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TRADER AID SERIES

Servicing Data Sheet No. 28

NORMAN MOPEDS (MARK II NIPPY & EARLY LIDO) FITTED WITH VILLIERS MARK 3K ENGINE

Manufacturer: Norman Cycles Ltd. Ashford, Kent.

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Norman mopeds have long had an enviable reputation for mechanical reliability allied to good styling. Their specification has progressively improved, and today they represent outstanding value for money. Both Sachs and Villiers engines have been fitted in the past—this data sheet deals with the Villiers-engined models.

USEFUL DATA

ENGINE GEAR UNIT

The Villiers Mark 3K is an air-cooled, single-cylinder two-stroke engine built in unit with a two-speed gearbox. The cast-iron cylinder has an integral frame mounting lug, and both the detachable cylinder-head and the flat-topped piston are made of aluminium alloy. Crankshaft rotation is clockwise, viewed from the magneto side and engine power is transmitted to the gearbox by a crankshaft-mounted clutch and a pre-stretched endless chain, both running in an oilbath. The engine sprocket is attached to the inner side of the clutch-cage and the large (or driven) chainwheel is splined onto the gear-cluster and is secured by a locknut and lock screw. The gearbox countershaft high- and low-speed gear wheels, which are in constant mesh with the driving-gear cluster, are free to rotate on the countershaft, and gear engagement is effected by a sliding hub (or dog) which turns with the countershaft and which engages with either the low- or high-speed gear as dictated by the handlebar controlled gear-selector. The final drive sprocket is located on the tapered end of the countershaft by a woodruff key and is secured thereon by a locknut and lock tab-washer; engine starting is by pedal operation, with neutral gear selected. Depressing either pedal rotates the pedal-shaft, and the starting effort is transmitted through the pedal-shaft ratchet-sleeve, the pedal-shaft sprocket and chain, the countershaft sprocket (attached to the low-gear wheel) and thence to the engine crankshaft by the main gear cluster and primary drive. The moped may be pedalled, with a dead engine, by disengaging clutch and selecting either low or high gear. Drive to the rear wheel is via the motor drive rear chain. "Back pedalling" brings the rod-operated rear brake into action by means of a ratchet operating lever mounted on the RH side of the pedal-shaft (maximum rear brake-rod horizontal movement is 1 in.). Engine lubrication is by petroil mixture.

Piston/cylinder. Bore — 40 mm.; stroke — 39.7 mm.; swept volume—50 c.c.; compression ratio — 7 to 1; power output — 2 b.h.p. at 5,500 r.p.m. The aluminium alloy piston carries two pegged rings measuring 40 mm. diameter by 3/32 in. width. Normal ring end-gap is .006 in. Oversize pistons are available in .015 in. and .030 in. oversize diameters. The cylinder requires reboring when the piston/cylinder clearance exceeds .007 in.

Crankshaft. The small end of the connecting rod is fitted with a phosphor-bronze bush and the big-end runs on a double row of 3/16 in. by 3/16 in. steel rollers (24 in all). The gudgeon-pin diameter is .4257 in.

Note. Separation and re-assembly of the crankshaft assembly is a specialized factory operation and should not be attempted in the normal workshop. In any case, if the original left- and right-hand drive shafts are used in the re-building of a dismantled assembly, then a .001 in. o/s diameter crank-pin (and a con-rod with a .001 in. o/s diameter big-end eye) must be used. A standard-size crankpin and con-rod must be used only with new left- and right-hand drive shafts.

The crankshaft runs on two ball-journal bearings (17 mm. by 40 mm. by 12 mm.), and crankcase compression is maintained by oilseals fitted in the left- and right-hand crankcases outboard of the bearings.

TRANSMISSION

The crankshaft-mounted clutch has two friction plates and runs in oil. Six springs are fitted. (See Control Adjustments for setting of clutch-unit adjustment).

Sprocket sizes. Engine—12T; primary chain-wheel 38T; final drive—12T; rear wheel 32T.

Chains. Primary—44 pitches of .375 in. by .225 in. wide. Pedal—26 pitches of .375 in. by .225 in. wide. Rear—99 links of ½ in. by 3/16 in. (Lido); 94 links of ½ in. by 3/16 in. (Nippy).

Bearings. Pedal-shaft ball-bearing—25 mm. by 52 mm. by 9 mm. Countershaft roller-bearing—12 rollers 3/16 in. by 3/16 in.

Primary-drive reduction. 3.16 to 1.

Gearbox reduction. Low gear 3.06 to 1, high—1.71 to 1.

Total reduction. Low gear 25.1 to 1, high—14.4 to 1.

Wheels. Tyre sizes—front and rear—23 in. by 2.25 in. (Lido). Tyre sizes—front and rear —23 in. by 2 in. (Nippy). Tyre pressures—23 lb. p.s.i. front; 34 lb. p.s.i. rear (Lido). Tyre pressures—25 lb. p.s.i. front; 37 lb. p.s.i. rear (Nippy).

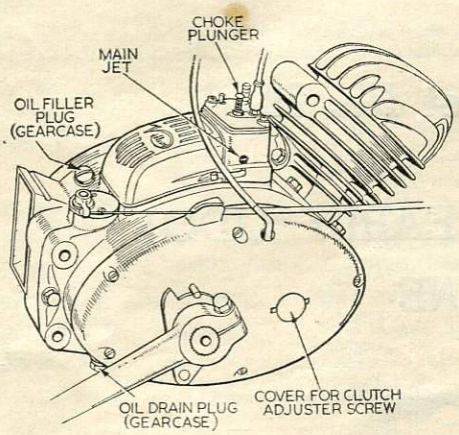


FIG. 1.—*Power-unit engine details, showing gearcase oil-drain plug.*

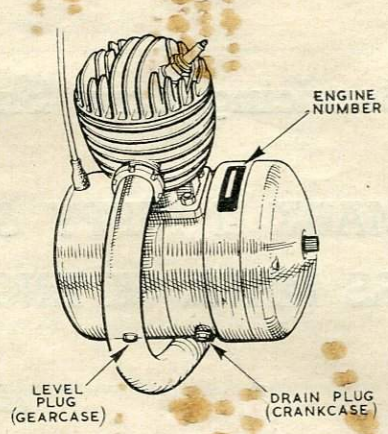


FIG. 2.—*Front view of the power unit, showing crankcase drain-plug.*

CARBURETTOR

Villiers type SM10, with oil-wetted air cleaner and self-cancelling shutter-choke.

Throttle needle, taper—No. 7A (with five grooves for mixture strength adjustment); throttle valve—No. 3. Gauze filters fitted in fuel-inlet union to carburettor and on petrol tap in tank.

FLYWHEEL MAGNETO

Villiers four-pole type. LT lighting output (AC)—6 volt 18 watts.

Ignition timing. 3/32 in., BTDC.

Contact-breaker points gap. .012 in. to .015 in.

Magneto flywheel. Four magnets. Magnetic strength seven (measured by Crypton fluxmeter).

Spark-plug. Lodge DN, 14 mm., ½ in. reach.

Spark-plug gap. .018 in. to .022 in.

Bulb sizes. 6v 15w/15w head; 6v 3w rear.

GENERAL

Weight—(Lido) 121 lb., (Nippy) 104 lb.; wheelbase—46 in.; width—25 in.; length 72 in.; fuel consumption—120 to 180 m.p.g.; fuel-tank capacity (Lido) 1⅛ gallon, (Nippy) 1¼ gallon; speed—30 m.p.h. (maximum); 20 m.p.h. (cruising).

ENGINE NO.

Stamped on plate riveted to top of LH crankcase.

FRAME NO.

Stamped on frame below saddle.

SERVICE TOOLS

Part No.	
ST2285D	Sprocket extractor.
ST2289D	Clutch nut and exhaust nut spanner.
ST2290D	Flywheel extractor.
ST2291D	Piston heating tool.
ST2301D	Clutch hub extractor.
ST2302D	Connecting rod clamp.
ST2312D	Oilseal insertion tool.
ST2313D	Oilseal insertion tool.

VILLIERS SERVICE EXCHANGE SCHEME

To help in the speedy and economical servicing of the Mark 3K unit, the following units are available for service exchange from the machine manufacturers (or their official agents) or from Villiers service department:

Engine complete; magneto complete; carburettor (less air-filter); crankshaft assembly; rebored cylinder complete with piston, rings and gudgeon-pin (the old cylinder must be suitable for reboring up to Villiers maximum oversize of .030 in.).

LUBRICATION

(See also lubrication chart)

Engine lubricated by petroil mixture made up in the ratio of 24 parts petrol to 1 part oil (or 1 gallon petrol to ½-pint oil) where a straight oil is used, or 20 parts of petrol to 1 part of self-mixing oil (see chart). If a straight oil is used, mix oil and petrol in clean container and shake well before pouring into tank. If self-mixing oil is used, turn off petrol tap, pour in self-mixing oil and then add petrol.

Gearbox. Every 500 miles, remove gearcase level-plug and filler-plug (see Figs. 1 and 2). Pour in SAE 30 engine oil until it runs out level plug hole with machine on level ground. Refit plugs, ensuring that filler plug vent is clear. Every 1,000 miles remove gearcase drain-plug (see Fig. 2) and filler-plug when engine is warm, and allow oil to drain out completely (about 15 minutes). Replace drain-plug. Remove level-plug and refill to correct level. Replace plugs.

Other routine lubrication

Weekly using SAE 30 oil in oil can, lubricate control cable ends and pivots, brake mechanism pivots, centre stand pivots, pedals and rear chain.

Every 1,000 miles apply grease gun to front fork link lubricators.

Every 2,000 miles apply grease gun to rear suspension (plunger type frames only).

Every 3,000 miles lubricate control cables thoroughly, either by use of special force-feed oil-gun, or by removing cables from machine, cleaning and immersing in warm oil.

Remove rear chain, clean and immerse in warm oil. Drain off surplus oil and refit chain to machine with closed end of spring-link facing direction of travel. Wash carburettor air-cleaner in petrol. Dry, then dip in SAE 30 oil. Drain and refit. Flush out front-fork link-bushes (and rear suspension slider-bearings, on plunger frame models) by use of oil-gun. Re-grease with light grease.

Every 8,000 to 10,000 miles re-pack steering head races and wheel hubs with Castrolease CL or equivalent.

The lubricating pad for the magneto contact-breaker cam should be lubricated by working a small quantity of grease (or heavy oil) into the pad whenever flywheel is removed or at 3,000 mile intervals.

ELECTRICAL SYSTEM

High-tension current for ignition, and low-tension alternating current for lighting and horn, is supplied by a Villiers flywheel magneto. The stator (or armature plate) carries the ignition coil, the lighting coil, the contact-breaker, the condenser and the cam-lubricating pad. Two screws and one stud and nut secure the armature plate to the crankcase, and the plate is slotted to allow alteration of the ignition timing. The rotor (or magnetic flywheel) has four magnets, the centre boss acts as the contact-breaker cam, and it is tapered internally to mate with the tapered end of the left-hand drive-shaft. The flywheel is located on the shaft by a woodruff key and secured by a collar-nut.

Resetting contact-breaker gap. Remove LH pedal-crank and LH engine cover. Rotate engine until contact-breaker points are fully open (seen through one of the flywheel apertures). If necessary, clean points by wiping with petrol-dampened clean rag. Slacken points bracket fixing-screw and adjust gap to .012 in. to .015 in. by turning the points-gap adjusting-screw (anti-clockwise to decrease gap; or clockwise to increase gap). Re-tighten bracket fixing-screw and re-check gap.

Re-timing ignition. Check and, if necessary, re-set contact-breaker gap as above. Remove spark-plug. Rotate engine in clockwise (facing magneto) direction until piston is 3/32 in. before top-dead centre. The contact-breaker points should be just breaking. If not, then slacken armature-plate securing screws (2) and nut (1). Move armature plate (by use of slots) either clockwise or anti-clockwise until points are just breaking, then re-tighten screws and nut. **Note** clockwise movement of armature plate retards timing and anti-clockwise movement advances timing. Refit engine cover and pedal-crank.

Periodic servicing of ignition system

(1) Every 500 miles remove spark-plug, clean on sand blast, reset gap and refit to engine.

(2) After first 500 miles, and subsequently every 2,000 miles, check contact-breaker points for cleanliness and adjustment. Adjust if necessary (see above). Light pitting or burning of the points can be removed by the use of fine abrasive wet or dry paper. Deeper pitting may require the points to be re-surfaced on an abrasive stone, or replacement with a new breaker-assembly may be required.

(3) Every 3,000 miles (or on removal of flywheel) work a small quantity of grease into the cam lubricating felt pad.

Servicing of lighting system

To check low-tension AC output from generator, disconnect LT output cable (yellow) at snap connector. Connect a moving-coil AC voltmeter (with 1 ohm. load) across yellow lead from generator and machine earth. At 2,000 r.p.m., the voltmeter reading should be at least 3 volts. If a voltmeter is not available, the output may be checked by use of a 6v 18w bulb (or 6v 15w plus 6v 3w bulbs, connected in parallel) with two leads connected to yellow output cable and machine earth. Bulb should light brightly at 2,000 r.p.m.

Burning out of bulbs can be caused by:

(1) use of bulbs of too low a wattage (see data).

(2) faulty dipswitch operation or faulty contacts in bulb-holder.

Note: Use of bulbs of too high a wattage will give poor lights.

Maintain all cables and connections in a secure and tidy condition.

CARBURETTOR

The carburettor, type SM10, is operated by a twistgrip throttle control through a Bowden cable. Fuel is fed through a plastic fuel-pipe from the fuel-tank and is filtered at the fuel-tap and at the carburettor fuel inlet-union. Fuel supply into the float chamber is controlled by a spherical float operating on a cut-off needle unit situated in the carburettor cover. The shutter-type choke which, when the ex-

ternal operating spindle is depressed, gives a rich mixture for starting is returned to the normal running position by the opening of the throttle slide. On later models, a tickler is fitted which, when depressed, raises the fuel level and floods the carburettor. The main jet, screwed into the right side of the carburettor, is easily removed for cleaning without the necessity of removing the carburettor from the engine. Fuel is metered through the main jet to the taper-needle jet and into the mixing chamber. The throttle needle is secured by a spring clip, fitted to one of its five grooves, to the throttle slide. The spring clip is cranked so that a fine adjustment of the throttle needle may be obtained by inverting the clip in its groove. An oil-wetted filter and induction-silencer, fitted to the carburettor body by two spring clips, cleans the air entering the induction tract and float-chamber vent. Slow running is set by screwing out the throttle cable adjuster to the required position when the engine is warm. No maintenance, other than dismantling periodically for cleaning, is required. Should the carburettor be removed, care should be taken when it is refitted, to position the heat-insulation washers correctly and to ensure that over-tightening of the securing nuts does not take place.

CONTROL ADJUSTMENTS

Clutch unit adjustment

With neutral gear selected, slacken off the clutch cable by screwing adjuster in cable inwards. After removal of rubber plug in RH cover, turn the clutch-unit adjuster screw clockwise until the clutch just begins to slip. Take up cable slack completely by means of the cable adjuster, then turn the clutch-unit adjuster screw ¼ to ½ turn anti-clockwise. Replace the rubber plug, then reset cable adjuster to give 1/16 in. to 3/16 in. free movement in the cable at handlebar control lever.

Clutch cable

The correct amount of free movement (1/16 in. to 3/16 in.) must always be present at the clutch-lever on handlebar. This free play is obtained by adjusting the cable adjuster. However, it is essential that the clutch unit adjustment is also set correctly.

Gear change cable

When top gear is engaged, the cable should have a small amount of free movement. The adjuster is situated at the handlebar end of the cable.

Carburettor cable

Set the adjuster in the carburettor top-cover so that the engine ticks-over when the twistgrip is closed.

Brake controls

Adjust front-brake cable so that the cable adjuster is as tight as possible, consistent with the wheel spinning freely without the brake-linings touching the drum. The rear brake requires no adjustment, but it should be relined when its efficiency is impaired by excessive movement of the pedals or operating arm being necessary.

REPAIRS TO ENGINE (IN FRAME)

Removal and refitting of magneto

Remove left-hand pedal and crank. Remove left-side engine cover screws (3), and remove engine cover. Grip magneto flywheel with strap wrench and remove locknut. Using tool ST2290, remove flywheel, placing it on clean wooden bench or sheet of paper, open side downwards. Remove HT lead from spark-plug and separate LT and cut-out cables at snap connectors. Remove cable-clip screw (on some engines this screw has a locking nut within carburettor recess). To facilitate assembly work (if ignition timing is correctly set), scribe a line across armature-plate edge and crankcase to mark location of armature plate. Remove two screws and nut, and withdraw armature plate, easing cable grommet from its recess. See Electrical System for repairs to magneto. To refit magneto, place armature plate—with scribe marks aligned—on crankcase, and fit two screws and nut, easing cable grommet into its recess. Tighten screws and nut. Wipe flywheel pole-pieces, drive-shaft taper, and cam boss, clean; check security of key in drive-shaft; and fit flywheel, after lubricating felt pad Use strap wrench to hold flywheel while nut is tightened. (Torque 320 lb. inches). Fit left-side engine cover using jointing compound on joint faces and ensuring that O rings on pedal-shaft bush and shaft housing are correctly located. Tighten three fixing screws and fit pedal and crank. Fit HT lead to spark-plug and re-connect lighting and cut-out cables.

Decarbonizing

To maintain top performance, this operation is recommended every 1,500 miles, although it may not be necessary until 3,000 miles have been run.

Unscrew exhaust pipe ring-nut (tool ST2289) and remove silencer fixing-bolt. Remove HT lead and spark-plug. Remove four cylinder-head bolts and washers, lift off cylinder-head and gasket. Should cylinder-head joint be difficult to break, tap cylinder-head front and rear alternately with hide mallet, at base of cooling fins, and gently ease off with screwdriver. Move piston to TDC and use a soft scraper to remove all carbon from piston top. Move piston to BDC, scrape carbon from exhaust port, taking care that loose carbon does not enter transfer or induction ports. Remove carbon from cylinder-head and scrape all traces of gasket material from cylinder and cylinder-head joint surfaces. Rotate engine several times to check that all loose carbon is removed from piston-top and exhaust-port. Set piston at BDC, smear oil lightly on cylinder-bore and refit cylinder-head (plug aperture to left side), using a new gasket. Fit steel washer on each cylinder-head bolt and tighten down evenly. Clean spark-plug, set gap to .018 in.-.020 in. and fit to cylinder-head. Fit HT lead. Remove small screw at extreme rear end of silencer, grip internal part of silencer with pliers, and withdraw baffle assembly for cleaning. Re-assemble and refit using new washer on exhaust pipe ring nut. Run engine until warm, then evenly tighten down cylinder-head nuts.

ENGINE REPAIRS

Removal of engine-gearbox unit

Turn off petrol tap, and disconnect fuel-pipe from carburettor. Remove carburettor, noting order of fibre and steel washers on studs, and heat-insulation and paper gaskets between cylinder and carburettor. Remove exhaust assembly, pedals and cranks. Disconnect brake rod from brake-operating lever. Disconnect rear chain joining link and remove chain from final-drive sprocket. Remove clutch cable from handlebar control and cable-clips from frame. Disconnect gear cable from gear lever on crankcase. Disconnect electrical cables at snap

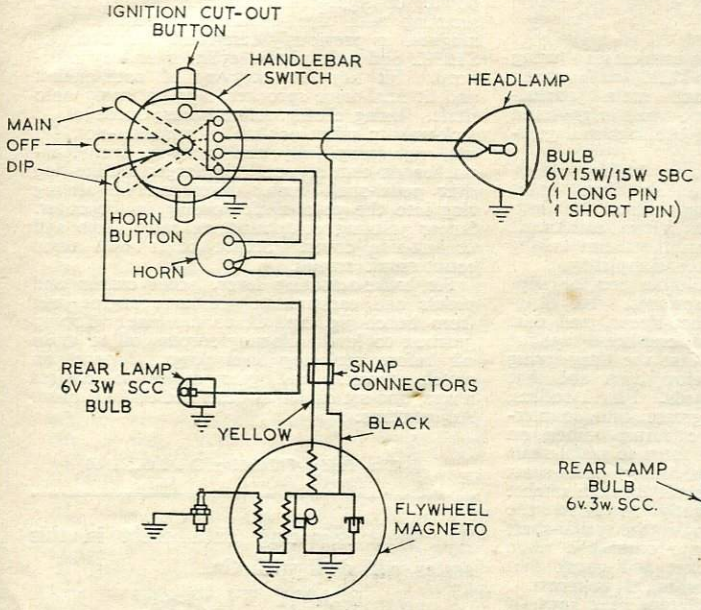
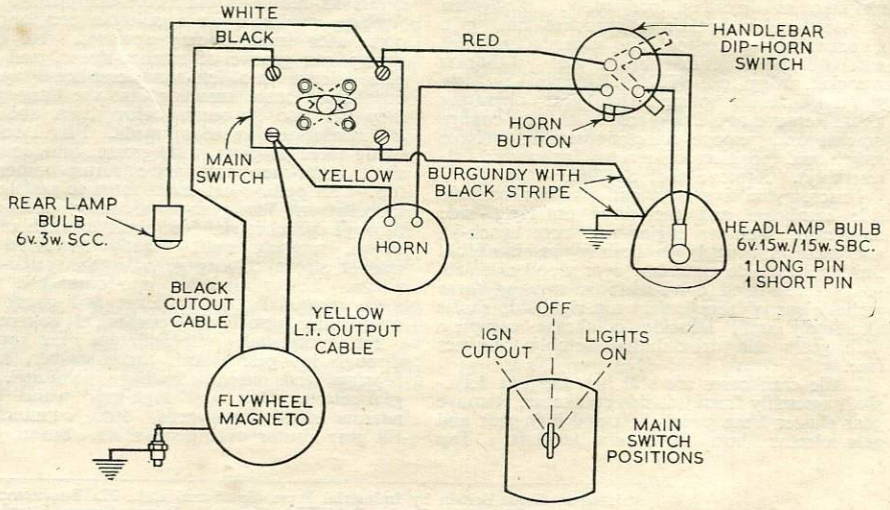


FIG. 4.—(*Right*) *Wiring diagram, Norman Lido.*

FIG. 3.—(*Left*) *Wiring diagram, Nippy Mark II.*



RECOMMENDED LUBRICANTS

Engine	Shell	Esso	Wakefield	BP	Mobil
Petrol/oil ratio 24:1 unless otherwise stated.	Shell 2T two-stroke Petroiler Mixture or Shell 2T two-stroke oil.	Esso two stroke motor oil (20:1) or Essolube 30.	Castrol two-stroke oil (20:1) or Castrol XL.	BP Zoom or Energol two-stroke oil.	Mobilmix TT (20:1) or Mobiloil A.
Gearbox.	Shell X100 30.	Essolube 30.	Castrol XL.	Energol SAE 30.	Mobiloil A.
CYCLE PARTS					
Oil can.	Shell X100 30.	Esso Handy Oil.	Castrol XL.	Energol SAE 30.	Mobiloil A.
Rear chain.	Retinax A.	Esso Fluid Grease.	Castrolease CL.	Energrease L2.	Mobilgrease MP.
Wheel hubs and other grease lubricated parts.	Retinax A.	Esso Multi-purpose Grease H.	Castrolease CL.	Energrease L2.	Mobilgrease MP.

connectors near engine. Remove three engine mounting bolts and lift engine from frame.

Engine dismantling

Drain oil from gearbox (drain-plug is near rear of right-side crankcase (see Fig. 2)). Remove oil-filler screw from gearbox to speed up oil drainage. Fit engine unit into bench-jig ST2307. Remove cylinder-head, as for decarbonizing. Remove four cylinder - base nuts. Lift cylinder straight up off piston. If cylinder is allowed to turn, piston rings may be broken by fouling cylinder ports. Note position of cylinder-base gasket and remove from cylinder-base studs. Remove gudgeon-pin circlips.

Heat tool ST2291 in boiling water for a few minutes, place on piston top. Allow piston to heat and press out gudgeon-pin using tommy-bar or rod. DO NOT use mallet or hammer. Place drip tray under right side of engine and remove five fixing screws on right-hand engine cover. Remove right-hand cover, rubber oil-seal on pedal-shaft and clutch cable and lever assembly.

Fit tool ST2302 into crankcase mouth and fit pin through small end of con-rod. Remove lockscrew and spring-washer locking primary chainwheel nut. Remove chainwheel nut. Straighten six locking tabs on clutch bolt locking plate. Leaving two diametrically opposed bolts in position, remove remaining four bolts securing clutch pressure-plate. Unscrew, evenly, the remaining two bolts, releasing pressure-plate and springs. Using screwdriver, lever out spring cups from pressure-plate. Fit pegged end of tool ST2289 into clutch hub-nut and unscrew nut, using mallet on spanner if necessary. Remove clutch plates, noting sequence of plates for correct re-assembly. Remove clutch-hub using tool ST2301. Withdraw primary chainwheel, chain-and-clutch cage, together with shims behind chainwheel (if any), and distance piece on pedal-shaft. Remove magneto as described previously. Straighten lock-tab under final-drive sprocket nut, grip sprocket with chain-tool and unscrew sprocket nut. Remove lock-washer and withdraw sprocket, using tool ST2285. Remove key from shaft. Unhook spring from gear - operating lever. Remove two fixing screws on gear-change bracket and remove selector-assembly. (Note length and position of screws for correct re-assembly). Remove tool ST2302.

Unscrew the five nuts and washers on left-side crankcase and the three on right - side crankcase. Remove engine-unit from bench-jig and heat thoroughly in boiling water. Hold unit by right-side crankcase over wooden bench, so that left-hand drive-shaft is two or three inches clear of bench, then tap right-side shafts alternately until left-side crankcase complete with gears and drive-shaft assembly becomes free.

While crankcases are still hot, tap out drive-shaft assembly from left-side crankcase. Remove gear cluster from pedal-shaft and high-gear and gear-selector hub from countershaft. Tap countershaft from crankcase, releasing low-gear pinion and collecting roller-bearings which will fall from countershaft outer-roller race. If oilseal is to be used again, wrap Sellotape around countershaft keyway before removal, to prevent damage to oilseal lip.

Clean components (other than magneto and clutch friction discs) in petrol and dry-off in air blast. Scrape all traces of gasket and jointing material from crankcase-joint faces, exercising great care with scraper, as correct sealing of crankcases will be impaired if joint faces are scored or if metal is removed. New oilseals should be used on re-assembly of engine, wherever possible. Examine all parts for wear or damage and replace as necessary. If big-end bearing requires replacement, the crankpin extractor (service tool ST2311) should be used to dismantle crankshaft. However, a better plan is to fit a replacement crankshaft assembly obtainable from the makers. See under Useful Data (crankshaft) for details of crankshaft re-assembly using oversize crankpin and con-rod. Should piston-cylinder clearance exceed .007 in., then cylinder should be re-bored to suit .015 in. or .030 in. oversize piston. Ball-journal bearings should be checked for roughness and bearings and bushes should be checked for "lift" or "play". Fit replacements where necessary.

Engine re-assembly

With oilseals fitted in crankcases (using service tools ST2212 and ST2213) with spring grooves facing inwards and main journal-bearings positioned on left- and right-hand driving shafts, lightly oil all bearings and gear-box parts.

Heat left-hand crankcase in boiling water, blow water from seal with air blast, insert left-hand drive-shaft through oilseal, in left-hand crankcase, and then press crankshaft assembly fully home, so that the main bearing enters its recess in crankcase completely.

Place crankcase on a suitable box or support, with inside facing upwards. Fit drag-spring into groove of ratchet sleeve, and next place sleeve into left-hand crankcase against pedal-shaft bush, ensuring that the drag-spring loop fits into its recess below bush and that the ratchet teeth face upwards. Fit 12 rollers, fixing them in place with grease, into countershaft outer-race and place thrust-washer on top. With pedal-shaft chain fitted to pedal-shaft sprocket and low gear-wheel, insert pedal-shaft through sprocket and feed shaft through ratchet sleeve, rotating shaft slightly to allow the ratchet sleeve to engage with the pedal-shaft worm. Lower assembly into crankcase when teeth mesh. Rotate sprocket and check that drag-spring loop is still positioned in recess.

Fit countershaft (with Sellotape over keyway) through low-gear wheel, thrust-washer, roller-bearing, and oilseal. Remove Sellotape. Fit gear-selector hub and high-gear wheel (with narrow slots downwards) onto countershaft. Fit gear cluster over pedal-shaft. Smear jointing compound onto crankcase-joint washer and fit onto left-hand crankcase.

Heat right-hand crankcase in boiling water, blow water from oilseal with air blast and fit crankcase over the shafts and ball-bearings, taking care not to damage oilseals, and tapping with mallet to ensure correct location of bearings in crankcase. Fit crankcase securing-studs, washers and nuts and tighten down evenly. Tap crankshaft and pedal-shaft lightly at each end (while crankcases are still warm) to relieve any side-thrust on bearings.

Fit crankcases into bench jig-tool ST2307. Grease gear-change bracket joint-washer and fit, together with bracket, to crankcase, placing the selector-slider into hub-selector groove. Fit the longer screw, which also has a larger head, through the spring loop and into left-side screw hole, and fit the shorter screw into right-side screw hole. Tighten both screws and check gear selection. Using a loop of stout string, hook the other end of spring over gear-operating lever so that lever is moved into high-gear position.

Fit tool ST2302 to connecting-rod. Fit primary - drive sprocket distance - piece and shims, if required, to pedal-shaft. Lightly grease clutch-cage bearing surface of drive-shaft with graphited grease. (Do not allow grease to spread to tapered part of shaft).

Assemble primary chain on clutch-cage sprocket and primary-drive sprocket and fit over drive-shaft and pedal-shaft. Wipe taper of drive-shaft clean and fit clutch splined hub, followed by clutch-plates in correct sequence, i.e. pillar-plate, friction-plate, thin steel-plate, friction-plate, thick steel-plate with chamfered edges of holes outwards. Fit clutch-securing nut, flat side inwards, and tighten with peg spanner (12 to 18 ft. lb. torque). Flats on nut must be aligned so as to allow the flats of the spring cups to fit on final tightening of the bolts. Fit cups and springs into clutch front-plate and place over pillars of back-plate. Fit pressure-plate, then locking-plate and screw the six small bolts evenly into the pillars until fuly home. Secure by bending over tabs of locking-plate.

Fit primary chainwheel sprocket nut and secure with lock-screw and washer. Smear jointing compound on gasket and fit over dowels of right-hand crankcase and fit cover, securing with five countersunk screws. Fit magneto as previously described. Remove tool ST2302 and refit piston, cylinder and cylinder-head. Fit key into keyway of countershaft and fit final-drive sprocket, tapping firmly onto shaft. Using chain tool to secure sprocket, fit lock-washer with lock-tab in sprocket-slot. Fit nut, tightening fully and bending over lock-washer on flat of nut. Fit larger sealing-ring over pedal-shaft bush. Insert smaller sealing ring into the pedal-shaft housing in the cover. Smear jointing compound on joint faces and fit left-side cover. Secure cover with three countersunk screws.

Fit brake-actuating lever, pedal cranks and pedals and carburettor. Remove engine unit from bench jig, and fit to machine. Top-up gearbox to level, allowing surplus oil to drain off before replacing level plug. Connect up clutch, throttle and gear cables to control levers, and set cables as described under Control Adjustments.

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

DIANA TS Scooter

and will be included in the issue dated April 22.

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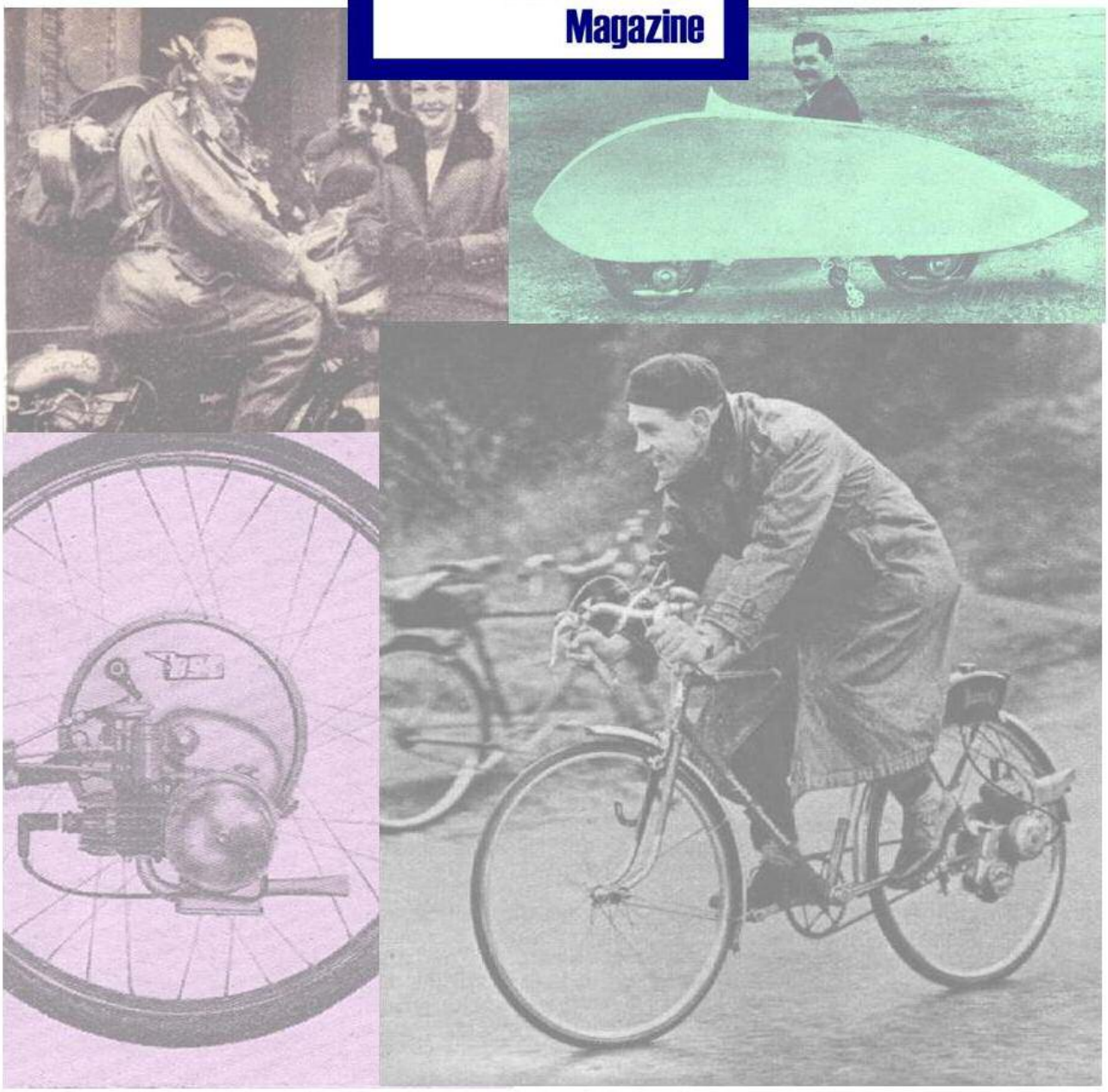

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