



HOME HEATING AND AIR CONDITIONING SYSTEMS

James L. Kittle

HOME HEATING AND AIR CONDITIONING SYSTEMS

James L. Kittle

Line Drawings by

Gary McKinney

GIFT OF THE ASIA FOUNDATION
NOT FOR RE-SALE

QUÀ TẶNG CỦA QUỸ CHÂU Á
KHÔNG ĐƯỢC BÁN LẠI

TAB Books

Division of McGraw-Hill

New York San Francisco Washington, D.C. Auckland Bogotá
Caracas Lisbon London Madrid Mexico City Milan
Montreal New Delhi San Juan Singapore
Sydney Tokyo Toronto



To the homeowner/handyperson:
To assist you in doing a better, safer job
of installing, repairing, and maintaining
your equipment.

© 1990 by **TAB Books**.

TAB Books is a division of McGraw-Hill, Inc.

Printed in the United States of America. All rights reserved. The publisher takes no responsibility for the use of any of the materials or methods described in this book, nor for the products thereof.

pbk 19 20 DOC/DOC 0 9 8 7 6 5
hc 3 4 5 6 7 8 9 10 11 DOC/DOC 9 9 8 7 6 5 4 3 2

Library of Congress Cataloging-in-Publication Data

Kittle, James L. 1913—

Home heating and air conditioning systems / by James L. Kittle.

p. cm.

ISBN 0-8306-9257-6 ISBN 0-8306-3257-3 (pbk.)

1. Dwellings—Heating and ventilation—Amateurs' manuals.

2. Dwellings—Air conditioning—Amateurs' manuals. I. Title.

TH7224.K58 1990

697—dc20

89-29159

CIP

Acquisitions Editor: Kimberly Tabor

Director of Production: Katherine G. Brown

HT3
3257

Contents

Acknowledgments	vii
Introduction	ix
1 Safety	1
Fire Hazards	1
Gas Utilities	2
Oil-Fired Furnaces	2
Building Codes	3
2 Tools	5
Hand Tools	5
Power Tools	7
Pipefitting Tools	8
Copper and Aluminum Tubing Tools	12
Soldering Copper Tubing and Fittings	
3 Detecting Faulty Installations	21
Oil Burning Systems	21
Oil Leaks and the Oil Line—Controls	
Gas Burning Systems	28
The Thermocouple	
Forced, Warm-Air Systems	29
Air Filters—The Fan and Fan Belt—The Combustion Chamber—Controls—Electrical Wiring—Fuel Leaks and the Fuel Line	
4 Evaluating Gas- and Oil-Fired Furnaces	33
The Oil Burner	33
The Primary Control—Boiler Controls for Hot Water and Steam—The Oil Burner Mechanism—Fuel Supply and Storage	

Service and Maintenance	40
The Centrifugal Switch	
The Gas Burner	42
The Gas Line—The Thermocouple	

5 Selecting a Heating System 47

Forced, Warm-Air Heaters	47
Hot-Water Boilers	50
Radiant Heating	53
Heat Sources	54
Natural Gas—Fuel Oil—The Heat Pump—Electric Resistance Heating	
Central Electrical Resistance Heating	66
The Electrical Furnace	67
The Electric Boiler	67
Selecting the Best System	68

6 Installing an Oil-Fired Furnace 69

Replacing the Oil Burner	69
Installing a New Burner and Furnace	70
Adapt the Ductwork—Adapting the Oil Burner—Setting the Burner—Wiring the Burner	

7 Installing a Replacement Boiler 79

Removing the Old Boiler	79
Removing the Riser—Disconnecting the Water Supply—Removing the Wiring—Removing the Smoke Pipe—Removing the Gas Line—Disconnecting the Oil Line	
Connecting the Gas Line	89
Hot-Water System Parts—Wiring the New Gas Burner—Adapting the Gas Burner to the Furnace—Boiler Controls—The Hot-Water Heating System	
Adapting an Oil Burner to a Boiler	103
Boiler Controls The Hot-Water Boiler System—The Steam Boiler System	

8 Installing Central Air Conditioning 107

Feasibility	107
Air Conditioning Systems	110
Installation	111
Refrigerant Tubing	

The Condensing Unit	116
Wiring the Condensing Unit—Electrical	
Connections—The Cooling Coil and Related	
Plumbing—The Furnace Fan and	
Motor—Thermostats—Wiring the Thermostat	
Testing the New System	120
Installing Central Air Conditioning to a Forced,	
Warm-Air Furnace	123
Installing Window Air Conditioners	124

9 Heat Pumps 129

Supplementary Heat	130
Heat Pump Operation	130
Types of Heat Pumps	131
A Heat Pump's Life Cycle	131
Servicing Heat Pumps	132

10 Space Heating Appliances 133

Space Heaters	133
Oil-Fired, Constant-Level Valve Space Heaters	
Wall Furnaces and Floor Furnaces	136
Wood Burning Stoves	139
Installing a Wood Burning Stove—Chimney	
Safety—Operating a Wood Stove	
Loading Wood and Starting and Maintaining a Wood	
Fire	144
Adding More Wood	149
Burn Times and Long Burns	150
Catalytic Combustion	150
Combustor Use	151
Creosote	152
Operating Rules	153

11 Servicing Heating and Air Conditioning Systems 159

Gas-Fired Furnaces or Boilers	159
The Heat Exchanger—The Air Circulating Fan—The	
Burner—Controls	
Gas-Fired, Hot Water Heaters	170
Oil-Fired Furnaces or Boilers	170
Electric Furnaces or Boilers	
Electric Water Heater	173
Forced Air Systems	174

12 General Maintenance 177

- Oil Burners 177
- Gas Burners 179
- Forced, Warm-Air Furnaces 179
- Electric Water Heater 180
- Heat Pumps 180
- Electric Motors 180

13 Related Heating and Cooling Equipment 183

- Thermostats 183
- Millivoltage Systems 186
- Humidifiers 189
 - Freestanding, (Portable) Humidifiers
- Dehumidifiers 195
- Air Filters 198
 - Electronic Air Filters
- Attic Fans 199

14 Troubleshooting Index 201

- Gas Burners 201
- Gas Furnaces 203
- Oil Furnaces 204
- Electric Resistance Heaters 206
- Forced, Warm-Air Furnaces 207
- Oil Burners 208
- Heat Pumps 209
- Air Conditioners 211
- Wood Stoves 213

Glossary 219

Index 226

Acknowledgments

The following companies have provided illustrations and text for this book. Their cooperation and courtesy are greatly appreciated.

American Gas Association, Arlington, Virginia.
The Beckett Corporation, Elyria, Ohio.
Blue Ray Systems, Upper Darby, Pennsylvania.
Bryan Steam Corporation, Peru, Indiana.
Burnham Corporation, Lancaster, Pennsylvania.
Carrier Corporation, Syracuse, New York.
Consolidated Dutchwest, Inc., Plymouth, Massachusetts.
Electric Furnace-Man Div., Emmaus, Pennsylvania.
Energy Vent, Inc., Dayton, Ohio.
Honeywell Inc., Minnetonka, Minnesota.
Hydrotherm, Northvale, New Jersey.
ITT Bell & Gossett, Morton Grove, Illinois.
Intertherm Nordyne, A Nortek Co., St. Louis, Missouri.
Klein Tools, Chicago, Illinois.
Lopi® International, LTD., Kirkland, Washington.
Monarch Manufacturing Works, Inc., Philadelphia, Pennsylvania.
Mueller Brass Company, Port Huron, Michigan.
Research Products Corporation, Madison, Wisconsin.
Ridge Tool Company, Elyria, Ohio.
Suburban Manufacturing Company, Dayton, Tennessee.
Suntec Industries, Inc., Rockford, Illinois.
Toastermaster, Inc., Columbia, Missouri.
The Trane Company, Tyler, Texas.
Vaco Products Div., Chicago, Illinois.
Weil McLain, A Marley Company, Michigan City, Indiana.