

Crane Stoves

QUALITY STOVES FROM QUALITY PEOPLE

Crane Stove Works Inc. Executive Offices, Braintree MA 02184 (617) 843-6150

4 STOVES IN 1

	Basic Full Stove	Quick Change Combustion Pac		
		Wood	Large Firepot	Mini Firepot
FUEL USED	Wood	Wood	Coal	Coal
LOG LENGTH (MAX)	22"	18"	N/A	N/A
POUNDS OF COAL (MAX)	N/A	N/A	50	20
NUMBER OF ROOMS	2-6	1-4	3-8	1-3
HOURS OF BURNING	5-10	4-8	15-40	12-32
NOMINAL OPERATING RANGE IN CUBIC FEET	5-10,000	3-6,000	5-10,000	3-6,000
CUBIC FEET (MAX)	15,000	9,000	19,500	9,000
BTU (MAX)	65,000	39,000	65,000	30,000

HEIGHT	25 1/2"
WIDTH	26"
DEPTH FOR HEARTH	13"
FLUE HEIGHT (Top)	24 1/2"
FLUE SIZE	6"

PLACE
STAMP
HERE

Crane Stoves

P.O. BOX 440
BRAINTREE, MASSACHUSETTS 02184

Price \$1.95

THE COAL & WOOD BURNERS ALMANAC

A Guide to Solid Fuel Burning
along with the
Owners Manual for the
Model 404

Crane Stoves

5th Edition

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FROM THE PRESIDENT

Congratulations on your selection of the finest solid fuel burning stove made anywhere. We at Crane Stoves are proud of our product and wish you many pleasant years of economical heating value and at the same time, enjoying good old-fashioned warmth. We are equally proud to be setting a new standard of technical achievement and consumer appeal in an industry that has finally come of age.

You the consumer have the right to expect your full range of needs and desires to be met by products that offer no compromise in form and function. Crane Stove Model 404 is first to offer a unique blend of heating range, fuel compatibility and an impressive variety of highly functional decorator options.

Behind our concern for your complete satisfaction in heating economy and your aesthetic taste, lies a firm commitment to safety. A safe installation is the best thing you can do for yourself and your family. Crane Stoves Model 404 has been engineered and tested so that the stove itself is the safest available, and we provide this detailed owners manual so that you may have the safest over all solid fuel heating system possible.

You are urged to study this owner's manual, follow its guide lines, have your installed system inspected and approved, and then enjoy the many benefits of your new stove. After you have conquered solid fuel burning and you realize that you have finally bought something for your home that was far better than you had expected . . . let us know . . . Just send a brief note or include a couple of comments right on the warranty card you drop in the mail.

Sincerely,



Doug Crane

By purchasing the Crane, you are not only acquiring a leading stove, but also the security of the very best. We thank you for your consideration, and wish you many hours of good old-fashioned warmth.

After you have conquered solid fuel burning and you realize that you have finally bought something for your home that was far better than you had expected . . . let us know . . . Just send a brief note or include a couple of comments right on the warranty card you drop in the mail.

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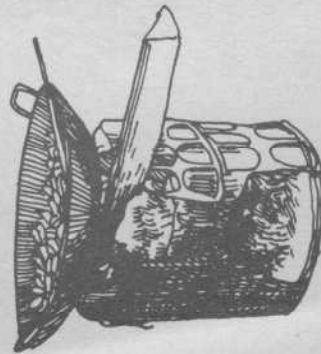
By purchasing the Crane, you are not only acquiring a leading stove, but also the security of the very best. We thank you for your consideration, and wish you many hours of good old-fashioned warmth.

THE CHALLENGE

Americans are very good at solving problems as long as they know what the problem is. In today's world we are keeping the cost of energy lower while maintaining American independence. A dollar will buy more satisfaction when spent on coal or wood than any other fuel. What you read here will help you understand the choices we all have to make. Of course, it wasn't always like this.

A SHORT HISTORY OF HEATING

What would earliest man have done without coming to a working relationship with fire. It provided security, warmth, and cooked food. It enabled him to inhabit otherwise intolerable regions, like New England. An open fire next to a cave is an image of the earliest of times and any history of man's other achievements necessarily includes his taming of this flickering beast.



Chinese Brazier
with Wok

During his travels through the Orient in the late thirteenth

century, Marco Polo observed the established practice of carrying black stones from the hillside and their subsequent use as fuel. A brazier, a portable, basin-shaped fire pan held the burning stones, supplying a cooking source as well as heat. The Chinese, inhabiting a coal-rich land, rely heavily on its use today.

In earlier times, the concept of central heating was adopted. By the first century, Romans developed the hypocaust or basement furnace made of brick or stone which heated the room above through tile flues. Roman baths were often warmed this way. Wood was probably used and perhaps coal also, since Theophrastus, the Greek philosopher, refers specifically to it in Greco-Roman times.

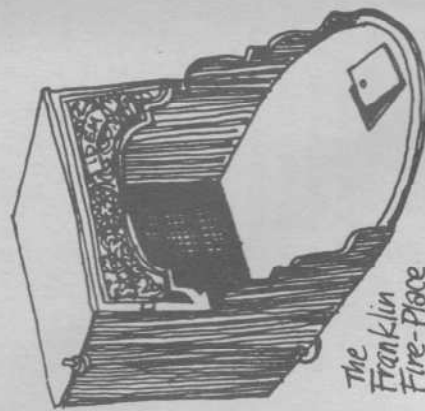
Earlier still, ancient cave dwellers originated the idea of the fireplace when they poked a hole in their shelter to vent out smoke from their fires. The woodburning fireplace remained a primary heat and cooking source in various parts of the world and was indeed the heart of the home for centuries in Europe and Colonial America.

Porcelain, earthenware and brick stoves were common from early times in Russia and Europe. The brazier was also used by early Europeans. They burned wood or charcoal while coal itself was not mentioned until about 1200 A.D. Its early use was intensely disliked due to the noxious fumes resulting from incomplete combustion.

So great was the dislike that Edward I (1239-1307) banned its use with the punishment of death. It was then primarily used by smiths or other artisans until the 16th century when the production began to increase as did the knowledge of casting iron. These early European technological advances resulted in the creation of a box-shaped stove, the forerunner of today's cooking range. The six-plate, or "Holland" stove was an early example. It was more sophisticated than another made in Germany because it had a fuel door and a draft hole of sorts with perforations for a smoke pipe. The pilgrims traveled with the molds of this stove, having been familiarized with them during their stay in Holland prior to their Atlantic crossing. In 1657, a blast furnace in Saugus, Massachusetts was making America's first cast iron stoves and the "Holland" model was probably what it produced.

Soapstone was also used for stoves and heaters and offered the advantage of holding heat hours after the fire died. Benjamin Franklin concerned himself with making wood burn more efficiently and in 1742 conceived his Pennsylvania fireplace, later to be called Franklin Stove. Actually a cast iron fireplace, it had an open front leaving the fire visible and radiated more heat making his living room "Twice as warm as it used to be with a quarter of the wood I formerly consumed . . ."

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The Franklin
Fire-Place

The availability of fuel has always dictated its use. Watt's invention of the steam-powered engine in 1769 which was adapted to the locomotive, allowed large amounts of coal to be transported from the mine. A growing scarcity of wood in addition to the wide availability of cast iron further set the stage for the extensive production of coal stoves by the early 19th century. In 1820, the Lehigh Valley Coal Mine Company sent a sample of its coal to an authority on fuel combustion, the Reverend Eliphalet Nutt in Schenectady, New York, requesting that he build a stove in which coal could be burned. He subsequently developed the "Saracenic grate" which worked well but produced dangerous side effects due to combustible gases. Simultaneously, another base burner was being developed by Jordan L. Mott of New York which was patented in 1833. It was devised to use nut coal which at that time cost \$3.50

per gross ton. Within a few years, the Mott Iron Works, located in what is now the Bronx, New York, was producing a great variety of stoves in different sizes, all with different

names like "Mott's" "Defiance", "Sirius" and the "Scorcher". The Littleton Stove

Company in Albany manufactured very successful models including their popular "Our Pleasant

Home" which combined practicality with a "pleasant, elegant effect." The globeshaped

"Station Agent" was used in schools, stores and

railroad stations and in fact heated the Sixth Avenue

elevated railroad stations until they were dismantled in 1939. By 1976 there were nearly a thousand stove patents with two hundred factories producing two and one-half million stoves.

Coal soon became the principal fuel for steam generated electricity after the introduction of the steam turbine engine in the 1880's so that by the beginning of the 20th century, nearly all energy for industry and home consumption was produced by coal.*

Consumption peaked in 1918, after which there was a gradual decline in its use for home heating oil and natural gas began to be utilized domestically while industry, particularly electric utilities and steel producers increased their coal consumption.

*Coal produced 22% of this country's energy during the 1960's.



The Station Agent

Other than a brief

resurgence of base burners during World War II when one was released for civilian use, coal stoves remained relatively unused for many years.

The past two decades brought extraordinary price increases in home heating oil plus concern about its availability. In addition, uncontrolled inflation began to demand that families alter long established habits of

wasteful energy consumption, and in so doing, changed a part of their lifestyles as well.

Illustrating one of life's many cycles, families redefined their wants and needs and returned to wood stoves as a means of heating their homes.

Smart consumers look for flexibility in today's designs. Stoves that burn both wood or coal with equal ease and efficiency are in increasing demand. It is the independent way of creating an atmosphere of old-fashioned warmth.

CATCHING UP WITH TODAY

We now know much more about the comings and goings of different energy systems.

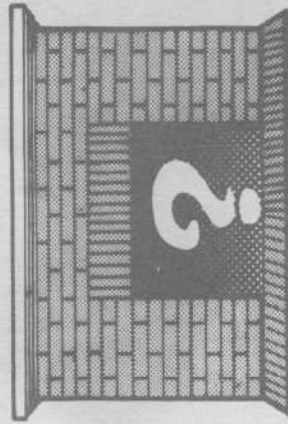
Solid fuel combustion processes center on pyrolysis - the cycling of a controlled fire from the ignition stage to the exhaustion stage. Basically, solid fuels have a specific temperature, the kindling temperature at which point they flame. This ignition stage heats up the main body of fuel,

driving volatile gases to the

surface where they attempt to escape. For the most part, the escaping fumes also ignite creating additional heat. Once the volatiles are burned the remaining fuel continues to burn flameless, in a "coaling" state. It is this state of combustion that produces the steadiest most desirable output of heat. Operating in this mode is most controllable.

FIREPLACE OR STOVE

In a fireplace we try to keep this "coaling" mode active by adding logs periodically. The logs flame for a while and settle into a mesmerizing glow. Since the air supply is virtually uncontrolled, the method of



control is by means of changing the time intervals between armloads of wood. In an air controlled stove, we slow the combustion process by adjusting the air supply, not the fuel. As a result, most of the heat passes into the home, not up the chimney. Air control balances comfort, effort and economy.

SOLID FUEL FACTS

The following chart summarizes some of the pertinent points of wood and coal. A chart can only show at a glance the benefits of solid fuel. For example, the complete scale of solid fuel starts at the low level of newspaper, then kindling, then logs, then wood pellets, lignite, bituminous coal, and then finally up to the highest level of anthracite coal. A stove designed for the lower level solid fuel can not and should not be used for the higher level fuels. However, a stove designed for a high level fuel can be used on fuels of a lower level. The uninformed buyer will be frustrated and disappointed when trying to burn anthracite coal in an improperly designed coal stove, and find it virtually impossible in a wood stove that calls itself a wood/coal combination.

Another topic a chart cannot explain is chimney deposits and their effect on cleaning both the chimney and the glass in a stove. Coal and wood both result in a deposit accumulation. Coal has soot; wood has creosote. Both should be removed with regular chimney cleaning. Creosote should be removed because it could cause a fire.

When coal is burned, the products of combustion combine with moisture to form a soot residue, which accumulates on the flue lining. When ignited, this soot makes an extremely hot fire. The chimney connector and

chimney should be inspected at least once every two months or less during the heating season to determine if a soot buildup has occurred.

If soot has accumulated, it should be removed to reduce the risk of a chimney fire.

Now to the subject of glass. Coal burning keeps the glass clean just like a self cleaning oven. Wood burning will dirty the glass in any stove, especially at a slow rate of burn and especially in a high quality air tight stove.

When comparing fuels, bias and myths run rampant. You are probably sick of the lies told about oil vs gas vs electricity. Gas people tell us that the oil freighters are not arriving through the fog. Oil people tell of the gas pressure loss and the imminent federal decontrol. Electricity people tell us of the safety of nuclear fuel, and everybody tells us of other people polluting. Even wood and coal people stretch the truth. For example, coal people don't tell you that ash impurities may vary from 7% to 14% and you can not tell the difference from looking. You need to know this information because 14% ash content coal will not work in a hopper stove and will not last long in other coal stoves. By the same token, wood people tell us that wood has 25,000,000 usable BTU's per cord, but forget to mention this is only true for solid wood with little moisture. Wood people forget to include the fact that bark has very little heat

value, that a one cord woodpile is not solid but has spaces, that up to half the heat value is lost trying to turn the water in moisture laden wood to steam.

So lets give the American Public credit. Tell the truth and they will make the best decision for themselves. No one fuel is ideal. No one stove is ideal. Maybe that's why 70% of Crane stove buyers already tried another brand and then chose a Crane.

THE PROMISE

Today's modern stoves promise performance benefits to maximize comfort. It is critical to control the path that air travels from the ignition cycle to the exhaust cycle. Key to this is seam integrity. Without seam integrity, control can range from inconsistent to unpredictable to non-existent. Anyone who has reclaimed a cast iron stove is well aware of the effort required to regain seam integrity. It usually involves dismantling of the stove, examining the metal to metal seals and, as they are put together again, liberally applying heat proof cement. This maintenance procedure is, sooner or later, followed on all bolt together designs. Only continuous welded seams require no maintenance.

Today's modern stoves also promise flexibility. One very predictable facet of life is that we all find our needs changing. People today are keeping their homes but adding rooms. What was once adequate for 5

rooms falls short for 7. Or people want to choose the fuel available at the best price when they have the money to make a bulk purchase. Many people simply want to upgrade the appearance of the stove. These circumstances point to the importance of having these options available either at the

time of purchase or at a later date. A stove that allows you future options lets you be flexible with your budget now. Yesteryear's stoves serve as a reminder of the general durable quality of solid fuel heaters. Today the same concern for ruggedness prevails. A Rolls-Royce is built to last, we all

WOOD		COAL	
SOURCE	Dealer or Cut your own	Dealer	
TYPICAL SMALLEST RETAIL QUANTITY	Armload	40 Pound Box	
NORMAL QUANTITY UNIT	One Cord 128 Cubic Feet	One Ton 2000 Pounds	
PROCESSING REQUIRED	Cut, Split, Dried for 12 Mo. (May be Purchased This Way)	None	
AVERAGE DAILY CONSUMPTION	50-100 Pounds (3-4 Armloads)	20-40 Pounds (One or Two Buckets)	
AVERAGE TIME BETWEEN REFUELING	6-8 Hours	12 Hours	
MAXIMUM TIME WITH RELIABLE HEAT	8 Hours	20 Hours	
SPACE NEEDED FOR ONE YEAR SUPPLY	640 Cubic Feet (5 Cord)	90 Cubic Feet (2½ Tons)	
STORAGE LOCATION	Outdoors Undercover	Indoors or Outdoors Undercover	
PRICE PER UNIT	\$55-\$175 Per Cord	\$125-\$150 Per Ton	
APPROXIMATE COST FOR ONE HEATING SEASON	\$500*	\$350	

*Many people forage for their own wood at no cost. This extra work results in your "Best Buy".

know that. It is also designed to offer complete satisfaction over the life of ownership, which is even more important. Modern stoves have staying power. They keep you energy independent year after year.

Thanks to the controllability found in solid fuel heaters, making the shift from the "dial on the wall" need not be a step backwards. The Good Old Days offered inexpensive fuels, and inefficient heaters that wasted fuel. Oil, gas, and electricity are perceived as requiring zero effort, designed for convenience. Today's modern stoves require as little effort as can be expected. You are more than compensated by dramatic increase in economy without sacrificing comfort.

There is a growing concern that we have forgotten the art of heating with solid fuel. Many people fire up Grandpa's old stove and some of these same people experience tragedy due to lack of experience in evaluating whether Grandpa's stove can handle it or not. Today, accredited testing is required and provided to assure consumers that every reasonable step has been taken to furnish a key ingredient of safety, a properly designed stove. Look for an approved laboratory label on every stove.

As more and more Americans choose the modern approach to independent energy, a sense of pride swells in acknowledgement of our collective ingenuity and

resourcefulness. Owning a stove that is durable, flexible, easy to use, completely controllable, without compromising safety, is the intelligent solution to a perplexing challenge.

THE CRANE PROMISE

Keeping in mind that the essence of coal combustion is the air flow from beneath the coal bed being forced up through the fuel and not allowed to wander around, let's examine the technical aspects of the Model 404 with the Coal System in an effort to demonstrate its incredible efficiency.

The live, free-flowing shaker grate nestles inside a heavy cast iron firebox with rounded corners to prevent excessive ash buildup and no dead spots. Over 50% of the fuel bed is exposed to primary air intake which results in not only dust free shaking, but the fastest startup and recycling time possible. Tunable secondary air inlets in the firebox preheat oxygen and provides extra efficiency with various chimney drafts. In addition, the outlet baffle spreads the flame path, increasing heat transfer into your home and decreasing heat loss up the chimney. Again, more efficiency results.

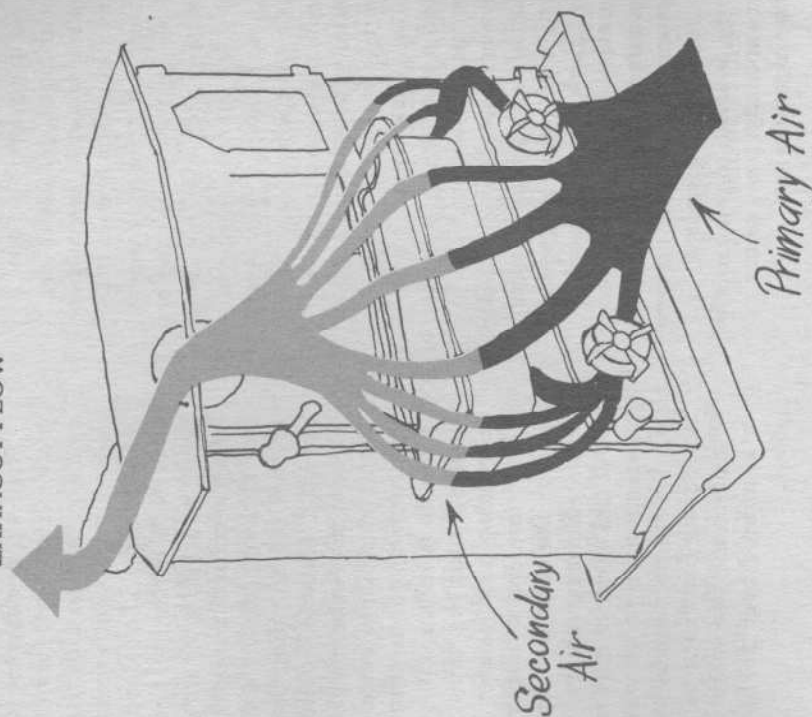
All this effort at efficient heat production would be wasted if not for the continuous welded solid plate construction. Maintenance free seam integrity is insured over the life of the stove.

The solid cast iron top level load door has a deep gasket channel to insure that, when the door is securely latched, the only air entering the system is through the dual controls on the equally well gasketed bottom level service door. Having separate opening doors, both above and below the firebox is critically important for precise coal burning. You will find this feature leads to more effective startups and cleaner operation. In addition, the bay window will allow

much wider angle viewing for all to enjoy the mesmerizing fire.

Several modular features are worth paying particular attention to as they offer unique benefits to the consumer. For example, consider the question: "How big a stove should I buy?" One size fits all is terrific if you are buying rubber gloves to wash dishes. When buying a stove however, it is wise to fully understand the range of outputs a unit is designed to produce. Heating requirements

EXHAUST FLOW



and comfort requirements vary both with the season and with the fuel.

Crane Stoves is proud to offer the 4 way flexibility with the Quick Change Combustion Pack. This provides you with one stove on the outside and 4 stoves on the inside with 4 firebox operational modes:

1. Large powerful heating with wood
2. Small heating with wood
3. Large powerful heating with coal
4. Small heating with coal

You need not worry if you purchased the correct size for your heating needs or fuel choice.

With absolutely no change, you have large coal stove ability and small woodstove ability always available at the same time. From here, you can either remove the complete coal system which results in a large wood stove or remove just the large firepot and replace it with the mini firepot which results in a small coal stove. This is flexibility not available until the development of Crane Stoves Model 404.

In summary, Mid-Winter heating or Spring-Fall chill chasing or coal and wood . . . You need not compromise.

"VARIETY IS THE SPICE"

Also let's consider Crane Stoves unique solution to the

question of appearance. The diversity in human interest and taste means differences in decorative styles, colors, etc. This is true for homes, furniture, cars, carpets, curtains, and . . . Crane Stoves.

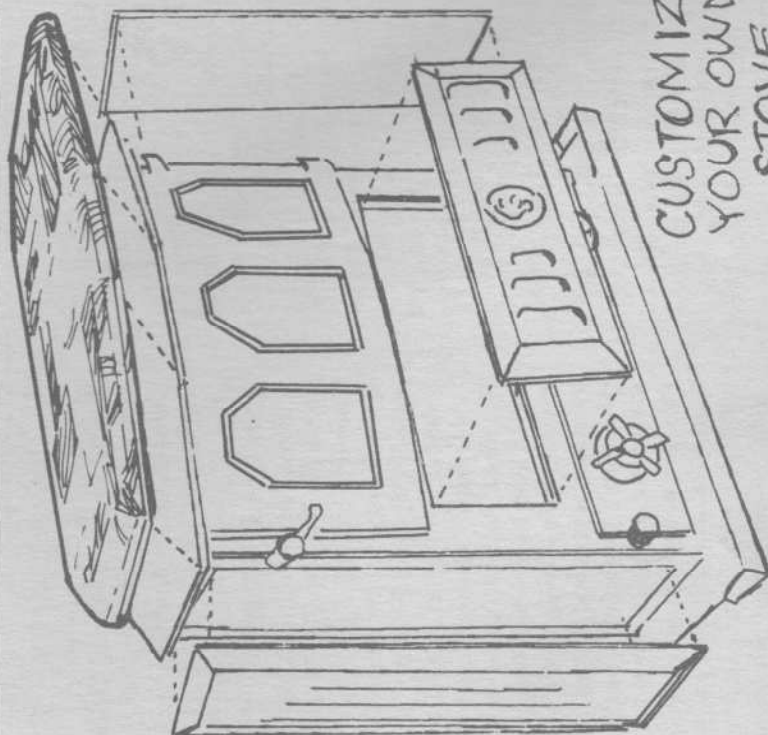
Through a system of knockout studs already in the frame of the basic stove, you may elect at any time to choose the decorative system that fits your special taste. Beautiful soapstone or cast engraving even adds to the thermal momentum of the stove.

Mixing and matching of these heavy modules increases the mass of the stove and smooths out the heating-cooling cycle. This enhances the steady state performance characteristics so desirable in today's stoves by comfort conscious consumers.

We place no limit on your creativity. If you have an idea of how you would like your stove to look, we will provide you with ideas to accomplish it. Italian Tile Anyone?

Some people today want the look of the fireplace insert without sacrificing efficiency or safety. We now offer a fireplace facing panel that effectively covers the fireplace opening yet doesn't effect the efficiency advantage of the free-standing stove.

For the home that ought to have everything we offer Auto-Shake. Push button probably is not for everyone because the



**CUSTOMIZE
YOUR OWN
STOVE**

stove requires very little effort

to operate manually. Think of it as an automatic transmission or power steering for your car. Shaking down the stove will soon become a job even the kids will want to do.

Another nice ability is having a blower system available with your stove. A word of caution here. A blower will provide you with no more additional heat. It will only move the heated air around better. This is an option that should only be considered

after installing your stove.

We at Crane Stoves feel we have the most comprehensive series of solutions to the challenge of energy independence. The Model 404 represents the ideal of comfort, economy, convenience and beauty. Our unique approach to meeting different needs and tastes enables you to achieve basic goals today and to acquire what you may need later, when your outlook changes.

HOW TO PREPARE YOUR CHIMNEY OR FIREPLACE FOR OUR STOVE

Have your masonry chimney inspected, cleaned, repaired and otherwise readied for installation. Have its condition approved by a local building inspector or fire marshal. Make absolutely certain that the chimney is not being used for another heater or an open fire in another fireplace unless specifically authorized by a properly licensed heating contractor and the local authorities. You should then block off the entire upper damper area with a non-burnable material and cut a 6" diameter hole for the flue connector pipe. This pipe should have a vertical rise of at least four feet to provide a good draft before it exits into the chimney. Under no circumstances should the uninsulated pipe pass through a wall or ceiling. The stove may rest directly on a multiple brick

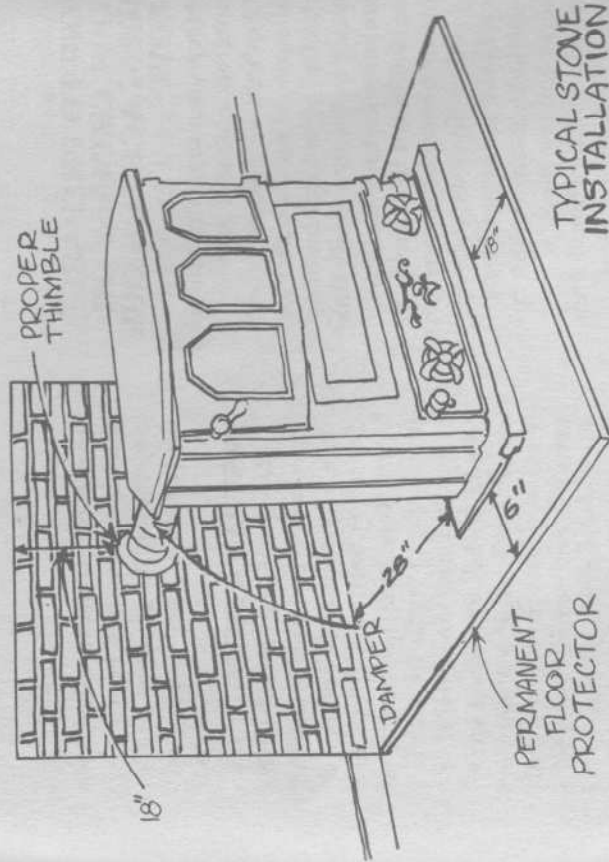
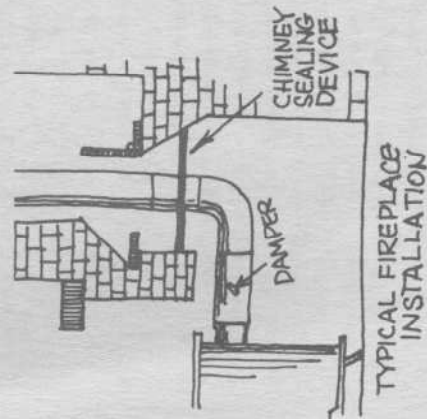
hearth or the standard 1/4 inch thick asbestos mill board covered by 28 ga. steel or its equivalent.

INSTALLATION

Please plan on installing the stove when you have plenty of time on your hands and use a day when hardware stores are open. Keep your heat on in the house. Don't try to heat the house with the stove the first few days. Ask any wood stove owner and he will tell you that it takes a little experience with even the best wood stoves to get promised results. Coal stoves are easier to operate, much less tending etc., but usually take a bit more patience at first.

The Crane Stoves 404, like other quality solid fuel heaters, should be installed with three major considerations: the clearance to other parts of the room, the connector pipe, and the use of a proper chimney.

First, the instructions on clearances. The front of the stove should be kept 36" from combustibles. The sides of the stove should be kept 24" from combustibles. The rear of the stove should be kept 28" from combustibles. Combustible material is anything that might catch fire — like wood walls, chairs, T.V.'s etc. Non-combustible materials (steel, asbestos, brick etc.) may be no closer than 18" to the stove.



The stove should rest on a permanent floor protector, equal to or better than a 1/4 inch thick asbestos millboard, covered by 28 gauge steel, extending 18" in front of loading door, 6" on either side and rear.

Second, a flue connector pipe is that section that connects from the stove to your approved chimney (factory built or masonry). Floor protection for flue connector must be provided: 2" on either side and 2" beyond the point where vertical rise begins. This pipe should be no closer than 18" from any combustible material. It shall be 6" in diameter, 24 gauge steel or heavier (22 gauge recommended for coal especially). This is to be securely fastened to the flue collar of the stove by either using two screws or a 6" draw-

band. This flue connector pipe may have up to a three-foot horizontal section with an upward slope of 1/4 inch per foot before it enters your chimney. It should be well supported until it is securely placed into your approved chimney.

You may install a 6" cast iron damper in the flue connector pipe. Generally speaking, depending on your draft, you should keep it open when using coal. You may find closing it slightly is helpful on a well established wood fire. There is no substitute for the rewarding feeling associated with the knowledgeable operation of your stove. Closing the manual damper can lead to a slight increase in efficiency. Don't experiment with it until you have mastered operating the stove with the manual damper in the open position.

A barometric damper may be installed to compensate for overpowering drafts (in coal stoves) and creosote reduction (in woodstoves). [See Draft Pressure on page 26] In some states, safety codes require it. Check with your local inspection authorities to make sure.

Third, instructions on a proper chimney: in the case of a factory built chimney, you should only use a properly insulated and approved unit that is installed according to manufacturer's instructions. These instructions include specific limitations as to clearances from walls, ceilings, roof etc. In the case of your masonry chimney, you should have it inspected and cleaned.

It should be in good repair with no cracks or loose bricks. Have it approved for use with solid fuel by your local building inspector or fire marshal. The chimney should not be used as an existing flue for another heater or for an open fire in a fireplace unless specifically authorized by a properly licensed heating contractor and the local authorities. In the case of a fireplace, you should block off the entire space around the flue connector pipe in the upper damper area with a non-burnable material. This pipe should have a vertical rise of 4 feet minimum before it is allowed to exit into the masonry chimney area. This provides a good draft. Under no circumstances should the non-insulated flue connector

pipe go through a wall or ceiling. This pipe may be no closer than 18 inches from any combustible material.

Whether using an approved factory built chimney or an approved existing masonry chimney, a proper installation prevails over mistakes, disappointment and accidents.

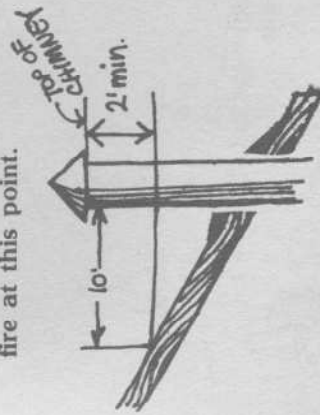
We do not wish to take the place of your own contractor or your own common sense, but we do wish to offer the following 10 rules of masonry chimney basics:

1. A safe masonry chimney must be lined. Suitable liners are clay tile, single wall stainless and poured refractory. Clay tile is preferred for straight chimneys that have interior dimensions allowing retrofit. Rigid and flexible stainless steel are appropriate for chimneys that have changes of direction. Both offer an easily cleaned hard surface and both do a good job of protecting the masonry from harmful byproducts of solid fuel exhaust. Poured refractory offers this and the additional benefit of insulation in the mix. A warmer chimney collects deposits at a slower rate. Being poured, it also can repair mortar joints that have failed, especially in masonry chimneys over 50 years old.
2. The chimney must not be used to support any part of the structure, otherwise, a settling or shifting of the house will crack the chimney. There

5. A chimney must extend above the roof.
6. Your chimney must have a metal cleanout door at the bottom. You need this to remove the soot loosened after

should be 2 inches of free clearance around the chimney. This keeps excess heat from igniting combustibles.

3. A chimney used for solid fuel heat should be built from the ground up. A chimney supported by brackets can be easily damaged by a chimney fire and a house fire may result. A shifting or sagging of the bracket will cause the chimney to crack.
4. If your chimney has more than one smokepipe inlet, cover these with a piece of clay tile liner and fill up the inlet with masonry material equal to the chimney thickness. Thin metal snap-in covers are not safe. The initial explosion of a chimney fire often blows such a cover out of the chimney. This opening would then provide oxygen for the chimney fire. You can no longer control it and many times the house catches fire at this point.



a chimney cleaning. Otherwise, the chimney will eventually fill with soot and plug the smokepipe resulting in a houseful of smoke. The cleanout door is really handy for inspecting the inside of the chimney. You do not have to stand on your head — just use a mirror to see inside.

7. Another reminder is to check the inside of the flue with a mirror before the heating season. It is surprising what can happen. On one occasion, a chimney was blocked with a wad of insulation which blew over from a nearby construction project.
8. Vent only one heating device into a chimney. Several things can happen including an automatic furnace failing to ignite and raw fuel is pumped into the chimney. Hot exhaust from a wood fire could then cause an explosion. Fuel oil furnaces and space heaters often fail to function properly, wasting fuel and may cause a house full of smoke. What happens if a chimney fire occurs? You cannot control it because you cannot shut off the draft openings of a gas or fuel oil device. With only a wood space heater vented into the chimney, you can control the chimney fire by shutting off the draft (air supply). Dangerous combustion gases also may be forced into the dwelling.
9. If you plan on building or using an exterior masonry chimney, it should have eight

inches of brick around the flue liner. This thickness is necessary to keep the gases from cooling and forming creosote.

10. Now, for the don'ts. Do not use an old chimney without a proper liner. Do not use a chimney built on brackets. Do not use a chimney with poor mortar. Do not use a chimney built outside the exterior wall of the dwelling made of concrete block for wood heat. This type of chimney is too cold, promotes creosote buildup and has a very high chance of a chimney fire. Also, this type of chimney has a short life. Concrete block can be used for an inside chimney as long as the part above the roof is built of brick or stone. In other words, use a warm chimney surrounded by warm rooms.

This stove is not for mobile homes.

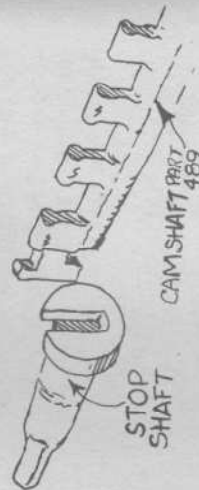
Should you have any question as to proper installation, you are strongly urged to seek specific advice. Too many severe accidents have occurred because of faulty installation. You may consult with the manufacturer and your local stove dealer in addition to the building inspector and fire marshal in your home town or state government. 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, HS-10-1978. The address of the NFPA is Battemarch Park, Quincy, MA 02269.

FULL COAL SYSTEM INSTALLATION INSTRUCTIONS:

The complete coal system is styrofoam packed in two cartons. No tools are needed and installation time is under 15 minutes.

1) Remove stop shaft plug on left rear of stove and insert stop shaft from the inside so that square portion of shaft faces left. The U-shaped channel should be open at the top on the inside.



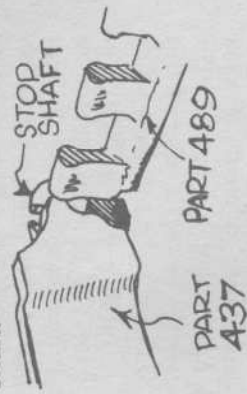
2) Insert the camshaft.



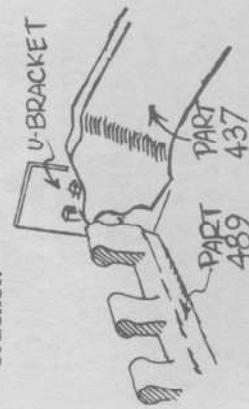
Flat end in stop shaft channel on left

3) The camshaft high-rise and low rise sections correspond exactly with the slotted support bracket already in the stove.

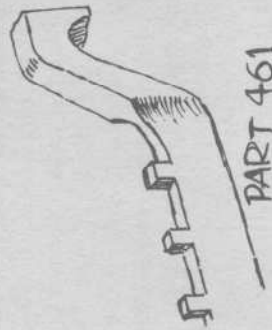
4) There are 21 grate pieces. The 2 end plates sit on extreme left and right sides of the camshaft. The left side end plate touches the end of the stop shaft.



The right side end plate touches the end of the U-bracket.



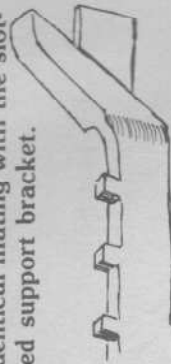
5) There are 10 4-nub pieces that begin and end the alternating array. NOTE: HIGH RISE CAMSHAFT MATING.



NOTE: LOW RISE CAM-SHAFT MATING

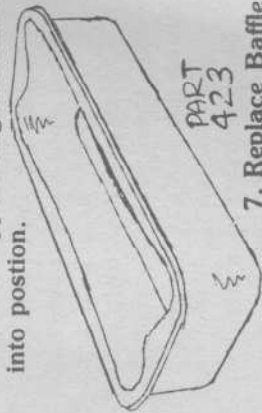


All moving grate pieces have identical mating with the slotted support bracket.



5. Remove exhaust baffle. Slide up, lay flat.

6. Insert the Firepot by using a helper handle that is as long as the inside of the firepot (17 3/4"). Fit the handle under the crescent grips and lift all 47 pounds one end first into the stove. Line up the firepot over the support ring and lower into position.



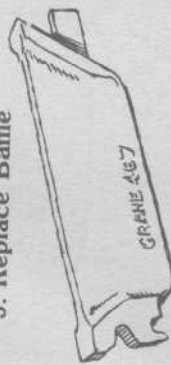
Partial Coal System - Installation of Mini Firepot

1. Repeat steps 1-4
2. Remove two of the 4 nub pieces (3rd from both ends) and replace with mini-pot grate panels. These grate panels reduce secondary air by-pass

- and create a fuel cylinder when the mini-pot is inserted
3. Remove Baffle
 4. Insert Mini-Fire Pot



5. Replace Baffle



SPRUCING UP THE STOVE

Your Model 404 can be adapted to accept a variety of exterior appearance packages. Each package has a mating system corresponding with holes that have been factory installed with knock out studs. These studs must be removed to reveal the hole.

To remove studs from stove wall, strike the exposed stud from the inside of the stove with a confident blow of an ordinary hammer. The front panel studs may require a center punch as your line of sight may be hampered. Once removed, these studs can not be replaced.

INSTALLING INLAID PARQUET SOAPSTONE

Tools required — scissors, hammer, pliers

You are to make an airspace between the unexposed side of the soapstone and the outside of the stove to assure long service life. Take two 1"x1" gasket squares and press over each stud. Gasket material is provided for this.

Once gasketed, the panels are ready to be attached to the stove. Line the threaded pins up with the holes and slip all four in together. Pressing lightly with the palm of the hand on the exposed face of the soapstone, place the nuts on threads and tighten — finger tight. Using the pliers, tighten each nut only 1/2 turn more.

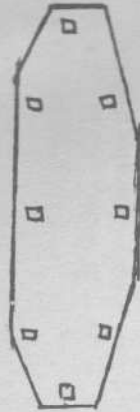
If you can not affix nuts to the lower pair of holes on the front panel, a nut driver will help. These nuts are not critical and you may elect to leave them off.

INSTALLING INLAID SOLID SOAPSTONE

Solid soapstone inlays have holes drilled in them that correspond with the holes in the stove. Take the threaded studs and place them in the holes from inside the stove facing out and secure with nuts. When finished the stove's inlay plates will have 4 rigid pins to mount the soapstone inlays. In this mounting system a second nut will hold the stone secure. This decorative nut is available at any lighting supply store. Ask your dealer for advice. Also, with this mounting system the first nut creates an air space but two gasket washers are still required.

INSTALLING INLAID SOLID CAST ENGRAVING

Tools required — screwdriver
Cast engraved inlays have pre-drilled holes in the mounting bosses on the unexposed side. We recommend fitting the self tapping screw to each hole prior to mounting on the stove. Do this by laying inlay face down and inserting and removing each screw. Then place inlay in correct position on stove and re-insert screws. Again, use a double thickness of gasketing material at each hole location.



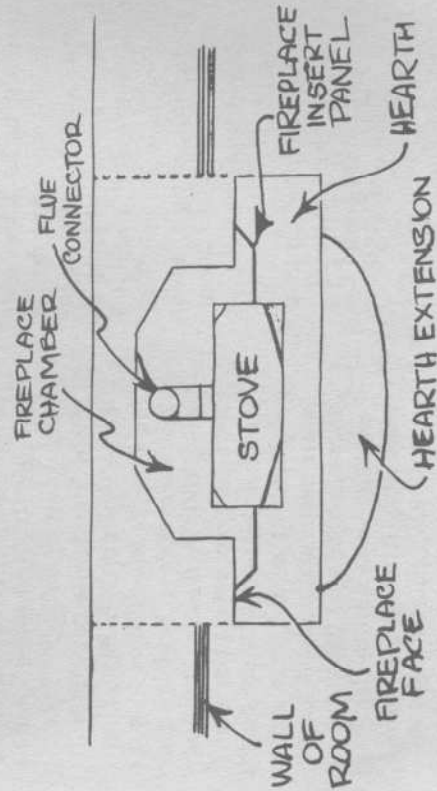
INSTALLING SOAPSTONE TOPS

It is desirable to create an airspace between the underside of the soapstone and the top of the stove. Place gasketing material (provided) on the stove in the positions diagrammed prior to easing the top in position.

INSTALLING FIREPLACE INSERT PANEL

This panel is ready to slide on to a completely installed stove. It has a small service access door on the left and

right hand side. Open these, slide panel until it makes full contact with the fireplace, and close them again. Opening the left access door allows you to shake the stove.



VIEW FROM ABOVE

INSTALLING THE AUTO-SHAKE

The Auto Shake is a motorized articulated arm that is attached to the base plate of the stove and to the stop shaft shaker control. Mounting it to the base plate secures the unit while mounting the arm to the stop shaft creates the drive linkage. A separate spring loaded push button engages the unit and does not require mounting.

OPERATING INSTRUCTIONS

Full Woodstove (No Coal System)

A stove is not a plug-in appliance. Successful operation requires patience and preparation.

After you have properly installed your Crane Stove Model 404 and you have received approval from local authorities, you are ready to begin enjoying the comfort you have been waiting for.

Helpful Tip: The initial firing of any stove produces a miserable odor as fumes from the oil in the stove are driven off. Some people prefer to initially fire a stove outdoors the first few hours. If the initial firing is done indoors, ventilate the room by opening windows and outside exit doors. Keep your conventional heating system on.

Let's light the fire! Open your flue damper, close the ash door and open the round air controls all the way. Take 10 sheets of newspaper and make grapefruit-size balls. Place 9 of these on the bottom of the

stove through the top loading door. Add some light-weight kindling, old shingles, small dry pine branches and the like. Not too much! Being the first fire, you want to heat the glass and painted metal slowly, to cure and bake.

Place one paper ball in the flue collar and light it. This will begin moving the stagnant air up the chimney and establish a draft immediately. This will help prevent smoke from entering the room. Draft is

established when the paper burns rapidly and makes a small roar. Light the paper at the bottom of the stove and close the top door. The paper will burn, igniting the kindling.

Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or freshen up a fire in this heater. Keep all such liquids well away from the heater while it is in use.

Once the kindling is lit add more kindling and 2 or 3 logs no bigger around than your wrist. Once the smaller logs are ignited, add more kindling and a few more logs. Once these logs ignite you have established a fire! Two things need to be looked for: 1) it is not necessary to heat the stove over 400 degrees for the first 24 hours, so adjust the draft controls as necessary to restrict air flow; 2) as the oil in the steel burns off, you will think there is a hole in the stove emitting smoke from the fire, especially from the series of ventilation exhaust holes on the left and right sides. Be patient, it will gradually stop.

There are two kinds of fires to learn how to maintain. One type of fire is employed in not so cold weather. Starting with the fire we have just made, we will maintain it by adding a couple of logs every hour. This fire will chase the chill away and does not require a full fuel load. It is a serious mistake to load the stove completely and starve it for air because it gives you too much heat. Certainly lower heat output is attained just as certainly as large quantities of creosote are produced!

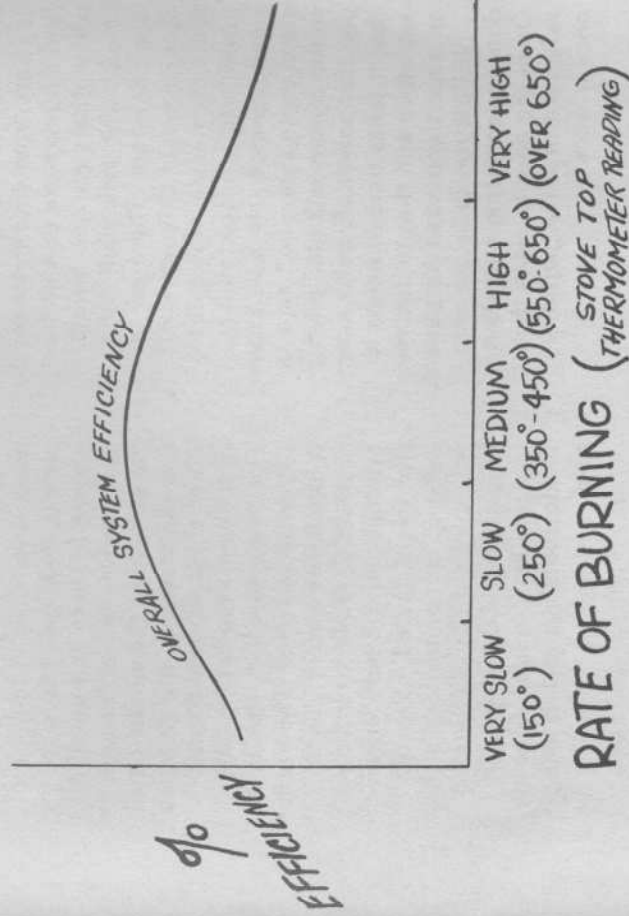
Creosote is the volatile material that can catch fire in the chimney and is to be avoided at all costs. To chase the chill keep a small bright fire

and not a big dull one. Safety first!

Colder weather demands a second type of fire. Fill the stove to capacity (not above bottom of top door) and let it burn at a rate that matches your need for comfort. Refill the stove every 4-6 hours to keep output consistently high.

For the all night burn, when our need for heat is lower, we will close the air controls, on a full load, to keep it burning until we wake up. Our goal is to have enough glowing coals in the morning to avoid re-lighting the stove.

Creosote will form during this overnight burn but it can be easily taken care of. Since every morning finds us longing



for some extra comfort, the first person up should open the air controls and put in some wood. As the hot fire comes to life, the creosote will burn away. At temperatures above 500 degrees on the surface thermometer for one hour or more, all the creosote is gone. Do, however, inspect your chimney once a month to become familiar with accumulation. Excessive amounts can be dangerous and should be removed with a stiff brush. Consult a professional chimney sweep for on sight advice. Once a year cleaning is only a minimum requirement.

Unlike the dial on the wall, stoves are not specific about meeting your comfort requirements. There are many reasons why your experience can vary from your neighbors. Some houses are easy to heat, while others are not. Some wood burns well, while other wood does not. There are as many types of chimneys as there are people. It is entirely possible to produce reliable, steady comfortable heat from a stove as anyone who has done so for 2 years will gladly tell you. Be patient. Experts agree that it takes time to adjust to any stove and that to become an expert you must be patient. NEVER run the stove with doors open during operation. Open the door to clean the ashes out of stove, perhaps once a week.

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning wood fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire. The chimney connector and chimney should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire. A similar explanation is that creosote can be the result of the incomplete combustion of wood. When combustion is not complete or when wood doesn't burn completely, unburned gases are given off. These unburned gases will be drawn through the stove into the smoke pipe and exhausted up the chimney. When these unburned gases cool down, creosote results. The colder they get, the harder the creosote forms. The harder it forms, the harder it is to remove. Creosote is still combustible and will burn uncontrollably if ignited. Creosote build-up can be avoided or kept to a minimum by: 1) burning only seasoned dry wood, 2) maintaining hot fires, 3) using inside chimneys and 4) using coal.

In the event that you should experience an uncontrolled or runaway fire in the stove, smoke pipe (flue connector pipe), or chimney, do the following immediately:

1. Close all doors, dampers, air controls, etc., on the stove. This will starve the fire of air and cause it to die down.
2. If there is a manual damper in the stove pipe (flue connector pipe), start closing it down slowly.
3. Call your local fire department.
4. If the fire is brought under control without any serious damage done to the building, and the stove appears to be operational, check it over thoroughly before putting it back into service.

5. Carefully examine the stove, dampers, controls, smoke pipe (flue connector pipe), and chimney from top to bottom. By following these basic steps you bring the fire under control. The time it takes to bring it under control depends upon the amount of fuel in the stove and the rate it is burning at the time it is detected. Smoke detectors and fire extinguishers are an absolute must and should be a standard part of any heating system.

COAL SYSTEM - WOOD OPERATION

Early and late season coal users have a need to chase the chill from their homes with the

spot heat bursts a modest wood fire can provide. Since this is also the foundation for full coal operation, let's begin by starting this type of fire.

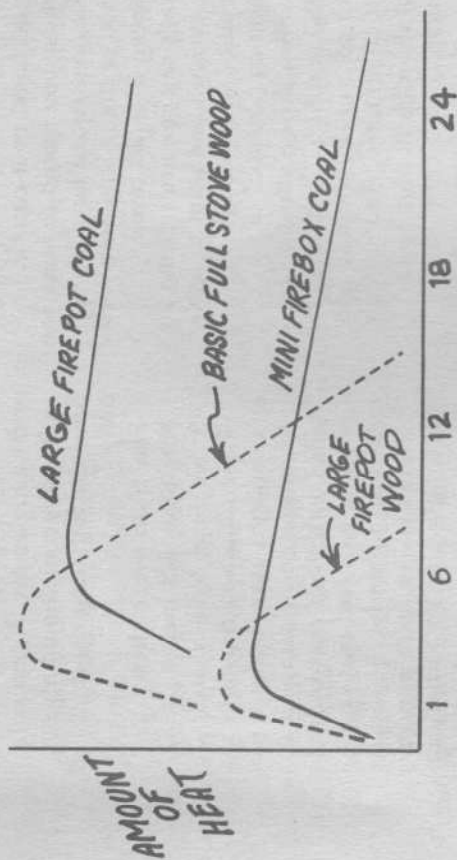
Crumple 6 sheets of newspaper into grapefruit size balls. Place 5 of them on top of the shaker grates and one in the flue collar. Place kindling on top of the newspaper. Light the paper ball in the flue collar to create a draft. Light the rest of the newspaper and shut the top level loading door. Make sure the draft controls on the bottom level service door are open all the way.

Our goal is to heat the entire exhaust path with a modest fire. This secures and stabilizes the draft. Once the kindling is fully involved, add more kindling and 3 or 4 small logs. Once the logs are fully involved, add a little more kindling and 2 or 3 more logs. Set the draft controls on the bottom level service door to maintain a stove top temperature reading of 500 degrees.

To maintain this fire and this output level, add logs every hour or so. If your demand for heat is short term, stop adding wood 4-6 hours before you expect your demand to cease. If your demand for heat increases, you may add more wood and more air, or, you may switch to burning coal.

COAL OPERATION

The hot coals from an established wood fire are the ideal beginnings of successful



4 WAY SOLID FUEL PERFORMANCE

coal burning. Add 10 lbs. of coal, enough to provide a layer 2" deep on a base of hot wood coals. Open draft controls all the way and wait 10 minutes. When the coal is glowing red, add 10 lbs. more coal. Wait 10 minutes. When the second 10 lbs. is glowing red, add 20 lbs. more coal. Never add more coal than is already burning! Wait 10 minutes. When the last 20 lbs. is fully involved, a nice blue flame dances vigorously across the fuel bed.

Close down the draft controls one at a time. Close one completely and re-open one full turn. Close the other completely and re-open one full turn. This gradually reduces output to a level of performance that combines comfortable output over a long time. At this level of performance, expect the

stove to maintain a stove top temperature reading of 550-650 degrees for 12 hours. If the temperature reading is above 650 degrees, close the draft controls $\frac{1}{4}$ turn each to bring this temperature to bear. It may take 2 hours to reach this point. Be patient.

If you should notice the firepot beginning to glow red, this is an indication that the stove is operating in excess of its nominal output. Again, close the draft controls to bring the temperature down to an appropriate level of 550-650 degrees. Continually operating the stove at extreme temperatures can damage the stove and affect your warranty privileges.

There comes a time when you will want to refuel the stove. This can be as the out-

put declines, or it can be because you intend to leave the stove unattended for a longer period of time. This time varies between 8 to 20 hours.

Let's say you are retiring for the evening and want to leave the stove with enough operating potential to re-

establish the combustion cycle in the morning. First, open the draft controls all the way and wait 10 minutes. Add enough coal through the top level loading door equal to the amount already burning. Close the door. Wait 10 minutes. Shake vigorously for 30 seconds.

Open the bottom level service door and inspect the underside of the grate system with a small mirror. There should be an even brightness — dark areas indicate ash residue. Continue shaking until this residue is gone. Close the door. Top off the fuel bed, reset the draft controls and the stove is set for the night.

It is a common misconception to think that adding more coal will produce more heat as is the case with wood in a fireplace. This is not true because coal responds slowly to change. An addition of coal reduces heat output for 15 minutes.

Any coal stove should be filled to a specific depth of coal. If the depth is shallow, it will not sustain itself. Too deep and it will form clinkers and pockets

and be inefficient. American anthracite coal should always have the following depth of fuel bed:

Pea Size: 4-6 inches

Nut Size: 6-9 inches

Stove Size: 9-15 inches

When adjusting the stove for an overnight burn, make sure it is shaken down completely, loaded with fresh coal with the fire going well and that it is closed up properly.

It's really easy with patience and a little practice to become an expert with your installation. As a matter of fact, as the weeks go on, you will be amazed at how easy it is to maintain a slow, clean, even heat with coal.

There is a nice and easy routine used once in the morning and once in the evening. Just follow these instructions for flawless operation:

1. Open bottom air controls all the way (for increased draft you open the bottom level service door, but only for this process.)
2. Wait 10 minutes. This allows a good draft to develop.
3. Open top level loading door and add one fourth the amount of coal you would use on a daily basis (7-12 lbs.). Close the top door.
4. Wait 10 minutes. This allows the fresh coal to get started in preparation for shaking.

5. Shake vigorously for 30 seconds. Open bottom level service door and inspect underside of shaker grate with small mirror. Additional shaking required if uneven brightness indicates ash buildup.

6. Open top door and add one fourth the daily amount. Close top door.

7. Close bottom door and adjust bottom air controls for a long burn. This is usually one full turn on each draft control.

The exact setting depends on your chimney, fuel quality, outside air temperature, wind velocity and, of course, how warm you want to be. Some people even marvel at the fact that their setting depends on the stars.

On a daily basis, you should remove ash that accumulates in the bottom of the stove. Simply use any standard fireplace shovel and remove the ashes. Should a small amount remain after cleaning, it does not matter at all. Do not allow them to build up more than a two-inch depth. If the ashes are allowed to accumulate near the grate, you are asking for trouble in any stove. This will block air from flowing through the grate. The air flow is what keeps the shaker grate from overheating, cracking or distorting.

Disposed ashes should be placed in a metal container with a tight fitting lid. 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 been thoroughly cooled.

MINI-COAL OPERATION

Once the Mini-Coal system is installed, the procedure is the same as full coal operation with minor differences. Secondary air holes should all be blocked. Kindling pieces need to be smaller. When inspecting the underside of the shaker grates during shaking, the left and right sides will be dark on the outside of the mini-firepot.

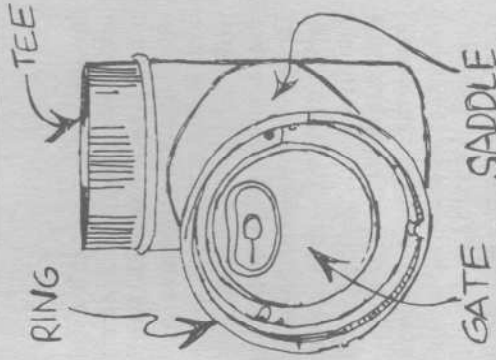
If acquiring smaller kindling is a problem, use 2-3 lbs. of charcoal. Use charcoal already impregnated with starting fluid and NEVER use liquid starter in your stove. Once the charcoal is glowing red, proceed with adding coal.

DRAFT PRESSURE

Draft pressure is the difference in air pressure between the inside and outside of a chimney. Positive draft means an upward and outward flow of air.

Negative draft means a downward and inward flow of air.

All solid fuel appliances require a positive draft for adequate venting of the by-products of combustion. All chimneys exert a natural pull on the appliances



attached to them. Draft pressure is affected by chimney design, temperature (inside and outside the chimney), wind direction and velocity, and atmospheric pressure. People who live in a valley typically have lazy drafts while people living on top of hills have vigorous drafts.

Too little draft or a negative draft and smoke or gases may enter the living environment. Modifying the chimney will solve this. Too much draft can turn the stove red hot and pose a safety threat to you and your family.

The Crane Stove Model 404 operates best in a range of flue collar draft of .03 to .06 (inches of water). If draft pressure consistently exceeds this level, damage to the appliance may result. Under these conditions, the proper installation of a barometric damper (ring and gate) is very helpful.

First, to test the chimney for draft pressure, locate a draft meter. Some dealers have

loaners. Light a fire in the stove. Once a modest fire is established, drill a hole in the flue connector large enough to insert the probe from the meter. Make the proper zero adjustment on the meter prior to inserting the probe. It is best to take the reading over at least a 60 second interval to allow the meter to completely respond to changes in pressure. After you have taken the reading, remove the probe and plug the hole.

Barometric dampers are automatic draft regulators that admit air to the flue connector to compensate for excessive pressure. They are installed in "T" connectors and consist of a ring and gate mechanism. The ring is a frame from which the gate is hinged and is adjustable to provide dead level swing. The gate has a sliding counter weight that will enable you to balance the draft. For a Model 404, it should be adjusted to admit air to the vent at a .07 draft pressure reading. Check this setting with the draft meter. It should not go above .06 if the gate is properly balanced. See your dealer for additional installation advice.

MAINTENANCE AND SPARE PARTS THE BASIC STOVE

The Model 404 is as maintenance free as any stove available. At the end of the heating season, disconnect the stove from the flue connector and vacuum all the ash from the stove. There are two areas

looking new, wipe with a cloth and apply a heat resistant paint. One aerosol can will give satisfactory results.

Inlay soapstone is a soft material and requires less maintenance if left unfinished. Lightly rubbing with fine steel wool removes most scratches. Finished stone, like painted stoves, will require re-application of finish to restore appearance of newness.

The dealer can provide all these maintenance supplies as well as spare parts list. The work itself is provided by the homeowner. Some chimney sweeps offer service contracts for system maintenance that could include labor and parts for stove maintenance if you choose not to do the work yourself.

COAL SYSTEM MAINTENANCE

This includes all the checks described for the basic stove. Additional maintenance includes carefully examining individual grate pieces for distortion. When cast iron changes shape, it is due to excessive heat. Since coal can generate significantly more heat than wood, accidental overfiring can distort an individual grate piece. Fortunately, this coal system has been designed to make replacement simple and inexpensive. Remove any distorted part and replace with a new one to keep the shaking mechanism operating freely.

of maintenance the homeowner should perform — functional and cosmetic. Let's take functional maintenance first.

Rope gasket seals the door and door frame mating. Opening and closing the door constantly tests the resilient nature of the gasket. Some people replace the gasket every spring just as some people change their car's oil every 3,000 miles. Certainly this provides optimum results. If you don't replace gasket every year, do it every other year. Window gasket is under constant compression and is not subjected to the same stress that rope gasket is. However, intense heat from the stove eventually degrades the gasket's resilient nature. Check the glass placement. Rattling or wobbling indicates gasket replacement is required. Gasket maintenance is vital to air control.

Overlooking this owner maintenance can overheat the stove in the next heating season and repairing it then will deprive you of the comfort the stove provides. Also, broken glass must be replaced. Scratched or crazed glass does not leak and replacement is optional.

Cosmetic maintenance is unrelated to stove performance. The finish on the stove is a heat resistant paint. This finish resists flaking, peeling and fading. To keep the stove

TOTAL SYSTEM MAINTENANCE

A complete system maintenance check includes careful examination of the stove, flue connector pipe and chimney.

Flue connector pipe has a service life directly related to the type of steel (galvanized, cold rolled or stainless) and how thick it is (28 gauge, 26 gauge, 24 gauge or 22 gauge) 22 gauge stainless flue connector has the longest service life, lasting in some cases indefinitely.

Typical installations have 24 gauge black pipe and are considered to have a medium duty service life, 26 gauge or 28 gauge galvanized or black pipe are generally unacceptable as they can wear out quickly enough to warrant replacement before a single season passes! Since most people check their pipe once a year, they may not see the perforations that can allow the flame path to escape, creating a fire hazard.

Perforations occur in two places more frequently than any other: 1) where the pipe sections connect to each other and overlaps. The part not seen, perforates and dangerously weakens the joint; 2) whenever the flame path changes directions — at elbows and tees.

Detach every piece and wire brush it thoroughly to locate excessive wear. Press firmly

with thumb any suspicious area. If brittle, your thumb will puncture it completely. Discard section and replace with a new piece.

Heavy gauge pipe is typically twice as expensive and lasts twice as long as medium gauge pipe. What you are buying is a greatly increased margin of safety and greatly reduced reinstallation time. In any case; if burning coal, buy the most durable pipe available as coal burning is even more corrosive than wood burning.

Chimney maintenance is a task many people prefer to entrust to professionals. Very tall chimneys, very steep roofs, the expense of professional quality tools are three reasons that come to mind that reflect this attitude. Cleaning chimneys is not a simple, clean, straight forward task.

Inspecting chimneys is a simpler matter. Today's codes require cleanout and inspection ports that give the home owner access to the chimney close to the base. Using a small mirror and a flashlight will enable you to get some idea of the quantity and quality of the deposits inside the chimney. It is important to be familiar with these deposits as they tell you when to clean or have cleaned the chimney.

If in doubt about what you see, call a professional chimney sweep to analyze and

fuel needs, nor should you. No, it is not as simple to heat with solid fuel as it is to write out a check for a monthly utility bill.

WHAT NEXT?

Reading an operations manual is like getting married. You are being told what to do and that it is good for you, but you know only time will tell. Knowledge forestalls disappointment.

A common complaint for stove owners is low heat output. All this money invested and you can't boil water! Ideally, any stove will operate to its nominal output if a temperature reading measured by a surface thermometer (top rear center of stove) falls between 550-650 degrees F. Low heat output indicates a fuel deficiency for woodstoves and a draft deficiency for coal stoves. If you burn wood, try drier wood. If you burn coal, boost the primary air supply by opening the bottom door.

CAUTION: Do Not Use This As A Permanent Solution. Only To Identify The Problem. If performance improves, what you need to do for a permanent solution is to modify the draft characteristics of the chimney. Options include making it taller (increases draft), lining it (reduces turbulence), and installing an electric draft inducer in the flue connector. The last method is the easiest to do, the least expensive and guaranteed to work.

evaluate the deposits with you. There is no substitute for being well informed regarding this important safety matter.

Your dealer may also be able to assist you. He will have books and most tools available for purchase if you choose to do the work. He will probably know the reputations of area chimney sweeps and can make recommendations if you don't want to do the work.

Maintenance items and spare parts are usually in stock and available from your local dealer. We highly suggest that you purchase them before they are needed. However, when necessary, they may be ordered from the factory, subject to a \$20.00 minimum charge and a 6 week delivery.

THE DIAL ON THE WALL VS. SOLID FUEL

The above chart reflects reasonably accurate estimates for prices in effect from Portland, Maine to Harrisburg, PA for 1982/1983. This is to act as a guide in helping to determine the cost effectiveness of providing supplemental solid fuel support to an existing central heating set up.

There are many ways to interpret any list of statistics. Bias abounds. Yes, you can save money with solid fuel. Yes, you will be warmer in the main living area of your home. No, you probably won't eliminate 100% conventional

	Conventional Fuel Central Heating			Solid Fuel Stove Heating	
	Electricity	Oil	Gas	Wood	Coal
Raw BTU in the Fuel	3413/ KWH	140,000/ Gal.	1000/ Cu. Ft.	6,000/ lb.	13,000/ lb.
Loss due to Combustion Efficiency	0%	20%	10%	20%	10%
Loss due to Heat Transfer Efficiency	0%	20%	20%	5%	4%
Loss Due to Impurity of Fuel	0%	4%	2%	35%	10%
Total Loss	0%	44%	32%	60%	24%
Net BTU Available in Living Areas	3413/ KWH	80,000/ Gal.	680/ Cu. Ft.	10 Million Per Cord	20 Million Per Ton
Units Needed For One Heating Season Using 50 Million BTU	15,000/ KWH	600/ Gal.	70,000/ Cu. Ft.	5 Cord	2½ Ton
Price Per Unit	10¢/ KWH	\$1.30/ Gal.	1¢/ Cu. Ft.	\$100/ Cord	\$140/ Ton
Heating Cost For One Season	\$1,500	\$800	\$700	\$500	\$350

- Bulk purchasing of fuel reduces your cost
- Heating living areas of home only and not including hot water
- Fuel price will vary with geography and time of year
- Your best buy is wood when it's free!

Monitor system performance with a surface thermometer. A stove gets hot, but how hot is it really? It is the least expensive way to get answers to performance questions. Buy a thermometer when you buy the stove and eliminate guesswork.

A common complaint for coal stove users is gradually declining output. Four days after starting the fire the heat output becomes unacceptable. What went wrong? Typically, the operator has not adequately shaken the stove down. The secret to keeping heat output consistent is to recreate the environment of the first fire or — ash free. When you feel you have shaken the stove enough, open the bottom service door and inspect the bottom of the shaker system. Using a mirror avoids standing on your head.

Uneven areas of brightness indicate excess ash blocking the air supply and displacing fuel. Continue shaking until all dark areas disappear.

Finally, getting the correct size stove means that once you get it working at rated capacity, you will neither overheat or underheat your home. If the temperature on the top of the stove is 650 degrees, pushing it beyond that point to keep the house comfortable is probably not as desirable as getting a larger stove. People mostly buy too big a stove and aside from wasting their money, are continually frustrated by the inability to control their comfort. Be honest in your assessment of how much of your house you want to heat. Work carefully with your dealer and listen to his advice. You can have your cake and eat it too!

A QUIZ FOR YOU

Take a few minutes out of your busy schedule and have a little fun with this quiz. Although it is quite serious and straight-forward, just relax in the comfort of your own home and take as long as you want. Over the years, it has been the careful and knowledgeable consumers that have a Crane.

1. When you install a stove, what is the first item you should buy?

- A. smoke detector
- B. fire extinguisher
- C. gas sniffer

A smoke detector is inexpensive and prevents loss of life. A fire extinguisher, although very good, requires you to be awake. Reliable gas sniffers are over \$1,000. The correct answer is A, although B is OK.

2. What is a good way to crack the glass when the stove is heating?

- A. throw a rock at it
- B. a squirt gun full of ice water
- C. shut the cold door swiftly on a hot fire
- D. all of the above

Best answer is D, although A, B and C are OK.

3. Coal burning produces soot in the chimney. Wood burning causes creosote. This creosote may cause:

- A. dirty glass and an odor
- B. chimney fires and a smokey burn
- C. dirty glass and chimney fires

Correct answer is C.

4. For a fireplace installation of a stove, where is it important to seal for safety:

- A. the upper damper area of the fireplace
- B. the entire opening face of the fireplace

Very important. A is the correct answer. Only sealing the face will cause a very poor draft. This is why an insert unit for coal burning can be dangerous and may become illegal.

5. The glass in a stove gets dirty with:

- A. coal burning
- B. wood burning

Correct answer is B.

6. Locating a heater in the main living floor is better because:

- A. much less fuel is used
- B. tending to the stove is much more handy
- C. you are warmer where you spend most of your waking hours
- D. cooking is much more convenient

E. no longer can the average homeowner afford the luxury of heating the basement

*F. all of the above.
Best answer is F, but A, B, C, D and E are OK.*

7. Using any stove on the market with a blower, when you use the same amount of fuel, approximately how much more heat will you get with the blower system turned on?

- A. an additional 30%
- B. an additional 20%
- C. an additional 10%
- D. the same

A blower will move air, and may even cause more fuel to be used, but a blower produces no more heat. Correct answer is D.

8. When you purchase a new stove, why does it matter where you buy it?

- A. the store may not be a Factory Authorized Dealer. You would not want to buy a new Ford from a Chevy dealer!
- B. the store may be 200 miles away from your home and that store will sell it cheap because they know they will not see you again
- C. the store might not know if the stove works well and therefore can't really help you
- D. all of the above

Best answer is D, but A, B and C are OK. When you buy a stove, you are also buying the company that locally services you. Be careful with your razorblade and pantyhose purchases. Be cautious with your family's safety and your heating dollars!

9. You might want to initially fire a new stove outside. Why?

- A. to see if it cracks
- B. to kill the Taiwan insects
- C. to burn off the smelly oil

Correct answer is C, but there is a tiny bit of truth to A & B.

10. If a coal fire is on the verge of going out, what do you do?

- A. shake lightly
B. open bottom draft all the way
C. fill the firebox with small fresh coal pieces
D. mix the coals together with a poker

Correct answer is B, because in all cases, the first thing to do is open bottom draft.

11. Which is correct?

- A. shake, then add coal
B. add coal, then open bottom air control
C. open bottom air control, then shake
D. open bottom air control, then add coal

Correct answer is D.

12. When loading coal, never add more than

- A. one half as much as already burning
B. same amount as already burning
C. twice as much as already burning

Correct answer is B.

13. What is the advantage of cast iron over steel?

- A. heat radiation is better
B. attractive relief designs
C. holds up longer

Cast iron holds heat very well, which is advantageous when a stove is used only a few hours a day. With 24 hour per day operation, you don't want heat to be held in the stove, you want it to be radiated into the room. With a lining, both cast iron and steel hold up excellently, as a matter of fact, steel will not chip or crack, so maybe steel is considered to hold up longer. Correct answer is B.

14. It's very important to have separately opening doors, both above the firebox, and another door below the firebox. There are times when you need one door open and one door closed for easy operation.

- A. true
B. false

True, as a matter of fact, when you find a stove with only side by side doors or only one door opening you know it was really a wood stove.

15. Nut size quality anthracite coal requires a sustained burning depth range of:

- A. 3 - 4 inches
B. 4 - 6 inches
C. 6 - 9 inches
D. 9 - 15 inches

Correct answer is C, now you know why some of your neighbors can't burn coal in their brand of stove.

16. For your maximum profit, a stove should be properly sized so that it meets how much of your heating need?

- A. 40%-just to take the chill of
B. 75%-just so your central heater can kick in on occasions like extra cold days or heat hot water or take over when you're away a few days.
C. 100%-so the maximum savings are realized

Correct answer is B, but this can be argued, so A and C or OK.

17. Winter time home heating cost is more expensive than domestic hot water cost. How much more?

- A. heating is just a little more
B. heating is twice as expensive
C. heating is four times as expensive
D. heating is six times as expensive

Correct answer is D. This surprises most people who spend an extra \$1,000 to get a heater with a hot water coil, only to save a little extra.

18. One ton of coal will provide your family with the warmth of

- A. 1 cord of wood

- B. 2 cords of wood
C. 3 cords of wood
D. 2 politicians

Most wood books claim that 1 ton equals 1.1 cords of wood, but they never go on to explain the following: A. The consumer doesn't get a cord when they buy a cord because of all the space between the bags. B. The average consumer uses wood with a moisture content of 40%-50%, not kiln dried 20%, and certainly not 0%. C. A coal stove is 15% more efficient than a wood stove. When all is said and done, correct answer is B, even though some coal dealers would say C, and some wood dealers would say A.

19. Using a high quality wood stove, the average well insulated six room home will use how many cords of wood for one heating season?

- A. 1 - 3 cords
B. 4 - 6 cords
C. 7 - 9 cords

Correct answer is B.

20. Using a high quality coal stove, this same home will use how many tons of coal?

- A. 1 ton
B. 2 tons
C. 3 tons
D. 4 tons

Correct answer is B.

21. Five full cords of wood requires 640 cubic feet of solid wood (128 each). This is about the size of a large bathroom. If this bathroom was full of anthracite coal, how long would it heat an average six room home?

- A. one year
B. three years
C. over 5 years

Correct answer is C.

22. All anthracite coal is about the same?

- A. true
B. false

- C. depends on the moisture content

Correct answer is B. Moisture content is not a factor with anthracite.

23. If you keep wood and coal outside, under cover for several years, which fuel will go bad first?

- A. coal
B. wood

Correct answer is B.

24. Which energy is the most polluting?

- A. oil
B. coal
C. wood
D. nuclear

E. depends on where you live
Wow, here is a debatable subject. Nuclear might be the most polluting if you live at TMI or at a radioactive waste dump. How about an oil pond in your backyard in Oklahoma or a tanker going aground next to your sandy beach cottage on Cape Cod. How about living next to a bituminous coal fired power plant without scrubbers. Have you ever enjoyed the odor of a pulp and paper mill. Correct answer is E, but A, B, C & D are understandable.

25. What is coal ash used for?

- A. vegetable and flower gardens
B. pet rocks and fake moon rocks
C. icy walkways and land fill
D. mixed with water for tar and feathering

Correct answer is C.

26. Lower percent ash content coal is better because:

- A. higher BTU per pound
B. the stove gives a longer burn time
C. the coal is less expensive

Correct answer is B.

27. European anthracite coal has an ash content of:

- A. 2% - 3%
B. 3% - 7%

- C. 7% - 14%
D. 14% - 18%

Correct answer is B. This is why most European type stoves have a difficult time with American coal.

28. American anthracite coal has an ash content of:

- A. 2% - 3%
B. 3% - 7%
C. 7% - 14%
D. 14% - 18%

Correct answer is C.

Give yourself one point for every correct answer. If your total score is:

TOTAL

- 21% - 28% You should have a Crane.
14% - 20% Please do a little more homework.
7% - 13% Seek professional advice.
0% - 6% Stick with the dial on the wall.

SUGGESTED RESULT



CAUTION

- HOT WHILE IN OPERATION.
- DO NOT TOUCH. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY.
- CONTACT MAY CAUSE SKIN BURNS.
- SEE NAMEPLATE AND INSTRUCTIONS.

CAUTION

KEEP ASH DOOR CLOSED
DURING FIRING OF THE HEATER
TO AVOID DEVELOPING
EXCESSIVE TEMPERATURES.

WARRANTY

The Crane Stove Model 404 is manufactured using the finest materials and workmanship. The factory will repair or replace, at factory option, any defect in workmanship or materials during the original purchaser's first 15 years of ownership. Excluded from this warranty are cast iron items. Also excluded are items considered to be spare parts or optional accessories — for example; glass, gasketing, paint, wooden handles, blowers, soapstone and other decorative

panels. The purchaser is requested to send in the warranty card to the factory within 30 days of purchase. Failure to comply may void the warranty. Should the purchaser feel that a defect has occurred, factory notification should be made before shipping the stove. The factory will review such notification and authorize the purchaser as to the best handling. Shipping charges to be paid by purchaser. This warranty is void if the stove is modified or used improperly.

CUT ALONG HERE AND SEND TO FACTORY

NAME _____

STREET _____

CITY _____ STATE _____ ZIP _____

WHERE PURCHASED _____ DATE _____

BRIEF REASONS FOR SELECTING THE CRANE OVER OTHER STOVES _____

SERIAL NUMBER _____

CRANE STOVE WORKS INC., BOX 440, BRAINTREE, MA 02184