

# Calculating Gears

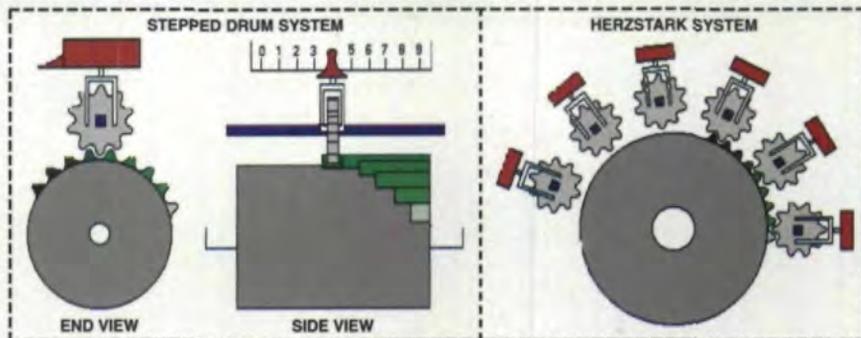
*Gear Technology's* bimonthly aberration — gear trivia, humor, weirdness and oddments for the edification and amusement of our readers. Contributions are welcome.

**I**nteresting gear factoids discovered wasting time on the Net while pretending to be working . . . The first four-function mechanical calculator was built by the mathematician Gottfried Leibniz in 1694. While not commercially available for nearly 200 years, the design was the basis of many such calculators until well into this century.

What caught the *Addendum* staff's attention was the gear problem presented by the mechanical calculator: How to move the gear an amount proportional to the number to be added. A number of solutions were tried at various times.

The first was the use of rocking segments. This system is a kind of curved rack and pinion arrangement. The rocker (rack) had nine teeth that meshed with a pinion. The operator would strike a key and turn a crank, engaging the pinion, which would move the rocker segment up until it hit the key's stop. When the crank was returned to its original position, so was the rocker, and the pinion disengaged so the return stroke wouldn't subtract the digit just added.

The second system was the stepped drum approach developed by Leibniz, although a man named Charles X. Thomas was the one who made it commercially viable. It solved the problem by using a drum on which cogs of varying length (one for each number between



one and nine) were attached. A gear was attached to a pointer, which the user could move to the desired digit on a numbered dial. The gear would move along the drum's length and engage the appropriate cog. For example, if the user set the point to four, the gear would miss all the cogs shorter than the fifth one.

A refinement of this system was developed by Curt Herzstark. He used a counter gear, which rotated based on its position along the length of the drum for each number. This led to a design that was simpler, smaller and less likely to jam.

(The *Addendum* staff thanks David Hicks, who provided this information and lots more on his Web page, The Museum of HP Calculators at [www.teleport.com/~dgh/mechwork.htm](http://www.teleport.com/~dgh/mechwork.htm).)

## The Entertainment Section

When we're not surfing the Net in search of gears, we're still following their Hollywood careers. Our nomination for both Best Gears in a Supporting

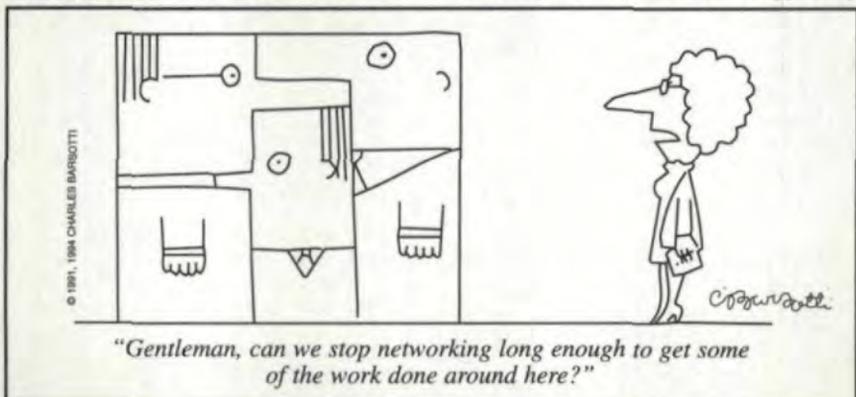
Role and Best Gears in a Family Movie goes to "Beauty and the Beast" (1991). For those of you who have been a) living on another planet, or b) have no children, grandchildren, nieces, nephews, or young friends of any variety, we're referring to the animated version of the story from the folks at Disney.

In the first 10 minutes of the film, there are at least three scenes with gears in them.

First are the almost inconspicuous gears attached to the weathervane on top of Belle's father's house. This clever contraption appears to be some sort of windmill generator, and its artistic placement here in the opening scenes provides subtle clues about the mad inventor (a gear engineer?) who lives inside.

The gear motif continues inside the inventor's house, when we see his latest contraption, an automatic wood chopping machine, which has a spur gear set prominently placed on the outside of the machine.

Finally, in a very dramatic scene, Cogsworth (an animated clock) is knocked down the staircase by his angry master, the Beast. All sorts of spare parts pop out of Cogsworth's case when he hits the floor. Never before has a gear demonstrated such anguish, such pain, such frustration. . . Rating: ○○○○



**The Addendometer:** If you've read this far on the page and enjoyed it, please circle 225.