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This masonry heater has an oven (the upper, arched door). The heater is finished in finely detailed stucco. The customer wanted a relatively conventional fireplace look blended with a five-sided corner-heater design. Three sides are visible here while the two back sides fit squarely in the corner.

## FOREWORD

My brother, Howie, and I became Boy Scouts in the late 1950's. Aside from mastering every imaginable knot on our side-by-side steel bedposts, scouting for us was all about camping, and central to the camping experience was Fire. We learned how to find dry wood and tinder in all weather conditions and how to build safe campfires. Early in our scouting journey, we entered a fire-starting competition using flint and steel. We studied the literature, found our flint and steel, and cooked old shreds of cotton sheets in a metal Band-Aid can in our mom's oven until the cotton was bone-dry and black. When the fire-starting competition was held indoors at the wooden-balconied junior high school gym, one of us struck the steel against the flint. The other caught the live spark in a nest of black cloth, carefully folded the cloth over the spark and swung the cloth in circles high and low like a windmill until, in only seconds, we had fire in our hands and won the contest. We did not realize at the time that we had also caught the fire in our hearts.

Years later, I was pushed by an invisible hand and urged by a silent but very clear voice to take on the mission of bringing an enduring masonry heater tradition to North America. Creating the spark of interest in masonry heaters, teaching others how to build them, fanning the knowledge of masonry heaters, and bringing them into their proper place as the Heart of the Home—this has been my life's work. Many people know intuitively when they see and experience a masonry heater for the first time functioning in a home that there is something truly unique, even extraordinary, about these huge, gentle, warming souls. Over a career of more than thirty-five years building and studying masonry heaters, bakeovens, and cookstoves, some of the logic, physics, and goodness of masonry heaters have been gifted to me and to others who build them. During that same period of time, I have been gradually invited to explore even deeper mysteries of fire and its healing power. Recently, I began to study,

in more earnest, some of the ancient fire-gifting stories indigenous to Europe and the world.

In the classic children's tale of Cinderella, the lost glass slipper, left on the steps at the stroke of midnight at the great ball, is carried by the Prince throughout the land, while he looks for the beautiful maiden who wore it to his ball. The slipper only fits one foot, the perfect dusty foot of the maid of the hearth, Cinderella. We all love the magic of the story, the justice and the union of the two partners, and even the forgiveness of the stepmother and her daughters. It is the timeless story of the return to right relationship and harmony in matters of the heart, which is where the fire lives and serves.

Many years ago, I read that there was an ancient fire-carrying tradition in Maine that involved large clamshells lined with blue marine clay and a spiral of some kind of tinder fungus wound like a fuse that could be carried as a living spark all day. This winter, reading a wonderful book by Kerry Hardy called *Notes on a Lost Flute: a Field Guide to the Wabanaki*, I learned that the shells could be carried in a woodchuck pelt slipped over a belt thong or sash with the woodchuck's own cleaned skull the counterbalance weight to the clay-lined shells with their tinder fungus fuse. A gifted woodsman and teacher friend, Ray Reitze, said that he knew the tradition well and that the Wabanaki had used thonged conch shells similarly lined with the clay and tinder fungus fuse and carried the shells in a pack basket in their day-long canoe trips. Ray said that the tinder fungus was the black Chaga fungus that grows on the birch tree. He also pointed out that while the tinder fungus could hold the fire, his Micmac native elder "grandfather" had taught him that the spindle for the bow drill to make fire should be made of spruce, which was the wood chosen to carry the fire within itself.

While in New Zealand, teaching a masonry heater workshop this winter, I learned that the Maori culture

had a story about the grandmother fire volcano hiding the fire in three trees during the struggle to create right relationship between humans and fire and water. All three of these trees are the chosen and known trees for making fire with friction by the native people.

Among the ancient Huichol people (who call themselves *Wixáritira*) of Mexico, there flourishes and is shared a remarkable tradition of meeting Grandfather Fire (Tatawari) himself in a way that the heart is opened and the fears and the mind are put at ease, where community grows, and the sacred relationship to all that is, is remembered and restored and kept alive.

In Ken Matesz's rich and wonderful new book, *Masonry Heaters*, Ken sweeps away the ashes of our ignorance about right relationship to fire. Ken guides us and explains with crystal-clear and gentle clarity how masonry heaters are the most intelligent, most efficient, most environmentally sound and sustainable, most beautiful, and most healthful form of heating that

humans have ever known. There is more knowledge about masonry heaters between these two covers than has ever been published before in English.

In 2010, as oil gushes up from the ocean floor off the coast of Louisiana and as our earth warms as we continue to use precious resources as if there were no tomorrow, this book makes it clear that we will only have a chance at enjoying tomorrow if we learn how to embrace and hold dear in our lives what really matters. Masonry heaters, which hold a fire, a little piece of the sun, with honor and care, really matter. They show us a gentle, sustainable, intelligent way to live in and heat our homes.

Catch the spark of masonry heaters in your minds and hearts and hands as you read this book and find ways to blow that spark gently into life. Dream, plan, and carefully build and share this warmth with others.

ALBIE BARDEN  
July 6, 2010

## INTRODUCTION

# What Is a Masonry Heater?

“What is a masonry heater?” If I had a dollar for every time I have been asked that question, I would not need to build masonry heaters for a living anymore; I could do it just for the challenge. I have found that, over time, my personal answer has changed, much as you would change your description of a friend the more intimate the relationship becomes. Early in my understanding, a masonry heater was “a high-efficiency fireplace of European origin that stores the heat from a hot, fast fire in thousands of pounds of solid masonry for slow release as radiant heat over the next twelve to twenty-four hours.” There is nothing blatantly false or wrong about this definition, of course, and I still use this information in any longer conversation I have about masonry heaters. Now, however, I define a masonry heater as “a piece of the sun—the warm center of the home’s universe.”

You will hear masonry heaters called masonry stoves, heat-storage fireplaces, *kachelofens*, *kakelugn*s, *kemence*, *grubkas*, *grundofens*, *putz-grundofens*, Russian fireplaces, Finnish fireplaces, Swedish stoves, contra-flow fireplaces, radiant fireplaces, mass-storage fireplaces, and more. They’re all masonry heaters, and they all work on the same principles. They all create a place to go to feel warm, to bask in the sun.

For whatever reason, it took me years of building masonry heaters to realize that the typical home today has no inviting place of luxurious warmth. The thermometer in a home might read 70°F, but people in that home still may have cold hands or feet, or may simply feel cold. What’s worse, there is no place in that house for a person to go to finally feel warm. With a piece of the sun—a masonry heater—in the middle of a home, there is no need to feel cold because there is a place to go. There’s always a place to soak up the sun.

When I was a teenager, my dad experimented with

solar water heating. I became interested in solar heating as well and thought that passive solar heating was the way to go when it came to heating houses. No one owns the sun or the energy it sends our way every day. It’s free energy. It’s natural energy. Passive solar heating *is* great, but it still has a drawback: There’s no accounting for long weeks without blue skies in a long winter. That’s what makes masonry heaters even better. Masonry heaters are passive solar energy under human control. With this simple technology, you get to decide when the sun shines in your house. And who doesn’t want that happening every day and all day long?

It is fascinating to watch the evolution of ideas concerning energy conservation and green, sustainable energy. You have to wonder at the complicated strategies people will undertake to “solve” the dilemma of becoming energy self-sufficient as a society. So many people have become accustomed to centralized sources of power, such as the gas company, electric company, or of course oil company, that they believe the way to freedom from foreign oil and energy is to create massive infrastructure for a green replacement for fossil fuels. It’s as if we’ve discovered that being dependent on foreign nations for energy is a not-so-good idea, but making sure that people are dependent on corporations for energy is a great one.

Thus we have massive studies and corporate development of ways to turn food crops into energy crops. And even more to the point is the environmental buzzword for renewable solid fuels: biomass. *Biomass*, of course, is the educated person’s term for what common people have used for fuel since time immemorial—wood, plants, and animal wastes. Whole industries are popping up “creating” the next fuel on which people can become dependent. It’s not technologically advanced just to burn wood cut from the



**FIGURE 1.** Who wouldn't want the sun shining in their home every day? This brick, stucco, and soapstone heater gently separates a living room from a dining room. The brick chimney is in the right foreground; the soapstone-topped benches contain flues that make these warm seats. The stucco mass behind the chimney contains more flues for heat storage. Photo courtesy of New England Hearth and Soapstone.

trees in the back 40; instead, we must have some large company first turn the wood into wood pellets before we burn that wood in stoves.

Ironically, just 150 years ago the average North American citizen *was* energy self-sufficient. At that time, a family knew it had to supply its winter's fuel, which was primarily wood (though coal was becoming more common). This wasn't something people thought much about. They just did it. If they didn't secure their winter's fuel, they would be cold. It was as simple as that. Today we act like being energy self-sufficient is a pipe dream. Certainly politicians and large corporations would love for the average person to believe

that being energy self-sufficient is nearly impossible. Otherwise, what would we need them for?

Advances in design and function now allow the creation of state-of-the-art wood-fired masonry heaters that approach the energy efficiency of modern gas furnaces and boilers. In 1850, home insulation was nonexistent, and people heated their homes using open fireplaces or very basic metal stoves. Imagine the quantities of fuel required in an attempt to heat an uninsulated home with a 20 or 30 percent efficient stove or fireplace! Now, with today's best masonry heaters at high efficiency and homes well insulated, heating with wood could be a breeze, except for one thing.



**FIGURE 2.** Heating with a masonry heater can be green, sustainable, enjoyable, and health-supporting. This tall, narrow soapstone masonry heater takes up little floor space, but has enough surface area to produce a considerable amount of heat. Photo courtesy of Tulikivi Corporation.

The missing piece of the puzzle is home size. The average home size in the United States in the 1950s, for example, was less than 1,000 square feet. Now it is more like 2,500 square feet. I personally grew up quite comfortably in an 1,100-square-foot home with a family of four. My wife grew up in a house smaller than that with a family of nine.

I am not suggesting that everyone must have a 1,000-square-foot home. I am pointing out, however, that most average families *could* be quite comfortable in homes of 1,500 square feet *and* it would be easy to be energy self-sufficient with a little passive solar design and a high-quality masonry heater. With good insulation; modern, high-quality windows; and a modest-sized home, a family can today be energy self-sufficient (for heating purposes) with little exertion. It's entirely

conceivable that such a home could be heated with less than two cords of wood annually at a 2009 (in Ohio) cost of less than \$400 (or for free with some extra effort).

It all comes down to personal priorities, of course. If someone doesn't mind being dependent on some distant land or corporation; if someone doesn't mind being subjected to the ups and downs of energy markets; if someone doesn't mind the politics and military conflicts that arise around energy; if someone doesn't mind having a heating system that is useless if a winter storm cuts power; if someone doesn't mind having cold feet and nowhere in the house to get warm; if someone can ignore the many benefits of masonry heaters, then a modest home and masonry heater are of little value. But for someone who really

craves being free from dependence and likes the idea of getting energy free from the earth and sun, this may all sound very enticing.

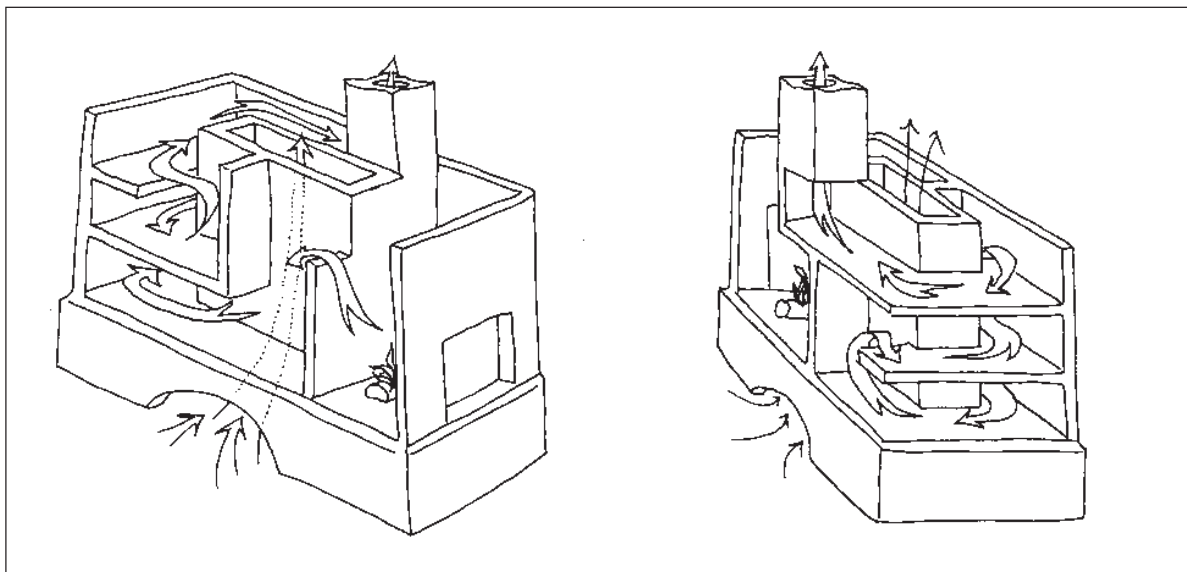
This is not to say it's impossible to have a larger house and heat it with a masonry heater. It just means the quantity of fuel that's needed increases. The more fuel needed, the more work is required and the less attractive the wood heating option becomes. The harder it is to be energy self-sufficient, the fewer people will do it. In this way, planning and building a very large house is like asking for an excuse to be dependent on others for fuel. It's a self-defeating behavior, like buying a full carton of cigarettes and all the while saying it's time to quit smoking. Large houses, like gasoline-powered automobiles, are designed for using fossil fuel energy. As I said, it's all about priorities.

This book is about returning to our roots and understanding why doing so is not a bad idea when we can apply some refined knowledge to the problem. Wood heating can be "green." It is "sustainable." It can also be simple and enjoyable, even health-supporting, with a masonry heater. People today in North America can be energy-independent with the simple technologies that have existed for centuries, but have been refined by modern research and development. It's not nearly

as hard as politicians and corporations make it sound; it merely requires resetting priorities and acquiring a little bit of knowledge.

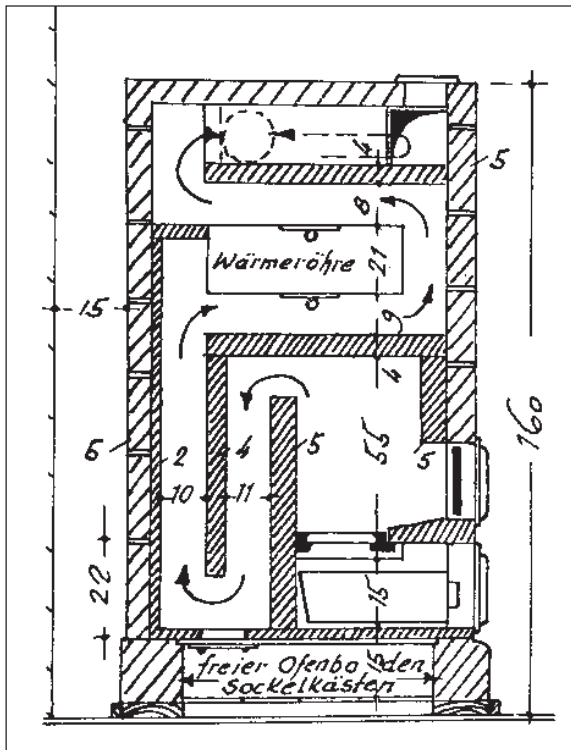
I find that people are already returning to their roots but don't quite realize it. New homes today boast granite or soapstone counters and wood floors and trim. People are remembering that these materials are real. They are the standard that manufactured products can never quite duplicate. Real stone and real wood have made a comeback. Not everyone has yet gotten back to "real" when it comes to fire, however. I frequently get calls from people saying, "Well, we built the house with a gas fireplace, but it hardly gives off any heat, and it's boring." What they're trying to say is it isn't real. It's a gas fire pretending to do what wood does for the soul, the eyes, the heart, and the skin. Real fire and real heat will also make a comeback, I predict.

Masonry heaters are here to stay. There is no better way to burn wood. There is no easier way to heat with wood. There is no more comfortable heat than what comes from a masonry heater—a piece of the sun. What is a masonry heater? It's a solution to restoring health, well-being, self-sufficiency, sustainability, and reality. It's a grassroots solution to our energy dilemma. It was Mahatma Gandhi who said, "Be the change you



**FIGURE 3.** The inner workings of a squat Austrian heater. From David Lyle, *The Book of Masonry Stoves*, p. 119.



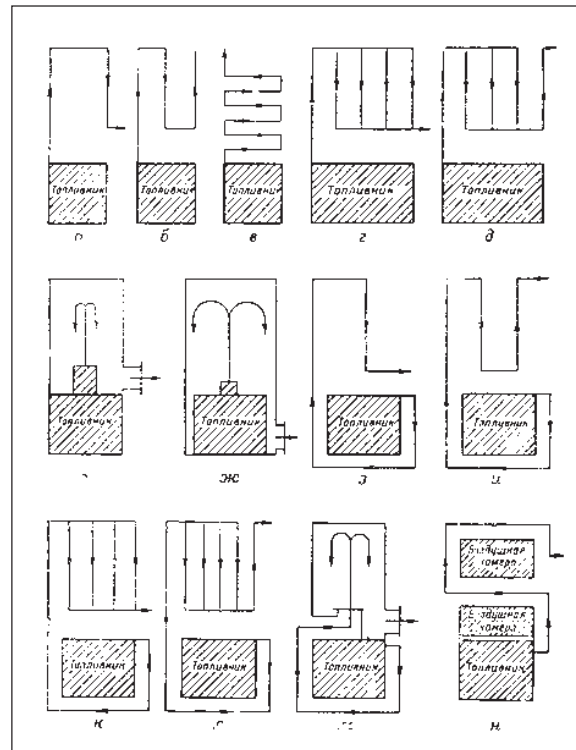


**FIGURE 4.** A German or Austrian design that is more upright. From David Lyle, *The Book of Masonry Stoves*, p. 178.

want to see in the world.” If you want to see energy self-sufficiency in North America, start by harnessing the sun via a masonry heater in your home.

So, you might still be asking, just what is a masonry heater? A masonry heater, of course, can be defined in much more technical terms than just “a piece of the sun.” In fact, industry-wide consensus, as developed through ASTM International, calls a masonry heater

a vented heating system of predominantly masonry construction having a mass of at least 800 kg (1760 lbs), excluding the chimney and masonry heater base. In particular, a masonry heater is designed specifically to capture and store a substantial portion of the heat energy from a solid fuel fire in the mass of the masonry heater through internal heat exchange flue channels, enable a charge of



**FIGURE 5.** A Russian drawing of some of the many different ways that the flues can be configured in a masonry heater. From David Lyle, *The Book of Masonry Stoves*, p. 97.

solid fuel mixed with an adequate amount of air to burn rapidly and more completely at high temperatures in order to reduce emission of unburned hydrocarbons, and be constructed of sufficient mass and surface area such that under normal operating conditions, the external surface temperature of the masonry heater (except in the region immediately surrounding the fuel loading door(s)), does not exceed 110°C (230°F).<sup>1</sup>

In short (and practically speaking, for North America), a masonry heater is a wood-burning heat-storage fireplace. Unlike conventional open fireplaces, however, such a heater saves the bulk of the heat produced by the wood fire and stores it in mass for long-term release rather than letting the heat (and room air) go up the chimney. As ASTM International’s



**FIGURE 6.** A masonry heater isn't always just a big, rectangular box. In this photo, it's a challenge to know where the heater begins and ends. Curved faces, tile mixed with stucco, and wooden sitting areas make this heater a one-of-a-kind. Photo courtesy of Biofire, Inc.

technical definition has it, the heat is saved and stored by virtue of heat exchange taking place in various flue channels. These flues are largely responsible for the shape of the masonry heater.

Over the millennia, masonry heaters have taken

many different forms in the cold regions of Europe and Asia. While a fireplace is a fireplace is a fireplace, that is, a firebox that vents up a chimney above the firebox—thus, a Rumford fireplace and a walk-in fireplace are still just fireplaces—a Swedish masonry heater may be

vastly different in appearance and construction than an Austrian one; the design and shape of a peasant's masonry heater in Hungary will be different from the prince's heater in Russia, and so on.

In this way it is impossible to point to one masonry heater and say that it is the archetypal masonry heater. One masonry heater in Austria may have flues like the ones seen in figure 3—making a heater that is squat and low. Someone in that region, seeing the design of a masonry heater for the first time, may afterward say, “Oh yeah, now I know what a masonry heater looks like inside.” Then that person may travel into Germany and see one with flues like in figure 4. Now it starts getting confusing: “You mean a masonry heater isn't just one of those squat things I saw in Austria, but it can be tall like this too?” Of course, yes is the answer.

I like the drawing of flue patterns from Russia

shown in figure 5 because it starts to chart the possibilities. Some designs have the flue gases go straight up first, and then go back down. Some have the exhaust go under the firebox before going up. Some have the final exit from the heater up high; others, down low. Yet even with a dozen or so options shown on one page, only the surface has been scratched in terms of the opportunities available. This book is inspired by the remaining infinite possibilities.

So, if you have seen a masonry heater in Canada or the United States before, and it looked like a big box (or, as a friend of mine put it, like a refrigerator), carefully turn page by page through this text as we investigate a little further. You might discover that, although you may not have room in your house, your house plans, or your room addition for a big box, you do have the need for a masonry heater.