THE SPEEDOMETER DRIVE

Main speedometer drive gearbox and mounting plate - PR32 & PR32/2
The Smiths angle drive gearbox equipped the majority of Series A machines and a number of post-war British motorcycles including all Vincents (except racing models normally sent out without speedometers) in preference to a 'direct drive' from the motorcycle's gearbox. It was claimed that a front wheel drive gave a more accurate reading because it was not affected by wheel spin during acceleration; not perhaps a very convincing argument! The real reason was probably the desire to retain the simple drive used on Series A machines, and in the case of the Twin, lack of space to accommodate the drive in the very compact engine/gearbox unit.

As fitted to Vincents, the gearbox input gear has 8 teeth and the output, for the cable drive, 12 (i.e. one and a half turns of the input shaft results in one clockwise turn of the slotted output shaft). According to the Smiths catalogue of the era, otherwise identical looking gearboxes were made, using gears with 5 and 12 teeth; another type was also made for use on left hand brake plates. Neither of these is any good on the Vincent; beware of both at autojumble sales. The outside diameter of each gear housing is some 15/16 in., (larger ones are likely to be rev.-counter boxes) whilst the distance between shaft axis centre lines is 0.560 in. On all versions the thread for the drive cable nut is 1/2 in. B.S.Cy., while the body mounting thread is 23/32 B.S.Cy..

The "long reach" gearbox PR32/2 fitted to the enclosed Series D machines is easy to recognise: the overall length of the input (pinion) shaft housing is 2.3/16 in.; on the "short reach" version fitted to all other models it is 1.11/16 in.. Furthermore, on most long reach versions the output (slotted) shaft housing is at the rear of the input shaft equivalent (i.e. the outside appearance of the gearbox is a mirror image of the short reach version). This can be seen in Know Thy Beast fig. 9, and on the jacket of Fifty Years of the Marque. Of course, this means the gears are opposite handed in order to achieve the required clockwise output and are therefore unique to enclosed Series D models.

In spite of its simple design (unbushed shaft housings, basic end-plate retention, zinc alloy body), the Smith's gearbox has proved reliable when its life has not been shortened by inadequate lubrication often due to a justified fear of overgreasing and contaminating the brake. This real risk can be avoided by removing the gearbox from the brake-plate before applying the grease gun, so that any surplus grease oozing out along the pinion shaft can be carefully wiped off. Smiths used to tie a little label to new gearboxes bearing the hopeful caption: "Leave attached for user of machine", and advising greasing every 2000 miles. But, in fact, far longer intervals can elapse between sparing applications of the grease gun.

Lack of lubricant leads to wear of the shafts and housings, and possibly to seizure. Wear of the input pinion shaft and its housing can be severe, because it is subject to side thrust unlike its vertical counterpart. There is ample metal to allow a bush to be fitted (Oiltite 5/16 in. i.d. x 7/16 in. o.d. would be ideal) but the alloy casting is awkward to hold in a lathe without some kind of fixture to locate the threaded Shank in the chuck and ensure that it is bored concentrically. It is really a job for a
skilled man in a well equipped workshop.

At very long intervals, if the shafts do not turn smoothly, or when dealing with a second-hand gearbox of unknown vintage, it is a good idea to strip and clean out the internals. To dismantle, withdraw the gearbox/pinion assembly and mounting plate from the brake-plate after removing the two 1/4 in. B.S.F. round head screws and spring washers. Pull out the pinion (originally steel, nowadays nylon) after extracting its split pin, and unscrew the mounting plate and locknut without losing the large spring washer. The dished bottom end-plate features either 4 notches or 2 holes in the flank. The retaining 1/16 in. split pin is located in two of the notches or goes through the holes; after its removal, push out the helical gear and shaft. The other end-plate (also a brass pressing) incorporates a grease nipple. It is held only by metal staked into the 4 notches. Remove the staked metal with a scraper and tap the shaft end, pushing out the end-plate and the gear itself after it.

The gears, end-plates, and the inside of the cast alloy body should be thoroughly cleaned with petrol, paying particular attention to the axial V or U groove in the pinion shaft housing. This groove retains some grease in the housing, besides helping to distribute it along the shaft. Look out for chipped teeth, not uncommon on abused boxes. Provided that damage is minor, the gears can usually be re-used. The body's internal surfaces against which the gears run take the form of raised shoulders surrounded by an annular recess which acts as a grease retainer. The shoulder should be smooth and free from burrs. Worn shoulders may cause excessive end float which can be remedied with shims slipped over the shaft.

A trial assembly can be made with the gears lightly greased but without the end-plates; with fingers gently pressed against the end faces of the gears, turn the input shaft and check for freedom of movement. Do remember that free rotation in both directions is vital, otherwise the assembly could seize the first time the bicycle is wheeled backwards. However, with gears that have run together for a long time, there is usually a difference in feel between forward and reverse rotation. Re-assemble with high melting point grease (as used for wheel bearings). Use a new split pin 1/16 in. x 1 1/4 in. long (with the head on the outside as shown on the drawing) to hold the bottom plate, and carefully stake the other plate in situ using a pin punch (not a screwdriver). Thread on the locknut, the spring washer and the mounting plate (with the 1.1/4 in. dia. boss towards the pinion end) and re-fit the pinion with a new split pin 3/32 in. dia. x 3/4 in. long. Make sure the end of the split pin cannot foul the mounting plate when the pinion rotates. Then, but not before, check that there is perceptible end-play within the gearbox; very gently tapping the pinion shaft-end is one way of obtaining the required 0.002 to 0.003 in. end-play. In fact, short of adding shims, there is no other way of adjusting the end-float. Some slight initial stiffness can be expected and, if necessary, the box can be "run-in", using a variable speed drill or in the lathe, prior to final application of the grease gun.

The gear box body(and the mounting plate) were originally finished in semi-matt black paint. A similar finish can be obtained with matt black paint intended for exterior iron work (i.e. garden gates, etc.). After replacing the assembly on the brake plate, remember to adjust it for pinion meshing (Details in Vincent Motor Cycles or Know Thy Beast). Finally, re-connect the drive cable and carefully tighten the locknut over the spring washer. It is all too easy to strip the fine threads on the gear box. Zinc alloy has a well deserved rude
name amongst uncouth engineers!

The mounting plate may be available from Vincent stockists. If not it can be copied on a lathe and need not be made from brass like the original part. A blank cut from 7/16 or 1/2 in. thick light alloy plate or from 2.1/4 in. diameter rod, is equally suitable and saves unsprung weight. A glance at the drawing shows that the threaded hole is 23/32 in. B.S.Cy. (26 t.p.i.). This is quite perverse; there was ample room to specify 3/4 in. diameter, a standard size in both B.S.Cy. and "Brass" threads (both 26 t.p.i.). The designer must have suffered from a hangover or worse on that fateful day. As it is, the required tap is very much a "Special" and would cost a fortune, so the hole will have to be bored out and screw-cut in the lathe, using a single point tool and finishing with a hand chaser. This could be Whitworth shape (55 deg., correct for 'Brass’ threads), easier to find than the 60 deg. tool theoretically required for a cycle thread.

If the locknut is missing, it can be made from a 0.920 A/F hexagonal steel bar (standard size for 9/16 in. B.S.F. nuts) using the same set up. The nut should be 3/16 in. thick and chamfered 30 deg. on one side only. The 23/32 in. single coil spring washer may prove impossible to find, but a 3/4 in. dia. washer will also fit, although less closely. The locknut, finished in "gunmetal black", and the spring washer rusted quickly; both should be cadmium- or zinc-plated.
SPEEDOMETER DRIVE GEARBOX - PR 32 & PR 32/2

PR 32

HELICAL GEARS HAVE BEEN DRAWN STRAIGHT FOR CONVENIENCE

CABLE DRIVE SHAFT SLOT (ALL MODELS)

BORE DIA. 0.280 + 0.001 - 0.000

SLOT 0.100 ± 0.002 WIDE BY 0.375 DEEP

PR 32/2

FITTED TO THE ENCLOSED SERIES D MACHINES

SPEEDOMETER DRIVE GEARBOX MOUNTING (ALL MODELS)

1/2 B.S.Cy.

23/32 B.S.Cy.
SPEEDOMETER GEARBOX MOUNTING PLATE
MATERIAL: CAST BRASS
FINISH: SEMI-MATT BLACK PAINT ON OUTER VISIBLE SURFACES ONLY

ITEMS:
1 off LOCKNUT, 23/32 B.S.Cy (26 T.P.I.) - REFER TO TEXT
1 off SINGLE COIL SPRING WASHER 23/32 I.D.
2 off ITEM 502 1/4 B.S.F. x 1/2 LONG ROUND HEAD SCREW
2 off ITEM 590 1/4 SINGLE COIL SPRING WASHER