



LaFarge, Wi 54639

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Installation and Operation Manual

for the KICKAPOO™ BBR and BOXER models

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To Order or for Information Call 1-800-356-5322

In Wisconsin Call 1-800-362-5442

I. Introduction: Safety First:

Kickapoo Stoves and Furnaces are wood burning, heat producing appliances that require a safe installation and a thorough knowledge of operating principles. It is absolutely necessary for you to read and understand these instructions before attempting the installation or operation of your stove or furnace. Your Kickapoo will give you many years of safe service if installed and operated according to these instructions.

There are a number of safety points (that are covered more fully in the text) that we wish to mention here so that you can take note of them as you read on.

1. Creosote — This is particularly insidious stuff that is a fire hazard when excessive amounts collect in the stove pipe and/or chimney.

2. Chimney — Your chimney is at least as important as the stove; they are inseparable. Construction, condition, maintenance and draft are all important.

3. Clearance — The distance a stove and chimney connectors are placed from any combustible surface.

4. Chimney Connector (Stove Pipe) — Can be a weak link to the chimney.

5. Maintenance — Includes ash removal, chimney cleaning and inspection, and stove operation.

6. Operation and Installation — Correct operation and installation mean efficient and safe heat.

Please take special note of these topics as you read on. They can save your life or prevent costly damage to your dwelling.

A fully charged fire extinguisher should be handily located on each floor of your home.

II. Installation

If you have a Home Furnace, please see separate installation instructions.

A. The Chimney

The other half of your installation.

Chimneys come in all different sizes and classifications. They are as important to your installation and operation as the stove itself. There are a number of factors to keep in mind when considering a chimney.

A "Class A" or all fuel chimney is a must. Tile lined masonry or insulated steel chimneys are "Class A".

An existing chimney must be inspected for loose mortar and leaks. If any deficiencies exist they must be corrected.

A chimney that leaks air at inspection ports, cleanouts or unused connection holes will encourage creosote formation because the cool air entering will lower the flue temperature. If your chimney has an unused flue hole, seal it tightly with a non-combustible flue stop. Make sure the chimney cleanout door has an air-tight seal to prevent cold air from entering and weakening the draft. It is not unusual to see a large knot of creosote forming adjacent to or above an air leak into the chimney. Also, the interior lining of the chimney should be as smooth as possible to reduce friction which can contribute to creosote formation.

Kickapoo's require at least a 6" diameter chimney flue if they are the only appliance connected to the chimney. If more than one appliance is connected to the same chimney, the flue area must be larger. Check local code to see if this practice is allowed. (See table II-A.) The stove pipe should remain at least the same diameter from the stove to the chimney. It can increase (if complying with chimney flue size) but **never** decrease.

The length of the chimney is also important. A short chimney (less than 20 feet in length) may or may not supply enough draft to operate the stove properly. A draft of .02" of water should be sufficient. If you feel the need to have this checked, contact your heating contractor; he will have the instruments to check the draft.

The height of the chimney should be at least 2 feet above the highest peak of the roof, and three feet above the point at which it passes through the roof. If the highest peak of the roof is 10 feet or more away from the chimney, the chimney should be at least even with that point. Keep in mind that large trees and surrounding buildings may have an effect on the performance of your chimney's draft.

Table II-A — Connecting a Kickapoo to a chimney already in use

To determine if your chimney is large enough for the Kickapoo, an existing furnace (if any), and/or any other connecting appliances (Check first with local codes to make sure such an installation is allowed!) first measure the width of the flue on all appliances vented through that chimney. Multiply the radius (half the width) of each flue times itself, then times 3.14, to find the area. Add the area of the flue on the Kickapoo and any present furnace, and half the area of any smaller appliances (water heater, for instance).

Example:

5" diameter gas furnace flue (2½ x 2½ x 3.14 = 19.6)	total area 19.6 sq. inches
6" diameter Kickapoo flue	total area 28.3 sq. inches
3" diameter hot water heater	half of area 3.5 sq. inches
	TOTAL AREA 51.4 sq. inches

The chart below gives the area of various diameter round and square masonry and round metal chimneys. Whatever type chimney is used, it must have as much or more area than the flue areas of the appliances vented through it. Round metal chimneys are rated one inch larger than actual size. In the example above, with 51.4 inches total flue area, at least an 8" round metal or square chimney, or a 9" round masonry chimney is required to safely vent all three units.

CHIMNEY DIAMETER OR WIDTH	ROUND MASONRY	ROUND METAL	SQUARE
3"	7.06 sq. in.	12.56 sq. in.	9 sq. in.
4"	12.56 sq. in.	19.6 sq. in.	16 sq. in.
5"	19.6 sq. in.	28.3 sq. in.	25 sq. in.
6"	28.3 sq. in.	38.5 sq. in.	36 sq. in.
7"	38.5 sq. in.	50.3 sq. in.	49 sq. in.
8"	50.3 sq. in.	63.6 sq. in.	64 sq. in.
9"	63.6 sq. in.	78.5 sq. in.	81 sq. in.

These standards were adopted from the codes of the City of Madison, Wisconsin, and may vary in other areas. Please check local codes to insure compliance.

If a new hole is to be made in a masonry chimney, be sure that all chimney connectors enter the chimney at different heights. Do not make a new hole directly opposite a hole now in use. A simple way to "finish" a newly-made chimney hole is to cut a piece of 6" pipe so it fits flush with the outside of the chimney and does not extend more than ¼" inside the flue liner, and mortar it in with furnace cement.

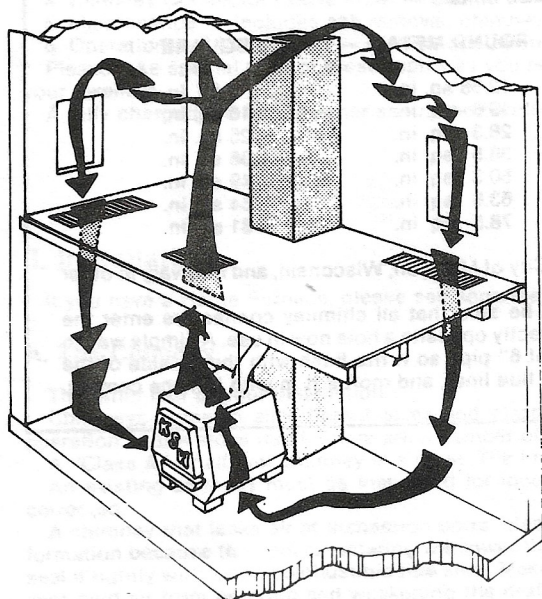
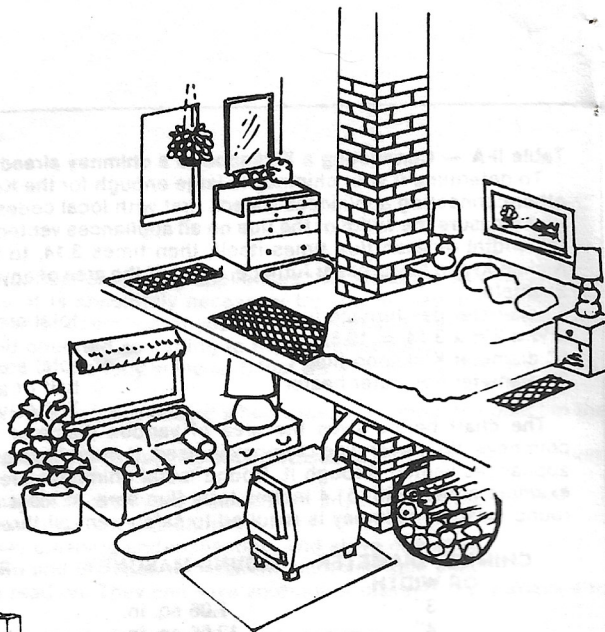
B. Placement in your dwelling

Where do I put it?

If you have an existing class "A" chimney in sound condition and of adequate size that you intend to use, you are limited to the chimney's location. However, this is normally not a problem in older houses because the chimney is usually in a central location which will give you the most even heat distribution. We recommend that the stove be as close as possible to the chimney, since this will keep stove pipe temperatures higher and minimize creosote formation.

If you intend to heat the whole living space, a basement or first story installation is indicated. When placement is in the basement, you will need a way to get heat upstairs. If you are heating a dual or multi-story home with a first floor installation, you'll need a way to get the heat upstairs. This can be accomplished through a number of methods, but you must keep air circulation in mind.

Hot air rises and cooler air sinks. Hot air will rise through an open stairway that is close to the stove only if the cooler air can return to the basement or first floor through holes, ducts, or floor grates. (See illustration.)



A better way for a basement installation would be to place a large floor grate (at least 2 feet by 3 feet) in the floor directly above the centrally located stove and numerous cool air grates (equivalent or exceeding the square area of the hot air floor grate) near the perimeters of the building. Keep in mind that with a basement location, you will lose some of the radiant heat from the stove to the basement. This will keep the upstairs floor and basement warmer, but won't be so good for storing root crops.

If the stove is to be installed on the first floor, place it as close as possible to the center of the area to be heated, keeping in mind the recommended minimum clearances from combustibles (See section II-C on clearances) and your chimney location.

If you are installing a new chimney, we recommend a central location that best suits your building design. A chimney that is installed through a building, as opposed to an outside installation, will give you better performance. An outside chimney location will cause the chimney temperature to be lower, which will encourage creosote formation — more chimney cleaning! If you must install the chimney on the outside, try to do so on the south-facing wall where temperatures will be somewhat warmer.

If you are installing your Kickapoo in a mobile home. **THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL AND CEILING/ROOF MUST BE MAINTAINED.**

C. Clearance

Both stove and stove pipe can get extremely hot. Therefore, it is necessary to keep a minimum clearance between combustible surfaces and the stove and pipe. (For safety purposes, combustibles would include all types of construction, excluding only masonry.) Walls, ceiling and floor need clearance or protection. Clearances can be minimized to one foot or more by installing non-combustible surfaces spaced out from the combustibles. It is essential that air be allowed to circulate between the two surfaces, as the non-combustible, if affixed directly to the combustible, will conduct heat and cause a fire hazard. (See illustration.) The following table contains minimum clearances recommended by the National Fire Protection Association.

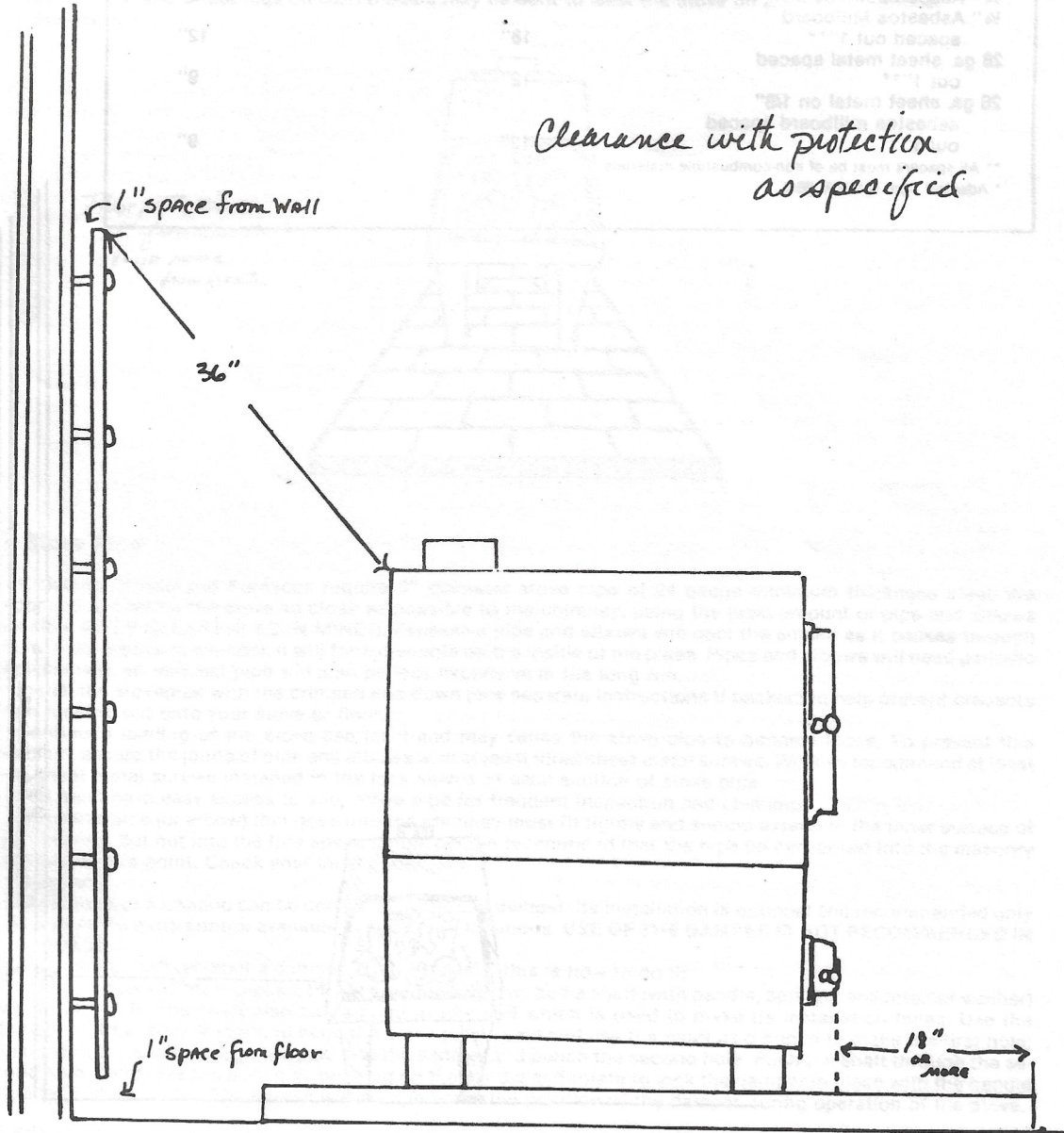
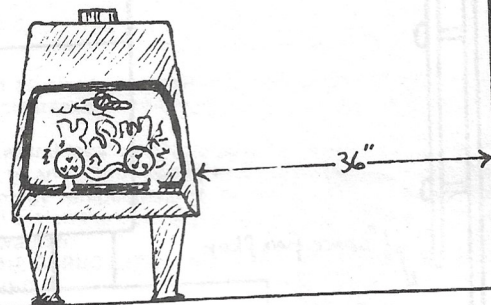


Table II-C — Recommended Clearances* from All Combustibles

Type of protection	Radiant Heater	Stove Pipe
NONE	36"	18"
1/4" Asbestos Millboard	36"	18"
1/4" Asbestos Millboard spaced out 1"***	18"	12"
28 ga. sheet metal spaced out 1"***	12"	9"
28 ga. sheet metal on 1/8" asbestos millboard spaced out 1"***	12"	9"

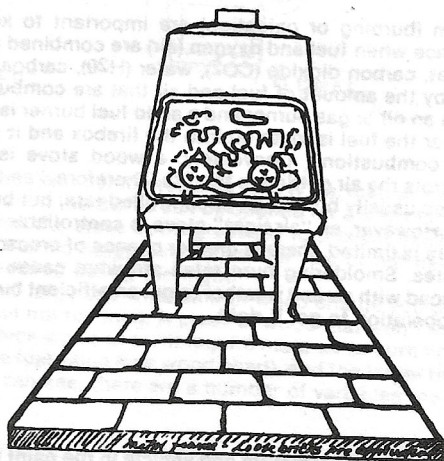
** All spacers must be of non-combustible materials
 * Adapted from N.F.P.A. 89M



D. Floor Protection

The stove or furnace must sit level on a non-combustible surface. Suitable materials include ½" or thicker asbestos millboard covered with 24 gauge sheet metal, mortared bricks or stone, concrete, etc. The floor protection should extend 12" beyond the sides, and a minimum of 18" should extend in front of the loading door (to catch any coals you might drop). The bottom tabs of the legs on BBR models may be bent to level the stove on an uneven surface.

Illustration:



*Floor protection
12" from sides + back
18" or more
from front.*

E. Stove Pipe

Kickapoo Stoves and Furnaces require 6" diameter stove pipe of 24 gauge minimum thickness steel. We recommend placing the stove as close as possible to the chimney, using the least amount of pipe and elbows possible (KEEP CLEARANCES IN MIND!). Excessive pipe and elbows will cool the smoke as it passes through them; if the smoke is too cool, it will form creosote on the inside of the pipes. Pipes and elbows will need periodic replacement, so minimal pipe will also be less expensive in the long run.

Install the stovepipe with the crimped end down (see separate instructions if packed) to help prevent creosote from running out onto your stove or floor.

Continued loading of the stove can jar it and may cause the stove pipe to become loose. To prevent this problem, secure the joints of pipe and elbows with at least three sheet metal screws. We also recommend at least two sheet metal screws installed in the lock seams of each section of stove pipe.

You must have easy access to your stove pipe for frequent inspection and cleaning.

The stove pipe (or elbow) that goes into the chimney must fit tightly and should extend to the inner surface of the chimney, but not into the flue space. Some people recommend that the pipe be cemented into the masonry chimney at this point. Check your local codes.

Damper

Because your Kickapoo can be controlled without a damper, its installation is optional and recommended only if you want the extra control available in good draft locations. **USE OF THE DAMPER IS NOT RECOMMENDED IN THE BOXER.**

If you are going to install a damper in BBR models, this is how to do it:

A damper has two main pieces; the iron "damper" plate, and a shaft (with handle, springs, and retainer washer) which rotates it. The shaft also has a point at one end which is used to make its installation holes. Use the damper as a backing or brace to keep the stove pipe round and use the shaft as a punch to make the first hole; then insert the shaft through the pipe and the damper and punch the second hole. Push the shaft through the second hole, compress the spring by pushing on the handle and rotate to lock the damper in place with the handle parallel to the damper. The handle will then indicate the position of the damper during operation of the stove.

III. Operation — "Air Tight"

CAUTION: Never use kerosene, gasoline, or any liquid fuel in your stove. **NEVER** store such combustibles near your stove.

NOTE: Never leave your stove unattended with the door(s) open or unlatched.

CAUTION: The loading door handle will become hot when the unit is fired.

The principles of combustion (burning or oxidation) are important to keep in mind when operating your Kickapoo. Combustion takes place when fuel and oxygen (air) are combined at a sufficient temperature. The by-products of combustion are heat, carbon dioxide (CO₂), water (H₂O), carbon monoxide (CO), and other gasses. The rate of burn is determined by the amount of fuel and air that are combusted in a given time.

The major difference between an oil or gas burner and a solid fuel burner is the way in which the rate of burn is controlled. In an oil or gas burner the fuel is metered into the firebox and it is given the optimum amount of air necessary to have "complete combustion." Conversely, a wood stove is usually loaded with a charge of fuelwood, and the operator controls the air getting to the fire. Therefore, "air tightness" is an important factor for fire control. Non-"airtight" stoves usually burn at an uncontrolled rate, but burn fairly clean because there is excess oxygen getting to the fire. However, an "air tight" stove is controllable and exhibits long burns per charge. Because the air getting to the fire is limited, there is greater chance of creosote formation (see sect. IV-A), due to the fire burning at very low rates. Smoldering burn rates are what cause creosote formation. Therefore, the operator must balance the fuel load with air and weather to get an efficient burn. This can be complicated and will require some experience with operation to get it right.

A. Starting the Fire

The first time you fire up your stove, the moisture and vehicle in the paint will burn off. This can take up to one hour or more. Pick a day when you can open windows for ventilation. To avoid blistering the paint, build your first few fires small and burn them slowly.

To start the fire in your BBR, place a small pile of kindling (cross stacked) on top of the grate. Then place two or three crumpled sheets of newspaper in the back of the firebox on top of the wood, under the flue. Next, put five or six pieces of newspaper under the grate through the ash door. If you have a damper — leave it fully open. Light the paper in the firebox and close the loading door, keeping the ash door open. Wait until the paper inside the firebox is burning well (this will induce the draft), then light the paper under the grate. Add more paper through the ash door if necessary. When the kindling is burning well, put on some slightly larger wood. Shut the ash door with the draft fully open and gradually add larger pieces of wood to the fire until there is a good bed of coals.

The boxer is somewhat different than the BBR to start — no grates. Crumple five or six sheets of newspaper, put them in the firebox and place kindling on top (cross stacked). Then crumple two or three sheets of newspaper or equivalent and lay them on top of the kindling. Light the paper. Close the loading door with both draft plates in "full open" position. When the kindling is burning well, add progressively larger wood until there is a good bed of coals.

Now your stove is ready to load for the type of burn the weather dictates.

B. Operating the Stove

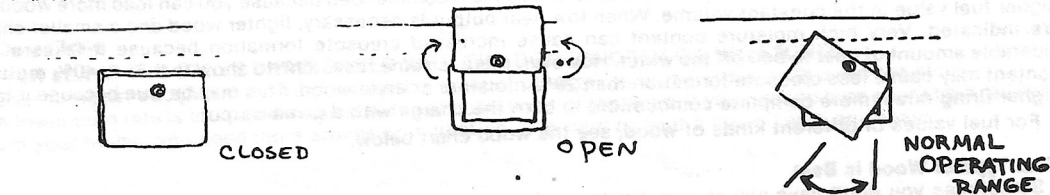
1. The Weather

The weather is the most important determinant in how you operate your stove. It will also affect the operation by changing the draft* characteristics of the chimney. The colder it is outside, the stronger the draft. The stronger the draft, the greater the amount of air the fire will get with a constant draft setting. (Remember, combustion rate is controlled by the amount of air getting to the fire.) Therefore, as you can see, any wood stove will burn harder with the same draft setting when the outside temperatures are colder.

* From "The Woodburners Encyclopedia: Wood as Energy", by Jay Shelton and Andrew B. Shapiro. Draft — The difference in air pressure inside and outside a chimney or stove. Draft is also used to mean air flow.

The manual draft plate, located on the ash door of the BBR, and the two circular plates on the loading door of the Boxer, are the means by which the operator controls the amount of air getting to the firebox. A "wide open" setting will give you a very fast burn. This setting is recommended for use only when starting the fire, right after reloading, or when a fast, short-lived fire is needed to take off the chill (see illustration).

BBR
DRAFT PLATE



After daily ash maintenance has been completed (see sec. IV-C), load in the new charge of wood. If you use a damper, open it fully. The ash door on the BBR's can be opened for a short time, with the operator in attendance, to get the fire roaring. **Always shut the stove down gradually** to prevent excessive stress on the materials.

When you load your stove in the morning, burn it hard for five or ten minutes. This will help burn out any creosote which may have accumulated during the night.

The weather will also affect how large and what kind of wood charge you put in. We recommend that you cut your wood to maximum length, but not too long. A piece of wood that won't fit wastes your energy. UGH! Finely split wood will burn faster than thick wood and will require more air to burn "completely". Generally, the denser and dryer the wood, the higher the fuel value (see wood chart), and the larger the charge, the longer the burn for a given weather condition. As you can see, there are a number of variables the operator must keep in mind:

1. Weather?
2. How much heat do I need?
3. Air setting?
4. How much wood? What size wood?
5. How much moisture in the wood?
6. What kind of wood?
7. How long a burn?
8. How hot a fire?
9. What condition is my chimney in?
10. Are the stove pipe and chimney clean?

All of these factors and more need to be considered when operating your stove. Experience will be your best teacher.

2. Creosote

When wood is loaded onto the fire, it will gradually heat while the water in the wood is driven off. When the temperature reaches 212° F, the water is gone. As the wood continues to rise in temperature, combustible solids are first boiled and then leave the wood as a gas. When these gasses are combined with air at **sufficient temperature** (about 1200° F), they will burn as a flame coming off the wood. This is what is called "secondary combustion." "Primary combustion" takes place at the base of the fire and is a result of combining air with the red-hot charcoal (the carbon left after the gaseous combustibles are driven off the wood). When there is insufficient air or temperature in the firebox, secondary combustion will not take place and the gasses will not burn. As these unburned gasses are drawn up the chimney, some of them will cool and condense on the stove pipe and chimney to form creosote. If the chimney and connectors are cool enough, water will condense and run back down the chimney carrying creosote with it, causing it to run out the joints in the stove pipe (what a mess!). All stages of combustion take place simultaneously after loading (a large piece of wood may have charcoal on the outside and be cold in the middle). Therefore, it is important to burn your fire hard for 20 to 30 minutes just after loading to warm the charge thoroughly and drive off most of the water before shutting down the draft (and damper if you have one). This will help prevent water from condensing and creating a mess.

Slow, smoldering burns cause creosote to form regardless of the wood's water content. Large charges at low firing rates cause creosote to form in stove pipe and chimney. Therefore, during fall, spring and warm winter days, it is important to load your stove with less wood to try to maintain a **hot** fire, so creosote formation is minimized.

3. The Wood

Different kinds of wood have different fuel values. When loading your stove you must consider the type of wood you are using. The denser the wood for a given volume, the higher the fuel value. The higher the water content, the lower the fuel value will be. One pound of dry wood, when burned, will give off approximately 7000 BTU's, and if your stove is burning at 50% efficiency, you will get 3500 BTU's of heat from that pound. If you burn ten pounds of wood in one hour, you will get (at 50% efficiency) 35,000 BTU's output in that hour.

When a high heat output is desirable, dense, hard wood is recommended because you can load more wood of a higher fuel value in the constant volume. When low heat output is necessary, lighter wood and a smaller charge are indicated. Very high moisture content can cause increased creosote formation because it takes a considerable amount of heat to boil off the water. However, there is some research* to show that 30 to 40% moisture content may cause less creosote formation than 20% moisture or dryer wood. This may be true because it takes higher firing rates (more complete combustion) to burn the charge with a given output.

For fuel values of different kinds of wood, see the wood chart below.

What Type of Wood Is Best

Sometimes you don't have any choice. However, if you do, the technical and poetic comparisons below will help you decide.

*Beechwood fires are bright and clear
If the logs are kept a year
Chestnut only good, they say,
If for long 'tis laid away
But ash new or ash old
If fit for queen with crown of gold.*

*Birch and fir logs burn too fast,
Blaze up bright and do not last.
It is by the Irish said
Hawthorn bakes the sweetest bread.
Elmwood burns like churchwood mold,
E'en the very flames are cold.
But ash green or ash brown
If fit for queen with golden crown.*

*Poplar gives a bitter smoke,
Fits your eyes and makes you choke.
Apple wood will scent your room
With an incense like perfume.
Oak logs, if dry and old,
Keep away the winter's cold.
But ash wet or ash dry
A king shall warm his slippers by.*

Fuel Values of Some Common Woods

	Average Density lb./cord; 20% moisture	Fuel Value/Cord (BTU's)
Shagbark Hickory	4400	30.8 million
White Oak	4400	30.8
Sugar Maple	4100	29.7
American Beech	4000	28.0
Red Oak	3900	27.3
Yellow Birch	3800	26.6
White Ash	3700	25.9
American Elm	3400	23.8
Red Maple	3400	23.8
Paper Birch	3300	23.1
Black Cherry	2900	21.4
Douglas Fir	2900	21.4
Eastern White Pine	2200	15.8

4. Opening the Door

Opening the loading door during operation must be done with CAUTION. During the second stage of combustion, when combustible gasses are being driven off, the fire can be smokey and you must increase the draft to prevent smoke from entering the house.

This can be accomplished on the Boxer by first opening the draft plates to get the fire burning faster, then opening the loading door just a crack until air starts moving into the firebox. Continue to open the door gradually.

To open the door on your BBR, first open the damper if you use one. Then, open the ash door until you hear the stove "roar". Open the draft plate all the way and shut the ash door. Next, unlatch the loading door. Slowly open the loading door a fraction of an inch — continue doing so slowly. You will hear the stove "roar" with each additional fractional opening. You should also be able to see the smoke being pulled up by the draft.

*Discussed by Jay Sheldon at Woodheating Seminar II, September 7, 8, and 9, 1977, at Hartford, Connecticut.

Do not open the door just after "shutting down" a hot fire, as this may cause a "back puff", spewing smoke and fire out the door. Adding air through the door when there are hot, unburned gasses in the stove can cause them to ignite.

If you experience back puffing, please follow carefully the recommended procedures for opening the door. You may find it necessary, after loading, to poke air holes up through the grates from the underside, using the pointed end of your poker inserted through the ash door.

5. Over Firing

NEVER LEAVE THE STOVE UNATTENDED WITH THE DOOR(S) OPEN OR UNLATCHED

Over firing is recognized by: 1) an excessive amount of warpage in the stove, or 2) a red-hot stove.

A lower burn rate is indicated if either of these conditions is observed. If you need to burn your stove red-hot to warm your house, you need more stoves or insulation. It is hard to heat a "barn" with any heater.

IV. Maintenance

Regular maintenance will assure you of a safe and long-lasting stove installation.

A. Creosote — if collected in excessive amounts, it can be ignited by flames reaching the stove pipe or chimney resulting in a chimney fire that can do considerable damage to a previously sound chimney. It is necessary to inspect and clean the stove pipe and chimney, especially during the fall and spring, and after warm spells when low firing rates are common.

B. Check stove pipe connections after every loading and after any back puffs.

C. Ashes — should be placed in a metal container with a tight fitting lid. (Hot coals can melt through a plastic container.) The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

1. BBR — Scrape ashes away from the back and sides of the firepot and over the grate where they will fall into the ash compartment with a fire poker daily, leaving coals exposed. Empty the ash pan when full. Caution: Do not let ashes build up so that they smother the grates; this will insulate them and cause them to "burn up" more rapidly. Ash build-up will also cause the fire to smolder. A small quantity of glowing coals left in the firebox over the grate will start a new charge of fuelwood.

2. Boxer — Scrape ashes and charcoal to the front of the firebox with a poker and reload. When the ashes build up (here's the trick), shovel out the ashes up to the charcoal bed in the back, then scrape the charcoal to the front and reload. The fire will burn from front to back.

D. Summer

1. Clean your chimney, flue passages and stove pipe. Replace stove pipe if necessary.

2. Clean out all ashes and coals. (Damp weather combined with ashes makes them caustic and they can corrode the steel.)

3. Inspect for open seams and cracks in the firebox and repair if necessary.

4. Repair to the firepot is only necessary if you have big chunks of the fire clay falling out. Cracks in the firepot will develop almost immediately after first use — Don't worry! They will not affect the operation of the stove.

5. Paint or polish your stove if needed. Paint will give better protection if the stove will be in a humid place.

6. Replace the lock washer on the draft if necessary.

7. Clean the baffle on the Boxer; access is through the flue hole.

For further information on using your heater safely, obtain a copy of the National Fire Protection Association publication, "Using Coal and Wood Stoves Safely", NFPA No. HS-8-1974. The address of the NFPA is 470 Atlantic Ave., Boston, MA 02210. An excellent reference book is "The Woodburners Encyclopedia — Wood as Energy", by Jay Shelton and Andrew B. Shapiro, published by Vermont Crossroads Press, Waitsfield, VT., available through your Kickapoo dealer.