The Single-cylinder o.h.v.
MODELS 50, ES2 and 18S
NORTON
Servicing Details for Current Bracebridge Street
Push-rod Models in Three Popular Capacities

The engine is roughly 2 ft. tall and it helps the single-handed worker to dismantle as much as possible with the unit still supported in the frame. First, obviously, the primary transmission must come away, including the clutch and oil bath. The clutch body is secured by a centre nut to the splined gearbox mainshaft—there is no engine-shaft shock absorber—and if the sprocket here is pulled free with a claw-type tool, it can be withdrawn as a whole, together with the chain and clutch assembly, and then the back oil bath pressing may be removed.

On the other side, the engine is linked to the Magdyno by endless-chain transmission, the driving sprocket being a taper fit with, and keyed to, the cam-spindle extension. The Magdyno sprocket is a simple taper fit and both sprockets can be removed complete with chain. Norton suggest the use of a hook-type tool (here the bent tyre-lever "persuaders" come into use) fitting behind the sprocket and bearing in front on the spindle end. Avoid using the back of the housing as a leverage point: it is alloy material and easily damaged.

Freed of H.T. and control cables, and with the oil pipes and carburettor removed, the engine presents no further stages. Taking off the rocker box, complete with rockers in situ, is straightforward. This work is followed by the removal of the light-alloy cylinder head which, it should be noted, is fitted with Armstrong "Helicoil" inserts for the rocker-box retaining bolts. The push rods can be withdrawn, leaving the tubes and "Naoprene" seals to come away with the head. These seals, located at the top of each tube, seldom need renewing, but the "O"-rings at the base are more readily expendable.

Check these renewable parts: also, when the cylinder has been slipped off, inspect the piston rings, the fit of the gudgeon pin (repeating the wire-type circlips once they have been removed), the tappet guides and the big-end assembly. Note that the piston and ring details set out in the Reference Data are applicable to the B.H.B. wire-wound type now being standardized throughout the Norton single-cylinder range. The B.H.B. piston is designed to control expansion under high-heat working conditions and so avoid distortion.

Cylinders and pistons are graded and marked either "A" or "B," the two gradings representing a 0.003-in. tolerance either side of a datum dimension. It is essential that "A" and "B" components are not fitted-up together: if that should happen, the engine will either be noisy, with excess piston clearance, or too tight. Pistons are marked on the crowns and barrels on the top joint faces.

Splitting the crankcase involves, first, the removal of the timing chest cover, revealing the oil pump (dropped by a worm, which also acts as a retaining nut—left-hand thread) and camwheels. Both wheels run in bushes which, if renewed, must be fine-reamed—and that is usually regarded as a factory job. The fitting of new bushes may mean a

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When, only recently, the long standing "Big Four" and 16H side-valve models were dropped from the Norton catalogue, the single-cylinder range was supplemented by the addition of a long-stroke o.h.v. "single" of 596 c.c. capacity to cater for sidecar requirements, previously the province of the bigger of the side-valves.

Generally, the specification of this model, the 18S, resembles that of the 490 c.c. ES2, for the cylinder head and crankcase arrangements are virtually identical in both cases, the pistons, connecting rod and crank-throw dimensions varying in proportion to the stroke length.

The 548 c.c. Model 50 is structurally similar, but the bend is not interexchangeable with those of the two bigger-capacity machines. Important, however, is the fact that practical work described for one of the trio applies to the other two: the trans-

mission and suspension assemblies are to a common pattern and the few special tools required by the home workshop enthusiast have equally wide application.

Special Tools

One can get along with the standard tool kit plus a selection of hand tools, some flat tyre levers to act as "persuaders" (for Magdyno sprocket removal), a claw-type puller and Terry valve spring compressor. Norton recommend a gadget to facilitate the fitting of rebushed rockers and new spindles (an unlikely job) and there is a special base-block rocker and screw-type extractor device employed to push out taper guided rockers due for renewal. In all cases the crankpin nuts are tightened at the works with a 3-ft.-long wrench, exerting many ft.-lb. at the pin, and the private owner is not likely to possess any tool capable of producing similar torque. Moreover, as Norton big-end assemblies are selectively assembled it is a

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Largest in capacity of the Norton "singles," the 596 c.c. 19S was designed to supplant the side-valve models in the sidecar class.

The sturdy long-stroke o.h.s. engine of the 19S. Its general specification is very similar to that of the 490 c.c. ES2. D.H.B. wire-wound pistons are in process of being standardized through out the range, although some machines will continue to be produced with the existing type of piston for some months to come.

The base-block with screw-type extractors used for removing the tappet guides.

Although it is of the crowded, loose-assembled type, the big-end bearing is supplied to Nortons, complete with crankpin, as a proprietary unit by a number of bearing manufacturers. The rollers are nominally $\frac{1}{4}$ in. by $\frac{1}{8}$ in., but tolerances vary according to the standard to which each supplier works. Assuming the big-end renovation is being tackled at home, it is not practicable, therefore, simply to order a new crankpin and fit it up with rollers, old or new, and an outer race from some other source. A complete assembly should be obtained and fitted with the existing connecting rod.

It is improbable that the oil pump of a 1956-7 machine will require servicing. Wear, when it occurs, is manifest by play in the driving spindle, indicating that the end-faces of the gears are reduced—a condition that permits oil to by-pass the gears, resulting in a lowered pump output. The cure is to adjust the housing to the gear-face level by nubbing that side of the assembly on a surface plate covered with fine emery cloth. Wash the parts meticulously after this operation and also check the abutting pump/crankcase faces before the refitting stage is reached.

Assembly

Mainshaft end-float in excess of .005/.008 in. is taken up by the use of pen-steel washers, the fitting of which should leave the flywheels in a central position in the crankcase. When that setting is established, draw off the crankcase halves, lubricate thoroughly all bearing assemblies and gold-size the abutting edges of the crankcases. Join the halves up and re-check shaft float. Then fit the timing wheels, pump-drive worm and lock up the unit.

Set the valve timing by the piston markings. See that the oil distribution system is correctly assembled and that, when offering up the timing cover, the fibre washer between the pump output shaft and the panel prevents the parts meeting by at least $\frac{1}{32}$ in. This ensures that when the panel pins are finally tightened the resultant compressing of the washer provides a thoroughly oil-tight union. Replace the piston and cylinder. Link up (Continued overleaf)
Transmission

The simplicity which characterizes the engine is also a feature of the gearbox. This is conventional in layout and operated by camshaft-controlled selector arms sliding on a spindle, which is screwed into the driveside end of the shell. An end cover on the kick-starter side supports the mainshaft in a ball-journal bearing, the layshaft running in the counter-bored K.S. spindle, which is bushed for the purpose.

A toggle-link with the operating-cam assembly extends through an aperture in the end cover forming a knuckle engagement with the striker plate, part of the foot-change mechanism housed in the outer cover. Removal of the K.S. crank (not the gear lever), gear indicator, oil filler and inspection plates, and the five shoring screws, suffices to bring away the cover complete with foot-change mechanism-paws, hairpin springs and striker plate. Before separating the two parts, however, mark on the outer surface of the end cover the line-up of the clutch-opener lever with the slotted thrust member (see sketch) to facilitate later reassembly.

Likely points of wear are, of course, the bearings. The ball-journal bearing in the end cover can be examined if the external nut is slackened to permit the cover to be removed. Applying a spanner to the squared end of the selector-arm spindle will effectively unscrew the spindle and, if the clutch has been taken off, the mainshaft and gears (except the sleeve gear, or higher gear axle, as Nortons term it) can now be pulled out, followed by the layshaft assembly.

The K.S. and control springs in the gear-change mechanism are parts which may call for attention after a fair period of use. A fiddling job, needing good luck at the first attempt or patience thereafter, is the engaging of the striker arm with the knuckle joint. A sketch of the order of assembly of the gearchange box and pieces provides a guide. Do not forget to inspect the K.S. escapement ratchet and paw—It is a wearing part, particularly if accidentally misused—and to assemble the gear-change mechanism into the cover, this must be offered up to the inner cover as a complete sub-assembly.

Suspension

In each leg, the main stauncheon of the "Roadholder" forks is a taper fit at the fork crown, where it is secured by a big hexagon-headed nut, and clipped in the lower leg by a pinch-bolt and nut. When adjusting the head bearings, it is essential to slacken the pinch-bolt nut to permit extension or contraction of the steering-column assembly. Failure to do this may result in distortion and impaired steering.

In dismantling either of the legs, the first operations are to slacken the pinch bolt, slightly unscrew the hexagon nut at the head of each fork and then gently tap the nut to break the taper fit of the stauncheon in the crown. The hexagon nut may then be removed and the stauncheon, complete with slider assembly and spring, withdrawn. The nut at the head of the slider is unscrewed by means of a tap spanner and beneath it will be found the main oil seal, which is expendable and should be renewed from time to time. The top bush, a flanged component, is now accessible and can be removed if necessary. At the lower extremity of the stauncheon, the bottom bush is retained by a terminal nut. It operates under ideal conditions and very seldom needs replacing. Fork dismantling work is facilitated by first draining out the damping fluid.

When the job is completed and the forks reassembled, the spindle clamp in the fork end leg should not be tightened until after the forks have been moved sharply up and down several times in order that the spindle and wheel become properly centred. Clamping-up the spindle prematurely results, usually, in a fork assembly which is not completely parallel and, therefore, sure to be inefficient.

The Giltedge type SB4 suspension units controlling rear swinging-fork movement, are non-adjustable. Sealed at the works, they should not be tampered with.

Lubrication

Silent points about the oiling system have been dealt with earlier because the distribution arrangements from the pump to the big end become obvious as the timing case is removed. The pressure-release valve is set at the works and, normally, should not be touched. There is no other form of adjustment. It should be noted that the plug and ball located in the timing side crankcase are there to seal off a drainway made during manufacture and have nothing to do with the lubrication system.

Wiring diagram of the three Norton "singles": Key to colour code: 1, black; 2, red; 3, blue; 4, brown; 5, green; 6, white; 7, yellow.
Motor Cycling

REFERENCE DATA

Norton Models 19S, ES2 and 50

CYLINDER-PISTON GROUP

<table>
<thead>
<tr>
<th>Bore</th>
<th>Stroke</th>
<th>SWP</th>
<th>Compression Ratio</th>
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</thead>
<tbody>
<tr>
<td>79 mm</td>
<td>113 mm</td>
<td>71 mm</td>
<td>7:1</td>
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</tbody>
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- Valve diameters:
  - At top land: 3.107/3.109 in., 2.995/3.000 in.
  - At bottom land: 3.107/3.120 in., 2.979/3.000 in.

- Piston ring gaps: 0.004/0.006 in., 0.004/0.006 in.

- Piston ring depth (thickness): 0.050/0.060 in.

- Piston pin width: 0.060/0.065 in.

- Gudgeon pin diameter: 0.975/1.043 in.

- Small-end bush diameter: 0.815/0.850 in.

VALVES AND VALVE GEAR

Valve stem diameter: 0.350/0.375 in.

- Valve guide length: 0.350/0.375 in.

- Seat angle: 45°

- Valve spring length: 0.375/0.399 in.

- Rocker arm diameter: 0.375/0.399 in.

- Rocker arm: 1.9980 in.

- Permissible side play: 0.020/0.026 inch

- Type of big-end bearing: Crowed roller (pressfit)

- Main bearings: 1 in. bore by 2 in. O/D by 3 in.; two roller and one ball journal.

- Permissible side and end play: 0.001/0.004 in. (adjusted by shims).

- Left-hand threads on engine components:
  - Oil-pump worm.
  - Location of exhaust breaker: In magneto

CRANKSHAFT GROUP

Coned big-end diameter: 1.9980 in.

Permissible side play: 0.020/0.026 inch

Type of big-end bearing: Crowed roller (pressfit)

Main bearings: 1 in. bore by 2 in. O/D by 3 in.; two roller and one ball journal.

Permissible side and end play: 0.001/0.004 inch (adjusted by shims).

Left-hand threads on engine components:
  - Oil-pump worm.
  - Location of exhaust breaker: In magneto

GEARBOX

Bearings: type and size: Sleeve gear supported by double-row rigid ball bearing SKF 6202 2RS, 17 mm. bore by 40 mm. O/D by 12 mm.

Mainshaft bearing at K.S. end: Single row rigid, 1 in. bore by 1 1/2 in. O/D by 3/4 in.

Last shaft supported by: Ball bearing SKF 6203, 17 mm. bore by 40 mm. O/D by 12 mm.

Internal reduction: 1:33

Left-hand threads on gearbox: Final drive sprocket nut.

TRANSMISSION

Sprocket sizes:
- Primary drive:
  - 26t 19T

- Clutch:
  - 42t 43t 42t

- Final drive:
  - Gearbox driving sprocket: 19t 19t 19t
  - Rear wheel:
    - 43t 43t 43t

- Gear ratios: ES2, 4.52, 4.75, 6.31, 8.41, 12.7, 19.55
- Primary chain: Renold 1109/4, 6 in. pitch by 305 in. by .335 in., 76 pitches (model 50, 75 pitches).

SECONDARY CHAIN:
- Renold 1109/4, 6 in. pitch by 225 in. by .400 in., 90 pitches.

WHEELS

Front: WM 2-19.

Brake diameter 8 in.

- Spokes, brake side: 6 1/2 in. long, 3 1/8 in. at bend (20 off)

- Spokes, plain side: 6 1/2 in. long, 3 1/8 in. at bend (20 off)

Hub bearings: One single row 17 mm by 12 mm; one double row ball joint, 17 mm by 40 mm by 16 mm.

Performance curves for the Lucas E3LM dynamo component of the MO11 Magneto.

LUBRICATION

Oil tank capacity: 4 pints. Circulation by gear-type pump, worm-driven from mainshaft.

ELECTRICAL EQUIPMENT

Ignition by Lucas type MO11 Magneto with internal E3LM 6v, 60 watt dynamo charging 20/27.5/11.13 amp. hr. battery through RB/707 6v.c.c. unit.

Cut-out:
- Cut-in voltage: 6.3/6.7 volts.
- Drop-out voltage: 5.8/5.2 volts.
- Reverse current: 0.3/0.5 amp.

Regulator:
- 10C: (50°F) 7.7/9.1 volts.
- 20C: (60°F) 7.6/9.5 volts.
- 30C: (76°F) 7.5/9.5 volts.
- 40C: (104°F) 7.4/7.8 volts.

Batt rating:
- 6v, 30/24w.
- Pilot: 6v, 3w.
- Tail: 6v, 6/16w.

Note:
- Manufacturer's output curves for the three Norton "singles": Figures obtained with premium grade fuel, test-bench exhaust system and engines in standard trim.