



Gas, Grate & Ingenuity

Ed. Note: Just prior to press time, Earth's Flame was awarded The Green Award in the Vesta Awards Program.

Earth's Flame uses a gas log lighter and an ingenious grate to create an open wood-burning fire that meets EPA Phase 2 regulations; it can be retrofit into low-mass, zero-clearance or masonry fireplaces.

We've got something interesting here."

So began a conversation with Steve Marple (Project Services International), a mechanical engineer who, for the past year, has been working with Lisa Leighton, president of Earth's Flame (Canterbury Enterprises), to create a retrofit product for wood-burning fireplaces that would reduce emissions to an EPA-acceptable level; it's called Earth's Flame.

Fifty-five years ago, Leighton's father, Joe, was the first to think of gas going into fireplaces; he invented the Blue Flame Log Lighter and Gas Valve, which the company continues to sell to this day. Leighton became convinced that using the principle of a log lighter on a sustained basis during a fire would reduce emissions because it could aid in surmounting the times of high emission levels, such as when starting or

re-stoking a fire.

She was introduced to Marple in Durango, Colorado, where they both have homes. He had worked on cleaning up the Durango-Silverton coal-fired, single-gauge railroad; his background is in industrial combustion systems and pollution control.

One year ago, Marple flew to Reno to meet with Leighton, and with the HPBA's John Crouch and the EPA's Gil Wood.

"I told Lisa that the simplest approach would be to attack the problem, which is poor combustion," says Marple. "Given my combustion background, I went straight to the time-honored Three Ts of good combustion – Time, Tem-

Earth's Flame reduces emissions 33 percent below EPA Phase 2 levels.



Steve Marple, mechanical engineer.

perature and Turbulence. Our first step was to use the principle of a log lighter on a sustained operation during a fire.

“We took Lisa’s log lighter as it has been produced for the last 55 years up to Ben’s lab (Myren Consulting, Colville, Washington) and stuck it in the Heatilator E-36 – a unit with a long list of testing results. We ran one single test and found that we had reduced emissions by 50 percent. That was enough good news to go to the next step, which was development of a grate that enhances good combustion.”

Without an unlimited amount of R&D dollars available, Marple went for a device that increases the time gases spend in the chamber, by creating a longer flame path.

“I’m splitting the flame, bringing it back together and having it travel a long distance,” he says. “Temperature-wise we have both the log lighter below, which helps us maintain temperatures, and a refractory panel above. Essentially I am separating and/or trying to separate it into a primary and secondary combustion zone. The refractory panel reflects heat down into the primary zone. Splitting the flame path, having the flame go over an irregular surface above, creates turbulence, which creates better mixing of the combustion gases.

“By the way it’s designed, there is a slight gap in the back side. The flames want to preferentially go up the back, so I have created a gap that splits the flame path 50/50 front and back. Fifty percent of the flames go up the back and 50 percent travel along the refractory panel and come up the front. The induced secondary combustion air comes out of the tube

network at those two places.

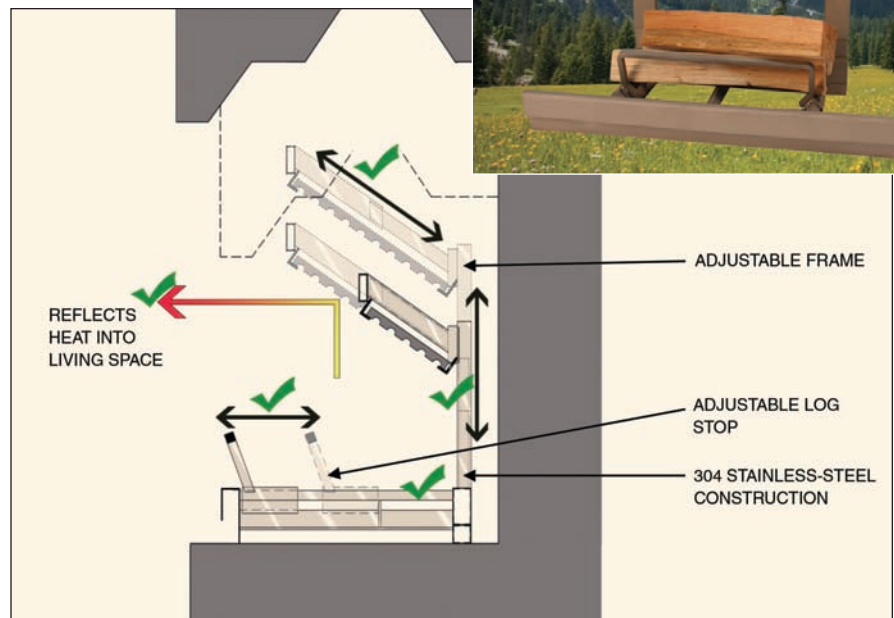
“As the design is right now, there are three tubes that the logs actually sit on. Those tubes bring in air from the very front bottom of the fireplace – induced convection. It travels through those tubes, preheats and then goes up the vertical tubes in the back. There are two horizontal tubes, one in the back and one in the front, and that air then goes through those horizontal tubes and exits as secondary combustion air, oxygen-rich secondary combustion air.”

Meanwhile, the log lighter is kept burning for the duration of the fire; at \$2 a gallon for propane, that cost is a bit over 60 cents an hour. There is a piece of metal that rests flat on the bottom of the hearth across the front of the grate, which helps sustain the coal bed. All components are 304 stainless steel. However, material for the refractory piece above is still indetermined. A vermiculite board has been tried, as has a ceramic board. “We may end up with a cast prod-

tion, for an average of a 66 percent reduction in emissions from baseline data on the Heatilator E-36.

“That one test went off the map for us,” says Marple. “Occasionally you have a rogue data point. Right now the average emission factor is 3.4 grams per kilogram, which is 33 percent below EPA’s Phase 2 Qualification Level for fireplaces (3.4 g/kg also represents an 80 percent reduction from what the EPA considers to be the typical average emissions from a fireplace, according to Ben Myren). If we get to 70 percent reduction, which I believe we can, then we will be under three grams.”

Aware that there is a myriad of fireplace configurations and dimensions, Marple also has designed the grate with expansion capabilities. “We will have



Earth’s Flame is constructed of durable 304 stainless steel. It is adjustable in both height and depth to accommodate most fireplace designs. It requires no maintenance and reflects heat into the living space.

uct in the end,” says Marple.

Testing has also gone far beyond that first effort mentioned earlier which showed a 50 percent reduction in emissions from the baseline data on the Heatilator E-36. With the grate and a modified log lighter, and using door-open tests, the unit achieved a 70 percent reduction, a 72 percent reduction and a 59 percent reduc-


vertical adjustment of the upper plate,” says Marple, “as well as a depth adjustment of the upper plate so it can accommodate numerous fireplace geometries.”

Marple is convinced that this device will work as well in masonry fireplaces as it did in the zero-clearance one. He is also convinced that principles in place here could be integrated into a

fireplace design.

He also underlines the fact that there are no electrical connections involved with the product; the air is induced. And there is no maintenance involved other

than cleaning out the ashes. Installation is simple and can be done easily by the homeowner, with the obvious exception of using a professional to hook up the gas line.

Right now there are approximately 40 million fireplaces in the U.S., so it's no wonder that Steve Marple says, "This was a challenge, and I am very excited to be involved in this project." 

WOMAN ON A MISSION

It's close to the end of January and Lisa Leighton has been flying around the country calling on major retailers such as Home Depot, Lowe's and Ace Hardware. She knows these folks well through sales of her Blue Flame log lighters. She also knows the specialty hearth retail channel quite well, and plans to sell the Earth's Flame through all channels.

Pressed on pricing, Leighton had to demure. She still is searching for the right manufacturer and waiting for bids to return. This is one busy lady. What she and Steve Marple have accomplished in one year is impressive.

"I am so excited," she says, "that the EPA has accepted our application for a partnership with them. I am working with them, and with John Crouch of the HPBA, to try to devise some type of rebate program for consumers. For example, if a product hits, say, a 70 percent reduction in emissions, then the consumer can get a rebate.

"My goal is also to contact all the air quality people throughout the nation and let them know that this product is available, so instead of banning wood-burning fireplaces, they should require that such a product as this be used in all new construction because



Lisa Leighton.

it is a win/win situation.

"I love wood-burning fireplaces. I want to see them kept alive and to know that the EPA is absolutely behind it as well. This is really thrilling; it's an exciting time!"

As we said, this is one busy lady.