

C21B

MANUFACTURE OF IRON OR STEEL (preliminary treatment of ferrous ores or scrap [C22B 1/00](#); electric heating [H05B](#))

Definition statement

This place covers:

- The production of iron or steel starting from iron ores, e.g. the production of pig-iron;
- The recovery of by-products, e.g. slag, from these production methods;
- Apparatus specially adapted therefore, e.g. blast furnaces, air heaters.

Relationships with other classification places

General metallurgical processes for obtaining metal from ores, and non-ferrous ores in particular, are treated in [C22B](#).

Details of the apparatus which are of general interest to the group of installations, e.g. shaft furnaces, are also to be classified in [F27B](#) and/or [F27D](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Furnaces, kilns, ovens or retorts in general	F27B
Details or accessories of furnaces, kilns, ovens or retorts in general	F27D

Special rules of classification

In the group [C21B 2100/22](#), reforming is based on a reaction with other hydrocarbon containing gases. In the group [C21B 2100/24](#), shift reactions involve steam, water vapor, or water.

[C21B 2100/40](#) concerns the specific purification and reuse of exhaust gases in metallurgical processes, while [B01D 2258/025](#) concerns only the purification process in general of waste gases from metallurgy plants.

C21B 3/02

by applying additives, e.g. fluxing agents

Definition statement

This place covers:

Processes in which the additives can be added to dry products (e.g. pellets, briquettes), a metal melt or a slag.

Special rules of classification

The group overlaps with [C21B 5/008](#), [C21B 5/02](#), [C21B 5/04](#), [C21B 13/008](#): depending on whether the additives are generally applicable or related to a specific process either in the Blast Furnace ([C21B 5/00](#)) or in Direct Reduction process ([C21B 13/00](#)), double or single classification will apply.

C21B 3/04

Recovery of by-products, e.g. slag

Relationships with other classification places

Treatment of (metallurgical) slag is also classified in [C04B 5/00](#) when artificial stone, cement, road material or like building materials are obtained therefrom.

C21B 3/06

Treatment of liquid slag (slag wool [C03B](#); slag stones [C04B](#))

References

Limiting references

This place does not cover:

Slag wool	C03B
Slag stone	C04B

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processes or devices for granulating material	B01J 2/00
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C21B 3/08

Cooling slag

Definition statement

This place covers:

Cooling covers both dry and wet methods of cooling.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

General arrangements of separating plants	B03B 9/04
Ingredients other than water added to the slag ; treatment with gases or gas generating material	C04B 5/06
Handling or treating discharged material	F27D 15/00 - F27D 15/02

C21B 5/00

Making pig-iron in the blast furnace

Definition statement

This place covers:

Also the injection of additional (pure) oxygen and additional fuel; automatic control of the process; condition of the cokes or their characterisation; composition and distribution of the charge.

C21B 5/06

using top gas in the blast furnace process (in coke ovens [C10B](#))

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

In coke ovens	C10B
Production of fuel gases by carbureting air or other gases without pyrolysis or of combustible gases containing carbon monoxide from solid carbonaceous fuels	C10J
Purifying or modifying the chemical composition of combustible gases containing carbon monoxide	C10K

Special rules of classification

In case the top gas is treated before being sent back into the furnace, this aspect is also classified : either by the relevant class in another field (specific, e.g. [C10K 1/02](#), dust removal).

C21B 7/00

Blast furnaces (lifts associated with blast furnaces [B66B 9/06](#))

Definition statement

This place covers:

Features which relate to the lay-out of the BF area or to repair ; also the evacuation and treatment of exhaust gases and the control and regulation of the top pressure.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Separation	B01D
Filtering elements	B01D 24/00 - B01D 35/00
Filtering material	B01D 39/00
Cleaning of gases from solids	B01D 45/00 - B01D 53/00
Separating solids from solids by wet methods	B03B
Magnetic or electrostatic separation of solid materials from solid materials or fluids, separation by high-voltage electric fields	B03C

Centrifuges	B04B
Apparatus using free vortex flow, e.g. cyclones	B04C
Purifying or modifying the chemical composition of combustible gases containing carbon monoxide	C10K

Special rules of classification

Groups [C21B 7/002](#) and [C21B 7/005](#) concern evacuating and treating of exhaust gases from blast furnaces in general. Further classification is mandatory in groups [C21B 2100/00](#) - [C21B 2100/80](#).

C21B 7/04

with special refractories (refractory materials [C04B](#))

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Refractory materials	C04B
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C21B 7/06

Linings for furnaces

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements of linings in shaft furnaces	F27B 1/14
Linings or walls for metallurgical furnaces in general	F27D 1/00

C21B 7/10

Cooling; Devices therefor

Definition statement

This place covers:

Cooling devices for the walls and bottom including staves, plates, pipes, etc; also leakage detection.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling of linings of combustion chambers	F23M 5/08
Shaft furnaces with cooling arrangements	F27B 1/24
Linings or walls incorporating cooling arrangements	F27D 1/12
Cooling of furnaces or of charges therein	F27D 9/00

Heat exchange apparatus in which heat exchange media do not come into direct contact	F28D
Details of heat exchange apparatus of general application	F28F

C21B 7/12

Opening or sealing the tap holes

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Tapping equipment	F27D 3/15 , C21C 5/46
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C21B 7/14

Discharging devices, e.g. for slag

Definition statement

This place covers:

Runners and their accessories (roofs, heating etc); also equipment for transporting said runners.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Charging or discharging liquid or molten material	F27D 3/14
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C21B 7/16

Tuyéres

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements of tuyeres	F27B 1/16
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C21B 7/20

with appliances for distributing the burden

Definition statement

This place covers:

All distribution means different from bell-and-hopper, i.e. including revolving chute.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transport or storage devices, including chutes, conveyor belts etc	B65G
Arrangements of devices for charging of shaft furnaces	F27B 1/20
Charging of particulate material	F27D 3/00
Charging directly from hoppers or chutes	F27D 3/10

C21B 7/22

Dust arresters

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Separation	B01D
Filtering elements	B01D 24/00 - B01D 35/34
Filtering material	B01D 39/00 - B01D 39/20
Cleaning of gases from solids	B01D 45/00 - B01D 53/96
Separating solids from solids by wet methods	B03B
Magnetic or electrostatic separation of solid materials from solid materials or fluids, separation by high-voltage electric fields	B03C
Centrifuges	B04B
Apparatus using free vortex flow, e.g. cyclones	B04C
Purifying or modifying the chemical composition of combustible gases containing carbon monoxide	C10K
Removal of waste gases or dust (from converter)	C21C 5/38
Offtakes or separating apparatus for converter waste gases or dust	C21C 5/40

C21B 7/24

Test rods or other checking devices

Definition statement

This place covers:

Covers any measuring, controlling or observation devices

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements of monitoring devices, of indicators, of alarm devices for shaft furnaces	F27B 1/28
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Arrangements of controlling devices	F27D 19/00
Arrangement of monitoring devices in furnaces, kilns, ovens or retorts	F27D 21/00
Specific investigation or analysing means of materials by determining their chemical or physical properties	G01N

C21B 13/00

Making spongy iron or liquid steel, by direct processes

Definition statement

This place covers:

Direct reduction processes obtaining either sponge iron or molten iron or steel.

Inventions which concern the treatment of the reducing gases, the solid reductant, the ores, the reduced iron or the addition of fluxes or the treatment of the ores in a fluidised bed or lead to attainment of molten iron or steel.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

General purpose Fluidised Beds	B01J 8/24 - B01J 8/44
General methods of reducing to metals: - by solid carbonaceous reducing agents;- by gases	C22B 5/10 , C22B 5/12
Fluidised bed furnaces	F27B 15/00 - F27B 15/20

Special rules of classification

When disclosed, the apparatus or group of apparatuses ([C21B 13/14](#)) in which the process takes place, should always be given a class

Details of apparatuses being part of the invention should be classified in the relevant apparatus class ([F27B](#), [F27D](#)) when possible.

C21B 13/10

in hearth-type furnaces

Definition statement

This place covers:

Also rotary-hearth furnaces.

C21B 13/12

in electric furnaces

Definition statement

This place covers:

Also using a plasma.

C21B 13/14**Multi-stage processes {processes carried out in different vessels or furnaces}****Definition statement***This place covers:*

Inventions in which different types of installations are used in sequence to arrive either at a solid or a molten product.

C21B 15/00**Other processes for the manufacture of iron from iron compounds (general methods of reducing to metal [C22B 5/00](#); by electrolysis [C25C 1/06](#))****Definition statement***This place covers:*

Also processes involving nuclear energy or a chloride process.

References***Informative references***

Attention is drawn to the following places, which may be of interest for search:

General methods of reducing to metals	C22B 5/00 - C22B 5/20
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