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FORGED IN FIRE

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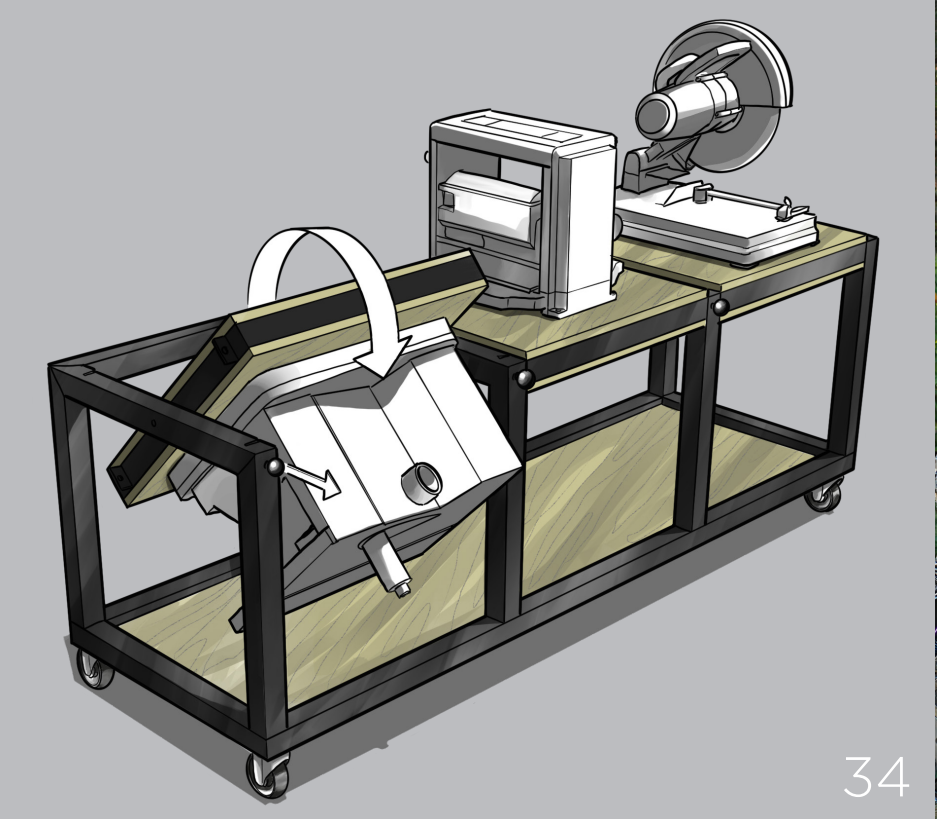

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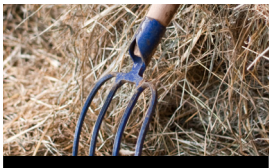
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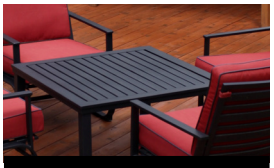
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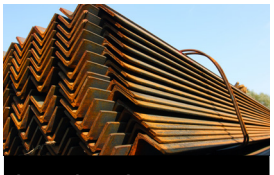
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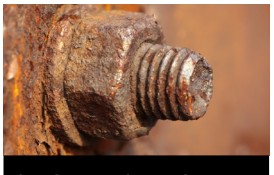
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LETTER TO THE EDITOR

AN EDGE ON THE FUTURE

We say it every December: "Wow. Where did the year go?" But it's a fair question. In our never-ending hustle to finish the current project, start the next one, get our shop in order (literally and figuratively) and balance our passion for welding with the numerous other responsibilities in our life, the weeks and months blow by pretty quickly. At the end of it all, we're a little bit older, but hopefully a little further along in our mastery of the trade – and maybe even a little bit wiser about how to use the skills we've mastered to do something meaningful.

'Tis the season for all things gleaming and shiny, so you'll want to check out our cover story. Writer Jeff Herrington, a frequent *ARC* contributor, provides a behind-the-scenes glimpse of *Forged in Fire*, the competitive reality show that's been part of the History Channel since 2015. Every week on *Forged in Fire*, sparks fly and emotions run hot as master craftsmen go head to head to create the perfect blade. "What makes *Forged in Fire* singular," says show producer Paul Hogan, "is that it's featuring normal people who are taking part in an art form, and a chemistry class, at the same time."

What better time of the year than this to recognize and remember that our creative aspirations make us all part of something bigger than ourselves?

Maybe you've given some thought to forging the perfectly crafted blade yourself. Or maybe your creative sensibilities tend more toward custom car or bike building, or decorative metal sculpture. Whatever the case, Lincoln Electric has an array of equipment that will help you get started – or provide you with the chance to upgrade your existing gear. Check out what we have to offer in our annual Holiday Gift Guide, an 11-page section loaded with welding machines and accessories that may be too big to fit under your tree this year, but not too steep for your budget.

This December marks the first holiday season since the Lincoln Electric Welding School relocated to the company's newly opened Welding Technology and Training Center in Cleveland, Ohio, in the early months of 2018. In recognition of that milestone, our Gift Guide showcases a few shining stars from among the diverse constellation of students at the weld school. They range in age from their late teens to at least their fifties, they come from a variety of different backgrounds and life experiences, and they hail from either coast and places in between. What they hold in common, though, is a passion to improve and master a technical skill that will provide them with career options, creative opportunities, and so much more. They're just as inspiring as any celebrity in any story we've told in these pages this year.

We hope you've had a successful and productive 2018. In the end, we don't know where the year went any more than you do. But we do know that time is a precious commodity. So whatever downtime you're able to manage this season, enjoy every minute of it. That project can wait at least a few days. So can the next one. Take a day or two to get your shop in order (figuratively, not literally) so you can be ready for the year ahead. It'll be here soon enough.

Until then, happy holidays!

— John C. Bruening, Editor-in-Chief
Editor@arcmagazine.pub

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EDGE OF THE WORLD

STORY BY JEFF HERRINGTON

TING

Bladesmiths test their metal – and their mettle – on cable TV's hottest reality series

DREW GOODSON removes his blade from the quench barrel.

Most competition reality shows do everything they can to put their television viewers on edge.

Few, however, do that as effectively – and literally – as *Forged in Fire*, which has been airing on History since 2015. Pitting a crew of bladesmiths against a merciless clock, the show challenges its contestants to quickly produce the best edge-based weapon they have in them.

Sparks fly from the welding tools and forges they use to craft their metallic masterpieces. Sweat pours off their furrowed brows as they await the decisions made by the show's expert judges. And as is the case with so many television series these days, some of the contestants who were hoping to take home the title of champion will instead face elimination.

But ask the program's showrunner just how intense the competition gets during filming, and he'll tell you *Forged in Fire* is more about personal rigor than it is about personal rivalries.

"This is definitely a competition reality show," says Paul Hogan, who's overseen the series for the past three seasons. "But the camaraderie among the contestants is actually quite strong."

"What makes them nervous is the role the clock plays in the competition. That's when they realize that, yes, the blades they will make will be forged in fire. But pretty quickly, so will they."

The episode titled "The Steel Crossbow" begins with four contestants standing elbow-to-elbow on a studio stage that resembles the mash-up of a

vo-tech classroom with an automobile body shop. Host Wil Willis, a former Army ranger and Air Force pararescue expert, delivers the group's first assignment with the bluster and gravitas of a boot camp drill sergeant.

"Today," he says, "you're to use any of three types of steel we're providing you, in three different thicknesses, to forge a Damascus knife blade that's between nine and 11 inches long." J.D., a 20-year-old mechanical engineering student, chooses to craft a simple camping knife. Michael, a pastor and part-time bladesmith, decides a Bowie knife will be his project. John-Francis, the 22-year-old forge operator from Ohio, opts for a modern seax (German dagger), while Jeffrey, who has 30 years of experience making armor, goes with a medieval style butcher knife.

They're given ten minutes to design their blades, then three hours to transform their visions into weapons. Relentless music, similar to what you'd hear beneath a battle scene in *Lord of the Rings*, underscores the challenge underway. Accentuating the tension even more are camera shots of a digital wall clock counting down the minutes remaining.

Pretty soon, Michael the pastor has a problem. His effort to strengthen his blade by folding the steel onto itself has gone awry. Meanwhile, he's allowed the forge he's using to get backed up, causing flames to erupt from one of its propane burners.

PREVIOUS SPREAD

MATT BERRY uses tongs to hold his hatchet's head against the machine belt grinder.

"That's when they realize that, yes, the blades they will make will be forged in fire. But pretty quickly, so will they."

JASON FRY'S Texas Bowie knife.

"We have a wonderful special-effects team," Hogan says. "Still, we're forging at incredibly high temperatures, using a lot of propane and expending a lot of power on this show. The weapons-testing segments add yet another element of danger. So we always have safety professionals and a medic team nearby when we're filming, just in case."

Michael shrugs his shoulders and hopes for the best. "This forge has so many bells and whistles," he says. "It's like visiting Candy Land when all you're used to at home are Brussels sprouts."

MODERN SEAX

CAMP KNIFE

MEDIEVAL KITCHEN KNIFE

BOWIE KNIFE

Nobody better understands the pressure an unexpected calamity can create for a contestant than Ben Abbott, one of the judges watching Michael's drama unfold. That's because Ben has hammered, hacksawed and welded his way to the title of "*Forged in Fire* Champion" not once, but twice.

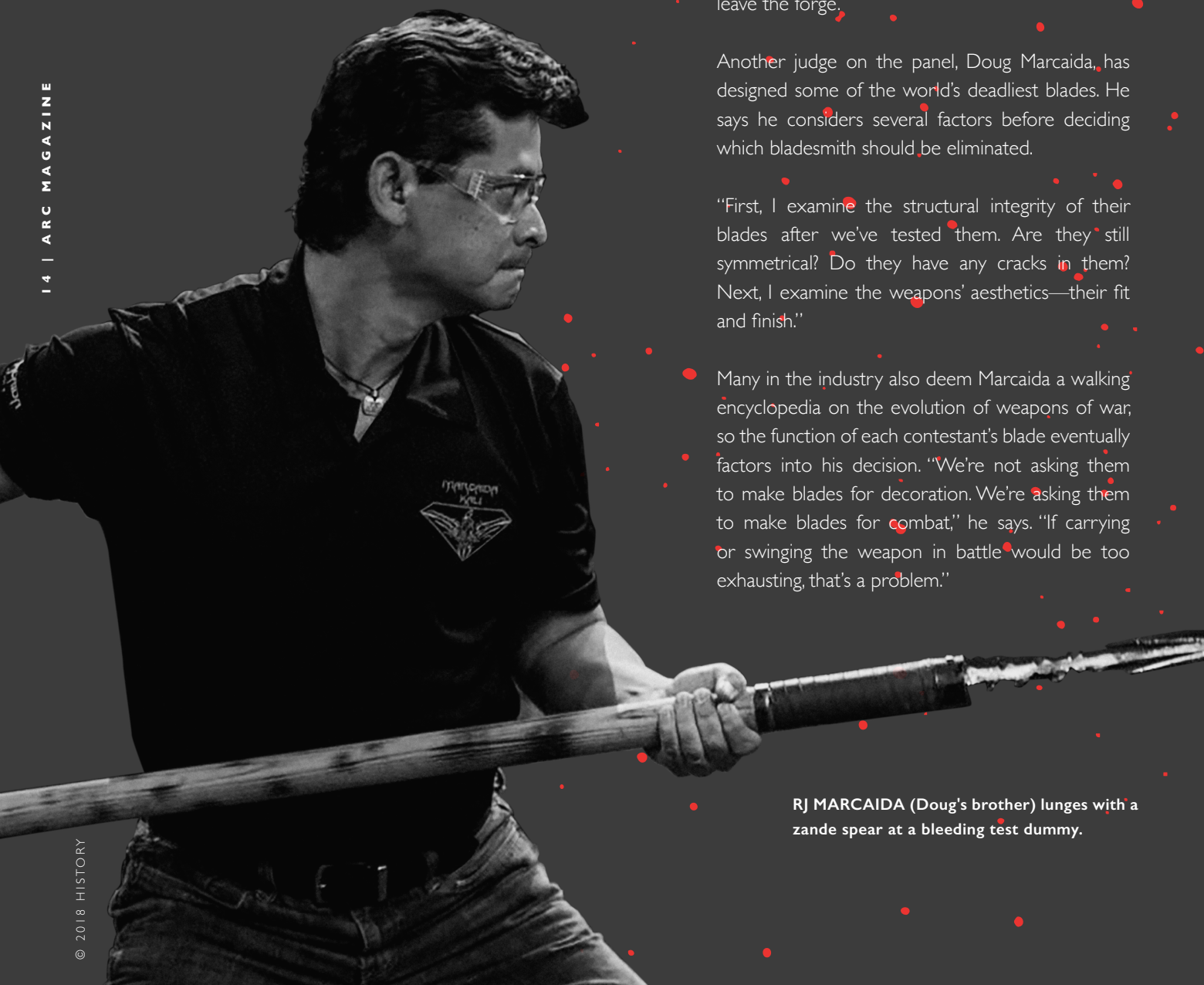
"It's easy to get rattled in front of the cameras, but I never did," says Abbott, who became enamored with blades in his teens after visiting castles and museums in England. "I'd get so focused on the task at hand, I'd sometimes forget to eat or tend to personal care issues," he adds with a laugh. "For me, the stress came when our work got judged."

Michael's propane flare has been extinguished but his blade is judged to be a quarter-inch shy of the round's nine-inch parameter. So he is told he must leave the forge.

Another judge on the panel, Doug Marcaida, has designed some of the world's deadliest blades. He says he considers several factors before deciding which bladesmith should be eliminated.

"First, I examine the structural integrity of their blades after we've tested them. Are they still symmetrical? Do they have any cracks in them? Next, I examine the weapons' aesthetics—their fit and finish."

Many in the industry also deem Marcaida a walking encyclopedia on the evolution of weapons of war, so the function of each contestant's blade eventually factors into his decision. "We're not asking them to make blades for decoration. We're asking them to make blades for combat," he says. "If carrying or swinging the weapon in battle would be too exhausting, that's a problem."



RJ MARCAIDA (Doug's brother) lunges with a zande spear at a bleeding test dummy.

It's time for round two. Wil Willis marches up and directs the remaining contestants to prepare for their next challenge, which is combining three different materials into a handle for the blade they just forged. More than one contestant arches his eyebrows and admits in candid camera takes that they may know a lot about metallurgy, but as for the properties of wood and carbon? Not so much.

However, Marcaida stresses it's that element of uncertainty that makes the show exciting to watch and totally compatible with Kali, the core philosophy of a Filipino martial arts form he learned in the military.

"Depending on its shape, a blade can cut, puncture, pierce or cause blunt-force trauma," he says. "So a central philosophy of Kali is that what you're holding in your hands is only a tool—your real weapon is your mind. Kali teaches you that you should be able to succeed in battle with whatever is thrown at you.

"I think the same philosophy applies to competing on this show."

Once everyone has perfected their handles and attached them to their blades, the judges first test the knives' sharpness by dragging them horizontally through a long line of ripe tomatoes. Then, they examine their durability by hammering them vertically into a slab of steel slate.

All three knives perform well on both tests, making it tough for the judges to decide who must leave. However, Jeffrey's weapon dulls more after the durability test, so he is selected to depart the forge. "Several times, it's been almost impossible to choose who should go home," Marcaida admits. "That's why we have an odd number of judges. But when the decision is difficult, that just shows that everyone gave it their all. It's a sign of a really good episode."

Ben Abbott agrees the role of judge is sometimes torturous. "It can be painful," he acknowledges. "We're often deciding—on the spot and under bad lighting—whether to hand someone $10,000 or totally dash their dreams. But we give everyone a fair shake. It's never personal. It's all about how the weapon feels going into a log, whether the blade warps or chips and whether the handle shifted during some test.

"I've learned to own my decisions and be confident that judging is a job I am qualified to do."

BEN ABBOTT performing the ice block chop test on a round 2 knife.

Wil Willis has a stern look on his face and his hands are planted firmly on his belt buckle. It's time to present the two remaining contestants with their final challenge – crafting, over five days, a medieval-style hunting crossbow. The good news for the finalists is they get to create their weapons in their workshops back home.

J.D. frets over how he'll fare on this assignment. "There's a lot of mechanics and physics involved in making a crossbow," he tells viewers. "This is much more complicated than our other assignments." Meanwhile, John-Francis expresses concern that he's made crossbows, but never one with the steel prod this challenge mandates.

Viewers watch as J.D. strives to make the arrowheads for the bolts his crossbow will shoot, but then abandons the plan when they don't clean up after forging. Viewers next see John-Francis fretting over the many things likely to go wrong with his crossbow.

A commercial airs, and the pair are back in the studio forge with their crossbows for the final judging. The judges evaluate the bows by using them to shoot bolts into deer decoys, then tempered glass, then inflated sacs filled with fake blood.

WIL WILLIS presenting the Round 3 challenge, the Arming Sword, while JAY NEILSON (LEFT), DAVID BAKER, and DOUG MARCAIDA sit patiently at the judge's table.

J.D.'s crossbow feels good in the hand, but judge Doug Marcaida can't break the tempered glass with it. With John-Francis's crossbow, Marcaida shatters the glass, but the weapon flings its bolts at odd trajectories.

As the judges confer, the young men hoping to snare the $10,000 prize stand stoic beside each other, anxiously awaiting the final verdict. Finally, though, Wil Willis assumes a power stance, keeps the audience in suspense for several seconds, then pronounces J.D. this episode's *Forged in Fire* champion.

"I didn't expect to win," the 20-year-old calmly says into the camera. "But even if I hadn't won, I proved what I came here to prove." He then shoots the viewers a big grin and adds, "By the way, I hate crossbows!"

It's a humorous moment, but producer Paul Hogan says what he most hopes viewers take away from the show is a serious respect for handmade craftsmanship.

"Most everything we buy today is born from mass production," he says. "Yet every knife you see at the end of our first round of competition is as unique as someone's fingerprint."

He adds: "At the end of the day, what makes "*Forged in Fire*" singular among competitive reality shows is that it's featuring normal people who are taking part in an art form, and a chemistry class, at the same time." ARC

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"Every knife you see at the end of our first round of competition is as unique as someone's fingerprint."

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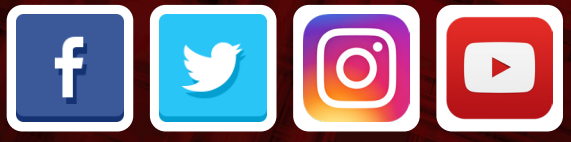

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Holiday 2018 Gift Guide

Whether you're a welding novice or a seasoned veteran, Lincoln Electric has what you need. The machines and accessories in this year's Holiday Gift Guide may be too big to fit under your tree, but they're not too steep for your budget.

This year's Gift Guide showcases a few shining stars from among the diverse constellation of students at the Lincoln Electric Welding School, which relocated to the company's newly opened Welding Technology and Training Center in Cleveland, Ohio, in early 2018. These students represent a range of ages, backgrounds, experiences and points of origin. What they hold in common, though, is a passion to improve and master a technical skill that will provide them with career options, creative opportunities and so much more. They're just as inspiring as any celebrity we've featured in these pages this year.

Cory Dalton
Age: 29
From: Euclid, Ohio

Cory has discovered that when it comes to welding, learning by doing is a good start, but it will only take you so far. He'd done plenty of welding on the job as a millwright apprentice at Lincoln Electric, but he enrolled in a six-week MIG course to improve his skills. "I thought I was a pretty good welder when I started the class," he says. "I knew the techniques, but I didn't always know the best time or the best way to use them. This is going to make me so much better at my job."

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Name: Daniel Rice (left)
Age: 40
From: Goldendale, Washington

Daniel is a rigger and welder for the Army Corps of Engineers at the Dalles Dam project (he's been working closely with Nate). He started welding as part of the metalworking classes he took while he was in the Army from 1996 to 2004. Like Nate, he came to the Lincoln Electric welding school to sharpen his TIG skills and bring his knowledge up to speed with current welding technology. "This is a great school," he says. "I'm learning a lot about TIG that I never knew, and I'm looking forward to bringing this knowledge back to the corps and bringing things up to date."

Name: Nate Narry (right)
Age: 36
From: Dalles, Oregon

Nate started welding Jeeps and off-road vehicles when he was a teenager. After working at a naval shipyard for a couple years, he landed a job in 2001 as a power plant mechanic and welder with the Army Corps of Engineers' Dalles Dam project. He spent a couple months this fall honing his TIG skills at the weld school with new, state-of-the-art technology and curriculum. "We'd like to get more up to speed with the times at our facility back home," he says. "It's nice to be able to come here, learn the newer processes and newer materials, and then share it with the rest of our team when we go back."

Luke Wilson (left)
Age: 20
From: LaGrange, Ohio

Luke's been welding since he was seven years old. That's what happens when you grow up in a family that runs a heavy equipment repair business. He learned on the job at a (very) young age, but he came to Lincoln Electric in early October for MIG welding training that will put him on more solid footing in the family business. Wilson's Welding and Fabricating will be waiting for him when he finishes the course, but he's also thinking about alternate career options that include heavy-duty bucket repair in the excavating industry.

Hannah Berlingeri (right)
Age: 22
From: Mayfield Heights, Ohio

Hannah had originally considered a career in veterinary medicine, but the emotional toll that came with putting sick animals down was more than she could manage. She had no prior welding experience when she started a course a week-long introductory session, followed by a comprehensive training course. She's already networking her way into the job market, with an eye on joining the Ironworkers Union. "There are so many different options with welding," she says. "It's definitely something I see myself doing in the future."

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$12.57

Jessi Combs Women's Shadow FR Welding Jacket
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$94.74

Steve Harris
Age: 25
From: Cleveland Heights, Ohio

Steve started out in nursing school, but he made a major course correction that took him in the direction of welding and the trades. When he finishes his comprehensive four-month course in flux-cored welding, he hopes to do an apprenticeship with the boilermakers union, get a journeyman card and land a job in the field. He still holds the nursing profession in high regard, but "there's a huge demand for welders," he says. "I like welding school a lot better than nursing school."

Justin Krewson
Age: 22
From: Long Island, New York

Justin is finishing a comprehensive flux-cored welding course. He started welding in 2015, when he was a 19-year-old Olympic luge athlete training in Lake Placid, New York. He even made his own luge handles that he used in the 2018 Olympics in PyeongChang, South Korea. He and his doubles partner performed well in the games – eighth place, better than projected – but Justin looks forward to a future as a civilian contractor for the military. "Those people are the pinnacle of welding," he says. "That's what I'd like to be."

2018 GIFT GUIDE

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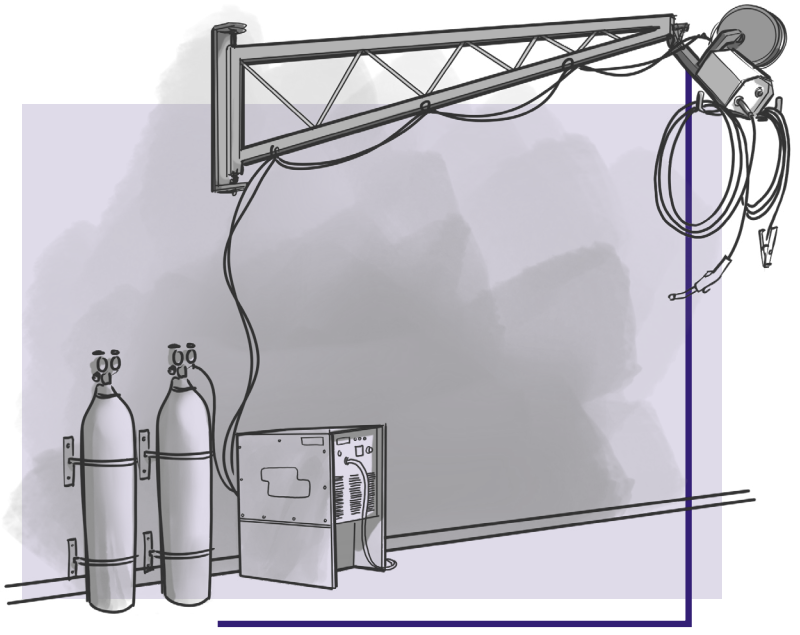


AVOID ENTANGLEMENTS

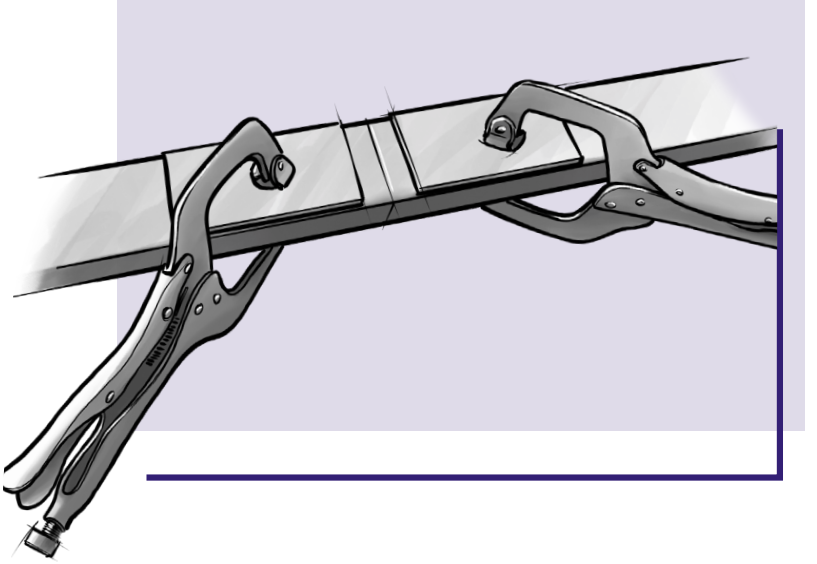
– CHRISTOPHER WILKINS, RALEIGH, NORTH CAROLINA

To increase productivity by reducing the amount of time every day that I was spending untangling my torch lines, my manager and I built our own weld boom to get our cables off the floor. We use it to lower the torch wherever we need it. This not only saves time, as I am no longer fighting with tangles, but it also helps save wear and tear on our equipment and keeps the torch from hitting the floor and breaking the gas cups. Make sure when you build your own, it matches your welding machine.

AVOID DISTORTION AND DISCOLORATION

– DIEGO ESPINOZA, YUMA, ARIZONA

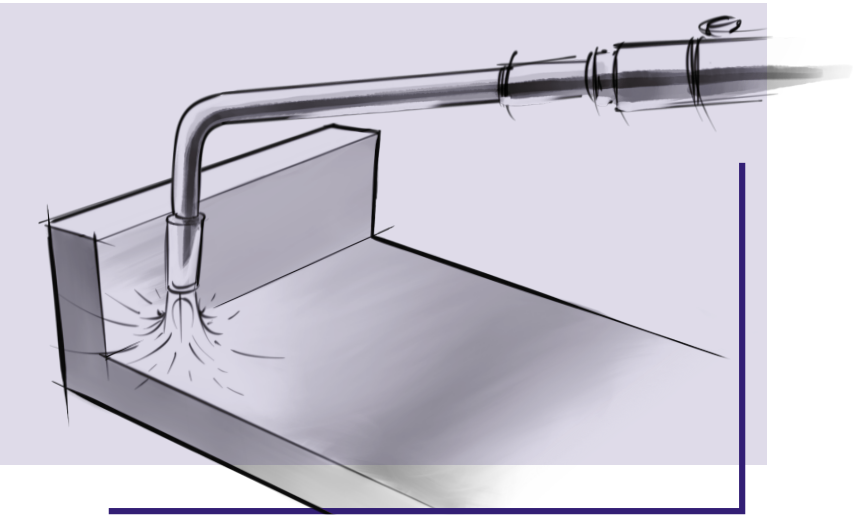
If you need to weld stainless steel, it's a good habit to clamp blocks of aluminum behind and around the weld joint. The aluminum blocks serve to draw heat out of the material, since aluminum has a higher thermal conductivity than stainless. Using chill blocks can reduce distortion and discoloration on the welds. Also, it may prevent sugaring on the backside of the weld, especially on thin material when back purging is not used.



PREHEAT HIGH-STRENGTH STEEL

– DAN SMITH, SEVIERVILLE, TENNESSEE

To make sure you have a good weld on high-strength steel, preheating the weld area is critical. If you know what kind of high-strength steel you're welding (carbon content), it will be easier to figure out how much preheat you need. The more carbon in the metal, the more preheating is necessary. Preheating your weld slows the cooling process, which will help prevent the weld from cracking. (See *ARC Magazine's* Summer 2015 Master Class on preheating steel for details.)



DIALING IN THE CORRECT AMPERAGE

– SUBMITTED BY MITCH CUTSFORTH, BIG RAPIDS, MICHIGAN

When determining the appropriate amperage for SMAW, always consider the diameter of the electrode. For example, if you're going to weld with a 1/8-inch 7018 low hydrogen electrode, a good starting point is 125 amps. Keep the following rule of thumb in mind: 1 amp for every 1/1000 of an inch in the electrode diameter.

A SMALL TAB FOR A LARGER PIECE

– JEFFREY KEPIRO, ROCK CREEK, OHIO

When you need to weld a small tab — such as 1 inch X 1 inch x 1/4-inch thick — to a larger piece, mark out the tab on a longer piece of material, drill any necessary holes in it, then cut with a bandsaw. Leave a small amount of material to hold the tab to the larger piece. You can produce many small tabs, but be careful not to cut them all the way off the larger piece. Then weld or tack firmly in place using the longer piece as a handle to hold in position, and then snap them off as you grind the corners after welding. This works with many types of material.

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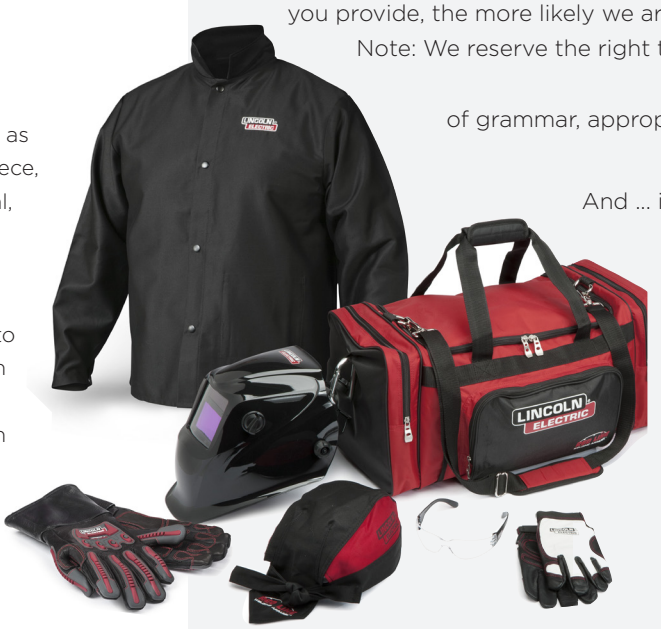
Send your tip or trick to **questions@arcmagazine.pub** and we just might feature it in an upcoming issue!

Feel free to submit more than one tip, but please be as specific and detailed as possible. The more details you provide, the more likely we are to use your tip. Note: We reserve the right to edit responses for the sake of grammar, appropriateness and/or available space.

And ... if we do use your submission, we'll send you a FREE Lincoln Electric Welding Gear Ready-Pak®.



EDUCATOR SPOTLIGHT

SCOTT LASLO

DOUBLE LIFE

By John C. Bruening

Scott Laslo wears two hats, but he wears them well. As both assistant professor and welding program coordinator at Columbus State Community College in Columbus, Ohio, he understands welding education from the big-picture perspective as well as the day-to-day point of view.

"I have two masters," says Laslo. "I have my students, and then I have the program that I oversee. It's challenging, but at the same time, it's rewarding. We try to bring teachers into this program who share the same vision and passion that we have here. If it weren't for the people around me, we wouldn't be anywhere near where we are."

Laslo oversees 21 welding courses at the community college that include all five manual welding processes – MIG, TIG, stick, flux-core and oxyfuel welding – and he teaches many of them himself during any given semester, from introductory to certification level. In his role as coordinator, meanwhile, he's responsible for recommending the hiring of adjunct instructors, monitoring curriculum, accommodating students' needs, procuring equipment and materials for the teaching labs, and numerous other related matters.

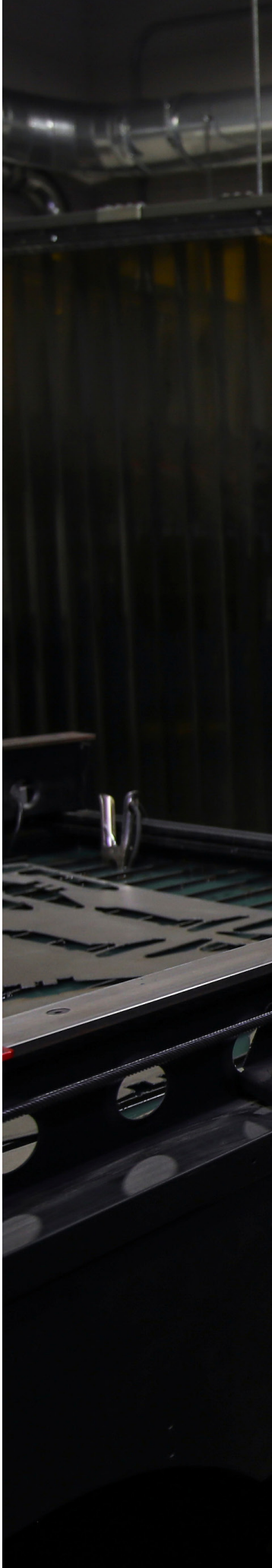
Like most tradesmen, Laslo worked his way up through the ranks. He attended a joint vocational school in central Ohio in the 1990s, then began a four-year apprenticeship with the Sheet Metal Workers Local Union. He spent six years as an instructor at the Delaware Area Career Center in Delaware, Ohio (about 30 miles north of Columbus), before assuming his current position at CSCC in 2011. Along the way, he earned an undergraduate degree in science education and a master's degree in science management.

"In eight years at Columbus State, we've gone from offering two certificates to five, as well as an associate degree in welding," says Laslo. "We're now an accredited test facility through the American Welding Society, and our enrollment has increased by 18 percent in the last two years."

Among the 200-plus students in CSCC's welding program is Wallace Blouch. He's nearly completed a two-year associate program, and he's already setting up his own fabrication business that involves the design and construction of the metal housing boxes for QR scanners in public parking garages. Most of his training at Columbus State has taken place under Laslo's tutelage.

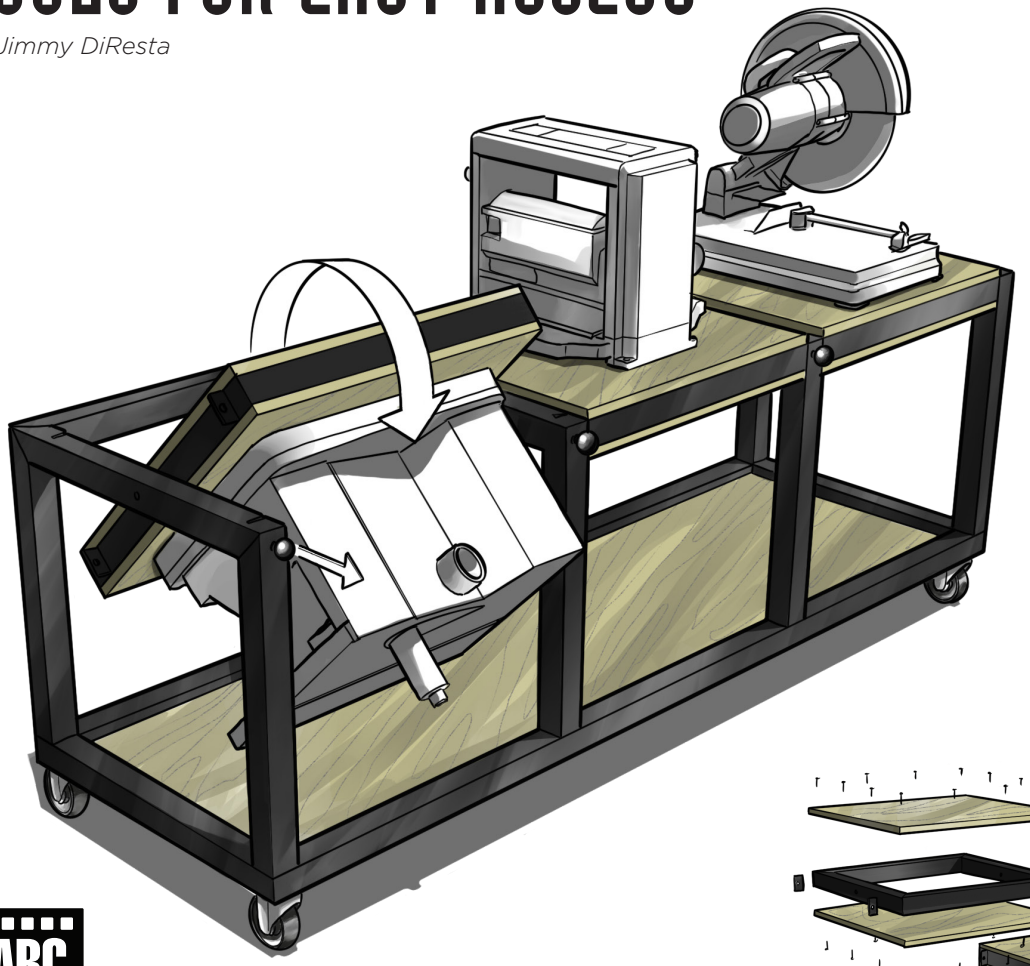
"Scott's an excellent teacher," says Blouch. "He's very good at explaining things. He won't just give you the answer outright. He wants you to learn the material by coming to conclusions on your own. But he'll make sure that if you're having trouble, he'll give you a demo, or he'll watch you weld and point out where your technique might not be correct. He's very good at breaking it all down and helping you understand things."

Whether he's teaching or tending to his administrative responsibilities, Laslo says developing relationships with students is his favorite part of his job. "I see them come in at the beginning of the program, maybe not exactly sure what they want to do or what they want to be," he says. "Or maybe some of them have an idea but they don't know what the next step should be. Then they go through the program, they leave, and they come back to visit a couple years later and say, 'Hey, I just wanted to let you know what I've been doing.' It's so great to know that I was helpful in some way. I was just one person in a short sliver in their lives, but I gave them some tools and they went out and did some amazing things with them."ARC



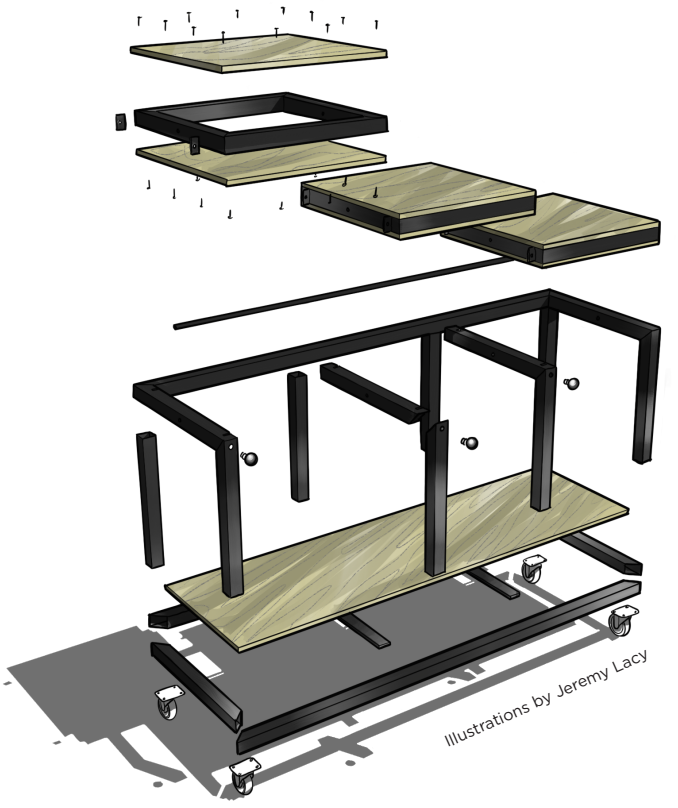
A MULTI-STATION TABLE TO STORE YOUR TOOLS FOR EASY ACCESS

By Jimmy DiResta



Watch exclusive footage at arcmagazine.pub

This build is a table with three separate flip stations to accommodate up to six otherwise stationary tools. This is a great way to store the tools that you don't use every day, but still have them available on short notice with minimal effort. This concept can be scaled to any dimension or number of "pods" to adapt to your own space limitations and needs.



Illustrations by Jeremy Lacy

© Jimmy DiResta

MATERIALS

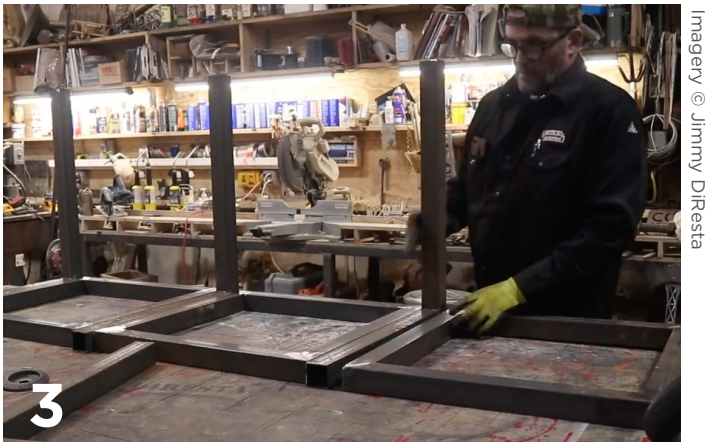
2 x 2-inch x 16-ga. box tubing
2 x 3-inch 16-ga. box tubing
1/2-inch round bar stock
Weld-in push pins
3/4-inch plywood
3/8 x 2-inch bar stock
Self-tapping screws
Locking casters

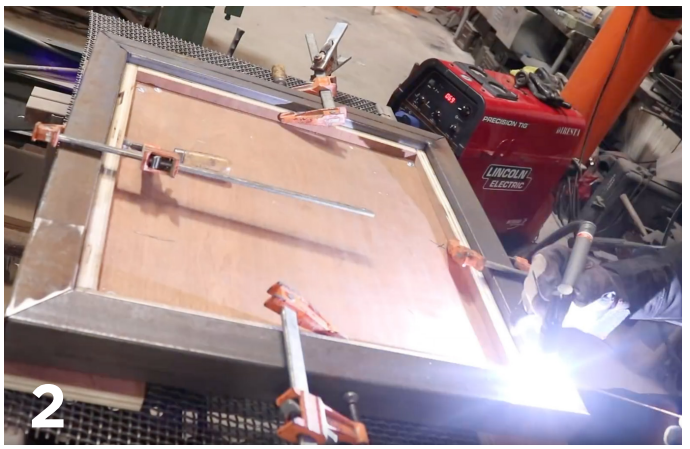
WELDING/CUTTING EQUIPMENT AND TOOLS

Angle grinder with cutting and grinding wheels
Band saw
Cordless drill and drill bits
Step drill bit

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.





Imagery © Jimmy DiResta

Step 1: Cut And Prep Materials For Flip Station Frames

Using the two-inch square stock, mark each piece to your desired width and depth. For this project, each table "pod" is approximately two feet by two feet square. To make this step faster and easier, I created a jig from plywood and used it as a guide. Using an angle grinder equipped with a cutting wheel, cut each side of the frame and use a sanding station to true up your cuts and add a bevel to prep for welding. These cuts could also be made using a metal cutting chop saw or band saw.

Step 2: Assemble The Inner Table Frame

To ensure the accuracy and repeatability of your inner table top frame, create a clamping jig that's equal to the inner dimensions of the table top section. This step can speed up your work if you're planning to make multiple stations in your table, but it will also help ensure that the table tops for each station are equally sized, square and true. Tack each corner, then remove the jig, check for square, and finish weld each joint, taking care to move from corner to corner to avoid heat distortion.

Step 3: Start Building Your Outer Frame

Cut and weld the four L-shaped legs that will form the back legs and horizontal cross member for the outer frame of the table and supports for the inner frame of each station. In order to achieve your desired finished height, the uprights of these legs should be carefully measured to take into consideration the height of the base (two inches in this case), and the height of the casters you are using to make this a mobile workstation. The cross members should be the same width as the table top frame, plus about a 1/8-inch gap. Lay out the leg assemblies alongside the table top frames on a worktable so that the entire table is upside down. Make sure to include about a 1/8-inch gap between the legs and horizontal cross member and about an inch from the back of the flip station to the rear frame so that they can freely rotate.

Step 4: Cut And Weld The Rear Spreader And Legs

Using an angle grinder and cutting wheel, cut a piece of tubing to the same length as the table, including clearances gaps, and weld to the L-shaped legs. Cut legs to length, using lap joints to cover open ends of tubing where needed. Using clamps and a square or a magnetic fixture to hold the legs in place, tack and then finish weld each joint, then grind each weld flush. Once assembled, the length and depth dimensions of the length will make up the dimensions of the rolling base described the next step.

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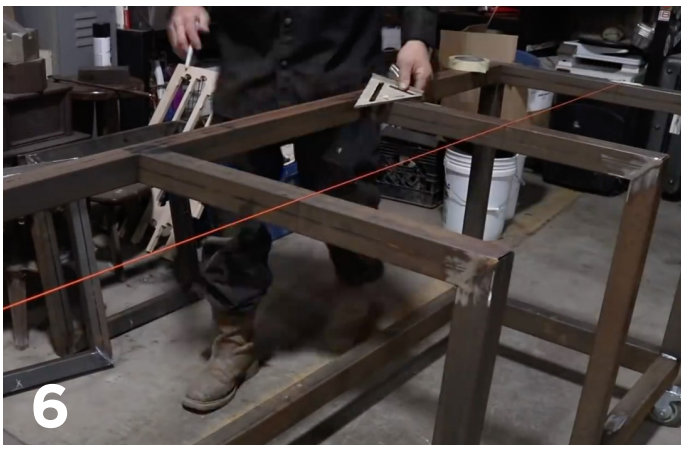
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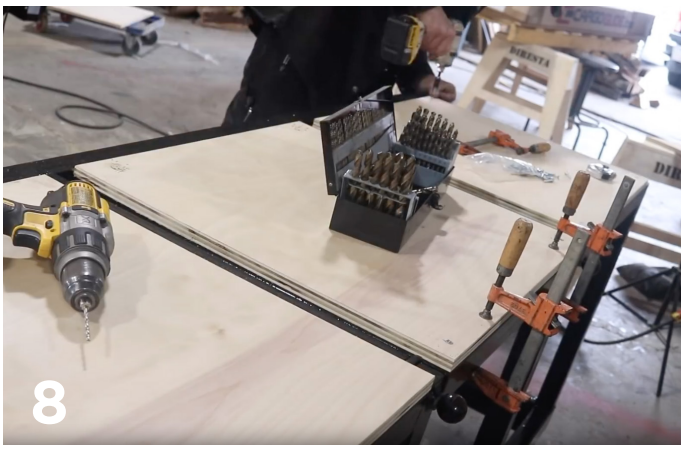
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Step 5: Assemble The Mobile Base

Using the leg assembly as a guide for length and width, mark and cut the pieces that will make up the base of the table from the 2 x 3 box tubing. Using a square and a set of clamps to ensure that each joint is 90 degrees, tack each corner, then come back and finish weld each joint. Like before, move from corner to corner with each weld to reduce distortion. Once the base is welded and the welds are ground flush, come back and add the casters, then place the entire base onto the inverted table assembly and weld in place, using squares and clamps to true everything up.

Step 6: Install The Center Pivot

Using a chalk line, snap a line to represent the center point of the table and of each of the inner table tops of your table. Transfer this mark to the vertical planes of the table top and to the horizontal pieces of each flip station. At the intersection of this center mark and the center of the square tubing, use a center punch to mark the hole location for the pivot bar, then drill a pilot hole at each location. Using the pilot hole as a guide, switch a step drill, and drill a 1/2-inch hole in each of the horizontal members along the depth of the table. Slide a piece of 1/2- inch round stock through each section of the table and through each of the table frame assemblies so that each can rotate independently.

Step 7: Pull Pin Locking Mechanism

Our push pins were purchased online (see video for source) and are designed to be inserted in a ¾-inch hole. Using a step drill, drill these holes into the front cross member of the table—one per "pod"—and weld them into place. Create the receivers for these push pins using the 3/8-inch bar stock with 1/2-inch holes in each. To accommodate the receivers and to allow each table pod to rotate freely, slots need to be cut into the intersection of the horizontal and vertical cross members, using an angle grinder and cutting wheel (see video for detail).

Step 8: Plywood Tops And Finish

To provide a surface to mount your tools, add pieces of ¾-inch plywood to the tops and bottoms of each of your table frames using self-tapping screws. Before you do that, it might be a good time to apply whatever type of finish you plan to use. To ensure a proper adhesion, first wipe all surfaces down with acetone, then apply a self-etching primer followed by two coats of finish.

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

ART REBORN

Brian Mock is a model citizen of Aloha, Oregon, in that he is constantly collecting recyclables. But the difference between Mock and every other environmentally conscious Oregonian lies in what Mock does with the items once he collects them. While many would simply toss them in a bin or haul them to a scrapyard, Mock fashions his into one-of-a-kind works of art.

As an amateur artist for many years, Mock tried his hand at metal sculpting in the late 1990s. It wasn't long before his work gained recognition and momentum – enough that he left his day job in printmaking.

"I thought I'd give metalworking a try, so I learned how to weld and found a real love for it," he says. "The sculpting started out as more of a hobby, but really took off as a career when I realized that people were interested in purchasing my work."

His self-taught skills have improved over time, and his pieces have landed in galleries, hotels, publications, museums and the hands of collectors across the world.

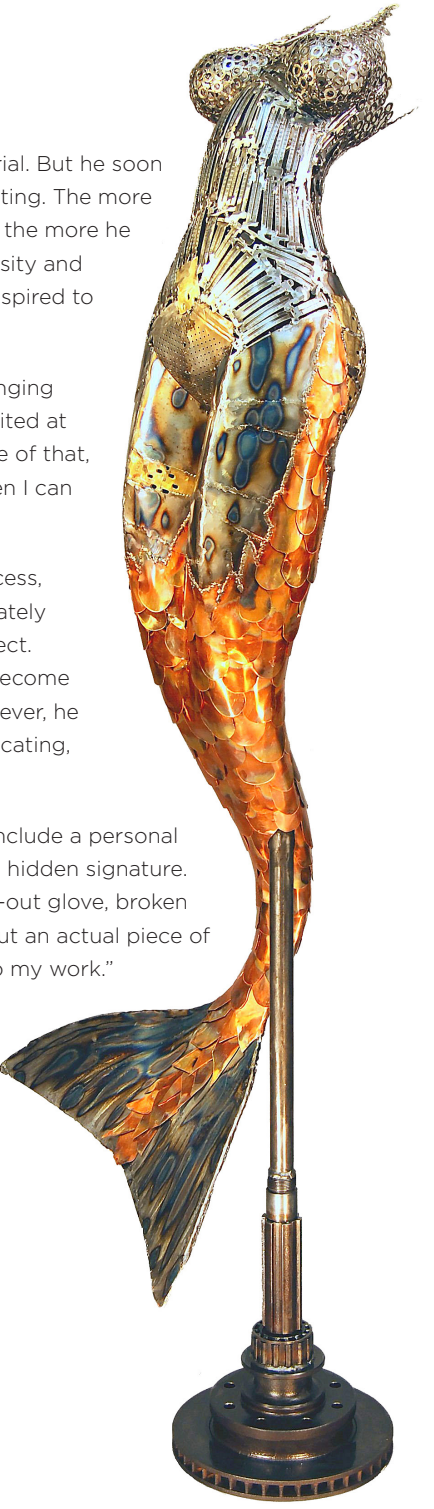
As is standard for assemblage art, each of his works were born from whatever object he had at hand in the creative moment. He started out using scrap metal and other found objects about 20 years ago, he says, because it was easily available and inexpensive practice material. But he soon realized that it was also fascinating. The more he worked with various scraps, the more he began to appreciate their diversity and history, and the more he was inspired to use them in new ways.

"This does make it more challenging since my resources can feel limited at times," says Mock, "but because of that, it's always more rewarding when I can make it work."

According to Mock's usual process, objects are sometimes immediately recognized as parts of his subject. Washers become eyes. Forks become feathers. Most of the time, however, he works them in as he goes; fabricating, cutting or grinding them to fit.

Recently, he's even started to include a personal item in all of his sculptures as a hidden signature. "It could be an old tool, a worn-out glove, broken glasses," he says. "It's a way I put an actual piece of myself and my own history into my work."

The results are entirely unique pieces of art that emphasize resourcefulness and encourage viewer engagement. **ARC**



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RIGHT - © Revere Hotel Boston Common all other photographs courtesy of Brian Mock

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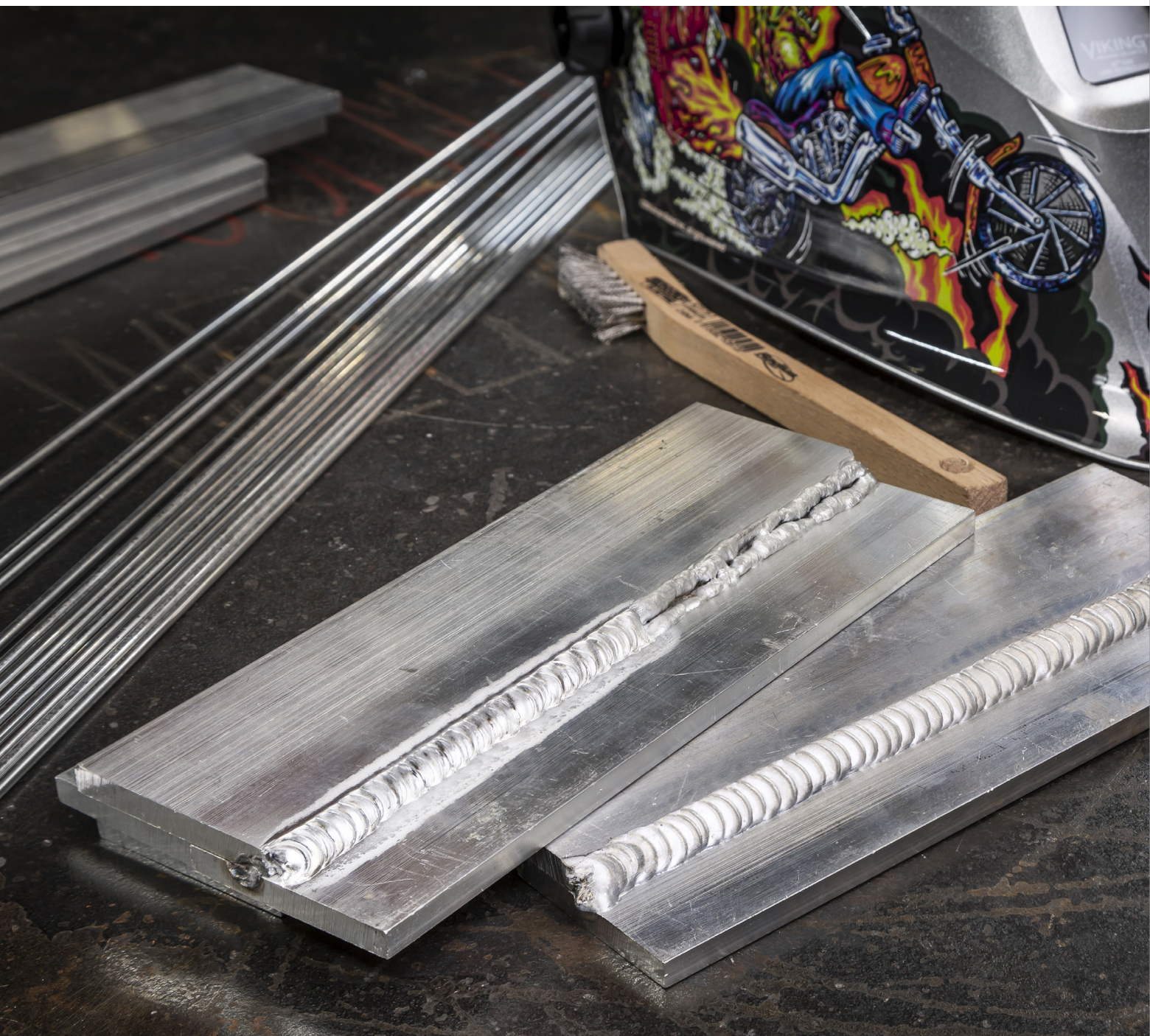
Master Class

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

USING DC- CURRENT AND HELIUM GAS TO WELD THICK ALUMINUM

By Lance Besse



Gas tungsten arc welding (GTAW), also known as TIG welding, was a process developed in the early 1940s to weld materials such as magnesium and aluminum using an inert shielding gas such as helium. The TIG welding of aluminum is normally performed using AC polarity, and argon as the inert shielding gas because the positive side of the AC wave performs the oxide cleaning and the negative side performs the penetration to the base metal. If thicker sections need to be welded, however, it can be done using DC- polarity and pure helium gas. The DC- process delivers excellent weld penetration and profile while using less current than AC. It's an option frequently used when the operator is using either a TIG machine that's incapable of AC welding or a machine with a lower current output.

The DC- TIG welding process delivers excellent weld penetration and profile without overburdening the power source. It's frequently used when AC welding is not an option.

The use of helium as shielding gas creates hotter arc plasma than argon gas. This additional heat burns the oxidation off the aluminum during the welding, which eliminates the need for the alternating current.

Our demonstration can be found among the exclusive footage on the ARC website (arcmagazine.pub). It includes the welding of two sections of ¼-inch aluminum. Even though the helium gas burns the oxides off the aluminum as we weld, it's important to manually clean the base metal with a stainless steel brush before starting in order to prepare the surface for the best possible weld.

We're using a Lincoln Electric Aspect 375 TIG machine with a water cooler. The amperage is set at about 200 amps because more heat is focused on the base metal in DC- polarity than in AC. The helium is set at about 60 cubic feet per hour. A 4043 1/8-inch diameter electrode ensures the proper weld size for this thickness of aluminum material.

Careful monitoring of the weld is required to ensure you are maintaining proper weld size, which is typically about the same thickness as the base material. You also want to maintain consistent bead appearance without overheating the base metal due to aluminum's high thermal conductivity. As you continue to weld, use your amptrol to slowly lower the amperage because the aluminum is becoming increasingly saturated with heat. Near the end of the weld, your amperage may be less than half of what you started with.

Notice that not all the oxides are completely burning off the surface, especially on the outer edges of the puddle. At the center of the puddle, however, the arc plasma created by the helium gas should eliminate the oxides and produce a desirable weld puddle.

If you examine the piece after the weld, you'll probably see some oxide along the sides of the weld bead, but as far as the overall appearance, there should be complete fusion between the two base metals combined with the filler. As we welders like to say, it looks like a stack of dimes.

To summarize, alternating current is the preferred method of welding lightweight materials such as aluminum and magnesium, and current technology enables you to unbalance the AC waveform to favor the negative side of the AC wave and increase the level of heat and penetration to the base metal. If you don't have a machine capable of high-amperage AC welding, you do have the option to weld aluminum with DC- polarity, but only if you use helium as the shielding gas. It will provide excellent penetration, acceptable cleaning of the oxides and a faster weld. **ARC**

Watch exclusive footage at:
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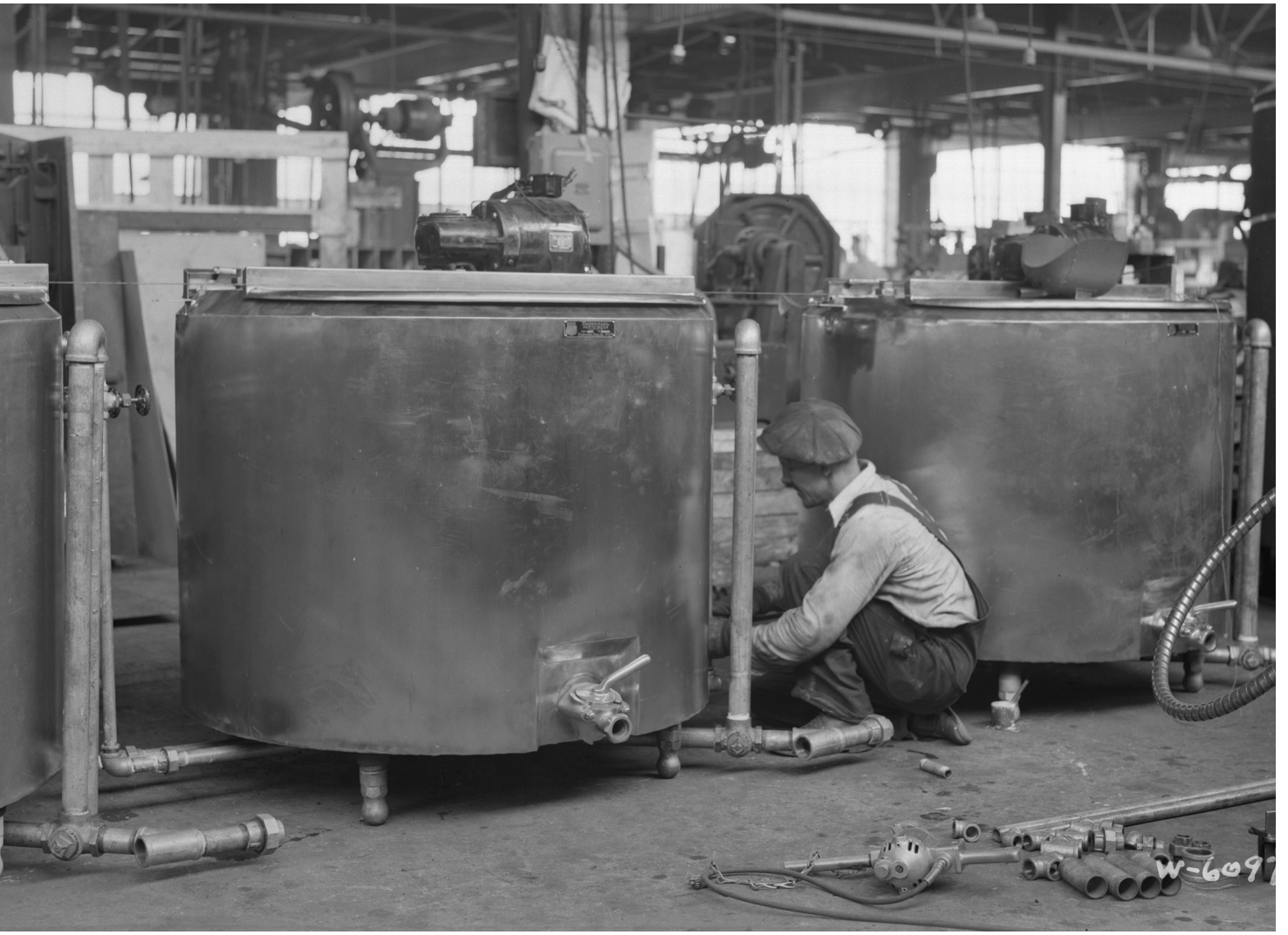
No Use Crying . . .



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August 1937 – An operator welds the outer shell and lid of a 500-gallon stainless steel milk pasteurizer at the Mojonnier Brothers Company in Chicago, Illinois. Large-scale equipment like this was common at Mojonnier Brothers, a company that specialized in the processing, testing and conveyance of dairy products for more than sixty years (1919 to 1980). ARC

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