Flow meters, 549
Flue gas loss, 308, 311
Fluid flow, 73
  theory, 73
Fluid meters, 549
Fog, 4, 167
Force, 4
Forced
  air heating system, 406
  circulation pipe sizes, 462
  convection, 98, 140
Free
  convection, 100
  enthalpy, 4

Friction loss
  air ducts, 746, 747
  circular pipes, 75
  elbows, 401, 410, 752, 869
  non-circular pipes, 77
  water heating, 456
  water piping, 456, 867

Fuel, fuels, 298
  burning equipment, 321, 343
  classification, 298, 301, 303
  consumption, 381
    load factor, 394
    maximum demands, 394
    seasonal efficiency, 395
  unit consumption, 385
  utilization, 358

Fuel oil, 303
  carbon residue, 302
  classification of, 303
  combustion of, 304, 333
  grade of, 303
  maximum carbon dioxide values, 304, 334
  theoretical air requirements, 304
  viscosity, 302
Fumes, 4, 166
Fundamentals heat transfer, 97

Furnace, furnaces, 4, 343, 357
  capacity, 360, 361
  casings, 363
  cast iron, 359
  design, 362, 414
  efficiency, 362
  fan, 358
  gas-fired units, 336
  gravity warm air, 357
  heating surface, 362
  heavy duty, 359
  materials, 359
  mechanical warm air, 406
    controls, 411
    cooling methods, 414
    cooling system, 414
    dampers, 407
    ducts, 408
    fans, 358
    filters, 358
    method of designing, 409, 415
    motors, 358
  oil-fired units, 333
  rating, 360, 361
  steel, 359
  stoker-fired units, 322
  types, 357
  volume, 4, 322

G

Gage, gages
  draft, 185
  pressure, 6, 185
Garage ventilation, 164

Gas, gases, 167, 172, 174, 303
  atmospheric, 888
  burner controls, 336, 609
  chimneys for heating, 375
  classification of, 303
  combustion of, 304, 307, 317, 338
  estimating consumption, 389
  expansion factor, 90
  specific heat, 5
  solubility, 889

Gaseous fuels
  classification of, 303
  combustion of, 304, 317
  flame temperature, 304
  maximum carbon dioxide values, 304, 308
  products of combustion, 304
  properties of, 304
  specific gravity, 304
  theoretical air requirements, 304, 306

Gas-fired appliances, 336
  boilers, 336, 343
  combustion process, 338
  controls, 336, 609
  conversion burners, 336
  furnaces, 336, 343
  measurement of efficiency of combustion, 339
  ratings for, 348, 360
  sizing heating plants, 339
  space heaters, 337

Glass
  coefficient of transmission, 136
  heat absorbent, 279
  shading of, 279
  solar heat transmitted, 274, 277

Glass block walls
  coefficient of transmission, 136
  solar heat gain, 278, 279
Globe thermometer, 193, 477, 577
Graphical symbols for drawings, 16
  duct work, 17
  heating, 19
  piping, 16
  refrigerating, 20
  ventilating, 19
Grate area, 4, 352, 361
Greek alphabet, 14

Grille, grilles, (*see Registers*), 397, 399, 406, 724
  air supply noises, 734, 774, 781
  attenuation, 774
  exhaust, 399, 407, 741, 851
  locations, 736, 738
    door, 743
    floor, 743
    wall, 743
  mechanical furnace systems, 406
  noises, 734, 774, 781
  railway car, 851
  recirculating, 401, 740
  return, 399, 407, 741
  selection, 782
  velocity, 742
Ground temperatures, 243

Guarded hot plate, 192
Gun type oil burners, 330

H

Hangers pipe, 517

Hay fever symptoms, 227

Heat, 5
  area transmitting surface, 879
  auxiliary sources, 248, 234
  balance, 309
  combustion, 303, 305, 306
  emission of
  appliances, 284, 286
    occupants, 199, 201, 207, 209, 285, 564
  exchange measurements, 200
  flow resistance, 105
  flow through roofs, 132-135, 270-274
  flow through walls, 127-129, 270-274
  gain, 253
  generated by motors, 285
  humid, 5
  infiltration equivalent, 282
  instantaneous load, 256
  introduced by outside air, 282
  latent, 5, 256, 284, 804
  liquid, 5

Heat (*continued*)
  mechanical equivalent of, 6, 14
  methods of, transfer, 97
  radiant, 563
  removal, natural ventilation, 159
  sensible, 5, 256, 284, 804
    factor, 793
  specific, 5
  transfer, 97, 111, 140
    boiler rates, 345
    over-all coefficients, 111, 140, 472
    surface coils, 480
    symbols, 12, 111
    through building materials, 111

Heat gain, 256
  appliances, 286
  ceilings, 282
  components of, 260
  electrical heating equipment, 286
  floors, 282
  gas burning equipment, 286
  glass, 274
  glass blocks, 278
  infiltration, 283, 289
  instantaneous, 281
  latent, 256, 804
  lights, 285
  occupants, 284
  outside air, 282, 283
  partitions, 282
  people, 207, 285
  roof, 273
  sensible, 256, 804
  shaded windows, 279
  solar, 262
  steam heated equipment, 286
  various sources, 256
  ventilation, 282
  wall, 270

Heat loss
  bare pipe, 473, 528
  basement, 244
  duct, 764
  infiltration, 245, 282
  insulated pipe, 529
  latent, 256
  residence problems, 249
  sensible, 256
  through ceilings and roofs, 245
  to sky, 265
  transmission, 244

Heater, heaters
  direct-fired unit, 495
  electric, 500
  solar water, 881
  unit, 495
  vertical blow unit, 498

Heating
  air conditioning units, 639
  boilers, 339
    surface, 2, 345
  coil selection, 490
  district, 543
  domestic water by electricity, 559
  effect, radiator, 477
  electric, 555
    hot water, 558
  load, 232, 795
  performance of coils, 140
  radiant (*see Radiant Heating*), 563
  reversed cycle refrigeration, 560
  steam systems, 416
  surface, 8
    square foot of, 8
  symbols for drawing, 16
  up the radiator, 478
  vacuum systems, 9, 423
  vapor, 9, 421
  warm air system, 9, 397, 406
  water, 867
Heavy duty fan furnace, 359
High duty humidifiers, 657
Hood, hoods, 827
Horsepower, boiler, 2

Hospital, hospitals
  air conditioning in, 217, 223, 229
  operating rooms, 220
    air conditions, 222
    reducing explosion hazard, 220
    sterilization of air, 218, 224
    ventilation requirements, 223

Hot water
  boiler supply load, 351, 875
  demand per
    fixture, 867
    person, 875
  electric heating, 555
  heating surface, 879
  indirect heater, 345
  methods of heating, 876
  panel heating, 563
  radiant heating, 563
  solar heaters, 881
  storage tank, 874
  supply
    boilers, 344, 559, 878
    piping, 867, 873
  temperature control, 880

Hot water heating systems, 5, 455
  classification, 459, 462
  direct return system, 460
  elbow equivalents, 457
  expansion tank, 468
  forced circulation, 456, 459
  friction heads, 456
  gravity, 459, 463
    available head, 455
    circulation, 455
    pressure heads, 455
  installation details, 470
  mechanical circulators, 466
  one-pipe
    forced circulation, 464, 465
    gravity circulation, 455, 460, 465
  orifice friction heads, 461
  pipe sizes, 458, 459, 460
    forced circulation, 456, 462
    gravity circulation, 455, 460
  piping design, 462
  pressure head, 456
  reversed return system, 460
  systems of piping, 460
  two-pipe
    forced, 456, 460, 467
    gravity, 455, 466
  zoning, 471

Human body
  acclimatization, 204
  adaptation, 201
    cold conditions, 204
    hot conditions, 204
  heat emission, 199, 201, 207, 285, 563
  high temperature hazards, 203
  metabolic rates, 202, 209
  odors, 199
  temperature, 200
  zone of evaporative regulation, 200
Humid heat, 5

Humidification, 651, 653
  control, 406, 607, 615
  mechanical furnace systems, 414

Humidifier, humidifiers
  air washer, 651, 653
  atomizing, 657
  high duty, 657
  spray, 657, 658
  unit, 495, 658
Humidify, 5
  air conditioning units, 508
Humidistat, 5, 607

Humidity, 5
  absolute, 5
  control, 852
  influence of, 210, 223
  measurement of, 191
  nurseries for premature infants, 223, 865
  permissible relative, 138
  ratio, 5, 23
  relative, 5, 65, 793
Hydraulic radius, 95, 102
Hygrostat, 5, 607