Index

Collector temperature, 82, 92, 110

```
93, 94, 107, 109, 117, 122, 129
                                             Condense, 142
Active, 115, 116, 119, 120, 129, 130,
                                             Conduction, 20, 21, 23, 26, 49, 50, 51,
      135, 139, 145
                                                   52, 72, 83, 102, 108, 122, 128,
Air-heating, 107, 108, 109, 110, 111,
                                                   134, 142
      112, 113, 119, 145
                                             Conservation, 53
Analogy, 9, 12, 37, 44, 47, 52, 66, 73,
                                             Control function, 120, 125, 129, 130,
                                                   137
      91, 93, 101
Auxiliary, 103, 106, 137, 147
                                             Controller, 89, 91, 93, 94, 99, 100, 110,
Awnings, 127
                                                   119, 133, 135
                                             Convection, 21, 26, 28, 29, 31, 49, 50,
Back-up, 105
                                                   51, 66, 71, 76, 82, 89, 101, 108,
Baseboard heaters, 43, 104, 108, 137
                                                   110, 123, 129, 137, 142
Beadwall, 122, 127
                                             Conventional heater, 103, 166, 148,
Biomass, 1
                                                   149
Boiling protection, 112
                                             Corrosion, 111
                                             Crushed rock, 39, 108
Caulking, 52
Changing phase, 41
                                             Daily control, 127, 129
Check valve, 88, 89, 91, 93, 95, 99,
                                             Depth, 37, 44, 73, 87
      100, 124, 134, 135
                                             Depth difference, 12, 14, 15, 26, 45,
Collector, 59, 60, 61, 63, 65, 66, 67,
      69, 72, 73, 77, 78, 79, 80, 82,
                                             Diode function, 120, 121, 122, 123,
      87, 94, 97, 102, 107, 110, 112,
                                                   125, 133, 135, 137
      116, 117, 119, 120, 122, 123,
                                             Direct-gain, 115, 116, 117, 118, 119,
      134, 135, 137, 139, 140, 142,
                                                   120, 121, 123, 127, 130
                                             Downhill, 14, 15, 16
Collector efficiency, 74, 76, 77, 78, 81,
                                             Direct use, 2, 3
      82, 94, 99, 110
                                             Distribution, 127, 130, 137
```

A bsorption, 56, 65, 68, 69, 82, 91,

Double-glazing, 50, 51 Heat store, 145 Drain-down, 112 Heat transfer medium, 35, 119 Drumwall, 121, 127 High-pitched, 55, 56, 84 Hot water heating, 5, 55, 63, 79, 81, 84, 85, 101, 105, 106, 107, 111, Electric furnace, 105 Electromagnetic radiation, 56 136, 137 Evacuated tube collector, 142, 143 House heating, 43, 55, 63, 79, 80, 84, Evaporate, 151, 152 101, 104, 105, 106, 111, 116, 136, 137 Fan, 110, 113, 119, 122, 123, 130, Hydronic, 107, 110, 111, 112, 113 Indirect use, 2 Fiberglass &tting, 33, 49 Fin, 104, 108 Infiltration, 52 nitial cost, 145, 147, 148 First cost, 145 Flap valve, 124, 135 Inlet, 107 Flat-plate collector, 4, 5, 7, 61, 98 Installation, 145, 148, 149 Fluid resistance, 19 Insulated- plate collector, 71 Forced-air, 137 Insulation, 20, 50, 51, 52, 53, 65, 72, Forced convection, 82, 83, 108 115, 116, 117, 119, 121, 122, Fossil fuels, 1 123, 134 nsulator, 23, 50, 51 Freeze protection, 112 Fuel savings, 148, 149 Interest, 147 Latent heat, 40, 41 Glazing, 81, 82, 83, 84, 85, 92, 98, 99, 108, 109, 116, 134, 142 Latitude, 51, 63 Glycol, 113 Leafy plants, 127 Ground reflection, 140 Living space, 119, 120, 122, 123, 125. Greenhouse, 56 129, 130, 137 Liquid-to-air heat exchanger, 107, 111, Greenhouse effect, 56, 130 Liquid-to-liquid heat exchanger, 104, Heat, 9, 10, 11, 12, 13, 37, 67, 69, 139 Heat exchanger, 102, 103, 104, 119, 105, 108 134, 136 Low-pitched, 55, 56, 84 Heat flow, 11, 13, 14, 43, 44, 55, 72, Maintenance, 147, 148, 149 102 Heat flow path, 23, 24, 25, 26 Masonry wall, 123, 127, 128, 145 Mass-production, 134 Heat losses, 43, 45, 46, 47, 49, 50, 52, 67, 78, 82, 83, 84, 85, 95, 110, Melting, 40, 42 Modular, 133 116, 117, 119, 122, 140, 142 Heat storage, 37, 39, 43, 59, 71, 72, Movable insulation, 121, 123, 127, 77, 87, 88, 89, 90, 93, 94, 95, 101, 102, 103, 104, 105, 117, Natural convection, 28, 82, 83, 102, 118, 119, 120, 121, 122, 127, 108, 123

Net income, 147, 148

128, 129, 130, 133, 136, 137

Nighttime heat loss, 87, 119, 137, 145 Sky temperature, 83 Skytherm, 122, 127, 145 Solar air-conditioning, 142, 143 Oil valve, 135, 136 Solar cells, 3, 4 Outlet, 107 Solar radiation, 55, 56, 57, 58, 59, 66, Overcast day, 69 67, 68, 69, 70-72, 77, 78, 84, Overheat, 117 89, 91, 92, 97, 99, 107, 110, 117, 119, 139 Parallel configuration, 105 Solidifying, 40, 41, 141 Passive, 115, 116, 119, 120, 121, 122, Sound radiation, 55, 56 123, 125, 129, 130, 133, 139, South-facing, 116 140, 145 Space heating, 79 Phase change materials, 41, 141 Stagnation depth, 66, 69, 100 Photovoltaic, 3 Stagnation temperature, 65, 68, 69, Pre-heater, 103, 104, 105, 136 76,92 Pump, 72, 75, 89, 90, 92, 93, 94, 99, Still air, 27, 28, 82 110, 112, 113, 119, 133, 135, Storage material, 38, 39, 40 Storage temperature, 76, 79, 93, 95 Pyramidal optical condenser, 140 Stratification, 108 Sun louvers, 140 Radiation, 22, 31, 32, 33, 49, 50, 51, Sun window, 129, 130 55, 56, 57, 58, 66, 67, 76, 82, Surface area, 27, 31, 33, 108 83, 84, 89, 108, 110, 122, 129, Swimming pool heating, 77, 78, 79, 137,142 85, 101 Radiator, 104 Rainwater collector, 66, 68, 73, 82, Tap, 101 87, 89, 91 Tax credits, 145, 147 Rainwater equivalent, 95, 110, 117, Temperature, 9, 10, 11, 13, 14, 69, 135,140 Reflection, 32, 57 Temperature difference, 11, 14, 19, Reflector, 140, 141, 142, 143 20, 23, 26, 27, 29, 32, 34, 45, Regulated hot water, 103 47, 79, 83, 93 Reliable 134, 135 Temperature rise, 111 Retrofit, 133 Temperature sensor, 89 Return hose, 133 Temperature swing, 117, 118, 127 Reverse thermosyphon, 124, 134 Thermal contact, Rock-bed, 108, 109, 145 Thermal resistance, 19, 20 Seasonal control, 127, 129 Thermic diode, 133, 134, 135, 137 Selective coating, 84 Thermodynamic cycle, 142 Selective surface, 84 Thermostat, 43, 45, 47 Thermosyphon, 123, 124, 128, 135, 145 Series configuration, 105 Set temperature, 43 Tilt angle, 63, 140 Silicon, 3 Tracking system, 4 Silvered surfaces, 32, 140 Transmission, 99

Transparent, 58, 82
Transport, 22, 35, 49, 71, 72, 110, 119, 145
Trombe wall, 123, 127, 130, 133, 134, 139, 145

Unglazed, 82-85 Useful heat, 38 Useful volume, 38 Vacuum jacket, 142 Vapor, 142 Volume, 9, 10-12, 26 39, 44 Volume flow, 44

Water-heating, 109-111, 119, 145 Water main, 103, 136 Weatherstripping, 52 Wind power, 2



Dr. Shawn Buckley, an engineering professor at MIT for the last seven years, is primarily an inventor. He holds seven patents in fields as diverse as control systems, solar energy, and automated manufacturing. In the classroom, Professor Buckley teaches courses in systems and design. It is through this classroom experience that the author has developed his views that analogy makes learning easier.

Most current books either explain solar energy using mathematical equations which are unfamiliar to the general public or discuss solar energy generally but do not explain just how solar systems actually work. This book fills the gap between these two approaches. The concepts of solar energy are explained without resorting to mathematical equations but still allow one to understand how the sun's heat can be used.

"One attractive feature of solar technologies is that the layman can understand them. Shawn Buckley's new book demonstrates this admirably. It is a clear, interesting introduction to the principles of solar space conditioning that can be understood by everyone who has boiled eggs or turned off a radiator."

Denis Hayes

Senior Researcher, Worldwatch Institute Chairman of the Board, Solar Lobby Washington, D.C.

"Using solar energy to heat our water and our homes, and to create electricity, is one of the most important tasks of the coming generation. This excellent book will help the average citizen understand the essentials of how solar energy can work."

Tom Hayden Member of SolarCal Council State of California

"in this age of declining oil supply, the perpetual energy of the sun becomes increasingly important. Dr. Buckley's book shows, in a very clear way, what can be done in home design to reduce dependence on fossil fuels by using solar energy."

Professor Jay Forrester, of "Limits to Growth" fame

"Making the basic concepts more easily accessible is bne answer. Fortunately, Shawn Buckley, an MIT professor, is a technician with the ability to simplify solar technology for a general audience."

Senator Paul Tsongas Washington, D.C.