

CLASS 432, HEATING**SECTION I - CLASS DEFINITION**

This is the residual class for apparatus and related methods for the generation of heat and its application to materials; and for subcombinations and adjuncts specialized to such heating.

Note. Patents issued prior to 1945 have not in all instances been classified by their claimed disclosure so the placement of these older patents does not necessarily indicate lines of classification.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS**A. HEATING FURNACES (I.E., CHAMBER FOR RECEIVING MATERIAL TO BE HEATED AND SUPPLIED WITH HEAT INDEPENDENTLY OF THE CHARGE) AND HEATING FURNACE COMBINATION:**

1. Class 266, Metallurgical Apparatus takes the following combinations of a heating furnace with additional structure for a metallurgical purpose:

a. A heating furnace with additional structure for cooling or quenching a solid metal object after heating is in Class 266 if the disclosure is limited to the metallurgical treatment of metals. If the disclosure is generic to metals and nonmetals or if the material has not been specified, Classification is in Class 432. It is noted that glass and ceramic article are commonly "annealed". Accordingly, a disclosure of "annealing" without a specification of material is in Class 432.

b. Those heating furnaces which are limited by disclosure to heating solid metal articles and which have structure for supplying or producing a special atmosphere either protective or treating, are in Class 266. Furnaces not elsewhere provided for having gas supplying or producing means will be found in this (432) Class.

c. A heating furnace in which material is melted having additional structure for the collection of flow, separation, dispensing or mixing of melted metal is in Class 266 when the sole disclosure relates to the handling of metal.

d. A heating furnace in combination with a fume arrester in which the sole disclosure relates to the arrest-

ing of metallurgical fume, i.e. of condensate of metallic vapor generated from a charge of metal ore or intermediate metal product, is in Class 266. A residual heating furnace with means separating dust or slag from the furnace discharge is classifiable in Class 432, subclasses 67+.

2. A residual heating furnace not specialized to metallurgical use as indicated above is in Class 432. It is noted that a "reverberatory" furnace or a furnace in which a steel making crucible is heated may be a Class 432 heating subcombination of general utility even though the disclosed charge includes metal or metal ore with reactive ingredients combined therewith or separately fed into the heating chamber.

B. OXYGEN REACTION FURNACES:

A furnace heated by reacting a charge of solid material with gaseous oxygen to produce heat and a chemical transformation of charge material and not having a separate heat generator is in Class 266 when the sole disclosed specific use of the apparatus is to produce metal or an intermediate metal product. It is considered that a "blast furnace," a "cupola furnace," and a "converter" are this type of Class 266 apparatus unless there is a positive indication that the apparatus may be used to treat a specific nonmetal. Also, in the absence of a disclosure that the apparatus of utility in treating nonmetal producing materials, the term "sintering" applied to a furnace treating bulk particulate material with gas is considered to indicate metallurgical apparatus for Class 266.

SECTION III - REFERENCES TO OTHER CLASSES**SEE OR SEARCH CLASS:**

- 4, Baths, Closets, Sinks, and Spittoons, subclass 360 for a dry sanitary closet having a means for drying or burning the discharge.
- 5, Beds, subclass 284 for an accessory device for heating or cooling a bed.
- 26, Textile: Cloth Finishing, subclass 81, 92, and 106 for apparatus for expanding (e.g., stretching, spreading) running length webs of cloth which further include means for heating or drying the cloth.
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 280+ for a process limited to drying even though involving the burning of fuel, and for a residual process of contacting a solid with a gas or vapor; and appropriate subclass for (1)

- a heating apparatus specialized to drying or (2) an apparatus specialized to contacting solid with a gas. A merely nominal heating means may be included in the structure of the apparatus of (1) and (2).
- 37, Excavating, subclass 226 for apparatus for excavating, compacting and melting snow.
- 43, Fishing, Trapping, and Vermin Destroying, subclass 144 for a burner specialized to destroying vermin.
- 47, Plant Husbandry, subclass 1.44 for a process or apparatus specialized for use in plant husbandry for flame cultivation.
- 48, Gas: Heating and Illuminating, subclass 61 for apparatus in which heating or illuminating gas is produced by heating carbonaceous material in a chamber.
- 53, Package Making, subclass 127 for a package making apparatus having means to heat or cool the contents of the package; and subclasses 373.7+ for a means to complete a package by heating or cooling a seam to seal the package.
- 68, Textiles: Fluid Treating Apparatus, subclass 15 for a clothes washing machine combined with means to heat the tub or for applying heat to liquid within the tub.
- 95, Gas Separation: Processes, for processes of gas separation perfected by the application of heat.
- 96, Gas Separation: Apparatus, for apparatus for gas separation perfected with heating means.
- 105, Railway Rolling Stock, subclass 451 for apparatus for thawing a frozen load in railway rolling stock.
- 106, Compositions: Coating or Plastic, subclasses 739+ for a process of (1) making cement, (2) making a cement intermediate product or (3) for treating calcareous or argillaceous material if the treatment is disclosed as being for the purpose of making "cement" or lime".
- 110, Furnaces, appropriate subclasses for a solid fuel combustion furnace or subcombination thereof; and subclasses 173+ for a door usable on either a heating furnace or a solid fuel combustion furnace.
- 118, Coating Apparatus, subclass 47 for coating apparatus including means for carbonizing, flame contact, or burning off of coating ingredient; and subclasses 641+ for coating apparatus having means for the radiant heating of the work or coating.
- 119, Animal Husbandry, subclasses 302+ for a brooder and subclasses 311+ for an incubator.
- 126, Stoves and Furnaces, for the apparatus for the application of heat, and for the stove and furnace elements specifically provided for in the various subclasses.
- 134, Cleaning and Liquid Contact With Solids, subclasses 105+ for a cleaning and liquid contact with solids device having a nominal heating, cooling or heat exchange means.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclass 497 for a surface bonding device with gas, vapor or flame contact means for the work; and subclasses 583.1+ for a heated press for a surface bonding apparatus.
- 159, Concentrating Evaporators, appropriate subclass for a residual process or apparatus for concentrating a liquid by heat.
- 164, Metal Founding, appropriate subclass for the molding of free flowing liquid metal.
- 165, Heat Exchange, appropriate subclass for a residual method or apparatus for the transfer of heat from one material to another.
- (1) Note. A heat generator is considered to make the arrangement special to heating except where the structure is a combined heating and cooling device.
- 196, Mineral Oils: Apparatus, subclasses 104+ for apparatus for vaporizing mineral oils.
- 237, Heating Systems, appropriate subclass for an apparatus or process of heating a room, chamber or other enclosing structure by a system delivering fluid heated by a heat generator to the room or structure or to a heat exchanger in the room or structure.
- 266, Metallurgical Apparatus, appropriate subclass, for apparatus concerned with the extraction of metals from their ores, with the refining of metal, and with the establishing a physical or mechanical property of a solid metal object by a heat treatment related to the composition of the object. The relationship of the two classes is as follows:
- 297, Chairs and Seats, subclass 180.1 for a heated chair or seat.
- 366, Agitating, subclass 144 for an agitator combined with means to heat the material during agitation, for purposes other than drying, involving no structural detail of the heating or heat transfer means and no new relationship of the heating structure to the agitating structure.
- 373, Industrial Electrical Heating Furnaces, appropriate subclass for a furnace specialized to the use of electricity as the heat source and particu-

- larly adapted to metallurgical and related work. Such furnace is generally characterized by electrical heating means within the chamber containing the material to be heated, the heating means being either an arc, a resistance, the material itself, or a combination of such means, and is further characterized by adaptation for operation on a granular material, such as crushed ore, or for handling molten material fusing at a very high temperature, the material in both cases being received immediately within the body of the furnace.
- 376, Induced Nuclear Reactions: Processes, Systems, and Elements, appropriate subclass for a nuclear reactor type of heat generator delivering heat energy to a material or to a power generator.
- 392, Electric Resistance Heating Devices, subclasses 307+ for a specific electrical heating device combined with nonelectric heating means; and appropriate subclass for a residual device for the generator of heat by electricity and the utilization of the heat wherein there is involved an electrical characteristic or electrical structure that is more than merely nominal.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, appropriate subclasses for heating sterilizers; combustion or reaction device for purifying gas, or with means for recovering, mixing, separating, or otherwise handling as a product formed in the device; autoclaves for carrying out a reaction at high temperature; a cooler or digest or not otherwise provided for; and residual chemical apparatus.
- 452, Butchering, subclass 73 for for singeing devices and subclasses 74+ for scalding devices.
- 607, Surgery: Light, Thermal, and Electrical Application, subclass 1 for a device for treating an abnormal condition of a living body with light, heat, or electricity.
- 65, involving metal working that may include heating of the work. Glass Manufacturing, subclasses 17.1+ for a process including the working of a glass type material after it has been softened or melted by heating.
- 106, Compositions: Coating or Plastic, subclasses 100+ for a process specialized to Portland type cement material.
- 134, Cleaning and Liquid Contact With Solids, subclasses 19+ for a process of cleaning including (1) contacting the work by hot products of combustion or (2) heating the work in any way other than or in addition to contacting the work with heated cleaning or liquid contact agents.
- 148, Metal Treatment, appropriate subclasses for processes of heat treating metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical properties of metal. If metal casting, fusion bonding, machining, or working is involved, there is a requirement of significant heat treatment as described in the Class Definition for Class 148.
- 159, Concentrating Evaporators, subclasses 47.1+ for a process of concentrating a liquid by evaporating one of the constituents.
- 165, Heat Exchange, subclasses 58+ and 201+ for a process involving both heating and cooling and in which the cooling accomplishes more than the return of the temperature of heated work to room temperature.
- 166, Wells, subclasses 302+ for a process of heating or cooling a well formation.
- 175, Boring and Penetrating the Earth, subclasses 11+ for a process of boring the earth by directly applying heat to the formation material.
- 201, Distillation: Processes, Thermolytic, appropriate subclass for a process comprising heating a carbonaceous material to vaporize a volatile material and to break down the substance into other chemical substances.
- 203, Distillation: Processes, Separatory, appropriate subclass for a process involving the heating of a liquid mix-
- SUBCLASSES
- 1** This subclass is indented under the class definition. Processes of heating or heating apparatus operation under the
- SEE OR SEARCH CLASS:
29, Metal Working, subclasses 592+ for a process of mechanical manufacture

- ture to drive off one constituent and the condensing of the expelled constituent.
- 237, Heating Systems, subclass 12, for an automatic control process in a heating system, and subclass 81 for a process for heating a house, room or other enclosure by a heat distributing system.
- 373, Industrial Electrical Heating Furnaces, subclass 85, 102+, 116, 135+, 146, and 149+ for processes of operating or manipulating an electric furnace and for merely heating by means of an electric furnace.
- 427, Coating Processes, subclasses 223+ for coating processes including flame contact.
- 431, Combustion, subclasses 2+ for a process of combustion not involving the application of the generated heat to external material.
- 2** This subclass is indented under subclass 1. Process including a procedure for flushing out, dislodging, or preventing collection of undesirable material in heating apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 50, for apparatus under the class definition including a protector, cleaner or support for a condition sensor: subclass 74 for heating apparatus with a drip, spill or leakage collector: and subclass 75 for heating apparatus having cleaning means.
- SEE OR SEARCH CLASS:
- 110, Furnaces, subclasses 341+ for method of operating solid fuel furnaces or refuse incinerators.
- 134, Cleaning and Liquid Contact With Solids, subclasses 1 through 42 for a residual process of cleaning, or contacting a solid with a liquid.
- 165, Heat Exchange, subclass 5 for the cleaning of a regenerator.
- 201, Distillation: Processes, Thermolytic, subclass 2 for a process including a step of cleaning an apparatus in which a solid carbonaceous material is heated.
- 431, Combustion, subclass 2 for a process of decarbonizing, cleaning or purging a combustion device.
- 3** This subclass is indented under subclass 1. Process in which a step of repairing, converting or assembling is an integral part of a heating procedure or in which repairing or assembling of the apparatus is effected in part by the heat incident to the operation of the apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 76, for heating apparatus having structural elements provided for use in repair or assembly of the apparatus.
- SEE OR SEARCH CLASS:
- 52, Static Structures (e.g., Buildings), subclasses 741.1+ and 745.06+ for a process of forming or assembling a structure in situ.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for a process of repairing or forming a furnace lining and see the extensive collected search class notes of this Class 264 subclass.
- 4** This subclass is indented under subclass 1. Process including (1) a step or procedure for preventing damage to a heating device or (2) a procedure effective to bring a heating device up to or to lower its temperature from operating temperature.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 35, for a heating apparatus having a frangible or fusible safety relief or shut-down means.
- 38, for a condition responsive control of apparatus protecting fluid or means:
- 116, for a rotary drum furnace having protective cooling means.
- 233+, for a heating apparatus element having protective cooling structure.
- 248, for a melt holding section of a furnace having a protected section.
- 251, for furnace structure having expansion, absorbing or relieving means.

- SEE OR SEARCH CLASS:
164, Metal Founding, subclass 121 for a process in which founding apparatus is readied for casting.
- 5** This subclass is indented under subclass 1. Process including a manipulation of, or an operation on the work prior to the application of heat, that conditions the work for receiving heat or that places it in position to be heated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
87, for heating apparatus having means supplying work to its work feeder.
- SEE OR SEARCH CLASS:
201, Distillation: Processes, Thermolytic, subclass 6 for the distilling of solid carbonaceous material involving a step of shaping the material prior to heating; subclass 8 for a process of distilling solid carbonaceous material involving grinding the material prior to charging it into the carbonizing zone; and subclass 40 for distillation of solid carbonaceous material with a step of arranging the material to be heated.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 57+ for a process of vitrifying or sintering a preform to make an inorganic article (e.g., ceramic etc.) involving the particular positioning, arranging or conveying of articles during heating.
- 6** This subclass is indented under subclass 5. Processes including positioning a plurality of objects in an orderly arrangement for exposure to heat.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
253+, for a structure in which material is placed or arranged for holding work within a furnace during heating.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclass 518 for a drying process involving piling or arranging the material treated.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 605+ for a process of stacking or arranging plural preformed articles for vitrifying or sintering by heating.
- 7** This subclass is indented under subclass 5. Process in which the arranging of the work material includes spreading out particulate material to form a porous sheet of relatively small transverse dimension.
- 8** This subclass is indented under subclass 1. Process including the step of passing a continuous strip, strand, web or sheet longitudinally through a heating zone.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
59, for heating structure with means winding, coiling or flexing a longitudinally moving sheet, web or strand.
122, for heating structure including means for manipulating, orienting, segregating or topically heating an individual article; and
231, for heating apparatus including a heat generator and means engaging and retaining an article in a desired relationship to the heat generator.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclasses 444+ for a process of drying a sheet, web or strand by contact with gas or vapor and subclasses 519+ for a process of drying a sheet, web or strand by radiant or conducted heat.
148, Metal Treatment, appropriate subclasses for processes of heat treating metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical properties of metal. If metal casting, fusion bonding, machining, or working is involved, there is a requirement of significant heat treatment as described

in the Class 148 Class Definition. Class 148 subclass 568, 576, and 595 through 600 relate to treatment of wire and subclasses 601 through 603, 657, and 661 relate to treatment of strips.

- 9** This subclass is indented under subclass 1. Process peculiarly adapted to individually treat a work entity identifiable as an article, batch, or body.

SEE OR SEARCH CLASS:

- 65, Glass Manufacturing, subclass 120 for a process of treating a glass preform by flame.
- 219, Electric Heating, appropriate subclass for a process of heating an article electrically.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 603+ for a process of heating a preform to a vitrifying or sintering temperature to produce an inorganic article, e.g., ceramic etc.

- 10** This subclass is indented under subclass 9. Process in which heating, cooling or other treatment is concentrated on a section of the entity; or a section of the entity is shielded from heating, cooling or other treatment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 62, for a heater having a mask, baffle, or conductor concentrating heat on, or protecting a section of an article.
- 123, for a work handler outside a heating chamber supporting work partially within the chamber.
- 184, for a heating chamber having an opening through which an article is partially inserted into the chamber to be heated.
- 225, for a heat applicator mounted on or assembled about a work article.

SEE OR SEARCH CLASS:

- 53, Package Making, subclass 477 for a process involving closing a package and heat sealing it at a localized area.
- 83, Cutting, subclass 16 for a cutting process having an ancillary heating of a localized area.

- 148, Metal Treatment, particularly subclasses 194+ for processes of chemical heat-removing (e.g., flame-cutting, etc.) or burning of metal, subclasses 210+ for processes of carburizing or nitriding of a selected area or zone of metal, or subclass 627 and subclasses 639-644 for localized or zone heating of iron base alloys.

- 11** This subclass is indented under subclass 9. Process in which the work entity is moved through a heating zone or past heating means while the heat is acting upon the article.

- 12** This subclass is indented under subclass 9. Process in which the work unit has heat applied to it (1) at a varying or stepped rate as it approaches a desired temperature, or (2) at a higher rate during a period at which it is being raised to a desired temperature than the rate at which it is supplied while the temperature is being maintained.

- 13** This subclass is indented under subclass 1. Process in which the work undergoes a change of phase, is comminuted, is sintered, or is classified in the course of treatment.

SEE OR SEARCH CLASS:

- 23, Chemistry: Physical Processes, subclass 308 for a process of melting out a fusible solid from a less fusible material.
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 519+ for a process of drying by heating.
- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 343+ for processes of producing or purifying free metal powder and subclasses 414+ for producing metal or treating molten metal at 300 degrees or greater.
- 148, Metal Treatment, subclasses 194+ for processes of chemical-heat removing (e.g., flame cutting, etc.) or burning of metal. Class 148 for processes of heat treating metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical properties of metal. If metal casting, fusion

- bonding, machining, or working is involved, there is a requirement of significant heat treatment as described in the Class 148 Class Definition.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 81+ for the melting or gasification of solid material in situ in an air tight cavity; subclasses 89.11+ for surface bonding with verification or firing of ceramic material.
- 159, Concentrating Evaporators, subclasses 47.1+ for a process of concentrating a material in a liquid by evaporating a constituent of the liquid.
- 164, Metal Founding, subclasses 1+ for process of casting metal.
- 203, Distillation: Processes, Separatory, appropriate subclass for a process involving the vaporization of a liquid from a mixture and the condensation of the vaporized liquid.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 79+ for a device melting solid spray material at a nozzle and spraying it from the nozzle.
- 241, Solid Material Comminution or Disintegration, subclass 23 for a process of comminuting solid material having ancillary heating.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, appropriate subclass for a process of shaping or treating a plastic, nonmetallic article generally involving the application of heat.
- 373, Industrial Electric Heating Furnaces, subclass 85, 102+, 116, 135+, 146, and 149+ for a process of manipulating an electrical melting furnace.
- 419, Powder Metallurgy Processes, appropriate subclasses, particularly subclasses 1+ for processes for making articles from metal containing particulate material involving the use of pressure and heat.
- 14** This subclass is indented under subclass 1. Process including a step in which a temperature modifying gas traverses a mass or stream of particulate work.
- 15** This subclass is indented under subclass 14. Process in which the operation is such that the work particles are so suspended in the gaseous current that the mixture of the gas and particles act like a liquid in forming a surface level, in flowing, and in supporting by buoyancy.
- 16** This subclass is indented under subclass 14. Process involving the separation of work particles from withdrawn treating gas.
- 17** This subclass is indented under subclass 14. Process in which the procedure includes continuously adjusting the flow of work particles or treating gas to maintain or establish steady flow conditions.
- 18** This subclass is indented under subclass 1. Process in which work is (1) moved along a path traversing zones of diverse characteristics
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 443+ for a process of drying involving gas or vapor contact with the material being dried.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclass 359 for a drying process or a residual process of contacting Solids with a gas involving fluidization of the solid material.
- 201, Distillation: Processes, Thermolytic, subclass 31 for a process of heating carbonaceous material in a fluidized bed for distillation.
- 502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, for a composition comprising a catalyst or sorbent, per se, and see especially subclasses 20+ for processes of regenerating such a composition which may use a fluidized suspension of particles in a gas.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 446+ for a process of drying by gas or vapor contact including temperature control or varying.

or a zone having an increasing or decreasing temperature along its length; or (2) has applied to it successive treatments different in kind or (3) has its temperature changed by successive or progressive heat treatments.

- 19** This subclass is indented under subclass 1. Process including a step of forming, maintaining or circulating atmosphere in a heating chamber or about work material.

SEE OR SEARCH CLASS:

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, for sintering or vitrifying of shaped bodies, particularly, subclasses 646+ or 674+ with controlling of gas composition of the heating chamber, subclasses 653+ with plural heating steps, subclasses 664+ or 667+ with specified gas pressure in the heating chamber, or subclasses 677+ with controlling or directing heated gas or exhaust within a heating chamber.

431, Combustion, subclass 8 for a combustion process involving flame shaping or distributing components in a combustion zone.

- 20** This subclass is indented under subclass 19. Process in which the heat radiation characteristics of the work atmosphere are controlled by providing an additive or adjusting combustion to produce a flame of high luminosity.

SEE OR SEARCH CLASS:

431, Combustion, for a combustion process including the feeding of a flame modifying additive.

- 21** This subclass is indented under subclass 19. Process in which the atmosphere is controlled by recycling withdrawn material back to the work zone.

SEE OR SEARCH CLASS:

431, Combustion, subclass 9 for a combustion process involving whirling, recycling material, or reversing flow in an enclosed flame zone.

- 22** This subclass is indented under subclass 19. Process in which a heating device is operated to establish a body of gas in the form of a sheet

within or forming the boundary of a heating zone.

SEE OR SEARCH THIS CLASS, SUBCLASS:

64, for a furnace chamber port or work path having a fluid curtain.

- 23** This subclass is indented under subclass 19. Process including a procedure by which a desired chemical makeup of the gaseous material surrounding the work is adjusted or established.

SEE OR SEARCH THIS CLASS, SUBCLASS:

37, for apparatus under the class definition comprising automatic control means including an analyzer or composition sensor of work, work atmosphere or exhaust gas.

- 24** This subclass is indented under subclass 19. Process including a step changing an operational parameter to produce or maintain a desired pressure in the work zone, or temperature of the work or its surrounding atmosphere.

- 25** This subclass is indented under subclass 19. Process in which the atmosphere surrounding the work is caused to reverse its direction of flow periodically or is given periodic or rhythmic pressure waves or impulses.

SEE OR SEARCH CLASS:

431, Combustion, subclass 1 for combustion bursts or flareups in pulses or in serial pattern.

- 26** This subclass is indented under subclass 19. Process in which the control of the environment is accomplished by adjusting the rate, direction, or position of feed of a component of the work atmosphere.

- 27** This subclass is indented under subclass 1. Process including a step of moving particulate heat storage material as a flowing stream.

SEE OR SEARCH THIS CLASS, SUBCLASS:

215, for apparatus in which a heat generator heats a fluent mass of solid heat

carrying or storing pebbles or particles.

SEE OR SEARCH CLASS:

- 208, Mineral Oils: Processes and Products subclass 127 for mineral oil cracking process using a suspension system of inert materials and subclasses 146+ for a process of chemical conversion of mineral oil involving solids contacting and mixing. See the collected notes of this subclass for related fields for search.

28 This subclass is indented under subclass 1. Process involving the application of heat to work in a chamber, oven, or retort in which a heat storage mass or body is used.

29 This subclass is indented under subclass 1. Process for heating fluid work or providing a high temperature fluid stream.

30 This subclass is indented under subclass 29. Process in which a body of material is caused to receive and temporarily retain sensible or latent heat.

31 This subclass is indented under subclass 1. Process for heating work by radiation or conduction or for heating a heating surface.

32 This subclass is indented under the class definition. Apparatus including structure (1) indicating a condition of the work or apparatus, (2) providing for the inspection of the work or apparatus; or (3) providing illumination.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 88 for a drier having a display, inspecting or indicating means and subclass 89 for a drier having indicating or testing means.
- 116, Signals and Indicators, subclasses 101+ for a thermally responsive alarm and subclasses 216+ for a thermally responsive indicator, per se.
- 122, Liquid Heaters and Vaporizers, subclass 504.2 for a boiler having an alarm or indicator.
- 165, Heat Exchange, subclass 11.1 for a residual heat exchange device having

- an alarm, indicator, signal, register, recorder, or test or inspection means.
- 236, Automatic Temperature and Humidity Regulation, subclass 94 for automatic control by a thermostat with an indicator or alarm.
- 340, Communications: Electrical, subclasses 500+ for electrical automatic condition responsive indicating systems.
- 374, Thermal Measuring and Testing, subclasses 100+ for a temperature measuring device, per se.
- 431, Combustion, subclasses 13+ for a combustion device having an indicator or inspection means.

33 Apparatus under subclass definition including a means mounting a work article and heat applicator for relative movement and a structure following a surface of the article or a template surface establishing the relative positions of the article and heat applicator.

SEE OR SEARCH CLASS:

- 33, Geometrical Instruments, subclasses 18.1+ for a pattern tracing subcombination.
- 228, Metal Fusion Bonding, subclass 7 for a fusion bonding apparatus in which a machine part follows a template or pattern and subclasses 25+ for a fusion bonding apparatus in which an applicator (e.g., of heat or pressure etc.) is movable along a seam during fusion.
- 266, Metallurgical Apparatus, subclasses 48+ for a metallurgical device for cutting metal by a flame including a support for proper manipulation of the cutting device.

34 This subclass is indented under the class definition. Apparatus in which an element of the apparatus is operated or controlled by engagement with a work unit, or by a holder for a work unit that is not a part of the apparatus.

SEE OR SEARCH CLASS:

- 126, Stoves and Furnaces, subclass 52 for a cooking stove using liquid or gaseous fuel, the feed valve for which is controlled by the weight of the article being heated.

- 219, Electric Heating, subclass 518 for an electrical heater the switch for which is responsive to the weight, position of presence of a body to be heated.
- 228, Metal Fusion Bonding, subclass 9 for a metal fusion bonding apparatus responsive to the presence, absence, size or other condition of the work being bonded.
- 35** This subclass is indented under the class definition. Apparatus having an element specially provided to be destroyed or consumed by breaking or fusing upon the occurrence of a selected condition or event to protect the apparatus or its surroundings by relieving an unsafe stress or shutting down the heat emitter.
- SEE OR SEARCH CLASS:
- 49, Movable or Removable Closures, subclass 3 and 4 for movable closure released or actuated by a fusible connection.
- 122, Liquid Heaters and Vaporizers, subclass 504.1 and 504.3 for a fusible type safety device in a boiler.
- 126, Stoves and Furnaces, subclass 287.5 for a stove having fusible released damper.
- 137, Fluid Handling, subclasses 72+ for a heat destructible or fusible control element in a fluid handling system of general utility.
- 169, Fire Extinguishers, subclass 42 for a fusible device adapted for use in fire extinguishing apparatus.
- 431, Combustion, subclass 21 for the control of a burner, per se, by a combustion destructible element.
- 36** This subclass is indented under the class definition. Apparatus that has a means that senses a condition or change of condition and effects a control on the apparatus.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 524+ for the automatic control of a heater supplying heat to a drier or to a gas or vapor and solid contact apparatus.
- 65, Glass Manufacturing, subclasses 160+ for the automatic control of a heater for glass manufacturing.
- 99, Foods and Beverages: Apparatus, subclasses 325+ for the automatic control of a food cooking apparatus.
- 165, Heat Exchange, subclasses 201+ for the automatic control of a combined heating and cooling system where the cooling is more than the reduction to ambient temperature of the heated material.
- 219, Electric Heating, subclasses 490+ for the automatic control of the power supply, voltage or current of an electrical heater and subclasses 509+ for an electrical heater having an automatically controlled switch.
- 236, Automatic Temperature and Humidity Regulation, appropriate subclass for an automatically operating temperature or humidity controlling mechanism actuating a broadly recited device that modifies temperature or humidity.
- 237, Heating Systems, subclasses 2+ for the automatic control of an enclosure heating system comprising a combination of heat generators or a combination of a heat generator and a heat distribution system.
- 431, Combustion, subclasses 18+ for the automatic control of a combustion device, per se.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for data processing control systems wherein the control system is claimed generically, and subclasses 207-212 for the application of a computer in the manufacturing of a product which includes heating.
- 37** This subclass is indented under subclass 36. Apparatus in which the control includes a device responsive to changes in the composition of work, of work atmosphere surrounding the work, or of exhaust material withdrawn from the work zone.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids subclass 557 for the automatic control of the humidity of the contacting gas in a drier or in gas-solid contact device.

- 165, Heat Exchange, subclasses 223+ for the automatic control of a combined heating and cooling system by a humidity sensor.
- 200, Electricity: Circuit Makers and Breakers subclass 61.03 for a smoke responsive switch.
- 236, Automatic Temperature and Humidity Regulation, subclass 44 for a control system responding to and controlling humidity.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 50+ for (a) an analytical or analytical-control device determining qualitatively or quantitatively the presence of one or more chemical constituents of a material which involves a chemical reaction or (b) combination of a test or measurement and means for regulating a chemical reaction.
- 431, Combustion, subclass 76 for the control of a burner, per se, by a means responsive to the composition of the combustion products of the burner.
- 38** This subclass is indented under subclass 36. Apparatus in which the flow of a fluid protecting the apparatus from injury, or protective structure, is controlled; or in which a means sensing the condition of such fluid or structure exerts a control.
- SEE OR SEARCH CLASS:
431, Combustion, subclass 23 for the automatic control of means protecting a component of a burner from combustion heat.
- 39** This subclass is indented under subclass 36. Apparatus in which the means responding to a sensed condition controls the operation of a system of regenerators recovering the heat of a furnace exhaust.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
28, for a process of operating a furnace utilizing a heat storage mass.
- 40** This subclass is indented under subclass 36. Apparatus effecting a control on an operating parameter of a hot blast stove, that is, of a structure comprising a combustion products generator and a mass of heat storage bricks in which the combustion products heat the bricks and the bricks after being heated heat a stream of air.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
30, for a process of heating a fluid using a heat storage mass.
- 41** This subclass is indented under subclass 36. Apparatus in which the control is of means dislodging, removing, collecting or flushing out a material undesirable at all times or at a particular time of operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
2, for a process including cleaning, purging or preventing undesirable accretion in a heating apparatus.
- SEE OR SEARCH CLASS:
431, Combustion, subclasses 29+ for a combustion device not having material heating features including a means automatically controlling a purging or scavenging arrangement.
- 42** This subclass is indented under subclass 36. Apparatus in which the control is (1) of a means establishing or adjusting the position of a heat applicator relative to the work; (2) of a cooling means that prevents overheat of the work; (3) of a protective atmosphere supply or (4) of a baffle means that shields work from a heat applicator.
- 43** This subclass is indented under subclass 36. Apparatus in which the control terminates the application of heat to a unit or batch of work by deactivating the heater, by removing the work from the heating zone, or by cooling the heating zone.
- 44** This subclass is indented under subclass 43. Apparatus in which a cooling means or cooling period timer is activated in correlation with the termination of the heating.
- 45** This subclass is indented under subclass 36. Apparatus in which the control is (1) of a means moving work into, within, or discharg-

ing it from, a zone in which it is heated or cooled or (2) by a means sensing quantity, position or movement of the work.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 33, for a heating apparatus in which an article or template follower positions a heat applicator relative to the article.
- 34, for a heating apparatus having an operating or controlling device responding to the presence or absence of a discrete work unit or removable unit holder.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 525 for a heater controlled by the tension or breaking or web or strand in a drying apparatus and subclass 560 for the automatic control of the rate of treated material motion in a dryer.
- 122, Liquid Heaters and Vaporizers, subclass 447 for cut off of fuel to a water heater responsive to the quantity of water in the heater and subclass 451.1 for the automatic control of a boiler feeder.

- 46** This subclass is indented under subclass 36. Apparatus in which the control shuts off or prevents operation of a heater upon the sensing of an unsafe condition and so disables the apparatus that external intervention is necessary to return it to an operative condition.

SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclasses 65+ for a combustion failure responsive fuel safety cut-off for a burner.
- 236, Automatic Temperature and Humidity Regulation, subclass 21 for a closed fluid heater having an automatic safety cut-out.
- 431, Combustion, subclasses 18+ for combustion devices, per se, having automatic control systems most of which are of the shut down type.

- 47** This subclass is indented under subclass 36. Apparatus in which pressure within a work chamber, either of the atmosphere of the cham-

ber or of fluid being heated, is sensed or controlled.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 24, for a process of modulating or stabilizing the temperature or pressure of the atmosphere in a heating chamber.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 558 for the automatic control of the gas or vapor pressure in a treating enclosure of a drier or of a residual gas and solid contact device.
- 165, Heat Exchange, subclasses 279+and 281+ for an automatic control responsive to or controlling the pressure in a combined heating and cooling system.
- 202, Distillation: Apparatus, subclass 160 for a separatory distillation column having an automatic temperature or pressure control means.
- 219, Electric Heating, subclass 496 for a pressure responsive control of the power supply to an electrical heater.
- 236, Automatic Temperature and Humidity Regulation, subclasses 26+ for an automatic temperature control system for a closed fluid heater that is pressure operated.
- 431, Combustion, subclass 19 for automatic control of a burner responsive to pressure in a combustion chamber.

- 48** This subclass is indented under subclass 36. Apparatus in which (1) in the feeding of inert or treating fluid is controlled or (2) the cooling, dilution, withdrawal, return, mixing, by-pass, circulation or recirculation of work chamber gas in or from a work chamber is controlled.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclass 565 for the automatic control of the flow of a treating gas or vapor in a drier or in a residual gas-solid contact device.

- 49** This subclass is indented under subclass 36. Apparatus in which heat generating structure or structure by which heat is transmitted to the work is controlled or its condition sensed.

50 This subclass is indented under the class definition. Apparatus with means supporting, cleaning or protecting a device sensing a condition of the apparatus or of the work.

51 This subclass is indented under the class definition. Apparatus in which (1) the time in which or length of time taken to perform an operation is controlled, (2) there is a fixed continuous sequential or fixed repetitive operation, or (3) there is a means terminating a single operation in a fixed position to restart an additional cycle, which cycle is more complex than a mere starting or stopping of a single device.

SEE OR SEARCH CLASS:

- 165, Heat Exchange, subclass 232; 238+ for a residual heat exchange system controlled by a time or program arrangement.
- 219, Electric Heating, subclasses 492+ for the automatic control, by a system comprising timing or cycling means, of the power supply to an electrical heating device.
- 236, Automatic Temperature and Humidity Regulation, subclass 46 for a temperature control system including a timing element, for nominally recited temperature modifier.
- 431, Combustion, subclasses 18+ for a residual combustion device, per se, controlled by a timer, programmer, retarder or condition responsive control.

52 This subclass is indented under subclass 51. Apparatus in which the means controls heating or manipulative operations on discrete work article or on a body of charge material handled as a unit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 44, for a condition responsive control discharging, or stopping the heating of, a unit or batch and including a cool-down timer or means.

53 This subclass is indented under subclass 52. Apparatus ... in which the means controls (1) a heating chamber access closure or a heater and (2) a work unit advancer or manipulator.

54 This subclass is indented under the class definition. Apparatus including a passage connected to be supplied with both a heating fluid and a fluid to be heated and flow control system for the two fluids having structure by which the flow of one fluid is controlled by the same actuator as the other fluid or is made dependent upon the actuation of the other controller.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 39, for condition responsive selection or load balancing of furnace exhaust heated regenerators.
- 40, for condition responsive control of a hot blast stove.
- 51+, for a control system for heating structure including a timing, programming or cycling means.

SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclasses 309+ for a reversing valve, per se, of the regenerative furnace type.

55 This subclass is indented under the class definition. Apparatus in which means are provided for relating various parts of the heating apparatus so that upon operation of one part another operating part is cut-off, disabled, stopped or operated.

56 This subclass is indented under subclass 55. Apparatus in which the operation of a baffle or furnace door is correlated with the operation of a device moving work within, feeding work into, or removing it from a heating zone.

57 This subclass is indented under subclass 55. Apparatus in which the operation of a means supplying, removing or circulating a heating gas (e.g., combustion product etc.) is correlated with the operation of a means moving work within, inserting it into, or providing access to a heating zone.

58 This subclass is indented under the class definition. Apparatus having means by which work is moved for scattered by the flow or pressure of heating gases, the arrangement being such that the work would not be so moved or scattered in the absence of the heating gases.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

15, for a heating process including the maintainance of a fluidized bed.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 576+ a drying or gas and vapor contact apparatus with fluid current conveying of the treated material; and subclass 640 for such apparatus in which a sheet, web, or strand is supported or guided by a fluid current.

110, Furnaces, subclasses 243+ for a refuse incinerator wherein the refuse is suspended in or supported by a fluid medium.

159, Concentrating Evaporators, subclasses 4.1+ for a device for concentrating a liquid by evaporation involving a gaseous current and a spray device.

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 79+ for a device melting and spraying solid material.

264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 12 for a process of forming solid particles from a molten mass by a gaseous jet or blast.

59 This subclass is indented under the class definition. Apparatus in which the work is in the form of a sheet, web, or strand and the apparatus flexes, coils or loops the work as it is advanced longitudinally through the apparatus.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

8, for a process including advancing a strip, strand or web longitudinally through a heating zone.

SEE OR SEARCH CLASS:

26, Textiles: Cloth Finishing, subclass 81, 92, and 106 for apparatus for expanding (e.g., stretching or spreading) a running length web of cloth and further including means for heating or drying the cloth.

34, Drying and Gas or Vapor Contact With Solids, subclasses 618+ for a drying or gas and solid contact apparatus for treating a running length of sheet, web or; and see the reference to Class 26, Textiles: Cloth Finishing, hereabove.

72, Metal Deforming, subclass 128 for a process of or apparatus for coiling or curving longitudinally moving metal with modification or control of the temperature of the work or of the machine.

60 This subclass is indented under subclass 59. Apparatus in which the longitudinally moving work is flexed over an internally heated roll member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

228, for an internally heated roll, per se.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 110+ for a rotary drum drier about which work to be dried is supported or flexed.

61 This subclass is indented under the class definition. Apparatus including structure (1) breaking up lumps formed from particulate material by the heating or (2) dividing work particles by size with recombining.

SEE OR SEARCH CLASS:

209, Classifying, Separating, and Assorting Solids, subclass 11 for a combination involving heating and classifying particulate work, except where the sole separation is a portion of the material for further heating with return of the separated portion.

241, Solid Material Comminution of Disintegration, subclass 23 for a residual combined comminuting and heat treating process; and subclasses 65+ for a comminuting apparatus having means for modifying the temperature of the work material.

62 This subclass is indented under the class definition. Apparatus (1) having a specific geos:graphic relationship, or (2) that is specifi-

cally related to but is ancillary to a nominally recited building or machine.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclass 648 for a power plant procedure including the production of withdrawable product or the use of the plant steam for external heating.
- 132, Toilet, subclass 118 for a comb having a heater.
- 184, Lubrication, subclasses 104.1+ for a lubricator having heating or cooling means.
- 219, Electric Heating, subclasses 201+ for a heater specialized to the use of electricity combined with a diverse type art device.
- 221, Article Dispensing, subclass 150 for an article dispenser having a merely nominal heating or cooling means for the article handled.
- 222, Dispensing, subclass 146.1 for a dispenser with merely nominal heating or cooling means.

- 63** This subclass is indented under subclass 62. Apparatus in which the heat generator or applicator is mounted to heat an element of an internal combustion engine.

SEE OR SEARCH CLASS:

- 123, Internal-Combustion Engines subclass 142.5 for an internal combustion engine having a heating means.

- 64** This subclass is indented under the class definition. Apparatus including structure by which a stream of fluid is directed to sweep across an opening of a heating or combustion chamber to hinder or prevent entry or discharge of gases through the opening.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclass 179 for a solid fuel furnace having a fluid screen for one of its openings.
- 454, Ventilation, subclasses 188+ for a building having a door or window provided with a fluid curtain.

- 65** This subclass is indented under the class definition. Apparatus comprising (1) a baffle mounted in front of and spaced from a furnace

door acting to shield persons or articles in front of the door from the heat of the furnace; or (2) a structure acting to collect and remove any fumes escaping from the work access area.

- 66** This subclass is indented under the class definition. Apparatus having a cooling or absorbing surface over which gaseous material in or exhausting from a work heating chamber passes to condense or absorb a component of the gaseous material.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 73+ for a drier with means treating the gas or vapor to produce condensation.
- 126, Stoves and Furnaces, subclass 381.1 and 382.1 for an open-top liquid heating vessel that may include a lid having a condenser for steam from the vessel.
- 202, Distillation: Apparatus, appropriate subclass for a material heater having means condensing evolved vapor to produce a liquid product.
- 266, Metallurgical Apparatus, subclasses 144+ for a metallurgical furnace having a fume arrester.
- 373, Industrial Electric Heating Furnaces, subclasses 56+ for an electric furnace combined with a condenser.

- 67** This subclass is indented under the class definition. Apparatus in which a work contacting heating gas has solid impurities removed from it before, during or after contact with the work.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclasses 119+ for a spark arrester for a solid fuel furnace.

- 68** This subclass is indented under subclass 67. Apparatus in which the separation of the impurities of the gas is before admittance of the gas, to or while it is within the work zone.

- 69** This subclass is indented under subclass 67. Apparatus having structure by which the separated solid material is passed from the separating means to the work chamber from which it came or to a second work heating chamber.

- 70** This subclass is indented under subclass 67. Apparatus in which the separator is positioned in a gas flow line between the work chamber and a heat exchanger fed from the work chamber.
- 71** This subclass is indented under subclass 70. Apparatus in which the separator has structure for the removal of the separated solids from the apparatus.
- 72** This subclass is indented under the class definition. Apparatus including structure for preparing heating chamber fumes for discharge by diluting them, destroying harmful vapors in them by combustion, or by purifying them by other means.
- SEE OR SEARCH CLASS:
- 60, Power Plants, subclasses 685+ for the treatment of power plant exhaust.
- 266, Metallurgical Apparatus, subclasses 144+ for a metallurgical furnace having an arrester for metallurgical fume.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 198+ for apparatus for purifying a gas by combustion.
- 73** This subclass is indented under the class definition. Apparatus in which structure that generates and supplies combustion material to, or by which combustion products are exhausted from work chamber are mounted on a handling means providing for movement between an operative position and a removed position leaving an opening providing access to the structure or work chamber.
- 74** This subclass is indented under the class definition. Apparatus combined with means catching, directing or collecting work atmosphere; work or apparatus material; or combustion products that have become waster or undesirable material by escaping from a normal confining or directing part of the apparatus.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclass 85 for a drier or gas and vapor contact with solids
- 431, apparatus having an apparatus cleaner or escaping material collector.
- 431, Combustion, subclass 119 for a residual combustion device having drip or leakage collecting structure.
- 75** This subclass is indented under the class definition. Apparatus having a device to render the heating apparatus or parts thereof free from undesirable material.
- (1) Note. Cleaning means for this subclass requires the installation of additional means or connections to treat the apparatus, not the material being handled, or the manipulation of the system in some special way to secure the cleaning effect.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 2, for a process of heater operation including a step of apparatus purging, cleaning or accretion preventing.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclass 85 for a drier including structure for cleaning the drier.
- 431, Combustion, subclass 121 for a residual combustion device including an apparatus cleaner.
- 76** This subclass is indented under the class definition. Apparatus including means, other than the parts making up the heater and securing them in operative relationship, which means aids in the assembly or disassembly, or restores or aids in restoring the apparatus to its former condition after injury or decay.
- 77** This subclass is indented under the class definition. Apparatus combined with a means by which the heated material is cooled during or after heating.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 62+ for a drier having means cooling the dried material.

- 65, Glass Manufacturing, subclasses 349+ for glass annealing or tempering apparatus including heating and cooling means.
- 165, Heat Exchange, subclasses 61+ for (1) a temperature control system that will both heat and cool a room or chamber (2) a system in which heat is added to and removed from a fluid stream, and (3) a residual combination of a heater and a cooling means in which the cooler does more than merely lower the temperature of heated work toward ambient temperature.
- 198, Conveyors: Power-Driven, appropriate subclass for a cooling bed in which a bar of metal is conveyed while cooling.
- 78** This subclass is indented under subclass 77. Apparatus in which the heat removed from the work is transferred to air on its way to a burner of the work heating apparatus.
- 79** This subclass is indented under subclass 78. Apparatus in which the contact structure is a section of a furnace traversed by work fed at the top and moved by gravity to a discharge at the bottom, said section receiving work from a section of the furnace heating work by combustion of fuel therein and being traversed by air passing through the work in the section and entering the combustion zone.
- 80** This subclass is indented under subclass 78. Apparatus in which the work being cooled is caused to move relative to adjacent work or randomly for better exposure.
- 81** This subclass is indented under subclass 74. Apparatus including a chamber and means by which heat is supplied to the chamber and also means by which heat is removed from the chamber, the two means being optionally usable.
- 82** This subclass is indented under subclass 77. Apparatus including means by which heat removed from the work during cool-down is transferred to work being supplied.
- 83** This subclass is indented under subclass 77. Apparatus in which there is a solid barrier through which heat passes holding the work or work atmosphere separate from the cooling medium.
- 84** This subclass is indented under subclass 83. Apparatus in which the cooling medium held separate from the work in the work cool-down zone is oxidizer or fuel on its way to a work heating combustion device.
- 85** This subclass is indented under subclass 77. Apparatus in which the work is cooled down by a liquid sprayed on it or in which it is immersed.
- SEE OR SEARCH CLASS:
266, Metallurgical Apparatus, subclass 111 and 114 apparatus, for the metallurgical treatment of solid metal by heat and liquid.
- 86** This subclass is indented under the class definition. Apparatus with structure receiving treated work that is more than the structure necessary to simply clear the heating apparatus to receive additional work material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
77+, for apparatus in which the means receiving the work discharged from the heating zone is a work cooling device.
- 87** Apparatus under class the definition including structure moving work to a heating zone that is more than is necessary to simply charge the apparatus.
- 88** This subclass is indented under the class definition. Apparatus comprising a heating assembly (i.e., work holder and heat source) carried by wheel, skid or handle means.
- SEE OR SEARCH CLASS:
126, Stoves and Furnaces, subclass 261 for a lunch wagon; subclass 271.1 for a heating device mounted to be moved over a surface to heat the surface; and subclasses 401+ for a handled, self-heated, heating or burning tool.

- 219, Electric Heating, subclasses 227+ for a hand manipulative electrical heating tool or instrument and subclasses 386+ for a portable or mobile electrically heated device including a container or support for the heater material.
- 431, Combustion, subclass 345 for a residual burner having an attached handle.
- 89** This subclass is indented under the class definition. Apparatus including means whereby a mode or condition of operation or use can be changed by shifting or rearranging all or some of the parts in a different relationship to each other or by addition or omission of a part.
- (1) Note. The mode of operation is not considered to be changed by the operation of a selector or reversing valve means acting in its intended manner to select the direction of flow in a work chamber.
- 90** This subclass is indented under the class definition. Apparatus including a chamber in which heat is applied to work and an associated structure in which vapor is generated from a liquid by the application of heat.
- SEE OR SEARCH CLASS:
- 122, Liquid Heaters and Vaporizers, subclass 7 for a nominal material heating furnace and a closed water chamber or conduit located so as to be heated by the waste heat of the furnace.
- 91** This subclass is indented under subclass 90. Apparatus including structure by which vapor from the boiler is discharged against or passed in heat transferring relationship to the work in the chamber.
- 92** This subclass is indented under the class definition. Apparatus having in combination with the basic heating structure, additional structure; said additional structure (1) having a function other than the application of heat to material, or (2) serving to perfect the basic heating structure as a whole for its intended purpose.
- (1) Note. Basic heating structure includes means holding or manipulating the work during heating, means for feeding work into a heating chamber, and means for returning escaping heat to the heating zone.
- (2) Note. The additional structure required by this definition must be added to the basic heating structure elements. A detail of an essential element that perfects the element rather than the combination is classified below. For example, a heating apparatus element having protective cooling structure in classified in subclasses 233+ and a heating chamber structure having expansion relieving or absorbing means is classified in subclass 251.
- 93** This subclass is indented under the class definition. Apparatus including a work heating enclosure and a structure outside of the chamber for holding and heating unenclosed work.
- SEE OR SEARCH CLASS:
- 126, Stoves and Furnaces, subclasses 1+ for a domestic type cooking stove.
- 219, Electric Heating, subclass 392 for an electrical heating device comprising an oven and a distinct container or support for material to be heated.
- 94** This subclass is indented under the class definition. Apparatus having (1) two distinctly different types of heat generators, (2) a heat generator and a source of heat that is not a generator or (3) a combustion type heat generating means using two different fuels.
- SEE OR SEARCH CLASS:
- 110, Furnaces, subclasses 260+ for a residual combustion device burning gas or oil and solid fuel.
- 126, Stoves and Furnaces, subclass 36 for a combined solid fuel and gaseous and liquid fuel domestic type cooking stove; and subclass 369.1 for a steam box for cooking food products including means for utilizing a second heating fluid other than steam, for heating material.
- 373, Industrial Electric Heating Furnaces, subclasses 1+ for a furnace using a combination of electricity and some other heating medium adapted for operation or granular material such as

- ore, or for handling molten material fusing at a very high temperature.
- 392, Electric Resistance Heating Devices, subclasses 307+ for a residual electrical heating device combined with at least one other heat source of a non-electrical nature.
- 95** This subclass is indented under the class definition. Apparatus comprising a chamber having a substantially vertical axis to which material is fed at an elevated level for gravitation generally downwardly across a heating surface or through a heating gas.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 165+ for a gravity flow type drier. See the search class note to Class 34 in the class definition of Class 432 for the line between Classes 34 and 432.
- 202, Distillation: Apparatus, subclasses 120+ for a vertical retort in which a material is heated to drive off a condensible component.
- 266, Metallurgical Apparatus, subclass 154 for a metallurgical shaft furnace having a fume arrester and subclasses for a 197+ metallurgical shaft furnace. See the search class notes in the class definition of Class 432 for the line between Classes 266 and 432.
- 96** This subclass is indented under subclass 95. Apparatus in which the work is heated by combustion products formed by the burning of material within the work chamber or by combustion products produced externally and fed into the chamber.
- 97** This subclass is indented under subclass 96. Apparatus comprising a grid, baffle or restricted passage means in the vertically extending work chamber, the means serving to act to restrict the downward movement of the solid work but permitting the passage of melted material.
- 98** This subclass is indented under subclass 96. Apparatus including a material moving member within, or at the chamber outlet for loosening the material for flow or for causing movement of the material from the chamber.
- SEE OR SEARCH CLASS:
- 48, Gas: Heating and Illuminating, subclass 85.2 for a vertical heating chamber for generating heating or illuminating gas having stirring means for the heated material.
- 99** This subclass is indented under subclass 96. Apparatus in which combustion materials are introduced into the work material through ports spaced vertically along the work chamber.
- SEE OR SEARCH CLASS:
- 110, Furnaces, subclasses 297+ for a mere conventional shaft type furnace with means for feeding air thereto.
- 100** This subclass is indented under subclass 96. Apparatus in which the work chamber has a work material supply port distinct from the opening through which the combustion products and any heat generated fumes are discharged.
- 101** This subclass is indented under subclass 96. Apparatus in which the combustion products that contact the work in the work chamber are produced in a chamber distinct from the work chamber.
- 102** This subclass is indented under subclass 95. Apparatus including a heating surface in the form of a tube or flue located within the chamber and across which the work flows.
- 103** This subclass is indented under the class definition. Apparatus comprising a work containing chamber structure mounted for rotation about a horizontal or slightly inclined axis, the rotation of the chamber structure imparting a tumbling motion to the work.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 108+ for a rotary drier or gas or vapor contact with solids apparatus. See the search notes in Class 432 for the line between Classes 34 and 432.
- 110, Furnaces, subclass 246 for a refuse incinerator comprising a rotary drum.
- 165, Heat Exchange, subclass 89 for a heat exchange comprising a rotary drum.

- 202, Distillation: Apparatus, subclass 100 for a directly, and subclass 136 for an indirectly heated rotary chamber or retort used for producing a condensable material from solid work.
- 219, Electric Heating, subclass 389 for an electrically heated revolving container.
- 248, Supports, subclass 130 for a stand for a movable receptacle rotating about a horizontal axis.
- 266, Metallurgical Apparatus, subclass 145 for a rotary metallurgical furnace with a fume arrester, and subclasses 163, 173 and 213 for metallurgical furnaces of the rotary drum type.
- 366, Agitating, subclasses 220+ for an agitator, per se, comprising a rotatable mixing chamber.
- 373, Industrial Electric Heating Furnaces, subclass 84 and 85+ for a tilting or rotating electrical arc furnace.
- 384, Bearings, subclass 549 for an antifriction bearing for a rotary drum.
- 104** This subclass is indented under subclass 103. Apparatus including means for engaging the top or rim of a stove hole of a domestic cooking stove for supporting the drum on the stove.
- 105** This subclass is indented under subclass 103. Apparatus having structure by which combustion products are generated within the work chamber or by which externally generated combustion products are fed into the chamber.
- 106** This subclass is indented under subclass 105. Apparatus in which (1) the drum includes two distinct chambers connected to provide for serial flow of work material or (2) the drum has connected thereto a separate chamber that received work from or feeds it to the drum chamber.
- 107** This subclass is indented under subclass 105. Apparatus in which the exterior surface of the drum is heated or in which there is a flue extending through the work space of the drum that conducts a hot material in indirect heat exchanging relationship with work material within the drum.
- 108** This subclass is indented under subclass 105. Apparatus having a structural feature providing for continuous movement of the work material from the inlet of the drum toward and through the drum outlet.
- 109** This subclass is indented under subclass 108. Apparatus with structure feeding a combustion material or a material that reacts with the work at zones spaced axially along the drum structure.
- 110** This subclass is indented under subclass 108. Apparatus including structure that provides (1) for different rates of heating of the work at different zones as it moves along the drum or (2) for different rates of movement of the material along the drum.
- 111** This subclass is indented under subclass 108. Apparatus in which the work material and combustion products move from drum end to drum end in opposite directions.
- 112** This subclass is indented under subclass 103. Apparatus in which the work carried by the drum receives heat by contact with a heated drum surface or by radiation from a heat radiating solid structure.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor With Solids, subclass 140, 141, and 142 for a rotary tumbler drum type drier having a broadly recited indirect heating means.
- 113** This subclass is indented under subclass 112. Apparatus comprising structure for feeding gaseous material into or removing it from the work chamber of the drum.
- 114** This subclass is indented under subclass 112. Apparatus including a heat emitting conduit passing through the work space of the chamber of the structure or through or along the cylindrical structure of the drum.
- 115** This subclass is indented under subclass 103. Apparatus having a stationary member and a rotary drum and including a means preventing or controlling dilution or escape of the drum atmosphere of their junction, the means being a

- flexible or cooler seal or an air curtain type flow controller.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
64, for a fluid curtain at a work chamber port or work path.
- SEE OR SEARCH CLASS:
277, Seal for a Joint or Juncture, for a generic sealing means or process, cross-reference art collection 903 seal for a rotating kiln or drum or cross-reference art collection 930 for a seal including a heating or cooling feature.
285, Pipe Joints or Couplings, appropriate subclass for a seal, per se, for a tubular structure.
- 116** This subclass is indented under subclass 103. Apparatus including structure protecting an element of the drum device from heat damage by cooling the element.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
115, for a cooler seal in a rotary tumbler drum device.
- 117** This subclass is indented under subclass 103. Apparatus including structure by which work, combustion material, inert gas or a treating agent is fed to the rotary drum.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclasses 130+ for a tumbler drum drier with gas or vapor flow means; and subclass 142 for a tumbler drum drier of the axial material feed type.
- 118** This subclass is indented under subclass 103. Apparatus in which the drum comprises structure effective to act on the work while within the drum to stir or advance it.
- SEE OR SEARCH CLASS:
366, Agitating, subclass 224 for a stirrer, and subclasses 225+ for a deflector in a rotatable mixing chamber.
- 119** This subclass is indented under subclass 103. Apparatus in which the drum comprises an outer cylindrical member and an inner layer made up of ceramic modules.
- 120** This subclass is indented under the class definition. Apparatus including (1) a chamber for containing work to be heated and (2) a source of heat heating the work.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
219+, for residual apparatus for heating liquid or gaseous work in a flowing stream.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclasses 201+ for a drier comprising a house, kiln, or container. See the search class notes in the class definition for the line between Classes 34 and 432.
126, Stove and Furnaces, subclasses 19 through 22 for a cooking stove having an oven, subclass 343.5 for a melting furnace, or subclasses 344-363.1 for a liquid heater that may include a kettle, a steam generator, stove pipe for use with a stove, a domestic water heater or boiler (e.g., kitchen boiler, range boiler, etc.) for use with a stove or furnace.
219, Electric Heating, subclasses 385+ for specific electrical heating structure heating work in or on a container, enclosure, or support.
237, Heating Systems, appropriate subclass, for a system for heating a room, house or other enclosing structure including combinations of two or more heat generators or a heat generator combined with a system for distributing the heat.
249, Static Molds, subclass 78 and 79+ for a material shaping mold having heating means.
- 121** This subclass is indented under subclass 120. Apparatus including (1) mechanism which carries or moves or stirs work material in bulk or as a unit or (2) structure by which work is directed, guided, or otherwise caused to move

- progressively through or along different sections of a heating chamber.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
162, for an unmechanized shelf, rack or tray on a guide or pivot carrying work into a heating chamber but not progressing it therein.
- SEE OR SEARCH CLASS:
99, Foods and Beverages: Apparatus, subclasses 360+ for an oven specialized to cooking food having a conveyor for the food.
- 122** This subclass is indented under subclass 121. Apparatus having means for handling or manipulating a distinct individual work unit as an entity to segregate it from other units, change its orientation, or position it within the chamber to present diverse areas of the article to diverse heating effects.
- 123** This subclass is indented under subclass 122. Apparatus in which a handling means outside of the heating chamber carries a distinct article so that one part of the article is outside of the chamber and an end or edge of the article is within the chamber.
- 124** This subclass is indented under subclass 122. Apparatus including structure by which the movement of the article produces a rotation of the article about its axis or a change of the angle of the axis of the article relative to the axis of the chamber.
- 125** This subclass is indented under subclass 122. Apparatus including a substantially vertical work path in which the individual articles rest upon each other to form a stack, the articles being supplied to, removed from, or advanced along the stack by a pushing device.
- 126** This subclass is indented under subclass 122. Apparatus in which work articles are arranged in alignment along a path and a pushing device moves the column of articles along the path in alignment.
- 127** This subclass is indented under subclass 126. Apparatus including means to overcome any unevenness of the heating of the article produced by the shielding effect of the article support upon which the article slides.
- 128** This subclass is indented under subclass 121. Apparatus in which work progresses through two distinct chambers.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclass 180 for a drier having plural units each comprising a stationary receptacle or tube with an agitator or conveyor and subclasses 203+ for a housing with conveyors providing plural zigzag treated material paths.
99, Foods and Beverages: Apparatus, subclasses 351+ for a filled receptacle type of food cooking apparatus having successive treating zones or units.
- 129** This subclass is indented under subclass 128. Apparatus in which the chambers are formed by vertically spaced substantially horizontal shelves or troughs and the work follows a downward path, dropping from chamber to chamber.
- SEE OR SEARCH CLASS:
34, Drying and Gas Vapor Contact With Solids, subclass 178 for a shelf or zigzag treated material flow type of drier.
- 130** This subclass is indented under subclass 129. Apparatus including structure by which combustion products are fed to the work path or fuel is fed to the path for combustion therein.
- 131** This subclass is indented under subclass 130. Apparatus comprising horizontal annular shelves having a common vertical axis and a rotary shaft at the axis having a work pushing arm arranged to sweep a shelf.
- 132** This subclass is indented under subclass 129. Apparatus in which a shelf or trough transfers heat to the work indirectly by conduction from heat supplied to the shelf or trough.
- 133** This subclass is indented under subclass 128. Apparatus including structure supplying combustion products to the work path or supplying fuel for combustion therein.

- 134** This subclass is indented under subclass 121. Apparatus having structure by which work is acted upon by vibrating or jarring means to agitate it or to cause it to advance along the path of travel.
- SEE OR SEARCH CLASS:
 34, Drying and Gas or Vapor Contact With Solids, subclass 164 for a drier of the treated material vibrating type.
 198, Conveyors: Power-Driven, subclass 521, 533, 594+, 609, and 752.1 for a vibrating trough conveyor, per se.
- 135** This subclass is indented under subclass 121. Apparatus in which the work within the chamber receives heat indirectly from a heating surface movably mounted to pass through or across the work or to support and carry the work.
- SEE OR SEARCH CLASS:
 159, Concentrating Evaporators, subclasses 25.1+ for a concentrating evaporator having a closed chamber in which the fluid being concentrated is heated by a rotatable agitator or coil.
 165, Heat Exchange, subclasses 86+ for a heat exchanger including a movable heating or cooling surface.
- 136** This subclass is indented under subclass 121. Apparatus including structure by which combustion products are admitted to or formed within the work chamber.
- 137** This subclass is indented under subclass 136. Apparatus in which the work moving device is a work supporting section of the bottom wall of the work chamber, said section of the chamber wall being mounted for movement relative to the rest of the chamber on an axle or guide means outside of the heated work chamber.
- 138** This subclass is indented under subclass 137. Apparatus in which the floor section is carried for movement about a vertical axis.
- 139** This subclass is indented under subclass 136. Apparatus including a blade or plough mounted for movement through or against par-
- ticulate work to advance the work or change the interrelationship of the particles.
- SEE OR SEARCH CLASS:
 110, Furnaces, subclasses 225+ for a multiple hearth dryer provided in a refuse incinerator.
 366, Agitating, subclasses 241+ for an agitator having a stationary mixing chamber and a movable stirrer.
- 140** This subclass is indented under subclass 139. Apparatus in which the blade or plough is carried or moved by an endless belt, rope or chain.
- 141** This subclass is indented under subclass 136. Apparatus in which the work is progressed through the work chamber on a carrying structure mounted for rotation about a central axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 162, for a work chamber having shelf or rack on a guide or pivot that is manually operated and serves merely to position work within the chamber.
- 142** This subclass is indented under subclass 141. Apparatus wherein the work support is a horizontal platform mounted for rotation about a vertical axis.
- 143** This subclass is indented under subclass 136. Apparatus in which the chamber means includes a distinct work inlet opening, a distinct outlet opening, and structure moving work from the inlet to the outlet or defining a path directing or guiding work for such movement.
- 144** This subclass is indented under subclass 143. Apparatus including structure by which heating gases are withdrawn from the work path and readmitted to the path at a different point.
- 145** This subclass is indented under subclass 144. Apparatus in which the flow is caused (1) by a plurality of mechanical gas movers discharging the gas at points spaced along the path of travel of the work or (2) by a mechanical gas mover feeding a distributor discharging at regions spaced along the path of travel of the work.

- 146** This subclass is indented under subclass 143. Apparatus in which fuel is fed into the work path at points spaced along the path for combustion in the path.
- 147** This subclass is indented under subclass 146. Apparatus in which the burner includes structure in the path of flame that, by its mass, conductivity and composition, is particularly adapted to discharge radiant energy toward the work path when heated.
- 148** This subclass is indented under subclass 143. Apparatus having (1) a closed combustion products conduit exposed to the path; (2) a baffle guiding the combustion products or shielding work; or (3) a distinct heat radiating structure adjacent the path.
- 149** This subclass is indented under subclass 143. Apparatus in which a combustion product or a combustion feed material is discharged into the work path from a plurality of ports spaced longitudinally along the path.
- 150** This subclass is indented under subclass 143. Apparatus in which combustion products are withdrawn from the work path through a plurality of distinct ports.
- 151** This subclass is indented under subclass 121. Apparatus including means for stirring a batch of material in a closed bottomed, liquid-tight vessel to which access is had from the top and to which heat is applied externally.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 179+ for a drier comprising a stationary receptacle or tube with agitator or conveyor.
- 159, Concentrating Evaporators, subclass 33 for an open pan having a rake means for evaporating a liquid for the specific purpose of concentrating it.
- 165, Heat Exchange, subclass 109.1 for a heat exchange structure having agitating or stirring means that is equally adapted to heat or to cool the agitated or stirred material.
- 366, Agitating, subclass 149 for a mixing chamber having a heating jacket.
- 152** This subclass is indented under subclass 121. Apparatus including an element or distinct structure by which the atmosphere of the work space is supplied, removed or circulated.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 181+ for a drier having a stationary receptacle with a conveyor and structure providing for flow or gas or vapor in contact with the treated material.
- 153** This subclass is indented under subclass 121. Apparatus having means by which the work itself or its carrier is caused to slide directly on a heat emitting surface of the work chamber.
- 154** This subclass is indented under subclass 153. Apparatus in which there is a pitched blade rotatable about an axis extending along the heated surface for sliding work along the surface.
- 155** This subclass is indented under subclass 121. Apparatus in which the heat emitting surface is heated by tortuous, branched or multiple combustion product flue means.
- 156** This subclass is indented under subclass 120. Apparatus in which the heating chamber includes structure specializing it to the reception and positioning of a removable pot or crucible.
- 157** This subclass is indented under subclass 156. Apparatus in which the furnace is mounted on supports providing for tilting or rocking movement to pour out the contents of the crucible or pot.
- 158** This subclass is indented under subclass 156. Apparatus in which the pot or crucible positioning structure is in the form of a pedestal surrounded by an annular chamber into which combustion material is admitted for burning therein.
- 159** This subclass is indented under subclass 120. Apparatus in which fuel and oxidizer react within the work chamber to produce heat or in which a combustion device produces hot gases that are fed into the work chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 96+, for a gravity flow shaft type furnace having combustion products generated in or fed to the shaft.
- 105+, for a tumbler type rotary drum furnace having combustion products generated in or fed to the drum.
- 136+, for apparatus having combustion products generated in or fed to a work chamber that also includes means by which work is progressed or moved mechanically in the chamber.

SEE OR SEARCH CLASS:

- 110, Furnaces, appropriate subclasses for a furnace in which solid material is burned.
- 431, Combustion, subclasses 159+ for a fluid fuel disperser installed in a chamber not having a work related feature.

- 160** This subclass is indented under subclass 159. Apparatus in which the furnace as a whole or its structure retaining a pourable material is mounted so that the furnace contents may be discharged over an upper edge by tilting.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 157, for a furnace specially adapted to receive a removable pot or crucible mounted to discharge the contents of the pot or receptacle by tilting.

SEE OR SEARCH CLASS:

- 266, Metallurgical Apparatus, subclasses 243+ for a converter for treating molten metal comprising a crucible or pot having tilting or other rotating movement.

- 161** This subclass is indented under subclass 159. Apparatus in which means are provided (1) for separating melted from unmelted solid work material, (2) for retaining all or part of the melt after removal thereof from the unmelted solid or (3) for directing flow of such melted work material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 97, for a gravity flow shaft type furnace having a flow controller restraining solid and passing melt.

SEE OR SEARCH CLASS:

- 266, Metallurgical Apparatus, subclasses 200+ a heating furnace modified in its structure to adapt it to the collection of flow of molten metalliferous material.

- 162** This subclass is indented under subclass 159. Apparatus in which work is supported by a shelf, tray, or rack mounted for movement on guide or pivot means or in which the work chamber is mounted on a guide or pivot means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 141, for a rotability mounted work carrier that moves the work mechanically or progresses it from zone to zone during heating.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 184+ for a drier having a rotary or swinging carrier or rack and subclasses 192+ for a drier of the removable shelf or tray type.
- 126, Stoves and Furnaces, subclass 338 for a rotary shelf or rack for a cooking oven and subclasses 339+ for a sliding shelf or rack for a cooking oven.

- 163** This subclass is indented under subclass 159. Apparatus including means forming two distinct work chambers that are parts of the same material heating apparatus.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 106, for plural distinct serially connected work chambers, one of which is of the rotary drum tumbler type; and subclasses 128+ for plural distinct chambers having means for progressing work or moving it mechanically.

- 164** This subclass is indented under subclass 163. Apparatus in which the two work chambers form a common flow path for the combustion products generated in or supplied to the apparatus, the products passing first through one and then through the other of the chambers.
- 165** This subclass is indented under subclass 164. Apparatus including a regenerator type heat exchanger connected in line with the serial connected work chambers.
- 166** This subclass is indented under subclass 164. Apparatus in which the plurality of chambers exist as separate structures.
- 167** This subclass is indented under subclass 164. Apparatus in which a dividing wall common to adjacent chambers is destructible or removable.
- 168** This subclass is indented under subclass 164. Apparatus in which one work chamber has opening in the floor for passage of the combustion products to or from another work chamber.
- 169** This subclass is indented under subclass 164. Apparatus in which an opening through a common wall forms a passage for combustion products.
- 170** This subclass is indented under subclass 164. Apparatus in which the structure has a flue or header to which the structurally related work chambers may be connected by branch flues to provide for selective parallel or serial connection.
- 171** This subclass is indented under subclass 163. Apparatus in which the two chambers are substantially noncommunicating and contain or are supplied with gases of distinctly different chemical compositions as work chamber atmospheres.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
18, for a process of heating or heater operation, including passing work through diverse or temperature graduated treating zones.
- 172** This subclass is indented under subclass 163. Apparatus in which the two chambers are fed with combustion products from a common combustion product generator.
- 173** This subclass is indented under subclass 159. Apparatus in which a conduit, passage, or other structure by which combustion material for heating the chamber is fed to, or removed from, a heating chamber is protected from damage by a cooling means.
- SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, subclass 6.5 and 6.7+ for a cooling device for a gas or air port of a nominal furnace comprising a closed chamber or conduit for water.
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 132.3 for a spray nozzle not specialized to combustion cooled by a heat exchange fluid.
431, Combustion, subclass 160 for a combustion chamber having no work material handling feature in which combustion material feed structure is cooled by a fluid additional to the combustion materials.
- 174** This subclass is indented under subclass 159. Apparatus including a flue by which combustion products by-pass the work chamber or exchange heat indirectly with the atmosphere of the work chamber and which are discharged outside of the work chamber.
- 175** This subclass is indented under subclass 159. Apparatus in which a chamber wall is permeated or swept by fuel or oxidizer and combustion takes place on the surface of the wall to cause the wall to become a glowing, heat radiating surface.
- SEE OR SEARCH CLASS:
126, Stoves and Furnaces, subclass 92 for a direct heat radiating heating stove including an incandescent fire grate heated by gaseous or liquid fuel.
431, Combustion, subclasses 326+ for a porous radiant surface burner, per se; and subclasses 347+ for a burner, per se, having an incandescing or reflecting component.

- 176 This subclass is indented under subclass 159. Apparatus including means by which a portion of the heating gas passing from the work zone of the work chamber is delivered back into the work zone or into combustion material being fed to the chamber.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
21, for a process of controlling the flame position or work atmosphere of a heating apparatus including recycling the work atmosphere; and subclasses 144+ for a work chamber having means circulating work atmosphere along or across a path of travel of work from a work inlet to a work outlet.
- SEE OR SEARCH CLASS:
110, Furnaces, subclasses 203+ for refuse incinerators or solid fuel furnaces provided with exhaust gas recirculation means.
- 177 This subclass is indented under subclass 159. Apparatus in which an exhaust flue from the work chamber is within or in heat exchanging relationship with a wall of the work chamber to transfer heat therewith.
- 178 This subclass is indented under subclass 159. Apparatus in which combustion feed moving toward the work chamber receives heat indirectly through a wall of the work chamber.
- SEE OR SEARCH CLASS:
431, Combustion, subclass 161 for a combustion chamber not specialized to the heating of materials in which the heat of the chamber heats the chamber feed.
- 179 This subclass is indented under subclass 159. Apparatus including structure in which the gaseous material exhausted from the work chamber transfer heat to combustion material being fed to the chamber.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
70, for a means between the work chamber and the heat exchanger separating
- solid particles or slag from the exhausting work chamber gas.
- 180 This subclass is indented under subclass 179. Apparatus utilizing a heat storage mass that alternately receives heat from chamber exhaust gases and later discharges the stored heat to combustion feed material.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
28, for a process of operating a furnace using a heat storage mass.
39, for the automatic control of the selection or load balancing of furnace exhaust heated regenerators.
54, for a controller alternating the flow of heated and heating fluid.
165, for plural work chambers serially connected for flow of combustion products and having a serially connected regenerator.
- SEE OR SEARCH CLASS:
165, Heat Exchange, subclasses 4+ for a regenerative type heat exchanger, per se.
- 181 This subclass is indented under subclass 180. Apparatus in which the discharge from the chamber occurs successively or alternately from spaced exhaust ports and to spaced heat storage masses.
- 182 This subclass is indented under subclass 181. Apparatus in which the combustion feed material heated by the regenerator is fuel.
- 183 This subclass is indented under subclass 159. Apparatus in which the work chamber conforms in shape to an annular article and also has article conforming product supply or distribution structure.
- 184 This subclass is indented under subclass 159. Apparatus including structure forming an enclosure having one or more openings or an open front through which an article is partially inserted to project into the enclosure to be heated by combustion products.

- SEE OR SEARCH CLASS:
34, Drying and Gas Vapor Contact With Solids, subclass 202 for drying apparatus of the article inserted type.
- 185** This subclass is indented under subclass 159. Apparatus comprising a cabinet having a combustion products generator in its lower interior with a combustion product previous divider thereabove defining separate work and burner chambers in the cabinet.
- 186** This subclass is indented under subclass 159. Apparatus in which combustion takes place in a chamber distinct from the work chamber and the combustion products pass from the combustion chamber into the work chamber.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclasses 218+ for a house, kiln or container with gas or vapor circulation for contact with the treated material. The gas may be combustion products. However, the combination including a specific combustion product generator is in Class 432.
- 187** This subclass is indented under subclass 186. Apparatus including a line or opening feeding a material to the combustion products to form a diluted mixture in the work chamber.
- 188** This subclass is indented under subclass 186. Apparatus in which (1) a wall common to the two chambers conducts heat from the combustion to the work chamber; or (2) a flue conducting the combustion products between the two chambers includes a section indirectly heating the work chamber.
- 189** This subclass is indented under subclass 186. Apparatus in which combustion air is forced into the combustion chamber by a pump or a steam jet.
- 190** This subclass is indented under subclass 186. Apparatus comprising means causing the products of combustion to flow both upwardly and downwardly in the work chamber either alternately, or simultaneously during work treatment.
- 191** This subclass is indented under subclass 186. Apparatus comprising two combustion chambers feeding combustion products to a single work chamber.
- 192** This subclass is indented under subclass 186. Apparatus in which a surface of the work chamber has a plurality of openings or passages over a substantial portion of its area so that the combustion products enter or leave the chamber over essentially the entire area of the surface.
- 193** This subclass is indented under subclass 159. Apparatus in which work atmosphere is withdrawn from the work chamber through plural ports spaced from each other.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
192, for a work chamber fed by a distinct combustion chamber, the supply or exhaust from the work chamber being through a wall floor or roof having multiple perforations.
- 194** This subclass is indented under subclass 159. Apparatus including a structure within the work chamber (1) supporting work, (2) directing the flow of combustion products within the work chamber, or (3) shielding work or an apparatus element within the chamber from radiant heat.
- 195** This subclass is indented under subclass 159. Apparatus in which the charge rests on the bottom of the furnace and is heated by hot gases passing over it; the bottom of the furnace serving to collect or hold molten material.
- 196** This subclass is indented under subclass 159. Apparatus in which fuel that burns within the work chamber or the air supporting combustion within the work chamber, is fed into the chamber at plural distinct points spaced from each other.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
146+, for plural burners longitudinally spaced along a work path; subclass 149 for combustion material supply ports spaced along a work path; and

- subclass 150 for spaced combustion product exhaust ports spaced along a work path.
- 197** This subclass is indented under subclass 120. Apparatus including a liquid or fluent heat transfer medium within the work chamber and forming a part of the apparatus.
- 198** This subclass is indented under subclass 120. Apparatus including structure by which a material of a different composition than atmospheric air is admitted to the work chamber.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 23, for a process of establishing or maintaining the composition of the atmosphere bathing work being heated.
- 37, for an automatic control responsive to a sensor of the composition of the work or work atmosphere; and 159+, for a work chamber in which the work is heated by contact with combustion products.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 516+ for a residual gas or vapor and solid contact process utilizing a special gas or vapor contact with a solid apparatus with means to treat the gas or vapor.
- 312, Supports: Cabinet Structure, subclasses 31+ for a residual cabinet having means to treat material with gas or vapor.
- 199** This subclass is indented under subclass 120. Apparatus including a device utilizing mechanical or kinetic energy to move the atmosphere in the work chamber in a flow pattern providing for the return of some of the atmosphere to repeat its transversal of the work.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 21, for a process of heater operation including recycling of the work atmosphere.
- 144+, for apparatus having structure recirculating combustion products along a work path extending through a work chamber.
- 152, for a work chamber having a means by which work is moved and a means providing for distinct atmosphere supply, removal or recirculation structure.
- 176, for a work chamber heating work by combustion products having an exhaust return passage or recirculating fan or jet.
- 200** This subclass is indented under subclass 120. Apparatus including an element or structure by which atmosphere of the work chamber is vented or admitted.
- 201** This subclass is indented under subclass 200. Apparatus in which air drawn from the atmosphere enters, passes through or across the work in the work chamber and discharges as a flowing stream.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 218+ for a gas-solid contact house, chamber or kiln having gas or vapor circulation. The gas or vapor may be heated by a nominal heater; however, a specific combustion type heater in this combination makes it classifiable in Class 432.
- 202** This subclass is indented under subclass 201. Apparatus in which the traversed work is in contact with a surface acting to heat the work indirectly or is exposed to an internally heated radiating surface.
- 203** This subclass is indented under subclass 201. Apparatus in which the air stream is caused to flow by a mechanical, electrical or jet pump.
- 204** This subclass is indented under subclass 201. Apparatus in which the work traversed by the flowing air is carried by a movable or removably mounted tray or drawer.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclass 197 for a drier of the removable shelf or tray type having gas or vapor circulation for contact with the work and having a heater.

- 205** This subclass is indented under subclass 200. Apparatus providing for the supply, removal, or maintenance of work atmosphere to establish a pressure in the work chamber substantially greater or less than atmospheric pressure.
- SEE OR SEARCH CLASS:
 34, Drying and Gas or Vapor Contact With Solids, subclass 92 for a drier treating material in a vacuum chamber.
 373, Industrial Electric Heating Furnaces, subclass 54, 63, 110+, and 140+ for an electric furnace in which the material is heated under pressure or under a vacuum.
- 206** This subclass is indented under subclass 120. Apparatus including an inner chamber formed by a removable hood, open its bottom, that sits on a heating chamber floor to form a closed inner work chamber within the heating chamber.
- 207** This subclass is indented under subclass 120. Apparatus including means forming distinct chambers that communicate with each other or are formed in the same heating apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 128+, for plural work chambers having heating means and through which work is progressed or moved mechanically; and 163+ for plural structurally related work chambers in which work is heated by contact with combustion products.
- SEE OR SEARCH CLASS:
 202, Distillation: Apparatus, subclasses 113+ for plural structurally related, externally heated chambers in which carbonaceous materials are broken down by heat.
- 208** This subclass is indented under subclass 207. Apparatus in which two closed work holding vessels providing for discharge of fluid outside of a furnace structure and that are necessary parts of the apparatus are mounted on structure providing for ready removal in a common heating chamber.
- 209** This subclass is indented under subclass 120. Apparatus including a work chamber traversed by a heat emitting tube or rod that supplies heat to the chamber atmosphere or to the work therein.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 102, for a shaft type furnace having a heat emitting tube or flue within or traversing the shaft chamber.
 135, for a work chamber in which a traveling heat emitter carries or stirs the work.
 148, for a work chamber in which work is progressed and heated by combustion products and that is also heated by a heat radiator in the chamber.
- 210** This subclass is indented under subclass 120. Apparatus in which the work enclosure is a liquid tight receptacle having a feed opening near, in or for its top and having a normally closed bottom.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 151, for a heated pot having means for stirring its contents.
 156, for a furnace adapted to receive a pot or receptacle in which work is heated.
 197, for a heated tank having a heat transfer liquid or fluent therein forming a part of the apparatus.
- 211** This subclass is indented under subclass 210. Apparatus in which the work container is mounted on a structure by which a lip of the container may be depressed to cause contents to discharge over the lip.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 157, for a furnace particularly adapted to contain a pot or receptacle mounted for tilting to discharge the pot or receptacle.
 160, for a furnace or a work holder of furnace in which work is heated by contact with combustion products mounted for tilting discharge.

- 212** This subclass is indented under subclass 120. Apparatus in which combustion products heating the work chamber atmosphere move through a conduit means within the wall of the chamber or including the chamber wall as a part thereof, the conduit means providing a tortuous, branched, or plural passages to distribute heat with respect to the chamber while holding the combustion products separated from the chamber atmosphere.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
155, for a chamber through which work is progressed or moved mechanically heated by multiple combustion product flues.
- 213** This subclass is indented under subclass 212. Apparatus including distinct conduits each having its own source of combustion products.
- 214** This subclass is indented under the class definition. Apparatus comprising (1) combustion products generating structure and a heat storage mass, the combustion products discharging through or across the mass to heat the mass or (2) means feeding a fuel and oxidizer into a heat storage mass for combustion therein.
- 215** This subclass is indented under subclass 214. Apparatus in which the heat storage mass is a quantity of fluent solid particles within a flow structure.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
27, for a process of heating including the flowing or circulating of a particulate heat carrier mass.
- 216** This subclass is indented under subclass 214. Apparatus in which heat storage masses are contained in two distinct lines connected cases.
- 217** This subclass is indented under subclass 214. Apparatus including a casing and a partition therein defining a distinct combustion chamber and a chamber holding the heat storage mass.
- 218** This subclass is indented under subclass 217. Apparatus in which the partition is an annular member concentrically arranged within a cylindrical casing.
- 219** This subclass is indented under the class definition. Apparatus including a means converting another form of energy to heat energy and structure for adding the generated heat to a flowing stream of a fluid or plastic material that is either work material or a part of the heating apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
31+, for a residual process of heating a liquid.
40, for the automatic control of an air heater of the hot blast stove type.
90, for a residual combination of a boiler and a work heating furnace.
201+, for a work chamber to which air from an air heater is supplied to flow through the chamber.
215, for a heat generator heating a fluent mass of heat storage material.
- SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, appropriate subclass for a closed water heater.
126, Stoves and Furnaces, subclasses 67 through 71 for a heating stove for air, subclasses 99-119 for a hot air furnace, subclasses 344-363.1 for a liquid heater that may include a kettle, a steam generator, stove pipe for use with a stove, a domestic water heater or boiler (e.g., kitchen boiler, range boiler, etc.) for use with a stove or furnace, subclasses 500-555 for a fireplace or an accessory thereto, subclasses 561-568 for a solar heat collector for a pond or pool, or subclasses 569-713 for a solar heat collector.
137, Fluid Handling, subclasses 334+ for a residual fluid handling system with heating or cooling of the system.
159, Concentrating Evaporators, appropriate subclass for an apparatus of general utility in concentrating a liquid.

- 196, Mineral Oils: Apparatus, subclasses 104+ for vaporizing apparatus peculiarly designed for use in the distillation of mineral oils.
- 202, Distillation: Apparatus, subclasses 163+ for a separatory distillation still.
- 261, Gas and Liquid Contact Apparatus, subclasses 141+ for a gas and liquid contact device having a heat generator.
- 392, Electric Resistance Heating Devices, subclasses 311+ for a fluid heater specialized to the use of electricity as the heat source.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 285+ and 307+ for apparatus for concentrating liquids in liquids by heat.
- 220** This subclass is indented under subclass 219. Apparatus in which a common heat generator furnishes heat to raise the temperature of a fluid and heat energy to a motor that drives a mechanical means that increases the pressure or velocity of the fluid.
- SEE OR SEARCH CLASS:
- 60, Power Plants, subclasses 39.01+ for a device producing hot gases under pressure solely disclosed for use in the production of power.
- 221** This subclass is indented under subclass 219. Apparatus having structure by which the heated fluid material is (1) directed against work or (2) passed in heat transferring relationship to structure for applying heat to work.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, appropriate subclass for residual structure for drying or for contacting a solid with a gas or vapor. See the search reference in the class definition of Class 432 for the line between Classes 34 and 432.
- 237, Heating Systems, subclasses 50+ for a system in which a heat generator heats air and having a means for distributing the air to rooms or chambers; and subclasses 56+ for a room or chamber heating system in which heat from a heat generator is distributed by flowing water.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 128+ for a fluid sprinkling, spraying or diffusing device having heating or cooling means for the system or system fluid.
- 222** This subclass is indented under subclass 219. Apparatus in which a stream of fluid is heated by mixing it with products of combustion from a burner.
- SEE OR SEARCH CLASS:
- 60, Power Plants, 39.53 for a combustion products generator having means for the addition of steam or water to the products. This combination is classified in Class 60 even though there is no disclosure for power purposes.
- 431, Combustion, subclass 341 for a pot type combustion device including an exhaust flue having air feed passages and subclasses 351+ for a flame holder having a flame enclosing structure with means feeding air at axially spaced points along the flame.
- 223** This subclass is indented under subclass 22. Apparatus including a confining passage by which a stream of the gas to be intermingled or a stream of combustion feed fluid is passed in heat exchange with the combustion products flowing to the mixing zone.
- 224** This subclass is indented under the class definition. Apparatus comprising a heat emitter and structure by which it is inserted into a hollow article or by which a hollow article is positioned about the emitter for the purpose of heating the interior of the article.
- SEE OR SEARCH CLASS:
- 34, Drying and Gas or Vapor Contact With Solids, subclasses 104+ for a drier for hollow articles.
- 166, Wells, subclass 59 for means for burning fuel within a well.
- 175, Boring or Penetrating the Earth, subclass 11 for apparatus for boring the Earth including the direct application of heat to the formation.

225 This subclass is indented under the class definition. Apparatus for heating an article including structure for applying heat to the article with elements (1) for engaging the article for support of the heating structure by the article or (2) for engagement with the article to hold it in fixed operative relationship about the article.

SEE OR SEARCH THIS CLASS, SUBCLASS:

63, for a heater installed on an internal combustion element for heating the element.

SEE OR SEARCH CLASS:

38, Textiles: Ironing, or Smoothing, subclasses 82+ for a residual flat-iron or smoothing textiles.

126, Stoves and Furnaces, subclasses 271.1+ for a residual surface heater comprising a heat emitter and means supporting the emitter spaced from or in contact with a surface to be heated.

138, Pipes and Tubular Conduits, subclass 35 for a portable apparatus specialized to thawing a pipe or tubular conduit.

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 398+ for a spraying or diffusing device for combining separately supplied fluids, per se, and appropriate subclass for such device supported on and traversing work in which the motion of the device is determined by the will of the operator. Such device is often disclosed as a flame torch.

226 This subclass is indented under the class definition. Apparatus including structure in the form of a mask, shield or baffle by which a portion of surface area of an article is shielded from direct heating or has heat concentrated therein to provide differential heating of the article sections.

SEE OR SEARCH THIS CLASS, SUBCLASS:

10, for a process of heating an article with provision for localized treating or shielding of a section of the article.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 447 for a heat distributor for a food cooker.

228, Metal Fusion Bonding, subclass 59 for a heat shield used in metal fusion bonding and subclass 214 for the process of bonding while using such a shield.

227 This subclass is indented under the class definition. Apparatus comprising a device producing heat by chemical, electrical, or mechanical, means and (1) structure for supporting work relative to the heat producing means or (2) structure by which heat is applied to work.

SEE OR SEARCH CLASS:

126, Stoves and Furnaces, subclasses 1+ for a cooking stove; subclasses 58+ for a direct heat radiating heating stove; subclasses 204+ for a body warmer; subclasses 261+ for a lunch heater; subclasses 263.01+ for a heater using a chemical type of heat generator; and 401+ for a hand manipulatable tool having a work engaging element and fluid fuel burner.

219, Electric Heating, subclasses 385+ for a heating device combined with a container, enclosure, or support for material to be heated.

228 This subclass is indented under subclass 227. Apparatus in which the work supporting or heat applying structure comprises a drum having within it a source of heat, and the exterior of which is adapted to support work and to apply heat to the supported work.

SEE OR SEARCH THIS CLASS, SUBCLASS:

60, for a residual heating structure that advances and flexes a sheet, web or strand and that includes an internally heated roll.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 110+ for a rotary drum type drier in which the work is treated by the drum exterior. See the search note to the class defini-

- tion of Class 432 for the line between Classes 34 and 432.
- 38, Textiles: Ironing or Smoothing, subclasses 44+ for a textile ironing or smoothing machine of the roller press type and subclasses 100+ for a roller type smoothing implement.
- 118, Coating Apparatus, subclass 60 for coating apparatus including a heated roll for treating the work.
- 126, Stoves and Furnaces, subclass 410 for a heated, roll type, hand manipulatable heating tool.
- 159, Concentrating Evaporators, subclass 11.1 for a concentrating evaporator using a rotary drum or disk as a moving film support for the material being concentrated.
- 165, Heat Exchange, subclasses 90+ for a heat exchanger of the rotary drum type.
- 219, Electric Heating, subclasses 469+ for a roller specialized for heating by electricity that supports and heats material.
- 492, Roll or Roller, for a roll, per se, not elsewhere provided for, and see the search notes thereunder.
- 229** This subclass is indented under subclass 227. Apparatus in which the heat producing means is supported on a means for carrying it along a path traversing the article.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 33, for a heating device in which an article or template follower positions a heating element relative to the article being heated.
- SEE OR SEARCH CLASS:
- 228, Metal Fusion Bonding, subclasses 25+ for a metal fusion bonding apparatus having an applicator of heat, pressure or flux movable during fusion.
- 266, Metallurgical Apparatus, subclasses 48+ for a metallurgical blowpipe including a support for proper manipulation of the same.
- 230** This subclass is indented under subclass 227. Apparatus in which the article support provides for movement of the article relative to the heat produced by the heat generator.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 45, for automatic control of or by means sensing or controlling work movement;
- 59+, for structure, flexing, looping, or coiling a sheet, web or strand as it advances across or through heating means; and
- 122, for a work chamber with heating means having structure by which the work is progressed or moved mechanically therein.
- SEE OR SEARCH CLASS:
- 99, Foods and Beverages: Apparatus, subclasses 386+ for a slice toaster or broiler having a conveyor; and subclasses 419+, for a spit or impaling type of food cooking device.
- 231** This subclass is indented under subclass 227. Apparatus in which the work support includes structure engaging the article to hold it in a fixed horizontal and vertical position relative to the heat emitter.
- SEE OR SEARCH CLASS:
- 12, Boot and Shoe Making, subclass 129.4 for a heated form for making a shoe.
- 53, Package Making, subclasses 387.4+ for a heated or cooled flap or seam holder.
- 99, Foods and Beverages: Apparatus, subclasses 385+ for a slice toaster or broiler; and subclasses 419+ for a spit or impaling type of food cooking device.
- 100, Presses, subclasses 300+ for a press having means for heating the material in the press.
- 126, Stoves and Furnaces, subclasses 226+ for a device for heating a tool including structure for positioning the tool relative to the heat source.
- 269, Work Holders, appropriate subclass for a residual device for clamping,

- supporting, or holding an article in position to be operated on or treated.
- 232** This subclass is indented under subclass 227. Apparatus in which the structure is a substantially horizontal openwork grid or rack for holding work against gravity within the flow path of combustion products.
- SEE OR SEARCH CLASS:
- 99, Foods and Beverages: Apparatus, subclasses 444+ for cooking apparatus including a perforated support for food and an associated drip collector; and subclass 450, for cooking apparatus comprising a foraminous food support.
- 126, Stoves and Furnaces, subclasses 1+ for a cooking stove not having a feature specializing it for use with food.
- 233** An element specialized for use in heating apparatus including structure removing heat from the element to keep it from being damaged by the heat of the apparatus.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 77+, for heating apparatus combined with work cooling structure.
- 115, for a tumbler drum furnace having a flexible or cooled seal between the rotary and stationary parts.
- 116, for a tumbler drum furnace having protective cooling structure.
- 173, for a furnace heated by combustion within the chamber and having protective cooling means for combustion material feed structure.
- SEE OR SEARCH CLASS:
- 122, Liquid Heaters and Vaporizers, subclass 6 for a broadly recited furnace having a cooling device comprising a closed chamber of conduit for water.
- 266, Metallurgical Apparatus, subclasses 190+ for a metallurgical shaft furnace having cooling means.
- 234** This subclass is indented under subclass 233. Apparatus in which the part is an elongate stationary member along which work or a work holder is slid.
- 235** This subclass is indented under subclass 233. Apparatus in which the cooled element is a part of a work chute, conveyor or agitator.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 116, for a rotary drum furnace having protective cooling structure.
- SEE OR SEARCH CLASS:
- 165, Heat Exchange, subclasses 92+ for a hollow stirrer or scraper.
- 236** This subclass is indented under subclass 235. Apparatus in which the cooled element is a work or belt supporting roll.
- 237** This subclass is indented under subclass 233. Apparatus in which the cooled element is a part of an opening, its cover, a work cover, or the joint of the cover to the heating structure e.g. door, cover, door frame, pot rim, etc.
- SEE OR SEARCH CLASS:
- 110, Furnaces, subclass 180 for a solid fuel combustion furnace door kept cool by the circulation of steam or air there-through.
- 238** This subclass is indented under subclass 233. Apparatus in which the cooled element is a part of a wall, floor, or roof of a heating chamber.
- SEE OR SEARCH CLASS:
- 122, Liquid Heaters and Vaporizers, subclass 6 for a closed chamber or conduit conducting liquid to cool a wall, roof, or lining of utility in a broadly recited heating or combustion chamber organization.
- 373, Industrial Electric Heating Furnaces, subclasses 71+, 113+, 158, and 165 for an electrical furnace having means for cooling the furnace walls.
- 239** This subclass is indented under the class definition. A subcombination of a heating device, specialized for use in heating, for feeding or discharging a work chamber or for conveying or agitating work while within such chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 53, for a work unit handler interrelated with a furnace closure or heating element operator.
- 86, for a furnace having associated means for receiving work from the discharge means.
- 87, for a furnace having associated means for supplying the furnace feed means.
- 95+, for a gravity flow type shaft furnace through which work is moved by gravity.
- 96, for a shaft furnace having an agitator or movably mounted baffle for the shaft outlet.
- 103+, for a rotary drum-type furnace for tumbling work material.
- 121+, for a furnace having heating structure and being of the type in which a charge is progressed or moved mechanically.
- 157, for a furnace for heating material in a crucible or pot and mounted to discharge the crucible or pot by tilting to pour melted material.
- 160, for a combustion gas heated furnace or furnace work holder mounted for tilting discharge.
- 162, for a combustion gas heated furnace charged by a movably mounted shelf, rack or tray.
- 211, for an externally heated liquid holding type of work container mounted for pouring discharge.
- 234, for a protectively cooled work skid or rail.
- 235, for a protectively cooled conveyor, chute, or work agitator element.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclass 101 for a means for feeding solid fuel into a combustion furnace.
- 198, Conveyors: Power-Driven, appropriate subclass for a power driven conveyor or conveyor element, per se, of general utility.
- 221, Article Dispensing, appropriate subclass for a means dispensing articles or arranging them in a chamber for dispensing.

- 222, Dispensing, appropriate subclass for a residual process or apparatus for dispensing fluent material.
- 366, Agitating, appropriate subclass for an agitator, per se, or one having merely nominally recited heating or cooling means.
- 414, Material or Article Handling, subclasses 147+ for the combination of a chamber of a type utilized for a heating function and material charging or discharging means therefor. Specific furnace structure is included there (147+) only when its sole purpose is to facilitate the movement of material to or from the chamber furnace. See also subclasses 586+ for a device or element associated with the handling or moving of a charge for a heating-type chamber.

240 This subclass is indented under subclass 239. Apparatus in which the structure includes a means for engaging a stove top or the rim of a stove hole for supporting it relative to the heat of the stove.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 104, for a rotary drum type agitator having a support for engaging the surface of a domestic stove.

241 This subclass is indented under subclass 239. Apparatus in which (1) platform structure that forms part of the floor a heating chamber is loaded while displaced from the rest of such chamber and carries the work into the chamber as it is moved into assembled position; or (2) a cart specialized for use in carrying work to be heated into a furnace.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 136+, for a work chamber having combustion product supply means and a movable floor section carried by an external guide or axle by which work is progressed through a work chamber.

242 This subclass is indented under subclass 239. Apparatus including a means closing or sealing an opening through which work is moved by the feeder or conveyor into the chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 53, for a work unit handler and a furnace closure operator controlled to work in a program or cycle.
- 56, for means correlating door movement and work movement or placement.
- 64, for a heating chamber having a fluid curtain at a chamber port or work path.

243 This subclass is indented under subclass 239. Apparatus in which a work support within the chamber is moved by an element extending therefrom through a slit in the chamber paralleling an external track on which the element is carried to move the work along the chamber.

244 This subclass is indented under subclass 239. Apparatus including a seal structure preventing leakage through a chamber wall about a conveyor or agitator element passing through the wall.

SEE OR SEARCH CLASS:

- 277, Seal for a Joint or Juncture, for a generic sealing means or process, subclass 906 for a seal for an article having indefinite length (e.g., strip, sheet, etc.).
- 384, Bearings, subclasses 130+ for a plain rotary bearing with a seal.

245 This subclass is indented under subclass 239. Apparatus including or having associated therewith structure specialized to (1) controlling the flow of heat; (2) protecting the apparatus or work from heat or (3) relieving or preventing stress from expansion or contraction produced by temperature changes.

246 This subclass is indented under subclass 239. Apparatus in which the feeding or conveying structure is, or includes a work supporting roll.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 60, for an internally heated roll advancing and flexing sheet, web, or strand type work.
- 228, for an internally heated roll, per se.

SEE OR SEARCH CLASS:

- 193, Conveyors, Chutes, Skids, Guides, and Ways, subclass 37 for a conveying roll not specialized for guiding work in a high temperature environment.

247 This subclass is indented under the class definition. Apparatus forming the work chamber of an apparatus specialized for heating work or for use in controlling the drop in temperature of highly heated work toward ambient temperature.

SEE OR SEARCH CLASS:

- 52, Static Structures (e.g. Buildings), appropriate subclass for a residual static structure; particularly subclasses 415+ for a structure assembled of bricks.
- 110, Furnaces, subclasses 317+ for the structure of a solid fuel combustion furnace.
- 220, Receptacles, subclasses 560.12+ and 592.01+ for a receptacle having insulation or other means to maintain its contents above or below ambient temperature.

248 This subclass is indented under subclass 247. Apparatus in which the furnace has a melt holding or receiving section that is specialized to withstand the action of the melt by having reinforcing means, a lining, or other protective structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 238, for a heating apparatus having a wall, floor or roof element protected by cooling means.

249 This subclass is indented under subclass 247. Apparatus including as a part thereof structure that supports or protects the work, or shields the work area.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
253+, for an adjunctive means for holding, shielding, or supporting work within a heating chamber.
- 250** This subclass is indented under subclass 247. Apparatus including structure defining (1) a feed or access opening of a work chamber or (2) a removable cover for such opening.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
64, for a heater having a fluid curtain at a chamber port or work path.
65, for a heat shield or fume collector at a furnace chamber access area.
73, for a combustion products flue or generator and a work chamber mounted for relative movement for access.
237, for a protectively cooled door, cover, door frame, or rim of a cover of a heating furnace.
242, for a closure or seal for an entrance passage through which a feeding means causes work to move.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclass 242 for a chamber seal in a gas-solid contact device.
49, Movable or Removable Closures, appropriate subclass for a movable or removable closure of general utility.
110, Furnaces, subclasses 173+ for a door, and subclass 181 for a door easing or arch, usable in either a heating or solid fuel combustion furnace.
126, Stoves and Furnaces, subclasses 190+ for door structure applicable to a cooking or direct heat radiating heating stove.
- 251** This subclass is indented under subclass 247. Apparatus having structure preventing or limiting damage to the apparatus by relieving or absorbing heat induced expansive forces.
- 252** This subclass is indented under subclass 247. Apparatus comprising a structure of masonry supported or reinforced by a metallic member.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
119, for a rotary tumbler drum type furnace having a brick type lining.
- SEE OR SEARCH CLASS:
110, Furnaces, subclasses 336+ for wall structure particularly adapted for use in a solid fuel furnace.
266, Metallurgical Apparatus, subclasses 280+ for a lining construction for a metallurgical furnace.
373, Industrial Electric Heating Furnaces, subclass 137, 155, and 164 for a furnace lining particularly adapted for use in an electrical furnace.
- 253** Structure specialized for use in a subordinate or temporary capacity in heating apparatus comprising (1) means by which a body or material is held in place in a heating zone or (2) a protective means for limiting or directing the transfer of heat from the heating medium or heat radiator to work or parts of work within a heating zone.
- SEE OR SEARCH CLASS:
34, Drying and Gas or Vapor Contact With Solids, subclasses 239+ for means to support solid work for drying or for contact of solid with gas or vapor.
269, Work Holders, appropriate subclass for a residual device for clamping, supporting or holding an article in position to be operated on or treated.
- 254.1** This subclass is indented under subclass 253. Apparatus comprising a removable enclosing receptacle or hood specially adapted for holding articles being heated, shielding them from the atmosphere, and equalizing the application of heat to the articles.
- SEE OR SEARCH CLASS:
266, Metallurgical Apparatus, subclasses 262+, for heat transferring boxes, shields or hoods which are solely disclosed for use in the heat treatment of metal objects, e.g., annealing boxes, carbonizing boxes will likewise be found therein.

254.2 This subclass is indented under subclass 254.1. Apparatus including structure adapted to be lowered about the work comprising a hood closed on its top and sides and open at its bottom, or the support upon which such hood is lowered.

SEE OR SEARCH THIS CLASS, SUBCLASS:

206, for a furnace in which a bell-type hood forming a part of the furnace encloses work in a chamber having heating means.

258 This subclass is indented under subclass 253. Apparatus comprising structure for supporting a rigid or semi-rigid work piece of ceramic material, or coated with ceramic material, while exposing it to heating fluid or radiant heat.

SEE OR SEARCH CLASS:

211, Supports: Racks, appropriate subclass for a residual rack for supporting plural articles and disclosed as having utility other than, or in addition to, use in the firing of ceramics.
248, Supports, appropriate subclass for a residual support for a single article disclosed as having utility other than, or in addition to, use in the firing of ceramics.

259 This subclass is indented under subclass 258. Apparatus in which the work support structure provides point or edge contact with the work piece to provide for maximum exposure of the surface of the work piece to heat.

260 This subclass is indented under subclass 253. Apparatus relying on the central passage in an annular body for the positioning in of the body.

261 This subclass is indented under subclass 253. Apparatus comprising a container or platform, having apertures or gaps, for supporting metal work to expose it to heating fluid or radiant heat.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 237+ for a tray or floor for a drier, or for a gas or vapor and solid contact device.
220, Receptacles, appropriate subclass for a metallic receptacle disclosed as being of general utility or as having a use additional to the support of metal work in a high temperature furnace.

262 This subclass is indented under subclass 253. Apparatus comprising a refractory vessel for melting or calcining, metals, ores, etc.

SEE OR SEARCH CLASS:

164, Metal Founding, subclasses 335+ for metal molding apparatus including a receptacle for holding or dispensing molten material.
266, Metallurgical Apparatus, subclasses 275+ for a receptacle specialized for holding molten metalliferous material.

263 This subclass is indented under subclass 262. Apparatus having a dispensing opening or spout.

SEE OR SEARCH CLASS:

222, Dispensing, subclasses 566+ for a receptacle of general utility having a nozzle, spout, pouring lip or other material pouring guide as a dispensing feature.

264 This subclass is indented under subclass 262. Apparatus in which the crucible has a coated or lined section or is made of layers of diverse materials.

265 This subclass is indented under subclass 262. Apparatus made of a named material.

266 This subclass is indented under the class definition. Miscellaneous apparatus .

CROSS-REFERENCE ART COLLECTIONS

500 The common disclosure of the art in this, digest is a barn used in the drying, curing, or storing of tobacco. The disclosures are examples only and are not exhaustive of the subject matter.

They have been placed in this subclass without regard to their original classification or to their claimed subject matter.

END