

18 Ferrous metallurgy

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| 18a | Ore preparation, production of pig iron, making of pig iron for special purposes, blast furnaces, hot-blast stoves, direct production of iron from iron ores |
| 18a | (IPC: C21B) Manufacture of iron and steel |
| 18b | Production of cast iron, steel and pure iron by processing of intermediate alloys or ferroalloys, sponge iron, scrap, etc. |
| 18b | (IPC: C21C) Processing of pig-iron |
| 18c | Treatment of iron, steel, and cast iron in order to obtain special properties |
| 18c | (IPC: C21D) Hardening and annealing of steel, iron, or articles made therefrom; Making malleable by decarburisation, tempering, or other treatments |
| 18d | Cast iron alloys, steel alloys, and ferrous alloys |

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| 18a | Ore preparation, production of pig iron, making of pig iron for special purposes, blast furnaces, hot-blast stoves, direct production of iron from iron ores (metallurgy 40; electrolytic iron making 40c-12, 40c-13; hot and cold working of iron by rolling, drawing, etc. 7, 49) |
| | Preparation of iron ores for iron production |
| 18a-1/01 | Process for roasting iron ores (roasting for iron extraction from ores 1a-33; for magnetic dressing 1b-2; for froth flotation 1c-9; roasting of nonferrous ores 40a, 2-6) |
| 18a-1/02 | Installations for iron ore roasting (for nonferrous ores 40a-2 – 40a-6) |
| 18a-1/03 | Desulphurisation, dephosphorisation, etc. of iron ores |
| | Sintering and agglomerating of iron ores |
| 18a-1/10 | not connected with processing in furnaces of special construction (for nonferrous ores 40a-2) |
| 18a-1/11 | in rotating furnaces (kilns) |
| 18a-1/12 | in channel-type furnaces and on belts |
| 18a-1/13 | in shaft furnaces |
| 18a-1/20 | Discharging equipment for shaft furnaces, only for iron ores and for obtaining a solid end product for roasting furnaces 80c-16) |
| 18a-1/30 | production of metallurgical coke |
| | Binding and briquetting of iron ores and furnace dust |
| 18a-2/01 | without binders |
| 18a-2/02 | with inorganic binders |
| 18a-2/03 | with organic binders |
| 18a-2/04 | with inorganic and organic binders |
| 18a-2/05 | Binding and briquetting of iron scrap, alloys, etc. |
| 18a-2/06 | Sintering of iron briquettes (coking 10a-18, 10b-9; briquetting presses 80a-25) |
| | Pig iron production in blast furnaces |
| 18a-3 | Processes for production of pig iron in blast furnaces |
| 18a-4/01 | Blast furnaces design: shape, brickwork, cooling (foundry shaft furnaces 31a-1; shaft furnaces for nonferrous metals 40a-7; calcining furnaces 80c-13) |

- 18a-4/02 Refractories for blast furnaces
- 18a-4/03 Taphole tapping and plugging (for foundry shaft furnaces 31a-6)
- 18a-5 Blast furnaces tuyeres (tuyeres for foundry shaft furnaces 31a-6)
- 18a-6/01 Charging equipment for blast furnaces and foundry shaft furnaces (for firings 24h)
- 18a-6/02 Inclined elevators
- 18a-6/03 Vertical and other types of elevators
- 18a-6/04 Skip-charging
- 18a-6/05 Component parts for skip charging; charging skips and covers, skin safety devices
- 18a-6/06 Bell and hopper
- 18a-6/07 Dust catchers
- 18a-6/08 Charging apparatus: bins, ore pockets and charging cars
- 18a-6/09 Measuring rods [probes] for blast furnaces and other shaft furnaces
- 18a-7 Removal of accretions [bears] in blast or shaft furnaces

- By-products of pig iron production
- 18a-8/01 Top gases (in coke ovens 10a-19)
- 18a-8/02 Slags (slag bricks 80b-5)
- 18a-9/01 Conveying cars for blast-furnace slag disposal
- 18a-9/02 Slag cooling
- 18a-10 Production of special pig iron in blast furnaces (Si-iron, Mn-iron, P-iron, etc.)

- Hot blast stoves for blast furnaces** (in general 24c-5; 24k-4)
- 18a-11 Cowper brickwork stoves and modifications
- 18a-12 Withwell brickwork stove and modifications
- 18a-13 Lurmann brickwork stove and modifications
- 18a-14 Lining for brickwork hot-blast stoves; special brick shapes, bottom bricks
- 18a-15/01 Cutoff valves for blast-furnace gas and hot-blast pipes, particularly hot-blast valves for hot-blast stoves (general 47g)
- 18a-15/10 Firings (stokers) for hot-blast stoves (gas heaters, general 24c-1)
- 18a-16/01 Iron hot-blast stoves for blast furnaces
- 18a-16/10 preheating of combustion air for hot-blast stoves
- 18a-17/01 Cooling and drying of hot blast
- 18a-17/02 Chemical drying of hot blast

- Direct production of solid sponge iron and molten iron and steel from ores**
- 18a-18/01 not requiring processing in furnaces of special design
- 18a-18/02 in shaft furnaces
- 18a-18/03 in muffle furnaces
- 18a-18/04 in multi-deck furnaces
- 18a-18/05 in rotary furnaces
- 18a-18/06 in hearth furnaces
- 18a-18/07 in electric furnaces
- 18a-18/08 in furnaces of special design
- 18a-19 Electrometallurgical processing of iron ores, electric blast furnaces (electrometallurgical steelmaking 18b-21; electrolytic production of steel [iron] 40c-12, 40c-13)

18a (IPC: C21B) Manufacture of iron and steel**Note:**

This sub-class covers the pretreatment of iron ores, production of pig-iron, blast furnaces, and air heaters.

- 18a-1/00 Pretreatment of iron ores of ferrous material for the production of iron** (pretreatment of ores in general 40a; washing and separating of ores 1a, 1c; furnaces)
- 18a-1/02 . Methods of roasting (18a-1/10 takes precedence)
 - 18a-1/04 . Removing sulphur, phosphorus, arsenic, other than by roasting
 - 18a-1/06 . Partial reduction, i.e. to a lower state of oxidation
 - 18a-1/08 . Agglomerating, binding, or briquetting iron ores, or intermediate products, e.g. flue dust
 - 18a-1/10 . . Sintering
 - 18a-1/12 . . . in tunnel furnaces
 - 18a-1/14 . . . in shaft furnaces
 - 18a-1/16 . . . in rotary furnaces
 - 18a-1/18 . . . in other apparatus, e.g. pots, sintering machines
 - 18a-1/20 . . Binding or briquetting
 - 18a-1/22 . . . with binders
 - 18a-1/24 inorganic
 - 18a-1/26 organic
 - 18a-1/28 with carbonaceous material for the production of coked agglomerates
 - 18a-1/30 . . . of ferrous waste or alloys
- 18a-3/00 General features in the manufacture of pig-iron** (mixers for pig-iron 18b-1/06)
- 18a-3/02 . by applying additives, e.g. fluxing agents
 - 18a-3/04 . Recovery of by-products, e.g. slag
 - 18a-3/06 . . Treatment of liquid slag (slag wool 80b-5/07; slag stones 80b-22)
 - 18a-3/08 . . . Cooling slag
 - 18a-3/10 . . . Slag pots; Slag cars
 - 18a-3/12 . . Removing deposits from ovens
- 18a-5/00 Making pig-iron in the blast furnace**
- 18a-5/02 . Making special pig-iron, e.g. by applying additives, e.g. oxides of other metals
 - 18a-5/04 . Making slag of special composition
 - 18a-5/06 . Using top gas in the blast furnace process (in coke ovens 10a, 26a)
- 18a-7/00 Blast furnaces**
- 18a-7/02 . Internal forms
 - 18a-7/04 . with special refractories (refractory materials 80b)
 - 18a-7/06 . . Linings for furnaces
 - 18a-7/08 . Top armourings
 - 18a-7/10 . Cooling; Devices therefor
 - 18a-7/12 . Opening or sealing the tap holes
 - 18a-7/14 . Discharging devices, e.g. for slag
 - 18a-7/16 . Tuyères
 - 18a-7/18 . Bell-and-hopper arrangements
 - 18a-7/20 . . with appliances for distributing the burden
 - 18a-7/22 . Dust arresters
 - 18a-7/24 . Test rods or other checking devices
- 18a-9/00 Stoves for heating the blast in blast furnaces**
- 18a-9/02 . Brick hot-blast stoves
 - 18a-9/04 . . with combustion shaft
 - 18a-9/06 . . Linings
 - 18a-9/08 . Iron hot-blast stoves
 - 18a-9/10 . Other details, e.g. blast mains
 - 18a-9/12 . . Hot-blast valves or slides for blast furnaces (valves in general 47g)
 - 18a-9/14 . Preheating the combustion air

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| 18a-9/16 | . Cooling or drying the hot-blast |
| 18a-11/00 | Making pig-iron other than in blast furnaces |
| 18a-11/02 | . in low shaft furnaces |
| 18a-11/06 | . in rotary kilns |
| 18a-11/08 | . in hearth-type furnaces |
| 18a-11/10 | . in electric furnaces |
| 18a-13/00 | Making spongy iron or liquid steel, by direct processes |
| 18a-13/02 | . in shaft furnaces |
| 18a-13/04 | . in retorts |
| 18a-13/06 | . in multi-storied furnaces |
| 18a-13/08 | . in rotary furnaces |
| 18a-13/10 | . in hearth-type furnaces |
| 18a-13/12 | . in electric furnaces |
| 18a-13/14 | . Multi-stage processes |
| 18a-15/00 | Other processes for the manufacture of iron from iron compounds (by electrolysis 40e) |
| 18a-15/02 | . Metallothermic processes, e.g. thermit reduction |
| 18a-56/01 | Charging equipment |
| 18a-56/02 | Inclined elevators |
| 18a-56/03 | Vertical elevators |
| 18a-56/04 | Skip charging |
| 18a-56/05 | Charging skips |
| 18b | Production of cast iron, steel and pure iron by processing of intermediate [master] alloys or ferroalloys, sponge iron, scrap, etc. (direct production of iron or steel from ores 18a-18) |
| | Processing of pig iron; production of cast iron and foundry or ferroalloys |
| 18b-1/01 | Production of foundry or ferroalloys in foundry shaft furnaces (production of ferroalloys, general 18b-20; in blast furnaces 18a-10) |
| 18b-1/02 | Production of cast iron |
| 18b-1/03 | Refining of pig iron |
| 18b-2 | Separation of phosphorus and sulphur from pig iron (from steel 18b-9) |
| 18b-3 | Pig iron mixers |
| | Production of wrought iron and wrought steel |
| 18b-4 | Processes for the production of wrought iron and wrought steel |
| 18b-5 | Simple puddling furnaces, including mechanical agitators |
| 18b-6 | Double puddling furnaces |
| 18b-7 | Oscillating and rotating puddling furnaces |
| | Production of low and medium carbon steel, cast steel and special alloys |
| 18b-8 | General processes for refining pig iron |
| 18b-9 | Separation of phosphorus and sulfur from molten steel baths (from pig iron 18b-2) |
| 18b-10 | Recarburisation and deoxidation of molten steel baths |
| 18b-11 | Modification [treatment] of molten steel with additives with a view to obtaining compact ingots (compact castings 31c-11 – 31c-15) |
| 18b-12 | Production of crucible steel |
| 18b-13 | Steelmaking in Siemens-Martin open-hearth furnaces |
| 18b-14/01 | Stationary and tilting open-hearth furnaces |
| 18b-14/02 | Refractory linings for open-hearth furnaces |
| 18b-14/03 | Open-hearth furnaces with pulverised coal firing |
| 18b-14/04 | Special equipment for open-hearth furnaces |
| 18b-14/05 | port ends for open-hearth furnaces |
| 18b-14/06 | Slag pockets for open-hearth furnaces |

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| 18b-14/07 | Tap holes of open-hearth furnaces (for cupola furnaces 31a-6/20) |
| 18b-14/50 | Slag removal from steel ladles |
| 18b-15 | Charging equipment for open-hearth furnaces (for electric furnaces 18b-21/10, for reheating furnaces 18c-11/20; for stokers 24h-1 – 24h-7) |
| 18b-16/01 | Steelmaking in Thomas and Bessemer converters |
| 18b-16/02 | production of phosphate or Thomas slag during steelmaking operations |
| 18b-16/03 | Refractory linings for Thomas and Bessemer converters |
| 18b-17 | Special equipment for Thomas and Bessemer converters |
| 18b-18 | Miscellaneous types of converters |
| 18b-19 | Nozzles and bottoms for Thomas and Bessemer converters |
| 18b-20 | Special procedures for making high-grade steels and special steels or ferroalloys by the molten method, e.g. chromium steels, chromium-nickel steels, molybdenum steels; transformer dynamo steel, or mild steel |
| 18b-21/01 | Electrometallurgical steelmaking processes (electrolytic production processes 40c-12, 40c-13, 48a-6/03) |
| 18b-21/02 | Electric furnaces for steelmaking, inasmuch as electrical features are not included (electric furnaces, general 21h-14 – 21h-25) |
| 18b-21/03 | Special equipment for electric furnaces |
| 18b-21/10 | Charging equipment for electric furnaces |
| 18b-22/01 | Production of steel in special-structure melting installations (wrought iron 18b-4; crucible steel 18b-12; open-hearth steel 18b-13; converter steel 18b-16; electric-furnace steel 18b-21) |
| 18b-22/10 | Duplex and triplex processes |
| 18b-23 | Production of iron alloys by processes other than smelting, e.g. by pressing, ramming, or sintering (nonferrous alloys 40b-2) |

18b (IPC: C21C) Processing of pig-iron, e.g. refining, manufacture of wrought-iron and steel

18b-1/00 Refining of pig-iron; Cast iron

- 18b-1/02 . Dephosphorising or desulphurising
- 18b-1/04 . Removing impurities other than carbon, phosphorus, and sulphur
- 18b-1/06 . Constructional features of mixers for pig-iron
- 18b-1/08 . Manufacture of cast-iron
- 18b-1/10 . Making spheroidal graphite cast-iron

18b-3/00 Manufacture of wrought-iron or wrought-steel

- 18b-3/02 . Puddling furnaces

18b-5/00 Manufacture of carbon steel, e.g. plain mild steel, medium carbon steel, or cast-steel

- 18b-5/02 . Crucible furnace process
- 18b-5/04 . Manufacture of hearth-furnace steel, e.g. Siemens-Marten steel
- 18b-5/06 . . Processes yielding slags of special composition
- 18b-5/08 . . Constructional features of hearth furnaces
- 18b-5/10 . . . Refractory linings
- 18b-5/12 . . . Details or accessories
- 18b-5/14 Venturi heads
- 18b-5/16 Burners
- 18b-5/18 Slag chambers
- 18b-5/20 Regenerative chambers
- 18b-5/22 Change-over devices for gas or air supply
- 18b-5/24 Charging apparatus
- 18b-5/26 Tapping methods or apparatus
- 18b-5/28 . Manufacture of steel in the converter
- 18b-5/30 . . Regulating or controlling the blowing
- 18b-5/32 . . . Blowing from above
- 18b-5/34 . . . Blowing through the bath
- 18b-5/36 . . Processes yielding slags of special composition

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| 18b-5/38 | . . . Removal of waste gases or dust |
| 18b-5/40 | Offtakes or separating apparatus for converter waste gases or dust |
| 18b-5/42 | . . . Constructional features of converters |
| 18b-5/44 | Refractory linings |
| 18b-5/46 | Details or accessories |
| 18b-5/48 | Bottoms or tuyères of converters |
| 18b-5/50 | Tilting mechanisms for converters |
| 18b-5/52 | . . . Manufacture of steel in electric furnaces |
| 18b-5/54 | . . . Processes yielding slags of special composition |
| 18b-5/56 | . . . Manufacture of steel by other methods |
| 18b-7/00 | Treatment in the molten state of steel, steel alloys, or ferrous alloys |
| 18b-7/02 | . . . Dephosphorising (18b-5/28 takes precedence); Desulphurising |
| 18b-7/04 | . . . Removing other impurities |
| 18b-7/06 | . . . Deoxidising |
| 18b-7/08 | Killing |
| 18b-7/10 | . . . Handling in vacuum |

18c **Treatment of iron, steel, and cast iron in order to obtain special properties** (if the invention relates only to special fields of electrotechnics 21h-14 – 21h-19; pulverised coal combustion in general, 241-4 – 241-10; gas heaters in general 24c; furnaces for heat treatment of nonferrous metals only 40d; furnaces for treatment of ceramics 80c)

Note:

Subclass 18c includes electric furnaces if the invention is intended to modify the material

General processes and methods for hardening steel

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| 18c-1/10 | Hardening by quenching |
| 18c-1/11 | Hardening by quenching the whole preheated workpiece |
| 18c-1/12 | Hardening processes in which only a portion of the workpiece is heated to the hardening temperature |
| 18c-1/30 | Hardening by tempering below the transformation point, precipitation hardening, age hardening |
| 18c-1/40 | Hardening of steels of special composition |
| 18c-1/50 | Determination of hardening temperature |
| 18c-1/60 | Heating baths, e.g. salt baths, metallic baths |
| 18c-1/70 | Quenching agents, e.g. liquids, gases, quenching tanks |
| 18c-1/80 | Cold hardening |

Processes and devices for hardening of steel articles (hardening in casting moulds 31c-16)

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| 18c-2/10 | Hardening of articles, in general |
| 18c-2/15 | Auxiliary tools for article hardening, e.g. tongs, holders |
| 18c-2/20 | Hardening of special articles |
| 18c-2/21 | of springs |
| 18c-2/22 | of scrapers |
| 18c-2/23 | of railway rails |
| 18c-2/24 | of hollow bodies, tubes |
| 18c-2/25 | of riffle barrels |
| 18c-2/26 | of projectiles |
| 18c-2/27 | of skate blades |
| 18c-2/28 | of blades, knives, scythes and similar tools |
| 18c-2/29 | of turning chisels, milling cutters, drill bits and similar tools |
| 18c-2/30 | of saw blades |
| 18c-2/31 | of magnets, permanent magnets |

- 18c-2/32 of needles
- 18c-2/33 of shafts, crankshafts
- 18c-2/34 of gears and the like articles
- 18c-2/35 of wheel tyres
- 18c-2/36 of balls and rollers
- 18c-2/37 of rings and annular-shaped elements

Processes, methods and furnaces for surface treatment of steel by decarburisation, carburisation, and nitriding

- 18c-3/10 Reduction of carbon content, decarburisation
- 18c-3/15 Enrichment of carbon content, carburisation, cementation
- 18c-3/25 Enrichment of nitrogen, nitriding
- 18c-3/50 Furnaces for the above processes, cementing furnaces, nitriding furnaces
- 18c-4 Cementation and hardening of armour plates

Hardening and tempering furnaces

- 18c-5/10 General structural features
- 18c-5/20 Furnaces with rotating heating chamber
- 18c-5/30 Automatic hardening furnaces, hardening machines
- 18c-5/40 Crucible furnaces for heating baths (heating baths 18c-1)

Heat treatment of iron and steel wires and strips (of nonferrous metals 40d)

- 18c-6/10 Annealing, hardening, and surface heat-treatment processes, e.g. patenting
- 18c-6/50 Furnaces with general structural features
- 18c-6/60 Continuous furnaces
- 18c-6/70 Furnace coilers

Heat treatment of iron and steel sheets (40d)

- 18c-7/10 Treatment of sheet metal, in general, heavy and medium plates, thin sheets
- 18c-7/20 Treatment of sheets for deep drawing and deep stamping, e.g. car body sheets
- 18c-7/30 Heat treatment of dynamo and transformer sheet
- 18c-7/50 Furnaces for special heat-treatment processes for finished sheets (sheet-annealing furnaces of conventional construction 18c-9)

Annealing and surface heat treatment of steel (for wire 18c-6; for sheet metal 18c-7; for cast iron 18c-12)

- 18c-8/10 Annealing, general, e.g. softening, normalising
- 18c-8/20 Heat treatment, hardening with subsequent tempering
- 18c-8/30 Annealing and heat treatment of special articles, e.g. tools, structural components
- 18c-8/40 Annealing and surface heat-treatment of steels of special composition
- 18c-8/50 Annealing and heat treatment of steel and steel articles with a view to obtaining special properties, e.g. fatigue strength, good workability and machinability
- 18c-8/55 Annealing and heat treatment of steel and steel articles with a view to obtaining special electric and magnetic properties
- 18c-8/80 Processes for annealing in solid protective media, in protective gases or in a vacuum (for nonferrous metals, 40d-2/31)
- 18c-8/90 Furnaces and apparatus for annealing in protective media and the like, e.g. in annealing pots, annealing boxes) for nonferrous metals 40d-2/30; annealing furnaces in general 18c-9)

Annealing, reheating, and tempering furnaces (for wire 18c-6; sheets 18c-7; for annealing in protective media, etc. 18c-8)

- 18c-9/01 Chamber furnaces
- 18c-9/02 Channel and tunnel-type furnaces
- 18c-9/03 Stack annealing furnaces

- 18c-9/50 processes and built-in devices for conveying the heated material, e.g. rollers, chains, travelling or vertically movable hearth bottoms (charging devices 18c-11)
- 18c-10/01 Pusher-type furnaces
- 18c-10/02 Roller-hearth furnaces
- 18c-10/03 Pit furnaces
- 18c-10/04 Soaking pits
- 18c-10/05 Sheet bar reheating furnaces
- 18c-10/06 Reheating furnaces for small iron articles, e.g. rivets, bolts

Accessories for heating, annealing, hardening, and tempering furnaces

- 18c-11/01 Roofs, covers, doors (general 24k-1)
- 18c-11/02 Automatic slide valves, flap valves (general 24k-1; 47g)
- 18c-11/10 Control of furnaces (24i-1 – 24i-8)
- 18c-11/20 Processes and apparatus for charging and discharging the annealed material, charging devices (for smelting furnaces 18b-15; fuel feeding 24h-1 – 24h-8)
- 18c-11/30 Labour protection safety devices (24k-8)
- 18c-11/40 Lining, brickwork

Processes and methods for the heat treatment of cast iron and malleable cast iron (furnaces 18e-5, 18e-9, 18e-10)

- 18c-12/01 Annealing, hardening, and heat treatment
- 18c-12/10 Annealing of malleable pig iron; making malleable, graphitising (furnaces 18c-9)
- 18c-12/11 Packing means

Miscellaneous

- 18c-13 Heat treatment during shaping by rolling, forging, drawing, etc.
- 18c-14 Working processes, including rolling and deep drawing, with a view to obtaining special properties (rolling and drawing, general 7)
- 18c-15 Testing methods as auxiliaries in material inspection, and direct testing during heat treatment (metallographic testing 42k-48; testing methods, general 42k)

18c (IPC: C21D) Hardening and annealing of steel, iron, or articles made therefrom; Making malleable by decarburisation, tempering, or other treatments (cementation by diffusion processes 48b)

18c-1/00 General methods or devices for heat treatments, e.g. annealing, hardening, quenching, tempering

- 18c-1/02 . Hardening articles or materials formed by forging or rolling, with no further heating beyond that required for the formation
- 18c-1/04 . with simultaneous application of supersonic waves, magnetic or electric fields
- 18c-1/06 . Surface hardening by heating
- 18c-1/08 . . with flames
- 18c-1/10 . . by electric induction
- 18c-1/12 . . Apparatus therefor
- 18c-1/14 . Hardening by precipitation
- 18c-1/16 . Hardening by cooling below 0° C
- 18c-1/18 . Tempering
- 18c-1/20 . . Bainitic hardening
- 18c-1/22 . . Martempering
- 18c-1/24 . . Low tempering
- 18c-1/26 . Methods of annealing
- 18c-1/28 . . Normalising
- 18c-1/30 . . Stress-relieving
- 18c-1/32 . . Soft annealing
- 18c-1/34 . Methods of heating (18c-1/06 takes precedence)
- 18c-1/36 . Shock-heating
- 18c-1/38 . . Heating by cathodic discharges
- 18c-1/40 . . Direct resistance heating

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| 18c-1/42 | . . Induction heating |
| 18c-1/44 | . . in heat-treatment baths |
| 18c-1/46 | . . . Salt baths |
| 18c-1/48 | . . . Metal baths |
| 18c-1/50 | . . . Oil baths |
| 18c-1/52 | . . with flames |
| 18c-1/54 | . Determining when the hardening temperature has been reached by measurement of magnetic or electrical properties |
| 18c-1/56 | . with special quenching agents |
| 18c-1/58 | . . oils |
| 18c-1/60 | . . aqueous agents |
| 18c-1/62 | . Quenching devices |
| 18c-1/64 | . . with circulating liquids (in general 17f) |
| 18c-1/66 | . . combined with induction heating |
| 18c-1/68 | . Protective coatings for locally preventing heat-treatment |
| 18c-1/70 | . . whilst heating and quenching |
| 18c-1/72 | . . during chemical change of surfaces |
| 18c-1/74 | . Methods of treatment in inert gas, controlled atmosphere, vacuum, or pulverulent material (production of gases 12i; 12k; 10a; 26a) |
| 18c-1/76 | . . Adjusting the composition of the atmosphere |
| 18c-1/78 | . Combined heat-treatments not previously covered, to produce special technological properties |
| 18c-1/80 | . . Hardening, combined with annealing between 300° and 600°C, i.e. heat refining [Vergüten] |
| 18c-1/82 | . Descaling by thermal stresses (mechanically 7a; chemically 48a) |
| 18c-3/00 | Diffusion processes for extraction of non-metals; Furnaces therefor (local protective coatings 18c-1/72) |
| 18c-3/02 | . Extraction of non-metals |
| 18c-3/04 | . . Decarburising |
| 18c-3/06 | . . Extraction of hydrogen |
| 18c-3/08 | . . Extraction of nitrogen |
| 18c-3/10 | . Furnaces therefor |
| 18c-5/00 | Heat treatments of cast-iron |
| 18c-5/02 | . improving the malleability of grey cast-iron |
| 18c-5/04 | . of white cast-iron |
| 18c-5/06 | . . Malleabilising |
| 18c-5/08 | . . . with oxidation of carbon |
| 18c-5/10 | in gaseous agents |
| 18c-5/12 | in solid agents |
| 18c-5/14 | . . . Graphitising |
| 18c-5/16 | Packing agents |
| 18c-7/00 | Modifying the physical properties of iron or steel by deformation |
| 18c-7/02 | . by cold working |
| 18c-7/04 | . . of the surface |
| 18c-7/06 | . . . by shot-peening or the like |
| 18c-7/08 | . . . by burnishing or the like |
| 18c-7/10 | . . of the whole cross-section, e.g. of concrete reinforcing bars |
| 18c-7/12 | . . . by expanding tubular bodies |
| 18c-7/13 | . by hot working |
| 18c-7/14 | . . by hot working combined with a heat treatment (treating with no heat other than that of shaping 18c-1/02; hot working methods in general 7a – 7c) |
| 18c-9/00 | Heat treatment, e.g. annealing, hardening, quenching, tempering, adapted for particular articles; Furnaces therefor |
| 18c-9/02 | . for springs |
| 18c-9/04 | . for rails (apparatus for heat treatment of railway rails on the spot 19a-31/18) |
| 18c-9/06 | . . with diminished tendency to become wavy |
| 18c-9/08 | . for tubular bodies or pipes |
| 18c-9/10 | . . shotgun barrels |

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| 18c-9/12 | . . barrels for ordnance |
| 18c-9/14 | . . wear- or pressure-resistant pipes |
| 18c-9/16 | . for explosive shells |
| 18c-9/18 | . for knives, scythes, scissors, or like hand cutting tools |
| 18c-9/20 | . for blades for skates |
| 18c-9/22 | . for drills; for milling cutters; for machine cutting tools |
| 18c-9/24 | . for saw blades |
| 18c-9/26 | . for needles; for teeth for card-clothing |
| 18c-9/28 | . for plain shafts |
| 18c-9/30 | . for crankshafts; for camshafts |
| 18c-9/32 | . for gear wheels, worm wheels, or the like |
| 18c-9/34 | . for tyres; for rims |
| 18c-9/36 | . for balls; for rollers |
| 18c-9/38 | . for roll bodies |
| 18c-9/40 | . for rings; for bearing races |
| 18c-9/42 | . for armour plate |
| 18c-9/44 | . for equipment for lining mine shafts, e.g. segments, rings, props |
| 18c-9/46 | . for sheet metals |
| 18c-9/48 | . . deep-drawing sheets |
| 18c-9/50 | . for welded joints |
| 18c-9/52 | . for wires; for strips |
| 18c-9/54 | . . Furnaces for treating strips or wire |
| 18c-9/56 | . . . Continuous furnaces for strip or wire |
| 18c-9/58 | with heating by baths |
| 18c-9/60 | with induction heating |
| 18c-9/62 | with direct resistance heating |
| 18c-9/64 | . . . Patenting furnaces |
| 18c-9/66 | . . . Tower-type furnaces |
| 18c-9/68 | . . . Furnace coilers; Hot coilers (cold coilers 7b) |
| 18c-9/70 | . Furnaces for ingots, i.e. soaking pits |

18d Cast iron alloys, steel alloys, and ferrous alloys

Alloying technology

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| 18d-1/10 | Intermediate [master] alloys of definite composition, for the production of cast iron alloys, steel alloys and iron alloys |
| 18d-1/20 | Cast iron alloys |
| 18d-1/30 | Steel alloys |
| 18d-1/70 | Iron alloys, carbon-free or practically carbon-free alloys |

Utilisation of alloys on the basis of their general, technological, mechanical, physical or chemical properties (utilisation of alloys for special technological purposes on the basis of special technological properties only in the respective classes), **i.e. according to:**

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| 18d-2/10 | magnetic or electric properties |
| 18d-2/20 | mechanical strength |
| 18d-2/30 | wear resistance |
| 18d-2/40 | corrosion resistance |
| 18d-2/50 | resistance to scaling |
| 18d-2/60 | edge durability |
| 18d-2/70 | workability and machinability |
| 18d-2/80 | thermal properties, e.g. thermal expansion, thermal conductivity |