PHOTOS BY DAVE SETTLEMYER

Flaming Boulders

A custom-built fire feature adds nighttime flair to a Colorado hardscape

by Dave Settlemyer

I've been working with natural stone for years, beginning by carving bowls into boulder tops, then coring through the boulders to run piping for water features. My familiarity with stonework eventually led to new ideas using natural gas and steel lines, and I also began carving shapes—from simple circles to boxed out rectangles and angles—into boulder tops for hardscape features such as Hibachi-style grill boxes that hold coals with grill grates on top, and inset natural gas grills built directly into the hollowed-out cavity of the stone.

These projects sparked the idea of creating a flaming boulder as part of a multiple-tier fire feature, something that could provide some depth of design and flame appeal. But when I included this concept in the design proposal for a recent project, the clients thought the feature was maybe a glitch in my design software, or an accident in my placement of flames. It took a little bit of convincing and explanation to help my clients understand the basis behind my ideas. Fire coming out of boulders?

After a short debate about cost effectiveness versus visual appeal, the argument for visual appeal prevailed. Of course, cost is always a factor with an original concept in a design, and clients have to be prepared to leave some wiggle room financially to account for unexpected issues arising during construction from unknown or previously untested features. This project started with a line item allowance of $10,967 for the fire feature, while complications stemming from delays, machinery overages, and extra labor added $1,142 to the cost.

Natural Gas and Permits

For a standard gas-fired outdoor appliance, such as a gas grill, we typically just make a connection to a ½-inch-diameter supply pipe stubbed out near a back door. For this design to work, we were going to require a bigger gas supply, which involved several exchanges with the local building department. To compensate for the maximum potential 220,000 Btu rating of the fire feature, we determined that the property fell under a renewable energy offset clause that required us to supply about 175 kilowatt-hours of renewable energy per month through

Figure 1. After laying a gas line in a 30-inch-deep trench and placing boulders in their proper locations (A), workers prepped the area for the concrete slab that would provide a base for the flagstone patio (B).

Figure 2. The author carved 8-inch-deep recesses into the tops of the boulders with a 10-inch-diameter core bit to house the burner assemblies (A). Then he drilled 2-inch-diameter holes down through the recess to connect to holes drilled horizontally through the backs of the boulders for the gas lines (B).

solar, wind, or geothermal heat recovery. In this case, the previous owners had retrofitted the house with solar panels and a Tesla battery bank that provided enough power reclamation and battery storage to allow us to move forward with the project.

Instead of being considered a single fire feature, the design was classified as three separate fire features, with three separate burners and ignition control sources, which made county approval difficult. Why did we need three burners? How were we going to control the gas supply? Was I doing this work myself or was I including additional contractors? Although my company carries several licenses from multiple jurisdictions for this kind of work, we weren't allowed to pull gas-line permits for this project, so we needed to hire a plumbing company to pull the permit and make the connections to the gas meter supplying the house.

Construction Delays

When we began the project in October 2020, our goal was to have the patio and fire feature ready by Thanksgiving so that our clients could enjoy it during Colorado's cool evenings over the holidays. Normally, this would be a reasonable time frame—six to eight weeks out from design to completion—and we began demo work on the existing lawn and patio, anticipating that the county would soon issue our building permit.

After demo was complete, we excavated a 30-inch-deep trench from the front yard at the gas meter all the way down the side of the house through the home's existing landscaping (which we had to maintain). From there, we continued our excavation under a fence, through the backyard, and around to the planned location for the new fire feature. Spanning nearly 150 feet, our trench managed to disturb the entire property, as we encountered sprinkler lines and drain piping and left mounds of dirt around the yard, all to bury a 1-inch-diameter yellow underground polyethylene gas pipe at the right depth.

Because of a hang-up in the building department due to COVID-related

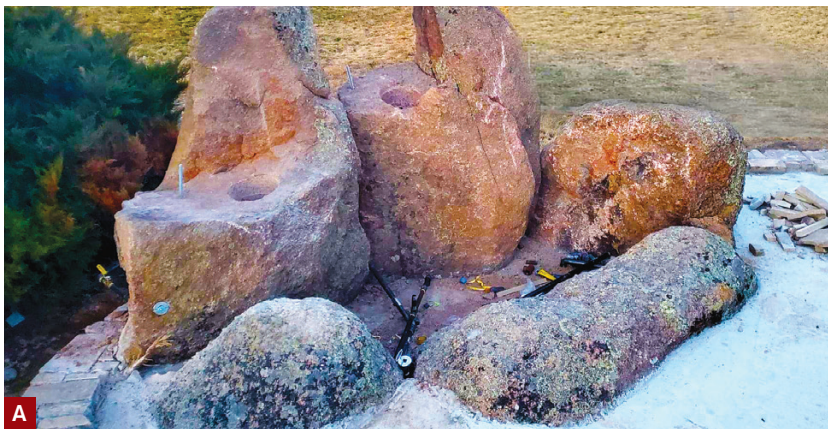

Figure 3. Along with the burners installed in the two boulders, there are also two ground-level burners (A). The black steel gas supply lines run through 2-inch-diameter holes drilled through the boulders (B). Rated at 50,000 Btu each, the assembled brass burners will be covered by porous lava rock (C).

understaffing coinciding with Colorado's worst fire season ever, receipt of our permit for this next phase of the project was delayed. All building departments and available inspectors had been redirected to help move along the rebuilding process for displaced families who had lost their homes from the wildfires, and work on our project was put on hold until the county could issue our building permit. What we were told might be a one-week delay ended up being almost six weeks of open trenches and a muddy lawn. It wasn't until after the Christmas holiday that we were able to begin construction.

Cutting Stone

The flaming boulders were one part of a much larger project that included a flagstone patio with stone sourced from around the world, a deck, a porch cover, and an outdoor kitchen. We began by strategically placing 42 tons of local moss-covered boulders—selected to complement the size and style of the planned fire feature—at various points in and around the patio footprint. After all the boulders were arranged in the proper locations, we framed the patio area encapsulating the boulders into what would be a concrete base for the stone veneer. Then we locked the boulders into position with 24 cubic yards of reinforced concrete to ensure they'd never move and would forever be a part of the flagstone patio (**Figure 1**).

The two boulders we used for the fire feature weighed nearly 4 tons each, with the tallest one being nearly 7 feet high. Initially, we had planned to use a crane to set the boulders in place, but it turned out to be much more economical to rent a four-wheel-drive forklift with an extendable boom to manipulate the boulders into position and erect them.

To make a connection to the gas line that we had buried in the yard, we had to bore holes through the boulders. I first used a 10-inch-diameter diamond-tipped coring bit mounted in a Hilti core drill to remove 8 inches from the top of the boulders. Custom burners would later be housed in the holes, which we would then fill with lava rocks. Besides filling the holes to a level point on top of the boulders and hiding the burners, the lava rocks would help disperse gas to create more combustible area for the fire.

Figure 4. The fire feature is the cornerstone of a larger patio project (A), with multicolored flagstones set in mortar on top of a steel-reinforced concrete slab (B).

Figure 5. The flaming boulders are meant to be an artistic touch and visual pyrotechnic display but not necessarily a source of heat (A). The bottom chambers where the burners are located utilize the rocks as an infrared heat reflector, creating an elongated bed of flames from below (B).

I began with a handheld version of the drill, but quickly found the tool too powerful for this application. So I mounted the drill's stand directly to the boulder tops, anchoring the stand's feet to the stone with 10-inch-long wedge bolts (with 4 inches of each bolt embedded in the stone) to keep the high-torque machine stationary while drilling accurately (**Figure 2**).

After I removed the top 8 inches of stone for the burners, I switched to a 2-inch-diameter bit to drill an additional 24 inches down into the stone. Because the boulders were encapsulated in concrete, we couldn't drill their full depth, so I then mounted the drill to the back of each boulder to drill a 90-degree connecting hole where piping could be connected for gas service.

These 2-inch-diameter holes house ½-inch-diameter black steel piping, which we coated with Diamond Vogel two-part epoxy paint to create a permanent weather barrier so the steel pipe wouldn't rust in the future. The extra clearance around the pipe through the rocks allows for ample air draw so the flames can burn at maximum efficiency (**Figure 3**).

We used parts from Warming Trends (warming-trends.com) to construct the burners. To create nozzles and multiple burn points, we threaded ⅛-inch-diameter pipe nipples into larger, ½-inch-diameter threaded brass pipe in a tee shape. The upper burners are rated at 50,000 Btu each, while each of the two lower burners is rated at 60,000 Btu, for a 220,000 Btu maximum burn potential. Actual use is less than half of that.

We drilled holes for service keys through the faces of the boulders so each feature could be controlled individually; we mounted the service key for the main fire pit in the front of the feature, vertically through the patio. Similar to a gas cock control for an indoor fireplace, the keys control gas flow and have a removable safety key to prevent unauthorized use. Each of the three fire features is manually lit and individually controlled.

I took it as a personal challenge that the pipe work for these features would remain unseen. One of my goals was for anyone who witnessed this project to wonder how it worked. Thanks to the literal maze of piping through the boulders, the result achieved everything I hoped for and more (**Figures 4, 5**). ❖

Dave Settlemyer owns LS Underground in Longmont, Colo.