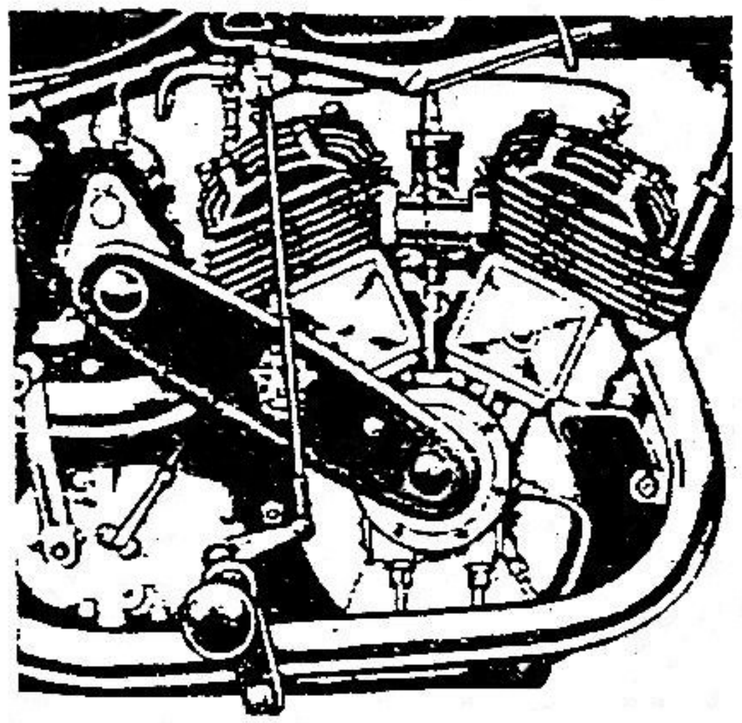
SERVICE SERIES No. 5

Engine Restoration Routine for the 1936-1939 MATCHLESS Model "X" Vee Twin

Rebuilding a Popular Pre-war 990 c.c. S.V. Unit

By BERNAL OSBORNE



The engine of the Model "X" Matchless.

MADE at the Plumstead factory by Matchless Motorcycles (Colliers), Ltd., and continued by Associated Motor Cycles Ltd., the 990 c.c. "X" series of engines were catalogued not only as Matchless vee-twin power units from 1929 onwards, but were employed in side-valve and o.h.v. form by A.J.S., Brough, Morgan and other concerns during the following decade. A slow-running, powerful engine with a b.h.p. rating of 26.2 at 3,440 r.p.m., the Matchless Model "X" came to be highly regarded by three-wheeler and sidecar users, many of whom regret that manufacture has not been carried on in post-war years.

Large numbers of these engines must now have seen at least 14 years service yet, because of their enduring character, will still be capable of a further long spell of work if reconditioned. Hence the inclusion of the Model "X" in this series. Dimensional data apply in most instances to the equivalent A.J.S. engine and, so far as crankcase details are concerned, to the water-cooled and o.h.v. versions fitted by other manufacturers.

General

Initially, the Model "X" used side-by-side connecting rods with offset small ends but, also around the 1936-7 period, that practice was dropped in favour of one plain and one forked rod running on a common crankpin. Subsequently, however, a reversion was made and some engines produced between that period and 1939 may be found to have the old-type connecting rod assembly.

The mainshaft timing pinion is a taper-and-key fit on the shaft and is secured by a left-hand threaded nut. One of the few special tools desirable, though not essential, is a device for withdrawing the pinion once the nut has been slackened. Another point to note before starting work is that the breather component is embodied in a through-bolt at the apex of the crankcase; it must be withdrawn before attempting to separate the crankcase halves. In like manner, the oil-pump plunger will prove stubborn, preventing the splitting of the crankcase, unless it is first removed.

Crankcase Assembly

Models made up to 1937 had the crankshafts supported on the drive side by a triple-row bearing of $\frac{1}{2}$-in. by $\frac{1}{4}$-in. caged rollers running in a steel sleeve. On all "X" engines drive-side shaft diameter is 1.5135 in. and the bore of the sleeve 2.014 in.

During 1938 and 1939 a ball-bearing type RLS8 and a CRM8 double-row roller bearing were used. In these engines the roller bearing is located against the flywheel and the ball bearing, fitted on the outer side, is retained by a circlip and distance collar. Both are standard components used in other fields and, therefore, probably obtainable from bearing specialists

The timing side of the shaft is supported by a bronze bush which, being directly lubricated under pressure, enjoys a long life. If replaced, the new bush must be reamed when fitted to $\frac{7}{8}$ in. $\frac{+0.00075 \text{ in.}}{-0.0000 \text{ in.}}$ Basically, four rows of 14 $\frac{1}{4}$-in. by $\frac{1}{4}$-in. rollers make up the complete big-end bearing, but the arrangement varies. For side-by-side connecting-rod engines, four separate single-row cages are used; in the alternative big-end assembly the two eyes of the forked connecting-rod member each bear on single-row caged rollers between which is a double-row cage for the centre member. In either case the total number of rollers adds up to 56. The manufacturers' spares list shows that oversize rollers were available in pre-war days. The $\frac{1}{4}$-in. type roller is still widely used today and could probably be obtained O/S by .001 in.

Standard crankpin dimensions are critical to half a "thou." The crankpin is a built-up centre member and outer sleeve, the O/D dimensions of the sleeve being, high, 1.5150 in. and low, 1.5145 in. The outer sleeve is case-hardened Ubas and the makers do not recommend grinding down to compensate for wear.

After a long period of use it is possible that the drive side flywheel face may have become heavily scored due to contact with the hardened crankcase bearing sleeve. The result will be a degree of increased end-play and the cure is to have the flywheel face machined back clear of the groove and to insert a hardened steel disc or washer to restore width. End-float should be limited to 0.015 in. to 0.020 in. and that movement can be adjusted by drawing in or pulling out a bronze timing side bush. Shim washers should not be used. With the crankcase cheek firmly supported, a length of steel tubing, the same size as the bush, can be used for the driving-in process. Conversely, a tube big enough to sleeve the bush and abut on the surrounding crankcase area will, if tapped lightly with a hammer, increase the space available for flywheel end play. The bush normally protrudes 1.32 in. from the face of the crankcase.

Measuring $\frac{7}{8}$ in. −.001 in. to .0015 in., the gudgeon pin is an easy sliding fit in the piston bosses and small end: this more than usually generous tolerance should not be mistaken for acute wear.

Oil Pump

This is of the reciprocating plunger type, long favoured by the Matchless factory, driven from the timing side of the mainshaft. Possible faults are wear on the worm or pump shaft, or in the crankcase casting which forms a housing for the shaft. The factory can supply pump components or bore out the housing O/S to take a bush. The pump plunger, in fact, acts as an oil seal; if advanced wear has occurred there will be

MODEL 'X" MATCHLESS

Tappet Clearance (Cold) Inlet .. .004 in.
Exhaust .. .006 in.

Valve Timing
(With .016 in. clearance)
Inlet opens 15° Before T.D.C.
Inlet closes 50° After B.D.C.
Exhaust opens 58° Before B.D.C.
Exhaust closes 12.5° After T.D.C.

Ignition Timing
(Fully Advanced)
Points break $\frac{1}{4}$ in. before T.D.C.

a perceptible drain of lubricant into the crankcase.

Oil drillways running up the face of the crankcase provide supplementary lubrication to the front and rear cylinders. Feed pressure is built up by two spring-loaded valves, set flush with th top of each crankcase mouth. These valves rarely need attention, but, if necessary, either of them can be dismantled by inserting a 3BA screw into the top of the bronze plug, which is already tapped for this purpose, and by placing the blade of a screwdriver beneath the screw head, so levering the plug free. The spring and ball can now be withdrawn and it should be noted at this stage that the springs are of different tension, the stronger being used for the rear cylinder. In reassembling, the balls are inserted first, then the springs and finally the plugs.

Camshaft and Timing Gear

Four cam levers are operated by a one-piece cam unit, which is supported in the crankcase and the outer timing cover by two bushes. To remove it, pressure should be taken off the contours, or the valves and springs removed. The two inlet cam levers are identical, being a two-off job, actually stampings of E.S.C. 15 C.C.H. steel, part No. M/3E313. The same material is used for the exhaust levers, the contours of which are identical but which are right- and left-handed.

Four tappet guides are fitted, and it will be noted that they vary in length, the longer ones being used for the exhaust tappets. These guides have a dia of $\frac{9}{16}$ in. + .002 to .0025 in., an internal bore of $\frac{5}{16}$ in. + .001 in., and a longitudinal $\frac{1}{16}$ in. radius groove down the outer wall acting as an oil return passage. The longer guides are apt to foul the cam levers if they are too long or pressed in too far.

The cam cluster is a Ubas stamping, case-hardened, and to accommodate the $\frac{1}{2}$-in.-diameter end-shafts of this unit the phosphor-bronze bushes in the crankcase and timing cover, if renewed, should be reamed to $\frac{1}{2}$ in. ± .0005 in. Reaming, of course, should be carried out with the timing cover assembled on the crankcase and the bushes dead in line. The oil groove in the cover bush should be on the outside. Worn cam-levers can be built up by the Stellite process and, as a guide to those who are in a position to get grinding carried out, the appropriate profile drawings accompany this article. If a forked con.-rod assembly is fitted the forked member goes into the forward cylinder when the job is reassembled.

Cylinder Heads

Both heads are of cast iron and can, if it is so desired, be decarbonized in caustic soda solution. Each has seven retaining studs which should be inspected for signs of extruded threads; a C-and-A gasket is used.

Cylinder Barrels

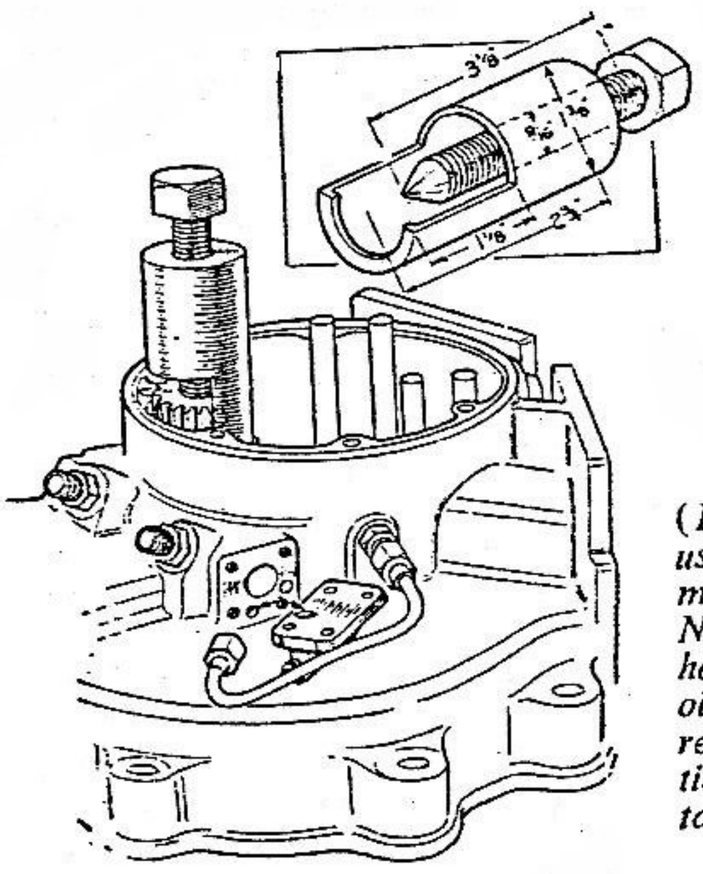
Reboring or re-lining is recommended if cylinder wear exceeds .008-in. Proprietary-type split-skirt pistons carrying two $\frac{1}{16}$-in.-deep compression rings and a $\frac{1}{8}$-in. scraper are available in O/S dimensions and must be fitted with the split located frontally in both cylinders. The gudgeon pin is retained by circlips. There are four chill-cast iron valve guides measuring 2$\frac{1}{2}$ in. in length. Each has a diameter of $\frac{9}{16}$ in. $\frac{+.00075 \text{ in.}}{-.00125 \text{ in.}}$ and the bore is $\frac{5}{16}$ in. $\frac{+.0005 \text{ in.}}{-.0005 \text{ in.}}$ A $\frac{1}{8}$-in.-diameter hole is drilled half-way down each guide for lubrication purposes.

Valve springs should have a free length of 1$\frac{3}{4}$ in.; each spring is retained by a cup flanged on its underside to retain a collet which passes through the slotted valve stem. The cups look identical on both sides but, in fact, they are not reversible. No special spring compressor tool is necessary.

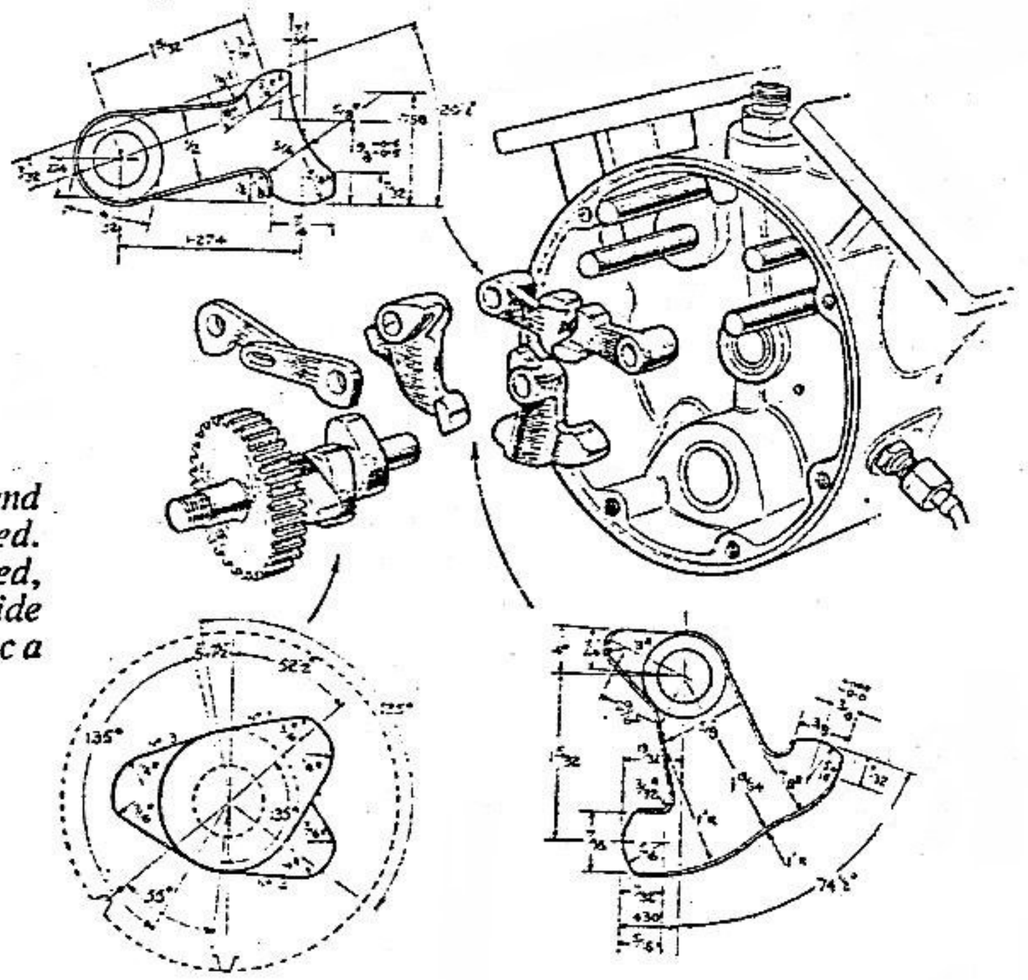
Good engine performance depends largely on valve efficiency and, in this case, the Mode "X" seatings may have to be machined O/S and a proprietary insert fitted. At least the valve seat may need truing and a 45-degree cutter should be used. Any good repairer will help with this work.

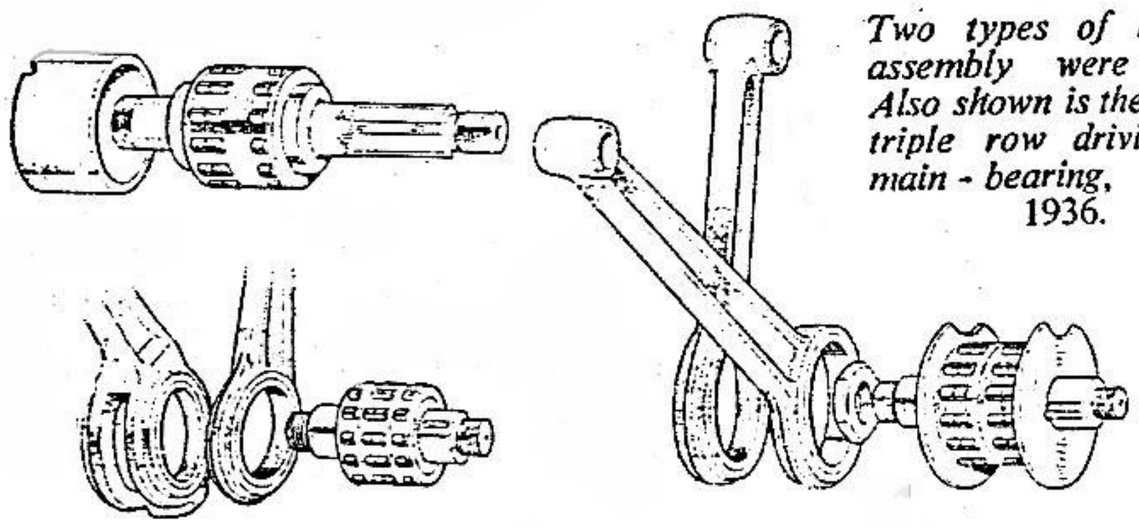
It remains only to reassemble carefully, ensuring that the cylinder-base paper washers are cut to allow for cylinder lubrication arrangements, and that there are no air leaks at the joints of the T-type carburetter induction manifold. Valve timing should be adjusted with 0.016-in. tappet clearances which must be reset to 0.004-in. inlet and 0.006-in. exhaust for normal running. Cam-wheel and timing-pinion marking indicates crankpin t.d.c. Ignition timing should be carried out on the rear, or No. 1 cylinder. Magdyno instruments originally fitted were marked adjacent to the brush holders and No. 1 lead goes to the rear "pot."

Whilst many Model "X" parts are obsolete, numbers of specialist repairers, most of them advertisers in *Motor Cycling's* classified columns, can usually make up parts if patterns are available. With that chance of obtaining replacements, overhauling an old power unit becomes a useful as well as interesting task.



(Left) The extractor used for removing the mainshaft timing pinion. Note the oil pump housing end cover and oilways which must register. (Right) Essential dimensions and details relating to the timing gear.





Two types of big-end assembly were used. Also shown is the caged, triple row driving-side main-bearing, circa 1936.