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MAGAZINE

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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).



Kate **Nicolosi** **Writer**

Kate Nicolosi is a writer and communication consultant. She has worked with organizations in a variety of industries including corporate, non-profit, pharmaceutical, telecom and financial services. Her work encompasses technology, banking, leadership, management and human resources. She has penned monthly features for an award-winning, internal print publication at JPMorgan Chase and reported for *The Ragan Report*, *Corporate Writer & Editor* and *Speechwriter's Newsletter*. She lives in Atlanta with her husband and three children.



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.

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# LETTER FROM THE EDITOR

## PERFECTION AND EXCELLENCE

► We all try to be good at what we do. As welders and fabricators, builders and makers, we do our best to fine tune our technique and be a little better today than we were yesterday. And the process usually doesn't end when we leave the shop at the end of the day. Most of us try every day to be good people in every aspect of our lives – as spouses, parents, friends, neighbors or members of a community.



David Ciriza, the subject of this issue's cover story, certainly makes that effort – and he's been doing it for years. He spends forty hours a week pipe welding for a petrochemical refinery. When he's off the clock, he builds vintage cars in his shop at his home in El Paso, Texas. As of this writing, his Instagram page (@cirizawelding) dedicated to "capturing the artistry of welding" has attracted 120,000 followers.

Depending on the nature and scope of the project at hand, Ciriza works with any number of collaborators. Among them are his father and Ryan Martinez, his friend since childhood and a skilled welder in his own right. Ciriza and Martinez share a bond that's practically a brotherhood, as their fathers have also been friends since childhood.

Both boys in this second generation of welders and custom car enthusiasts grew up with a motto handed down to them from their dads: "Strive for perfection. Settle for excellence." It was a bit of wisdom that Ciriza and Martinez – now adult men – have internalized in the years since.

"That's the philosophy David brings to our team," says Martinez. "David believes every weld is a signature of your character – how hard you work, how much you care about the details."

As guiding principles go, it's one worth following, whether you're a twelve-year-old kid learning the ropes in your dad's shop or a veteran pipe welder. It's a mindset that's likely to make you a little better today than you were yesterday.

By the time these words reach you, summer will be under way. It's that window of the year when time moves a little differently and the days seem to give us more room. By mid-year, many of us are taking the various plans that were merely ideas during the winter months and turning them into something concrete. Whether our base of operations is a petrochemical refinery, a custom car fabrication shop or just a corner of our garage, it's the ideal time to find the zone and be the best welder you can be.

Perfection is a hard target to hit – probably an impossible one – but it's one worth aiming for. Even if you don't hit it, you're likely to catch some excellence in the process. Just ask David Ciriza.

In the end, every weld is a signature of your character. It's an indication of how hard you work and how much you care about what you're doing.

Enjoy your summer.

— John C. Bruening, Editor-in-Chief  
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# Art & Craft

By Jeff Herrington

# Art and Craft

In his videos and industrial work, David Ciriza aims for both beauty AND performance.

The colors, movements, sounds and shapes are mesmerizing.

A ghost-white flame emanates from a stubby, cylindrical object that rocks back and forth against a ridged tower of metal. The hues on the screen run the gamut from magenta to orange to blue to black. Meanwhile, the haunting strains of “Zombie” by The Cranberries provide an eerie backdrop to the hypnotic rhythm playing out in the foreground.

You’d be forgiven for thinking this was some epic scene from a sci-fi flick. Instead, what has you transfixed is one of the stunning welding videos posted online by El Paso native David Ciriza (pronounced Suh-RIZZA).

Shot from the point of view of a welder under the hood, the videos vividly cover topics ranging from how to master the art of gas-tungsten arc welding, to how to use an oxygen acetylene torch to fabricate a spool piece. The result? Ciriza has, in just three years, watched his Instagram fan base balloon from about 200 to 120,000.

But beyond their beautiful production values, the videos also reflect Ciriza’s rock-solid commitment to superior craftsmanship. “True craftsmanship is evident when passion meets expertise,” he says, “and I’m fortunate to work alongside dedicated teammates who share that love for their craft.”

Ciriza discovered his love for the craft early, thanks to a father, and uncles, who were eager to ensure he learned the proper way to weld.

“Welding trucks were always around when I was growing up,” he recalls. “So I started to learn welding when I was about six. By age ten, I was welding on my own. My brother was racing go-karts, and I helped weld a rotating jack stand he could use to lift up a kart whose clutch had gotten too tight.”



Photos by Nick Roth

“At the time, the fact I was welding at that age seemed perfectly normal. Looking back, I realize now it wasn’t normal at all.”

As a teenager, Ciriza used his welding skills to fix the brakes on his friends’ bikes and repair miscellaneous items brought to him by neighbors. “I surprised myself in fixing all that stuff,” he admits. “But my confidence with welding really grew as a result.”

It wasn’t long before Ciriza got the opportunity to exercise his talents in the industrial arena. His father found him a job at a fabrication shop building piping for the petrochemical industry. “At first, I was just grinding pipe fittings,” he says. “Then I started watching the pipe welders, and I thought, ‘Not only can I do that, I bet I can do that really well.’ So, I started practicing pipe welding during my lunch break and whenever I wasn’t learning how to fit pipe.”

On one occasion, his extracurricular activity flipped from getting him into trouble to getting him discovered. “I was secretly practicing pipe welding on a coupon, which I would take down whenever my supervisor would stroll by,” he says. “But he caught me once, and asked what I was doing.

“He examined the penetration on the coupon, then walked away, and boy did I start sweating bullets. Soon, he returned with the plant’s quality control manager who, after looking at my work, said, ‘This looks great. Finish it.’

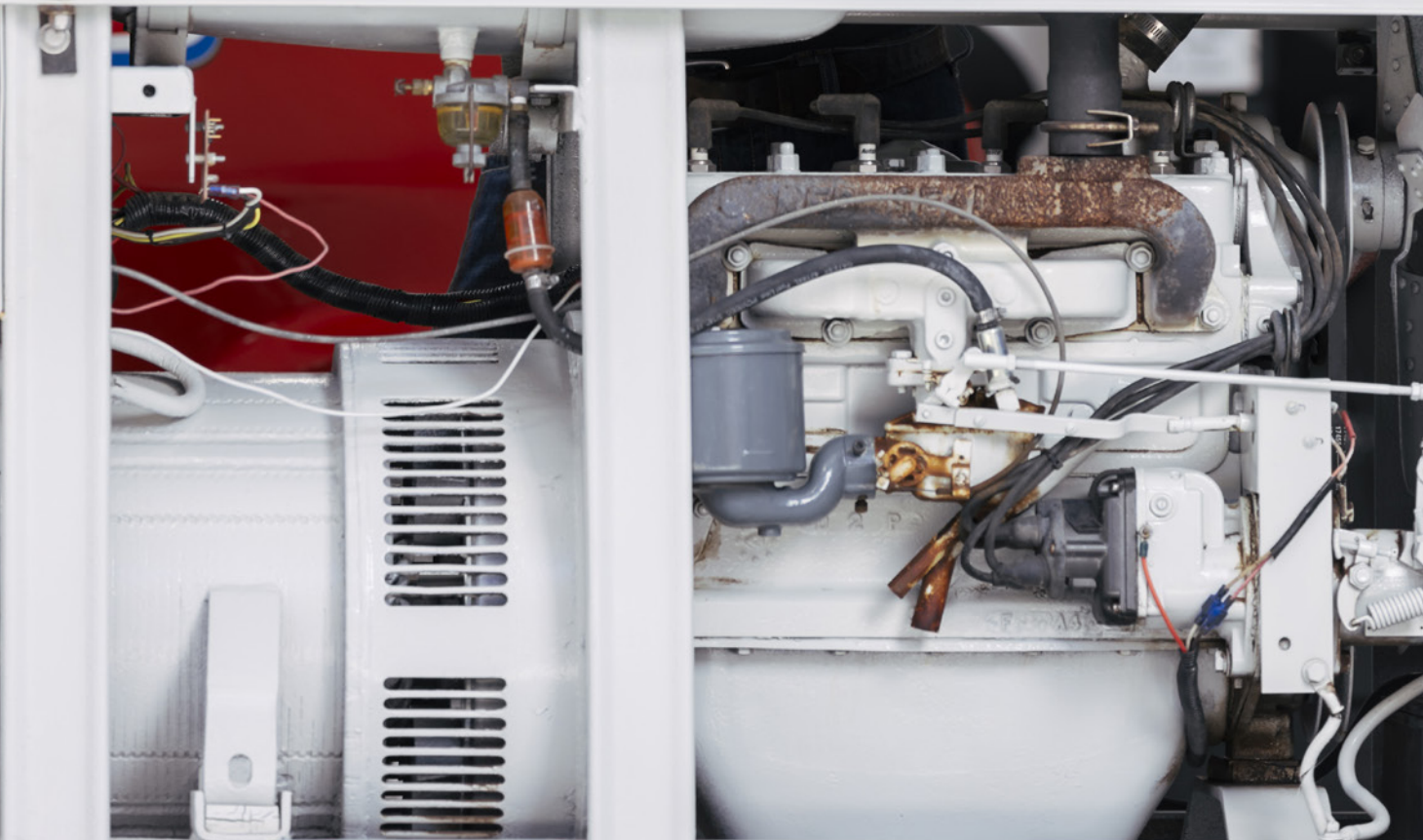
“I did, and it passed all the non-destructive tests they gave it.”

Since then, Ciriza has easily passed all the tests given to most younger welders. At his full-time job, he quickly graduated from working on simple welding projects to helping the maintenance team with more complex repairs. He was only supposed to fill in with the maintenance team for a couple of weeks, “but once they saw what I could do, they brought me on full-time,” he says.





LINCOLN *Shield Arc* WELDER



Photos by Nick Roth



That change in status led to the company encouraging him to pursue a track in quality control and within a couple of years, he had passed the American Petroleum Institute's 570 piping inspection exam, its 510 pressure-vessel inspection exam, and its 653 tank inspection exam. He also earned CWI status from the American Welding Society.

But perhaps his biggest test came not in a classroom but on the plant floor itself.

"Several welds on one of our heat exchangers began to crack," he recalls. "Every company available attempted repairs for a week with no luck - which was concerning, since the plant would lose millions of dollars every day it was offline.

"I threw myself into the fire, asking them to let me give it a shot. That was controversial since I worked directly for the plant, but they approved it. In one night, my team got the plant back online. I couldn't sleep the next morning, knowing the testing of our work was underway.

"But our repairs all held."

---

Today, Ciriza applies his skill at two locations - the petrochemical refinery where he works 40 hours a week and a pristine shop at home, where he and his father rebuild vintage cars and undertake miscellaneous welding projects they find challenging.

"The home shop is sentimental to me since it's where I honed my welding skills under my father's guidance. Even though he's in his sixties, he continues to mentor and tease me. But our relationship has evolved into one of mutual respect and trust. Together, we solve problems there,

exchange ideas and pursue our philosophy of leaving welds as artistically perfect as possible, even if it's going to be on a piece of industrial equipment."

That sentiment doesn't surprise Andres Moya, who works alongside Ciriza at the petrochemical refinery.

"Our team is always joking that if David ever busts a weld, we're going to throw a shindig, because it will be the first time he's messed up." He adds with a laugh, "We may just have to throw that party, regardless."

Moya met Ciriza at the refinery about 12 years ago and turned to him for help in becoming a better welder. "He was there from day one," he says, "guiding me on my hand and foot movements. He also taught me how to watch my heat. I tended to keep it low, so I'd have more control of the puddle, but he explained I needed to turn it up to avoid porosity.

"Now, after 12 years, we know the other's body language so well, I'll go ahead of him on a pipe and work toward him, knowing we'll meet in the middle. He's taught me a lot, but I probably taught him patience, because I wasted several welding rods early on."

Still, Moya views Ciriza to be not just a patient teacher but also a kick-butt welder.

"Whenever we've needed someone to knock out something, we've turned to David," he says. "He welds fast, and the welds are smooth, tight, uniform and clean.

"That's because he believes welding, even in an industrial setting, is an art form."



Ryan Martinez agrees with Andres Moya about Ciriza's elevated view of welding. Like Moya, Martinez is a welder who works alongside Ciriza on many projects. But unlike Moya, Martinez has known him almost since day one.

"Our fathers hung out together because they grew up on the same street and were both into vintage muscle cars," he says. "So as a kid, I was at the Cirizas' house a lot. David's father taught me the basics of welding when I was in sixth grade, and when I started showing promise in high school, David started showing me TIG welding.

"My father is a principal. His motto was always, 'Strive for perfection, settle for excellence,' and that's the philosophy David brings to our team. Like my dad, David believes every weld is a signature of your character - how hard you work, how much you care about details."

Ciriza has significantly influenced Martinez's knowledge and skill as a welder. What's ironic is that Martinez has, almost by accident, exerted just as significant an influence on Ciriza's trajectory.

"During COVID, we were the ones working in the refinery," Martinez recalls. "I was always on social media, watching welding videos on Instagram and WeldTube. One day, David asked, 'What are you always looking at?' I showed him, and explained social media wasn't just social. It was also something people learned from.

"And, man, that dude just ran with it."

Together, Martinez and Ciriza shot and posted several videos that veered from the norm. Rather than telling viewers how to weld something, they showed viewers what correct welding looks like. Within weeks, Ciriza saw his Instagram following blow up, leapfrogging by thousands in just a few days.

The videos also caught the eye of Alan Solorzano, WeldTube's owner and president. Solorzano started following Ciriza's page and quickly determined that he was "confident and someone who knows his stuff and how to translate that knowledge from screen to viewer."

Solorzano invited Ciriza to fly to Houston and create content for WeldTube. Soon, they were knocking out five or six videos in four days.

"My favorite video of his is the one on pipefitting," he says. "Pipe welding is hard, but pipefitting is harder because it involves so much math. David's amazing in how he reads blueprints and understands them.

"He's what I call a triple threat - someone who masters pipefitting, pipe welding and inspection. It's almost impossible to find someone who excels at all those skills the way David does.

"Really, the sky's the limit for that gentleman."

Given the way his videos have taken off on Instagram and WeldTube, Ciriza is certainly flying high at the moment. But cultivating his celebrity status matters nowhere near as much to him as does expanding his skills and passing along that knowledge to the next generation of welders.

"I want to build stuff with specialty alloys," he says, "and do other forms of high-level fabrication that I hope the petrochemical industry will want. And I want to continue to pass along what I've learned to aspiring welders."

Ciriza currently visits high schools and community colleges to coach their welding programs and helps those programs prosper by supplying them with hoods, gloves and other welding accessories. One high school program he mentored advanced to the state championship in sculpture.

But he cautions those entering the craft that success like that isn't always so immediate.

"I tell them mastering this craft is more challenging than it's often portrayed," he says. "I emphasize that achieving excellence in this field demands years of unwavering commitment and extensive practice.

"You've got to be prepared to persevere. Even during the discouraging moments - and you will encounter them as I have - maintaining resilience is paramount. But the good news is, you'll eventually feel your competence emerge, along with an ability to refine intricate details into exceptional craftsmanship." **ARC**

# QUESTION MARK



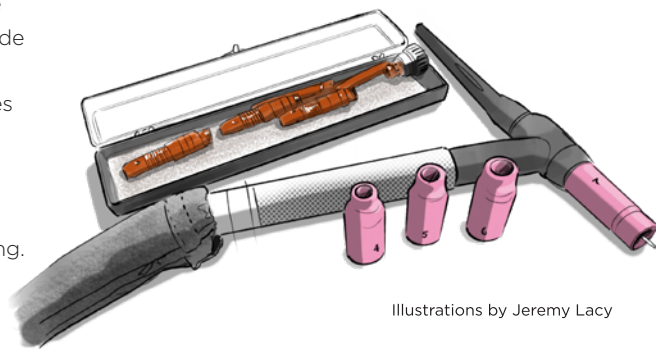
ARC taps into the vast experience of veteran tradesman, educator and author Mark Prosser (CWI/CWE). In addition to many years as a welder for the automotive and motorsports industries, Mark has also spent the last 15 years teaching welding at the college level, where he fields challenging questions from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

## What does the number on my TIG torch nozzle mean?

▶ Most TIG torch nozzles – or cups, as they are commonly called – are marked with an identification number. This number represents the inside diameter of the cup in 1/16-inch increments. For example, a number 5 cup has a 5/16-inch inside diameter. Cups come in various sizes, shapes and configurations for many different applications.

Cup selection is important because we always want our welds to be free of atmospheric gas contamination. Selecting the proper cup depends on a couple factors, including the type of joint you are welding. A multilayer weld may require a smaller cup, one that can fit further down into the joint and a larger nozzle as the joint is filled to protect the weld. The type of material being welded can also have a bearing on the proper cup selection. For example, any of the nickel-based materials – such as stainless, titanium, Inconel – require a great deal more protection from the air, so larger cups are used to deliver more gas to the area.

The important thing to remember is that larger cups deliver a higher volume of gas. Keep in mind that this doesn't work the same way as turning up the pressure with a small nozzle. Larger cups deliver more volume of gas, not more pressure.



Illustrations by Jeremy Lacy

## Is stick welding as versatile as other welding processes?

▶ Contrary to popular belief, stick welding – or shielded metal arc welding (SMAW) – is still a widely used and versatile process. When people think of stick welding, they usually think of pipeline welders, but various types of materials can be welded via the stick process. Stick electrodes are made in many different sizes, from 1/16-inch up to massive electrodes. The small electrodes can be used for thin materials – and even sheet metal, if the operator is sufficiently skilled. Electrodes are made for different steel types, castings, stainless steel and even aluminum.

However, stick welding does have drawbacks. It requires the added step of slag removal after the welding is finished, and it's a slow process in comparison to MIG welding. But the advantage to stick welding in many applications is that it produces a clean, strong weld. The flux helps to clean the weld, but more importantly, it allows the weld to cool in the protection of the flux.

As always, much depends on the knowledge and skill level of the operator. In the right hands, that old stick welder sitting in the corner of the shop can do a lot of different types of welds on many different kinds of material.



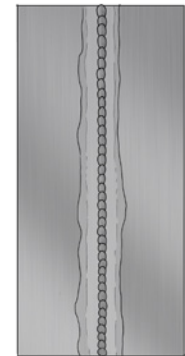
Illustrations by Jeremy Lacy

## What is the heat affected zone, and why is smaller better?

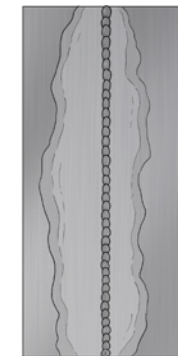
▶ If you've been welding for a while, you've probably heard about the heat affected zone, also known as the HAZ zone. If you've ever pulled a weld apart, or bent it back and forth until it breaks, the base material will likely crack or fracture in an area alongside the weld (assuming the weld was done correctly). This area of the weld is known as the heat affected zone. The term refers to the area on either side of the weld where the base material has been affected in an adverse way by the heat of the welding process. There is a line where the base material is weakened by being brought to a temperature just below the melting point.

When we test welds, we do not want the weld to break as it is stronger than the base metal if done correctly.

Logic suggests that larger welds should be stronger welds. This is true to an extent, but large welds also deliver much more overall heat to the base metal, which creates a larger heat affected zone (HAZ). We need to use sufficient filler metal for the material being welded, which is why material thickness and proper weld size for the material are important, but we need to avoid excessive heat. Making welds with less overall heat input can be done several ways.



Illustrations by Wishva Hettiarachchi



When we talk about the heat affected zone, we're talking about heat as an overall detriment to the strength of the metal. A correct weld size for any given material will greatly reduce the HAZ. In addition, different metal transfer modes – pulse welding in particular – can also reduce the HAZ. Even the simple technique of increasing travel speed can greatly reduce the HAZ (with the understanding that faster travel speeds require a higher skill level by the operator).

Reducing the heat affected zone as much as possible should always be a priority when welding. Controlling the heat will also help reduce distortion during your fabrication process.

## What is the difference between a push-pull gun and a spool gun for MIG welding aluminum?

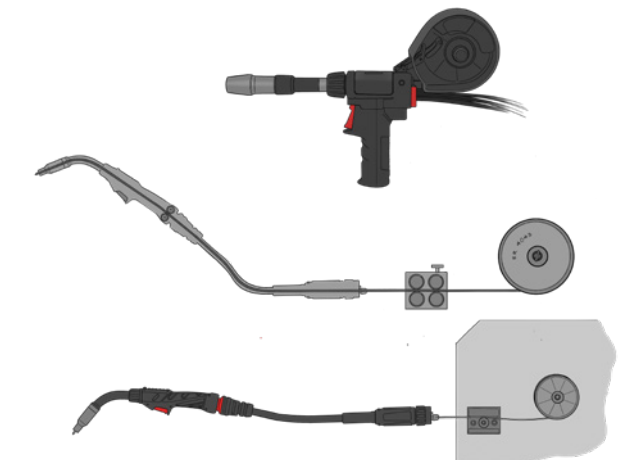
▶ There is a big difference between a spool gun and a push-pull gun when MIG welding aluminum. The filler metal wire used to MIG weld aluminum is usually flimsy, and as such, it can be difficult to feed through a long gun. Aluminum wire can be fed through a gun typically used for regular MIG welding, but it's not the ideal setup.

If you change the feed rollers on a regular MIG setup and clean the liner, you can feed aluminum wire through a regular gun with some success. If you are planning to do a moderate amount of MIG welding, investing in a spool gun is worth every dime. If you are getting into heavy aluminum MIG welding, you'll want to consider a push-pull gun for your aluminum welder.

The biggest difference between the two is that spool guns are very affordable and durable. The gun carries a small 1- or 2-lb. spool of wire that sits on top of the gun with rollers that pull the wire through the gun. The distance from the roll of wire to the contact tip is only inches – a short distance that allows for the easy feed of the soft wire. The disadvantage of spool guns is that they can be heavy and cumbersome. In addition, while the guns themselves are affordable, the small spools of wire that feed the guns can be expensive – and because of their size, they don't last long.

The push-pull guns are the best choice but are considerably more expensive. They use the feed rollers of the MIG machine to push the flimsy aluminum wire, but they also include a set of smaller rollers at the top of the gun that are synchronized with the feed rollers. As a result, the wire is pushed from one end and pulled from the other at the same time.

If MIG welding aluminum is only a small to moderate portion of what you do, a spool gun is an affordable option that will produce satisfactory results. But if it comprises most of your welding work, investing in a push-pull gun will result in a more efficient and productive experience.



Illustrations by Wishva Hettiarachchi

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BY KATE NICOLOSI

# A LESSON IN INVENTION



**Make48 gives innovation, creativity and sweat equity a two-day deadline at schools and maker spaces nationwide. The results are stellar.**

Imagine accomplishing more in two days than in an entire year. That's what Make48 inspires competitors to do by bringing together students, educators and business leaders to design, collaborate and build.

Make48 holds competitions around the country, enticing participants to try their hand at a challenge. The invention series, which has its own YouTube Channel and can also be found on the *This Old House Makers Channel*, takes place at maker spaces where experts in welding, woodworking, electrical and textiles stand at the ready to help teams get an idea out of their heads, onto the shop floor, and into the real world.

The competitions create opportunities for innovation, brainstorming and problem solving, and enable creative teams to turn their back-of-a-napkin idea into a prototype.

A sponsor – often a local business – throws down a challenge, and the teams harness their creativity to build a solution in two days.

Tom Gray, co-founder and producer for the Make48 television series, aims to turn 48 straight hours into the most productive two days of the contestants' lives. And the prerequisites – or lack thereof – might surprise you.

"No engineering background is needed whatsoever," says Gray. "Experts build on behalf of the teams, so the teams themselves don't have to (fabricate) anything."

Participants not only build prototypes, but they also build new skills, a network of friends and confidence that they take with them into other parts of their lives.



## Teaching

“Anything in this industry is really challenging,” says Gray. “We wanted to teach people. I’m teaching people the shortcuts, and that’s where it becomes powerful.”

The teaching happens throughout the competition and is televised for audiences to follow along in real time. The program began in 2015. In the nine years since, it has grown, evolved and gained a widespread following.

Make48 brings together eight teams, each with four participants. Contestants arrive at the maker spaces, primarily in the Midwest, and compete in a challenge revealed just moments before the 48-hour clock starts ticking.

“There are no pre-conceived ideas,” Gray says. In 48 hours, teams create a prototype, a one-page sales sheet and a one-minute video describing the invention.

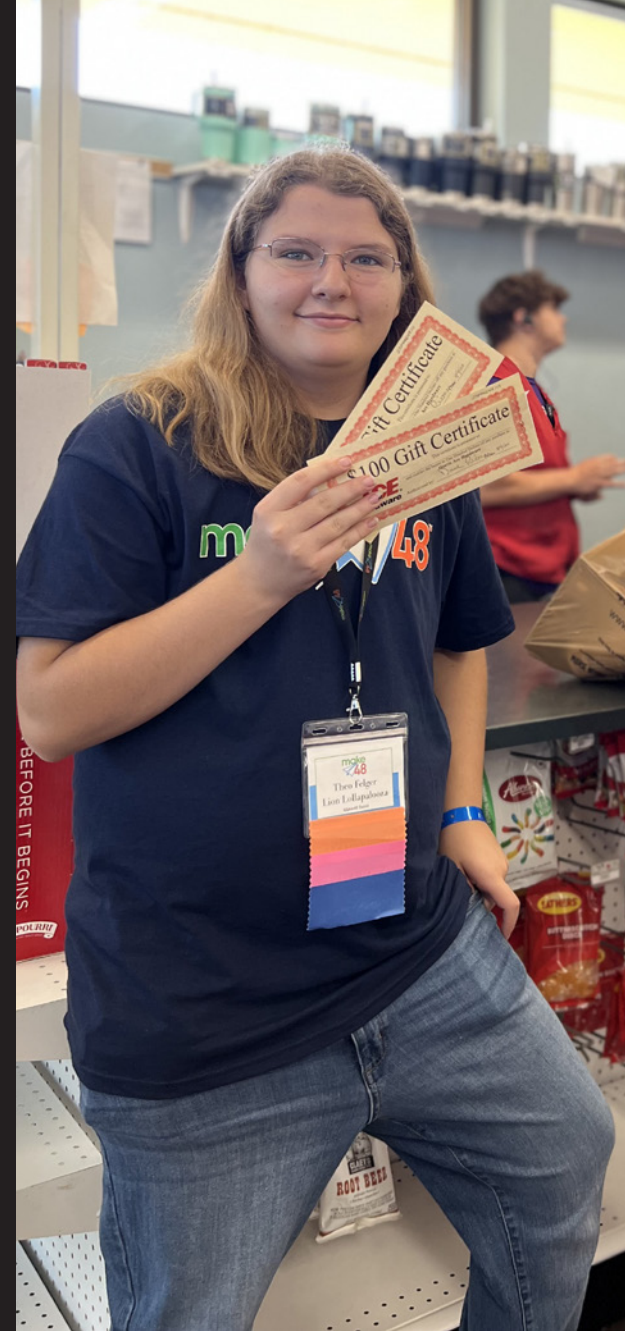
Gray operates from the premise that only a relatively small percentage of the population has the combination of passion

and technical skills to be efficient makers. He himself makes no claim to being a builder. “The rest of the population has ideas,” he says. “Those ideas are stuck in our heads. And until you can prototype something, you really can’t prove anything.”

Gray, an entrepreneur with a farming background, helps inventors license products and take them to market via manufacturing, distribution and marketing. He co-founded Make48 with three inventors: Rich Brull, Bob Coulsten and Curt McMillan. The other three partners have since left the organization, but they left their mark by working with Gray to bring a wide range of experience to share with contestants.

Gray says his greatest strength is in “looking at something and saying, ‘We can fix this for the consumer benefit.’ I took products to market the hard way – the expensive way. I can help people avoid the traps.”

Some inventions from the Make48 series have been ushered into the real world. If companies see promise, they fine-tune the idea and build on the initial prototype.



“Small businesses start when people can find a manufacturer or an investor,” says Gray. “That’s the sweet spot we are trying to achieve. Let’s get that innovation out of your head and prototype it. Then you can do something with it.”

One such success story is the Well Played team from Madison, Wisconsin. They recently created a portable, outdoor game called BocceRoll as a result of a Make48 challenge. The game is a new take on bocce and skeeball, and is now being sold to consumers. “They raised over \$175,000 on their pre-launch,” says Gray, adding that the company has since been assessed at a much higher value.”

Make48 challenges vary from the simple, such as an outdoor game, to the more complex – like creating a sustainable bicycling product using recycled bike materials.

The bike challenge winners – the Stellar Tech Girls, also from Madison, Wisconsin – were a team of high school students led by STEM advocate Marina Bloomer. They created a radar-equipped safety device that alerts bikers to the presence of oncoming cars and helps them stay focused on the road and avoid accidents. The Stellar Tech Girls moved up to compete at the national level and won. They were tasked with creating a product that related to animal wellness and transportation. The team invented a product called the Recupercrate – a comfortable, portable, high-tech space for dogs to recover after veterinary surgery. In exchange for their idea and prototype, the team won \$10,000 and high praise from the competition judges, all of whom are builders and makers themselves.



## Partnerships

The Make48 competitions offer more benefits to contestants than just hands-on learning and cash prizes. The entire experience is “like a job fair on steroids,” Gray says. “Students have created amazing partnerships and network opportunities. The companies are saying, ‘Consider working for us in an internship or job.’ That’s pretty unique.”

Make48 also fosters confidence, helping students find new talents they never realized they had. For example, the DeBruce Foundation, a Make48 partner

based in Kansas City, works to teach people how uncover their “agilities.”

“Agility is what you are really good at – leadership, innovating, numbers – but it is also your passion,” Gray says. “We survey the students before they compete to figure out their agility, and during the competition they wear a special badge that tells everybody what their skills are. That has helped dramatically in getting teams organized and giving certain roles to members of teams.”

On the flip side, students who may have thought they weren’t strong

public speakers, for instance, often rise to the occasion when presenting their ideas to the judges.

Make48 recently invited visually impaired students to compete at the Kansas School for the Blind. The students worked in a uniquely designed maker space with carpeted and tiled areas to help participants with canes determine their location at all times. The space was also outfitted with an array of laser engravers, 3D printers, welders, power tools and woodworking equipment.

Teams were tasked with an “egg challenge,” which involved

making a chicken egg holder that displays and dispenses farm-fresh eggs. Each team created sophisticated storage units with various components for dispensing eggs. Due to the success of the event, Make48 is planning to expand on the concept and host six schools for the blind from around the nation.

“This event proved to the world that just because you may have a disability, it does not matter,” says Gray. “We want to showcase that these kids are extremely capable. With a few tools and some support, they can innovate like anybody else.”

Make48 is currently focusing on teams made up entirely of high school or college students. Team captains will be over 18 and will likely be teachers who can bring hands-on lessons back to the classroom. This strategy is aimed at helping to spread Make48’s reach and allow students to develop skills in the classroom that will help them succeed in the workforce.

“A lot of teachers (who participated in Make48 competitions) say they are learning more in 48 hours than in a whole year with their students,” says Gray. “That’s amazing for us to hear that we



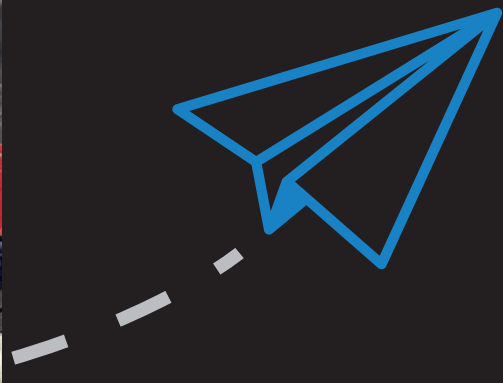


can teach so quickly. What these kids learn in forty-eight hours is really an unrealistic whirlwind of information, but it's also very, very powerful."

Since Make48 typically touches only 32 students per competition, Gray is excited to expand the program's reach. Make48 is now offering a course that can be taught in schools during the term or a summer session. The curriculum supports hands-on learning, design, innovation and problem solving.

"Challenges presented in the Make48 course are presented by real companies seeking real innovation," says Gray. "At the end of the day, I want these students to be well-versed in how to innovate. Hopefully, they can go on to compete in a live Make48 one day."

Gray and his team are uniquely positioned to create relationships with companies and connect students and teachers to those businesses. "Partnerships are being formed," says Gray. "Teachers can now take the lessons into schools. It feels like we are getting some really good traction (which provides) meaningful learning opportunities."



## Make48 for all

Scaling the Make48 concept “for the world to learn” is the next iteration, says Gray, who eventually plans to give the general public a shot at inventing. Instead of 48 hours, the program will launch a challenge online with a 48-day deadline for contestants to build prototypes. The longer form competition will entice participants from anywhere in the country to get resourceful in solving a business problem.

“For example, if a major farming company wants to develop a new accessory for a tractor, a farmer in Florida might have the right answer,” says Gray, who believes anyone with a good idea can help solve a problem.

This new Make48 format will make it easier than ever to turn an idea into something meaningful.

“When you innovate, you use multiple disciplines,” says Gray. “You have to use woodworking, metal working, electronics. There are not many people who can do it all, but these maker spaces are everywhere. You walk in and there are amazing welders and

woodworkers. If you just ask, they will build it with you or for you. You can prototype stuff so easily compared to twenty years ago.”

The Make48 concept is a reminder that an idea is worth pursuing, no matter what. It also underscores the power of collaboration.

“Don’t be afraid to take the chance to go forward with whatever idea you have,” said Keerthi Peddinti, one of the Stellar Tech Girl teammates from Wisconsin, after her win. “Because any idea is a start for anything.”

Gray agrees. You may have thought of an idea years ago and “now it’s being sold at Wal-Mart and making millions,” he laughs. “Well, maybe you should’ve done something when the idea came to you.”

Now you can. **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.

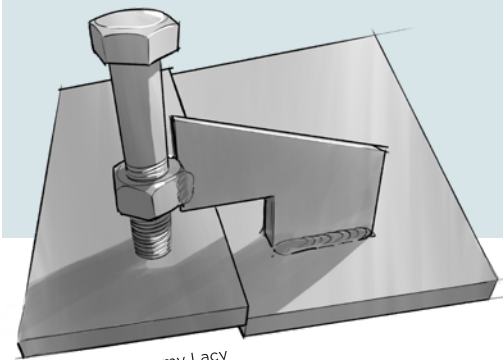
## ALIGNMENT TOOL

▶ An alignment tool can be a handy gadget in the shop, especially during repair welding. This simple tool can be created in a short time and provides a bit of pressure to ensure that your materials fit up properly.

Start by cutting the bracket out of material that's at least the same thickness if not thicker than what you're welding. The shape can vary, depending on your specific needs and the nature of your welding job.

Weld a nut at the end of the bracket to hold a bolt in place that will apply the pressure to the part. Be careful not to damage the threads of the nut while welding. Then weld the tool to one piece and thread the bolt through the nut until it pushes the other piece into position.

This tool can be constructed as a light-duty device for thin materials, or you can create a more robust version for thicker materials. Devices like this have been used for many years to align separate work pieces in the pipe industry, but they can be modified and welded in various configurations to accommodate your application.



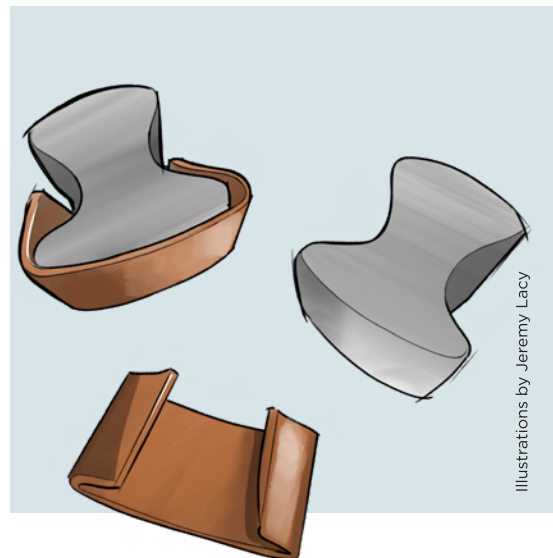
Illustrations by Jeremy Lacy

## COPPER COVER DOLLY

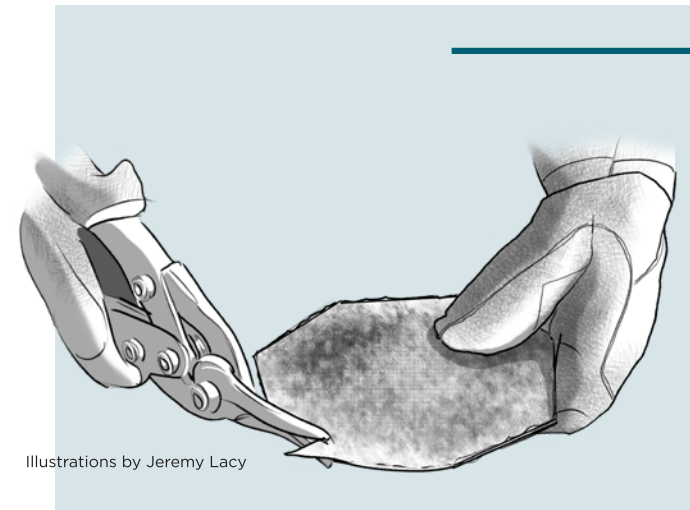
▶ Welding sheet metal is always a challenge, especially when it comes to welding up holes. This can be a very difficult task, one that includes the constant risk of destroying the material. This sheet metal dolly wrapped with copper will make the process much easier and give you much better results.

Start with 1/8-inch copper bar and your favorite dolly and wrap the face of the dolly with the copper. Since welds don't fuse to copper, the copper-covered dolly acts as a backing bar to hold the weld in place. The copper covered dolly is placed on the backside of the hold with pressure and the weld is made. When completed, the copper covered dolly is simply removed.

The copper covering also serves as an excellent heat sink on the back of the weld, which gives you much more weld control. When this is done correctly, the welded hole is small and flat, with very little heat input into the panel. This results in less distortion, which is something every welder strives for.



Illustrations by Jeremy Lacy



Illustrations by Jeremy Lacy

## TRIMMING SANDING AND GRINDING DISCS

▶ We all use some kind of grinder or sander, and we all know how expensive sanding discs can be. Over time, the outer edge of the disc – anywhere from 1/8 to 1/4-inch – generally gets the most use and wears out the most quickly.

When that happens, the discs can be trimmed into a star pattern using a pair of old aviation snips, which accomplishes a couple things. First, the edge of the disc becomes new again, so it lasts twice as long. The star pattern also allows the disc to fit into tight corners better than a round disc.

This trick will greatly increase the life of your grinding discs. You'll feel better when it does come time to throw them away, knowing that you've maximized their usefulness.

## REMOVING A STUBBORN BROKEN BOLT

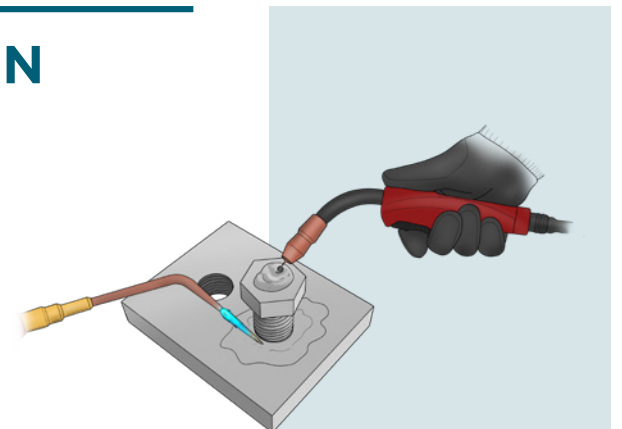
▶ Rusty bolts can be frustrating obstacles on any project. What's more, removing the remaining portion of a bolt that is partially broken off can be even more challenging. There are several ways to remove a broken bolt, but the best strategy usually depends on how much of the bolt is still protruding from the hole. If there is enough to get a handle on, you can sometimes lock onto it with a good pair of vise grips, but sometimes it's just too frozen by rust and corrosion to turn it at all.

When the bolt is broken flush with the surface of the part – or worse yet, even slightly recessed from the surface – turning up the heat can make a big difference.

First, find a nut just large enough to slide over the bolt. Hold the nut in place and weld it to the bolt from the top on the inside. This can be done with any process – Stick, MIG or TIG – but you'll need to be careful not to destroy the outside of the nut as you weld. Attaching the nut will enable you to grip the bolt with a wrench. Even if the bolt is locked up in rust and corrosion, the small weld will usually be enough to loosen it – especially if you add some heat to the surrounding areas.

When adding heat to the area with an oxyfuel torch, make sure that the area you are heating is not the bolt but the part around the bolt. Keep the torch away from the bolt and heat around the edges of the bolt. You want the heat to expand the metal around the bolt, but not the bolt itself. Expanding the bolt will only make it harder to remove. After heating the surrounding area, something as simple as a sharp tap on the wrench with a hammer will help loosen the bolt.

Broken, rusty bolts can be challenging to remove, but sometimes the solution is as simple as applying the right amount of heat to the right places.



Illustrations by Wishva Hettiarachchi

# EDUCATOR SPOTLIGHT

## CAELAN KEENAN

### GIRL POWER

By John C. Bruening

We all know about Rosie. Hair wrapped in a bandanna, eyes focused and determined, biceps flexing, she's been a cultural icon since the 1940s. More than eighty years after she first appeared on motivational posters in factories and shipyards at the height of wartime production during World War II, Rosie the Riveter continues to be the fictional symbol of not-so-fictional women everywhere who prove that they can roll up their sleeves and do the hard work just as well as the boys.

Caelan Keenan has no first-hand memory of that bygone era, but she understands Rosie's legacy. Keenan is the Youth Program Manager at Vermont Works for Women, a statewide organization that seeks to create and promote opportunities for women and young girls at every stage of their career development. She oversees a variety of initiatives to provide school-age girls with opportunities to explore education and career pathways in STEM fields and in the trades. Some of those opportunities are offered in summer camps and after-school programs called Rosie's Girls.

Supported by partnerships between VWW and schools and community organizations around the state, Rosie's Girls programs introduce middle-school girls – typically ages 11 to 14 – to skills and career fields that are nontraditional for their gender through hands-on learning in a supportive and empowering environment. In addition to learning welding and other trade skills, members also learn skills to help them navigate school, friendships, and societal issues. The program provides an opportunity for

members to step outside their comfort zones, make new friends, and build confidence in exploring their passions.

"We have a full week with the kids, all day, and we really get to see their evolution in that time," says Keenan. "It's amazing to watch them. At the start of the week, they're excited to be there, mostly because you're excited to have them. But they don't really know what to expect...Many of them are intrigued to learn to weld, but they can't even fathom what that is."

But the perspective inevitably changes by mid-week, says Keenan. "At some point, maybe Tuesday afternoon or Wednesday morning, that motivation has become completely internalized. They're hooked on it. They realize, 'Whoa. I can do this thing. It's a little scary with all this heat and all these sparks, but the outcome is that these two pieces of metal stick together.' Just watching them getting really invested in that is very rewarding."

Keenan lends a hand at the camps by helping the girls operate a plasma cutter and other peripheral equipment, but she considers herself more of a program administrator than a welder per se. She gets a lot of help from Sabrina Fadial, a mixed media sculptor whose primary background is in welding and blacksmithing. Fadial has been teaching girls how to weld at Rosie's Girls after-school and summer camp programs for nearly four years.

"At first the girls are just saying, 'No, I just want to stand here. You weld a little bit and I'll watch you,'" says Fadial. "And

then they'll step a little closer. And then they'll be standing right next to you. And then they'll hold onto the welding gun with you. And then they'll say, 'Okay, I can do it now.' It's amazing to see the transformation that happens from the time when their families drop them off in the morning to the time they put on their welding jackets and adult-size gloves that are too big for their little hands, to the time they make their first welds."

Keenan sees this transformation with almost every member at every camp at every location around her state.

"We talk a lot about education standards that help kids form a STEM identity," she says. "The week-long discovery process at the camps is that identity creation in action. After the first day or two, they're not intimidated about putting the welding gear on. They're not embarrassed about having an oversized helmet on their heads. These are just the tools that they need to build the things they want to build, and it's all one continuous stream of learning to them. That's the stuff that you hope changes their outlook on their career options and their lives overall." **ARC**

**"THEY REALIZE, 'WHOA. I CAN DO THIS THING.'"**

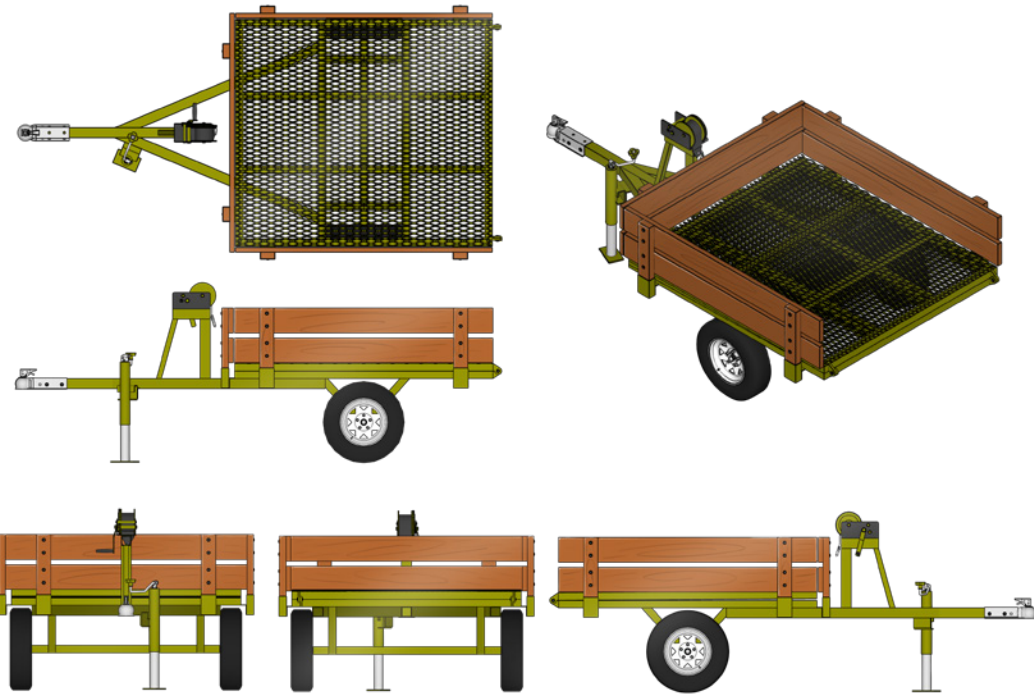


Photo by Brian Wade

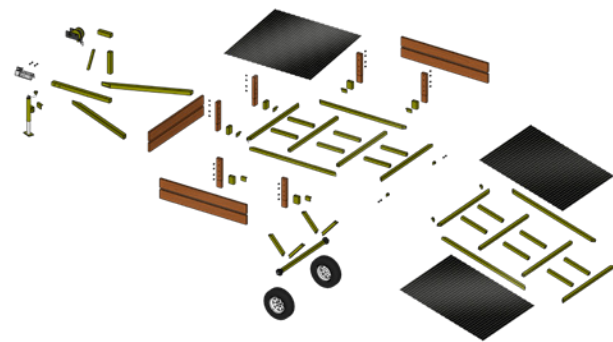
## Project Spotlight

# A SMALL TRAILER FOR HAULING PALLETS

By Jimmy DiResta

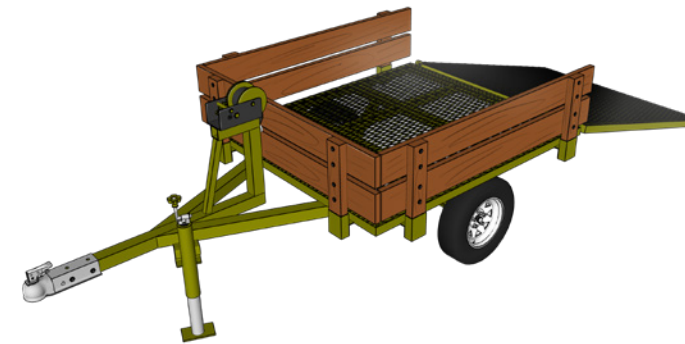


Illustrations by Wishva Hettiarachchi



For many of us, summer is the time when the landscaping and home improvement projects get into high gear. But when materials are delivered in large quantities on a wooden pallet, getting the goods from the end of the driveway to a place closer to the house or yard can be a challenge. In this issue, we build a small trailer that hitches to

the back of your truck or car so you can haul the entire pallet to its destination without having to spend time and muscle on multiple trips. The trailer also includes a ramp that enables you to load and unload the goods without damage or mess. Here's hoping your summer is fun and relaxing, and all of your projects are successful.



### STOP 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.

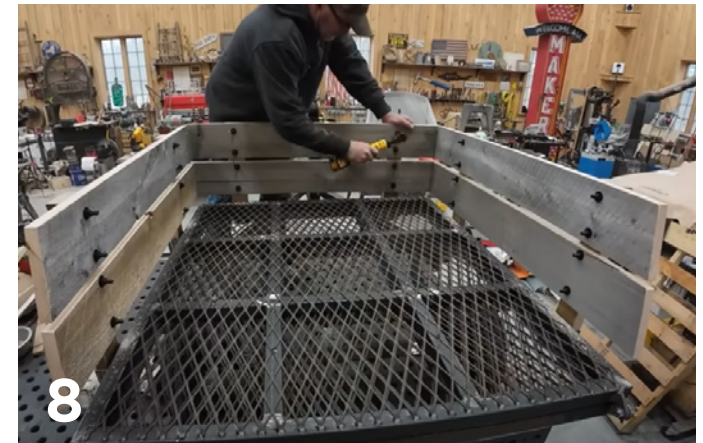
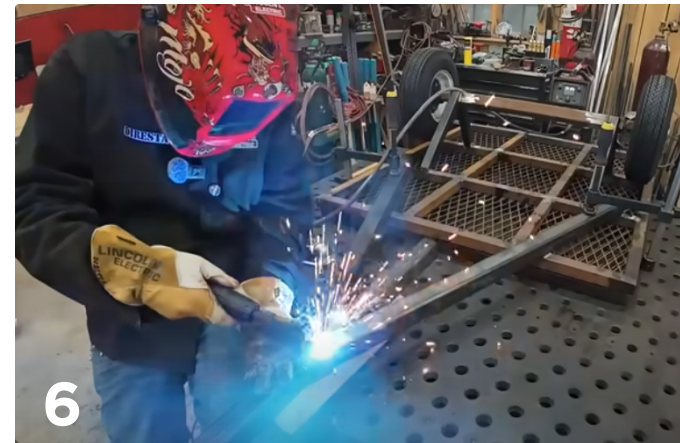
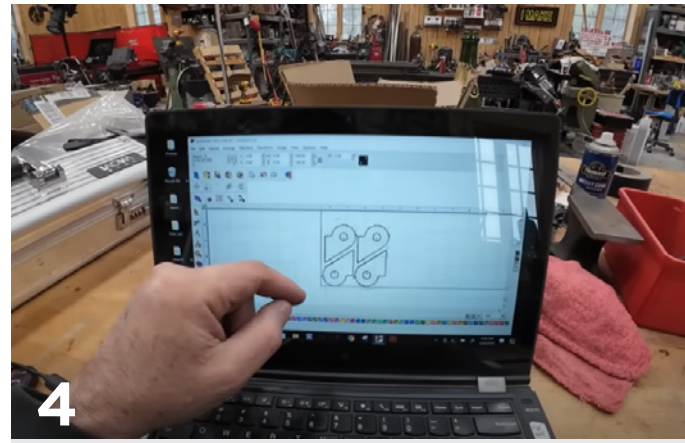
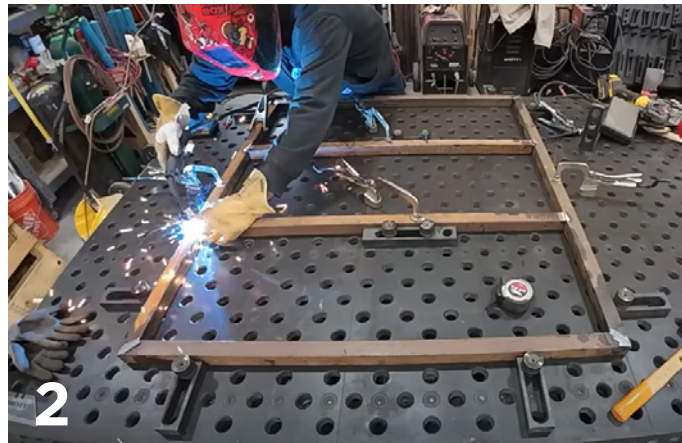
### MATERIALS

- 70 ft. of 1.5-square-in. 16-gauge tube
- 50 square ft. of expanded steel mesh
- 40 ft of 1x6-in. rough-cut wood for the side fence
- 36 3-in. carriage bolts
- Trailer tires and hubs
- Trailer hitch
- Trailer adjustable leg
- 4 cans of green paint

### WELDING/CUTTING EQUIPMENT AND TOOLS

- Horizontal band saw
- Precision® 225 TIG welder
- Power MIG® 215MP welder
- Torchmate® 4400 cutting table

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Imagery © Jimmy DiResta

### Step 1:

Use the pallet itself to create the template for the cart frame on the fabrication table. Use the band saw cutter to cut all the frame pieces square according to the template, then put a 45-degree bevel on each piece. You can cut wood templates to enable you to make quick and easy 45-degree angle cuts. Set up the frame pieces on the fabrication table, then grind away any rough edges to make each angle as smooth as possible. Use the Precision 225 TIG welder to weld the main frame together at each corner.

### Step 2:

Using the Power MIG 215MP, weld the ribbing to the main frame of the deck to add strength and stability to the perimeter of the frame. This completes the main frame of the deck. Cut and weld the second deck in the same configuration as the first. The second deck will be the ramp that flips down. It will be identical to the main frame in size, shape and ribbing configuration.

### Step 3:

Cut the expanded metal wire mesh with the angle grinder to fit the ramp. It will become the deck of the ramp, the deck of the underside of the ramp and the deck of actual working surface. Weld every open edge of the wire mesh to avoid any potential stability problems.

### Step 4:

Use the plasma cutting software to map out the templates for the hinge plates and cut the 1/4-inch plate. Grind the rough edges on each piece after cutting and bore a half-inch hole in each plate. Connect each set of plates with a nut and bolt, then weld the two hinge plate assemblies to the edges of the deck and ramp.

### Step 5:

Pack the tire hubs with grease and bolt the axle/hub assembly to each tire. Cut the 2-inch x 2-inch square tubing to connect the two axles. If necessary, weld spacers onto the shaft of each axle to securely fit the axle into either end of the tubing. Weld the shafts into either end of the tubing. Cut the brace tubing with 45-degree bevels at both ends and weld them to the axle tube to secure the tube to the deck of the cart.

### Step 6:

Cut the square tubing to make the two angled arms of the cart that will converge to connect to the hitch. Weld the angled arms to the cart, with a long tube at the center to become part of the ratchet mount. Square up the entire assembly with a laser before welding it all together.

### Step 7:

Weld the ratchet crank to the side of the center tube and bolt the trailer hitch to the end of the tube. Weld a bolt onto a short strip of square tubing to mount the ratchet. Cut and weld the separate pieces to make the bracket, then weld the ratchet mount to the top of the bracket assembly.

### Step 8:

Cut six 5-inch lengths of steel 2x4 to create the stake pockets for the outside of the trailer on three sides. Weld the pockets to the three sides using 2-inch angle iron as connecting pieces to keep the pockets slightly removed from the outer edges of the cart. Cut the wood panels and bolt them to the stakes to serve as liners for the sides of the trailer. Finish with a coat of paint to the deck, ramp and front assembly.

## HOPE IN A FLASH

By John C. Bruening

Sometimes redemption starts with a single spark.

That's the mission at ReIGNITE Hope, a training program based in Gardena, California, that teaches welding and welding-related skills to men and women struggling with homelessness, substance abuse, limited education, criminal history or other enormous challenges.

Founded in a church on Skid Row in Los Angeles in 2011, ReIGNITE Hope has trained more than 1,300 students in thirteen years. Many of the graduates are from the immediate area, but others have benefited from the organization's small fleet of 18-wheeler trucks that have taken the program on the road - throughout California and into other parts of the country. To date, ReIGNITE Hope has trained welders as far afield as Dallas and Philadelphia. The wish list of destinations includes Atlanta, Cleveland and other cities around the U.S., according to Steve Bunyard, founder and president.

In a previous life, Bunyard owned a high-performance automotive manufacturing and retail operation in Orange County, California. He sold the company in 2010 and became a pastor at Rolling Hills Covenant Church in Los Angeles. The job brought him face to face with the homeless and other at-risk populations within the community, which motivated him to establish ReIGNITE Hope.

"Our church didn't do job training, but I started thinking and praying about that," says Bunyard. "I had learned to weld when I was young, and that just kept going around in my head as something

that could get some of these people out of their situations. That could get them out of Skid Row. We could have kept feeding them every day, and that would have been fine, but that wasn't going to get them out of there."

Bunyard is now a Certified Welding Educator and Certified Welding Inspector, and he teaches TIG welding to students in the program when he's not otherwise busy with higher-level administrative duties.

ReIGNITE Hope's curriculum covers TIG, MIG, flux-core and stick welding. Every student who has come through the program has earned AWS certification. But the support hasn't ended there. Sherrie Newton, vice president of the organization, oversees job placement once the training is complete and the certification is in hand.

"Our job placement team works one-on-one with each one of our students to help identify any employment barriers and determine the best way to support them in their transition to full-time employment after completing the training," says Newton. "All students have access to services that we offer for transportation, GED, childcare, mental health, getting reentry."

At the same time, ReIGNITE Hope is "continually working to establish our partnerships with local workforce boards, employers and unions," she adds. "They just catch the vision, and they really want to help give the students a second chance."



Bunyard says the transformation among students who enter the program is rapid and remarkable. "Each of them in their own way becomes a different person, even just in a month's time," he says. "They're not used to somebody coming alongside them like we do, caring about them at no cost and with no strings attached. They just haven't had that in their lives. They generally haven't had great role models or people who believe in them. So to see what happens when they come here - the way they start acting differently, talking differently, making different choices in their lives - is extremely rewarding."

The spark of redemption at ReIGNITE Hope isn't a transaction, says Bunyard. It's a gift.

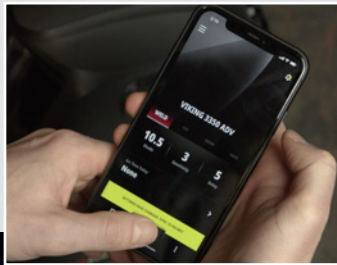
"There's no catch here. Just love." **ARC**



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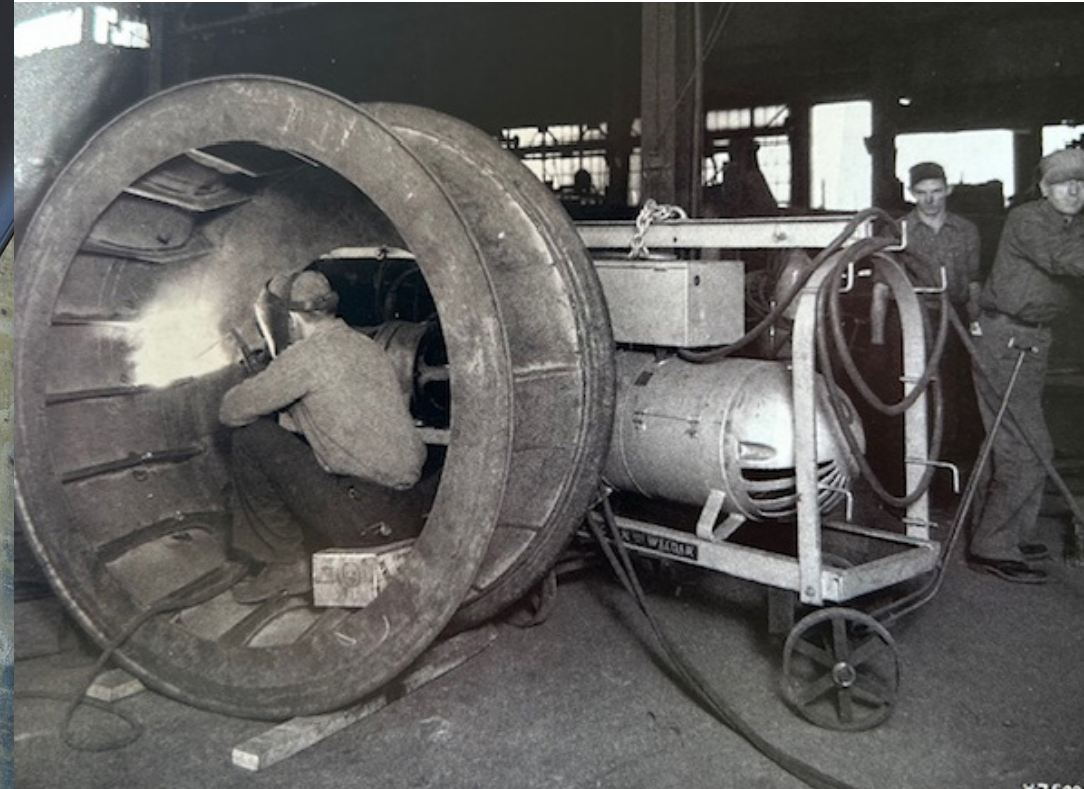
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## Flashback

### Arctic Wheel



#### ▶ October 1939

Workers at the Lasker Boiler & Engineering Company in Chicago, Illinois, fabricate one of the half-ton wheels for the Snow Cruiser, the primary transport vehicle for Admiral Richard E. Bird's second Antarctic expedition. Once completed, the wheels spanned a 20-foot wheelbase, and were fitted with 12-ply Goodyear tires. The 75,000-lb., 55-foot-long Snow Cruiser arrived in Antarctica the following January. **ARC**

*Have any vintage (pre-1975) photos you'd like to share? Email them in jpeg format to [editor@arcmagazine.pub](mailto:editor@arcmagazine.pub) with a date the photo was taken (actual or approximate), a brief description (three or four sentences), and an email address where we can reach you for additional information.*



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