READY for the "OFF" | **A Series on the Preparation of Production Racers**

Servicing the Single-o.h.c. A.J.S. 7R "Boy Racer"

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Part 1

THIS article, in common with the whole of the present series, is written primarily for the man who will undertake work on a racing machine—that is, a capable mechanic, generally familiar with the features of his own motor, who has already carried out some routine racing maintenance. Again, it must be emphasized that the information given here should be regarded as supplementing rather than replacing the literature available from the makers—in this case, Associated Motor Cycles, Ltd., Plumstead Road, London, S.E.18.

Detailed information in the present article covers *all* A.J.S. 7R racing engines sold over the counter from 1948 onwards.

The 7R has a "350" single-o.h.c. single-cylinder engine. As originally laid down, it had a bore and stroke of 74 x 81 mm., giving a swept volume of 348 c.c. In those days of pool petrol, its compression ratio was 9 : 1. It remained virtually unchanged for 1949, although its output was increased by 2 b.h.p.

In 1950, the flywheel weight was reduced and a sump plate and gauze added to protect the scavenge pump. At this time, too, the delivery pump was modified, all existing engines being given attention. A larger head to the inlet valve was specified, together with a smaller ($\frac{7}{16}$ in. diameter) stem.

A number of minor changes were instituted in 1951. A new design of inlet cam was successfully developed and is still in production. The inlet valve guide was fitted with an "O"-ring oil seal to improve combustion chamber cleanliness; the head of the exhaust valve was also modified. The exhaust pipe was shortened and the timing side bearing keyed. The compression ratio was increased to 9.5 : 1. In 1952, roller cam followers were fitted to the rockers and the compression ratio increased to 10 : 1.

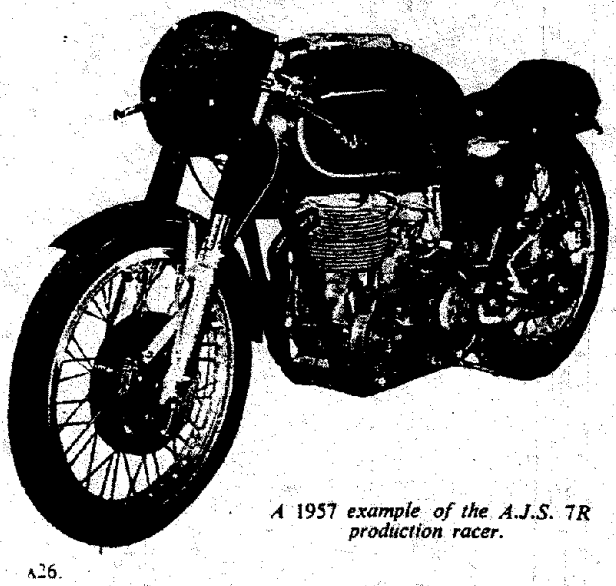
The first major changes were made in 1953, however. The drive-side mainshaft was modified and the breather changed. A new cylinder head with a closer included angle between the valves and a revised cam oil feed reached the production line. On the exhaust side, the valve was sodium filled and the pipe flanged. The con.-rod section was also improved. Both sets of main bearings were sleeved to improve stability, the primary chain line offset was reduced and the mainshaft shock-absorber dropped.

Minor changes to the lubrication system inaugurated in 1953 were designed to afford better oil control. The principal one was the by-passing of the crankcase by oil falling under gravity from the valve gear to the sump.

The following years saw little change until 1956, when the bore/stroke measurements were altered, the dimensions becoming 75.5 x 78 mm., giving a displacement of 349 c.c. The double bearing on the timing side was introduced and the inlet port modified.

The 1957 engines are structurally unaltered, though the output has been further increased. Present-day acceptance figures run at not less than 37.5 b.h.p. at 7,400 to 7,600 r.p.m., the output rising rapidly with brake running time, and still more with extra running in use.

This year's production, taking place, as is normal, before the start of the season, will bring the total number of "Boy Racers" produced to a round 350.



A 1957 example of the A.J.S. 7R production racer.

Dismantling the Engine

After removing such obvious items as oil pipes and the rev.-counter gearbox, the first step is to take off the rocker box, a one-piece magnesium alloy casting. Remove the six cheese-headed 2BA screws on the exhaust rocker cover and the five similar screws on the inlet rocker cover, as well as the one remaining inlet screw (in the top left-hand corner), which is of the Allen type to give clearance under the head steady. The two covers are then free.

To release the chaincase outer cover, remove 15 long and nine short 2BA cheese-headed screws. This exposes the camshaft drive; to take off the rocker box it is not necessary to remove the inner half of the chaincase. Both of the right-hand-threaded nuts on the camshaft must be unscrewed to free the top sprocket, the peg plate and the sprocket sleeve (hub). Mark the holes in use in the vernier coupling to assist reassembly, and pull off the components, perhaps using a screwdriver for leverage. No extractor is required. Now remove the magneto pinion nut, vernier and gear. It is not necessary to remove the hub.

Provided the engine has been placed on TDC on the compression stroke (to ensure that the valves are seated) the 12 $\frac{1}{4}$-in. screws and the four central bolts can be removed to release the rocker box, which can then be "wiggled" out. It is not necessary to remove the inner half of the chaincase; the rubber "O"-ring between the case and the box may cause a little "stiction," but nothing more. It is advisable to take out the 12 trunnions from their tunnels in case they get lost. Shimming between the box and the head is often used; if found, it should be preserved, for it controls camshaft chain tension.

If it is desired to leave the valve timing undisturbed, it may be accomplished thus: Set the crankshaft so that the piston is on TDC on the compression stroke. Now remove the small right-hand-threaded nut on the end of the camshaft. Take out the tensioner blade and spring. Next release the rocker box. Tilt the box and pull off the sprocket sleeve, complete with the camshaft sprocket, the peg plate and the big nut, leaving the chain on the sprocket. Pass a length of wire through a link of the chain to secure the chain to the sprocket.

Undo the four $\frac{1}{4}$-in. Whit. cheese-headed screws to ease the oil-pump housing off the shafts in the magneto pinion train; two captive dowels are used for alignment. Mark the bottom camshaft gear and half-time pinion and remove the top and bottom camshaft

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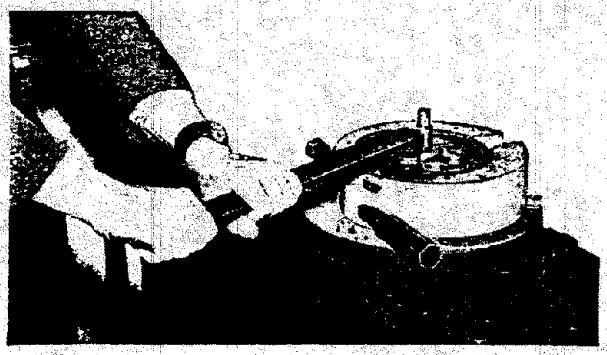
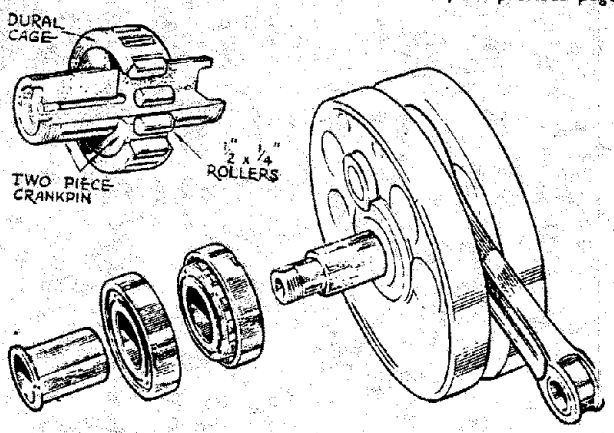




(Above) Tightening the flywheel nuts with the aid of the specia jig which the factory uses to secure automatic shaft alignment. (Top right) The two-piece crankpin. (Right) Support for the timing-side mainshaft takes the form of two roller bearings, one of which has a fixed track for flywhee' location.

timing-side wheel first, making certain that the oilways are in line. To get the pins right home, a powerful press is a distinct advantage.

During wheel alignment, the nuts are tightened with a 4-ft.-long spanner—really tight. The wheels are checked at the shafts, off bearings, to a standard at least as high as .00075 in. total run-out, though .001 in. is sometimes acceptable in a really obstinate case.

When alignment is as correct as it can be and the nuts are fully tight, the hexagonal part is cut off via the slot provided. The wheels must be shielded to prevent the ingress of any swarf either to the big end or down the hollow timing-side mainshaft. The "nuts" must then be filed smooth and flush with the unhardened pin, any swarf being dug out of the part-exposed uppermost thread.

Crankcase Attention

All 7Rs have sleeves inserted into the timing-side main-bearing housings, and on the late-type engines in the drive side also. The steel sleeves are machined after insertion and must never be disturbed, replacement being a "works" job; they are retained by recessed Allen screws.

Within these sleeves, where used, are located the outer tracks of the main bearings. On the timing side, the outermost roller bearing has a fixed track for flywheel location, while the inner roller bearing is free. Drive-side support takes the form of two sets of rollers working in a common cage and outer track.

The actual outer track of each bearing is gripped in the steel sleeve by means of two special washers, which bed down under the pressure of a countersunk Allen screw against the sleeve, and special scallops ground in the edge of the bearing.

To take out the races it is only a matter of removing the screws and washers, heating up the case and pressing out the bearing(s) from the outside by means of pins inserted in the three external holes provided for the purpose.

In early motors, a phosphor-bronze turning is pressed into the outer part of the bore of the drive-side case to act as an oil seal; later engines dispensed with this, the steel bearing sleeve being thickened and suitably machined at this point. Faulty inserts must be replaced and reamed to 1.446 ± .0005 in. diameter.

Press the drive-side common outer track into a warmed case up to the end of its recess and replace the security devices. Examine the cage and the rollers for damage. Two steel cups are used for retention purposes and should be offered up as shown in the illustration in Part II of this article.

On the timing side, the outer fixed-roller bearing is pressed in up to the recess and then followed by the outer track of the free-roller bearing, care being taken that the scallops line up with the washer recesses. (The case is, of course, heated.) Insert the two security devices. Offer up the rest of the inner bearing.

In the timing-side crankcase, above the mainshaft bearing, is a small ball bearing which supports the shaft for the lower sprocket of the camshaft drive. If it is worn, it should be renewed by the simple expedient of pressing it out, and a new one inserted while the case is warm. No security device is used. There is also a phosphor-bronze bush for the "idler" wheel spindle that can be pressed outwards. A new one must be line reamed with the pump plate in position and taken out to such a size that its spindle is a snug yet free-running fit.

Upon assembly of the wheels in the cases, a final inner sleeve is inserted into the centre of the timing side main bearings, this sleeve accepting the actual mainshaft. One end is flanged; it should be outermost.

No shims are used either to set endfloat or to centralize the rod in the bore. Careful design and manufacture ensure that, with correct assembly, these factors must be right, just as endfloat of the rod on the crankpin is automatically obtained. Flywheel location is achieved by the nut on the mainshaft pinion pulling the whole assembly hard over against the fixed-roller timing-side bearing designed to take this thrust. At this stage, the pinion can be inserted; be sure that the keys are in sound condition. It is not necessary to remove the keys to carry out any of the servicing.

Piston and Barrel

With genuine A.J.S. spares, all clearances and fits will be correct when new parts are installed. Rings are supplied ready gapped and it is by no means a "must" to check the parts. On early pistons, two compression rings and a two-piece scraper were used; later, when the bore/stroke ratio was made "squarer," a single Dykes compression ring and a two-piece Wrights scraper ring were introduced. Owing to the change in dimensions, pistons and other relevant parts are not interchangeable.

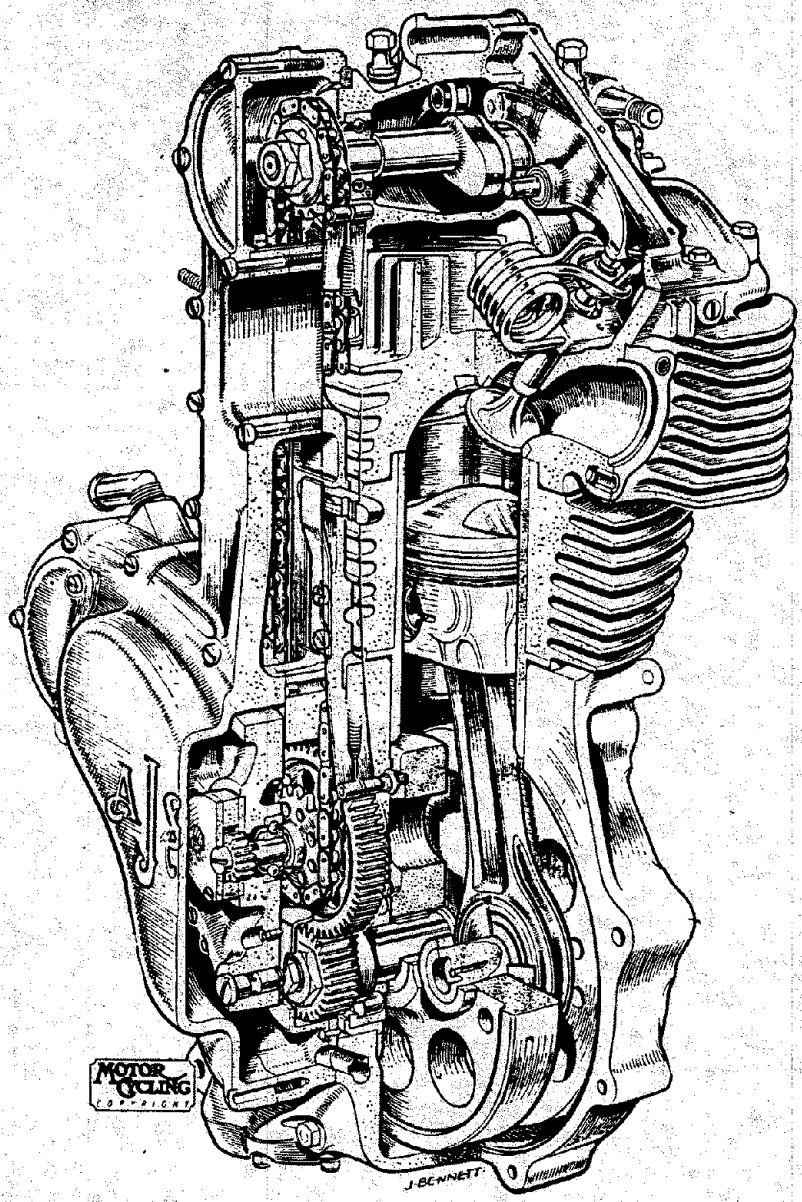
The 7R piston is domed, with sufficiently large valve pockets to ensure that, no matter what compression ratio is obtained by adjustment with compression plates at the base of the barrel, the valves cannot touch the piston. Two types are offered: one, at 10 : 1, is for petrol or petrol-benzole, and the other for alcohol gives up to 13 : 1. Lower values, up to a half-a-ratio decrease, can be obtained with compression plates; below this, it is necessary to mill the piston crown very judiciously. A limit to compression plate thickness is imposed by the distance between the two camshaft chain sprockets.

Unless the head has been blowing—and it will show visible evidence of this—the head-to-barrel joint need not be reground. If it does need regrinding, however, two alternative procedures are possible, depending on the type of barrel in use. On the ungrommeted variety, to ensure oil tightness, fine paste is applied both on the land of the top fin and the top of the sleeve. On the later-type barrels, fitted with rubber grommets for the internal oilways, fine paste is used on the top of the sleeve *only*; in service, the head-to-barrel joint will appear to have a slight gap immediately above the top fin.

Such grinding as may be necessary is carried out during the servicing of the head and it is performed with a part-arc motion around the normal fitted position of the parts.

Fitting the piston and barrel at this stage means that the engine can be turned without fear of the con.-rod threshing about. No paper gasket or jointing compound is used at the cylinder/crankcase joint, whether or not compression plates are used.

(To be continued)



A "Motor Cycling" artist's cut-away drawing of the A.J.S. 7R racing engine. The 1953 version is shown; the general arrangement has remained essentially the same from 1948 to the present year, although successive detail improvements have yielded steady increases in power output. Plainly visible here are the domed piston and the roller cam followers to the rockers. In the centre of the chaincase is a pressed steel strip which exerts pressure on the damper of the tensioner blade. Also shown, below the bottom sprocket, is the strip-steel stop that prevents the chain from dropping off the sprocket during overhaul.

sprockets (if this has not already been done) and also the chain as a unit. Then wire the bottom sprocket to the chain if it is desired to preserve the timing.

Leaving the chaincase *in situ* at this stage, undo the four reduced-hexagon ¼-in. nuts and lift off the head. To release the barrel, slacken the two bolts on the drive-side case at the top of the register and the magneto-strap bolt to free the deep cylinder spigot. The barrel can then be pulled out.

Before removing the piston, undo the left-hand-threaded nut holding the timing-side pinion to its mainshaft, the pinion being trapped at this stage. Leave the two No. 3 Woodruff keys in place in the shaft—for no operation whatsoever need they be taken out.

The free-fit gudgeon pin can easily be pulled out of an unheated piston by hand after the drive-side circlip has been prised out (circlips may be used more than once). It may be noted at this juncture that the inlet-valve pocket is slightly larger than that of the exhaust; the difference is by no means great and the piston might usefully be marked inside the skirt.

The inner half of the chaincase may be removed after 10 ¼-in. Whit. cheese-headed screws have been undone; the case is also located by two captive dowels. The mainshaft pinion is now exposed and as it is not tight can be levered off.

Before splitting the cases, the magneto straps, the magneto and the sump plate must be removed. Two bolts retain the straps, which should be marked to ensure that they are correctly replaced. Five ¼-in. nuts hold the sump plate in position over a paper gasket.

To part the cases, take out the three Allen screws (fitted with self-locking nuts) and two register bolts. Lift the timing-side case off the flywheels and pull the wheels out of the drive-side case.

Flywheel Servicing

Before the flywheels are separated, the big end should be checked for "up-and-down." A barely perceptible amount is permissible; anything more calls for replacement. The check should be carried out with an oil-free assembly.

To part the flywheels (perhaps to inspect the bearing cage) the big-end "nuts" must be removed by carefully drilling and chiselling, for the hexagonal part is sawn off on assembly. Two diametrically opposed 5/32-in. drill holes, ¼ in. deep, are made in the "nut," in line with the crankpin, and the holes chiselled until the "nut" splits. The threads on the crankpin can easily be damaged by a momentary slip! The tapered pin is a heavy interference fit in the wheels and access to a press is necessary to extract it.

The bearing cage should be carefully examined for any flaws, whether prominent or in their early stages, and renewed if necessary. Cages are available as spares. The roller track on the crankpin should also be scrutinized for blemishes or wear, particularly in the neighbourhood of the two oil holes. The cage may also have scuffed the track, in which case the pin must be renewed. Similar remarks also apply to the rod; this should also be inspected for any nicks which might be the source of an eventual fracture, and if found, they must be carefully polished out.

If the two thrust washers are unduly worn, they should be replaced by new parts; reversal is not condoned.

Check the fit of the gudgeon pin in the small-end bush; the pin should be freely floating yet snug-fitting. Any "up-and-down" calls for new components, though a new pin may rectify matters temporarily. To carry out a 100 per cent. repair, the rod must be returned to the "works" for reconditioning.

Small-end bushes are ground out to size after replacement, and reaming by a private owner of a home-made bush is not advisable. Rods are also re-heat-treated as a precautionary measure and to remove any stresses that may have developed. All rods for a given year are fully interchangeable, as are the gudgeon pins.

As a two-piece crankpin, with matching parts, was introduced in 1950, owners ordering spares should quote the year and engine number. Late-type parts cannot be fitted to early motors.

When reassembling, fit the pin into the drive-side wheel first; on late-type engines, a key then automatically assures alignment. Earlier engines without the key necessitate assembly in the

(*Continued overleaf*)