ARC MAGAZINE

Spring 2019 | arcmagazine.pub

ALSO INSIDE:

HELL ON WHEELS
Builder and racer Chris Hrabik approaches challenges and limitations at top speed

PROJECT SPOTLIGHT
Put your giant bandsaw on wheels, by Jimmy DiResta

ALEC STEELE
An ambitious young UK blacksmith forges a career in metal

RANGER® 330MPX™

WELDER/GENERATOR

A SMALLER, SMARTER,

ADVANCED FEATURES. MORE POWER.

The Ranger® 330MPX™ welder/generator has everything you need to work smarter, not harder. A 25 horsepower Kohler® engine and advanced welding features provide incredible power for every job, while a durable digital interface makes it simple to turn on 330 amps of welding power or 10kW of clean AC continuous power. Use the Ranger's CrossLinc® Technology to adjust settings remotely and the ArcFX® technology to get feedback on your weld.

READY. SET. WELD®

PUSH-AND-TURN DIGITAL SETUP

CROSSLINC® TECHNOLOGY

CONTROL WELD SETTINGS REMOTELY

ARCFX™ TECHNOLOGY

INSTANT FEEDBACK ON WELD SETTINGS

BUY NOW AT

$5049*

*WITH END USER REBATE

For more information visit **lincolnelectric.com/Ranger-330-MPX**

QUIETER, MORE POWERFUL WAY IS HERE.

Lead the way with Ranger. Our engine-driven welder is 20% smaller and 25% lighter while reducing noise by 60%.

330
AMPS
100% DUTY CYCLE

11.5
KILOWATTS
PEAK POWER

25
HORSEPOWER
KOHLER® ENGINE

LINCOLN® ELECTRIC

CONTENTS

STEEL WILLED & STARRY EYED

Alec Steele

The UK-born blacksmith and YouTube sensation uses the power of video to share his passion for metalwork.

12

HELL ON WHEELS

Chris Hrabik

A Missouri-based fabricator and racer approaches challenges and limitations at top speed.

22

ARC

This icon means there's video content available on the *ARC Magazine*™ website.

Visit us at arcmagazine.pub

ARC MAGAZINE

Publisher
Craig Coffey
publisher@arcmagazine.pub

Editor
John C. Bruening
editor@arcmagazine.pub

Art Director
design@arcmagazine.pub

Advertising Manager
advertising@arcmagazine.pub

Digital Media Manager
apps@arcmagazine.pub

Circulation Manager
circulation@arcmagazine.pub

Production Manager
Erin Abed
reprints@arcmagazine.pub

Designers
Brian Kitko
Travis Lefelhoc
Anthony Schneider
Daniel Cromaz

facebook.com/LEArcMedia

@LE_ArcMedia

WANT TO SUBSCRIBE?

Send your name and address to **circulation@arcmagazine.pub** or sign up at **arcmagazine.pub/subscribe** and we will get you on the list!

CONTRIBUTORS

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.

John **Ryland** Writer

John Ryland is the owner of Classified Moto in Richmond, Virginia. A long-time advertising copywriter and art director, John now designs custom bikes and writes and produces Classified Moto's RESTRICTED series on YouTube. He has turned most of his hobbies into work, but he still finds time for minibike wheelies and a good karaoke session now and then.

Mark **Prosser** Instructor

Mark Prosser is a Certified Welding Inspector/Educator (CWI/CWE) who has taught at the college level for 11 years. 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.

Lance **Besse** Instructor

Lance Besse is a welding instructor at the Lincoln Electric Welding Technology and Training Center. His past welding experience includes sheet metal, heavy structural fabrication, and pressure vessels. He is a Certified Welding Inspector (CWI) specializing in ASME and AWS codes, and also a Certified Welding Educator (CWE). Before he was a welder, Lance worked in the high-performance automotive aftermarket industry. His hobbies include road racing and occasional drag racing, and building hot rods and other high-performance cars.

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.

PORT-A-TORCH®

The most versatile tool in your toolbox.

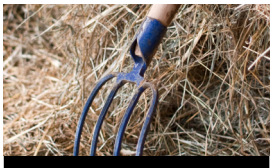
WORKING ON A WEEKEND PROJECT?

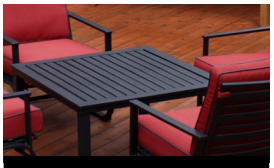
WHETHER YOU NEED TO CUT, BRAZE, WELD OR SOLDER, THE HARRIS PORT-A-TORCH® CAN HELP!

Turn to the HARRIS Pros

HERE'S JUST A FEW THINGS YOU CAN DO WITH A PORT-A-TORCH®!


WELD A WROUGHT IRON FENCE


STRAIGHTEN A BENT PITCHFORK

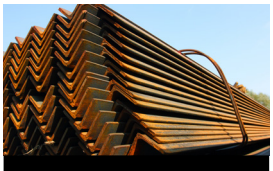

REPAIR PATIO FURNITURE

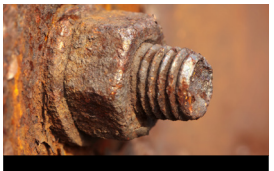

FIX A WHEELBARROW


FIX A METAL TRICYCLE


HEAT A FROZEN LOCK


SOLDER WATER PIPES


CUT ANGLE IRON


CUT OFF A RUSTED BOLT

YouTube

1.800.733.4043
@TheHarrisProductsGroup

THE HARRIS PRODUCTS GROUP
www.harrisproductsgroup.com

HARRIS
A LINCOLN ELECTRIC COMPANY

LETTERS TO THE EDITOR

DEAR EDITOR:

I am a welder/repairman at a mom-and-pop welding supply house in Toledo, Ohio. Our shop distributes *ARC Magazine* to any customers interested in the field. We have a broad clientele, from beginners with many questions to seasoned welding veterans who know exactly what they want and need. This magazine is of interest to both ends of the spectrum. As a Marine Corps veteran, I spend many hours at our local VA medical facility. The wait times for an appointment can sometimes be long, and I like to take several copies of *ARC* with me to spread around the facility so the other vets have an opportunity to read something that's not mainstream news and fluff. *ARC* is a big hit with them. I just wanted to take a minute to pass on my thanks to the staff at *ARC Magazine* for bringing the welding community (and my local vets) a periodical that is entertaining and also educational.

– *Ivol Caudill*
Toledo, Ohio

First of all, Ivol, thank you for your military service. And thanks also for taking it upon yourself to promote the magazine to your fellow vets. *ARC* is intended to educate and entertain folks who are either part of the welding culture or are interested in becoming part of it. We're glad you understand where we're coming from, and we appreciate your enthusiasm to spread the word.

DEAR EDITOR:

What an excellent idea, showcasing the 40-and-under welding generation as part of the Holiday Gift Guide in the winter issue of *ARC*. These are the future of our nation's welding trade. *ARC* and Lincoln Electric did a great job of giving readers ideas for the holidays.

— Bernard Satterfield
New Ipswich, New Hampshire

> "... As a Marine Corps veteran, I spend many hours at our local VA medical facility... I like to take several copies of *ARC* with me to spread around the facility so the other vets have an opportunity to read something that's not mainstream news and fluff. *ARC* is a big hit with them ..."

Thanks, Bernard! Rounding up a cross section of students to help promote some of our gear for the holidays was a fun project. FYI, there were a couple students over 40 who didn't make the final cut in the Gift Guide due to space considerations. In the end, you're never too old to learn a trade – welding or otherwise – as a way to broaden your skill set, increase your earning potential and/or expand your creative options.

DEAR EDITOR:

I recently went into an Airgas welding shop I found copies of *ARC*. I didn't know what I was going to find, but when I saw the *Forged in Fire* team on the cover, that's what pulled me into the magazine. I looked through the issue and enjoyed it so much I read it three times! I especially enjoy how you include some history about welding, and I loved the multi-station table project. I'm going to enjoy getting this magazine every quarter!

— Seth Martinez
Hillsboro, Oregon

We try to include something for everyone, Seth, which can be challenging at times, considering the diversity of our readership. There are a million different facets to the welding trade and the culture that has developed around it over the last several decades, and we throw the spotlight on a few in each issue.

DEAR EDITOR:

I am currently an instructor with the Ohio carpenters and millwrights union. I love *ARC Magazine* because it keeps me informed about all of the new gear. I love reading the individuals' stories as well as the articles about projects and initiatives by organizations. It's always an enjoyable read. Thanks, *ARC*!

— Jevin Williams
Lancaster, Ohio

Glad you're enjoying the magazine, Jevin! Depending one's circumstances, welding can either be a solitary pursuit or a group initiative – but always rewarding regardless.

WE WELCOME YOUR FEEDBACK!

Email us at editor@arcmagazine.pub

Please include your mailing address. If we print your letter, we'll send you a free Lincoln Electric baseball cap or ARC Magazine t-shirt!

We reserve the right to edit responses for the sake of grammar, appropriateness and/or available space.

IN YOUR MAILBOX ABSOLUTELY FREE!

Subscribe now and we'll add you to our mailing list. You'll receive the print edition of *ARC Magazine*.

And it's all absolutely free!

Visit and subscribe today at:
arcmagazine.pub/subscribe

QUESTION MARK

Beginning with this issue, *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'll share some of those questions – and his answers – with *ARC* in every issue.

How thick of a metal can I weld with my small MIG welder?

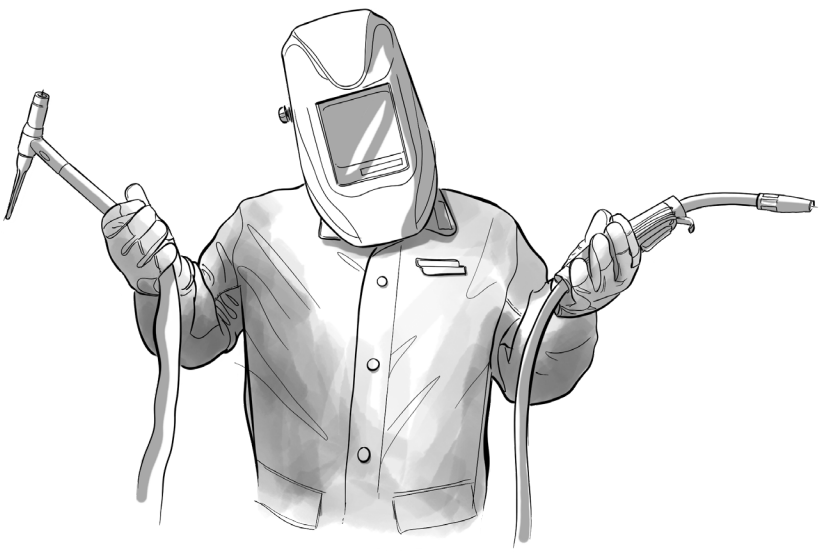
The real question being asked is: How thick of metal can I weld with a single-pass weld? Thick materials can be welded with smaller machines if you have a good understanding of welding technique and welding process. However, as the material thickness increases, so does the need to prepare the weld joint to accept the weld metal. For example, performing a butt joint on 3/8-inch material requires the edges of the metal to be beveled in order to get full penetration at the root of the weld. Even large industrial welding machines have a hard time penetrating through thick materials with a single pass.

A single-pass weld is usually sufficient for a material thickness of 3/16-inch or less, but things change as the material reaches ¼-inch or thicker. The thicker the material, the more prep is necessary, and multi-pass weld layers will be required. Slowing down and making bigger welds is not the solution. On the contrary, it will cause problems with weld integrity. Always remember that no matter how big of a machine you're using, you must stay on the front edge of the puddle to ensure fusion. For most hobby/garage applications, a 200-amp machine would be ideal. If you want to fabricate ½-inch plate, you'll need a larger machine. More importantly, you need proper technique and understanding how to make multipass welds.

Is a MIG weld stronger than a TIG weld?

When properly executed, the MIG and TIG processes both make for strong, reliable welds. The difference between the two processes is the way the filler metal is deposited – and more importantly, the heat involved. It helps if we know the application of the weld. What does the weld need to do? How will it be stressed? How will it be finished? The filler metal for both is the same – usually an ER70S-X – so the major difference between the two is the way the filler is entered into the weld pool. With MIG welding, the electrode is the filler. With TIG, the filler is fed by hand and thus easier to control. The TIG welding process requires cleaner materials, but generally results in better fusion.

Each process has advantages and disadvantages, but if performed correctly, both MIG and TIG can produce welds with excellent strength and integrity.

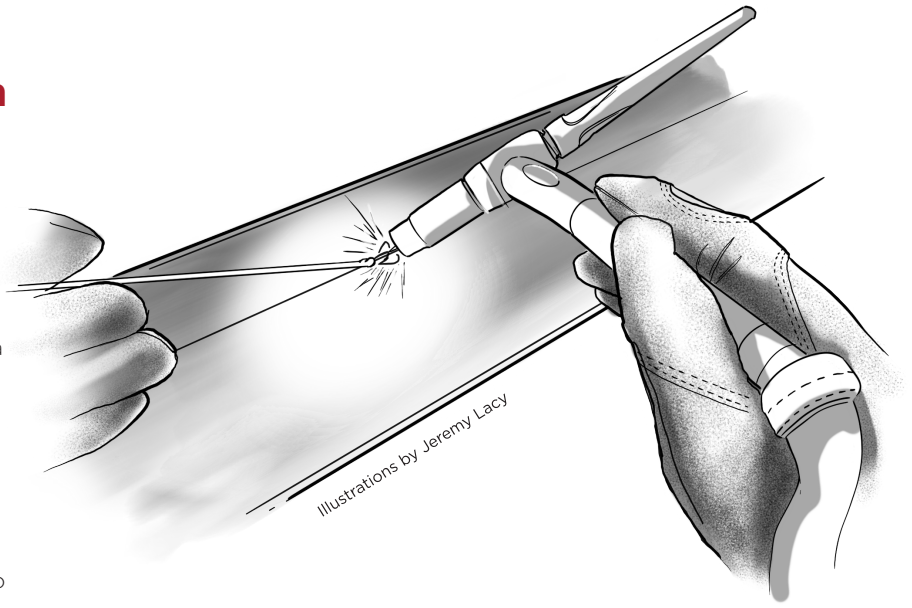


Illustrations by Jeremy Lacy

Why does the filler metal ball up before I can reach the puddle when I TIG weld?

One reason this happens is because of improper travel angles of the torch – or more simply, the torch is laid over too much. Remember that the arc is shaped like a cone or a bell, and when the torch is angled more into the material the arc is directed into the base metal. The filler rod balls up because the arc is being redirected too much from a bad torch angle and is actually deflecting off the metal – much like a Frisbee skipping on concrete. It's often the result of our natural inclination to lay the torch over too far in order to get a better view of the puddle.

When this happens, the arc is not pointed in the proper direction. Try working on body and head positioning so you can see the puddle better. Being comfortable and creating clear sight lines is very important before even striking the arc.



Is a hotter, larger weld stronger than a smaller weld?

One of the biggest misconceptions is that a hot, oversized weld is stronger than a smaller one. I want to address the old saying, "Turn it up and burn it in," "The bigger the weld, the stronger the weld," and some of the other "helpful" mottos we've all heard over the years.

When we do various destructive testing with welds, a good weld often breaks next to the weld, depending on the base metal. This area where the metal was heated almost to melting temperature but did not become liquid is called the HAZ (heat affected zone). Heat changes metal on a molecular level, and the change is usually not for the better. A hotter weld, laid down larger than necessary, is not stronger. It actually weakens the base metal in different ways with the excessive and unnecessary heat from the larger weld. The thickness of the materials determines the size of the weld.

When a weld is tested for integrity, we remove the weld reinforcement on the top and bottom of the weld. The only weld metal being tested is the same thickness as the base material. It's important to remember that bigger welds cannot make the material any stronger. Use the correct size welds for the given material and forget the advice about bigger and hotter.

What size TIG filler should I use for welding sheet metal?

Selecting the diameter of TIG filler for a weld is partly a matter of preference, but the filler should never be thicker than the material to be welded, especially when working with thin materials. If you're welding 16-gauge sheet metal, the filler should be the same thickness or thinner. It takes a certain amount of heat to melt the filler, but if you use filler metal that requires more heat to melt than the base metal, you'll simply burn the material away before the filler can melt.

I prefer .045 filler for 16-gauge and .035 for 18- to 20-gauge. When done correctly, the small fillers produce a small flat weld that requires very little finish work. The wire on your MIG welder can also be cut and used, as it's the same filler that's used for TIG. Smaller TIG filler can also be purchased in .035 and .045 diameters and 36-inch lengths. Once you get into the thicker materials, the filler size must increase too. Thicker materials will require more joint design, material prep, multipass welds and welding technique. Use the size filler that works best for you.

STEEL WILLED & STARRY EYED

Alec Steele, an upbeat and innovative blacksmith and YouTube sensation from the U.K., uses the power of video to connect with an audience and share his passion for working with metals.

BY KATE NICOLOSI

Alec Steele offers tutorials on bladesmithing while he makes steel swords and other ancient weaponry. He shares his intensity, enthusiasm, "mistakes and stupidity" in the name of education and viewership.


KURT

Alec Steele follows his heart, takes risks and occasionally breaks the rules. Despite pleas from teachers and family, Steele left high school to pursue his love of blacksmithing. With no investors or capital, he turned his hobby into a viable business.

It's been a gamble, but a gamble that has paid off. At 21, an age when most blacksmiths are only beginning the long journey toward perfecting their craft, Steele is at the top of his game.

"It's a big decision to make at a young age," Steele says of leaving school at 16 and going to work full time. "My parents explained how much better off I'd be if I finished school. It wasn't a case of, 'This whole school thing is terrible.' I just really wanted to do blacksmithing."

Five years after that decision, Steele is breathing new life into an age-old craft. He's a whiz on the forge, has a cheery personality, toils countless hours in his workshop, and spends his free time devouring books about business.

Click on his YouTube channel and you'll see Steele at home in his industrial space lined with British and American flags representing the two countries he loves. It's the backdrop for a frenetic Steele, who scribbles math calculations on the fly and does all the heavy lifting, pounding, hammering, heating and creating – always with a smile. Steele offers tutorials on bladesmithing while he makes steel swords and other ancient weaponry. He shares his intensity, enthusiasm, "mistakes and stupidity" in the name of education and viewership.

"MY JOB IS TO SHOW PEOPLE HOW TO CREATE THINGS."

As Steele entertains online viewers – his channel has about 1.6 million subscribers – he pulls back the curtain exposing the imperfect process of building.

"It's trial and error and learning," he says. "It is not only extremely normal in my workshop, its normal in most workshops. My job isn't to be the perfect craftsman. My job is to show people how to create things."

His typical viewers love metal working and blacksmithing, but they also tune in for the fun. "They are invested in these crafts – as a hobby or professionally," says Steele. "Even then, they are not watching because they want to learn. They are watching for entertainment."

WATCH ALEC ON YOUTUBE
youtube.com/alecsteele

VISIT ALEC ONLINE
alecsteeleblacksmith.com

Today, instead of making things for people, Steele makes videos about making things. His business is media content and his brand is his captivating personality.

Steele is the star, and the format that includes a power hammer beating in sync with rock music is exciting to watch. The videos are a way for Steele to share his passion for creating with a broad audience of like-minded viewers.

To understand how Steele became a top blacksmith and translated that skill to a prolific content creator in a space dominated by older craftsmen, you have to go back a decade.

As a child in Norfolk, England, Steele enjoyed working with his hands – especially with his father, whose background is in woodworking. It was a good place for the boy to start, but it was metal that really intrigued him. "The first time I heard it was possible to drill a hole in steel," he says, "my mind was completely blown."

Steele witnessed blacksmithing first-hand when he visited a country fair at age 11. He stumbled upon the local blacksmith "hammering away in a little forge" and making trinkets and leaf pendants for key chains.

"On this rainy July day, I was completely captivated," he recalls. "Completely mesmerized. It was unbelievable. You can take steel, heat it up, hammer it and turn it into something beautiful? I absolutely had to try it."

So Steele created his own primitive "hole-in-the-ground charcoal forge" with items from around his house and a section of railroad track given to him by James Spedding, the local blacksmith at the fair.

"YOU CAN TAKE STEEL, HEAT IT UP, HAMMER IT AND TURN IT INTO SOMETHING BEAUTIFUL? I ABSOLUTELY HAD TO TRY IT."

Steele bought a used forge and an anvil with money given to him for Christmas and birthdays. He practiced every weekend, "making hundreds of hooks and hundreds of leaves, repeating it over and over and over again," he says. He never tired of the process.

Steele also benefited from others who loved the craft. "Amazingly, other blacksmiths let me loiter and help out in their shops," he says. "People have been incredibly gracious and generous with their knowledge."

1.67M SUBSCRIBERS ON YOUTUBE

CURRENTLY 21 YEARS OLD

10 YEARS AS A BLACKSMITH

RESIDES IN MONTANA

One such person: A Mississippi-based blacksmith named Brian Brazeal, with whom Steele trained during holidays and summer breaks.

"I was fascinated by the beautiful hammers and tools he was making, and the reasoning behind them," says Steele. "He spoke a lot about rationalizing every step along the way, including the period of time you have when hot steel is coming out and working it before it cools down."

Steele took what he learned and jumped in with both feet. He opened his own shop at age 16. The message from friends and family to stay in school wasn't lost on him.

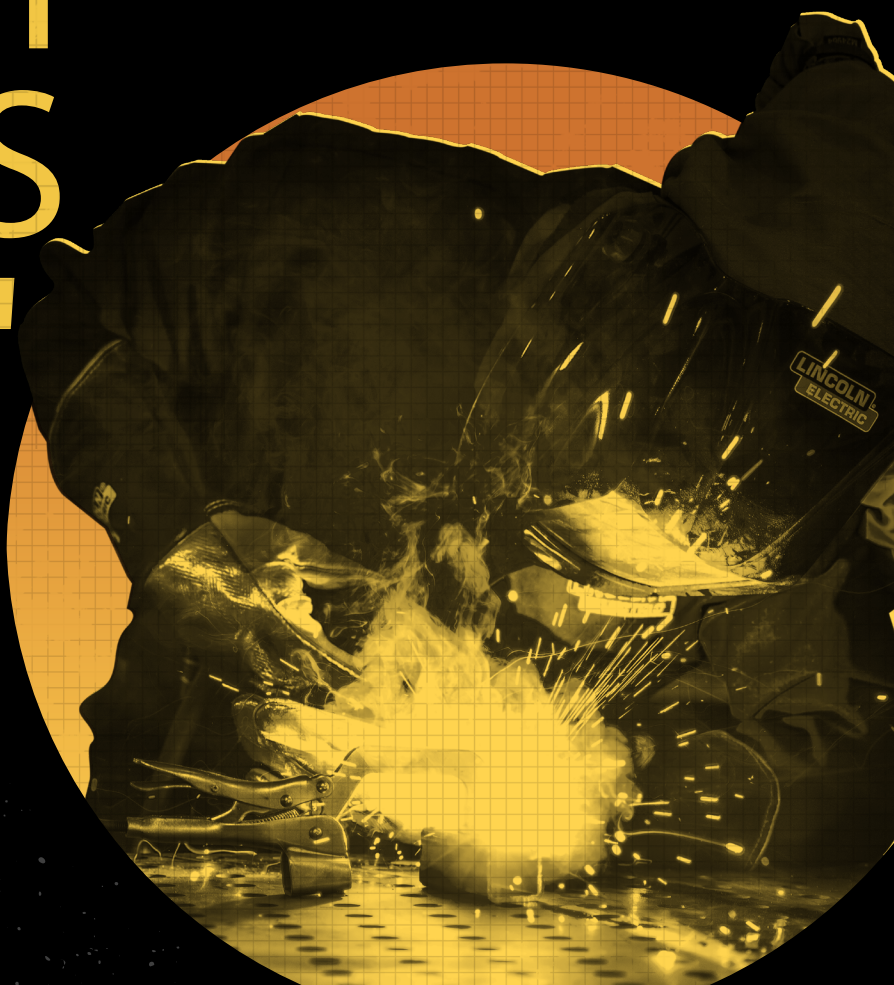
"If I hadn't been able to properly answer the pushback, if it had swayed my determination, then good," he says. "Because [if I gave in] I wouldn't have been cut out to leave school and start my own business. There is a pretty good textbook way of getting yourself into a good spot in life. It is to finish school, go to university, get a degree and work your way up the career ladder. It's not an easy thing to stay steady in the force against pressure and pushback."

Certain practical matters, such as not being old enough to drive a car, didn't dampen his spirits. Steele had to be resourceful when hauling materials back to his studio. He used duct tape to fasten them to back of his bicycle. "That's how I had to get it done," he says. "I had to get original. I had to get my hands dirty."

To pay the rent on his small studio in the outskirts of town, Steele made architectural inlays and sculpture for customers. That evolved into making custom tools for other blacksmiths. Steele made the business work with "sweat and sheer force of will," he says. There was a time when finances were precarious.

With the rise of the maker culture, craftspeople are not only making things but also sharing their creative journeys online. Steele, a standout in this space, believes other makers offer a boost to his own business.

"I HAD TO GET ORIGINAL. I HAD TO GET MY HANDS DIRTY."



"There is so much to gain from other people being successful in the niche. It's inspiring and helps me to be better. I think it's fantastic that other people are sharing their work and getting more people interested in building and making stuff."

"I was thinking to myself 'OK, I have 18 cents in my bank account. I need to pay $230 workshop rent next week. What am I going to do?' You get very creative in ways to make a living."

Eventually he became a teacher, training other blacksmiths how to make their tools. Many of Steele's clients were older and more educated, but Steele's knack for explaining things kept students engaged.

"I've always been a little bit of an effervescent cad, so to speak," he jokes. "If I was 17 teaching a 65-year-old, or a top-end London barrister, I always try to be professional and take the time. I want to give my customers a great experience. Not just make a hammer but make something beautiful at the anvil."

Any good entrepreneur makes adjustments to the business plan, which is how Steele became a YouTube sensation. "It was an evolution," he says. "How am I going to point the ship and make tweaks and aim it in the right direction?"

Today, instead of making things for people, he makes videos about making things. His business is media content and his brand is his captivating personality.

Making a sale "doesn't really come into my mind in the process [of building]," he confesses. The whole business is structured around producing content. "I'm going to put my focus on content because this is scalable. The aim is to make a really great piece, share the love of craft with people and generate revenue through advertising, sales and merchandise on YouTube."

Steele's projects are chosen based on what viewers want, what piques his own creative interest and what will generate views. Hundreds of his YouTube videos are free to the public. More specific tutorials are behind a paywall for a one-time fee.

Steele's purpose, in addition to generating revenue, remains consistent: "To give as many people as possible 15 minutes of entertainment sprinkled in with some education, a little bit of enjoyment, and the opportunity to get inside the world of craft that has always intrigued them."

For example, in a recent episode when Steele forges a Scottish Claymore sword too wide, he turns to the camera to discuss the options to fix it. By the end of the show Steele has found a fix and viewers have weighed in through online comments. By the final episode in the series, Steele's sword is artfully completed.

With the rise of the maker culture, craftspeople are not only making things but also sharing their creative journeys online. Steele, a standout in this space, believes other makers offer a boost to his own business.

"My thought is very much, 'A rising tide lifts all boats.' There is so much to gain from other people being successful in the niche. It's inspiring and helps me to be better. I think it's fantastic that other people are sharing their work and getting more people interested in building and making stuff."

Last year, Steele broke from the norm and sold a Viking Sword that took nearly three months to make. The proceeds – $23,000 – helped him fund his move from the U.K. to the U.S. The sword was also a way "to create a beautiful piece of craftsmanship for the YouTube channel and see how the market responded to offering my larger pieces for sale," he says. Given the positive response, Steele intends to do something similar in the future.

Now that Steele is making the mountains of Montana his home he is excited for what's next.

"I love the big open spaces," he says. "It's a dream. It's just beautiful here. I've always loved America. Growing up, watching American movies, I always loved the people, the culture. I love the possibility of the U.S. There's vitality and progress here."

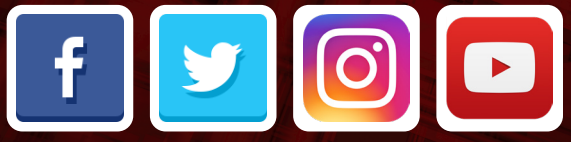
Back in the U.K., The History Channel's *Forged in Britain* series just wrapped *Forged with Steele*. It included 18 episodes of Steele showing his skill in recreating historic weaponry, including knives and swords. Perhaps there will be more television in his future. For now, though, Steele is keen to focus on the world of YouTube – and the joy of making things.

Once a one-man show, Steele churned out 120 hours of work a week and pushed himself to the limit. Today, Steele employees a full-time bladesmith, an administrative assistant and a part-time videographer.

"I want to keep growing the team and make as much good content as possible," he says. "Many people don't have the hunger that I do. I want to provide value in the marketplace with my passions for creating. I'm 21 years old. I'm at the very beginning of this journey and craft." **ARC**

GET MORE FROM ARC MAGAZINE

CONNECT WITH OUR SOCIAL CHANNELS!



Like us on Facebook
facebook.com/LEArcMedia

Follow us on
Twitter & Instagram
@LE_ArcMedia

Subscribe to our
YouTube Channel
youtube.com/ARCMagazineTV

POWER MIG® 140 MP®

THE WELDER TO HAVE
IF YOU CAN ONLY HAVE ONE

COMPACT VERSATILITY.

The POWER MIG® 140 MP® is a lightweight and portable multi-process welder that connects to 120-volt power and enables you to choose from a variety of processes: MIG, Stick, Flux-Cored and DC TIG. The intuitive interface and easy setup will get you started in no time.

VERSATILE PERFORMANCE

CHOOSE FROM MIG, DC TIG, FLUX-CORED AND STICK WELDING

EASY TO USE

INTUITIVE INTERFACE AND SIMPLE SETUP

COMPACT DESIGN

LIGHTWEIGHT AND PORTABLE

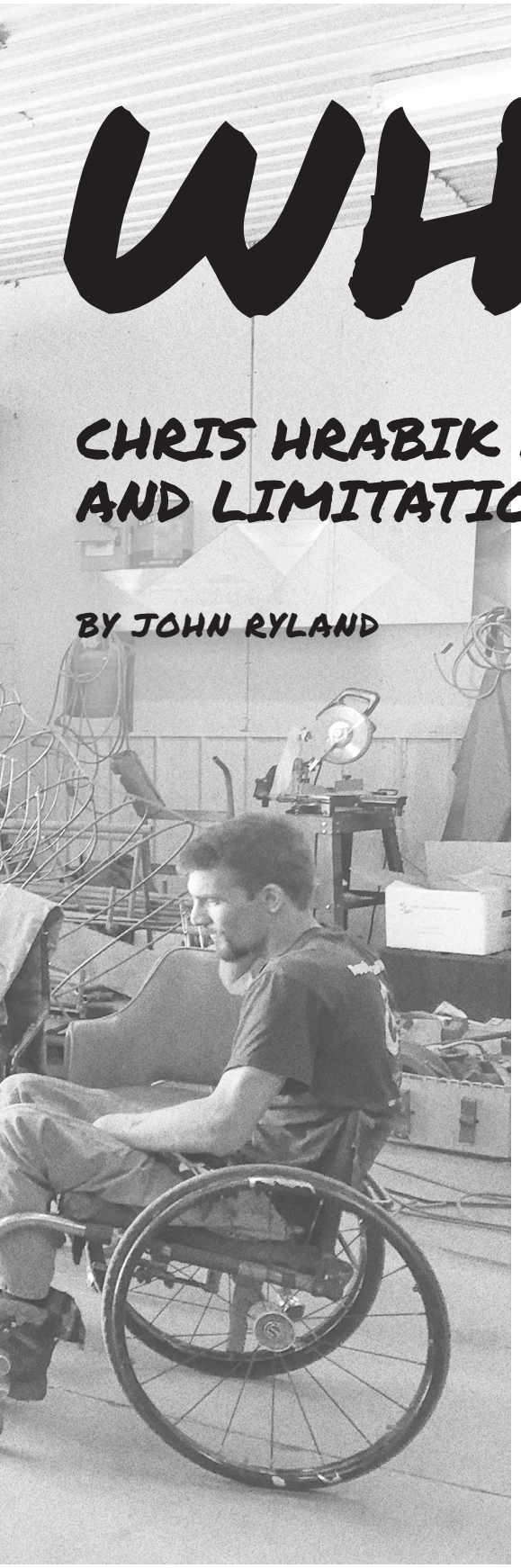
STARTING AT

$782

For more information visit
www.lincolnelectric.com

LINCOLN® ELECTRIC

HELL ON



WHEELS

CHRIS HRABIK APPROACHES CHALLENGES AND LIMITATIONS AT TOP SPEED

BY JOHN RYLAND

From the passenger seat, Chris Hrabik felt the country road slide out from under him. Loose gravel had gotten the best of his girlfriend as she learned to shift gears in his truck.

It was almost no big deal.

Had it happened 20 seconds before or after, that memory from 2004 would barely register now.

But context is everything. The shoulder was steep, and the truck took a lazy sideways roll down an embankment, breaking Chris's neck in the process.

He was 18 and he wouldn't walk again.

Fourteen years later, I'm looking for Apple Creek Metal Works — the welding and fabrication shop Chris owns in rural Missouri. It's not easy for a Google mapper like me to find, but as the saying goes, "you'll know it when you see it."

In the grass between the road and the shop, a rusty oversized fish is hooked to a 25-foot rod-and-reel sculpture. Across the driveway I see a steel dragonfly — graceful wings welded to a massive auger bit.

There's also a nearly full-size metal palm tree rusting happily against a wall.

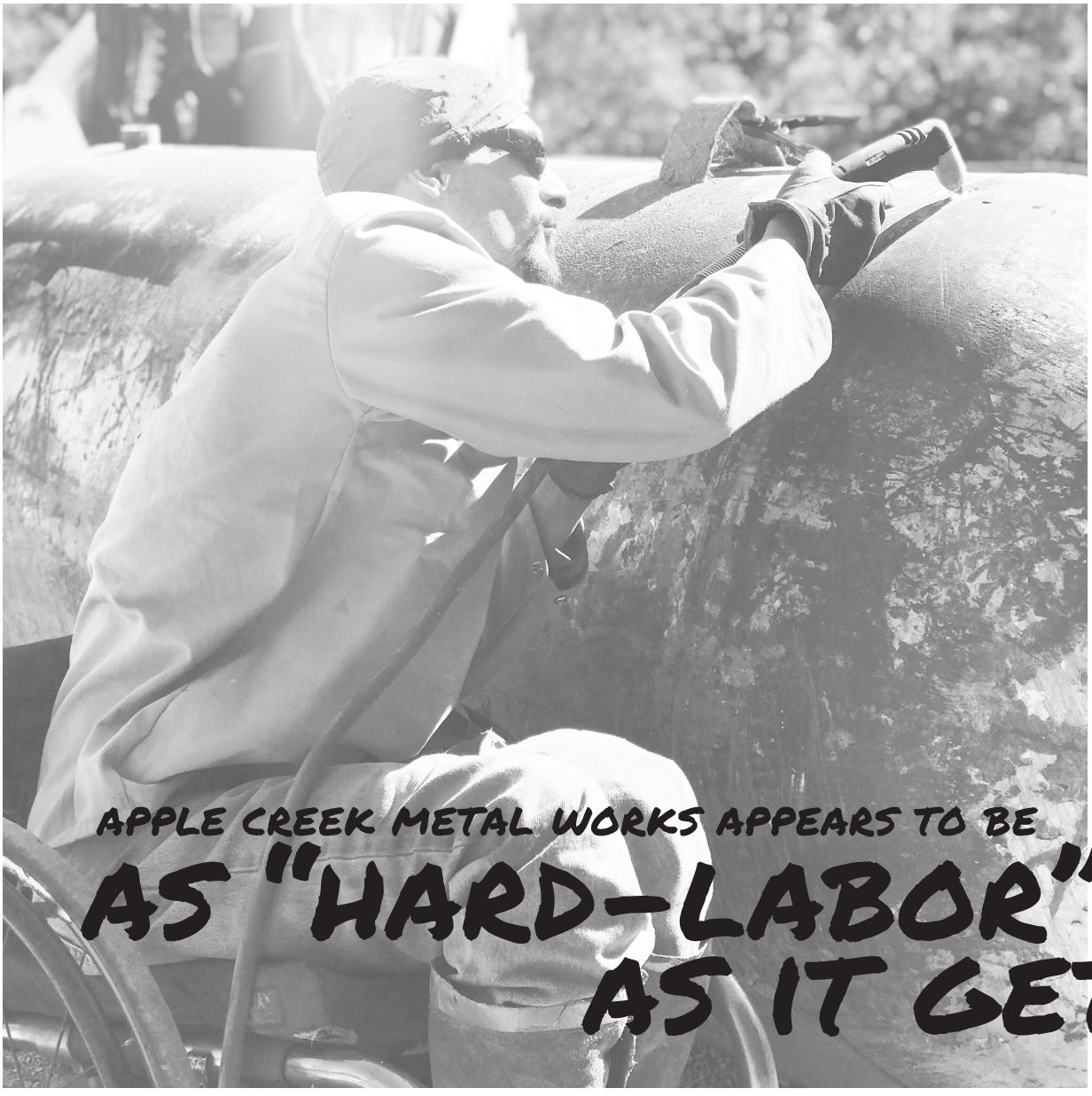
Oh, and livestock. I count three goats in a pen studying me as I pull up to the garage.

What I don't see is anything that even pretends to accommodate the owner's disability. Artwork aside, Apple Creek Metal Works appears to be as "hard-labor" as it gets — rugged acreage punctuated by stacks of heavy material, scrap, agricultural implements and works in progress wherever space allows.

Someone stays very busy here. But it's hard to imagine how a wheelchair gets around the place.

It's harder still to picture which Chris Hrabik will greet me at the door. Tough, blue-collar welder? Mild-mannered artist-type? Wisecracking fabricator?

It's fair to say Chris is all of the above. But at his core, who is he really?



APPLE CREEK METAL WORKS APPEARS TO BE

AS "HARD-LABOR" AS IT GETS

Throughout my visit, I watch Chris do one thing after another that, honestly, makes me feel like a complete wimp. It's next to impossible not to question my own ability to do what he does were I in his situation.

But I also feel like I'm buying into a cliché for framing my observations in the context of a wheelchair.

The fact that Chris is paralyzed is certainly part of his story, but that context seems less and less relevant as I get to know him. He has plenty of workarounds for the physical obstacles. It's impressive but it doesn't define him. So we talk about what's in his head.

Chris can get pretty deep into the specifics of fabricating and repairing heavy equipment. He's proud of his work ethic and has sharp opinions about companies that cut corners or engineer obsolescence into their products.

He's a smart guy, and he seems wise beyond his 33 years. He'll get fired up over politics and society's wastefulness. He'll talk at length about diversification as a tactic for weathering the slow times.

But if you want to know where Chris's true passion lies, ask him

about the battle-scarred Subaru in the driveway.

He lights up, and his true identity is revealed. My host is most definitely Chris Hrabik, Race Car Driver.

There's uncertainty every day about his business, but not about what motivates him to do it.

"I got into welding because I wanted to build and race rally cars. That's why I have this shop.

"Purely selfish reasons," he grins.

Rally racing dates back pretty much to the invention of the automobile, and has existed in its current white-knuckle, high flying form since the 1970s. Feisty compact cars — filthy and battered — twist one at a time through serpentine roads in harsh conditions.

The speeds are extreme and demand that the drivers and their navigators be equal parts technician and daredevil.

Courses in Europe are often lined with frenzied fans who congregate dangerously close to the biggest jumps and fastest turns. Crashes are common and tend to be spectacular.


Missouri
MEO-S4T

Extreme sports heroes like Travis Pastrana and Ken Block have brought attention to rallying in recent years, but the discipline is still relatively underappreciated in the States. That is to say, it attracts uncommon spectators — and uncommon drivers.

"Rallying is the purest form of motorsport in my opinion. You have street legal cars, real roads, unpredictable conditions. You have no pit crew. No ambulance nearby."

Chris lists the perils of rally racing like someone somehow in need of more challenges in his life.

"It's man, machine — and that's it. There's no, 'Oh, it's raining, let's pit and cover our cars up and get into our tents.' As long as there's not a tornado," he shrugs, "we're racing."

After a few introductions that include Chris's parents Bob and Linda, his friends Robbie and Nelson and his pet dachshund Porkchop, we migrate out front to the race car he built with help from his buddies.

To the uninitiated, it's nothing too noteworthy. It's not flashy or covered in sponsor decals. It's missing its front bumper cover and some other parts. The trunk lid is held shut with a bungee cord.

But if you know what you're looking at, it's impressive.

The little two-door has full racing seats and harnesses, with an intricate roll cage meant to withstand a major impact. It has top-of-the-line competition rally tires that you can't get just anywhere.

And most interestingly, it has a clever set of hand controls that enable Chris to drive despite his limitations. And not just the "point-A-to-point-B" kind of driving, either. More like the sliding sideways, rooster-tailed, nausea-inducing kind. It's what the sport requires.

Later on, watching Chris let loose behind the wheel — blasting through the gravel piles at a nearby rock quarry — it's easy to see what he gets out of it.

HIS TRUE IDENTITY IS REVEALED... CHRIS HRABIK, RACE CAR DRIVER.

I'm watching a man making up for lost time.

After his accident, Chris was left without the use of his legs and only partial use of his hands. Yet as he lay in a hospital bed, his biggest regret was having not taken more risks in his life.

"Back then, I just wanted to fish and work," he laughs. "I had a friend who would do backflips on his dirt bike on homemade jumps. And I loved going to watch him, but you could never pay me enough money to get on that bike. My viewpoint at the time was, 'Oh, that kind of thing is too dangerous.'

"But after my injury, I looked back and said, 'I'm not doing that anymore.'"

Life is too short for any of us. And statistically speaking, even shorter for Chris due to complications from his injury and the physical toll they take. That fact has instilled in him a sense of urgency to push himself out of his comfort zone – in every sense.

"In life and racing and anything, really, you have to take risks and you have to, you know, be willing to hit that tree." He laughs at his choice of words.

For Chris, the willingness to hit that tree is sometimes literal. But more and more lately it means laying it on the line in front of hundreds of people listening to what he has to say. The possibility still exists to crash and burn.

When he's not working or racing, Chris can be found at schools, businesses and other institutions, offering words of encouragement he hopes will inspire his audience to achieve something unexpected.

Chris has seen the kind of lows that can leave a person without hope or motivation. And he knows a "get-off-your-ass" drill sergeant speech isn't necessarily the answer, tempting as it might be sometimes.

Instead, he preaches the gospel of chasing your passion.

"Your passion is your motivation. Find yours and go for it," he says matter-of-factly.

"And not just something you like to do. I mean your real passion. The thing you have to achieve before you die. That's what you'll derive your motivation from."

Does Chris love to fabricate and weld cattle feeders or repair rock crushing equipment? Actually, yes. Sometimes. But it's not his passion.

And it doesn't have to be.

Chris says his advice can be misinterpreted to mean, 'Take your passion and make it your job.' But his point is more advanced than that.

"My passion is racing. I'm not a professional race car driver and I probably never will be," he explains. "But I found a career that allows me to support what I love to do."

Chris chose to make a living welding and fabricating — things that also further his racing obsession. Someone else might work for an airline to support their travels, or pick up extra shifts to pay for their guitar habit.

And that's great in Chris's view. His advice is really about perspective. Take pride in your work. But build your life around joy.

"I work constantly, so I can have that little bit of joy," he says. "It's a lot of work, but the reward is huge."

On and off the record, Chris talks about the highs and lows of running a business, his recovery, relationships, general trials and tribulations and other aspects of life. It's a bona fide saga, but he's telling me because I'm asking. Not because he's prone to dwell on the past.

In fact, Chris will tell you straight up that he's all about what's next — not some romanticized version of the process. This seems a bit out of character, but it's the passion talking.

"Your passion is your motivation"

"Everybody says, 'It's not the result, it's the journey,'" he says. "No, I don't believe in that. Because when I did my first rally in 2013, I had been through almost ten years of hell — and that all just went away. It didn't matter anymore. I was in a rally car, in a staged rally race. I had a license. I was legitimate. And very few people — especially in my condition — had ever done it."

He adds: "I forgot all about the journey."

In work and play, Chris is focused on the end result, whether it's a hand-built cattle pen or a successful rally stage. And it seems all his decisions funnel to that result.

"I don't need much," he says. "There's beauty in simplicity. Somebody wants to get a brand new phone. That's their big goal for that month? I want machines I can put to work. I want old machines I can save from the scrapyard."

Chris sits proudly in his shop, surrounded by tools he's acquired or built. Most are recognizable. Some are not. But they all exist in service to the final product.

His welders and benders and tricked-out, tank-treaded wheelchair are tools. His $50K loader is a tool. The three-dollar two-by-four in the corner is one, too.

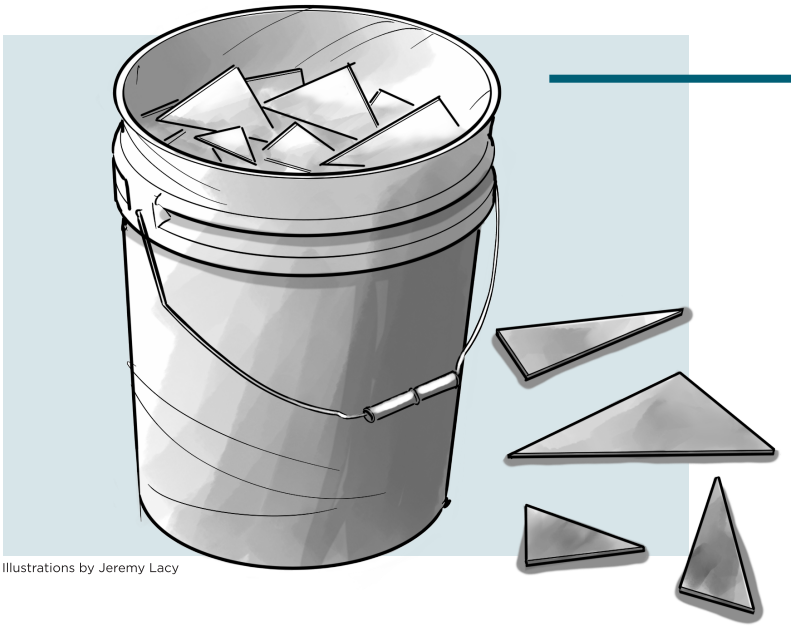
"A board is a tool," he says. "A chain is a tool. Everything can be if you use it to gain the advantage. "They always say, 'With the right lever you can move the world.'"

In Chris's world, true passion is the best lever he's come across. **ARC**


Missouri
ME0 S4T
Nelson

WELDING HACKS & TIPS

We've scoured YouTube to bring you time saving, money saving ideas to improve the quality of your projects, and the process by which you complete them. The complete versions of these tips and more can be found at ARCMagazine.pub.



Illustrations by Jeremy Lacy

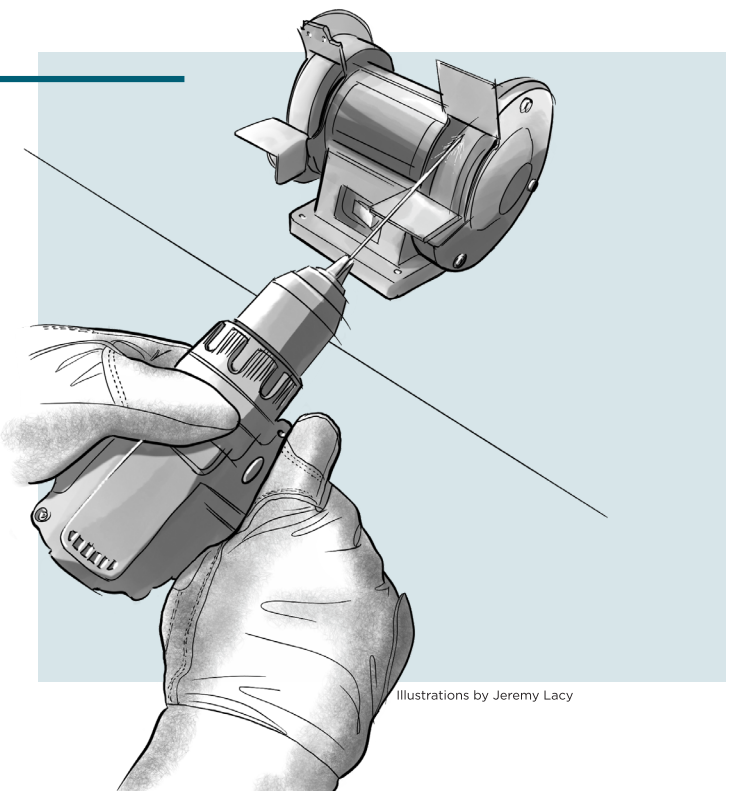
SAVE THOSE TRIANGLES!

Any time you're cutting plate and end up with scrap in the shape of a right triangle, save those pieces in a separate bucket or bin for later use. Next time you're working on a project that requires gussets, you can reach into your handy collection of triangles and save yourself a lot of time. Thanks ChuckE2009!

SHARPENING TUNGSTEN FASTER AND MORE EVENLY

If you need to quickly sharpen a piece of tungsten for TIG welding, chuck it into your famous cordless drill before taking it to the grinding wheel. Trigger down on the drill to activate it, then set it against the grinder. The two spinning surfaces will make quick work of sharpening the tungsten to a point, and will ensure that an even cone shape is created. Attributed to APEX Welding.

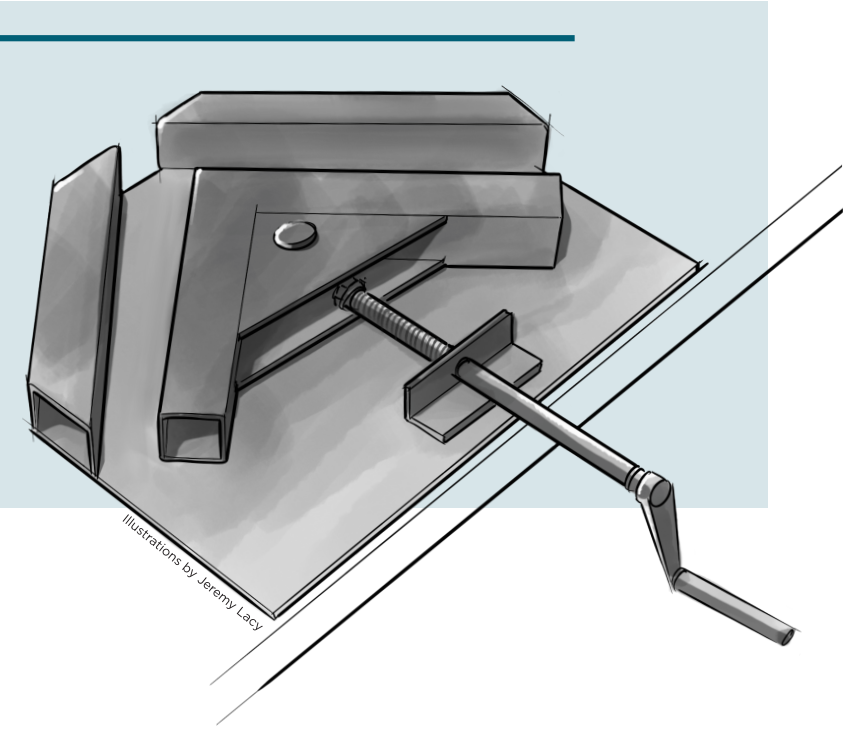
Note: Be sure to use a grinding wheel that's made for tungsten only. A carbon steel grinding wheel will contaminate the tungsten.



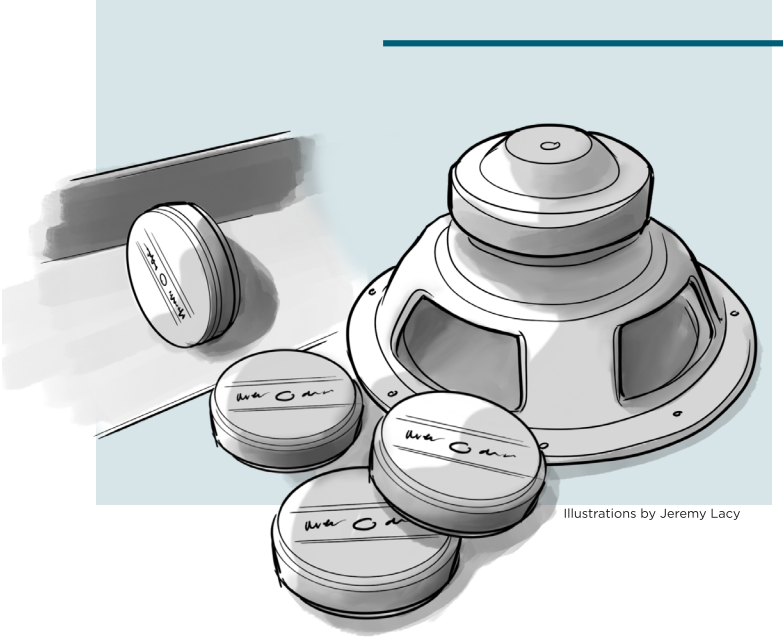
Illustrations by Jeremy Lacy

90-DEGREE CLAMPING VISE

This project was brought to you by the YouTube channel Mr. Novruz, and can probably be assembled from pieces you have in your scrap bin. The unique pivoting center point ensures that you get a 90-degree angle every time, even from materials that are not the same dimension. Great for holding square tubing to assemble corner joints or even coped round tubing or stock.



Illustrations by Jeremy Lacy



Illustrations by Jeremy Lacy

SPEAKERS YIELD MAGNETIC HOLDING TOOLS

With smaller, "smarter" audio speakers replacing the woofers and tweeters of old, there's a good chance you have a set of cabinet-style speakers in your attic or basement ripe for repurposing. If not, your local landfill is probably getting daily deliveries. At the core of these speakers is a high-grade magnet that can be harvested and used to hold pieces of steel in place for welding. To find them, just open the cabinet to access the speaker cone. Strip away all the material until you get to the magnetic core, then grind the faces flush for that perfect extra set of hands for any project. Thanks to ZippoVarga for this simple tip.

EDUCATOR SPOTLIGHT

KEVIN COLEMAN

UNIVERSAL LANGUAGE

By John C. Bruening

Kevin Coleman is invested in making connections in places where they're often hard to make.

He teaches welding in two very different environments in the same city: Central Carolina Community College and the Harnett Correctional Institution, both located in Lillington, North Carolina.

Coleman is equally committed to the students in either setting, but what he does feel most passionate about is the importance of vocational training, regardless of the setting. "I think schools and other training institutions should be flooded with vocational programs," he says. "Not everybody is going to be a doctor. You need mechanics to fix your cars. You need welders to build and fix things."

He's spent more than half of his 43 years as one of the builders and fixers. His first experience with welding was a high school vocational training course in the early 1990s. He later earned an associate degree from CCCC that led to a series of jobs in the industrial trades: welding, mechanical engineering and tool and die work.

After more than 25 years of real-world experience, he started teaching MIG, TIG and Stick welding at the correctional facility four years ago. Two years later, he began teaching similar courses at the community college.

The nine-month welding program at the prison includes 17 students from various backgrounds. His same course at CCCC includes 10 students who meet two nights a week for four semesters.

Teaching in the prison setting can be especially challenging, as the education levels of individual student inmates are "all over the map," he says.

"You may have someone with a third grade education level and reading level, all the way up to a college graduate," he says. "That can make for a very awkward classroom situation."

But Coleman can walk the tightrope. "I can have a conversation with a highly educated person as well as I can have a conversation with a person who is not quite as educated," he says. "I think most of my students appreciate that from me. I can get the information across without having to go way over their heads, or having to dilute it to the point where it doesn't help them. I like to talk about concepts, and then I like to take them into the shop and show them how to apply those concepts. I mix the book material with the hands-on experience, and that means a lot to them."

Last fall, *ARC* received a letter from the Harnett facility signed by 19 inmates who have taken Coleman's welding class. They wrote:

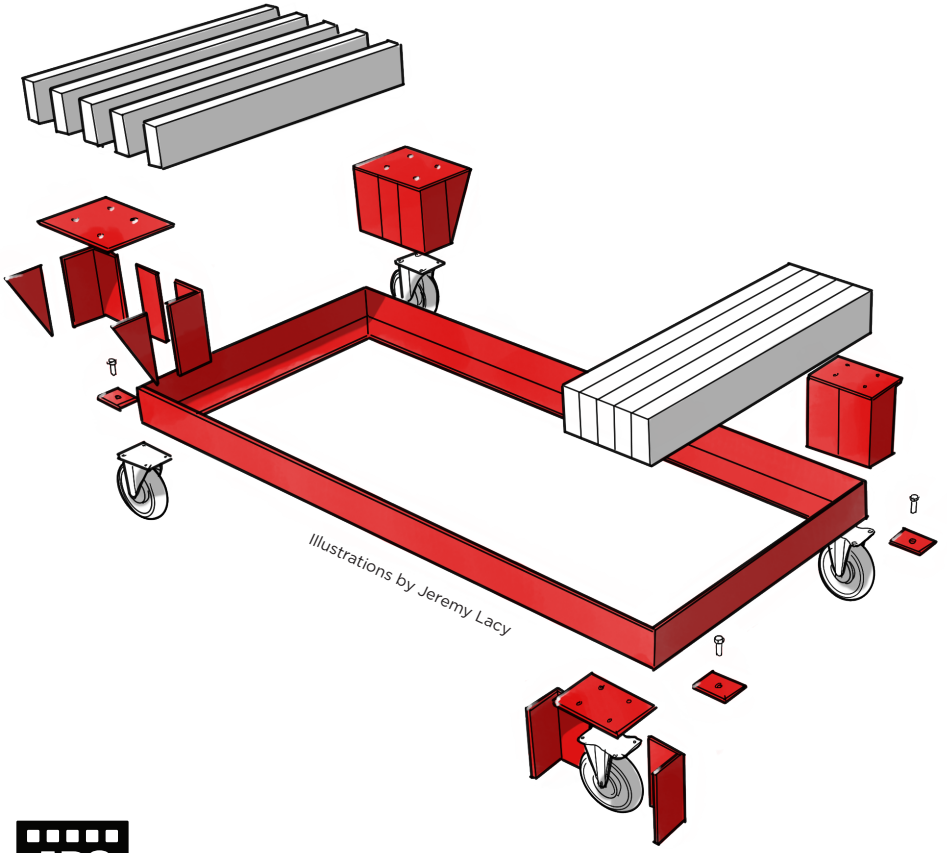
"More than just helping build friendships and vocational skills in a shop or working environment, he's teaching us a life-changing, perhaps even a life-saving skill set. Some of us never had jobs. Others couldn't hold one down due to struggles with addiction. Some may have never considered themselves 'smart enough' to be a welder or a metal fabricator. No matter the decisions, circumstances or events that landed us in here, we're at least leaving with a better shot at doing something positive with the rest of our futures."

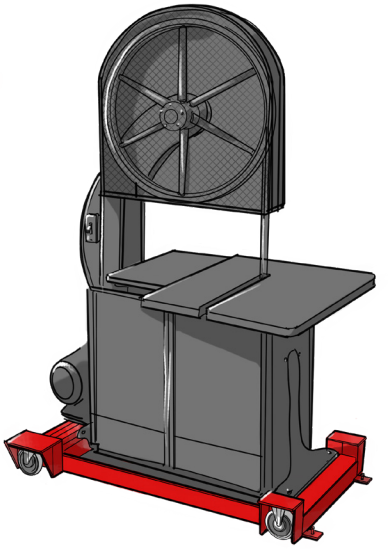
Coleman says seeing his students "get it" is the most rewarding part of the job, especially when those students are in a place where options are limited. "At first they say, 'I can't get it, I can't get it," he says, "but I don't let them give up. I just keep pushing them and pushing them. Next thing you know, they come to me and say, 'I got it," and that's great. That's when I know I'm doing my community a service. I'm doing something worthwhile in my little corner of the world." **ARC**


HE'S TEACHING US
A LIFE-CHANGING,
PERHAPS EVEN
A LIFE-SAVING
SKILL SET.
BSX

WHEELS FOR A GIANT BANDSAW

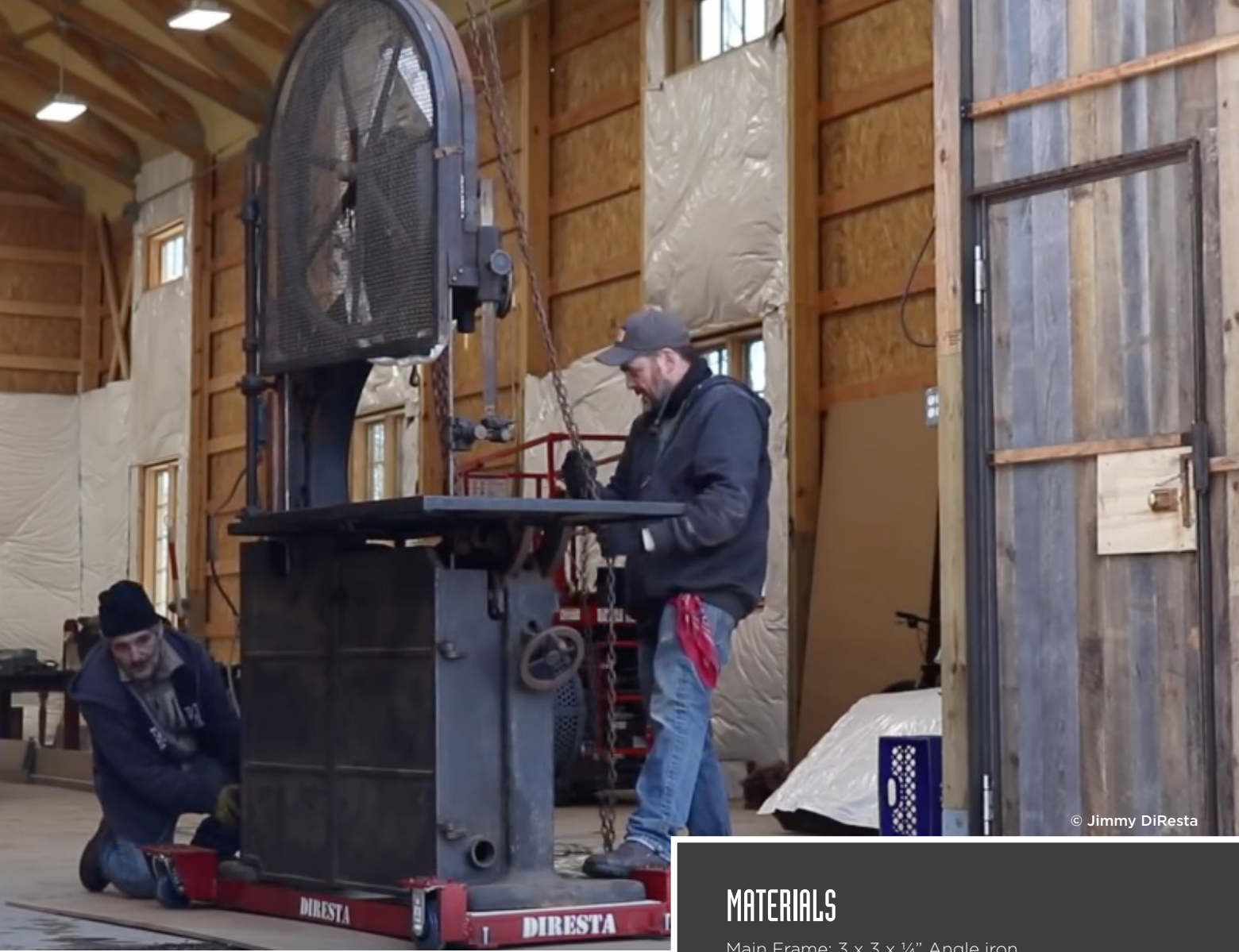
By Jimmy DiResta





Watch exclusive footage at arcmagazine.pub

Over the course of his career, Jimmy DiResta has amassed and astonishing number of vintage stationary tools. But stationary tools are, by nature, difficult to move – and in a shop that's constantly in flux, that's not a good thing. In this Project Spotlight, Jimmy builds a mobile base for a vintage bandsaw weighing in at approximately 1500 pounds. Because this will be a working addition to his collection, he wanted to build a base that could be mobile so he could easily jockey it around his shop, but also be locked in place when in use. Also, adding an additional six inches or more to the working height of this saw would make it uncomfortable to use, so it had to be built low to the ground in order to be functional. To accomplish this task, Jimmy used a very limited amount of materials from his scrap pile, and welded everything using the flux cored process. This process and technique can be adapted for any large tool in your shop.



© Jimmy DiResta

MATERIALS

Main Frame: 3 x 3 x ¼" Angle iron
3/4 inch bolts
Hardwood for cross members
5 Inch casters, rated at 400 lbs each

WELDING/CUTTING EQUIPMENT AND TOOLS

Lincoln Electric Power MIG® 260
Flux cored wire
Large welding/clamping square
Drill
Angle Grinder
Cutting and flap disks

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.

Step 1: Cut and prep metal for the base frame

Carefully measure your tool's base. Using a bandsaw or other metal cutting saw, cut lengths of angle iron to make up the length and width. Using an angle grinder equipped with a metal cutting blade, create lap joints by cutting out a 3-inch square piece from each mating piece.

Step 2: Square and weld the base frame

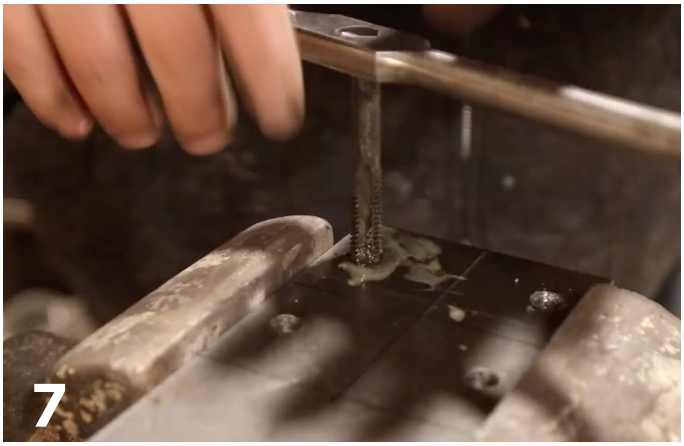
Using a large clamping square, clamp each corner together, first tacking, then finish welding as you go. Weld the horizontal as well as the vertical joints at each corner.

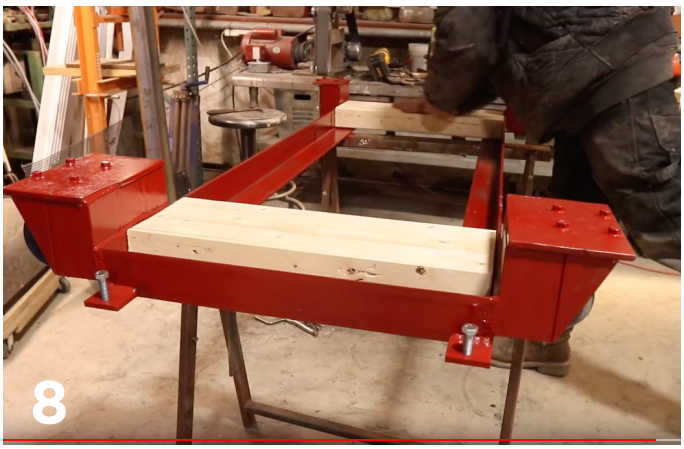
Step 3: Fabricate the "outriggers"

In order to keep the base of the bandsaw as low to the ground as possible, fabricate outriggers out of lengths of angle iron. Each outrigger is fabricated from two pieces of angle iron with a 3 inch filler piece in between. This can be adjusted based on the size of the caster you're using. On the front outriggers, an additional angled piece is added to provide clearance, since the front casters swivel and the rear casters are fixed.

Step 4: Join the outriggers to the frame

Using total height of the casters as a guide, clamp the outriggers to each corner of the frame. Once welded in place, cap each outrigger with a piece of ¼-inch plate, cut to fit. These cap plates will be the mounting points for the casters.





Step 5: Mount caster to outriggers

Using a caster to mark the bolt hole locations, drill four holes in each outrigger cap to accept the mounting bolts. Remember that the fixed casters should be at one end of the frame and the swivel casters should be at the other end. Once the nuts and bolts are sufficiently tight, use an angle grinder to cut the bolts flush.

Step 6: Fabricate lifting plates

Now that the basic dolly for the bandsaw is complete and mobility has been established, it's time to tackle the objective of keeping it stationary. Segment a piece of ¼-inch steel plate so that when cut, you'll end up with four pieces, roughly 2 x 2 inches square.

Step 7: Drill and tap the lifting plates

Before cutting the segments, drill and tap a ¾-inch bolt hole in each segment. It will be easier to do now rather than later. As the ends of these bolts make contact with the ground, they will apply pressure against the floor of the shop to immobilize the bandsaw. Weld each of the lifting plates into place at the front and back of the dolly frame.

Step 8: Apply finish, add cradles

If you're planning to finish your dolly, now is the time to do it. In order to distribute the weight of the tool to more than just the corners, take the time to fabricate cross members to act as cradles out of some scrap hardwood.

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

SCULPTING ON WHEELS

By John C. Bruening and Dan Cromaz

Since he was a young boy, Jamie Schena has been fascinated with things that go. A veteran of automotive design by day, his metal sculpture reflects that affinity for motion.

Maybe it's in the DNA. Back in his homeland of Trafalgar, Australia, his father runs a longstanding mechanical and engineering business that includes repairing trucks and tractors as well as designing and manufacturing agricultural machinery for the potato farming industry in Australia. Young Jamie was welding by the time he was eight, and pretty soon after that he was working for the family business as a fabricator/mechanic.

In those early years, he collected scrap metal and engine parts from his dad's scrap bins to build automotive-inspired sculptures.

"As a family, we raced go-karts as a sport," he recalls. "My love for cars and racing grew the more I raced. At age 12, I had a personal sponsor for the race season. At the end of that season, I wanted to thank him so I built a sculpture using some of the scrap parts. Once people saw what I had made, I began receiving orders to have metal sculptures built. I have been making metal sculptures for 22 years."

After college, Schena went to work as a designer and sculptor for General Motors in Australia. Three-and-a-half years later, he moved to California in 2014 to do similar work for GM in the United States. Off the clock, he does more of the same. Just like the early days with his family, he still gets his greatest inspiration from all things automotive.

"I am more inspired by objects than by people," he admits. "I enjoy repurposing automotive parts and giving the material new life through industrial art. However, I do find it amazing how Renaissance sculptors were able to achieve the level of detail and accuracy in stone when creating their masterpieces."

He may prefer metal over marble, but that doesn't make him any less of a Renaissance man. Every artist is shaped by his era. Schena's window of creativity is the four-wheeled, fast-paced 21st century. **ARC**

SEE MORE PHOTOS AT
ARCMAGAZINE.PUB

Master Class

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

OXYFUEL COBALT OVERLAY ON STAINLESS STEEL

By Lance Besse

Oxy-acetylene welding is one of the oldest forms of welding. It combines a fuel gas, acetylene, with oxygen to raise the flame to a very high temperature – up to 6,300° F, more than adequate to melt most metals. Oxy-acetylene (or OAW) welding was developed in the early 1900s - only slightly after arc welding was developed – and it quickly became a popular process in manufacturing and fabrication because it enabled workers with minimal training to create high-quality welds. It was also an extremely mobile process, as it required no electricity or flux covered electrodes.

Proper OAW welding requires the correct fuel-to-air mixture in order to produce adequate flame temperature. Most OFW welds are created by the neutral flame, which includes an equal balance of acetylene and oxygen. A reducing flame (or carburizing flame) contains more fuel than oxygen, while an oxidizing flame contains more oxygen than fuel. Different torch sizes and different volumes of gas allow for the welding of different metal thicknesses.

Although not as popular as it once was, oxy-acetylene welding is still used in various industries, including petrochemical, nuclear, polymer, and general maintenance and repair. The petrochemical, nuclear, and polymer industries use the oxy-acetylene process to overlay high-wear or corrosive-resistant weld metals on surfaces that are used in severe or critical service conditions. The overlays are often used for wear components in high-temperature valves. The maintenance and repair industry uses the process to fix cast iron products with braze-welding. It's not the fastest method of welding, but the quality of the end result justifies the extra time.

In this demonstration of oxy-acetylene welding, I'm overlaying stainless steel with hardfacing and corrosion resistant material known as Weartech 6, or AWS A5.21 ERCoCr-A. Weartech 6 is a cobalt alloy. The oxy-acetylene process is beneficial in that it produces an adequate layer of abrasion- and corrosion-resistant surface overlay with a typical dilution of 5% or less at the weld interface – much lower than GTAW and GMAW. The low dilution will allow for maximum performance of the overlay.

Before welding, preparation is important. Remove all scale with a sanding disk or weld on a freshly machined surface. Acetone or some other non-chlorinated degreasing agent will remove any excess oils. After you've selected the correct torch size, ignite the acetylene and add oxygen to the fuel mixture until flame feather is about three times longer than the inner cone. Hold the torch to where the inner cone is almost contacting the base metal. You'll start to see it heat up and turn red.

Once the base metal surface has reached melting temperature, pull away slightly and begin adding the overlay. Use a daubing method by balancing the heat between the base metal and filler metal. This will maintain molten surfaces and also allow for fusion between the two materials. After the weld is complete, usually after a minimum of 2 layers, pull the flame away slowly to allow for filler metal solidification and to reduce contamination by atmospheric air. Carefully place the weldment in a bucket or tub filled with vermiculite or sand to allow for slow and controlled cooling and to reduce the chance of cracks.

Even though this method of overlay is not very common, it does produce extremely desirable results for the industries in which it's still used. Always remember to select the correct Harris torch size, and ensure that you have adequate acetylene volume prior to welding. Base materials need to be extremely clean and flame adjustment is critical to produce an acceptable weld. Taking the extra time to focus on the small details will pay dividends in the end. ARC

Watch exclusive footage at: **arcmagazine.pub**.

Bridge Over Cleveland Water

June 1939

A welder for Great Lakes Welding & Boiler Company joins the steel grating of the Main Avenue Bridge at West 25th Street in Cleveland, Ohio. Measuring 8,000 feet long, 100 feet tall and 82 feet wide, the bridge has carried vehicular traffic across the Cuyahoga River in downtown Cleveland for 80 years since it first opened (minus temporary closures for renovations in 1991-1992 and 2012-2013). It was the tallest elevated structure in Ohio until 2007. **ARC**

Have any vintage (pre-1975) photos you'd like to share? Email them in jpeg format to 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.

SHOW US THE ONE
WHO SHOWED YOU THE WAY

Teachers come in many forms. We want to celebrate all of them. Help us tell the story of how gifted educators are changing the world of welding, one student at a time. If your submission looks like a good fit for an upcoming issue, we'll contact you for more information.

Tell us about your teacher at **www.arcmagazine.pub/educator**

www.arcmagazine.pub

ARC MAGAZINE

The Lincoln Electric Company
22801 St. Clair Avenue
Cleveland, OH 44117

DESIGN | CUT | WELD

High Performance Plasma Cutting

The Torchmate® X table is a light industrial CNC plasma table that is ideal for heavier metal plate and can withstand the rigors of a harsher shop environment. The Torchmate X is available in a variety of sizes up to 8x22, giving you a versatile table that will match your needs.

Call **1-866-571-1066** or visit **www.Torchmate.com** for more details!

Join the Conversation at **FabricationForum.com**

LINCOLN ELECTRIC