

## **Four Speed Conversion for Traction**

Foreword by Rob Little.

The following is a compilation of articles and drawings written for Front Drive and TOC.

Front Drive authors are Peter Hugan, Bill Graham and Jack Weaver, TOC author is Roger Williams. These articles were originally printed in Front Drive, volume 12, no 3, September/October 1988, volume 12, no 4, November/December 1988 and volume 13, no 1, Autumn 1989. They were re-printed in 2009 in volume 33, no's 6, 7 and 8.

These represent commonly used methods of achieving this transplant but are not the only way to carry out this modification. Recent developments by other members have seen the gearshift successfully controlled down the LH side of the engine and most notably the conversion by Warren Seidel that has the gearshift controlled by only one shaft. Other efforts by John Beswick in S.A. has seen the overall width of the modified transmission reduced by a further 20mm, not much perhaps but in a narrow bodied Light 15 every reduction is gratefully accepted. The main stumbling block for this conversion lies in the manufacture of output shafts, to do this two at a time is costly, a few years ago the club undertook the manufacture of ten sets, most were snapped up by members but contact the Spare Parts Officer if you are interested as there may still be some left, these were made from a solid billet of steel which is the best method as outlined in the later article by Roger Williams.

# Traction Transplants

## Gearbox problems.

The major cause of really serious mechanical problems in the Citroen Traction Avant is the loss of a tooth or teeth from the crown-wheel-and-pinion (CWP) in the transmission final drive. Experience and common opinion seem to support this proposition. The CWP and the low gear constant mesh pinion have long been the transmission's major weak points and appear to result from design (and material?) faults in the original production.

Other Traction weak points such as the drive shafts do not normally cause the instantaneous and traumatic immobilisation which a bad CWP failure is well and truly capable of producing.

While there are examples of CWPs having travelled many tens of thousands of miles without or before failure, none-the-less, every few months or so, we hear the tragic story of a club member whose car has become immobilised because of CWP failure.

Were the problem to be just the loss of the CWP itself, it would be bad enough. However, the situation can be one of either a "clean break" or a "dirty break", as David Gries so eloquently puts it.

In the clean break situation, the piece(s) of broken gear tooth fall into the bottom of the transmission case, and the prudent driver, hearing something amiss, stops his vehicle and doesn't proceed. He "only" has to find a replacement CWP and rebuild it into the transmission.

In the more tragic and not uncommon dirty break situation, the broken tooth after falling to the bottom of the box, is picked up and jams between the crown-wheel and pinion gears themselves. This may occur immediately on breakage of the tooth, or commonly, if the imprudent or unwary driver ignores the characteristic clicking due to the missing tooth and "pushes on", the broken piece subsequently picks between the moving gear faces.

The result is usually very sad. The momentum of the car, conveyed from the road-wheels through the transmission, causes the still-rotating crown-wheel and pinion to be strongly wedged apart by the presence of the "foreign object" jammed between them. The usual result is that sufficient lateral force is generated to actually split the gearbox housing (and bell housing?), and incidentally to deposit the transmission oil on the roadway beneath. It is possible that

other gears in the transmission will be damaged also by the shock loadings. All in all, not a pretty sight! Now the Tractionist must find not only another CWP but also another gearbox casing and possibly other bits as well. Even spare casings are now difficult to come by.

Admittedly, opinions vary a bit, and almost certainly, having a properly adjusted CWP is a better bet than plugging fervently onwards with a pig-in-a-poke type of setup of uncertain background.

However, any CWP you come across now (except the few newly-made ones) will be many years old, probably have done a lot of work, and probably have fatigue and worn case-hardening added to any "built-in" shortcomings. While insensitive clutch operation and violent acceleration on hard surfaces may increase the risk of CWP failures, there are stories of that ominous "snap" sound occurring when gently backing out from the curb, especially when the car is cold.

Thus, I believe it is no exaggeration to consider any Traction gearbox still fitted with an original-type CWP as a potential time-bomb, just waiting to cause serious and expensive damage to your Tractioning pleasure.

## What can be done about it?

The ideal would be to rebuild the Traction gearbox, using a newly-manufactured modern CWP. That way, you'd gain reliability and retain originality which many are keen to do. Of course, you should make any other improvements and repairs to the box at the same time (second gear bushes, bearings, seals etc). However, unless you bought a set when they were still available (\$300/set!), you'll find that all the original run of new CWPs made in Europe a few years ago have now gone. Plans to make further sets of CWPs in the UK (or even here in Australia) seem to be in abeyance at present, the main obstacle in all cases being to get enough orders in advance to provide for a long enough production run and hence to get an acceptably low unit cost. Incidentally, if you'd bought your spare CWPs in 1960, they'd have cost you all of 19 pounds sterling each!

The other way is to install an alternative gearbox and put your Traction box aside so it doesn't destroy itself in use and so it can be rebuilt later when new CWPs become available. It could be argued that by doing this, you are actually retaining the ability to readily restore your car to full originality at some later date.

## Which alternative?

One could replace the gearbox only, adapting it to fit onto the Traction motor, or what would be easier in all probability, find an

existing motor/transmission of similar configuration to that of the Traction, and "slip it in" as a unit. For example, the Renault 16, 18, 20 etc power-units are aligned "north-south", have the gearbox to the front, with front-wheel-drive offtake coming out between the box and motor. Alternatively, one might consider "transmission only" adaptations, taken for example from VW Beetle, Renault, Subaru, Skoda and so on. All these would require a reasonable amount of modification to make them "fit" at the mounting points, clutch housing and driveshaft coupling points. No doubt, such problems are not insurmountable however, and there is one local example where a VW gearbox has been used as above but with a "foreign" motor as well.

However the most common and earliest adaption is based on the power unit which followed the Traction - that of the 1911 cc Citroen ID. A 1911 cc Citroen DS unit can also be used if an ID gearbox lid is available to be fitted to it.

Apart from having a cross-flow head (carburettor on left side of motor) and four forward gears instead of three, the ID power unit is and looks very similar to that of the Traction, in fact many components are interchangeable. Hence, the ID unit doesn't look "out of place" under the Traction bonnet. If you are keen enough, you can "Tractionise" the ID unit by fitting the non-crossflow head and manifolds. Even the Traction-style two-rod gearshift has been very effectively adapted to fit the ID gearbox in one instance.

With such modifications, the ID power unit can be made so that only the relative expert would pick it as non-original. And you've eliminated many worries and gained some positive benefits - no gearbox worries, more power, shell bearings on the crankshaft, four speeds with a higher and easier cruising top gear etc.

Careful planning and fitting keeps modifications to the Traction engine bay (and cockpit) down to to an absolute minimum - usually the odd small hole which can be plugged up later if desired - so that refitting the Traction unit later is not a problem in terms of structure or appearance. No wonder it is such a popular conversion.

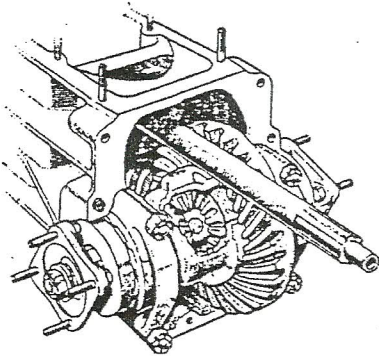
Any Tractionist is well advised to collect an ID power unit (or gearbox at least) and put it aside for this purpose. Don't leave your move too late though - even ID units are becoming scarce.

Incidentally, it is claimed that the first "ID conversion" may have been performed in Australia or New Zealand - more research and story to follow?

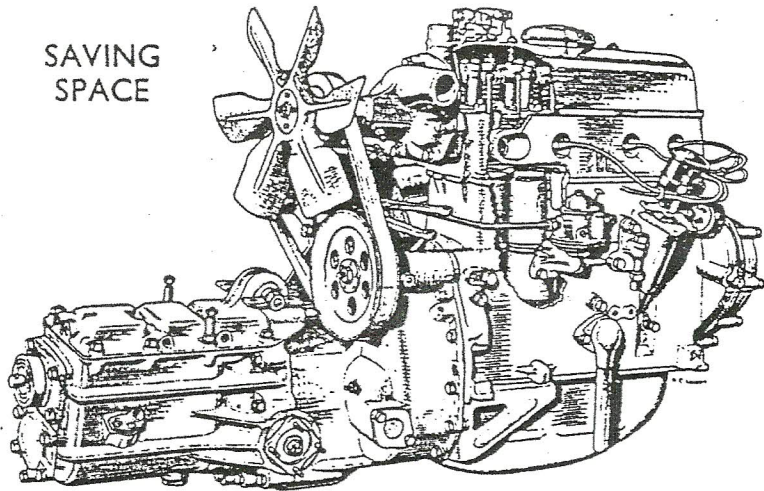




## SAVING SPACE



The crown-wheel, bevel pinion and differential are compact and in unit with the gearbox, the bevel pinion being integral with the gearbox layshaft. Short transmission shafts run at right angles to the front wheels.



The three-gear gearbox on the Citroën is mounted ahead of the front wheel centre as clearly shown in this drawing, the drive being taken over the crown wheel and pinion by an extension shaft shown below, left. The above drawing also indicates the principal features of the 1,911 c.c. engine which produces 56 b.h.p. Of particular interest is the way in which wet cylinder liners are inserted into the water space of the main crankcase cylinder casting.

**Footnote:** Lest the above discussion appear to be a misleading indictment that Traction CWP's "have only themselves to blame" for their demise, it should not be overlooked that gearboxes using these components were employed very successfully in competition situations. However, this usually required strengthening and stiffening of the box to ensure that the CWP remained in

proper mesh under load. In fact, the major obvious improvement apparent in the D box in this regard is not in the CWP design but in box strength and rigidity of location of components.

Hence in rebuilding a Traction gearbox, it is highly advisable to closely examine it and consider making some of the after-market or competition improvements to enhance component lifespan, especially of the CWP.

We start the following series of overseas and local notes on Traction Transplants with the first of the excellent presentations by Roger Williams in the November 1986 issue of Floating Power (Traction Owners Club UK).

Bill Graham/Jack Weaver.

When words fail

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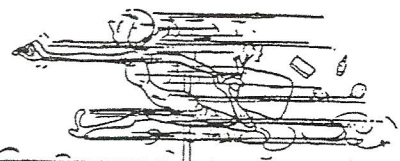
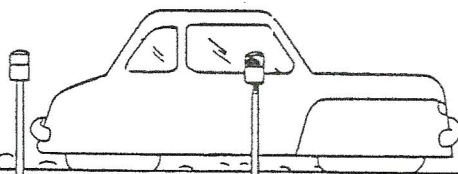
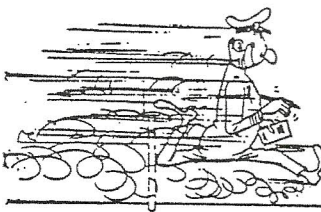
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# TRACTION TRANSPLANTS:

## "HOME-MADE" OUTPUT SHAFTS

Peter Hughan has performed a very satisfying transplant into his splendidly restored black 1951 11 BL (Traction Avant Legere).

Peter's transplant incorporates a number of innovations which have not been previously reported, especially with respect to transmission output shafts from the 1D gearbox, and to modifications to adapt the Traction gear-shift mechanism to work the changes on the 1D box.

We have changed Peter's order of presentation so as to deal with the gearbox output shafts first, since a functionally-similar but engineeringly-different version was quite recently described in Front Drive 12 (3) as developed by Roger Williams (UK). In particular, readers are directed to Roger's Fig. 11 (left-hand output shaft) in the article reproduced in the above FD number (article reproduced with thanks to Traction Owners Club (UK) from Floating Power November 1986).

Peter's information and diagrams are supplemented by comments from Jeff Harris (CCOCA, South Australia) who produced the shafts in conjunction with Jim Le Mesurier.

The starting point for the new output shafts is with rear axle half-shafts from a live axle setup (Chrysler Valiant). The adaption uses the outer end of the axle drive shaft, including outer driving flange.\* Most likely, the steps described below would be outside the capabilities of most CCOCA members, and are provided for

general guidance and information. Normally, the specifications and raw materials would be handed over to a specialist heat-treatment and machining shop(s).

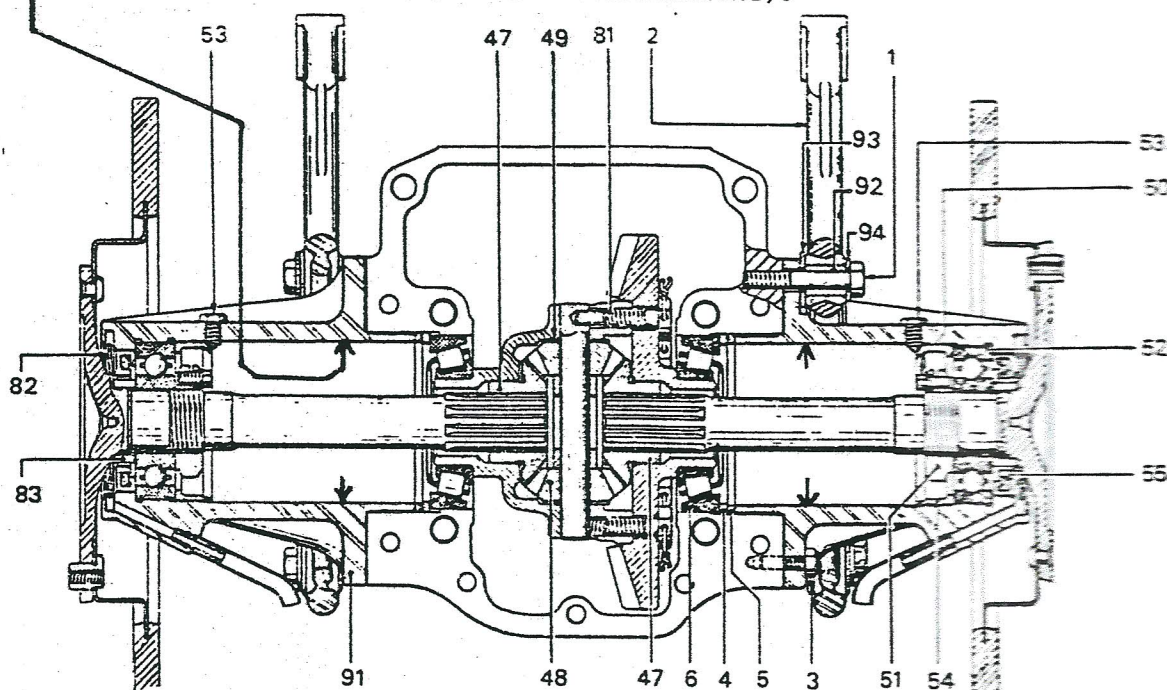
The axles as obtained have a hardness of about 60 Rockwell. These were heated for 3-4 hours to lower the hardness to the point where they are just machinable (30 Rockwell). Using a locally-made cutter, the axles were machined to the dimensions indicated in the attached diagram. The hardness at machining as reported above is a compromise between ease of machining and long-term durability of the part in service, since in the method described, the shafts were not re-tempered. Jack Weaver and Peter Boyle suggest Rockwell values of 24-27 may be necessary for machining, while Jack suggests that the shafts should be left slightly over-size and then re-hardened back to 40-45 Rockwell before precision grinding to final size. However, re-hardening would add to the final cost thereby, and therein lies the basis for the compromise mentioned earlier.

To date, three sets of shafts have been made up. To make up further sets with the original set-up would require re-sharpening of the cutter. One set is in Peter Hughan's Legere, one set went with Jeff Harris's 1954 Light 15 when purchased by Mark Wheatley in Western Australia, and the third set has been driven in daily use in Jim Le Mesurier's Light 15.\*\* The latter is a measure of the shafts' durability.

Cut casing (91) flush with outer face of flanges and remove bits outboard of this line.

\*\*fortwo years.

**VERTICAL SECTION THROUGH 1D DIFFERENTIAL, HOUSING, AND OUTPUT SHAFTS**  
(Before modifications).



**Key to Fig**  
 1 Screws for support arm 2 Support bracket 3 Bearing fixing screws 4 Adjusting washer 5 Distance washer 6 Tapered roller bearing 47 Planet wheel 48 Satellite wheels 49 Thrust washers 50 Retaining screw for 51 Locknut 52 Differential bearing 53 Retaining screw for 54 54 Bearing locknut 55 Oil seal 81 Differential housing screws 82 Oil retaining washer 83 Thrust washer 91 Casing 92 Distance piece 93 Large diameter washer 94 Washer

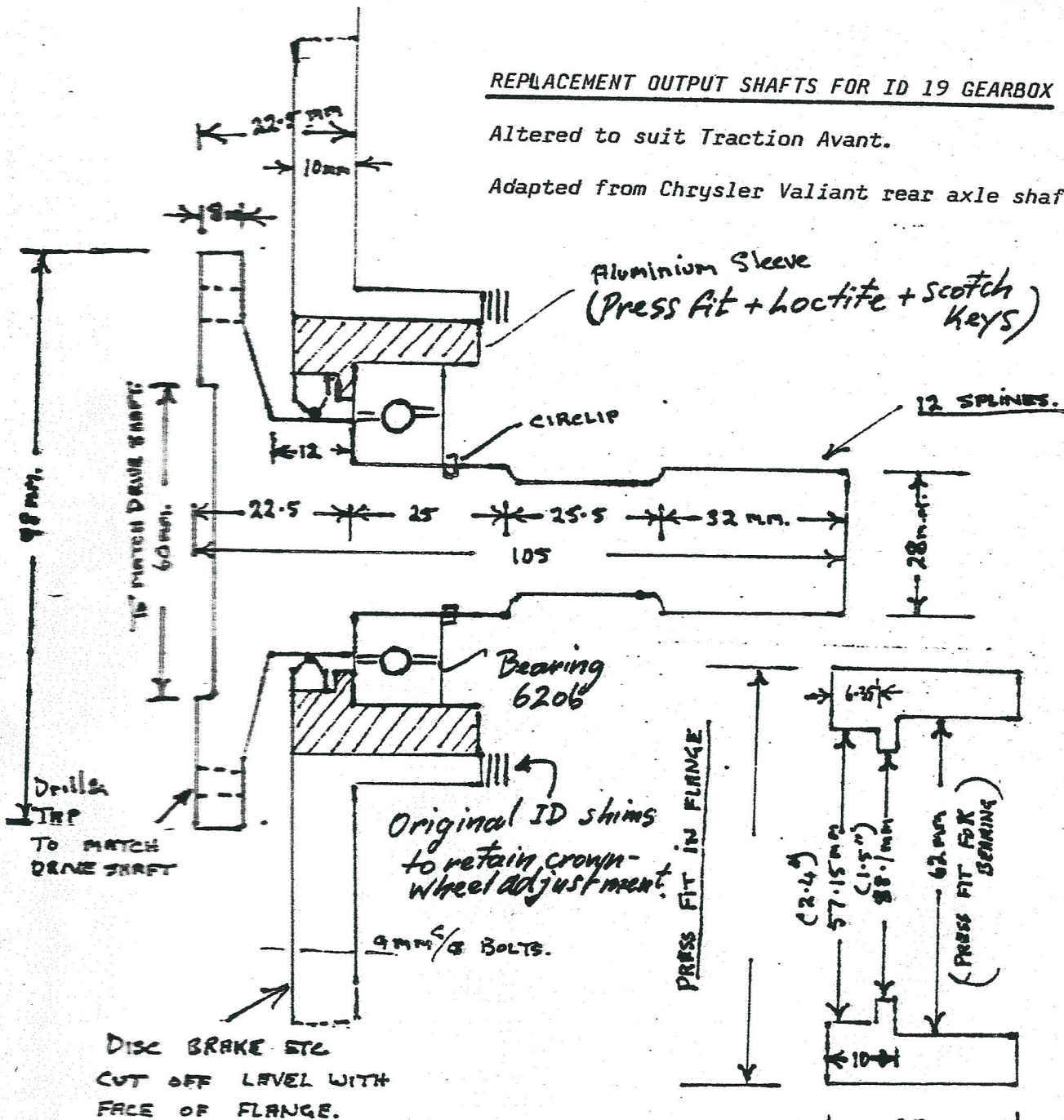
\*1972-78 axles have an adequate-sized flange (check!).



REPLACEMENT OUTPUT SHAFTS FOR ID 19 GEARBOX

Altered to suit Traction Avant.

Adapted from Chrysler Valiant rear axle shafts.

BEARING

6206

O.D. 62 M.M.  
I.D. 30 M.M.  
WIDTH 16 M.M.

SEAL

FIRN 11687 (57.15)  
O.D. 2.4 inches  
Shaft Diam 1.875" (47.625)  
WIDTH 0.250" (6.35)

ADAPTER SLEEVE TO FIT ID 19 BOX

Jack Weaver suggests that special cutters would not be needed, and that the splining could be done on a milling machine with indexing head.

It seems quite likely that shafts other than Valiant could be used as a starting point, provided they were of adequate dimensions.

Peter Hughan reports that the 6206 bearing is a cheap and readily available industrial type. The FIRN 11687 seal or equivalent is readily obtained by quoting the indicated dimensions to suitable bearing/seal suppliers.



From: Floating, Power November 1986  
(Traction Owners Club, UK).

## More glide in your Stride!

In the first of two articles, Roger Williams describes his conversion to a four-speed box – just the task to start on during the long winter evenings.

WHILST renovating the bodywork of my Light 15 I decided that a four speed gearbox would be better than the fragile (or so I was told) original three speed box. I saw Tom Evans's car at the Dent rally in 1980, and although at the time it did not mean much to me, as I had never seen an ID19 engine/gearbox before, various statements coming over the shoulders of the front row of onlookers did stick in my mind . . . "across the gate movement . . . joined to cables . . . behind the dash . . . difficult to get into reverse sometimes . . . bags of space" . . . etc.

In due course I acquired an ID19 engine/gearbox and set about fitting it into my Lt15 with the brief that the modifications to the car itself should be minimal, so that the original power unit could be put back in without further work. I soldiered-on on my own and eventually got my prototype conversion working but not road tested, when Jonathan Howard asked me to do a similar conversion

for his Commerciale. This became Mk2, which performed very satisfactorily under hard everyday driving conditions, and this was followed by Mk3 for his Lt15, and Mk4 as a spare. Mk5, Mk6 and finally Mk7 followed with small but successive refinements, and the current version described here, Mk8, represents, dare I say it, the final version!

The ID/DS power unit was not designed for fitting into a Traction, and the solution to one problem seems to generate another, and whilst none of the modifications necessary are major, there are quite a few of them.

The final result, however, is a robust, reliable and economic power unit which, not being a purist, I think is a great improvement over the original.

The basis of the conversion is:

- (i) The ID/DS engine block is similar to the Traction allowing direct transfer of engine

side suspension brackets and timing chain cover with the rear rubber mounting block.

- (ii) The Traction differential unit, and hence the output shafts, can with suitable bushing and shimming, replace the original ID/DS one.

The ID/DS bellhousing, however, is 35mm shorter than the Traction bellhousing, thus when the output shafts from the gearbox are aligned with the drive shafts, the engine block side and rear mountings do not align with the original hull mountings.

The hull side mounting brackets are replaced by new ones as shown in Fig. 1, and the housing for the rear rubber mounting modified as shown in Fig. 2.

Cut-out is necessary on the narrow-bodied cars to give clearance for handbrake lever

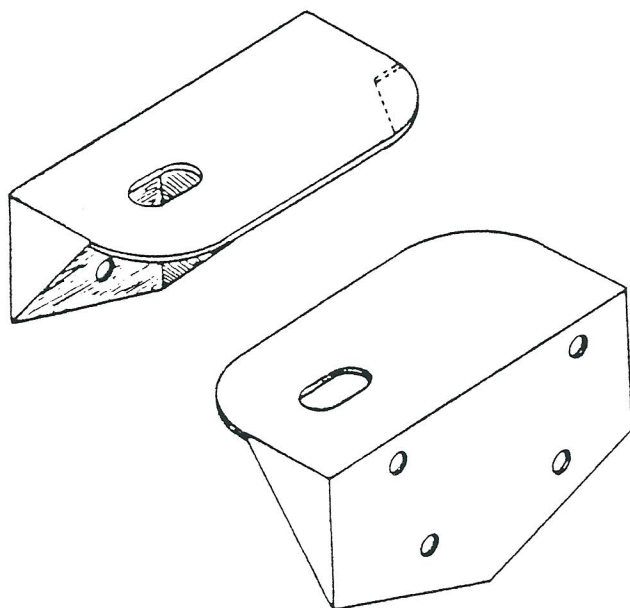


Fig. 1. New brackets for engine side mountings.

- 1 Grind off original weld between box & plate.
- 2 Reverse plate (also locating peg).
- 3 Reweld box flush with back of plate.
- 4 Remember spacer washers between plate & bulkhead.

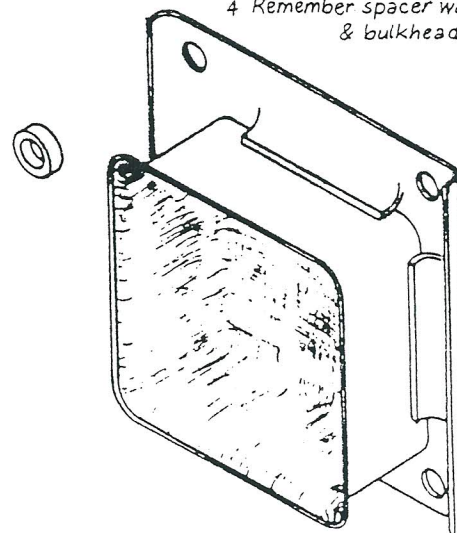


Fig. 2. Modified housing for rear engine mounting.



There certainly is not "bags of space" in the narrow bodied cars, and the mechanism shown in Fig. 3 is necessary to operate the carburettor on RHD cars. The LHD cars are easier because the throttle pedal is on the 'correct' side of the car, and a direct connection to the carburettor drive rod is, therefore, fairly straightforward.

A steel mounting boss, to the same dimensions as the one cast into the top of the Traction gearbox, is machined and welded to a steel plate as shown in Fig. 4, and bolted to the top of the ID/DS gearbox, such that its position relative to the output shafts is the same as the Traction.

Unfortunately, however, the gearbox side lower flanges foul the suspension cradle on the narrow bodied cars, and the cradle has to be modified as shown in Fig. 5 to allow the power unit to float on/about its mounting.

The next problem to be overcome is to provide a clearance between the camshaft pulley and the cross member which, in the original state, can be seen from Fig. 6 as being about minus 5mm. The radiator, however, is mounted on the cross member and anything other than minor modification

will affect the position of the radiator, which in turn affects the alignment and fit of the grill/bonnet/side valance panels/wings etc.

Various solutions were tried on the earlier prototypes, all of which were variations of machining back the camshaft and water pump pulleys as far as possible, combined with cutting and strengthening of the cross member to give sufficient clearance to run the pulley, and to also allow a fan belt to be changed without dismantling half the car!

If all the original parts are to be re-used, the limiting factor is the water pump pulley which can only be set back about 5mm before it fouls the nose of the water pump body. When the camshaft pulley is then lined up with it there is just enough running clearance, and the extra 10mm required to change a fan belt can only be obtained by cutting into the cross member. The solution is to machine a completely new water pump pulley, as shown in Fig. 7, which changes the limiting factor to the clearance between the rim of the camshaft pulley and the pivot bar of the clutch fork lever.

The camshaft pulley is a steel pressing, dished towards the front and rivetted to a central boss. The most satisfactory way of

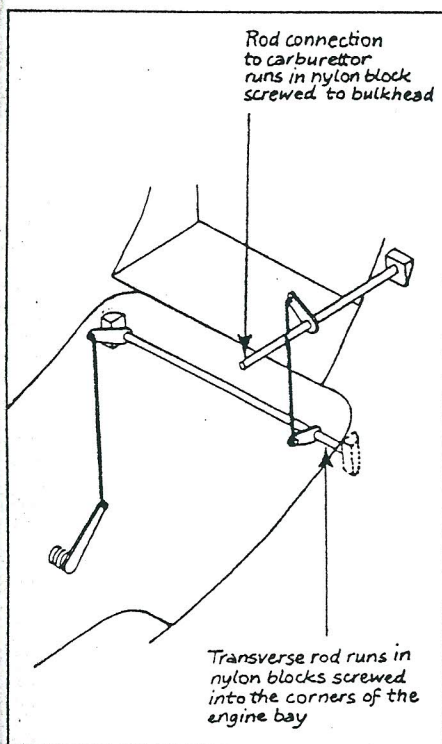


Fig. 3. Carburettor control mechanism for RHD cars.

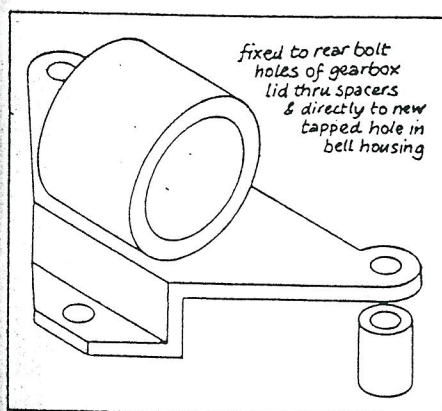


Fig. 4. Front engine/gearbox mounting boss.

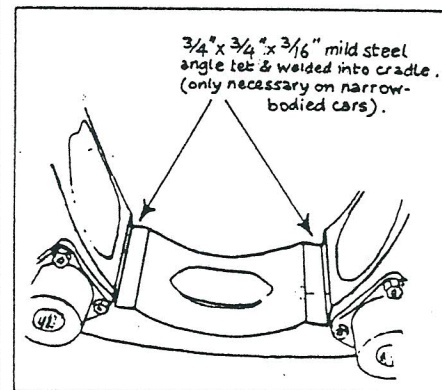


Fig. 5. Modification to cradle. (On narrow bodied cars only.)

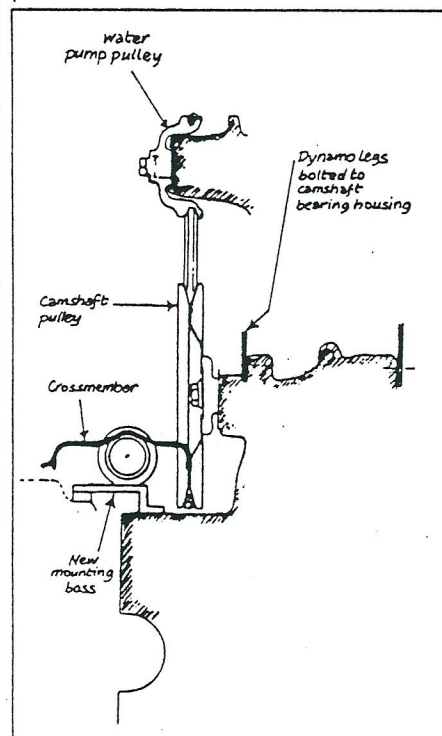


Fig. 6. Camshaft pulley fouling cross member.

re-positioning it is to separate it, reverse the dish and then re-rivet the dish to the central boss. The result of these modifications is to move the line of the pulley train back by about 15mm, as shown in Fig. 8, which also gives details of the new mounting position of the dynamo.

Some modification is still necessary to the cross member, but it is extremely minor and is shown in Fig. 9.

Now we get to the heart of the problem—the output shafts from the gearbox. The original ID/DS gearbox is shown in Fig. 10.

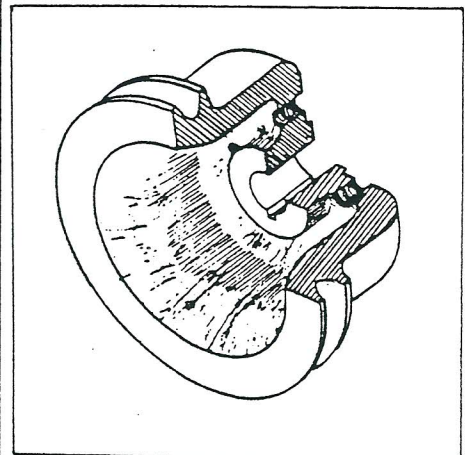


Fig. 7. New water pump pulley.

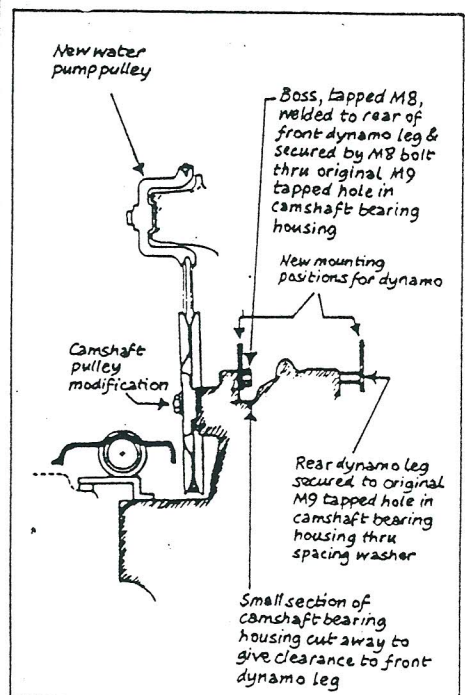


Fig. 8. New water pump pulley and modified camshaft pulley in position.

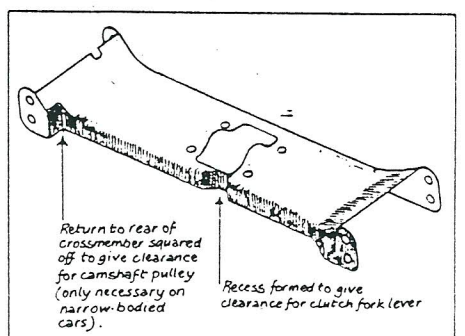


Fig. 9. Modification to rear edge of cross member.



The easy way is to swap the ID/DS differential for a Traction one, and machine a bush into the ID/DS crown wheel in which the Traction planetary wheel shaft can run. Whilst this is an easy, and in many ways, a practical solution it uses a Traction differential, which is not particularly well engineered. It is inherently weak because the planetary wheel shaft, onto which the output flange is splined, runs in a bush bearing from which the face of the output flange overhangs by about 50mm.

The only other work necessary is to machine off the gearbox flange to accept a 3" x 1 3/8" x 9/16" oil seal, machine down the Traction output flange from 36mm to 1 3/8", and re-shim the differential-side taper roller bearings.

This layout is shown on the right-hand side of Fig. 11.

By the time I'd got to Mk4, I was convinced it would be far superior to retain the ID/DS differential and make up a new pair of output shafts. These are machined from a solid 3" x 3" bar of EN24 steel, and it grieves me to see over 90% of the original bar disappear in swarf! The shafts are then hardened and tempered after basic machining, and finally ground to the correct dimensions and finish for the bearing seating/oil seal face.

The principle is the same as the original: the outer end of the output shaft runs in a ball bearing. I considered various arrangements for retaining the bearing to the output shaft and the flange of the gearbox using standard bearing and oil seals, but could not better the original layout, with the possible exception of using circlips instead of threaded sections.

The existing bearing/oil seal housing, however, is begging to be re-used, which I

did by machining down the outside of the housing and shrinking it into the flange, as shown in the left-hand side of Fig. 11.

In order to provide proper support for the bearing, it must be located mostly within the flange and this pushes the oil seal outside the line of the flange. This in turn pushes the face of the output flange out so far that it would be impossible to install if the normal stud fixings to the drive shafts were used. The output flange is, therefore, made a little thicker and the stud holes tapped for connection to the drive shafts via caphead allen screws.

The flanges are held to the gearbox via four No. M7 bolts and six No. M9 bolts. The M9 bolts pass through the original gearbox support brackets and are too long for re-use. Replace these with 3/8" BSF bolts 1 1/4" or 1 1/2" lg. (M9 is 0.354" dia. with 20.32 TPI - 3/8" BSF is 0.375" dia. with 20 TPI - just run a plug tap through original holes but be careful not to leave swarf inside gearbox). It is necessary to recess countersunk head allen screws for the bottom two holes on each side, and file away the bottom of the flange for the narrow-bodied cars, to give clearance in the cradle.

The engine/gearbox unit is now ready for installation in the car, so we are about half way there! I will describe the gear change mechanism and the other ancillary modifications necessary to complete the conversion in the next issue.

Roger has certainly given a lot of thought and hard work into the planning and development of his 4 speed gearbox conversion in recent years, and we are fortunate to be able to publish details of his work for the benefit of all members.

Many members may feel, however, that the actual task of doing the conversion themselves is beyond their ability and scope, or just as likely, they do not have the engineering equipment required!

Roger is, however, willing to undertake the conversion of members' cars at what is a very reasonable cost, considering the amount of time and work involved. For further details, Roger can be contacted at the address given in the Classified Ads. section of the magazine.

Whilst every effort is made to ensure the accuracy of the information and advice published in this magazine, neither the T.O.C. or the officers and members thereof, or the authors, accept any liability whatsoever for such information and advice.

#### Service

4 speed gearbox conversion complete with gearchange mounted behind dash as per original. See article in this issue of FP, contact Roger Williams, 37 Wood Lane, Beverley, North Humberside, HU17 8BS. Tel. 0482 881220.

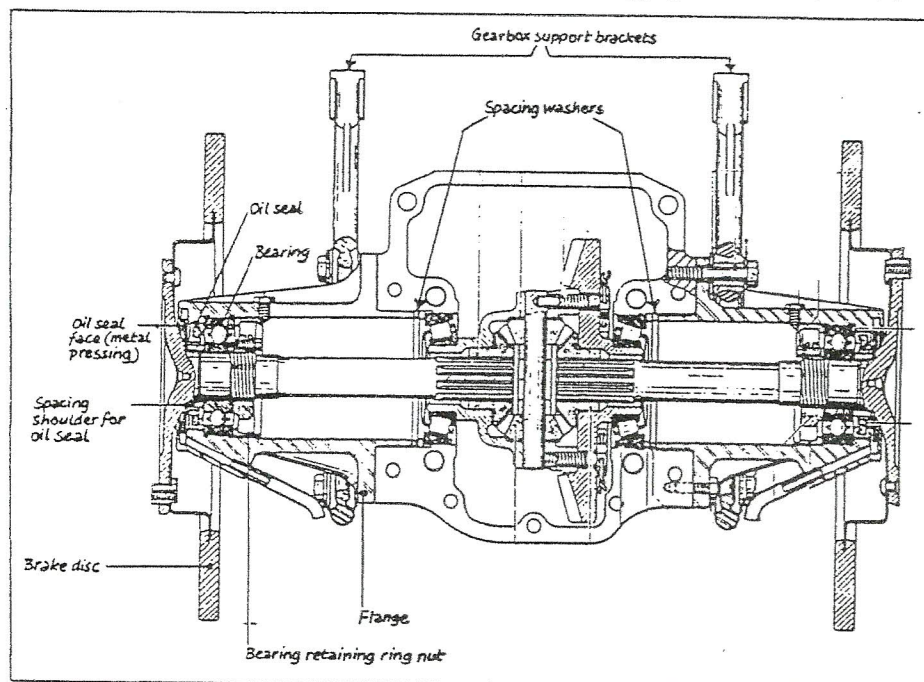


Fig. 10. Original ID/DS gearbox before modifications.

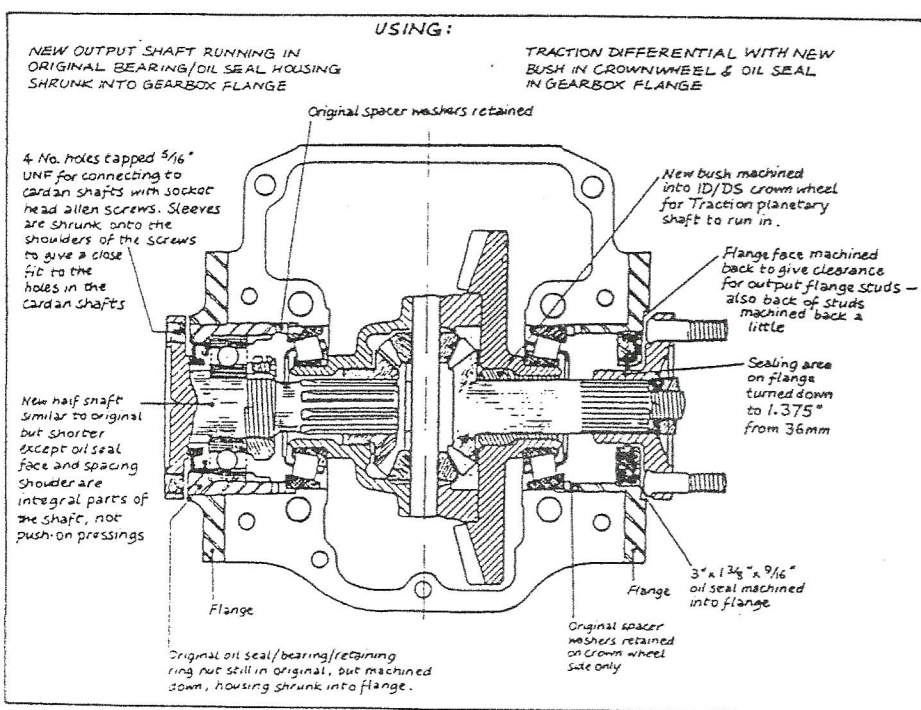


Fig. 11. Section through ID/DS gearbox showing conversion using



# More glide in your Stride!

From: Floating Power, January 1987  
(Traction Owners Club, UK).

Roger Williams concludes his workshop special on his conversion to a four-speed box.

AFTER INSTALLING the engine/gearbox unit in the car as described in the last issue there is the small problem of getting the ancillaries like the gear change and clutch to work properly AND look as if they were original fittings.

Starting with the exhaust — there are at least two types of exhaust manifold fitted to ID/DS engines depending on the age. The most common type appears to be the one which points toward the front of the car which gives very little space in which to turn the line of the exhaust through 90° to get it through the hole in the side valance panel. It is particularly tight on the narrow bodied cars. I've not found an exhaust factor that can satisfactorily bend a 50 mm dia. pipe through 90° with a centre line radius of 75 mm adjacent to a flared end. The solution was to make one up based on a malleable iron water pipe elbow which is perfectly smooth and of constant section around the bend. A flared flange is brazed into the top end and new pipe, which an exhaust factor can bend, connects to the existing pipe under the hull.

The other types of manifold points relatively directly at the hole in the valance panel and a special pipe can be made up by the local exhaust factor. These non-standard front sections are made of the thickest gauge steel available so that replacement is only necessary every 5–10 years.

The bottom hose connection from the radiator to the water pump has to follow a tortuous path around the camshaft pulley and under the dynamo as shown in Fig. 1. This can be made from odd bits of heater hose but is more satisfactorily made by brazing together a series of large diameter copper central heating elbows. The water pump on the ID/DS cylinder head is offset to the left and the original Traction fan which is mounted on the new water pump pulley has to have the tips of the blades shortened by about 20 mm on the narrow bodied cars to give clearance to the bottom hose. Cooling efficiency is unaffected. The bottom hose, on the narrow bodied cars, covers the rear wishbone grease nipple and this is replaced by one with a 45° elbow.

The top hose is made by joining the radiator end of the Traction one to a shortened ID/DS one. Push an old bit of exhaust pipe into the Traction hose and then feed the ID/DS hose over it and clamp with a jubilee clip. When connecting the water pipes make sure you can get to all the jubilee clips to tighten them with all the body panels on. I made the mistake first time of clamping the piping before installing the engine/gearbox in the car and connecting to the radiator before fitting the body panels. Needless to say there was the odd weeping joint and half the car had to be taken to bits to get at the offending joints.

And so to the gearbox linkage. The gear change mechanism is a combination of back/forward and lateral movements. In the ID19 the gear change is via a column mounted mechanism which provides the back/forward motion via a series of articulated ball cranks/rods and the lateral one with a cable. To keep the Traction looking original, the guts of the original column change mechanism is mounted horizontally behind the dash with the original gear lever cut off just behind the dash and a Traction leader welded to the stump. The layout is as shown in Fig. 2. However, this repositioning of the column change mechanism moves it further away from the gearbox and the original cable and rod are too short. Also the operating mechanism of the gearbox is forward of the radiator and on the narrow bodied cars there is no direct line between the bulk head and the gearbox without going through the radiator. It is possible to get a direct connection on the wide bodied cars but I wanted a mechanism that would fit all cars with only minor modifications necessary when changing to/from a wide to a narrow bodied car. With the column change mounted horizontally behind the dash, the cable and rod (with a small extension piece) can reach the bell housing and the solution was to provide a new linkage system from here to the gearbox operating mechanism. Fig. 3 shows a general view of an ID19 gearbox fitted with a gear linkage for a narrow bodied car with a rod operated clutch. Fig 4 shows this mechanism in more detail. Note that the connecting rod between the cable and the bell crank operating the 'across the gate'

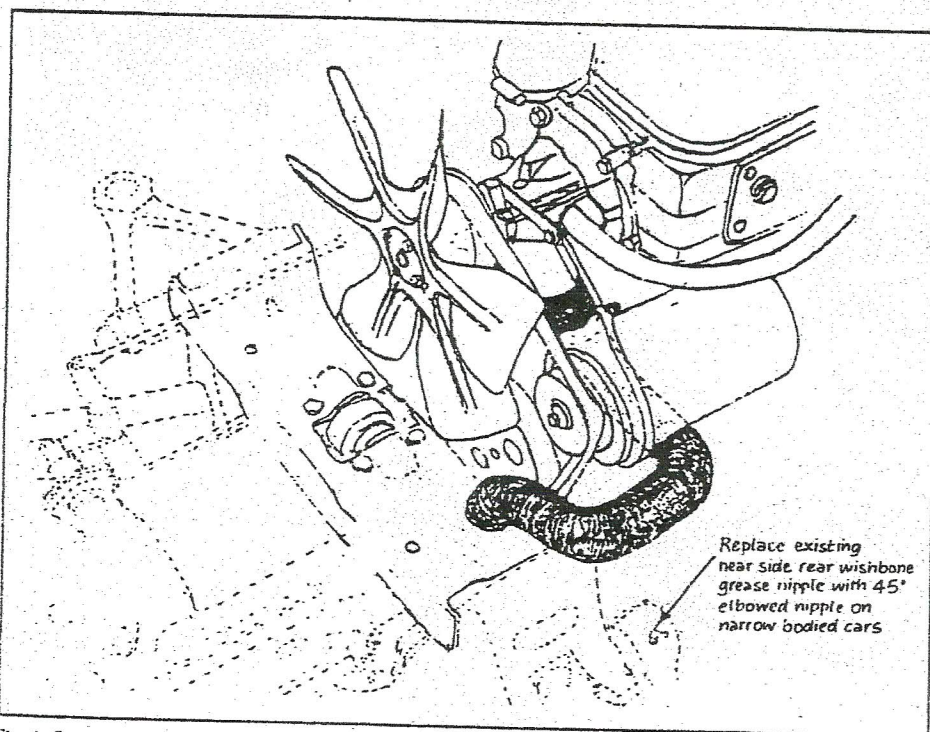


Fig. 1. Special bottom hose for the narrow-bodied cars (wide-bodied cars similar).



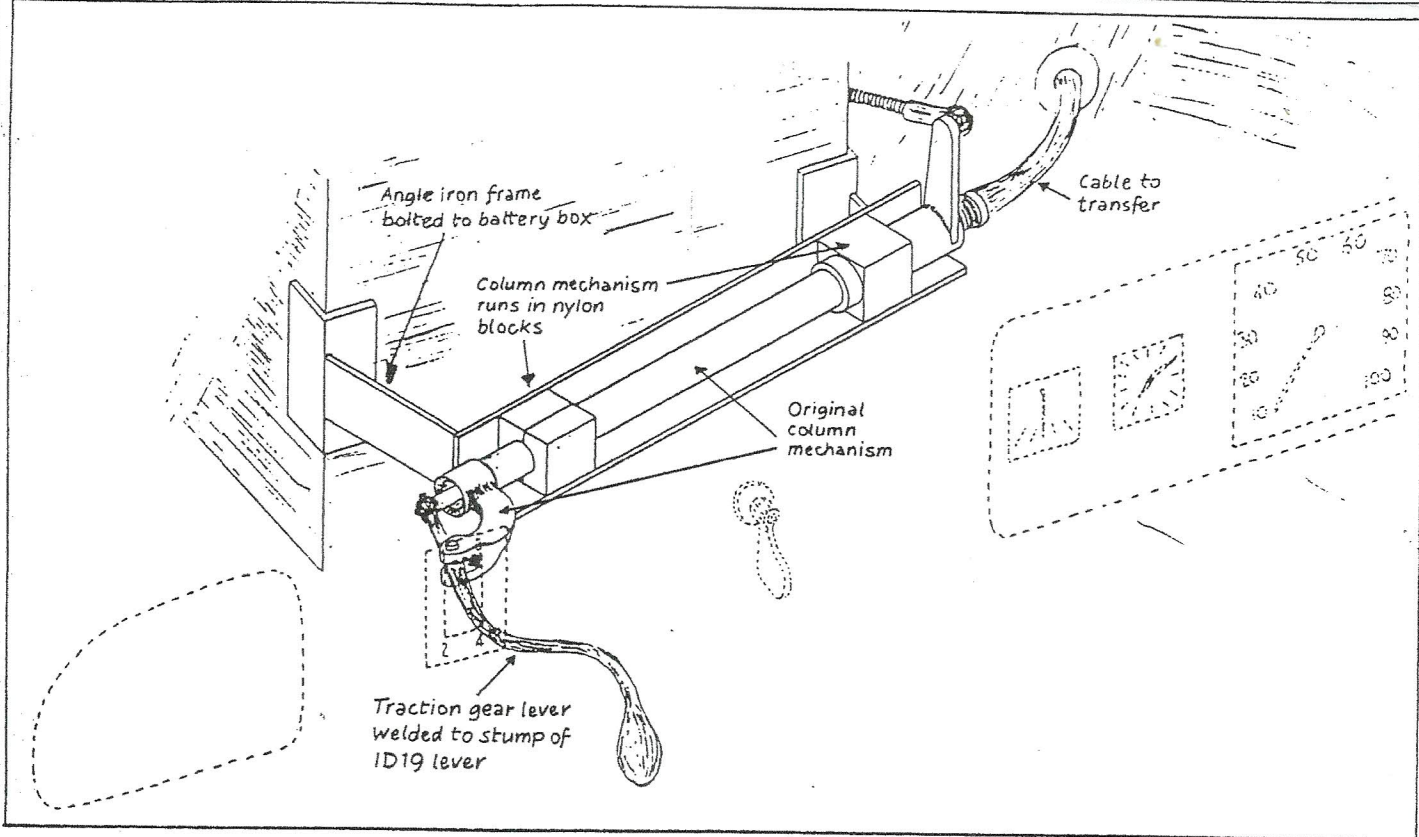


Fig. 2.

movement passes over the crossmember but under the radiator. There is enough room but only just! Unfortunately this rod passes exactly through the offside radiator mounting on the wide bodied cars. Early systems had a kink in the rod to get around this mounting but this did not prove entirely satisfactory and a modification was necessary. Tom Evans and I arrived at the same solution independently which was to take the connecting rod under the crossmember. This involved inverting the transfer mechanism, which is mounted on the bell housing, and the bell crank operating the 'across the gate' movement. Fig. 5 shows this in more detail. The individual components of the transfer mechanism and the extension of the 'across the gate' plunger are shown in exploded form in Figs. 6 & 7 respectively.

One of the problems is getting reverse gear which is engaged by pushing against a strong spring within the gearbox presumably to stop anyone slipping into reverse instead of top. In the ID19 the original gear lever gives more than a 10:1 lever arm and the push forward with the full support of the seat is easy. However, when the column mechanism is mounted horizontally behind the Traction dash with the Traction gear lever, not only is over half the lever arm advantage lost but the action is across the car. This is not so bad on the LHD cars where you can push away from yourself with the support of the seat/door. On the RHD cars you have to pull with your left hand and you tend to slide over the slippery leather seat. A couple of coils are ground off the spring to give some resistance to warn you that you are going into reverse, but not enough to develop a Charles Atlas left arm.

Finally to the clutch – the operation in the original ID19 cars was by cable which was anchored in a boss cast into the top of the bell housing. Bosses are cast for both left and right hand drive cars but only one will have been slotted and tapped. The clutch fork lever is operated by an articulated rod actuated by a bell crank and this system can

be used directly with an original compatible cable on the left hand drive cars with minor modification at the pedal end. Right hand drive cars have rod operated clutches and to retain this robust and reliable operation a new clutch lever and pivot boss, as shown in Fig 8, is made up.

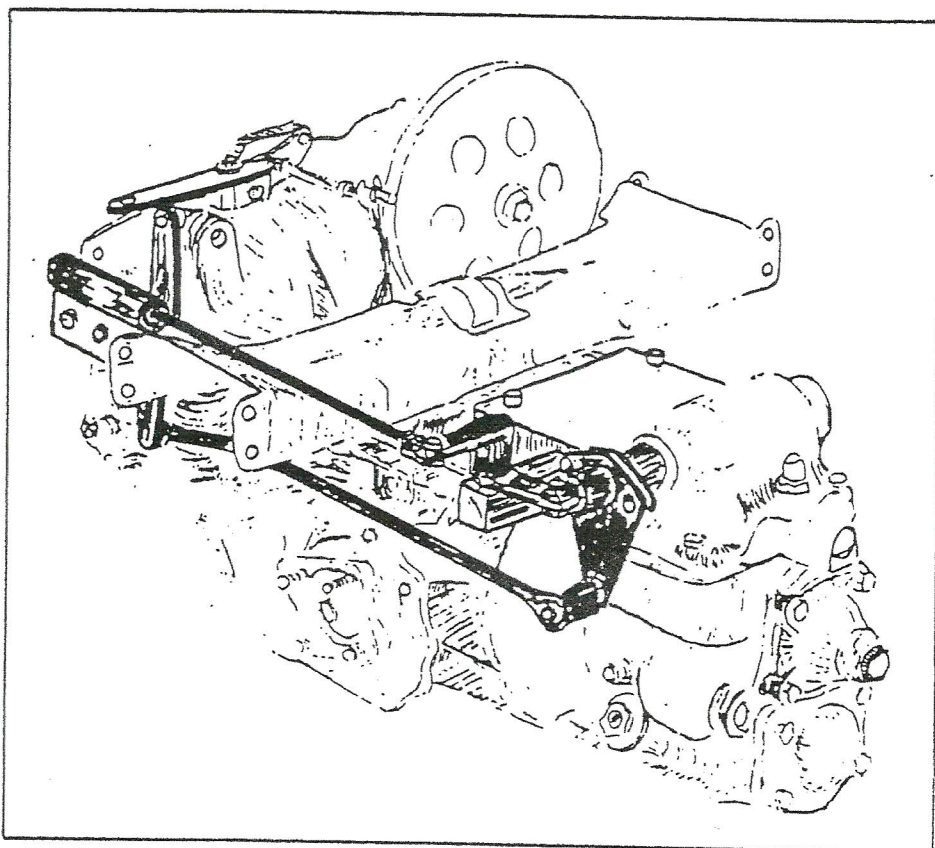


Fig. 3.



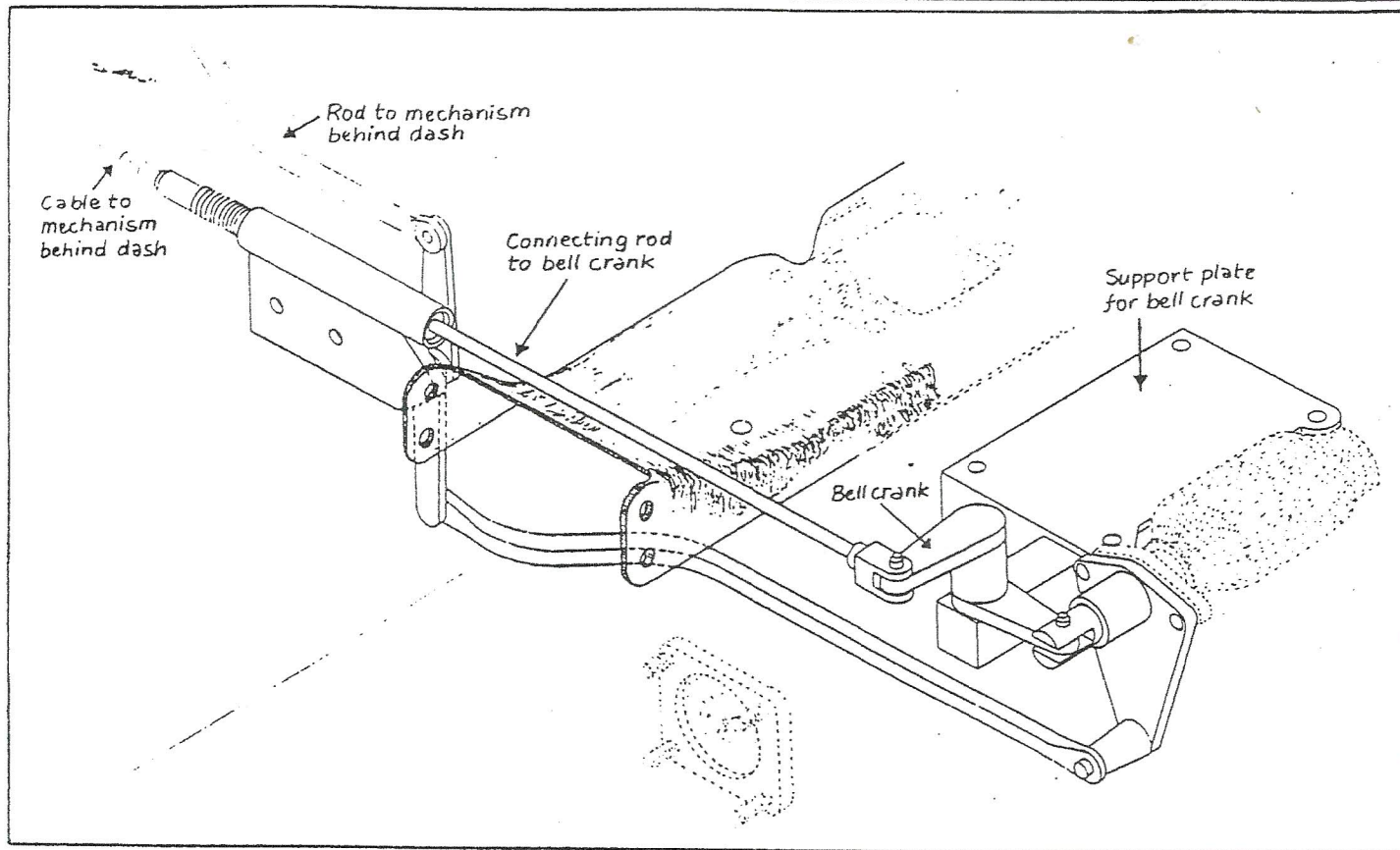


Fig. 4. Arrangement for narrow-bodied cars.

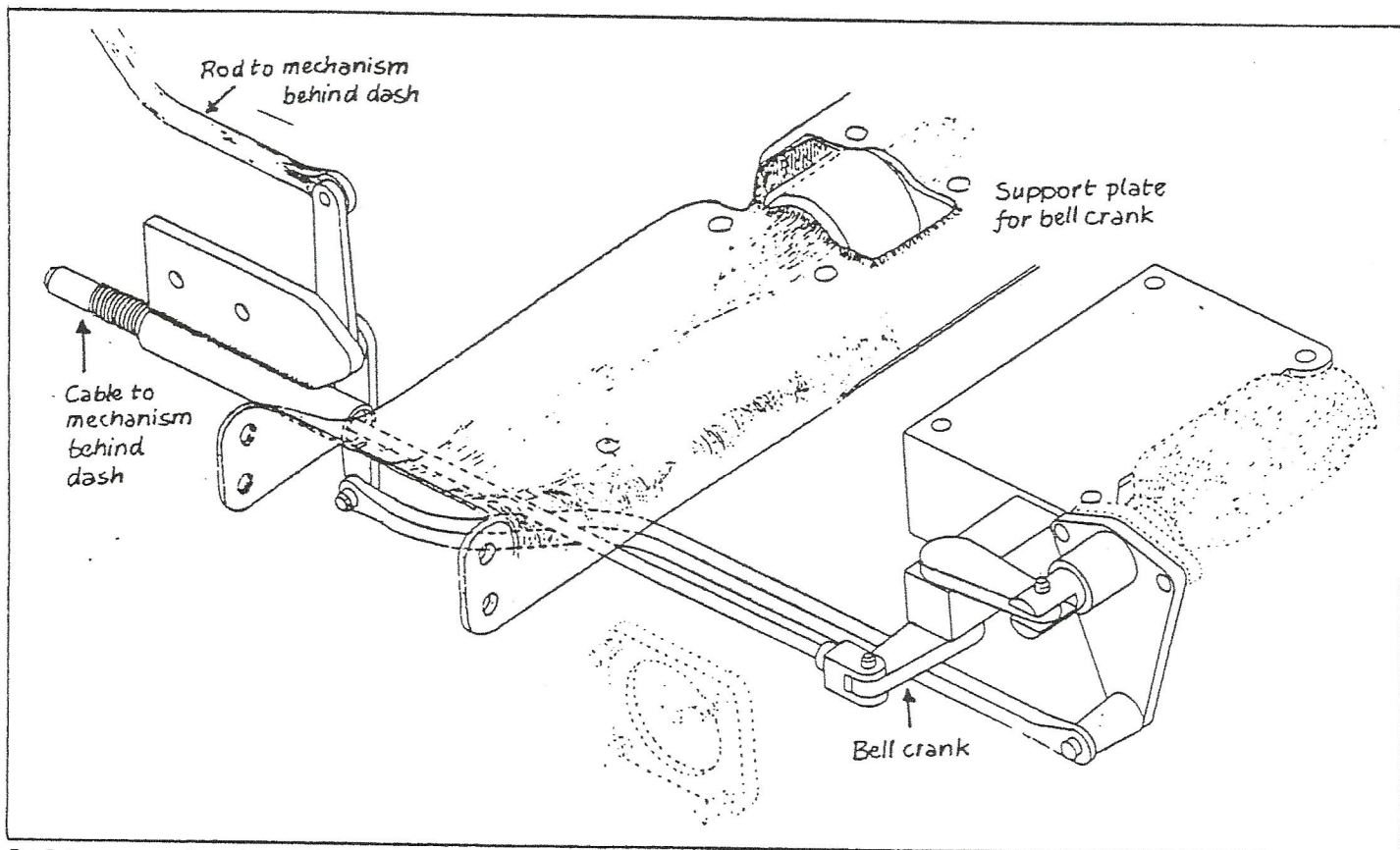


Fig. 5. Arrangement for wide-bodied cars.

Although you can get everything in, it is a bit of a squeeze on the narrow bodied cars. However, once installed and operational there is less maintenance than on a Traction and the performance and economy are in a higher league altogether.

And what of the future. The supply of early ID/DS engines/gearboxes is becoming

limited in this country and these are the only ones that will fit into the narrow bodied cars. However, it should be possible to fit the later engines, which are plentiful at the moment, into the wide bodied cars and that is my next project. The gearbox is wider and deeper and the 5-speed version does stick a long way out at the front but I am hopeful that it can be made to work.



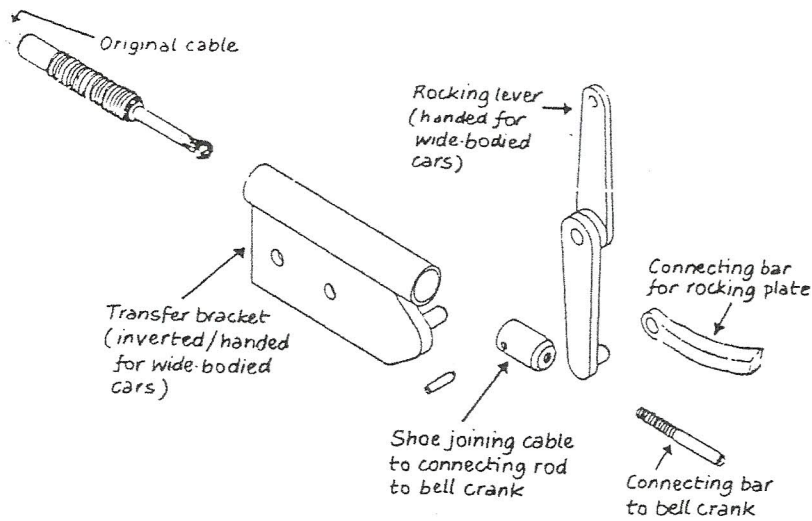


Fig. 6. Transfer mechanism for narrow-bodied cars.

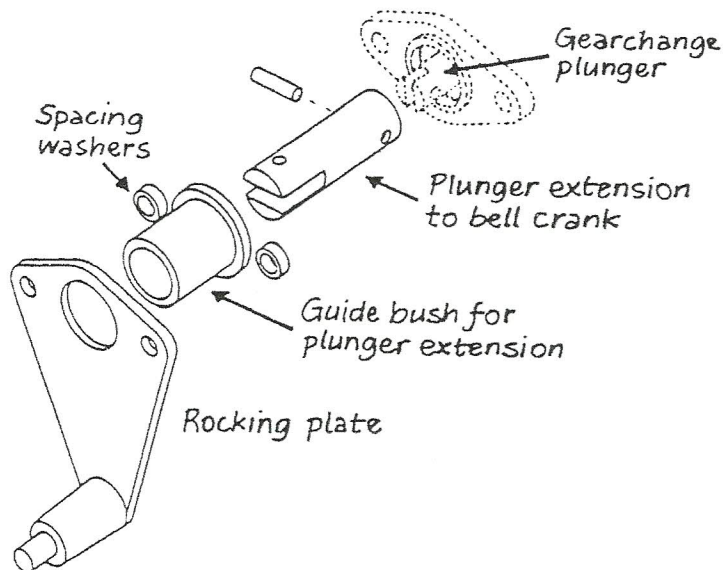


Fig. 7.

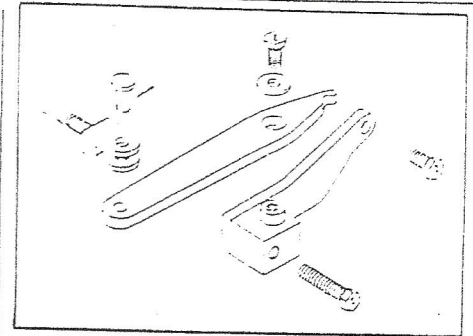


Fig. 8. New clutch lever and pivot boss for rod-operated clutches.

Roger has certainly given a lot of thought and hard work into the planning and development of his 4 speed gearbox conversion in recent years, and we are fortunate to be able to publish details of his work for the benefit of all members.

Many members may feel, however, that the actual task of doing the conversion themselves is beyond their ability and scope, or just as likely, they do not have the engineering equipment required!

Roger is, however, willing to undertake the conversion of members' cars at what is a very reasonable cost, considering the amount of time and work involved. For further details, Roger can be contacted at the address given in the Classified Ads. section of the magazine.

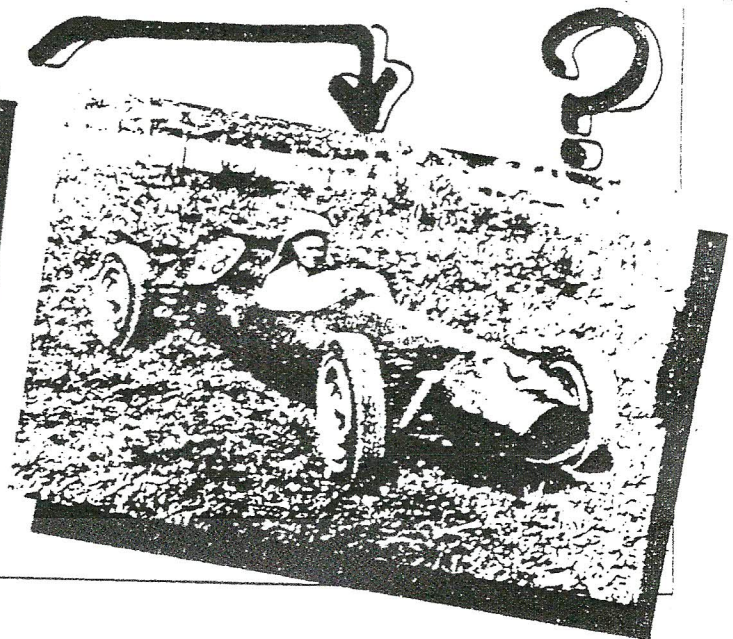
Whilst every effort is made to ensure the accuracy of the information and advice published in this magazine, neither the T.O.C. or the officers and members thereof, or the authors, accept any liability whatsoever for such information and advice.

#### WHAT'S THE STORY BEHIND THIS PICTURE?

The car, we can tell you, is a rear-drive Traction-based Grand Prix racer. The driver is none other than our **GUEST SPEAKER** at the March CCOCA meeting at Nunawading (8 pm, March 22nd).

We're not going to give much more away, but let's put it this way. If you want a good evening out, and would like to hear from someone who has devoted a lifetime to Citroens, especially Traction and 2CVs, from the technical side and in fierce competition, then this has to be the opportunity for you. Format informal, question-and-answers after a short intro.

Coffee and chat to follow. You'll be sorry if you don't come!





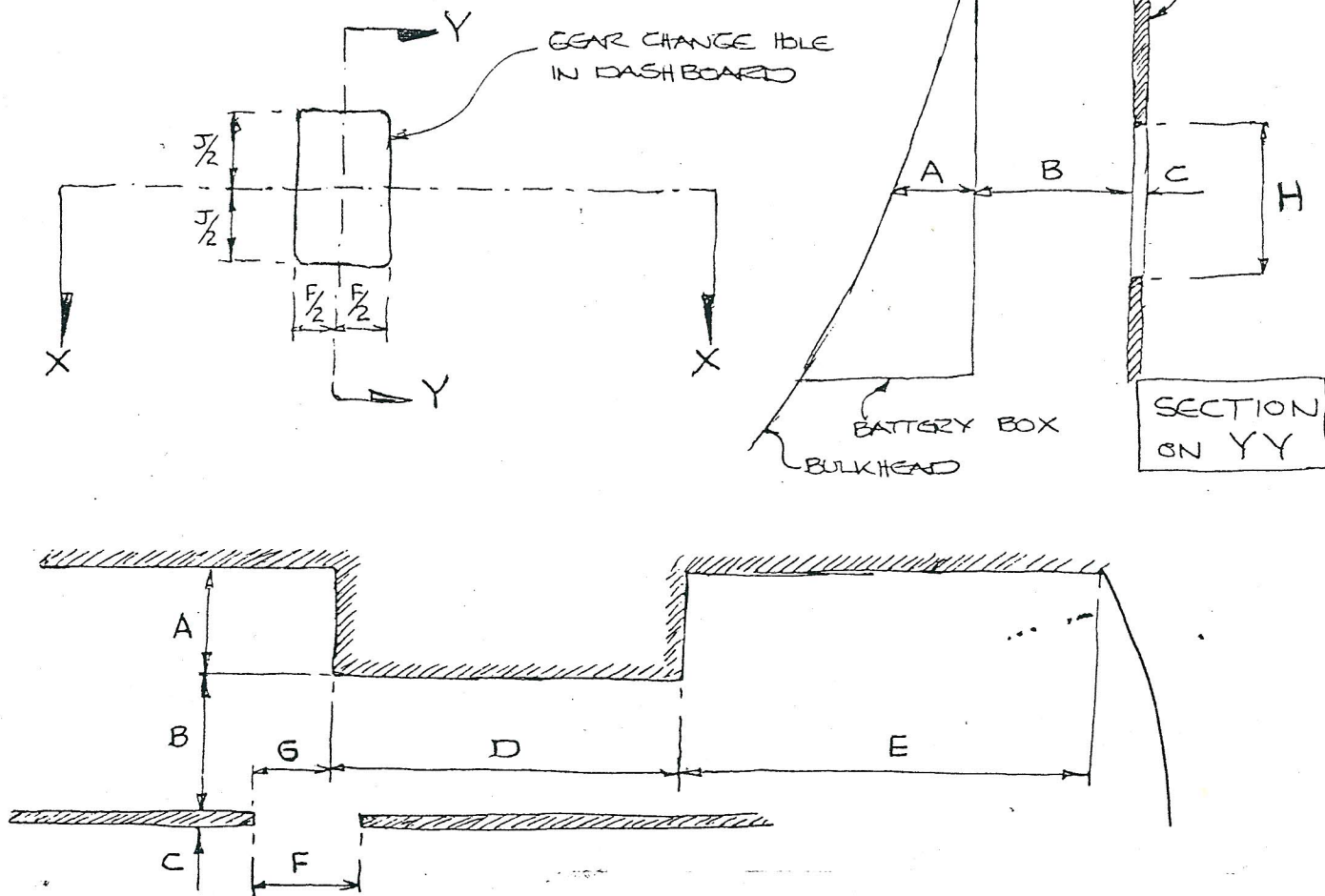
CAR TYPE :

YEAR :

RHD/LHD

OWNER :

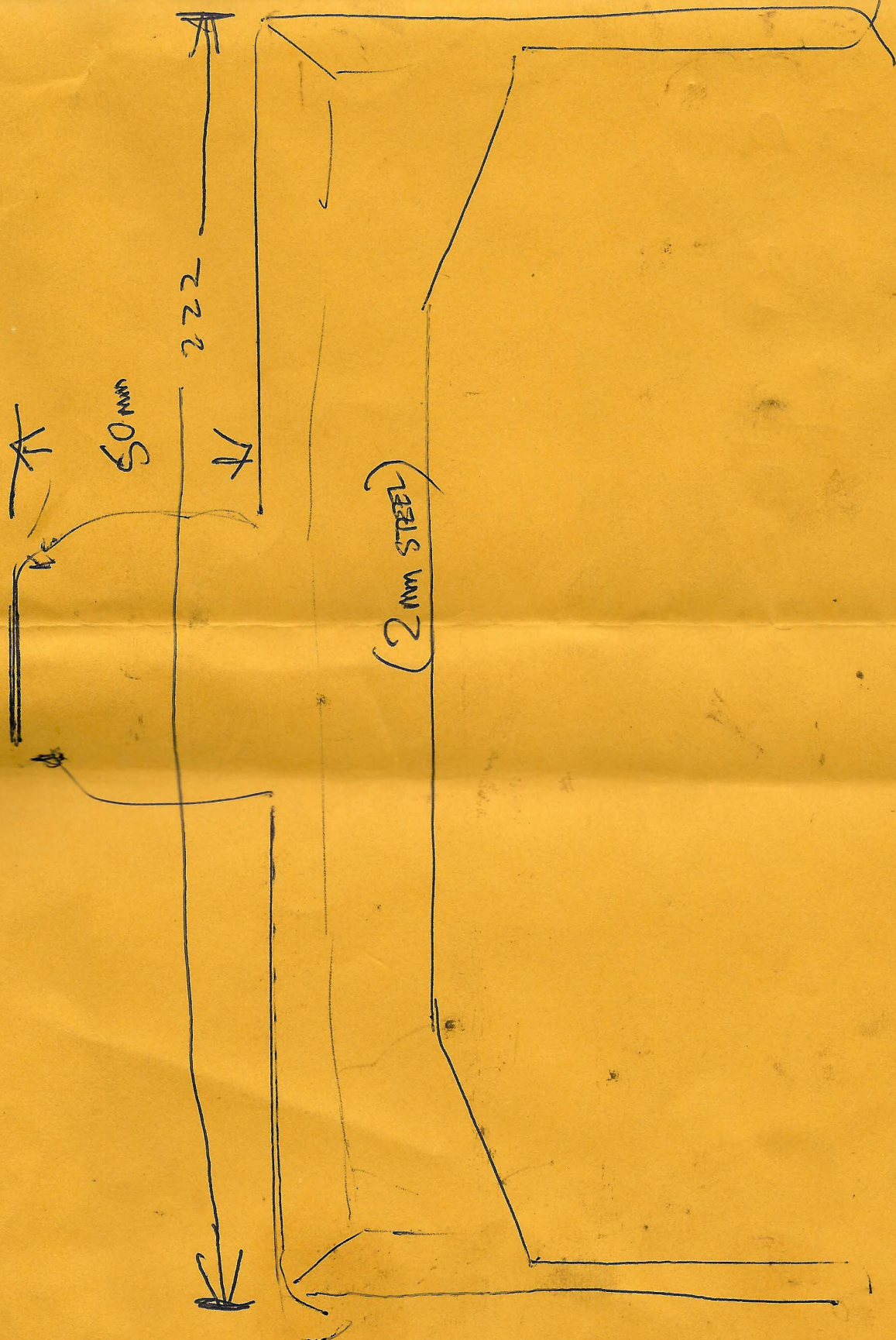
DIMENSIONS*	A	B	C	D	E	F	G	H

\* DIMENSIONS TO BE  $\pm 0.5\text{mm}$ 

NB. ALL DIMENSIONS ARE TO BE MEASURED ON A HORIZONTAL PLANE THROUGH THE CENTRE OF THE GEARCHANGE HOLE IN THE DASHBOARD

FIG 1





(2 mm STEEL)

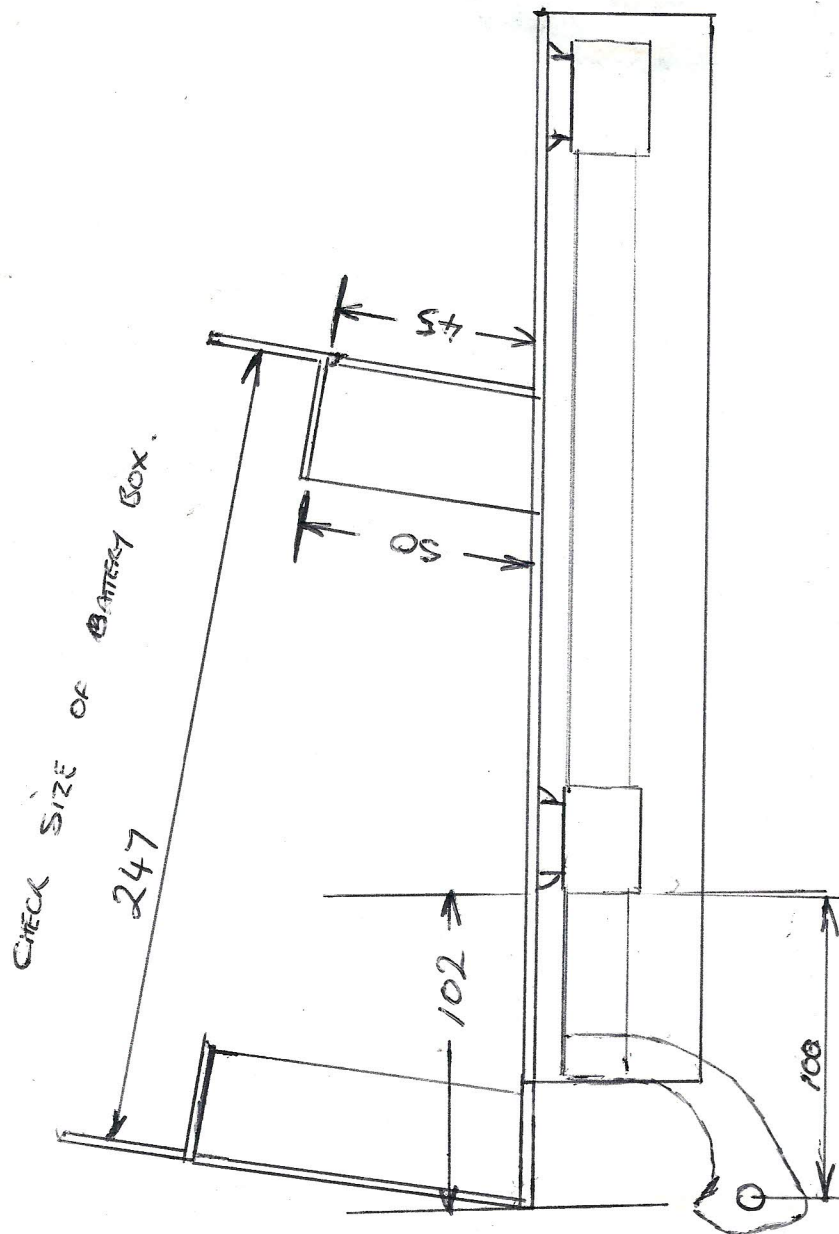
222

50 mm

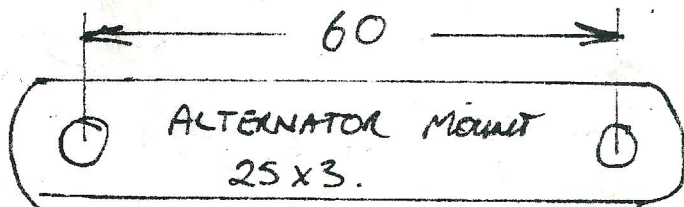
$K_2$



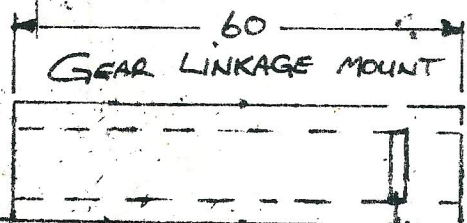
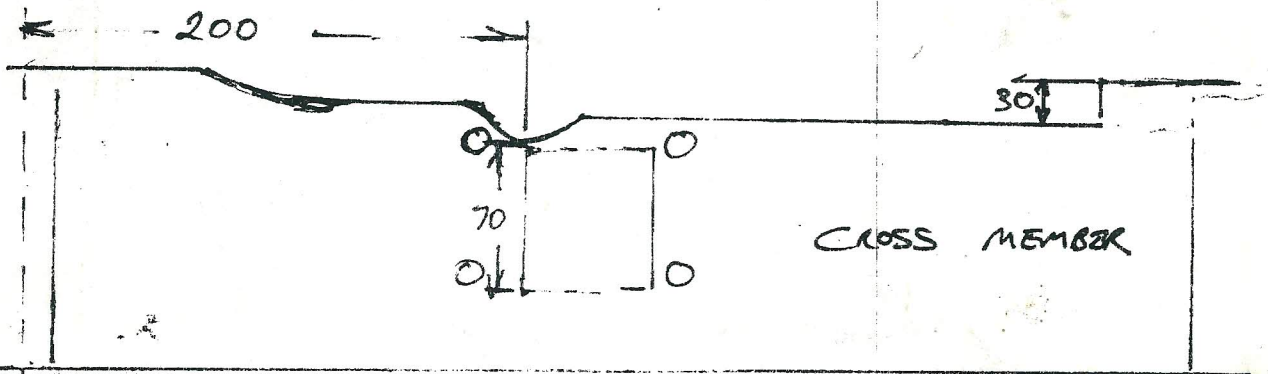
# 11 BL GEAR CHANGE BRACKET.



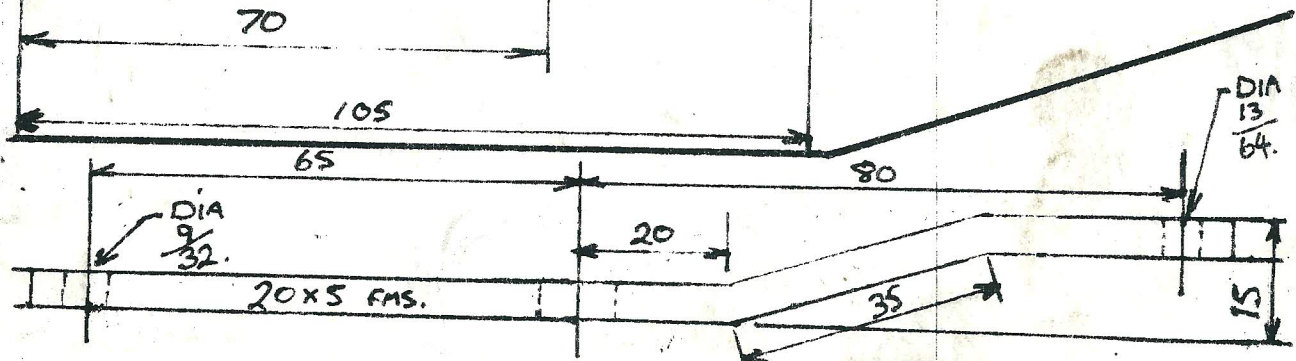
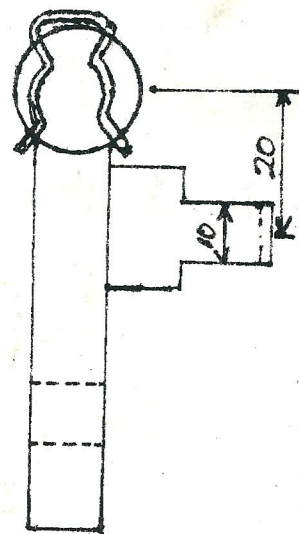
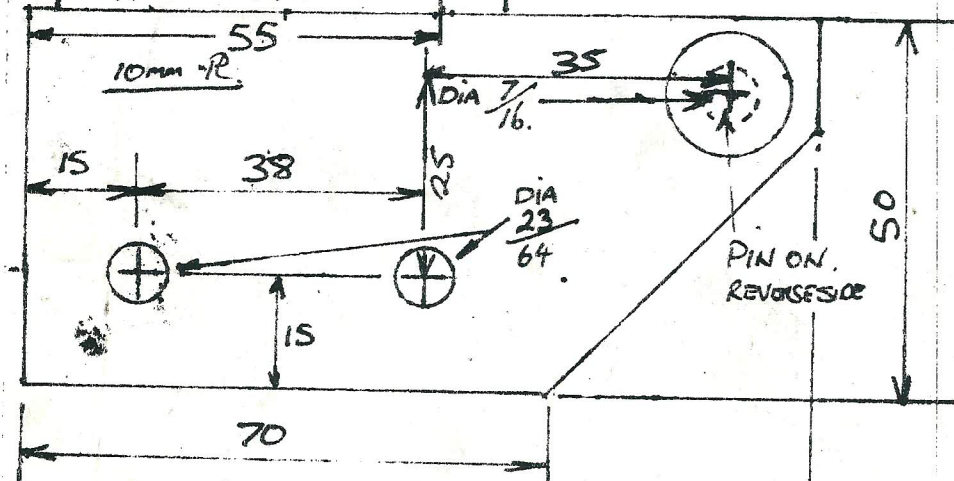




SPACERS 10mm



BIG 15  
BIG 6





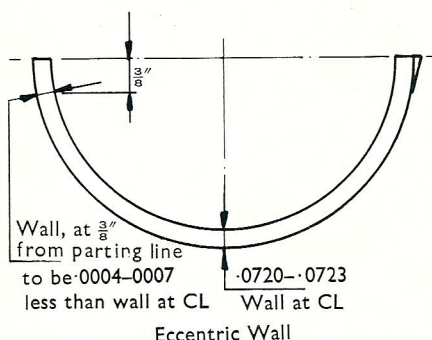
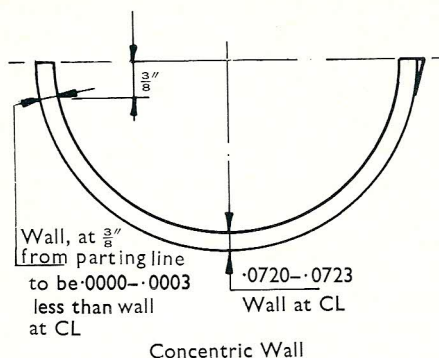


Fig. 2.9.4—Illustrations showing essential difference between concentric and eccentric wall bearings.

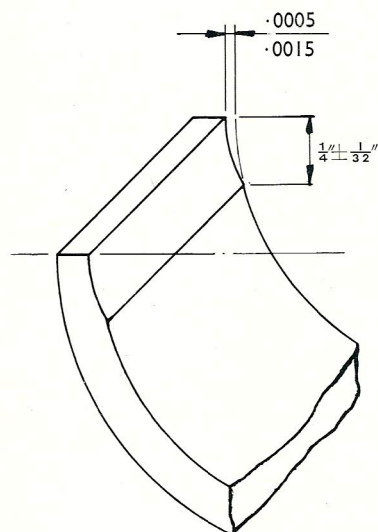


Fig. 2.9.5—Illustration showing in exaggerated form the effect of parting line relief.

### Parting Line Chamfer

A small chamfer (usually 0.015" maximum) is permitted at the inside corner of half bearings to discourage burrs caused by slight knocks during

handling, and to further avoid the possibility of a square corner being presented to the shaft, which might set up a scraping action and disrupt the oil film.

In the case of flange bearings, a slightly greater chamfer (up to 0.025") is sometimes used to provide an oil channel for metered lubrication of the thrust faces.

Excessive parting line chamfers must be avoided on main bearings in particular, as they provide a direct escape for the oil, and may cause starvation of the rod bearings if not controlled.

### Oil Holes

Oil holes are used for the purpose of admitting oil to a bearing or for conveying it from the bearing to another part of the engine.

Oil is usually admitted to the main bearing via a drilling from the engine block oil gallery which registers with a hole in the main bearing. Oil which is surplus to the main bearing requirements may then be transferred—

- to the adjacent camshaft bearing via the main bearing oil groove and a second oil hole and drilling in the crankcase connecting the main bearing tunnel to the camshaft tunnel.
- to the adjacent rod bearings by way of drillings in the crankshaft connecting the main journal and big end journals. The drilling opening onto the main journal registers with the main bearing oil groove to provide a continuous oil feed.

Connecting rod bearings are sometimes provided with small spurt holes to give an intermittent oil feed to cylinder walls and piston pins.

Some recent types of connecting rod bearing have a small "cut-out" on one parting face which permits oil to spurt via a chamfer cut across the joint faces of the rod, or through a channel in the rod joint face, thus serving the same purpose as a drilled spurt hole.

### Oil Grooves

Main bearings are usually provided with only a circumferential oil groove, for the transfer of oil to camshaft and rod bearings as described above. Rod bearings are usually ungrooved, the reason for this is that grooving reduces the effective bearing area and breaks up the surface into a number of smaller areas which act independently. Hence the number and size of grooves must be kept to a minimum.



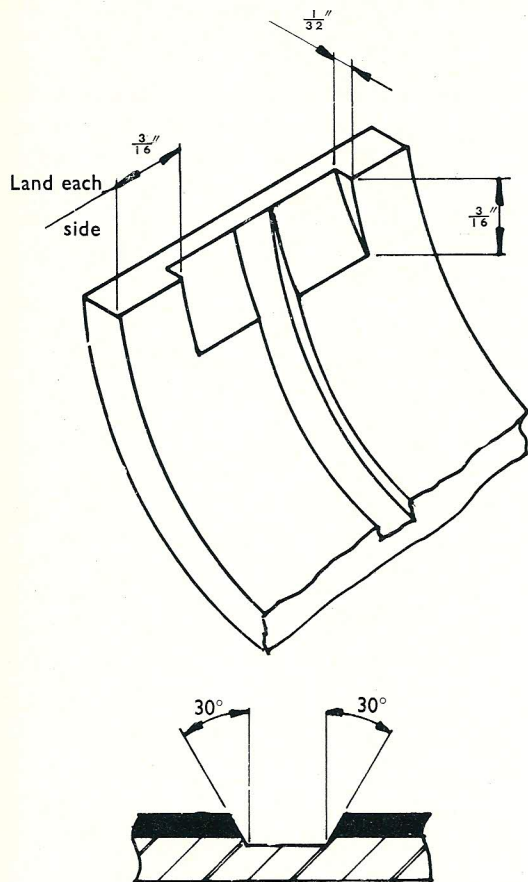


Fig. 2.9.6—Typical groove and oil spreader.

An oil spreader is sometimes used at the parting face of half bearings, but only when the length of the bearing is such that some assistance is necessary to ensure an adequate oil film out to the edges of the bearing.

### Thrust Bearings

Thrust bearings are used as an endwise location for the crankshaft and to absorb thrust loads caused by clutch operation etc.. They may take the form of a one piece half bearing having integral flanges, or a three piece construction using loose thrust washers.

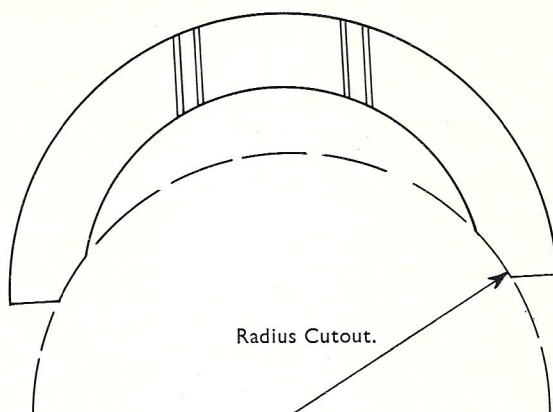


Fig. 2.9.7—Illustration showing radius which is provided on some thrust washers for manufacturing reasons.

Small grooves, usually two in number, are used on the thrust faces for the distribution of oil metering from the adjacent journal surface, and a relief, similar to the parting line relief described above, is used to blend one half to the other. Flange thickness should thus be checked in an area other than at the parting faces.

The flange parting faces are tapered on the flange only so that when two half bearings are paired a small gap will appear in the joint at the flange tips. The purpose of this is to prevent "heeling" of the flange tips at assembly, causing false crush or distortion of the flange faces.

Thrust washers are located in a machined recess in the housing end faces, and prevented from turning by a projecting lug on the lower half which registers in a notch in the bearing cap.

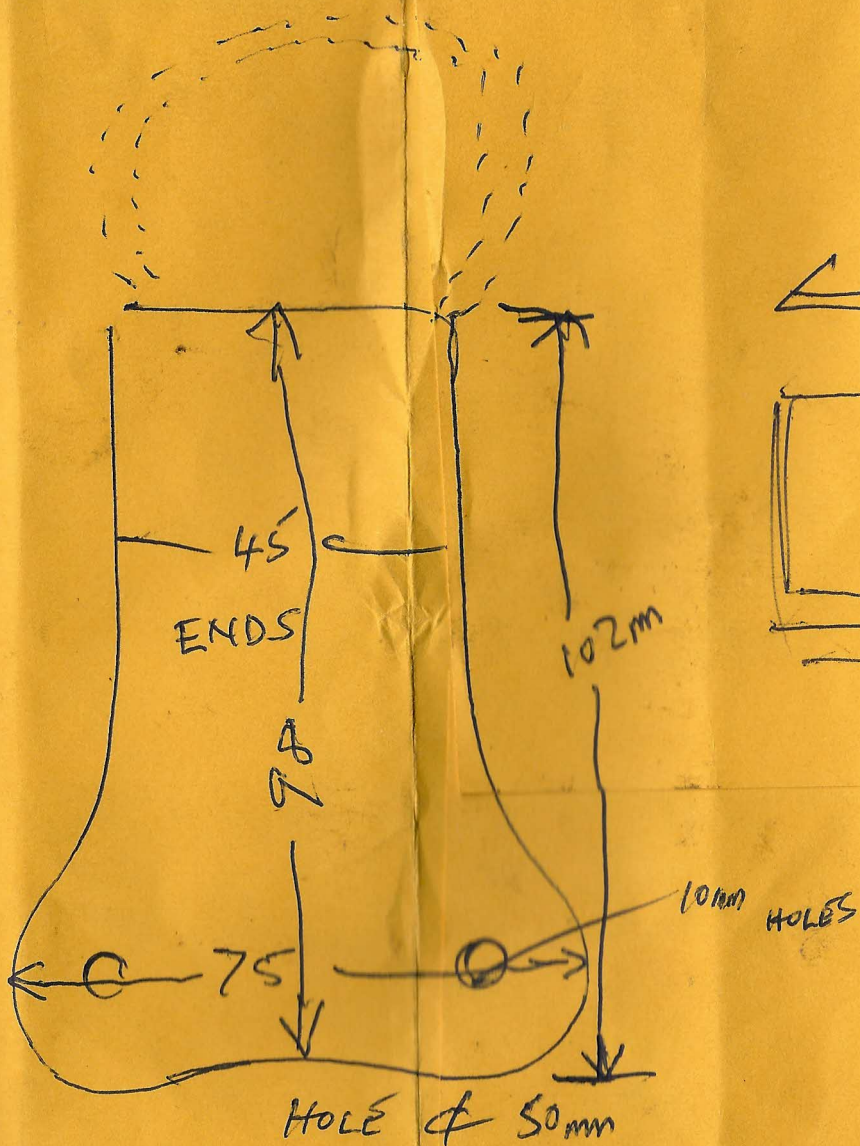
In some washers a small radius cut-out may be found at the junction of inside diameter and the joint face. This is included for manufacturing reasons only and plays no part in the function of the washers.

### Camshaft Bearings

Camshaft bearings provide supports to hold the rotating camshaft in place. They are usually made from strip materials and oil holes are punched in the strip before forming to shape. Some distortion of the holes occurs in forming and circular holes may become slightly elliptical in the finished bearing, without detriment to performance.

Original equipment camshaft bearings are frequently provided with a small semi-circular cut-out on one end face. This is purely an assembly location and useful only to the original engine

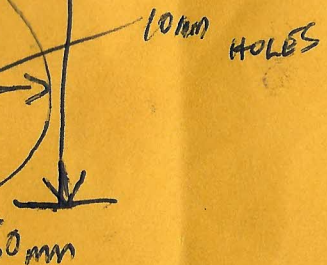
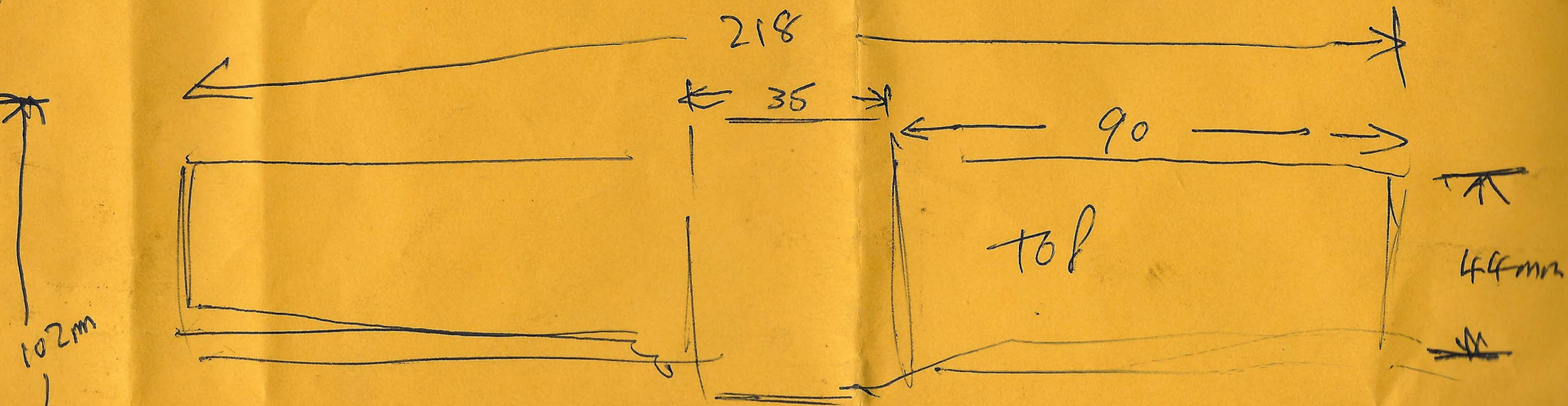




(4mm STEEL)



# FRONT ENGINE MOUNT



CORRECT G/Box SPRING  
IS ~~CS 206~~  
(CENTURY) C742.

~~THIS SPRING~~  
WORKS OK

G/Box

TRIED ONE BUT WAS  
A BIT LIGHT

REVERSE SPRING  
CHANGE TO 2 OFF

CS 207  
(CSW PRODUCTS  
0397285666)



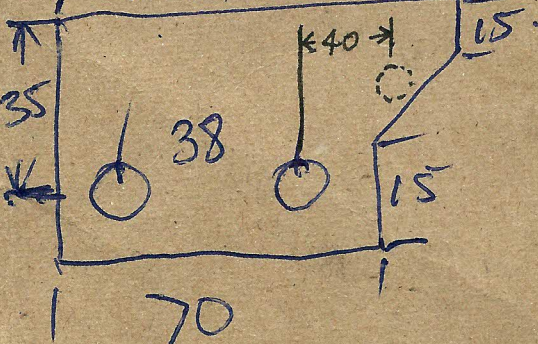
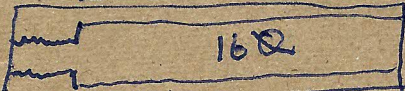
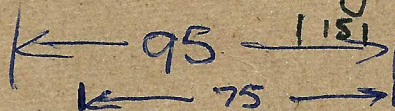
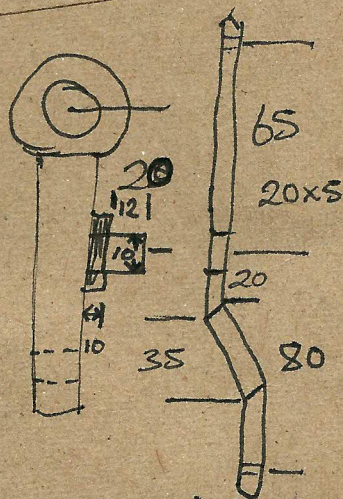
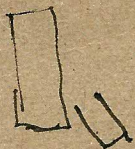
CH 1135 - TOP HOSE CHRYSLER VAL 6CYL 77-81.

CH 1425 BOT HOSE MQ PATROL DIES 80 on.

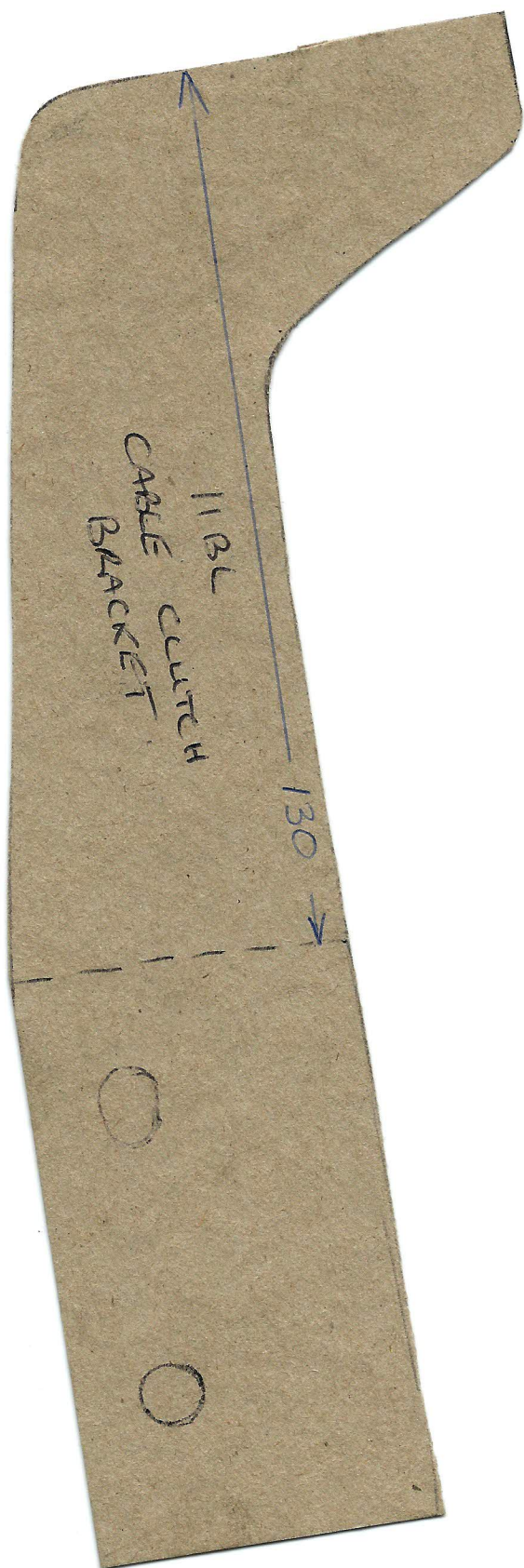
15AC LUCAS ALTERNATOR OFF DATSON  
(BUILT IN REGULATOR 48A)

RADIATOR BOTTOM HOSE OUTLET

PLAN

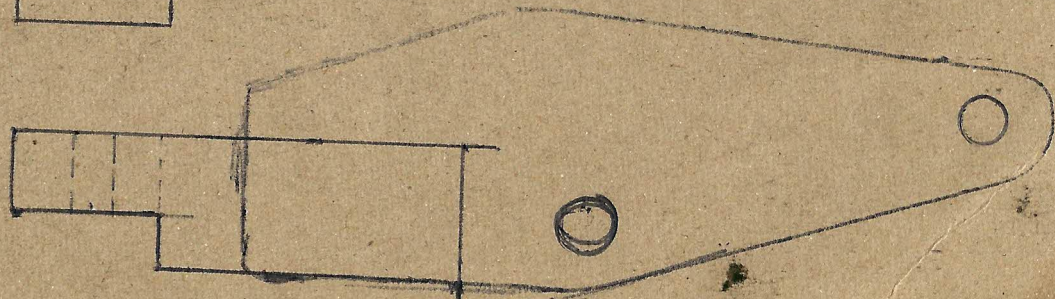
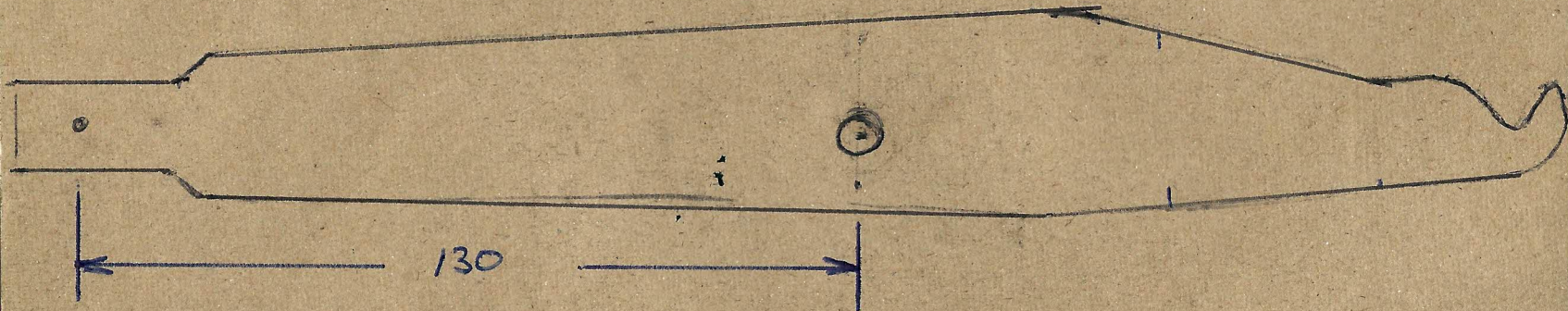








11 BL CLUTCH



98994411