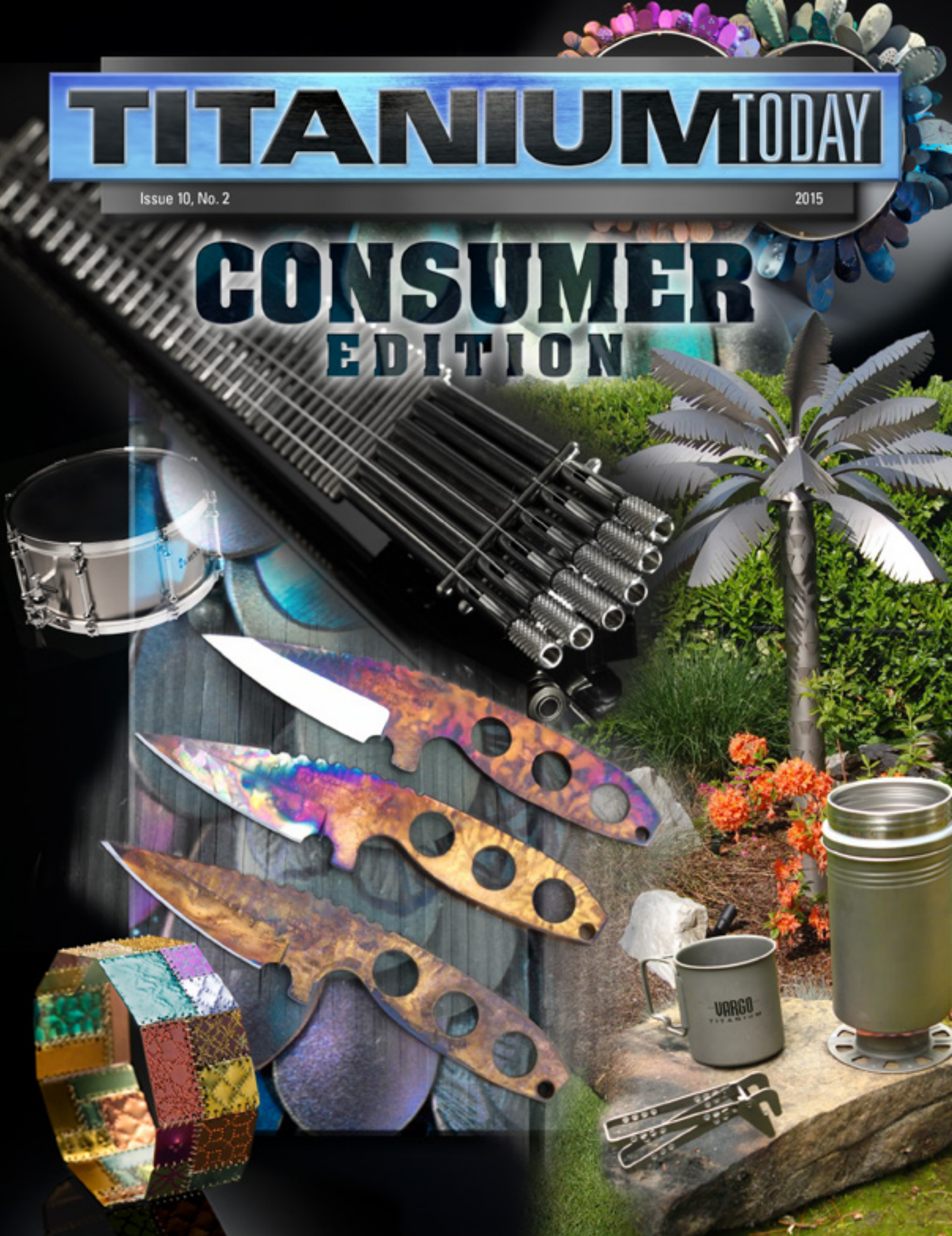


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Knew Concepts ‘Accidentally’ Selects Titanium to Create Enhanced Birdcage Frame for Fret Saw

Who “knew?” Choosing titanium as the material for the “birdcage” frame of Knew Concepts’ fret saw was a “happy accident,” according to Lee Marshall, company founder and chief designer. As a result, during the last three years, the world of metalsmithing artisans, jewelry designers and woodworking crafters have, quite literally, “beaten a path to his door” in Santa Cruz, CA.

The happy accident referred to by the 80-year-old Marshall, known to his legion of fans as “the saw guy,” occurred when he unexpectedly had the opportunity to purchase off-spec 1/8th inch thick, 6/4 titanium sheet. It dawned on Marshall that, with the proper design, a titanium birdcage frame would greatly enhance the stiffness and stability of his line of fret saws, which are used for cutting expensive materials such as gold and platinum, or doing intricate woodworking. The design was identical to the fret saw aluminum frames already in use, but when the distressed material ran out, the design had to be changed to improve “nesting” on the sheet to reduce waste. This led to the work that Marshall’s associate Brian Meek did to create the birdcage frame design.

Meek, operations manager for Knew Concepts, recalling the origins of the birdcage concept from 2009, said that Marshall developed the original “flat” design for the fret saw, which utilized aluminum. Having obtained the off-spec titanium sheet from distributor Supra Alloys Inc., Camarillo, CA, Meek said he and Marshall “spent about six months bending both of our heads trying to come up with a ‘pieced together’ version of the flat frame that would work. We came up with some very strong designs, but unfortunately, none of them had any torsional rigidity. They were rigid as anything in compression, but were



Lee Marshall, Company Founder and Chief Designer of Knew Concepts

‘spaghetti’ in torsion.”

After a number of iterations, Meek took some of the spare prototype pieces to his home workshop, where he has a micro-scale tungsten inert gas (TIG) welder and started welding parts together to try and create a feasible concept. The recollection of this brainstorming shared by Meek offers a rare glimpse of an engineer’s inventiveness and the often-daunting trial-and-error process of developing a functional product design. Eventually, Meek said he received a bolt of inspiration from his seafaring days.

“I spent a chunk of my 20s sailing historical wooden ships, including a couple of summers working on a replica of the ‘Santa Maria’ back in the early 1990’s,” he said. “Once I looked at the pile of scrap titanium on the table, I got to thinking about how sailing ships stabilize their masts, which led me to weld a pair of the reject spine designs onto a set of legs, and then splay the top of the two spines apart, to generate a triangle truss. I welded some scrap titanium strip across the top of it to stabilize it, and suddenly had an

immensely stiff truss. It quickly became very clear which way we needed to go.”

Meek said that the spine of the birdcage saw resembles the hull of a square-rigger ship. “The legs step into the truss the same way the masts of a sailing ship step into her keel, and the triangulations of the truss mimic the shrouds that stabilize the masts as they rise.” He said that, after his fit of inspiration, born of pure frustration, the design concept for the fret saw birdcage came together pretty quickly. He then looked to translate this inspiration to a CAD drawing. “I did finite element analysis runs on the truss design to shave the weight down to the absolute minimum we needed for full strength, as every extra gram in the truss is weight in the absolute wrong place for ease of use.”

In addition to his experience on vintage sailing ships, Meek has considerable experience working with titanium and wrote his master’s degree thesis on mechanical bonding of gold foils onto titanium substrates. He also noted that Daren Forbes, a retired “exotic materials” welder from Arc-Tec Welding,



Original 5-inch Titanium Saw

Santa Cruz, CA, assisted Knew Concepts in the program. Meeks explained he designed the production version of the birdcage so that it goes together with a “Tab-A/Slot-B” setup, so that the rivets in the legs hold it together for welding. “It’s self-jigging. There is extra length designed into all the tabs to provide welding filler material. In the end, we can be proud to say that we’ve built the stiffest, most rigid fret saw in the history of the human species,” he declared, adding that “if only because nobody else has ever been quite that nuts.”

Marshall said using titanium also had ergonomic advantages, making the fret saw nearly half the weight of a comparable steel saw frame. While the fret saw frame is titanium, the saw blade is Swiss-made steel. Initially, he had enough titanium material to produce about 200 fret saws. Marshall knew he was on to something when they all sold, and he started getting orders for more saws. Knew Concepts purchased titanium 6/4 sheet from Supra. The fret saw, in 3, 5 and 8-inch sizes, was

commercially launched and, as a specialty tool, has been a success for the company. Marshall explained that the saw’s rigid design not only offers greater cutting accuracy for the artisan, it also greatly extends the life and reduced the breakage of the saw blade, which is subjected to constant flexing. The saws are priced from \$195 to \$225.

Along with the fret saws, Knew Concepts also designs and markets titanium soldering clamps. According to information posted on its website (<http://www.knewconcepts.com>), the titanium strips can be easily bent into a wide range of specialized custom clamps for jeweler’s hard soldering operations. The website posting indicated that “titanium has several advantages over traditional steel clamps when it comes to soldering. Solder doesn’t stick to it. Enamel doesn’t stick either. It stays strong when red hot. It doesn’t erode and flake away at heat, so your clamp tips can be smaller. Most importantly, titanium doesn’t transfer heat nearly as quickly as steel clamps, so it interferes

with nearby joints less than steel clamps do.” The clamps are sold in a pack of 10 “blanks” as straight, fully annealed, 4-inch strips, designed to be configured for individual soldering needs.

Marshall proudly described Knew Concepts as a “customer oriented small business” with five employees that sells and distributes products around the world. The company has a stable of Taiwan-built machine tools, such as a vertical machining center and a five-axis, twin-spindle lathe.

As for his own resume, Marshall said he was born in Kansas, lived in Denver and worked as a tool and die designer for many years. During the 1960s he was employed at Coors USA Chemical and Scientific Porcelain Co., and also worked on the Telstar satellite communications program. “I’ve been building specialized tools all my life,” he said, pointing out that he remains a “drafting table” designer. ■