

Note: The following summary was written for Mike Kelly so that he understood what work was performed on his Model A coupe. A first-time Model A buyer, the car had been sold to Mike as "restored", a gross misstatement. His dissatisfaction with the car's operation led him to request help in correcting several mechanical deficiencies. More work needed to be performed on "Molly" in Phase II, which was planned for early Summer, 2000. Unfortunately, before work could begin, Mike's cancer returned, incapacitating him until his death in August.

Repairs to Mike Kelly's 1929 Standard Coupe "Molly", Phase I, 3/00-4/00

Work performed by Marshall V. Daut

Inspection

The front end assembly on Mike Kelly's 1929 Standard Coupe "Molly" was only kept from shaking by use of an after-market "anti-shimmy" device attached between the tie rod bar and axle. Removing it allowed the car to shimmy, indicating serious problems somewhere in the front suspension. Before removing the front end assembly from the car, a cursory examination of it was made. The steering system was also examined at this time. Several incorrect features were noted:

- (1) Jacking up the front end revealed that the left side wheel was easily rocked = worn kingpins and/or their bushings, or loose hub on the spindle. It turned out to be a combination of both. Removing the drum showed that the outer bearing race was loose in the hub, literally to the point where it fell out! It had been partially shimmed around its circumference by tin pieces in a vain attempt to center the race in the hub. This condition not only allowed the drum to be loose on the spindle, but had the outer washer's circumference been worn smaller, the drum and wheel could have possibly fallen off!
- (2) The wishbone was checked in its retaining cap beneath the bell housing and pronounced to be nice and tight. This was a pleasant surprise, as this area is almost always loose. *[note: a loose radius rod ball will cause the car to shimmy at low speed after hitting a bump in the road]*
- (3) The kingpin (spindle) bolt retaining bolts and long nuts had been installed backwards in the axle. The elongated nut is supposed to act as a "stop" when the wheels are turned to either extreme and must be on the *backside* of the axle (after early '28's did the opposite). Predictably, "Mr. Restorer" had installed them incorrectly on the front side, which would have allowed the wheels to turn too far and hit the brake rods, if not the frame, under extreme turning conditions. Wear to the brake rods confirmed this, to the point of being unsafe.
- (4) The front spring appeared to sag low in the shackles and the individual leaves looked rusted together, negating any springing action designed into the system. Spring restoration would definitely be needed.

- (5) The seven-tooth steering box had a zerk grease fitting on the top instead of a plug. Someone had been putting chassis grease into the box instead of the proper 600wt. lubrication. This would result in wear on the gear teeth. The car also was hard to steer, even though Mike had installed new steering arm balls and teflon seats. The play at the steering wheel was unacceptable, indicating the need for a new steering worm and/or sector.
- (6) Disconnecting the front brake rods from the actuating arms showed that the wear to this component left no more leverage for proper operation. The arm was already in a straight up and down position before the brake rod pulled it back into operation. Because the Model "A" braking system is leverage dependent, this was a serious problem.
- (7) With the left brake drum removed, it was noticeable that the newly installed shoes were not making full contact with the drum. Two things caused this. First, the shoes had not been "cut" to match the drum's surface. And second, the drums were so badly worn oversized and scored that they were unusable for turning true again. They were already too thin. New cast iron drums would need to be purchased, plus at least one hub to replace the bad left front one.

As a result of discovering these deficiencies in what had been sold to Mike as a "restored car", it was decided the best and safest approach to repairing these problems was to remove the entire front end assembly, front braking system and the steering gear and overhaul them. Once removed and disassembled, a parts list was drawn up for the needed supplies and services. Sammy Guthrie's Arizona Model "A" Parts was selected as the Model "A" parts supplier because of the high quality of his inventory, while several local businesses would be used for such services as machine work, chrome plating, brake shoe re-lining and spring re-arching.

Unquestionably the MOST expensive element in the whole equation would be the purchase of two new cast iron brake drums and the machine shop cost to remove the hub from the one good drum, install it and a different used hub into the new drums and then stake the new studs. Finally, the drums would need to be trued again after all this work had been performed. Unavoidable, but given the deplorable (and unsafe) condition of the existing drums and hubs, this was absolutely necessary. Had this step been avoidable, the cost of restoring the front end, steering and braking systems would have been about half of the final cost! It's easy to see why the "restorer" who owned the car before Mike hadn't gone the extra mile in this area of restoration. In fact, almost everything he *did* do was wrong, incomplete or just plain sloppy. Or even worse, he did nothing at all, as in the case of the criminally worn front brake hub that he attempted to shim into place and pass off as "restored".

The following describes the work performed to the various components:

Front End Assembly

The entire assembly was taken apart, as can be seen in the accompanying photos. Incidentally, there are about 100 parts to the front end assembly and almost all of them on this car needed some kind of attention or replacement! The only things not removed

during disassembly were the spring perches in the axle (although the bushings were removed and replaced) and the wishbone they secured. However, the perch nuts on the underside of the axle were heated until cherry red and then tightened two castle nut notch turns and re-cotter pinned. It's very common for wear and rust to leave these nuts slightly loose, allowing the spring to twist as the perches move in their seats. This heating and tightening were done while the spring was still in place to retain proper perch alignment in the axle.

Once the front end had been disassembled, every part was wire brushed and/or sanded to remove old crud, grease and paint. Then everything was sprayed with semi-gloss black enamel, as original. New cotter pins were also installed, as many were missing or rusted. Missing zerk fittings were replaced and the correct angled ones installed on the lower spindles. The old kingpin bushings were driven out and new ones pressed in, followed by honing with a special kingpin bushing reamer. New felts were put in place and the kingpins replaced into the spindles. A nice tight fit had been achieved, but in order to make the thrust bearings carry the weight of the car as designed, special shims were placed beneath them on top of the axle. Often when kingpins are replaced, the operation of the bearings isn't checked, which results in hard steering. The kingpin retaining bolts and elongated nuts were replaced in the *proper* orientation so that the wheels would no longer hit the brake rods or frame. Funny, how well things function when properly assembled!

The spring perch bushings were driven out and new ones pressed in. The spring eye bushings were also removed and replaced with new ones. Some kind of plastic bushing had been used on one side and the other side's metal bushing was paper thin from wear and misalignment. Because of this looseness, the shackles were worn as the spring "rocked". New bushings and shackles will solve this problem.

Since new steering arms with round balls had already been installed prior to this work by Mike, there was no further need to spend any time on them. *[note: usually these steering arm balls are worn into an oblong shape. Tightening the drag link and tie rod plugs to reduce shimmying also makes steering harder because as the wheels turn, the high part of the ball causes a bind]*

The final - and arguably most important - element in the front end restoration was the re-arching of the front spring. As suspected, when the center bolt was removed, seven of the ten spring leaves wouldn't separate easily, actually rusted together from lack of lubrication. This condition would cause the spring to act like one big piece of steel instead of a spring, which would have had a negative affect on handling. The leaves were separated and examined. Eight of the ten leaves had been dug into by the leaf above it, further creating a one-piece chunk of metal. Plus, the arch had long since gone out of the spring. To correct these problems, the leaves were taken to Dunbar Spring Company in Phoenix to be re-arched to factory spec's. Measurements taken before and after prove that the spring was definitely in need of re-arching.

Once the re-arched spring leaves were returned to me, each top surface was ground until the depression created by the leaf above was gone. Then the underside of each end was beveled at 45 degrees to keep the leaves from digging into each other in the future. Rather than using grease or graphite as a lubricant between the leaves, Poly-Slide urethane spring liners were substituted. *[note: graphite paste between leaves was originally used, but it washes away or becomes contaminated by road crud and water]* The front sides were trimmed so that their presence wouldn't be noticeable from the front view. Only by crawling underneath the car and looking at the backside of the spring can the Poly-Slide liners be seen. A new center bolt was installed as the spring was assembled. Because the Poly-Slide liners increased the overall thickness of the assembled spring by about 1/8", the original spring clamps would no longer fit. So new ones were fashioned from steel strapping, bent to fit and drilled for the bolts. The original ones can be saved for use on another spring without liners. The assembled spring and new shackles completed the front axle assembly process.

With the kingpins, thrust bearings, felt seals, perch and spring bushings and re-arched springs re-assembled, it was time to do the backing plates and brakes.

Backing Plates and Brakes

As was to be expected, the roller tracks on both plates had grooves or notches worn into them where the roller clevis heads had moved for the past 70 years. It was necessary to grind down the two rivet heads on each plate and then pry the roller track free. A new track was then riveted in place, the heads heated cherry red and then flattened to secure the track assembly. This is almost a mandatory step on an un-restored Model "A", which in fact, this car truly is. Replacing the roller tracks provides a smooth surface for the clevis heads to slide, thereby retaining proper shoe alignment vis-à-vis the brake drum surface. The backing plates were then sprayed semi-gloss black.

Brake shoes with modern bonded composition linings were installed and ground to fit the new drums when they finally arrived from Snyder's Antique Auto Supply in Ohio and had been prepared by a local machine shop. To improve the front braking performance, special brake equalizers were installed. This gives a better balance between the front and rear brakes over the original 40/60 ratio. The front actuating arms were pushed farther forward in their travel by use of operating brake rod "pills" underneath the rods. This gives the arm better leverage when the brakes are applied.

The plates were then bolted to the spindles, inner and outer bearings packed with grease and the new drums and hubs installed. The proper pre-load of the outer wheel bearings was achieved and then cotter pinned in place. Once assembled, the entire front end was jacked up into the cross member and bolted in place, measuring each end from the ground to make it level. While hooking up the brake rods, it was discovered that not only were the anti-rattle springs missing from the frame, the brake rods were also too short. This was because the front actuating arms' operation and position had been properly restored and the rods had been shortened by a previous "mechanic" to allow for wear as the arm moved farther and farther back in the static position. So, two new service brake rods were purchased. The old ones also showed signs of deep wear from where the tires had been

rubbing during turns, a result of the improper kingpin retaining bolt installation. The old rods can be shortened even more, re-threaded and used to replace the missing emergency brake rods, when the rear end gets its turn at repair.

With everything back in place - including re-attaching the shock absorber arms/links and installing a new brake pedal return spring - the front brakes were adjusted for a preliminary test drive, once the steering gear box had been rebuilt. But first, the front end alignment was measured. The existing alignment had almost 1/2" toe-OUT instead of toe-in. The tie rod ends were loosened and the tie rod turned until the proper 1/8" to 1/4" toe-IN adjustment was achieved. In effect, the alignment was almost 3/4" out of adjustment! Properly aligning the front end will really help steering and stability while driving on non-smooth roads, resisting the tendency to get into ruts or follow surface contours. The caster checked out properly, so nothing needed to be done here.

Steering Column Restoration

Sad as the front end assembly was, the steering column was in even worse condition! Not just wear is meant here. Extremely poor rebuilding practices had been followed somewhere in the past, which ruined the insides and made steering unsafe.

As the column was disassembled, it became obvious just how screwed up this seven-tooth gear box really was. First, for some unknown reason - presumably during its initial disassembly - someone had ground off the weld between the column tube and the gear box. The two sections were now held together by a radiator hose clamp! Had the "mechanic" disassembled the column properly he would have discovered that the shaft and worm gear slide out through the bottom of the housing, not the top. Grinding off the weld was absolutely unnecessary.

When the side cover on the steering box was unbolted so that the sector gear could be removed, it was immediately noticeable that one tooth was missing from the sector gear! Bits of it were found forced into the thrust bearings and lying in the grease throughout the housing. Looking at how the thrust gears had been placed on the steering shaft explained why the tooth had broken off. Instead of one bearing being placed above and one below the worm gear, BOTH bearings were above the gear! This moved the worm gear down further in the housing and threw off the sector gear-to-worm gear relationship. The extra stress on the teeth eventually caused the middle one to break off, explaining the excessive play in the steering wheel in the straight-on position. The bushings in the column were also badly worn from lack of proper lubrication, which chassis grease couldn't have supplied. The thrust bearings were full of metal shards from the severed tooth, so they also needed to be replaced. To help keep the 600 wt. steering lube inside the box, the housing was machined to accept a modern steering shaft seal. All these re-bushing, honing and machine operations were performed by a local automotive machine shop, owned by a Model "A" enthusiast.

Once everything had been machined to fit properly, the steering box was re-assembled. It wasn't necessary to replace the worm gear after all, so only a new sector was purchased. Upon assembling the shaft inside the housing, it became apparent that "Mr. Mechanic"

hadn't even adjusted the shaft play at the bottom end properly. Brass shims take up the shaft's endplay, adding or subtracting until there is no up and down play. Three shims are usually sufficient to achieve this. But there were SIX brass shims on this column, plus the bottom gasket had been put between the shims and the housing, instead of the bottom plate, thereby increasing the endplay even more! Three shims were removed, the gasket properly placed and correct endplay was achieved. The bottom seal retaining nut was missing entirely, so I removed one from my columns in the backyard and installed it with a new felt seal.

In the meantime, the spark and gas control rods were taken in to Papago Chrome Plating in Phoenix to be re-finished. Once re-plated, I drilled a small depression into the underside of each rod and JB Welded a small ball bearing in place. Then the grooves in the steering quadrant were hand-filed. Once assembled, the control arms will "click" again as they travel over the grooves. The completed column was sprayed gloss black.

The steering wheel wasn't badly cracked enough to warrant replacing, so Mike filled the small cracks and sanded them down. I went over some of these with a triangle file, deepening the grooves to accept more filler. This results in a smoother finish when sanded. The wheel was then sprayed with semi-gloss black enamel. Although still not a perfect steering wheel, it's definitely usable until a new one can be purchased.

To complete the steering system overhaul, a new pitman arm was purchased and shortened by 2" for the seven-tooth steering box. I had cut the arm into two pieces (eliminating a 2" section), notching the two pieces into "L" shapes that will be joined together by weld. A professional welding shop that does arco-space welding (Futureweld in Phoenix) used stainless steel weld applied by the TIG welding method for increased strength. Shortening the pitman arm improves steering ease. The longer one can retained in case Mike ever wants to change back So, along with the new internal steering box parts, teflon buttons and new, round steering arm balls, this car ought to steer better than 98% of the Model "A"s out there!

Once installed in the chassis, 600wt. lube was put into the steering box. A zerk fitting was place in the sector gear housing (as original) to lube that gear with grease.

Because the steering box is made of cast iron and the column tube made of plain steel, I was unable to weld the two back together the way they originally were. This needs to be done by a professional welder with the proper equipment to weld cast iron. To maintain alignment, however, I replaced the hose clamp and really tightened it down. Because the steering housing is rigidly bolted to the frame and the column tube is secured in the gas tank bracket, it's unlikely that these two parts will ever separate. But just to be safe, it would be a good idea to have a welder run a bead at least along the top seam someday.

Other

Several other things were checked, adjusted or repaired during "Molly's" visit. The rear brake drums were removed and to my surprise, they were even WORSE than the front drums! I didn't think it was possible that these drums could be any worse than the fronts -

but they were! The emergency brake parts were all missing and the brake shoe lining was almost non-existent. Until such time that the rear end and its braking system can be properly rebuilt, the woven brake shoes removed from the front brakes were installed and ground to fit on the rear axle. Better than the way it was, but still not good enough to expect optimal brake system operation. The rear brake cams were rusted solid in the camshafts, diminishing braking efficiency. The roller tracks also were as badly worn as the fronts, if not worse. As is, the rear brakes are probably only at 50% efficiency, perhaps less. New drums, modern composition brake shoe linings, new cams and camshafts, new roller tracks and proper adjustment will restore the braking efficiency of "Molly" significantly. Plus, the missing emergency brake parts need to be installed. This should be done fairly soon to ensure that the car is as safe as it can be.

The water pump and water return pipe petcock continued to drip water during "Molly's" visit, so I re-packed the water pump and replaced the petcock. This seemed to take care of the nagging radiator coolant leakage.

Because the battery support assembly had been a Mickey Mouse hodge-podge affair and was in danger of letting the battery fall out of the bottom, a new support was bolted in place to the frame and center cross member. Unfortunately, the battery hold-down frame supplied by Mike Kelly had been improperly constructed and was backwards to the way it was supposed to mount. The hold-down tabs had been welded to the *opposite* corners where the studs pass through and secured by 3/8" SAE thread nuts. As is, there is no way to bolt this frame in place! I supplied the correct frame from my parts and hope Mike will exchange his incorrect frame where he purchased it.

The muffler was leaking through two small holes and an open seam on the bottom side. It was removed and the two holes and seam welded up. The intake/exhaust manifold nuts were also tightened considerably, eliminating any possible leakage and/or noise at this point. The car should be quieter now.

Predictably, the 14 cylinder head nuts had never been properly tightened, just "snugged". So I torqued them to 55 foot-pounds in the proper sequence. They were so loose that it's wonder the head gasket hadn't blown! Why should I be surprised that "Mr. Mechanic" hadn't even observed this rudimentary practice? The car now has a little more pep with the proper compression restored.

I also adjusted the ignition timing to increase top speed and acceleration. To compensate for this, the distributor cap opening was filed wider. This allows the upper plate to travel a wider arc, thereby increasing the range of timing achieved by use of the spark rod.

"Molly" was taken for several test drives and performed very well, stopping nice and straight and provided better speed. Even at 50mph there was no shimmying, vibration or pulling to one side of the road or another. All the effort and expense were well spent to restore the Model "A" handling characteristics to "Molly". With the rear end overhaul someday, the chassis will be almost completely restored! Mike has already rebuilt the transmission and installed new shock absorbers. With the front end and steering

assemblies rebuilt, the only thing left besides the rear end is the engine, which although seems to run fine, has some internal noises and leaks that need to be corrected.

So at long last, "Molly" no longer needs the anti-shimmy bar and she is even safer, faster and more fun to drive than before. Rebuilding the Model "A" the way it's supposed to be built really does make a difference doesn't it?

For Sale - one used anti-shimmy bar. Contact Mike Kelly for info.