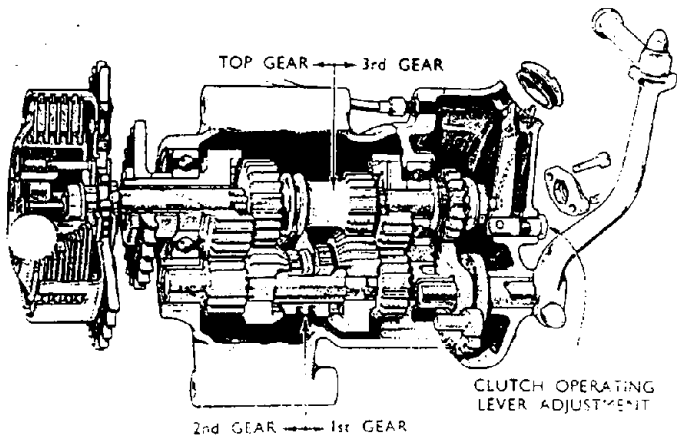


SERVI-SERIES by **BERNAL OSBORNE**

Overhauling the
BURMAN
GEARBOXES

Routine Applicable to a Series
of Generally Similar Design

THE Burman gearboxes dealt with here were used over a period of 21 years, from approximately 1933 to 1954. The basic model was the type "C"; later it became the "CP" and, in that form, was fitted to motorcycles with engines developing up to 17-18 b.h.p., which included many pre- and post-war 250 c.c. and 350 c.c. roadsters. The type "BAP," a gearbox of similar design, embodying larger bearings, shafts and gears, was listed as a transmission unit for engines with an output of up to 35 b.h.p. It is the "CP" version which survives in large numbers.



Cutaway impression of the "CP" type box and standard clutch, showing gear movements to obtain the four ratios.

notably on ex-W.D. Matchless and Ariel models and also on 250 c.c. and 350 c.c. Panthers made up to 1954.

Over the years there has been detailed change and improvement. Most significant "mod." probably, was the use post-war of a Gaco oil-seal at the sleeve-gear ball journal bearing. Previously a fibre-ring seal was used, but its efficiency was not 100% and, for that reason, grease was recommended as lubricant.

This arrangement called for constant inspection and replenishment to compensate for grease "flinging" to the walls

of the box remote from the working parts. The addition of small quantities of oil as a safeguard was satisfactory until the viscous grease/oil mixture seeped past the felt ring and was lost. It is feasible to fit the Gaco seal to any "CP" shell and so convert an old gearbox to modern oil lubrication.

The points which are most likely to demand attention in this gearbox are the kickstart spring, the gear selectors, the two ball-journal mainshaft bearings and the plain bearings which carry the layshaft. For clarity, the gearbox is shown removed from the machine, but all the work described can be carried out with the box *in situ*. The clutch and mainshaft can normally be left intact.

Renovation of the drive-side ball journal bearing entails dismantling the mainshaft, clutch and final-drive sprocket, details of the work involved varying from model to model.

W.D. models were geared lower than standard machines, and details of the internal reductions of the two boxes are shown on this page. Alterations can be made by changing either the engine sprocket or the final-drive sprocket, and the resulting overall top-gear ratio is then determined by the following calculation:—

$$\text{Top gear} = \frac{\text{No. of teeth in rear-wheel sprocket} \times \text{No. of teeth in clutch sprocket}}{\text{No. of teeth in engine sprocket} \times \text{No. of teeth in gearbox sprocket}}$$

Other ratios are worked out by multiplying this figure by the internal reductions.

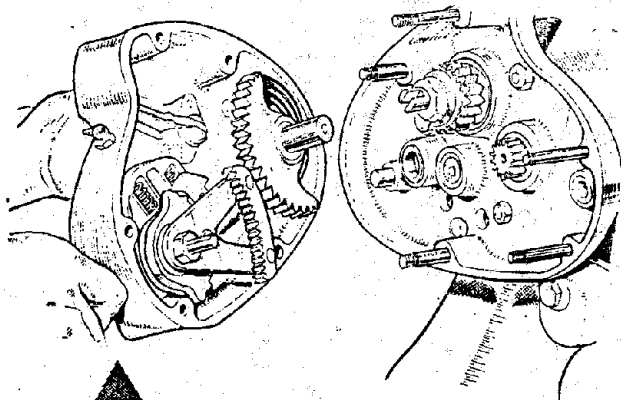
"CP" SPECIFICATION FOR W.D. MACHINES

	Top	3rd	2nd	1st
Internal Reductions				
Ariel	1:1	1.51:1	2.08:1	3.17:1
Matchless	1:1	1.29:1	2.08:1	3.18:1
Mainshaft Details				
Part No	15C-12	24C-3 24C-4	23	Sliding 14C-6 18
No. of teeth	Ariel Matchless	27 29	23	18
Layshaft Details				
Part No	28C/6	25C-3	26C/5	27C/5
	Matchless	28C/6	26C/5	27C/5
No. of teeth	Ariel Matchless	19 21	27 27	32 32

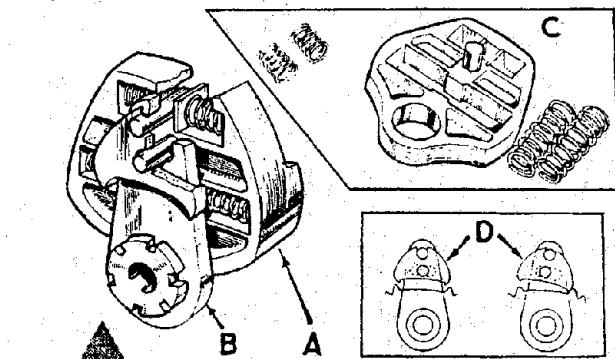
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SERVI-SERIES

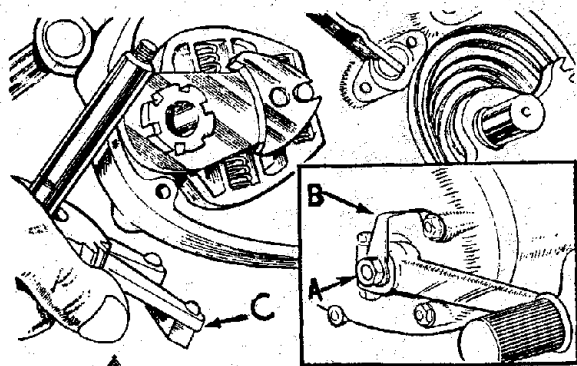
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ACCESS to the kickstart mechanism, including the spring and ratchet assembly, and to the gear selector parts, is by removing the outer cover, retained by three $\frac{1}{4}$ -in. and two $\frac{1}{8}$ -in. nuts. Use the gear pedal and k.s. crank as "handles" to pull the cover free.

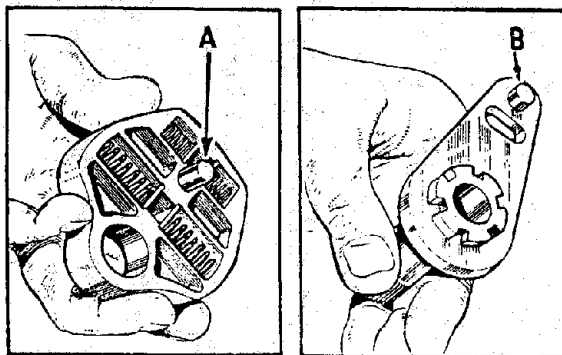


OPERATE the pedal, watching the movement of the gear selector spring-box "A" and pawl carrier "B"; wash away residual lubricant with petrol and a stiff brush and observe the action of the two sets of captive springs (shown dismantled at "C") and the two pegs in tilting the pawl "D" to move the selector ratchet.

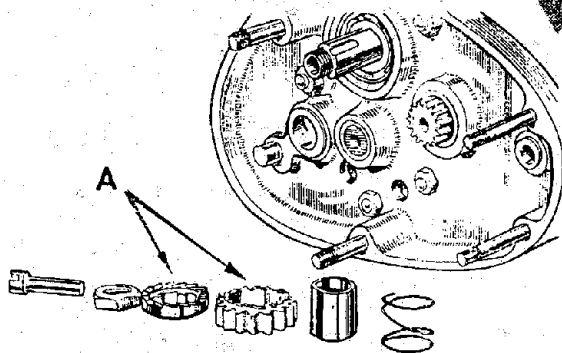


TO dismantle outer parts, slacken the nut "A" and take off the indicator pointer "B." Unscrew the pinch-bolt and pull off the lever. Turn to the inner assembly and inspect the two rivets that secure the ratchet sector to the quadrant fork ends "C"; re-rivet if slack.

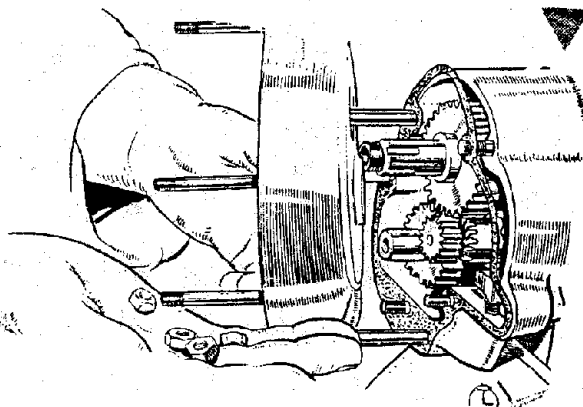
THE $\frac{1}{8}$ -in. peg "A," forming a bearing for the trip pawl, must be a tight fit. The peg "B" also must be unworn and secure. Weld or braze this peg if it is loose, otherwise gear selection will be uncertain. Wear of the small springs is unlikely, but renew either of the larger pair if more than $\frac{1}{4}$ in. under length.



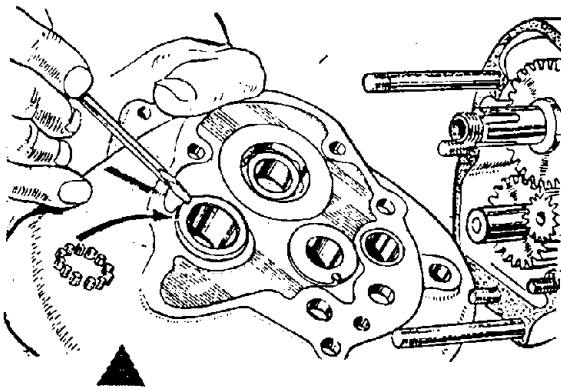
NEGLECT of a broken k.s. spring may have let the crank drop, partially engaging (and therefore wearing) the face-ratchet "A" while the engine is running. Stripping involves removing (l. to r. in sketch): clutch-thrust plunger, $\frac{1}{2}$ -in. 20 t.p.i. mainshaft nut, ratchet and pinion, sleeve-bush and spring.



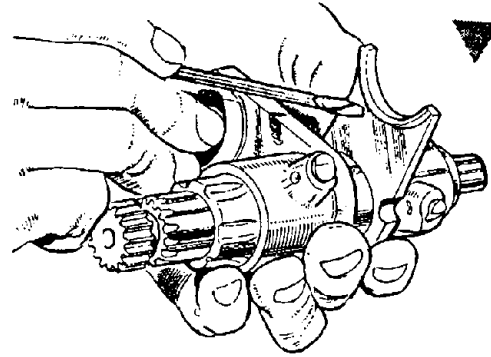
THE inner cover is retained by $\frac{1}{4}$ -in. (2) and $\frac{1}{8}$ -in. (2) nuts and studs without washers. When the nuts are removed there should be no difficulty in pulling free the cover. If the box has been used with oil as a lubricant, some residue will drip away as the seal is broken.



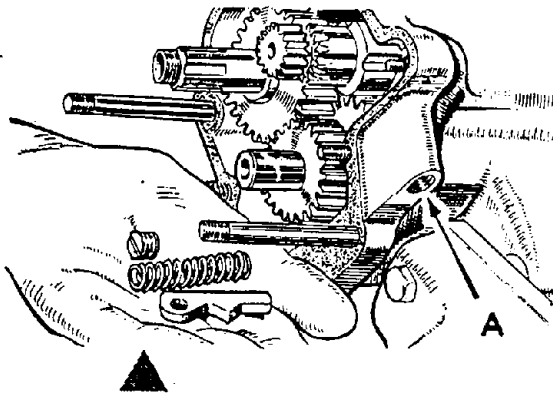
THE selector forks are critical factors in obtaining clean gear-changes. It is likely that, after considerable service, either or both forks will have become ridged. The parts cannot be reclaimed and it is necessary, therefore, to regard the assembly as a service replacement job. Wear may also occur at the two peg locations.



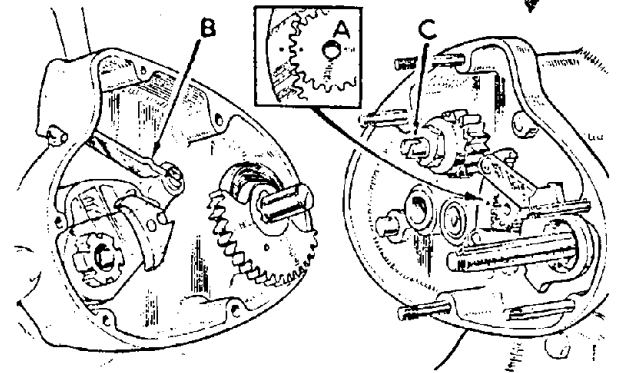
SHOWN lower left is the camshaft bearing formed by 12 rollers. These are grease-packed, but may fall out. Collect and replace, in grease, in the annular space behind the pinion when assembling. From 1942 to 1945 some boxes were produced with a phosphor-bronze bush instead of rollers.



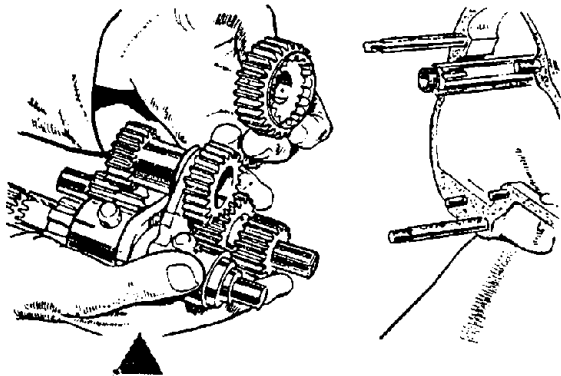
IN refitting, important details are to replace and fully tighten the plunger assembly; to insert the long clutch push-rod and to mesh cam-pinion and sector with markings in the nine o'clock position "A." Then fit the assembled cover with "B" lined up with the thrust rod "C."



BEFORE the gearbox contents can be taken out, it is necessary to extract the pointed indexing member held in contact with the cam-barrel grooves by a plunger spring and grub-screw. Gears jumping out are often the result of the grub-screw slackening. It should always be kept screwed in as far as possible at "A."



CORRECT clutch adjustment is important. For some models the adjuster is as at "A," with the lever "B" pivoting on a sleeved bolt "C." Alternatively, the adjustment is as at "D," located by the outer cap and screws "E," with the operating arm "F" floating in the cover housing to transmit thrust to the slotted rod "G."



FIRST take off the third-gear floating mainshaft pinion (shown F in the left hand), then gently pull away the main cluster (in the right hand) leaving the mainshaft intact. Inspect lubricant left in the shell base for signs of minute bronze particles which indicate advanced bush wear.

