1. The result is the Winters quick-change rearend under your project. Does anything else say "hot rod" better than a quick-change?

GEARED FOR SUCCESS

How a Quick-Change Axle can Transform How Your Rod Looks ... and How it Goes

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PHOTOGRAPHY BY **DANNY TESAR**

Ah, there's nothing quite like the look (or whirr) of a quick-change axle. Inspired by circle track racers who needed to fine-tune their gearing to suit course conditions, the venerable quick-change axle has made its way under just about everything, including land speed cars, sports cars, dragsters, Modifieds, and even drift cars.

A quick-change axle is basically a conventional axle with a gear case modified or designed to use a pair of spur gears. In a conventional axle, the driveshaft and pinion rotate at a 1:1 ratio. In other words, the pinion rotates at the same rate as the driveshaft. But the spur gears in a quick-change axle alter the ratio between the driveshaft and pinion. Depending on how it's oriented, a spur-gear set can spin the pinion faster or slower than the driveshaft to alter the axle's final drive, or its total gear ratio. That's a big deal when trying to tune an engine to operate within its peak powerband on a racetrack.

But one could make the case that nearly as many quick-change axles live under cars that will never see a checkered flag. After all, few things convey a sense of performance more than real race car parts. But quick-change axles offer real utility to even road-going vehicles. It takes a few minutes to make the change, but there's a gear ratio for everything from long-haul treks to events and blasts around town once you're there within one set of properly chosen spur gears.

Due to Precision Hot Rods in Macedonia, Ohio, we can add another street-driven example to that list. Danny Tesar and Chico Caraballo recently built a Deuce chassis specifically to house a complete Winters Performance quick-change axle.

2. Winters shipped a 56-inch axle complete with limited slip and axle shafts. For mockup, Chico Caraballo protected the centersection's delicate polished finish with masking tape.

3. A frame built for a quick-change axle doesn't necessarily differ from any other frame, but the spur-gear housing does require some concessions that Danny Tesar and Caraballo made for this application.

4. To accommodate the spur-gear case, they swapped the flatter Deuce-style crossmember and spring for one of their Model A crossmembers and a Posies spring. Other options exist, like coils, coilovers, air springs, or even torsion bars. But nothing says nostalgia more than a quick-change peeking out from under a Model A spring.

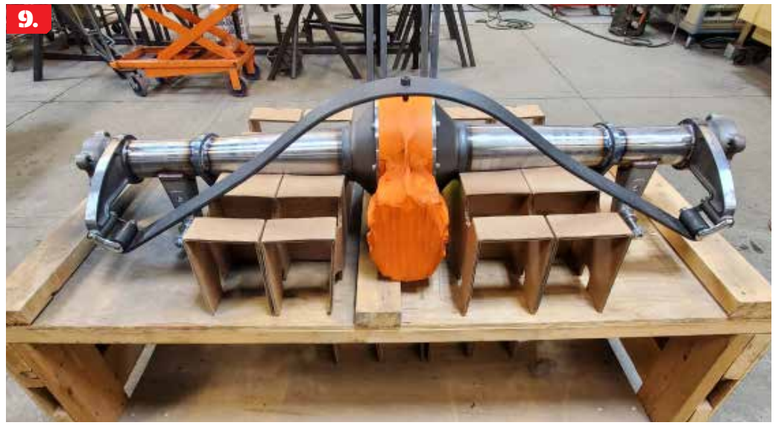
5. They located the axle with a Roadster Supply Company forged-end ladder bar kit, splitting the axle brackets since the axle ends prevent them from sliding on. They pointed the pinion 3 degrees up from level in anticipation of the tailshaft pointing down the equal amount. They also threaded the clevises halfway in to offer the most adjustment potential.

6. Tesar then installed the spring hangers by the same method he used on the ladder bar brackets. Rather than position the brackets individually, he made this fixture that holds them parallel and at the correct distance apart.

7. Once they got everything in place, Tesar and Caraballo reattached the remainder of the brackets and welded everything together (note the bead across the hanger bracket). He also installed the Roadster Supply Co. lower shock mounts at the same time.

8. Spreading a transverse leaf spring isn't the easiest. Spring spreaders make quick work of the job, but this spring's reversed eyes prohibit their use.

9. The main plate (leaf), however, can be wrestled into place almost easily. Tesar and Caraballo disassembled the spring and installed it on the shackles.



10. Then they installed the remainder of the spring plates. This perspective should remove all doubt if it wasn't obvious why Model A springs go with quick-changes like peas and carrots. A stock Deuce spring would go right through the spur-gear housing.

11. Though not necessary for a quick-change installation, Precision Hot Rods' spring clamp tidies up the crossmember by eliminating the U-bolts and cumbersome clamps.

12. The system consists of threaded sleeves that attach to the crossmember walls by simple tabs. The clamps mimic the dog-bone shape of the shackles and attach to the sleeves with fine-thread 3/8-inch bolts.

13. Winters' axle systems use plug-in axles and Torino-style bearing housings. That eliminates the brittle axles and the need to contain the wheel should said axle fail. Precision specified the 4.5 and 4.75 bolt pattern, but Winters offers them with the 5 and 5.5 patterns as well.

14. This application called for the 11x2.25 drum brake package. It fits the Torino-style bearing ends and has a 2.5-inch brake offset—basically the industry standard.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15. It makes little sense to invest in that much axle only to hide it with a tank (that needs modifying to accommodate the spur-gear housing). So, Tesar and Caraballo eliminated the tank, kicked up the framehorns to follow the trunk floor, and bobbed them to end at the apron. Precision slip-rolls these 2-1/8-inch spreader bars to follow the apron's curve.


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16. Tesar and Caraballo wrapped up the job with the installation of a Wide Track antiroll bar from Johnson's Hot Rod Shop.


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17. Winters makes these ribbed Champ-style axle housings. They accommodate axle widths narrow enough for Pro Street and as wide enough for late-model fullsized pickups and vans. This one has the Billet Finned cover.

18. These Champ-style gear housings partially reveal the extent of options. These have been set up for independent rear suspension. One features a Teflon coating that mimics the thermal-dispersant coatings Winters applies to parts in racing applications. Though larger, the Champ-style axles handle roughly 1,000 hp.

19. Winters also offers several spur-gear covers like the cast Nostalgia *(shown here)* and the cast Straight Finned.

Though conceived as a gear case that used existing Ford or Dana components, the quick-change gear housing evolved into a complete axle made of entirely new parts thanks to Winters. Building an axle from all-new components pays dividends greater than eliminating the need to hunt down and restore vintage parts. For one thing, building from scratch opens the door to make the axles stronger and perform better.

To understand why is to know the origins of the heart of the quick-change axle: its gear case. The most popular design in the hot rod world evolved from the banjo-style axle used in '35-48 Fords. Squint just right at a bare quick-change housing and you'll likely see that—design-wise anyway—a quick-change housing is basically a Ford banjo flipped backward and amended with a quill-shaft boss and a spur-gear housing. In fact, the earliest examples of quick-change housings are nothing more than Ford banjos that users flipped backward and modified with some castings, a quill shaft, and spur gears.

While convenient, Ford banjo parts have a few issues, mostly axle-shaft related. Specifically, those shafts break under duress. Over the years various builders adapted Ford 9-inch bearing housings to Ford axle tubes, opening the door to stronger semi-float shafts. But that still required finding obsolete parts if you wanted to run Ford-style tapered axle bells. Winters took things another step further by making the bells from scratch with the 9-inch bearing housings in place and including semi-float shafts in a complete assembly. Then the company took it upon itself to build a dedicated limited-slip gear carrier, conferring the benefit of equal torque to both drive wheels to the design. According to Winters' Curt Iseli, the result is an axle assembly capable of handling 600 hp in an application that can achieve traction sufficient to hook up.

20. If the characteristic quick-change whirr isn't your bag, Winters offers helical-cut gears. Though quieter, they generate a thrust load that threatens the spur-gear cover, so Winters discourages them for high-traction applications, like launching on sticky tires.

21. As shown here, any spur-gear set can be installed in two ways: either with the larger of the gears at the bottom to overdrive the pinion for greater top speed or with it at the top to underdrive the pinion for greater acceleration.

Winters offers the axles in near countless combinations. The standard bell-style axles measure 56 inches wide. But because the tubes straighten out, axles with Ford-style housings can go as narrow as 48 inches and as wide as 60 inches. The ribbed-style axle housings can go narrow enough for Pro Street applications and nearly indefinitely wide. Complete axle assemblies include a limited-slip carrier and 31-spline axles, but Winters sells the components individually if you're inclined to run a Ford gear carrier.

Three ring-and-pinion options and 36 spur-gear options offer a fine degree of resolution across a whopping range from 1.80:1 to 11.33:1. Other options include (but aren't limited to) numerous gear cover designs, multiple finishes, including polished and Teflon coated, and a variety of brake packages.

While different internally, a quick-change axle assembly mounts much like any other axle, with only one potential exception: spur-gear housing clearance. Though it affects primarily '32-48 Fords like the subject of this installation, Larry shows us how they prevailed in what's probably the most time-honored method. The housings can also interfere with fuel tanks—the Deuce is a known example—but remedies run the gamut from notching the tank to flat-out relocating it as Larry and Caraballo did.

But beyond that, installing a quick-change axle presents few significant issues (even the cost of a complete Winters quick-change remains competitive with a new, similarly equipped 9-inch). In fact, the only thing keeping a quick-change axle from under your hot rod is, well ... you. **MR**

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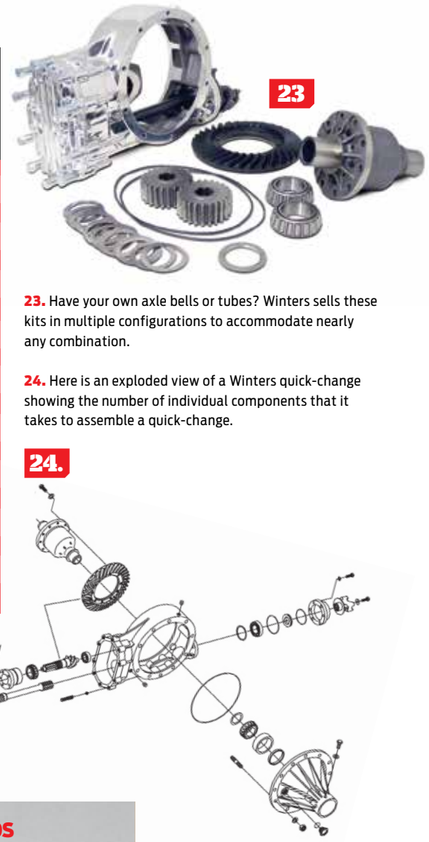
22. Winters offers three ring-and-pinion ratios: 3.78:1, 4.11:1, 4.33:1. This chart shows the spur-gear combinations available for six-spline pinions in V-8–style quick-changes.

1	24/24	**12**	19/29
2	23/24	**13**	15/26
3	23/25	**14**	14/22
3B	17/19	**15**	15/24
3A	22/25	**16**	16/26
4	22/26	**17**	18/30
5	21/26	**18**	13/22
5A	19/24	**18A**	16/28
6	21/27	**19**	14/25
24	23/30	**20**	15/27
25	18/24	**27**	13/24
7	20/27	**21**	17/32
23	16/22	**28**	19/36
8	20/28	**29**	12/23
22	19/27	**26**	15/29
9	16/23	**30**	20/40
10	15/22	**31**	20/41
11	18/27	**32**	19/40



23. Have your own axle bells or tubes? Winters sells these kits in multiple configurations to accommodate nearly any combination.

24. Here is an exploded view of a Winters quick-change showing the number of individual components that it takes to assemble a quick-change.

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HOW TO CALCULATE RATIOS

Options are everything but they don't matter if you don't know which ones you need. Here's the formula for calculating the axle's final drive, or the product of the ring-and-pinion and spur gears.

(Driven-Gear Teeth/Drive-Gear Teeth) x Ring-and-Pinion Ratio = Final Drive.

This is how a 3.78 ring-and-pinion with a #4 (22/26) spur-gear set works out with the 22-tooth gear as driven (upper) and the 26-tooth gear as the drive (lower): **(22/26) x 3.78 = 3.20:1**

In this orientation, the spur gears calculate to 0.846:1, or roughly a 15 percent overdrive. That makes an axle with a 3.78:1 ring-and-pinion behave as if it had a 3.20:1 ring-and-pinion. That's great for reducing engine speeds on the highway.

Now flip that spur-gear set with the 26-tooth gear as the driven (upper) and the 22-tooth gear as the drive (lower): **(26/22) X 3.78 = 4.30**

In this orientation, the spur gears calculate to 1.182:1, or roughly an 18 percent underdrive. That makes our axle with the 3.78:1 ring-and-pinion behave as if it had a 4.30:1 ring-and-pinion. That's great for increasing torque for those stoplight blasts.

SOURCES

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