CIRCULAR SERIES
INDEX NUMBER G3.5

FUELS AND BURNERS
FOR DOMESTIC HEATING

SOLID LIQUID GAS

ISSUED BY THE SMALL HOMES COUNCIL

UNIVERSITY OF ILLINOIS BULLETIN

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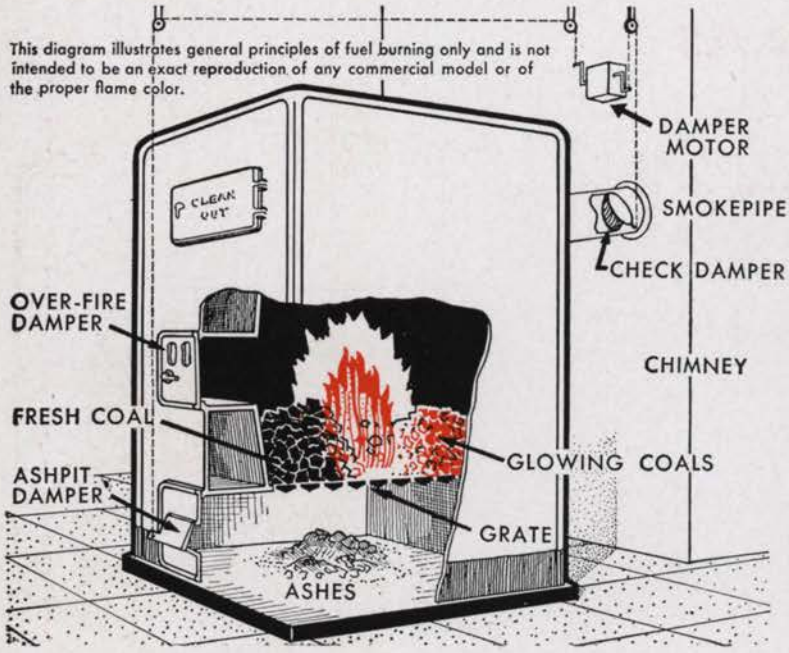
This Circular (G3.5) is one of a series on Small Homes. Requests for Circulars should be addressed to Small Homes Council, Mumford House, University of Illinois, Urbana.

FUELS AND BURNERS
SMALL HOMES COUNCIL G3.5

HAND-FIRED COAL OR COKE



HOW THEY BURN . . .

Coal and coke are burned on top of a **grate**. The air necessary for burning enters the **ashpit damper** and rises through openings in the grate. The intensity of the fire varies with the amount of this air. Additional air, entering above the fire through the **overfire damper**, is necessary to complete the burning of gases released from the fuel. These hot gases then pass through the furnace or boiler into the smoke pipe and chimney.

The chimney must furnish enough draft to cause the air to flow through the fuel bed, and to remove the burned gases. The **check damper** in the smoke pipe controls the draft, and, together with the ashpit damper, regulates the amount of air passing through the fuel bed. Thus these two dampers control the rate of burning.

PROPER HAND-FIRING IS EASY . . .

- Use coal which is properly sized (egg, nut, or stove size — about 2 or 3 inches in diameter) and treated for the elimination of dust. If the coal is dusty, spray it lightly with water.
- Do not disturb partly burned soft coal any more than necessary. If you do, smoke will be released and may come out of the firing door.
- When firing, follow these steps: (1) Shake the grates lightly, and only until a faint glow appears in the ashpit. (2) Use an **all-metal hoe** to move glowing coals to one side before adding fresh coal.* (3) Place fresh coal at the side of the live coals. (4) If a flame does not start immediately after firing, use crumpled papers to start a blaze. (5) If the blaze does not continue freely when the firing door is closed, leave it open about ¼ inch until the flame is well established. ***Failure to establish a flame after firing coal is likely to cause a minor explosion.*** (6) Leave the overfire damper open just enough to avoid "puffing" when the flame has been established and the door is closed.
- Maintain a thick fuel bed (particularly with anthracite and coke). In mild weather, keep only a small fire in the center of the firepot, leaving ashes around the edges. When banking the fire open the check damper and see that the ashpit door and ashpit damper are tightly closed. Coke requires very little draft, and careful draft control is essential to prevent overheating.
- Placing ashes on top of the fuel bed to bank a fire is not good practice, since clinkers will be formed. Do not burn garbage in the furnace.
- ***To avoid overheating, check the fire before the house is thoroughly warm.*** Some heat will be delivered after the fire has been checked.
- Tend your heating plant regularly; at least once a day in mild weather and four times a day in severe weather. Remove the ashes daily.
- At the night-firing period, wet the ashes in the ashpit so that they will be dustless and in a condition to be handled the following morning. Remove the damp ashes in the morning before shaking the grates.

PROPER PLANNING OF THE HOUSE IS NECESSARY

To keep out dirt, put a weatherstripped door and a doormat between your furnace room and living portion of the house.

Use mineral wool insulating material to plug the space where the heat stacks, soil stacks, and water or gas pipes enter walls and floors.

Proper planning will simplify fuel delivery, firing, and ash removal. The coal bin should be dust-tight, of adequate size, and fitted with a tight weatherstripped door.

Note the list of Basic Requirements for any Fuel-Burning Equipment on page four.

AUTOMATIC CONTROLS ARE RECOMMENDED . . .

Automatic controls to open and close the dampers in response to the action of a room thermostat should be provided, as well as a limit control to prevent a runaway fire. These controls are designed to maintain a more uniform fire, to promote more efficient use of fuel, to protect the heating plant, and to reduce fire hazards. Controls are available both for new and for existing heating systems.

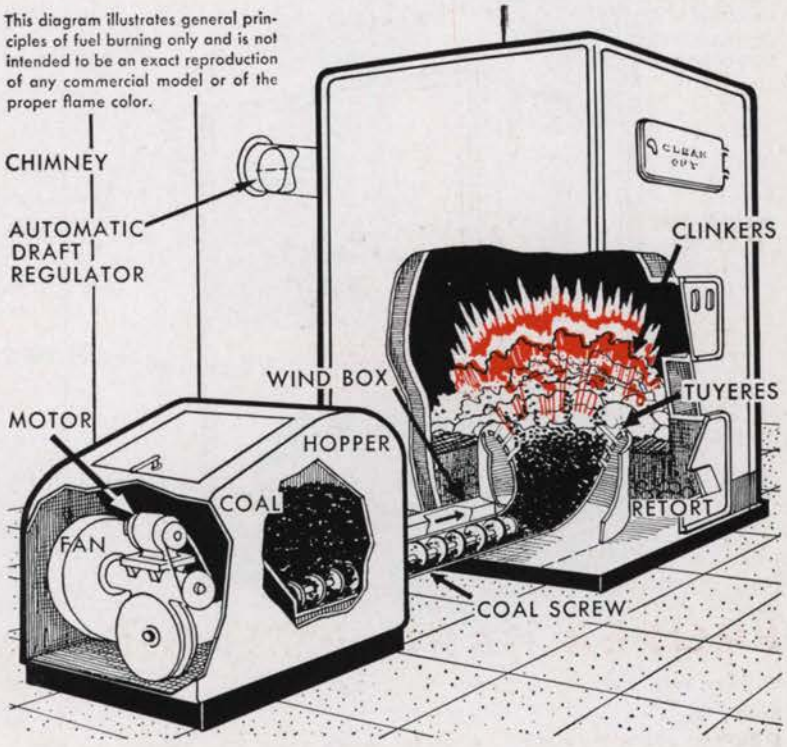
* For more complete details see University of Illinois Engineering Experiment Station Circular No. 46, "Hand-firing of Bituminous Coal."

THE AUTOMATIC COAL STOKER

HOW A STOKER OPERATES . . .

A stoker is designed to feed and burn coal automatically in a furnace or boiler. In the **underfeed stoker** (the most common residential type) a **coal screw** feeds fresh coal from either a **hopper,** or a **storage bin,** into the **retort.** (The bin-feed stoker does away with the handling of coal in the home, and requires careful planning for fuel delivery, storage and burning.) Air necessary for burning is forced by a **fan** through openings in the retort. An electric motor drives both the coal screw and the fan.

The fire is started with kindling, after which it is maintained by a **hold-fire** control which automatically operates the stoker for a few minutes each hour. When a heat demand occurs, the stoker operates in response to a room thermostat. In a **bituminous stoker** the hot fire fuses the ashes into clinkers, which can be removed through the furnace door. In an **anthracite stoker** the ashes are not fused into clinkers, but are pushed to the outside edge of the fuel bed where they fall into the ash pit for removal.



STOKERS REQUIRE REASONABLE CARE . . .

- Use a size and type of coal recommended by the stoker manufacturer or by the installer. Use coal which is treated for the elimination of dust, and which is one inch in diameter or smaller (but avoid coals containing a large number of very small particles). Smaller sizes of coal are less apt to make a crunching noise in the coal screw.
- The hopper should be kept at least half full. Check it at least once a day.
- The adjustments of the coal feed and air supply, as well as the setting of the controls, should be made by a competent service man. In a properly-adjusted stoker the thickness of the fuel bed will be about equal to the diameter of the retort. If the type of coal is changed, readjustments may have to be made by the service man.
- A **bar** is used to locate the clinkers, to loosen them from the fuel bed, and to move them to one side to cool. They may then be removed by means of **clinker tongs.** If there is no room in the firebox to allow the hot gassy clinkers to cool, place them in a metal container with a tight cover.
- Do not disturb the fuel bed any more than necessary. Remove only large-sized clinkers which, in mild weather, may take several days to form. If clinkers are not readily formed and difficulty is experienced in cleaning the fire, reduce the temperature setting of the room thermostat at night, thus prolonging the stoker operation in the morning and producing the hot fires needed to form clinkers.
- At the end of the heating season remove all coal, ash, and clinkers from the system. Clean the stoker, and coat the coal screw and the inside surfaces of the hopper with oil to prevent rust. Have your stoker inspected annually.

PROPER INSTALLATION NECESSARY FOR ANY STOKER

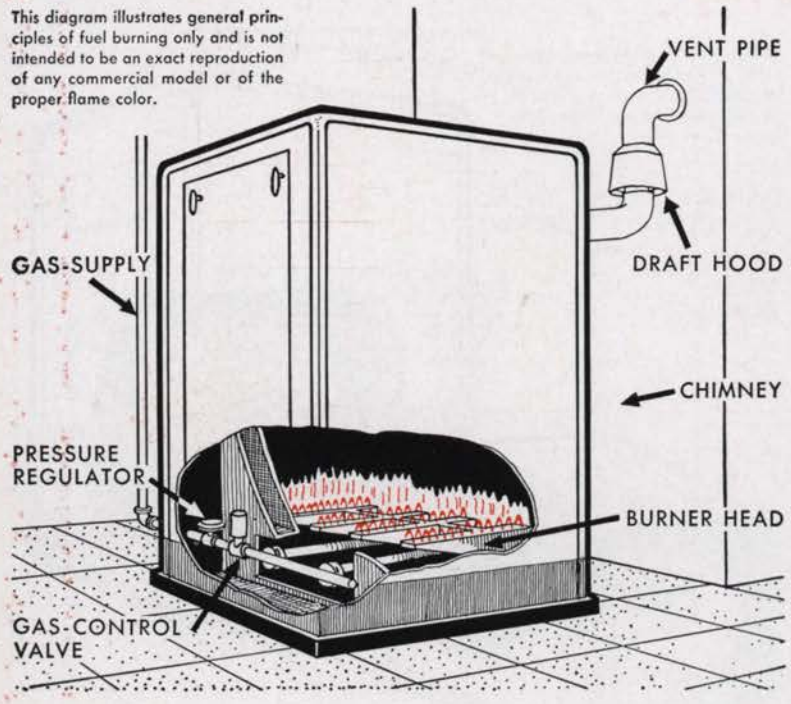
The seal of the Stoker Manufacturer's Association indicates the maximum capacity rating of your stoker in pounds of coal fired per hour.

A furnace or boiler should have long flue passages. Furnaces and boilers having horizontal heating surface may collect fly ash (fine powdery ash) more rapidly than those with vertical surfaces, and therefore may require more frequent cleaning.

The stoker may be installed at the front, side or rear of the furnace or boiler, but room should be provided in front of the unit to clean the fire. The use of an **automatic draft regulator** in the smoke pipe is recommended.

Note the list of Basic Requirements for any Fuel-Burning Equipment on page four.

GAS-FIRED HEATING EQUIPMENT



HOW GAS BURNS . . .

Gas fuel is supplied at low pressure into a **burner head,** where it is mixed with the air required for burning. The combustion forms hot gases which pass through the furnace or boiler into the vent pipe and chimney. The rate at which gas is supplied to the burner is controlled by a **gas-control valve.** The pressure is controlled by an automatic **pressure regulator. A draft hood,** to maintain a constant but small draft, is required in the vent pipe to prevent air currents from coming down the chimney and blowing out the gas flame. It also helps to keep moisture from condensing in the chimney and vent pipe.

In most models, a pilot is lighted at the beginning of the heating season and is maintained continuously. When a heat demand occurs a large gas flow is introduced automatically through the **gas-control valve** and a large fire is obtained. If the pilot is extinguished a safety device shuts off the gas flow.

USE ONLY APPROVED EQUIPMENT . . .

- Gas-burning equipment should bear the approval seal of the American Gas Association. This seal is evidence that the model has been tested in the Association's laboratories for safety, reliability, and efficiency.
- Gas pressure is maintained by a central gas plant, and no storage facilities are necessary inside the building. (In some localities, compressed liquefied gases, delivered in bottled form, are used, the container being installed outside the building.)
- Aside from the operating controls, a gas burner has no moving parts. Gas burners are quiet in operation, and relatively long in service life.
- The initial cost of a furnace or boiler designed for use with gas, together with burner equipment, is relatively low. The cost to the home owner of installing gas pipe from the street mains to the burner depends both upon local utility practice and upon the conditions existing at the home. Consult your utility company for an estimate of piping costs which may be incurred.
- The final adjustment of the gas control valve usually is made by a service man from the gas supply company.
- **Conversion gas burners** can be installed in existing boilers and furnaces. These installations should be made by a competent installer in strict accordance with instructions of the burner manufacturer. **Complete gas-designed furnaces and boilers** usually are more satisfactory than conversion installations.

Following is a list of Basic Requirements for any Fuel-Burning Equipment.

BASIC REQUIREMENTS FOR ANY FUEL-BURNING EQUIPMENT

Competent installation and service is essential for satisfactory operation and long life of equipment. You should see that your dealer is able to provide both.

Better heating will result if the fuel-burning equipment is **properly sized** to the heat demands of your house.

A separate switch with fuses should be installed in the electrical supply to the burner and electrical equipment on the heating system. In case of trouble open this switch and call the service man.

Do not tamper with equipment or controls. Equipment should be inspected and cleaned annually.

The life of mechanical equipment depends largely upon **proper maintenance.** If reasonable care is exercised, the life of the equipment should be at least 12 to 15 years.

The chimney and smoke pipe must be **tightly constructed** *(see Small Homes Council Circular F7.2 —"Chimneys and Fireplaces").*

THREE TYPES OF OIL BURNERS

THE PRESSURE TYPE BURNER

consists of a **pump** and a **nozzle,** which spray the oil into a fine mist, and a **fan** which mixes it with air. This mixture of oil and air is ignited by an electric spark. The burner is not operated continuously, but is turned on or off in accordance with the demand of a room thermostat. The installation of the **refractory firepot** should be made by an experienced installer in accordance with the manufacturer's instructions. This type of burner usually projects outside of the furnace or boiler, making it readily accessible for servicing. Oil as heavy as grade No. 3 may be used.

PRESSURE BURNERS ARE OF TWO TYPES: HIGH PRESSURE AND LOW PRESSURE

THE ROTARY BURNER

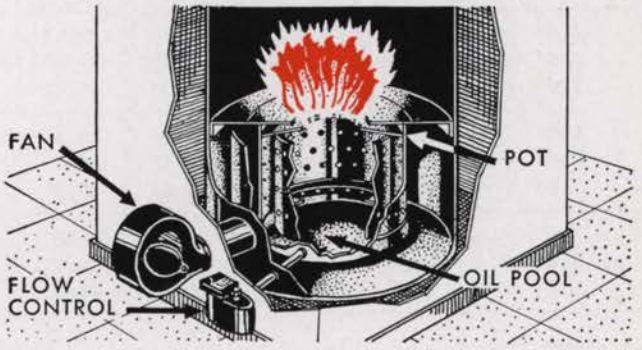
consists of a horizontally spinning **cup** (or a set of **tubes**) which sprays the oil by centrifugal force. The oil spray is further broken up and mixed with air by a **fan** attached to the underside of the spinner. This mixture is ignited by an electric spark. The burner is not operated continuously, but is turned on or off in accordance with the demand of a room thermostat. As the entire unit is located inside of the furnace or boiler, it occupies less floor space, but is not as accessible for servicing as are other types.

ROTARY BURNERS CAN BE USED SUCCESSFULLY WITH LOW OIL FEED RATES

THE VAPORIZING or POT-TYPE BURNER

consists of a **pot** containing a pool of oil and a **control** which regulates the oil flow. Heat from the burning process vaporizes the oil. The air necessary for burning is admitted into the vapor above the oil pool by natural draft or by a very small fan. There are few moving parts, and the burner operates quietly. The fire is started manually with oily waste, after which a low pilot flame keeps the fire alive. When heat is needed, more oil is fed into the pool and a hot flame results. Careful adjustment of both fuel and air is necessary in order to avoid a smoky, sooty flame. The initial cost of this type of burner is low.

THE POT-TYPE BURNER IS QUIET IN OPERATION, BUT REQUIRES CLOSE ADJUSTMENT



These diagrams illustrate general principles of fuel burning only and are not intended to be an exact reproduction of any commercial model or of the proper flame color.

PROPER INSTALLATION IS NECESSARY

Your oil burner should carry the label of the Underwriter's Laboratories. Use oil of the ***grade*** shown on this label.

The adjustment of the oil feed rate and air supply should be made by a competent service man to provide a non-smoky flame without any evidence of soot or odors.

All oil burners (particularly the vaporizing type) require a small but steady draft. This usually is provided by an ***automatic draft regulator*** installed in the vent pipe.

Oil tanks should be installed in accordance with the rules of the National Board of Fire Underwriters. They are commonly located in the basement, above the level of the burner. Such tanks should not exceed 275-gallon capacity and should be 7 feet or more from any flame. Two such tanks, with a total capacity of 550 gallons, are the maximum storage allowed in the basement. For installation requiring more capacity than this, tanks often are buried in the ground. Tanks should be vented to the outside and should have an outside fill-pipe connection.

Have your oil burner inspected and cleaned annually by a reliable service man.

Note the list of Basic Requirements for any Fuel-Burning Equipment on page four of this Circular.

COMPARATIVE COSTS OF HEATING WITH

A GAS	B OIL		C BITUMINOUS COAL (Hand-fired without controls) (See note below[2])								
100,000 B.t.u. per therm	140,000 B.t.u. per gallon		Heating Value in B.t.u. per pound								
	Heating Unit DESIGNED FOR Oil Burning	Heating Unit CONVERTED TO Oil Burning	Low			Medium			High		
COST (cents per therm) (See note below[1])	COST (cents per gallon)		10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000
			COST (dollars per ton)								
3.0	4.2	3.7	4.10	4.35	4.55	4.75	4.95	5.15	5.35	5.55	5.75
3.2	4.5	3.9	4.40	4.60	4.85	5.05	5.30	5.50	5.70	5.95	6.15
3.4	4.7	4.2	4.65	4.90	5.15	5.35	5.60	5.85	6.10	6.30	6.55
3.6	5.0	4.4	4.95	5.20	5.45	5.70	5.95	6.20	6.45	6.70	6.95
3.8	5.3	4.7	5.20	5.50	5.75	6.00	6.25	6.55	6.80	7.05	7.30
4.0	5.6	4.9	5.50	5.80	6.05	6.30	6.60	6.90	7.15	7.45	7.70
4.2	5.9	5.1	5.75	6.05	6.35	6.65	6.95	7.20	7.50	7.80	8.10
4.4	6.1	5.4	6.05	6.35	6.65	6.95	7.25	7.55	7.85	8.15	8.45
4.6	6.4	5.6	6.30	6.65	6.95	7.25	7.60	7.90	8.20	8.55	8.85
4.8	6.7	5.9	6.60	6.95	7.25	7.60	7.90	8.25	8.60	8.90	9.25
5.0	7.0	6.1	6.90	7.20	7.55	7.90	8.25	8.60	8.95	9.30	9.60
5.2	7.3	6.4	7.15	7.50	7.85	8.20	8.60	8.95	9.30	9.65	10.00
5.4	7.5	6.6	7.45	7.80	8.15	8.55	8.90	9.30	9.65	10.00	10.40
5.6	7.8	6.9	7.70	8.10	8.45	8.85	9.25	9.60	10.00	10.40	10.80
5.8	8.1	7.1	8.00	8.40	8.75	9.15	9.55	9.95	10.35	10.75	11.15
6.0	8.4	7.3	8.25	8.65	9.05	9.50	9.90	10.30	10.75	11.15	11.55
6.2	8.7	7.6	8.55	8.95	9.40	9.80	10.25	10.65	11.10	11.50	11.95
6.4	8.9	7.8	8.80	9.25	9.70	10.10	10.55	11.00	11.45	11.90	12.30
6.6	9.2	8.1	9.10	9.55	10.00	10.45	10.90	11.35	11.80	12.25	12.70
6.8	9.5	8.3	9.35	9.80	10.30	10.75	11.20	11.70	12.15	12.60	13.10
7.0	9.8	8.6	9.65	10.10	10.60	11.05	11.55	12.05	12.50	13.00	13.45
7.2	10.1	8.8	9.90	10.40	10.90	11.40	11.90	12.35	12.90	13.35	13.85
7.4	10.3	9.1	10.15	10.70	11.20	11.70	12.20	12.70	13.25	13.75	14.25
7.6	10.6	9.3	10.45	10.95	11.50	12.00	12.55	13.05	13.60	14.10	14.65
7.8	10.9	9.6	10.70	11.25	11.80	12.35	12.85	13.40	13.95	14.45	15.00
8.0	11.2	9.8	11.00	11.55	12.10	12.65	13.20	13.75	14.30	14.85	15.40
8.2	11.5	10.0	11.30	11.85	12.40	12.95	13.55	14.10	14.65	15.20	15.80

[1] NOTE: To find your local Gas cost in cents per therm, divide local market price in cents per 1000 cubic feet (your local gas company can give you the figure that applies in your case) by the number of therms in 1000 cubic feet (see below).

TYPE OF GAS	Manufactured			Mixed		Natural	
Average B.t.u. per cu. ft.	500	600	700	800	900	1000	1100
Number of therms in 1000 cu. ft.	5.0	6.0	7.0	8.0	9.0	10.0	11.0

[2] NOTE: Heating value in B.t.u. per pound for a given Coal or Coke may be obtained from your fuel dealer. All heating values of Coal are based on commercial conditions with normal moisture.

* NOTE: Comparisons in the Table are based on the assumption that the fuels are burned in the same building and in the same heating system; reasonably well operated and properly adapted to the fuel in use. The costs shown for each type of fuel are based upon average values of the "over-all house efficiency," as determined at the University of Illinois from extensive tests conducted in two research homes where the heaters were located in the basement. "Over-all house efficiency" represents that portion of heat in the fuel which is actually used for heating the ***entire house.*** Such an efficiency may be affected by differences in house construction, living habits, heating plant design, by installation and by operating controls.

VARIOUS FUELS IN THE SAME BUILDING*

D **BITUMINOUS COAL** (Hand-fired with controls) **BITUMINOUS COAL** (Stoker-fired) **ANTHRACITE** (Hand-fired without controls) **COKE** (Hand-fired without controls)									E **ANTHRACITE** (Hand-fired with controls) **ANTHRACITE** (Stoker-fired) **COKE** (Hand-fired with controls)				
Heating Value in B.t.u. per pound									Heating Value in B.t.u. per pound				
Low			Medium			High			Medium		High		
10,000	10,500	11,000	11,500	12,000	12,500	13,000	13,500	14,000	12,000	12,500	13,000	13,500	14,000
COST (dollars per ton)									COST (dollars per ton)				
4.85	5.10	5.35	5.60	5.85	6.10	6.35	6.60	6.80	7.20	7.50	7.80	8.10	8.40
5.20	5.45	5.70	6.00	6.25	6.50	6.75	7.00	7.30	7.70	8.00	8.30	8.65	8.95
5.50	5.80	6.10	6.35	6.65	6.90	7.20	7.45	7.75	8.15	8.50	8.85	9.20	9.55
5.85	6.15	6.45	6.75	7.05	7.30	7.60	7.90	8.20	8.65	9.00	9.35	9.70	10.10
6.15	6.50	6.80	7.10	7.40	7.70	8.05	8.35	8.65	9.15	9.50	9.90	10.25	10.65
6.50	6.85	7.15	7.50	7.80	8.10	8.45	8.80	9.10	9.60	10.00	10.40	10.80	11.20
6.85	7.15	7.50	7.85	8.20	8.55	8.90	9.20	9.55	10.10	10.50	10.90	11.35	11.75
7.15	7.50	7.85	8.25	8.60	8.95	9.30	9.65	10.00	10.55	11.00	11.45	11.90	12.35
7.50	7.85	8.20	8.60	8.95	9.35	9.70	10.10	10.45	11.05	11.50	11.95	12.40	12.90
7.80	8.20	8.60	9.00	9.35	9.75	10.15	10.55	10.90	11.55	12.00	12.50	12.95	13.45
8.10	8.55	8.95	9.35	9.75	10.15	10.55	10.95	11.35	12.00	12.50	13.00	13.50	14.00
8.45	8.90	9.30	9.75	10.15	10.55	11.00	11.40	11.80	12.50	13.00	13.50	14.05	14.55
8.80	9.20	9.65	10.10	10.55	10.95	11.40	11.85	12.30	12.95	13.50	14.05	14.60	15.15
9.10	9.55	10.00	10.45	10.90	11.35	11.85	12.30	12.75	13.45	14.00	14.55	15.10	15.70
9.45	9.90	10.35	10.85	11.30	11.75	12.25	12.75	13.20	13.95	14.50	15.10	15.65	16.25
9.75	10.25	10.75	11.20	11.70	12.20	12.70	13.15	13.65	14.40	15.00	15.60	16.20	16.80
10.10	10.60	11.10	11.60	12.10	12.60	13.10	13.60	14.10	14.90	15.50	16.10	16.75	17.35
10.40	10.90	11.45	11.95	12.50	13.00	13.50	14.05	14.55	15.35	16.00	16.65	17.30	17.95
10.70	11.25	11.80	12.35	12.85	13.40	13.95	14.50	15.00	15.85	16.50	17.15	17.80	18.50
11.05	11.60	12.15	12.70	13.25	13.80	14.35	14.90	15.45	16.35	17.00	17.70	18.35	19.05
11.40	11.95	12.50	13.10	13.65	14.20	14.80	15.35	15.90	16.80	17.50	18.20	18.90	19.60
11.70	12.30	12.85	13.45	14.05	14.60	15.20	15.80	16.40	17.30	18.00	18.70	19.45	20.15
12.05	12.60	13.25	13.85	14.45	15.00	15.65	16.25	16.85	17.75	18.50	19.25	20.00	20.75
12.35	12.95	13.60	14.20	14.80	15.45	16.05	16.70	17.30	18.25	19.00	19.75	20.50	21.30
12.70	13.30	13.95	14.60	15.20	15.85	16.50	17.10	17.75	18.75	19.50	20.30	21.05	21.85
13.00	13.65	14.30	14.95	15.60	16.25	16.90	17.55	18.20	19.20	20.00	20.80	21.60	22.40
13.35	14.00	14.65	15.35	16.00	16.65	17.35	18.00	18.65	19.70	20.50	21.30	22.15	22.95

INSTRUCTIONS FOR USE OF CHART

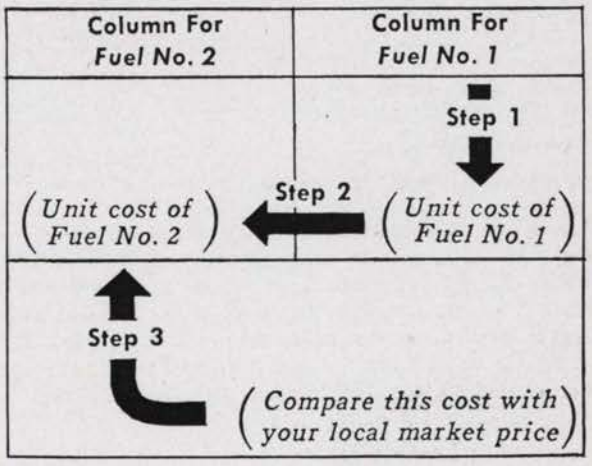
To compare the cost of fuel selected as a base (Fuel No. 1) with another fuel (Fuel No. 2):

Step 1. Locate in the proper vertical column the unit cost prevailing in your locality for Fuel No. 1. (For Gas see Section A; for Oil see Section B; for Solid Fuels see Sections C, D, and E. Note that several firing methods and several heating values are shown for Solid Fuels.)

Step 2. Read across the Table in the same horizontal line to locate in the proper column the comparative unit cost of Fuel No. 2.

Step 3a. If the market price prevailing in your locality for Fuel No. 2 is greater than the cost indicated in **Step 2,** a change to this fuel will increase your total fuel bill.

Step 3b. If the market price prevailing in your locality for Fuel No. 2 is less than the cost found in **Step 2,** a change will lower your fuel bill.



EXAMPLES

(The values shown here serve merely as examples, and are not based on any specific situations.)

COMPARING TWO FUELS . . .

• Each winter our house uses 8 tons of 12,000 B.t.u. **Bituminous Coal,** costing $8.25 per ton, or $66.00 per season. Our furnace is hand-fired, and has no controls. About how much would my fuel bill be if I used **Gas** which costs 6¢ per therm in my locality?

1. Locate your local market price for Coal ($8.25) in proper vertical column under C (12,000 hand-fired bituminous without controls). This is Fuel No. 1.
2. On the same horizontal line find the comparable cost for Gas (5.0¢) in vertical column under A. This is Fuel No. 2.
3. The market price prevailing in your locality for Gas (6¢) is greater than the price indicated in Step 2 (5.0¢). A change to this fuel would increase your total fuel bill.

On chart:

A	C
GAS	COAL
	(12,000)
5.0¢ ←	↓ $8.25

Market price of coal —$8.25 per ton
Comparative cost of gas—5.0¢ per therm
Market price of gas —6.0¢ per therm
•Bill for gas = $66.00 × $\frac{6.0}{5.0}$ or $79.20

COMPARING THREE FUELS . . .

• I am selecting a heating unit for my new house. The cost of **Oil** is 7.5¢ per gallon, the cost of **Gas** is 6¢ per therm, and the cost of a good grade of **Bituminous Stoker Coal,** with a heating value of 12,000 B.t.u. per ton, is $8.40. What would be the comparison between total fuel bills?

1. Select Oil (column B, "Heating Unit Designed for Oil Burning") for a base. Move down column to unit cost of 7.5¢ per gallon.
2. Read across to columns A (Gas) and D (stoker-fired Bituminous Coal @ 12,000 B.t.u.). You will find comparative unit costs to be: Gas — 5.4¢ per therm; Stoker Coal — $10.55 per ton.

3a. Your market price for Gas (6¢) is greater than listed unit cost (5.4¢). In this case, the fuel bill for Gas will be greater than that for Oil.

3b. Your market price for Stoker Coal ($8.40) is less than listed unit cost of $10.55. In this case, use of Stoker Coal will decrease the fuel bill with respect to Oil.

On chart:

A	B	D
GAS	OIL	COAL
	↓	(12,000)
5.4¢ ←	7.5¢ →	$10.55

Market price of oil —7.5¢ per gallon
Comparative cost of gas—5.4¢ per therm
Market price of gas —6.0¢ per therm
•Bill for gas = $\frac{6.0}{5.4}$ or 1.1 times bill for oil
Comparative cost of coal—$10.55 per ton
Market price of coal —$8.40 per ton
•Bill for coal = $\frac{8.40}{10.55}$ or 0.8 times oil bill

SUPPLEMENTARY COSTS

POWER REQUIREMENTS FOR OIL BURNERS AND STOKERS . . .

• To obtain the cost of operation when using stokers or oil burners (other than the pot type), it is necessary to add the cost of the power for operating the motors to the cost of the fuel used. The average power consumption of oil burners and stokers is:

Oil Burners — 0.1 Kilowatt hour per gallon of oil fired.
Stokers — 10.0 Kilowatt hours per ton of coal burned.

• To obtain the electrical power cost, multiply these values by the local electrical rate (cents per kilowatt hour).

Variations resulting from differences in operating conditions make it impossible to give definite figures for either depreciation, maintenance or repairs. These costs, however, should be considered in addition to the initial costs of your heating system and fuel. The chart at the right will enable you to figure out your own total heating costs:

	Hand-fired Coal	*Stoker-fired Coal*	*Gas*	*Oil*
Cost of Equipment				
Repairs and Upkeep				
Depreciation				
Fuel Cost				
Power (Electricity)				
Labor, Tending Fire				
Total Costs				