8.3 Wheels, Hubs, and Tyres

THE TECHNICAL CORRESPONDENT'S POSTBAG

Dear Lofty,

I have sorted out many problems on my 1929 Scott Squirrel with every sign of success, in fact I'm feeling quite proud of myself. There is one thing which still bothers me and I find the advice I receive from various sources rather tends to be contradictory so I am turning to you in the hope that you can explain the difficulties and suggest a cure.

For some while I was troubled with the rear chain adjustment varying as the wheel revolved and I observed that the rear sprocket had a bit of a wobble. I tightened up the bolts that pass through the hub : this cured the wobble but only partially cured the chain trouble. The other week, to my horror, I discovered that a piece of the steel ring retaining the procket had completely vanished, along with one of the nuts !

I have been told :

(*a*) That the bolts must not be fully tightened ;
(*b*) They must be dead tight (how do you hold the heads anyway ?)
(*c*) The trouble is prevalent on this hub design and a new ring every few months is the expected order ;
(*d*) Fit cap-head screws and lock the whole thing absolutely solid.

Since there is some back-lash on the sprocket which is annoying when driving in traffic, I have been disposed to try solution (*d*) but hope that you can suggest something more satisfactory.

Yours sincerely,
E.B.G.

Dear Eddie,

Its nice to hear of someone having success come his way with one of the vintage models which can pose serious problems with the wear, tear and neglect of years having had a real "go" at their substance. We will do all we can to help on any problem that crops up.

Your particular difficulty is not insoluble but may prove troublesome on spares ; I'm afraid I cannot help here but you could try the usual Scott agents or Nick Sloan our Club Spares Registrar.

The machine you are riding has an Enfield cush-drive hub unit ; the sprocket can rotate a few degrees each way on the hub against the restraining force of six rubber blocks that are interposed between three vanes in the hub and three formed on the back of the sprocket. In good condition the blocks will only allow "half a tooth" of rotation using the full force of both hands, upon the sprocket. The ring retaining the sprocket is secured by three special bolts which have the part below the head of oval form and it is the fit in the oval holes in the ring which prevents them rotating when tightening-up.

This oval shouldered section terminates with a "countersink" taper which matches a seating in the hub. The bolt then continues with a plain section and has a cycle thread only the last ¾ of an inch.

In practice the nut pulls the countersunk surfaces together and is tightened down hard. (A spring washer may be used here). The shouldered section does not clamp the ring but gives a small clearance to allow the sprocket to move around the hub.

What usually happens, is that the hardened sprocket gets yanked around the hub when the rubbers perish and, lacking lubricant wears away the hub. The sprocket being off-set now pulls against the ring which eventually gets worn through at the weak spots at the holes, with the consequence you already know. Somewhere along the line, the bolts come loose and wear badly so that they will never be secure again. They are replaced with all manner of substitutes which have little hope of permanence.

Rings are sometimes made of heavier gauge material in an effort to ensure their survival but this removes the working clearance and resort is then made to "lock-nutting" to keep the bolts in place. The round holes invariably drilled in the rings obviously reduced the width of metal left at the weak spots.

For a quick cure, the "cap-head plus ring-spanner" system has merits if you can persuade the sprocket to sit co-axially with the hub. Of course, there will be no cush drive and chain snatch will become quite noticeable. The only other way is the "'ard way" ; and, like the sergeant said, "its ruddy 'ard" but not impossible.

Take the wheel right out, remove the bolts and attempt to get the sprocket off. If the hub is badly chewed or the rubbers have gone all doughy with age, oil and grease, there may be problems here. You'll have to play this bit by ear. If it appears impossible, try getting another wheel from Nick Sloan ; but its not likely you'll find a perfect specimen after all these years. You could try Tom Ward for rubbers, a ring and the bolts. If you can get these (if they are necessary, that is) you are halfway there. If the sprocket teeth are badly worn, try for a better one before proceeding.

Inspect the hub for damage. It is likely that the hub where the sprocket fits is still round but has been worn down so that the sprocket is loose. The cut-away portion in the sprocket bore leaves an unworn portion around the hub and it is usually this which makes it difficult to pull off the sprocket. The best thing here is to have the hub set up in a lathe and machined back to a cylindrical form. A thin sleeve is then made up to take up the excess clearance to the sprocket. Few people will tackle this without the wheel being dismantled, so unless you want to do it the really hard way, you could try the following solution which has given satisfaction on several machines.

The hub usually remains substantially round and parallel and this makes the removal of the ridge a proposition by "hand" methods. A file and quite a few hours sweat can get that ridge down level with the rest, so this is the first fatique. A touch of Alfred Scott's doggedness should see you through this bit !

Now drop on the sprocket and have a look at the clearance. Try feeler gauges and see what it measures. The exercise now is to make up a sleeve from sheet metal that will leave a reasonable working clearance. When it comes to it, however, the best approach is to get the thing on as tight as you can since the components are not dead true surfaces and clearance for the necessary few degrees of rotation will soon appear.

Sheet steel seems best for the job and material from food cans has proved successful on several occasions. Cut a strip about an inch wider than the width of the sprocket and form it into a cylinder by initially wrapping it around a U2 battery and then gradually bringing to the correct diamenter by the fingers. Trim down the length so that it just slides into the sprocket, the ends of the strip butting neatly together. Leave the sleeve projecting each side and offer-up to the hub.

By pushing, wriggling and filing down any obvious high spots on the hub it should be possible to get the thing on. "Trefolex" paste and a good pair of leather gloves help a lot on this stretch. A slight chamfer filed on the edge of the hub, will often help the operation considerably.

Snip into the end of the sleeve projecting from the inner side of the sprocket every 1/8 of an inch for a depth of about 1/4 of an inch. Bend a couple of the "fronds" outward and pull sleeve as far through as they will allow. Fold out the remainder. Trim sleeve on the outside to within 3/32 ins. of sprocket, fit to hub and peen the projecting portion out with a light hammer, proceeding round and round until a neat flange results.

Now try the bolts and clamping ring and check clearance when bolts are pulled up tight. If insufficient it may be due to the "fronds" ; if so they will have to come off and the sleeve punched internally into the groove in the sprocket bore to retain it in service. (It is a good idea to test the bolts before fitting the sleeve, if they are to hand at that time). The countersink seatings in the hub may need trueing up and metal may need to be removed from behind the bolt heads to restore clearance.

In theory, the sleeve should be peened all round into the grease groove in the sprocket but this has never been done because none of the hubs previously given attention has had a hole for the grease to emerge from the inside. Perhaps George Stevens has an ancient drawing that will show us how lubrication was effected.

Having got all the parts to fit, we come to the bitter bit! Getting it to go together with all the rubbers in place. The best (and maybe, least expected) approach seems to be to put the wheel onto the sprocket. Lay the sprocket, vanes uppermost, on top of a wooden box, with a hole cut below to clear spindle. Lay the rubbers in position on the sprocket and place the wheel on top with the vanes in the correct position. Wiggle the wheel around whilst levering rubbers if necessary, to persuade them into the hub. By rocking and rolling the wheel on the sprocket the whole lot should go together. The use of soap or rubber lubricant has never been necessary but could be used in stubborn cases.

The sleeve could be greased on assembly but obviously the supply will not last for long. The writer's answer was to lay the machine, once a month, on its side on the lawn and run a few drops of gear oil between the sleeve and the hub, also behind the ring. After 60,000 miles of this treatment the sleeve shows only moderate wear and the ring is far from dropping apart.

In spite of the previous tests for clearances, with a new set of rubbers a sprocket will often appear to bolt up solid. Fit the wheel to the machine, attach chain and slip into first gear. By pulling hard on the tyre it should be possible to make the sprocket move. If not, slacken the nuts until it will, then, proceed to pull the wheel forward and backward, whilst taking the nuts up a bit at a time. If you are not happy, take it all down again, since occasionally the rubbers get bits "skinned" off them which jam up the system. On no account leave the nuts loose. Fit stiff-nuts if you like, but they must be tightened right up!

My apologies here for suggesting something which smacks of a "botch-up." If you are replating or fitting new rims you can easily do it the tool-room way, but the "tin-can" sleeve trick really works and there is nothing to show since the flange is covered by the cap.

All the best in your Scotting.

EDITOR'S NOTE

Far be it from me, a comparative "new boy" with a mere 10 years or so of Scotting behind me, to criticise the omniscience of our Technical Correspondent. However, so impressed and fascinated was I by the contents of this, his latest, epistle, that I immediately made an inspection of my own wheels of this pattern. Most of my previous Scotts have been fitted with the Enfield "Cush-Hub" rear wheel but I'd got a nagging suspicion that they were not identical in design to those described here by Lofty. My '29 T.T. bike has the conventional Enfield wheel fitted—fortunately in good condition—and the first point which drew my attention as the assembly was taken apart was that the central bearing was, in fact, nice and greasy. Upon inspection it became apparent that it was fed by a small hole some 3/32 in. dia., drilled through from the spindle cage about ½ in. from the base of the vane housing. The only other wheel I had available of similar pattern was provided also with this hole, although, in fact, in this case it was blocked with I think, a delightful combination of congealed grease and rubber dust. It occurs to me that if this feed hole was discontinued on later models as Lofty suggests, the reason could be that of the danger of excessive grease affecting the rubber "cushes" by creeping around the rear of the sprocket bearing. However, it might be worth introducing this grease hole at the same time as the other modifications are made. The remaining problem is then, of course, that of pre-packing the hub bearings to such an extent and with suitable viscosity grease to supply just sufficient lubricant to the sprocket whilst avoiding starving the races themselves. I personally am against upwards of ½ pint of grease rolling about in the hub, in what appears rather pointless fashion. Perhaps Lofty will eventually encompass this subject in a later episode of his valuable maintenance series.

I will now return if I may to the question of the construction of the sprocket retaining ring and bolt assembly. Without exception all the assemblies of this type that I've ever inspected have been basically similar to that described here, with the exception that the bolts have in all cases been screw-driver slotted (for constraining the bolts when tightening — "Eddies" point *b*) not exhibited the shank ovality mentioned by Lofty and instead of the "countersink" have been equipped with approximately 3/8 in. of similarly dimensioned, shouldered portion.

In practice the design works in precisely the same way, the bolts when installed being pulled up hard against an abutment face provided at the bottom of a counterbored "mouth" of the hub drillings. My experience has been much the same as is detailed here, one or two extra comments not being, I think, entirely out of place. Lofty is, of course, quite correct, the nuts must be really tight and in fact the original equipment was a 5/16 in. nut, but made from 3/8 in. section material—thus the extra spanner torque. "Grover" washers were utilised under the nuts. It is particularly important that the wearing face of the sprocket is flat ; if the whole arrangement has been "locked-up" at some time and subsequently started moving again it will be quite impossible to maintain correct chain alignment for any length of time, even with the repairs described and a new or trued-up sprocket or at least one in good condition should be procured.

New cush rubbers are still available and are naturally an automatic purchase. It is as well to remember though that the three fitted rearward of the sprocket vanes come into action only under over-run conditions and can, therefore, be conveniently exchanged for those in front after a good mileage when perhaps inspecting the assembly for wear etc. Another point—on the post-vintage model the bolts and ring were no longer separate, the heads being brazed around their edges. It may be that the excessive movement of the assembly has resulted in a fracture here, explaining E.B.G.'s "holding" query. Until a short while ago the Enfield parts were still available at E. S. Motors, Chiswick W.4., London's main R.E. parts stockists (and incidentally the last suppliers that I know of those splendid "T" type Lucas batteries, which came complete with connexions, cover and clips).

OVERHAUL OF THE POST-WAR CUSH-DRIVE HUB

T. C. Windsor

Having purchased a 1958 Birmingham Scott in excellent condition, with the engine recently overhauled by Ken Lack, I was faced with the problem of overhauling the rear hub.

The situation was that the aluminium sprocket carrier had a clearance of over $\frac{1}{16}$ in. on the hub sleeve and was deteriorating rapidly. I decided that the only way to overcome any further wear was to strip out and investigate what could be done to bring it back to standard.

1. The rear wheel was carefully dismantled, all the parts being marked with centre punching or scribe lines.

2. It was found that the hub sleeve was worn unevenly over the diameter, i.e., there were ridges between the working surface and the original diameter towards the centre of the hub.

3. Having no lathe capable of swinging a complete wheel, I decided that the hub sleeve could be made of a constant diameter by some hand machining. The brake drum side of the spindle was put in the bench vice. The wheel was then spun by hand. A file was applied to the hub sleeve so as to remove the large diameter area. This process seems a little crude but considering the movement of the sprocket in relation to the hub, precision is not essential. With careful use of Vernier calipers the hub was machined parallel to finally clean up the worn areas. In order to give a good surface finish, emery tape was used. On completion, the diameter was carefully measured.

4. The next item for attention was the aluminium sprocket carrier. First all the studs are removed or at least the ones that have not already come out. It is then necessary to bore out the sprocket carrier to give a good machined bore which is parallel to the spindle. Only having a 3½ in. Myford lathe it was only possible to mount the carrier on the face plate.

Some additional holes were drilled in the plate so as to be able to bolt the carrier concentrically to the plate. Careful clocking off the sprocket flange is important to ensure a concentric bore. The actual boring operation was simple and it cleaned up leaving about $\frac{1}{16}$ in. plus wall thickness on the existing webbed sleeve.

5. It was then that the size of the mild steel sleeve could be decided. This was machined out of the solid. The O.D. made five 'thou' up on the sprocket carrier bore and the I.D. ten 'thou' under the hub sleeve. (At this point one send's one's wife out for the evening.)

Drill the grease hole through the sleeve. The new machined sleeve is then put in the deep freeze, and the sprocket carrier in the oven at maximum temperature. When all has stabilised, press the sleeve into the sprocket carrier and quench to give the shrink fit.

Remount the sprocket marrier in the lathe and bore to give three 'thou' running clearance on the hub sleeve.

6. Reassemble the hub without the rubbers. It will probably be found that the sprocket carrier has lateral movement because the aluminium has worn in relation to the stepped studs on the wheel hub. The studs should then be machined on a boss face to allow a rotational movement of the sprocket carrier in relation to the hub when the flange is bolted on. Finally check that the flange stud nuts can be fully tightened allowing the sprocket carrier to move freely rotationally.

7. CUSH RUBBERS. Preparing the cush drive rubbers. I obtained some extruded rubber section from James Walker Ltd., ⅞in x 1¼in. From this rubber one cuts out ten blocks as per the best original found in the old hub. The key to this operation is a very sharp kitchen knife and a bowl of 'Fairy' liquid in water. The knife must be sharpened after every block. Finally drill two ⅜in holes through the blocks to give resilience. (Note: Glyn Chambers can now supply these blocks, or see P. J. Davenport's article in March '75 Yowl).

8. To assemble the hub all studs should be refitted with Loctite, and stripped threads being sleeved and brought back to standard. It will be necessary to lift all the rubbers so that the sprocket carrier can be rocked in the hub. Finally grease the face of the sprocket carrier steel flange and reassemble.

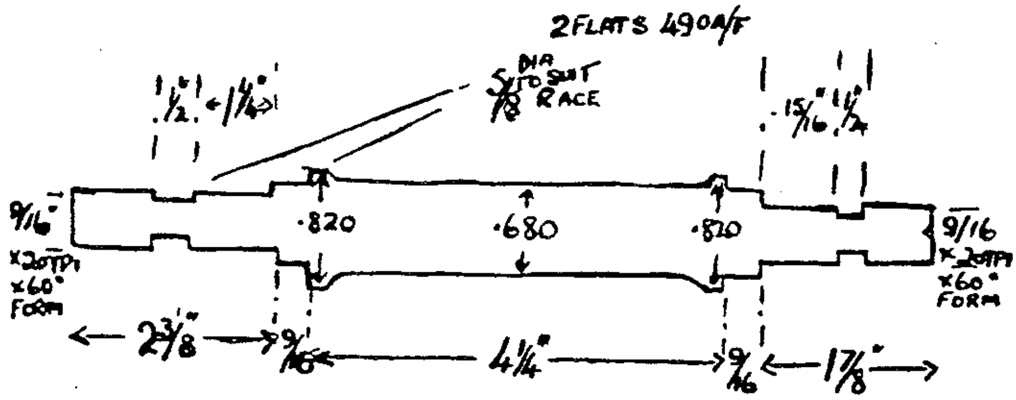
9. After completion of the wheel assembly in the frame it can be tested so that there is slight movement of the sprocket in relation to the rear wheel when attempting to kick over in gear with the footbrake applied.

ENFIELD REAR WHEELS

Jim Best.

As the rear wheel bearings in the Enfield wheels are now almost unobtainable, i.e., the taper type with the threaded centre, I enclose a drawing for the conversion to standard ball races.

The material I quote is EN8, which is what I use for wheel spindles and fork spindles. As it is important to use the right material, there is a "get-out" if you have any problem getting hold of any, go to your local breaker's yard, and get a rear half shaft from a car, and turning it from this.



2 OFF BEARINGS 1 13/16" O.D. 5/8" WIDE 5/8" BORE.
MAKERS NUMBER MS7

ENFIELD REAR WHEEL
BALL RACE CONVERSION.
(MAT. EN8 OR EQUIVALENT.)

There is story that goes with this. There was a well known sponsor tuner who had broken two rear wheel spindles on his special, though one was made of quality nickel steel, and the other made at a well known aircraft firm from material advised by their boffins. My father made one from a Jowett half shaft. It was raced in the Island and for several seasons until the type became non-competitive. He kept asking what material specification it was made from but my father always replied: "It would only upset you if I told you."

V17/10 June 1992

ENFIELD REAR WHEEL BEARINGS

The Enfield rear wheels used on Flying Squirrels from 1927 onwards (excluding Tourers with Webb wheels) are a big problem to overhaul, because the taper roller bearings with threaded centres have been unobtainable for many years. On wheels that I have had rebuilt recently I have therefore had to "modernise" and convert to ballraces. These are 1 13/16" O.D., 5/8" Wide and 5/8" Bore (Number MS7). One can either use a basic ballrace or improve things even further by using "retainer type" sealed journals. With these, no water or grit can get into the bearing, giving much improved life. One can be even more cunning, and prise out the inner retainer from each bearing, thereby allowing fresh grease to reach it from the normal centre grease nipple, although of course the hub is usually full of grease (a grease gun full!) before any reaches the bearings!

The normal felt "seals" are of course discarded, and the outer water deflector on the L/H side can be replaced with a simple spacer if you are not too fussy about appearance.

The big snag of course is that you need a new wheel spindle to suit the new bearings. I am prepared to have a batch made if sufficient interest is shown. Price will be no more than about £30.00 plus P&P, depending upon the size of the order. This will be for a finished but bare spindle, made in EN8 and threaded 9/16"x20TPI "British Standard Cycle" thread. A pair of ball races will probably cost you no more than £20 at most bearing factors (that is for "retainer type" races, open journal type being cheaper).

Let me know if you are interested, enclosing a S.A.E. (Overseas members, two I.R.C's please) and I will then let you know a firm price when I know how many are to be made. I will want a deposit of £15.00 before placing the order, but don't send any money yet.

Ask me very nicely and I MIGHT be prepared to supply the new spindle, two new sealed-journal ballraces and two new wheel nuts (nuts plated nickel or chrome to your choice) for about £50 plus P&P. It all depends on demand. As usual dear member, the ball is in YOUR court.

Brian Marshall.

V19/3 April 1995

THE SCOTT/ENFIELD REAR WHEEL HUB

Potty

An Enfield hub is an Enfield hub? Sorry, no! — as I have found out to my cost! They vary greatly; Scott ones are marked 'S' next to the grease nipple in the centre of the hub. Brough ones are marked 'B', Panther ones 'P'. Norton ones do not seem to be marked, so I assume that the Enfield/Enfield ones and Norton ones are considered standard and therefore unmarked. I do not know what the many other users of the hub used, but it was a very popular hub in the late 20s, 30s and 40s.

The differences between Scott, Brough, Panther and Norton hubs are only in the location of the cush/spoke flange on the central hub.

I am sure that with a bit of 'bodging' all of these hubs can be made to fit a Scott, but the wheel rim would require moving in relation to the chain run. Scotts seem to be central between the flanges.

Rim and tyre size anomalies

Dear Tom,
I have briefly touched on this subject before, but I have recently come into possession of some more definite information to fill the gaps, so here goes:

Over many years, when restoring bikes, I have encountered difficulties when trying to find out what size rims were fitted in the early years of wired-on type tyres (i.e. about 1927 onwards). I would assume that if a tyre size was shown in the catalogue as, for example, 26 x 3.00 the rim size would always be six inches less (i.e. 20" for that tyre size). However, a conversation with Ralph Denman suggested that this was not always the case and could account for some of the wrist-breaking struggles sometimes encountered with old tyres!

The following chart was produced many years ago when the system for labelling W.O. rims and tyres changed, presumably to avoid confusion with beaded-edge sizes. The old descriptions are very misleading! Just look at the 27 x 4.00, the 27 x 3.25, and the 27 x 3.00. they fitted 19", 20" and 21" rims respectively!

For instance, a catalogue could say 27 x 2.75 front and 27 x 3.25 rear tyres, and I used to think that this meant that the bike had 21! rims front and rear. NOT SO! — it would have had 21" front and 20" rear. I wonder how many of us have fallen into the trap, maybe fitted wrong size rims and tyres, and struggled for tyre clearance against the rear mudguard etc?

I hope this clears up a few mysteries.

Brian Marshall,
Aslockton, Nottingham.

P.S. Don't forget the implications for speedometers too.

Internal Width of Rim—W (Inches)	RIM		TYRE	
	Rim No.	Previous Description	New Description	Previous Description
1.850	W.M.2—18	2½ x 18	3.25 —18	25 x 3.25
2.156	W.M.3—18	3 x 18	3.25 —18	25 x 3.25
			4.00 —18	26 x 4.00
1.500	W.M.0—19	2 x 19	2.375—19	24 x 2.375
			2.75 —19	25 x 2.75
1.600	W.M.1—19	2¼ x 19	2.375—19	24 x 2.375
			2.75 —19	25 x 2.75
			3.00 —19	25 x 3.00
1.850	W.M.2—19	2½ x 19	2.75 —19	25 x 2.75
			3.00 —19	25 x 3.00
			3.25 —19	26 x 3.25
			3.50 —19	26 x 3.50
2.156	W.M.3—19	3 x 19	3.25 —19	26 x 3.25
			3.50 —19	26 x 3.50
			4.00 —19	27 x 4.00
1.600	W.M.1—20	2¼ x 20	3.00 —20	26 x 3.00
1.850	W.M.2—20	2½ x 20	3.00 —20	26 x 3.00
			3.25 —20	27 x 3.25
1.500	W.M.0—21	2 x 21	2.375—21	26 x 2.375
			2.75 —21	27 x 2.75
1.600	W.M.1—21	2¼ x 21	2.375—21	26 x 2.375
			2.75 —21	27 x 2.75
			3.00 —21	27 x 3.00
1.850	W.M.2—21	2½ x 21	2.75 —21	27 x 2.75
			3.00 —21	27 x 3.00
			3.50 —21	28 x 3.50
2.156	W.M.3—21	3 x 21	3.50 —21	28 x 3.50
1.600	W.M.1—22	2¼ x 22	3.00 —22	28 x 3.00
1.600	W.M.1—23		2.75 —23	28 x 2.75