

## **REBUILDING THE MORGAN FRONT SUSPENSION**

*by Lorne Goldman September 22, 2011*

There are VERY few jobs on a Morgan that present a danger to the operator. Of course, as with anything on a car, there is always the possibility of damaging a component or getting the job wrong but few Morgan tasks present a personal danger to the home mechanic who takes standard safety precautions. The Morgan front end disassembly and assembly is an exception to this. There are dangers. Yet it draws amateurs as this task, specific to Morgans only, has become an icon of what the accomplished home mechanic can do. An Everest to climb. That is not altogether a good thing. Without a study of what is entailed and the watchpoints, sadness can result.

Recently, a Morgan internet forum publicly posted how-to instructions prepared by a new owner who attempted the job without advice or research. Sadly, aside from technical errors that will require the job to be redone, his method is inherently dangerous and caused concern amongst those who have done this job before. Word arrived from France last week that a mogger had been very badly hurt following his instructions. Please beware!

We have had a spotless record for 15 years. We used to provided three (3) methods here to do the job, depending on the reader's skill level and experience with a Morgan front end. There has NEVER been a come-back or mishap on any of them in all that time. However, I have decided to remove the more expert methods and concentrate on the one considered the safest. The method below has the least risk. It has been used with uneventful success by hundreds of first-timers for a decade. **PLEASE BE CAREFUL ABOUT WHAT INSTRUCTIONS YOU CHOOSE TO USE.**

To avoid confusion, I have made these instructions as detailed as possible. If you have questions or comments, Please contact me. ([webmaster@gomog.com](mailto:webmaster@gomog.com))

**READ THE SAFETY NOTES FIRST.** The ignorance of one of these elements in the other instructions caused the accident referred to above.

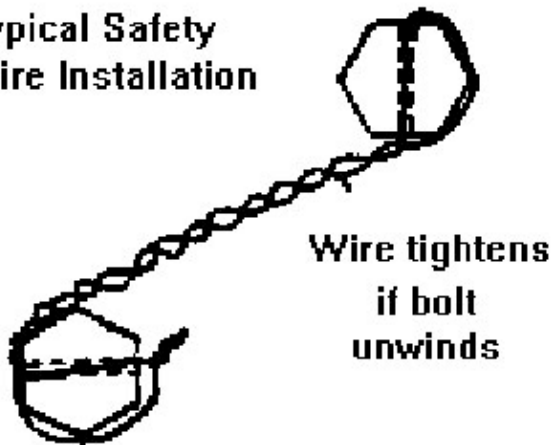
- A. [SAFETY NOTES](#)
- B. [SOME DEFINITIONS](#)
- C. [PARTS NEEDED](#)
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## SAFETY COMMENTS AND WATCHPOINTS

1. When working on the front suspension, the cross-axle must be seated on jack stands or their equals. Don't work on the car with it resting on a jack only.

2. **A SPECIAL NOTE:** Pros and old timers have all learned to shun spring compressors to assist in this task. Recently, a first timer installer published a how-to method that relied on them. The queries to GoMoG about it precipitates this update. Because of the (obscured) presence of the kingpin dust protector inside the main spring, NO pre-made compressor can be fit just right. The clamp sections do not have sufficient space to seat properly. They can often precariously hold the springs unevenly until, at high tension, they can slip. Then they expand suddenly with enough power to kill or cause great damage to the car. **DO NOT USE A SPRING COMPRESSOR.**

### Typical Safety Wire Installation



3. Make sure the caliper securing bolts have been safety wired such that the wire will tend to tighten the bolts (see sketch).

4. After the job, check every nut and bolt again after you have put about 100 miles on the car. Also check for wheel bearing play and take up if required.

5. Make sure you have all the parts of the assemblies in the order so that you do NOT forget something and be forced to deassemble again.

6. ASSURE that the hubs have not been reversed. Look at each knock-off and make sure it threads in the same direction as the rear wheel on the same side. If you have removed the hubs, and install them in the reversed direction (threads going the wrong way), you will loose a wheel. It is no fun --- so check!

7. Be sure to bleed the brakes if the pipes have been disconnected.

8. Make sure you understand which front system you have. From 2000 on, the MMC has been changing the front and you must be aware of the changes to do the job right. Check with the [greasing methods](#) in this Manual to ascertain the necessary watchpoints for each or contact the webmaster.

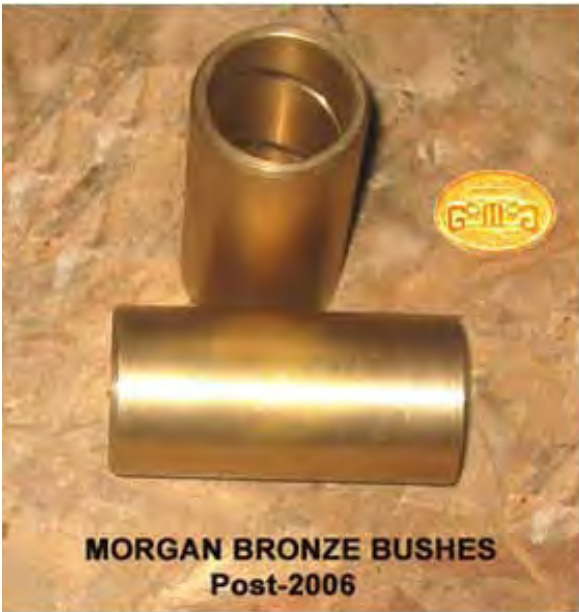
## **SOME DEFINITIONS**

**Wheel Spindle or Stub axle:** the front axle component to which the front wheel, brake caliper and rotor, shocks and road springs attach. Slides up & down on the kingpin. One per front wheel.

**Brake Caliper:** on cars with front wheel disk brakes, the clamshell shaped component housing the brake pads, to which the brake line attaches. Bolts to the back of the wheel spindle. One per front wheel. (Replaces front brake drum technology on older models)

**Brake rotor:** again on cars with front wheel disk brakes, the round flat plate like device which turns with the front wheels. Secured to the wheel spindle by the wheel bearings. Straddled by the brake caliper, with a brake pad residing on either side of it at approximately 2:00 o'clock. One per front wheel.

**Track Rod:** the rod connecting the left wheel spindle to the right spindle, and also the steering arm from the steering box. Each end terminates in a ball joint, which will need to be separated where it attaches to the wheel spindle.



**MORGAN BRONZE BUSHES**  
Post-2006



**DEVOL BUSHES**  
2002-2006



**Vesconite**

**HYLUBE**



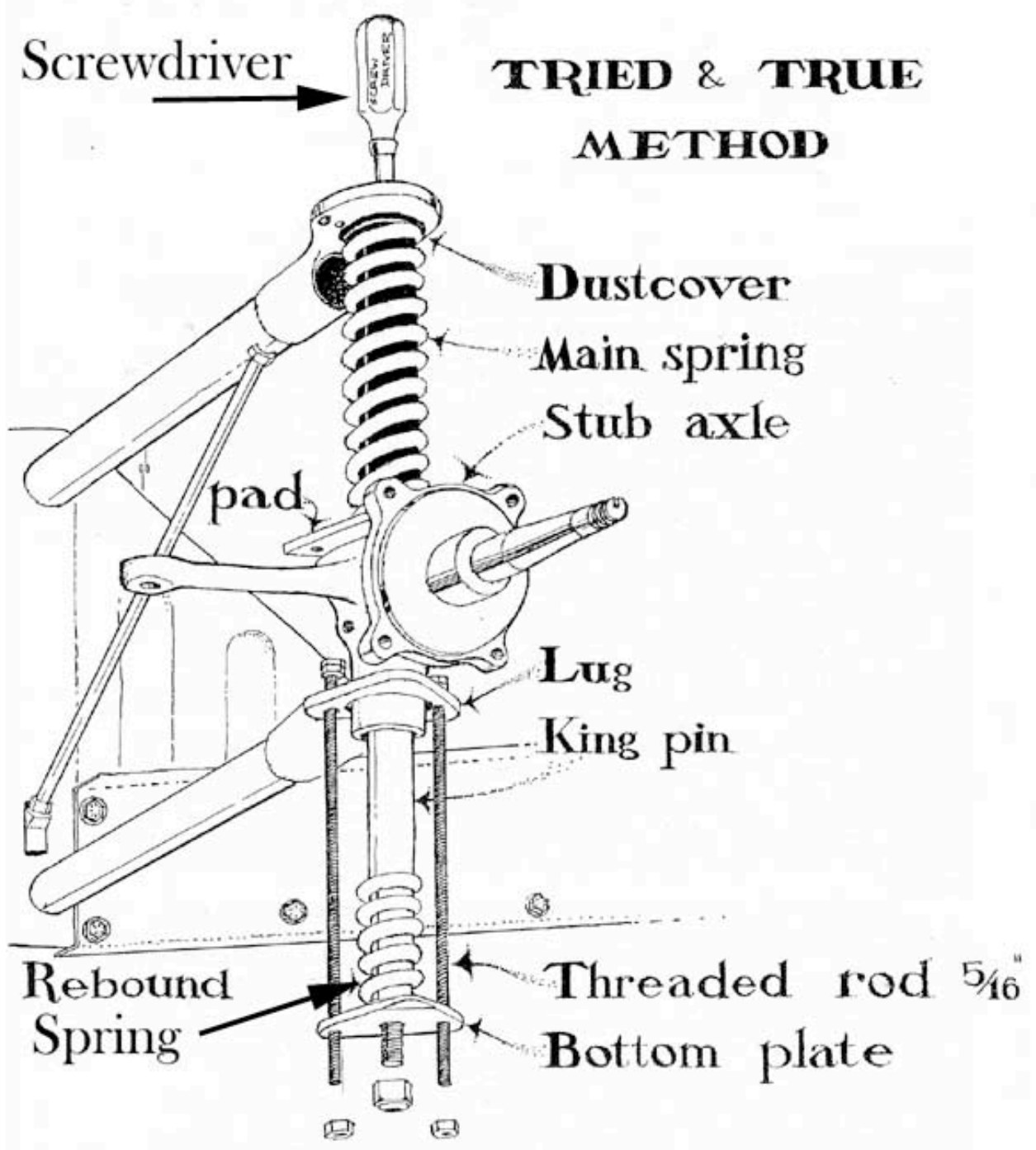
**Vesconite**  
**Regular**

## **PARTS NEEDED**

1. Two [hardchrome](#) (preferably) kingpins
2. Two new main springs
3. Two of the new shorter rebound springs.
4. Four bronze bushes. (See bush types.) (The new ones have a grease groove cut in them and should only be pressed in one way which is more or less obvious in examining them.)
5. Two new damper plates. (The damper blades and shims can be changed at any time.)
6. You should think of changing the main spring top bolts and the lock nuts below.
7. You will need wire to re-wire the brake caliper bolts.
8. Bearing grease

## **TOOLS NEEDED**

1. Rubber gloves (if wanted)
2. Small trolley jack (borrow one if need be)
3. Spanners, 21 mm, 14 mm, 13 mm, 11 mm,
4. Spanners,  $\frac{3}{4}$  in.,  $\frac{9}{16}$  in,  $\frac{7}{16}$ " and  $\frac{1}{2}$ "
5.  $\frac{11}{16}$  in socket
6. At least one if not two ratcheting  $\frac{1}{2}$ " (or 13mm) spanners. The job is a pain without one.
7. Small handheld sledge hammer (steel not lead)
8. Lead knockoff hammer
9. Two Needle nose pliers
10. Jack stands or blocks
11. 2 wire coat hangers or empty boxes
12. 12 inch pry bar (flat type used by burglars, available at any hardware store)
13. You may need a tie rod end remover.
14. A cut down Phillips screw driver.
15. 15. Two lengths of  $\frac{1}{4}$  inch- 20 threaded rod approximately 4.5 to 5.0 inches long. (Cut the rods with a nut already on. Then slowly thread it over the newly cut ends to repair the threads and make sure it is easy to put the nuts on.)



**CUTHBERT: a Yank at Malvern.**

## STEP BY STEP - DISASSEMBLY

1. Clean your front suspension. Use a high pressure hose or brake spray cleaner. The front end can become unbelievably greasy due to oil from the one-shot lube, grease and road dirt. It builds up. This is a much easier job for those who keep their front end cleaned.
2. Loosen the front wheel bolts/spinner until hand tight. Do not remove yet.
3. Jack up the front of the car and place it on stands. You will need about 18" of height.
4. Now remove the spinners and wheels.
5. Have little boxes or hangers at the ready. Now remove the calipers by cutting their lock wire, removing it, and then undoing the caliper bolts. Slip the caliper off the rotor and place it on the little box with the brake line still attached or hang it under the wing with the wire coat hangers.
6. Remove the shocks from their bottom posts only.
7. Detach the tie-rod ends. Clever people (like me!!!) can get them off with a hammer. I do so by removing the nuts and a sharp whack or two at the cast joint itself and it falls off.) Plop! Others require a tie-rod end puller. Use a Snap-On puller (P/N CJ89A or CJ89-3) or a Napa Puller # SER3918 to separate if necessary. One leaves the nut on loosely. With the Snap-on, slip the puller "C" disk between the rubber seal and spindle arm and install the puller. Screw bolt end of puller onto the rod end bolt. Things will separate with a loud snap.
8. Remove the damper blades by unscrewing them from the spacer and damper plate.
9. Now... see the two little fittings at the bottom plate on either side of the larger nyloc nut in the middle? Remove ONE of these little bolts and replace it with the threaded rod with 2 nuts locked at the top and one at the bottom, snugged up against the bottom of the plate. Then do the same with the other little fitting. Push the strut attached to the rear fitting to the side. No need to remove it from the chassis side.
10. Now go to the top of the assembly. If you have and are still using the old [one-shot oiler](#), detach it. This is a delicate operation as the brass coupling which screws into the top of the large bolt holding the top of the kingpin in place rounds off very easily. Use lots of penetrating oil before hand, and unscrew it carefully. Taking care not to bend the copper oil tube, gently push the assembly to the side once it is removed.
11. Take some small screw drivers and see if you will be able to get them into the top when the big bolt is removed. I take a smallish size Phillips screw driver and cut off part of the handle to make it fit. The point of this is that 3 inches or so of the little screwdriver, when placed down the top bolt hole, will actually hold the assembly together.
12. Remove the top bolt and slip in your cut down screwdriver.
13. Making sure the rods do NOT turn (I put my vice grips on the bottom of the rods and hold) ratchet down the nuts at the bottom evenly and the kingpin will start to drop. SLOWWWLLLLLYYYY. Keep a heavy hammer nearby to make the main spring stay in place if needed.

14. When you have about 3 inches between the now dropped bottom plate and the lower frame it was bolted to..the assembly will become looseish. Go down until you see little or no tension at the little nuts you are turning on the threaded rods.

15. At this point, I take something I have around (I used a deflated folded swimming pool raft). and place it above the kingpin assembly to cushion any impact. I then knock the kingpin and spring off the top. Don't worry about it hitting the inside of the front fender when extended– its rest position is only 2 inches (approx.) longer than its length when compressed into position on the front end. (BTW, the kingpin is not only held by the bolts. There is a little 1 inch diameter détente in the upper frame that the kingpin fits into.)

16. Remove the threaded rods by removing their top nuts. Remove the assembly by lifting it up. You can also slip the kingpin out.

***NOTE: At this point some people remove the rotors. This makes the other work easier but it is more work and not strictly necessary. (See [Bearing and Rotor Removal](#))***

***NOTE: You can leave the hubs in place if you have a Devol bush car. The ones with the resultant fit blue nylon bushes as the bushes are that easy to fit. Drive them out with a socket and extension and bang the new ones in with a hammer and a flat piece of wood. Once in, the fit should be fine without any reaming or other adjustment..***

Have a beer. You deserve one.



## REAMING THE BUSHES



***NOTE: DEVOL bush cars need not go through this process. Their blue bushes are a resultant fit and very easy to press out and install. Drive the old ones out with a socket and extension and bang the new ones in with a hammer and a flat piece of wood. Once in, the fit should be fine without any reaming or other adjustment.***

***NOTE: This part of the job requires specialized equipment. It can be left to your local machine shop if you wish. The job can be done with a reamer (it has been done this way for 100 years) but for precision a Sunnen laser guided honer is perfect. Here are instructions for DIYers like me.***



i. After degreasing my friend's stub axles, I went to one of the machine shops in the village and "borrowed" their hydraulic press. With the help of some blocks of wood, I got the tube in position and pressed out both bushes from one side. **However, this can be done at home with a poor-man's drift.** **Nonetheless, I advise the first timers to find a machine shop to do this task!**

ii. Then I pressed the four bushes in separately, taking care to get them oriented properly so that the bush "lip" is facing outward..(bottom at the bottom and top and at the top).

iii. Then I went home and fit the axles to be held by a large table vice (the best garage friend of the home mechanic).

iv. I then took the Morgan line reamer Norm Patterson lent me 27 years ago. (wry smile) This is a 1" reamer with an attached rod and a removable tapered end that slides on the rod and fits into the other end of the stub axle tube. The rod and taper aligns the reamer and therefore guarantees that your bushes will also be aligned with each other. That is key. You then adjust and turn gently through each bush until the kingpin can just slide through snugly. Don't worry too much about measuring the clearance. Feel is better than measurements here. I greased the bushes by filling the spiral bush grooves with my finger. Morgan line reamers can be had from **John Worrall.**

v. I increase the reamer until the kingpin will JUST slide in the bush with a bit of effort. The check is done by putting light oil (vaseline oil, for instance) on the king pin. Insert it in the slider all the way, put the palm of the hand at the far end of the slider and pull the kingpin, if the vacuum thus created sucks the king pin back, good enough for me, job done. White lithium or molybdenum sulphide (water repellants and low friction) give excellent results as front end grease.

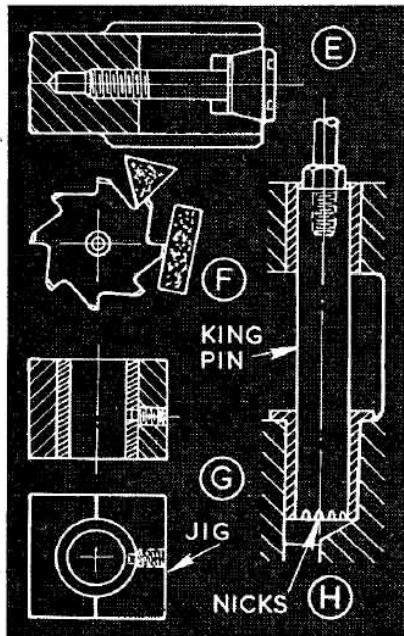
## Reamers and how to use them

GEOMETER describes the processes involved in using hand and machine reaming

**W**HETHER USED ON machine or by hand, the function of a reamer is to produce a smooth accurate surface in a bore such as that of a bearing or bush, for the shaft, pin or bolt to enter with a very good fit.

In this respect, a reamer is a much better tool than a drill and can also produce finishes superior to normal machining on lathes. In fact, bores machined on lathes are often finished with reamers to improve the surface and bring them to size.

Holes to be reamed must be drilled or machined undersize, the amount of material left depending on the roughness of the surface. For a smooth surface and true hole, between 0.001 in. and 0.002 in. is ample to leave in reaming parallel bores. Excess material means extra work and in some cases can cause the reamer to chatter and the surface to become wavy. Bushes fitted in housings compress on entering and must be reamed to size.



29 DECEMBER 1955

In all reaming, machining or hand, rotation is very slow and ample power is essential. In hand work, either the component is held in the vice and the reamer turned with a substantial tap wrench, or the reamer is held and the component turned when it is a size and shape permitting proper leverage.

Rotating slowly, the reamer or component is advanced and, should swarf clog the flutes, withdrawal is made, but maintaining the same direction of rotation, since a reamer must not be turned backwards. If possible, it should pass through the bore to admit of which, it has an undersize shank.

Should chatter occur in the early stages, a strip of thin shimstock down the flutes one side will often cause the reamer to cut smoothly. Before finishing, the shimstock must be removed, or the result will be an oversize hole. Different thicknesses of shimstock afford, however, a means of utilising worn reamers and producing holes of required size or oversize.

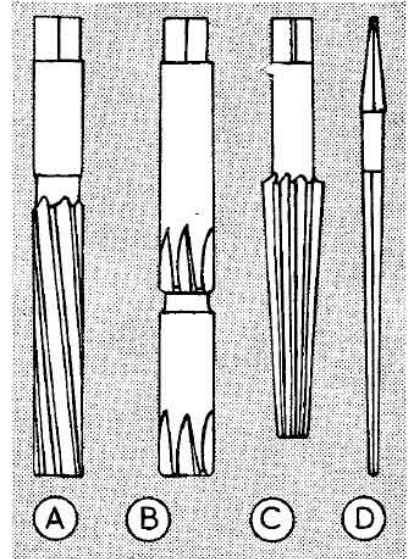
Oil can be used as a lubricant on steel, silver-steel, phosphor-bronze, brass and gunmetal; paraffin on aluminium and duralumin; tallow and graphite in equal parts on cast-iron.

### Types of reamers

An ordinary hand reamer *A* has straight or left-hand spiral flutes, to prevent self-advance in the bore. The diameter may be parallel, though normally it is slightly tapered from the end for entering. Adjustable reamers are provided with six blades regulated by nuts on the threaded shanks.

A line reamer *B* has two sets of cutting edges to ensure correct alignment of separate bores—such as the kingpin fittings of car stub axles. A taper reamer *C* is for finishing or adjusting taper bores in sprockets (motorcycle) or small pulleys. Use in a lathe ensures true-running of the sprocket or pulley.

A taper broach *D*, which has a scraping rather than a cutting action,



is for opening out drilled holes to take taper pins—as when a collar is pinned to a shaft, the pin then driving in firmly. A machine reamer *E* has short normal cutting blades, an axial slit and a coned central screw for adjusting with a pin-spanner to regulate the size.

Reamers slightly dulled on the cutting edges can be sharpened with hand hones *F*, rubbing along the flutes and the relief edges. When undersize, shimstock can be used to increase diameter—obtainable in thicknesses from 0.0015 in. upwards.

### Reaming blind bushes

Bushes in blind holes (certain kingpins) present a problem, for the taper on a reamer prevents finishing to the end for the pin to go right home. Such bushes must either be brought to size before fitting, or specially finished in situ.

If a lathe is available? a reaming jig *G* is made from two pieces of steel in the four-jaw chuck, with a bore the size of that in the component—obtained by calipering. A shouldered screw into the oil hole prevents rotation. In reaming, the bush is compressed in the vice, and brought to fitted size for the pin when in the component.

## ASSEMBLY OF THE FRONT SUSPENSION

**DO NOT** forget parts and the order they go on! You need the little plate that attaches to the kingpin bottom, the kingpin, the rebound spring, the stub axle, the damper plate (or bearing thingie if you are using one), the dust cover and the main spring.

A. Remove the little plates from the old kingpins and fit them on the new kingpins. In case you forget, the sloped edge of the plate is on the bottom and outboard.

B. Gather the parts needed in the right order. Place the correct stub axle assembly (right and left stub axles are different) on top of the opening on the lower arm of the crosshead and then slide the kingpin into the stub axle tube from the bottom. (This is the point where many people add gaiters or [steering bearing thingies](#) or [O Rings](#) .)

***WATCHPOINT: Do not forget the damper plate! Do not forget to place the dust cover inside the top of the main spring before you slide the main spring on.***

C. Go find the threaded rods you lost and set them up again, through the little plate and through their bolt holes in the crosshead. Two nuts (locked together) on the top and one nut at the bottom.

D. Tighten the lower nuts until most of the slack is taken up but before the kingpin starts rising.

E. Now here is the hardest part..for me at least. You will find that the main spring does not politely slip into its place under the top of the cross frame. It won't do that unless it is compressed..often more than you can manage with brute force. Here is how I did it the first time (though I have fashioned a three sided funnel to help me out since). I put a jack under the "nose" of the stub axle. I angle a strong (3/16" thick) metal plate (about 4" x 15") under the spot I want the top of the spring to go. The main spring top may/will be facing outboard. I use my hammer to force the top flush with the plate and inward. As I am doing this, I use the jack to straighten the end of the axle and that forces the entire spring to straighten. You cannot do this before you start, because you need the angle outward to give you more length to deal with the spring. This spring will curve and then straighten as you use the jack and get closer to the near the springs happy home.

Keep banging inward until the plate is sandwiched between the top of the main spring and its place under its crosshead position.

Now here is where life gets exciting. With hammer in one hand and plate grabbed in the other, wiggle the plate out while keeping the main spring in the same place by banging/positioning it with the hammer. (I usually get Audrey to do this part while I watch Muppet reruns.) As you wiggle out the plate, you may find that you can slip in your trusty cut down screwdriver. In any event, as you can slip that screwdriver in and once in, you will be considerably safer.

F. Now start ratcheting up the bottom threaded rod nuts. You can measure your progress (it is slow) by seeing the space between the lower plate the kingpin is held to and the crosshead flange which is its destination. You will need the hammer to make sure the main spring behaves and stays aligned as you want.

***WATCHPOINT: Be very careful not to crush the dust covers with the stub axle tube (it is hard to see inside the Main spring).The dust cover fits over the tube as a very tight fit and it is easier to crush it than not. When they approach the point of contact, make SURE the cover slides over the tube. [see here](#)***

G. I find that my top kingpin bolts cannot thread properly if the kingpins are raised fully into to final position. So I leave it about 25-35mm from the top. I feel for the kingpin with the cut down screw driver. Use a small mirror, flashlight and hammer to carefully center the pin under the hole. Finding the thread can be difficult and could require a number of tries! (PLEASE place the cut down screwdriver back when you are not trying!!!!!!) When the center pin is under the hole, thread the bolt (with loctite) home. It is not necessary to tighten it completely.

H. Once you have the "loctited" bolt threaded, finish ratcheting up the nuts on the threaded rods and then tighten the big one on top.

I. Now remove one of the threaded rods and replace with its bolt and nut. Do the second one and don't forget to put the strut back on.

J. Put the tie-rods back on.

K. Fit back the calipers. If it won't slide onto the rotor, pry the pads apart with a big screw driver and try again. In extremis, remove the pads, fit the calipers and then install the pads. Make sure you don't twist the brake lines. Use the [wire](#) to lock the caliper bolts..they both have holes for that in them.

L. Fit the shocks on their bottom posts.

M. Refit the damper blades and spacer and attach them to the damper plates. You can allign the plate with a few knocks of a small hammer. You can bend the damper blades to fit them back into their slot on the frame but I usually remove the shims and lengths of metal, clean them and reassemble after examining them for wear. Adjust the shims (part of the damper blade assembly on the car frame) to ensure that the assembled damper blades have no lateral motion where they attach to the body. See [HERE](#).

N. Install the one shot oil pipes. (if you have them and still use them)

O. Pump the stub axles full of grease.

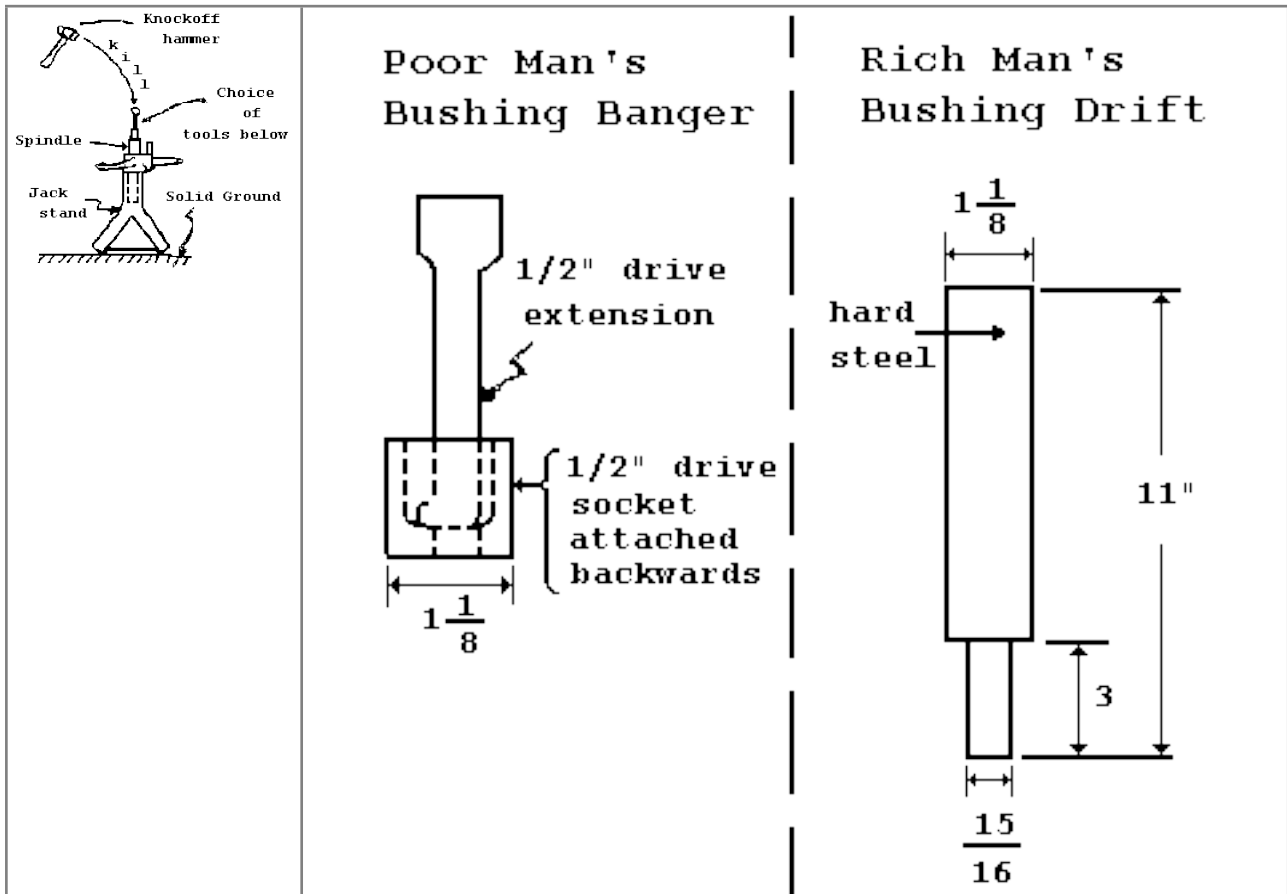
P. You now need a professional wheel alignment.

and another beer!

Q. As a word of caution, ensure that you recheck the tightness of all fittings and bolts after your first few kilometers, and again several times after driving longer distances (I suggest 50, 100, and again at 200 Kms.).

## BUSHING REMOVAL

Removal requires a bushing tool (see sketch) that will push out the bushings and clear the ID of the spindle. Use a jack stand to hold the spindle, and a drift (rich man's or poor man's) to drive out the bushing. A brass knock off hammer is about the right weight. Both bushings are driven out from the same side.



[Here is an alternate method from Downunder.](#)

## BUSHING INSTALLATION

Installation is best done using a hydraulic press (any machine shops and many garages can do this). In a pinch you can, with care, use the poor man's drift and drive them in. [Here is an alternate method from Downunder.](#)

## EPILOGUE

My apologies to the pros in our midst, but this article is written for Morgan-owning lay persons. Those owners who derive great satisfaction from performing most of their routine and periodic maintenance.