

# U.S. Gear - Creating Art and Motion from Cold Steel

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from the [Power Stroke Registry](#) (Summer, 2001)

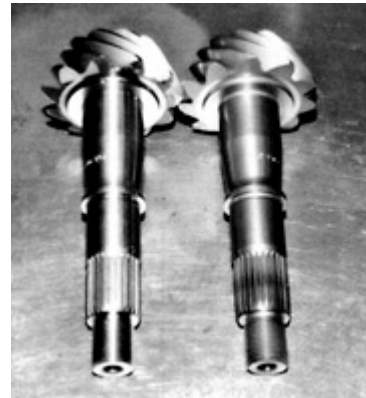
Have you ever gotten into one of those discussions about what is the most important part of your truck? The part that really makes it go?

I guess the right answer is that all-important Power Stroke engine under the hood, but without some other parts, that engine would just be a very expensive lawn ornament.

Other critical parts include the transmission, transfer case, front and rear axles and other parts like the frame, wheels and more.

Key to most of these other parts are all the gears in the transmission, transfer case and front and rear axles. I admit to a fascination with gears. When I was 15 my father bought me a \$50 promotional car off a used car lot in Champaign, Illinois. Dad's deal with me was that I had until I was 16 to make this '51 stovebolt Chevy into a dependable car or I was going to be on foot for an unspecified period of time after that! He bought the parts, but I had to turn all the wrenches, getting help only when parts were too heavy to move safely by myself.

The engine overhaul was a snap, did it in the car. Hone the cylinders, put in new babbitt rods, rings and check the valves. But the transmission and rear axle were different. I had studied motors since I was 12 and got my first subscription to Hot Rod Magazine. Transmission 101 had eluded me. With a Motors Manual in hand I dropped the tranny on my chest, raised it up to the work bench and proceeded to tear it apart. A donor transmission from a junkyard contributed the parts necessary to repair what was wrong. I became fascinated with how power flowed through this "three on a tree" transmission, taking it apart and putting it together



*"Green" pinion on the left and one that has been heat treated on the right, note discolorations on splines.*

like an erector set, dozens of times. I could almost field-strip it like a soldier does a rifle. I did the same thing with the rear axle, studying it 'til I understood the compound angles and how the teeth had to be aligned properly with the correct clearance to prevent whine and rattle.

That '51 Chevy went together and drove like a Swiss watch (or a new car) from the start. I completed my task 6 months early (okay, we won't go into why I had to replace one rod with only 5 minutes on the motor, that is another story having to do with dipper tray lubrication and one bolt that could not be found).



*Computerized probe checks for dimensional stability before and after heat treatment.*

All this leads up to my visit to U.S. Gear this past January, on the South Side of Chicago at 1020 W. 119th Street. It was cold outside, but within inches of entering the doors, I felt the heat from the several processes needed to turn raw steel blanks into gears for all sorts of applications. The smell of all the cutting oils was also like perfume to the nose of this gearhead. U.S. Gear makes all sorts of gears for cars, trucks, big trucks and even BIGGER trucks. If it rolls, it has to have gears, and chances are they were made in Chicago. I saw stuff that looked like toys (going into compact cars), and gears that would stress the winner of a strongman competition to lift off the shelf.

Meeting me on this day was Jeff Hostetler, Product manager for R-V Performance; Mark Garfien, President; and Donald Garfield, Executive Vice President.

Those of you that are into drag racing might know this company by another brand name: Strange. The Strange Gears semi is at every N.H.R.A. Nationals event providing gears and expertise to the racers. Virtually every Top Fuel and Funny Car has "Strange" gears.



*Joe Garfien, Founder. Note picture of Joe with Golda Mier directly behind him.*

While we walk towards the factory I learn that Mark is the son of company Founder Joe Garfien. Joe came to America in 1928 as a 16 year-old and immediately got a job at Perfection Gear for 35 cents an hour. His only real marketable skill was as a soccer player. At 16 Joe had played for the Austrian national team. In America he actually made more money playing soccer than working at the gear factory, but he soon found out he had an intuitive gift for understanding the complex factors surrounding gear manufacturing and use.

In 1934, Joe was sent by Perfection to learn how to cut the new "hypoid" gears that allowed the pinion to ride lower on the ring gear. This allowed the driveshaft to be lower and bodies on cars to also ride lower on the frame, leading to a lower

more modern look. Joe actually helped come up with a better way to cut the gears that led to him being asked to be a consultant with the U.S. Army in 1941. Joe's gear design literally helped win the war, making U.S. trucks more dependable. Years later, Joe was asked to reverse engineer the gears in Russian-made tanks captured during the 1967 six-day war between Israel and Egypt. He helped set up the largest gear plant in Israel and became a personal friend to Golda Meir.

Joe started U.S. Gear in 1952. Today it employs over 300 people; many of them started with Joe in 1952 and now work alongside their sons, brothers and cousins. U.S. Gear is a major supplier of gears to Ford, GM and other major OEMs. The company is a Ford Q1 quality certified supplier and is ISO-9000 compliant. Joe still comes to work every day and loves to greet visitors. He arrives at 7am every day and can talk to his workers in any of the several languages spoken at the plant.

We continue our tour going through the many different areas of the plant, starting with the main gear cutting building. Here the floor is filled with large machines for the many different processes necessary to turn a chunk of steel into that complex gear. Newer and larger computerized machines share space with smaller machines that are manually operated. U.S. Gear turns out large quantity jobs on the big machines and does a lot of small specialty jobs on the smaller equipment.

Need a gear for a 50-year-old truck? U.S. Gear was running a small batch of gears for a 2-speed axle that has not been made for 15 years. Keeping that truck on the road is worth the effort to produce the special parts essential to its operation.

Each part that leaves U.S. Gear has a code for the purchase order for the steel, when it was in the plant, what heat treatment process was used and codes for the dates for manufacture and shipping. Being able to back-trace parts in this manner helps assure quality control.

Each ring and pinion set comes complete with the proper pinion depth dimension marked on the face of the pinion. Use of this dimension with the proper setting tool guarantees long life and quiet operation.

Walking through the plant I get to watch how ring and pinion gear sets come to life. Think about the artist that looks at a block of granite and just has to remove the bits that are not "statue". The "artists" at U.S. Gear remove all the bits that are not gear. What is left is art in steel.

U.S. Gear makes more than just gears. They make complete two-speed transmissions for both under and overdrive units for trucks and cars. If you have



*Left to right: Jeff Hostetler, Product Mgr. RV Performance; Mark Guggenheim, Head of Engineering; Don Garfield, Executive Vice President.*

a street car that you want to drag race, but driving with a 4.56 gearset is a bother at the high rpm's necessary, then U.S. Gear can provide a two-speed unit to let you cruise at low rpm's and then dig with the best of them at the drags. Or they make an underdrive unit so your Power Stroke truck can really pull stumps without having to put up with super low gears the rest of the time.

Two dyno test cells put over and underdrive units to the test before leaving the factory. They test for operation, noise, pressure and leaks.

A big part of making gears that last is heat treatment. In another building at Heat Treat Corporation are several huge furnaces. As big as many homes, these units caseharden steel to a varying thickness. By controlling several factors the type and depth of hardening is varied. In addition to temperature, other factors that are taken into account are time, the type of material and atmosphere (type of gas).

I watch a pusher furnace harden ring gear sets. Cases of gears are slid into the machine on trays. To prevent outside atmosphere from contaminating the inside of the furnace, the tray goes into a pre-chamber. When the door opens, flame escapes preventing outside gasses or oxygen from entering the furnace. A pusher rod is used to force the line of trays through the furnace. Chains or other ways to force material through would not survive the 1500 to 1700 degree environment day after day.

These trays of parts can take up to 24 hours to work their way through the length of the machine. Up to 1500 pounds of parts can come out of the machine per hour. It takes a full day to change the environment. This is done by pushing through trays of junk parts. This keeps the line full and heavy. Otherwise, empty trays would just flip up like so many dominoes pushed in a line.

Another way metal is worked at U.S. Gear is through the shot peen process. The surface of the metal is work hardened by bead blasting with iron shot under controlled velocity.

In another portion of the plant an accessory is put together that may be on many of the PSR member's trucks. The D-Celerator exhaust brake is made here and works well with the PowerStroke engine.

U.S. Gear also makes the Unified Tow Brake for safer towing of a vehicle behind a motorhome. The Total Control Brake Remote gives fingertip control over trailer brakes.

The Cyclone Power Fan reduces parasitic loss of up to 40 hp by letting the cooling fan free wheel when not needed. An in-cab control gives the driver complete manual control, or let the temperature control decide when extra cooling is needed.

U.S. Gear also offers a custom made Turbo Down Pipe for the 1997 and earlier PowerStroke F-250.

As the tour of the U.S. Gear facilities winds down, I get to watch some other final processes such as Magnafluxing of parts to check for cracks and stress fractures. Another machine takes any dimensional wobble out of shafts and pinion gears that might have happened as a result of heat treatment.

We tend to take our modern vehicles for granted. The gears that let all that rotation motion turn corners and change ratios toil away day after day without a thought in most cases. If your truck is a real stump puller or smooth highway cruiser, then thank the folks at U.S. Gear for the bits of art in steel that make it all possible.



*Artists at work in their "studio."*