

INSPIRATION GREEN



Masonry Heaters

Also known as masonry stoves, kachelofens, Russian fireplaces, Finnish fireplaces, Swedish stoves, tile stoves, contra-flow fireplaces, radiant fireplaces and mass-storage fireplaces. Inside, masonry stoves burn hotter than metal wood stoves and their winding maze of flue (baffles) warms the surrounding masonry, which then emits heat for 18 to 24 hours. The temperature can reach 2000 degrees inside some masonry heaters (vs 700 inside a metal stove), yet they stay comfortable to the touch on the surface. At these high internal temperatures, the hydrocarbon gases ignite, leaving very minimal pollution. When burning wood, about 30% of the generated heat is supplied by the wood solids and 70% of its heat is contained in released gases. If the volatile gases are not fully combusted, they escape as wasted heat and polluting particulate emissions. Igniting and then drawing the heat out of the combustion gases turns almost every ounce of wood into energy. A slow burning, low temperature, low oxygen fire produces tar and hydrocarbons, a fast, hot, air-fed fire burns the pollutants up. Add a storage battery (the masonry) and you have a very efficient, non-polluting heating system. A metal stove gives out its heat rapidly, thus never allowing the inside combustion temperatures to achieve the 1100 degree F plus needed to ignite all the gases.

Because the stored heat radiates slowly from the masonry, it is only necessary to light a fire once a day in most circumstances. In really cold conditions, you might need to light two fires a day. Metal wood stoves must be tended to continually and fluctuate from peak high temperatures, to no heat, when the fire is out. If you tamp down the flue on a metal wood stove you increase the emissions of pollutants as the combustion of the wood is incomplete. A masonry heater always burns wood at the highest heat, if you desire less heat, you simply use less wood. In a well insulated home, a masonry heater will use 1/5th (or much) less wood, then a home heated with a metal wood stove. All well-designed masonry heaters easily outperform the highest rated EPA metal wood stoves. And like a wood stove, a masonry heater can exhaust through a metal flue pipe.

The masonry stove has been around in many different forms in almost all ancient northern cultures, from the 7200 year old Kang bed stove in China to the Hypocaust in ancient Rome. In northern Europe, 500-600 years ago, a long-lived cold spell caused local wood to become scarce and masonry heaters became common due to their efficiency. In the past hundred years dirty coal, then oil replaced the masonry heater. Wood is a renewable resource and absorbs CO2 as it grows. Burning releases about the same amount of carbon monoxide, carbon dioxide and methane as would occur if the

wood were decomposing naturally on the forest floor.* Yet wood is a sustainable energy source, only when proper wood lot management is employed and when its energy is extracted efficiently and cleanly.

Although these effective heaters were and are still popular in Russian and northern Europe, the United States has never had a wood shortage, so the masonry heater has been pushed aside for the wood guzzling metal stove. Considering that masonry heaters are efficient and emit little pollution, the United States should take a closer look.

Surround your heater core with stone, brick, stucco or tile. Although kits are available, this is not a project for one new to masonry (see resources section). In the meantime, before I build one, I am simply going to pile large rocks around the wood stove.



Masonry heater - new stove based on an old design. A Kachelofen is a ceramic tiled wood stove which has mazelike, masonry channels within. The meandering exhaust gas warms the surrounding masonry which then slowly radiates its heat. A small windowless door allows the fire to burn very hot inside the heater. High heat and the addition of a second combustion chamber, burns up the polluting volatile gases and efficiently turns them into heat. biofireinc.com



Tiled Kachelofen by biofireinc.com. Special 'kachel' tiles surround the internal fire brick.



Stucco and tile masonry heater. fliesen-ofen-ritter.at



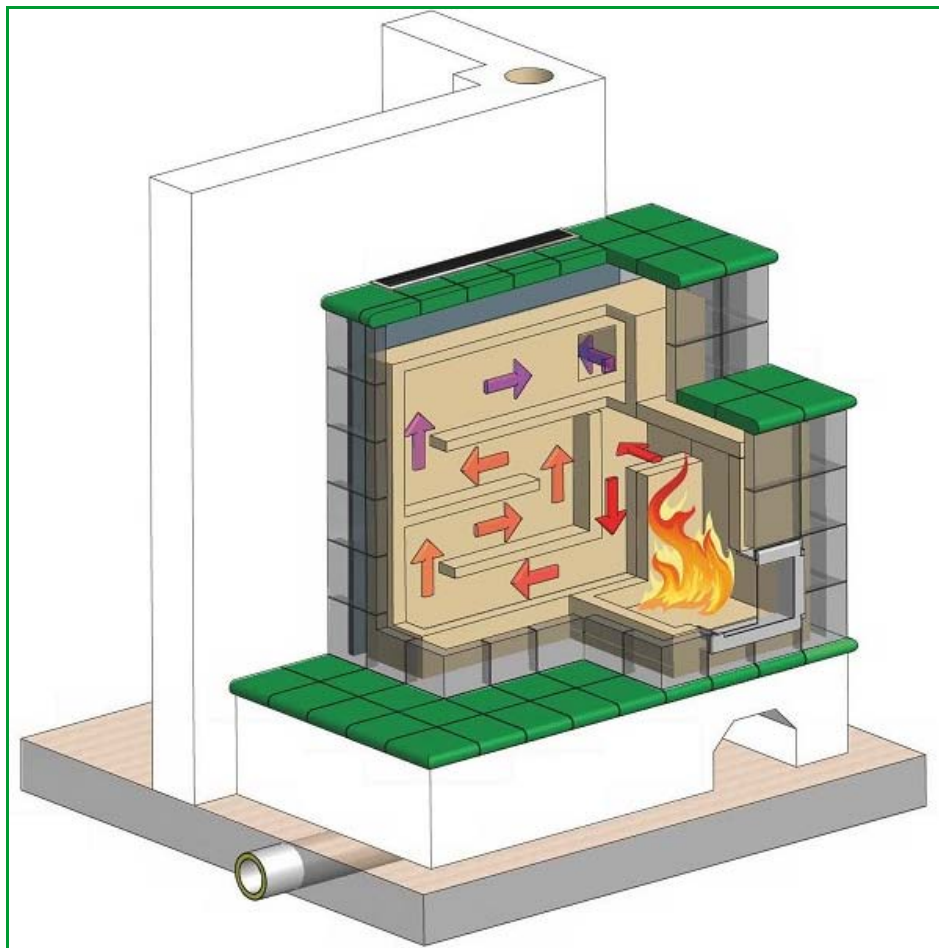
Old fashioned masonry heater clad in stucco and tile. fliesen-ofen-ritter.at



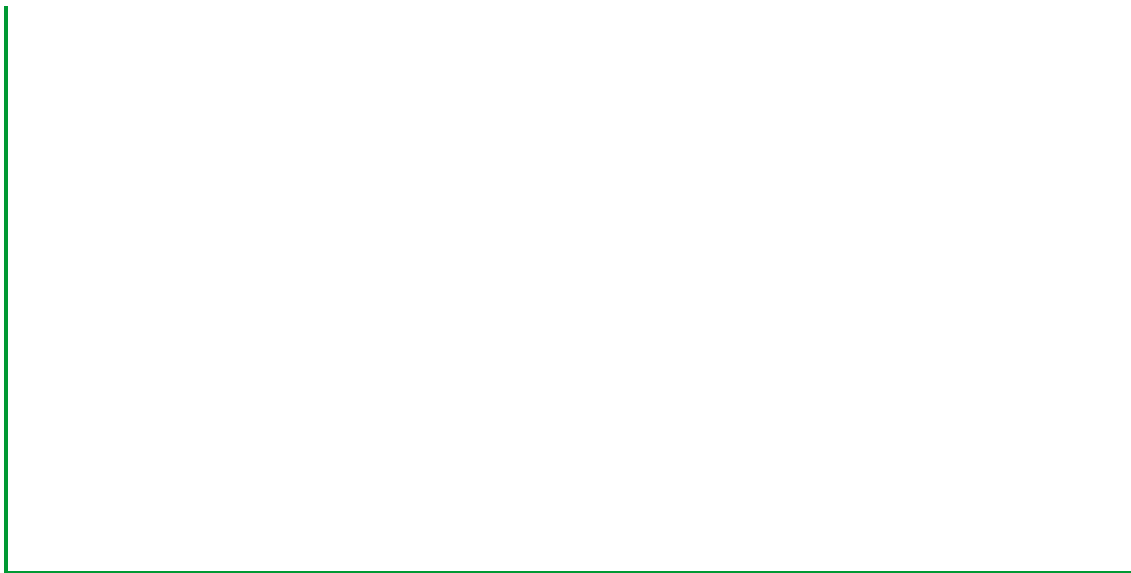
Tiled masonry heater with Asian influence. Only special 'kachel' tiles can touch the inner firebrick, all other tiles must be spaced away from the inner masonry, otherwise they will crack. fliesen-ofen-ritter.at



Stucco and tile masonry heater. biofireinc.com The small door keeps the heat inside, so high combustion temperatures are reached more easily.



Inside a Kachelofen. Channels or baffles are efficient at removing heat from the exhaust.



Tiled masonry heater in Finland. The Finnish government encourages the use of masonry heaters with tax incentives, the program has been so successful that 90% of new homes have masonry heaters. contura.eu



Swedish stove or kakelugn. Interior has masonry baffles, exterior is clad in curved tile. There is actually lots of masonry inside there to soak up the heat. contura.eu



Brick masonry heater with heated bench in France by feudebois.com. A heater with a façade thickness of 3-4 inches, gives a moderate heat transfer, not too fast, not too slow.



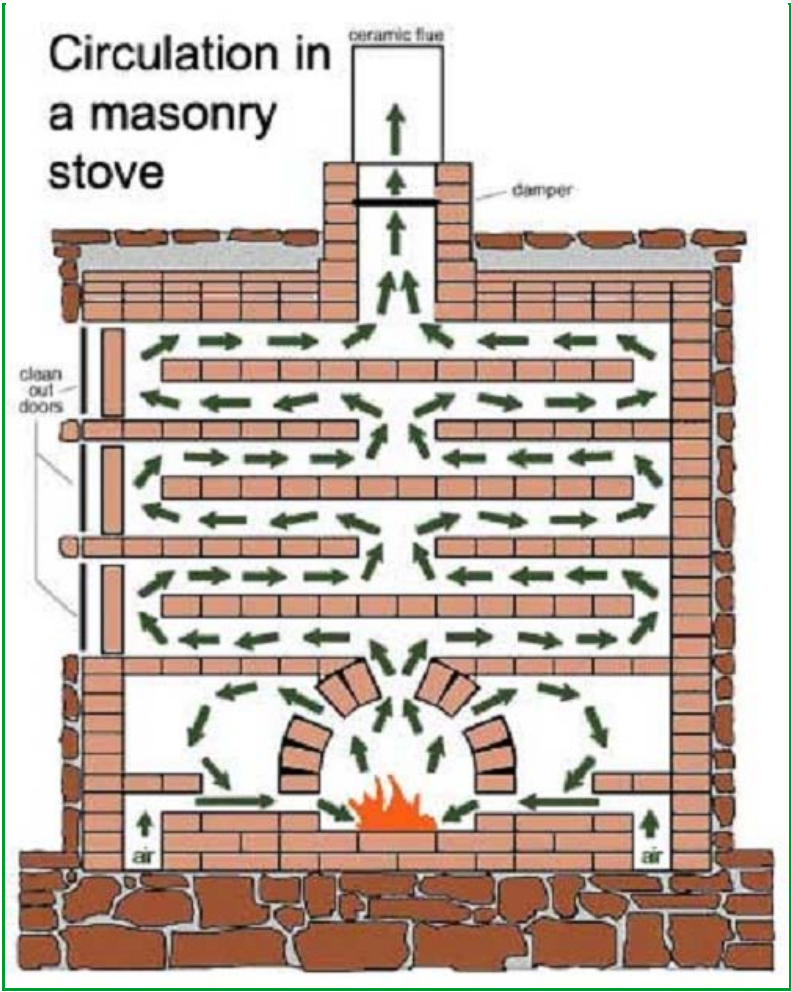
Brick masonry heater in France by feudebois.com



This masonry heater acts as a wall between two rooms in Quebec, Canada.
By maconneriegillesgoyette.com



Brick masonry heater made with reclaimed brick, sand and lime mortar, lilac bluestone and a Heat-Kit heater core. By William Davenport. turtlerockheat.com. To reduce stress, masonry heaters in North America are usually built with a double-wall system; a refractory core including firebox and channels or baffles, and a separate, unattached masonry veneer. Otherwise the heat of the firebrick might crack the façade, although brick is least likely to be stressed.



Directing the hot flue exhaust through a series of baffles heats up the surrounding masonry. The baffles can meander in numerous directions. Some stove's baffles take the exhaust side to side, some up and down, some front to back, and vice versa. There is always a source of air coming in the base of the heater to feed the fire. Yet, flues that are too long and convoluted might restrict the draft through the system, as each change of direction creates resistance to the gas flow and decreases the suction of the chimney draft. energybible.com



Masonry Heater with wrap around heated bench, direct fire oven (on kitchen side), and wood storage by Carsten Homstead of Massachusetts. homespunworks.com



This masonry heater in Burlington, Vermont has a bake oven on the kitchen side.
Masons: William Davenport, Spencer Blackwell, Norbert Senf. turtlerockheat.com



Stone masonry heater with a heatkit.com core. If there is too much façade mass, 5" or more, the mass can slow down the heat exchange. An efficient heater should produce heat at the same rate, as the heat is given off (emitted). The firebox size should also match the size of the heater and home.



It is not efficient to put your heater on an exterior wall. When on an exterior wall, that portion of the masonry facing toward the outside, will simply be heating the outside air. This heater is an interior wall. Vermont masonry heater by smithandvansant.com



A masonry heater's chimney can be ceramic or metal. Large fireboxes reduce combustion efficiency and generate higher emissions. Keeping the window small means the heat gets absorbed into the masonry. Canadian heater by bien-o-chaud-portail-poeles-et-foyers.com



Brick masonry heater. There is no reason why some heaters can't be low and long. There is a wood fired cookstove on the opposite side of this heater. stenovne.dk



Masonry heaters are best positioned in the center of the home. The kitchen side of this heater is faced in brick. Massachusetts heater by Steve Bushway, ultimateridgehook.com. Core by heatkit.com



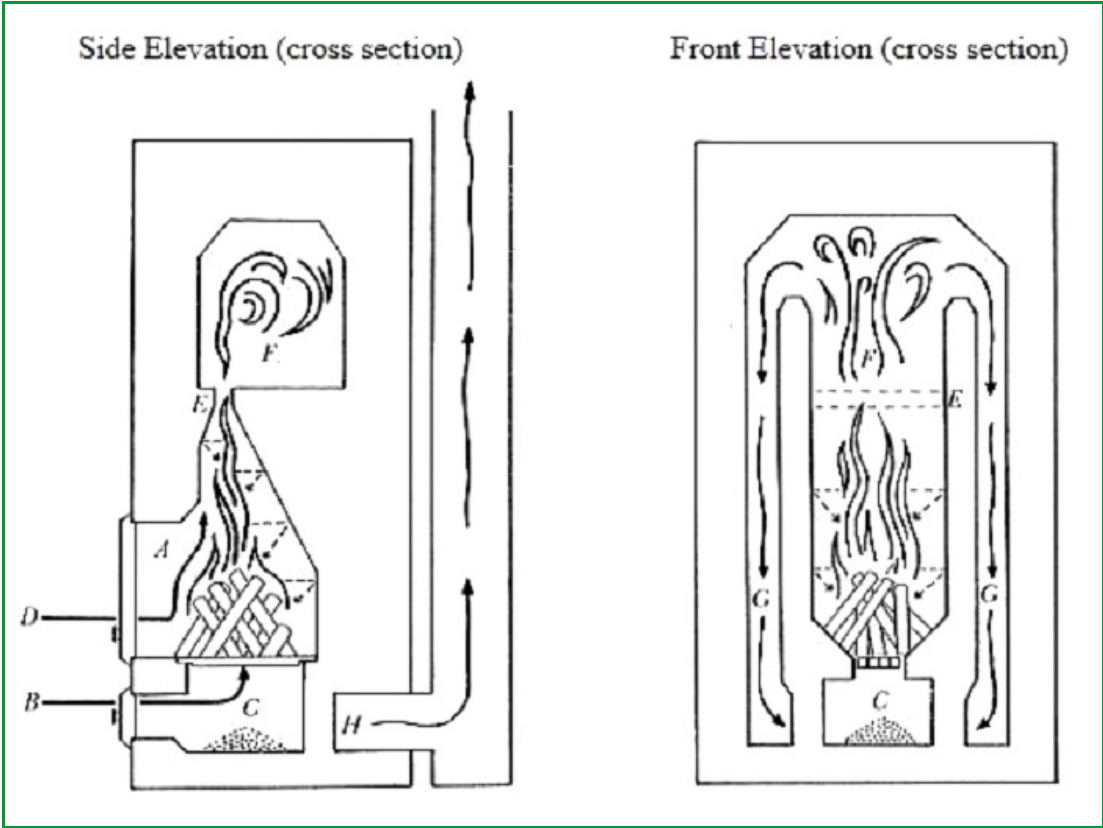
Local slate covers this masonry heater in Vermont by William Davenport. The heater has doors on both sides. turtlerockheat.com



Masonry heater that extends to room on other side of wall. Custom concrete slabs, steel, black walnut wood box top, bluestone, lilac bluestone. By turtlerockheat.com

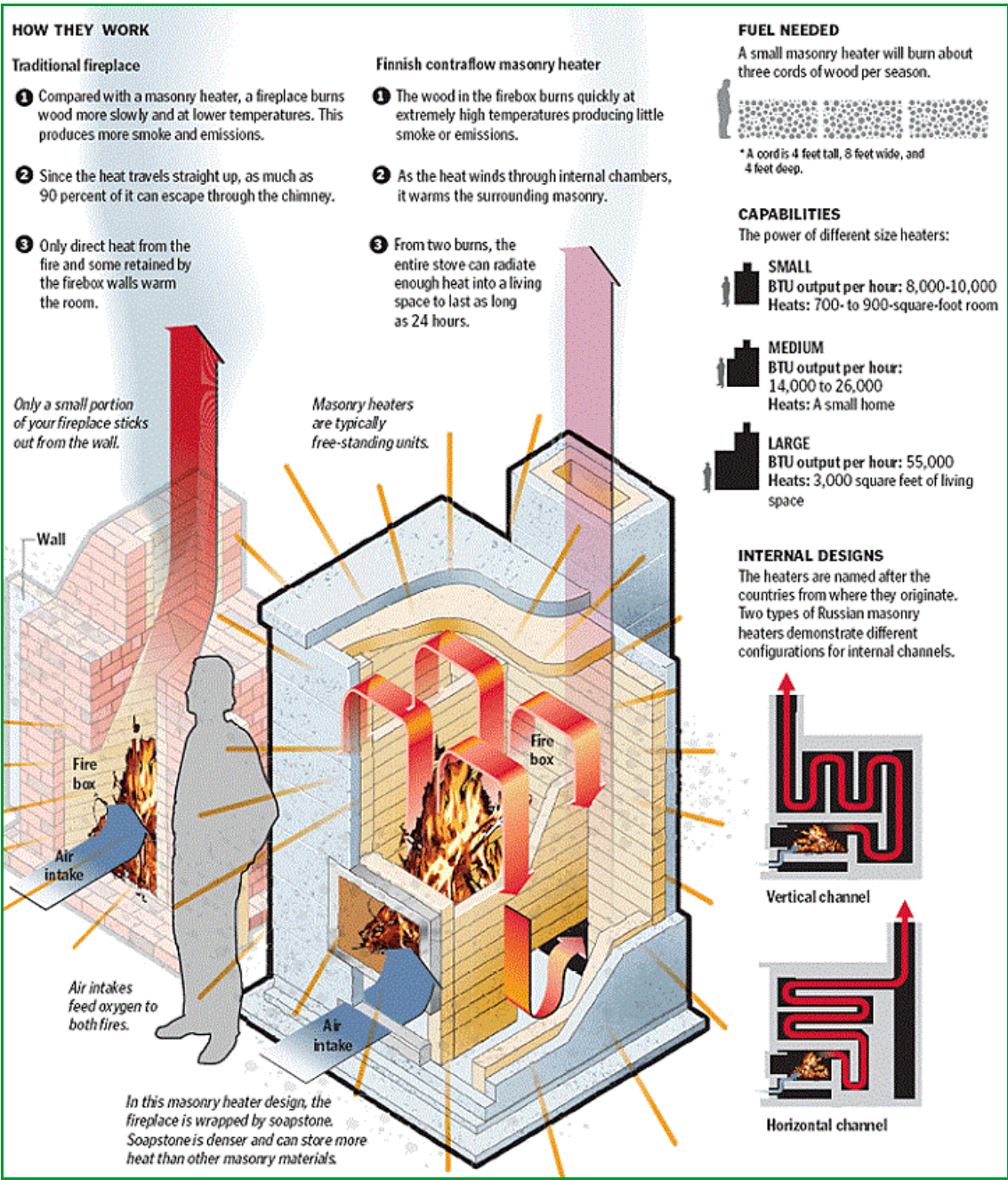


Soapstone masonry heaters come in all sorts of shapes and sizes. Soapstone has thermal properties that exceed all other stone, brick or stucco. These Tulikivi heaters are at the virginiaradiant showroom. Pictures of a Tulikivi being put together: mha-net.org



Scheme of a contra flow heater:

As the fire burns, air is drawn in through the primary air intake (b), passes up through the grate in the firebox floor (c) and feeds the burning wood. Due to the design of the fire box and its angled ceiling, heat radiating from the fire is reflected off the firebox walls back onto the fire, helping obtain firebox temperatures of 600 Degrees C. a prerequisite for secondary ignition. Air from the secondary air intake (d) located in the loading doors, the flame and unburnt gases rush up through the narrow throat in the firebox ceiling (e) and enter the secondary combustion chamber (f). Due to the angled ceiling, the flame, air and gases are pressurised slightly. Once through the throat they expand, tumble and mix, allowing secondary combustion and temperatures in the region of 900 degrees C (2,200 degrees F). The hot gases pass over the top of the side walls of the secondary combustion chamber into the vertical flues on both sides of the heater.(g) Drawn by the draft from the chimney, the hot air flows down the flues transferring its heat to the flue walls before entering the chimney at the base of the heater (g). Via: pyromasse.ca



Note the drawings on right, the channels (baffles) can meander up and down, side to side or both. Graphic: boston.com



Masonry heater with large see-through windows. A large firebox reduces combustion efficiency and generates higher emissions. See-through heaters also increase the amount of heat escaping the firebox and therefore lowers combustion temperature and generates higher emissions. brunner.de



Masonry heater in a bathroom by peacedesign.org. If the distance from the core to the surface of the stove is very thick (5" or more) or complicated (many layers), the heat will radiate out very slowly. An efficient heater should produce heat at the same rate, as the heat is given off (emitted). A massive heater will also be much slower at responding to changes in temperature.



Stucco and mosaic masonry heater. Core is by Heat-kit. www.mha-net.org



Wood stove on the bottom, Kachelofen tile on top. This stove will give you fast, direct heat passing through the metal, and the slower, radiant heat from the upper masonry baffles, whose surface has been tiled. Yet because the metal gives off heat so rapidly, this stove may not reach the internal temperatures necessary to burn off all hydrocarbons. ofenhaus-hoppe.de



In a two story home, this is one of the best locations for a masonry heater. erdwerk-keramik.at



Masonry Heater in the Via Miodula Hotel, Poland.
www.villamiodula.pl



Masonry stove in France by poele-cuisiniere.fr Remember if there are no flames, half the wood is being wasted as smoke...



This masonry heater is veneered with the same earth-clay plaster used on the walls of the main floor. A heated bench topped with sandstone makes for a warm perch on winter days. By Gimme Shelter Construction. gimmeshelteronline.com



A masonry heater made from paving slabs. But, this heater most likely will not pass

code in the U.S.. www.envisioneer.net

Mark Twain on the Kachelofen...from "*In Europe and Elsewhere*" 1923.

"Take the German stove, for instance - where can you find it outside of German countries? I am sure I have never seen it where German was not the language of the region. Yet it is by long odds the best stove and the most convenient and economical that has yet been invented. To the uninstructed stranger it promises nothing; but he will soon find that it is a masterly performer, for all that. It has a little bit of a door which you couldn't get your head in - a door which seems foolishly out of proportion to the rest of the edifice; yet the door is right, for it is not necessary that bulky fuel shall enter it. Small-sized fuel is used, and marvelously little of that. The door opens into a tiny cavern which would not hold more fuel than a baby could fetch in its arms. The process of firing is quick and simple. At half past seven on a cold morning the tender brings a small basketful of slender pine sticks - say a modified armful - and puts half of these in, lights them with a match, and closes the door. They burn out in ten or twelve minutes. He then puts in the rest and locks the door, and carries off the key. The work is done. He will not come again until next morning.

All day long and until past midnight all parts of the room will be delightfully warm and comfortable, and there will be no headaches and no sense of closeness or oppression. In an American room, whether heated by steam, hot water, or open fires, the neighborhood of the register or the fireplace is warmest - the heat is not equally diffused throughout the room; but in a German room one is comfortable in one part of it as in another. Nothing is gained or lost by being near the stove. Its surface is not hot; you can put your hand on it anywhere and not get burnt. Consider these things. One firing is enough for the day; the cost is next to nothing; the heat produced is the same all day, instead of too hot and too cold by turns; one may absorb himself in his business in peace; he does not need to feel any anxieties of solitudes about the fire; his whole day is a realized dream of bodily comfort.

America could adopt this stove, but does America do it? The American wood stove, of whatsoever breed, it is a terror. There can be no tranquility of mind where it is. It requires more attention than a baby. It has to be fed every little while, it has to be watched all the time; and for all reward you are roasted half your time and frozen the other half. It warms no part of the room but its own part; it breeds headaches and suffocation, and makes one's skin feel dry and feverish; and when your wood bill comes in you think you have been supporting a volcano." Via, kachelofen-usa.net

How To:

Missouri Mass Stove: www.dnr.mo.gov/pubs/pub781.pdf

Design plans for small (cute!) cabin heater in brick: firespeaking.com

Lots of 'inside' pictures/designs/lessons: www.firespeaking.com

Manuals: mainewoodheat.com

Masonry Heaters: Planning Guide for Architects, Home Designers and Builders.
By Alex Chernov. stovemaster.com/files/masonry.pdf

Core construction manuals, kits start at \$5400: heatkit.com

Cob masonry heater with bench, handprintpress.com

Masonry Heater Planning Guide: tempcast.com

Step by step photos: mha-net.org

Russian Steam Sauna!: stove.ru

FAQ:

Masonry Heater Association: mha-net.org

heatkit.com/html/faq

Good read: stove.ru/

Notes on combustion: stove.ru

Heater Cores:

masonryheater.com/cores

heatkit.com

tempcast.com -tested at 94.4% combustion efficiency.

brunner.de - Europe

Hardware/Doors:

mainewoodheat.com

masonryheater.com

Kachelofen Tiles:

kachelofen-usa.net

Certified Heater Masons:

mha-net.org

Modulars/Freestanding:

Soapstone: tulikivi.com

Tiled: cronspisen.eu

Netherlands: bergkachel.nl

Netherlands: tigchelkachels.nl

Metal: wittus.com

Vintage:

Gorgeous antique tiled stoves: vintageelements.com

Pellet Masonry Heaters:

Pellet burning in a masonry wood heater. heatkit.com

Inserts:

Vermont Castings
osburn-mfg.com
hearthstonestoves.com
Morso
archgard.com
pacificenergy.net
renaissancefireplaces.com
Wittus H530 - wittus.com

Books:

Masonry Heaters: Designing, Building, and Living with a Piece of the Sun by Ken Matesz, published in 2010.

The Book of Masonry Stoves: Rediscovering an Old Way of Warming by David Lyle, published in 1998.

Build your Own Masonry Fireplace by Thomas Elpel, www.hopspress.com.



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Earth Sheltered

The earth-house uses the ground as an insulating blanket that efficiently protects it from temperature



Modern Underground

Underground homes with a modern bent. A large thermal mass stabilizes inside



Pit Greenhouses

For those in northern, high altitude or windy climates who wish to grow their food year round. Take advantage



Stacking Firewood

Ingenuous ways to stack firewood.



Rocket Mass Heaters

The rocket mass heater works on similar properties as a masonry heater. A fast,



Masonry Wood Cookstoves

Masonry heaters can incorporate cook stoves. And cook stoves can act as



Masonry Heaters with Ovens

Bake ovens can be either white (the fire is in another box, usually below the oven)



Masonry Heaters

Heat, not pollution. The cleanest burning wood stoves have been around for centuries, yet have taken a



Indoor Pizza Ovens

If you live in a cool climate, you might as well investigate adding a masonry heater along side your pizza oven.



Outdoor Earth Ovens

Examples of pure cob and adobe, and refractory castable cement over bricks.



Hedge Laying

Over two thousand years older than chain link.



River Rock Fireplaces

Although lots of mass and beautiful, most heat goes straight up the flue. Build a



Outdoor Brick Ovens

Recycle some old bricks...into an oven.



Greenhouses from Old Windows and Doors

Replacing your old windows or windowed doors with



Container Homes

Somewhere around 30 million steel shipping containers exist today. 8 feet wide by 8.5 feet high, and either 20



Outdoor Masonry Ovens

Build an outdoor oven with local stone and DIY skills for a few hundred dollars. Or,



Stone Furniture

No more plastic! Or vinyl, or PVC! Looks great as a weight loss program as well. First, the perspiration created



Insect Hotels

Call them bug condos, insect hotels, insect habitats, wildlife stacks, insect boxes, insect houses, insect walls,



Living Willow Hedges

Willow cuttings called 'withies' easily root in either water or moist soil. Plant in



Pebble Pathways

More pebble ideas...

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123

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