You Can Do It, Too

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Maintaining Conventional Residential Gas-Fired Heating Systems

Periodically, conventional gas-fired heating systems need adjustment to keep them running in the safest, most efficient and least costly manner. This publication is designed to help you understand how gas-fired heating systems work (both forced air and hot water systems), the periodic preventive maintenance the units should have, and what special tasks and problems need the attention of a heating contractor.

This publication covers maintenance of conventional gas-fired heating systems only. Maintenance and repair of the newer condensing gas furnaces are not covered. Many of the same procedures and maintenance activities described in this publication are applicable if propane (L.P. gas) is used as the heating fuel. The orifices (the mechanism controlling the amount and direction of the gas flowing to the burners) and the pressure regulator must be changed to convert a natural gas unit to propane. As a unit is converted, a label should be added

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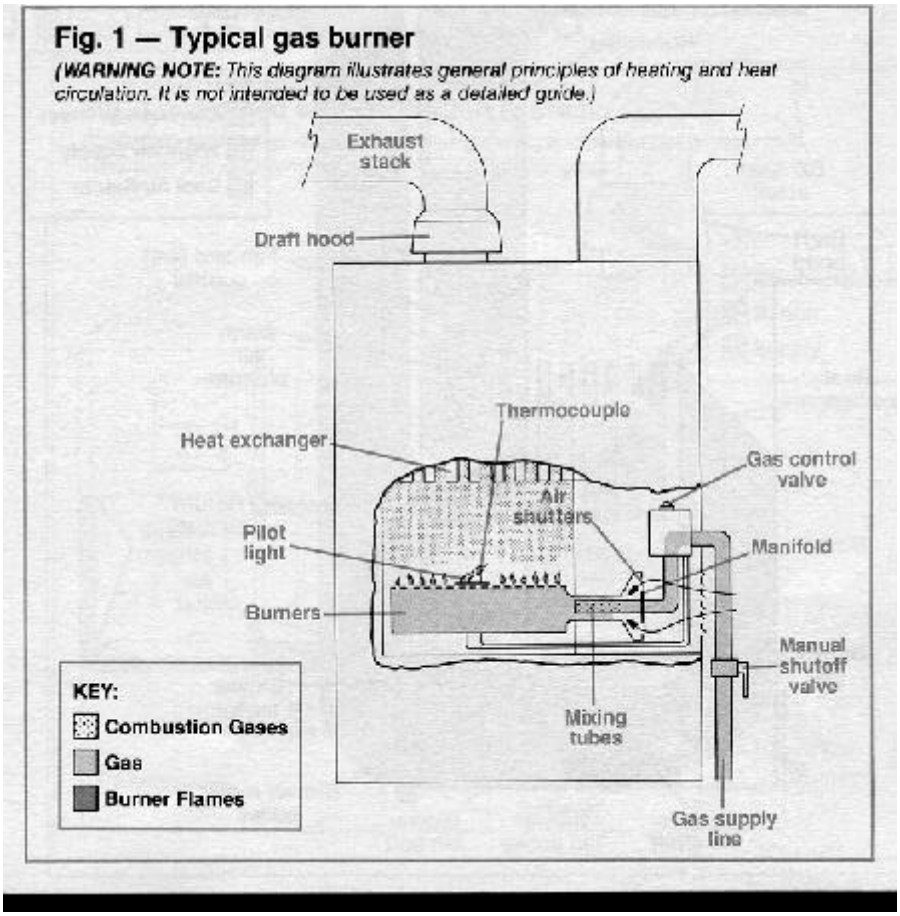
All gas-fired heating systems are composed of a heat-producing source (a furnace in the case of forced air systems and a boiler for hot water systems) that contain both a burner and a heat exchanger; a distribution system (ducts in the case of forced air systems, pipes in hot water systems); a burner by-products elimination system (exhaust stack, flue or chimney); and control mechanisms (such as the thermostat, gas control valve and safety control devices). Understanding how these various parts operate and work together is an important part of any preventive maintenance program.

Fig. 1 — Typical gas burner

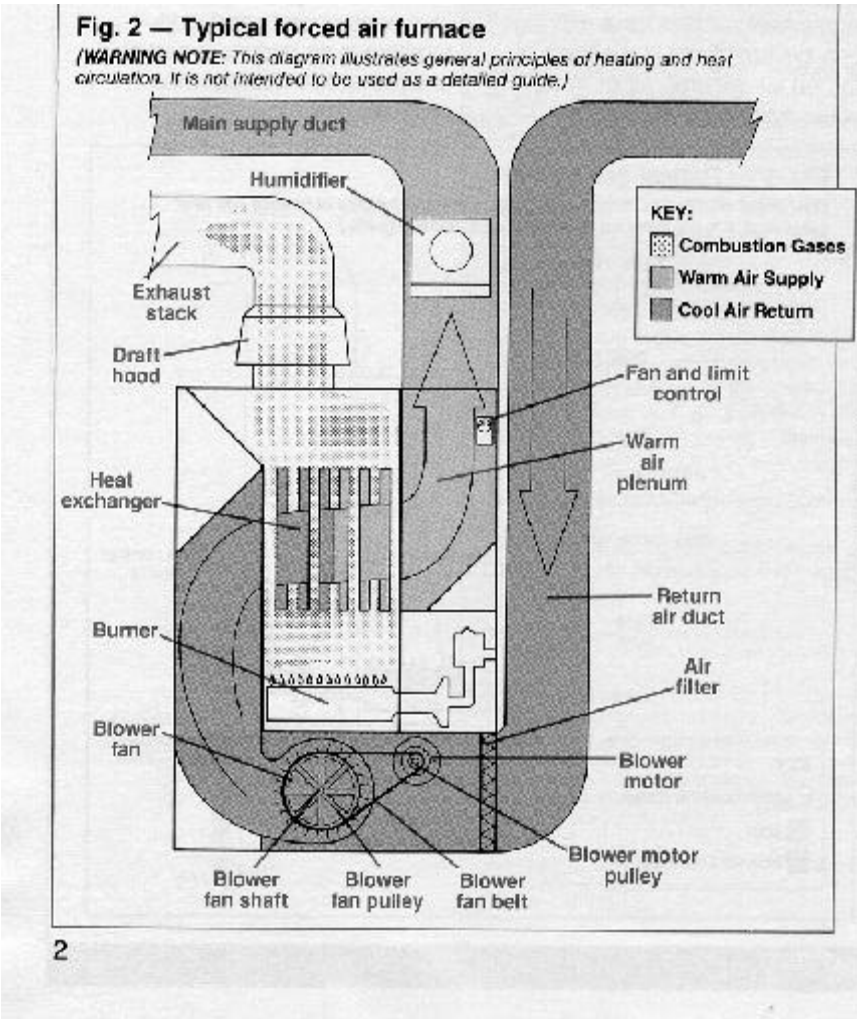
***(WARNING NOTE:** This diagram illustrates general principles of heating and heat circulation. It is not intended to be used as a detailed guide.)*



HOW A GAS-FIRED HEATING SYSTEM WORKS

How the Typical Gas Burner Works

When a room thermostat is turned up or the room temperature drops below the thermostat setting, the unit signals the furnace or boiler that additional heat is needed. As a result of the signal, the gas control valve opens, allowing gas to flow into the mixing tubes (see Fig. 1), where it mixes with the incoming combustion air. The fuel/air mixture then flows to the burners, where it is ignited by either a pilot light or an electronic spark. Ignition occurs only during start-up. Once started, the flames continue to burn , with additional gas and air fed to the burners by the gas supply line, the air shutters and furnace/ boiler room air. In turn, the combustion gases from the flames flow through the flue passages of the heat exchanger, heating it, and then continue to flow up and out the exhaust stack (see Fig. 2 for a forced air distribution system and Fig. 3 for a hot water distribution system). In the meantime, heat is transferred from the flue gases in the heat exchanger to the medium (either air or water) that flows through the distribution system that supplies heat to the various parts of the home.



How A Typical Forced Air Distribution System Works

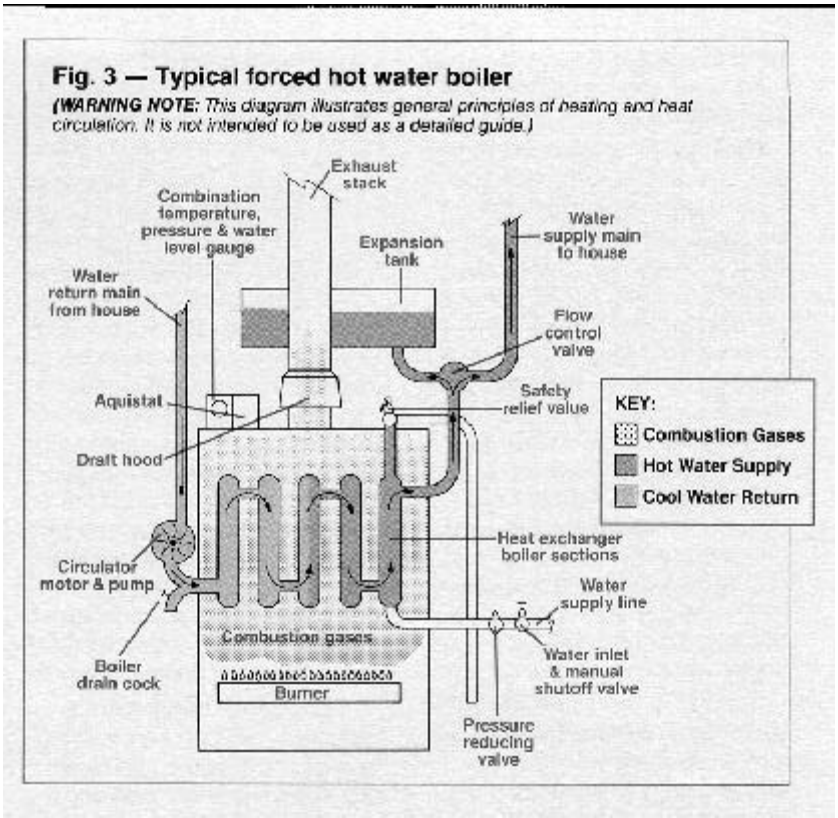
When the air temperature in the heat exchanger reaches a predetermined temperature, which is controlled by the fan-and-limit control, the furnace blower begins pulling cool room air through the return air registers and ducts (see Figs. 2 and 4). The air is passed through an air filter to remove dust. It then passes through the heat exchanger, as described above, where it is warmed by hot combustion gases passing through the heat exchanger on their way out of the house. The furnace blower then forces the warm supply air into a plenum and through the supply ducts, finally distributing it through supply registers located in each room in the home. The two air supplies, the combustion air and the air distributed through the house supply system, should never come in direct contact with each other.

How A Hot Water Distribution System Works

When a house thermostat calls for heat from a hot water distribution system, the circulator pump is activated (see Fig. 3) and supplies hot water held in reserve in the boiler throughout the distribution system- through the supply main, the supply branches and finally the baseboard units (i.e., radiators or convectors in some systems) in the various rooms (see Fig. 5). As cool room air passes over the warmed baseboard unit surfaces, the air absorbs heat and distributes it throughout the room.

Individuals, furnishings and objects near the baseboard units are also warmed by heat given off by the units. The now cool water completes the cycle, flowing from the baseboard units through the return branches and the return main and back to the boiler.

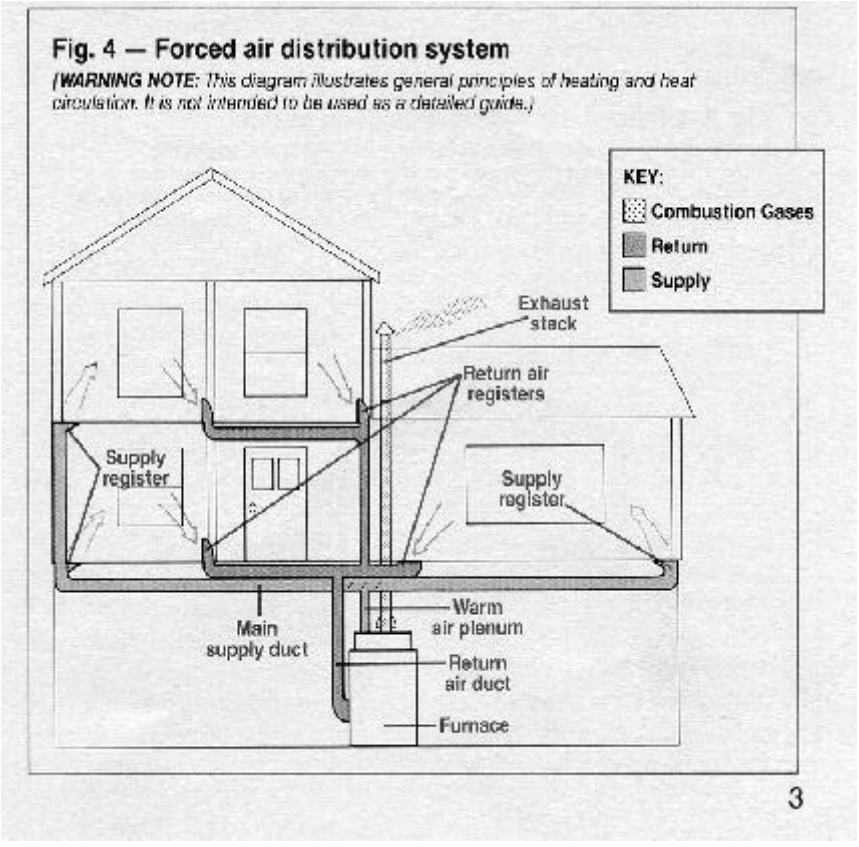
When the water in the boiler drops below a predetermined temperature, the aquastat activates the burner (see Fig. 3). The heat given off by the burner warms the heat exchanger and rewarms the water in the boiler, which holds it in reserve until the circulator pump moves it through the distribution system once again. This two-phase process enables the system to maintain an on-demand supply of hot water at all times. The homeowner doesn't have to wait for the water to be reheated and circulated through the system.



MAINTENANCE AND INSPECTION YOU CAN DO

During the heating season, furnaces and boilers can accumulate a buildup of dirt In addition, the various moving parts wear. Dirt and water can lead to a loss of system efficiency, system failures, and health and safety problems. Annual inspections and maintenance are required to keep a gas-fired heating system operating efficiently and safely.

You can do a number of maintenance tasks yourself. You may want to ask your heating contractor to show you some of the procedures during his or her next visit, or consult your heating system owner's manual. It should provide an excellent guide to the activities do-it-yourselfers can do. This publication describes some of those activities in a



general way, but the owner's manual will give you specifics for your system.

If the owner's manual is not available, write to the manufacturer and request that one be sent to you. You will find the manufacturer's name and probably the address on the nameplate affixed to your unit somewhere..If the manufacturer's address is not available, consult your heating contractor or search the yellow pages to find the name of a heating contractor that sells the brand you own. In your letter, give the model and serial number of your unit so the correct owner's manual can be sent to you. Both numbers can be found on the unit's nameplate.

If you are a novice do-it-yourselfer, follow the manufacturer's recommendations carefully and do only those tasks the manual explains clearly. All others should be done by a heating contractor. Gas is a clean, efficient and safe fuel if the equipment burning it is well maintained by knowledgeable people. Novices and inexperienced tinkerers should be aware of the potential for creating problems.

The Furnace/Boiler

1. Inspect the pilot flame height and color (see Figs. 1 and 6). Check your unit's owner's manual for the procedure and the correct height. The flame should be blue and fairly sharp. If it isn't, or if it seems too high or too low, have a heating contractor adjust it. Some gas burners may have a spark ignition unit in place of a standing pilot light. This is an energy-saving feature that helps cut gas consumption and so saves on heating bills.

2. Inspect the flame color of the burners and the pilot light (see Fig. 1). A natural gas flame should be primarily bluish and it should be fairly sharply defined. (It you are burning propane, the tips of the flame should be yellow.) If theflame is lazy or yellow, the burners should be cleaned or the gas-to-air ratio in the mixing tubes needs to be adjusted. Contact a heating contractor to clean the unit and adjust the amount of air entering the system through the air shutters.

3. Gas is a clean-burning fuel. If during your inspections you notice greasy dirt or soot built up on the burners, a problem is present. Call your heating contractor to locate and repair it.

4. Clean the draft hood (see Fig. 1), the mechanism that controls the rate at which combustion gases are pulled up and out of the flue or chimney. Dust buildup can interfere with the hood's efficient operation. Vacuum any loose dust. Note: on some gas burners, the draft hood is incorporated into the body of the unit and may not be directly visible. Your owner's manual will explain the location and any care it needs.

5. Inspect the exhaust stack for bad connections and damaged or corroded pipes (see Figs. 1, 2 and 3). Have a heating contractor replace any damaged parts.

6. Inspect the furnace's/boiler's electrical system (master switch and electrical cable, for example). Electrical problems affect the performance of a unit and also present a safety hazard. Bad connections, bare wires, blown fuses or tripped circuit breakers indicate that an electrical problem is present. Contact your heating and cooling contractor to correct it. (Warning: electricity is potentially dangerous for people not familiar with its operation. Use care in trying to correct any problems yourself.) If you ever notice damaged wires in front of the burners, contact your heating contractor.

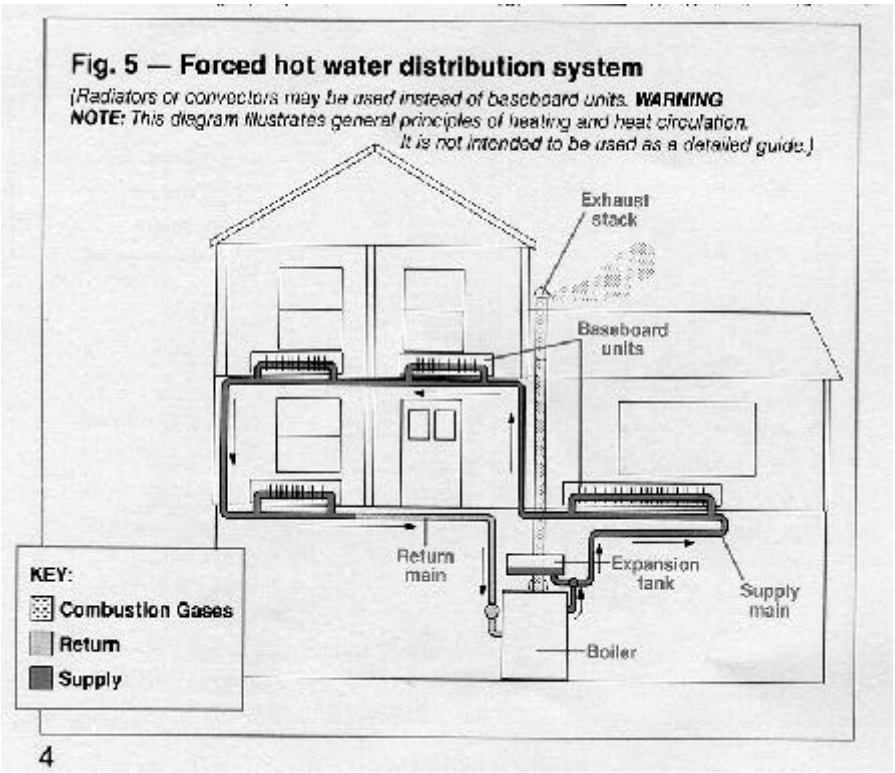


Fig. 5 — Forced hot water distribution system

*(Radiators or convectors may be used instead of baseboard units. **WARNING NOTE:** This diagram illustrates general principles of heating and heat circulation. It is not intended to be used as a detailed guide.)*

7. Clean the furnace room periodically. Dirt and lint from areas surrounding the unit can be pulled into the burners along with combustion air. Eventually they will slow the movement of combustion air to the unit, causing it to burn inefficiently and give off soot.

8. Clean the room thermostat(s). Dust buildup interferes with efficient thermostat operation. Remove the cover and wipe away dust with a soft brush, such as a watercolor paint brush. Work carefully-thermostats are fragile.

9. Inspect any visible sections of the chimney and the chimney top. If they are worn or damaged, consult your heating contractor.

10. Safety note: gas-fired-furnaces and boilers require an adequate supply of air to ensure proper and safe burning of the fuel. In addition, adequate clearances are necessary between combustibles such as walls, doors and framing members and the furnace/boiler, the vent stack and the chimney. Never enclose a unit unless you check with a heating contractor about the unit's combustion air needs. Never store combustible materials near the unit.

Forced Air Distribution System

1. Clean the blower fan and the blower housing and clean and lubricate the blower fan shaft and the blower motor (see Fig. 2). Dust, dirt and debris buildup affects the efficient operation and useful life of these components. Remove it with a vacuum or soft cloth and lubricate according to your owner's manual. (Note: some newer units may not require lubrication because the bearings are sealed.) Warning: shut off electricity to the unit before starting these procedures.

2. Inspect the blower fan belt for wear and correct tension (see Fig. 2). It is fairly common for the belt to be too tight, which can lead to failure of the motor or fan bearings. On the other hand, a loose belt can slip, causing faster belt wear and premature belt failure. Replace the belt when slippage can no longer be corrected or belt failure seems likely. Adjust the belt tension according to your furnace's owner's manual. Warning: shut off electricity to the unit before starting belt adjustment. (Note: many newer gas furnaces do not have a fan belt-a motor drives the fan directly.)

3. Replace the air filter periodically to ensure that air is circulating freely and cleanly (see Fig. 2). Dirty air filters slow air movement, make other furnace components work harder (which shortens their useful life) and waste energy. Inspect them monthly to determine how often they should be changed. Follow directions provided in the furnace owner's manual.

4. Inspect duct work for air leaks that result in heat loss and wasted money (see Fig. 4). Locate them by running your hand over areas where you suspect leaks. Seal leaks with duct tape.

5. Clean and clear room supply and return air registers of any dust or obstructions (see Fig. 4). They reduce air circulation and waste energy dollars. A vacuum will do a good job.

6. Any warning signs noted during the heating season such as unusual odors from the registers, discoloration over registers, excessive dirt in the house air supply, or unusual cycling of the burner or fan or both-should be reported to your heating contractor.

7. Periodically throughout the heating season, make a conscious effort to listen to your unit as it goes through a heating cycle. The normal procedure is: the room thermostat calls for heat, the burner goes on, the fan then starts. Both should remain on until the thermostat temperature is satisfied. Once it is satisfied, the burner stops first, followed by the fan. If the burner or the fan or both cycle on and off frequently before the thermostat is satisfied, a problem exists. Consult your heating contractor. Likewise, if the burner ever goes on but the fan does not follow, call a heating contractor.

Hot Water Distribution System

1. Clean the circulator motor and lubricate the motor and circulator pump (see Fig. 3). Dust and dirt buildup inhibits efficient operation. Consult your owner's manual for instructions and lubrication needs.

2. Clean and bleed baseboard units (convectors or radiators in some systems; see Figs. 5 and 7). Both dust and dirt buildup on the baseboard unit's fins and air in the pipes decrease the heat transfer efficiency of the baseboard unit. A vacuum and a softbristle brush work well together for cleaning the fins. If air is present in the pipes, you'll hear a sound similar to water trickling. Bleed the unit by opening the air valve until water runs freely from the unit. Then close the valve. (Note: many modern hot water systems contain automatic bleeders and do not require this step. Consult and follow your

owner's manual for the correct procedures.)

3. Inspect baseboard units to ensure that adequate clearance exists between them and the floor, particularly carpeted floors. Clearance is necessary to allow air to flow freely around the unit. If your hand cannot slip easily into this area, consult a heating contractor about raising the unit.

MAINTENANCE AND INSPECTION A SERVICE PERSON SHOULD DO

Though you can do the maintenance and repair tasks described in your owner's manual, other jobs require the knowledge of a heating contractor. Inexperienced homeowners attempting these tasks may make mistakes that expose them and their families to unnecessary hazards and possibly damage the equipment. We mention these tasks because a heating contractor should do them during a regular maintenance visit. When selecting a contractor, ask about the standard service procedures followed and see if they are similar to those described here. We suggest that a heating contractor service your system every two to three years and perhaps annually if the system is old. The cost will be approximately $50 per visit.

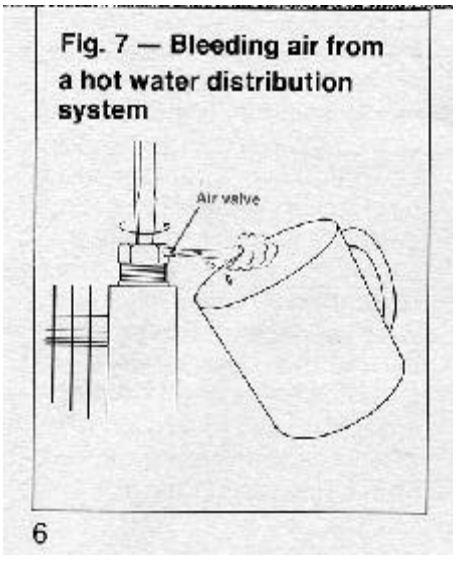


Fig. 7 — Bleeding air from a hot water distribution system

The Furnace/Boiler

1. Inspect and clean the burners (see Fig. 1). They can easily become plugged by dust or soot. Cleaning requires special equipment.

2. Adjust the air shutters (see Fig. 1). The air shutters control and regulate the air/fuel mixture released for ignition and combustion. Their correct adjustment improves overall furnace efficiency and thus helps reduce energy costs.

3. Adjust the gas pressure to the burner. The pressure affects the volume of gas delivered to the burner and, thus, the air/fuel mixture.

4. Inspect the gas control valve (see Fig. 1). This valve controls the amount of gas flowing into the system. The heating contractor will determine if it is operating correctly and inspect for leaks in the valve.

5. Inspect the thermocouple, a safety device designed to sense and shut down the gas supply to the pilot flame if the pilot light goes out (see Figs. 1 and 6). If it is worn, the heating contractor will replace it.

6. Inspect and adjust safety devices incorporated into the unit, such as the fan-and-limit switch or aquastat, burner safety devices and any power flue devices, if the unit contains a power draft.

7. Clean the heat exchanger surfaces (see Figs. 2 and 3). Cleaning improves heat transfer between the heat exchanger and the household air or water supply.

8. Check for gas leaks, which are extremely dangerous. Serious health hazards are possible if sufficient quantities of gas are released into the home. Gas has a peculiar odor. If you ever suspect a leak, immediately leave the home and contact your gas company or service person from a nearby phone.

9. Check for combustion leaks. Combustion leaks allow dangerous gases to escape into the furnace room and duct work.

Forced Air Distribution System

1. Align the blower pulley and the blower motor pulley (see Fig. 2). Improper alignment can cause abnormal belt wear and slippage. (Note: most newer gas

Continued on page 11.

POTENTIAL PROBLEMS: THEIR CAUSES AND SOLUTIONS

PROBLEM:	CAUSE:	SOLUTION:
Furnace/Boiler		
1. No heat.	• Room thermostat is set too low.	Turn up.
	• Pilot light is out.	Relight, following the lighting instructions found on the unit. If it goes out again, consult a heating contractor.
	• No power.	Check master switch.
	• Blown fuse or broken circuit breaker.	Replace fuse/trip circuit breaker. If it immediately reoccurs, consult a heating contractor.
2. Not enough heat.	• Not enough gas being supplied to the burner *(see Fig. 1).*	Consult a heating contractor.
	• Burner holes obstructed.	Consult a heating contractor.
	• Fuel line obstructed	Consult a heating contractor.
	• Low fuel pressure at burners.	Consult a heating contractor.
	• Broken fan belt.	Replace or have a heating contractor replace.
	• Blower not operating.	Consult a heating contractor.
	• Air filters plugged or dirty.	Change filters.
3. Pilot light won't light.	• Pilot light opening obstructed *(see Figs. 1 and 6).*	Consult a heating contractor.
	• Loose or defective thermocouple *(see Figs. 1 and 6).*	Consult a heating contractor.
	• Pilot flame too large or too small.	Consult a heating contractor.
	• Pilot flame not heating thermocouple.	Consult a heating contractor.
4. Pilot light won't stay lit.	• Pilot flame too large or too small *(see Figs. 1 and 6).*	Consult a heating contractor.
	• Loose or defective thermocouple.	Consult a heating contractor.
	• Pilot flame not heating thermocouple.	Consult a heating contractor.
5. Burner flame pulsates.	• Poor draft	Have a heating contractor adjust.
	• Defective gas regulator.	Have a heating contractor adjust or replace.

continued

PROBLEM:	CAUSE:	SOLUTION:
Furnace/Boiler *Continued from previous page*		
	• Heat exchanger may be cracked.	Have a heating contractor inspect.
6. Flashback, aspirating burners only (one that mixes air with the fuel to get a combustible mixture). Flashbacks occur when the fuel/air mixture ignites before leaving the burner.	• Low fuel line pressure. *(see Fig. 1).*	Consult a heating contractor.
	• Clogged fuel line.	Consult a heating contractor.
	• Obstructed burner.	Consult a heating contractor.
	• Not enough or too much air in the fuel/air mixture.	Consult a heating contractor.
7. Burner quits.	• Fuel pressure too high.	Consult a heating contractor.
	• Water in fuel line.	Consult a heating contractor.
	• Pilot light out.	Relight following your owner's manual. If it goes out again, consult a heating contractor.
	• Blown fuse or circuit breaker	Replace fuse/trip circuit breaker. If it immediately reoccurs, consult a heating contractor.
Forced Air Distribution System		
1. Blower is extremely noisy, with a clattering sound.	• Blower unit needs oiling. *(see Fig. 2).*	Lubricate.
	• Defective or broken fan belt *(see Fig. 2).*	Replace.
	• Fan belt is too tight or too loose *(see Fig. 2).*	Adjust tension.
	• Blower fan shaft is loose *(see Fig. 2).*	Tighten or consult a heating contractor.
	• Blower motor and/or blower motor mountings are loose *(see Fig. 2).*	Tighten or consult a heating contractor.
	• Blower and blower motor pulleys are loose on shafts *(see Fig. 2).*	Tighten or consult a heating contractor.
	• Blower and blower motor pulleys and shafts are warped or bent *(see Fig. 2).*	Consult a heating contractor.
	• Bearings worn in motor.	Have a heating contractor replace.
	• Air filter has fallen against the blower fan *(see Fig. 2).*	Move and secure.

continued

Forced Air Distribution System *Continued from previous page*

PROBLEM:	CAUSE:	SOLUTION:
	• Electrical cable to motor is rubbing against a metal surface.	Move and secure.
2. Not enough heat.	• Fan-and-limit control temperature is set too low *(see Fig. 2)*.	Have a heating contractor adjust.
	• Incorrect blower fan speed *(see Fig. 2)*.	Have a heating contractor adjust.
	• Supply ducts do not have adequate insulation *(see Fig. 2)*.	Add insulation, especially to any duct work passing through unheated areas.
	• Dirty air filter *(see Fig. 2)*.	Replace
	• Improperly adjusted supply duct dampers. Dampers can be located anywhere in the duct system to control the heat supply to each room.	Open or close as required.
	• Air leak in supply ducts *(see Fig. 4)*.	Patch leaks.
	• Supply registers are blocked *(see Fig. 4)*.	Remove blockage.
	• Return air registers are blocked *(see Fig. 4)*.	Remove blockage.
	• Heat exchanger surfaces are dirty *(see Fig. 2)*.	Have a heating contractor clean them.
3. Short heating cycles.	• Improper amperage (anticipator) setting on thermostat.	Consult a heating contractor.
	• Thermostat not functioning.	Consult a heating contractor.
	• Furnace sized too large.	Consult a heating contractor.
4. Large temperature differences between rooms.	• Improperly adjusted branch and supply duct dampers *(see Fig. 4)*.	Open or close as required.
	• Branch supply ducts do not have adequate insulation *(see Fig. 4)*.	Add insulation.
	• Air leak in branch supply ducts *(see Fig. 4)*.	Patch leaks.
	• Branch supply registers are blocked *(see Fig. 4)*.	Remove blockage.

continued

PROBLEM:	CAUSE:	SOLUTION:
Forced Air Distribution System *Continued from previous page*		
	• Return air registers are blocked *(see Fig. 4)*.	Remove blockage.
	• Poor duct design.	Consult a heating contractor.
5. Dirt/dust on surface near registers.	• Dirty air filter *(see Fig. 2)*.	Replace.
	• Register grills dirty/ dusty *(see Fig. 4)*.	Clean.
	• Supply ducts are dirty/ dusty *(see Fig. 4)*.	Consult a heating contractor.
	• Blower fan compartment is dirty/dusty *(see Fig. 2)*.	Clean.
	• Access door to blower is open or loose *(see Fig. 2)*.	Close and secure.
	• Heat exchanger cracked.	Consult a heating contractor.
6. Excessive rushing noise or vibration in ducts *(see Fig. 4)*.	• Air velocity too high.	Consult a heating contractor.
	• Loud blower noise may be transferred into the ducts.	Consult a heating contractor.
	• Incorrectly sized duct work.	Consult a heating contractor.
Hot Water Distribution System		
1. No heat.	• No power.	Check master switch, fuse or circuit breaker.
	• Closed gas supply valve *(see Fig. 1)*.	Open gas supply valve.
	• Dirty or defective thermostat.	Clean thermostat or have heating contractor clean or replace.
2. Cold baseboard unit, convector or radiator.	• Air in baseboard unit, convector or radiator *(see Fig. 5)*.	Bleed air from baseboard unit, convector or radiator.
	• Frozen pipes.	Locate and thaw frozen spot.
3. Leaking water inlet, valve *(see Fig. 3)*	• Worn stem packing.	Have a heating contractor replace.
4. Leaking circulator pump *(see Fig. 3)*	• Defective seal.	Have a heating contractor replace.
5. Noisy circulator pump *(see Fig. 3)*	• Coupler broken.	Have a heating contractor replace.
6. Water dripping from safety relief valve *(see Fig. 3)*	• Excess water in expansion tank.	Have a heating contractor adjust air-water levels in expansion tank.
	• Defective water feed valve.	Consult a heating contractor.
	• Excessive temperature and pressure in boiler.	Consult a heating contractor.

Continued from page 6.

furnaces do not have pulleys-a motor drives the fan directly.)

2. Adjust the blower fan speed (see Fig. 2). Overly high fan speed will cause duct noise and waste electricity. If the fan is set unnecessarily low, an excessive amount of heat will be lost through the supply ducts before it reaches the registers to provide room heat.

3. Adjust and test the fan-and-limit control, which measures the temperature of the air surrounding the heat exchanger. It automatically turns the furnace blower on and off during each burning cycle and shuts the burner down if the heat exchanger becomes overly hot. The control monitors three temperatures: a fan-on temperature, a fan-off temperature and a temperature limit, which is the safety device designed to shut the burners off if the heat exchanger becomes too hot. It is never adjusted or changed-the other two can be, however.

For example, the fan-on temperature is usually about 135 degrees F. When the air around the heat exchanger reaches this temperature, the blower fan comes on and moves the heated air throughout the home. The fan-off temperature is usually set at approximately 100 degrees F. When the air surrounding the heat exchanger reaches this temperature, the fan blower stops so it doesn't circulate cooler air through the home and cause uncomfortable drafts.

To save energy, you may want to ask your heating contractor to lower these two temperature settings to a level closer to the house thermostat setting. As a result, the furnace will supply more heat to the house but the air will feel cooler. You may experience some draftiness and discomfort after the changes until you become accustomed to the new settings.

Hot Water Distribution System

1. Check the circulator pump coupler for wear and broken coupler springs (see Fig. 3). Normally, if the coupler springs are broken, a loud racket occurs; they have been known to be broken, however, with little noise.

2. Check the operation of all safety controls (see Fig. 3), such as the safety relief valve, which would relieve the system if overly high pressure should occur because of overheating, and the limit thermostat, which would turn the unit off if the boiler should overheat.

3. Check and adjust air and water levels in the expansion tank, which provides a reservoir for the safe collection of water as it expands during the heating cycle (see Fig. 3). Note: many new expansion tanks contain bladder or diaphragm devices that control water and air levels automatically.

Sources:

Brotherson, Donald. "Heating the Home," G3.1. Small Homes Council-Building Research Council, University of Illinois, 1976.

Energy, Mines and Resources Canada. "The Billpayer's Guide to Heating Systems." Minister of

Many other Extension publications are available on housing, home maintenance/care and energy conservation. Call, write or visit the Cooperative Extension Service Office in your county for more information. Following is a list of related publications available there or by writing to the MSU Bulletin Office, P.O. Box 6640, East Lansing, MI 48826-6640.

Energy Conservation

E-0953, *Replacing and Repairing Screens* (free)
E-0954, *Replacing Broken Window Glass* (free)
E-1103, *Insulate your Unfinished Attic* (free)
E-1104, *Weatherstrip your Doors and Windows* (free)
E-1105, *Insulate your Basement Walls* (free)
E-1141, *Window Treatments for Thermal Comfort* (free)
E-1196, *Low Cost Weatherproofing* (free)
E-1301, *Low Cost Ways to Reduce your Fuel Bills* (free)
E-1302, *Save Fuel: Check your Heating Systems* (free)
E-1384, *A Checklist for Energy-Saving Homes* (free)
E-1521, *Maintaining Your Septic System* (free)
E-1573, *Caulking and Weatherstripping* (free)
E-1771, *Energy Conscious Interior Design* (free)
E-1798, *Increase Insulation Value:Stud Frame Wall Construction* (free)

Heating Systems

E-1387, *Chimneys* (free)
E-1388, *The Creosote Problem—Chimney Fires/Chimney Cleaning* (free)
E-1389, *Smoke Problems and Their Cures* (free)

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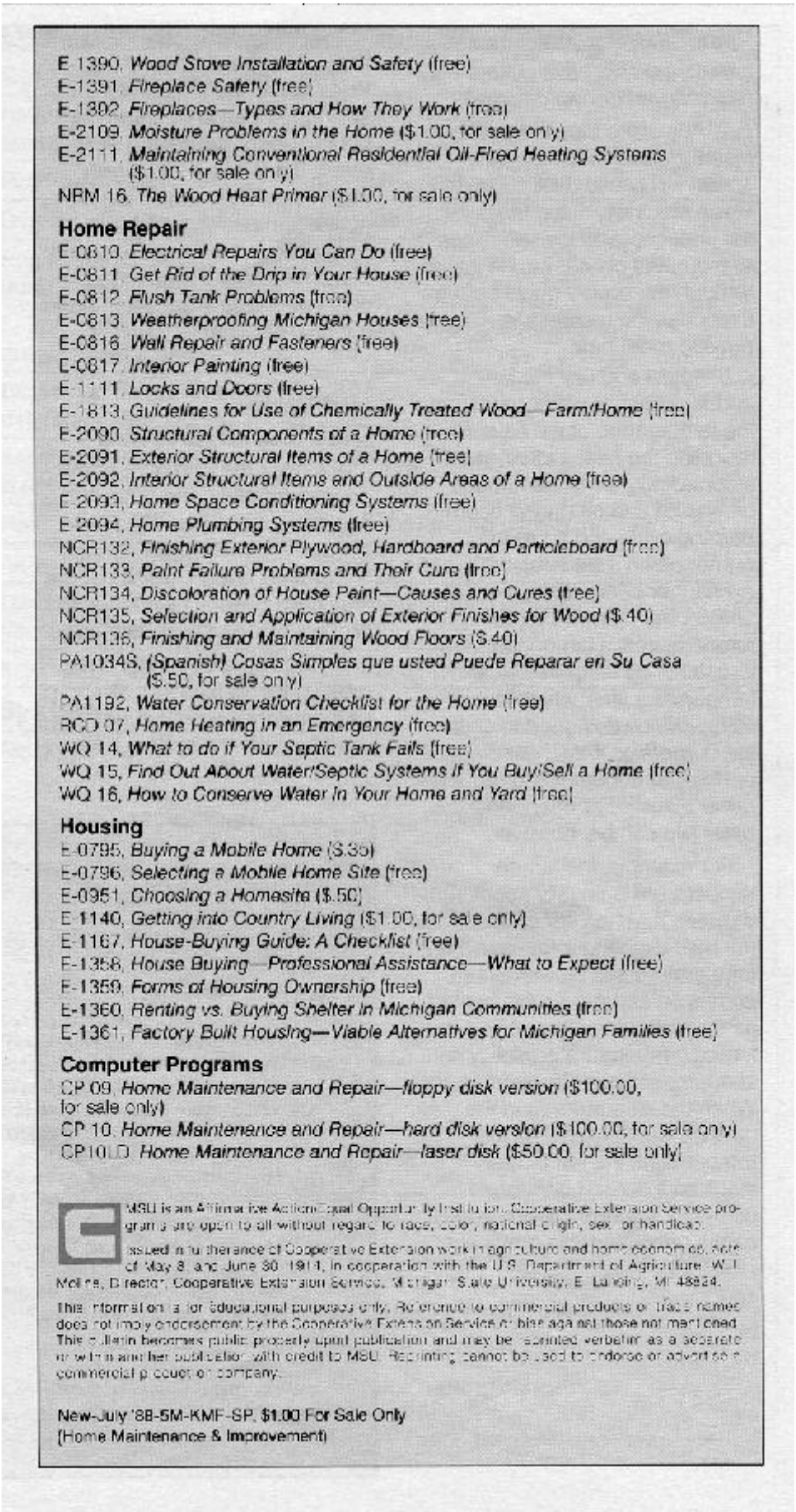
Mireley, Susan and Don D. Jones. "The Indiana Do It Yourself Home Maintenance Checklists: Space Conditioning Systems," HE-63. Indiana Cooperative Extension Service, Purdue University, July 1986.



E 1390, *Wood Stove Installation and Safety* (free)
E-1391, *Fireplace Safety* (free)
E-1392, *Fireplaces—Types and How They Work* (free)
E-2109, *Moisture Problems in the Home* ($1.00, for sale only)
E-2111, *Maintaining Conventional Residential Oil-Fired Heating Systems* ($1.00, for sale only)
NRM 16, *The Wood Heat Primer* ($1.00, for sale only)

Home Repair

E 0810, *Electrical Repairs You Can Do* (free)
E-0811, *Get Rid of the Drip in Your House* (free)
E-0812, *Flush Tank Problems* (free)
E-0813, *Weatherproofing Michigan Houses* (free)
E-0816, *Wall Repair and Fasteners* (free)
E-0817, *Interior Painting* (free)
E-1111, *Locks and Doors* (free)
E-1813, *Guidelines for Use of Chemically Treated Wood—Farm/Home* (free)
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