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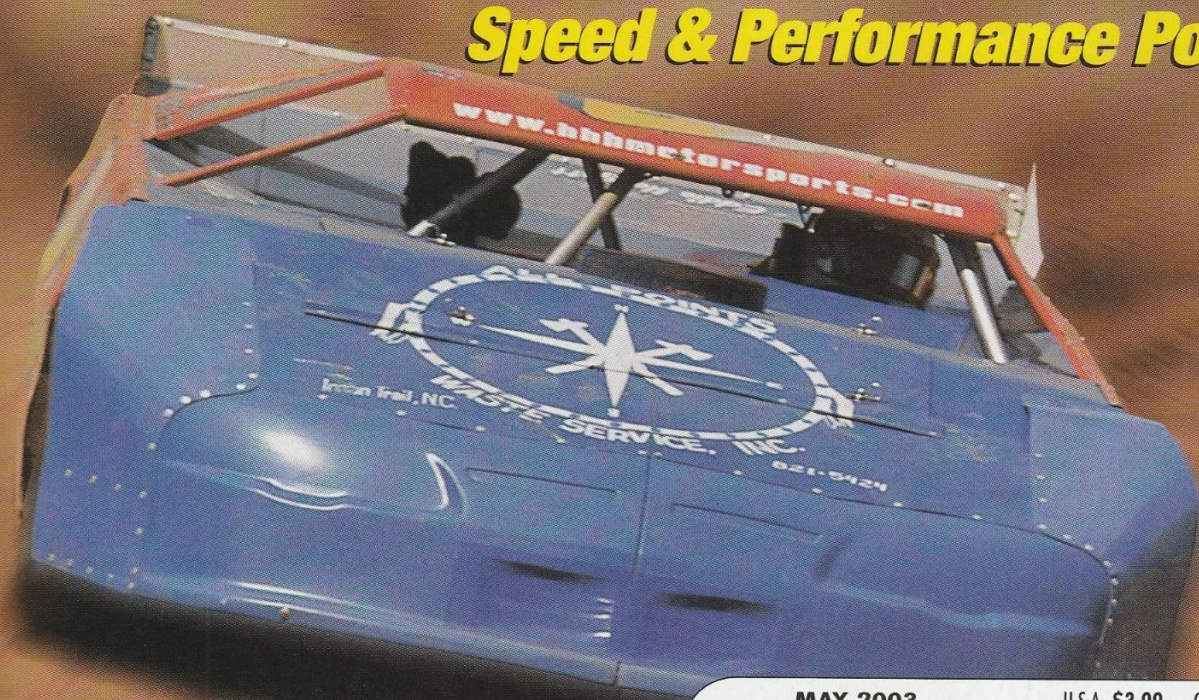
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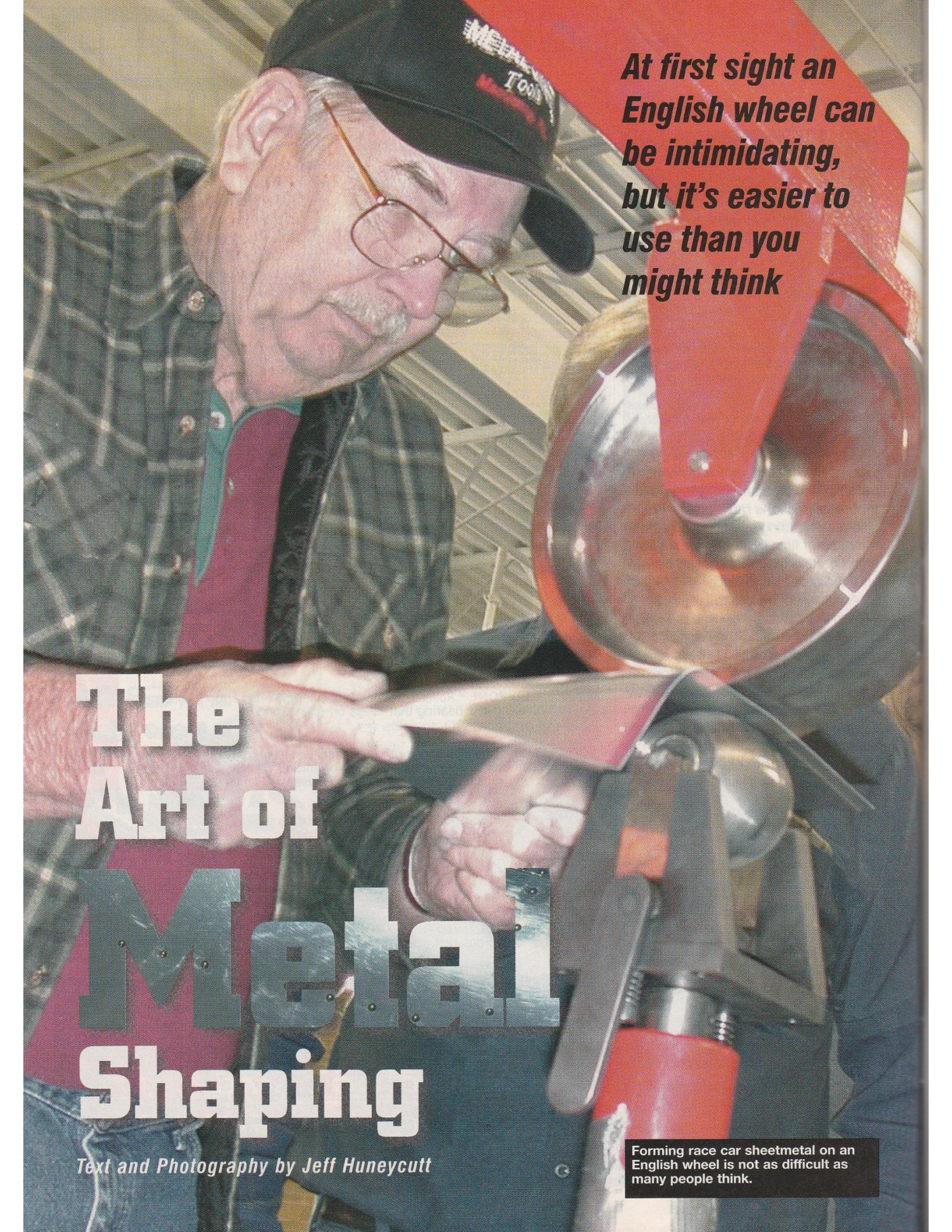
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A man with a mustache and glasses, wearing a black baseball cap and a plaid shirt, is working in a workshop. He is using a large, red, hand-operated English wheel to shape a piece of metal. The wheel is mounted on a stand and has a large, polished metal disc. The man is holding a piece of metal with both hands, carefully guiding it against the wheel. The background shows a workshop environment with various tools and equipment.

*At first sight an English wheel can be intimidating, but it's easier to use than you might think*

# The Art of Metal Shaping

*Text and Photography by Jeff Huneycutt*

Forming race car sheetmetal on an English wheel is not as difficult as many people think.

**W**inston Cup bodymen have achieved a status as practitioners of some type of black magic.

Part of that mystique comes from one of the bodyman's most valuable tools—the English wheel. Because it is used almost nowhere other than racing and other small-scale fabrication shops, the wheel—and how to use it properly—isn't familiar to most people. Granted, fabricating body panels by hand does require skill as a craftsman and a good amount of practice to perfect, but it is not impossible to learn. The key is finding a good teacher who can make the learning process as painless as possible.

Cal Davis is often credited with reintroducing the English wheel to Winston Cup shops in the late '80s. He was helping his son Mark build stock car bodies and built himself a wheel to aid the process. (Mark is helping us with the two-part story on hanging Late Model bodies. Part Two can also be found in this issue.) The wheel turned out to be so useful, he began building more and selling them to race teams. Robert Yates, in fact, was his first customer. Since that time, Davis estimates he has sold over 400 English wheels and now teaches classes on using one properly.

"It's not rocket science," Davis explains of the craft of metal shaping. "There's just two things you can do to sheetmetal: You can stretch it and you can shrink it. Now all you have to do is know how to stretch it in the right place and shrink it in the right place to get what you want. The English wheel is helpful because it is an easy way to stretch metal in a curve, and it's a fantastic planishing tool (a planishing tool smooths metal). You just have to be patient and keep working a piece of metal until you get what you want. If you are the kind of guy that stands in front of a microwave yelling 'Hurry up!' then this isn't for you. Move on to something else."

Davis' classes are normally three-day affairs (from Friday to Sunday to minimize time out of



The English wheel stretches and smooths metal by compressing it between two steel wheels. Like a rolling pin rolling out dough, the wheels push metal forward causing the metal to stretch.



Cal Davis teaches his metal shaping class at his son Mark Davis' racing school, so race cars are always handy for examples when demonstrating how to make fenders.

work) aimed at providing students a general knowledge of the entire metal-shaping process. Emphasis is put on learning by doing. Davis limits the amount of time he spends talking and tries to maximize the amount of time each student gets to spend experimenting with various tools. Students come from all walks of life and with every level of skill, and the agenda is flexible to allow each student to concentrate on his area of interest. A recent class I attended included three stock car racers, four custom motorcycle builders, and

three men attempting to restore a dozen old railroad trolleys.

The English wheel is useful to stock car fabricators because it is one of the best tools available to shape compound curves. Think about the front fender: On the really nice pieces there are no simple curves; everything curves away in multiple directions to take advantage of aerodynamics and make the most of the car's shape. This isn't just a skill for high-end Winston Cup teams; anyone running steel-bodied cars can take advantage of a wheel

## The Art of Metal Shaping

and fabricate—or repair—their own bodies. Even a Late Model Stock racer may want to experiment with his own fenders.

An English wheel works by stretching metal between two steel wheels set up on a frame. The pressure can be varied by moving the lower wheel (known as the anvil)

closer or farther away from the upper wheel. The concept is much the same as spreading dough with a rolling pin. As the pin compresses the dough, it pushes excess out in front of it. The same thing happens with a piece of sheetmetal. The wheels actually push the metal out in compression, stretching the metal. If you



Davis (left) shows how to duplicate a fender mounted on a buck.

roll a piece of sheetmetal through an English wheel consistently in one direction, it will make it slightly longer in that direction and cause it to curve into a crescent shape. Rotate the piece of sheetmetal as you move it through the wheel, though, and you can achieve gentle arcing curves that are nearly impossible to create with any other tool.

Most English wheels use a variety of lower anvils. The upper wheel is flat on the rolling surface, but the lower anvils are all different. Each has a flat crown that curves away on both sides. The crown or “flat” is the only part of the lower anvil that makes contact with the metal going through the wheel. The flat on each anvil is a different width and, generally, you want to use the anvil with the widest flat on the piece of metal with which you are working will allow. To keep from marking the metal as it is rolled through the English wheel, there are no hard edges near the flats. Instead, the surface of the anvil curves away in a gentle arc of a specific radius (see chart).

If there is a lot of stretching to be done to a piece of sheetmetal, initial shaping can be done by hand with a hammer and shot bag (the bag forms a pliable surface on which to place the metal) or a power hammer. The English wheel can be used for the more delicate work and smoothing out the dents that are unavoidable when pounding on sheetmetal. The anvils with the smaller flats are matched with sharper radii on either side to get into tighter curves. These anvils are good for putting a lot of pressure on a small area of metal but are not as good at smoothing the sheetmetal as the anvils with the larger flats.

If you are working on an intricate piece, such as a front fender, it can be easier if you break it into pieces to simplify the curves. Then, when you have everything fitting like you

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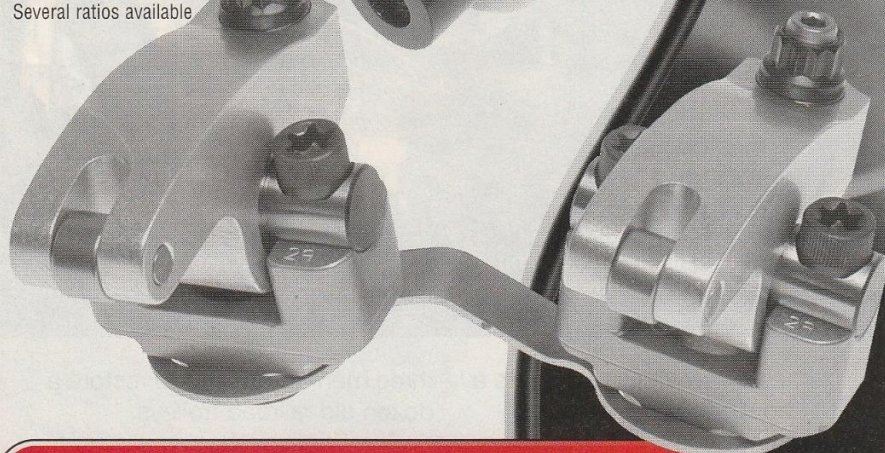
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want, you can butt-weld the pieces back together. The downside to this practice, though, is the more welds you have the more Bondo is required to get everything smooth. And Bondo, of course, means weight. Also, be careful when using the English wheel not to wheel the metal all the way to its edge. The pressure can cause sheetmetal to crack and split when the anvils roll over the edges, which can drastically weaken the piece's strength.

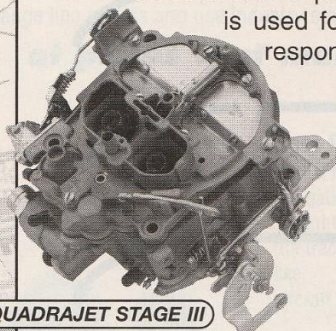
Finally, while the English wheel and good-old-fashioned hammer are excellent tools when it comes to stretching sheetmetal, they are of little help when it comes to shrinking. Shrinking sheetmetal is actually possible, and even necessary in areas such as the fenderwells where the metal often curves in on itself. Fortunately, a hand-powered shrinker is an effective tool. Its usefulness is proven by the fact that it is a common sight in most race shops. The shrinker works by pulling metal together into a ridge and then squashing it flat again. It leaves a rough texture on sheetmetal, but nothing that cannot be fixed with a little sandpaper and maybe Bondo.

## ROLL WITH IT

Most English wheels use interchangeable anvils to allow you to do more precise work. Davis' wheels use five anvils, numbered one through five. The No. 5 wheel has the smallest flat for tight work. The No. 1 anvil is the other extreme: The flat is an inch wide and is used mostly for smoothing entire panels, a process known as "wash over." Although the rest of the anvil does not make contact with the sheetmetal, it is still important. The radius is specifically sized to keep the anvil from marking the sheetmetal as it rolls through. On anvils with smaller flats, the radius is tighter. All the anvils are 3 inches wide, so on the No. 1 anvil with the largest flat, the radius can actually be tough to see, but it's there.

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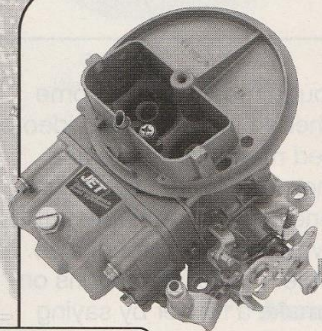
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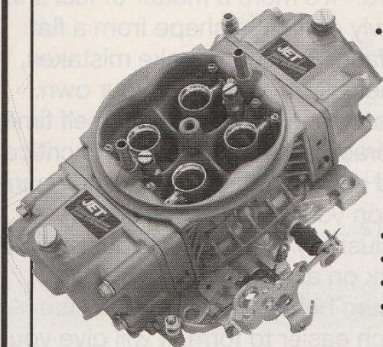
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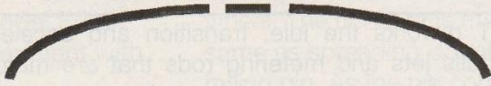
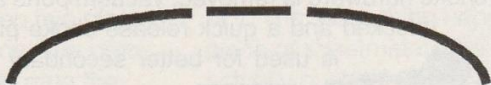
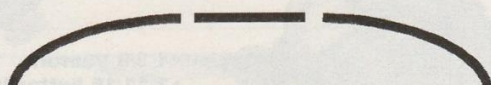
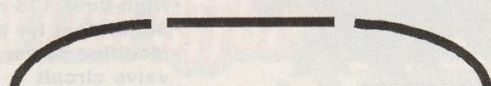
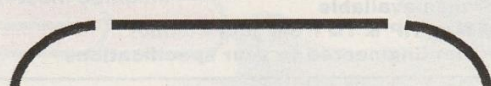
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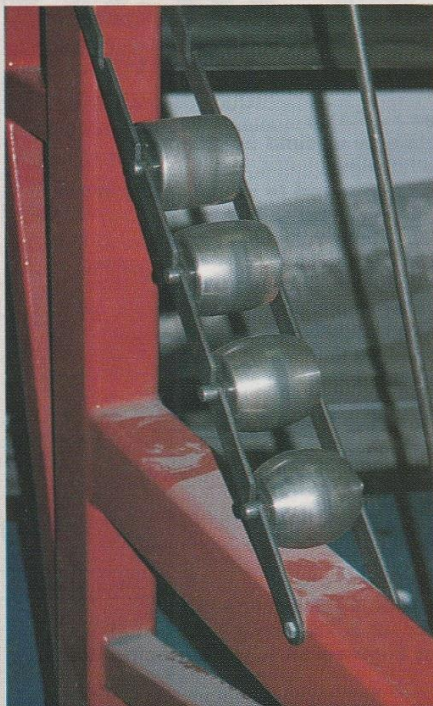
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# The Art of Metal Shaping

WHEEL #	SHAPE	FLAT	CURVE RADIUS
5		1/8"	2 3/8"
4		1/4"	3 1/4"
3		3/8"	5 1/2"
2		1/2"	8"
1		1"	12"



A good selection of lower anvils allows you to tailor the compressive area of force of the wheel to the shape you are trying to create. The anvil at the bottom of this rack has the smallest flat (area where the anvil stretches the sheetmetal) and tightest side radius, which makes it good for creating curves with a high crown. The anvil at the top of the rack has the widest flat (1 inch) and is best for creating curves with a slight slope or simply smoothing dented sheetmetal.

Although most wheels come with either an instructional video or a detailed manual that provide guidelines for how to use the tool, this is one piece of equipment that can only be learned through use. It's impossible to give instructions on how to make a fender by saying something like "roll three times here in this direction and four times there." It's more a matter of feel and slowly crafting a shape from a flat surface. Expect to make mistakes, especially if you are on your own. This means that giving yourself time to practice and experiment is critical. And although most of the body panels on your race car will almost exclusively be steel, do your practice work on aluminum first. The aluminum behaves like steel but is much easier to form. It will give you an idea of how the metal will react to different inputs much more quickly than steel and with much less effort.

"The biggest problem people have with the English wheel is they don't know how to set it up right to make the best parts," Davis says as a final piece of advice. "If the wheel is set up properly and used properly you can literally make parts that have a mirror finish on them. But if it isn't set up right—if the wheels

aren't rolling in alignment and tracking properly—it will make marks on the metal. You can still make parts, but they won't be as good as they can be. I made parts using the wheel for two years and didn't know what I was doing. The problem was it was hit-and-miss. Sometimes I'd hit, but more often than not I'd miss.

"The thing, though, is don't be afraid to learn. Whether you take a class or hire on at a shop and learn from somebody there, don't be afraid of the tool. Use it, and practice on it, and don't be afraid to make mistakes. Just learn from those mistakes. Metal shaping takes patience, but it's worth it. I've done a lot of rewarding things in my life, but this is one of the most rewarding things that I've done. And almost every metal shaper that I've talked to will tell you the same thing. To be able to take a piece of raw, flat sheetmetal and make something out of it—whether it be a fender, or a patch panel, or a complete race car body—it's extremely rewarding." **CT**

## SOURCE

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