

**CLASS 266, METALLURGICAL APPARATUS****SECTION I - CLASS DEFINITION**

This class provides for apparatus for (a) enriching metal bearing ores, (b) extracting metals from their source materials, (c) refining, purifying, or otherwise treating molten or liquefied metals where such treatment is not elsewhere provided for, (d) melting metals, and (e) establishing desired physical or chemical properties in solid metal objects, and for subcombinations peculiar to such apparatus. This class also provides for methods of operating such apparatus where not elsewhere provided for.

- (1) 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**

While Class 266 provides for certain methods of operating metallurgical apparatus, those patents which recite a step of treating an ore or molten metal or of altering the parameters effecting such a treatment, e.g., temperature, oxygen content, will not be found in Class 266, unless such a method is less comprehensive than the apparatus. The methods provided for in Class 266 are merely of an operational nature and contain no treatment steps. The order of superiority among various metal, alloy, and metal stock areas and methods of manufacture involving them is as follows:

- (1) Class 419, Powder Metallurgy Processes.
- (2) Class 148, Metal Treatment, subclasses 22-30, compositions for treatment of solid metal.
- (3) Class 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 300, 301, and 303-329, gaseous, liquid or solid treating compositions for liquid metal or charges, and subclass 302, welding rod defined by composition.
- (4) Class 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 228-250, consolidated metal powder compositions and subclasses 255-254, loose metal particulate mixtures.
- (5) Class 420, Alloys or Metallic Compositions, claimed as products.
- (6) Class 148, Metal Treatment, subclasses 95-122, 194-287, and 500-714, in class schedule order, providing for certain processes of treating solid or semisolid metal by modifying or maintaining the internal physical structure (i.e., microstructure) or chemical properties of metal, processes of reactive coating of metal or processes of chemical-heat removing (e.g., flame-cutting etc.) or burning of metal. However, 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.
- (7) Class 148, Metal Treatment, subclasses 33-33.6, barrier layer stock material and subclasses 400-442, stock.
- (8) Class 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 331-341, processes of making solid particulate alloys directly from liquid metal and subclasses 343-374, processes of producing or purifying alloys in powder form.
- (9) Class 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 10.1-10.66 and 10.67, processes of making alloys by electrothermic, electromagnetic, or electrostatic processes.
- (10) Class 420, Alloys or Metallic Compositions, processes of manufacture.
- (11) Class 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 330-773, processes of making metal and processes of treating liquid metals and liquid alloys and consolidating metalliferous material.
- (12) Class 204, Chemistry: Electrical and Wave Energy, processes.
- (13) Class 164, Metal Founding, subclasses 1-138, processes.
- (14) Class 266, Metallurgical Apparatus, subclasses 44-47, processes of operating metallurgical apparatus.

This list is not complete and may be added to as the proper relationship of other areas as determined.

### SECTION III - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

- 29, Metal Working, subclasses 33+, for article assembly means combined with means to metallurgically treat the assembled article.
- 34, Drying and Gas or Vapor Contact With Solids, appropriate subclasses for apparatus for contacting a solid with a gas not elsewhere provided for. See especially subclasses 576-594 for fluidized beds of granular material where the fluidizing agent is a treating gas.
- 65, Glass Manufacturing, appropriate subclasses, for processes of or apparatus for glass working or treating.
- 72, Metal Deforming, appropriate subclasses for a method or an apparatus including a step of or a means for maintaining or modifying the temperature of the work subjected to the metal shaping operation where (a) nominally recited means are provided to alter the temperature of the work in some unspecified manner, (b) specific heating means are provided which merely condition the work to perfect the shaping, or (c) nominal annealing means are provided where the annealing is for the purpose of relieving work stresses or to facilitate working.
- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for consolidating metalliferous material, or extracting, refining or melting metals. See Lines With Other Classes, above, for a list of superiority of this and other metal, allow, and metal stock areas.
- 96, Gas Separation: Apparatus, for apparatus for gas separation, per se (e.g., electrostatic precipitators, etc.). Because Class 96 is subcombinational in character, the combination of a metallurgical treating apparatus with a gas separation means will be found in Class 266.
- 110, Furnaces, appropriate subclasses for furnaces of general utility, especially subclasses 235-259 for incinerators for the disposal of waste material, which incinerators may have structure to render a molten material, including metals, disposable. Class 266 provides for furnaces specialized for extracting a desired metallic constituent from a source of such metal, which source could be waste material.
- 118, Coating Apparatus, subclasses 58 through 69, for coating apparatus combined with heating means for drying the coating or for effecting a metallurgical treatment, e.g., annealing, of a coated article or of an article which is about to be coated.
- 122, Liquid Heaters and Vaporizers, subclass 6.6 for tuyeres cooled by a liquid circulating in a closed path, see subclass 270 of this class (266) for a further statement of the line, and subclass 7 for waste heat boilers, per se, or combined with a nominally recited converter and for hoods which are cooled by a liquid circulating in a closed path.
- 134, Cleaning and Liquid Contact With Solids, appropriate subclasses for metal quenching apparatus, per se. See the search note to subclass 134 in subclass 114 of this class (266) for a more complete statement of the line between the classes.
- 148, Metal Treatment, appropriate subclasses for processes of treating solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal and appropriate subclasses for processes of chemical-heat removing (e.g., flame cutting, etc.) or burning (i.e., oxidizing) of a metal workpiece. While Class 266 provides for certain methods of operating a metallurgical apparatus, it does not provide for a combined operation that includes subject matter proper for Class 148.
- 164, Metal Founding, appropriate subclasses for metallurgical apparatus combined with metal casting means.
- 165, Heat Exchange, appropriate subclasses, especially subclasses 9.1 through 9.4 for air heaters and other heat exchange devices which transfer heat in an indirect manner, that is through a body or wall that physically separates the fluids, or which employs a heat storing mass.
- 198, Conveyors: Power-Driven, appropriate subclasses for conveyors or for conveyors combined with nominal treating apparatus, Class 198 provides for cooling beds for metal bars, including those beds which have means to turn the bars while they are being conveyed to keep the bars straight, provided no additional treating structure is claimed in more than a nominal fashion.

- 202, Distillation: Apparatus, appropriate subclasses for distilling apparatus not elsewhere provided for. See the class definition of Class 202 for a statement of the line between Class 202 and Class 266.
- 209, Classifying, Separating, and Assorting Solids, appropriate subclasses for nonchemical types of separation employing the use of amalgams or magnet lines of force and subclass 11 and 182 for separating apparatus combined with heating means.
- 219, Electric Heating, appropriate subclasses, especially subclasses 50 through 162 for electric heaters specialized to heat metal objects. Patents which claim an electric heater combined with a quenching device are placed as an original in Class 266 and are cross referenced into the appropriate heater subclass in Class 219.
- 222, Dispensing, subclasses 591 through 607, especially subclasses 592 and 593 for ladles or tundishes used to dispense molten metals. Such dispensing vessels may include means to treat the molten metal where such a treatment is solely ancillary to and supportive of the dispensing operation, e.g., spout heaters to prevent clogging of the vessel outlet. If other treating structure is provided, e.g., additional heater remote from the outlet, or if the vessel is a metallurgical furnace, the patent should be placed in this class (266).
- 239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses, especially subclasses 132 through 132.5 for lances, per se, and for nozzles of general utility.
- 241, Solid Material Comminution or Disintegration, appropriate subclasses, especially subclasses 65 through 67 for comminuting or disintegrating means, per se, or combined with heating means which do not effect a change in the chemical nature of the material being treated.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for methods of forming or repairing furnace linings by shaping, e.g., molding, fluent refractory material.
- 373, Industrial Electric Heating Furnaces, for furnaces having specific electric heating means, except as noted below, or for such furnaces combined with such additional treating structure, e.g., condensers, as is provided for in Class 373. Class 266 takes patents having claims to electric furnaces where no electric heating structure is recited and where that structure would be useful in other types of metallurgical furnaces. Class 266 also provides for metallurgical furnaces having specific electric heating means where additional means are recited for introducing reactant materials, e.g., tuyeres.
- 414, Material or Article Handling, subclasses 147 through 216 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 (subclasses 147-216) only when its sole purpose is to facilitate the movement of material to or from the furnace.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 255 through 290 for apparatus not elsewhere provided for, for extracting inorganic chemical elements or compounds from their source material.
- 423, Chemistry of Inorganic Compounds, subclasses 210 through 215.5 for processes modifying or chemically removing a component of a normally gaseous mixture which may contain hazardous or toxic waste.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, appropriate subclasses, especially subclass 222 for means to shape or agglomerate particles of ore into pellets or balls which may be combined with additional treating means to improve or complete the shaping, e.g., heaters, other than sintering or indurating means, which merely dry or harden the shaped article, and subclass 78, for means to form and sinter a mass of powdered metal.
- 428, Stock Material or Miscellaneous Articles, subclasses 544 through 687 for stock material which is all metal or has adjacent metal components, especially subclasses 546-569 for such material containing metal particles.
- 432, Heating, appropriate subclasses for heating apparatus of general utility. Class 432 also takes reheat furnaces which elevate the temperature of a metal object to facilitate some subsequent treatment of the object, e.g., bending, provided that no means for providing or circulating a treating or protecting gas is claimed. See the search note to Class 266 in the class definitions for Class 432 for a further statement of the line between the two classes.
- 588, Hazardous or Toxic Waste Destruction or Containment, subclasses 300 through 321 for processes for the chemical destruction of nongaseous hazardous or toxic waste and subclass 900

for a cross-reference art collection of apparatus.

#### SUBCLASSES

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#### **PROCESS:**

This subclass is indented under the class definition. Methods of operating metallurgical apparatus which are solely directed to those steps of operating such an apparatus which do not effect a chemical or physical change in the work being treated.

- (1) Note. Examples of the types of methods to be found herein are methods of cooling a furnace or some part thereof, a method of operating tuyeres in a certain sequence where no metallurgical action is attributable to such an operation, methods of plugging furnaces and like treating vessels not elsewhere provided for, methods of tapping a vessel, etc.
- (2) Note. Only those patents which contain claims to methods not elsewhere provided for should be placed in this or the indented subclasses as either an original or a cross-reference.

#### SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for methods of treating ores extracting, refining or melting metals.
- 148, Metal Treatment, appropriate subclasses for processes of treating solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

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#### **Plugging or tapping:**

This subclass is indented under subclass 44. Method for closing or opening apertures in the walls of metallurgical apparatus.

- (1) Note. An example of the type of process to be found herein is a method of operat-

ing a mud gun to seal or plug a blast furnace tap hole.

#### SEE OR SEARCH THIS CLASS, SUBCLASS:

271, through 273, for apparatus for plugging or tapping apertures in metallurgical furnaces.

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#### **Cooling:**

This subclass is indented under subclass 44. Method for maintaining the temperature of a metallurgical apparatus or some portion thereof within a desired range.

#### SEE OR SEARCH THIS CLASS, SUBCLASS:

190, through 194, and 241, for metallurgical furnaces and other treating apparatus having means to cool such furnaces or apparatus.

270, for water cooled tuyeres.

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#### **Tuyere operation:**

This subclass is indented under subclass 44. Method for operating short tubular means adapted to be mounted in wall of a metallurgical apparatus for injecting fluents therein.

#### SEE OR SEARCH THIS CLASS, SUBCLASS:

186, through 189, and 218-224, for tuyeres combined with treating vessel structure.

265, through 270, for tuyere structure, per se.

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#### **MEANS FOR CUTTING SOLID METAL WITH HEAT, E.G., BLOWPIPES:**

This subclass is indented under the class definition. Device including means for severing a metal or removing a portion thereof with a flame by supplying an excess of oxygen to the heated metal.

#### SEE OR SEARCH CLASS:

110, Furnaces, for solid fuel burners, per se, and particularly subclasses 260 through 262 for torches which burn both solid and liquid fuels.

148, Metal Treatment, appropriate subclasses for processes of chemical-heat removing (e.g., flame cutting, etc.) or

- burning (i.e., oxidizing) of a metal workpiece.
- 175, Boring or Penetrating the Earth, subclasses 11 through 16 for a process or means for forming a hole in the earth by directly applying heat to fluidize or comminute the material forming the earth, and particularly subclass 14 for such process or apparatus in which the heat is produced by combustion in a confined chamber having a restricted orifice.
- 228, Metal Fusion Bonding, appropriate subclasses for welding apparatus which apply heat to the members to be bonded together.
- 239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses, for tips or nozzles which dispense combustibles where no feature or structure is recited which specializes the tip for cutting or burning.
- 431, Combustion, appropriate subclasses, for a residual fuel burner, per se.
- 49 With waste entrapping fluid:**  
This subclass is indented under subclass 48. Device including gas or liquid means for collecting or ensnaring refuse material generated by the flame cutting of the workpiece.
- 50 Means for cutting continuously cast workpieces:**  
This subclass is indented under subclass 48. Device including means for severing or removing a portion of a workpiece as it emerges from a continuous casting facility.
- SEE OR SEARCH CLASS:  
164, Metal Founding, subclass 263 for a continuous casting apparatus combined with means to sever the cast workpiece.
- 51 Means for removing surface material, e.g., scarfing:**  
This subclass is indented under subclass 48. Device wherein means are provided to cut defects from the face of a workpiece.
- SEE OR SEARCH CLASS:  
148, Metal Treatment, subclasses 194 through 205 for processes of chemical-heat removing (e.g., flame cutting,
- etc.) or burning (i.e., oxidizing) which includes desurfacing or gouging operations utilizing said chemical-heat removing.
- 52 Having means to simultaneously scarf multiple sides of a workpiece:**  
This subclass is indented under subclass 51. Device including a multiplicity of cutting torches arranged such that their flames concurrently impinge against plural faces of an article to remove surface defects therefrom.
- 53 Having workpiece-contacting cutting means spacer:**  
This subclass is indented under subclass 51. Device including a means adapted to engage the face of the workpiece to position the torch means a predetermined distance therefrom.
- 54 With means for cutting tubular workpiece:**  
This subclass is indented under subclass 48. Device including a means adapted to sever a pipe-like article.
- SEE OR SEARCH CLASS:  
148, Metal Treatment, subclasses 194 through 205 for processes of chemical-heat removing (e.g., flame cutting, etc.) or burning (i.e., oxidizing) which includes transversely cutting metal tubes utilizing said chemical-heat removing.
- 55 Having torch mount secured within workpiece:**  
This subclass is indented under subclass 54. Device wherein the torch supporting means is attached to the interior of the tubular article.
- 56 Having means to circumrotate torch about workpiece:**  
This subclass is indented under subclass 54. Device including means to propel the severing means over and around the peripheral surface of the tubular article.
- SEE OR SEARCH CLASS:  
82, Turning, subclasses 59 through 70 for cutting implements which are circumrotated about a workpiece.

- 57 With means to rotate workpiece:**  
This subclass is indented under subclass 54. Device including means to revolve the tubular article about its longitudinal axis.
- 58 With pattern control means:**  
This subclass is indented under subclass 48. Device having means for storing operating instructions which means cause the cutting means to move in a predetermined path.
- SEE OR SEARCH CLASS:  
33, Geometrical Instruments, subclasses 18.1 through 45 for pattern-tracing devices.  
82, Turning, subclasses 11 through 13 and 55 for cutting implements of the type provided for in that class combined with pattern-control means.  
409, Gear Cutting, Milling, or Planing, subclasses 79 through 124 for a pattern-controlled milling machine. See the notes thereunder for additional searches.
- 59 With tape-control means:**  
This subclass is indented under subclass 58. Device wherein the stored operating instructions are contained on a ribbon-like memory.
- SEE OR SEARCH CLASS:  
409, Gear Cutting, Milling, or Planing, subclasses 79 through 124 for a pattern-controlled milling machine. See the notes thereunder for additional searches.
- 60 With automatic line-follower means:**  
This subclass is indented under subclass 58. Device wherein the information storing means includes a planer surface having a control pattern inscribed thereon and means are provided to scan said surface to sense and follow the outline of the pattern.
- (1) Note. Examples of devices to be found herein are devices having photoelectric or magnetic reading heads which scan mechanical drawings to follow lines drawn thereon.
- 61 With means to rotate workpiece:**  
This subclass is indented under subclass 58. Device including means revolving the workpiece about an axis.
- 62 Having articulated arm supporting torch:**  
This subclass is indented under subclass 58. Device including a means for holding the cutting means having a plurality of segments pivotally joined to one another.
- 63 With pantograph arm means:**  
This subclass is indented under subclass 62. Device having plural arms pivotally interconnected for parallel movement.
- 64 Having spaced, superposed templet:**  
This subclass is indented under subclass 58. Device wherein the information storing means includes a patterning cam which is located above and out of contact with the piece to be cut.
- 65 With work supporting grate means:**  
This subclass is indented under subclass 48. Device wherein a lattice-type surface is provided which holds the article to be cut against the effects of gravity.
- 66 Hand held, work riding torch:**  
This subclass is indented under subclass 48. Device wherein the torch includes means by which an operator can engage the torch to manipulate and partially support the same and wherein the supporting structure is adapted to travel upon the surface of the work being cut.
- 67 With wheeled carriage torch mount:**  
This subclass is indented under subclass 48. Device wherein the cutting means is carried by a supporting means which is provided with wheels.
- 68 Having work contacting torch spacing means:**  
This subclass is indented under subclass 67. Device including a means adapted to engage the face of the workpiece to position the blow pipe a predetermined distance therefrom.

- 69 With work-spanning torch mount:**  
This subclass is indented under subclass 67. Device wherein the wheeled supporting means is adapted to extend across the workpiece, having the supporting wheels engaging surfaces adjacent to opposite sides of the workpiece.
- 70 Circle cutter:**  
This subclass is indented under subclass 48. Device provided with means constraining the cutting means to follow an accurate path.
- 71 Having torch solely supported by work-piece:**  
This subclass is indented under subclass 48. Device wherein the cutting means is provided with supporting structure which is adapted to entirely rest upon and be exclusively sustained by a surface of the work.
- 72 With cantilevered arm torch support:**  
This subclass is indented under subclass 48. Device wherein the cutting means is supported on a projecting structure which is supported at only one end.
- 73 Having carriage-supported cantilevered arm:**  
This subclass is indented under subclass 72. Device wherein the projecting structure is in turn carried by a mobile mount.
- 74 Having adjuvant material feed:**  
This subclass is indented under subclass 48. Device wherein means are provided to supply material which will enhance the cutting operation.
- 75 Solid material:**  
This subclass is indented under subclass 74. Device wherein the material supplied is in the form of discrete units of hard matter.
- (1) Note. Rod and bar feeders will be found herein; likewise, means feeding a pulverulent or granular material will also be found herein.
- 76 Having torch spacing means:**  
This subclass is indented under subclass 48. Device including means for controlling the position of the cutting means with respect to the workpiece surface in response to variations in the distance between the cutting means and said surface.
- 77 With torch mounting means:**  
This subclass is indented under subclass 48. Device including means adapted to affix the cutting means to its supporting means.
- 78 WITH CONTROL MEANS RESPONSIVE TO SENSED CONDITION:**  
This subclass is indented under the class definition. Device wherein the treating apparatus is provided with means to regulate the operation of the apparatus which means react to means which perceive a characteristic or a change in a characteristic of either the treated material or the treating apparatus.
- SEE OR SEARCH CLASS:  
432, Heating, subclasses 36 through 49 for heating devices of general utility having condition-responsive control structure associated therewith.
- 79 By treated material sampling means:**  
This subclass is indented under subclass 78. Device wherein the control means reacts to means measuring a characteristic of a specimen taken from the work.
- 80 With analyzer or computation means:**  
This subclass is indented under subclass 78. Device wherein (a) the control means is responsive to means which determine the chemical composition of the treated material or a by-product of the treatment or (b) information from the sensors is fed to an information storage device wherein additional information is determined, which additional information is then utilized to control the treatment.
- (1) Note. Servomechanisms, i.e., automatic control devices in which the output is constantly or intermittently compared with the input through feedback so that the error or difference between the two quantities can be used to bring about the desired control, are classified with their appropriate sensing devices.
- 81 With means supplying a treating agent:**  
This subclass is indented under subclass 78. Device wherein means are provided for the controlled addition of a solid, liquid, or gas-

- eous substance to the treating apparatus, which substance then reacts with the material contained therein.
- 82 Correlated flow of diverse fluents:**  
This subclass is indented under subclass 81. Device wherein means are provided for proportioning the supply of a multiplicity of streams based upon a condition sensed in any of the streams or in the treating apparatus.
- SEE OR SEARCH CLASS:  
137, Fluid Handling, subclasses 87.01 through 87.06 for self-proportioning or correlating fluid-handling systems.
- 83 With flow rate sensor:**  
This subclass is indented under subclass 82. Device wherein the control means is responsive to means which perceive the amount or volume of the fluent flowing through the apparatus in a given time.
- SEE OR SEARCH CLASS:  
137, Fluid Handling, subclasses 100 through 101.19 for fluid-handling systems having means to sense differences between the rates of flow in a plurality of correlated flow lines.
- 84 With means sensing moisture content:**  
This subclass is indented under subclass 82. Device wherein means are provided which are responsive to the perceived humidity of one of the streams.
- 85 Individual control of diverse inputs:**  
This subclass is indented under subclass 81. Device wherein means are provided for the control of a plurality of fluent-supply means, each of which has a condition-responsive flow regulating means therein, whereby the volume or flow rate of each stream can be independently regulated in response to a sensed condition.
- 86 By means positioning dispenser:**  
This subclass is indented under subclass 81. Device wherein means are provided to control the attitude or displacement of the means supplying the treating agent to the treating apparatus, e.g., a lance height control apparatus.
- 87 With temperature sensor:**  
This subclass is indented under subclass 78. Device wherein the control means is responsive to a variation in sensible heat.
- SEE OR SEARCH CLASS:  
236, Automatic Temperature and Humidity Regulation, appropriate subclasses for control systems employing thermostats and other heat-responsive switches.  
337, Electricity: Electrothermally or Thermally Actuated Switches, appropriate subclasses for temperature-responsive switches.  
374, Thermal Measuring and Testing, subclass 125 for a radiation thermometer with fluid flow purging and subclasses 139 and 140 for a molten metal thermometer.
- 88 In a fluid:**  
This subclass is indented under subclass 87. Device wherein the control means is responsive to the sensed temperature of a fluid, e.g., gas, liquid, bath of molten metal.
- 89 With pressure sensor:**  
This subclass is indented under subclass 78. Device wherein the control means is responsive to a variation in the force per unit area existing within the treating apparatus or in lines connected thereto.
- SEE OR SEARCH CLASS:  
73, Measuring and Testing, subclasses 700 through 756 for pressure-indicating devices.  
200, Electricity: Circuit Makers and Breakers, subclasses 81+ for switches that are responsive to fluid pressure.
- 90 With means responsive to condition of treated material:**  
This subclass is indented under subclass 78. Device wherein the control means reacts to means sensing a physical, chemical, or mechanical characteristic of the work.
- SEE OR SEARCH CLASS:  
432, Heating, subclass 45 for heating devices of general utility having



means to sense work movement, quality, or position.

**91 By means sensing weight or density of work:**  
This subclass is indented under subclass 90. Device wherein the control means is responsive to (a) the mass of treated material at a specified location on the treating apparatus or (b) the mass per unit volume of treated material at a specified position in the treating apparatus.

**92 By means sensing position of work:**  
This subclass is indented under subclass 90. Device wherein the control means is responsive to the attitude of the treated material.

(1) Note. Devices wherein a sensor is used to sense the height of material in a furnace are classified herein.

**93 By means sensing presence or absence of work:**  
This subclass is indented under subclass 92. Device wherein the control means is responsive to the entrance or exit of the treated material from a particular position in the apparatus.

(1) Note. Devices which have means which sense the presence of a workpiece which has been conveyed to the device and which means actuate the device are classified herein.

**94 By means sensing level of molten liquid:**  
This subclass is indented under subclass 92. Device wherein the control means is responsive to means perceiving the surface of a molten material in a container.

**95 By float means:**  
This subclass is indented under subclass 94. Device wherein the surface-sensing means incorporates a buoyant-sensing means.

**96 WITH PROGRAMMED, CYCLIC, OR TIME RESPONSIVE CONTROL MEANS:**  
This subclass is indented under the class definition. Device wherein the control means is provided with (a) means for storing coded instructions or other data necessary to regulate the operation of the treating apparatus, (b) means repetitively regulating the sequence of operational steps performed in or by the treating apparatus or, (c) means for determining the

time at which an operation occurs or length of time taken to perform such an operation.

(1) Note. The type of cyclic control to be found herein includes limit switch arrangements of the interlock type which control the sequence of operation based on the movement of apparatus elements to specific locations, e.g., the closing or opening of a door, the movement of a mud gun to an advanced position, etc.

SEE OR SEARCH CLASS:

432, Heating, subclass 51 for heating devices of general utility having timing, programming, or cyclic control means; further, see the search notes attached to subclass 51 for additional search areas.

**97 By timer:**  
This subclass is indented under subclass 96. Device wherein the control means is provided with means for controlling the time at which an operation occurs or the length of time in which said operation is performed.

**98 Having driven disk or drum:**  
This subclass is indented under subclass 97. Device wherein the timer includes a rotatable, cylindrical, or circular member and an associated information pick-up means, which member is provided with means storing the information necessary to control the operation of the apparatus such that control signals are generated through the interaction of the rotated member and the associated pick-up means.

**99 WITH RECORDING, INDICATING, INSPECTION OR MEASURING MEANS:**  
This subclass is indented under the class definition. Device wherein means are provided which (a) automatically make a permanent record of selected events occurring during the operation of said device, (b) display information concerning the condition of the device or a material therein, (c) provide for the examination of selected portions of the device or material therein, or (d) gauge or otherwise determine a physical, chemical, or electrical characteristic or property of the device or material therein.

**SEE OR SEARCH CLASS:**

432, Heating, subclass 32 for heating devices of general utility having indicating, illuminating, or inspection means; for additional search areas, see the search notes attached to the subclass definition of subclass 32.

**100 Having observation means:**

This subclass is indented under subclass 99. Device wherein means are provided for the visual examination of a portion of the device.

**101 HAVING MEANS FOR LEACHING AND SUBSEQUENTLY PRECIPITATING A METAL:**

This subclass is indented under the class definition. Device wherein a means for extracting a metal from an ore or concentrate is provided having first means for contacting the ore or concentrate with a suitable solvent, and second means for rendering the dissolved metal insoluble in its carrier solvent.

**SEE OR SEARCH CLASS:**

75, Specialized Metallurgical Processes, Compositions for Use therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 711 through 744 for producing metal using nonmetallic material which is liquid under standard conditions.

210, Liquid Purification or Separation, subclasses 177 and 178 for purification or separation of general utility with the addition of heat and additional fluid for treatment and subclasses 198.1-221.2 for liquid purification or separation with means to add an additional treating material.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 255 through 290 for leaching apparatus.

**102 MEANS TREATING A CONTINUUM OF WORK:**

This subclass is indented under the class definition. Device wherein either (a) a plurality of discrete articles are joined together so as to form an uninterrupted supply or (b) an object of indeterminate length is fed into a zone

wherein the articles or object is operated on to enhance the physical, metallurgical, or chemical properties thereof.

(1) Note. Devices which are solely disclosed for annealing or patenting of a continuous strip, rod, sheet, or web of metal are classified in Class 266.

**SEE OR SEARCH CLASS:**

118, Coating Apparatus, subclasses 65, 67, and 68 for means to anneal or temper a running length of metal combined with means to apply a metallic coating to the running length, e.g., galvanizing.

148, Metal Treatment, appropriate subclasses for processes of treating a running length of solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

226, Advancing Material of Indeterminate Length, appropriate subclasses for method of, and apparatus for, feeding material without utilizing the leading or trailing ends to effect movement of the material.

432, Heating, subclass 8 for a process including passing a continuous strip longitudinally through a heating zone and subclass 59 for heating apparatus having advancing structure flexing, looping, or coiling a sheet, web, or strand. See the search notes to the class definition of Class 432 for a more complete statement of the line between these classes.

**103 With heating means:**

This subclass is indented under subclass 102. Device wherein means are provided to elevate the temperature of the object being treated.

**SEE OR SEARCH CLASS:**

219, Electric Heating, subclass 155 for electric-heating means specialized to treat material of indeterminate length.

432, Heating, subclasses 59 and 60 for heating means of general utility specialized to treat a running length of material.

- 104 By joule effect:**  
This subclass is indented under subclass 103. Device wherein a plurality of electrical contacts physically bear against the object to be treated and the object is heated by passing an electric current through that portion of the object located between the contacts.
- SEE OR SEARCH CLASS:  
219, Electric Heating, subclasses 50 through 162, especially subclass 71 for electric-heating means which heat bypasses current directly through the body to be heated.
- 105 Discrete article continuum:**  
This subclass is indented under subclass 103. Device wherein the object being treated consists of a multiplicity of individual units or blanks which are fastened together by removable clips, or the like, to form a continuous composite article for treatment.
- 106 Overlapped planar coil:**  
This subclass is indented under subclass 103. Device wherein the object being treated is formed into looped coils which lie in a substantially horizontal plane.
- 107 In a molten material bath:**  
This subclass is indented under subclass 103. Device wherein the heating means comprises a body of molten material, e.g., lead bath or salt bath.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
120, for apparatus which contacts discrete solid metal objects with a molten material.
- 108 In a muffle furnace:**  
This subclass is indented under subclass 103. Device wherein the object is heated by passing it through a heated receptacle having means therein to maintain the object out of direct contact with any source of heat or gases evolved thereby.
- 109 With cooling by contact with solid heat sink:**  
This subclass is indented under subclass 103. Device wherein the heated object is further treated by physically contacting it with a solid object which is at a lower temperature than the heated object.
- 110 In specific environment, e.g., vacuum:**  
This subclass is indented under subclass 103. Device wherein means are provided to introduce, maintain, or generate a particular gaseous atmosphere within a chamber wherein an object is treated.
- 111 With fluid contact means:**  
This subclass is indented under subclass 103. Device wherein the heated object is further treated by the application of a liquid or gaseous medium to the object.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
121, through 133, for means to heat a metal object and contact the object with a liquid.  
251, through 258, for means to heat a metal object and contact the object with a gas.
- SEE OR SEARCH CLASS:  
134, Cleaning and Liquid Contact With Solids, subclass 122 for apparatus for contacting a running length of work with a liquid.
- 112 In liquid bath:**  
This subclass is indented under subclass 111. Device wherein the fluid medium is a body of liquid, e.g., water or oil.
- 113 In liquid spray:**  
This subclass is indented under subclass 111. Device wherein the fluid medium is a projected liquid.
- 114 HAVING MEANS FOR CONTACTING A SOLID METALLIFEROUS MATERIAL OR METAL OBJECT WITH A LIQUID:**  
This subclass is indented under the class definition. Device wherein an apparatus is provided for treating either a metallic article or a metal bearing ore which is in a hardened form by applying a liquid thereto.
- (1) Note. The term "solid" as used herein includes within its purview granular or pulverulent material which is composed of discrete solid particles.

## SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, for cleaning and liquid contact apparatus of the type stated below as going to Class 134, where a brush, wiper, scraper, suction, or gas blast cleaning means or a squeegee is part of the combination.
- 118, Coating Apparatus, appropriate subclasses for apparatus for coating metal work including apparatus for performing a coating process in which a chemical reaction occurs.
- 134, Cleaning and Liquid Contact With Solids, for solid metal cleaning and pickling processes, per se, i.e., not combined with any other solid-metal treating operations. This class also has apparatus for cleaning and pickling solid metal combined with such means for handling or operating upon the solid metal as are necessary for the cleaning or pickling operations. Class 266 has apparatus for heating solid metal by contact with molten solids for heat treating the solid metal, Class 134 having no apparatus disclosed for this purpose. Class 134 also has apparatus for contacting solid metals with liquid for other purposes (as quenching) where the means claimed pertain to the applying of the liquids and only such means for manipulating or handling of the solid metal as are required to present the metal to, move or support it during, and/or remove it from the means that applies the liquids. Apparatus involving, in addition to the cleaning or liquid-contact means, means for the purpose of preventing warping, straightening, forming by any manufacturing means (note stretching below) or separate heating, is considered to be beyond the scope of Class 134 and is in Class 266. Separating material from solid metal by heating only (as distinguished from the application of liquids which liquids may be heated) has not been placed in Class 134, but remains in Class 266 or other appropriate heating class. In the case of strip or strand material, Class 134 has apparatus

which involve means for uncoiling, coiling, or temporarily distorting the material to feed and/or discharge such material during the cleaning or liquid contact operation, and also has means to stitch (as by welding, for example) or otherwise fasten one piece to another to make the operation continuous with or without means to subsequently cut the material into sections. Further, apparatus for contacting only certain areas of a metal body with a liquid to selectively harden the body will be found in this class (266).

- 148, Metal Treatment, appropriate subclasses for processes of quenching or utilizing liquid contact with metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

**115 With means changing the shape of a treated object, e.g., roller means:**

This subclass is indented under subclass 114. Device including means to alter the configuration of the object to be treated prior to or during the liquid contact.

## SEE OR SEARCH CLASS:

- 72, Metal Deforming, subclasses 38, 39, and 46 for gas or liquid contact with a metal prior to plastically shaping it, for the purpose of protecting, cleaning, or coating the metal; and subclass 201 for deforming rollers with cooling means.

**116 Spring shaping means:**

This subclass is indented under subclass 115. Device wherein the object having its configuration altered is an elastic body.

**117 With means to prevent warping of treated object:**

This subclass is indented under subclass 114. Device including means for constraining the object being treated to prevent any unwanted deformation thereof which might result from the liquid contact.

**118 Of a gear wheel:**

This subclass is indented under subclass 117. Device wherein the constraining means is configured to retain castellated cylindrical bodies.

**119 With heating of object:**

This subclass is indented under subclass 117. Device wherein means are provided to increase the temperature of the treated article thereby enhancing the grain structure and reducing stress within the treated article (e.g., tempering).

**120 By immersing an article to be treated in bath of molten material, e.g., salt bath:**

This subclass is indented under subclass 114. Device wherein the contacting apparatus includes a tank containing a liquid made from melted, normally solid matter, e.g., salts.

- (1) Note. Molten material, as used herein, is limited to a material which is in the solid state under standard atmospheric condition of pressure and temperature, which material is liquefied by an altering of one or both of these conditions, e.g., heating a mass of salt to fuse the same. Thus, a bath composed of a material which is normally a liquid under standard atmospheric conditions, e.g., mercury, oil, water, is not found herein unless combined with a molten material bath.

**SEE OR SEARCH CLASS:**

148, Metal Treatment, appropriate subclasses for treatment of solid or semi-solid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal or for processes of reactive coating of metal, particularly subclasses 631, 632, or 711 for use of a fused molten material to treat the metal.

**121 With heating means, e.g., flame contact:**

This subclass is indented under subclass 114. Device further including means to raise the temperature of the work prior to, during, or after the work has been contacted with the liquid.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

261, for heating a solid metal object by flame contact heating.

**SEE OR SEARCH CLASS:**

148, Metal Treatment, appropriate subclasses for processes of heating or cooling of metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of the metal.  
219, Electric Heating, subclasses 50 through 162 for electric heaters specialized to heat metals.

**122 By means treating metalliferous materials, e.g., ores:**

This subclass is indented under subclass 121. Device wherein the heating means and the liquid-contact means are particularized to operate on metal bearing matter to remove unwanted constituents from said matter.

**SEE OR SEARCH CLASS:**

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for methods of heating an ore and subsequently contacting said ore with a liquid.

**123 By heating means adapted to be inserted into a hollow object:**

This subclass is indented under subclass 121. Device wherein the heating means is configured to pass into or through a cavity or passage formed in the article to be treated.

**SEE OR SEARCH CLASS:**

134, Cleaning and Liquid Contact With Solids, subclasses 166+ for liquid contact of a solid workpiece having hollows or passages.  
219, Electric Heating, subclasses 59.1 through 67 for electric-heating means specialized to heat metallic workpieces of cylindrical configuration.

**124 By means heating selected areas of an object:**

This subclass is indented under subclass 121. Device wherein the heating means is specialized to effect heating of only certain zones on the surface of the article to be treated.

## SEE OR SEARCH CLASS:

148, Metal Treatment, particularly subclasses 210 through 214, 627, and 639-644 for processes of localized or zone heating of solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

219, Electric Heating, appropriate subclass for electric-heating means specialized to heat metal in selected areas.

**125 By means specialized to heat an article having an irregular contour (e.g., cams, gears):**

This subclass is indented under subclass 124. Device wherein the heating means is particularized to effect heating selected areas on the surface of objects having a nonuniform or a discontinuous surface or profile.

(1) Note. Examples of objects having non-uniform or discontinuous surfaces are valve cams, spur or helical gears, racks, etc.

## SEE OR SEARCH CLASS:

148, Metal Treatment, particularly subclasses 559 through 714 for treatment of solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

**126 By heating means configured to fit between adjacent gear teeth:**

This subclass is indented under subclass 125. Device wherein the heating means is specialized for heating power transmission elements which have castellated power transmitting surfaces, and wherein the heating means has a profile allowing it to be inserted between adjoining castellations.

## SEE OR SEARCH CLASS:

148, Metal Treatment, particularly subclasses 573 and 586 for processes of treating solid or semisolid metal gears to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

219, Electric Heating, subclass 640 for induction-heating means specialized to heat gears.

**127 Unitized heating and fluid contact means:**

This subclass is indented under subclass 121. Device wherein the heating and the fluid-contact means either are formed as a single treating member or are so closely juxtaposed that they constitute a unitary treating member.

(1) Note. An example of unitized structures to be found herein is heating torch having a supply outlet for a quenching fluid formed therein.

**128 By electric heating means:**

This subclass is indented under subclass 121. Device wherein the heat to treat the material is produced by a current passing through a conductive medium.

## SEE OR SEARCH CLASS:

219, Electric Heating, appropriate subclass, especially subclasses 50 through 162 for electric-heating means specialized to heat metal.

**129 Inductance type:**

This subclass is indented under subclass 128. Device wherein the heating means include means to impress a fluctuating magnetic field across the workpiece to be treated, which field causes current to pass through and heat said workpiece.

**130 Having bath for contacting the work with liquid:**

This subclass is indented under subclass 121. Device wherein the means for contacting the work with a liquid includes a receptacle which confines a body of liquid into which the work is dipped or immersed.

**131 With means to agitate or control temperature of bath:**

This subclass is indented under subclass 130. Device wherein means are provided for (a) generating a current within the liquid body or (b) adding, removing, or otherwise changing the heat content of the liquid body.

## SEE OR SEARCH CLASS:

134, Cleaning and Liquid Contact With Solids, subclasses 105 through 111 for a means of general utility for contacting a solid with a liquid including heating, cooling, or heat-exchange means.

**132 Having work introducing elevator:**

This subclass is indented under subclass 130. Device wherein a vertically moving support is provided, which support partakes of a generally straight up and down motion to lower the work into and subsequently raise it out of the bath.

**133 Having means to move work through bath:**

This subclass is indented under subclass 130. Device wherein means are provided for conveying the work through the body of liquid.

## SEE OR SEARCH CLASS:

198, Conveyors: Power-Driven, appropriate subclasses for conveyors of general utility.

**134 By means contacting only selected areas of treated article with liquid:**

This subclass is indented under subclass 114. Device wherein the apparatus is so arranged or additional means are provided to insure that the liquid contact with the object to be treated will be restricted to only a certain pre-established section of said object.

(1) Note. Means to mask the surface of the object to be contacted so that only certain areas will have liquid applied thereto are found herein.

**135 WITH CLEANING OR LUBRICATING MEANS:**

This subclass is indented under the class definition. Device wherein means are provided for (a) removing accumulations of unwanted material which are deposited on or in the device during the operation of same or (b) the introduction of an anti-friction agent, e.g., oil, into or on the device.

## SEE OR SEARCH CLASS:

432, Heating, subclass 75 for a heating means of general utility having a means for cleaning the heating means.

**136 Fluid injector cleaner:**

This subclass is indented under subclass 135. Device wherein means are provided for removing unwanted accumulations from a fluid nozzle, e.g., tuyere punches.

**137 WITH MEANS TO COMMUNUTE OR DISINTEGRATE SOLIDS:**

This subclass is indented under the class definition. Device having means to break up or reduce the size of an individual unit of hard matter.

(1) Note. Included within the definition of an individual unit are a solid metal object, a sintered mass, and the individual particle of a granular mass.

## SEE OR SEARCH CLASS:

241, Solid Material Comminution or Disintegration, appropriate subclasses for comminuting or disintegrating apparatus, per se, and for comminuting combined with heating where no chemical change to the material heated occurs.

**138 WITH MEANS TO PREHEAT GAS:**

This subclass is indented under the class definition. Device having means to elevate the temperature of a gas or vapor supplied to a treating vessel prior to the entry of the gas into the treating zone.

## SEE OR SEARCH CLASS:

165, Heat Exchange, appropriate subclasses for a heat exchange, per se, particularly subclasses 4 through 10 for a regeneration-type heat exchanger.

432, Heating, subclass 40 for the automatic control of a hot blast stove; subclasses 78-80, wherein combustion feed air cools existing work by contact; subclass 84, wherein combustion feed air cools the furnace wall; subclasses 179-182, wherein the furnace exhaust heats the furnace feed air; subclasses

214-218 for a hot blast stove, per se; and subclasses 219-223 for a residual gas heater, per se.

**139 Having heat storage means, e.g., checkers, stoves:**

This subclass is indented under subclass 138. Device including means adapted to receive and retain heat energy and thereafter give up said energy to a gas flowing therepast to raise the temperature of the gas.

**SEE OR SEARCH CLASS:**

165, Heat Exchange, subclasses 4 through 10 for heat-storage devices, such as checker bricks, per se.  
432, Heating, appropriate subclasses for general utility furnaces combined with heat-storage means, especially subclasses 214 through 218 for heat storage means combined with a heat generator.

**140 By heat generating means:**

This subclass is indented under subclass 138. Device wherein the means to elevate the temperature of the gas includes means in addition to the heating means for the treating vessel for producing heat energy by a chemical reaction, e.g., combustion, or by the transformation of some other form of energy into heat energy, e.g., electric resistance-type heaters.

**141 By remote heat exchanger:**

This subclass is indented under subclass 138. Device wherein the means to elevate the temperatures of the incoming gas includes means physically separated from the treating vessel, which means effects a transfer of heat from a material at a relatively high temperature to the relatively cool incoming gas.

**SEE OR SEARCH CLASS:**

165, Heat Exchange, appropriate subclasses for indirect heat-exchange structure.

**142 GEOGRAPHIC OR STRUCTURAL INSTALLATION:**

This subclass is indented under the class definition. Device wherein (a) a work-processing device is related either to some feature of the earth or to a definable building feature, e.g., a hall, or (b) a plurality of such devices are

arranged so as to form a specific machinery layout.

(1) Note. Examples of limitations that are indicative of geographic features or structural installations are pits, bays, corridors, plural working levels, etc.

(2) Note. Merely positioning one device above another so that gravity flow between the devices is effected is not considered to constitute a specific machinery layout.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

161, through 164, for apparatus performing diverse metallurgical operations, e.g., metal extracting and refining.

**143 Having refining vessel with travelling support:**

This subclass is indented under subclass 142. Device wherein the structural or geographic installation is provided with a means for treating a molten metal having a support means which mounts the treating means for movement from one location to another within the installation.

(1) Note. Examples of a traveling support are cranes, wheel vehicles, etc.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

165, for a metallurgical apparatus which includes a vehicle-mounted receptacle.

**144 WITH MEANS TREATING OR HANDLING GASES EXHAUSTED BY TREATING MEANS:**

This subclass is indented under the class definition. Device wherein the metallurgical apparatus is provided with means for (a) removing fumes and the like from the apparatus, (b) conditioning such fumes to either remove valuable components, e.g., gaseous mercury or render the fumes less objectionable to the environment, e.g., pollution abatement devices, or (c) to extract heat energy from the fumes.

(1) Note. While apparatus to condense metallic vapors within a vacuum will be



found herein, apparatus to remove entrained gases from a mass of molten metal by subjecting at least a portion of the mass to a vacuum is not considered to be a fume handling or treating means since such gases do not normally "evolve" by themselves from the molten mass. Such apparatus thus will not be found in this or the indented subclasses.

- (2) Note. A nominally recited flue or a nominal flue and damper combination is not considered to be a fume-handling means and thus will not be found herein. Further, a mere windbox or a nominal windbox and blower combination used in conjunction with an ore-sintering apparatus is not considered to be a fume-handling means for this subclass. Such patents have been placed on the features of the particular treating apparatus with which they are associated.

SEE OR SEARCH THIS CLASS, SUBCLASS:  
207, through 211, for vacuum-degassing apparatus for molten metals.

SEE OR SEARCH CLASS:  
432, Heating, subclasses 66 through 72 for a heating means of general utility having means for treating or handling the exhaust gas.

**145 Having means to treat or handle gases evolving from rotary furnace:**

This subclass is indented under subclass 144. Device wherein the gas handling or treating means are specialized to receive fumes from a furnace adapted to rotate through more than 360 degrees.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 173, for a rotary drum ore treating or metal extracting furnace.  
213, for a revolving-drum type furnace for melting metal or treating a molten metal.  
244, for a Bessemer-type treating vessel mounted to revolve about its longitudinal axis.  
248, for a horizontal, rotatable, cylindrical metal melting or molten metal treating

means which oscillates about its longitudinal axis.

- 146 By contacting gas with nonmetallic liquid:**  
This subclass is indented under subclass 144. Device including means specialized to commingle or otherwise encounter the fumes with a nonmetallic liquid medium.

SEE OR SEARCH CLASS:

- 261, Gas and Liquid Contact Apparatus, appropriate subclasses for apparatus of general utility for contacting a gas with a liquid.

- 147 By liquid spraying:**  
This subclass is indented under subclass 146. Device wherein the commingling means is a shower of liquid through which the fumes flow.

- 148 By condensing and collecting a volatile constituent:**  
This subclass is indented under subclass 144. Device including means specialized to receive vaporized material and cause said vaporized material to undergo a phase change to the solid or liquid state.

SEE OR SEARCH CLASS:

- 202, Distillation: Apparatus, appropriate subclasses for distilling apparatus other than that used to condense metal.  
432, Heating, subclass 66 for a heating means of general utility with a condenser for work chamber vapor.

- 149 Within evacuated chamber:**  
This subclass is indented under subclass 148. Device wherein said phase change is effected within a vacuum environment.

- 150 Having molten metal splashing means:**  
This subclass is indented under subclass 148. Device wherein means are provided to hurl molten metal into the path of the evolved gas to condense metallic vapors contained therein.

- 151 By cascading material evolving the gas:**  
This subclass is indented under subclass 148. Device wherein the material from which the vapor is generated is caused to flow in a descending stepped path.

- 152 By indirect liquid heat exchange means:**  
This subclass is indented under subclass 148. Device wherein the vaporized material gives up its heat of vaporization to a body of liquid which is physically separated therefrom by a structural member, e.g., a wall, a tube, etc.
- 153 Having retort condenser:**  
This subclass is indented under subclass 148. Device wherein a heating means is provided which is adapted to contain and externally heat a vessel which holds a discrete charge of material to be treated and wherein means are mounted on and carried by the vessel to liquefy or solidify vapors evolved in the vessel.
- 154 Vertical shaft furnace:**  
This subclass is indented under subclass 148. Device wherein the vapors are evolved from an elongated chamber, the major axis of which is substantially perpendicular to the horizon and through which the vapor generating material is moved by the effects of gravity.
- 155 With heat exchanger, e.g., waste heat boiler:**  
This subclass is indented under subclass 144. Device including means specialized to remove heat from the evolved gas by means of an indirect heat exchanger.
- SEE OR SEARCH CLASS:  
122, Liquid Heaters and Vaporizers, subclass 7 for apparatus for capturing the waste heat of industrial devices.
- 156 By means recycling exhaust gas:**  
This subclass is indented under subclass 144. Device wherein a portion of the evolved gas is returned to the metallurgical apparatus.
- 157 By separating particles from evolved gas:**  
This subclass is indented under subclass 144. Device wherein the fume treating or handling means includes means to remove particulate matter suspended in the exhausting fumes from the fumes.
- SEE OR SEARCH CLASS:  
96, Gas Separation: Apparatus, for apparatus for gas separation, per se.  
432, Heating, subclasses 67 through 71 for means separating solid particle or slag from work chamber gas.
- 158 Hood:**  
This subclass is indented under subclass 144. Device wherein the gas-handling means includes an inverted, generally funnel-shaped fume collecting member which is disposed above and in unattached, juxtaposed relation with the metallurgical apparatus.
- SEE OR SEARCH CLASS:  
122, Liquid Heaters and Vaporizers, subclass 7 for apparatus for capturing the waste heat of industrial devices.  
454, Ventilation, subclasses 49 through 67 for hood and off-take structure.
- 159 Offtake:**  
This subclass is indented under subclass 144. Device wherein the gas handling means includes fume conducting means connected to the fume outlet of a metallurgical apparatus, which conducting means conveys the fumes away from said apparatus.
- 160 COMBINED OR CONVERTIBLE:**  
This subclass is indented under the class definition. Device (a) including means in addition to the basic metallurgical apparatus for performing some additional nonmetallurgical operation or for perfecting the operation of the basic metallurgical apparatus or (b) which can by an addition, removal, or rearrangement of one or more of its parts be caused to have a different mode or condition of operation.
- 161 MEANS FOR EXTRACTING AND REFINING METAL:**  
This subclass is indented under the class definition. Device comprising a means to treat an ore or other metal bearing material to remove a metal therefrom, combined with additional means to purify or otherwise treat the removed metal.
- 162 With separate refining zone:**  
This subclass is indented under subclass 161. Device wherein a distinct region or chamber is provided within which the metal purification or treatment occurs.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
212, for refining means having a separate metal melting zone.

**163 With rotating heating vessel:**

This subclass is indented under subclass 162. Device including an extracting or refining means adapted to revolve about its longitudinal axis.

**164 With heated vertical extracting means:**

This subclass is indented under subclass 162. Device wherein the means to extract the metal comprises a treating chamber within which the temperature of the material to be treated is elevated and the longitudinal axis of which is generally normal to the horizon.

**165 AMBULANT VESSEL:**

This subclass is indented under the class definition. Device wherein the metallurgical apparatus includes a vehicle mounted receptacle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

142, and 143, for geographic or structural installations.

SEE OR SEARCH CLASS:

105, Railway Rolling Stock, subclasses 238.1 through 395 for special car bodies for carrying molten metal or slag.  
432, Heating, subclass 88 for a heater assembly having a wheel-, handle-, or skid-type support.

**166 TREATING VESSEL WITH DISTINCT MOLTEN MATERIAL HOLDING MEANS, E.G., FOREHEARTH:**

This subclass is indented under the class definition. Device wherein a means to treat a metalliferous or a metallic material is provided with a separate additional substantially nonambulant storage receptacle or a separate additional ambulant storage receptacle adapted to be attached to the treating means, which receptacles receive molten material from the treating means and store said molten material prior to its delivery to a point of use.

**167 THERMITE REACTION VESSEL:**

This subclass is indented under the class definition. Device including a receptacle specialized to contain a thermite mixture while the mixture reacts to form a molten mass.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 959 for a process of thermit-type reduction and treatment.  
164, Metal Founding, subclasses 53 and 54 for a process of molding a metal object with in situ reactive heating.

**168 MEANS FOR TREATING ORES OR FOR EXTRACTING METALS:**

This subclass is indented under the class definition. Device having means to (a) concentrate and enrich the metalliferous material or (b) liberate metal from the metalliferous material.

(1) Note. The term "ore" as used herein may include other than naturally occurring sources, e.g., waste photographic solutions.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for processes of treating ore or extracting a metal.

**169 Amalgam-type extraction means:**

This subclass is indented under subclass 168. Device wherein means are provided for contacting a metal bearing material with mercury such that the metal is drawn from said material by the mercury.

SEE OR SEARCH CLASS:

209, Classifying, Separating, and Assorting Solids, subclasses 12.1 through 44.4 and 174-206 for processes and apparatus for separating by nonchemical means or procedure, e.g., magnet, amalgamating from liquid suspensions.

**170 By means precipitating metal from solution:**

This subclass is indented under subclass 168. Device including means for rendering a metallic element insoluble in its liquid environment.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

101, for an apparatus for leaching and subsequently precipitating a metal.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a process of precipitating a metal from a solution.

204, Chemistry: Electrical and Wave Energy, subclasses 194 through 297.16 for electrolytic apparatus (e.g., specialized for electrolytic precipitation of metal, etc.).

205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, appropriate subclasses for electrolytic precipitation of metal.

**171 By means applying heat to work, e.g., furnace:**

This subclass is indented under subclass 168. Device having means to raise the temperature of metalliferous material.

(1) Note. Those furnaces which are alternately usable to melt metal or to treat ore will be found herein.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclass for processes of treating ore or extracting metal.

432, Heating, appropriate subclass for treating furnaces of general utility.

**172 Fluidized zone:**

This subclass is indented under subclass 171. Device wherein means are provided for introducing a gas into the heating chamber so that the solid material within said chamber is maintained in a fluent condition while it undergoes treatment.

SEE OR SEARCH CLASS:

34, Drying and Gas or Vapor Contact With Solids, subclasses 576 through 594 for an apparatus for conveying treated material by means of a fluid current.

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for treating ores in gaseous suspension.

432, Heating, subclass 58 for a fluidized bed in a furnace of general utility.

**173 Rotary drum-type furnace:**

This subclass is indented under subclass 171. Device wherein the heating means includes a barrel-like receptacle within which the work is placed, which receptacle is mounted to continuously revolve about its longitudinal axis while the work is being heated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

145, for fume-handling means combined with rotary drum-type furnaces.

163, for rotary furnaces adapted to extract and refine a metal.

178, through 180, for revolving annular-load-supporting grates.

213, for rotary melting or refining vessels.

SEE OR SEARCH CLASS:

432, Heating, subclasses 103 through 119 for rotary drum furnaces of general utility. For further searches, see the search notes for subclass 103.

**174 With safety device:**

This subclass is indented under subclass 171. Device having means (a) to prevent a dangerous or potentially dangerous operating condition from occurring within the treating means or (b) to protect operating personnel from injury.

**175 With separate preheat chamber:**

This subclass is indented under subclass 171. Device wherein a distinct compartment or receptacle is provided within which the temperature of the material to be treated by the

heating means is elevated prior to its entry into the heating means.

**SEE OR SEARCH CLASS:**

432, Heating, subclasses 163 through 172 for furnaces of general utility having plural, structurally related work chambers.

**176 With means for moving solid material to or through heating zone:**

This subclass is indented under subclass 171. Device wherein the heating means is provided with means to supply a charge of fuel, flux, or ore thereto, which supplied material is in a solid form, or means to convey or propel the charge within the heating means.

**SEE OR SEARCH CLASS:**

198, Conveyors: Power-Driven, appropriate subclasses for conveyors of general utility.

414, Material or Article Handling, subclasses 150 through 159 for the combination of a chamber of a type utilized for a heating function and a driven device, and/or an inclined flow path to carry or convey material into, within, and out of the chamber; and subclasses 160-208 for such a chamber and the charging, in general, thereof.

**177 By means for moving charge through zone:**

This subclass is indented under subclass 176. Device wherein means are provided within the heating means for propelling or conveying the work undergoing treatment through said heating means.

**SEE OR SEARCH CLASS:**

198, Conveyors: Power-Driven, appropriate subclasses for conveyors of general utility.

414, Material or Article Handling, subclasses 159 and 160-208 as discussed in the reference to that class in subclass 176 above, and see particularly subclasses 153 and 166 of the respective areas.

432, Heating, subclasses 121 through 155 for an apparatus having means by which work is mechanically moved

through a heating device of general utility.

**178 Traveling grate:**

This subclass is indented under subclass 177. Device wherein the means for moving the charge through the treating zone comprises a mobile charge supporting surface which surface is perforated to allow air or combustion gases to pass therethrough.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

159, for a traveling-grate means combined with gas offtake structure.

**SEE OR SEARCH CLASS:**

432, Heating, subclasses 136 through 150 for apparatus having means by which work is mechanically moved through a heating device of general utility.

**179 With seal means:**

This subclass is indented under subclass 178. Device wherein means are provided at the junction between said mobile charge supporting surface and the heating means to prevent the ingress of atmospheric air into the heating zone or the escape of gas from the heating zone.

**180 Train of grate elements:**

This subclass is indented under subclass 178. Device wherein the mobile supporting surface is composed of plural unconnected moving cars which follow closely adjacent each other to form a moving support for the charge material.

**181 Means forming cascading array:**

This subclass is indented under subclass 177. Device wherein the heating means has a plurality of shelves disposed one above the other and the moving means conveys the charge from one shelf to the next adjacent lower shelf in a zigzag fashion.

**SEE OR SEARCH CLASS:**

432, Heating, subclasses 129 through 132 for a means for cascading work through a furnace of general utility.

**182 By fluid current:**

This subclass is indented under subclass 176. Device wherein the propelling means comprises means for entraining the charge material in a moving stream of fluid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 221, for a tuyere means for introducing diverse material into a molten metal treating means.
- 267, for a tuyere specialized for simultaneously feeding diverse material.

SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a process of treating molten metal with combined solid and gaseous treating agents.
- 110, Furnaces, subclasses 261 through 266 for an apparatus for burning fine fuel in suspension in a furnace of general utility.
- 406, Conveyors: Fluid Current, appropriate subclasses for an apparatus for conveying solids in fluid suspension.

**183 By power-driven means conveying solid charge into zone:**

This subclass is indented under subclass 176. Device wherein means are provided for propelling the charge material to be treated into the heating zone.

**184 Bell and hopper type:**

This subclass is indented under subclass 176. Device wherein the charge-feed means includes a storage chamber having a discharge port in the bottom thereof, which port is closed by a valve member which is movable axially of said passage.

SEE OR SEARCH CLASS:

- 414, Material or Article Handling, subclasses 170 and 201-205 for the combination of a chamber of a type utilized for a heating function and a material charging means therefor, and

wherein the means includes a device of the bell and hopper type.

**185 With work supporting grate:**

This subclass is indented under subclass 171. Device wherein the heating means includes a work-supporting surface, which surface is perforated to allow air or combustion gas to pass therethrough.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 159, for grate structure combined with gas offtake means.
- 279, for apparatus which supports the work material on a grate member.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclasses 267 through 294 for a progressive feed-grate means in a furnace of general utility.
- 122, Liquid Heaters and Vaporizers, subclasses 371 through 378 for a water-cooled grate means.
- 126, Stoves and Furnaces, subclasses 152+ for grates for use in stoves and furnaces.

**186 With means for feeding fluids:**

This subclass is indented under subclass 171. Devices including a means for introducing a gas, liquid, or combination thereof to the interior of the heating means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 218, through 224, for a tuyere means for feeding fluid into a molten metal treating means.
- 265, through 270, for tuyere structure, per se.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclass 182.5 for a tuyere means for a furnace of general utility.
- 122, Liquid Heaters and Vaporizers, subclass 6.6 for a tuyere having a closed water-cooling system.

**187 With flow regulating means:**

This subclass is indented under subclass 186. Device including means to control the volume of flow of the fluid.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 82, through 84, for a control means responsive to a sensed condition which correlates a flow of diverse fluents.  
 223, for a control means for a tuyere combined with a molten-metal treating means.  
 266, for a tuyere means combined with a flow-control means.
- 188 With common outlet means to feed diverse fluids:**  
 This subclass is indented under subclass 186. Device including means to comingle two or more fluids for injection into the heating means.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 221, and 222, for a tuyere for feeding diverse material into a molten-metal treating means.  
 267, for a tuyere for simultaneously feeding diverse material.
- 189 With means to cool fluid feeding means:**  
 This subclass is indented under subclass 186. Device including means for supplying a cooling medium to the fluid-feeding means to maintain the temperature of said feeding means within acceptable limits.
- SEE OR SEARCH CLASS:  
 110, Furnaces, subclass 182.5 for a cooled tuyere means for a furnace of general utility.  
 122, Liquid Heaters and Vaporizers, subclass 6.6 for a tuyere having a closed water cooling system.
- 190 With cooling of heating means:**  
 This subclass is indented under subclass 171. Device including means for maintaining the temperature of the heating means structure at a safe operating level.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 241, for a means to cool a metal melting or molten-metal treating means.
- SEE OR SEARCH CLASS:  
 65, Glass Manufacturing, subclass 355 for means-cooling glass manufacturing apparatus.  
 165, Heat Exchange, subclasses 47 through 57 for a heat exchanger installed in a disparate device, subclasses 58-66 for heating and cooling of the same device, and subclass 134.1 for a heat exchanger with protective means.  
 432, Heating, appropriate subclasses for means cooling a furnace of general utility.
- 191 By means cooling material discharge means:**  
 This subclass is indented under subclass 190. Device for maintaining the temperature of a delivery opening or structure associated therewith within acceptable limits.
- 192 By direct fluid contact:**  
 This subclass is indented under subclass 190. Device wherein the temperature of a specific portion of the heating means is maintained within acceptable limits by applying a cooling medium thereagainst, as for example, by flowing the medium over or impinging the medium against said portion.
- 193 By means embedded in heating means:**  
 This subclass is indented under subclass 190. Device wherein the temperature is maintained within acceptable limits by a cooling medium flowing through a heat-exchange member contained within the wall or base structure of the heating means.
- 194 Having means to facilitate removal of cooling means:**  
 This subclass is indented under subclass 193. Device including means enabling easy insertion or extraction of the heat-exchange member.
- 195 With discharge means:**  
 This subclass is indented under subclass 171. Device wherein the heating means is provided with delivery means for drawing off the material treated within the heating means.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 191, for means for cooling a material-discharge means.  
 236, for converters and other molten metal treating or holding vessels with specific discharge structure.
- SEE OR SEARCH CLASS:  
 414, Material or Article Handling, subclasses 209 through 216 for the combination of a chamber of a type utilized for a heating function and either a driven device, or a gravity arrangement, respectively, for the discharge of material from the chamber.  
 432, Heating, appropriate subclasses, especially subclasses 157, 160, and 161 for furnaces of general utility having discharge structure.
- 196 With trough-shaped outlet, e.g., runner:**  
 This subclass is indented under subclass 195. Device wherein the delivery means is further provided with a channel shaped means through which the material passes after it has been discharged from the heating means.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 231, for a discharge runner combined with a molten-metal treating means.
- 197 Shaft-type furnace, e.g., blast furnace:**  
 This subclass is indented under subclass 171. Device comprising a chamber having a substantially vertical axis to which material is fed at an elevated level for gravitation downwardly across a heating surface or through a heating medium.
- SEE OR SEARCH CLASS:  
 432, Heating, subclasses 95 through 102 for shaft-type furnaces of general utility.
- 198 Having external support:**  
 This subclass is indented under subclass 197. Device having means external of the furnace for sustaining the furnace against the effects of gravity.
- 199 Having specific top structure:**  
 This subclass is indented under subclass 197. Device wherein the upper region of the furnace has a particular configuration or includes additional structural members which facilitate the operation of the furnace.
- 200 MEANS FOR MELTING OR VAPORIZING METAL OR TREATING LIQUEFIED METAL:**  
 This subclass is indented under the class definition. Device for (a) refining or otherwise purifying metal while in the liquid state, (b) removing or separating constituents from a molten bath, (c) mixing or stirring a molten bath, (d) applying heat to a molten bath to maintain the molten condition, or (e) liquefy or volatilize a metal.
- SEE OR SEARCH CLASS:  
 65, Glass Manufacturing, appropriate subclasses for a means to melt glass.  
 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a process of refining a metal.  
 164, Metal Founding, appropriate subclasses for an apparatus for treating metal in a mold.  
 373, Industrial Electric Heating Furnaces, appropriate subclasses for a metal melting or refining means having specific electrical heating structure.  
 432, Heating, appropriate subclasses for melting furnaces of general utility.
- 201 Slag refining means:**  
 This subclass is indented under subclass 200. Device wherein means are provided to effect slag contact with a molten metal, thus promoting thorough intermingling and interaction of the slag with the metal.
- SEE OR SEARCH CLASS:  
 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a process of treating slags and oxidized drosses.



**202 Spray refining means:**

This subclass is indented under subclass 200. Device wherein means are provided to enhance treating gas contact with a molten metal, which means causes the metal to fall through a treating gas in either a finely divided stream or as a plurality of narrow streams and thus promotes the thorough intermingling and interaction of the gas with the metal.

**SEE OR SEARCH CLASS:**

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 331 through 341 for producing solid particulate free metal directly from liquid metal and subclass 525 for impinging free-falling molten metal stream or spray with a gas or solid agent or spraying (i.e., atomizing) of molten metal.
- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 7 for a means for atomizing a molten metal by a blast of fluid in a powder-making apparatus.

**203 By means specialized to puddle metal:**

This subclass is indented under subclass 200. Device wherein means are provided to mechanically work and to contact molten metal with an additive, such as mill scale or ore, while in the presence of an oxidizing atmosphere, whereby a semisolid product is produced.

**204 Means applying centrifugal force:**

This subclass is indented under subclass 200. Device including means to rotate the vessel to effect outward radial movement of a bath of molten material contained therein.

**SEE OR SEARCH CLASS:**

- 494, Imperforate Bowl: Centrifugal Separators, appropriate subclasses for apparatus for breaking up a mixture of fluids or fluent substances into two or more components by centrifuging within a generally solid-walled, receptacle-like member.

**205 Means to melt and separate metal from mass of diverse constituents:**

This subclass is indented under subclass 200. Device which is particularized to heat a body which consists of a plurality of different materials, one of which is a metal, to liquefy and liberate said metal from said body.

**SEE OR SEARCH CLASS:**

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 401 for processes of treating multicomponent metal-containing scrap having an integral substrate to separate metal therefrom by temperature modification wherein at least one metal remains solid during separation.

**206 Means for melting-type material, e.g., Linotype:**

This subclass is indented under subclass 200. Device particularized to liquefy metals used in the manufacture of printing characters.

**207 By providing, treating or protecting environment, e.g., vacuum:**

This subclass is indented under subclass 200. Device wherein means are provided either for subjecting molten metal to a specific atmosphere or atmospheric condition to bring about a desired physical or chemical change in the metal or for surrounding or blanketing the metal in an inert fluid to prevent contamination of the metal being operated upon.

- (1) Note. An example of structure to be found in this and the indented subclasses is vacuum degassing apparatus.

**208 By application of vacuum:**

This subclass is indented under subclass 207. Device wherein the treating atmosphere is at a pressure less than standard atmospheric.

**SEE OR SEARCH CLASS:**

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Composi-

- tions, and Loose Metal Particulate Mixtures, for a process of treating a molten metal within a vacuum environment.
- 373, Industrial Electric Heating Furnaces, subclasses 54, 63, 110-112, 140, and 141 for electric furnaces combined with means to lower the pressure therein to subatmospheric levels.
- 209 By upward flow of metal within treating zone:**  
This subclass is indented under subclass 208. Device wherein an evacuated receptacle is provided with a downwardly extending supply passage within which the molten material is raised to a level higher than the level of the source.
- 210 Recirculating material to its source:**  
This subclass is indented under subclass 209. Device wherein the metal is returned from the reduced pressure zone to its point of origin.
- 211 Enclosed within casing:**  
This subclass is indented under subclass 208. Device wherein a molten-metal containing or receiving vessel is contained within and surrounded by a housing, which housing is communicable with a source of vacuum.
- 212 Refining means with separate metal-melting zone:**  
This subclass is indented under subclass 200. Device wherein the means to treat the molten metal is provided with a distinct metal liquefying region or chamber from which the molten metal to be treated is drawn.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
162, through 164, for means specialized to extract and refine a metal within separate treating zones.
- 213 Revolving drum-type furnace:**  
This subclass is indented under subclass 200. Device wherein the vessel is mounted to be turned about its longitudinal axis through more than 360 degrees.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
248, for a drum-type melting or refining vessel adapted to revolve or oscillate about its longitudinal axis.
- SEE OR SEARCH CLASS:  
432, Heating, subclasses 103 through 119 for a tumbler-type rotary drum furnace of general utility.
- 214 Reverberatory refining vessel, e.g., open hearth:**  
This subclass is indented under subclass 200. Device wherein the means to melt metals or to treat a molten metal comprises a treating receptacle within which hot gas sweeps over the surface of material contained within the receptacle to elevate the temperature of the material.
- 215 Continuous refining:**  
This subclass is indented under subclass 200. Device wherein the treating means includes a treating vessel which is provided with means for supplying an unrefined molten metal mass thereto and for drawing refined molten metal therefrom in a substantially uninterrupted fashion.
- 216 By means introducing treating material:**  
This subclass is indented under subclass 200. Device including means for adding a solid, liquid, or gaseous substance to the molten metal.
- SEE OR SEARCH CLASS:  
75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a process of introducing a treating material into molten metal.
- 217 Gaseous treating material:**  
This subclass is indented under subclass 216. Device wherein the added substance is in gaseous form.
- (1) Note. Means introducing a gas stirring agent will be found in this and the indented subclasses.

- SEE OR SEARCH CLASS:  
261, Gas and Liquid Contact Apparatus, appropriate subclasses for devices of general utility for contacting a gas with a liquid.
- 218 Having fluid inlet formed in vessel wall, e.g., tuyere:**  
This subclass is indented under subclass 217. Device wherein the means is a short tubular member forming an aperture in the vessel wall.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
265, through 270, for tuyere structure, per se.
- SEE OR SEARCH CLASS:  
110, Furnaces, subclass 182.5 for a tuyere in a furnace of general utility.  
122, Liquid Heaters and Vaporizers, subclass 6.6 for a tuyere having a closed water circulation.
- 219 Having intersecting streams converging on central axis of vertical furnace:**  
This subclass is indented under subclass 218. Device wherein a plurality of tuyeres are arranged in the wall of a vertical furnace such that the streams issuing therefrom will meet or cross in one area substantially in the center of said furnace.
- (1) Note. Cupola furnaces are found herein where the sole disclosure is for melting metal.
- 220 Having porous outlet:**  
This subclass is indented under subclass 218. Device wherein the means discharges through a foraminous member.
- SEE OR SEARCH CLASS:  
261, Gas and Liquid Contact Apparatus, subclasses 94 through 99 and 100-107 for gas-liquid contact sheet.
- 221 By means to introduce diverse material:**  
This subclass is indented under subclass 218. Device wherein said adding means is adapted to concurrently supply plural materials.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
182, for a means to introduce a solid entrained in a fluid into an ore treating or metal-extracting device.  
188, for a means to introduce diverse fluids via a common outlet into an ore treating or metal-extracting device.  
267, for a means specialized for simultaneously feeding diverse materials into a vessel.
- 222 Concentric flow paths:**  
This subclass is indented under subclass 221. Device wherein the adding means has a plurality of coaxial flow paths.
- 223 Having control means:**  
This subclass is indented under subclass 218. Device wherein a regulating means is provided in the flow path to control fluid flow into the treating vessel.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
82, through 84, for means correlating the flow of diverse fluents responsive to a sensed condition.  
187, for regulating the flow of a fluid into an ore treating or metal extracting means.  
266, for a tuyere means combined with a flow-control means.
- 224 Having tuyere formed in plug bottom:**  
This subclass is indented under subclass 218. Device wherein the treating vessel is provided with a separate, distinct bottom closure which has an integrally formed tuyere therein.
- (1) Note. The plug bottoms are usually removable or replaceable to facilitate changing of worn or damaged tuyeres.
- 225 Lance:**  
This subclass is indented under subclass 217. Device wherein the introducing means is a long, narrow tube extending into the interior of the treating vessel.

- SEE OR SEARCH CLASS:  
239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for lances, per se, and for nozzles of general utility.
- 226 With manipulating means:**  
This subclass is indented under subclass 225. Device including means to adjust the position of the lance.
- 227 By separating metal in a molten mass from undesired material, e.g., slag:**  
This subclass is indented under subclass 200. Device including means to segregate a metal from other constituents.
- SEE OR SEARCH CLASS:  
210, Liquid Purification or Separation, subclasses 513 through 540 for gravitational separators and subclasses 767-808 for processes of separating solids and liquids.
- 228 By skimming a material:**  
This subclass is indented under subclass 227. Device having means for drawing off a material floating on the surface of a molten mass.
- SEE OR SEARCH CLASS:  
210, Liquid Purification or Separation, subclasses 242.1 through 242.4 for movable means floating on the surface of a liquid.
- 229 By baffle means:**  
This subclass is indented under subclass 227. Device including a separating arrangement having a barrier member associated therewith which effects the separation of a desired constituent from the molten mass by blocking the flow of one of the constituents.
- 230 At discharge outlet:**  
This subclass is indented under subclass 229. Device wherein the separating arrangement comprises a receptacle having a baffle associated with the receptacle outlet to block the flow of undesired constituents.
- 231 In discharge trough, e.g., runner:**  
This subclass is indented under subclass 229. Device wherein the barrier member is associated with a channel shaped means through which the molten mass flows.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
196, for a runner system combined with a metal-extracting furnace.
- 232 Settling receptacle, e.g., slag pot:**  
This subclass is indented under subclass 227. Device wherein the separating means comprises a vessel within which the molten mass is allowed to stand and separate by the effects of gravity.
- 233 By stirring or mixing molten metal:**  
This subclass is indented under subclass 200. Device including means to agitate a molten metal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
217, through 226, for means which agitates a body of molten metal by introducing a gas into said body.
- SEE OR SEARCH CLASS:  
366, Agitating, appropriate subclasses for stirring or mixing apparatus of general utility.
- 234 Induction stirring:**  
This subclass is indented under subclass 233. Device wherein the agitating means includes an electromagnetic means which creates flux lines passing through the metal to cause movement of the metal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
237, for electromagnetic molten-metal dispensing means.
- SEE OR SEARCH CLASS:  
373, Industrial Electric Heating Furnaces, subclasses 85, 116, and 146 for induction stirrers combined with an electric furnace.

**235 Having impeller means:**

This subclass is indented under subclass 233. Device wherein the agitating means includes a blade-like member having a fluid reactant surface which engages and moves the molten mass.

**236 With means to discharge molten material:**

This subclass is indented under subclass 200. Device wherein the vessel containing the molten mass undergoing treatment is provided with specific terminal outlet structure for removing the mass from the vessel.

## SEE OR SEARCH CLASS:

- 65, Glass Manufacturing, subclasses 324 through 333 for molten-glass dispensing means.
- 222, Dispensing, subclasses 590 and 591-607 for receptacles having means to effect discharge of molten metal therefrom.
- 251, Valves and Valve Actuation, appropriate subclasses for valves specialized to control flow of molten material.

**237 Including electromagnetic means:**

This subclass is indented under subclass 236. Device including means which create flux lines to cause the material to flow in a desired direction.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 234, for a molten-metal treating means or melting means having an induction stirring means.

## SEE OR SEARCH CLASS:

- 417, Pumps, subclass 50 for electromagnetic pumps.

**238 Means for removing residual material:**

This subclass is indented under subclass 236. Device including a means effecting withdrawal of molten matter remaining in the vessel after normal emptying of the vessel.

**239 By changing ambient pressure on material surface, e.g., suction:**

This subclass is indented under subclass 236. Device wherein the means for discharging material from the treating vessel includes

means for varying gas pressure at a selected location on the exterior of the molten mass to create a gas pressure gradient across the exterior which is effective to deliver material from the vessel.

- (1) Note. The means to vary the gas pressure on a portion of a liquid surface includes both devices that raise the gas pressure, e.g., pressurized gas cylinders, and that lower the gas pressure, e.g., vacuum pumps.

## SEE OR SEARCH CLASS:

- 222, Dispensing, appropriate subclasses for miscellaneous receptacles having means to effect discharge of fluent material therefrom. Note especially subclasses 394 through 402.25 for fluid pressure means and subclass 416 for siphon means.

**240 With means to tilt heating means:**

This subclass is indented under subclass 236. Device including means to cant the vessel to effect discharging.

## SEE OR SEARCH CLASS:

- 432, Heating, subclass 157 for crucible or pot-heating furnace of general utility having a tilting arrangement.

**241 With means to cool treating means:**

This subclass is indented under subclass 200. Device wherein means are provided to remove excess heat energy, the means treating the material thus maintaining the temperature of said means within a safe operating range.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 46, for a process of cooling a metallurgical apparatus.
- 138, for a means within a heating or treating vessel for preheating a gas, which heating inherently cools the heating or treating vessel.

## SEE OR SEARCH CLASS:

- 432, Heating, appropriate subclasses for cooling furnaces of general utility.

**242 Heated melting pot:**

This subclass is indented under subclass 200. Device including a kettle-like receptacle having a means for raising the temperature of the metal therein to liquefy the same.

**SEE OR SEARCH CLASS:**

- 219, Electric Heating, subclasses 420 through 427 for crucible or furnace-type electric heating devices adapted to hold meltable material.
- 432, Heating, subclasses 156 through 158 for a crucible or pot-type heating furnace of general utility.

**243 Bessemer-type treating vessel:**

This subclass is indented under subclass 200. Device wherein the means to treat the molten mass comprises an open topped, flask-like receptacle within which a molten mass is adapted to be subjected to a self-sustaining refining action by the introduction of a treating gas.

**244 By mounting vessel to revolve about its longitudinal axis:**

This subclass is indented under subclass 243. Device wherein means are provided for supporting the receptacle such that it may be rotated through more than 360 degrees about its lengthwise center line.

**245 With means pivotally mounting vessel:**

This subclass is indented under subclass 243. Device wherein means are provided for supporting the treating vessel such that the vessel may be swung about an axis generally normal to its longitudinal axis so that the mouth of the vessel can be moved to a selected one of a plurality of positions.

**246 Means mounting vessel to trunnion ring:**

This subclass is indented under subclass 245. Device wherein the means pivotally mounting the vessel includes a generally annular member which girdles the receptacle and means interposed between the receptacle and the girdling member to secure the receptacle to the girdling member.

**247 Means mounting vessel to U-shaped trunnion support means:**

This subclass is indented under subclass 245. Device wherein the means pivotally mounting the vessel includes a member having two arms between which the receptacle is supported.

**248 Horizontal, rotatable, cylindrical type:**

This subclass is indented under subclass 200. Device including a generally drum-like vessel having its longitudinal axis generally parallel to the horizon and adapted to revolve or oscillate about its longitudinal axis.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 213, for a drum-type molten metal treating means which rotates about its longitudinal axis through more than 360 degrees.
- 244, for a Bessemer-type treating vessel which rotates about its longitudinal axis through more than 360 degrees.

**249 MEANS TREATING SOLID METAL:**

This subclass is indented under the class definition. Device wherein means are provided which operate upon a metallic object or mass to discrete metal granules to enhance their physical, chemical, or mechanical properties.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 114, through 134, for apparatus which both heats and contacts a metallic object with a liquid or which includes means to control the shape of an object undergoing a liquid contact operation.

**SEE OR SEARCH CLASS:**

- 148, Metal Treatment, particularly subclasses 559 through 714 for processes of treating solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.
- 432, Heating, appropriate subclasses for furnaces which merely elevate the temperature of a metal object to facilitate some further treatment, e.g., rolling, and where no specific gaseous environment, treating, or protective, is

supplied to, circulated in, or generated within the furnace.

**250 Having evacuated chamber:**

This subclass is indented under subclass 249. Device wherein the work is placed in a receptacle having means to change the temperature thereof, said receptacle further having means to create a treating environment by lowering the gas pressure therein.

**251 By contact with gas:**

This subclass is indented under subclass 249. Device wherein the treating operation involves (a) surrounding the metallic article with a specific gaseous atmosphere or (b) applying or directing a specific treating gas against the metallic article

**252 With heating means:**

This subclass is indented under subclass 251. Device wherein means are provided to elevate the temperature of the article being treated.

SEE OR SEARCH CLASS:

65, Glass Manufacturing, subclasses 349 through 351 for glass annealing or tempering apparatus including heating and cooling means.

219, Electric Heating, subclasses 50 through 162 for other electric heating of metal and subclasses 600-677 for inductive heating. Note subclasses 74 and 75 where a gas is supplied to the heated area.

432, Heating, subclasses 198, 199, and 200-205 for furnaces of general utility having gas-introducing means.

**253 Bottom feeding furnace:**

This subclass is indented under subclass 252. Device wherein the article is loaded into a treating chamber from underneath said chamber by means moving said article in a substantially vertical direction, e.g., an elevator.

**254 With indirect heat-exchange means for gas:**

This subclass is indented under subclass 252. Device wherein a separate means is provided for altering the temperature of the specific atmosphere, which means is separate from the means heating the metallic articles.

SEE OR SEARCH THIS CLASS, SUBCLASS:

138, through 141, for devices having means to elevate the temperature of the gas prior to the entry of the gas into the treating zone.

**255 Having work contained in separate, non-communicating chamber, e.g., muffle:**

This subclass is indented under subclass 252. Device wherein the article to be heated is disposed within a receptacle and is maintained out of direct contact with the source of heat or gases evolved thereby.

SEE OR SEARCH THIS CLASS, SUBCLASS:

262, for a means for treating a solid metal within a fluid tight heat transferring box shield, e.g., annealing box.

**256 Bell furnace:**

This subclass is indented under subclass 255. Device wherein the receptacle containing or protecting the article during treatment is open-bottomed and is lowered over stationary article prior to said treatment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263, for a means for treating a solid metal within a bell-type hood.

**257 Having atmosphere generating means within treating zone:**

This subclass is indented under subclass 252. Device wherein means are provided within the work confining chamber for evolving a gaseous treating agent.

**258 By contacting only selected areas of object:**

This subclass is indented under subclass 251. Device wherein the apparatus is so arranged or additional means are provided to insure that the gas contact with the object to be treated will be restricted to only a certain pre-established section of said object.

**259 By cooling of the solid:**

This subclass is indented under subclass 249. Device wherein means are provided to lower the temperature of the article.

## SEE OR SEARCH CLASS:

- 148, Metal Treatment, particularly subclasses 559 through 714 for processes of heating or cooling of solid or semisolid metal to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.
- 165, Heat Exchange, appropriate subclasses for heat exchanger of general utility.

**260 By contact with solid heat sink:**

This subclass is indented under subclass 259. Device which includes means for conduction cooling of the articles by physical contact with a solid object which is at a lower temperature.

**261 By flame contact heating:**

This subclass is indented under subclass 249. Device wherein the workpiece is juxtaposed with a burner element whereby the burning fuel of said burner is allowed to impinge against and heat said workpiece.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 121, for apparatus for contacting a solid with a flame and with a liquid.

## SEE OR SEARCH CLASS:

- 148, Metal Treatment, particularly subclass 642 for processes of heat treatment of an iron or iron based alloy with a flame to modify or maintain the internal physical structure (i.e., microstructure) or chemical property of metal.

**262 Fluid tight heat transferring box shield or hood (e.g., annealing box):**

This subclass is indented under subclass 249. Device including a removable enclosing receptacle or hood specially adapted for holding metal articles being heated, shielding them from the atmosphere, and equalizing the application of heat to the metal articles, e.g., annealing or carbonizing boxes.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 255, for fluid-tight chamber having means for contacting the workpiece within the chamber with a gas.

## SEE OR SEARCH CLASS:

- 432, Heating, subclasses 254.1 and 254.2 for fluid-tight heat transferring boxes of general utility.

**263 Bell-type hood, or support for such hood:**

This subclass is indented under subclass 262. Device 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, SUB-CLASS:

- 256, for bell-type furnace having means for contacting the workpiece within the hood with a gas.

**264 Having packing at hood lip:**

This subclass is indented under subclass 263. Device including distinct structure for sealing the joint between the hood and its support.

**265 MEANS FOR INTRODUCING FLUENT INTO VESSEL, E.G., TUYERE:**

This subclass is indented under the class definition. Device comprising short tubular means adapted to be mounted in a vessel wall for permitting fluents to flow therethrough.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 47, for a method of injecting fluents through a tuyere.
- 186, for a tuyere means combined with an ore treating or metal extracting means.
- 218, for a tuyere means combined with a metal melting or molten metal treating means.

## SEE OR SEARCH CLASS:

- 110, Furnaces, subclass 182.5 for a tuyere in a furnace of general utility.



**266 With flow control means or internal flow guide:**

This subclass is indented under subclass 265. Device including means to alter either the quantity of material moving through the introducing means or the direction in which said material is delivered.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 82, for a control means responsive to a sensed condition for correlating the flow of diverse fluents.
- 187, for a means for feeding a fluid having flow-regulating means combined with an ore treating or metal extracting means.
- 223, for a means for feeding a gas having flow-regulating means combined with a metal melting or molten metal treating means.

**SEE OR SEARCH CLASS:**

- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 590 through 590.5 for nozzles of general utility having internal flow guides.

**267 Having means for simultaneously feeding diverse materials:**

This subclass is indented under subclass 265. Device including means to concurrently deliver two different materials.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 182, for a device for feeding a gas entrained solid into an ore-treating means.
- 188, for a tuyere for feeding diverse fluids into an ore-treating means.
- 221, for a tuyere for feeding diverse material into a means for treating molten metal.

**SEE OR SEARCH CLASS:**

- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 398 through 434.5 for a nozzle of general utility having means for combining separately supplied fluids.

**268 Having plural outlets:**

This subclass is indented under subclass 267. Device including two separate flow paths, each of which terminate at the outlet of the tuyere and each of which discharges a different material.

**SEE OR SEARCH CLASS:**

- 239, Fluid Sprinkling, Spraying, and Diffusing, subclass 549 for a nozzle of general utility having multiple outlet openings, each of which is supplied with a different fluid.

**269 Having drain means or cleaner insertion means, e.g., punch hole:**

This subclass is indented under subclass 265. Device wherein means are provided which will either allow a blockage removing cleaning implement to be inserted into the introducing means or allows undersized material contained within the introducing means to run off.

**270 Having means preventing damage to introducing means, e.g., wear linings, cooling:**

This subclass is indented under subclass 265. Device including means to protect the tubular means.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 189, for means cooling a tuyere in a metallurgical apparatus.

**SEE OR SEARCH CLASS:**

- 122, Liquid Heaters and Vaporizers, subclass 6.6 for liquid-cooled tuyere elements, per se, where a coolant flows through the tuyere element in a closed path. Those patents which disclose a diversity of water cooled blast furnace accessories (e.g., monkeys, cooling boxes), in addition to tuyeres and which either specifically claim one of these diverse accessories or includes a claim generic to all such accessories, will be placed as an original in Class 266 and will be cross referenced to Class 122.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclass 591 for nozzles of general utility having wear linings.

**271 MEANS SEALING OR OPENING APERTURE IN VESSEL:**

This subclass is indented under the class definition. Device for (a) plugging openings in the walls of treating or holding receptacles or (b) tapping such openings or otherwise removing plugs or other blockages therefrom.

- (1) Note. Examples of apertures plugged by the sealing means are tuyere openings, cinder or slag notches, tap holes, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 45, for process of opening or closing an aperture in the wall of a metallurgical vessel.  
136, for tuyere punches combined with the tuyere.

**272 By means plugging aperture:**

This subclass is indented under subclass 271. Device wherein the means is specialized to seal or stop the opening in the vessel wall.

**273 By means injecting plugging compound, e.g., mud gun:**

This subclass is indented under subclass 272. Device wherein the means to seal the aperture includes means for extruding a hardenable fluent substance into the aperture.

SEE OR SEARCH CLASS:

- 222, Dispensing, appropriate subclasses for dispensers of general utility and especially subclass 390 for dispensers having a supply container with a follower, e.g., a piston, therein and having a screw to advance the follower.

**274 MEANS FOR HOLDING OR SUPPORTING WORK:**

This subclass is indented under the class definition. Device which comprises means specialized to contain or retain either metalliferous material or a solid metal member while such material or member undergoes a metallurgical treatment.

SEE OR SEARCH CLASS:

- 269, Work Holders, appropriate subclasses for work holders of general utility.

**275 Receptacle:**

This subclass is indented under subclass 274. Device wherein the containing or retaining means is a container which volumetrically confines the work undergoing treatment.

SEE OR SEARCH CLASS:

- 164, Metal Founding, subclasses 335 through 337 for metal-casting apparatus including a ladle or crucible-type metal receptacle.  
432, Heating, subclasses 262 through 265 for a refractory vessel for holding metals or ores while being melted or calcined.

**276 With means movably supporting receptacle:**

This subclass is indented under subclass 275. Device wherein means are provided for mounting the container such that its attitude may be changed, e.g., by moving it from place to place, by tilting, or the like.

**277 By bed of rollers:**

This subclass is indented under subclass 276. Device wherein the container is mounted on a plurality of cylindrical members, each of which is adapted to revolve about its longitudinal axis.

**278 Having corrugated wall:**

This subclass is indented under subclass 275. Device wherein a wall of the container is formed with a plurality of alternating ribs and grooves which give an undulating appearance to the wall.

**279 Grate:**

This subclass is indented under subclass 274. Device wherein the means for supporting the work is a member having a generally planar surface, which surface sustains the work against the effect of gravity and which surface has openings therethrough for the passage of combustion gases, air, or the like.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 159, for grate-support means combined with gas offtake means.  
178, through 180, for a traveling grate means combined with heating structure.

- 185, for grate-support means combined with heating structure.
- SEE OR SEARCH CLASS:
- 110, Furnaces, subclasses 267 through 294 for progressive-feed grates.
- 122, Liquid Heaters and Vaporizers, subclasses 371 through 378 for water-cooled grates.
- 126, Stoves and Furnaces, subclasses 152+ for general structure of grates.
- 280 LININGS:**  
This subclass is indented under the class definition. Device which comprises the specific construction or composition of the metal or ore contacting inner covering of a treating vessel.
- SEE OR SEARCH CLASS:
- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 301 for reactive furnace linings.
- 432, Heating, subclasses 248 and 264 for linings of furnaces of general utility.
- 501, Compositions: Ceramic, appropriate subclasses for ceramic compositions useful as linings.
- 281 With making or repairing means:**  
This subclass is indented under subclass 280. Device including means facilitating the forming, building, replacing, or restoring of such lining.
- (1) Note. Included herein are forms, means to remove old linings, and means to handle the linings to be or being constructed or replaced.
- SEE OR SEARCH CLASS:
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for processes of furnace lining formation and repair.
- 282 With metallic means to prevent lining abrasion:**  
This subclass is indented under subclass 280. Device including metallic elements fastened to, supported by, or otherwise contained within the lining for the purpose of warding off wear of the lining surface.
- (1) Note. The metal elements included herein are adjuncts to the lining, a complete metal lining even though made in parts is not included herein.
- 283 Having particular lining element shape:**  
This subclass is indented under subclass 280. Device including the particular configuration of at least one of the elements which, together with others of like or unlike configuration, make up the lining.
- 284 Having specific grain size:**  
This subclass is indented under subclass 280. Device including the particular size or range of sizes of the particles forming the raw material of the lining.
- 285 With means allowing for expansion:**  
This subclass is indented under subclass 280. Device including means to allow for the swelling of the lining or lining elements due to temperature change.
- 286 With specific lining enclosing structure:**  
This subclass is indented under subclass 280. Device including the particular shape, composition, structure, or characteristic of the vessel wall or walls adjacent the lining.
- (1) Note. The coating of a vessel wall is not sufficient for this subclass unless some cooperating characteristic of the wall is claimed. The characteristic of the wall may be relative denseness or relative heat-absorbing capacity, with respect to the lining, or any other specific cooperating feature as between the wall or walls and the lining.
- (2) Note. Specific structural supports between the lining and adjacent wall or walls is included under this subclass.
- 287 MISCELLANEOUS:**  
This subclass is indented under the class definition. Apparatus not provided for above.
- (1) Note. Examples of the devices to be found herein are ladle repair cages and hand held skimming tools.

## CROSS-REFERENCE ART COLLECTIONS

**900 METAL MELTING FURNACES, E.G., CUPOLA TYPE:**

Furnaces, especially shaft type, adapted to liquefy metal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

213, for revolving-drum type melting furnaces.

242, for heated melting pots.

SEE OR SEARCH CLASS:

373, Industrial Electric Heating Furnaces, appropriate subclasses for metal melting furnaces of the electric type.

432, Heating, appropriate subclasses for heating furnaces of general utility.

**901 SCRAP METAL PREHEATING OR MELTING:**

Device wherein (a) a means is provided for the reclamation of scrap metal by liquefying it by the application of heat or (b) a means is provided for raising the temperature of scrap metal prior to its introduction of the treating vessel.

**902 BLOWPIPES SPECIALIZED TO TRANSVERSELY CUT OR NOTCH BLOOMS, BILLETS OR BARS:**

Torches adapted to notch or sever a bloom, billet, or bar in a plane normal to the longitudinal axis of the workpiece.

**903 SAFETY SHIELDS:**

Apparatus including plate-like means to protect a vessel or operating personnel from the effects of heat and molten material.

**904 BLOWPIPE CUTTING HEADS:**

Tips used in conjunction with cutting torches.

**905 REFRACTORY METAL-EXTRACTING MEANS:**

Apparatus adapted to liberate a refractory metal from a source of such metal.

END