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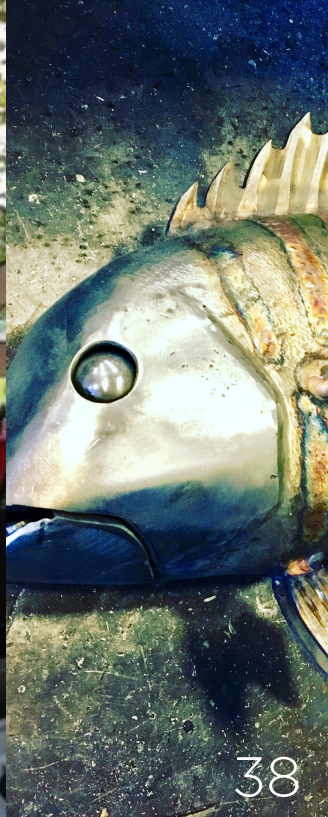
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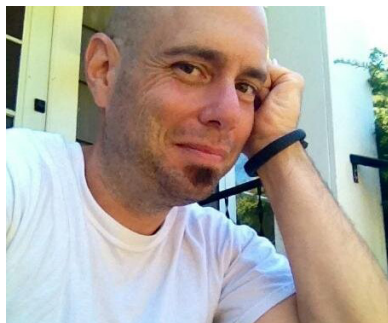
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Peter Chakerian is an award-winning writer, author and journalist whose work has been featured in dozens of publications across the country. His 25-year career has earned him several awards, including “Best in Ohio” nods for online journalism by the Ohio Society of Professional Journalists. A regular contributor to the Cleveland Plain Dealer and Cleveland.com, Chakerian covers dining, nightlife, popular culture, features and entertainment for Northeast Ohio. He is the author of four books.



Jeff **Herrington** **Writer**

A Dallas-based writer, Jeff Herrington has traveled to more than 40 countries on five continents. His interview subjects include a prime minister of New Zealand, a top heart surgeon in France and the CEO of Argentina’s state oil company, as well as hurricane-ravaged business owners and Nazi-occupation survivors. Along the way, he’s climbed Sri Lankan ruins and reported on a Japanese ice festival in below-zero weather. He is the author of two mystery novels, *Murder Becomes Manhattan* (2014) and *Murder Becomes Miami* (2015).



Jimmy **DiResta** **Fabricator**

Jimmy DiResta is a New York-based artist, designer, master builder and video producer. His work has been showcased on Discovery Channel, HGTV, DIY and FX, as well as YouTube. His goal is to educate and inspire people to embark on their own home projects in an entertaining way. His unique builds are comprised of many different materials and processes. With his artisan skills and a shop full of power tools, he lets the build process speak for itself.



Mark **Prosser** **Instructor**

Mark Prosser is an assistant professor of welding engineering at Ferris State University and has taught at different colleges around the country for the last two decades. He has welded in the automotive and motorsports industries, for a governmental contract shop, and on high-pressure chemical piping and aluminum tubing. Mark has authored numerous instructional books, including *Full-Bore Welding* and *Full-Bore Sheet Metal*, both of which he co-wrote with Bryan Fuller.



Karl **Hoes** **Instructor/Welder**

Karl Hoes is a former welding instructor at Lincoln Electric, where he taught many aspects of the company’s welding school curriculum, including basic and advanced motorsports classes. He has trained welders and instructors at multiple welding schools and national union training programs across the country. Karl is a Certified Welding Inspector/Educator (CWI/CWE).

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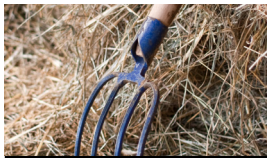
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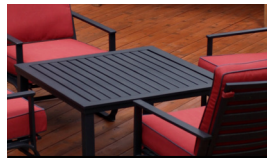
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LETTERS TO THE EDITOR

DEAR EDITOR:

After seeing one of the previous issues of *ARC* at my local welding and gas supply store, I subscribed and have been receiving it for about two years.

You have created a fine magazine that captures the industry as well as professional and amateur welders and fabricators like myself. I always read it cover to cover.

However, I cannot understand why the cover story of the Summer 2020 issue was about Emily Riedel (other than being blonde) in a magazine for the welding industry. The article never mentions anything about her doing any welding or cutting, much less arc welding fabrication.

I did enjoy reading this issue. Keep up the good work. I look forward to receiving the next issue.

— *Donn Marinovich*
Columbia, California



► **Glad you're enjoying the magazine, Donn. I won't comment on the color of Emily's hair (because I'm pretty sure it's not relevant to this particular conversation), but I will say she's all the things that make a good cover story: innovative, resourceful, creative, tenacious and more. And while it wasn't mentioned directly in the story, as captain of her own dredge, she occasionally has to do some impromptu maintenance and repairs on her boat - oftentimes when she's out on the water and there's no one else around to do it (did I mention resourceful?). So yes, welding and fabrication are very much a part of her extensive skill set.**

In the end, *ARC* is interested in putting the spotlight on any person or organization that's thinking outside the box and cutting a path for others when it comes to welding, fabrication and related trades.

DEAR EDITOR:

I just wanted to write to you and tell you how much I always enjoy each installment of *ARC*.

I think it's well balanced between showcasing individuals who have interesting stories, helpful tips on craft, master classes and fun projects to work on. I especially enjoyed the article about Emily Riedel and how she started out as a performance artist like myself. Welding has a very aesthetic quality to it, so it makes sense that those of us with an artistic nature gravitate to the craft.

I have been a journeyman actor for most of my life, and there was nothing I loved doing more - until I discovered welding. When my daughter was born, I had to

find another way to make a living, so my father suggested I look into welding. The skill always interested me, so I got a grant from the Actor's Fund and took a cycle of TIG welding classes at a local school here in Los Angeles. I've been working as a professional welder for three years now and I love it. It's been nice to find something else in my life to be equally passionate about. Keep up the good work with the magazine. I look forward to the next installment of *ARC*.

— *Spencer Rowe*
Los Angeles, California

► **Sounds like an interesting journey, Spencer. We hear so many stories like yours, from people whose circumstances take their lives in unexpected directions. For many of those people, welding turns out to be a rewarding destination. All the best to you and your daughter. Maybe we'll see her striking an arc someday just like her dad.**

DEAR EDITOR:

I love the motto, "Making a better world, one build at a time" [*ARC*, Fall/Winter 2019]. It is backed up by articles and different project ideas that make me want to go out and start building! This is a great magazine, and I am hoping to save enough money to build up my shop with the right tools so I can hopefully do my part in "making a better world, one build at a time!"

— *Creed Pariera*
Burbank, WA

► **Glad to hear you found inspiration from the issue, Creed. The tagline to the Adam Savage story was derived from Adam's own worldview, which he laid out very clearly in his interview with us. More than just a personal passion**

or a career option (or both), he sees the maker life – be it welding, fabricating, carpentry or any other creative pursuit – as a way to transcend the various obstacles and misunderstandings that currently divide our culture and build bridges to a more unified society. We couldn't agree more.



DEAR EDITOR:

I recently picked up the Summer 2020 issue of ARC from a local welding supply store in Plymouth, Indiana. At first glance, it's not a very thick magazine, but you guys managed to fit a lot of useful information into this publication. I'm very impressed with the content and I will be subscribing to receive future publications. Keep up the good work, guys!

— Matthew Pinks
LaPorte, Indiana

► Thanks for checking in, Matthew. If time and resources were unlimited, we'd publish far more articles and other content in a given issue. But ARC is just one facet of a larger marketing initiative at Lincoln Electric. You can keep up with us daily via our social media pages on Facebook (LEArcMedia), Twitter (@LE_ArcMedia) and Instagram (@LE_ArcMedia).

DEAR EDITOR:

As a third-year welder apprentice with Ford Motor Company, I really enjoy reading your magazine. I've recommended it highly to my peers as well as seasoned welders. I've never received an issue that didn't have something new and useful for my job, not only processes but also new products. Also, a special nod to the Question Mark section, as I'm just starting on TIG. I've already picked up some great tips. Thank you for helping out the new apprentices!

— Melissa Ross
West Chester, Ohio

► Thanks for getting in touch, Melissa! Glad to hear that you're finding guidance and inspiration in the pages of ARC. We're fortunate to have Mark Prosser in the mix. He brings a lot of great experience and expertise to every issue, thanks to his dual perspective as a welder/fabricator and an instructor.

Good luck with the apprenticeship. The learning curve never ends, but the time you're investing now will result in some big dividends in the future.

DEAR EDITOR:

I have a son who is getting into welding, and you have a lot of helpful articles. I have been welding for 31 years, so it's good to see the younger generation showing interest in the field.

— Jonathan Tharington
Tobaccoville North Carolina

► Nice to hear from you, Jonathan. Congratulation on your decades of success in the trade, and kudos for creating a path for your son to follow. Best of luck to both of you!

As always, the communication channel is always open at ARC Magazine, and we welcome your feedback about what you see or what you'd like to see on these pages. Contact us at editor@arcmagazine.pub or publisher@arcmagazine.pub.

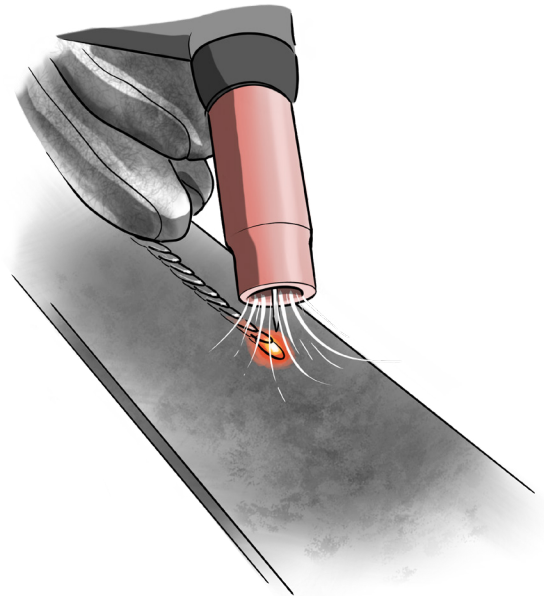
QUESTION MARK



ARC taps into the vast experience of veteran tradesman, educator and author Mark Prosser (CWI/CWE). In addition to many years as a welder for the automotive and motorsports industries, Mark has also spent the last 15 years teaching welding at the college level, where he fields challenging questions from his students every day. He shares some of those questions – and his answers – with *ARC* in every issue.

Why does my tungsten look black and burnt after welding?

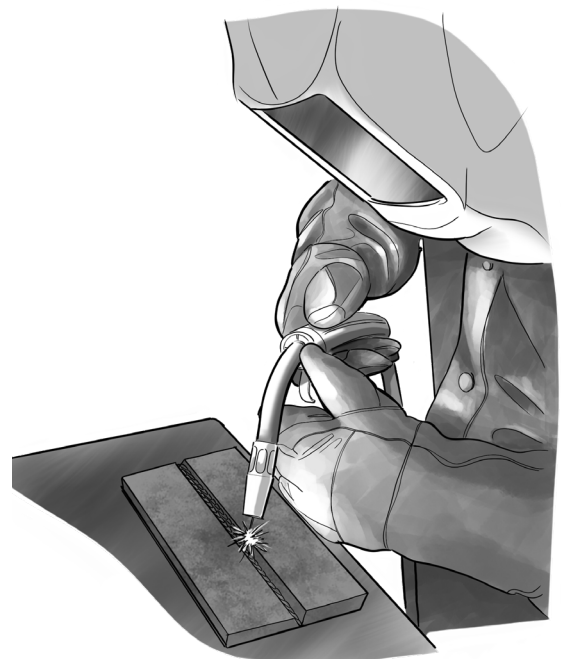
▶ TIG welding with a contaminated tungsten can be a frustrating experience. When learning how to TIG weld, you'll need to maintain a clear path in your work space to the grinder to keep that electrode sharp and clean. As you develop skill, the trips to the grinder will be less frequent. When you weld after dressing the electrode and it turns black and burnt immediately after, it's because you don't have sufficient post flow to allow the tungsten to cool in a protected atmosphere. Some welding machines establish the post flow automatically, according to the diameter of the tungsten you're using. The more sophisticated machines have a control to adjust the amount of post flow. It's also possible that you have a loose connection, a hole in the line or even an incorrectly assembled torch. Whichever the case, the black and burnt coloration suggests that the tungsten is not getting enough gas flow after the arc is extinguished.



Illustrations by Jeremy Lacy

How big can I make a single-pass weld?

▶ Making larger welds on thicker materials is a process of combining several smaller welds fused together to fill the weld joint. No matter the process, the puddle can only fuse and penetrate into the base metal so far, unless you're using a very powerful machine. The knowledge and skill required to perform multi-pass welds will change depending on position and process. Different welding positions require different techniques to ensure proper fusion when creating a multi-pass weld. So the ultimate answer to the question is: the code book determines how big your single-pass weld can be while still maintaining weld integrity with different welding processes. Again, when you begin welding materials thicker than 3/16 inch thick, the situation changes. Joint preparation changes, welding technique changes and the number of welds required to produce the weld changes.



Illustrations by Jeremy Lacy

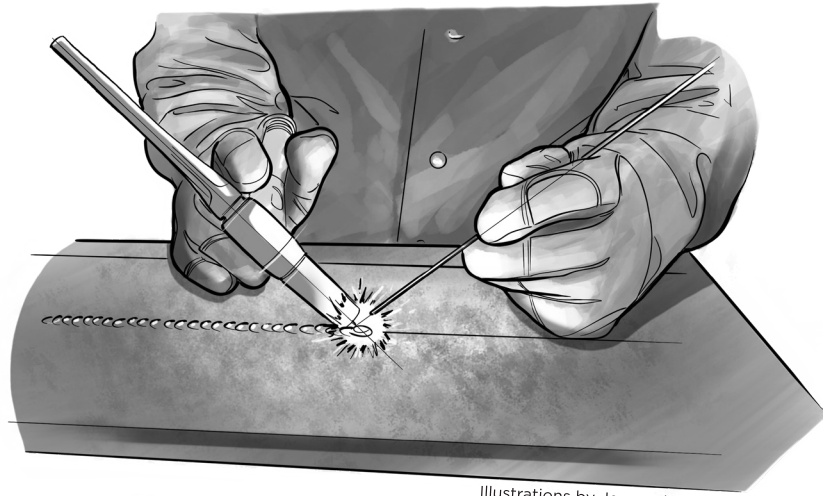
What is the most important component of learning to TIG weld?

► A good question, with a much simpler answer than you might think. Learning to be a competent TIG welder requires two components. The first is learning a little about the process of welding — what polarity to use, what cover gas to use, filler metal type and size, and voltage/amperage relationships. These elements make up the science of how a weld works, and you need to understand them in order to understand what happens during the welding process.

The second component is learning the technique of welding. This requires developing eye-hand coordination and muscle memory — your eyes' ability to see the weld, your brain's ability to process what it sees, and your hands' ability to react to the puddle.

Some of the most important factors a beginning welder should focus on are comfort, the position of head and hands to maximize visual access to the puddle, and an understanding of how the puddle reacts to things like arc length, torch angle and change in travel speed.

Simply put, it takes time and practice to develop the necessary skills to become a competent welder.

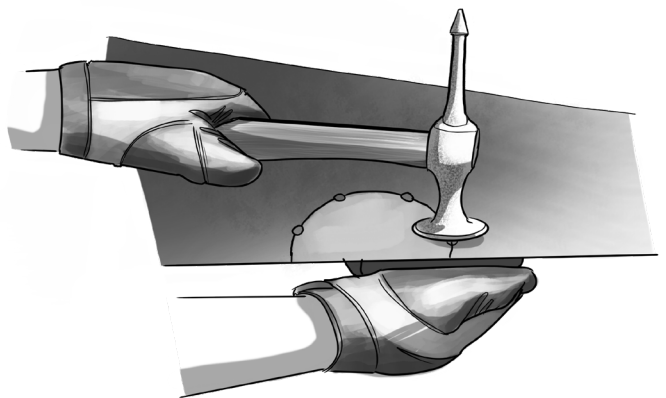


Illustrations by Jeremy Lacy

I have heard several people refer to “hammer welding” sheet metal, what does that mean?

► I'm not entirely certain where the term originated. It certainly isn't used in any code books, but it's a recognized technique — and if you work with thin sheet metal, it's an important technique to learn.

When we weld sheet metal on a car, for example, the material is going to distort. There's no stopping it. So you have one of two choices to fix the distorted panel on that car. You can wipe big globs of a polyester surface enhancer into the distorted space, or you can hammer weld. Hammer welding is the process of hammering the weld against a dolly to stretch the weld back into place. Welding creates shrinkage, and in order to reverse the shrinkage we have to stretch the material back into place. Hammering the weld on a dolly will return the metal to its original condition. TIG welds are soft enough to hammer, but MIG welds can crack from hammering. This is why, when welders operate sheet metal that will be finished, they usually use the TIG process.



Illustrations by Jeremy Lacy



EVERYTHING GOES

STORY: PETER CHAKERIAN

PHOTOS: AUSTIN PRENDERGAST

**CHRIS ZEPPIERI MAKES
EVERYTHING AND ANYTHING
IN HIS SHOP ON LONG ISLAND,
AND HE'S ON A MISSION TO
INSPIRE EVERYONE WITHIN
THE SOUND OF HIS VOICE -
AND WITHIN REACH OF HIS
INTERNET PLATFORM -
TO DO THE SAME.**

"Whatever happened to shop class?" It's a valid question, one that's been debated for a generation or two.

Once the basis for post-scholastic careers in the workforce, vocational coursework began a slow fade into the background in the 1970s and 1980s. This marked a cultural shift away from skilled trades like plumbing, electrical and electronics, woodworking, welding, fabrication and auto repair, and towards collegiate study.

The aptly-named Make Everything Workshop in Sea Cliff, New York, has picked up the gauntlet this trend has thrown down, and is committed to putting America back into the workshop, one student at a time.

A custom fabrication shop and educational space, Make Everything is the brainchild of founder Chris Zeppieri, a self-described "lifelong creator" with an extensive background in fabricating and a vast knowledge of materials and processes.

By day, Zeppieri has a Bruce Wayne job in asset management, "overseeing a 600,000-square-foot distressed property redevelopment project in Princeton, New Jersey." By night, he's a fabricating crusader, with a legit utility tool belt and enough power tools and equipment in his lair to build the equivalent of his own batmobile.

Zeppieri graduated from Tufts University in Massachusetts with a Bachelor of Fine Arts degree, and has spent the subsequent years building public works and private art collections. He has a number of robust, one-off design projects under his belt. When speaking with him, one gets the sense that “hands-on creation” has always been his forte.

“I’ve always been a maker,” he says, “which has really informed what I do with Make Everything. No project is too big or small, and it’s that approach I hope to convey to other people.”

If you’re interested in having *anything* made, he’s your guy with the will *and* the way. But he has taken his art, craft and trades a step further with Make Everything.

What started as his own workshop “for wild ideas and experiments” has morphed into a “full-blown public-access shop” stocked with equipment and a soup-to-nuts approach to coursework and how-to for any manner of fabrication.

toe-in experience. If you wondered what happened to the glory days of shop class in junior high and high school, here’s your answer.”

In the not-so-distant past, the trades helped keep the country moving and competitive. These days, a longing for that bygone era may lead to a full-blown pendulum swing.

Makers are making a comeback, thanks in large part to the Internet, and it stands to reason: as recently as 2015, figures cited by Forbes from the U. S. Bureau of Labor Statistics showed that 68% of high school students attend college, leaving a staggering 30-plus-percent of graduates with neither academic nor job skills.

People in skilled trades today are aging out and retiring. Without shop classes at traditional schools, and with apprenticeships coming to a grinding halt, what Zeppieri is doing “draws from a diverse clientele into the trade/maker aesthetic” with

“No project is too big or small, and it’s that approach I hope to convey to other people.”

What’s more, the former professional BMX cyclist (with now-defunct FBM Racing in Binghamton, New York) is using a wildly-hip approach to the maker-creation experience, integrating technologies and a pop-culture bent to appeal to audiences young and old. Much of his educational content has transcended the workshop classroom and into the Make Everything YouTube Channel, where some 140,000 subscribers soak up all that Zeppieri has to offer.

And his Make Everything Patreon subscribers can score access to patron-only content, candid video and sneak preview photos showing the process behind builds and upcoming video class releases.

With Make Everything, Zeppieri is creating a blueprint for educational priorities as our culture zooms (pun very much intended) toward a more vocational future.

“If you didn’t get this kind of training back in the day, and can’t afford the time or money for a dedicated trade program, we’re your shop,” he says. “Nothing is out of bounds — this is a down-and-dirty, dip-your-

equal parts ingenuity, elbow grease and cutting-edge technology.

His Make Everything classes range from “fabricating knives, cutting boards and live-edge furniture, to household goods and tables,” along with more equipment-specific courses “like our ‘Intro to MIG Welding,’ which is in essence Welding 101 for some people, and a refresher course for others who haven’t used their skills in a while.”

That recurring class teaches “the process of prepping steel, cutting, clamping, tacking and finish welding,” according to the syllabus. “Students will make a small steel structure during class that utilizes various skills learned.” The class is taught by professional welder and motorcycle builder Matt Paris.

“He’s my only ‘employee’ and the homegrown answer to the ‘Orange County Choppers’ guys,” Zeppieri laughs. “He’s quite the motorcycle fabricator.”



“The eyeballs of the Internet are really a life-giving force to us,” says Zeppieri. “That viewership attention really is our lifeblood in many ways. We just wouldn’t be the same as a workshop without it.”

He isn’t kidding. “Well over half of our business is online education,” he says, and from his perspective, that has to be the model for a lot of people going forward.

“So many talented craftspeople struggle with a physical-object business, but they would be great teachers whether they know it or not,” he says. “And vice-versa. There’s so much opportunity for everyone out there by simply creating and maintaining your own content.”

Sales, affiliate links and sponsors generate tens of thousands of dollars for Make Everything every year, says Zeppieri. “Fifty percent of our gross [income] comes from educational content. Every single video is a project. It may not all be build-along, but every one of them is put out there as a watch-and-learn.”

To put it another way, “I can only reach five at a time in a physical class,” says Zeppieri, “but Make Everything has nearly ten million [channel] views, which are monetized. That’s an absolutely huge scale.”

Online video “is like a free lottery for makers,” he says. “What a time to be alive! They really right-size your value in real-time, exposing you to a much wider world. Dedicate your focus accordingly. Everyone should. If you’re a maker and not taking advantage of that technology, you’re leaving money on the table.”

Zeppieri’s Make Everything “batcave” is a 2,800-square-foot facility with everything one would need to create whatever their mind can dream up.

“The shop we are in now came to us four years ago,” says Zeppieri. “Prior to that, I was working out of a two-car garage, and toward the end, we were working under pop-up tents [adjacent to it] too, because we kept getting bigger and bigger gigs. I wanted a larger place for those projects, but I also wanted a place where our people would feel comfortable.

His current space had been vacant for six or seven years, “and went from condemned cave to the shop that it is today with the help of a couple friends,” he explains. “Once we moved, there was no turning back.”





AN ALLY IN PARIS

There's an old saying attributed to milkshake mixer salesman and McDonald's icon Ray Kroc: "You're only as good as the people you hire." To wit, Chris Zeppieri of Make Everything nailed it with Matt Paris – his instructional partner, a professional welder and chief motorcycle designer of Yard Ratz Fabrication.

The longtime friends made perfect sense partnering for instruction at the workshop. While they didn't go to school together, they met through mutual friends and a love of BMX dirt bikes.

"We've known each other for ten years at least," says Paris, who's daytime gig is construction welding. "We've had the same friend circle, we are the same age [31], and that mutual love of the BMX world has always been there."

A shared interest in opening their own shop led them to the Make Everything project, says Paris, adding that he's invested almost as much time in fabricating motorcycles as he has in his friendship with Zeppieri.

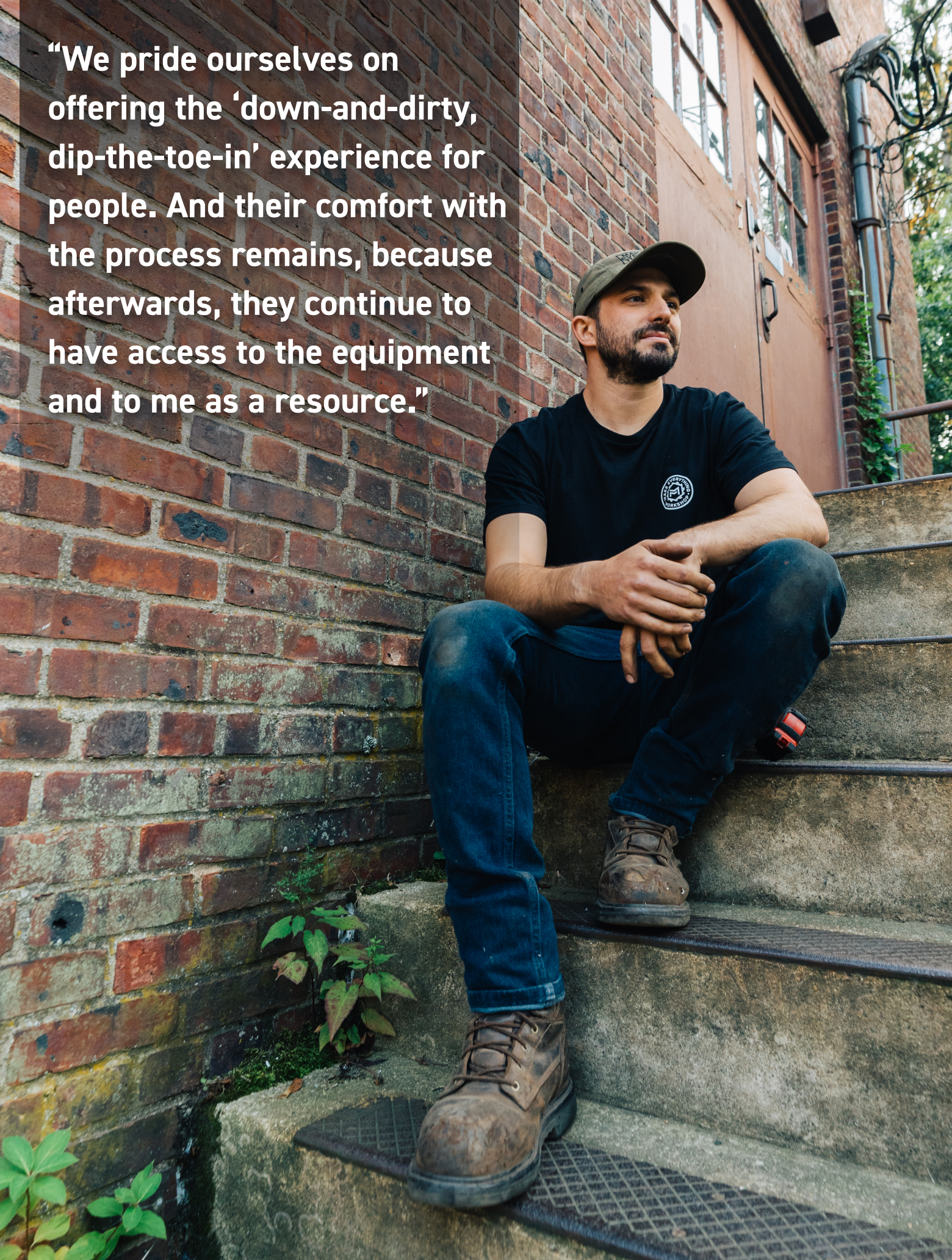
Teaching together, the partners truly are a Batman and Robin of sorts, playing off one another's strengths, senses of humor and respective skill sets. Paris finds teaching as "a natural extension" of his love of welding, building custom motorcycles and fabricating one-off parts.


"Teaching is pretty different," says Paris, "but I really love one-to-one connection – helping people learn tricks and gain a baseline of knowledge. It's nice to show people what you know."

Indeed, teaching "wasn't in my lineage," Paris explains, "and I know that my mom didn't want me to have a motorcycle, but we had a small construction garage and yard and they took up less space than cars."

Given the success of Make Everything to date, the unlikely path seems to be the right one for Paris. "I got my first motorcycle at 19 and cut it in half immediately and showed everyone," he explains. "I should have known then that teaching would be natural fit."

“We pride ourselves on offering the ‘down-and-dirty, dip-the-toe-in’ experience for people. And their comfort with the process remains, because afterwards, they continue to have access to the equipment and to me as a resource.”





Make Everything is decked out with three dozen different woodshop-specific tools (including bench planers, drill presses, lathes, mortisers and 3-D printers) and nearly that many pieces of metalshop equipment (head mills, chuck lathes, a tubing roller, pipe bender, MIG welder and more). There's cabinet-grade woodworking and finishing, along with professional metal machining equipment.

Zeppieri has spent the last several years collecting both modern and vintage machinery and is "just about maxed out on space again!" He adds that he'd love to have a sprawling 5,000 square feet, "but at this point, I can rearrange what I have and be content here for several more years."

One of the aspects of this venture that he finds most fulfilling is that "next-level" of fusing his degree in art and sculpture with his background in building and construction, and using the combined knowledge to educate others.

"When we opened up to students, the pitch was, 'This is adult shop class,'" he says. "That's what gets me excited. And that's how I market Make Everything when people ask me, and it's what brought the diversity of students to us.

"If you didn't get this kind of training back then, it used to be there was no way to learn unless you enrolled in a dedicated trade program," he says. "For a lot of people, that's just not possible." He invokes the same phrase he often uses to describe the Make Everything approach. "We pride ourselves on offering the 'down-and-dirty, dip-the-toe-in' experience for people. And their comfort with the process remains, because afterwards, they continue to have access to the equipment and to me as a resource."

Make Everything is "an open-to-the-public shop for all kinds of students, ages 11 to 88," says Zeppieri. "Access to professional tools and individuals who have mastery on how they operate is becoming harder to find every day. The goal with Make Everything was accessibility, helping makers add to their skills, develop new ones and create whatever they dream up."

He adds: "But give them access to tools and instructors who can help them navigate them?"

Anything is possible, and anything you can build with your own two hands and mechanical know-how is not just exciting, but it's really empowering."

Especially, he said, for women and children.

"Women who come and take classes always end up being some of the best welders in the room. They're more meticulous, good listeners. Men 'know everything but don't know anything,'" he says with a laugh. "But women are so much more patient. It's a shame there's been such a gender gap where women weren't allowed to take these kinds of classes all these years. They're incredible welders, for sure."

One of Zeppieri's female students even had him take photos of her work afterwards to verify her newly acquired welding skills for an old friend from high school. Her chance to prove to the former classmate who teased her about not being able to weld was a highlight for Zeppieri.

Zeppieri has an equally fond memory of a father-son class a year ago, inspired by an old-school dad's dream.

"The dad wanted to build a go-cart with his 11-year-old boy," he recalls, "and the kid was great! We did private classes, gave the kid an apple box to stand on, he's there working the cordless grinder, welding, working the vise—and he did a great job!" He recalls that "the hardest part was finding him gloves that fit. It was absolutely awesome and pretty hysterical!"

If there's a dream project for Zeppieri's own kid-at-heart, it will likely materialize on the 6.5-acre property he recently bought in upstate New York. While not branded (yet) as a Make Everything location, "everything is always on the table," he says.

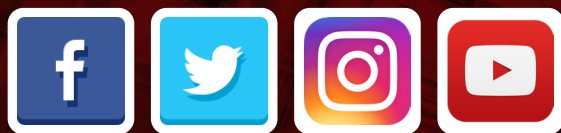
"The idea is to use that space up there as a free-for-all, 'kitchen-sink' experiment location to get crazy-creative," he says, referring to a large-scale BMX bike ramp project he recently completed.

"If I could drop everything tomorrow and go do something up there, I could see working on a tiny house project, and I have visions for also doing a full-sized, insane adult treehouse compound. That's what the creator-kid in me would do."

No doubt Batman's BMX bike would be parked out front, too. [ARC](#)

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PEDAL TO

By Jeffrey Herrington

AUSTIN RILEY DOESN'T LET AUTISM SLOW HIM DOWN - IN LIFE OR ON THE RACETRACK



THE METAL



Austin Riley rarely encountered raucous cheers and thunderous applause while growing up in Uxbridge, Ontario.

His autism undiagnosed for 13 years, Austin led a childhood fraught with frustration. "We'd sign him up for soccer but that wouldn't work out," his father, Jason, recalls. "Then we'd give power skating a go.

"It didn't really matter. No matter what we tried, it would always end in flames and sadness."

Fast-forward to today. Thanks to his achievements as a race car driver and promotional speaker, Austin enjoys a celebrity status Justin Bieber might envy. He's heard the roar of racing fans after winning a tournament and the applause of schoolkids after delivering a speech. At 21, Austin is now that anything-but-textbook example of someone who surges into the lead from several laps back once they've found their joy and set out to pursue it.

"For the first time, my wife and I have hope for Austin's future," his father says. "And we're committed to keeping him on the yellow-brick road to whatever Oz awaits him."

Though remarkable, Austin's successes on racetracks across North America come as little surprise to his family.

"From the moment Austin could walk, he's been obsessed with anything sporting four wheels and an engine," Jason says. "When he was two, he'd walk into a car dealership with me and start describing every car and their engines."

Jason even recalls an incident that now seems like the perfect intersection of Austin's exuberance for cars and his experience with autism.

"One day, we pulled into the parking lot of a Tim Horton's restaurant. Nearby was a replica 1965 Shelby Cobra, my favorite car. When its owner exited Tim Horton's, Austin darted across the lot toward the vehicle.

"But he didn't want to sit in the car or interact with the owner. Instead, he lay on the pavement beside the exhaust pipe, so he'd feel the engine when the owner started it."

Finding a school compatible with a boy who only wanted to play Formula One video games or talk about Dodge Hellcats was challenging, Jason admits. One poignant memory he has is that of Austin trudging off to another day of classes, his knapsack full of Hot Wheels crunching as he walked.

Then, one day, the mail delivered what Jason considered a blessing from heaven. "It was a flyer promoting a program 20 minutes away that teaches kids go-kart racing and race craft," he recalls. "I thought, 'this is perfect.'"

Austin wasn't so sure.

"Why would I want to try that, Dad?" he asked. "I suck at everything."

Four weeks later, Austin agreed to give it a shot, but with one condition. He'd drive the go-kart, but for one lap only.

Things didn't go as planned.

"At the end of the lap, Austin wouldn't take his foot off the gas pedal," Jason says. "Even on the turns, he wouldn't take his foot off the gas pedal. They gave him the checkered flag, but he refused to leave the track. The officials finally had to swarm the track to make him stop."

Ever since, it's been tough keeping Austin off the racetrack – and the winner's stand. He launched his resume as a go-kart racer at age eight, and spent the next five years burnishing it with multiple karting championships at tracks across Ontario.

And all the while, neither Austin, his competitors, nor his parents knew he had autism.

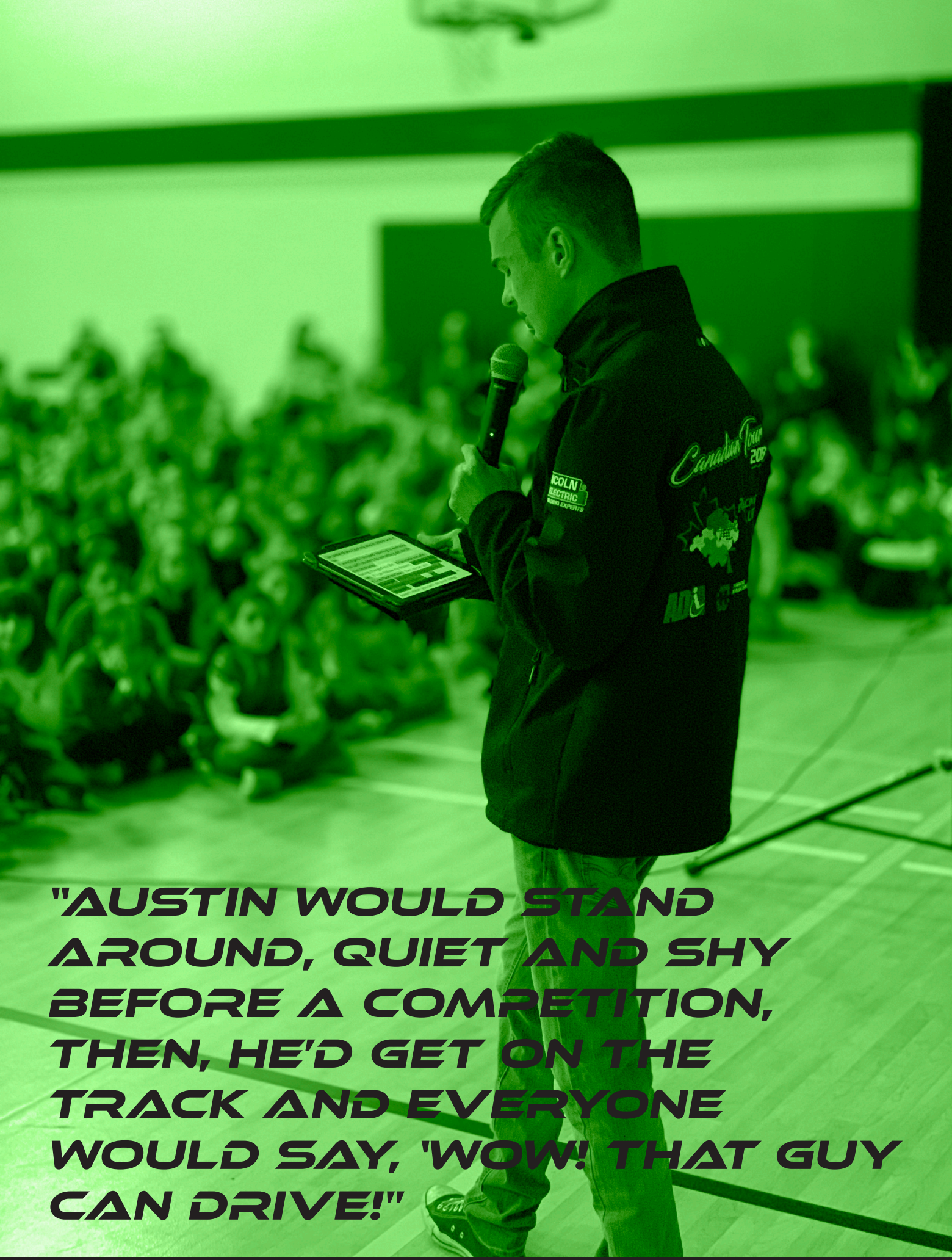
"Austin would get really anxious going to a race if the route didn't present any landmarks he recognized," Jason recalls. "But once we'd arrive at the track, he'd suddenly become a rock star behind the wheel."

In 2012, Austin's life, and his racing career, kicked into overdrive. Doctors officially diagnosed him autistic, prompting his family to redesign his lifestyle. They introduced more repetition and familiarity to his schedule and minimized the noises that would cause him distress. Soon after, Austin returned to racing and slayed the competition. He won two club championships and "only placed second in the Eastern Canadian Karting Championship," Jason insists, "because his mechanic dad forgot to tighten a bolt."

That's also the year Austin's current mechanic, Jeremy Mitchell, first noticed the standout driver from Uxbridge. At the time, Mitchell had been working with the Energy Kart Canada race team, which had recruited Austin to drive for them.

"Austin would stand around, quiet and shy before a competition," he recalls. "Then, he'd get on the track and everyone would say, 'Wow! That guy can *drive!* *that guy can race!* *who is that guy?*'"

"Working with Austin back then meant patiently building a relationship he could trust. If he needed some parts, I'd find them and go out of my way to deliver them. When he arrived for a race, he'd sometimes discover I'd set up a hospitality tent for him.



"AUSTIN WOULD STAND AROUND, QUIET AND SHY BEFORE A COMPETITION, THEN, HE'D GET ON THE TRACK AND EVERYONE WOULD SAY, 'WOW! THAT GUY CAN DRIVE!'"

“But Austin gives back. If a competitor crashed, he’d ask me to go help them. And the first time he reached the podium for us, he presented the trophy to me and the team owner.”

Word of Austin’s skill was spreading across Canada. But word of his autism was not. So, with a measure of apprehension, Austin and his father decided to go public with his diagnosis. “No one else with autism was racing at that level,” Jason says. “We worried how his racing fans – and the licensing body – might react.”

Turns out, they had no need to fret. “The support was overwhelming,” Jason says, “from local car clubs and parents of autistic kids outside of racing. We printed t-shirts promoting Austin and couldn’t meet the demand.”

As with most sports, however, t-shirt sales didn’t cover the cost of competing, which Jason estimates to be \$3,500 per weekend. The middle-class family soon faced financial constraints that threatened to curtail Austin’s budding career.

“One day, we were studying the upcoming schedules for local races,” Jason recalls, “when Austin burst in and announced he wanted to race in the Western Canadian Karting Championship in Regina, Saskatchewan. I was thrilled Austin wanted to try something different. But I was skeptical, for it meant an expensive, 27-hour drive in our diesel pick-up.”

Turned out, Austin was prepared for his father’s pushback.

“What if I miss a couple local events I usually race in,” he suggested, “and race in Regina instead?”

In the race’s final practice, Austin clocked one half-second faster than everyone, and in the race itself, he roared from 28th place to finish third. “People went crazy when he ascended the podium,” Jason recalls. “They instantly wanted to meet him.”

Austin’s comfort with speed makes perfect sense to Jessica Bengé, an autism advisor in Tasmania who lived and consulted with Austin for several years.

“Austin’s brain is constantly thinking,” she says. “So, the faster he’s moving, the more relaxed he gets. It’s the only time he feels he has control of his thoughts and emotions.”

On their trek home, Austin was indulging an alternate persona he calls ‘DJ Schizophrenic’ because he’s inclined to stream Frank Sinatra one moment, Megadeth the next. Reflecting on the successful weekend, Jason announced, “You know, we raised awareness of autism here without meaning to.” Then he added, “Maybe we should do this more often.”

From that comment sprang Racing With Autism, a continent-wide tour that would feature Austin at a racetrack one day, an area school the next. The message from both appearances? “Don’t dismiss people because they can’t tie their own shoelaces,” Jason says. “Instead, appreciate everyone for what they can do.”

The tour nudged Austin beyond his comfort zone, as a racetrack driver and public personality. At the tour’s first stop in Ocala, Florida, he competed for the first time in a DD2 (two-speed kart) against several kick-ass car racers. His team hoped for a top-15 finish. He captured tenth.

Then came New Orleans. Austin had never been there, so his anxieties kicked in. Rather than sit onstage with his helmet while his father presented, he hung back . . . until he heard the audience applaud Jason. He ambled out and signed autographs for more than 400 kids, many of whom had autism and asked to hug him.


But it was eight weeks later, in Calgary, Alberta, that Austin did the truly unthinkable.

“I was to present at a large elementary school,” his father recalls, “when Austin tapped my shoulder and said he wanted to speak. I was flabbergasted. When the time came, I asked him, ‘Are you sure about this?’ He just pushed me aside and, holding a piece of paper, walked onstage and spoke for 45 seconds.”



**"FROM THE
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**"RACING
CHANGED
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CAN ALL
OF YOU."**

The powerful moment is captured on video. It's Austin's manifesto, his clear and resounding statement of purpose that speaks to something even greater than the art and skill of moving a car around a track at high speeds.

"Thank you for listening to Racing with Autism," Austin tells the audience.

"Racing changed my life. It makes me feel really free. If I can follow my dreams, so can all of you. Just because you have autism doesn't mean you can't do great things."

More than five years later, Jason still stands in awe of his son's courage and the strength of his convictions. "It was the purest, most beautiful thing I'd ever seen from my son. I just stood there, tears streaming down my face."

Jessica Bengé also finds that moment unforgettable.

"Five months earlier, I could hardly get Austin to participate in class discussions," she says. "And when Jason launched Racing With Autism, it was sometimes difficult getting Austin to even enter the school."

"But in Calgary, something just clicked inside him. I helped him write the speech and stood on one side, his cousin, Shane, on the other. His putting himself out there screamed to me what a one-of-a-kind hero Austin is."

After Calgary, Austin started trying foods he'd never tasted, exploring places he'd never visited, talking to people he'd never met. He seemed transformed . . . until the tour's final week, when he suddenly became argumentative with others and sloppy on the track. Exasperated, Jason yanked Austin from his car and marched him to their pick-up. "Dude!" he said. "what is going on?"

His son sat quiet for a moment, then jumped off the tailgate. "Dad," he said as he began walking away, "it's because I know the tour is almost over and that this is what I'm meant to do."

Jason now passionately believes that what Austin is meant to do is advocate full-time for racing and autism.

As a driver, Austin's graduated from go-karts to Radicals - proper race cars that clock 160 miles per hour but with downforce that grips them to the track. The transition certainly hasn't slowed Austin; among other achievements, he won four of his five races in a Radical before the pandemic arrived.

As a motivator, Austin's eager to teach kids with autism how to commandeer go-karts and to share his narrative with those just starting to confront their differences. His renown is even spreading across the globe. Jessica Bengé recently launched Racing With Autism Australia, an initiative that's helping 12 autistic kids learn to love racing.

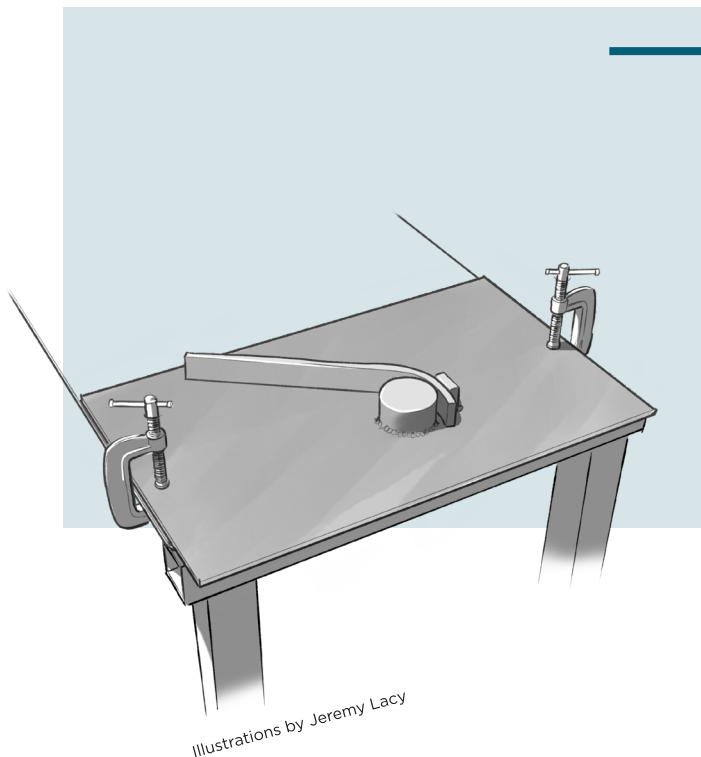
"Our ability to keep Austin racing and presenting to groups depends on whether we're able to attract sponsorships in the months ahead," says Jason. "I hope we do, because Austin's story really resonates with anyone, whether they have a disability or not."

"I think that's because what Racing With Autism emphasizes is, 'There's greatness in all of us. Find your passion and pursue it, for that's how Austin's fulfilled his dreams.'" **ARC**



SHOP TRICKS AND TOOLS

ARC brings you time-saving, money-saving ideas to improve the quality of your projects and the process by which you complete them.

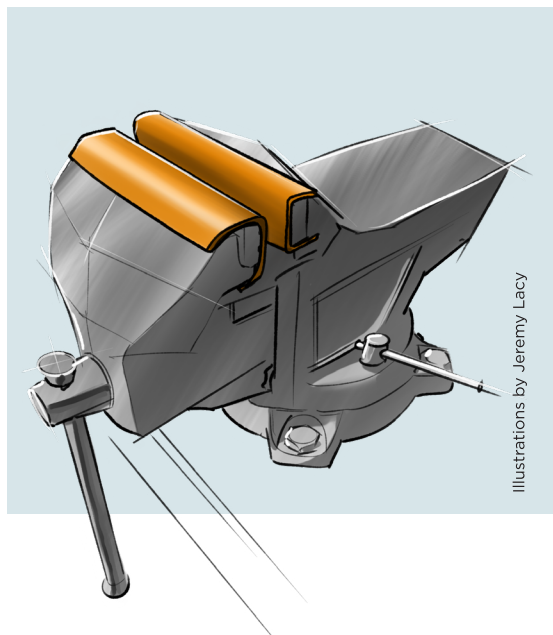


STEEL BENDING TOOL

► The ability to bend flat bar or round stock can be useful when making parts for plant hangers, scroll work or anything that requires a smooth bend in a piece of material. This is a very simple bending tool that can be made out of items lying around your shop. The first thing you'll need is a scrap hunk of pipe or tube that's approximate to the diameter you want to bend. You'll also need a base plate that can be clamped to a table because you'll be applying a significant amount of force to bend your steel. The second part you'll need is a tube that's either the same size or smaller than the bend you want to create. Weld the round tube to the plate in position; this will act as the die for the material to be bent. The third component is a holding tab welded next to the welded tube with just enough room for the material to fit in. This will hold the material tight to the tube (die). Simply apply pressure to make the bend. This simple tool works well when set up correctly. If it doesn't, make the necessary modifications to get the desired results.

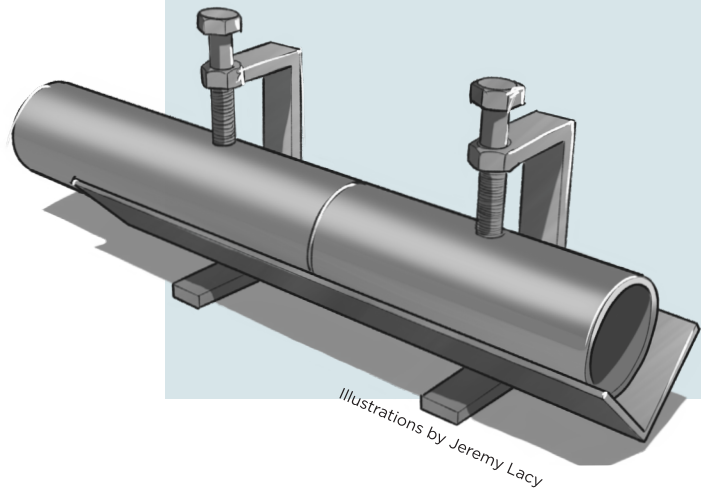
VICE WRAPS

► We often need a large vise to hold something without scuffing it. This is especially the case when we're working with a softer material like aluminum. We need to clamp the piece tightly, but we don't want to leave vise jaw marks on it. Vise wraps are excellent for these situations, and have been used for many years in the fabrication industry. It's a matter of simply wrapping the jaws of your vise in a softer material such as aluminum or copper. These covers enable you to apply more pressure on the vise without damaging the parts. Use a sheet of aluminum and measure the width of your vise jaws. Make the necessary cuts to enable wrapping the covers around the jaws and don't be afraid to hammer them into place after cutting. Simply clamp the sized pieces in the vise and work the material around the jaws. Don't worry; the pieces can be easily removed when needed. These covers will save a lot of finish time because you won't have to sand the scuff marks out of your parts.

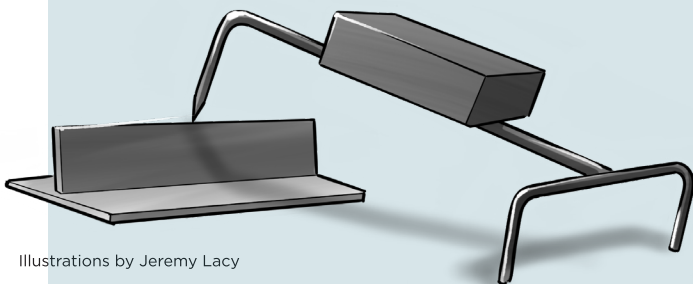


TUBE/PIPE HOLDER

► Learning to weld tube or pipe takes a lot of practice. And you'll learn quickly that one important part of tube and pipe welding is the fit up of the material. Many times, the fit up is critical for the weld to happen. This tool will make aligning and holding those two round pieces perfectly flat and even for tacking. The first thing you need is a piece of angle iron. Laying the tube in the angle will make an excellent fit up. Next are feet of some sort to hold the angle in position on the table. You then need a couple bolts, a couple nuts and some random scrap pieces. Tack weld the feet on the bottom of the angle iron so the V of the angle is facing upward. Make two other pieces that can be welded to the sides of the angle to act as the clamping device. Weld the nuts onto the hold arms and simply screw the bolts into the nuts. This is a very simple tool, and I've seen many different versions of it. When practicing welding round materials, this tool can be very helpful.



Illustrations by Jeremy Lacy



Illustrations by Jeremy Lacy

THE THIRD HAND

► This simple but effective tool is designed to act as a third hand, which is especially helpful for students and new welders who are practicing technique. When welding at the table on small coupons, the torch or nozzle will often bump the material, which can cause frustration and ruin that perfect stack of dimes you're working on. This tool is easy to make, and will act as a third hand to keep your practice plates in place. You'll need about 2 feet of 3/16-inch to 1/4-inch round bar and a decent hunk of scrap to provide sufficient weight. Bend one end of the round bar with a 90-degree angle and sharpen it to a point. Next, bend a 6-inch-wide piece of the bar to act as feet, and weld the other bar to it. Finally, tack the weight to the bar somewhere in the middle. This can be made in several different ways, but the goal is to create a third hand to hold your material. These types of simple tools don't take long to make, and they do a great job of keeping materials stationary while you weld.

EDUCATOR SPOTLIGHT

MUHAMMAD NAQVI

A PLAN TO CHANGE LIVES

By John C. Bruening

Muhammad Naqvi is a man who recognizes the importance of having a plan.

His eight-year journey from his native Pakistan to a career as a welding instructor at Odessa College in Odessa, Texas, included some interesting turns along the way. But the turns taught him a few lessons about maintaining a commitment to achieving a specific goal. He does his best to impart these same lessons to his students seeking a career in welding.

“There are two things that I always tell them,” says Naqvi. “One, the goals should be very high. They should never, ever compromise on their goals. They must always set a goal, and they must always have a plan.”

Naqvi arrived in the United States on his 26th birthday in 2008. His early career pursuits in this country included software engineering and radiology, but he ultimately found these avenues to be unfulfilling.

In 2010, he enrolled in welding classes at Odessa College, and within a year, he was working as a welder for a local business that made steam turbine engine parts for the aerospace industry. He continued his course work at the college in the evenings and eventually earned an associate degree in 2014. He started teaching at the college shortly thereafter.

These days, he teaches a variety of welding processes: Stick, TIG, MIG, submerged arc and automation. Of the

250 to 300 welding students enrolled at the college every semester, he’s responsible for about 60 or 70.

“I always tell every class that the best quality of any employee is availability,” he says. “They have to be available. No matter how good a welder I might be, if I’m not available on the jobsite, if I’m not available to learn in the classroom, I’m no good.”

He also encourages his students to remember that every weld counts. “I always tell them that every weld they make is a representation of their skill,” he says. “So I always tell them to take pride in their work and make each weld as if their whole career is depending on it.”

For as much as he tries to inspire his students every day, Naqvi often gets just as much inspiration back from them. Part of the inspiration comes from knowing them on a personal level and knowing their individual stories.

“Many of them have a lot of challenges in their lives – family challenges, social challenges, challenges with transportation just to get to their classes,” he explains. “But they make sacrifices with their time. They work during the daytime and they take classes at night. And then I watch their success as they study for the certification and earn their associate degrees. And then they’re successful when they go to work in the field. That is the most inspiring moment for me. When I go to different companies to do inspections, I see some of my

students working in those places, and it makes me very happy. It’s very inspiring to see their hard work paying off.”

In the end, Naqvi operates according to a specific plan based on a specific goal: to make the mastery of welding a game changer for his students, just as it was for him less than a decade ago.

“Welding is a skill that changed my life,” he says. “So I really want them to be successful too. I want to give them the opportunity to change their lives. And that is the inspiring moment for me, when I see them being successful.” **ARC**

“I ALWAYS TELL EVERY CLASS THAT THE BEST QUALITY OF ANY EMPLOYEE IS AVAILABILITY.”



SYSTEM
5

LINCOLN
ELECTRIC

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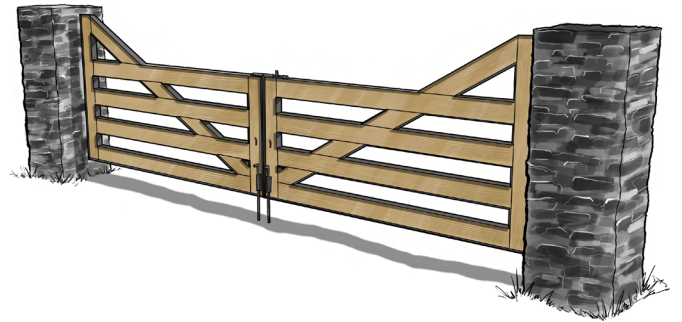
LINCOLN
ELECTRIC
THE WELDING EXPERTS

Photo courtesy of Odessa College.

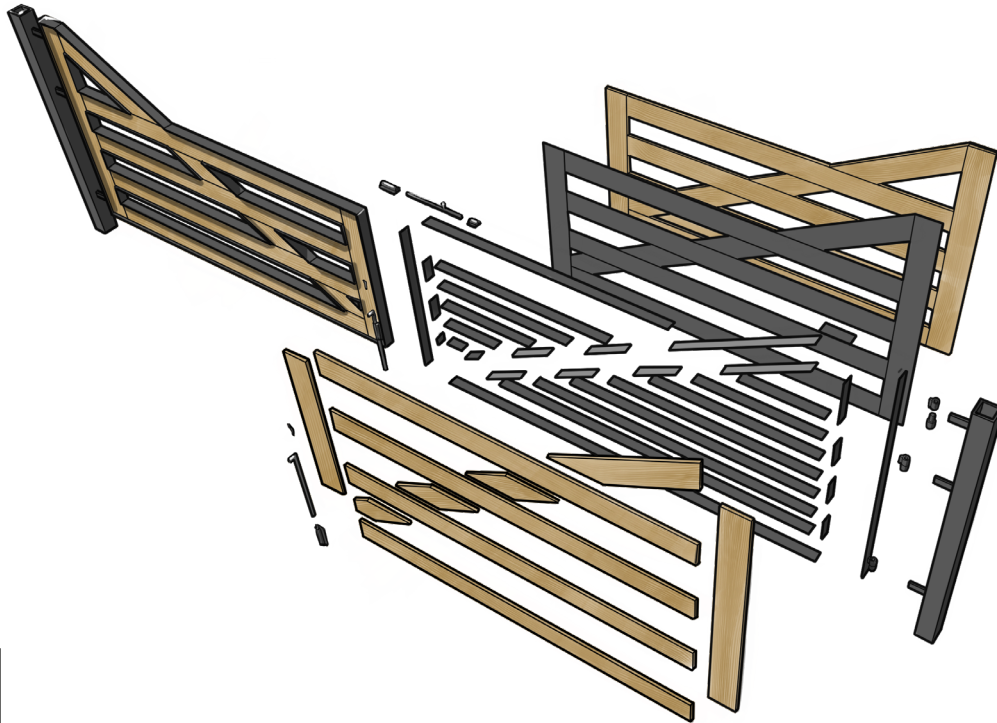
Project Spotlight

HINGED GATES FOR YOUR DRIVEWAY OR PATHWAY

By Jimmy DiResta



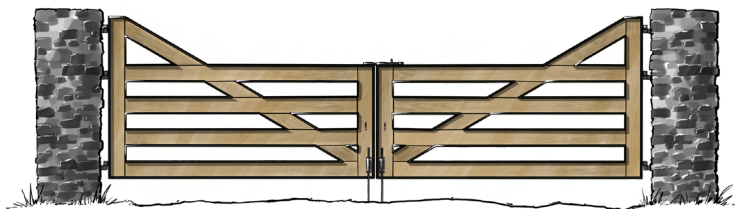
Illustrations by Jeremy Lacy



Watch exclusive footage at arcmagazine.pub

With the arrival of fall, few things put a more appealing face on a piece of property than a set of well-crafted hinged gates at the end of a driveway or pathway. In this issue of ARC, Jimmy DiResta builds a sturdy yet attractive entrance to your estate that features white oak panels inlaid in a carefully fabricated metal frame. You'll need a fair amount of floor space to map this one out in actual

size before the cutting and welding starts – and a few helpers to get the hefty pieces into position on their hinges – but once the gates are hung and mounted, the entrance to your property will be not only eye-catching but durable and practical too.



Illustrations by Jeremy Lacy

SAFETY FIRST

Before you start any project involving welding, make sure you have the right Personal Protective Equipment (PPE), which includes, at least, an ANSI-approved welding helmet, safety glasses, appropriate welding gloves for the process you're using, and a flame-resistant shirt, jacket, or sleeves to protect from UV rays and burns. You should also keep a fire extinguisher close at hand. Use adequate ventilation when welding. Use an approved respirator if exposure to welding fume cannot be controlled, or if welding outside and natural air movement is not sufficient to keep welding fume out of your breathing zone.

MATERIALS

Gate

60 feet of 1/8 x 6-inch flat steel
110 feet of 1/8 2.5-inch flat steel
12 pieces of 1-inch x 6-inch x 16-foot white oak

Hinges

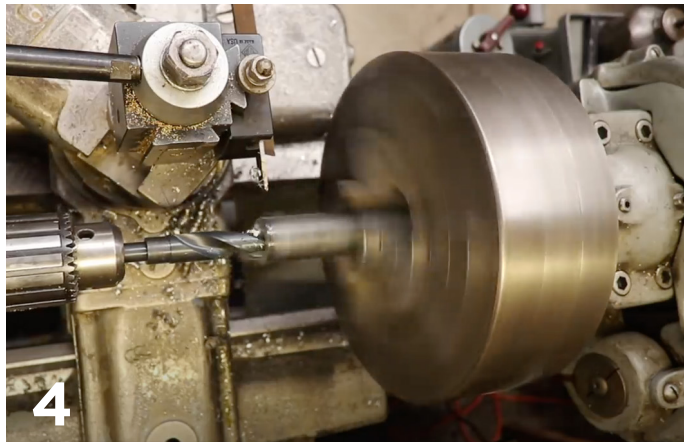
12 inches of 1.25-inch round bar hinge barrel
12 inches of 3/4-inch round bar hinge pin

Other

Wood epoxy
(60) 1-inch zinc coated screws (finished head)

WELDING/CUTTING EQUIPMENT AND TOOLS

Lincoln Electric Power MIG 260 MIG welder
Lincoln Electric Power MIG 210 MP
Lincoln Electric Ranger 330 MXP welder/generator
Band saw
Lathe



Imagery © Jimmy DiResta

Step 1:

Lay out your pattern in actual size (1:1) on a large flat surface in your work area. Given the size of the project, your shop floor might be the best option. Lay out the exact dimensions of the pillars, and the welded spots that will be the hinge locations. (The hinge points were previously welded onto 4 X 4 ½-inch steel posts on either side of the driveway, and the posts were then surrounded by dry stack and stone work.)

Step 2:

Cut the 1/8-inch X 6-inch-wide bars, and then cap the ends with 2 ½-inch X 1/8-inch flatbar. Lay out the smaller diagonal pieces, then tack weld them into place before going back and welding the diagonal pieces. Use the band saw to cut all the longer diagonal pieces that will be used for cross bracing.

Step 3:

Weld the edge pieces into place along the edges of all horizontal, vertical and diagonal bars. In addition to creating spaces for the wood panels to fit into, this step also reinforces the metal frame to prevent unwanted flexing or drooping.

Step 4:

Use a lathe to make bullet hinges by drilling a 3/4-inch hole into a 1 ¼ -inch cylinder stock. Then cut each at 1 ½ inches. Make the top and bottom barrels, but weld the pin itself to only one of the two barrels. Make a total of 12 barrels, which will require three hinges for each side of the gate. Cut the hinge pins, grind off any burrs with the lathe, then fit the barrels to the pins. A loose fit is okay, because the gate is designed to swing only 90 degrees. Weld 3/4-inch separators to the barrels to offset the hinges from the frame itself.



Step 5:

Use a single long rod to line up the hinge barrels, then weld the separators to a 1 x 1 angle iron. Weld the angle iron to either side of the gate to serve as a reinforcement for the overall structure. It's best to prepare the hinges in the shop, so that when you bring the gate to the location where it will be hung, you can just weld the bottom part to the angle iron coming off the poles and protruding from the stone pillars. Give the entire metal assembly a couple coats of weather resistant paint.

Step 6:

Cut the 6 x 1-inch white oak panels to fit the spaces in the gate framework (we milled the panels to the proper thickness, from 1 1/8 inch down to 3/4 inch). When fitting the joints, leave about 1/8- to 1/4-inch of space between the edges of the adjacent boards to allow the wood to expand and contract in the elements.

Step 7:

Glue the wood into place within the metal frame as an extra layer of insurance, then screw each piece down. The screws should have small finished head that will remain mostly buried in the wood and barely visible.

Step 8:

You'll need some assistance hauling the gates out to the end of the driveway or pathway for installation. Weld the barrels onto the angle irons protruding from the stone pillars. Bolt the slide lock to the top edge of the gate doors, and bolt the gate pins onto the inside of each gate door. Each of the pins will hold the gate in position wherever they stab the surface of the driveway or pathway.

► A detailed drawing and cut list for this project can be downloaded at arcmagazine.pub.

IMITATING LIFE

By John C. Bruening

Some artists have to seek out inspiration. But some, like metal sculptor Jason Haas, don't have to look far. More often than not, the inspiration comes to him – from just about anywhere.

“I'll see something in nature or even a movie or game and it gets stuck in my brain,” says Haas, whose base of artistic operations – a shop he calls Blue Phoenix Metal Works – is located in Jacksonville, Florida. “The only way to get it out is to make it. Sometimes it's as simple as finding an interesting piece of scrap metal and an idea springs to life. The idea of making something permanent appeals to me. A stainless steel sculpture will last forever.”

Haas, now 40, started welding and metal sculpting when he was about 15 years old. His earliest lessons came from his father and a 100-volt flux-core welder.

“The welds were rough, but I was hooked,” he recalls. “I studied art in college and got a job as a graphic designer, but I didn't like it at all. I decided to go to welding school, and I was able to land a very cool job welding for theme parks. At that point, I had the skills I needed to finally make the kind of art that I always dreamed about.”

Haas's theme park job includes the fabrication of large-scale installations and interactive structures, but his non-disclosure agreement with his employer prohibits him from divulging much more than that.

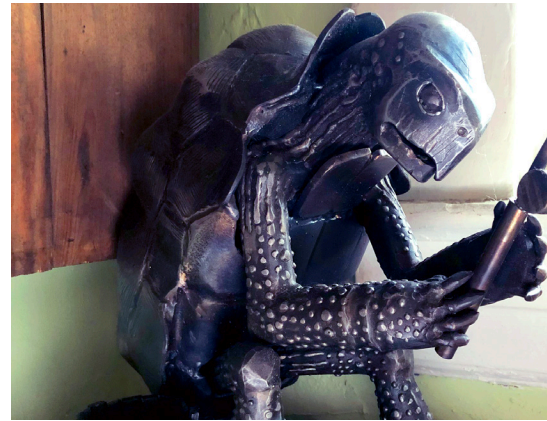
“In a sense, I make art full time,” he says. “But really, I do my own sculpture at night and on weekends.”

When it comes to his own work, the process starts with nothing more than an idea, followed by the collecting of the materials – usually scrap left over from various side projects.

“Let's say I'm making a person,” Haas explains. “I make sure that I have metal to account for all the different body parts. Next, I'll cut them into the rough shapes. Then I tack weld them together and get the proportions and pose. That's absolutely the most important part. Then I cut it back apart and work on each limb individually. After hours of welding and grinding, hopefully it looks like it did in my head.”

If there's a consistent philosophy or theme running through Haas's work, it's more organic than calculated. In the end, he makes art that is primarily a reflection of some aspect of his life. Whatever happens to his creations after that is just a bonus.

“The worst thing for me is making art with the intention of selling it,” he says. “Trying to anticipate what people want and how to monetize it is a sure-fire way to ruin the experience for me. Now I just make whatever I want, and if someone wants it, that's amazing. If not, my yard could always use another sculpture.” **ARC**





Master Class

A discussion of advanced materials and techniques for the seasoned welder.



TOOLS

- Soapstone to mark area to be preheated
- Temp stick to measure the temperature of the steel prior to welding
- Oxy-propane torch (with striker)

PERSONAL PROTECTIVE EQUIPMENT

- Heat-Resistant Welding Gloves
- Safety Glasses
- Welding Coat

PREHEATING STEEL: WHY, WHEN AND HOW

By Karl Hoes, Welding School Instructor,
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Preheating steel isn't always necessary, as the majority of steel fabrication is done with materials that can be successfully welded without the need for additional preheat. That is because these steels have low hardenability due to their low carbon and alloy content. In addition, thinner sections often reduce or eliminate the need for preheat as the heat affected zones will experience slower cooling rates.

But there are times when we have to weld on thicker sections, or steel of higher strength, or alloy content that may require preheat. There are many codes that address the need for preheating the grades of steel applicable to that code. An example of a code would be the AWS D1.1 "Structural Welding Code for Steel."

The primary reason for preheating is to slow the cooling rate of the weld and heat-affected base metal just underneath the weld. When we heat steel to a high temperature, which happens during welding, it transforms the steel's basic structure and allows carbon atoms to move in between the iron atoms. If it cools slowly, the carbon has a chance to move back out, and the steel can return to a normal state. But if the steel cools too rapidly, the carbon can get trapped and the heated area under the weld will transform to a hard and brittle microstructure that can lead to cracking.



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Preheating the base metal prior to welding allows the metal to cool down slowly. This is especially important as the material thickness increases, because thick, cold steel quenches the weld area faster. As the carbon or alloy content goes up, the hardening effect from rapid cooling is increased. The slower cooling rate also allows residual hydrogen more time to diffuse out of the weld and heat affected zone. Hydrogen contributes to cracking in welds and heat affected zones especially on thick restrained sections of steels with susceptible hard microstructures.

Preheating also can help reduce residual stresses and distortion, as well as help to ensure that weld metal mechanical properties, such as impact strength, are met.

In this demonstration, we will be working with a model of a structural steel connection similar to what might be found on a high-rise building, and we will assume that the AWS D1.1 code applies. In Table 3.2 of that code, the prequalified minimum preheat and interpass temperatures are specified based on the grade of steel, material thickness, and welding process used.

For demonstration purposes, we will say the flange on the column is 1 ¾" thick and made of an A 572 grade 50 steel, and the girder is made of an A 992 steel with a flange thickness of 1." For a field welding application, we would typically weld steels of this grade with the self-shielded flux-cored arc welding process.



MINIMUM PREHEAT TEMPERATURE

Per table 3.2, both A572 Gr 50 and A992 are listed as Category B steels. For FCAW welding, and for a steel more than 1 ½" thick through 2 ½" thick, a minimum 150° F preheat and interpass temperature is required. Clause 5.6 states that the preheat and interpass temperature should be checked just prior to initiating the arc for each pass.

MINIMUM INTERPASS TEMPERATURE

For large welds, more than one pass is required to achieve the required size. Interpass temperature is the temperature of the steel after the initial pass. The minimum interpass temperature is the same as the minimum preheat temperature. Minimum interpass temperature should be checked just prior to initiating each pass. Often the minimum interpass temperature can be maintained by the heat of continuous welding, but there are times when welding on thicker sections - or if welding is interrupted - that additional heat may need to be applied during welding to maintain minimum interpass temperature.

PREHEAT SAFELY

We always want to make sure we're working safely when welding and working with torches. Refer to ANSI Z49.1: "Safety in Welding, Cutting, and Allied Processes," which includes heating.

Make sure to wear the proper safety gear, including flame-retardant clothing, gloves and proper safety glasses. Make sure your jeans or pants are not frayed.

For proper torch setup and application, refer to the manufacturer's guidelines. Make sure to have the correct check valves on the torch, flash arresters back at the regulator, hoses in good condition, and regulators set and operating properly.

WHERE TO MEASURE PREHEAT AND INTERPASS TEMPERATURES

The D1.1 code requires that minimum preheat and interpass temperature should be maintained for a distance at least equal to the distance of the thickest welded part (but not less than 3") in all directions from the point of welding. Since the steel in our demonstration is less than 3" thick, we only have to measure preheat a minimum of 3" in all directions from the point of welding. If the steel were 5" thick, we would have to measure 5" in all directions from the point of welding.

I mark out an area at least 3" from the weld in all directions from the point of welding. This is the area that will be preheated - all the way through the thickness. If this were a 5" thick flange on a column, along with increasing the preheat to 225° F, we would also have to heat 5" in all directions from the point of welding.

Be sure to maintain minimum interpass temperature as welding progresses.

PICK YOUR SPOT

Use soapstone to mark out the minimum area where preheat will occur, including the backside and bottom. The area doesn't need to be 100% accurate as long as the minimum distance from the point of welding is measured. Use a temp stick to check the temperature of this area as the steel warms up.

As mentioned earlier, the steel will be welded with a low-hydrogen process. Typically, high-rise construction on a big building is welded with a semi-automatic process like shelf-shielded flux core.

The flat position T-joint, a bevel-grooved joint, would be welded with an E- 70T-6 wire, such as an NR®-305, usually a 5/64" or 3/32" size. That would be the fastest way to weld these flat position welds. The vertical and overhead welds would be welded with a E- 71T-8 wire like Innershield® NR®-232 or NR®-233, usually with a 5/64" or 0.072" diameter. SMAW welding with low hydrogen electrodes such as Excalibur could also be used.



MEASURING PREHEAT

There are several ways to measure preheat, such as infrared guns and thermal couples but temperature indicating crayons (i.e., temp sticks) are most commonly used because they are portable, cost effective and very accurate. It's important to achieve the minimum temperature. Heating above the minimum is acceptable, but maximum interpass temperature must be avoided. Excessive interpass temperature could negatively affect mechanical properties such as notch toughness in both the weld and base metal.

THE PROCESS

Map out your territory with several marks to ensure applying and measuring heat the correct distance from the weld. Check your temperature on the opposite side that the heat is applied to assure heating through the entire thickness. Follow these steps for using the propane rosebud heater:

- » Make sure you're wearing your safety gear.
- » Make sure all connections are tight.
- » Turn on the propane tank valve.
- » Open the oxygen tank valve all the way as it is a double seated valve.
- » Set the fuel gas and oxygen pressure according to the tip manufacturer's recommendation for the tip being used.
- » Purge fuel gas and oxygen separately out of the line before lighting torch; 1 second for every 10" of hose.

- » Partially open the fuel valve first and light the torch with a striker. Then open the torch oxygen valve to achieve a neutral flame. Continue to alternately adjust fuel gas and oxygen until the desired flame is attained.

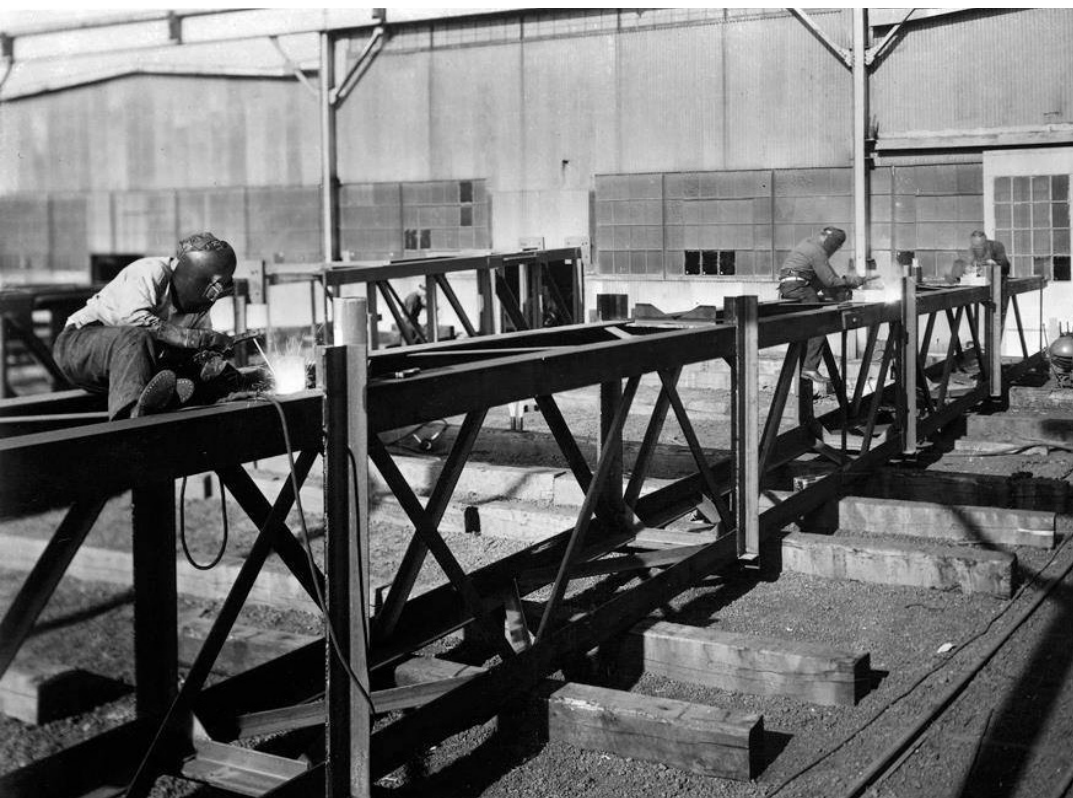
When you first start preheating, the steel might appear to sweat. This is due to condensation resulting from the combustion of the oxy-fuel torch. The water is not coming from the steel itself.

As you warm up the steel, make sure the heat soaks into the web of the beam and all the way through the flange. You'll soon start to see the temperature indicating crayon marks melt.

When the joint is heated to above the minimum interpass temperature, it's ready for welding. When you achieve the required temperature, turn the torch off. If using alternate fuel such as oxy propane, turn the fuel gas valve at the torch off first to extinguish the flame, then turn the oxygen valve off at the torch. Turn off tanks, bleed off lines, and back regulator screw out when shutting torch down.

Remember to check between passes that you're staying above the minimum interpass temperature of 150° F. In some cases, you'll have to watch the upper interpass temperature, depending on what's indicated by the code. **ARC**

Welding Deeds



► Summer 1940

Fabricators weld one of the four main steel towers of the Deeds Carrillon in Dayton, Ohio. The Deeds Carillon, completed in 1942, is an assembly of bells housed in a 151-foot-tall tower that currently stands in Carillon Historical Park in Dayton. The carillon was originally fitted with 23 bells and later expanded to include 57 (which makes it the largest structure of its kind on the State of Ohio). It was commissioned by the family of Dayton industrialist Edward Deeds. **ARC**

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