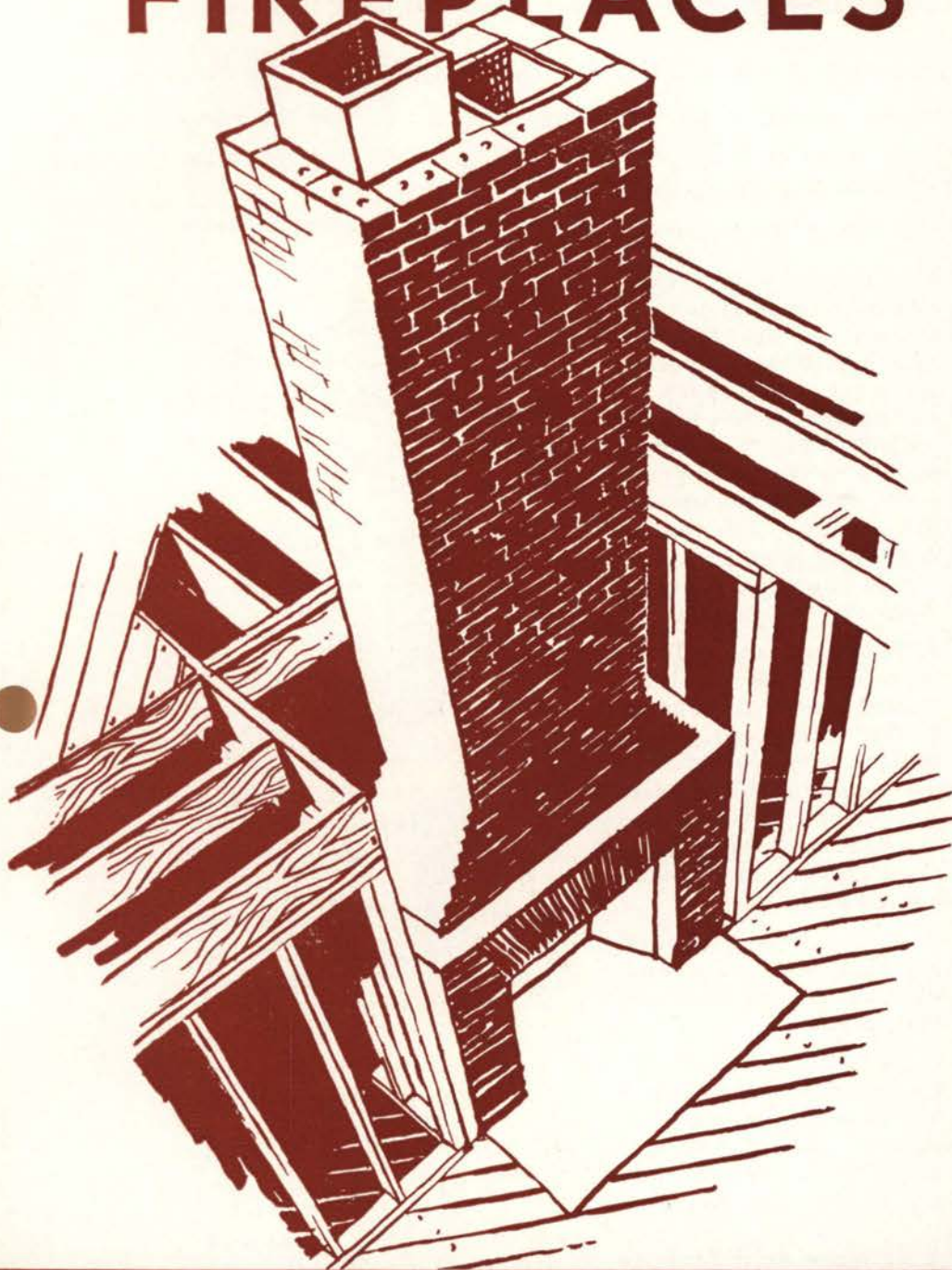


CHIMNEYS and FIREPLACES



ISSUED BY THE SMALL HOMES COUNCIL

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CIRCULAR SERIES

INDEX
NUMBER F7.0

YOUR CHIMNEY —

Is it safe?

Is it efficient?

Is it the right size?

Is it lined?

Is it correctly built?

Is it properly connected
to the heating plant?

YOUR FIREPLACE —

Is it necessary?

Is it safe?

Is it smoke-free?

Is it the right size?

Is it properly located?



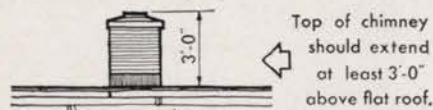
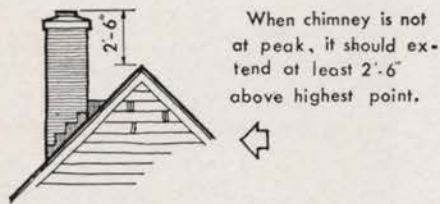
CHIMNEYS AND FIREPLACES
SMALL HOMES COUNCIL
F7.0

A CHIMNEY IS A NECESSITY

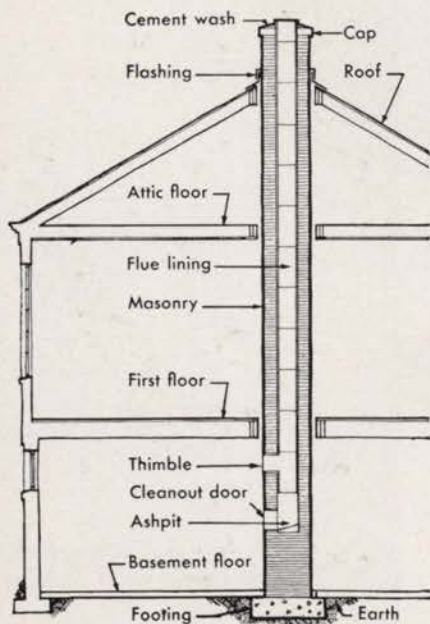
with any fuel-burning equipment. It must be capable of producing and maintaining a *draft* to bring a supply of fresh air to the fire. It must also carry away particles and harmful gases emitted from the fuel-burning equipment. The passage in the *chimney* through which these gases travel is called a *flue*. It and the entire chimney must be carefully built in order to be free of *fire hazards*. Defective or overheated chimneys form the greatest single known cause of residential fires.

BUILD YOUR HOME AROUND A SAFE AND EFFICIENT CHIMNEY

1. Masonry chimneys must be free-standing — giving no support to, and receiving none from the house.
2. A cap of stone or concrete on the top of the chimney will shed water, and thereby preserve the masonry below. The flue lining should extend through the cap and project above it.
3. Chimneys should extend above roofs and ridges so that air currents will not be deflected down into the flue. (See drawing.)



HEIGHT OF CHIMNEY



SECTIONAL VIEW OF CHIMNEY

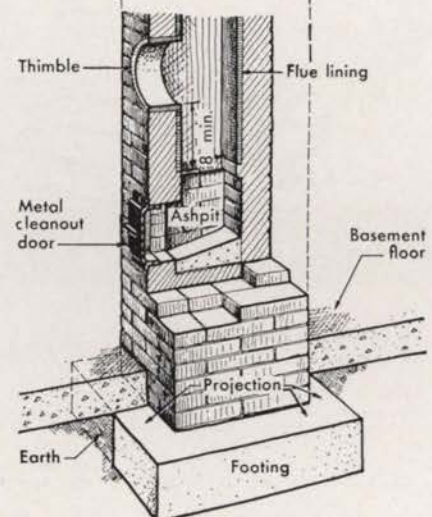
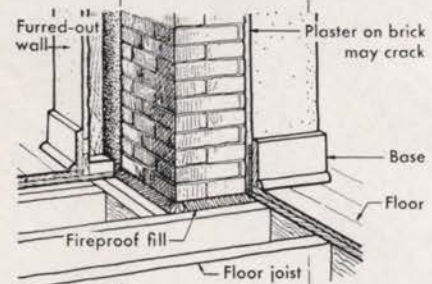
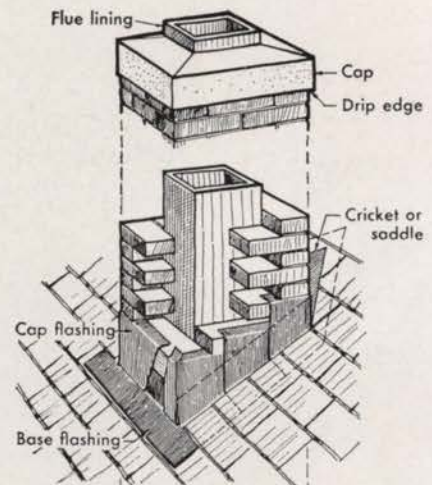
4. Water leakage around chimneys can be prevented by proper *flashing* and *counter flashing*. Corrosion-resistant metal such as sheet copper is best for this purpose. The flashing is built into the roofing material, and extends up onto the masonry. The counter flashing is bonded into the mortar joints and is lapped down over the flashing.

5. The roof and all the floors and walls should be framed around the chimney so that no combustible material is within 2 inches of the masonry. This space between the framing and the masonry should be filled with fireproof insulating material.

6. A *cricket* (or saddle) on the high side of a sloping roof will shed water around the chimney.

7. The chimney should be supported by a spread *footing*, located below the frost line. A poor footing may result in uneven settling and cracks in the chimney.

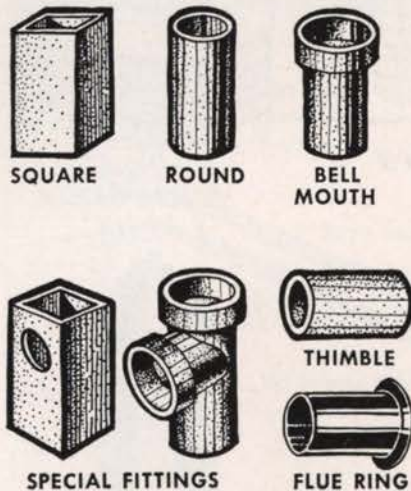
A chimney is difficult to remodel. Build it right the first time.



FIRE-CLAY FLUE LININGS ARE RECOMMENDED

for all masonry chimneys. They are available in three common shapes and in several sizes of each shape. The flues listed below are those more commonly used in home construction and are included in the tentative standards for Vitri-fied Clay Products (issued by Clay Products Association, Chicago).

SHAPES, SIZES, AND TYPICAL APPLICATIONS



USUAL APPLICATION	RECTANGULAR	CIRCULAR	BELL MOUTH (preferred for gas fuel)
	Outside Dimension	Inside Diameter	Inside Diameter
Gas Heating Equipment	4½" x 8½"	6"	6"
	8½" x 8½"	6"	6"
	4½" x 13"	6"	6" or 7"
Stoves, Ranges, and Room Heaters	8½" x 8½"	8"	8"
	8½" x 13"	8"	8"
Minimum Size for Coal and Oil-fired Central Heating Systems.	8½" x 13"	10"
	13" x 13"	12"

OPENINGS TO THE CHIMNEY

The smoke pipe should enter the flue through the *side* of the lining. If a rectangular lining is used, the lowest section should be one that has been scored or grooved during manufacture to form a panel which can be knocked out at the job.

Bell mouth linings are available with openings or connections with side outlets of the same diameter as the vertical passage.

Flue rings and thimbles, made either of metal or fire clay, are used as a connection between the side opening of the flue and the smoke pipe or vent pipe. They also act as the form around which the masonry is laid.

THESE FLUE LININGS ARE USUALLY AVAILABLE

WHEN THERE IS MORE THAN ONE FLUE IN A CHIMNEY BE SURE THAT:

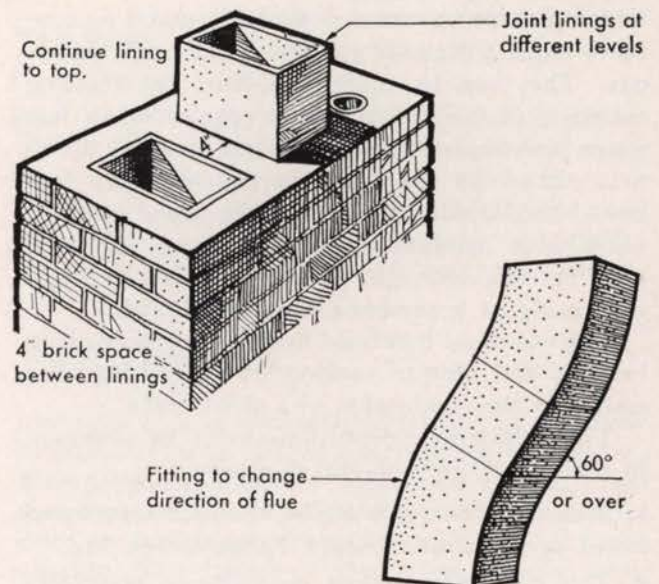
1. Each flue is entirely separate from the other flues with no cross connections between them.
2. Brick spacers separate the flue linings in one chimney.
3. Flue linings are built *ahead* of the construction of the chimney, and the brickwork is laid up around the lining. Joints in the flue lining must be bedded in mortar or in fire clay.
4. The flue for the heating plant is favored in every way. Be sure that the heating plant has a flue of its own.

WHEN A FLUE MUST CHANGE DIRECTION

(such as in a chimney which serves both fireplace and heating plant), the offset should be put in the fireplace flue. The flue from the heating plant should be kept straight. Changes in direction may be made by careful cutting and mitering of the linings or by special fittings. In either case the joints must be tight and the lining smooth on the inside.

The home owner must decide whether he will use a solid, liquid, or gaseous fuel, and must consider the probability of later changing from one fuel to another. If there is a likelihood that such a change may be made, he should select a flue lining that is adaptable to all fuels.

For chimneys serving gas-burning equipment, see page 8.



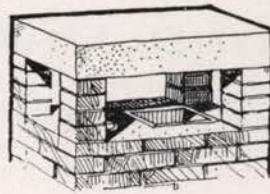
CHIMNEY TOPS, ROTATING CAPS, AND SPARK ARRESTERS

are three types of coverings which may be placed over the top of a chimney flue. They should not be confused with *chimney pots*, which are usually only decorative extensions of the flue itself. In general, the use of any restricting device at the top of a chimney may interfere with the flow of gases and is therefore not recommended.

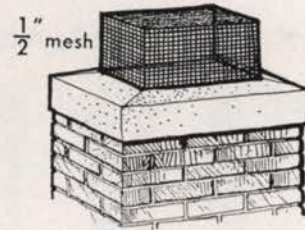
CHIMNEY TOPS will help to protect the masonry by keeping out the rain and snow, especially in buildings such as summer cottages, where the chimney may not be used for a large portion of the year. When downdrafts from surrounding trees or tall buildings hit the top of the chimney and prevent proper draft, a hood or cover may be helpful in deflecting these air currents. The total area of the side openings should be at least four times the area of the chimney flue.

ROTATING CAPS and rotating cowls are operated by the wind, and are occasionally used to increase the effectiveness of chimneys where sluggish drafts have interfered with proper operation of the heating equipment. These caps may be used with oil or gas fuel, but are not recommended for use with soft coals, as the smoke and soot may corrode the metal parts.

SPARK ARRESTERS are often placed at the tops of chimneys when one is firing fuels (such as sawdust) which may emit sparks or when using incinerators in which paper is burned. Arresters are not recommended for use with soft coal because they may become plugged with soot.



STONE OR CONCRETE CHIMNEY TOP



1/2" mesh
WIRE SCREEN SPARK ARRESTER



ROTATING METAL CHIMNEY TOP



METAL OR ASBESTOS CONE-TYPE TOP

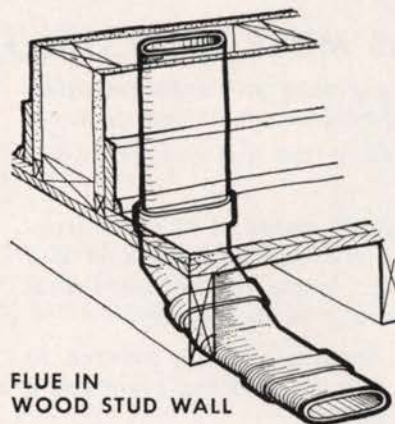
LIGHTWEIGHT CHIMNEYS

which require no masonry protection and no concrete footing are now approved and available for use. They can be suspended from the framing members of the building and require much less space than the conventional lined masonry chimney. One type approved for use with any fuel has a double metal wall, with the space between filled with insulation. Another type, approved only for use with gas as the fuel, has a single wall made of a cement-asbestos material.

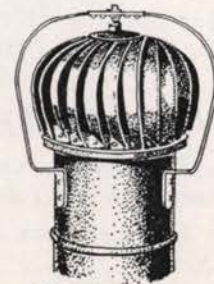
The use of an insulated flue insures more rapid heating and slower cooling of the lining, and assists in the production of a good draft.

The following precautions must be observed in the use of lightweight chimneys:

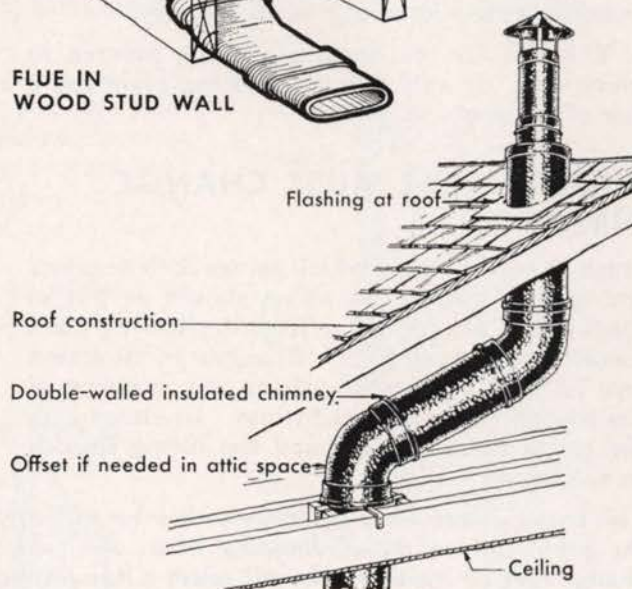
1. Make sure that the model has been tested and listed by the Underwriters' Laboratories, Inc.
2. The installation must be made in strict accordance with the manufacturer's instructions.
3. Vent pipes made specifically for gas-fired equipment are known as Type "B" vent piping and are not suitable for use with solid or liquid fuels. A sign "For Gas Fuel Only" should be attached to these flues.



FLUE IN WOOD STUD WALL



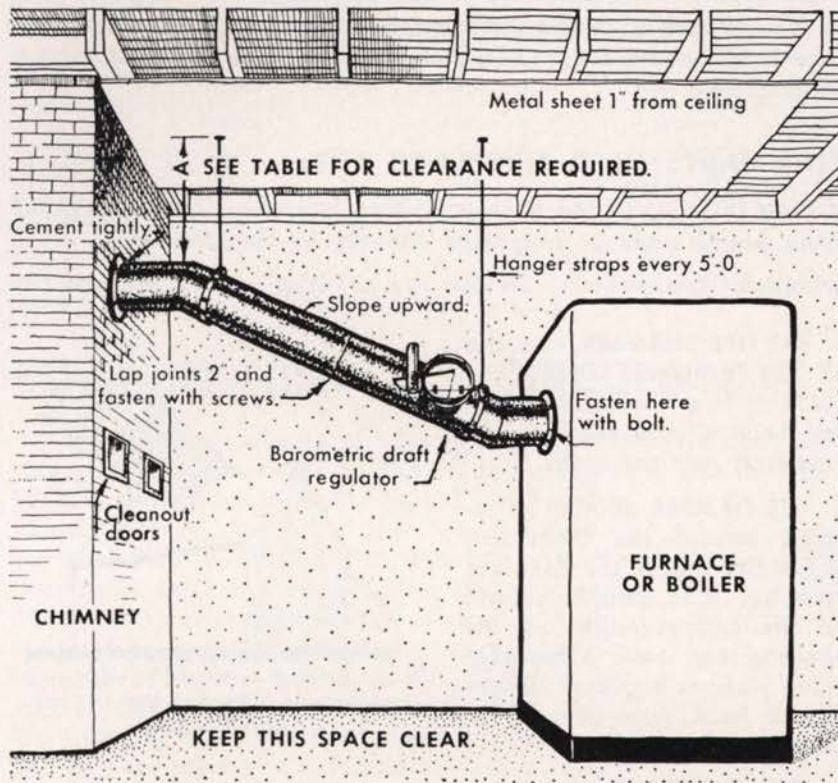
TURBINE-TYPE ROTATING TOP



THE CEILING SUPPORTS THIS CHIMNEY.

SMOKE PIPE OR VENT PIPE CONNECTIONS

to the chimney should conform to the standards shown on this page. They are minimum standards for safe and efficient operation of fuel-burning equipment and are based on the requirements of the National Fire Protection Association and the National Board of Fire Underwriters.



SMOKE AND VENT PIPE CLEARANCES REQUIRED FOR SAFETY
(See "A" in drawing above.)

TYPE OF SURFACE	COAL OR OIL		GAS			
	With Metal Shield 1" from Ceiling	Without Metal Shield	Furnace or Boiler		Water Heater, Space Heater, Floor Furnaces	
			Metal Vent	Type B Vent	Metal Vent	Type B Vent
Exposed Woodwork.....	12	24	6	1	9	3
Wood Lath & Plaster....	9	18	6	1	9	3
Incombustible Lath & Plaster.....	6	9	1	1	1	1
Masonry or Concrete....	1	1	1	1	1	1

FIRES IN CHIMNEYS CAN BE PREVENTED

to a large extent by keeping the flues clean. The accumulation of soot (which results from incomplete combustion) can be reduced by proper firing methods. This is especially true when bituminous coal is hand-fired.

Cleaning the chimney, which should not be necessary in the average home, can be done best by an expert using modern suction equipment.

Chemicals are not recommended for use in cleaning chimneys or heating equipment. The Underwriters' Laboratories, Inc., have examined materials of this type and sometimes have found they

are made of common salt, which is not effective in removing soot. Other materials tested are oxidizing agents, which if applied to soot at high temperatures and in sufficient quantities may produce an explosion or intense uncontrolled combustion. The danger of fires from chemical soot removers is great, both from the lumps of burning soot that may be blown from the chimney and the flames that may work through cracks in the chimney.

If a chimney fire should occur, close all the dampers and the firing and ashpit doors to reduce the amount of air reaching the fire.

1. Combustible material must be kept away from the smoke pipe. Do not store things near it.

2. The smoke or vent pipe may be *sheet metal, cement-asbestos, or porcelain enamel* pipe. If sheet metal is used, it should be 24 gauge or heavier. (24 gauge is almost 1/32 inch.) The other materials should be listed by the Underwriters' Laboratories, Inc.

3. The size of the smoke or vent pipe should be equal to the size of the connection at the fuel-burning equipment.

4. The connection to the chimney should be as short and straight as possible.

5. All joints and seams should be smoke and gas tight and must be fastened securely, so any expansion or "puffs" will not loosen the pipe.

6. A draft hood is required as standard equipment for gas-fired devices.

7. Automatic or barometric dampers are recommended for use with stokers and oil burners and have been successfully used in installations where coal is hand-fired.

8. A cross damper should not be used with a draft hood or a barometric damper. If it is used (usually only on hand-fired coal installations), it must be between the heater and the check damper.

A FIREPLACE IS A LUXURY

except in mild climates or locations where other heating systems are not available. An ordinary fireplace has an efficiency of only about 10 percent, so its value consists primarily of the homelike or cheerful atmosphere it may create.

The essential parts of a fireplace are shown in the sectional or cutaway views on this page. The proportions of a fireplace (that is, the size of each part and the relation between parts) must be kept within close limits if a smoky fireplace is to be avoided. The sizes given on these pages have been found by practical experience to be satisfactory.

THE ESSENTIAL PARTS OF A FIREPLACE ARE:

1. THE FRONT HEARTH, an area of the floor in front of the fireplace which is made of some fireproof material such as stone or tile. The front hearth must be supported entirely by the chimney.

2. THE BACK HEARTH, or surface on which the fire is built, usually has a "drop" or opening to the ashpit below.

3. THE FIRE CHAMBER, or walls of the fireplace, should be made of fire brick. The sides and back should slope to reflect heat into the room.

4. THE DAMPER should be located toward the front and above the top of the fireplace opening. The damper should be the entire length of the opening and have a movable valve plate or adjuster hinged at the back (not pivoted in the center).

5. THE SMOKE SHELF is a horizontal surface just back of the damper. It helps in preventing downdrafts from reaching the fire (thus avoiding smoking), and if properly constructed, it and the damper valve plate will turn the downdrafts back up the chimney.

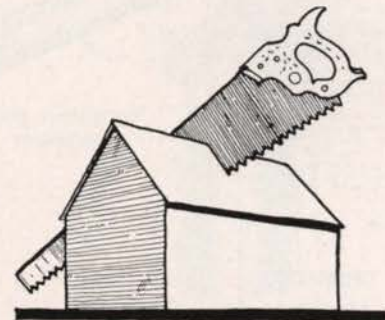
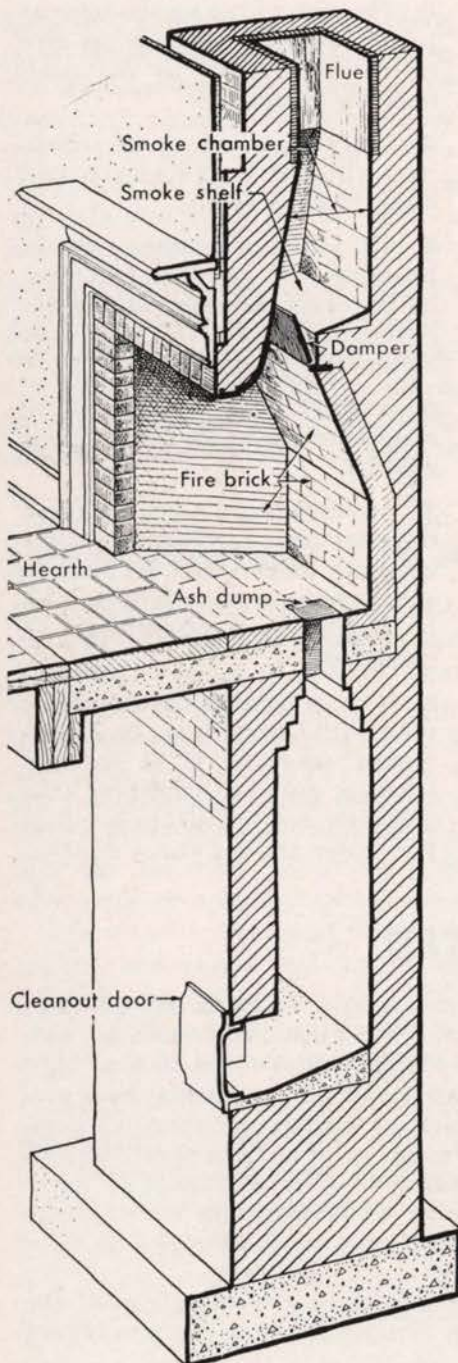
6. THE SMOKE CHAMBER is a triangular area which connects the damper with the chimney flue.

7. THE CHIMNEY FLUE must be adequate in size and height to provide the necessary draft.

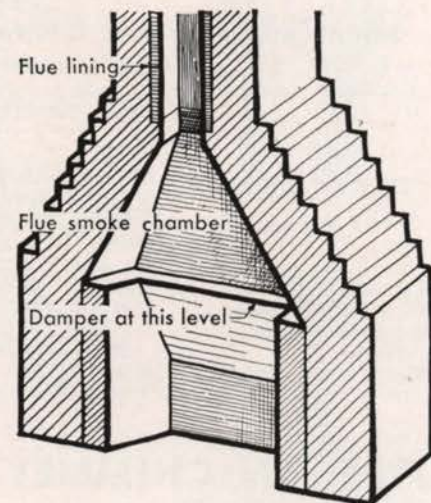
8. THE FIRE BRICK should be laid in *fire clay*. The rest of the chimney can be laid with cement or lime-cement mortar.

Close the damper when the fireplace is not in use. This will make the house easier to heat and will reduce floor drafts.

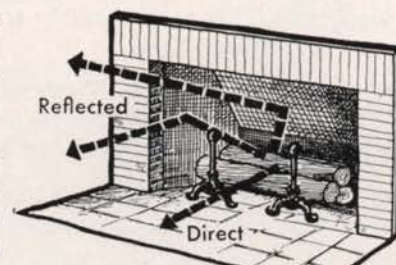
If an existing fireplace smokes because of an undersized flue, a metal hood at the top of the fireplace opening may in some cases eliminate the trouble.



These sectional views can be visualized if you imagine a fireplace that has been "sawed in half."



CUTAWAY VIEW OF FIREPLACE



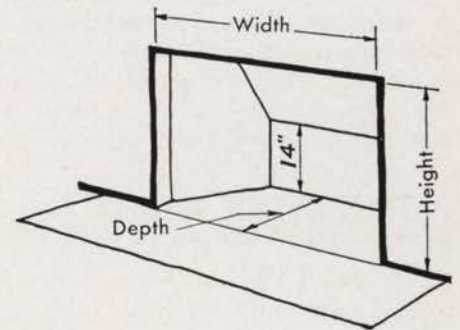
THE FLUE MUST FIT THE FIREPLACE

for the larger the fireplace opening the larger the flue must be to provide the necessary draft.

A fireplace should be wide enough to allow the use of firewood 2'-0" long (standard cord wood cut in half) and high enough to be convenient for the person tending the fire.

FIREPLACE OPENING SIZE AND FLUE SIZE

	Width	Height	Depth	Flue lining
	inches	inches	inches	inches
Small	28	28	16	8½ x 13 or 10" round
	30	30	16	8½ x 13 or 10" round
Medium	34	30	16	13 x 13 or 12" round
	36	30	18	13 x 13 or 12" round
Large	40	30	18	13 x 13 or 12" round



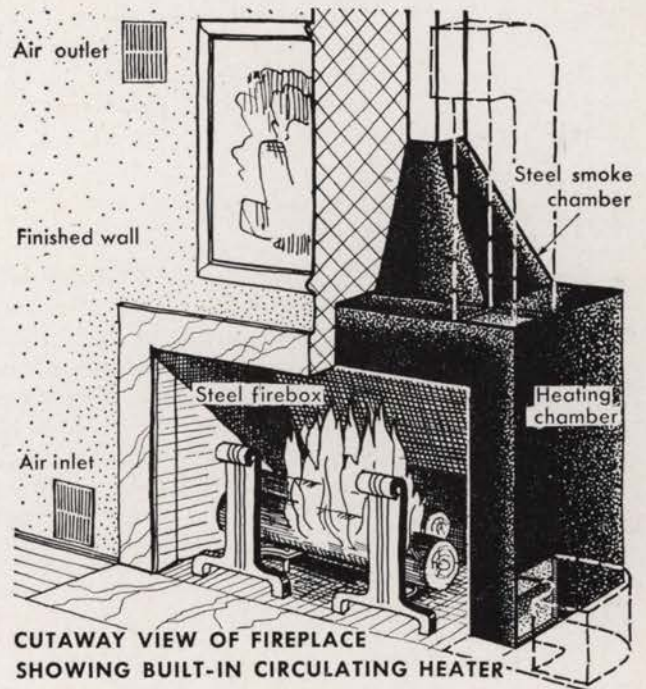
BUILT-IN FIREPLACE CIRCULATORS

The heating capacity of a fireplace can be increased noticeably by the use of a factory-made metal unit which allows air to be heated and circulated in a system separate from the direct heat of the fire.

In these units a double-walled metal firebox forms a heating chamber at the sides and back of the fire. Cool air enters this chamber near the floor level, and when heated, rises and returns to the room through registers located at a higher level. The operation is similar to the gravity warm-air furnace described in "Heating the Home" (Small Homes Council Circular G3.1). By locating the registers in rooms adjacent to the one containing the fireplace, several rooms may be warmed. A fan to force the air through the heating chamber may be added to maintain a positive circulation and to increase still further the heating capacity of the unit.

Frequently the unit includes not only the firebox and heating chamber, but also the smoke shelf, damper, throat, and smoke chamber or the complete fireplace up to the flue.

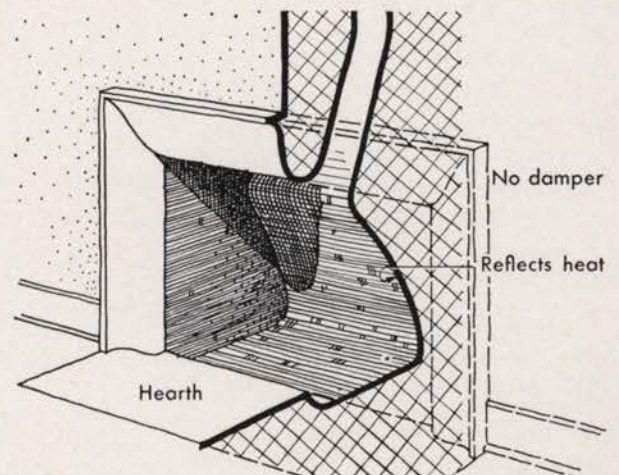
These fireplace circulators should not be expected to replace central heating systems for areas where central heat is normally used. They are more efficient than the normal fireplace, and usually follow proportions and sizes which have been found to be satisfactory.



CUTAWAY VIEW OF FIREPLACE SHOWING BUILT-IN CIRCULATING HEATER

NEW DEVELOPMENTS

The British Coal Utilization Research Association recently has made an extensive study of fireplace design. In a highly technical paper "The Aerodynamics of Domestic Open Fires" by Professor P. O. Rosin, a radically different design of fireplace has been evolved that consists of a streamlined passage for the flow of air and flue gas, a narrow throat, and a rounded chimney breast. In laboratory tests an efficiency almost twice that of the conventional fireplace has been obtained. Studies of the practical application of this new design are in progress in England, but no attempts have been made in the United States to pursue developments in this field.



SECTIONAL VIEW OF NEW STREAMLINED FIREPLACE

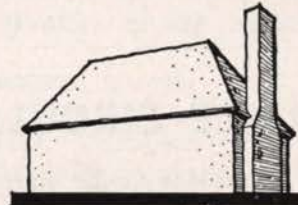
CHIMNEYS SERVING GAS-BURNING EQUIPMENT

require special flue lining because water vapor, formed by the combustion of gas fuel, may condense and form dilute acids. Without the protection of a flue liner these acids may attack both the mortar and the brick, eventually weakening the chimney.

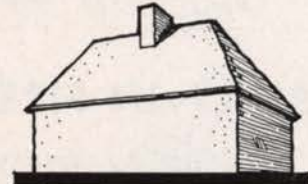
Enamelled metal liners and other corrosion-resisting flue liners designed specifically for gas fuel are available. It must be understood that these are not chimneys (see page 4 for lightweight chimneys), but are liners for masonry chimneys. If an existing unlined chimney is straight from top to bottom, these small-diameter liners can be assembled in sections on the roof and gradually lowered into position. When these liners are usable *only for gas fuel*, a sign to that effect should be attached near the connection at the base of the flue.

LOCATIONS OF CHIMNEYS AND FIREPLACES

are important. If your chimney is located on an inside wall, you will reduce construction costs by saving on both material and labor. The efficiency of the chimney will be increased, for if protected from extreme cold it will not cool so rapidly and a better draft will be maintained. The heat of the chimney will also help to warm the rooms through which it passes. In case the chimney must be on an outside wall, it will be more efficient if the masonry of the exposed walls of the chimney is increased 4" in thickness (8" of masonry and a flue lining) or if insulation is placed between the flue lining and the masonry.



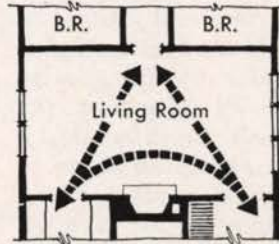
Chimney exposed to cold — inefficient. Expensive to build.



Chimney protected — gain in efficiency. Cheaper to build.

THE FIREPLACE

is a natural center for furniture arrangements. Care should be exercised in planning for its location so there will be ample unobstructed wall space on each side of the fireplace, as well as floor space in front of it to allow for these furniture groups. If the fireplace is located in the dining room or bedroom, the position of the larger and more permanent pieces of furniture must be considered because a hot fire can ignite cloth or scorch varnish some distance from the fire.



POORLY PLANNED
Broken lines show paths of travel.

Furniture cannot be arranged in groups at fireplace.



WELL PLANNED
Broken lines show paths of travel.

Floor and wall areas make furniture arrangement flexible and simple.

FIREPLACE ACCESSORIES

A screen to prevent sparks and bits of burning wood from falling beyond the limits of the hearth is a necessity — not a luxury. It should be made from a fine gauge wire mesh and be large enough to cover the entire fireplace opening. One-piece and folding or hinged portable screens are available for average-sized fireplaces. Curtain type and sliding screens are usually custom-made to be built into the wall or mounted on the facing material.

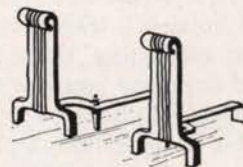


Roll-up or sliding curtain type screens must be made to fit the fireplace opening.

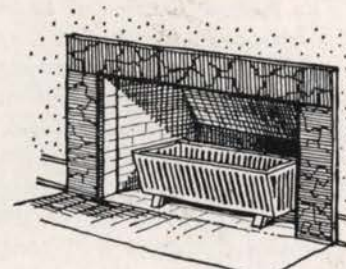
Andirons are needed to hold the burning wood so air for combustion may enter below the fire.

Baskets or containers with a grate at the bottom are necessary when coal is burned, and also may be used with wood as the fuel.

Tongs, poker, shovel, brush, and bellows are tools often kept at the fireplace and make good housekeeping easier.



Andirons may vary in appearance.



Baskets or grates should fit the fireplace.