnect cable and set free movement at handlebar control lever to $\frac{3}{64}$ in. to $\frac{3}{32}$ in. (with engine cold), by use of cable adjuster. As the clutch-plates wear, and the cable free play decreases, restore it by screwing the cable adjuster inwards. When the adjuster is fully screwed in, re-set the actuating lever free travel by means of the adjuster in the clutch pressure-plate (after removal of the S plate and slackening locknut). Re-set the handlebar control free movement.

GEAR CONTROL. If the gear control cable has been dismantled, screw the locknut fully onto the cable adjuster (on RH side of gearbox) and the adjuster, in turn, as far as possible into the housing lug. The spring, incorporated in the gear-selector mechanism, will automatically rotate the gear actuating lever into the 2nd gear position. Turn the handlebar twist-grip to the 2nd gear position, and hook the free end of the control cable into the actuating lever. Set the cable adjuster until a small amount of end clearance is felt in the cable-sheath. Select neutral gear and with clutch lever lifted, find the mid-position between 1st and 2nd gears by turning the twist-grip. Re-set cable adjuster until this mid-position corresponds with the neutral position, notch in the handlebar control. Cable adjustment must always be done with cable routed in working position.

WHEEL HUBS. Bearings should be adjusted so that barely perceptible spindle end-float is present (with wheel out of machine). When wheel is fitted, and spindle nuts tightened, this end-float should disappear, but a trace of side motion at the rim should remain. If, however, this play disappears completely on tightening the spindle nuts, check that the fork ends are true and parallel.

When the angle between the brake actuating-arm and the operating rod (or cable) is greater than 90 degrees (when brake is applied), then brake shoes require re-lining.

CARBURETTOR

(1) Air-filter. Every 500 miles remove filter, wash in petrol, dry and then wet with engine-oil before refitting. **Note:** On latest engines, air-filter is readily detachable without removing carburettor complete.

(2) The main jet may be removed for

cleaning without dismantling or removing the carburettor. Use air-blast to clean and do not over-tighten when refitting.

(3) Periodically, the carburettor should be removed and dismantled for cleaning. Sediment and water usually collects in the float chamber and in the mixing-chamber plug. Do not oil the slide on re-assembly. Occasionally, remove the petrol-tap from the tank and clean the gauze-filter.

DECARBONISING is usually necessary every 2,000 miles, and the main deposits will be found in the cylinder-head, transfer and exhaust-ports, exhaust-pipe and silencer and on top of the piston. The need for decarbonising is shown by lack of power, usually accompanied by a muffled exhaust note, rough running, overheating and poor m.p.g. Remove carbon from cylinder-head and cylinder-ports by scraping with soft metal-scraper, from piston crown by wire brush (removing only the burnt brown flakes) and, in the case of the silencer and exhaust-pipe only, by means of immersion in hot caustic-soda solution. **Note:** When cleaning out the cylinder exhaust-ports, position the piston at bottom dead-centre.

REMOVING ENGINE UNIT FROM FRAME

Remove engine-shields from left and right side. Close fuel-tap and remove fuel-pipe from carburettor. Unscrew mixing-chamber knurled-ring, withdraw cable and slide assembly. Engage 2nd gear, disconnect gear-cable and adjuster from gear-lever and crankcase lug. Disconnect clutch-cable and adjuster from engine clutch-lever and crankcase-lug. Remove cable clips from cylinder-head mounting-bolt, tie all cables to frame. Unscrew exhaust ring-nut from cylinder, remove silencer bracket-bolt and remove exhaust assembly. Disconnect rear brake-rod at engine brake-lever. Remove both pedals and cranks. Undo lighting and cut-out cables at screwed connectors. Disconnect rear chain at joining link and remove from final drive sprocket. Remove one engine mounting-bolt at cylinder-head and two bolts at crankcase rear and remove engine unit from machine. Wash unit and drain-off gearbox oil.

ENGINE REPAIRS

DISMANTLING

Fit engine-unit into assembly stand 276680 with two bolts through rear crankcase mounting holes. Remove carburettor and gasket. Unscrew two screws and remove magneto casing. Place supporting-bracket and support bolt in rear position, with chain over sprocket from right to left. Unscrew sprocket-nut, remove spring-washer. Remove chain from sprocket. Place adaptor 277700 over mainshaft, and using puller 277765, remove sprocket. Remove woodruff key. Fit supporting-bracket and support bolt in front position engaged in magneto flywheel slot to prevent rotation of flywheel, unscrew flywheel centre-nut and remove spring-washer. Re-set supporting-bracket in flywheel slot; to prevent clockwise rotation of flywheel, fit adaptor 277700 over crankshaft end and using extractor 277755, remove flywheel. Ease cable grommets from crankcase slots, remove three fixing screws and washers holding stator-plate, withdraw stator-plate assembly and place inside flywheel. Lever woodruff key from crankshaft. Unscrew four securing studs on cylinder-head, lift out washers and remove cylinder-head. Remove four cylinder base-nuts and washers, lift cylinder straight up off piston without turning cylinder. Remove gasket from crankcase opening. Remove both gudgeon-pin circlips. Using gudgeon-pin adaptor 277830 and remover 276651, press out gudgeon-pin from piston. From right-side pedal-shaft remove circlip, thrust-washer and shims, unlock tab-washer, unscrew nut (left-hand thread), remove brake-lever, thrust-washer and shims. Fit holder 276140 on connecting-rod. Unscrew five fixing screws and remove clutch-casing and gasket. Slacken lock-nut and remove adjuster in clutch-centre. Using clutch-compressor

276570 screwed into pressure-plate, compress springs sufficiently to allow removal of two locking-plates. Lift out clutch-spring plate-assembly. Ease compressing-nut on tool-centre until springs are free. Remove plain and insert clutch-plates and clutch push-rod (three pieces). Fit clutch retaining-plate over clutch-hub and into clutch-housing. Unlock tab-washer and unscrew hub nut. With extractor 676111 remove clutch-hub. Remove retaining-plate 292220 and woodruff key on shaft. Unlock tab-washer and unscrew nut on outer bearing bush (left-hand thread). Remove crankshaft sprocket nut and washer. Fit protector 276460 over countershaft, grip clutch-housing firmly and — tapping protector — withdraw clutch-housing, chain and crankshaft sprocket. Check number of shims on crankshaft and remove together with woodruff key (chain primary-drive engines). **Note:** On engines fitted with gear primary-drive, either the clutch or crankshaft gear can be removed individually. Remove connecting-rod holder. Remove 11 crankcase holding screws from magneto side of crankcase. Remove crankcase from assembly stand and refit to stand by two screws into clutch side of crankcase front. Position assembly stand with magneto side of crankcase upwards. Tap mainshaft, crankshaft and bracket-shaft lightly with hide mallet and ease crankcase halves apart. Remove crankshaft. Lift out assembly of bracket-shaft with sprocket, carrier with brake-spring and carrier-bush, mainshaft with 1st gear and chain. Check number of shims under carrier-bush. Remove selector fork spring, selector disc, two selector fork shoes, 2nd gear pinion and thrust-washer. Remove counter-shaft, star washer for ball-bearing bush, ball-bearing bush and sleeve. Unscrew gear actuating lever fixing bolt and oil-drain screw, remove lever, washers and dust excluder. Remove clutch side crankcase from stand. Wash all parts, examine each component for wear.

ATTENTION TO ENGINE SUB-ASSEMBLIES

- (1) **Crankcases.**
 - (a) **Both housing sections**—before heating housings to 70 degrees C. for removal and refitting of bearing outer races, etc., remove the engine mounting rubber bushes.
Crankshaft bearings—fit rubber seals to housings (lip inwards) and press in outer races of main bearings. **Note:** The housings are electron die-castings and cannot be welded.
 - (b) **Magneto side housing.**
Gearbox mainshaft bearing—fit oil-seal (lip inwards)—thrust-washer—roller bearing outer race—pack race with grease and fit 15 rollers 4 mm. by 8 mm.—cover with thrust-washer.
Counter-shaft bearing—the bronze bush is pressed into housing. Combined expanding/withdrawing tool 277140 extracts bush. Ensure, when fitting, that lubricating groove in new bush is in line with hole in housing and that 4 mm. hole is drilled into bush. Use tool 277660 to ream bush to size (remove outer race for clutch ball-bearing bush from clutch side housing to seat reamer guide piece).
Bracket bearing—consists of oil-seal and bronze bush.
Clutch actuating lever—fit rubber seal into adaptor, position on lever (lip towards housing), locate lever by 3 mm. by 18 mm. grooved pin.
Engine mounting rubber bushes—insert two mountings (collar of steel bush to outside).
- (c) **Clutch side housing.**
Gearbox mainshaft bearing—fit thrust-washer—roller-bearing outer race—pack race with grease and fit 13 rollers, 4 mm. by 6 mm.—cover with thrust-washer.

Countershaft bearing—insert outer race for E15 bearing.

Gearshift lever—fit rubber seal into adaptor and position on lever (lip towards housing).

Engine mounting rubber bushes—insert two mountings and two retaining washers.

(2) Crankshaft assembly.

- (a) **Small end**—if worn remove (tool 277080), press in new bush and ream to suit gudgeon-pin.

Crankshaft main bearings—to remove, first take off ball retainers and extract inner races with tool 277735 and protector 277720.

Crankshaft end-float—measure the distance from the centre face of each housing section to the inner face of each of the respective main bearings (fitted into housing sections). Add the two measurements together and subtract the width of the crankshaft assembly. This will give the measurement to be made up by fitting shims (equally both sides) between main-bearing inner races and crank-webs. This would give no end-float but fitting of the crankcase joint gasket gives the correct clearance.

Fitting mainbearing to crankshaft—immerse bearings in hot oil (70 degrees C.), press onto crankshaft (distance-plate 276191 fitted between webs).

- (3) **Gearbox mainshaft large gear**—remove circlip by use of spreader tool 277880 and lift off gear. Fit new gear onto shaft, slide circlip into position using assembly adaptor 277870 and extension tube 277890.

- (4) **Piston and cylinder**—(see Piston/Cylinder Data).

ASSEMBLING

Re-assemble unit in the following sequence. Mount clutch side crankcase with two screws in assembly stand. Fit gear-actuating lever, seal and washer assembly and gear-shift fork, securing with fixing bolt, oil-drain screw and washer. Fit outer bearing, bush, star-washer and countershaft. Fit thrust-washer and 2nd gear pinion (23 teeth) using guide bolt 676225. With longer ends towards countershaft locate fork shoes and engage in groove of selector disc. Fit spring with anchor pin in crankcase and screw in selector fork. Fit mainshaft with 1st gear pinion (25 teeth), driver sleeve with 1 mm. shim and oil-seal outer, driver with axle-shaft oil-seal and thrust-washer, engaging driver brake spring in recess in crankcase, then axle-shaft and sprocket without chain. Using straight-edge, check alignment of sprockets, fit shims under axle-shaft sprocket to correct alignment. Next, fit thrust-washer and circlip to axle-shaft, using shims to take up end-float of sprocket, allowing .1 mm. to .2 mm. free movement. Remove shafts, fit chain and refit shafts. Place one shim each on mainshaft and countershaft, fit crankcase gasket and temporarily fit magneto-side crankcase. Using measuring-plate 277260 check end-float of shafts, mainshaft should have .1 mm. to .2 mm. and countershaft .05 mm. to .1 mm. end-float. Remove magneto-side crankcase and fit extra shims to obtain these clearances. Fit crankshaft (drive side) into crankcase using extension tube 277780. See Engine sub-assemblies for crankshaft end-clearance. Fit magneto-side crankcase and gasket, using extension tube 277770 over crankshaft (magneto-side). Tighten 11 fixing screws. Refit crankcases in assembly stand using two rear mounting-bolt holes. Clean clutch ball-bearing taper, fit clutch-housing and crankshaft sprocket (without key), check sprocket alignment with straight-edge and fit shims under crankshaft sprocket as required. Remove clutch-housing and sprocket, fit connecting-rod holder. Fit crankshaft key. Fit clutch-housing, crankshaft sprocket and chain securing with respective nuts and lockwasher (clutch-housing nut LH

thread). Fit key into countershaft, fit clutch hub with nut and lockwasher using retaining-plate 292220. Fit clutch thrust-pins into countershaft (lubricating centre roller). Assemble clutch-plates into housing (insert plate first), compress spring assembly in tool 276570, fit assembly securing with two locking-plates, release tool and remove from clutch. Re-check security of locking-plates. Fit clutch adjuster-screw and locknut so that 8 mm. to 10 mm. free movement exists at actuating lever. Remove connecting-rod holder, fit clutch-cover, ensuring that gasket and carrier-sleeve oil-seal are in place and tighten five securing screws. Fit shims behind splined distance-washer on driver-sleeve, allowing 1 mm. to 2 mm. end-float when brake-lever, lockwasher and nut are fitted. Shims must fit inwards of splined and recessed section of sleeve. Secure lockwasher and nut (LH thread). Fit shims, thrust-washer and circlip on axle-shaft, selecting shims to allow 1 mm. to 2 mm. axle-shaft end-float. Heat piston and fix to connecting-rod (arrow to front of piston), ensuring circlips are secure. Use tools 276651 and 277830 if gudgeon-pin is difficult to locate. Fit base-gasket, lightly oil and fit cylinder to piston without turning. Tighten four fixing nuts and washers. Fit cylinder-head, aligning mounting lug with crankcase mounting lugs before drawing securing studs down tightly. Fit magneto-side crankcase key, fit magneto and set ignition timing as in Ignition System. Fit final drive sprocket using support bracket to prevent sprocket rotation, fit spring-washer and tighten nut. Fit magneto cover with two screws. Refit carburettor. Replenish gearbox oil-level (see Lubrication). Check security of cover screws. Remove unit from stand.

REPAIR TOOLS

- | | |
|--------|--|
| 276140 | Connecting-rod holder. |
| 276191 | Distance-plate. |
| 276460 | Mainshaft-protector. |
| 276570 | Clutch-compressor. |
| 276651 | Gudgeon-pin remover. |
| 276830 | Gudgeon-pin adaptor. |
| 277700 | Fibre insert adaptor for magneto-side of crankshaft and mainshaft. |
| 277720 | Adaptor for drive-side of crankshaft. |
| 277735 | Ball-bearing extractor. |
| 277755 | Magneto flywheel-extractor. |
| 277765 | Sprocket puller. |
| 277770 | Magneto-side crankshaft extension tube. |
| 277780 | Drive-side crankshaft extension tube. |
| 277866 | Retaining nut wrench. |
| 292220 | Clutch retaining-plate. |
| 676111 | Clutch hub-extractor |
| 676225 | Guide bolt. |

SPECIAL SERVICE TOOLS

- | | |
|--------|---|
| 277000 | Magneto centring-plate. |
| 241170 | Magneto centring-plate screw. |
| 277080 | Connecting-rod bush remover and replacer. |
| 277131 | Ignition timing gauge. |
| 277140 | Countershaft bush-extractor. |
| 277260 | End-float tool for mainshaft and countershaft. |
| 277660 | Countershaft bush-reaming tool. |
| 277800 | Magneto centring-ring. |
| 277820 | Magneto spacer. |
| 277870 | Mainshaft assembling adaptor. |
| 277880 | Mainshaft assembling spreader. |
| 277890 | Mainshaft assembling extension tube. |
| 276680 | Assembly stand with mounting-plate 277840 and supporting-bolt 277855. |

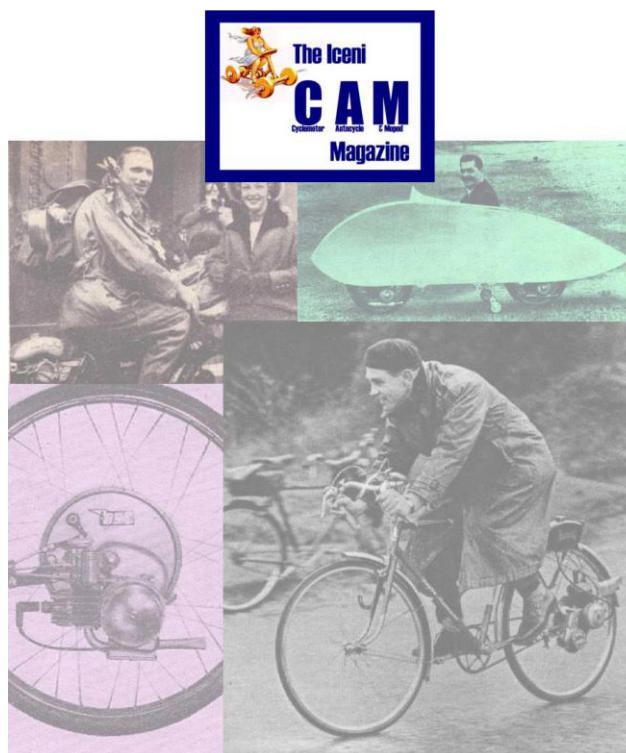
The next servicing data sheet in this series will deal with the

MILLER AC4 GENERATOR

and will be included in the issue dated
NOVEMBER 15, 1958

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