

# CPC COOPERATIVE PATENT CLASSIFICATION

## C CHEMISTRY; METALLURGY

(NOTES omitted)

### METALLURGY

#### C21 METALLURGY OF IRON

#### C21B MANUFACTURE OF IRON OR STEEL (preliminary treatment of ferrous ores or scrap [C22B 1/00](#))

##### NOTE

This subclass covers:

- the production of iron or steel from source materials, e.g. the production of pig-iron;
- apparatus specially adapted therefor, e.g. blast furnaces or air heaters.

#### **3/00 General features in the manufacture of pig-iron** (mixers for pig-iron [C21C 1/06](#))

- 3/02 . by applying additives, e.g. fluxing agents
- 3/04 . Recovery of by-products, e.g. slag
- 3/06 . . Treatment of liquid slag
- 3/08 . . . Cooling slag
- 3/10 . . . Slag pots; Slag cars

#### **5/00 Making pig-iron in the blast furnace**

- 5/001 . {Injecting additional fuel or reducing agents}
- 5/002 . . {Heated electrically (plasma)}
- 5/003 . . {Injection of pulverulent coal}
- 5/004 . . . {Injection of slurries}
- 2005/005 . . {Selection or treatment of the reducing gases}
- 5/006 . {Automatically controlling the process}
- 5/007 . {Conditions of the cokes or characterised by the cokes used}
- 5/008 . {Composition or distribution of the charge}
- 5/02 . Making special pig-iron, e.g. by applying additives, e.g. oxides of other metals
- 5/023 . . {Injection of the additives into the melting part}
- 5/026 . . . {of plastic material}
- 5/04 . Making slag of special composition
- 5/06 . using top gas in the blast furnace process

#### **7/00 Blast furnaces**

- 7/002 . {Evacuating and treating of exhaust gases}
- 7/005 . . {Bleeder valves or slides}
- 7/007 . {Controlling or regulating of the top pressure}
- 7/02 . Internal forms
- 7/04 . with special refractories
- 7/06 . . Linings for furnaces
- 7/08 . Top armourings
- 7/10 . Cooling; Devices therefor
- 7/103 . . {Detection of leakages of the cooling liquid}
- 7/106 . . {Cooling of the furnace bottom}
- 7/12 . Opening or sealing the tap holes
- 7/125 . . {Refractory plugging mass}
- 7/14 . Discharging devices, e.g. for slag
- 7/16 . Tuyères
- 7/163 . . {Blowpipe assembly}
- 7/166 . . {Tuyere replacement apparatus}
- 7/18 . Bell-and-hopper arrangements

- 7/20 . . with appliances for distributing the burden
- 7/205 . . . {Details concerning the gear-box driving the charge distribution system}
- 7/22 . Dust arresters
- 7/24 . Test rods or other checking devices

#### **9/00 Stoves for heating the blast in blast furnaces**

- 9/02 . Brick hot-blast stoves
- 9/04 . . with combustion shaft
- 9/06 . . Linings
- 9/08 . Iron hot-blast stoves
- 9/10 . Other details, e.g. blast mains
- 9/12 . . Hot-blast valves or slides for blast furnaces
- 9/14 . Preheating the combustion air
- 9/16 . Cooling or drying the hot-blast

#### **11/00 Making pig-iron other than in blast furnaces**

- 11/02 . in low shaft furnaces {or shaft furnaces}
- 11/06 . in rotary kilns
- 11/08 . in hearth-type furnaces
- 11/10 . in electric furnaces

#### **13/00 Making spongy iron or liquid steel, by direct processes**

- 13/0006 . {obtaining iron or steel in a molten state}
- 13/0013 . . {introduction of iron oxide into a bath of molten iron containing a carbon reductant}
- 13/002 . . . {Reduction of iron ores by passing through a heated column of carbon}
- 13/0026 . . {introduction of iron oxide in the flame of a burner or a hot gas stream}
- 13/0033 . {In fluidised bed furnaces or apparatus containing a dispersion of the material}
- 13/004 . {in a continuous way by reduction from ores}
- 13/0046 . {making metallised agglomerates or iron oxide}
- 13/0053 . . {On a massing grate}
- 13/006 . {Starting from ores containing non ferrous metallic oxides}
- 13/0066 . {Preliminary conditioning of the solid carbonaceous reductant}
- 13/0073 . {Selection or treatment of the reducing gases}
- 13/008 . {Use of special additives or fluxing agents}
- 13/0086 . {Conditioning, transformation of reduced iron ores}

13/0093	. . {Protecting against oxidation}	2400/026	. . . using air, inert gases or removable conductive bodies
13/02	. in shaft furnaces	2400/028	. . . with the permanent addition of cooled slag or other solids
13/023	. . {wherein iron or steel is obtained in a molten state}	2400/03	. . Removing sulfur
13/026	. . . {heated electrically}	2400/032	. . Separating slag from liquid, e.g. from water, after quenching
13/029	. . {Introducing coolant gas in the shaft furnaces}	2400/034	. . Stirring or agitating by pressurised fluids or by moving apparatus
13/04	. in retorts	2400/04	. Specific shape of slag after cooling
13/06	. in multi-storied furnaces	2400/042	. . Sheets
13/08	. in rotary furnaces	2400/044	. . Briquettes or moulded bodies other than sheets
13/085	. . {wherein iron or steel is obtained in a molten state}	2400/05	. Apparatus features
13/10	. in hearth-type furnaces	2400/052	. . including rotating parts
13/105	. . {Rotary hearth-type furnaces}	2400/054	. . . Disc-shaped or conical parts for cooling, dispersing or atomising of molten slag rotating along vertical axis
13/12	. in electric furnaces	2400/056	. . . Drums whereby slag is poured on or in between
13/125	. . {By using plasma}	2400/058	. . . Rotating beds on which slag is cooled
13/14	. Multi-stage processes {processes carried out in different vessels or furnaces}	2400/06	. . Conveyors on which slag is cooled
13/143	. . {Injection of partially reduced ore into a molten bath}	2400/062	. . Jet nozzles or pressurised fluids for cooling, fragmenting or atomising slag
13/146	. . {Multi-step reduction without melting}	2400/064	. . Thermally-conductive removable bodies, e.g. balls
<b>15/00</b>	<b>Other processes for the manufacture of iron from iron compounds (by electrolysis C25C 1/06)</b>	2400/066	. . Receptacle features where the slag is treated
15/003	. {By using nuclear energy}	2400/068	. . . with a sealed or controlled environment
15/006	. {By a chloride process}	2400/07	. . . open to atmosphere
15/02	. Metallothermic processes, e.g. thermit reduction	2400/072	. . . Tanks to collect the slag, e.g. water tank
15/04	. from iron carbonyl	2400/074	. . . Tower structures for cooling, being confined but not sealed
<b>2100/00</b>	<b>Handling of exhaust gases produced during the manufacture of iron or steel</b>	2400/076	. . . Fluidised bed for cooling
2100/20	. Increasing the gas reduction potential of recycled exhaust gases	2400/08	. with energy recovery
2100/22	. . by reforming		
2100/24	. . by shift reactions		
2100/26	. . by adding additional fuel in recirculation pipes		
2100/28	. . by separation		
2100/282	. . . of carbon dioxide		
2100/284	. . . of nitrogen		
2100/40	. Gas purification of exhaust gases to be recirculated or used in other metallurgical processes		
2100/42	. . Sulphur removal		
2100/44	. . Removing particles, e.g. by scrubbing, dedusting		
2100/60	. Process control or energy utilisation in the manufacture of iron or steel		
2100/62	. . Energy conversion other than by heat exchange, e.g. by use of exhaust gas in energy production		
2100/64	. . Controlling the physical properties of the gas, e.g. pressure or temperature		
2100/66	. . Heat exchange		
2100/80	. Interaction of exhaust gases produced during the manufacture of iron or steel with other processes		
<b>2200/00</b>	<b>Recycling of non-gaseous waste material</b>		
<b>2300/00</b>	<b>Process aspects</b>		
2300/02	. Particular sequence of the process steps		
2300/04	. Modeling of the process, e.g. for control purposes; CII		
<b>2400/00</b>	<b>Treatment of slags originating from iron or steel processes</b>		
2400/02	. Physical or chemical treatment of slags		
2400/022	. . Methods of cooling or quenching molten slag		
2400/024	. . . with the direct use of steam or liquid coolants, e.g. water		