

## CLASS 373, INDUSTRIAL ELECTRIC HEATING FURNACES

### SECTION I - CLASS DEFINITION

#### GENERAL STATEMENT OF CLASS SUBJECT MATTER

Apparatus of this class is characterized by the following: (1) Specialized to the use of electricity as the heat source; (2) heating within a chamber, enclosure, or other holding means; (3) melting of a charge (e.g., materials such as crushed ore or scrap), or preserving a melted charge in a molten state; and (4) manipulated, or operated in an industrial environment.

Processes of Operating the Apparatus of the above paragraph, per se, which do not recite a specific metallurgical treatment step.

Residual Industrial Electric Furnace Processes not elsewhere classifiable.

Industrial Electric Furnaces not elsewhere classifiable.

Apparatus used to simulate electric furnace operations and that is not elsewhere classifiable.

#### SUBCOMBINATIONS OF INDUSTRIAL ELECTRIC FURNACES PROVIDED FOR IN THIS CLASS

Any subcombination within the purview of the Statement of Class Subject Matter, above, and disclosed as having primary utility as part of an industrial electric furnace apparatus.

Other subcombinations (e.g., charge stirring apparatus) either claimed in conjunction with nominally disclosed industrial furnace apparatus, or disclosed as having primary utility in an industrial furnace apparatus except as enumerated by Exclusions, below.

#### COMBINATIONS OF OTHER APPARATUS WHICH INCLUDES APPARATUS OF THIS CLASS

Control Systems, or disparate device regulators not elsewhere classifiable are classified in this class.

Noninteractive combinations where the industrial electric furnace apparatus is more than nominally claimed, or where the combination is not elsewhere classifiable are classified in this class.

#### EXCLUSIONS

(1) An Industrial Electric Furnace which is a subcombination of a claimed encompassing system;

(2) Residential, or home heating furnace systems, or devices;

(3) Electrical Heating Apparatus with Furnacelike Enclosure, or holding means where: (a) there is no disclosure of utility relating to charge melting, or preserving in a molten state, or (b) any utility requiring melting is incorporated in a specific metallurgical treatment step (e.g., welding) which is elsewhere classifiable;

(4) Furnace apparatus powered by electricity whose primary principle of operation is unrelated to heating (e.g., electrolytic furnaces).

(5) Furnace apparatus of the charging and discharging type, wherein the furnace is only nominally recited. For example, a furnace apparatus of the aforementioned type only nominally reciting an electric furnace having a heating element will be found with the particular charging and discharging type.

### SECTION II - REFERENCES TO OTHER CLASSES

#### SEE OR SEARCH CLASS:

65, Glass Manufacturing, appropriate subclasses for nonelectric glass furnaces and furnace devices.

75, Specialized Metallurgical Processes, Compositions for use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for processes of consolidating metalliferous material or extracting, refining, or melting metals and subclasses 10.1+ for electric reduction processes not directed merely to processes of operation or manipulation of the furnace.

110, Furnaces, appropriate subclass, for furnaces of general utility, especially subclasses 235+, for incinerators for the disposal of waste material, which incinerators may have structure to render a molten material, including metals, disposable.

117, Single-Crystal, Oriented-Crystal, and Epitaxy Growth Processes; Non-Coating Apparatus Therefor, for non-coating apparatus for growing therein-defined single-crystal of all types of materials, including those having means for zone melting.

- 118, Coating Apparatus, subclasses 58+ 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, and subclasses 726+ for details of crucible structures which contain coating material during vaporization.
- 126, Stoves and Furnaces, appropriate subclasses for structural features peculiar to stoves and furnaces, see particularly subclass 343.5 for melting furnaces, or domestic utility.
- 159, Concentrating Evaporators, appropriate subclasses for electrically heated furnaces for vaporizing liquid for the specific purpose of concentrating attendant solids.
- 164, Metal Founding, appropriate subclasses for metal casting apparatus which may employ electric heating means.
- 175, Boring or Penetrating the Earth, subclass 16 for an electrical heating process, or device for forming a hole in the earth by directly applying heat to fluidize, or comminute the material forming the earth.
- 196, Mineral Oils: Apparatus, subclass 121 for vaporizing devices with electric heating means.
- 204, Chemistry: Electrical and Wave Energy, appropriate subclasses for electrical furnaces and electrical processes for electrolysis, or for using electrical energy to cause chemical change as distinguished for its use for mere heating.
- 219, Electric Heating, which is the generic class for heating electrically, as welding, metal heating, domestic heating, heating articles, or fluids.
- 222, Dispensing, subclasses 591+, especially subclasses 592+ 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.
- 236, Automatic Temperature and Humidity Regulation, subclass 15 for automatic temperature, or humidity control in combustion furnaces.
- 237, Heating Systems, subclass 48 for furnace heating system ventilation.
- 241, Solid Material Comminution or Disintegration, appropriate subclass, especially subclasses 65+, 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.
- 250, Radiant Energy, subclass 251 for molecular, or atomic beam devices for producing and propagating an unidirectional stream of neutral molecules, or atoms through a vacuum, usually at thermal velocity, subclasses 324+ for methods and apparatus to irradiate materials by corona radiation, subclass 423 for methods and apparatus to generate ions, subclasses 428+ for methods and apparatus to support, contain, or transfer fluent material with, or without an irradiating source, subclasses 453.1+ for methods and apparatus including supports for objects to be irradiated with, or without an irradiating source, subclasses 458.1+ for methods and apparatus to irradiate luminophors, subclass 492.1+ for methods and apparatus to irradiate objects, or materials generally, and subclasses 472.1+ for invisible radiation generation and sources, particularly subclasses 493.1+ for neutron generators.
- 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.
- 266, Metallurgical Apparatus, for electric, or non-electric features of metallurgical furnaces not limited to characteristics of an electric furnace (except electric heating or pouring spout, or material at discharge area when only disclosed in an electric furnace).
- 313, Electric Lamp and Discharge Devices, subclass 327 for self-baking electrode structures, per se.
- 315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for systems for supplying electric current to arc furnaces provided that the arc furnace is only nominally disclosed.
- 323, Electricity: Power Supply or Regulation Systems, for electrical power supply, or regulating systems with nominally disclosed electric furnace devices.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits, subclasses 509+ for miscellaneous externally effected circuits, subclasses 518+ for miscellaneous control circuits, and subclasses 538+ for miscellaneous bias circuits with regulating.
- 336, Inductor Devices, for inductive devices, per se.
- 376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclass 107, 121+ and 144 for means utilizing an electrically con-

- trolled plasma to produce a thermonuclear reaction.
- 414, Material or Article Handling, subclasses 147+ for furnace charging apparatus, or for furnace chargers combined with that specific furnace structure which is solely for facilitating the movement of the material into the furnace.
- 432, Heating, appropriate subclass, for heating apparatus of general utility.
- 501, Compositions: Ceramic, appropriate subclasses for furnace lining compositions.

### SECTION III - GLOSSARY

#### ARC

A prolonged electrical discharge, or series of prolonged discharges between two electrodes, or between an electrode and a current carrying material.

#### CHANNEL

A hollow loop, or ring which will contain material to be heated, and which permits the insertion of a core of iron to improve the coupling between a primary coil and a secondary in the loop, or ring.

#### CHARGE

The material heated by the furnace.

#### CHARGING

The function of supplying a charge to a furnace.

#### CRUCIBLE

A component of the furnace which holds, or otherwise contains the charge.

#### DISCHARGING

The function of removing a charge from a furnace.

#### ELECTRODE

An electrical conducting element that emits, or collects electrons, or ions, or controls their movement by means of an electric field on it.

#### ELECTRON BEAM

A narrow stream of electrons moving in the same direction under the influence of an electric, or magnetic field.

#### ELECTROSLAG DEVICE

Apparatus enabling one, or more electrodes to be immersed in a slag layer which floats on top of the melt.

#### FILAMENT

A slender thread of material.

#### FURNACE

A chamber, enclosure, or other holding means for heating materials therein.

#### GLOW DISCHARGE

The phenomenon of electrical conduction in gasses shown by a slight luminosity, without great hissing, or noise, and without appreciable heating, or volatilization of the electrode, when the electrostatic pressure exceeds a certain value.

#### HEARTH

The part of the furnace upon which the charge is placed and melted down, or refined.

#### INDUCTION HEATING

The method of producing heat in a charge by placing it in a electromagnetic relationship with an inducing winding, the charge forming the secondary.

#### INGOT

The casting obtained when molten metal is poured into a mold with the expectation that it be further processed.

#### PLASMA

A wholly, or partially ionized gas in which the positive ions and the negative electrons are roughly equal in number.

#### ROOF

A cover, or lid for the furnace.

#### SLAG

A more, or less completely fused and vitrified material separated during the reduction of a metal from its ore which generally floats on top of the molten metal during the heat reduction processes found in this class.

#### ZONE MELTING

A process where a selected area of a charge is heated in liquification.

#### SUBCLASSES

**1 PLURAL DIVERSE HEATING MEANS:**  
This subclass is indented under the class definition. Subject matter including plural, different in kind, or type heating elements.

- (1) Note. Usually either the plural heating elements operate on the same charge, or one of the heating elements operates as a substitute for the other.

#### SEE OR SEARCH CLASS:

432, Heating, subclass 94 for heating apparatus having (a) two distinctly different types of heat generators, (b) a heat generator and a source of heat that is not a generator, or (c) a combustion type heat generating means using two different fuels.

**2 Arc:**  
This subclass is indented under subclass 1. Subject matter wherein one of the heating elements is an electric arc between two electrodes, or between an electrode and a current carrying material (e.g., the charge material).

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

9, for arc furnaces with environmental control devices.  
60, for arc furnace devices, per se.

#### SEE OR SEARCH CLASS:

164, Metal Founding, subclass 514 for electric arc heating apparatus used for metal casting.  
219, Electric Heating, subclasses 121.11+ for arc metal heating, per se.

**3 With resistance:**  
This subclass is indented under subclass 2. Subject matter including means to develop heat by the passage of current through a material, or device having the property of electrical resistance.

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

5+, for resistance furnaces combined with heating elements other than an electrical arc.  
109+, for resistance furnace details, per se.

#### SEE OR SEARCH CLASS:

219, Electric Heating, subclasses 200+ for electric resistance heating, per se.

**4 With induction:**  
This subclass is indented under subclass 2. Subject matter including means to produce heat in a charge by placing it in an electromagnetic relationship with an inducing winding, the charge forming the secondary.

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

6, for induction heating elements combined with resistance furnaces.  
7, for induction furnaces combined with heating elements other than an electrical arc, or resistance element.  
138+, for induction furnace details, per se.

#### SEE OR SEARCH CLASS:

164, Metal Founding, subclass 513 for inductive heating apparatus used for metal casting.  
219, Electric Heating, subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating.

**5 Resistance:**  
This subclass is indented under subclass 1. Subject matter wherein one of the heating elements is a means to develop heat by the passage of current through a material, or device having the property of electrical resistance.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 3, for resistance heating elements combined with arc furnaces.
- 109+, for resistance furnace details, per se.

SEE OR SEARCH CLASS:

- 219, Electric Heating, subclasses 200+ for electric resistance heating, per se.

## 6

### **With induction:**

This subclass is indented under subclass 5. Subject matter including means to produce heat in a charge by placing it in an electromagnetic relationship with an inducing winding, the charge forming the secondary.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 4, for inductance heating elements combined with arc furnaces.
- 7, for induction furnaces combined with heating elements other than an electrical arc, or resistance element.
- 138+, for induction furnace details, per se.

SEE OR SEARCH CLASS:

- 164, Metal Founding, subclass 513 for inductive heating apparatus used for metal casting.
- 219, Electric Heating, subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating.

## 7

### **Induction:**

This subclass is indented under subclass 1. Subject matter including means to produce heat in a charge by placing it in an electromagnetic relationship with an inducing winding, the charge forming the secondary.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 4, for inductance heating elements combined with arc furnaces.
- 6, for inductance heating elements combined with resistance furnaces.
- 138+, for induction furnace details, per se.

SEE OR SEARCH CLASS:

- 164, Metal Founding, subclass 513 for inductive heating apparatus used for metal casting.
- 219, Electric Heating, subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating.

## 8

### **ENVIRONMENTAL CONTROL:**

This subclass is indented under the class definition. Subject matter including means to withdraw furnace gases, or to trap dust and fumes escaping from the furnace while in operation.

SEE OR SEARCH CLASS:

- 266, Metallurgical Apparatus, subclasses 144+ for means treating, or handling gases exhausted by treating means.

## 9

### **Arc furnace:**

This subclass is indented under subclass 8. Subject matter wherein, the furnace heating element is an electric arc between two electrodes, or between an electrode and a current carrying material (e.g., the charge material).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 2+, for arc furnaces combined with other heating means.
- 60+, for arc furnace devices, per se.

## 10

### **ELECTRON BEAM FURNACE DEVICE:**

This subclass is indented under the class definition. Subject matter wherein heat is generated to melt charge material by the effects of the impingement, of a directed beam, of accelerated electrons on the charge.

SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 10.19+ for the production of metal or the treatment of molten metal using a wholly or partially charged mixture of gaseous ions and electrons (i.e. plasma) as the source of thermal energy.
- 219, Electric Heating, subclasses 121.13+ for welding, machining and general

- heating applications utilizing electron beams, search here also for electron guns, or emitters, per se.
- 250, Radiant Energy, subclass 251 for molecular, or atomic beam devices for producing and propagating a unidirectional stream of neutral molecules, or atoms through a vacuum, usually at thermal velocity, subclasses 324+ for methods and apparatus to irradiate materials by corona radiation, subclass 423 for methods and apparatus to generate ions, subclasses 428+ for methods and apparatus to support, contain, or transfer fluent material with, or without an irradiating source, subclass 453.11 for methods and apparatus including supports for objects to be irradiated with, or without an irradiating source, subclass 458.1 for the methods and apparatus to irradiate luminophors, subclasses 492.1+ for methods and apparatus to irradiate objects, or materials generally, and subclass 493.1 for invisible radiation generation and sources, particularly subclasses 493.1+ for neutron generators.

#### 11 Vaporizing furnace:

This subclass is indented under subclass 10. Subject matter wherein the charge is heated by the electron beam to a gaseous state.

- (1) Note. Generally crucibles are fully charged, then moved into an area to be struck by the electron beam and then out from under the beam when the charge is substantially vaporized.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 33+, for glass furnace charging devices.  
 46+, and 42, for electroslag remelting furnace start up charging and alloying devices respectively.  
 63, for indirect arc furnaces where the charge is fed into the space between the electrodes.  
 67+, for arc furnace ingot remelting where furnace electrodes constitute the charge material.  
 72+, for arc furnace crucible details.  
 79+, for arc furnace charging, per se.

- 115, for resistance furnace charging, per se.  
 142+, for induction furnace charging, per se.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclasses 267+ and 327+ for furnace solid fuel feeders and subclasses 101+ for furnace fuel feeders, per se.  
 118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.  
 219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.  
 266, Metallurgical Apparatus, subclasses 200+ for means to melt, or vaporize metal, or to treat liquified metal.  
 392, Electric Resistance Heating Devices, appropriate subclasses for electric heating apparatus.  
 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 244 for serially disposed vaporizing heating means with solid material deposition means maintained at a temperature lower than said heating means.  
 431, Combustion, subclass 208 for a fuel burner having an electrically heated fuel vaporizer.

#### 12 Power supply and control circuit:

This subclass is indented under subclass 11. Subject matter including means to regulate and power the operation of the vaporizing furnace.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 25, for plasma furnaces control systems.  
 40, for glass furnace electrical system regulation.  
 49+, for electroslag remelting furnaces with power supply control.  
 70, and 104+, for arc furnace power regulation.  
 135, for resistance furnace control, per se.  
 148, for induction furnace power supply regulation.

**13 Gun assembly:**

This subclass is indented under subclass 11. Subject matter including the component structure of the means which emits the electron beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18, for plasma furnace plasma gun details.

SEE OR SEARCH CLASS:

219, Electric Heating, subclass 121.27 for electron gun assembly in electron beam heating devices.

**14 With deflection control:**

This subclass is indented under subclass 13. Subject matter including means to regulate the path of the electron beam.

**15 Ingot remelting:**

This subclass is indented under subclass 10. Subject matter wherein a previously melted and subsequently solidified ingot charge is remelted by the furnace.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21+, for plasma furnace ingot remelting.  
67+, for arc furnace ingot remelting.

SEE OR SEARCH CLASS:

266, Metallurgical Apparatus, subclasses 200+ for means to melt, or vaporize metal, per se.  
432, Heating, appropriate subclass for melting furnaces of general utility.

**16 With plural beam devices:**

This subclass is indented under subclass 10. Subject matter wherein the furnace has more than one electron beam gun.

**17 Zone melting:**

This subclass is indented under subclass 10. Subject matter wherein a small area, or zone of the charge is liquified by the electron beam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

139, for zone melting utilizing induction heating.

SEE OR SEARCH CLASS:

- 75, Specialized Metallurgical Processes, Compositions for use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 10.11 for processes of zone melting of metal.  
117, Single-Crystal, Oriented-Crystal, and Epitaxy Growth Processes; Non-Coating Apparatus Therefor, subclasses 37+ for processes for growing therein-defined single-crystal of all types of materials, including by zone melting, and subclasses 219+ for non-coating apparatus for growing therein-defined single-crystal of all types of materials, including by zone melting means.  
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 250.1 for non-coating crystallizing apparatus which includes means for zone melting, not including means for chemical reaction, and not provided for elsewhere.

**18 PLASMA FURNACE DEVICE:**

This subclass is indented under the class definition. Subject matter including a plasma generating means as the heat source to melt, or otherwise treat the material within the furnace device.

- (1) Note. A plasma flame is generated when an ionizable gas is forced through an electrical field.  
(2) Note. Plasmatrons are also referred to as "arc torches," "plasma guns", etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 13+, for electron beam vaporizing furnace gun assembly details.  
24, for direct plasma furnaces with side wall mounted plasmatrons.

SEE OR SEARCH CLASS:

- 313, Electric Lamp and Discharge Devices, subclasses 231.31+ for fluent material supplied plasma devices.  
315, Electric Lamp and Discharge Devices: Systems, subclasses 111.21+ for plasma generating systems.

- 19 Indirect heating:**  
This subclass is indented under subclass 18. Subject matter wherein the material being heated is heated principally by heat radiation from the plasma flame, without direct contact with the flame.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
61+, for arc furnace indirect heating details.
- 20 Rotary furnace:**  
This subclass is indented under subclass 19. Subject matter wherein the furnace is rotated, generally about its longitudinal axis.
- SEE OR SEARCH CLASS:  
432, Heating, subclasses 103+ for tumbler- type rotary drum furnaces, per se.
- 21 Remelting furnace (i.e., ingot remelting):**  
This subclass is indented under subclass 18. Subject matter wherein the plasma furnace remelts ingots produced from a previous melting/costing process.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
15, for electron beam furnace ingot remelting apparatus.  
42+, for electroslag remelting devices.  
67+, for arc furnace ingot remelting apparatus.
- 22 Direct furnace (i.e., plasma flame impinges on the melt):**  
This subclass is indented under subclass 18. Subject matter wherein the plasma flame is in contact with the material being melted.
- SEE OR SEARCH CLASS:  
204, Chemistry: Electrical and Wave Energy, subclasses 164+ for chemical processes employing a plasma.  
376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 100+ for means utilizing plasma to produce a thermonuclear reaction.
- 23 Expanded arc column:**  
This subclass is indented under subclass 22. Subject matter wherein the plasma flame expands, usually in a conical shape, as it extends away from the plasmatron.
- 24 Sidewall mounted plasmatron:**  
This subclass is indented under subclass 22. Subject matter wherein the plasmatron means extends through and is supported by the furnace sidewall.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
18, for plasma furnace plasmatrons, per se.
- 25 Control system:**  
This subclass is indented under subclass 22. Subject matter including means to regulate the operation of the furnace.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
25, for control systems in plasma remelting furnaces.  
40, for electrical system regulation of glass furnaces.  
49+, for power supply control in electroslag remelting furnaces.  
70, 77 and 104+, for control, or regulation of arc furnace devices.  
110+, and 135, for control, or regulation of resistance furnace devices.  
140+, 148, and 149+, for control, or regulation of induction furnace devices.
- 26 GLOW DISCHARGE FURNACE DEVICE:**  
This subclass is indented under the class definition. Subject matter wherein the heat is produced from a glow discharge generated within the furnace.
- SEE OR SEARCH CLASS:  
313, Electric Lamp and Discharge Devices, subclass 615, 618 and 619 for glow-type discharge devices, per se.
- 27 GLASS FURNACE DEVICE:**  
This subclass is indented under the class definition. Subject matter specifically adapted for melting, or treating glass or silica.



- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
109+, for resistance furnaces, per se.
- SEE OR SEARCH CLASS:  
65, Glass Manufacturing, subclass 335 for nonelectric glass furnaces with furnace charging means; subclass 347 for nonelectric furnaces having a structurally defined delivery or fining zone, and see the search notes thereunder.
- 28 Filament discharge (i.e., bushing):**  
This subclass is indented under subclass 27. Subject matter wherein the glass is melting in a bushing from which the molten glass is discharged as filaments, the bushing being heated by passing a current therethrough.
- SEE OR SEARCH CLASS:  
65, Glass Manufacturing, subclasses 384+ for glass fiber and filament making apparatus, especially subclasses 493+ for means for forming bushings with designated compositions; subclasses 496+ for means for forming specified bushing tip or glass feeder structure.
- 29 Joule effect heating:**  
This subclass is indented under subclass 27. Subject matter wherein the glass is melted, or maintained in a molten condition by passing an electric current therethrough between at least two electrodes.
- SEE OR SEARCH CLASS:  
266, Metallurgical Apparatus, subclass 104 for treating a continuum of work by joule effect heating means.
- 30 Furnace body detail:**  
This subclass is indented under subclass 29. Subject matter pertaining to the furnace body or tank for holding the molten glass.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
44, for details of electroslag remelting furnace bodies.  
71+, for arc furnace body details.
- 156, and 163, for induction furnace crucible details.
- 31 Multichamber:**  
This subclass is indented under subclass 30. Furnaces which are composed of at least two discrete interconnected sections.
- (1) Note. For example, melting and refining section, or melting and delivery zones.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
78, for plural arc furnace units operating sequentially on the same charge.  
80, for arc furnace charge preheating.  
144, for induction furnaces with plural heating elements operating sequentially on a charge.
- 32 With heating between chambers:**  
This subclass is indented under subclass 31. Subject matter including heating means mounted in the passageway between the plural furnace sections, or including furnaces where the heating current flows between electrodes mounted one in each furnace section.
- 33 Charging or discharging:**  
This subclass is indented under subclass 29. Subject matter including means to supply, or remove material to be heated, to or from the furnace.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
11, for electron beam furnace charging means.  
42+, and 46+, for electroslag remelting furnace start up charging and alloying devices respectively.  
63, for indirect arc furnaces where the charge is fed into the space between the electrodes.  
67+, for arc furnace ingot remelting where furnace electrodes constitute the charge material.  
79+, for arc furnace charging/discharging, per se.  
115, for resistance furnace charging/discharging, per se.  
142+, for induction furnace charging/discharging, per se.

## SEE OR SEARCH CLASS:

- 110, Furnaces, subclasses 267+ and 327+ for furnace solid fuel feeders and subclasses 101+ for furnace fuel feeders, per se.
- 222, Dispensing, subclasses 591+ for molten metal dispensing.
- 266, Metallurgical Apparatus, subclasses 176+ for means to supply a charge to a heating means.
- 414, Material or Article Handling, subclasses 147+ for charging a chamber utilized for a heating function.

**34 Including batch preheating:**

This subclass is indented under subclass 33. Subject matter wherein the batch is heated prior to being charged into the furnace, also preheating may be achieved by utilizing the waste heat from the furnace, or by means of a separate heat source.

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

- 80, for arc furnace charge preheating.

**35 Including discharge area heating:**

This subclass is indented under subclass 33. Subject matter wherein means are provided at, or near the discharge opening of the furnace to heat the material as it is discharged.

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

- 28, for resistance-heated discharge bushings, the discharge usually being in the form of filaments for making glass fibers.

**36 Electrode assembly:**

This subclass is indented under subclass 29. Subject matter pertaining to the electrode, its holder and associate structure.

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

- 54+, for electroslag remelting furnace electrode structure or composition.
- 88+, for arc furnace electrode structure.

**37 Protection means:**

This subclass is indented under subclass 36. Subject matter including means to protect the electrode from excessive deterioration while in use.

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

- 55, for electroslag remelting furnace electrodes with protective shields.
- 64, for arc furnace electrodes with protective shields.

**38 Holder:**

This subclass is indented under subclass 36. Subject matter including apparatus to support the electrode while in use.

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

- 52+, for electroslag remelting furnace electrode support details.
- 94+, for arc furnace electrode support details.

**39 Electrical system:**

This subclass is indented under subclass 29. Subject matter including means to supply electrical power to the furnace.

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

- 47+, for electroslag remelting power supply system details.
- 102+, for arc furnace power supply system details.
- 147+, for induction furnace power supply system details.

## SEE OR SEARCH CLASS:

- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits, subclasses 509+ for miscellaneous externally effected circuits, subclasses 518+ for miscellaneous control circuits, and subclasses 538+ for miscellaneous bias circuits with regulating.

**40 Regulation:**

This subclass is indented under subclass 39. Subject matter including means to regulate the electrical power supplied to the furnace.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 25, for control systems indirect plasma furnaces.
- 26, for plasma remelting furnace control systems.
- 49+, for power supply control in electroslag remelting furnaces.
- 70, 77 and 104+, for control, or regulation of arc furnace devices.
- 110+, and 135, for control, or regulation of resistance furnace devices.
- 140+, 148 and 149+, for control, or regulation of induction furnace devices.

**41 Electrode arrangement (e.g., array):**

This subclass is indented under subclass 39. Subject matter wherein the electrodes are arranged in the furnace to achieve specific electrical characteristics within the melt (e.g., for specific heating patterns in the melt, or to eliminate overlap between heating currents).

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 47, for electroslag remelting furnace plural electrode arrangements.

**42 ELECTROSLAG REMELTING DEVICE:**

This subclass is indented under the class definition. Subject matter wherein during electrode remelting the electrode is immersed in a slag layer which floats on top of the melt.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 15, for electron beam furnace ingot remelting.
- 21+, for plasma remelting furnaces.
- 67+, for arc furnace ingot remelting where the ingot is a consumable electrode which is melted by the arc during furnace operation.

SEE OR SEARCH CLASS:

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

tions, and Loose Metal Particulate Mixtures, subclasses 10.24+ for processes in which an electrode is in electrical contact with a slag and the electrical current therebetween melts the electrode causing the molten metal therefrom to be refined by passing through the slag.

- 219, Electric Heating, subclass 73.1 for electroslag welding apparatus.
- 266, Metallurgical Apparatus, subclasses 216+ for means for adding a solid, liquid or gaseous substance to molten metal.
- 314, Electric Lamp and Discharge Devices, Consumable Electrodes, appropriate subclasses for consumable electrode devices, per se.

**43 Plural furnace units:**

This subclass is indented under subclass 42. Subject matter wherein more than one furnace unit, or crucible is provided at one location for cooperative simultaneous, or sequential operation.

- (1) Note. Plural crucibles may be provided to be placed under one electrode.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 11, for plural electron beam furnace crucible construction.
- 31+, for glass furnaces with multichamber heating.
- 78, for plural arc furnace units.

**44 Body detail:**

This subclass is indented under subclass 42. Subject matter including details of the furnace structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 30+, for details of glass furnace bodies.
- 71, for arc furnace body details.

**45 Crucible:**

This subclass is indented under subclass 44. Subject matter including the part which holds the melt.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 11, for electron beam furnace crucible construction.
- 30+, for glass furnace crucible details.
- 72+, for arc furnace crucible details.
- 118, for crucible details in resistance furnaces where the crucible is a resistance heating element.
- 156+, and 163, for induction furnace crucible details for coreless and core-type induction furnaces respectively.

SEE OR SEARCH CLASS:

- 118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.
- 164, Metal Founding, subclasses 335+ for metal molding apparatus receptacles for holding, or dispensing molten material.
- 219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.
- 266, Metallurgical Apparatus, subclass 167 and 275+ for details, or crucibles used in the metallurgical treatment of molten material.
- 432, Heating, subclasses 156+ and 262+ for details of crucibles where the heating means is nonelectric.

#### 46 **Start-up:**

This subclass is indented under subclass 42. Subject matter having means for adding material to the furnace to initiate operation.

- (1) Note. Generally molten, or granular slag is added to fill the space between the electrode end and the crucible bottom to complete the electrical circuit and thus commence furnace operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 45, for crucibles having means built into the bottom thereof to complete the circuit for furnace start up.

#### 47 **Power supply system:**

This subclass is indented under subclass 42. Subject matter including means to supply electrical power to the furnace.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 12, for electron beam vaporizing furnaces with power supply and control circuitry.
- 102, for arc furnace power supply systems.
- 147, for induction furnace power supply systems.

#### 48 **Conductor arrangement:**

This subclass is indented under subclass 47. Subject matter relating to the arrangement (e.g., spacing) of the power conductors of the furnace.

#### 49 **Control:**

This subclass is indented under subclass 47. Subject matter wherein means are provided to control or regulate electrical power to the furnace.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 12, for electron beam vaporizing furnaces with power supply and control circuitry.
- 25, for plasma furnaces control systems.
- 40, for glass furnace electrical system regulation.
- 70, and 104+, for arc furnace power regulation.
- 135, for resistance furnace control, per se.
- 148, for induction furnace power supply regulation.

#### 50 **By changing electrode position:**

This subclass is indented under subclass 49. Subject matter wherein the power is regulated by changing the depth of immersion of the electrode into the slag.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 51, for replacement of electrodes during furnace operation in an electroslag remelting furnace.
- 105+, for regulating the power supply by changing the positions of the elec-

trodes relative to the charge, or each other in an arc furnace.

**51 Electrode replacement:**

This subclass is indented under subclass 42. Subject matter including apparatus to refit and reposition electrode during furnace operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

50, for electroslag remelting furnace power supply system control by changing electrode position.

**52 Electrode support:**

This subclass is indented under subclass 42. Subject matter including apparatus to support and hold the electrode during remelting.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

38, for glass furnace electrode holders.  
94+, for arc furnace electrode support apparatus.

**53 Plural electrodes:**

This subclass is indented under subclass 52. Subject matter for supporting more than one electrode simultaneously.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

47, for electroslag remelting furnace power supply systems for plural electrode arrangements.

**54 Electrode:**

This subclass is indented under subclass 42. Subject matter including the shape, or composition of electrodes utilized in the electroslag remelting furnace.

**55 With protective shield:**

This subclass is indented under subclass 54. Subject matter wherein the electrode is provided with sheltering, or screening means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

37, for glass furnace electrode assembly means to protect the electrode from excessive deterioration while in use.  
64, for arc furnace electrodes with protective shields.

127, for resistance furnace resistance encasement means.

**56 WITH CONDENSATING DEVICE:**

This subclass is indented under the class definition. Subject matter specifically adapted for reducing gaseous volatile material.

(1) Note. Condensation is used frequently for treatment of zinc ores and cinnabars.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

9+, for arc furnaces with environmental control.

SEE OR SEARCH CLASS:

266, Metallurgical Apparatus, subclasses 148+ for means treating, or handling gases exhausted by the treating means by condensing and collecting a volatile constituent.

432, Heating, subclass 66, for a heating means, or general utility with a condenser for work chamber vapor.

**57 Including resistance furnace detail:**

This subclass is indented under subclass 56. Subject matter including a furnace having a means to develop heat by the passage of current through a material, or device having the property of electrical resistance.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

3, and 5+, for resistance furnaces combined with other type furnaces.  
109+, for resistance furnaces, per se.

**58 With open circuit (e.g., charge internal resistance heating):**

This subclass is indented under subclass 57. Subject matter wherein the charge completes the circuit and the internal resistance of the charge is the heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

120+, for resistance furnaces with open circuit configurations, per se.

- 59 Including induction furnace detail:**  
This subclass is indented under subclass 56. Subject matter including an induction coil to subject the charge to a variable electromagnetic field for producing a heating current by internal resistance losses in the charge.
- SEE OR SEARCH CLASS:  
219, Electric Heating, subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating.
- 60 ARC FURNACE DEVICE:**  
This subclass is indented under the class definition. Subject matter wherein the charge is heated by means of an electric arc produced between opposed electrodes (indirect arc furnaces) or between an electrode and the charge (direct arc furnaces).
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
1+, for arc furnaces with other heating means.  
9+, for arc furnaces with environmental control.
- SEE OR SEARCH CLASS:  
204, Chemistry: Electrical and Wave Energy, subclass 171 for arc furnaces used for the preparation of acetylene by pyrolysis of hydrocarbons, especially with the removal of carbon deposits from the arc region.
- 61 Indirect:**  
This subclass is indented under subclass 60. Subject matter wherein the arc is between spaced electrodes, or between an electrode and the crucible exterior and the material is heated by radiation from the arc.
- 62 Arc between spaced electrodes:**  
This subclass is indented under subclass 61. Subject matter the arc is between spaced electrodes and the material is heated by radiation from the arc.
- 63 Charge fed into space:**  
This subclass is indented under subclass 62. Subject matter wherein the charge passes through the arc as it is added to the furnace.
- 64 Wish arc deflection means:**  
This subclass is indented under subclass 62. Subject matter including means (usually a magnet) to deflect the arc from its normal path.
- 65 Arc between electrode and crucible exterior:**  
This subclass is indented under subclass 61. Subject matter wherein the arc is drawn between the electrode tip and the exterior of the crucible.
- 66 Combined with or convertible to direct arc furnace:**  
This subclass is indented under subclass 61. Subject matter including both direct and indirect arc heating, or which may be changed from one to the other.
- 67 Ingot remelting:**  
This subclass is indented under subclass 60. Subject matter wherein the electrode is metal mass which is reheated to liquification to form the charge of the furnace.
- 68 With internal atmosphere control (e.g., pressure, vacuum, etc.):**  
This subclass is indented under subclass 67. Subject matter wherein the environment within the remelting furnace is regulated to have a specific pressure, a vacuum, or a specific medium.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
77, for other arc furnaces with internal atmosphere control.  
110, for resistance furnaces with internal atmosphere control.  
140, for induction furnaces with internal atmosphere control.
- 69 With electrode holder or guide:**  
This subclass is indented under subclass 67. Subject matter including means to support, or at least partially contain the electrode, or means to direct the position, or movement of the electrode.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
38, for glass furnace electrode holders.

- 50, and 52+, for electroslag electrode support and position control arrangements.
- 70 With power regulation:**  
This subclass is indented under subclass 67. Subject matter including means to control the arc heating capability either, by maintaining a desired electrical power input, or by maintaining a desired arc length.
- 71 Furnace body detail:**  
This subclass is indented under subclass 60. Subject matter including details of the furnace structure.
- 72 Hearth or crucible:**  
This subclass is indented under subclass 71. Subject matter including the part of the furnace structure which holds the molten material.
- 73 Roof:**  
This subclass is indented under subclass 71. Subject matter including a cover, or lid for the furnace.
- 74 With cooling:**  
This subclass is indented under subclass 73. Subject matter including a means to remove, or reduce heat from the roof.
- 75 Sidewall:**  
This subclass is indented under subclass 71. Subject matter including means forming the furnace sidewalls.
- 76 With cooling:**  
This subclass is indented under subclass 75. Subject matter including means to remove, or reduce heat from the sidewalls of the furnace.
- (1) Note. The cooling means may be intended to cool the entire sidewall of the furnace, or for localized (hot spot) cooling.
- 77 With internal atmosphere control (e.g., pressure, vacuum, etc.):**  
This subclass is indented under subclass 71. Subject matter wherein the furnace body is sealed and means are provided to increase the pressure within the furnace, or to create a vacuum therein.
- 78 Plural furnace units:**  
This subclass is indented under subclass 60. Subject matter wherein more than one complete furnace is provided in the same general location for cooperative simultaneous, or sequential operation.
- (1) Note. The furnace unit may be movable from one heating station to another, or the contents of one furnace may be discharged from one furnace to another.
- 79 Charging or discharging:**  
This subclass is indented under subclass 60. Subject matter including means to supply charge material to the furnace, or means to let out the heated charge from the furnace.
- 80 With charge preheating:**  
This subclass is indented under subclass 79. Subject matter including means to heat the charge prior to heating the charge within the furnace.
- 81 Top charging:**  
This subclass is indented under subclass 79. Subject matter including specific means to charge the furnace from the top.
- (1) Note. This subclass includes furnaces having chutes for charging extending through the roof as well as furnaces having a movable roof to open the furnace for charging.
- 82 Through electrode:**  
This subclass is indented under subclass 81. Subject matter wherein the furnace is charged through a hollow electrode.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
88, for hollow electrodes, per se.
- 83 Bottom pour:**  
This subclass is indented under subclass 79. Subject matter wherein the hearth, or crucible includes means in its bottom, or lowest point to discharge the molten charge of the furnace.

- 84 Discharge by tilting:**  
This subclass is indented under subclass 79. Subject matter wherein the furnace is inclined to allow the discharge of its molten charge contents.
- 85 For manipulation of the charge or melt (e.g., stirring):**  
This subclass is indented under subclass 60. Subject matter wherein means is provided to mix, agitate, or otherwise move the furnace charge while it is within the furnaces.
- (1) Note. Generally the charge is undergoing treatment within the furnace as it is manipulated.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
116, for resistance furnace charge manipulation means.  
146, for induction furnace charge manipulation means.
- 86 Mechanical:**  
This subclass is indented under subclass 85. Subject matter wherein the stirring device is mechanically operated.
- 87 Crust breaking device:**  
This subclass is indented under subclass 85. Subject matter for poking the top of the furnace charge to fracture incrustation of the molten charge material.
- 88 Electrode:**  
This subclass is indented under subclass 60. Subject matter including the structure, or composition of the electrode means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
82, for hollow electrodes utilized for charging a furnace.
- 89 Self-baking (i.e., soderberg):**  
This subclass is indented under subclass 88. Subject matter wherein an electrode means is made in situ by adding raw electrode material in the form of a paste to an electrode casing above the furnace, forcing the paste down the casing whereby it bakes into a solid electrode as it enters into the furnace.
- (1) Note. The baking is a result of the heat from within furnaces.
- SEE OR SEARCH CLASS:  
313, Electric Lamp and Discharge Devices, subclass 327 for self-baking electrode structures, per se.
- 90 Nonconsumable:**  
This subclass is indented under subclass 88. Subject matter wherein the electrode means remains substantially intact during operation.
- (1) Note. Generally these electrodes include internal water cooling.
- (2) Note. Carbon or graphite electrodes are excluded from this subclass unless the carbon, or graphite forms only the tip of the electrode.
- 91 Sectional:**  
This subclass is indented under subclass 88. Subject matter including electrode segments joined together to form a unitary electrode.
- (1) Note. Generally the sections are joined end-to-end utilizing screw and socket, or nipple and socket connection techniques.
- 92 With means to join sections:**  
This subclass is indented under subclass 91. Subject matter including means to connect the electrode segments.
- 93 Composite (e.g., water cooled body with carbon tip):**  
This subclass is indented under subclass 88. Subject matter wherein the electrode is composed of a water cooled top section and a replaceable, usually carbon, bottom, or tip portion.
- 94 Electrode support:**  
This subclass is indented under subclass 60. Subject matter including structural means to support the electrode means above the melt during operation of the furnace.
- 95 Seal:**  
This subclass is indented under subclass 94. Subject matter including means to close off the interstices between the electrode means and



- openings in the furnace roof, or sidewall through which the electrode means extends to prevent the escape of fumes, etc., from the furnace.
- 96 With electrode shield:**  
This subclass is indented under subclass 94. Subject matter including means surrounding the electrode to protect it as it is suspended over the melt.
- 97 For soderbert electrode (i.e., casing):**  
This subclass is indented under subclass 94. Subject matter including a casing means into which electrode material in the form of a paste is fed and from which the baked electrode emerges.
- 98 Mast:**  
This subclass is indented under subclass 94. Subject matter wherein the support system arrangements extends vertically, adjacent the furnace body, and forms a support for the electrode crosshead.
- 99 Crosshead:**  
This subclass is indented under subclass 98. Subject matter which extend horizontally from the mast and have a clamp to hold the electrode suspended over the melt.
- 100 Slipping holder:**  
This subclass is indented under subclass 94. Subject matter including holder, or support means to permit selective slippage of a consumable electrode into the furnace.
- 101 With electrical contact or terminal:**  
This subclass is indented under subclass 94. Subject matter including means to connect the electrode to the power supply circuit.
- 102 Power supply system:**  
This subclass is indented under subclass 60. Subject matter including means to provide electric power for the arc.
- SEE OR SEARCH CLASS:  
219, Electric Heating, subclasses 130.1+ for details of power supplies for electric heating arc devices.  
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for systems for supplying electric current to arc furnaces provided that the arc furnace is only nominally disclosed.
- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 530+ for miscellaneous circuits with specific source of supply or bias voltage.
- 103 Cable or cable suspension arrangement:**  
This subclass is indented under subclass 102. Subject matter including power cable construction, or hanging support details.
- 104 With power regulation:**  
This subclass is indented under subclass 102. Subject matter including means to control the electrical power to the arc.
- (1) Note. Where the power to the arc is regulated without changing the arc length, the voltage is regulated by means of an induction regulator, or by changing the forms of connections used (i.e., top changing).
- 105 By changing arc length:**  
This subclass is indented under subclass 104. Subject matter wherein the arc power is regulated by changing the positions of the arc electrodes relative to the charge or each other.
- 106 Using hydraulic or pneumatic device:**  
This subclass is indented under subclass 105. Subject matter wherein the adjustment means includes a hydraulically, or pneumatically operated means.
- 107 With magnetically influenced arc:**  
This subclass is indented under subclass 102. Subject matter including magnetic means to rotate, deflect, or otherwise effect change in the arc parameter.
- 108 D.C. power:**  
This subclass is indented under subclass 102. Subject matter wherein the electric power is supplied by direct current.
- 109 RESISTANCE FURNACE DEVICE:**  
This subclass is indented under the class definition. Subject matter including electrical resistance means as the heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 3, and 5+, for resistance furnaces combined with other types of furnaces.  
27+, for glass furnaces which are a species of resistance furnaces.

SEE OR SEARCH CLASS:

- 219, Electric Heating, subclasses 50+ for resistance heating of metal general; subclasses 200+ for resistance heating devices used to heat nonmetals.

**110 With internal atmosphere control (e.g., pressure, vacuum, etc.):**

This subclass is indented under subclass 109. Subject matter wherein the environment within the furnace housing is regulated to have a specific pressure, a vacuum, or a specific medium.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 68, for ingot remelting arc furnaces with internal atmosphere control.  
77, for arc furnace internal atmosphere control in general.  
140+, for induction furnace internal atmosphere control.

**111 Having tubular charge containing or supporting element:**

This subclass is indented under subclass 110. Subject matter wherein the means holding, or holding up the charge has a cylindrical shape.

**112 Vacuum:**

This subclass is indented under subclass 110. Subject matter wherein the environment within the furnace housing is regulated to have a vacuum.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 141, for induction furnace apparatus to provide and maintain a vacuum within the furnace.

**113 For cooling:**

This subclass is indented under subclass 109. Subject matter including means for lowering the temperature of the resistance furnace device.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 45, for electroslag furnace body cooling means.  
74, and 76, for arc furnace roof and side wall cooling means respectively.  
154, 158 and 160, for induction furnace cooling means in coreless and core-type induction furnaces.

**114 Terminal:**

This subclass is indented under subclass 113. Subject matter wherein the furnace device being cooled is the electrode terminal.

**115 Charging or discharging:**

This subclass is indented under subclass 109. Subject matter including devices for supplying the charge into the furnace, or taking the charge out of the furnace.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 11, for electron beam vaporizing furnace charging.  
33+, for glass furnace charging devices.  
42, and 46+, for electroslag remelting furnace start-up charging and alloying devices respectively.  
63, for indirect arc furnaces where the charge is fed into the space between the electrodes.  
67+, for arc furnace ingot remelting where furnace electrodes constitute the charge material.  
79+, for arc furnace charging, per se.  
142+, for induction furnace charging, per se.

SEE OR SEARCH CLASS:

- 110, Furnaces, subclasses 267+ and 327+ for furnace solid fuel feeders and subclasses 101+ for furnace fuel feeders, per se.  
222, Dispensing, subclasses 591+ for molten metal dispensing.  
266, Metallurgical Apparatus, subclasses 176+ for means to supply a charge to a heating means.  
414, Material or Article Handling, subclasses 147+ for charging a chamber utilized for a heating function.

**116 For manipulation of the charge or melt (e.g., stirring):**

This subclass is indented under subclass 109. Subject matter including means to mix, agitate, or otherwise move the charge within a furnace heating chamber.

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

- 85+, for arc furnaces with means to manipulate the charge, or melt.
- 146, for induction furnaces with means to manipulate the charge, or melt.

**SEE OR SEARCH CLASS:**

- 266, Metallurgical Apparatus, subclasses 200+ for various means to manipulate charge, or melt material as it is being metallurgically treated.
- 432, Heating, subclasses 103+ for nonelectric furnaces where the charge, or melt material is heated in a rotary drum structure; subclasses 120+ for other nonelectric furnaces with charge, or melt manipulation means.

**117 With heating element detail:**

This subclass is indented under subclass 109. Subject matter including specific features of the electrical resistance means.

- (1) Note. These features include the shape, or composition of the resistance, the mounting means for, or the terminal means directly connected to the resistor, or the means rendering the resistance electrically conductive.

**SEE OR SEARCH CLASS:**

- 219, Electric Heating, subclasses 50+ for resistance heating where the internal resistance of the work is the heating element; appropriate subclasses under subclasses 200+ for details of electrical resistance heating elements of general utility.
- 338, Electrical Resistors, appropriate subclasses for details of electrical resistance heating elements, per se.

**118 Resistance crucible:**

This subclass is indented under subclass 117. Subject matter wherein the heating element is an electrically conductive vessel for containing the charge of the furnace.

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

- 11, for electron beam furnace crucible construction.
- 30+, for glass furnace crucible details.
- 45+, for electroslog remelting furnace crucible details.
- 72+, for arc furnace crucible details.
- 156+, and 163, for induction furnace crucible details for coreless and core-type induction furnaces respectively.

**SEE OR SEARCH CLASS:**

- 118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.
- 164, Metal Founding, subclasses 335+ for metal molding apparatus receptacles for holding, or dispensing molten material.
- 219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.
- 266, Metallurgical Apparatus, subclass 167 and 275+ for details, or crucibles used in the metallurgical treatment of molten material.
- 432, Heating, subclasses 156+ and 262+ for details of crucibles where the heating means is nonelectric.

**119 Wall contained:**

This subclass is indented under subclass 117. Subject matter wherein the heating element is located within the wall of the furnace.

**120 Open circuit (e.g., charge internal resistance heating):**

This subclass is indented under subclass 117. Subject matter wherein a molten material completes the circuit and the internal resistance of the molten material is the heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

58, for open circuit resistance furnaces with a condensating device.

**121 Salt bath heating:**

This subclass is indented under subclass 120. Subject matter wherein a salt is melted by passing electric current through it and the charge is immersed in the salt and is heated by conduction, with the salt performing the dual function of resistance medium and heat-transfer medium.

SEE OR SEARCH CLASS:

266, Metallurgical Apparatus, subclass 107 and 120 for treatment of articles by immersion heating in a salt bath, or other molten material.

**122 Including crucible or hearth structure details:**

This subclass is indented under subclass 120. Subject matter including structural details of the means which holds the melt.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

11, for electron beam furnace crucible construction.  
30+, for glass furnace crucible details.  
72+, for arc furnace crucible details.  
118, for crucible details in resistance furnaces where the crucible is a resistance heating element.  
156+, and 163, for induction furnace crucible details for coreless and core-type induction furnaces respectively.

SEE OR SEARCH CLASS:

118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.  
164, Metal Founding, subclasses 335+ for metal molding apparatus receptacles for holding, or dispensing molten material.  
219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.

266, Metallurgical Apparatus, subclass 167 and 275+ for details of crucibles used in the metallurgical treatment of molten material.

432, Heating, subclasses 156+ and 262+ for details of crucibles where the heating means is nonelectric.

**123 With preheating:**

This subclass is indented under subclass 120. Subject matter including means to preheat the principal heating means of the furnace to a temperature for rendering the heating means electrically conductive.

**124 Including starting resistor:**

This subclass is indented under subclass 123. Subject matter including a resistor which is the preheating means.

**125 Including terminal detail:**

This subclass is indented under subclass 120. Subject matter including specific structural details of the connection point between the charge, or melt and the electrical power supply.

**126 With axial bore:**

This subclass is indented under subclass 125. Subject matter wherein the terminal has an axially hollow interior extending therethrough.

**127 Having resistance encasement means:**

This subclass is indented under subclass 117. Subject matter including an enclosure for the resistance heating element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

55, for electroslag remelting furnaces with protectively shielded electrodes.  
64, for arc electrodes with protective shields.

**128 Mounting:**

This subclass is indented under subclass 117. Subject matter with details of the means for attaching the heating element to some other part of the furnace.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

94, for arc furnace electrode support apparatus, per se.

## SEE OR SEARCH CLASS:

219, Electric Heating, subclass 536 and 542+ for heating unit, or resistive element attaching, or securing means.

**129 Base:**

This subclass is indented under subclass 128. Subject matter wherein the heating element is attached to the base of the furnace.

**130 Side wall:**

This subclass is indented under subclass 128. Subject matter wherein the heating element is attached to a vertical wall of the furnace.

## SEE OR SEARCH CLASS:

219, Electric Heating, subclass 424 for resistance heating elements combined with a container for the material being heated, where the resistance heating element either surrounds, or is embedded within the walls of the container.

**131 With resistor element compression:**

This subclass is indented under subclass 130. Subject matter wherein the resistor element is subjected to pressure.

**132 Nonmetallic resistor:**

This subclass is indented under subclass 117. Subject matter including a resistor heating element comprised of a material which is metal free.

**133 Rodlike:**

This subclass is indented under subclass 132. Subject matter wherein the resistor heating element has the shape of an elongated cylinder, or bar.

**134 Including resistor shape detail:**

This subclass is indented under subclass 117. Subject matter including significant details of the shape of the resistor.

**135 Control:**

This subclass is indented under subclass 109. Subject matter including circuitry for regulating the furnace operation.

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

12, for electron beam vaporizing furnace power supply and control circuits.  
25, for plasma furnaces control systems.  
40, for glass furnace electrical system regulation.  
49+, for electroslag remelting furnaces with power supply control.  
70, and 104+, for arc furnace power regulation.  
148, for induction furnace power supply regulation.

## SEE OR SEARCH CLASS:

219, Electric Heating, subclasses 482+ for heating devices with power supply and voltage, or current regulation, or current control means.  
315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for systems for supplying electric current to arc furnace provided that the arc furnace is only nominally disclosed.  
327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits, subclasses 509+ for miscellaneous externally effected circuits, subclasses 518+ for miscellaneous control circuits, and subclasses 538+ for miscellaneous bias circuits with regulating.

**136 Temperature:**

This subclass is indented under subclass 135. Subject matter including means to control the temperature of the furnace.

## SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 501+ for temperature responsive indicating systems.

**137 Lining:**

This subclass is indented under subclass 109. Subject matter including covering means for the interior walls of the furnaces.

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

30, for glass furnace wall composition.

- 75, for arc furnace side wall details.  
155, and 164, for induction furnace linings.

**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.  
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for processes of furnace lining formation or repair.  
432, Heating, subclass 248 and 264 for lining of furnaces of general utility.  
501, Compositions: Ceramic, appropriate subclasses for specific lining compositions.

**138 INDUCTION FURNACE DEVICE:**

This subclass is indented under the class definition. Subject matter including an induction coil to subject the charge to a variable electromagnetic field for producing a heating current by internal resistance losses in the charge.

**SEE OR SEARCH CLASS:**

- 164, Metal Founding, subclass 513 for high frequency induction heating coils combined with metal casting devices.  
219, Electric Heating, subclasses 600+ for inductive heating, subclasses 678+ for microwave heating, and subclasses 764+ for capacitive dielectric heating.  
266, Metallurgical Apparatus, subclass 129 for inductance-type heat treatment means.  
336, Inductor Devices, appropriate subclasses for inductive devices, per se.

**139 Zone melting:**

This subclass is indented under subclass 138. Subject matter wherein a narrow portion of a solid charge is liquified by the heating means.

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

- 17, for electron beam furnace zone melting.

**SEE OR SEARCH CLASS:**

- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Con-

solidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclass 10.11 for processes of zone melting of metal.

- 117, Single-Crystal, Oriented-Crystal, and Epitaxy Growth Processes; Non-Coating Apparatus Therefor, subclasses 37+ for processes for growing therein-defined single-crystal of all types of materials, including by zone melting, and subclasses 219+ for non-coating apparatus for growing therein-defined single-crystal of all types of materials, including by zone melting means.  
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 250.1 for non-coating crystallizing apparatus which includes means for zone melting, not including means for chemical reaction, and not provided for elsewhere.

**140 With internal atmosphere control (e.g., pressure, vacuum, etc.):**

This subclass is indented under subclass 138. Subject matter including means to regulate the surrounding conditions of the charge.

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

- 68, and 77, for arc furnaces with internal atmosphere control.  
110, for resistance furnaces with internal atmosphere control.

**141 Vacuum:**

This subclass is indented under subclass 140. Subject matter wherein the atmosphere is an enclosed space from which air, or other gases have been removed.

**142 For charging or discharging:**

This subclass is indented under subclass 138. Subject matter including means to supply charge material to the furnace, or means to let out the heated charge from the furnace.

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

- 11, for electron beam vaporizing furnace charging means.  
33, for glass furnace charging devices.

- 42, and 46+, for electroslag remelting furnace start up charging and alloying devices respectively.
- 63, for indirect arc furnaces where the charge is fed into the space between the electrodes.
- 67, for arc furnace ingot remelting where furnace electrodes constitute the charge material.
- 79, for arc furnace charging, per se.
- 115, for resistance furnace charging, per se.
- SEE OR SEARCH CLASS:**
- 110, Furnaces, subclasses 267+ and 327+ for furnace solid fuel feeders and subclasses 101+ for furnace fuel feeders, per se.
- 222, Dispensing, subclasses 591+ for molten metal dispensing.
- 266, Metallurgical Apparatus, subclasses 176+ for means to supply a charge to a heating means.
- 414, Material or Article Handling, subclasses 147+ for charging a chamber utilized for a heating function.
- 143 By tilting:**  
This subclass is indented under subclass 142. Subject matter wherein the furnace, or a portion thereof is inclined from its vertical position to either charge, or discharge the furnace.
- 144 Having plural heating elements:**  
This subclass is indented under subclass 138. Subject matter including more than one inductive heating means for a single furnace.
- SEE OR SEARCH THIS CLASS, SUBCLASS:**
- 1+, for furnaces having plural diverse heating means.
- 145 Having condition signaling means:**  
This subclass is indented under subclass 138. Subject matter including means for monitoring and indicating a characteristic of the furnace operation.
- SEE OR SEARCH CLASS:**
- 340, Communications: Electrical, subclasses 500+ for condition responsive indicating systems, per se.
- 146 With means for manipulation of the charge or melt (e.g., stirring):**  
This subclass is indented under subclass 138. Subject matter including means to mix, agitate, or otherwise move the charge within a furnace heating chamber.
- SEE OR SEARCH THIS CLASS, SUBCLASS:**
- 85+, for arc furnaces with means to manipulate the charge, or melt.
- 116, for resistance furnaces with means to manipulate the charge, or melt.
- SEE OR SEARCH CLASS:**
- 266, Metallurgical Apparatus, subclasses 200+ for various means to manipulate charge, or melt material as it is being metallurgically treated.
- 432, Heating, subclasses 103+ for nonelectric furnaces where the charge, or melt material is heated in a rotary drum structure; subclasses 120+ for other nonelectric furnaces with charge, or melt manipulation means.
- 147 Power supply system:**  
This subclass is indented under subclass 138. Subject matter including means to provide electrical current and voltage for the induction furnace device.
- SEE OR SEARCH THIS CLASS, SUBCLASS:**
- 12, for electron beam vaporizing furnaces with power supply and control circuitry.
- 47, for electroslag remelting furnace power supply systems.
- 102, for arc furnace power supply systems.
- 148 Regulating:**  
This subclass is indented under subclass 147. Subject matter including means to control the power supplied to the furnace device.
- SEE OR SEARCH THIS CLASS, SUBCLASS:**
- 12, for electron beam vaporizing furnace power supply and control circuits.
- 25, for plasma furnace control systems.
- 40, for glass furnace electrical system regulation.

- 49+, for electroslag, remelting furnaces with power supply control.
- 70, and 104+, for arc furnace power regulation.
- 135, for resistance furnaces with control circuitry.
- SEE OR SEARCH CLASS:  
219, Electric Heating, subclasses 482+ for heating devices with power supply and voltage, or current regulation or current control means.
- 149 For furnace regulating:**  
This subclass is indented under subclass 138. Subject matter including means to control the operation of the furnace.
- 150 Electrical:**  
This subclass is indented under subclass 149. Subject matter wherein the control means is electrically actuated.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
148, for induction furnace power supply regulation.
- 151 Coreless:**  
This subclass is indented under subclass 138. Subject matter wherein the induced current is produced without using a magnetic-core material.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
159+, for core-type induction furnace apparatus.
- 152 Coil:**  
This subclass is indented under subclass 151. Subject matter wherein the induced current is produced by wrapping a current carrying wire around the charge, or around means intermediate the charge and the wire.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
160+, for core-type induction furnace coil details; and core-type induction furnace coil compositions.
- 153 Support:**  
This subclass is indented under subclass 152. Subject matter including means to hold, or maintain the coil in a particular configuration with respect to the furnace.
- 154 Cooling:**  
This subclass is indented under subclass 152. Subject matter including means to reduce heat generated in the coil.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
158, for other coreless induction furnace cooling arrangements.  
160, and 165, for core-type induction furnace coil cooling and cooling, per se, details respectively.
- SEE OR SEARCH CLASS:  
336, Inductor Devices, subclasses 55+ for modifying the temperature of inductive devices, per se.
- 155 Lining:**  
This subclass is indented under subclass 151. Subject matter including material covering the interior surface of the crucible, or furnace.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
30+, for glass furnace body details.  
44+, for electroslag remelting furnace body details.  
71+, for arc furnace body details.  
137, for resistance furnace lining details.  
162, and 164, for lining details of core-type induction furnace channels, crucibles, or furnace bodies.
- 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.  
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for processes of furnace lining formation or repair.  
432, Heating, subclass 248 and 264 for linings of furnaces of general utility.



- 501, Compositions: Ceramic, appropriate subclasses for specific lining compositions.
- 156 Crucible:**  
This subclass is indented under subclass 151. Subject matter including means to contain the charge while the charge is being heated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
11, for electron beam furnace crucible construction.  
30+, for glass furnace crucible details.  
72+, for arc furnace crucible details.  
118, for crucible details in resistance furnaces where the crucible is a resistance heating element.  
163, for core-type induction furnace crucible details.
- SEE OR SEARCH CLASS:  
118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.  
164, Metal Founding, subclasses 335+ for metal molding apparatus receptacles for holding, or dispensing molten material.  
219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.  
266, Metallurgical Apparatus, subclass 167 and 275+ for details of crucibles used in the metallurgical treatment of molten material.  
432, Heating, subclasses 156+ and 262+ for details of crucibles where the heating means is nonelectric.
- 157 Conducting (e.g., graphite):**  
This subclass is indented under subclass 156. Subject matter wherein the crucible is constructed of material which allows the flow of electric current.
- 158 Cooling:**  
This subclass is indented under subclass 151. Subject matter including means to reduce heat generated by the coreless furnace device.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
154, for coreless induction furnace coil cooling details.  
160, and 165, for core-type induction furnace coil cooling and cooling details, respectively.
- SEE OR SEARCH CLASS:  
266, Metallurgical Apparatus, appropriate subclasses for cooling furnaces having specified treatment apparatus.  
336, Inductor Devices, subclasses 55+ for modifying the temperature of inductive devices, per se.  
432, Heating, appropriate subclasses for cooling nonelectric, or nonspecified furnace apparatus.
- 159 Core-type (i.e., channel):**  
This subclass is indented under subclass 138. Subject matter wherein the induced current is produced using a magnetic-core material.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
151+, for coreless induction furnace apparatus.
- 160 Coil:**  
This subclass is indented under subclass 159. Subject matter wherein the induced current is produced by wrapping a current wire around the charge, or around means intermediate the charge and the wire.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
152, for coreless induction furnace coil details, and coreless induction furnace coil compositions.  
154, and 158, for coreless induction furnace coil cooling and cooling, per se, details, respectively.  
165, for other core-type induction furnace cooling arrangements.
- SEE OR SEARCH CLASS:  
336, Inductor Devices, subclasses 55+ for modifying the temperature of inductive devices, per se.

- 161 Channel:**  
This subclass is indented under subclass 159. Subject matter including details of the charge channel structure, or composition.
- 162 Lining:**  
This subclass is indented under subclass 161. Subject matter including material covering the interior surface of the channel.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
30+, for glass furnace body details.  
44+, for electroslag remelting furnace body details.  
71+, for arc furnace body details.  
137, for resistance furnace lining details.  
164, for lining details of core-type induction furnace crucibles, or furnace bodies.
- 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.  
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for processes of furnace lining formation or repair.  
432, Heating, subclass 248 and 264 for linings of furnaces of general utility.  
501, Compositions: Ceramic, appropriate subclasses for particular lining compositions.
- 163 Crucible or hearth:**  
This subclass is indented under subclass 159. Subject matter including means to contain the charge while the charge is being heated.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
11, for electron beam furnace crucible construction.  
30+, for glass furnace crucible details.  
72+, for arc furnace crucible details.  
118, for crucible details in resistance furnaces where the crucible is a resistance heating element.
- 156+, for coreless induction furnace crucible details.
- SEE OR SEARCH CLASS:  
118, Coating Apparatus, subclasses 726+ for details of crucible structures which contain coating material during vaporization.  
164, Metal Founding, subclasses 335+ for metal molding apparatus receptacles for holding, or dispensing molten material.  
219, Electric Heating, subclasses 420+ for electric heating devices combined with nominally disclosed crucible, or furnace-type containers.  
266, Metallurgical Apparatus, subclass 167 and 275+ for details of crucible used in the metallurgical treatment of molten material.  
432, Heating, subclasses 156+ and 262+ for details of crucibles where the heating means is nonelectric.
- 164 Lining:**  
This subclass is indented under subclass 159. Subject matter including material covering the interior surface of the crucible.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
30+, for glass furnace body details.  
44+, for electroslag remelting furnace body details.  
71+, for arc furnace body details.  
137, for resistance furnace lining details.  
162, for lining details of core-type induction furnace channels.
- 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.  
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for processes of furnace lining formation, or repair.  
432, Heating, subclass 248 and 264 for linings of furnaces of general utility.

501, Compositions: Ceramic, appropriate subclasses for specific lining compositions.

**165 Cooling:**

This subclass is indented under subclass 159. Subject matter including means to reduce heat generated by the core-type furnace device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

154, for coreless induction furnace coil cooling details.

160, for core-type induction furnace coil cooling details.

SEE OR SEARCH CLASS:

266, Metallurgical Apparatus, appropriate subclasses for cooling furnaces having specified treatment apparatus.

336, Inductor Devices, subclasses 55+ for modifying the temperature of inductive devices, per se.

432, Heating, appropriate subclasses for cooling nonelectric, or nonspecified furnace apparatus.

**166 MISCELLANEOUS:**

This subclass is indented under the class definition. Subject matter including electric furnace device details not provided for in the other subclasses of this class.

END