"DO-IT-YOURSELF SERIES" No. 12 - - by BERNAL OSBORNE

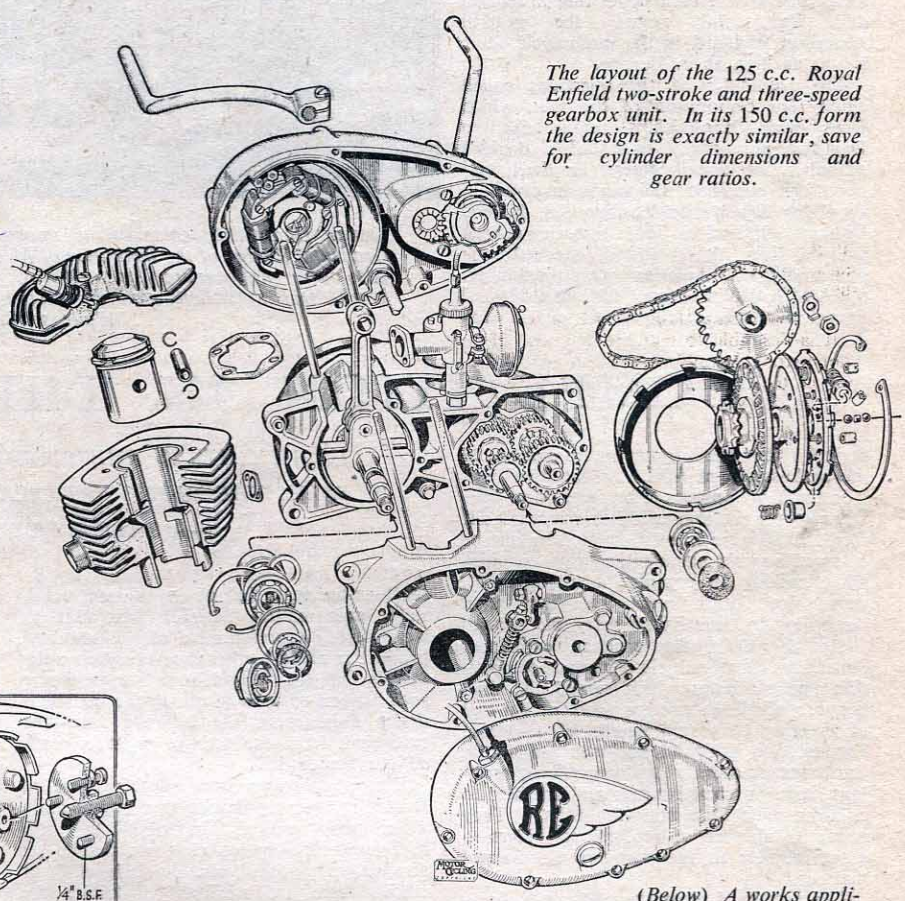
The Single-cylinder Two-stroke
"ENSIGN II"
ROYAL ENFIELD

Maintenance and Technical Data for a Long-established Lightweight with Universal Design Features

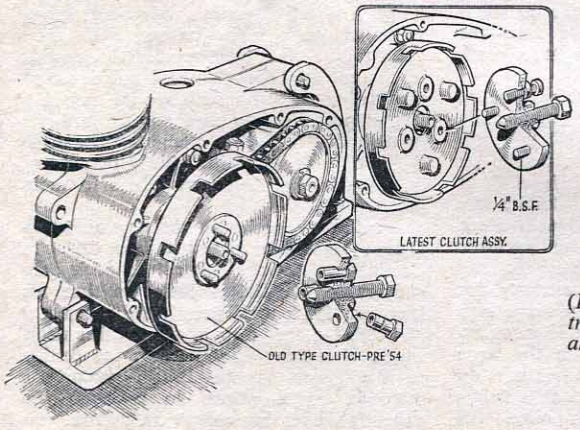
IT might be said that the Royal Enfield "Ensign" goes back historically to the "RE II," a Redditch-made machine which, in turn, carried on the line of W.D. two-strokes and, before them, the pre-war unit construction job of 125 c.c.—the first of its kind to make an appearance in this country. Many components of the current "Ensign II" are, in fact, similar to those of its forerunners, but the model was substantially redesigned in 1952, when the bore and stroke dimensions were modified to 56 mm. and 60 mm. respectively to provide a 148 c.c. swept volume.

In both forms—as a 125 c.c. and as a 150 c.c. model—the unit has become well known for originality of design, the most outstanding feature of which is the employment of an engine-shaft clutch. Here the engine sprocket and insert plate are integral (riveted together) and, being free to float, transmit torque only when under spring-pressure contact with the driven plates abutting on each side. One is the back plate, a bell member, slotted at the edge to accept the tongued rim of the outer spring carrier plate. The other is the clutch driving plate. Relieving spring pressure (by operating the clutch lever) extends the sandwich-like assembly, freeing the back plate from the insert component, so that while the complete clutch assembly continues rotating with the engine-shaft, the drive is not transmitted at this stage to the sprocket and primary chain. Also unusual at the time (though other designs have now drawn level) was the use of a remote ignition coil, the advantages of which are dealt with later.

The unit, generally, is an easy one to overhaul completely with a minimum number of special tools. Those shown and described are Works recommended but are not entirely indispensable. A good vice is necessary, particularly if it is proposed to tackle the renewing of the big-end, in which the crankpin is a press-fit with the webs.

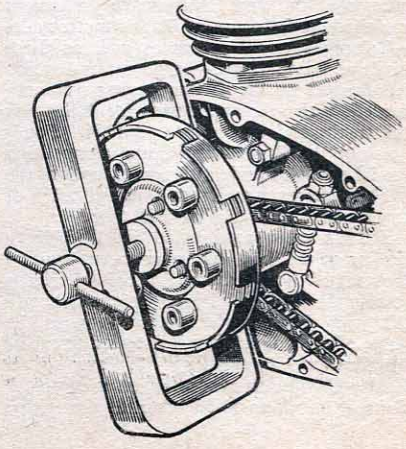


The layout of the 125 c.c. Royal Enfield two-stroke and three-speed gearbox unit. In its 150 c.c. form the design is exactly similar, save for cylinder dimensions and gear ratios.



(Left) Clutch body extractors for pre-1954 and current assemblies.

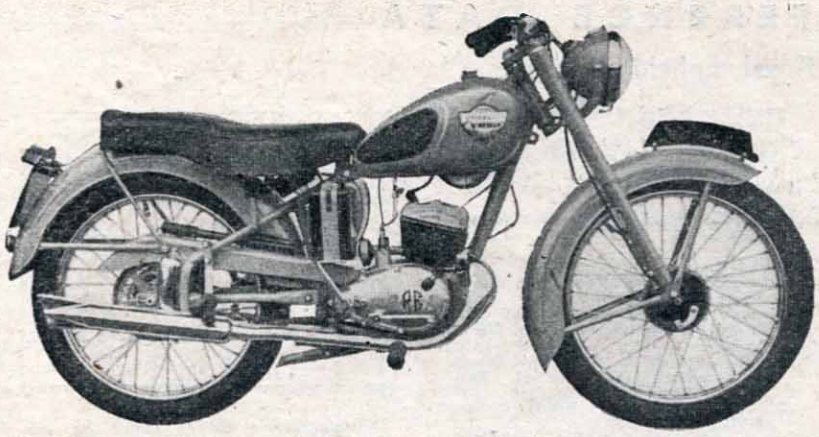
(Below) A works appliance for compressing the clutch assembly to release the circlip.



Special Tools

The most elaborate appliance is the Enfield Company's tool No. E4889, employed to push in the clutch pressure plate, relieving the big retaining circlip while it is removed from the groove in the bell housing. As a substitute, it is feasible to make up three plain sleeves, each to take a ¼-in. diameter B.S.F.-threaded bolt. With washers under the heads of the bolts, which are screwed into the tapped holes of the three driving bosses, the sleeves bear down on to the spring carrier plate and relieve presure of the circlip in the same way. A somewhat similar bolt-type extractor is recommended for breaking the taper-fit of the clutch driving plate and engine shaft.

Seasoned D.I.Y. workers will recognize the simple kit for renewing a small-end bush, but it is re-illustrated here as a reminder to the less experienced. And there is a useful Works screw extractor (to take



Neat, simple, straightforward—in these words can be summed up the two-stroke Royal Enfields, an example of which is pictured above.

off the rotor body, keyed to the engine shaft), thread dimensions for which are shown as a guide to the home gadget maker.

Dismantling Procedure

It is desirable to take the unit out of the frame straightaway because, due to the location of the primary drive behind the engine-shaft clutch assembly, and the screening of the final-drive sprocket by the generator housing, the usual dodge of locking the sprockets to facilitate the slackening of the shaft nuts is not expedient. Stripping down is simplified by the manufacturer's method of securing the cylinder head and cylinder to the crankcase with four through studs and nuts. There is no head gasket and no arrangement of cylinder-base flange nuts, but a cylinder-base washer is fitted.

Take off the drive-side cover (nine screws) with the quick-thread clutch-thrust mechanism and return springs. Five screws and one nut secure the generator cover and kickstarter housing on the other side of the engine; the K.S. crank may be left in position, but the gear control pedal must be removed from its splined shaft before the cover will come away. A nut visible just forward of the K.S. crank secures the K.S. ratchet spindle and may be left undisturbed; so may the contact-breaker cam—although it, together with the C.B. mechanism, may have to be readjusted after assembly later on. The cam is threaded to take a $\frac{5}{16}$-in. B.S.F. bolt as an extractor.

Application of the screw-type rotor extractor is called for at this stage and then work on the clutch may begin. After the retaining circlip and spring carrier have been removed, draw the driving plate off the tapered shaft and prepare to take away the primary chain, which is of the endless type, complete with both sprockets. This, of course, involves first slackening the nut at the extremity of the gearbox mainshaft and the extracting of the driven sprocket by means of a proprietary claw-type puller. Note that the engine-shaft sprocket bears on a bronze bush behind which is an oil seal.

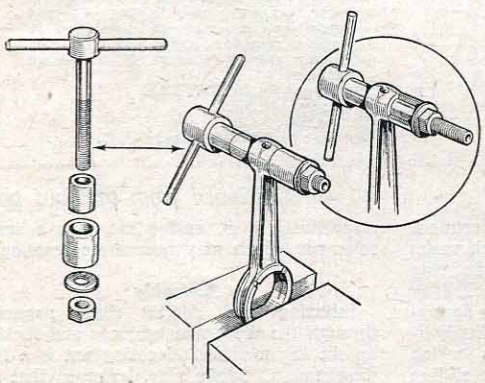
Dismantling is continued by removing the kickstarter ratchet nut, the final-drive sprocket locking screw and nut, and then the sprocket. On the opposite side of the unit, the footchange pawl mechanism is mounted on the tapered end of a cross-shaft and secured by a nut which should now be slackened: the circular retaining plate should be taken away and the shaft driven out until the pawl body is freed. Three Allen screws (set around the gearbox mainshaft boss on the generator side) and four studs and screws within the generator housing secure the crankcase halves, which are dowelled and which may now be divided by removing the off-side casting, giving access to the engine mainshaft and gear cluster.

On the near-side, the engine shaft is still locked in position by a large nut screwed up to the outer bearing location. This nut should now be removed, the shaft withdrawn and the bearings, if they are in need of attention, tapped out after the surrounding metal has been pre-heated. There are oil seals and compression-retaining washers at the ends of the crankshaft and, on the drive side, a locating circlip is positioned between the two bearings.

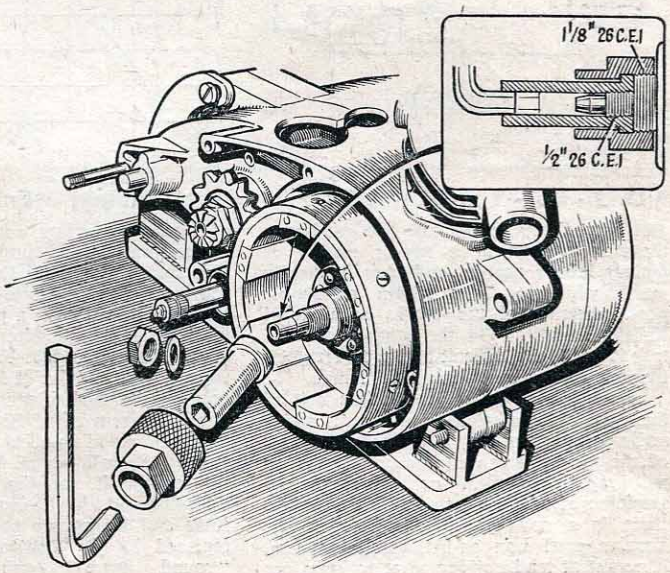
Owners whose engines show signs of big-end wear might wisely take advantage of the manufacturer's replacement service. Those who, lacking ready access to Redditch, may wish to tackle the work themselves, can set about it by rigidly supporting one web and, from the supported side, driving out the crankpin complete with the connecting rod and second web. This method must be adopted because the crankpin is stepped and cannot be pressed right through at one go. The pin is driven out of the second web as a separate operation.

Replacement pins are supplied to standard size. Assembly is a reversal of the dismantling process, using a powerful vice to engage the pin and one of the webs and then to press up the second web against the assembled rollers and thrust washers, leaving an essential side clearance for the connecting rod of .008/.015 in. Note that, if this work is necessary at all, it is usually essential to fit up a new crankpin with new rollers and a new connecting rod, and that the finished job must be trued at the shafts to within

(Continued overleaf)



No special skill is needed to make up this small-end bush fitting tool.



(Right) Application of a screw-type withdrawal tool for the generator rotor body.

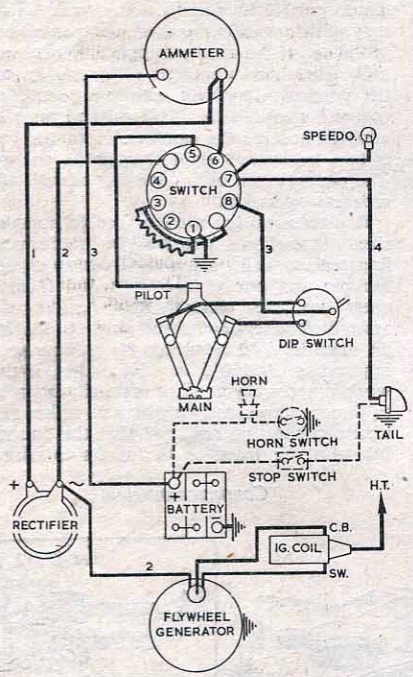
REFERENCE DATA

Royal Enfield "Ensign II"

CYLINDER-PISTON GROUP
Bore : 56 mm.
Stroke : 60 mm.
Swept volume : 148 c.c.
Rebore to .015 in. (first) and .030 in. (second) O.S. when maximum wear exceeds .008/.010 in.
Compression ratio : 6.5 : 1.
Piston/cylinder clearances :
At top land 2.1839/2.1859 in.
At bottom land (below groove) 2.1729/2.1831 in.
At skirt (bottom) 2.1999/2.2009 in.
At skirt (top) 2.1979/2.1989 in.
Piston ring gap : .008/.012 in.
Piston ring depth : .250 in.
Permissible vertical play : .005 in.
Gudgeon-pin diameter : .4958/.4960 in.
Small-end bush diameter : .4965/.4970 in. bore by .628/.630 in. O/D.

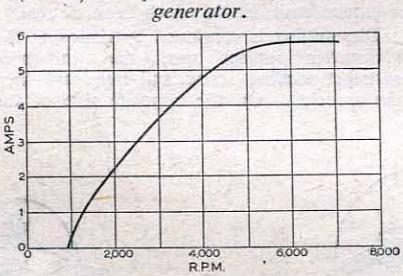
ENGINE-SPROCKET FLOATING BUSH
Ph. bronze, .6140/.6145 in. bore by .9865/.9870 in. O/D.
Diameter of shaft : .6127/.6131 in.

CRANKSHAFT GROUP
Crankpin track diameter : .7234/.7238 in.
Con-rod, big-end diameter : 1.2234/1.2238 in.
Permissible side play : .006/.012 in.



(Left) Wiring diagram of the "Ensign II's" rectifier set with flywheel generator.

(Below) Output curve of the a.c. generator.

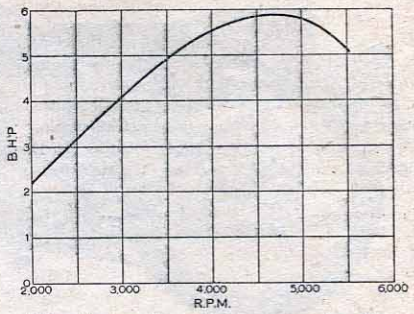


Type of big-end bearing : ¼ in. by ½ in. single-row roller (12 off).
Main bearings : SKF ball journal type 6204, 20 mm. bore by 47 mm. O/D by 14 mm. (4 off, two per shaft).
Left-hand threads on engine components : None.
Location of contact breaker : In right-hand engine cover

GEARBOX
Sleeve-gear supported by SKF 6204, 20 mm. bore by 47 mm. O/D by 14 mm.
Mainshaft bearing at primary-drive end : SKF 6301, 12 mm. bore by 37 mm. O/D by 12 mm.
Layshaft supported by : Plain ph. bronze bushes pressed into crankcases, .5000/.5005 in. bore by .688/.691 in. O/D.
Kick-starter spindle bush : .750/.751 in. bore by .8775/.8780 in. O/D.
Internal reductions : 1 : 1, 1.8 : 1, and 3.12 : 1.
Left-hand threads on gearbox ; None.

TRANSMISSION
Sprocket sizes :
Engine : 14t. by ⅜ in. pitch by .210 in.
Primary drive : 29t. by ⅜ in. pitch by .210 in.
Final drive : 14t. by ½ in. pitch by .189 in.
Rear wheel : 47t. by ½ in. pitch by .189 in.
Primary chain : Renold 110038, ⅜ in. pitch by .225 in. by .250 in. roller (46 pitches).
Secondary chain : Renold 110044, ½ in. pitch by .205 in. by .335 in. roller (111 pitches).
Gear Ratios : 6.95, 12.0, and 21.7 : 1.

WHEELS
Front : WM 0-19.
Brake diameter : 5 in.
Spokes, brake side : 7 7/16 in. by 12g. (18 off).
Spokes, plain side: 8 13/16 in. by 12g. (18 off).
Hub bearings : SKF type 6200, 10 mm. bore by 30 mm. O/D by 9 mm.
Rear : WM 0-19.
Brake diameter : 5 in.
Spokes, brake side : 7⅞ in. by 10-12g. butted (18 off).



Manufacturer's output curve for the 148 c.c. engine of the "Ensign II".

Spokes, plain side : 8 11/16 in. by 10-12g. butted (18 off).
Hub bearings : SKF type 6200, 10 mm. bore by 30 mm. O/D by 9 mm.

FRONT SUSPENSION
Telescopic type, carried on cupped head bearings, comprising 44 3/16 in. diameter balls (22 each race) with 1.375 in. pitch circle.
Compression springs : 32/33 lb./in.
Fork angle : 27°.
Trail : 3½ in.
Fork top-up content : approx. 1 fl. oz. per leg., S.A.E. 20 oil.
Slider bush dimensions (ph. bronze):
Main tube bush, 1.123/1.124 O/D.
Slider tube bush, 1.000/1.001 in. bore.

REAR SUSPENSION
Swinging-fork assembly, with 8½ in. coil spring in compression and 6½ in. coil spring in tension : 250 lb. loading.
Pivot spindle M.S. tube .7485/.7490 in. O/D, pivoting direct in cast-iron lug on frame, .751/.752 in. bore.

CARBURATION
Amal type 223/6 carburetter ; ⅜ in. choke ; 100 main jet ; .1075 needle jet ; .107 needle in No. 3 groove ; No. 5 throttle slide.

LUBRICATION
Petroil, 24 : 1 admixture.

ELECTRICAL EQUIPMENT
Miller 6v. flywheel generator unit with 6-pole rotor, energizing two lighting coils and single ignition coil with connection in series to remote H.T. coil. 6v. 8 amp. hr. battery charged through Miller ½-wave rectifier.
Headlamp : 6v. 24/24W. S.B.C.
Pilot : 6v. 3W. S.C.C.
Tail 6v. 3W. S.C.C.
Speedo : 6v. 1.8W. (.3 amp.) M.C.C.

"DO-IT-YOURSELF"—Royal Enfield "Ensign II"

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.001 in. Carrying out the job at home, therefore, results in a saving merely of factory labour charges and may be hardly worth while to those within reasonable postal distance of the Works or a Royal Enfield stockist. On the other hand, the task is not really difficult and provides good training for an ambitious D.I.Y. man.

In considering an engine-gearbox unit of this type, transmission topics must necessarily precede assembly work and inspection of the gear cluster and change mechanism will rapidly confirm or confound any suspicion of advancing wear. For instance, there is a rod-type linkage between the circular pawl box and the selector arm. A persistent tendency for gears to jump out of engagement points to incorrect adjustment of the spring-loaded turnbuckle which varies the effective length of the main connecting rod in the linkage assembly. Controlled by this mechanism, plus a positive-stop spring-located plunger, the selector arm carries half-moon-shape phosphor-bronze pads which engage with annular grooves in the sliding gear member and, if gear selection has been unreliable, renewal of the arm complete with pads will probably effect a cure.

Both the ball journal bearings supporting the mainshaft can be replaced without difficulty and the bushes carrying the lay-shaft and kickstarter spindle also may be replaced by the amateur mechanic. The "round figure" bush dimensions are respectively ½ in. and ¾ in., plus a small tolerance which may necessitate reaming.

Assembly

Inserting the engine shaft assembly through the drive-side bearings and locking up the big mainshaft locating nut is a first requirement. Make sure, however, that the circlip, the compression and locking washers and the oil seal are in position. Now re-fit the gear cluster and connect up the change mechanism, leaving the final adjustment of the rod linkage until later. Carefully slide the opposite half of the crankcase on to the dowel points, first checking that the generator-side assembly of two bearings, a compression washer and an oil seal is in

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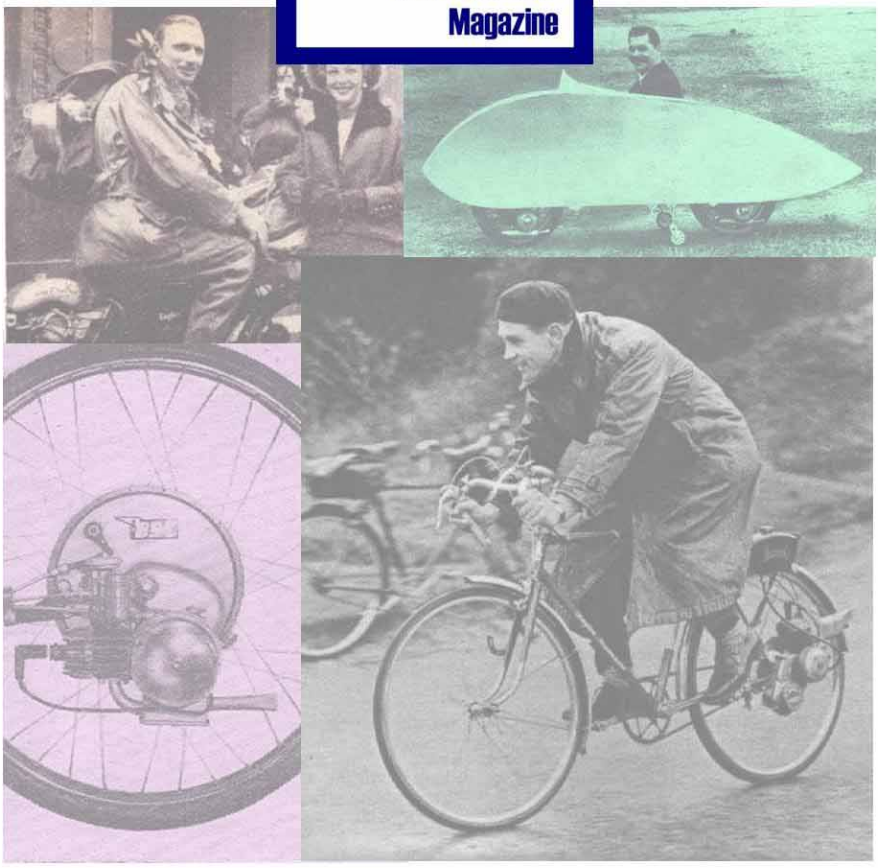

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