# renewing the DRIVE SHAFTS on a CITROEN Light 15

By JOHN THORPE

## There's no tool problem— you can hire them

FOR many years, the Citroen Light Fifteen was virtually the only front-wheel drive car readily available, and as the basic design enjoyed a production run of some 20 years, a considerable number of these cars are still in service.

Generally speaking, they are of straightforward design, although no Citroen has really been conceived with the idea of owner-overhaul as a prime requirement. Most jobs, ideally, require the use of service tools, some of which can often be hired from Citroen agents. None the less, a reasonably well-equipped owner can still undertake much work himself.

A case in point is the removal of drive shafts for servicing. The actual servicing itself calls for the use of special press tools, and cannot normally be attempted, but there is no reason why the dismantling and reassembly should not be carried out at home, thus saving a considerable amount in labour costs.

Before work can start in earnest, the front hub covers must be sprung off, and the wheel spindle nuts loosened. Each wheel spindle is held by a single 25mm. centre nut, with a split-pin retainer. Naturally, the correct spanner to use is a 25mm. ring; however, a 1¼in. Whitworth ring spanner will also fit the nuts.

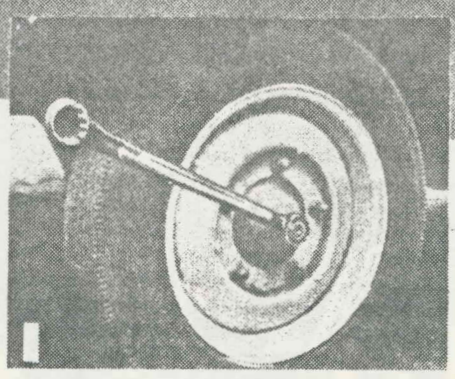
On the nearside wheel, a right-hand thread is used, but the offside wheel nut has a left-hand thread. To avoid left-right, right-left mental contortions, however, the simplest way of memorising which is which is to remember the purely practical aspect—both nuts must be turned towards the front of the car to loosen them.

Most owners will be able to remove these nuts without first taking off the wheels, but an exception must be made in the case of cars with "boat-shaped" wheels, in which the spindle nut lurks coyly behind the welded-on bracket for the wheel disc. In the case of this model, the car must be jacked up, the wheels removed, and the nuts then unlocked. To prevent the shafts rotating, the brakes must be applied.

If the front of the car has not previously been raised on blocks, it should be done now, before commencing the next stage—drawing off the hubs. For this, a special hub drawer/race puller is required. This costs just under £4 to buy, but it should be possible to hire it from a Citroen agent. Normans, the London area distributors, charge a nominal fee of 5s. for the loan of such a tool—subject to a returnable deposit of £6.

The drawer is fitted to the hub, and screwed up—using heavy spanners—to pull the hub and brake drum off the spindle. This done, an 8mm. open-ended spanner is used to loosen

*Continued over*



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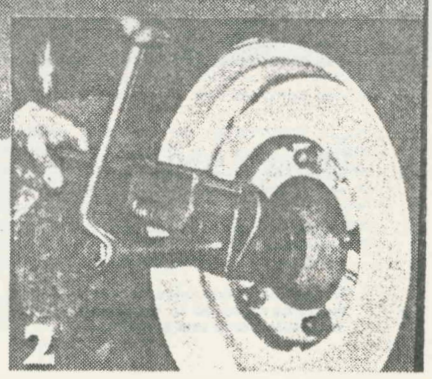
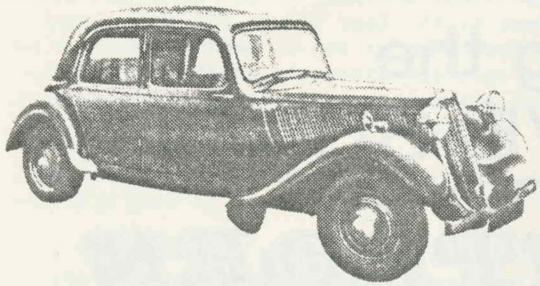


2

1 On both wheels turn the spindle nuts towards the front of the car.

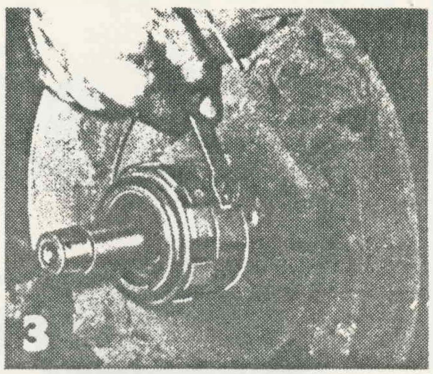
2 Use a combined hub drawer/race puller to draw off the wheel hub.

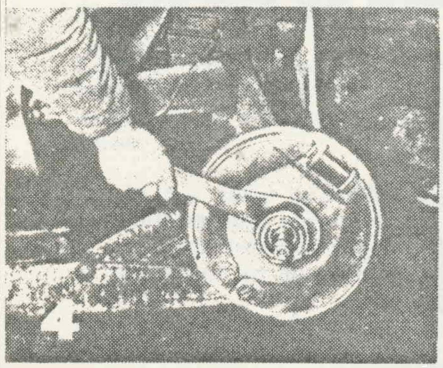


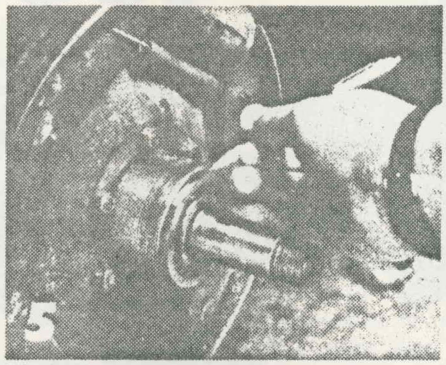
3
Although only the rearmost of the two 8mm. bolts locks the bearing, both should be removed.

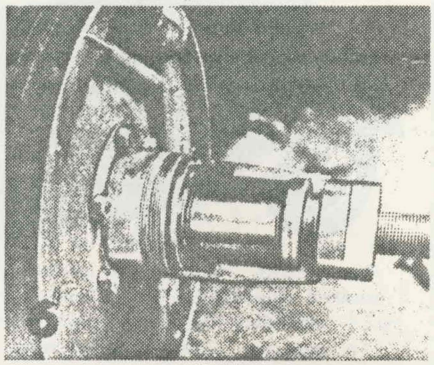
4
A large C-spanner is the correct tool for undoing the locking ring on the bearing housing.

5
The flange in which the puller engages is very thin and brittle. Make no attempt to hammer it.



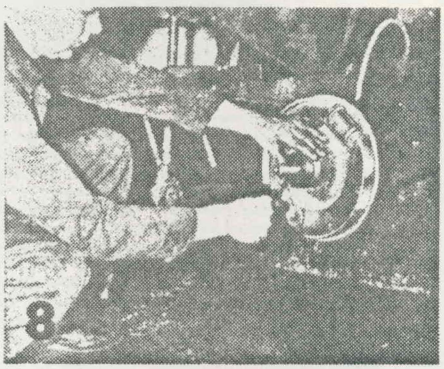



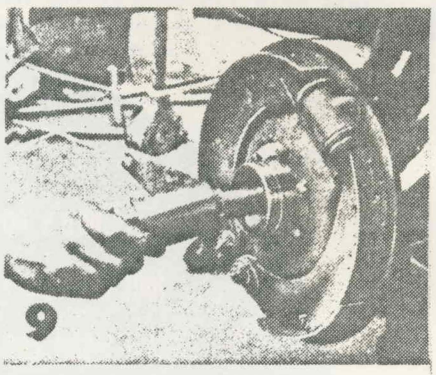



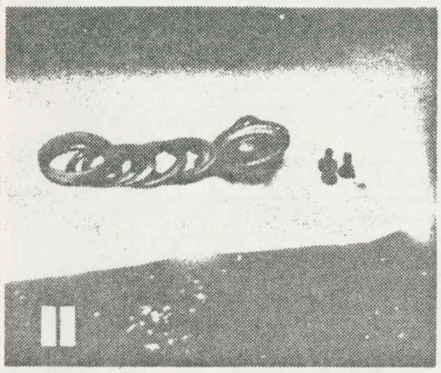

8
After removal of the bearing, the distance piece can be hooked out.

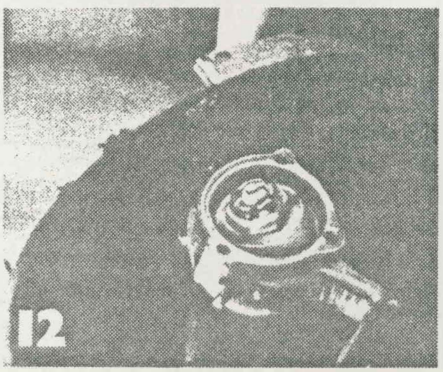
9
The nut inside the housing can be reached with this box spanner.

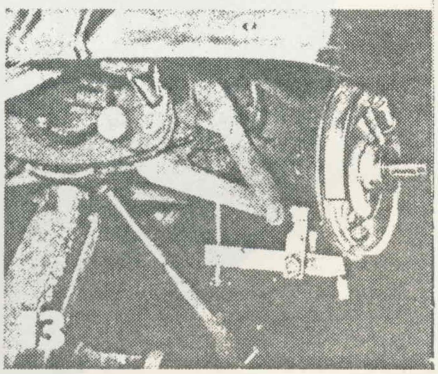
10
This simple tool is normally used to break the ball joint taper.



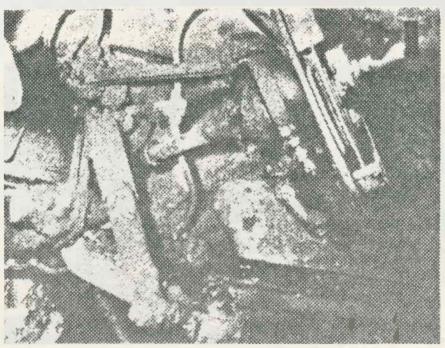




11
Take care not to lose the shims under the cover plate on the swivel housing of the ball joint.

12
A split pin secures the 29mm. nut which locks the ball against pressure of a spring below it.

13
To free the swivel joint, a puller should be clamped to the lower suspension arm and tightened.



14
To free the shaft, the entire unit is lifted until the splined end of the shaft disengages.

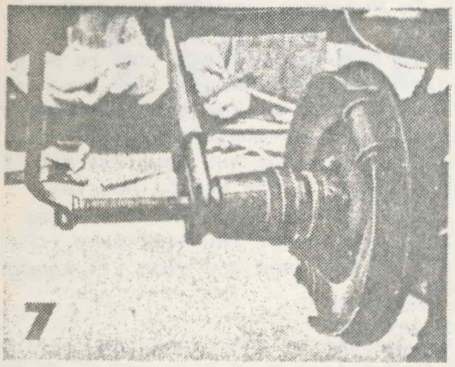
15
Using a soft-faced hammer, the shaft can now be driven backwards out of its housing.

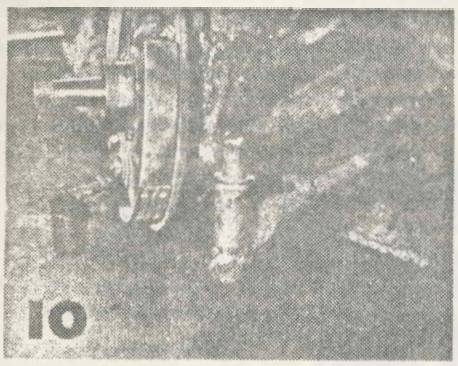
*Don't follow this article too literally. Illustration 12 is upside down!*

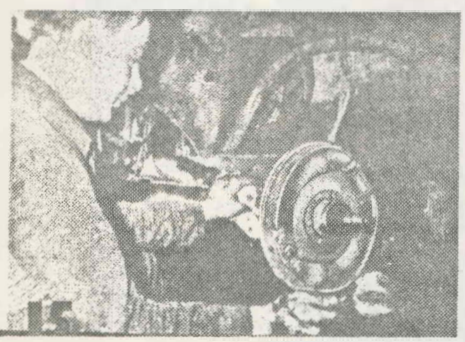
# continuing Renewing the DRIVE SHAFTS on a CITROEN light 15

6
The race puller is of split design, and must be accurately positioned on the flange.

7
An adjustable spanner can be used to hold the puller while the screw is tightened.




the race locking screw, which is actually the rearmost of the two small screws located on top of the race housing. Since the front screw may foul the inner sleeve, however, it is perhaps better to play safe and remove both.

A large C-spanner is the "pukka" tool for loosening the large diameter race locking ring, although careful use of a soft-metal drift and a hammer can be equally effective.

When it comes to the races themselves, though, no liberties can be taken. The hub drawer/race puller *must* be used. It engages on a thin flange cut into the periphery of the race, which is made of hard metal, and attempts to lever or tap the race from its housing are fated to end in disaster.

It may even prove difficult to engage the puller. If so, it is permissible to tap gently on the rear of the shaft's universal joint housing to bring the race a little farther out of the hub.

Once the bearing has been drawn, a piece of bent wire can be slipped into the hub and the distance piece hooked out.

Now, another special tool is needed—a large diameter castellated box spanner, which costs 25s. approx. to buy. This is needed to remove the interior nut, which is locked by a tap washer, which must first be flattened.

For the time being, this terminates work on the hubs, and attention must be switched to ancillary jobs connected with the actual removal of the shafts. This requires that the entire shaft assembly shall be lifted about a foot, and to enable this to be done the track rod and the swivel spindle must be disconnected.

## Special Extractor

On the outer track rod ball joint is a 21mm. nut, secured by a split pin. This should be removed. A special extractor is made for forcing the rod and its pin away from the steering arm, and one should be used if possible. If necessary, however, the taper can be broken by maintaining leverage on the track rod with a suitably stout type lever, and knocking the ball joint housing smartly with a mallet.

Beneath the lower ball joint on the suspension arm is a cover plate, held by three bolts with 12mm. heads. Remove these, and gently detach the plate, taking care not to lose the shims which you will find behind it. These are used to adjust play in the ball joint.

A split-pinned 29mm. nut holds the actual ball. It should be loosened—a 1⅛in. A.F. spanner will fit if the correct metric size is not available—but should not be removed at this stage. Instead, run it down to the bottom of the thread, where it will protect the pin from damage during the next part of the dismantling procedure.

Here, it is essential to use the special bottom ball joint puller—it costs nearly £6, but can again be hired for 5s. This is clamped to the suspension arm, braced by a hand screw, and the extractor bolt is then tightened to press the ball joint spindle upwards, out of its housing. A somewhat desperate makeshift, however, is to press a powerful jack against the spindle, and then to jar the joint by hammering the suspension arm downwards.

Once the joint has been freed, the remaining work is extremely simple. The 29mm. nut is removed—it will automatically clean up any burring of the threads on the spindle as it is unscrewed—and the ball will simply fall out.

Slip two fingers into the housing, and pull out the spring which supports the rubber grease bag. Then—again using one's fingers—unscrew the knurled cap on the gearbox end of the drive shaft.

To free the shaft, it is now necessary only to lift the entire backplate/shaft assembly, so that the shaft disengages from its splines. Then drop the shaft so that the backplate rests on the lower suspension arm, and using a soft-faced hammer drive the shaft backwards, out of the hub.

## Different Threads

Normally, it will not be necessary to disturb the inner drive shaft coupling, but if this is to be removed for any reason it is only a matter of undoing the four 14mm. head bolts which hold it to the gearbox flange. On older models, these bolts have an 8mm. thread; later models use a 10mm. thread.

Reassembly is straightforward, and requires the use of only one special tool—the castellated box spanner. It is important to note, however, that when refitting the shaft in its splines the grease nipple on the shaft *must* be aligned with the nipple on the inner drive shaft coupling. This keeps the universal joints "in step." When reassembling the lower ball joint, the ball must be engaged on its key, and held against the pressure of the spring while the nut is tightened. There is a trick of the trade, too, for simplifying replacement of the shims and cover plate. After the ball has been fitted, and the nut tightened and locked, a lever should be inserted under the drop arm. Then, using the lower suspension arm as a fulcrum, the swivel is raised while the shims are greased into place, and the cover plate is fitted.

Finally, a word of warning regarding the replacement of the bearings. Here, if new races are to be fitted, it is essential that the original bearing is first measured for width. Two different bearing widths have been employed—17mm. onearlier light 15s.; 19mm. on later cars. Different distance-pieces are used with each bearing, and if a 17mm. bearing chanced to be used with a 19mm. distance-piece, it would sink in to the housing sufficiently to blanket the flange, and make subsequent removal very difficult indeed.

*SOME LOCAL COMMENTS ON THE DRIVESHAFT NOTES*

*A. The terminology for nut and bolt sizes as used in the article is a bit variable, sometimes referring to the "across the flats" size of the head, and sometimes to the major diameter of the threaded item (bolt etc). Thus on the first page, the nut on the end of the 25 mm stub axle will be fitted by 1½ inch AF (across flats) ring spanner. A spanner fitting a 1½ inch Whitworth nut (i.e. the major diameter of the thread = 1½ inch) is too big by a country mile.*

*B. In Illustration 3, either locking screw may be holding the outer locking-ring tab-plate since choosing between the two enables a more accurate "vernier" setting of the castellated locking ring to be obtained.*

*C. The C-spanner (Illustration 4) is not as good as the workshop tool (1825T or equivalent) as it bears on only one tooth of the locking ring. A square edged hard drift is preferable to a soft drift, and certainly not a cold-chisel.*

*D. It is difficult to bend back the inner locking tab-washer as it is hidden in the grease. Put on the special spanner 1826T (Illustration 9) and drive it onto the locking ring with a firm thump from a soft hammer to get a complete grip. Then simply unwind it. If the axles are correctly fitted (left-hand thread on right-hand side of car and vice versas), the inner locking ring needs only firm tightening since driving the vehicle briskly soon brings these rings up very tight. The tab washer is not much of a locking system anyway. (Perhaps I'd go for "two-bob each way"* and fit the tab-washer as well - Ed).

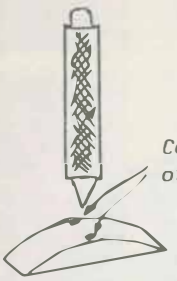
*E. The method suggests just removing the outer axle/driveshaft and leaving the inner cardan joint in place. It is far preferable to unbolt the cardan joint from the driving flange of the differential and have the lot out for examination. By undoing the track-rod ball-pin nut and detaching at the taper, the swivel housing (swivelling hub carrier) can be hauled well round and the whole shaft assembly pushed inwards and removed. (You may have to remove the inner bearing to get enough clearance. This is not hard to do with careful drifting once the shaft has been driven inwards. Even more clearance can be obtained by driving the splines firmly back into the cardan joint, so pushing out the grease-retaining welsh-plug). The main thing is that you then don't have to undo the* lower suspension ball joint.

*F. Check the Woodruff key used to locate the hub on the stub axle. Note the deliberate use of the word "locate". The Woodruff key should transmit only very light loadings. Most of the driving torque should be transmitted by the correct tapered fit of the hub onto the stub axle which provides a powerful wedging action. If the fit is poor and you are relying on the key for drive, then you have problems! [However, do note that wear of the taper, especially in the hub, is not the end of the earth and repairs can be made - perhaps more later]. Anyway, if there are any signs of fretting on the key due to movement, replace the key.*

*Unfortunately, replacement keys seem to be a few thou thinner than originals, and they can rotate in the key seat as the hub is advanced onto the taper. Such movement could well foul up the fitting of the hub and bearings and leave a nasty taste in the mouth! However, two small indentations made near the edges of the curved face of the key will make it a light tap fit in the seat and stop its wanderlust.*

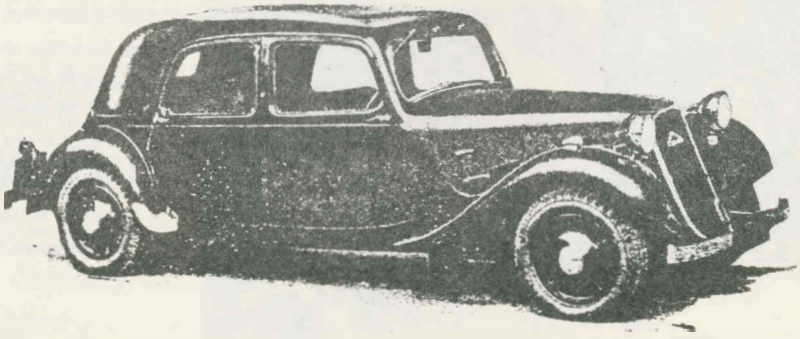
*G. As noted the use of the wrong combination of bearings and spacer must be avoided. If the combination is too long, the hub may put a great deal of end loading onto the inner runner of the outer bearing as the stub axle nut is tightened. [Peter Simmenauer can give personal testimony as to how long the bearing will last from then on - Ed]. The same kind of end loading can occur due to excessive wear on the hub/axle taper, permitting the hub to again contact the outer bearing. Incidently, it is possible to greatly extend the life of the bearings in arduous use, e.g. racing, by reducing the length of the spacer appropriately and fitting a second outer bearing.*

*Jack Johansen Weaver.*



*Centre-punch pips on bottom of Woodruff key.*

*Note: The essential clearance between the hub and the outer bearing is shown (33) on the accompanying sectional drawing. To prevent working between hub and stub axle, the hub nut is pulled up to 216 ft.lb (30 m.kg).*



# DRIVESHAFT REMOVAL

*MORE LOCAL COMMENTS ON THE PUBLISHED METHOD:*
*See Front Drive 10 (1), Pages 7-9.*

*A. When refitting the shims and cover plate of the lower suspension ball joint, instead of using a lever as described in the text (second last para P. 9), having to hold it, stand on your head to see where you are putting the shims, simply try this instead. Assume a squatting pose in front of the swivel assembly, offer up the outer bearing retaining ring (item 9 in the diagrams of page 4, also clearly seen in Illustration 3 on page 8) between the drive shaft and the lower suspension arm.*

*By taking the weight of the assembly with both knees, the retaining ring can be slid outward away from the gearbox, thereby wedging snugly to hold the assembly in situ and leaving you with two free hands (and knees). You are then free to see what you are doing!*

*B. When refitting these shims which will by now be quite numerous unless you are fortunate enough to have new ball joints, always ensure that the ones fitted last are the thickest. Reason? Some shims may have been damaged thro' improper fittment in the past and even though rectified by tapping flat, they could still cause the total thickness of the uncompressed stack to be a good deal greater than the final compressed value. Therefore, it is likely that as one secures the cover plate, the lower shims may shift sideways and become trapped between the cover plate and the edge of the recess in lower arm, especially if a thin shim is put in last. The displaced shim(s) result in a less effective bearing support and of course more damage to the shims as above.*

*Should the shims have become displaced and trapped, it is revealed by the presence of a gap between the cover plate and the machined face of the arm after tightening. This is rectified by backing off the three screws retaining the plate a fraction and inserting another shim or similar into the gap and pushing until the offending shim(s) moves into the proper location. Then retighten the screws and recheck for a gap.(The screws, shims, arm etc are clearly seen in Illustrations 11 & 12).*

*C. If attempting to break (remove, free) the lower ball joint without the special puller, a few points are well worth noting:*

*(1) This point also applies when using the special puller. Ensure that the centre line of the jack or whatever support is used is directly in line with the pivot pins of the swivel housing. Failure to do so may result in not being able to break the joint and almost certainly the threaded section of the pivot pin would be bent and probably compressed at the end.*

*(2) In order to attempt to jar the joint by hammering the lower link arm, the mudguard on that side should be removed first.*

*(3) Hammering may jar the car off the jack. For convenience sake therefore, erect a support of criss-crossed timber (4x2 in.) under but not in contact with the cradle.*

*This is preferable to locating a jack stand beneath the cradle, for in order to do so requires the car to be raised an appreciable amount. This in turn creates problems as in (1) above, since for best effect, it is advisable to keep the car as close as possible to its normal ground clearance.*

*(4) You will find it impossible to strike directly upon the lower link (suspension) arm. Most people will resort to placing a piece of water pipe or the like in the vertical plane with its bottom end located on the lower arm close to the swivel housing and then proceed to wollop its upper end with a sledge hammer. The idea seems good but the pipe will not be precisely vertical. Ergo, the blows are less effective than they should.*

*I would recommend instead that you get a metre long piece of 37 mm (1 3/4 x 39 in.) heavy wall water pipe - it comes in two grades - and place it horizontally across the lower arm, with the bulk of the pipe extending to the rear of the car.*

*You will find that the rear end of the pipe will comme up under the seam of the body below the sill. This is undesireable. Place a scrap of timber, approximately 25x100x150 mm between the underfloor and the end of the pipe. The packing piece of timber should be placed such that it contacts the underfloor at the seam made by the floor and the firewall, and straddling the seam. The pipe should should be sited near the seam, but slightly toward the rear of the car. The end of the pipe will need to be located by another jack, holding it snugly against the packing piece.*

*Thus set up, the front end of the pipe should protrude about 15 cm ahead of the lower arm, providing an easy target for the sledge hammer to strike.*
*This configuration enables a direct line of force to act in a plane parallel to the centre line of the swivel housing, as would be done by the special puller. Due to this, it is likely that the ball joint will break free on the first blow, given that the blow is a substantial one.*

*D. With regard to the cardan (inner) joint, I would remove it, for although it may well be a long-wearing part, its life can be increased.*

*This may be done by dismantling the universal joint and repacking it with fresh grease. When reassembling, the cross should be first turned through 180 ° i.e. about one of the journal axes. This puts the drive thrust on the previously unworked faces of the journals.*

*Kenn Gilbert.*