



Old-house fireplaces and the requisite chimneys that exhaust them are misunderstood fixtures. Learn more for better comfort and safety.

BY MARY ELLEN POLSON

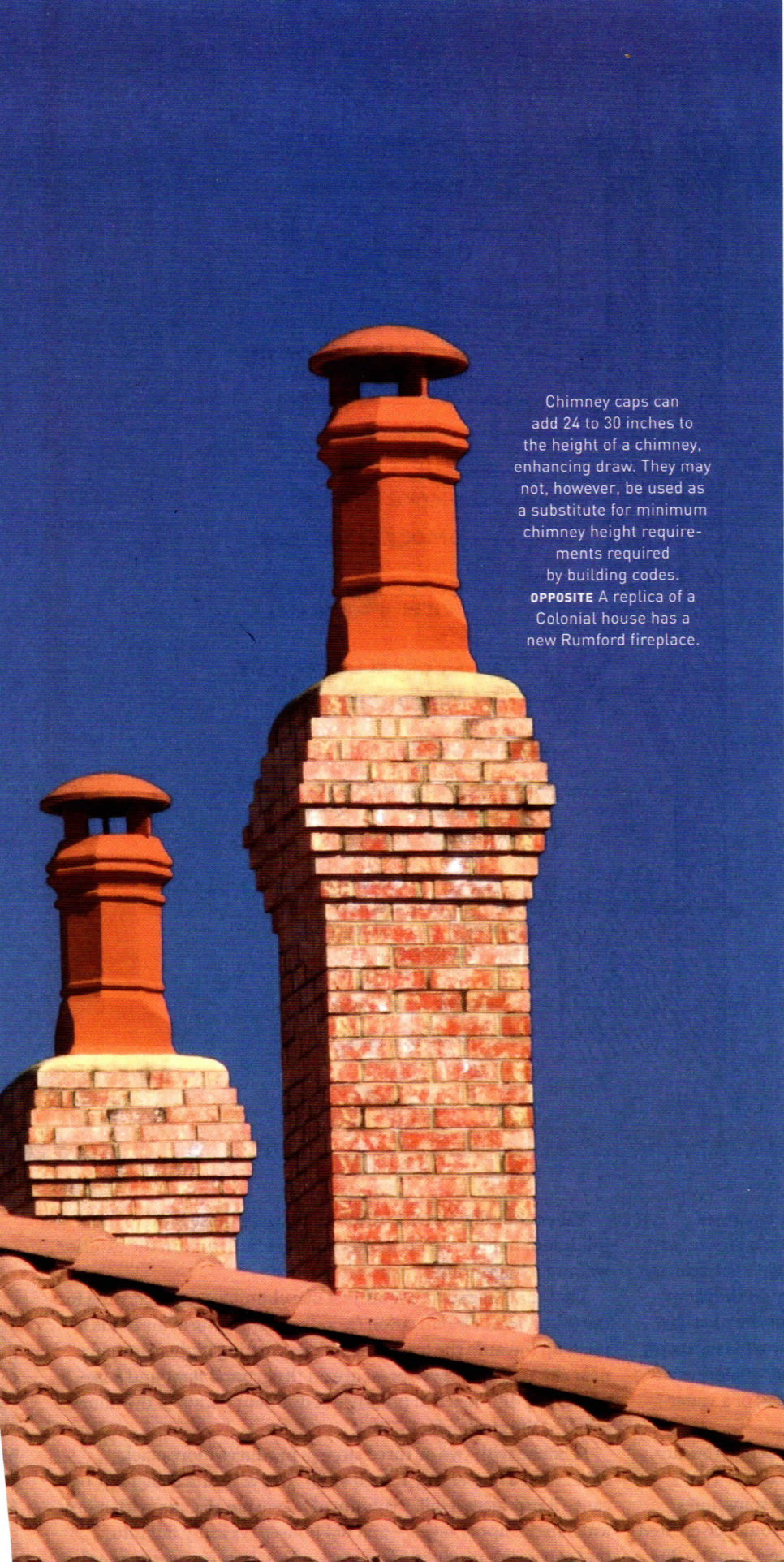
UNDERSTANDING FIREPLACES

Nothing like the flickering flames and cozy warmth of a fire on a cold, damp evening. That is, if the fire actually catches and draws without smoke billowing into the room.

Chimneys work on the principle that hot air rises because it is less dense than cold air. When a chimney is filled with hot gas, the gas tends to rise because it is less dense than the air outside. The rising hot gas creates a pressure difference called draft, which draws combustion air into the firebox and expels the exhaust gas outside.

Most old-house fireplaces draw well because they were built by masons skilled in the art of chimney and firebox construction. Over time, however, conditions that affect draw may change. "The house has to be in a pressure situation that allows the chimney to draw," says Tyler McClave of Superior Clay, a maker of Rumford fireplaces.

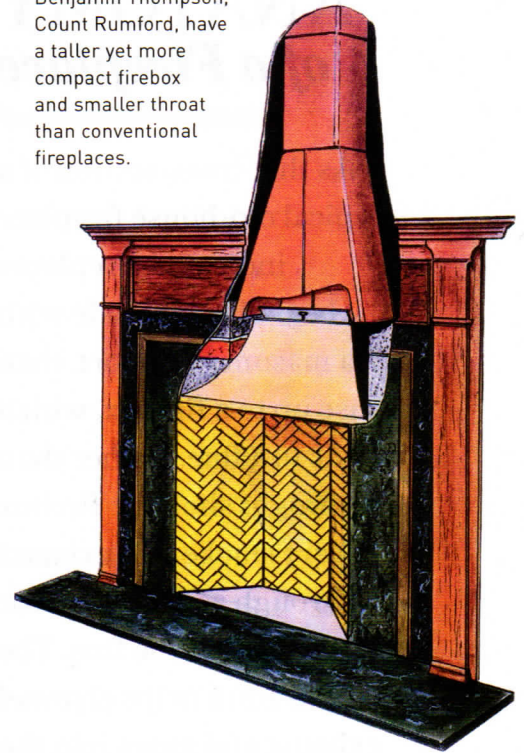




Chimney caps can add 24 to 30 inches to the height of a chimney, enhancing draw. They may not, however, be used as a substitute for minimum chimney height requirements required by building codes.

OPPOSITE A replica of a Colonial house has a new Rumford fireplace.

RIGHT Rumford fireplaces, based on a pattern developed in the 1700s by Benjamin Thompson, Count Rumford, have a taller yet more compact firebox and smaller throat than conventional fireplaces.



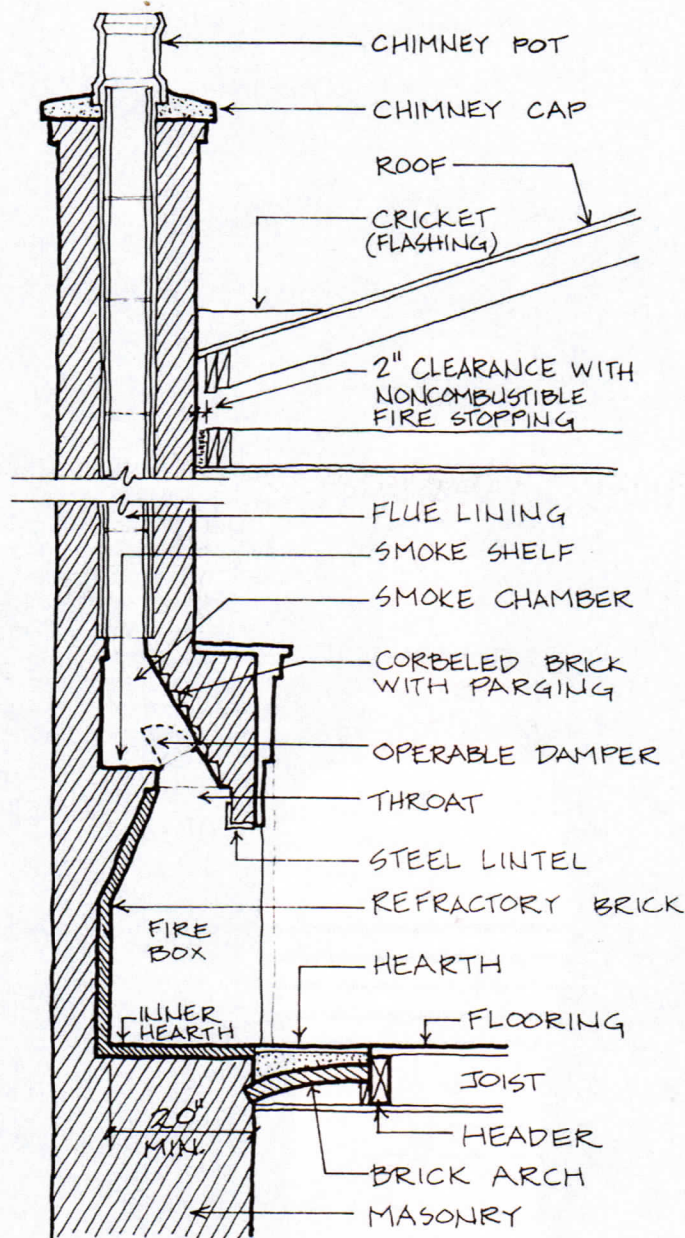
Rumford's Radiant Idea

Count Rumford's fireplace design, taller than earlier conventions, was also shallower, with widely angled covings to better reflect and radiate heat. He advocated plastering and whitewashing the firebox to keep it clean and reflective. Modern physicists argue that what really happens is that, whitewashed or not, the firebox absorbs heat and re-radiates it out into the room. There isn't a significant difference in performance between whitewashed plaster and soot-covered brick.

PHOTO & ILLUSTRATION COURTESY SUPERIOR CLAY, SANDY AGRAFIOTIS (OPPOSITE)

ANATOMY of a Fireplace

As this cross-section of a typical old-house fireplace indicates, fireplaces begin below grade with a masonry support, then rise up to a firebox, which opens to a flue. Rather than a straight shot, the firebox delivers smoke and exhaust through a narrow throat at the base of the flue. The configuration helps channel exhaust and gases into the flue, where they quickly exit through the top of the chimney.



In a conventional wood-burning fireplace, the hot gases formed by combustion create turbulence that swirls around and eventually finds its way through the throat—a tight spot near the bottom of the flue—and out through the chimney. In the more compact design of a Rumford chimney, named for the physicist who invented the style in the 18th century, the throat is narrower and more streamlined, so that the turbulence and smoke evacuate more quickly. “It’s sort of like squeezing the end of a water hose to make it flow faster,” McClave says.

The hotter the gases in the chimney are compared to the air temperature outside, the better the chimney will draw. That’s why a fireplace that draws well in cold weather is sometimes smoky or fitful when it’s not cold outside. The turbulence created during combustion has a harder time finding its way up the flue.

Taller chimneys tend to draw better than those built to the minimum requirements, as do chimneys built within the exterior walls of a house rather than outside.

That said, houses draw air just like chimneys do, according to the Wood Heat Organization (woodheat.org). Warm air tends to push up towards the top of the house, creating higher pressure near the roof and lower pressure on the ground floor and basement. The difference in pressure at different points in the house is called the stack effect.

A house with two or three storeys produces more stack effect than a one-storey Ranch or an Arts & Crafts Bungalow because it produces a taller column of warm air. Houses with more leaks in the upper levels—and old houses typically fall into that category—produce more stack effect. [text cont. on page 44]

THE PRO TIP

Cracked bricks and crumbling mortar are warning signs of a deteriorating chimney. Have damage repaired by a professional certified by the Chimney Safety Institute of America.

Cleaning Brick & Stone

Count yourself lucky if your brick or stone fireplace surround is just dirty. If someone painted over it in the past, restoration is harder.

Over time, small, black, carbon-based particles become embedded in the surface of masonry fireplaces. Removing this built-up dirt is usually fairly labor intensive, and effective cleaning materials range from art-gum erasers—they really work!—to a variety of household and specially formulated cleaners.

The go-to cleanser in the past was trisodium phosphate (TSP), but this harsh chemical is a notable pollutant of waterways. Today there are more eco-friendly cleaners, such as

Chimney Rx. Even a wash with window cleaner can significantly improve the appearance of materials like stone or rugged brick.

Since masonry is so varied, experiment with a variety of cleaners, beginning with the gentlest. When working with any kind of harsh cleaner, use a sponge or wire brush and wear long rubber gloves to protect hands and arms.

Painted surfaces require more elbow grease and the process is messy. Start with gentle hand-scraping with a variety of tools, with or without a heat gun or infrared tool, such as Eco-Strip's Speedheater, to loosen paint from the surface.

Since masonry surfaces

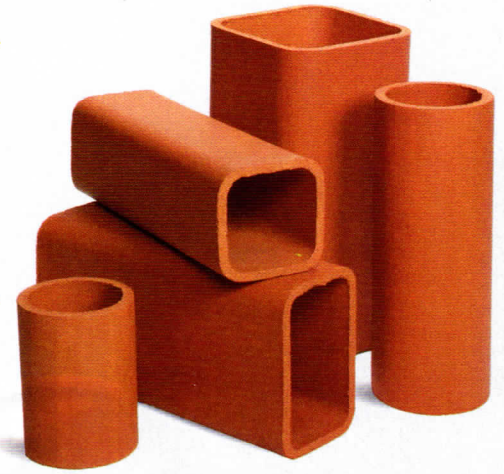
tend to be at least slightly rough, it's almost impossible to get all of the paint off without one or more applications of a proprietary cleaner specifically formulated for jobs like this. Only a few, such as Blue Bear's Soy-Gel, are free from harsh chemicals. Be sure to protect other surfaces. In the end, the results may be well worth the mess.



ABOVE Never paint a brick or stone surround—or a future owner may be forced to do this.
LEFT Blue Bear's Soy-Gel removes paint from masonry safely and easily.

THE
PRO
TIP

Mortared in place as the chimney is constructed, hollow vitrified clay flue liners are the traditional material for lining chimneys. They are available in various shapes, sizes, and lengths.



Do you need a chimney liner?

Old chimneys are subject to wear and tear, from chinks in the mortar and percolating moisture to the buildup of creosote inside the flue. While many of these issues can be addressed with proper maintenance, the enclosed nature of the chimney makes it impossible to see or anticipate every potential hazard. That's why many chimney sweeps and building professionals often urge owners to install chimney liners as a safety precaution.

Chimney liners perform three functions:

- **They protect the building** by insulat-

ing any flammable material around the chimney from the hot gases in the flue.

- **They protect the masonry, brick or stone**, as well as the mortar from the deleterious effects of the acidic chemistry of the by-products of burned gas, oil, or wood.
- Finally, **a liner can be sized to optimize airflow** through the flue.

Chimneys constructed before the first decades of the 20th century were usually straightforward affairs of brick or stone. As the masonry was laid up, the interior of the chimney received a parging coat of mortar as a means of protecting the brick or stonework and mortar joints from the effects of the acids created during the combustion process.

Early in the 20th century, masons began to install rectangular tubes of terracotta as the chimney was built. These clay flue liners were stacked and mortared as the chimney rose around them. When complete, the clay liners could last 50 years or more.

Problems arise when inspections find that one or more of the clay liner pieces have developed cracks or breaks. Repair made by replacing individual flue "tiles" is not only difficult, but also can be quite destructive. Usually an interior or exterior wall must be opened to remove the broken clay flue liner and replace it.

Clay is durable and has a low material cost. Normally unaffected by heat and combustion acids, clay liners are sometimes prone to thermal shock, particularly when the outside air temperature is very low. Impurities and even minor

defects during the manufacturing process can increase the chance of damage. Alternative liners include metal and cast-in-place masonry liners. Like clay, both have pluses and minuses.

Metal liners are commonly galvanized steel, aluminum, or stainless steel. For straight runs they can be supplied as bolt-together sections. For chimneys that present with turns, stainless steel (for example) is supplied in a corrugated tube to assist bending and produce a virtually seamless flue from the firebox opening or stove to the top of the chimney.

UNLINED CHIMNEYS

don't retain heat as well as lined flues, leading to more condensation of flue gases and **creosote** buildup.

Call the chimney sweep when creosote reaches the thickness of a dime—or once a season with regular use.

A new liner will undoubtedly decrease the diameter of the flue, which may affect how well a chimney draws if the fireplace is an open one. Decreasing the size of the flue can actually be a benefit if the liner serves a stove or insert. (Metal liners are required by code for both.) While aluminum and stainless-steel liners have shorter lifespans than either clay



TOP Clay flue liners made by Superior Clay. **LEFT** An old square flue before lining; the same flue, after being lined using the Thermocrete process.

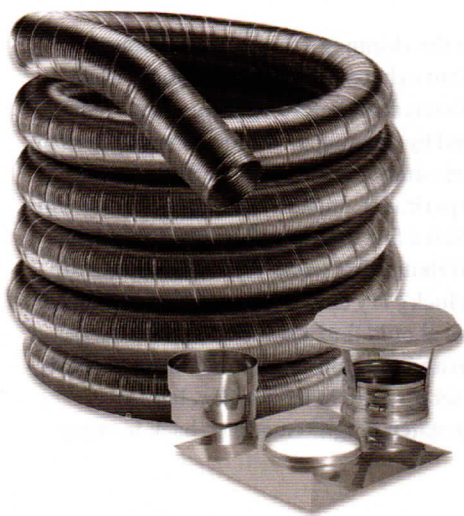
OPPOSITE A stainless-steel flue liner kit made by Duraflex.

or masonry, they are far easier to replace. The cost is not insignificant, with most liner jobs running from about \$1,200 to \$2,400.

Cast-in-place liners are installed in one of three ways. In a system marketed by Thermocrete, a rotating spray nozzle can be lowered into any chimney to spray on a coating that can be layered over several passes. This process will maintain the diameter of the existing flue as it repairs cracks and chips in a clay liner or unlined chimney. The surfacing can be refreshed in the event of coating failure.

Another process, available from Supafly, involves inserting a long rubber tube into the chimney flue. The tube is then inflated and a lightweight, heat-resistant (refractory) cement is poured around the tube. When it hardens, the tube is deflated and pulled from the chimney, leaving behind a smooth flue suitable for use with any fuel. This permanent liner is also known to strengthen older chimneys. It is, however, non-reversible and about twice the cost of a stainless-steel liner. If the masonry fails, the alternative is to reline the chimney with a stainless-steel liner.

Finally, the Ahrens system employs a vibrating bell that is lowered into the chimney. As it is drawn up, a refractory cement is slowly installed around the bell, which subsequently packs it tightly to the walls of the chimney. The end result is a liner not unlike the lining described above, and at about the same cost. —Ray Tschoepe



A custom-designed masonry fireplace by New England Hearth & Soapstone incorporates stovetop burners, storage shelves, and niches as part of a rustic kitchen.

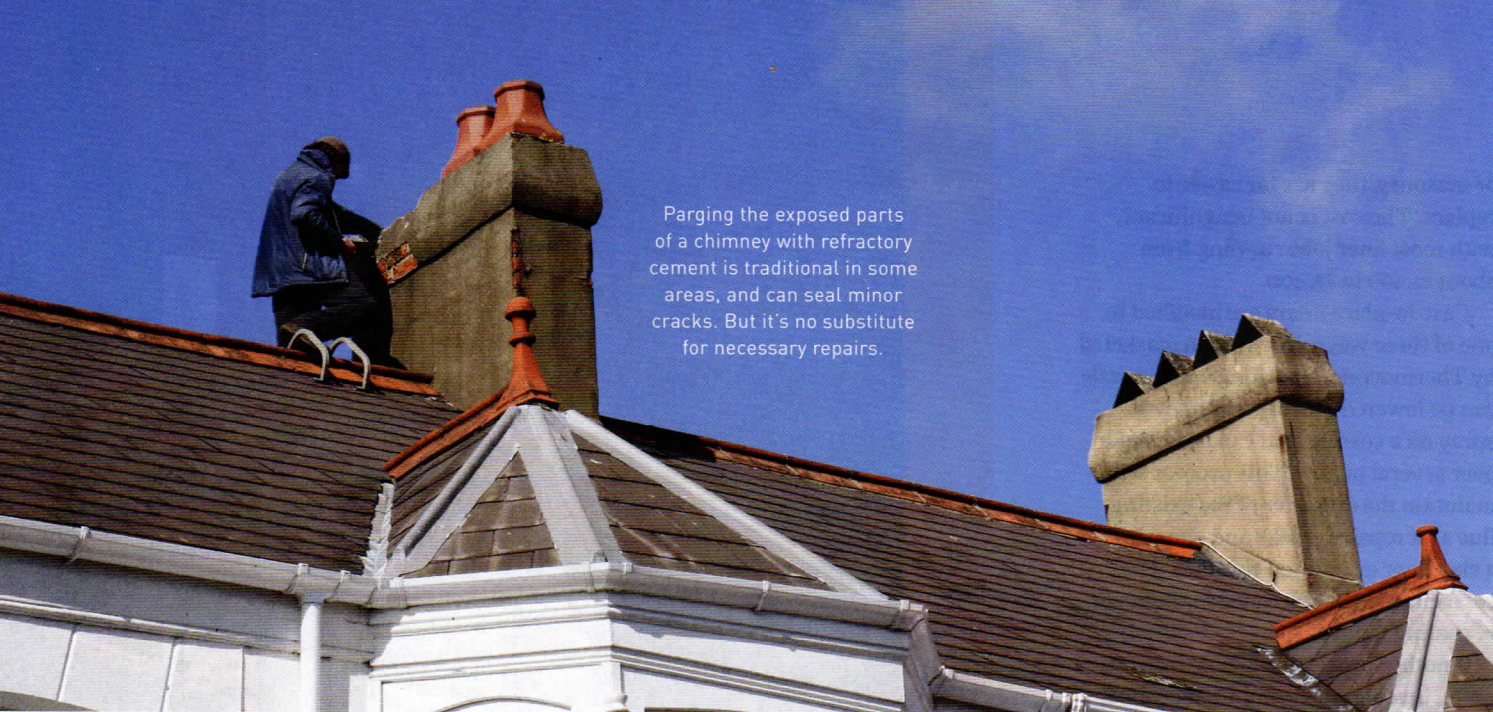
WHOLE HOUSE FIREPLACES

Suppose your old house has lost its original fireplaces, or that it's cost-prohibitive to restore them. Or you're interested in a whole-house heating method that burns a low-cost material.

The answer could be a masonry fireplace. With a heritage that goes back hundreds of years to the earliest stoves in Scandinavia and Europe, masonry fireplaces are massive, enclosed whole-house heaters with heat-exchange channels that conserve energy and slowly release it. Masonry stoves use less wood than wood stoves or fireplace inserts to produce more heat. What's better, they produce fewer emissions, not least because fueling one even in the coldest weather means opening the door to reload only twice a day.

Masonry stoves are considered radiant heat sources. While they require a certain amount of mass and surface area to heat a given amount of space, they can be embellished with such features as warming benches and bake and pizza ovens. And a masonry fireplace burns clean, so that you'll always see flickering flames or glowing coals through the firebox opening.

While fireplace inserts typically run from \$4,000 to \$7,000 including installation, masonry fireplaces are a bigger undertaking. They not only weigh between 1½ and 3 tons, but are also more expensive because they're usually custom built. M. Teixeira Soapstone makes compact units finished in soapstone that begin at \$5,000 to \$6,000. Custom-designed masonry fireplaces made by 30-year veteran Rod Zander of New England Hearth & Soapstone range from \$20,000 to \$25,000 finished in tile or stone.



Parging the exposed parts of a chimney with refractory cement is traditional in some areas, and can seal minor cracks. But it's no substitute for necessary repairs.

Dampers Easy to open and close with a pull on a chain, poker, or latch, a damper is essential for fireplaces in colder climates. Without one, heat generated by a furnace will go straight up the chimney. • In many older houses, cast-iron dampers are located in or near the throat of the chimney. In chimneys that lack a top screen, **a cast-iron damper is subject to rust** and can collect leaves, soot, or bird and squirrel nests. It's usually dirty to handle, and opening the damper

after the fire is already going is a recipe for both a smoky house and burns. • If the chimney lacks a damper, by all means install one. But there's no need to place it in the traditional throat location, which is difficult to reach and seal effectively, whether you are a professional or a homeowner.

Instead, choose a top-sealing unit (see Resources, p. 87). They are much easier to install, even as a DIY project, and eliminate the need for screening at the top of the chimney.



LEFT Constructed of cast aluminum and stainless steel and set with silicone gaskets, a Seal Tight damper won't rust or corrode.

A chimney that draws well should not be affected by the stack effect inside the house. A chimney can, however, become smoky or fail to draw well if the house is too airtight, especially if other appliances that vent air are running. "If the bath or kitchen fans are on, the fireplace may get smoky," says Jim Buckley of the Buckley Rumford Company.

Assuming the fireplace is in good working order, the damper is open, and that there are no obstructions, do a test to see whether the chimney is drawing properly. Hold a stick of incense or a candle in the throat of the fireplace, Buckley advises. If the smoke goes up the chimney, the problem isn't pressurization; it could be that the chimney flue is cold (or it could be your fire-building skills).

If the smoke blows down and out into the room, that means

there is a down draft in the chimney—that is, air is being drawn into the house rather than exhausted out the chimney. You'll need to neutralize the down draft before lighting a fire. Usually this can be accomplished by opening a window or turning off an air-handling vent, which alters the air pressure in the house.

Start with a small experiment, such as opening a door or window on a lower floor. Wait a few minutes, then test again with the incense or candle. If that didn't work, turn off a ventilation fan. Test again. Still no luck? Try closing an upstairs window or skylight. Eventually you should find a solution to the internal pressurization problem and the chimney should draw properly.

Once that happens, set up a fire in the firebox, light it in several places with a match or igniter, and sit back to enjoy the cheerful glow.